Integrated Resource Plan/

Electric Resource Plan

for

Tri-State Generation and Transmission Association, Inc.

Submitted to:

Western Area Power Administration
Colorado Public Utilities Commission

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Executive Summary

Introduction

In this filing Tri-State Generation and Transmission Association, Inc. (Tri-State) presents its Integrated Resource Plan/Electric Resource Plan ("Resource Plan"). This Resource Plan was developed to meet the Integrated Resource Planning requirements of the Western Area Power Administration ("Western") as described in 10 CFR part 905 (see Appendix G); and to satisfy the CPUC Decision No. C10-0101 (Docket No. 091-041E) (see Appendix F). This Resource Plan includes energy and demand forecasts, an evaluation of existing resources, analysis of reserve requirements, a description of the public process, scenario modeling and analysis, and an action plan. The evaluation of load and resource requirements is undertaken to satisfy the obligation of Tri-State to provide reliable and economic power to its Members and develop options to meet resource needs in a potentially carbon-constrained future.

This IRP also covers the following Western preference allocation recipients: Pueblo of Acoma, Pueblo of Laguna, Pueblo of Zuni, Ramah Navajo Chapter, To'hajiilee Chapter, Canoncito Band of Navajos, Ute Mountain Ute Tribe, Wind River Reservation, Nambe Pueblo, Pueblo of Jemez, Pueblo of Pojoaque, Pueblo of San Ildefonso, Pueblo of San Juan, Pueblo of Santa Clara, Pueblo of Zia, Pueblo of Taos, Picuris Pueblo, Southern Ute Indian Tribe, Mescalero Apache Tribe, Alamo Navajo Chapter, the Town of Frederick, Colorado, the City of Truth or Consequences, New Mexico and Schriever Air Force Base.

Tri-State has filed annual updates to the 2010 Resource Plan in accordance with the requirements of the CPUC and Western, and this document reflects the first "full" update to the 2010 Resource Plan.

Tri-State has elected to utilize a 20 year planning period and a six year resource acquisition period. The period covered by this plan is 2016 through 2035. The plan evaluates both supply-side and demand-side resources on an integrated basis.

As a part of the process to develop this Resource Plan, Tri-State held four public meetings and encouraged input from stakeholders. Based on this input, a list of resource planning scenarios was developed for detailed analysis. The results of the scenario analysis were presented at the third and fourth public meetings, and are detailed in this Resource Plan. Tri-State performed detailed modeling of nine scenarios that involved various load forecasts, retirement of coal-fired generation, different levels of energy efficiency (EE) and demand side management (DSM), the impact of federal tax support for renewable generation, varying forecasts of future gas and electricity energy prices, and a scenario with high levels of penetration of distributed solar generation with energy storage.

Discussion of the Clean Power Plan

On August 3, 2015, The Environmental Protection Agency (EPA), issued its Clean Power Plan (CPP) Final Rule , under Section 111(d) of the Clean Air Act, which introduces CO2 emission limits for existing electric generation facilities. It is anticipated that the final CPP will be published in the federal register this fall. Initial State Plans (SP) are required to be filed by September 2016 and require very basic input from states as ot how they are reaching out to communities and approaching development of a plan. A detailed report from the states to the EPA is required in September of 2017 that will address specifics of how compliance will be accomplished. It is likely that the several of the States that are relevant to Tri-State will take advantage of the two-year extension that is contemplated in the CPP, and so final SPs may not be complete until late 2018.

Because of the timing of the CPP, the development of the SPs and the required time to complete the analytical work to support this Resource Plan, Tri-State did not attempt to specifically model the projected impacts of the CPP and SPs. Clearly this action by EPA will have significant impacts on the nature of the generation fleet in the United States, and future resource decisions will be heavily impacted by the CPP. However this Resource Plan did not attempt to model the CPP impacts because the specific implementation implications remain unclear as of the time of this writing.

Discussion of Load Forecast

Tri-State typically completes an annual update to its load forecast in May of each year, and the work necessary to take the results of the load forecast and create computer data files suitable for use in simulation models is typically completed in June of each year. As a result of this schedule, Tri-State elected to use the load forecasts that were completed in 2014 in order to complete the analytical work provided in this Resource Plan in a timely manner and provide modeling results to stakeholders, the Tri-State Board of Directors, the Colorado Public Utilities Commission (CPUC), and to Western Area Power Administration (Western).

The one exception to this approach was use the load forecast that Tri-State completed in May of 2015 to produce the analysis that indicates when new generating capacity (or additional EE/DSM) will be needed. Tri-State believed that all parties would be best served by providing this information on a more current basis.

Discussion of Timing of the Need for Additional Resource

Figure 1 below shows the results of load/resource analysis based on the load forecast completed in 2015 and indicates that Tri-State has a need for new supply side or demand side resources by 2023.

This forecast is based on the "Base Case" or median forecast for Tri-State load growth, the retirement of the Tri-State share of the San Juan Generating Station by 12/31/2017, and the addition of new renewable generation that is under contract, but not yet constructed.

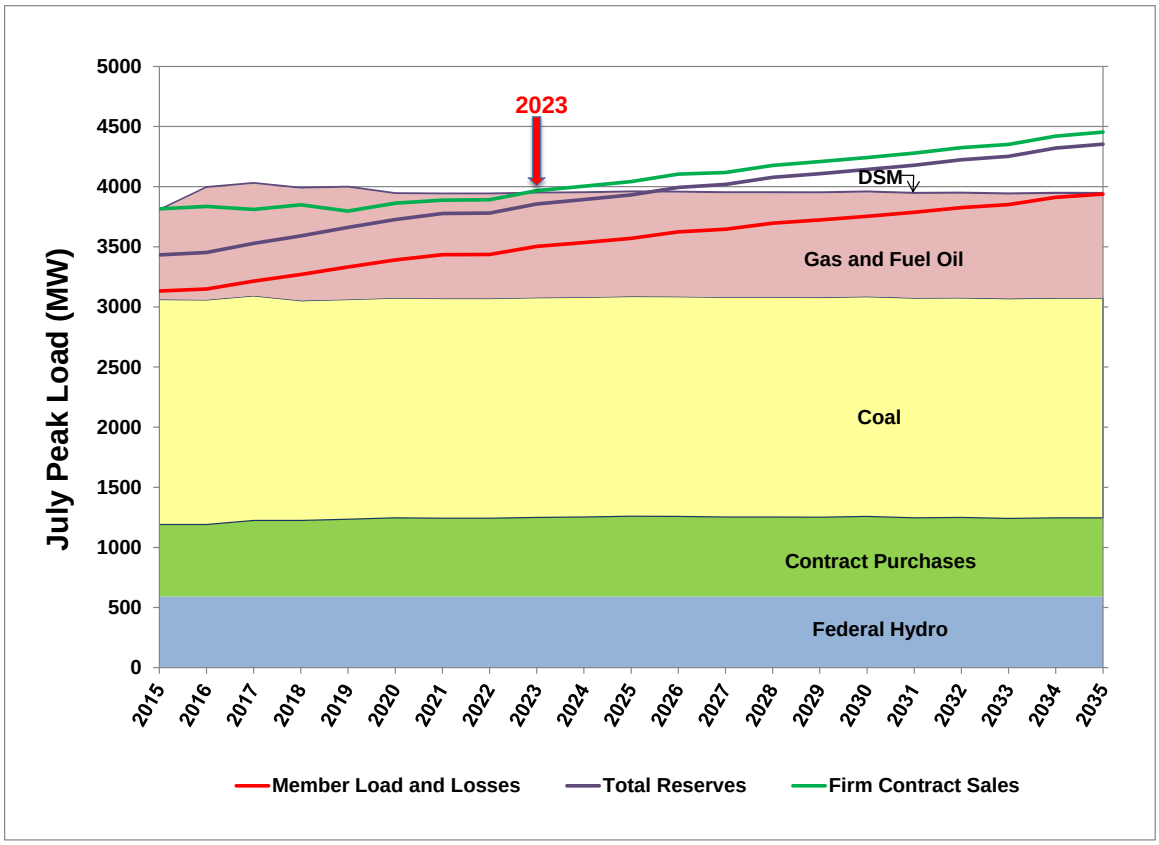


Figure 1

The forecasted need for new demand–side or supply-side resources occurs in approximately eight years, and consequently it is outside the six year resource acquisition period. Therefore, no specific actions related to supply-side resource acquisition are described in the Resource Plan, aside from generalized generation site development activities.

Discussion of Action Plan

The Tri-State action plan consists of the following six elements that are discussed in more detail in Section V - Resource Plan.

- Clean Power Plan and SPs Review and Evaluation
- Generation Planning and Development
- Transmission Planning and Development
- Possible Expansion of Renewable Energy Portfolio
- Refinement and Development of New EE and DR Products & Services
- R&D Programs and Projects via EPRI & CRN

Tri-State Board Approval

The Tri-State Board of Directors approved this Resource Plan at its regular board meeting of October 6-7, 2015. The executed Tri-State resolution is contained in Appendix F.

Section I - Resource Planning at Tri-State

1. Introduction

Tri-State's Board of Directors supports a balanced resource planning approach. The general resource planning approach continues to call for a portfolio of baseload generation, dispatchable resources, renewable resources, demand-side management program development, transmission development, and research and development activities.

Each year, following the development of the annual update to the Tri-State load forecast, Tri-State staff evaluates when existing generating resources will be unable to meet load requirements, including the effects of demand side management, energy efficiency (DSM/EE), losses and reserves. This analysis provides for a view of future capacity and energy needs. At the same time, Tri-State is continuously evaluating opportunities for transactions for economic purposes, risk minimization, fuel diversity, and regulatory compliance purposes. The acquisition of significant renewable resources under power purchase agreements since the completion of the last Resource Plan are evidence of this approach. The acquisition of the 270 MW natural gas combined cycle power plant now known as the JM Shafer Generating Station is also an illustration of this view of a continuous process involving resource planning.

2. Organization of this Document

The Resource Plan has been organized into five logical sections, followed by appendices. Additionally, references to specific CPUC ERP requirements are provided in the Table of Contents to help direct readers to specific sections that discuss compliance with those requirements. Also, reference to specific WAPA IRP requirements is provided in Table 1 below.

	WAPA IRP Requirements	Section
905.11(a)	1. Does the IRP evaluate the full range of alternatives for new energy resources.	IV.1 - 11
	2. Does the IRP provide adequate and reliable service to customers.	I.6
	3. Does the IRP take into account the following necessary features for system operation (i.e., diversity, reliability, dispatchability, other risks).	I.5 - 9
	4. Does the IRP take into account the ability to verify energy savings achieved thru EE.	V.e
	5. Does the IRP take into account the projected durability of such savings measured over time.	V.e
905.11(b)	6. Does the IRP treat demand and supply resources on a consistent and integrated basis.	IV
	7. The IRP must consider electrical energy resource needs. The IRP may, at the customers' option, consider water, natural gas and other energy resource options.	II.6 & III.5
	8. Does the IRP identify and compare resource options.	IV.11
	9. Does the IRP demonstrate that decisions were based on a reasonable analysis of the options.	IV.11
	10. Does the IRP include an action plan describing specific actions the customer will take to implement the IRP.	Exec. Summary & V.9
	11. Does the IRP list the time period that the action plan covers.	Intro & V.9
	12. Does the IRP contain an action plan summary consisting of actions the customer expects to take in accomplishing the goals identified in the IRP.	Intro & V.9
	13. Does the IRP minimize adverse environmental effects of new resources acquisitions.	IV.12 - 14
	14. Does the IRP include a qualitative analysis of environmental effects in a summary format.	IV.12 - 14
	15. Does the IRP provide ample opportunity for full public participation in preparing and developing the IRP.	Intro, I.3 and Appendix D & E
	16. Does the IRP include a brief description of public involvement activities.	Intro & I.3
	17. Does the IRP document that the MBA board approved the IRP, confirming all requirements have been met.	Appendix F
	18. Does the IRP contain the signature of the MBA board's responsible official or document passage.	Appendix F
	20. Does the IRP contain a brief description of measurement strategies for identified options to determine whether the IRP's objectives are being met.	IV & V
	21. Does the IRP identify a baseline from which the customer will measure the benefits of IRP implementation.	IV & V
	22. Does the IRP specify the responsibilities and participation levels of individual members of the MBA.	V.1

Table 1

3. Description of Public Process

For the 2015 ERP Tri-State had four public meetings at its headquarters in Westminster, CO. The first public meeting on February 25, 2015 was preceded by a public announcement on January 26, 2015 which was placed in The Denver Post, The Lincoln Journal Star, The Albuquerque Journal and the Wyoming Tribune Eagle .

During all four public meetings Tri-State allowed time for the public to ask questions and provide suggestions. Additionally, Tri-State provided an email address for use by the public to submit written questions.

The Tri-State presentations for all four public meetings are contained in Appendix D. Also, theresponses to all public comments are contained in Appendix D.

Verbal comments during the public meetings were answered directly by Tri-State staff.

The draft ERP report was placed on the Tri-State website on Friday, October 9th for public review and comment. As of October 28 no public comments have been received regarding the draft 2015 ERP Report.

4. A statement of the planning and resource acquisition periods that Tri-State has chosen, including a statement as to why such periods were chosen. (CPUC ERP Requirement 1)

Tri-State's resource planning process uses a 20-year planning period and a 6-year resource acquisition period. The planning period represents the modeling time horizon. The resource acquisition period represents the time period for which detailed plans for specific actions are outlined. Tri-State has selected a 20-year planning period based on several factors. First, the 20-year planning period is well coordinated with internal planning and forecasting methods and other external requirements. Second, Tri-State believes that the accuracy of various forecasts such as the price of natural gas, load growth rates and regulatory changes diminish significantly beyond this 20- year period, leading to questionable modeling results. Also, by selecting a 20-year planning period Tri-State will have the opportunity to evaluate and respond to changes in markets, technology, load trajectory and changes to the environmental and regulatory environment over time.

Tri-State has chosen a 6-year resource acquisition period. A 6-year resource acquisition period is appropriate to allow selection and implementation of various demand-side and resource-side actions. Six years is a time period sufficient to make substantial progress on selected actions that could include site development and permitting, initial design of conventional or renewable resources, or design and deployment of demand-side resources. Within the selected resource acquisition period, there is adequate time for competitive market assessments of resource expansion opportunities.

5. An assessment of need for additional resources (CPUC ERP Requirement 5).

> ***By comparing the electric energy and demand forecasts with the existing level of resources developed and planning reserve margins, Tri-State will assess the need to acquire additional resources during the resource acquisition period and the planning period.***

This assessment is discussed below for resource needs during the resource acquisition period, and is further discussed along with the scenario results for resources that are forecasted to be needed during the planning period.

6. Capacity/Energy Planning

Traditional utility planning requires that a comparison of demand forecasts, existing generation and purchase/sales commitments be developed to show a forecast for additional resources as required to maintain appropriate reserve margins.

The assumptions for the load/resource balance provided in Figure 1 are as follows:

- Total obligations is defined as firm load, losses, firm contract sales, operating reserves, and planning reserves
- All existing purchase and sales contracts are assumed to expire on their terms (except for the Western Area Power Administration purchases which are assumed to extend through the 20-year planning horizon)
- San Juan Unit 3 will be retired by December 31, 2017, resulting in a loss of 40 MW of capacity
- No spot purchases or sales are included
- Updated DSM forecast based on actuals since 2010 with DSM growth flat for the planning period.
- Renewable capacity assumptions are as described later in this section

Figure 2 below supplements the information from Figure 1 by including the results for the high and low economic load growth scenarios and indicates approximate dates when new resources could be needed.

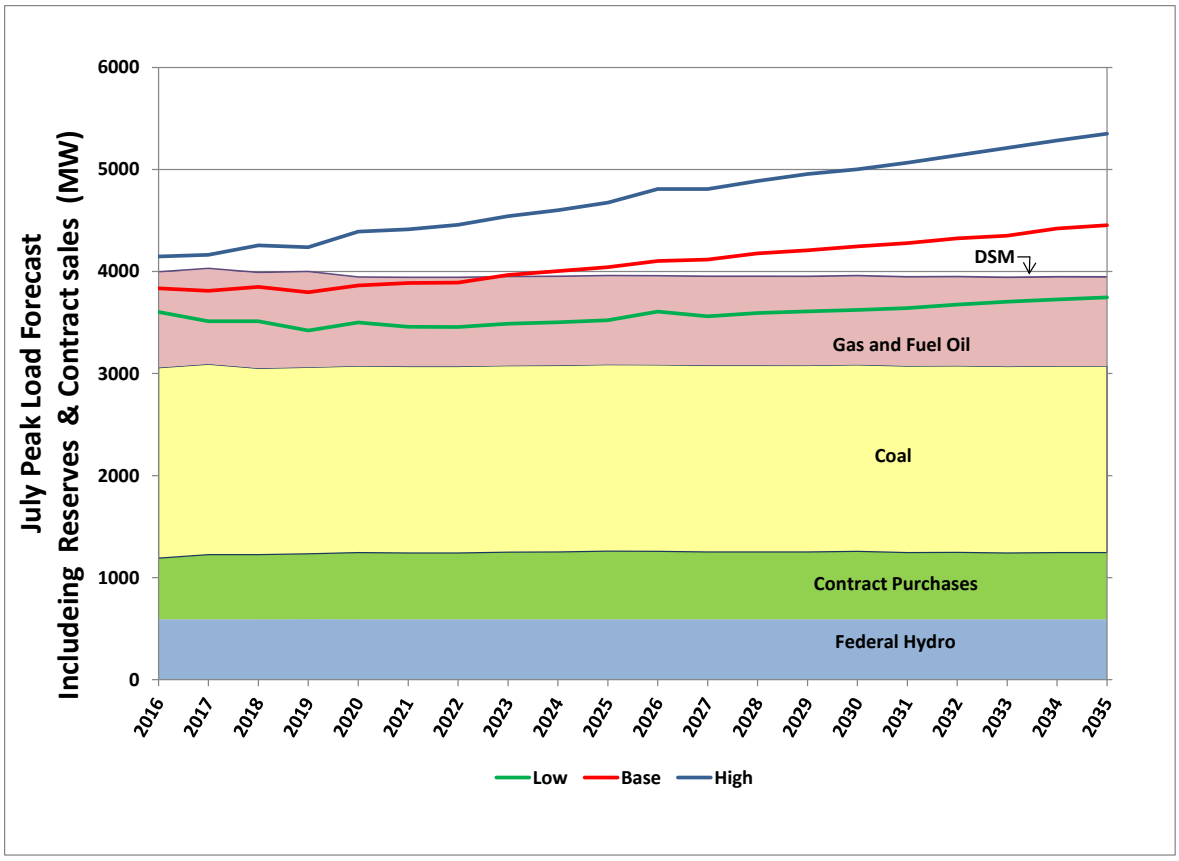


Figure 2

It is important to note that other factors may drive the need for additional generation. First, early retirements of existing generation due to regulatory or economic effects could accelerate the need for additional generation. Second, limitations on fleet-wide carbon emissions (i.e. a "carbon cap") may require new generation to facilitate fuel switching from coal to gas and renewable generation. Finally, for some scenarios, where high levels of intermittent renewable generation are developed, additional generation may be required to provide regulation and maintain an operable system. This generation requirement is typically met by reciprocating engines, gas turbines or combined-cycle gas with favorable dispatchability characteristics. Also, the need for new generation could be delayed by lower load growth or power purchases.

Between now and 2023 several power sales agreements will expire, and Tri-State plans to take advantage of this capacity and energy to serve member load growth.

To determine the amount of capacity that intermittent resources should be allocated at the time of peak load, the following methods and results were used in this Resource Plan. For both solar and wind renewable resources the output during Tri-State's top 10 peak hours in 2014 were determined. The wind and solar output during these top 10 peak hours was averaged to

determine the capacity credit for solar and wind resources. Using this method, solar resources received a capacity credit of 25% and wind resources received a capacity credit of 5%.

7. Renewable Energy Standards

Tri-State and its Members are required to comply with Colorado Renewable Energy Standard (RES) and the New Mexico Renewable Portfolio Standards (RPS). The Colorado RES currently requires that 6% of retail energy sales be served by renewable generation, growing to a 20% level in 2020. Similarly, the New Mexico RPS currently requires that 5% of retail energy sales be served by renewable sources, growing to a 10% level by 2020.

With the addition of significant renewable generation to the Tri-State fleet since the 2010 IRP, Tri-State and its Members plan to be in full compliance with the Colorado RES and New Mexico RPS by 2020.

Figure 3 below shows the growth in Tri-State's renewable portfolio from contracted new renewable power purchase agreements that Tri-State and its Members have executed since 2010 .

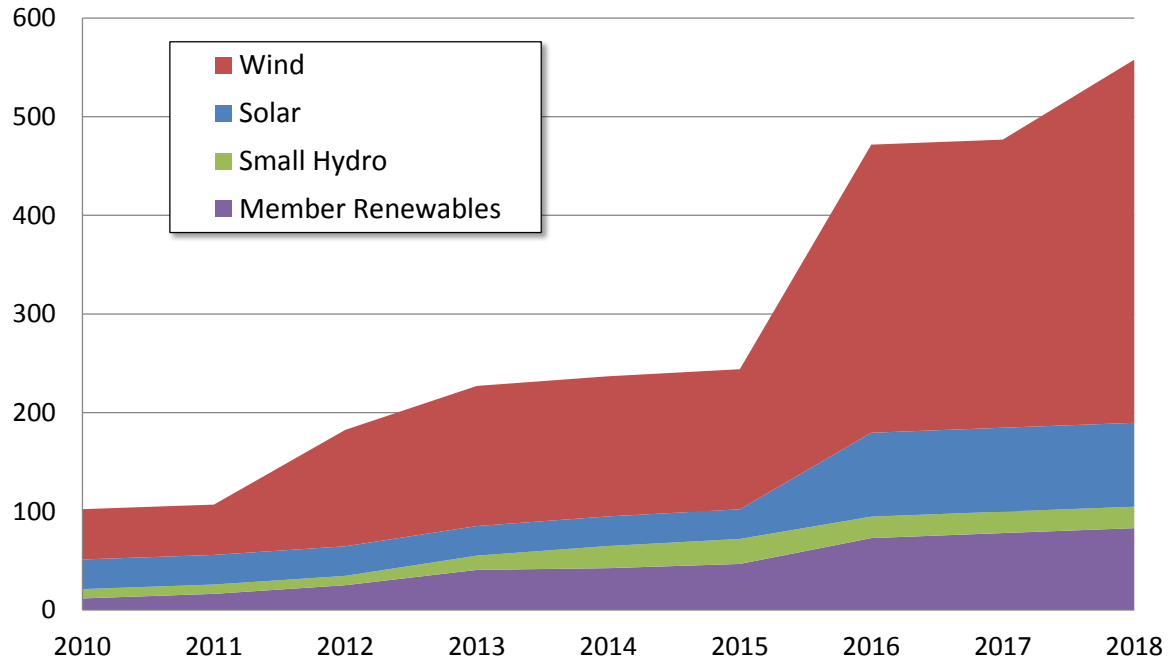


Figure 3

When assessing Tri-State's system with a median load forecast, Tri-State projects a need for additional capacity by 2021 (2023 using the updated 2015 load forecast). For the ERP, various scenarios were developed to project the timing and preferred technology of the resource(s).

Using current projections for key variables such as the price of natural gas, load growth, the cost of renewable generation, and capital costs for new conventional and renewable generation, the planning models consistently indicate that the preferred resources for the planning period will be a combination of natural gas and wind generation and demand-side resources.

Tri-State is positioning itself to have viable options to meet future needs that will include various alternatives such as natural gas-fired generation, renewable generation and demand side resources. No decisions have been made at this time as to the timing, technology, magnitude or location of new generation projects.

8. An explanation of how Tri-State coordinates and plans to coordinate (i) its operations and (ii) its plans to acquire new generation resources and transmission facilities with other utilities (CPUC ERP Requirement 15).

(i)

Tri-State has a proven history of participating in coordinated operation of the electric power system, and is committed to continuing these efforts.

Tri-State operates a power system that is geographically dispersed over a large region. As a result, Tri-State has historically integrated its operations with the operations of other utilities and will continue to do so in the future. Because of Tri-State's low load density and the large geographic footprint, the degree of Tri-State's physical and operational coordination is substantial, and this situation in not likely to change in the future.

Tri-State owns substantial transmission assets and is a transmission provider (i.e. sells transmission service to others). Tri-State is also a customer of transmission and control area services from other utilities including Platte River Power Authority, PacifiCorp, Public Service Company, PNM, WAPA, the City of Farmington, NPPD, Black Hills (Colorado), Tucson Electric Power Company and others. As a customer of network transmission service, Tri-State is party to numerous operating agreements and procedures that entail coordinated operation of the power system.

Tri-State has load and/or generation in five control areas. Tri-State participates in both the Rocky Mountain Reserve Group and the Southwest Reserve Sharing Group. Tri-State is a member of the Rocky Mountain Power Pool, Western Electricity Coordinating Council, and the North American Electric Reliability Corporation. Tri-State participates in regional system operator training and black-start efforts. Tri-State participates in daily operational status calls facilitated by the Rocky Mountain / Desert South West Peak Reliability Coordinator.

As Tri-State adds additional solar and wind resources to its generation portfolio, it continues to engage balancing authority operators to develop arrangements whereby Tri-State can utilize its generating assets to provide real-time balancing capabilities. For example, Tri-State and Western have an arrangement in place that allows Western the ability to re-dispatch Tri-State generating facilities to support balancing authorities' needs.

This arrangement and similar arrangements will mature and evolve with time as the economic conditions change and as the balancing authorities' needs change over time. It is very likely that Tri-State will offer additional dispatch, load following and regulation services in the future and across the system. Tri-State also optimizes the dispatch of conventional and renewable generation by implementing hourly energy transfers from region to region depending on needs and economic conditions.

Tri-State operates a power system that is geographically dispersed and as a result, has historically integrated its operations with the operations of several other utilities. Because of Tri-State's low load density and the large geographic footprint, the degree of Tri-State's physical and operational coordination is substantial, and this situation is not likely to change in the future.

Tri-State owns substantial transmission assets and is a transmission provider (i.e. sells transmission service to others). Tri-State is also a customer of transmission services from other utilities. As a provider and customer of network transmission service, Tri-State is party to numerous operating agreements and procedures that entail coordinated operation of the power system.

(ii)

Tri-State has historically participated in the development of generation projects with other utilities when the timing, location and economic factors are favorable. For example, Tri-State is a participant in the jointly-owned Missouri Basin Power Project (Laramie River Station and related transmission), the San Juan Station, and the Yampa Project (Craig Units 1 and 2 and related transmission). Tri-State is also the operator of the Yampa Project generation (Craig Units 1 and 2). Tri-State is the partial owner of Springerville Unit 3, which is one unit of a four-unit plant operated by Tucson Electric Power Company. Tri-State owns and operates the JM Shafer Generating Station and sells a portion of the plant capacity to Xcel Energy under a tolling agreement.

Tri-State has also executed bilateral transactions with other utilities that are based on generating units that allow the parties to optimize the use of generation assets. Transactions of this type have been executed involving generation assets at the Craig Station, Laramie River

Station, the R.D. Nixon plant, Nucla, Brush, Rawhide, JM Shafer Generation Station Pyramid Generation Station, Limon Generating Station , and Knutson Generating Station.

Tri-State and other utilities have adopted competitive bidding processes. This process does not always lend itself to joint development of projects; however, bidding can be and has been used to introduce new projects to potential participants. Tri-State continues to monitor the status of generating resources that are under contract to other utilities and may become available for Tri-State purchase or lease.

Tri-State has participated in a number of efforts associated with the development of new generation assets such as the solar energy consortium in New Mexico involving PNM, Xcel Energy, and El Paso Electric. Tri-State has participated in research and development efforts for Integrated Combined-Cycle Gasification ("ICCG") plants. Tri-State remains committed to working toward regional development of generation projects with other utilities when practical. Tri-State continues to have discussions with developers and other entities to evaluate expansion options for existing renewable and conventional generating plants.

For the acquisition of new resources, Tri-State generally favors the use of the Request For Proposal ("RFP") process to provide maximum value to Tri-State's Members. In this process, Tri-State includes "self-build" options and analyzes these options against market opportunities. While Tri-State is not currently engaged in an RFP process to procure new resources, Tri-State continues to conduct comprehensive discussions with regional utilities and independent generation owners and developers throughout the region. These discussions range from evaluations of possible expansion of existing renewable and conventional generators, to purchase and sale opportunities, to joint development efforts such as build-transfer arrangements. Based on the 2014 RFP bids , Tri-State believes it has the ability to expand existing wind and solar generation facilities in Colorado and surrounding states.

Based on these discussions and formal and informal offers that have been tendered to Tri-State, we believe that the scalability of renewable generation facilities provides economic benefits comparable to those attained through joint development efforts. As a part of any future RFP, Tri-State plans to follow the practices established in past RFPs, namely to encourage entities to bid creative, cost effective concepts that often include joint development, purchase/sales opportunities for existing facilities or expansion of existing facilities.

Tri-State is an active member of the Colorado Coordinated Planning Group, the Southwest Area Transmission Planning Group and WestConnect. These organizations provide the framework for regional and sub regional planning among the region's transmission providers. Tri-State supports the "WestConnect Objectives and Procedures for Regional Transmission Planning For the WestConnect Planning Area."

Tri-State holds open public transmission planning meetings each year to allow customers, interconnected utilities, regulatory and state bodies and other stakeholders to participate in the development of the Tri-State transmission plan. The public meetings provide a forum

whereby electric transmission stakeholders can comment and provide advice to Tri-State during the planning process.

Tri-State routinely collaborates with other regional transmission providers and interested potential transmission owners or users in planning and building its transmission system. Through collaboration of this nature, Tri-State and its neighboring transmission providers seek to balance optimization of the regional transmission system with their load serving obligations. The above examples are indicators of the successful nature of this approach.

Tri-State's transmission planning process is intended to facilitate the timely and coordinated development of transmission infrastructure that both maintains system reliability and meets customer needs, while continuing to provide reliable low cost electric power to its member cooperatives.

The Tri-State planning process includes an annual open planning meeting to permit all interested parties, including network and point-to-point transmission service customers, interconnecting neighboring transmission providers, regulatory agencies, and all other Stakeholders, to provide input into and comment on Tri-State's transmission plan.

Tri-State coordinates its planning process with other transmission providers and Stakeholders at the regional and sub regional levels of the Western Interconnection through its active participation in the Colorado Coordinated Planning Group (CCPG), the Southwest Area Transmission Planning (SWAT) group, membership in WestConnect, and membership in the Western Electricity Coordinating Council (WECC).

9. An explanation of the planning risks that Tri-State faces (CPUC ERP Requirement 14).

> ***Tri-State will include in the explanation how it has assessed such risks under different assumptions of future resource costs, fuel prices, environmental and other regulation, including regulation of greenhouse gas emissions, and other variables. Tri-State will also include whether it has plans to mitigate such risks and, if so, will identify such plans.***

For Tri-State and virtually every other electric utility in the United States, the Clean Power Plan presents new and unique risks. Because the CPP does not provide a uniform and clear implementation pathway, and because there is a real probability the implementation plans will vary by State, the viability of various generators could be put at risk. Additionally, the ability to meet the system peak and maintain system reliability could become a concern.

The CPP also presents deliverability risk. The integrated transmission and generation systems that are in place today are the result of decades of planning, design and construction efforts. If the CPP results in the loss of significant baseload generation, it is unclear what type of resource will be able to fill that role, in the right location, in an uncertain regulatory environment. Because Tri-State moves significant amounts of power across state lines, and if the state implementation of the CPP were to require the shutdown of certain key power plants, reliability could be threatened in adjoining states.

For resource planning purposes Tri-State uses scenario analysis reflecting varying resource costs, load growth rates, commodity prices, coal plant retirements, high levels of EE/DR, PTC/ITC extension, and behind the meter solar with storage. The use of scenario planning gives Tri-State the ability to weigh future outcomes beyond a business-as-usual perspective. If many scenarios reflect a benefit to a particular resource planning strategy due to future risks, Tri-State will use that information to inform its future resource decisions.

To look at future resource costs Tri-State included multiple potential resource options in its scenario modeling (see Table 1 in Section III). The expansion planning model found economically optimized solutions to Tri-State's future capacity and energy needs. As generation capacity and operation costs change the modeling process will reflect the change in system economics over time. In addition to differing types of generation, Tri-State simulated the effect of commodity price fluctuations in future scenarios.

The mitigation of all of the risks described will be evaluated as conditions change through time. Tri-State does not believe that any of these potential risks will have a significant effect during the 6-year resource acquisition period. During the 20-year planning period, growth, regulatory and carbon risks are the most significant risks and will need to be considered in the resource plan.

Tri-State has evaluated a number of new, evolving and potential environmental regulations that could increase costs for the existing Tri-State coal generation fleet. To the extent new requirements are known and relatively certain, the associated capital and operating expenses are included in Tri-State budgets and long range economic forecasts. Tri-State continues to evaluate the viability of all generation technologies in response to changing conditions including market pricing, replacement costs, operating costs, and environmental regulation.

10. <u>An explanation of any policies or regulations relating to resource planning (i) implemented by states other than Colorado in which Tri-State provides electricity to Members and (ii) implemented by agencies of the federal government of which Tri-State seeks the public and the Commission to be aware of in their review of Tri-State's resource plan (CPUC ERP Requirement 21).</u>

(i)

Tri-State's Members are required to meet the New Mexico Renewable Energy Standard discussed earlier. This mandate requires that Tri-State's New Mexico Members supply 5% of retail sales from renewable sources by 2015. The renewable energy standard increases by 1% each year until it reaches 10% in 2020.

(ii)

Tri-State is required to file an Integrated Resource Plan with the Western pursuant to 10 CFR Part 905 "Energy Planning and Management Program; Integrated Resource Planning Approval Criteria." Tri-State is anticipating filing its IRP, which will be essentially the same plan as is being submitted to the Colorado PUC, no later than February 15, 2016.

Section II - Existing System and Forecasts

1. Existing transmission capabilities and future needs (CPUC ERP Requirement 13, a & b).

a. Tri-State will report its existing transmission capabilities and future needs during the planning period for facilities of 115 kilovolts and above, including associated substations and terminal facilities. Tri-State will generally identify the location and extent of transfer capability limitations on its transmission network that may affect the future siting of resources. With respect to future needs, Tri-State will explain the need for facilities based upon future load projections (including reserves). To the extent reasonably available, Tri-State will include a description of the length and location of any facilities needed, their estimated costs, terminal points, voltage and megawatt rating, alternatives considered or under consideration, and other relevant information.

b. Tri-State will report on how it has considered the effect of its transmission system and plans for new transmission facilities on the siting of renewable resources and new clean-energy technology facilities.

Each year, Tri-State develops a 10-year transmission plan that assesses future transmission needs to serve load and integrate generation resources. The transmission component of this plan is developed in conjunction with WestConnect and the Colorado Coordinated Planning Group (CCPG), the regional transmission planning organizations recognized by the Western Electricity Coordinating Council (WECC). As part of the Colorado Public Utilities Commission (CPUC) Rule 3627, Tri-State files its 10-year transmission plan with the Commission. CPUC Rule 3627 requires that government agencies and other stakeholders have an opportunity for meaningful participation in the planning process. Tri-State's plan was included in a coordinated transmission plan report together with the transmission plans of Public Service Company of Colorado and Black Hills Energy. The utilities' joint 10-year transmission plan report is posted on Tri-State's web site.

Refer to Appendix B for a listing of all of the current and planned projects in Tri-State's 2016-2025 Ten-Year Transmission Capital Construction Plan.

2. An Evaluation of Existing Resources (CPUC ERP Requirement 3)

Tri-State will describe its existing generation resources, all generating facilities for which the utility has obtained a CPCN from the Commission pursuant to 40-5-101, C.R.S., at the time the plan is filed, and existing or future purchases from other utilities or non-utilities pursuant to agreements effective at the time the plan is filed. The description will include, where applicable, the following:

a. Name(s) and location(s) of Tri-State-owned generation facilities.
b. Rated capacity and net dependable capacity of Tri-State-owned generation facilities.
c. Fuel type, heat rates, annual capacity factors and availability factors projected for Tri-State-owned generation facilities over the planning period.
d. Emission rates (in pounds per MWh) and total tons per year of sulfur dioxide, nitrogen oxides, particulate matter, mercury and carbon dioxide.
e. Estimated in-service dates for generation facilities for which a CPCN has been granted to the utility but which are not in service at the time the plan under consideration is filed with the Commission.
f. Estimated remaining useful lives of existing generation facilities without significant new investment or maintenance expense.
g. The amount of capacity and/or energy purchased from utilities and non-utilities, the duration of such purchase contracts and a description of any contract provisions that allow for modification of the amount of capacity and energy purchased pursuant to such contracts.
h. The amount of capacity and energy provided pursuant to wheeling or coordination agreements and a description of any contract provisions that allow for modification of the amount of capacity and energy provided pursuant to such wheeling or coordination agreements.
i. The amount of capacity and/or energy sold to other utilities, the duration of such sales contracts and a description of any contract provisions that allow for modification of the amount of capacity and energy sold pursuant to such contracts.
j. The percentage of kilowatt-hours generated by each fuel used by the utility on its existing system, for the latest year for which such information is available.
k. For each existing supply-side resource on its system, the amount of water consumed per MWh of electricity produced and the total annual amount of water consumed.

The above requirements are discussed in Sections 3, 4 and 5 below.

3. Existing Generation Resource Assessment

In the following discussion of unit characteristics, Tri-State considers the rated capacity and net dependable capacity to be synonymous except in the case of combustion turbines that experience capacity reductions due to high temperature ambient conditions during summer months and intermittent solar and wind generation. With proper maintenance, all of Tri-State's generating resources have an expected life of more than the 20-year period that Tri-State has selected as the Planning Period (see Table 2 below). However, the actual economic life of the resources will be determined by on-going evaluations of continuing operation compared to alternatives. The capacity factors discussed in the individual evaluations are representative of past experience and future expectations of performance. The emission and water usage data presented in the report is based on average historic emissions rates and water consumption rates multiplied by the forecasted plant energy production. Actual emissions and water consumption will vary from the forecast due to plant generation, overall portfolio mix and regulatory constraints.

Figure 4 below depicts the source of Tri-States 2014 energy sales to its member-owners. Figure 5 below depicts Tri-State's 2014 capacity as a function of generation source.

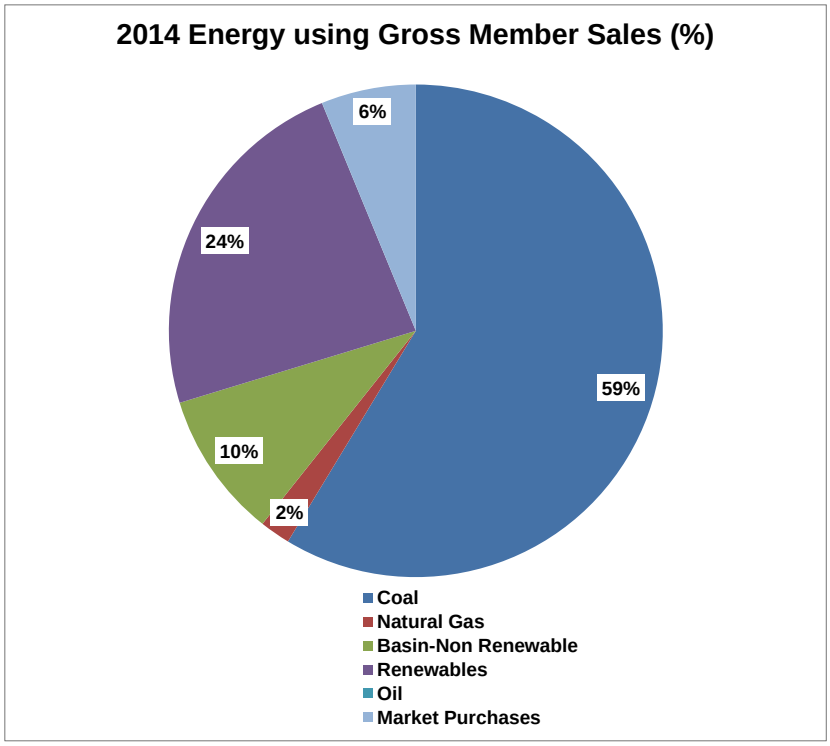


Figure 4

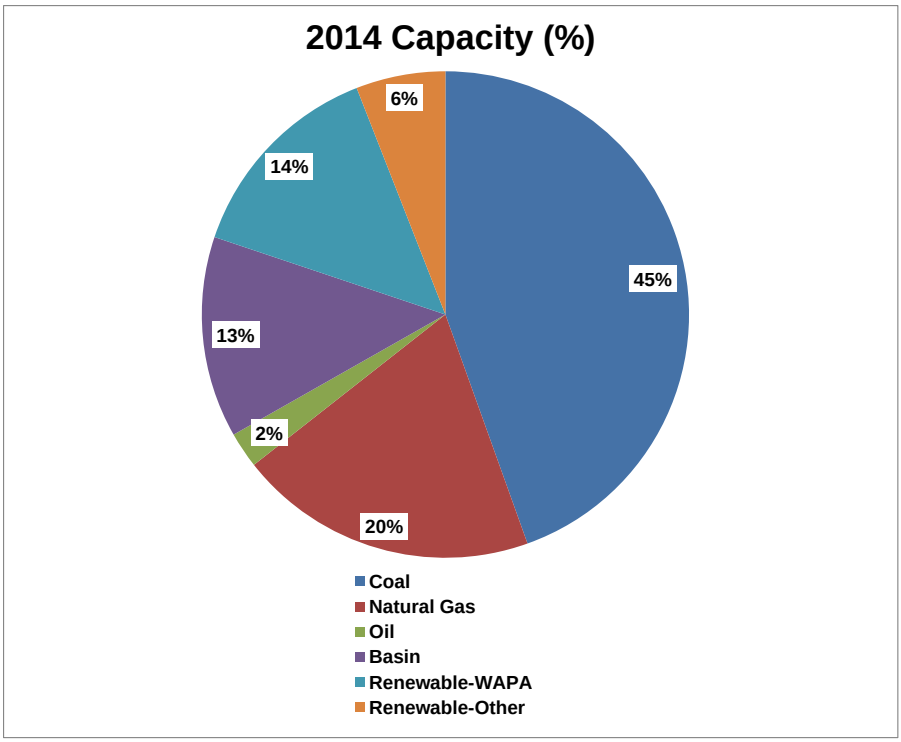


Figure 5

In 2014, Tri-State's total sales to its members was 18,699GWh. Of this total 10,970GWh was generated by coal, 4,397GWh was generated by renewables including federal hydro, 1,797GWh was generated by Basin, 1,159GWh was from market purchases, 374GWh was generated by natural gas and 2GWh was generated by oil.

a. Missouri Basin Power Project (Laramie River Station)

The Missouri Basin Power Project (MBPP) generating facilities consist of three coal-fired, steam electric generating units (the Laramie River Station) near Wheatland, Wyoming. Following Unit 2 and 3 turbine rebuilds in 2012-2013, the project currently has a net capacity output of 1,710 MW, with Unit 1 rated at 570 MW, Unit 2 rated at 570 MW, and Unit 3 rated at 570 MW. The projected net heat rate is 10,350 Btu/kWh, with a capacity factor of 90 percent and availability factor of 90 percent; this is assumed to degrade by 5% between 2020 and 2029. As a participant in the MBPP, Tri-State owns 24.13 percent (413 MW) of the project, with the remaining 75.87 percent (1,297 MW) split among five other participants. Unit 1 is dedicated to the East Side electrical grid and Units 2 and 3 are dedicated to the West Side grid. For scheduling purposes, Tri-State is allocated 206 MW from LRS 2 and 207 MW from LRS 3.

The average emission rates and water consumption rates used in this Resource Plan are shown below each unit description.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
LRS 2	2287	1.269	2.053	.0000411	.0953	.036	576
LRS 3	2502	2.074	2.59	.0000468	.177	.036	576

b. Yampa Project (Craig Station Unit 1 and Unit 2)

The Yampa Project generating facilities consist of two coal-fired, steam electric generating units near Craig, Colorado. The project has a net capacity output of 856 MW, with each unit rated at 428 MW. Craig Unit 1's projected net heat rate is 10,100 Btu/kWh, with a capacity factor of 83 percent and availability of 92 percent; this is assumed to degrade by 5% between 2020 and 2029. Craig Unit 2's projected net heat rate is 10,100 Btu/kWh, with a capacity factor of 83 percent and availability of 92 percent. To meet the Regional Haze CIP NO_x requirement, a Selective Catalytic Reduction (SCR) will be installed on Craig Unit 2 by the compliance deadline. As a participant in the Yampa Project, Tri-State owns 24 percent (206 MW) of the project, with the remaining 76 percent (650 MW) split among four other participants.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Craig 1	2214	.615	2.931	.0000017	.0421	.00209	489
Craig 2	2235	.590	2.955	.0000014	.0469	.00210	489

c. Craig Station Unit 3

The Craig Station Unit 3 generating facility is a coal-fired, steam electric generating unit that is co-located with the Yampa Project. The unit has a net capacity of 448 MW. Its projected net heat rate is 10,050 Btu/kWh, with a capacity factor of 83 percent and availability of 94 percent; this is assumed to degrade by 5% between 2020 and 2029.

To meet the Regional Haze CIP NO_x requirement, Selective Non-Catalytic Reduction (SNCR) will be installed on Craig Unit 3 by the compliance deadline.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Craig 3	2102	1.163	3.048	.0000078	.0614	.0304	489

d. San Juan Station

The San Juan generating facility is a coal-fired, steam electric generating station consisting of four units located near Farmington, New Mexico. Tri-State owns 8.2 percent or 40 MW of San Juan 3, which is rated at 500 MW. Tri-State has announced it will retire its 40 MW no later than December 31, 2017. Until 2017, its projected net heat rate is 11,600 Btu/kWh, with a capacity factor of 85 percent and equivalent availability of 70 percent.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
San Juan 3	2333	1.007	3.035	.000001	.043	.035	594

e. Escalante Generating Station

The Escalante generating station is a coal-fired, steam electric generating station located near Grants, New Mexico. The station is rated at 245 MW. Its projected net heat rate is 10,300 Btu/kWh with a capacity factor of 77 percent and availability of 93 percent; this is assumed to degrade by 5% between 2020 and 2029.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Escalante	2411	1.339	3.920	.000009	.0275	.036	675

f. Nucla Station

The Nucla generating facility is a coal-fired, steam electric generating unit near Nucla, Colorado. The station is rated at 100 MW. The unit has a circulating fluidized bed boiler that provides steam for several turbine/generators. Its projected net heat rate is 11,800

Btu/kWh, with a capacity factor of 61 percent and an availability of 79 percent; this is assumed to degrade by 5% between 2020 and 2029.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Nucla	2671	4.182	4.177	0.0000002	.2163	.032	879

g. Springerville Unit 3

Springerville Station Unit 3 is a coal-fired, steam electric generating unit located near Springerville, Arizona, at the existing Springerville Generating Station. Unit 3 is rated at 418 MW. Its projected net heat rate is 10,000 Btu/kWh with an availability of 93 percent and 78 percent capacity factor.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Springerville 3	2075	.679	.694	.000016	.0306	.034	554

h. Burlington Generating Station

The Burlington generating facility consists of two oil-fired combustion turbine units near Burlington, Colorado. The station has a net summer capacity output of 100 MW, with each unit rated at 50 MW. Winter net capacity is 120 MW, with each unit rated at 60 MW. As is the case for all Tri-State simple-cycle turbines, the station is primarily used for peaking power and emergency generation, and the historical capacity factors have been less than 5% and the starting availability is been greater than 95%. The expected station net heat rate, based on past operation, is 11,300 Btu/kWh at full load.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Burlington 1	2212	.206	11.907	N/A	.162	.0054	85
Burlington 2	2086	.182	11.239	N/A	.153	.0051	85

i. Pyramid Generating Station

The Pyramid generating facility is a dual-fuel, simple-cycle, combustion turbine facility located near Lordsburg, New Mexico. The station consists of four General Electric LM6000 combustion turbines that can run on natural gas or fuel oil and are rated at 40 MW each for a net dependable plant output of 160 MW year round. The net heat rate of these units is 9,600 Btu/kWh on natural gas at full load operation. The historical capacity factors of these units have been less than 10% and the starting reliability of the units is greater than 95 percent.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Pyramid 1	1267	.013	1.400	N/A	.071	.021	323
Pyramid 2	1248	.017	1.252	N/A	.072	.019	323
Pyramid 3	1282	.012	1.259	N/A	.072	.020	323
Pyramid 4	1168	.006	1.087	N/A	.065	.020	323

j. Rifle Generating Station

The Rifle generating station is a combined-cycle, gas-fired combustion turbine facility located near Rifle, Colorado. The station consists of three General Electric MS5001 combustion turbines each rated at 15 MW, and one 40 MW Westinghouse steam turbine, for a total net dependable plant output of 85 MW. The station has a net summer capacity of is 77MW. The net heat rate of the facility at full load conditions is 11,700 Btu/kWh. The average historical capacity factor of Rifle has been less than 10%. .

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Rifle	1206	.00063	2.099	N/A	.239	.227	626

k. Limon Generating Station

The Limon generating station is a simple-cycle, dual-fuel, combustion turbine facility located near Limon, Colorado. The station consists of two General Electric 7EA combustion turbines, which can run on natural gas or fuel oil, with a rated and net dependable output of 77 MW each, for a station output of 154 MW. The station has a net summer capacity of is 128MW.

The expected net heat rate of the facility at full load conditions is 10,600 Btu/kWh on natural gas. The historical capacity factor of Limon has been less than 10%, and the starting reliability of the units is greater than 95 percent.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Limon 1	1538	.008	.341	N/A	.0616	.0010	38
Limon 2	1504	.008	.358	N/A	.0625	.0008	38

l. Knutson Generating Station (formerly Brighton Generating Station)

The Knutson generating station is a simple-cycle, dual-fuel, combustion turbine facility located near Brighton, Colorado. The station consists of two General Electric 7EA combustion turbines that can run on natural gas or fuel oil, with a rated and net dependable output of 77 MW each, for a station output of 154 MW. The station has a net summer capacity of is 128MW. The net heat rate of the facility at full load conditions is 10,600 Btu/kWh. The historical capacity factor of the Knutson units has been less than 10% and the starting reliability of the units is greater than 95 percent.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Knutson 1	1535	.0085	.387	N/A	.1237	0.000	22
Knutson 2	1549	.0098	.415	N/A	.1237	0.000	22

m. J.M. Shafer Generating Station

In 2011, Tri-State purchased the J.M. Shafer combined-cycle power plant located in Fort Lupton, CO. It was formerly known as Thermo-Cogen Partners. Tri-State will receive 150 MW of capacity and energy until June 30, 2019. Starting July 1, 2019 Tri-State will receive all 272 MW of output from JM Shafer.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
J.M Shafer	1554	0.0078	1.651	N/A	.0804	.0694	357

Table 2 below shows the current estimated end of useful life for all of Tri-State's thermal stations.

Plant	Completed By	Date of Study	In-Service Date	End of Life
Burlington	R.W. Beck	Jan-10	1977	2053
Craig 1	R.W. Beck	Jan-10	1980	2052
Craig 2	R.W. Beck	Jan-10	1979	2053
Craig 3	R.W. Beck	Jan-10	1984	2056
Escalante	R.W. Beck	Jan-10	1985	2057
LRS 1	Burns & McDonnell	Aug-15	1980	2040
LRS 2	Burns & McDonnell	Aug-15	1981	2041
LRS 3	Burns & McDonnell	Aug-15	1982	2042
Nucla	R.W. Beck	Jan-10	1987	2050
Rifle	R.W. Beck	Jan-10	1987	2035
San Juan #3	Stone & Webster	Oct-02	1979	2032
Limon	R.W. Beck	Jan-10	2002	2050
Knutson	R.W. Beck	Jan-10	2002	2050
Pyramid	R.W. Beck	Jan-10	2003	2051

Table 2 – End of Useful Life for Tri-State's Thermal Stations

4. Capacity/Energy Purchases

In addition to the generating resources it owns, Tri-State purchases power and energy from a number of other entities, most notably from Basin Electric Power Cooperative and Western.

a. Firm Power Purchases

Firm power purchases are supply-side resources that cannot be cut by the supplier based on economics, and are generally only curtailed during periods of system disturbances.

1. Western Loveland Area Projects Firm Power Contract

   Tri-State has an allocation of firm federal power from the Western Loveland Area Projects (Western-LAP) resources, which include the Western Division of the Pick-Sloan Missouri Basin project and the Fryingpan-Arkansas project.

The purchase of capacity and energy under the Western-LAP allocation is covered by Tri-State Contract No. TS-89-0002 (Western Contract No. 87-LAO-134), which expires on September 30, 2024. In addition, Tri-State entered into a new contract (Tri-State Contract No. TS-14-0238, Western Contract No. 14-RMR-2535) with Western for the purchase of Western-LAP capacity and energy, October 1, 2024 through September 30, 2054. Tri-State's total allocation of Western-LAP firm power is delivered to Points of Delivery in five areas in Colorado, Wyoming, and Nebraska. Each area is assigned a portion of the LAP allocation. Tri-State may request a change in Points of Delivery or amounts allocated to each area. Western will make a determination of the impact on its system prior to approving changes. The maximum capacity entitlement for the summer season is 349 MW, while for the winter season it is 285 MW. Maximum annual energy entitlement is 894 GWh, which equates to an annual load factor of approximately 29 percent.

2. Western Salt Lake City Area Integrated Projects Firm Power Contract

Tri-State also has allocations of firm federal power from the Western Salt Lake City Area Integrated Projects (Western-SLCA/IP) resources, which include the Colorado River Storage Project, Collbran and Rio Grande projects. This includes both the former Plains Western-SLCA/IP allocation, Tri-State Contract No. PL-89-0002 (Western-SLCA/IP Contract No. 87-SLC-0025), and the original Tri-State Western SLCA/IP allocation, Tri-State Contract No. TS-89-0005 (Western-SLCA/IP Contract No. 87-LAO-172). The terms of both contracts are through September 2024.

The sustainable energy deliveries under the Western-SLCA/IP firm power contracts have previously been reduced to reflect hydrological conditions and the effects of drought. These sustainable energy deliveries are to remain constant for the remainder of the contract term. The maximum guaranteed capacity entitlement in the summer season is approximately 403 MW, while for the winter season it is 236 MW. The estimated energy provided by Western is a function of weather conditions and is estimated as being in the range of 1,417 GWh. This equates to a capacity factor of approximately 40 percent.

3. Basin Electric Power Cooperative Wholesale Firm Power Supply Contracts

The Tri-State Colorado-Wyoming purchase from Basin has a peak contract capacity of 225 MW and the energy amounts purchased are proportional to the historical patterns of the Colorado and Wyoming Member loads. The contract provisions for the Nebraska purchases from Basin differ from those that govern the Colorado-Wyoming purchases. For Member loads located in Nebraska, Tri-State is contractually obligated to purchase all of its Member requirements from Basin that are in excess of the Western-LAP federal power made available for use in Nebraska.

b. Contingent Power Purchases

Contingent power purchases are purchased resources that can be reduced or interrupted by the seller under specific conditions or contingencies. Such conditions are typically the availability of the seller's generation resources; for example, delivery of a unit contingent purchase that is subject to the availability of that unit. As long as none of the contractually specified conditions exists, the seller is obligated to deliver the requested amounts of capacity and energy, within the limits specified by the purchase contract.

1. Brush 2 Power Purchase Agreement

   Under this tolling agreement, Tri-State has purchased capacity and energy from the owner of the Brush 2 generating facility located in Morgan County, Colorado. The facility uses natural gas in a combined-cycle configuration to provide 70 MW of capacity and associated energy to Tri-State beginning on October 1, 2009. The agreement expires on December 31,2019. The generic modeled emissions for this station are in the table below.

Unit	CO_2 (lbs per Net MWh)	SO_2 (lbs per Net MWh)	NO_x (lbs per Net MWh)	Hg (lbs per Gross MWh)	PM (lbs per Gross MWh)	VOC (lbs per Gross MWh)	Water Usage (gal/MWh)
Brush 2	1182	0.066	0.09	0.051	0		500

2. Cimarron I Solar Power Purchase Agreement
   In February of 2009 Tri-State signed a power purchase agreement with First Solar for 30 MW of photovoltaic solar capacity and associated energy in northeastern New Mexico. This facility began operation in December 2009. The PPA has a term of 25 years and expires January 1, 2036.

3. Kit Carson Wind Project Power Purchase Agreement
   In June of 2009 Tri-State signed a power purchase agreement with Duke Energy to acquire all the electricity generated at a new wind farm being developed in east-central Colorado. This facility began operation in December 2010 and consists of 34, 1.5 MW G.E. turbines with a total output of 51 MW. . . The PPA has a term of 20 years and expires January 1, 2031.

4. Colorado Highlands Wind Project Power Purchase Agreement
   In February of 2012 Tri-State signed a power purchase agreement with Colorado Highlands Wind, LLC to acquire all the electricity generated at a new 67 MW wind farm developed in northeast Colorado. The wind farm utilizes 42 1.6 MW GE wind turbines. The PPA has a term of 20 years and expires December 31, 2032.

In October 2013, the project was expanded to 91 MW, a 36% increase. The wind addition consists of 14, 1.7 MW GE wind turbines.

5. Carousel Wind Project Power Purchase Agreement
   In February of 2014 Tri-State signed a 25 year power purchase agreement with NextEra Energy Resources, LLC to acquire all the electricity generated at a new 150 MW wind farm being developed in east-central Colorado. The projected is under construction and is expected to be operational in mid-2016

c. Non-Firm Power Purchases

For non-firm capacity purchases, the seller has no extended capacity obligation to the purchaser and may curtail the sale for any reason, including economics. Tri-State makes non-firm energy purchases on a regular basis. Non-firm energy purchases are often more available and/or more economic than firm energy purchases and are used when there is sufficient flexibility in Tri-State's other resources to cover the risk of them being curtailed or interrupted. It is expected that such purchases will continue to occur throughout the planning period.

d. Small Hydro

Since 2010, Tri-State has entered into several power purchase agreements for the output of small hydroelectric projects located throughout its member system service territory. These include an extension of the power purchase agreement for the output of the 5.6 MW Vallecito Hydroelectric Project near Durango, Colorado, and new contracts for the output from the 8 MW Tri-County Water Hydropower Project in Ridgway, Colorado, the 5 MW Boulder Canyon Hydroelectric Project located west of Boulder, Colorado, and the 2.9 MW Garland Canal Hydroelectric Project located in northwest Wyoming.

e. Member Distributed Generation

Since Tri-State members have the opportunity to invest in locally-developed projects to supply a portion of their power requirements under their wholesale contract with Tri-State. The number of megawatts operating or under development by Tri-State members has more than doubled since 2010 and over a third of Tri-State's member systems have elected to support local distributed generation projects under Tri-State's existing board policies. Currently, there are 48 such projects, totaling 73 MW of nameplate capacity and representing technologies including solar, wind, landfill gas, hydro, and recycled heat.

f. Other Power Purchases

1. Reserve-Sharing Group Purchases

   As a member of the Rocky Mountain Reserve Group and the Southwest Reserve Sharing Group, Tri-State may make short-term purchases from other members if necessary due to forced outages of Tri-State generating resources.

2. Southwest Reserve Sharing Group

   Tri-State became a member of the Southwest Reserve Sharing Group (SRSG) in 2006. As a member, Tri-State makes short-term purchases from other members to provide support for forced outages for a period of 60 minutes.

3. Platte River Power Authority Forced Outage Assistance Agreement

   Tri-State has a forced outage assistance agreement with Platte River to receive 100 MW in the event of a forced outage of Craig Unit 3. This purchase can last up to 168 hours per forced outage event. This agreement remains in effect until April 1, 2011, and continues thereafter until terminated by either party with one year's notice.

4. Colorado Springs Utilities Forced Outage Assistance Agreement

   Tri-State has a forced outage assistance agreement with Colorado Springs Utilities to receive 50 MW in the event of a forced outage of Craig Unit 3. This purchase can last up to 168 hours per forced outage event. This agreement expires on January 1, 2011.

5. Tucson Electric Power Forced Outage Assistance Agreement

   Tri-State has a forced outage assistance agreement with TEP to receive 100 MW in the event of a forced outage of either Springerville Unit 3 or the Escalante Generation Station, and 150 MW in the event of a forced outage of both units. This purchase can last up to 168 hours per forced outage event. This agreement remains in effect until January 1, 2017, and continues thereafter until terminated by either party with one year's notice.

5. Annual Energy and Capacity Sales to Other Utilities

In addition to supplying its own Member-Systems' requirements, Tri-State has arranged for the sale of capacity and/or energy to a number of other utilities. Such sales to other utilities may be made on a firm, contingent or non-firm basis, as described below.

a. Firm Power Sales

Firm power purchases are supply-side resources that can be counted upon, regardless of the load and resource conditions on the seller's system. The seller is obligated to deliver the requested amounts of capacity and energy, within the limits specified by the purchase contract.

1. Basin/Sheridan-Johnson

   In 1996, Tri-State Member Sheridan-Johnson merged with Basin Member Tri-County Electric. An agreement with Basin states that Tri-State will sell power to Basin, at the Tri-State Member rate, in amounts equal to the Sheridan-Johnson loads projected in the 1994 Tri-State Power Requirements Study.

b. Contingent Power Sales

Contingent sales contracts allow the seller to curtail deliveries under specified conditions, such as generation availability. For example, if a purchase is contingent on a particular generating unit and that unit is limited to 75 percent of its fully rated output, the seller's obligation to the purchaser is also limited to 75 percent of the full contract amount. The same would be true for a system if the purchases were contingent on a collection of units in a system. Tri-State's existing contingent-firm sales contracts are as follows:

1. Public Service Company of Colorado Contract

   This power purchase agreement between Tri-State and Public Service Company, dated November 3, 1986, provides for the sale of 100 MW of contingent capacity and associated energy to Public Service Company. The obligation is contingent on the generation available from Tri-State's entitlements in the Laramie River and Craig Stations. This contract is effective through March 31, 2017, and may be extended thereafter by mutual agreement.

2. Public Service Company of Colorado Contract

   This power purchase agreement between Tri-State and Public Service Company, dated June 29, 1990, provides for the sale to Public Service Company of 25 MW of contingent capacity and associated energy in the summer season, and 75 MW of contingent capacity and associated energy in the winter season. The obligation is contingent on the generation

available from Tri-State's entitlements in the Laramie River and Craig Stations. This contract is effective through March 31, 2016, and may be extended thereafter by mutual agreement.

3. Public Service Company of Colorado Tolling Agreement – JM Shafer

This power purchase agreement between Tri-State and Public Service Company, dated April 13, 2001, provides for the sale to Public Service Company 122 MW of contingent capacity and associated energy year round from the JM Shafer combined cycle plant. The obligation is contingent on the availability of the plant. The agreement expires on June 30, 2019.

4. PacifiCorp

The agreement between Tri-State and PacifiCorp provides for the sale to PacifiCorp of 35 MW of capacity and associated energy, decreasing to 30 MW in 2010, and 25 MW in 2011. The obligation is contingent on the availability of generation from Tri-State's entitlements in the Laramie River and Craig Stations. The contract is effective through December 31, 2020, and may be extended by mutual agreement.

5. Salt River Project

This agreement between Tri-State and Salt River provides for the sale of 100 MW of contingent capacity and associated energy. The obligation is contingent on Tri-State's Springerville Unit 3, and has a term of 30 years.

6. Public Service Company of Colorado Tolling Agreement

The Knutson Generating Station (formerly known as Brighton Generating Station) consists of two General Electric Frame 7EA turbines. Under the original terms of the Public Service Company-Knutson contract, the output of the Knutson turbines is available exclusively for Public Service Company for a period of 10 years, concluding on April 1, 2013. The terms have been modified so that the capacity rights of the Knutson turbines will return to Tri-State May 2010 through May 2013, at which time it would return to Public Service Company May 2013 through May 2016.

The Limon Generating Station consists of two General Electric Frame 7EA turbines. Under the original terms of the Public Service Company-Limon contract, the output of one of the two turbines is available exclusively for Public Service Company for a period of 10 years expiring on May 2016..

c. Other Power Sales

1. Rocky Mountain Reserve Group

   As a member of the Rocky Mountain Reserve Group (RMRG) Tri-State makes short-term sales to other RMRG members to provide forced outage support for a period of up to 105 minutes.

2. Southwest Reserve Sharing Group

   Tri-State became a member of the Southwest Reserve Sharing Group (SRSG) in 2006. As a member Tri-State makes short-term sales to other members to provide support for forced outages for a period of 60 minutes.

3. Platte River Power Authority Forced Outage Assistance Agreement

   Tri-State has a forced outage assistance agreement with Platte River Power Authority to provide 100 MW in the event of a forced outage at Rawhide Energy Station. This sale can last up to 168 hours per forced outage event.

4. Colorado Springs Utilities Forced Outage Assistance Agreement

   Tri-State has a forced outage assistance agreement with Colorado Springs Utilities to provide 50 MW in the event of a forced outage at Nixon Power Station. This sale can last up to 168 hours per forced outage event.

5. Tucson Electric Power Forced Outage Assistance Agreement

   Effective beginning the third quarter of 2006, Tri-State has a forced outage assistance agreement with TEP to provide 100 MW in the event of a forced outage at either Tucson's Springerville Unit 1 or Springerville Unit 2, and 150 MW in the event of a forced outage at both units. This sale can last up to 168 hours per forced outage event.

6. Electric demand and energy forecasts (CPUC ERP Requirement 2).

a. System-wide forecast requirements: For each year within the planning period:
i. Annual sales of energy and coincident summer and winter peak demand;
ii. Annual sales of energy and coincident summer and winter peak demand for each major customer class;
iii. Annual energy and capacity sales to other utilities; and capacity sales to other utilities at the time of coincident summer and winter peak demand;
iv. Annual intra-utility energy and capacity use at the time of coincident summer and winter peak demand;
v. Typical day load patterns for each major customer class and
vi. Annual load factors

b. Tri-State regional (ECO, WCO, NM, WY and NE) forecast requirements: For each region:
i. Annual sales of energy and coincident summer and winter peak demand;
ii. Annual sales of energy and coincident summer and winter peak demand for each major customer class;
iii. Typical day load patterns for each major customer class; and
iv. Annual load factors.

c. Range of forecasts: Tri-State shall develop and justify ranges of forecasts of coincident summer and winter demand and energy sales that it may reasonably be required to provide to meet (i) system requirements and (ii) the requirements of its Members on a region-by-region basis during the planning period. The ranges shall include base case; high and low forecast scenarios of coincident summer and winter peak demand and annual energy sales, based on alternative assumptions about the determinants of coincident summer and winter peak demand and energy sales during the planning period.

d. Description and justification: Tri-State shall fully explain, justify, and document the data, assumptions, methodologies, models, determinants, and any other inputs upon which it relied to develop its coincident peak demand and energy sales forecasts pursuant to this section, as well as the forecasts themselves. In complying with this subsection, Tri-State shall describe the manner in which its Members develop their forecasts and the way in which Tri-State uses its Member forecasts to determine the forecasts referenced in such subsections.

e. Demand-Side Management: Tri-State shall explain the effect of Demand-Side Management on the forecasts set forth in this section.

f. Historical data: Tri-State shall compare the annual forecasts of coincident summer and winter peak demand and energy sales made by Tri-State to meet (i) its system requirements and (ii) Tri-State regional requirements, to the actual

coincident demand and energy sales experienced, in each case, by Tri-State for each of the five years preceding the year in which the plan under consideration is filed with the Commission. In addition, Tri-State shall compare the annual forecasts in its most recent previous resource plan to the annual forecasts in the current resource plan.

g. Format and graphical presentation of data: Tri-State shall include graphical presentation of the data to make the data more understandable to the public, and shall make the data available to requesting stakeholders in electronic format.

Forecast2a - ANNUAL SALES SYSTEM-WIDE AND BY REGION

Load forecasts are prepared for each Member of Tri-State and are summarized here on a system-wide and regional basis. Regional forecasts are used in resource planning. The regions are shown in Chart Fcst1.

Tri-State, as a wholesale provider, does not bill retail customers and does not possess the data to provide typical day load patterns for each major customer class.

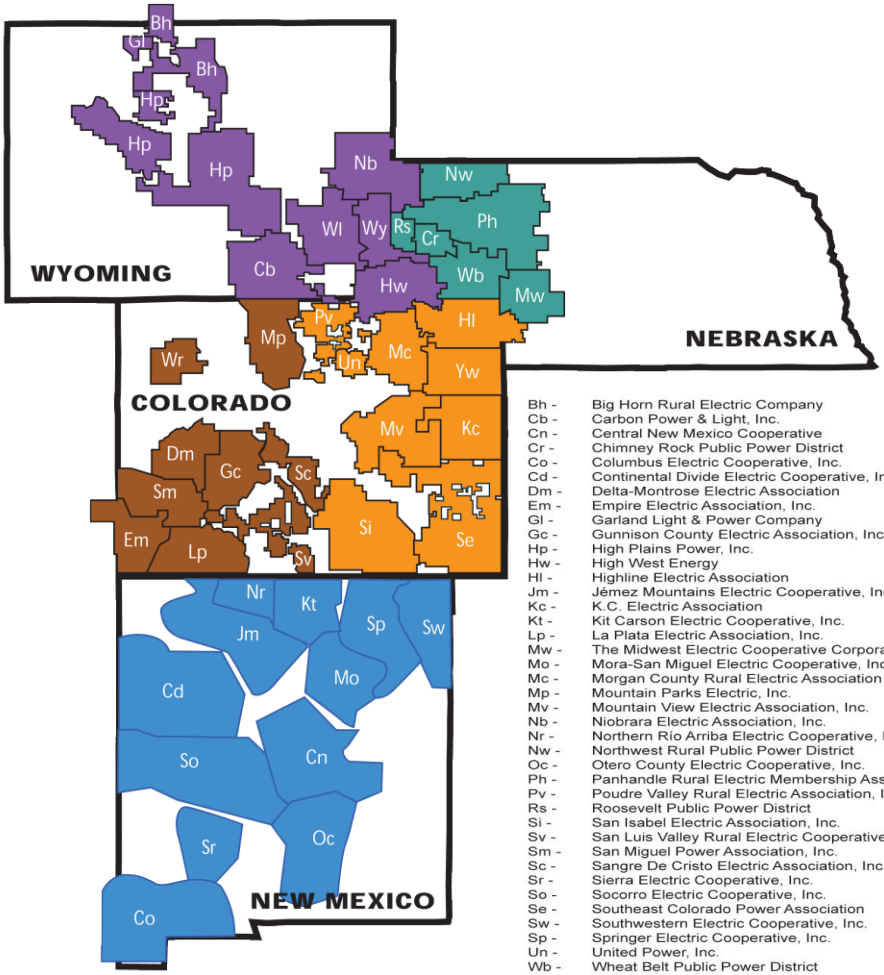
The forecasts are from the 2014 Load Forecast. The load forecasts are jointly prepared by Tri-State and each of its Members. Each customer class, for each Member, is individually evaluated and forecast.

The load forecast includes two alternative forecasts that reflect high and low loads resulting from weather extremes, and two other alternative forecasts resulting from high and low economic activity. These alternatives are shown in Section Forecast1c.

The forecasted annual energy, coincident summer and winter peak demands and annual load factors are presented in Tables Fcst1 through Fcst4 for both system-wide and by regions. Tri-State loads grow at a more linear rate, rather than a compound rate, so the near-term growth rates year-to-year are larger than the long-term year-to-year growth rate. Annual compound growth rates from 2014 actual are also shown in the tables.

Typical day load patterns for summer and winter for the total system and each region are in Tables Fcst5 and Fcst6 and are shown in Forecast Chart2 and Forecast Chart3. Timed demand information is not available by major customer class.

Chart Fcst1
Load Forecast Regions



Bh - Big Horn Rural Electric Company
Cb - Carbon Power & Light, Inc.
Cn - Central New Mexico Cooperative
Cr - Chimney Rock Public Power District
Co - Columbus Electric Cooperative, Inc.
Cd - Continental Divide Electric Cooperative, Inc.
Dm - Delta-Montrose Electric Association
Em - Empire Electric Association, Inc.
Gl - Garland Light & Power Company
Gc - Gunnison County Electric Association, Inc.
Hp - High Plains Power, Inc.
Hw - High West Energy
Hl - Highline Electric Association
Jm - Jémez Mountains Electric Cooperative, Inc.
Kc - K.C. Electric Association
Kt - Kit Carson Electric Cooperative, Inc.
Lp - La Plata Electric Association, Inc.
Mw - The Midwest Electric Cooperative Corporation
Mo - Mora-San Miguel Electric Cooperative, Inc.
Mc - Morgan County Rural Electric Association
Mp - Mountain Parks Electric, Inc.
Mv - Mountain View Electric Association, Inc.
Nb - Niobrara Electric Association, Inc.
Nr - Northern Rio Arriba Electric Cooperative, Inc.
Nw - Northwest Rural Public Power District
Oc - Otero County Electric Cooperative, Inc.
Ph - Panhandle Rural Electric Membership Association
Pv - Poudre Valley Rural Electric Association, Inc.
Rs - Roosevelt Public Power District
Si - San Isabel Electric Association, Inc.
Sv - San Luis Valley Rural Electric Cooperative, Inc.
Sm - San Miguel Power Association, Inc.
Sc - Sangre De Cristo Electric Association, Inc.
Sr - Sierra Electric Cooperative, Inc.
So - Socorro Electric Cooperative, Inc.
Se - Southeast Colorado Power Association
Sw - Southwestern Electric Cooperative, Inc.
Sp - Springer Electric Cooperative, Inc.
Un - United Power, Inc.
Wb - Wheat Belt Public Power District
Wl - Wheatland Rural Electric Association, Inc.
Wr - White River Electric Association, Inc.
Wy - Wyrulec Company
Yw - Y-W Electric Association, Inc.

Table Fcst1

		Annual Energy (GWH)						Annual Growth Rate f		
	Year	System-wide	Eastern Colorado	Western Colorado	New Mexico	Wyoming	Nebraska	System-wide	Eastern Colorado	Western Colorado
Actual	2010	15,106	5,154	4,349	3,058	1,687	858			
Actual	2011	15,496	5,240	4,440	3,158	1,810	848			
Actual	2012	15,811	5,366	4,272	3,134	1,861	1,178			
Actual	2013	15,440	5,175	4,227	3,140	1,888	1,010			
Actual	2014	15,568	5,437	4,165	3,144	1,903	918			
Projected	2015	17,158	6,128	4,504	3,435	2,078	1,013	10.2%	12.7%	8.1%
Projected	2016	17,618	6,493	4,535	3,462	2,110	1,018	6.4%	9.3%	4.3%
Projected	2017	17,953	6,736	4,567	3,488	2,141	1,021	4.9%	7.4%	3.1%
Projected	2018	18,302	6,974	4,602	3,516	2,182	1,029	4.1%	6.4%	2.5%
Projected	2019	18,667	7,191	4,678	3,548	2,214	1,035	3.7%	5.8%	2.3%
Projected	2020	18,990	7,375	4,753	3,578	2,242	1,042	3.4%	5.2%	2.2%
Projected	2021	19,293	7,523	4,836	3,610	2,274	1,049	3.1%	4.7%	2.2%
Projected	2022	19,412	7,608	4,928	3,513	2,306	1,057	2.8%	4.3%	2.1%
Projected	2023	19,589	7,757	5,014	3,414	2,338	1,066	2.6%	4.0%	2.1%
Projected	2024	19,808	7,886	5,044	3,435	2,371	1,072	2.4%	3.8%	1.9%
Projected	2025	20,023	8,012	5,078	3,455	2,401	1,077	2.3%	3.6%	1.8%
Projected	2026	20,211	8,108	5,115	3,477	2,430	1,082	2.2%	3.4%	1.7%
Projected	2027	20,402	8,204	5,147	3,505	2,459	1,088	2.1%	3.2%	1.6%
Projected	2028	20,611	8,303	5,186	3,539	2,490	1,093	2.0%	3.1%	1.6%
Projected	2029	20,813	8,398	5,221	3,575	2,521	1,099	2.0%	2.9%	1.5%
Projected	2030	21,018	8,496	5,254	3,611	2,552	1,104	1.9%	2.8%	1.5%
Projected	2031	21,221	8,594	5,288	3,648	2,581	1,110	1.8%	2.7%	1.4%
Projected	2032	21,436	8,695	5,329	3,686	2,610	1,116	1.8%	2.6%	1.4%
Projected	2033	21,645	8,793	5,367	3,722	2,640	1,122	1.7%	2.6%	1.3%
Projected	2034	21,855	8,893	5,402	3,759	2,673	1,128	1.7%	2.5%	1.3%
Projected	2035	22,063	8,994	5,436	3,796	2,704	1,133	1.7%	2.4%	1.3%

Table Fcst2

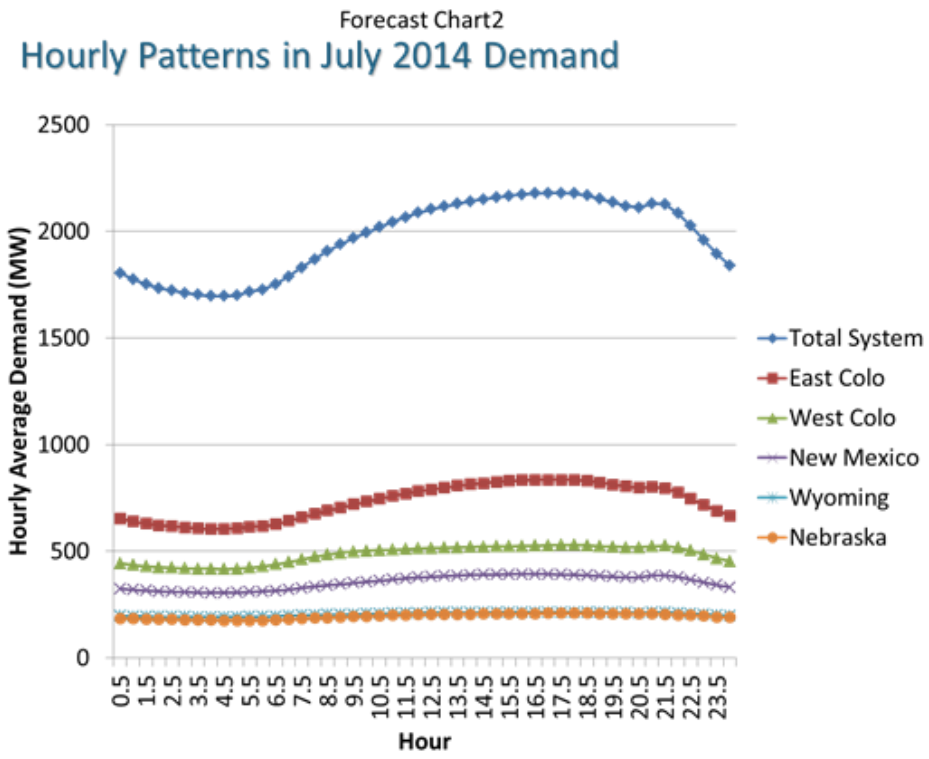
		Coincident Summer Peak Demand (MW)						Annual Growth Rate from 2014 De		
	Year	System-wide	Eastern Colorado	Western Colorado	New Mexico	Wyoming	Nebraska	System-wide	Eastern Colorado	Western Colorado
Actual	2010	2,568	1,061	543	432	216	316			

Actual	2011	2,654	1,099	524	438	267	326			
Actual	2012	2,798	1,149	554	429	278	388			
Actual	2013	2,666	1,110	551	461	243	301			
Actual	2014	2,813	1,164	549	449	263	388			
Projected	2015	2,982	1,279	561	474	292	375	6.0%	9.9%	2.2%
Projected	2016	3,041	1,336	561	471	295	377	4.0%	7.1%	1.1%
Projected	2017	3,099	1,378	566	476	299	380	3.3%	5.8%	1.0%
Projected	2018	3,158	1,419	569	481	305	383	2.9%	5.1%	0.9%
Projected	2019	3,223	1,462	579	487	309	386	2.8%	4.7%	1.1%
Projected	2020	3,277	1,494	588	493	313	389	2.6%	4.2%	1.1%
Projected	2021	3,326	1,521	598	498	317	392	2.4%	3.9%	1.2%
Projected	2022	3,332	1,541	609	464	321	396	2.1%	3.6%	1.3%
Projected	2023	3,382	1,568	621	468	325	400	2.1%	3.4%	1.4%
Projected	2024	3,418	1,592	623	471	329	402	2.0%	3.2%	1.3%
Projected	2025	3,456	1,617	628	474	333	404	1.9%	3.0%	1.2%
Projected	2026	3,489	1,636	632	478	337	406	1.8%	2.9%	1.2%
Projected	2027	3,522	1,655	636	482	340	408	1.7%	2.7%	1.1%
Projected	2028	3,559	1,676	642	486	344	410	1.7%	2.6%	1.1%
Projected	2029	3,593	1,696	646	491	348	412	1.6%	2.5%	1.1%
Projected	2030	3,629	1,716	650	496	352	414	1.6%	2.5%	1.1%
Projected	2031	3,664	1,736	654	501	356	416	1.6%	2.4%	1.0%
Projected	2032	3,701	1,757	660	506	360	418	1.5%	2.3%	1.0%
Projected	2033	3,737	1,777	665	511	363	421	1.5%	2.3%	1.0%
Projected	2034	3,774	1,798	669	516	368	423	1.5%	2.2%	1.0%
Projected	2035	3,809	1,819	673	521	372	425	1.5%	2.1%	1.0%

Table Fcst3

		Coincident Winter Peak Demand (MW)						Annual Growth Rate from 201 De		
	Year	System-wide	Eastern Colorado	Western Colorado	New Mexico	Wyoming	Nebraska	System-wide	Eastern Colorado	Western Colorado
Actual	2010	2,182	729	650	459	251	93			
Actual	2011	2,227	769	645	457	257	99			
Actual	2012	2,112	716	622	455	236	83			
Actual	2013	2,179	751	631	458	245	94			
Actual	2014	2,339	840	634	492	270	102			
Projected	2015	2,428	909	657	489	270	104	3.8%	8.1%	3.6%
Projected	2016	2,483	956	660	494	271	103	3.0%	6.7%	2.0%
Projected	2017	2,533	993	665	497	275	103	2.7%	5.7%	1.6%
Projected	2018	2,592	1,033	673	502	280	104	2.6%	5.3%	1.5%
Projected	2019	2,640	1,064	684	504	284	104	2.5%	4.8%	1.5%
Projected	2020	2,691	1,094	694	510	288	105	2.4%	4.5%	1.5%

Projected	2021	2,738	1,118	707	515	293	106	2.3%	4.2%	1.6%
Projected	2022	2,742	1,136	720	483	297	106	2.0%	3.8%	1.6%
Projected	2023	2,783	1,160	729	487	300	107	2.0%	3.6%	1.6%
Projected	2024	2,817	1,182	734	490	304	107	1.9%	3.5%	1.5%
Projected	2025	2,849	1,201	740	493	308	108	1.8%	3.3%	1.4%
Projected	2026	2,879	1,217	746	497	311	108	1.7%	3.1%	1.4%
Projected	2027	2,911	1,234	752	502	315	109	1.7%	3.0%	1.3%
Projected	2028	2,943	1,250	758	507	319	109	1.7%	2.9%	1.3%
Projected	2029	2,975	1,267	764	512	323	110	1.6%	2.8%	1.3%
Projected	2030	3,007	1,283	770	517	327	110	1.6%	2.7%	1.2%
Projected	2031	3,039	1,300	776	522	330	111	1.6%	2.6%	1.2%
Projected	2032	3,073	1,317	783	527	334	112	1.5%	2.5%	1.2%
Projected	2033	3,106	1,334	789	532	338	112	1.5%	2.5%	1.2%
Projected	2034	3,138	1,351	795	537	342	113	1.5%	2.4%	1.1%
Projected	2035	3,172	1,369	801	543	346	113	1.5%	2.4%	1.1%


Forecast Chart2
Hourly Patterns in July 2014 Demand
Hourly Average Demand (MW)
2500
2000
1500
1000
500
0
0.5
1.5
2.5
3.5
4.5
5.5
6.5
7.5
8.5
9.5
10.5
11.5
12.5
13.5
14.5
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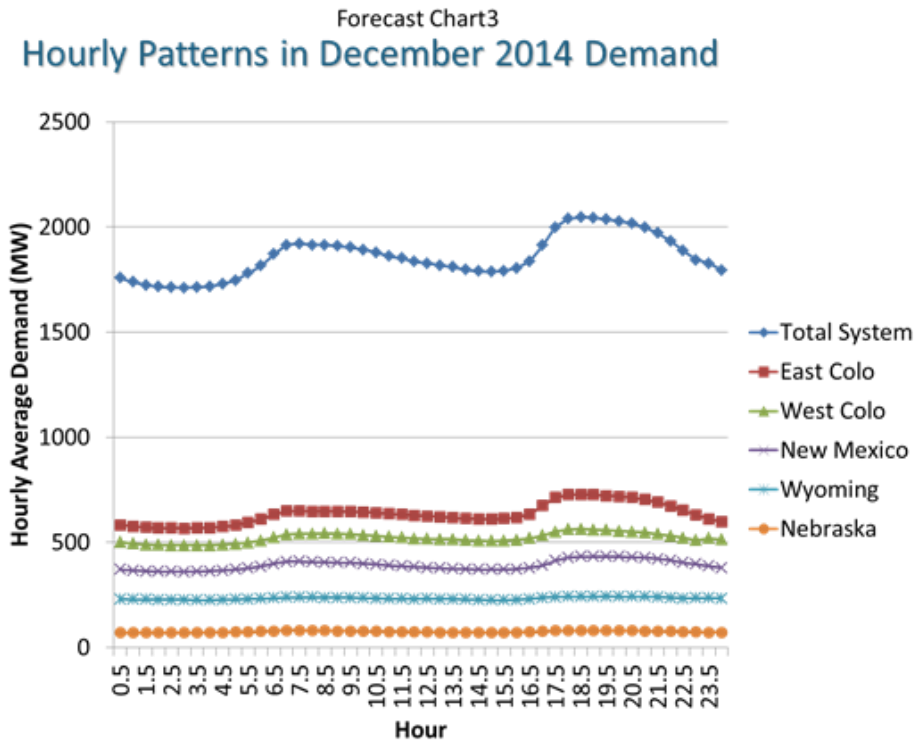
Hour
Total System
East Colo
West Colo
New Mexico
Wyoming
Nebraska


Forecast Chart3
Hourly Patterns in December 2014 Demand
Hourly Average Demand (MW)
2500
2000
1500
1000
500
0
0.5
1.5
2.5
3.5
4.5
5.5
6.5
7.5
8.5
9.5
10.5
11.5
12.5
13.5
14.5
15.5
16.5
17.5
18.5
19.5
20.5
21.5
22.5
23.5
Hour
Total System
East Colo
West Colo
New Mexico
Wyoming
Nebraska

Forecast 2b – ANNUAL SALES BY CUSTOMER CLASS

Tri-State is a wholesale power supplier and has no retail customer classes. Forecasts are prepared for each distribution Member of Tri-State and Member projected sales by major customer class are summarized in this section. The annual energy forecasts for each class are shown in Tables Fcst5-Fcst10. Demand information is not available for each customer class.

The proportions of Member load by class are compared for total and each region in Forecast Chart4. The system-wide history and forecast by class is shown in Forecast Chart5.

Table Fcst5

Annual Energy by Class (GWh)

System-Wide

	Year	Residential	Irrigation	Small Commercial	Large Commercial	Others	Losses	Total
Actual	2010	4,410	1,196	2,990	5,536	272	701	15,106
Actual	2011	4,499	1,290	3,042	5,664	261	740	15,496
Actual	2012	4,434	1,811	3,073	5,475	279	740	15,811
Actual	2013	4,605	1,439	3,184	5,156	309	748	15,440
Actual	2014	4,502	1,234	3,290	5,497	382	662	15,568
Projected	2015	4,522	1,368	3,256	6,711	529	771	17,158
Projected	2016	4,578	1,376	3,311	7,040	525	787	17,618
Projected	2017	4,629	1,385	3,368	7,252	521	799	17,953
Projected	2018	4,690	1,393	3,423	7,456	527	812	18,302
Projected	2019	4,759	1,401	3,479	7,671	534	823	18,667
Projected	2020	4,817	1,410	3,534	7,855	540	834	18,990
Projected	2021	4,873	1,419	3,590	8,016	547	847	19,293
Projected	2022	4,945	1,429	3,645	8,110	423	861	19,412
Projected	2023	5,013	1,438	3,700	8,266	297	874	19,589
Projected	2024	5,085	1,446	3,755	8,339	298	885	19,808
Projected	2025	5,150	1,453	3,810	8,415	299	896	20,023
Projected	2026	5,223	1,461	3,864	8,457	300	906	20,211
Projected	2027	5,294	1,468	3,919	8,505	302	915	20,402
Projected	2028	5,373	1,475	3,974	8,561	303	924	20,611
Projected	2029	5,443	1,483	4,029	8,622	304	934	20,813
Projected	2030	5,517	1,490	4,083	8,681	305	943	21,018
Projected	2031	5,592	1,497	4,138	8,736	306	952	21,221
Projected	2032	5,674	1,504	4,192	8,795	308	962	21,436
Projected	2033	5,747	1,512	4,247	8,858	309	971	21,645
Projected	2034	5,824	1,519	4,302	8,919	310	981	21,855

Projected	2035	5,901	1,526	4,357	8,977	311	990	22,063

Table Fcst6

Annual Energy by Class (GWh)

Eastern Colorado

	Year	Residential	Irrigation	Small Commercial	Large Commercial	Others	Losses	Total
Actual	2010	1,832	574	1,158	1,189	145	254	5,152
Actual	2011	1,874	628	1,173	1,162	141	261	5,239
Actual	2012	1,882	797	1,195	1,086	142	263	5,365
Actual	2013	1,943	646	1,230	963	140	251	5,173
Actual	2014	1,937	553	1,345	1,264	132	203	5,435
Projected	2015	1,935	609	1,294	1,807	133	276	6,054
Projected	2016	1,974	613	1,324	2,016	135	281	6,343
Projected	2017	2,011	616	1,354	2,172	136	287	6,577
Projected	2018	2,052	620	1,385	2,317	137	294	6,805
Projected	2019	2,096	623	1,415	2,440	139	299	7,012
Projected	2020	2,136	627	1,446	2,529	140	305	7,182
Projected	2021	2,175	630	1,476	2,571	142	310	7,305
Projected	2022	2,220	634	1,507	2,547	143	316	7,368
Projected	2023	2,265	637	1,538	2,590	144	322	7,496
Projected	2024	2,310	641	1,569	2,631	145	328	7,624
Projected	2025	2,354	644	1,600	2,673	145	334	7,750
Projected	2026	2,400	648	1,631	2,683	145	338	7,846
Projected	2027	2,446	652	1,662	2,693	146	343	7,942
Projected	2028	2,496	655	1,694	2,704	146	347	8,041
Projected	2029	2,541	659	1,725	2,714	146	351	8,137
Projected	2030	2,589	663	1,757	2,724	147	355	8,234
Projected	2031	2,637	666	1,788	2,734	147	360	8,332

Projected	2032	2,688	670	1,820	2,744	147	364	8,434
Projected	2033	2,736	674	1,852	2,754	148	368	8,532
Projected	2034	2,785	678	1,884	2,764	148	373	8,632
Projected	2035	2,835	682	1,916	2,775	148	377	8,732

Table Fcst7

Annual Energy by Class (GWh)

Western Colorado

	Year	Residential	Irrigation	Small Commercial	Large Commercial	Others	Losses	Total
Actual	2010	1,128	117	836	2,109	22	135	4,349
Actual	2011	1,141	131	853	2,145	18	151	4,440
Actual	2012	1,099	112	854	2,046	21	140	4,272
Actual	2013	1,165	105	893	1,873	45	146	4,227
Actual	2014	1,112	106	857	1,927	19	144	4,165
Projected	2015	1,128	110	900	2,190	29	146	4,504
Projected	2016	1,137	110	911	2,200	29	148	4,535
Projected	2017	1,145	110	922	2,211	29	149	4,567
Projected	2018	1,157	110	934	2,222	29	150	4,602
Projected	2019	1,170	110	945	2,272	29	152	4,678
Projected	2020	1,181	111	956	2,324	29	153	4,753
Projected	2021	1,191	111	967	2,383	30	155	4,836
Projected	2022	1,206	111	978	2,447	30	157	4,928
Projected	2023	1,219	111	989	2,507	30	159	5,014
Projected	2024	1,234	111	999	2,510	30	160	5,044
Projected	2025	1,246	111	1,010	2,520	30	162	5,078
Projected	2026	1,261	111	1,020	2,529	30	163	5,115
Projected	2027	1,275	111	1,031	2,536	30	165	5,147
Projected	2028	1,291	111	1,041	2,545	30	167	5,186

Projected	2029	1,304	111	1,052	2,555	30	168	5,221
Projected	2030	1,319	111	1,062	2,562	30	170	5,254
Projected	2031	1,334	112	1,072	2,569	30	171	5,288
Projected	2032	1,351	112	1,082	2,580	30	173	5,329
Projected	2033	1,365	112	1,093	2,592	31	175	5,367
Projected	2034	1,380	112	1,103	2,600	31	176	5,402
Projected	2035	1,396	112	1,113	2,607	31	178	5,436

Table Fcst8

Annual Energy by Class (GWh)

New Mexico

	Year	Residential	Irrigation	Small Commercial	Large Commercial	Others	Losses	Total
Actual	2010	886	109	659	1,157	76	171	3,058
Actual	2011	910	147	674	1,175	71	180	3,158
Actual	2012	885	152	669	1,176	85	167	3,134
Actual	2013	908	145	676	1,146	82	183	3,140
Actual	2014	868	145	715	1,087	180	149	3,144
Projected	2015	890	144	681	1,234	313	174	3,435
Projected	2016	896	144	690	1,239	318	175	3,462
Projected	2017	900	144	700	1,244	324	177	3,488
Projected	2018	906	145	708	1,249	329	178	3,516
Projected	2019	914	146	717	1,258	334	180	3,548
Projected	2020	919	146	725	1,267	338	181	3,578
Projected	2021	924	147	734	1,278	345	183	3,610
Projected	2022	932	147	743	1,288	218	185	3,513
Projected	2023	939	148	751	1,299	91	186	3,414
Projected	2024	946	149	759	1,302	92	188	3,435
Projected	2025	953	149	766	1,305	92	190	3,455

Projected	2026	960	150	774	1,308	93	191	3,477
Projected	2027	968	150	782	1,318	94	193	3,505
Projected	2028	976	151	790	1,333	95	195	3,539
Projected	2029	983	152	797	1,351	95	196	3,575
Projected	2030	991	152	804	1,370	96	198	3,611
Projected	2031	999	153	812	1,389	97	200	3,648
Projected	2032	1,008	153	819	1,407	97	202	3,686
Projected	2033	1,015	154	827	1,426	98	203	3,722
Projected	2034	1,023	154	834	1,445	99	205	3,759
Projected	2035	1,031	154	841	1,463	100	207	3,796

Table Fcst9

Annual Energy by Class (GWh)

Wyoming

	Year	Residential	Irrigation	Small Commercial	Large Commercial	Others	Losses	Total
Actual	2010	347	93	210	951	16	71	1,689
Actual	2011	359	94	220	1,056	17	66	1,811
Actual	2012	347	155	221	1,038	17	83	1,862
Actual	2013	359	116	240	1,057	24	94	1,890
Actual	2014	360	95	238	1,086	33	94	1,905
Projected	2015	355	119	248	1,300	34	95	2,151
Projected	2016	361	122	255	1,391	28	102	2,259
Projected	2017	363	124	260	1,429	20	105	2,300
Projected	2018	365	125	264	1,469	20	108	2,351
Projected	2019	368	126	269	1,500	20	110	2,393
Projected	2020	371	127	273	1,532	20	112	2,435
Projected	2021	373	129	278	1,577	20	116	2,492
Projected	2022	377	130	282	1,618	20	119	2,545

Projected	2023	380	131	287	1,660	20	122	2,600
Projected	2024	383	132	291	1,683	20	123	2,632
Projected	2025	385	133	295	1,705	20	125	2,662
Projected	2026	389	133	298	1,724	20	126	2,691
Projected	2027	392	134	302	1,745	20	127	2,721
Projected	2028	395	135	306	1,766	20	129	2,751
Projected	2029	398	135	310	1,788	21	130	2,782
Projected	2030	401	136	314	1,811	21	131	2,814
Projected	2031	405	137	317	1,831	21	132	2,843
Projected	2032	409	138	321	1,850	21	134	2,871
Projected	2033	412	138	325	1,871	21	135	2,902
Projected	2034	415	139	329	1,895	21	136	2,935
Projected	2035	418	140	332	1,917	21	138	2,966

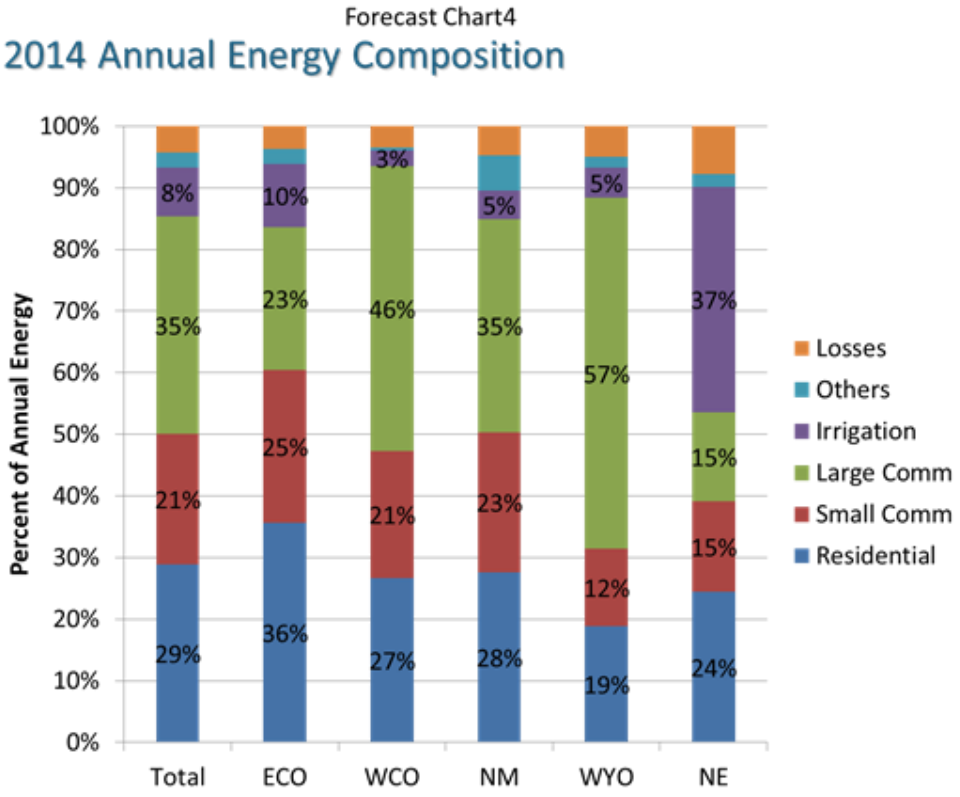
Table Fcst10

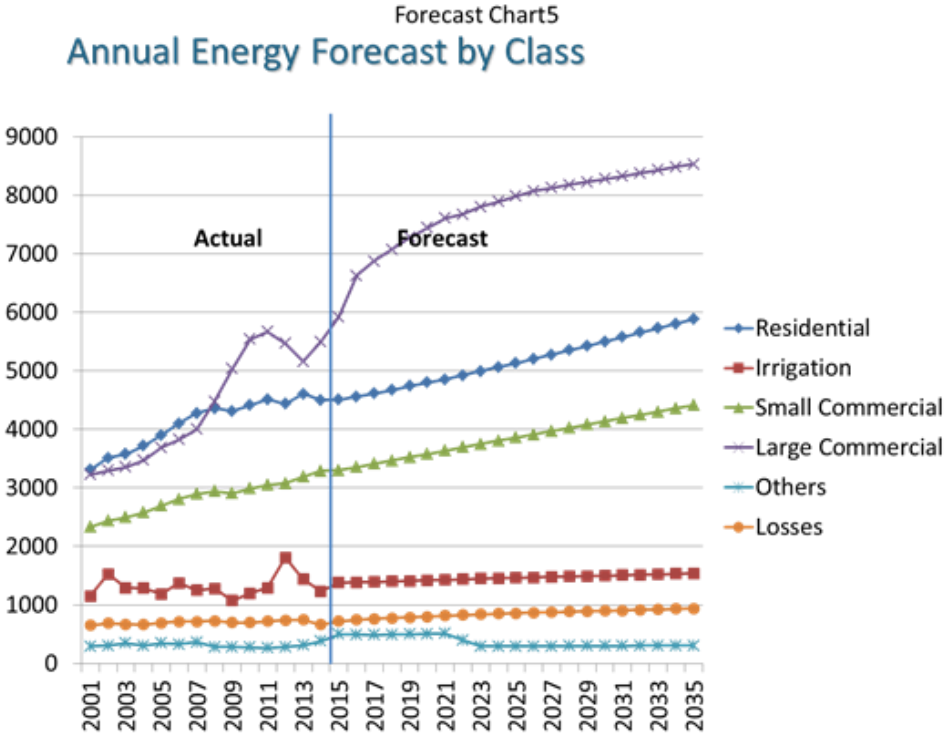
Annual Energy by Class (GWh)

Nebraska

	Year	Residential	Irrigation	Small Commercial	Large Commercial	Others	Losses	Total
Actual	2010	216	302	127	131	13	70	858
Actual	2011	215	290	123	125	13	82	848
Actual	2012	220	595	134	129	14	86	1,178
Actual	2013	230	427	144	118	17	74	1,010
Actual	2014	224	336	135	133	19	71	918
Projected	2015	214	386	133	180	19	80	1,013
Projected	2016	211	387	131	194	15	81	1,018
Projected	2017	210	390	131	197	12	81	1,021
Projected	2018	210	392	132	200	12	82	1,029
Projected	2019	211	395	133	202	12	82	1,035

Projected	2020	210	399	134	203	12	83	1,042
Projected	2021	210	403	135	207	12	84	1,049
Projected	2022	210	407	135	209	12	84	1,057
Projected	2023	211	410	136	212	11	85	1,066
Projected	2024	211	414	138	212	12	86	1,072
Projected	2025	212	416	139	212	12	86	1,077
Projected	2026	213	418	140	213	12	86	1,082
Projected	2027	214	421	142	213	12	87	1,088
Projected	2028	215	423	143	213	12	87	1,093
Projected	2029	216	425	145	213	12	88	1,099
Projected	2030	216	427	147	214	12	88	1,104
Projected	2031	217	429	148	214	12	89	1,110
Projected	2032	219	432	150	214	12	89	1,116
Projected	2033	220	434	151	215	12	90	1,122
Projected	2034	221	437	153	215	12	90	1,128
Projected	2035	222	439	155	215	12	91	1,133


Forecast Chart4
2014 Annual Energy Composition
Percent of Annual Energy
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Total
ECO
WCO
NM
WYO
NE
8%
35%
21%
29%
10%
23%
25%
36%
3%
46%
21%
27%
5%
35%
23%
28%
5%
57%
12%
19%
37%
15%
15%
24%
Losses
Others
Irrigation
Large Comm
Small Comm
Residential


Forecast Chart5
Annual Energy Forecast by Class
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Actual
Forecast
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
Residential
Irrigation
Small Commercial
Large Commercial
Others
Losses

Forecast 2c – RANGE OF FORECASTS

Tri-State developed a range of forecasts of peak demand and energy sales that could reasonably be required to serve through 2035. The range includes two scenarios where weather conditions cause higher or lower loads assuming normal economic activity, and two scenarios where economic and demographic conditions cause higher or lower loads assuming normal weather. The ranges presented here are the first standard deviation from the base case forecasts. The variability of load forecasts due to weather is not explicitly used in the resource planning process; however it is used to validate the appropriateness of planning reserve levels. The Tri-State load forecasting models include elasticity effects for both demand and energy, however these elasticity effects are based only upon the prior-year economic forecast of future rates and do not reflect scenario-specific rate impacts. Tables Fcst11 through Fcst28 contain the ranges for the total system and each region. Charts Fcst6, Fcst7 and Fcst8 show the system-wide ranges.

Table Fcst11
Forecast Ranges
Annual Energy (GWh)
System-Wide

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	15,106				
Actual	2011	15,496				
Actual	2012	15,811				
Actual	2013	15,440				
Actual	2014	15,568	16,483	15,476	16,158	15,801
Projected	2015	17,158	17,907	16,409	17,349	16,967
Projected	2016	17,618	18,540	16,695	17,814	17,422
Projected	2017	17,953	19,016	16,889	18,152	17,753
Projected	2018	18,302	19,490	17,113	18,505	18,099
Projected	2019	18,667	19,969	17,365	18,874	18,460
Projected	2020	18,990	20,393	17,587	19,201	18,779
Projected	2021	19,293	20,788	17,798	19,507	19,079
Projected	2022	19,412	20,978	17,845	19,627	19,196
Projected	2023	19,589	21,224	17,953	19,806	19,372
Projected	2024	19,808	21,511	18,104	20,027	19,588
Projected	2025	20,023	21,790	18,257	20,245	19,801
Projected	2026	20,211	22,035	18,387	20,435	19,987
Projected	2027	20,402	22,280	18,525	20,628	20,177
Projected	2028	20,611	22,541	18,680	20,839	20,382
Projected	2029	20,813	22,793	18,833	21,044	20,583
Projected	2030	21,018	23,046	18,991	21,251	20,786
Projected	2031	21,221	23,294	19,148	21,456	20,986
Projected	2032	21,436	23,553	19,318	21,673	21,199
Projected	2033	21,645	23,804	19,485	21,884	21,405
Projected	2034	21,855	24,055	19,655	22,097	21,614
Projected	2035	22,063	24,302	19,824	22,307	21,819

Table Fcst12

Forecast Ranges

Summer Peak Demand (MW)

System-Wide

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	2,568				
Actual	2011	2,637				
Actual	2012	2,798				
Actual	2013	2,649				
Actual	2014	2,813	2,879	2,732	2,880	2,731
Projected	2015	2,982	3,090	2,875	3,062	2,903
Projected	2016	3,041	3,172	2,910	3,122	2,960
Projected	2017	3,099	3,251	2,948	3,182	3,017
Projected	2018	3,158	3,327	2,988	3,242	3,074
Projected	2019	3,223	3,409	3,037	3,309	3,138
Projected	2020	3,277	3,477	3,077	3,364	3,190
Projected	2021	3,326	3,540	3,112	3,414	3,238
Projected	2022	3,332	3,556	3,108	3,420	3,243
Projected	2023	3,382	3,616	3,148	3,472	3,292
Projected	2024	3,418	3,661	3,175	3,509	3,327
Projected	2025	3,456	3,709	3,202	3,548	3,364
Projected	2026	3,489	3,750	3,227	3,581	3,396
Projected	2027	3,522	3,792	3,252	3,615	3,428
Projected	2028	3,559	3,835	3,282	3,653	3,464
Projected	2029	3,593	3,878	3,309	3,689	3,498
Projected	2030	3,629	3,920	3,337	3,725	3,533
Projected	2031	3,664	3,962	3,365	3,761	3,566
Projected	2032	3,701	4,005	3,397	3,799	3,603
Projected	2033	3,737	4,048	3,426	3,836	3,638
Projected	2034	3,774	4,091	3,457	3,874	3,673
Projected	2035	3,809	4,132	3,486	3,910	3,708

Table Fcst13

Forecast Ranges

Winter Peak Demand (MW)

System-Wide

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	2,182				
Actual	2011	2,119				
Actual	2012	2,112				
Actual	2013	2,179				
Actual	2014	2,339	2,373	2,197	2,338	2,232
Projected	2015	2,428	2,543	2,312	2,484	2,372
Projected	2016	2,483	2,621	2,346	2,540	2,426
Projected	2017	2,533	2,689	2,377	2,591	2,474
Projected	2018	2,592	2,764	2,419	2,651	2,532
Projected	2019	2,640	2,828	2,453	2,701	2,579
Projected	2020	2,691	2,892	2,490	2,753	2,629
Projected	2021	2,738	2,951	2,525	2,801	2,675
Projected	2022	2,742	2,965	2,520	2,805	2,679
Projected	2023	2,783	3,015	2,551	2,847	2,719
Projected	2024	2,817	3,058	2,576	2,882	2,752
Projected	2025	2,849	3,100	2,599	2,915	2,784
Projected	2026	2,879	3,137	2,621	2,945	2,813
Projected	2027	2,911	3,176	2,646	2,978	2,844
Projected	2028	2,943	3,216	2,671	3,011	2,875
Projected	2029	2,975	3,255	2,695	3,043	2,906
Projected	2030	3,007	3,293	2,720	3,076	2,937
Projected	2031	3,039	3,332	2,747	3,109	2,969
Projected	2032	3,073	3,371	2,775	3,144	3,002
Projected	2033	3,106	3,411	2,801	3,177	3,034
Projected	2034	3,138	3,449	2,828	3,211	3,066
Projected	2035	3,172	3,488	2,856	3,245	3,099

Table Fcst14
Forecast Ranges
Annual Energy (GWh)
Eastern Colorado

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	5,154				
Actual	2011	5,240				
Actual	2012	5,366				
Actual	2013	5,175				
Actual	2014	5,437	5,687	5,297	5,582	5,402
Projected	2015	6,128	6,386	5,869	6,227	6,028
Projected	2016	6,493	6,783	6,203	6,598	6,388
Projected	2017	6,736	7,044	6,428	6,845	6,627
Projected	2018	6,974	7,296	6,653	7,087	6,862
Projected	2019	7,191	7,524	6,859	7,307	7,076
Projected	2020	7,375	7,717	7,034	7,494	7,257
Projected	2021	7,523	7,872	7,174	7,644	7,402
Projected	2022	7,608	7,960	7,255	7,730	7,485
Projected	2023	7,757	8,117	7,397	7,882	7,633
Projected	2024	7,886	8,252	7,520	8,012	7,759
Projected	2025	8,012	8,384	7,640	8,140	7,883
Projected	2026	8,108	8,484	7,732	8,238	7,978
Projected	2027	8,204	8,584	7,823	8,335	8,072
Projected	2028	8,303	8,688	7,917	8,436	8,170
Projected	2029	8,398	8,788	8,008	8,533	8,264
Projected	2030	8,496	8,890	8,101	8,632	8,360
Projected	2031	8,594	8,992	8,195	8,731	8,456
Projected	2032	8,695	9,099	8,292	8,834	8,556
Projected	2033	8,793	9,201	8,385	8,934	8,653
Projected	2034	8,893	9,306	8,481	9,036	8,751
Projected	2035	8,994	9,411	8,576	9,138	8,850

Table Fcst15

Forecast Ranges

Summer Peak Demand (MW)

Eastern Colorado

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	1,061				
Actual	2011	1,080				
Actual	2012	1,149				
Actual	2013	1,055				
Actual	2014	1,164	1,200	1,138	1,206	1,132
Projected	2015	1,279	1,320	1,238	1,320	1,239
Projected	2016	1,336	1,381	1,291	1,378	1,294
Projected	2017	1,378	1,426	1,330	1,422	1,334
Projected	2018	1,419	1,470	1,369	1,464	1,374
Projected	2019	1,462	1,515	1,410	1,509	1,416
Projected	2020	1,494	1,547	1,440	1,541	1,447
Projected	2021	1,521	1,575	1,466	1,569	1,472
Projected	2022	1,541	1,597	1,486	1,590	1,492
Projected	2023	1,568	1,625	1,512	1,618	1,519
Projected	2024	1,592	1,650	1,535	1,643	1,542
Projected	2025	1,617	1,675	1,558	1,668	1,565
Projected	2026	1,636	1,695	1,576	1,688	1,584
Projected	2027	1,655	1,716	1,595	1,708	1,603
Projected	2028	1,676	1,737	1,615	1,729	1,623
Projected	2029	1,696	1,757	1,634	1,749	1,642
Projected	2030	1,716	1,778	1,653	1,770	1,662
Projected	2031	1,736	1,799	1,673	1,791	1,681
Projected	2032	1,757	1,821	1,693	1,813	1,702
Projected	2033	1,777	1,842	1,712	1,834	1,721
Projected	2034	1,798	1,864	1,732	1,855	1,741
Projected	2035	1,819	1,885	1,752	1,876	1,761

Table Fcst16

Forecast Ranges

Winter Peak Demand (MW)

Eastern Colorado

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	729				
Actual	2011	712				
Actual	2012	716				
Actual	2013	751				
Actual	2014	840	845	775	850	770
Projected	2015	909	951	866	953	864
Projected	2016	956	1,002	911	1,003	909
Projected	2017	993	1,041	945	1,042	944
Projected	2018	1,033	1,083	983	1,084	982
Projected	2019	1,064	1,116	1,013	1,117	1,012
Projected	2020	1,094	1,146	1,041	1,148	1,039
Projected	2021	1,118	1,172	1,065	1,173	1,063
Projected	2022	1,136	1,190	1,081	1,192	1,080
Projected	2023	1,160	1,216	1,105	1,218	1,103
Projected	2024	1,182	1,238	1,126	1,240	1,123
Projected	2025	1,201	1,258	1,144	1,260	1,142
Projected	2026	1,217	1,275	1,159	1,277	1,157
Projected	2027	1,234	1,292	1,175	1,295	1,173
Projected	2028	1,250	1,310	1,191	1,312	1,188
Projected	2029	1,267	1,327	1,206	1,329	1,204
Projected	2030	1,283	1,344	1,222	1,347	1,220
Projected	2031	1,300	1,362	1,239	1,365	1,236
Projected	2032	1,317	1,380	1,255	1,383	1,252
Projected	2033	1,334	1,397	1,271	1,400	1,268
Projected	2034	1,351	1,415	1,287	1,418	1,284
Projected	2035	1,369	1,433	1,304	1,437	1,301

Table Fcst17
Forecast Ranges
Annual Energy (GWh)
Western Colorado

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	4,349				
Actual	2011	4,440				
Actual	2012	4,272				
Actual	2013	4,227				
Actual	2014	4,165	4,414	4,134	4,301	4,248
Projected	2015	4,504	4,712	4,295	4,531	4,476
Projected	2016	4,535	4,792	4,278	4,563	4,507
Projected	2017	4,567	4,865	4,268	4,595	4,539
Projected	2018	4,602	4,938	4,265	4,630	4,573
Projected	2019	4,678	5,053	4,304	4,707	4,650
Projected	2020	4,753	5,164	4,342	4,782	4,724
Projected	2021	4,836	5,283	4,390	4,866	4,807
Projected	2022	4,928	5,410	4,445	4,958	4,897
Projected	2023	5,014	5,531	4,496	5,044	4,983
Projected	2024	5,044	5,590	4,498	5,075	5,013
Projected	2025	5,078	5,652	4,505	5,109	5,047
Projected	2026	5,115	5,716	4,513	5,146	5,083
Projected	2027	5,147	5,775	4,520	5,179	5,116
Projected	2028	5,186	5,840	4,531	5,218	5,154
Projected	2029	5,221	5,901	4,541	5,253	5,189
Projected	2030	5,254	5,960	4,549	5,287	5,222
Projected	2031	5,288	6,018	4,558	5,321	5,256
Projected	2032	5,329	6,084	4,573	5,361	5,296
Projected	2033	5,367	6,147	4,587	5,400	5,334
Projected	2034	5,402	6,206	4,597	5,435	5,369
Projected	2035	5,436	6,264	4,607	5,469	5,403

Table Fcst18

Forecast Ranges

Summer Peak Demand (MW)

Western Colorado

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	543				
Actual	2011	563				
Actual	2012	554				
Actual	2013	547				
Actual	2014	549	549	513	543	519
Projected	2015	561	587	535	574	549
Projected	2016	561	593	529	574	548
Projected	2017	566	603	529	579	553
Projected	2018	569	611	528	582	556
Projected	2019	579	626	533	593	566
Projected	2020	588	639	537	602	575
Projected	2021	598	654	543	612	585
Projected	2022	609	669	549	623	596
Projected	2023	621	685	556	635	606
Projected	2024	623	691	555	637	609
Projected	2025	628	699	556	642	613
Projected	2026	632	707	558	647	618
Projected	2027	636	715	558	651	622
Projected	2028	642	723	560	656	627
Projected	2029	646	731	561	661	631
Projected	2030	650	738	562	665	635
Projected	2031	654	745	563	669	639
Projected	2032	660	754	565	675	645
Projected	2033	665	762	567	680	649
Projected	2034	669	770	568	684	654
Projected	2035	673	777	569	688	658

Table Fcst19

Forecast Ranges

Winter Peak Demand (MW)

Western Colorado

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	650				
Actual	2011	624				
Actual	2012	622				
Actual	2013	631				
Actual	2014	634	662	616	652	626
Projected	2015	657	687	626	670	643
Projected	2016	660	696	623	673	646
Projected	2017	665	706	623	678	651
Projected	2018	673	720	627	687	660
Projected	2019	684	735	633	698	670
Projected	2020	694	750	639	709	680
Projected	2021	707	767	646	721	692
Projected	2022	720	785	655	735	705
Projected	2023	729	798	660	744	714
Projected	2024	734	806	661	749	719
Projected	2025	740	816	664	755	725
Projected	2026	746	826	666	761	730
Projected	2027	752	835	669	767	736
Projected	2028	758	845	672	774	743
Projected	2029	764	854	674	780	748
Projected	2030	770	863	676	786	754
Projected	2031	776	873	679	792	760
Projected	2032	783	883	683	799	767
Projected	2033	789	893	686	805	773
Projected	2034	795	902	688	811	779
Projected	2035	801	911	691	818	784

Table Fcst20

Forecast Ranges

Annual Energy (GWh)

New Mexico

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	3,058				
Actual	2011	3,158				
Actual	2012	3,134				
Actual	2013	3,140				
Actual	2014	3,144	3,375	3,132	3,275	3,231
Projected	2015	3,435	3,598	3,273	3,459	3,412
Projected	2016	3,462	3,644	3,280	3,485	3,438
Projected	2017	3,488	3,682	3,294	3,512	3,464
Projected	2018	3,516	3,717	3,314	3,540	3,492
Projected	2019	3,548	3,755	3,341	3,572	3,524
Projected	2020	3,578	3,789	3,367	3,602	3,553
Projected	2021	3,610	3,825	3,396	3,635	3,586
Projected	2022	3,513	3,723	3,304	3,537	3,489
Projected	2023	3,414	3,618	3,210	3,437	3,391
Projected	2024	3,435	3,641	3,229	3,458	3,412
Projected	2025	3,455	3,662	3,248	3,479	3,432
Projected	2026	3,477	3,685	3,268	3,501	3,453
Projected	2027	3,505	3,715	3,295	3,529	3,481
Projected	2028	3,539	3,751	3,327	3,563	3,515
Projected	2029	3,575	3,789	3,360	3,599	3,551
Projected	2030	3,611	3,828	3,395	3,636	3,587
Projected	2031	3,648	3,867	3,429	3,673	3,623
Projected	2032	3,686	3,907	3,465	3,711	3,661
Projected	2033	3,723	3,946	3,499	3,748	3,697
Projected	2034	3,759	3,985	3,534	3,785	3,734
Projected	2035	3,796	4,024	3,568	3,822	3,770

Table Fcst21

Forecast Ranges

Summer Peak Demand (MW)

New Mexico

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	432				
Actual	2011	422				
Actual	2012	429				
Actual	2013	422				
Actual	2014	449	476	443	472	447
Projected	2015	474	496	453	487	462
Projected	2016	471	495	448	484	459
Projected	2017	476	501	451	489	463
Projected	2018	481	507	455	494	468
Projected	2019	487	514	459	500	473
Projected	2020	493	521	466	506	480
Projected	2021	498	526	469	511	484
Projected	2022	464	492	437	477	452
Projected	2023	468	495	442	481	456
Projected	2024	471	498	445	484	459
Projected	2025	474	501	447	487	462
Projected	2026	478	505	450	490	465
Projected	2027	482	509	454	494	469
Projected	2028	486	514	459	499	473
Projected	2029	491	519	463	504	478
Projected	2030	496	524	468	509	483
Projected	2031	501	530	472	515	488
Projected	2032	506	535	477	520	493
Projected	2033	511	540	482	525	497
Projected	2034	516	546	487	530	502
Projected	2035	521	551	491	535	507

Table Fcst22

Forecast Ranges

Winter Peak Demand (MW)

New Mexico

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	459				
Actual	2011	470				
Actual	2012	455				
Actual	2013	458				
Actual	2014	492	502	463	497	468
Projected	2015	489	512	466	504	474
Projected	2016	494	520	469	509	480
Projected	2017	497	523	470	512	482
Projected	2018	502	529	474	517	486
Projected	2019	504	532	476	519	489
Projected	2020	510	539	481	525	495
Projected	2021	515	544	486	531	500
Projected	2022	483	511	455	497	468
Projected	2023	487	514	459	501	472
Projected	2024	490	518	462	505	475
Projected	2025	493	521	465	508	478
Projected	2026	497	525	469	512	482
Projected	2027	502	530	473	517	486
Projected	2028	507	535	478	522	491
Projected	2029	512	541	482	527	496
Projected	2030	517	546	487	532	501
Projected	2031	522	552	492	538	506
Projected	2032	527	557	497	543	511
Projected	2033	532	562	502	548	516
Projected	2034	537	568	507	553	521
Projected	2035	543	573	512	559	526

Table Fcst23
Forecast Ranges
Annual Energy (GWh)
Wyoming

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	1,687				
Actual	2011	1,810				
Actual	2012	1,861				
Actual	2013	1,888				
Actual	2014	1,903	2,082	1,884	2,008	1,959
Projected	2015	2,078	2,224	1,932	2,103	2,052
Projected	2016	2,110	2,291	1,928	2,136	2,084
Projected	2017	2,141	2,353	1,928	2,167	2,114
Projected	2018	2,182	2,424	1,940	2,208	2,155
Projected	2019	2,214	2,483	1,945	2,241	2,187
Projected	2020	2,242	2,536	1,948	2,269	2,214
Projected	2021	2,274	2,593	1,956	2,302	2,246
Projected	2022	2,306	2,648	1,964	2,334	2,278
Projected	2023	2,338	2,704	1,973	2,367	2,310
Projected	2024	2,371	2,759	1,982	2,400	2,342
Projected	2025	2,401	2,811	1,990	2,430	2,371
Projected	2026	2,430	2,861	1,997	2,459	2,400
Projected	2027	2,459	2,912	2,006	2,489	2,429
Projected	2028	2,490	2,964	2,015	2,520	2,459
Projected	2029	2,521	3,016	2,025	2,552	2,490
Projected	2030	2,552	3,069	2,035	2,584	2,521
Projected	2031	2,581	3,119	2,043	2,613	2,550
Projected	2032	2,610	3,167	2,051	2,642	2,578
Projected	2033	2,640	3,218	2,061	2,673	2,608
Projected	2034	2,673	3,273	2,073	2,706	2,641
Projected	2035	2,704	3,324	2,083	2,737	2,671

Table Fcst24

Forecast Ranges

Summer Peak Demand (MW)

Wyoming

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	216				
Actual	2011	252				
Actual	2012	278				
Actual	2013	263				
Actual	2014	263	290	265	294	261
Projected	2015	292	311	274	309	275
Projected	2016	295	318	272	312	278
Projected	2017	299	326	273	317	282
Projected	2018	305	336	275	323	287
Projected	2019	309	343	275	327	291
Projected	2020	313	349	276	331	294
Projected	2021	317	357	277	335	299
Projected	2022	321	364	278	339	302
Projected	2023	325	371	280	344	306
Projected	2024	329	377	281	348	310
Projected	2025	333	384	282	352	314
Projected	2026	337	390	283	356	317
Projected	2027	340	397	284	360	321
Projected	2028	344	403	285	364	324
Projected	2029	348	410	286	368	328
Projected	2030	352	417	288	373	332
Projected	2031	356	423	289	377	335
Projected	2032	360	429	290	380	339
Projected	2033	363	435	291	385	342
Projected	2034	368	442	293	389	346
Projected	2035	372	449	294	393	350

Table Fcst25

Forecast Ranges

Winter Peak Demand (MW)

Wyoming

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	251				
Actual	2011	229				
Actual	2012	236				
Actual	2013	245				
Actual	2014	270	270	239	267	242
Projected	2015	270	290	249	283	257
Projected	2016	271	295	246	284	257
Projected	2017	275	303	247	289	262
Projected	2018	280	312	249	294	267
Projected	2019	284	319	249	298	270
Projected	2020	288	326	251	302	274
Projected	2021	293	333	252	307	278
Projected	2022	297	340	253	311	282
Projected	2023	300	346	254	315	286
Projected	2024	304	353	255	319	289
Projected	2025	308	359	256	323	293
Projected	2026	311	366	257	326	296
Projected	2027	315	372	258	330	300
Projected	2028	319	378	260	335	303
Projected	2029	323	385	261	339	307
Projected	2030	327	391	262	343	311
Projected	2031	330	397	263	346	314
Projected	2032	334	403	265	350	318
Projected	2033	338	410	266	355	322
Projected	2034	342	417	267	359	325
Projected	2035	346	423	269	363	329

Table Fcst26
Forecast Ranges
Annual Energy (GWh)
Nebraska

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	858				
Actual	2011	848				
Actual	2012	1,178				
Actual	2013	1,010				
Actual	2014	918	1,073	881	1,025	929
Projected	2015	1,013	1,135	891	1,063	964
Projected	2016	1,018	1,151	885	1,068	968
Projected	2017	1,021	1,159	883	1,071	971
Projected	2018	1,029	1,170	887	1,079	978
Projected	2019	1,035	1,179	892	1,086	985
Projected	2020	1,042	1,187	897	1,093	991
Projected	2021	1,049	1,196	903	1,100	998
Projected	2022	1,057	1,205	909	1,109	1,006
Projected	2023	1,066	1,215	916	1,118	1,013
Projected	2024	1,072	1,222	922	1,124	1,019
Projected	2025	1,077	1,228	926	1,130	1,024
Projected	2026	1,082	1,234	931	1,135	1,029
Projected	2027	1,088	1,240	935	1,141	1,034
Projected	2028	1,093	1,246	940	1,147	1,040
Projected	2029	1,099	1,253	945	1,153	1,045
Projected	2030	1,104	1,259	950	1,159	1,050
Projected	2031	1,110	1,265	954	1,164	1,055
Projected	2032	1,116	1,272	959	1,170	1,061
Projected	2033	1,122	1,279	965	1,177	1,067
Projected	2034	1,128	1,285	970	1,183	1,072
Projected	2035	1,133	1,292	974	1,189	1,078

Table Fcst27

Forecast Ranges

Summer Peak Demand (MW)

Nebraska

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	316				
Actual	2011	320				
Actual	2012	388				
Actual	2013	362				
Actual	2014	388	384	353	388	349
Projected	2015	375	395	356	395	356
Projected	2016	377	399	356	397	358
Projected	2017	380	402	358	400	360
Projected	2018	383	406	360	403	363
Projected	2019	386	409	363	406	365
Projected	2020	389	412	366	409	369
Projected	2021	392	416	369	413	372
Projected	2022	396	420	372	417	375
Projected	2023	400	424	376	421	379
Projected	2024	402	426	378	423	381
Projected	2025	404	428	380	425	383
Projected	2026	406	431	382	428	385
Projected	2027	408	433	384	430	387
Projected	2028	410	435	386	432	389
Projected	2029	412	437	388	434	391
Projected	2030	414	439	390	436	393
Projected	2031	416	441	391	438	394
Projected	2032	418	443	393	440	397
Projected	2033	421	446	395	443	399
Projected	2034	423	448	397	445	401
Projected	2035	425	450	399	447	403

Table Fcst28

Forecast Ranges

Winter Peak Demand (MW)

Nebraska

STATUS	Year	Base Case	Economic High	Economic Low	Severe Weather	Mild Weather
Actual	2010	93				
Actual	2011	84				
Actual	2012	83				
Actual	2013	94				
Actual	2014	102	115	83	111	87
Projected	2015	104	122	86	117	91
Projected	2016	103	122	83	115	90
Projected	2017	103	123	83	116	90
Projected	2018	104	124	83	117	91
Projected	2019	104	125	83	117	91
Projected	2020	105	126	84	118	92
Projected	2021	106	127	84	119	93
Projected	2022	106	128	85	120	93
Projected	2023	107	128	85	120	93
Projected	2024	107	129	86	120	94
Projected	2025	108	129	86	121	94
Projected	2026	108	130	86	122	95
Projected	2027	109	131	87	122	95
Projected	2028	109	131	87	123	96
Projected	2029	110	132	88	123	96
Projected	2030	110	133	88	124	97
Projected	2031	111	133	89	125	97
Projected	2032	112	134	89	125	98
Projected	2033	112	135	89	126	98
Projected	2034	113	136	90	127	99
Projected	2035	113	136	91	128	99

Chart Fcst6

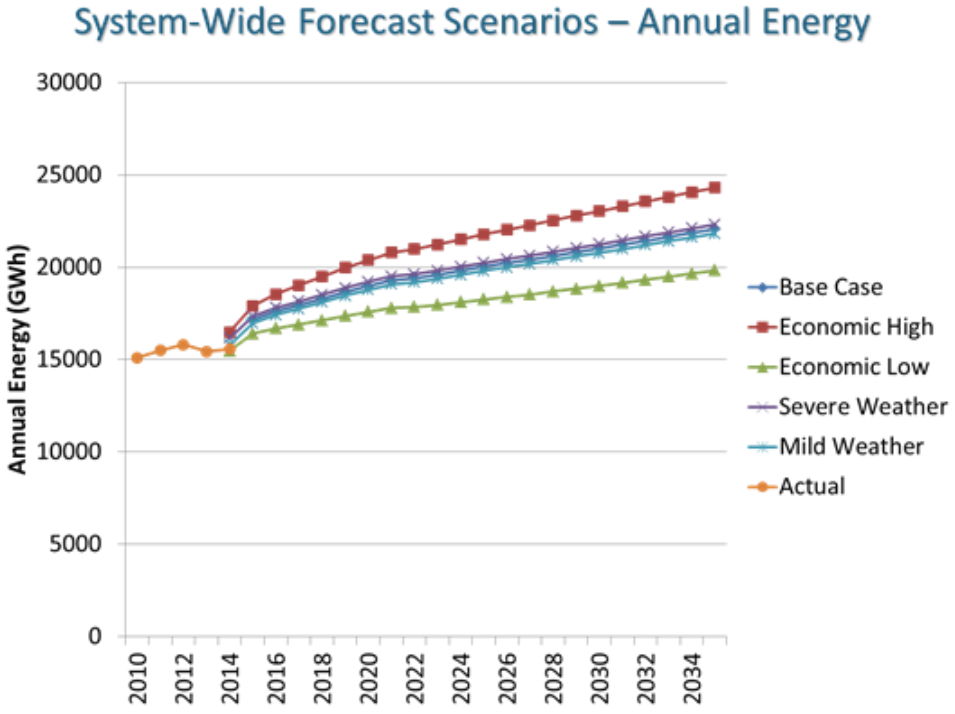
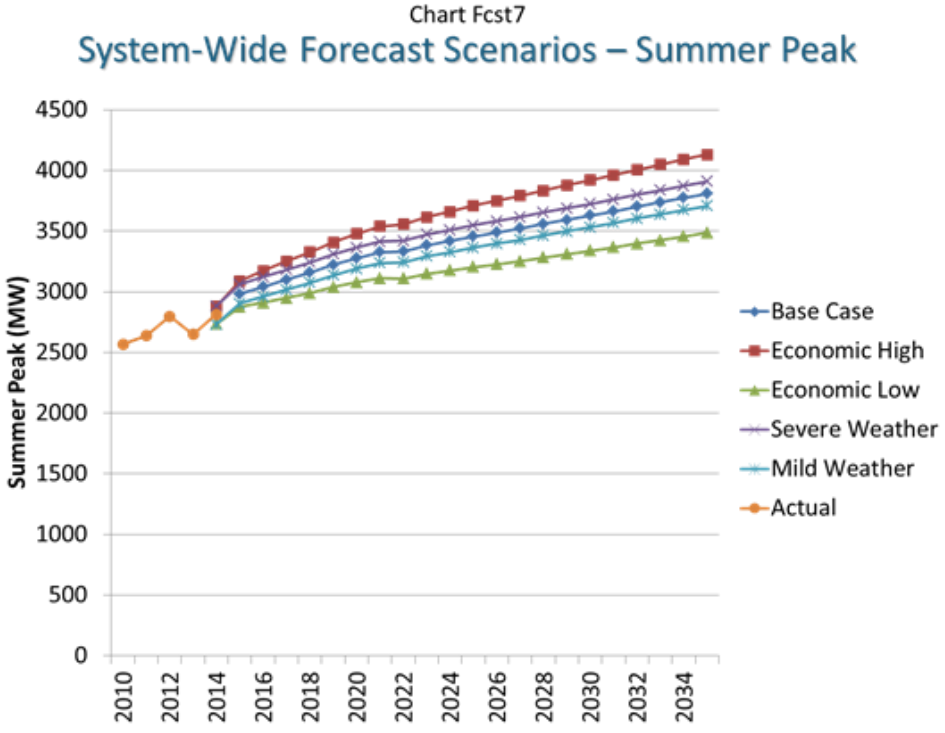
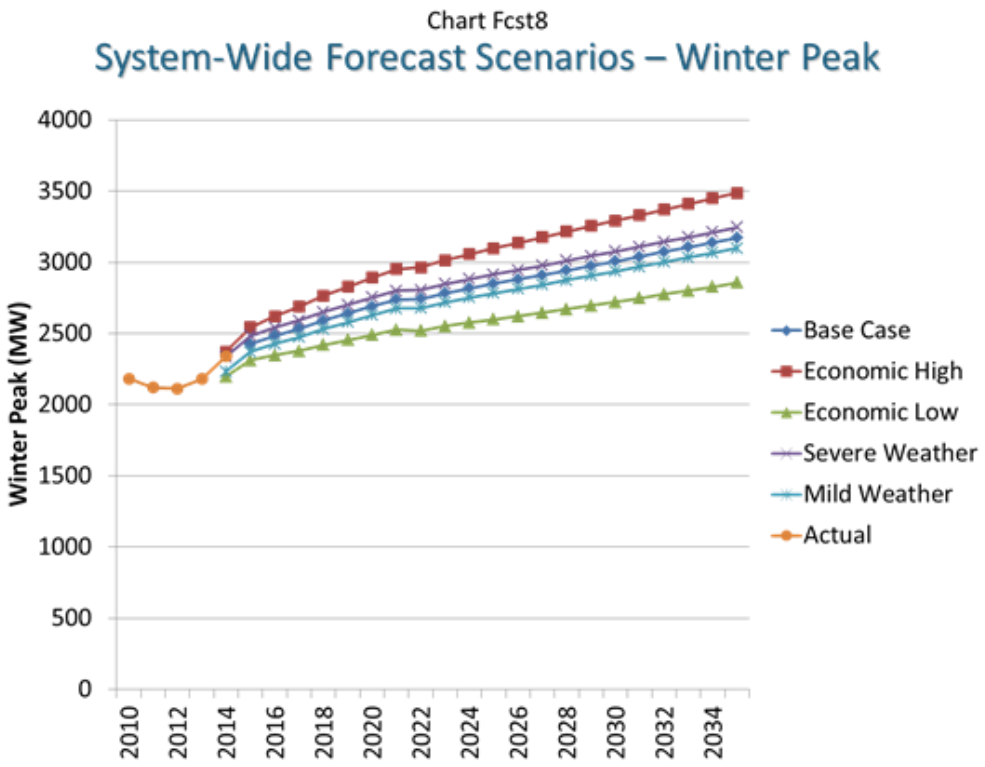


Chart Fcst7





Forecast 2d – DESCRIPTION AND JUSTIFICATION

The forecasts in this section are based on the 2014 Load Forecast prepared with each of Tri-State's 44 Members. Forecasts are prepared for each Member system and these are combined to form Tri-State's Load Forecast. Members break down their consumer energy sales into nine possible classes: residential, seasonal, irrigation, small commercial, large commercial, public authorities, streetlights, resales to RUS, and resales to others. Forecasts of energy use in each of these classes are developed using econometric techniques, time series extrapolation or customer and managerial expectations. Seasonal sales represent sales to accounts that do not have year-round energy use. Sales to RUS are sales to other distribution cooperatives that are RUS borrowers. These RUS sales typically serve areas of neighboring cooperatives that are electrically isolated from larger load pockets. The RUS sales total less than 1 MW, and are included as a part of applicable Member load forecasts.

The forecast of coincident peak demand for each Member is based on historical load shapes. Coincident peak demand forecasts for Tri-State are derived from the hourly sum of Member load forecasts.

The primary source for historical data regarding use by each class of consumers is RUS Form 7. Information on the number of accounts, energy use per account, total energy and the average

price of electricity is collected monthly from each Member. In addition, data on large commercial accounts is gathered on RUS Form 345.

Tri-State obtains economic and demographic data for each Member from Woods & Poole Economics, Inc. (W&P). The vast majority of data from W&P originates with the Department of Commerce, Bureau of Economic Analysis (BEA). All projections of the economic and demographic data have been performed by W&P. Tri-State uses more than 20 measures of employment and income activity by sector from the W&P data.

The electricity that Tri-State Members offer often competes with propane, natural gas and fuel oil as an energy source. Historical price data for these alternative fuels has been obtained from the DOE's Energy Information Administration (EIA). Tri-State based its price projections for each of these alternative fuels on information from the EIA.

Tri-State uses weather data from 20 weather stations within Tri-State's region supplied through DTN Meteorlogix. Tri-State's database includes temperature, heating and cooling degree-days, and precipitation. Weather normalizations of this data (defined as 10-year average values) are used for Tri-State's energy and demand forecasting.

Forecasts of energy sales for the retail classes of each of Tri-State's 44 Members were made on the basis of econometric analysis and/or extrapolation techniques. The econometric analysis examined correlations between energy use and customer numbers with such factors as weather, fuel prices, electric prices, employment and income. Tri-State employs statistically adjusted end-use models for the residential class.

Forecast 2e – DEMAND-SIDE MANAGEMENT

The load forecast presented here includes the impact of existing demand-side management measures through the econometric method used to prepare the forecasts. These models accommodate changes in technology or customer preferences that impact the energy use per account through the use of time-trend variables.

The load forecast also accounts for changes in end-use equipment saturations and efficiency improvements anticipated through equipment efficiency standards, building shell efficiency improvements and natural attrition of less efficient equipment. This impact is modeled through the statistically adjusted end-use modeling approach.

Forecast 2f – HISTORICAL DATA

Previous forecasts of coincident summer and winter peak demand and energy sales are shown in Table Fcst29 through Table Fcst46 compared to actual. The forecast used in the 2008 CPUC Annual Progress report is also shown in the tables and is shown in Charts Fcst9, Fcst10 and Fcst11 for the total Tri-State system.

Table Fcst29

Forecast Comparison

Annual Energy (GWh)

System-Wide

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	15,140						15,106
2011		15,470					15,496
2012			15,899				15,811
2013				15,773			15,440
2014					15,985		15,568
2015					16,285	17,158	
2016					16,518	17,618	
2017					16,744	17,953	
2018					16,980	18,302	
2019					17,250	18,667	
2020					17,525	18,990	
2021					17,802	19,293	
2022					17,999	19,412	
2023					18,281	19,589	
2024					18,579	19,808	
2025					18,860	20,023	
2026					19,154	20,211	
2027					19,441	20,402	
2028					19,745	20,611	
2029					20,030	20,813	
2030					20,324	21,018	
2031					20,620	21,221	
2032					20,927	21,436	
2033					21,218	21,645	
2034						21,855	
2035						22,063	

Table Fcst30

Forecast Comparison

Summer Peak Demand (MW)

System-Wide

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	2,618						2,568
2011		2,689					2,637
2012			2,744				2,798
2013				2,731			2,649
2014					2,765		2,813
2015					2,809	2,982	
2016					2,846	3,041	
2017					2,886	3,099	
2018					2,922	3,158	
2019					2,966	3,223	
2020					3,010	3,277	
2021					3,053	3,326	
2022					3,090	3,332	
2023					3,132	3,382	
2024					3,179	3,418	
2025					3,222	3,456	
2026					3,268	3,489	
2027					3,311	3,522	
2028					3,359	3,559	
2029					3,402	3,593	
2030					3,448	3,629	
2031					3,493	3,664	
2032					3,540	3,701	
2033					3,584	3,737	
2034						3,774	
2035						3,809	

Table Fcst31

Forecast Comparison

Winter Peak Demand (MW)

System-Wide

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	2,195						2,182
2011		2,240					2,119
2012			2,295				2,112
2013				2,232			2,179
2014					2,249		2,339
2015					2,283	2,428	
2016					2,321	2,483	
2017					2,352	2,533	
2018					2,390	2,592	
2019					2,431	2,640	
2020					2,472	2,691	
2021					2,514	2,738	
2022					2,550	2,742	
2023					2,593	2,783	
2024					2,637	2,817	
2025					2,679	2,849	
2026					2,723	2,879	
2027					2,768	2,911	
2028					2,812	2,943	
2029					2,855	2,975	
2030					2,899	3,007	
2031					2,945	3,039	
2032					2,990	3,073	
2033					3,034	3,106	
2034						3,138	
2035						3,172	

Table Fcst32

Forecast Comparison

Annual Energy (GWh)

Eastern Colorado

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	5,239						5,154
2011		5,197					5,240
2012			5,344				5,366
2013				5,297			5,175
2014					5,417		5,437
2015					5,534	6,128	
2016					5,643	6,493	
2017					5,746	6,736	
2018					5,843	6,974	
2019					5,941	7,191	
2020					6,041	7,375	
2021					6,137	7,523	
2022					6,146	7,608	
2023					6,243	7,757	
2024					6,351	7,886	
2025					6,456	8,012	
2026					6,565	8,108	
2027					6,673	8,204	
2028					6,786	8,303	
2029					6,892	8,398	
2030					7,001	8,496	
2031					7,111	8,594	
2032					7,225	8,695	
2033					7,331	8,793	
2034						8,893	
2035						8,994	

Table Fcst33

Forecast Comparison

Summer Peak Demand (MW)

Eastern Colorado

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	1,079						1,061
2011		1,089					1,080
2012			1,113				1,149
2013				1,123			1,055
2014					1,142		1,164
2015					1,163	1,279	
2016					1,183	1,336	
2017					1,206	1,378	
2018					1,223	1,419	
2019					1,243	1,462	
2020					1,262	1,494	
2021					1,281	1,521	
2022					1,292	1,541	
2023					1,310	1,568	
2024					1,332	1,592	
2025					1,352	1,617	
2026					1,374	1,636	
2027					1,395	1,655	
2028					1,417	1,676	
2029					1,437	1,696	
2030					1,459	1,716	
2031					1,480	1,736	
2032					1,503	1,757	
2033					1,523	1,777	
2034						1,798	
2035						1,819	

Table Fcst34

Forecast Comparison

Winter Peak Demand (MW)

Eastern Colorado

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	793						729
2011		779					712
2012			802				716
2013				768			751
2014					761		840
2015					778	909	
2016					798	956	
2017					810	993	
2018					826	1,033	
2019					843	1,064	
2020					859	1,094	
2021					875	1,118	
2022					885	1,136	
2023					903	1,160	
2024					921	1,182	
2025					939	1,201	
2026					957	1,217	
2027					975	1,234	
2028					994	1,250	
2029					1,012	1,267	
2030					1,030	1,283	
2031					1,049	1,300	
2032					1,068	1,317	
2033					1,086	1,334	
2034						1,351	
2035						1,369	

Table Fcst35
Forecast Comparison
Annual Energy (GWh)
Western Colorado

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	4,232						4,349
2011		4,450					4,440
2012			4,700				4,272
2013				4,533			4,227
2014					4,528		4,165
2015					4,626	4,504	
2016					4,699	4,535	
2017					4,772	4,567	
2018					4,852	4,602	
2019					4,931	4,678	
2020					5,012	4,753	
2021					5,103	4,836	
2022					5,198	4,928	
2023					5,293	5,014	
2024					5,391	5,044	
2025					5,484	5,078	
2026					5,580	5,115	
2027					5,676	5,147	
2028					5,775	5,186	
2029					5,870	5,221	
2030					5,967	5,254	
2031					6,065	5,288	
2032					6,165	5,329	
2033					6,261	5,367	
2034						5,402	
2035						5,436	

Table Fcst36

Forecast Comparison

Summer Peak Demand (MW)

Western Colorado

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	556						543
2011		590					563
2012			609				554
2013				591			547
2014					589		549
2015					602	561	
2016					612	561	
2017					621	566	
2018					631	569	
2019					641	579	
2020					651	588	
2021					663	598	
2022					675	609	
2023					687	621	
2024					699	623	
2025					711	628	
2026					723	632	
2027					735	636	
2028					747	642	
2029					759	646	
2030					771	650	
2031					783	654	
2032					796	660	
2033					808	665	
2034						669	
2035						673	

Table Fcst37

Forecast Comparison

Winter Peak Demand (MW)

Western Colorado

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	636						650
2011		669					624
2012			699				622
2013				673			631
2014					680		634
2015					690	657	
2016					701	660	
2017					713	665	
2018					725	673	
2019					737	684	
2020					750	694	
2021					764	707	
2022					778	720	
2023					792	729	
2024					806	734	
2025					820	740	
2026					834	746	
2027					849	752	
2028					863	758	
2029					877	764	
2030					891	770	
2031					906	776	
2032					921	783	
2033					935	789	
2034						795	
2035						801	

Table Fcst38

Forecast Comparison

Annual Energy (GWh)

New Mexico

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	3,019						3,058
2011		3,106					3,158
2012			3,147				3,134
2013				3,193			3,140
2014					3,198		3,144
2015					3,266	3,435	
2016					3,312	3,462	
2017					3,357	3,488	
2018					3,396	3,516	
2019					3,448	3,548	
2020					3,504	3,578	
2021					3,557	3,610	
2022					3,611	3,513	
2023					3,663	3,414	
2024					3,718	3,435	
2025					3,769	3,455	
2026					3,822	3,477	
2027					3,875	3,505	
2028					3,930	3,539	
2029					3,981	3,575	
2030					4,034	3,611	
2031					4,087	3,648	
2032					4,142	3,686	
2033					4,193	3,723	
2034						3,759	
2035						3,796	

Table Fcst39

Forecast Comparison

Summer Peak Demand (MW)

New Mexico

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	414						432
2011		415					422
2012			422				429
2013				433			422
2014					433		449
2015					443	474	
2016					449	471	
2017					455	476	
2018					460	481	
2019					468	487	
2020					475	493	
2021					483	498	
2022					490	464	
2023					497	468	
2024					505	471	
2025					511	474	
2026					518	478	
2027					525	482	
2028					533	486	
2029					540	491	
2030					547	496	
2031					554	501	
2032					562	506	
2033					568	511	
2034						516	
2035						521	

Table Fcst40

Forecast Comparison

Winter Peak Demand (MW)

New Mexico

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	447						459
2011		467					470
2012			470				455
2013				455			458
2014					457		492
2015					464	489	
2016					470	494	
2017					475	497	
2018					481	502	
2019					489	504	
2020					496	510	
2021					503	515	
2022					509	483	
2023					516	487	
2024					523	490	
2025					530	493	
2026					537	497	
2027					544	502	
2028					551	507	
2029					558	512	
2030					564	517	
2031					572	522	
2032					579	527	
2033					585	532	
2034						537	
2035						543	

Table Fcst41
Forecast Comparison
Annual Energy (GWh)
Wyoming

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	1,719						1,687
2011		1,821					1,810
2012			1,803				1,861
2013				1,895			1,888
2014					1,952		1,903
2015					1,964	2,078	
2016					1,963	2,110	
2017					1,962	2,141	
2018					1,977	2,182	
2019					2,011	2,214	
2020					2,042	2,242	
2021					2,073	2,274	
2022					2,106	2,306	
2023					2,139	2,338	
2024					2,170	2,371	
2025					2,198	2,401	
2026					2,229	2,430	
2027					2,258	2,459	
2028					2,290	2,490	
2029					2,320	2,521	
2030					2,350	2,552	
2031					2,383	2,581	
2032					2,415	2,610	
2033					2,449	2,640	
2034						2,673	
2035						2,704	

Table Fcst42

Forecast Comparison

Summer Peak Demand (MW)

Wyoming

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	238						216
2011		266					252
2012			264				278
2013				267			263
2014					275		263
2015					276	292	
2016					276	295	
2017					275	299	
2018					278	305	
2019					283	309	
2020					287	313	
2021					291	317	
2022					295	321	
2023					299	325	
2024					303	329	
2025					307	333	
2026					311	337	
2027					315	340	
2028					319	344	
2029					323	348	
2030					326	352	
2031					331	356	
2032					335	360	
2033					339	363	
2034						368	
2035						372	

Table Fcst43

Forecast Comparison

Winter Peak Demand (MW)

Wyoming

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	228						251
2011		240					229
2012			240				236
2013				247			245
2014					257		270
2015					257	270	
2016					257	271	
2017					258	275	
2018					261	280	
2019					265	284	
2020					269	288	
2021					273	293	
2022					277	297	
2023					281	300	
2024					285	304	
2025					289	308	
2026					293	311	
2027					296	315	
2028					300	319	
2029					304	323	
2030					308	327	
2031					312	330	
2032					317	334	
2033					321	338	
2034						342	
2035						346	

Table Fcst44

Forecast Comparison

Annual Energy (GWh)

Nebraska

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	931						858
2011		896					848
2012			905				1,178
2013				856			1,010
2014					891		918
2015					895	1,013	
2016					901	1,018	
2017					907	1,021	
2018					913	1,029	
2019					919	1,035	
2020					926	1,042	
2021					933	1,049	
2022					938	1,057	
2023					943	1,066	
2024					948	1,072	
2025					952	1,077	
2026					957	1,082	
2027					960	1,088	
2028					964	1,093	
2029					968	1,099	
2030					972	1,104	
2031					976	1,110	
2032					980	1,116	
2033					984	1,122	
2034						1,128	
2035						1,133	

Table Fcst45

Forecast Comparison

Summer Peak Demand (MW)

Nebraska

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	331						316
2011		329					320
2012			337				388
2013				317			362
2014					325		388
2015					325	375	
2016					327	377	
2017					328	380	
2018					330	383	
2019					331	386	
2020					334	389	
2021					336	392	
2022					338	396	
2023					339	400	
2024					340	402	
2025					341	404	
2026					342	406	
2027					342	408	
2028					343	410	
2029					343	412	
2030					344	414	
2031					344	416	
2032					345	418	
2033					345	421	
2034						423	
2035						425	

Table Fcst46

Forecast Comparison

Winter Peak Demand (MW)

Nebraska

YEAR	2009 Update	2010 Load Forecast	2011 Update	2012 Load Forecast	2013 Update	2014 Load Forecast	ACTUAL
2010	91						93
2011		84					84
2012			83				83
2013				89			94
2014					94		102
2015					94	104	
2016					95	103	
2017					96	103	
2018					97	104	
2019					98	104	
2020					98	105	
2021					99	106	
2022					100	106	
2023					101	107	
2024					101	107	
2025					102	108	
2026					103	108	
2027					103	109	
2028					104	109	
2029					105	110	
2030					105	110	
2031					106	111	
2032					107	112	
2033					108	112	
2034						113	
2035						113	

Chart Fcst9

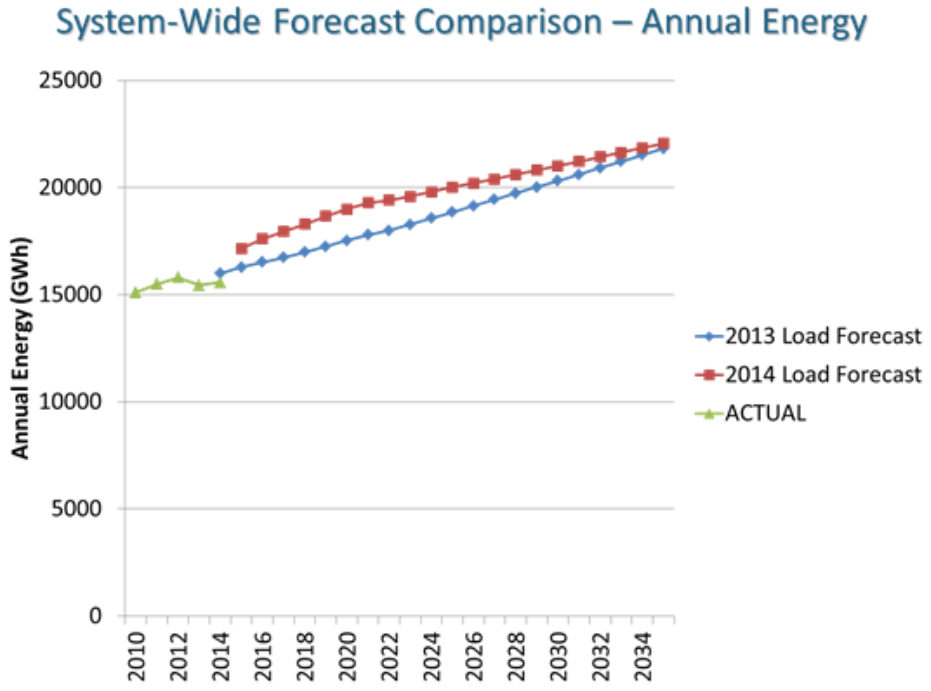
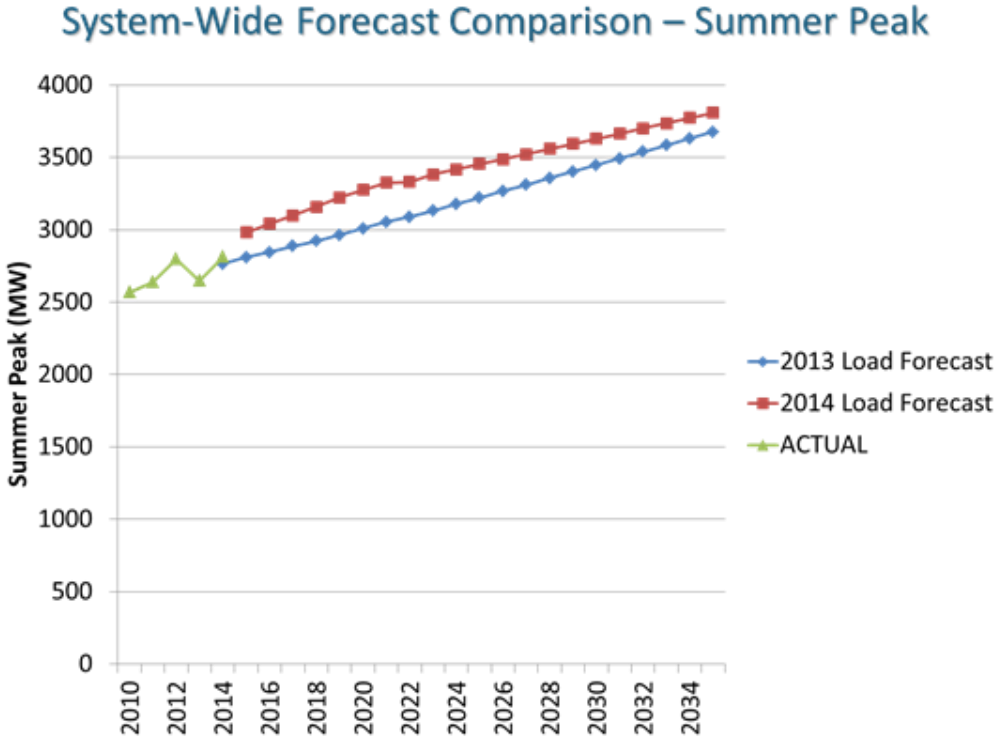
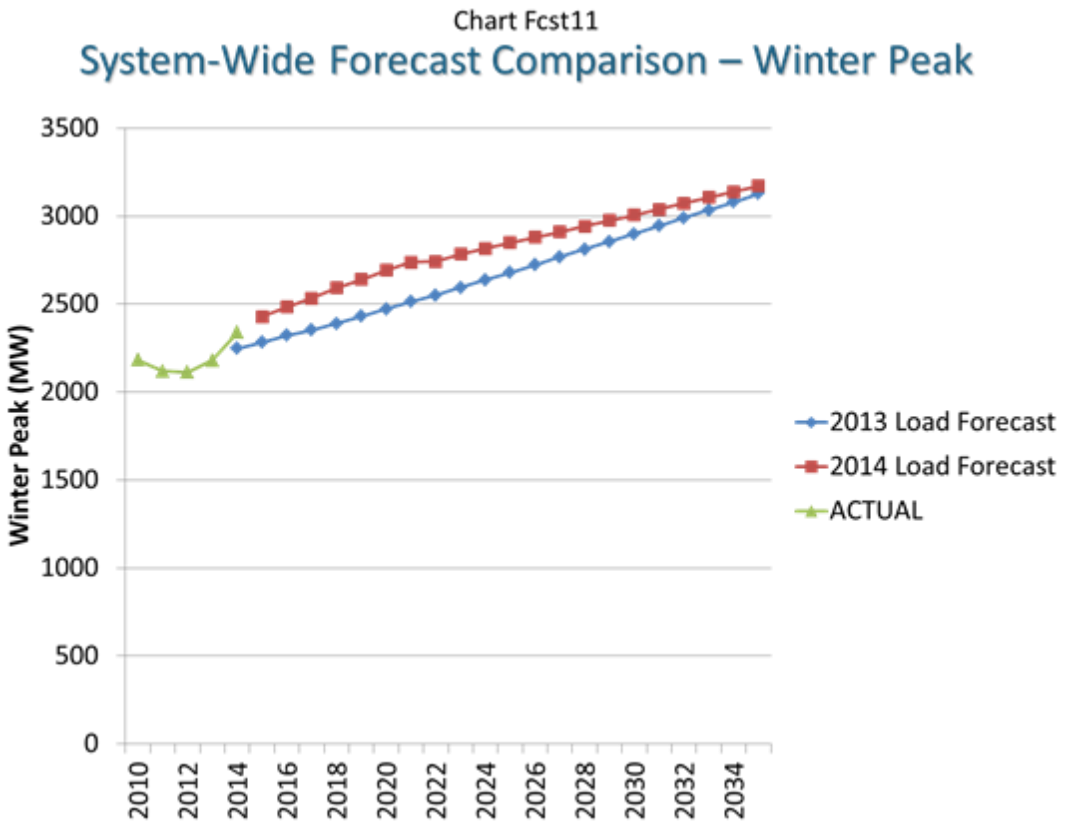


Chart Fcst10





7. Annual Intra-Utility Energy and Capacity Use at the Time of Coincident Summer and Winter Peak Demand

Tri-State intra-utility loads consist of a number of service centers and the headquarters building. For these loads, Tri-State takes retail service from the local provider. Accordingly, Tri-State has no intra-utility loads that contribute to energy and capacity requirements for purposes of Tri-State resource planning.

8. Annual Energy and Capacity Sales to Other Utilities

Energy sales contracts are discussed in Section 3. The energy delivered under the contract is assumed to be the maximum yearly capacity factor times the associated capacity available as described for each contract. The capacity at the time of summer and winter peak is assumed to be at the maximum level available as defined in Section 3. This has historically been accurate but it is also a necessary conservative estimate for capacity planning since these contracts can be called on real time.

9. Gas and Electricity Pricing

Tri-State purchases commodity price forecasting services from Ventyx Energy and Wood Mackenzie. Both are well-known and widely used consulting firms for domestic and global energy pricing as well as market analysis and research. Tri-State subscribes to both services' energy information databases, research materials and published fundamental price outlooks for energy products. Both Ventyx and Wood Mackenzie publish a fundamental wholesale gas and electric price outlook twice annually in April and November

Ventyx and Wood Mackenzie formulate electricity price forecasts based on information received from individual companies within a study region (e.g., WECC), but also on complex models taking into account the relationships and interrelationships between available fuel sources, regional supply and demand equations, transmission issues, economic conditions, new/retiring resources, state and federal legislation, and emerging technologies. It is important to maintain the consistency of the electric and gas price forecasts to ensure the implied heat rates are reasonable for the two forward curves.

These fundamental forecasts use data related to current and forward-looking market trends, and a library of data related to historical trends, correlations and seasonal shapes.

Typical fundamental electricity pricing information is presented as monthly peak and off-peak prices for supply regions around the United States. In addition to a monthly forecasted price, Ventyx provides a "typical week" shape for each month. This shape is used in conjunction with the price forecast to produce hourly granularity for a given day of the week/month.

Tri-State uses the data from Ventyx and Wood Mackenzie as well as in-house market expectations and knowledge to combine into a single forecast for each commodity and market. The results of this data as it was used during the resource planning process can be found in Figure 6 for natural gas and Figure 7 for electricity.

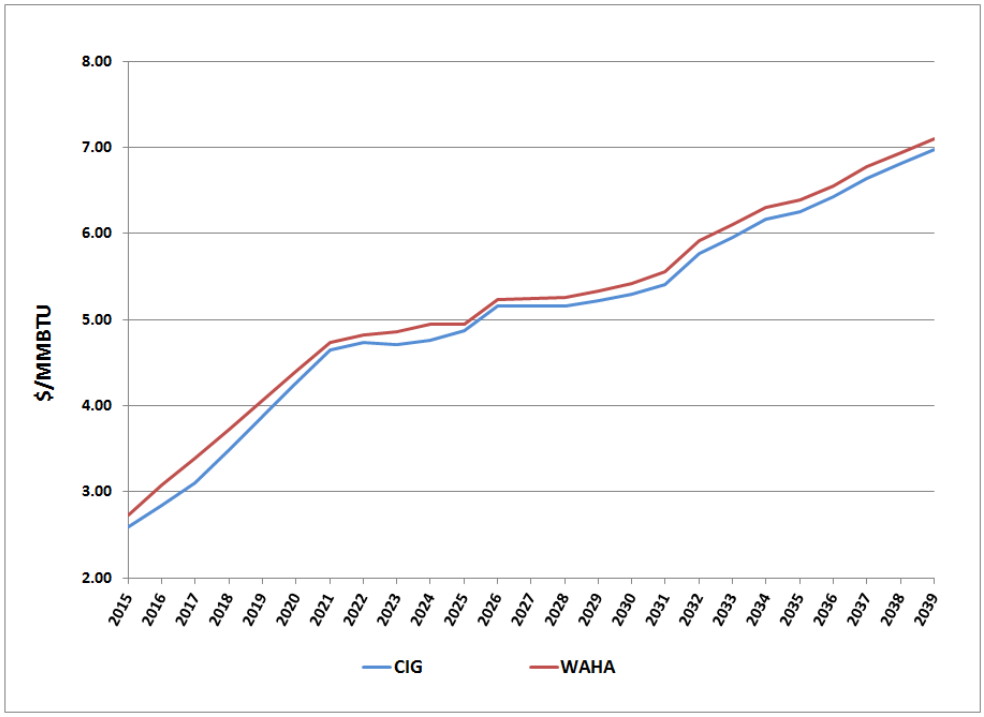


Figure 6 – Natural Gas Price Forecast

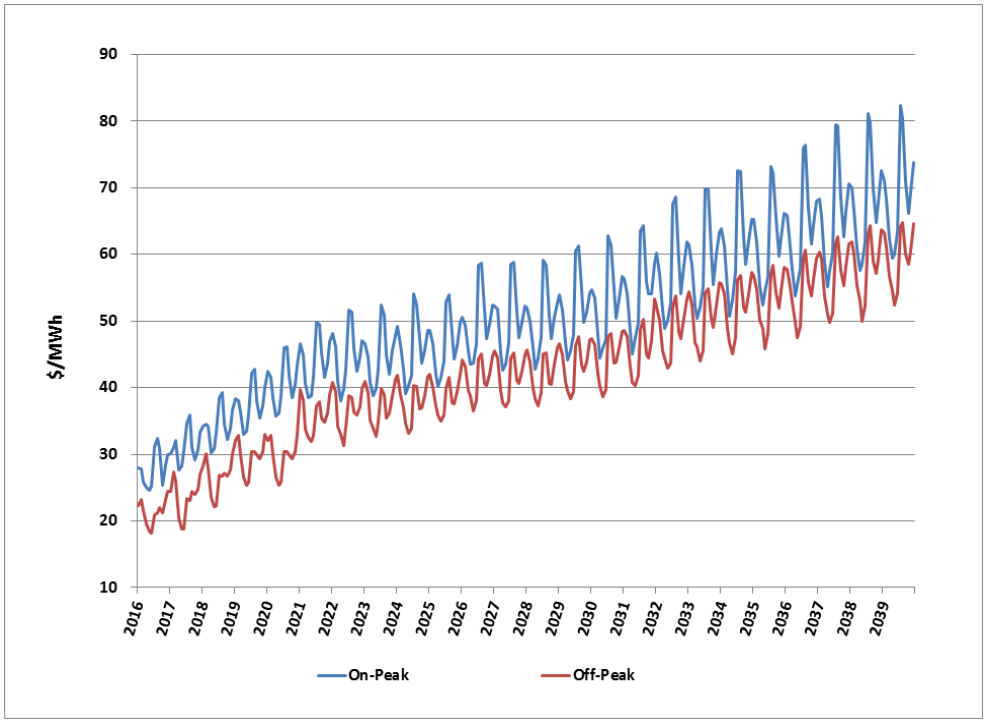


Figure 7 – Electricity Price Forecast

Coal pricing is highly dependent on the various long-term coal contracts Tri-State has in place and the forecasted production costs at the Colowyo Mine which Tri-State now owns The forecasted production costs at the Colowyo Mine impact the coal costs for Craig. The data in Figure 8 represents a composite coal price forecast based on a weighted average of the coal usage across Tri-State's coal generation fleet.

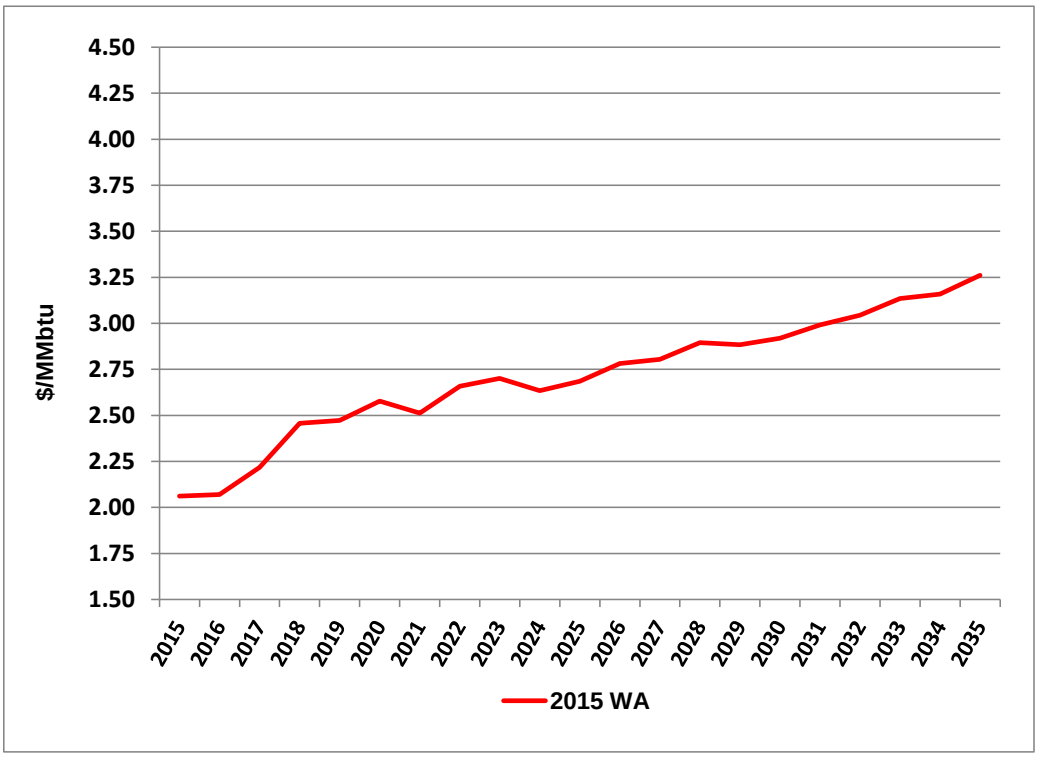


Figure 8 – Composite Weighted-Average Coal Price Forecast

Section III - Inputs for Resource Planning Modeling

1. Modeling System Information

Tri-State's Resource Planning modeling is a multistage process that attempts to meet reliability, emissions, and renewable portfolio standards while minimizing costs over the planning period. The process involves three major software modules: System Optimizer(SO), Planning and Risk(PaR), and the Long Range Economic Forecast(LREF). Figure 9 below provides a process flow diagram. SO, PaR, and LREF, general model assumptions, and scenario conclusions are discussed later in this section.

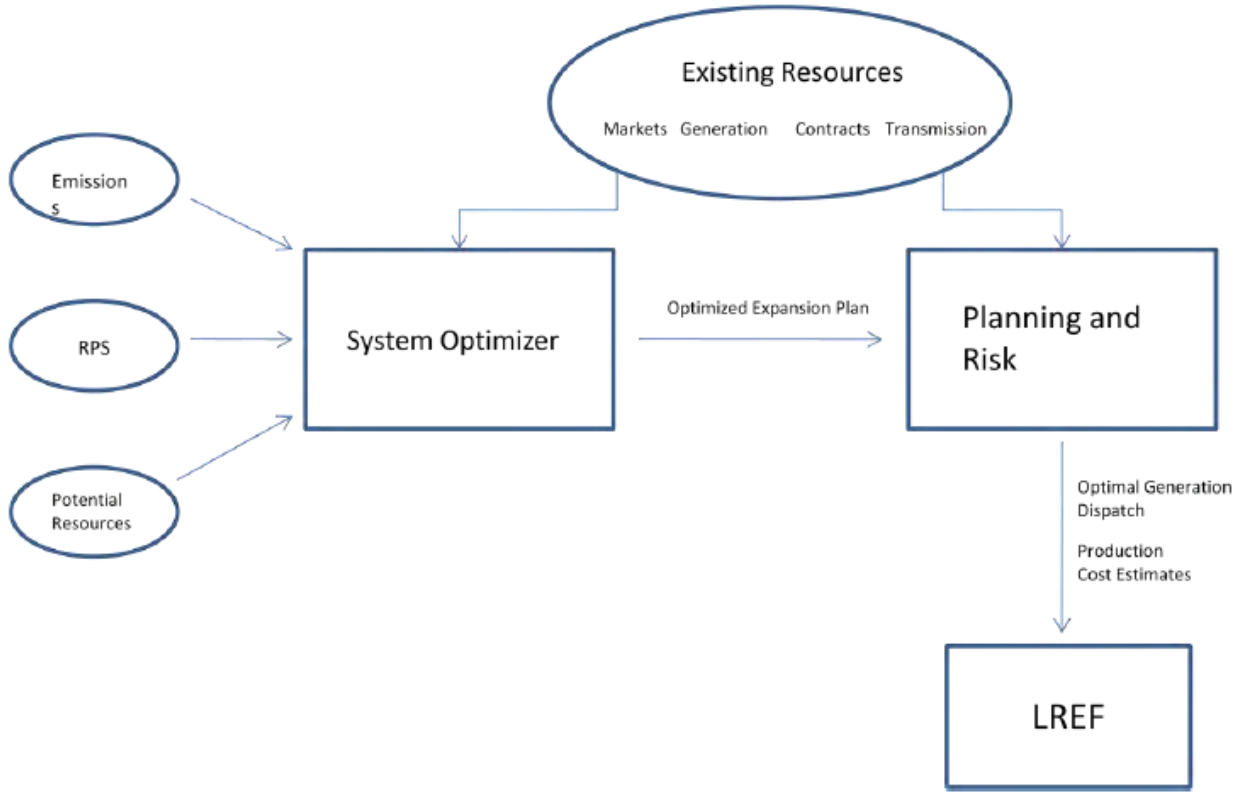


Figure 9 – Modeling Process Flow Overview

a. System Optimizer

SO is a system expansion model which was developed by Ventyx and when used with PaR creates an optimized expansion plan.. SO consists of two modules, Capacity Expansion and Emissions.

Capacity Expansion develops a resource investment plan over a long term horizon. The optimal solution is determined using a Mixed Integer (MIP) algorithm to provide a single optimized solution. The capacity module provides answers to key portfolio investment decisions such as type, timing, size, and locations of additions and retirements given reserve margin requirements. In addition, the module can account for Demand Side Management (DSM), RPS requirements, and transmission expansion alternatives.

b. Planning and Risk

Utilizing the optimal expansion plan from SO, PaR is a production cost model which optimizes the Tri-State electric system to find the least-cost hourly solution balancing all resources and obligations. PaR uses the PROSYM optimization model to determine the hourly minimum system cost. The hourly production cost modeling provides a view of high and low peaks for loads, generation, and prices. To achieve the least system costs, PaR incorporates dispatch, contract evaluation, transmission constraints and emission limits.

The dispatch features include:

1. Thermal unit dispatch using individual generator attributes. These include heat rate curves, ramp rates, minimum up and minimum down times, start costs, etc.
2. Multi-area dispatch optimization
3. Ancillary Service Dispatch – spin and non-spin reserves, regulation

PaR has the ability to model a wide variety of contract structures. The contracts can be electric energy or fuel based. The contract structure can be:

1. Fixed or index priced
2. Forwards

PaR also accurately models the tolling, firm transmission rights, and load management options associated with contracts.

c. Long Range Economic Forecast

The LREF is a tool used to calculate the Present Value of Revenue Requirements (PVRR) for various scenarios utilizing capital and O&M. For scenario analysis, the LREF uses the generation operating expenses from PaR, the generation capital expenditures from SO, and transmission expansion capital costs. The LREF outputs the PVRR discussed in the scenario analysis.

d. Internal Modeling Consistency

Tri-State works to maintain consistency throughout the resource planning modeling process; however, the models do give different results. Tri-State attempts to maximize each model's strengths and ensure reasonable results. SO provides a detailed expansion plan, but a less detailed dispatch model. PaR utilizes this expansion plan within an hourly dispatch production cost environment. The inputs to both models are internally consistent in that they both refer to the same input database. Therefore, all unit characteristics, loads, contracts, and transmission constraints are the same between both models. The LREF takes all of the dispatch data from PaR which ensures that the costs associated with the dispatch are based off of the same volumes from the production cost model.

2. **The costs, performance characteristics and other principal information on which Tri-State relies in considering the types of resources it may acquire during the planning period (CPUC ERP Requirement 6).**

Tri-State relies on a wide range of data, information, and factors to perform modeling studies. These studies in turn inform future resource selection. The data used to populate these models is vetted internally and represents Tri-State's collective best estimates regarding key variables including load growth, resource performance and price characteristics, fuel costs, carbon costs, unit upgrade requirements, timing and costs, unit retirement costs, reserve margins, transmission transfer capability, inflation rates, and interest rates.

Some of these key assumptions have been discussed in the preceding sections and include: Electric Demand and Energy Forecasts(Section II), Existing Resources and Contracts (Section II), and Capacity Planning Reserve Levels (Section III). Also, general results from the modeling efforts have been discussed in Section I.

3. Geography

Tri-State operates in 4 different states and serves over 200,000 square miles of Member service territory. This puts Tri-State in a unique position for generation options and transmission availability. Figure 10 below shows Tri-State's service territory divided into load and generation areas for modeling purposes and the current transmission links are shown as yellow arrows. The constrained "TOT" transmission paths are shown with red cross-sections. Future generation considerations will maximize the usage of transmission as well as the geographically advantageous areas for wind and solar energy (see Figures 11 and 12 below).

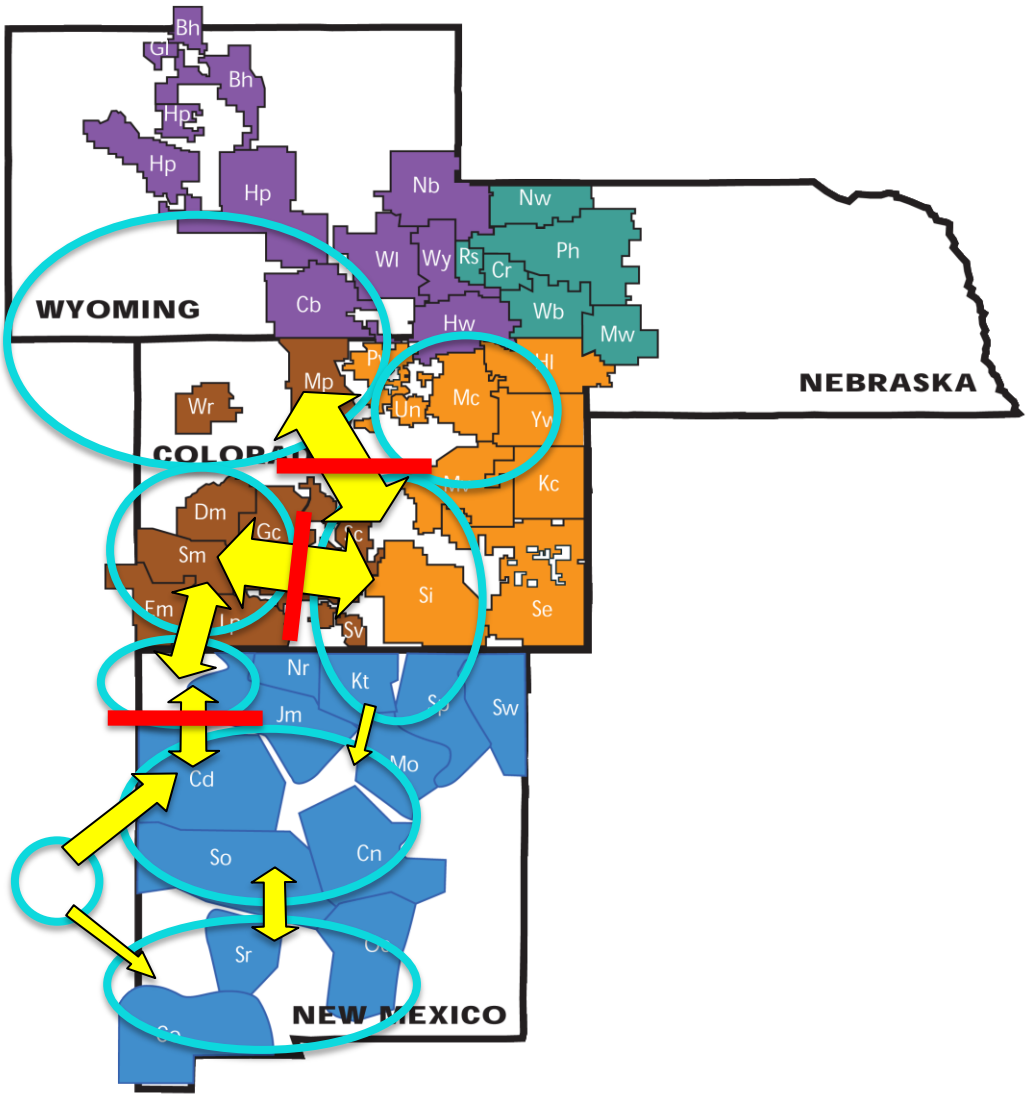

WYOMING
NEBRASKA
Bh
Bh
Hp
Hp
Hp
Nb
Nw
Ph
Wl
Wy
Rs
Cr
Cb
Wb
Hw
Mw
Mp
Mc
Wr
Kc
Dm
Gc
Sm
Si
Se
Nr
Kt
Jm
Sw
Cd
Mo
So
Cn
Sr

Figure 10

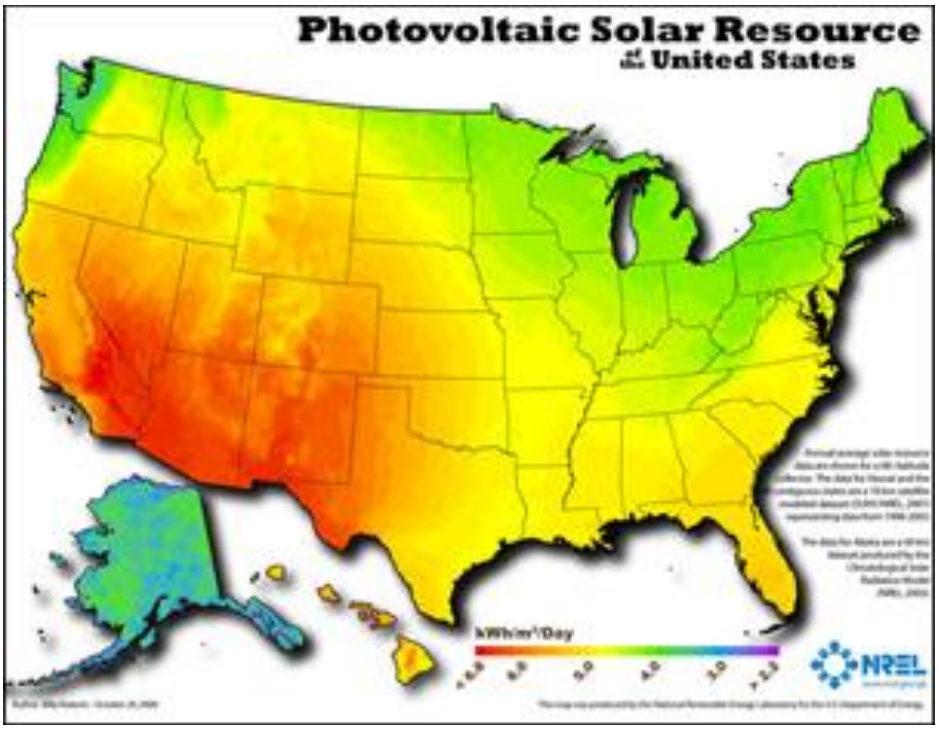


Figure 11

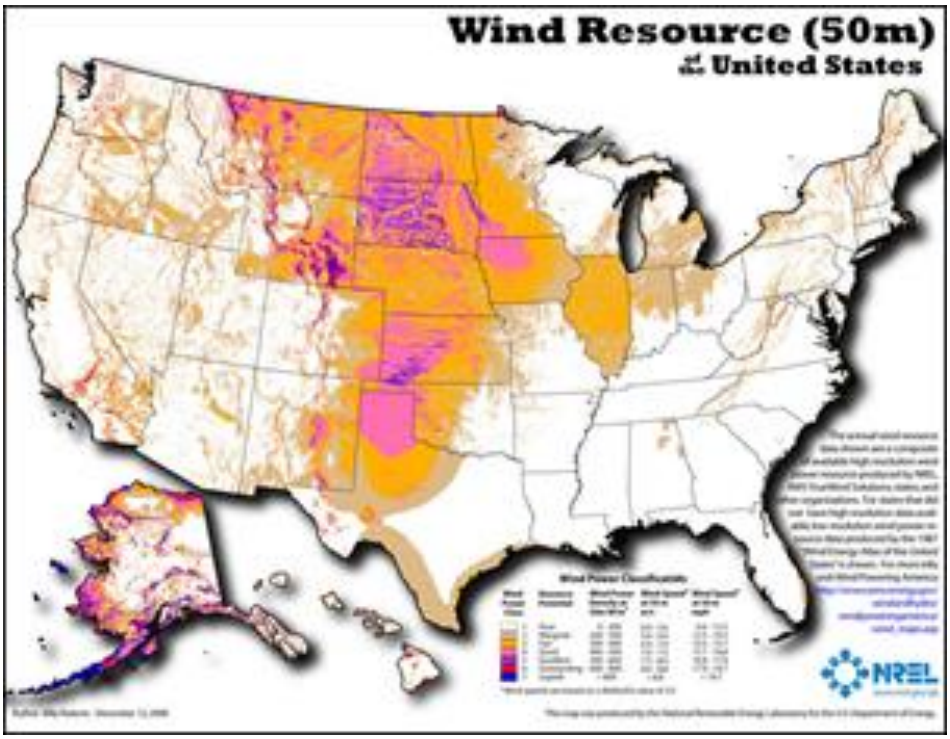


Figure 12

4. Generation Characteristics

The list of potential generation resources used in this effort was compiled from the Electric Power Research Institute (EPRI) Technical Assessment Guide, (TAG).

Tri-State has a full membership in EPRI and sponsors several renewable, efficiency, and emissions research and development projects as discussed in Section V. As part of Tri-State's EPRI membership, Tri-State has access to EPRI's extensive generation databases and reports.

Electric Power Research Institute (EPRI) Technical Assessment Guide, (TAG) provides cost and performance data for various technologies. Due to EPRI's data screening, sifting, and evaluation process, the TAG has become an industry standard for cost and performance information. Tri-State uses the TAG for variable O&M costs, estimated forced outage rate, estimated maintenance rate, emissions, and overnight capital costs. The TAG provides two major benefits in Tri-State's resource planning process. First, the TAG provides consistent financial and economic assumptions between the various technologies eliminating any financial or economic bias between the technologies. Second, the TAG annual updates provide updated cost analysis that capture technology and market trends allowing Tri-State have the latest technological information. The detailed TAG technology information is confidential and available to EPRI TAG members. However, an EPRI public document, Program on Technology Innovation, provides the public costs and performance parameters that are indicative to Tri-State's potential resource list.

For this Resource Plan, Tri-State used data from EPRI's 2013 Technical Assessment Guide (TAG)

Table 2 below shows the potential generation resources Tri-State considered in the generation expansion modeling process.

Potential Resource Categories	Fuel	Dura-tion (yrs)	First/Last Year Available	Nominal Plant Capacity (MW)	Heat Rate (Btu/ kwH)	Capacity Factor (%)	Fixed Costs ($/kw /yr)	Variable O&M ($/MW h)	Total Plant Costs[2] ($/kw)*
Pulverized Coal	Coal	40	2015/ 2050	600-800	9000-10000	85	80	5	2000-4000
Pulverized Coal with Carbon Capture	Coal	40	2015/ 2050	800	9840-13100	85	80	5	3700-4400
Integrated Gasification Combined Cycle	Coal/ Natural Gas	30	2015/ 2050	500	9100	85	110	2	3100-4400
Natural Gas Combined Cycle	Natural Gas	30	2015/ 2050	450	7000	85	22	2-6	900-1300
Natural Gas Simple Cycle	Natural Gas	30	2015/ 2050	150	9500	10	4-9	8-12	700-1500
Wind	Wind	25	2015/ 2050	50-200	-	28-45	24-36	-	1600-2400
Concentrating Solar Thermal	Sunlight	25	2015/ 2050	250	-	25-49	64-68	-	4000-8000
Photovoltaic	Sunlight	20	2015/ 2050	10	-	14-26	17-25	-	2000-2900
Reciprocating Engine	Natural Gas	30	2015/ 2050	50-500	8000-9000	40-60	15-25	1-5	900-1200

Table 2: Potential Base Load, Intermediate and Renewable Resources

* *The Total Plant Cost values have been rounded to protect EPRI TAG confidentiality.*

5. An assessment of planning reserve margins and contingency plans for the acquisition of additional resources (CPUC ERP Requirement 4).

Tri-State will provide a description of, and justification for, the means by which it assesses the desired level of reliability on its system throughout the planning period (e.g., probabilistic or deterministic reliability indices). Tri-State will also develop and justify planning reserve margins for each year of the planning period for the base case, high, and low load forecast scenarios. Tri-State will develop contingency plans for each year of the resource acquisition period.

Tri-State uses a fixed 15 percent minimum planning reserve margin in its planning process. This minimum level of desired planning reserve margin is calculated as 15 percent of net load; that is, 15 percent of firm load, minus firm imports, plus firm and contingent exports. Tri-State assumes that it's operating reserve requirements (namely its contingency reserve obligations in the Rocky Mountain Reserve Group(RMRG) and Southwest Reserve Sharing Group (SRSG) are inclusive as part of its planning reserve (i.e. not additive). This 15 percent level, and the methodology for the calculation of minimum planning reserve margin has been the industry standby for years and is used by many neighboring utilities and state regulatory bodies. Although Tri-State has not attempted to conduct a probabilistic loss-of-load study, Tri-State believes that the selected planning reserve margin establishes an appropriate capacity margin. Tri-State loads and resources are located over a large geographic region and are subject to transmission constraints. Because of this large geographic reach and Tri-State-owned and contracted transmission assets, Tri-State can and does undertake wholesale transactions with a number of counterparties. This geographic reach has allowed Tri-State access to a reasonably diverse and deep capacity market.

Another factor that adds to the Tri-State belief that the selected planning reserve margins are appropriate lies in the components of planning reserves. Typically, utilities include regulating reserves within planning reserve margins. Tri-State currently contracts for regulating reserves, and so compared to some other utilities, the Tri-State reserve margins may contain an additional reliability margin. Tri-State uses this minimum planning reserve margin level in all forecast scenarios. The application of the planning reserve margin and use of scenario modeling gives Tri-State a broad view of potential future outcomes. As shown in Section I of this document, under the base load scenario with full planning reserves, Tri-State does not expect a capacity shortage within the resource acquisition period.

If there was a marked increase in loads beyond the base load scenario or if existing resources were to become unavailable within the resource acquisition period, Tri-State would be well positioned to respond to this contingency or other possible contingencies. Possible responses

could include pursuing additional demand-side resources, power purchase agreements or conventional capacity via self-build.

Tri-State owns small diesel generation capacity that can be located to assist with short-term delivery problems, and could quickly ramp up additional mobile generation assets as needed. As required by the North American Electric Reliability Corporation as a part of reliability planning, Tri-State has an Emergency Operation Plan that describes methods that can be used in the event of unplanned resource or transmission adequacy shortages. As a part of this plan, methods are in place to curtail customer demand via public appeal and other methods. This plan is intended to minimize the impact of unplanned events.

Tri-State is a member of the Rocky Mountain Reserve Group and the Southwest Reserve Sharing Group. These two organizations provide rapid response to unplanned generator outages. As a result of membership in these groups, Tri-State and other utilities assume a shared responsibility to quickly respond and provide coordinated reserve responses to unplanned, sudden generating unit outages.

Also, Tri-State has several “Hazard Sharing” arrangements in place that provide for reciprocal assistance from utilities in the event of generation outages. These contracts effectively reduce the size of large generating hazards under contingency conditions. As a result of these arrangements, Tri-State is able to better manage the impact of forced generating unit outages to the largest generators in the fleet.

At a minimum one-year interval, Tri-State reevaluates its future load/resource balance based on revisions to the load forecast and any other adjustments to load and resource capabilities. This on-going commitment to reliability-based planning ensures that maximum time is available to design and implement appropriate measures to anticipated resource adequacy shortcomings.

Section IV - Scenario Analysis

1. An assessment of alternative ways of meeting the need for additional resources (CPUC ERP Requirement 8).

> ***Tri-State will consider the output of reasonable resource scenario modeling over the planning period, including those reasonable modeling scenarios requested by members of the public in the Public Participation process, and will provide comments regarding these scenarios. Tri-State will model scenarios that provide an analysis of the effect on the costs of Tri-State's plan over the planning period of including high levels of (i) renewable resources, (ii) new clean energy and energy-efficient technologies and (iii) Demand-Side Management in the plan under differing assumptions regarding the level of fuel and other resource costs over time. For purposes of this agreement, "new clean energy and energy-efficient technologies" means a supply- or demand-side resource or demonstration project that is clean and incorporates one or more technologies, representing a substantial portion of its overall installed cost, that have not been regularly commercially demonstrated up to the point the resource may be acquired.***

Table 3 below provides a high level summary regarding the various scenario assumptions.

2. Scenario Variables

In this filing, Tri-State presents the modeling results of nine scenarios that encompass a wide range of possible outcomes. The nine scenarios provide reasonable "bookends" of the various resource, commodity price and strategic uncertainties Tri-State faces during the 20-year planning period. The scenarios encompass various load growth rates, forced coal retirements, high EE/DR penetration, lower cost renewables, high commodity prices with carbon and residential customers going off-grid with rooftop solar and battery storage. All of the scenarios begin in 2016 and conclude in 2035.

3. Load Growth

Tri-State modeled three different rates of load growth -- low, base, and high as was discussed in Section II. The low load growth rate grows at a rate of roughly 149 GWh per year. The median has an annual growth rate of roughly 310 GWh per year and the high load growth has an annual growth of roughly 511 GWh per year.

4. Gas and Electricity Pricing

The methodology for developing the gas and electric prices is discussed in Section II. There were three different electric price forecasts which were modeled; base and high. The base electric pricing had an initial average annual value of $25/MWH and increased to $60/MWH in 2035. The high electric forecast had an initial average annual value of $25/MWH and increased to $75/MWH in 2030.

The base natural gas price forecast had an initial average value of $2.75/MMBtu and increased to $6.20/MMBtu in 2035. The high natural gas price forecast had an initial average value of $3.00/MMBtu and increased to $10.00/MMBtu in 2035.

5. Renewable Portfolio Standards

To reflect the potential of a higher state or Federal mandated Renewable Portfolio Standard, Tri-State modeled a lower renewable cost scenario. Basically, the PTC and ITC were extended to the end of the planning period in 2035. All of the other scenarios reflect compliance with the existing 20% RPS in Colorado and 10% RPS in New Mexico.

6. Demand Side Management

For the 2015 ERP an updated DSM forecast based on historical activity was used for all of the scenarios. Additionally, a scenario was developed based on the EE requirement contained in the draft Clean Power Plan. This scenario assumed EE ramped up from current levels in 2016 to approximately 3% in 2020. The 3% represents a reduction in Tri-State's total demand in 2020. From 2020-2029 EE was increased by approximately .85% per year. The EE savings were 648GWh in 2020, growing to 2,372GWh in 2035. In 2035, the EE reduced Tri-State's average demand approximately 10.5%.

7. Emission Regulations

Tri-State modeled a high commodity and carbon cost scenario. This scenario had a carbon cost of $7.95 per ton starting in 2018 and increasing to $25.22 per ton at the end of the planning period in 2035.

8. Decommissioning Costs

After reviewing the available literature regarding decommissioning costs for coal facilities and also consulting with Tri-State's generation department, decommissioning costs were modeled at $350 per kilowatt. All of the scenarios allowed for the selection and retirement of any coal facility.

9. Market Interactions

For the 2015 planning process, capacity markets were set at 50MW in the North and South or 100MW total in SO. By adding the 50MW capacity markets in the North and South, Tri-State allowed for small capacity deficits to be met by capacity market purchases versus building new generation. In PaR market purchases serve to optimize generation dispatch and lower overall system costs.

10. General Scenario Assumptions

The economic assumptions used during the integrated resource planning model simulations reflect Tri-State's historical trend and were used to study the financial impacts of each scenario.

Tri-State uses the Blue Chip Financial Forecast from WK Law and Business to forecast treasury and LIBOR rates to which an internal spread is added to forecast future borrowing rates. Additionally, operations and maintenance costs are escalated utilizing general inflation rates.

The general model assumptions were used in all the scenarios and are as follows:

- 15% planning reserve margin
- Contract sales and contract purchases expire according to their contract terms
- Capital and operating costs are in 2015 Dollars
- Starting in 2020, a half percent reduction in capacity for all Tri-State coal units, except Springerville, to reflect aging effects

Scenario Name	*BAU - Base*	*BAU - High*	*BAU - Low*	*100MW Forced Coal Retirement*	*300MW Forced Coal Retirement*	*High Energy Efficiency*	*Behind the Meter Distributed Generation w/Energy Storage*	*PTC Extension w/ Low Cost Renewables*	*High Commodity Prices w/ High Load*
Load Forecast	Base	High	Low	Base	Base	Base	Base	Base	High
Electric Price Forecast	Base	Base	Base	Base	Base	Base	Base	Base	High
Gas Price Forecast	Base	Base	Base	Base	Base	Base	Base	Base	High
Coal Price Forecast	Base	Base	Base	Base	Base	Base	Base	Base	High
Coal Retirement	Allowed	Allowed	Allowed	Forced 2020	Forced 2020	Allowed	Allowed	Allowed	Allowed
DSM/EE Level	Base	Base	Base	Base	Base	CPP-BB#4 for EE	Base	Base	Base
RPS Level	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance
Carbon Cost Adder	None	None	None	None	None	None	None	None	$8
Renewable Integration Costs	$5	$5	$5	$5	$5	$5	$5	$5	$5

Table 3 – Scenario Characteristics

11. Scenario Analysis

A total of nine(9) scenarios were completed as part of the resource planning process. These scenarios take into effect Tri-State's planning assumptions, input from public participants, and boundary cases designed to show potential future operating conditions. A description and analysis of each scenario is discussed in this section. Additionally, a comparison of all scenarios is provided at the conclusion of this section.

Business as Usual (BAU)
The Business as Usual (BAU) scenario studies the effects of median economic load growth given current environmental and renewable portfolio standard regulations. The BAU scenario uses a median commodity price forecast and no carbon cost adder. The average load growth is forecasted to be 310 GWh per year. An integration cost for intermittent renewable resources was assumed to be $5/ MWh. Also, the DSM forecast was updated to reflect Tri-State's actual EE/DR results since 2010. EE/DR growth was assumed to be our base forecasted values.

The results of the BAU scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The optimized expansion plan for the BAU scenario resulted in the addition of 700 MW of new renewable generation and 1,040 MW of new thermal generation. Two 520 MW 2x1 combined cycle gas plants are built during the planning horizon, one in 2021 and the second in 2034.

The BAU scenario resulted in a Net Present Value Revenue Requirement (NPVRR) of $20.04 billion including transmission CAPEX of $1.15 billion.

Business as Usual-Low Load (BAU-Low Load)
The major difference between the BAU and BAU-Low Load scenario is the assumed economic load growth. The BAU-Low Load assumes average load growth of 149 GWh per year.

The results of the BAU-Low Load scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The optimized expansion plan for the BAU-Low Load scenario resulted in the addition of 700 MW of new renewable generation and 520 MW of new gas-fired generation. The reduced economic load growth delayed the building of the first 2x1 combined-cycle gas plant until 2035 and eliminated the need for a second 520MW 2x1 combined-cycle gas plant.

The NPVRR for the BAU-Low Load scenario is $17.53 billion, a 12.5% reduction from the BAU scenario, including transmission CAPEX of $1.07 billion.

Business as Usual-High Load (BAU-High Load)
The difference between the BAU and BAU-High Load scenario is the assumed economic load growth. The BAU-High Load assumes average load growth of 511 GWh per year.

The results of the BAU-High Load scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The optimized expansion plan for the BAU-High Load scenario resulted in the addition of 1500 MW of new renewable generation and 1471 MW of new gas-fired generation. The increased economic load growth resulted in the need for two 488 MW 2x1 combined cycle gas plants in 2020 and 2025 and three 165 MW simple-cycle gas plants in 2021, 2031 and 2033. The three simple-cycles are needed to maintain the planning reserves.

The NPVRR for the BAU-High Load scenario is $22.15 billion, an increase of 10.5% over the BAU scenario, including transmission CAPEX of $1.795 billion.

100MW Coal Retirement
After evaluating the BAU scenarios, Tri-State created a scenario to assess the retirement of 100MW of coal generation. The coal retirement of 100MW was assumed in 2020 and to be from all of Tri-State's coal generation on a nameplate weighted basis. This scenario assumed $35 million of decommissioning costs starting in 2017.

The results of the 100MW coal retirement scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The NPVRR for this scenario is $19.69 billion including transmission CAPEX of $1.32 billion. The expansion plan includes a 488 MW 2x1 combined-cycle resource in 2020 and two 165MW simple-cycle resources in 2025 and 2033. Also, there is 700 MW of renewable generation capacity included in the expansion plan, all coming from wind resources.

300MW Coal Retirement
This scenario increased the coal retirement amount to 300MW. The coal retirement of 300MW was assumed in 2020 and to be from all of Tri-State's coal generation on a nameplate weighted basis. This scenario assumed $100 million of decommissioning costs starting in 2017.

The results of the 300MW coal retirement scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The NPVRR for this scenario is $20.24 billion including transmission CAPEX of $0.98 billion. The expansion plan includes a 488 MW 2x1 combined-cycle resource in 2020 and three 165MW simple-cycle resources in 2025, 2028 and 2030. Also, there is 900 MW of renewable generation capacity included in the expansion plan, all coming from wind resources.

High EE/DSM
This scenario is modeled after the EE building block contained in the draft Clean Power Plan. The Clean Power Plan target EE was 1.5% in 2020. Tri-State's current EE was increased linearly from 2016 tom 2020. From 2020 thru 2029 the EE was increased 1.5% per year with EE reaching 10.7% of retail load. EE costs were estimated based on Tri-State's 2014 EE program costs extrapolated to meet the higher goals. All EE costs were assumed to be borne by Tri-State and are recovered from its members through wholesale rates.

The results of the High EE/DSM scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The NPVRR for this scenario is $19.31 billion including EE costs of $1.09 billion and transmission CAPEX of $0.94 billion. The expansion plan includes a 520MW 2x1 combined-cycle resource in 2028. Also, there is 700 MW of renewable generation capacity included in the expansion plan, all coming from wind resources.

PTC/ITC Extension with Low Cost Renewables
This scenario assumed the wind PTC and the solar ITC were extended to the end of the planning period in 2035. It was assumed Tri-State executed PPAs for all new renewables and therefore Tri-State committed no capital except for transmission.

The results of the PTC/ITC Extension with Low Cost Renewables scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The NPVRR for this scenario is $19.60 billion including transmission CAPEX of $1.02 billion. The expansion plan includes a 520MW 2x1 combined-cycle resource in 2028 and three 165MW simple-cycles in 2023, 2025 and 2031. Additionally, there is 1200 MW of new nameplate wind capacity included in the expansion plan.

High Commodity Price and High Load
This scenario assumed high commodity prices and high load consistent with a high economic activity. The high commodity price forecast was used which includes a carbon adder starting 2020.

The results of the High Commodity Price and High Load scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The NPVRR for this scenario is $25.50 billion including transmission CAPEX of $1.43 billion. The expansion plan includes two 678MW combined-cycles in 2020 and 2034 and a 488MW combined-cycle in 2025. Additionally, there is 1600 MW of new nameplate wind capacity included in the expansion plan.

High Behind the Meter Distributed Solar Generation with Energy Storage
This scenario assumes 20% of Tri-State's residential customers (approx.. 90,000) go off grid using distributed solar generation and battery storage. In order to simplify the modeling it was assumed they go off grid and do not rely on Tri-State for any of their energy needs. The capital costs to implement the solar distributed generation and the battery storage are not included in this analysis.

The results of the High Behind the Meter Distributed Solar Generation with Energy Storage scenario, including generation additions by year, capital expenditures, and generation by fuel type are shown in Appendix A.

The NPVRR for this scenario is $18.84 billion including transmission CAPEX of $1.01 billion. The expansion plan includes two 520MW combined-cycles in 2026 and a 165MW simple-cycle in 2035. Additionally, there is 400 MW of new wind capacity included in the expansion plan.

12. Projected emissions (CPUC ERP Requirement 9)

Tri-State will project the emissions associated with each of the alternative scenarios assessed under section 8, in pounds per MWh and tons per year, of sulfur dioxide, nitrogen oxides, particulate matter, mercury and carbon dioxide for each year in the planning period.

13. Projected water consumption (CPUC ERP Requirement 10).

Tri-State will project the amount of water consumed per MWh of electricity produced and the total amount of water consumed in each of the alternative scenarios assessed under section 8 for each year in the planning period.

Annual emissions and water consumption were forcasted for each generating unit in a given scenario based on the resulting generation and the emission/water consumption rates identified in Section II for each unit. The projected emissions and water consumption for all scenarios are provided by year in Tables 4 to 9 below and in Appendix B. Additionally, graphs are provided below for projected emissions and water consumption for each scenario in Figures 13 to 24.

14. BAU Scenarios

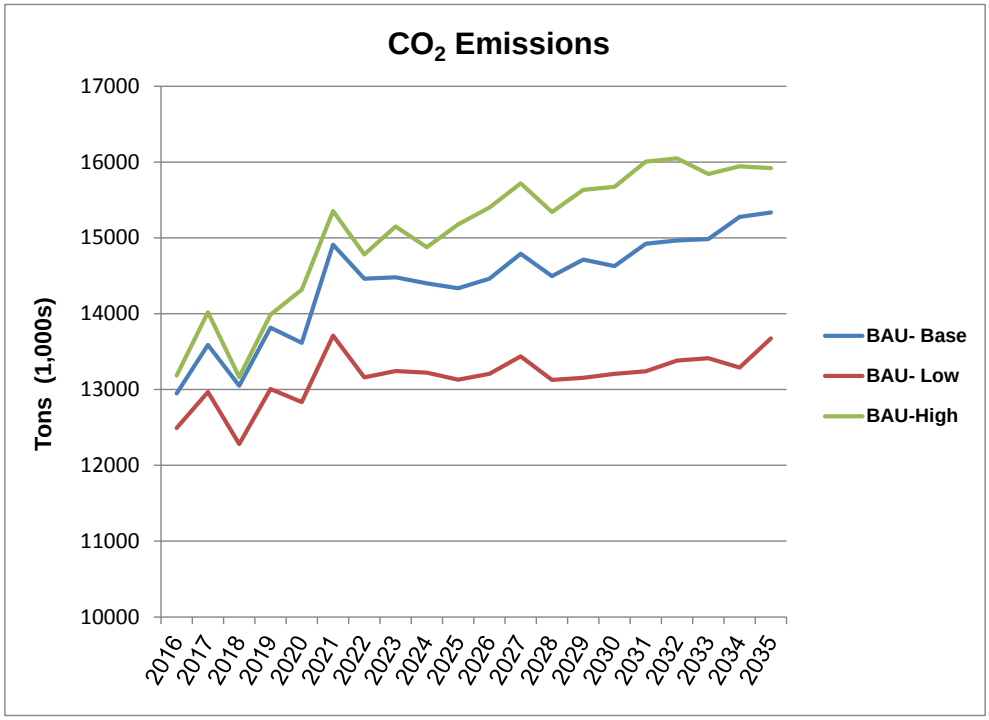


Figure 13 - CO_2 Emissions

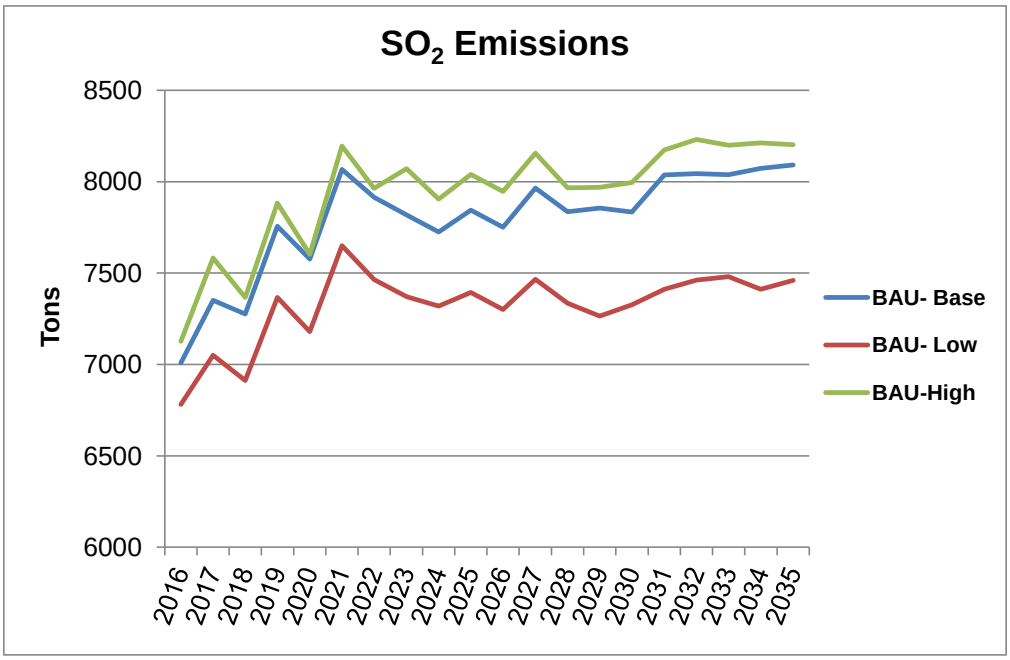


Figure 14 - SO_2 Emissions

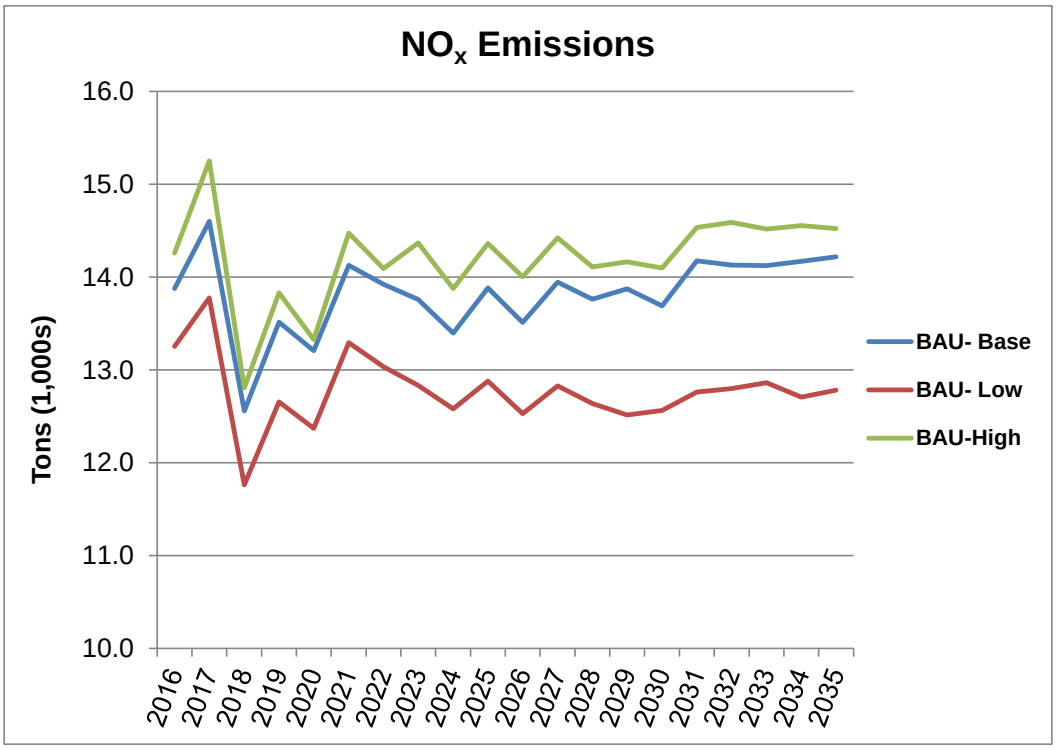


Figure 15 – NO_x Emissions

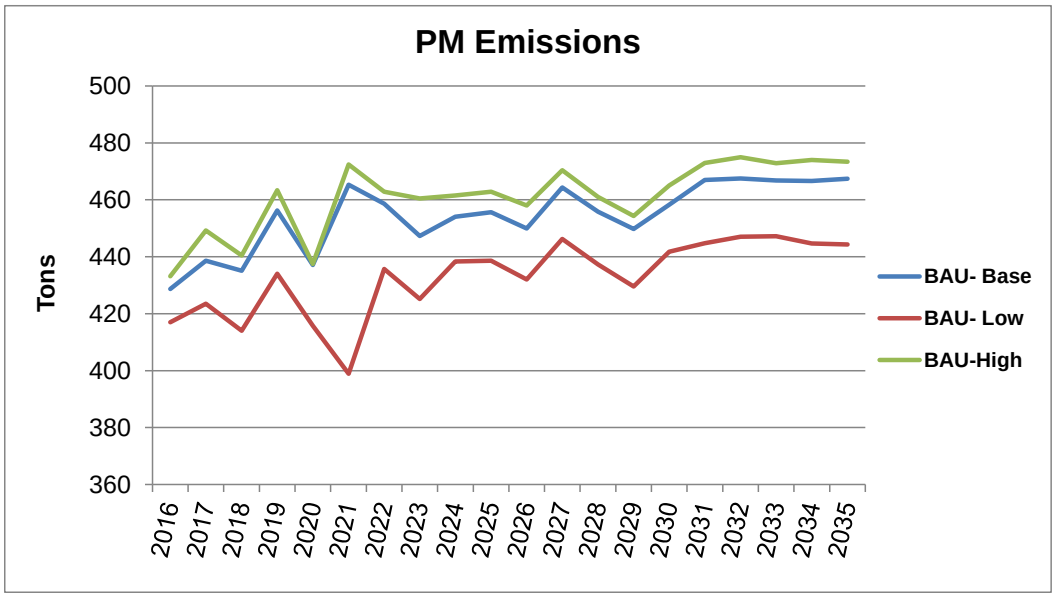


Figure 16 - Particulate Matter

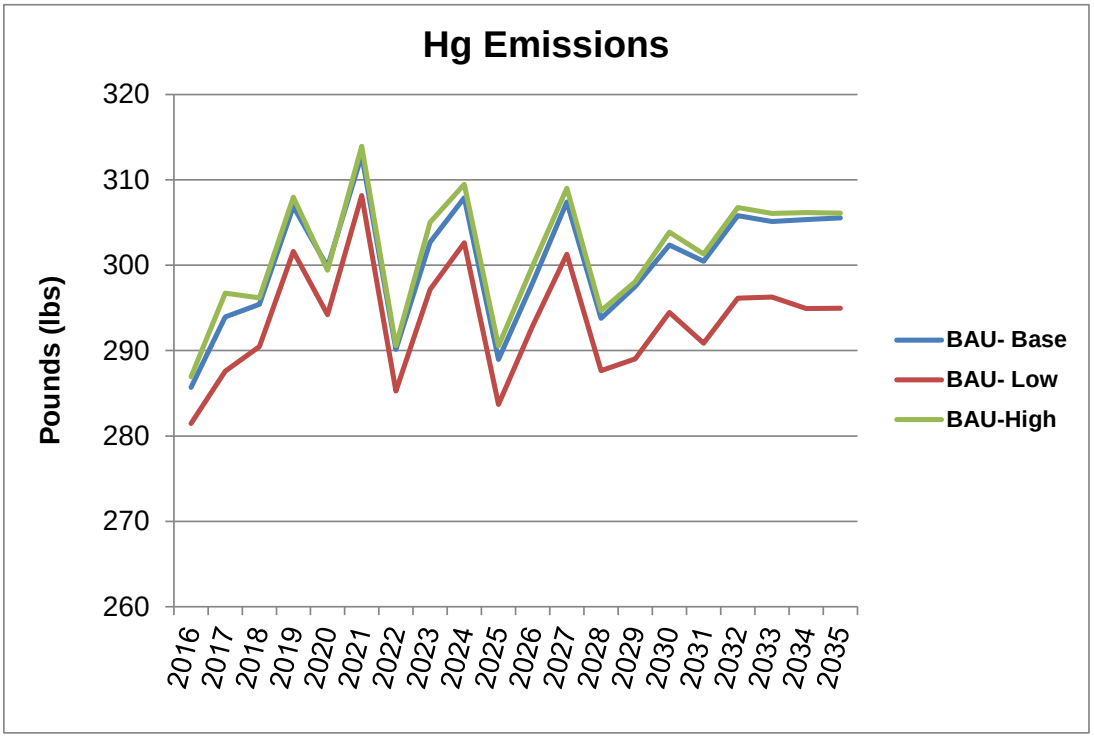


Figure 17 - Mercury Emissions

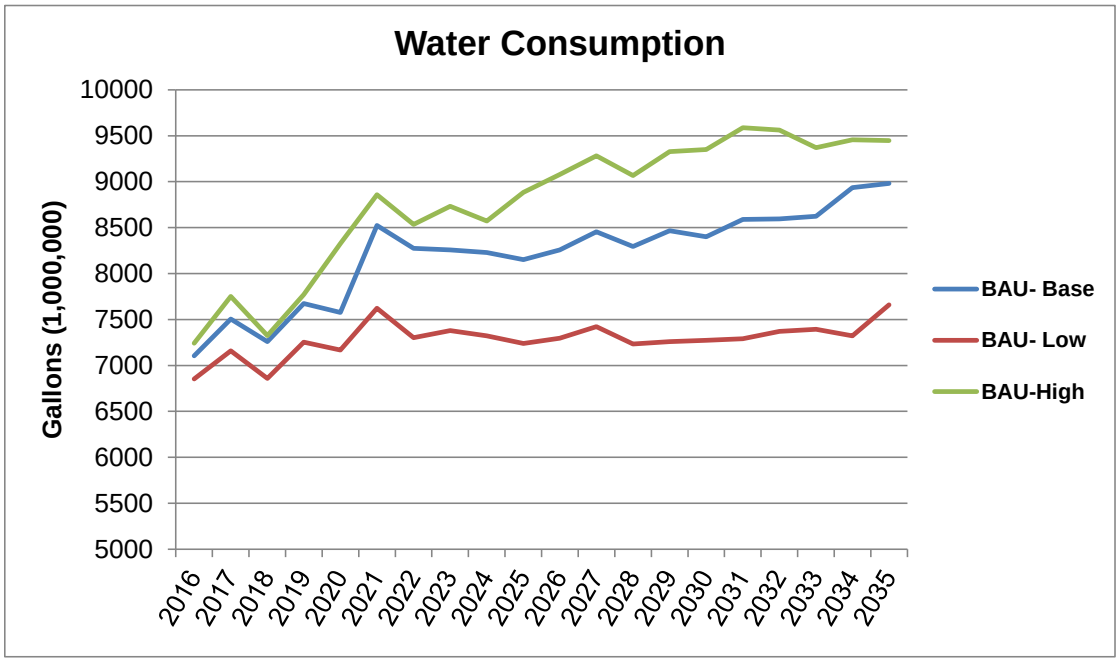


Figure 18 - Water Consumption

15. All Scenarios

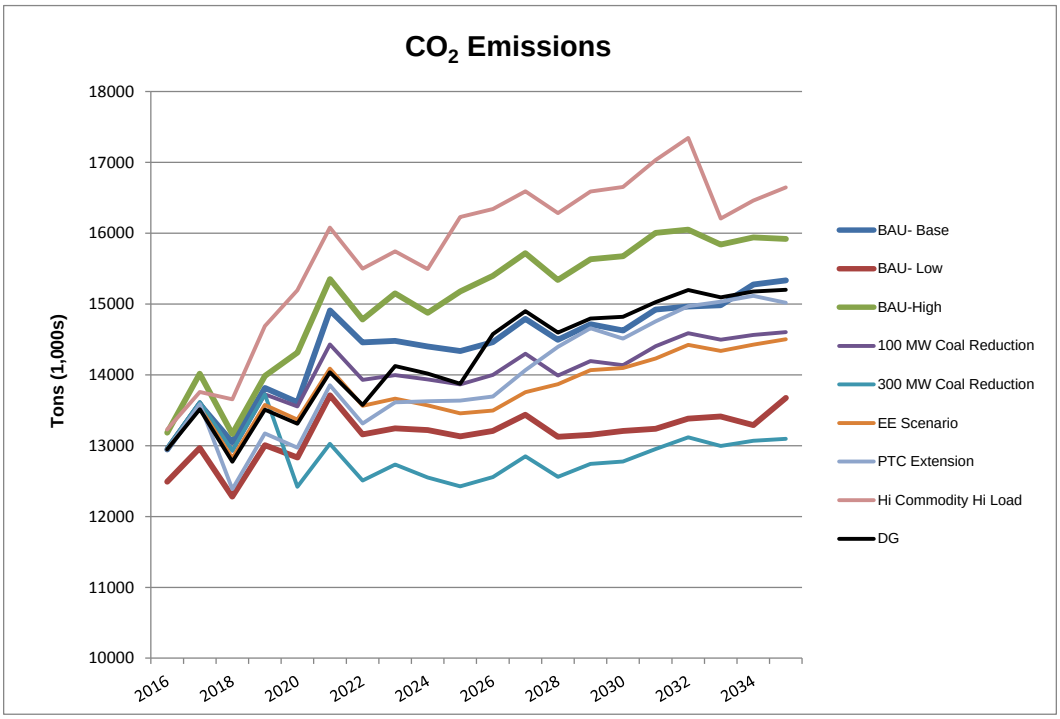


Figure 19 - CO_2 Emission

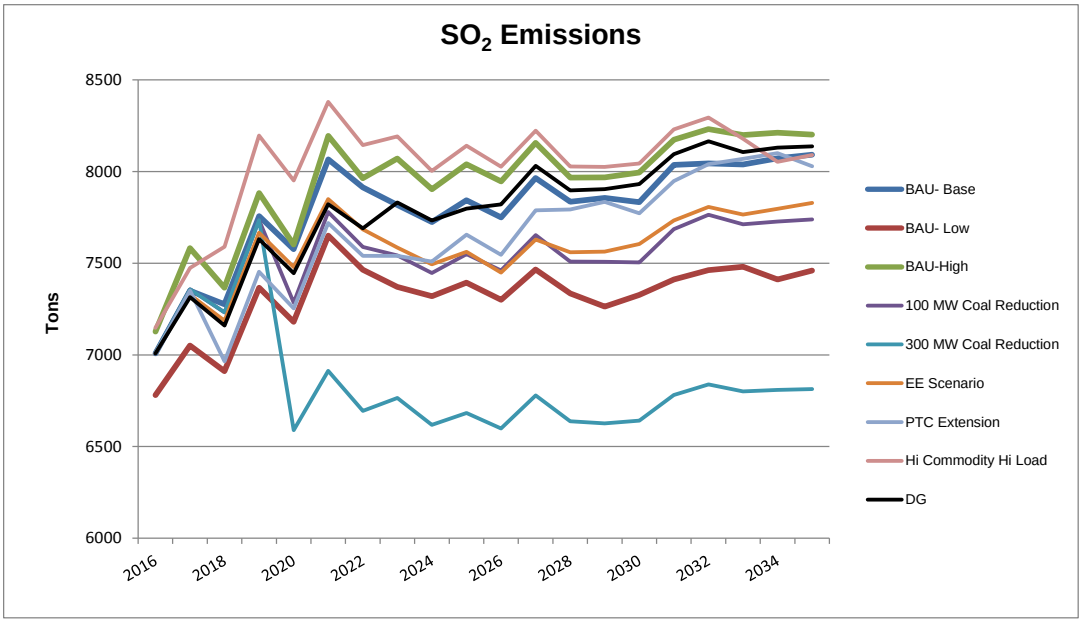


Figure 20 - SO_2 Emissions

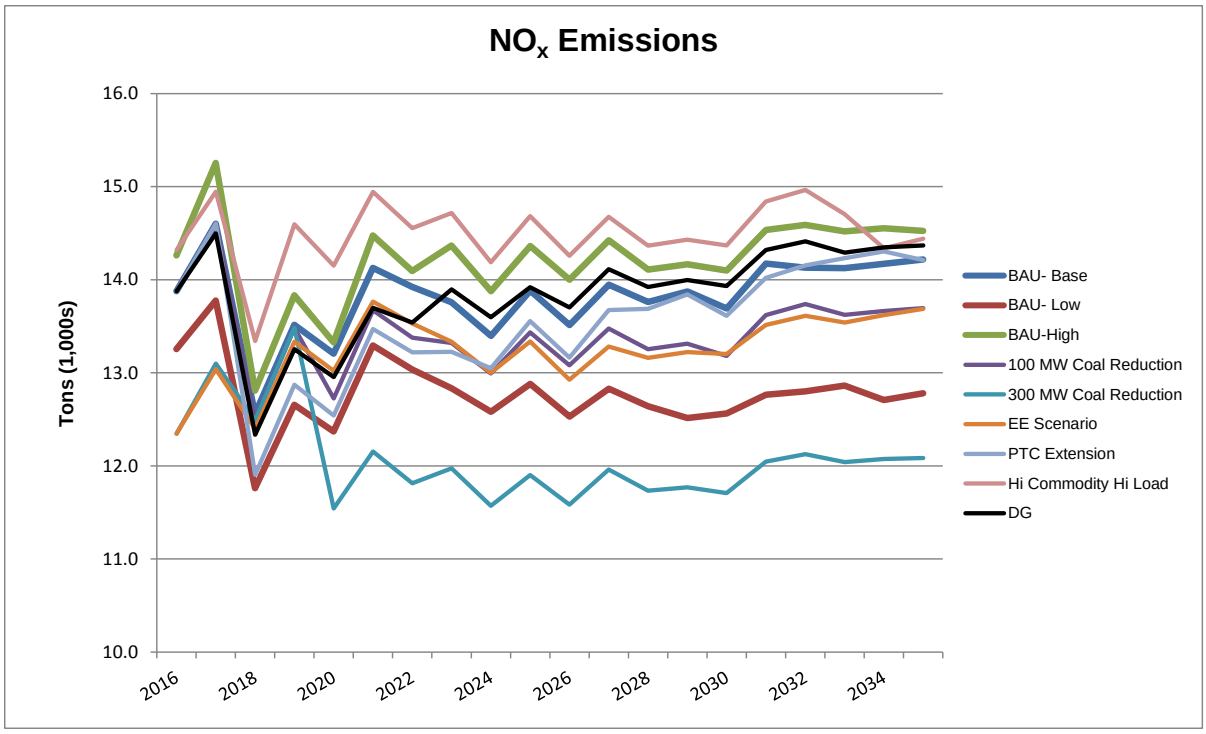


Figure 21 - NO_x Emissions

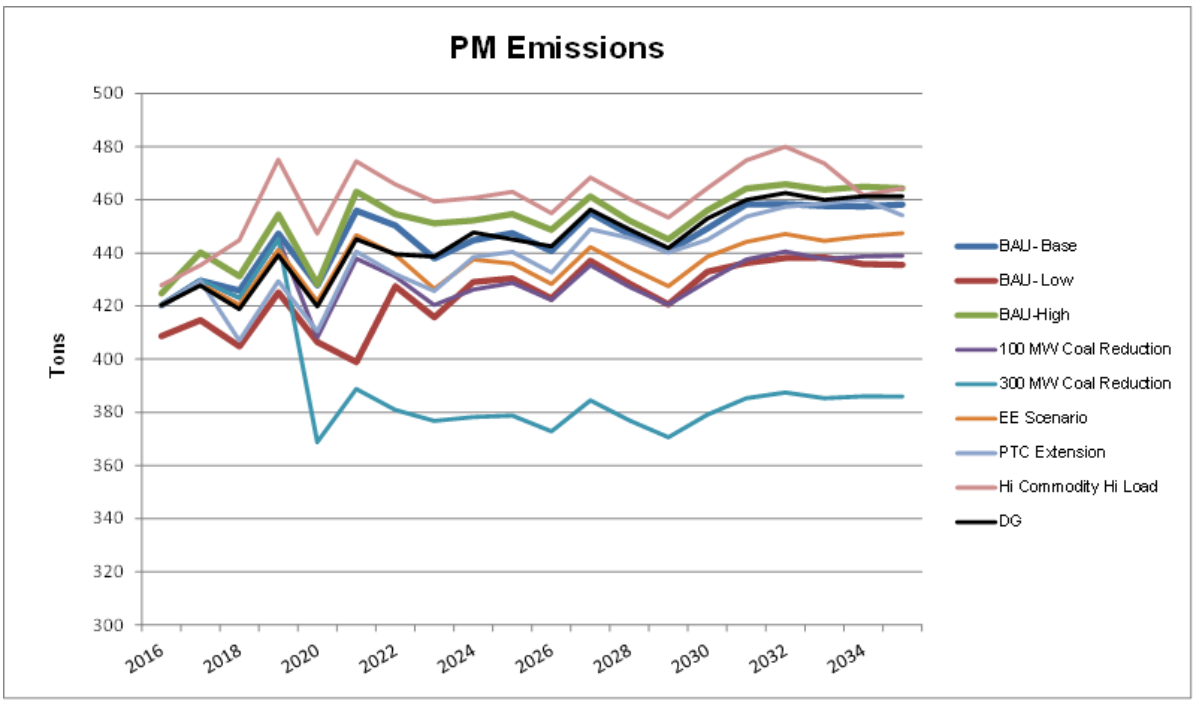


Figure 22 - Particulate Matter

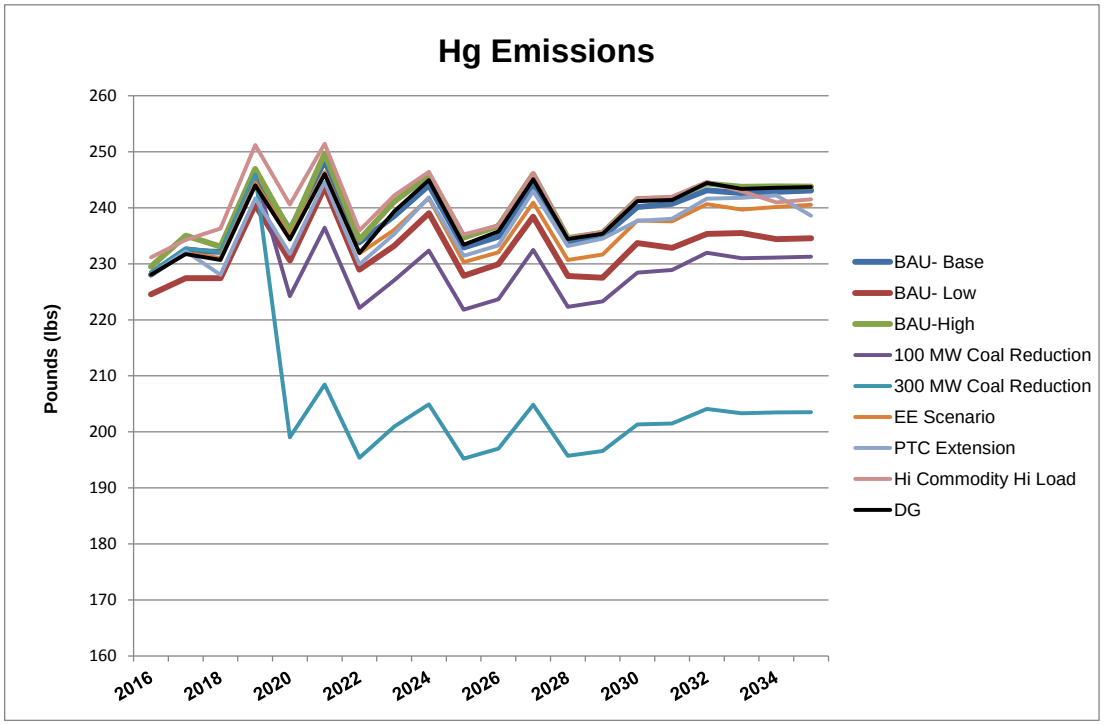


Figure 23 - Mercury Emissions

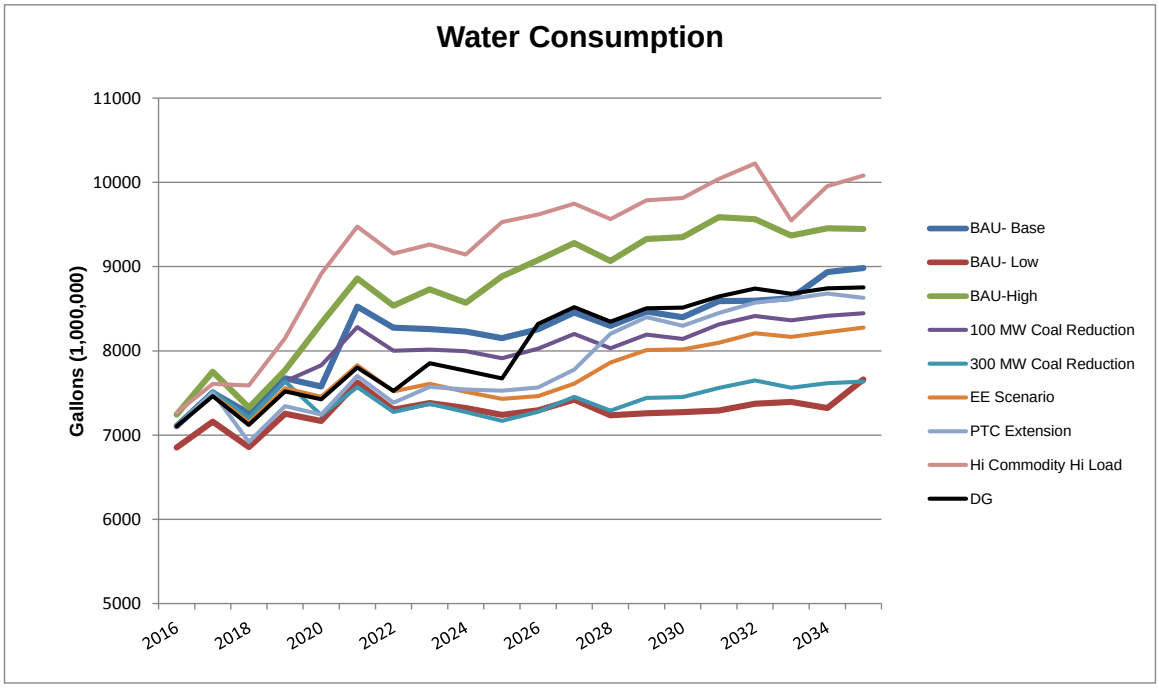


Figure 24 – Water Consumption

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU- Base	**12947**	**13588**	**13051**	**13816**	**13615**	**14911**	**14460**	**14479**	**14401**	**14336**	**14461**	**14790**	**14495**	**14714**	**14627**	**14922**	**14965**	**14983**	**15277**	**15335**
BAU- Low	12492	12967	12282	13006	12834	13711	13160	13244	13220	13131	13207	13438	13125	13154	13207	13240	13381	13413	13290	13674
BAU-High	13185	14018	13165	13987	14317	15353	14782	15151	14878	15179	15399	15718	15342	15634	15674	16006	16050	15841	15943	15921
100 MW Coal Reduction	12969	13614	12928	13725	13555	14429	13930	13996	13936	13866	14000	14298	13992	14194	14137	14404	14589	14498	14564	14603
300 MW Coal Reduction	12969	13614	12928	13725	12419	13027	12510	12734	12551	12427	12557	12851	12561	12743	12776	12955	13119	12997	13070	13099
EE Scenario	12947	13542	12827	13577	13370	14088	13565	13666	13570	13456	13496	13757	13870	14067	14098	14231	14424	14339	14427	14502
PTC Extension	12947	13588	12386	13173	12972	13854	13312	13614	13627	13638	13695	14067	14395	14660	14512	14757	14971	15034	15116	15018
Hi Commodity Hi Load	13229	13759	13655	14689	15195	16079	15499	15745	15496	16229	16341	16591	16285	16588	16654	17035	17346	16207	16460	16647
DG	12947	13515	12773	13507	13311	14037	13576	14125	14019	13875	14575	14901	14597	14796	14819	15028	15197	15096	15178	15200

Table 4 - CO_2 – 1000s of tons

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU- Base	**7008**	**7350**	**7276**	**7757**	**7577**	**8066**	**7914**	**7818**	**7725**	**7844**	**7750**	**7965**	**7836**	**7856**	**7833**	**8036**	**8044**	**8039**	**8072**	**8092**
BAU- Low	6781	7051	6912	7366	7180	7650	7465	7371	7320	7395	7301	7465	7335	7264	7327	7412	7462	7481	7411	7460
BAU-High	7127	7582	7367	7883	7602	8194	7963	8071	7904	8040	7947	8157	7967	7969	7995	8174	8232	8199	8212	8202
100 MW Coal Reduction	7013	7357	7232	7736	7285	7780	7589	7542	7446	7549	7460	7653	7509	7508	7504	7686	7765	7712	7727	7738
300 MW Coal Reduction	7013	7357	7232	7736	6589	6913	6695	6766	6618	6683	6599	6779	6638	6626	6642	6781	6839	6801	6809	6813
EE Scenario	7008	7328	7187	7666	7479	7850	7685	7585	7494	7562	7449	7630	7560	7563	7605	7733	7807	7766	7797	7830
PTC Extension	7008	7350	6965	7454	7254	7719	7540	7540	7509	7656	7546	7788	7794	7835	7772	7948	8040	8069	8100	8029
Hi Commodity Hi Load	7147	7474	7590	8197	7952	8381	8144	8192	8004	8141	8026	8223	8028	8025	8044	8230	8294	8179	8053	8091
DG	7008	7314	7160	7632	7446	7822	7691	7832	7733	7798	7821	8031	7897	7904	7932	8095	8166	8107	8131	8137

Table 5 - SO_2 - Tons

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU- Base	**13.9**	**14.6**	**12.6**	**13.5**	**13.2**	**14.1**	**13.9**	**13.8**	**13.4**	**13.9**	**13.5**	**13.9**	**13.8**	**13.9**	**13.7**	**14.2**	**14.1**	**14.1**	**14.2**	**14.2**
BAU- Low	13.3	13.8	11.8	12.7	12.4	13.3	13.0	12.8	12.6	12.9	12.5	12.8	12.6	12.5	12.6	12.8	12.8	12.9	12.7	12.8
BAU-High	14.3	15.3	12.8	13.8	13.3	14.5	14.1	14.4	13.9	14.4	14.0	14.4	14.1	14.2	14.1	14.5	14.6	14.5	14.6	14.5
100 MW Coal Reduction	13.9	14.6	12.5	13.5	12.7	13.7	13.4	13.3	13.0	13.4	13.1	13.5	13.3	13.3	13.2	13.6	13.7	13.6	13.7	13.7
300 MW Coal Reduction	12.3	13.1	12.5	13.5	11.5	12.2	11.8	12.0	11.6	11.9	11.6	12.0	11.7	11.8	11.7	12.0	12.1	12.0	12.1	12.1
EE Scenario	12.3	13.0	12.4	13.3	13.0	13.8	13.5	13.3	13.0	13.3	12.9	13.3	13.2	13.2	13.2	13.5	13.6	13.5	13.6	13.7
PTC Extension	13.9	14.6	11.9	12.9	12.5	13.5	13.2	13.2	13.0	13.6	13.2	13.7	13.7	13.8	13.6	14.0	14.2	14.2	14.3	14.2
Hi Commodity Hi Load	14.3	14.9	13.3	14.6	14.2	14.9	14.6	14.7	14.2	14.7	14.3	14.7	14.4	14.4	14.4	14.8	15.0	14.7	14.3	14.4
DG	13.9	14.5	12.3	13.3	13.0	13.7	13.5	13.9	13.6	13.9	13.7	14.1	13.9	14.0	13.9	14.3	14.4	14.3	14.3	14.4

Table 6 - NO_x - Tons

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU- Base	**285.7**	**293.9**	**295.4**	**306.9**	**299.8**	**312.9**	**290.1**	**302.7**	**307.9**	**289.0**	**297.9**	**307.4**	**293.8**	**297.5**	**302.4**	**300.5**	**305.8**	**305.1**	**305.3**	**305.6**
BAU- Low	281.4	287.6	290.5	301.6	294.2	308.2	285.3	297.2	302.6	283.7	292.9	301.3	287.6	289.0	294.5	290.9	296.2	296.3	294.9	295.0
BAU-High	286.9	296.7	296.2	308.0	299.4	314.0	290.6	305.0	309.5	290.5	299.9	309.0	294.7	298.1	303.9	301.3	306.8	306.1	306.2	306.1
100 MW Coal Reduction	286.8	295.1	296.1	307.8	285.9	298.7	276.5	289.0	294.1	275.9	284.6	293.5	280.4	283.9	288.5	286.6	292.5	291.3	291.5	291.6
300 MW Coal Reduction	286.8	295.1	296.1	307.8	254.8	264.7	244.5	256.9	260.6	244.1	252.0	260.0	248.2	251.3	255.7	253.6	258.8	257.8	258.0	258.0
EE Scenario	285.7	293.6	294.3	305.7	298.5	310.9	288.2	300.2	305.5	286.3	295.2	304.0	290.8	294.3	299.9	297.2	303.3	302.1	302.6	303.0
PTC Extension	285.7	293.9	291.2	302.9	295.5	309.1	286.2	299.5	305.7	287.4	296.4	306.1	293.3	297.2	299.7	297.6	304.2	304.0	304.5	300.9
Hi Commodity Hi Load	289.1	295.3	300.2	313.2	305.1	315.9	292.3	306.2	310.1	291.1	299.7	309.2	294.6	298.3	303.8	301.6	307.1	305.4	302.4	303.1
DG	228.1	231.8	230.7	244.0	234.4	246.0	231.9	239.4	245.0	233.4	235.8	245.1	234.5	235.4	241.2	241.4	244.5	243.4	243.6	243.7

Table 7 - Mercury - lbs

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU- Base	**428.7**	**438.6**	**435.1**	**456.2**	**437.1**	**465.3**	**458.6**	**447.3**	**454.1**	**455.6**	**449.9**	**464.3**	**455.8**	**449.8**	**458.3**	**467.0**	**467.5**	**466.8**	**466.6**	**467.4**
BAU- Low	417.0	423.5	414.0	434.1	415.8	398.9	435.7	425.1	438.4	438.6	432.0	446.3	437.3	429.6	441.8	444.7	447.1	447.2	444.7	444.3
BAU-High	433.2	449.2	440.4	463.4	437.5	472.4	462.9	460.5	461.5	462.8	458.0	470.4	461.0	454.3	465.1	472.9	475.0	472.9	474.0	473.4
100 MW Coal Reduction	429.0	439.0	432.4	454.3	417.3	447.0	439.1	429.5	435.3	436.7	431.2	444.3	435.8	429.4	438.1	446.0	449.4	446.6	447.6	447.8
300 MW Coal Reduction	429.0	439.0	432.4	454.3	377.0	397.0	388.1	384.9	386.4	385.9	380.9	392.6	384.6	378.6	387.1	392.9	395.5	393.3	394.1	393.9
EE Scenario	428.7	437.4	429.8	450.2	431.1	456.1	447.6	435.9	446.9	444.2	437.5	451.5	443.3	436.7	447.7	452.9	456.3	453.7	455.4	456.6
PTC Extension	428.7	438.6	416.3	438.4	419.8	449.9	440.4	435.0	447.8	448.6	441.9	458.1	454.4	449.4	454.0	462.4	466.5	467.7	469.3	463.3
Hi Commodity Hi Load	436.3	444.3	454.2	484.2	456.7	483.9	474.1	468.7	470.0	471.2	464.1	477.6	469.1	462.5	473.5	483.6	489.1	482.8	470.7	473.4
DG	420.3	427.7	418.8	439.1	419.9	445.2	439.5	438.6	447.7	445.0	442.5	456.3	448.8	441.9	453.0	460.0	462.6	460.0	461.3	461.3

Table 8 - Particulate Matter - Tons

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU- Base	**7104.4**	**7504.7**	**7259.2**	**7675.0**	**7575.8**	**8524.3**	**8276.0**	**8258.4**	**8228.6**	**8151.5**	**8257.1**	**8456.2**	**8295.7**	**8465.8**	**8399.9**	**8590.2**	**8594.5**	**8624.5**	**8934.0**	**8982.5**
BAU- Low	6852.2	7158.5	6858.4	7252.6	7167.4	7623.6	7302.2	7379.5	7320.8	7240.3	7295.3	7421.3	7233.6	7259.1	7273.0	7291.2	7371.8	7393.0	7322.0	7660.2
BAU-High	7242.5	7752.3	7325.8	7772.1	8325.5	8858.9	8536.2	8731.3	8570.7	8883.0	9078.4	9280.3	9065.8	9327.6	9349.4	9587.7	9562.4	9369.0	9454.8	9448.3
100 MW Coal Reductior	7117.3	7520.2	7204.1	7637.1	7830.1	8281.2	8000.6	8013.9	7995.6	7912.5	8025.2	8200.9	8030.6	8194.0	8142.9	8315.0	8414.3	8362.2	8415.7	8445.9
300 MW Coal Reductior	7117.3	7520.2	7204.1	7637.1	7235.1	7571.0	7275.0	7370.2	7273.5	7169.0	7276.2	7455.0	7291.4	7439.8	7453.0	7559.6	7649.0	7561.9	7615.9	7636.1
EE Scenario	7104.4	7478.7	7148.7	7556.6	7454.5	7828.4	7518.2	7607.0	7513.2	7431.2	7462.2	7610.5	7861.4	8010.1	8017.5	8096.5	8209.4	8166.6	8223.4	8276.9
PTC Extension	7104.4	7504.8	6917.7	7344.8	7243.2	7701.8	7384.6	7572.3	7540.2	7527.4	7565.9	7777.1	8202.3	8400.0	8298.4	8447.6	8571.9	8619.4	8681.4	8628.6
Hi Commodity Hi Load	7265.4	7609.2	7590.4	8148.7	8913.7	9476.1	9154.0	9263.4	9143.4	9529.6	9618.2	9746.6	9563.5	9787.7	9814.4	10041.0	10223.5	9547.5	9956.2	10082.7
DG	7104.4	7463.4	7120.0	7520.1	7424.1	7800.9	7524.0	7852.9	7764.9	7671.8	8318.4	8519.8	8346.4	8505.9	8513.3	8645.0	8739.2	8678.9	8743.4	8753.1

Table 9 - Water Consumption – Millions of Gallons

16. Projected Transmission Expansion (CPUC ERP Requirement 13c)

For transmission expansion costs, Tri-State used estimates provided by the transmission engineering department. These estimates were determined based on the size of the new unit and the expected miles of transmission required. The cost estimates for incremental transmission can be seen in Tables 10 and 11 below.

For the purposes of this Resource Planning process certain transmission was considered a sunk cost and assumed to be part of the available transmission for use in expansion planning. This includes the Burlington-Lamar Project detailed in the 10-year plan in Appendix C. The transmission in the following tables represents any transmission required beyond Tri-State's existing transmission rights and the planned additions.

The location and timing of new thermal additions effects transmission costs resulting in varying costs for the addition of the same or similarly size generation additions. Also, if Tri-State was able to use some portion of its existing transmission system or transmission required for a future project this would result in lower costs.

Item	Unit	Cost/Unit ($000's)	Cost/Unit with rough terrain factor = Cost x 1.25
New 345 kV Line	per mile	$ 1,200	$ 1,500
New 230 kV Line	per mile	$ 750	$ 937.5

Table 10 – Transmission Cost Estimates

Transmission	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Tot
BAU Base	$0.0	$0.0	$0.0	$0.0	$0.0	$456.5	$455.0	$234.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$2.0	$0.0	$2.2	$2.3	$2.4	$0.0	$1,1
BAU Low Load	$0.0	$0.0	$0.0	$0.0	$0.0	$100.8	$117.3	$73.3	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$57.0	$54.9	$263.8	$257.5	$140.5	$1,0
BAU High Load	$0.0	$0.0	$0.0	$0.0	$1.5	$1.1	$0.0	$493.9	$489.1	$245.4	$0.0	$0.0	$1.9	$119.7	$133.8	$75.5	$4.4	$84.6	$73.3	$41.8	$1,7
100 MW Coal Retirement	$0.0	$0.0	$0.0	$0.0	$1.5	$156.0	$172.5	$100.9	$0.0	$1.2	$0.0	$0.0	$0.0	$0.0	$2.0	$323.7	$358.4	$202.8	$0.0	$0.0	$1,3
300 MW Coal Retirement	$0.0	$0.0	$0.0	$0.0	$1.5	$139.7	$316.5	$267.5	$96.2	$1.7	$58.4	$58.4	$31.1	$0.0	$1.5	$2.1	$0.0	$4.5	$0.0	$2.4	$98
Energy Efficiency	$0.0	$0.0	$0.0	$0.0	$0.0	$55.2	$55.2	$33.6	$0.0	$0.0	$284.3	$320.4	$180.2	$0.0	$0.0	$2.1	$0.0	$4.5	$0.0	$0.0	$93
High Commodity Prices, High Load	$0.0	$0.0	$0.0	$0.0	$1.5	$139.7	$317.6	$320.1	$248.0	$140.7	$66.1	$1.8	$1.9	$0.0	$0.0	$0.0	$70.8	$84.4	$39.1	$0.0	$1,4
PTC/ITC Extension	$0.0	$0.0	$5.4	$0.0	$1.0	$90.9	$102.7	$112.7	$52.6	$28.0	$173.5	$183.3	$98.5	$63.9	$65.9	$35.6	$0.0	$1.6	$0.0	$2.4	$1,0
Distributed Generation	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$41.7	$153.4	$152.6	$76.0	$0.0	$0.0	$0.0	$0.0	$220.6	$238.1	$133.4	$0.0	$2.4	$1,0

Table 11 – Scenario Transmission Upgrade Costs (millions)

Section V - The Resource Plan

1. A statement of the criteria that Tri-State uses in the development of its plan (CPUC ERP Requirement 16).

The Tri-State Board of Directors has established a policy that states:

"Tri-State will provide an adequate and reliable supply of electrical power, in accordance with the terms and conditions of its contracts with its Members, to meet the needs of its Members at the lowest possible cost consistent with sound utility business practices."

This policy reflects the overall desire of the Tri-State Membership to maintain stable and affordable electricity rates, as well as to provide a reliable source of power.

In accordance with this Policy, Tri-State continues to investigate existing and new generation technologies for both centralized and distributed generation; to investigate new technologies, to engage in joint transmission and generation planning, construction and operations; and to investigate long term power supply contracts.

As Tri-State implements this Board Policy, care is taken to assure that adequate supplies exist with the proper timing and location to serve Member loads, system losses, and long-term firm sales obligations while also maintaining reserve margins.

Tri-State also plans its system to meet applicable renewable portfolio standards.

Tri-State engages in active risk management and attempts to minimize risks to the Membership, including risks associated with fuel prices, wholesale electricity market prices, transmission and delivery risk, REC and carbon prices, risks associated with large single shaft failures, cyber security, sabotage and security risks, and environmental compliance risks.
For forward risk evaluations that involve fundamental changes in the operating environment (such as high carbon taxes or required carbon reductions) where historic volatilities and co-variances may not remain as accurate predictors of the future, Tri-State relies on the scenario analysis that has been presented in this IRP/ERP.

The Tri-State risk management program involves well evolved methods to evaluate relative contributions to operating margins due to various operational factors and market conditions. This program includes a monthly presentation of critical data to the Tri-State Board of Directors including a summary of expected future energy needs and opportunities for sales, a valuation of open positions, and a probabilistic representation of future margin expectations and variance. The Margin at Risk representation is the result of detailed simulations of forward gas, coal and electricity market conditions, forced and planned generation and transmission outages, load variability, long-term purchase and sales transactions, and other effects.
The probabilistic modeling of future outcomes has been developed over a period of several years, and reflects an appropriate use of simulation technology over an appropriate time horizon. The volatilities of markets, the performance of power plants, and the variability of loads is based on the actual historical behaviors, and continues to be validated through post-analysis. These methods have been reviewed and acknowledged by rating agencies and other outside parties.

2. An explanation of Tri-State's current rate design for the sale of power by the utility to its Members and the effect of that rate design on and its consistency with its resource plan (CPUC ERP Requirement 18).

In September 2014, Tri-State, convened a Rate Design Committee that conducted an in depth analysis of the current rate design. This analysis addressed cost causation, recovery of fixed and variable expenses, the impacts of rate design on various Members based on load characteristics and possible load management responses to the new rate. The Rate Design Committee was comprised of Member System Board Members, Member System Managers and Tri-State Board Members.

The Rate Design Committee retained NewGen Strategies & Solutions, a consulting firm based in Lakewood, Colorado to;

- Perform an independent cost of service (COS) analysis for the Tri-State System.
- Educate the Committee on COS and rate design methodology widely accepted in the industry.
- Develop a rate design alternatives for Committee consideration.
- Provide general advice and recommendations as requested by the Committee.

The Rate Design Committee held ten meetings from Sept. 2014 through May 2015. In order to determine the desired revenue recovery from each of these three cost components of the rate, Tri-State and NewGen conducted an in-depth Cost of Service Study of the Tri-State cost structures including analyses of fixed and variable costs. Cost structures were further analyzed for functional assignment between generation and transmission/delivery categories. The result of this process was a rate design recommendation

from the Rate Committee to the Tri-State Board of Directors in June 2015. The Board approved the rate design recommendation creating the "A-39" Wholesale Firm Power Service Class A Rate. This rate consists of a Generation Demand Rate, a Transmission/Delivery Demand Rate, and an Energy Rate. Both demand rates will be measured during the Tri-State Peak Period, which is defined as the period between 12:00 (noon) and 10:00 PM, Monday through Saturday, except certain holidays.

This rate structure that was approved for implementation in January, 2016, affords Members the opportunity to implement various load-shifting or energy-reduction strategies, either in response to the economic signals that this rate design provides, or through specific DSM/EE offerings from Tri-State that would serve to reduce their costs, and to possibly delay the need for future Tri-State generation resources. With proper allocation of fixed and variable costs and proper functionalization of costs between generation and transmission/delivery, Tri-State believes that the linkages between these price signals and projected load responses are appropriate and beneficial to Tri-State, the Members of Tri-State, and ultimately to end-use consumers of electricity.

3. **An Action Plan (CPUC ERP Requirement 17).**

   Tri-State will describe the specific actions it will take during the resource acquisition period starting with the filing of its plan with the Commission. The action plan will include a status report of the specific actions contained in any previous action plan.

4. **A description of any studies or investigative efforts underway relevant to the resource planning process and related resources, including any studies relating to Demand-Side Management CPUC ERP Requirement 7).**

5. **An explanation of how Tri-State helps and plans to help its Colorado Members meet the renewable energy standard applicable to such Members established in 40-2-124(c)(V), C.R.S (CPUC ERP Requirement 11).**

6. **An explanation of the role of Demand-Side Management in helping Tri-State meet resource needs during the planning period (CPUC ERP Requirement 12).**

   In the explanation, Tri-State will include a description of how Tri-State is working, and plans to work, with its Members to develop Demand-Side Management resources.

7. **An explanation of whether and, if so, how Tri-State's plan will give the fullest possible consideration to the cost-effective development of new clean energy and energy-efficient technologies, bearing in mind the beneficial contribution such technologies make to Colorado's energy security, economic prosperity, environmental protection, and insulation from fuel price increases (CPUC ERP Requirement 19).**

8. **A description of the effect of Tri-State's plan on Colorado's economic prosperity, insulation from fuel price increases, energy security and the environment (CPUC ERP Requirement 20).**

The above requirements are discussed in Sections 9 and 10 below.

9. Action Plan

Tri-State has developed this Action Plan as a component of its commitment in Docket No. 09I-041E and the requirements of Western's IRP rules. Tri-State continues to pursue several important activities, initiatives and programs to ensure it can provide its Member Systems with a diverse, reliable and affordable supply of electricity, including full consideration of "new clean energy and energy-efficient technologies."

The Resource Planning Period used for this Resource Plan was 20 years from 2016 through 2035. The Resource Acquisition Period is the first 6 years of the Planning Period. Because this plan is being filed late in 2015, Tri-State is using the six years, 2016 through 2021, for the purpose of defining the Acquisition Period and for the purpose of developing its Action Plan.
As discussed in earlier sections of this report, Tri-State modeled nine scenarios and related resource expansion plans and calculated costs. With reference to projected sales levels, forward energy prices, operating costs, compliance with applicable environmental

requirements and resource portfolio standards incorporated in the modeling under “normal” or “median” conditions, Tri-State projects that it will not need additional resources to satisfy its system capacity requirements until 2023 (based on the 2015 load forecast).

While Tri-State has identified no capacity need during the six-year acquisition period, this should not be construed to mean that the Company will not continue to take actions to maintain and perfect other specific resource opportunities and alternatives. Tri-State will allocate necessary resources to develop opportunities, technologies and projects that may ultimately be considered for inclusion in its supply portfolio.

Tri-State sets forth the following specific and general actions and considerations that it plans to pursue during the six-year Resource Acquisition Period. These efforts include the following six(6) specific elements:

a. Clean Power Plan and SPs Review and Evaluation
b. Planning and Development for Future Generation
c. Planning and Development for Future Transmission
d. Possible Expansion of Renewable Energy Portfolio
e. Refinement and Development of New DSM/EE Products & Services
f. R&D Programs and Projects via EPRI & CRN

a. <u>Clean Power Plan and State Plans Review and Evaluation</u>

As was discussed earlier in this document, the CPP presents significant challenges from a resource planning perspective. Additionally, the development and deployment of various state-by-state plans to implement the rule will be a complex and difficult task. Tri-State is committed to a thorough review of the CPP and to active participation in development of the State Plans as the process unfolds.

Also, possible SPs that willresult from this process could have significant impact on schedules for new generation builds, DSM/EE deployment, and risk management and trading actions related to natural gas, transmission and gas pipeline rights, gas storage, wholesale electricity, carbon credits and other commodities.

b. Planning and Development for Future Generation

If the CPP places existing generation resources at risk, then Tri-State and other utilities must be ready to continue to satisfy customer needs for electricity through the development of demand side and supply side resources. In order to have the ability to construct new supply-side resources, site development work must occur years in advance of the commercial operation of new generation facilities. As a result, Tri-State will be engaged in continuing planning and development activities for new generation resources. From the analysis presented in this document, and based on the base-case load forecast, Tri-State is now projecting it will not need additional generation resources until approximately 2023. Of course that date could be accelerated or delayed based on higher/lower load growth, or any number of other causes that would result in current assumptions or forecasts being off-target.

c. Planning and Development for Future Transmission

As indicated in Section II and Appendix C, Tri-State is one of the major participants in the analysis and development of transmission in Colorado and the other states in which it serves. Tri-State will continue to support vital transmission studies that are directed at supporting the acquisition of traditional and renewable generation resources to meet the needs of end users of both our Members and of other regional utilities.
Tri-State owns (wholly or jointly) more than 5,300 miles of transmission lines across Colorado, Nebraska, New Mexico and Wyoming. Tri-State will continues to invest in transmission infrastructure to ensure dependable power delivery across its Member-Systems' service territory. Also, Tri-State works closely with other utilities and transmission providers to maintain existing infrastructure and plan for new system additions.

Tri-State is positioned to invest in transmission that will not only meet its Members' current requirements and load growth, but will provide transmission pathways for renewable resources to get to market and for resource option development to mitigate potential carbon/GHG impacts.

Colorado's existing transmission system is constrained, especially in eastern and southern Colorado, and significant transmission investments are required to serve growing loads, increase reliability, ensure system stability, and support additional generation development, including new low carbon energy resources. Tri-State has plans for a high-voltage transmission system across eastern and southern Colorado that will reliably serve the association's Member-Systems, relieve existing transmission constraints and support additional interconnections, including those from renewable energy developers. The Burlington – Wray 230kV project,

scheduled to be completed in 2016, with alleviate existing constraints in eastern Colorado and allow for the delivery new renewable energy projects, including the 150MW Carousel Wind Farm. This project will be followed by the Lamar – Burlington 230kV project to create a 230kV transmission backbone across eastern Colorado, which will alleviate existing constraints in southwest Colorado, support additional interconnections, and assist in the delivery of energy across the Front Range.

The planned Wayne Child Phase II project will increase north to south transfer capability by 163MW between southeast Wyoming and northeast Colorado. Other planned expansion projects included the San Juan Basin 230kV transmission line from northwest New Mexico to southwest Colorado and the Montrose – Nucla – Cahone 230kV project. These projects demonstrate Tri-State's commitment to transmission development that will have significant benefits to Colorado and the region.

d. <u>Possible Expansion of Renewable Energy Portfolio</u>

Tri-State remains engaged in and interested in continuing to expand its already impressive renewable resource portfolio. As we have detailed throughout the public participation process, Tri-State actions regarding new renewable generation commitments will be driven by market opportunities, CPP implementation responses, transmission availability, integration capabilities and costs, ITC/PTC extensions or modifications, and Member rate impact. Tri-State continues to examine and evaluate the role and economic impacts of distributed generation technology.

Tri-State's resource portfolio includes a number of small renewable generation facilities that are directly interconnected with its Members' systems. These resources were installed in conjunction with Tri-State's contractual relationship with its Members that provide that each Member may self-provide up to five percent of their energy requirements. Tri-State also has a policy that enables its Members to exceed the five percent threshold by providing a market for those resources. During the Resource Acquisition Period Tri-State will continue to support its Members in the identification, evaluation and development of economic resources to directly interconnect with their distribution systems.

Also, during the Public Participation Processes, Tri-State discussed various issues associated with integrating intermittent renewable resources. Tri-State is committed to improving its models to better understand the operational impacts of integrating intermittent resources into its portfolio.

e. Refinement and Development of New DSM/EE Products & Services

Tri-State and its Members will continue to evaluate a full range of EE and DR products that add value to member-owners, Member Systems (Members) and Tri-State as a whole. Through the opportunity for pilots, both self-generated and Member generated, Tri-State will investigate alternative means of marketing and implementing promising new EE/DR technologies and programs to the Members' and their member-owners. Every year, Tri-State's Board of Directors evaluates and determines the Association's annual budget, including the funds dedicated to EE/DR programs.

In 2012 Tri-State began to consider/study the use of DSM by using Demand Response (DR) for load control during; economic conditions, peak demand and either generation or transmission emergency conditions and Energy Shaping (ES) to shift loads from on-peak to off-peak periods for energy efficiency, reducing on-peak loads and economic conditions. The ES and DR products would also assist our member systems with their efforts in energy efficiency and cost control as it relates to their member-owners.

Tri-State also studied a new wholesale rate design with the intent of incorporating ES and DR products. In order to implement the DR and ES products, it was determined that they had to benefit the member-owners, member systems and Tri-State becoming a win-win-win scenario.

In 2013 Tri-State implemented its Demand Response (DR) and Energy Shaping (ES) Products for use by the member systems. DR Products included control for; air conditioning, distributed generation (standby generators), irrigation, water heaters and commercial loads. ES Products included Time-of-Day; Electric Thermal Storage heaters, irrigation and water heaters. These were voluntary enrollments open to the member systems. Fourteen member systems were enrolled in fourteen DR and ES Products and some were enrolled in more than one product in 2013. Each year since the program's inception the products have been reviewed by Tri-State and the member systems and modified as needed to enhance the incentives for participation and terms and conditions.

In late 2013 Tri-State contracted with Power System Engineering (PSE) to conduct and analysis of Tri-State's Wholesale-Retail integration and demand response and energy shaping product design, modeling and deployment. In their final report, PSE indicated the approach Tri-State was considering to decouple the DR and ES Products from its wholesale power rates, while different from many G&T cooperatives around the country, holds promise to be an effective and efficient means of delivering DSM to the Member Systems and ultimately to the Member-owners. While the success of the program is contingent on many things, it certainly is

affected by the level of participation by the member-owners. Achievement of maximum participation will need to consider each stakeholder's interest and perspectives (i.e., Tri-State, member systems, and member-owners).

In PSE's independent assessment of the DR and ES Products, the following attributes were identified as being major drivers in product participation:

- Pricing
- Administrative Ease
- Simplicity and Convenience
- Stability and Predictability
- Technology Requirements

Tri-State did a thorough review of the PSE analysis and utilized portions of the findings and recommendations in consideration of the DR and ES product design, incentives and verification. Tri-State continued the DR and ES program through 2014. In late 2014 Tri-State again met with its member systems to review and modify the products to maintain and enhance the incentives offered by the various DR and ES products. These meetings led to refinement of the products for the 2015 deployment.

Additionally, Tri-State initiated the DR and ES Product Advisory Council in December of 2012 with the intent of obtaining input from member systems and their member-owners on ways to make and keep the program beneficial for all three parties. In addition to Tri-State staff monitoring the DR and ES program, Tri-State obtains comments from the member systems throughout the year. Periodically the member systems submit comments and suggestions from participating member-owners for program evaluation and potential changes for the following year. Every August Tri-State compiles the comments and potential changes for the following year and conducts a webinar with the member systems. The products are then further refined and recommendations are brought to the External Affairs Committee in October for their consideration. In November, Tri-State staff brings the final DR and ES recommendations to the TS Board for approval for the following year.

Tri-State's ability to verify energy savings achieved through its energy efficiency programs rests with Tri-State staff and our Member Systems reports and their adherence to program guidelines. Tri-State has the ability to audit the applications if necessary and that would include proof of installation. With the exception of pilot programs, actual savings achieved are difficult for Tri-State to measure. Until recently Tri-State has relied on the deemed savings calculated using the Rural Utility Services recommended

spreadsheet. Starting with the 2014 reporting, Tri-State has also used the California Database for Energy Efficient Resources (DEER) where appropriate to inform the calculated results.

Beginning in 2014, Tri-State has used the California Database for Energy Efficient Resources (DEER) where appropriate to inform our calculated results. The savings calculated are assumed to last for the average life of the equipment, which has been gathered from various sources.

f. R&D Programs and Projects via EPRI & CRN

Tri-State strongly supports research, development and advanced technology. We've been a full-member of the Electric Power Research Institute (EPRI) and the National Rural Electric Cooperative Association (NRECA) research program (aka, CRN) since 1993. Tri-State is commited to continuing this support for vital R&D going forward. Tri-State's R&D efforts are directed at compressed air storage, enhanced batteries and carbon sequestration.

Also, an important part of our program is direct participation in research projects. This helps solve unique problems, brings us early information on advanced technology, facilitates the commercialization of new products and provides information exchange with industry SME.
Some examples of these projects include:

1. Extensive support and guidance on CO2 capture and sequestration at several major DOE / EPRI pulverized-coal power plant demo projects.
2. Study and analysis of proposed concentrated solar augmentation project at a New Mexico and Italian power plant.
3. Demo of low-cost Ion-membrane O2 Production as an option to concentrate CO2 for subsequent capture and beneficial utilization.
4. Geological characterization of Colorado Plateau formation for possible CO2 sequestration.
5. Support for the development and field demo for a live-line insulation test system.
6. Multi-year field demo of six advanced Plug-in Hybrid Electric Trucks (PHEV), including Smart Charging and vehicle-to-grid test.
7. Field testing of several electric water heaters in order to demo high-speed remote control which may be needed to integrate increased levels of variable renewable resources.

8. Support and guidance to the DOE / NRECA SUNDA project (solar utility network deployment acceleration) in order to provide opportunities to member systems who may want to fiancé/build/op their own solar PV system.
9. "Electrification" study with EPRI to find area opportunities to shift end-use loads to more environmentally friendly and energy efficient options.

10. Status Report Regarding the 2010 Action Plan

In the 2010 Resource Plan, a number of planned actions were outlined. In summary, the action plan generally consisted of the following elements:

a. Integrating Renewable Resources
b. Pursuing Additional Renewable Resources
c. Expanding and Improving EE Programs
d. Generation and Transmission Investment for Efficiency Gains
e. R & D related to Advanced Technologies and Greenhouse Gases

The following section provides a summary of Tri-State activities in these areas since 2010.

Additionally, it is worth noting that many important underlying factors have changed since 2010. The continued decline of wholesale prices for electricity and natural gas and the extension of the ITC and the continuing decline of costs of renewable resources due to this tax treatment and due to technological improvements have impacted resource planning. The approach that the EPA has taken regarding regional haze reductions has resulted in Tri-State agreeing to an arrangement that will result in the closure of San Juan Unit 3, where Tri-State owns 41 MW of coal-fired generation. This closure will occur no later than 12/31/2017.

Also since 2010, the price of oil has been in rapid flux, which has impacted the rate of change of new extraction related loads as well as the behavior some existing loads. The rapid development of horizontal drilling and fracturing wells and the addition of new gas processing capability in northeastern Colorado since 2010 resulted in the accelerated development of several new Tri-State transmission projects.

In December 2011, Tri-State closed on the purchase of the Thermo-Cogeneration Partnership, whose assets included a 272 MW natural gas combined cycle generation facility located in Fort Lupton, Colorado. The generation facility was later renamed the JM Shafer Generating Station. While this acquisition was not contemplated under the 2010 action plan, the general indications from 2010 IRP analyses indicated that natural gas combined cycle generation was a natural addition to the Tri-State generation fleet, and the purchase of this resource served to delay the need for future new generation additions to the Tri-State fleet, and it was an economically advantageous transaction.

a. **Integrating Renewable Resources**

Tri-State has implemented power purchase agreements for significant amounts of new renewable wind and solar generation, and Tri-State Members have implemented numerous distributed renewable projects. Additionally, there have been many other projects that were evaluated, but for various reasons did not achieve commercial operation. Each of these generation projects (and each of the unsuccessful projects) presented various challenges, including transmission congestion, transmission/distribution interface issues, metering, telemetering, forecasting, environmental effects, avian / raptor issues, financing, and other commercial obstacles. When Tri-State developed this 2010 action plan element, our focus was more simply on balancing authority level real-time load/resource balancing, and not on the many other integration issues that we have explored since 2010. Nonetheless, the experience we have gained in this process has been invaluable and has allowed us to pursue additional projects on an expedited basis.

As to the balancing area load/resource balancing issue, Tri-State has seen several important developments transpire since 2010. First, the WECC standards for real-time balancing have effectively been relaxed by the implementation of initiatives such as Reliability Based Control, and ACE Diversity Exchange. This has allowed our host balancing authorities to effectively integrate larger amounts of variable resources. Another trend that is developing is the application of transmission-based ancillary service charges directed specifically at variable generation such as wind and solar. Xcel Energy has implemented tariff provisions that will effectively charge wind generators located in their balancing authority and designated as network resources, approximately $5 / MWH for integration services. Western Area Power Administration is developing similar ancillary service charges to be implemented in the coming months.

Tri-State continues to work with our host balancing authorities to develop commercially viable methods to utilize Tri-State resources to assist with the load following and interchange management balancing function, and has run a pilot program in New Mexico, and has implemented a contractual arrangement with Western Area Power Administration to provide this functionality.

Tri-State continues to attempt to improve our capabilities to forecast intermittent generation and has structured contractual terms to incent renewable project operators based on the accuracy of those forecasts. Despite these efforts we remain disappointed at the general state of the art in this arena, with industry standard Mean Average Percentage Error (MAPE) values consistently remaining well above 10%

b. **Pursuing Additional Renewable Resources**

Since 2010, Tri-State has implemented the following new renewable generation projects:

Colorado Highlands Wind
In February 2012, Tri-State signed a 20 year power purchase agreement with Colorado Highlands Wind, LLC for the output and environmental attributes from a 67 MW wind farm located in northeastern Colorado. The project began operating in December 2012. In March 2013, Tri-State amended the power purchase agreement with Colorado Highlands Wind, LLC to reflect an expansion of the facility by 24 MW. The Phase II portion of the project began operating in September 2013, bringing the project's total nameplate capacity rating to 91 MW.

Carousel Wind
In December 2013, Tri-State signed a 25 year power purchase agreement for a 150 MW wind farm to be built in eastern Colorado. Tri-State state will purchase the entire output and environmental attributes from Carousel Wind Farm, LLC when the facility achieves commercial operation in the spring of 2016. This agreement is Tri-State's largest wind power purchase agreement to date.

Twin Buttes II Wind Project
In June 2015, Tri-State announced it had signed a 25 year power purchase agreement for a 76 MW wind project to be built in southeastern Colorado. The project will be owned by Twin Buttes Wind II LLC and is expected to be completed in late 2017.

San Isabel Solar
In August 2015, Tri-State signed a 25 year power purchase agreement with San Isabel Solar LLC for the output of a 30 MW solar project to be built in Las Animas County, Colorado. The project is expected to begin operations in the fourth quarter of 2016 and will be Tri-State's first utility scale solar project in Colorado.

Alta Luna Solar
In September 2015, Tri-State signed a 25 year power purchase agreement with TPE Alta Luna, LLC for the output of a 25 MW solar project to be built in southern New Mexico. The solar project is expected to begin operations in the fourth quarter of 2016.

Tri-State Supported additional Member Distributed Renewable Generation
Tri-State members have the opportunity to invest in locally-developed projects to supply a portion of their power requirements under their wholesale contract with Tri-State. The number of megawatts operating or under development by Tri-State members has more than doubled since 2010 and over a third of Tri-State's member systems have elected to support local distributed generation projects under Tri-State's existing board policies. Currently, there are 48 such projects, totaling 73 MW of nameplate capacity and representing technologies including solar, wind, landfill gas, hydro, and recycled heat. Also,Tri-State's financial support for these member renewable projects, in the form of over-market purchases of the RECs associated with the projects, has significantly improved the economics..

Small Hydro Power Purchase Agreements
Since its last IRP/ERP, Tri-State has entered into several power purchase agreements for the output of small hydroelectric projects located throughout its member system service territory. These include an extension of the power purchase agreement for the output of the 5.6 MW Vallecito Hydroelectric Project near Durango, Colorado, and new contracts for the output from the 8 MW Tri-County Water Hydropower Project in Ridgway, Colorado, the 5 MW Boulder Canyon Hydroelectric Project located west of Boulder, Colorado, and the 2.9 MW Garland Canal Hydroelectric Project located in northwest Wyoming.

c. <u>Expanding and Improving Demand Response (DR), Energy Shaping (ES) and Energy Efficiency Products (EEP) Programs</u>

To date in 2015 there are eighteen member systems enrolled in fourteen Demand Response and Energy Shaping (DE and ES respectively) products, with some members enrolled in multiple products.. There are 134.7MW's enrolled under DR Products and 94.1MW's enrolled under ES Products. Tri-State staff continues to work with the member systems and their member-owners in reviewing and modifying the DR and ES products for 2016 and beyond. The growth of these DR products is reduced from 2010, primarily due to having a better outlook on uptake and continued use by the member systems and their member-owners. In 2010, Tri-State relied upon the System Wide Electric Energy Efficiency Potential Study completed by Nexant and Cadmus while DR

products were still under development. The DR suite of products was released to the members in late 2012. Given time to completely assess member system and their member-owners response to the current suite of DR products has resulted in a flatter DR forecast for 2016 and beyond. Energy Shaping products are set to terminate at the end of their current contracts due to a change in rate structure in which the signal to "shape" energy is within the rate.

In 2015, Tri-State staff conducted an annual review of the current EEP Program, its energy savings and recommend modifications to the EEP Program for 2016. Based on this review, the growth of DR and ES products is reduced from the 2010 ERP. In 2014, Tri-State had saved 134,653 megawatt-hours of energy through the EEP program's new and previously installed equipment

d. <u>Generation and Transmission Investment for Efficiency Gains</u>

Tri-State has a proven history of making investments in its transmission system to ensure reliability and efficiency gains, The Burlington-Wray and Burlington-Lamar transmission projects in eastern Colorado were planned to enable Tri-State to integrate additional low cost renewables.

Tri-State's transmission planning process is intended to facilitate the timely and coordinated development of transmission infrastructure that both maintains system reliability and meets customer needs, while continuing to provide reliable low cost electric power to its member cooperatives.

Also, Tri-State routinely collaborates with other regional transmission providers and interested potential transmission owners or users in planning and building its transmission system to ensure reliability and efficiency gains. Through collaboration of this nature, Tri-State and its neighboring transmission providers seek to balance optimization of the regional transmission system with their load serving obligations.

Finally, Tri-State coordinates its planning process with other transmission providers and Stakeholders at the regional and sub regional levels of the Western Interconnection through its active participation in the Colorado Coordinated Planning Group (CCPG), the Southwest Area Transmission Planning (SWAT) group, membership in WestConnect, and membership in the Western Electricity Coordinating Council (WECC).

e. R & D related to Advanced Technologies and Greenhouse Gases

Tri-State leverages its R&D dollars by participating in the Electric Power Research Institute (EPRI) and the National Rural Electric Cooperative Association (NRECA/CRN) R&D programs. Numerous Tri-State staff serve on various EPRI committees and vote on various R&D projects related to advanced technologies to reduce greenhouse gas emissions. Tri-State's R&D efforts are directed at compressed air storage, enhanced batteries and carbon sequestration.

Some of the recent R&D projects Tri-State has participated in related to Advance Technologies and Greenhouse Gases include;

- CO2 capture and sequestration at several major DOE / EPRI pulverized-coal power plant demo projects.
- Concentrated solar augmentation project at a New Mexico and Italian power plant.
- Low-cost Ion-membrane O2 Production as an option to concentrate CO2 for subsequent capture and beneficial utilization.
- Geological characterization of Colorado Plateau formation for possible CO2 sequestration.

In performing the analysis to support the nine scenarios in the 2015 Resource Plan, Tri-State has given the fullest possible consideration to the minimization of long-term costs over the planning period. By doing so, Tri-State is ensuring the economic prosperity of its member-owners. Also, by ensuring Tri-State can meet the peak capacity requirement of its member going forward minimizes the reliance on volatile spot power and fuel markets. Additionally, all of the renewable PPAs Tri-State has executed over the past 5 years have helped to lower the cost of wholesale electricity for our member-owners.

Appendix A

Scenario Analysis Graphs

Business as Usual Scenario (BAU)

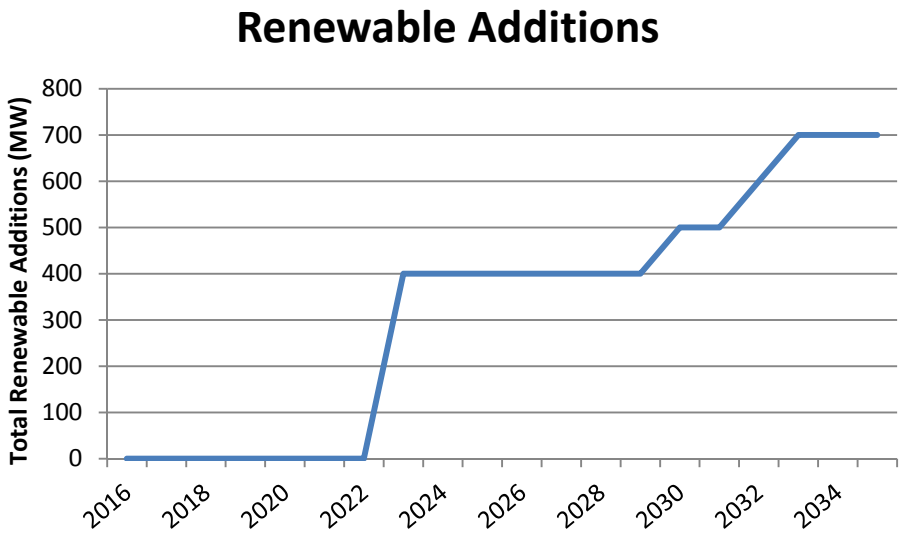


Figure A1: Renewable Energy Additions for BAU scenario

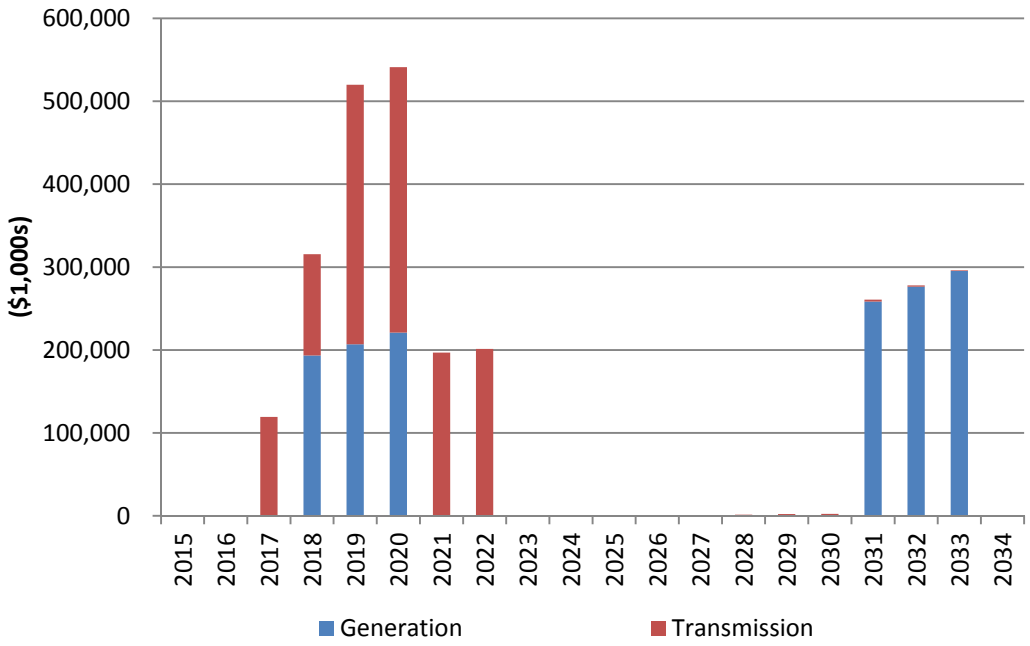


Figure A2: Capital Expenditures for BAU scenario

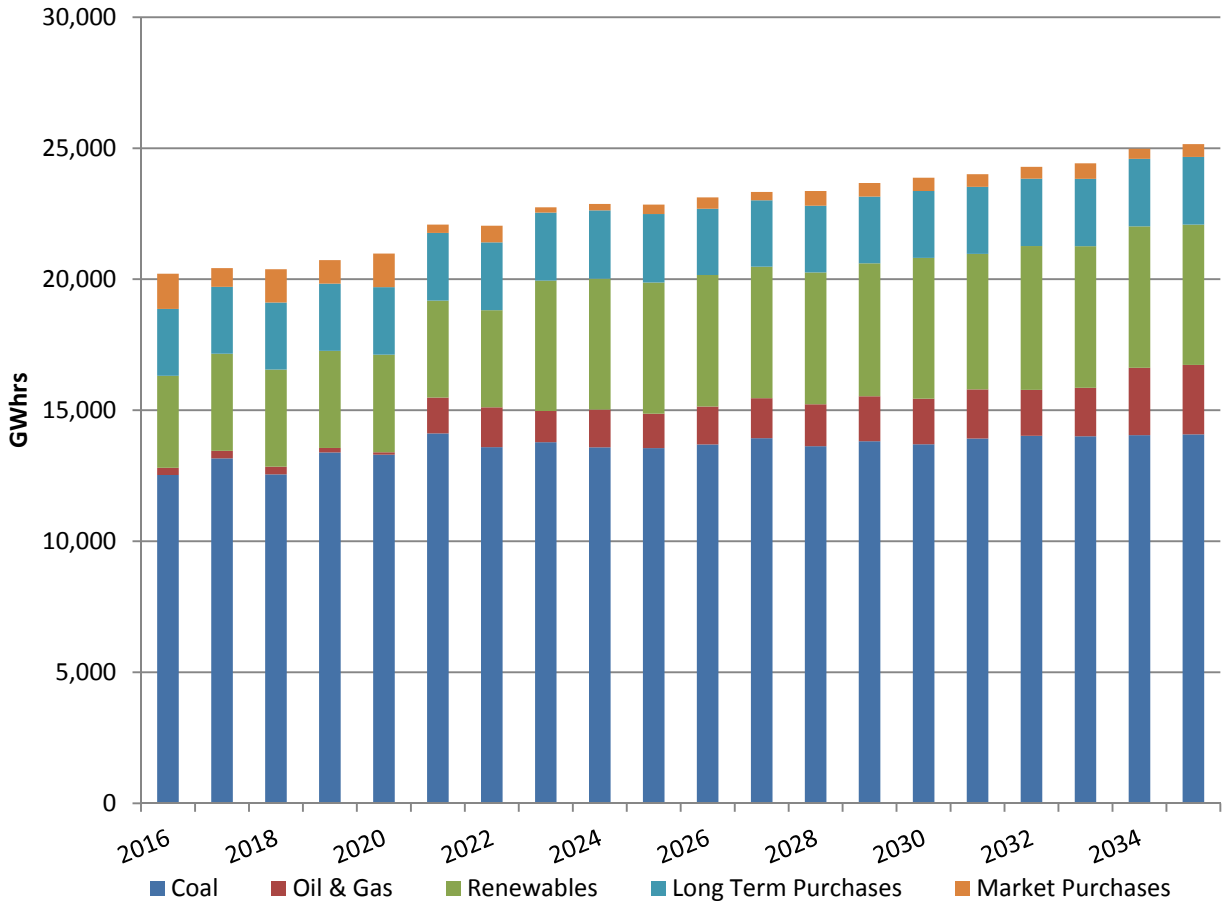


Figure A3: Generation by Fuel Type for the BAU scenario

Business As Usual – Low Load Scenario (BAU-Low Load)

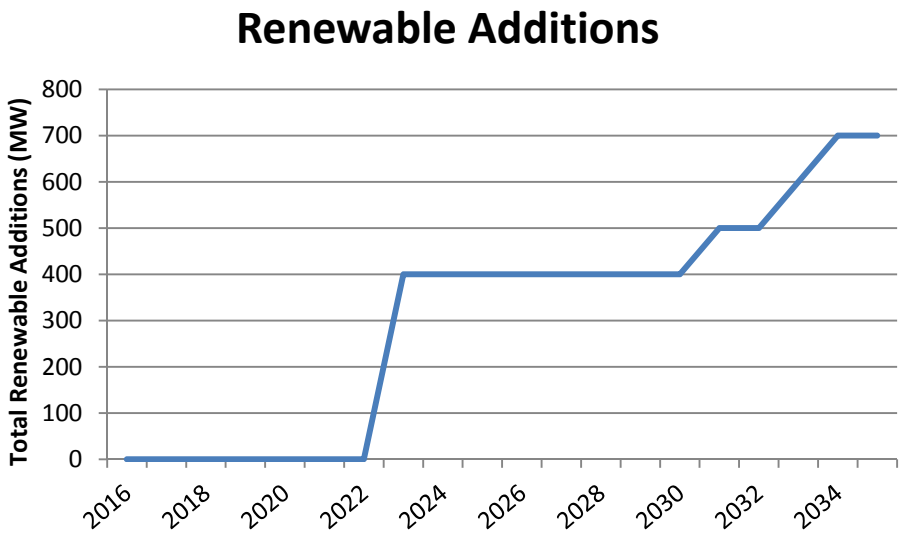


Figure A4: Renewable Energy Additions for BAU-Low Load scenario

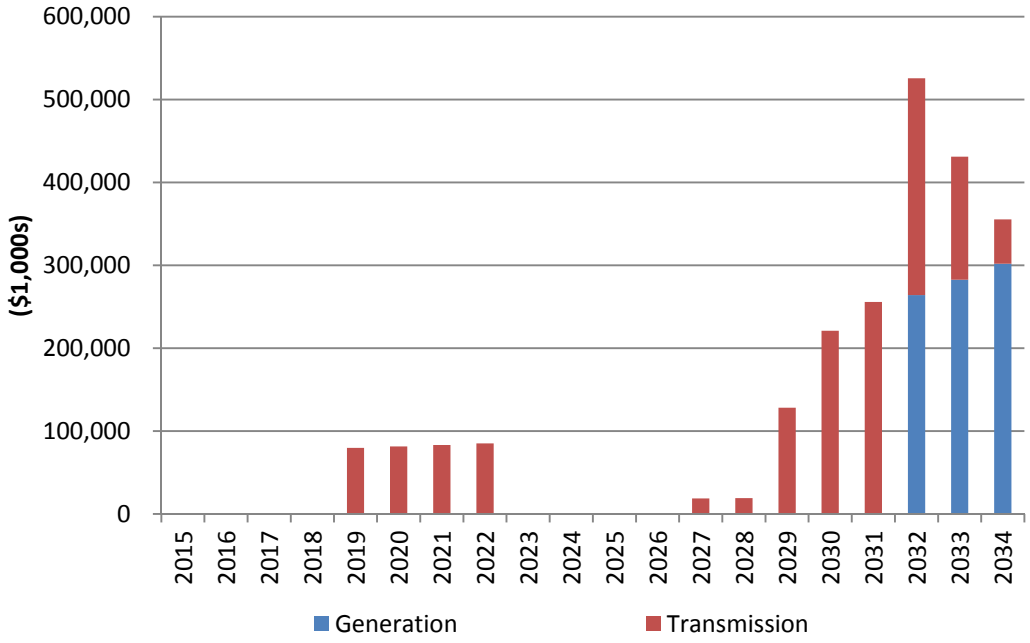


Figure A5: Capital Expenditures for BAU-Low Load scenario

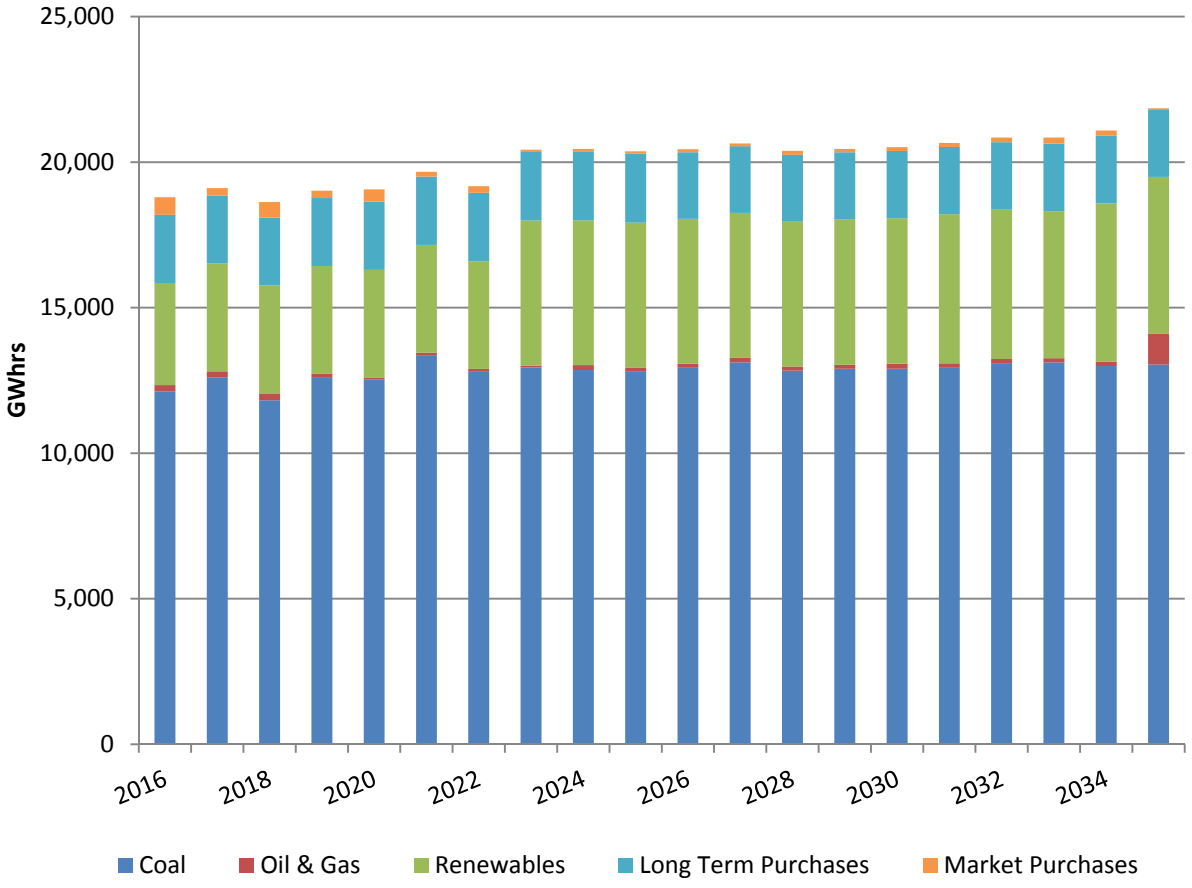


Figure A6: Generation by Fuel Type for the BAU-Low Load scenario

Business As Usual-High Load Scenario (BAU-High Load)

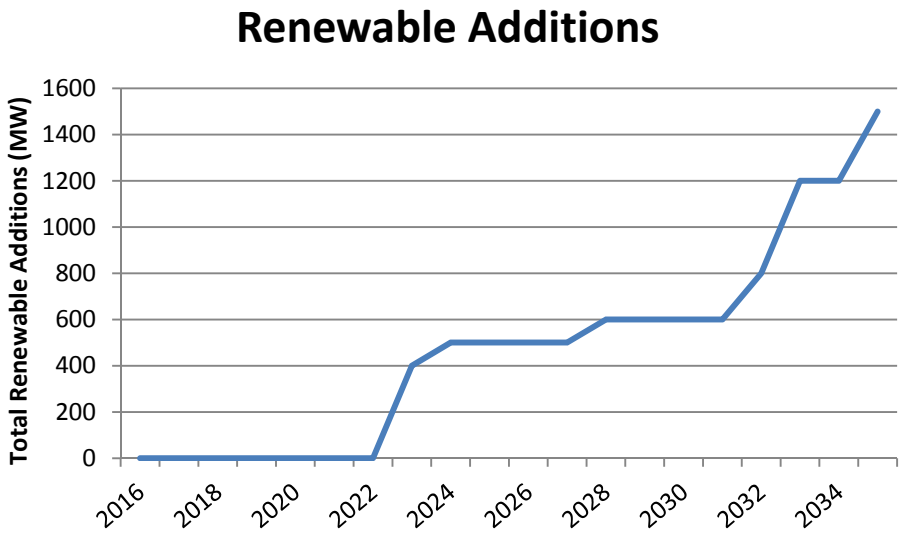


Figure A7: Renewable Energy Additions for BAU-High Load scenario

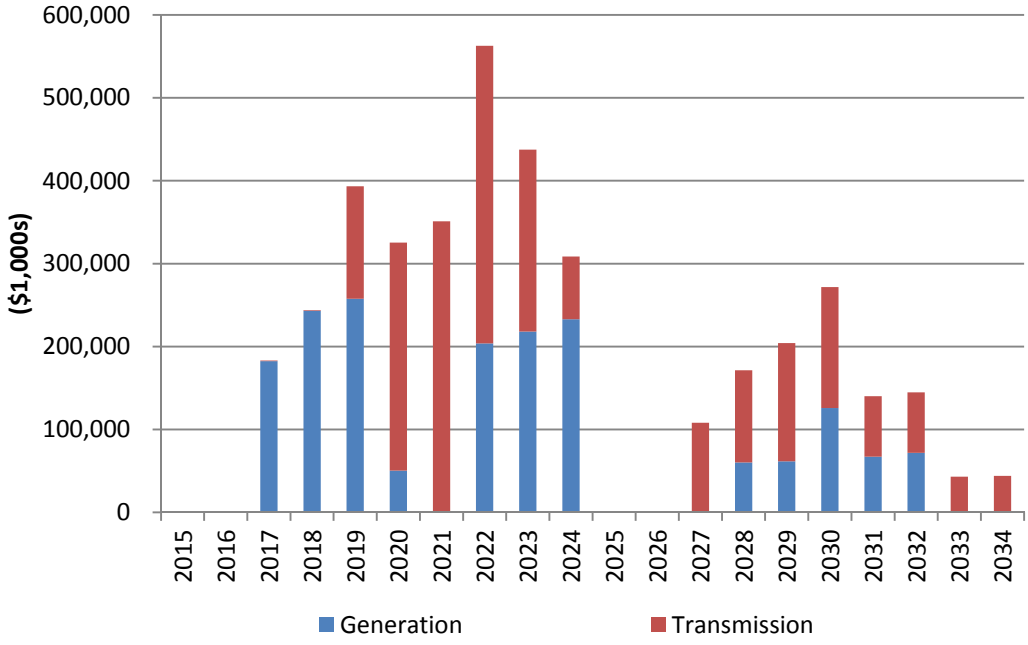


Figure A8: Capital Expenditures for BAU-High Load scenario

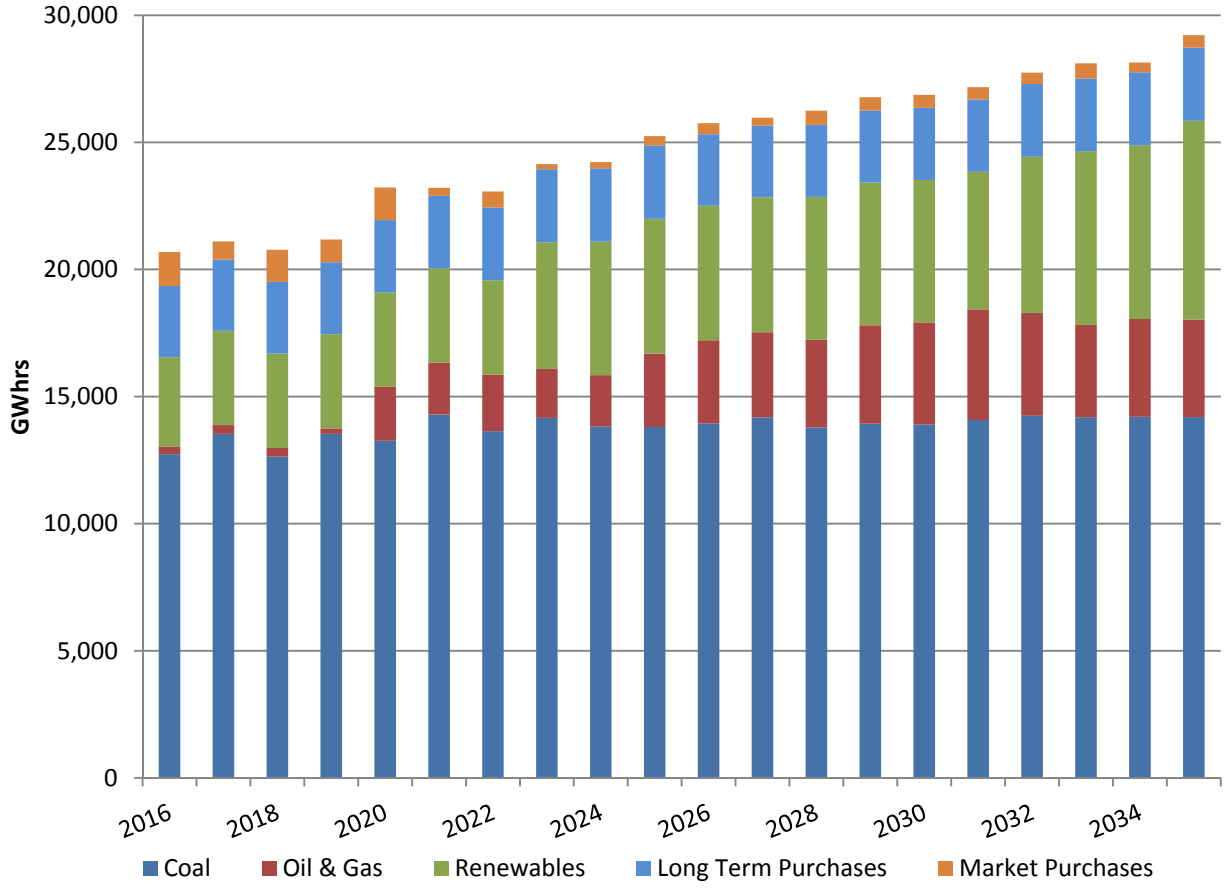


Figure A9: Generation by Fuel Type for the BAU-High Load scenario

100 MW Coal Retirement Scenario

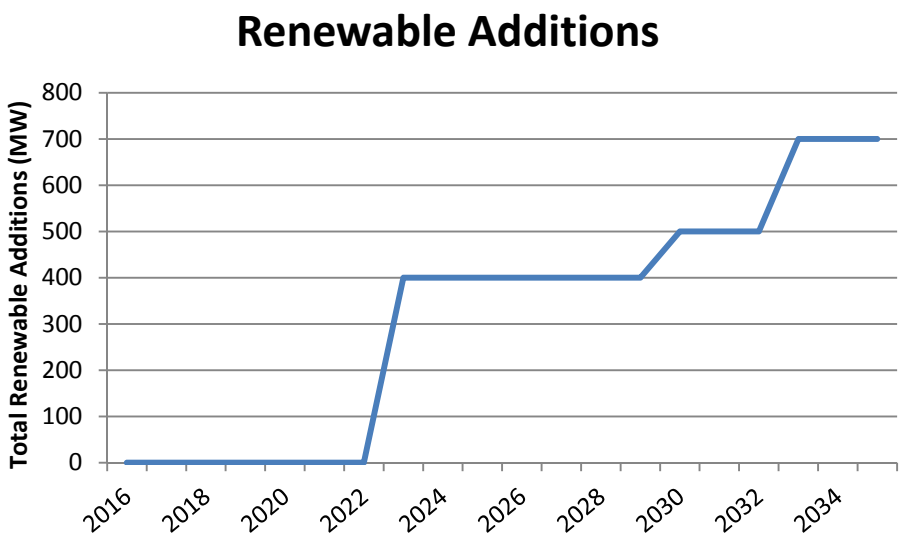


Figure A10: Renewable Energy Additions for the 100 MW Coal Retirement scenario

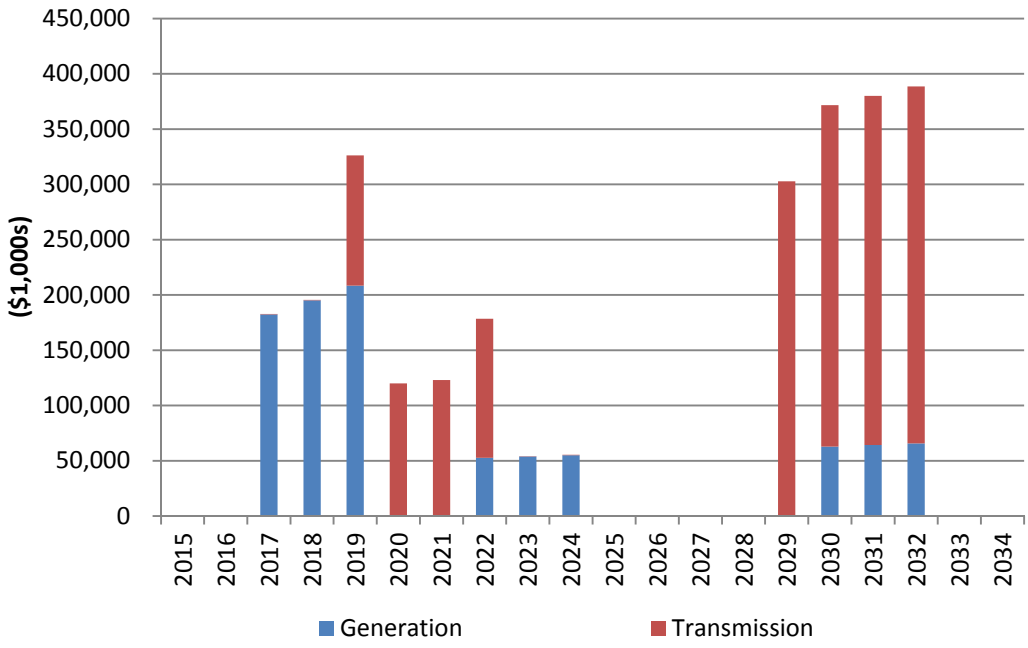


Figure A11: Capital Expenditures for 100 MW Coal Retirement scenario

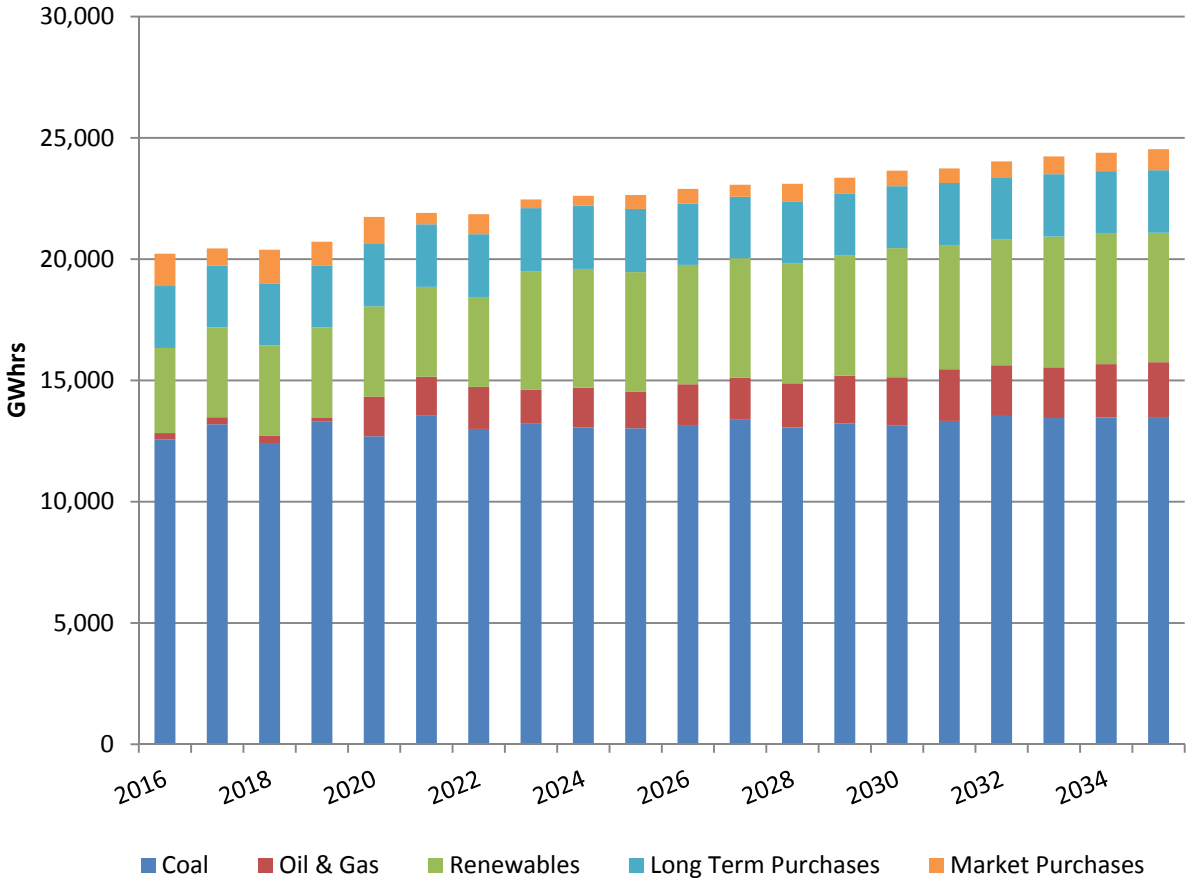


Figure A12: Generation by Fuel Type for the 100 MW Coal Retirement scenario

300 MW Coal Retirement Scenario

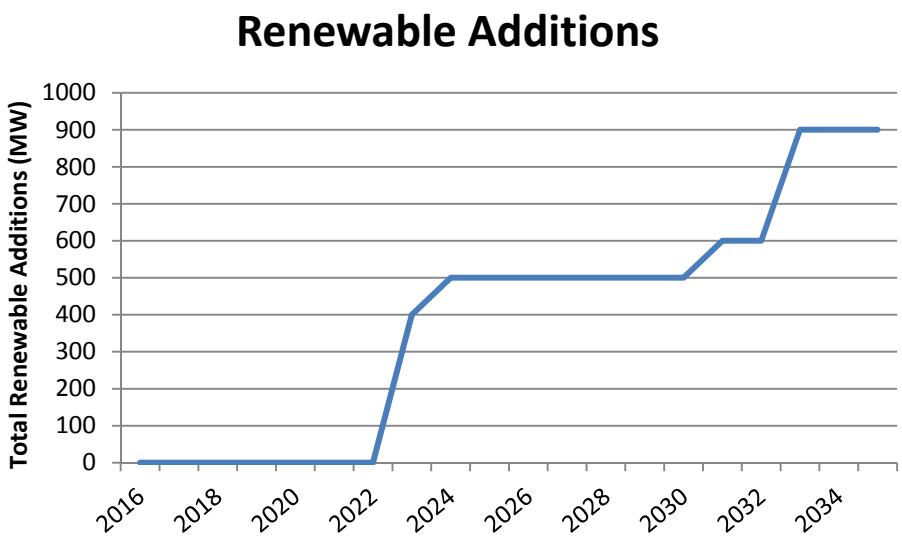


Figure A13: Renewable Energy Additions for the 300 MW Coal Retirement Scenario

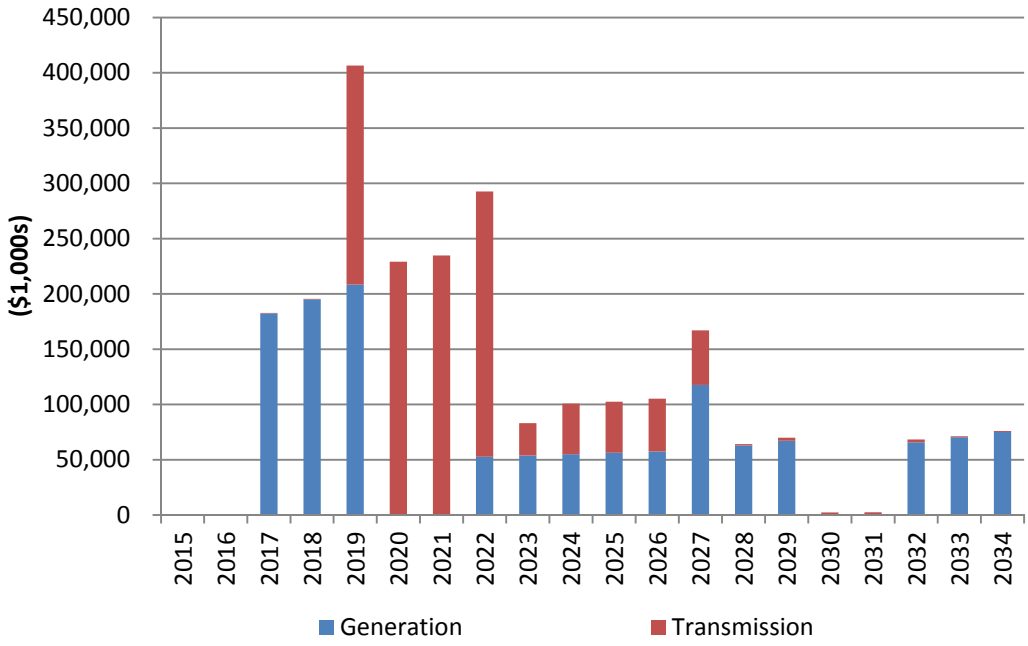


Figure A14: Capital Expenditures for 300 MW Coal Retirement Scenario

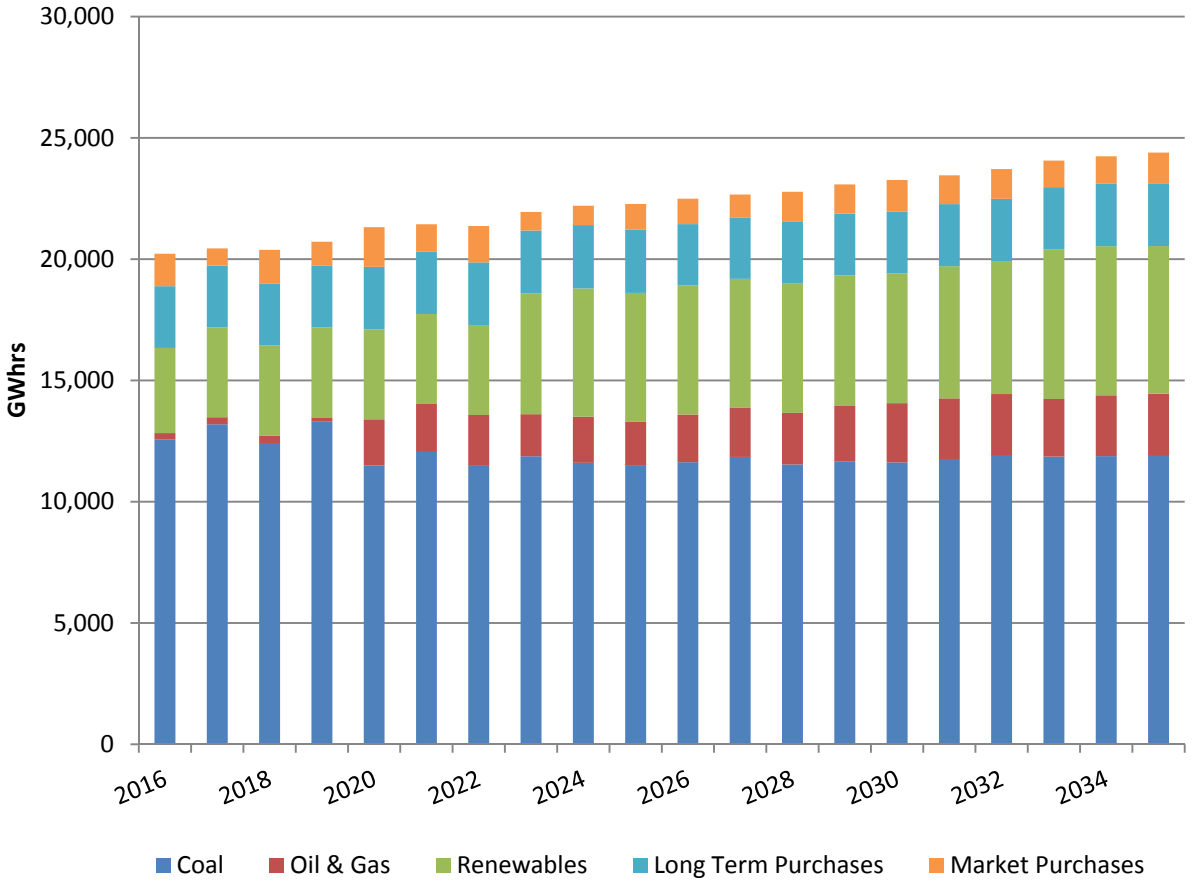


Figure A15: Generation by Fuel Type for the 300 MW Coal Retirement Scenario

Energy Efficiency Scenario

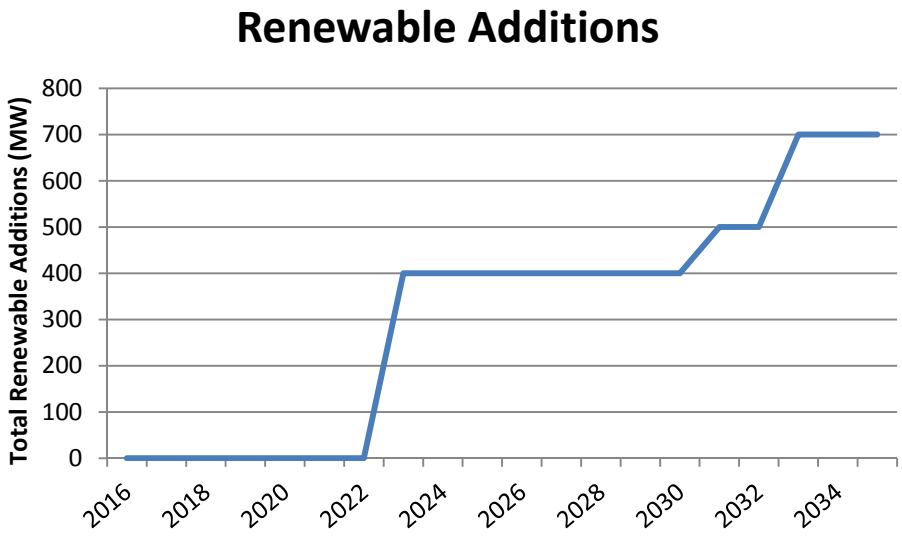


Figure A16: Renewable Energy Additions for the Energy Efficiency Scenario

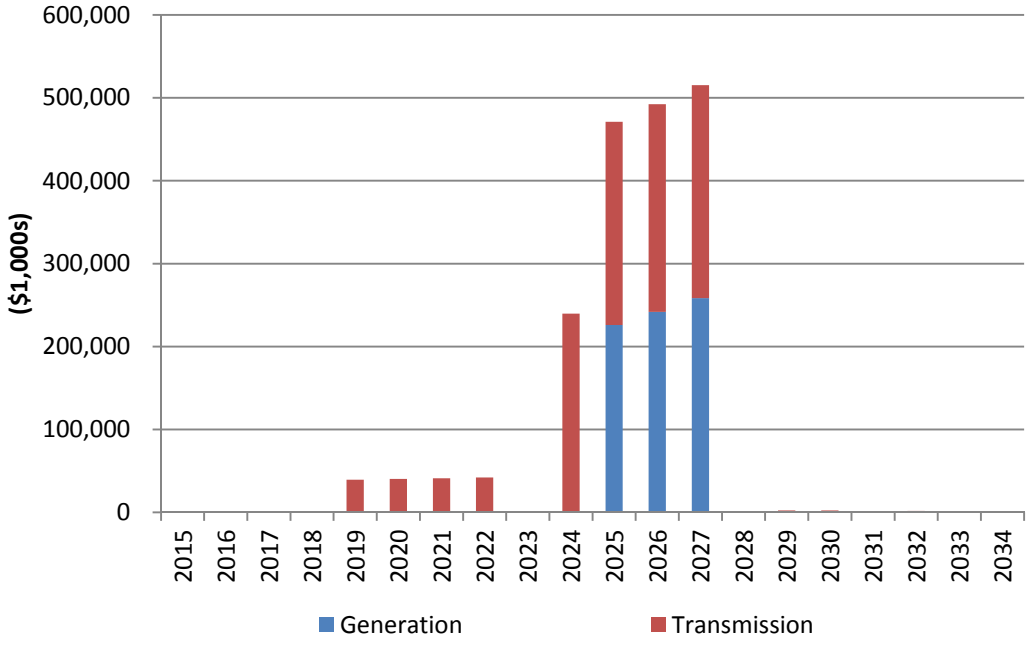


Figure A17: Capital Expenditures for the Energy Efficiency Scenario

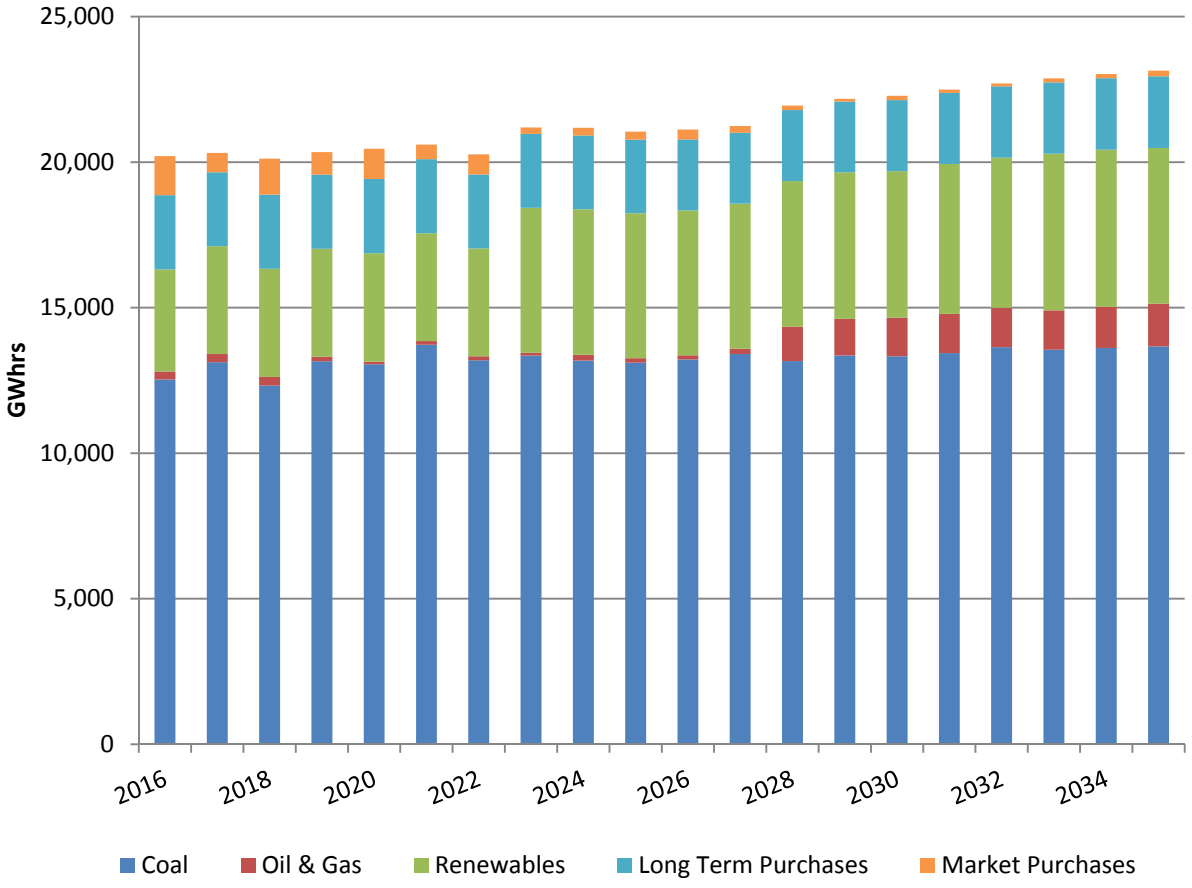


Figure A18: Generation by Fuel Type for the Energy Efficiency Scenario

Production Tax Credit (PTC) Scenario

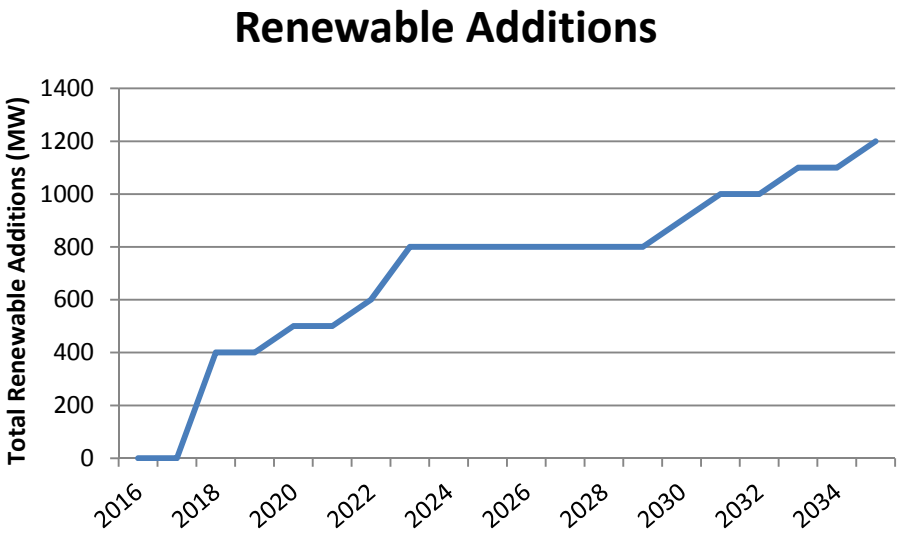


Figure A19: Renewable Energy Additions for the Production Tax Credit (PTC) Scenario

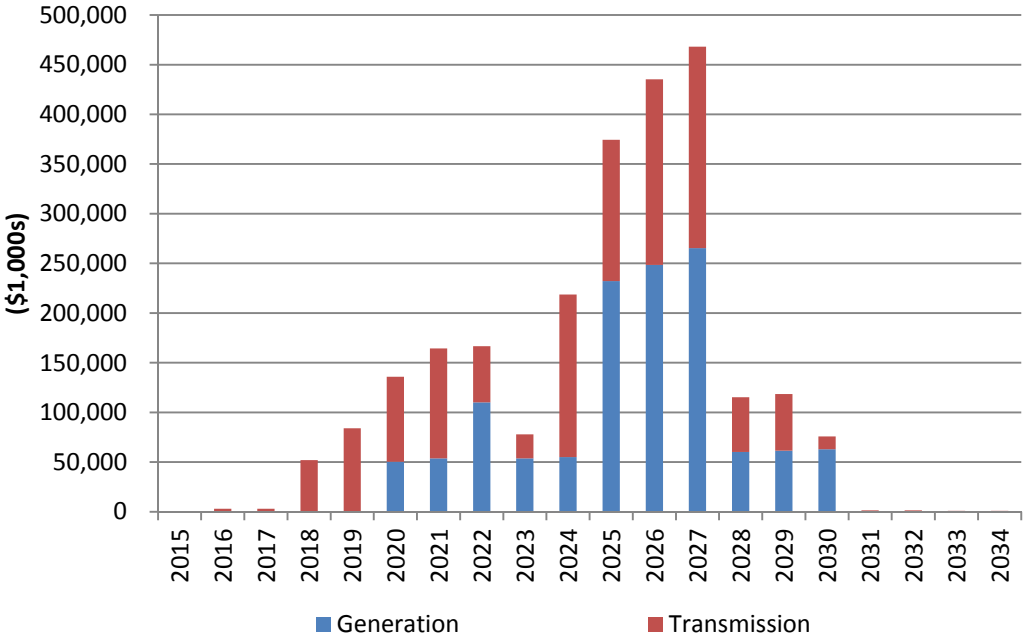


Figure A20: Capital Expenditures for the Production Tax Credit (PTC) Scenario

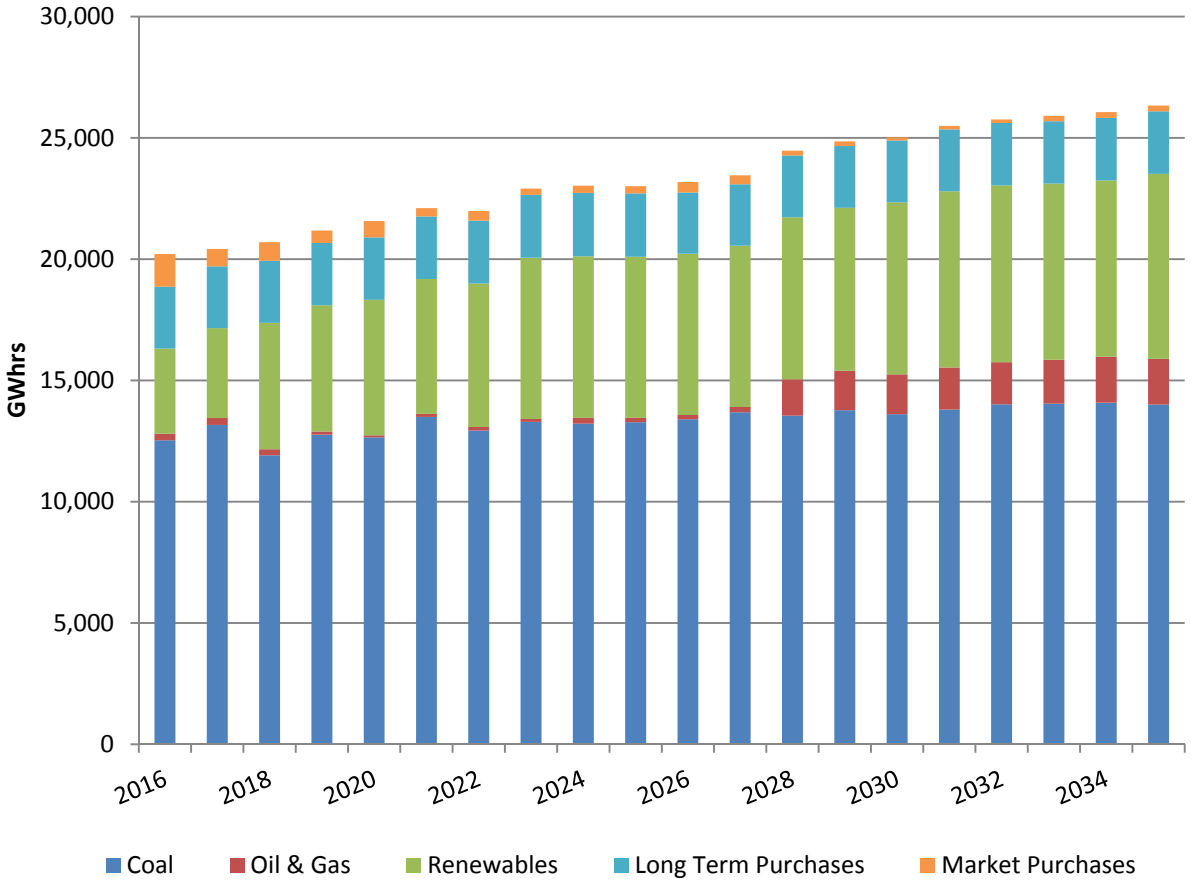


Figure A21: Generation by Fuel Type for the Production Tax Credit (PTC) Scenario

High Commodity Prices, High Load Scenario

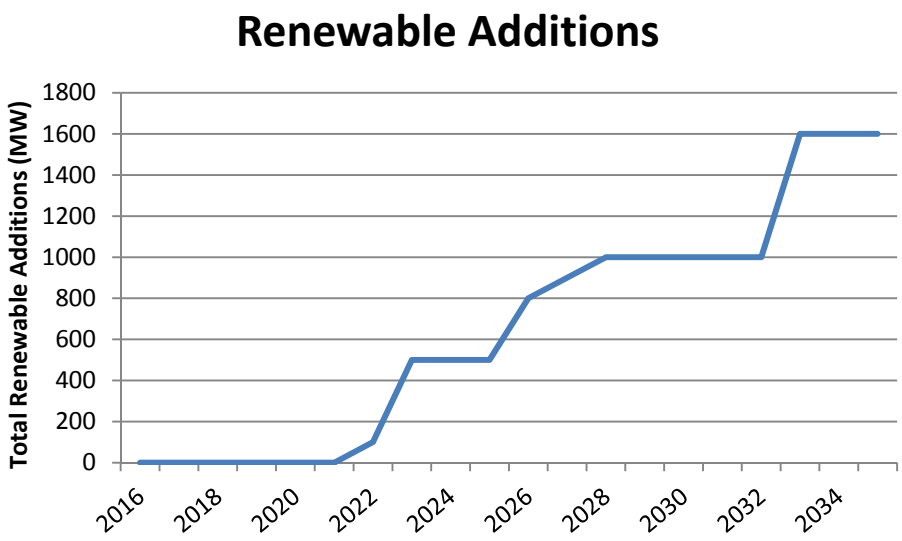


Figure A22: Renewable Energy Additions for the High Commodity Prices, High Load Scenario

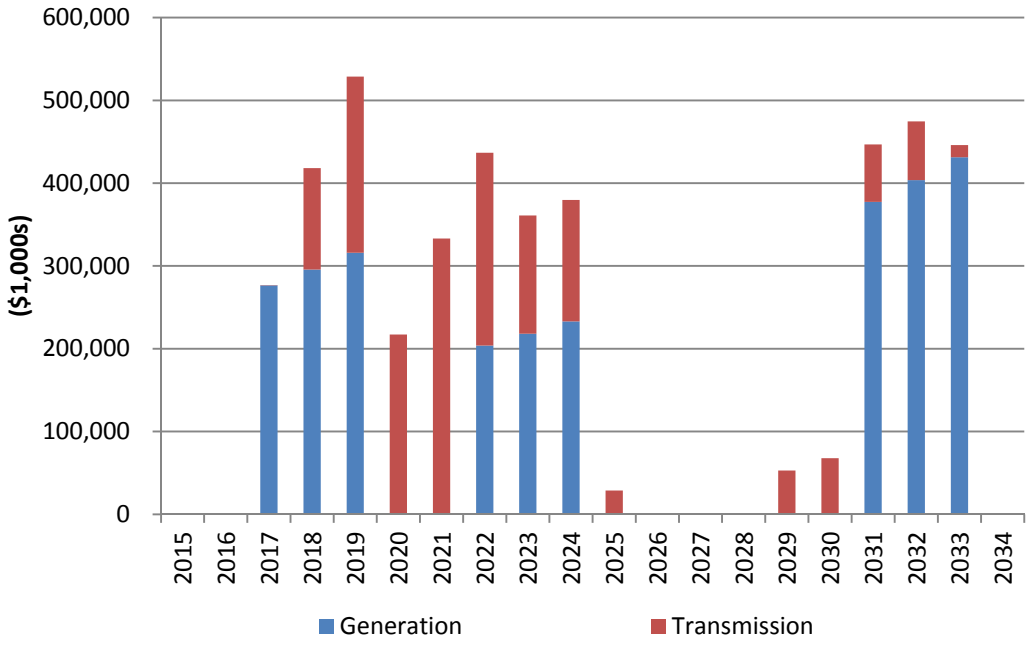


Figure A23: Capital Expenditures for the High Commodity Prices, High Load Scenario

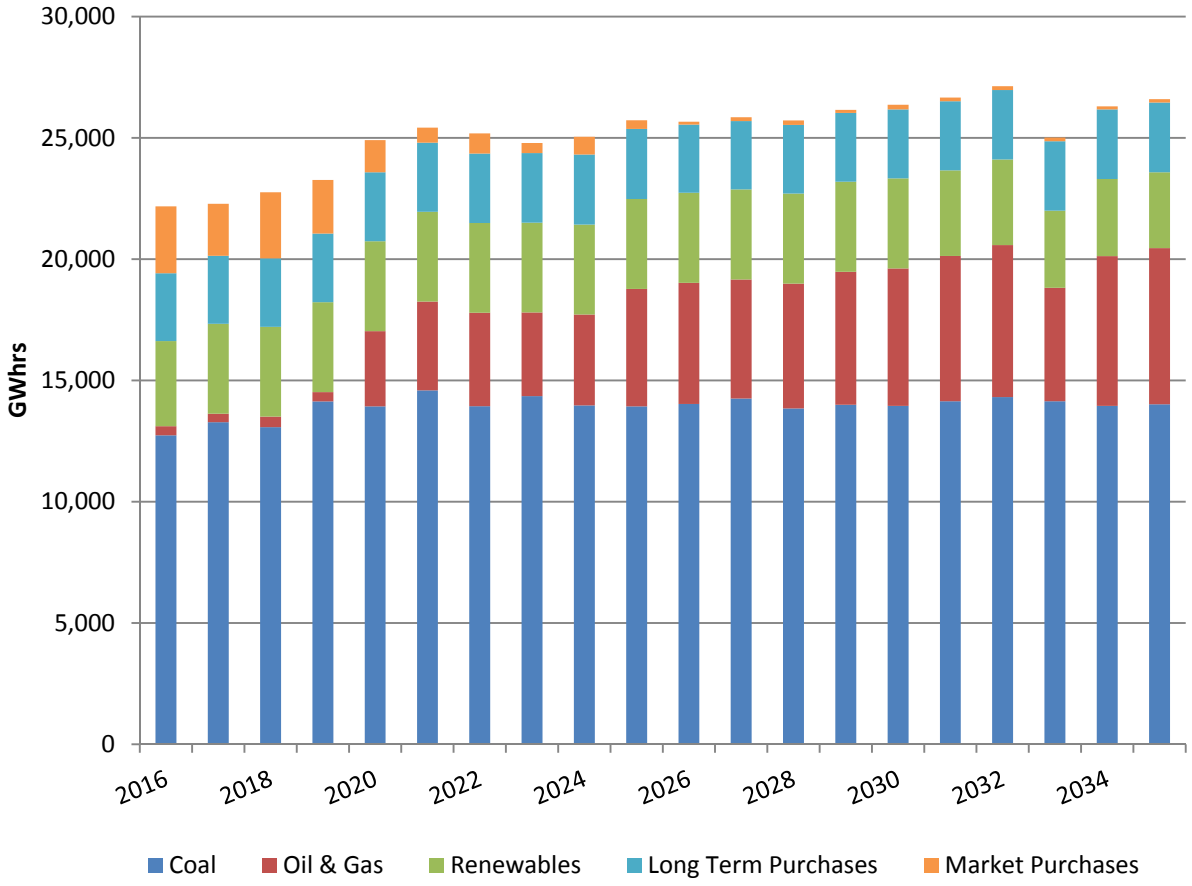


Figure A24: Generation by Fuel Type for the High Commodity Prices, High Load Scenario

Distributed Generation (DG) Scenario

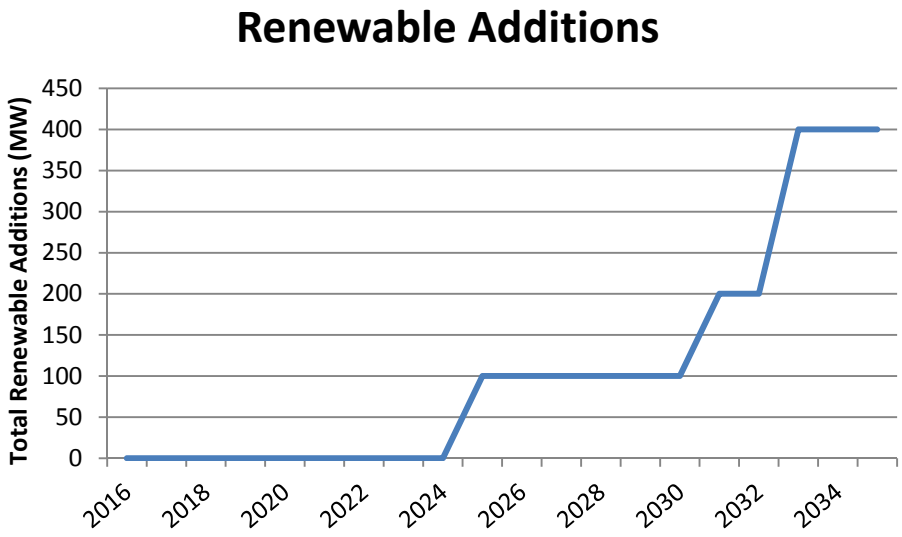


Figure A25: Renewable Energy Additions for the Distributed Generation (DG) Scenario

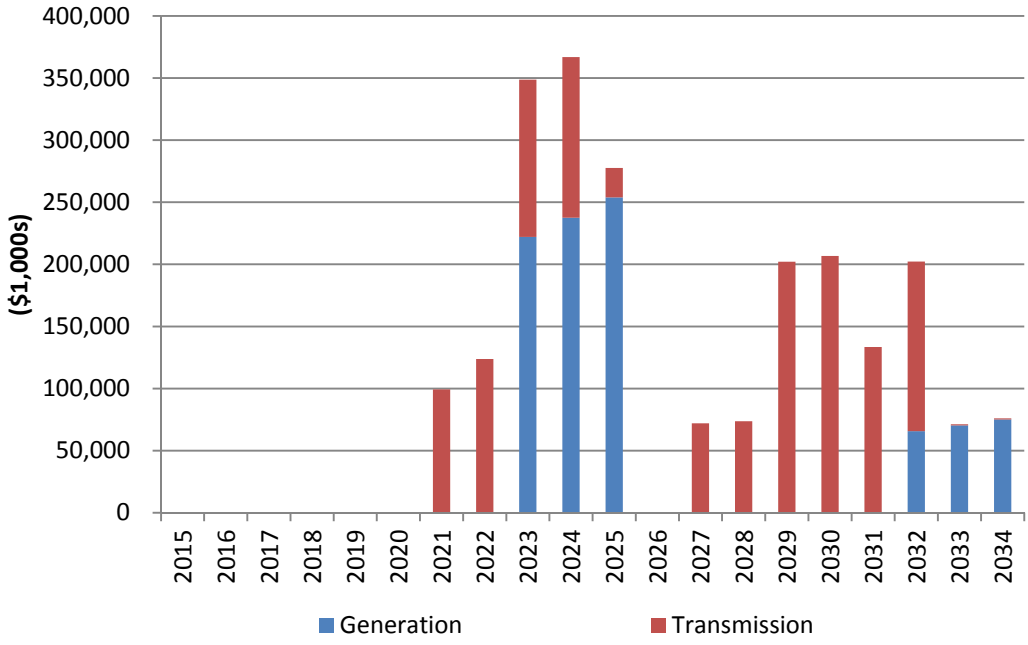


Figure A26: Capital Expenditures for the Distributed Generation (DG) Scenario

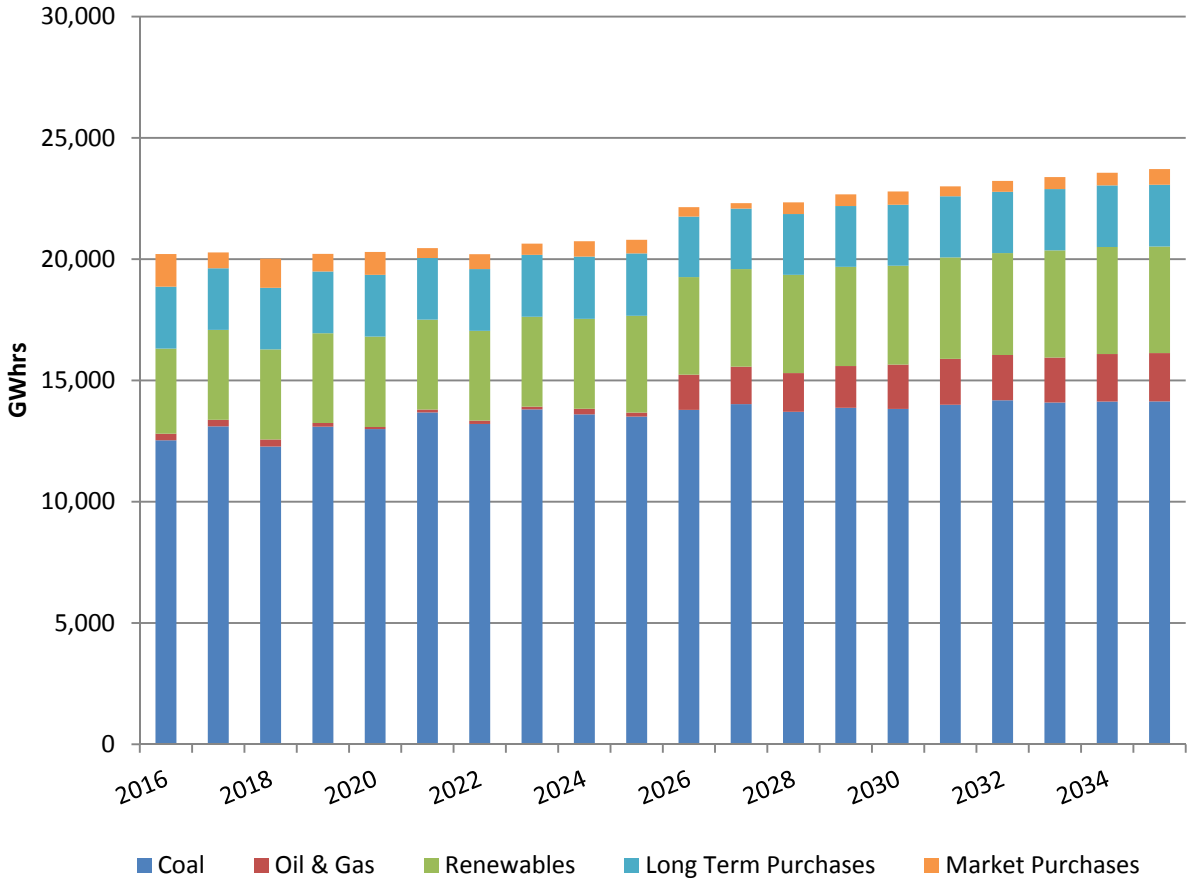


Figure A27: Generation by Fuel Type for the Distributed Generation (DG) Scenario

Appendix B

Total Emissions and Water Consumption by Scenario by Year for each Generating Unit

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	657	753	695	703	734	812	784	791	813	812	780	814	812	717	810	813	810	809	815	816
Craig 2	722	666	654	723	705	815	816	756	821	793	827	822	786	819	812	815	813	811	813	813
Craig 3	2882	2994	2394	2811	2897	3155	3328	3171	2930	3378	3377	3214	3364	3359	3178	3344	3331	3325	3343	3346
LRS 2	1556	1803	1551	1803	1799	1785	1528	1768	1764	1539	1741	1732	1521	1715	1707	1707	1711	1707	1707	1707
LRS 3	1988	1705	1983	1983	1702	1914	1953	1709	1939	1924	1683	1905	1900	1658	1876	1876	1881	1876	1876	1876
Nucla	470	595	697	704	710	735	762	723	688	724	734	734	737	740	731	772	760	763	773	777
PEGS	1257	1448	1739	1940	1855	1995	1926	1940	1734	1891	1647	1856	1792	1947	1768	1921	1887	1894	1906	1927
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2851	3052	3130	3030	3155	3190	2787	3174	3161	2772	3123	3128	2974	3105	3080	2957	3101	3092	3091	3092
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	4	1	17	2	4	23	9	9	17	11	11	18	12	12	9	10
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	0	1	4	4	5	3	5	10	9	10	10	11	12	12	13	12	12	13
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	179	196	203	107	45	15	23	21	40	26	34	49	37	47	53	54	53	52	22	21
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	485	529	417	496	440	493	512	541	578	586	629	588	625	906	934
Total	12947	13588	13051	13816	13615	14911	14460	14479	14401	14336	14461	14790	14495	14714	14627	14922	14965	14983	15277	15335

Table B1 - Business As Usual Base Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	183	209	193	195	204	226	218	220	226	226	217	226	226	199	225	226	225	225	227	227
Craig 2	191	176	173	191	186	215	215	200	217	209	218	217	207	216	214	215	215	214	215	215
Craig 3	1595	1657	1325	1555	1603	1746	1841	1754	1621	1869	1868	1778	1861	1859	1758	1850	1843	1840	1850	1851
LRS 2	863	1001	861	1001	998	991	848	981	978	854	966	961	844	952	947	947	949	947	947	947
LRS 3	1648	1413	1643	1643	1411	1586	1619	1416	1607	1594	1395	1579	1575	1374	1555	1555	1559	1555	1555	1555
Nucla	736	931	1091	1103	1112	1151	1192	1132	1078	1134	1149	1149	1154	1158	1144	1209	1190	1194	1210	1216
PEGS	698	804	966	1077	1030	1108	1069	1077	963	1050	915	1030	995	1081	982	1066	1048	1052	1059	1070
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	933	999	1024	991	1032	1044	912	1039	1034	907	1022	1023	973	1016	1008	967	1015	1012	1011	1012
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7008	7350	7276	7757	7577	8066	7914	7818	7725	7844	7750	7965	7836	7856	7833	8036	8044	8039	8072	8092

Table B2 - Business As Usual Base Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.87	1.00	0.92	0.93	0.97	1.08	1.04	1.05	1.08	1.08	1.03	1.08	1.08	0.95	1.07	1.08	1.07	1.07	1.08	1.08
Craig 2	0.95	0.88	0.20	0.23	0.22	0.26	0.26	0.24	0.26	0.25	0.26	0.26	0.25	0.26	0.25	0.26	0.25	0.25	0.25	0.25
Craig 3	4.18	4.34	2.81	3.30	3.40	3.70	3.90	3.72	3.43	3.96	3.96	3.77	3.94	3.94	3.73	3.92	3.90	3.90	3.92	3.92
LRS 2	1.40	1.62	1.39	1.62	1.62	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.54	1.53	1.53	1.53
LRS 3	2.06	1.76	2.05	2.05	1.76	1.98	2.02	1.77	2.01	1.99	1.74	1.97	1.97	1.72	1.94	1.94	1.95	1.94	1.94	1.94
Nucla	0.74	0.93	1.09	1.10	1.11	1.15	1.19	1.13	1.08	1.13	1.15	1.15	1.15	1.16	1.14	1.21	1.19	1.19	1.21	1.21
PEGS	2.04	2.35	2.83	3.15	3.02	3.24	3.13	3.15	2.82	3.07	2.68	3.02	2.91	3.17	2.87	3.12	3.07	3.08	3.10	3.13
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.95	1.02	1.05	1.01	1.06	1.07	0.93	1.06	1.06	0.93	1.04	1.05	1.00	1.04	1.03	0.99	1.04	1.03	1.03	1.03
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.03	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.19	0.21	0.22	0.11	0.05	0.02	0.02	0.02	0.04	0.03	0.04	0.05	0.04	0.05	0.06	0.06	0.06	0.06	0.02	0.02
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2x1 C-C	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.06	0.06
Total	13.9	14.6	12.6	13.5	13.2	14.1	13.9	13.8	13.4	13.9	13.5	13.9	13.8	13.9	13.7	14.2	14.1	14.1	14.2	14.2

Table B3 - Business As Usual Base Case NO_x Output (1,000 of tons)

This analysis included the installation of SCR at Craig 2 in 2017 and SNCR at Craig 3 in 2017.

This analysis does not include SCR at LRS 2 and 3 due to the compliance uncertainty.

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	14	13	13	14	15	15	15	15	15	15	15	15	14	15	15	15	15	16	16
Craig 2	15	14	14	15	15	17	17	16	17	17	17	17	16	17	17	17	17	17	17	17
Craig 3	84	88	70	82	85	92	97	93	86	99	99	94	98	98	93	98	97	97	98	98
LRS 2	65	75	65	75	75	74	64	74	74	64	73	72	63	71	71	71	71	71	71	71
LRS 3	141	121	140	140	120	135	138	121	137	136	119	135	134	117	133	133	133	133	133	133
Nucla	38	48	56	57	57	60	62	59	56	59	59	59	60	60	59	62	62	62	63	63
PEGS	14	17	20	22	21	23	22	22	20	22	19	21	20	22	20	22	22	22	22	22
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	42	45	46	45	47	47	41	47	47	41	46	46	44	46	46	44	46	46	46	46
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	9	10	11	6	2	1	1	1	2	1	2	3	2	2	3	3	3	3	1	1
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	428.7	438.6	435.1	456.2	437.1	465.3	458.6	447.3	454.1	455.6	449.9	464.3	455.8	449.8	458.3	467.0	467.5	466.8	466.6	467.4

Table B4 - Business As Usual Base Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.4	1.2	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	1.0	0.9	0.9	1.0	1.0	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Craig 3	23.5	24.4	19.5	22.9	23.6	25.7	27.1	25.8	23.9	27.5	27.5	26.2	27.4	27.4	25.9	27.2	27.1	27.1	27.2	27.2
LRS 2	61.5	71.2	61.3	71.2	71.1	70.5	60.4	69.8	69.7	60.8	68.8	68.4	60.1	67.8	67.4	67.4	67.6	67.4	67.4	67.4
LRS 3	81.8	70.2	81.6	81.6	70.0	78.8	80.4	70.3	79.8	79.2	69.3	78.4	78.2	68.2	77.2	77.2	77.4	77.2	77.2	77.2
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	10.8	12.4	14.9	16.6	15.9	17.1	16.5	16.6	14.9	16.2	14.1	15.9	15.4	16.7	15.2	16.5	16.2	16.2	16.3	16.5
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	105.6	113.1	116.0	112.3	116.9	118.2	103.3	117.6	117.1	102.7	115.7	115.9	110.2	115.1	114.1	109.6	114.9	114.6	114.6	114.6
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	286	294	295	307	300	313	290	303	308	289	298	307	294	298	302	300	306	305	305	306

Table B5 - Business As Usual Base Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	319	366	338	341	357	395	381	384	395	395	379	396	395	348	393	395	393	393	396	396
Craig 2	347	320	314	348	339	392	392	364	395	382	398	396	378	394	391	392	391	390	391	391
Craig 3	1475	1532	1225	1439	1482	1615	1703	1623	1500	1729	1728	1645	1721	1719	1627	1711	1705	1702	1711	1712
LRS 2	862	999	859	999	997	989	847	979	977	852	965	960	842	950	945	945	948	945	945	945
LRS 3	1007	864	1004	1004	862	969	989	865	982	974	852	965	962	840	950	950	953	950	950	950
Nucla	340	430	504	510	514	532	551	523	498	524	531	531	534	536	529	559	550	552	559	562
PEGS	774	892	1071	1194	1142	1228	1186	1195	1068	1164	1014	1143	1103	1199	1089	1182	1162	1166	1174	1186
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1674	1792	1838	1779	1853	1873	1636	1864	1856	1628	1834	1837	1746	1823	1808	1736	1821	1816	1815	1816
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	2	0	10	1	2	13	5	5	9	6	6	10	7	7	5	6
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	0	0	3	2	3	2	3	6	6	6	6	7	7	7	8	7	7	8
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	91	99	103	54	23	8	12	11	20	13	17	25	19	24	27	27	27	26	11	11
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	518	564	445	529	469	526	547	577	617	626	672	628	667	967	996
Total	7104	7505	7259	7675	7576	8524	8276	8258	8229	8151	8257	8456	8296	8466	8400	8590	8594	8624	8934	8983

Table B6 - Business As Usual Base Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	641	726	677	692	727	774	745	755	788	803	765	801	802	716	811	807	810	808	804	806
Craig 2	694	633	494	574	570	689	694	613	675	654	685	682	657	699	696	683	688	686	675	684
Craig 3	2713	2782	1958	2321	2385	2723	2821	2671	2638	3212	3181	3040	3218	3290	3120	3243	3260	3251	3218	3201
LRS 2	1553	1803	1551	1803	1796	1785	1528	1768	1761	1539	1741	1732	1518	1715	1707	1707	1708	1707	1707	1707
LRS 3	1985	1705	1983	1983	1699	1914	1953	1709	1936	1924	1683	1905	1897	1658	1876	1876	1878	1876	1875	1874
Nucla	454	576	681	691	696	687	702	683	644	662	667	665	662	646	651	673	674	675	669	689
PEGS	1112	1247	1654	1844	1771	1890	1867	1837	1522	1501	1300	1405	1333	1308	1235	1292	1273	1320	1262	1310
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2816	2977	3119	3024	3148	3188	2786	3166	3146	2763	3116	3111	2959	3043	3007	2870	3010	3008	2994	2989
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	0	1	17	1	4	21	8	9	15	9	9	16	9	9	10	9
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	0	0	0	1	2	2	4	9	8	9	9	10	10	10	11	11	11	9
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	140	142	161	65	37	53	41	37	101	40	47	73	51	55	80	59	57	58	61	24
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	369
Total	12492	12967	12282	13006	12834	13711	13160	13244	13220	13131	13207	13438	13125	13154	13207	13240	13381	13413	13290	13674

Table B7 - Business As Usual Low Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	178	202	188	192	202	215	207	210	219	223	213	223	223	199	225	224	225	225	223	224
Craig 2	183	167	130	152	151	182	183	162	178	173	181	180	173	185	184	180	182	181	178	180
Craig 3	1501	1539	1083	1284	1320	1507	1561	1478	1459	1777	1760	1682	1780	1820	1726	1794	1804	1799	1780	1771
LRS 2	862	1001	861	1001	997	991	848	981	977	854	966	961	842	952	947	947	948	947	947	947
LRS 3	1645	1413	1643	1643	1408	1586	1619	1416	1604	1594	1395	1579	1572	1374	1555	1555	1557	1555	1554	1553
Nucla	711	901	1066	1082	1090	1076	1099	1069	1007	1036	1044	1042	1036	1012	1019	1054	1056	1057	1048	1079
PEGS	618	693	918	1024	983	1050	1037	1020	845	833	722	780	740	726	686	717	707	733	700	728
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	921	974	1020	989	1030	1043	912	1036	1029	904	1020	1018	968	996	984	939	985	984	980	978
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	6781	7051	6912	7366	7180	7650	7465	7371	7320	7395	7301	7465	7335	7264	7327	7412	7462	7481	7411	7460

Table B8 - Business As Usual Low Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.85	0.96	0.90	0.92	0.96	1.02	0.99	1.00	1.04	1.06	1.01	1.06	1.06	0.95	1.07	1.07	1.07	1.07	1.06	1.07
Craig 2	0.92	0.84	0.15	0.18	0.18	0.22	0.22	0.19	0.21	0.20	0.21	0.21	0.21	0.22	0.22	0.21	0.22	0.21	0.21	0.21
Craig 3	3.93	4.03	2.29	2.72	2.80	3.19	3.31	3.13	3.09	3.76	3.73	3.56	3.77	3.86	3.66	3.80	3.82	3.81	3.77	3.75
LRS 2	1.39	1.62	1.39	1.62	1.61	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.53	1.53	1.53	1.53
LRS 3	2.05	1.76	2.05	2.05	1.76	1.98	2.02	1.77	2.00	1.99	1.74	1.97	1.96	1.72	1.94	1.94	1.94	1.94	1.94	1.94
Nucla	0.71	0.90	1.06	1.08	1.09	1.07	1.10	1.07	1.01	1.03	1.04	1.04	1.03	1.01	1.02	1.05	1.05	1.06	1.05	1.08
PEGS	1.81	2.03	2.69	3.00	2.88	3.07	3.04	2.99	2.47	2.44	2.11	2.28	2.17	2.13	2.01	2.10	2.07	2.15	2.05	2.13
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.94	1.00	1.04	1.01	1.05	1.07	0.93	1.06	1.05	0.92	1.04	1.04	0.99	1.02	1.01	0.96	1.01	1.01	1.00	1.00
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.15	0.15	0.17	0.07	0.04	0.06	0.04	0.04	0.11	0.04	0.05	0.08	0.05	0.06	0.09	0.06	0.06	0.06	0.07	0.03
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2x1 C-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Total	13.3	13.8	11.8	12.7	12.4	13.3	13.0	12.8	12.6	12.9	12.5	12.8	12.6	12.5	12.6	12.8	12.8	12.9	12.7	12.8

Table B9 - Business As Usual Low Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	12	14	13	13	14	15	14	14	15	15	15	15	15	14	15	15	15	15	15	15
Craig 2	15	13	10	12	12	14	15	13	14	14	14	14	14	15	15	14	14	14	14	14
Craig 3	79	81	57	68	70	80	82	78	77	94	93	89	94	96	91	95	95	95	94	94
LRS 2	65	75	65	75	75	74	64	74	73	64	73	72	63	71	71	71	71	71	71	71
LRS 3	140	121	140	140	120	135	138	121	137	136	119	135	134	117	133	133	133	133	133	132
Nucla	37	47	55	56	56	56	57	55	52	54	54	54	54	52	53	54	55	55	54	56
PEGS	13	14	19	21	20	22	21	21	17	17	15	16	15	15	14	15	15	15	14	15
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	42	44	46	45	47	0	41	47	47	41	46	46	44	45	44	42	45	44	44	44
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	7	7	8	3	2	3	2	2	5	2	2	4	3	3	4	3	3	3	3	1
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	417.0	423.5	414.0	434.1	415.8	398.9	435.7	425.1	438.4	438.6	432.0	446.3	437.3	429.6	441.8	444.7	447.1	447.2	444.7	444.3

Table B10 - Business As Usual Low Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.3	1.4	1.4	1.2	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	0.9	0.9	0.7	0.8	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Craig 3	22.1	22.7	15.9	18.9	19.4	22.2	23.0	21.7	21.5	26.2	25.9	24.8	26.2	26.8	25.4	26.4	26.5	26.5	26.2	26.1
LRS 2	61.3	71.2	61.3	71.2	71.0	70.5	60.4	69.8	69.5	60.8	68.8	68.4	59.9	67.8	67.4	67.4	67.5	67.4	67.4	67.4
LRS 3	81.7	70.2	81.6	81.6	69.9	78.8	80.4	70.3	79.6	79.2	69.3	78.4	78.1	68.2	77.2	77.2	77.3	77.2	77.1	77.1
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	9.5	10.7	14.2	15.8	15.2	16.2	16.0	15.7	13.0	12.9	11.1	12.1	11.4	11.2	10.6	11.1	10.9	11.3	10.8	11.2
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	104.4	110.3	115.6	112.0	116.6	118.1	103.2	117.3	116.6	102.4	115.5	115.3	109.6	112.8	111.4	106.4	111.5	111.5	111.0	110.8
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	281.4	287.6	290.5	301.6	294.2	308.2	285.3	297.2	302.6	283.7	292.9	301.3	287.6	289.0	294.5	290.9	296.2	296.3	294.9	295.0

Table B11 - Business As Usual Low Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	311	353	329	336	353	376	362	367	383	390	372	389	390	348	394	392	393	393	391	392
Craig 2	334	305	238	276	274	332	334	295	325	315	330	328	316	336	335	328	331	330	325	329
Craig 3	1389	1424	1002	1188	1220	1394	1444	1367	1350	1644	1628	1556	1647	1683	1597	1659	1668	1664	1647	1638
LRS 2	860	999	859	999	995	989	847	979	975	852	965	960	841	950	945	945	946	945	945	945
LRS 3	1005	864	1004	1004	860	969	989	865	980	974	852	965	961	840	950	950	951	950	950	949
Nucla	329	417	493	500	504	498	508	494	466	479	483	482	479	468	471	487	488	489	484	499
PEGS	685	768	1018	1135	1090	1164	1150	1131	937	924	801	865	821	806	761	795	784	812	777	807
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1654	1748	1831	1775	1848	1872	1636	1859	1847	1622	1830	1827	1738	1787	1766	1685	1767	1766	1758	1755
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	0	0	9	0	2	12	4	5	8	5	5	9	5	5	5	5
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	0	0	0	1	1	1	3	5	5	5	6	6	6	6	7	7	7	6
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	71	72	81	33	19	27	20	19	51	20	24	37	26	28	41	30	29	29	31	12
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	321
Total	6852	7158	6858	7253	7167	7624	7302	7380	7321	7240	7295	7421	7234	7259	7273	7291	7372	7393	7322	7660

Table B12 - Business As Usual Low Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	662	767	720	731	765	843	803	839	840	848	810	841	838	739	834	836	837	834	835	835
Craig 2	728	681	555	633	599	777	771	742	784	760	797	793	755	792	789	793	793	784	789	789
Craig 3	2937	3101	2520	2976	2921	3280	3391	3393	3025	3454	3449	3282	3409	3402	3237	3393	3397	3375	3383	3386
LRS 2	1553	1803	1551	1803	1796	1785	1528	1768	1761	1539	1741	1732	1518	1715	1707	1707	1708	1706	1707	1707
LRS 3	1985	1705	1983	1983	1699	1914	1953	1709	1936	1924	1683	1905	1897	1658	1876	1876	1878	1874	1875	1876
Nucla	471	620	716	729	732	755	773	764	717	769	779	774	772	774	772	812	814	809	813	809
PEGS	1425	1677	1765	1970	1867	2058	1933	2052	1902	2050	1802	2032	1900	2023	1883	2014	2021	2016	2016	2005
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2837	3046	3116	3014	3142	3173	2780	3157	3147	2758	3121	3112	2967	3090	3077	2943	3084	3077	3077	3076
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	6	0	0	7	4	8	19	7	8	13	10	11	14	14	16	20	15	16	17	14
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	3	1	9	8	19	9	15	19	25	11	24	14	22	17	15	15	16	15
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	203	241	231	136	39	35	45	43	50	21	28	32	35	42	45	55	51	44	50	48
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	10	1	6	9	6	7	9	10	13	20	26	36	42	33
2x1 C-C	0	0	0	0	741	713	752	663	682	1011	1143	1183	1202	1357	1399	1515	1406	1250	1319	1325
Total	13185	14018	13165	13987	14317	15353	14782	15151	14878	15179	15399	15718	15342	15634	15674	16006	16050	15841	15943	15921

Table B13 - Business As Usual High Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	184	213	200	203	213	234	223	233	234	236	225	234	233	205	232	232	233	232	232	232
Craig 2	192	180	147	167	158	205	204	196	207	201	211	209	199	209	208	209	209	207	208	208
Craig 3	1625	1716	1394	1646	1616	1815	1876	1877	1674	1911	1908	1816	1886	1882	1791	1878	1879	1867	1872	1873
LRS 2	862	1001	861	1001	997	991	848	981	977	854	966	961	842	952	947	947	948	947	947	947
LRS 3	1645	1413	1643	1643	1408	1586	1619	1416	1604	1594	1395	1579	1572	1374	1555	1555	1557	1553	1554	1554
Nucla	738	970	1121	1142	1146	1182	1210	1195	1122	1204	1219	1211	1208	1212	1209	1270	1274	1266	1272	1266
PEGS	791	931	980	1094	1037	1143	1073	1139	1056	1138	1001	1128	1055	1123	1046	1118	1122	1119	1120	1113
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	928	997	1019	986	1028	1038	910	1033	1030	902	1021	1018	971	1011	1007	963	1009	1007	1007	1007
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7127	7582	7367	7883	7602	8194	7963	8071	7904	8040	7947	8157	7967	7969	7995	8174	8232	8199	8212	8202

Table B14 - Business As Usual High Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.88	1.02	0.95	0.97	1.01	1.12	1.06	1.11	1.11	1.12	1.07	1.11	1.11	0.98	1.10	1.11	1.11	1.10	1.11	1.11
Craig 2	0.96	0.90	0.17	0.20	0.19	0.24	0.24	0.23	0.25	0.24	0.25	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Craig 3	4.26	4.50	2.95	3.49	3.42	3.84	3.97	3.98	3.55	4.05	4.04	3.85	4.00	3.99	3.79	3.98	3.98	3.96	3.97	3.97
LRS 2	1.39	1.62	1.39	1.62	1.61	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.53	1.53	1.53	1.53
LRS 3	2.05	1.76	2.05	2.05	1.76	1.98	2.02	1.77	2.00	1.99	1.74	1.97	1.96	1.72	1.94	1.94	1.94	1.94	1.94	1.94
Nucla	0.74	0.97	1.12	1.14	1.14	1.18	1.21	1.19	1.12	1.20	1.22	1.21	1.21	1.21	1.21	1.27	1.27	1.26	1.27	1.26
PEGS	2.32	2.73	2.87	3.20	3.03	3.35	3.14	3.34	3.09	3.33	2.93	3.30	3.09	3.29	3.06	3.27	3.29	3.28	3.28	3.26
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.95	1.02	1.04	1.01	1.05	1.06	0.93	1.06	1.05	0.92	1.04	1.04	0.99	1.03	1.03	0.98	1.03	1.03	1.03	1.03
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.22	0.26	0.25	0.14	0.04	0.04	0.05	0.05	0.05	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.05	0.05	0.05	0.05
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Simple Cycle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
2x1 C-C	0.00	0.00	0.00	0.00	0.05	0.04	0.05	0.04	0.04	0.06	0.07	0.07	0.07	0.08	0.09	0.09	0.09	0.08	0.08	0.08
Total	14.3	15.3	12.8	13.8	13.3	14.5	14.1	14.4	13.9	14.4	14.0	14.4	14.1	14.2	14.1	14.5	14.6	14.5	14.6	14.5

Table B15 - Business As Usual High Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	15	14	14	15	16	15	16	16	16	15	16	16	14	16	16	16	16	16	16
Craig 2	15	14	12	13	13	16	16	16	16	16	17	17	16	17	17	17	17	16	17	17
Craig 3	86	91	74	87	85	96	99	99	88	101	101	96	100	99	95	99	99	99	99	99
LRS 2	65	75	65	75	75	74	64	74	73	64	73	72	63	71	71	71	71	71	71	71
LRS 3	140	121	140	140	120	135	138	121	137	136	119	135	134	117	133	133	133	133	133	133
Nucla	38	50	58	59	59	61	63	62	58	62	63	63	62	63	63	66	66	65	66	65
PEGS	16	19	20	23	21	24	22	23	22	23	21	23	22	23	22	23	23	23	23	23
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	42	45	46	45	46	47	41	47	47	41	46	46	44	46	45	44	46	46	46	45
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	11	12	12	7	2	2	2	2	3	1	1	2	2	2	2	3	3	2	3	2
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	433.2	449.2	440.4	463.4	437.5	472.4	462.9	460.5	461.5	462.8	458.0	470.4	461.0	454.3	465.1	472.9	475.0	472.9	474.0	473.4

Table B16 - Business As Usual High Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.3	1.3	1.5	1.4	1.4	1.4	1.5	1.4	1.5	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	1.0	0.9	0.8	0.9	0.8	1.0	1.0	1.0	1.1	1.0	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Craig 3	23.9	25.3	20.5	24.2	23.8	26.7	27.6	27.6	24.6	28.1	28.1	26.7	27.8	27.7	26.4	27.6	27.7	27.5	27.5	27.6
LRS 2	61.3	71.2	61.3	71.2	71.0	70.5	60.4	69.8	69.5	60.8	68.8	68.4	59.9	67.8	67.4	67.4	67.5	67.4	67.4	67.4
LRS 3	81.7	70.2	81.6	81.6	69.9	78.8	80.4	70.3	79.6	79.2	69.3	78.4	78.1	68.2	77.2	77.2	77.3	77.1	77.1	77.2
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	12.2	14.4	15.1	16.9	16.0	17.6	16.6	17.6	16.3	17.6	15.5	17.4	16.3	17.3	16.1	17.3	17.3	17.3	17.3	17.2
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	105.3	113.0	115.6	111.8	116.6	117.7	103.1	117.1	116.8	102.3	115.8	115.4	110.1	114.6	114.1	109.2	114.4	114.2	114.2	114.1
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Simple Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	286.9	296.7	296.2	308.0	299.4	314.0	290.6	305.0	309.5	290.5	299.9	309.0	294.7	298.1	303.9	301.3	306.8	306.1	306.2	306.1

Table B17 - Business As Usual High Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	321	373	350	355	372	409	390	408	408	412	394	409	407	359	405	406	407	405	406	406
Craig 2	350	328	267	304	288	374	371	357	377	366	384	382	363	381	380	382	382	377	379	380
Craig 3	1503	1587	1290	1523	1495	1678	1735	1736	1548	1767	1765	1679	1745	1741	1656	1737	1738	1727	1731	1733
LRS 2	860	999	859	999	995	989	847	979	975	852	965	960	841	950	945	945	946	945	945	945
LRS 3	1005	864	1004	1004	860	969	989	865	980	974	852	965	961	840	950	950	951	949	949	950
Nucla	341	448	518	528	530	547	559	553	519	556	564	560	559	560	559	587	589	585	588	585
PEGS	877	1033	1087	1213	1149	1267	1190	1263	1171	1262	1110	1251	1170	1246	1160	1240	1244	1241	1242	1234
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1666	1789	1830	1770	1845	1863	1633	1854	1848	1619	1833	1827	1742	1814	1807	1728	1811	1807	1807	1806
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	3	0	0	4	2	4	11	4	5	7	6	6	8	8	9	11	8	9	10	8
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	2	1	5	5	12	5	9	12	15	7	14	9	14	10	9	9	10	9
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	103	122	117	69	20	18	23	22	25	11	14	16	18	21	23	28	26	22	25	24
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	2	2	3	4	3
2x1 C-C	0	0	0	0	762	733	773	682	702	1040	1175	1216	1237	1396	1439	1558	1446	1285	1356	1362
Total	7243	7752	7326	7772	8326	8859	8536	8731	8571	8883	9078	9280	9066	9328	9349	9588	9562	9369	9455	9448

Table B18 - Business As Usual High Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	657	753	703	715	743	800	765	783	802	807	769	800	799	699	791	791	794	791	791	791
Craig 2	721	666	536	612	552	712	713	654	711	685	719	719	687	722	717	721	724	718	721	721
Craig 3	2880	2992	2325	2765	2811	3102	3258	3091	2865	3314	3310	3153	3296	3301	3129	3286	3303	3278	3286	3288
LRS 2	1556	1803	1551	1803	1691	1678	1436	1662	1658	1447	1637	1629	1429	1612	1604	1604	1609	1604	1604	1604
LRS 3	1988	1705	1983	1983	1600	1799	1836	1606	1823	1809	1582	1791	1786	1559	1764	1764	1769	1764	1764	1764
Nucla	470	594	703	714	723	736	751	725	683	711	719	715	712	706	703	739	740	734	737	738
PEGS	1252	1445	1740	1945	1769	1928	1820	1890	1714	1836	1608	1803	1717	1842	1688	1826	1852	1819	1830	1845
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2882	3085	3167	3067	3050	3081	2691	3066	3053	2677	3015	3021	2872	2998	2974	2856	2995	2987	2986	2986
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	0	1	18	2	5	22	10	10	17	12	11	19	13	12	13	14
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	0	1	4	7	9	6	7	11	10	10	11	13	13	13	14	14	14	15
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	179	196	215	109	27	21	28	26	47	32	40	55	45	55	61	62	64	58	64	60
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	3	5	5	5	5	8	8	11	15	15	18
2x1 C-C	0	0	0	0	579	559	599	480	565	508	571	583	610	665	668	711	697	700	735	754
Total	12969	13614	12928	13725	13555	14429	13930	13996	13936	13866	14000	14298	13992	14194	14137	14404	14589	14498	14564	14603

Table B19 - 100 MW Coal Retirement Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	183	209	195	199	207	222	213	218	223	224	214	222	222	194	220	220	221	220	220	220
Craig 2	190	176	142	162	146	188	188	173	188	181	190	190	182	191	189	190	191	189	190	190
Craig 3	1593	1655	1286	1530	1555	1716	1803	1710	1585	1834	1832	1745	1823	1826	1731	1818	1827	1814	1818	1819
LRS 2	863	1001	861	1001	938	931	797	922	920	803	908	904	793	895	890	890	893	890	890	890
LRS 3	1648	1413	1643	1643	1326	1491	1522	1331	1510	1499	1311	1484	1481	1292	1462	1462	1466	1462	1462	1462
Nucla	736	931	1101	1118	1132	1152	1175	1135	1069	1113	1125	1119	1115	1106	1101	1156	1159	1149	1153	1155
PEGS	695	802	966	1080	982	1070	1010	1049	952	1020	893	1001	953	1023	937	1014	1028	1010	1016	1024
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	943	1009	1036	1003	998	1008	881	1003	999	876	986	988	940	981	973	934	980	977	977	977
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7013	7357	7232	7736	7285	7780	7589	7542	7446	7549	7460	7653	7509	7508	7504	7686	7765	7712	7727	7738

Table B20 - 100 MW Coal Retirement Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.87	1.00	0.93	0.95	0.98	1.06	1.01	1.04	1.06	1.07	1.02	1.06	1.06	0.93	1.05	1.05	1.05	1.05	1.05	1.05
Craig 2	0.95	0.88	0.17	0.19	0.17	0.22	0.22	0.20	0.22	0.21	0.23	0.23	0.22	0.23	0.22	0.23	0.23	0.22	0.23	0.23
Craig 3	4.18	4.34	2.73	3.24	3.29	3.64	3.82	3.62	3.36	3.88	3.88	3.70	3.86	3.87	3.67	3.85	3.87	3.84	3.85	3.85
LRS 2	1.40	1.62	1.39	1.62	1.52	1.51	1.29	1.49	1.49	1.30	1.47	1.46	1.28	1.45	1.44	1.44	1.44	1.44	1.44	1.44
LRS 3	2.06	1.76	2.05	2.05	1.66	1.86	1.90	1.66	1.89	1.87	1.64	1.85	1.85	1.61	1.82	1.82	1.83	1.82	1.82	1.82
Nucla	0.73	0.93	1.10	1.12	1.13	1.15	1.17	1.13	1.07	1.11	1.12	1.12	1.11	1.10	1.10	1.15	1.16	1.15	1.15	1.15
PEGS	2.03	2.35	2.83	3.16	2.88	3.13	2.96	3.07	2.79	2.98	2.61	2.93	2.79	3.00	2.74	2.97	3.01	2.96	2.97	3.00
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.96	1.03	1.06	1.03	1.02	1.03	0.90	1.03	1.02	0.90	1.01	1.01	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.02
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.19	0.21	0.23	0.12	0.03	0.02	0.03	0.03	0.05	0.03	0.04	0.06	0.05	0.06	0.06	0.07	0.07	0.06	0.07	0.06
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Simple Cycle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2x1 C-C	0.00	0.00	0.00	0.00	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05
Total	13.9	14.6	12.5	13.5	12.7	13.7	13.4	13.3	13.0	13.4	13.1	13.5	13.3	13.3	13.2	13.6	13.7	13.6	13.7	13.7

Table B21 - 100 MW Coal Retirement Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	14	13	14	14	15	15	15	15	15	15	15	15	13	15	15	15	15	15	15
Craig 2	15	14	11	13	12	15	15	14	15	14	15	15	14	15	15	15	15	15	15	15
Craig 3	84	87	68	81	82	91	95	90	84	97	97	92	96	97	91	96	97	96	96	96
LRS 2	65	75	65	75	71	70	60	69	69	60	68	68	60	67	67	67	67	67	67	67
LRS 3	141	121	140	140	113	127	130	114	129	128	112	127	126	110	125	125	125	125	125	125
Nucla	38	48	57	58	59	60	61	59	55	58	58	58	58	57	57	60	60	59	60	60
PEGS	14	17	20	22	20	22	21	22	20	21	18	21	20	21	19	21	21	21	21	21
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	43	46	47	45	45	46	40	45	45	40	45	45	42	44	44	42	44	44	44	44
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	9	10	11	6	1	1	1	1	2	2	2	3	2	3	3	3	3	3	3	3
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	429.0	439.0	432.4	454.3	417.3	447.0	439.1	429.5	435.3	436.7	431.2	444.3	435.8	429.4	438.1	446.0	449.4	446.6	447.6	447.8

Table B22 - 100 MW Coal Retirement Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.3	1.4	1.3	1.4	1.4	1.4	1.3	1.4	1.4	1.2	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	1.0	0.9	0.7	0.8	0.7	1.0	1.0	0.9	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Craig 3	23.4	24.4	18.9	22.5	22.9	25.3	26.5	25.2	23.3	27.0	27.0	25.7	26.8	26.9	25.5	26.8	26.9	26.7	26.8	26.8
LRS 2	61.5	71.2	61.3	71.2	66.8	66.3	56.7	65.6	65.5	57.1	64.7	64.3	56.5	63.7	63.4	63.4	63.5	63.4	63.4	63.4
LRS 3	81.8	70.2	81.6	81.6	65.8	74.0	75.5	66.1	75.0	74.4	65.1	73.7	73.5	64.1	72.6	72.6	72.8	72.6	72.6	72.6
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	10.7	12.4	14.9	16.7	15.2	16.5	15.6	16.2	14.7	15.7	13.8	15.5	14.7	15.8	14.5	15.7	15.9	15.6	15.7	15.8
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	106.8	114.3	117.4	113.6	113.0	114.2	99.7	113.6	113.1	99.2	111.7	112.0	106.4	111.1	110.2	105.8	111.0	110.7	110.7	110.7
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Simple Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	286.8	295.1	296.1	307.8	285.9	298.7	276.5	289.0	294.1	275.9	284.6	293.5	280.4	283.9	288.5	286.6	292.5	291.3	291.5	291.6

Table B23 - 100 MW Coal Retirement Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	319	366	342	348	361	389	372	380	390	392	373	389	388	340	384	385	386	384	384	384
Craig 2	347	320	258	294	266	342	343	315	342	330	346	346	331	347	345	347	349	345	347	347
Craig 3	1474	1531	1190	1415	1439	1587	1667	1582	1466	1696	1694	1614	1687	1689	1602	1682	1690	1678	1682	1683
LRS 2	862	999	859	999	937	930	796	921	918	801	907	902	792	893	889	889	891	889	889	889
LRS 3	1007	864	1004	1004	810	911	930	814	923	916	801	907	905	789	893	893	896	893	893	893
Nucla	340	430	509	517	523	533	543	525	494	515	520	517	516	511	509	535	536	531	533	534
PEGS	771	889	1071	1198	1089	1187	1120	1164	1055	1130	990	1110	1057	1134	1039	1124	1140	1120	1126	1136
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1692	1812	1860	1801	1791	1809	1580	1800	1793	1572	1770	1774	1687	1761	1746	1677	1759	1754	1753	1753
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	0	1	10	1	3	12	6	6	10	7	6	10	7	7	7	8
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	0	0	2	4	6	4	4	7	6	6	7	8	8	8	8	8	9	9
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	91	99	109	55	14	11	14	13	24	16	20	28	23	28	31	31	32	29	32	30
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2
2x1 C-C	0	0	0	0	595	575	616	494	581	522	587	600	628	684	687	731	717	720	756	775
Total	7117	7520	7204	7637	7830	8281	8001	8014	7996	7913	8025	8201	8031	8194	8143	8315	8414	8362	8416	8446

Table B24 - 100 MW Coal Retirement Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	657	753	703	715	688	715	680	709	712	708	674	701	699	611	691	691	693	691	691	691
Craig 2	721	666	536	612	516	629	625	593	631	599	629	628	598	627	626	626	628	622	625	626
Craig 3	2880	2992	2325	2765	2621	2746	2850	2807	2525	2877	2878	2739	2854	2859	2719	2848	2861	2836	2849	2851
LRS 2	1556	1803	1551	1803	1476	1464	1253	1450	1446	1262	1428	1421	1247	1407	1400	1400	1403	1400	1400	1400
LRS 3	1988	1705	1983	1983	1396	1570	1602	1402	1590	1578	1381	1562	1559	1360	1539	1539	1543	1539	1539	1539
Nucla	470	594	703	714	677	676	676	672	625	650	652	649	647	636	634	663	662	658	657	657
PEGS	1252	1445	1740	1945	1570	1705	1596	1684	1542	1656	1450	1640	1552	1655	1540	1645	1654	1639	1644	1649
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2882	3085	3167	3067	2762	2782	2431	2766	2755	2417	2720	2727	2594	2707	2687	2579	2705	2697	2697	2696
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	4	7	23	5	8	26	11	11	19	14	14	20	15	14	15	16
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	5	5	4
Pyramid 4	0	0	0	1	5	8	14	9	10	13	13	12	14	15	16	15	15	15	16	16
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	179	196	215	109	38	30	39	36	56	38	48	62	51	61	68	67	67	62	68	63
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	3	9	10	16	19	33	38	48	44	52	62
2x1 C-C	0	0	0	0	663	691	716	597	646	596	661	684	708	767	804	820	820	775	813	830
Total	12969	13614	12928	13725	12419	13027	12510	12734	12551	12427	12557	12851	12561	12743	12776	12955	13119	12997	13070	13099

Table B25 - 300 MW Coal Retirement Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	183	209	195	199	191	199	189	197	198	197	187	195	194	170	192	192	193	192	192	192
Craig 2	190	176	142	162	136	166	165	157	167	158	166	166	158	166	165	165	166	164	165	165
Craig 3	1593	1655	1286	1530	1450	1519	1577	1553	1397	1592	1592	1515	1579	1582	1505	1576	1583	1569	1577	1577
LRS 2	863	1001	861	1001	819	812	695	804	802	700	792	788	692	780	777	777	779	777	777	777
LRS 3	1648	1413	1643	1643	1157	1301	1327	1161	1318	1308	1144	1295	1292	1127	1275	1275	1279	1275	1275	1275
Nucla	736	931	1101	1118	1060	1058	1059	1052	978	1017	1021	1016	1012	996	993	1038	1037	1031	1028	1028
PEGS	695	802	966	1080	872	947	886	935	856	920	805	911	862	919	855	913	919	910	913	915
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	943	1009	1036	1003	904	910	795	905	901	791	890	892	849	886	879	844	885	882	882	882
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7013	7357	7232	7736	6589	6913	6695	6766	6618	6683	6599	6779	6638	6626	6642	6781	6839	6801	6809	6813

Table B26 - 300 MW Coal Retirement Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.87	1.00	0.93	0.95	0.91	0.95	0.90	0.94	0.94	0.94	0.89	0.93	0.93	0.81	0.91	0.91	0.92	0.91	0.91	0.91
Craig 2	0.23	0.21	0.17	0.19	0.16	0.20	0.20	0.19	0.20	0.19	0.20	0.20	0.19	0.20	0.20	0.20	0.20	0.19	0.20	0.20
Craig 3	3.38	3.51	2.73	3.24	3.07	3.22	3.34	3.29	2.96	3.37	3.37	3.21	3.35	3.35	3.19	3.34	3.35	3.32	3.34	3.34
LRS 2	1.40	1.62	1.39	1.62	1.32	1.31	1.12	1.30	1.30	1.13	1.28	1.28	1.12	1.26	1.26	1.26	1.26	1.26	1.26	1.26
LRS 3	2.06	1.76	2.05	2.05	1.44	1.62	1.66	1.45	1.65	1.63	1.43	1.62	1.61	1.41	1.59	1.59	1.60	1.59	1.59	1.59
Nucla	0.73	0.93	1.10	1.12	1.06	1.06	1.06	1.05	0.98	1.02	1.02	1.02	1.01	0.99	0.99	1.04	1.04	1.03	1.03	1.03
PEGS	2.03	2.35	2.83	3.16	2.55	2.77	2.60	2.74	2.51	2.69	2.36	2.67	2.52	2.69	2.50	2.67	2.69	2.66	2.67	2.68
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.96	1.03	1.06	1.03	0.92	0.93	0.81	0.93	0.92	0.81	0.91	0.91	0.87	0.91	0.90	0.86	0.90	0.90	0.90	0.90
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.01	0.03	0.01	0.01	0.03	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.19	0.21	0.23	0.12	0.04	0.03	0.04	0.04	0.06	0.04	0.05	0.07	0.05	0.06	0.07	0.07	0.07	0.07	0.07	0.07
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Simple Cycle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.02	0.02
2x1 C-C	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	12.3	13.1	12.5	13.5	11.5	12.2	11.8	12.0	11.6	11.9	11.6	12.0	11.7	11.8	11.7	12.0	12.1	12.0	12.1	12.1

Table B27 - 300 MW Coal Retirement Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	14	13	14	13	14	13	13	14	13	13	13	13	12	13	13	13	13	13	13
Craig 2	15	14	11	13	11	13	13	12	13	13	13	13	13	13	13	13	13	13	13	13
Craig 3	84	87	68	81	77	80	83	82	74	84	84	80	83	84	80	83	84	83	83	83
LRS 2	65	75	65	75	62	61	52	60	60	53	60	59	52	59	58	58	59	58	58	58
LRS 3	141	121	140	140	99	111	113	99	112	112	98	110	110	96	109	109	109	109	109	109
Nucla	38	48	57	58	55	55	55	54	51	53	53	53	52	51	51	54	54	53	53	53
PEGS	14	17	20	22	18	19	18	19	18	19	17	19	18	19	18	19	19	19	19	19
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	43	46	47	45	41	41	36	41	41	36	40	40	38	40	40	38	40	40	40	40
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	9	10	11	6	2	2	2	2	3	2	2	3	3	3	4	3	3	3	4	3
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	429.0	439.0	432.4	454.3	377.0	397.0	388.1	384.9	386.4	385.9	380.9	392.6	384.6	378.6	387.1	392.9	395.5	393.3	394.1	393.9

Table B28 - 300 MW Coal Retirement Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2
Craig 2	1.0	0.9	0.7	0.8	0.7	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Craig 3	23.4	24.4	18.9	22.5	21.3	22.4	23.2	22.9	20.6	23.4	23.4	22.3	23.2	23.3	22.1	23.2	23.3	23.1	23.2	23.2
LRS 2	61.5	71.2	61.3	71.2	58.3	57.8	49.5	57.3	57.1	49.9	56.4	56.1	49.3	55.6	55.3	55.3	55.4	55.3	55.3	55.3
LRS 3	81.8	70.2	81.6	81.6	57.4	64.6	65.9	57.7	65.4	64.9	56.8	64.3	64.1	56.0	63.3	63.3	63.5	63.3	63.3	63.3
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	10.7	12.4	14.9	16.7	13.5	14.6	13.7	14.4	13.2	14.2	12.4	14.1	13.3	14.2	13.2	14.1	14.2	14.0	14.1	14.1
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	106.8	114.3	117.4	113.6	102.3	103.1	90.1	102.5	102.1	89.6	100.8	101.1	96.1	100.3	99.6	95.6	100.2	99.9	99.9	99.9
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Simple Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	286.8	295.1	296.1	307.8	254.8	264.7	244.5	256.9	260.6	244.1	252.0	260.0	248.2	251.3	255.7	253.6	258.8	257.8	258.0	258.0

Table B29 - 300 MW Coal Retirement Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	319	366	342	348	334	347	330	344	346	344	327	341	340	297	336	336	337	336	336	336
Craig 2	347	320	258	294	249	303	301	286	303	288	303	302	288	302	301	301	302	299	301	301
Craig 3	1474	1531	1190	1415	1341	1405	1458	1437	1292	1472	1473	1402	1461	1463	1392	1457	1464	1451	1458	1459
LRS 2	862	999	859	999	818	811	694	803	801	699	791	787	691	779	775	775	778	775	775	775
LRS 3	1007	864	1004	1004	707	795	811	710	805	799	699	791	789	689	779	779	781	779	779	779
Nucla	340	430	509	517	490	489	490	487	452	470	472	470	468	461	459	480	479	477	475	476
PEGS	771	889	1071	1198	966	1050	983	1037	950	1020	893	1010	955	1019	948	1013	1019	1009	1012	1015
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1692	1812	1860	1801	1622	1634	1428	1625	1618	1419	1597	1601	1523	1590	1578	1514	1588	1584	1584	1583
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	2	4	13	3	4	14	6	6	11	8	8	11	8	8	9	9
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2
Pyramid 4	0	0	0	0	3	5	9	5	6	8	8	7	9	9	10	9	9	9	10	10
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	91	99	109	55	19	15	20	18	28	19	24	31	26	31	34	34	34	31	34	32
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	1	1	1	2	3	3	4	4	5	5
2x1 C-C	0	0	0	0	682	711	737	614	665	613	680	703	728	789	827	844	843	797	836	854
Total	7117	7520	7204	7637	7235	7571	7275	7370	7274	7169	7276	7455	7291	7440	7453	7560	7649	7562	7616	7636

Table B30 - 300 MW Coal Retirement Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	657	752	700	711	745	792	760	775	803	808	771	804	810	717	813	810	814	804	809	811
Craig 2	722	664	536	611	590	706	702	659	714	681	710	706	681	726	723	716	721	707	716	723
Craig 3	2883	2980	2279	2685	2756	2942	3119	2894	2772	3252	3242	3067	3222	3252	3084	3217	3238	3181	3209	3231
LRS 2	1556	1803	1551	1803	1799	1785	1528	1768	1764	1539	1741	1732	1521	1715	1707	1707	1711	1706	1707	1707
LRS 3	1988	1705	1983	1983	1702	1914	1953	1709	1939	1924	1683	1905	1900	1658	1876	1876	1881	1875	1876	1876
Nucla	470	593	701	710	716	698	715	693	651	667	671	669	697	691	692	719	720	720	720	724
PEGS	1257	1430	1737	1935	1853	1983	1919	1936	1636	1729	1477	1643	1601	1712	1604	1704	1711	1725	1743	1764
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2851	3050	3130	3030	3155	3190	2787	3173	3159	2770	3122	3123	2973	3100	3075	2950	3097	3088	3089	3090
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	3	6	20	5	7	24	10	10	15	9	9	16	10	10	11	11
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	0	0	4	7	11	6	7	12	10	10	8	9	9	9	10	10	10	11
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	179	190	206	97	43	61	47	45	113	46	55	82	26	27	41	32	34	36	40	35
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	411	446	462	469	474	472	492	516
Total	12947	13542	12827	13577	13370	14088	13565	13666	13570	13456	13496	13757	13870	14067	14098	14231	14424	14339	14427	14502

Table B31 - Energy Efficiency Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	183	209	195	198	207	220	211	215	223	225	214	223	225	199	226	225	226	224	225	226
Craig 2	191	175	141	161	156	186	185	174	189	180	188	186	180	192	191	189	190	187	189	191
Craig 3	1595	1649	1261	1486	1525	1628	1725	1601	1534	1799	1794	1697	1783	1799	1706	1780	1792	1760	1776	1787
LRS 2	863	1001	861	1001	998	991	848	981	978	854	966	961	844	952	947	947	949	947	947	947
LRS 3	1648	1413	1643	1643	1411	1586	1619	1416	1607	1594	1395	1579	1575	1374	1555	1555	1559	1554	1555	1555
Nucla	736	928	1097	1111	1121	1093	1119	1084	1020	1043	1051	1048	1092	1082	1084	1125	1127	1126	1127	1133
PEGS	698	794	964	1075	1029	1101	1066	1075	909	960	820	913	889	951	890	946	950	958	968	979
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	933	998	1024	991	1032	1044	912	1038	1034	906	1021	1022	973	1014	1006	965	1013	1010	1011	1011
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7008	7328	7187	7666	7479	7850	7685	7585	7494	7562	7449	7630	7560	7563	7605	7733	7807	7766	7797	7830

Table B32 - Energy Efficiency Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.87	1.00	0.93	0.94	0.99	1.05	1.01	1.03	1.06	1.07	1.02	1.06	1.07	0.95	1.08	1.07	1.08	1.06	1.07	1.07
Craig 2	0.23	0.21	0.17	0.19	0.18	0.22	0.22	0.21	0.22	0.21	0.22	0.22	0.21	0.23	0.23	0.22	0.23	0.22	0.22	0.23
Craig 3	3.38	3.49	2.67	3.15	3.23	3.45	3.66	3.39	3.25	3.81	3.80	3.59	3.78	3.81	3.61	3.77	3.80	3.73	3.76	3.79
LRS 2	1.40	1.62	1.39	1.62	1.62	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.54	1.53	1.53	1.53
LRS 3	2.06	1.76	2.05	2.05	1.76	1.98	2.02	1.77	2.01	1.99	1.74	1.97	1.97	1.72	1.94	1.94	1.95	1.94	1.94	1.94
Nucla	0.74	0.93	1.10	1.11	1.12	1.09	1.12	1.08	1.02	1.04	1.05	1.05	1.09	1.08	1.08	1.12	1.13	1.12	1.13	1.13
PEGS	2.04	2.32	2.82	3.15	3.01	3.22	3.12	3.15	2.66	2.81	2.40	2.67	2.60	2.78	2.61	2.77	2.78	2.80	2.83	2.87
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.95	1.02	1.05	1.01	1.06	1.07	0.93	1.06	1.06	0.93	1.04	1.04	0.99	1.04	1.03	0.99	1.04	1.03	1.03	1.03
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.01	0.03	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.19	0.20	0.22	0.10	0.05	0.06	0.05	0.05	0.12	0.05	0.06	0.09	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.04
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2x1 C-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	12.3	13.0	12.4	13.3	13.0	13.8	13.5	13.3	13.0	13.3	12.9	13.3	13.2	13.2	13.2	13.5	13.6	13.5	13.6	13.7

Table B33 - Energy Efficiency Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	14	13	14	14	15	14	15	15	15	15	15	15	14	15	15	15	15	15	15
Craig 2	15	14	11	13	12	15	15	14	15	14	15	15	14	15	15	15	15	15	15	15
Craig 3	84	87	67	79	81	86	91	85	81	95	95	90	94	95	90	94	95	93	94	94
LRS 2	65	75	65	75	75	74	64	74	74	64	73	72	63	71	71	71	71	71	71	71
LRS 3	141	121	140	140	120	135	138	121	137	136	119	135	134	117	133	133	133	133	133	133
Nucla	38	48	57	57	58	57	58	56	53	54	54	54	56	56	56	58	58	58	58	59
PEGS	14	16	20	22	21	23	22	22	19	20	17	19	18	20	18	19	20	20	20	20
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	42	45	46	45	47	47	41	47	47	41	46	46	44	46	45	44	46	46	46	46
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	9	10	11	5	2	3	2	2	6	2	3	4	1	1	2	2	2	2	2	2
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	428.7	437.4	429.8	450.2	431.1	456.1	447.6	435.9	446.9	444.2	437.5	451.5	443.3	436.7	447.7	452.9	456.3	453.7	455.4	456.6

Table B34 - Energy Efficiency Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.3	1.4	1.3	1.3	1.4	1.4	1.3	1.4	1.4	1.2	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	1.0	0.9	0.7	0.8	0.8	1.0	0.9	0.9	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Craig 3	23.5	24.3	18.6	21.9	22.4	24.0	25.4	23.6	22.6	26.5	26.4	25.0	26.2	26.5	25.1	26.2	26.4	25.9	26.1	26.3
LRS 2	61.5	71.2	61.3	71.2	71.1	70.5	60.4	69.8	69.7	60.8	68.8	68.4	60.1	67.8	67.4	67.4	67.6	67.4	67.4	67.4
LRS 3	81.8	70.2	81.6	81.6	70.0	78.8	80.4	70.3	79.8	79.2	69.3	78.4	78.2	68.2	77.2	77.2	77.4	77.1	77.2	77.2
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	10.8	12.3	14.9	16.6	15.9	17.0	16.5	16.6	14.0	14.8	12.7	14.1	13.7	14.7	13.8	14.6	14.7	14.8	14.9	15.1
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	105.7	113.0	116.0	112.3	116.9	118.2	103.3	117.6	117.1	102.7	115.7	115.7	110.2	114.9	113.9	109.3	114.8	114.4	114.5	114.5
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	285.7	293.6	294.3	305.7	298.5	310.9	288.2	300.2	305.5	286.3	295.2	304.0	290.8	294.3	299.9	297.2	303.3	302.1	302.6	303.0

Table B35 - Energy Efficiency Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	319	365	340	345	362	385	369	376	390	393	375	391	394	348	395	394	395	391	393	394
Craig 2	347	319	258	294	284	340	338	317	344	327	342	340	328	349	348	344	347	340	345	348
Craig 3	1475	1525	1166	1374	1410	1506	1596	1481	1419	1664	1659	1570	1649	1664	1578	1647	1657	1628	1642	1653
LRS 2	862	999	859	999	997	989	847	979	977	852	965	960	842	950	945	945	948	945	945	945
LRS 3	1007	864	1004	1004	862	969	989	865	982	974	852	965	962	840	950	950	953	950	950	950
Nucla	340	429	507	514	518	506	517	501	471	482	486	485	505	500	501	520	521	521	521	524
PEGS	774	880	1069	1192	1141	1221	1182	1192	1007	1064	909	1012	986	1054	987	1049	1053	1062	1073	1086
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1674	1791	1838	1779	1852	1873	1636	1863	1855	1627	1833	1834	1746	1820	1805	1733	1818	1813	1814	1814
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	2	3	11	3	4	14	5	6	9	5	5	9	6	6	6	6
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	0	0	2	4	7	4	5	7	6	6	5	5	5	6	6	6	6	7
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	91	96	104	49	22	31	24	23	57	23	28	41	13	14	21	16	17	18	20	17
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	421	457	474	481	486	484	505	529
Total	7104	7479	7149	7557	7455	7828	7518	7607	7513	7431	7462	7611	7861	8010	8018	8097	8209	8167	8223	8277

Table B36 - Energy Efficiency Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	657	753	678	694	731	780	749	783	806	818	780	816	831	734	829	832	834	833	834	833
Craig 2	722	666	488	575	572	696	698	681	736	700	730	729	732	776	769	775	778	779	781	778
Craig 3	2883	2994	2009	2408	2459	2797	2918	2861	2767	3328	3317	3178	3374	3380	3203	3372	3384	3380	3384	3381
LRS 2	1556	1803	1551	1803	1799	1785	1528	1768	1764	1539	1741	1732	1521	1715	1703	1703	1709	1705	1705	1683
LRS 3	1988	1705	1975	1980	1701	1913	1952	1708	1938	1924	1683	1904	1899	1657	1828	1831	1843	1848	1852	1784
Nucla	470	595	685	696	702	691	706	690	651	675	678	680	733	739	729	766	770	777	783	781
PEGS	1257	1448	1700	1898	1803	1928	1892	1882	1660	1783	1546	1772	1738	1907	1734	1837	1865	1907	1933	1938
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2851	3052	3126	3028	3153	3189	2786	3172	3159	2771	3122	3125	2974	3104	3067	2947	3095	3081	3082	3084
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	3	6	22	6	8	25	11	11	17	11	10	18	11	11	12	12
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	0	1	4	7	11	8	8	12	11	11	9	11	11	11	11	11	12	14
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	179	196	171	78	42	58	46	49	117	50	59	88	40	52	52	56	57	62	65	63
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	3	9	9	14	15	6	6	8	11	12	14	16	15
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	518	563	566	596	597	620	651	646
Total	12947	13588	12386	13173	12972	13854	13312	13614	13627	13638	13695	14067	14395	14660	14512	14757	14971	15034	15116	15018

Table B37 - Production Tax Credit Extension Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	183	209	188	193	203	217	208	218	224	227	217	227	231	204	230	231	232	231	232	231
Craig 2	191	176	129	152	151	184	184	180	194	185	193	193	193	205	203	205	205	206	206	206
Craig 3	1595	1657	1111	1332	1360	1547	1614	1583	1531	1842	1835	1758	1867	1870	1772	1866	1872	1870	1873	1871
LRS 2	863	1001	861	1001	998	991	848	981	978	854	966	961	844	952	945	945	948	946	946	934
LRS 3	1648	1413	1637	1641	1410	1585	1618	1415	1606	1594	1395	1578	1573	1373	1515	1517	1527	1532	1535	1478
Nucla	736	931	1072	1090	1098	1082	1105	1080	1019	1057	1061	1064	1147	1156	1141	1199	1206	1216	1226	1223
PEGS	698	804	944	1054	1001	1071	1050	1045	922	990	858	984	965	1059	963	1020	1036	1059	1073	1076
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	933	999	1023	991	1032	1043	912	1038	1034	907	1022	1023	973	1016	1004	964	1013	1008	1008	1009
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7008	7350	6965	7454	7254	7719	7540	7540	7509	7656	7546	7788	7794	7835	7772	7948	8040	8069	8100	8029

Table B38 - Production Tax Credit Extension Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.87	1.00	0.90	0.92	0.97	1.03	0.99	1.04	1.07	1.08	1.03	1.08	1.10	0.97	1.10	1.10	1.10	1.10	1.10	1.10
Craig 2	0.95	0.88	0.15	0.18	0.18	0.22	0.22	0.21	0.23	0.22	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Craig 3	4.18	4.34	2.35	2.82	2.88	3.28	3.42	3.35	3.24	3.90	3.89	3.72	3.96	3.96	3.75	3.95	3.97	3.96	3.97	3.96
LRS 2	1.40	1.62	1.39	1.62	1.62	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.53	1.53	1.53	1.51
LRS 3	2.06	1.76	2.04	2.05	1.76	1.98	2.02	1.77	2.01	1.99	1.74	1.97	1.96	1.71	1.89	1.89	1.91	1.91	1.92	1.85
Nucla	0.74	0.93	1.07	1.09	1.10	1.08	1.10	1.08	1.02	1.06	1.06	1.06	1.15	1.15	1.14	1.20	1.20	1.21	1.22	1.22
PEGS	2.04	2.35	2.76	3.09	2.93	3.13	3.07	3.06	2.70	2.90	2.51	2.88	2.82	3.10	2.82	2.99	3.03	3.10	3.14	3.15
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.95	1.02	1.05	1.01	1.05	1.07	0.93	1.06	1.06	0.93	1.04	1.05	0.99	1.04	1.03	0.99	1.04	1.03	1.03	1.03
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.01	0.03	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.19	0.21	0.18	0.08	0.04	0.06	0.05	0.05	0.12	0.05	0.06	0.09	0.04	0.06	0.06	0.06	0.06	0.07	0.07	0.07
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Simple Cycle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2x1 C-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04
Total	13.9	14.6	11.9	12.9	12.5	13.5	13.2	13.2	13.0	13.6	13.2	13.7	13.7	13.8	13.6	14.0	14.2	14.2	14.3	14.2

Table B39 - Production Tax Credit Extension Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	14	13	13	14	15	14	15	15	16	15	16	16	14	16	16	16	16	16	16
Craig 2	15	14	10	12	12	15	15	14	15	15	15	15	15	16	16	16	16	16	16	16
Craig 3	84	88	59	70	72	82	85	84	81	97	97	93	99	99	94	99	99	99	99	99
LRS 2	65	75	65	75	75	74	64	74	74	64	73	72	63	71	71	71	71	71	71	70
LRS 3	141	121	140	140	120	135	138	121	137	136	119	135	134	117	129	129	130	131	131	126
Nucla	38	48	55	56	57	56	57	56	53	55	55	55	59	60	59	62	62	63	63	63
PEGS	14	17	19	22	21	22	22	21	19	20	18	20	20	22	20	21	21	22	22	22
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	42	45	46	45	47	47	41	47	47	41	46	46	44	46	45	44	46	46	46	46
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	9	10	9	4	2	3	2	3	6	3	3	5	2	3	3	3	3	3	3	3
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	428.7	438.6	416.3	438.4	419.8	449.9	440.4	435.0	447.8	448.6	441.9	458.1	454.4	449.4	454.0	462.4	466.5	467.7	469.3	463.3

Table B40 - Production Tax Credit Extension Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.3	1.4	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	1.0	0.9	0.7	0.8	0.8	0.9	0.9	0.9	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
Craig 3	23.5	24.4	16.4	19.6	20.0	22.8	23.8	23.3	22.5	27.1	27.0	25.9	27.5	27.5	26.1	27.5	27.6	27.5	27.6	27.5
LRS 2	61.5	71.2	61.3	71.2	71.1	70.5	60.4	69.8	69.7	60.8	68.8	68.4	60.1	67.8	67.3	67.3	67.5	67.4	67.4	66.5
LRS 3	81.8	70.2	81.3	81.5	70.0	78.7	80.3	70.3	79.8	79.1	69.2	78.4	78.1	68.2	75.2	75.3	75.8	76.1	76.2	73.4
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	10.8	12.4	14.6	16.3	15.5	16.5	16.2	16.1	14.2	15.3	13.3	15.2	14.9	16.4	14.9	15.7	16.0	16.4	16.6	16.6
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	105.7	113.1	115.8	112.2	116.8	118.2	103.2	117.6	117.1	102.7	115.7	115.8	110.2	115.0	113.7	109.2	114.7	114.2	114.2	114.3
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Simple Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	285.7	293.9	291.2	302.9	295.5	309.1	286.2	299.5	305.7	287.4	296.4	306.1	293.3	297.2	299.7	297.6	304.2	304.0	304.5	300.9

Table B41 - Production Tax Credit Extension Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	319	366	329	337	355	379	364	380	392	397	379	397	404	357	403	404	405	405	405	405
Craig 2	347	320	235	277	275	335	336	328	354	337	351	351	352	373	370	373	374	375	376	375
Craig 3	1475	1532	1028	1232	1258	1431	1493	1464	1416	1703	1697	1626	1727	1730	1639	1726	1732	1730	1732	1730
LRS 2	862	999	859	999	997	989	847	979	977	852	965	960	842	950	943	944	947	945	945	932
LRS 3	1007	864	1000	1003	862	969	989	865	982	974	852	964	962	839	926	927	933	936	938	903
Nucla	340	430	496	504	508	500	511	500	471	488	490	492	530	535	527	554	558	562	567	566
PEGS	774	892	1046	1169	1110	1187	1165	1158	1022	1098	952	1091	1070	1174	1067	1131	1148	1174	1190	1193
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1674	1792	1835	1778	1851	1873	1636	1863	1855	1627	1833	1835	1746	1823	1801	1730	1817	1809	1810	1811
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	2	4	12	3	4	14	6	6	9	6	6	10	6	6	7	7
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	0	0	2	4	7	5	5	7	7	7	6	7	7	6	7	7	7	8
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	91	99	86	39	21	29	23	25	59	25	30	45	20	26	26	28	29	31	33	32
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	531	578	580	611	612	636	668	662
Total	7104	7505	6918	7345	7243	7702	7385	7572	7540	7527	7566	7777	8202	8400	8298	8448	8572	8619	8681	8629

Table B42 - Production Tax Credit Extension Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	674	764	757	776	820	869	829	856	857	860	820	851	846	742	840	841	842	832	835	837
Craig 2	745	677	610	712	669	827	826	767	812	789	823	814	771	810	805	810	814	776	786	793
Craig 3	3013	3076	2718	3269	3297	3389	3528	3470	3066	3486	3475	3295	3423	3416	3248	3406	3412	3351	3371	3382
LRS 2	1553	1803	1551	1803	1796	1785	1528	1768	1761	1539	1741	1732	1518	1715	1707	1707	1708	1703	1703	1704
LRS 3	1985	1705	1983	1983	1699	1914	1953	1709	1936	1924	1683	1905	1897	1658	1876	1876	1878	1864	1867	1867
Nucla	480	621	735	758	761	799	811	791	749	808	816	806	804	801	797	837	842	818	796	803
PEGS	1510	1696	1845	2070	1947	2113	1974	2089	1927	2063	1805	2029	1896	2019	1879	2014	2021	1995	1828	1854
San Juan 3	140	151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2867	3018	3162	3065	3193	3190	2786	3165	3149	2764	3109	3118	2964	3095	3077	2950	3091	3087	3037	3047
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	3	0	1	2	7	3	4	7	11	9	3	5
Knutson 2	0	0	0	0	0	0	0	0	4	0	1	2	7	4	4	9	12	11	5	6
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	2	0	1	1	4	3	2	5	8	6	3	3
Pyramid 1	6	0	5	17	9	14	22	12	17	27	18	23	33	33	41	47	56	65	7	9
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	1	0	8	10	16	16	30	18	20	37	20	23	31	33	41	45	51	59	7	8
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Shafer	252	243	278	222	58	64	69	71	89	47	56	68	71	85	92	112	127	119	91	106
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	925	1094	1141	1024	1099	1879	1967	1919	2009	2166	2236	2364	2466	1507	2116	2218
Total	13229	13759	13655	14689	15195	16079	15499	15745	15496	16229	16341	16591	16285	16588	16654	17035	17346	16207	16460	16647

Table B43 - High Commodity High Load Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	187	212	210	216	228	242	230	238	238	239	228	237	235	206	233	234	234	231	232	233
Craig 2	197	179	161	188	177	218	218	203	215	208	217	215	204	214	213	214	215	205	208	209
Craig 3	1667	1702	1504	1809	1824	1875	1952	1920	1696	1929	1922	1823	1894	1890	1797	1885	1888	1854	1865	1871
LRS 2	862	1001	861	1001	997	991	848	981	977	854	966	961	842	952	947	947	948	945	945	945
LRS 3	1645	1413	1643	1643	1408	1586	1619	1416	1604	1594	1395	1578	1572	1374	1555	1555	1557	1545	1547	1547
Nucla	751	972	1150	1187	1192	1251	1269	1239	1172	1265	1277	1261	1258	1255	1248	1311	1317	1280	1246	1257
PEGS	839	942	1024	1149	1081	1173	1096	1160	1070	1146	1002	1127	1053	1121	1044	1118	1122	1108	1015	1030
San Juan 3	60	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	938	987	1035	1003	1045	1044	911	1035	1030	904	1017	1020	970	1013	1007	965	1011	1010	994	997
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7147	7474	7590	8197	7952	8381	8144	8192	8004	8141	8026	8223	8028	8025	8044	8230	8294	8179	8053	8091

Table B44 - High Commodity High Load Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.89	1.01	1.00	1.03	1.09	1.15	1.10	1.13	1.13	1.14	1.09	1.13	1.12	0.98	1.11	1.11	1.12	1.10	1.11	1.11
Craig 2	0.99	0.89	0.19	0.22	0.21	0.26	0.26	0.24	0.25	0.25	0.26	0.25	0.24	0.25	0.25	0.25	0.25	0.24	0.25	0.25
Craig 3	4.37	4.46	3.19	3.83	3.86	3.97	4.14	4.07	3.59	4.09	4.07	3.86	4.01	4.00	3.81	3.99	4.00	3.93	3.95	3.96
LRS 2	1.39	1.62	1.39	1.62	1.61	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.53	1.53	1.53	1.53
LRS 3	2.05	1.76	2.05	2.05	1.76	1.98	2.02	1.77	2.00	1.99	1.74	1.97	1.96	1.72	1.94	1.94	1.94	1.93	1.93	1.93
Nucla	0.75	0.97	1.15	1.19	1.19	1.25	1.27	1.24	1.17	1.26	1.28	1.26	1.26	1.25	1.25	1.31	1.32	1.28	1.24	1.26
PEGS	2.46	2.76	3.00	3.36	3.17	3.43	3.21	3.40	3.13	3.35	2.93	3.30	3.08	3.28	3.06	3.27	3.29	3.24	2.97	3.01
San Juan 3	0.18	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.96	1.01	1.06	1.03	1.07	1.07	0.93	1.06	1.05	0.92	1.04	1.04	0.99	1.04	1.03	0.99	1.03	1.03	1.02	1.02
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.03	0.02	0.02	0.04	0.04	0.05	0.05	0.06	0.07	0.01	0.01
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.27	0.26	0.30	0.24	0.06	0.07	0.07	0.08	0.09	0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.14	0.13	0.10	0.11
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2x1 C-C	0.00	0.00	0.00	0.00	0.11	0.13	0.13	0.12	0.13	0.18	0.18	0.18	0.19	0.20	0.20	0.22	0.22	0.15	0.22	0.23
Total	14.3	14.9	13.3	14.6	14.2	14.9	14.6	14.7	14.2	14.7	14.3	14.7	14.4	14.4	14.4	14.8	15.0	14.7	14.3	14.4

Table B45 - High Commodity High Load Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	15	14	15	16	17	16	16	16	16	16	16	16	14	16	16	16	16	16	16
Craig 2	16	14	13	15	14	17	17	16	17	17	17	17	16	17	17	17	17	16	17	17
Craig 3	88	90	79	96	96	99	103	101	90	102	102	96	100	100	95	100	100	98	99	99
LRS 2	65	75	65	75	75	74	64	74	73	64	73	72	63	71	71	71	71	71	71	71
LRS 3	140	121	140	140	120	135	138	121	137	136	119	135	134	117	133	133	133	132	132	132
Nucla	39	50	59	61	62	65	66	64	61	65	66	65	65	65	64	68	68	66	64	65
PEGS	17	19	21	24	22	24	23	24	22	24	21	23	22	23	21	23	23	23	21	21
San Juan 3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	42	45	47	45	47	47	41	47	47	41	46	46	44	46	45	44	46	46	45	45
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	1
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	1	1	1	1	1	1	2	1	1	2	2	2	3	3	4	0	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	1	1	1	2	1	1	2	1	1	2	2	2	3	3	3	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	13	13	14	11	3	3	4	4	5	2	3	4	4	4	5	6	7	6	5	5
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	436.3	444.3	454.2	484.2	456.7	483.9	474.1	468.7	470.0	471.2	464.1	477.6	469.1	462.5	473.5	483.6	489.1	482.8	470.7	473.4

Table B46 - High Commodity High Load Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.2	1.3	1.3	1.3	1.4	1.5	1.4	1.5	1.5	1.5	1.4	1.5	1.5	1.3	1.4	1.5	1.5	1.4	1.4	1.4
Craig 2	1.0	0.9	0.8	1.0	0.9	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.1	1.1
Craig 3	24.5	25.0	22.1	26.6	26.8	27.6	28.7	28.3	25.0	28.4	28.3	26.8	27.9	27.8	26.4	27.7	27.8	27.3	27.4	27.5
LRS 2	61.3	71.2	61.3	71.2	71.0	70.5	60.4	69.8	69.5	60.8	68.8	68.4	59.9	67.8	67.4	67.4	67.5	67.3	67.3	67.3
LRS 3	81.7	70.2	81.6	81.6	69.9	78.8	80.4	70.3	79.6	79.2	69.3	78.4	78.0	68.2	77.2	77.2	77.3	76.7	76.8	76.8
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	12.9	14.5	15.8	17.7	16.7	18.1	16.9	17.9	16.5	17.7	15.5	17.4	16.3	17.3	16.1	17.3	17.3	17.1	15.7	15.9
San Juan 3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	106.2	111.8	117.2	113.6	118.3	118.2	103.2	117.3	116.7	102.4	115.2	115.5	109.8	114.7	114.0	109.3	114.6	114.4	112.6	112.9
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	289.1	295.3	300.2	313.2	305.1	315.9	292.3	306.2	310.1	291.1	299.7	309.2	294.6	298.3	303.8	301.6	307.1	305.4	302.4	303.1

Table B47 - High Commodity High Load Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	327	371	368	377	398	422	403	416	416	418	398	414	411	361	408	409	409	404	406	407
Craig 2	359	326	293	343	322	398	397	369	391	380	396	392	371	390	387	390	391	373	378	381
Craig 3	1542	1574	1391	1673	1687	1735	1806	1776	1569	1784	1778	1686	1752	1748	1662	1743	1746	1715	1725	1731
LRS 2	860	999	859	999	995	989	847	979	975	852	965	960	841	950	945	945	946	943	944	944
LRS 3	1005	864	1004	1004	860	969	989	865	980	974	852	965	961	840	950	950	951	944	945	946
Nucla	347	449	532	549	551	578	587	573	542	585	591	583	582	580	577	606	609	592	576	581
PEGS	930	1044	1136	1274	1199	1301	1216	1286	1187	1270	1111	1249	1167	1243	1157	1240	1244	1228	1126	1142
San Juan 3	78	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1683	1772	1857	1800	1875	1873	1636	1858	1849	1623	1826	1831	1740	1818	1807	1732	1815	1813	1783	1789
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	3	0	3	9	5	8	12	7	9	15	10	13	19	18	23	27	31	37	4	5
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	5	6	10	10	18	11	12	22	12	14	19	20	25	27	31	36	4	5
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0
Shafer	127	123	141	112	29	32	35	36	45	24	28	34	36	43	46	57	64	60	46	53
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	980	1159	1207	1084	1164	1579	1648	1604	1662	1775	1823	1912	1979	1398	2016	2096
Total	7265	7609	7590	8149	8914	9476	9154	9263	9143	9530	9618	9747	9563	9788	9814	10041	10223	9547	9956	10083

Table B48 - High Commodity High Load Case Water Consumption (1,000,000 of gallons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	657	751	698	709	743	789	760	800	822	824	803	837	835	736	832	832	835	831	833	832
Craig 2	722	664	533	608	588	708	707	686	740	701	773	774	742	778	777	777	779	772	777	775
Craig 3	2883	2974	2245	2640	2704	2906	3124	3187	2949	3387	3421	3256	3402	3390	3226	3379	3389	3370	3378	3376
LRS 2	1556	1803	1551	1803	1799	1785	1528	1768	1764	1539	1741	1732	1521	1715	1707	1707	1711	1707	1707	1707
LRS 3	1988	1705	1983	1983	1702	1914	1953	1709	1939	1924	1683	1905	1900	1658	1876	1876	1881	1876	1876	1876
Nucla	470	592	699	708	714	697	715	704	664	684	743	742	747	748	750	783	785	776	781	781
PEGS	1257	1416	1730	1927	1854	1973	1922	2029	1833	1951	1719	1921	1848	1989	1847	1968	1983	1943	1960	1973
San Juan 3	373	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	2851	3050	3130	3030	3155	3190	2787	3175	3162	2773	3123	3129	2975	3105	3080	2957	3101	3092	3091	3092
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	7	0	0	7	2	5	22	6	8	26	8	9	16	11	11	18	12	12	12	13
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Pyramid 4	0	0	0	0	4	6	10	7	9	12	8	8	9	10	11	11	12	11	12	13
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	179	186	199	88	42	59	45	50	125	50	29	34	34	44	59	49	49	50	54	51
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
2x1 C-C	0	0	0	0	0	0	0	0	0	0	519	550	565	608	639	666	657	653	692	694
Total	12947	13515	12773	13507	13311	14037	13576	14125	14019	13875	14575	14901	14597	14796	14819	15028	15197	15096	15178	15200

Table B49 - Distributed Generation (DG) Case CO_2 Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	183	209	194	197	206	219	211	222	229	229	223	233	232	204	231	231	232	231	231	231
Craig 2	191	175	141	160	155	187	187	181	195	185	204	204	196	205	205	205	206	204	205	205
Craig 3	1595	1645	1242	1461	1496	1608	1729	1763	1631	1874	1893	1801	1882	1876	1785	1869	1875	1864	1869	1868
LRS 2	863	1001	861	1001	998	991	848	981	978	854	966	961	844	952	947	947	949	947	947	947
LRS 3	1648	1413	1643	1643	1411	1586	1619	1416	1607	1594	1395	1579	1575	1374	1555	1555	1559	1555	1555	1555
Nucla	736	926	1094	1108	1117	1091	1119	1102	1039	1071	1163	1162	1169	1171	1175	1226	1228	1215	1223	1223
PEGS	698	786	961	1070	1030	1095	1067	1127	1018	1083	955	1066	1026	1105	1025	1093	1101	1079	1088	1096
San Juan 3	161	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	933	998	1024	991	1032	1044	912	1039	1035	907	1022	1024	973	1016	1008	967	1015	1012	1011	1012
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7008	7314	7160	7632	7446	7822	7691	7832	7733	7798	7821	8031	7897	7904	7932	8095	8166	8107	8131	8137

Table B50 - Distributed Generation (DG) Case SO_2 Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	0.87	0.99	0.92	0.94	0.98	1.04	1.01	1.06	1.09	1.09	1.06	1.11	1.11	0.97	1.10	1.10	1.11	1.10	1.10	1.10
Craig 2	0.95	0.88	0.17	0.19	0.18	0.22	0.22	0.21	0.23	0.22	0.24	0.24	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Craig 3	4.18	4.31	2.63	3.09	3.17	3.41	3.66	3.74	3.46	3.97	4.01	3.82	3.99	3.97	3.78	3.96	3.97	3.95	3.96	3.96
LRS 2	1.40	1.62	1.39	1.62	1.62	1.60	1.37	1.59	1.58	1.38	1.56	1.56	1.36	1.54	1.53	1.53	1.54	1.53	1.53	1.53
LRS 3	2.06	1.76	2.05	2.05	1.76	1.98	2.02	1.77	2.01	1.99	1.74	1.97	1.97	1.72	1.94	1.94	1.95	1.94	1.94	1.94
Nucla	0.74	0.93	1.09	1.11	1.12	1.09	1.12	1.10	1.04	1.07	1.16	1.16	1.17	1.17	1.17	1.22	1.23	1.21	1.22	1.22
PEGS	2.04	2.30	2.81	3.13	3.01	3.21	3.12	3.30	2.98	3.17	2.79	3.12	3.00	3.23	3.00	3.20	3.22	3.16	3.19	3.21
San Juan 3	0.48	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Springerville	0.95	1.02	1.05	1.01	1.06	1.07	0.93	1.06	1.06	0.93	1.04	1.05	1.00	1.04	1.03	0.99	1.04	1.03	1.03	1.03
Burlington 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Burlington 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knutson 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limon 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 1	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.01	0.03	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Pyramid 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyramid 4	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rifle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shafer	0.19	0.20	0.21	0.09	0.04	0.06	0.05	0.05	0.13	0.05	0.03	0.04	0.04	0.05	0.06	0.05	0.05	0.05	0.06	0.05
Brush	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Simple Cycle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2x1 C-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total	13.9	14.5	12.3	13.3	13.0	13.7	13.5	13.9	13.6	13.9	13.7	14.1	13.9	14.0	13.9	14.3	14.4	14.3	14.3	14.4

Table B51 - Distributed Generation (DG) Case NO_x Output (1,000 of tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	13	14	13	13	14	15	14	15	16	16	15	16	16	14	16	16	16	16	16	16
Craig 2	15	14	11	13	12	15	15	14	16	15	16	16	16	16	16	16	16	16	16	16
Craig 3	84	87	66	77	79	85	91	93	86	99	100	95	99	99	94	99	99	99	99	99
LRS 2	65	75	65	75	75	74	64	74	74	64	73	72	63	71	71	71	71	71	71	71
LRS 3	141	121	140	140	120	135	138	121	137	136	119	135	134	117	133	133	133	133	133	133
Nucla	38	48	57	57	58	56	58	57	54	55	60	60	60	61	61	63	63	63	63	63
PEGS	14	16	20	22	21	23	22	23	21	22	20	22	21	23	21	22	23	22	22	23
San Juan 3	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	34	36	37	36	37	38	33	38	37	33	37	37	35	37	36	35	37	37	37	37
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	0	0	0	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 4	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	9	10	10	5	2	3	2	3	6	3	1	2	2	2	3	3	3	3	3	3
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2x1 C-C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	420.3	427.7	418.8	439.1	419.9	445.2	439.5	438.6	447.7	445.0	442.5	456.3	448.8	441.9	453.0	460.0	462.6	460.0	461.3	461.3

Table B52 - Distributed Generation (DG) Case PM Output (tons)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	1.1	1.3	1.2	1.2	1.3	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4
Craig 2	1.0	0.9	0.7	0.8	0.8	1.0	1.0	0.9	1.0	0.9	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.0	1.0	1.0
Craig 3	23.5	24.2	18.3	21.5	22.0	23.7	25.4	25.9	24.0	27.6	27.9	26.5	27.7	27.6	26.3	27.5	27.6	27.4	27.5	27.5
LRS 2	61.5	71.2	61.3	71.2	71.1	70.5	60.4	69.8	69.7	60.8	68.8	68.4	60.1	67.8	67.4	67.4	67.6	67.4	67.4	67.4
LRS 3	81.8	70.2	81.6	81.6	70.0	78.8	80.4	70.3	79.8	79.2	69.3	78.4	78.2	68.2	77.2	77.2	77.4	77.2	77.2	77.2
Nucla	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEGS	10.8	12.1	14.8	16.5	15.9	16.9	16.5	17.4	15.7	16.7	14.7	16.5	15.8	17.1	15.8	16.9	17.0	16.7	16.8	16.9
San Juan 3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Springerville	48.0	51.4	52.7	51.1	53.2	53.7	47.0	53.5	53.3	46.7	52.6	52.7	50.1	52.3	51.9	49.8	52.2	52.1	52.1	52.1
Burlington 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burlington 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Knutson 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limon 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pyramid 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rifle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shafer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Simple Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2x1 C-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	228.1	231.8	230.7	244.0	234.4	246.0	231.9	239.4	245.0	233.4	235.8	245.1	234.5	235.4	241.2	241.4	244.5	243.4	243.6	243.7

Table B53 - Distributed Generation (DG) Case Hg Output (lbs)

Thermal Unit	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Craig 1	319	365	339	344	361	384	369	389	400	400	390	407	406	357	404	404	406	404	405	404
Craig 2	347	319	256	292	283	341	340	330	356	337	372	372	357	374	374	374	375	371	374	373
Craig 3	1475	1522	1149	1351	1384	1487	1599	1631	1509	1733	1751	1666	1741	1735	1651	1729	1734	1725	1728	1728
LRS 2	862	999	859	999	997	989	847	979	977	852	965	960	842	950	945	945	948	945	945	945
LRS 3	1007	864	1004	1004	862	969	989	865	982	974	852	965	962	840	950	950	953	950	950	950
Nucla	340	428	506	512	516	504	517	510	480	495	538	537	541	542	543	567	568	562	565	566
PEGS	774	872	1065	1187	1142	1214	1183	1249	1129	1201	1059	1182	1138	1225	1137	1212	1221	1196	1207	1215
San Juan 3	209	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springerville	1674	1791	1838	1779	1852	1873	1636	1864	1857	1628	1834	1837	1747	1823	1809	1736	1821	1815	1815	1816
Burlington 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burlington 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knutson 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limon 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 1	4	0	0	4	1	3	12	4	4	15	5	5	9	6	6	10	7	6	7	7
Pyramid 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramid 3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pyramid 4	0	0	0	0	2	4	6	5	5	8	5	5	6	6	6	7	7	7	7	8
Rifle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shafer	91	94	101	45	21	30	23	25	63	25	15	17	17	22	30	25	25	25	28	26
Brush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simple Cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2x1 C-C	0	0	0	0	0	0	0	0	0	0	532	563	579	623	655	683	673	669	709	712
Total	7104	7463	7120	7520	7424	7801	7524	7853	7765	7672	8318	8520	8346	8506	8513	8645	8739	8679	8743	8753

Table B54 - Distributed Generation (DG) Case Water Consumption (1,000,000 of gallons)

Appendix C

Transmission Reports

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN

CONTINUING PROJECTS -- TRANSMISSION PAGE 1

NEW PROJECTS -- TRANSMISSION PAGE 4

PLANNED PROJECTS -- TRANSMISSION PAGE 5

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN
CONTINUING PROJECTS--TRANSMISSION ($000'S)

AREA	PROJECT TITLE	SCHED IN-SERVICE DATE	DESCRIPTION / COMMENTS
BH	Badwater-Sawmill Creek 230kV Transmission Line	20/4Q	230kV Single Circuit-Project Development Only
	Nahne Jensen 115/34.5kV 2nd XFMR	16/4Q	New 115/34.5kV 40 MVA XFMR T2
	Pilot Butte 115kV Cap Bank	16/2Q	Western to Install 115 MVAR Cap Bank; Budget represents TS 35% share
CNM	Frontier 24.9kV Reactors Addition	19/2Q	
EC	Burlington 230kV Carousel Wind Farm Network Facilities	15/2Q	Network Facilities in Ring Bus for new Carousel Wind Farm
	Burlington-Wray 230kV Project	16/2Q	72 mi 230kV Line w/OPGW; new location portion of project Bonny Lake Regen LOC #5920;Add 230kV Line Bay
	Deering Lake 115kV DP	15/2Q	Install (1) 115/69kV 35 MVA XFMR, (1) 115/12.5kV 12.5 MVA XFMR
	Fort Morgan North 115-12.47kV XFMR Replace	17/1Q	Replace with 12/16/20 MVA 115/12.5kV XFMR w/o LTC
	Prospect Valley 115-12.47kV XFMR Replace	16/2Q	WAPA to replace with 12/16/20 MVA 115/12.5kV w/ LTC
	Story 345kV T1 & T2 DGA Monitors & Relay Placements	16/2Q	
EN	Sidney 115/34.5kV XFMR Upgrade	15/4Q	WAPA Replace existing XFMR with 25 MVA XFMR
FAC	Montrose Storage Expansion	16/4Q	10706
	NCMC Finish Space	16/4Q	10706
	Sidney Warehouse Yard Improve	17/1Q	10706
General Plant Facilities	Enterprise Electronic Security Refresh		Project moved from Corp
FH	Ault XFMR KU1A Replacement	18/4Q	WAPA to replace XFMR KU1A; This is Tri-State's 36% Share
	Poudre 115-12.5kV DP	16/2Q	WAPA Joint Project
	Rockport 115-12.47kV XFMR RPL	15/4Q	New 115/12.5kV 7.5 MVA XFMR
	Southwest Weld Expansion Project (SWEP)	18/4Q	Total of all SWEP Projects (SBA 02/2014)
	United Power Sys Improve Project-Phase III	15/4Q	4.1 mi of new 115kV line w/OPGW
LANDS	RI: Black Lake Wetland Mitigation	15/4Q	Funding from 3494
	RI: Cousins Comm Site: Right-of-Way	15/4Q	Funding from 3494
	RI: Gallup-Ya-Ta-Hey Navajo Permit	15/4Q	
	RI: Gore Pass-Windy Gap	16/4Q	Funding from 9511
	RI: Grand Junction-Montrose BLM Permit	16/4Q	Funding from 3494
	RI: Lamar-Vilas Right-of-Way Improvement	15/4Q	Funding from 3494
	RI: Lost Creek-Lost Creek Tap Right-of-Way Improvement	16/3Q	Funding from 3494
	RI: Lovell-Big George (Glendale)BLM Permit	16/4Q	Funding from 9511
	RI: Meeker-Axial Basin-Hayden BLM Permit	16/4Q	Funding from 9511
	RI: Nucla-Sunshine Right-of-Way Improve	15/4Q	Added 6/18/13
	RI: Pueblo of Taos ROW	15/4Q	Funding from 3494
	RI: Rainsville-Rainsville Tap R-O-W Improvement	15/4Q	Funding from 3494
	RI: Riverton-Wind River Tap	15/4Q	Funding from 9511
	RI: Smith Lake BIA	20/4Q	Funding from 9511
	RI: Taos-Black Lake	15/4Q	
	RI: Taylor Substation Acquisition	16/3Q	Funding from 3494
	RI: Zia Pueblo Permit	16/4Q	Funding from 9511

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN
CONTINUING PROJECTS--TRANSMISSION ($000'S)

AREA	PROJECT TITLE	SCHED IN-SERVICE DATE	DESCRIPTION / COMMENTS
MISC	GIS Field Inventory & Implementation	17/4Q	GIS - 18303 Project
	Mobile Substations (2)	16/4Q	
MP	Fern-Windy Gap 138x69kV DBL-CKT Loop Project	17/4Q	Total of Fern-Windy Gap Projects
NNM	Escalante-Gallup 115kV Line Uprate	16/2Q	100° C, 42 mi w/OPGW
	Torreon 345/115kV Substation	17/3Q	3 Brkr 115kV Ring & XFMR
	Torreon Trans Line La Jara-San Ysidro 115kV Line	16/1Q	
SCC	Plaza-Waverly 115kV Loop Project	14/1Q	Total of Plaza-Waverly Capital Projects
	San Luis Valley 230kV Line Development	19/4Q	Jan 2013 SBA TLS-See Proj Dev 3768/3769
SEC	Emil Anderson: 3rd XFMR Addition	15/4Q	Install (1) 115/12.5kV 25 MVA XFMR
	Pueblo West Tap Line Uprate	16/3Q	Uprate line to 100° centigrade
SEW	Dalton 115kV Cap Bank Add	16/3Q	Install (1) 7.5 MVAR Cap Bank & One (1) 15 MVAR Cap Bank.
	Guernsey Rural XFMR Replace	15/4Q	Replace XFMR with the Relocated Sterling Sub 27 MVA XFMR
	Southeast Wyoming Transmission Project	17/4Q	SBA 11/14
	Wayne Child 345kV & 230kV Substation Additions	18/4Q	CPN's 0547 & 0548 Cancelled
SWNM	Caballo-Mimbres 115kV Rebuild	20/4Q	Rebuild 57.2 mi of existing line
WC	Bayfield 115/69kV XFMR Replace	15/4Q	
	Crested Butte Reactors Add & Sub Upgrades	16/4Q	Add (1) 115kV 8 MVAR Shunt Reactor
	Happy Canyon Sub Improvements	17/2Q	DMEA Participation in Line Sectionalizing, Control Bldg & Bkrs-As of 3/31/15 DMEA no longer participating
	LPEA-San Juan Project	18/4Q	Total of the San-Juan Projects
	Meeker 138kV Control Bldg Replace	17/3Q	
	Montrose-Nucla-Cahone 230kV Project	18/4Q	Total of the Montrose-Nucla-Cahone 230kV Projects
	Norwood 14MVA Reactor	15/4Q	Install (1) 115kV 14 MVAR Shunt Reactor
	Sunshine DP	17/4Q	The location will likely be a comm site
NETSER	Long Term Resource Develop Project (Trans)	16/4Q	EPTP Study Projects
MISC	Alta Luna Solar IC	16/4Q	
	Alta Luna-Caballo Line	17/4Q	
	Alta Luna-Mimbres Line	17/4Q	
	Axial Basin Sub-69kV Line Bay Addition	16/4Q	
	Basket Maker Sub - RTU Install	15/2Q	On hold per Empire
	Burlington 230kV Carousel Wind Farm Line Bay	15/3Q	230 kV Bkr Addition for Line Bay for new Carousel Wind Farm
	Chesapeake Substation	17/4Q	Potential 230 kV/69kV Yard
	Cortez Pipeline Substation-RTU Install Ph2	15/4Q	On hold per Empire
	Cow Canyon Sub-RTU Install PH3	16/4Q	On hold per Empire
	Doe Canyon Substation-RTU Install Ph1	15/2Q	On hold per Empire
	Fuller Substation Bus Reconfiguration XE	15/4Q	
	Goodman Point Substation-RTU Install Ph3	16/4Q	On hold per Empire
	Hovenweep Substation-RTU Install Ph2	15/4Q	On hold per Empire
	Lost Canyon T1 & T2 XFMR Replacement	15/4Q	Replace 230/115kV 100 MVA XFMRS with 150 MVA SFMRS

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN

CONTINUING PROJECTS--TRANSMISSION ($000'S)

AREA	PROJECT TITLE	SCHED IN-SERVICE DATE	DESCRIPTION / COMMENTS
	Main Switching Station-RTU Install Ph1	15/2Q	On hold per Empire
	Moqui-C Substation-RTU Install Ph2	15/4Q	On hold per Empire
	PNM WW Line OPGW Work (for Torreon Sub)	15/2Q	
	Relocation Axial-Hayden 138kV Line on Trapper Mine	17/4Q	
	Sand Canyon Substation-RTU Install Ph3	16/4Q	On hold per Empire
	Sheridan Hill - Sheridan Hill Tap	15/3Q	WAPA 3 Way Tap Switch Project for Highline on Frenchman Creek-Waunata 115kV Line.
	Sheridan Hill DP	15/3Q	Includes Payment to WAPA
	SLV 230kV Solar Plant Connection	15/3Q	230kV Line Bay Addition
	Sterling Ranch 115kV Transmission Line	18/2Q	
	Sterling Ranch Substation (Delivery Point)	17/4Q	
	Torreon Delivery Point	16/1Q	3 Bkr 115kV Ring & XFMR
	Tyrone Sub		
	Tyrone Tap	16/1Q	
	Yellow Jacket II - RTU Install Ph1	15/3Q	
	Yellow Jacket West RTU Install Ph1	15/2Q	

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN
NEW PROJECTS--TRANSMISSION ($000'S)

AREA	PROJECT TITLE	SCHED IN-SERVICE DATE	DESCRIPTION / COMMENTS
BH	Iron Creek Project	17/2Q	
EC	Burlington Lamar Project	20/4Q	See 5010/5013 for proj dev estimates for stations; New 106 mile 230kV single circuit line; 1272 ACSR; Development Budget Only. Includes $639,000 of prior year forecast $$
	Lindon DP Project	16/1Q	Includes $351,000 in prior year forecast $$; TS Share ($14,000)
FH	Bromley T2 Replacement	17/2Q	
MISC	MBPP 2016 Projects	16/4Q	Captures TS 24.13% of MBPP Projects
MP	Blue River 115/24.9kV Delivery Point	17/4Q	Includes $1,401,000 in prior year forecast $$; TS Share ($449,000)
NENM	Gladstone 115kV Cap Banks & 230 kV Reactor CB Additions	17/4Q	
SEC	Falcon T2 Xfmr Replacement	17/1Q	
	Lamar Reactor & Reactor Breaker Replacement	16/3Q	CO 57 LOC # 1550
SWNM	Alta Luna Network Facilities	17/4Q	Includes $91 in prior year forecast $$
WC	Bodo T1 & T2 Xfmr Replacements	17/4Q	Bodo Sub - 1595 (100% TS)

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN
PLANNED PROJECTS--TRANSMISSION ($000'S)

AREA	PROJECT TITLE	SCHED IN-SERVICE DATE	DESCRIPTION / COMMENTS
BH	Wind River 115kV Reliability Upgrade Development	20/4Q	Loop WYPO to Wind River 115kV
CNM	Biomass Interconnection Study @ Willard Switch	17/4Q	PNM - (1) 115 CB & Bay to Terminate Biomass Line
EC	Burlington-Burlington KCEA 115kV Transmission Line Rebuild	18/4Q	Reconductoring 1.94 miles of 115kV line between TSGT's Burlington and KCEA's Burlington Substation
	Smoky Hill 115/69kV XFMR Replacement	18/4Q	Replace 110/67kV 16/20 MVA XFMR with a new 24/32/40 MVA unit
EN	Hemingford 115/34.5kV XFMR Replacement	18/4Q	Replace 115-34.5kV transformer with 50 MVA unit
	Lamar (NE) 115kV Reactors	20/4Q	Install (1) 115kV 7.5 MVAR Reactor Bank
	Wildhorse 115kV Cap Add	18/4Q	Install two 115kV 7.5 MVAR capacitor banks with high side circuit switchers at the Wild Horse Substation
FH	Greenhouse 13.2kV DP Development	18/4Q	Addition of 115/13.2kV 40 MVA XFMR at Green House
	Greenhouse 34.5kV DP Development	18/4Q	Addition of 115/34.5kV 40 MVA XFMR at Green House
NENM	NENM Transmission Improvements Phase I Development	20/4Q	32 mi 795 ACSR Springer-Gladstone 115kV
	NENM Transmission Improvements Phase II Development	20/4Q	29 mi 1272 ACSR 230kV Line, new Antelope Spg Sub, new Mosquero Sub, acquire Gladstone-Hess Line
	Rowe 115/24.9kV XFMR Replace	18/4Q	Replace existing 115kV-24.9 XFMR
NNM	Cruz Alta 115/24.9kV DP Development	19/4Q	New Substation 115/24.9 XFMR
SEC	Big Sandy & Calhan 230kV Project Development	21/4Q	55 mi 230kV-1272 ACSR Wood H Frame transmission line & 2-200 MVA 230/115kV XFMRs
	Calhan-Paddock 115kV Line Development	19/4Q	18 mi 115/69kV circuit rebuild
	Falcon 69/115kV Sub Upgrade Development	19/4Q	4 - 115kV CB's
	Falcon-Midway 115kV Line Uprate Development	19/2Q	26.7 mi Line Uprate from 50° to 75°C (146 MVA)
	Falcon-Paddock 69/115kV Line Rebuild Development	19/4Q	7 mi 115kV 795 ACSR, 100°C
	La Junta (TS) 2nd 115/69kV XFMR	18/2Q	Replace spare 115/25kV, 25 MVA XFMR with 42 MVA XFMRs
	Paddock 69/115kV Sub Upgrade Development	19/4Q	(4) 115kV CB's, 16 MVA 115/12.5kV XFMR
	Rolling Hills 115kV DP Development	19/4Q	(2) 115kV CB's, 20 MVA 115/12.5kV XFMR
	Santa Fe Springs 115kV DP Development	19/4Q	(2) 115kV MOLB's, CB, 25 MVA 115/12.5kV XFMR
	Shaw Ranch 115kV DP Development	19/4Q	(2) 115kV MOLB's, CB, 25 MVA 115/12.5kV XFMR
SEW	Big Laramie 115/34.5kV DP Development	18/4Q	New 115/34.5kV DP near Laramie
	Goshen Hole 115/12.5kV DP Development	18/2Q	New 20 MVA 115/12.5kV Substation
	White Rock 115/34.5kV XFMR Addition	18/2Q	Addition of second 115/34.5kV XFMR at White Rock

TRI-STATE 2016-2025 TEN-YEAR TRANSMISSION CAPITAL CONSTRUCTION PLAN			
PLANNED PROJECTS--TRANSMISSION ($000'S)			
AREA	PROJECT TITLE	SCHED IN-SERVICE DATE	DESCRIPTION / COMMENTS
SNM	Tularosa 115kV DP Development	19/4Q	New 115/24.9kV Substation, 20 MVA XFMR
	White Sands 115kV Substation	20/4Q	NON-MEMBER-El Paso Electric - Interconnection req on 115kV Dona Ana-Alamogordo Ln & 3 bkr switching station (Developmental Costs only)
WC	Empire 115-24.9kV DP	19/4Q	Remove 115/44kV XFMR, Install 115/25kV XFMR
	Lost Canyon - Main Switch 115kV	18/4Q	New 115kV line from Lost Canyon to Main Switch
WNM	Gallup 115/24kV XFMR Replacement	18/4Q	Replace existing unit with 115/24.9kv XFMR with 25 MVA unit

The latest Tri-State *Load and Resource Transmission Analysis* report for 2011-2020 can be found on the below link.

Load and Resource Transmission Analysis
2011 through 2020

TRI-STATE
Generation and Transmission Association, Inc.

June 30, 2011

http://www.oatioasis.com/TSGT/TSGTdocs/LR_Report_2011_final_JGC_IK_MS_BT_RS_7_7_11.pdf

The latest Tri-State 10-Year Transmission Plan can be found on the below link.

10-YEAR TRANSMISSION PLAN

For the State of Colorado

To comply with

Rule 3627

of the

Colorado Public Utilities Commission

Rules Regulating Electric Utilities

February 3, 2014

Web addresses updated as of 7/28/14

http://www.tristategt.org/transmissionPlanning/puc3627_TransmissionProjects.cfm

Appendix D

Tri-State and Public Presentations and Public Comments

Appendix E

Public Comments to Draft ERP

The draft ERP report was placed on the Tri-State website on Friday, October 9th for public review and comment. As of October 28 no public comments have been received regarding the draft 2015 ERP Report.

Appendix F

Tri-State Board of Directors Resolution

RESOLUTION

WHEREAS, TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC. Board Policy #102, "Long-term Power Supply Policy", has the stated objective "To meet the long-term power supply needs of the Member Systems of Tri-State"; and

WHEREAS, Tri-State's Board Policy #402, "Environmental Compliance Policy", states that Tri-State will ensure compliance with all laws, rules, regulations and permits which apply to its operations. It is the responsibility of Tri-State, its Board of Directors, management, and employees, to ensure compliance with all legal environmental requirements. Tri-State is committed to work within its organization and with outside entities to protect the environment; and

WHEREAS, Tri-State is required by C.F.R., Title 10, Chapter III, Part 905, Energy Planning and Management Program, to every five years submit to Western Area Power Administration ("Western") an Integrated Resource Plan and Action Plan for approval; Tri-State's next required plan is due to be filed in February, 2016; and

WHEREAS, on December 8, 2009, Tri-State submitted a letter to the Colorado Public Utilities Commission ("CoPUC") wherein Tri-State agreed to increase the information it files with the CoPUC with respect to its Electric Resource Plan and to adopt a public participation process that provides the opportunity for more public input into Tri-State's resource planning process; and

WHEREAS, Tri-State agreed to develop its Integrated Resource Plan and its Electric Resource Plan filings ("Filings") using a two-step process; and

WHEREAS, the first step involved the public participation process in which members of the public, the Commission Staff, the Office of Consumer Counsel, and the staff of Western, had the opportunity to provide input to Tri-State in advance of and during the development of the Filings. During this stage, Tri-State developed its draft findings, with regular reports and opportunities for input and discussion by the public. The Filings cover a 20-year planning period, beginning in 2016, and a 6-year resource acquisition period for the years 2016-2021. The Filings describe Tri-State's intended actions during the resource acquisition period; and

WHEREAS, the second step is the filing of the Electric Resource Plan with the CoPUC. Tri-State will make its filing with the CoPUC by November 30, 2015; and

WHEREAS, the content and purpose of the Filings to be submitted to Western and the CoPUC are nearly identical; and

WHEREAS, Tri-State held four public participation meetings on February 25, 2015, on May 1, 2015, on August 6, 2015 and on September 8, 2015; and

WHEREAS, those meetings were held for the specific purposes of providing information about Tri-State, including an overview of existing generating resources, transmission system planning, member loads, and load forecasting and resource planning processes. The meetings were also held to solicit public input into the modeling process and for presenting the results of scenario modeling; and

WHEREAS, Tri-State's resource planning staff modeled nine alternative expansion plans for the 20-year resource planning period and presented the results of the modeling of its reference scenarios, as well as certain boundary scenarios and other scenarios recommended by the public participants, including a comparison of the net-present value of the modeled alternatives; and

WHEREAS, at the September 8, 2015 public participation meeting, Tri-State's resource planning staff provided an overview of Tri-State's draft Filings and explained the process and schedule for submitting comments to Tri-State regarding the draft Filings; and

WHEREAS, Tri-State intends to publish its draft Filings for public comment on its website on October 8, 2015; and

WHEREAS, Western's rules require the governing body of Tri-State to approve the Filings in accordance with its by-laws, confirming that all requirements have been met; and

WHEREAS, at the October 6-7, 2015 Board of Directors meeting, staff provided an overview of the public participation process, reviewed the results of the nine expansion plan scenarios, provided a summary of the public commenters' principle criticisms and recommendations, and provided a final overview of Tri-State's Filings which are all intended to fully comply with the requirements of Western and to be in accordance with Tri-State's commitment to the CoPUC.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC., that the Board has been fully apprised of the resource planning process and the associated public participation process that has resulted in the production of the Integrated Resource Plan and the Electric Resource Plan filings to be submitted to the Western Area Power Administration ("Western") and to the Colorado Public Utilities Commission ("CoPUC") respectively. The Board is aware of public comments regarding the Integrated Resource Plan and Electric Resource Plan filings and the related action plans; and

BE IT FURTHER RESOLVED, by the Board of Directors of TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC., that the Integrated

Resource Plan and the Electric Resource Plan filings are approved, and that the Chief Executive Officer be, and hereby is, authorized to formally submit the Integrated Resource Plan and the Electric Resource Plan filings to Western and the CoPUC, respectively.

CERTIFICATE

I hereby certify that I am Secretary of TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC., and that the foregoing is a true and correct copy of a Resolution adopted by the Board of Directors of TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC. at its regular meeting held October 6-7, 2015.

Leo Brekel
Secretary

(CORPORATE SEAL)

Appendix G

CPUC Settlement Agreement between Tri-State and WRA

December 8, 2009
Chairman Ron Binz
Colorado Public Utilities Commission
1560 Broadway, Suite 250
Denver, CO 80202

Dear Chairman Binz:

In January of this year, the Commission opened an investigatory docket (Docket No. 09I-041E) (the "Docket") to examine whether the Commission should revise its regulations pertaining to the resource plans of Tri-State Generation and Transmission Association, Inc. ("Tri-State"). In the Docket the Commission indicated, among other things, that it was concerned about the Commission's ability to understand and evaluate new generation resources Tri-State might propose to develop in the state of Colorado, as well as whether there exists a reasonable opportunity for parties other than Tri-State's members to participate in Tri-State's resource planning process.

The Commission invited a series of comments on the issue and held a meeting on July 16 wherein Tri-State and various members of the industry and public appeared before the Commission to discuss the legal and policy implications of the issue and to answer questions from the Commission. Western Resource Advocates ("WRA") filed comments in the Docket as a member of the Environmental and Community Groups ("ECG") and participated in the July 16 meeting representing ECG.

As outlined by the comments filed in the investigatory Docket, the positions of Tri-State and ECG with respect to the role of the Commission and the next steps that the Commission should take are in conflict. ECG has proposed to the Commission that it move forward with a new rulemaking that would expand the role of the Commission over Tri-State's resource planning process and that to do so would be lawful. Tri-State has argued that the expansion of the Commission's role into Tri-State's resource planning would be inappropriate and contrary to law.

Subsequently, Tri-State and WRA have engaged in a series of discussions with each other in an attempt to craft a process that meets our respective goals and addresses the concerns expressed by the Commission in the opening of this Docket without the need to litigate the legal issues raised in the Docket. We are pleased to report that Tri-

State and WRA have reached an agreement on a process to be used in Colorado that we believe meets those goals.
As Tri-State has previously stated, it is re-evaluating its resource needs and resource planning process. As a part of the re-evaluation, Tri-State has resolved to take steps to ensure that the Commission is able to understand Tri-State's process and to
provide a meaningful opportunity for the public to participate in that process. Tri-State views this new process as a regional, system-wide planning process that can be used in each of the states in which it operates and with other agencies that may have jurisdiction over these issues, including the Rural Utilities Service and the Western Area Power Administration. This letter, however, and the attached document entitled "Tri-State's Colorado Resource Planning Process" are designed to address the particular process that Tri-State will use in Colorado with this Commission.
In general, Tri-State will increase the information it files and will adopt a public participation process that will provide the opportunity for meaningful public input into Tri-State's resource planning process. The process is also intended to increase the transparency with which Tri-State develops its plan.
Tri-State will develop its Resource Plan in a two-step process. The first step will involve a public participation process in which members of the public, the Commission Staff and Office of Consumer Counsel will have the opportunity to provide meaningful input to Tri-State in advance of and during the development of the Resource Plan. During this stage, Tri-State will develop its Resource Plan, with regular reports and opportunities for input and discussion by the public. The Resource Plan will contain a planning period of from 20 to 40 years; a Resource Acquisition Period of 6-10 years; and an Action Plan which will describe Tri-State's intended actions during the Resource Acquisition Period. In developing its plan, Tri-State will fully consider the input of members of the public. Members of the public will also have a final opportunity to comment on the plan to Tri-State before it is filed with the Commission.
The second step is the filing of the Resource Plan with the Commission. Tri-State will file with the Commission the first plan under this process by November 30, 2010. After filing, Tri-State will appear before the Commission in an Open Meeting to fully explain the planning process and the Resource Plan. In order to preserve Tri-State's positions regarding jurisdiction, this Open Meeting would not be a hearing and the Commission would not enter an order approving the Resource Plan. However, in our view, the Commission's current rules permit the Commission to solicit public comment, to request additional information, to ask follow-up questions and to express any opinions it may have with regard to the Resource Plan.

Tri-State intends to file a Resource Plan with the Commission every four years. It will also continue to file Annual Updates and will appear before the Commission on an annual basis if requested. In addition, it will provide an annual opportunity to members of the public, Commission Staff and the OCC to meet with Tri-State between plans.

Attached to this letter is a detailed description of the new Tri-State Colorado Resource Planning Process which has been developed by Tri-State and WRA. Both Tri-State and WRA agree that the implementation of this new process by Tri-State is a reasonable settlement of the differences between our positions respecting the issues raised in the Docket.

Accordingly, Tri-State and WRA request that, after inserting this letter and attachment into the record, the Commission close the current docket and take no further action at this time with respect to its Resource Planning Rules as they affect Tri-State.

Sincerely,

TRI-STATE GENERATION AND TRANSMISSION
Kenneth Anderson
Executive Vice President/General Manager

WESTERN RESOURCE ADVOCATES
John Nielsen
Energy Program Director

KA/JN:slm
Enclosure1

Tri-State's Colorado Resource Planning Process
December 2009
OVERVIEW

The Colorado Public Utilities Commission ("Commission") has opened an investigatory docket to review the role of the Commission in the resource planning efforts of Colorado generation and transmission cooperatives. As a part of that docket, Environmental and Community Groups ("ECG") argued that the Commission should commence a rulemaking that would expand the scope and role of the Commission with respect to the resource plans of Colorado generation and transmission cooperatives. ECG believed this would provide for a better information exchange and opportunity for the public to understand the resource plans and planning done by generation and transmission cooperatives. Tri-State Generation and Transmission Association, Inc. ("Tri-State") is the only generation and transmission cooperative in Colorado. It opposed changes to the current Commission rules. Tri-State believes that a change to the rules would have the effect of the Commission replacing its elected Board of Directors as the regulatory body that is authorized to make decisions with respect to resource planning.

In subsequent discussions with Western Resource Advocates ("WRA"), a member of ECG, Tri-State has proposed to conduct a public participation process to inform the development of its resource plans and to expand the information included in these plans, which ultimately will be filed with the Commission. WRA agrees that Tri-State's proposal as set forth in this document is a reasonable process and should expand the amount of information available and the opportunity for public participation with respect to Tri-State's resource planning.

As a result of reaching agreement with Tri-State on this proposal, WRA will forego seeking changes to the Commission's regulations to govern Tri-State's resource plan through the first iteration of the planning process described herein, as long as WRA is satisfied that this process is being followed and is meaningful and productive.

PURPOSE

The purposes of this document are to set forth the contents of Tri-State's resource plans, to outline the information to be provided by Tri-State and the process that will be used in the public participation process that Tri-State will implement prior to filing its resource plans with the Commission, to suggest how the Commission consider such plans and to set forth how public input into Tri-State's planning process will occur between the filings of Resource Plans. 2

SECTION 1

CONTENTS OF THE RESOURCE PLAN

Tri-State's Resource Plans will contain the following information. Terms appearing in this document that are defined in 4 CCR 723-3-3602 shall have the same meaning in this document as they have in that section, except for "Resource Plan," the contents of which are set forth in this section.

1. A statement of the planning and resource acquisition periods that Tri-State has chosen, including a statement as to why such periods were chosen.

2. Electric demand and energy forecasts.

a. *System-wide forecast requirements*: For each year within the planning period:

i. Annual sales of energy and coincident summer and winter peak demand;

ii. Annual sales of energy and coincident summer and winter peak demand for each major customer class;

iii. Annual energy and capacity sales to other utilities; and capacity sales to other utilities at the time of coincident summer and winter peak demand;

iv. Annual intra-utility energy and capacity use at the time of coincident summer and winter peak demand;

v. Typical day load patterns for each major customer class and

vi. Annual load factors

b. *Tri-State regional (ECO, WCO, NM, WY and NE) forecast requirements*: For each region:

i. Annual sales of energy and coincident summer and winter peak demand;

ii. Annual sales of energy and coincident summer and winter peak demand for each major customer class;

iii. Typical day load patterns for each major customer class; and

iv. Annual load factors.

c. *Range of forecasts:* Tri-State shall develop and justify ranges of forecasts of coincident summer and winter demand and energy sales that it may reasonably be required to provide to meet (i) system requirements and (ii) the requirements of its members on a region-by-region basis during the planning period. The ranges shall include base case; high and low forecast scenarios of coincident summer and winter peak demand and annual energy sales, based on alternative assumptions about the determinants of coincident summer and winter peak demand and energy sales during the planning period.

d. *Description and justification:* Tri-State shall fully explain, justify, and document the data, assumptions, methodologies, models, determinants, and any other inputs upon which it relied to develop its coincident peak demand and energy sales forecasts pursuant to this section, as well as the forecasts themselves. In complying with this subsection, Tri-State shall describe the manner in which its members develop their forecasts and the way in which Tri-State uses its member forecasts to determine the forecasts referenced in such subsections.

e. *Demand-Side Management:* Tri-State shall explain the effect of Demand-Side Management on the forecasts set forth in this section.

f. *Historical data:* Tri-State shall compare the annual forecasts of coincident summer and winter peak demand and energy sales made by Tri-State to meet (i) its system requirements and (ii) Tri-State regional requirements, to the actual coincident demand and energy sales experienced, in each case, by Tri-State for each of the five years preceding the year in which the plan under consideration is filed with the Commission. In addition, Tri-State shall compare the annual forecasts in its most recent previous resource plan to the annual forecasts in the current resource plan.

g. *Format and graphical presentation of data:* Tri-State shall include graphical presentation of the data to make the data more understandable to the public, and shall make the data available to requesting stakeholders in electronic format.

3. An evaluation of existing resources.

Tri-State will describe its existing generation resources, all generating facilities for which the utility has obtained a CPCN from the Commission pursuant to 40-5-101, C.R.S., at the time the plan is filed, and existing or future purchases from other utilities or non-utilities pursuant to agreements effective at the time the plan is filed. The description will include, where applicable, the following:

a. Name(s) and location(s) of Tri-State-owned generation facilities.

b. Rated capacity and net dependable capacity of Tri-State-owned generation facilities.

c. Fuel type, heat rates, annual capacity factors and availability factors projected for Tri-State-owned generation facilities over the planning period.

d. Emission rates (in pounds per MWh) and total tons per year of sulfur dioxide, nitrogen oxides, particulate matter, mercury and carbon dioxide.

e. Estimated in-service dates for generation facilities for which a CPCN has been granted to the utility but which are not in service at the time the plan under consideration is filed with the Commission.

f. Estimated remaining useful lives of existing generation facilities without significant new investment or maintenance expense.

g. The amount of capacity and/or energy purchased from utilities and non-utilities, the duration of such purchase contracts and a description of any contract provisions that allow for modification of the amount of capacity and energy purchased pursuant to such contracts.

h. The amount of capacity and energy provided pursuant to wheeling or coordination agreements and a description of any contract provisions that allow for modification of the amount of capacity and energy provided pursuant to such wheeling or coordination agreements.

i. The amount of capacity and/or energy sold to other utilities, the duration of such sales contracts and a description of any contract provisions that allow for modification of the amount of capacity and energy sold pursuant to such contracts.

j. The percentage of kilowatt-hours generated by each fuel used by the utility on its existing system, for the latest year for which such information is available.

k. For each existing supply-side resource on its system, the amount of water consumed per MWh of electricity produced and the total annual amount of water consumed.

4. An assessment of planning reserve margins and contingency plans for the acquisition of additional resources. Tri-State will provide a description of, and justification for, the means by which it assesses the desired level of reliability on its system throughout the planning period (e.g., probabilistic or deterministic reliability indices). Tri-State will also develop and justify planning reserve margins for each year of the planning period for the base case, high, and low load forecast scenarios. Tri-State will develop contingency plans for each year of the resource acquisition period.
5. An assessment of need for additional resources. 5

By comparing the electric energy and demand forecasts with the existing level of resources developed and planning reserve margins, Tri-State will assess the need to acquire additional resources during the resource acquisition period and the planning period.

6. The costs, performance characteristics and other principal information on which Tri-State relies in considering the types of resources it may acquire during the planning period.

7. A description of any studies or investigative efforts underway relevant to the resource planning process and related resources, including any studies relating to Demand-Side Management.

8. An assessment of alternative ways of meeting the need for additional resources.

Tri-State will consider the output of reasonable resource scenario modeling over the planning period, including those reasonable modeling scenarios requested by members of the public in the Public Participation process, and will provide comments regarding these scenarios. Tri-State will model scenarios that provide an analysis of the effect on the costs of Tri-State's plan over the planning period of including high levels of (i) renewable resources, (ii) new clean energy and energy-efficient technologies and (iii) Demand-Side Management in the plan under differing assumptions regarding the level of fuel and other resource costs over time. For purposes of this agreement, "new clean energy and energy-efficient technologies" means a supply- or demand-side resource or demonstration project that is clean and incorporates one or more technologies, representing a substantial portion of its overall installed cost, that have not been regularly commercially demonstrated up to the point the resource may be acquired.

9. Projected emissions.

Tri-State will project the emissions associated with each of the alternative scenarios assessed under section 8, in pounds per MWh and tons per year, of sulfur dioxide, nitrogen oxides, particulate matter, mercury and carbon dioxide for each year in the planning period.

10. Projected water consumption.

Tri-State will project the amount of water consumed per MWh of electricity produced and the total amount of water consumed in each of the alternative scenarios assessed under section 8 for each year in the planning period. 6

11. An explanation of how Tri-State helps and plans to help its Colorado members meet the renewable energy standard applicable to such members established in 40-2-124(c)(V), C.R.S.

12. An explanation of the role of Demand-Side Management in helping Tri-State meet resource needs during the planning period.

In the explanation, Tri-State will include a description of how Tri-State is working, and plans to work, with its members to develop Demand-Side Management resources.

13. Existing transmission capabilities and future needs.

a. Tri-State will report its existing transmission capabilities and future needs during the planning period for facilities of 115 kilovolts and above, including associated substations and terminal facilities. Tri-State will generally identify the location and extent of transfer capability limitations on its transmission network that may affect the future siting of resources. With respect to future needs, Tri-State will explain the need for facilities based upon future load projections (including reserves). To the extent reasonably available, Tri-State will include a description of the length and location of any facilities needed, their estimated costs, terminal points, voltage and megawatt rating, alternatives considered or under consideration, and other relevant information.

b. Tri-State will report on how it has considered the effect of its transmission system and plans for new transmission facilities on the siting of renewable resources and new clean-energy technology facilities.

c. Tri-State will report on the transmission facilities needed to support the resources contained in the scenarios modeled under Section 8.

14. An explanation of the planning risks that Tri-State faces.

Tri-State will include in the explanation how it has assessed such risks under different assumptions of future resource costs, fuel prices, environmental and other regulation, including regulation of greenhouse gas emissions, and other variables. Tri-State will also include whether it has plans to mitigate such risks and, if so, will identify such plans.

15. An explanation of how Tri-State coordinates and plans to coordinate (i) its operations and (ii) its plans to acquire new generation resources and transmission facilities with other utilities.

16. A statement of the criteria that Tri-State uses in the development of its plan. 7

17. An Action Plan.
Tri-State will describe the specific actions it will take during the resource acquisition period starting with the filing of its plan with the Commission. The action plan will include a status report of the specific actions contained in any previous action plan.
18. An explanation of Tri-State's current rate design for the sale of power by the utility to its members and the effect of that rate design on and its consistency with its resource plan.
19. An explanation of whether and, if so, how Tri-State's plan will give the fullest possible consideration to the cost-effective development of new clean energy and energy-efficient technologies, bearing in mind the beneficial contribution such technologies make to Colorado's energy security, economic prosperity, environmental protection, and insulation from fuel price increases.
20. A description of the effect of Tri-State's plan on Colorado's economic prosperity, insulation from fuel price increases, energy security and the environment.
21. An explanation of any policies or regulations relating to resource planning (i) implemented by states other than Colorado in which Tri-State provides electricity to members and (ii) implemented by agencies of the federal government of which Tri-State seeks the public and the Commission to be aware of in their review of Tri-State's resource plan.
SECTION 2
PUBLIC PARTICIPATION PROCESS
Tri-State will incorporate a Public Participation process into the development of its resource plan. The purpose of this process is to give the public, including the Commission Staff and the Office of Consumer Counsel, an opportunity to provide meaningful input to Tri-State before, during and after the development of its plan prior to Tri-State filing its plan with the Commission.
1. At least 8 months prior to the filing date of its resource plan with the Commission, Tri-State shall initiate the public participation process.

a. Tri-State shall initiate the process by providing effective notice to the public at least 30 days prior to the first scheduled meeting of Tri-State with members of the public. Such notice shall include:
i. a brief description of the resource planning process;
ii. time, date and location of the first meeting;

iii. a statement that interested members of the public should notify Tri-State of their interest in participating in the process, and
iv. Tri-State contact information.

b. Tri-State or its designee shall chair the public participation process, schedule meetings, and develop agendas for these meetings. With adequate notice to Tri-State, participants shall be allowed to place relevant items on the agenda of public participation process meetings.

c. Meetings held as part of the public participation process shall be noticed and scheduled as necessary and shall be open to members of the public who shall be heard and their input considered as part of the public participation process. Notes of such meetings will be taken by Tri-State and circulated to attendees prior to the next meeting. Upon request, the utility shall provide an executive summary containing a non-technical description of its most recent resource plan.

d. As part of the public participation process, Tri-State will make reasonable information available to the public that is relevant to the development of its plan. Tri-State reserves the right to deem certain information as business proprietary and confidential.

e. All of the topics set forth in Section 1 of this agreement will be open for discussion as part of the public participation process.
f. Tri-State shall run reasonable modeling scenarios requested by members of the public.
g. Tri-State acknowledges that disputes may arise during the public participation process. Tri-State commits to try to resolve these disputes in a manner that is sensitive to all participants in the public participation process. Tri-State will maintain a record of any such disputes and the way in which they were resolved, and will include that record in the report referenced in subsection 2 of this section.
2. Tri-State shall prepare a report of all verbal and written comments received in the public participation process and will provide a written response to such comments. Such comments and responses shall be included in Tri-State's filing with the Commission as described in this agreement.

3. In order to allow members of the public to offer input to Tri-State between public participation processes, Tri-State agrees to hold a meeting with members of the public on the subject of its resource plan prior to the filing of any Annual Progress report. Such meeting will be held at least three months prior to the filing of any such report with the Commission. 9

SECTION 3
FILINGS WITH THE COMMISSION
1. **First filing.**

Tri-State will file with the Commission the first plan developed under this document by November 30, 2010.
2. **Appearance before the Commission.**

Tri-State will appear before the Commission in an open meeting to fully explain the planning process, including the public participation process, and its resource plan.
3. **Commission consideration.**

Tri-State understands that the Commission's current procedures permit the Commission to solicit public comments on the plan and the public participation process, to request additional information, to ask follow-up questions and to express any opinion it may have with regard to the Resource Plan.
4. **Annual Progress Reports.**

Tri-State will file with the Commission, and will provide copies to members of the public who participated in the most recent public participation process described in Section 2, annual progress reports after submission of its plan. The annual progress report will inform the Commission of Tri-State's actions under the plan. Annual progress reports shall contain the following information:
a. An updated annual electric demand and energy forecast
b. An updated evaluation of existing resources
c. An updated evaluation of planning reserve margins and contingency plans
d. An updated assessment of need for additional resources
e. An updated report of the utility's action plan
f. An updated report on resource scenario modeling.
g. An updated report on the utility's efforts to give the fullest possible consideration to the cost-effective implementation of new clean energy and energy-efficient technologies (as defined in Section 1, subsection 8) in its consideration of generation acquisitions, and
h. Any material changes to its resource plan or action plan.

Appendix H

WAPA IRP Requirements

Integrated Resource Plan Review and Evaluation Checklist

10 CFR Part 905 (Energy Planning and Management Program) requires that Western's customers provide certain information in their Integrated Resource Plans (IRP).

In general, each customer must address it power resource needs in an IRP prepared and submitted to Western (905.10(a)). IRPs must consider electrical energy resource needs (905.11(b)). In order to satisfy the specific requirements of the regulation, Western must address the following questions. If Western concludes that the customer has satisfactorily addressed the criteria in the regulation as evidenced by an affirmative response to these questions, and that the IRP is otherwise reasonable, Western should approve the IRP.

CHECKLIST

1. Does the IRP evaluate the full range of alternatives for new energy resources (905.11(a))?
    a. New generating capacity?
    b. Power purchases?
    c. Energy conservation and efficiency?
    d. Cogeneration and district heating/cooling applications?
    e. Renewable energy resources?

2. Does the IRP provide adequate and reliable service to the customer's electric consumers (905.11(a))?

3. Does the IRP take into account the following necessary features for system operation (905.11(a))?
    a. Diversity?
    b. Reliability?
    c. Dispatchability?
    d. Other risk factors?

4. Does the IRP take into account the ability to verify energy savings achieved through energy efficiency (905.11(a))?

5. Does the IRP take into account the projected durability of such savings measured over time (905.11(a))?

6. Does the IRP treat demand and supply resources on a consistent and integrated basis (905.11(a))?

7. The IRP must consider electrical energy resource needs. The IRP may, at the customer's option, consider water, natural gas, and other energy resource options (905.11(b)).

8. Does the IRP identify and compare resource options? An assessment and comparison of existing and future supply and demand-side resource options available to the customer based on its size, type, resource needs, geographic location, and competitive situation must be conducted. The options should relate to the customer's unique resource situation as determined by profile data (service area, geographical characteristics, customer mix, historical loads, projected growth, existing system data, rates, financial information, load forecasts, etc.) (905.11(b)(1))?

a. Supply-side options include, but are not limited to, purchased power contracts, and conventional and renewable generation options (905.11(b) (1) (i)).
b. Demand-side options alter the customer's use pattern to provide for an improved combination of energy services to the customer and ultimate consumer (905.11(b) (1) (ii)).
c. Considerations that may be used to develop potential options include cost, market potential, consumer preferences, environmental impacts, demand or energy impacts, implementation issues, revenue impacts, and commercial availability (905.11(b) (1) (iii)).

9. Does the IRP clearly demonstrate that decisions were based on a **reasonable** analysis of the options (905.11(b) (1) (iv))?

10. Does the IRP include an action plan describing specific actions the customer will take to implement the IRP (905.11(b) (2))?

11. Does the IRP list the time period that the action plan covers (905.11(b) (2) (i))?

12. Does the IRP include an action plan summary consisting of (905.11(b) (2) (ii) (A-C)):

a. Actions the customer expects to take in accomplishing the goals identified in the IRP?
b. Milestones to evaluate accomplishments of those actions during implementation?
c. Estimated energy and capacity benefits for each action planned?

13. Does the IRP, to the extent practicable, minimize adverse environmental effects of new resource acquisitions and document these efforts (905.11(b) (3))?

14. Does the IRP include a qualitative analysis of environmental effects in a summary format (905.11(b) (3))?

15. Does the IRP provide ample opportunity for full public participation in preparing and developing the IRP (905.11(b) (4))?

16. Does the IRP include a brief description of public involvement activities (905.11(b) (4))?

a. How the customer gathered information from the public?
b. How public concerns were identified?
c. How information was shared with the public?
d. How public comments were responded to?

17. Does the IRP document that the MBA board approved the IRP, confirming that all requirements have been met (905.11(b) (4) (i))?

18. Does the IRP contain the signature of the MBA board's responsible official, or document passage of an approval resolution by the appropriate governing body (905.11(b) (4) (i))?

19. Does the IRP contain a statement that the customer conducted load forecasting? See (905.11(b) (5) for data that should be included in load forecasting.

20. Does the IRP contain a brief description of measurement strategies for identified options to determine whether the IRP's objectives are being met (905.11(b) (6))?

21. Does the IRP identify a baseline from which the customer will measure the benefits of IRP implementation (905.11(b) (6))?

22. Does the IRP specify the responsibilities and participation levels of individual members of the MBA and the MBA (905.12(b) (2))?

Integrated Resource Plan Reporting Status:

1. Every year on the anniversary of Western's approval of the first IRP, customers must submit an annual IRP status report to Western.

2. The annual report must describe accomplishments achieved under the action plan, including projected goals and implementation schedules, and energy and capacity benefits and renewable energy developments achieved as compared to those anticipated.

3. The annual report shall also set forth a revised summary of actions if the previous summary of actions has changed or expired.

Appendix D

Tri-State and Public Presentations and Public Comments

Tri-State Presentations

TRI-STATE G&T
A Touchstone Energy Cooperative

2015 Electric Resource Plan/Integrated Resource Plan - 1st Public Meeting

February 25, 2015

TRI-STATE G&T
A Touchstone Energy Cooperative

Tri-State's Resource Planning Public Participation Process

Sarah Carlisle
Public Affairs Coordinator

Introduction and Housekeeping

- **WELCOME to Tri-State**
  - Keep to schedule
  - Cell phones on silent
  - Location of facilities
  - Webcast
  - Use microphone for questions
  - One person speaking at a time
  - Questions

Today's Agenda

- Introduction and Housekeeping
- Executive Welcome
- Purpose of the ERP/IRP Process and Public Meetings
- Tri-State 2015 ERP/IRP Timeline
- Tri-State Background
- Tri-State Update
  - Load and Load Forecasting
  - Generating Resources
  - Loads and Resources
  - DSM/EE
  - Transmission
  - Environmental
- Review of Recent Tri-State Resource Activities
- 2015 ERP/IRP Resource Planning and Scenario Modeling Discussion
- Questions

TRI-STATE G&T
A Touchstone Energy Cooperative

Executive Welcome

Mike McInnes
Executive Vice President & General Manager

TRI-STATE G&T
A Touchstone Energy Cooperative

Purpose of the ERP/IRP Process and Public Meetings

Rob Wolaver
Senior Manager
Energy Resources

Purpose

- Kick-off meeting for the 2015 Tri-State Integrated Resource Planning and Electric Resource Planning Process
- Tri-State 2015 process will address both the CPUC and Western Area Power Administration's (WAPA) resource planning requirements, including public input

CPUC Electric Resource Planning Requirements

- 21 Listed Requirements:

1. Planning and resource acquisition periods
2. Electric Demand and Energy Forecasts
3. Evaluation of Existing Resources
4. Assessment of planning reserve margins
5. Assessment of Needs
6. Cost, Performance and other information
7. Description of other studies including DSM
8. Assessment of alternative means to meet needs
9. Projected Emissions
10. Projected Water consumption

CPUC Electric Resource Planning Requirements

11. Colorado Renewable Energy Standards
12. DSM for meeting resource needs
13. Transmission
14. Explanation of Risks
15. Coordination with other Utilities
16. Statement of Planning Criteria
17. Action Plan
18. Effect of Rate Design
19. Fullest possible consideration to new clean energy and energy-efficient technologies
20. Effect on Colorado's economy, energy security
21. Impact of policies implemented by other states

WAPA Integrated Resource Plan

- Address Resource Needs
- Requires evaluation of full range of alternatives including conservation, energy efficiency, new generation, purchases
- Five year cycle with annual updates

WAPA Integrated Resource Plan

- Identify Resource Options
  - Supply Side
  - Demand Side
- Action Plan
- Environmental Effects
- Public Participation
- Load Forecasting
- Measurement Strategies

Public Meeting Purposes

- To provide overview and background about Tri-State
- To receive public input regarding Tri-State's long-term resource plan
- To comply with the requirements of the WAPA's Integrated Resource Planning
- To meet the terms of Tri-State's commitment to the Colorado Public Utilities Commission

Purpose of This Public Meeting

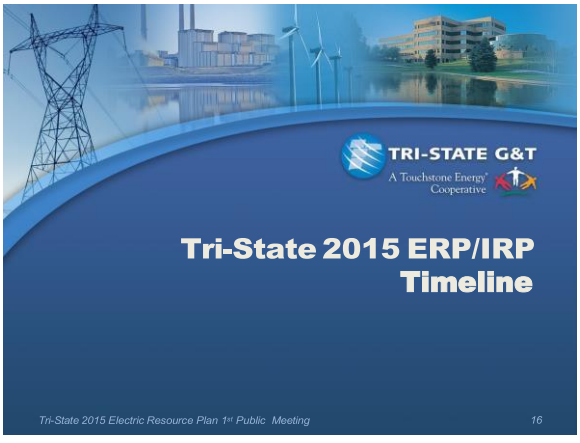
- To establish the timeline for the 2015 ERP/IRP
- To provide an update regarding Tri-State loads and resources
- To answer any questions regarding the 2015 ERP/IRP process and timeline

Miscellaneous

- Tri-State will prepare a summary of each meeting and post the summary on its Web site (www.tristategt.org/resourceplanning/ResourcePlanDoc.cfm)
- Tri-State will maintain a list of issues raised during the course of the public participation process

Process Questions?

- Comments and questions regarding resource plan or process:
  - e-mail: **ResourcePlanning@tristategt.org**
- Contacts
  - F. Michael Salva
    - 303-254-3755
    - msalva@tristategt.org
  - Sarah Carlisle
    - 303-254-3396
    - scarlisle@tristategt.org
- Tri-State will post responses to comments to individual or grouped questions on its Web site



Planned Public Meeting Schedule

2rd Meeting: Fri, May 1 8 a.m. - Noon

Tri-State will share critical assumptions and the results of several preliminary scenarios modeled (e.g., Business As Usual, High Load, Low Load, etc.) with public. Public participants can ask questions about the results of these scenarios and provide suggestions for additional scenarios for Tri-State to model. Public presentations?

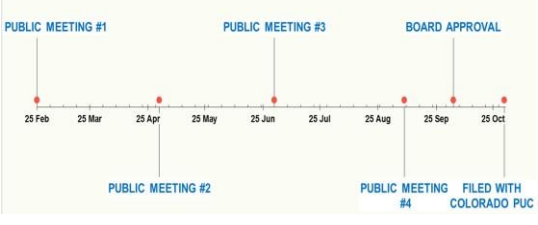
3rd Meeting: Wed, July 1 8 a.m. - Noon

Tri-State will share the critical assumptions and the results of several additional scenarios modeled. Public can provide suggestions for additional scenarios to model. Future public participant comments must be submitted via email or in written form.

4th Meeting: Tues, Sept 8 8 a.m. - Noon

Tri-State will present the draft results of its evaluation and the various resource scenarios it modeled during the public participation process. Tri-State will discuss the components of any action plan that stems from the public participation process.

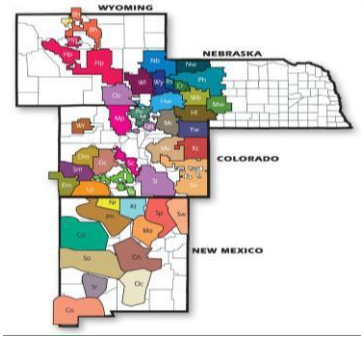
2015 ERP/IRP Timeline



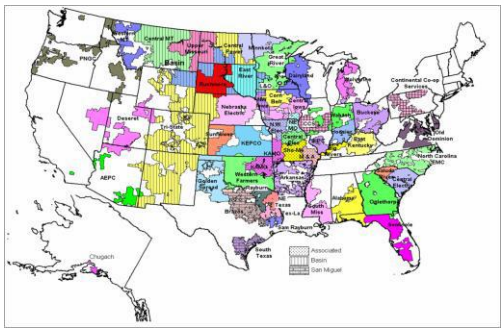
WAPA IRP deadline is Feb. 2016

Who We Are

Tri-State is a not-for-profit, wholesale power supplier owned by 44 electric cooperatives and public power districts serving a population of approximately 1.5 million people.



Generation & Transmission Cooperatives



Tri-State History

- Cooperatives formed to electrify rural America
- Federal hydroelectricity was the primary source of power
- 1940s-50s G&Ts formed to meet developing power shortages
  - Tri-State formed in 1952
- Federal hydroelectric power now about 12% of Tri State's portfolio (accounted for 20% in 1990)
- Business structure premised on wholesale Members' Services Contract (All-Requirements)
- New policies adopted to allow Member-Systems more flexibility
  - Modified to allow Member-Systems to meet 5% of their requirements

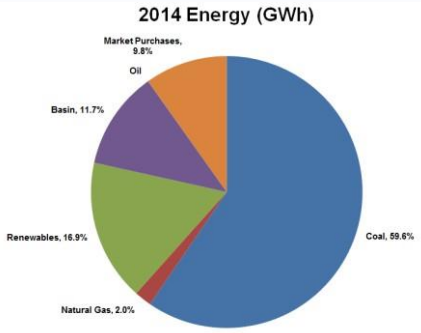
Tri-State Mission

Tri-State's mission is to provide our member owners with a reliable, cost-based supply of electricity while maintaining a sound financial position through effective utilization of human, capital and physical resources in accordance with the cooperative principles.

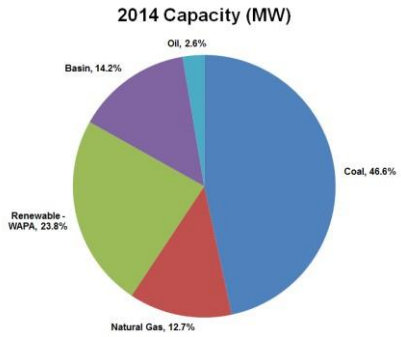
At A Glance

Member Energy Sales	15.3 million megawatt-hours
Total operating revenue	$1.3 billion
Assets	$4.6 billion
Average wholesale rate	7.1 cents/kilowatt-hour
Member consumer meters	610,000
Population served	1.5 million
Member peak demand	2,813 megawatts
Employees	1,531

Tri-State Energy Breakdown



Tri-State Capacity Breakdown



Tri-State Governance

- 44 Member-Systems in four states
- Each Member-System elects a representative to Tri-State's Board of Directors
- Each Tri-State Director has an equal voice
- Board meets monthly, sets budget and rates annually
- Board establishes rate structure and patronage capital policy
- Operates under Colorado Law

Cooperative/Power District Business Model

- Not-for-profit utilities
- Vertically dis-aggregated
  - G&Ts operate at wholesale
  - Distribution cooperatives operate at retail
- Distribution systems formed G&Ts
  - To mitigate risk
  - For buying power
  - For system operations

How is Tri-State Regulated

- Tri-State is Member-Owned and thus is regulated by its Board of Directors
- Tri-State's transmission tariff is posted on its OASIS
- Tri-State is subject to WECC/NERC reliability standards

TRI-STATE G&T
A Touchstone Energy Cooperative

2014 Load and Demand Forecast Update

Mike Stortz, P.E.
Long Range Load Forecasting Manager

"I guess I should warn you, if I turn out to be particularly clear, you've probably misunderstood what I've said."

- Alan Greenspan

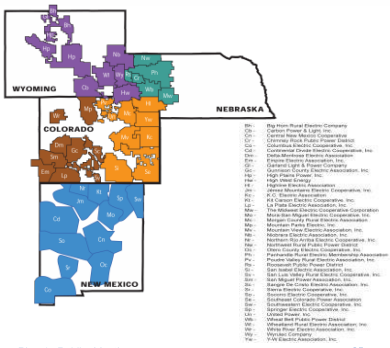
Tri-State Load Forecast Overview

- Load profiles: Tri-State and sub areas
  - Location
  - Retail class composition
  - Historical changes
  - Historical patterns
- Methodology
  - Member level forecasts by retail class
  - Data sources
  - Econometric techniques
  - Incorporation of existing DSM and government efficiency standards

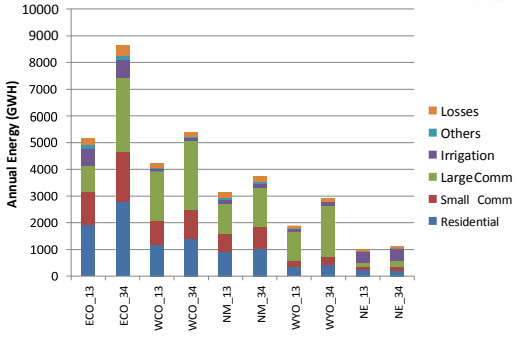
TRI-STATE G&T
A Touchstone Energy Cooperative

Load Profiles Tri-State and Sub-Areas

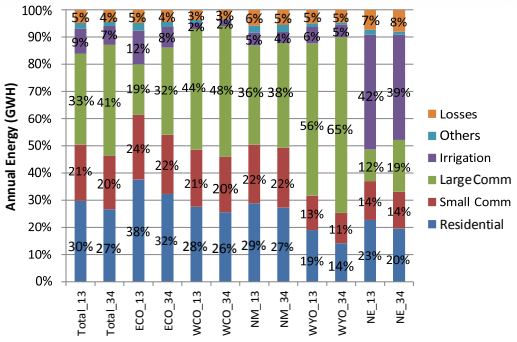
Planning Regions



2013-2034 Annual Energy Composition



2013-2034 Annual Energy Composition

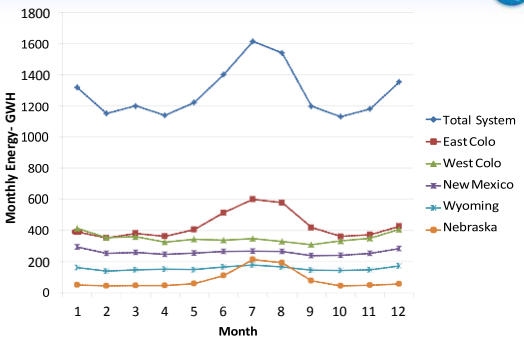


Number of Large Commercial Accounts by NAICS

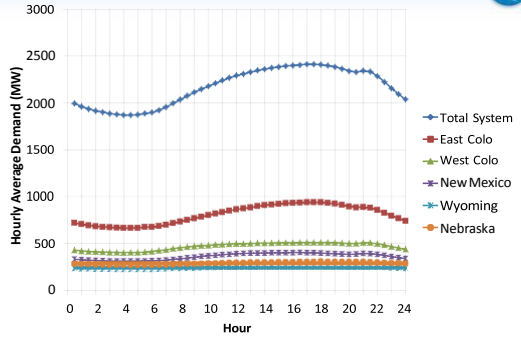
North American Industry Classification System

70	Pipeline Transportation
44	Oil and Gas Extraction
25	Mining (except Oil and Gas)
23	Utilities
16	Amusement, Gambling, and Recreation Industries
10	Machinery Manufacturing
8	Chemical Manufacturing
7	Educational Services
7	Nonmetallic Mineral Product Manufacturing
6	Justice, Public Order, and Safety Activities
5	Animal Production
5	General Merchandise Stores
	Wood Product Manufacturing
4	Accommodation
3	Miscellaneous Manufacturing
3	National Security and International Affairs
3	Primary Metal Manufacturing
2	Furniture and Related Product Manufacturing
2	Petroleum and Coal Products Manufacturing
2	Space Research and Technology
2	Support Activities for Agriculture and Forestry
2	Support Activities for Transportation
2	Warehousing and Storage
2	Wholesale Trade, Durable Goods
1	Administration of Environmental Quality Programs
1	Crop Production
1	Electrical Equipment, Appliance, and Component Manufacturing
1	Executive, Legislative, and Other General Government Support
1	Food Manufacturing
1	Insurance Carriers and Related Activities
1	Paper Manufacturing
1	Performing Arts, Spectator Sports, and Related Industries
	Religious, Grantmaking, Civic, Professional, and Similar
1	Organizations
1	Special Trade Contractors
1	Support Activities for Mining
1	Transportation Equipment Manufacturing
1	Waste Management and Remediation Services

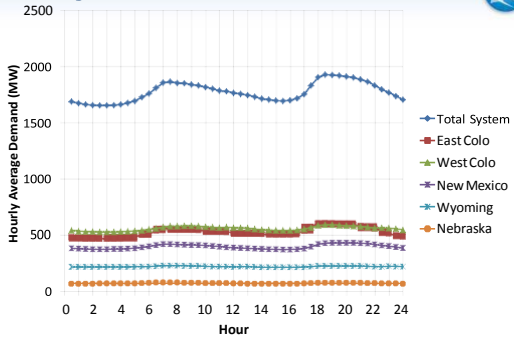
2013 Monthly Patterns in Annual Energy



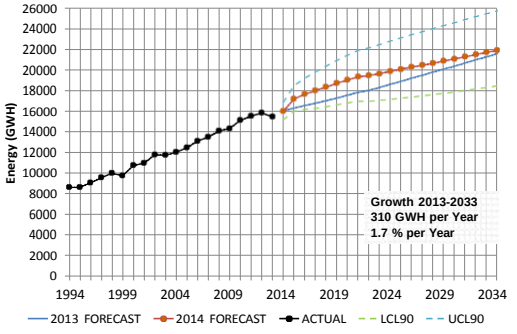
Hourly Patterns in July 2013 Demand



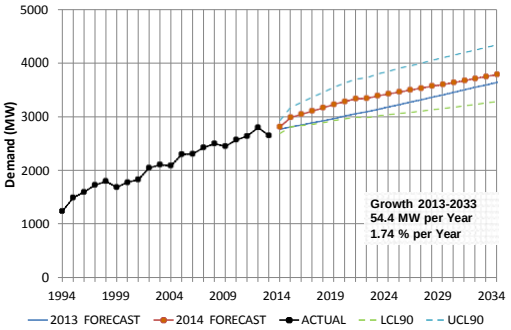
Hourly Patterns in Dec 2013 Demand



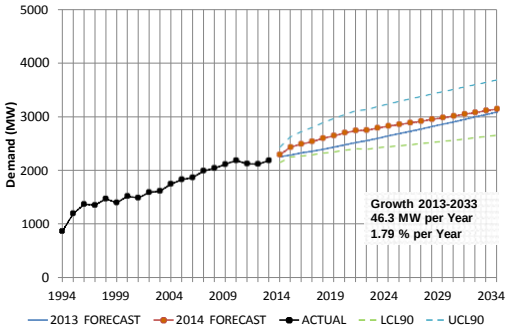
Annual Energy Forecasts Total Tri-State



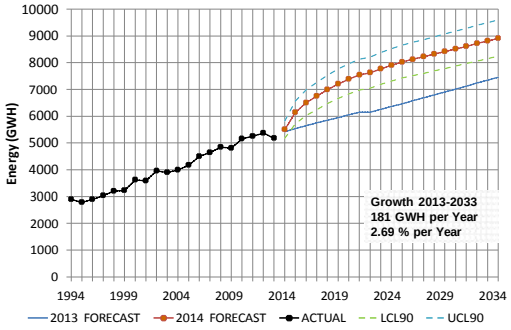
Summer Peak Demand Forecasts
Total Tri-State



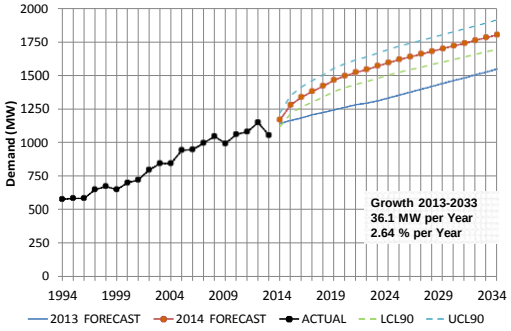
Winter Peak Demand Forecasts
Total Tri-State



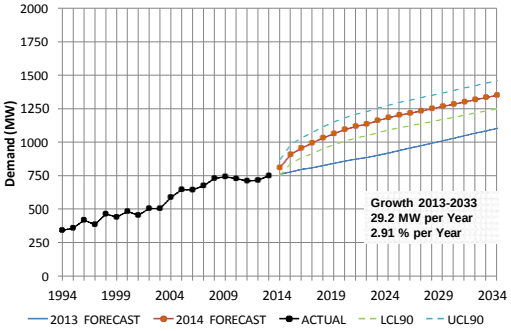
Annual Energy Forecasts
Eastern Colorado



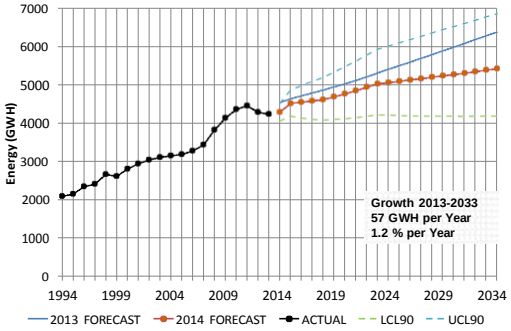
Summer Peak Demand Forecasts
Eastern Colorado



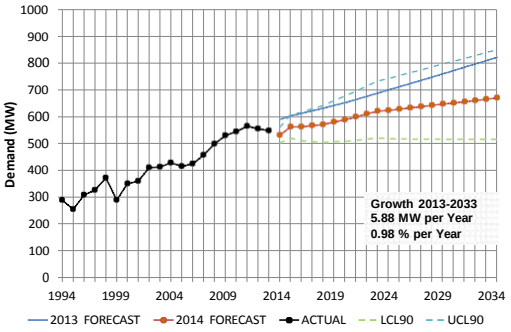
Winter Peak Demand Forecasts
Eastern Colorado



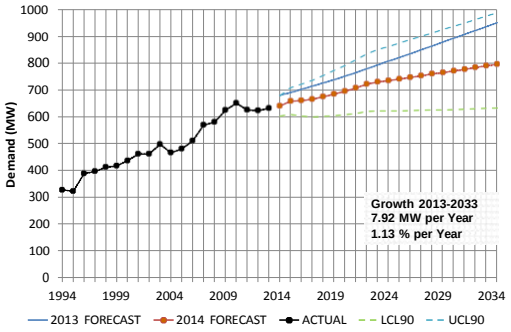
Annual Energy Forecasts
Western Colorado



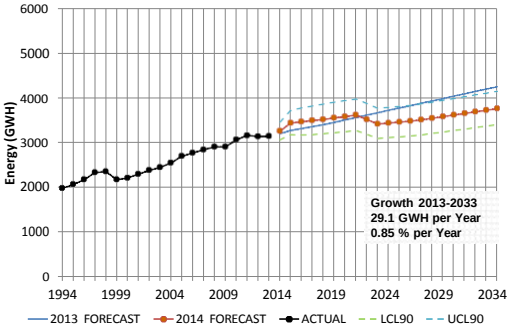
Summer Peak Demand Forecasts
Western Colorado



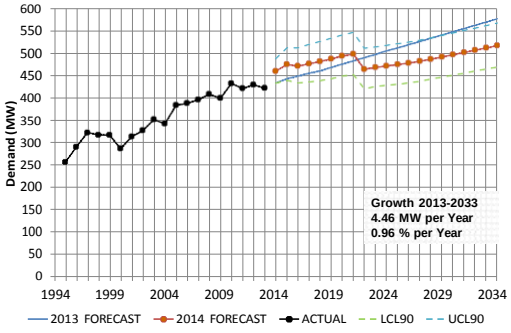
Winter Peak Demand Forecasts
Western Colorado



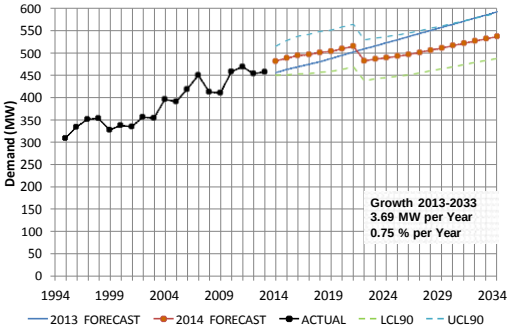
Annual Energy Forecasts
New Mexico



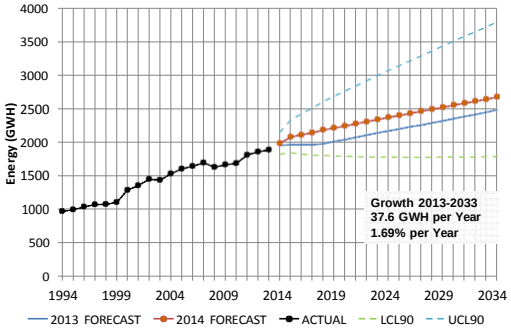
Summer Peak Demand Forecasts
New Mexico



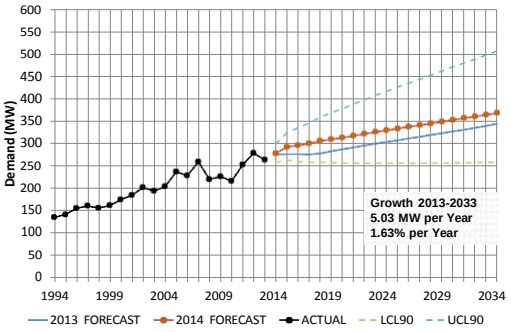
Winter Peak Demand Forecasts
New Mexico



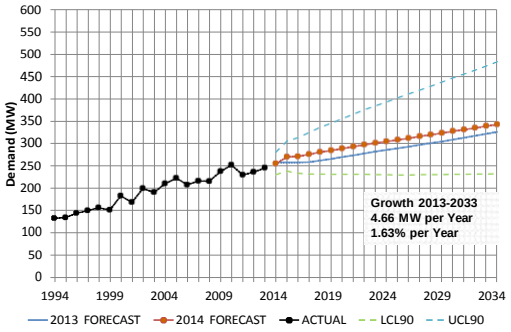
Annual Energy Forecasts
Wyoming



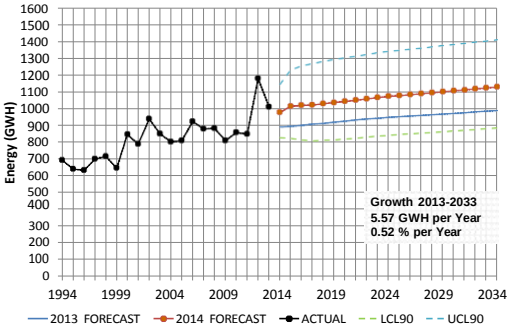
Summer Peak Demand Forecasts
Wyoming



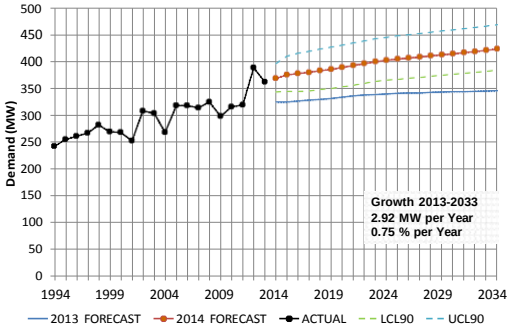
Winter Peak Demand Forecasts
Wyoming



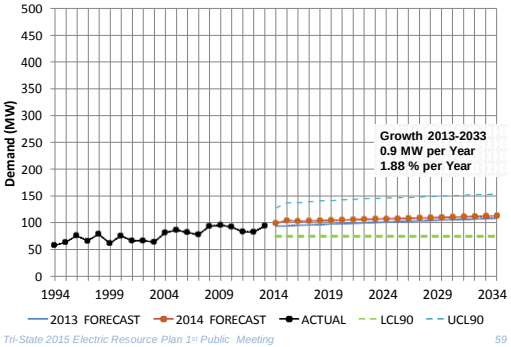
Annual Energy Forecasts
Nebraska



Summer Peak Demand Forecasts
Nebraska



Winter Peak Demand Forecasts
Nebraska



TRI-STATE G&T
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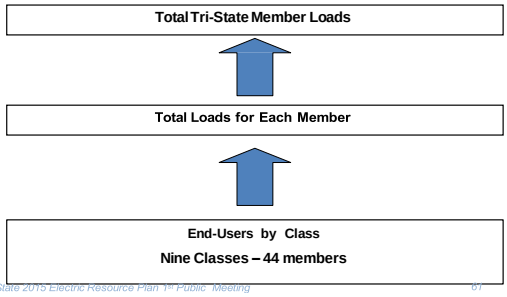
Methodology

Load Forecast Process

BOTTOM UP APPROACH: Annual Energy



Nine Classes

1. Residential
2. Seasonal
3. Irrigation
4. Small commercial
5. Large commercial
6. Public street and highway lighting
7. Other sales to public authorities
8. Sales for resale to RUS borrowers
9. Sales for resale to others

Load Forecast Process

End-Users by Class
Nine Classes – 44 members

- Number of accounts
- Energy sales
- revenues
- Individual large customer details
- Information about local activities by customers or Member demand response programs

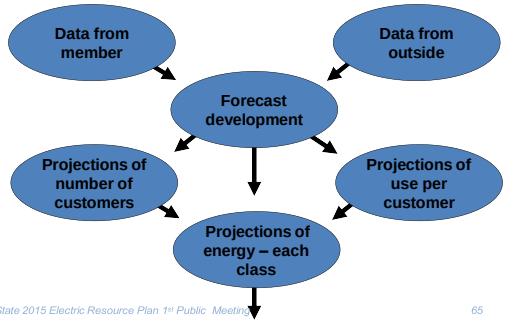
Load Forecast Process

End-Users by Class
Nine Classes – 44 members

- Weather
- Population
- Households
- Employment
- Income

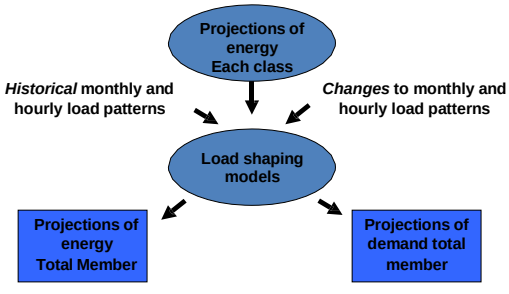
Load Forecast Process

End-users by Class
Nine classes – 44 members



Load Forecast Process

Total loads for each member



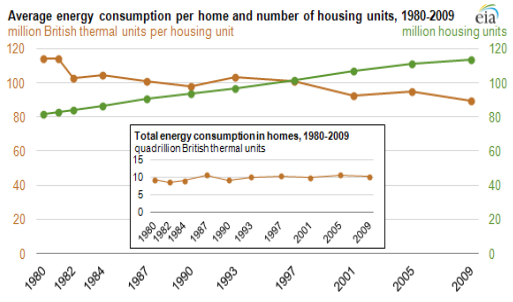
Resources Used to Develop the Load Forecast

- Member load data
  - Energy sales by class
  - Individual large accounts
  - Power bills from Tri-State (monthly load shape, load factor)
  - Hourly meter data (hourly load shape)
- Economic and demographic data
  - Woods and Poole, data by county
    - Employment by category
    - Population
    - Income
- Weather
  - DTN/Meterologix
- Alternative fuels
  - Department of Energy - Energy Information Administration

Model Approaches

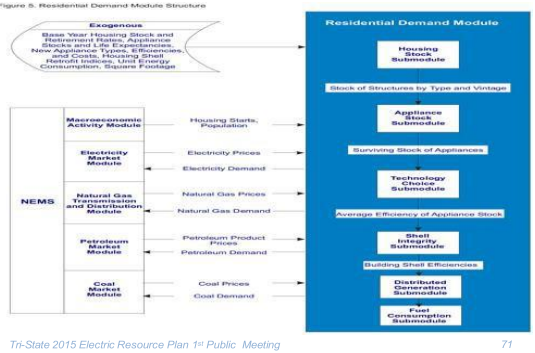
- Statistically adjusted end-use model – from NEMS (residential, seasonal)
  - *AvgUse = f (Xheat, Xcool, XOther)*
  - *Customers = f (HHolds, Population)*
  - *Residential Sales = Customers × AvgUse*
- Regression model (small commercial, others)
  - *AvgUse = f (Price, Inc, HHSize, CDD, HDD, Trend)*
  - *Customers = f (HHolds, Population)*
  - *Sales = Customers × AvgUse*
- Member/Customer input and time series (large commercial)
  - *Customers*
  - *Sales*

National Energy Modeling System

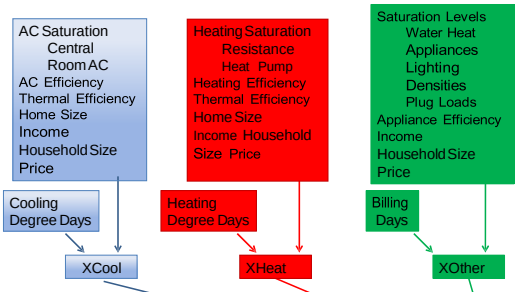


National Energy Modeling System

National Energy Modeling System

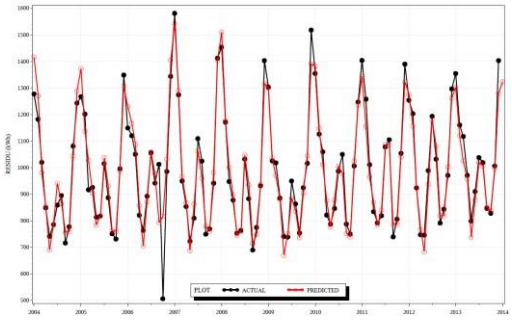


Statistically Adjusted End-Use Model (Residential)

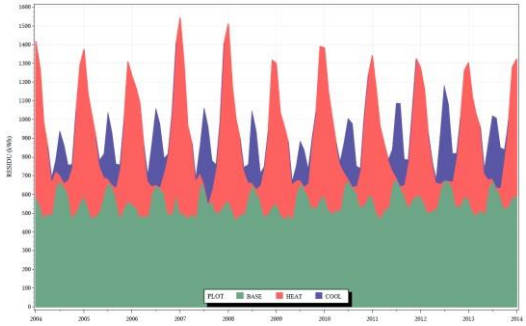


$$Use\ per\ Account_m = b_0 + b_1 \times XCool_m + b_2 \times XHeat_m + b_3 \times XOther_m$$

Statistically Adjusted End-Use Model
Model Performance

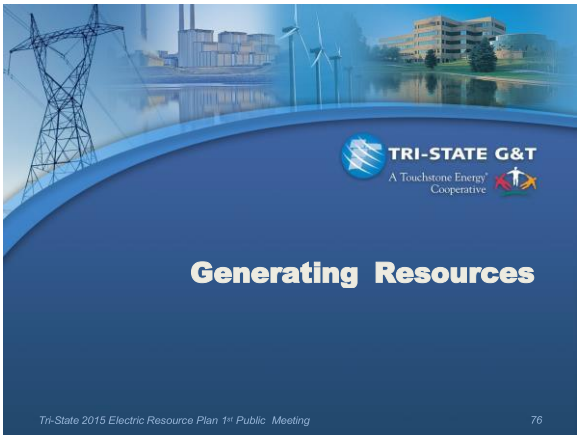


Statistically Adjusted End-Use Model
Model Performance



Tri-State Member Load Forecast Process

- This process provides a structure to determine each Member's future power needs
- It provides for information exchange between Members and Tri-State
- It provides Members and Tri-State with information to fulfill requirements of lenders



Tri-State Thermal Stack

Thermal Units	Summer Capacity (MW)	Winter Capacity (MW)
Craig 1	104	104
Craig 2	103	103
Craig 3	448	448
LRS 2	204	204
LRS 3	206	206
Nucla	100	100
PEGS	245	245
San Juan 3	40	40
Springerville 3	417	417
Total Coal	***1867***	***1867***
Brush Capacity Purchase	66	72
Burlington 1	50	60
Burlington 2	50	60
J.M. Shafer	272	272
Knutson 1	64	77
Knutson 2	64	77
Limon 1	64	77
Limon 2	64	77
Pyramid 1	40	40
Pyramid 2	40	40
Pyramid 3	40	40
Pyramid 4	40	40
Rifle	77	85
Total Gas	***931***	***1017***
Total Thermal Units	**2798**	**2884**

Laramie River Station

- Southern Wyoming
- Online: 1982
- 414 MW to Tri-State
- 1,710 MW total
  - Other Ownership
    - 723 MW: Basin Electric Power
    - 282 MW: Missouri Basin Municipal
    - 218 MW: Lincoln Electric System
    - 51 MW: Heartland Consumers Power
    - 22 MW: Wyoming Municipal Power

Laramie River Station

- Fuel Supply:
  - Subbituminous Coal
  - Powder River Basin, Wyoming
- Water Supply:
  - Laramie River
  - Grayrocks Reservoir
  - Well Water
- Heat Rate: 10,263 BTU/kWh
- Emission Controls
  - Electrostatic Precipitators
  - Scrubbers
  - Low NOx Burners

Craig Station

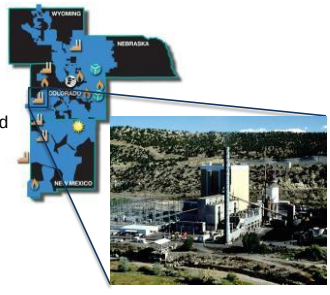
- Northwest Colorado
- Online: 1979 - 1984
- 653 MW to Tri-State
- 1,304 MW Total
  - Other Ownership
    - 248 MW: Salt River Project
    - 166 MW: PacifiCorp
    - 154 MW: Platte River Power Authority
    - 83 MW: PSCo

Craig Station

- Fuel Supply:
  - Subbituminous Coal
  - Trapper Mine, Colorado
  - ColoWyo Mine, Colorado
- Water Supply:
  - Yampa River
  - Elkhead and Yamcolo Reservoirs
- Heat Rate: 10,075 BTU/kWh
- Emission Controls
  - Fabric Filter Baghouse
  - Wet Scrubbers on Units 1&2
  - Dry Scrubbers on Unit 3
  - Low NOx Burners
  - Over-fire Air

Nucla Station

- Western Colorado
- Repowered in 1987
- 100 MW
  - 100% Tri-State Owned
- Circulating Fluidized-bed boiler



Nucla Station

- Fuel Supply:
  - Bituminous Coal
  - New Horizon Mine, Colorado
- Water Supply:
  - San Miguel River
  - Trout Lake
- Heat Rate: 12,413 BTU/kWh
- Emission Controls
  - Atmospheric Circulating Fluidized-bed Combustion for reduced SO_2 and NOx
  - Fabric Filter Baghouse
  - SNCR for NOx control

San Juan Station

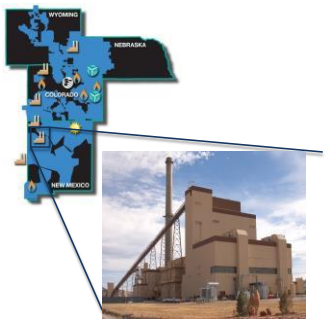
- Northwest New Mexico
- Online: 1973
- 41 MW to Tri-State (8.2% of Unit 3)
- 1,684 MW
  - Other Ownership
    - 783 MW: PNM
    - 340 MW: Tucson Electric Power
    - 208 MW: Southern California PPA
    - 146 MW: MSR Public Power
    - 50 MW: Anaheim
    - 43 MW: Farmington
    - 37 MW: Los Alamos
    - 36 MW: Utah Assoc. Muni Power

San Juan Station

- Fuel Supply:
  - Bituminous Coal
  - San Juan Coal Co., New Mexico
- Water Supply:
  - San Juan River
  - Navajo Reservoir
- Heat Rate: 10,796 BTU/kWh
- Emission Controls
  - Electrostatic Precipitators
  - Forced Limestone Oxidation System
  - Low NOx Burners

Escalante Station (PEGS)

- Western New Mexico
- Online: 1984
- 247 MW
  - 100% Tri-State Owned

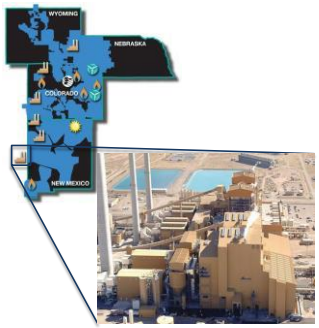


Escalante Station (PEGS)

- Fuel Supply:
  - Subbituminous Coal
  - Lee Ranch Mine, New Mexico
- Water Supply:
  - Well Water
- Heat Rate: 11,179 BTU/kWh
- Emission Controls
  - Fabric Filter Baghouse
  - Wet Scrubbers

Springerville Station

- Eastern Arizona
- Online: 2006
- 417 MW to Tri-State (100% of Unit 3)
- 1,609 MW
  - Ownership
    - 777 MW: Tucson Electric Power
    - 415 MW: Salt River Project



Springerville Station

- Fuel Supply:
  - Subbituminous Coal
  - Powder River Basin, Wyoming
- Water Supply:
  - Well Water
- Heat Rate: 10,275 BTU/kWh
- Emission Controls
  - Pulse Jet Baghouse
  - Selective Catalytic Reduction
  - Dry Flue Gas Desulfurization
  - Low NOx Burners

J.M. Shafer Station

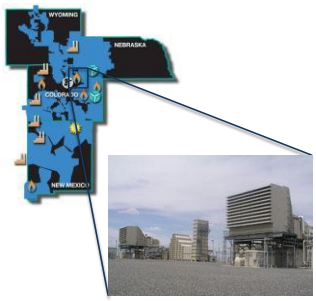
- Eastern Colorado
- Online: 1994
- 272 MW
  - 5 x 34.8 MW CT's
  - 2 x 49 MW ST's
  - 100% Tri-State Owned

J.M. Shafer Station

- Fuel Supply
  - Natural Gas
  - CIG Pipeline
- Heat Rate: 9,660 BTU/kWh
- Emission Controls
  - Enhanced Steam Injection

Knutson Station

- Eastern Colorado
- Online: 2001-2002
- 140 MW
  - 2 x 70 MW CT's
  - 100% Tri-State Owned



Knutson Station

- Fuel Supply:
  - Natural Gas
  - CIG Pipeline
  - Fuel Oil Backup
- Water Supply:
  - On-site well water
- Heat Rate: 11,303 BTU/kWh
- Emission Controls
  - Dry Low NOx Combustion
  - Water Injection
  - Catalytic Oxidation for Carbon Monoxide Emissions

Rifle Station

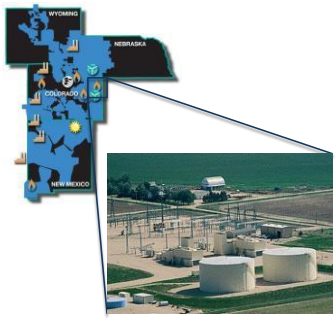
- Western Colorado
- Online: 1986
- 85 MW
  - 3 x 15 MW CT's
  - 1 x 40 MW ST
  - 100% Tri-State Owned

Rifle Station

- Gas Supply:
  - Natural Gas
  - Questar Pipeline
- Water Supply:
  - City of Rifle
- Heat Rate: 6,690 BTU/kWh
- Emissions Controls:
  - Low NOx burners
  - Compliant with federal and state laws

Burlington Station

- Eastern Colorado
- Online: 1977
- 100 MW
  - 2 x 50 MW CT's
  - Fuel: No. 2 Diesel
  - 100% Tri-State Owned

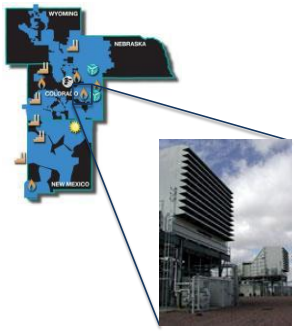


Burlington Station

- Fuel Supply:
  - No. 2 Diesel fuel
- Heat Rate: 11,075 BTU/kWh
- Emissions Controls:
  - Compliant with federal and state laws

Limon Station

- Eastern Colorado
- Online: 2001-2002
- 140 MW
  - 2 x 70 MW CT's
  - 100% Tri-State Owned



Limon Station

- Fuel Supply:
  - CIG Pipeline
  - Fuel Oil Backup
- Water Supply:
  - City of Limon
- Heat Rate: 12,121 BTU/kWh
- Emission Controls
  - Dry Low NOx Combustion
  - Water Injection
  - Catalytic Oxidation for Carbon Monoxide Emissions

Pyramid Station

- Southwestern New Mexico
- Online: 2003
- 160 MW
  - 4 x 40 MW CT's
  - 100% Tri-State Owned

Pyramid Station

- Fuel Supply:
  - Kinder Morgan Pipeline
  - Fuel Oil Backup
- Water Supply:
  - On-site wells
- Heat Rate: 10,133 BTU/kWh
- Emission Controls
  - Enhanced Steam Injection

Small Hydro Contracts

- Tri-County Ridgway Reservoir 8MW
  - Terminates 9/30/2024
- Vallecito 5.6MW
  - Terminates 6/24/2024
- Mancos Water Conservancy .26 MW
  - Terminates 2/8/2035
- Williams Fork 3.6 MW
  - Terminates 1/1/2017
- Boulder Canyon Hydro 5 MW
  - Terminates 6/7/2018
- Garland Hydro 2.9 MW
  - Terminates 12/31/2024

Western Area Power Administration

- Colorado River Storage Projects – 2014 Allocations
  - Eastern Colorado: 149 MW Summer
    130 MW Winter
  - NW Colorado: 14 MW Summer
    22 MW Winter
  - New Mexico: 71 MW Summer
    99 MW Winter

Total: 234 MW Summer
251 MW Winter

Western Area Power Administration

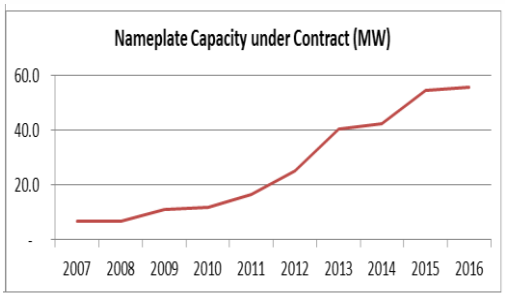
- Loveland Area Projects – 2014 Allocations
  - Eastern Colorado: 187 MW Summer
    164 MW Winter
  - Nebraska: 80 MW Summer
    50 MW Winter
  - Wyoming: 82 MW Summer
    71 MW Winter

Total: 349 MW Summer
285 MW Winter

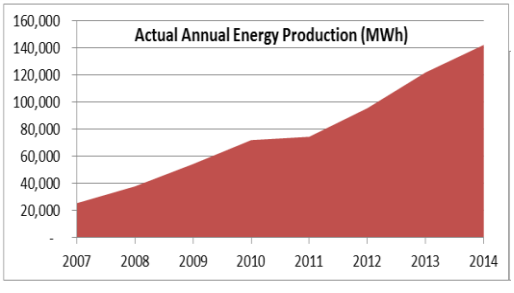
Member Distributed Generation

- 46 Distributed Generation projects operational or under development by Tri-State Members.
- Approx. 56MW of Distributed Generation
- Tri-State subsidizes through REC premiums

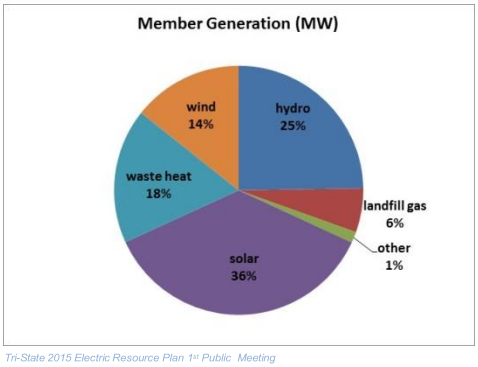
Member Distributed Generation



Member Distributed Generation

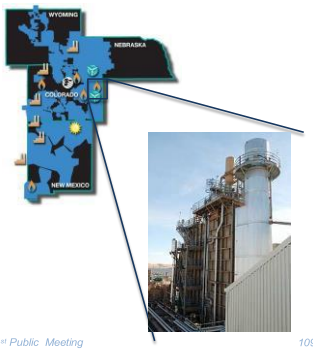


Member Distributed Generation



Brush Station Power Purchase

- 72 MW PPA
  - Expires 12/31/2019
  - Tolling Contract
- 292 MW
  - 4 x 25MW CT's
  - 1 x 32 MW CT
  - 1 x 30 MW ST
  - 1 x 40 MW ST
  - 1 x 90 MW ST

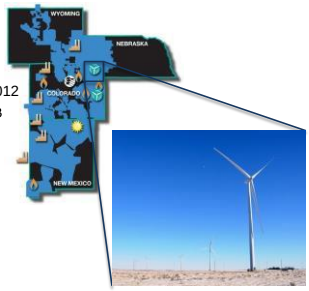


Basin Electric Coop

- Basin provides approximately 300 MW for Nebraska member load
  - Terminates 12/31/2050
- Basin provides 236 MW for Colorado and Wyoming member loads
  - Terminates 12/30/2050

Colorado Highlands Wind

- 91 MW PPA
  - Began operation in:
    - Phase 1: December 2012
    - Phase 2: October 2013
  - Expires 1/1/2032
- Capacity Factors
  - 2013: 46%
  - 2014: 46%



Kit Carson Wind

- 51 MW PPA
  - Began Operation in December 2010
  - Expires 1/1/2031
- Capacity Factors
  - 2011: 41%
  - 2012: 45%
  - 2013: 41%
  - 2014: 43%

Unit Contingent Contract Sales

Capacity	Counter Party	Units	Termination
25 MW	Public Service Co. of Colorado	LRS/Craig	3/31/2016
140 MW	Public Service Co. of Colorado	Knutson Unit 1&2	4/30/2016
70 MW	Public Service Co. of Colorado	Limon Unit 1	4/30/2016
100 MW	Public Service Co. of Colorado	LRS/Craig	3/31/2017
122 MW	Public Service Co. of Colorado	JM Shafer	6/30/2019
25 MW	Pacificorp.	LRS/Craig	12/31/2020
100 MW	Salt River Project	Springerville Unit 3	8/1/2036

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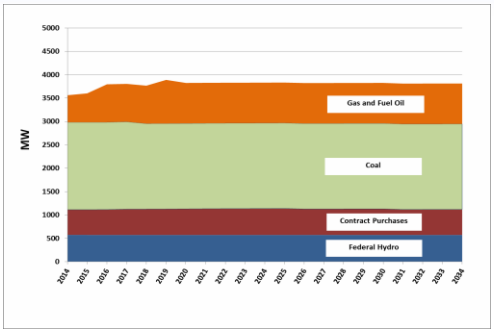
Loads and Resources

F. Michael Salva, PE
Energy Resources and Analytics Manager

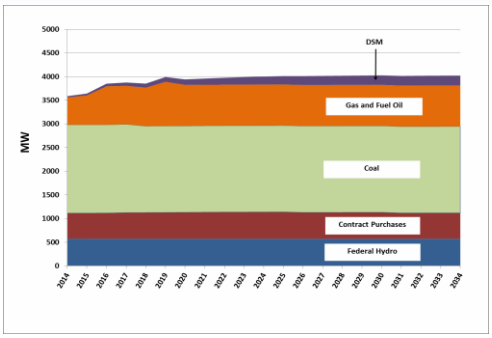
20-Year Load and Resource Balance Base Case

- Summer Peak Hour – Median Forecast from 2104
- Contracts expire on their terms except WAPA hydro
- San Juan 3 retirement at end of 2017
- 5% capacity credit for wind
- 22% capacity credit for solar
- 15% Planning Reserves –includes operating reserves

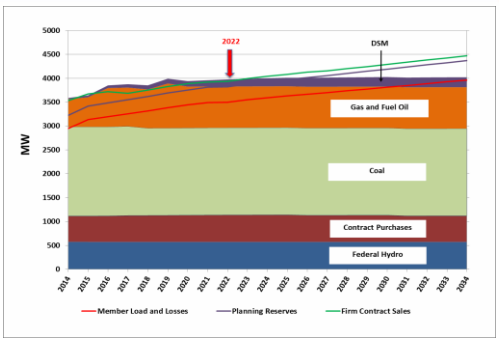
Tri-State Resource Stack



Tri-State Resource Stack with DSM/EE



Tri-State Load and Resource Balance - 2014



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Product & Services Update

Myles Jensen
Senior Manager, Member Relations

Demand Response (DR) & Energy Shaping (ES) Products

- Demand Response (DR) managed by Tri-State
  - Reduce load during times of high cost and operational need
- Energy Shaping (ES) managed by Member Systems
  - Encouraging beneficial scheduling of energy use

DR & ES Products – 4 Groups

- **Group #1: Residential / Small Commercial**
  - Electric Thermal Storage (ETS) Energy Shaping (ES) – 3 options
  - Water Heater Demand Response (DR)
  - Water Heater Energy Shaping (ES)
  - Air Conditioning / Air Source Heat Pump Demand Response (DR)
  - Time-of-Day
- **Group #2: Irrigation**
  - Irrigation Demand Response (DR) Zone 1
  - Irrigation Demand Response (DR) Zone 2
  - Irrigation Energy Shaping (ES) Zone 1 & 2

DR & ES Products – 4 Groups (cont.)

- **Group #3: Large Commercial / Industrial (C&I)**
  - Member System Choice Demand Response
    - Can be Large C&I, Residential, Small Commercial, or Irrigation load. The type and amount is managed by Member Systems.
  - Large C&I ETS Energy Shaping (ES)
  - Large C&I Demand Response (DR) – 2 options
    - 1 hour notice; 6 hour notice
  - Coordinated Production Program
  - Large C&I Take-or-Pay – 2 Options
  - Time-of-Day
- **Group #4: Other products**
  - Distributed Generation Harvesting (DG-H)

2014 DR & ES Products Statistics

- 2014 Demand Response and Energy Shaping Products
  - Current Enrollment of 224 MW
    - Group 1 Res. & Sm Commercial – 115 MW
    - Group 2 Irrigation – 96 MW
    - Group 3 Large C & I – 13 MW
    - 93.5 MW of Energy Shaping Products
    - 127 MW of Demand Response Products
    - 3.5 MW of Performance Products
  - Development and refinement of products is a continual process
  - More products may be developed
  - Modifications to Terms and Conditions may be needed to some products

Energy Efficiency Program (EEP)

- The Program started in 1985
  - Primarily for load switching from diesel to electric motors for irrigation. Then added electric water heaters
- Changes over time based upon regulation, legislation, Tri-State and Member System goals and objectives
- In 2000, TS Board created the Conservation Load Management and Renewable Resource Policy 100

Energy Efficiency Products 2013 Results

Category	Typical Measures	kW Savings	kWh Savings
Agricultural	Irrigation Motors Variable Speed Drive Retrofits	9,135	15,224,873
C&I HVAC	Ground-Source Heat Pumps	4,131	4,781,034
C&I Lighting	Commercial Lighting Retrofits LED New Constructions Street, Parking Lot, and Area Lighting Refrigerated Case Doors Variable Speed Drive Retrofits	11,617	31,863,730
Res Heating / Cooling	Heat Pumps and Air-Conditioners Electrical Thermal Storage	63,633	65,867,045
Residential - Other	LED Lamps Energy Star Large Appliances Heat Pump and Regular Water Heaters Low Income Weatherization	56,284	17,874,628
Total		**144,800**	**135,611,310**

Energy Efficiency Products 2014 Results

Category	Typical Measures	Kw Savings	kWh Savings
Agricultural	Irrigation Motors Variable Speed Drive Retrofits	12,102	20,172,427
C&I HVAC	Ground-Source Heat Pumps	4,131	4,781,034
C&I Lighting	Commercial Lighting Retrofits LED New Construction Street, Parking Lot and Area Lighting Refrigerated Case Doors	7,985	26,775,314
C&I Motors	Variable Speed Drive Retrofits	2,265	5,503,918
Residential HVAC	Heat Pumps and Air-Conditioning Electric Thermal Storage	62,895	59,133,512
Residential - Other	LED Lamps, Energy Star Appliances Heat Pump and Regular Water Heate rs Low Income Weatherization	41,307	17,952,139
Total		**130,685**	**134,318,344**

EEP Summary

- Tri-State Board Policy promoting Conservation, Load Management and Renewable Resources
- Reviewed annually for potential changes
- Promote new technologies
- Promote wise use of electricity
- Help the Member Systems promote the same ideals to their Member-Owners
- Regulations / RPS, etc.
- Saving energy

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Transmission Update

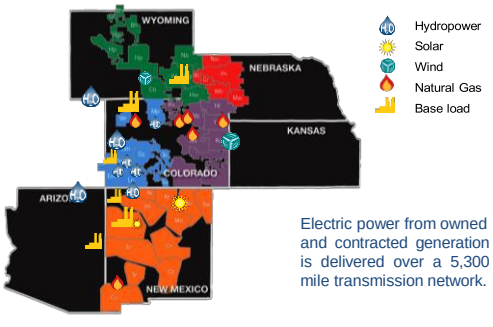
Mark Stout, PE
Planning Studies and Interconnection Manager

Transmission System Overview

- Transmission Resources
- Transmission Objectives
- Open Access
- Transmission Limits and Constraints

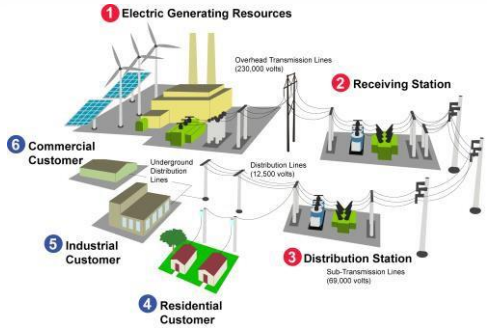
Tri-State Service Area

Resource Delivery



Electric power from owned and contracted generation is delivered over a 5,300 mile transmission network.

Resource Delivery



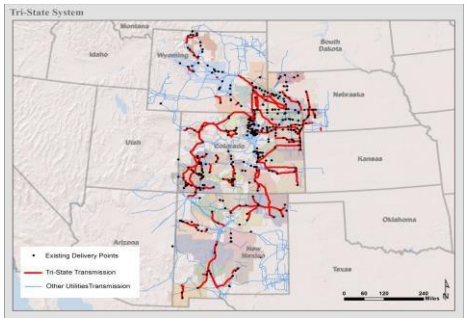
Resource Delivery

- Tri-State Energy Management performs the merchant or wholesale power function for Tri-State and is responsible for power sales to Tri-State Members under the terms of the Wholesale Electric Service Contracts with the Members.
- Tri-State System Operations performs the transmission function for Tri-State and sells transmission services to Tri-State Energy Management under the terms of Tri-State's tariff.
- Power delivery at retail for use by end-users is provided by Tri-State Member systems.

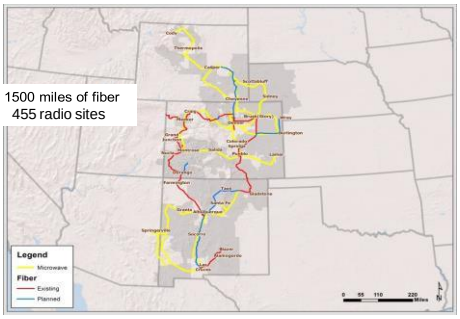
Transmission Resources

- 5,396 miles of transmission in which Tri-State has an ownership or capacity interest:
  - 1220 miles - 345 kV
  - 1001 miles - 230 kV
  - 184 miles - 138 kV
  - 2942 miles - 115 kV
  - 49 miles - 69 kV
- Over 220 bulk system substations
- David A. Hamil DC Tie at Stegall, NE
- Extensive high-speed communications system of fiber optics and microwave links for operation and control of the transmission system.

Transmission System



Telecommunications System



Transmission Objectives

Transmission Objectives

1. Provide *Transmission Service* to all network customers.
2. Provide *Reliable Service* under NERC/WECC Reliability Standards.
3. Provide *Low Cost Service* to Member owners.
4. Provide *Access* to other stakeholders for the efficient utilization and development of the transmission system.

Transmission Service

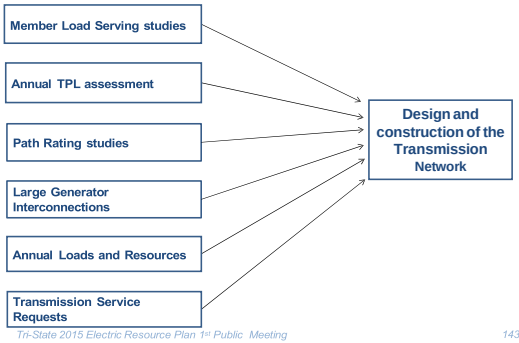
- Ensuring delivery of wholesale power and energy to Member systems consistent with the Wholesale Electric Service Contracts.
- Planning transmission additions consistent with all FERC 890 principles for coordinated, open and transparent planning.

Transmission Service

- Arranging transmission service, as necessary, from other Transmission Providers (or multiple providers) such as Western, Xcel, PNM, etc.
- Planning adequate lead-times for design, permitting and construction.

Note: Transmission service is separate from Interconnection service.

Transmission Service

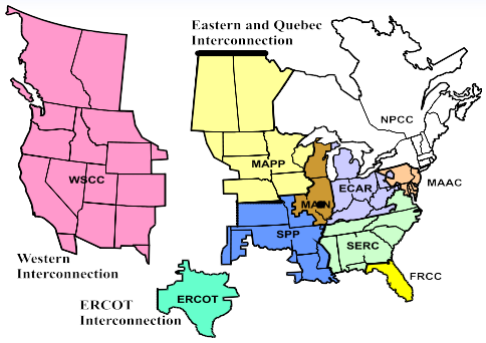


Transmission Planning

- Tri-State participates with other transmission providers in regional transmission planning and coordinates its planning with other stakeholders in the Western Interconnection.

CCPG
SWAT
WECC
WEST CONNECT

Reliable Service



Reliable Service

- Requiring an evaluation of transmission system performance for all new facilities and their connections to the transmission system.
- Assuring compliance with all NERC/WECC Reliability Standards and applicable regional, sub-regional, Power Pool, and system planning criteria.

Reliable Service

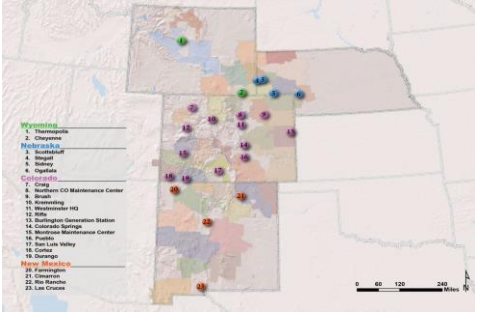
System studies are performed to:

1. Determine steady-state electrical performance of the system during system normal and N-1 conditions.
2. Identify thermal overloads and voltage criteria violations.
3. Analyze inadequately damped response to system disturbances.
4. Test the performance of proposed network upgrades.

Reliable Service

- Tri-State's planning criteria is published in its Engineering Standards Bulletin – *Criteria for System Planning and Service Standards*.
- The Engineering Standards Bulletin includes facility rating methodologies, standards applying to steady-state and transient analysis and criteria for power quality concerns, such as harmonics and voltage unbalance.

Transmission Maintenance Facilities



Transmission Line Maintenance

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Low Cost Service

Low Cost Service

- By applying the "single-entity" goal of least possible total annual cost.
- By assessing lower cost alternatives to transmission.
- By properly assigning ownership, operation, maintenance and compliance responsibilities.

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Open Access

Open Access

- Tri-State is a transmitting utility subject to Section 211 of the Federal Power Act as amended by the Energy Policy Acts of 1992 and 1995.
- As such, Tri-State is committed to providing open and non-discriminatory access to the transmission facilities under its control.
- Tri-State's planning process permits all interested parties to participate and provide input to and comment on Tri-State's transmission plans.

Generation Interconnections

- Applications are to be submitted during a request window: either January-February or July-August.
- Requests for interconnection are subject to the terms and conditions of the Large Generator Interconnection Procedures (LGIP) of Tri-State's Tariff.
- Customer can view and download application requirements from Tri-State's Tariff as posted at the OASIS site http://www.oatioasis.com/tsgt.

Transmission Limits and Constraints

1. System Design Constraints
2. Policy Constraints
3. Regulatory Constraints
4. Operational Constraints

Transmission Limits and Constraints

1. System Design Constraints:

Steady-State conditions – system normal
- Thermal loading limits
- Operating voltage criteria
- Power factor requirements

Transient conditions – caused by lightning strikes, faults, motor starting and switching.
- Clearing times for faults
- Maximum voltage deviations

Transmission Limits and Constraints

System Design Constraints continued:

Transient conditions
- Utilizing reactive power adjustments
- Automatic voltage control
- Assuring stable generator unit operation
- Analyzing transient voltages (voltage stability)
- Providing positive damping (system frequency)

Transmission Limits and Constraints

System Design Constraints continued:

- Existing system designed and built for load-serving not generation export.
- Non-contiguous system with multiple Transmission Providers involved.

Transmission Limits and Constraints

2. Policy Constraints:

Tri-State Board of Directors Policies
- Financial ratios (e.g., operating margins)
- Transmission extension policy
- Transmission underground policy

Renewable Portfolio Standards
- Multiple states

FERC 890 rules – standards of conduct

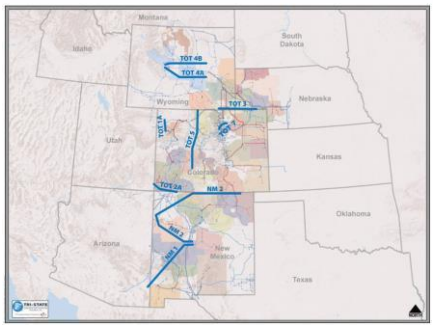
Transmission Limits and Constraints

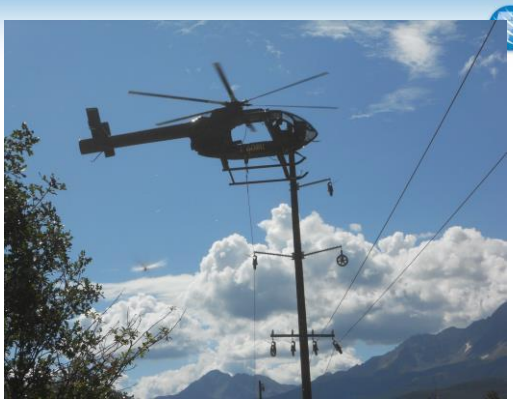
3. Regulatory Constraints:
   - Reliability Compliance
   - Environmental reviews and siting permits
   - Electromagnetic fields (EMF)
   - Audible Noise

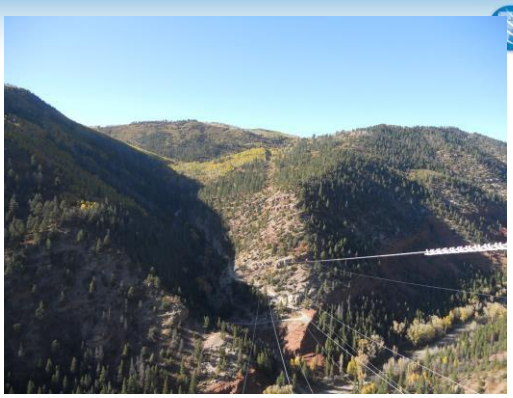
Transmission Limits and Constraints

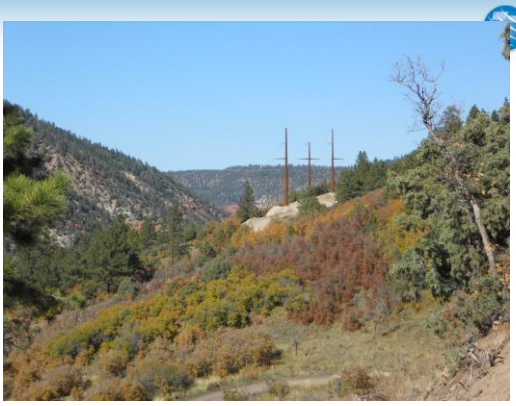
4. Operational Constraints:
   - System Operating Limits for peak and off-peak conditions
   - Interconnection Reliability Operating Limits
   - Integration of renewable resources
   - WECC rated TOT paths

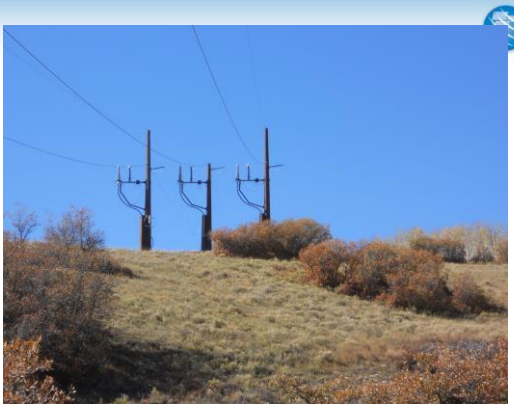
Transmission Limits and Constraints

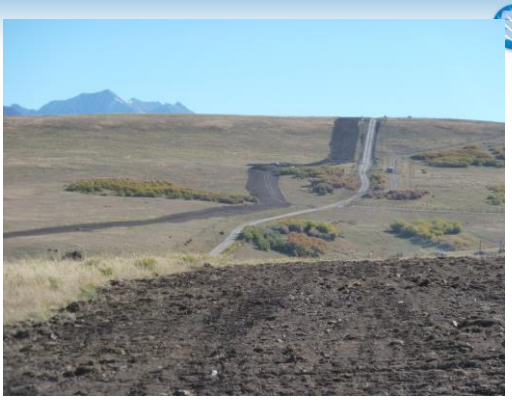








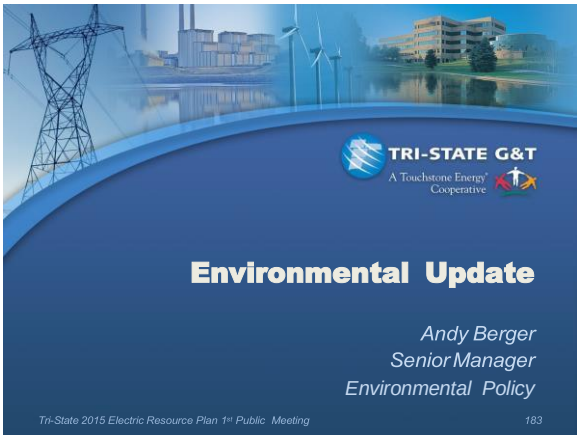




For More Information

- www.tristategt.org/
- About Us
  - Transmission Planning

- www.tristategt.org/
- Operations
  - OATT Queues and Studies



Environmental Update

Andy Berger
Senior Manager
Environmental Policy

Clean Power Plan

- Regulates greenhouse gases (carbon dioxide)
- Proposed June 18, 2014
- Clean Air Act Section 111(d) for existing units
- Comments submitted December 1, 2014
- Rule goes into effect in 2020 with significant interim goals and compliance deadline of 2030
- National average of 30% reduction from 2005 levels, by 2030
- EPA received more than 3.8 million comments
- Concerns expressed by reliability organizations and 30 states

MACT/MATS

- Maximum Achievable Control Technology/Mercury and Air Toxics (MACT/MATS) rule
- Various compliance planning activities for Tri-State electric generating units, including compliance extensions
- Supreme Court granted petition to hear issue of cost on March 25, 2015

Regional Haze

- Initial round of State Implementation Plans complete
- Legal actions in some states ongoing
- Various requirements on Tri-State electric generating units
- Progress reports and next State Implementation Plans in coming years

Ozone

- EPA proposed to make the ozone standard more stringent
- Proposed range is 65-70 parts per billion (ppb)
- EPA accepting comments about 60-75 ppb
- Significant debate on the concentration that protects high-risk groups and the environment with an adequate margin of safety
  - Clear scientific evidence that the current standard protects public health
  - Great deal of uncertainty in the studies that EPA uses as a basis to lower the standard
- Comments due March 17, 2015

Recent Generation Resource Additions

- **Colorado Highlands Wind**
- 67.2MW Wind PPA – 42, 1.6MW Turbines
- Located in Northeast Colorado in Tri-State's Service Territory
- 20 Year PPA
- Online December 2012

Recent Generation Resource Additions

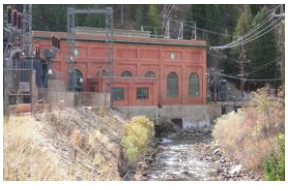
- **Colorado Highlands Wind Expansion**
- Additional 24MWs; 14, 1.7MW GE Turbines
- Located in Northeast Colorado near Sterling, CO in Tri-State's Service Territory
- 20 Year PPA
- Online September 2013
- **Total Colorado Highlands Wind Project – 91MWs**

Recent Generation Resource Additions

- **J.M. Shafer Station** (Formerly Ft. Lupton)
- Tri-State Purchased Thermo Cogeneration Partnership in Dec. 2011
- 150MW PPA through 2019
- 122MW PPA with PSCo through 2019
- July 1, 2019 Tri-State will get the Full Plant Output – 272MW
- 5x2 Combined Cycle Natural Gas

Recent Generation Resource Additions

- **Boulder Canyon**
- 5MW Hydro
- 5 Year PPA
- Started June 2013



Recent Generation Resource Additions

- **Tri-County/Ridgway Reservoir**
- 8MW Hydro
- 10 Year PPA
- Started 2013

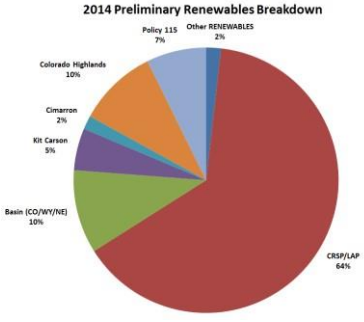
Recent Generation Resource Additions

- **Garland Canal Hydroelectric Project** near Garland, WY in Tri-State's Service Territory
- 2.9MW Hydro
- 10 Year PPA
- Started 2015

Recent Generation Resource Additions

- **Carousel Wind Farm**
- 150 MW (88 GE 1.7 MW xle WTGs)
- 25 year PPA with NextEra Energy
- Construction expected to begin in 2015
- Commercial Operation projected to occur in 2016
- Commercial Operation Dependent on the energization of the Burlington-Wray 230kV line

Renewable Generation – Preliminary 2014 YTD



Renewable Generation RFP

- RFP was issued in October 2014
- Currently negotiating power purchase agreements
- Transmission remains an issue in implementing new large-scale renewable projects
- Integration of intermittent projects presents challenges.

Recent Member Distributed Generation

- 4 Community Solar Gardens in or around Durango, CO
- 1.5MW Storie Lake Solar Project
- 500kW Community Solar Farm
- 320kW Pandora Hydro – Town of Telluride Water Treatment Facility

Resource Planning Objectives

- Adequacy / Reliability
  - Capacity and energy
  - Renewable Portfolio Standards
- Low Cost
- Minimize Risks
  - Exposure to Price Volatility
  - Carbon Risk
- On-time, right location, robust

Nature of the Load Obligation

- Member Load
  - Wholesale Electric Service Contract
  - "…provide a constant and uninterrupted supply of electric service…"
- Member option to self-supply 5%
  - Small but growing distributed generation fleet
  - Incentives for renewable generation
- Firm / Contingent sales to counterparties

Resource Planning Modeling

- Tools
  - Expansion planning
  - Production cost model
  - Economic modeling
- Inputs
  - Load forecast
  - Existing and candidate resources
  - Commodity prices
  - Contracts
  - Transmission effects
  - Reserves
  - Renewable Portfolio Standards

Modeling Process

Standard Methods:

- Accepted models – Ventyx Planning Analytics and Risk Assessment software
- Accepted methods
- Present Value of Revenue Requirements (PVRR)

System Optimizer (SO)

- Ventyx system expansion model
- Creates optimized expansion plan
  - Capacity Planning Margin
  - Emissions
  - Present Value of Revenue Requirements (PVRR)
- Mixed Integer Linear Processing model
- No market interaction for expansion planning
  - Energy
  - Capacity
  - Renewable Energy Credits (RECs)

Planning and Risk (PaR)

- Ventyx economic dispatch model
- In use for 20+ years
- Deterministic or stochastic based simulation model (ProSym)
  - Hourly dispatch
  - Includes market effects
- Open energy markets for dispatch forecasting

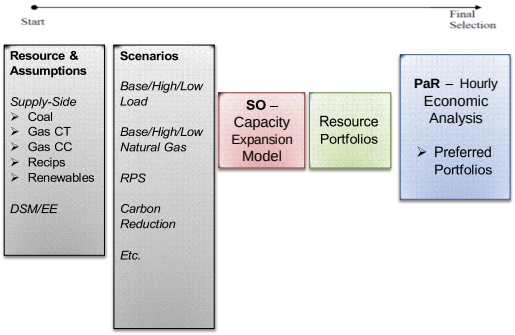
Resource Planning Modeling

- System Optimizer (SO)
- Planning and Risk (PaR)
  - ProSym
- Long Range Economic Forecast (LREF)

Long Range Economic Forecast

- Proprietary rate forecasting system
- In use for more than 25 years
- Utilizes corporate–wide financial model

Modeling and Analysis Process Flow Diagram



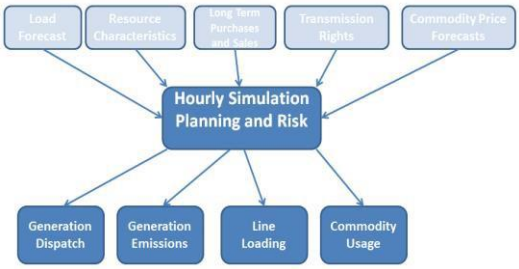
Inputs to Hourly Chronological Production Cost Model

Inputs to Hourly Chronological Production Cost Model

Resource Characteristics

- Dispatch
  - Heat Rate
  - Start-up Cost
  - Minimum Up Time
  - Minimum Down Time
  - Forced Outage Rate
  - Scheduled Outages
  - Variable O&M
  - Emissions
- Expansion
  - All Dispatch Characteristics
  - Capital Costs
  - Annual Fixed Costs
  - Potential Resources
  - First Year Available
  - Book Life
  - Portfolio Requirements

Outputs to Hourly Chronological Production Cost Model



Inputs and Outputs to Hourly Chronological Production Cost Model

Continuous Improvement

- Tri-State Continually Updates and Improves Assumptions for:
  - Market Prices
  - Member Loads
  - Capital Costs
  - Transmission Constraints
  - Unit Characteristics
  - Potential Resource Additions
  - Operating Reserves

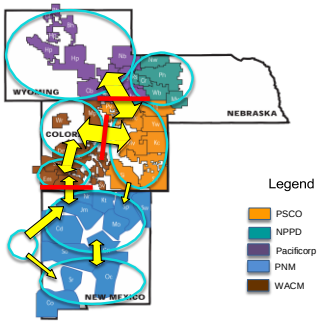
Potential Resources

- New resources will be used to more closely match the EPRI Technical Assessment Guide
  - Combined Cycle Gas
  - Simple Cycle Gas
  - Reciprocating Gas Engines
  - Coal with and without Carbon Capture
  - Advanced Nuclear
  - More Solar, Wind and Geothermal Technologies
- Indicative Pricing can be Found in EPRI's Publicly Available *"Program on Technology Innovation: Integrated Generation Technology Options Report"*

Tri-State Modeling Challenges

- 5+ Balancing Authorities
- Transmission constraints are significant
- Firm purchase and sale complexities
- Intermittent Resource Integration Cost
- Market interactions
  - Dispatch to Market vs. Dispatch to Load
  - Energy
  - Capacity
  - RECs
- Operating Reserves

Tri-State Modeling Challenges



Resource Scenario Modeling

- Possible Scenarios for 2015 ERP/IRP
  - Business as Usual
    - No carbon regulation, Compliance RPS, Traditional DSM, Limited markets
  - Business as Usual – High Load
  - Business as Usual – Low Load
  - Business Default
    - Carbon regulation, DSM, Limited markets
  - Business Default plus additional renewables
  - Public Input Scenario #1
  - Public Input Scenario #2
  - Public Input Scenario #3
  - Carbon Reduction Plan

Public Input and Questions?

- Comments and questions regarding resource plan or process:
  - e-mail: **ResourcePlanning@tristategt.org**
- Contacts
  - F. Michael Salva
    - (303)254-3755
    - msalva@tristategt.org
  - Sarah Carlisle
    - (303)254-3396
    - scarlisle@tristategt.org

Questions?

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A Touchstone Energy Cooperative

TRI-STATE G&T
A Touchstone Energy Cooperative

2015 Electric Resource Plan
2nd Public Meeting

May 1st, 2015

Introduction and Housekeeping

- **WELCOME to Tri-State**
  - Keep to schedule
  - Cell phones on silent
  - Location of facilities
  - Webcast
  - Use microphone for questions
  - One person speaking at a time
  - Questions

Today's Agenda

- 2015 ERP/IRP Timeline
- Overview of Planning Process
- Commodity Price Update (Power/Natural Gas/Coal)
- Load Forecast Update
- Resource Selection Update
  - Eligible resources
  - Capital costs/Heat rates
- Scenario Update
  - Business As Usual w/ Base Load and RPS renewables
  - Business As Usual w/ High Load and RPS renewables
  - Business As Usual w/ Low Load and RPS renewables
- Future Scenario Development Discussion
- Public Input
  - WRA
  - Leslie Glustrom
- Open Session
- Tri-State Summary
- Questions?

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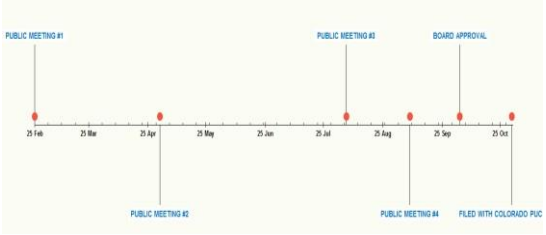
Tri-State 2015 ERP/IRP Timeline

2015 ERP/IRP Timeline



WAPA IRP deadline is Feb. 2016

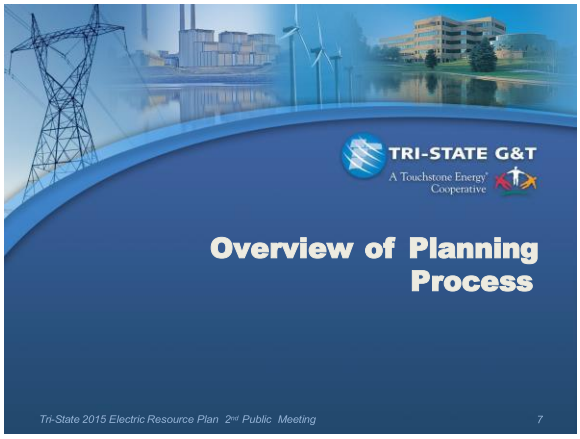
Planned Public Meeting Schedule

3rd Meeting: Thurs., Aug. 6 9 a.m. - Noon

Tri-State will present the results of additional scenarios modeling. Public input is welcome to provide suggestions for additional scenarios. Additional (post Aug. 6) public comments must be submitted via email or in written form.

4th Meeting: Tues., Sept. 8 9 a.m. - Noon

Tri-State will present the draft results of its evaluation and the various resource scenarios it modeled during the public participation process. Tri-State will discuss the components of the draft action plan.



Resource Planning Objectives

- Adequacy / Reliability
  - Capacity and energy
  - Renewable Portfolio Standards
- Low Cost
- Minimizes exposure to commodity price volatility
- 100% Environmental and Regulatory compliance
- On-time, right location, robust

Overview of Planning Process

- 20-Year Planning Period
- 6-Year Resource Acquisition Period
- All contracts expire on their terms except WAPA hydro
- No retirements except for SJ3 in 2017
- 15% Planning Reserves

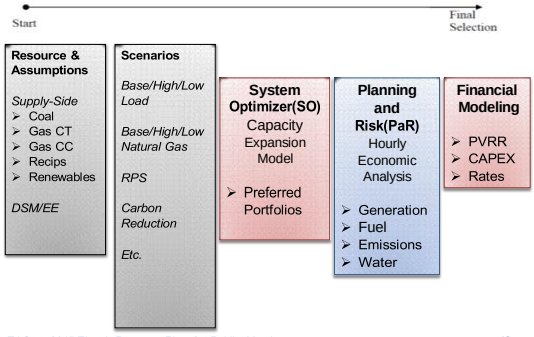
Overview of Planning Process

- First -- Forecast member load
- Second -- Assess current resources available to meet member load
- Third -- Determine resource need
- Fourth -- Assess available generic resource options, including demand side, to fill need
- Fifth -- Financial modeling of alternative expansion scenarios
- Sixth – Financial and operational results of alternative expansion scenarios

Overview of Planning Process

- Key Inputs
  - Load forecast
  - Existing and candidate resources
  - Retirements
  - Commodity prices
  - Long-term contracts
  - Transmission effects and congestion
  - Reserve requirements
  - Renewable Portfolio Standards

Overview of Planning Process



Continuous Improvement

- Tri-State Continually Updates and Improves Assumptions for:
  - Market Prices
  - Member Loads
  - Capital Costs
  - Transmission Effects
  - Unit Characteristics
  - Candidate Resources
  - Operating Reserves

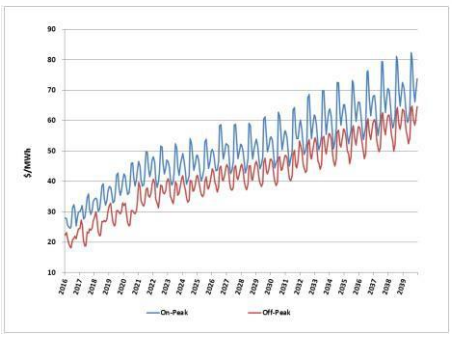
Commodity Pricing Methodology

- Liquid forward markets (years 1-3)
- Short-Term/Long-Term Blend (years 4-6)
- Long-Term Fundamental Pricing (years > 6)

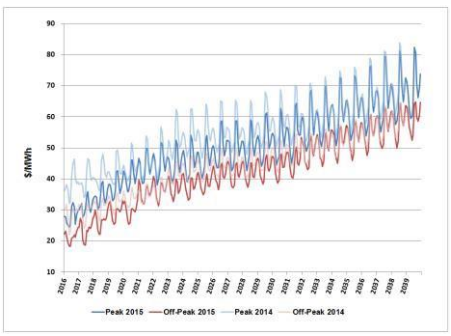
Electricity Price Assumptions

- For years 2015-2017, PV quotes were obtained from Bloomberg as of March 10th.
- Basis obtained from WoodMcKenzie and Ventyx are then applied to the PV prices to yield the CO East, CO West and New Mexico prices for 2015-2017.
- The "blended" prices are derived by taking various percentages of CO East, CO West and NM forward prices.
- CO East, CO West and NM prices for years 2018-2020 were calculated by smoothing the transition from market pricing to fundamental pricing in latter years.
- CO East, CO West and NM prices for 2021-2039 are a blend of published WoodMcKenzie and Ventyx electricity price forecasts from their Fall Updates.

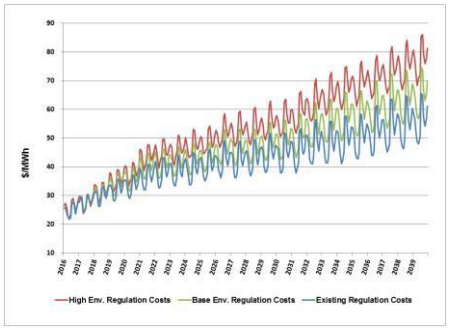
2015 Electricity Price Forecast



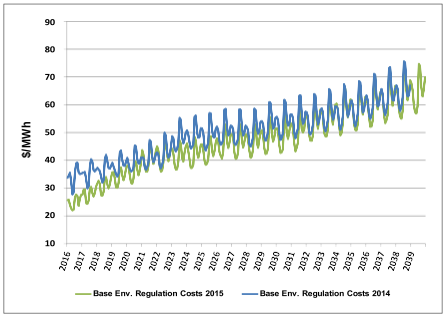
2014 vs 2015 Electricity Price Forecast



2015 Electricity Price Forecast w/ Carbon Scenarios



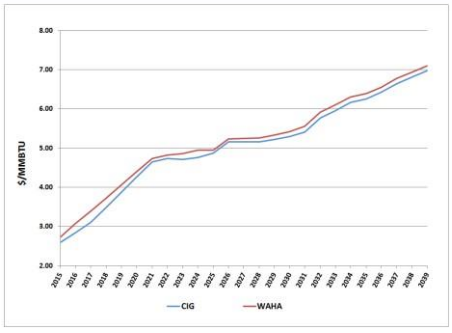
2014 vs 2015 Electricity Price Forecast w/ Base Carbon Scenario



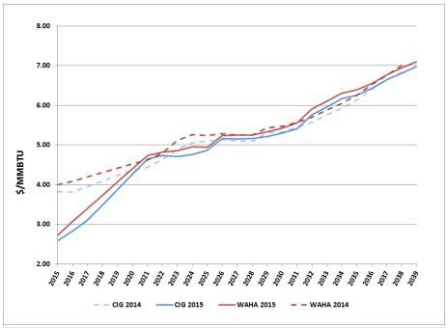
Natural Gas Price Assumptions

- For years 2015-2017, actual forward NYMEX HH prices as of March 10th were obtained.
- CIG and WAHA basis quotes for 2015-2017 were obtained as of Match 10th and applied to NYMEX HH prices.
- CIG and WAHA prices for years 2018-2020 were calculated by smoothing the transition from market pricing to fundamental pricing in latter years.
- Natural gas prices for 2021-2039 are a blend of published WoodMcKenzie and Ventyx natural gas price forecasts from their Fall Updates.

2015 Natural Gas Price Forecast



2014 vs 2015 Natural Gas Price Forecast



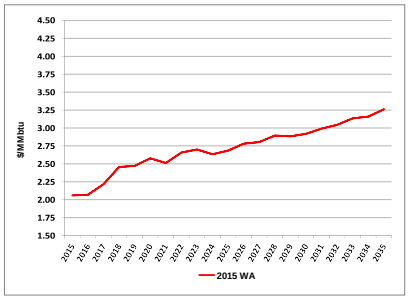
Coal Price Assumptions

- For Craig and Nucla coal prices are based on the estimated production costs for Coloywo, Trapper and New Horizon mines which Tri-State owns through subsidiaries.
- Coal prices for all other plants are based on long-terms contracts that have been executed with various coal producers, and spot coal purchases at forecasted market price.
- Weighted-average coal price is obtained by taking the coal burn by plant and multiplying it by the delivered coal price and then dividing by the total coal burn.
- Weighted-average coal costs are forecasted to drop from $2.098/MMBtu in 2014 to $2.017/MMBtu in 2015 ($2014 dollars).

Historical Weighted Average Coal Costs

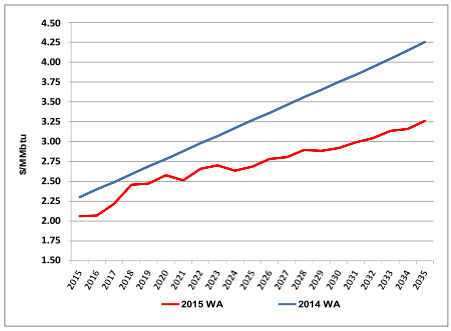
19 year average increase – 4.3%

2015 Weighted Average Coal Cost Forecast

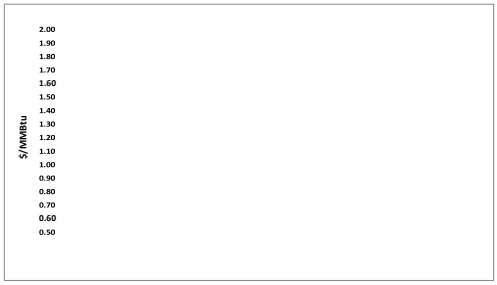


20 year forecasted average increase – 2.3%

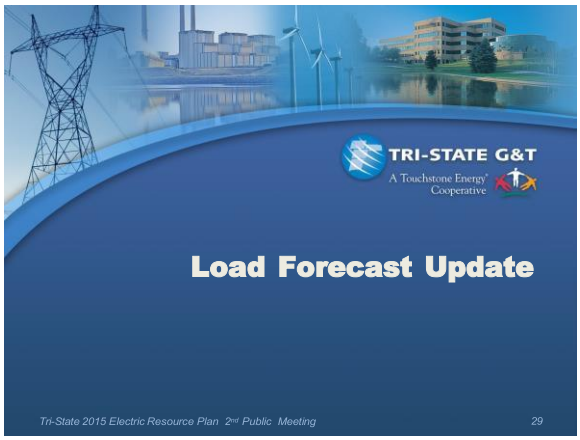
2014 vs 2015 Weighted Average Coal Cost Forecast



Ventyx and WoodMac PRB8800 Basin Coal Price Forecast – Fall 2014



20 year forecasted average increase – 3.0%



Load Forecast Update

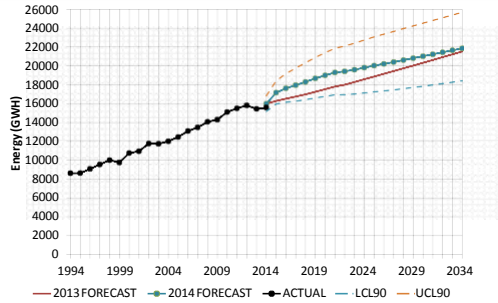
Load Forecast Assumptions

- Using the 2014 load forecast as the 2015 forecast will not be completed until June.
- Tri-State is a summer peaking system (2014 summer peak was 2813 MW).
- Tri-State uses a bottom up approach for load forecasting. First predict load forecast for each of 44 members and then aggregate for total Tri-State load forecast. This process provides a structure to determine each Member's future power needs.
- 2014 Load Forecast results in projected average load growth of 1.7% per year for 2014-2034 (314 GWH/yr).
- Historical average load growth for past 10 years is 355 GWH/yr.
- Monthly (i.e. seasonal) and hourly load patterns and based on historical load data.
- DSM/EE forecast is backed out as a separate resource in System Optimizer (SO).

Load Forecast Assumptions

- Average Load Growth Rate
  - Low Economic Growth 149 GWH/year
  - Base Economic Growth 310 GWH/year
  - High Economic Growth 511 GWH/year
- DSM Level
  - 15.5 MW over the peak in Summer 2015 and growing over time

Annual Energy Forecasts Total Tri-State



Resource Selection Update

Eligible Resources

- Subcritical Pulverized Coal
- Supercritical Pulverized Coal
- Ultra-Supercritical Pulverized Coal
- Integrated Gasification Combined Cycle (IGCC)
- Circulating Fluidized Bed Boiler
- Nuclear (LWRs not SMR)
- Aeroderivative Peaking
- Heavy Frame Gas Turbine
- Combined Cycle (1X1 and 2x1)
- Reciprocating Engine
- Renewables (wind, solar, biomass, landfill gas, etc.)

Coal and Nuclear Candidate Resources

Technology	Size (MW)	Heat Rate (Btu/kWh)	Capital Costs ($/kW)
Subcritical PC	300	10000	3100
Subcritical PC	600	9600	2400
Supercritical PC	600	9400	2400
Supercritical PC	900	9200	2100
Ultra-Supercritical PC	900	9000	2100
IGCC 2x2x1	500	9100	3500
Circulating Fluidized Bed	300	10000	3200
Circulating Fluidized Bed	600	9800	2500
Subcritical PC w/ CSS	800	10000	4200
Nuclear	1100	10000	5300

Natural Gas Candidate Resources

Technology	Size (MW)	Heat Rate (Btu/kWh)	Capital Costs ($/kW)
1x1 7FA CC	244	6700	1200
2x1 7FA CC	488	6700	1000
4x0 Aeroderivative	362	8900	1500
8x0 Aeroderivative	320	9200	1400
4x0 Heavy Frame	292	11700	1300
Reciprocating Engines	100-200	8800	1000

Renewable Candidate Resources

Technology	Size (MW)	Capital Costs ($/kW)
Biomass	35	5200
Land Fill Gas	5	3000
Wind	50-100	1900
Solar Trough (3 hr storage)	100	5000
Solar Trough (6 hr storage)	100	5597
Solar MC Si PV(Single Axis)	10	2758
Solar PC Si PV (Fixed Tilt)	10	2310

Scenario Modeling

- Modeling is a complex exercise and provides necessary insight into alternative future situations.
- Modeling can inform future decision-making, but is not dispositive.
- Business decisions can be based on information and policies that are not evident in resource planning models.
- A primary goal is to establish a viable and credible modeling process.
- Models are based on best available information – they are still snapshots and subject to change.

Scenario Modeling

- Tri-State uses information for modeling from credible commercial firms and research organizations – Ventyx, WoodMac, Black & Veatch, EPRI, NREL, etc.
- Transmission expansion plans and costs are provided by Tri-State's transmission organization.
- Attempt to model coherent and pragmatic scenarios and boundary cases.
- Modeling untenable or incredible boundary cases or alternative scenarios is not worthwhile.
- Modeling is an iterative process.

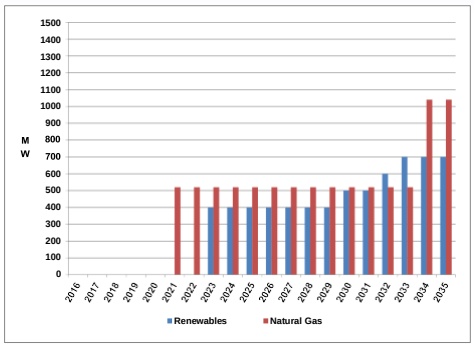
Scenario Update

- For this 2nd public meeting we analyzed three(3) Business As Usual (BAU) scenarios;
  - BAU - Base Load
  - BAU - High Load
  - BAU - Low Load
- BAU represents the current commodity and resource landscape and is consistent with how Tri-State develops its annual budget
- Compliance RPS (20% in CO, 10% in NM)
- Historical DSM
- Open Markets

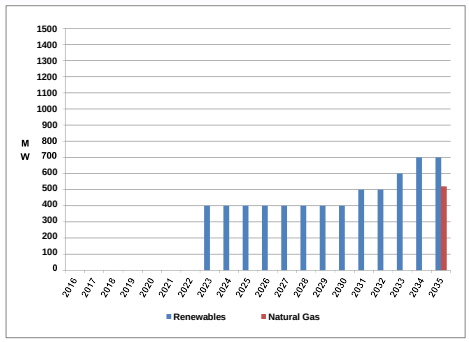
BAU Scenarios

Scenario Attributes and Assumptions			
Scenario	BAU	High Load	Low Load
Growth Rate	Median	High	Low
DSM level	Base		
Electric price	Median		
Gas price	Median		
Coal Price	Median		
RPS level	Compliance		
Renew. Integration Cost	$5		
Carbon Cost Adder start 2015 escalating 5% /year	$0		
Plant lives	40 years		
Planning and Op. Reserves	15%		

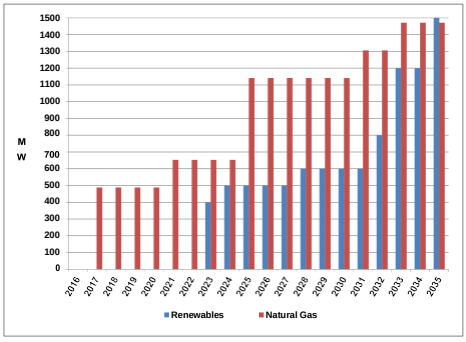
BAU Base – Generation by Fuel Type



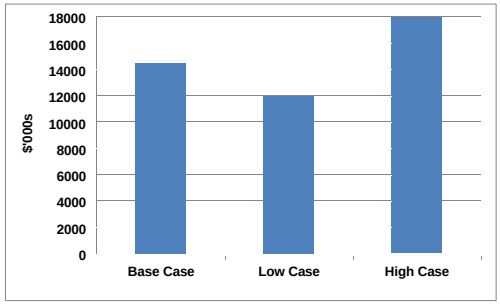
BAU Low – Generation by Fuel Type



BAU High – Generation by Fuel Type



BAU Scenario PVRRs (Generation Only)



Future Scenario Development

- Designed alternate scenarios to accomplish;
  - Bracketing or bookending possible outcomes
  - Provide details regarding likely outcomes
  - Evaluate sensitivities
  - Satisfy requests of participants

Future Scenario Development

- Possible Scenarios for 2015 ERP/IRP
  - Business As Usual (Base/High/Low)
    - *No carbon regulation, Compliance RPS, Historical DSM, Limited markets*
  - Business Default Scenario (BDS)
    - *Carbon regulation, Max DSM, Limited markets*
  - BDS plus additional renewables
  - BDS plus carbon reduction plan
  - Public Input Scenarios

2010 Scenarios

- BAU (Base/High/Low)
- BDS - *$20/MT CO2, Low DSM level, Closed Sales Market*
- BDS plus 20% RPS
- BDS plus High DSM
- BDS - Moderate DSM (50%)
- BDS plus Low/High Commodity Prices
- BDS - GEO Climate Action Plan With Limited Wind
- BDS - Forced Addition of Renewable Resource
- WRA Base Case
- High Carbon Cost (Use WRA's Carbon Cost Curve)
- WRA Base Case with Max DSM
- WRA Base Case with Max DSM and High CO2
- Governor's Energy Office Climate Action Plan

2010 Scenario Assumptions

- BDS Scenario Assumptions
  - $20/metric ton CO_2
  - Low DSM level
  - 10%/20% RPS
  - High commodity prices
  - Governor's Climate Action Plan
- WRA Scenario Assumptions
  - Higher CO2 costs ($18 in 2013 escalating at 6.5%)
  - Lower natural gas prices
  - Lower capital costs
  - 20% RPS
  - DSM

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Open Discussion for Scenario Development

Future Scenario Development

- Possible Scenarios for 2015 ERP/IRP
  - Business As Usual (Base/High/Low)
    - *No carbon regulation, Compliance RPS, Historical DSM, Limited markets*
  - Business Default Scenario (BDS)
    - *Carbon regulation, Max DSM, Limited markets*
  - BDS plus additional renewables
  - BDS plus carbon reduction plan
  - Public Input Scenarios

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Public Input

Public Input

- WRA
- Leslie Glustrom

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Tri-State Summary

Next Steps

- Document all inputs and questions
- Complete BDS modeling based on input from public participants
- At Aug. 6 meeting, present results from completed BDS runs
- At Sept. 8th meeting, present complete results of a;; scenarios and draft of Electric Resource Plan Filing for public review and comment

Public Input and Questions?

- Comments and questions regarding resource plan or process:
  - e-mail: **ResourcePlanning@tristategt.org**
- Contacts
  - F. Michael Salva
    - (303)254-3755
    - msalva@tristategt.org
  - Sarah Carlisle
    - (303)254-3396
    - scarlisle@tristategt.org

Questions?

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2015 Electric Resource Plan 3rd Public Meeting

August 6, 2015

Introduction and Housekeeping

- **WELCOME to Tri-State**
  - Keep to schedule
  - Cell phones on silent
  - Location of facilities
  - Webcast
  - Use microphone for questions
  - One person speaking at a time
  - Questions

Today's Agenda

- 2015 ERP/IRP Timeline
- Modeling Issues
- 2015 ERP Scenario Results
  - 100MW Coal Retirement Case
  - 300MW Coal Retirement Case
  - High EE/DSM Case
  - PTC/ITC Extension with Low Cost Renewables Case
  - High Commodity Prices and High Load Case
  - High Behind the Meter DG with Energy Storage Case
- Transmission Cost Update
- Participant Feedback
- Tri-State Summary
- Questions?

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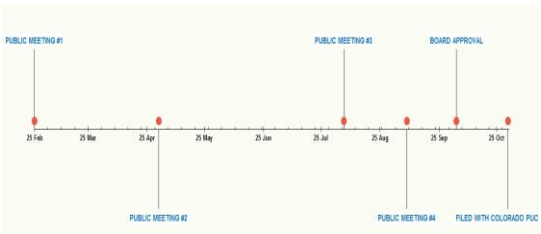
Tri-State 2015 ERP/IRP Timeline

2015 ERP/IRP Timeline

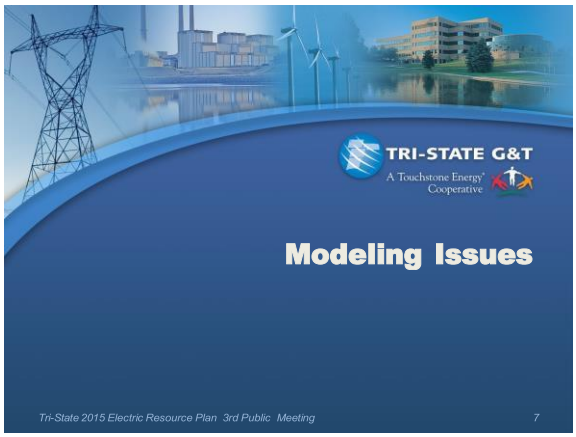


WAPA IRP deadline is Feb. 2016

Planned Public Meeting Schedule

4th Meeting: Tues., Sept. 8 9 a.m. - Noon

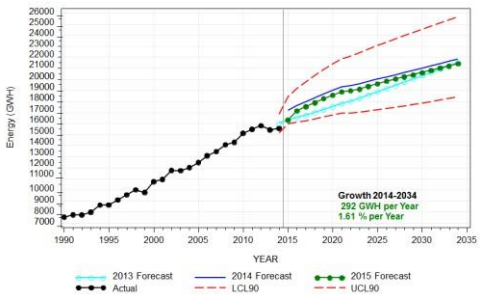
Tri-State will present the final results of its evaluation and the various resource scenarios it modeled during the public participation process. Tri-State will discuss the components of the draft action plan.



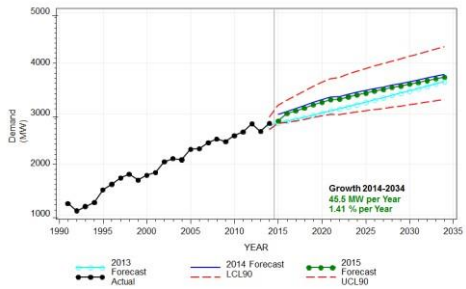
Modeling Issues

- Load Forecast
- Coal Retirements
- Intermittent Resource Integration
- Rooftop Solar and Battery Storage Scenario

2015 Load Forecast – Annual Energy



2015 Load Forecast – Summer Peak Demand



Coal Unit Retirement Analysis

- Modeled in System Optimizer
- $350/KW decommissioning costs
- Replacement Resources: Wind and Gas
  - More Expensive CapEx and Operating Costs
- Unlikely to be selected in the absence of other effects
- Future CapEx for Coal
  - Planned, approved projects
- Joint-Owned Unit Effects
- Actual retirement decisions based on detailed, case-specific information – San Juan 3 example

Intermittent Resource Integration

- Scenario economics favor wind over solar
- Scenarios show the addition of 700 to 1300 MW of additional wind
- Existing models provide hourly detail and likely will mask sub-hourly ramping constraints
- Ramping problems may be addressed by market structures and/or technology

Rooftop Solar and Battery Storage Scenario Assumptions

- Assumed 20% of Tri-State's retail customers (approx. 90,000) leave the system and go off-grid with rooftop solar and battery storage
- The CAPEX of implementing this retail option was assumed to not be borne by Tri-State, so overall customer costs are not captured in the analysis
- No Tri-State standby obligation

Scenario Modeling

- Modeling is a complex exercise and provides necessary insight into alternative future situations.
- Modeling can inform future decision-making, but is not dispositive.
- Business decisions can be based on information and policies that are not evident in resource planning models.
- A primary goal is to establish a viable and credible modeling process.
- Models are based on best available information – they are still snapshots and subject to change.
- Modeling untenable or incredible boundary cases or alternative scenarios is not worthwhile.
- Modeling is an iterative process.

Scenario Update

- Previously we modeled three(3) BAU scenarios;
  - BAU Base Case
  - BAU Low Load Case
  - BAU High Load Case
- Have updated these scenarios to include transmission CAPEX

Scenario Update

- For this 3rd public meeting we analyzed an additional six(6) scenarios;
  - 100MW Coal Retirement
  - 300MW Coal Retirement
  - High EE/DSM
  - PTC/ITC Extension with Low Cost Renewables
  - High Commodity Prices and High Load
  - Behind the Meter Solar DG with Energy Storage

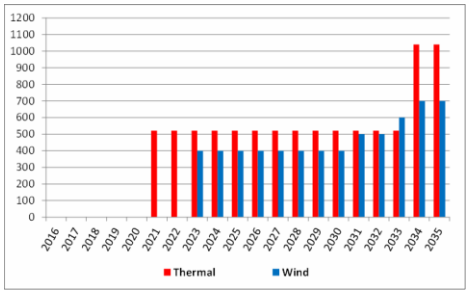
Scenario Update

- These additional six(6) scenarios adequately "bookend" various resource, commodity price and strategic uncertainties Tri-State faces going forward;
  - Future coal retirements due to various new environmental costs
  - Higher EE and lower per household energy intensity
  - Lower cost renewables with the PTC/ITC extensions
  - High commodity prices
  - Residential customers leaving the grid with solar DG and battery storage

BAU Scenarios

- BAU represents the current commodity and resource landscape
- 2014 load forecast
- San Juan 3 retiring Dec. 2017
- Compliance RPS (20% in CO, 10% in NM)
- Historical EE/DSM
- Open Markets
- Updated coal and natural gas prices
- Updated TAGWeb Capex values
- Transmission costs;
  - BAU Base - $1.154B
  - BAU High - $1.765B
  - BAU Low - $1.065B

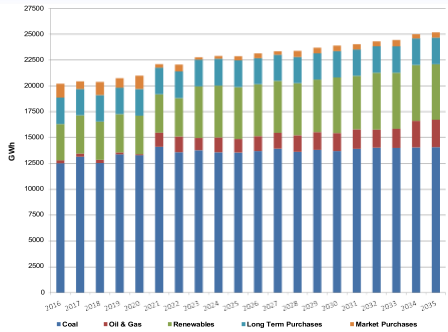
BAU Base – Generation by Fuel Type



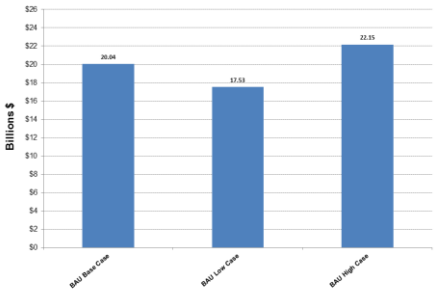
BAU Base Scenario

- 700MW of wind (600MW in ECO and 100MW in WY)
- 1040MW of thermal (520MW 2x1 CC in 2021 and 2034)

BAU Base Generation by Fuel Type



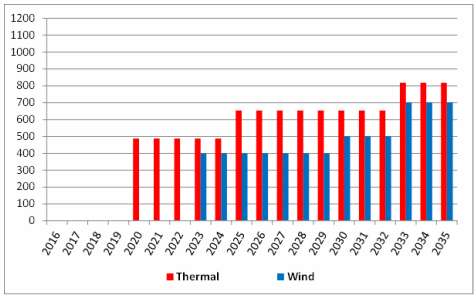
BAU Scenario PVRRs including Transmission (G&T)



100MW Coal Retirement Scenario

- 100MW of coal retired from Tri-State coal fleet in 2020
- Assumed $35MM in coal retirement costs
- Compliance RPS (20% in CO, 10% in NM)
- Historical DSM
- Open Markets

100MW Coal Retirement Scenario



100MW Coal Retirement Scenario

- 700MW of wind (600MW in ECO and 100MW in WY)
- 818MW of thermal (488MW 2x1 CC in 2020 and 165MW 7FA SC in 2025 & 2033)

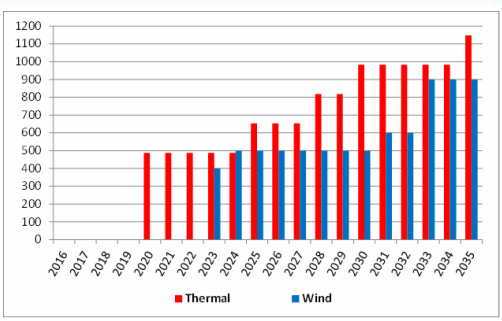
100MW Coal Retirement Scenario PVRR

- PVRR (G&T) - $19.69B
- Transmission CAPEX - $1.32B
- PVRR is slightly lower than BAU Base Case due to;
  - Distributed 100MW across Tri-State's system which tends to lower the need for more capacity sooner esp. in CO
  - Lumpiness of capacity additions (BAU Base Case builds two large 2x1 CC vs 1 large CC)
- PVRR and SO expansion plan differences are well within the uncertainty expected for these models esp. with the SO convergence criteria set at 1%

300MW Coal Retirement Scenario

- 300MW of coal retired from Tri-State coal fleet in 2020
- Assumed $100MM in coal retirement costs
- Compliance RPS (20% in CO, 10% in NM)
- Historical DSM
- Open Markets

300MW Coal Retirement Scenario



300MW Coal Retirement Scenario

- 900MW of wind (600MW in ECO and 300MW in WY)
- 1148MW of thermal (488MW 2x1 CC in 2020 and 165MW 7FA SC in 2025, 2028 & 2030)

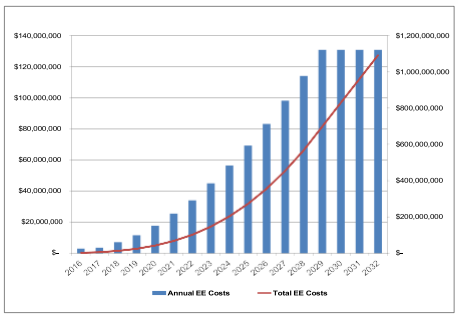
300MW Coal Retirement Scenario PVRR

- PVRR (G&T) - $20.24B
- Transmission CAPEX - $0.981B
- PVRR is $200M higher than BAU Base Case

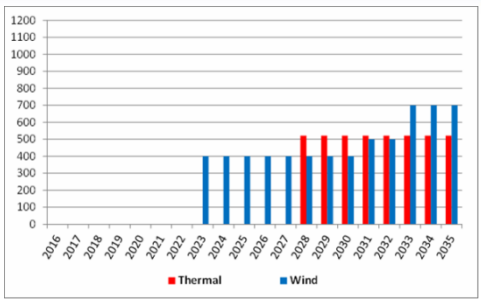
High EE/DSM Scenario

- Reflects energy efficiency goal of 1.5% in 2020
- Linearly increased Tri-State's current energy efficiency forecast from 2017-2020
- From 2020-2029 increased energy efficiency by 1.5% per year. Energy efficiency in 2032 is approx. 10.7% of retail load
- Energy efficiency costs were estimated based on Tri-State's 2014 actual energy efficiency program costs extrapolated to meet the higher goals
- Total energy efficiency CAPEX is estimated to be $1.09B
- These costs are assumed to be borne by Tri-State and are recovered from its member coops thru wholesale rates
- Compliance RPS (20% in CO, 10% in NM)
- Open Markets

High EE/DSM Scenario – Costs



High EE/DSM Scenario



High EE/DSM Scenario

- 700MW of wind (600MW in ECO and 100MW in NM)
- 520MW of thermal (520MW 2x1 CC in 2028)

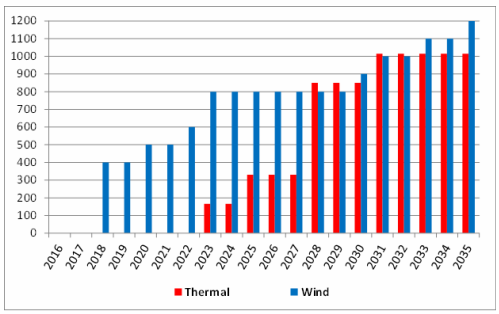
High EE/DSM Scenario PVRR

- PVRR (G&T) - $19.31B
- Transmission CAPEX - $0.936B
- Significant CAPEX to meet energy efficiency goals from 2020-2032

PTC/ITC Extension w/ Low Cost Renewables Scenario

- Extension starts 2016 thru 2035
- PPAs for new renewables
- No Tri-State capital
- Compliance RPS (20% in CO, 10% in NM)
- Open Markets

PTC/ITC Extension w/ Low Cost Renewables Scenario



PTC/ITC Extension w/ Low Cost Renewables Scenario

- 1200MW of wind (700MW in ECO, 300MW in WY and 200MW in NM)
- 1015MW of thermal (165MW 7FA SC in 2023, 2025 & 2031 and 520MW 2x1 CC in 2028)

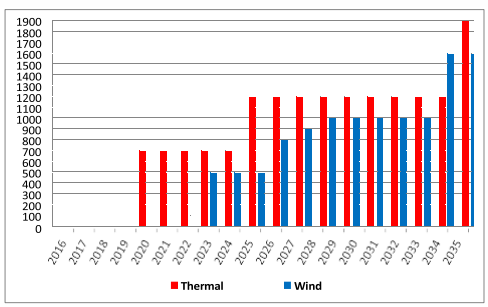
PTC/ITC Extension w/ Low Cost Renewables Scenario PVRR

- PVRR (G&T) - $19.60B
- Transmission CAPEX - $1.02B
- 1200MW of wind PPAs
- PaR models generation and load on a hourly basis and does not consider sub-hourly ramping issues which can be critical as more variable resources are put on Tri-State's system
- Further analysis would be required to ensure >1000MW of renewable resources can be reliably integrated into Tri-State's system

High Commodity Prices and High Load Scenario

- 2014 high commodity price forecast which includes a carbon adder starting in 2020
- Compliance RPS (20% in CO, 10% in NM)
- Open Markets

High Commodity Prices and High Load Scenario



High Commodity Prices and High Load Scenario

- 1600MW of wind (700MW in ECO, 500MW in WY and 400MW in NM)
- 1844MW of thermal (678MW 2x1 CC in 2020, 488MW 2x1 CC in 2025 and 678MW 2x1 CC in 2034)

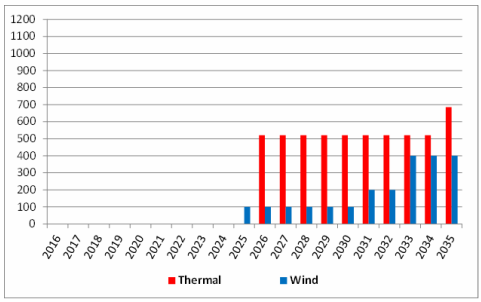
High Commodity Prices and High Load Scenario PVRR

- PVRR (G&T) - $25.50B
- Transmission CAPEX - $1.43B

High BTM DG with Energy Storage Scenario

- 20% of Tri-State's retail customers (approx. 90,000) leave the system and go off-grid with DG solar and battery storage
- The capital costs to implement the solar DG with battery storage are not included in this analysis. Costs can be significant.
- Compliance RPS (20% in CO, 10% in NM)
- Open Markets

High BTM DG with Energy Storage Scenario



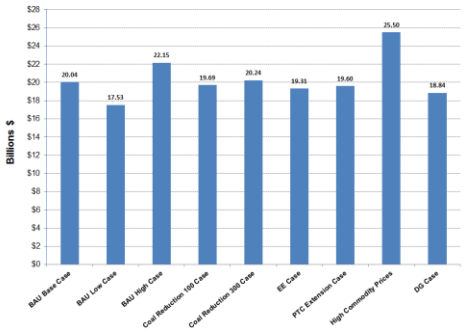
High BTM DG with Energy Storage Scenario

- 400MW of wind in ECO
- 685MW of thermal (520MW 2x1 CC in 2026 and 165MW 7FA SC in 2035)

High BTM DG with Energy Storage Scenario PVRR

- PVRR (G&T) - $18.84B
- Transmission CAPEX - $1.018B
- Does not include capital costs associated with solar DG and battery storage

PVRR By Scenario



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Transmission Cost Update

Transmission Cost Update

- Transmission CAPEX is estimated by Tri-State's Transmission Planning Department
- Transmissions CAPEX is based on many factors including;
  - New or upgraded transmission lines
  - New or upgraded substations
  - Location of capacity expansion
  - Size of capacity expansion
  - Utilization of existing transmission system
- Transmissions CAPEX ranged from $0.9B to $1.43B for the nine(9) ERP scenarios

Participant Feedback

TRI-STATE G&T
A Touchstone Energy Cooperative

Tri-State Summary

Next Steps

- Document all inputs and questions
- Start drafting Action Plan and 2015 ERP report ensuring all 21 CPUC requirements are addressed
- At 4th public meeting on Sept. 8th, present complete results of all scenarios and a draft Action Plan for public review and comment

Public Input and Questions?

- Comments and questions regarding resource plan or process:
  - e-mail: **ResourcePlanning@tristategt.org**
- Contacts
  - F. Michael Salva
    - (303)254-3755
    - msalva@tristategt.org
  - Sarah Carlisle
    - (303)254-3396
    - scarlisle@tristategt.org

Questions?

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TRI-STATE G&T
A Touchstone Energy Cooperative

2015 Electric Resource Plan 4th Public Meeting

September 8, 2015

Introduction and Housekeeping

- **WELCOME to Tri-State**
  - Keep to schedule
  - Cell phones on silent
  - Location of facilities
  - Webcast
  - Use microphone for questions
  - One person speaking at a time
  - Questions

September 8, 2015 IRP Agenda

- 2015 ERP/IRP Timeline
- Updated Load & Resource Chart
- Accomplishments Since 2010 ERP
- Draft Tri-State Action Plan
- Additional Scenario Results (PVRR & Emissions)
- Tri-State Summary and Next Steps
- Questions?

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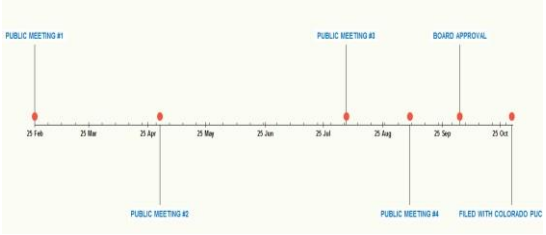
Tri-State 2015 ERP/IRP Timeline

2015 ERP/IRP Timeline



WAPA IRP deadline is Feb. 2016

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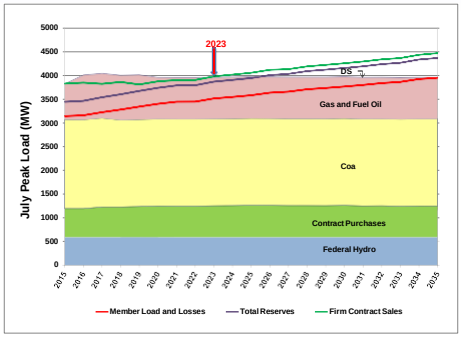
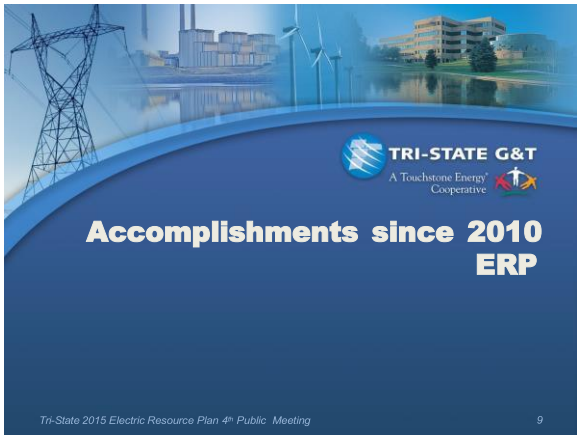
Updated 2015 Load & Resource Chart

Load Forecast

- All scenario analysis was performed based on load forecast developed in 2014
- 2015 load forecast update showed little change compared to 2014
- The following Load/Resource chart uses the 2015 load forecast
- This Load/Resource information is also used to drive the action plan regarding timing of new generation

Updated 2015 L&R Chart





Accomplishments since 2010 ERP

Acquisition of Thermo Cogeneration Partnership

- December 2011 Closing
- Purchased existing 272 MW Natural Gas Combined Cycle Power Plant
- Fort Lupton, Colorado
- Later renamed JM Shafer Generating Station

Colorado Highlands Wind

- February 2012 signed 20 year Power Purchase Agreement
- 67 MW wind farm near Sterling, CO
- December 2012 Plant began operations
- March 2013 Amended PPA for additional 24 MW
- Phase II operational in September, 2013
- 91 MW Total

Retirement of San Juan Unit 3

- Response to EPA Regional Haze Requirements
- Two of four units to be retired
- Tri-State Share is 41 MW of Unit 3
- Effective no later than 12/31/2017
- Regulatory approvals are pending

Carousel Wind

- December 2013 signed 25 year Power Purchase Agreement
- 150 MW Wind Farm
- Near Burlington, CO
- Construction underway
- Commercial operation will commence following completion of Burlington-Wray 230 kV transmission line, scheduled for Mid 2016
- Test energy in November, 2015

Twin Buttes II Wind

- June 2015 signed 25 year Power Purchase Agreement
- 76 MW wind project
- Near Lamar, CO
- Expected to achieve commercial operation in 2017

San Isabel Solar

- August 2015 signed 25 year Power Purchase Agreement
- 30 MW Solar PV single axis tracking
- Las Animas County, Colorado near Trinidad
- Expected to be in commercial operation in late 2016

Member Generation Projects

- Total Member distributed, renewable generation operating or under development has more doubled since 2010
- 48 Total Projects
- 73 MW
- Solar, wind, landfill gas, hydro, recycled heat
- Tri-State plays active role to facilitate these projects and purchases RECs above market

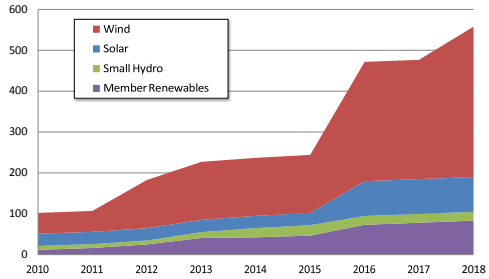
Small Hydro

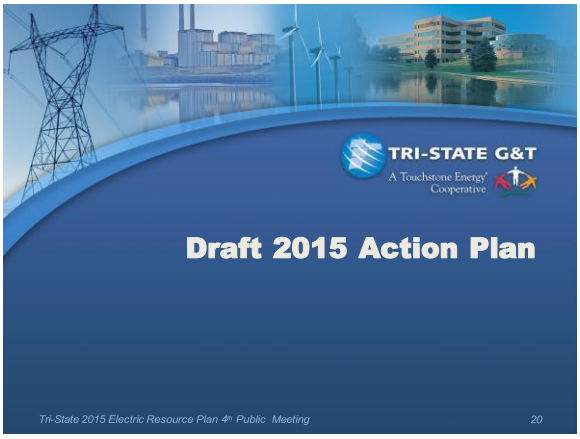
- Tri-State direct Power Purchase Agreements
- Extension of term of Vallecito Hydro 5.6 MW, near Durango, CO
- New PPA for Ridgway Hydro, 8 MW
- New PPA for Boulder County Hydro, 5 MW
- New PPA for Garland Canal Hydro, 2.9 MW

EE and DSM

- Continue to pursue various energy efficiency and demand side management programs with Tri-State Member-Owners
- Implementation is dependent on Member

Tri-State Renewable Portfolio Growth (MW) *2010-2018*





Draft 2015 Action Plan

- Six(6) elements;
  - Clean Power Plan and SIPs Review and Evaluation
  - Generation Planning and Development
  - Transmission Planning and Development
  - Possible Expansion of Renewable Energy Portfolio
  - Refinement and Development of New EE and DR Products & Services
  - R&D Programs and Projects via EPRI & CRN

Clean Power Plan and SIPs Review and Evaluation

- CPP and SIP(s) will likely have major impacts on resource planning for every utility in the United States, including Tri-State
- Likely impacts include changes to capacity expansion dates, technology selection, risk management, commodity forward price curves, …
- Tri-State will evaluate various CPP compliance paths (i.e., rate vs mass based) and participate in development of State Implementation Plans in multiple states
- Tri-State needs to review and evaluate compliance in five states (CO, NM, WY, NE and AZ)
- Higher renewable penetration will require resources that can follow wind
- Regulatory uncertainty is very high which adds an additional level of complexity to resource planning

Generation Planning and Development

- Based on recent 2015 load forecast and current assumptions, Tri-State does not have the need for additional capacity until 2023
- CPP has the potential to change Tri-State's capacity needs depending on final SIPs, DSM/EE penetration, etc.
- Tri-State will continue process of planning and developing sites for new generation, both greenfield and at existing sites
- Resource technology decisions for new capacity will likely be heavily influenced by the CPP and SIPs

Transmission Planning and Development

- Tri-State will continue to invest in transmission infrastructure to ensure dependable power delivery to its members and allow for interconnection of new renewable and conventional generation
- Objectives of Tri-State's Planning Process
  - Provide Transmission Service to all network customers.
  - Provide Reliable Service under NERC/WECC Reliability Standards.
  - Provide Low Cost Service to Member owners.
  - Provide Access to other stakeholders for the efficient planning, utilization and development of the transmission system.
- Interconnection of large, new renewable generation projects will require new transmission
- Future Transmission
  - Details of Tri-State's 10 year transmission plan is in the WESTCONNECT 2015 ten-year transmission plan
    - http://www.westconnect.com/filestorage/2015_wc_order_890_ten_year_transmission_plan_final_021915.pdf

Expansion of Renewable Energy Portfolio

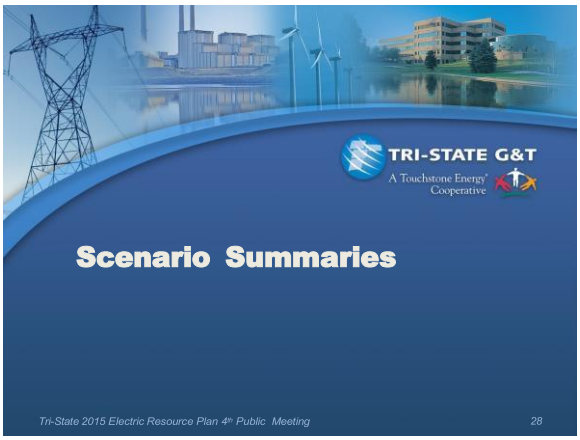
- Depending if the wind PTC and solar ITC are extended by Congress, Tri-State will consider issuing additional RFPs for renewable resources
- Recently announced the Carousel wind RFP (COD 2016), the Twin Buttes II wind RFP (COD 2017) and the San Isabel solar RFP (COD 2016)
- Continue to support members local/community-based renewable energy projects, including solar farms, biomass, micro hydro, geothermal and recovered heat energy

Refinement and Development of New EE and DR Products & Services

- Tri-State and its Members will continue to evaluate a full range of EE and DR products that add value to member-owners, Member Systems (Members) and Tri-State as a whole
- Through the opportunity for pilots, both self-generated and Member generated, Tri-State will investigate alternative means of marketing and implementing promising new EE and DR technologies and programs
- Every year, Tri-State's Board of Directors evaluates and determines the Association's annual budget, including the funds dedicated to EE and DR programs
- Tri-State's Board has also authorized different demand response/load management (DR/LM) programs for the Members to offer to their member-consumers, called "Products and Services". These programs for residential, agricultural and small/large businesses include the Emergency Load Management Program, the east-side Irrigation Load Program and the Basin Electric Pilot Program.
- Tri-State is currently in the process of formulating additional DR/LM programs to meet economic/market conditions for 2016.

R&D Programs and Projects via EPRI & CRN

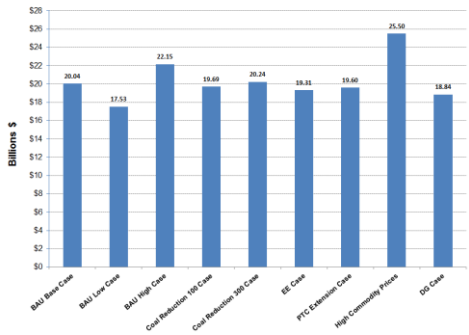
- Tri-State strongly supports research, development and advanced technology
- Member of the Electric Power Research Institute (EPRI) and the National Rural Electric Cooperative Association (NRECA) research program (aka, CRN) since 1993
- An important element of Tri-State's R&D program is direct participation in research projects
- Some R&D examples;
  - CO2 capture and sequestration demonstration at several major Department of Energy (DOE) / EPRI pulverized-coal power plant demo projects
  - Analysis of proposed concentrated solar augmentation project at a New Mexico and Italian power plant
  - Low-cost Ion-membrane O2 production as an option to concentrate CO2 for subsequent capture and beneficial utilization.
  - Geological characterization of Colorado Plateau formation for possible CO2 sequestration
  - Field testing of electric water heaters to demonstrate a high-speed remote control which may be needed to integrate increased levels of variable renewable resources



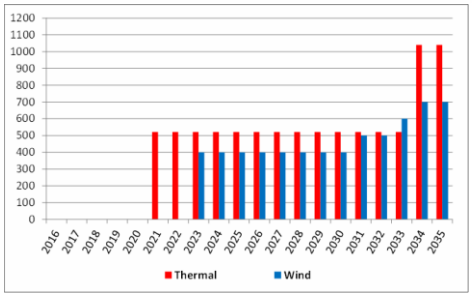
Scenario Update

- Modeled nine(9) scenarios;
  - BAU Base, Low Load and High Load (3)
  - 100MW & 300MW Coal Retirement (2)
  - High EE/DSM
  - PTC/ITC Extension with Low Cost Renewables
  - High Commodity Prices and High Load
  - Behind the Meter Solar DG with Energy Storage

PVRR By Scenario including transmission



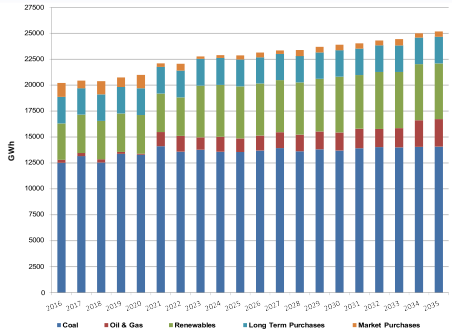
BAU Base – Generation by Fuel Type

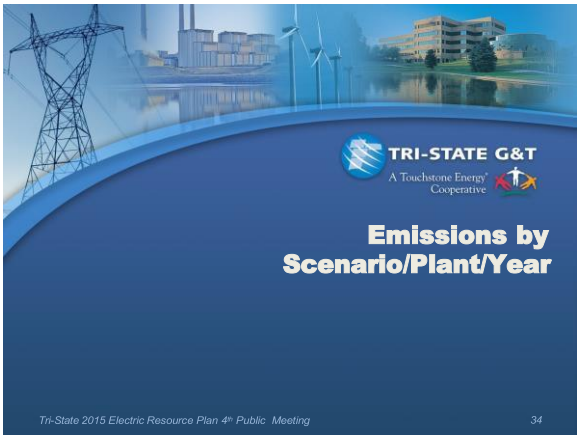


BAU Base Scenario

- 700MW of wind (600MW in ECO and 100MW in WY)
- 1040MW of thermal (520MW 2x1 CC in 2021 and 2034)

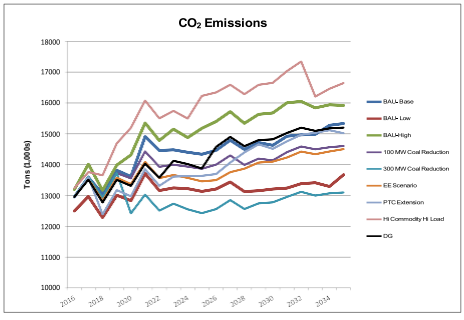
BAU Base Generation by Fuel Type



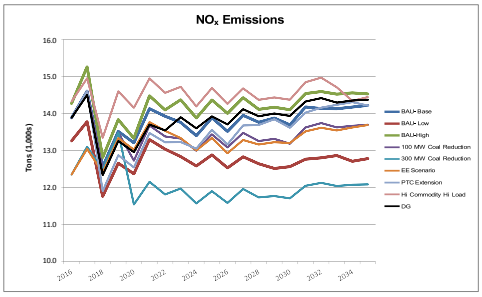


Emissions by Scenario/Plant/Year

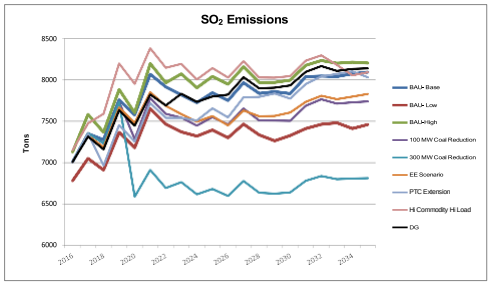
CO2 Emissions



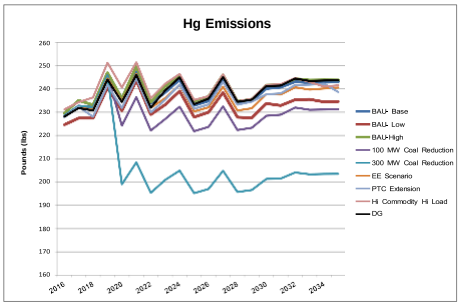
NOx Emissions



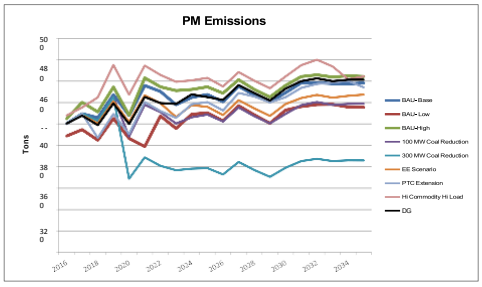
SO2 Emissions



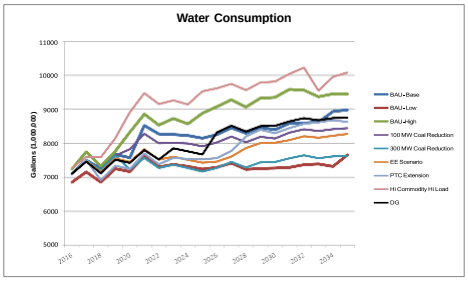
Hg Emissions



PM Emissions



Water Usage



Next Steps

- Complete Action Plan Write-up and 2015 ERP Report
- Post 2015 ERP on Tri-State website for public review and comment the first week of October
- Submit ERP/IRP to Tri-State's Board for approval at October Meeting
- Submit final 2015 ERP to Colorado PUC by October 31, 2015 and to WAPA by February 2016

Participant Feedback

Public Input and Questions?

- Comments and questions regarding resource plan or process:
  - e-mail: **ResourcePlanning@tristategt.org**
- Contacts
  - F. Michael Salva
    - (303)254-3755
    - msalva@tristategt.org
  - Sarah Carlisle
    - (303)254-3396
    - scarlisle@tristategt.org

Questions?

TRI-STATE G&T
A Touchstone Energy® Cooperative

Public Presentations

WESTERN RESOURCE ADVOCATES

Recommendations for Tri-State 2015 IRP Scenario Analyses

May 1, 2015

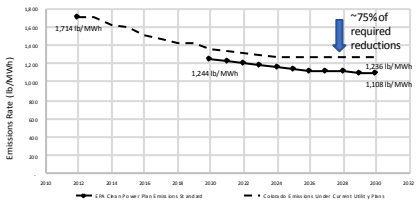
gwen.farnsworth@westernresources.org

Overview

WRA Scenario Recommendations

- EPA Clean Power Plan (CPP/111d)
- Additional EPA Requirements
- Holcomb 2 Coal Plant
- Demand Side Management (DSM)

Colorado's Emissions Rate Under EPA's Clean Power Plan



Clean Power Plan Scenarios

Three options:

- CPP compliance scenario
- CPP compliance assumption in each scenario (as baseline assumption)
- Check each scenario against CPP compliance

These are clearly challenging to implement before the rule is final.

Clean Power Plan Scenarios

Option 4:

Report CO_2 emissions for each scenario

- Continue reporting *system* emissions by scenario
- Additionally, report:
  - Colorado only
  - Convert to CPP-relevant CO_2 emissions (EGU's, adjusted for energy efficiency, renewables)
  - In tons of CO_2 emissions (mass-based)

Additional Scenarios

Additional EPA Requirements:

- MATS
- Ozone
- Regional Haze
- Cooling water intake

Additional Scenarios

Holcomb 2:

- Include at least one scenario showing impact of the Holcomb 2 coal plant (under construction)

Additional Scenarios

Demand Side Management (DSM):

- Clarify amount of DSM in baseline load forecast
- Model baseline, plus two levels of additional DSM, or
- Include DSM as a generic resource to compete with other resources in the modeling on a cost basis

Questions?

Gwen Farnsworth
Sr. Policy Advisor, Western Resource Advocates
303-444-1188
gwen.Farnsworth@westernresources.org

Tri State 2015 Planning

Time for New Thinking on Affordability and Reliability

Tri State Generation and Transmission
2015 Resource Plan Public Meeting
May 1, 2015

Leslie Glustrom Lglustrom(at)gmail.com
303-245-8637

Tri State's Mission Statement:

Guided by the cooperative principles, we work with each of our

44 MEMBER SYSTEMS

to ensure communities across the West have access to affordable and reliable electricity.

From Tri State's 2014 Annual Report available from http://www.tristategt.org/Financials/annual-report.cfm

What Tri-State Professes….

http://www.tristategt.org/

Affordability…does it mean:

1)Lowest cost product for TSGT members?

OR

2) Coal at any cost?

The Aesthetic Part of

Tri State Reports Not Providing Clear Picture of What is Happening

Pages 2-3, Tri State 2014 Annual Report—Available from http://www.tristategt.org/Financials/annual-report.cfm

Humans Long Thought the Sun Went Around the Earth…

(It sure seems like it does…)

Image from http://hdwallpapersfit.com/sun-hd-wallpapers.html

Reviewing the Facts Can Improve the Accuracy of Our Understanding….

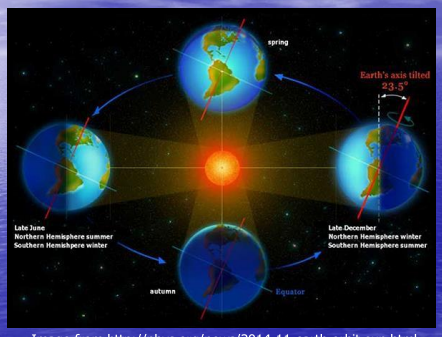
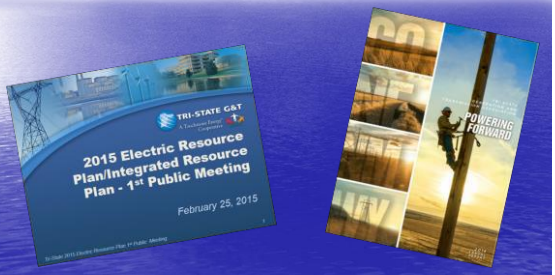
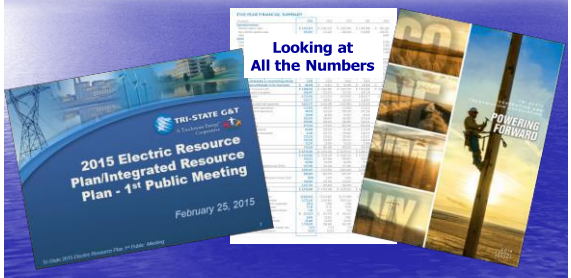


Image from http://phys.org/news/2014-11-earth-orbit-sun.html

Facts on Tri State…. From Tri-State….



Facts on Tri State…. From Tri-State….



First…. Affordability

Affordability…does it mean:

1)Lowest cost product for TSGT members?

OR

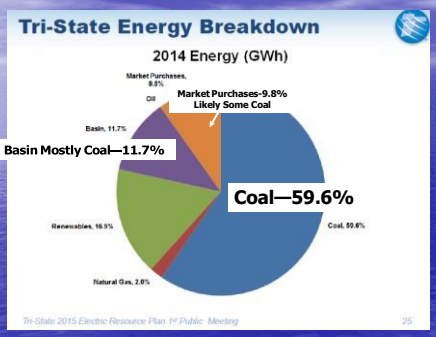
2) Coal at any cost?

For Sake of This Analysis….

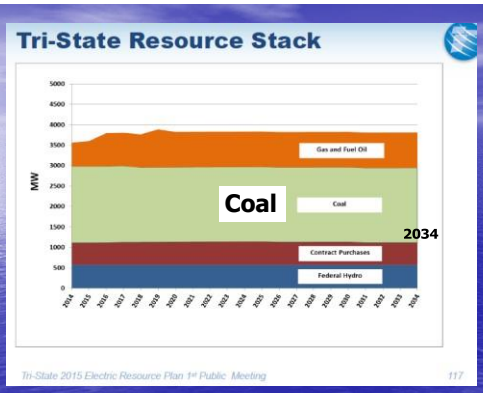
Assuming Value = $0

Not my personal opinion—just assuming it for this analysis… The truth of course is that the planet is priceless

70% (or More) of TSGT Energy from Coal

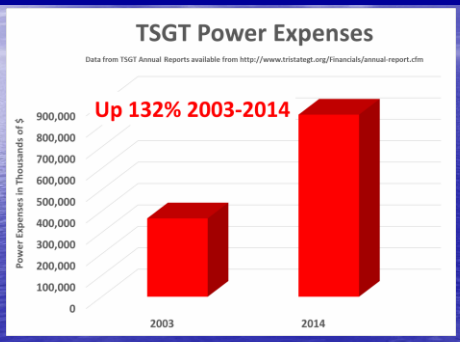


Source Feb 26, 2015 TSGT PPT, Slide 25, available at
http://www.tristategt.org/ResourcePlanning/documents/2015%20ERP%20First%20Public%20Meeting%20Combined%20Presentation%20Final.pdf



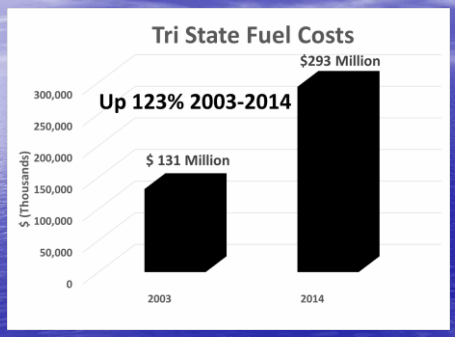
From Feb 26, 2015 TSGT PPT, Slide 117, available from
http://www.tristategt.org/ResourcePlanning/PublicMeetingDetails.cfm

Tri-State Power Expenses Are Rising Rapidly 2003-2014



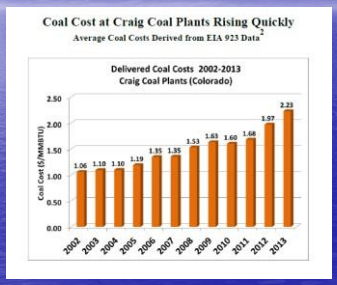
Data from TSGT Annual Reports available from http://www.tristategt.org/Financials/annual-report.cfm

Tri State Fuel Costs Rising Rapidly



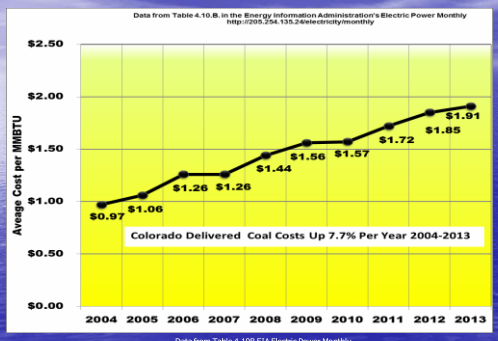
From TSGT Annual Reports, Consolidated Statements of Operations
Available from http://www.tristategt.org/Financials/annual-report.cfm

Coal Costs at TSGT Craig Power Plants More Than Double 2003-2013 From $1.10/MMBTU in 2003 to $2.23 in 2013



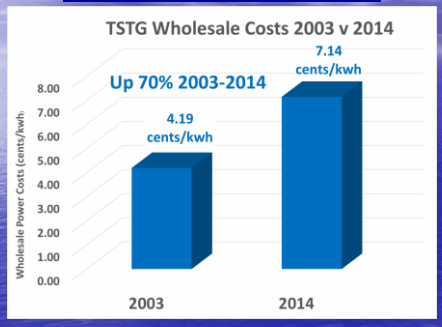
Coal Costs Derived From EIA 923 Database at
http://www.eia.gov/electricity/data/eia923/

Colorado Delivered Coal Costs 2004-2013



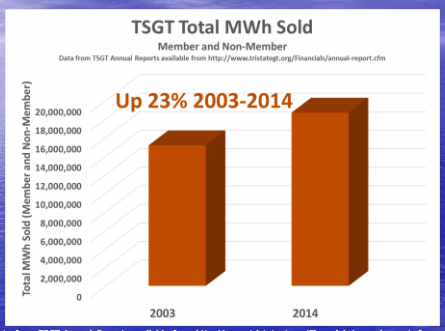
Data from Table 4.10B EIA Electric Power Monthly
http://www.eia.gov/electricity/monthly/

Tri State Costs to Members Increasing Rapidly



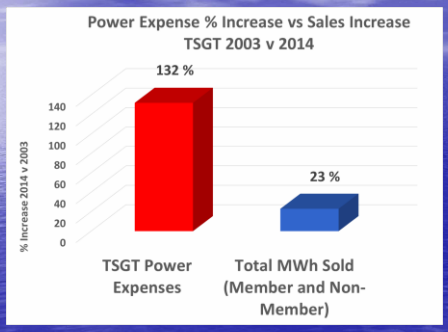
Data from TSGT Annual Reports available from http://www.tristategt.org/Financials/annual-report.cfm

Tri State Sales Not Increasing Rapidly 2003-2014



Data from TSGT Annual Reports available from http://www.tristategt.org/Financials/annual-report.cfm

TSGT Power Expenses Going Up Almost 5 Times Faster Than Sales



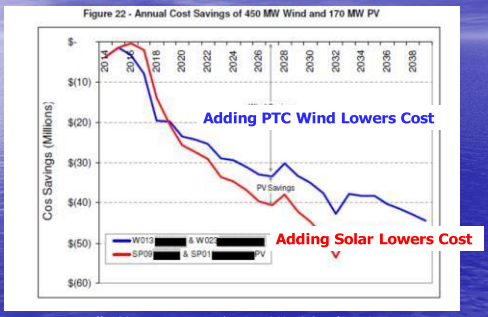
Data from TSGT Annual Reports available from http://www.tristategt.org/Financials/annual-report.cfm

Time for New Thinking on "Affordability."

In the 21st Century,

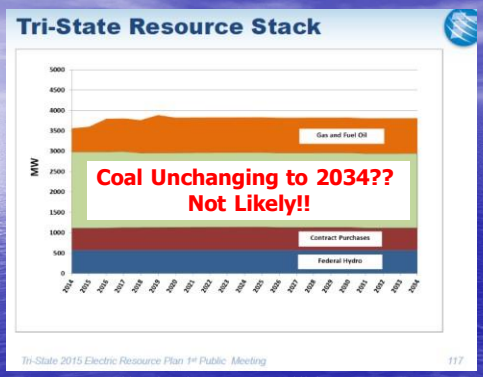
Coal is Not the Best Choice for Affordability

Example of Xcel Modeling Results September 9, 2013



Xcel's 120 Day Report, Docket 11A-869E Colorado PUC

Tri-State Resource Stack



Slide 117 from Feb 26, 2015 TSGT PPT available from http://www.tristategt.org/ResourcePlanning/PublicMeetingDetails.cfm

In the 21st Century Reliance on Coal Will Almost Certainly Diminish Due to Reasons of Geology—Not Politics

Going Forward, Coal Use Will Very Likely Change, Even If:

1) The EPA is Abolished

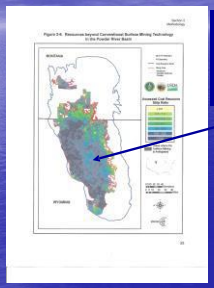
2)The US Congress Becomes 100% Republican

3) We Have Republican Presidents Until 2050

4)Climate Change is "Proven" to be a Hoax

As of 2015, The United States is Now Largely Beyond Coal That Can be Mined at a Profit

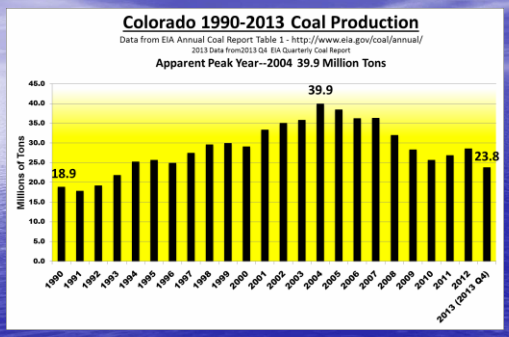
70% of the Coal In the Powder River Basin is Not Surface Accessible



Blue Hatched Areas = Areas Where Surface Mining Is Not Anticipated…

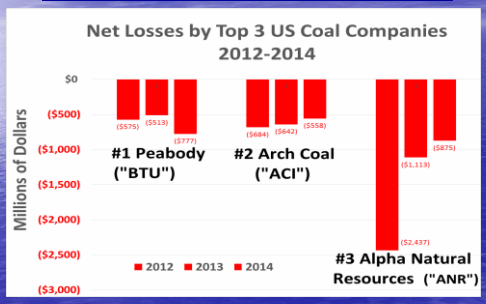
Source: US DOE, DOI and DOA Inventory of Federal Coal Resources August 2007
Full details available in USGS 2008-1202 available at http://pubs.usgs.gov/of/2008/1202/
For more details, see the YouTube talk at https://www.youtube.com/watch?v=t0y3KPmM22g

Colorado Coal Production Dropping Off Dramatically

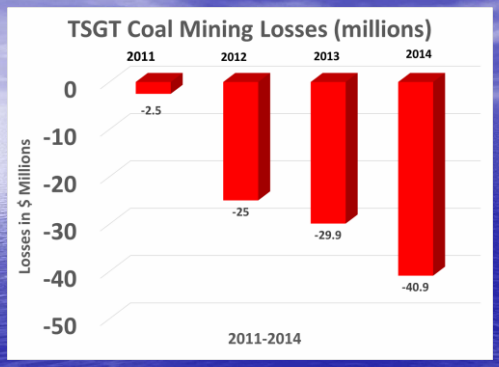


See also http://www.denverpost.com/business/ci_27502096/colorado-coal-production-slips-20-year-low

Top 3 US Coal Companies Losing Money Mining Coal…



Source: 2014 10-K Reports of Coal Companies. Peabody p F-2, Arch p 61, Alpha p 58



Data from TSGT 2014 Annual Report, page 19, available from http://www.tristateet.org/Financials/annual-report.cfm

With Losses Like These,

Who Will Be Mining Coal

in 2034??

Coal Plants Are <u>Not</u> Reliable

Without

A Supply of Coal....

In the 21st Century,

Coal is Not the Right Strategy

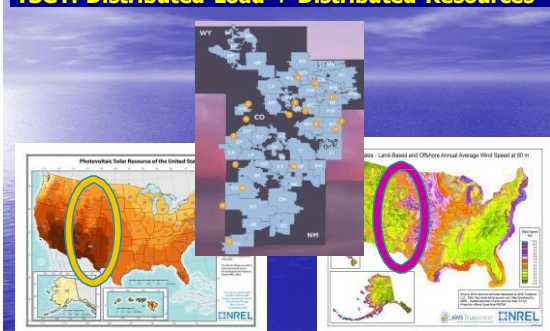
For Affordability

<u>Or</u>

Reliability....

The Good News....

TSGT: Distributed Load + Distributed Resources



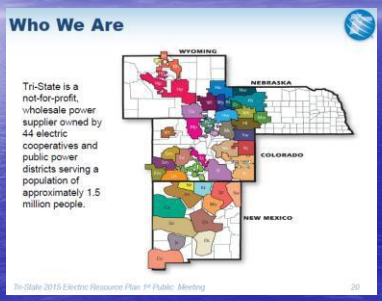
PV Map from http://www.nrel.gov/gis/images/eere_pv/national_photovoltaic_2012-01.jpg
Wind Map from http://www.nrel.gov/gis/images/80m_wind/awstwspd80onoffblpC3-3dp600.jpg

TSGT—Distributed Load + Distributed Resources

= Big Success!!!

PV Map from http://www.nrel.gov/gis/images/eere_pv/national_photovoltaic_2012-01.jpg
Wind Map from http://www.nrel.gov/gis/images/80m_wind/awstwspd80onoffbigC3-3dpi600.jpg

Many TSGT Member Coops Ready to Self Generate. It is time to Grant Them That Freedom!



Requested Scenario:

Model Increasing Member Generation:

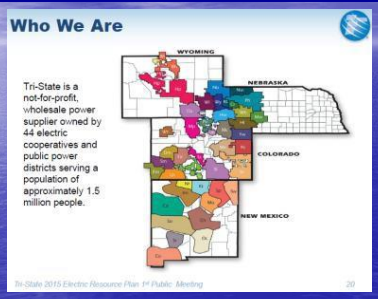
2016-Up to 10% Self Generation

2020—Up to 15% Self Generation

2025—Up to 20% Self Generation

2030—Up to 30 % Self Generation

Thank You
Looking Forward to Tri State's Success Story!



Leslie Glustrom lglustrom (at) gmail.com 303-245-8637

Public Comments and Tri-State Responses

Tri-State Comments regarding discussions during public meetings:

Because there was relatively low turnout for the four public meetings (approximately 8-10 public attendees per meeting) Tri-State encouraged a relatively informal exchange of ideas and information. During each of the public meetings there were discussions between Tri-State staff and members of the public that covered modeling assumptions, data sources and scenarios. During some of this discussion questions were answered, but no transcript was kept. Also during each public meeting Tri-State encouraged the meeting attendees to submit questions in writing so that we could provide more complete answers.

Written Comments:

In the following section, all written comments that have been received are presented along with Tri-State's responses embedded in the correspondence. In each response, we underline "Tri-State", or "Tri-State Response" to indicate where the response begins, and use bold font for the response so it is clear where the response ends.

As a result of email and other formats for incoming comments, the format of the following section is variable.

9/17/2015

Hello Mike,

Please accept these comments on the modeling in advance of the final report from Interwest Energy Alliance.

Thank you for the opportunity and public process.

If you have the savings data which I requested in my separate email (just yesterday, I believe) do please send it on and I'll find a way to use it because we like to give public positive feedback for Tri-State.

Lisa

Lisa Tormoen Hickey

Alpern Myers Stuart LLC---14 N. Sierra Madre, Suite A---Colorado Springs, CO 80903

Tri-State Generation and Transmission

Attn: F. Michael Salva, P.E.

Energy Resources and Analytics Manager

msalva@tristategt.org

Re: 2015 Integrated Resource Plan

Comments of the Interwest Energy Alliance

Dear Mike:

On behalf of the Interwest Energy Alliance, I submit these comments on the final scenario results as portrayed in the public meeting held at Tri State offices on September 8, 2015. Interwest is a non-profit trade association whose members include utility-scale renewable developers working with non-governmental conservation organizations to promote renewable energy throughout the Intermountain West, which includes much of Tri-State's service area. Tri- State's generation fleet and transmission lines are integral to the network which provides electricity to all Colorado residents. We acknowledge your capital expenditures towards compliance with the Colorado Renewable Energy Standard and federal emissions regulation, and more recently, to provide fuel-cost savings to your members.

1. Tri-State's Recent Renewable PPAs and Transmission Investments Will Reduce Costs and Increase Reliability. Interwest is pleased to see Tri-State's recent purchase of several utility-scale renewable energy projects at low cost: the 67 MW Colorado Highlands Wind PPA signed in 2012, which was expanded to 91 MW in March 2013; the 150 MW Carousel Wind PPA signed in 2013; the 76 MW Twin Buttes II Wind PPA signed in June 2015; and the 30 MW San Isabel Solar PPA signed in August 2015. In addition, you have nearly doubled the member-owned distributed, renewable

generation since 2010 to 78 MW. These cost-competitive new projects will reduce overall greenhouse gas emissions and save your members millions of dollars in fuel costs over the long term.

Interwest appreciates Tri State's recent transmission investments, which will also promote new renewable projects to be built in new Energy Resource Zones while they increase reliability. Tri-State's commitment to building transmission for reliability reasons will allow it to benefit from the flexible options allowed for compliance under the Clean Power Plan.

Tri-State acknowledges this comment.

2. Action Plan Including More Renewables Will Save Money. Interwest has several comments and suggestions for the Action Plan.

A. The "Business as Usual" base case assumes Tri-State will acquire another 700 MW of wind (600 MW in Eastern Colorado and 100 MW in Wyoming), and acknowledges the plan to retire two San Juan Generating Station units. Interwest applauds Tri-State for including these renewable additions in its Action Plan. Tri-State could go further, so we understand that it will remain open to opportunistic acquisitions during the next four years, depending on market and regulatory changes. We note that the PVRR by Scenario including transmission costs for the PTC extension case is $440,000,000 less than the BAU Base Case. Therefore, Interwest urges Tri-State to take additional steps to save your members even more money if the production tax credit and/or the investment tax credits are extended. If Tri-State were to issue another RFP every two years, there would be less chance that opportunities would be lost, and you can ensure your members that Tri-State has found all available means to hedge against future fuel cost increases and price volatility, and reduce future regulatory risks and costs. Interestingly, the DG Case reveals even lower cost, so continued renewable acquisitions of all types appears to serve your members' interests.

Tri-State agrees that the scenario with extension of the PTC yields a lower Present Value of Revenue Requirements (PVRR) than the BAU scenario without PTC extension. This is one of the reasons that our Action Plan includes possible expansion of the Tri-State renewable portfolio. Tri-State has issued several RFPs for renewable generation over the last several years, and recognizes the value that the RFP process can yield. Although the DG scenario results in a lower PVRR for Tri-State, it should be recognized that this case did not include the cost of rooftop solar and battery storage systems, based on the assumption that these costs would be borne by either Tri-State Member systems or end-use consumers.

B. The 300 MW Coal Reduction Case yields substantial benefits in emissions reductions, reduced water use, and additional benefits from reducing reliance on coal, with a more reasonable price increase that the cost of the BAU High Case or the High Commodity Prices case. This scenario warrants further study and consideration over the next few years, because the costs of bearing the risks of higher commodity (natural gas) prices seems to be greater than the cost of these additional coal retirements.

<u>Tri-State</u> agrees that the PVRR increase from this scenario was less than the other referenced scenarios. Tri-State also agrees that retirement of coal will very likely be subject to further study and consideration over the next few years.

3. Annual Updates Should be Expanded to Promote Tri-State's Clean Power Plan Alternatives.

Interwest requests that Tri-State provide detailed current emissions data including carbon analysis with its annual reports. In light of the updated load analysis which delays the projected natural gas acquisitions from 2021 to 2023, Interwest appreciates the timing difficulties in providing emissions data with this report to be filed in late October 2015. Assuming that this data is not forthcoming with Tri-State's October filing with the Colorado PUC, Interwest requests that Tri-State provide updated emissions data and generation availability analysis coinciding with this data in each of its annual reports thereafter.

We believe this request is consistent with your Letter Agreement with Western Resource Advocates filed with the CO PUC, where Tri-State committed to provide data as follows:

c. Fuel type, heat rates, annual capacity factors and availability factors projected for Tri-State-owned generation facilities over the planning period.

d. Emission rates (in pounds per MWh) and total tons per year of sulfur dioxide, nitrogen oxides, particulate matter, mercury and carbon dioxide.

Letter Agreement, Sec. 3, subparts (c) and (d).[1] Interwest appreciates Tri-State's commitment to provide this information as part of its resource plans, and we ask that you extend this commitment a bit further in light of the promulgation of the Clean Power Plan. Emissions data and generation and transmission resource availability will be of critical importance to Colorado as it develops its Clean Power Plan compliance strategies. Tri-State can benefit itself and its members by active participation in this discussion. Active discussions with other utilities and stakeholders developing the Colorado state implementation plan under the Clean Power Plan will increase Tri-State's available alternatives. Developing several alternative scenarios will give Tri-State more time to plan its compliance strategies and will enable it to choose the most cost-effective plan. Therefore, Interwest urges Tri-State to play an active role in developing the Colorado state implementation plan, even while litigation runs its course.

<u>Tri-State</u> has provided emissions forecasts and water consumption forecasts for each of the nine scenarios modeled for the 2015 Resource Plan. Tri-State will continue to provide emissions forecasts and water consumption forecasts for a limited number of scenarios in the annual update filings, and will strongly consider including the same emissions forecasts for any scenarios related to the CPP.

Interwest sincerely appreciates the opportunity to provide these comments on the 2015 Resource Plan.

Respectfully submitted this 17th day of September, 2015,

Lisa Tormoen Hickey

Senior Regulatory Attorney

Interwest Energy Alliance

9/16/2015

Hello Mike,

On behalf of Interwest Energy Alliance, thank you again for the public meetings and opportunity for input. I am trying to find figures showing the savings to Tri State members from your recent wind and solar acquisitions, and/or from the 700 MW of wind anticipated as part of the BAU base case. Are these available somewhere? If not in the aggregate, is there public information which shows the savings from each unit, or one of the new facilities, or the price of these facilities, wind and solar?

Just trying to give you kudos for these savings in our written comments.

Tri-State has not provided comparative data for scenarios associated with individual transactions to protect confidential data. Tri-State did not run any scenario without additional wind generation, so the requested savings associated with the 700 MW of wind in the BAU case is not available.

Thank you,

Lisa Tormoen Hickey

Alpern Myers Stuart LLC---14 N. Sierra Madre, Suite A---Colorado Springs, CO 80903

719.471.9231 (office)---719.964.5526 (cell)

lisahickey@coloradolawyers.net

9/8/15

Hi Mike, Rob--I'd like to do more formal comments, but this is an especially busy week, so I'll just send some quick bullet points for the questions I had today.

- **Update CO2 Emissions:** Request to update at least the CO2 emission projections based on pushing the thermal resource need out to 2023

Tri-State has provided emissions forecasts and water consumption forecasts for each of the nine scenarios modeled for the 2015 Resource Plan. Tri-State will continue to provide emissions forecasts and water consumption forecasts for a limited number of scenarios in the annual update filings, and will strongly consider including the same forecasts for scenarios related to the CPP.

- **Consider Member Generation:** Include an assumption about # MW/year that will be added through member self generation with solar, small hydro, wind, biomass etc, particularly in light of the FERC decision on the DMEA PURPA question.

Tri-State Response:

Tri-State assumed an average annual growth rate of 2.1% for member self-generation though the planning period.

- **Review Coal Cost Assumptions:** Review the coal costs given by Ventyx/Wood MacKenzie in slide 28 of the PPT from 2015-05-01. They are saying $0.70/MMBTU for PRB 8800 coal in 2015 while coal being delivered to the Laramie River Station in 2015 is largely above $1.10 according the EIA 923 database. If the Ventyx/Wood MacKenzie price is for coal before delivery, please clarify and include details on the assumptions about transportation expenses.

Tri-State Response:

The Ventyx/WoodMac prices in the 2015-05-01 PPT presentation are only PRB coal commodity prices (i.e., no transport cost). Transportation costs were included in the SO and PAR modeling.

- **Prepare for Possible Coal Supply Constraints:** Move forward with planning for flexible natural gas resources to come on line in the next 3-10 years based on concern about the dire financial condition of the top US coal companies and possible coal supply constraints showing up between now and 2025. Continue to encourage member coop self generation but natural gas capacity may be needed to compensate for the loss of coal generation as the US moves beyond coal that can be mined at a profit.

Tri-State has included generation planning and development as part of the action plan, and while no decision has been made as to the specific technology, timing or size of a generation expansion, Tri-State is preparing for the future by developing generation sites. Tri-State acknowledges the difficult financial conditions of many US coal companies. However, Tri-State also recognizes that natural gas historically has had higher price volatility than coal.

- **Discount Rate Sensitivity:** It is probably too late to do now, but for next year, make a note to try some sensitivities related to the discount rate and how it affects PVRR calculations and the relative benefits of using fuel free resources that avoid the risks of future fuel costs.

Tri-State used a constant discount rate for all nine scenarios. Tri-State acknowledges the hedging effects associated with renewable resource power purchase agreements that have defined energy pricing.

Thanks again for your thoughtful handling of this complex process!!

Leslie

Boulder, Colorado
303-245-8637
lglustrom@gmail.com

9/8/15

Hi Rob, Mike--Thanks again for the meeting today and for staying calm in the face of our questions and concerns. It is much appreciated!

The question I was asking Rob after the meeting relates to page 19 in Tri State's 2014 Annual Report.

Coal mining expenses have gone from about $2.5 million in 2011 to about $40.9 million in 2014. I am looking for a breakdown of these costs and wonder if you can help?

Tri-State acquired the Colo-Wyo coal mine in 2012, consequently additional mining expenses were recognized as a Tri-State expense rather than a fuel purchase expense in 2014. Colowyo Coal Company L.P. is wholly owned by General Partner: Axial Basin Coal Company, a Delaware close corporation which is wholly owned by Western Fuels-Colorado, a Limited Liability Company, its sole stockholder, a Colorado limited liability company by Tri-State Generation and Transmission Association, Inc., its parent.

Thanks

Leslie

Boulder, Colorado
303-245-8637
lglustrom@gmail.com

9/7/15

HI Mike--You may or may not be able to answer these questions at the next TSGT public meeting on August 8, 2015 but thought I'd send them to you in writing so we can keep track of your answers as we go.

Thanks for all your work!

1) Please identify all capital expenditures (size of expenditure and what it is for) at Tri State Coal plants that are expected over the planning period. Thanks.

Tri-State has used 2016 budgetary estimates and long term forecasts for all scenarios in the Resource Plan. Generally, 2016 budgetary data is more accurate and projects are well defined. For long term forecasts, Tri-State relies on historical trends to develop forecasts. Tri-State will not provide specific data to protect confidential information.

2) What is Tri State's expected life time of the Colo Wyo mine and expected cost of the coal in $/MMBTU and in coal expenses for TSGT members through the life of the mine.

Tri-State Response:

The expected life time of the Colo-Wyo mine is 2050 depending on the volume of coal shipped.

The expected cost of coal at Colo-Wyo mine is considered proprietary.

3) What coal supply constraints is Tri State anticipating at its coal fleet over the modeling period.

Tri-State is not anticipating coal supply constraints, due to mining or transportation issues, over the resource planning period.

4) What discount rate is being used for fuel and operating costs in the Present Value Revenue Requirement (PVRR) calculations?

The discount rate Tri-State used in this Resource Plan for the fuel and operating costs is the 30-year Treasury rate + 200 basis points.

5) What does Tri State project for member self generation going forward in MW/year and projected project type. (e.g. wind, solar, biomass, small hydro etc.

Tri-State assumed an average annual growth rate of 2.1% for member self-generation though the planning period.

Many thanks

Leslie

Boulder, Colorado
303-245-8637
lglustrom@gmail.com

8/17/2015

Gwen,

Please find below in red our responses to your ERP scenario questions.

We look forward to discussing these further next week at the 4th public meeting on Tues., Sept. 8.

Mike

F. Michael Salva, PE

Energy Resources and Analytics Manager

From: Gwen Farnsworth [mailto:gwen.farnsworth@westernresources.org]
Sent: Monday, August 17, 2015 5:31 PM
To: Salva, Mike
Subject: ERP Scenario questions

Hello Mike,

Thank you for sharing the results of your scenario analysis at the August meeting. I appreciate the time you and your staff took in preparing the analysis and presenting the results at the public meeting.

Could you answer some questions I have regarding the Tri-State 2015 ERP Scenario presentation on August 6?

My questions are:

1. For which power plants did you include emissions control upgrade costs in the BAU and scenario cases? In particular, did you include pollution control device costs to comply with the EPA MATS rule and the Wild Earth Guardians settlement agreement for Nucla and Craig Units 1, 2 and 3? If so, in what year did you assume the costs would be incurred, for each unit?

Tri-State Response: **For Joint Owned Units, before we add capital costs to our models the specific projects must be approved by the Owners of the power plant, acting under the plant participation agreements. Emission control capital costs were included for Craig 2 & 3 for the various ERP scenarios. The capital costs for Craig 2 & 3 were assumed to be incurred in 2015-2017.**

Costs to comply with the MATS rule are included in the PVRR values provided for the various scenarios. Much of the MATS work has already been completed and accounted for at those units where compliance has been achieved since April 2015.

The WildEarth Guardians-related settlement agreement pertains only to Craig Unit 1 and related capital costs have not yet been approved by the ownership of that unit.

2. What are the assumed costs per MWh of energy efficiency in the High DSM case in 2015, 2020 and 2030, and on average across the planning period?

Tri-State Response: **The cost per MWh of EE savings were $19 in 2016, $27 in 2020 and $35 in 2030. The average cost across the 20 year planning period was $29.6.**

3. Can you provide some explanation of how transmission costs were developed for the coal retirement scenarios, considering the retirements were assumed to be just shaving off some MW of nameplate capacity across multiple plants, rather than individual plant retirements?

Tri-State Response: **Resource Planning provides the Transmission Planning Group at Tri-State with the resource expansion plan for each of the scenarios. The Transmission Planning Group uses the resource expansion plan, which includes a general location of the new resources, to develop the transmission build out plan and costs. Then the transmission costs, along with the resource expansion plan costs, are given to the Financial Planning Group at Tri-State to develop the overall PRVV impact of the scenario.**

4. It seems to me that because transmission costs were added in after the scenario runs, they did not impact the resource selections made by the model. Is that a correct interpretation?

Tri-State Response: **Tri-State's expansion plan model does have the high-voltage transmission system between various Transmission Areas (TA) modeled as links. These links have import and export limits between the various TAs in the model and the general location of new resources is established within a specific TA. The transmission cost estimates we receive from the Transmission Planning Group for each scenario are primarily for localized transmission projects to serve growing load and to interconnect new generation projects**.

5. Can you confirm again that coal plant decommissioning costs are not depreciated and included in customer tariffs for the lifetime of each coal power plant, as is usually done by regulated utilities?

Tri-State Response: **For the two (2) coal retirement scenarios in the 2015 ERP, we assumed $350/kW in decommissioning costs. These retirement costs were given to the Financial Planning Group, along with the resource expansion plan and transmission costs, to determine the PVRR impact of the various scenarios. These decommissioning costs were assumed to be incurred over a three year time period.**

Thanks again!

- Gwen

Gwen Farnsworth

Sr. Energy Policy Advisor

Western Resource Advocates

2260 Baseline Road, Suite 200

Boulder, CO 80302

7/1/2015

Hi Mike, This is good information.

http://www.utilitydive.com/news/what-happened-when-nrg-energy-disrupted-its-own-business-model/401472/

Steve Szabo
Clean Energy Advocate
Co-Founder - The Family Garden

Tri-State acknowledges this comment.

6/16/2015

Hello Mr. Salva,

See initial comments from the Interwest Energy Alliance attached.

Thank you for your consideration,

Lisa Tormoen Hickey

Alpern Myers Stuart LLC---14 N. Sierra Madre, Suite A---Colorado Springs, CO 80903

719.471.9231 (office)---719.964.5526 (cell)

lisahickey@coloradolawyers.net

F. Michael Salva, PE
Energy Resources and Analytics Manager
Tri-State Generation and Transmission
msalva@tristategt.org
Re: 2015 Integrated Resource Plan
Initial Comments and Questions of the Interwest Energy Alliance

Mr. Salva,

On behalf of the Interwest Energy Alliance we submit initial comments and questions related to the scenario modeling for Tri-State Generation and Transmission's 2015 IRP. Interwest sincerely appreciates the ability to provide input through this public process. Interwest's board and members acknowledge Tri-State's recent renewable energy acquisitions, including Colorado Highlands Wind and Cimarron Solar. Interwest applauds your recent purchase of additional wind from the new Twin Buttes II Wind Project which will provide 25 years of cost-effective stably-priced clean energy to your members, along with tax revenues and economic benefits for rural Colorado.

1. Interwest would like to know more about the assumptions used for the portfolio modeling. The wind and utility-scale solar prices should reflect current market pricing revealed through recent RFP results. An aggregation of the bid prices received in Tri-State's own 2014 RFP could provide a reliable LCOE for wind and solar resources available in the region. Also, the bid prices submitted to Public Service Company of Colorado in Phase 2 of its 2011 ERP, are *public information* available on their website in accordance with PUC regulations.1 We calculated the average levelized cost of energy of all wind energy and utility-scale solar energy bids with contract duration of 30 years or less. The average wind LCOE (24 bids) was $42.89. The average solar LCOE (11 bids) was $77.59. Similarly, in New Mexico, wind and solar prices have dropped to record lows. We understand from public market reports that there is excess capacity which will be available in these markets for a period of time, reflecting current federal incentive levels, so Tri-State should assume the resources could be acquired within the resource acquisition period under the 2015 IRP. Interwest requests detailed information about the assumptions used for its generation resource modeling and project sizes that are available for

2.

1 *Commission Rule 3613(k) Bid Disclosure Summary*, *Wind and Solar Resources*, Available at: http://www.xcelenergy.com/Company/Rates_&_Regulations/Resource_Plans/Public_Service_Company_of_Colorado_2011_Electric_Resource_Plan. **ALPERN MYERS STUART LLC** June 15, 2015 Page 2 of 3

selection through the modeling process. What MW blocks are assumed to be available to be selected by the model for incorporation into the portfolio?

Tri-State Response: The candidate resources that were considered in the scenario modeling process are listed in Section III, Table 2 of the Resource Plan. Based on the 2014 RFP issued by Tri-State, we believe that additional renewable generating capacity is available for purchase. Tri-State will not release bid information to protect confidentiality.

Interwest recommends that Tri State strongly consider acquisition of additional wind and utility-scale solar resources above the renewable portfolio standard minimums while they are available under current incentives regime. Economic modeling show that wind and solar energy provide low-cost hedge benefits in the near term under current incentive levels over the period of a long-term purchase power agreement even assuming the production tax credit is no longer available and current lower natural gas prices. See, e.g., M. Bolinger, *Revisiting the Long-Term Hedge Value of Wind Power in an Era of Low Natural Gas Prices,* Lawrence Berkeley National Laboratory, March 2013, Figure 9, p. 20, available at: http://emp.lbl.gov/sites/all/files/lbnl-6103e.pdf. In addition, economic wind energy is now available in many regions where it was not previously understood to be cost-effective because of new technologies providing economic wind production at lower wind speeds. Dept. of Energy, *Wind Vision: A New Era For Wind Power in the United States*, March 2015, available at: http://www.energy.gov/windvision; see also Dept. of Energy, *Enabling Wind Power Nationwide*, May, 2015, http://energy.gov/eere/wind/downloads/enabling-wind-power-nationwide

Tri-State Response: The Action Plan associated with this Resource Plan provides for possible acquisition of additional renewable resources by Tri-State.

3. Interwest is also interested in the transmission costs which will be assumed by the model for each resource, if any. Are there any transmission adders attributed to wind and solar or other resources? How are these costs calculated and assigned? Are there benefits assigned to offset the cost of new transmission, due to the cost savings accruing through fuel-free renewable energy acquisitions and locational diversity made possible by new transmission?

Tri-State Response: The cost of transmission expansion used for financial analysis associated with new resources is discussed in Section IV of this Resource Plan. When decisions are made by the Tri-State Board of Directors to construct new transmission projects or generation projects, those decisions are made on a case-by-case basis with consideration given to all related costs and benefits associated with the proposed project. In the modeling process, transmission cost "adders" were assessed after the System Optimizer selections and reflected in the PVRR associated with each scenario.

4. Are integration or cycling costs added to any resources, and if so, how much? If they are to be applied, what is the methodology for your analysis? Please provide copies of any integration studies used for these purposes.

Tri-State Response: For all scenarios, a cost of $5 was added to each MWH of wind or solar, but solar was not selected in any scenario. These estimates are based on a general survey of industry experience, and with actual Tri-State experience as a customer of transmission ancillary services. For example, under the PSCO Open Access Transmission Tariff, PSCO charges approximately $5/MWH for wind generation that is a network resource located in their balancing authority.

5. The expanding regulatory regime which will apply to electric utilities will increase the cost of operating thermal plants, especially coal. What assumptions will be used to recognize these costs? Interwest suggests the carbon prices and emissions controls be modeled consistent with the suggestions of Western Resource Advocates provided orally and in WRA's follow-up written comments, because WRA has completed extensive analysis of the impact of carbon regulations on the markets and on the potential impacts of the Clean Power Plan. WRA makes reasonable recommendations for cost-effective compliance regimes which may be helpful to Tri-State.

Tri-State Response:

In the 2015 Resource Plan and as described in section IV of this Resource Plan, Tri-State included a scenario that included a carbon cost of $8 per ton, growing to $25 per ton by 2035.

In consultation with the public participants in the IRP/ERP process, Tri-State developed a list of proposed scenarios, and then added several scenarios based on public input. Also, Tri-State has consistently indicated that we would not attempt to model the CPP during the 2015 IRP/ERP cycle, largely because of uncertainty surrounding the implementation of the CPP and the timing required to complete scenario analysis.

6. What prices do you use for water withdrawal and consumption for the thermal resources modeled as part of your future portfolios? Do you publish reports to your members about the water consumption from each of your supply side resources in your portfolio? Do you assume that the costs of water consumption will rise for new resources? Please consider that water is likely to be more constrained if the severe drought conditions in portions of your service territory persist. New Mexico and Southeast Colorado continue to reflect severe drought conditions, despite this wet Spring. The rivers from which your water supply for coal plants may have reduced flows and increased regulation about cooling and discharge impacts. It is likely that water restrictions will bring higher withdrawal and consumption costs to bear for supply side resources, and the modeling should include a sensitivity for this likelihood.

Tri-State Response:

Tri-State has not modeled the pricing associated with water withdrawal and consumption for future thermal resources because these costs are generally small compared to capital and fuel. As a part of the IRP/ERP process, and as part of the annual updates to the IRP/ERP, Tri-State publishes

forecasted water consumption related to each scenario for both exiting resources and resources that are implied in various expansion plans related to the scenarios.

6. How will you incorporate new storage technologies into your modeling? Storage technologies can allow Tri-State to defer distribution investments in remote areas. Department of Energy, *Grid Energy Storage*, Dec. 2013, p. 26, available at: http://energy.gov/oe/downloads/grid-energy-storage-december-2013.

Tri-State Response:

Specifically in response to public input, Tri-State modeled a scenario that involved significant amounts of new battery storage, coupled with distributed solar generation. The results of this scenario analysis are presented in the Resource Plan.

Thank you for your work. We look forward to receiving responses to these comments and questions and to their incorporation into your modeling scenarios. I am available to discuss if you have questions.

Very truly yours,
ALPERN MYERS STUART LLC

6/9/2015

Mike,

Attached are WRA's comments on the Tri-State proposed ERP scenarios. I apologize for the delay.

WRA staff are available to discuss the attached comments and, in particular, approaches to account for the EPA's Clean Power Plan rule in the scenario modeling.

Regards,

Gwen

Gwen Farnsworth

Sr. Energy Policy Advisor

Western Resource Advocates

2260 Baseline Road, Suite 200

Boulder, CO 80302

WRA Comments on Tri-State Draft 2015 IRP Scenarios

WRA appreciates the opportunity to provide this initial feedback on Tri-State's proposed scenario analysis for its 2015 Colorado Integrated Resource Plan (IRP) cycle.

Our comments concern four elements of the IRP scenario analysis: scenarios, resource options, assumptions and sensitivities.

Scenarios

WRA's primary request for Tri-State's scenario analysis is to include two Clean Power Plan (CPP) scenarios. These CPP scenarios should be based on the goal of EPA's CPP draft 111d rule for existing power plants. Although a final rule is not expected until this summer, Tri-State is able to and should test the impact of these pending requirements in its IRP modeling. This type of risk analysis is the fundamental reason to undertake the IRP scenario modeling. Carbon emissions are a key future risk for electric utilities.

The CPP Scenarios below apply the draft 111d rule until a final rule is available.

Scenario WRA CPP-A, "CO_2 BAU":

- Base Case scenario
- \$20/ton CO_2 price for all CO_2 emissions that exceed, by state, EPA CPP emissions maximum (calculated as a 10-year average during 2020-2029)

- The $20/ton cost for CO_2 exceeding the CPP limits may be calculated after the Base Case scenario is run
- This scenario approximates the cost of compliance if a CO_2 credit trading mechanism exists

Scenario WRA CPP-B, "CO_2 Max":

- EPA CPP emissions maximum applies as a constraint (10-year average during 2020-2029)
- Run scenarios as both mass-based and rate-based emissions constraints

Scenario WRA CPP-C, "CO_2 Credit Trading":

- EPA CPP emissions maximum applies as a constraint (10-year average during 2020-2029)
- Allow purchase of CO_2 emissions reduction credits for $20/ton (ie., model will select resources that reduce CO_2, up to the $20/ton price)
- Run scenarios as both mass-based and rate-based emissions constraints
- This scenario approximates the cost of compliance if a CO_2 credit trading mechanism exists

WRA would be happy to discuss ways to implement these CPP scenarios. For example, if it is not possible for the model to select resources based on a 10-year average emissions constraint in 2020-2029, Tri-State should calculate the CO_2 emissions exceeding the draft CPP rule as described in WRA CPP-A, above. Given the estimated shortfall in CO_2 emissions compliance, Tri-State can then define CPP Compliance scenarios and require the model to select sufficient amounts of additional renewable energy and energy efficiency annually to eliminate the excess CO_2 emissions in the 2020-2029 timeframe. The cost of the resulting CPP Compliance scenarios (with additional renewable energy and energy efficiency) can then be compared to the WRA CPP-A "CO_2 BAU" calculation of compliance costs assuming a $20/ton CO_2 credit price.

Tri-State Scenario 6, "Increased DSM/EE and DG," should reflect a DSM standard at least as strict as the assumptions underlying the EPA's draft 111d rule. In that case, Tri-State should achieve reductions of system energy use of 1.5% annually, against a 2012 baseline, by 2030. Interim constraints can be applied at 2020 (reduce system energy use by 0.5% annually compared to 2012) and 2025 (reduce system energy use by 1% annually). This construction is not the same as "increasing consumer EE by 1.5% per year for 2020-2030." Important factors determining the outcome of this scenario will be the assumed cost of additional DSM and the cost of DG. The model should use reasonable cost assumptions for these resources and should be able to select DG up to at least a 10% penetration level.

Tri-State Response:

Tri-State has consistently indicated that we would not attempt to model the CPP during the 2015 IRP/ERP cycle, largely because of uncertainty surrounding the implementation of the CPP and the timing required to complete scenario analysis. However, the EE/DSM scenario did use Building Block #4 from the draft Clean Power Plan as a guideline for EE.

Resource Options

In modeling *each* scenario, the model should be able to select increasing amounts of not only renewable energy resources, but also energy efficiency. The cost of additional demand side

management can be estimated per MWh, with related MW reductions assumed per MWh energy savings, in blocks of 1 GWh savings per year, for example.

Tri-State Response:

The DR forecast was modeled as a contract in SO, and the EE forecast was included in the load forecast.

Sensitivities

Run each scenario with high commodity costs and low renewable resource costs (representing lower development costs or extended PTC/ITC tax credits) as sensitivity tests.

It will be more informative to understand the impacts of scenarios under these varying sensitivity tests. High energy efficiency, high renewables, and coal retirement scenarios should be run with sensitivity tests for high fossil fuel costs and low renewable resource costs.

A CO_2 emissions sensitivity can be applied to the coal retirement scenarios, but only if a CO_2 price sensitivity is *also* applied to other scenarios, including the Base Case, for comparison.

Tri-State Response:

Agreeing to this request would have added many additional scenarios to the 9 for which Tri-State performed detailed modeling. Tri-State believes that the 9 scenarios it analyzed resulted in a representative set of outcomes that "bookend" a wide range of future conditions and did not believe the additional time and effort required to complete all of these additional scenarios would provide a commensurate benefit and so we declined to run these additional scenarios.

Assumptions

WRA requests clarification and further details of Tri-State's proposed assumptions. Tri-State has not provided assumption data in a useful format nor in sufficient detail for stakeholders to respond. In order to comment on the proposed assumptions, WRA and other stakeholders should have the opportunity to review assumptions in detail, including baseline values, escalation factors, or annual forecast values.

Additionally, the available resource types the model may select will also be defined based on a set of assumptions. WRA requests detailed assumptions for renewable resource price forecasts (e.g., utility-scale and distributed wind and solar; recycled energy) and project sizes the model will be permitted to select.

Other types of assumptions are the system operational and external policy constraints assumed in the scenarios. For example, what level of DSM achievement is assumed in each year, and is this assumption defined only as a MW reduction or also MWh reductions? What transmission costs are assigned to different types of resources and how are transmission costs modeled? As requested by Justin Wilson, WRA also requests Tri-State's assumptions and restrictions controlling coal plant operations, including minimum operational constraints and take-or-pay coal contracts. WRA also requests identification of assumptions for compliance with federal environmental regulations. In other words, which federal environmental regulations are assumed to be required, at what dates is

compliance assumed to be required, and what additional costs are assumed per plant to achieve compliance?

Tri-State Response:

Tri-State has provided extensive information to the public participants regarding the data used in the scenario modeling including forward fuel price forecasts, forward market price forecasts, load growth (base, high and low), a characterization of existing generating resources, a summary of power purchase and sales information, and information describing demand side / energy efficiency offerings to Tri-State Members. Tri-State also summarizes the list of candidate resources available to System Optimizer for selection. Tri-State has not provided certain detailed modeling information to the public to protect confidential information

Questions

1. For scenarios other than Tri-State's Scenario 9, will the model be limited to RES compliance, or will the model allow selection of renewable resources above the RES minimum?

Tri-State Response:

For all scenarios, Tri-State does not place limits on the generation resources that are selected.

2. What level of DSM achievement is assumed in each year, and is this assumption defined only as a MW reduction or also MWh reductions?

Tri-State Response:

In 2015, Tri-State staff conducted an annual review of the current Demand Side Management (DSM) program and Energy Efficiency (EEP) programs to verify energy savings and recommend modifications to the EEP Program for 2016. Tri-State estimates that these efforts resulted in a savings of 134,653 megawatt-hours of energy through the utilization of EEP program's new and previously installed equipment.

For DSM, Tri-State assumes a MW and MWh reduction during certain time frames. The DSM forecast was flat for entire planning period.

3. What transmission costs are assigned to different types of resources and how are transmission costs modeled?

Tri-State Response:

This information is provided in Section IV of this Resource Plan.

4. What are Tri-State's assumptions controlling coal plant operations, including minimum operational constraints and take-or-pay coal contracts? For example, what percentage of Tri-State's coal plant operations are under take-or-pay coal contracts?

Tri-State Response:

Tri-State includes modeling of minimum load levels of coal plants based on operating experience and these minimum load requirements are typical throughout the industry. Tri-State will not provide information regarding take-or-pay coal contracts.

5. Which federal environmental regulations are assumed to be required in the future, at what dates is compliance assumed to be required, and what additional costs are assumed per plant to achieve compliance?

Tri-State Response:

Tri-State strives to maintain 100% compliance with all applicable state and federal regulations in the operation of all facilities. Additionally, in the PVRR calculations, Tri-State assumes specific expense associated with SCR and/or SNCR at Craig and LRS. The specific amounts are proprietary.

6. What is the average adder or range Tri-State will to apply to the public EPRI generation technology cost values, to calibrate the costs to the Colorado market?

Tri-State Response:

In order to protect the confidential nature of the EPRI TAG data Tri-State cannot provide any more detail than that which is provided elsewhere in this Resource Plan regarding the capital costs of new candidate generation resources.

7. Will Tri-State adjust renewable resource cost forecasts to take into account bids Tri-State and Public Service Company of Colorado have received in 2013-2014?

Tri-State Response:

Tri-State updates renewable energy price forecasts on an annual basis based on the best information available to it, including recent bid information and other public data.

8. Over what timeframes will System Optimizer be run to select resources and minimize costs? For example, will Tri-State run System Optimizer to select resources and minimize costs hourly or annually?

Tri-State Response:

For this Resource Plan, Tri-State selected a 20-year planning period, and System Optimizer is programmed to minimize PVRR over that 20-year period.

From: Justin Wilson [mailto:justin@westerncec.org]
Sent: Tuesday, May 26, 2015 12:27 PM
To: Salva, Mike
Subject: 2015 IRP Comment/Data Request

Hi Mike -

Gwen Farnsworth at WRA forwarded me the proposed scenarios Tri-State plans to run as part of its 2015 IRP. Could you please add me to your mailing list for this type of information related to the IRP?

If memory and my notes serve me correctly you were also going to include some information about any constraints incorporated into the System Optimizer model related to your coal units. At the meeting we discussed and the Tri-State team indicated they would provide information related to any constraints related to coal units and renewable energy such as: minimum run rates for coal units or any forced run of units, ability for the model to choose retirement for any coal units, maximum allowable MW for renewable or DSM/EE allowed on the system, are the cost of breaking fuel contracts included in the PVRR output of the model, how does the model handle any outstanding cost for capital projects on plants.

Also, what is the assumption for Regional Haze Compliance for the Laramie River Station and at what date?

Additionally, Rob indicated that there would be a write up of the differences between the public and private EPRI data sets. Certainly not asking for any private data to be shared, but we need to know some sort of bounds around the difference between what was provided in the presentation and what is actually used in the model.

Finally, it would be very useful to have this information laid out in a more complete manner. PacifiCorp does a good job of laying out this sort of information that allows for stakeholders to provide meaningful feedback. The links below are examples:

PacifiCorp Scenario Matrix

PacifiCorp Case Descriptions

Thanks

Justin

Justin Wilson

Director

Western Clean Energy Campaign

1536 Wynkoop St., Suite 420

Denver, CO 80202

5/26/2015

Tri-State Response:

Justin,

I've added you to the distribution email related to the 2015 IRP.

The primary purpose of Tri-State's System Optimizer (SO) model is to develop long-term resource plans by evaluating the economics related to capacity expansion and retirement, various contracts, load growth, gas and fuel prices, DSM programs, etc. The optimization process in SO minimizes total system costs subject to a number of constraints. Of course, the SO model requires resource supply sufficient to meet peak demand on the system.

SO works by adding or subtracting assets from a portfolio based on minimizing the Present Value of Revenue Requirements (PVRR) subject to the following constraints:

- **Energy Balance**
- **Reserve Margin**
- **Generation and Transmission Operating Limits**
- **Fuel Purchase and Utilization Limits**

SO generates multiple combinations of resources for each year of the study period and computes the costs of each combination.

Capital costs for supply-side options are amortized for investment recovery using a real economic carrying cost method that accounts for the unequal economic lives of generating assets and ensure that assets with higher capital costs, but longer service lives, are not unduly penalized relative to assets with lower capital costs but relatively shorter economic lives. The least cost (i.e., lowest PVRR) path through the possible states in the study period is retained as the optimized capacity plan.

Some of the key SO inputs include;

- **The latest CAPEX for various generating technologies (we use the EPRI TAGWeb data)**
- **Load by region**
- **Fuel costs**
- **Plant heat rates**
- **Transmission constraints**
- **Reserve requirements**

- **Retirement costs**
- **Discount rate**

Specifically regarding your questions below;

- **Coal and gas units are dispatched economically in SO**
- **Minimum run rates for coal are consistent with take-or-pay coal contracts**
- **Coal retirements are allowed**
- **Renewables are added based on economics, however, we could force them in to ensure we meet our CO and NM RPS requirements in 2020**
- **Future approved CAPEX are included (e.g., SCR at CRG2, etc.)**
- **We don't model the cost of breaking coal contracts as Tri-State does not consider this a normal business practice**
- **The capital cost for regional haze compliance at LRS is not currently being modeled because there have been no approved capital projects. At**

this time the regulation has been challenged in the courts and stayed and therefore, the compliance method is not yet defined.

Below is a link for the "public" EPRI TAGWeb data. – http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001026656. I n general the

public version of TAGWeb simply lacks details such as cost to construct based on regional economics, compared to the proprietary version.

Finally, we plan to release the final scenarios to be modeled for the 2015 ERP shortly.

Mike

F. Michael Salva, PE

Energy Resources and Analytics Manager

5/28/15

HI Mike--Thanks for the scenarios. Sorry for the delay in getting the attached comments and supporting documents to you. Hopefully they might still be of some use.

Thanks for all your work on Tri State's Resource Plan. Things are changing quickly. You have a difficult, but interesting, job!

Best

Leslie

Leslie Glustrom

Boulder, Colorado
303-245-8637
lglustrom@gmail.com

May 27, 2015

Mike Salva
Resource Planning
Tri State Generation and Transmission
1100 West 116th Avenue
Westminster, CO 80234
RE: 2015 Resource Plan Scenarios

Dear Mike,
Thank you for the opportunity to comment on the Tri State 2015 proposed scenarios.
Thank you also for the hard work that has gone into developing the plan so far and your willingness to run a number of scenarios. It is very much appreciated!
I would like to make the following comments and requests:

I. More Detail Needed on Assumptions
While I and others appreciate receiving the outlines for the 9 proposed scenarios, it is hard to make constructive comments without more detail on the assumptions that will be used.
In that regard, I have the following requests:

1) Please provide the 20 years cost projections for each assumption. In addition to knowing the capital costs for generation options (e.g slides 35-37 in the May 1, 2015 PPT), it is important to know what is likely to happen to these costs overtime—i.e. will the capital costs for natural gas turbines increase or decrease over the 20 year planning horizon and at what rate? Will the capital costs for solar increase or decrease over the 20 year planning horizon—and at what rate? Also what are the assumptions about Operating and Maintenance costs over time.

Tri-State Response:

Tri-State has provided information regarding projected capital costs of new candidate resources used in System Optimizer, and these costs are assumed to escalate at 2.25% over the planning period.

2) Slides 14-29 provide information on the "base" commodity prices. Please provide this information in spreadsheet format so the values will be easily discernible.

Tri-State Response:

Tri-State elects to maintain the current format of data presentation.

3) Please provide in spreadsheet format the values that will be assumed for the "High Commodity Prices" of Scenario 8.

Tri-State Response:

Tri-State elects to maintain the current format of data presentation.

4) Please provide the discount rate that will be used to determine the Present Value Revenue Requirement and explain why it was chosen and whether it will be applied to fuel and operating costs as well as capital costs.

Tri-State Response:

The discount rate Tri-State used to determine the PVRR for this Resource Plan was the 30-year Treasury + 200 basis points.

II. Sensitivities Needed on Discount Rate

Discounting future fuel costs has the effect of making these future costs appear, well, "discounted!" Future fuel prices are not likely to be experienced as "discounted" but rather at their full price—which is likely to be significant. Tri State's fuel costs have been rising dramatically. To keep power affordable for Tri State members, the impact of discount rate should be explored and understood before moving forward with large investment decisions.

5) Please run sensitivities related to discount rate.

Tri-State Response:

Tri-State has an understanding of the impact of discount rate on the analysis it has performed, and believes it has used an appropriate discount rate in the analyses. To change the discount rate (and perform multiple sensitivities) would require full analysis of many more scenarios and Tri-State believes that the existing 9 scenarios provide a good view of many possible outcomes.

III. More Sensitivities Needed in the Coal Plant Retirement Scenarios

The scenarios for coal plant retirements both assume No Production Tax Credit (PTC), no price on carbon and base commodity prices. This is an equation for finding high costs associated with coal plant retirements, so running these scenarios is not likely to be very productive.

In reality, it is very likely that at least one or two of these assumptions will be different than Tri State has proposed—i.e. there is a PTC or coal and natural gas prices are higher than expected or a price on carbon emissions has been established.

In this regard, I have the following requests.

6) Run the coal plant retirement scenarios with varied sets of assumptions. If you need to keep the number of scenarios down, then it would be better to run the 100 MW coal retirement with the opposite set of assumptions (i.e. PTC extended, coal and gas commodity prices high and a fee on carbon) and leave out the 300 MW coal retirement.

Tri-State Response:

Tri-State performed complete analysis on 9 scenarios based on public input and consideration of conflicting objectives. Tri-State believes that the results that have been presenting regarding the 9 scenarios that were chosen for detailed analysis provide a good view of a wide range of alternatives.

IV. More Variation in Scenario Assumptions

Again, all the scenarios except Scenarios 7 and 8 use the same set of assumptions—

- Base commodity (i.e. coal and natural gas) costs
- No Production Tax Credit (PTC)
- No carbon tax

Again, it will be more informative if the scenarios are run with a variation in the base assumptions. One thing that is often done is to run some preliminary runs to see which sensitivities for which variables have the biggest impact and then once that is determined, then vary those variables for a number of runs. Other models do probabilistic or Monte Carlo analysis to run many trials with a variation in the assumptions. In that regard, I have the following request:

7) Do some preliminary runs to see which variables have the biggest impact on the modeling outcomes and then use that information to run more sensitivities for the scenarios.

Tri-State Response:

Tri-State performed complete analysis on 9 scenarios based on public input and consideration of conflicting objectives. Tri-State believes that the results that have been presenting regarding the 9 scenarios that were chosen for detailed analysis provide a good view of a wide range of alternatives. Tri-State believes that scenario analysis (in contrast to stochastic or Monte Carlo) analysis is more appropriate for long term planning when the co-variance between key variables cannot be accurately predicted.

IV. Assumptions About Renewable Energy Costs Should Derive From Recent Bids

Two Colorado utilities, Xcel/Public Service Company of Colorado (PSCo) and Black Hills, have recently put out Request for Proposals (RFPs) for wind and solar resources. The results of these RFPs should be used to inform cost assumptions for renewable energy rather than relying on generic

estimates that may not reflect the excellent solar, wind, biomass and small hydro resources available in Tri State territory. In this regard I have the following requests:

8) Please confer with PSCo and Black Hills to get a range of prices that are appropriate for wind and solar resources in Colorado.

9) Please confer with any New Mexico or Wyoming utilities that might have recent data on bid prices for wind, solar and small hydro that can be used to inform Tri State's assumptions about renewable energy costs.

Tri-State Response:

As we have discussed at the public meetings, Tri-State issued an RFP in October, 2014 and as a result of that process has executed three renewable PPAs in the last few months. As a result of the many responses to this RFP and other public data, Tri-State believes that the assumptions we have used regarding future pricing for renewable resources is valid.

V. Base Assumption About Coal Generation Is Not Likely to Be Correct

Perhaps the most important issue at play here is that Tri State's assumptions about future coal generation are almost certainly not correct. Below is a copy of the PPT slide showing that Tri State assumes its coal plants will run in the future as they have in the past. **The assumption that coal will be the backbone of the Tri-State system in the 21st century is almost certainly incorrect for the reasons outlined below.**

Coal is not likely to form the backbone of the Tri State system in the 21st century for a number of reasons, including:
 Coal is losing its "social license:" As these comments are being written, Houston, Texas is being devastated by floods and a heat wave in India has killed hundreds of people as discussed in the following links and shown in the following images:1 The statistical connection between a warming planet driven by emissions of carbon dioxide and increased extreme weather events and heat waves is discussed in a recent scientific paper2 that I will include with these comments.

2 "Anthropogenic contribution to global occurrence of heavy precipitation and high-temperature extremes, " available from
http://www.nature.com/nclimate/journal/v5/n6/pdf/nclimate2617.pdf
While many on Tri State's board may still be in denial about the relationships between burning coal and other carbon based fuels, a warming planet and extreme weather events, an increasing number of people—including many who are customers of Tri-State—are recognizing these relationships and the urgency of reducing our reliance on carbon-based fuels.
As the current Tri-State board ages, there is a good chance that the replacement members will understand the imperative of addressing climate change and want to move beyond coal—even if there are no formal regulations requiring it.

b) **Coal costs are rising making coal no longer "cheap"—even when externalities are ignored.**
As shown in the Power Point presentation I gave on May 1, 2015, Tri State's coal costs are rising with the coal costs for the Craig plant more than doubling over the last decade:
One consequence is that Tri State's power expenses have risen over 5 times faster

than their sales over the last decade, as shown below using data from Tri State's Annual Reports. 7

As Tri-State fuel and power expenses rise much faster than their sales, Tri State members are likely to start noticing and choosing not to retain a heavy reliance on coal for cost and affordability reasons alone.

c) Coal Supply Constraints Are a Distinct Possibility in the Coming Years and Decades

The US coal industry is in dire financial straits and it is now unclear who will be mining coal even a few years from now—what's less 2 decades from now. If coal can't be mined at a profit, not much of it will be mined. The figure below underscores that the top 3 US coal companies are no longer able to mine coal at a profit. These coal companies are all important suppliers to Tri-State coal plants and no number of bankruptcy attorneys or judges can change the geologic facts of coal which make most of the remaining coal in the US unlikely to be mined at a profit. 8

While Tri-State likes to claim that it has "long term coal contracts," it is not clear that many such contracts exist. Included with these comments is a spreadsheet of the coal contracts and deliveries for February 2015—the most recent month that data are available--using the "EIA 923" database found at http://www.eia.gov/electricity/data/eia923/ (See Sheet 5 for the fuel deliveries).
As can be seen from the spreadsheet, the only significant long term coal contract for Tri State coal plants seems to be with the Dry Fork mine for the Laramie River Station. Otherwise, the coal being delivered to Tri-State's coal plants appears to be under contracts that expire in the next several years.
10) If Tri-State believes it has additional long term coal contracts other than with the Dry Fork mine, please make at least the outlines of these agreements available to Tri-State members and other interested parties.

d) Climate Change May Threaten the Stability of the Western Grid

Included with these comments is an analysis of the possible impacts of climate change on the stability of the western electric grid. 3 As drought, heat waves and extreme weather become more common, the generation capacity of Tri-State's coal fleet could be impacted by low water flows or warm intake water or destruction from extreme weather. All of this will help drive a transition to a more resiliant and distributed grid that will be less subject to the vagaries of our changing climate.
3 See Impacts of climate change on electric power supply in the Western United States," available from
http://www.nature.com/nclimate/journal/vaop/ncurrent/pdf/nclimate2648.pdf
A description of the attached study can be found at the following link:
http://www.pvbuzz.com/arizona-state-university-changing-climate-challenges-power-generation-facilities/

<u>Tri-State Response:</u>

Tri-State is dedicating significant resources to study of and reaction to the topics that are raised here, including the CPP, climate change, coal pricing, and coal availability, and we acknowledge these comments.

e) Renewable Energy is Quickly Becoming Cost Competitive

Another reason that Tri-State is unlikely to continue burning coal at the same rate that it did in the last century is that wind and solar costs have plummeted and have helped make wind and solar cost-competitive with fossil fuel resources. The graph below shows how Xcel in Colorado (Public Service Company of Colorado) found that

bids submitted in 2013 **lowered** system costs for its customers. 9

As the costs of fossil fuels rise and the costs of renewable energy fall, Tri State will likely find that the path to affordability for Tri State customers no longer lies with burning coal—even if the external costs are ignored and there are no regulations on carbon. In this century, renewable energy is increasingly making sense based on cost issues only!

For all of these reasons, the future is likely to see a significant reduction in a step-wise fashion of Tri State coal generation, resulting in something that looks like the diagram below with the light green being coal that is displaced by other generation, shown in blue.
For all the reasons described above, coal burning is not likely to continue in the 21st century as it did in the 20th century. The good news is that Tri State is is blessed with magnificent clean energy potential in its service territory. This 201 Resource Plan is a prime time to help Tri State find a new path to affordability!

Tri-State Response:

Tri-State has significantly expanded its renewable resource position over the last months, and we acknowledge these comments.

5/24/2015

Steve,

We will analyze all 9 proposed scenarios for the 2015 ERP/IRP.

See my comments below in red.

Mike

F. Michael Salva, PE

Energy Resources and Analytics Manager

From: Steve Szabo [mailto:coopmembersalliance@gmail.com]
Sent: Sunday, May 24, 2015 9:21 AM
To: Salva, Mike
Subject: Re: Proposed Scenarios for Tri-State 2015 ERP/IRP

Tri-State Response:
Hello Mike,

At first glance I would opt for #9, but it's difficult to make an informed choice since there are no details provided. Some information provided with each bullet item would be nice.

Please note on scenario #6 - "EE by 1.5% per year for 2020-2020 ?? – Thanks, it should be 2020-2030.

I do have questions about some of the information provided in 2015 ERP second public meeting:

1. On slide #27 it shows coal costs comming down compared to the estimate in 2014. What do you attribute this to? – Two things, Tri-State ownership of Colowyo and Trapper Mines and a change in methodology for estimating future coal prices.

2. On slide # 43, why is coal missing from the chart. – Coal was not selected as it was not economic esp. with low natural gas prices.

Since the next public meeting was changed form July 1st to August 6th I won't be able to attend. Also please consider extending the deadline for comments on the scenarios since there was a schedule change for the next public meeting. Also please consider providing more information on each scenario. – I told Gwen at WRA last week that comments on the proposed scenarios will be accepted thru Weds., May 27.

Thanks,

Steve Szabo

303-809-3547

On May 18, 2015, at 3:19 PM, Salva, Mike wrote:

Mr. Szabo,

Please find attached the scenarios we are proposing for Tri-State's 2015 ERP/IRP.

I would appreciate your comments by COB on Monday, May 25.

F. Michael Salva, PE

Energy Resources and Analytics Manager

5/1/15

Hi Mike--The PPT for the Tri State planning meeting is attached. Sorry for the delay. There were several complications in my week.

See you soon.

Leslie

Boulder, Colorado
303-245-8637
lglustrom@gmail.com

On Wed, Apr 1, 2015 at 9:52 AM, Salva, Mike <msalva@tristategt.org> wrote:

Leslie,

I'm reaching out to you to see if you want to make a presentation at Tri-State's next public meeting on Friday, May 1st.

We have allocated time for public presentations.

Please let me know by Friday, April 17 if you would like to make a public presentation.

Thanks,

F. Michael Salva, PE

Energy Resources and Analytics Manager

4/30/15

Hi Mike,

I will send you the slides today. I apologize if my delay has been an inconvenience for you. Our slides will be short, less than 10. Nothing shocking, I think.

Regards,

Gwen

From: Gwen Farnsworth [mailto:gwen.farnsworth@westernresources.org]
Sent: Friday, April 17, 2015 3:45 PM
To: Salva, Mike
Cc: Erin Overturf; John Nielsen; Stacy Tellinghuisen
Subject: RE: Presentation at Tri-State 2015 ERP/IRP Public Meeting

Hi Mike,

Thanks for your email.

Yes, WRA would like to give a presentation at the next Tri-State IRP meeting. Please reserve about 10 minutes for us.

Thanks,

Gwen

On Apr 1, 2015 11:21 AM, "Salva, Mike" <msalva@tristategt.org> wrote:

Gwen,

I'm reaching out to you to see if you want to make a presentation at Tri-State's next public meeting on Friday, May 1st.

We have allocated time for public presentations.

Please let me know by Friday, April 17 if you would like to make a public presentation.

Thanks,

F. Michael Salva, PE

Energy Resources and Analytics Manager

3/3/2015

Mike,

I guess what I'm looking for is the Value of Wind and Solar vs the fossil fuel plants. A chart something like this.

On Mar 3, 2015, at 3:43 PM, Salva, Mike wrote:

Steve,

Thanks for the follow-up email.

Exactly what are you looking for wind and solar; capital or installed costs.

Mike

From: Steve Szabo [mailto:coopmembersalliance@gmail.com]
Sent: Tuesday, March 03, 2015 8:48 AM
To: Salva, Mike
Cc: Carlisle, Sarah
Subject: 2015 ERP/IRP

Hello Mike,

When I spoke at the meeting I requested that for our next meeting in May you include cost forecasts for coal, nat gas, wind, and solar. Rob requested that I put the request in via email, so here it is.

It would be great if you could include all four on one chart if possible. Attached is the charts that we usually see in the ERP / IRP.
Thank You, Steve Szabo

<u>Tri-State Response:</u>

Tri-State does not view the value of renewables in exactly the same way that is presented, and instead in this process has evaluated the PVRR associated with various scenarios that include

additions of different resources. In general, at this point, with the Investment Tax Credit (ITC) in place, we believe that utility scale solar can be implemented at approximately 4 cents per kWH, community solar at approximately 8 cents per kWH, and rooftop solar at approximately 12 cents per kWH, with significant variability due to location, construction costs, scale and other effects.