INTEGRATED RESOURCE PLAN 2018

Approved

Nebraska Public Power District

Always there when you need us

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EXECUTIVE SUMMARY

Introduction

Nebraska Public Power District (NPPD) is Nebraska's largest electric utility, serving all or parts of 86 of Nebraska's 93 counties. NPPD supplies the total wholesale power requirements of 46 municipalities and 24 public power districts and cooperatives. NPPD also serves 79 entities at Retail with Professional Retail Operations (PRO) Agreements as well as others, that combined, add up to more than 91,500 customers. NPPD's electrical system, including transmission and sub-transmission grids, comprises more than 5,200 miles of power lines.

NPPD uses a mix of fuel resources, including renewables, nuclear, coal, oil, and natural gas to generate electric power. In addition, NPPD purchases energy from the Western Area Power Administration (WAPA), which is a Federal marketing and transmission agency for, primarily, Federal hydropower.

The Energy Policy Act of 1992 requires all WAPA customers to submit an Integrated Resource Plan (IRP) every five (5) years. The Department of Energy (DOE) defines an IRP as a planning process for new energy resources that evaluates the full range of alternatives, including new generating capacity, power purchases, energy conservation and efficiency, cogeneration and district heating and cooling applications, and renewable energy resources, to provide adequate and reliable service to a customer's electric consumers.[1]

This report meets NPPD's 2018 IRP cooperative filing requirement under WAPA's regulations for a five-year report. A complete list of entities covered under the NPPD IRP is provided in Appendix A. This IRP is being prepared on behalf of:

NPPD's Wholesale Requirements Customers receiving WAPA power benefits through NPPD's purchases from WAPA, and the following direct purchasers of WAPA power (those receiving their own allocation):

> Auburn, Beatrice, Beatrice State Development Center, Cambridge, David City, Deshler, DeWitt, Emerson, Franklin, Indianola, Laurel, Lodgepole, Lyons, Madison, Norfolk Regional Treatment Center, Northeast Nebraska Public Power District, Oglala Sioux Tribe, Omaha Tribe, Ord, Randolph, Santee Sioux Tribe, Schuyler, South Sioux City, Spalding, Superior, Wahoo, Wakefield, Wayne, Wayne State College, Wilber, Winnebago Tribe, and Winside

This report also meets the requirements of Nebraska Revised Statutes Section 66-1060 and NPPD's Wholesale Power Contract.

[1] This sentence is taken from the 2017 Code of Federal Regulations, Title 10 – Energy, Chapter III, Part 905 – Energy Planning and Management Program, Subpart A – General Planning, Section 905.2

IRP Planning Principles

NPPD decided to look at the next five (5) years, 2018-2022 for this IRP. The reasons include:

- NPPD does not require new resources within this period. As shown in the Load and Capability Section of this report, NPPD's existing resources are sufficient to meet the base load forecast, and even the high forecast.
- The planning horizon for new supply side resources is relatively short based on resources normally installed in the industry today. Nuclear and coal facilities have relatively long lead times, but with the exception of one nuclear facility in the southeast part of the U.S., no utilities are building or planning to build these types of facilities. Natural gas peaking units, combined cycles, and renewables have been the units of choice in today's competitive industry environment. These types of units tend to have relatively short lead times (e.g., within five years), provided that transmission is available.
- The nature of electric utility industry is ever changing. In regions of the country with higher utility costs, a significant amount of distributed generation is being installed. In the Southwest Power Pool (SPP), a significant amount of renewables have been added recently, and if all presently proposed renewables projects are installed the amount of renewables in the SPP footprint would be more than three times today's amount. This would have a significant impact to the wholesale energy market even if only a portion of the proposed amount is built.
- The environmental regulatory landscape has changed with the new U.S. administration. It is not presently known as to the degree of change or how administrations will adjust in the future.
- NPPD's new 2016 Wholesale Power Contract allows a 10% renewable self-supply option, or 2 MW, whichever is greater. Since this is a new contract provision it will take some time to understand how much will be built.

Based on the above, NPPD has time to see how the future unfolds. Delaying the decision on future resources until there is more certainty will result in better decisions.

Interface with the Public

Public involvement and comment is a cornerstone for many activities of the Nebraska Public Power District, including past IRPs, transmission line projects, relicensing of Cooper Nuclear Station, and specific industry topics, such as community solar programs.

NPPD communicated the 2018 IRP study, its development, and rationale for a five-year plan through a variety of methods including several board of director meetings, wholesale customer meetings, and communications to the public. Customers and members of the public were invited to read the draft report and provide feedback via a survey on special IRP microsite located on NPPD's homepage, www.nppd.com. Promotions to learn more about NPPD's generation resources and take a survey were communicated via press release and media inquiries, social media postings, presentations, customer newsletters and publications, and call waiting messages for retail customers contacting NPPD's Centralized Customer Care Center.

The public input received, whether from the survey on www.nppd.com/irp or submitted through emails or letters, is summarized in Section 7 of this report.

Changes Since the Last IRP

One of the most significant changes since the completion of the 2013 IRP Report is the extension of contracts with a majority of our wholesale customers from 2022 to 2035. The new contract allows our wholesale customers to install and self-serve up to 10% of their demand with renewable generation in their communities. If all of NPPD's Firm Load customers who entered into the new 2016 Wholesale Power Contract exercise this contractual right, it could add approximately 300 MW of renewable generation that will serve the entities covered under this IRP.

Cooper Nuclear Station (CNS) installed a new, more efficient high pressure turbine, resulting in approximately five (5) MW of additional capacity. After further analysis, NPPD Board of Directors voted not to move forward with the Extended Power Uprate (EPU) for CNS. A more detailed feasibility study completed after the 2013 IRP estimated higher costs and schedule risks associated with the EPU. The 2013 IRP included an EPU in the lowest cost resource plans.

NPPD receives generation from two additional wind facilities via power purchase agreements (PPA). Our share of these two facilities is approximately 94 MW.

The NPPD and Lincoln Electric System (LES) Boards approved ending LES's participation agreement at Sheldon Station. This results in approximately 65 MW of additional capacity. Monolith Materials has broken ground on Phase 1 of its Olive Creek Facility, located adjacent to Sheldon Station. This facility will produce carbon black. NPPD will convert the Unit 2 boiler to burn the hydrogen rich tail gas after Monolith completes Phase 2 of its facility.

NPPD has continued its EnergyWise^{SM} energy efficiency (EE) program. NPPD's customers have saved over 200,000 MWh using this program. The actual energy savings have trended very close to the high assumptions from the 2013 IRP.

The SPP implemented an Integrated Marketplace (IM) in 2014. This market expansion coordinated next-day generation across its footprint to maximize cost-effectiveness. The electric energy market throughout the U.S. has been impacted by recent innovations in the shale gas industry, as well as by the addition of renewable resources and a slowdown in load growth.

The final version of environmental regulations, contemplated at the time of the 2013 IRP, did not require NPPD to install major controls in order to comply other than low Nitrogen Oxide (NOx) burners and activated carbon injection for mercury control at Gerald Gentleman Station (GGS) and over-fire air and coal additives for mercury control at Sheldon Station. The Trump administration is undergoing a detailed regulatory review of existing environmental regulations. President Trump also signed an executive order in March 2017 mandating the Environmental Protection Agency (EPA) to review the Clean Power Plan and the new source performance standards for new fossil power plants. NPPD does not believe it is likely that any new or

modified existing regulations will be implemented which would require additional pollution equipment to be installed at its fossil units before 2023.

Existing System & Committed Resources

Generation

NPPD uses a diverse mix of generation resources such as coal, nuclear, natural gas, hydro, wind, and a small amount of solar to meet the needs of its customers. For 2016, non-carbon resources were approximately 62% of NPPD's Native Load Energy Sales. Appendix B lists all of NPPD's existing generation resources, including in-state hydro purchases and peaking capacity purchases.

Load Forecast

NPPD employs both top-down and bottom-up forecasting methods. The top-down forecast uses service area socioeconomic "drivers" to project loads based on overall service area economic and demographic trends. The top-down forecast includes models for NPPD system level demand and energy at the Busbar, or system inlet. The top-down forecast also develops customer class energy forecasts at the end-use meter level. The bottom-up or distributor level forecast consists of producing monthly demand and energy forecasts for all of NPPD's wholesale distributors, including NPPD Retail. The distributor level forecast uses data at Bus A, the metering point for wholesale billing. The two methods are reconciled by transmission and distribution losses so that Busbar, Bus A, and meter level forecasts are consistent with each other.

The base case load forecast used in the IRP analysis assumes that NPPD's summer demand requirements will decline at an average rate of 0.80% annually between 2018 and 2022. NPPD's base case energy requirements are forecasted to decline at an average rate of 1.12% annually between 2018 and 2022. These growth rates reflect the continuation of the EnergyWise^{SM} EE programs and the addition of customer behind the meter generation. Load reductions due to several wholesale customers not renewing their power supply contract with NPPD has also dampened forecasted load growth.

Load & Capability

NPPD compared its existing resources to three (3) different load forecasts and reserves required to maintain reliability. For all three (3) forecast scenarios, existing resources were sufficient to serve load and planning reserve obligations. Under the base load forecast, NPPD is expected to have 415 MW of surplus capacity in 2022. Even under the high load forecast, NPPD is expected to have 129 MW of surplus capacity.

By definition, an IRP is a planning process for new energy resources. No new resources are needed since the load and capacity analysis indicated existing resources are adequate over the five year time period considered in this IRP report. As such, no additional IRP work was performed regarding new resources cost assumptions, and no alternative resource plans to the existing resource mix were developed or analyzed.

Resource Mix

NPPD uses a diverse mix of generation resources such as coal, nuclear, natural gas, hydro, and wind to meet the needs of its customers. In 2016, the non-carbon energy resources as a percent of native load sales were 62%. This is expected to grow to 66% by 2022 using the base load forecast.

Action Plan

The goal of the action plan is to better position NPPD for the future. The IRP can be updated on a regular basis as business conditions and available technologies change. Therefore, the action plan will also be periodically reviewed and updated to align with the changing business environment. The action plan items listed in Section 6 and summarized below are expected to be completed by the next IRP report.

- Major Uncertainties - Monitor major uncertainties such as load, market and fuel prices, and environmental regulations.
- Qualifying Local Generation (QLG) - Report on the amount the QLG and other distributed resources.
- Monolith Materials (Monolith) - Report on the progress of the Monolith project.
- Carbon Management Plan - Continue to evaluate carbon management options for GGS, Sheldon, and Beatrice Power Station (BPS).

1. Changes Since the Last IRP

1.1 Wholesale Customers

In 2013, NPPD had contracts with all of our wholesale customers through 2021. More than 70 percent of NPPD's native load was represented by these wholesale power contracts. The remaining load is served by NPPD Retail.

NPPD negotiated with our wholesale customers to extend these contracts. These negotiations resulted in all but nine (9) wholesale customers signing a new 20-year wholesale power sales contract effective January 1, 2016.

1.2 Resource Additions

1.2.1 Qualifying Local Generation (QLG)

QLG is generally defined in NPPD's wholesale contracts as a renewable generator or group of generators behind the meter used by NPPD for determining the customer's wholesale power bill and is not classified as distributed generation. This provision allows NPPD's wholesale customers to add renewable generation in their communities. The 2016 Wholesale contract generally allows wholesale customers to add QLG capacity up to ten percent (10%) of the customer's peak demand, or 2 MW whichever is greater. No QLG was assumed installed in the 2013 IRP. As of mid-2017, 15 solar facilities with nameplate capacity from 50 kW to 5700 kW, or a total of 13 MW have been or are planned to be installed by NPPD's Wholesale Customers (including NPPD Retail). In addition, 3 wind facilities totaling 21 MW are installed or are in the construction phase. Additional QLG facilities are in the planning stages.

1.2.2 Cooper Nuclear Station (CNS)

1.2.2.1 High Pressure (HP) Turbine Uprate

A new HP turbine was installed in the fall of 2016. This new turbine is more efficient than the old one, resulting in approximately five (5) MW of additional capacity.

1.2.2.2 Extended Power Uprate (EPU)

The lowest-cost resource plans in the 2013 IRP included an EPU at CNS. In December of 2012, NPPD's Board directed management to pursue implementation of an EPU while also continuing to study its feasibility. This direction was based on the 2008 IRP and other studies underway at the time.

At its August 2013 meeting, management provided a presentation of a detailed feasibility study which outlined the costs and schedule risks associated with conducting an EPU at CNS. The study revealed a more detailed cost estimate that was higher than the IRP's estimate. Management recommended that NPPD no longer pursue the EPU and NPPD's Board of Directors voted to accept management's recommendation not to move forward with the EPU at CNS.

1.2.3 Wind Generation Facilities

Two wind facilities have been added to NPPD's energy resource portfolio since the beginning of 2013.

1.2.3.1 Steele Flats Wind Farm

NPPD entered into a 20-year PPA in early 2013 with NextEra Energy resources for the total output of Steele Flats Wind Farm. Located in southern Nebraska near the Kansas border, the facility began commercial operation on November 1, 2013. The Steele Flats Wind Farm is capable of generating 75 megawatts of electricity from 44, 1.7- megawatt turbines.

NPPD receives the entire output of the facility, but sells 30 megawatts of renewable energy credits from the facility to Becton-Dickinson Company (BD), a New Jersey company with operations in Columbus, and Holdrege, Nebraska, as part of that company's sustainable energy initiative.

1.2.3.2 Broken Bow II Wind Farm

The 43–turbine Broken Bow II Wind Farm near Broken Bow was completed in the fall of 2014 by Sempra U.S. Gas & Power, which has a PPA with NPPD. Maximum capacity is 73 megawatts. NPPD purchases the entire 73 megawatts, keeping 29 megawatts for NPPD's customers and selling 44 megawatts to Omaha Public Power District (OPPD). Commercial operation began in October 2014.

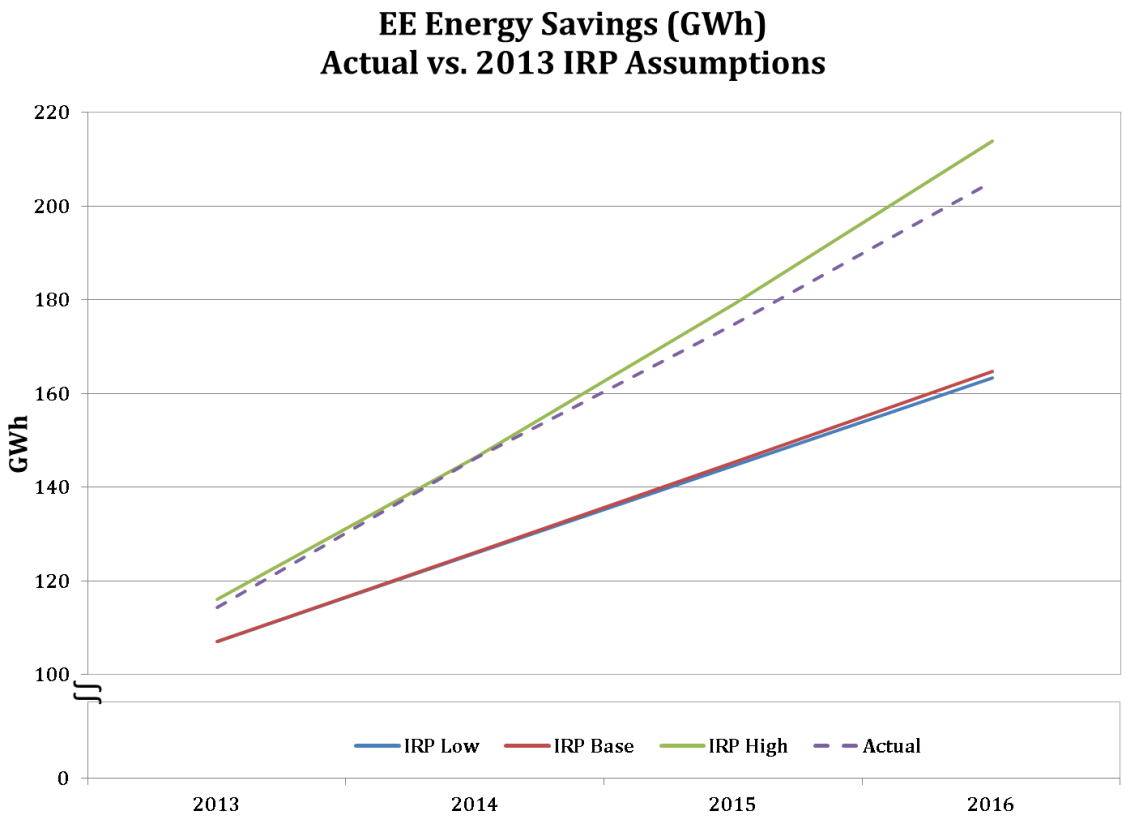
1.3 Capacity Agreements

In May 2017, NPPD and the LES Boards approved ending LES's participation agreement at NPPD's Sheldon Station for approximately 65 MW of capacity and energy. NPPD is pursuing a venture at Sheldon Station with Monolith. Refer to subparagraph 1.5 in this section for further details.

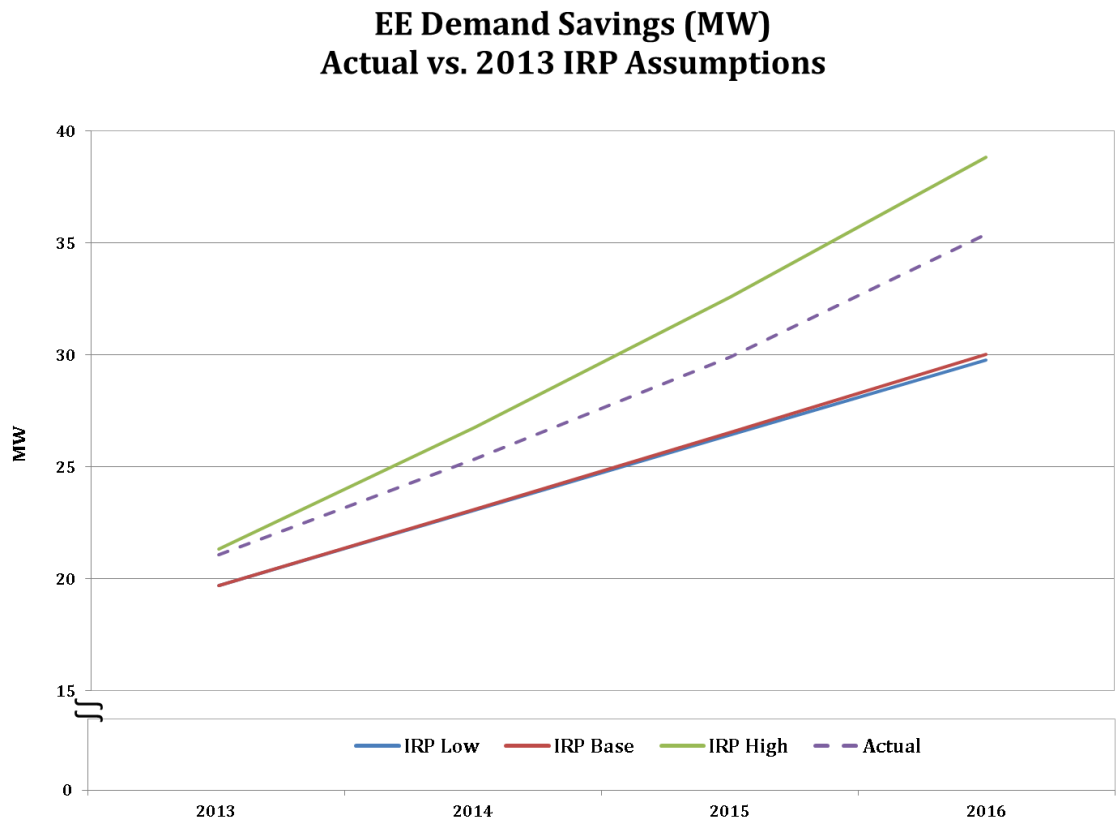
1.4 Energy Efficiency (EE)

NPPD continues its EnergyWise^{SM} EE program. Since the 2013 IRP, NPPD has invested approximately $10 million in many different incentive programs for home, agriculture and businesses served by both NPPD and our wholesale customers. NPPD works in conjunction with its wholesale customers to fund and market a variety of incentive offerings. Two of the most popular incentives include LED lighting and high-efficiency heat pumps.

The actual energy savings have trended very close to the high assumption from the 2013 IRP. Refer to the following chart for how actual energy savings trended to the assumptions in the 2013 IRP report.



Although the primary focus of energy efficiency programs is on energy savings, they do also produce demand reductions. Actual demand savings have trended between the base and high assumptions from the 2013 IRP, as shown in the following chart.



1.5 Monolith Materials

In 2014, Monolith expressed an interest to construct and operate a carbon black facility adjacent to NPPD's Sheldon Station coal-fired generating facility in Nebraska. Carbon black is a material used in reinforcing tires and other industrial rubber products. It can be customized to act as a pigment in inks, paints and toner. Construction of the carbon black facility, to be called the Olive Creek Facility, is expected to be accomplished in two phases.

Groundbreaking for the first phase occurred in October 2016. Monolith expects Olive Creek Facility—Phase 1 to be mechanically complete and operational in 2018. Monolith has signed a contract with NPPD to construct the necessary transmission facilities to serve the operations' initial load. After successful commissioning of the Olive Creek Facility—Phase 1, Monolith intends to construct a large expansion for the Olive Creek Facility—Phase 2.

Electric service to the Monolith facilities will be provided by Norris Public Power District, a firm wholesale customer of NPPD. After completion of the Olive Creek Facility—Phase 2, Monolith will become the single-largest industrial customer served in NPPD's territory.

NPPD entered into a 20-year contract with Monolith to purchase the plants' production of hydrogen rich tail gas, which will be produced by Monolith during its production of carbon black. NPPD will convert its existing coal-fired boiler at Sheldon Station Unit No. 2 to burn the hydrogen rich tail gas. The boiler conversion is expected to result in a reduction of NPPD's carbon dioxide (CO_2), sulfur dioxide (SO_2), mercury, and other air emissions.

NPPD is waiting on the successful commissioning of Phase 1 before including Phase 2 in its base case planning forecast. Phase 2 is included in the high forecast scenario.

1.6 Industry

1.6.1 Southwest Power Pool (SPP)

The SPP launched its IM in 2014. In turn, NPPD began participating as a member utility in the energy marketplace. This market coordinates next-day generation across its footprint to maximize cost-effectiveness for its members. Participation in the market means NPPD sells and purchases power in a day-ahead market with transmission congestion rights, a reliability unit commitment process, a real-time balancing market, and a price-based operating reserve market. It also combines the Balancing Authorities (BAs) in its footprint into a single BA. A single BA has allowed for a much greater penetration of renewable resources than what would be feasible under the old system of multiple BAs.

1.6.2 Market

The shale gas revolution has impacted wholesale electricity market prices in the SPP and other regions. Recent innovations in the industry have dramatically reduced cost and increased the amount of natural gas available to the market, resulting in reduced wholesale electricity market prices.

A significant amount of renewables has been added in the SPP footprint and more potential capacity is in its generation queue. The amount of wind was just under 3,100 MW at the end of 2012.[2] By the end of 2016, the nameplate rating of wind grew to over 16,000 MW.[3] An additional 31,000 MW of wind and 3,100 MW of solar are in the generation interconnection queue in May 2017.[4] Although not all of the generation in the queue may be built, it indicates the potential for significant growth in the near term. To put this amount of generation into context, the maximum hourly SPP load is projected to be from 53,000 to 54,000 MW in the 2018-2022 timeframe[5]. The minimum hourly SPP load in 2015 was just under 17,000 MW[6]. This amount of renewable generation impacts the wholesale electricity market prices since these types of facilities are typically price takers.

Although not as prevalent today in SPP, solar generation has grown in the United States. There is nearly 45,000 MW of solar capacity operating by the end of the first quarter of 2017. The annual growth rate over the last 10 years was 68%.[7]

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[2] 2012 State of the Market Report, Figure i.6 from SPP's website.
[3] Spring 2017 State of the Market Report, Section 3.2
[4] SPP presentation to the Rocky Mountain Electrical League (RMEL) in May 2017.
[5] SPP June 2017 Resource Adequacy Report, SPP Current and Five-Year Outlook Section from their website
[6] 2015 State of the Market Report, Section 2.4.4 from SPP's website
[7] Source for this paragraph is the Solar Energy Industries Association (SEIA) website as of June 2017, located in the Solar Industry Data under Research & Resources

1.7 Environmental

1.7.1 Pollution Control Equipment at NPPD's Resources

At the time of the 2013 IRP report, no existing regulations required NPPD to add significant expenditures for SO_2 and NOx reduction equipment. There were several proposed regulations at the time of the 2013 IRP such as MATS, CSAPR, Regional Haze and the SO_2 and Ozone NAAQS that prompted NPPD to develop some "what if" scenarios in the 2013 IRP which assumed additional SO_2 and NOx controls were installed by the end of 2018.

The final versions of the proposed regulations did not require NPPD to install major controls in order to comply other than low NOx burners and activated carbon injection for mercury control at GGS and over-fire air and coal additives for mercury control at Sheldon Station. There have been no new regulations since the 2013 IRP report was issued requiring NPPD to install any additional pollution control equipment.

President Trump was elected in 2016. The new administration is undergoing a detailed regulatory review of existing environmental regulations that may be repealed, replaced or modified. Until this is completed we will not know for sure the future status of any specific existing or proposed regulation. However, NPPD does not believe any new regulations or modifications to existing regulations will be implemented requiring additional pollution equipment before 2023 based on the Administrations statements and actions to-date.

1.7.2 Carbon Regulation

In the 2013 IRP NPPD assumed some type of carbon/CO_2 regulation or legislation would be enacted in the not too distant future. The costs associated with this assumed regulation or legislation started in 2016 and was under $10 per metric ton in 2022, and ranged from $15 per metric ton to just over $100 per metric ton in 2032.

The Obama Administration finalized the Clean Power Plan (CPP) and it was published in the Federal Register in October of 2015. It required Nebraska to reduce its CO_2 emissions by approximately 40% below 2012 baseline by 2030.

President Trump signed an executive order in March 2017 mandating the EPA to review the CPP and the new source performance standards for new fossil power plants. The legal actions regarding the CPP have been stayed allowing the EPA to recommend whether the CPP should be repealed or if it should be repealed and replaced. We will update this section once the EPA and the Courts have decided on a course of action regarding the CPP.

1.8 2013 Action Items

1.8.1 ACTION 10.1.a – NPPD will work with other utilities to develop interactive tools and training materials for benchmarking EE performance.

Training Webinars for reporting Demand-Side Management (DSM) data via Energy Information Administration (EIA) Form 861 were held in 2013 and 2015, and a practical guide was

completed through the Benchmarking Tools grant awarded through the American Public Power Association's (APPA) Demonstration of energy Efficient Developments (DEED) program.

1.8.2 ACTION 10.1.b – Review best practices for incorporating EE into the load forecast.

Since 2013, NPPD has reviewed several industry surveys and discussed methods for incorporating EE in its load forecast with The Energy Authority (TEA) and LES. NPPD was also invited to appear on a panel discussing load forecasting methodologies at the SPP's Cost Allocation Working Group in 2015. These research initiatives confirm NPPD's methodologies are similar to many in the industry.

1.8.3 ACTION 10.1.c – Conduct a detailed EE study for the state/NPPD end-use customer base to determine specific programs and their costs for NPPD's firm end-use customer load.

NPPD annually tracks end-use customer participation in its EnergyWise^{SM} EE incentive programs. This participation has remained steady over the years, with annual average disbursements about equal to incentive program budget. Rather than performing a detailed study about specific incentive programs, NPPD continues its evaluation of new programs through ongoing methods: feedback from NPPD's wholesale customers through working group meetings; sharing of incentive program information with utilities and organizations, such as OPPD, LES, Nebraska Municipal Power Pool (NMPP), and the Nebraska Energy Office; involvement in the Large Public Power Council's Energy Efficiency Working Group; and participation with organizations such as the Consortium for Energy Efficiency, Questline, and Association of Energy Engineers.

This interpersonal approach has led to numerous new programs being implemented or being considered, such as heat pump water heaters, residential LED lighting, heat mats used in livestock production, and corner system variable frequency drives (VFD) for center pivot irrigation systems.

1.8.4 ACTION 10.2.a – Complete technical studies as required to verify the proposed site is a feasible Compressed Air Energy Storage (CAES) location.

In June 2016 NPPD issued a notice of abandonment to the owner operator of a CAES location NPPD was investigating. Refer to next action item for more information.

1.8.5 ACTION 10.2.b – Perform a more in-depth economic analysis of CAES.

A high-level analysis comparing combustion turbines, reciprocating internal combustion engine, and lithium-ion battery storage with CAES was completed in 2014 and 2015. The analysis determined RICE to be more cost effective than CAES. This helped guide the NPPD decision to end further investigation of a proposed CAES location, as reported in action item 1.8.4.

1.8.6 ACTION 10.3.a – Perform a natural gas pipeline study to assist in locating the next resource.

The proposed Monolith project for Sheldon Station Unit 2 may bring an independent natural gas pipeline to the Sheldon Station Town Border Station.

1.8.7 ACTION 10.4.a – Periodically review the major uncertainties identified in the IRP and report on the changes.

Periodic reports were presented to NPPD's executive team and Board of Directors. The last report was provided to NPPD's Board at their August 2016 meeting. It showed the latest demand and energy forecast to be between the low and base forecasts assumed in the 2013 IRP. By 2030, CO2 prices were projected to be between the low and base forecast values. The market prices were trending below the low forecast.

1.8.8 ACTION 10.5.a – Evaluate carbon management options for GGS, Sheldon, and BPS.

A carbon management options report was completed in 2013. NPPD participated with ION Engineering and the DOE on a post combustion capture pilot. ION testing in Mongstad Norway is currently scheduled to run through second quarter 2017. ION will provide an updated GGS model after Technology Centre Mongstad (TCM) testing is complete. NPPD continues to participate with the Energy and Environmental Research Center at the University of North Dakota on the "Nebraska Integrated Carbon Capture and Storage Pre-Feasibility Study" which started in March 2017 and will conclude fourth quarter 2017.

1.8.9 ACTION 10.6.a – Continue to evaluate the costs and benefits of renewable options including distributed photovoltaic solar. Provide periodic updates and make recommendations as appropriate.

Community solar was installed at Venango and Scottsbluff. A Power Purchase Agreement was also signed for a 5.76 MW community solar project at Kearney.

1.8.10 ACTION 10.7.a – Develop transition plans for aging production facilities.

An Operations standard was developed for non-nuclear power plant transition planning. A plan has been implemented to collect funds to cover future decommissioning costs for these facilities.

2. Existing System and Committed Resource

2.1. Existing

NPPD uses a diverse mix of generation resources such as coal, nuclear, natural gas, hydro, and wind to meet the needs of its customers. Appendix B lists all of NPPD's existing generation resources, including in-state hydro purchases and peaking capacity purchases. NPPD, through its demand waiver program, also utilizes load management to reduce its maximum system demand during on-peak hours. A large portion of NPPD's energy resource mix is with non-carbon sources. Exhibit 2.1-1 shows NPPD's non-carbon energy sources as a percent of native load energy sales. In 2016, non-carbon energy was 62% of Native Load Sales. Exhibit 2.1-2 presents the capacity breakdown for all resources.

Exhibit 2.1-1 – Sources of Non-Carbon Resources as a Percent of Native Load

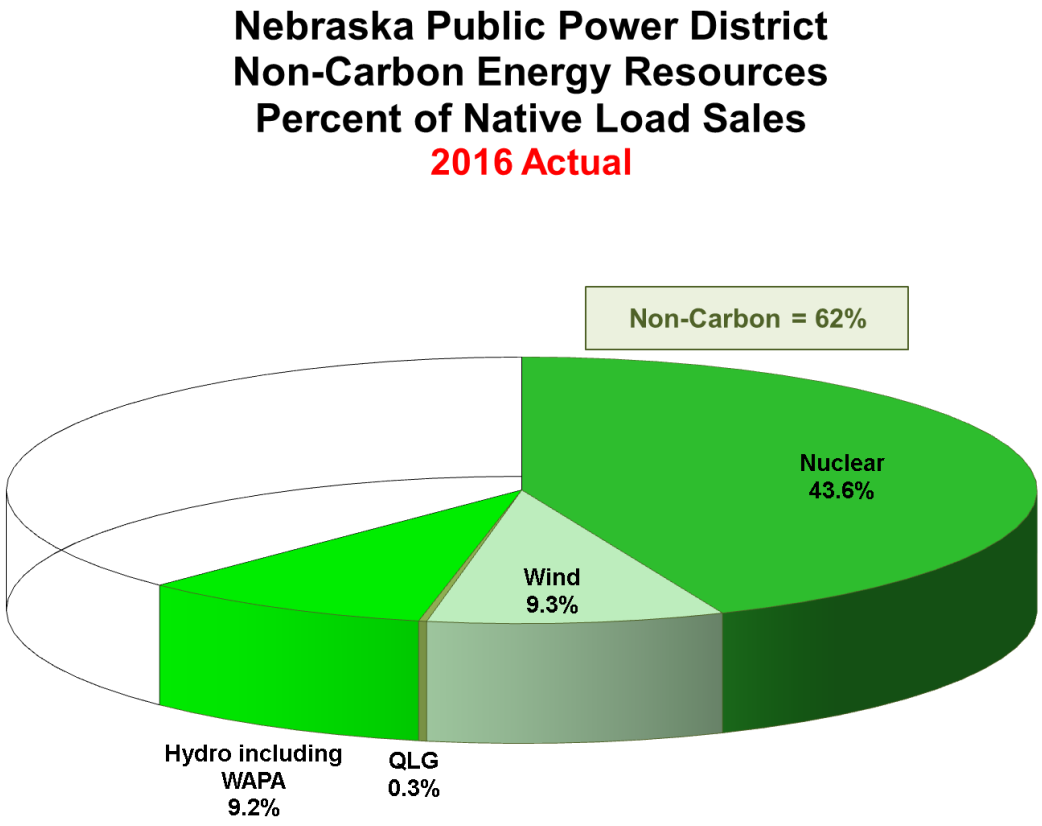
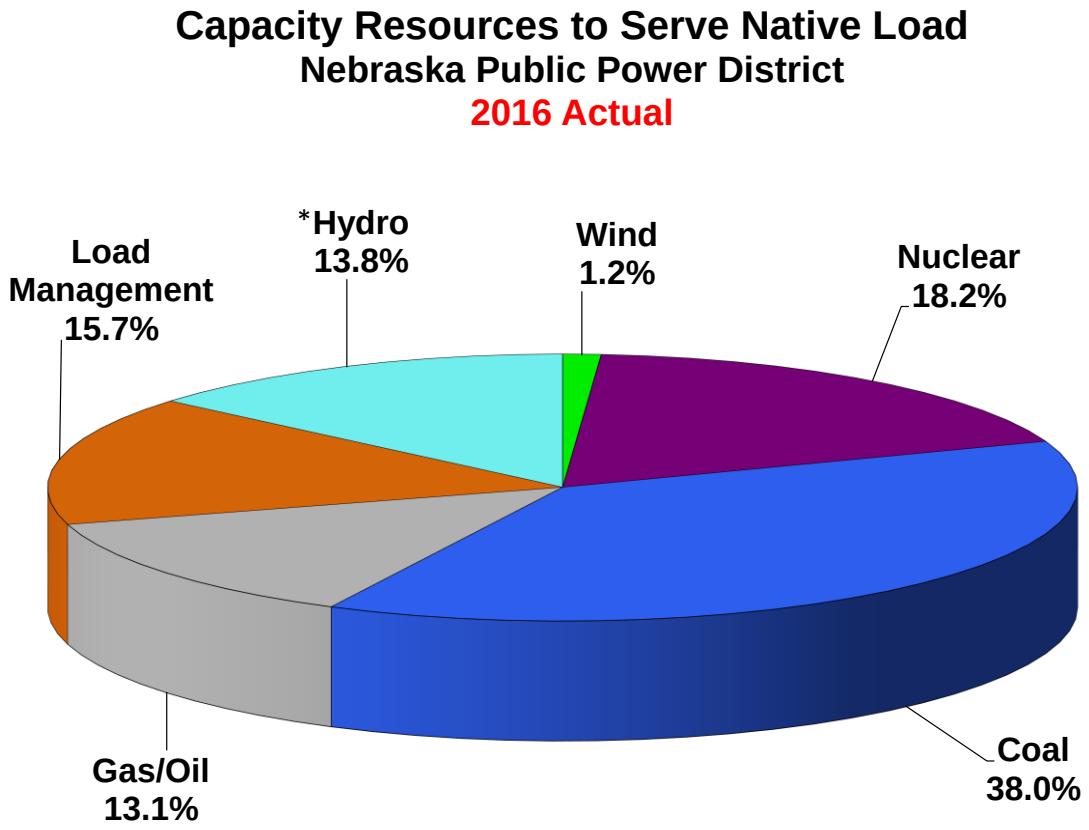


Exhibit 2.1-2 – Sources of Capacity to Meet Service Obligation during On-Peak Hours



*** Hydro includes WAPA**

GGS, a coal plant located near Sutherland, is Nebraska's largest generating facility. GGS consists of two generating units which have the capability of generating 1,365 MW of power. GGS Unit 1, which has been in-service since May 1979, has a net generation capability of 665 MW. GGS Unit 2, the larger unit at 700 MW net, has been commercial since January 1982. GGS is fueled using sub-bituminous low sulfur coal from Wyoming's Powder River Basin. Participation sales with other utilities amount to approximately 133 MW of GGS' output in 2016.

Sheldon, a coal fired plant near Hallam, consists of two boilers that can generate 215 MW of electricity. Sheldon Unit 1, a 100 MW unit, was commissioned in 1961 while Unit 2, a 115 MW unit, was added in 1968. Sheldon also burns Powder River Basin low-sulfur coal.

Nebraska City Unit 2 (NC2) is an approximate 676 MW coal-fired generating unit that OPPD constructed adjacent to its Nebraska City Unit 1 plant. NPPD has a life of plant power agreement with OPPD to receive 23.67%, or approximately 160 MW, of NC2's output. Commercial production of electricity commenced May 2009.

NPPD's second largest source of generation, and largest single generation unit, is CNS. CNS was put into operation in July 1974. NPPD owns and operates CNS but has entered into an

agreement for support services with Entergy through Jan 2029. In 2016, CNS's energy was 44% of NPPD's native load sales, as shown in Exhibit 2.1-1. CNS, which has a net summer capacity of approximately 765 MW in 2016, is a Boiling Water Reactor (BWR) unit. In 2016, participation contracts account for 26 MW of the capacity. NPPD's operating license for CNS has been extended 20 years to 2034.

BPS, a combined cycle gas fired unit, came on-line in January 2005. BPS uses two combustion turbines and one steam unit to generate up to 220 MW. Canaday Station is a 94 MW gas fired unit. Canaday, constructed in 1958, was originally owned by Central Nebraska Public Power & Irrigation District (CNPPID). In 1995 NPPD acquired the "mothballed" plant and had it accredited in June 1998.

NPPD also owns three gas turbine peaking units. The Hallam unit is accredited to 43 MW in the summer and can run on natural gas or distillate oil. The Hebron and McCook units are both accredited at 41 MW and run on distillate oil.

NPPD owns and operates three hydroelectric generation facilities. The largest is a two unit hydro located near North Platte. The North Platte hydro consists of two 12 MW units for a total of 24 MW capacity. This hydro, operating since 1937, uses water from the North and South Platte rivers. After flowing through the hydro, the water reenters the South Platte River and powers other hydro's and irrigation needs downstream. The Kearney Hydro, the oldest in the state, has been operational since 1921. The Spencer Hydro, situated on the Niobrara River in northern Nebraska generates about 1.2 MW from two turbines. Spencer has been operating since 1927, however, NPPD has reached an agreement to sell Spencer Hydro to the Nebraska Game & Parks Service and a coalition of local Natural Resource Districts. This could possibly take effect by 2019.

In addition to NPPD owned hydro facilities, NPPD also purchases the output of hydro generation owned by Loup Power District and CNPPID. Loup owns and operates two facilities along the Loup canal system which in 2016 had a generation capacity of approximately 45 MW. CNPPID owns and operates Kingsley Hydro, a 38 MW unit located directly below Kingsley dam on Lake McConaughy.

The Ainsworth Wind Energy Facility (AWEF) was built by NPPD in 2005. The facility consists of thirty six 1.65 MW turbines for a total nameplate capacity of approximately 60 MW. OPPD, Municipal Energy Agency of Nebraska (MEAN), and the City of Grand Island participate in 30% of AWEF's generation. Jacksonville Energy Authority (JEA), a public power utility in Jacksonville, Florida, purchases 10 MW of environmental benefits of AWEF until the end of 2019, while NPPD retains JEA's share of energy and capacity.

In addition to AWEF, NPPD has PPAs for the purchase of energy from seven (7) wind facilities in Nebraska.

- The Elkhorn Ridge Wind facility, at 80 MW, became operational in 2009. NPPD keeps 40 MW of power from this facility and sells the remaining 40 MW to four other Nebraska utilities.

- The Laredo Ridge Wind facility began commercial operation in 2010. It too is an 80 MW site. NPPD takes 61 MW of this facility's production and sells the remaining 19 MW to three Nebraska utilities.
- Crofton Bluffs Wind farm is a 42 MW facility that began operation in late 2012. NPPD keeps 21 MW of Crofton Bluffs capacity.
- Broken Bow Wind, an 80 MW facility in Central Nebraska, also began operation in late 2012. NPPD keeps 51 MW of Broken Bow.
- Steele Flats Wind, located in Southeast Nebraska, is a 75 MW wind farm that began generating in late 2013. NPPD retains all energy from Steele Flats but sells a portion of its environmental benefits to a private corporation.
- Broken Bow II Wind farm is a 73 MW facility in which NPPD retains 29 MW while selling the remaining 44 MW to OPPD. Broken Bow II has been in operation since late 2014.
- Springview II Wind Facility is a 3 MW facility owned by Blue Stem LLC, with NPPD taking the entire output. It began operation in 2011.

Several of NPPD's wholesale municipal customers own internal combustion generators. NPPD has capacity purchase agreements with these municipals for an additional 91 MW generation capacity. These smaller units are generally dispatched at peak usage times, as emergency generation or to stabilize local transmission constraints.

In addition to the above generation facilities, NPPD purchases approximately 448 MW of firm power from the WAPA and other capacity or energy on both a short-term and non-firm basis in the wholesale energy market. Of the capacity purchases, 288 MW are a WAPA peaking product available in summer months.

2.2. Committed

Committed resources are future resources that have been approved by NPPD's Board of Directors to proceed. At this time, NPPD has not committed to any new resources.

2.3. Transmission

NPPD's transmission system includes more than 4,500 miles of transmission lines in the state of Nebraska. This is composed of 1,106 miles of 345 kV, 665 miles of 230 kV and 2,805 miles of 115 kV facilities. The system encompasses a significant portion of the state of Nebraska. NPPD's transmission system is now part of the SPP Consolidated Balancing Authority (CBA).

3. Load Forecast

NPPD employs both top-down and bottom-up forecasting methods. Top-down forecasts use service area economic and demographic variables as "drivers" for NPPD electric demand. The top-down forecast includes models for NPPD system level demand and energy at the Busbar, or generator inlet. The top-down forecast also develops customer class energy forecasts at the end-use meter level.

The bottom-up or distributor level forecast consists of producing monthly demand and energy forecasts for all of NPPD's wholesale distributors, including NPPD Retail. NPPD completes a distributor level or bottom-up forecast annually. In addition to NPPD Retail's eight billing regions, NPPD currently serves 24 Public Power Districts and 46 Municipalities at wholesale. The distributor level forecast examines a number of different model structures and selects the most appropriate model based on forecast performance. In all, NPPD develops forecasts for nearly 90 data series of demand and energy for each wholesale distributor.

The distributor level forecast uses data at Bus A, the metering point for wholesale billing. The two methods are reconciled by transmission losses from Busbar to Bus A, meter level and Bus A forecasts are consistent with each other.

The NPPD summer peak is highly dependent on irrigation loads. Irrigation contributes 700 – 1,400 MW to NPPD's summer peak. Demand from irrigation creates unmatched volatility in NPPD summer loads. Recent NPPD summer peaks range from 2,350 MW in 2009 to 3,030 MW in 2012. Corn is the main crop irrigated in NPPD's service territory. Water requirements for corn are greatest during the tasseling, pollination, blister, and dough stages of development when the plant bears fruit. This usually coincides with the hottest and most humid periods of July and August. So, in addition to heat and humidity; summer and annual rainfall patterns and drought conditions which determine the soil moisture profile, along with corn prices, highly influence NPPD summer peaks.

NPPD winter peaks occur when the jet stream brings blistery cold Canadian air across Nebraska. In 2015 this occurred for only two winter months. Conditions in 2016 started and ended the year in similar fashion, but mild weather prevailed during February-April, and November. NPPD's Winter Peak in 2016 of 2,227 exceeded the 2015 peak by 315 MW, but fell short of the all-time winter peak (2,252 MW) from the 2013 winter season.

3.1 Forecast Uncertainty

To incorporate uncertainty in the IRP forecast NPPD used a high scenario based on the addition of both the Monolith project and Keystone XL. See Table 3.2.1 high. For the low scenario NPPD modeled a rather quick full buildout of QLG to the threshold level of 337 MW. Exhibits 3.2-1 and 3.3-1 show the results for demand and energy, respectively.

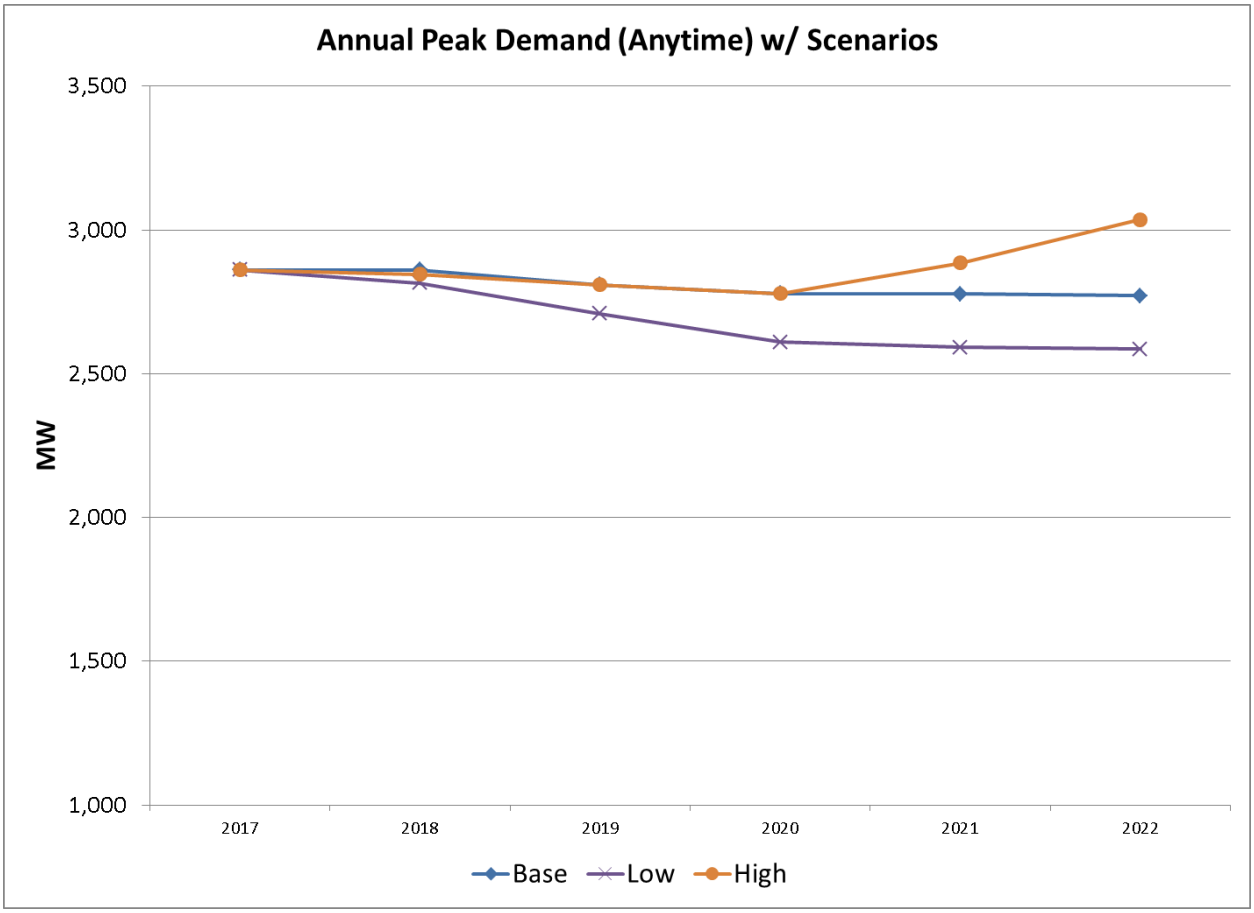
3.2 Peak Demand Forecasts

NPPD develops forecasts for both "anytime" and "billable" summer peak demand. The models for peak demand use service area personal income, customers, appliance stocks, and peak day weather conditions as inputs. Peak models also include irrigation contribution at the time of the peak. As noted above, irrigation contribution can vary considerably from year to year, depending on the weather. NPPD closely monitors its assumptions for irrigation contribution to peak and adjusts accordingly, as conditions change.

The anytime or overall peak occurs outside hours used for billing production demand, during times when wholesale customers do not control loads. Thus, there are no DSM impacts included in the forecast for anytime peak demand.

The model for "billable" peak includes DSM impacts from the direct load control programs implemented by NPPD's wholesale customers. During the summer, NPPD system operators determine which hours are subject to production demand charges based on anticipated loads. This amounts to altering the price signal for demand charges to wholesale customers when load is high. The model for irrigation contribution to the billable peak accounts for wholesale customer load control programs.

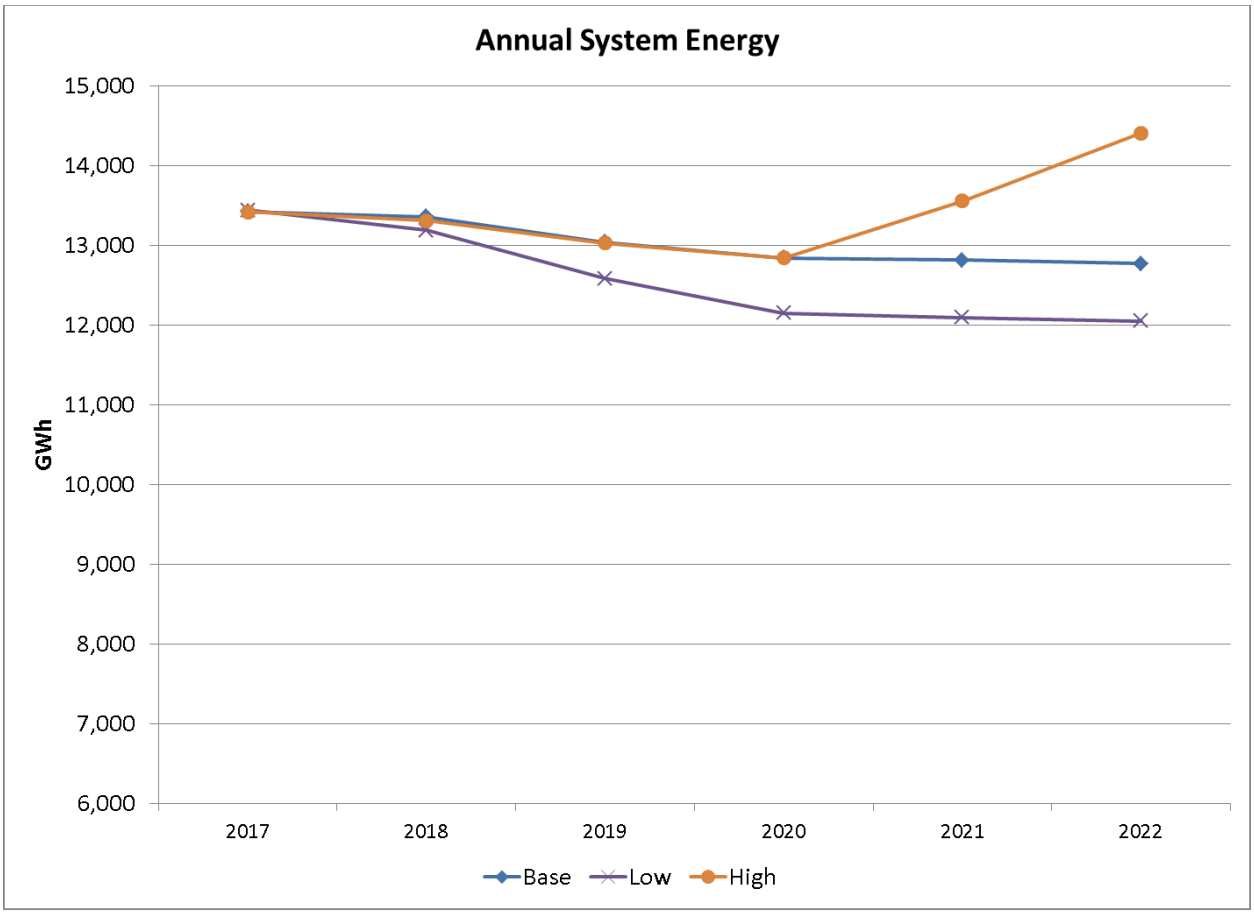
Exhibit 3.2-1 – Peak Demand Forecast



3.3 Energy Forecast

The load forecast develops energy projections by customer class for the entire NPPD system. NPPD's wholesale distributors, including 46 municipalities, 24 public power districts, and NPPD Retail provide meter level sales information by customer class, (e.g. residential, commercial, and industrial). Wholesale distributors submit end-use data "at the meter" on a monthly basis. The compiled data represent energy use by class from NPPD native load or firm total requirements customers. The load forecast includes a model and forecast for each individual customer class.

Exhibit 3.3-1 – System Annual Energy Forecast



3.4 Limit/Reduce Customers

Several NPPD wholesale customers did not sign the new wholesale power contract with NPPD. The base case load forecast includes adjustments for wholesale customers that provided notice to NPPD regarding their desire to limit and reduce future purchases from NPPD. The balance of each customer's load will be forecast and reported separately by those customers. These customers will cease being NPPD customers at the end of 2021.

3.5 Load Management

NPPD's summer wholesale rate structure provides a significant incentive for wholesale customers to control loads during on-peak hours which are deemed as "non-waived" for billing purposes. Irrigation and industrial loads account for the largest share of NPPD's demand-side managed loads. Wholesale customers also control a small amount of air conditioning and water heater loads. NPPD conducts a post-season survey of wholesale customers each year to develop data on customer irrigation and non-irrigation DSM program effects at the time of NPPD's

billable and anytime summer peaks. The load forecast assumes no DSM reduction during the time of NPPD's System Anytime Peak.

3.6 Energy Efficiency

The base case load forecast incorporates a projection of EE reductions due to NPPD's EnergyWise^{SM} program. NPPD's Sustainable Energy department provides EE forecasts for demand and energy based on budgeted incentive dollars in the short-term and an assumed escalation rate in more distant years. The EE projections are then subtracted from the peak and energy forecasts mentioned above.

3.7 Qualifying Local Generation (QLG)

NPPD's new wholesale power contract allows customers to install renewable "behind-the-meter" generation up to 10 percent of their total peak load. The distributor level forecast makes adjustments for QLG. The contract allows QLG to reduce customers' wholesale billing demands and energy. NPPD conducted a survey of wholesale customer QLG plans in the fall of 2016, and then incorporated the survey information into the distributor level forecast in the form of load reductions for each responding wholesale customer. A full QLG scenario where all wholesale customers install QLG up to their maximum allowable capacity per the 2016 wholesale power contract makes the low forecast scenario.

3.8 Above the Trend Loads

Where appropriate, the distributor level forecast makes step-change adjustments for loads considered large enough to be "above-the-trend". The new loads listed below, Monolith and Keystone XL are the only above the trend loads included in the IRP load forecast. They will provide the high forecast scenario as mentioned above and below.

3.8.1 Monolith

Refer to Section 1.5 for more details. The IRP load forecast includes Monolith Phase 2 expansion in the high forecast scenario.

3.8.2 Keystone XL

In January, 2017 the Trump administration issued a memorandum inviting TransCanada to submit an application. In March, the administration approved the Keystone XL pipeline, reversing the Obama administration attempt to block the project. This came shortly after the State Department issued TransCanada's permit. The project still faces considerable local opposition making it an uncertain load included only in the high forecast scenario.

4. Load and Capability

4.1 Load and Capability

NPPD prepares load and capability reports to ensure that it has sufficient capacity to meet its load and planning reserve obligations[8]. Attachment AA of the SPP Tariff describes the Resource Adequacy Requirements (RAR) that Load Responsible Entities (LREs), such as NPPD, must adhere to with regard to load and planning reserves[9]. Attachment AA also identifies the process by which SPP will calculate and assess Deficiency Payments for failure of an LRE to comply with the RAR. Currently, Deficiency Payments would only be assessed for non-compliance during the Summer Season (June 1 through September 31)[10].

Load and capability reports have been developed for all three of the load forecast scenarios described in section 3 and considering only existing resources operating throughout the study period. Results from the load and capability analysis are shown graphically in Exhibit 4.1-1. This graph generally confirms that NPPD has sufficient resources to meet its seasonal capacity obligations over the study period under all three load forecast scenarios[11]. Tabular load and capability results for the base forecast scenario are included in Appendix C as Exhibit C-1.

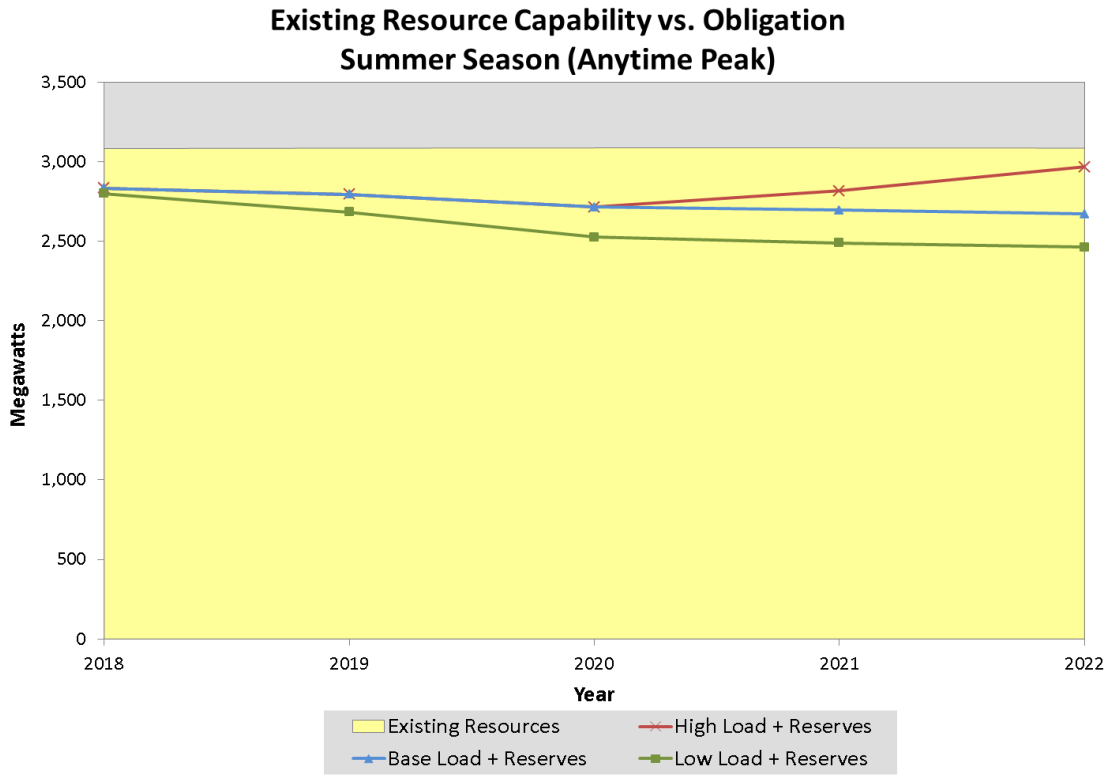
[8] Planning reserves represent generating capacity in excess of a utility's peak load and are required to ensure reliable electric supply given factors such as generation outages, load uncertainty, etc. Planning reserves can be quantified in terms of a Planning Reserve Margin (PRM), which is equal to $\{generating\ capacity\ (MW) - peak\ load(MW)\}/peak\ load\ (MW)\ x\ 100$.

[9] The current PRM requirement is twelve percent (12%).

[10] SPP has indicated that no Deficiency Payments will be assessed for non-compliance in 2017. Enforcement will begin in 2018, assuming FERC approval of the tariff changes implementing the RAR.

[11] The surplus capacity in 2022 under the high, base, and low load forecast scenarios is estimated to be approximately 129 MW, 415 MW and 622 MW, respectively.

Exhibit 4.1-1 – Load and Capability with Only Existing Resources, Summer Season (Anytime Peak)



4.2 Coincident vs. Non-coincident Peak

SPP currently requires that the RAR be calculated based on an LRE's highest seasonal peak demand, regardless of when it occurs relative to the overall for the SPP system[12]. This non-coincident approach doesn't fully account for the natural diversity that exists between the various LREs within the SPP footprint, which would lower the overall planning reserves required for reliable operation.

The SPP Supply Adequacy Working Group (SAWG), of which NPPD is a member, has oversight responsibility for the SPP RAR. In 2017, the group began discussions about the positive and negative impacts of applying the RAR on an SPP coincident peak (CP) basis, vs. the current non-coincident peak (NCP) methodology. Although it is not possible at this time to predict if or when SPP might change to a CP approach, NPPD performed some additional load and capability analysis, as part of this IRP, to estimate the potential impact of such a change on NPPD's capacity obligation. Results from this analysis suggest that changing to a CP methodology could increase NPPD's projected surplus capacity by approximately 130 MW. NPPD will continue to follow and participate in SAWG discussions on this subject.

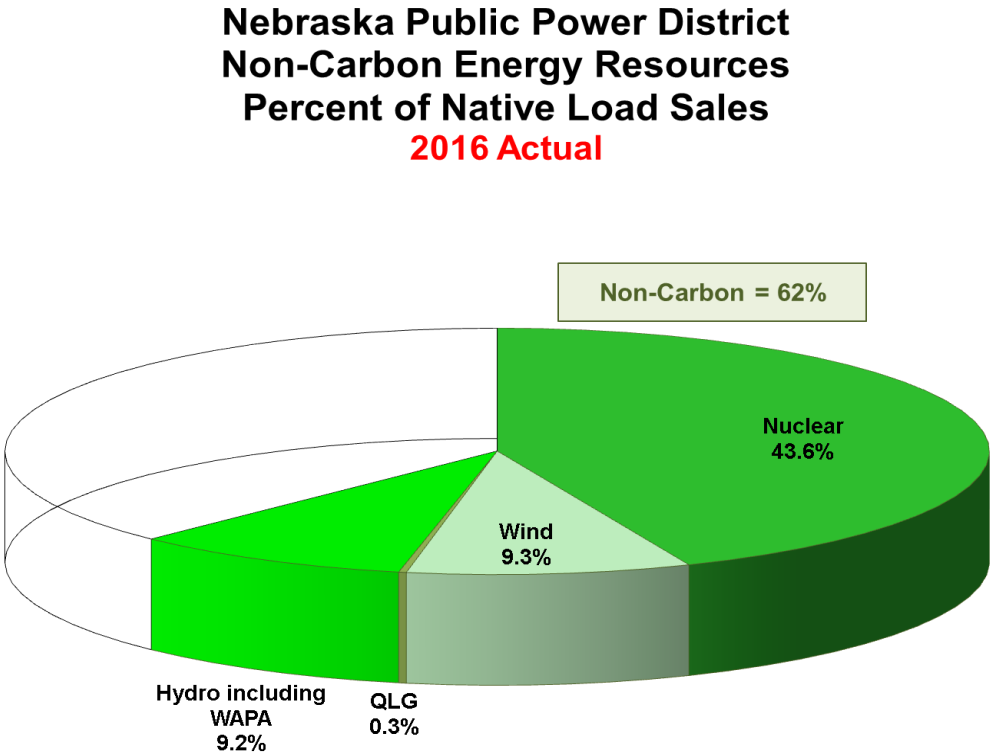
[12] NPPD commonly refers to this as its "Anytime" peak demand.

5. Resource Mix

5.1 Fuel Diversity

NPPD uses a diverse mix of generation resources such as coal, nuclear, natural gas, hydro, and wind to meet the needs of its customers, as described in Section 2. This diversity helps NPPD to manage uncertainty associated with the day-to-day and hour-to-hour volatility of energy prices in the wholesale electricity market. It also positions NPPD to respond to uncertainty regarding future environmental regulations, particularly carbon regulation. Exhibit 5.1-1 shows NPPD's non-carbon energy sources as a percent of native load energy sales in 2016. This percentage has grown over the past few years and is now approximately 62%. In 2012, this value was approximately 54%.

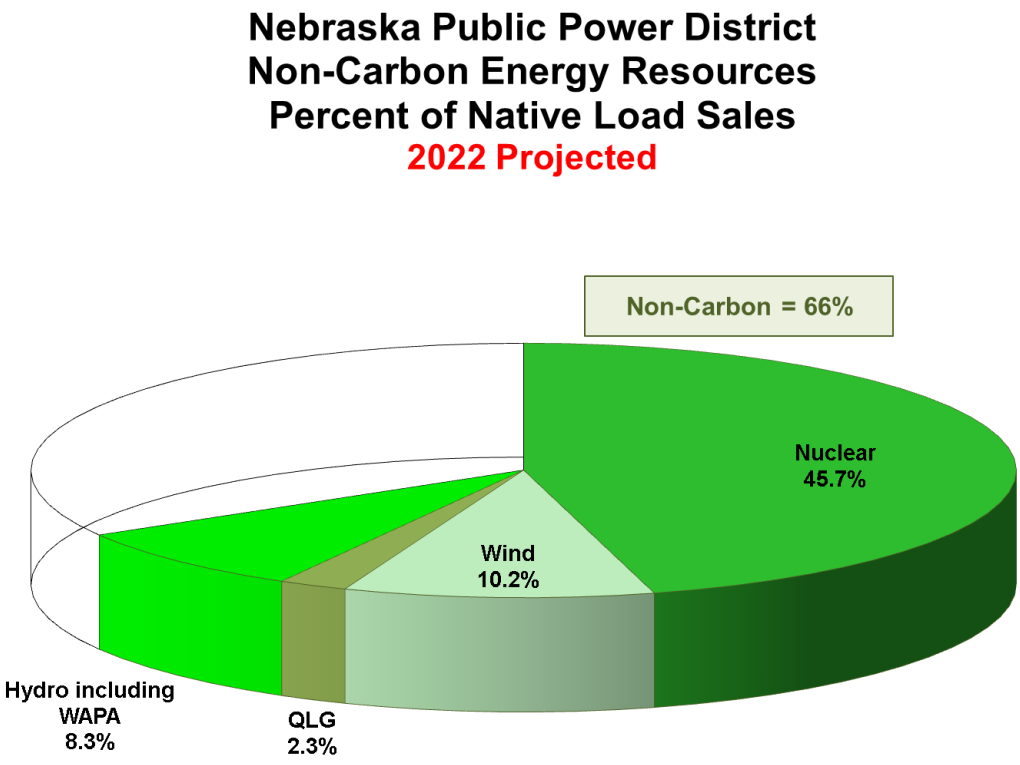
Exhibit 5.1-1 – Non-Carbon Resources as a Percent of Native Load in 2016



Although not a substantial source of energy in 2016, QLG, is expected to grow significantly over the study period. QLG additions by NPPD's wholesale customers are forecast to total approximately 34 MW and 112 GWh by the end of 2017, growing to 72 MW and 271 GWh by the end of 2022, which would represent about 2% of native load sales. NPPD's portfolio of non-carbon resources is projected to be approximately 66% of native load sales[13], as shown in Exhibit 5.1-2.

[13] In a year with no refueling outage at CNS, NPPD's percentage of non-carbon resources will be higher.

Exhibit 5.1-2 – Projected Non-Carbon Resources as a Percent of Native Load in 2022



The Monolith project, as discussed in Section 1.5, has the potential to further increase NPPD's fuel diversity. Although not yet a certainty, Phase 2 of the project would entail the conversion of the Sheldon Station Unit No. 2 boiler to burn the hydrogen rich tail gas produced by Monolith. This unit's annual energy production is expected to be similar to a 225 MW wind facility. Over 700 MW of wind would be required to provide the same summer accredited capacity as this unit based on present SPP Planning Criteria. It is projected that NPPD's portfolio of non-carbon resources would increase to approximately, 68% of native load sales in 2022 with the addition of burning hydrogen rich tail gas.

5.2 Dispatchability

With the significant amount of intermittent renewable generation being added in the SPP footprint, as noted in Section 1.6.2, it is important to the stability of the system to maintain dispatchable capacity that can respond to changing load and renewable generation patterns. As noted in Section 2.1, NPPD's resource mix includes five[14] coal units, one nuclear unit, a combined-cycle gas fired unit, a gas fired steam unit, and three gas turbine peaking units.

[14] Includes PPA for Nebraska City Unit 2.

5.3 Demand-Side Management

The control of irrigation pumping load accounts for a majority of NPPD's demand-side managed loads. NPPD's summer wholesale rate structure provides a significant incentive for wholesale customers, including NPPD Retail, to control loads during on-peak hours which are deemed as "non-waived" for billing purposes. Historically, this has resulted in 500 to 600 MW of effective control at the time of the billable peak. NPPD's billable peak forecast includes DSM impacts of wholesale customer direct load control programs. The anytime or overall peak occurs outside hours used for billing, during times when wholesale customers do not control loads and therefore is assumed to include no DSM impacts. From a resource adequacy perspective, DSM reduces NPPD's load obligation by an estimated 200-500 MW, shifting the time of peak from on-peak hours, as it would occur if NPPD did not have DSM, to off-peak hours, where irrigation and industrial loads see lower coincidence with air conditioning loads.

5.4 Energy Efficiency

Section 1.d, documents the energy reductions associated with NPPD's EnergyWise^{SM} program. As of 2016, cumulative energy savings have exceeded 200 GWh[15]. EE reductions are expected to grow by an additional 105 GWh over the 2018 – 2022 study period, based on currently budgeted program incentive dollars.

5.5 Summary

Overall, NPPD's diverse resource mix of current and near-term supply-side resources, powered by a variety of fuels, as well as effective demand-side programs help NPPD achieve its mission to safely generate and deliver reliable, low cost, sustainable energy and provide outstanding customer service.

6. Action Plan

The goal of the action plan is to better position NPPD for the future. All action items listed in this section are expected to be completed by the next IRP report. A status update for all action items will be periodically prepared and will include a short description of work completed for each action item.

6.1. Major Uncertainties

Monitor major uncertainties such as load, market and fuel prices, and environmental regulations.

[15] For the majority of programs, generally agreed upon industry standard values are used to calculate energy savings. Other values have been derived from extensive measurement and verification (M&V) efforts that were previously conducted and demonstrated little variance. Some programs require M&V procedures. M&V procedures include measuring and/or modeling through one or more of the four options defined in the International Performance Measurement and Verification Protocol (IPMVP).

6.2. Qualifying Local Generation

Report on the amount the QLG and other distributed resources.

6.3. Monolith

Report on the progress of the Monolith project.

6.4. Carbon Management Plan

Continue to evaluate carbon management options for GGS, Sheldon, and BPS.

7. Public Involvement, Comments and Input

7.1. Public Input Overview

The 2018 IRP Draft Report was presented to the Board of Directors during their September 13, 2017 open session meeting. The presentation described the methods NPPD was planning to perform to gather input from the public. NPPD chose to mainly solicit public input on the draft report electronically through a public website established on www.nppd.com. In addition to various communications, including the 2013 report, videos and questions and answers, the website promoted a 4-question survey.

The website and survey were advertised to the public and NPPD's customers between Sept. 13 and Nov. 30 via:

- a special rotator on the front page of www.nppd.com,
- social media posts on Facebook and Twitter,
- 14 newspaper outlets advertisements
- media inquiries generated from a press release requesting public input,
- a bill message on the bills of NPPD's 91,000 Retail customers,
- a voice-recorded message for customers calling into NPPD's Centralized Customer Care Center between October and November encouraging them to take the survey and where they could locate it,
- communications to NPPD's 70 wholesale customers, including meeting presentations, emails and account managers, and
- various meetings and/or communications with non-governmental organization representatives, such as the Sierra Club.

Previous IRPs, in 2008 and 2013, involved primarily open houses or meetings held throughout the state. The turnout and public input for these labor-intensive efforts was not as beneficial to NPPD's processes as desired. The electronic approach was offered as an opportunity to advertise for and obtain more public input.

For instance, in 2013, a total of 58 individuals attended four IRP public meetings and about half of those answered a provided questionnaire.

Public input for the 2018 IRP was received through four (4) primary sources:

- Online survey located on our website
- Letters sent electronically or in hard-copy from NPPD wholesale customers to NPPD leadership and/or NPPD's Board of Directors;
- Letters sent electronically or in hard copy from non-governmental organizations interested in NPPD's generation mix to NPPD leadership and/or NPPD's Board of Directors; and
- Electronic mailings from members of the public sent to NPPD's Board of Directors.

Specifically, NPPD received:

- Eight wholesale customer letters representing 28 utilities. These eight entities also represent 92% of our wholesale revenue from our 2016 wholesale contract customers. Customer letters were submitted by the:
    - City of Cozad,
    - City of Gothenburg,
    - City of Lexington,
    - City of North Platte,
    - Loup Power District,
    - Nebraska Electric Generation and Transmission Cooperative, Inc., which represents 20 wholesale utilities under NPPD's power supply contract,
    - Norris Public Power District, and
    - Southern Power District.
- Survey answers from 145 survey respondents, 94 of whom offered comments via the survey at www.nppd.com/irp.
- Three letters from non-governmental organizations: the League of Women Voters, Sierra Club, and Center for Rural Affairs.
- 118 emails sent directly to each NPPD Board Director. The emails were duplicate messages sent as form letters via an electronic web-based contact platform called, Knowwho.com, used in managing campaigns involving elected officials. Approximately one in five varied the copy slightly with a more personal message.

7.2. Summary of Public Comments

7.2.1. Wholesale Customer Input and NPPD's Response

Comments submitted by NPPD's wholesale customers generally expressed support for NPPD's 5-year approach, recognizing the uncertainty and influence a new administration can have on the power industry, as well as the changes happening rapidly in the industry.

Many wholesale customers commended NPPD for its present and future non-carbon mix. They also showed appreciation for the new power supply contract's flexibility to add more local renewables via qualifying local generation.

Additional comments stressed the importance of ensuring NPPD provide low-cost generation. Customers advised when new resource additions are needed, NPPD should look at those

resources with the least cost and involve the wholesale customers in the decision-making process since they represent the revenues used for the investments.

> *NPPD's Response:* We appreciate the feedback from the eight wholesale utility entities that represent 92% of our 2016 power supply contract revenues. Their revenues, along with those of our Retail customers, provide the financial foundation on which to invest in new resources and the equipment improvements which help reduce emissions, maintain our power plant operations for optimal performance and ultimately provide at least 500,000 Nebraskans throughout rural Nebraska with reliable and low-cost electricity.

In its letter, representing 20 wholesale utilities, the Nebraska Electric Generation & Transmission Cooperative, Inc. (NEGT) expressed concern the energy savings projections due to energy efficiency programs in the IRP "seem somewhat high, and there is no mention of a capacity component."

> NPPD's Response: We included a graph in the IRP which documents the estimated actual capacity reductions, as compared to the 2013 IRP projections.

The NEGT said Section 1.8.5 of the report was confusing regarding the amount of analysis conducted in the areas of combustion turbines and batteries.

> NPPD's Response: We adjusted the language to say, "*A high-level analysis comparing combustion turbines, reciprocating internal combustion engine, and lithium-ion battery storage with CAES was completed in 2014 and 2015. The analysis determined RICE to be more cost effective than CAES. This helped guide the NPPD decision to end further investigation of a proposed CAES location, as reported in action item 1.8.4.*"

The NEGT also questioned language on page 5 of the report regarding why the IRP would include considerations for customers no longer served during the timeframe of the IRP.

> NPPD's Response: We provide discussion of these customers and their treatment in the IRP in Section 3.4 of this report. When NPPD no longer provides their load requirements, these customers will need to perform their own IRPs.

The NEGT and Southern Power District questioned the value of NPPD's energy efficiency program, with the NEGT specifically pointing out there is no mention of it in Exhibit 2.1.1 of the report and Southern's recommendation to continue to study the cost-benefits of this program.

> NPPD's Response: We acknowledge other utilities do include energy efficiency (EE) program impacts in discussing their energy resource mix. In Exhibit 2.1.1, our focus was on physical generation resources (thermal, as well as renewable). We will consider including EE program impacts in future IRP discussions of the District's resource portfolio.

Overall, NPPD recognizes some services we offer, such as our EnergyWise℠ energy efficiency program, may not be universally accepted by every wholesale customer or be as popular as other programs, such as the demand waiver program; yet our goal is to continue offering innovative solutions to reduce costs and demand for the purposes of generating electricity more efficiently and with the end-use customer in mind.

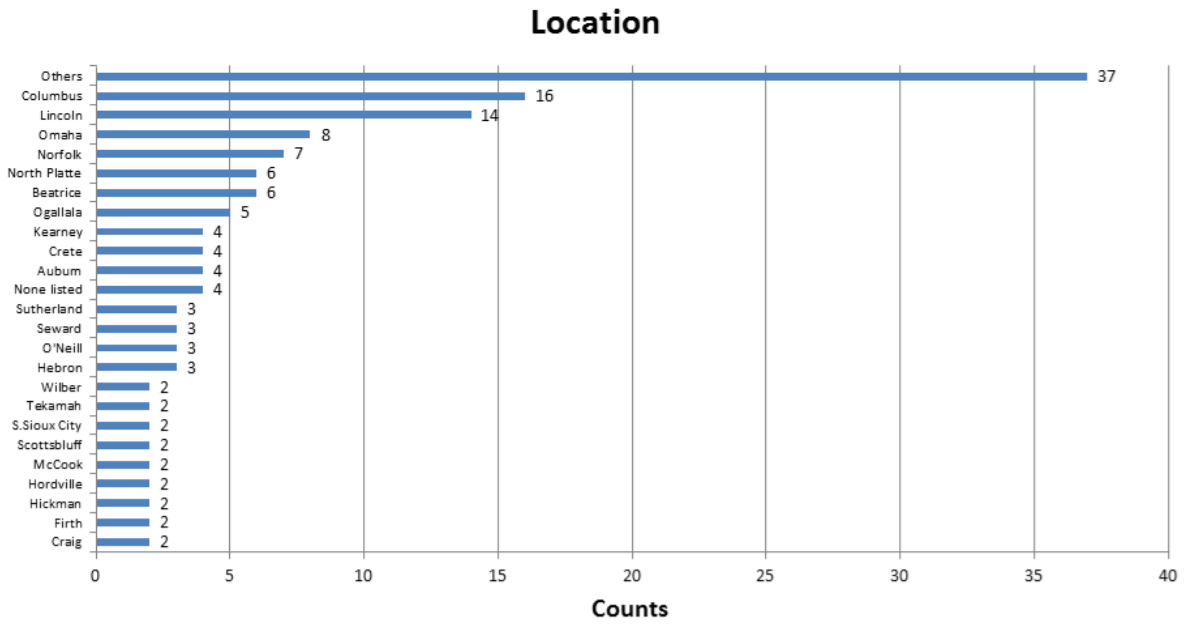
We annually review the cost effectiveness of our services and programs to confirm the life of measure cost is below our avoided costs. Also, we plan to continue discussing ideas for efficient electrification with our wholesale partners and to develop future programs accordingly. The recently added Electric Vehicle Charging Station incentive is one such program.

7.2.2. **Survey Respondent Input**

Survey answers were provided from 145 respondents and submitted as part of a 4-question survey available at www.nppd.com/irp between Sept. 13 and Nov. 30. Ninety-four offered comments were collected as part of this survey.

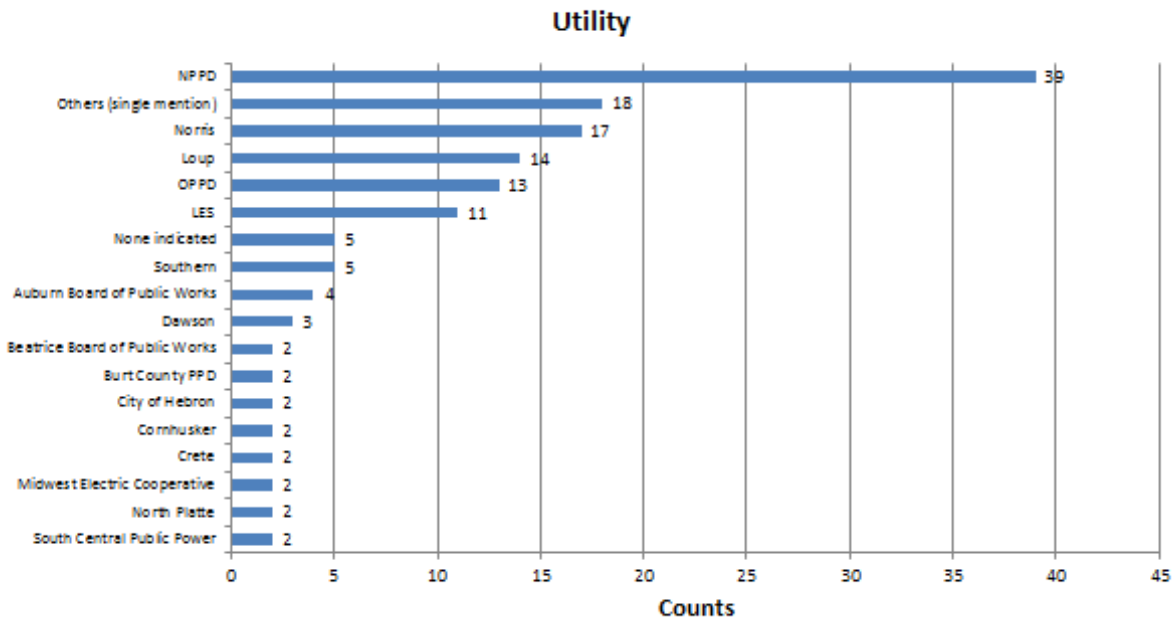
While not every respondent provided demographic information, analysis of the 145 respondents indicated:

- 95% (138 out of 145) of the responses came from Nebraska.
  - Three responses came from Minnesota, Missouri, and Oklahoma
- Of the Nebraska respondents,
  - 84% (116 out of 138) were from outstate Nebraska.
  - 80% (110 out of 138) were from NPPD's service area.
  - 20% (28 out of 138) were from communities not in NPPD's service area.

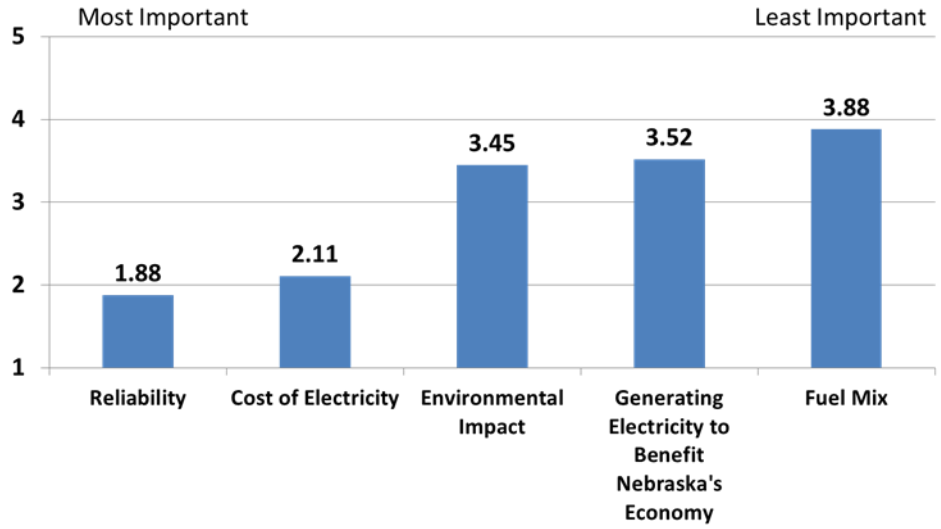


*There were 37 survey responses from individual locations, as well.

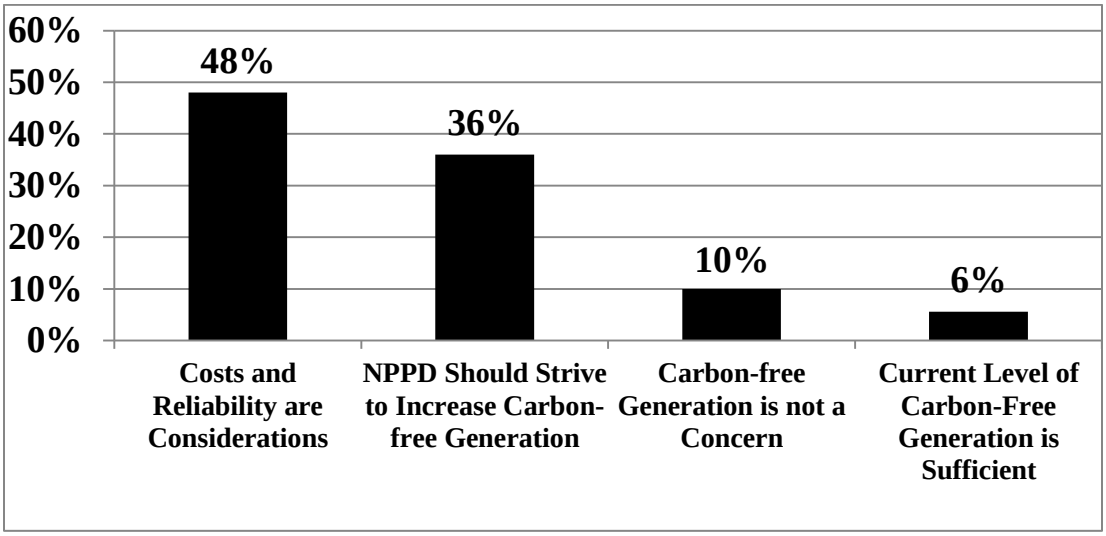
Demographic information also asked for utility provider. While the vast majority indicated the respondent was served either by NPPD or one of its wholesale customer utilities, 17% were customers of either the Omaha Public Power District or the Lincoln Electric System.



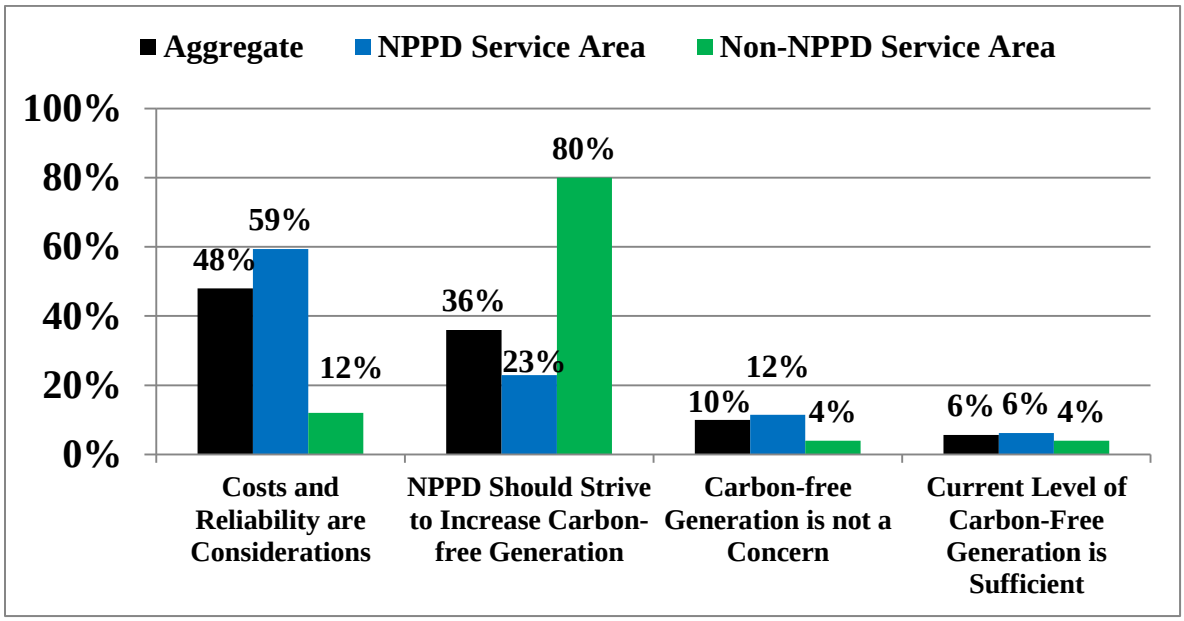
Survey respondents were asked to rank four statements according to their importance to the respondent in meeting his/her electrical needs. Respondents could only rank one as most important, another as second most important, and so on. Results showed that "costs and reliability" were most important.



Survey respondents were also asked to provide their opinions regarding NPPD's current and future generation resource mix. Results again showed that "costs and reliability" were most important.



In assessing this data according to those NPPD serves either directly as a Retail customer or indirectly as a customer of one of NPPD's wholesale customers versus respondents outside of our area, the data indicated strong differences in opinion between the importance of costs and reliability as compared to increasing NPPD's carbon-free generation mix.



The 94 offered comments from survey respondents were reviewed and could generally be placed into the following over-arching categories and opinions:

- Costs and Reliability
  - *"I would like to see generation that takes into consideration reserves…Not what is cheap 'now' and available 'now' we need to look at dependability."*
- Increase carbon-free/renewable generation
  - *"Carbon-free is the future, be progressive and look for economic opportunities in these areas."*
  - *"Continue expanding wind, solar and hydro-electric resources…"*
- Coal and nuclear are important
  - *"Nuclear is carbon-free, it's the only carbon-free resource worth consideration."*
  - *"I support the use of coal as an electricity source."*
- Stay the course
  - *"It appears that NPPD has been doing a good job of using existing and looking for new resources.*

NPPD Response: NPPD appreciates every respondent who took the time to answer the survey and provide commentary. The results of the survey questions and numerous comments on maintaining low costs and reliable service fits well with our mission to

"Safely generate and deliver reliable, low-cost, sustainable energy and provide outstanding customer serve."

NPPD's definition of sustainable is "a practice that balances societal, environmental and economic needs." One decision NPPD has made is to pursue the transformation of coal-fired generation at Sheldon Station to hydrogen in conjunction with the Monolith Materials. This project meets societal, environmental and economic needs for our customers and many comments on the survey reflect this understanding. NPPD also has one of the highest non-carbon resource mix in the region.

7.2.3. Non-Governmental Organization (NGO) Input and NPPD's Response

Three letters were received as part of the IRP's public input process from the non-governmental organizations: Sierra Club, League of Women Voters, and the Center for Rural Affairs. The Sierra Club also provided a white paper with its own analysis of costs and recommendations.

All expressed the importance of economic development associated with renewable energy development. There was recognition of NPPD's community solar program and the innovative solutions or partnerships NPPD has sought, such as the project NPPD is pursuing with Monolith Materials to replace one of the coal-burning boilers at Sheldon Station with a boiler of advanced design that will burn hydrogen instead.

The NGOs strongly challenge NPPD to invest in more renewables, start over on its IRP process, develop an IRP with a longer timeframe (e.g., 20 years), and seek more public involvement.

Statements from the letters reflecting these sentiments include:

- *"Nebraska Public Power District (NPPD) continues to fall behind in investing in renewable energy compared to other large public power entities in the state. … The Center applauds NPPD for its efforts to support community solar and seek out innovative partnerships in the case of Monolith Materials".* – Center for Rural Affairs

- *"We renew our recommendation that NPPD set aside this iteration of a 5 year Integrated Resource Plan and begin the process anew, conducting a full, 20-year analysis with robust public input. Much has changed in the five short years since NPPD's last IRP. Nebraska is now part of the Southwest Power Pool, wind is booming across the SPP footprint, and changes in technology have radically altered the power mix."* - Beyond Coal Campaign Representative, Sierra Club

- *"NPPD's current IRP ignores the potential of jobs, economic benefits, and property tax relieve that could result from generating home-grown electricity from wind and solar."* - League of Women Voters

NPPD's Response: NPPD respects the views proposed in the letters and white paper offered by the NGO representatives; however, we offer evidence to the contrary of the perceptions presented.

NPPD has been a leader in bringing wind farms into the state. We are proud to have power purchase agreements or ownership for eight of the state's wind farms to Nebraska, and our involvement in wind development dates back as early as 1998.

It is important to note that nearly 19% of NPPD's generation in 2016 came from renewable resources, adding to over a 60% carbon-free portfolio. When it comes to meeting climate change goals, NPPD's carbon-free percentage nearly doubles the national average, and NPPD's Cooper Nuclear Station contributes 44 percent toward this carbon-free resource mix.

We also are pleased to offer a wholesale power supply contract that advances the renewable energy generation of our wholesale customers who want to invest and which continue to steadily grow. As of mid-2017, solar and wind facilities totaling 34 MW are installed or in the construction phase. This includes NPPD's Retail community solar program where facilities were launched in Venango, Scottsbluff, and Kearney. Kearney's solar array is presently the state's largest solar project. These projects provide exactly the kind of local jobs and benefits the NGO representatives are promoting.

Most importantly, we agree with the statement made in the quote above by the Sierra Club representative who said, "much has changed in the five short years since NPPD's last IRP." The dynamic changes in the industry over the past five years is one of the primary reasons NPPD determined the 2018 IRP should take a 5-year approach, instead of a 20-year.

7.2.4. Public E-Mail Campaign to NPPD's Board of Directors

Finally, NPPD's IRP also prompted emails to NPPD's Board of Directors in December of 2017. The emails were sent via Automail@Knowwho.com, the web-based contact platform used by Knowwho.com which is used in managing campaigns involving elected officials.

Each of NPPD's 11 board directors were sent 118 emails containing the same basic text and overall message with wording similar to that of the League of Women Voters' letter; however, approximately one in five had additional copy. An example of the additional copy is shown below.

- *NPPD's current IRP ignores the potential of jobs, economic benefits, and property tax relief that could result from generating home-grown electricity from renewable sources. Rather than seize the cost-saving potential of resources like wind power, NPPD's plan doubles down on risky coal and continues sending hard-earned dollars out of state to purchase fossil fuels.*

A couple of board members responded personally to some of the senders, and all are included within the 2018 IRP public input documentation.

NPPD Response: NPPD appreciates all the letters, emails and survey responses and opinions submitted by the public. NPPD recognizes the importance of economic development, property tax relief and beliefs regarding power generation's impact on health and climate. NPPD is working to reduce our carbon impact through such initiatives as the inclusion of qualifying local generation for our wholesale utility partners through their energy supply contract; our community solar program in our retail communities; and the conversion of a coal boiler to use hydrogen at Sheldon Station, in conjunction Monolith Materials, a manufacturing facility. While this project is not a key driver in the 2018 IRP, it has tremendous potential to transform the industry in future years.

NPPD also offers energy efficiency incentives for homes, businesses and irrigators throughout the state. We are partnering with our retail communities, such as Kearney, to develop the state's largest solar array; and we are installing LED lights in other communities, such as Plattsmouth. Most recently, we announced incentives for the purchase of electric vehicle charging stations. All of these show the "leadership, vision and clean energy" you are requesting of NPPD.

Appendix A – Customer Listing

NPPD WHOLESALE REQUIREMENTS CUSTOMERS
PUBLIC POWER DISTRICTS AND COOPERATIVES

Utility Name	City, State	G&T Member
Burt County PPD	Tekamah, NE	Yes
Butler PPD	David City, NE	Yes
Cedar-Knox PPD	Hartington, NE	Yes
Cornhusker PPD	Columbus, NE	Yes
Cuming County PPD	West Point, NE	Yes
Custer PPD	Broken Bow, NE	Yes
Dawson PPD	Lexington, NE	Yes
Elkhorn RPPD	Battle Creek, NE	Yes
Howard Greeley RPPD	St. Paul, NE	Yes
KBR RPPD	Ainsworth, NE	Yes
Loup Valleys RPPD	Ord, NE	Yes
McCook PPD	McCook, NE	Yes
Niobrara Valley EMC	O'Neill, NE	Yes
North Central PPD	Creighton, NE	Yes
Perennial PPD	York, NE	Yes
Polk County RPPD	Stromsburg, NE	Yes
South Central PPD	Nelson, NE	Yes
Southwest PPD	Palisade, NE	Yes
Stanton County PPD	Stanton, NE	Yes
Twin Valleys PPD	Cambridge, NE	Yes
Loup Power District	Columbus, NE	No
Norris PPD	Beatrice, NE	No
Northeast Nebraska PPD	Emerson, NE	No
Southern PD	Grand Island, NE	No

NPPD WHOLESALE REQUIREMENTS CUSTOMERS

MUNICIPAL UTILITIES:

Utility Name	City, State	Direct WAPA
City of Arapahoe	Arapahoe, NE	
City of Auburn	Auburn, NE	Yes
City of Battle Creek	Battle Creek, NE	
City of Beatrice	Beatrice, NE	Yes
Village of Bradshaw	Bradshaw, NE	
Village of Brainard	Brainard, NE	
City of Central City	Central City, NE	
Village of Chester	Chester, NE	
City of Cozad	Cozad, NE	
Village of Davenport	Davenport, NE	
City of David City	David City, NE	Yes
City of Deshler	Deshler, NE	Yes
Village of DeWitt	DeWitt, NE	Yes
Villaage of Dorchester	Dorchester, NE	
Village of Fairmont	Fairmont, NE	
City of Friend	Friend, NE	
City of Gothenburg	Gothenburg, NE	
Village of Hampton	Hampton, NE	
Village of Hemingford	Hemingford, NE	
Village of Hildreth	Hildreth, NE	
City of Holdrege	Holdrege	
City of Lexington	Lexington, NE	
Village of Lodgepole	Lodgepole, NE	Yes
City of Lyons	Lyons, NE	Yes
City of Madison	Madison, NE	Yes
City of Minden	Minden, NE	
City of Nelson	Nelson, NE	
City of North Platte	North Platte, NE	
City of Ord	Ord, NE	Yes
Village of Prague	Prague, NE	
City of Randolph	Randolph, NE	Yes
City of Scribner	Scribner, NE	
City of Seward	Seward, NE	
City of South Sioux City	South Sioux City, NE	Yes
Village of Summerfield	Summerfield, NE	
City of Superior	Superior, NE	
City of Sutton	Sutton, NE	
City of Valentine	Valentine, NE	
City of Wahoo	Wahoo, NE	Yes
City of Wakefield	Wakefield, NE	Yes
Village of Walthill	Walthill, NE	
Village of Wauneta	Wauneta, NE	
City of Wayne	Wayne, NE	Yes
City of Webber	Webber, NE	
Village of Wilcox	Wilcox, NE	
City of Wymore	Wymore, NE	

* Although these municipals currently purchase primarily non-firm energy from NPPD, there is in place an agreement which provides for the municipal to purchase and NPPD to provide firm power and energy to serve any load growth above the municipal's WAPA allocation plus existing generating capacity.

REQUIREMENTS CUSTOMERS OF
NPPD'S WHOLESALE CUSTOMERS

Requirements Customer	Direct WAPA Allocation
Bartley, NE	
Belleville, KS	
Cambridge, NE	Yes
Campbell, NE	
Clarkson, NE	
Decatur, NE	
Edgar, NE	
Emerson, NE	Yes
Filley, NE	
Franklin, NE	Yes
Giltner, NE	
Hebron, NE	
Hickman, NE	
Holbrook, NE	
Hubbell, NE	
Indianola, NE	Yes
Laurel, NE	Yes
Leigh, NE	
Mullen, NE	
Polk, NE	
Sargent, NE	
Schuyler, NE	Yes
Spalding, NE	Yes
St. Paul, NE	
Stanton, NE	
Stratton, NE	
Stromsburg, NE	
Weston, NE	
Wilber, NE	Yes
Winside, NE	Yes
Wayne State College	Yes
Beatrice SDC	Yes
Santee Sioux Tribe	Yes
Omaha Tribe	Yes

NPPD Retail Customers with WAPA Allocation

Norfolk Regional Center	Direct WAPA Allocation - Yes
Winnebago Tribe	Direct WAPA Allocation - Yes
Oglala Sioux Tribe	Direct WAPA Allocation - Yes

NPPD Retail Entities with Professional Retail Operations (PRO) Agreements

Ainsworth	Gibbon	O'Neill
Alma	Gordon	Oshkosh
Ashton	Hartington	Pawnee City
Atkinson	Hay Springs	Plattsmouth
Aurora	Homer	Ravenna
Barada	Humboldt	Rushville
Bassett	Inman	Scottsbluff
Big Springs	Kearney	Shelton
Bloomfield	Lewellen	Shubert
Bristow	Lewiston	Steinauer
Broadwater	Long Pine	Stella
Brule	Loup City	Sterling
Burchard	Lynch	Sutherland
Butte	Madrid	Table Rock
Chadron	McCook	Tekamah
Clinton	McGrew	Terrytown
Crab Orchard	Meadow Grove	Tilden
Craig	Melbeta	Union
Crawford	Merriman	Venango
Creighton	Milford	Verdon
Dakota City	Minatare	Whitney
Dawson	Murray	Winnebago
DuBois	Nehawka	York
Elm Creek	Norfolk	
Elsie	Oakdale	
Emmet	Oakland	
Geneva	Ogallala	
Oglala Sioux Housing Authority	Oglala Sioux Tribal Council	

Other Entities

Anoka	Lisco	Pine Ridge, SD
Brandon	Mynard	St. Mary
Crystal Lake	Northport	Whiteclay
Fort Robinson	Odessa Industrial	

RETAIL CUSTOMERS OF NPPD'S WHOLESALE CUSTOMERS

Abie	Chambers	Fordyce	Linwood	Ong	Springranch
Adams	Chapman	Fullerton	Litchfield	Orchard	Springview
Agnew	Clarks	Funk	Loma	Orleans	St. Bernard
Akron	Clatonia	Gandy	Loomis	Osceola	St. Edward
Albion	Clay Center	Garland	Loretto	Osmond	St. Helena
Alda	Clearwater	Garrison	Lowell	Overton	St. James
Alexandria	Closter	Gates	Lushton	Page	St. Libory
Allen	Cody	Genoa	Macon	Palisade	St. Stephens
Almeria	Coleridge	Glenvil	Macy	Palmer	Stamford
Aloys	Columbus	Goehner	Magnet	Panama	Staplehurst
Altona	Comstock	Grafton	Malcolm	Parks	Stapleton
Amelia	Concord	Greeley	Malmo	Pauline	Stockham
Amherst	Cordova	Gresham	Marion	Petersburg	Stockville
Angus	Cornlea	Gross	Marquette	Phillips	Strang
Anselmo	Cortland	Guide Rock	Martell	Pickrell	Sumner
Arcadia	Cotesfield	Hadar	Martinsberg	Pilger	Surprise
Archer	Cowles	Haigler	Mascot	Platte Center	Swan Lake
Assumption	Creston	Hallam	Maskell	Pleasant Dale	Swanton
Atlanta	Crofton	Halsey	Mason City	Pleasant Hill	Swedehome
Axtell	Crookston	Hamlet	Max	Pleasanton	Sweetwater
Ayr	Crowell	Hansen	Maxwell	Plymouth	Tamora
Bancroft	Culbertson	Hardy	McCool Junction	Ponca	Tarnov
Barneston	Cushing	Harvard	McLean	Poole	Taylor
Bartlett	Danbury	Havens	Merna	Powell	Thayer
Bazile Mills	Dannebrog	Hayes Center	Midway	Primrose	Thedford
Beaver Crossing	Darr	Hayland	Milburn	Princeton	Thurston
Bee	Davey	Hazard	Miller	Prosser	Tobias
Beemer	Daykin	Heartwell	Milligan	Purdum	Toughy
Belden	Denman	Henderson	Mills	Raeville	Trumbull
Belgrade	Denton	Hendley	Monowi	Ragan	Tryon
Bellwood	Deweese	Hershey	Monroe	Raymond	Uehling
Belvidere	Diller	Holland	Monterey	Republican City	Ulysses
Benedict	Dixon	Hollinger	Moorefield	Richland	Upland
Bertrand	Dodge	Holmesville	Mt. Clare	Rising City	Utica
Berwyn	Doniphan	Holstein	Murphy	Riverdale	Valparaiso
Beverly	Duncan	Hordville	Naper	Riverton	Verdel
Bladen	Dunning	Hoskins	Naponee	Roca	Verdigre
Bloomington	Dwight	Howells	Nemaha	Rockford	Verona
Blue Springs	Eddyville	Hubbard	Nenzel	Rockville	Virginia
Boelus	Edison	Humphrey	Newark	Rokeby	Waco
Boone	Elba	Huntley	Newcastle	Rosalie	Waterbury
Bostwick	Eldorado	Inavale	Newman Grove	Rose	Wausa
Bow Valley	Elgin	Inland	Newport	Roseland	Webster
Brady	Elsmere	Jackson	Niobrara	Rosemont	Weissert
Brewster	Elwood	Jamison	Nora	Rosenburg	Wellfleet
Brownlee	Elyria	Johnson	Norden	Royal	Western
Brownville	Enders	Johnstown	Norman	Ruby	Westerville
Bruning	Enola	Keene	North Loup	Ruskin	Willis
Bruno	Ericson	Kenesaw	North Star	Santee	Willow Island
Brunswick	Eustis	Kennedy	Nysted	Saronville	Wilsonville
Burton	Ewing	Kilgore	Oak	Scotia	Winnetoon
Byron	Exeter	Kramer	Obert	Seneca	Wolbach
Cairo	Fairfield	Kronberg	Oconto	Shelby	Wood Lake
Carleton	Farnam	Lawrence	Octavia	Sholes	Wynot
Carroll	Farwell	Lebanon	Odell	Silver Creek	
Cedar Rapids	Firth	Liberty	Odessa	Smithfield	
Center	Flats	Lindsay	Ohiowa	Sprague	

Appendix B – Existing Generating Unit Data

Nebraska Public Power District
Generating Capability Data
2017 Existing Megawatts

Unit Name	Location	Unit Type	Fuel Type	Summer Rating	Winter Rating	Commercial Start Date
ADM	Columbus, NE	ST	BITW	53.31	53.31	2010
Auburn 1	Auburn, NE	IC	NG,FO2	2.10	2.10	1982
Auburn 2	Auburn, NE	IC	NG,FO2	0.00	0.00	1949
Auburn 4	Auburn, NE	IC	NG,FO2	3.60	3.60	1993
Auburn 5	Auburn, NE	IC	NG,FO2	3.30	3.30	1973
Auburn 6	Auburn, NE	IC	NG,FO2	2.50	2.50	1967
Auburn 7	Auburn, NE	IC	NG,FO2	4.80	4.80	1987
BPS	Beatrice, NE	CC	NG	220.00	220.00	2005
Belleville 4	Belleville, KS	IC	NG,FO2	0.00	0.00	1955
Belleville 5	Belleville, KS	IC	NG,FO2	1.40	1.40	1961
Belleville 6	Belleville, KS	IC	NG,FO2	2.50	2.50	1966
Belleville 7	Belleville, KS	IC	NG,FO2	3.30	3.30	1971
Belleville 8	Belleville, KS	IC	NG,FO2	2.80	2.80	2005
Cambridge	Cambridge, NE	IC	FO2	3.00	3.00	1958
Canaday	Lexington, NE	ST	NG, FO6	99.30	99.30	1958
Columbus 1	Columbus, NE	HY	WAT	15.00	15.00	1936
Columbus 2	Columbus, NE	HY	WAT	15.00	15.00	1936
Columbus 3	Columbus, NE	HY	WAT	15.00	15.00	1936
Cooper	Brownville, NE	NB	UR	765.00	770.00	1974
David City 1	David City, NE	IC	NG, FO2	1.30	1.30	1960
David City 2	David City, NE	IC	FO2	0.80	0.80	1949
David City 3	David City, NE	IC	NG, FO2	0.90	0.90	1955
David City 4	David City, NE	IC	NG, FO2	1.80	1.80	1966
David City 5	David City, NE	IC	FO2	1.33	1.33	1996
David City 6	David City, NE	IC	FO2	1.33	1.33	1996
David City 7	David City, NE	IC	FO2	1.34	1.34	1996
Emerson_2	Emerson, NE	IC	FO2	1.40	1.40	1968
Emerson_4	Emerson, NE	IC	FO2	0.20	0.20	1958
Franklin 1	Franklin, NE	IC	NG, FO2	0.65	0.65	1963
Franklin 2	Franklin, NE	IC	NG, FO2	1.35	1.35	1974
Franklin 3	Franklin, NE	IC	NG, FO2	1.05	1.05	1968
Franklin 4	Franklin, NE	IC	NG, FO2	0.70	0.70	1955
Gentleman 1	Sutherland, NE	ST	BITW	665.00	665.00	1979
Gentleman 2	Sutherland, NE	ST	BITW	700.00	700.00	1982
Hallam	Hallam, NE	GT	NG, FO2	42.90	42.90	1973
Hebron	Hebron, NE	GT	FO2	41.50	41.50	1973
Kearney	Kearney, NE	HY	WAT	0.00	0.00	1921
Kingsley	Ogallala, NE	HY	WAT	37.50	37.50	1985
Madison 1	Madison, NE	IC	NG, FO2	1.70	1.70	1969
Madison 2	Madison, NE	IC	NG, FO2	0.95	0.95	1959

Unit Name	Location	Unit Type	Fuel Type	Summer Rating	Winter Rating	Commercial Start Date
Madison 3	Madison, NE	IC	NG, FO2	0.85	0.85	1953
Madison 4	Madison, NE	IC	FO2	0.50	0.50	1946
McCook	McCook, NE	GT	FO2	40.90	40.90	1973
Monroe	Monroe, NE	HY	WAT	3.00	3.00	1936
North Platte 1	North Platte, NE	HY	WAT	10.00	10.00	1937
North Platte 2	North Platte, NE	HY	WAT	10.00	10.00	1937
Ord 1	Ord, NE	IC	NG, FO2	5.00	5.00	1973
Ord 2	Ord, NE	IC	NG, FO2	1.00	1.00	1966
Ord 3	Ord, NE	IC	NG, FO2	2.00	2.00	1963
Ord 4	Ord, NE	IC	FO2	1.40	1.40	1997
Ord 5	Ord, NE	IC	FO2	1.40	1.40	1997
Sheldon 1	Hallam, NE	ST	BITW	100.00	105.00	1961
Sheldon 2	Hallam, NE	ST	BITW	115.00	120.00	1968
Spalding	Spalding, NE	IC	FO2	0.00	0.00	1955
Spencer 1	Spencer, NE	HY	WAT	0.80	0.80	1927
Spencer 2	Spencer, NE	HY	WAT	0.48	0.48	1952
Wahoo_1	Wahoo, NE	IC	NG,FO2	1.70	1.70	1960
Wahoo_3	Wahoo, NE	IC	NG,FO2	3.60	3.60	1973
Wahoo_5	Wahoo, NE	IC	NG,FO2	1.80	1.80	1952
Wahoo_6	Wahoo, NE	IC	NG,FO2	2.90	2.90	1969
Wakefield 2	Wakefield, NE	IC	NG, FO2	0.54	0.54	1955
Wakefield 4	Wakefield, NE	IC	NG, FO2	0.69	0.69	1961
Wakefield 5	Wakefield, NE	IC	NG, FO2	1.08	1.08	1966
Wakefield 6	Wakefield, NE	IC	NG, FO2	1.13	1.13	1971
Wayne 1	Wayne, NE	IC	FO2	0.75	0.75	1951
Wayne 3	Wayne, NE	IC	FO2	1.75	1.75	1956
Wayne 4	Wayne, NE	IC	FO2	1.85	1.85	1960
Wayne 5	Wayne, NE	IC	FO2	3.25	3.25	1966
Wayne 6	Wayne, NE	IC	FO2	4.90	4.90	1968
Wayne 7	Wayne, NE	IC	FO2	3.25	3.25	1998
Wayne 8	Wayne, NE	IC	FO2	3.25	3.25	1998
Western Sugar	Scottsbluff, NE	ST	SUB	4.55	4.55	1987
Wilber	Wilber, NE	IC	FO2	2.94	2.94	1949
Total				3047.87	3062.87	

Unit Name	Location	Unit Type	Fuel Type	Nameplate Rating	Summer Accredited Rating[1]	Commercial Start Date
Ainsworth Wind	Ainsworth, NE	WD	WD	59.40	20.2%	2005
Elkhorn Ridge Wind	Bloomfield, NE	WD	WD	80.00	12.5%	2009
Crofton Hills Wind	Crofton, NE	WD	WD	42.00	7.6%	2012
Laredo Ridge Wind	Petersburg, NE	WD	WD	80.00	21.3%	2011
Broken Bow Wind	Broken Bow, NE	WD	WD	80.00	16.3%	2012
Broken Bow Wind II	Broken Bow, NE	WD	WD	73.00	4.4%	2014
Springview Wind	Springview, NE	WD	WD	3.00	11.6%	2011
Steele Flats	Diller, NE	WD	WD	75.00	24.5%	2013

[1] Per SPP Planning Criteria, accredited capacity for wind is determined based on how the facility performed during the utility's top load hours. The values in the appendix are based on a percentage of nameplate rating, and use NPPD's top load hours for the calculation.

Appendix C - Load and Capability Reports

Exhibit C-1 – Load and Capability with Only Existing Resources, Summer Season (Anytime Peak), Base Load Forecast

Nebraska Public Power District
Load & Capability Information (MW)
Summer Season Conditions

		2018	2019	2020	2021	2022
1	Projected Seasonal System Demand	2903.7	2867.3	2836.9	2834.4	2828.4
2	Projected Seasonal Firm Purchases - TOTAL	444.7	444.7	444.7	444.7	444.7
3	Projected Seasonal Firm Sales - TOTAL	71.9	73.9	32.3	18.1	0.6
4	Seasonal Peak Responsibility (1 - 2 + 3)	2530.9	2496.5	2424.5	2407.8	2384.3
5	Projected Net Generating Capability	3109.1	3086.6	3086.6	3086.6	3085.0
6	Projected Participation Purchases	160.0	160.0	160.0	160.0	160.0
7	Projected Participation Sales	186.2	161.2	159.2	159.2	159.2
8	Projected Adjusted Seasonal Net Capability (5 + 6 - 7)	3082.9	3085.4	3087.4	3087.4	3085.8
9	Minimum Seasonal Reserve Margin (4 x 0.12)	303.7	299.6	290.9	288.9	286.1
10	Seasonal System Capacity Responsibility (4 + 9)	2834.6	2796.1	2715.4	2696.8	2670.4
11	Seasonal Capacity Balance (8 - 10)	248.2	289.4	372.0	390.7	415.4

LIST OF ACRONYMS

APPA, American Public Power Association
AWEF, Ainsworth Wind Energy Facility
BA, Balancing Authorities
BD, Becton-Dickinson
BPS, Beatrice Power Station
BWR, Boiling Water Reactor
CAES, Compressed Air Energy Storage
CBA, Consolidated Balancing Authority
CO_2, Carbon Dioxide
CNPPID, Central Nebraska Public Power & Irrigation District
CNS, Cooper Nuclear Station
CPP, Clean Power Plan
DEED, Demonstration of energy Efficient Developments
DOE, Department of Energy
DSM, Demand-Side Management
EE, Energy Efficiency
EIA, Energy Information Administration
EPA, Environmental Protection Agency
EPU, Extended Power Uprate
GGS, Gerald Gentleman Station
HP, High Pressure
IM, Integrated Marketplace
IRP, Integrated Resource Plan
JEA, Jacksonville Electric Authority
LES, Lincoln Electric System
LRE, Load Responsible Entities
MEAN, Municipal Energy Agency of Nebraska
Monolith, Monolith Materials
NC2, Nebraska City Unit 2
NCP, non-coincident peak
NGO, Non-Governmental Organization
NMPP, Nebraska Municipal Power Pool
NPPD, Nebraska Public Power District
NO_x, Nitrogen Oxide
OPPD, Omaha Public Power District
PPA, Power Purchase Agreements
PRO, Professional Reatil Operations
QLG, Qualifying Local Generation
RAR, Resource Adequacy Requirements
SAWG, Supply Adequacy Working Group
SO_2, Sulfur Dioxide
SPP, Southwest Power Pool
TCM, Technology Centre Mongstad
TEA, The Energy Authority
VFD, variable frequency drives
WAPA, Western Area Power Administration