Presented to

Meeting Transmission Challenges in the Rocky Mountain Region

a workshop sponsored by

Western Area Power Administration

U.S. Department of Energy | Energy Efficiency & Renewable Energy

Wind Powering America

CENERGY

June 21, 2011

Morey Wolfson
GEO's Senior Transmission Policy Advisor

State of Colorado 1876

Governor's Energy Office

RECHARGE COLORADO

- **GEO's Strategic Transmission and Renewables (STAR) Report**
- **The Colorado Clean Energy Development Authority (CEDA)**
- **Colorado Senate Bill 2011-45: Creation of a a Transmission Siting and Permitting Task Force**
- **Recommendations for consideration**

Colorado Governor's Energy Office (GEO)

Mission

The Governor's Energy Office promotes sustainable economic development in Colorado by advancing the state's energy markets and industries to create jobs, increase energy security, lower long term consumer costs, and protect our environment.

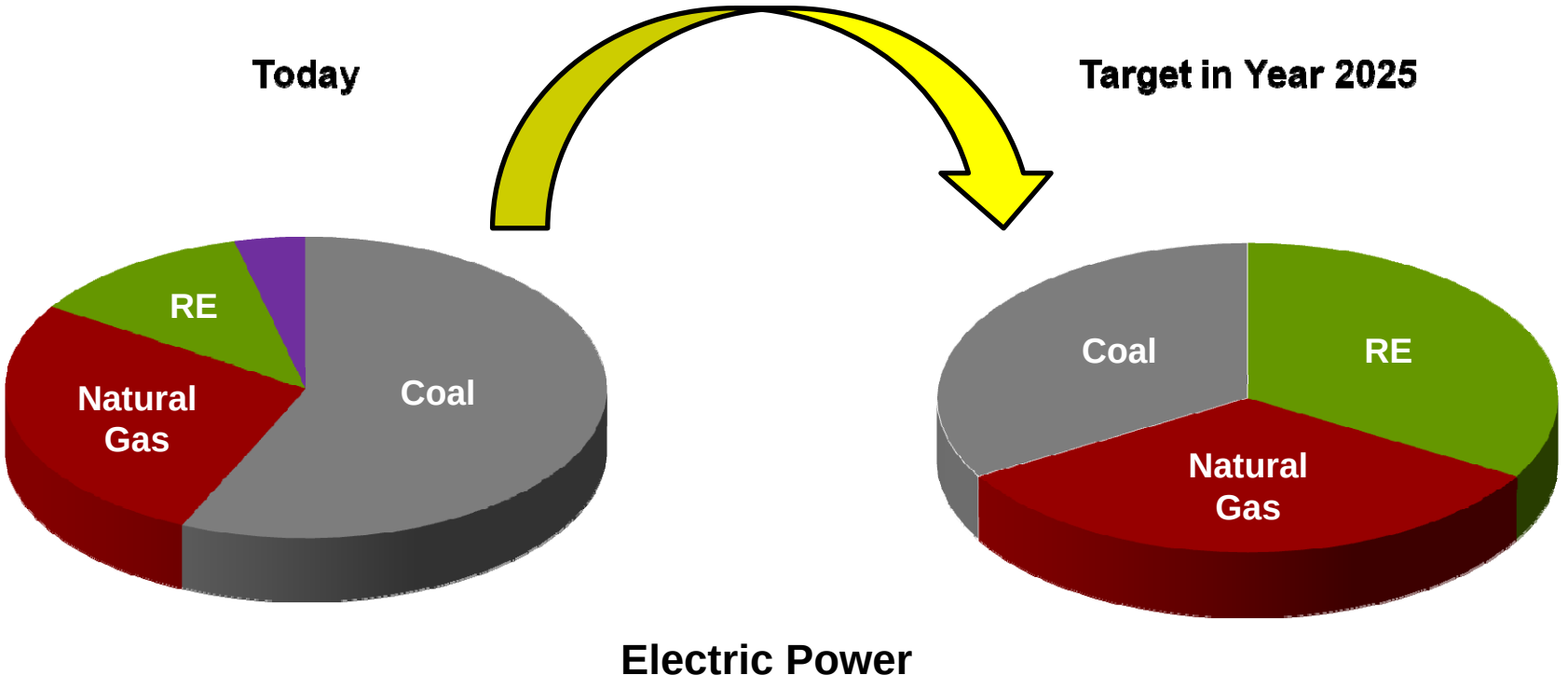
Jobs

Security

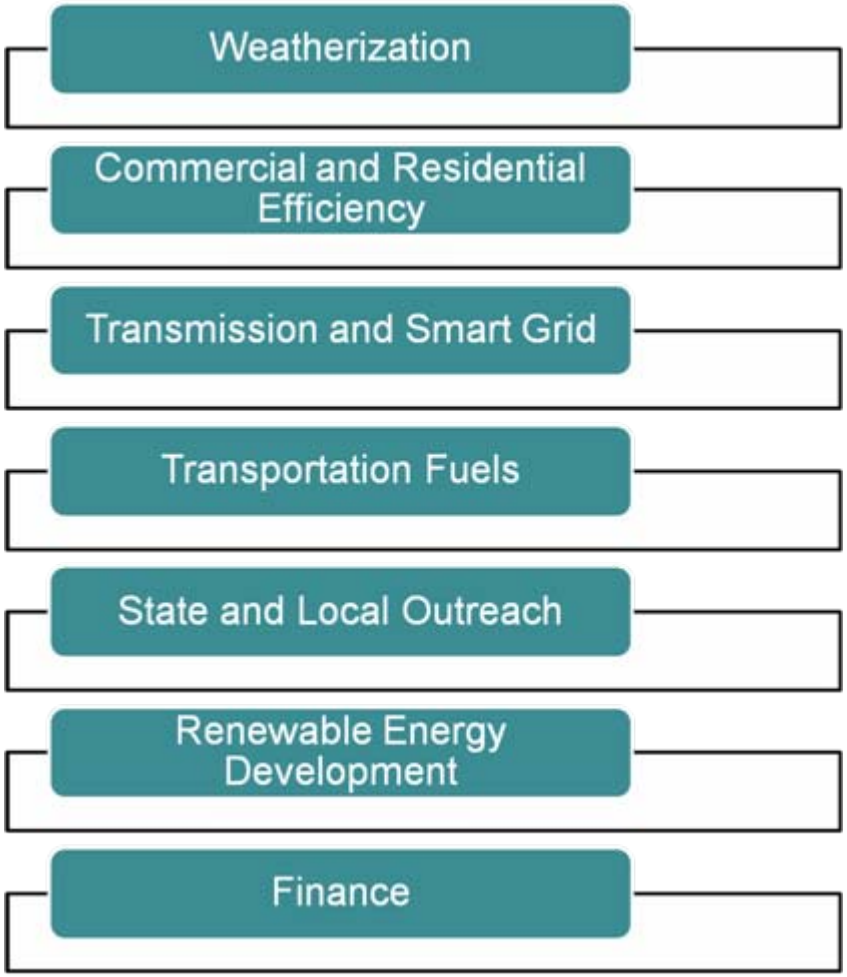
Cost

Environment

GEO works to transform Colorado's electric power sector towards a "Balanced Energy Portfolio"



GEO Programs



Electric & Gas Utilities

Governor's Energy Office

RECHARGE COLORADO

STAR

Strategic Transmission and Renewables

A Vision of Colorado's Electric Power Sector to the Year 2050

A Report of the Colorado Governor's Energy Office

GEO's STAR Project

Strategic

Transmission

And

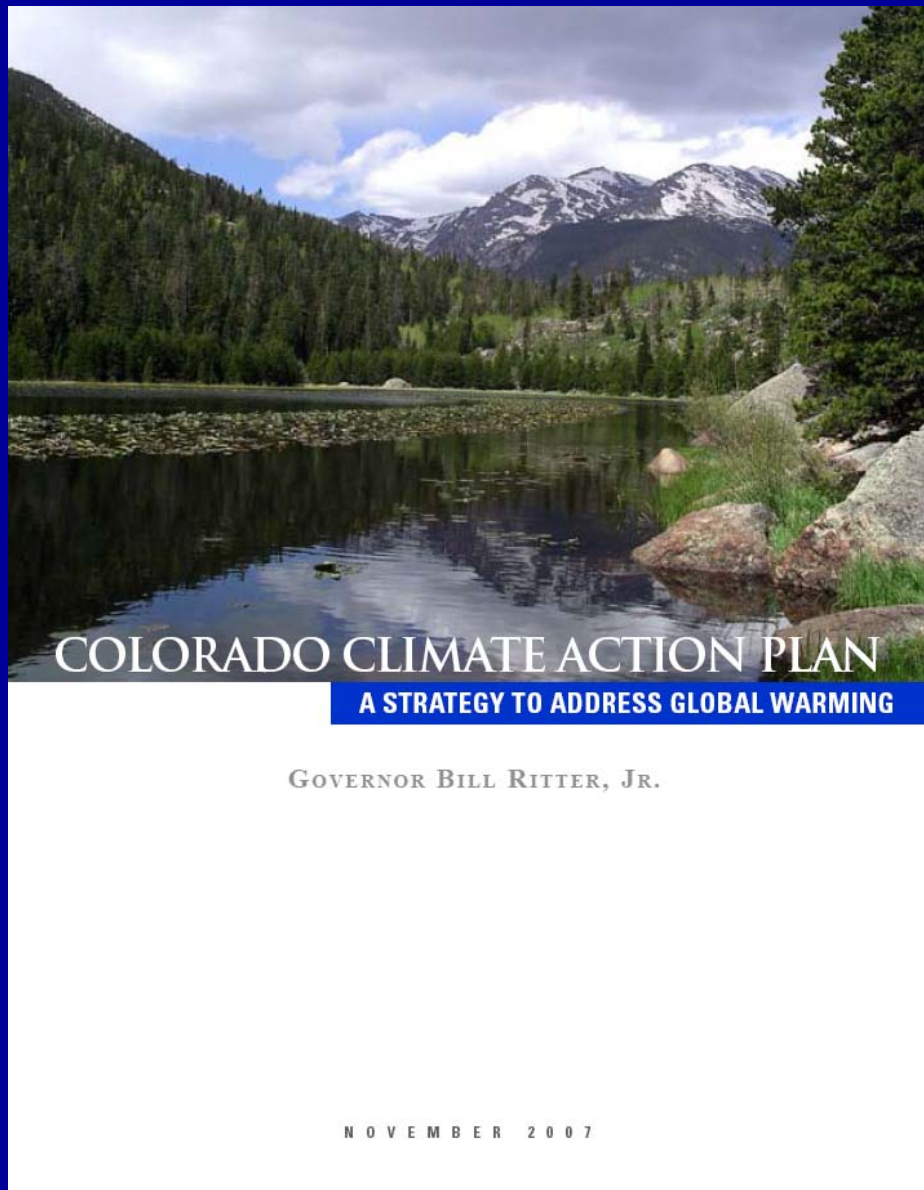
Renewables

The STAR Project is the latest installment in GEO's 4 year activity to help inform and coordinate results-oriented electricity sector planning in Colorado and the region.

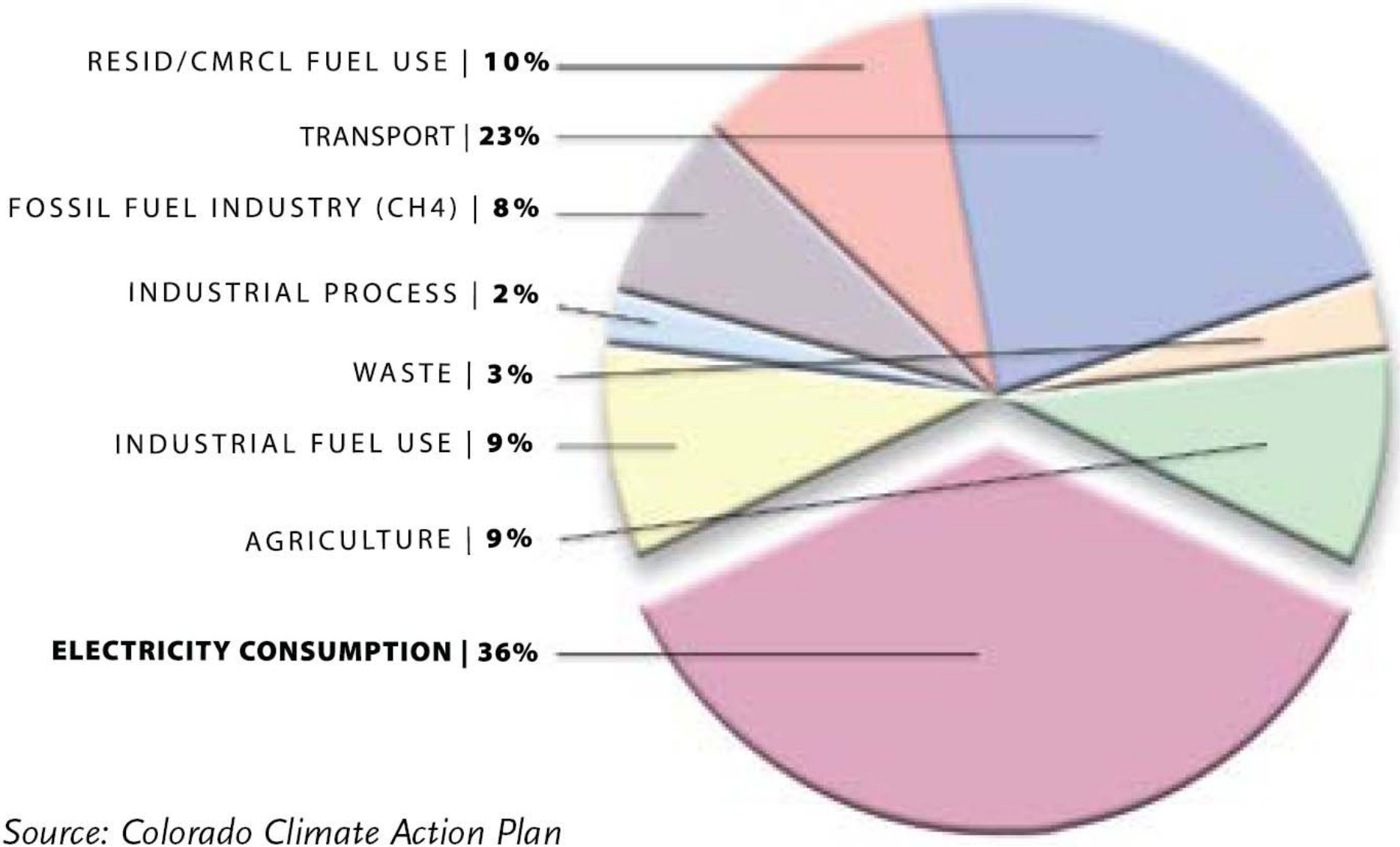
Background

Colorado's Climate Action Plan

- Released Nov. 2007
- Established goals for the state to reduce CO_2 emissions:
  - 20% below 2005 levels by 2020
  - 80% below 2005 levels by 2050
- 36% of Colorado's CO_2 emissions are from electric generating stations



Colorado CO_2 Emissions by Sector



Source: Colorado Climate Action Plan

SB07-091 Report:

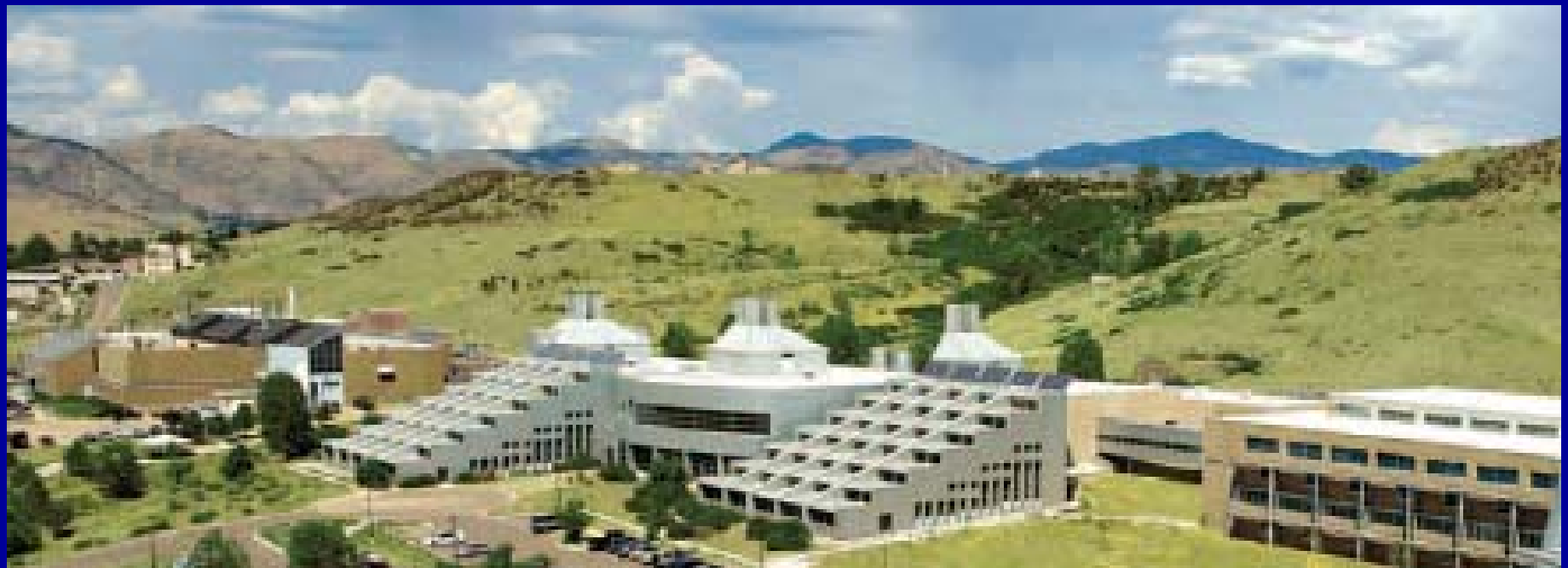
Mapping Colorado's Renewable Resources Generation Development Areas (GDAs)

- Legislature established a 16 Member Task Force
- Report describes existing generation
- Assesses Colorado's transmission capabilities

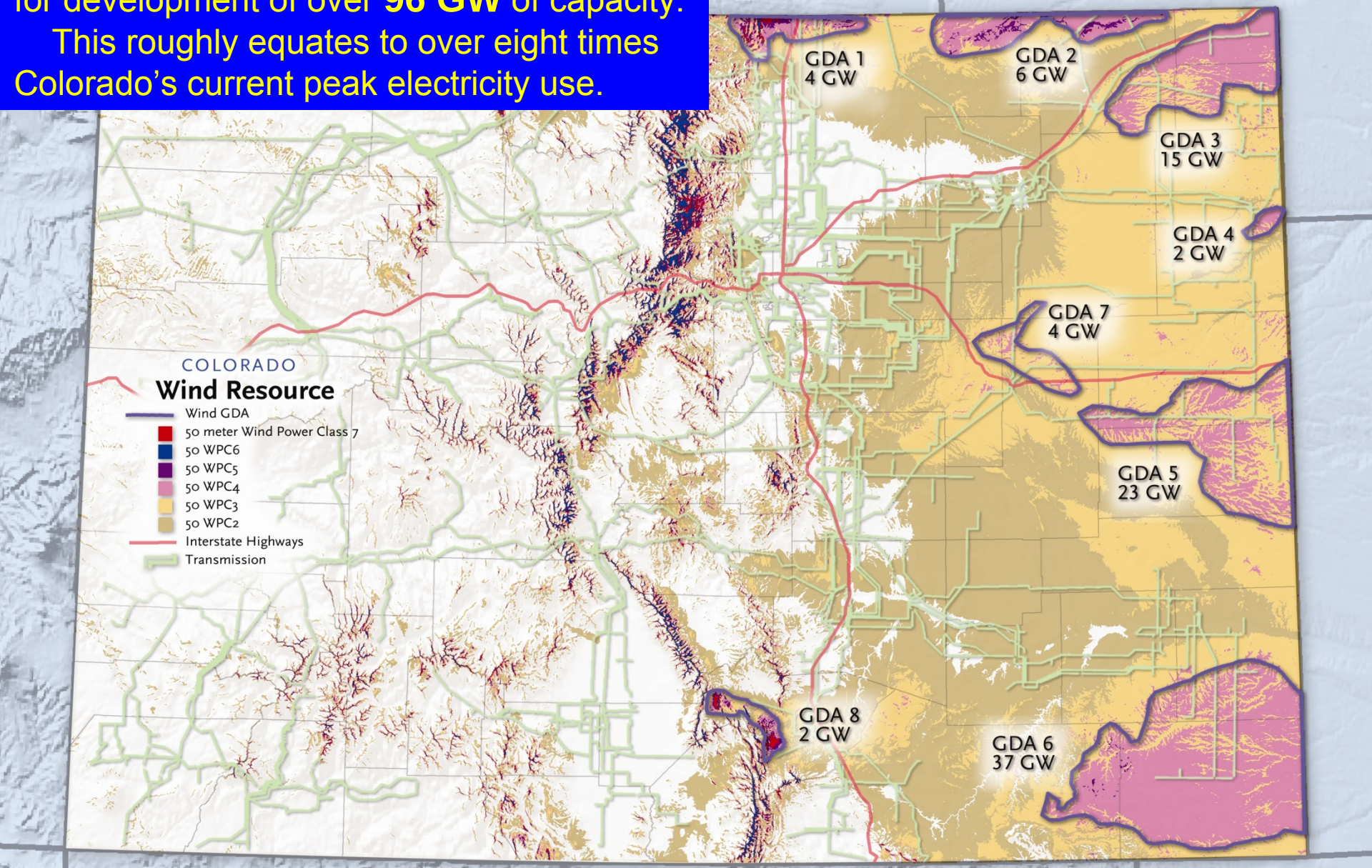
NREL and GEO conducted detailed analyses that determined electric capabilities from GDAs.

A GDA was defined by the Task Force as any sub-region of Colorado that is capable of hosting a minimum of 1,000 MW of name-plate renewable energy electric generating capacity.

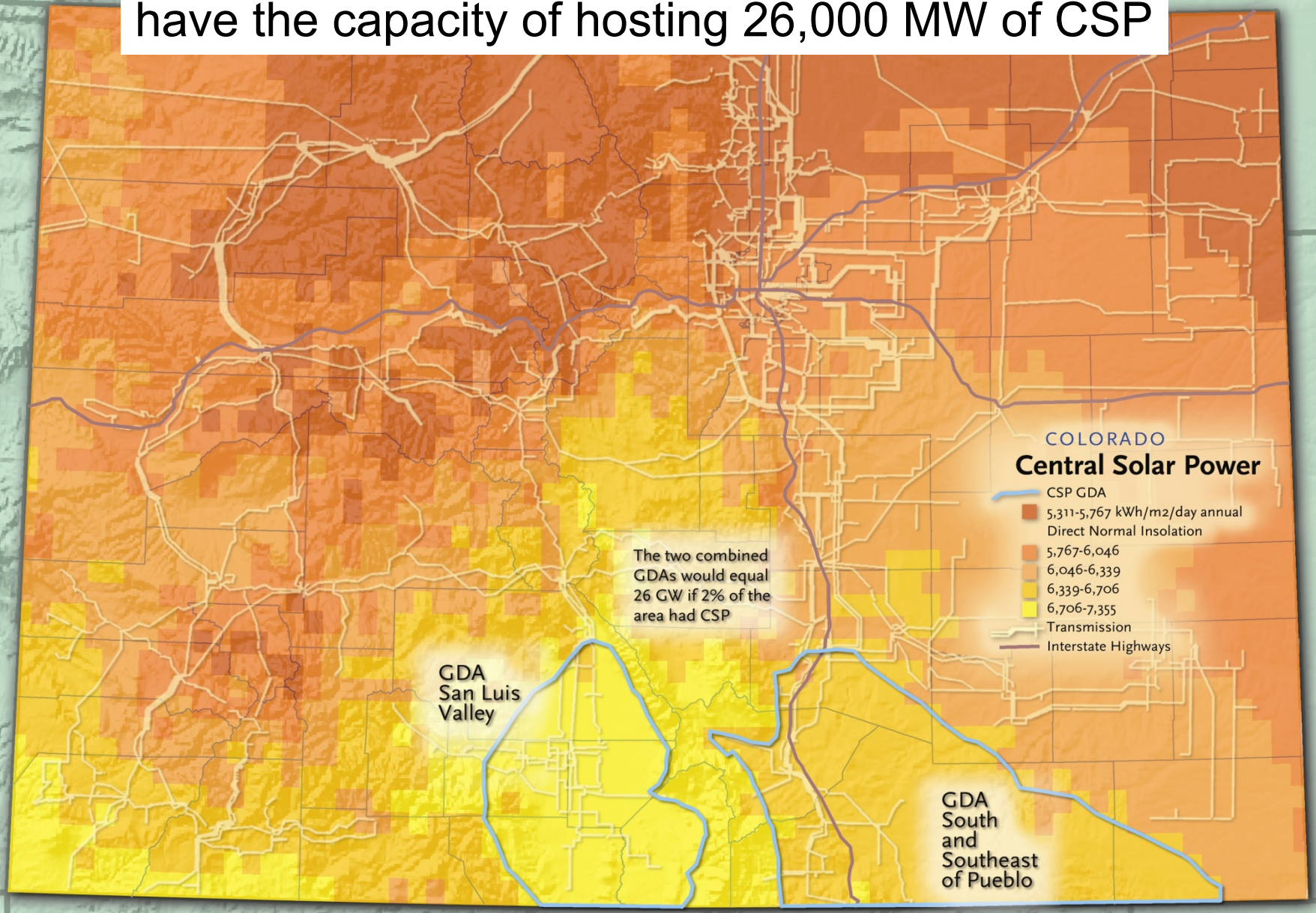
Ten GDAs identified with over 120,000 MW (120 GW) of wind and solar.



The eight wind GDAs have the potential for development of over **96 GW** of capacity. This roughly equates to over eight times Colorado's current peak electricity use.



2% of the land area in the 2 solar GDAs have the capacity of hosting 26,000 MW of CSP



GEO's REDI Project

Renewable

Energy

Development

Infrastructure:

"Connecting Colorado's Renewable Resources to the Markets in a Carbon-Constrained Electricity Sector"

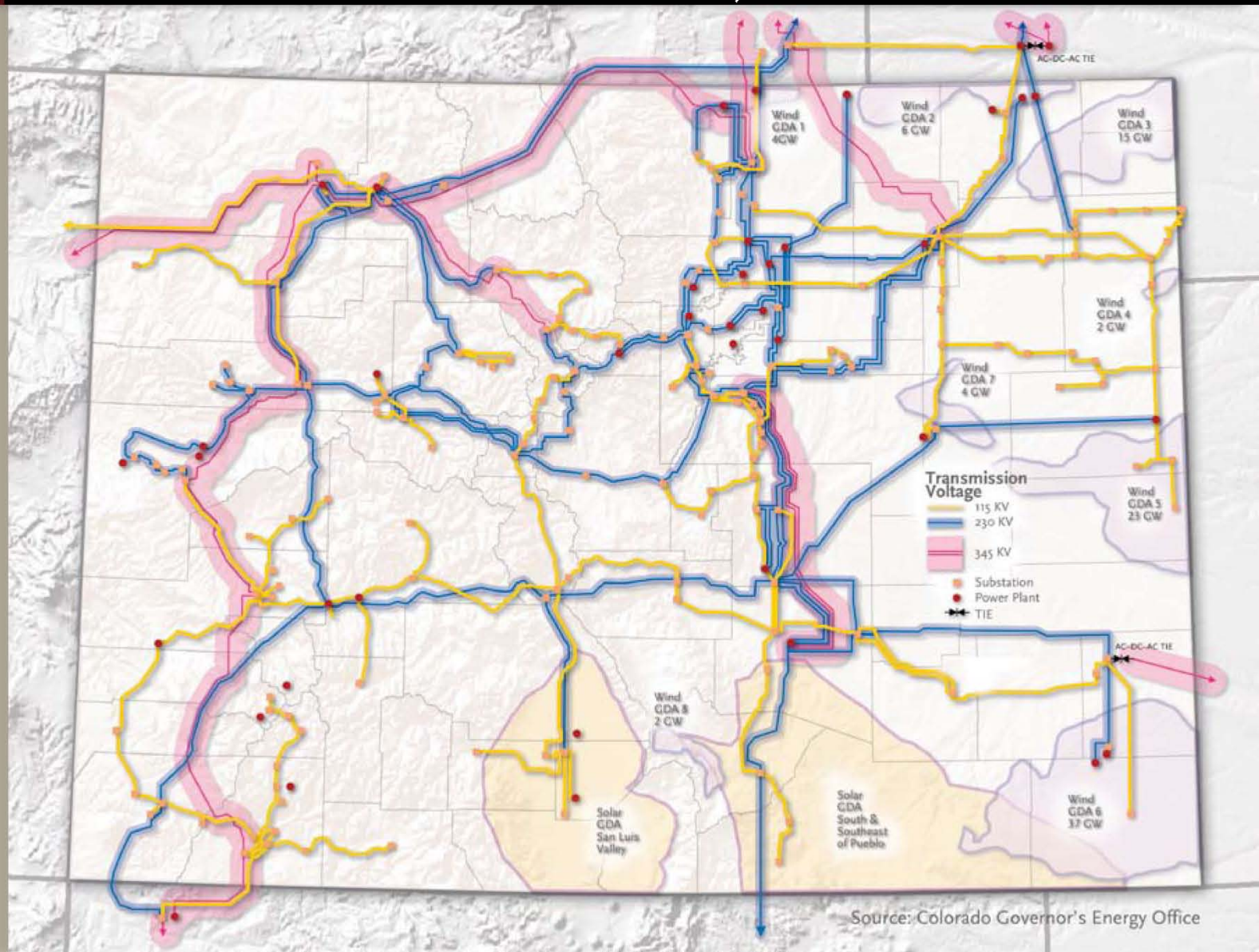
The December 2009 project includes:

- 100 page report
- 5 technical studies, including modeling
- a video

RENEWABLE ENERGY DEVELOPMENT INFRASTRUCTURE

REDI

Connecting Colorado's Renewable Resources to the Markets in a Carbon-Constrained Electricity Sector



A Report of the Colorado Governor's Energy Office

The primary focus of the REDI Report

- Discussed the challenges and opportunities of Colorado's electricity sector meeting the goal of a 20% reduction in CO_2 emissions by 2020, from 2005 levels.

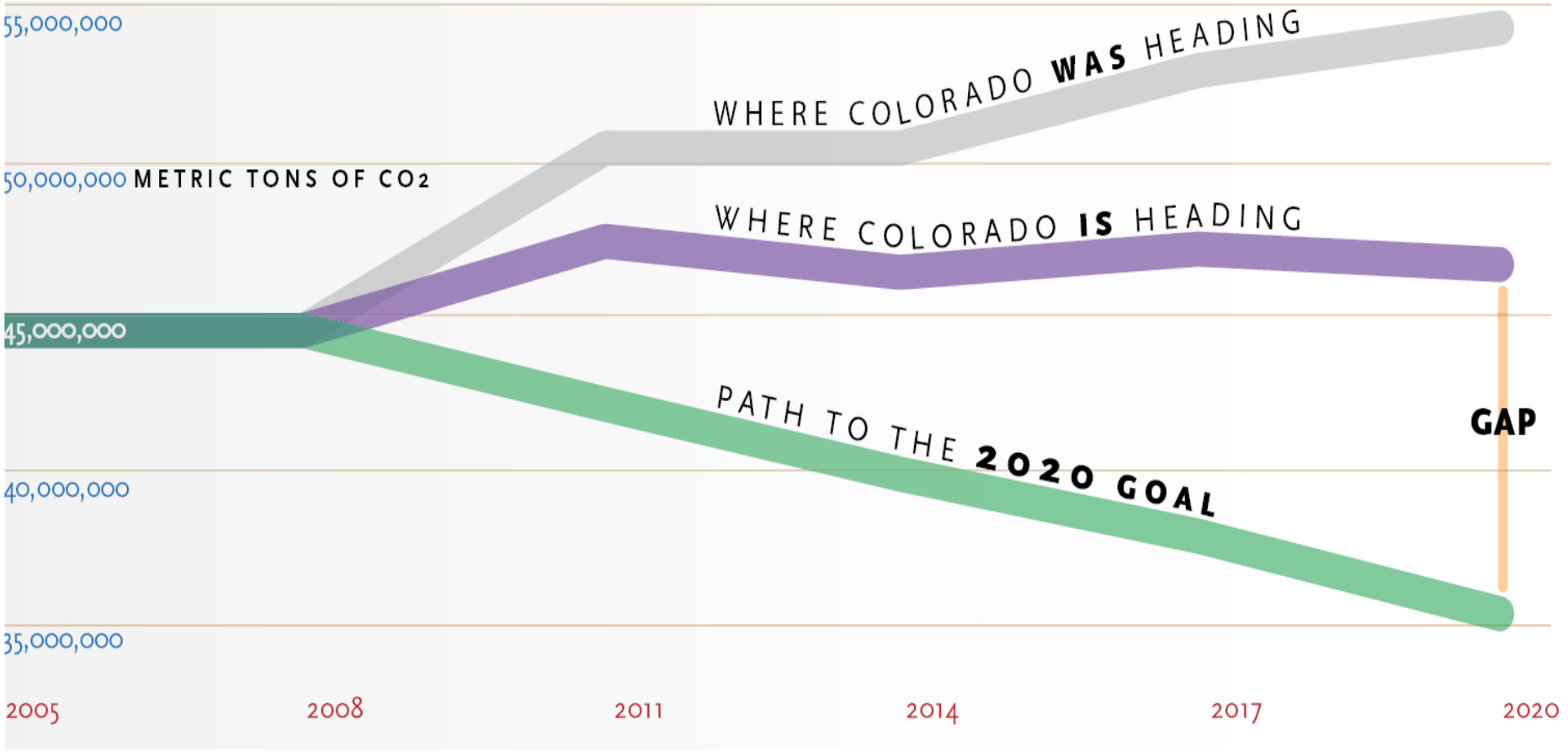
- The REDI Report refers to this as the "20x20 goal."

RENEWABLE ENERGY DEVELOPMENT INFRASTRUCTURE

REDI

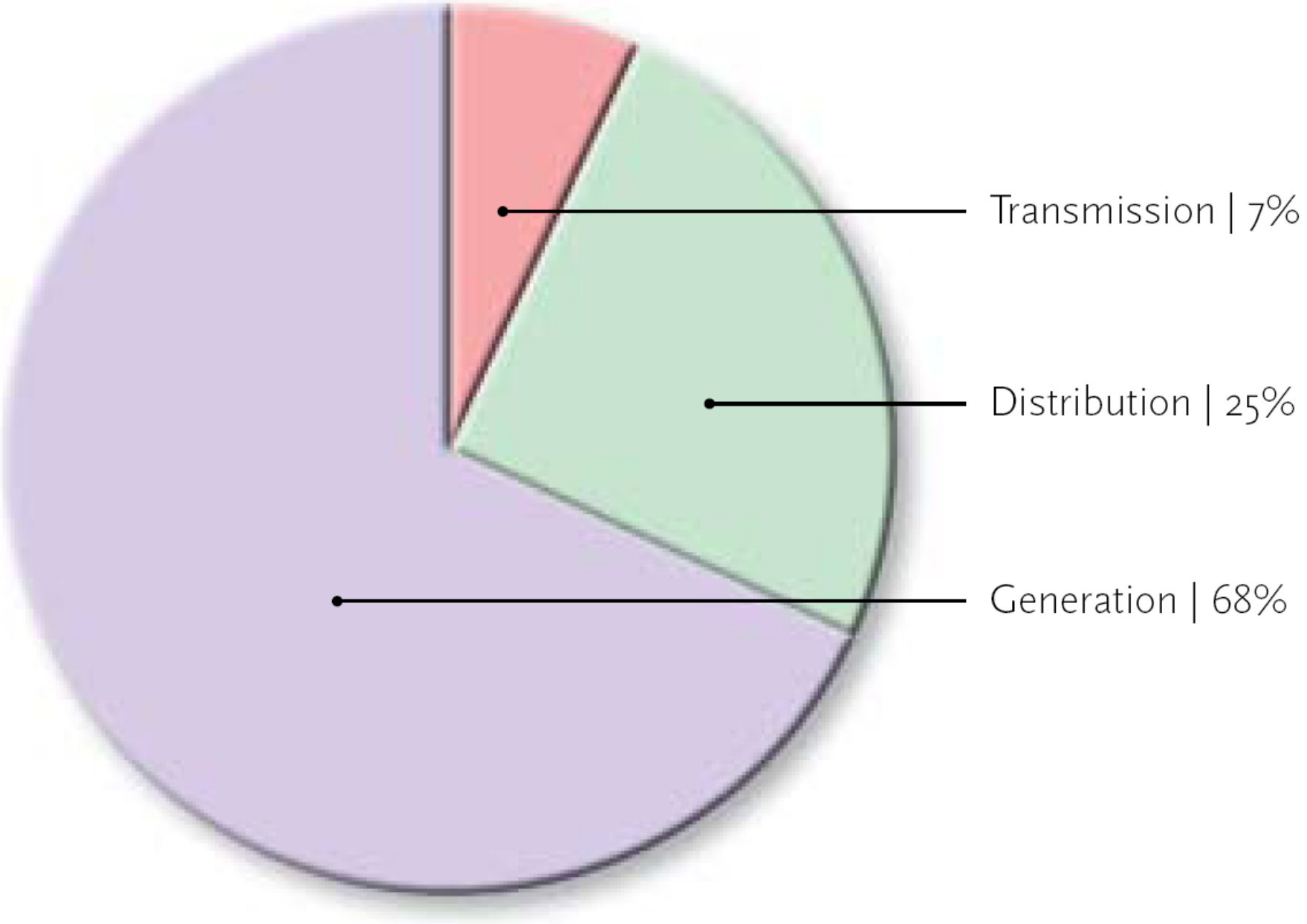
Connecting Colorado's Renewable Resources to the Markets in a Carbon-Constrained Electricity Sector

Colorado Electricity Sector Carbon Dioxide Emissions in Millions of Metric Tons



Source: University of Colorado-Denver College of Engineering

National Average Cost of Electricity



Source: USDOE Energy Information Administration

GEO's STAR Project

Strategic

Transmission

And

Renewables

STAR models the CO_2 reduction goals of the CAP as the primary metric for analysis:

- 40% reduction in CO_2 by 2030
- 80% reduction in CO_2 by 2050

After the CAP's CO_2 reduction goals have been met, the model selects a generation mix that minimizes the net present value out to 2050.

The model uses a power generation technology cost and performance deck.

The deck:

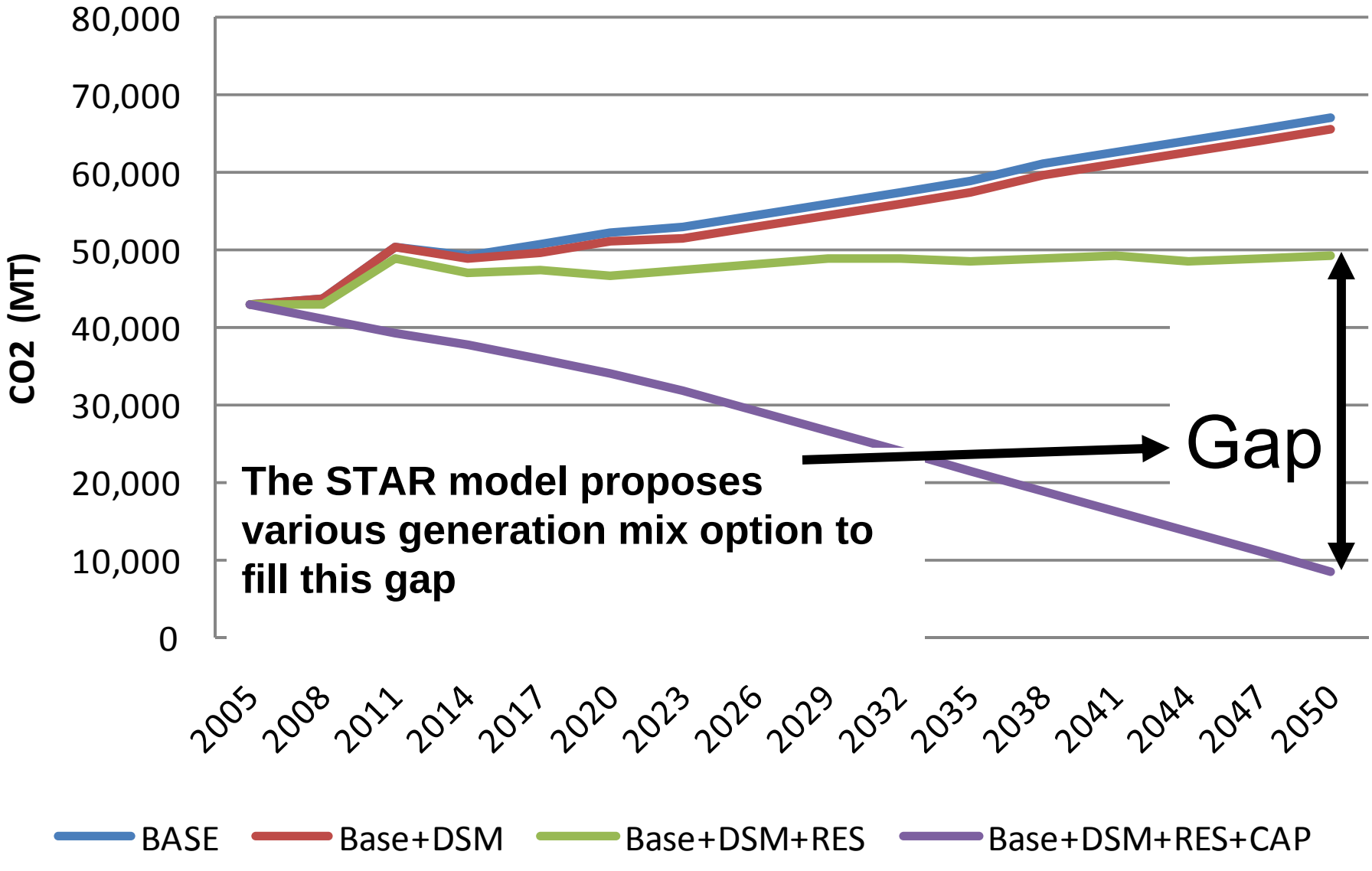
- uses reliable, published data from a variety of sources (FERC, EIA's National Energy Modeling System, NREL, and Colorado utilities' regulatory filings).

- contains capacity costs, life expectancies, heat rates, availability factors, variable O&M, fixed O&M costs, and emission rates for CO_2, NOx, and SO_2.

Model Assumptions

Assumes that Colorado's Electricity Sector will meet the Climate Action Plan carbon dioxide reduction goals.

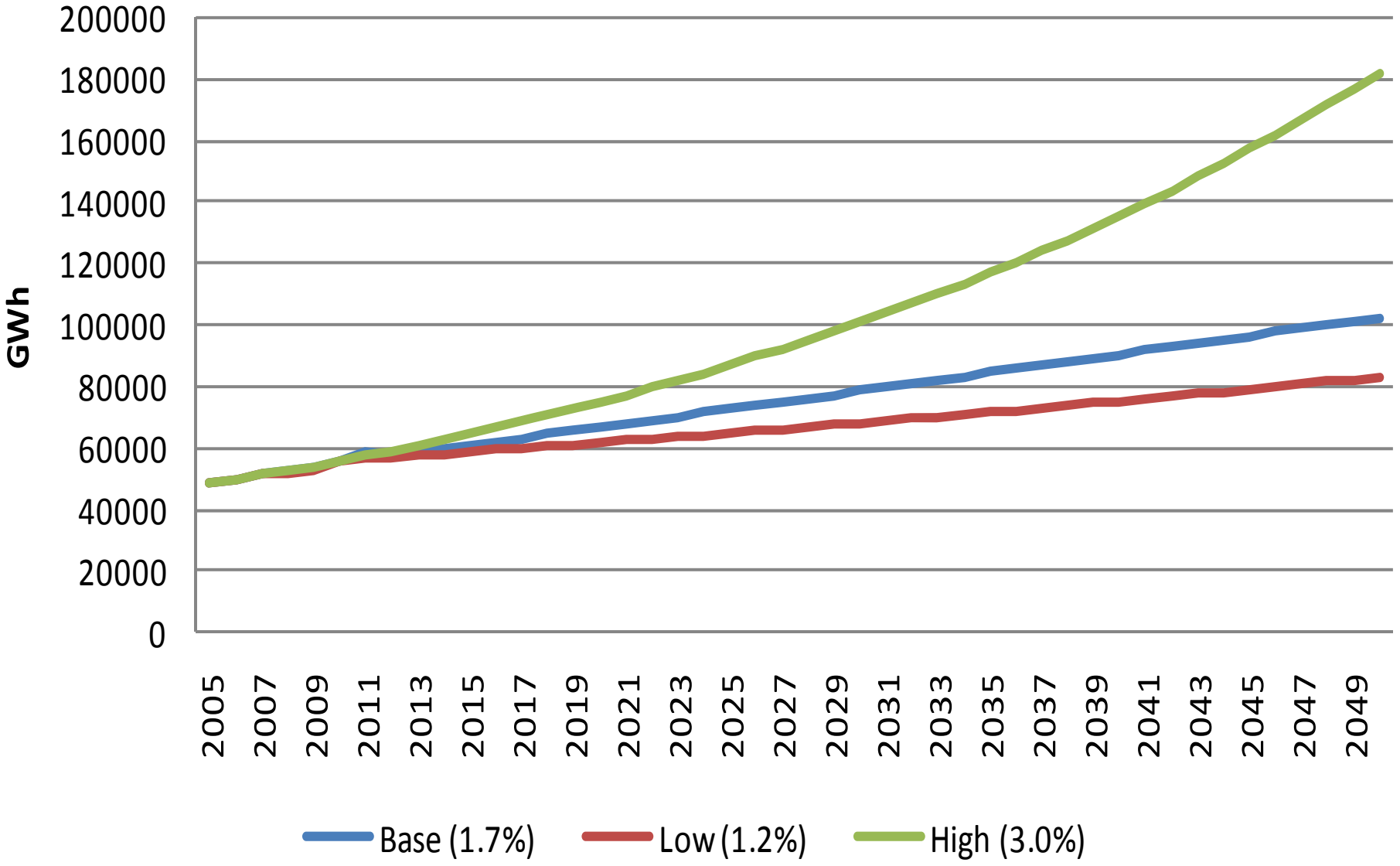
Colorado CO2 Emissions Profile (2005-2050)



STAR's model did not incorporate a price on CO_2.

Colorado will experience an aggregate, statewide annual average growth (AAG) rate of 1.7 percent to 2030 and beyond to 2050.

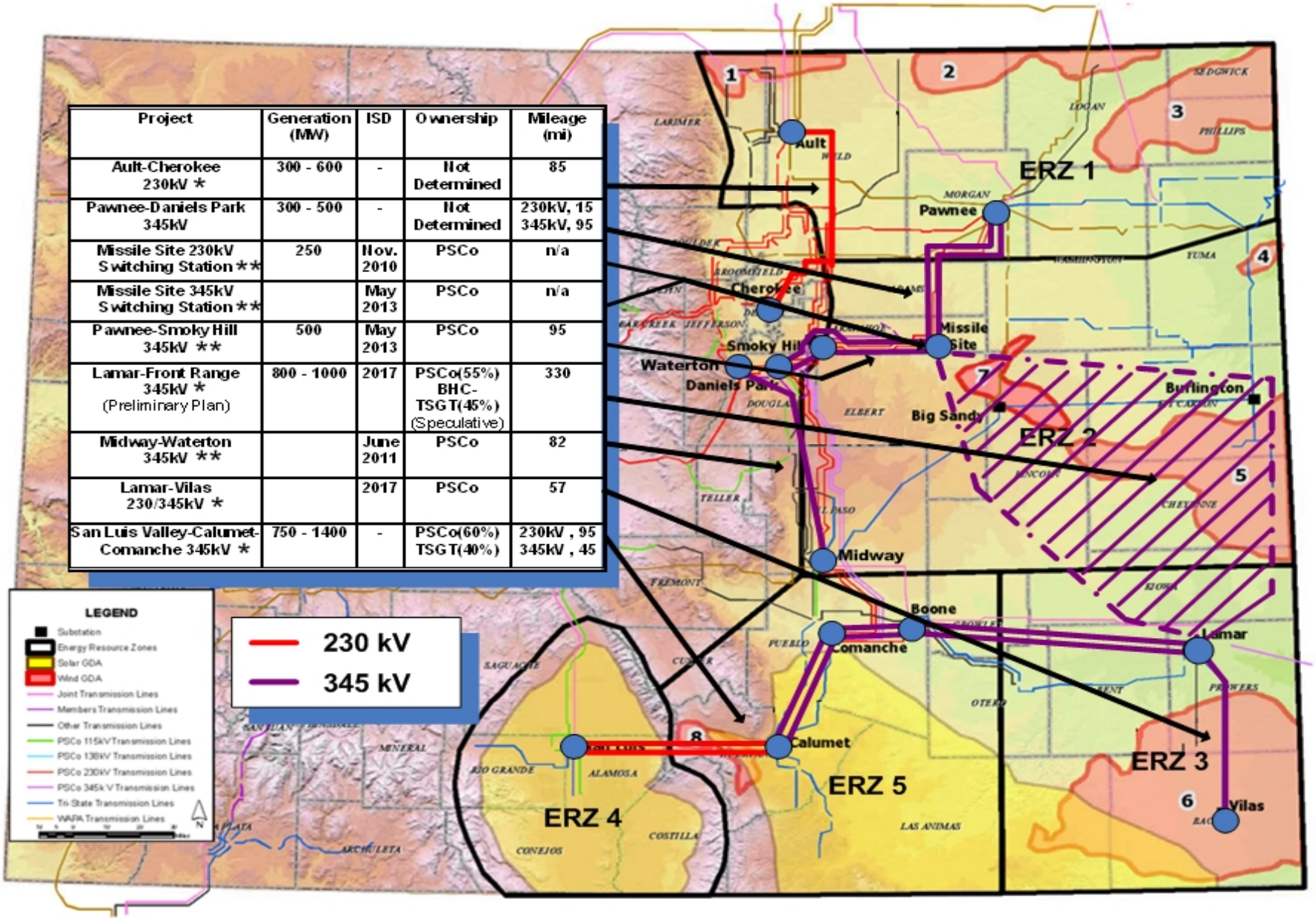
Colorado Energy Load Forecast
(2005-2050)



Assumes that all of PSCo's SB07-100 transmission lines will be in service by 2030.

Public Service Company of Colorado
SB-100 Projects as of 11-5-2010

Project	Generation (MW)	ISD	Ownership	Mileage (mi)
Ault-Cherokee 230kV *	300 - 600	-	Not Determined	85
Pawnee-Daniels Park 345kV	300 - 500	-	Not Determined	230kV, 15 345kV, 95
Missile Site 230kV Switching Station **	250	Nov. 2010	PSCo	n/a
Missile Site 345kV Switching Station **		May 2013	PSCo	n/a
Pawnee-Smoky Hill 345kV **	500	May 2013	PSCo	95
Lamar-Front Range 345kV * (Preliminary Plan)	800 - 1000	2017	PSCo(55%) BHC-TSGT(45%) (Speculative)	330
Midway-Waterton 345kV **		June 2011	PSCo	82
Lamar-Vilas 230/345kV *		2017	PSCo	57
San Luis Valley-Calumet-Comanche 345kV *	750 - 1400	-	PSCo(60%) TSGT(40%)	230kV , 95 345kV , 45

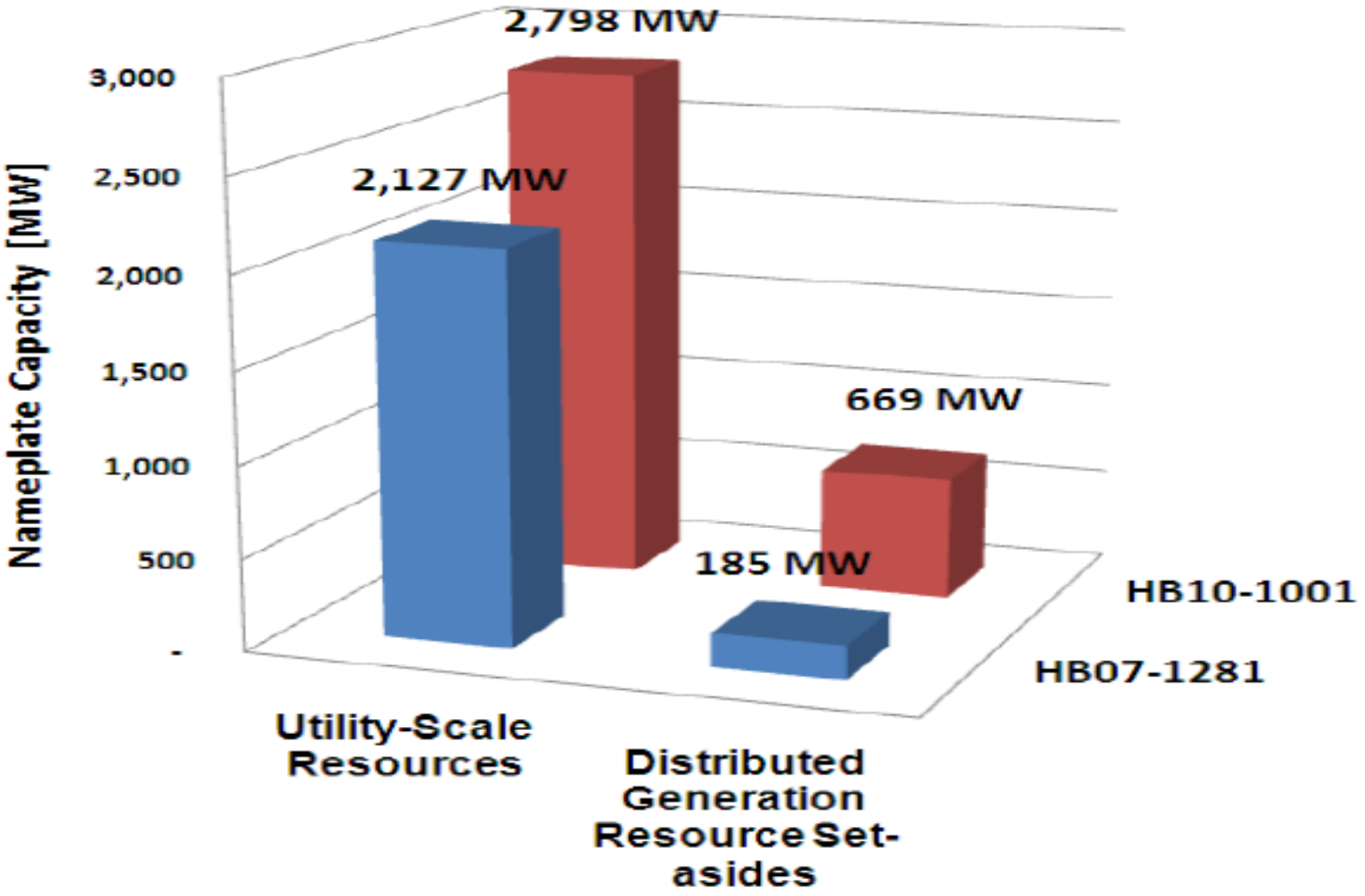


* Indicates Actual Routing Has Not Been Determined

** Currently Under Construction

For the retirement scenario, assumes that all of Colorado coal-fired generating stations will be retired during the end of the year when they reach the age of 45 or older, beginning in 2017.

Generation Comparison of 20% and 30% Renewable Energy Standards



Wind generation is constrained to 33 percent penetration through year 2035.

The model slowly begins increasing the penetration starting in 2036 until it reaches a maximum penetration of 45 percent in 2050.

The following topical areas encompass the primary results of the STAR project:

The extent of implementing demand side measures will have a material impact on the need for new generation.

Load growth assumptions play a critically important function in determining ultimate outcomes, driven in large part by the growth of Colorado's population and economy.

Depending on the generation mix selected to meet strategic goals, demand side measures will have an impact on the extent that new transmission is required to support the generation.

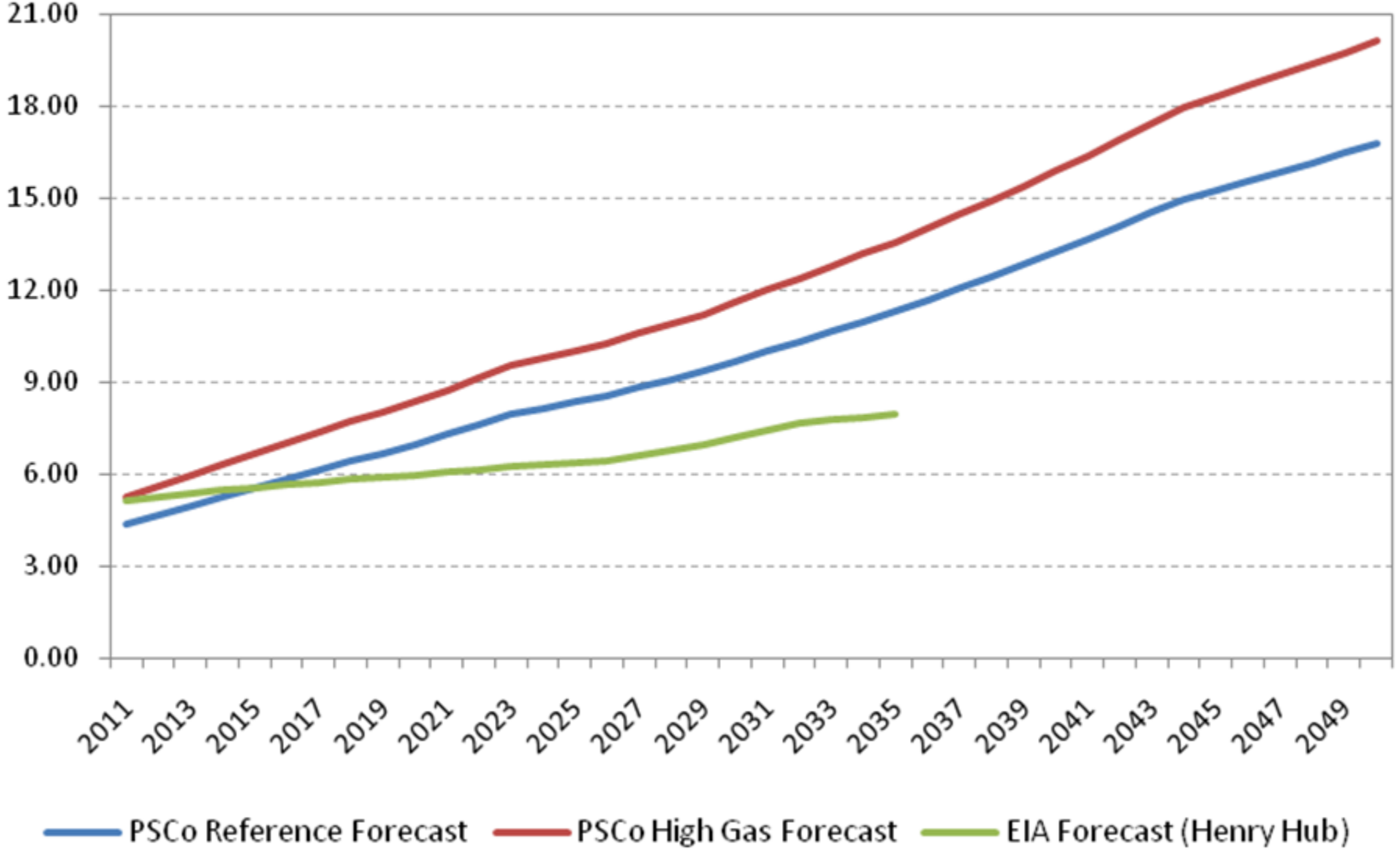
Strategic expansion of Colorado's high voltage backbone to Colorado's GDAs is needed to meet the needs of a reliable, responsible electricity sector into the foreseeable future.

Meeting the goal to strategically plan for Colorado's electricity sector in 2050 will require significant investments in natural gas generation and pipeline infrastructure.

The price of natural gas into the future will be a significant variable that may materially affect the economic competiveness of renewable energy.

Modeled Gas Price Forecast

(2005$/mmBTU)



In order to fully realize the state's strategic electricity sector and transmission objectives, Colorado would benefit by examining, and potentially reforming, its land use, siting, and permitting procedures.

Colorado should implement changes to its long range generation and transmission planning processes, featuring closer cooperation between utilities and citizens.

Utilities and policy decision-makers will benefit by focusing on strategic results that:

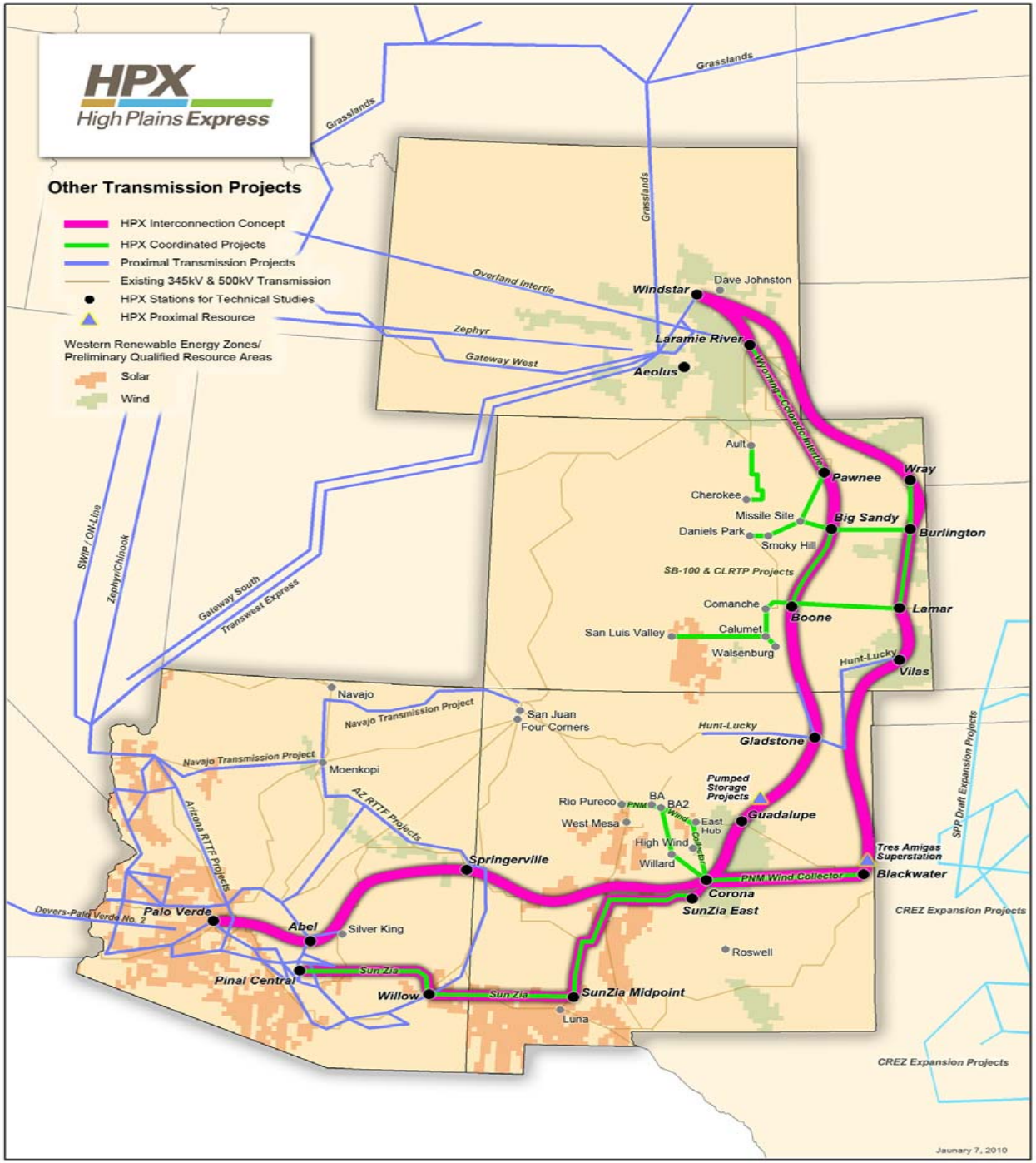
- minimize environmental impacts
- minimize water consumption
- stabilize long-term costs by foregoing avoidable fuel costs
- mitigate financial risks associated with potential new environmental regulations.

Cost recovery and cost allocation policies and procedures need to be revised and clarified to fully develop Colorado's RE potential and to stimulate more investment in high-voltage transmission.

Either a physically larger or a virtual larger balancing authority is needed to support increased development of RE and lower overall transmission costs (e.g. capacity charges, ancillary services, and rate pancaking).


Local Forecast
The Weather Network
PDC (A) Alarms
RTL (H) Alarms

Development of export oriented transmission projects should be part of a long term conceptual generation and transmission plan's vision.


HPX
High Plains Express
Other Transmission Projects
HPX Interconnection Concept
HPX Coordinated Projects
Proximal Transmission Projects
Existing 345kV & 500kV Transmission
HPX Stations for Technical Studies
HPX Proximal Resource
Western Renewable Energy Zones/
Preliminary Qualified Resource Areas
Solar
Wind
Grasslands
Overland Intertie
Zephyr
Gateway West
Windstar
Dave Johnston
Laramie River
Aeolus
Wyoming-Colorado Intertie
Ault
Pawnee
Wray
Cherokee
Missile Site
Big Sandy
Burlington
Daniels Park
Smoky Hill
SB-100 & CLRTP Projects
Comanche
Boone
Lamar
San Luis Valley
Calumet
Walsenburg
Hunt-Lucky
Vilas
SWIP / ON-Line
Zephyr/Chinook
Gateway South
Transwest Express
Navajo
Navajo Transmission Project
San Juan
Four Corners
Gladstone
Moenkopi
Pumped
Storage
Projects
Rio Pureco
PNM
BA
BA2
West Mesa
Wind Collector
East
Hub
Guadalupe
High Wind
Willard
Tres Amigas
Superstation
Springerville
Blackwater
PNM Wind Collector
Corona
SunZia East
Arizona RTTF Projects
AZ RTTF Projects
SPP Draft Expansion Projects
Devers-Palo Verde No. 2
Palo Verde
Abel
Silver King
CREZ Expansion Projects
Roswell
Sun Zia
Pinal Central
Willow
SunZia Midpoint
Luna
CREZ Expansion Projects
Jaunary 7, 2010

Greater adoption of new technologies and new approaches are needed to support Colorado's electricity sector, e.g.:

- new conductors
- synchrophasors
- storage
- smart grid

The STAR report goes into detail regarding recent energy policy developments in:

- Congress
- EPA
- WECC
- WGA
- WestConnect
- CCPG
- PUC
- FERC
- DOE
- etc.

Colorado utilities and others have considerable transmission planning and proposed implementation activities under way.

A stronger commitment is needed to speed strategic investments in more high-voltage transmission infrastructure.

STAR discusses recent Colorado General Assembly legislation, in particular:

HB10-1001 (Renewable Energy Standard)

HB10-1365 (Clean Air-Clean Jobs)

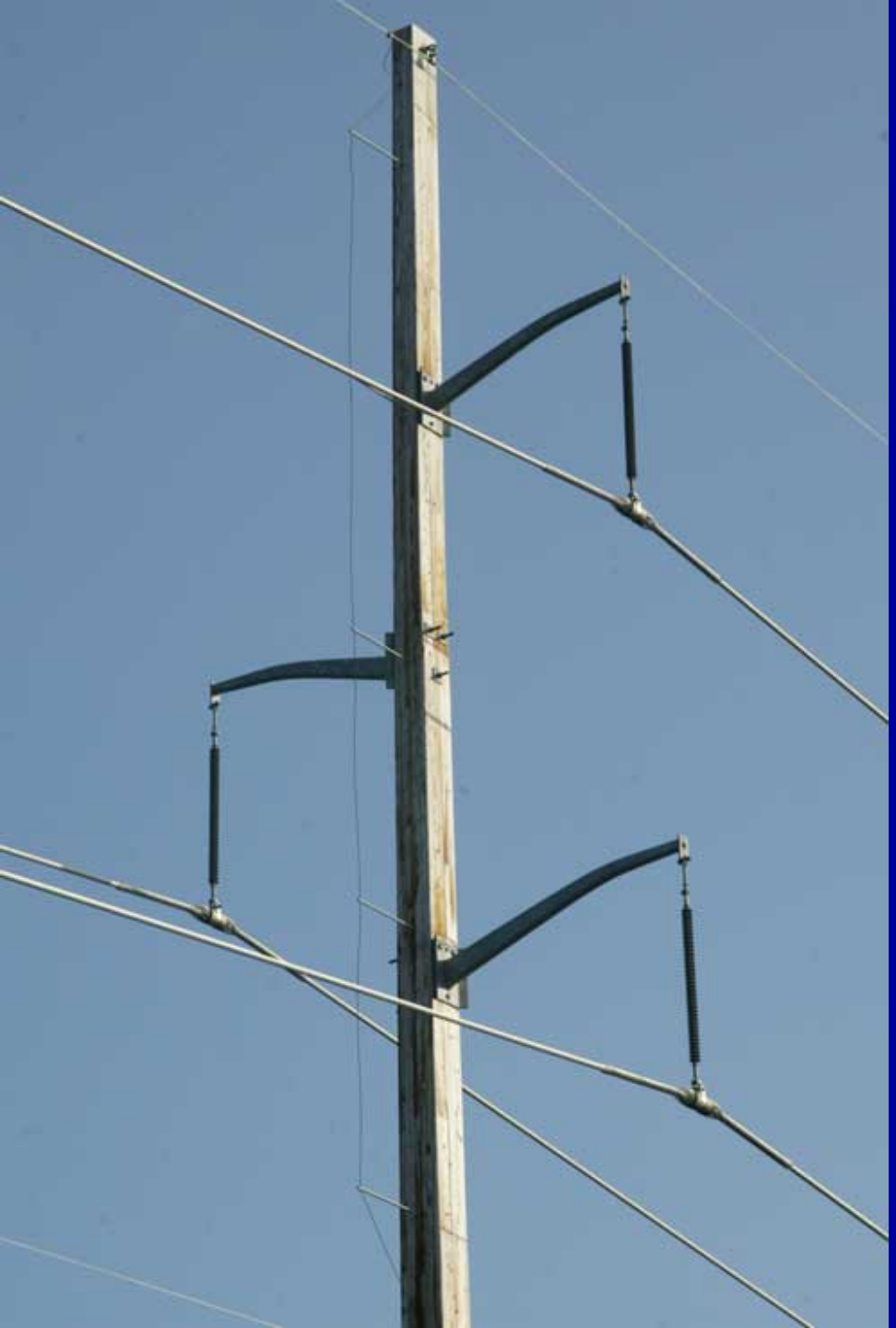
Promising techniques are being explored to help meet the challenge of wind integration.

Colorado should explore whether the state would benefit by widening entry into the transmission market by independent transmission companies.

- Pending breakthroughs in storage and substantial changes in electric system operations, RE penetration will be limited.

- RE variability, and the limits on RE penetration, point to the need for a major increase in gas-fired generation.

- Natural gas has its price and environmental risks. However, compared to other alternatives, NG generation represents a realistic and appropriate choice.



If society determines that we need RE development “at scale” to make a credible contribution to reduce CO_2 and meet other goals, we need to continuously improve planning, and the development of more high-voltage transmission infrastructure.

Colorado Clean Energy Development Authority

(CEDA)

CEDA

2007 –

CEDA was enacted into state law in May, 2007 pursuant to HB07-1150.

By statute, CEDA is “an independent public body and corporate.”

“The authority shall be a political subdivision of the State, shall not be an agency of State government, and shall not be subject to administrative direction by any department, commission, board, or agency of the State.”

CEDA

The 32-page statute established broad goals, including energy efficiency, storage, pipelines, transmission, solar, and studies.

No funding was provided for CEDA's operation.

CEDA

Of key significance - a defect existed in the statute, as it contained a clause that prohibits CEDA from making "a direct commercial loan to a user." Expert legal and business advice indicated that this clause was a show-stopper, nullifying CEDA's ability to help with project finance.

The CEDA Board determined that until the defect is remedied through legislation, the Board would convene meetings to discuss utility-scale renewable energy (RE) and transmission development in Colorado and the West.

2008 –

The Board offered legislation to remove the statutory defect.

However, that effort did not pass.

2009 –

The Board reached an agreement with representatives from the banking community that removed that community's opposition to a legislative remedy if the Board would limit its activity to financing transmission.

2009 –

This agreement caused Xcel Energy to oppose CEDA's ability to help finance "backbone" transmission.

Xcel proposed that if the Board agreed to submit the selected transmission projects to a utilities' right of first refusal (RFR), the company would not oppose the elimination of the prohibition on commercial lending.

2009 –

Despite the Board's unanimous vote of disapproval of the proposed RFR, Xcel pressed for a modification to CEDA's statute to include a RFR.

When it became apparent that Xcel had secured the votes in the legislative committee of reference, CEDA's legislative sponsor, who was seeking to remove the prohibition on commercial lending, had to pull the bill.

2010 –

The Board recognized that an agreement with Xcel was required to remedy the prohibition on commercial lending. An agreement was achieved when the Board approved legislative language that limits CEDA's scope to only providing financial assistance for interconnection facilities (primarily generation tie-lines).

2010 –

The agreement resulted in the passage of HB10-1182, in April 2010. The Act includes these amendments to the CEDA statute:

1) CEDA's scope is limited to financing electric power interconnection projects.

2) The prohibition on commercial lending is eliminated.

The Attorney General's Office issued a 15-page informal opinion on March 1, 2011, concluding:

1. Voter Approval - CEDA is not required to obtain advance voter approval if CEDA acts solely as a "conduit financier," as long as CEDA is not pledging its own revenues for future years (as opposed to the revenues being pledged from the third party) and is acting strictly as a conduit for the actual financing plan.

The Attorney General's Office issued a 15-page informal opinion on March 1, 2011, concluding:

2. General Assembly Pre-Approval - Even if CEDA acts solely as a "conduit financier" and issues bonds, General Assembly pre-approval is required. General Assembly approval will also be required if CEDA acts solely as a "conduit financier" and the plan of finance requires annual appropriation from the General Assembly.

3. Reserve Funds - Financial obligations issued by CEDA and secured by a reserve fund funded with bond proceeds are not considered a debt of the State.

Potential CEDA general direction going forward:

- Over the summer, the Board will draft legislation that would make CEDA viable and useful.
- Present a draft bill to legislative sponsors in the fall of 2011.
- Introduce the bill in 2012 asking for what may amount to an “up or down” vote.
- If the vote is down, then the legislature should sunset CEDA.
- If the vote is up, then CEDA will have the value-added to bring to the table regarding project finance.

Colorado Senate Bill 2011-045

Enacted on June 3, 2011 concerning a streamlined process for securing governmental approval for the siting of electric transmission facilities, and, in connection therewith, **creating a 16 member task force**.

The general assembly finds, determines, and declares that the development of new electric transmission facilities is necessary to promote the development of additional clean and renewable electric generation resources, Colorado's energy security, and the state's long-term economic growth.

The siting and permitting of electric transmission facilities is currently subject to various state and local government requirements.

Because electric transmission facilities often traverse multiple jurisdictions, compliance with multiple requirements creates the potential for permitting delays or inconsistent decisions.

It is, therefore, in the state's interest to consider opportunities to improve existing siting and permitting processes applicable to electric transmission facilities, including the possible establishment of a single, statewide siting and permitting process for such facilities.

The task force shall make recommendations to the governor and the General Assembly regarding Colorado's existing statutory and regulatory framework applicable to the siting and permitting of electric transmission facilities as well as opportunities to improve that framework.

Shall report to the governor and the general assembly on such testimony and **recommendations no later than December 1, 2011**.

The task force shall hold at least four meetings, which shall be open to the public.

The task force consists of sixteen members:

the Director of the Colorado Public Utilities Commission

(Ii) eight members appointed by the Governor as follows:

(A) one member representing cooperative electric associations that distribute electricity;

(B) one member representing cooperative electric associations that generate and transmit electricity;

(C) two members representing investor-owned electric utilities;

(D) two members representing municipally owned electric utilities;

(E) one member representing renewable energy electric generation interests; and

(F) one member rep resenting large commercial consumers of electricity;

(Iii) one member appointed by the Speaker of the House of Representatives, who must not be affiliated with any of the groups represented by other members of the task force;

(Iv) one member appointed by the president of the Senate, who must not be affiliated with any of the groups represented by other members of the task force;

(V) two members representing the interests of Colorado municipalities, appointed 1 by the executive director of the Colorado Municipal League or its successor organization;

(Vi) two members representing the interests of Colorado counties, appointed by the executive director of Colorado Counties, incorporated, or its successor organization;

The appointing authorities shall make their appointments within thirty days after the effective date of this section. The official who appointed a member whose absence results in a vacancy shall fill the vacancy by appointment.

Scope of inquiry. At a minimum, the task force shall take comments on the following topics:

(A) an inventory and evaluation of Colorado's current siting and permitting framework for electric transmission facilities, including its benefits and shortcomings;

(B) research into examples of how other states approach siting and permitting of electric transmission facilities;

(C) identification of possible models for improving Colorado's existing siting and permitting processes applicable to electric transmission facilities;

Recommended actions to streamline siting and permitting processes applicable to electric transmission facilities, including a balancing of environmental, land use, and community effects with transmission project costs and schedule risks;

An examination of the advantages and disadvantages of a statewide transmission siting and permitting framework for electric transmission facilities; and

An examination of the political acceptability of, and potential strategies for, creating a state-level siting entity.

Recommendations for consideration

Conclusions from Chapter 9 of the STAR Report - Federal Action and Inaction

The federal government is a critically important partner, setting rules and regulations that determine the economic and environmental performance of the electricity sector. Recent congressional efforts to address the need for a comprehensive approach to climate protection, energy independence, clean energy, and transmission development, have been either stopped or seriously compromised.

GEO recommendations for consideration

While congressional progress has stalled, positive signals and developments have come from the Administration and the Federal Energy Regulatory Commission.

Many states, including Colorado, have stepped in to fill federal policy gaps by implementing their own environmental and energy policies. Although this provides greater clarity in a particular state, the interdependency of the electric markets among neighboring states means regional solutions cannot be predicated on assessing the aggregate collection of individual state actions.

Recommendations for consideration

If, and when it comes, coordinated federal action could address the fragmentation and uncertainty that characterizes the nation's electricity sector.

Recommendations:

Colorado executive and regulatory leadership should expand its existing interaction with the Western Governors' Association's (WGA) initiatives and other entities to ensure that federal executive, congressional, and agency leaders develop timely and effective state-federal policy frameworks to create a dynamic, clean, efficient, and renewable 21st century electricity sector.

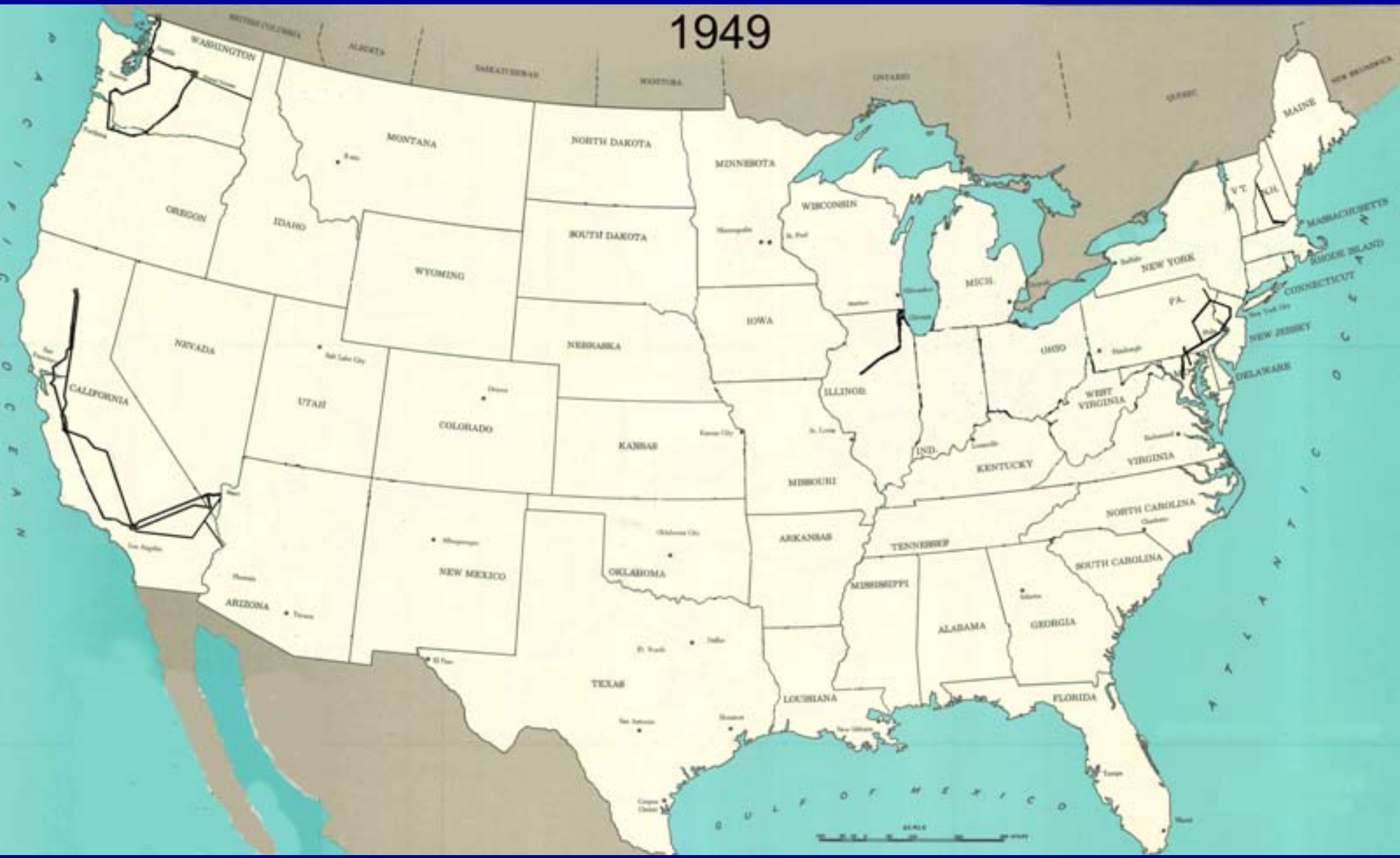
Recommendations:

The return of a strong federal role in national transmission infrastructure development should be actively pursued by Colorado policy-makers. Transmission infrastructure investments have the opportunity to be substantially expanded if the FERC pursues the cost allocation and renewable integration frameworks as articulated in their proposed rulemakings.

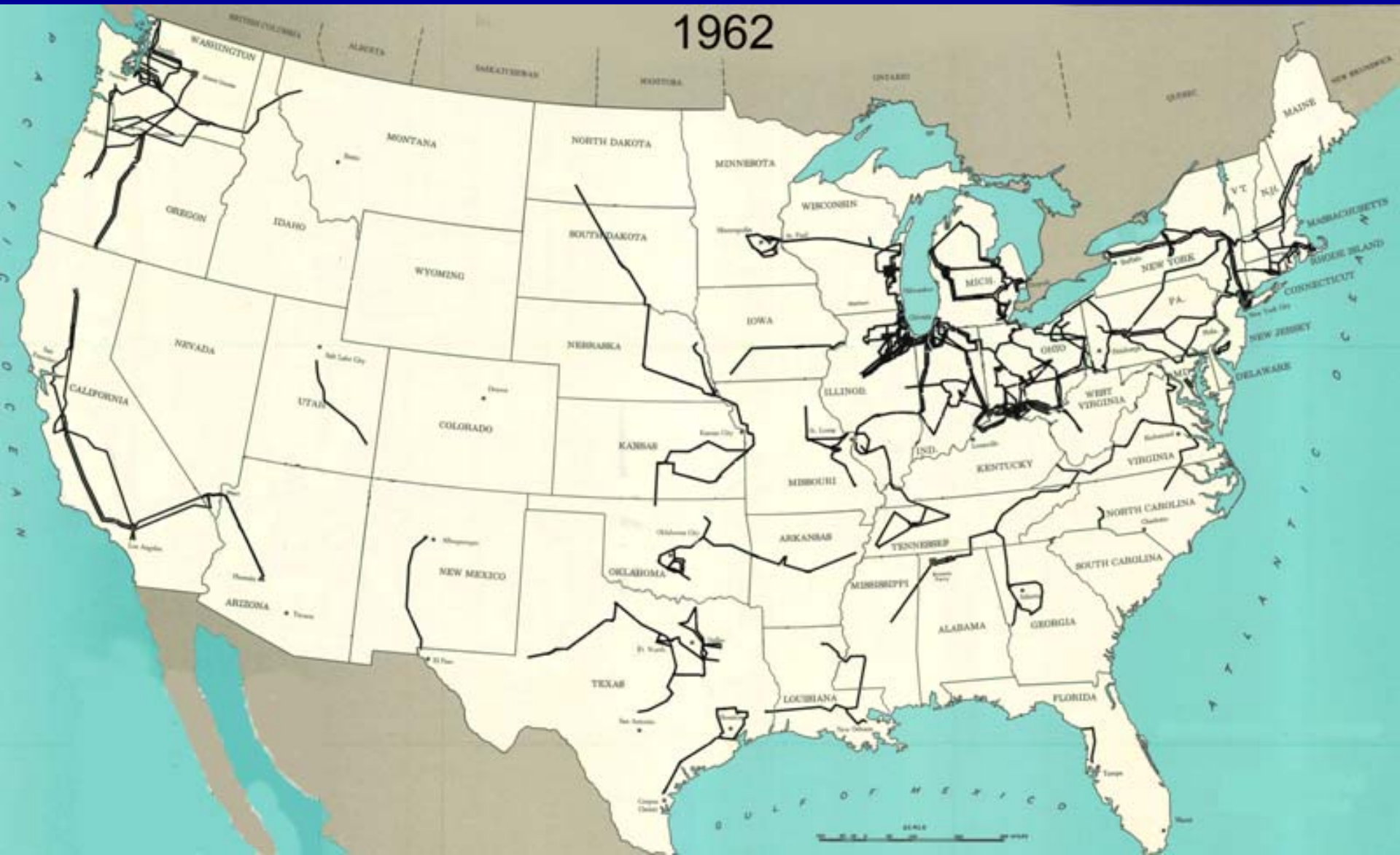
Recommendations:

State policy-makers are also encouraged to see what changes are required to ensure that WAPA expands strategic backbone transmission, or help other utilities expand that backbone transmission.

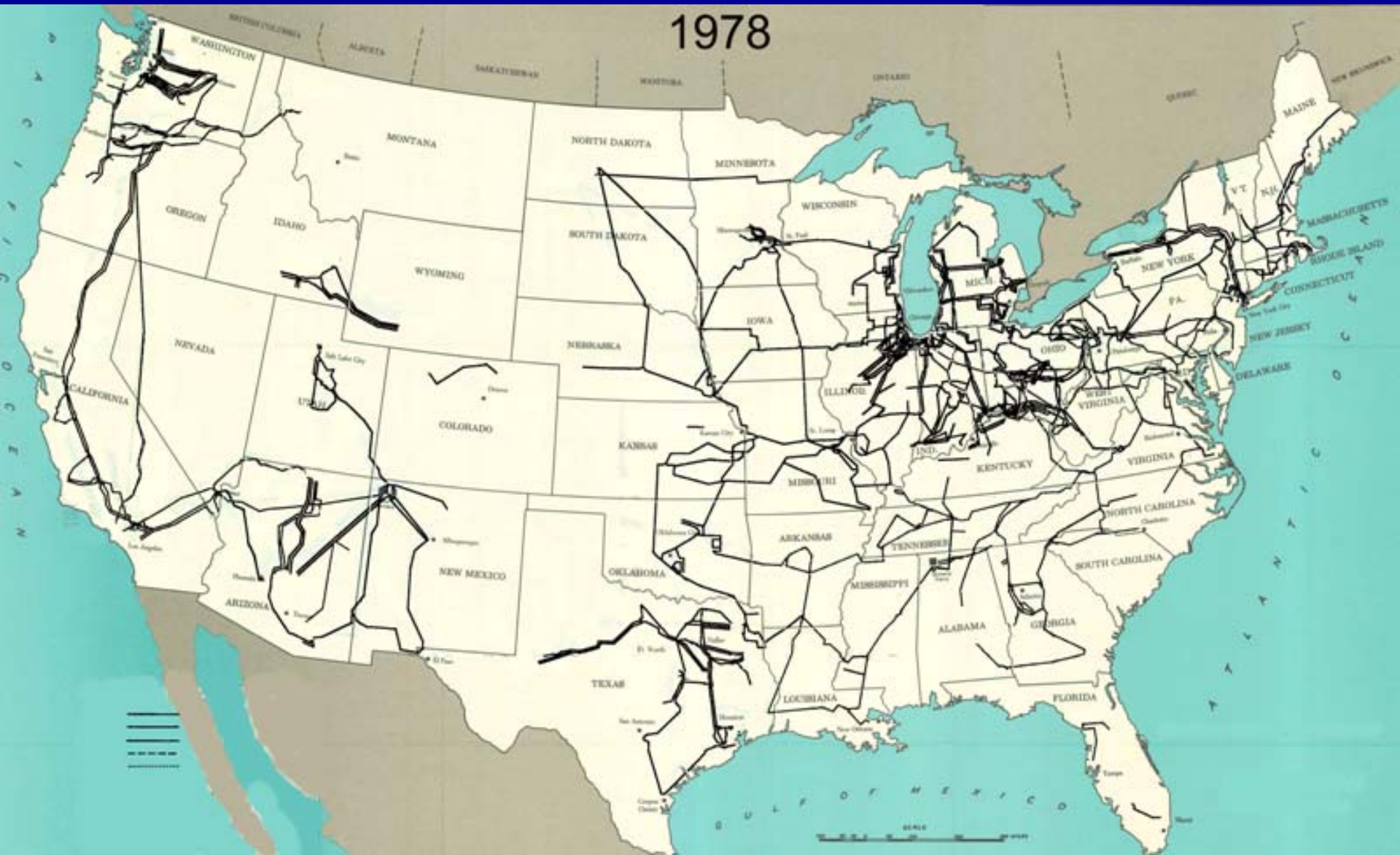
345 kV+ Transmission Growth at a Glance



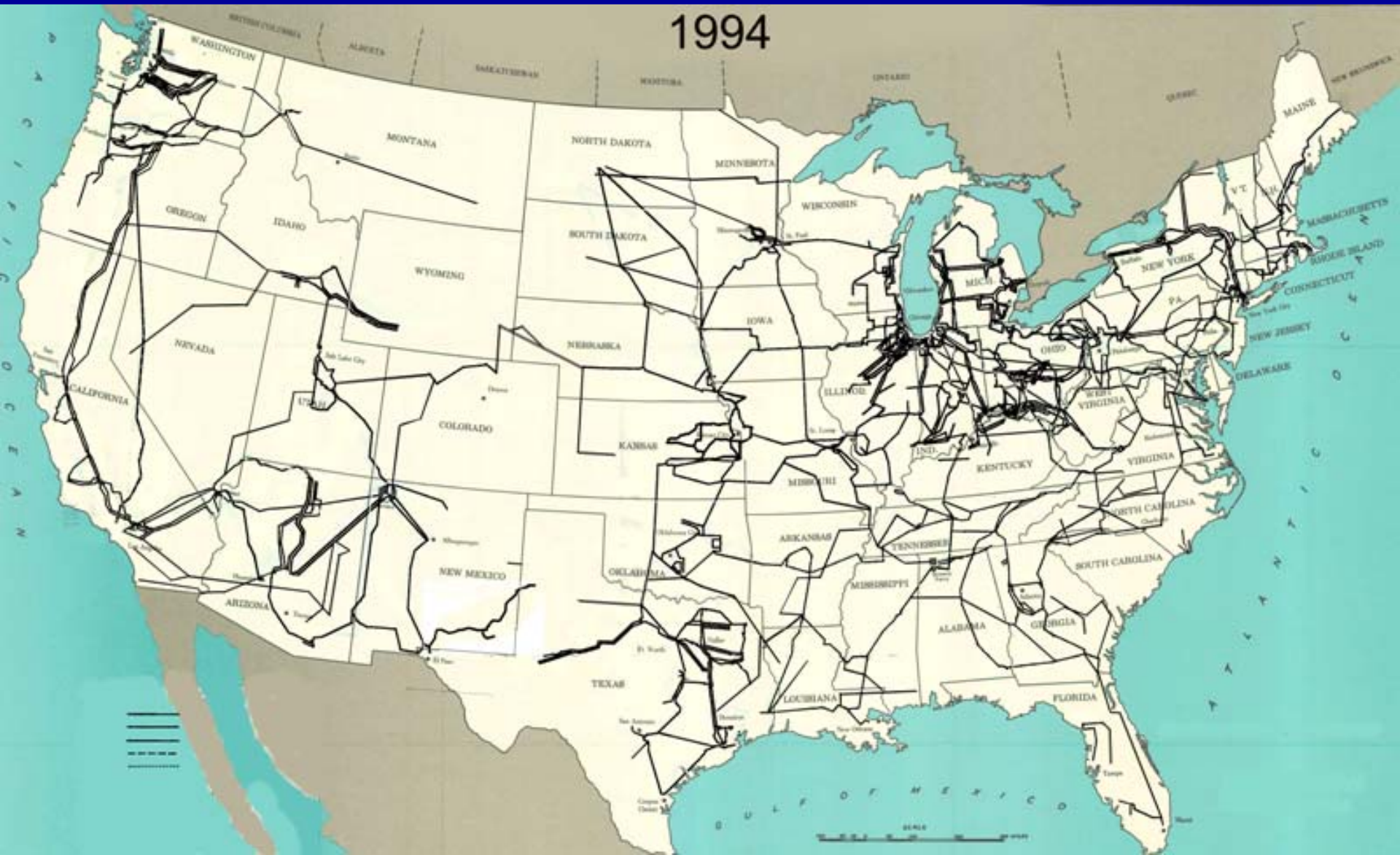
345 kV+ Transmission Growth at a Glance



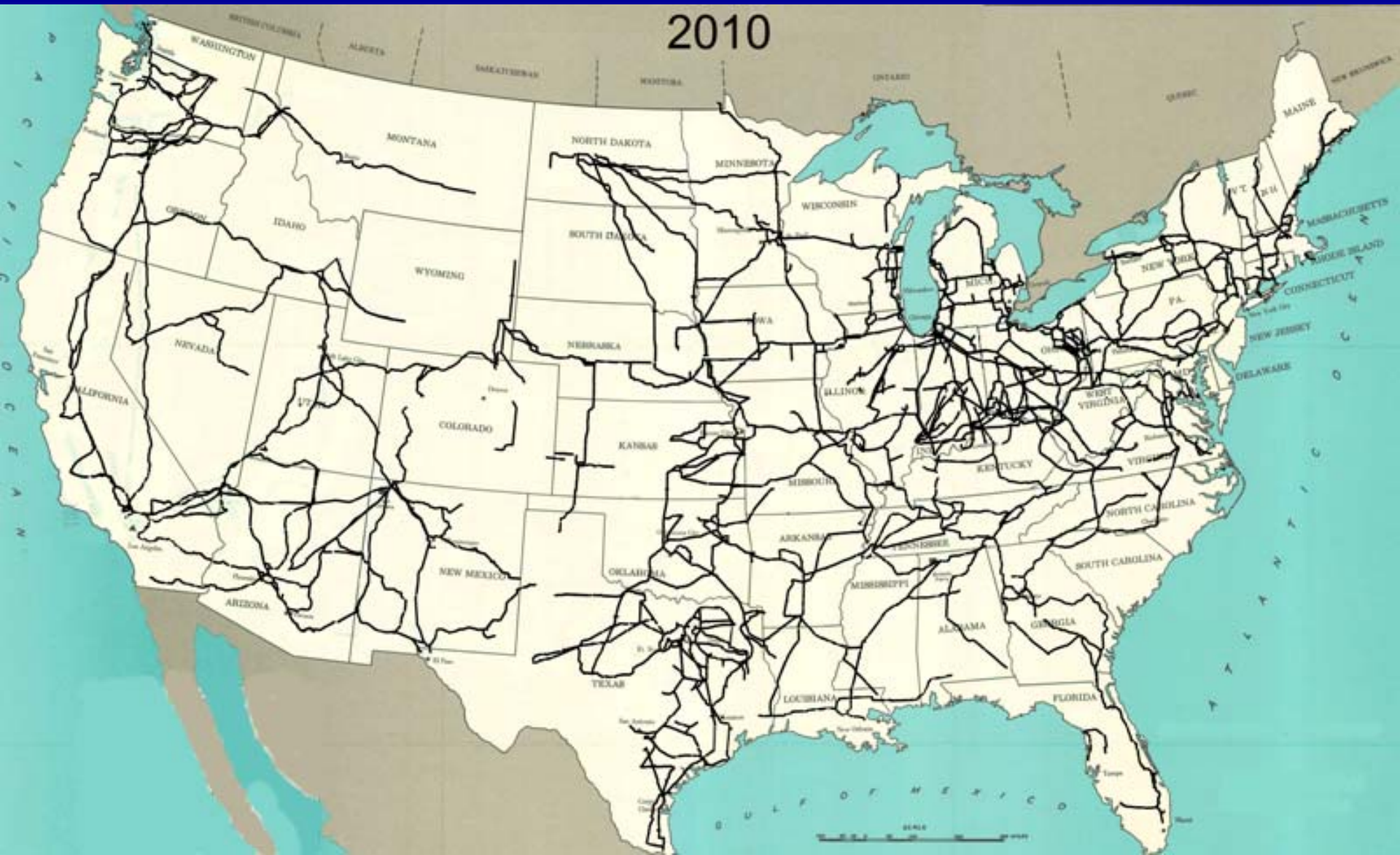
345 kV+ Transmission Growth at a Glance



345 kV+ Transmission Growth at a Glance



345 kV+ Transmission Growth at a Glance



GEO Renewable Energy Subject Matter Experts

Morey Wolfson
Senior Transmission
Policy Advisor

morey.wolfson@state.co.us

303-866-2163

TJ Deora
Director

Matt Futch
Utilities Program Manager

Stacey Simms
Associate Director, Programs

Governor's Energy Office
State of Colorado
1580 Logan Street, Suite 100
Denver, Colorado 80203
(303) 866-2202