1.800.462.0184
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Colorado's Experience in Facilitating Renewable Energy Development

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13 September 2011

NASEO Annual Meeting

Governor's Energy Office | RECHARGE COLORADO

Overview: Colorado's Experience in Facilitating Renewable Energy Development

- Colorado's Governor's Energy Office (GEO)
- The Colorado Success Story
- How Did We Do It?
- Challenges to Further Development
- Next Steps

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The Governor's Energy Office (GEO) Mission

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

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Energy Markets Represent a Significant Opportunity for Colorado

Jobs — Tens of thousands of new jobs in the industry across fuel types (emerging & legacy) & supply chain (R&D, manufacturing, O&M)

Security — Diversifying fuel types & geographic location & reducing demand through resource efficiency reduces volatility & increases reliability

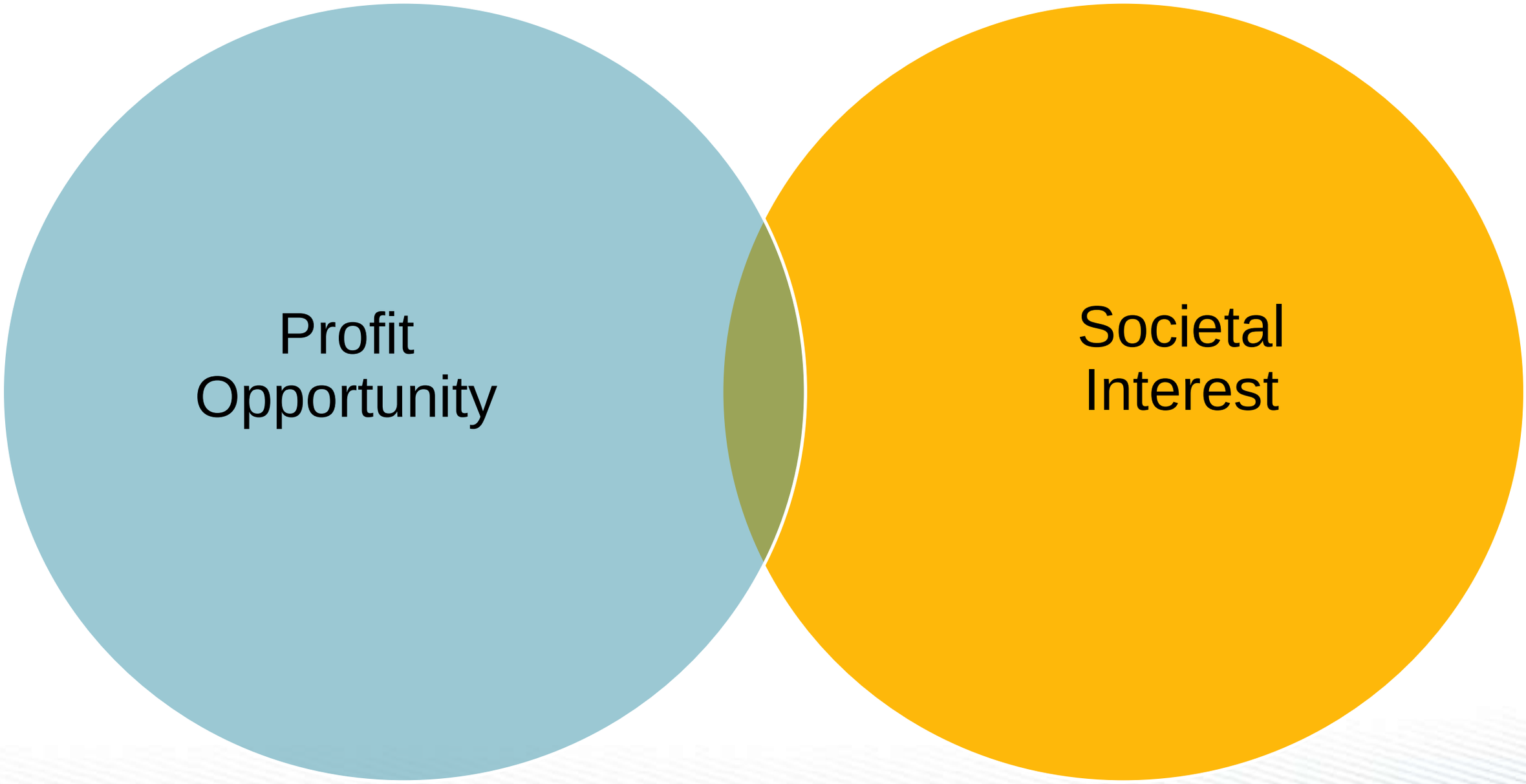
Cost — Increased efficiency and maturation of renewable energy and alternative fuels have resulted in new low cost sources of energy

Environment — Fuel consumption represents a major source of emissions of local pollutants and greenhouse gases

Market Opportunities and Barriers in the Colorado Energy Sector

	Est. Colorado Market Size ($ MM/yr)	Market Opportunities	Market Barriers
Power Generation (In State)	$17,000	• Accelerate investment in new technologies (driven by environmental and security factors)	• Full accounting of externalities • Transmission infrastructure • Technology maturity (eg clean coal, solar)
Power Generation (Export)	-$1,700 (CO is a net importer)	• Displace imports (~10% of consumption • Export $1,000s CA, AZ, NV energy markets)	• Transmission infrastructure • Protectionist policies (CA)
Consumer Efficiency	TBD*	• Additional annual economic consumer savings TBD FY12*	• Valuation by market makers / regulators • Consumer information • Access to financing
Transportation Fuels	$8,000	• 10% displacement of oil with alternative fuels will keep $8,077 mm / yr in Colorado	• Fueling infrastructure • Economies of scale • Price volatility concerns • Accounting for externalities
Natural Gas Production	$11,000	• Increased investment potential in CO (amount TBD)	• Limited market demand and export capacity • Public perception driving regulatory uncertainty

GEO Promotes Policies that Support Private Sector Solutions



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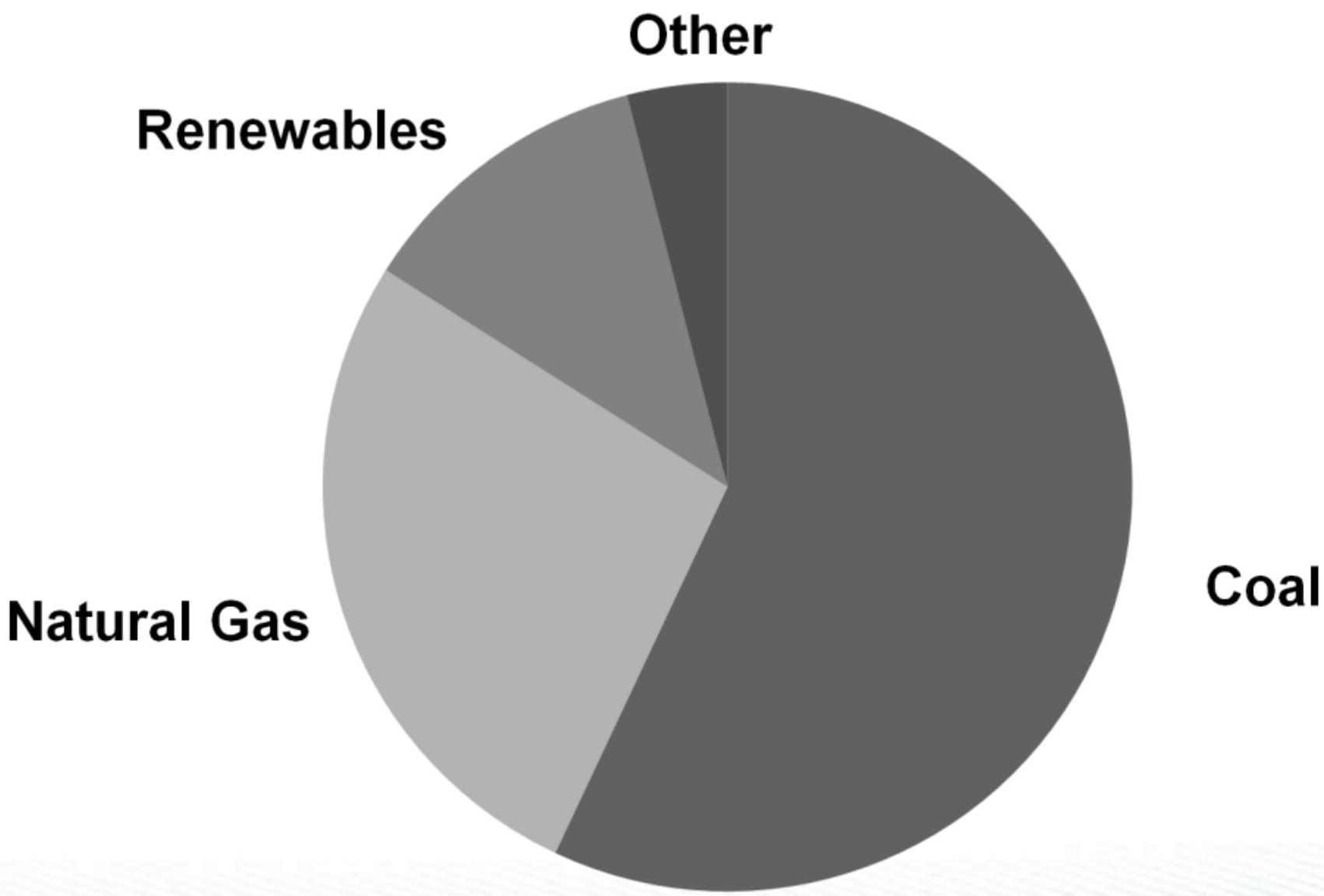
Colorado has a Typical Electric Power Mix

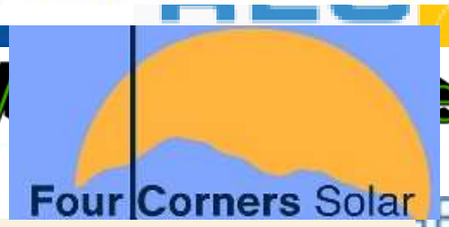


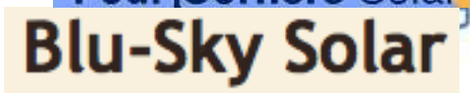
Public Service Company of Colorado (Xcel) 2010 fuel source for electric power

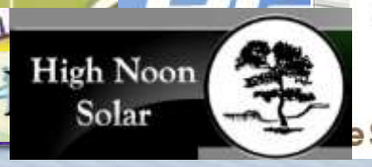
Utilities have Demonstrated RES Targets are Achievable in Colorado

Xcel Energy announced it would meet their 30% RES compliance commitment 8 years ahead of schedule.

ess: Renewable Energy Ja

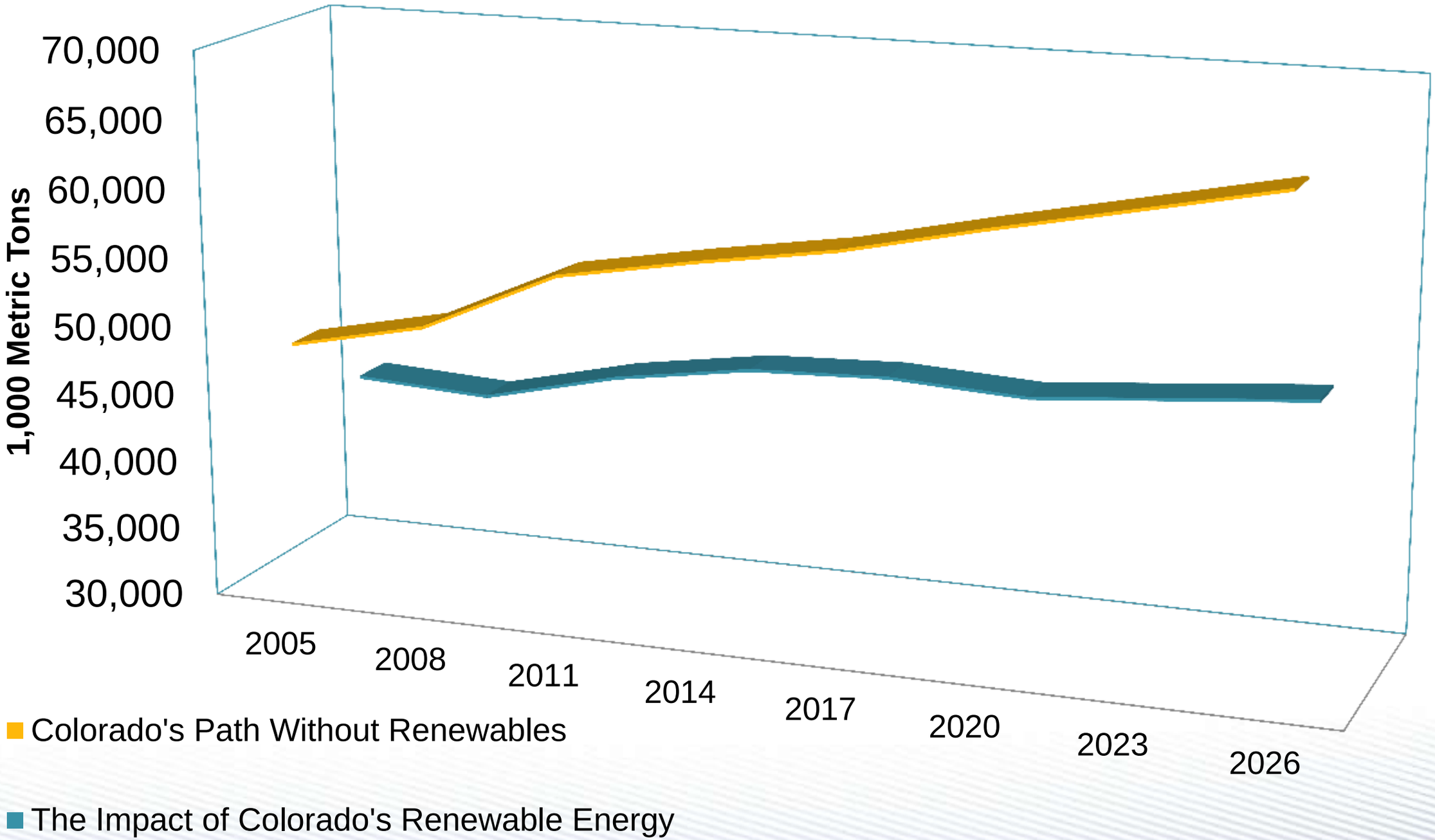






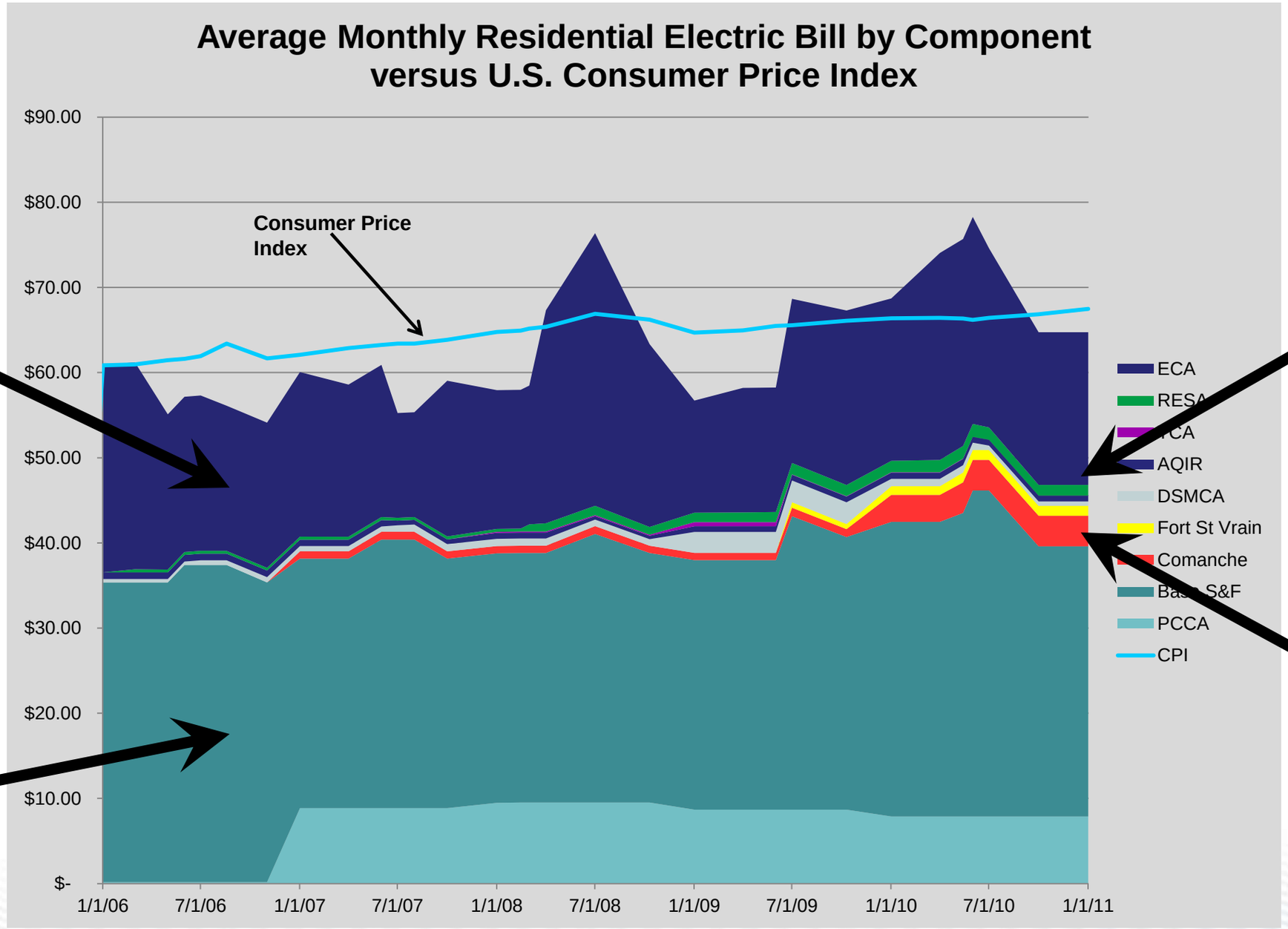
simplifying solar

Success: Colorado's CO2 Reductions



The RES has a low impact on retail rates

FUEL
(Gas, Oil, and Coal)



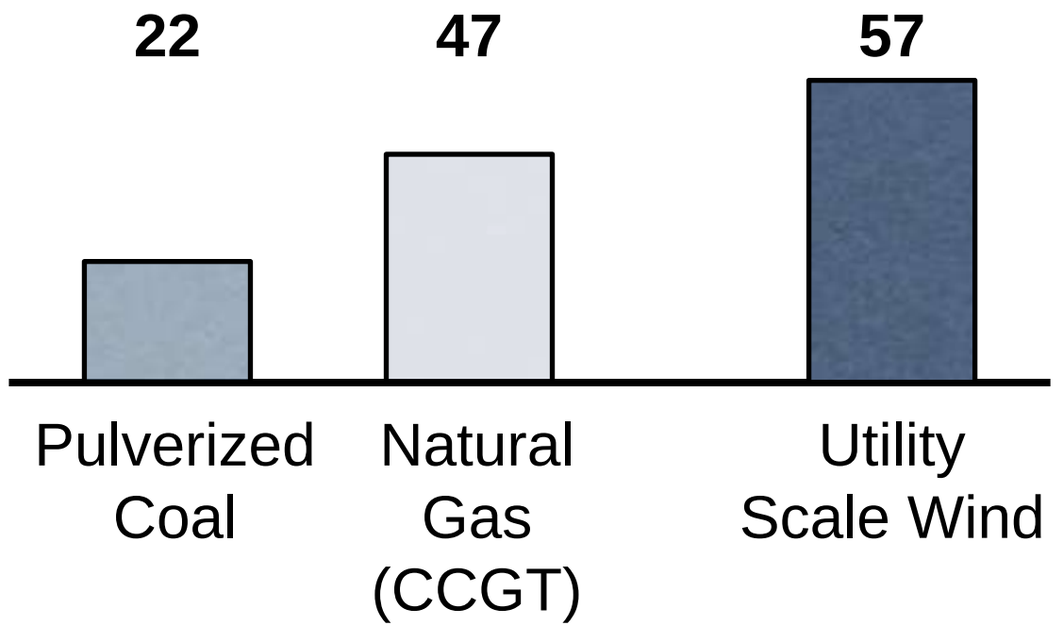
RES
(~1.3 GW, 2% rate impact)

BASE
(Utility Asset Recovery)

NEW COAL
(~0.9 GW, 6% rate impact)

The Cost of Energy is Not Obvious to the Public

Levelized Cost of Energy
$/MWh – No PTC



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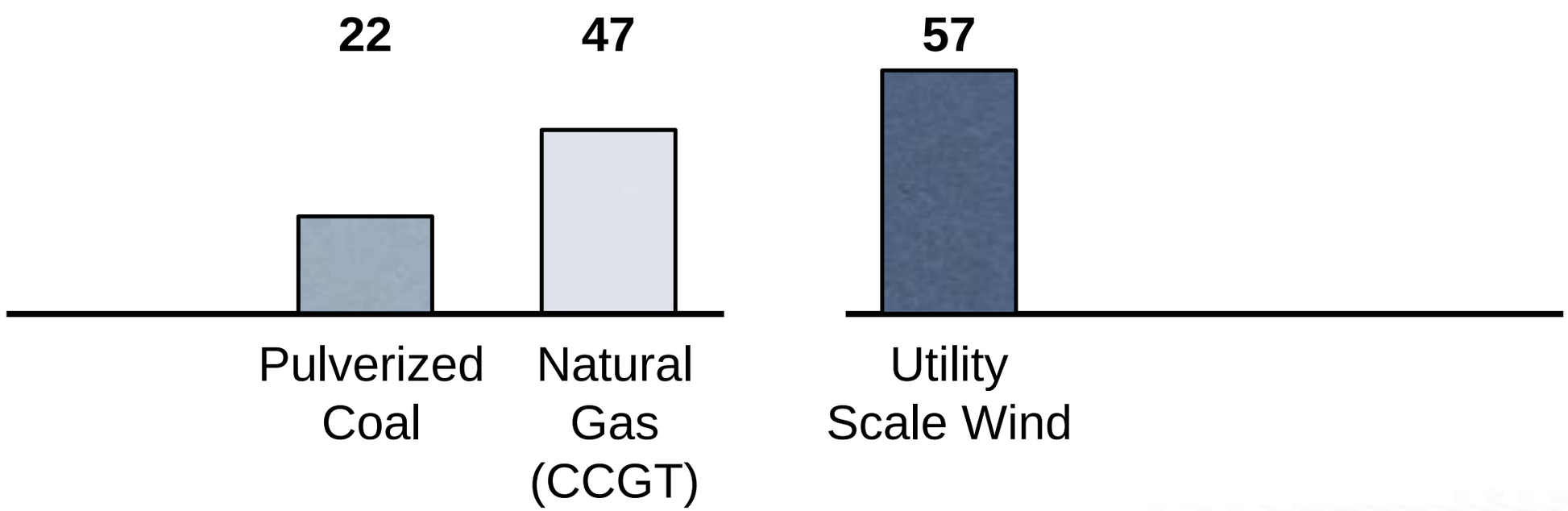
Existing Resources
(Marginal Cost)

New Resources
(Total Cost)



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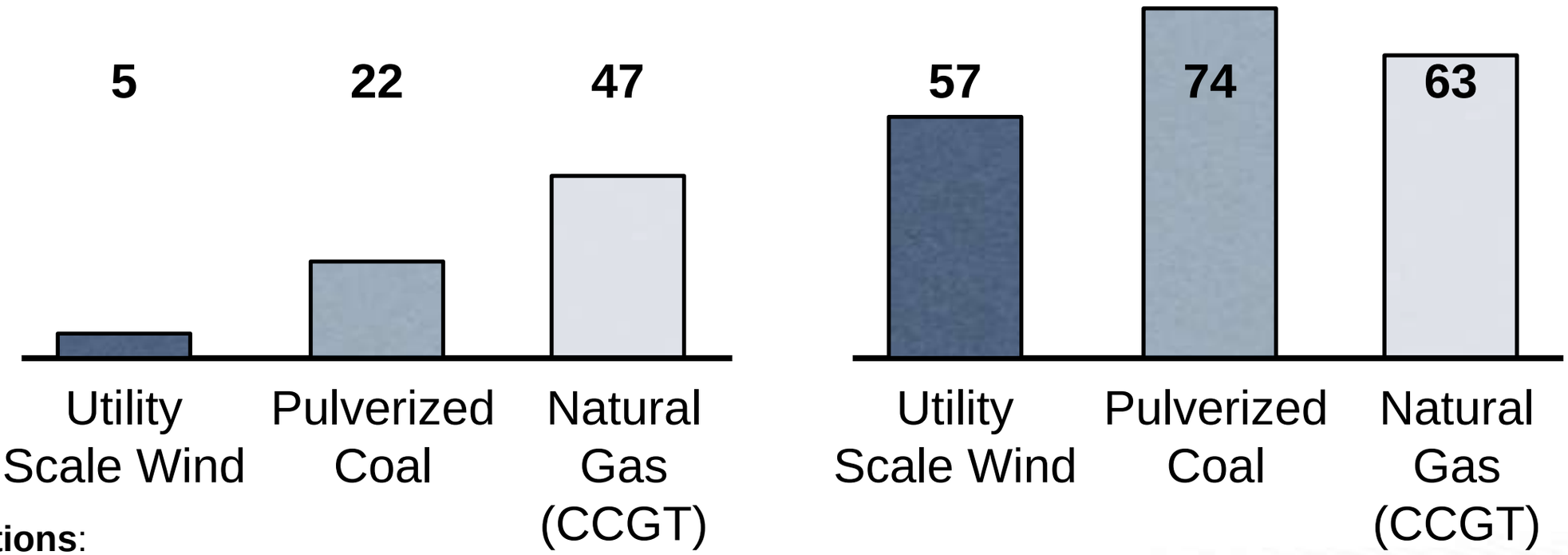

Assumptions:
Wind: 45% capacity factor, $1700 / kW
Coal: $2.00 / mmBTU; 9 mmBTU/MWh; $3000 / kW; 90% utilization
Gas: $5.50 / mmBTU; 7 mmBTU/MWh; $800 / kW; 50% utilization

What Has $4 Billion of Investment Meant for Colorado's Prosperity?

Jobs

10,000+ new jobs in the industry across fuel types (emerging & legacy) & supply chain (R&D, manufacturing, O&M)

Security

Over 2000 MW of new distributed and central station generation of diversified fuel types on the system located in locations across the state

Cost

Utility bills for our largest utility's customers increasing at less than CPI while sparking a market that drove down costs of wind and solar by about 50%

Environment

Reductions of electric power sector emissions of SO2 and NOx around ~10% to date; on the path for 15%+ CO2 reductions by 2017

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Elements to Developing a Successful Wind Energy Project in the US

Overall Market

REC Sales

Financing

Turbine Supply

Power Sales

EPC/BOP

Transmission

Grid Connection

Project Specific

Wind Resource

Permits and Siting

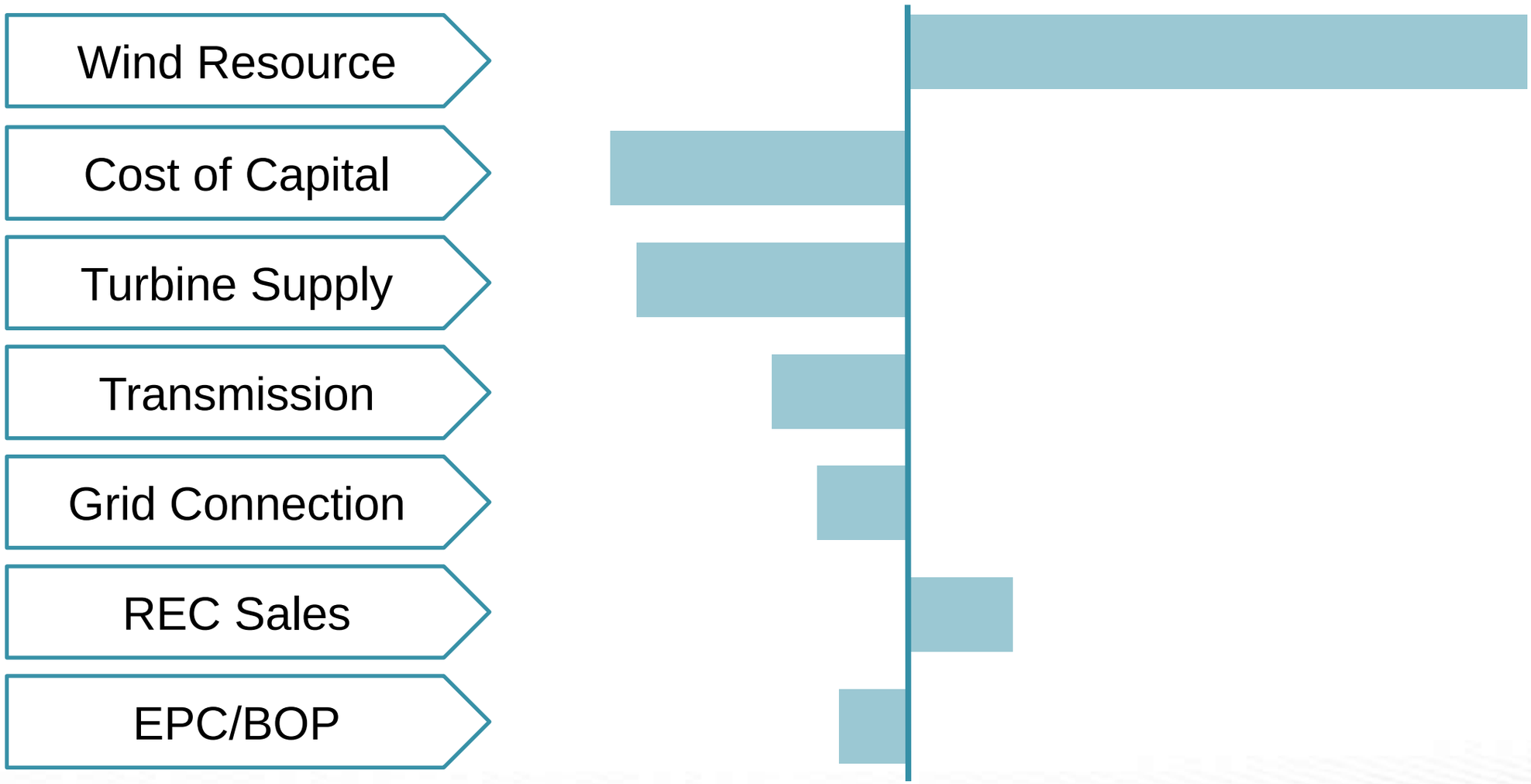
Site Control

Revenue Drivers

Cost Drivers

Wind Energy Economics are Sensitive to a Number of Key Drivers

Impact on Levelized Cost of Energy
($/MWh)



Unfavorable ⟷ Favorable

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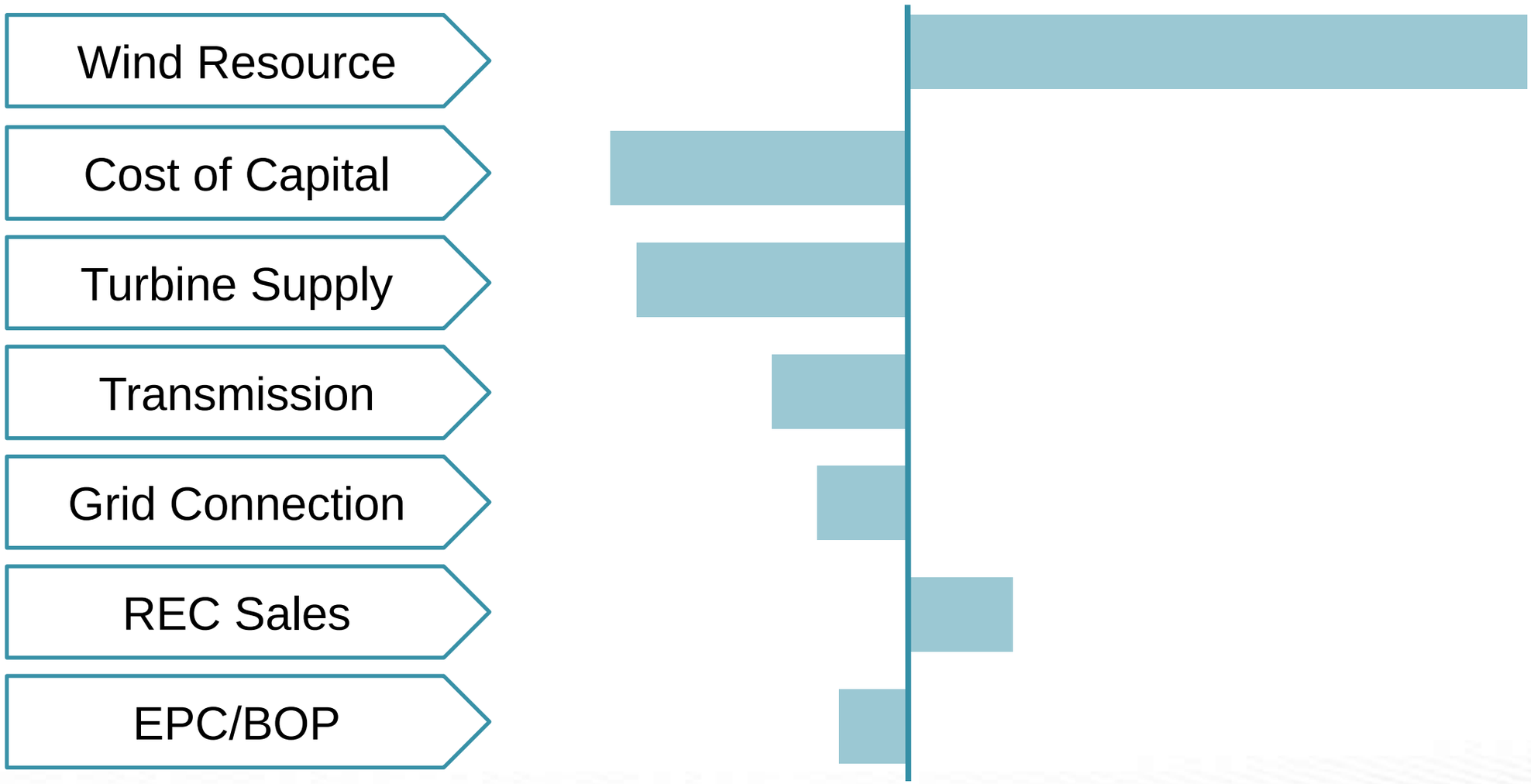


Unfavorable ⟷ Favorable

Colorado Offers a Number of Incentives for Renewable Energy Investment

Financial Incentives

Property Tax Incentive
- Local Option - Property Tax Exemption for Renewable Energy Systems
- Property Tax Exemption for Residential Renewable Energy Equipment
- Renewable Energy Property Tax Assessment

Sales Tax Incentive
- City and County of Boulder - Solar Sales and Use Tax Rebate
- Local Option - Sales and Use Tax Exemption for Renewable Energy Systems
- Sales and Use Tax Exemption for Renewable Energy Equipment

State Loan Program
- Direct Lending Revolving Loan Program

Rules, Regulations, & Policies

Generation Disclosure
- Fuel Mix Disclosure

Interconnection
- Interconnection Standards

Line Extension Analysis
- Mandatory Photovoltaic System Cost Estimate

Mandatory Utility Green Power Option
- Mandatory Green Power Option for Large Municipal Utilities

Net Metering
- Colorado - Net Metering

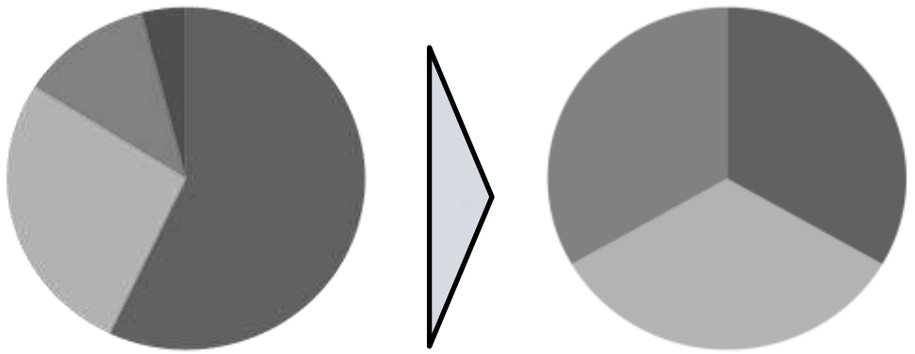
Renewables Portfolio Standard
- Renewable Energy Standard

Solar/Wind Access Policy
- Solar, Wind and Energy-Efficiency Easements & Rights Laws

Solar/Wind Permitting Standards
- Solar Construction Permitting Standards

57 Separate Clean Energy Bills Signed into Law During the Ritter Administration

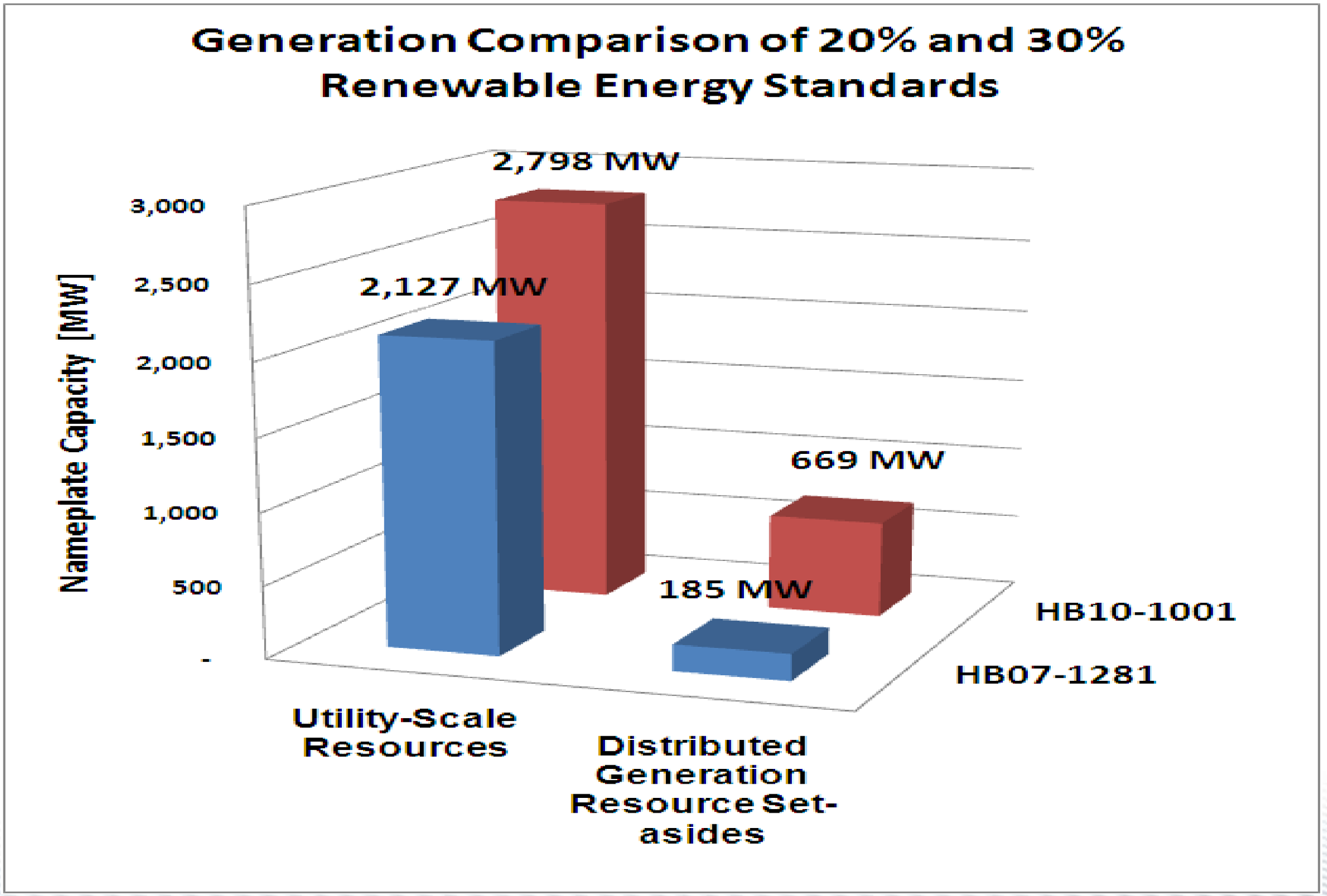
Colorado Renewable Energy Market Development Legislation



Colorado State Market Drivers

2004	A 37	10% RES
2007	HB-1281	20% RES
2010	HB-1001	30% RES
	HB-1281	900 MW Coal to Gas

3% of IOU revenue will go to distributed generation



Why could we do it?

Colorado is well positioned to demonstrate energy policy leadership:

1. High awareness of and concern about health & environment
2. Abundant traditional & renewable energy resources
3. Straightforward (relatively) energy markets
4. Willing host communities
5. Bold leadership

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State Level Market Challenges

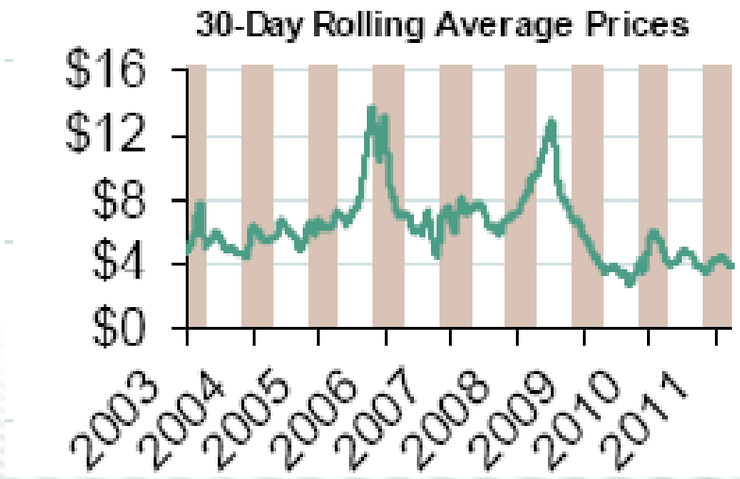
- **Load growth**
- RES compliance
- **Transmission Infrastructure**
- Integration Costs

Policy (or lack thereof) reinforces broader market trends

Regulatory Uncertainty

Reduced Investment Levels

Low Energy Prices



Xcel Energy
PUBLIC SERVICE COMPANY

TRANSMISSION OWNERSHIP OF COLORADO
2011

LEGEND

- PSCO 345KV TRANSMISSION LINES
- PSCO 230KV TRANSMISSION LINES
- PSCO 138KV TRANSMISSION LINES
- PSCO 115KV TRANSMISSION LINES
- PSCO 69KV TRANSMISSION LINES
- TRI-STATE TRANSMISSION LINES
- WAPA TRANSMISSION LINES
- JOINT TRANSMISSION LINES
- OTHER TRANSMISSION LINES
- SUBSTATION or SWITCHING STATION
- POWER PLANT
- SEE DENVER AREA TRANSMISSION & SUBSTATIONS MAP FOR FURTHER DETAIL

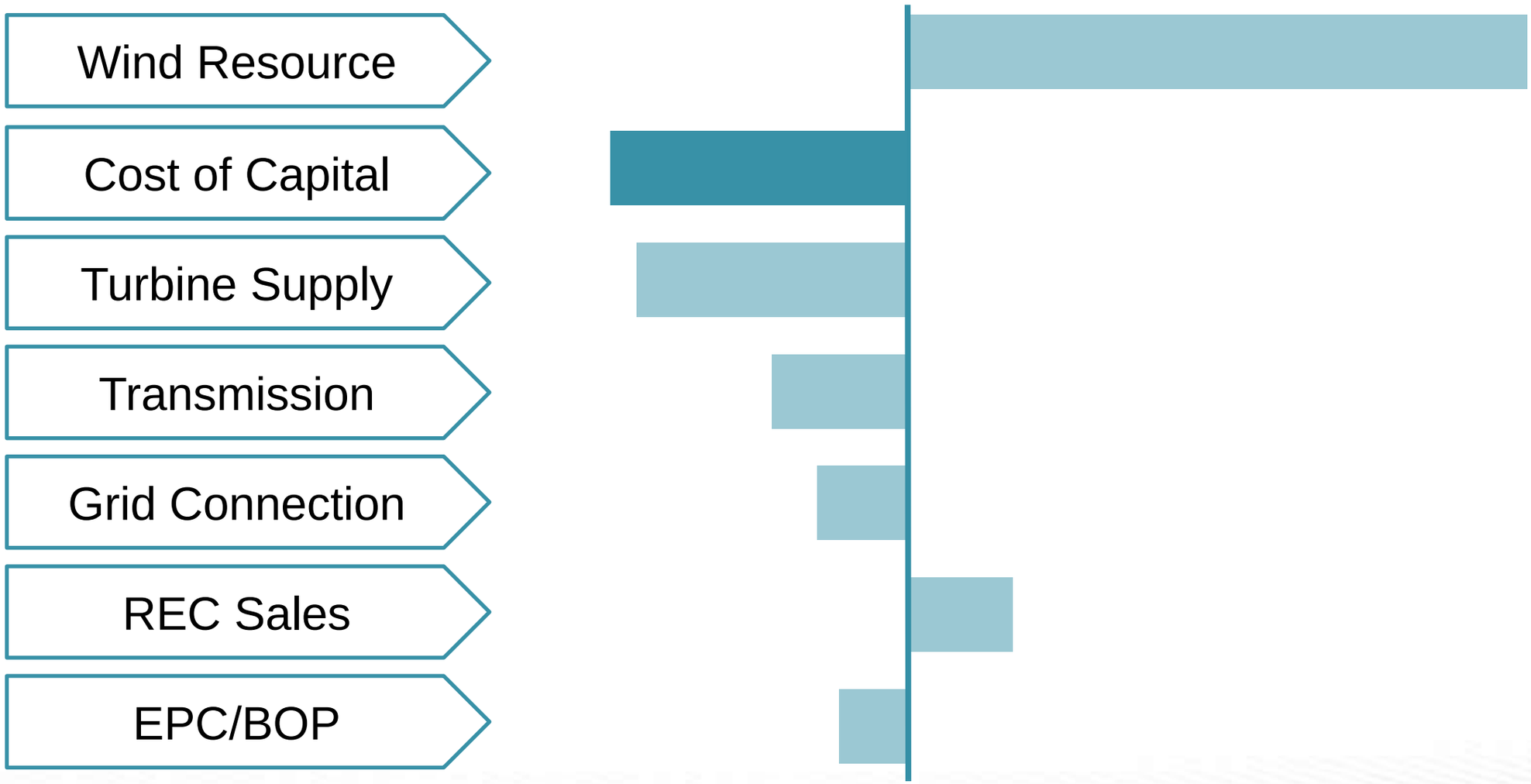
REVISION DATE: 06/24/2010 REVISED BY: KIM HOUSTON
SOURCE: PUBLIC SERVICE DRAWING NAME: TRANSOWN-SERV2010.DWG

National Market Challenges

- Policy Support (PTC/ITC)
- **Interest Rates**
- Transmission Infrastructure
- Protectionism

Wind Energy Economics are Sensitive to a Number of Key Drivers

Impact on Levelized Cost of Energy
($/MWh)



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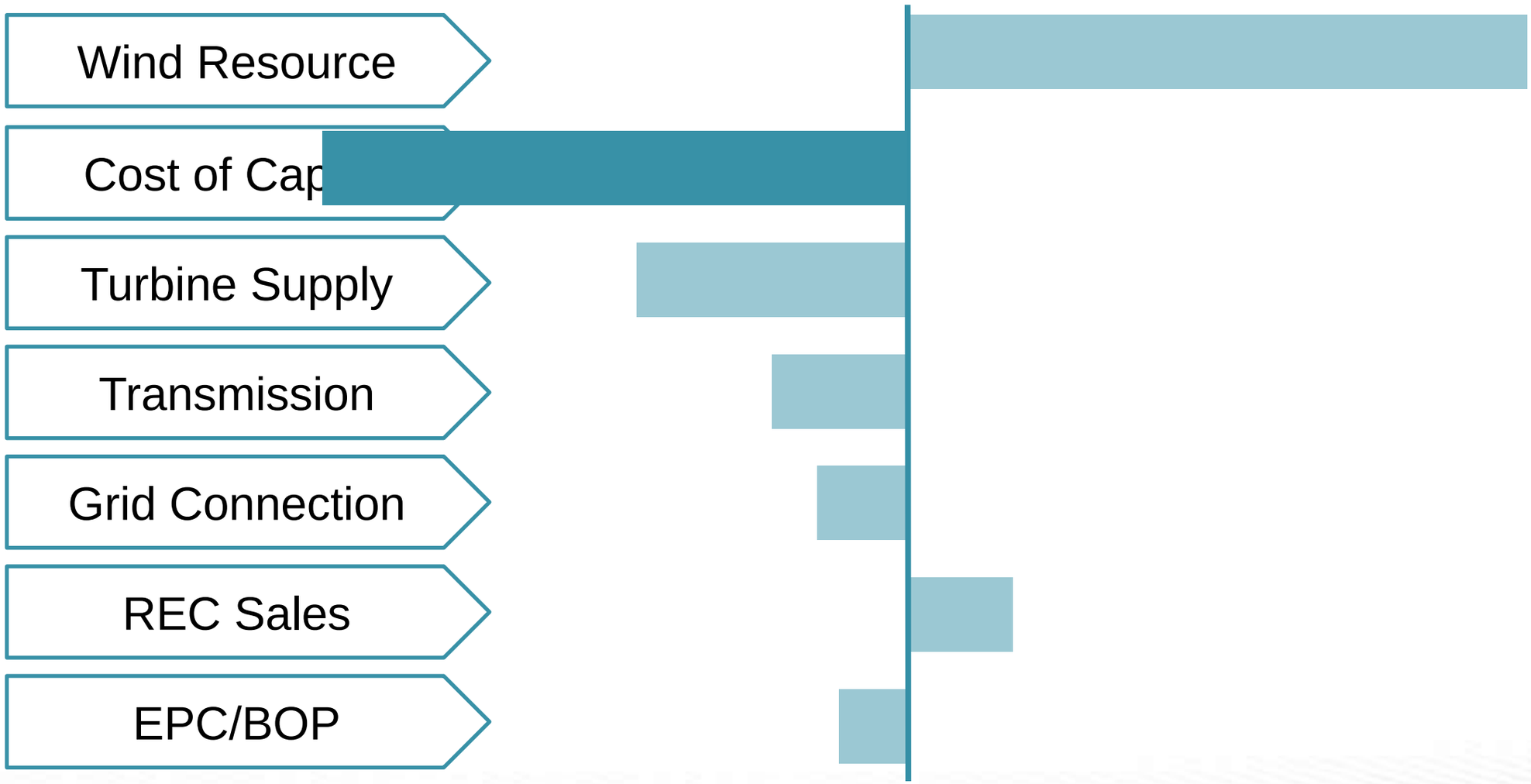

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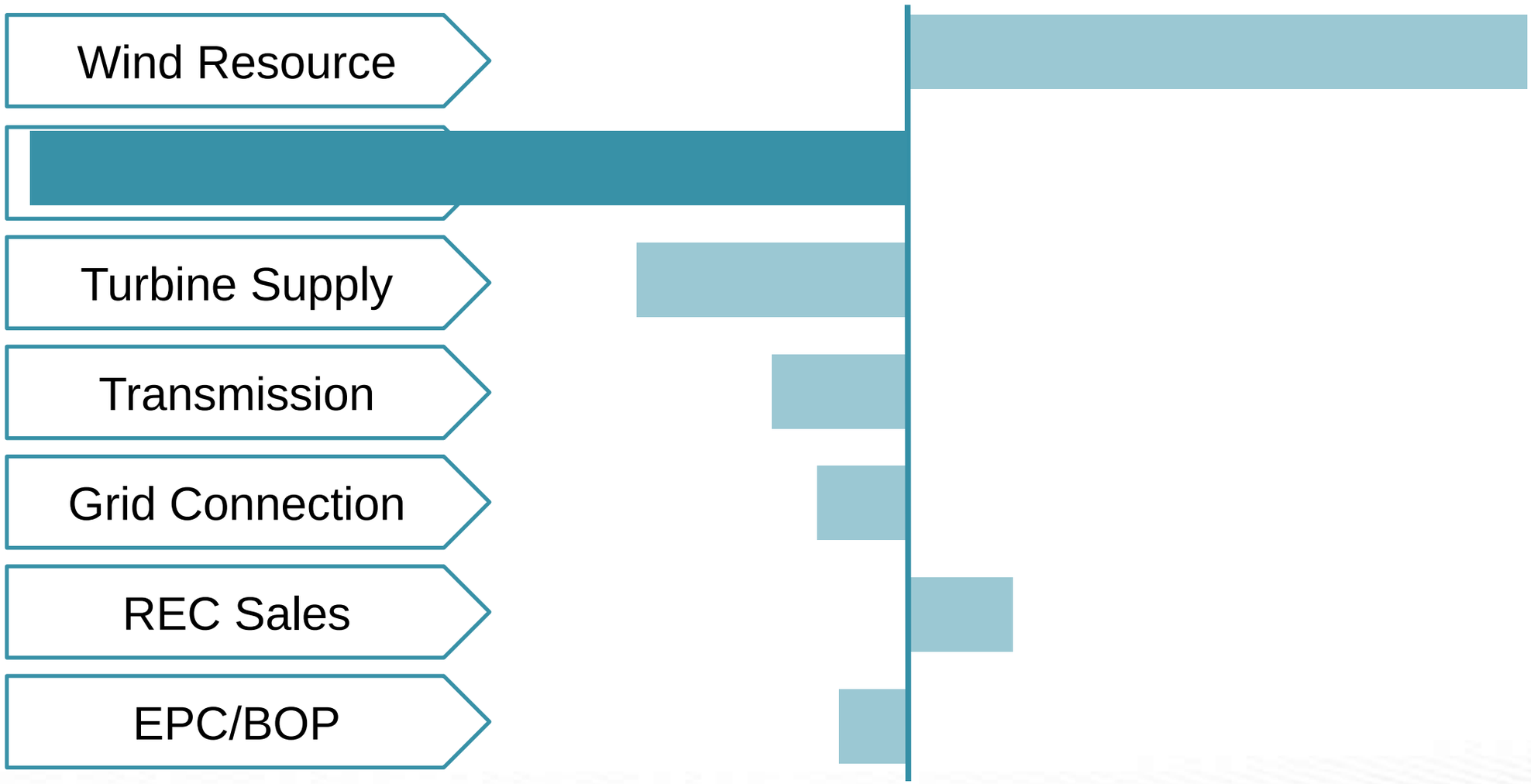

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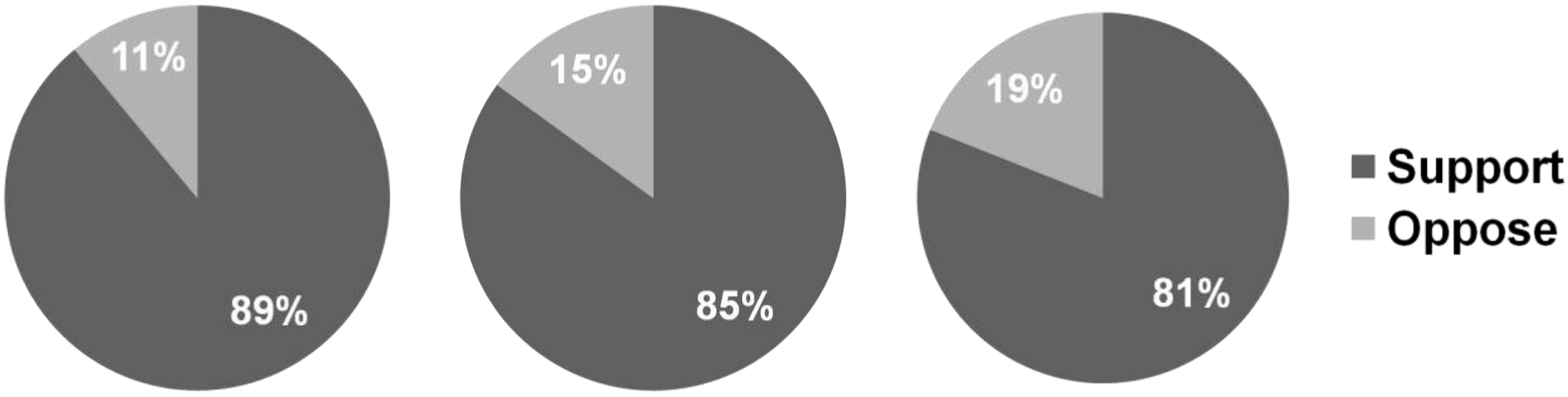
Should Colorado Further Promote Renewables?

Our country should do more to support renewable energy…



Source: GEO Analysis + AWEA / Public Opinion Strategies

Colorado's 30% RES Will Spur Billions in Additional Investment, but There is Room for Even More

Small Utilities <40,000	15% x 0% = 0%
REAs & Munis >40,000	25% x 10% = 2.5%
Investor Owned Utilities (IOUs)	60% x 30% = 18%
Total	20.5%
Factor in Multiplier for In-State Generation	20.5% ÷ 125%

Effective state-wide Colorado RES

~16.4%

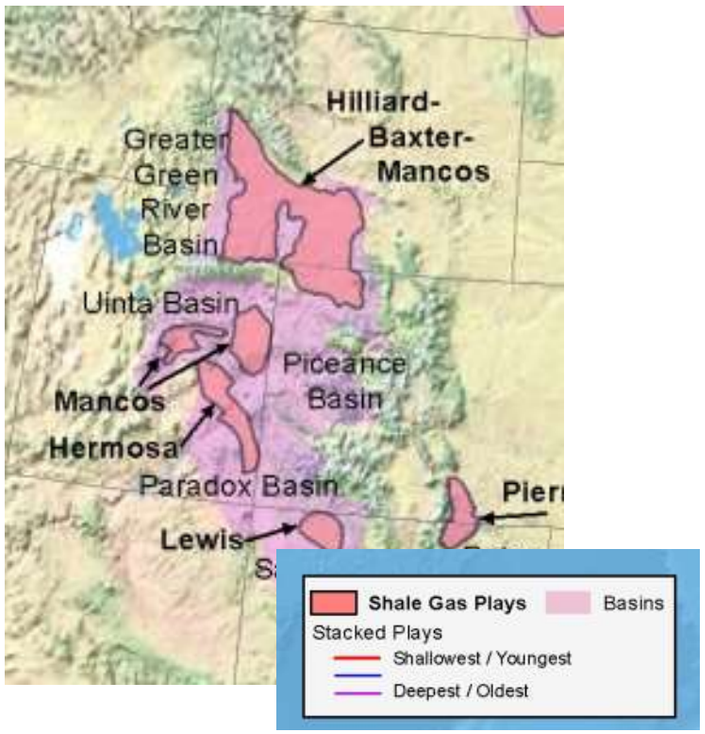
What is next for Colorado?

Understand portfolio potential post-2020

COAL

No or Low Emission Power Generation

GAS



New Supply / Demand Dynamics

RENEWABLES

1. **16.4% to 35%**
2. **Integration > 35%**

An Inclusive Balanced Energy Portfolio Analysis Provides Transparency in Electric Power Policy

GEO

CDPHE

DNR

PUC

Public

NREL

Academia

SMEs

IOUs

Munis

REAs

IPPs

Holistic Quantitative Analysis

Internal Factors	External Factors
Fuel cost projection	Job creation
Interest rates	Risk mitigation
Construction costs	Price volatility
O&M costs	Health impacts of pollutants
Heat rates	Cost of water
Capacity factors	Others?
Capacity values	

OCC

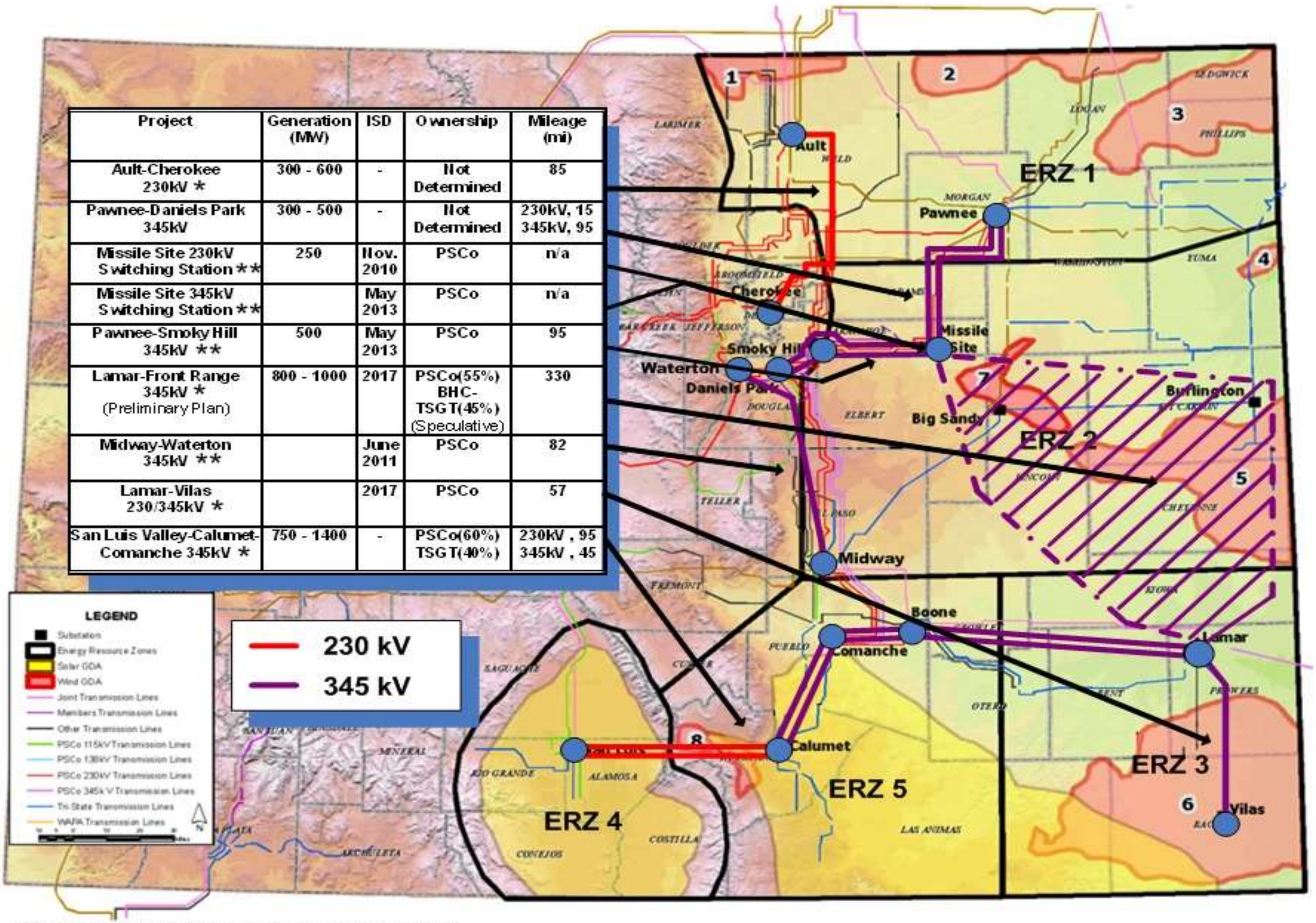
Fuels

Industry

Enviros

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

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FY'12 Goals:

1. Develop a **"Balanced Energy Portfolio"** (BEP) for the electric power sector through stakeholder guided analysis.
2. Unlock the potential from residential and small commercial **energy efficiency** through valuation and financing.
3. Promote the use of **compressed natural gas** as the leading element of a BEP for transportation fuels.
4. Support the **innovation ecosystem** in energy markets.
5. Increase the **energy literacy** in Colorado

Thank You!

Governor's Energy Office
State of Colorado
John W. Hickenlooper, Governor

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