A Clean Energy Plan for the Interior West

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Presentation Overview

- Background & Methodology
- Preliminary Findings
- Transmission issues

Study Objectives

Develop a long-term clean electric energy plan for the Interior West

- Relative to Business-as-Usual, Clean Plan includes significantly increased renewables and energy efficiency

Compare Clean Plan to a Business-as-Usual Plan in terms of:

- Costs
- Environmental Impacts
- Risk Mitigation
  - Fuel price risk – especially natural gas
  - Drought & hydro supply
  - Environmental regulatory risk – especially carbon
- Transmission needs

Identify the public policies and business strategies needed to implement the plan, engage decision makers

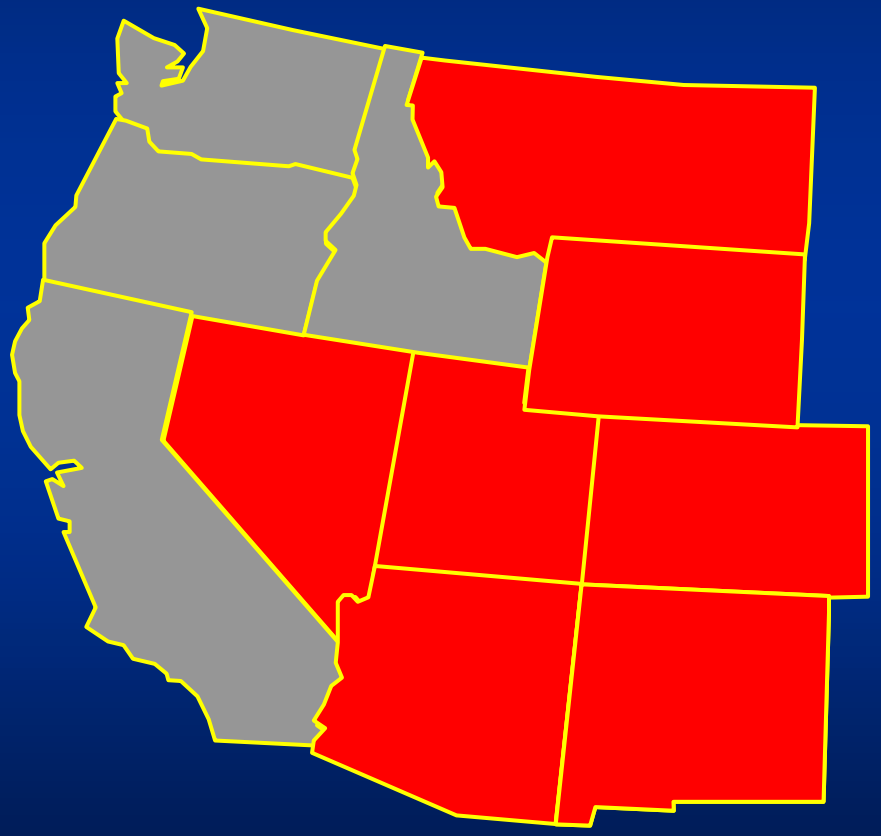
Analytical Tools

- Use standard utility production cost model (PROSYM)
- Compare a Business-as-Usual scenario and the Clean Energy Plan in computer simulation of western electric system

- PROSYM
  - Detailed information on:
    - Cost and performance characteristics of power plants in the region
    - Western transmission system
    - Location, type, & cost and performance characteristics of new resources were inputs for Clean Plan
  - Simulates optimal power plant dispatch to meet electric demand, subject to transmission constraints

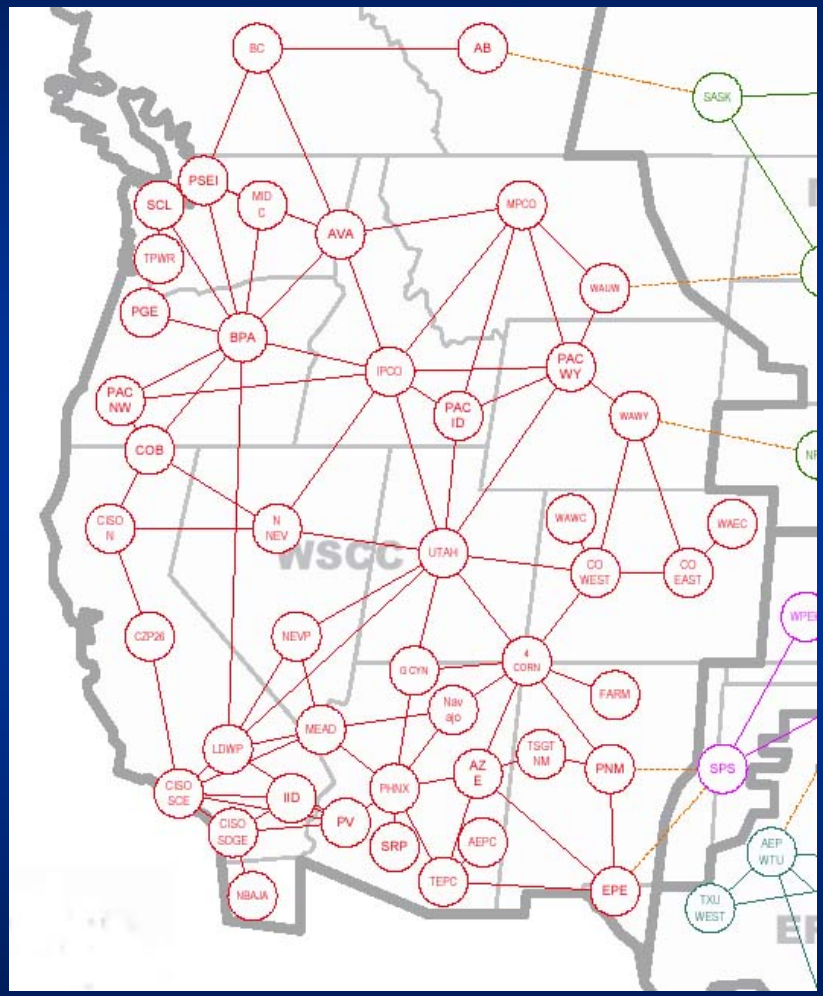
Geographic Scope

- Seven state Interior West region – AZ, CO, MT, NM, NV, UT, WY
- PROSYM modeling includes CA and PNW but we do not develop clean energy plans for those regions
- Instead, we draw on existing studies and information from those regions



Geographic Detail

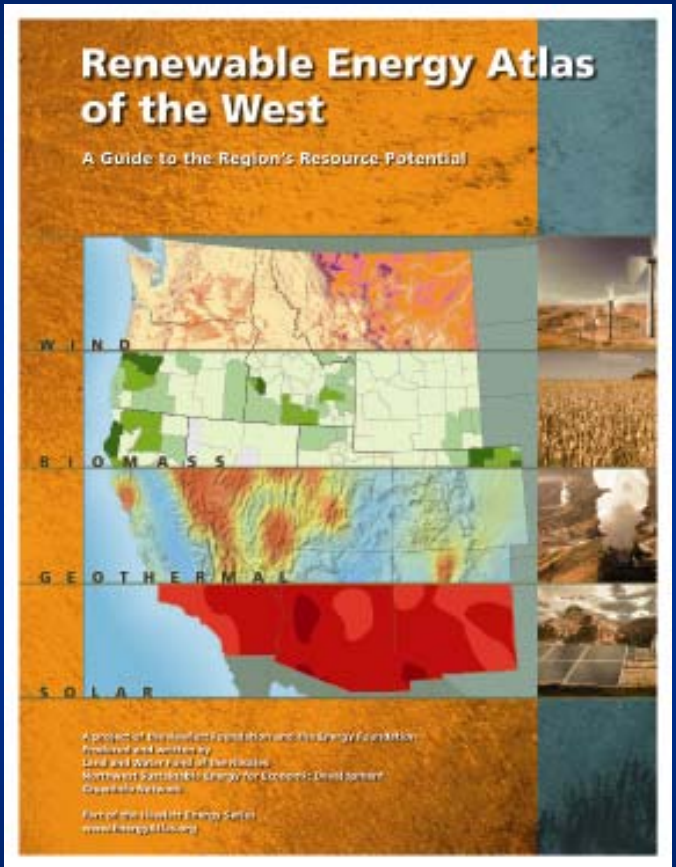
- Modeling analyzes the operation of the electric system within distinct transmission areas (“trans areas”)
- Inputs to study were developed at the trans area level
- Results presented at the state and regional level (and available at trans area level)



Clean Energy Plan Design Guidelines

- Take full advantage of the region's cost-effective energy efficiency potential
- 20% of total electricity generated in the study region to come from renewable energy by 2020 using a mix of technologies
- Tap roughly 20% of regional CHP potential

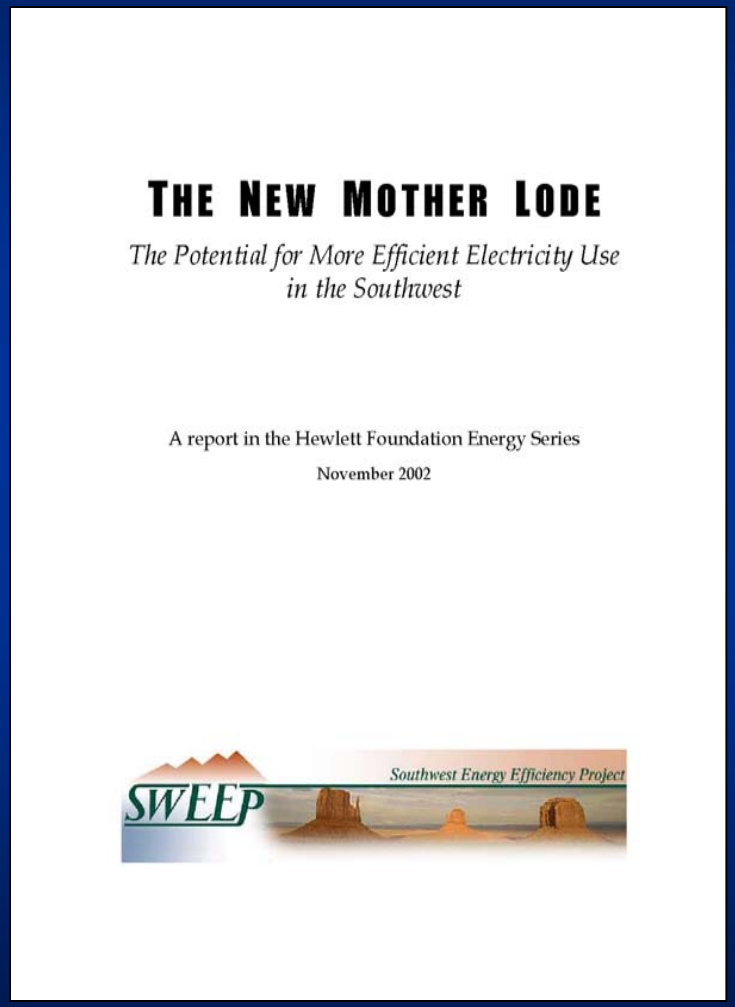
Renewable Resource Assessment



- Compiles most recent data on wind, solar, geothermal, biomass resources
- GIS technology allows identification of:
  - Areas with best resources
  - Inappropriate lands for development
  - Location of facilitating infrastructure like existing transmission lines and substations

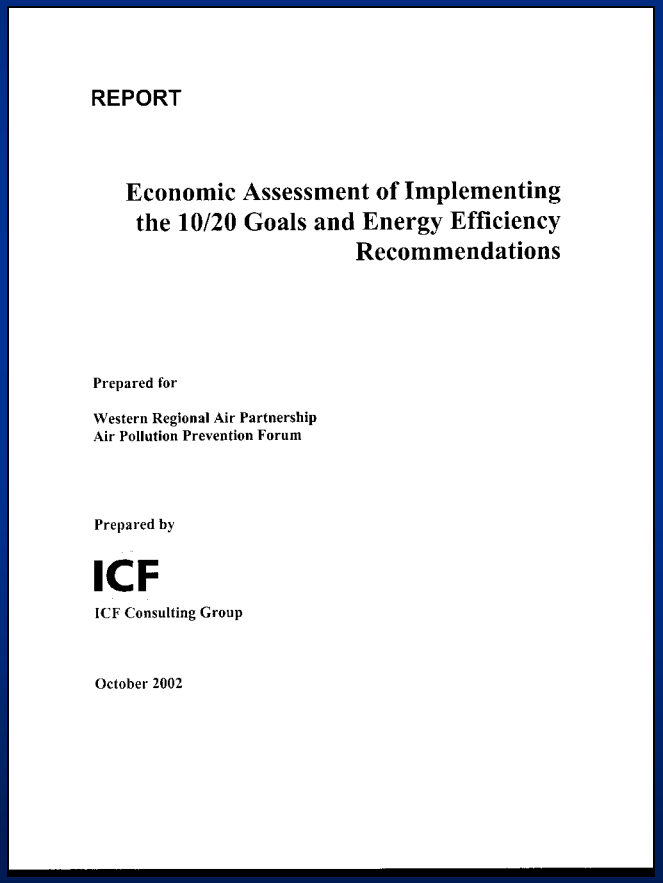
www.energyatlas.org

Energy Efficiency Resource Assessment



- Recent SWEEP report assesses potential for more efficient energy use in the region
- By 2020, energy demand could be reduced by roughly 1/3 using technologies commercially available today

Combined Heat & Power Resource Assessment



REPORT

Economic Assessment of Implementing the 10/20 Goals and Energy Efficiency Recommendations

Prepared for

Western Regional Air Partnership
Air Pollution Prevention Forum

Prepared by

ICF

ICF Consulting Group

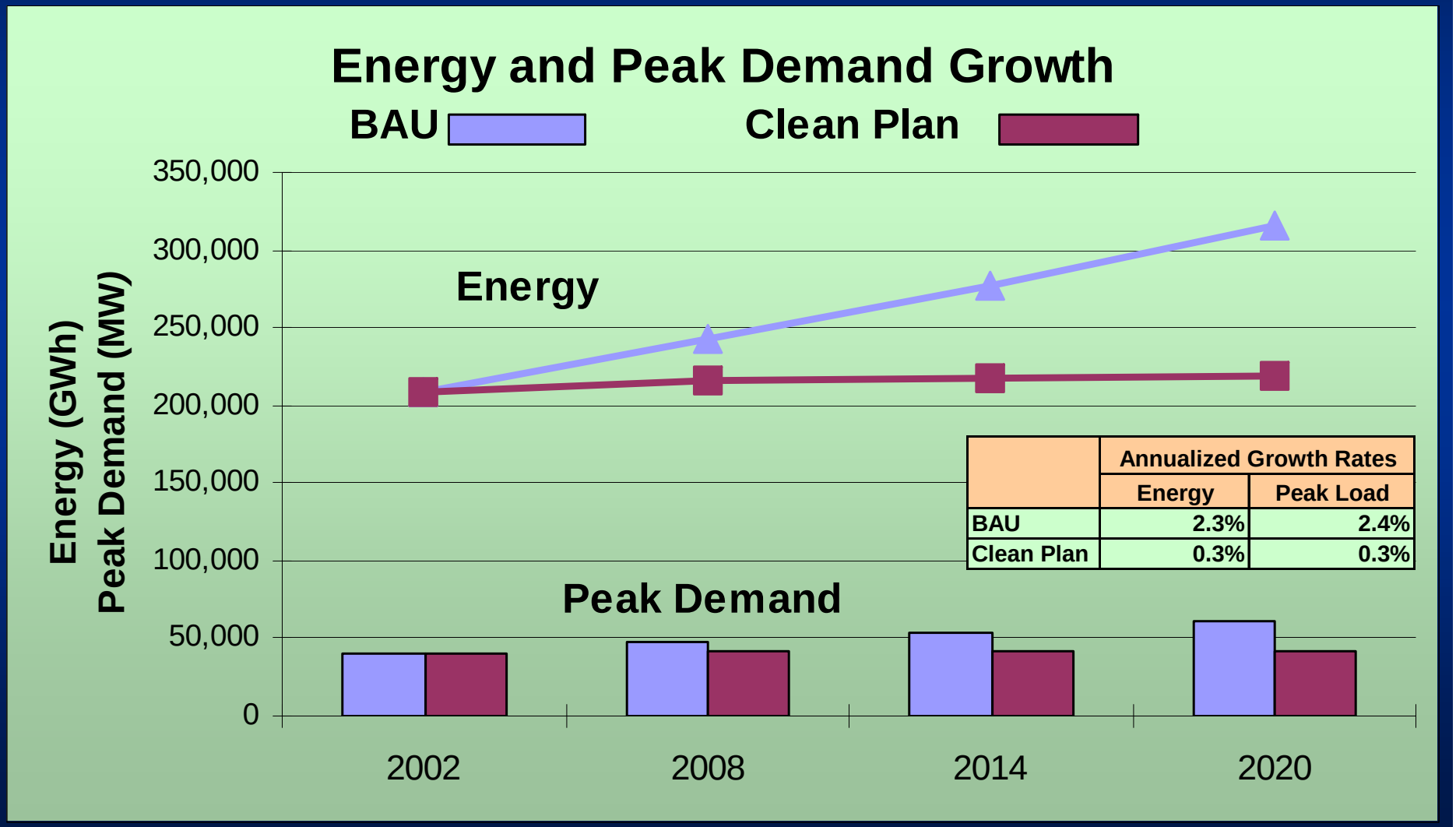
October 2002

- Roughly 15,000 MW of commercial and industrial sector CHP potential identified in the region
- Based on Western Regional Air Partnership clean energy technology assessments
- Strategies to reduce regional haze in the West

Preliminary Results

Energy & Peak Demand Requirements

Seven Interior Western States

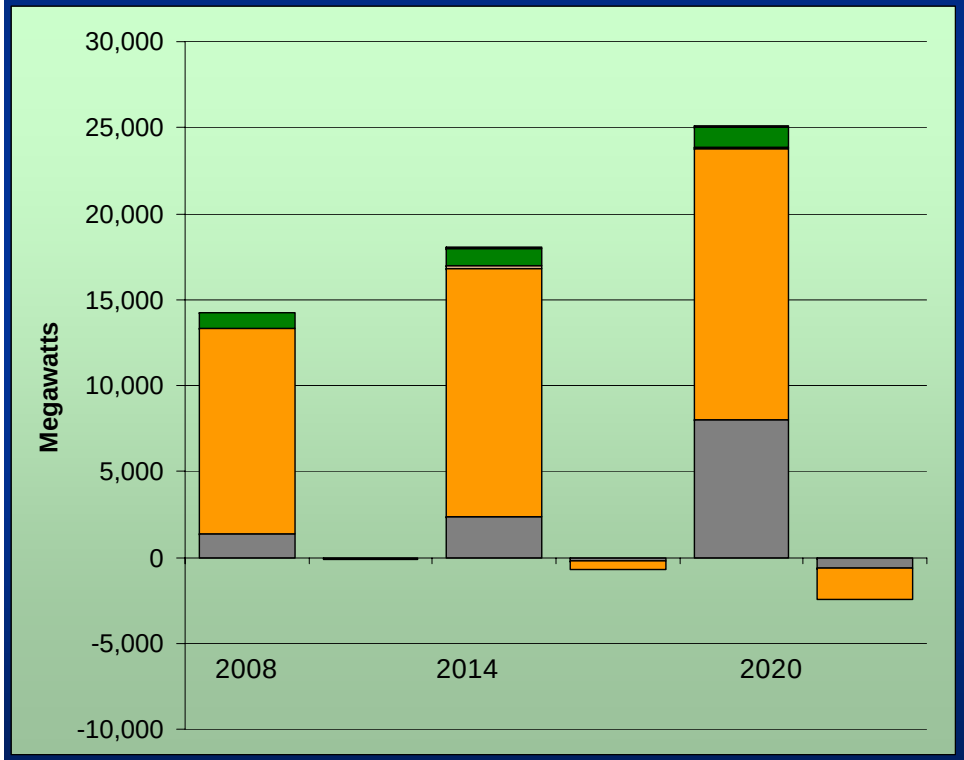


	Annualized Growth Rates	
	Energy	Peak Load
BAU	2.3%	2.4%
Clean Plan	0.3%	0.3%

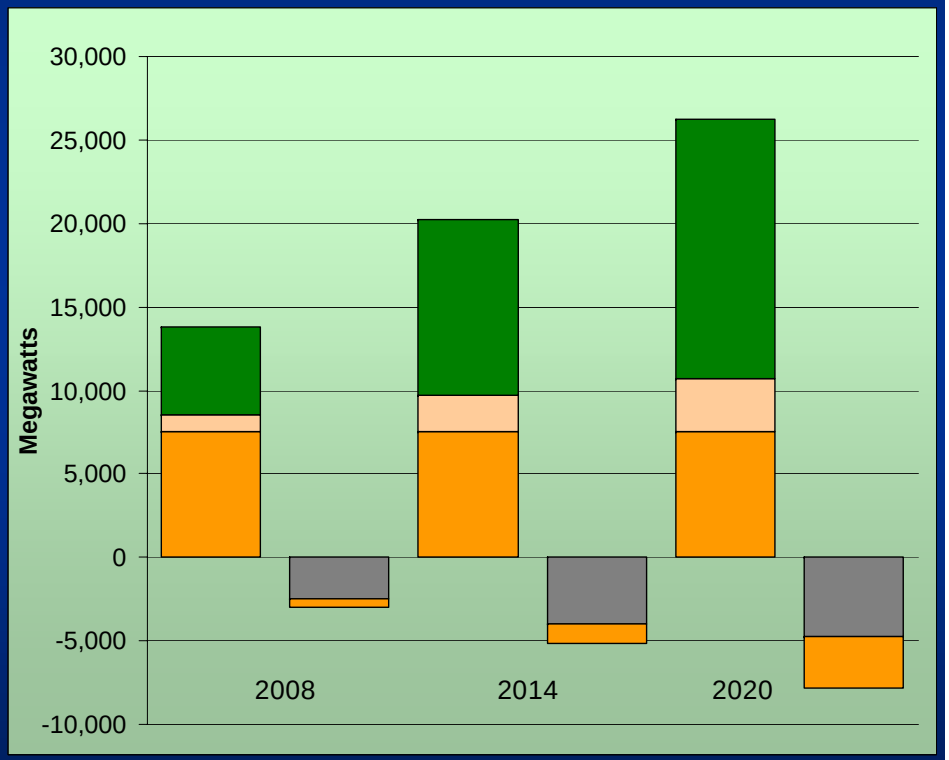
Cumulative Power Plant Additions & Retirements: Business-as-Usual vs. Clean Plan

Seven Interior Western States

BAU



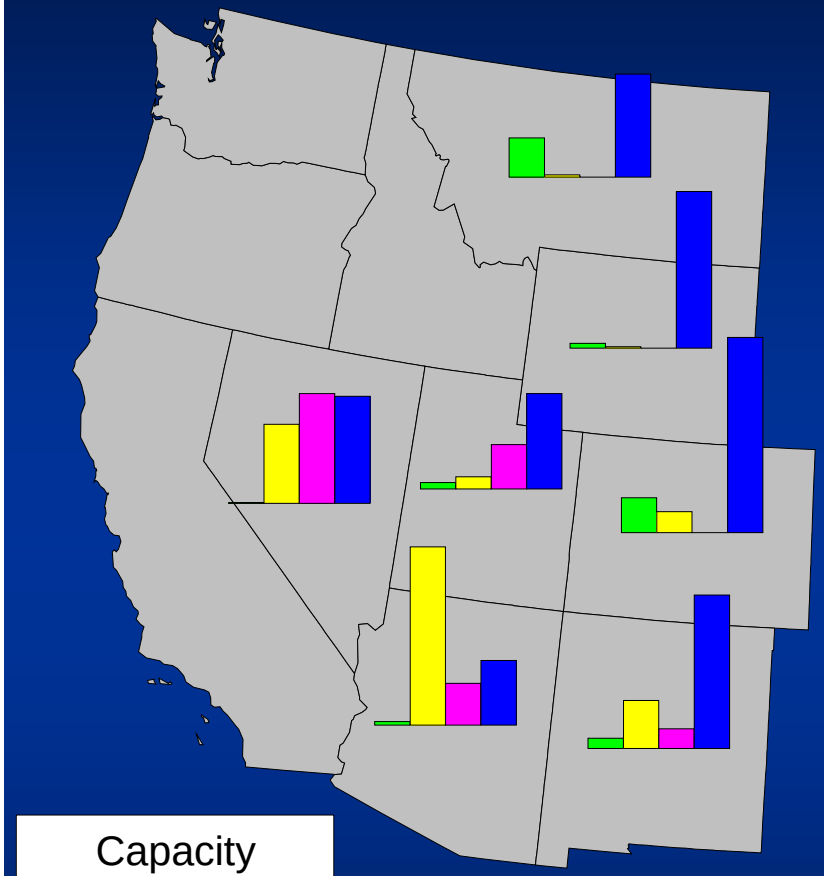
Clean Plan



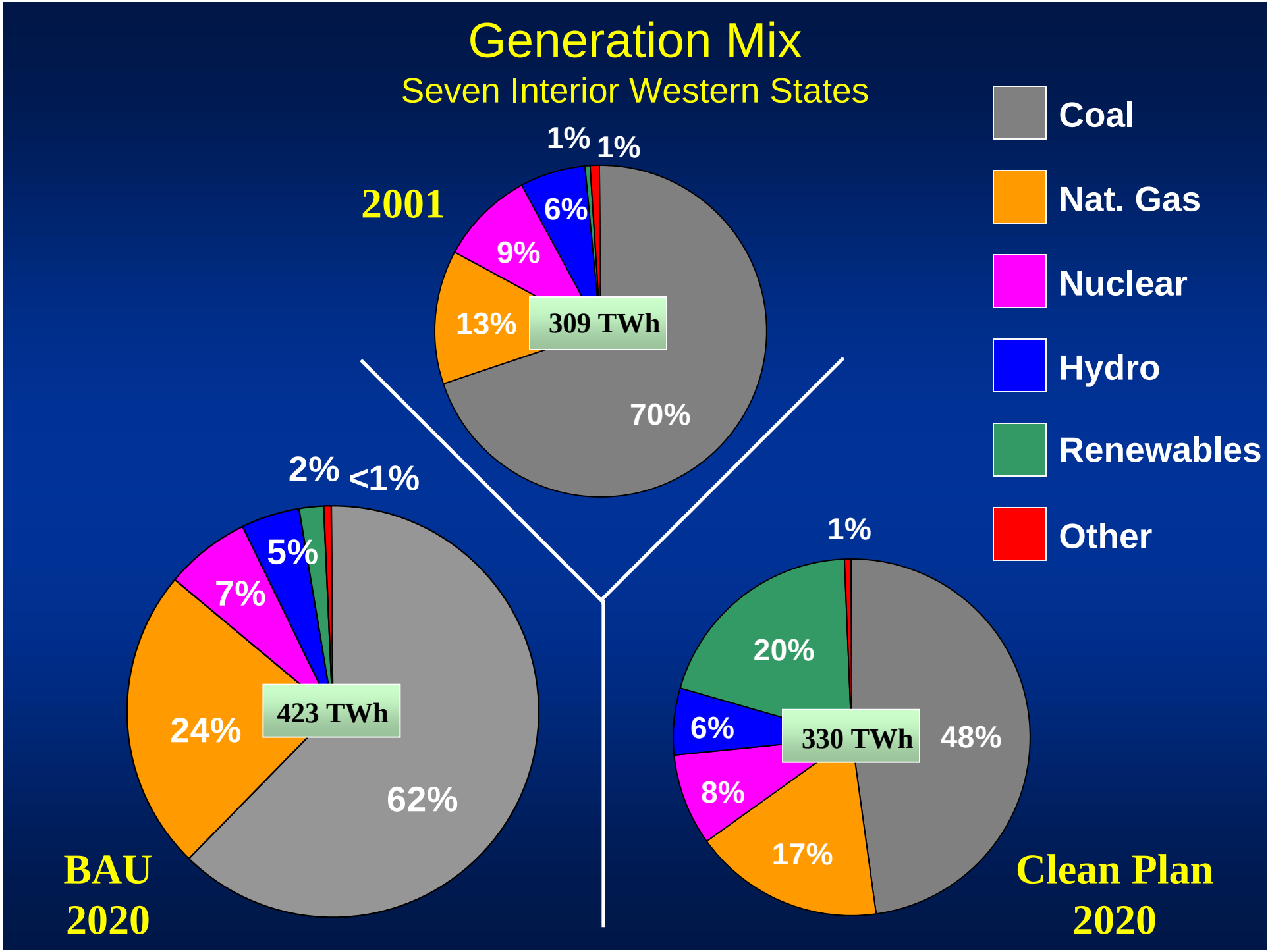
Coal **Natural Gas** **CHP** **Renewables**

Renewable Capacity by Type & Location

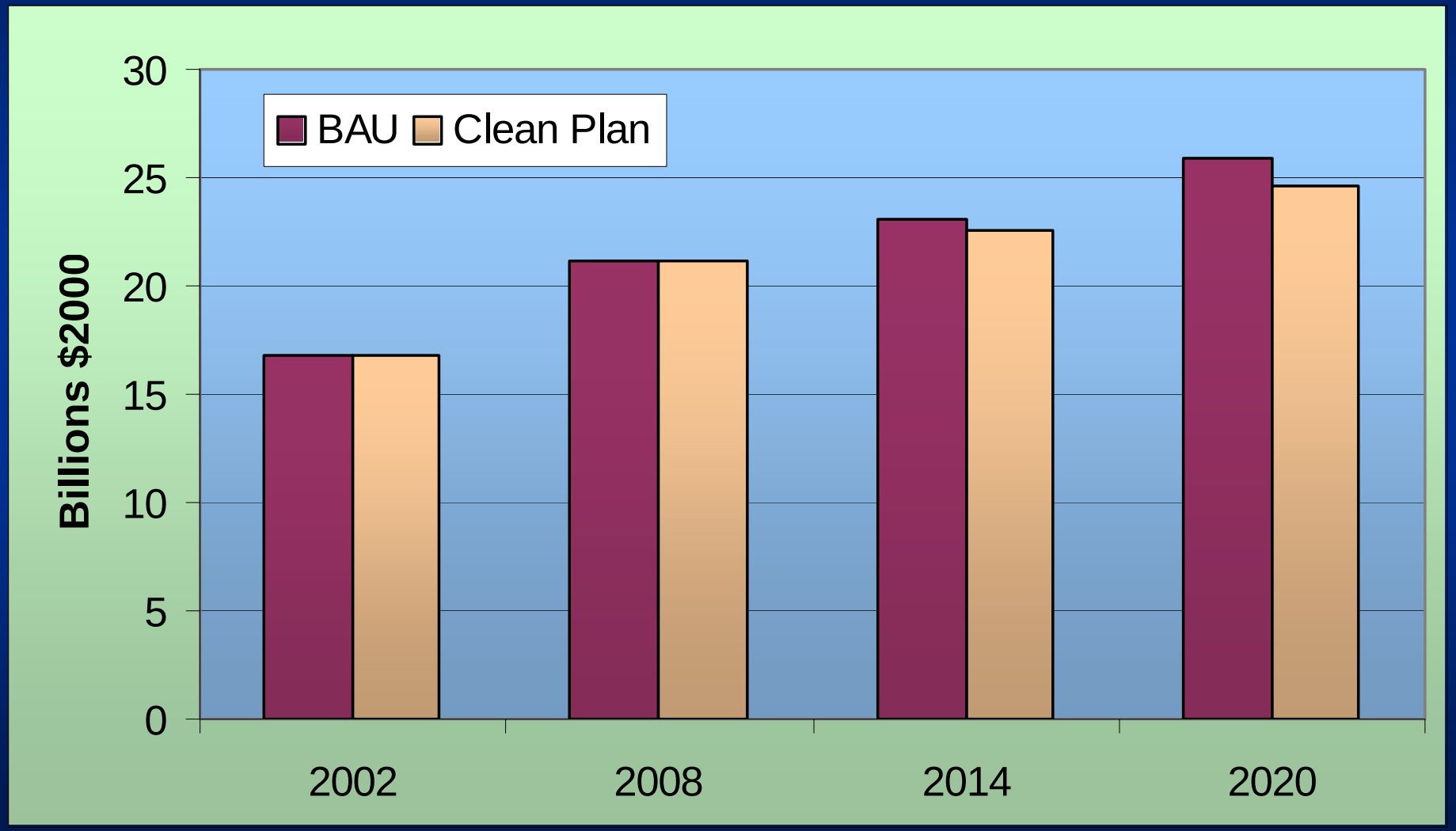
Clean Plan: 2020



	Capacity (MW)				
State	Wind	Geo-thermal	Solar	Bio-mass	State Total
Arizona	660	430	1,800	40	2,930
Colorado	1,990	0	210	350	2,550
Montana	1,040	0	30	400	1,470
New Mexico	1,550	200	490	100	2,340
Nevada	1,080	1,110	800	10	3,000
Utah	960	450	120	70	1,600
Wyoming	1,590	0	10	50	1,650
Resource Total	8,870	2,190	3,460	1,020	15,540

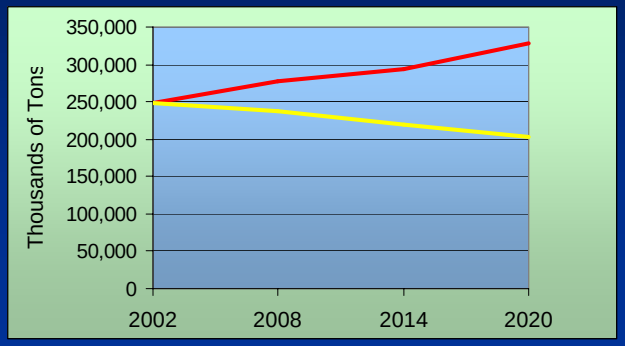

Generation Mix
Seven Interior Western States
Coal
Nat. Gas
Nuclear
Hydro
Renewables
Other
2001
1%
1%
6%
9%
13%
309 TWh
70%
BAU
2020
2%
<1%
5%
7%
24%
423 TWh
62%
Clean Plan
2020
1%
20%
6%
330 TWh
48%
8%
17%

Annual System Cost
Business-as-Usual vs. Clean Plan
Seven Interior Western States

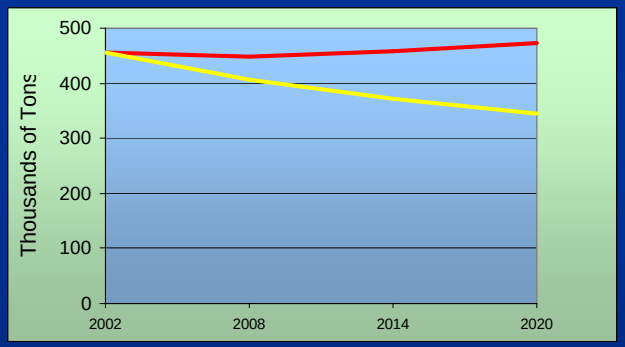


Air Pollutant Emissions
Business-as-Usual vs. Clean Plan
Seven Interior Western States

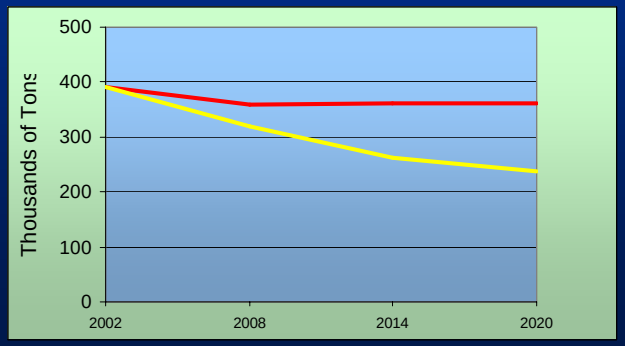
CO_2



NO_X



SO_2



By 2020 Clean Plan is:

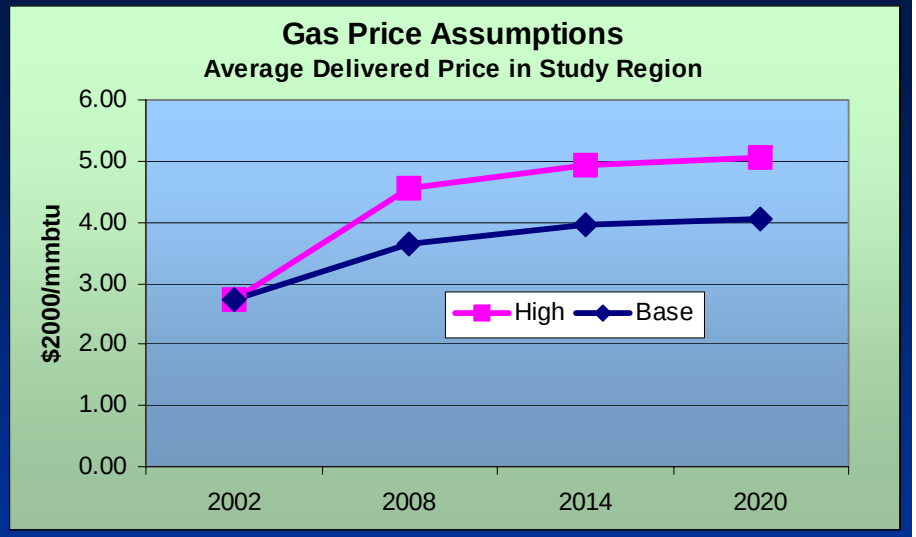
- 38% below BAU
- 19% below current levels
- 4% below 1990

- 27% below BAU
- 24% below current levels

- 34% below BAU
- 39% below current levels

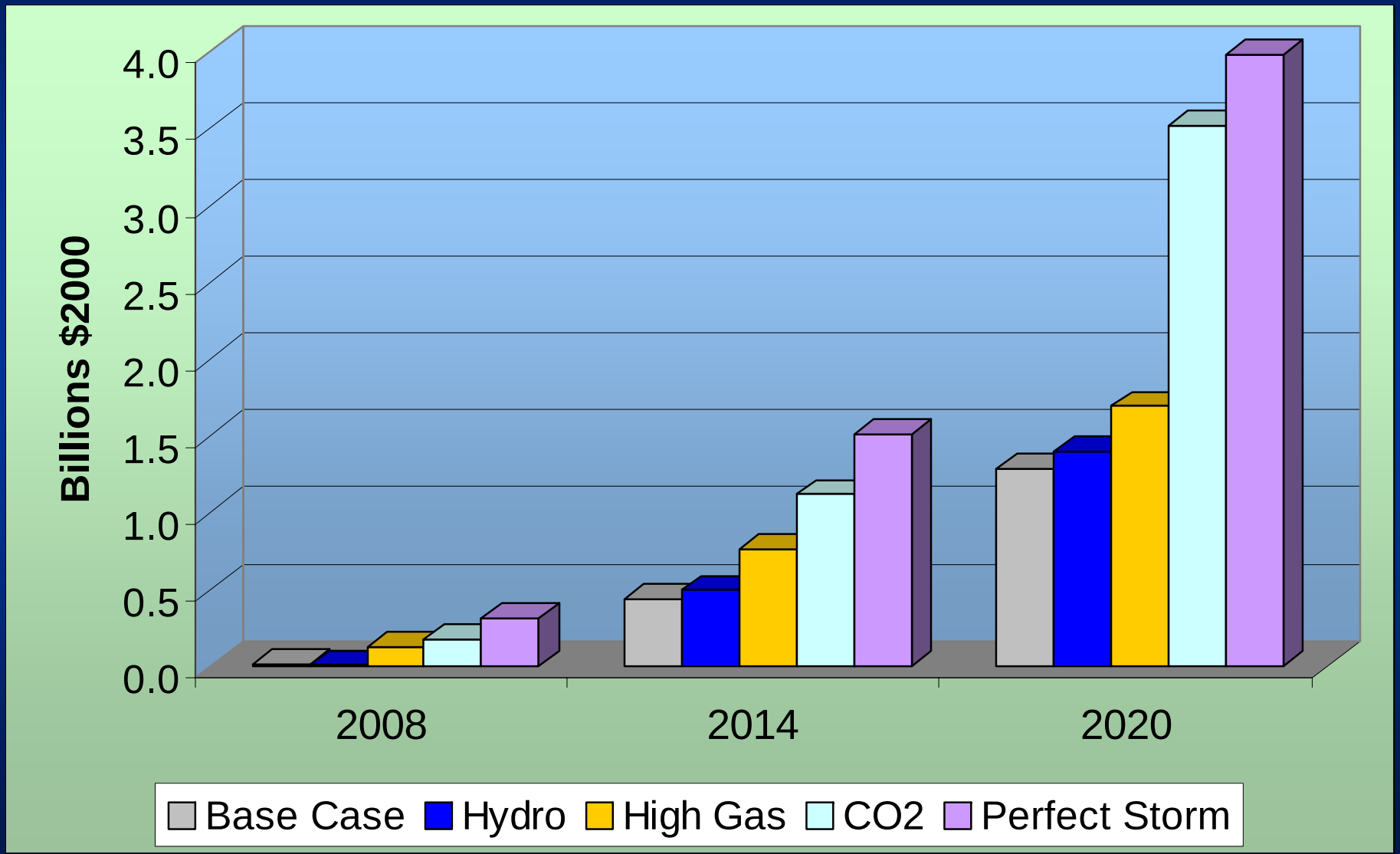
Risk Scenarios

- High Gas Price
  - 25% increase above base case levels
- Carbon regulation results in CO_2 allowance costs of:
  - $10/ton in 2008
  - $15/ton in 2014
  - $20/ton in 2020
- Drought/Adverse hydro
  - Hydro generation 20% below base case
  - Historically, 10% of years this bad or worse
- Perfect Storm
  - High gas prices, CO_2 regulations & drought all at the same time



Estimated Savings Under Clean Plan

Base Case & Risk Scenarios



Transmission Issues

- As part of developing the Clean Plan we wanted to:
  - Identify extent to which RE & EE resources can help alleviate transmission system constraints
  - Identify areas where transmission system upgrades are needed to bring remote renewables to market — mainly wind
  - Weigh costs of tapping higher quality, higher transmission cost remote renewables versus less favorable resources closer to load

Remote Wind Scenario

- Taps region's high quality Class 6 & 7 resources regardless of location
- Identifies transmission upgrades necessary to support the wind

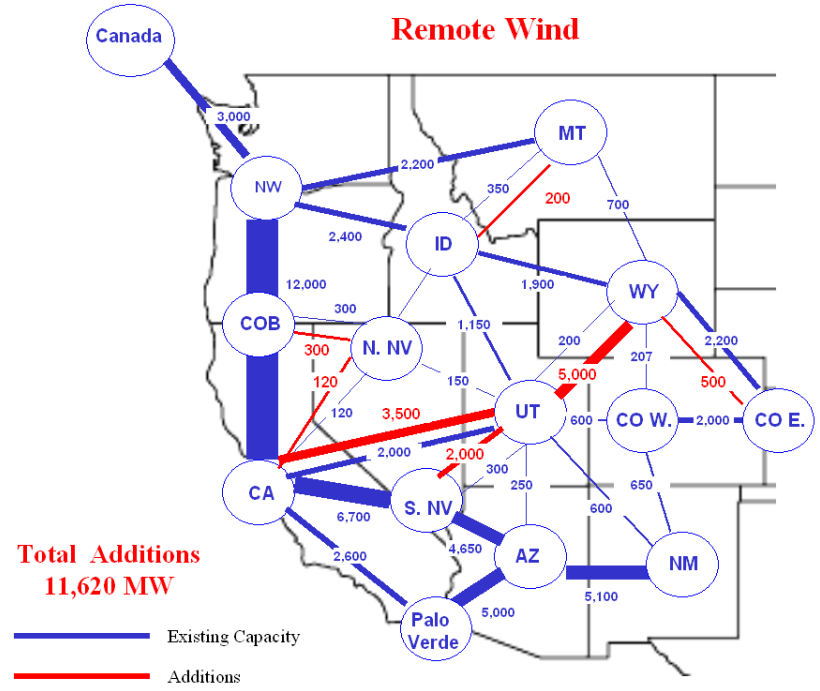
Cumulative Wind Capacity Additions in 2020			
	Capacity (MW)		
	Class 6	Class 7	Total
Colorado	1,200	120	1,320
Montana	1,010	830	1,840
Wyoming	4,050	1,280	5,330
Total	6,260	2,230	8,490

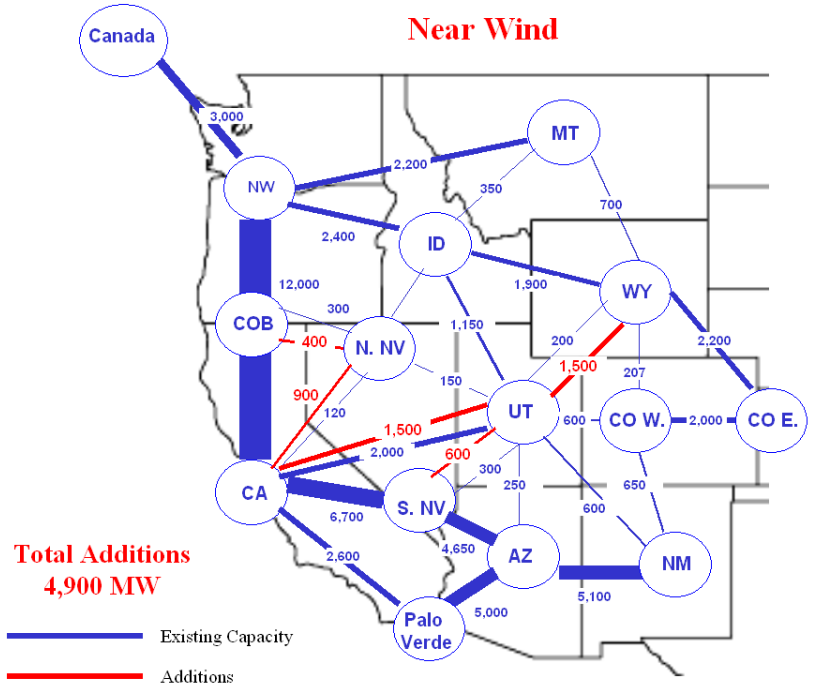
Near Wind Scenario

- Allocates wind resources throughout seven state region nearer load centers
- Taps Class 4-7 wind resources
- Identifies any transmission upgrades necessary to support the wind

Cumulative Wind Capacity Additions in 2020					
	Capacity (MW)				
	Class 4	Class 5	Class 6	7	Total
Arizona	240	380	40	0	660
Colorado	1,510	250	1,625	350	3,735
Montana	0	0	0	575	575
Nevada	0	370	435	210	1,015
New Mexico	890	510	135	20	1,555
Utah	0	0	855	110	965
Wyoming	0	0	0	725	725
Total	2,640	1,510	3,090	1,990	9,230

Transmission Additions
Remote vs. Near Wind

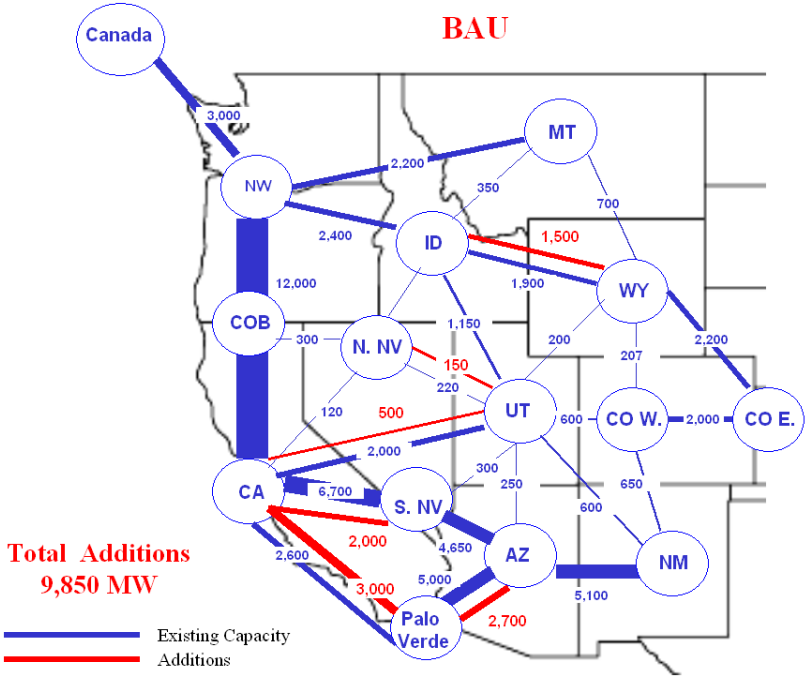


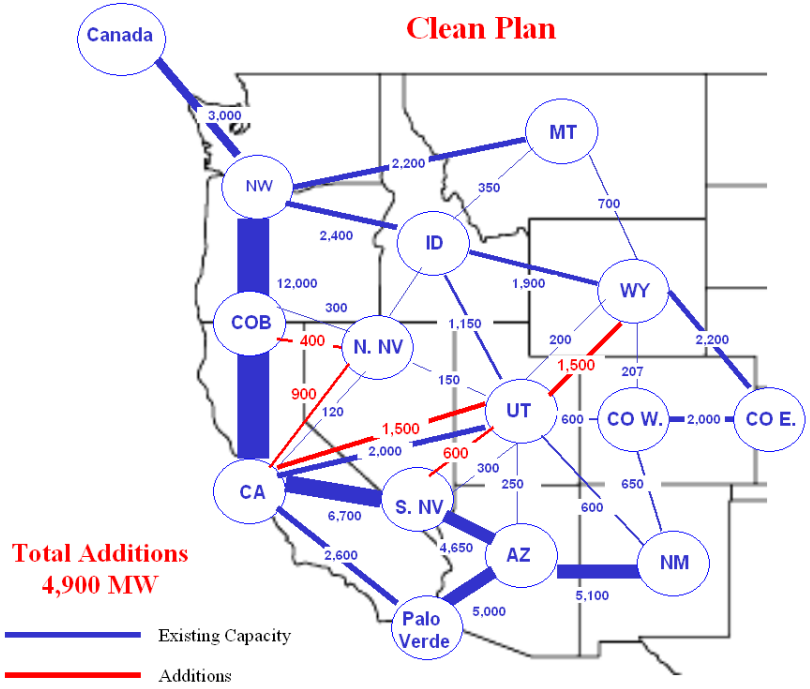


Preferred Clean Plan
based on Near Wind scenario

- Overall costs of Near and Remote scenarios essentially equal
- Several factors favor near scenario as basis for Clean Plan:
  - Equitable geographic distribution of renewables
  - Spreading economic development benefits brings support for the plan
  - Fewer major inter-state transmission upgrades reduces planning and financing challenges
  - Dispersed resources less susceptible to supply, transmission, security failures
  - Dispersed wind less susceptible to correlated power output swings due to localized weather patterns

Transmission Additions by 2020
Business-as-Usual vs. Clean Plan





Next steps

- Moderate Efficiency Scenario
- Formulate public policies and business strategies needed for implementing the plan
- Report write-up – January 2004 Release
- Engaging regional decision makers and the public on plan implementation

Contact Information

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