



NIPPC Annual Meeting...Sept 2008 Pointing the Ways to the Future

Resources and Markets...What will be the role of renewables?

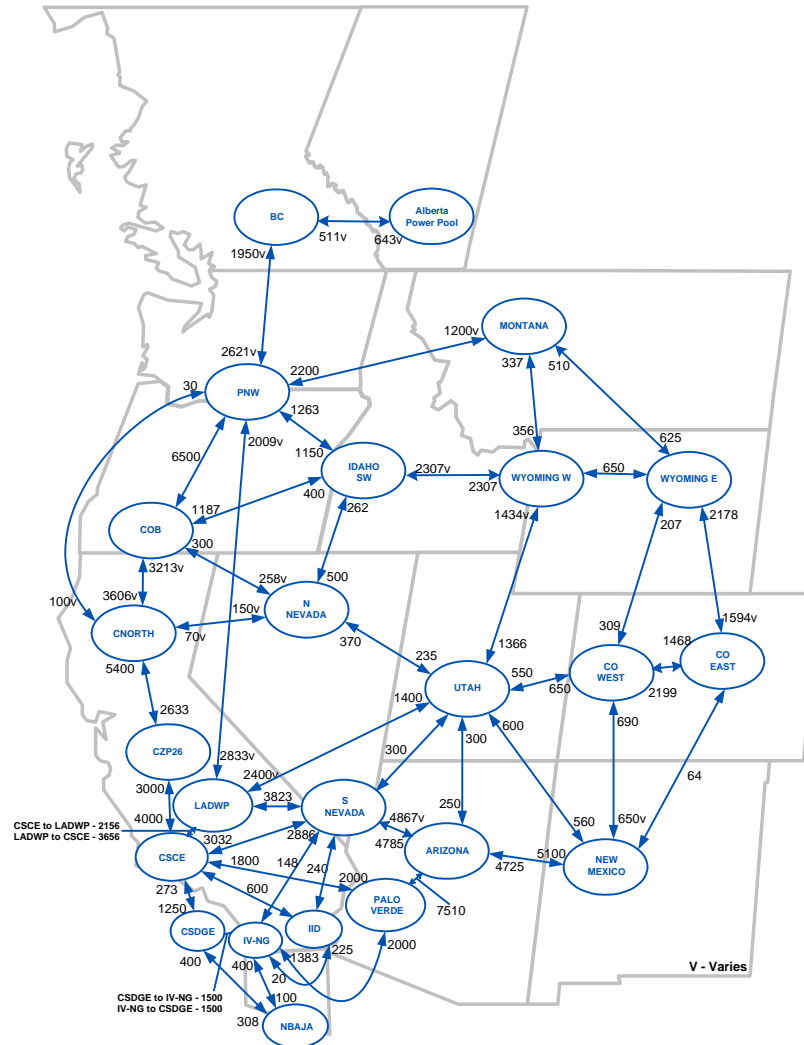
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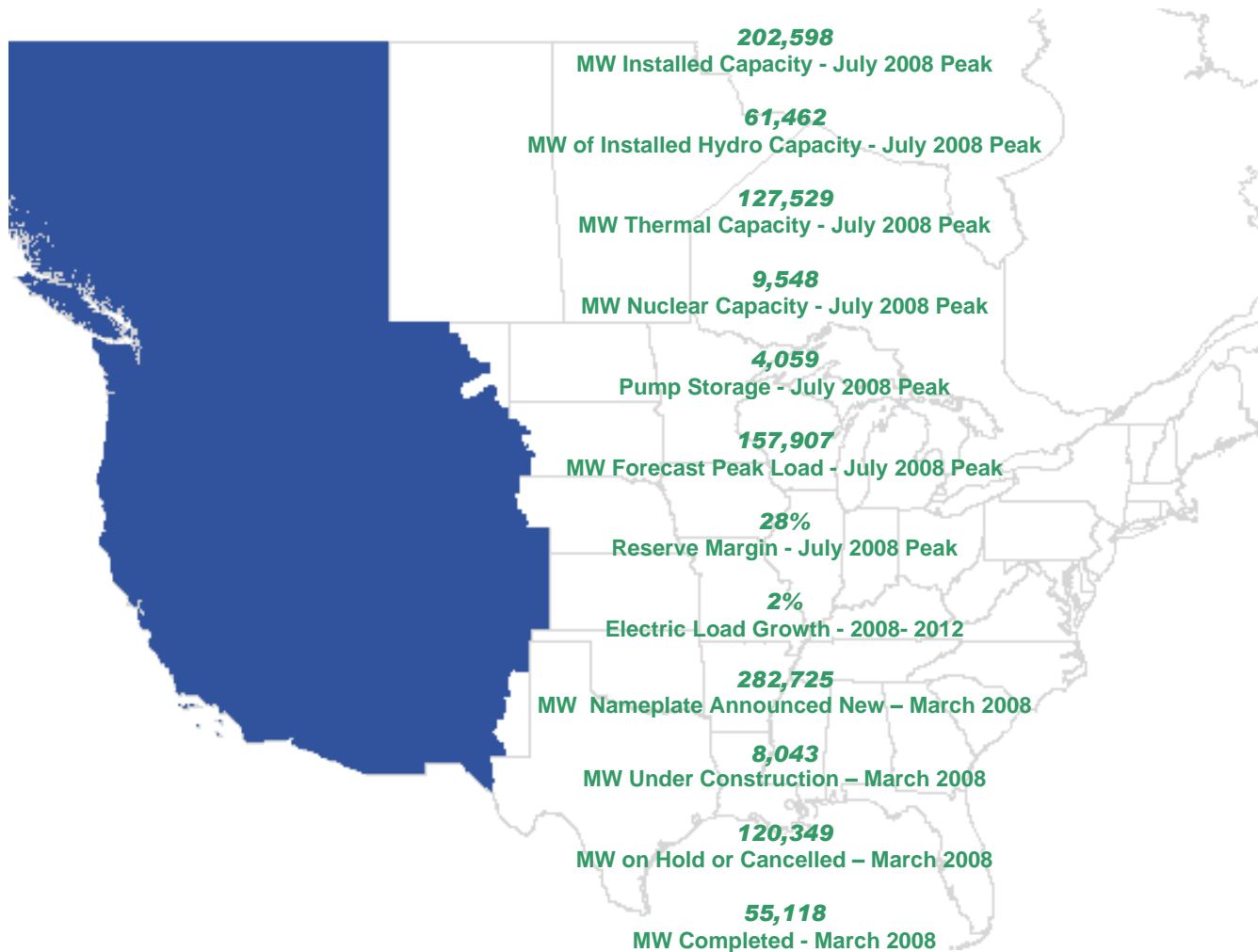
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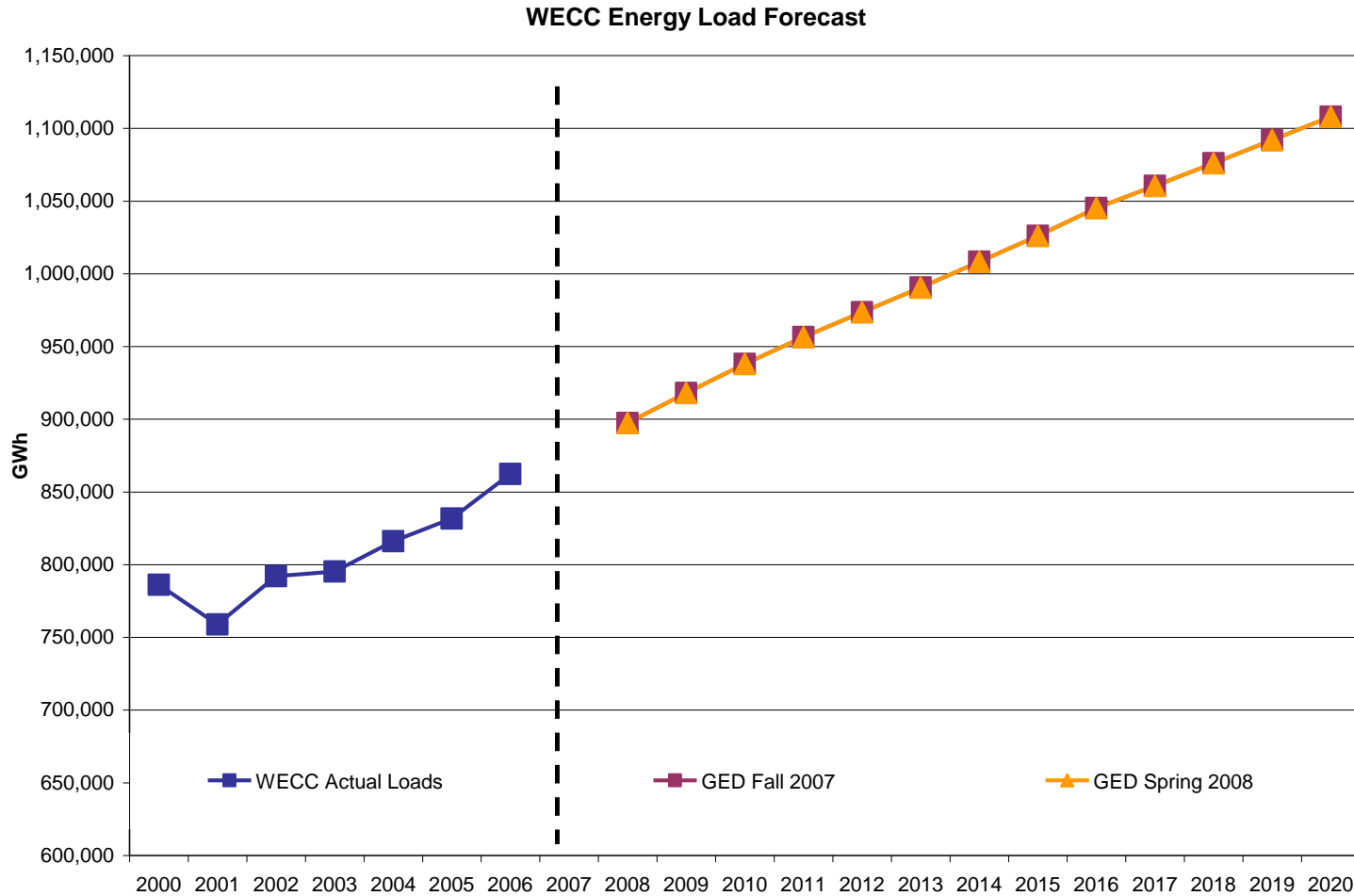
The Northwest and the rest of WECC are highly connected!



WECC At a Glance



Loads...Actual and Forecast (still in the 2%/year range)



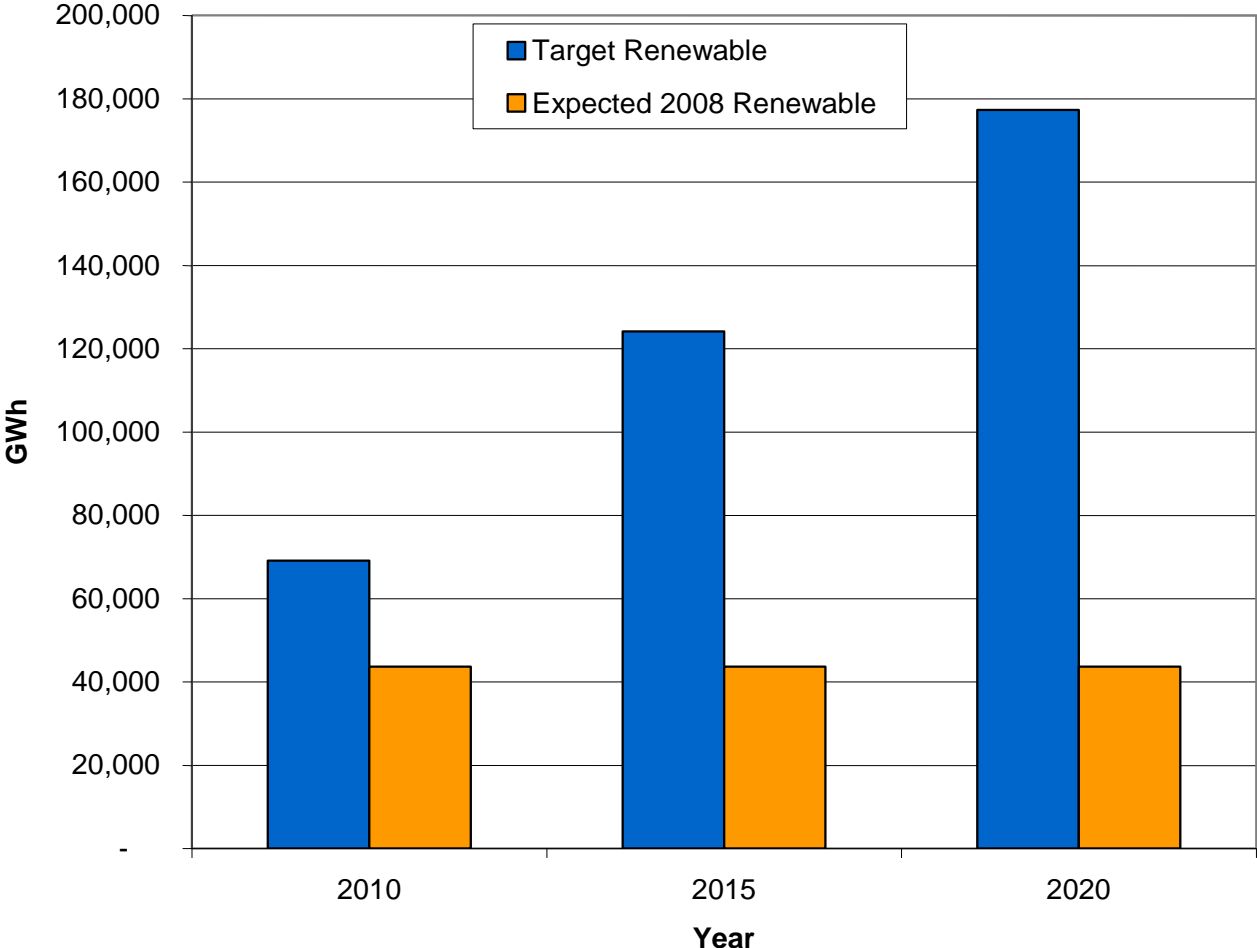
Renewables...How Much Should We Assume?

- ▶ States have set renewable “goals”
 - ▶ Goals are expressed as a percentage of billed energy
 - ▶ Goals would have new renewables added even if the power was not needed. As such, the renewables displace other resources, typically gas-fired resources
 - ▶ Most Goals have some economic criteria that, by its application, may result in not meeting goals without being penalized
 - ▶ Recent indications are that these economic criteria may be skirted
 - ▶ LADWP Pine Tree Wind \$425 million, 120 MW facility
 - ▶ SCE Daggett Ridge Wind Farm, LLC ("Daggett Ridge")
 - ▶ APS 280 MW Solar...\$140/MWh
- ▶ Cost of Renewables becomes important in forecasting whether “Goals” will be met
- ▶ Renewables with large potential supply
 - ▶ Wind...\$100/MWh +
 - ▶ Central Station Solar Thermal...\$140/MWh

Renewables....State Goals

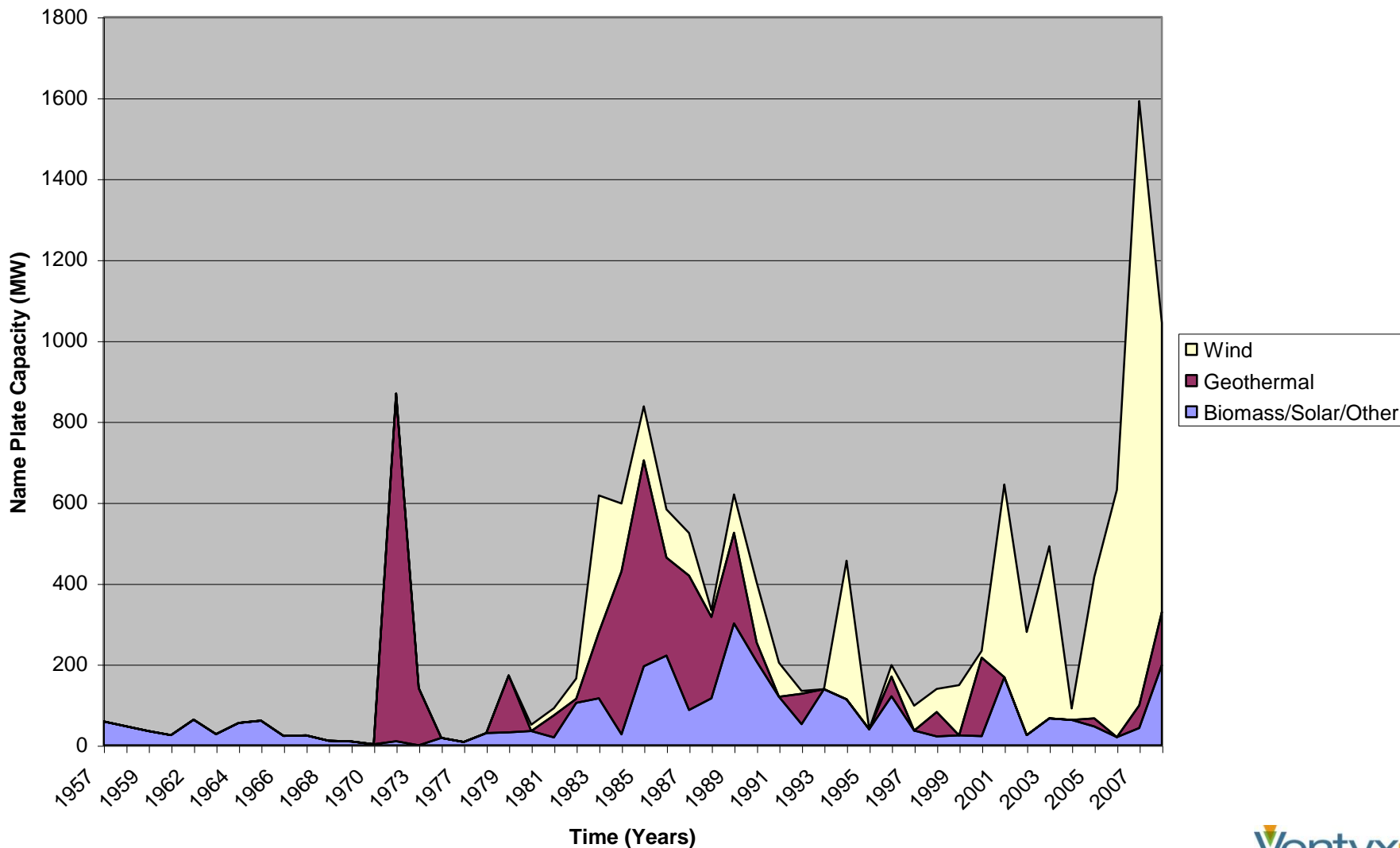
State	2010	2015	2020
BC	N/A	N/A	N/A
Alberta	N/A	N/A	N/A
Washington	0	3%	15%
Montana	10%	15%	15%
Oregon	0	15%	20%
Idaho	0	0	0
Wyoming	0	0	0
California	20%	26%	33%
	Must at least +1% per Year		
Nevada	12%	20%	20%
Utah	0	0	0
Colorado	5%	15%	20%
Arizona	2.50%	5%	10%
New Mexico	0	15%	15%

Renewables....WECC wide: Goals vs. Current

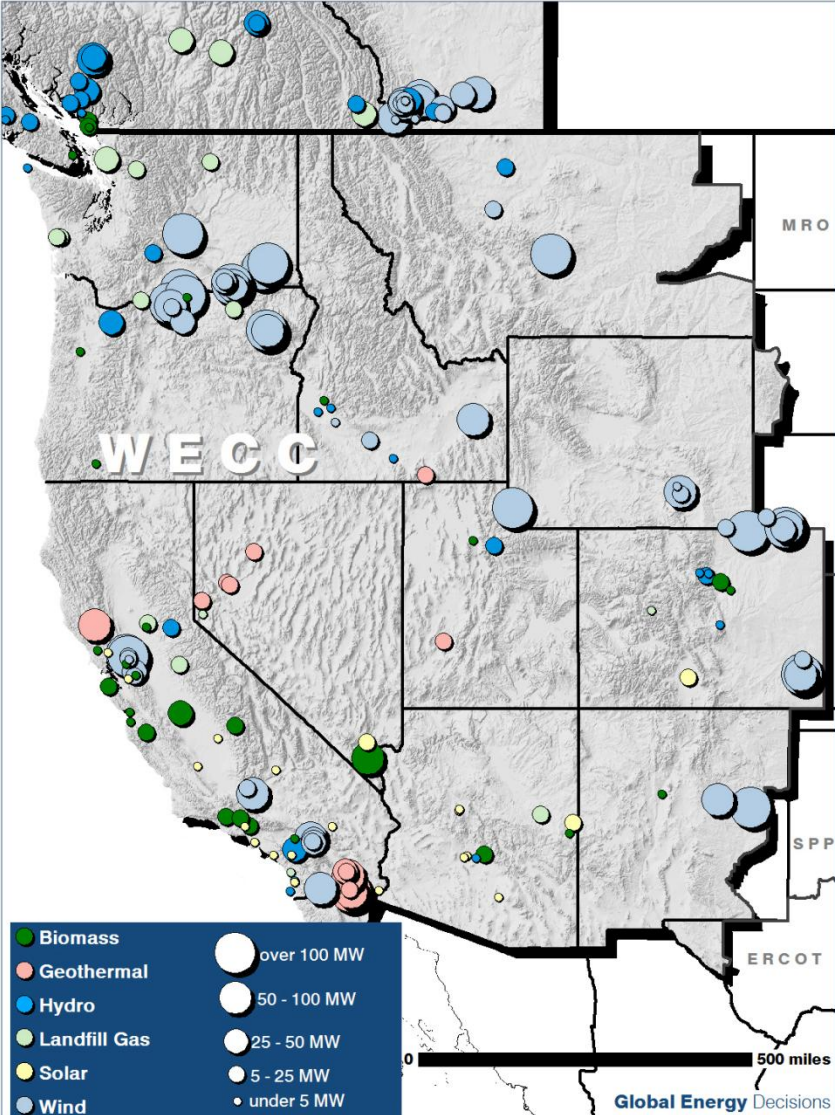


Historical Renewable Additions...WECC

Renewables Added in WECC by Year



Renewable Additions in WECC 2000-2008



Renewables....Challenges in Meeting Goals

- ▶ Increasing competition for renewables projects from other states/countries/utilities
- ▶ Many renewable resources are located in areas requiring either new transmission or transmission upgrades
- ▶ Uncertain whether contracts will perform as projected
- ▶ System integration of intermittent resources becomes more challenging at higher volumes
- ▶ Cost of Renewables are very high (e.g., in comparison to Market Price Referent)
- ▶ Development infrastructure may not be sufficient
 - ▶ **How many sites can be chased by developers at the same time**
 - ▶ **Permitting issues...how much can be handled by permitting agencies**
 - ▶ **Availability of equipment given world-wide increasing demand**
 - ▶ **Availability of funds...concerns expressed by rating agencies re debt risk**

Wind and Solar are key renewables

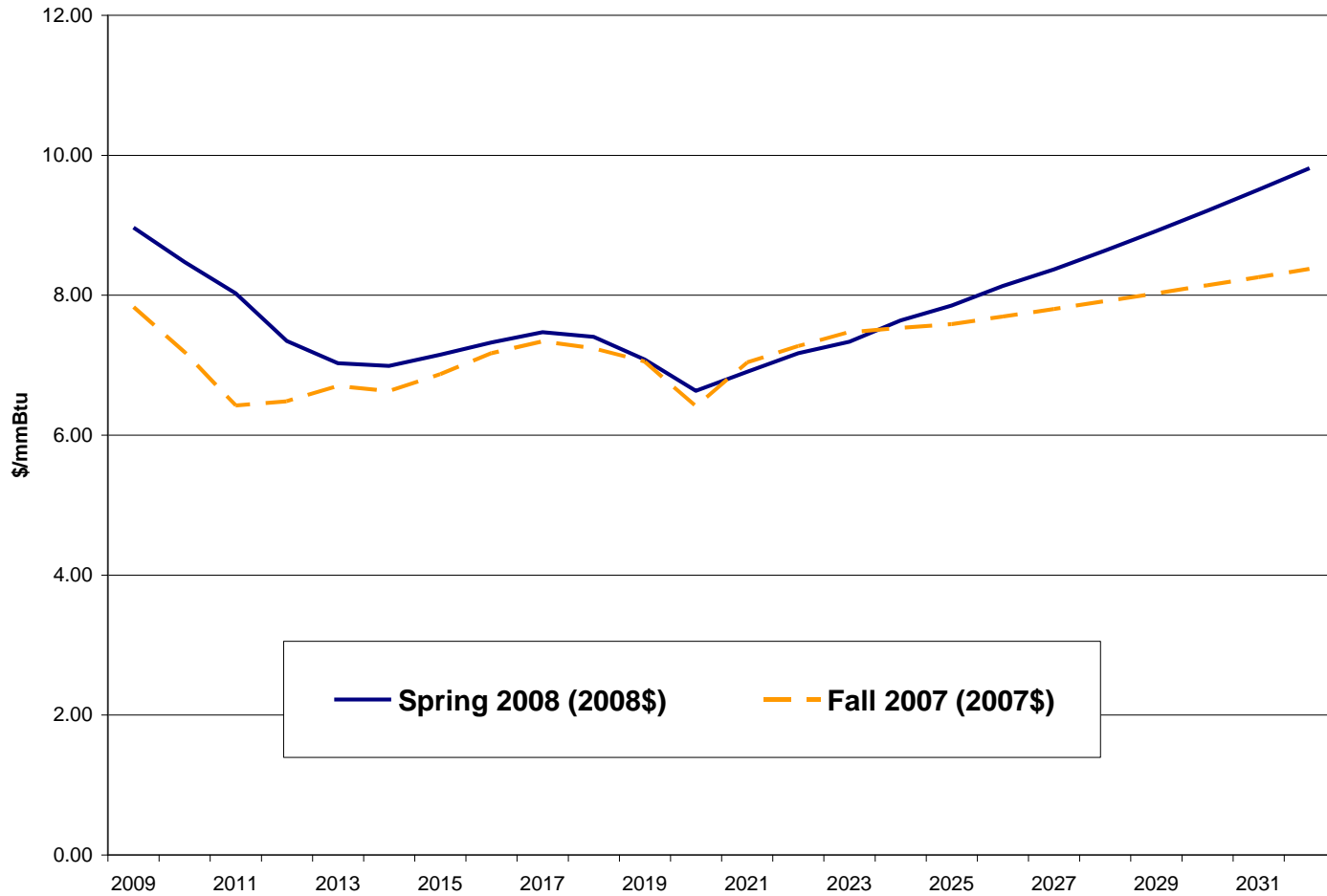
▶ Wind [location-location-location]

- ▶ Capital Cost 1500-3500 \$/KW? (excluding transmission)
- ▶ O&M Cost ???????
- ▶ Production Tax Credit....maybe-maybe not
- ▶ Capacity Factor...23% - 50%
- ▶ Resource Adequacy Contribution...5%-20%
- ▶ Financing debt/equity...debt cost/equity cost???
- ▶ Bottom Line....\$70-120/MWh. Generally over \$100
 - ▶ REC value (function of PTC, gas price, firmness of RPS requirement, GHG rules, etc.)

▶ Solar - Thermal Trough

- ▶ \$140/MWh
- ▶ Good Resource Adequacy Contribution

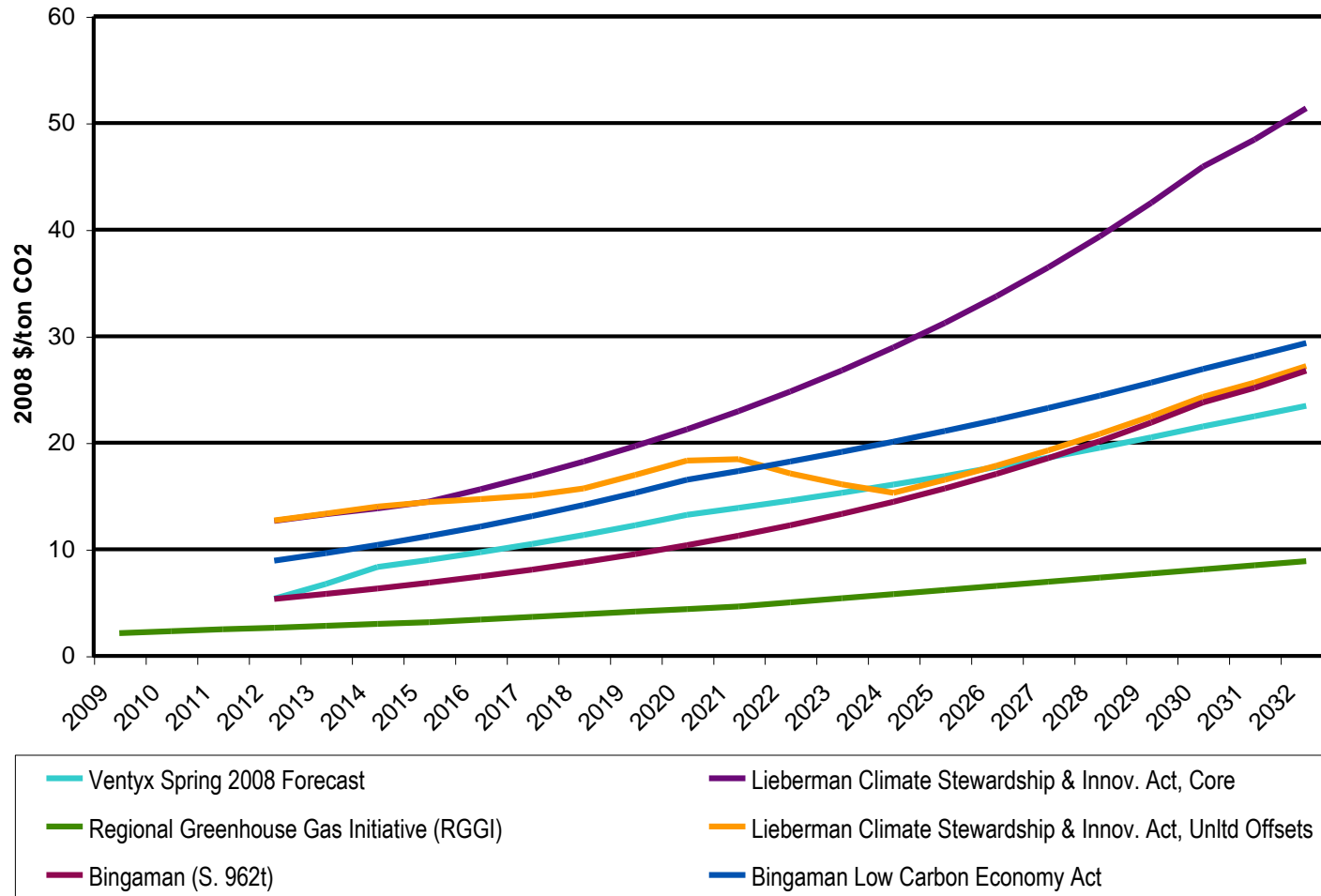
Fuel Prices



Combined Cycle

- ▶ Heat Rate 7000 or less
- ▶ At \$10 gas price, fuel is \$70/MWh
- ▶ Fixed Cost may add \$15-20/MWh
- ▶ 0.5 tons/MWh CO₂...
- ▶ At \$10/ton CO₂ allowance cost, CO₂ cost is \$5/MWh.
- ▶ Resource Adequacy value is full MW rating
- ▶ Gas plants can be built close to load, reducing the need for new major transmission lines

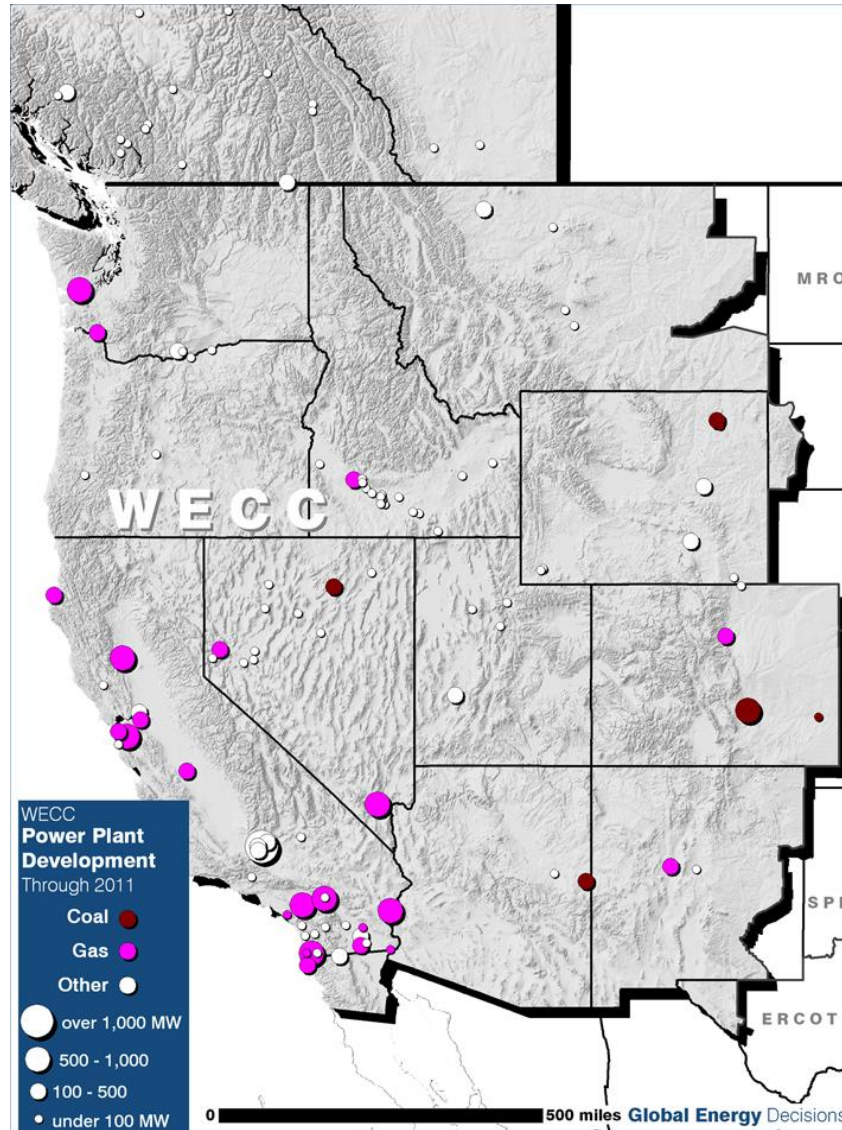
CO₂ Price Forecast



Current Conditions extended into the future scenario

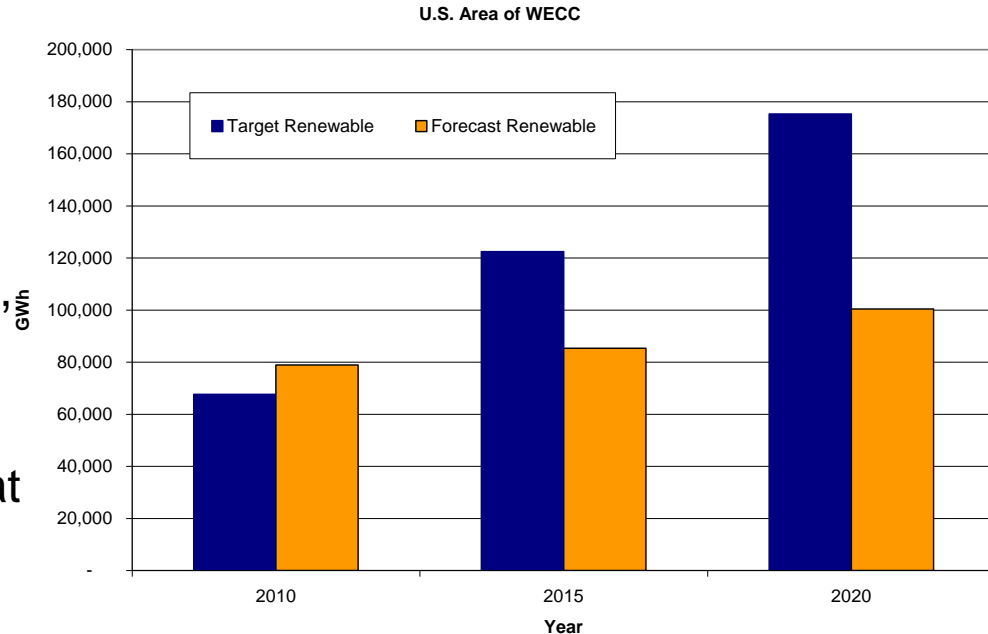
Gas continues to have advantages over other resource candidates in our opinion. Unless/until politicians and regulators put more teeth in RPS rules or establishes a large CO2 cost, our view is that we will build some renewables, but not meet our goals.

Location of 19,000 MW WECC Named New Additions 2008-2012



Our Renewable Assumptions

- ▶ Fall 2007 Assumption was 1,000 MW/year of new wind
- ▶ Spring 2008 assumption is
 - ▶ 1,000 MW/year new wind
 - ▶ 2,000 MW total Geothermal
 - ▶ 2,500 MW total Solar
- ▶ This moves us closer toward Goals, but does not get us there
- ▶ We have distributed the wind across promising areas of WECC, but not put so much in one area that new transmission is needed
- ▶ We have not attempted to determine who gets credit for the wind in their RPS



Item of Interest - Our View of the Future vs. Others

California Energy Commission “Scenarios” *Project - Purpose*

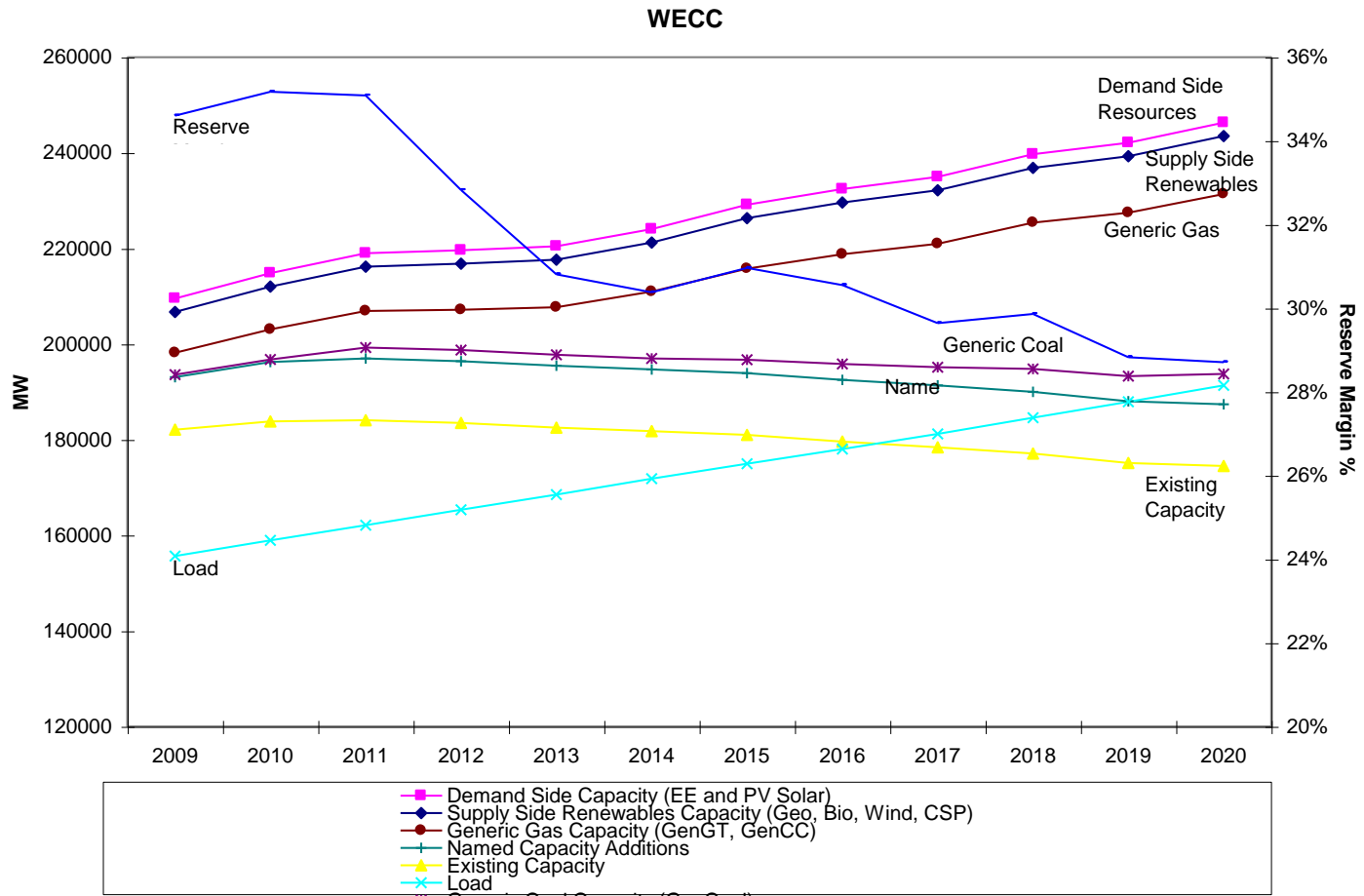
This scenario project is designed to:

- ▶ **Develop a greater understanding of the actions believed to be needed to achieve major reductions in green house gases (GHG) for the electricity sector,**
- ▶ **Understand at least some of the consequences of these actions, and**
- ▶ **Permit some degree of trade-off comparisons.**
- ▶ **Project was originally an extension of the Clean and Diversified Energy Advisory Committee (CDEAC) of the Western Governors [Committee was created to respond to Governors request regarding feasibility of 30,000 MW new renewables by 2015]**

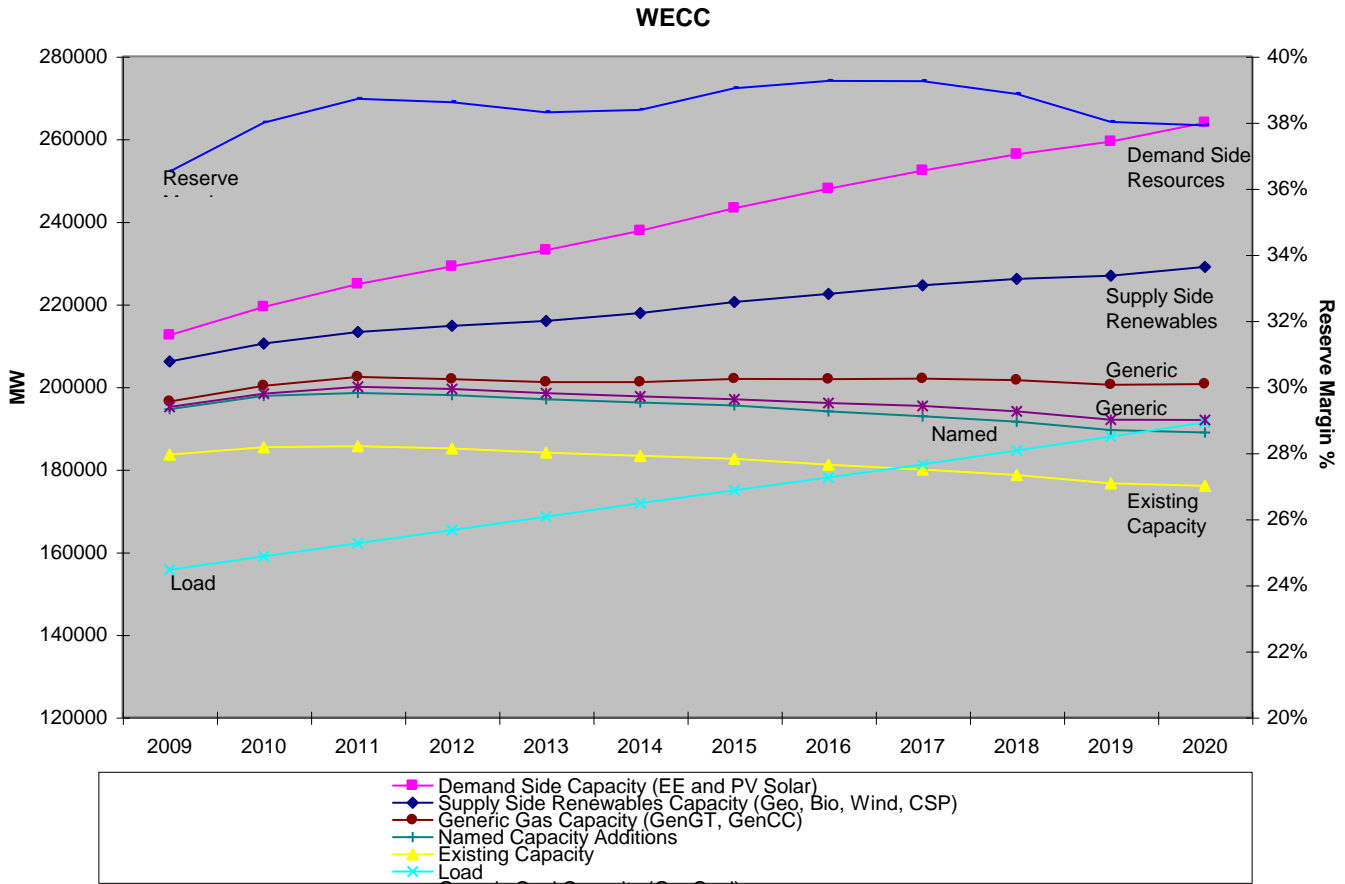
CEC Scenarios –

- ▶ **Case 1 - Current conditions extended into the future**
- ▶ **Case 1B - Compliance with current requirements**
- ▶ **Case 2 - High sustained natural gas and coal prices**
- ▶ **Case 3A - High energy efficiency in California only**
- ▶ **Case 3B - High energy efficiency throughout the West**
- ▶ **Case 4A - High renewables in California only**
- ▶ **Case 4B - High renewables throughout the West**
- ▶ **Case 5A - High energy efficiency and renewables in California only**
- ▶ **Case 5B - High energy efficiency and renewables throughout the West**

Case 1 Load/Resources



Case 5b Load/Resources



Concluding Thoughts

- ▶ Renewables are in great demand based on RPS but...
 - ▶ Renewable targets today have economic out criteria
- ▶ There are many potential renewable sites in WECC but..
 - ▶ Renewables still tend to be expensive
 - ▶ Good renewable sites tend to be in areas where transmission may be necessary
- ▶ GHG concerns may make renewables even more attractive but...
 - ▶ Will policy makers have the willpower to do something to put more teeth in RPS or teeth in GHG rules to assure renewables will be developed despite their high cost?