CARBON UPDATE

February 20, 2018

Items to be covered today

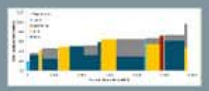
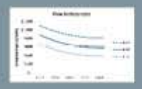
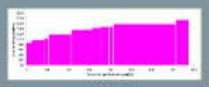
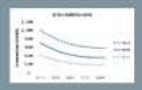
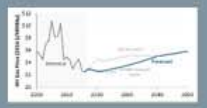
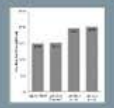
- E3 Study Overview
- Impact of carbon pricing on the District
- Legislative proposals

Public Generating Pool hired E3 to create a scenario analysis tool, to assess how different policies impact cost, emissions, and reliability of the **Electric Sector**.

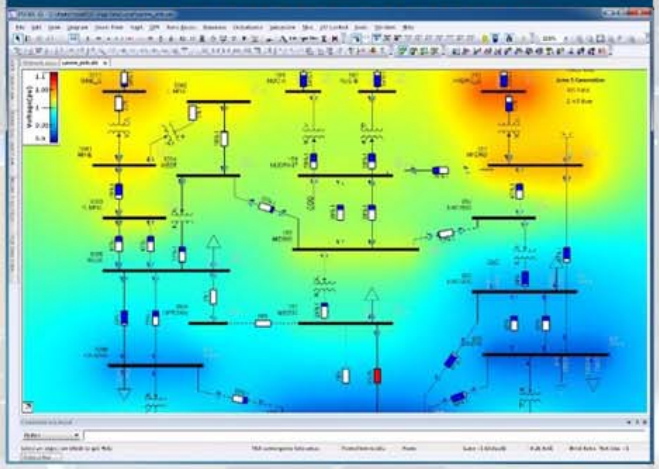
1. How do the policy options impact overall costs?
2. Do different policies perform better or worse in reaching carbon goals?
3. How do carbon policies impact the Northwest resource portfolio?
4. How can modeling of the electric grid protect from unintended policy consequences?

RESOLVE = GRID SIMULATOR

KEY INPUTS

GRID SIMULATOR MODEL



SIMULATOR OUTPUT

- Emissions
- Costs
- Reliability
- Generation Resources

POLICY CONSTRAINTS

- Scenarios 1
- Scenarios 2
- Scenarios 3
- Scenarios 4
- Scenarios 5

POLICY SCENARIOS MODELED

BASE CASE

Case 1
Existing Policies

1. Planned coal retirements
2. 7th Power Plan Conservation
3. Current RPS

+

Case 2 – Carbon Cap

1. Reduce carbon by 40%, 60%, 80%

=

Modeled Impacts

+

Case 3 – Tax

1. $15/ton plus escalation
2. $25/ton plus escalation

=

Modeled Impacts

+

Case 4 – High RPS

1. Build Renewables to 30%, 40%, 50%

=

Modeled Impacts

+

Case 5 – No New Gas

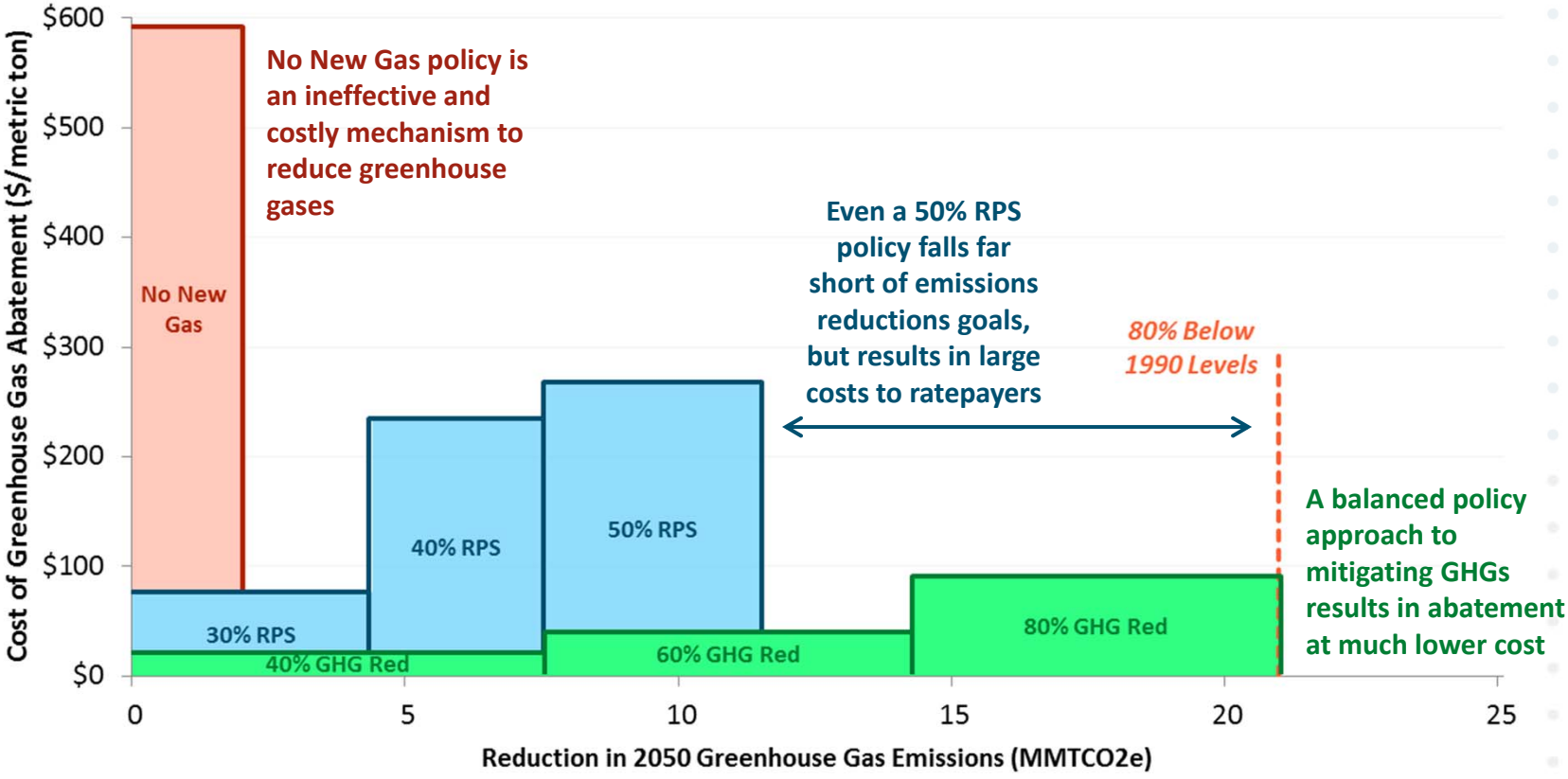
1. No new gas generation

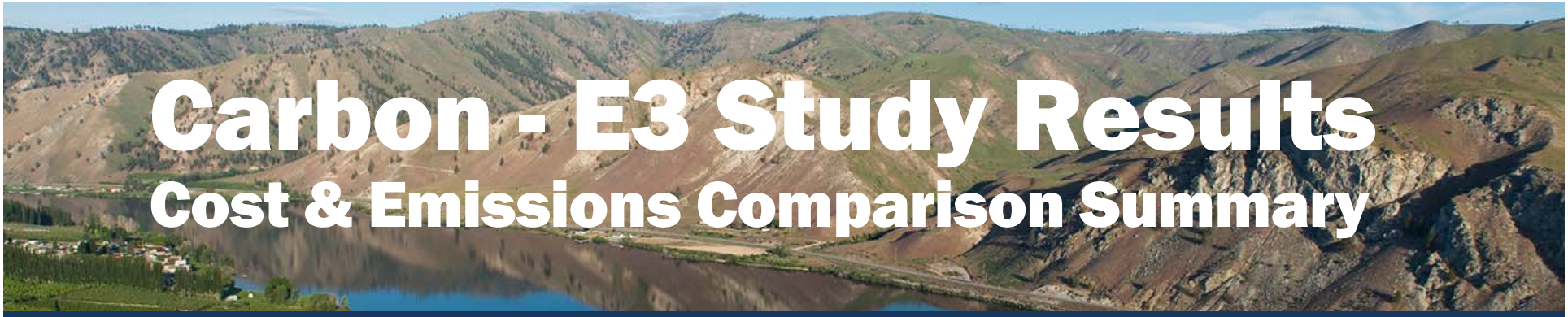
=

Modeled Impacts

Cost of GHG Abatement

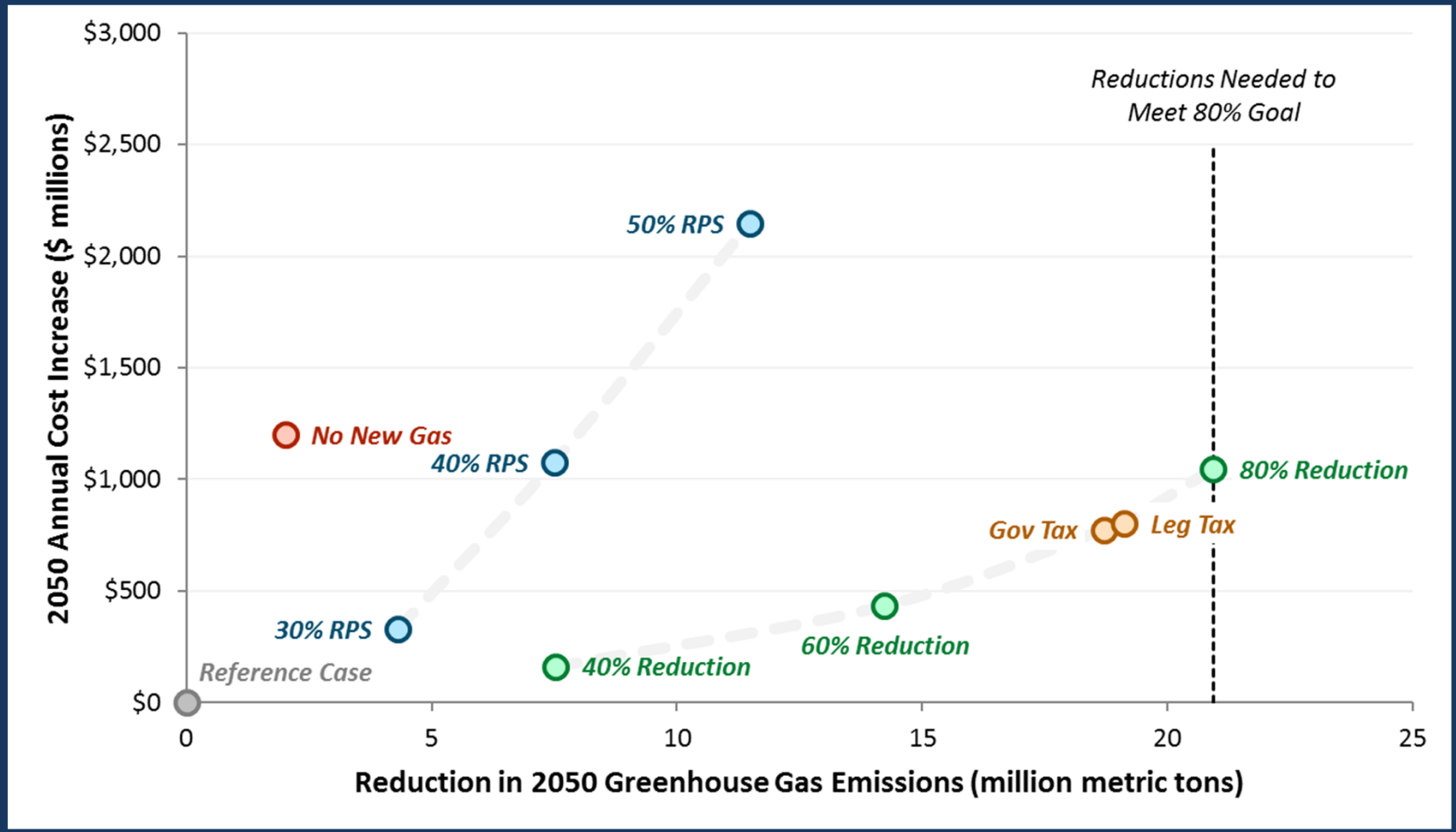
- **Shape of GHG marginal cost curve highlights (1) low-hanging fruit; and (2) high cost of final mitigation measures needed to meet 2050 targets**





Carbon - E3 Study Results

Cost & Emissions Comparison Summary

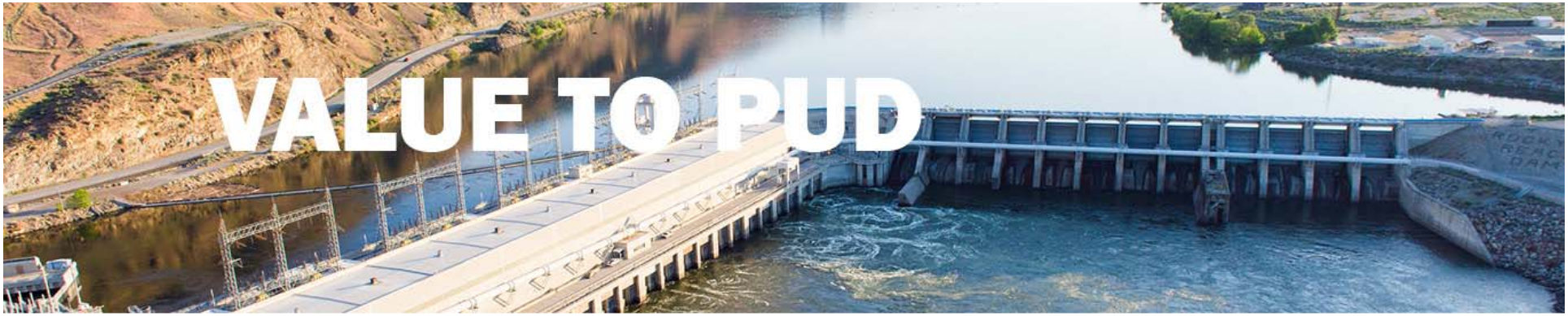


Carbon Findings

1. The most cost-effective opportunity to reduce carbon in the electric sector is to **replace coal** with energy efficiency, renewables, and natural gas.
2. **Natural gas is a critical flexible** capacity resource for reliability. The value of flexible capacity will increase over time.
3. Additional **renewable resources are essential** to meet a low carbon future.
4. A **cap and trade or carbon tax approach costs less** than an increase to the Renewable Portfolio Standard

Carbon Findings

5. **Prohibition of new natural gas adds significant cost** but does little to reduce GHG emissions.
6. **Existing zero-carbon resources are extremely valuable**. Replacing 2000 MW of existing hydro and nuclear would require nearly 6000Mw of new wind and solar in addition to 2000Mw of gas. Cost would increase an additional $1.6B per year.
7. **Research and Development is needed** for the next generation of Energy Efficiency measures. Higher cost measures may become cost-effective.
8. **Vehicle Electrification is a low-cost measure** for reducing carbon emissions in the transportation sector. Early carbon reduction achiever opportunity.



- Impact of carbon tax bill

Regulatory Approach	Incremental Revenue Earlier Years	Incremental Revenue Later Years
Carbon Tax	$0-3M	$0-6M

- Impact of renewable portfolio standard bill

LEGISLATION AND INITIATIVE PATHWAYS

Bill #	Type	Sponsor	Summary
SB6203	Carbon Tax	Carlyle	$12-30 tax increasing $1.80/yr. Revenues used for carbon reduction, EV investments.
SB6253	100% clean, tax breaks	Ranker, Doglio	Eliminate fossil fuel by 2045. Increasing carbon use penalties starting in 2030. 1/3 revenues used for low income assistance and 2/3 for emission reduction investments
HB2402	RPS, EIA Increase, Tax Credits	Tarleton	Increases RPS by 15% for COU, 20-50% increase for IOU. Eliminates alternative compliance pathways. Federal Incremental Hydro.
HB 2283	Drafting Striker Tax Incentives	DeBolt, Condotta	Requires "Clean Energy Resources" for "new energy or capacity needs". Includes BPA incremental power (including RECs), "clean" resources must be used for new load, gas is permitted for NERC compliance, tax credits for GHG reduction investments.
Initiative	Tax or Fee	Alliance for Clean Energy and Jobs	Similar to 6203, load based, higher tax/fee rates
Initiative	100% Clean No Carbon	Climate Solutions	Unlikely to evolve, could be based on SB6253


Questions?