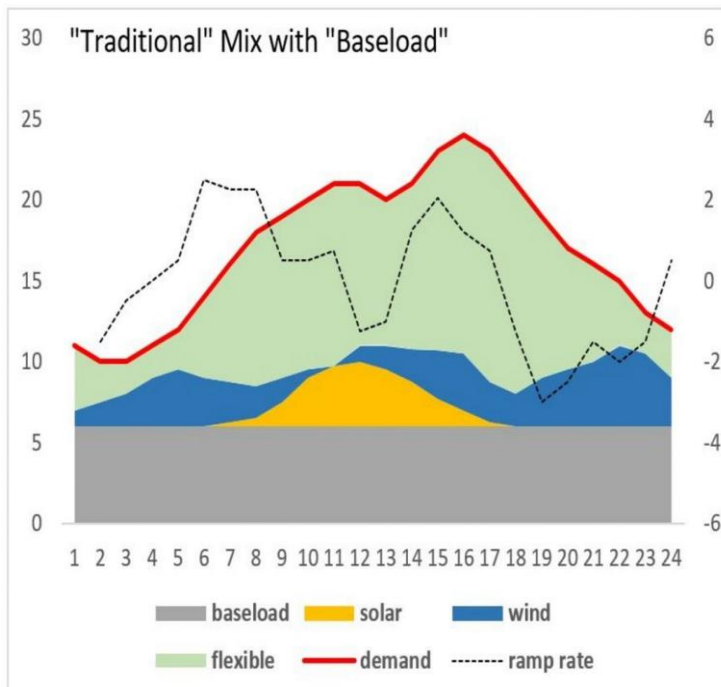


Proposals using carbon emissions

- ga-050-Total System Performance Ratio
 - Adds performance calculation to Prescriptive Path using carbon emissions rather than energy cost.
 - Recommend disapproval because it adds complexity, time and expense rendering Prescriptive Path no longer prescriptive.
 - Or, use energy cost or correct carbon emissions factor for electricity.
- ga-141-Use ASHRAE 90.1, Appendix G for Performance Path.
 - Uses carbon emissions rather than energy cost.
 - Recommend using energy cost or the correct carbon emissions factor for electricity.

Avoided/Marginal Emissions

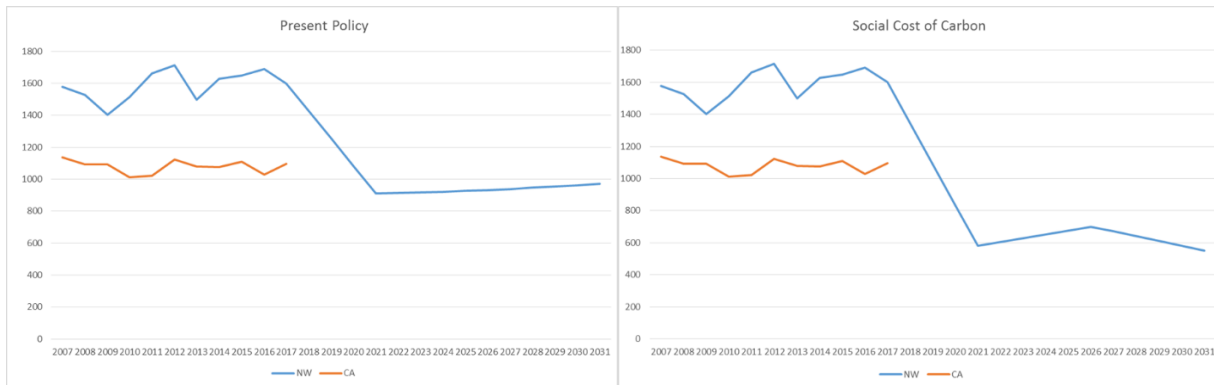
- Saved energy/conservation = saved or avoided emissions.
- Emissions factor for natural gas is straightforward. Emissions factor for electricity is more complex because of different resources (coal, nuclear, natural gas, hydro, wind, solar).
- EPA, ASHRAE, NWPC and others agree that using a marginal rather than an average emissions factor is the correct metric for those avoided emissions in evaluating effects of energy conservation (energy codes).
- Thermal resources (coal, natural gas) and not renewables are almost always the marginal resource. Adding load or saving energy does not affect base-loaded or renewable resources.



Northwest Power & Conservation Council Report

- NWPCC March, 2018 report on “Avoided Carbon Dioxide Production Rates in the Northwest Power System.”
 - Actual avoided rate in 2016 for WECC was 1.83 lbs/kwh. eGrid for NWPP slightly lower.
 - Projected rates based on Present Policy Scenario in 2021, 2026 & 2031 are .91, .93 & .97 lbs/kwh respectively.
 - These rates assume a cost of carbon based mostly on the CA market ranging from \$11/ton in 2016 to \$23/ton in 2031.
 - Projected rates based on Social Cost of Carbon Scenario are .58, .70 & .55 lbs/kwh respectively.
 - These rates assume using the Social Cost of Carbon as the real cost of carbon ranging from \$45/ton to \$66/ton.
 - There is no actual cost of carbon today other than in CA and it would be highly speculative to project a real cost of carbon = SCC.

Comparison between historical and projected avoided emissions rates for Present Policy & SCC



Why does the emissions factor matter?

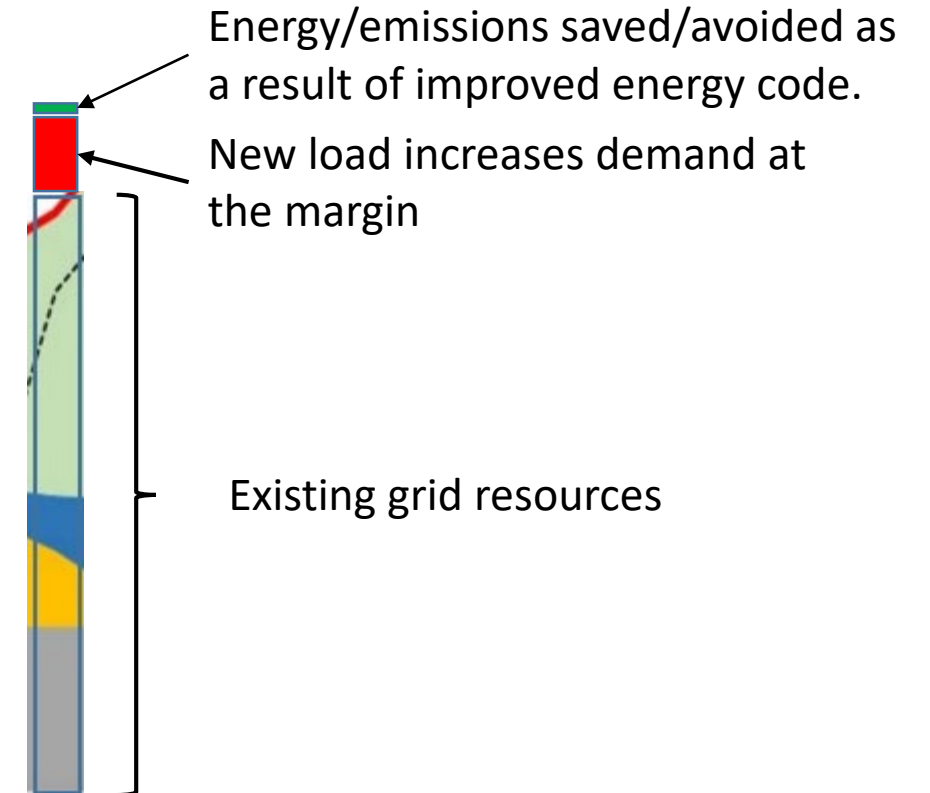
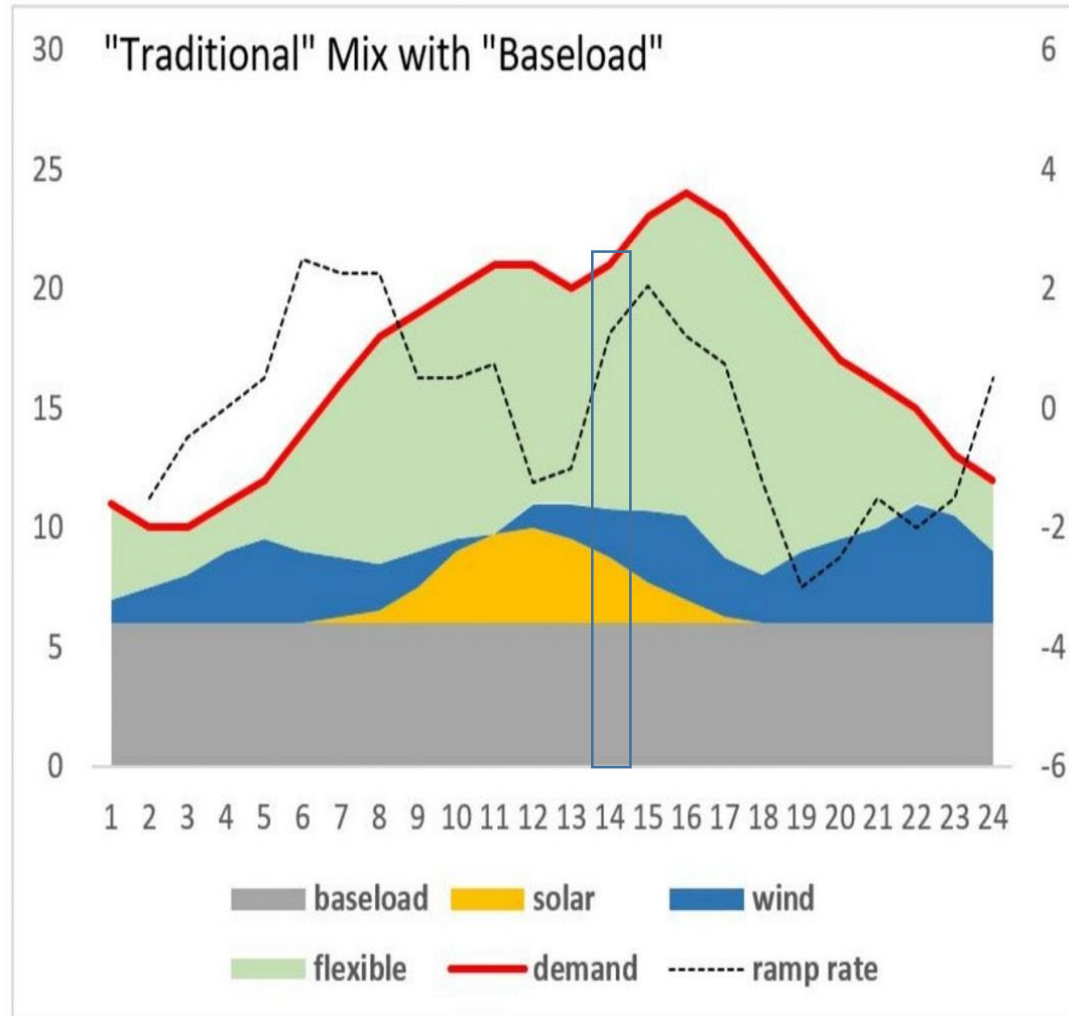
A1 A2 B1 B2 C1 C2

	Base System: WSHP/DOAS/ERV 70%	Minimum FCU: DOAS/ERV 50%	Improved FCU: DOAS/ERV 70% +eff: CH/HW/Pump	Minimum VAV: HW RH	High-Eff.+ VAV: HW RH; DCV; MDP +eff: CH/HW/Pump	Minimum VAV: Elec RH	High-Eff.+ VAV: Elec RH; DCV; MDP +eff: CH/HW/Pump
TSPR (Energy Cost)	74.65	69.41	77.78	80.73	100.27	55.72	80.62
TSPR (CO2e- Electric 0.55 lb./kWh, Gas 11.7 lb./Therm)	14.92	13.21	15.4	12.63	16.73	11.35	16.42
TSPR (CO2e- Electric 0.46 lb./kWh, Gas 11.7 lb./Therm)	17.71	15.41	18.23	13.88	18.72	13.57	19.63
TSPR (CO2e- Electric 0.82 lb./kWh, Gas 11.7 lb./Therm)	10.13	9.25	10.52	9.95	12.69	7.61	11.01
TSPR (CO2e- Electric 1.0 lb./kWh, 11.7 lb./Therm)	8.34	7.71	8.68	8.71	10.93	6.24	9.03

Summary Recommendations

- ga-050-Total System Performance Ratio
 - Option 1: Disapprove based on the added complexity, time and expense necessary for compliance. Renders Prescriptive Path no longer prescriptive.
 - Option 2: Retain, but use energy cost or an emissions factor for electricity of .91 - .97 lbs/kwh.
- ga-141-ASHRAE 90.1, Appendix G as Performance Path
 - Retain, but use energy cost or an emissions factor for electricity of .91 - .97 lbs/kwh.

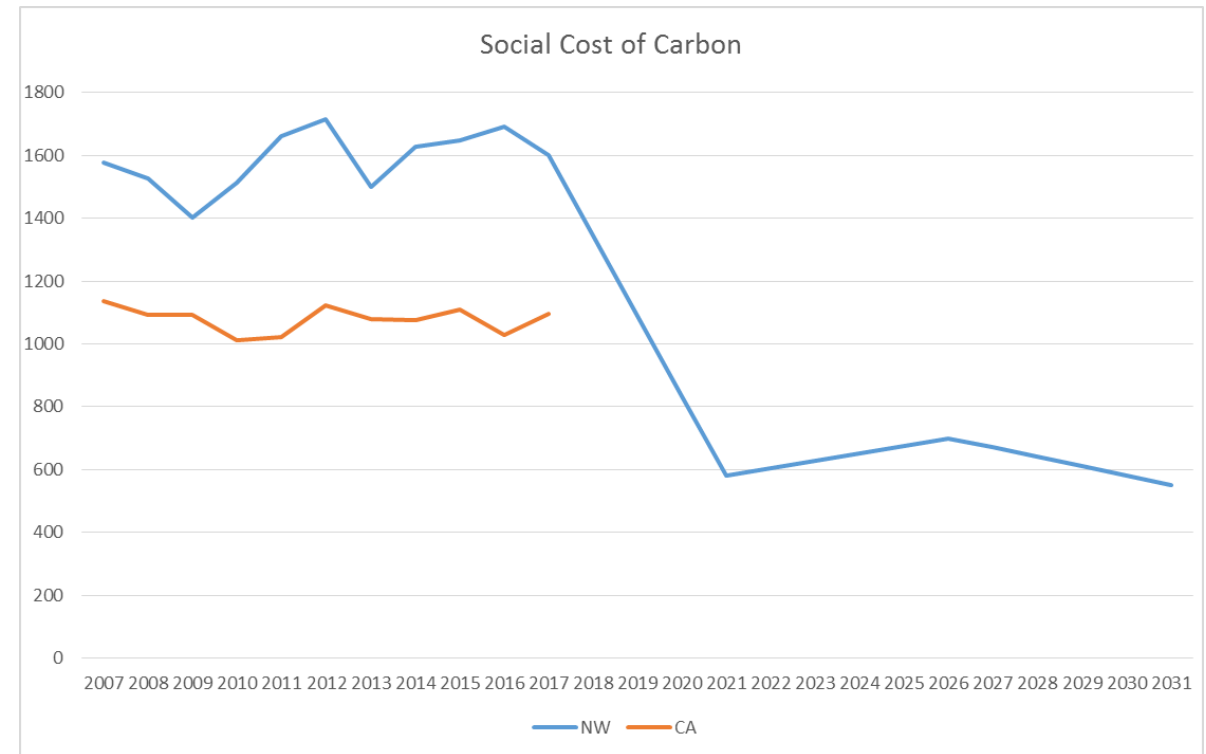
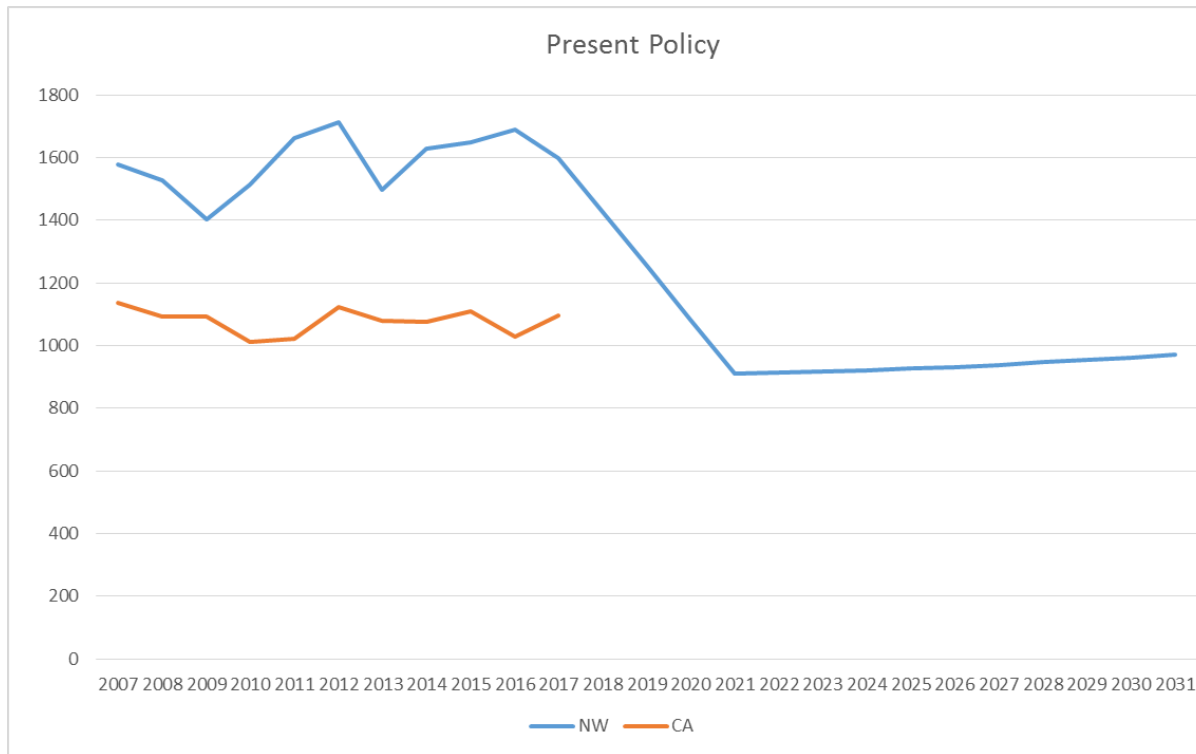
Marginal (Non-Baseload) Electricity Resource



NWPCC March 2018 Report on Avoided Emissions

- Present Policy: .91-.97 lbs/kwh; CC=\$11-\$23/ton
- SCC: .55-.70 lbs/kwh; CC=SCC=\$45-\$66/ton

Comparison between historical and projected carbon factors for Present Policy & SCC



Why does the emissions factor matter?

	Base System: WSHP/ DOAS/ ERV 70%	Minimum FCU: DOAS/ ERV 50%	Improved FCU: DOAS/ ERV 70% +eff: CH/HW/ Pump	Minimum VAV: HW RH	High-Eff.+ VAV: HW RH; DCV; MDP +eff: CH/HW/ Pump	Minimum VAV: Elec RH	High-Eff.+ VAV: Elec RH; DCV; MDP +eff: CH/HW/ Pump
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