Incorporating Energy Efficiency into Regional Transmission Planning: Experiences from the West

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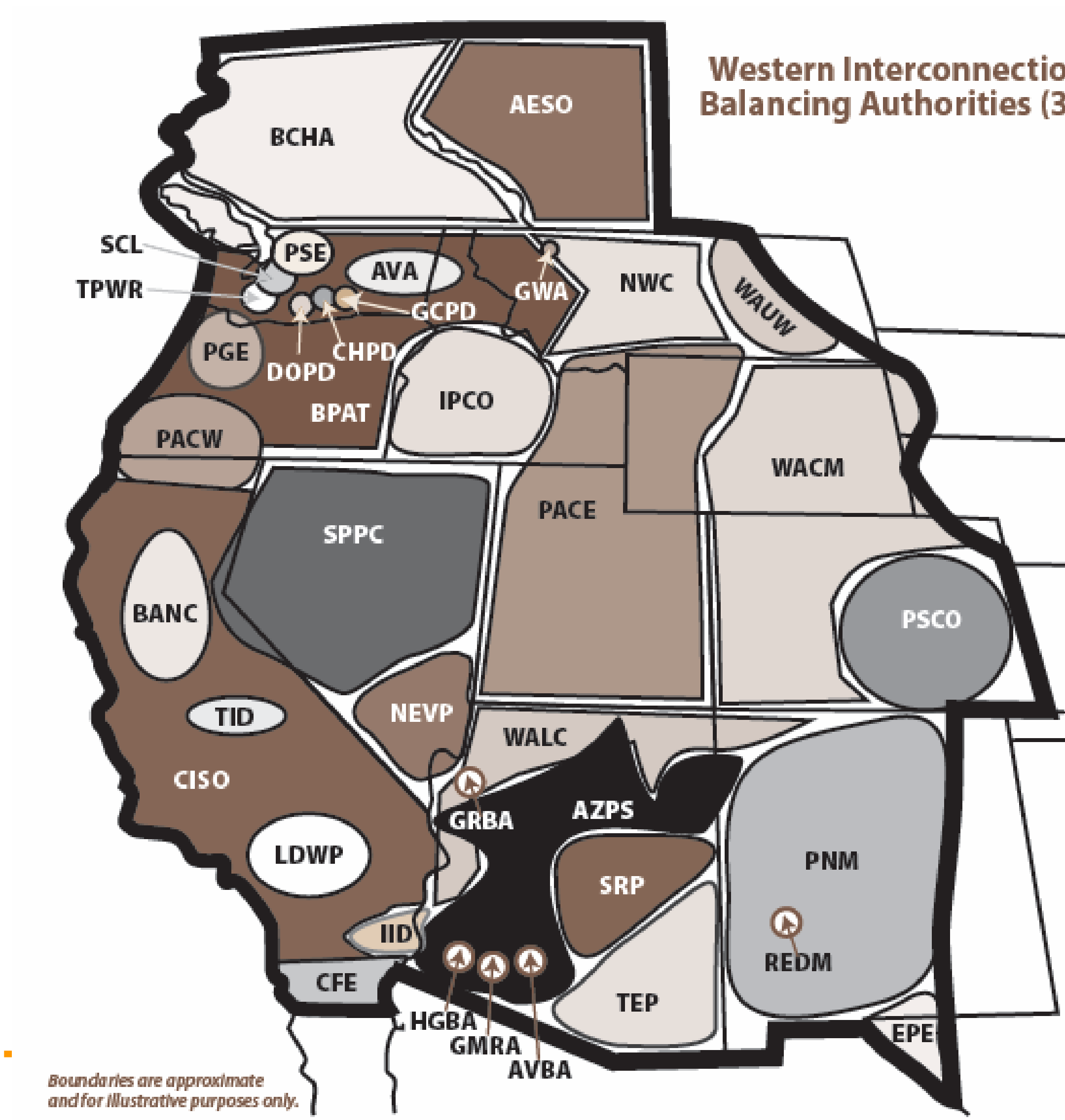
Background: Transmission Planning Process in the Western Interconnection

- **The Western Electricity Coordinating Council (WECC) conducts transmission planning studies for the Western Interconnection**
- **Purpose is to evaluate economic transmission upgrades, not reliability upgrades**
- **Production cost modeling to characterize future congestion levels and inform decisions about potential transmission capacity additions**
- **Stakeholder-driven process to develop scenarios and assumptions**
- **Currently conducting 10-year analysis** (2022)
- **Similar to utility IRP, but different:**
  - Informational, not prescriptive
  - WECC does not have regulatory authority over transmission development

Background: DSM in WECC's Transmission Planning Analyses

- **DSM assumptions varied across two scenarios:**
  - Common Case (i.e., the reference case)
  - High DSM Case
- **Both scenarios required the development of modeling assumptions regarding the impact of:**
  - Energy efficiency programs and policies
  - Demand response programs and dynamic pricing tariffs
  - Distributed generation
- **DSM and DG assumptions (resource levels and characteristics) developed for each individual balancing authority**

Balancing Authorities (BAs) in the Western Interconnection

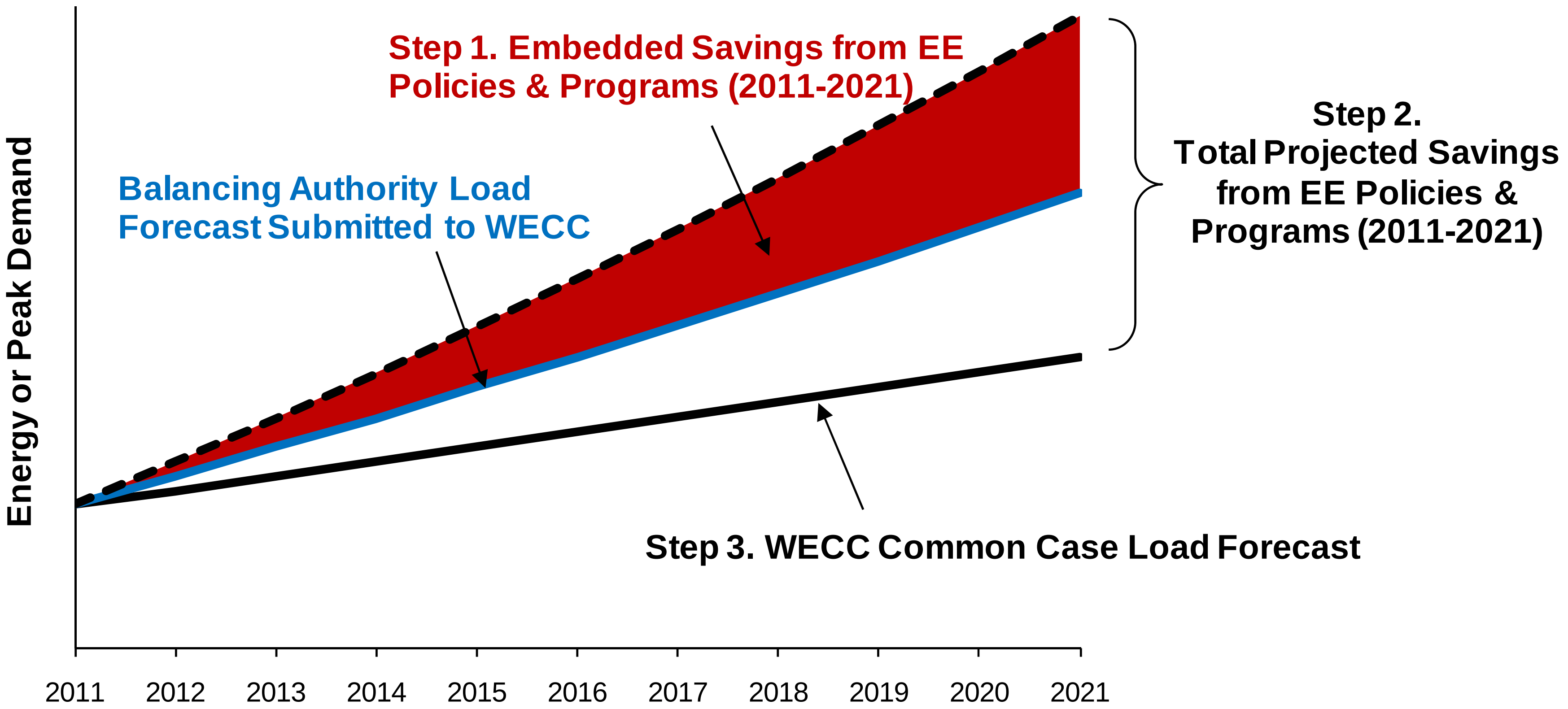


WECC Common Case

Energy Efficiency Assumptions and Methodology

Developing the Common Case Load Forecasts

Adjust load forecasts submitted by balancing authorities to reflect the expected impact of current EE policies and program plans



Estimating the “Embedded” Savings in Balancing Authority Load Forecasts

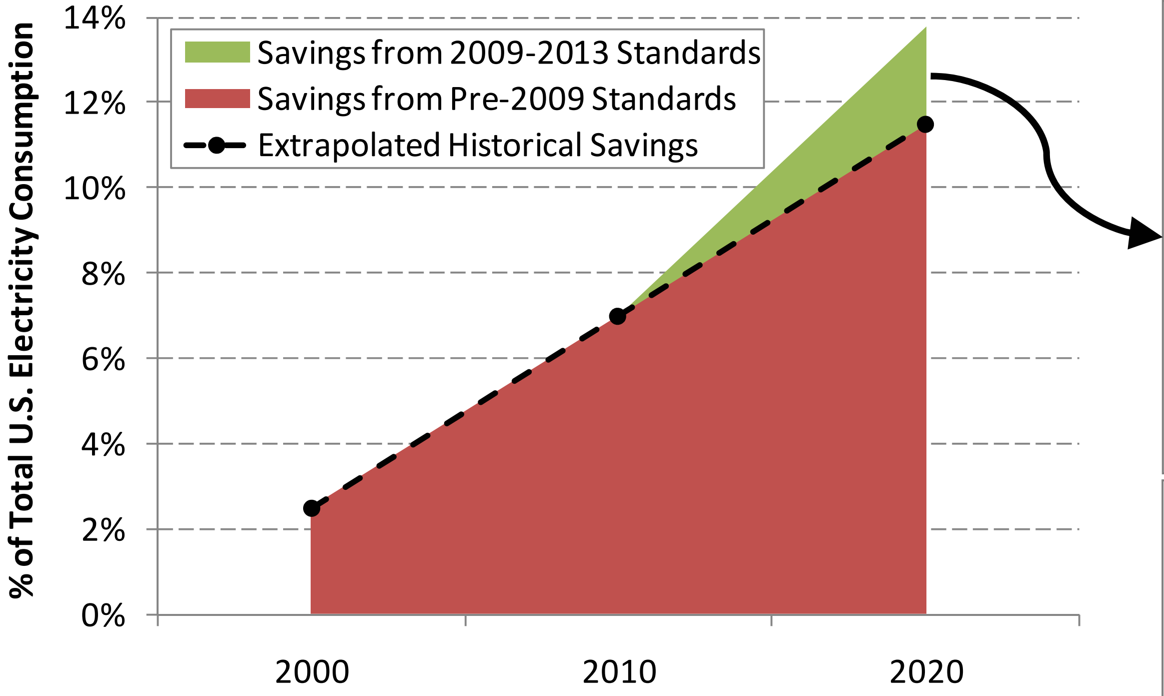
- **Two types of policies of primary interest:**
  - Customer-funded (aka “ratepayer-funded”) EE programs
  - Federal appliance, lighting, and equipment standards
- **Interacted extensively with balancing authority load forecasting staff in order to understand underlying EE assumptions**
- **Most BA forecasts fully captured expected savings from customer-funded programs, though there were exceptions:**
  - Some only account for existing programs, not planned new programs
  - Some only account for programs through the end of their current funding cycle
  - Some forecasts do not explicitly model any programs; implicitly assume continuation of historical savings rate

Federal Appliance/Lighting Standards
Embedded Savings in BA Load Forecasts

- **Many load forecasts do not explicitly model the impact of federal standards**
- **Default Assumption:** *Embedded savings from standards is equal to the amount that would occur if savings continued to accumulate at their historical rate*
- **Some load forecasts are based on end-use model or statistical adjustments that can capture the impact of federal standards**
  - These load forecasts may account for recently-adopted federal standards, even those that haven't yet gone into effect, but typically don't model scheduled future standards
- **BPA and Northwestern public utility districts:** Load forecasts are net of Council's conservation targets, which capture the potential savings from future federal standards

Adjusting Load Forecasts to Account for Accelerated Savings from Federal Standards

- **Savings from federal standards over the next decade expected to accumulate at faster than the historical rate, due to standards adopted over the 2009-2013 timeframe**

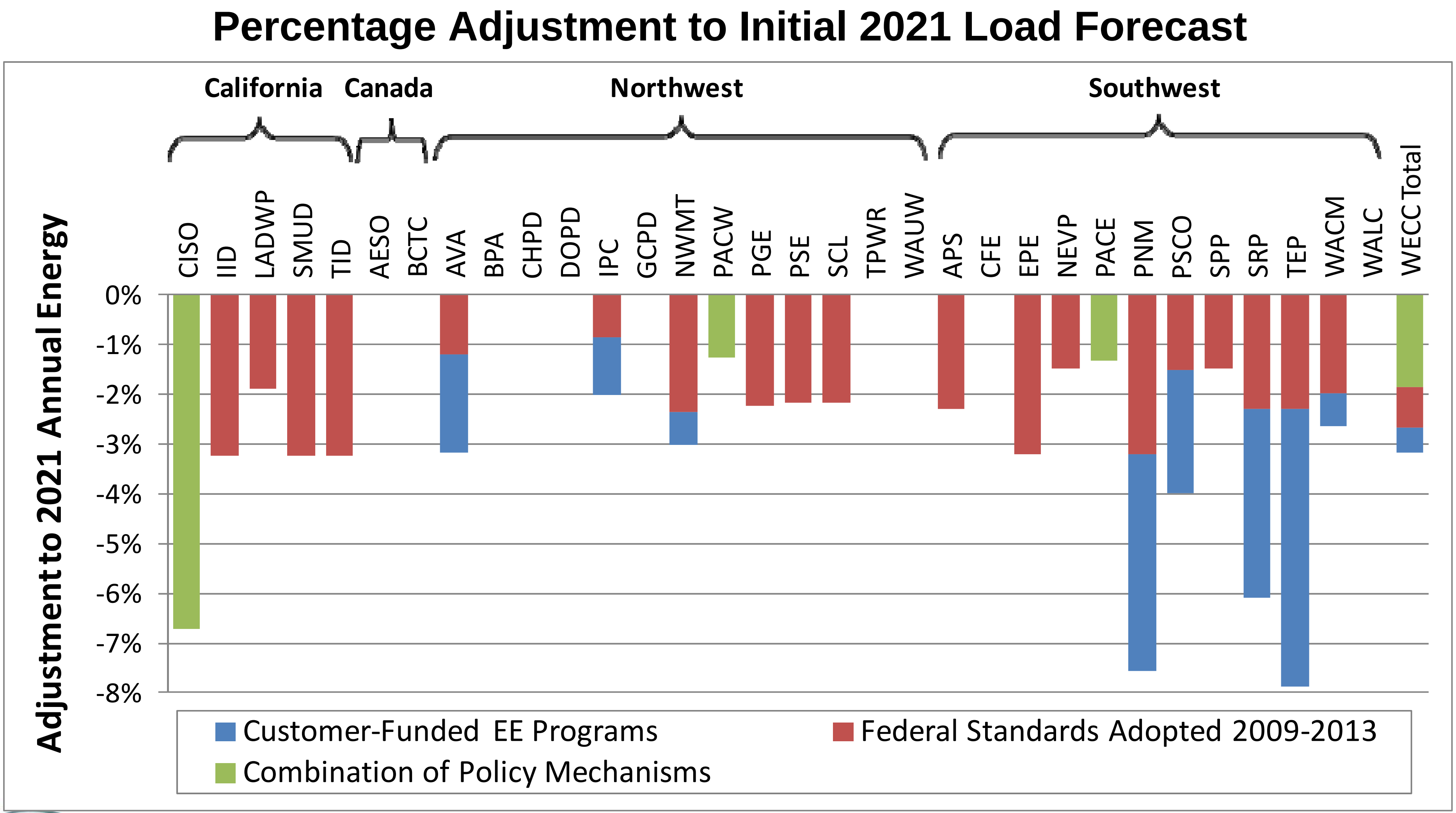


Source: Chart based on data in ACEEE/ASAP "KaBOOM" report

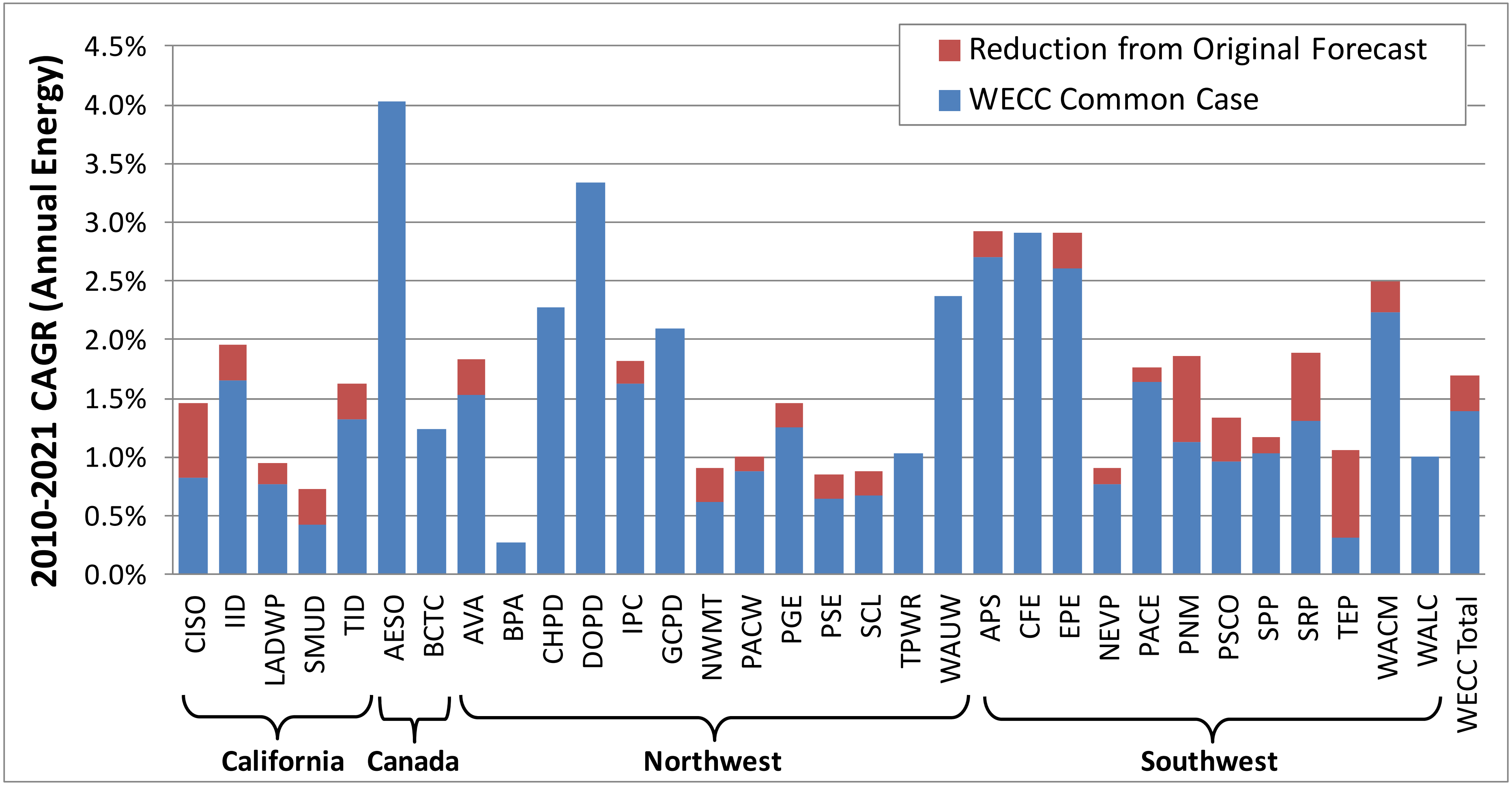
Assume that savings from 2009-2013 standards are not captured in pure econometric forecasts lacking an end-use model or adjustment

For other balancing authorities, assume that forecast captures all or a portion of savings from 2009-2013 standards

Adjustments to Initial BA Load Forecasts:
Percentage Reduction to Annual Energy in 2021



WECC Common Case Load Forecasts



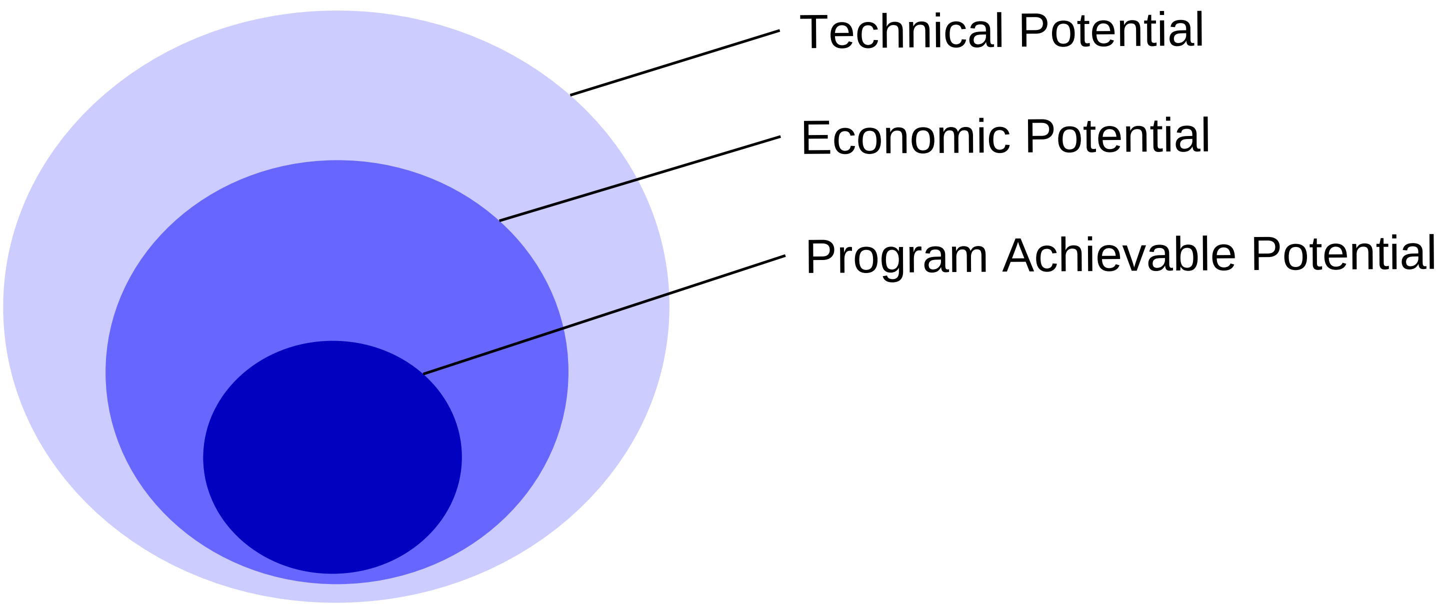
High DSM Case

Energy Efficiency Assumptions and Methodology

Results shown here are for last year's WECC study; the high DSM case for this year's study is currently under development

High DSM Scenario
Background

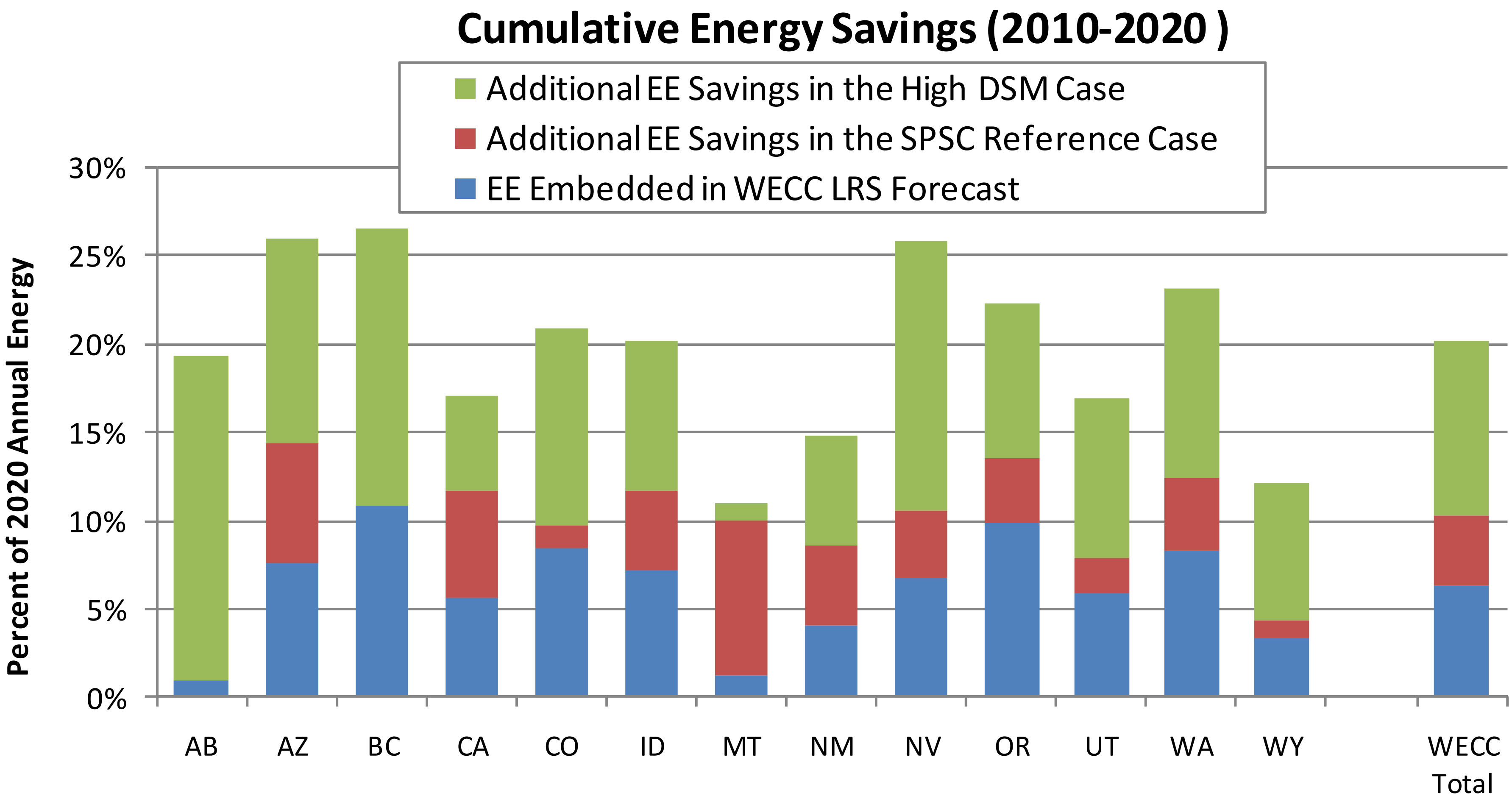
- **High DSM scenario was based on achieving the full *economic energy efficiency potential* throughout the West**



Energy Efficiency Potential Studies Used for the High DSM Scenario

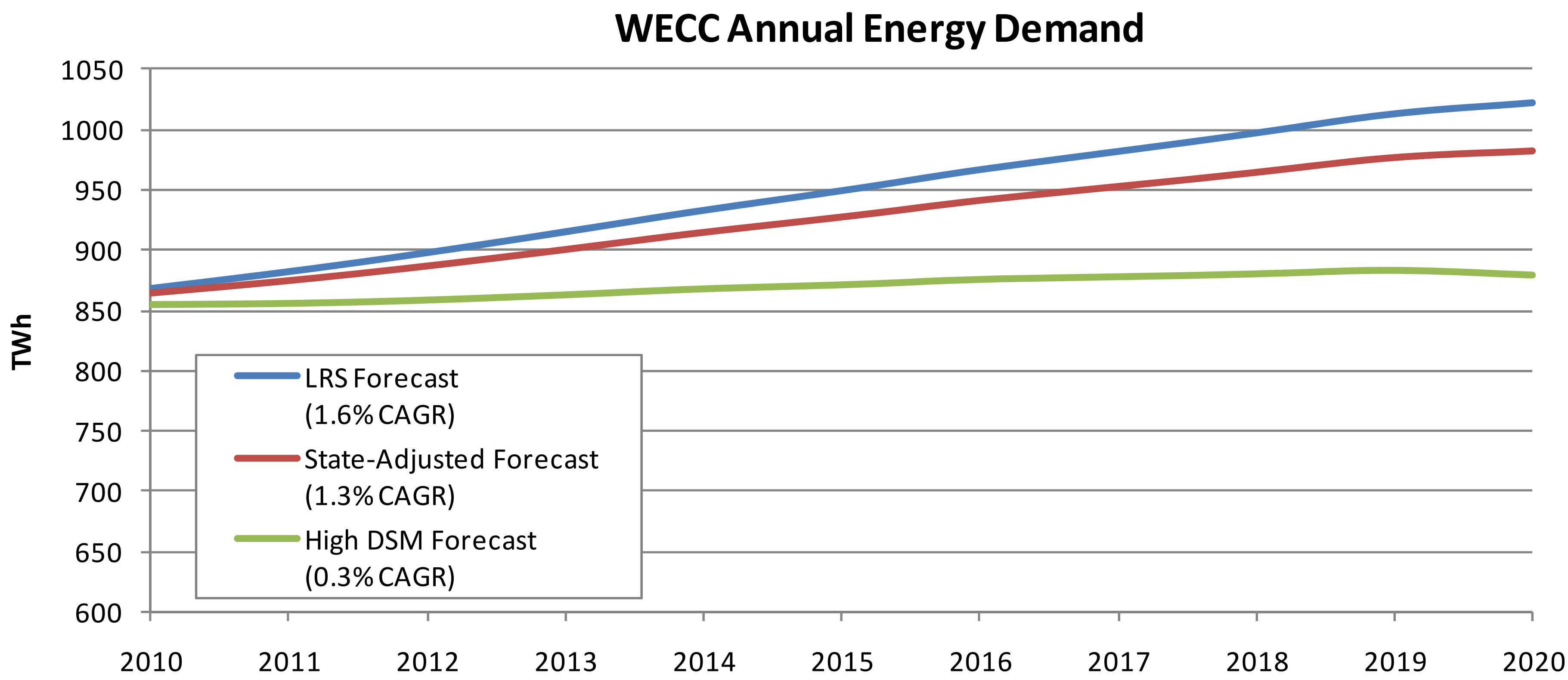
Region	Utility	Potential Study
Mountain	PSCo	KEMA. 2010. *Colorado DSM Market Potential Assessment: Final Report.* Prepared for Xcel Energy.
	Tri-State	Nexant. 2010. *System Wide Electric Energy Efficiency Potential Study*
	Colorado Springs	Summit Blue Consulting. 2010. *Colorado Springs Utilities Demand-Side Management Potential Study and Plans.*
	Alberta	Canadian Manufacturers and Exporters Association. 2010. *Improving Energy Efficiency for Alberta's Industrial and Manufacturing Sectors.*
Pacific Northwest	N/A (region-wide)	Northwest Power and Conservation Council. 2010. *6th Power Plan.*
	BC Hydro	Marbek & Associates. 2007. *BC Hydro 2007 Conservation Potential Review*.
	Idaho Power	Nexant. 2009. *Idaho Power Demand Side Management Potential Study.*
	Northwestern	Nexant. 2010. *NorthWestern Energy Assessment of Energy Efficiency Potentials (2010-2029).*
	Pacific Power	Quantec. 2007. *PacifiCorp Assessment of Long-Term, System-Wide Potential for Demand-Side and Other Supplemental Resources*.
Southwest	Rocky Mountain Power	Quantec. 2007. *PacifiCorp Assessment of Long-Term, System-Wide Potential for Demand-Side and Other Supplemental Resources.*
	Arizona Public Service	ICF. 2007. *Arizona Public Service Energy Efficiency Potential Study.*
	Public Service New Mexico	Itron. 2006. *Public Service New Mexico Electric Energy Efficiency Potential Study*.
	Salt River Project	Cadmus. 2010. Salt River Project 2012-2017 Energy Efficiency Plan, Final Report.
California	Investor-owned utilities	California Energy Commission. 2010. *Incremental Impacts of Energy Efficiency Policy Initiatives Relative to the 2009 Integrated Energy Policy Report Adopted Demand Forecast.*
		Itron. 2008. *California Energy Efficiency Potential Study*.

Energy Efficiency Savings in the High DSM Case, Reference Case, and Initial Forecasts



Note: "WECC LRS Forecast" refers to the set of forecasts initially submitted to WECC by the balancing authorities (i.e., prior to any efficiency adjustments)

Comparison of High DSM Load Forecast to Reference Case and Initial BA Forecasts

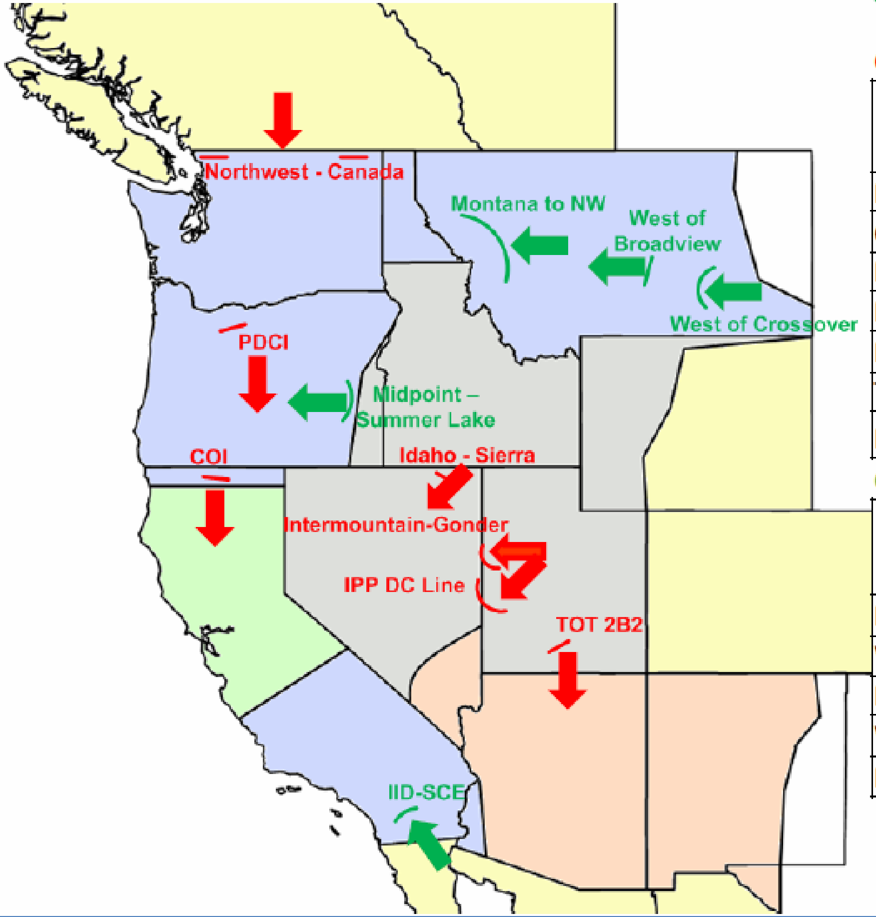


Impact of High DSM on Congestion: The Fundamentals

- **Congestion occurs when transmission constraints require relatively expensive generation to be dispatched instead of cheaper generation located on the other side of the constraint**
- **Impact of High DSM on congestion is not totally intuitive**
- **Primary effect**
  - High DSM will decrease congestion if it occurs in an importing region
  - But it will increase congestion if it occurs in an exporting region
- **Secondary effect: High DSM reduces RPS requirements**
  - Reduces congestion by reducing the need for remote renewables
- **Net impact of High DSM on congestion levels will depend on the relative magnitude of the effects above**

Impact of High DSM on Congestion in the WECC 2020 Study

- Greatest increases in U90 shown in red
- Greatest decreases in U90 shown in green



Greatest Increases in U90

Path	U90	Change in U90 Relative to Ref Case
NORTHWEST - CANADA	31%	25%
COI	74%	22%
IDAHO - SIERRA	21%	19%
IPP DC LINE	38%	17%
PACIFIC DC INTERTIE	23%	13%
TOT 2B2	19%	13%
INTERMOUNTAIN - GONDER 230 KV	36%	12%

Greatest Decreases in U90

Path	U90	Change in U90 Relative to Ref Case
MIDPOINT - SUMMER LAKE	4%	-3%
WEST OF BROADVIEW	2%	-3%
MONTANA - NORTHWEST	21%	-4%
WEST OF CROSSOVER	5%	-4%
IID - SCE	10%	-9%

Summary and Conclusions

- **EE is not really a "resource" for relieving *economic* transmission congestion** (in the same way as it is for reliability)
  - Reducing congestion is potentially a byproduct of EE, but not really an objective
- **But it is still important to rigorously account for EE and DSM in transmission planning activities → it affects congestion levels and the value of potential transmission additions**
- **The impact of EE on regional congestion is not always intuitive**
- **The methods and protocols for ensuring a robust treatment of energy efficiency and other DSM resources are still evolving (lots of lessons to be learned from utility IRP)**
- **Challenges: Data availability, time/resource constraints, educating broad base of stakeholders**

Thank you!