

Building a Sustainable 21st Century Electric Market

Minnesota Public Utilities Commission

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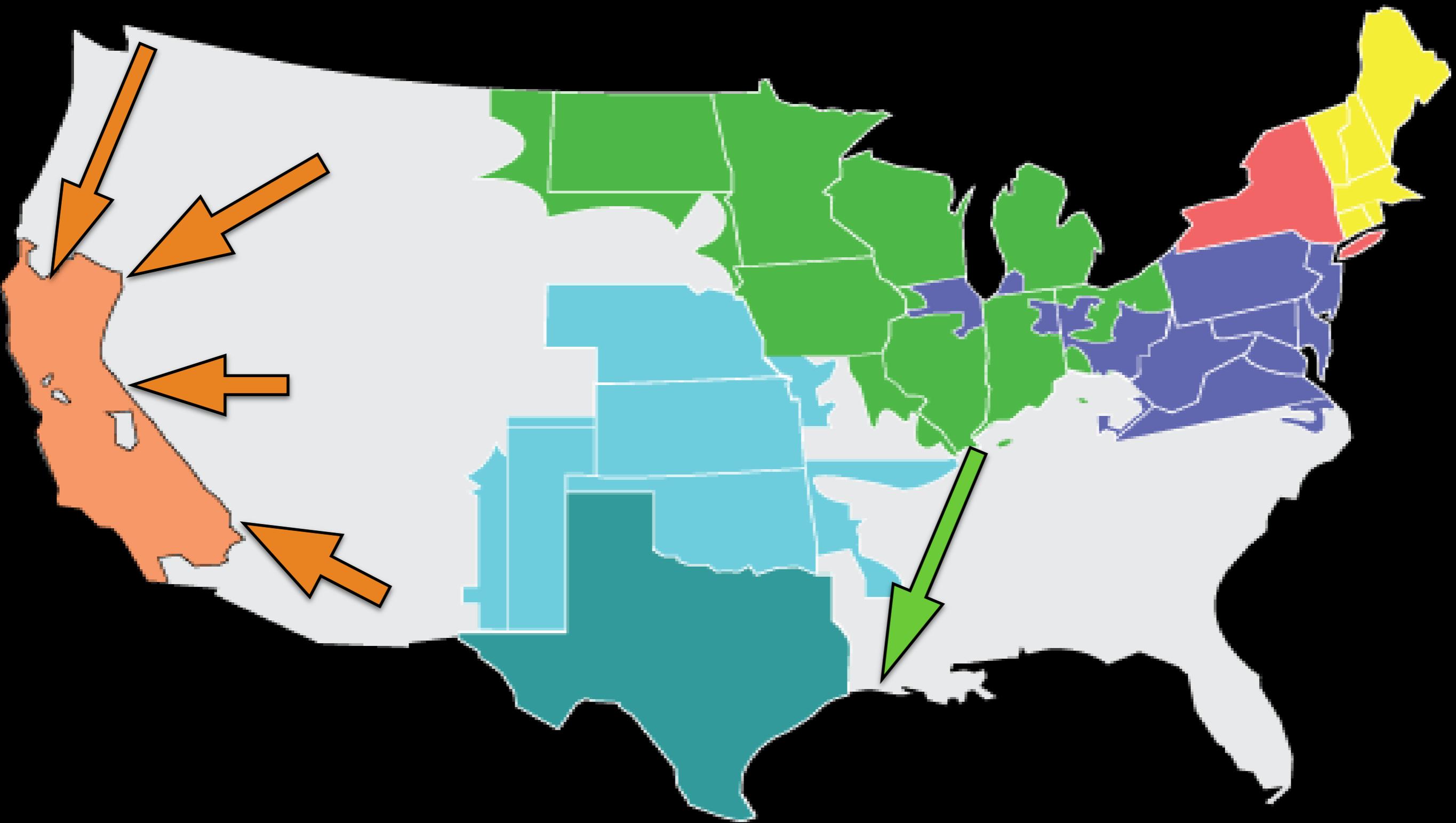
Legacy Power Plants



Antiquated Distribution Systems



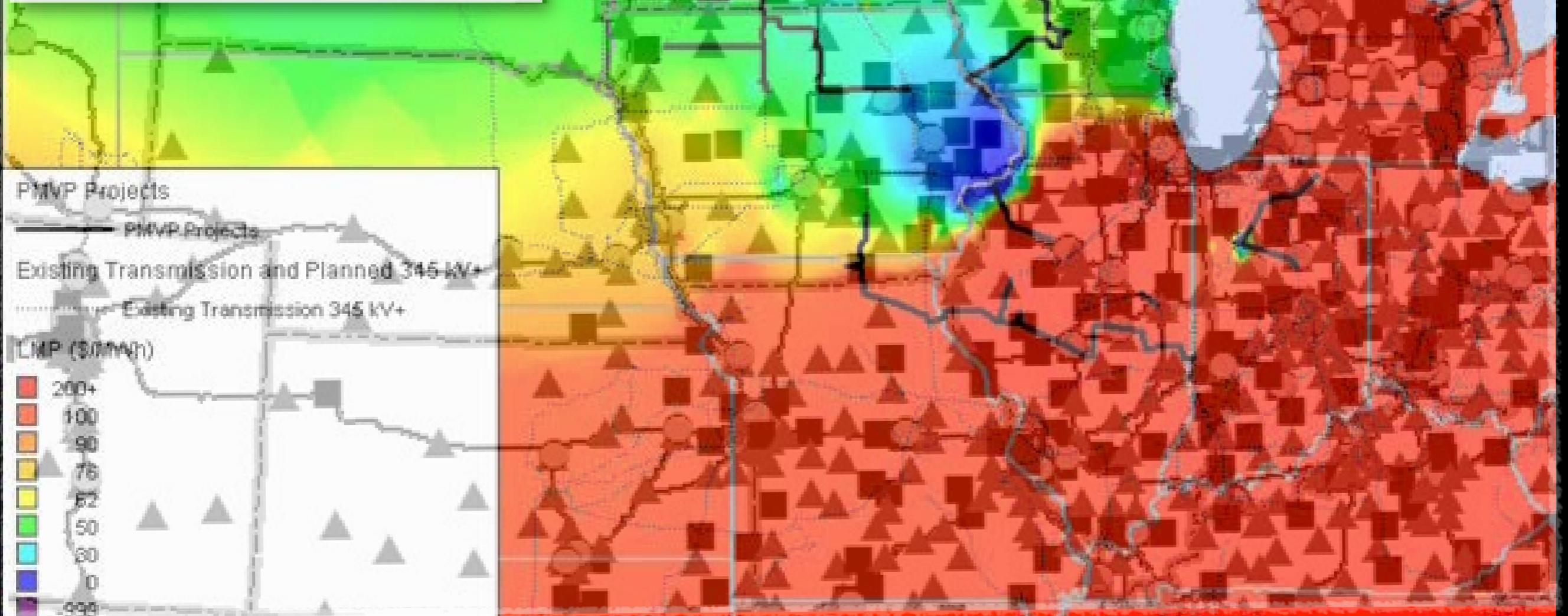
FERC Wholesale Independent Electric Market Regions



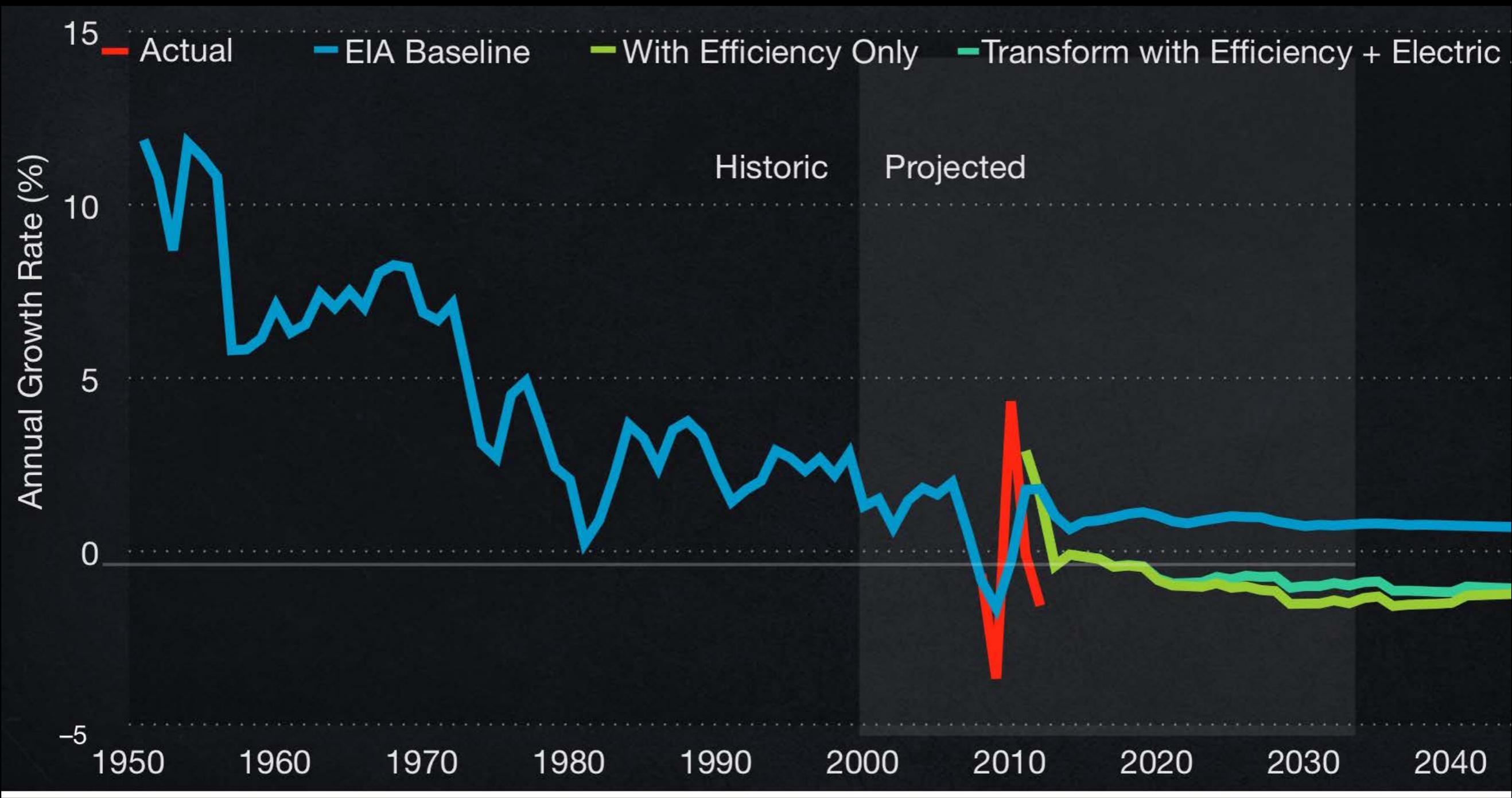
Wholesale Electric Markets



MISO 7/21/2011 1:00 PM

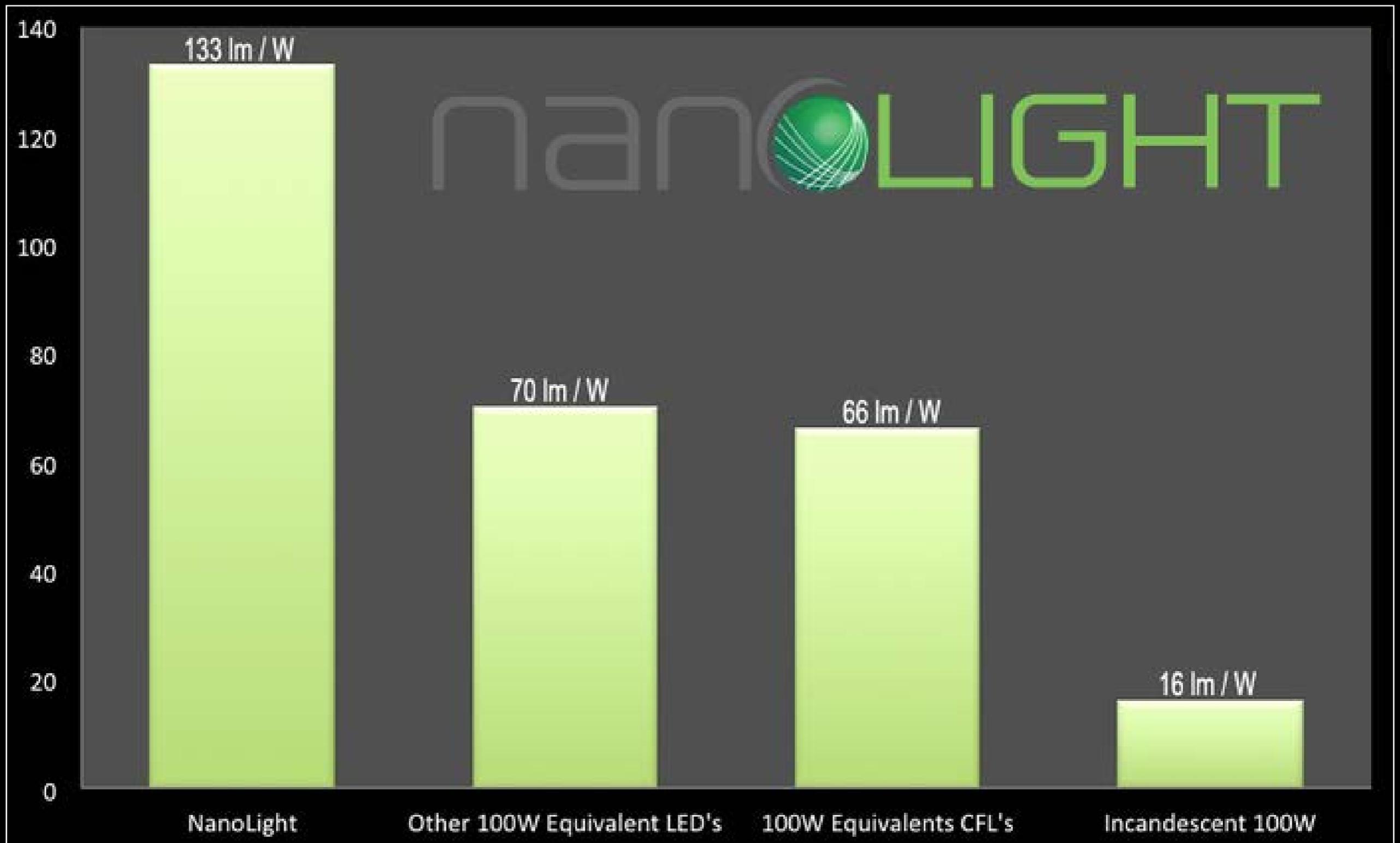


Annual Changes in U.S. Electric Consumption



Source: RMI

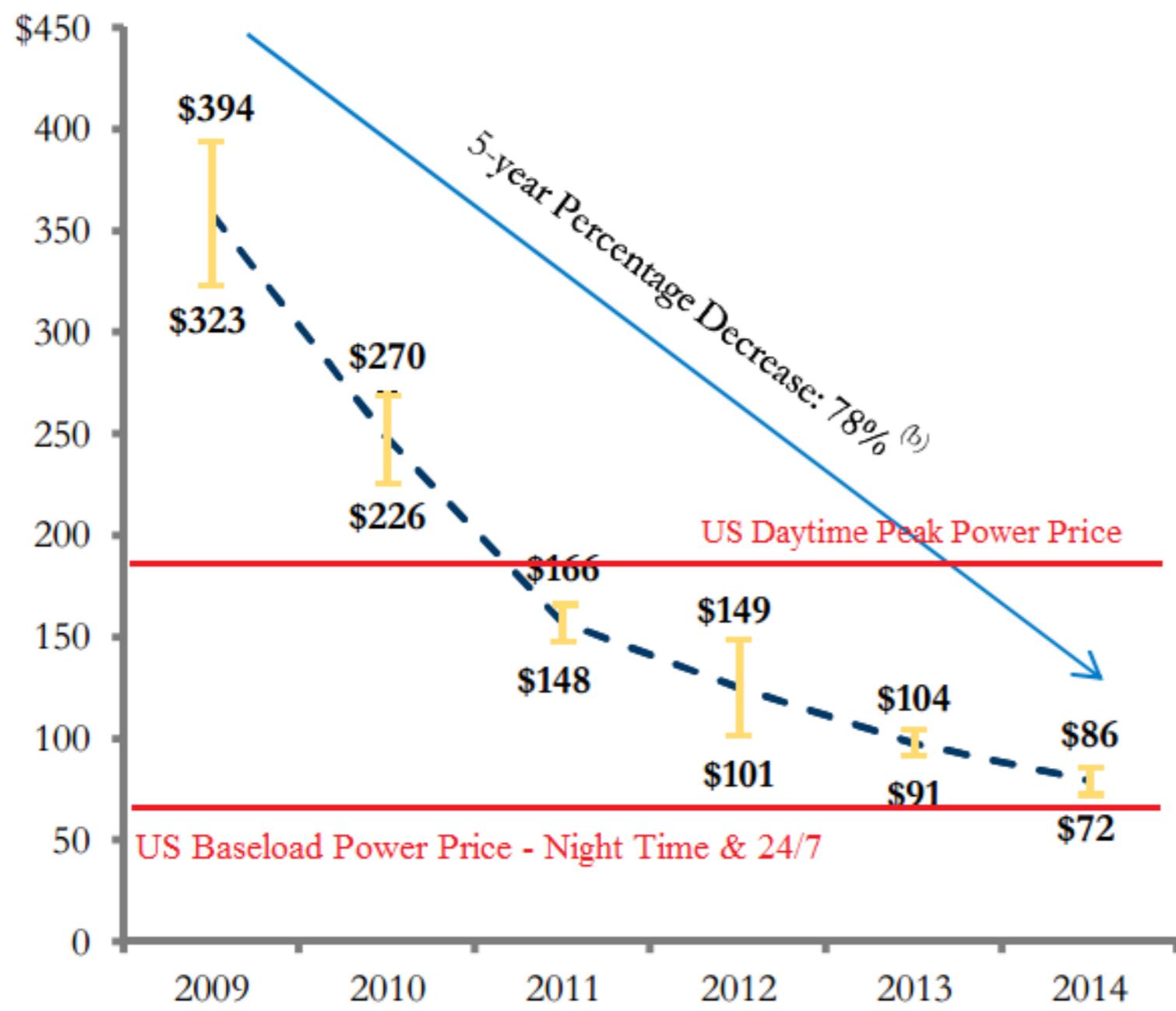
Efficiency Is Improving Everywhere



U.S. PV LCOE Trends

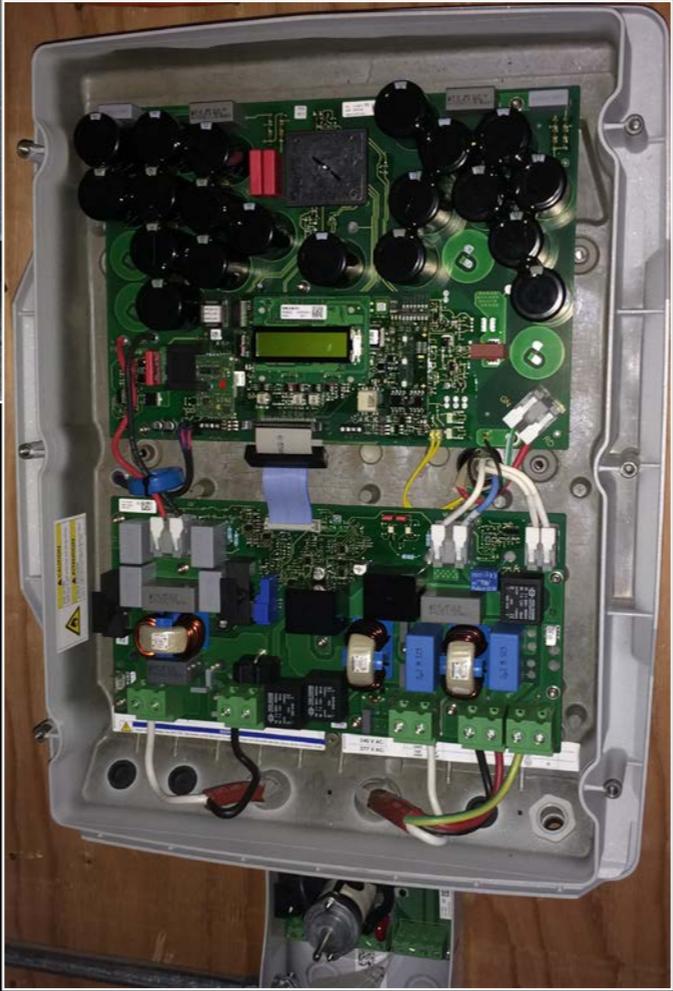
SOLAR PV LCOE ^(a)

LCOE
\$/MWh



Source: Lazard 2014

12 % ROI



SUNPOWER ? ☰

NOW GENERATING **0.6 kW**

🏠 < 2/18/2015 >

BILL SAVINGS (Bill Saving setup required. Please login to your account on a computer or tablet at <http://monitor.us.sunpower.com> and setup your bill savings estimator.)

100+ % solar	Total energy usage	13 kWh
	Total from solar	18 kWh
	Total to grid	5 kWh

ENERGY OVER TIME [show details >](#)

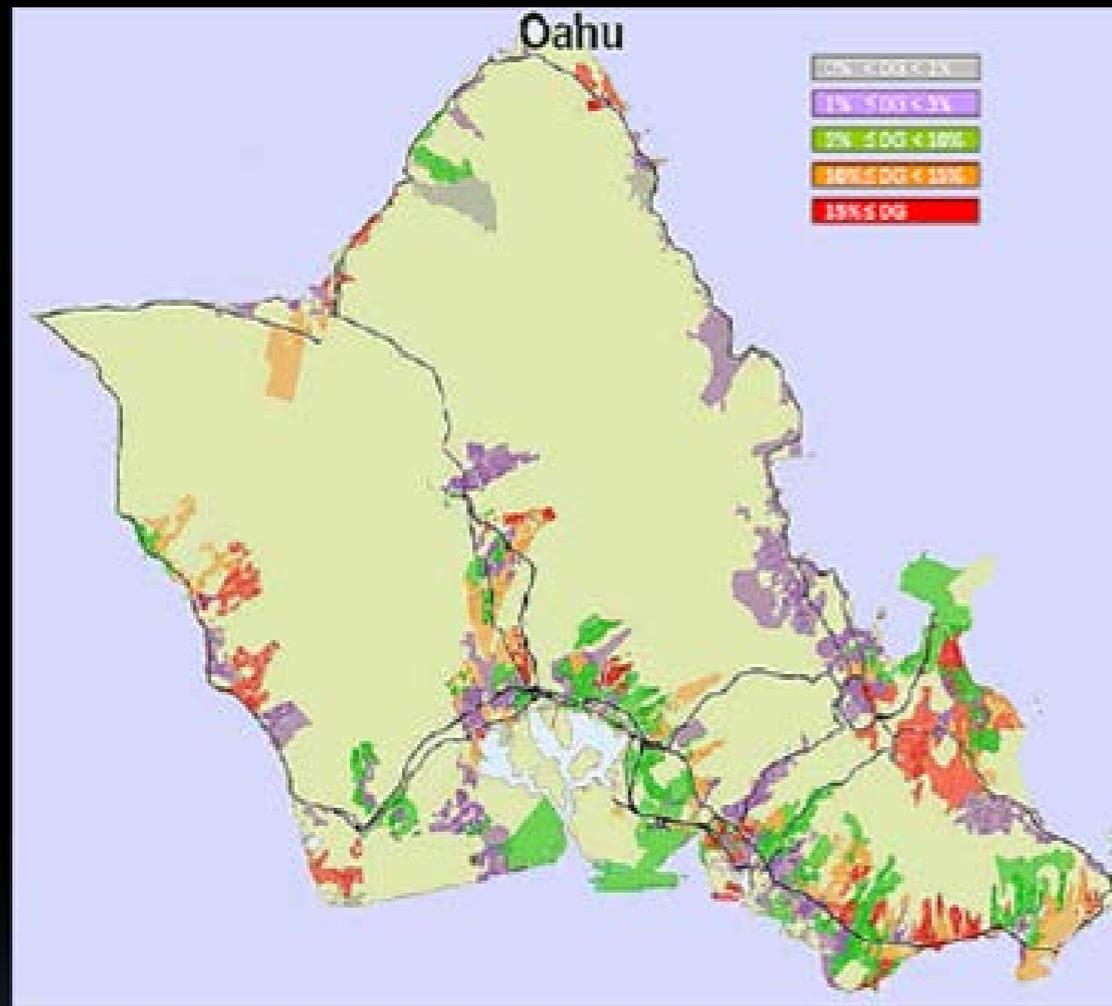
4 kWh _
2 kWh _
0 kWh

12 2 4 6 8 10 12p 2p 4p 6p 8p 10p

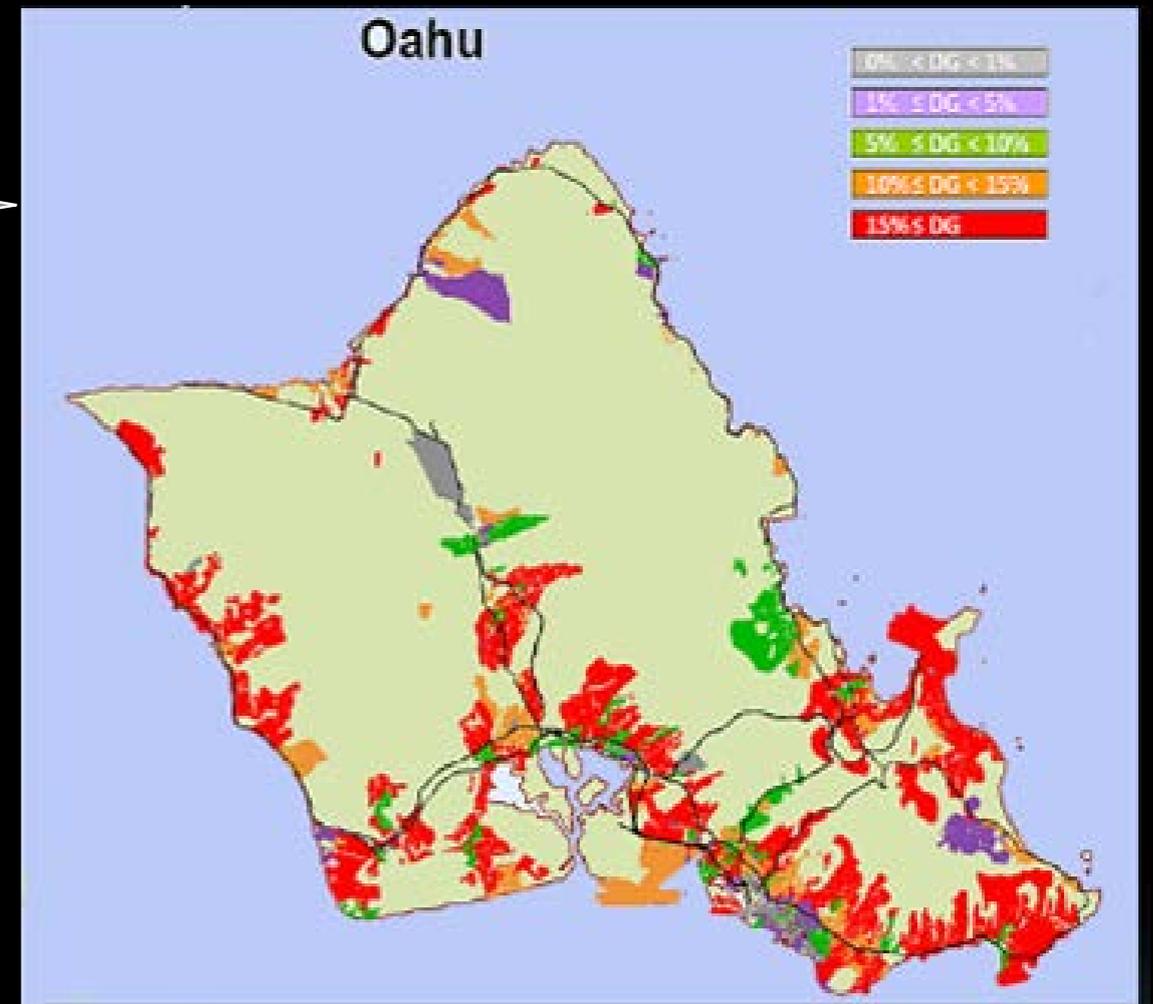
■ Solar Generated ■ Household Use

Hawaii Distributed Generation Penetration Trend

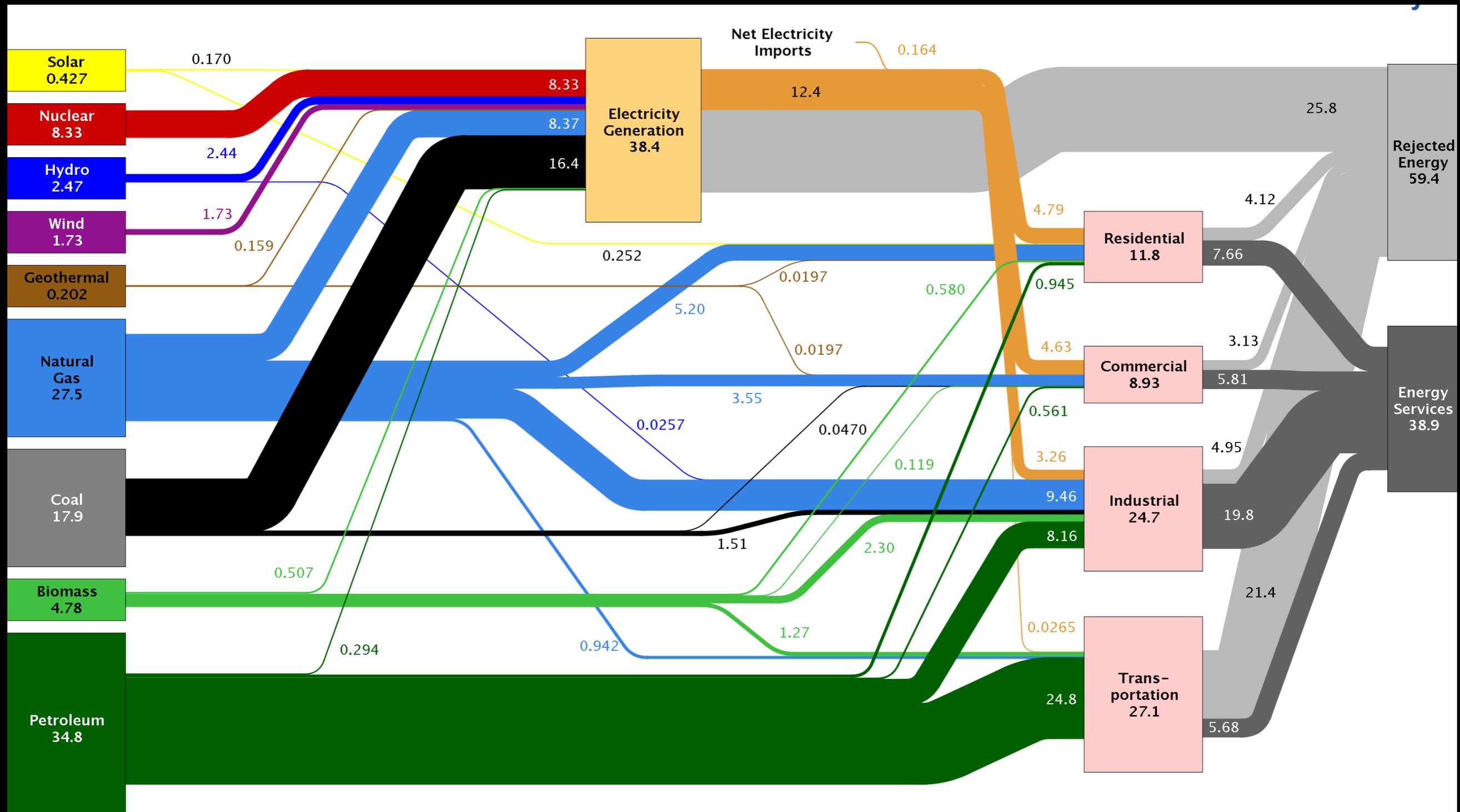
December 2011



January 2013



U.S. Energy Use/2014- 98.3 Quads

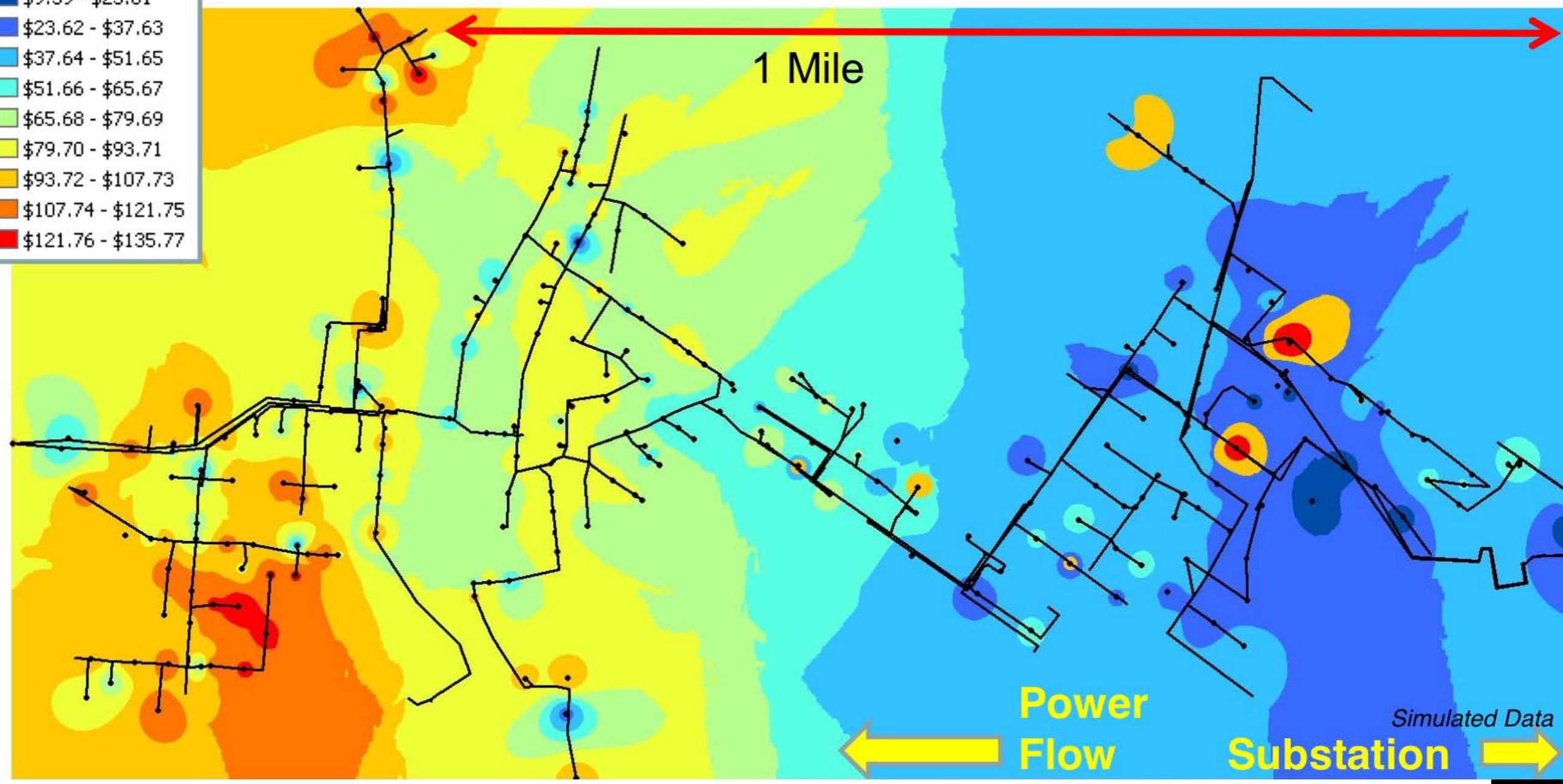


DMC Prices (4pm) **BASE CASE**

Transactive Price Signal from IDROP
(Circuit 11XX, Western US Utility)
4 – 5 PM

\$/MWH

- \$9.59 - \$23.61
- \$23.62 - \$37.63
- \$37.64 - \$51.65
- \$51.66 - \$65.67
- \$65.68 - \$79.69
- \$79.70 - \$93.71
- \$93.72 - \$107.73
- \$107.74 - \$121.75
- \$121.76 - \$135.77

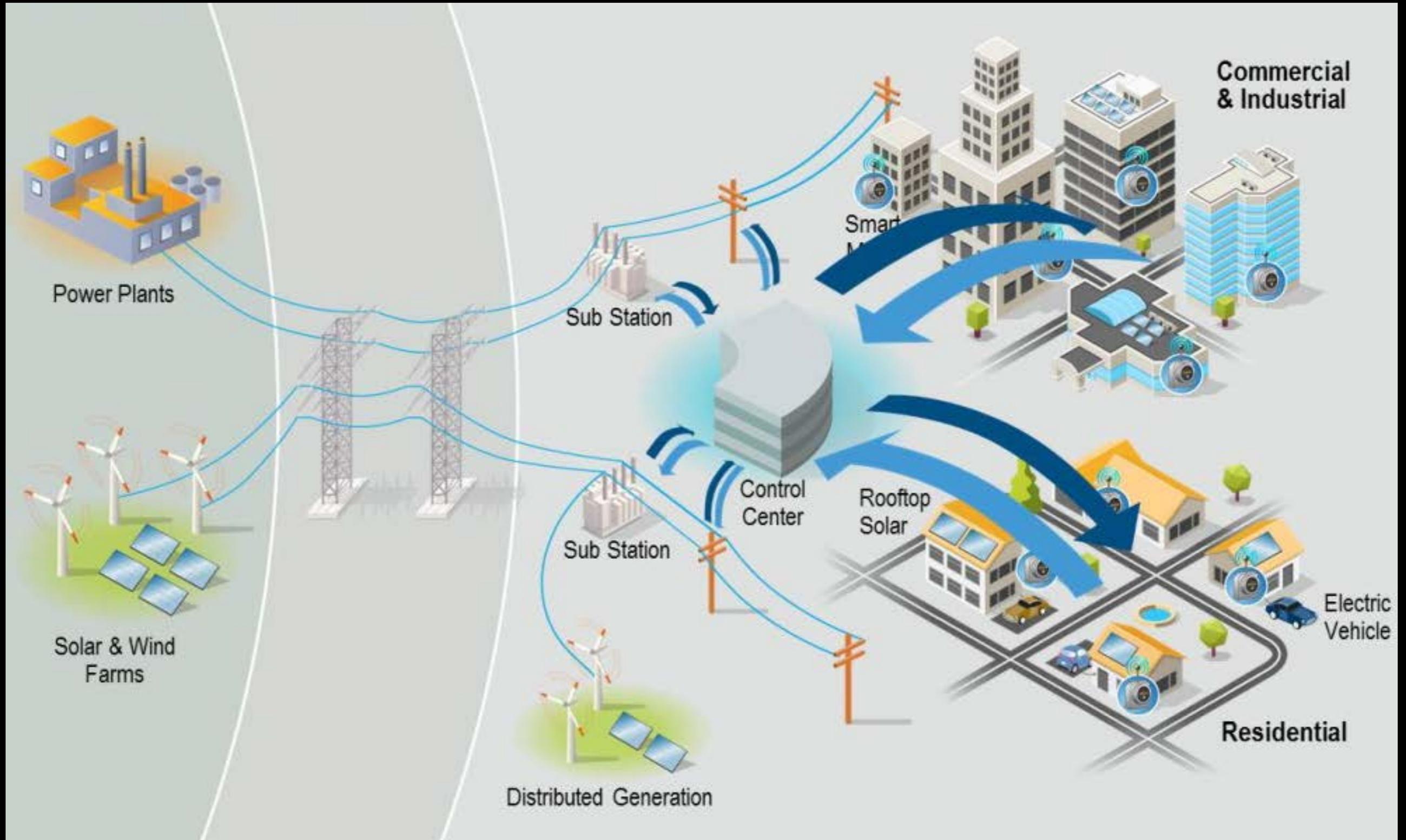


The Evolving Electric Grid & Conflicting Jurisdiction

FERC



State Regulators



Grid Neutrality

- Empower the Consumer
- Demarcate the Commons
- Align Risks and Rewards
- Create Transparent Level Playing Field
- Foster Open Access

Valuation

Monetization

Innovation

Optimization

Helping Consumers Control Energy Costs



Dvorak keyboard™

A faster, more comfortable
typing experience.

Consumers' Opportunity Costs & Choices





<http://www.fortnightly.com/fortnightly/2015/10/grid-neutrality>



http://r.org/submissions/submissions/Tong_Wellinghoff_Hu_51st_State.pdf

Thank  You

