



Edison Electric Institute

Power by AssociationSM

Market Design and Renewables in the U.S.

IEA Electricity Security Advisory Panel (ESAP)

Scarcity and Flexibility Pricing

Wednesday, July 2, 2014

Lola Infante

Director, Generation Fuels and Market Analysis

Edison Electric Institute

Edison Electric Institute

The Edison Electric Institute (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ more than 500,000 workers.

With more than \$85 billion in annual capital expenditures, the electric power industry is responsible for millions of additional jobs. Reliable, affordable, and sustainable electricity powers the economy and enhances the lives of all Americans.

EEI has 70 international electric companies as Affiliate Members, and 250 industry suppliers and related organizations as Associate Members.

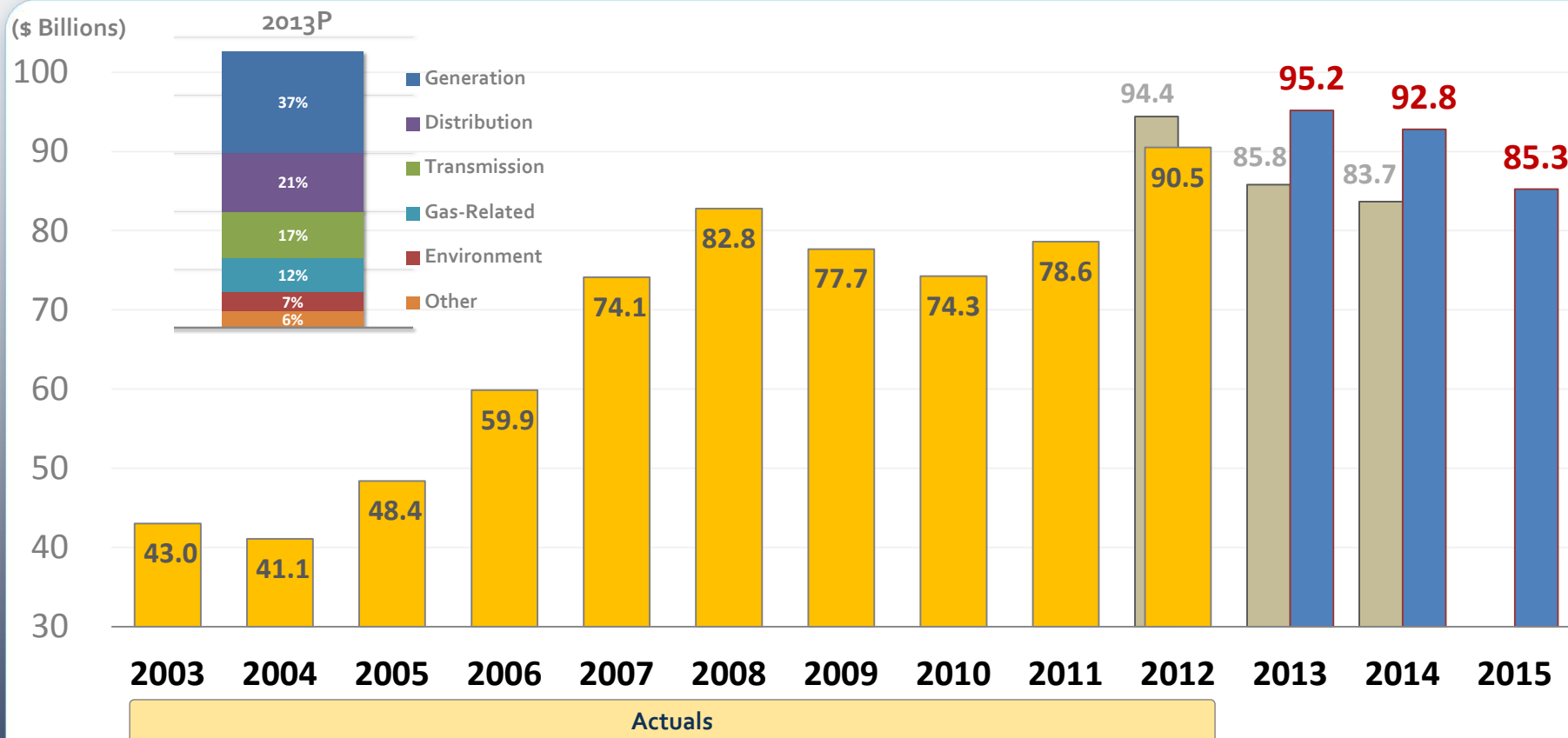
Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.



Overview

- Geographic, economic, institutional diversity
- Regional efforts to modify market rules to promote and accommodate increased renewables
 - Recent FERC Orders: transmission, interconnection, integration
 - Other jurisdictions: Pacific Northwest ,California/Pacificorp
- Increasing need for flexibility and diversity

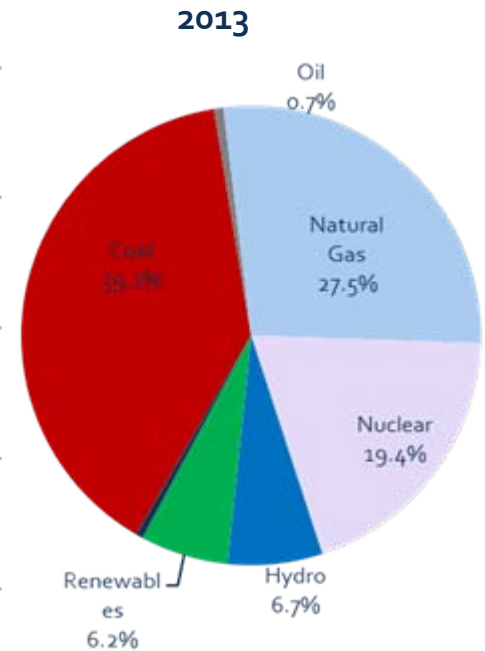
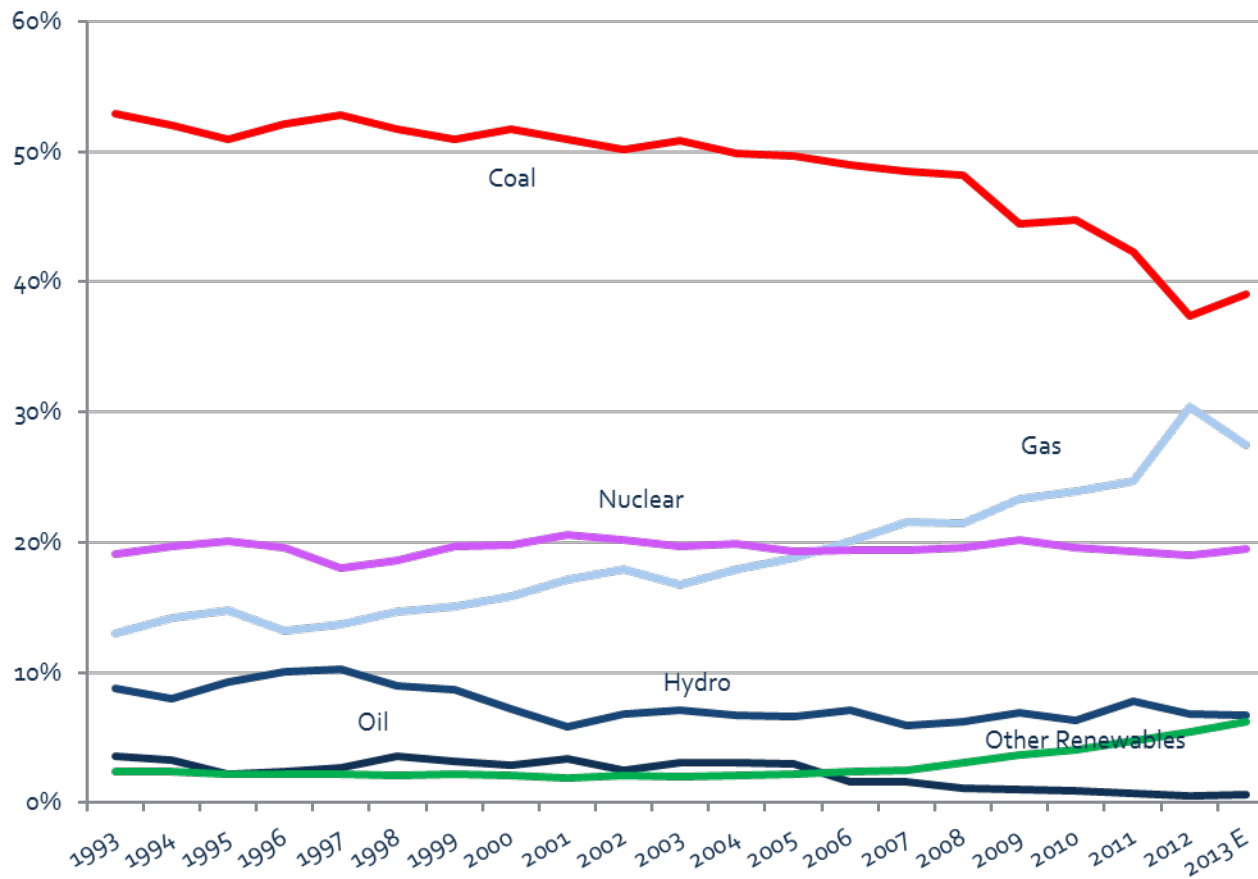
Industry Capital Expenditures



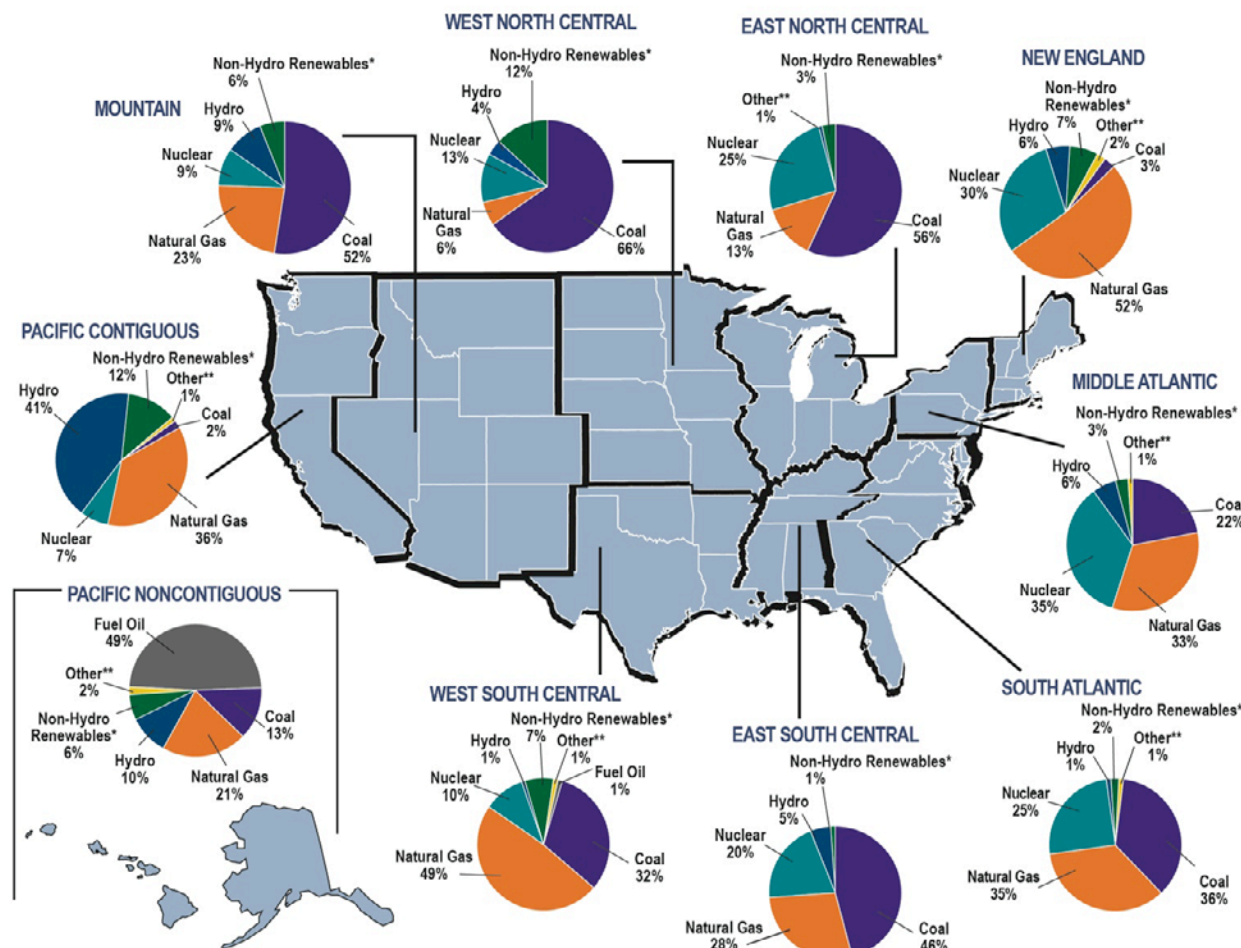
Notes: Total company spending of U.S. Shareholder-Owned Electric Utilities

Projections based on publicly available information and extrapolated for companies reporting fewer than three projected years (6% in 2014 and 2015).

Evolving Generation Mix



Generation Fuel Mix Varies By Region



*Includes generation by agricultural waste, landfill gas recovery, municipal solid waste, wood, geothermal, non-wood waste, wind, and solar.

** Includes generation by tires, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

Sum of components may not add to 100% due to independent rounding.

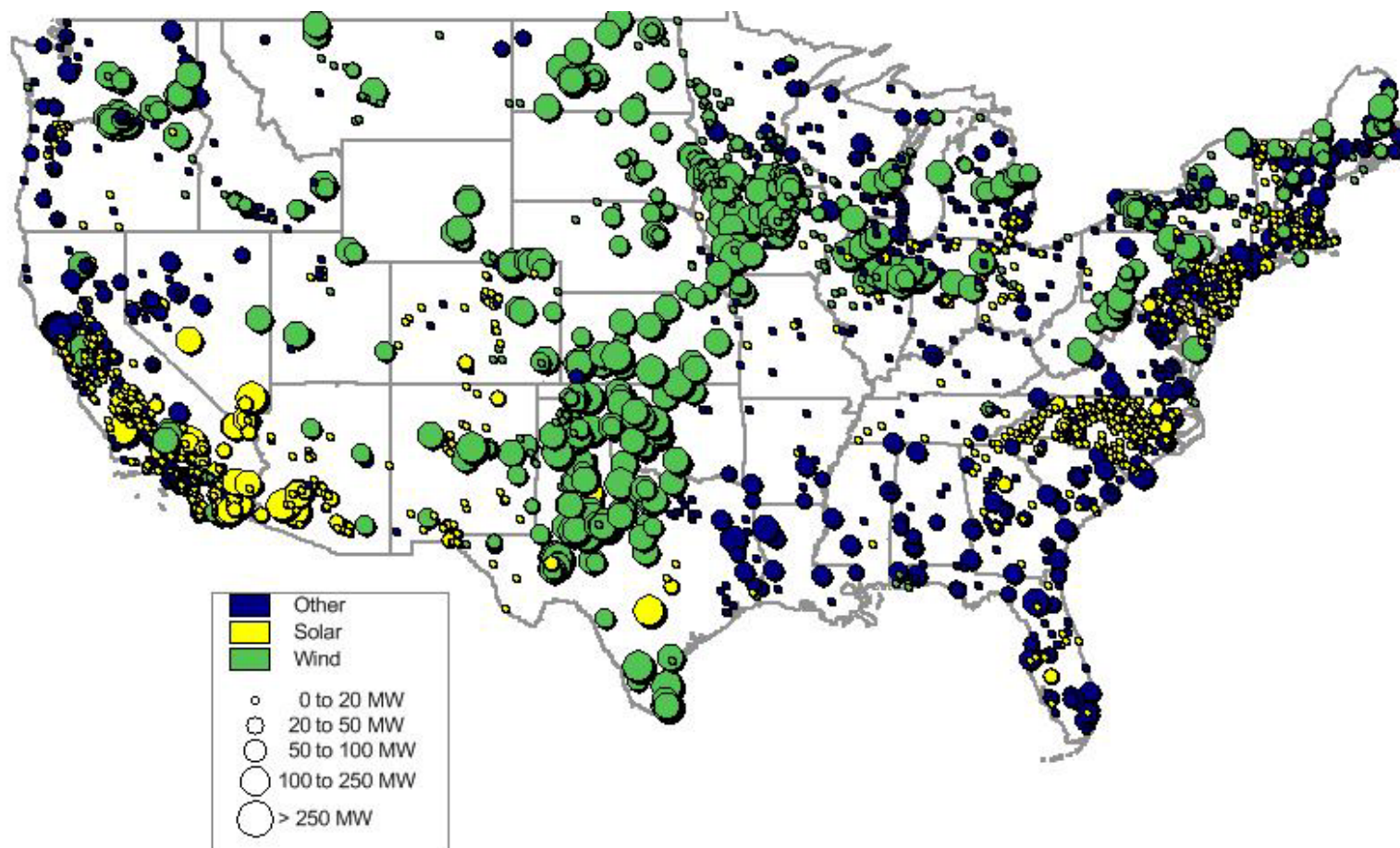
Source: U.S. Department of Energy, Energy Information Administration, Power Plant Operations Report (EIA-923); 2012 final generation data.

February 2014

© 2014 by the Edison Electric Institute. All rights reserved.

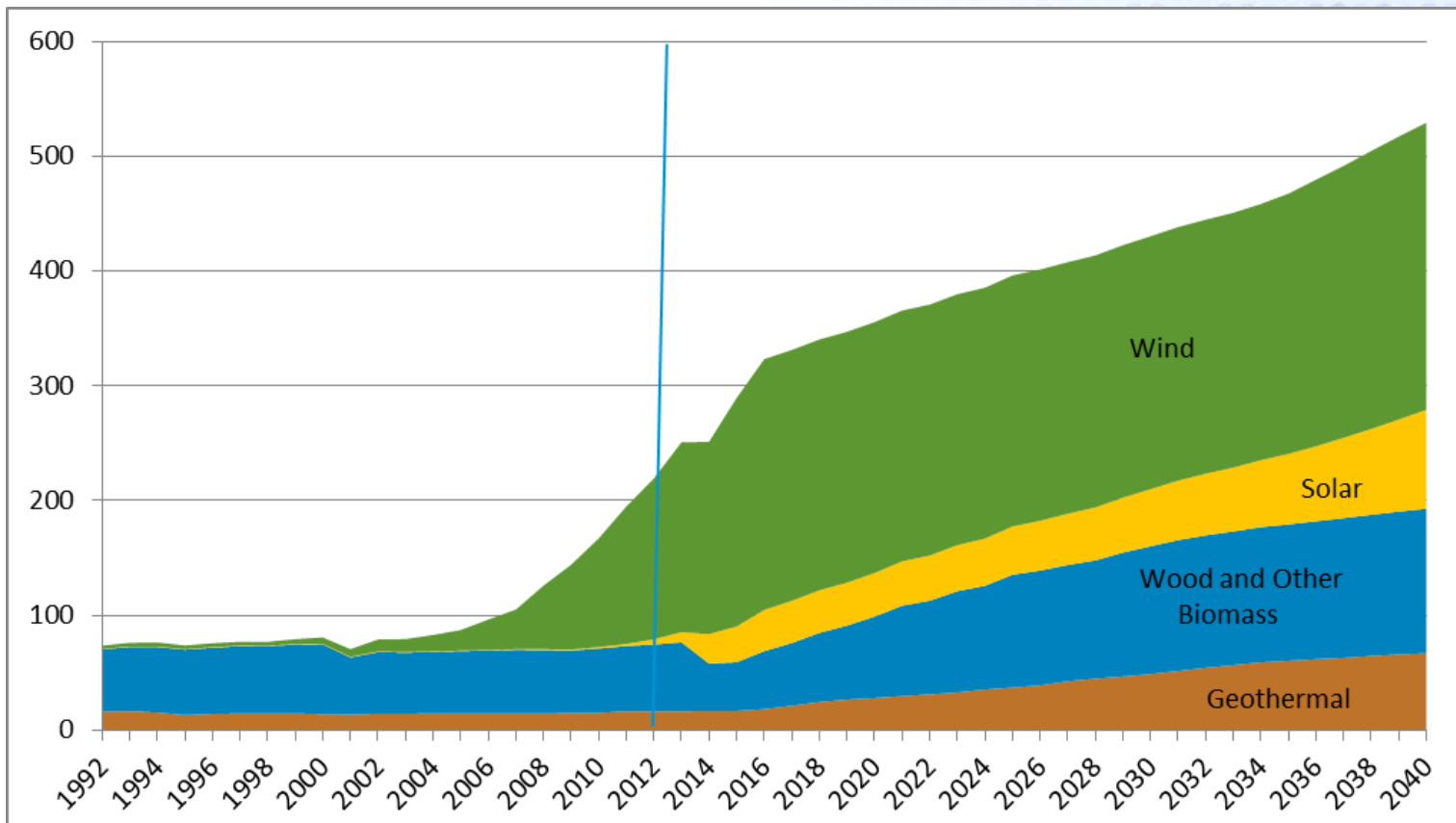
Renewables Deployment

Installed non-hydro renewable capacity

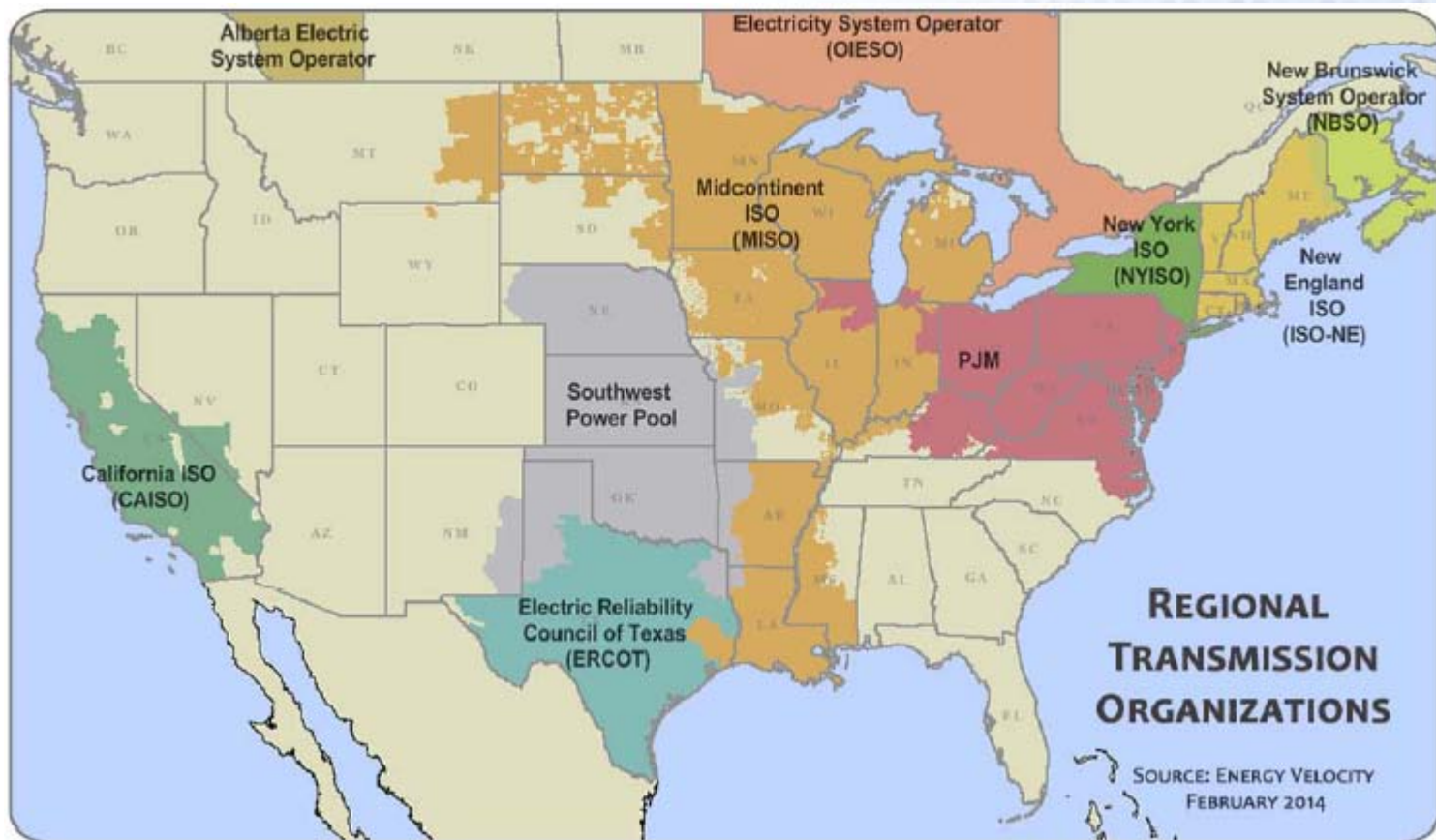


Non-Hydro Renewable Sources More than Double between 2012 and 2040

Non-hydro generation, Billion kWh



The U.S. Electric System(s)



Enabling Increased Penetration of Renewables – Transmission

Transmission Planning and Cost Allocation FERC Order 1000

- Recognizes that changes in generation mix influence the need for new transmission
- Implements regional planning and cost allocation reforms
 - Public policy requirements (federal or state) must be considered
 - Planning must be coordinated regionally
 - A regional cost allocation method for new transmission must be developed
 - Right of First Refusal is removed from regional plans for the purpose of cost allocation

Enabling Increased Penetration of Renewables – Market Rules

Integrating Variable Energy Resources – Large Scale FERC Order 764

- Intra-hour scheduling (15 min.)
- Improved forecasting tools
- Cost recovery of ancillary services – case by case

Not all regions of the country are experiencing high enough renewable penetration to make the required investments to implement intra-hour scheduling worthwhile.

Enabling Increased Penetration of Renewables – Interconnection

Small Generator Interconnection Procedures – Small Scale Resources

FERC Order 792

- Pre-application reporting
- Revised thresholds for fast track process (up to 5 MW)
- Supplemental review screens

A cautious approach to interconnection of DG resources is warranted until greater experience is gained.

Enabling Increased Penetration of Renewables – Ancillary Services

Frequency Regulation Compensation in Organized Wholesale Power Markets

FERC Order No. 755

- Provides payment for performance for faster ramping resources
- Payment includes a capacity payment and a payment for performance

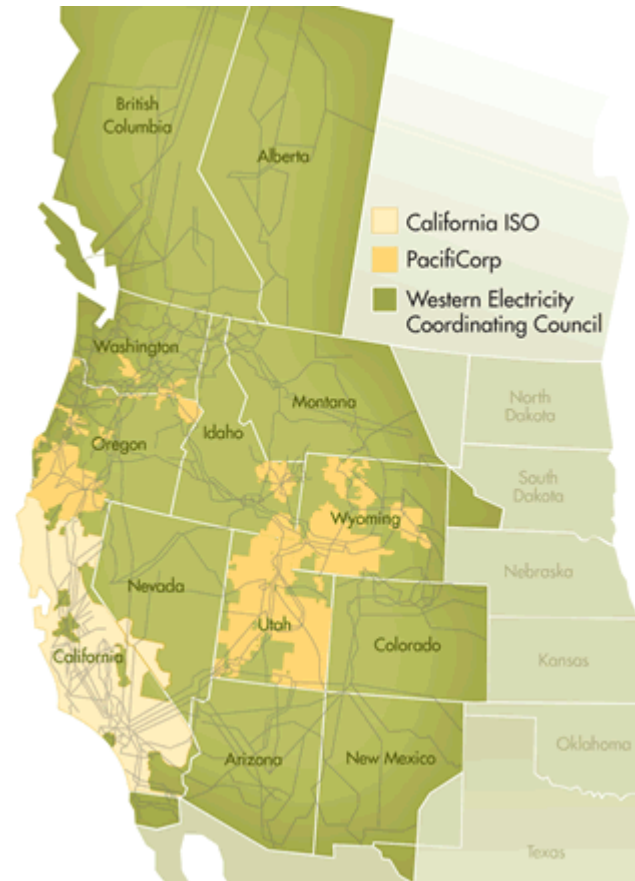
FERC reviewing comments: “Third-Party Provision of Reactive Supply and Voltage Control and Regulation and Frequency Response Services.” (Docket No. Ad14-7)

FERC will hold staff workshops this fall to examine regional price formation issues. (Docket No. Ad14-14)

Regional flexibility is needed.

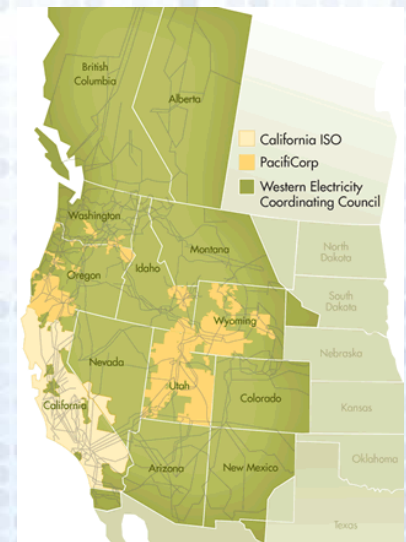
PacifiCorp/CAISO Energy Imbalance Market

- FERC conditionally approved (June 2014) PacifiCorp's and CAISO's request to establish an Energy Imbalance Market (EIM) in order to more economically and efficiently dispatch variable energy resources.
- Includes balancing authorities in California, Idaho, Oregon, Utah, Washington, Wyoming and Nevada.
- Expected to be open by October 2014; Nevada to join by October 2015.



PacifiCorp/CAISO Energy Imbalance Market

- Annual benefits estimated to be up to \$129 million.
- More efficient dispatch of low cost resources
- 5 min balancing of supply and demand
- Increased pool of resources for balancing supply and demand
- Minimized need for flexible reserves
- Reduced curtailment of renewable generation



Bonneville Power Authority Oversupply Management Protocol

The Problem: Too much generation

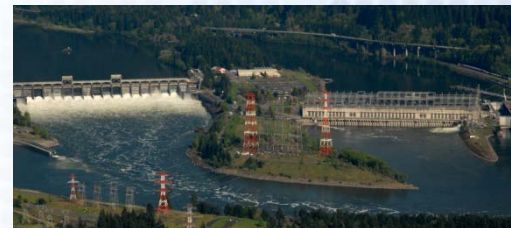
- During times of low electric demand and high wind and hydro generation supply (typically Spring, at night), too much electricity is generated.
- Too much water spilled over dams can exceed water quality standards and threaten aquatic life, including endangered species.
- BPA offered free hydro electricity in these situations, but with increased wind, which receives a production tax credit, there is no incentive to accept free hydro. Wind generators filed a complaint with FERC, which found the BPA policy of curtailing non-hydro without compensation discriminatory.



BPA Oversupply Management Protocol

The BPA Solution: Oversupply Management Protocol (OMP)

- The water must run through the dams and non-hydro generation must be curtailed.
- Generators are compensated for their associated displacement-related costs.
- Displacement costs are allocated to all generators online in BPA's balancing authority area during the oversupply period, in proportion to their scheduled generation.
- Provides an incentive for generators to minimize generation during oversupply situations, increasing BPA's ability to manage excess hydropower.



Remaining Challenges

- Regional differences - Different market structures and fuel mixes necessitate a variety of solutions.
- Flexibility and diversity – Increased renewables affect markets and require increased fuel diversity and flexibility. Proper price signals are critical.
- Learning from others' mistakes – Speed of deployment and cost matter.
- The value of the grid – The enabler of technology deployment and reliability.

Thank you!

Lola Infante
linfante@eei.org

