

Meeting Renewable Energy Targets in the West at Least Cost: The Integration Challenge

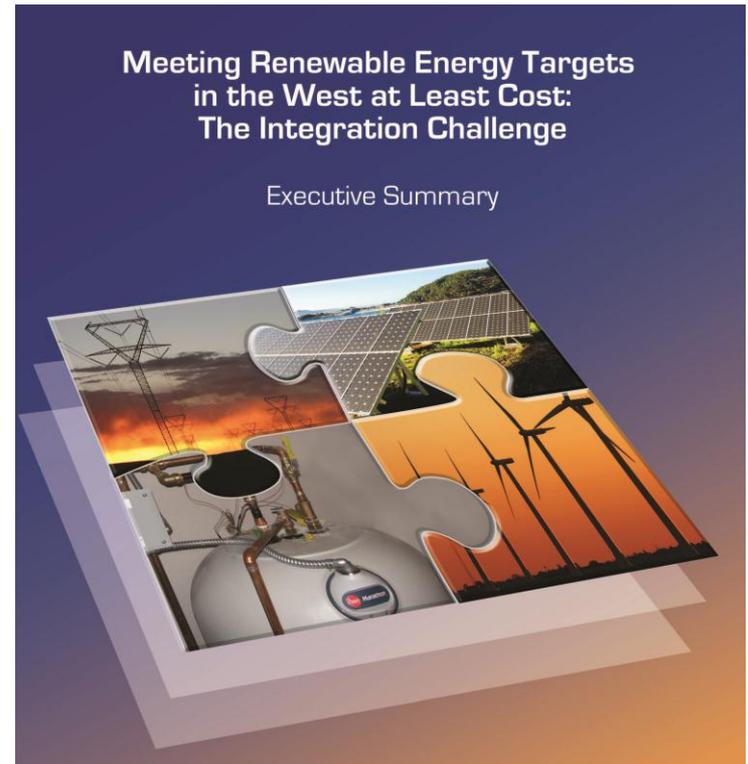
Presentation for Governors' Wind Energy Coalition

Lisa Schwartz

- New Western Governors’ Association report explores ways to reduce costs for integrating wind and solar resources, barriers and possible state actions
- By RAP (lead), Exeter Associates & National Renewable Energy Laboratory
- Funded by Energy Foundation and USDOE
- Technical committee for scoping, resources, review
- Focuses on operational and market tools, flexible demand and supply resources

Executive summary: http://www.westgov.org/index.php?option=com_joomdoc&task=doc_download&gid=1602

Full report: http://www.westgov.org/index.php?option=com_joomdoc&task=doc_download&gid=1610



Broad Conclusions

- The Western grid is operated inefficiently.
 - Energy largely delivered on hourly schedules with little/no ability to make changes
 - Insufficient automation
- We're spending more than needed for integration.
 - Carrying too many reserves, and dispatching higher cost generation when lower cost generation is available
- Integrating high levels of renewables reliably and affordably will require unprecedented cooperative action.
- Governors can accelerate efforts to reduce costs, such as:
 - Asking utilities and transmission providers what they are doing to put in place the recommendations in the report
 - Convening parties to discuss benefits from least-cost delivery of wind and solar resources and craft solutions to institutional barriers



1. Improve Institutional Flexibility

- Expand and standardize intra-hour scheduling of energy and transmission across the West
- Facilitate dynamic transfers
 - Allow the balancing authority receiving energy from wind located in another area to manage intra-hour integration needs
 - Facilitate energy exchanges and increase flexibility options
 - **Key recommendation**
 - Prioritize transmission improvements to increase transfer capability
- Improve reserves management
 - **Key recommendations**
 - Expand reserve-sharing
 - Explore calculating reserves dynamically
 - Assess benefits of using contingency reserves for wind
 - Equip more generation with Automatic Generation Control*



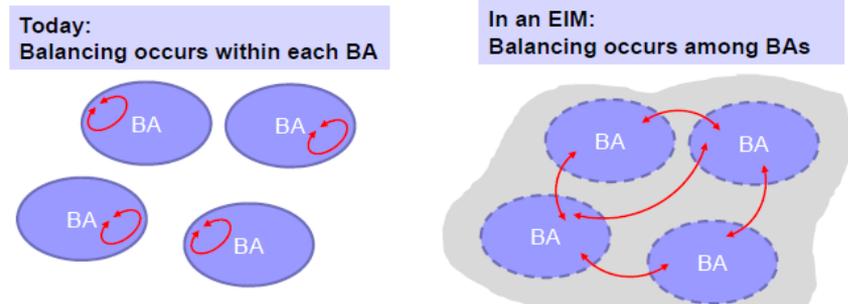
*AGC is equipment that automatically adjusts generation from a central location

- **Implement an energy imbalance market**

- Imbalance energy = Scheduled energy - actual energy delivered
- Each hour, initial operating conditions would still be based on traditional bilateral transactions.
- EIM would re-dispatch generation every 5 minutes to manage grid constraints and supply imbalance energy from least-cost resources
- Enables dispatch of generation and transmission *across* balancing authority areas to resolve energy imbalances using the full geographic diversity of load and generation in the EIM footprint

- **Key recommendations**

- Further investigate costs and benefits
- Address governance issues and concerns
- Define rates/terms for transmission service agreements
- Support Northwest Power Pool's evaluation of an EIM and West-wide efforts to design an EIM for the broadest footprint



- **Improve weather, wind and solar forecasting**
 - Wind and solar forecasts allow better scheduling of other resources
 - $1/2$ of Western balancing authorities use wind and solar forecasts
 - **Key recommendation**
 - Encourage use of forecasts for day-ahead schedules/dispatch (not common practice now), not just same-day unit commitment
- **Take advantage of geographic diversity**
 - Spreading wind and solar plants over a larger area lowers aggregate variability* and forecast errors, reducing reserves needs
 - **Key recommendations**
 - Consider sites that minimize variability of aggregate output and better match utility load profiles.
 - Support right-sizing of interstate lines that access renewable resources from stakeholder-designated zones – when project benefits exceed costs.



Alstom 2010. Photo courtesy of DOE/NREL

*Variability - The range of expected load and generation

2. Explore Demand Response That Complements Variable Generation

- Some customer loads are flexible.
- Consider direct load control (e.g., for electric water heaters) and real-time pricing with automation to shift loads up and down to complement wind and solar resources.
- **Key recommendations**
 - Test value propositions to assess customer interest in strategies for demand response that complements wind and solar
 - Encourage participation of third-party aggregators
 - Allow demand response to compete with supply-side alternatives in resource planning and acquisition



3. Develop a More Flexible Generating Fleet

- At high levels of wind and solar, simply counting megawatts is inadequate for determining capacity needs. Instead, consider flexible capabilities:
- Assess whether some existing generating plants can be retrofitted to increase flexibility
 - Lower min. loads, reduce cycling costs, increase ramp rates
- Focus on flexibility for new generating plants
 - **Key recommendations**
 - Rethink resource adequacy analysis to reflect flexibility needs
 - Amend guidance for resource planning
 - Use competitive procurement to evaluate alternative flexible capacity solutions



About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

Lisa Schwartz, senior associate

Albany, Oregon

802-498-0723 (o); 541-990-9526 (m)

lschwartz@raponline.org



Global
US
China
EU

The Regulatory Assistance Project

50 State Street, Suite 3
Montpelier, Vermont 05602

phone: 802-223-8199
fax: 802-223-8172

www.raponline.org