The Full Value of Low Carbon Resources

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May 8, 2014

Carl Linvill, PhD
RAP Principal
Agenda

• The Full Value of EE is Well-developed
  • Strategy: Societal Cost Test
  • Tactic: Getting Utility Costs/Benefits Right

• Utility Benefits/Costs of Wind
  • Sources of Utility System Benefits
  • Examples of Wind Portfolio Value

• Toward Capturing the Full Value of Wind
  • Aligning Power Markets to Deliver Value
The Full Value of EE

A “Layer Cake” of Benefits from Electric Energy Efficiency

**Utility System Benefits**
- Power Supply
- T&D Capacity
- Environmental
- Losses and reserves
- Risk
- Credit and Collection

**Participant Benefits**
- Other Fuels
- Water, Sewer
- O&M Costs
- Health Impacts
- Employee Productivity
- Comfort

**Societal Benefits**
- Air Quality
- Water
- Solid Waste
- Energy Security
- Economic Development
- Health Impacts
In Practice, the Full Value of EE is Not Usually Counted

• The Utility Cost Test and the Total Resource Cost Test as applied leaves layers out

• A Societal Cost Test requires policy support
Strategy and Tactics

- The Societal Cost Test with all the layers is a worthy strategic target.
- Getting the utility costs and benefits right is a tactical step in the right direction.
All the Utility Costs/Benefits of EE

• Avoided energy/capacity/capabilities
• Avoided T&D
• Avoided env. compliance cost (current)
• Avoided env. compliance cost (future)
• Avoided losses & reserves
• Risk management benefit
What Utility Costs and Benefits Apply to Wind?

- The Capabilities of Wind
  - Sources of utility system benefits
  - Cost/Risk trade-offs among technologies
  - Other benefits: active controls

- Examples of the Portfolio Value of Wind
  - The value of wind in a diversified portfolio
  - The value of wind in addressing operational challenges
Which Sources of Benefit Apply?

- Energy Value
- Capacity and Capabilities
- Risk Management
- Environmental (Current and Future)
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<th>Technology</th>
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<th>LCOE - Simple 2027 vintage ($/kW-yr)</th>
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WECC Staff Final Draft, September 19, 2013
2013 Interconnection-Wide Plan: Data and Assumptions
Table 39: Summary of LCOE from cash flow and simple analyses
From Binz, et al., 2012
Capacity and Capabilities

• Dependable Capacity
  • Geographic diversity benefit

• Active Control Capabilities:
  • Synthetic inertial control
  • Primary Frequency Control (PFC)
  • Automatic Generator Control (AGC)
Examples of Wind Portfolio Value

• A 50% RPS example
• An integration challenge example
One look at the value of Diversity
(E3, Investigating a Higher Renewable Portfolio Standard in California, Executive Summary, Jan 2014)

![Graph showing cost differences between RPS portfolios under a range of assumptions; relative to 2030 33% RPS scenario (2012 cents/kWh)](image)

Figure 2: Cost differences between RPS portfolios under a range of assumptions; relative to 2030 33% RPS scenario (2012 cents/kWh)
A Second Look at the Value of Diversity
(Teaching the Duck to Fly, Jim Lazar - RAP, January 2014)
Ten Strategies To Align Loads to Resources (and Resources to Loads) with Illustrative Values for Each

1. Targeted energy efficiency
2. Orient solar panels
3. Use solar thermal with storage.
4. Manage electric water heat
5. Require new large air conditioners to include storage
6. Retire older inflexible power plants
7. Concentrate demand charges into “ramping” hours
8. Deploy energy storage in targeted locations
9. Implement aggressive demand response programs
10. Use inter-regional exchanges of power

Not every strategy will be applicable to every utility.
What Happens?

Pre-Strategy, without Solar/Wind: 73% LF
Pre-Strategy, with Solar/Wind: 63% LF
Post-Strategy, with Solar/Wind: 83% LF

Hourly Ramp: 340 MW vs. 400 today, and 550 w/o strategies
Toward Capturing the Full Value of Wind

• Fix Markets and Procurement Processes
  • Establish net need transparently & well
  • Establish net, net need likewise
  • Structure markets and procurement criteria according to identified net, net need
  • Qualify supply and demand side resources to provide capabilities fairly
• See Mike Hogan (RAP), Aligning Power Markets to Deliver Value, 2013 (part of APP)
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

Contact Carl at: clinvill@raponline.org

Full Value of EE: http://www.raponline.org/document/download/id/6739
Teaching the Duck to Fly: http://www.raponline.org/document/download/id/6977
Aligning Markets to Deliver Value: http://www.raponline.org/document/download/id/6932