



Effects of Increased Penetration of PV in New England

Department of Energy's Sunshot Initiative

SunShot Prize: Race to the Rooftops Workshop

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About ISO New England

- Not-for-profit corporation
 - Created in 1997 to oversee New England's restructured electric power system; regulated by Federal Energy Regulatory Commission
- Regional Transmission Organization
 - Independent of companies doing business in markets; no financial interest in companies participating in markets
- Major responsibilities
 - Maintain reliable operation of the electric grid
 - Administer wholesale electricity markets
 - Plan for future system needs



New England's Electric Power Grid at a Glance

- 6.5 million households and businesses; population 14 million
- 350+ generators
- 8,000+ miles of high-voltage transmission lines (115 kV and above)
- 13 interconnections to electricity systems in New York and Canada
- 32,000 megawatts (MW) of supply
 - About 2,000 MW are demand resources
- 28,130 MW all-time peak demand, on August 2, 2006
- \$5-11 billion annual wholesale electricity market value



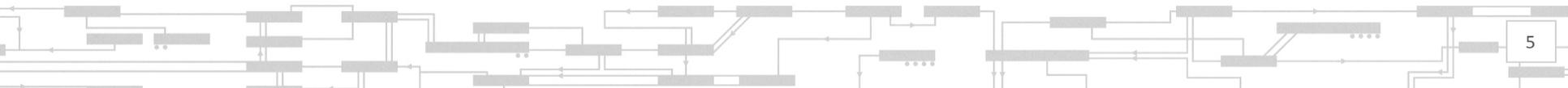
Growth of Solar PV in New England

- New England state policies and PV technology cost reductions are driving the increased deployment of solar resources
 - Differences in state policies create heterogeneity in the geographic distribution of PV
 - Currently more than 250 MW installed; rates of installation increasing
 - A total of 1,000 MW (or more) likely in the next 5-10 years
- The integration of intermittent resources, such as solar PV, is an regional strategic planning issue
- PV is predominantly interconnected at the distribution level (i.e., it is embedded with load)
 - Most PV resources are not “visible” to ISO in real-time, but act as a load modifier



Potential Benefits of Increased Amounts of PV

- Environmental benefits
 - No emissions during operation (CO_2 , NO_x , SO_x)
 - Requires no cooling water
- Can help satisfy state policy goals
- Added fuel diversity
- Solar generation can be built relatively quickly
- Solar resource is “ubiquitous” → solar can be built close to load
- PV energy production puts downward pressure on wholesale energy prices
- May defer need for transmission or distribution infrastructure improvements



Some Potential Impacts of Increased PV

- To date, PV has not had a noticeable impact on system operations
- Increased variability and uncertainty due to weather-dependence may eventually introduce the need for:
 - Solar forecasting
 - ISO-NE is part of a team that is working with IBM on a DoE funded project to improve the state of the science of solar forecasting
 - Increased reserve requirements
- Potential impacts on reliability due to different electrical characteristics during grid disturbances
 - Interconnection standards relevant to PV and other kinds of distributed generation are evolving → future PV installations will likely be more “grid-friendly”

Questions

