Updates from Arizona and Massachusetts
State-Federal RPS Collaborative Webinar

Hosted by Clean Energy States Alliance
February 29, 2012
State-Federal RPS Collaborative

- With funding from the Energy Foundation and the US Department of Energy, the Clean Energy States Alliance facilitates the Collaborative.
- Includes state RPS administrators and regulators, federal agency representatives, and other stakeholders.
- Advances dialogue and learning about RPS programs by examining the challenges and potential solutions for successful implementation of state RPS programs, including identification of best practices.
- To get the monthly newsletter and announcements of upcoming events, sign up for the listserv at: www.cleanenergystates.org/projects/state-federal-rps-collaborative
Updates from Arizona and Massachusetts

Presenters:

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Howard Bernstein, Program Manager, MA Renewable & Alternative Energy Portfolio Standards, Massachusetts Department of Energy Resources

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Massachusetts RPS: Changes & Challenges

Howard B. Bernstein, Ph.D.
Program Manager
Renewable & Alternative Energy Portfolio Standards (RPS & APS)

February 29, 2012
DOER Mission

Creating a Cleaner Energy Future for the Commonwealth

The Massachusetts Department of Energy Resources (DOER) develops and implements policies and programs aimed at ensuring the adequacy, security, diversity, and cost-effectiveness of the Commonwealth’s energy supply within the context of creating a cleaner energy future. To that end, DOER strives to:

- Ensure deployment of all cost-effective energy efficiency
- Maximize development of clean energy resources
- Create and implement energy strategies to assure reliable supplies and improve the cost of clean energy relative to fossil-fuel based generation
- Support Massachusetts’ clean energy companies and spur Massachusetts’ clean energy employment
MA Renewable Energy Framework

• Patrick/Murray Administration Goals

• Renewable Energy Portfolio Standards (RPS/APS)
  - Creates demand (Minimum Standard) and provides additional revenue (Renewable Energy Certificate) for qualified generation
  - Establishes an obligation of all Massachusetts Retail Electric Suppliers to provide a percent of their load with renewable energy generation
  - Strategy is to “green up” the ISO-NE grid. Generation from throughout New England and adjacent control areas are eligible

• Green Communities Act of 2008
  Net Metering, Long Term Contracts, and utility owned solar PV

• Mass. Clean Energy Center (MassCEC)
  Provides targeted funding programs to support development of renewable energy supply in Massachusetts.
<table>
<thead>
<tr>
<th>Sub-Class</th>
<th>Resources/Technologies</th>
<th>Minimum Standard in 2011 &amp; thereafter</th>
<th>ACP Rate ($/MWh) 2011 &amp; thereafter</th>
</tr>
</thead>
<tbody>
<tr>
<td>as of 2009: RPS Class I (2002-08 called “RPS”)</td>
<td>Renewable Energy (post-1997 units)</td>
<td>Solar Elec, Wind, LFG, Biomass, Small Hydro, etc.</td>
<td>6% minus Solar Carve-Out Minimum Standard (increases 1% per year)</td>
</tr>
<tr>
<td></td>
<td>as of 2010: Solar Carve-Out (post-2007 units)</td>
<td>Solar PV; ≤ 6 MW per parcel; grid-connected; in MA</td>
<td>0.1627% (never lower) (increases are set annually by formula to grow the installed capacity to 400 MW)</td>
</tr>
<tr>
<td>as of 2009: RPS Class II (pre-1998 units)</td>
<td>Renewable Energy</td>
<td>same as Class I</td>
<td>3.6% (stays constant)</td>
</tr>
<tr>
<td></td>
<td>Waste Energy</td>
<td>MA Municipal Solid Waste Plants</td>
<td>3.5% (stays constant)</td>
</tr>
<tr>
<td>as of 2009: APS (post-2007 units)</td>
<td>--</td>
<td>CHP (&amp; several other non-renewably-fueled technologies)</td>
<td>2% (rises 0.5% per yr to 3.5% in 2014, rises 0.25% per yr thereafter)</td>
</tr>
</tbody>
</table>

*Visit the RPS/APS Homepage to find post-2011 Minimum Standards & ACP rates.
RPS Class I Compliance & REC Prices

<table>
<thead>
<tr>
<th>Year</th>
<th>Surplus Banked</th>
<th>ACP Compliance</th>
<th>Compliance from Banked</th>
<th>Compliance Year Generation</th>
<th>REC Price, $/MWh*</th>
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</thead>
<tbody>
<tr>
<td>2003</td>
<td>61</td>
<td>0</td>
<td>255</td>
<td>304</td>
<td>$40</td>
</tr>
<tr>
<td>2004</td>
<td>20</td>
<td>265</td>
<td>61</td>
<td>445</td>
<td>$45</td>
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<tr>
<td>2005</td>
<td>1</td>
<td>368</td>
<td>20</td>
<td>645</td>
<td>$50</td>
</tr>
<tr>
<td>2006</td>
<td>9</td>
<td>323</td>
<td>2</td>
<td>939</td>
<td>$50</td>
</tr>
<tr>
<td>2007</td>
<td>81</td>
<td>11</td>
<td>7</td>
<td>1600</td>
<td>$45</td>
</tr>
<tr>
<td>2008</td>
<td>211</td>
<td>1</td>
<td>81</td>
<td>1896</td>
<td>$30</td>
</tr>
<tr>
<td>2009</td>
<td>386</td>
<td>0</td>
<td>190</td>
<td>2130</td>
<td>$20</td>
</tr>
<tr>
<td>2010</td>
<td>241</td>
<td>4</td>
<td>381</td>
<td>2324</td>
<td>$20</td>
</tr>
</tbody>
</table>

*from NREL Report

Creating A Greener Energy Future For the Commonwealth
Green Communities Act of 2008: Challenges & Benefits of Expansion

• Class I expansion:
  – Small, “low-impact” Hydro eligibility (& “Hydrokinetic”)
  – Behind-the-Meter everywhere in ISO New England, with “independent verification”

• Developing a Solar Carve-Out:
  – Innovative program design
  – Ramping up (successfully)
  – New developers, new aggregation models

• Class II for pre-1997 Units:
  challenge of supply projection with declining “exempt load”

• APS: challenges of CHP design, evaluation, & promotion; and of supply projection with declining “exempt load”
Wind, Solar, Hydropower: Changing Market Forces, etc.

• **Riding the market:**
  – Class I development & supply up, REC prices down
  – Obligation up, development slows, REC prices up

• **Finances:**
  – ARRA (Fed. Stimulus): big wave now receding
  – PTC & ITC: after helping, uncertainties loom
  – Long-term contracting still inadequate
  – Cost of competing, conventional power sources
  – “Soft” but serious costs of permitting, litigating, etc.

• **Local opposition to siting** (esp. wind turbines/farms)

• **Transmission & utility interconnection**

• **Globalization of materials, manufacturing**
New Assistance, New Resources

• **Green Communities Program**
  in DOER, established by Green Communities Act of 2008

• **Clean Energy Results Program**
  MassDEP in collaboration with DOER

• **ACP Revenues** ([2010 ACP Spending Plan](#))

• **PV on Closed Landfills Handbook** (under prep.)

• **SunShot Rooftop Solar Challenge** (DOE grant)

• **Wind Turbine Health Impact Study**
  by independent panel for MassDEP & Mass Dept of Public Health

• **US Dept of Interior (BOEM) opening new off-shore areas for wind farms**
Contacts & Links

DOER RPS-related contacts

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Michael Judge, Solar Carve-Out/RPS Program Coordinator
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Links

http://www.mass.gov/doer (DOER homepage)
http://www.mass.gov/energy/rps (RPS & APS homepage)
RPS Annual Compliance Reports, 2003-2010

REC prices for the graph on the fifth slide were based on graphs (roughly averaged for each year and rounded to the nearest $5) in these sources:
http://apps3.eere.energy.gov/greenpower/pdfs/51904.pdf (Fig. 4)
Arizona’s Renewable Energy Standard and the AZ Corporation Commission

Nancy LaPlaca, J.D. Advisor to AZ Corporation Commissioner Paul Newman, Esq. Arizona Corporation Commission nlaplaca@azcc.gov 602-542-3682
What is the Arizona Corporation Commission?

• Established upon statehood in 1912, as a Constitutional authority; a separate, popularly-elected branch of state government.

• Originally made up of 3 commissioners; expanded by popular vote to 5 commissioners in 2000.

• Arizona voters have protected the independence of the Commission--especially election of commissioners--from constitutional amendment on numerous occasions.

• The Commission has constitutional authority to regulate public utilities, corporate filings, securities, and railroad and pipeline safety.

• The commission regulates 16 electric utilities, 7 natural gas utilities and over 350 private water and sewer utilities.
AZ’s Electricity Mix

• Total in-state generation: 25,000 MW
• Total in-state consumption: 16,000 MW
  – 50% coal
  – ~28% natural gas
  – ~22% nuclear
  – ~2-3% solar

  • 54 MW installed in 2010; about 100-200 MW in 2011
  • Total in-state solar: ~2-300 MW
  • 280 MW Concentrating Solar Power (CSP) project built by Abengoa to come online ~2014; molten salt storage will provide 6 hours of electricity after the sun goes down; parabolic trough design.
Renewable Energy in Arizona

- Arizona implemented the Environmental Portfolio Standard for electric utilities in 2001; and in 2006 the Commission approved the Renewable Energy Standard – 15% by 2025.

- The RES rules went into effect on August 14, 2007.

- The Commission has been sued repeatedly over the past 5 years by the Goldwater Institute, which for some odd reason dislike solar and energy efficiency.

- The ACC is currently (2/29/12) in a constitutional crisis as Chairman Gary Pierce wants to cede the ACC’s authority to the legislature. Both ACC attorneys and the legislature’s attorneys have declared this unconstitutional.

- The chaos is making it harder for solar and efficiency.
The RES: The Power of Distributed Generation

• Require regulated utilities to generate 15% of their energy from renewable resources by 2025.
• These rules do not have a dedicated solar set-aside, rather it has a specific set-aside for distributed generation.
• The RES allows utilities to use solar, wind, biomass, biogas, geothermal and other similar technologies to generate “clean” energy to power Arizona’s future.
• Big recent fight at the ACC with a 3-2 vote to allow a waiver and count burning trash as ‘clean’ energy, thus displacing solar or wind.
Distributed Renewable Energy Requirement

2007 – 5%
2009 – 15%
2011 – 25%
After 2011 – 30%

Utilities to meet half of the requirement from commercial projects and half from residential projects.
# RES Percentage Requirement

<table>
<thead>
<tr>
<th>Year</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>2008</td>
<td>1.75 %</td>
</tr>
<tr>
<td>2009</td>
<td>2.00 %</td>
</tr>
<tr>
<td>2010</td>
<td>2.50 %</td>
</tr>
<tr>
<td>2011</td>
<td>3.00 %</td>
</tr>
<tr>
<td>2012</td>
<td>3.50 %</td>
</tr>
<tr>
<td>2013</td>
<td>4.00 %</td>
</tr>
<tr>
<td>2014</td>
<td>4.50 %</td>
</tr>
<tr>
<td>2015</td>
<td>5.00 %</td>
</tr>
<tr>
<td>2016</td>
<td>6.00 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>7.00 %</td>
</tr>
<tr>
<td>2018</td>
<td>8.00 %</td>
</tr>
<tr>
<td>2019</td>
<td>9.00 %</td>
</tr>
<tr>
<td>2020</td>
<td>10.00 %</td>
</tr>
<tr>
<td>2021</td>
<td>11.00 %</td>
</tr>
<tr>
<td>2022</td>
<td>12.00 %</td>
</tr>
<tr>
<td>2023</td>
<td>13.00 %</td>
</tr>
<tr>
<td>2024</td>
<td>14.00 %</td>
</tr>
<tr>
<td>After 2024</td>
<td>15.00 %</td>
</tr>
</tbody>
</table>
Performance Based Incentives

• Commercial customers who want to install solar on their buildings do not get an up-front lump sum payment from the utility; rather, they now qualify for Performance Based Incentives (“PBI”).

• Under PBI’s the utility will pay commercial customers based on the actual energy produced.

• PBI’s are not popular with the current Commission because payments are obligated 15-20 years out; so costs can increase rapidly.

• Residential customers use UFIs (Up-front incentives) rather than PBIs.
Funding for the RES

- RES is funded by a tariff (surcharge).
- This year, maximum that an Arizona Public Service residential customer would pay is $3.84/month.
- Unfortunately, clean energy in Arizona has become very political and there are not 3 votes to support solar.
- Recent amendment and 3-2 vote added surcharge to customers who have solar installed.
- REST plans for Arizona’s regulated utilities (Arizona Public Service, Tucson Electric Power, Unisource and the 15 coops) change year-to-year.
- The mines keep looking for waivers. Arizona produces 60% of U.S. copper.
Taking Advantage of Renewable Energy

- Individuals, businesses, schools, municipalities can all take advantage of RES funding from regulated utilities.
- Arizona has about 17,000 rooftops with solar right now.
- The REST has been a very political battle, and since the utilities are way ahead of schedule, the current Commission allowed APS to cut funds for DG by almost half.
- *SolarCity* case in 2010 decided that onsite solar was not subject to regulation as a utility; huge decision.
- Rebates are currently at 60 cents/watt, and will be at 10 cents/watt soon. *Solar companies tell us they are leaving the state.*
AZ RES: 15% by 2025 is lower than most Western states

- Other states’ RES:
  - NM  20% by 2020
  - CO  30% by 2020
  - NV  25% by 2025
  - CA  33% by 2020
  - OR  25% by 2025
APS’ RW Beck Study on the Value Of Distributed Energy
Operating Impacts and Valuation study

Build-Up of Solar DE Value

- Distribution Savings: 0 to 0.31 cents/kWh
- Transmission Savings: 0 to 0.51 cents/kWh
- Generation Savings: 0 to 1.85 cents/kWh
- Fixed O&M Savings: 0.81 to 3.22 cents/kWh
- Fuel, Purchased Power, & Losses Savings: 7.10 to 8.22 cents/kWh

TOTAL SAVING*: 7.91 to 14.11 cents/kWh (79.1 to 141.1 $/MWh)

*Minimum and maximum value shown not reflective of any specific scenario as evaluated in this Study

RW Beck study says the value of distributed solar is 7.9 to 14.11 cents/kWh in avoided costs for fuel, transmission, line losses, etc.
9 out of 10 Americans think it is important to develop and use solar power.

SOLAR: Top energy choice

- Solar: 39%
- Natural Gas: 21%
- Wind: 12%
- Nuclear: 9%
- Coal: 3%

If the American public were in charge of U.S. energy policy...

82% support federal solar incentives
- 82% of Independents
- 87% of Democrats
- 71% of Republicans

82% support U.S. solar manufacturing
- 51% of Independents
- 43% of Democrats
- 31% of Republicans

Think it is extremely important

The Solar Barometer is a nationally representative survey conducted annually by independent polling firm Kelton Research.
Installed System Price per Watt, 2008-2011

Source: Deutsche Bank, January 2011; Systems are global (i.e., blended across geographies)
PV Power Plants Are Cost Competitive Today

2012 LCOE by Resource $/MWh: 2010 USD

<table>
<thead>
<tr>
<th>Resource</th>
<th>Levelized Cost ($/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PV</td>
<td>$73 ground – 192 roof</td>
</tr>
<tr>
<td>Solar Thermal</td>
<td>$120 - 198</td>
</tr>
<tr>
<td>Wind</td>
<td>$38 - 79</td>
</tr>
<tr>
<td></td>
<td>$164 off-shore</td>
</tr>
<tr>
<td>Gas Peaking</td>
<td>$211-242</td>
</tr>
<tr>
<td>Gas CC</td>
<td>$69-97</td>
</tr>
<tr>
<td>Nuclear</td>
<td>$77-113</td>
</tr>
<tr>
<td>Coal</td>
<td>$70-152</td>
</tr>
</tbody>
</table>

Prices include federal incentives
Not as Pretty Without ITC

2012 LCOE by Resource $/MWh: 2010 USD

Renewables

- Solar PV: $104 ground – 274 roof
- Solar Thermal: $171 - 283
- Wind: $54 - 113, $234 off-shore

Conventional

- Gas Peaking: $211-242
- Gas CC: $69-97
- Nuclear: $77-113
- Coal: $70-152

Prices include federal incentives
Thank you!

Nancy LaPlaca, Policy Advisor to Arizona Corporation Commissioner
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