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12:00  Adjourn
DG Updates
DG Updates – High Saturation Areas

Central MA has high saturation in particular- Barre, Ware, Gardner

- Stress on substation transformers and feeders

Impact on interconnection process:

- Higher costs for system modification upgrades,
- Longer times for impact studies if over $1 Million
At a minimum the following supplemental data will be required for all applications that include storage:

- an operating narrative for the energy storage including
  - Usage and operating modes
  - System configuration
  - Energy Storage and PCS Technical Details
  - System Applications

Documentation needed will be sent to the customer prior to the impact study.

Documents: 1) Supporting Documentation for Interconnection Study Application For Inverter-based DER Systems 2) ESS Data Collection
Safety Moment: Smith System 5 Keys to Safe Driving

# 1. Aim High in Steering.
   • Look a minimum of 15 seconds ahead of you.

# 2. Get the Big Picture.
   • Maintain 4 second following distance.
   • Check mirrors every 5-8 second.

# 3. Keep Your Eyes Moving.
   • Do not focus on any object for more than 2 seconds.

# 4. Leave Yourself an Out.
   • Maintain open space around your vehicle.

# 5. Make Sure They See You.
   • Seek eye contact or try and observe where other drivers are looking.
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National Grid Interconnection Process for Distributed Energy Resources
Topics Covered

- Purpose and Scope
- Process Mechanics
  - Milestones and timelines
Importance of the Interconnection Process

- **Safety** of utility workers and general public
- **No adverse impact** to power quality, in terms of:
  - Islanding
  - Transient Voltage Conditions
  - Noise and Harmonics
  - Frequency
  - Voltage Level
  - Machine Reactive Capability
- **Customers cannot interconnect to the Electric Power System (EPS) without the Company’s authorization.**
- Billing implications
Interconnection Process Steps

- Pre-Application
- Application
  - Simplified/Expedited/Standard
- Engineering Review
  - Supplemental Review/Impact Study/Detailed Study
- Conditional Approval (to construct DG system)
- National Grid Construction
- Witness Test
- Authorization to Interconnect

https://www.nationalgridus.com/masselectric/home/energyeff/4_interconnection-process.asp
http://ngridustest/narragansett/home/energyeff/4_interconnection-process.asp
Simplified Review Process
Simplified Criteria

- UL Listed, inverter based systems with power ratings of **15kW** (was previously 10 kW) or less on a single phase service on a radial feed.

- UL Listed, inverter based systems with power ratings of **25kW** or less on a three phase service on a radial feed.

  - The Simplified Process does not apply for:
    - non-listed inverters or other generators (induction / synchronous / asynchronous)
    - aggregate generation capacity of listed inverters that exceed the above-mentioned limits
Expedited Review Process
Expedited Criteria

- Single phase customers with listed single-phase inverter based systems with power ratings of \( >15 \text{ kW} \) on a radial feed
- Three phase customers with listed three-phase inverter based systems with power ratings of \( >25\text{kW} \) on a radial feed
- Any project that did not pass the Simplified process screens
- Non-simplified projects that do not require an impact study
- Maximum size and supplemental review is based on review of screens
Expedited Review Path

<table>
<thead>
<tr>
<th>Eligible Facilities</th>
<th>Listed Inverter DG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledge Receipt of Application</td>
<td>(3 days)</td>
</tr>
<tr>
<td>Review Application for Completeness</td>
<td>10 days</td>
</tr>
<tr>
<td>Complete Review of All Screens</td>
<td>25 days</td>
</tr>
<tr>
<td>Complete Supplemental Review (if needed)</td>
<td>20 days or Standard Process</td>
</tr>
<tr>
<td>Send Executable Agreement</td>
<td>10 days</td>
</tr>
<tr>
<td>Total Maximum Days</td>
<td>45/65 days</td>
</tr>
<tr>
<td>Construction Schedule</td>
<td>By Mutual Agreement</td>
</tr>
<tr>
<td>Notice/ Witness Test</td>
<td>Within 10 days of receiving CoC or by mutual agreement</td>
</tr>
</tbody>
</table>

- If any screens are not passed, the Company may require a **Supplemental Review Agreement** before providing an Interconnection Service Agreement.
  - Key threshold: if aggregate generation is less than 67% of minimum load on the feeder. Other screens review voltage quality, reliability and safety to reduce the potential need for impact studies.
- Relay control system must be well defined to make supplemental review easier.
Standard Review Process
Standard Criteria

- Applies to:
  - Projects that require System Impact Study (SIS)
  - Large-scale DG projects
    - Generally greater than 500 kW but project specific
  - DG projects requiring system modifications at the substation level
  - Non-listed inverters or generators other than PV:
    - Induction, Synchronous, Asynchronous
  - Most CHP systems
  - All projects that do not qualify for the Simplified or Expedited process
### Standard Review Path

<table>
<thead>
<tr>
<th>Step</th>
<th>Timeframes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible Facilities</td>
<td>Any DG</td>
</tr>
<tr>
<td>Acknowledge Receipt of Application</td>
<td>(3 days)</td>
</tr>
<tr>
<td>Review Application for Completeness</td>
<td>10 days</td>
</tr>
<tr>
<td>Complete Standard Process Initial Review</td>
<td>20 days</td>
</tr>
<tr>
<td>Send Impact Study Agreement</td>
<td>5 days</td>
</tr>
<tr>
<td><strong>Complete Impact Study</strong></td>
<td>55 days or 60 Days Complex</td>
</tr>
<tr>
<td>Complete Detailed Study (if needed)</td>
<td>30 days or by mutual agreement</td>
</tr>
<tr>
<td>Send Executable Agreement (ISA)</td>
<td>15 days</td>
</tr>
<tr>
<td>Total Maximum Days</td>
<td>135/160 days (200 days for Standard Complex)</td>
</tr>
<tr>
<td>Construction Schedule</td>
<td>By Mutual Agreement</td>
</tr>
<tr>
<td>Witness Test</td>
<td>10 days or by mutual agreement</td>
</tr>
</tbody>
</table>

- Impact Study will determine the level of impact on EPS, other customers, other generators
- Impact and/or Detailed Study will determine System Modifications required and cost (Risk of Islanding)
- ISO-NE Notification Process and Transmission Study may be required
- Interconnection Service Agreement (ISA) provided after study completed or an Early ISA could be requested if Detailed Study is required
- If substation modifications required, Company has 60 BD for study (MDPU 1320 – pg. 50)
Summary and Recommendations

- This is a high-level overview of the interconnection process. The interconnection tariff, applicable rules, laws, regulations and MDPU orders set forth the interconnection requirements. The customer must comply with all interconnection requirements.

- Submit your interconnection application with National Grid early, during conception phase before committing to buying no matter how simple or small the DG might be.

- Large interconnection applications take longer to study
  - Proposed facilities ≥ 5MW must undergo ISO-NE Notification Process and Transmission Study

- Company processing time frames are standard working days (Business Days) and do not include customer delays, including due to missing information, third party delays, or force majeure events

Before considering any system design changes consult your CEI project manager, including but not limited to:

- Adding energy storage
- Change in system size
- Change in generator type
- Change in inverters
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Retail Connections Policy & Standards Updates
Recent Updates

- ESB 756
  - Interim Amendments Published Feb 2018
  - ISO NE Ride Through Request Published Feb 2018
    - Section 7.6.11 and 7.8 Updated
  - Expected to be updated June 2018
ISO NE Ride Through Requirements
Who is ISO NE?

- New England Independent System Operator
  - Operates the transmission system in New England
  - Directs the flow of electricity
  - Concerned with bulk stability (i.e. preventing major blackouts)
- [https://www.iso-ne.com/about/what-we-do/three-roles](https://www.iso-ne.com/about/what-we-do/three-roles)
ISO NE Ride Through Requirements

- Advanced implementation of new IEEE 1547 – 2018 settings
  - Similar to California Rule 21 and Hawaii ride through requirements
  - New England is in the early beginning of a US-wide industry change
Why is ISO NE Concerned?

- Distributed Energy Resources (DERs) are adding up
  - National Grid presently has over 1.38 GW connected across its system in the U.S.
- Concerns with effects on transmission system reliability
  - Example – California Blue Cut Fire Event
Blue Cut Fire Event - CA

Rapid loss of 1.1GW of PV generation

Ride Through Requirements
# Voltage Ride Through Capability Requirements

## Table III: Inverters’ Voltage Ride-through Capability and Operational Requirements

<table>
<thead>
<tr>
<th>Voltage Range (p.u.)</th>
<th>Operating Mode/Response</th>
<th>Minimum Ride-through Time(s) (design criteria)</th>
<th>Maximum Response Time(s) (design criteria)</th>
<th>Comparison to IEEE Std 1547-2018 (2nd ed.) for Category II</th>
</tr>
</thead>
<tbody>
<tr>
<td>V &gt; 1.20</td>
<td>Cease to Energize</td>
<td>N/A</td>
<td>0.16</td>
<td>Identical</td>
</tr>
<tr>
<td>1.175 &lt; V ≤ 1.20</td>
<td>Permissive Operation</td>
<td>0.2</td>
<td>N/A</td>
<td>Identical</td>
</tr>
<tr>
<td>1.15 &lt; V ≤ 1.175</td>
<td>Permissive Operation</td>
<td>0.5</td>
<td>N/A</td>
<td>Identical</td>
</tr>
<tr>
<td>1.10 &lt; V ≤ 1.15</td>
<td>Permissive Operation</td>
<td>1</td>
<td>N/A</td>
<td>Identical</td>
</tr>
<tr>
<td>0.88 ≤ V ≤ 1.10</td>
<td>Continuous Operation</td>
<td>infinite</td>
<td>N/A</td>
<td>Identical</td>
</tr>
<tr>
<td>0.65 ≤ V &lt; 0.88</td>
<td>Mandatory Operation</td>
<td>Linear slope of 8.7 s/1 p.u. voltage starting at 3 s @ 0.65 p.u.: $T_{VRT} = 3 s + \frac{8.7}{1} \frac{s}{\text{p.u.}} (V - 0.65 \text{ p.u.})$</td>
<td>N/A</td>
<td>Identical</td>
</tr>
<tr>
<td>0.45 ≤ V &lt; 0.65</td>
<td>Permissive Operation</td>
<td>0.32</td>
<td>N/A</td>
<td>See footnotes a &amp; b</td>
</tr>
<tr>
<td>0.30 ≤ V &lt; 0.45</td>
<td>Permissive Operation</td>
<td>0.16</td>
<td>N/A</td>
<td>See footnote b</td>
</tr>
<tr>
<td>V &lt; 0.30</td>
<td>Cease to Energize</td>
<td>N/A</td>
<td>0.16</td>
<td>Identical</td>
</tr>
</tbody>
</table>

The following additional operational requirements shall apply for all inverters:

a. In the Permissive Operation region above 0.5 p.u., inverters shall ride-through in Mandatory Operation mode, and

b. In the Permissive Operation region below 0.5 p.u., inverters shall ride-through in Momentary Cessation mode with a maximum response time of 0.083 seconds.
### Table IV: Inverters’ Frequency Ride-through Capability

<table>
<thead>
<tr>
<th>Frequency Range (Hz)</th>
<th>Operating Mode</th>
<th>Minimum Time(s) (design criteria)</th>
<th>Comparison to IEEE Std 1547-2018 (2nd ed.) for Category II</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f &gt; 62.0$</td>
<td>No ride-through requirements apply to this range</td>
<td></td>
<td>Identical</td>
</tr>
<tr>
<td>$61.2 &lt; f \leq 61.8$</td>
<td>Mandatory Operation</td>
<td>299</td>
<td>Identical</td>
</tr>
<tr>
<td>$58.8 \leq f &lt; 61.2$</td>
<td>Continuous Operation</td>
<td>Infinite</td>
<td>Identical</td>
</tr>
<tr>
<td>$57.0 \leq f &lt; 58.8$</td>
<td>Mandatory Operation</td>
<td>299</td>
<td>Identical</td>
</tr>
<tr>
<td>$f &lt; 57.0$</td>
<td>No ride-through requirements apply to this range</td>
<td></td>
<td>Identical</td>
</tr>
</tbody>
</table>
### ESB 756 C Table 7.6.11.1-1 Utility Grade Relay and Parallel Generation Default Voltage & Frequency Set Points

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>PICKUP RANGE</th>
<th>CLEARING TIME RANGE (sec)</th>
<th>DEFAULT CLEARING TIME (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Frequency (81U)</td>
<td>( \leq 56.5 \text{ Hz} )</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Under Frequency (81U)</td>
<td>(&lt; (58.9 - 57.1) \text{ Hz} ) adjustable Default set to 58.5 Hz</td>
<td>0.1 – 300.0</td>
<td>300</td>
</tr>
<tr>
<td>Over Frequency (81O)</td>
<td>( 61.2 \text{ Hz} \leq f &lt; 62.0 \text{ Hz} )</td>
<td>0.1 – 300.0</td>
<td>300</td>
</tr>
<tr>
<td>Over Frequency (81O)</td>
<td>( \geq 62.0 \text{ Hz} )</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Under Voltage (27)</td>
<td>( \leq 50% \text{ of Nominal} )</td>
<td>0.1 – 11.0</td>
<td>0.16</td>
</tr>
<tr>
<td>Under Voltage (27)</td>
<td>( 50% \leq V &lt; 88% \text{ of Nominal} )</td>
<td>0.1 – 21.0</td>
<td>2</td>
</tr>
<tr>
<td>Over Voltage (59)</td>
<td>( 110% \leq V &lt; 120% \text{ of Nominal} )</td>
<td>0.1 – 13.0</td>
<td>2</td>
</tr>
<tr>
<td>Over Voltage (59)</td>
<td>( \geq 120% \text{ of Nominal} )</td>
<td>0.16</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Pickups are exact set points and the time delays are maximum total clearing times (including relay and device interruption time).
How is this an ‘Advanced IEEE 1547-2018 Implementation?’

- Inverters Required to meet Ride Through matching IEEE 1547-2018 Category II
  - Voltage Ride Through
  - Frequency Ride Through
- Uses new IEEE 1547-2018 Vocabulary
  - Momentary cessation, permissive operation, etc.
- Trip Settings align with those permitted in IEEE 1547-2018 Category II
  - Wider voltage trip settings (than 2003)
  - Wider frequency trip settings (than 2003)
What Do We Look For in Applications?

- **Ride Through: UL 1741 SA Certification documentation**
  - Proof of the ISO requirements for ride through (such as NRTL letter/certification, or letter from manufacturer for pending testing)
  - One line must show “UL 1741 SA inverters” or ‘pending’ UL 1741 SA inverters
    - (Verify pending gets listed to SA with ISO ride through prior to Witness test/operation)
    - Nameplate should show UL 1741 SA compliance and shall be marked as a “Grid Support Interactive Inverter“ or “Grid Support Utility Interactive Inverter”
  - *Some UL1741 SA tested functions MUST be default set as shown in Table V (next slide)*

- **Updated Trip Settings**
  - Study – One Lines must show correct trip settings
    - Should match defaults in ESB 756 section 7.6.11 and ISO request
  - Witness Test – Inverter Witness or Screen Shot of Settings verification
UL 1741 SA tested Functions That Must be set to Specific Defaults

Table V: Grid Support Utility Interactive Inverter Functions Status

<table>
<thead>
<tr>
<th>Function</th>
<th>Default Activation State</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPF, Specified Power Factor</td>
<td>OFF²</td>
</tr>
<tr>
<td>Q(V), Volt-Var Function with Watt or Var Priority</td>
<td>OFF</td>
</tr>
<tr>
<td>SS, Soft-Start Ramp Rate</td>
<td>ON</td>
</tr>
<tr>
<td>FW, Freq-Watt Function OFF</td>
<td>Default value: 2% of maximum current output per second</td>
</tr>
</tbody>
</table>

Table V Source: Inverter Source Requirement Document of ISO New England (ISO-NE)

Footnote 2: OFF and operating at unity PF. Or set to ON with unity PF.
When the Requirements Apply:

- Inverter-based Projects over 100kW:
  - Application received March 1, 2018 or later
- Inverter-based Projects 100kW or less:
  - Application received June 1, 2018 or later
- See National Grid’s website for more info:

MA:

RI:
Website References

Interconnection Documents

Interconnection Standards, Regulations & Reports

Interconnection Status Reports
- National Grid's DOER Report (XLS) – Updated 03/19/18

Interconnection Standards and Regulations:
- Interconnection Tariff (PDF) – DPU 1320 Effective 10/01/2018
- ESB 756 – Technical Requirements for DG (PDF) – Updated February, 2018
- ESB 756 2017 Revision – Review of Changes for MA Jurisdiction (PDF) – August 23, 2017
- New England Independent System Operator Ride Through Requirements Memo (PDF) (PDF) – February, 2018
- ESB 750 – Specifications for Electrical Installations (PDF) – Updated September 2010
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
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<tr>
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</tr>
<tr>
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<td>Adjourn</td>
<td></td>
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Creating A Clean, Affordable, and Resilient Energy Future For the Commonwealth

COMMONWEALTH OF MASSACHUSETTS
Charles D. Baker, Governor
Karyn E. Polito, Lt. Governor
Matthew A. Beaton, Secretary
Judith F. Judson, Commissioner

Solar Massachusetts Renewable Target (SMART) Program Summary
Purpose of Presentation and Links to Program Resources

- This presentation is designed to provide stakeholders with easily digestible information on the current design and status of the SMART Program, but should not necessarily be relied upon by stakeholders when making financial decisions. DOER strongly recommends that stakeholders consult the official resources listed below.
- For the official program rules, procedures, and eligibility criteria, stakeholders should consult the Department of Energy Resources’ (DOER) SMART regulation (225 CMR 20.00), which was promulgated on August 25, 2017 and can be accessed at:
- Additionally, the SMART regulation is supplemented by several Guidelines published by DOER, which clarify how elements of the regulation will be enforced and can be found at:
  - [Development of the SMART Program Webpage](#)
- At this time, the SMART Program is not fully in effect as the Department of Public Utilities still has an open proceeding to review the model tariff that was jointly filed by the electric distribution companies in September 2017. Information on the status of this proceeding can be found at:
  - [http://web1.env.state.ma.us/DPU/Fileroom/dockets/bynumber](http://web1.env.state.ma.us/DPU/Fileroom/dockets/bynumber) (type in 17-140 and click go)
- Program updates will continue to be provided by DOER as the program moves closer towards full implementation. Status updates and more information on the program can be found at the following two webpages:
  - [masmartsolar.com](#) (Solar Program Administrator’s SMART Website)
  - [Development of the SMART Program Webpage](#)
- Interested stakeholders can sign up for email updates from DOER at:
  - [https://www.mass.gov/forms/subscribe-to-doer-email-lists](https://www.mass.gov/forms/subscribe-to-doer-email-lists) (select “Solar PV list include SREC Contacts“)
- Questions on the program should be directed to one of the following:
  - [DOER.SMART@state.ma.us](mailto:DOER.SMART@state.ma.us)
  - [MA.SMART@clearesult.com](mailto:MA.SMART@clearesult.com)
Basic Features of SMART Program

• 1,600 MW AC declining block tariff program that provides fixed Base Compensation Rates to qualified generators
• Base Compensation Rates decline as Capacity Blocks are filled
• Applies to all investor owned electric distribution companies
• The amount of time a facility may receive compensation under the tariff is based on facility’s AC rated capacity
  ➢ 10-year term for facilities less than or equal to 25 kW AC
  ➢ 20-year term for facilities larger than 25 kW AC
• Compensation structure differentiated between behind-the-meter and standalone facilities
• Four types of Compensation Rate Adders are available to eligible facilities:
  ➢ Location Based Adders
  ➢ Off-taker Based Adders
  ➢ Energy Storage Adder
  ➢ Solar Tracking Adder
• Maximum project size of 5 MW AC per parcel
Additional Program Features

• Initial Base Compensation Rates were established using the results of a competitive procurement for larger projects (> 1 MW) and were announced on January 11, 2018
• Base Compensation Rates are based on a facility’s electric distribution company and Capacity Block
• Eligible projects may elect to receive compensation for energy through one of three mechanisms:
  ➢ Net metering (via Net Metering Tariffs)
  ➢ Qualifying facility tariff (via QF Tariffs)
  ➢ Alternative on-bill crediting mechanism (via SMART Tariffs)
• Alternative on-bill crediting mechanism is a new energy compensation option that is designed to be an alternative to virtual net metering
• Alternative on-bill credit is not proposed to be made available to facilities with on-site load
Additional Program Features

• Program design steers projects towards optimal locations by providing Location Based Adders and Greenfield Subtractors
  ➢ A Greenfield Subtractor will be applied to the Base Compensation Rate of any facility sited on open space that does not meet the criteria to receive the full incentive

• Energy storage will be compensated via variable adder that is based on the ratio of storage capacity to solar capacity as well as the duration of the storage
  ➢ Minimum performance standards will apply to ensure grid benefits are realized
Solar Program Administrator

- CLEAResult was announced as the Solar Program Administrator on November 13, 2017
- CLEAResult has partnered with Clean Power Research and will utilize its PowerClerk platform to accept applications
- CLEAResult will be responsible for:
  - Reviewing applications and managing block reservations
  - Calculating total compensation rates
  - Making recommendations to DOER and electric distribution companies on project eligibility
  - Creating the public interface for SMART program, through its website and application portal
- CLEAResult’s SMART Program website is now live: https://masmartsolar.com
Factors that Establish a Solar Tariff Generation Unit’s Total Compensation Rate

- Electric Distribution Company Service Territory
  - Base Compensation Rates are differentiated by electric distribution company service territory
- Capacity Block
  - Base Compensation Rates are differentiated by Capacity Block, which are established for each service territory and may be subscribed faster in one service territory than another
- Facility’s AC Rated Capacity
  - Base Compensation Rates are also differentiated by system size
- Compensation Rate Adder Eligibility
  - Depending on its rate capacity, a facility may be eligible to receive one or more Compensation Rate Adders
- Greenfield Subtractor Applicability
  - If a facility falls under Category 2 or Category 3 Land Use, it will be subject to a Greenfield Subtractor (see slides 14-17)
- Behind-the-Meter Facility vs. Standalone Facility
  - While being classified as Behind-the-Meter vs. Standalone does not change the total compensation rate for which a facility is eligible under the tariff, the actual incentive payment is calculated differently depending on whether the facility serves an on-site load or exports 100% of its output to the electric grid
### Capacity Block Sizes

<table>
<thead>
<tr>
<th>Distribution Company</th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
<th>Block 5</th>
<th>Block 6</th>
<th>Block 7</th>
<th>Block 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitchburg Gas &amp; Electric d/b/a Unitil</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>Not Applicable</td>
<td></td>
<td></td>
<td></td>
<td>15.8</td>
</tr>
<tr>
<td>Massachusetts Electric d/b/a National Grid</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>720.2</td>
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<tr>
<td>Nantucket Electric d/b/a National Grid</td>
<td>3.0</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.0</td>
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<tr>
<td>NSTAR d/b/a Eversource Energy</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>732.1</td>
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<tr>
<td>WMECO d/b/a Eversource Energy</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>125.9</td>
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<tr>
<td>Total Capacity</td>
<td>204.2</td>
<td>204.2</td>
<td>201.2</td>
<td>201.2</td>
<td>197.3</td>
<td>197.3</td>
<td>197.3</td>
<td>197.3</td>
<td>1600.0</td>
</tr>
</tbody>
</table>

- Capacity available in each service territory was determined by multiplying 1,600 MW by each distribution company’s percentage share of total statewide distribution load in 2016.
- Unitil and Nantucket Electric have each elected to have fewer than eight blocks, as permitted by regulation.
- Each block has a minimum of 20% and a maximum of 35% of capacity set-aside for projects <=25 kW AC.
- Capacity selected under the initial competitive procurement is deducted from the capacity available under Block 1 for each distribution company.
- More information can be found in DOER’s [Guideline on Capacity Blocks, Base Compensation Rates, and Compensation Rate Adders](#).
Competitive Procurement Results

- Bids for approximately 100 MW of projects were jointly solicited by the distribution companies in November 2017
- Each company solicited an amount of capacity proportional to their load share
- Results of the procurement were announced on January 11, 2018
- Results were used to establish the Base Compensation Rates for Block 1 in each service territory

<table>
<thead>
<tr>
<th></th>
<th>Massachusetts Electric d/b/a National Grid</th>
<th>Nantucket Electric d/b/a National Grid</th>
<th>NSTAR d/b/a Eversource Energy</th>
<th>WMECO d/b/a Eversource Energy</th>
<th>Fitchburg Gas &amp; Electric d/b/a Unitil</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW Solicited</td>
<td>45.0</td>
<td>2.0</td>
<td>46.0</td>
<td>8.0</td>
<td>4.0</td>
</tr>
<tr>
<td>MW Received</td>
<td>53.3</td>
<td>0.0</td>
<td>2.0</td>
<td>13.0</td>
<td>0.0</td>
</tr>
<tr>
<td>MW Selected</td>
<td>43.5</td>
<td>0.0</td>
<td>2.0</td>
<td>7.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Clearing Price ($/kWh)</td>
<td>$0.16933</td>
<td>N/A</td>
<td>$0.17000</td>
<td>$0.14890</td>
<td>N/A</td>
</tr>
<tr>
<td>Mean Price ($/kWh)</td>
<td>$0.15563</td>
<td>N/A</td>
<td>$0.17000</td>
<td>$0.14288</td>
<td>N/A</td>
</tr>
<tr>
<td>Block 1 Base Compensation Rate for 1-5 MW Facilities ($/kWh)</td>
<td>$0.15563</td>
<td>$0.17000</td>
<td>$0.17000</td>
<td>$0.14288</td>
<td>$0.15563</td>
</tr>
</tbody>
</table>
### Block 1 Base Compensation Rates

<table>
<thead>
<tr>
<th>Electric Distribution Company</th>
<th>Generation Unit Capacity</th>
<th>Term Length</th>
<th>Block 1 Compensation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fitchburg Gas &amp; Electric d/b/a Unitil</strong></td>
<td>Low income less than or equal to 25 kW AC</td>
<td>10-year</td>
<td>$0.35795</td>
</tr>
<tr>
<td><strong>Massachusetts Electric d/b/a National Grid</strong></td>
<td>Less than or equal to 25 kW AC</td>
<td>10-year</td>
<td>$0.31126</td>
</tr>
<tr>
<td></td>
<td>Greater than 25 kW AC to 250 kW AC</td>
<td>20-year</td>
<td>$0.23345</td>
</tr>
<tr>
<td></td>
<td>Greater than 250 kW AC to 500 kW AC</td>
<td>20-year</td>
<td>$0.19454</td>
</tr>
<tr>
<td></td>
<td>Greater than 500 kW AC to 1,000 kW AC</td>
<td>20-year</td>
<td>$0.17119</td>
</tr>
<tr>
<td></td>
<td>Greater than 1,000 kW AC to 5,000 kW AC</td>
<td>20-year</td>
<td>$0.15563</td>
</tr>
<tr>
<td><strong>Nantucket Electric d/b/a National Grid</strong></td>
<td>Low income less than or equal to 25 kW AC</td>
<td>10-year</td>
<td>$0.39100</td>
</tr>
<tr>
<td><strong>NSTAR Electric d/b/a Eversource Energy</strong></td>
<td>Less than or equal to 25 kW AC</td>
<td>10-year</td>
<td>$0.34000</td>
</tr>
<tr>
<td></td>
<td>Greater than 25 kW AC to 250 kW AC</td>
<td>20-year</td>
<td>$0.25500</td>
</tr>
<tr>
<td></td>
<td>Greater than 250 kW AC to 500 kW AC</td>
<td>20-year</td>
<td>$0.21250</td>
</tr>
<tr>
<td></td>
<td>Greater than 500 kW AC to 1,000 kW AC</td>
<td>20-year</td>
<td>$0.18700</td>
</tr>
<tr>
<td></td>
<td>Greater than 1,000 kW AC to 5,000 kW AC</td>
<td>20-year</td>
<td>$0.17000</td>
</tr>
<tr>
<td><strong>WMECO d/b/a Eversource Energy</strong></td>
<td>Low income less than or equal to 25 kW AC</td>
<td>10-year</td>
<td>$0.32862</td>
</tr>
<tr>
<td></td>
<td>Less than or equal to 25 kW AC</td>
<td>10-year</td>
<td>$0.28576</td>
</tr>
<tr>
<td></td>
<td>Greater than 25 kW AC to 250 kW AC</td>
<td>20-year</td>
<td>$0.21432</td>
</tr>
<tr>
<td></td>
<td>Greater than 250 kW AC to 500 kW AC</td>
<td>20-year</td>
<td>$0.17860</td>
</tr>
<tr>
<td></td>
<td>Greater than 500 kW AC to 1,000 kW AC</td>
<td>20-year</td>
<td>$0.15717</td>
</tr>
<tr>
<td></td>
<td>Greater than 1,000 kW AC to 5,000 kW AC</td>
<td>20-year</td>
<td>$0.14288</td>
</tr>
</tbody>
</table>

- Base Compensation Rates in Massachusetts Electric, NSTAR Electric, and WMECO decline 4% per Capacity Block over eight blocks.
- Base Compensation Rates in Fitchburg Gas & Electric decline 8.8% per Capacity Block over four blocks.
- Base Compensation Rates in Nantucket Electric decline by 16% per Capacity Block over two blocks.
- More information can be found in DOER’s [Guideline on Capacity Blocks, Base Compensation Rates, and Compensation Rate Adders](#).
Compensation Rate Adders

- There are four categories of Compensation Rate Adders
  - Location Based Adders
  - Off-taker Based Adders
  - Energy Storage Adder
  - Solar Tracking Adder
- Systems larger than 25 kW AC may qualify for one adder from each category
- Systems less than or equal to 25 kW AC may only qualify for the Energy Storage adder
- More details on the eligibility criteria for certain adders can be found in the following DOER Guidelines
  - Definition of Agricultural Solar Tariff Generation Units Guideline
  - Definition of Brownfield Guideline
  - Energy Storage Adder Guideline
  - Low Income Generation Units Guideline
  - SQ and Capacity Block Reservation Guideline
- These Guidelines are published at: https://www.mass.gov/service-details/development-of-the-solar-massachusetts-renewable-target-smart-program
## Adder Values

### Location Based Adders

<table>
<thead>
<tr>
<th>Type</th>
<th>Adder Value ($/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural</td>
<td>$0.06</td>
</tr>
<tr>
<td>Building Mounted</td>
<td>$0.02</td>
</tr>
<tr>
<td>Brownfield</td>
<td>$0.03</td>
</tr>
<tr>
<td>Floating Solar</td>
<td>$0.03</td>
</tr>
<tr>
<td>Landfill</td>
<td>$0.04</td>
</tr>
<tr>
<td>Solar Canopy</td>
<td>$0.06</td>
</tr>
</tbody>
</table>

### Off-taker Based Adders

<table>
<thead>
<tr>
<th>Type</th>
<th>Adder Value ($/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Shared Solar (CSS)</td>
<td>$0.05</td>
</tr>
<tr>
<td>Low Income Property Owner</td>
<td>$0.03</td>
</tr>
<tr>
<td>Low Income CSS</td>
<td>$0.06</td>
</tr>
<tr>
<td>Public Entity</td>
<td>$0.02</td>
</tr>
</tbody>
</table>

### Energy Storage Adder

<table>
<thead>
<tr>
<th>Type</th>
<th>Adder Value ($/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage + PV</td>
<td>Variable</td>
</tr>
</tbody>
</table>

### Solar Tracking Adder

<table>
<thead>
<tr>
<th>Type</th>
<th>Adder Value ($/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Tracking</td>
<td>$0.01</td>
</tr>
</tbody>
</table>

- Adder values will decline by 4% as adder tranches are filled
- The first adder tranche is 80 MW for each adder
- Subsequent tranche sizes will be established by DOER
- More information on adder values and future tranche sizes can be found in DOER’s [Guideline on Capacity Blocks, Base Compensation Rates, and Compensation Rate Adders](#)
Incentive Payments: Standalone vs. Behind-the-Meter

- **Standalone facilities**: Any facility with no associated load other than parasitic or station load
  - Net Metered, Alternative On-bill Credit, and Non-net Metered Solar Tariff Generation Units
  - Incentive payment varies over life of project and is equal to all-in compensation rate (i.e. base + adders) \( \text{minus} \) the value of the energy

- **Behind-the-Meter Facilities**: Any facility that does not meet the definition of standalone
  - Incentive payment value is fixed for the duration of the tariff term and is determined at the time a project is interconnected
  - Facilities may or may not be eligible for net metering, but net metering eligibility has no impact on calculating the total compensation rate and the SMART incentive payment
Energy Compensation and Incentive Compensation for Standalone Facilities

- The total compensation to all SMART facilities is intended to account for energy and for incentive compensation.
- The method of calculating the incentive payment depends on whether a system is classified as Behind-the-Meter or Standalone.
- **Standalone facilities**: The Value of Energy depends on the type of energy compensation the facility is receiving and will be either a bill credit or direct payment.
  - Net Metered Generation Unit
    - The value of the bill credit determined by the system’s net metering eligibility pursuant to MGL c. 164 § 138 and 220 CMR 18.00
  - Alternative On-bill Credit Generation Unit
    - The value of the bill credit determined by the final SMART Tariff, currently proposed at basic service
  - Non-net Metered Generation Unit
    - The value of the direct compensation subject to the utility company’s Qualifying Facility Tariff.
- Energy compensation + incentive payment always equals the total compensation rate for which a system is qualified under SMART.
Standalone Incentive Calculation

Standalone Solar Tariff Generation Unit Incentive Payment
= (Base Compensation Rate + Compensation Rate Adders
- Greenfield Subtractor) * kWh – Value of Energy Generated

• Example:
  - A 500 kW net metered Canopy Solar Tariff Generation Unit facility qualifies under Eversource Block 1 and is eligible to receive a $0.21250/kWh all-in compensation rate
  - Canopy Solar Tariff Generation Unit Adder is $0.06/kWh
  - Greenfield Subtractor is $0.00/kWh
  - Net metering credit value is approximately $0.20/kWh
  - Incentive payment will fluctuate with change in net metering credit value
  - Total compensation value will always be $0.27250/kWh for entire 20-year tariff term
Energy Compensation and Incentive Compensation for Behind-the-Meter Facilities

- The total compensation to all SMART facilities is intended to account for energy and for incentive compensation.
- The method of calculating the incentive payment depends on whether a system is classified as Behind-the-Meter or Standalone.
- **Value of Energy**: The Value of Energy approximates the avoided costs of electricity from a kWh of on-site load offset by a solar facility and is equal to the sum of the following:
  - Current volumetric distribution rate
  - Current volumetric transmission rate
  - Current volumetric transition rate
  - Three-year average Basic Service Rate
- These values are based on the distribution company service territory and the rate class of the End-use Customer’s meter (e.g. Massachusetts Electric customer on an R-1 residential rate).
- The value of the incentive payment the facility is eligible to receive is calculated by subtracting the Value of Energy from the total compensation rate to which it is entitled under the tariff.
- This resulting incentive payment value is fixed for the duration of the tariff term of the facility and does not fluctuate as electricity prices change as it does for Standalone Facilities.
- Because of this structure, Behind-the-Meter facilities will not necessarily always receive the total compensation rate for which a system is qualified under SMART, but may receive more or less depending on 1) the future retail price of electricity, and 2) the amount of electricity exported by the facility to the grid (i.e. facilities that export more electricity may receive less total compensation because their avoided electricity costs will be lower than if the electricity was consumed behind-the-meter).
- More information on how to calculate an estimated Value of Energy and SMART incentive payment value can be found in DOER’s *Value of Energy Guideline and Calculator* for Behind-the-Meter facilities.

[NEED HYPERLINK]
Behind-the-Meter Incentive Calculation

Behind the Meter Solar Tariff Generation Unit Compensation Rate
= (Base Compensation Rate + Compensation Rate Adders)
  - (Current Volumetric Delivery Rates
  + Three year average of Basic Service Rates)

• Example:
  ➢ A 500 kW facility qualifies under National Grid Block 1 at a
    $0.255/kWh compensation rate and is eligible for a $0.02/kWh
    Building Mounted Adder for a total compensation rate of
    $0.275/kWh
  ➢ Project is interconnected behind a meter on the G-1 rate class
  ➢ The Value of Energy (i.e. volumetric distribution + transmission +
    transition + 3-year average basic service) for this particular rate
    class is determined to be $0.18/kWh
  ➢ The incentive rate would be set at $0.095/kWh ($0.275/kWh
    minus $0.18/kWh) and would remain in effect for 20 years,
    regardless of what happens to electric rates over that timeframe
Energy Storage Requirements

• **Minimum and Maximum Nominal Rated Power:** The nominal rated power capacity of the Energy Storage System paired with a solar photovoltaic Generation Unit must be at least 25 percent and shall be incentivized for no more than 100 percent of the rated capacity, as measured in direct current, of the solar photovoltaic Generation Unit.

• **Minimum and Maximum Nominal Useful Energy:** The nominal useful energy capacity of the Energy Storage System paired with the solar photovoltaic Generation Unit must be at least two hours and shall be incentivized for no more than six hours.

• **Minimum Efficiency Requirement:** The Energy Storage System paired with the solar photovoltaic Generation Unit must have at least a 65% round trip efficiency in normal operation.

• **Data Provision Requirements:** The Owner of the Energy Storage System must provide historical 15-minute interval performance data to the Solar Program Administrator for the first year of operation and upon request for the first five years of operation.

• **Operational Requirements:** The Energy Storage System must discharge at least 52 complete cycle equivalents per year and must remain functional and operational in order for the solar photovoltaic Generation Unit to continue to be eligible for the Energy Storage Adder.
## DPU 17-140 Procedural Schedule

The DPU has established the following procedural schedule for the docket:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday, September 12, 2017</td>
<td>Model Tariff filed by Electric Distribution Companies</td>
</tr>
<tr>
<td>Thursday, October 19, 2017</td>
<td>Deadline for Intervention</td>
</tr>
<tr>
<td>Tuesday, October 24, 2017</td>
<td>Public hearing</td>
</tr>
<tr>
<td>Monday, November 13, 2017</td>
<td>DPU issues Procedural Schedule</td>
</tr>
<tr>
<td>Friday, January 12, 2018</td>
<td>Deadline for Intervenors to provide notice of intent to file testimony</td>
</tr>
<tr>
<td>Friday, January 26, 2018</td>
<td>Reply Comment Deadline</td>
</tr>
<tr>
<td>Monday, January 29, 2018</td>
<td>Deadline for Intervenors to file direct testimony</td>
</tr>
<tr>
<td>Thursday, February 08, 2018</td>
<td>Deadline for Electric Distribution Companies to file rebuttal testimony</td>
</tr>
<tr>
<td>Wednesday, February 21, 2018</td>
<td>Deadline for Intervenors to file surrebuttal testimony</td>
</tr>
<tr>
<td>Friday, February 23, 2018</td>
<td>Deadline for issuing discovery</td>
</tr>
<tr>
<td>Tuesday, March 20, 2018</td>
<td>Final discovery responses due</td>
</tr>
<tr>
<td>Thursday, March 29, 2018</td>
<td>Evidentiary Hearings begin</td>
</tr>
<tr>
<td>Thursday, April 5, 2018</td>
<td>Evidentiary Hearings conclude</td>
</tr>
<tr>
<td>Monday, April 23, 2018</td>
<td>Deadline for Intervenors to file initial brief</td>
</tr>
<tr>
<td>Monday, May 7, 2018</td>
<td>Deadline for Electric Distribution Companies to file initial brief</td>
</tr>
<tr>
<td>Monday, May 14, 2018</td>
<td>Deadline for Intervenors to file reply briefs</td>
</tr>
<tr>
<td>Monday, May 21, 2018</td>
<td>Deadline for Companies to file reply brief</td>
</tr>
<tr>
<td>TBD</td>
<td>DPU issues Order on model tariff</td>
</tr>
</tbody>
</table>
Additional Questions?

- For any interconnection questions that are not related to a submitted application please contact:

  Distributed.generation@nationalgrid.com