EE Education

MIC

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IMM

Monitoring Analytics

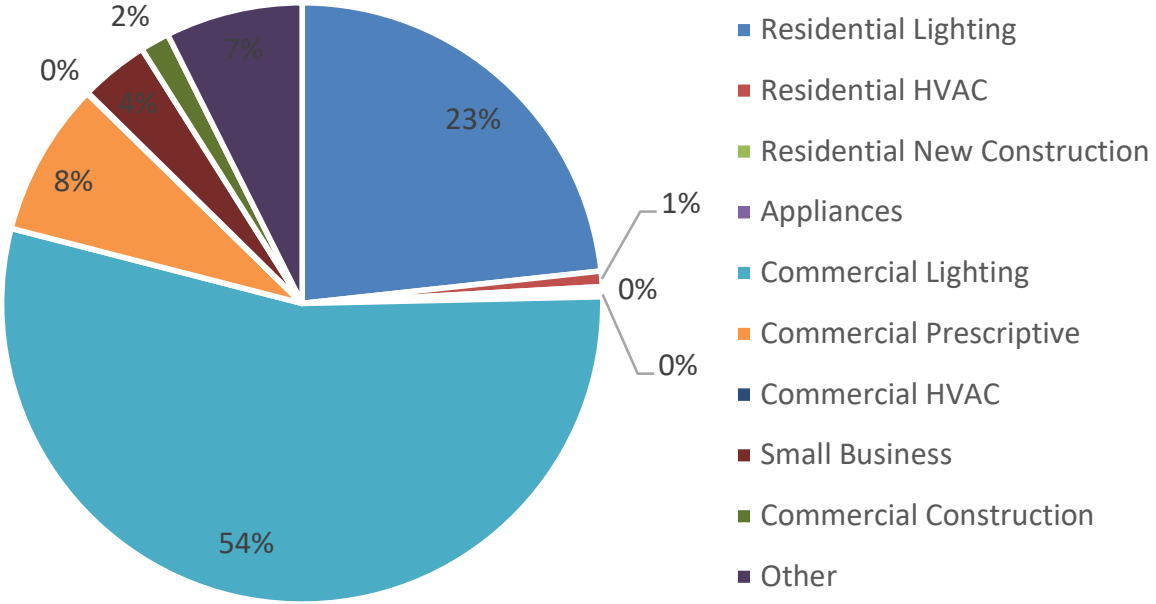
RAA Definition of an EE Resource

- **An EE Resource is a project including the installation of more efficient devices or equipment, or the implementation of more efficient processes or systems, exceeding then current building codes, appliance standards, or other relevant standards.**
- **Definitions from Reliability Assurance Agreement. Schedule 6, L 1.**
- **EE Resources included in PJM Capacity Markets:**
  - **2012/2013 BRA in May 2009**
  - **Remaining 2011/2012 Incremental Auctions.**

RAA Definition of an EE Resource

- The EE resource must achieve a permanent, continuous reduction in electric energy consumption at the End Use Customer's retail site during the defined EE Performance Hours that is not reflected in the peak load forecast used for the auction delivery year for which the EE Resource is proposed.
- EE resource must be fully implemented at all times during that delivery year, without any requirement of notice, dispatch, or operator intervention.
- An installed EE resource may participate as a capacity resource for up to four consecutive delivery years from its installation date.

Types of EE Projects



Figures derived from 2020/2021 Delivery Year Post Installation M&V Reports

Basic Requirements for RPM Participation

- **Submit Initial M&V Plan and Nominated EE Value Template no later than 30 days prior to RPM Auction**
  - **No contracts required**
  - **Marketing plan**
- **Establish credit with PJM prior to RPM Auction**
- **Submit Post-Installation M&V Report by 15 business days prior to each Delivery Year for which the EE Resource is committed**

Accreditation

- **Despite the fact that a Capacity Performance EE Resource must be fully implemented at all times during the delivery year, without any requirement of notice, dispatch, or operator intervention,**
- **EE accreditation is based only on extremely limited days of the year and hours on those days.**

EE Performance Hours

- **Capacity Performance EE is required to demonstrate savings only during the EE Performance Hours:**
  - **the four hours from hour ending 15:00 through hour ending 18:00 EPT during June 1 through August 31 inclusive, that is not a weekend or federal holiday.**
  - **the four hours from hour ending 08:00 through hour ending 09:00 EPT and hour ending 19:00 through hour ending 20:00 EPT during January 1 through February 28 inclusive, that is not a weekend or federal holiday.**
- **For the 2023/2024 Delivery Year, the EE Performance hours comprise only 416 hours across 104 days.**
  - **4.7 percent of all hours**

Persistence of Benefits

- The benefits of EE measures decline over time as energy saving technology is increasingly adopted by customers.
  - This decreases the baseline against which savings are measured
  - Product saturation (e.g. LED lighting) reduces savings
- Many EE measures are installed even in the absence of EE program participation in PJM markets
- EE Providers repackage the independent actions of customers that have already occurred
  - Submit projects installed prior to M&V submission

Property Rights to EE Capability

- Eligibility requirements to claim property rights are poorly defined
- The EE Provider can satisfy this requirement by
  - submitting to PJM a written sworn, notarized statement of a corporate officer certifying that the EE Provider has the legal authority to claim the demand reduction associated with the EE installations that constitute the EE Resource for the applicable delivery year or,
  - including a statement, prepared by PJM and included in the template instructions, that they have legal authority to claim the demand reduction associated with the installations that constitute the EE Resource for the applicable DY.

Basic Components of M&V Reporting

- Project description, location and installation schedule
- Methods to be used to determine the nominated EE value
- Variables affecting the project's electrical demand
- Assumptions including baseline demand, post-installation demand, process changes, and measure life.
- Equipment specifications
- Determination of estimated savings achieved during the EE Performance Hours

Measurement and Verification

- **Most EE MW are not directly measured. Savings are calculated based on an assumed installation rate and assumed usage level, compared to the assumed electricity usage of the default.**
- **The direct measurement and verification methods are inadequate and rely on assumptions and samples from limited periods.**
- **Many EE Providers rely on data from industry publications rather than their own measurements**

Summer Period Lighting Savings Example

A 10W 550 lumen LED directional lamp installed in a residential interior location vs. incandescent as base:

$$\Delta kW = ((WattsBase - WattsEE) /1000) * ISR * WHFd * CF$$

Where:

- **ISR = In Service Rate approximating percent of bulbs installed in calculation year**
- **WHFd = Waste Heat Factor for Demand to account for cooling savings from efficient lighting**
- **CF = Summer Peak Coincidence Factor approximating percent of EE Performance Hours device is in use**

$$\Delta kW = ((50 – 10)/ 1,000) * 0.965 * 1.17 * 0.084 = 0.0028 kW$$

M18: Performance Measurement and Penalties

- **Commitment Compliance**
  - **RPM committed MW (sold in capacity market; "expected") compared to PJM accredited MW ("actual")**
- **Performance Assessment**
  - **Actual performance compared to expected performance. Actual performance is determined prior to the start of the Delivery Year based on the Post Installation M&V Report**
- **M&V Audit option**
  - **PJM or an independent third-party audit, at the EE Provider's expense, of the EE installation, conducted prior to or during the Delivery Year.**

EE Payments: Winter Storm Elliott

Day	Expected Performance MW	Actual Performance MW	Shortfall MW	Bonus MW	Bonus MW Percent of Expected Performance	Bonus Credits
23-Dec-22	4,987.5	6,698.3	0.0	1,710.8	34.3%	$22,167,952.78
24-Dec-22	4,987.5	6,698.3	0.0	1,710.8	34.3%	$67,324,985.48

- **Actual performance is not measured during a PAI. Actual based on assumptions; calculated prior to the Delivery Year.**
- **Approved MW in excess of the resource's committed MW received bonus payments. (See IMM SOM; pre settlement data.)**
- **No EE resources were assessed a nonperformance charge during Winter Storm Elliott.**

EE Inclusion in PJM Load Forecast

- **PJM modified load forecast method in April 2015**
  - **Revisions to the PJM load forecast to incorporate energy efficiency were endorsed at the November 19, 2015, MRC.**
  - **Included improvements to more comprehensively incorporate energy efficiency based on U.S. Energy Information Administration (EIA) data.**
  - **Beginning with auctions conducted in 2016, PJM began use of add back method to reflect the inclusion of EE in the peak load forecast.**
- **Prior approach to EE was based on historical cleared energy efficiency quantities.**

EE Inclusion in PJM Load Forecast

- The PJM load forecast model captures energy efficiency impacts through incorporation of projections from EIA Annual Energy Outlook (AEO).
- The AEO forecast is based on a set of end use models for the residential, commercial, and industrial sectors.
- EIA accounts for state and utility efficiency programs by mapping regional EE program expenditures to end uses
- EIA tracks number of units sold and associated efficiency information on an ongoing basis

EE Addback in RPM Auctions

- The EE addback method is described in Manual 18, section 2.4.5 (See also IMM BRA reports.)
- EE addback mechanism uses an iterative approach such that the EE addback MW quantity ultimately applied to an RPM auction matches the MW quantity of EE Resources cleared in the auction
  - With the EE addback MW quantity equal to the cleared EE Resource MW quantity, the target impact on the clearing price is zero
- Current add back method adopted with 2023/2024 DY
  - Followed IMM recommendation

Costs to Load

- **While EE does not affect the clearing price when the EE addback is done correctly, customers do pay for the cleared quantity of EE at market clearing prices.**
- **EE does not contribute to meeting the RPM Reliability Requirement.**

EE Participation in RPM

Delivery Year	EE RPM Cleared (UCAP MW)	Total RPM Cleared (UCAP MW)	EE Percent Cleared	EE RPM Revenue
2011/2012	76.4	134,139.6	0.1%	$139,812
2012/2013	666.1	141,061.8	0.5%	$11,408,552
2013/2014	904.2	159,830.5	0.6%	$21,598,174
2014/2015	1,077.7	161,092.4	0.7%	$42,308,549
2015/2016	1,189.6	173,487.4	0.7%	$66,652,986
2016/2017	1,723.2	179,749.0	1.0%	$68,709,670
2017/2018	1,922.3	180,590.3	1.1%	$86,147,605
2018/2019	2,296.3	175,957.4	1.3%	$103,105,796
2019/2020	2,528.5	177,040.6	1.4%	$92,569,666
2020/2021	3,569.5	173,688.5	2.1%	$101,348,169
2021/2022	4,806.2	174,713.0	2.8%	$185,755,803
2022/2023	5,734.8	150,465.2	3.8%	$135,265,303
2023/2024	5,896.4	150,143.9	3.9%	$93,603,058

Issues

- EE is incorporated in PJM load forecasts. The original logic for the inclusion of EE in the capacity market is no longer correct.
  - PJM should have eliminated EE from the capacity market when the load forecast incorporated EE.
- Property rights and conditions for claiming property rights are not clearly defined.
- Measurement and verification (M&V) largely assumption based.
  - No actual performance data required for delivery year.

Issues

- EE obligation is only 4.7 percent of annual hours.
- Without a registration system, there is no reliable way to prevent duplicative claims to EE Resources
  - EE Providers overlap in territory and project types
- No reliable way to authenticate installation period of projects which defines capacity market eligibility

Issues

- There is no evidence that the EE programs result in changed behavior or increases in savings.
  - EE Providers may repackage the independent actions of customers that have already occurred
  - No evidence that EE participation in PJM markets causes end use customers to reduce their energy consumption beyond what they would have otherwise
- EE is appropriately and automatically compensated through markets. To the extent that EE actually reduces energy and capacity use, it reduces customer payments for energy and capacity.

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