The Role of Distributed Generation in Demand Response Programs

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PSEG

Recap of how Demand Response Participates in PJM Markets

- Energy (Economic)
- An incentive to customers to reduce consumption when power prices are high
  - Voluntary load reductions for energy, even during an emergency event
  - May participate in the Day-Ahead and Real-time markets and potentially set price
- Capacity (Reliability)
  - Full (gets Energy and Capacity Payment) or Capacity only
  - *Load Reduction* is mandatory during PJM emergency event
  - Three RPM products: 10x6, Summer Unlimited, Annual
  - Paid RPM price like a generator but does not have a Day Ahead obligation like a generator

Demand Response's load reduction participates as a supply resource in PJM's RPM Capacity Market and collects RPM capacity payments (fixed payments) just like a traditional generation capacity resource.

Generation utilized to support demand response retail meter reductions

The terms "back-up generation" or "back-up generator" do not appear in PJM's tariff, Operating Agreement, or Reliability Assurance Agreement.

- The term "back-up generation" implies Distributed Generation:
  - Customer owned, Behind-the-meter, on-site generation:
    - Serve as belts and suspenders to distribution and transmission system outages
    - Localized outages
    - Emergency care facilities and civil shelters
    - Convenience
    - Peak Shaving to reduce capacity obligations
- May support demand response (Emergency Load Management) participation and allows the customer to continue to have electricity while satisfying its RTO demand reduction obligation

Demand Response for PJM requires a reduction in consumption on the customer's meter but PJM does not specify how the meter reduction is accomplished

What is typical Behind the Meter Generation to PJM

- "Generating resources operating —behind the meter, in isolation from the PJM bulk power transmission system and which do not intend to participate in the PJM wholesale energy market, need only coordinate planning, construction and/or operation with the host Transmission Owner (the local utility)" (see PJM Manual 14A, page 8)
- "[A] generating unit that delivers energy to load without using the Transmission System or any distribution facilities…, however, that Behind The Meter Generation does not include (i) at any time, any portion of such generating unit's capacity that is designated as a Capacity Resource or (ii) in any hour, any portion of the output of such generating unit that is sold to another entity for consumption at another electrical location or into the PJM Interchange Energy Market." (see PJM RAA § 1.4)

Demand Response receiving a RPM payment does <u>not</u> have a day-ahead energy obligation but a distributed generator may become a Capacity Resource in which case the resource may be called upon during non- emergency conditions

Emergency Load Management vs. Emergency Generation

- PJM's Emergency Alerts:
  - Maximum Emergency Generation Alert (this is not a call for "emergency generators)
  - Primary Reserve Alert (estimated operating reserve capacity is less than the forecast primary reserve requirement)
  - Voltage Reduction Alert (estimated operating reserve capacity is less than the forecasted synchronized reserve requirement)
- During a Maximum Emergency event PJM *may* purchase energy from any member
- PJM Manual 13 has an order of application for emergency procedures:
  - But, "*PJM dispatchers may find it necessary to vary the order of application to achieve the best overall system reliability…"(see PJM Manual 13, Emergency Operations, page 19)*

Under PJM's Emergency Load Response ("ELR") Program, end-use customers are compensated for undertaking a mandatory obligation to reduce load during an emergency and to start a distributed generator

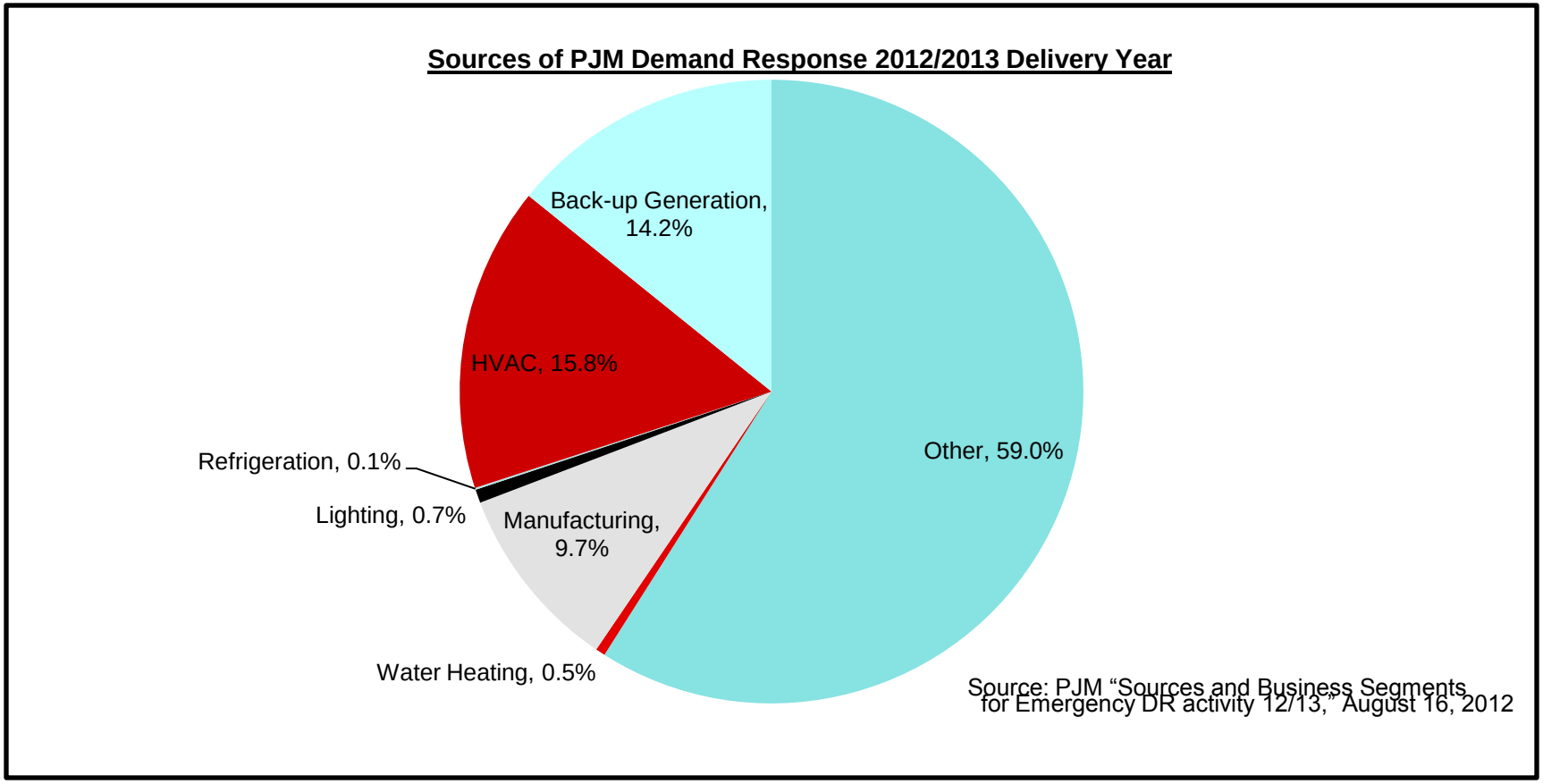
Back-up generators value to the grid

- Reliability
  - PJM's reliability objectives are met by RPM and the RTEP
    - "***Emergency Load Management"*** with sound market design can be an important tool to maintain reliability
      - Back-up generators value is local and primarily customer specific ; and is "*lowest hanging fruit"* for demand response. ***(see Enernoc Q2 Earnings Call transcript, August 7, 2012, page 21.)***
- Economic
  - Back-up generators may help to reduce energy/capacity costs
    - If they are used to support grid demand reductions
    - May reduce customer capacity obligation
- Social
  - E.g., Provides electricity to emergency care facilities and emergency management faciltiies during events such as a lighting storm, etc.

Ability of a resource to Reduce Load

On-site distributed generation is not analyzed as a separate element of PJM's reliability review: however, it is relied upon in that analysis (to an unknown extent) because of its role in enabling customer meter reductions by DR capacity resources

It is difficult to evaluate back-up generation's role in demand response as well as its impact on air quality attainment



Currently, PJM is unable to account for the source of almost two-thirds of the stated demand response MWs

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines (RICE)

- The EPA is required to issue national emissions standards for stationary RICE (i.e., limits on hazardous air pollutant emissions). EPA issued a final rule for diesel engines in March 2010. (see Section 112 of the Clean Air Act)
- The RICE NESHAP currently allows for "emergency" engines to operate uncontrolled with regard to emissions:

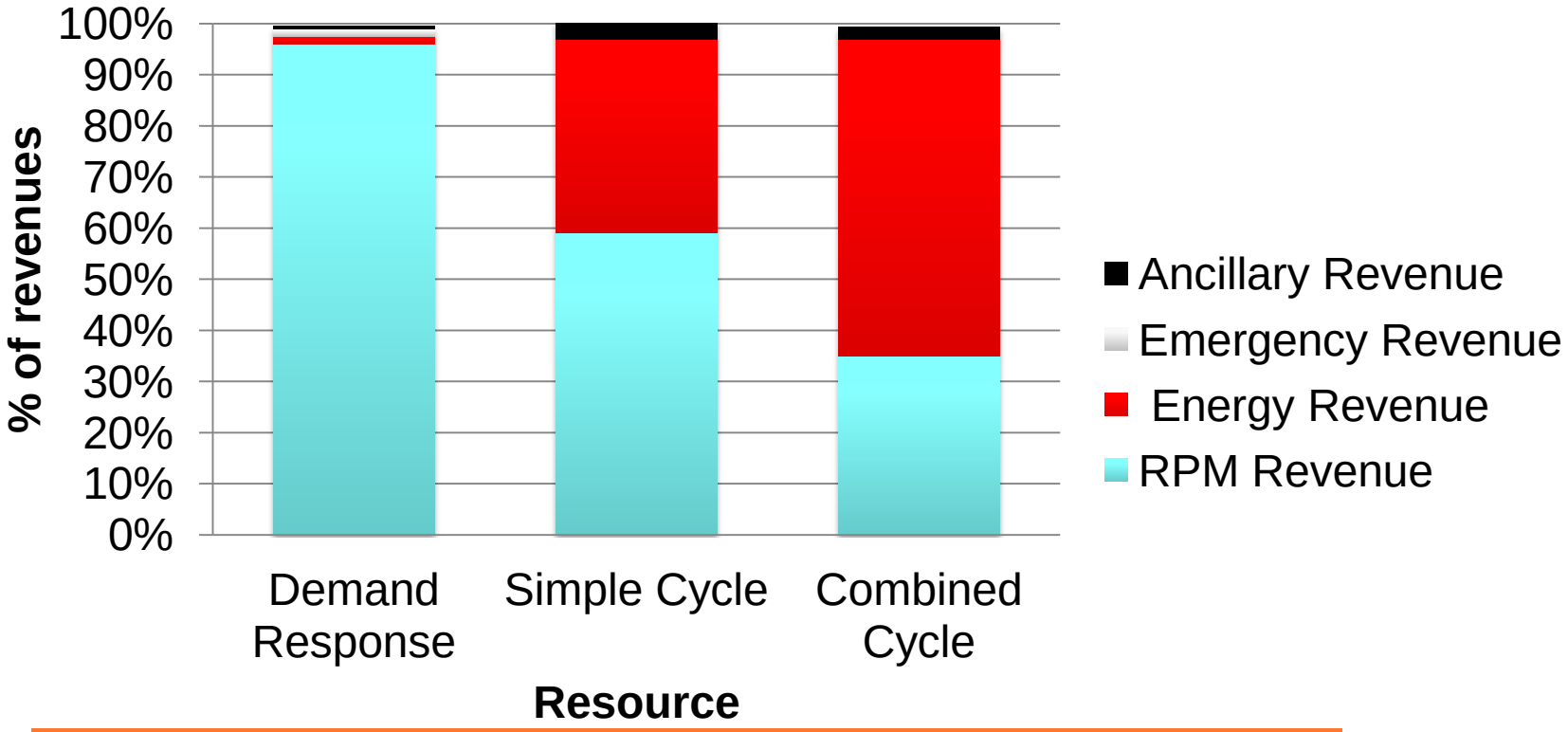
  100 hours per year for maintenance checks and readiness testing, and

  15 hours per year for emergency demand response when RTO/ISO determines that emergency conditions could lead to a blackout.

  Unlimited operation during an emergency situation
- The Proposed Rule perversely incentivizes the procurement of diesel-fired BTM generators in electricity capacity markets displacing new clean generating resources.

Uncontrolled RICE units acting as DR displaces new cleaner resources with no increase to system reliability;

Demand response revenue profile



Demand Response Resources collect a significantly higher percentage of overall revenues from RPM than traditional generation resources; yet do not have a mandatory "must offer" requirement like a generator

Source: PJM Demand Side Response 2011 Activity Report. Generation Revenue is derived from the IMM 2011 State of the Market and the 2012/2013 BRA RPM Clearing prices.

The PJM capacity and energy market revenues support putting emission controls on Stationary Reciprocating Internal Combustion Engines (RICE).

- *In both [NYISO and PJM] ISOs, the capacity and energy revenues would pay for the costs of emission controls [for RICE engines]in approximately one year.* (See MJBradley **RICE NESHAP Emission Controls Analysis,** page 1., http://www.mjbradley.com/node/103)
- Demand response backed by RICE engines can earn the same capacity payment as a generation resource (The limited 10x6 product is paid approximately 90% of an annual generation resource)
- There is no empirical demonstration that customers will fail to participate in DR supported by RICE engines if these engines are subject to emission limits
  - In fact, customers are beginning to provide load response at levels greater than the output of their on-site generator. (see Enernoc Q2 Earnings Call transcript, August 7, 2012, page 21.)

Price Responsive Demand (PRD) can fill the void, if any, of dampened DR participation resulting from emission controls on RICE engines

- Traditional LSE retail load management concept integrated into the wholesale market
- Energy Supply stack will contain PRD prices
- PRD may set price lowering customers' energy costs
- Conducted via a customer's LSE
- Customer must have active load control (and a smart meter)
- LSE may adjust RPM PLC prior to bid parameters being set lowering customers' capacity costs

The driver behind PRD is the deployment of AMI throughout the PJM region which allows for Customers to respond directly and reliably to wholesale real-time price changes

Summary

- Demand Response along with a sound market design can provide market efficiencies in RTO markets
- DR may enhance reliability but PJM needs to address the issues raised by the Brattle group with regard to auditing contracts and resource testing
  - Also, PJM needs to address Stakeholder concerns with regard to measurement and verification and as directed by the FERC
- Back-up generators enhance reliability at customer sites mainly to meet distribution system disturbances; however there is no evidence that back-up generators are needed for supply adequacy
- The PJM RPM market supports the emission upgrades for RICE NESHAP units
- PRD which keeps demand side response on the demand side is best for customers to realize capacity and energy benefits of DR