



Cost-Effective Grid Reliability

The Use of Emergency Generators in Emergency DR

September 6, 2012

Introduction to EnerNOC

Market Leader in C&I Demand Response and Energy Efficiency

- Largest Demand Response provider in the world
- More than **8,000 MW of Demand Response** under management across **12,500** customer sites
- Over **500,000 MWh of Energy Efficiency** achieved to date
- 100+ utility and grid operator partners

Strong Track Record

- Publicly traded on NASDAQ (ticker: ENOC)
- 2011 revenues of ~\$280 million
- 600+ full-time employees
- Headquarters in Boston

What is *Emergency* DR?

End users become part of the grid reliability solution

- **Customers reduce their demand** for electricity from the grid in response to ISO declared ***Emergency* DR dispatch** signal
- **Customers receive payments** for participation and **risk reduction** due to the reduced likelihood of outages
- ***Emergency* DR is NOT economic DR or peak shaving**



How does Emergency DR work?

Grid load is reduced through reduced consumption and/or on-site generation



Curtailment – Turning off lights, turning up cooling set-points, turning off air handlers, shifting production schedules, escalators, elevators, water features, parking lights, signage, heating elements, etc.



Self Generation – facilities use properly permitted emergency back up generation to serve part or all of their facility load

ISOs only dispatch Emergency DR for imminent emergencies

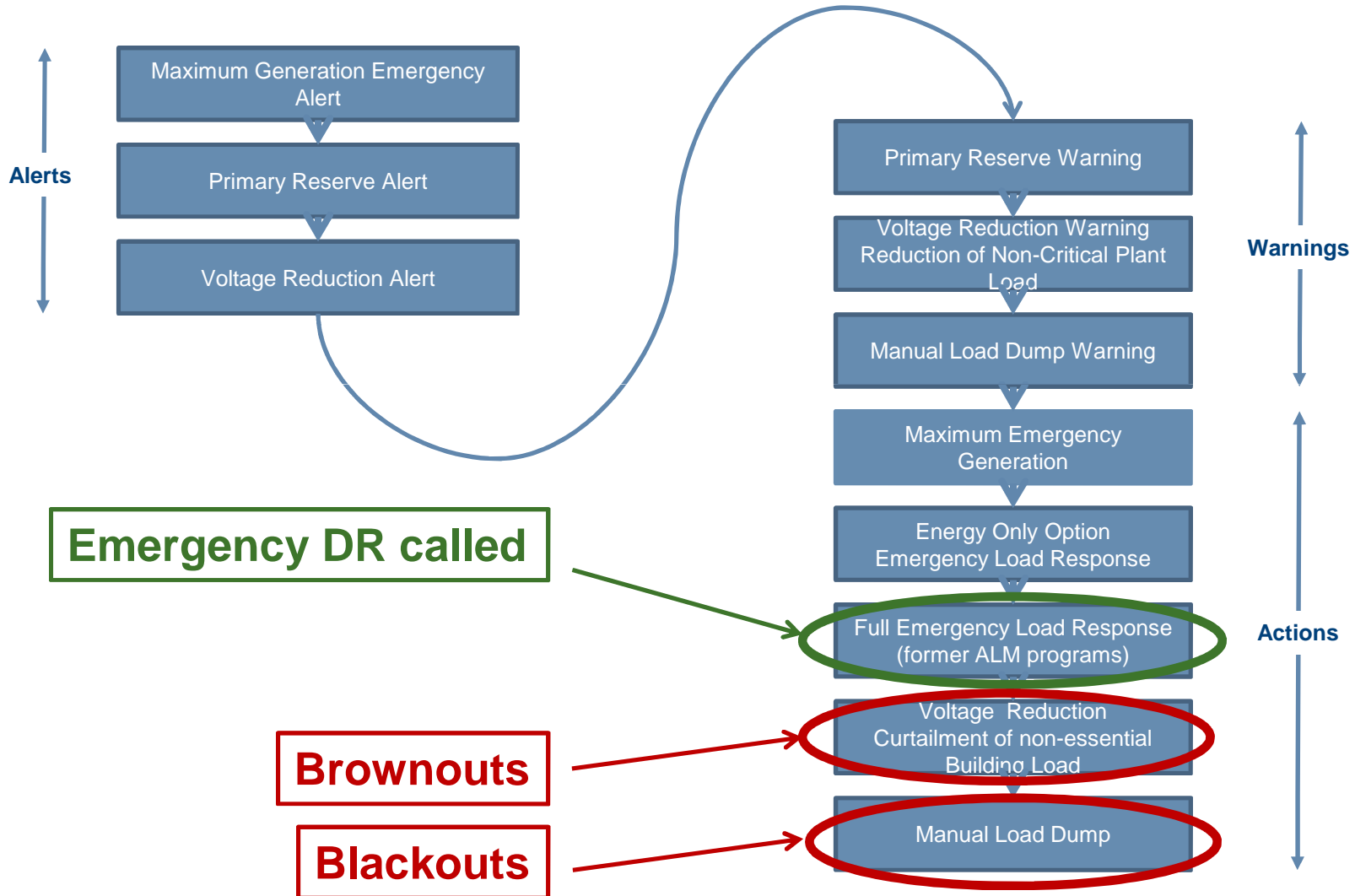
Emergency DR dispatches follow rigorous procedures and reporting

- **North American Electric Reliability Council (NERC) requires formal plans for Capacity and Energy Emergencies** to be executed when dispatching Emergency DR
- When facing an energy shortfall a **grid operator must declare an Energy Emergency Alert Level 2 (EEA Alert 2)**; measures at this step can include:
 - Public appeals
 - Voltage reduction
 - Interruption of non-firm load
 - **Emergency DR**
 - Utility-side load conservation
- Following an EEA Alert 2 declaration, the **grid operator must report back to the NERC** on causes, measures taken to address the shortfall, and post-event mitigation

Emergency DR is only dispatched for emergencies – not high load or prices

PJM's procedures during a grid emergency

Their process during an emergency is very specific and regimented

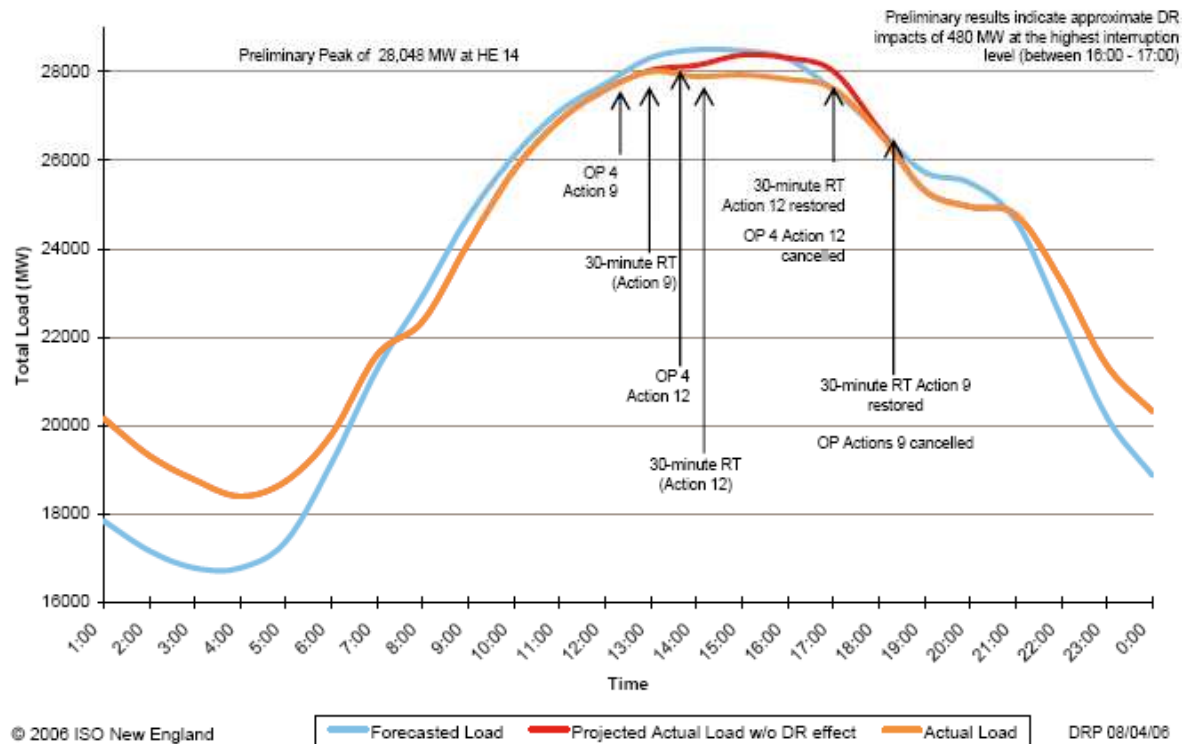


From PJM's Manual 13 (Emergency Operations), Section 2 (Capacity Emergencies)

Demand Response is a tangible resource

Emergency Demand Response is reliable and verifiable, as demonstrated in New England on August 2nd, 2006

Actual, Forecasted and Projected Actual with and without Demand Response



Emergency DR Programs are Rarely dispatched

The risk of dispatch to maximum hours is low

Location	Total events called, 2003-2011	Cumulative event duration (hours)	Notes
ERCOT	2	30.5	<ul style="list-style-type: none">• Extreme Weather Feb 2-3, 2011 for 28 hours, 15 min
ISO-NE	3	26	<ul style="list-style-type: none">• Southwest Connecticut only dispatched in 2003 (16 hours) following 2003 blackout• Connecticut only dispatched in 2005 (6 hours)• All of New England dispatched in 2006 (4 hours)
NYISO	16	113	<ul style="list-style-type: none">• No events called in 2004, 2008, or 2009• 2 events (total 22 hours) of events dispatched immediately following 2003 blackout• 5 events (total 35 hours) in 2006; majority of events responded to distribution system failure in NYC
PJM	14	61	<ul style="list-style-type: none">• All events called in eastern PJM zones only; western zone have not been called• No events called in 2003, 2004, 2008, and 2009

Emergency DR events do not correlate with high Ozone days

See Analysis of Emergency DR and Ozone Concentrations; February, 2012

Date	Geographic Extent	Duration (Hours)	High O ₃ Day?	Notes
July 17, 2012	Dominion and AEP Only	4	MD data not available; Yes in DE	
July 18, 2012	Mid Atlantic (subset)	2	MD data not available; No in DE	
May 26, 2011	Norfolk portion of Dominion	2	Yes in MD, No in DE	Only 1 out of 17 monitors in MD showed a slight exceedance (76 ppb)
May 31, 2011	Mid Atlantic and Dominion	2	Yes in MD, No in DE	
July 22, 2011	Mid Atlantic (subset)	6 (BGE, PECO, DPL, DLCO); 5 (JCPL, METED)	Yes	Highest observed O ₃ for July was on July 2 which was not a DR event
July 7, 2010	Mid Atlantic (subset)	4-5.5 depending on zone	Yes	July 5-6 recorded higher concentrations
June 11, 2010	Pepco Only	4.2	No	
May 26, 2010	Pepco Only (DC Only)	2.7	No	
August 8, 2007	Mid Atlantic	4-5 depending on zone	No	August 6 and 7 had exceedances
August 2, 2006	Mid Atlantic	4	No in MD, Yes in DE	
August 3, 2006	Mid Atlantic	5	No in MD, Yes in DE	
July 27, 2005	Mid Atlantic and Dominion	4	Yes	July 25-26 recorded higher concentrations
August 4, 2005	Mid Atlantic	3	Yes	

State Air Regulators recognize the value of DR

Most permitting agencies allow the operation of emergency engines for emergency DR

States/Counties that allow use of emergency DR in air regulations

- Connecticut*
- Massachusetts*
- Vermont*
- Rhode Island*
- New Hampshire*
- Maine
- New York
- Ohio*
- Pennsylvania
- Maryland*
- Virginia*
- West Virginia
- Illinois
- Indiana
- Michigan
- Texas

States/Counties that do not currently support emergency DR in air regulations

- Delaware
- New Jersey
- Washington, DC

States noted with * required regulatory change to facilitate emergency DR participation by emergency engines

Capacity = Energy delivered when needed



Capacity

- A commitment of a resource to provide energy during PJM emergency under the capped energy price.
- Capacity revenues paid to committed resource whether or not energy is produced by resource.
- Daily product

Capacity vs. Energy

Energy

- Generation of electrical power over a period of time
- Energy revenues paid to resource based on participation in PJM's Day-Ahead & Real-Time Energy Markets
- Hourly product

Capacity, energy & ancillary services revenues are expected, in the long term, to meet the fixed and variable costs of generation resources to ensure that adequate generation is maintained for reliability of the electric grid.

Capacity: A MW is a MW is a MW

“In all capacity markets, all MWs are effectively treated as equal in the auction mechanism: a MW from a fast-start, fast-ramping resource that is available every hour of the year is no more valuable than a MW from a resource that has limited operational hours, has very slow ramping capability, no automatic generation control (AGC) capability, very long start-up times, or extended minimum run or minimum down times. In short, in current capacity market designs, no value is placed on fuel type, technology type, or resource flexibility. Those attributes may be valued (from a financial perspective) through existing energy, reserve or ancillary market constructs, but the only performance requirement placed on a *capacity resource is that the level of capacity sold by a resource owner in the market has to be an accurate representation of the facility’s capability under peak load conditions. Resources clear (are selected by) the auction based almost exclusively on price; the auction does not differentiate among capacity resources based on any type of resource-specific reliability criteria.” (emphasis added)*

Emergency DR Saves Billions of Dollars

1. The PJM Independent Market Monitor reported that without 9,300 MW DR and EE clearing in the 2013/2014 Base Residual Auction, capacity costs paid by consumers would have been **\$11.8 billion** more than they were **for just one year**. That is over \$400 for every customer in PJM.
2. This occurred because the DR, and DG, offered was far less expensive than Generator alternatives, because it is already in place.
3. Stated differently, revenues to generators would have been \$11.8 billion higher than they will now be.
4. These represent 11.8 billion reasons why Calpine and other EPSA members want to reduce DR participation by any means possible.
5. This debate is NOT about clean air, it is about Generator profits, and incumbent suppliers attempting to crush a disruptive competitor

Emergency Generators are not going anywhere

- Emergency DG is inexpensive because it is already installed. It is a least cost source of pure capacity
- Emergency DG is not installed because of PJM markets, it is there because it is required to serve health, safety and convenience requirements in the event of a power outage
- Emergency DG is and will continue to be tested weekly to monthly. Such testing is unlikely to occur on weekends or at night, but rather on weekdays
- Emergency DG emissions from regular testing exceed those from operation during PJM emergencies
- Emergency DG units are often not required to be permitted and their existence, numbers and locations are poorly understood

Emergency DG is not going anywhere and will continue to operate in relative obscurity if prohibited from participating in PJM capacity markets

All that will change is that instead of these already existing units being identified and used for a few more hours each year, billions of dollars will be spent on the construction of new Generation, or the revitalized operation of aging existing Generation.

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