

2020 Distributed Energy Resources (DER) that participate in PJM Markets as Demand Response

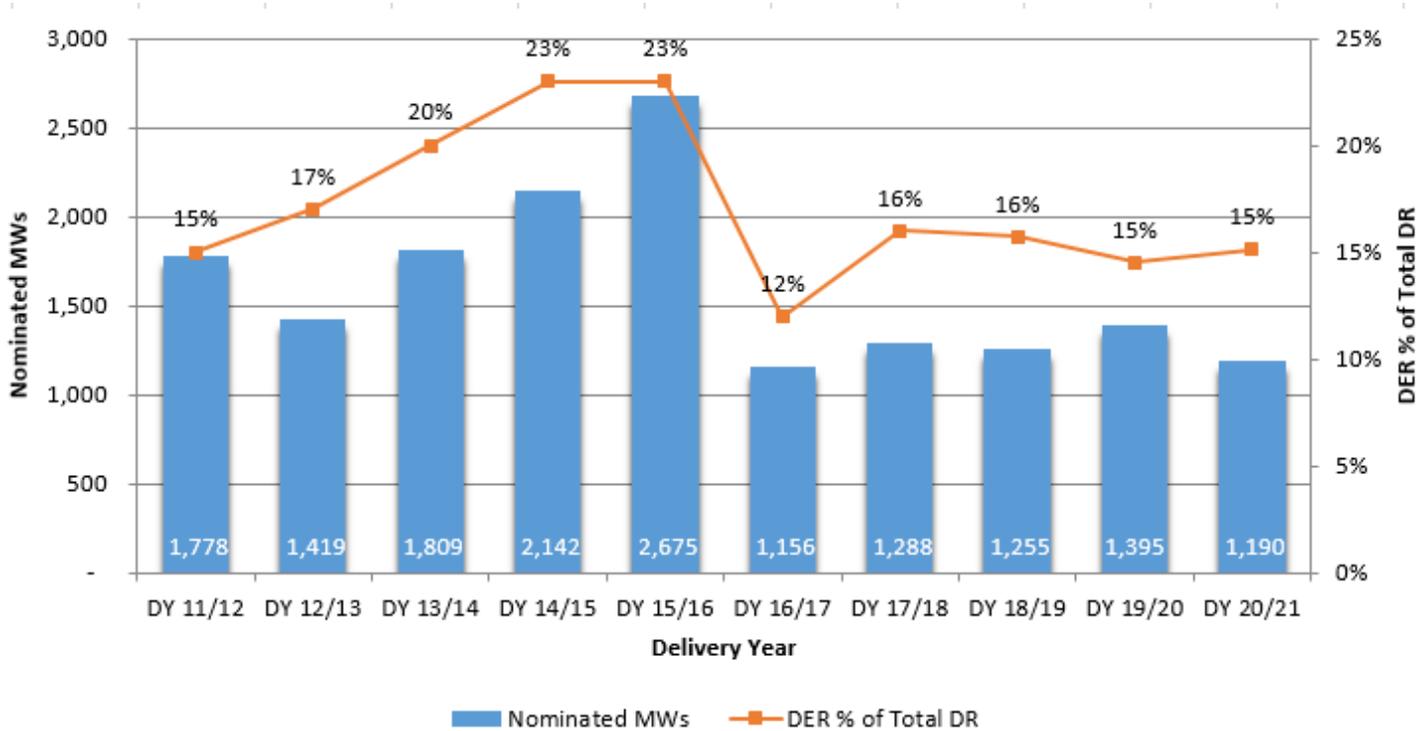
PJM Demand Side Response Operations

February, 2021



For the purposes of this report PJM will refer to behind the meter devices capable producing electricity in Demand Response as “DR DER”.

Figure 1: Demand Response from DER in Capacity Market



DER participation in the Capacity Market as Demand Response, represented here both in MW volume and as a percentage of overall Demand Response volume, showed steady growth through 15/16 DY and then dropped by close to 50% in 16/17 DY. For 20/21 DY the amount of DR DER decreased from previous year by about 200MW but its share of total DR remained close to three previous delivery years.

Observation: Based on discussions with CSPs, PJM believes the drop in 16/17 DY was due to U.S. Court of Appeals for the District of Columbia Circuit issuing a mandate (May 1, 2015) vacating specific RICE NESHAP and NSPS provisions for Emergency Engines with the further guidance released by the EPA on April 15, 2016.

Figure 2: DER Registered Capability in DR Programs (2020 for Economic and 20/21 DY Load Management)

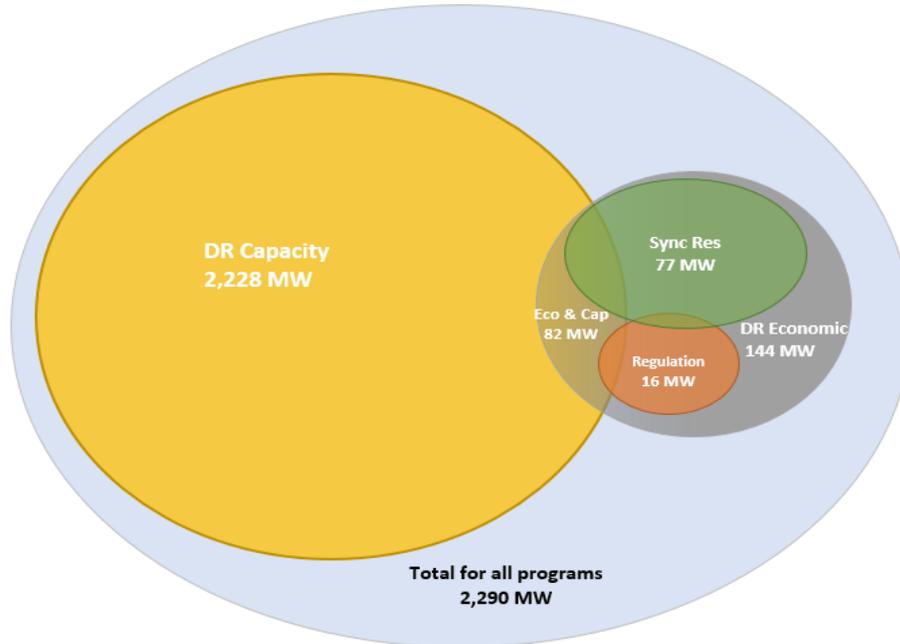
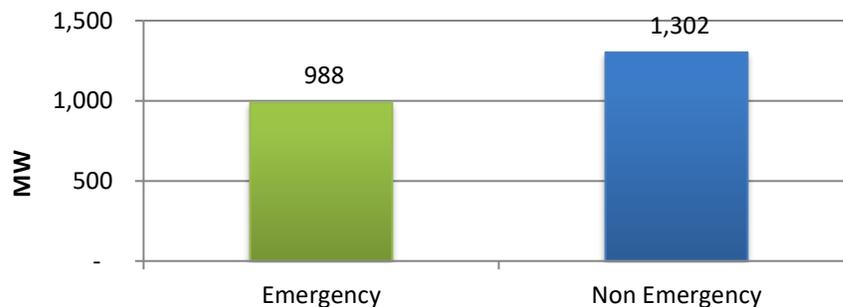


Figure 2 shows assigned for load reduction MW capability for DERs registered in Demand Response programs. Of 2,228 MWs registered in capacity market, only 144 MWs also participate as Economic DR in the Energy and Ancillary Service wholesale markets. 62 MWs of capability are registered as Economic DR only. This brings total DR DER capability to 2,290 MWs. Slightly more than a half of DERs participating as Economic DR have been certified to provide ancillary services.

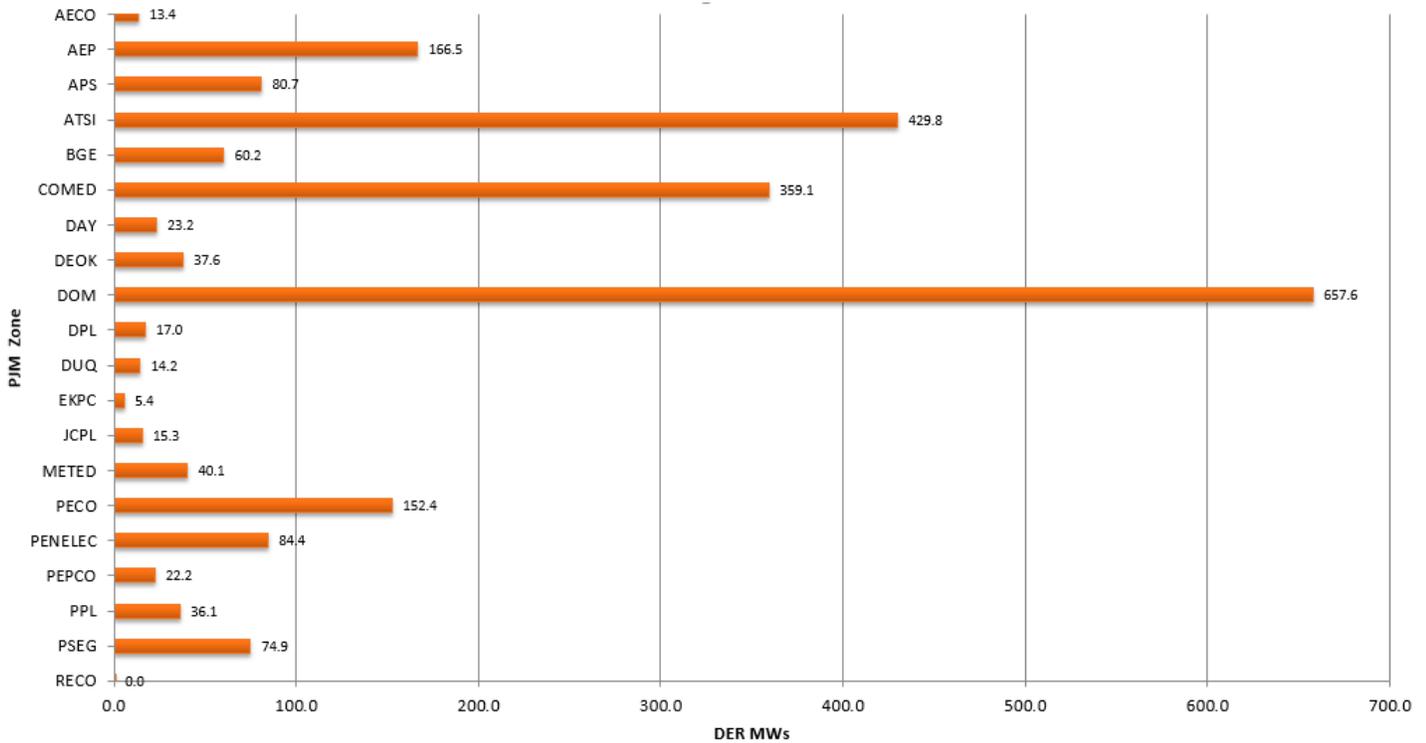
Notes: Values are CSP reported max output MWs assigned to reduce load in DR programs (real nameplate capability is higher and described in this report). These DER max output values may exceed nominated MWs for capacity resources because, in some cases, only partial capability may be offered. DER capability for economic registrations is captured as of 1/2021.

Figure 3: DER capability by generator permit type



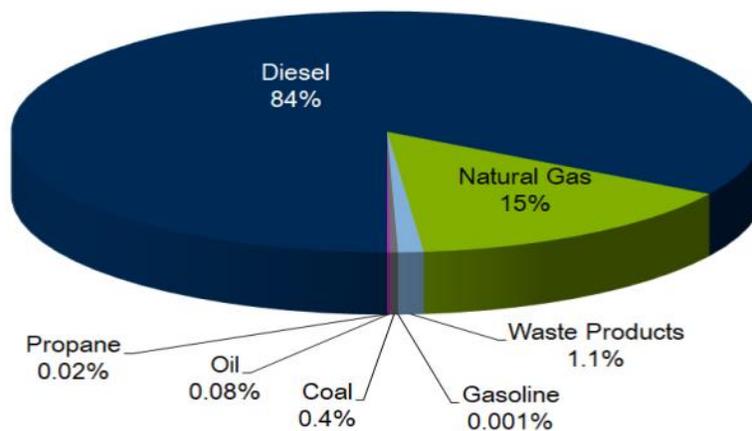
Emergency generators account for approximately 40% of total DER registered capability (2,290MWs). Generators with emergency permit can only operate during emergency conditions. Even if they have extra capability beyond their load they cannot use it unless they upgrade machine and/or upgrade emergency permit to non-emergency permit.

Figure 4: DR DER Registered MW Capability by Zone



Note: Values are CSP reported MWs for load reduction purposes by DR DER. Locations that participate in both Load Management and Economic are included only once.

Figure 5: DR DER Registered MW Capability (20/21 DY) Fuel Mix with Behind the Meter Generation



Fuel mix for behind the meter generation that participates in Capacity Market as Load Management for DY 2020/21 predominantly consists of diesel (84%) and natural gas (15%) which make up a combined 99% of the total fuel types. This is consistent with previous delivery year.

Figure 6: DR DER Registered generator count by engine type (2020 for Economic and 20/21 DY for Load Management)

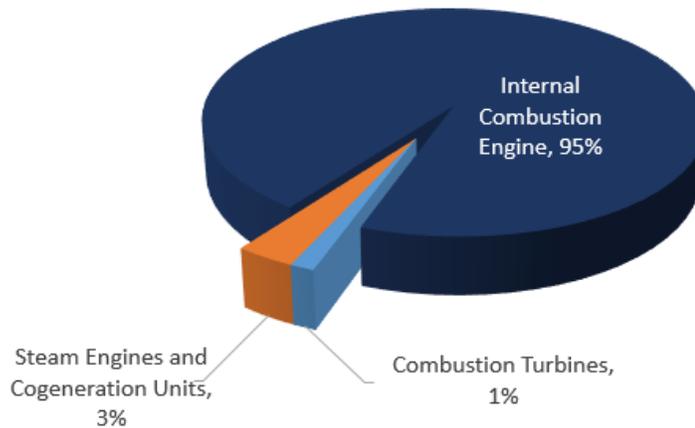
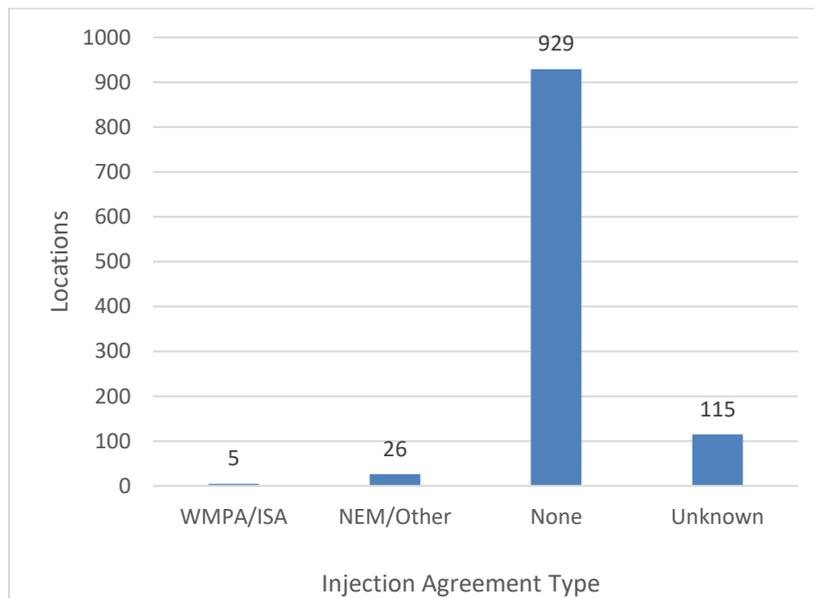


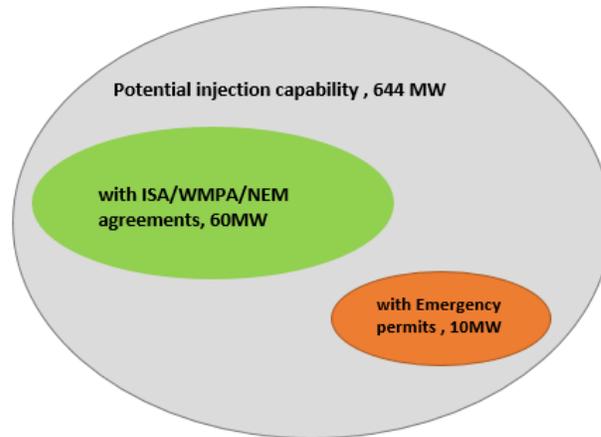
Figure 7: DR DER Registered Locations by interconnection agreement type



Majority of locations with behind the meter generator or battery do not have any agreement to export excess energy onto the grid. As of time of this report there are only 5 locations that have a wholesale agreement (WMPA/ISA) and 26 locations that have other retail level agreement to inject energy onto the grid¹.

¹ There are 115 locations with unknown agreement status because the locations were input into the system before the option was added.

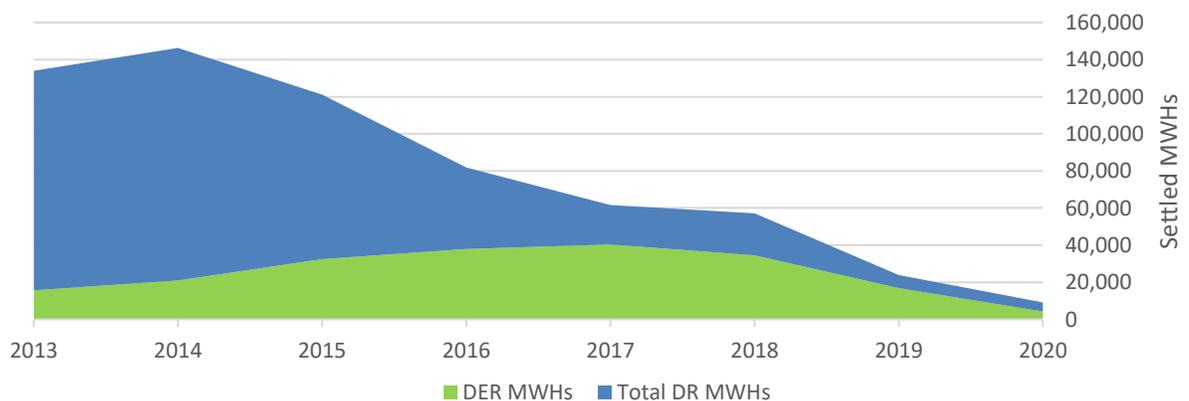
Figure 8: 2020 DR DER Potential injection capability



Potential DR DER injection capability is calculated as an excess MW capability of the generator/battery nameplate over the location's highest load and totals 644MW (20% of 3,143MW total nameplate capability) for registrations active in 2020. 60MW come from locations that have interconnection agreement (retail or wholesale) and are most likely to be able to realize such value. The vast majority (634MW) come from generators that have non-emergency permits, and only 10MW of the injection capability come from generators with an emergency permits. If the generators had agreements that allowed injections the majority would likely be realized because they have non-emergency permits.

Note: Calculated amounts come from CSP reported values

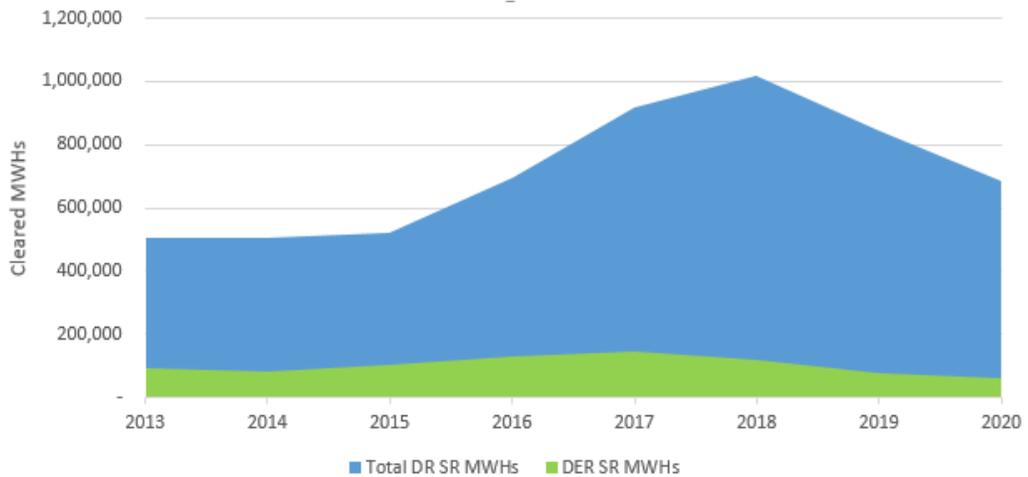
Figure 9: PJM Demand Response Economic Energy Settled MWhs Trend



DR DER participation in Economic Energy market in 2020 decreased by more than a half from 2019 and almost 6 times from 2018. At the same time, the share of DER participating as Demand Response also decreased from 70% in 2019 to 45% in 2020. Significant reduction in Economic Energy activity may be due to Covid-19 epidemic.

*Note: 2020 settled MWhs number may increase when all settlements for events in December get confirmed. The final number will be reflected in 2021 DER report.

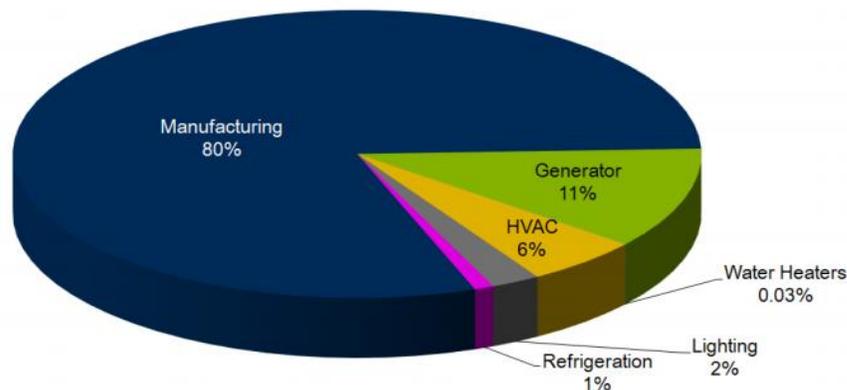
Figure 10: PJM Demand Response Synchronized Reserves Cleared MWhs Trend



DR Synchronized Reserves cleared MWhs decreased by 19% from 2019. DER share of Total DR in 2020 remained unchanged from the previous year and comprised 8.5%.

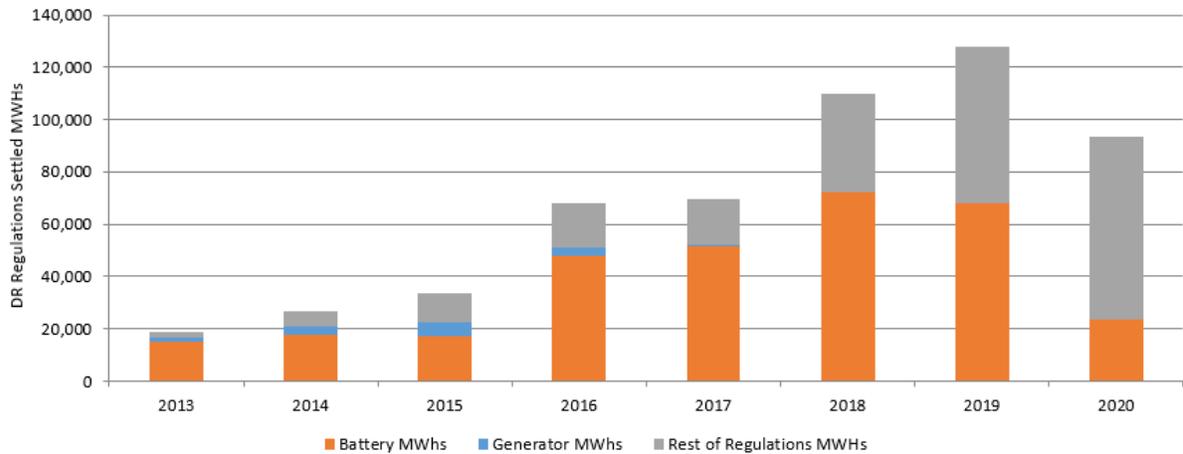
Note: PJM findings are based on extrapolation of DR capability by load reduction method submitted by curtailment service providers. PJM does not know what load reduction method was deployed in any given event.

Figure 11: 2020 PJM Demand Response Confirmed Synchronized Reserve Registrations Load Reduction Methods



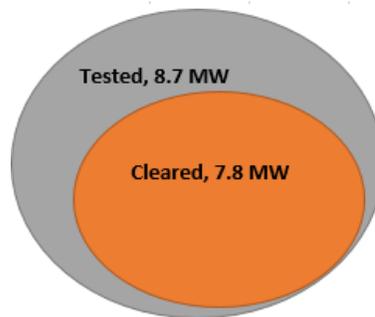
Behind the meter generators represent only 11% of total Synchronized Reserves participating as Demand Response while the load reduction from the manufacturing process leads with 80%.

Figure 12: PJM Demand Response Regulation Settled MWhs trend for DER



Behind the meter battery storage participation in DR regulation market decreased in 2020 by 65% from 2019. Batteries share of total DR provided has decreased by 50% from 2019 due to a large battery that left the market, which led to a total MWhs participation decrease from 128,000MWhs to 93,000MWhs accordingly. Electrical water heaters contribution (rest of regulation) has in turn increased in 2020 by 15%.

Figure 13: 2020 DR DER Regulation MW participation



DERs cleared volume in regulation market was at about 90% of the tested capability. Cleared capability is calculated as a sum of the highest amount cleared for each resource during 2020.