

## Distributed Energy Resources (DERs) Aggregation Opportunities in FERC jurisdictional ISO/RTOs

Federal Energy Regulatory Commission (FERC) defined Distributed Energy Resources (DER) as “a source or sink of power that is located on the distribution system, any subsystem thereof, or behind a customer meter. These resources may include, but are not limited to, electric storage resources, distributed generation, thermal storage, and electric vehicles and their supply equipment<sup>1</sup>” In some states like Minnesota distributed generation<sup>2</sup> is the common term used. This article is all about the market size opportunity for these DERs.

This is timely because FERC issued a data request to ISO/RTOs in September 2019 focusing on DER interconnections. Previously FERC had issued a Notice of Proposed Rulemaking (NOPR) on DER Aggregation at the same time they issued a NOPR on Electric Storage Resources (ESR) in November 2016. Since then FERC staff have issued a Technical Considerations document on the role DERs play at the bulk electric system in February 2018<sup>3</sup>. In case you are wondering what happened between November 2016 and February 2018, U.S. Presidential elections happened and as a result there was a time when there was no “quorum” at FERC Commissioner level and FERC Chairman role was up in the air to issue big orders. But FERC staff has been busy internally on both DER and ESR front as evidenced by FERC Order 841 for ESRs issued in February 2018 and received compliance plans on how ISO/RTOs plan to comply with that initial order in December 2018.

FERC pushed Electric Storage Resource (ESR) Order 841 out the door first relative to the DER Aggregation matter. But FERC staff also continued their progress on the DER topic, with a technical conference in April 2018 and ample time for ISO/RTOs to provide technical comments post-technical conference in June 2018. Recently in September 2019, FERC issued data requests for ISO/RTOs on the DER Aggregation matter focusing more on the interconnection aspects of distributed energy resources. All this begs the question, is FERC ready to issue an order on DER Aggregation like energy storage order 841 and reaffirmed order 841-A issued on May 2019? If so, what is the size of those opportunities for DERs at ISO/RTOs?

The market size for DERs at FERC jurisdictional ISO/RTOs and ERCOT depends on the current pace of DER adoption in these regions. It helps to understand some new terms regarding DERs. We know that “resource” is a defined term at all ISOs, because this implies the operator in the control room can depend on this resource and dispatch the unit i.e. resource when the need arises. Since distributed energy resources are sprinkled i.e. distributed all over the transmission and distribution grid, some are registered with the market and some are not registered (“un-registered”). As an example, ERCOT has as of December 2018 – 1,300 MW of registered and un-registered DERs, out of which ERCOT thinks 450-550 MW are un-registered<sup>4</sup>. That’s almost 40% of their 1,300 MW DERs. Can you imagine not knowing whether you can dispatch 40% of your resources, if you are a grid operator responsible for keeping the lights on?

ERCOT peak demand occurred in July 2018 at 73,308 MW<sup>5</sup>, so 1,300 MW of DERs is not a big deal yet because that is only 2% of their peak demand. But in places like California ISO (CAISO), DERs are

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<sup>1</sup> FERC Technical Document reference, <https://www.ferc.gov/legal/staff-reports/2018/der-report.pdf>

<sup>2</sup> <https://mn.gov/puc/energy/distributed-energy/>

<sup>3</sup> <https://www.ferc.gov/legal/staff-reports/2018/der-report.pdf>

<sup>4</sup> [http://ercot.com/content/wcm/lists/164134/DER\\_OnePager\\_2019\\_FINAL.pdf](http://ercot.com/content/wcm/lists/164134/DER_OnePager_2019_FINAL.pdf)

<sup>5</sup> [http://www.ercot.com/content/wcm/lists/144927/2018\\_Summer\\_Performance\\_One\\_Pager\\_FINAL.pdf](http://www.ercot.com/content/wcm/lists/144927/2018_Summer_Performance_One_Pager_FINAL.pdf)

forecasted to be a significant percentage of their peak demand. At the time of FERC staff issuing technical considerations document on DERs – February 2018, CAISO had 7,000 MW of DERs. And the forecast was 12,000 MW of DERs by 2020. That translates into 24% of peak demand because CAISO peak occurred in July 2006 at 50,270 MW<sup>6</sup>. And if ERCOT’s 40% un-registered DERs is a norm for the sake of argument, CAISO is forecasted to have 40% of 12,000 MW i.e. 4,800 MW of “un-registered” DERs, resources that are outside operators command and control.

So what? We are not California – that’s a common theme I hear in Minnesota where I live. Sure, Minnesota is not California. But if you think California and what is happening in CAISO is an anomaly – think again! New England grid operator referred as ISO-NE has a peak demand of 28,130 MW which occurred in August 2006<sup>7</sup>. New England ISO has a comprehensive Photovoltaic (PV) forecast that is developed annually with the help of their State utility commission staff and working group stakeholders. As a result, we now have statistics of PV forecasts that ISO-NE expects to see in their capacity market, energy only market and behind the meter DERs. So, in their 2018 report – ISO-NE reported 2,800 MW of total DER with a forecast of 5,800 MW by 2027. And those numbers have increased in their current 2019 report, ISO-NE reported 3,300 MW of total DERs (capacity market, energy market and behind-the-meter i.e. behind the ISO settlement meter) with a forecast of 6,700 MW by 2028<sup>8</sup>. If you are keeping track of percentages, that 6,700 MW of DER forecast from ISO-NE by 2028 is 24% of peak demand (28,130 MW).

Do you want to take chances that CAISO and ISO-NE are just 2 data points where DERs are forecasted to be a significant percentage of their peak demand? Let’s take New York ISO (NYISO) as another example where DER penetration is increasing. NYISO publishes a report on their current and future load and capacity values called the “Gold Book”, which I have first relied on during my earlier stint as a consultant in early 2000. Per 2019 Gold Book<sup>9</sup>, NYISO expects 4,487 MW of Behind-The-Meter (BTM) PV Solar, 1,200 MW of BTM Storage, and 671 MW of non-solar Distributed Generation (DG) by 2039. That is 19% of their 33,956 MW of peak demand which occurred in July 2013.

CAISO, ISO-NE and NYISO are forecasted to have significant percentages of distributed energy resources as a percentage of their peak demand in the next year (CAISO), next 10 years (ISO-NE) and next 20 years (NYISO). Which ISO/RTOs are left? PJM, MISO and SPP because we already discussed the DER situation at non-FERC jurisdictional ERCOT market.

Pennsylvania-new Jersey-Maryland (PJM) Interconnection has 7,000 MW of BTM Generation (BTMG) of which 5,000 MW is on the retail side and 2,000 MW is on the non-retail side<sup>10</sup>. You must add these terms - retail side and non-retail side to the DER vocabulary along with registered and un-registered DERs. In PJM retail and non-retail definitions are critical because PJM operates in states where there is retail choice. Meaning, retail customers have choice to choose their own energy supplier in those states that PJM manages the bulk electric system.

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<sup>6</sup> <https://www.caiso.com/Documents/CaliforniaISOPeakLoadHistory.pdf>

<sup>7</sup> <https://www.iso-ne.com/about/key-stats/>

<sup>8</sup> <https://www.iso-ne.com/system-planning/system-forecasting/distributed-generation-forecast/> (Source: slide 31 of 72, Final 2019 PV Forecast)

<sup>9</sup> <https://www.nyiso.com/power-trends>

<sup>10</sup> <https://www.pjm.com/-/media/committees-groups/subcommittees/irs/20190619/20190619-item-04-improving-load-forecasting-with-the-btm-solar-forecast.ashx>

PJM provides granularity on the retail and non-retail numbers. Currently out of the 5,000 MW retail side BTMG, PJM has approximately 50-50 split with solar and non-solar generation. Out of 2,656 MW of retail solar, roughly 2,200 MW is less than 1 MW and the remaining 400 MW of retail solar is greater than or equal to 1 MW. So, 83% of retail solar is smaller than 1 MW size. If we stay on solar for a minute, grid connected solar i.e. non-retail solar is 648 MW at PJM today. These are all installed values. So, lot more distributed solar than grid-connected solar at PJM. What does this mean for DER Aggregation opportunities? I think there is room for aggregation, but if those smaller 1MW size retail solar are all over different balancing authorities – it is tough to aggregate them.

What about non-solar BTMG at PJM? PJM has 2,373 MW of non-solar BTMG which is entirely greater than or equal to that 1 MW threshold according to PJM reporting.

So, what does PJM values mean for our DER penetration percentages we have seen at other ISOs like CAISO, ISO-NE and NYISO? PJM's peak demand is 165,492 MW, which occurred in summer of 2006<sup>11</sup>. Installed BTMG value of 7,000 MW is only 4% of that historical peak demand. But if distributed solar reaches to the level of ERCOT un-registered DER then we are looking at 15,887 MW<sup>12</sup> of resources outside PJM operator dispatch order.

What about MISO and SPP? Organization of MISO States (OMS) did a survey of DERs and found 2,600 MW of DERs in 2018<sup>13</sup>. SPP does not have a DER forecast per se, but their latest 2019 Integrated Transmission Plan (ITP) models 300 MW of distributed solar by 2024 and 500 MW by 2029 in one of the planning scenarios<sup>14</sup>. One explanation behind these low DER forecasts relative to ISOs like CAISO/ISO-NE/NYISO is most states in MISO and SPP are vertically integrated. There is no retail choice except in Illinois. Which is interesting because atleast in the case of MISO, there is 90,000 MW sitting in the generator interconnection queue<sup>15</sup>.

All these DER forecasts beg the question, how close is FERC to releasing a DER Aggregation order? I think FERC is closer because in their data request sent to ISO/RTOs dated September 5, 2019 – FERC is asking pointed interconnection related questions on DERs to each of the ISO/RTOs. In my opinion, FERC is right to focus on the DER interconnection piece first because for all the stars to align for a successful DER aggregation to occur and wholesale market operators to see the benefit distributed resources provide – they need visibility. Market operators need to know where these DERs are on their system, at which node/bus. And that's why focusing on interconnection is important. But does that mean MISO like interconnection queue for DERs? I hope not. Because that will only drive the DERs to not register with the market operator.

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<sup>11</sup> <https://www.pjm.com/-/media/about-pjm/newsroom/2018-releases/20180507-pjm-ready-to-meet-expected-hot-summer-demand.ashx>

<sup>12</sup> How did I arrive at this 15,887 MW value? PJM's peak demand is 165,492 MW. If PJM sees significant growth of DERs like CAISO, ISO-NE – then I expect 24% of that peak demand to be DERs, which is 39,718 MW. Forty percent (40%) of DERs are un-registered in ERCOT, if that is true of PJM when PJM has 39,718 MW of DERs – then I expect PJM to have 40% of 39,718 MW i.e. 15,887 MW un-registered.

<sup>13</sup> <https://cdn.misoenergy.org/20190129%20DER%20100%20Workshop314809.pdf> (slide 41)

<sup>14</sup> [SPP Documents Engineering & Planning](#) ITP Postings (for distributed solar planning model estimate)

<sup>15</sup> <https://cdn.misoenergy.org/GIQ%20Web%20Overview272899.pdf>

Stay tuned for more details based on ISO/RTO responses back to FERC, which are due October 7, 2019 and industry has 30 days to comment on the responses filed at FERC by the ISOs<sup>16</sup>. In the case of energy storage order 841, FERC sought additional information in April 2019 after ISO/RTOs filed their compliance plans. Then, FERC issued Order 841-A reaffirming role of electric storage resources in May 2019 which takes effect December 2019<sup>17</sup>. In July 2019, National Association of Utility Regulatory Commissions (NARUC) and others filed at D.C. Circuit of Appeals essentially saying FERC overstepped in Order 841-A and states and utilities should be able to “opt-out” much like Demand Response Order 715. Advanced Energy Economy (AEE) and Solar Energy Industries Association (SEIA) support FERC Order 841-A and they filed at D.C. Circuit of Appeals in August 2019<sup>18</sup>. This is where energy storage order resides now. DER Aggregation order from FERC perhaps has similar trajectory, but FERC by focusing on the DER interconnection aspects continues to make progress.

Meanwhile, the industry and distributed energy resources are not waiting for FERC to release an Order. CAISO is expecting to reach that magic threshold of 24% of its peak demand provided by DERs in 2020. If there are no clear rules from FERC or if FERC DER Aggregation Order results in MISO like generator interconnection queue, the percentage of un-registered DERs i.e. DERs that have not interconnected with the grid operator are only going to increase to a % like 40%. Which means the operator in the control room will not be able to dispatch those “un-registered” resources. So, hurry up FERC!

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<sup>16</sup> Search for Docket number RM18-9 here <https://www.ferc.gov/docs-filing/elibrary.asp>

<sup>17</sup> Search for Docket number ER19-465 here <https://www.ferc.gov/docs-filing/elibrary.asp>

<sup>18</sup> <https://blog.aee.net/aee-goes-to-court-to-stop-utilities-and-states-from-opting-out-of-ferc-energy-storage-rules>