Extreme Weather Impacts on Resource Adequacy Intermittent Renewable Modeling: BTM Solar Update

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Installed Capacity Subcommittee #305

July 10, 2025

Recap from EWWG 23 & ICS #304

- **There are many ways to determine "extreme weather" conditions for resource adequacy modeling purposes**
  - The "low output count" is one method that measures an aggregation of the output from intermittent renewable resources to determine if a single hour is below a specified capacity factor value (a 10% value was used for the analysis to date)
- **Based on the prior analysis, the DNV simulated data (2000 to 2022) and production data (2019 to 2024) regarding intermittent renewable resource output showed similar trends**
  - Both datasets indicated that 2021 represents a "bad weather" year (i.e., exhibiting lower intermittent renewable resource production) and most other years fall within one standard deviation of the average
  - Observed differences in datasets:
    - DNV simulated data indicated that 2018 represents a "bad weather" year
    - Production data indicated that 2022 represents a "good weather" year (i.e., exhibiting higher intermittent renewable resource production) and 2023 represents a "bad weather" year
- **Increasing the historical data period for the intermittent renewable production shapes from 5 to 10 years had a limited impact on the 2024-2025 Final Base Case**
  - The IRM increased from 24.4% to 24.57% (Delta = +0.17%)
  - The hourly output of individual shapes during the 10 highest peak load hours was strongly correlated with the change in loss of load expectation (LOLE) observed
    - Focusing solely on the 10 highest peak load hours to identify "extreme weather" conditions is not advised because the driver(s) for LOLE may change over time with future modeling updates
    - Methodologies such as the "low output count" provide a more objective and sustainable approach for identifying "extreme weather" conditions

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Information Requests from Prior Discussions

- **Zonal considerations for the intermittent renewable fleet**
- **Incorporation of behind-the-meter (BTM) solar into the analysis**
- **Consideration of "lulls"**
  - The NYISO is currently working on this analysis
  - Preliminary results show similar trends to the analysis described in this presentation
  - More information will be provided at a future meeting

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Zonal Considerations

- **Most of the existing, non-BTM solar intermittent renewable fleet is in Load Zones A-E (i.e., land-based wind (LBW) and utility-scale solar (UPV))**
  - Existing BTM solar is, in aggregate, more evenly distributed among Load Zones A-E (~46%) and Load Zones F-K (~54%)
- **From the previous test case results, there does not appear to be a significant correlation between hourly output from the intermittent renewables in Load Zones F-K and the LOLE events**
  - The upstate fleet is driving the test case LOLE changes based on its aggregate output during the peak load hours
  - This may change in the future with addition of downstate BTM solar, offshore wind (OSW), and energy storage

Zones	BTM Solar (MW)	UPV (MW)	LBW (MW)	OSW (MW)	Total (MW)
A	410	0	278.9	0	688.9
B	560	0	0	0	560
C	980	217	735.8	0	1,932.8
D	120	0	678.4	0	798.4
E	660	0	737.1	0	1,397.1
F	800	300	0	0	1,100
G	650	0	0	0	650
H	110	0	0	0	110
I	140	0	0	0	140
J	560	0	0	0	560
K	990	54.4	0	136	1,180.4
NYCA	5,980	571.4	2,430.2	136	9,117.6

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Incorporation of BTM Solar

- **The BTM solar data contains hourly data from 2012 to 2024 and is combined with the DNV simulated data from 2000 to 2022**
  - The NYISO developed a time series of estimated BTM solar production for the period from 2012 through 2024
  - Pre-2017 estimates were modeled based on historical Global Horizontal Irradiance (GHI) and installed BTM solar capacity data
  - 2017 through current year estimates were based on sampled inverter data
- **There is approximately 5,980 MW of BTM solar installed capacity in NYCA based on the 2025 Load & Capacity Data report (Gold Book) and previous work conducted by the NYISO's Demand Forecasting and Analysis team (LFTF 2024 Long Term Forecast)**
  - BTM solar makes up a majority of the total intermittent renewable fleet at roughly 66%
    - The other intermittent renewables are as follows: 571.4 MW of utility-scale solar (~6%), 2,430.2 MW of LBW (~27%), and 136 MW of OSW (~1%)
- **Results:**
  - 2021 represents a "bad weather" year as previously identified in the production and DNV data without BTM solar
  - 2014 represents a "good weather" year with the incorporation of BTM solar data
  - 2018 has an overall capacity factor (indicated as "CF" in the table) that is two standard deviations below the average (see Z-Score results in the table)
    - Refer to Slide 5 of the 5/30/2025 EWWG presentation for additional information on Z-score calculations
  - All other weather years included in the assessment fall within approximately one standard deviation of the mean (see Z-Score results in the table) when measured by low output count (indicated as "LOC" in the table) and capacity factor

DNV Simulation & BTM Solar Data Summary

Years	BTM Solar CF	UPV CF	LBW CF	OSW CF	CF	CF Z Score	Low Output Count	LOC Z Score
2012	0.182	0.224	0.298	0.421	0.219	0.331	2998	0.224
2013	0.180	0.220	0.314	0.482	0.223	0.767	2857	-0.657
2014	0.181	0.221	0.331	0.446	0.227	1.258	2678	-1.774
2015	0.177	0.230	0.312	0.446	0.220	0.432	2883	-0.494
2016	0.178	0.234	0.314	0.471	0.222	0.681	2913	-0.307
2017	0.166	0.218	0.321	0.484	0.215	-0.182	2885	-0.482
2018	0.150	0.207	0.306	0.469	0.200	-2.010	3064	0.636
2019	0.159	0.217	0.321	0.458	0.210	-0.756	3051	0.554
2020	0.167	0.227	0.320	0.462	0.216	-0.080	2943	-0.120
2021	0.164	0.214	0.287	0.453	0.204	-1.509	3357	2.465
2022	0.184	0.227	0.314	0.457	0.226	1.068	2955	-0.045

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Incorporation of BTM Solar (cont.)

- **The addition of BTM solar to historical production data shows a similar trend to what was seen previously in the low output counts analysis:**
  - 2021 continues to represent a “bad weather” year
  - 2022 continues to represent a “good weather” year
  - With the addition of BTM solar data, 2023 represents a more average year
  - Other weather years included in the assessment fall within approximately one standard deviation of the mean for each measurement (i.e., capacity factor and low output count)

Production & BTM Solar Data Summary

Years	BTM Solar CF	UPV CF	LBW CF	OSW CF	CF	CF Z Score	Low Output Count	LOC Z Score
2019	0.159	0.182	0.254	0.449	0.190	0.103	3638	-0.477
2020	0.167	0.174	0.255	0.451	0.190	0.092	3582	-0.772
2021	0.164	0.181	0.223	0.443	0.179	-1.716	4001	1.439
2022	0.184	0.187	0.250	0.457	0.199	1.407	3466	-1.384
2023	0.182	0.184	0.209	0.461	0.185	-0.667	3934	1.085
2024	0.175	0.177	0.237	0.301	0.195	0.781	3749	0.109

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Observations

- **Incorporation of the BTM solar data does not materially change the results of the previous work**
  - 2021 continues to represent a “bad weather” year based on the analysis
    - 2021 is incorporated in the 5-year historical dataset for the 2026-2027 IRM study
  - Most other years included in the assessment represent fairly average weather years based on the analysis

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Next Steps

- Continue discussions at Extreme Weather Working Group based on feedback
- Share additional research and findings at future ICS meetings

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Questions?

Our Mission and Vision

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Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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