New York ISO
Independent System Operator

Appendix []: New York Renewable Production Profiles

2023-2042 System & Resource Outlook

A Report from the New York Independent System Operator

DRAFT for May 14 2024, ESPWG

Appendix []: New York Renewable Production Profiles

Overview

The NYISO contracted with DNV to produce long-term hourly simulated weather and generation profiles for representative offshore wind (OSW), land-based wind (LBW), and utility-scale solar (UPV) generators. Information about these databases and their production methods were presented to and discussed with stakeholders.[1] DNV provided data for seven OSW locations and nearly 80 LBW and UPV locations throughout the state. The locations were aggregated to the county or zonal level to be put into a format consistent with the capacity expansion modeling framework for use in this Outlook. Capacity weighted aggregation of the net capacity factor (NCF) shapes by technology type in each zone was performed in each hour to determine the zonal or county aggregate NCF profiles that the NYISO used as inputs into the capacity expansion model.[2] To align with the weather underlaying the demand forecasts used in this Outlook, the renewable generation profiles from 2018 were leveraged from the 20-plus-year database to represent the production from renewable generators in every year of the 20-year study.

New York Weather

[This section will be filled out in future versions of this draft.]

Renewable Technologies

While most of the renewable energy generation in the state today is produced by hydroelectric generators, the expected growth of LBW, OSW, and solar—both UPV and behind the meter (BTM) PV are key factors in achieving the CLCPA targets. The production amounts are considered when determining the representative days selected for the capacity expansion model and are used as hourly generation shapes in the production cost model for this Outlook.

The NYISO acknowledges that advances in technology are continuously occurring and can lead to improved performance among generators built in the later years of the study period. Offsetting this effect, however, is that better sites may be utilized before less favorable resource sites leading to older technology on more favorable sites. Moreover, once installed, equipment performance can degrade over time. While these impacts are known, the exact magnitude of the impacts is hard to quantify. Accordingly, this Outlook does not make any assumptions about improved performance of

[1] The Offshore Wind Profile Details & Methodology was shared and discussed at the February 7, 2023 ICAP/MIWG/PRLWG meeting, and the Solar and Land-Based Wind Profile Details & Methodology was shared by DNV and discussed at the November 21, 2024 ESPWG/TPAS meeting.

[2] Simulated hourly production profiles for renewable resources for years 2000 through 2022.

renewable generators built in the later years of the study period or performance degradation of generators once in operation.

Data

For this Outlook, the NYISO is employing a multi-year database containing consistent OSW, LBW, and UPV production profiles based on a single weather model run and resource projections. DNV was contracted by the NYISO to produce retrospective databases spanning from 2000 to the present providing hourly generation output, as net capacity factors (NCF), for hypothetical projects sited throughout the state and in the New York Bight on the Outer Continental Shelf.[3] The full suite of site level shapes across the OSW, LBW, and UPV database were derived from a single weather model run, and the production values in the simulated database are representative of actual historical weather conditions. However, increasing weather dependent supply resources and electrified load will necessitate more careful attention of spatiotemporally correlated renewable generation and load models are employed in long-term planning studies.

Offshore Wind Generation Profiles

The OSW database was developed as part of the ICAP market process to provide estimates for OSW capacity values.[4] Hourly NCF values from 2000 to 2021 were provided for seven locations representative of awarded and anticipated lease areas for OSW development by the Bureau of Ocean Energy Management.[5]

Land-Based Wind and Utility PV Generation Profiles

DNV developed LBW and UPV profiles for approximately 160 sites throughout New York that included existing and expected project sites and other locations to capture potential resource variations throughout the state.[6] The database provides hourly NCF values from 2000 to 2022 for each LBW and UPV site under various assumptions about the performance and technology of the individual projects modeled.

Benefits of New Data

With a new catalog of correlated LBW, OSW, and UPV profiles now available for use in the NYISO's planning and other studies, better characterization of the impacts of electrification and

[3] These profiles can be used to not only simulate production from potential hypothetical projects in the NYISO's long-term planning studies but also for the addition firm resources that will be included in the planning database.

[4] https://www.nyiso.com/documents/20142/36079056/4%2023_02_07_ICAPWG_OffshoreWindProfileDevelopment.pdf

[5] https://www.nyiso.com/documents/20142/36079056/4%20NYISO_OffshoreWind_Hourly_NetCapacityFactor.xlsx/

[6] https://www.nyiso.com/documents/20142/41314645/06_10430908%20DNV%20LBW%20and%20Solar%20Presentation%20for%20NYISO.pdf

renewable energy integration is possible as large structural system changes make the grid more weather dependent. Correlating the renewable profiles with load for the same weather year leads to improved representation of potential renewable generation production relative to the expected system demand. . In addition, a large catalog of smaller site-level representations allows for more accurate representation in nodal models where differences in renewable resource production across each of the individual sites will be aggregated to develop representations for larger regions (*e.g.*, county or zone). More granular representation in nodal models will reduce the potential of overestimating the inter-hourly ramps that may become a key constraint in high renewable energy systems.

Renewable Resource Characterization

Resource production profiles can be characterized in various ways to describe interannual variability in, for example, resource output, hourly ramps, variability, and duration of low output. In order to understand the consequences of selecting a single weather year for modeling all future years' system operations and renewable profiles, a comparison of 2018 statistics to those across the 20-plus-year period was performed.

Based on the granular site-level DNV data, the NYISO developed hourly zonal NCF profiles for integration into the capacity expansion model to represent the output of candidate generators. The NYISO used aggregated zonal profiles to represent OSW, LBW, and UPV generators in the capacity expansion model, site-level and aggregated count-level profiles for existing and new renewable resources modeled in the production cost model respectively.

Metrics for Characterizing Renewable Production

[This section will be filled out in future versions of this draft.]

Offshore Wind Characterization

[This section will be filled out in future versions of this draft.]

Land-Based Wind Characterization

[This section will be filled out in future versions of this draft.]

Utility PV Characterization

[This section will be filled out in future versions of this draft.]

Conclusions

[This section will be filled out in future versions of this draft.]

Relationship to Power Demand (Net-Load)

[This section will be filled out in future versions of this draft.]