Assumptions for the 2020 IRM High Renewable Resources Sensitivity

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NYSRC Installed Capacity Subcommittee
Meeting #222

July 30, 2019

Background

- The NYSRC ICS requested a 2020 IRM sensitivity containing greater quantities of renewable resources than exist in the NYCA today
- The sensitivity was agreed to be an extension of the 2018 IRM sensitivity to include off-shore wind
  - The 2018 IRM sensitivity added 2,000 MW of on-shore wind and solar
  - The 2018 IRM sensitivity showed that the 4,000MW of renewables added would have resulted in an IRM of 26.3% (relative to a final base case IRM of 18.2%)
  - http://nysrc.org/pdf/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20201/Agenda%20Item%204.2%20-%20Sensitivity%20results%20-Table%20B%2012%20v7.pdf

Method and Assumptions

- **Begin with the 2020 IRM preliminary base case**
- **Add incremental renewable resource ICAP**
  - 4,000 MW of incremental on-shore wind and 4,000 MW of solar consistent with the 2018 IRM sensitivity's resource locations and output shapes (see next slide)
  - Add 4,000 MW of off-shore wind, evenly split between NYC and LI
    - General Electric consulting has been retained to provide off-shore wind production shapes (5 years) for interconnection locations near NYC and LI
- **Calculate an IRM for the high renewable sensitivity using the TAN45 method**

Assumed location of solar and on-shore wind

Solar	
Zone	IRM sensitivity (MW)
A	874
C	406
F	1,884
G	448
K	388
NYCA Total	4,000

On-Shore Wind	
Zone	IRM sensitivity (MW)
A	1,030
C	994
D	893
E	1,082
NYCA Total	4,000

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Off-shore wind modeling assumptions

- General Electric consulting will review modeling assumptions on the following slides

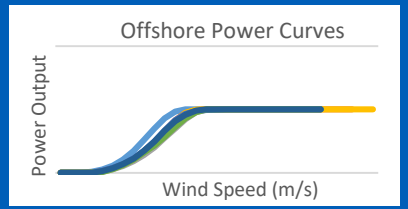
GE Wind Tool Overview

2 **Hourly MW Profile**

1 **Data Extraction**
Process Overview

NREL WIND Toolkit

- 6 Historical Wind Years
- 2007-2012
- 2 km x 2 km Grid Cell



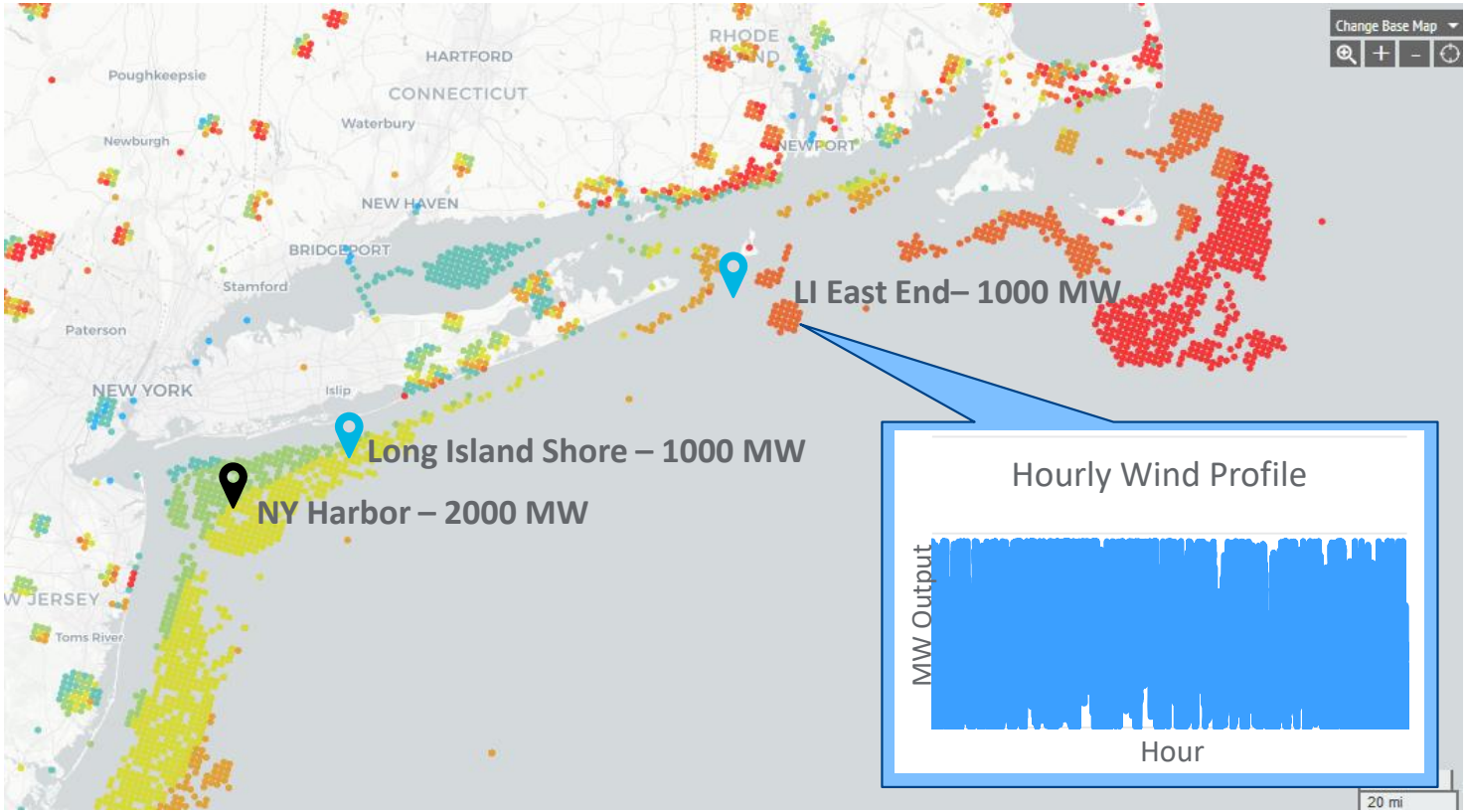
Wind Plant Specifications

- Lat/Long
- Turbine Model
- Hub Height

Plant Size

Pulls data for sites required to meet specified capacity

NY Specific Offshore Wind Profiles



Input Assumptions

- One 2000 MW shape for NY Harbor, Two 1000 MW shapes for LI
- Using generalized offshore power curve provided by NREL
- Assumed hub height of 110m based on operational/planned offshore wind plants
- Loss Factors – Wake loss, density adjusted wind speed loss, electrical loss, forced outage, ~20% loss in total
- Prevalent turbine size of 12 MW anticipated ~2025

Next steps

- Incorporate feedback from today's ICS meeting
- Return to the ICS on 8/15 to discuss off-shore wind output characteristics
- The sensitivity case will be run concurrent with the other 2020 IRM sensitivities and results will be reported as available (usually around October)

Appendix

Wind and Solar Data for use in the IRM Study and Sensitivity Case

Nathaniel Gilbraith

NYSRC Installed Capacity Subcommittee
Meeting #195

May 3, 2017

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Agenda

- **Part 1 - Preparation of wind and solar data for the 2018 IRM study**
  - Overview of the data and resources – only resources with CRIS
  - Treatment of resources without five years of output data
  - Monthly results
- **Part 2 - Locating wind and solar resources for the IRM sensitivity case**
  - This portion of the presentation is for a sensitivity case only and will not affect the 2018 IRM
- **Next steps**

Background

Date	Working Group	Discussion points and links to materials
03-29-16	NYSRC Installed Capacity Subcommittee (Mtg. #182)	Preparation of wind data for the 2017 IRM study. Presentation – http://nysrc.org/pdf/MeetingMaterial/ICSMeetingMaterial/ICS_Agenda%20182/Preparation%20of%20Wind%20Data.pdf Data - http://nysrc.org/pdf/MeetingMaterial/ICSMeetingMaterial/ICS_Agenda%20182/Copy%20of%20Monthly%20Average%20Wind%20Output%20V2.pdf
03-10-17	NYSRC Executive Committee (Mtg. #215)	Wind and solar sensitivity analysis See minutes, ICS Chair Report (Section 4.1.iv) “Impact of a High Penetration of Renewable Resources on the IRM” – http://nysrc.org/pdf/MeetingMaterial/ECMeetingMaterial/EC%20Agenda%20216/ECMinutes215Draft.pdf

Part 1:
Wind and solar data in the 2018 IRM study

Preparation of wind data

Data overview

- Five years of billing-quality meter data will be used (i.e., 1/1/2012 – 12/31/2016)
- Only wind facilities with CRIS were included in the dataset
  - Data were backfilled for facilities without five years of data (as described below)

Data overview

Resource	Zone	Nameplate (MW)	CRIS (MW)
Altona Wind Power	D	97.5	97.5
Bliss Wind Power	A	100.5	100.5
Canandaigua Wind Power	C	125	125
Chateaugay Wind Power	D	106.5	106.5
Clinton Wind Power	D	100.5	100.5
Ellenburg Wind Power	D	81	81
Hardscrabble Wind	E	74	74
High Sheldon Wind Farm	C	118.1	112.5
Howard Wind	C	59.5	57.4
Jericho Rise Wind Farm	D	77.7	77.7
Maple Ridge Wind 1	E	231	231
Maple Ridge Wind 2	E	90.8	90.7
Marble River Wind	D	215.5	215.2
Munnsville Wind Power	E	34.5	34.5
Orangeville Wind Farm	C	93.9	94.4
Madison Wind Power	E	11.55	11.5
Wethersfield Wind Power	C	126	126

- Nameplate and CRIS ratings are from the 2017 Gold Book
- Monthly average output is posted with these materials
- Highlighted facilities were not in service for the full five years

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Modeling facilities without five years of data

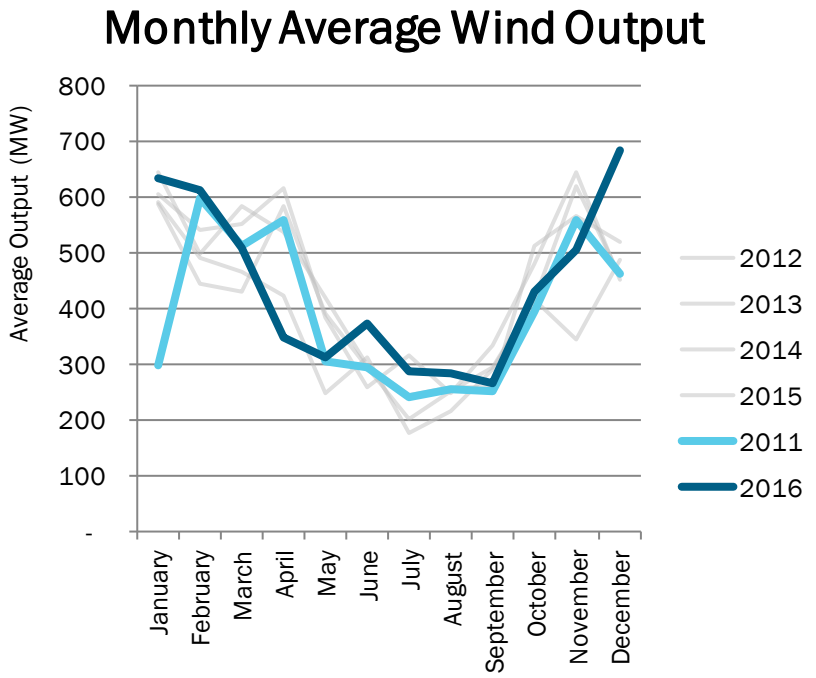
- Hourly output for facilities that commenced operation after January 2012 was scaled on a zonal basis using a ratio of nameplate MW to zone total nameplate MW multiplied by zone total output MW

Zone	A	A	A	A	A
Name Plate	50	100	100	100	100
Resource	New Resource	Existing #1	Existing #2	Existing #2	Existing #4
Output	25	75	50	50	25

$$Name\ plate\ ratio = \frac{New\ resource\ name\ plate}{\sum Existing\ name\ plate} = \frac{50}{400} = 12.5\%$$

$$New\ resource\ output = \sum Zone\ output * name\ plate\ ratio = 200 * 12.5\% = 25MW$$

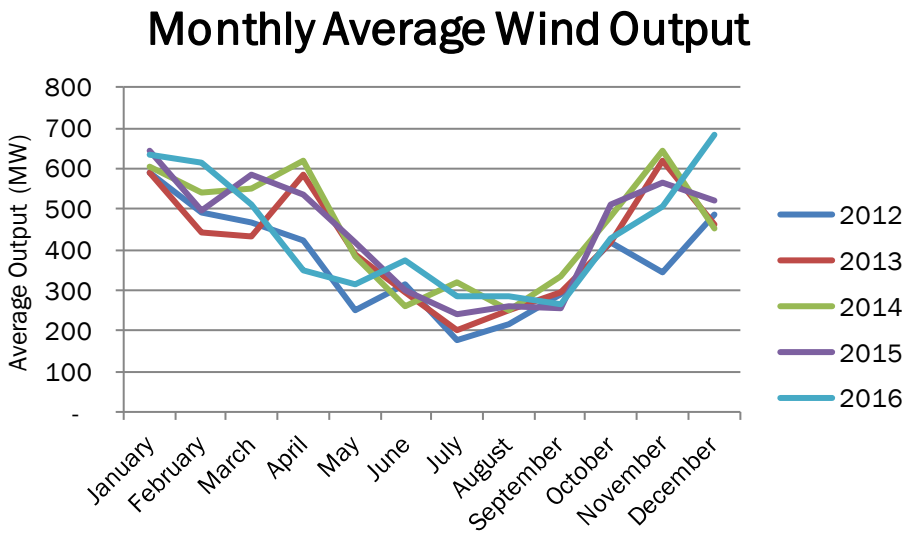
Rolling on 2016 data, rolling off 2011 data



- Both 2011 and 2016 data exhibited seasonal trends consistent with the NYISO's expectation

Monthly average output data

- Supporting data are included with the posted material



Zonal output trends

Correlation matrix Shows the correlation of zonal wind output data (2012-2016)					
ZONE	A	C	D	E	NYCA
A	1.00				
C	0.95	1.00			
D	0.52	0.55	1.00		
E	0.73	0.78	0.66	1.00	
NYCA	0.84	0.88	0.85	0.91	1.00

- **Wind output is positively correlated across all load zones**
  - A correlation coefficient of +1 indicates a perfect positive linear relationship between variables
  - A correlation coef. of -1 indicates a perfect negative linear relationship between variables

Preparation of solar data

Data overview

- Five years of billing-quality meter data will be used (i.e., 1/1/2012 – 12/31/2016)
- Only solar facilities with CRIS were included in the dataset
  - Long Island Solar Farm, Zone K, 31.5MW (Nameplate and CRIS)

Solar output data

- Data characteristics (e.g., capacity factor) were consistent with NYISO's expectations

Part 2:
The location of onshore wind and solar resources in the 2018 IRM sensitivity

Location of onshore wind and solar

- **Based on NYSDPS' projection of wind and solar installations**
  - The primary source of projections for the quantity and location of qualified CES renewable generation is the NYSDPS Final Supplemental Environmental Impact Statement ("Final EIS") in CASE 15-E-0302 using the "Blend Base Case."
  - E.g., slide 32 from this MIWG presentation:

  http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2017-04-24/MIWG%20Public%20Policy%20Update%2020170424.pdf
- **Resource quantities were scaled on a zonal basis to the 2,000 MW being evaluated in the 2018 IRM sensitivity case**
  - Resources were only distributed across zones that had substantial renewable build outs in the CES (i.e., zones with few MWs in the CES order will not receive MWs in the sensitivity)

Proposed distribution of resources

Utility scale solar

Zone	NYS DPS EIS Nameplate (MW)	IRM Sensitivity %	IRM Sensitivity Nameplate (MW)
A	841	22%	437.1
C	391	10%	203.2
F	1812	47%	941.8
G	431	11%	224.0
K	373	10%	193.9
NYCA Total			2,000.0

On-shore wind

Zone	NYS DPS EIS Nameplate (MW)	IRM Sensitivity %	IRM Sensitivity Nameplate (MW)
A	981	26%	515.0
C	947	25%	497.1
D	851	22%	446.7
E	1031	27%	541.2
NYCA Total			2,000.0

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Questions?

We are here to help. Let us know if we can add anything.

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