# NYSRC Distributed Energy Resources Workshop Summary

Roger Clayton, NYSRC Chairman

Presentation to NPCC Governmental/Regulatory Affairs Advisory Group

Toronto, Canada.  December 4, 2018

# NYSRC DER Workshop Agenda – November 7, 2018

***Workshop Objective – To raise awareness of possible adverse reliability impacts of widespread DER penetration***

1. **Introduction**
2. **Regulatory Status**
   - **National**
   - **Regional**
   - **New York**
3. **DER Penetration into NYCA (current & future)**
   - **Retail (net metered)**
   - **Wholesale (REV DSP)**
   - **Wholesale (NYISO queue)**
4. **Technical Considerations**
   - **Fundamentals**
   - **Operations**
   - **Planning**
5. **Panel Discussion**

All presentations available on the NYSRC home page: http://www.nysrc.org/

# DER Regulatory Status

FERC

- Order 841 – Electric Storage (February 2018)
- Staff Report - DER Technical Considerations for the BPS (February 2018)
- Technical Conference – DER Technical Considerations for the BPS (April 2018)

IEEE

- IEEE Standard 1547-2018 - Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces
- Technical Report - Impact of Inverter Based Generation on BPS Dynamics & Short-Circuit Performance (July 2018)

NERC

- Standard PRC-024-2 — Generator Frequency and Voltage Protective Relay Settings (July 2016)
- Reliability Guideline – Modeling DER in Dynamic Load Models (December 2016)
- Report – Connection Modeling & Reliability Considerations (February 2017)
- Reliability Guideline – DER Modeling (September 2017)
- Report - 900 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance (February 2018)
- Technical Brief – Data Collection Recommendations (March 2018)
- Industry Recommendation – Loss of Solar Resources during Transmission Disturbances due to Inverter Settings (May 2018)
- Reliability Guideline – BPS Connected Inverter Based Resource Performance (September 2018)
- Working Group - System Planning for Impact of DER (SPIDER WG) (September 2018)

# DER Regulatory Status

NPCC

- Report on the Impact of DER (March 2016)
- Report on the Effect of Lower System Inertia on Transmission Reliability due to Inverter Based Generation (December 2016)
- UFLS Study on Sensitivity to DER
- On-Going
  - Development of guidelines & practices to address DER modeling in planning studies
  - Examine potential regional approach to DER modeling
  - Study potential reliability impacts of DER

# DER NYCA Penetration – Retail (Liz Grisaru-NYS DPS)

REV Targets:

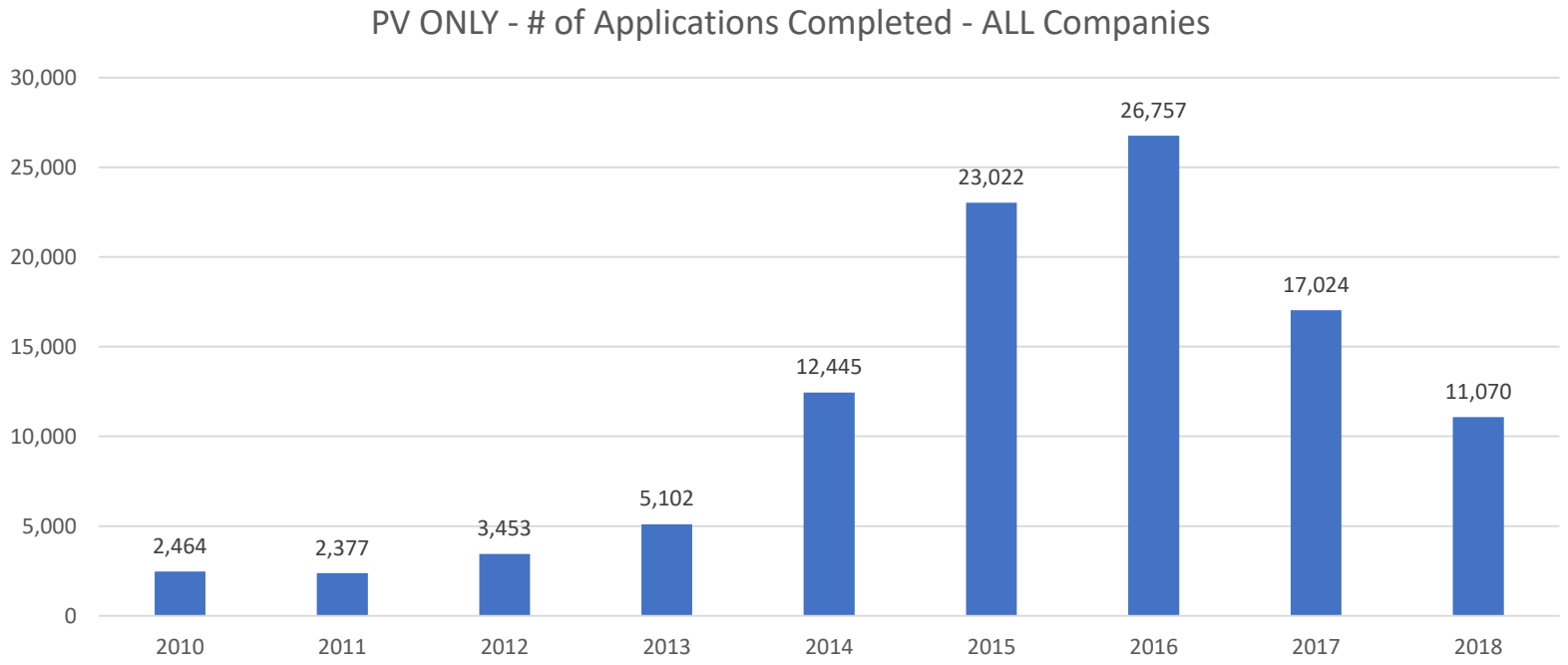
- 40% reduction in GHG from 1990 levels
- 50% renewables <= 2030
- 600E12 Btu increase in EE from 1990 levels
- 1.5 GW energy storage <= 2025
- NY Sun incentive program 3 GW <= 2023

New York Standardized Interconnection Requirements (SIR) apply to:

- New DG facilities sized up to 5 MW AC nameplate aggregated on the customer side of the PCC;
- New energy storage, stand alone or combined with DG, also limited to 5 MW
- Modifications to an existing facility that affect the interface at the PCC

# DER NYCA Penetration – Retail (Liz Grisaru-NYS DPS)

## Number of PV Projects in-service <= August 2018



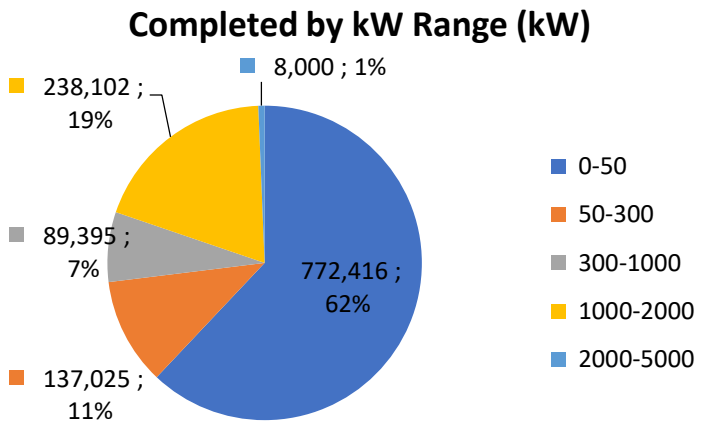

New York State DPS - SIR Interconnection Queue Summary:

http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/286d2c179e9a5a8385257fbf003f1f7e/

# DER NYCA Penetration – Retail (Liz Grisaru-NYS DPS)

## Net Capacity (KW) of PV Projects in Service <= August 2018

| | PV ONLY - Completed by kW Range (kW) to Date | | | | | |
|---|---|---|---|---|---|---|
| Company | 0-50 | 50-300 | 300-1000 | 1000-2000 | 2000-5000 | Total |
| National Grid | 149,113 | 49,594 | 20,154 | 135,636 | - | **354,496** |
| Con Edison | 140,880 | 33,711 | 26,109 | 6,312 | - | **207,012** |
| Central Hudson | 62,618 | 6,259 | 6,094 | 6,295 | - | **81,266** |
| Orange and Rockland | 48,226 | 3,437 | 2,653 | 16,544 | - | **70,859** |
| NYSEG | 60,512 | 12,477 | 8,718 | 37,502 | - | **119,208** |
| RGE | 11,138 | 4,307 | 6,366 | 22,498 | - | **44,310** |
| PSEG | 299,930 | 27,241 | 19,301 | 13,316 | 8,000 | **367,788** |
| Total | 772,416 | 137,025 | 89,395 | 238,102 | 8,000 | **1,244,938** |




New York State DPS - SIR Interconnection Queue Summary:

http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/286d2c179e9a5a8385257fbf003f1f7e/

# DER NYCA Penetration – Wholesale (Paul Haering-Central Hudson)

## Interconnected Projects & Queue Size

- Queue Coordination is critical as interconnection queues continues to grow
- Besides PV and Wind, Battery storage resources proposals are becoming significant

| | In Service (MW) | In Service (# of Projects) | In Queue (MW) | In Queue (# of Projects) |
|---|---|---|---|---|
| NYISO | 1,884 | 24 | 15,318 | 140 |
| NYS SIR | 1,362 | 109,054 | 1,849 | 13,310 |
| Total | 3,246 | 109,078 | 17,167 | 13,450 |

# DER NYCA Penetration – Wholesale & Retail (NYISO 2018 Gold Book)

Reforming the Energy Vision Programs as of 2018

- Distributed Energy Resources (DER)
  - Inverter connected solar & wind resources
  - NYISO 2018 Gold Book nameplate total installed capacity before the meter
    - Wind 1739 MW <=2018, ~3,300 MW <=2025 (Queue estimate)
    - Solar 31 MW <=2018, ~8,900 MW <=2025 (Queue estimate)
  - NYISO 2018 Gold Book nameplate total installed capacity behind the meter
    - Non-solar 213 MW <=2018, ~422 MW <=2025
    - Solar 1,504 MW <=2018, ~3,313 MW <=2025

# DER NYCA Penetration – Wholesale & Retail (Paul Haering-Central Hudson)

Interconnection study lead and process based on three criteria

- Intended Market (Wholesale or Retail)
- Interconnection Point (Transmission, Distribution FERC or non-FERC jurisdicational)
- Project Size

| Intended Market | Interconnection Point * | Project Size | Study Process |
|---|---|---|---|
| Wholesale | NYS Transmission System or Distribution subject to NYISO's OATT Interconnection Procedures** | > 5MW | NYISO |
| | | ≤ 5MW | NYISO |
| | Distribution not subject to NYISO's OATT Interconnection Procedures | > 5MW | Utility |
| | | ≤ 5MW | SIR |
| Retail | NYS Transmission System or Distribution subject to NYISO's OATT Interconnection Procedures | > 5MW | Utility |
| | | ≤ 5MW | Utility |
| | Distribution not subject to NYISO's OATT Interconnection Procedures | > 5MW | Utility |
| | | ≤ 5MW | SIR |

# DER NYCA Penetration – Wholesale (Paul Haering-Central Hudson)

## SIR Interconnection process

- Coordination of inclusion rules is critical for study work
- Projects are competing for the same interconnection points
- Interconnection procedures are not consistent
  - SIR and Utility procedures require full deliverability (NYISO procedure is a minimum interconnect standard)
- Projects may be dependent on upgrades paid for by developers in other interconnection processes
- No ability to share upgrade costs between Interconnection processes
- In many cases the same project may be venue shopping and have applied through both NYISO and Utility Procedures

# DER NYCA Penetration – Wholesale (Liz Grisaru-NYS DPS)

## Interconnection Working Groups


Technical

- Technical barriers & new technologies
- Consultants – EPRI & Pterra
- SIR screening
- Islanding Protection
- Monitoring and Control
- Voltage Flicker
- Energy Storage
- Metering Configurations

Policy

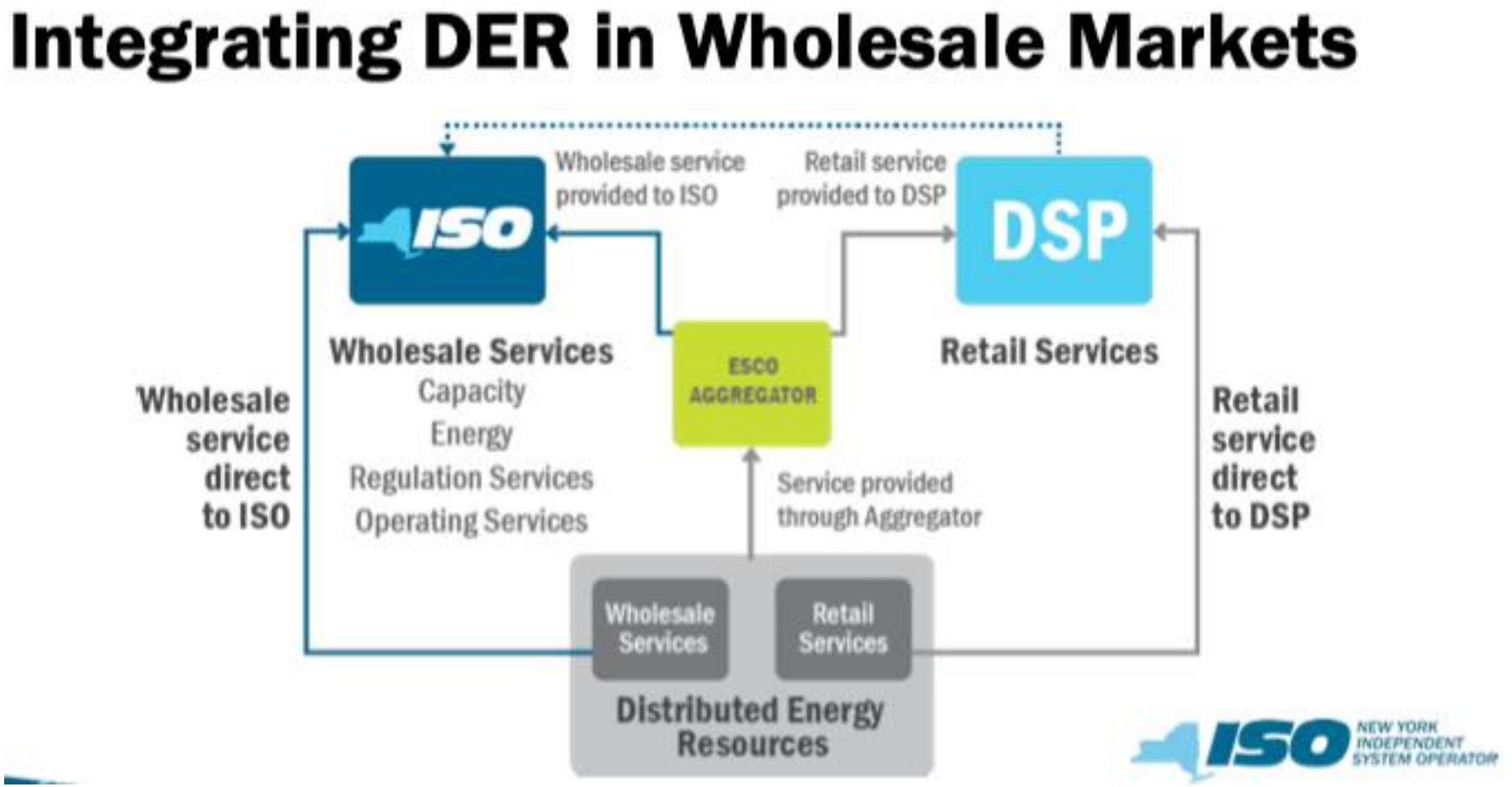
- Queue management methodology
- Communication
- Policy interpretation, timelines, and stage gates
- VDER / NEM grandfathering
- Cost allocation

# Technical Considerations – Fundamentals (John Undrill)

## Frequency and Voltage Control in systems with high DER penetration

- The availability and prompt delivery of primary frequency response is critical today
- The timing of delivery will need to be quicker as the fraction of electronically coupled equipment increases
- The frequency sensitivity and voltage sensitivity of loads are as important as the characteristics of generation
- It will be necessary for electronically coupled generation to contribute primary frequency response
- The effects on frequency control of replacing rotating generation with electronically coupled DER are system wide
- The effects on voltage control of replacing direct connected equipment with electronically coupled equipment may be mainly local (but not always so)
- Proper use of primary response of electronically coupled generation can be expected to improve quality of frequency and voltage control

# Technical Considerations – Operations (Vijaya Ganugula-NYISO)



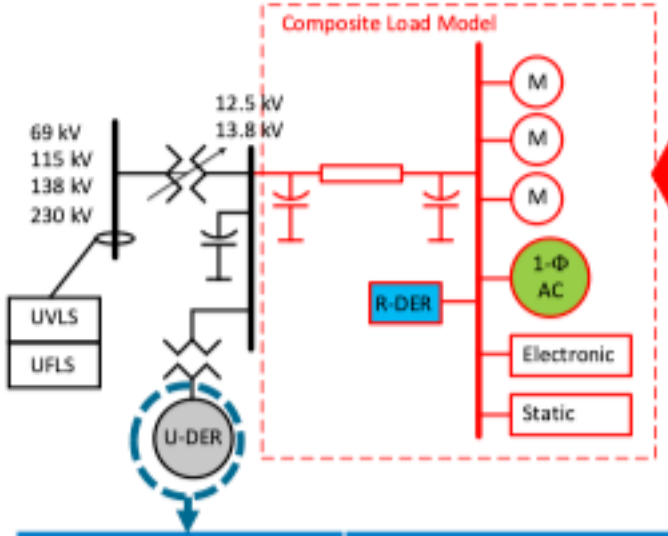
# Technical Considerations – Operations (Vijaya Ganugula-NYISO)

## DER: Additional Operations' Considerations

- **NYISO Operations continues to monitor and evaluate if any additional changes are required to integrate DER:**
  - Regulation requirements
  - Operating reserve requirements
    - Geographical granularity
  - Solar PV forecasting
  - Load forecasting
    - Behind-the-meter (non-wholesale) DER
    - Price responsive load
    - Geographical granularity
  - Transmission security requirements
  - Voltage support requirements
  - Black start requirements
  - Future market design efforts to incent resource flexibility and dispatchability

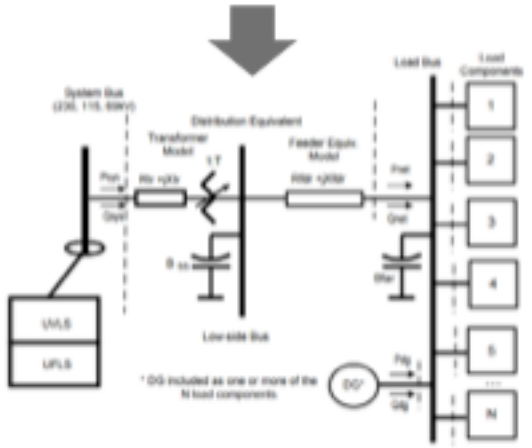
# Technical Considerations – Planning (Pramila Nirbhavane-NYISO)

## Representation of DER and Composite Load Model




| Model | R-DER Representation# |
|---|---|
| cmpldwg | Inherently negative load. Can alternatively be added as an additional source |
| cmpldw2 | Modular structure with PVD1 or DER_A |

| U-DER Representation | Model# |
|---|---|
| Detailed and specific | REGC_A<br>REEC_A/REEC_B/REEC_C<br>REPC_A |
| Simple and aggregate | PVD1 or DER_A |

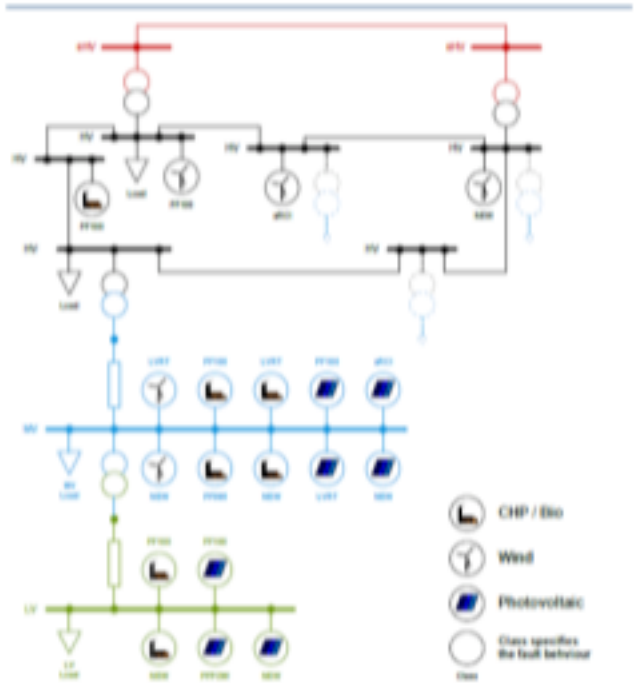



NEW YORK INDEPENDENT SYSTEM OPERATOR

# Technical Considerations – Planning (Pramila Nirbhavane-NYISO)

## Complex Problems of Load Modeling and DER Resources

- Current practices net DER with loads at the substation level
- NERC recommends avoiding the netting of DER with loads
  - This is subject to the accurate DER models available for system modeling
- All components of the system must be represented in the models, either directly or in an aggregated way, to provide meaningful and accurate simulation results



# Major Workshop Conclusions

- The interconnection of DER devices is already significant and continues apace
- There are significant challenges to the successful integration of DER into the electric power system
  - Resolution of institutional, planning and operational issues for behind the meter & network DER
    - Coordination of planning & operations between the DSP & NYISO
    - Development of appropriate communication requirements, monitoring, supervisory control & standards
    - Development of market rules addressing queue inclusion, gaming & curtailment
  - Development of appropriate DER simulation tools & planning methods
    - Validated DER models for individual DER & DER aggregations
    - Development of integrated transmission & distribution system models
    - Collection of DER performance data