Flexible Interconnection

REV Demo Lessons Learned and Scalability Roadmap

AVANGRID Networks – NYSEG/RG&E

March 24th, 2022

AVANGRID

Outline

01 Flexible vs. Static Capacity Interconnections

02 FICS REV Demo

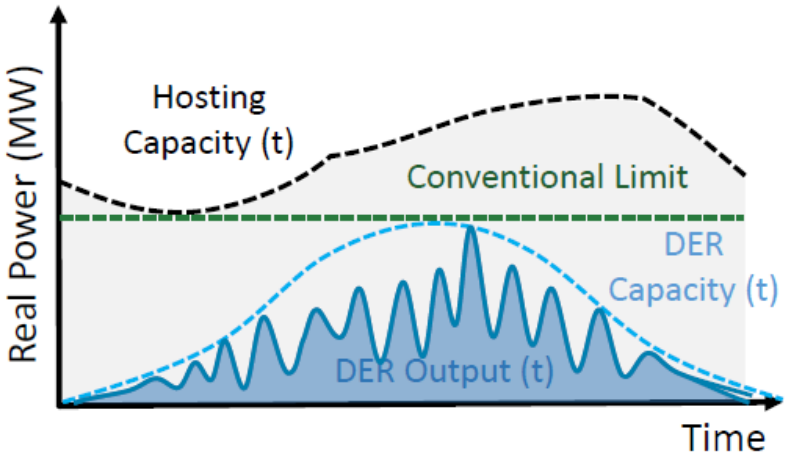
03 Flexible Interconnection Roadmap

04 Flexible Interconnection Pilot

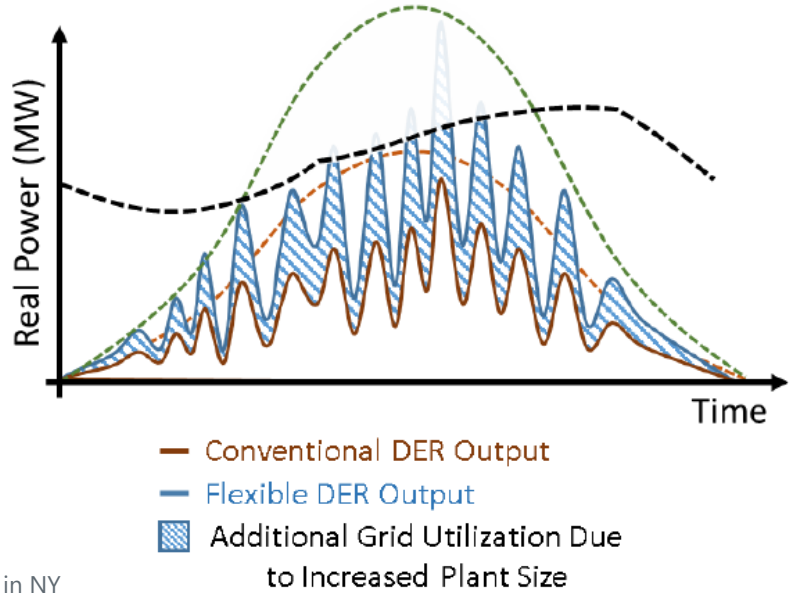
What is Flexible Interconnection?

Arrangements enabling **more DER capacity to interconnect to the electric grid** by utilizing DER **control schemes** to automatically manage DER output to stay within grid constraints

Static Capacity



Flexible Capacity



- Increases the utilization of existing infrastructure
- Enables increased DER output when its needed most (high load times)
- Automatically curtails DER output to protect system without tripping when system is at a constraint

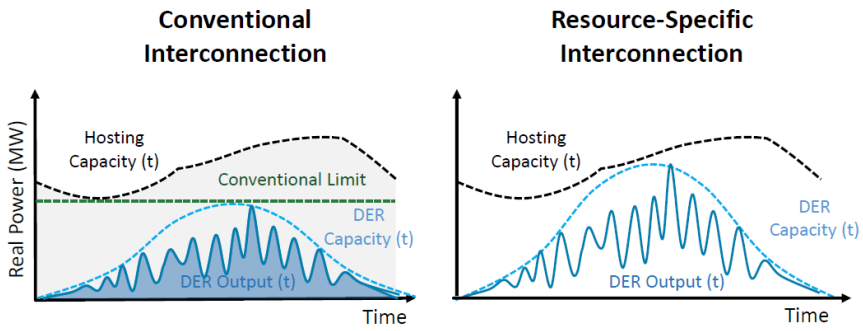
Chart Credit: EPRI PON 3770 Quantifying the Value of DERMS for Flexible Interconnection in NY

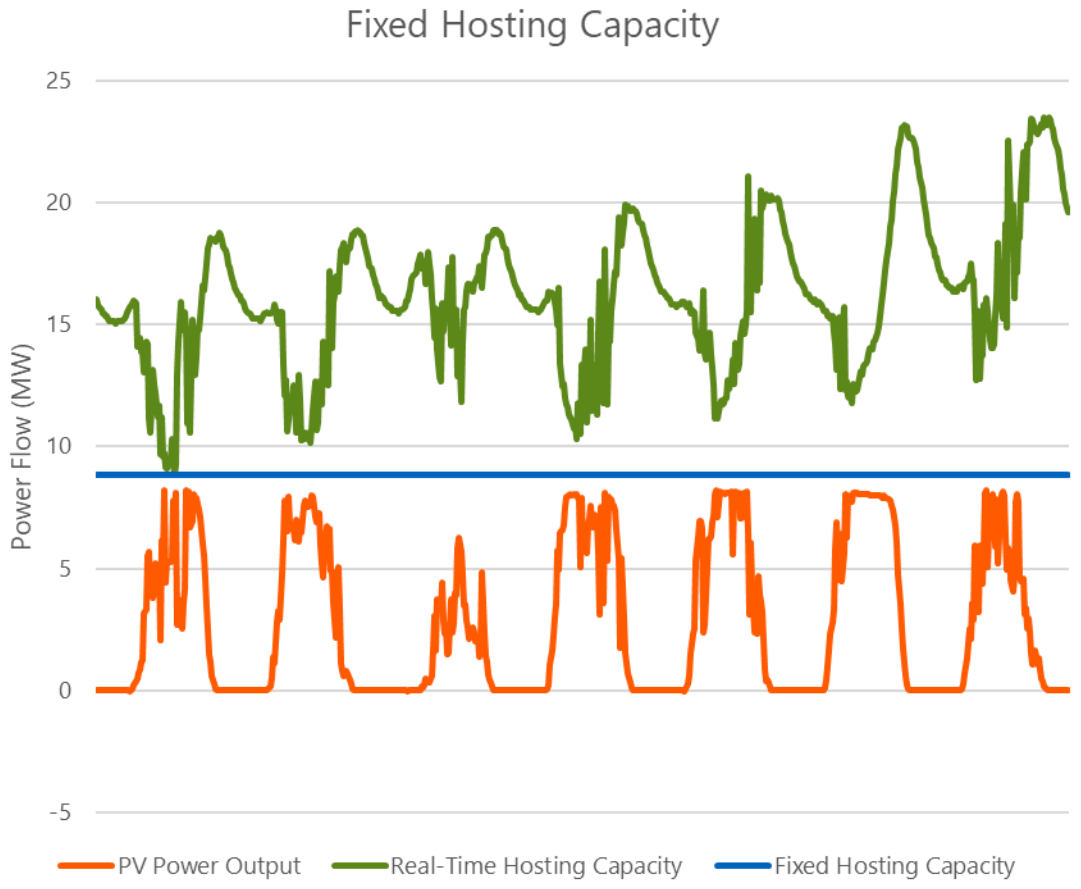
Static Capacity Interconnections

Reinforce grid to fully accommodate DER at all times

Current Interconnection Process

- ✓ Simulate several worst-case scenarios for DER output and grid conditions to determine if any grid constraints are violated
- ✓ Determine what upgrades must be made in order to allow DER to interconnect at full capacity based on the results of these simulations
- ✓ The "worst case" scenario may occur 1 hour a day, or 1 hour a month or 1 hour a year or 1 hour every 5 years
- ✓ This is often exacerbated when data is limited for a particular part of the system where a DER is trying to interconnect





Costs: $0.01/W-$4.50/W

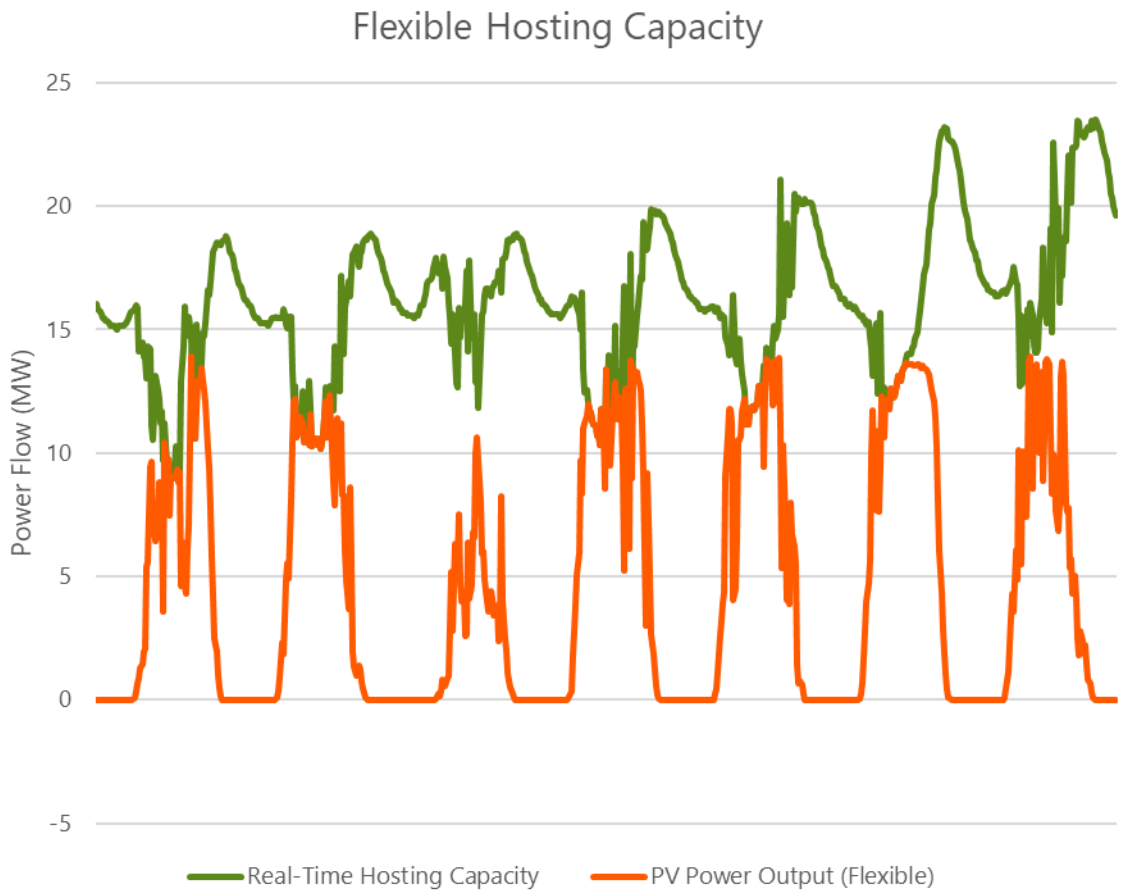
Chart Credit: EPRI PON 3770 Quantifying the Value of DERMS for Flexible Interconnection in NY

Flexible Capacity Interconnections

Reinforce grid to accommodate DER at most times. Curtail DER when grid is constrained

Proposed Future Add. Interconnection Option

- ✓ Developers agree to be curtailed before the grid constraint is breached in exchange for avoiding the upgrade cost (reconductoring, substation transformers, etc.) associated with that constraint
- ✓ Install a monitoring and control system that automatically curtails the output of the participating DER
- ✓ Additional Energy from Additional Capacity Installed Under Flexible Interconnection > Lost Energy from Curtailment Events
- ✓ Enables planning and cost sharing for system upgrades based on observed DER capacity installed instead of predicted DER capacity
- ✓ We are currently implementing a "Last-In-First-Out" LIFO model as it seems to fit best with current interconnection practices while also making it easier for the developer to quantify the curtailment risk



Costs: <$0.25/W (Goal)

FICS REV Demo

We have deployed two (2) Flexible Interconnections and are currently operating both

Robinson PV (NYSEG)

- ✓ 2 MW
- ✓ Champlain, NY
- ✓ **Constraint:** Overvoltage and Undervoltage*
- ✓ **Commissioned:** Sept. 2021

Spencerport PV (RG&E)

- ✓ 15 MW (3 sites @ 5 MW each)
- ✓ Spencerport, NY
- ✓ **Constraint:** Substation Transformer Thermal
- ✓ **Commissioned:** April 2021

*Two Line Regulators that were deferred were installed between site identification and commissioning

FICS REV Demo Lessons Learned

REV Demo deployment of two Flexible Interconnections has allowed NYSEG and RG&E to gather several valuable lessons learned that will be applied to future deployments

Parasitic Curtailment

- When visibility or control of a Flexible Interconnection site is lost the site must be automatically curtailed to a "fail-safe" level of generation to protect the system
- When a site is interconnected under a Flexible Interconnection solution, curtailment must be expected from both normal curtailment caused by the targeted system constraint as well as "Parasitic Curtailment" from loss of comms to the site or other malfunction of a system component[1]
- As the technology matures and we gain more familiarity with the new systems and procedures we expect the amount of "parasitic curtailment" a site can expect to drop

Operational Engagement

- Flexible Interconnection requires greater utility engagement in DER operations compared to DER with static capacity interconnection contracts
- While DERMS technology allows the DER curtailment to occur automatically, appropriate Operating Procedures (OP) and proper staffing are critical to ensuring smooth operation and proper communication with DER Operators

DER Site Controller Interface

- IEEE 1547-2018 lays out the groundwork for utility to DER communications
- While progress is being made on implementing these standards at the Inverter level, we have experienced significant deficiencies when communicating to DER Site Control/Data Acquisition systems
- IEEE 1547-2018 may need to be modified to better accommodate communicating with site control systems for Flexible Interconnections as the standard is focused at the inverter level.

Flexible Capacity Potential

- Based on our experience on Station 113 in Spencerport, NY Flexible Interconnections have the potential to reduce the $/W required to interconnect new DERs to constrained parts of the system
- 16.8 MVA static capacity -> 24.2+ MVA static + flexible capacity = 44% increase
- Constraints that trigger expensive upgrades such as reconductoring, voltage class upgrade, or substation transformer replacement are the most suitable for deferral by Flexible Interconnections

1. Estimated 3.5% parasitic curtailment seen between two (2) of the Spencerport PV sites since June 2021

Flexible Interconnection Timing and Roadmap

Proposal will give NYSEG and RG&E time to continue to gain lessons learned from Flexible Interconnections while gradually expanding their deployment and developing the necessary supporting technology and procedures

Proposed Roadmap 2022-2025+

2022

- Operate FICS REV Demo Sites
- Identify Additional Pilot Sites
- Implement Additional Pilot Sites

2023

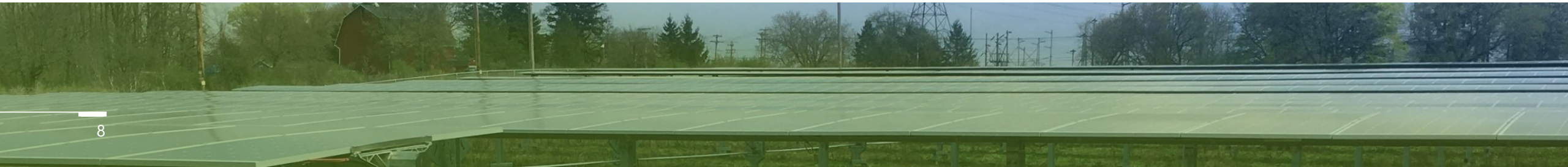
- Issue Flexible Interconnection Guidance Documentation
- Offer Flexible Interconnection as a Business-As-Usual Option

2024

- Continue to Improve Flexible Interconnection Process

2025+

- Upgrade ANM System to DERMS



The Next Step in Flexibility

Leverage the lessons learned from the FICS REV Demo to expand the application of Flexible Interconnection to strong candidate sites

Flexible Interconnection Pilot

How Many?

Scope

- Target of 4 Substations[1]
- Candidate sites identified and notified by NYSEG/RG&E last week

What Happens If?

Flexibility

- Additional DER can be added to existing schemes (with certain conditions)
- DER can transition off a Flexible Interconnection if deferred upgrades are paid for

Who?

Eligibility[2]

- PCC Voltage > 4.8 kV
- Thermal Overload < 150%
- >700k Deferrable Capacity Upgrades
- DER Capacity > 1 MW

Why?

Goals

- Obtain additional experience with Flexible Interconnections
- Begin to tap into Flexible Capacity on more substations

1. Total number of substations will depend on the number of current candidate sites that move forward with a Flexible Interconnection Agreement
2. Not a comprehensive list as additional criteria are also used to determine eligibility for the Pilot