**MEMO - Distribution System Upgrade Cost Sharing**
**8/16/2019**

Stakeholders seem generally encouraged by and supportive of Staff's proposal around distribution upgrade cost sharing and many were particularly interested in the "preemptive upgrade" model. To help further that discussion, this Memo provides a summary of experience in New York relating to preemptive distribution upgrade cost sharing. It also includes considerations relating to the pursuit of these types of policies for Oregon's community solar program. The document consists of three primary segments: 1) cautionary notes and considerations that should be accounted for before any potential concept is pursued in Oregon; 2) an overview of New York's current activity around preemptive upgrade cost sharing; and 3) an in-depth review of demonstration projects (initial and second phases) performed by National Grid in New York.

## Cautionary Notes and Considerations Relating to Distribution Upgrade Cost Sharing

The following includes a non-exhaustive list of important cautions and additional considerations relating to potential policies supporting distribution upgrade cost sharing in Oregon's community solar program.

### Cautions

- **Don't delay the program**. Any cost sharing proposal put forth in the community solar program should not cause delays to the program launch. This may mean that any upgrade cost sharing concept would need to be explored in parallel to the program rolling out, and/or could be tested via smaller pilot projects.
- **Transparency and third-party oversight are critical**. The components and costs associated with interconnection upgrades in major Oregon utility service territories have become increasingly contentious. Therefore, any program or policy relating to this area should be highly transparent and involve third-party engineer review and input.
- **Focus on equity and efficiency.** A pilot testing of distribution upgrade cost sharing should include any community solar project, but also ideally include other types of projects that are potentially benefiting from the same upgrade (possibly limited by projects that are in a queue up to a certain date). This will spread the costs wider and reduce administrative complexity.

### Additional design considerations

- **Integrated resource/system planning**. Identifying potential upgrades could/should be part of larger integrated resource and/or distribution system planning efforts.
- **Alternatives to substation upgrades.** The program can also consider incenting opportunities for smart inverters/distributed energy management systems/energy storage, etc., for testing cost effectiveness of specific system output control rather than wholesale substation upgrades.
- **Different utility programs.** Distribution upgrade cost sharing programs could be uniquely designed/catered for each utility based on the respective territory needs and opportunities.
- **Project size considerations**. There could be a cutoff relating to the project size minimum for having to share in upgrade costs to help incent/support smaller projects.

**New York Experience with Preemptive Distribution Upgrade Cost Sharing**

- In New York, distributed upgrade cost sharing is an existing policy[1], whereby:
  - The first DG applicant is responsible for 100% of "common-system[2]" upgrade costs
  - Subsequent projects pay a prorated portion of the upgrade costs (based on their capacity size relative to the total capacity of all projects benefiting from the upgrade)
  - Payments are made to the utility who then redistributes it among the developers
    - Developers are subject to a $750 administrative fee
- Even with New York's cost sharing allocation mechanism, there are challenges:
  - Timing and uncertainty of reimbursement remain a hurdle
  - Ability to fork up initial payment also a hurdle
  - Timing to perform "coordinated electric system interconnection review" every time a developer seeks to interconnect can create delays and costs
  - Inefficient for utilities to ramp up each DER-related substation upgrade independent of other system work – utility construction resources are limited
- Further, the sharing mechanism, was an "interim measure" set to expire at end of 2020
- In response, National Grid (NGrid) deployed demonstration projects over the past two years which are helping inform potential solutions – i.e., preemptive upgrades – utility builds out upgrades from which cost is subsequently recovered via DG applicants
  - Initial Phase (launched winter/spring 2017):
    - NGrid pursued "common-system" upgrades at two substations where they anticipated developer interest, and actively marketed/solicited applicants in parallel to the design and construction upgrades
    - Applicants (over 50 kW) were charged a fixed fee associated with project size
    - NGrid anticipates full cost recovery for upgrades by end of 2019
  - Second Phase (launched Fall 2018)
    - NGrid incorporating more policy goals: expanding focus to target municipal landfills and brownfield sites that have high DG (or DG coupled with storage) development potential, while also able to leverage related NYSERDA incentives
- The New York DPS is currently working with stakeholders to identify/refine potential approach:
  - Proposal to coordinate utility capital planning and construction with DER development
  - Release of utility's 5-year capital plan opens "window" for DER interest
  - Utility publishes cost estimate and schedule
  - Developers commit to pay (or drop out)
  - Work proceeds once threshold is met

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[1] New York. Standardized Interconnection Requirements (issued Feb. 2017). Appendix E. http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/dcf68efca391ad6085257687006f396b/$FILE/October%20SIR%20Appendix%20A%20-%20Final%2010-3-18.pdf. See also, SIR Queue Management and Cost Allocation Order - http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B22BEAB22-7F9F-45B8-89FD-0E8AD84692B4%7D

[2] Upgrades that can benefit multiple interconnection customers. E.g,high-side transmission ground fault overvoltage protection equipment (i.e., 3Vo protection), transformer load tap changer, and other upgrades

**National Grid** - (Niagara Mohawk Power Corporation)
**Distributed Generation Interconnection REV Demonstration Project(s)**

***Initial Phase***

**NGrid's Objective:** Test alternative solutions for increasing pace and scale of interconnecting DG systems (above 50 kW) through upfront investments by NGrid, coupled with a cost-allocation methodology aimed at removing barriers for DG applicants.

**Big picture**

- NGrid proactively upgraded two substations to make them "DG-Ready"
- Design/engineering underway in May (2017), with construction completion by December (2017)
- As the project progressed, NGrid notify developers of the upgrades and solicit DG applications
- NGrid also solicited feedback during initial and late stages of the project to inform pilot design
- Participation by developers was voluntary
- As of July 2019, the project is expected to be completely cost recovered by the end of 2019

**Site selection**

- Selected Peterboro[3] and East Golah[4] substations
    - NGrid anticipated significant DG interconnection interest at these locations:
        - Both locations are in areas where applicants had proposed a number of DG projects, and where NGrid can quickly deploy and test efficacy of its proposal
            - Queue for these stations decreased significantly following a "Queue Management Order[5]" which filtered out projects
    - Upgrades create 40 MW of hosting capacity

**Project upgrade details**

- Installation of 3V0 protection at four transformer banks (two at each substation)
    - Prepares for reverse power flows and transmission line ground-fault protection
- Installation includes:
    - 3Vo protection relays associated voltage transformers; relay racking and hardware; foundations; support structures; grounding; and 115 kW bus modifications
    - Upgrades to load tap changer (LTC) controllers
    - Communications processors and ancillary control and integration equipment
- Timing: design/engineer phase - 3 months / construction – 4-5 months

[3] Peterboro serves 8,000 customers; has 1 transmission supply line; 8 distribution feeders; 1 DG applicant at launch
[4] E Golah serves 7,500 customers; has looped transmission supply line; 6 feeders; 5 DG applicants at launch
[5] SIR Queue Management and Cost Allocation Order - http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B22BEAB22-7F9F-45B8-89FD-0E8AD84692B4%7D

**Cost recovery**

- Accounting – Ngrid will place cost of upgrades and fees received in a "regulatory asset"
    - If fees don't equal costs, NGrid will recover via a future proceeding
- NGrid will charge a one-time pro-rated fee to all applicants (above 50 kW)
    - The fee is based on estimated common-system upgrades (subject to true-up)
    - Due at the same time as payment of site-specific and other upgrade costs
    - Calculated by a factor that represents the substation transformers bank's capacity
        - Factor is assumed to be 80% of the smaller of the respective transformer bank's capacity at the highest bank rating (in case of bank failure/outage)
- Estimated cost – $1,581,351
    - $850,146 at Peterboro substation
        - Transformer bank 1 (TB1) is smaller of two banks (used in calculation)
        - TB1 highest rating is 25 MVA (assumes 1 MVA equals 1 MW)
        - The capacity to utilize the bank is 80% = 20 MVA
        - TB1 is 38% (7.7 MW) of overall station capacity and TB2 is 62% (12.4 MW)
        - Cost of each bank is divided by 2
        - Cost per kW is then calculated by dividing the bank costs by bank MW capacity
        - Cost to upgrade TB1 = $55.26/kW; TB2 = $34.54/kW
    - $731,206 at East Golah substation
        - TB1 = $32.13/kW; Tb2 = $42.41/kW

**Marketing**

- As the project progressed, NGrid notified developers of the upgrades and solicited DG interconnection applications via emails and webinars
- NGrid will solicit feedback during initial and late stages of the project

**Results**

- Actual cost ended up being $1,751,259 (~$200K above initial estimate)
- Through marketing during the design and construction phases, NGrid was able to secure enough applications to fully subscribe the hosting capacity (40 MW)
- As of July 30, 2019, the company had recovered $1,452,227.
    - The Company expects full Project cost recovery in 2019.
        - *If any additional payments are made in excess of project spend total, they will be refunded once the remaining part of the project is reconciled
    - Peterboro = 1 project interconnected, 4 under construction, 2 in the interconnection agreement phase, 2 in interconnection process, and 1 submitting application
    - East Golah = 5 under construction, 2 in the interconnection agreement phase, 2 in interconnection process, and 1 at preliminary step
- Project shown that simplifying this part of the interconnection process reduces upfront cost barriers, provides increased certainty, and shortened construction timelines

***Second Phase***

- Revised in October 2018
- Expanding focus to target municipal landfills and brownfield sites that have high DG (or DG coupled with storage) development potential
- NYSERDA had also established a $0.10/kW incentive adder for projects on these sites
- Additional potential benefits: reducing energy costs for municipalities; meeting local sustainability commitments; additional stream of revenue through lease payments; and preserving farmland

**Site selection**

- Worked with NYSERDA to identify four substations where common upgrades are required before DG projects would be capable of interconnecting from nearby landfill/brownfield sites.
- Cross-referenced municipal landfill locations with the NY-Sun MW Block Program's incentive pipeline.
- Narrowed the list of priority locations that either share the same substation or are within ten miles of other proposed DG projects.
- The Company and NYSERDA then selected the four sites from that group based on:
    - the peak load at the substation,
    - proximity to downstate load centers (potential to receiver higher compensation rates),
    - the estimated size of the DG projects.
- NYSERDA also helped the NGrid gauge local receptiveness to DG development by evaluating whether local governments had enacted a solar moratorium or opted out of Real Property Tax Law Section 487, which provides a tax exemption for renewable energy development.

**Upgrades**

- $3V_0$ protection and LTC controller upgrades for the transformer banks at 4 substations
- Also install switched-source technology at on substation to evaluate whether use of the equipment complements $3V_0$ technology by helping to increase hosting capacity.
- Also testing whether it can reduce $3V_0$ construction times through the installation of optical VT.

**Notably**

- Before and during substation construction, NGrid will continue its marketing and outreach efforts with the DG community: conducting webinars, presenting to working groups and NYSERDA stakeholder meetings, and disseminating educational materials.
- In addition, NGrid will reach out directly to the municipalities where the upgrades will be constructed, in an effort to answer questions, facilitate quicker permitting, and assist in the development of the landfill sites for DG project installation.

**Costs**

- NGrid estimates total common upgrade costs of $2,826,180 for the four substations (Cedar, Indian River, Butler, Prospect Hill).
- The amount, which will initially be paid using the Company's REV demonstration project budget, includes capital work and marketing.

| Cumulative Lessons Learned (July 30, 2019) | | |
|---|---|---|
| **The Customer** | **Market Partner** | **Utility Operations** |
| • Prebuilt 3V0 system upgrades at substations reduce interconnection lead times.<br>• The cost-allocation methodology reduces upfront costs, enabling developers to pay a proportionate share of common upgrade costs.<br>• Upfront engagement with municipalities is a key to reduce permitting and zoning delays for DG projects | • Developing DG projects on municipal landfills and brownfield sites may benefit municipalities by reducing energy costs, meeting local sustainability commitments, providing an additional stream of revenue via lease payments, and protecting farmland. | • Prebuilt 3V0 system upgrades at substations located near landfills and brownfields may lead to increased DG in those areas.<br>• The Company believes that reducing upfront costs for DG projects and accelerating the installation will help meet clean energy goals.<br>• The potential benefits of switchsource technology are outweighed by the cost of required system protections. |

**Resources:**

- Feb. 2017 - filing – initial proposal[6]
- April 2017 - New York DPS Staff approved the Project with modification[7]
    - NGrid begins marketing and outreach for the project
- May 2017 – NGrid files "Implementation Plan"[8]
- October 19, 2018 – NGrid files "Revised Implementation Plan"[9]
- July 30, 2019 – Quarterly Report filed.[10]

[6] DPS. (2/17/2017) Case 14-M-0101. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={6B0377EF-F949-4DAA-A164-AB8ABB019E5B}

[7] DPS. (04/24/2017) Case 14-M-0101. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={ED355AF4-4C27-40CB-8D6C-36038A7DD82E}

[8] DPS. (05/24/2017) Case 14-M-0101. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={3F006D77-0B18-46D3-900A-C084C6D0A925}

[9] DPS. (10/19/2018) Case 14-M-0101. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={3F3F51A8-1EC8-4F6C-846C-B40237588478}

[10] DPS. (07/30/2019) Case 14-M-0101. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={A8C44AEB-B5F0-4A0B-833D-541A98DA8264}