National Grid Challenge: Building-to-Grid (B2G) Gateway – Controllers for Grid-Interactive Efficient Buildings

Background

National Grid acknowledges that to meet carbon neutral goals and prepare for increased loads as customers electrify appliances, utilities will face new system capacity challenges. Utilities will need to either build new infrastructure to meet forecasted peak demands or manage customer demand to increase electric system utilization. Meeting customer needs is a complex and dynamic challenge, and utilities must adapt to new uses of the electric grid, support bi-directional flows of energy, provide revenue opportunities, offer new products and services, and collect more data to anticipate customer needs.

Customers now have access to a variety of affordable "smart" or programmable devices that control their appliances or devices, such as thermostats, smart panels or sensors, heaters and air conditioners, and lighting, often integrated within a single building and sometimes across multiple buildings on the same premise. The settings or actions of these assets, when coordinated, could be a valuable tool for utilities. Utilities could see significant benefits to leveraging customers' controllable devices to address these challenges. However, today many of these smart building appliances or devices and the building management systems (BMS) that are utilized to manage them at a premise level do not actively communicate with utilities.

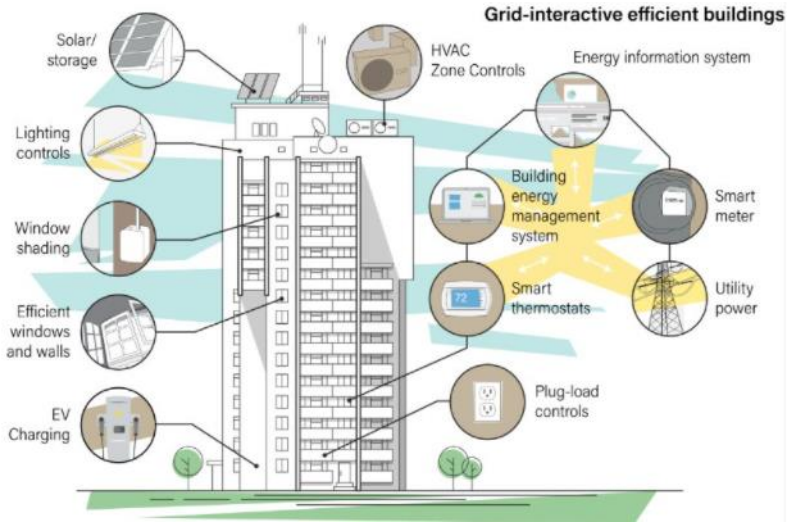

Figure 1: Perry, Christopher. "Grid-Interactive Efficient Building Features." ACEEE, 20 Nov. 2019, Grid-interactive Efficient Buildings Are the Future, and Utilities Can Help Lead the Way | ACEEE

Technological and Strategic Business Goals

National Grid invites further collaboration to propel the specification, development, and implementation of a scalable and repeatable solution to directly connect a portfolio of behind-the-meter customer equipment. This primarily must include customer Building Management Systems (BMS) but also devices such as vehicle chargers, inverters, storage, and other smart

devices. This solution must interface with customer devices and provide a single communication interface to be integrated with National Grid's utility Distribution Energy Resource Management Systems (DERMS) to allow grid-interactive efficient buildings (GEBs) to serve as flexible resources that are responsive to grid needs. National Grid believes it is in utilities' best interest to partner with a third-party aggregator experienced in managing small, distributed energy resources and hosting their own DERMS platforms to mitigate the need for excessive internal resources and expensive hardware to individually monitor and control each behind-the-meter device. Proposers are asked to deploy solutions to multiple locations in the New York service territory.

A. Use Cases:

- **Localized distribution peak load reduction:** Predicted (day-ahead) thermal overload at a transformer or a feeder from high demand during certain hours (like automatic dynamic load management (auto DLM)). Many feeders or substations are forecasted to see multiple high demand days during a peak. To mitigate strain on the network, utilities often seek to mitigate these events by looking at options to reduce load, with existing Demand Response type programs. Having access to other behind-the-meter customer assets, such as smart devices within a large apartment building, could provide further means to reduce load on these peak demand events.
- **Generation backfeed mitigation and hosting capacity support:** Increasing load at commercial and industrial (C&I) sites can mitigate generation backfeed concerns and potentially increase hosting capacity limits on the feeder. The ability to adjust demand of behind-the-meter assets could allow existing distributed generation and other renewables to reduce planned curtailment or additional renewables to be interconnected onto a given feeder.

B. Outcomes:

- Creation of a specification of technical requirements for a solution to be used between BMS and our utility DERMS for monitoring and dispatch to support the above use cases. Integration cost with the utility's DERMS would be the responsibility of the proposer.
- Develop hardware or cloud/server-based solution, utility owner, to be installed at a customer facility and integrated directly to the proposer's BMS. See Figure 2 below; final solution configuration could be separated into (1) building management system and (2) gateway or a single integrated platform.
- Develop protocol(s) for translating feeder/substation-specific event dispatches informed by Utility into dispatch actions to customer BMS and non-BMS integrated devices.
- Review and propose modifications to the existing BMS used for the pilot location. It is assumed that the capabilities of existing BMS may be insufficient for integration into the utility's DERMS, and that new settings, firmware or other activities may be necessary to dispatch or curtail behind-the-meter assets.

- Inform advancement, commercialization and standardization of solutions that enable buildings to transition to GEBs more widely by being able to optimize building electric loads while maintaining acceptable levels of customer comfort and convenience in a manner that is beneficial for the grid.
- Increase familiarity, utilization, and standardization of OpenADR and IEEE 2030.5 communication protocols for dispatch coordination and DER monitoring between utility and DER such as GEBs.

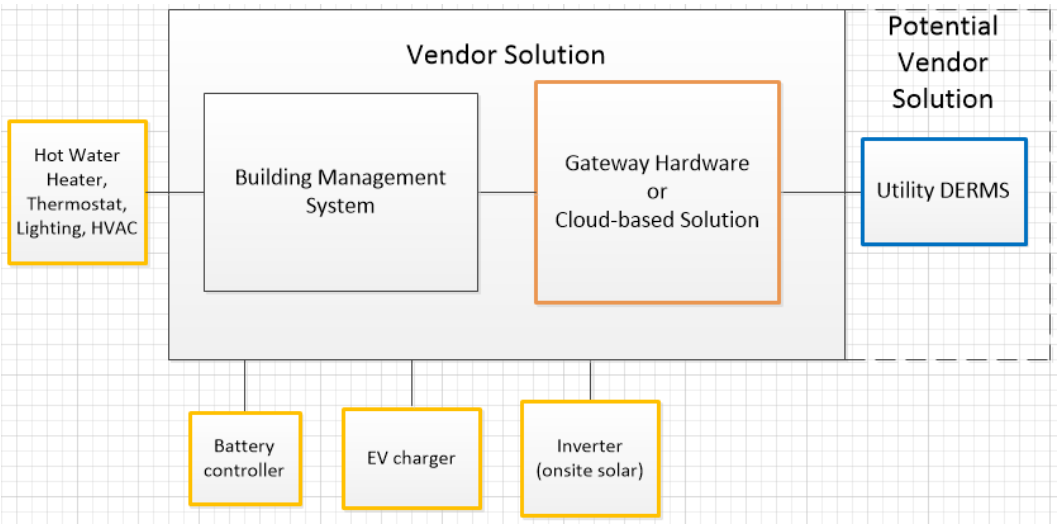

Figure 1: Options for GEB Gateway Connections

C. Building Locations

- While National Grid is currently recruiting partners with existing buildings or planned developments across our Niagara Mohawk Power Corporation electric distribution territory, proposers are encouraged to seek buildings partners for this demonstration.
- The Company seeks partners with distributed energy resources and a desire to be integrated into Distribution Energy Resource Management Systems (DERMS) to allow grid-interactive efficient buildings (GEBs) to serve as flexible resources.
- Proposers should be prepared to develop and integrate a solution for both their selected building candidates and those recruited by National Grid.
- Deployments of solutions should occur at a minimum of two (2) buildings or developments, with a desire for solutions at an additional two (2) buildings or developments located on constrained circuits in the following locations:
    - Capitol Region
    - Mohawk Valley
    - Central New York
    - Western New York

- Proposer are encouraged to seek buildings in grid-constrained areas of the New York Service Territory. The following public resources can be used for additional information:
    - https://www.nationalgridus.com/Upstate-NY-Business/RFP/Term-DLM-and-Auto-DLM-Program-Request-for-Proposals
    - https://usa.picloflex.com/dashboard
    - https://systemdataportal.nationalgrid.com/NY/

      Suggested process for developers to locate constrained feeders using the National Grid System Data Portal:
      1. Use https://systemdataportal.nationalgrid.com/NY
      2. Select Overview tab
      3. Select Query box in top left
      4. Select Overhead Feeders from drop down menu
      5. Leave Criteria blank
      6. Run query
      7. From three dot menu, select View in Attribute Table
      8. Select Export to CSV
      9. View percent rating in column i
      10. Sort largest to smallest
      11. Query individual feeder number of interest to find exact location

D. Building types

- Buildings targeted for integration include existing and new construction for the following building types:
    - Multifamily master-metered, one (1) site minimum
    - Commercial office master-metered, one (1) site minimum
    - Multifamily with common space and tenant-metered, one (1) site desired
    - Mixed commercial & industrial common space and tenant-metered, one (1) site desired

Teaming and Partnerships

- Internally, a multi-disciplinary team will include Future of Electric (FoE), Research and Development (R&D), Distribution Control and Integration (DC&I), IT and Digital, Integrated Planning and Asset Management, Critical Network Infrastructure (CNI), and Cybersecurity team members.
- Externally, the team will be seeking a partner with experience in Distributed Energy Resource (DER) integration that has worked with building, BMS and/or DER developers or other third parties to bridge the connection between smart building devices and utility DERMS with a DER gateway type device or solution and with building facility managers, owners, and tenants.

Deliverables

- Present a detailed project roadmap, complete with clear milestones and integration steps.
- Provide project management for deployment locations, with a recurring meeting schedule and minutes for the project's duration.
- Coordinate with building owners and existing BMS vendors (if applicable) to develop integration solutions between BMS and the vendor's solution but also between the vendor's solution and utility DERMS to manage customer's BMS and other connected devices at the GEB.
- Provide detailed technical specifications of the proposed solution to ensure system compatibility and integration with existing utility EMS and DERMS applications, security requirements (e.g., security implementation as applicable to communication protocol) and regulatory compliance. Solutions must be meet National Grid's Electric Service Bulletin 750 Series (https://gridforce.my.site.com/electric/s/article/Electric-Specifications).
- Develop a communication interface specification with the utility and utility DERMS vendor over mutually agreed upon communication protocol, including but not limited to IEEE1547 (as appliable) and OpenADR.
- Develop testing, commissioning and decommissioning plans for laboratory or pilot locations, with a responsibility matrix to differentiate utility and proposer tasks.
- Develop a mutually agreeable operating plan with the customer of how the proposer's solution will manage customer assets for the duration of the project.
- Deploy the proposer's solution, commission communication systems, and conduct dispatches of customer assets in response to utility dispatch requests.
- Facilitate and participate in an online seminar at the conclusion of project to share project learnings and recommendations for next steps to further grid-interactive buildings to audience that includes building owners, real estate developers, facility managers, regulatory staff, and DER developers.

Project Timeline

- Month 0: Kick-off Meeting
- Month 3: Detailed Design **Specifications** Submission
- Month 6: Platform **Development**
- Month 9: **Implementation**
- Month 10: Testing and Analysis
- Month 12: Reporting and Recommendations
- Month 15: Review Implementation Plan

- Month 18: Implement at Demonstration Site(s)
- Month 20: Test Events
- Month 22: Report on Test Results

Requirements

To best succeed in achieving the goals and outcomes mentioned above, potential proposers must be evaluated based on their ability to demonstrate and meet the following requirements focused on: (1) BMS and device integration to ensure their solution is suited to meet the needs of the buildings participating in the project and more generally existing, planned, and anticipated buildings across New York and (2) integration features with utility communication and dispatch systems that are cost effective, scalable, and repeatable:

A. BMS and Non-BMS Device Integration

- Support a subscription- based software (Software as a Service - SaaS) licensing and delivery model where hosting, management, and maintenance of said software is performed by the Vendor.
- Capable with products and services of (and integrate with) multiple connected device Manufacturers (i.e., OEMs).
- Proposers must be able to integrate to the customer Building Management System(s) and devices not integrated with the Building Management System of the designated locations provided by National Grid and to the extent desired by the building owner.
- Have a portfolio of demonstrated and active integrations with Manufacturer cloud-based platforms across connected thermostats, batteries, electric vehicles, electric vehicle chargers, solar inverters, and other connected devices.
- Have a portfolio of demonstrated and active integrations with BMS manufacturers that manage typical building devices such as lighting, HVAC (including heat pumps), electric hot water and other connected devices.
- The proposer's solution must be compatible with standard industry communications protocol to communicate with customer connected devices. These must include, but are not limited to, 2030.5, DNP-3, Modbus, and OpenADR.
- Perform protocol translation (as needed) if protocol between proposer's solution to device or BMS differs from utility-GEB interface.
- Solution must be able to translate aggregate utility dispatch request over the Utility-GEB interface into an optimized, disaggregated set of actions for each BMS and non-BMS integrated devices that can be scheduled or issued immediately.
- Solution must be able to implement fail-safe or default set of actions in the event of a failure of the Utility-GEB interface.
- The solution must allow for event logging, data logging and data reporting to both the building owner and the utility. Details of these events and data will be determined during specification and development.

- Real-time, or near real-time status monitoring to the utility DERMS or SCADA system must also be compatible with the final solution. Details regarding the data and frequency to be determined during specification and development.
- Proposers must make available performance and loading data from aggregated devices within GEBs; data will be necessary for analysis including GEB performance verification but not for real-time monitoring. Direct communication for utility access to be determined during specification and development.
- Demonstrate that proposer's product or service is best positioned to be a cost effective and scalable solution for building owners and facility managers to enable wide-scale grid-interactive buildings across New York state. Preference will be given to proposers who demonstrate that their solutions utilize open-source technologies and standards.

B. Utility-GEB Communications and Coordination

- The partner's solution must declare its target customer segment and demonstrate broad market coverage and experience in that segment to support integration of building management systems and/or directly to building devices that contribute to significant building electric load such as lighting, HVAC, computing and processing devices in addition to on-site generation (e.g., back-up generators, energy storage, PV).
- Use of any hardware solutions (i.e., gateway, programmable logic controller (PLC) or protocol translator) must allow for both serial and ethernet connections.
- Have at least three (3) years of experience deploying and managing at least five (5) successful utility projects of similar scope to this RFP. Proposers with less experience may participate, however, they must provide additional details on relevant deployments and partners.
- Have demonstrated experience managing connected devices and enrolling them with utility programs and coordinating settlement and performance reporting activity with the utility on behalf of their customers.
- The proposer's solution must be compatible with and utilize standard industry communication protocols to communicate with utility's DERMS. Proposers should provide direct communications to National Grid (public internet, fiber, MPLS, etc.). These must include OpenADR and optionally IEEE 2030.5. The proposer's solution must meet the utility's data requirement via these protocols documented during the specification process. For solutions providing IEEE 2030.5 capabilities, the proposer's product shall meet the Joint Utilities monitoring and control requirements, particularly those outlined for smart inverters drawn from IEEE 1547-2018.
- At minimum, the proposer's solution should be able to receive and respond to day-ahead and in-day notification requests to reduce or maintain load at a specific demand level of a building or group of buildings served by a single point of interconnection to the electric power system and follow a similar template to that characterized by the Capacity Bidding Program in OpenADR 2.0b DR Program Guide for any OpenADR

integration. Proposers are encouraged to develop a solution that is compatible with other demand response program types characterized by the Program Guide.

- The solution must also be able to monitor and manage smart inverter interactive functions per IEEE 1547-2018 and CSIP and of UL 1741 SB certified smart inverters if present at the pilot sites and telemeter individual as-operated smart inverter settings to the utility. The solution must also be able to send changes to smart inverter settings to connect customer DER if desired by the utility. At minimum, the grid support functions that the solution is to be capable of include:
    - Dynamic Volt-VAR
    - Connect/Disconnect
    - Set Active Power Mode Just
    - Real Power Output Limit Control
    - Fixed Power Factor Control

- The partner must allow for the integration of direct communication to the utility's own Distributed Energy Management System. The line of communication could be integrated using MLPS, software-defined wide areas networks (SDWAN), or other discussed mediums.

C. Legal and Security Agreements

- The partner must have an existing Non-Disclosure Agreement with National Grid or be willing to execute a new agreement to participate.
- The supplier MUST agree to permitting National Grid or its representatives to perform audits during regular business hours and upon reasonable notice of supplier's facilities, equipment, records, operational systems, and such other audits as may be necessary to ensure: (a) compliance with the agreement, (b) compliance with all applicable laws/regulations, and (c) compliance with all applicable internal controls, security standards and policies. Potential partners MUST complete NG Supplier RFP Security Assessment form to the best of its ability and return it within the requested response deadline. The supplier MUST commit to collaborate with National Grid representatives to provide any additional clarification or evidence as necessary in a timely manner.
- Be authorized to do and have experience doing business in the Company service area and obtain any necessary licenses, registration and permits to perform the proposed services.

D. Training and Documentation

- The partner must develop and maintain documentation and job aids for National Grid to detail use of their equipment or software for the duration of the scope of work.

Documentation must cover extraction of data, programming guidance for hours of operation and dispatch, and specification of operation conditions.

- The partner will provide training to National Grid staff during the program.

E. Warranty and Maintenance

The partner must service and maintain equipment, software, and interfaces/integration provided for the entirety of the contract period.