New Hampshire Locational Value of Distributed Generation Study Scope Proposal

This document describes the proposed study parameters and methodology for the distribution-level Locational Value of Distributed Generation (LVDG) study. The proposed approach takes into account recommendations from the Smart Electric Power Alliance (SEPA) white paper, Beyond the Meter: Addressing the Locational Valuation Challenge for Distributed Energy, as well as additional considerations specifically relevant to the New Hampshire utility context.

I. Study Objectives

Pursuant to Commission Order No. 26,124, issued in Docket DE 16-576, Development of New Alternative Net Metering Tariff and/or Other Regulatory Mechanisms and Tariffs for Customer-Generators, this study will focus on the locational value of distributed generation (DG) to the utility distribution system through analysis of relevant data.

The Order directs the working group to evaluate alternative study designs and methodologies to address the potential locational value of DG on the utility distribution system. It states that such locational value may result from capital investment avoidance or deferral, and operating expense reduction or deferral, such as through equipment life extension or lower maintenance and labor costs.

This analysis will inform the Value of Distributed Energy Resources (VDER) study, as well as the Commission's evaluation of future net energy metering (NEM) tariff development. The study results are not intended to pre-determine future NEM tariff design or applicable rates, but rather to inform further NEM tariff development proceedings before the Commission. In addition, determining locations and costs of avoided or deferred capacity investments may be relevant in a number of other contexts before the Commission, such as grid modernization, future utility rate cases, and future Least Cost Integrated Resource Plans.

II. Study Parameters

Relation to Value of Distributed Energy Resources (VDER) Study

Due to the significant differences in the type and level of analysis required for a distribution-level LVDG, the LVDG study will be conducted as a separate analysis from the VDER study. Findings from the LVDG study will be used in conjunction with the VDER study to inform future NEM tariff development and DG compensation proceedings.

Technologies Considered Within Study Scope

Because the study will be performed within the context of the NEM docket, study analysis will focus on DG that is eligible for NEM and is interconnected to a New Hampshire regulated distribution utility (i.e.,

Eversource, Unitil, and Liberty Utilities), including solar, hydroelectric, and solar paired with energy storage.

The study will not include analysis of load reduction approaches, such as demand response and energy efficiency as these resources are not eligible for NEM. However, the study results are expected to provide technology-neutral load reduction values organized by time and location.

Eligible Avoided or Deferred Investment Costs

The LVDG study will consider the value of avoided or deferred distribution investment costs due to capacity constraint elimination at a number of locations on the New Hampshire electrical distribution grid.

Potential avoided or deferred distribution costs related to power quality and lower distribution elements, including distribution transformers and capacitor banks, will be considered on a system-wide level within Section 17 "Distribution Grid Support Services" of the VDER study, and not considered here. The LVDG study is not intended to determine a system-wide value for DG.

Timeframe

The study will examine avoided or deferred investment costs over a ten-year timeframe. The study will review the last five years of load and investment data to establish historical expenditures. Due to the increased uncertainty in forecast and distribution investment beyond five years, future projections will be limited to five years.

Geographic Scope

Unitil, Eversource, and Liberty Utilities distribution asset locations.

Distribution System Analysis Level

Subtransmission (13kV-69kV), Substation, and Distribution Circuits.

Load Growth Projections

Conduct a baseline analysis utilizing load growth projections as developed by each utility for its planning processes, if available and to the extent possible. The study will also consider incorporating a high load growth scenario in order to represent the potential impact of beneficial electrification, including electric vehicles and electric heat pumps.

Investment Threshold

The LVDG study scope specifies no minimum investment threshold level for the cost of upgrades that must be met before considering a location for further study. However, the level of analysis is expected to exclude small program investments that are part of a "system benefit initiative," such as pole top distribution transformers and capacitors. Those small program investments may be included in the separate system-wide VDER analysis currently under consideration. The LVDG study will focus on significant distribution system issues and planned or potential investments.

Locations and Projects for Review

Projects considered for detailed review will include:

- Locations identified through forward-looking load growth projections and the screening method outlined below using N-0 criteria.
- Locations identified with capacity-related investments through review of five-year historical spending and planning materials.
- Locations with identified N-1 reliability investments due to capacity constraints in five-year historical spending plans and established investments in forward-looking five-year capital investment plans.
- Locations with non-load growth-related investment needs (e.g., asset management) that include increases to capacity may be reviewed in order to examine incremental investment costs due to equipment capacity increases.

III. Study Approach for New Hampshire LVDG Study

After review and consideration of relevant locational value methodologies, and stakeholder input, Commission Staff proposes the following study scope and methodology.

Step 1. Identifying Locations for Detailed Analysis

The LVDG study will employ a number of methods to identify locations for analysis. It will conduct an analysis on all substations and distribution circuits to identify locations with a high probability of requiring investments over the study timeframe for further review. The analysis will look at the projected load growth forecasts developed utilizing the existing utility distribution planning methodology. A high load growth scenario, assuming significant beneficial electrification, will also be examined as a sensitivity. Using utility planning criteria, the analysis will determine where loads are expected to exceed the N-0 design rating of the lowest-rated component of each circuit. The study will also review established N-1 violations to identify capacity-related projected investments for review. That process is outlined in subsection A below. The study will review five years of historical investment

information as well, to identify past capacity-related investments for review, as outlined in subsection B below.

A. Projected Violation Screening

(1) Utility Load Growth Forecast

A 5-year load growth forecast will be generated employing each utility's current forecast methodology, if available and to the extent possible. The consultant will use load growth forecasts developed through distribution forecast review and/or through work with utility planning departments as well as Commission Staff input. Utility load growth forecasts will be used as the preferred approach when available. If forecasts need to be developed beyond available utility forecasts, the consultant will work to incorporate weather forecasts, econometric forecasts, DG integration forecasts, as well as known future residential, commercial, and industrial significant load impacts as incorporated in each utility forecasting process.

(2) Identify Violations Using Component Criteria

The consultant will develop appropriate component criteria thresholds through distribution planning materials and forecast review and/or work with utility planning departments to develop a list of distribution circuits, subtransmission, and distribution substation capacities (i.e., components), and their associated peak loading on each location. Distribution assets that are forecasted to exceed normal (N-0) design criteria for capacity will be further reviewed. Identified N-1 violations will be reviewed for circuit, subtransmission, and substation projected forecasts.

In addition to the above screening, the most recent existing planning and other relevant documents will be reviewed to further assist in identifying locations for review. These may include, but are not limited to, utility capital plans and marginal cost of service studies.

B. Identifying Additional Locations for Review

Five years of historical planning and expenditure information will also be reviewed to identify current or recent criteria violations and associated investments related to load growth or reliability-based capacity-constrained locations for review.

Once relevant locations have been identified through the screening process, the consultant will work with utility planning departments and Commission Staff to review each specific location in order to confirm the existence of load-related violations or the need to relieve forecasted overload conditions. That review will determine to what extent existing and projected capacity investments are related to load growth or reliability-based capacity constraints (as opposed to asset management replacements or other unavoidable upgrades), and therefore could be addressed by peak load reduction through DG energy production. Those confirmed locations, or a representative subset, will be used in Step 2.

Step 2. Determining Avoided or Deferred Distribution Investment Costs

Confirmed projected and existing or historical overload locations will undergo a more detailed analysis in order to calculate actual or potential avoided or deferred investment costs. If a detailed load analysis is not feasible for all substations and circuits with confirmed load-growth-related constraints, the consultant will establish a representative subset by first grouping those locations by load shape characteristics (e.g., urban residential, rural residential, urban commercial, similar circuit proxies, etc.), and then selecting a representative sample from each group. This subset of locations will then undergo the more detailed analysis defined below to calculate potential avoided or deferred investment costs.

For each location with projected or historical load-growth or capacity constraint-related concerns, this method would perform analysis to determine the necessary upgrade(s) and investment costs based on modeled load growth projections.

(1) Identify Possible Upgrades and Required Load Reductions

The analysis will identify component upgrades and costs, tracking the utility planning process as closely as possible, as well as load reduction levels required to avoid or defer upgrades. This analysis may include, but is not limited to, the use of load flow analysis software.

(2) Develop Avoided or Deferred Cost Estimates

The consultant will work with each utility to develop investment cost estimates based on the utility's existing study-grade investment cost estimate methodology, which will include the previous five-year historical expenditures data. Equipment replacements will be reviewed to identify possible incremental additional costs associated with equipment capacity increases.

For recent and current investments identified as capacity constraint-related, available existing utility documents will be reviewed to determine investment costs and load reduction that would have been required to avoid violations. Equipment replacements will be reviewed to identify possible incremental additional costs associated with equipment capacity increases.

Step 3. Assigning Values Using Load Profile and Mapping to Generation Profiles

The final step intends to assign values by capacity-constrained hours (i.e., hours of criteria threshold violation). In order to achieve potential avoided or deferred costs, load reduction must be provided at specific peak days and times during the year. Step 3 assigns values by capacity-constrained hours (i.e., hours of potential criteria threshold violation) which will allow for further examination of the ability of DG to achieve avoided or deferred costs through load reduction during hours of actual or projected criteria threshold violation.

That analysis will allow comparisons of required load reductions to particular DG generation profiles to determine if a specific DG technology is likely to meet the required load reductions at a location, and

therefore will be useful for informing NEM compensation mechanism discussions. This portion of the study will be performed at locations identified through Steps 1 and 2.

(1) Develop Representative Load Profiles

The consultant will work closely with utility planning departments to complete a review using utility information and guidance to determine representative load profiles for the specific selected locations. Additional data collection and analysis may be required to develop accurate load profiles. Representative load profiles will identify hours when load exceeds threshold cutoff (e.g., equipment thermal design rating). Avoided or deferred cost values will be allocated across the duration of required load reduction. Detailed methods for avoided or deferred cost allocation will be developed with the consultant and may be informed by methods outlined in the SEPA white paper, Beyond the Meter: Addressing the Locational Valuation Challenge for Distributed Energy.1

(2) Map DG Production Profiles to Load Profiles

Finally, a sample of DG electricity production profiles will be developed and mapped against the identified hours of need for each specified location to provide illustrative examples of DG contributions to load reduction. Sample profiles investigated for this study will include DG systems eligible for NEM, including solar, hydroelectric, and solar plus storage.

However, in order to achieve avoided or deferred costs, load reduction must be provided at specific peak days and times during the year and a mechanism must be in place to ensure the DG is available when needed. LVDG study results will be indicative of potential values for associated load reduction, and compensation mechanism discussions should also address reliability and performance issues.

IV. Study Process and Timeline

A report containing this proposed scope and timeline for the distribution-level LVDG study will be filed by Staff for review and approval by the Commission prior to the engagement of a consultant to perform the study. The report will be used as the basis for the Request for Proposals (RFP) to engage a consultant to further refine the methodology and conduct the LVDG study.

The consultant and Staff will hold periodic stakeholder working group meetings, not less frequently than bi-monthly, to provide status updates and answer questions during the LVDG study process.

The LVDG study is anticipated to commence during the second calendar quarter of 2019, following engagement of the study consultant, and to be completed by the end of 2019.