Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-001 **Page 1 of 3**

Request from: Clean Energy NH

Witness: Freeman, Lavelle A, DiLuca Jr, James P

Request:

Please provide a written narrative of the four (4) points Mr. Lavelle Freeman enumerated and described, during the Settlement Agreement Call on December 19, 2022, concerning distribution system upgrades necessary for certain DER project interconnection.

Response:

The Eversource Distribution System Planning Guide (DSPG) states that bulk distribution substations shall be designed to sustain any single contingency (N-1) event with no loss of load. As defined in the current draft revision of the DSPG which will be published in Q1, 2023, this N-1 planning standard applies to all load (reverse and forward) and all customers (load and Distributed Energy Resources (DER) alike). The design standard aims to maintain adequate levels of operational flexibility which ensures power quality and reliability that meet or exceed our customers' expectations.

The explicit application of an N-1 planning standard to DER impact studies was formalized in New Hampshire[1] in the fourth quarter of 2020 as part of the Company's continuously evolving planning standards due to the increasing level of DER penetration (number and size) at PSNH's bulk distribution substations. With increased DER penetration comes the associated thermal capacity, voltage, and power quality impacts, which can be observed primarily during reverse power flow conditions (low load/high generation periods) on PSNH's distribution lines and station equipment. Maintaining operational flexibility on lines and substation equipment that are intentionally designed to pick up customer load and generation during outages resulting from N-1 contingences at the station is especially critical to ensuring reliability and service continuity for all customers.

Distribution feeders that have been intentionally designed to provide transfer capability between bulk substations during emergency conditions shall be considered Load Carrying Capability (LCC) lines, since they contribute to the LCC of that station. During a System Impact Study (SIS), System Planning shall determine if the proposed DER point-of-interconnection (POI) is on an LCC line. If the POI is located on an LCC line or is supplied by the LCC line in an alternate configuration,

1 While this planning standard was formalized in 2020, N-1 testing is not new and has been performed for large generator interconnections in New Hampshire over the past decade.

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the SIS must include N-1 scenarios in which the line is supplying customers that would otherwise have been isolated following the N-1 triggering event at the substation.

PSNH realizes that the aggregate impacts of DER present both a challenge and an opportunity for the design and operation of the distribution system. The Company has a responsibility and obligation to ensure the reliability of the distribution system and to mitigate the risk of extended outages to all customers. In addition, the Company recognizes that infrastructure upgrades are the key to enabling DER to remain online in support of New Hampshire's clean energy goals. These challenges are addressed through application of the N-1 planning standard to DER.

If the N-1 planning standard is not consistently applied to DER customers, the Company would be required to trip DER off-line (either remotely, via a System Operator, or automatically, via a Direct Transfer Trip scheme) during an N-1 event. This undermines clean energy goals and exposes PSNH's DER customers to the risk of outages for extended durations (weeks or months). This extended outage scenario fails to meet PSNH's reliability planning standards and does not qualify as a suitable mitigation for substation N-1 criteria violations. Additionally, even if PSNH were to agree to trip particular DER off-line during N-1 events, this would pose a major operational challenge for the Company. The combination of the N-1 contingency event with the need to identify and trip certain DER would create unnecessary additional operator burden, potentially delay response, and negatively impact reliability for all customers (load and DER alike).

Finally, an N-1 distribution planning standard ensures that DER can remain online to support the Bulk Power System (BPS) during events that might have a widespread impact on the region. Several NERC publications have cited concerns regarding the aggregate impact of DER on the BPS:

- Lack of DER disturbance ride through capability.
- As the DER penetration increases across the system and offsets load, it displaces BPS connected generation (e.g., synchronous machines).
- Parts of the electric system are trending from very large, centralized power plants (> 300 MVA) to smaller BPS connected plants (25-100 MVA) to DER (0.25-5 MVA) indicating a major decentralization of generation.
- Tripping and momentary cessation of DER are of interest as both can have major impacts on the flows, system stability, and voltage profile of both the distribution and transmission systems.
- During certain conditions a sudden increase in loads leads to additional reactive power requirements and may lead to voltage collapse.

PSNH is committed to evolving its distribution planning practices to meet the needs of the modern distribution grid. Formalization of Eversource's N-1 planning standard is just one of several

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improvements to DER interconnection study requirements that have naturally evolved over the past decade in response to changing conditions and performance requirements. The Company's priority is to provide the highest level of reliability to all customers while planning for the future needs of the system.

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-002 **Page 1 of 2**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Johnson, Russel D, Freeman, Lavelle A

Request:

Please provide documentation concerning the outages that occurred in Eversource territory, enterprise wide, that co-occurred with low-load conditions resulting in back feeding by DERs onto transmission system.

Response:

The Company does not currently track outages based on loading conditions or power flow direction. Therefore, data on outages that occurred in Eversource territory, enterprise wide, during low-load conditions resulting in reverse power flow onto the transmission system are not readily available. However, an example the Company is aware of is provided below for illustration:

The North Road distribution bulk station has two (2) 44.8 MVA, 115/34.5kV transformers, TB38 and TB49. There are two (2) individual 34.5 kV buses electrically tied together via one (1) Bus Tie switch, with four (4) 34.5kV circuits fed from the two buses.

During September 2018, TB49 was out of service (OOS) for about ten (10) days (from 9/15 to 9/25), and TB38 was OOS for about five (5) days (from 9/25 to 9/30). During those fifteen (15) days, the entire station 34.5 kV system (load & DER), which is typically supplied by two bulk transformers was supplied by the bulk transformer that remained in-service at that time (N-1 operating condition).

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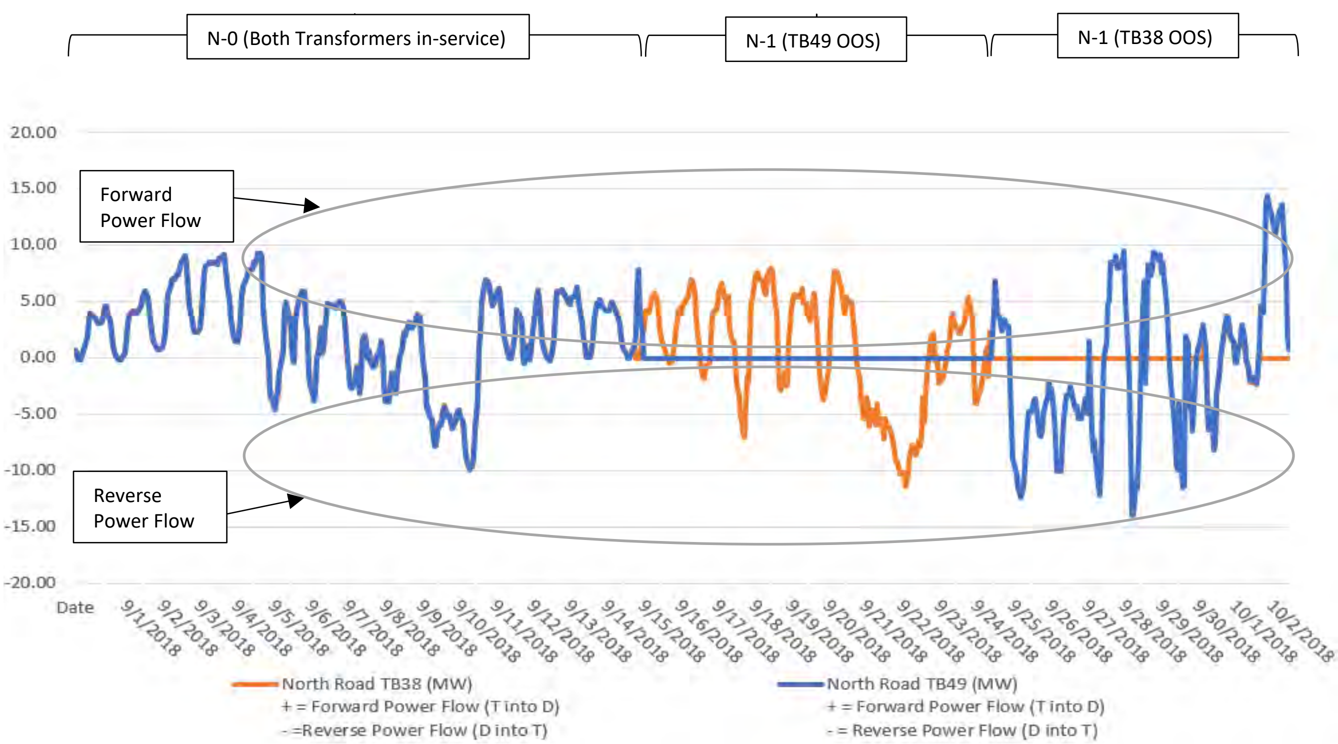
The graph below shows the hourly MW data measured at TB49 and TB38 transformer breakers during September 2018. During the N-1 conditions (TB49 or TB38 OOS), the station experienced Reverse Power Flow (RPF) of up to 14 MW during low-load and high-generation periods.



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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-003 **Page 1 of 2**

Request from: Clean Energy NH

Witness: Walker, Gerhard, Freeman, Lavelle A

Request:

Please provide justification for why the company elected to impose the full costs of N-1 interconnection upgrades to the distribution system, when those upgrades could benefit a broader customer base, including, potentially, future DERs.

Response:

Currently, the Company assesses interconnection costs during the interconnection process based on the cost-causation principle, assigning the full cost of system upgrades to the project that triggers the upgrades. While these infrastructure upgrades might provide benefits to distribution customers (rate-payers) as well as future DER developers, there is currently no mechanism in place in New Hampshire to equitably allocate costs to current or future beneficiaries.[1] However, it must be noted that in most situations where DER can connect without paying for system upgrades (because there is sufficient hosting capacity), the cost of that system capacity was borne entirely by rate payers or a previous DER project that proceeded with an interconnection upgrade.

As detailed in footnote 1, the Company is working with regulators and stakeholders in other jurisdictions to explore alternative cost allocation mechanisms, and has already received an Order approving a beneficiary-pays methodology for a set of DER-driven upgrades in Massachusetts. The Company is open to working with New Hampshire stakeholders, including Clean Energy New Hampshire, to explore similar mechanisms that could support DER development, especially in

[1] Alternate cost allocation methodologies were explored in the Massachusetts Department of Public Utilities (DPU) Docket D.P.U. 20-75 ("*Investigation by the Department of Public Utilities on Its Own Motion into Electric Distribution Companies' (1) Distributed Energy Resource Planning and (2) Assignment and Recovery of Costs for the Interconnection of Distributed Generation*"). Recently, a Capital Investment Project (CIP) that allocated the cost of upgrades between distribution customers and DER developers in proportion to benefits accrued was approved for the Marion-Fairhaven group under Massachusetts DPU docket D.P.U. 22-47 in Massachusetts. CIPs for five other groups are being adjudicated in dockets D.P.U. 22-51 to D.P.U. 22-55. Similar cost allocation methodologies are also being explored in Connecticut under Public Utilities Regulatory Authority docket 22-06-29RE01 ("*PURA Investigation into Distributed Energy Resource Interconnection Cost Allocation – Non-residential Interconnection Upgrades*").

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congested areas, for approval by the New Hampshire Public Utilities Commission. Any cost allocation mechanism must allow the Company to maintain safe, reliable service for all customers.

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-004 **Page 1 of 2**

Request from: Clean Energy NH

Witness: Walker, Gerhard, Freeman, Lavelle A

Request:

Please provide a description of whether Eversource conduct group studies of DER projects to see how they will affect the distribution system, or does it study each project independently from the rest of the queue in the order that the DER project files an interconnection application? If not, please provide justification.

Response:

DER projects entering the Eversource New Hampshire queue are studied independently in sequential order based on the interconnection application deemed completion time stamp by Eversource and on a signed System Impact Study (SIS) agreement, between the applicant and Eversource. To date, for the Eversource New Hampshire territory, there has not been a formal DER group study with the intent to equitably allocate costs to the DER group study participating projects.[1] The reason for this is that the current interconnection process guidelines do not include provisions for group studies, and the established cost-causation principle, where each DER project pays for the costs to interconnect and any required system upgrades for the project.

For a distribution DER group study to be performed, a revised interconnection process, and cost allocation methodologies may need to be considered, such as those currently being explored in other jurisdictions.[2] With these mechanisms in place, the Company would have a way to justify and perform group DER studies, where warranted, in New Hampshire.

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[1] Eversource has previously combined study analysis for more than one project requesting to interconnect to the same circuit or substation, while following the interconnection process guidelines. The main purpose of this is to achieve efficiency and cost savings to interconnection customers where possible.

[2] In Massachusetts docket D.P.U. 17-164, the Department of Public Utilities approved proposed revisions to Section 3.4.1 of the Standards of Interconnection of Distribution Generation Tariff Group Study to allow electric distribution companies to perform interconnection studies of a defined group of DER to develop a group interconnection solution. In Massachusetts docket D.P.U. 20-75, alternate cost allocation methodologies were explored for common DER group upgrades. Recently, in Massachusetts docket D.P.U. 22-47, a Capital Investment Project (CIP) that allocated the cost of upgrades between distribution customers and DER developers in proportion to benefits accrued was approved for the Marion-Fairhaven group. Similar group study and cost allocation

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Data Request No. CENH 1-004 **Page 2 of 2**

Under the current rules (sequential queue) and certain system conditions, if the cumulative amount of DER projects proposing to interconnect to a substation exceeds a specific MW threshold; then a study may be required in order to evaluate the potential impact to the reliability and operation of the transmission system

methodologies are also being explored in Connecticut Public Utilities Regulatory Authority under docket 22-06-29RE01.

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-005 **Page 1 of 2**

Request from: Clean Energy NH

Witness: Walker, Gerhard

Request:

Please provide a description of why installing curtailing devices for when DER projects' generation exceeds demand at substation is not a viable mitigation option for low load situations.

Response:

There are principally two curtailment options that could be considered for managing output of a site in a manner that benefits the interconnection (cost). Static curtailment, in which a fixed limit is imposed on the resource that cannot be exceeded; and dynamic curtailment, which dynamically and in real time manages the resource to prevent critical system conditions. In both cases, a trade-off is made between potential energy output, and consequently revenue, and cost of interconnection.

With respect to static curtailment, the Company currently allows DER projects to "self-curtail." For example, a solar project with a 5 MW solar installation and a co-sited 2 MW battery storage facility could request interconnection at 3 MW (5 MW – 2 MW battery curtailment). This self-curtailment enables developers to strike a suitable balance between facility output and cost of interconnection. It would therefore not be advisable for the Company to impose any other static curtailment than the one already proposed by the developer as the Company does not know the details of the project finances and has to assume the customer has already found their "optimal" configuration. Customers can make use of this self-curtailment feature to any extent they deem financially viable. Installation of a function-32 relay will ensure from a technical standpoint that the static limits are obeyed.

With respect to dynamic curtailment, this requires real-time visibility of the system conditions, actual power flow, and capabilities to not only optimally dispatch the resource, but in real time assess the impact of re-dispatching a given DER. This capability applied to all DERs, implies real time distribution automation at a system level – where dispatch of all DERs is coordinated and managed in a security constrained dispatch ensuring no thermal and voltage limits of the existing distribution system are exceeded – in short, a fully implemented ADMS and DERMS platform. While it has been claimed that ad-hoc or point solutions for dynamic curtailment can be used, they

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are not replacements for a DERMS solution and leave a lot of questions un-answered. These questions include: (1) who should be curtailed if there are two resources on a circuit; (2) how to address new resources added to a circuit; and (3) how the Company can reliability integrate an array of different ad-hoc solutions.

Most importantly however, without a DERMS, these ad-hoc solutions can at most be rule-based, and at worst require a human in the loop. With the amount of solar interconnecting to the Eversource system, it would be infeasible for the Company's Operations Group to have human-in-the-loop decision-making for the curtailment of every single DER on the system that chooses to go this route. In addition to complicating system operations, this could potentially delay response during critical emergency periods and create a reliability risk for all customers. The Company is therefore currently exploring a DERMS deployment. When such a DERMS becomes available it is the Company's expectation that dynamic curtailment of resources would be an additional solution for integrating renewable energy. However, it should be noted that a DERMS cannot void the need for distribution system reliability upgrades, necessary especially in high saturation areas where the DER penetration makes it infeasible to maintain safe and reliable service to all customers through curtailment.

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Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-006 **Page 1 of 1**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Walker, Gerhard, Freeman, Lavelle A

Request:

Please describe, generally, how, if a DER project interconnection triggers an N-1 upgrade and that upgrade occurs, that upgrade affects the distribution system's capacity to handle subsequent DER project interconnection.

Response:

If a DER project interconnection triggers an upgrade to the system based on an N-1 violation identified during the interconnection study, and if that project chooses to proceed and the upgrade is put in place, that upgrade may expand system capacity at that location. The Company utilizes standard equipment sizes for transformer and conductor upgrades which consequently enables capacity or creates headroom above and beyond the interconnecting DER's requirements. This headroom would then be available to interconnect future DERs until the capacity is fully subscribed, and then the need for further upgrades would be identified during a subsequent interconnection study. The same applies on the load side, where capacity upgrades increase load-carrying capability on the system. This in turn can supply load in that region before additional capital investment is needed to accommodate future growth.

To address the "free rider" concerns with DER-driven upgrades, the Company is working with regulators, developers and other stakeholders to explore alternate cost allocation methodologies in other jurisdictions,[1] and would be open to working with the New Hampshire Public Utilities Commission, Department of Energy, Office of Consumer Advocate, Clean Energy New Hampshire, and other stakeholders to explore similar concepts in New Hampshire.

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[1] Alternate cost allocation methodologies were explored in the Massachusetts Department of Public Utilities (DPU) Docket D.P.U. 20-75 ("*Investigation by the Department of Public Utilities on Its Own Motion into Electric Distribution Companies' (1) Distributed Energy Resource Planning and (2) Assignment and Recovery of Costs for the Interconnection of Distributed Generation*"). Recently, a Capital Investment Project (CIP) that allocated the cost of upgrades between distribution customers and DER developers in proportion to benefits accrued was approved for the Marion-Fairhaven group under Massachusetts DPU docket D.P.U. 22-47 in Massachusetts. CIPs for five other groups are being adjudicated in dockets D.P.U. 22-51 to D.P.U. 22-55. Similar cost allocation methodologies are also being explored in Connecticut under Public Utilities Regulatory Authority docket 22-06-29RE01 ("*PURA Investigation into Distributed Energy Resource Interconnection Cost Allocation – Non-residential Interconnection Upgrades*").

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-007 **Page 1 of 1**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Walker, Gerhard, Freeman, Lavelle A

Request:

If a DER project interconnection triggers an N-1 upgrade and that upgrade occurs, how much additional DER capacity can be added to the alternate path circuit before a subsequent distribution system upgrade is needed? If there is not a standard capacity value, please provide the range of values.

Response:

The amount of DER that can be added to any part of the system depends on the existing system design and conditions, the amount and type of DER to be connected, and the system operational requirements. These are all accounted for in a System Impact Study (SIS) that determines if the DER causes any violations of planning and operating criteria, and thus poses a safety and reliability risk to all customers. While the Company uses standard equipment sizes for system upgrades, it is not possible to determine general headroom, give a standard capacity value, or even provide a range of values without considering the specific application use case and/or performing an SIS. However, it should be noted that if a DER project pays for N-1 upgrades on an alternate path, any subsequent DER that limits the use of the alternate path will be responsible for further upgrades.

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-008 **Page 1 of 1**

Request from: Clean Energy NH

Witness: Walker, Gerhard; Freeman, Lavelle A

Request:

Please describe whether the company considered alternative DER interconnection cost allocation mechanisms, and if it did not, please provide justification for why those alternate cost-allocation mechanisms were not selected.

Response:

As discussed in the responses to data requests CENH 1-003 and CENH 1-004, under the current cost-causation principle, DER projects entering the Eversource New Hampshire queue are studied independently in sequential order, and the full cost of system upgrades is assigned to the project that triggers the upgrades. To date the Company has not considered alternative DER interconnection cost allocation mechanisms as there is currently no regulatory mechanism in place in New Hampshire to group DERs in a common area and equitably allocate costs to current or future beneficiaries.[1]

As detailed in footnote 1, the Company is working with regulators and stakeholders in other jurisdictions to explore alternative cost allocation mechanisms similar to the Massachusetts Department of Public Utilities approved Marion-Fairhaven Capital Investment Proposal established under Massachusetts docket D.P.U. 22-47. The Company would welcome the opportunity to work with the New Hampshire Public Utilities Commission, Department of Energy, Office of Consumer Advocate, Clean Energy New Hampshire, and other stakeholders to explore similar mechanisms in New Hampshire.

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[1] Alternate cost allocation methodologies were explored in the Massachusetts Department of Public Utilities (DPU) Docket D.P.U. 20-75 ("*Investigation by the Department of Public Utilities on Its Own Motion into Electric Distribution Companies' (1) Distributed Energy Resource Planning and (2) Assignment and Recovery of Costs for the Interconnection of Distributed Generation*"). Recently, a Capital Investment Project (CIP) that allocated the cost of upgrades between distribution customers and DER developers in proportion to benefits accrued was approved for the Marion-Fairhaven group under Massachusetts DPU docket D.P.U. 22-47 in Massachusetts. CIPs for five other groups are being adjudicated in dockets D.P.U. 22-51 to D.P.U. 22-55. Similar cost allocation methodologies are also being explored in Connecticut under Public Utilities Regulatory Authority docket 22-06-29RE01 ("*PURA Investigation into Distributed Energy Resource Interconnection Cost Allocation – Non-residential Interconnection Upgrades*").

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Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-009 **Page 1 of 1**

Request from: Clean Energy NH

Witness: Freeman, Lavelle A, Johnson, Russel D

Request:

Please provide documentation related to the first date of application of the N-1 interconnection standard to DER projects in Eversource's New Hampshire Service Territory.

Response:

As discussed in the response to data request CENH 1-001, explicit application of the N-1 planning standard to DER impact studies was formalized in Eversource's New Hampshire Service Territory in the fourth quarter of 2020 as part of the Company's continuously evolving planning standards due to the increasing level of DER penetration (number and size) at bulk distribution substations. However, the Company was doing N-1 testing for large generator interconnections over a decade ago. PSNH's internal standard ED-3025, "Feasibility Study for Interconnection of Independent Power Producers" effective 1/12/2011, revised 7/19/2012, includes the following requirement in Section VIII, subsection A, "Determine Applicability for Distribution Interconnection":

> *The maximum proposed generation level considered for interconnection shall not cause the aggregate generation amount at a T to D interface to exceed one half the sum of the individual TFRAT ratings[1] of the parallel transformation installed between the high voltage bus and the contiguous lower (interconnection) voltage bus.*

The requirement to limit the aggregate generation to half the total transformer rated capacity is in effect an N-1 standard for DG interconnection at a substation, and it was applied as such over a decade ago.

Please refer to Attachment CENH 1-009a for this since retired procedure.

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[1] Calculated Megavolt-Ampere capacity of a substation transformer.

ED-3025 Feasibility Study for Interconnection of Independent Power Producers

I. PURPOSE

To establish guidance and procedure for System Planning and Strategy (SP&S) and Distribution - Protection and Control Engineering (DP&CE) to conduct Feasibility Study segments for the interconnection of an Independent Power Producer (IPP) to the PSNH distribution system. This procedure also applies to the expansion of existing IPPs on the PSNH distribution system.

In general, a feasibility study for an IPP is initiated and coordinated by the Supplemental Energy Sources Department (SESD).

This document does not cover the additional work necessary to determine the actual interconnection requirements. A distribution Interconnection Study would be performed at a later date, using actual data of the equipment being installed. In addition, other studies may be required such as transmission studies, ISO studies, or detailed technical studies such as stability or device and product analysis.

II. AREAS/PERSONS AFFECTED

This procedure applies to the following areas:

- PSNH Energy Delivery (ED)
- Supplemental Energy Sources Department (SESD)

III. POLICY

It is the policy of PSNH to facilitate and expedite the interconnection of electric generation onto the PSNH electric system consistent with applicable municipal, state and federal rules and regulations. It is also the intent of this policy to adhere to standard construction and operating practices supported by industry, material and equipment manufacturers, and readily available, proven technology. Refer to Section IX – References.

It is the practice of PSNH to design and operate the distribution system to serve retail and wholesale loads as appropriate, maintaining a reliable, cost effective, and efficient electric delivery system to meet customer needs.

The interconnection of individual or aggregate generation onto the distribution system should not change the predominant direction of power flow at the interface of Transmission to Distribution. See FERC Seven Factor Test which defines an electrical distribution system, Appendix A. To work toward maintaining the load-serving character of PSNH's distribution system, 50% of the standard PSNH system operating limits for 115-34.5 kV transformation and standard distribution line conductor is used to determine the proxy for maximum interconnected generation to be considered for study. The maximum aggregate amount of generation allowed to be interconnected to the PSNH distribution system at various source voltages is listed in Table 1, below. Actual approved generation level for an individual IPP will depend upon amount of existing generation and feasibility analysis for the proposed point of interconnection (POI).

Table 1

Interconnection Voltage	**Maximum Aggregate Generation**(1) (3)
46 kV	25 MW
34.5 kV (115 kV source)	18 MW
34.5 kV (345kV source)	5 MW (2)
22 kV	10 MW
12.47 kV	7 MW
4.16 kV	2 MW

Notes:

1. Listed generation levels do not apply to network systems.
2. A 5 MW maximum is stipulated for distribution circuits fed from PSNH's 345 kV – 34.5 kV transformers to avoid overvoltage conditions at the 345 kV transformer bushings caused when 34.5 kV generation backfeeds the 345 kV transformer during 345 kV fault and/or non-fault conditions.
3. Maximum aggregate generation connected to a T to D interface is based upon one half the sum of the individual transformer standard operating limits (TFRAT) installed between the 115kV bus and the contiguous lower (interconnection) voltage bus with bus tie switches open and/or one half the maximum summer conductor rating of PSNH's largest standard conductor.

PSNH will consider and study for interconnection to the distribution system, as may be requested, applications made either under the FERC jurisdictional Small or Large Generation Interconnection Procedures (SGIP or LGIP), see Appendix B, or under state jurisdiction, including those generators deemed as Qualifying Facilities (QF), up to 25MW, or less, per Table 1, above. Interconnection requests which cause the aggregate generation at a T to D interface to exceed the maximum aggregate generation amount for the source circuit voltage may require higher voltage interconnection or Transmission Interconnection with a dedicated Generator Step Up Transformer and developer owned generation leads.

Under no circumstances does this policy imply or state that a generator has access to the distribution system at the maximum aggregate generation amount. Technical and operating limits based on completion of impact studies shall determine specific interconnection output allowed. Results of the impact studies shall be contained within appropriate agreements.

IV. DEFINITIONS

Developer – Entity proposing interconnection of the IPP
D – Distribution System, less than 69kV
DP&CE – Distribution Protection and Controls Engineering Department
ED 3002 **–** Distribution System Planning and Design Criteria Guidelines
ED 3015 **–** Customer Voltage Policy
FE – Field Engineering Department
FERC – Federal Energy Regulatory Commission
Feasibility Study – Initial technical study to determine feasibility of introducing generation into the PSNH distribution system from an electric system operating characteristics basis
Interconnection Study – Detailed study to determine interconnection requirements once actual generator data and electrical interconnection construction are defined. Interconnection Study results are documented in the Interconnection Report.
IPP – Independent Power Producer, a generator which requests to interconnect to the PSNH electric system. Other names commonly used are NUG (Non-Utility Generator) and QF (Qualifying Facility)
ISO or ISO-NE – Independent System Operator of the New England grid
Minimum Load Conditions – The lowest load level of the area based upon PI data at the nearest "PI tag" for the previous calendar year
NUG – Non Utility Generator; same as IPP
Peak Load Conditions – The one-hour annual system and/or area peak MVA load for the season identified in the year that the IPP is expected to come online
PI – PI DataLink software which provides access to historical operating loadings, voltages, tap positions, and other operating data
PI tag – A defined location within the PSNH electric system where operating data is collected, such as a substation
POI – Point of Interconnection of the IPP facility
PSS®E – Power Technologies, Inc. power flow software used by PSNH
QF – Qualifying Facility
SE – Substation Engineering Department
SESD – Supplemental Energy Sources Department
SESD IPP Study List – List kept by SESD to determine order of consideration for study purposes
Steady State Analysis – The study of the system after automatic voltage regulation devices have operated for an event on the system
SP&S – System Planning and Strategy Department
T – Transmission System, 69kV and above
TFRAT – Calculated Megavolt-Ampere capacity of a substation transformer
Transient Analysis – The study of the system before automatic voltage regulation devices have operated for an event on the system

V. OVERVIEW

This procedure establishes the responsibilities of Energy Delivery for the feasibility evaluation of IPPs seeking interconnection to the PSNH distribution system.

VI. PERIODIC REVIEW OF GUIDELINES

The Procedure Owner is responsible for maintaining this guideline and keeping current with good engineering design practices. The Procedure Owner for this Energy Delivery Procedure is the Manager of System Planning and Strategy unless designated otherwise by the Director of Energy Delivery.

Annually, the Procedure Owner shall review design guidelines for conformance to standard engineering practices and industry criteria to determine if the guideline shall be revised, rewritten, or cancelled.

As required, the Procedure Owner shall recommend changes to the Director of Energy Delivery. If approved by the Director, the Procedure Owner shall change the Procedure in accordance with AP-2001 Writing and Publishing Procedures.

VII. IPP FILES

SP&S shall maintain IPP Interconnection information in appropriate folders on the K Drive. Documents and reports relating to the IPP shall be saved in appropriate folders on the K Drive in K:\Deptdata\Energy Delivery\System Plan&Strategy\Interconnection Studies. Related power flow cases shall be saved in K:\Loadflow\IPP Studies. Related paper documentation shall be maintained in the IPP file cabinet in the SP&S office.

DP&CE shall maintain feasibility of interconnection information in appropriate folders on the K Drive in K :\RESTRICTED-ED\System Projects\Protection & Controls.

VIII. PROCEDURE

A. Determine Applicability for Distribution Interconnection

1. SESD will inform SP&S and DP&CE of a developer's intent to request a Feasibility Study for interconnection of a proposed IPP or proposed upgrades to an existing IPP.
2. The maximum proposed generation level considered for interconnection to a PSNH distribution line shall not exceed the maximum aggregate generation amount shown in Table 1, Section III, above. Also, the maximum proposed generation level considered for interconnection shall not cause the aggregate generation amount at a T to D interface to exceed one half the sum of the individual TFRAT ratings of the parallel transformation installed between the high voltage bus and the contiguous lower (interconnection) voltage bus. Greater than the maximum aggregate generation amount shown in Table 1,

ED-3025 Feasibility Study for Interconnection of Independent Power Producers

Section III, will be deemed inappropriate for distribution and will receive no further study for distribution interconnection. The developer will be referred to the transmission interconnection process and will be required to prepare and submit a separate request for transmission interconnection. Note: In instances where there are multiple T to D interfaces connected by lower voltage lines, transformation at the electrically closest T to D interface will be used for the applicant screening process.

3. The requesting IPP generation may be further limited or be required to interconnect to Transmission if any of the following exist at the same T to D interface:
   - other IPPs or regulated generation units already exist
   - other IPPs are in the queue ahead of the requesting IPP
   - other regulated generation projects are planned or underway

B. Estimate Request for an Interconnection Feasibility Study

1. SESD requests of SP&S and DP&CE estimates for Feasibility Study work for a proposed IPP or proposed upgrades to an existing IPP.
2. SP&S and DP&CE will determine the level of study required.
3. SP&S and DP&CE will estimate cost of PSNH labor at fully loaded average engineering labor rates. SP&S and DP&CE will estimate the cost of any required outsourced engineering work (such as Stability Study) at the most recently available vendor rate.
4. SP&S and DP&CE will provide SESD comprehensive cost estimates to perform the feasibility study and the timeframe within which the study can be completed. This shall be provided within one week of the request or by the SESD requested deadline.

C. Request for a Feasibility Study

1. SESD shall request SP&S and DP&CE to perform studies to determine the feasibility of connecting a proposed IPP to the PSNH distribution system or the feasibility of expanding an existing IPP.
2. SESD shall provide a work order number and notice that Developer has authorized the study.
3. A meeting shall take place between SESD, SP&S, DP&CE, and if appropriate, the developer, and ISO-New England to clarify and document the scope of the feasibility study.
4. The feasibility study shall evaluate defined generation (specific size and location) and an agreed upon distribution interconnection location.
5. In the event that the distribution system impact of the proposed generator size violates PSNH's published standards and procedures, PSNH shall, if requested by the developer, determine the size of generator that can be connected to existing system.

D. Data Supplied to SP&S by SESD

1. SESD shall provide SP&S with a copy of the "Site Data Sheet for Interconnected Generation" completed by the requesting IPP (See Appendix B).

E. Responsibilities of SP&S

1. **Research:** SP&S should research the following IPP and distribution system characteristics for the proposed area of interconnection:
   a. system area peak and minimum loads
   b. the long range plan and projected load growth in the area
   c. equipment thermal ratings
   d. voltage control systems on transformers, regulators, capacitors
   e. generation level of previous installations at the site
   f. generation level, operating histories, present operating status, and interconnection studies for other generators in the area
   g. IPPs ahead of the subject developer in the SESD Study List

2. **Required Construction Options:** The following stipulations shall apply to distribution system additions, 34.5kV and below, which are required to accommodate the IPP installation.
   a. Any distribution lines required along the road in PSNH territory shall
      - be owned by PSNH
      - be capable and allowed to serve local customer load
      - be constructed to NU standards
      - use approved line materials, including maximum wire size of 477 MCM ACSR
      - not be express lines, not allowing local load service
      - (may) consider double circuit line construction for short distances where reliability is not compromised
   b. Any distribution lines required in PSNH rights-of-way shall
      - be allowed only on a case by case basis
      - be owned by PSNH
      - be capable and allowed to serve local customer load
      - be constructed to NU 200kV BIL standards
      - use approved line materials including maximum wire size of 477 MCM ACSR,
      - not be allowed when the line
        - would preclude future right-of-way use by T or D
        - would not provide service consistent with standard distribution system planning studies
        - is express and for the sole benefit of the subject IPP, i.e. generator leads
   c. Any distribution lines built in a private right-of-way shall not cause reliability or power quality issues for PSNH customers. They shall:

- use NU standards and approved materials or equivalent approved by PSNH
- be owned, operated, and maintained by an entity other than PSNH under direct control and authority of the developer
- be maintained in a manner consistent with NESC, NERC, FERC and State jurisdiction

3. **Power Flow Studies:** The Power Technologies Inc.'s PSS/E power flow model will include forecasted loads and planned distribution system expansion, up through the proposed year of IPP interconnection, as identified in the current SP&S ten year plan. The model will include existing generation currently in operation as well as proposed generation ahead of this developer in the SESD IPP Study List. SP&S will run power flow studies for the following system conditions to ensure the IPP interconnection meets all ED-3002 requirements:
   a. peak load case under normal conditions without the proposed IPP
   b. minimum load case under normal conditions without the proposed IPP (historic minimum load for affected 115/34.5kV interface[s])
   c. peak load case under normal conditions with the proposed IPP
   d. minimum load case under normal conditions with the proposed IPP
   e. contingent loss of proposed IPP at peak load, basecase conditions:
      - Transient (limited to time zero)
      - Steady state
   f. contingent loss of proposed IPP at minimum load, basecase conditions:
      - Transient (limited to time zero)
      - Steady state
   g. contingent loss of the worst case line element at peak load, basecase conditions
   h. contingent loss of the worst case line element at minimum load, basecase conditions

   Power flow studies shall ensure that:
   a. The IPP will operate within the full range of PSNH control systems (i.e. transformer LTCs, regulators, capacitors and other generators) without manual intervention.
   b. Voltage levels are maintained in accordance with PSNH Procedure ED-3015 and NU Standard DSEM 17.101, under all operating conditions at all locations within the PSNH distribution system, including but not limited to the IPP point of interconnection, the bulk power substation, and the applicable ISO node. More stringent voltage limits may apply for IPPs whose generation pattern is of a varying nature.
   c. Power factor at the ISO interconnection must be maintained in accordance with ISO-NE Operating Procedure 17. The IPP may be

restricted under certain conditions to run at a reduced generation level or with a specified power factor.

d. Transient analysis shall be performed (for time zero) to ensure that the instantaneous voltage variation caused by an IPP trip is no greater than 3.0% at all locations within the PSNH distribution system, including but not limited to the IPP point of interconnection, the bulk power substation, and the applicable ISO node.
e. Study results are subject to modification including reduction of capacity or added operating restrictions or controls, based on required Transmission impact studies.

4. **Necessity of Stability or Dynamic Interaction Studies:** SP&S will review the necessity of conducting a stability study of the impacted system. Some properties of a system that may indicate the need for a stability study are:
   a. a generator connected to a weak system with long fault clearing times
   b. more than one generator connected to the same circuit
   c. more than one generator connected to the same substation or T to D interface
   d. multiple generators which are relatively electrically close to one another

5. **Necessity of Static Compensator Device Studies**: If the IPP developer intends to utilize static compensator devices (SVC/DVAR technology) on its internal system to control its output voltage and/or reactive flow, PSNH shall commission an independent study to analyze the effects of this equipment on the PSNH distribution system, other generation in the area and its customers. Any static compensator devices to support IPP generation shall be located on the IPP side of the interconnection point. Operating limits will be determined if the IPP system is not interlocked with the compensation device.

6. **Loss Study:** For generators over 1MW, SP&S will perform a system losses study following procedure ED-3024 Calculation of Independent Power Producer Line Loss Adjustment Factor and include the results in the Feasibility Study Report.

7. **Report:** The SP&S feasibility study report should address the following items:
   a. proposed IPP site (i.e. substation, circuit, and street)
   b. the amount of generation requested and approved
   c. state what other existing and proposed generation is modeled
   d. required system improvements and preliminary review of any obstacles to their construction

e. any operating restrictions such as:
   - generation level
   - hold voltage and/or power factor lead/lag See Appendix D for typical voltage schedule
   - voltage variation due to varying nature of output of certain generation types, e.g. wind, solar
   - VAR requirements at minimum and maximum load levels
   - any developer use of solid state voltage or reactive power controller devices (i.e. STATCOM, DVAR, SVC)

f. system losses, if applicable

g. recommendation for a Stability or Dynamic Study, if applicable

h. the extent to which this generator will be exporting power to the transmission system and, when applicable, a recommendation to the developer to contact SESD or ISO to request an impact study on the transmission system. Note that following the completed transmission impact study, PSNH may need to review and update PSNH's distribution findings at developer cost

i. stipulate reasons for not allowing interconnection (i.e. ED 3002 violations), if applicable

F. Responsibilities of DP&CE – Following completion of the SP&S Feasibility Study Report, DP&CE will perform its feasibility study. DP&CE will perform analyses to identify any protection and control issues that limit the amount of generation as well as to identify the major protection and control upgrades necessary to properly interface the proposed generation facility. The study will be limited to evaluating the impact of the proposed generation on the PSNH distribution system only. Detailed requirements for the interconnection will be identified in the PSNH Interconnection Report to be produced if the developer chooses to proceed with the project.

1. Short Circuit Study:

a. The addition of an IPP to the PSNH grid may have significant impact on pre-existing PSNH protection in the area. Infeed effects result when a source is added in a line section. A multi-phase fault now results in a contribution from the IPP which tends to elevate the voltage at the PSNH source, which reduces the contribution from the PSNH source and tends to increase the apparent impedance from the PSNH line terminal to the point of the fault. Large IPPs near the PSNH source combined with faults at the remote end of the line maximize the problem. Line-to-ground faults can cause similar problems, but the impacts are typically less intuitive due to the complexity of the zero sequence networks. Fault studies will be performed to properly evaluate the infeed effects of the IPP.

b. The proposed generation facility and any distribution system upgrades identified in the SP&S report will be modeled in the current PSNH ASPEN OneLiner short circuit and system protection analysis program model basecase.

c. Simulations will be performed for the normal all-in system configuration as well as credible contingent system arrangements. Impacts of the proposed site on existing short circuit interrupting devices and existing protection schemes will be evaluated. No attempt will be made to perform a detailed coordination study of all elements.
d. Interrupting device upgrades and/or additions, as a result of the IPP interconnection, will be determined.
e. Protective device upgrades and/or additions, as a result of the IPP interconnection, will be determined.
f. In the process of preparing the detailed Interconnection Report for the site, additional PSNH system modifications required to interface and operate this site may be identified.

2. **Transfer Trip**:
   a. IPP sites with installed capacity of 5 megawatts (MW) or more will require transfer trip from each remote three phase automatic sectionalizing device. The transfer trip equipment shall cause all site generation to be disconnected from the PSNH Distribution System.
   b. In special cases of high perceived risk, smaller sites may also be required to include transfer trip capability.
   c. If the IPP interconnects to a distribution circuit with other IPP sites, transfer trip will be required if the aggregate capacity of generation should exceed 5 megawatts with no transfer trip capability already installed.

3. **Estimates of Large Expenditure Items Remote from IPP Site**:
   a. Items such as the addition of transfer trip remote terminals, reclosers, breakers, and relays are included.
   b. All estimated costs will be based on using an engineering, procurement and construction (EPC) contractor.
   c. A rough order of magnitude (ROM) estimate will be provided for planning purposes only. Analogous projects can be used in preparing an estimate.
   d. In the event that this project moves forward, the costs of any and all equipment ultimately required will be the responsibility of the developer of the site.

G. Management Approval of Work Products

1. **Departmental Work Products**:
   a. System Planning and Strategy Feasibility Study component parts, including Loss Adjustment Factor calculations shall be approved by the Manager – System Planning and Strategy.
   b. When more than one POI is being considered, PSNH must seek a POI selection from the developer so that DP&CE may proceed with its Feasibility Study components considering only one POI. Preliminary

management and director approvals must be obtained for the SP&S Feasibility Study component prior to submission to the developer.

c. Distribution Protection and Control Feasibility Study component parts shall be approved by Manager – Engineering and Design.

2. **Final Report:** The Energy Delivery combined final Feasibility Study Report submittal to SESD shall be approved by the Director – Energy Delivery. ED will issue its written report to SESD, the Division Field Engineering Manager, the Supervisor DP&CE, the Director of Energy Delivery, the Manager Engineering and Design, the System Operations Manager, the Manager of SP&S, and the Manager of Transmission Planning.

IX. REFERENCES

ED-3002 – Distribution System Planning and Design Criteria Guideline

ED-3015 – Customer Voltage Policy

ED-3024 – Procedure for Calculating IPP Line Loss Adjustment Factor

NU STANDARD DSEM 17.101 - FLICKER

ANSI C84.1-1995 Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)

C2-2007 – National Electrical Safety Code (NESC)

IEEE 1547 – Standard for Interconnecting Distributed Resources with Electric Power Systems

IEEE 519-1992 – IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems

ISO-NE Operating Procedure OP-12 – Voltage and Reactive Control

ISO-NE Operating Procedure OP-17 – Load Power Factor Correction

ITIC (CEBMA) curve – Information Technology Industry Council acceptable voltage envelope

NFPA 70 (2002), National Electrical Code

X. ED-3025 - REVISION HISTORY

Revision Number	Date	Reason
Rev 0	01/24/11	Original issue
Rev 1	07/19/12	Wording changes in the sections that refer to limiting generation to 50% of TFRAT and line conductor. Changes in the table to limit the generation to 50% of the normal rating instead of the emergency rating. Substituted Appendix D for a typical voltage schedule with what was written for Timbertop. Changed Approver to J. C. Eilenberger on all appendices.

XI. APPENDICES

Appendix A – FERC Seven Factor Test

Appendix B – FERC Interconnection Procedures

Appendix C – Feasibility Study Procedure Flow Chart

Appendix D – Typical Voltage Schedule

ED-3025 FERC SEVEN FACTOR TEST

From: http://www.ferc.gov/legal/maj-ord-reg/land-docs/rm95-8-00w.txt

The Federal Energy Regulatory Commission proposed seven indicators of local distribution to be evaluated on a case-by-case basis:

Page 402
Seven Factor Test

(1) Local distribution facilities are normally in close proximity to retail customers.
(2) Local distribution facilities are primarily radial in character.
(3) Power flows into local distribution systems; it rarely, if ever, flows out.
(4) When power enters a local distribution system, it is not reconsigned or transported on to some other market.
(5) Power entering a local distribution system is consumed in a comparatively restricted geographical area.
(6) Meters are based at the transmission/local distribution interface to measure flows into the local distribution system.
(7) Local distribution systems will be of reduced voltage.

ED-3025 FERC INTERCONNECTION PROCEDURES

Appendix B
Page 1 of 1

For current FERC Interconnection Procedures, go to the links listed below:

Standard Large Generator Interconnection Procedures (LGIP) - >20MW
http://www.ferc.gov/industries/electric/indus-act/gi/stnd-gen.asp

Standard Small Generator Interconnection Procedures (SGIP) - <= 20MW
http://www.ferc.gov/industries/electric/indus-act/gi/stnd-gen.asp

SITE DATA SHEETS FOR INTERCONNECTED GENERATION

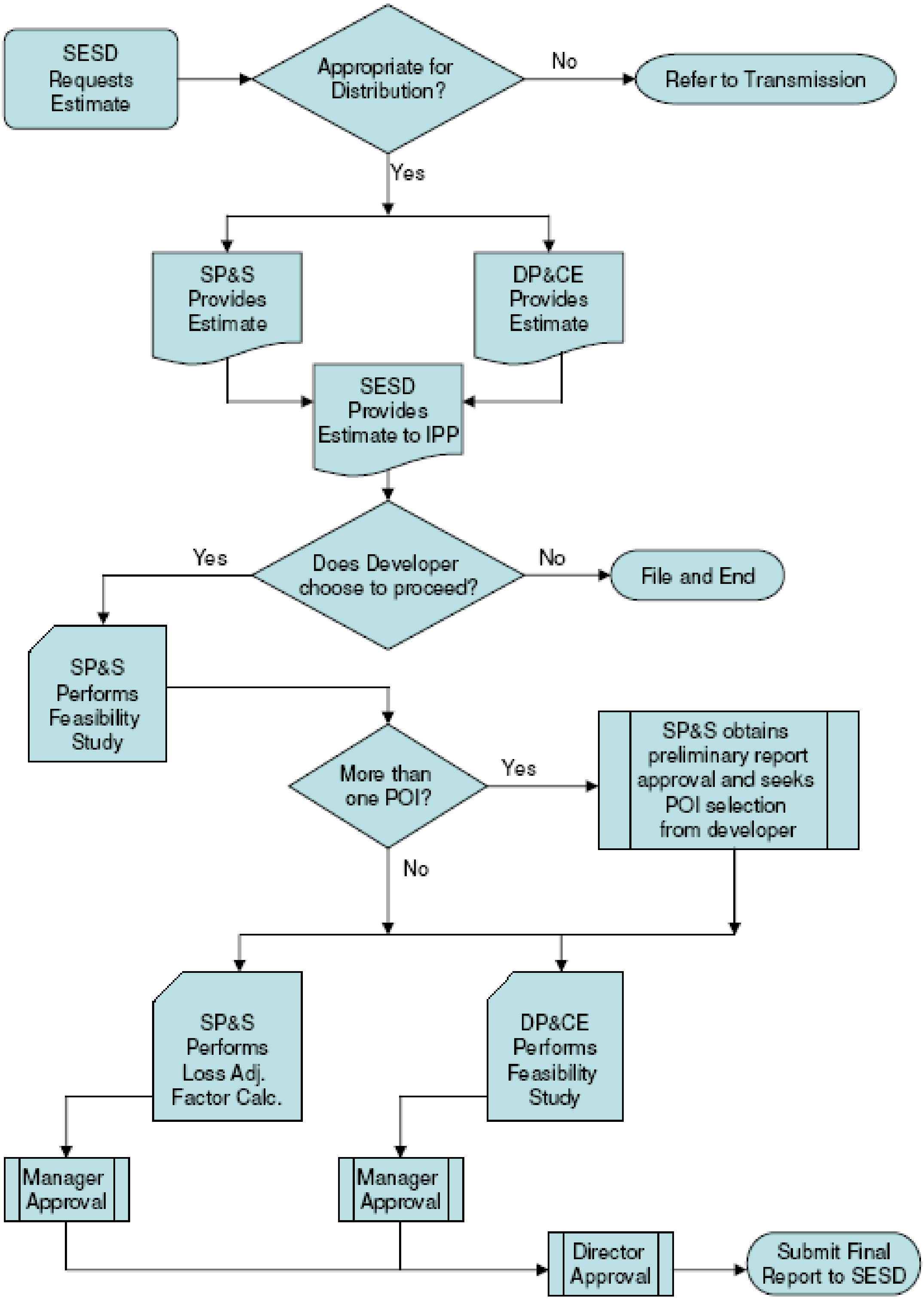
For the most current site data sheets, go to the links listed below.

ISO-NE Large Generation Instructions and Interconnection Form – > 20MW
http://www.iso-ne.com/genrtion_resrcs/nwgen_inter/lg_gen/index.html

ISO-NE Small Generation Instructions and Interconnection Form – <= 20MW
http://www.iso-ne.com/genrtion_resrcs/nwgen_inter/smgen_20/index.html

ED-3025 FEASIBILITY STUDY PROCEDURE FLOW CHART

Appendix C
Page 1 of 1



ED-3025 TYPICAL VOLTAGE SCHEDULE

The interconnection shall not interfere with PSNH's requirement to maintain system voltage levels in accordance with New Hampshire Public Utilities Commission (NHPUC) Rules. In order to accomplish this, an automatic voltage controlled set point of 102.5 % shall be scheduled at the delivery point. The generation facility shall have enough regulation capacity to produce or absorb VARS to hold the scheduled voltage. The generator control system shall maintain the system operating voltage at the delivery point between 101.5 % and 103.5 % of nominal voltage under normal operating conditions. If (the IPP) is not able to maintain the system operating voltage as described, PSNH reserves the right to require system enhancements at the generator's expense. The results of the loadflow study, although identifying a calculated power factor requirement of 0.98 leading under certain system conditions, shall only be used as a guide to predict system response. Actual system performance shall be verified when the installation has been completed.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-010 **Page 1 of 2**

Request from: Clean Energy NH

Witness: Freeman, Lavelle A

Request:
Please provide documentation related to the first date of application of the N-1 interconnection standard for DER projects in Eversource's Massachusetts Service Territory.

Response:

The first date of application of N-1 testing for a DER interconnection in the Eversource Massachusetts Service Territory was in 2004 for a 3.5 MW landfill-gas fired generating plant. Full distribution-level N-1 (single contingency outage) testing was conducted on the feeder the applicant was interconnecting to, backed up by other feeders within the same substation and a feeder supplied by a remote substation. Each contingency case simulated evaluated steady state loading, voltages, and fault current performance.

The impact study report illustrating the legacy N-1 testing is a voluminous customer-confidential work product. However, the Company is providing a redacted one-page snapshot of the study below which summarizes the N-1 testing that was conducted.

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Docket No. DE 20-161

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TABLE #1 CONTINGENCY OUTAGE CONDITIONS FOR [redacted] INTERCONNECTION

INTERCONNECTION SCENARIO	CONTINGENCY OUTAGES TESTED
Base Case – Existing System	Peak Load Base Case, All Lines In Light Load Base Case, All Lines In #101 Circuit Out, Transfer to #103 Circuit #103 Circuit Out, Transfer to #101 Circuit #107 Circuit Out, Transfer to #103 Circuit #605 Circuit Out, Transfer to #102 Circuit #541 Circuit Out, Transfer to #103/107 Circuit
Interconnection #1,1A,1B,1C – URD Loop	Peak Load Base Case, All Lines In Light Load Base Case, All Lines In #101 Circuit Out, Transfer to #103 Circuit #103 Circuit Out, Transfer to #101 Circuit #107 Circuit Out, Transfer to #103 Circuit #541 Circuit Out, Transfer to #103/107 Circuit
Interconnection #2 – #107 Circuit	Peak Load Base Case, All Lines In Light Load Base Case, All Lines In #101 Circuit Out, Transfer to #103 Circuit #103 Circuit Out, Transfer to #101 Circuit #107 Circuit Out, Transfer to #103 Circuit #541 Circuit Out, Transfer to #103/107 Circuit
Interconnection #3 – #102 Circuit	Peak Load Base Case, All Lines In Light Load Base Case, All Lines In #102 Circuit Out, Transfer to #106 Circuit #604 Circuit Out, Transfer to #102 Circuit
Interconnection #4 – #541 Circuit	Peak Load Base Case, All Lines In Light Load Base Case, All Lines In #541 Circuit Out, Transfer to #103/107 Circuit

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-011 **Page 1 of 1**

Request from: Clean Energy NH

Witness: Freeman, Lavelle A

Request:

Please provide documentation related to the first date of application of the N-1 interconnection standard for DER projects in Eversource's Connecticut Service Territory.

Response:

Eversource Energy's Connecticut Service Territory began to apply the N-1 interconnection standard for DER projects in the fourth quarter of 2020 consistent with the Eversource tri-state planning guide. All DER interconnection applications received in the first quarter of 2020 and thereafter were studied using the N-1 criterion.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-012 **Page 1 of 5**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide data on the number, size, and time in queue for DER projects with applications to interconnect into Eversource's NH distribution system between 2018 and 2022.

Response:

The requested data are presented below in the following tables:

- Table 1 includes data on the number of DER projects with applications to interconnect received between 2018 and 2022.
- Table 2 includes data on the average kW size of DER projects with applications to interconnect received between 2018 and 2022.
- Table 3 includes data on the total kW size of DER projects with applications to interconnect received between 2018 and 2022.
- Table 4 includes data on the average time in queue for DER projects with applications to interconnect received between 2018 and 2022.

The data in tables 1, 2, 3, and 4 are broken down by:

1- The year the application was received.

2- The current project status:
   a. Online.
   b. In-queue.
   c. Withdrawn.

3- MW size:
   a. < 0.5 MW.
   b. 0.5 – 1 MW.
   c. 1 – 5 MW.
   d. > 5 MW.

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Note that; the data presented in Tables 1-4 are exclusive to DER projects greater than or equal to 100 kW and following Eversource Standard Interconnection Process or the ISO-NE Interconnection Process.

Table 1: Number of DER Projects		**MW Size Category**			
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Grand Total**
2018					
In-Queue				1	1
Online	10	2			12
Withdrawn	7	14		5	26
2018 Total	**17**	**16**		**6**	**39**
2019					
In-Queue				2	2
Online	10	9			19
Withdrawn	1	27	18	3	49
2019 Total	**11**	**36**	**18**	**5**	**70**
2020					
In-Queue		1		2	3
Online	10	5	1		16
Withdrawn		20	7		27
2020 Total	**10**	**26**	**8**	**2**	**46**
2021					
In-Queue	4	3	2	1	10
Online	16	4			20
Withdrawn	1	1	1	1	4
2021 Total	**21**	**8**	**3**	**2**	**34**
2022					
In-Queue	10	14	8	6	38
Online	4		1		5
Withdrawn			2		2
2022 Total	**14**	**14**	**11**	**6**	**45**
Grand Total	**73**	**100**	**40**	**21**	**234**

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Table 2: Average of project Capacity (KW)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2018					
In-Queue				20,000	20,000
Online	224	858			330
Withdrawn	171	964		11,800	2,834
2018 Average	**202**	**951**		**13,167**	**2,504**
2019					
In-Queue				16,250	16,250
Online	177	909			524
Withdrawn	250	994	4,018	21,600	3,351
2019 Average	**184**	**973**	**4,018**	**19,460**	**2,952**
2020					
In-Queue		1,000		13,000	9,000
Online	213	862	2,656		568
Withdrawn		984	3,426		1,617
2020 Average	**213**	**961**	**3,330**	**13,000**	**1,734**
2021					
In-Queue	100	863	2,500	20,000	2,799
Online	212	940			358
Withdrawn	144	1,000	3,300	20,000	6,111
2021 Average	**188**	**919**	**2,767**	**20,000**	**1,753**
2022					
In-Queue	201	993	2,979	11,058	2,792
Online	138		1,100		330
Withdrawn			2,994		2,994
2022 Average	**183**	**993**	**2,811**	**11,058**	**2,527**
Overall Average	**193**	**965**	**3,454**	**14,698**	**2,382**

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
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Table 3: Sum of project Capacity (KW)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Grand Total**
2018					
In-Queue				20,000	20,000
Online	2,240	1,717			3,956
Withdrawn	1,194	13,500		59,000	73,694
2018 Total	**3,434**	**15,217**		**79,000**	**97,651**
2019					
In-Queue				32,500	32,500
Online	1,770	8,183			9,953
Withdrawn	250	26,833	72,318	64,800	164,201
2019 Total	**2,020**	**35,016**	**72,318**	**97,300**	**206,654**
2020					
In-Queue		1,000		26,000	27,000
Online	2,130	4,310	2,656		9,096
Withdrawn		19,670	23,980		43,650
2020 Total	**2,130**	**24,980**	**26,636**	**26,000**	**79,746**
2021					
In-Queue	400	2,590	5,000	20,000	27,990
Online	3,400	3,760			7,160
Withdrawn	144	1,000	3,300	20,000	24,444
2021 Total	**3,944**	**7,350**	**8,300**	**40,000**	**59,594**
2022					
In-Queue	2,011	13,897	23,831	66,348	106,087
Online	550		1,100		1,650
Withdrawn			5,988		5,988
2022 Total	**2,561**	**13,897**	**30,919**	**66,348**	**113,725**
Grand Total	**14,089**	**96,460**	**138,173**	**308,648**	**557,370**

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Table 4: Average length of Time in Queue (Days)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2018					
In-Queue				1,562	1,562
Online	292	358			303
Withdrawn	227	449		270	355
2018 Average	**265**	**438**		**485**	**370**
2019					
In-Queue				1,277	1,277
Online	205	634			408
Withdrawn	273	212	107	348	183
2019 Average	**211**	**318**	**107**	**720**	**275**
2020					
In-Queue		997		1,002	1,000
Online	202	672	483		367
Withdrawn		133	84		120
2020 Average	**202**	**270**	**134**	**1,002**	**263**
2021					
In-Queue	517	499	387	595	494
Online	256	191			243
Withdrawn	181	42	270	420	228
2021 Average	**302**	**288**	**348**	**508**	**315**
2022					
In-Queue	132	164	188	33	140
Online	192		8		155
Withdrawn			71		71
2022 Average	**149**	**164**	**151**	**33**	**139**
Overall Average	**237**	**301**	**142**	**463**	**268**

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-013 **Page 1 of 15**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide data on the number and size for DER project interconnection costs between 2018 and 2022, including those projects that trigger N-1 upgrades and those that do not.

Response:

The requested data are presented below in the following tables:

- Data for DER projects where a System Impact Study (SIS) was performed, and an interconnection cost estimate was issued to the Interconnection Customer (IC):
  - Table 1 includes data on the number of DER projects with applications to interconnect received between 2018 and 2022.
  - Table 2 includes data on the average kW size of DER projects with applications to interconnect received between 2018 and 2022.
  - Table 3 includes data on the average interconnection cost for DER projects with applications to interconnect received between 2018 and 2022.
  - Table 4 includes data on the average interconnection cost per kW of capacity for DER projects with applications to received interconnect between 2018 and 2022.
- Data for DER projects where a System Impact Study (SIS) was performed, the N-1 planning criteria was applied, and an interconnection cost estimate was issued to the IC:
  - Table 5 includes data on the number of DER projects with applications to interconnect received between 2018 and 2022.
  - Table 6 includes data on the average kW size of DER projects with applications to interconnect received between 2018 and 2022.
  - Table 7 includes data on the average interconnection cost for DER projects with applications to interconnect received between 2018 and 2022.
  - Table 8 includes data on the average interconnection cost per kW of capacity for DER projects with applications to interconnect received between 2018 and 2022.

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- Data for DER projects where a System Impact Study (SIS) was performed, <u>the N-1 planning criteria was applied, the project triggered N-1 upgrades</u>, and an interconnection cost estimate was issued to the IC:
    - Table 9 includes data on the number of DER projects with applications to interconnect received between 2018 and 2022.
    - Table 10 includes data on the average kW size of DER projects with applications to interconnect received between 2018 and 2022.
    - Table 11 includes data on the average interconnection cost for DER projects with applications to interconnect received between 2018 and 2022.
    - Table 12 includes data on the average interconnection cost per kW of capacity for DER projects with applications to interconnect received between 2018 and 2022.
- Data for DER projects where a System Impact Study (SIS) was performed, <u>the N-1 planning criteria was applied, the project did not trigger N-1 upgrades</u>, and an interconnection cost estimate was issued to the IC:
    - Table 13 includes data on the number of DER projects with applications to interconnect received between 2018 and 2022.
    - Table 14 includes data on the average kW size of DER projects with applications to interconnect received between 2018 and 2022.
    - Table 15 includes data on the average interconnection cost for DER projects with applications to interconnect received between 2018 and 2022.
    - Table 16 includes data on the average interconnection cost per kW of capacity for DER projects with applications to interconnect received between 2018 and 2022.

The data in tables 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 are broken down by:

1- The year the application was received.

2- The current project status:
   a. Online.
   b. In-queue.
   c. Withdrawn.

3- MW size:
   a. < 0.5 MW.
   b. 0.5 – 1 MW.
   c. 1 – 5 MW.
   d. > 5 MW.

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Note that interconnection cost estimate data are only available for projects where a SIS was performed, fully completed, and an interconnection cost estimate was issued to the IC.

Therefore, the data presented in Tables 1-16 are exclusive to DER projects greater than or equal to 100 kW and following Eversource Standard Interconnection Process or ISO-NE Interconnection Process, where the above criteria are met.

Data for DER projects where a System Impact Study (SIS) was performed, and an interconnection cost estimate was issued to the Interconnection Customer (IC):

Table 1: Number of DER Projects	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Grand Total**
2018					
In-Queue				1	1
Online	5	2			7
Withdrawn	1	10		2	13
2018 Total	**6**	**12**		**3**	**21**
2019					
In-Queue				2	2
Online	5	9			14
Withdrawn	1	11	1	2	15
2019 Total	**6**	**20**	**1**	**4**	**31**
2020					
In-Queue		1		2	3
Online	7	5	1		13
Withdrawn		4	1		5
2020 Total	**7**	**10**	**2**	**2**	**21**
2021					
In-Queue	1	2	2		5
Online	10	2			12
Withdrawn			1	1	2
2021 Total	**11**	**4**	**3**	**1**	**19**
2022					
In-Queue	2	1	3		6
Online	2				2
2022 Total	**4**	**1**	**3**		**8**
Grand Total	**34**	**47**	**9**	**10**	**100**

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Table 2: Average of project Capacity (KW)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2018					
In-Queue				20,000	20,000
Online	267	858			436
Withdrawn	233	1,000		7,500	1,941
2018 Average	**262**	**976**		**11,667**	**2,299**
2019					
In-Queue				16,250	16,250
Online	247	909			673
Withdrawn	250	1,000	2,000	22,500	3,883
2019 Average	**248**	**959**	**2,000**	**19,375**	**3,231**
2020					
In-Queue		1,000		13,000	9,000
Online	261	862	2,656		677
Withdrawn		980	4,980		1,780
2020 Average	**261**	**923**	**3,818**	**13,000**	**2,128**
2021					
In-Queue	100	795	2,500		1,338
Online	279	980			396
Withdrawn			3,300	20,000	11,650
2021 Average	**263**	**888**	**2,767**	**20,000**	**1,828**
2022					
In-Queue	320	1,000	2,364		1,455
Online	175				175
2022 Average	**248**	**1,000**	**2,364**		**1,135**
Overall Average	**258**	**951**	**2,781**	**15,850**	**2,370**

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Table 3: Average of Interconnection Cost ($)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2018					
In-Queue				$920,000	$920,000
Online	$9,400	$231,500			$72,857
Withdrawn	$0	$207,400		$2,135,200	$488,031
2018 Average	**$7,833**	**$211,417**		**$1,730,133**	**$370,210**
2019					
In-Queue				$1,045,500	$1,045,500
Online	$7,600	$239,556			$156,714
Withdrawn	$136,600	$403,545	$2,549,000	$12,733,900	$2,172,827
2019 Average	**$29,100**	**$329,750**	**$2,549,000**	**$6,889,700**	**$1,189,594**
2020					
In-Queue		$238,000		$3,896,750	$2,677,167
Online	$17,332	$238,600	$512,000		$140,486
Withdrawn		$372,500	$512,000		$400,400
2020 Average	**$17,332**	**$292,100**	**$512,000**	**$3,896,750**	**$564,753**
2021					
In-Queue	$0	$541,912	$1,175,000		$686,765
Online	$0	$296,500			$49,417
Withdrawn			$1,650,000	$10,250,000	$5,950,000
2021 Average	**$0**	**$419,206**	**$1,333,333**	**$10,250,000**	**$838,254**
2022					
In-Queue	$1,000	$350,000	$295,333		$206,333
Online	$1,750				$1,750
2022 Average	**$1,375**	**$350,000**	**$295,333**		**$155,188**
Overall Average	**$10,248**	**$299,571**	**$939,889**	**$5,079,270**	**$736,799**

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Table 4: Average of Interconnection Cost per kW of capacity ($)	MW Size Category				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2018					
In-Queue				$46	$46
Online	$38	$264			$103
Withdrawn	$0	$207		$232	$195
2018 Average	**$32**	**$217**		**$170**	**$157**
2019					
In-Queue				$67	$67
Online	$17	$256			$171
Withdrawn	$546	$404	$1,275	$509	$485
2019 Average	**$105**	**$337**	**$1,275**	**$288**	**$316**
2020					
In-Queue		$238		$336	$303
Online	$49	$276	$193		$148
Withdrawn		$382	$103		$326
2020 Average	**$49**	**$315**	**$148**	**$336**	**$212**
2021					
In-Queue	$0	$710	$421		$452
Online	$0	$305			$51
Withdrawn			$500	$513	$506
2021 Average	**$0**	**$507**	**$447**	**$513**	**$204**
2022					
In-Queue	$6	$350	$123		$122
Online	$10				$10
2022 Average	**$8**	**$350**	**$123**		**$94**
Overall Average	**$35**	**$316**	**$365**	**$285**	**$222**

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Data for DER projects where a System Impact Study (SIS) was performed, the N-1 planning criteria was applied, and an interconnection cost estimate was issued to the IC:

Table 5: Number of DER Projects	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Grand Total**
2019					
Withdrawn				1	1
2019 Total				**1**	**1**
2020					
In-Queue				2	2
Online	2	2			4
Withdrawn		1			1
2020 Total	**2**	**3**		**2**	**7**
2021					
In-Queue	1	2	2		5
Online	8	1			9
Withdrawn			1	1	2
2021 Total	**9**	**3**	**3**	**1**	**16**
2022					
In-Queue	1	1	3		5
Online	2				2
2022 Total	**3**	**1**	**3**		**7**
Grand Total	**14**	**7**	**6**	**4**	**31**

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Table 6: Average of project Capacity (KW)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2019					
Withdrawn				35,000	35,000
2019 Average				**35,000**	**35,000**
2020					
In-Queue				13,000	13,000
Online	233	875			554
Withdrawn		960			960
2020 Average	**233**	**903**		**13,000**	**4,168**
2021					
In-Queue	100	795	2,500		1,338
Online	269	1,000			350
Withdrawn			3,300	20,000	11,650
2021 Average	**250**	**863**	**2,767**	**20,000**	**2,071**
2022					
In-Queue	160	1,000	2,364		1,650
Online	175				175
2022 Average	**170**	**1,000**	**2,364**		**1,229**
Overall Average	**230**	**900**	**2,565**	**20,250**	**3,417**

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Table 7: Average of Interconnection Cost ($)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2019					
Withdrawn				$21,400,000	$21,400,000
2019 Average				**$21,400,000**	**$21,400,000**
2020					
In-Queue				$3,896,750	$3,896,750
Online	$0	$253,000			$126,500
Withdrawn		$560,000			$560,000
2020 Average	**$0**	**$355,333**		**$3,896,750**	**$1,265,643**
2021					
In-Queue	$0	$541,912	$1,175,000		$686,765
Online	$0	$200,000			$22,222
Withdrawn			$1,650,000	$10,250,000	$5,950,000
2021 Average	**$0**	**$427,941**	**$1,333,333**	**$10,250,000**	**$970,864**
2022					
In-Queue	$2,000	$350,000	$295,333		$247,600
Online	$1,750				$1,750
2022 Average	**$1,833**	**$350,000**	**$295,333**		**$177,357**
Overall Average	**$393**	**$385,689**	**$814,333**	**$9,860,875**	**$1,517,252**

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Table 8: Average of Interconnection Cost per kW of capacity ($)	**MW Size Category**				
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**>5MW**	**Overall Average**
2019					
Withdrawn				$611	$611
2019 Average				**$611**	**$611**
2020					
In-Queue				$336	$336
Online	$0	$295			$148
Withdrawn		$583			$583
2020 Average	**$0**	**$391**		**$336**	**$264**
2021					
In-Queue	$0	$710	$421		$452
Online	$0	$200			$22
Withdrawn			$500	$513	$506
2021 Average	**$0**	**$540**	**$447**	**$513**	**$217**
2022					
In-Queue	$13	$350	$123		$147
Online	$10				$10
2022 Average	**$11**	**$350**	**$123**		**$108**
Overall Average	**$2**	**$449**	**$285**	**$449**	**$216**

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Docket No. DE 20-161

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Data for DER projects where a System Impact Study (SIS) was performed, the N-1 planning criteria was applied, the project triggered N-1 upgrades, and an interconnection cost estimate was issued to the IC:

Table 9: Number of DER Projects Year/Status	**MW Size Category** >5MW	**Grand Total**
2019		
Withdrawn	1	1
2019 Total	**1**	**1**
2020		
In-Queue	2	2
2020 Total	**2**	**2**
2021		
Withdrawn	1	1
2021 Total	**1**	**1**
Grand Total	**4**	**4**

Table 10: Average of project Capacity (KW) Year/Status	**MW Size Category** >5MW	**Overall Average**
2019		
Withdrawn	35,000	35,000
2019 Average	**35,000**	**35,000**
2020		
In-Queue	13,000	13,000
2020 Average	**13,000**	**13,000**
2021		
Withdrawn	20,000	20,000
2021 Average	**20,000**	**20,000**
Overall Average	**20,250**	**20,250**

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Table 11: Average of Interconnection Cost ($)	**MW Size Category**	
Year/Status	**>5MW**	**Overall Average**
2019		
Withdrawn	$21,400,000	$21,400,000
2019 Average	**$21,400,000**	**$21,400,000**
2020		
In-Queue	$3,896,750	$3,896,750
2020 Average	**$3,896,750**	**$3,896,750**
2021		
Withdrawn	$10,250,000	$10,250,000
2021 Average	**$10,250,000**	**$10,250,000**
Overall Average	**$9,860,875**	**$9,860,875**

Table 12: Average of Interconnection Cost per kW of capacity ($)	**MW Size Category**	
Year/Status	**>5MW**	**Overall Average**
2019		
Withdrawn	$611	$611
2019 Average	**$611**	**$611**
2020		
In-Queue	$336	$336
2020 Average	**$336**	**$336**
2021		
Withdrawn	$513	$513
2021 Average	**$513**	**$513**
Overall Average	**$449**	**$449**

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Data for DER projects where a System Impact Study (SIS) was performed, <u>the N-1 planning criteria was applied, the project did not trigger N-1 upgrades</u>, and an interconnection cost estimate was issued to the IC:

Table 13: Number of DER Projects	**MW Size Category**			
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**Grand Total**
2020				
Online	2	2		4
Withdrawn		1		1
2020 Total	**2**	**3**		**5**
2021				
In-Queue	1	2	2	5
Online	8	1		9
Withdrawn			1	1
2021 Total	**9**	**3**	**3**	**15**
2022				
In-Queue	1	1	3	5
Online	2			2
2022 Total	**3**	**1**	**3**	**7**
Grand Total	**14**	**7**	**6**	**27**

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Table 14: Average of project Capacity (KW) Year/Status	MW Size Category <0.5MW	0.5-1MW	1-5MW	Overall Average
2020				
Online	233	875		554
Withdrawn		960		960
2020 Average	**233**	**903**		**635**
2021				
In-Queue	100	795	2,500	1,338
Online	269	1,000		350
Withdrawn			3,300	3,300
2021 Average	**250**	**863**	**2,767**	**876**
2022				
In-Queue	160	1,000	2,364	1,650
Online	175			175
2022 Average	**170**	**1,000**	**2,364**	**1,229**
Overall Average	**230**	**900**	**2,565**	**923**

Table 15: Average of Interconnection Cost ($) Year/Status	<0.5MW	MW Size Category 0.5-1MW	1-5MW	Overall Average
2020				
Online	$0	$253,000		$126,500
Withdrawn		$560,000		$560,000
2020 Average	**$0**	**$355,333**		**$213,200**
2021				
In-Queue	$0	$541,912	$1,175,000	$686,765
Online	$0	$200,000		$22,222
Withdrawn			$1,650,000	$1,650,000
2021 Average	**$0**	**$427,941**	**$1,333,333**	**$352,255**
2022				
In-Queue	$2,000	$350,000	$295,333	$247,600
Online	$1,750			$1,750
2022 Average	**$1,833**	**$350,000**	**$295,333**	**$177,357**
Overall Average	**$393**	**$385,689**	**$814,333**	**$281,160**

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Table 16: Average of Interconnection Cost per kW of capacity ($)		**MW Size Category**		
Year/Status	**<0.5MW**	**0.5-1MW**	**1-5MW**	**Overall Average**
2020				
Online	$0	$295		$148
Withdrawn		$583		$583
2020 Average	**$0**	**$391**		**$235**
2021				
In-Queue	$0	$710	$421	$452
Online	$0	$200		$22
Withdrawn			$500	$500
2021 Average	**$0**	**$540**	**$447**	**$197**
2022				
In-Queue	$13	$350	$123	$147
Online	$10			$10
2022 Average	**$11**	**$350**	**$123**	**$108**
Overall Average	**$2**	**$449**	**$285**	**$181**

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-014 **Page 1 of 1**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide data on the number and size for DER projects between 2018 and 2022 that triggered N-1 interconnection upgrades and subsequently withdrew their applications.

Response:

The N-1 planning standard was applied to System Impact Studies (SIS) for a total of thirty-one (31) DER projects that applied for interconnection between 2018 and 2022. Of these DER projects, four (4) triggered N-1 interconnection upgrades. All four projects are rated greater than 5 MW and have an average rated output of over 20 MW. Of the four DER projects with N-1 upgrades, two (2) have subsequently withdrawn their applications. The average rated output of the two withdrawn projects is about 28 MW.

Please refer to the Company's response to Data Request CENH 1-013, Tables 5, 6, 7, and 8 for additional data on DER projects where an SIS was performed, the N-1 planning standard was applied, and an interconnection cost estimate was issued to the interconnecting customer (IC). The response to Data Request CENH 1-013,Tables 9, 10, 11, and 12 also provides additional data on DER projects where an SIS was performed, the N-1 planning standard was applied, *the project triggered N-1 upgrades*, and an interconnection cost estimate was issued to the IC.

Note that the data for projects that triggered N-1 interconnection upgrades are only available when a SIS was performed and fully completed. Therefore, the data presented in the answer above are exclusive to DER projects greater than or equal to 100 kW and following Eversource Standard Interconnection Process or ISO-NE Interconnection Process, where the above criteria are met.

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-015 **Page 1 of 1**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide data on the number of DER projects and their average length of time that they spent in the Eversource's NH queue between 2018 and 2022.

Response:

Please refer to the Company's response to Data Request CENH 1-012, Table 4 for data on the average time in queue for DER projects with applications to interconnect received between 2018 and 2022.

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Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-016 **Page 1 of 2**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide data on the average length of time DER projects spend in the queue once the project interconnection triggers an N-1 upgrade in the Eversource NH territory, before:

a. Proceeding with the project.
b. Withdrawing from the project.

Response:

A total of four (4) DER projects have triggered N-1 interconnection upgrades. Of these DER projects, two (2) have subsequently withdrawn their applications. Eversource does not have data on the time projects spent in the queue between when they triggered an N-1 upgrade and the decision to proceed or withdraw the project. Typically, the time projects can spend in the queue following the completion of the System Impact Study (SIS) before deciding to withdraw or proceed, is determined by the rules of the interconnection process the project falls under (State or FERC) and is independent of the outcome of the SIS.

All four DER projects that have triggered N-1 interconnection upgrades follow the FERC interconnection process, which is managed by ISO-NE. Table 1 includes the data available for each of the four projects:

- ISO-NE queue position.
- Eversource interconnection project number.
- Capacity in MW.
- The date Eversource received the interconnection application from ISO-NE.
- The current project status:
    - In-queue.
    - Withdrawn.
- The date of withdrawal if applicable.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-016 **Page 2 of 2**

ISO-NE Queue Position.	Eversource interconnection project number	Capacity in MW	The date Eversource received the interconnection application from ISO-NE.	The current project status	The date of withdrawal if applicable
938	D1141	35	11/21/2019	Withdrawn	09/21/2020
956	D1189	10	3/16/2020	In-queue	N/A
1016	D1162	16	5/1/2020	In-queue	N/A
1164	D1296	20	10/22/2021	Withdrawn	12/07/2022

Note that the data for projects that triggered N-1 interconnection upgrades are only available when a SIS was performed and fully completed. Therefore, the data presented in the response above are exclusive to DER greater than or equal to 100 kW and following Eversource Standard Interconnection Process or ISO-NE Interconnection Process, where the above criteria are met.

ISO-NE queue positions QP956 and QP1016 have a status of the Interconnection Agreement being in process as of 12/27/22.

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Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-017 **Page 1 of 1**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide a list of the DER project and project sizes that have proceeded with interconnection once they triggered an N-1 upgrade.

Response:

Please refer to the Company's response to Data Request CENH 1-016, for a list of DER projects and project sizes that are still in the queue following the completion of all System Impact Study (SIS) analyses, where the project triggered N-1 upgrades.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: December 27, 2022 **Date of Response: January 11, 2023**
Data Request No. CENH 1-018 **Page 1 of 1**

Request from: Clean Energy NH

Witness: DiLuca Jr, James P, Moawad, Mina

Request:

Please provide a list of the DER project and project sizes that withdrew their interconnection application once they triggered an N-1 upgrade.

Response:

Please refer to the Company's response to Data Request CENH 1-016, for a list of DER projects and project sizes that withdrew their interconnection application following the completion of all System Impact Study (SIS) analyses, where the project triggered N-1 upgrades.