

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Investigation by the Department of Public Utilities)	
On Its Own Motion Into Electric Distribution Companies')	
(1) Distributed Energy Resource Planning and)	D.P.U. 20-75
(2) Assignment and Recovery of Costs for the)	
Interconnection of Distributed Generation)	

**FITCHBURG GAS AND ELECTRIC LIGHT COMPANY d/b/a UNITIL
SYSTEM PLANNING ANALYSIS PROPOSAL**

I. Introduction

On March 23, 2021, the Hearing Officer in the above-referenced docket issued an Memorandum directing the Massachusetts Electric Distribution Companies, including Fitchburg Gas and Electric Light Company d/b/a Unitil (“Unitil” or the “Company”), to develop system planning analysis proposals to implement a distribution system assessment process and submit their respective proposals to the Department of Public Utilities on or before April 23, 2021. The Memorandum instructed the EDCs to consider comments filed in this docket as well as certain criteria including: a defined scope of analysis; analysis for distribution and transmission level upgrades; procedural steps that each EDC will take internally to implement the proposal; how the analysis will consider the Commonwealth’s clean energy and climate policy objectives; stakeholder participation; and a timeline for implementation.

Unitil’s proposed system planning analysis proposal is set forth below. The Company’s proposal is consistent with the Commonwealth’s clean energy and climate policy objectives. Generally speaking, the Commonwealth has committed to achieving Net Zero greenhouse gas

emissions by 2020. Massachusetts Office of Energy and Environmental Affairs, *Massachusetts 2050 Decarbonization Roadmap* at 7 (December 2020). The Commonwealth is also developing a Clean Energy and Climate Plan for 2030 “to equitably and cost-effectively achieve the 2030 limit while maximizing Massachusetts’ ability to achieve Net Zero by 2050.” *Id.* The Commonwealth has identified the increased interconnection of DERs as a strategic component of achieving these objectives. See, e.g., Massachusetts Office of Energy and Environmental Affairs, *Interim Clean Energy and Climate Plan for 2030* at 40-41 (December 30, 2020). Incorporating DER forecasting and planning into the Company’s Electric System Planning process to identify necessary system upgrades to facilitate the incorporation of DER is consistent with the Commonwealth’s expressed clean energy and climate goals.

II. System Planning Analysis Description

Unitil performs various planning activities to assess the short-term and long-term requirements and capabilities of its electric system. These activities include Distribution System Planning to evaluate primary distribution circuits and substations, and Electric System Planning to evaluate Unitil transmission and subtransmission systems. Unitil proposes to enhance its annual planning process to include the analyses needed for the forecasting and planning of distributed energy resources (DER), as described more fully below.

III. Equipment Rating and Voltage Threshold Criteria

Thermal ratings of each load-carrying element in the system are established based on Unitil’s Equipment Rating Procedure and Planning Guidelines. The Company’s Planning Guidelines and Rating Procedures are attached hereto as Attachments A, B, and C. These rating methodologies are used for 69kV system, substation, and distribution equipment. The thermal

ratings of each modeled system element reflect the most limiting series equipment within that element (including related station equipment such as buses, circuit breakers, and switches). Minimum and Maximum voltage thresholds are also established based on Unitil's planning guidelines for each modelled "bus"/location on the system.

It is Unitil's intent to utilize these historically established thresholds for all loading analysis (peak load, minimum daytime load, etc.) that is performed and utilize one consistent planning criteria for all studies.

IV. Electric System Planning

Unitil's Electric System Planning performs analysis of the FG&E 115kV supply and the 69kV lines which serve distribution substations. The study process is conducted on an annual basis and examines a ten year forecast of system conditions to identify when individual equipment loading and voltage performance concerns will occur, and propose specific system modification recommendations to meet Unitil's system planning guidelines.

The electric system planning process starts with the Distribution Engineering Department forecasting the system load demands for the Unitil operating area. Three load levels (Average Peak Load, Peak Design Load and Extreme Peak Load) are calculated and projected for ten years in the future. In projecting future loads, it is important to use realistically conservative load projections. If the load projections are not conservative enough, the system could be undersized for the amount of load experienced and electric equipment could fail resulting in large customer outages. However, if the load projections are overly conservative, the cost to the ratepayers to design and build a system capable of serving the projected load could be unrealistically high. For that reason Unitil uses two load levels in its system planning process. The Peak Design Load

is used when evaluating the system's ability during equipment contingencies. The Extreme Peak Load is the load level with a probability of being exceeded once every twenty-five years. This load level is used to evaluate the system's capability during normal system conditions with no equipment contingencies.

The load projections are then entered into a computer model of the lines and electric system equipment. The model contains impedance and thermal ratings of the electric equipment to calculate the expected voltages and power flows at each point on the 69 kV system. These calculated power flows are used to ensure the voltage is within specific ranges and the equipment is not overloaded.

Historically, DER forecasting and system load forecasting has been performed separately. However in 2021 Unitil began directly incorporating DER projections into system load forecasts. This is done by combining the individual system load and system DER forecasts (see DER Forecasting below) to create an overall system load forecast.

Unitil intends to add Minimum Daytime Load/Peak DER analysis to this process in an attempt to identify potential future constraints due to anticipated DER penetration. At a minimum this will require the creation of a minimum daytime load snapshot model that will then be modified to create future models that include forecasted DER. In the event DER facilities have special operating agreements, such as generation curtailment, additional snapshot and future case models could be required.

V. Distribution System Planning

Distribution planning consists of radial circuit analysis planning on Unitil's 13.8kV and 4.16kV distribution circuits. Distribution planning also includes circuit load forecasting and

loading reviews of the distribution substation transformers and equipment. Distribution system planning is conducted annually and has historically covered a five year timeframe. The distribution system planning process evaluates distribution substations and distribution circuits to identify individual equipment loading and voltage performance concerns, and propose specific system modification recommendations.

A five year history of summer and winter peak demands for each individual circuit is compiled from historical peak demand information. A linear regression analysis is performed on the historical loads to forecast future peak demands for substation transformers, circuits and other major devices. A detailed review is made of the limiting equipment associated with the circuit positions and transformers at each substation. The limiting equipment include current transformer ratings, protection device ratings and settings, voltage regulator ratings, switch ratings, circuit exit conductor ratings, regulator ratings, and transformer ratings. Overall Summer Normal and Winter Normal ratings for each circuit positions or substation transformers are based upon the most restrictive of these limiting elements.

Summer and winter peak load projections for the five year study period are compared to these ratings. Individual assessments are made where projected loads reach 90% of the Normal ratings for any circuit position or transformer. These individual assessments determine whether the loading condition requires remediation or further monitoring. System enhancements and/or modifications are made prior to the load reaching 100% of the limiting element rating

Circuit planning analysis is performed on every circuit on the Unitil system each year. Detailed analysis is performed on a three year rotating cycle, where each circuit is analyzed at

least once every three years and more often if required. All other circuits not scheduled for detailed analysis in a given year are reviewed to confirm previous study results.

Detailed circuit analysis starts with each circuit being exported from Unitil's GIS. The circuits are then imported into circuit analysis software and loads are applied across the circuit using historical customer billing data and the five year peak load projections discussed above. Any violations of loading and/or voltage criteria are flagged and reviewed in more detail to determine/if when system upgrades are needed.

A circuit review starts with a previous year's circuit model and has updated load projections applied. The circuit is reviewed for voltage and loading constraints to confirm previous results. Any discrepancies between results are reviewed in more detail.

Additionally, any substation that serves a circuit with aggregate amount of DER of more than 500kW or 15% of the circuit peak (whichever is smaller) will be analyzed under minimum daytime load conditions. It is Unitil's intent to enhance this analysis to include the utilization of customer billing information from the minimum daytime load month and to include all DER that is approved for installation in the analysis. Unitil is also evaluating the possibility of utilizing estimated (actual if available) DER output and customer load for the minimum daytime hour from ADMS, however this information is not expected to be readily available until late in 2022. Additionally, Unitil is considering the possibility of including projected small scale DER in this analysis and is currently reviewing how to incorporate forecasted DER in the minimum daytime load modelling process.

It is Unitil's intent to directly incorporate DER projections into the distribution planning process. The forecasted DER will be combined with minimum load forecast to perform circuit analysis in a similar manner to which it is currently being done for system load forecasts.

VI. DER Forecasts

Unitil produces ten year projections of the installed capacity of DER. The process for developing the DER capacity projections requires the projection of small DER facilities based on five years of historical data. These projections are then added to the capacity of all DER facilities to create an overall DER capacity projection for each distribution circuit, distribution substation transformer and the overall system. Overall system DER capacity projections also include the projected penetration of medium and large DER facilities.

Due to the limited number of medium and large facilities and the uncertainty of where these facilities may be located, Unitil does not include these in the circuit and substation transformer DER projections. Similarly, circuit, substation transformer and system projections will not include the forecasting of utility scale facilities. Instead, Unitil has elected to treat these facilities in a similar fashion to large customer load additions and add them to the DER projections as step-adders per the customer schedule and engineering judgement.

It is Unitil's intent to utilize the DER forecasts to develop minimum daytime load/generation forecasts for each distribution circuit that will include forecasts of small scale DER. These forecasts will be compared against the substation equipment and transformer ratings as well as the limiting conductor rating from the substation to the first "mainline" protective device in an attempt to identify equipment loading violations.

VII. Project Evaluation

All loading and/or voltage based projects are reviewed and evaluated per Unitil's Project Evaluation Process. This process establishes a workflow for project evaluation, thresholds for alternative requirements, such as non-wires alternatives and a detailed cost/benefit analysis template.

Whenever a loading and/or voltage driven constraint is identified that will require upgrades to the distribution system, 69kV system, and/or within a substation, Project Evaluation Process will be followed to determine the need for alternatives and the necessary detail of project evaluation that will be required.

The detailed cost benefit analysis template establishes a weighted scoring methodology that is used to calculate an overall ranking of alternatives. Alternatives are reviewed based on functionality, environmental impacts, reliability, feasibility, cost, and value added benefits of DER.

VIII. Stakeholder Participation and Time Line

Unitil anticipates stakeholder participation at three stages of the annual forecasting and planning process. The first stage will be a presentation of the area to be studied as well as the circuits to undergo detailed circuit analysis. At this first presentation, the DER forecast will also be presented. This meeting would be held in in the first quarter of the year. This first stakeholder presentation will allow stakeholders to present plans of developing DER that may not have been known by Unitil at the time of forecasting the DER. The DER forecast will be adjusted as needed and the planning model will be developed to perform the planning analysis to determine the system constraints as described above.

The second stage of stakeholder participation will be the presentation of the constraints determined by the planning process with the proposed system enhancements being evaluated to alleviate the constraints. At this stage, stakeholders will have the opportunity to suggest reasonable alternative solutions. The alternative solutions (if any) may be added to those enhancements being evaluated. Some alternative solutions may require additional analysis to determine their effect on the system constraints. After all optional solutions are evaluated, final recommendations will be made. Unitil expects this stakeholder meeting would take place during the third quarter of the year.

The third stage of stakeholder participation will be the presentation of the final recommended solutions, and costs. Assuming the alternative solutions are not too complex and require additional study, Unitil expects the presentation of the final recommended solutions would be performed in the fourth quarter of the year. After this is done, the Planning reports will be finalized.

Unitil conducts Electric System Planning on an annual basis and has already commenced its 2021 Electric System Planning process. The earliest that the Company would be able to implement the proposal outline above would be in its 2022 Electric System Planning Process.

Respectfully submitted,

Fitchburg Gas and Electric Light Company d/b/a Unitil

By its counsel,

A handwritten signature in black ink, appearing to read 'P. H. Taylor', written over a horizontal line.

Patrick H. Taylor (BBO# 663958)

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