October 7, 2022

Mr. Jeffrey R. Gaudiosi, Esq.
Executive Secretary
Public Utilities Regulatory Authority
10 Franklin Square
New Britain, CT 06051

RE: Docket No. 17-12-03RE08 – Public Utilities Regulatory Authority Investigation into Distribution System Planning of the Electric Distribution Companies – Resilience and Reliability Standards and Programs - **Compliance Order No. 12**

Dear Mr. Gaudiosi:

The United Illuminating Company ("United Illuminating") and the Connecticut Light and Power Company d/b/a Eversource Energy ("Eversource") hereby jointly submit to the Public Utilities Regulatory Authority ("PURA" or "Authority") the following in compliance with Order No. 12 of the Authority's final decision dated August 31, 2022 in the captioned docket (the "Decision").

Order No. 12 states:

> "No later than October 7, 2022, the EDCs shall conduct and submit for Authority review and approval a detailed scope of work, timeline, and anticipated budget for completing its Climate Change Vulnerability Study as described in Section B.8.b., Prospective Modeling of Climate Change Risk."

Pursuant to Order No. 12, United Illuminating and Eversource have collaborated to prepare the attached scope of work, timeline, and anticipated budgets for completing their Climate Change Vulnerability Study. The Companies have also begun collaborating and meeting with the Department of Energy and Environmental Protection (DEEP) and the Connecticut Institute for Resilience and Climate Adaptation (CIRCA), including having shared a draft version of the study scope included in this filing. We look forward to active engagement and collaboration with DEEP and CIRCA throughout all phases of this important study to ensure the deliverables are useful, practical, and based on best available information.

Respectfully Submitted,

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Enclosure: UI+ES Climate Change Vulnerability Study Scope

Connecticut EDC Climate Change Vulnerability Scope

Introduction

To prepare for the effects of climate change, and as directed by the Public Utilities Regulating Authority (PURA) in Docket No. 17-12-03RE08, United Illuminating ("UI") and Eversource ("ES") (the EDCs) will be performing a Climate Change Vulnerability study to determine how future climate change may affect the EDC's electric distribution planning, operations, and infrastructure. This proposed scope of work includes input and collaboration with the Connecticut Department of Energy and Environmental Protection (DEEP), the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) as well as other UConn faculty to ensure that the study scope considers guidance from the latest climate science, ongoing research activities, and climate change findings developed through other internal state efforts; e.g., the Governor's Council in Climate Change.[1] The EDCs look forward to continued collaboration with DEEP and CIRCA to help leverage their extensive expertise in the climatology of Connecticut.

The EDCs propose that the study be broken down into three phases as follows:

> **Phase 1:** Identify climate change hazards and development of short and long-term projections of relevant climate change variables.
>
> **Phase 2:** Identify the expected EDC asset vulnerabilities resulting from the climate hazard projections.
>
> **Phase 3:** Develop a strategic roadmap and plan to address the identified vulnerabilities. This roadmap and plan will be used as an input to inform changes to EDC planning policies, including Reliability and Resilience Frameworks.

The EDCs have elected to work collaboratively in development of this scope to ensure consistency in study approaches. The EDCs plan to work together in the Phase 1 portion of the study and then work separately, but collaboratively, on the more EDC specific Phases 2 and 3. The climate vulnerability study will establish a set of criteria for adapting to climate change by establishing a transparent and replicable study methodology.[2]

Phase 1: Climate Change Projections

The first phase of the Climate Change Vulnerability Study will assess relevant climate variables utilizing best available and industry-approved techniques to develop climate variable and extreme weather projections on a decadal timescale for two future emissions scenarios: RCP/SSP2-4.5 and RCP/SSP5- 8.5. These projections will be developed with spatial resolution sufficient to identify vulnerabilities at a granular level (i.e., at least by substation) and a time horizon that reflects the useful life of utility assets. Figure 1 below provides a graphical representation of this first study phase.

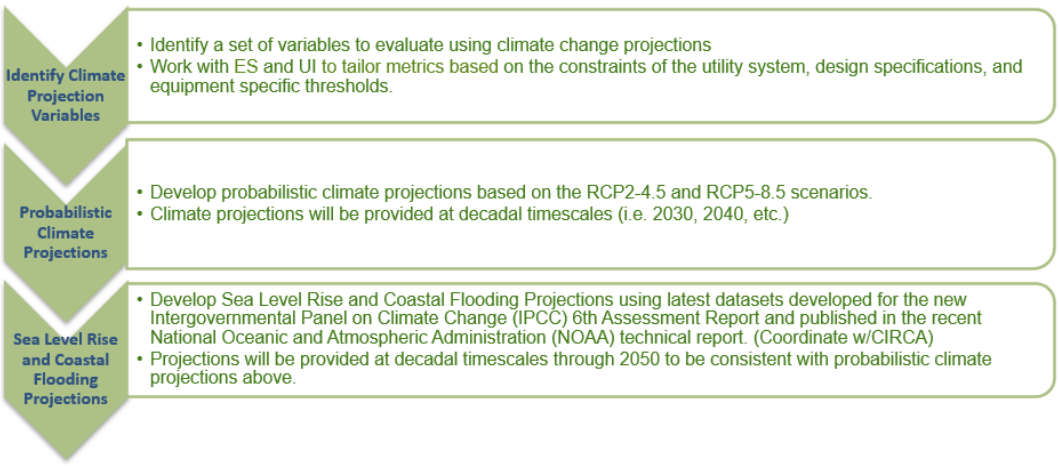
[1] https://portal.ct.gov/DEEP/Climate-Change/GC3/Governors-Council-on-Climate-Change
[2] Planning or studies related to efforts to enable decarbonization of the energy sector, or reduce EDC greenhouse gas emissions are not part of this study.

UI+ES Order No 12 Attachment 1 CT EDC Climate Change Vulnerability Study Scope

The United Illuminating Company

Docket No. 17-12-03RE08

Figure 1 – Climate Projection Overview



Climate science probabilistic projections will include a set of climate variable projections used to assess the effects and pace of climate change that is expected to occur. The EDCs will endeavor to determine probabilistic projections for climate hazards that are conducive to modeling with a sufficient level of confidence in the results. For climate hazards that are not suitable for probabilistic projections, e.g., tropical cyclones, Phase 1 of the study will instead include a qualitative assessment of climate change projections.

In some cases, previous studies and/or peer-reviewed literature, e.g., Sea Level Rise in Connecticut Final Report February 2019 (O'Donnell),[3] may be used in lieu of, or in concert with, modeling efforts performed by the EDC.

A listing of sample climate variables and associated hazards that may be utilized are shown in Table 1.

Table 1 - Sample Climate Hazards

Hazard	Example Climate Variables
Temperature	• Average monthly temperature • 1-in-10 year daily maximum temperature • Days with maximum daily temperature above 95°F, 100°F, 104°F, 105°F, 110°F • Number of 3 and 5 consecutive days over 95°F and 100°F • Days with minimum daily temperatures above 75°F • 1-in-10 year daily minimum temperature • Annual coldest temperatures and cold snaps
Precipitation	• Maximum 5-day precipitation (relevant for inland flooding) • Days with precipitation above 1, 2, and 3 inches • Days with frozen precipitation (ice and snow)
Energy Demand	• Annual and monthly heating degree days and cooling degree days

[3] https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/10/Sea-Level-Rise-Connecticut-Final-Report-Feb-2019.pdf

Sea Level Rise & Coastal Flooding	• Relative sea level rise • Relative sea level rise plus the 100-year storm • Category 1, 2, and 3 hurricane storm surge and extent
Wind	• Days exceeding the 95th percentile daily average windspeed • Average annual windspeed
Extreme Weather	• Extratropical cyclones (Nor'easters) • Tropical cyclones • Extreme heat / cold • Event Return Period evaluation

Phase 2: Climate Change Vulnerability Assessment

The objective of this second phase of the study will be to identify the expected EDC location and asset vulnerabilities resulting from the climate hazard projections established in Phase 1. As part of this phase, the study will prioritize the vulnerabilities of at-risk assets based on their exposure, sensitivity, and adaptive capacity as described below:

- Exposure: Exposure aims at showing vulnerable locations on the system at the substation level (same granularity as the climate change variables), as well as whether an impact relationship exists between the asset type and the climate change variable. For example, wind affects overhead distribution lines but not underground distribution lines. Exposure entails a temporal element as it can vary with the range of values of each variable and thus can change across the decadal timesteps. For example, sea level rise may have no initial adverse impact on a new substation but in the later years of its expected 50 plus year life, the sea levels may rise to a level that exceeds the threshold of concern.
- Sensitivity: A sensitivity assessment includes an evaluation of comparative qualitative relationships. For example, winds impact both poles and overhead conductors, but poles are less sensitive than conductors to a given wind speed. There are also other factors affecting an asset's sensitivity to climate variables, including its physical condition, and proximity to interfering vegetation. Although these factors are considered in our planning standards and studies, they are outside the scope of this effort.
- Adaptive Capacity:[4] For this study the term adaptive capacity is considered to be synonymous with flexibility in adaptability. In this sense, the study will consider possible measures to counteract the impacts climate change to an asset type and an evaluation at their effectiveness.

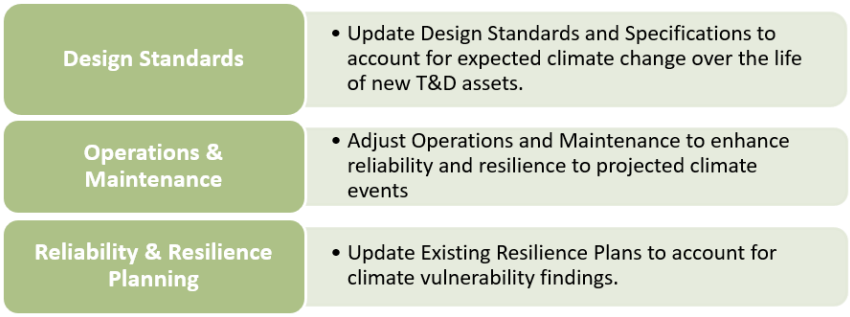
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[4] In the context of "exposure, sensitivity, and adaptive capacity," the term capacity refers to an asset's ability to adapt and not to the amount or type of electricity generation and/or distribution line headroom an area possesses.

Phase 3: Mitigation Recommendations

Phase 3 of the Climate Change Vulnerability Study will focus on identifying planning policy and standards changes needed to effectively address the asset type vulnerabilities defined in Phase 2. Figure 2 below describes some example mitigation strategies that may be identified as a result of this study. Any mitigation strategies will be reconciled with other projects and initiatives that are part of the reliability and resilience frameworks.

Figure 2 – Example Mitigation Strategies



Stakeholder Engagement

Engaging stakeholders throughout the Climate Vulnerability study will be crucial in communicating the study goals and adapting the study process and outputs to align with municipal and state agency plans for climate resiliency. To enable our community engagement goals, the EDCs will develop a comprehensive engagement plan for disadvantaged communities and other stakeholders, including use of the PURA Data Dashboard to communicate climate change vulnerability study results. In this engagement plan the EDCs expect to hold a number of stakeholder engagement meetings or other outreach opportunities to share information, collaborate on issues, and collect feedback.

Potential stakeholders may include, but are not limited to: PURA, DEEP, CIRCA, municipalities, and customer advocacy groups.

Budget & Schedule

Climate science and the related projection modeling necessary for this study is a specialized skill set that the EDCs do not have with their own internal resources. Additionally, each EDC may need to outsource other portions of this study depending on available internal expertise and resource bandwidth. For this reason, the budget amount for each EDC is described separately below.

Eversource

Eversource is at this point expecting to conduct Phases 2 and 3 using internal resources and is therefore assuming a project cost in the area of $150,000, with an accurate cost figure to be determined once the scope is finalized.

UI+ES Order No 12 Attachment 1 CT EDC Climate Change Vulnerability Study Scope

United Illuminating

At this time, United Illuminating expects to contract out a substantial portion of all three phases of this study with internal subject matter expert leadership and oversight. United Illuminating does not have an accurate estimate of the total cost of this study as the scope is not yet approved. However, based on experience with similar studies, a placeholder budget of $400,000 is proposed which will be finalized once the study scope is complete and issued for contractor pricing.

Schedule

The proposed schedule to complete this study is dependent on when the scope is finalized and approved but overall, it is expected to take approximately 18 months to complete from when approval is received. The individual timelines of each phase is estimated as follows:

Phase 1: Approximately 6 months. This allows time to secure specialized support based on the final approved scope.

Phase 2: Approximately 6 months after completion of Phase 1.

Phase 3: Approximately 6 months after completion of Phase 2.