STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Web Site: portal.ct.gov/csc

VIA ELECTRONIC MAIL

May 16, 2022

Leonard Rodriguez Esq.
Deputy General Counsel
Avangrid Networks, Inc.
180 Marsh Hill Road
Orange, CT 06477
Leonard.Rodriguez@avangrid.com

RE: **LIFE-CYCLE 2022 -** Connecticut Siting Council Investigation into Life-Cycle Costs of Electric Transmission Lines.

Dear Attorney Rodriguez:

The Connecticut Siting Council (Council) requests your responses to the enclosed questions no later than June 13, 2022.

Please submit an original and 15 copies to the Council's office and an electronic copy to siting.council@ct.gov. In accordance with the State Solid Waste Management Plan and in accordance with Section 16-50j-12 of the Regulations of Connecticut State Agencies, the Council requests all filings be submitted on recyclable paper, primarily regular weight white office paper. Please avoid using heavy stock paper, colored paper, and metal or plastic binders and separators. Fewer copies of bulk material may be provided as appropriate.

Please be advised that the original and 15 copies are required to be submitted to the Council's office on or before the June 13, 2022 deadline.

Any request for an extension of time to submit responses to interrogatories shall be submitted to the Council in writing pursuant to §16-50j-22a of the Regulations of Connecticut State Agencies.

Sincerely,

Melanie Bachman
Executive Director

LIFE-CYCLE 2022

The United Illuminating Company - Interrogatories, Set One

Overhead Transmission Lines

1. For new overhead transmission line installations in Connecticut, what transmission structure designs, including structure material and conductor arrangement (e.g. single-circuit vertical steel monopole), are mostly commonly used and for what reason(s)?

2. What structure designs, including structure material and conductor arrangements, are no longer used and for what reason(s)?

3. Of the overhead configurations listed in response to Question 1, what configurations would UI consider prudent for life cycle analysis? Please complete the table provided with current first cost per linear mile and losses for each of the noted configurations. Include information for both a single circuit and double circuit transmission line design.

First Costs		**Losses**	
Poles & Foundations		Conductor Size & Type	
Conductor & Hardware		Resistance (ohms/mile per conductor)	
Site Work		Number of Conductors Per Phase	
Construction		Peak Line Current (amps)	
Engineering		Annual Load Growth (%)	
Sales Tax		Loss Factor	
Project Management		Energy Cost ($/MWh)	
		Annual Energy Cost Escalation (%)	

4. Complete the table provided with current first cost per linear mile and losses for each of the following overhead electric transmission line configurations, if not already addressed in Question 3:
    a) 115 kilovolt (kV) wood H-frame
    b) 115 kV steel delta
    c) 345 kV wood H-frame
    d) 345 kV steel delta

First Costs		**Losses**	
Poles & Foundations		Conductor Size & Type	
Conductor & Hardware		Resistance (ohms/mile per conductor)	
Site Work		Number of Conductors Per Phase	
Construction		Peak Line Current (amps)	
Engineering		Annual Load Growth (%)	
Sales Tax		Loss Factor	
Project Management		Energy Cost ($/MWh)	
		Annual Energy Cost Escalation (%)	

5. What type of conductors does UI typically install for new overhead transmission lines? Why was this conductor type selected?

6. What is the expected design life of an overhead transmission line?

7. For variables listed under Losses in Questions 3 and 4, provide the origin of the value. Is the Loss Factor constant or does it vary over the life cycle period?

8. Provide costs per circuit mile of the past five years for operation and maintenance of UI's existing overhead transmission lines in accordance with Federal Energy Regulatory Commission (FERC) Accounts 560, 563, 564, 568, 571, and 572.

9. Provide costs per mile of the past five years for UI's vegetation management activities for transmission line rights-of-way. What FERC Account is UI's vegetative management cost assigned to?

10. Provide the rationale of including or not including the following overhead transmission line configurations:
    a) Lattice structures;
    b) Laminate structures; and
    c) Vertical conductor design.

Underground Transmission Lines

11. For new underground transmission line installations in Connecticut, what underground transmission designs, including cable type and arrangement (e.g. single-circuit horizontal XLPE), are most commonly used and for what reason(s)?

12. Which underground transmission line designs, including cable type and arrangements, are no longer used and for what reason(s)?

13. Of the underground configurations listed in response to Question 11, what configurations would UI consider prudent for life cycle analysis? Please complete the table provided with current first cost per linear mile and losses for each of the noted configurations. Include information for both a single circuit and double circuit transmission line design.

First Costs		**Losses**	
Ducts & Vaults		Cable Size & Type	
Cable & Hardware		Resistance (ohms/mile per conductor)	
Site Work		Number of Conductors Per Phase	
Construction		Peak Line Current (amps)	
Engineering		Annual Load Growth (%)	
Sales Tax		Loss Factor	
Project Management		Energy Cost ($/MWh)	
		Annual Energy Cost Escalation (%)	

14. Complete the table provided with first cost per linear mile and losses for each of the following underground electric transmission line configurations if not already addressed in Question 13:

    a) 115 kV high pressure fluid filled (HPFF) pipe
    b) 345 kV HPFF
    c) 115 kV cross-linked polyethelene (XLPE)
    d) 345 kV XLPE

First Costs		**Losses**	
Ducts & Vaults		Cable Size & Type	
Cable & Hardware		Resistance (ohms/mile per conductor)	
Site Work		Number of Conductors Per Phase	
Construction		Peak Line Current (amps)	
Engineering		Annual Load Growth (%)	
Sales Tax		Loss Factor	
Project Management		Energy Cost ($/MWh)	
		Annual Energy Cost Escalation (%)	

15. Do First Costs for HPFF transmission include fluid pumping and cooling equipment?

16. For variables listed under Losses in Questions 13 and 14, provide the origin of the value. Is the Loss Factor constant or does it vary over the life cycle period?

17. What is the expected design life of an underground transmission line?

18. Provide costs per circuit mile of the past five years for operation and maintenance of UI's existing underground transmission lines in accordance with FERC Accounts 560, 563, 564, 568, 571, and 572.

19. What type of conductors does UI typically install for new underground transmission lines? Why was this conductor type selected?

Life Cycle Costs

20. Provide the following variables for cost calculations including the origin of the value:
    a) Capital recovery factor;
    b) Annual Operation and maintenance cost escalation rate as a percent; and
    c) Discount rate.

21. Provide information regarding existing transmission facilities by length, voltage, construction type, and single/double circuit installation.

22. List all relevant standards applicable to 115kV and/or 345kV transmission resources for the following categories:
    a. Reliability;
    b. Security;
    c. Vegetation Management, and
    d. Storm hardening.

23. Have the National Electric Safety Code and/or the State of Connecticut Building Code been updated within the last five years? If yes, would the updated codes impact life cycle costs? Identify code changes that significantly increase life cycle costs.

24. List federal and state permits and registrations that may be required to a construct a transmission line in Connecticut. How are such permits/registrations accounted for in first costs and life cycle costs?

25. Does UI anticipate constructing new transmission lines that operate only at 69-kV or 138-kV within the next 5 years. If yes, in what locations and for what reasons?

26. Describe how leak prevention and containment measures used for HPFF cable systems could impact life-cycle costs.

27. Has UI experienced, in the last five years, issues with construction or maintenance of overhead or underground transmission lines in locations that required special processes or procedures due to environmental sensitivity? If so, please describe the situations and the cost impacts.

28. ISO-New England (ISO-NE) has issued planning and operating standards for design and operation of transmission facilities. One standard prescribes transmission line ratings for normal conditions,

short-term emergency and long-term emergency conditions. Does UI expect the standards to impact transmission line life-cycle costs, and if so, to what extent?

29. Has UI identified other ISO-NE policies or operating procedures that are anticipated to impact transmission line life-cycle costs? If so, what are they and what is the anticipated impact?

30. Under what conditions would UI consider using high voltage direct current (HVDC) lines for long-distance power transfers? How would the life cycle costs of HVDC lines compare to high voltage alternating current (HVAC) transmission lines?

31. Are UI's transmission line capital and construction costs higher, on par, or lower than other Northeast Power Coordinating Council region utilities? If higher or lower, by what percentage and perceived reason?

32. Are UI's transmission line operation and maintenance costs higher, on par, or lower than other Northeast Power Coordinating Council region utilities? If higher or lower, by what percentage and perceived reason?

33. What policies and/or methods could be implemented to reduce or offset life-cycle costs of transmission lines?

34. Does UI have a telecommunications antenna attachment policy for overhead transmission line structures? If so, what is the policy?