

75 Charter Oak Avenue, Suite 1 - 103, Hartford, CT 06106
T 860.563.0015
ctgreenbank.com



August 1, 2024

Via Electronic Filing

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

Re:

Docket No. 23-08-02 - ANNUAL RESIDENTIAL RENEWABLE ENERGY SOLUTIONS PROGRAM REVIEW - YEAR 3 - Compliance with PURA Order No. 35.

Docket No. 24-08-02 - ANNUAL RESIDENTIAL RENEWABLE ENERGY SOLUTIONS PROGRAM REVIEW - YEAR 4

Docket No. 24-08-03 - ANNUAL NON-RESIDENTIAL RENEWABLE ENERGY SOLUTIONS PROGRAM REVIEW - YEAR 4

Docket No. 24-08-04 - ANNUAL SHARED CLEAN ENERGY FACILITY PROGRAM REVIEW - YEAR 6

Docket No. 24-08-05 - ANNUAL ENERGY STORAGE SOLUTIONS PROGRAM REVIEW - YEAR 4

Dear Mr. Gaudiosi:

The Connecticut Green Bank (the "Green Bank") respectfully submits its compliance with Order No. 35 of the Final Decision dated November 1, 2023, in the above-referenced docket. Specifically, Order No. 35 states:

35. No later than August 1, 2024, the Authority requests that CGB provide an update on the stakeholder process to develop recommendations to resolve the issue of solar panel and battery recycling and waste for clean energy projects in Connecticut. The Authority respectfully requests that CGB convene and lead a working group of relevant stakeholders, including DEEP and the EDCs, to develop recommendations to resolve the issue of solar and battery waste that consider the environmental effects of solar panel and battery waste and the success or failure of approaches used in other jurisdictions. Further, all recommendations should include a description of the pros and cons of each approach, and an estimate of each approach's implementation timeline

and cost. The Authority requests that the update, including any recommendations developed, be filed in Docket Nos. 24- 08-02, 24-08-03, 24-08-04, and 24-08-05.

The Green Bank submits the following response in compliance with Order No. 35.

The attached Solar and Battery End of Life Considerations (the “Report”) was prepared by Power Advisory, LLC, a consultant selected through an incredibly competitive RFP.

Process and Collaboration

The recommendations in the Report prepared by Power Advisory are the result of an extensive and collaborative process:

- 1. Literature Review:** Power Advisory conducted a thorough review of existing policies, programs, and practices related to the end-of-life management of solar panels and batteries in other jurisdictions. While this is a new field, several other states have taken the initial steps towards implementing solar and storage end-of-life solutions. This review provided a foundational understanding of the challenges and strategies implemented elsewhere.
- 2. Working Group Sessions:** The End-of-Life Working Group (“EOL Working Group”), consisted of representatives from key stakeholder groups, including the Department of Energy and Environmental Protection (“DEEP”), the Office of Consumer Council (“OCC”), Connecticut Innovations, electric distribution companies (Eversource and United Illuminating), installers, developers, manufacturers, and recyclers. The EOL Working Group held five monthly meetings from March to July 2024. Notice of the EOL Working Group was posted to the Secretary of State, RSIP and ESS installer and manufacturer lists, and to the RRES docket. All materials generated as part of the EOL Working Group are posted to the Green Bank website¹. These sessions facilitated comprehensive discussions on the best practices and potential solutions for Connecticut.
- 3. In-Depth Interviews:** Power Advisory and the Green Bank conducted sixteen one-on-one interviews with various stakeholders, including three state agencies, one federal agency, three OEMs, four developers, two trade associations, one solar panel recycler, one battery recycler, and one academic institution. These interviews provided valuable insights into current practices, market readiness, and stakeholder perspectives.

The collective effort of these activities ensured a holistic approach to identifying and evaluating the most viable end-of-life management options for Connecticut. The Green Bank is grateful to the members of the EOL Working Group and our interviewees for supporting this process and by providing their expert knowledge. In particular, we wish to thank DEEP staff for their expert support regarding Connecticut waste standards and policy.

¹ <https://ctgreenbank.com/eol-working-group>

Environmental Effects of Solar and Storage End-of-Life

The environmental effects of improper end-of-life management for solar panels and batteries are significant:

- **Solar Panels:** If not properly disposed of, solar panels can end up in landfills. If the solar panels contain hazardous materials such as lead or cadmium, those materials can leach into the soil and groundwater. To our knowledge, no solar panels containing cadmium were installed as part of the RSIP program. However, landfilling solar panels wastes materials like aluminum and glass, which could be recovered and reused.
- **Batteries:** Batteries, especially lithium-ion batteries, contain hazardous materials that can cause soil and water contamination if disposed of improperly. They are also prone to thermal runaway, which can lead to fires and explosions, posing significant safety hazards. Proper recycling can recover valuable materials such as lithium, cobalt, nickel, and manganese, reducing the need for new mining and its associated environmental impact.

It is timely that PURA directed the Green Bank to convene the EOL Working Group now:

1. **Consumer Protection:** As solar panels and batteries begin to fail, there is currently no standardized or developed plan for how they will be handled or who will bear the costs of their disposal and recycling. Without clear guidelines and financial mechanisms in place, the burden may fall on consumers, potentially leading to improper disposal and associated environmental risks. By establishing these frameworks now, we protect consumers from unforeseen costs and responsibilities, ensuring a safe and orderly process as the volume of waste increases.
2. **Growing Waste Stream:** As the adoption of solar panels and battery storage systems increases, so does the volume of end-of-life products. Proactively establishing effective end-of-life management strategies will prevent a future waste crisis.
3. **Economic Opportunities:** Effective recycling and material recovery can create economic opportunities by fostering a recycling industry, creating jobs, and reducing the costs associated with raw material procurement.
4. **Public Health and Safety:** Proper management of hazardous materials in solar panels and batteries will protect public health and safety by preventing environmental contamination and reducing fire risks associated with improper disposal.

End-of-Life Management Strategies Overview

In developing the Report, Power Advisory identified three primary waste management strategies:

- **Extended Producer Responsibility (“EPR”):** EPR is a policy approach that places the responsibility for the end-of-life management of products on the manufacturers. Under EPR, manufacturers are accountable for the collection, recycling, and disposal of a given product. This framework encourages manufacturers to design products that are easier to recycle and have a lower environmental impact.

- **Advanced Fee Administration (“AFA”):** AFA involves collecting a fee at the point of sale to fund future recycling efforts. This fee ensures that adequate resources are available for the proper disposal and recycling of equipment at the end of its life cycle. This method provides a sustainable funding source and promotes responsible end-of-life management without imposing a significant financial burden on end-users at the time of disposal.
- **Decommissioning Bonds:** Decommissioning bonds are financial instruments that project owners must secure to cover the costs of decommissioning and recycling equipment installations at the end of their operational life. These bonds ensure that funds are available to properly dismantle and recycle systems, preventing them from becoming a burden on local communities or the environment. This approach aligns the financial responsibility with the project owners and promotes sustainable practices.

Recommendations

The EOL Working Group included many different types of stakeholders with nuanced and divergent opinions as to the best path forward. The details of sector-specific stakeholder feedback can be found in Appendix B of the Report. Based on this feedback and informed by successes in other states, the Report includes the following high-level recommendations:

Infrastructure type	End-of-life management framework		
	Extended Producer Responsibility	Advanced Fee Administration	Decommissioning bond
Solar – residential-scale		X	
Solar – commercial-scale			X
Battery storage – residential-scale	X		
Battery storage – commercial-scale	X		

- **Recommendation 1:** Distinct solutions should be designed for each of the residential-scale solar, commercial-scale solar, and stationary battery energy storage systems.
- **Recommendation 2a:** Connecticut should adopt an AFA model for residential-scale solar installations.
- **Recommendation 2b:** Connecticut should require third-party-owners of residential-scale systems to have formal end-of-life protocols.
- **Recommendation 3:** Connecticut should enhance the present model of decommissioning plans and bonds for commercial-scale solar systems by requiring the preparation of decommissioning plans that include details of how panels will be recycled at end-of-life.
- **Recommendation 4:** Connecticut should adopt an EPR model for stationary batteries.
- **Recommendation 5a:** The End-of-Life Working Group should be continued and brought under the auspices of PURA or DEEP.
- **Recommendation 5b:** DEEP should launch a process to qualify and publish a roster of state-approved recyclers for batteries and solar panels.

- **Recommendation 5c:** DEEP should continue to support federal efforts underway that would allow hazardous waste solar panels to be managed under the universal waste rule.
- **Recommendation 5d:** Connecticut should consider banning the landfill disposal of solar panels and batteries.
- **Recommendation 5e:** DEEP should identify intermediate recycling steps or solutions that can be taken at the local level.
- **Recommendation 5f:** PURA should encourage the replacement of solar PV and/or battery storage systems at end-of-life with new systems, rather than simply removal.
- **Recommendation 5g:** Connecticut should investigate opportunities and means of reusing solar panels and batteries, in addition to recycling.
- **Recommendation 5h:** PURA should direct the Green Bank and DEEP to engage with nearby states on developing a regional approach to end-of-life management of solar panels and batteries.

Next Steps and Future Discussions

This report represents the first step in an ongoing process to gather feedback and refine the proposed end-of-life management strategies. The Green Bank thanks the Authority for recognizing the need to investigate end-of-life management strategies in a working group setting. As the former program administrator for the Residential Solar Incentive Program, the Green Bank oversaw the deployment of 330MW of residential solar in 46,219 projects. As the current co-program administrator for Energy Storage Solutions, we are supporting the deployment of 580MW of storage.

As we deploy these distributed energy resources to generate sustainable power and clean air, so too must we consider the potential impact that deploying these systems may have at the end of their useful lives. We believe that the solutions informed by the EOL Working Group reflect a potential pathway to address these challenges. Given the timeline of this group, it focused on learning about strategies, rather than on program design for a potential deployment. Large questions remain – for instance, would these solutions be applied on a prospective basis? And if so, how will the already-installed equipment be managed? Who will have to pay for legacy system removal and recycling? While the EOL Working Group initiated conversations to address these topics, they are far from settled.

The Green Bank looks forward to participating in an ongoing discussion about end-of-life management strategies in our role as a solar asset owner and co-administrator of Energy Storage Solutions.

Because Order No. 35 does not require Authority approval, this submission is being submitted as a compliance filing; not as a motion.

I hereby certify service of this filing upon all parties and interveners of record in this proceeding.

Respectfully submitted,

CONNECTICUT GREEN BANK

By: *Brian Farnen*

Brian Farnen
General Counsel and Chief Legal Officer
Connecticut Green Bank
Phone: (860) 257-2892
Brian.farnen@ctgreenbank.com

By: *Sara Harari*

Sara Harari
Associate Director
Innovations & Strategic Advisor to the President
Connecticut Green Bank
Phone: (860) 249-0806
Sara.harari@ctgreenbank.com

cc: Service List