CONNECTICUT GREEN BANK
COMMUNITY SOLUTIONS

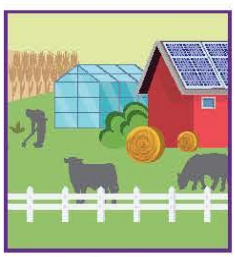
environmental infrastructure primer

waste and recycling

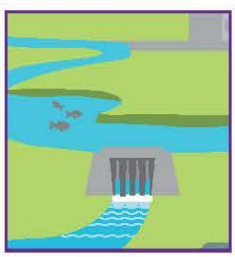
Environmental Markets

Land Conservation

Parks and Recreation



Agriculture



Water

Waste and Recycling

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Environmental Infrastructure Primer

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Introduction

In October of 2021, the Connecticut Green Bank ("Green Bank") developed a plan to engage stakeholders to understand the various components of "environmental infrastructure" – see Figure 1. With its mission to "confront climate change by increasing and accelerating investment into Connecticut's green economy to create more resilient, healthier, and equitable communities" within each component of "environmental infrastructure," the cross-cutting issues of reducing greenhouse gas emissions ("GHG"), increasing climate adaptation and resilience, and enabling investment in vulnerable communities was explored.

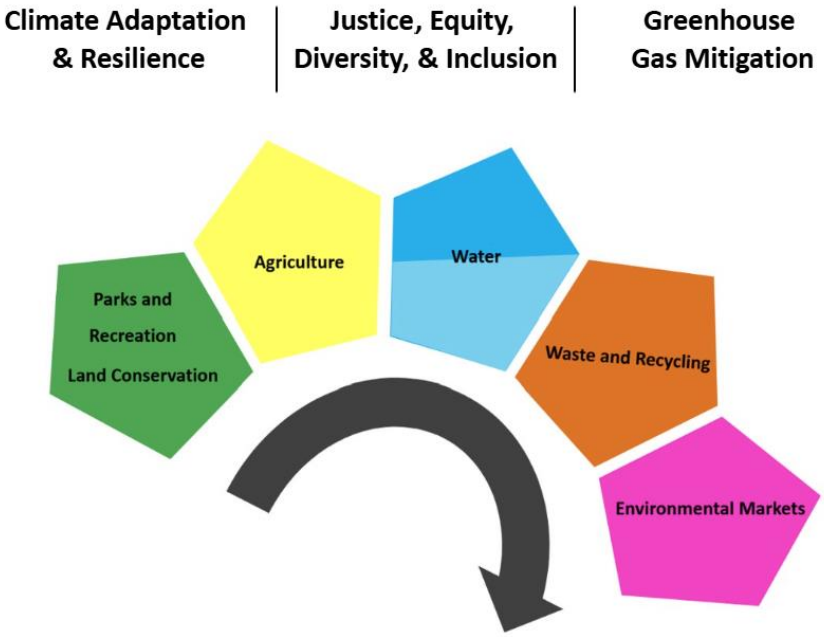

Figure 1. Sectors of Environmental Infrastructure Per Public Act 21-115

This primer reflects the observations, findings, and initial recommendations from conversations with stakeholders and research conducted on waste and recycling.

Overview

On July 6, 2021, Governor Ned Lamont signed Public Act 21-115 "An Act Concerning Climate Change Adaptation" ("the Act") into law. The bipartisan-supported public policy was among the sixty-one (61) recommendations made by the Governor's Council on Climate Change ("GC3"), which included a recommendation to expand the scope of the Green Bank beyond "clean energy" to include "environmental infrastructure" (i.e., Recommendation #57).

Since its founding over a decade ago, the Green Bank has focused its efforts on using a limited amount of public resources to mobilize multiples of private investment in Connecticut to increase and accelerate the deployment of "clean energy" to deliver social and environmental impact – see Appendix A.

Given its mission, the Green Bank helps the State of Connecticut achieve its ambitious public policy objectives (e.g., GHG emission reductions targets, renewable portfolio standards). In

so doing, by 2025, no less than 40 percent of investment and benefits from its programs are to be directed to vulnerable communities.[1]

The Act expands the scope of the Green Bank beyond "clean energy" to include "environmental infrastructure," and includes the following key provisions:

- **Definition** – "environmental infrastructure" means structures, facilities, systems, services and improvement projects related to (A) water, (B) waste and recycling, (C) climate adaptation and resiliency, (D) agriculture, (E) land conservation, (F) parks and recreation, and (G) environmental markets, including, but not limited to, carbon offsets and ecosystem services;
- **Comprehensive Plan** – requirement for the Green Bank to develop a Comprehensive Plan[2] prior to implementing any programs or initiatives related to "environmental infrastructure
- **Reporting** – inclusion of the Banks Committee and the Environment Committee, alongside the Energy and Technology Committee and Commerce Committee in terms of reporting; and
- **Bonding** – the ability to issue up to 25-year bonds for "clean energy" and 50-year bonds for "environmental infrastructure" (i.e., no more than the useful life of the projects), supported by the Special Capital Reserve Fund ("SCRF"), for up to 25 years to improve the credit rating of the bonds issued.

This document summarizes the findings from the research and outreach efforts conducted by the Green Bank[3] on "waste and recycling" from mid-June through mid-December of 2024. It includes a section on supporting state policy and deeper explorations into end-of-life planning for solar PV and batteries and food and organic waste management, each with the following sections: (A) overview, (B) key public policies, (C) market potential, (D) targets, (E) funding and financing programs, (F) other programs, (G) stakeholder outreach, (H) findings, (I) opportunities, (J) references, and (K) definitions.

[1] "Vulnerable communities" means populations that may be disproportionately impacted by the effects of climate change, including, but not limited to, low and moderate income communities, environmental justice communities pursuant to section 22a-20a, communities eligible for community reinvestment pursuant to section 36a-30 and the Community Reinvestment Act of 1977, 12 USC 2901 et seq., as amended from time to time, populations with increased risk and limited means to adapt to the effects of climate change, or as further defined by DEEP in consultation with community representatives.

[2] Connecticut Green Bank. *Comprehensive Plan Fiscal Years 2023-2025.* 2025. Available here: https://www.ctgreenbank.com/wp-content/uploads/2024/07/Comprehensive-Plan_FY-2025_071924.pdf.

[3] This primer was developed by Leigh Whelpton (Director of Environmental Infrastructure Programs), Bryan Garcia (President and CEO), Bert Hunter (Executive Vice President and Chief Investment Officer), Sara Harari (Associate Director of Innovation & Senior Advisor to the President and CEO), Austin Dziki (Senior Manager, Environmental Infrastructure Programs), Ashley Stewart (Manager of Engagement, Environmental Infrastructure Programs), Janice Cheng (Associate, Environmental Infrastructure Programs), and James Desantos (Associate Director of Legislative & Regulatory Affairs).

Introduction to Waste and Recycling in Connecticut

Connecticut faces significant challenges in managing its waste and recycling streams stemming from limited in-state processing capacity and persistent barriers to achieving diversion targets. As waste streams grow more complex, the state grapples with balancing environmental sustainability, economic feasibility, and operational capacity. Addressing these issues requires innovative strategies to reduce waste generation, expand recycling and composting infrastructure, address environmental justice concerns, and enhance local capacity to create a more resilient, sustainable, and equitable materials management system.

Connecticut's Comprehensive Materials Management Strategy ("CMMS") (CGS 22a-241a)[4] provides the overarching policy framework and targets related to Municipal Solid Waste ("MSW"). Municipalities design programs following the framework of the state's waste hierarchy (see Figure 9) to achieve the stated targets. CMMS emerged from Connecticut's Solid Waste Management Plan, first passed in 1987.[5] The primary goal of CMMS is to divert 60% of MSW from the 2005 baseline, a target codified in Connecticut statute.

According to a 2022 Solid Waste Disposal and Diversion report by Connecticut's Department of Energy and Environmental Protection ("DEEP"), the state generated 3.49 million tons of MSW in 2022, with 1.55 million tons (44%) disposed at in-state Resource Recovery Facilities ("RRFs"), 640,000 tons (18%) shipped out of state for disposal, and 1.3 million tons (37%) diverted via recycling, composting, or anaerobic digestion.[6] Of the total waste diverted, approximately 75% went to recycling and 25% went to compost or anaerobic digestion. This diversion rate has remained relatively consistent between 2012 and 2022, hovering between 30% and 40%. These figures fall short of the CMMS target 60% diversion rate by 2024, the "Connecticut Solid Waste Management Plan,"[7] and emphasize the need for increased investment in Connecticut's waste management capacity.

The closure of the Materials Innovation and Resource Recovery ("MIRA") facility in July of 2022[8] has intensified these challenges, straining the system's ability to handle MSW locally while increasing dependence on out-of-state disposal options that carry higher costs and

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[4] Connecticut General Statutes § 22a-241a (2023), https://www.cga.ct.gov/2021/pub/chap_446d.htm#sec_22a-241a.

[5] The Solid Waste Management Plan was amended in 1991 and 2006. In 2014, after the passage of Public-Act No. 14-94 (through an amendment that replaced Section 22a-241a of Chapter 446d), the DEEP Commissioner was required to draft a new Solid Waste Management Strategy, leading to the creation of CMMS.

[6] Connecticut Department of Energy and Environmental Protection (DEEP), *2022 Solid Waste Disposal & Diversion Report* (Hartford, CT: Connecticut DEEP, 2024), 3, https://portal.ct.gov/-/media/deep/reduce_reuse_recycle/data/diversion_report_2024_3.pdf?rev=70afa4a7e67a4fa182f704eb4a8fe67e&hash=4186C1ADCCA5D3170E537DB52597DA0F.

[7] Connecticut Department of Energy and Environmental Protection (DEEP), *Comprehensive Materials Management Strategy (CMMS)* (Hartford, CT: Connecticut DEEP, 2016), 7, https://portal.ct.gov/-/media/deep/waste_management_and_disposal/solid_waste_management_plan/cmmsfinaladoptedcomprehensivematerialsmanagementstrategypdf.pdf?rev=19c414dbac054fa78dab6f5d70699bfb&hash=75F1D8DE80FA40AE32807E6BF7EE090C.

[8] MIRA's closure represents an additional 720,000 tons of annual MSW processing capacity that Connecticut will need to replace.

environmental impacts. The MIRA closure reduced Connecticut's waste processing capacity by approximately one-third and has led to increased disposal at landfills in Pennsylvania, Ohio, and other states, increasing the associated GHG emissions of MSW disposal from transportation. The MIRA dissolution has exacerbated the state's disposal capacity deficit and highlights the challenges and complexity of Connecticut achieving its target diversion rate.

The Importance of Supporting State Policy

Connecticut's regulatory landscape is crucial to achieving the state's diversion goals, especially given heightened constraints to disposal capacity and its impact on GHG emissions, environmental quality concerns, and equity considerations. Properly enforced state policy unlocks private capital and animates markets by encouraging innovative waste technologies, robust recycling/composting infrastructure, and implementation of food diversion programs at the municipal and regional levels. The Green Bank is thus committed to supporting any and all state policy conducive to delivering the 60% diversion goal, as well as other initiatives that remedy the self-sufficiency deficit around financing and regulatory constraints. Waste stream circularity and organic materials infrastructure are still nascent, hence stringent legislation will be the driving mechanism in propelling innovative development forward and holding stakeholders liable to obligations mandated by statute.

The Importance of End-of-Life Planning for Solar PV & Batteries

End-of-life ("EOL") planning for solar photovoltaic ("PV") systems and batteries is an essential component of Connecticut's transition to a clean energy future. As the state accelerates the deployment of renewable energy technologies to meet its ambitious energy policy goals—such as achieving the 40% Class I Renewable Portfolio Standard by 2030 and the 100% zero-carbon electricity by 2040—managing the eventual disposal and recycling of these systems has become a priority. For example, the Green Bank supported the deployment of 380 MW of solar PV systems for residential end-use customers through its administration of the Residential Solar Investment Program ("RSIP"), which has transformed the market for residential solar PV in Connecticut.

While solar and storage systems currently represent a small fraction of the overall waste stream today, their volumes are projected to grow significantly as installations mature. Without robust EOL strategies, the environmental and economic benefits of solar and storage technologies risk being undermined by waste management challenges.

The Importance of Food and Organic Waste Reduction

The Green Bank is a leading investor in Connecticut's organic waste infrastructure through prior investments in Quantum Biopower in Southington (i.e., food waste to energy project) and Fort Hill Farms with Ag-Grid in Thompson (i.e., farm waste to energy). Reducing and recapturing food and organic waste is a critical strategy for addressing GHG emissions and combating food insecurity, particularly in vulnerable communities. Wasted food accounts for approximately 6% of U.S. GHG emissions due to the energy-intensive processes of production, transportation, and disposal and approximately 21% of U.S. freshwater use.[9]

[9] ReFED, *New Estimates on Food Waste in the United States: 2020-2021, Trends, and COVID-19 Impact* (New York: ReFED, 2023), https://refed.org/articles/refed-s-new-estimates-on-food-waste-in-the-united-states-2020-2021-trends-and-covid-19-impact/

This waste contributes to climate change and resource scarcity while also exacerbating inequities in access to nutritious food, as millions of Americans face food insecurity despite the surplus of edible food being discarded. Often, vulnerable communities disproportionately bear the brunt of these challenges, enduring both higher exposure to environmental hazards and limited access to affordable, healthy food. Prioritizing food and organic waste reduction can mitigate GHG emissions (e.g. avoided methane emissions from organic decomposition in landfills) and contribute to a more sustainable and equitable food system by recapturing prevented food waste and making it available to food insecure communities.

Connecticut Green Bank Strategy Outlook

The Green Bank is focusing its initial strategy development on areas where there is alignment with organizational capacity, experience, and expertise. The following primer sub-sections breakdown the Green Bank's strategic approach to waste and recycling, as summarized in Table 1.

Table 1. Green Bank Waste & Recycling Strategy Outlook

Support the State	Solar PV & Battery Storage End-of-Life	Expand & Scale Organic Waste Management
Support DEEP's goals for waste management and recycling.[10]	Assess existing technology deployed in solar PV and battery storage programs – both those administered by the Green Bank and by other entities – to identify strategies to reuse, recycle, and dispose of these products.	Assess opportunities to scale-up solutions to organic waste management including strategies to prevent, rescue, and recycle these materials.

The Green Bank strategy to "Support the State" is informed by a recognition that the policy and programmatic landscape is dynamic and that the Green Bank will be supportive and adaptive to future DEEP considerations on waste and recycling. This is further influenced by DEEP's ability to enter into agreements with the Green Bank that are supportive of bonding and financing for recycling and waste management projects.

The initial outlook on "Solar PV & Battery Storage End-of-Life" is informed by the Green Bank's implementation of CGS 16-245ff (i.e., Residential Solar Investment Program) which deployed nearly 380 MW of solar PV for over 45,000 households.

Through its implementation of Section 103 of Public Act 11-80, the Green Bank is a leading financier of Connecticut's first food waste and farm waste (i.e., components of "organic waste") to energy projects, Quantum Biopower and Fort Hill Farms, which utilized anaerobic digestion and combined heat and power to reduce methane and produce renewable natural

[10] Per Public Act 23-170

gas for onsite clean energy.[11] These transactions help inform the strategy outlook to "Expand & Scale Organic Waste Management."

This focused approach to the broad and complex issue of waste and recycling will best position the Green Bank to align with and support DEEP's strategies to address the state's waste and recycling crisis,[12] noting the evolving policy environment and as the state faces the impacts of the closure and dissolution of the MIRA facility[13] with a constrained ability to build additional facilities in state.

Support the State

In addition to the sections below on solar PV and battery EOL and organic waste management, Public Act 23-170 "An Act Establishing the Management of Solid Waste and Establishing the MIRA Dissolution Authority" includes several important provisions for the Green Bank to support the state (i.e., DEEP) with its "waste and recycling" efforts, including:

1. **State-Wide Solid Waste Management Plan** – per Section 17, DEEP is to submit revisions of the CMMS to the joint standing committee of the Connecticut General Assembly having cognizance of matters relating to the environment (i.e., Environment Committee) for approval prior to the implementation of such revisions.[14]
2. **Agreements between DEEP and Green Bank** – per Section 21, DEEP may enter into agreements with the Green Bank to effectuate the issuance of environmental infrastructure bonds to support such solid waste facilities, supported by a SCRF that was adjusted from $250MM up to $500MM.[15]

As the CMMS is revised and approved, DEEP may seek assistance from the Green Bank to assist it in raising capital to finance solid waste facilities for the betterment of the state.

Solar PV & Battery Storage End-of-Life

Overview

The rapid growth of solar PV and battery storage technologies in Connecticut and beyond presents both opportunities and challenges. While these technologies are crucial for

[11] As part of its Anaerobic Digestion Pilot program, the Connecticut Green Bank provided novel capital investment in two anaerobic digestion projects, Quantum Biopower and Fort Hill Farms, a partnership with AgGrid. See Appendix B for more information.
[12] Connecticut Department of Energy and Environmental Protection (DEEP), *Comprehensive Materials Management Strategy (CMMS) Amendment* (Hartford, CT: Connecticut DEEP, 2023), https://portal.ct.gov/-/media/deep/waste_management_and_disposal/solid_waste_management_plan/january2023/cmms-amendment-2023-draft.pdf
[13] Public Act 23-170 created the MIRA Dissolution Authority effective July 1, 2023. It replaces the Materials Innovation and Recycling Authority (MIRA) and was established in response to the closure of MIRA's Resource Recovery Facility in Hartford.
[14] Connecticut General Assembly, *Public Act No. 23-170: An Act Concerning the Management of Solid Waste and Establishing the MIRA Dissolution Authority*, § 17 (2023), https://www.cga.ct.gov/2023/act/Pa/pdf/2023PA-00170-R00HB-06664-PA.PDF.
[15] Conn. Gen. Assembly, *Public Act No. 23-170*, § 21.

achieving our renewable energy goals, they have finite lifespans and will eventually need to be managed at their EOL. While large volumes of equipment will only reach EOL some years from now, it is important to begin thinking about this subject so that the policies and infrastructure needed to manage the waste stream at EOL are in place when the time comes. This section aims to provide a comprehensive overview of the current state of waste and recycling for solar panels and batteries in Connecticut, outline key policies, assess market potential, and highlight opportunities for intervention by the Green Bank.

Key Public Policies

In 2023 the Public Utilities Regulatory Authority ("PURA") tasked the Green Bank with facilitating a public process to create a framework for guiding the management of solar panels and stationary battery energy storage systems at the end of their useful lives. This stakeholder process concluded in 2024, the takeaways are discussed more extensively in Section E ("EOL Working Group"). The following are key public policies that advance our ability to collectively manage the EOL impacts of solar PV and storage equipment in Connecticut, including, but not limited to:

Federal Policies

- **Resource Conservation and Recovery Act ("RCRA")** – a federal law enacted in 1976 that governs the disposal of solid and hazardous waste. Its primary goals are to protect human health and the environment from the potential hazards of waste disposal, conserve energy and natural resources, reduce the amount of waste generated, and ensure that waste is managed in an environmentally responsible manner.

  Under RCRA, the Environmental Protection Agency ("EPA") has the authority to control hazardous waste from its creation to its final disposal, often referred to as "cradle-to-grave" management. This includes the generation, transportation, treatment, storage, and disposal of hazardous waste.

  RCRA is divided into several components, key among which are:

  - Subtitle C: Governs hazardous waste management, establishing a framework for managing hazardous waste from its point of origin to its ultimate disposal. It requires stringent tracking and management practices to prevent environmental contamination.

  - Subtitle D: Focuses on non-hazardous solid waste, including the management of municipal and industrial waste in landfills and other disposal facilities. It sets standards for the design, operation, and closure of these facilities to minimize environmental impact.

  In the context of solar panels and batteries, RCRA plays a crucial role in determining whether these materials are classified as hazardous waste when they reach the end of their life. For example, the Toxicity Characteristic Leaching Procedure ("TCLP") test, a key component of RCRA, is used to determine if the leachate from waste materials exceeds regulatory levels for specific toxic substances. If it does, the waste must be managed as

hazardous under Subtitle C, which imposes stricter disposal and recycling requirements.

Additionally, the **Universal Waste Classification** is made under authority of RCRA. Universal Waste is a category of hazardous waste materials that are widely produced by households and many different types of businesses. The EPA established the Universal Waste Rule to streamline the collection and recycling of these common hazardous wastes, making it easier for businesses and households to comply with hazardous waste regulations.

The Universal Waste Rule was created to encourage the proper disposal and recycling of these materials by reducing the regulatory burden on generators of universal waste. It provides more flexible storage, transportation, and collection requirements compared to other hazardous wastes under RCRA Subtitle C. This flexibility aims to promote recycling and proper disposal, preventing the release of hazardous substances into the environment. Currently, batteries, pesticides, mercury-containing equipment, lamps, and aerosol cans can be classified as universal waste if they are hazardous. In response to a petition from the electric power industry, the EPA is currently consulting on adding hazardous waste solar panels to the universal waste regulations, with the final rule expected in December 2026.

States have the option to adopt the federal Universal Waste Rule or develop their own state-specific regulations. Some states have added additional types of waste to their own lists of universal waste. For example, California has classified certain types of electronic waste, including some solar panels, as universal waste, simplifying their disposal process.

- **Infrastructure Investment and Jobs Act ("IIJA")** – also known as the Bipartisan Infrastructure Law, this act provides significant funding opportunities to support the development of recycling infrastructure. For example, the Department of Energy ("DOE") is channeling resources into research and development of advanced recycling technologies for solar panels and batteries. Connecticut stands to benefit from these federal programs, which can help offset the costs of implementing new recycling facilities and programs.

- **Inflation Reduction Act ("IRA")** – enhances or creates numerous tax incentives for clean energy and manufacturing, including for clean energy production, clean vehicles, etc. – many of which are expected to increase rates of production and deployment of solar PV and battery storage equipment. Greater deployment of this equipment will eventually mean greater volumes of waste as equipment reaches EOL.

State Policies

- **Comprehensive Materials Management Strategy ("CMMS") (CGS 22a-241a)** - EOL management of solar PV panels and battery storage systems align with CMMS objectives to reduce disposal and increase recycling of complex waste streams.

- **<u>E-Waste Recycling</u> (P.A. 07-189**)– Connecticut has had an electronic waste ("e-waste") recycling policy since 2007, which covers residential televisions, monitors, printers and computers under an extended producer responsibility ("EPR") model (see Section E for more information on EPR). Under the provisions of this law, manufacturers of such devices must register with the DEEP and pay approved recyclers to collect, transport and process these devices from municipalities. In turn, municipalities collect the specified devices from residents through transfer stations or other collection events. Recyclers sort the computers and monitors by manufacturer and submit a bill to the responsible manufacturer for the cost of transporting and recycling devices with the manufacturer's brand name on them. Television manufacturers pay a percentage of the total cost of recycling televisions equivalent to their market share.

  In addition to the EPR policy itself, since 2011 Connecticut has banned the disposal of devices covered under the e-waste law at any Connecticut solid waste facility; rather, they must be recycled. Note that there are currently no landfills in Connecticut accepting MSW.

For additional Connecticut policies concerning general MSW, see Policy under Expand & Scale Organic Waste Management section below.

Market Potential

Connecticut's deployment of solar and storage technologies has grown rapidly, with projections indicating continued expansion. Understanding the market potential for deployment of these technologies – and hence, for their eventual end-of-life and subsequent entry into the waste/recycling stream – is crucial for developing a sustainable waste management strategy.

<u>Market Sizing</u>
Connecticut has deployed solar and storage technologies through a variety of programs:

<u>Table 2 - State-Administered Solar Programs</u>

Program	**1st Yr of Program**	**Program Size**	**MW_{AC} deployed as of early 2023[1]**	**Approximate # of Panels[2]**
Pre-SHREC RECs	2011	47 MW_{AC} in total	47	190,000
Residential Solar Investment Program (RSIP)	2011	330 MW_{AC} in total	330	1,430,000
Residential Renewable Energy Solutions (RRES) Program	2022	Target of 50-60 MW_{AC}/year	161	634,000
Low Emission / Zero Emission Renewable Energy Credit Program (LREC/ZREC)	2012	349 MW_{AC} of solar thus far	349	1,376,000
Virtual Net Metering Program (VNM)	2014	77 MW_{AC} of solar thus far	77	305,000

Shared Community Energy Facilities (SCEF) Program	Pilot 2017 Permanent 2020	Max procurement of 25 MW_{AC}/year	3	12,000
Non-Residential Renewable Energy Solutions (NRES) Program	2022	6 year program x 60 MW_{AC}/year	2	6,000
		Total	**922**	**3,763,000**

Table 3 - State-Administered Energy Storage Programs

Program	1st Yr of Program	Program Size
Energy Storage Solutions (Residential & Commercial)	2022	1 GW of energy storage by the end of 2030 (includes utility scale) Interim targets of 300 MW of storage by the end of 2024 and 650 MW by the end of 2027.
ConnectedSolutions Demand Response (Residential & Commercial)	2020	11,041 kW total enrolled residential capacity 950 kW total enrolled C&I capacity

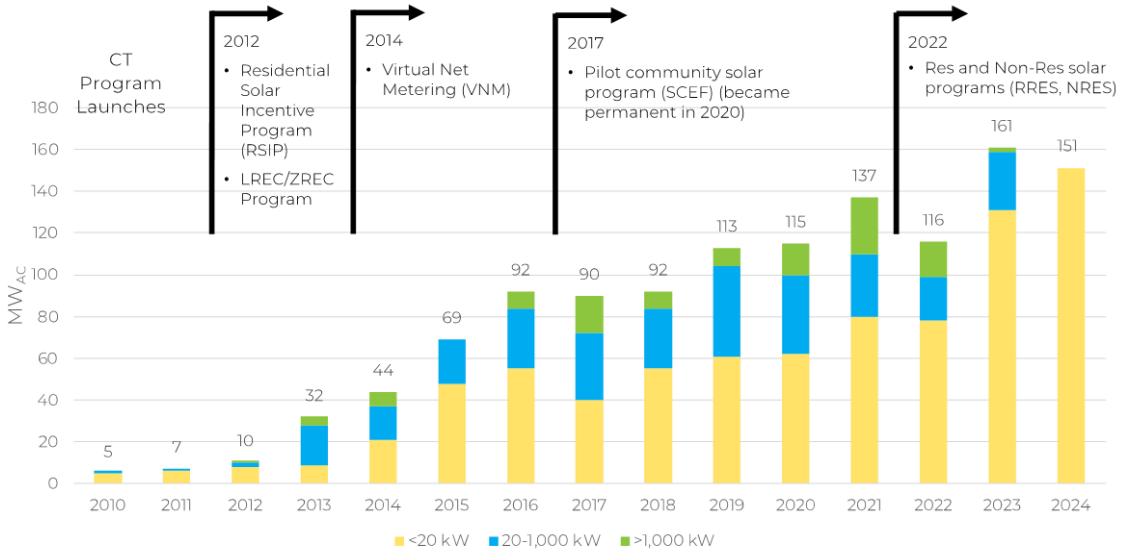

Figure 2: Solar Installations in CT, 2010-2024 (MW_{AC}). *Note that as of July 2024, installed storage projects totaled 1.8 MW of residential and 0.4 MW of commercial. Source: ISO-New England 2024 Final PV Forecast, Eversource*

However, when discussing solar and storage waste, it is important to consider the regional and national volumes that will be generated, as solutions will likely benefit from a regional approach.

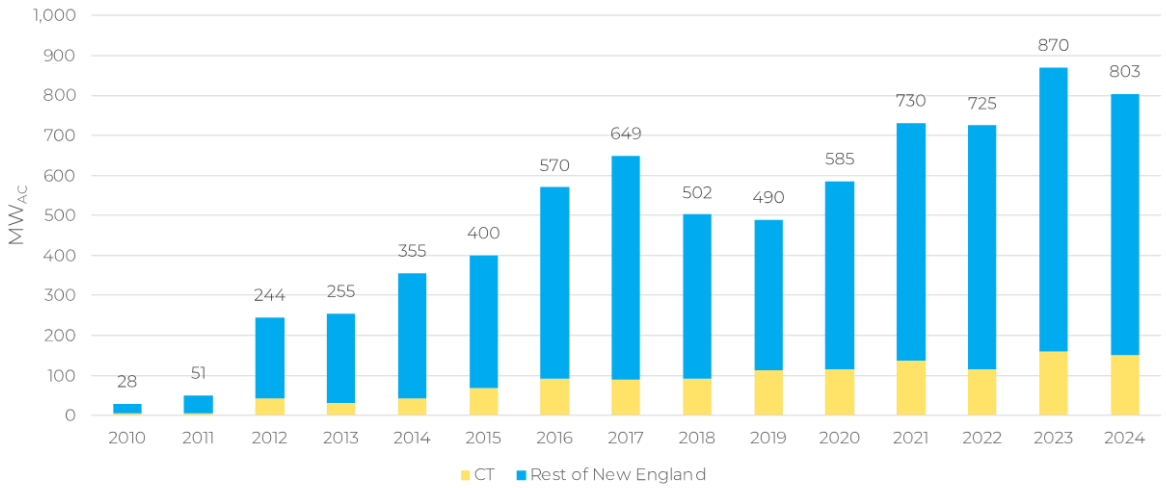

Figure 3: Solar Installations in New England, 2010-2024 (MW_{AC}). *Source: ISO-New England 2024 Final PV Forecast*

Combining these trends with the average life expectancy for solar panels and storage, it is possible to estimate at what point Connecticut may start to see high volumes of solar and storage waste – see Figure 3. It should be noted that, at present, the estimated life expectancy of these technologies is not definitively characterized, and that different industry stakeholders have widely differing views as to reasonable life expectancies.

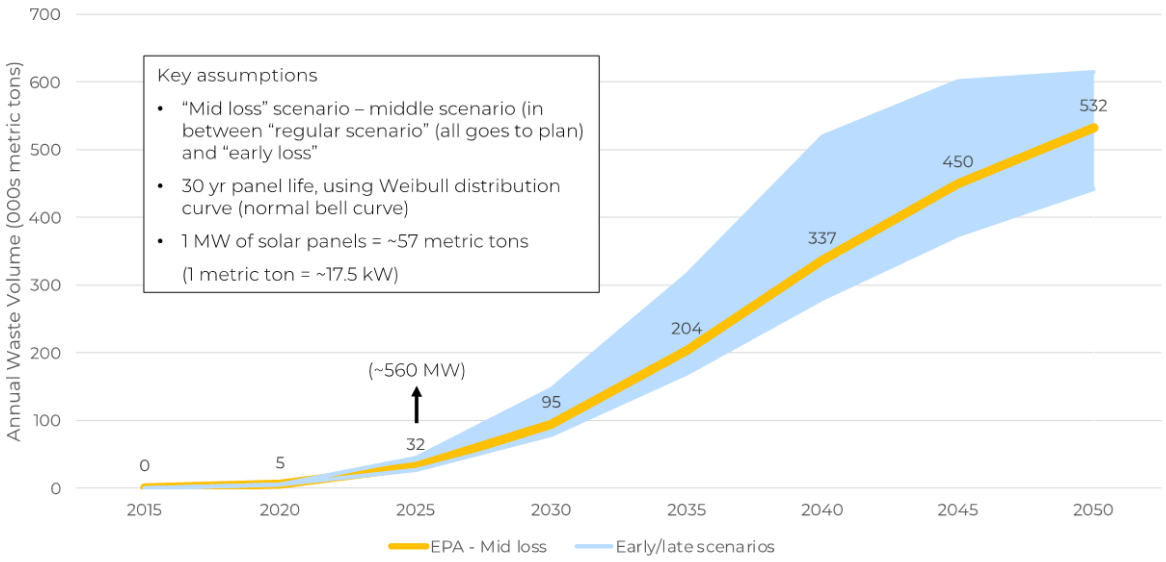

Figure 4: US Annual PV Waste Volume Forecast. *Source: US EPA, 2023; "early/late" scenarios are Power Advisory rough estimates*

<u>Economic Considerations</u>

Today, the economic value derived from recycling solar panels means that the market for recycling is in an early stage of development; as costs come down, the economics and uptake of solar panel recycling are expected to improve considerably. However, currently, the costs associated with the dismantling, transporting, and recycling solar panels often exceed the value of the materials recovered, such as aluminum, glass, and semiconductors. This negative economic balance – where recycling costs outstrip material resale value – can make private sector investment in solar panel recycling infrastructure more challenging. Consequently, many solar panels risk ending up in landfills rather than being recycled, especially where (as is the case in Connecticut) there is no legal impediment to landfill

disposal once a panel can be demonstrated to be non-toxic. In contrast, the economics of battery recycling present a more promising landscape.

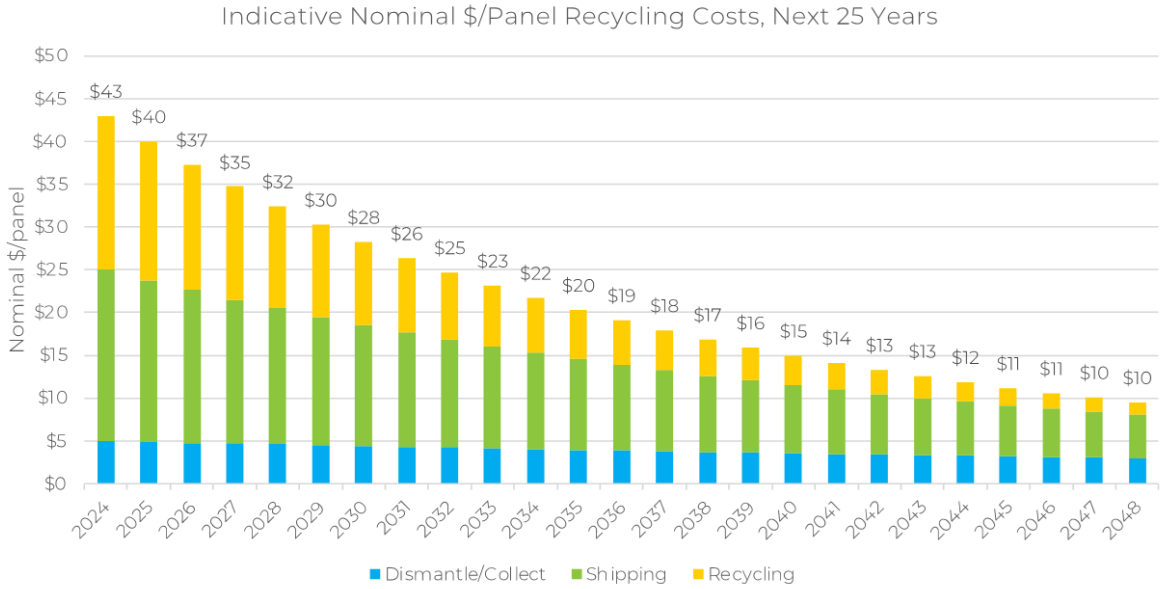

Figure 5: Indicative Pricing of Solar Panels – Commercial Scale Systems. *Source: Power Advisory estimates based on stakeholder feedback*

In contrast to solar panels, lithium-ion batteries, particularly those used in energy storage systems, contain valuable materials such as lithium, cobalt, nickel, and manganese. These materials have a high market value and are in increasing demand, especially as the electric vehicle (EV) and renewable energy sectors expand. The substantial market interest in reclaiming these materials has led to the development of profitable recycling processes and a growing private market for battery recycling. In addition, manufacturers of stationary batteries (and EV batteries, which can be repurposed for stationary use) have expressed clear interest in recovering used batteries for refurbishment and recycling, given the value of the materials contained therein. Companies are incentivized to invest in battery recycling technologies, as the reclamation of these materials not only offsets the recycling costs but can also generate significant profits, making the economics of battery recycling far more favorable than that of solar panels.

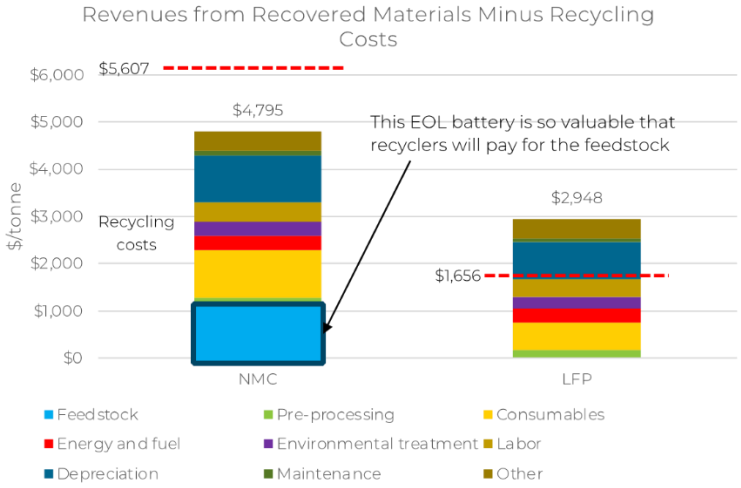

Figure 6: Indicative Economics of Batteries. *Source: Circular Energy Storage*

Solar PV and Battery Storage Removal Options

When solar panels and batteries begin experiencing reduced output or functionality and approach the end of their useful life, there are several options for managing the equipment: reuse, landfilling, or recycling. Each of these options has distinct implications for the environment, economics, and the sustainability of renewable energy technologies.

1. **Reuse** – involves refurbishing and redeploying solar panels and batteries that are still functional but have been removed from service for various reasons, such as system upgrades or repowering. Reusing equipment extends its lifespan and delays the need for recycling or disposal, which can provide significant environmental and economic benefits. For example, solar panels removed from one site might be installed in another location where lower efficiency is acceptable, such as in off-grid or developing regions. Similarly, batteries that still have some useful capacity might be repurposed for less demanding applications. The secondary market for reused equipment is growing, particularly for solar panels, as more systems reach the end of their initial deployment. However, the success of reuse depends on the condition of the equipment and the availability of markets for second-hand products. Given that some Connecticut program rules restrict the use of used/refurbished equipment, the Green Bank and the state of Connecticut have opportunities to consider how, if at all, solar panels and batteries can be reused for energy generation/storage purposes within the state, as well as what the appropriate role of the Green Bank might be in making that determination.

2. **Landfilling** – is the least desirable option for managing EOL solar panels and batteries, as it can pose significant environmental risks; for example, certain types of solar panels, such as cadmium telluride (CdTe) panels, can release hazardous substances like cadmium, which may leach into the soil and groundwater if not properly managed. Similarly, improperly landfilled batteries can release toxic chemicals and pose fire risks due to the potential for thermal runaway. While landfilling is often the most cost-effective option in the short term, it fails to recover valuable materials and contributes to environmental degradation. The eventual goal is to minimize the reliance on landfills as the end point for renewable energy

technologies, in favor of more circular economic models that emphasize resource recovery and environmental protection.

3. **Recycling** – is the most environmentally responsible option for managing EOL solar panels and batteries. In the recycling process, valuable materials such as glass, aluminum, and semiconductor materials from solar panels, as well as lithium, cobalt, nickel, and manganese from batteries, are extracted and processed for reuse in new products. Recycling helps to reduce the need for virgin materials, conserving natural resources and minimizing environmental impacts. However, the current economics of solar panel recycling are challenging, as the costs (both for transportation to recycling facilities and the recycling process itself) often outweigh the value of the recovered materials. Despite these challenges, recycling is crucial for creating a sustainable lifecycle for renewable energy technologies and is expected to become more viable as technology advances and economies of scale are achieved. In contrast, battery recycling is more economically favorable, driven by the high value of the reclaimed materials, which are in demand for new batteries and other technologies.

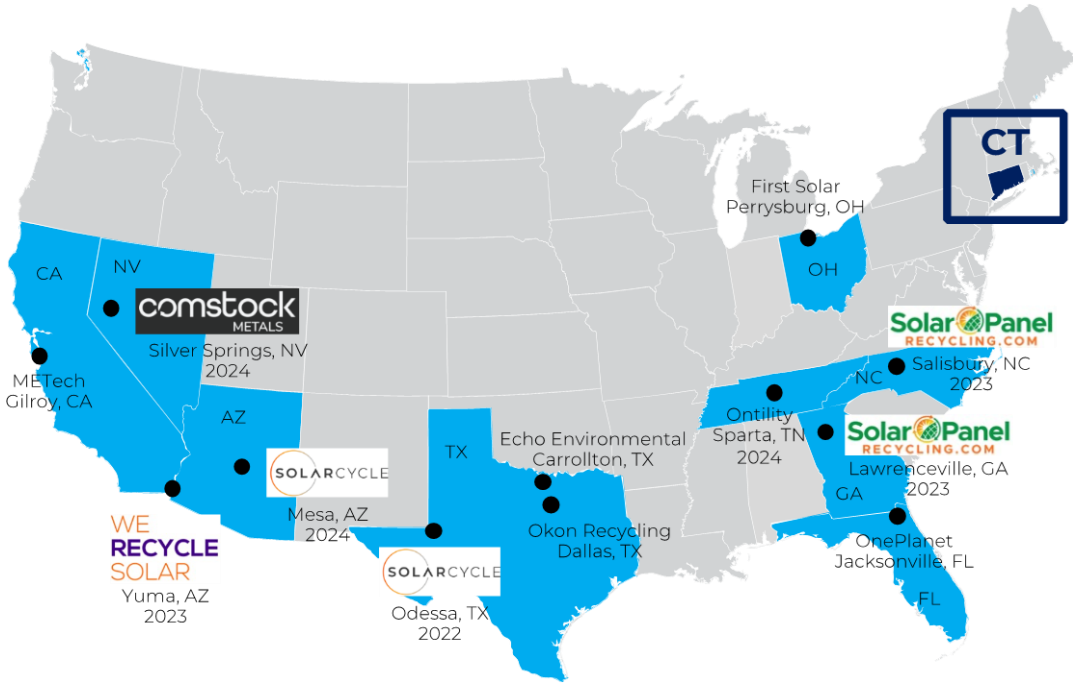

Figure 7: Select Solar Panel Recycling Facilities

Environmental Impacts of Solar and Storage Waste

The environmental impacts of improperly managed solar and battery waste are substantial and must be carefully mitigated through effective recycling and disposal strategies.

- **Solar Panels:** Solar panels, particularly those containing cadmium, can pose significant environmental risks if not properly managed. The leaching of toxic substances into the soil and groundwater is a primary concern, especially if panels are disposed of in landfills. The smelting process, one of the primary methods for recycling solar panels, produces slag, which can either be reused in industrial applications or, if improperly managed, contribute to environmental degradation.

- **Batteries:** Lithium-ion batteries, commonly used in energy storage systems, present unique challenges. These batteries contain valuable materials like cobalt, nickel, and lithium, which can be recovered through recycling. However, improper disposal can lead to contamination, fire risks, and the loss of these critical resources. Advanced recycling techniques, such as hydrometallurgy, offer more environmentally friendly alternatives to traditional methods like pyrometallurgy, which are less efficient and have higher environmental impacts.

The environmental impacts of solar and battery waste extend beyond direct contamination. The energy consumption, emissions, and material loss associated with the recycling processes themselves must also be considered. For instance, hydrometallurgy is favored for its lower environmental footprint compared to pyrometallurgy, but it requires careful management of chemical waste. Additionally, the disposal of "black blob" slag from smelting processes can either minimize or exacerbate environmental harm, depending on how it is managed.

Targets

As aforementioned, Connecticut's CMMS established a 60% waste diversion target by 2024, emphasizing a holistic approach to sustainable materials management. While there are no specific targets for the EOL management of solar PV panels and battery storage systems, these materials align with broader CMMS objectives to reduce disposal and increase recycling of complex waste streams.[16]

Funding and Financing Programs

While there are numerous state and federal programs designed to support the deployment of solar PV and battery storage systems, there are few programs that specifically address this equipment at EOL.

- **Bipartisan Infrastructure Law ("BIL")** – Federal funding opportunities, such as those provided by the DOE under the BIL, can support Connecticut's recycling infrastructure. These funds could be used to establish new recycling facilities or upgrade existing ones, ensuring that Connecticut can manage the EOL materials generated by its growing solar and storage sectors. For example, the DOE's Advanced Energy Manufacturing and Recycling Grant Program offers $750 million to re-equip, expand, or establish facilities dedicated to recycling solar equipment.

For insight on potential sources of financing, see Funding and Financing Programs under Expand & Scale Organic Waste Management section below.

Other Programs

The following are other programs or coalitions of note with respect to solar and PV battery storage:

- **National PV Recycling Program** – A network of recycling and refurbishment providers founded in 2016 by the Solar Energy Industries Association ("SEIA") with EOL management services for solar and storage installers, project and system

[16] Connecticut DEEP, *Comprehensive Materials Management Strategy (CMMS)*, 7.

owners, developers, distributors and other parties. Participants can repair, refurbish, resell, and recycle PV modules, inverters and other equipment.

Stakeholder Outreach: End-of-life Working Group

The End-of-Life Working Group ("EOL Working Group") was formed in response to the PURA directive to develop a proactive approach to managing solar and battery waste. The group included representatives from DEEP, electric distribution companies ("EDCs"), solar developers, battery manufacturers, and recycling firms. The working group was convened to allow the Green Bank and its consultant, Power Advisory, to gather comprehensive insights into the challenges and opportunities associated with the disposal and recycling of solar panels and batteries. The EOL Working Group held five monthly meetings from March to July 2024, which were designed to facilitate open dialogue among stakeholders, allowing identification of key issues and development of potential policy recommendations. The meetings also served as a platform for stakeholders to present their perspectives on existing practices, regulatory gaps, and the economic implications of various EOL management strategies.

In addition to these group meetings, Power Advisory conducted sixteen one-on-one interviews with key industry and government stakeholders. These interviews provided a more in-depth understanding of specific concerns and priorities. Industry stakeholders, including original equipment manufacturers ("OEMs"), developers, and recyclers, were asked about their current and future plans for managing EOL panels and batteries, the economics of recycling, market readiness, and the environmental impacts of different disposal options. Government stakeholders, including state and federal agencies, were interviewed to gain insights into their jurisdiction's existing policies and their experience in developing and implementing new recycling regulations. The input from these interviews was invaluable in shaping the working group's recommendations, ensuring that they were grounded in practical experience and aligned with both industry capabilities and environmental goals.

Overall, these meetings and interviews played a critical role in building a shared understanding among stakeholders and laying the groundwork for Power Advisory's recommended framework for EOL management of solar and battery technologies in Connecticut. The collaborative nature of these discussions helped to identify common goals, potential challenges, and areas where further research or policy development is needed.

Diverse Opinions

Throughout the EOL Working Group process, stakeholders expressed a wide range of opinions on the best approaches to managing the disposal and recycling of solar panels and batteries. This diversity of perspectives underscored the complexity of the issue, and the challenges involved in developing a cohesive strategy that meets the needs of all parties.

A key area of discussion revolved around the costs of recycling versus the value of recovered materials. While some stakeholders emphasized the long-term environmental benefits and the need for robust recycling infrastructure, many industry participants highlighted the current economic realities. Solar panel manufacturers and developers pointed out that the costs associated with recycling, such as transportation and recycling often outweigh the value of the materials recovered, making it difficult to justify large-scale investment in recycling facilities without significant policy incentives or subsidies. They

expressed concerns that mandating recycling could impose additional financial burdens on the industry, potentially stifling innovation and growth.

In contrast, there was more consensus around the recycling of batteries, driven by the substantial market value of reclaimed materials like lithium, cobalt, and nickel. Battery manufacturers and recyclers were generally more optimistic about the economic prospects of battery recycling and supported the development of policies that would facilitate the growth of this market. However, opinions varied on the necessity of government involvement in setting or mandating recycling policy. Some industry players advocated for a market-driven approach, arguing that the high value of battery materials would naturally lead to the development of a robust recycling market without the need for heavy-handed regulation. Others suggested that formal policymaking, for example by instituting an EPR framework, would be necessary to ensure that all batteries are properly recycled and that environmental impacts are minimized. Overall, Connecticut will need to evaluate the tradeoffs of requiring EPR for battery energy storage systems versus relying on market-based solutions, both in terms of the current landscape for battery recycling and with reference to the state's experience with existing (and other proposed-but-not-implemented) EPR policies.

Stakeholders also differed in their views on the timing and urgency of implementing new policies. Environmental groups and some government representatives advocated for immediate action, citing the growing volume of solar panels and batteries reaching the end of their life and the environmental risks associated with improper disposal. In contrast, some industry participants favored a more cautious, phased approach, arguing that the market for recycling these technologies is still emerging and that premature regulation could have unintended consequences.

Recommendations

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 EOL management of products on its 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 EOL 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 project sites at the end of their operational life. These bonds ensure that funds are available to properly dismantle (and ideally recycle) systems and remediate project lands, 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.

The EOL Working Group included many different types of stakeholders with nuanced and divergent opinions as to the best path forward. Based on this feedback and informed by successes in other states, Power Advisory's report includes the following high-level recommendations:

Table 4 - End-of-Life Management Framework 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		

Findings

The EOL Working Group's efforts have yielded several important findings that will guide Connecticut's approach to managing solar and battery waste.

- **Connecticut as a Policy Leader**: Connecticut is positioned to be a leader in solar and battery waste management, with few states having developed comprehensive strategies for these materials. By taking a proactive approach, Connecticut can set an example for other states to follow. The EOL Working Group also identified the risk of being an early mover in this space. While Connecticut's leadership position offers many advantages, it also comes with the challenge of navigating uncharted territory; regional coordination could alleviate some of these risks. Stakeholders expressed concerns about the potential costs and logistical challenges associated with implementing comprehensive recycling policies, particularly in the absence of national standards.

- **Divergent Views Persist:** Despite the progress made, stakeholders remain divided on the optimal policy approach. This reflects the complexity of the issue and the early stage of the market's development.

- **Current Market Status:** The market for recycling solar panels and batteries in Connecticut is still emerging. While there is increasing recognition of the need for effective EOL management, the infrastructure and policies required to support these activities are not yet fully established.

Opportunities

- **Role of the Green Bank in Facilitating Recycling Solutions**: The Green Bank has the potential to play a key role in establishing recycling facilities in the Northeast by exploring partnerships, co-investments, or incentives. Supporting the development of a local facility – whether an entirely new one or a dedicated recycling line within an existing facility –could significantly reduce logistics costs and provide an accessible solution for recycling solar panels and batteries. Additionally, the Green Bank could assist these facilities in navigating permitting and regulatory processes.
- **Enhancing Collection and Shipping Logistics**: There is an opportunity to strengthen the recycling supply chain by supporting logistics solutions that include backhauling. This would optimize the use of transportation resources and potentially involve landfills or transfer stations as consolidation points, reducing overall recycling costs.

- **Ongoing Task Force Engagement and Stakeholder Coordination**: Establishing a task force or small dedicated team within the Green Bank could support continuous involvement in solar and battery recycling developments. Regular meetings would help refine strategies, monitor policy shifts, and stay aligned with regional efforts. This task force could work on:
    - **Regional Collaboration**: Engage with stakeholders such as DEEP, neighboring states, and organizations like SEIA to foster regional solutions for recycling. Collective action and consistency in policies across the region would strengthen the overall recycling ecosystem.
    - **Due Diligence and Market Research**: Continue gathering information on market dynamics such as pricing, logistics, and cost structures. Research could include field visits to recycling facilities, meeting with investors, and reviewing supply chain dynamics to better inform the Green Bank's potential investment priorities.

- **Supporting Policy Advancement and Market Development**: The Green Bank can advance recycling policy by supporting or potentially leading a task force at the legislative level. Additionally, conducting a survey of existing and new solar installers and OEMs involved in energy storage could provide insights into their recycling plans, helping shape the Green Bank's strategy.

- **Preparing for Potential Capital Solutions Investment**: Conducting further market analysis will be essential in assessing investment opportunities. Understanding facility costs, profit margins, and operational needs will provide a foundation for a potential capital solutions investment, aligning with the Green Bank's objective of fostering sustainable recycling infrastructure.

Expand & Scale Organic Waste Management

Overview

The overarching policy framework for managing MSW in Connecticut is provided by the 2016 CMMS. The policy has three objectives: 1) to improve municipal recycling programs, reduce waste, and increase participation, 2) to develop and improve recycling and waste conversion technologies, and 3) to encourage organizations in EPR obligations. Through these objectives, the policy aims to achieve three goals: 1) reduce MSW by 10%, 2) increase the recycling rate from 35% to 45%, and 3) divert 300,000 tons of organic waste annually. The long-term goal is to divert 60% MSW by 2024 which is codified in Connecticut General Statute Section 22a-241a.[17]

Due to the closure of MIRA, which reduced the state's capacity to manage MSW by nearly 40%, CMMS released a draft[18] amended in 2023 to restore self-sufficiency in managing MSW through accelerated diversion solutions and investments in disposal infrastructure. The amendment recommends legislation for an EPR program and implementation of organic reuse and diversion strategies to reduce the self-sufficiency deficit from -860,000 to -485,000 tons per year. For the remaining 485,000 annual tons, DEEP aims to build additional disposal infrastructure for which it issued an RFI in February of 2023 and received 19 responses from individuals and organizations.

Though Connecticut has the potential to aerobically compost, anaerobically digest, or otherwise recycle up to 41% or 1.49 million tons of suitable organic MSW, only a fraction of that material was diverted in 2022 (nearly 326,000 tons)[19], indicating greater potential for scaling up solutions to organic waste management.

Key Public Policies

Federal Public Policies

At the federal level, the EPA, the US Department of Agriculture ("USDA"), and the US Food and Drug Administration ("FDA") are the three main institutions that formulate policies and programs for food systems. The three agencies signed a formal interagency agreement to coordinate and cooperate on efforts to address food loss and waste in 2018, detailed below.

- **National Strategy for Reducing Food Loss and Waste and Recycling Organics** – In June 2024, the USDA released the National Strategy for Reducing Food Loss and Waste and Recycling Organics to support EPA's goal of reducing food loss and waste by 50% by 2030 and its own Climate Smart Agriculture and Forestry Strategy and US Methane Emissions Reduction Plan. Following the EPA food waste hierarchy, the four objectives of the strategy are to 1) prevent food loss, 2) prevent food waste, 3) increase recycling rate of all organics, and 4) support policies to incentivize and encourage the achievement of the first three objectives. Recognizing the challenges in food waste diversion, such as limited awareness, poor infrastructure, and small organics recycling market, the document goes on to identify specific strategies for each objective.

[17] Conn. Gen. Stat. § 22a-241a.
[18] Connecticut DEEP, *Comprehensive Materials Management Strategy (CMMS) Amendment*, 2023.
[19] Connecticut DEEP, *Solid Waste Disposal & Diversion Report, 2022*, 15.

- **National Recycling Strategy** – Released in 2020, the National Recycling Strategy aims to create a more robust and cost-effective MSW recycling system to achieve the national goal of 50% recycling rate by 2030. It is one part of a larger effort of EPA to build a circular economy. The strategy does not address food waste directly.

- **Federal Interagency Collaboration to Reduce Food Loss and Waste (FIFLAW) Agreement** – EPA, FDA, and USDA signed an interagency agreement to coordinate and communicate their strategies towards reducing food loss and waste by adopting a whole-of-government approach with the ultimate target of 50% recycling rate. First formed in 2018, it has been renewed twice since then, once in December 2020 and once in May 2024. In the latest renewal, the US Agency for International Development (USAID) also joined the alliance to increase the reach to a wider group of international stakeholders. The National Strategy for Reducing Food Loss and Waste and Recycling Organics is a direct outcome of this interagency agreement.

- **ReFED Food Waste Roadmap to 2030**[20] – In collaboration with the Interagency Agreement, ReFED, a national nonprofit working on food waste solutions, has designed a roadmap to 2030 to achieve a 50% recycling rate across the country. The roadmap identifies key areas of action across prevention, rescue, and recycling strategies and provides a set of recommended solutions along with their estimated net benefits (i.e. tons of food waste diverted and GHG emissions avoided). The recommended solutions and associated metrics have informed the Green Bank's organic waste and recycling strategy and can be accessed on ReFED's "Insights Engine."[21]

State Public Policies

All policies and programs related to solid waste management in Connecticut derive their authority from Chapter 446d in Title 22a of Volume 8 of the General Statutes of Connecticut, which outlines the regulations for the sector.[22] Some of the key policies and bills in the statute are listed below. This list is not exhaustive but rather represents the key policies and bills that contained targets or actionable items related to organic waste.

- **Comprehensive Materials Management Strategy ("CMMS") (CGS 22a-241a)**[23] – To expand on the targets detailed above, the first 2016 CMMS target aims for the reuse, recycling, and composting of 1.46 million tons of materials and the second target aims to divert 300,000 tons of waste towards waste conversion processes, including anaerobic digestion, that would otherwise be disposed in traditional waste-to-energy or landfill.[24]

[20] ReFED, *Roadmap to 2030: Reducing U.S. Food Waste* and the ReFED Insights Engine (New York: ReFED, 2021), https://refed.org/uploads/refed_roadmap2030-FINAL.pdf.
[21] ReFED, *Insights Engine*, https://insights.refed.org/.
[22] Connecticut General Statutes, Chapter 446d, § 22a (2023), https://www.cga.ct.gov/2021/pub/chap_446d.htm.
[23] Conn. Gen. Stat. § 22a-241a.
[24] Connecticut DEEP, *Comprehensive Materials Management Strategy (CMMS)*, 7.

- **Commercial Organics Recycling Law (CGS Sec. 22a-226e)**[25] – The Commercial Organics Recycling Law requires large-scale commercial establishment, defined as those establishments generating more than 26 tons of source-separated organic material, to keep separate other solid waste and ensure that the organic material is recycled at a DEEP-authorized composting or clean waste-to-energy facility. While there are no fines for failing to comply with the law, DEEP can seek enforcement in alignment with the Enforcement Response Policy. The quantity threshold under this law is determined by the rate at which organic waste is generated, not disposed. Establishments can meet compliance requirements through methods like food donation or on-site composting. However, any organic waste not diverted through these means must still be recycled at DEEP-authorized composting or clean waste-to-energy facilities. The facility is not required to be located within the state of Connecticut.

  The law has tightened over time. First passed in 2014, the bill initially defined large commercial establishments as those that generate more than 104 tons per year which was reduced to 52 tons per year through an amendment in 2020 and then 26 tons per year in 2022. Prior to January 1, 2025, there was a 20-mile proximity requirement, meaning the law only applied to establishments within 20 miles of a DEEP-authorized composting or clean waste-to-energy facility, and the definition of commercial establishments was limited to commercial food wholesalers or distributors, industrial food manufacturers or processors, supermarkets, and resorts or conference centers. As of January 1, 2025, previously exempted institutions generating over 26 tons per year such as hospitals, public or independent institutions of higher education, and correctional facilities are now subject to the law. After March 1, 2025, all establishments subject to the law will newly be required to submit annual compliance reports to DEEP summarizing the entity's total edible food donated, the amount of food scraps recycled, and which organics recyclers and collectors were used. Beginning July 1, 2026, K-12 public and private schools will also be regulated.

- **Solid Waste Advisory Committee ("SWAC")** – SWAC was created following the passing of the State Solid Waste Management Plan in 2006 to guide the implementation of the plan. The committee is meant to meet once every quarter to discuss progress and learnings from ongoing pilot programs, funding opportunities, and required legislative and policy support.

- **Executive Order 21-3 (A)**[26] – The order mandated that by 2024, to the extent practicable, all executive branch agency facilities shall implement an organic and food waste diversion program.

[25] Connecticut General Statutes § 22a-226e (2023), https://www.cga.ct.gov/2021/pub/chap_446d.htm#sec_22a-226e.
[26] Connecticut, *Executive Order No. 21-3(A)* (2021), https://portal.ct.gov/-/media/office-of-the-governor/executive-orders/lamont-executive-orders/executive-order-no-21-3.pdf.

- **Public Act 24-151 (House Bill 5524)**[27] – The 2024 Bond Bill directed up to $10 million in bond proceeds to DEEP for solid waste reduction strategies. These funds are to be allocated to municipal food scrap diversion programs and a variety of other waste reduction and diversion initiatives in the state. The specific program or use of funds has not yet been determined.

- **Public Act 17-218 Section 5 (Senate Bill 943)**[28] – The act requires PURA to authorize $3 million per year in virtual net metering credits for agricultural customers with anaerobic digestion facilities. PURA must use at least half of the $3 million for anaerobic digestion facilities 1) located on dairy farms that aim to use 100% of the manure generated on the farm and 2) that complement the farm's nutrient management plan. The act's credits are in addition to the credits already allocated to agricultural customers under the law's virtual net metering credit cap. In general, virtual net metering allows EDC customers to 1) receive retail-rate billing credits for excess power they generate with a renewable energy facility and 2) share the credits with their other designated electric accounts. The law limits virtual net metering to agricultural, municipal, and state agency customers. It also caps the total amount of virtual net metering credits available each year (PA 19-35 Section 7 increases the annual cap from $10 million to $20 million). The law further limits each eligible customer class (agricultural, municipal, and state) to 40% of the available credits. In 2013, the legislature established a process (similar to the one established by PA 19-35) for the DEEP commissioner to procure power from Class I hydropower, landfill methane gas, or biomass resources.

- **Public Act 17-144 Section 10 (House Bill 7036)**[29] – The act expanded DEEP's energy procurement authority to also allow for Class I fuel cells, offshore wind, or anaerobic digestion facilities; energy storage systems; or any combination of them. The commissioner may procure up to 6% of the EDCs' load (i.e. demand) through this procurement.

- **Public Act 18-50 Section 7 (Senate Bill 9)**[30] – The act requires the EDCs, DEEP, and PURA to establish new tariff-based programs for EDCs to purchase energy and RECs from low-emission, zero-emission, and shared clean energy facilities. Anaerobic digesters may qualify as eligible low-emission projects under the new programs, as

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[27] Connecticut General Assembly, *House Bill No. 5524, Public Act No. 24-151: An Act Authorizing and Adjusting Bonds of the State and Concerning Provisions Related to State and Municipal Tax Administration, General Government and School Building Projects* (2024), https://www.cga.ct.gov/2024/act/pa/pdf/2024PA-00151-R00HB-05524-PA.pdf.

[28] Connecticut General Assembly, *Senate Bill No. 943, Public Act No. 17-218: An Act Concerning the Installation of Certain Solar Facilities on Productive Farmlands, Incentives for the Use of Anaerobic Digesters by Agricultural Customer Hosts, Applications Concerning the Use of Kelp in Certain Biofuels and the Permitting of Waste Conversion Facilities*, § 5 (2017), https://www.cga.ct.gov/2017/act/pa/pdf/2017PA-00218-R00SB-00943-PA.pdf.

[29] Connecticut General Assembly, *House Bill No. 7036, Public Act No. 17-144: An Act Promoting the Use of Fuel Cells for Electric Distribution System Benefits and Reliability and Amending Various Energy-Related Programs and Requirements ,* § 10 (2018), https://www.cga.ct.gov/2017/act/pa/pdf/2017PA-00144-R00HB-07036-PA.pdf.

[30] Connecticut General Assembly, *Senate Bill No. 9, Public Act No. 18-50: An Act Concerning Connecticut's Energy Future,* § 9 (2018), https://www.cga.ct.gov/2018/act/pa/pdf/2018PA-00050-R00SB-00009-PA.pdf.

long as they also meet various criteria required by the act (e.g., under two MW in size, built after November 7, 2019).

- **PURA Docket No. 19-07-04**[31] – In 2021, PURA approved a gas quality and interconnectedness standard for injecting renewable natural gas derived from organic waste sources into the state's natural gas distribution system as a transition fuel, which could allow the state to decarbonize its fuel consumption.

Market Potential

In 2015, food waste accounted for approximately 520,000 tons (22%) of Connecticut's MSW (273,000 tons or 53% from residential and 247,000 tons or 47% from institutional, commercial, and industrial sources), the second highest source of waste generation after paper.[32] This figure has only grown from 2010, when food waste accounted for only 13.5% of MSW, and is the waste category with the most significant increase.[33] DEEP's 2015 Statewide Waste Characterization Study showed the potential to divert up to 41.4%[34] of MSW generated across the state as compostable organics, including food waste, green waste, and compostable paper.[35] A high fraction of these compostable organics remain in disposed waste sent to landfills or to four in-state RRFs. As such, organic waste management solutions, especially food scrap diversion, have great potential to contribute toward the state's 60% waste diversion target alongside other benefits.

Increased organic waste diversion represents a significant opportunity for GHG reduction. Landfills are one of the largest sources of methane emissions, with food waste accounting for nearly 60% of these emissions.[36] Unrecovered food waste also results in the wasted GHG emissions from the resources used to grow, process, transport, and cool or store food.

Further, local organic waste processing solutions can also reduce GHG emissions associated with avoided MSW transportation. The recent closure of the MIRA facility in July of 2022[37]

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[31] Public Utilities Regulatory Authority, *Adoption of Gas Quality and Interconnection Standards for the Injection into the Natural Gas Distribution System of Conditioned Biogas Derived from Organic Material*, Docket No. 19-07-04 (New Britain, CT: Public Utilities Regulatory Authority, Ten Franklin Square), July 2019.

[32] Connecticut Department of Energy and Environmental Protection (DEEP), *Statewide Waste Characterization Study, 2015* (Hartford, CT: Connecticut DEEP, 2015), 3-1, https://portal.ct.gov/-/media/deep/waste_management_and_disposal/solid_waste_management_plan/cmmsfinal2015mswcharacterizationstudypdf.pdf?rev=e42fc570bb604483bb35c00e3dbca669&hash=61D61099597658DF0830E9B2CBA5C2F8.

[33] Connecticut DEEP, *Statewide Waste Characterization Study, 2015*, 3-2.

[34] It is important to note that this 41.4% figure for potential diversion includes compostable organics that are not easily source-separated due to difficulties with sorting or cross-contamination before and after disposal. For example, mixed food scraps may be irrecoverable when mingled with other non-recoverables, rendering them unsuitable for reuse and recycling in the absence of infrastructure or technologies that could segregate them. Such bottlenecks point to opportunities to improve sorting technology that separates recoverable waste and adequately minimizes contamination.

[35] Connecticut DEEP, *Statewide Waste Characterization Study, 2015*, 3-3.

[36] U.S. Environmental Protection Agency, *Quantifying Methane Emissions from Landfilled Food Waste* (Washington, DC: EPA, 2023), https://www.epa.gov/system/files/documents/2023-10/food-waste-landfill-methane-10-8-23-final_508-compliant.pdf.

[37] MIRA's closure represents an additional 720,000 tons of annual MSW processing capacity that Connecticut will need to replace.

led to Connecticut losing one-third of its capacity to process MSW and significant increase in exported waste, mainly to Pennsylvania and Ohio, representing additional GHG emissions related to transportation of that waste out of state, an estimated average of nearly 400 miles per ton[38] and approximately .65 Mtco2 per ton transported by freight truck.[39]

Municipalities in Connecticut are required by law[40] to provide pathways for solid waste disposal and recycling, often relying on tipping fees to cover costs. These fees reflect the cost of various pathways for disposing of waste at landfills, transfer stations, or RRFs,[41] and where applicable, diverting and processing recyclable or compostable materials. Funding for these expenses typically comes from property taxes, user fees, or other municipal revenue streams. Municipalities using unit-based pricing ("UBP") may reduce waste disposal costs by incentivizing households to generate less waste. Additional funding can come from transfer station permits or private hauling subscriptions.[42] Current municipal budget outlays represent a potential ability to pay for or save costs from reduced MSW and alternative waste solutions.

Targets

Substantial scaling and investment are needed to increase organic waste diversion from 9.3% to 41%. Analogous to that outlined in Connecticut General Statutes (CGS) Section 22a-228(b), the EPA food waste management hierarchy provides an effective framework to reduce the environmental impact of the food waste sector. Investments in preferred solutions such as reducing and recycling, composting, and sustainable waste-to-energy conversion will lead to better management of food waste. The stated goals of the 2016 CMMS to reuse, recycle, and compost 1.46 million tons of material and divert 300,000 tons of food waste to more sustainable waste-to-energy technologies like anaerobic digestion already recognizes the importance of investments in these preferred solutions.

[38] Connecticut DEEP, *Solid Waste Disposal & Diversion Report, 2022*, 10.
[39] Per EDF carbon calculator for freight trucking
[40] Connecticut General Statutes § 22a-220(a) 2023, https://www.cga.ct.gov/2021/pub/chap_446d.htm#sec_22a-220a.
[41] DSM Environmental Services Inc., *Solid Waste Management and Municipal Finance*, prepared for the Connecticut Governor's Recycling Working Group (Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2012), 2, https://portal.ct.gov/-/media/deep/waste_management_and_disposal/solid_waste/transforming_matls_mgmt/gov_recycling_work_group/appendixdpdf.pdf?rev=86bbad1e54ce4d77bb600e0e03677ae5&hash=E50BEEC5E2D8A1FF7DB55734581ECCB7.
[42] DSM Environmental Services, *Solid Waste Management and Municipal Finance*, 4.

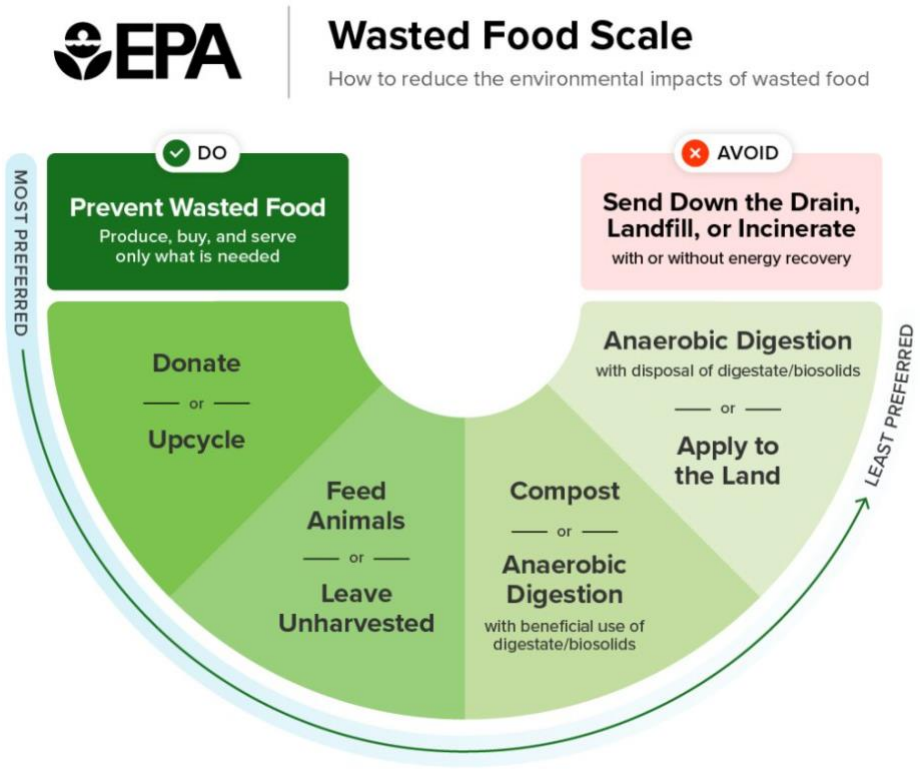

Figure 8: EPA Food Waste Hierarchy. *Source: EPA*

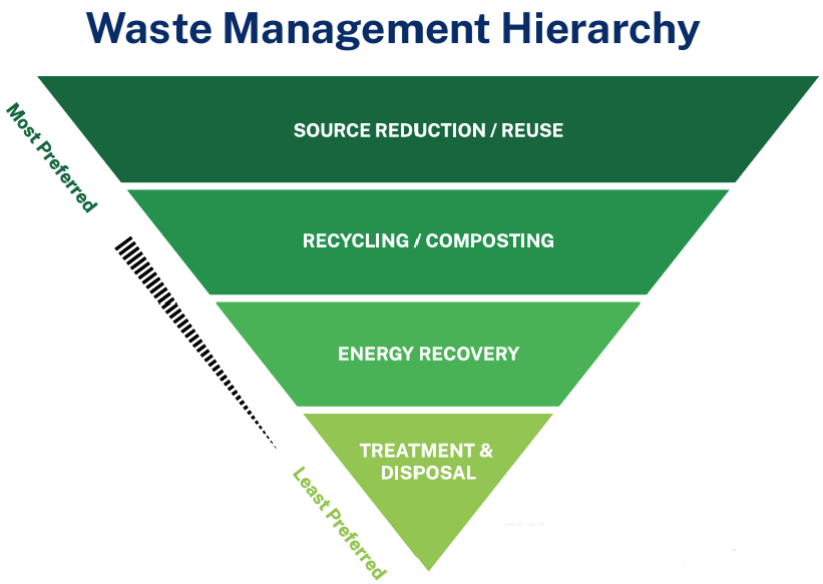

Figure 9: CT DEEP Waste Management Hierarchy established in Sec. 22a-228. *Source: DEEP 2022 Solid Waste Disposal & Diversion Report.*

ReFed, a leading national nonprofit focused on solutions to reduce food loss and waste, developed a "Roadmap to 2030" framework to reduce food waste in the US by 50% by 2030 as part of an interagency agreement between the USDA, EPA, and FDA. The framework's key action areas are well-aligned with CT DEEP's waste management hierarchy and 2016 CMMS food waste solutions framework as well as other state targets for materials management and organic waste diversion.

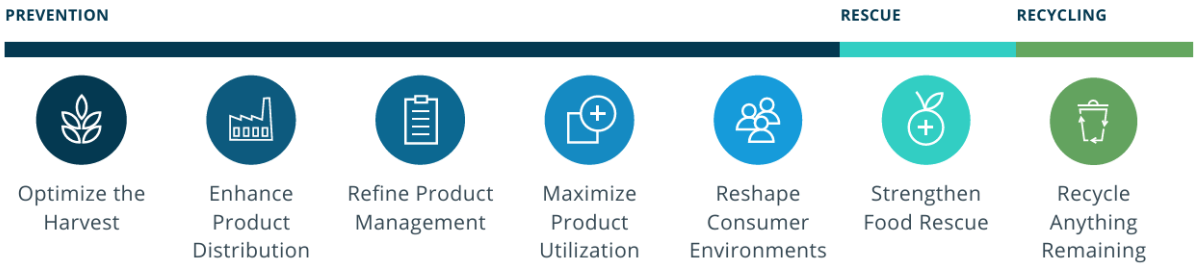

Figure 10: Key Action Areas from "Roadmap to 2030: Reducing U.S. Food Waste." Reproduced with permission from ReFED.

Table 5: Key Action Areas Adapted from ReFED "Roadmap to 2030: Reducing U.S. Food Waste by 50%"

Prevent	**Optimize the Harvest:** Avoid over-production, then harvest as much as possible. For wild caught products, source only what is needed.
	Enhance Product Distribution: Leverage technology to create smart systems that help efficiently move products to maximize freshness and selling time.
	Refine Product Management: Align purchases with sales as closely as possible and find secondary outlets for surplus. Build out systems and processes for optimal on-site handling.
	Maximize Product Utilization: Design facilities, operations, and menus to use as much of each product as possible. Upcycle surplus and byproducts into food products.
	Reshape Consumer Environments: Drive consumers towards better food management and less waste by creating shopping, cooking, and eating environments that promote those behaviors. Shift culture to place more value on food and reduce waste.
Rescue	**Strengthen Food Rescue:** Further the rescue of high-quality, nutritious food by increasing capacity, addressing bottlenecks, and improving communication flow.
Recycle	**Recycle Anything Remaining:** Find the highest and best use for any remaining food or food scraps in order to capture nutrients, energy, or other residual value.

- **Key Action Areas for Preventing Organic Waste:** Preventing organic food waste can include production or harvest management approaches and other solutions which are technology-oriented or induce behavioral change. They include both system level changes as well as incremental improvements to existing systems. For example, irregular produce, or produce which does not conform to conventional commercial color, shape, or size, is a substantial source of food waste and in recent years has compelled several businesses to capture the beneficial use of this produce (e.g. Imperfect Product, Misfits Market, etc.).

- **Key Action Areas for Strengthening Food Waste Rescue:** This includes solutions that prevent high-quality food from going to waste and instead divert it for donations. Solutions in this focus area typically include strengthening the operations

of organizations involved in collection of food that may not be appropriate for sale but remains safe for donation and consumption. This can include improving compliance with food donation laws, improving infrastructure facilities like transportation and cold-storage facilities, technology to support rescue operations, and other approaches.

- **Key Action Areas for Increasing Organic Waste Infrastructure:** This includes solutions which allow to recycle food to capture the nutrients, energy or any other residual value. The solutions in this focus area can include anything from home composting to centralized infrastructure (e.g. commercial aerobic composting and anaerobic digestion facilities).

Funding and Financing Programs

The following is a breakdown of the funding (i.e., grant) programs as of January 15, 2025, in support of organic waste management in Connecticut, including, but not limited to:

- **Clean Heavy-Duty Vehicles Grant Program** – Under the IRA, the EPA-administered 2024 Clean Heavy-Duty Vehicles Grant program will award up to $932 million in funding to replace existing non-zero emission Class 6 and 7 heavy-duty vehicles with eligible Class 6 and 7 zero-emission vehicles. Communities living in areas that do not comply with the National Ambient Quality Standards will receive at least $400 million in funding. This grant can be used to electrify and decarbonize fleets of waste collection trucks. Other eligible costs cover general zero-emission vehicle refueling infrastructure, workforce development and training, and project implementation.

- **Climate Pollution Reduction Grant Program** – Under the IRA, the EPA-administered grant provides nearly $5 billion in funding for states, local governments, tribes, and territories to reduce greenhouse gas emissions and other harmful air pollution, including through sustainable waste management strategies. The two-phase program will allocate $250 million for non-competitive planning grants and $4.6 billion for competitive implementation grants. The former's grantees must develop both a Comprehensive Climate Action Plan (CCAP) and Priority Climate Action Plan (PCAP) that detail measures to reduce GHG emissions across six key sectors, notably including waste management in addition to electricity generation, industry, transportation, buildings, and agriculture/natural and working lands, and waste management); the latter's represent lead organizations from the planning stage, as well as other federal agencies, state departments, municipalities, Tribes, and related entities for follow-through on implementing identified measures in an applicable PCAP.

- **Composting and Food Waste Reduction Cooperative Agreements ("CFWR")** –Through a partnership between the USDA's Office of Urban Agriculture and Innovative Production ("OUIAP") and the National Institute of Food and Agriculture ("NIFA"), CFWR agreements enable projects to assist eligible entities with testing and implementing municipal compost and food waste reduction programs. Eligible entities include but are not limited to municipalities, Tribes, RWAs, and school districts. Successful CFWR projects deliver economic benefits, improve compost

accessibility to farmers, strengthen food recovery efforts, and center strategic partnerships. Awardees must commit a 25% matching contribution to satisfy the statutory requirement.

- **Consumer Recycling Education and Outreach Grant Program** – This EPA grant provides funding to increase awareness about community recycling and composting, acceptable materials for recycling and composting, increasing collection rates, and decreasing contamination. The BIL has provided $75 million throughout fiscal years 2022 to 2026 with awards ranging from $250,000 to $2 million. As of early 2025, the EPA has announced 25 tribal and inter-tribal groups to receive more than $33 million in funding through this program. 40% of the announced funding was dedicated to disadvantaged communities and at least 20% was dedicated to low income, rural, and Native American communities. Grants are available to states, Tribes, territories, local governments, nonprofits, and public-private partnerships.

- **DECD Community Investment Fund 2030 (CGS Sec. 32-285a)**[43] – Authorized in Section 32-285a of the Connecticut General Statutes, the Community Investment Fund ("CIF") awards up to $175 million each fiscal year, for a total of $875 million, towards projects that foster economic development in underserved communities. Eligible applicants include Public Investment Communities, Alliance Districts (Connecticut's lowest performing districts), non-profits, and community development organizations. As the lead administrator, the Department of Economic Development oversees the application process for the grant program across two funding installments per year. Funded projects have launched food hubs or community kitchens to serve under-resourced residents, ensuring that equitable and just food systems are accessible while strengthening the local food economy. The CIF remains open for application, allowing municipalities to leverage this opportunity as a resource to further empower local businesses, expand workforce development, and create new avenues for economic growth.

- **DEEP Materials Management Infrastructure Grant Program (MMI Grant)** – CT DEEP has announced a $15 million grant opportunity to municipalities, councils of government ("COGs"), and RWAs to develop MMI that enhance ongoing waste reduction and diversion efforts. Grant funds will span two separate installments, with administration of the second round being dependent on the first. Eligible proposals will help to advance the state's self-sufficiency in MSW management while reducing the costs and environmental damages resulting from current disposal methods. Priority project proposals will demonstrate a high potential for waste diversion across a wider, regional scale, in addition to addressing environmental justice concerns. The grant follows DEEP's launch of the SMM Grant program, where the former will be a supplementary source of funding for waste reduction and diversion by bolstering regional and local MMI.

- **DEEP Regional Waste Authority ("RWA") Grant Program** – This program provides $2 million in state grant funding through the Sustainable Materials

[43] Connecticut General Statutes § 32-285a (2023), https://cga.ct.gov/2022/sup/chap_588n.htm#sec_32-285a.

Management Grant Program to assist Connecticut municipalities and state entities with forming and expanding RWAs by offering support on technical, legal, and administrative needs. As codified in statutory language, Section CGS 7-273 describes the range of powers vested in RWAs, most importantly issuing bonds, negotiating multi-year MSW service agreements, and implementing regional waste and recycling programs. Funding can thus provide further impetus for centrally organized governance to realize readily, actionable MSW.[44] Awarded participants agree to disclose progress reports on their proposed project as agreed upon with DEEP, from which the findings will be instructive for further planning, designing, and establishing RWAs that advance the state's waste diversion goals and ameliorate capacity deficits.

- **DEEP Sustainable Materials Management Grant Program (SMM Grant)** – Launched in September 2021, the SMM Grant authorized over $5 million across 15 municipalities to develop pilot programs for food scrap collection, UBP, collection strategies, and regional infrastructure projects. Six of the participating municipalities— Bethel, Guilford, Madison, Kent, Woodbury and Middletown—have decided to convert these pilots into permanent programs. CT DEEP is planning to make an additional $10 million available for waste diversion and reduction programs.

- **Healthy Communities Grant Program for New England** – Launched in 2003 under the authority of the Clean Air Act, Section 103(b)(3), the Healthy Communities Grant Program is EPA New England's primary grant program that targets environmental risks to protect and improve human health. Eligible applicants include state and local governments, public and private nonprofit organizations, federally recognized Tribal governments, K-12 schools and school districts, and grassroots and community-based organizations. Proposed projects must adhere to the following criteria: 1) be located in and/or benefit target investment areas,[45] and 2) describe how the project would achieve measurable environmental and/or public health impacts in target investment areas. Target program areas should address one or more of the following: capacity building on environmental and/or public health issues, clean, green, and healthy schools, energy efficiency, healthy indoor environments, healthy outdoor environments, pollution prevention, and sustainable materials management.

- **ReFed Catalytic Grant Fund** – These grants are designed to accelerate the creation and adoption of food waste solutions across the food system by offering both recoverable and non-recoverable funding alongside post-grant support. The fund prioritizes initiatives with strong potential to reduce food waste and GHG emissions. Funding is distributed through recurring open calls which advance priority food waste themes.

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[44] Connecticut General Statutes, § 7-273aa to 7-273pp (2023), https://www.cga.ct.gov/2023/pub/chap_103b.htm.

[45] As defined by the EPA's RFA for the 2024 Healthy Communities Grant Program. Available here: https://www.epa.gov/system/files/documents/2024-07/2024-healthy-communities-rfa.pdf

- **Rural Energy for America Program (REAP**) - Under the IRA, the USDA-administered program makes loan financing and grant funding available to agricultural producers and small rural businesses for renewable energy systems or energy efficiency improvements. Funds support agricultural producers with installing renewable energy infrastructure for agricultural production or processing, including anaerobic digestors or biogas projects. Recipients must be located in rural areas with populations of 50,000 residents or less, notwithstanding adhering to other requirements and restrictions, including funding caps.

- **Solid Waste Infrastructure for Recycling Grant Program ("SWIFR")** – Launched by the EPA in September 2023, the SWIFR grant program will invest $55 million throughout fiscal years 2022 – 2026 to expand recycling infrastructure and improve waste management systems across the country and provide assistance to states, communities (e.g. local waste management authorities), and Tribes or intertribal consortia. This is the largest investment in recycling made by the department in the last 30 years and enables implementation of the National Recycling Strategy. Eligible activities for targeted applicants will vary but may support the development or implementation of plans – including data collection efforts to demonstrate progress – that advance post-consumer materials management, or support more localized and physical actions, such as constructing and upgrading organic waste facilities via direct grants to communities. For example, in 2023 the City of Stamford received a community grant over $2 million for strengthening food scrap collection, implementing compost programs, and promoting a recycling education and outreach program to the general public. DEEP was also awarded SWIFR funding to refine its data management and analyses capabilities and expand capacity support for the Northeast Waste Management Official Association.

- **Sustainable CT Community Match Fund** – Sustainable CT operates a program of crowdsourced funding matched with grant funds for projects that align with their identified areas of action. A typical funding structure for a $15,000 project will crowdsource $7,500 with Sustainable CT matching that amount with $7,500 in grants. The proportion of crowdsourced funding and grant funding vary across project types. The Community Match Fund has been used to finance small projects for community composting, food scrap and organic waste collection bins, and education awareness.

The following is a non-comprehensive summary of different sources of finance that might support organic waste management projects in Connecticut:

- **Connecticut Green Bank:** works to mobilize greater investment in environmental infrastructure and works with a variety of capital providers to successfully finance projects and accelerate the growth of the green economy.

- **Community Development Financial Institutions ("CDFIs"):** These entities are often open to longer or more flexible financing and terms than commercial lenders. CDFIs focus on offering local financial services tailored to underserved populations. Like green banks, CDFIs can play a catalytic role in making impactful investments that often would not have happened otherwise.

- **Impact investors:** These investors balance financial performance alongside measurable social and environmental outcomes and may be motivated by investments with specific impact objectives to take market risks other lenders would not or invest at a lower rate of return. There are a number of firms with an aligned interest in organic waste management.

- **Commercial Financing:** These firms prioritize returns for their stakeholders by only making investments that meet minimum requirements for forecasted growth, a demonstrated history of performance, or where the value of their investment is otherwise secured.

Other Programs

The following are other programs or coalitions of note with respect to organic waste management in Connecticut:

- **Connecticut Coalition for Sustainable Materials Management ("CCSMM"):** CCSMM is a coalition of over 90 municipalities with DEEP formed in September 2020 to reduce, recycle, and divert solid waste. The coalition is chaired by the Commissioner of DEEP. The coalition has established four working groups: Food Scraps/Organics Collection and Diversion, EPR, Reuse and Recycling, and Unit-Based Pricing. CCSMM has issued a public request for solutions to implement its goals and received 43 submissions. During meetings between October and December 2020, each working group designed a menu of options to pursue to improve waste management in Connecticut. For food waste, the coalition followed the EPA food waste hierarchy and identified options in three broad areas as seen in Table 6. After the recommendation of the Food Scraps/Organics Collection and Diversion Working Group, CCSMM started the Organics Infrastructure Initiative. The last CCSMM meeting for which meeting materials are available is September 19, 2023.

Table 6: Recommendations of the CCSMM Food Scraps/Organics Collection and Diversion Working Group

Promote Collection and Diversion of Food Scrap/Organics	Infrastructure Development	Expand, Strengthen, and Increase Compliance with Existing Organics Diversion Laws

• Support food donation for human consumption
• Expand education, outreach, and support for composting of food scraps
• Expand education, outreach, and support for collection
	• Anaerobic Digestors
	  ○ Authorize DEEP to initiate power purchase agreements ("PPAs").
	  ○ Increase share of non-agricultural feedstock in on-farm anaerobic digestors
	• Encourage the development of food waste to animal feed facilities
		• Strengthen the requirement for commercial generators to divert organics from the waste stream to be donated, composted or processed in anaerobic digestion facilities
		• Increase compliance assistance to the

and diversion of food scraps/organics • Promote co-collection of food scrap/organics with MSW	• Establish a transfer station food waste drop off location and option for in-vessel composting • Promote the inclusion of food waste composting with leaf composting • Streamline siting and permitting for composting facilities	food waste generators withing the commercial organics recycling law; develop enforcement strategy

- **Connecticut Compost Alliance:** A coalition of composting advocates from nonprofits, state and federal agencies, and businesses dedicated to advancing composting education, resources, and activities across the state. With a mission to support and educate current and future composters, the Alliance fosters collaboration and engagement among stakeholders to promote aerobic composting practices that enhance and improve soil health.

- **Connecticut Zero Waste Coalition** – Established in 2020, the coalition aims to address the state's waste crisis by promoting zero waste solutions that enhance environmental and economic well-being and seeks to reduce the negative impacts and disproportionate burden of the impacts of waste management on low income and communities of color. The coalition's initiatives include advocating for waste reduction, opposing trash incineration, and supporting innovative and sustainable waste management practices (e.g. organic waste management solutions and "pay" or "save-as-you throw" unit-based pricing programs).

- **Sustainable CT** – Commits municipalities to take on a variety of tasks to promote sustainability and earn points for community designation, including:

    - **9.4 Reduce and Compost Organic Waste** – Reduce or eliminate food and organic waste and increase food scrap recovery.

Stakeholder Outreach

The Green Bank met with key stakeholders and attended the 2024 ReFED Food Waste Solutions Summit to explore the public policy and marketplace context for organic waste management in Connecticut.

These entities represented primarily public and for-profit organizations. The objectives of these conversations included sharing information on the scope expansion in environmental infrastructure and eliciting discussion in the following areas:

- **Sector Insight and Experience** – Exploring stakeholders' direct experiences with operating and market conditions for organic waste management in areas such as collection, transportation, pre-processing, composting, anaerobic digestion, municipal programs, and the broader waste management ecosystem.
- **Policies and Targets** – what local, state, and federal policies are important from the stakeholder's perspective, and what targets are they seeking to achieve;
- **Vulnerable Communities** – how the stakeholder's organization thinks about the impacts that must be addressed from climate change to build the resilience of vulnerable communities; and

- **Stakeholder Identification** – learning more about other key entities in the sector.

Through this targeted engagement, the Green Bank refined its understanding of the challenges and opportunities of organic waste management in Connecticut and the role it might play in terms of financing solutions from the perspective of its mission – to confront climate change.

Findings

Given its experience investing in food- and farm-waste to energy facilities and various meetings with stakeholders, the following are key findings with respect to organic waste management:

- **Prevent food from becoming waste:** Multiple approaches have been proven to support the prevention of food and other organic materials from ending up in the waste stream, including strategies and approaches on display at the 2024 ReFED Food Waste Conference. These include technological innovations and educational campaigns that help to enact behavioral change, innovative ways to sell imperfect produce to consumers, and the reuse of food scraps in consumer product creation. Among potential approaches, the web application company Flash Foods has partnered with Stop and Shop locations across Connecticut to offer discounts on groceries that are nearing their "best by" date to reduce food waste and address food insecurity, including meat, dairy, seafood, fruits, vegetables, and snack foods. Nationwide across all 1,100 Flash Food partner stores in 2023, 37 million pounds (18,500 tons) of food were diverted from landfill.[46]

- **Supporting Connecticut's food rescue network:** Connecticut's network of food rescue organizations often provides services and benefits to vulnerable communities while preventing food that is no longer fit for sale—but still suitable for consumption—from ending up in the waste stream. In some instances, these entities also provide offtake services for commercial and industrial consumer product processing facilities that would otherwise need to pay for product disposal. One such organization, Food Rescue US, was founded in Fairfield, Connecticut in 2011 and has since expanded to 43 locations across 23 states and the District of Columbia, preventing 199 million pounds (99,500 tons) of excess food from going to landfill while addressing food insecurity. Their web application and network of volunteers help to transfer surplus food from local businesses to social service agencies and other support organizations. Haven's Harvest, an affiliate nonprofit partner of Food Rescue US, is a New-Haven based non-profit that collects and distributes excess and recovered food to over 200 sites. Since 2021, they have recovered 1.5 million pounds (750 tons) of food. Other national solutions providers active in Connecticut include organizations like FoodRecovery.org, which operates a web platform to connect organizations with surplus food to food rescue organizations and food insecure communities with a network of over 3,400 food partners across the country. Also, Connecticut Foodshare (formerly the Connecticut Food Bank) has been a member of Feeding America since 1982 and is part of their nationwide network of

[46] Flashfood, *2023 Impact Report* (Toronto: Flashfood, 2023), 3, https://cdn.sanity.io/files/7topkt8d/production/8d57fbba40b60a275d84b1532ed2cf8d51076081.pdf?dl=.

food banks. Overall, increasing the operational efficiency and capacity of food rescue organizations could support the dual outcomes of food insecurity and organics diversion, though the scaling of these operations through conventional financing may be difficult, especially for storage and distribution centers funded through nonprofit grants and donations.

- **Organic Waste Diversion and Recycling, from Collection to Transit to Processing:** Organic waste diversion in Connecticut faces a variety of challenges across efforts to collect, transport, and process organic waste generated from residential and industrial, commercial, and institutional stakeholders. Collection is a critical, costly, and complicated piece of logistics and infrastructure for many municipalities. Collection efforts must address disparities in access to food scrap separation programs, particularly in vulnerable communities, while maintaining low degrees of material contamination for effective downstream processing. Transportation logistics are complicated by the need for regional transfer stations and optimized routes, particularly for municipally managed organic waste, which often requires adjustments to infrastructure and carry municipal budget implications. Processing solutions, including anaerobic digestion, composting facilities, and upcycling (e.g. animal feed) operations, must navigate regulatory hurdles such as permitting and site constraints, as well as comply with important environmental justice policies, alongside economic considerations for scaling operations to meet the diverse needs of residential and industrial, commercial, and institutional waste generators.

- **Elevated need for organic waste infrastructure:** The closure of the MIRA RRF and the volume of MSW it previously processed has heightened the importance of organic waste diversion and processing solutions to address the state's waste management challenge. Centralized composting of food waste and centralized approaches to anaerobic digestion represent the most impactful ways to increase the total tons of organic waste diverted, currently contributing 13.8 and 3.8 million tons of diversion, respectively.[47] In addition, the January 1, 2025 expansion of the Commercial Organics Law represents a greatly expanded set of regulated entities, and DEEP is committed to increased enforcement of the law. The expanded law paired with enforcement could help to increase the reliable diversion of organic waste feedstock to aerobic composting, anaerobic digestion, and upcycling facilities, create new market opportunities, and bolster Connecticut's self-sufficiency.

- **RWAs can help to address fragmented governance of waste management:** Connecticut municipalities have a variety of circumstances that have led to individual programs, approaches, and contracts for MSW collection, hauling, and processing. Disparate or small-scale approaches can limit municipal contract negotiating power and can be difficult for service providers to navigate given the need for economies of scale and business efficiency, which increases the operational cost of service provision. RWAs could help to address these challenges through regional coordination and contracting capabilities. DEEP has extended funding through the RWA grant for municipalities to conduct a needs assessment to estimate their waste

[47] ReFED, *Roadmap to 2030*, 11.

generation and handling capacity as well as infrastructure requirements. The grant also encourages the creation of RWAs by providing technical support to municipalities in drafting legal documents and ordinances. Several municipalities have shown interest in the formation of RWAs and view DEEP's related funding program as an opportunity to explore feasibility and address the fragmentation of municipal-level waste management. Best practice guidance for RWA administration remains consequential for most municipalities and COGs, given the lack of experience and expertise in opting for centralized waste management strategies, all while learning how to navigate a dynamic regulatory environment.

- **Municipalities are sensitive to future price risk and seek control of waste management options:** For many years, MIRA acted as the public option for waste management and provided a ceiling on waste disposal pricing, which the RWAs could seek to emulate. Municipalities and COGs will expect to confront sweeping changes in the waste industry in the wake of MIRA's closure, with a need for new solutions and contract agreements, tip fee management, and the predictable flow of waste processing streams. For instance, as a result of its dissolution MIRA will no longer be engaged in tip fee stabilization, which has provided significant price control for certain municipalities. There is some hesitancy to shift to private contracts for MSW management given the price risk over time.

- **Municipal Pilot Programs demonstrate solutions:** Outcomes from the SMM grant have yielded some of the most substantial findings on municipal-scale waste collection to date, highlighting the advantages and limitations of the methods employed. Through the program, DEEP funded seven transfer station drop-off programs, five co-collection programs, and three separate collection programs, which diverted over 1 million pounds of food scraps cumulatively. Co-collection was more cost effective in increasing diversion but had the drawback of increasing contamination rates. Conversely, drop-off and separate collection programs had lower contamination rates but were more expensive to implement. Results from the pilots have effectively demonstrated widespread success in reducing food waste, leading the six aforementioned municipalities - Bethel, Guilford, Madison, Kent, Woodbury and Middletown - to adopt permanent programs. These findings underscore the potential scalability of such initiatives across the state, especially when equipped with the appropriate financial and technical resources.

- **Transit costs of organic waste are a significant barrier to diversion and limit service sheds of processing infrastructure:** Transportation costs and related investment in equipment, logistics and infrastructure are critical barriers to the effectiveness and affordability of organic waste diversion strategies. Current challenges related to the price and distance of transporting organic waste to processing facilities significantly limit the service area and efficacy of existing infrastructure, especially for the management of municipally generated organic waste. Strategies such as establishing satellite collection facilities can significantly reduce transportation costs, create opportunities for municipal collection programs, and increase the predictable supply of organic feedstock. Satellite collection facilities act as localized hubs for organic waste consolidation, reducing the distance and associated costs of transporting materials to centralized processing facilities. Alternately, high transportation costs of MSW to out-of-state landfills due to the

shortage of in-state disposal capacity may create opportunities to incentivize organic waste diversion, as reducing the volume of MSW being transported long distances for disposal could yield potential cost savings for municipalities and haulers. By addressing these barriers or seeking price and logistics efficiency, Connecticut can bolster organic waste diversion efforts.

- **Utilizing Current Infrastructure and Permitting Pathways:** Municipalities can further enhance organic waste diversion by leveraging existing transfer stations and exploring expanded permitting pathways for food waste management with DEEP. Both public and private waste facilities may seek to obtain permits to offer food waste collection and transfer or provide processing or composting services. As examples, the Mansfield and Ridgefield transfer stations accept food scraps, coupled with leaf composting, while private facilities like WeCare Denali, LLC and BrightFeeds provide organic waste services for municipal and commercial needs.

- **Current organic waste processing is under permitted capacity:** Connecticut's existing organic waste processing capacity is underutilized, with only about 40% of the permitted 100,000 tons being processed. This inefficiency stems from several factors, including a lack of predictable feedstock supply, limited enforcement of the Commercial Organics Recycling Law, and reliance on out-of-state sources for organic waste. Facilities like Quantum Biopower, for instance, derive only 15% of their feedstock locally, highlighting the challenges of ensuring a steady, in-state supply. The state's commitment to enhancing compliance with food scrap diversion laws and expanding mandatory participation under the Commercial Organics Law presents an opportunity to address these issues.

- **Expressed interest in private sector partnership and support programs:** Comments from the project sponsor community note that current grant funding and support programs for food waste and organics processing focus on municipalities, nonprofits, and other public entities. They note that limited grant funding, support programs, or other incentives for private industry is a potential barrier to the expansion of centralized or larger scale organic waste processing solutions in the state. For example, the expansion of virtual net metering for on-farm anaerobic digestion, or funding or other incentives for pre-processing infrastructure (e.g. depackaging facilities) could support private sector development of additional processing capacity. There is broad interest in public-private coordination or partnership to explore support mechanisms for private companies to advance organic waste management solutions.

- **Increasing the Recyclability of Organic Waste as a "Feedstock:"** Solution providers must consider the ability to convert organic waste streams into usable feedstocks for either compost or digestion, through a series of pre-processing steps which may include depackaging, purifying, sizing, shredding, or homogenizing. Logistics and infrastructure innovation which helps to create predictable feedstocks can help to increase the ability for organic waste to be diverted and recycled for beneficial use.

- **Enforcement needed for Connecticut's mandatory food scrap diversion law (Public Act 11-217) to be effective:** Lack of enforcement of the existing food scrap diversion law reduces compliance. The state is committed to increasing compliance. It would require a huge investment of state resources for enforcement to be effective.

Table 7. Relevant Metrics Identified by Stakeholders on Organic Waste Management

Inputs	Outputs	Outcomes
• Collection systems and infrastructure • Logistics infrastructure (including transportation and equipment) • Pre-processing infrastructure (depackaging, homogenization) • Regional waste authorities • Municipal pilot programs • Technological innovation (e.g. compost grinding and dehydrating, app for discounts on food near the end of its shelf life, etc.)	• Food scraps diverted (tons) • Yard waste diverted (tons) • Wood waste diverted (tons) • Compostable paper diverted (tons) • Power, heat, and/or transportation fuel generated • Finished compost and soil amendments • More affordable food	• Methane and other GHG reduction • Waste self-sufficiency • Price control/certainty • Reduced food insecurity • Household savings (from food cost reduction and/or waste management)

Opportunities

The Green Bank will pursue opportunities related to the market development and scaling of existing solutions for organic waste management through Green Bank investments (see Capital Solutions below) and related initiatives. The Green Bank strategy will seek to:

1. Prevent Organic Waste by investing in solutions that prevent the creation of food and other forms of organic waste.
2. Strengthen Food & Organic Waste Rescue by investing in solutions that increase food and organic waste rescue and reuse, including strategies meant to capture food that would otherwise go to waste and increase diversion to beneficial use, especially to use by food banks or other organizations working with vulnerable communities.
3. Increase Organic Waste Processing Capacity by investing in solutions that help to capture, segregate, collect, transport, pre-process, and process organic waste, including scaling up solutions that increase materials management and food waste processing infrastructure like aerobic or anaerobic digestion of food and farm waste.

Table 8: Examples of Potential Investment Opportunities

Impact	Opportunity
Prevent	Technology and equipment adoption to reduce harvest losses (e.g. on-farm solar-powered frost fans or field cooling units)
	Food aggregation and distribution facilities for improved supply chain efficiencies
	Facility upgrades for improved produce management and reduced loss
	New commercial services to reduce food waste, save costs and improve supply chain efficiency
	Processing capacity expansion for upcycling defect produce into value-added products
Rescue	Working capital support for food rescue initiatives
Recycle	Pre-processing infrastructure (e.g. depackaging, homogenizing)
	Increased regional processing capacity (e.g. commercial aerobic composting, anaerobic digestion, etc.)
	Regional infrastructure to support organic waste processing capacity
	Increased capacity for organic waste management and compost (on-farm, at food-processing facilities, etc.)
	Expanding or improving organic waste hauling services
	Feedstock offtake agreements
	Support the development of onsite capacity to divert organic waste and generate products and energy for waste producers
	End product creation (e.g. finished compost, power, heat, or transportation fuels)
	Organic waste tracking and aggregation services

The Green Bank is poised to address municipal and industrial, commercial, and institutional waste management challenges through targeted investments that bolster organic waste management systems, create cost-effective municipal organic waste solutions and commercialize emissions reductions from organic waste prevention, rescue, and recycling. Realizing this vision will require strong partnerships among municipalities, DEEP, RWAs,

nonprofits, private sector businesses, community leaders, research institutions, and investors. The Green Bank aims to leverage its financing capacity to play a catalytic role in structuring these partnerships to secure the necessary capital.

The Green Bank provides catalytic capital for investments that—but for the Green Bank's participation—would either not happen, happen at a much slower pace, or happen with less impact. The Green Bank can provide competitive project financing for bespoke projects through the Capital Solutions program, which maintains an open rolling request for proposals (RFP)[48] that align with the strategy and opportunities outlined in this primer. This Open RFP will support a variety of developers and capital providers—from emerging developers of commercially established technologies to well-established manufacturers of emerging technologies, to lenders and investors of all types. It is important to note that the Open RFP is not intended to be a venture capital program, nor will it seek to assume risks that are more appropriate for other elements of a project or business's capital stack. At its core, the Green Bank is a special purpose financial institution, with a responsibility to be good stewards of funds committed to it by statute to promote the clean energy and environmental infrastructure goals of the state. Prospective borrowers that are interested in financing through the Capital Solutions RFP should review the program criteria and contact the Green Bank to express interest or ask questions.

[48] https://www.ctgreenbank.com/wp-content/uploads/2024/07/Open-RFP-for-Green-Bank-Capital-Solutions-for-Clean-Energy-and-Environmental-Infrastructure-Investment.pdf

References

References for Support the State

The Green Bank reviewed the following documents to support its outlook:

- Connecticut Public Act No. 23-170 "AAC the Management of Solid Waste and Establishing the MIRA Dissolution Authority"

References for Solar PV & Battery Storage End-of-Life

In addition to the conversations with stakeholders, Power Advisory and the Green Bank reviewed the following documents to support its findings and opportunities:

- **End-of-Life Management of Photovoltaic Solar Panels in the United States** (EPA/600/R-23/186)
  U.S. Environmental Protection Agency. (2023). Office of Research and Development, Center for Environmental Solutions and Emergency Response. Retrieved from https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=547839&Lab=CESER
- **ISO New England 2024 Final PV Forecast**. ISO New England. (2024). *Final 2024 Photovoltaic (PV) Forecast*. Retrieved from 2024_pv_forecast_final_updated.pdf
- **Global EV Outlook 2024**. International Energy Agency. (2024). *Global EV Outlook 2024: Moving Towards Increased Affordability*. Retrieved from Global EV Outlook 2024 – Analysis - IEA.
- **The 50 States of Solar Decommissioning: 2023 Snapshot.** North Carolina Clean Energy Technology Center. (2024). *The 50 States of Solar Decommissioning: 2023 Snapshot*. North Carolina State University. Retrieved from NCCETC Releases New 50 States of Solar Decommissioning 2023 Snapshot Report | NC Clean Energy Technology Center.
- **NREL Study on Solar Photovoltaic Module Recycling.** Curtis, T. L., Buchanan, H., Heath, G., Smith, L., & Shaw, S. (2021). *Solar Photovoltaic Module Recycling: A Survey of U.S. Policies and Initiatives* (NREL/TP-6A20-74124). National Renewable Energy Laboratory. Retrieved from https://www.nrel.gov/publications.
- **New Jersey Solar Panel Commission Report.** New Jersey Solar Panel Recycling Commission (2023). *Report of Investigation of Recycling and other Management Methods for Solar Panels, and Recommendations by the New Jersey Solar Panel Commission*. New Jersey Department of Environmental Protection. Retrieved from https://www.nj.gov/dep/dshw/recycling/Solar%20Panel%20Commission.pdf

References for Expand & Scale Organic Waste Management

In addition to the conversations with stakeholders, the Green Bank reviewed the following documents to support its findings and opportunities:

- **Comprehensive Materials Management Strategy (CMMS)**.
  Connecticut Department of Energy and Environmental Protection. (2016). *Comprehensive Materials Management Strategy*. Retrieved from Connecticut Solid Waste Management Plan.
- **Draft Amendment to the Comprehensive Materials Management Strategy**. Connecticut Department of Energy and Environmental Protection. (2023). *Draft Amendment to the Comprehensive Materials Management Strategy*. Retrieved from CMMS Amendment.

- **Statewide Waste Characterization Study.** Connecticut Department of Energy and Environmental Protection. (2015). *Statewide Waste Characterization Study*. Retrieved from 2015 MSW Characterization Study.
- **2022 Solid Waste Disposal & Diversion Report.** Connecticut Department of Energy and Environmental Protection. (2024). *2022 Solid Waste Disposal & Diversion Report.* Retrieved from https://portal.ct.gov/-/media/deep/reduce_reuse_recycle/data/diversion_report_2024_3.pdf.
- **ReFED 2030 Roadmap.** ReFED. (2021). *Roadmap to 2030: Reducing U.S. Food Waste* by 50% and the ReFED Insights Engine. Retrieved from https://refed.org/uploads/refed_roadmap2030-FINAL.pdf

Definitions

The following are important definitions referenced in this primer:

- **Advanced Fee Administration (AFA)** – A program that charges a fee at the point of sale to fund end-of-life management of products.
- **Anaerobic Digestion** — an organic waste management process that utilizes specialized bacteria in the absence of oxygen to convert organic materials into biogas. Biogas can then be used as a renewable fuel to generate electricity and heat, among other purposes. The material leftover after anaerobic digestion, the digestate, is rich in nutrients and can be put to beneficial use as compost, fertilizer, bio-based products, and animal bedding.
- **Co-collection** – A method of source-separated recycling without the high costs and logistics of separate collection systems. By using color-coded bags for different materials such as food scraps, it integrates with certain existing logistics and equipment (e.g. haulers pick up source-separated organic material alongside other waste) and can be adapted over time as waste management needs evolve. Some co-collection programs may complement unit-based pricing to further enhance waste diversion efforts.
- **Compost** - a biological process that occurs when microorganisms, bacteria and insects break down organic materials such as leaves, grass clippings and certain kitchen scraps into a soil-like product called compost. Composting is a natural way of recycling, returning nutrient-dense material back to the soil.
- **Performance (Decommissioning) Bond** – A financial guarantee or assurance that ensures the completion of decommissioning and recycling activities for solar and battery projects at end of life.
- **End-of-Life Management** – The process of collecting, processing, and reusing materials that would otherwise be considered waste. It can involve converting these materials into new products, thereby reducing the need for raw materials, minimizing environmental impact, and conserving natural resources. Within the context of this report, recycling occurs the end-of-life of a battery or solar panel. Repurposed batteries and solar panels are not considered recycling.
- **Extended Producer Responsibility (EPR)** – A policy approach where producers are given significant responsibility for the cotreatment or disposal of post-consumer products, such as lithium-ion batteries. In Connecticut, EPR policies already apply to paint, mattresses, electronic waste, mercury thermostats, gas cylinders, and, beginning in 2025, tires.
- **Municipal Solid Waste** – Solid waste from residential, commercial, institutional (e.g. schools and hospitals), and industrial sources, excluding solid waste consisting

of significant quantities of hazardous, land-clearing debris, demolition debris, biomedical waste, sewage sludge and scrap metal.

- **Organic Waste** – biodegradable wastes that can be processed through composting or anaerobic digestion, including but not limited to food waste, compostable paper, and manure. Organic waste encompasses a wide range of material, some of which may not be easily separated prior to the point of disposal or processing for anaerobic digestion or composting.
- **Recycling** – The process of collecting, processing, and reusing materials that would otherwise be considered waste. It can involve converting these materials into new products, thereby reducing the need for raw materials, minimizing environmental impact, and conserving natural resources. Within the context of this report, recycling occurs the end-of-life of a battery or solar panel. Repurposed batteries and solar panels are not considered recycling.
- **Source Separated Organic Material** – Organic material, including, but not limited to, food scraps, food processing residue, and soiled or unrecyclable paper that has been separated at the point or source of generation from nonorganic material.
- **Unit-Based Pricing** – commonly referred to as "pay-as-you-throw," the variable rate pricing structure institutes a per unit of waste collected fee for MSW management services as opposed to a fixed one. By charging households based on the amount of trash they generate, the system not only incentivizes waste reduction and prevention but is a much more equitable alternative to traditional pricing models that charge a flat rate.
- **Virtual Net Metering** – a program that enables a participating customer, otherwise known as the "host," to absorb or share the billing credits for excess power generated when the renewable energy system produces more power than the owner uses. Eligible participants include 1) municipalities and state agencies with class I (e.g. solar or wind) or class III (cogeneration) energy systems and 2) agricultural customers with class I energy systems, both of which must be served by an EDC and hold a generating capacity no greater than three megawatts.

Appendix A: Societal Impact Report

Since the Connecticut Green Bank's inception through the bipartisan legislation in July 2011, we have mobilized more than $2.88 billion of investment into the State's green economy. To do this, we used $409.4 million in Green Bank dollars to attract $2.47 billion in private investment, a leverage ratio of $7 for every $1. The impact of our deployment of renewable energy and energy efficiency to families, businesses, and our communities is shown in terms of economic development, environmental protection, equity, and energy (data from FY 2012 through FY 2024).*

ECONOMIC DEVELOPMENT

JOBS The Green Bank has supported the creation of more than **29,248** direct, indirect, and induced job-years.

TAX REVENUES
The Green Bank's activities have helped generate an estimated **$148.0** million in state tax revenues.

$56.4 million individual income tax

$58.0 million corporate taxes

$32.0 million sales taxes

$1.5 million property taxes

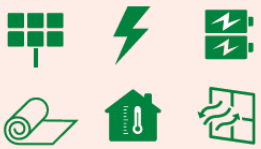
ENERGY

ENERGY BURDEN
The Green Bank has reduced the energy costs on families, businesses, and our communities.

63,300+ *families*

8,125+ *businesses*

DEPLOYMENT
The Green Bank has accelerated the growth of renewable energy to more than **707.2 MW** and lifetime savings of over **89.3 million MMBTUs** through energy efficiency projects.



ENVIRONMENTAL PROTECTION

POLLUTION The Green Bank has helped reduce air emissions that cause climate change and worsen public health, including **7.0** million pounds of SOx and **8.7** million pounds of NOx lifetime.

11.4 MILLION tons of CO_2 : EQUALS

172 MILLION tree seedlings grown for 10 years

OR

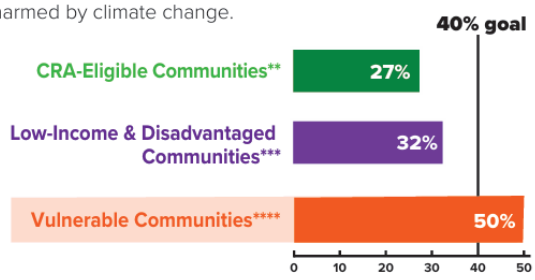
2.3 MILLION passenger vehicles driven for one year

PUBLIC HEALTH The Green Bank has improved the lives of families, helping them avoid sick days, hospital visits, and even death.

$218.9 – $494.9 million of lifetime public health value created

EQUITY

INVESTING in vulnerable communities, The Green Bank has set **goals** to reach **40% investment** in communities that may be disproportionately harmed by climate change.



** Community Reinvestment Act (CRA) Eligible Communities – households at or below 80% of Area Median Income (AMI)

*** Low-Income and Disadvantaged Communities – those within federal Climate and Economic Justice Screening Tool and Environmental Justice Screening Tool

**** Vulnerable Communities – consistent with the definition of Public Act 20-05, including low- to moderate-income communities (i.e., less than 100% AMI), CRA-eligible communities, and environmental justice communities (e.g., including DECD distressed communities)

* Includes projects, deployment, and investments approved, but not yet interconnected under Energy Storage Solutions.

Learn more by visiting ctgreenbank.com/strategy-impact/societal-impact/

Winner of the 2017 Harvard Kennedy School Ash Center Award for Innovation in American Government, the Connecticut Green Bank is the nation's first green bank.

Sources: Connecticut Green Bank Comprehensive Annual Financial Reports

Appendix B: Anaerobic Digestion Pilot Program Case Studies

As implementor of Section 103 of Public Act 11-80, "An Act Concerning Anaerobic Digestion," the Connecticut Green Bank financed the state's first two anaerobic digestors under a pilot program created to pair organic waste with on-site anaerobic digestion facilities through loans, grants, or PPAs. Anaerobic digestion is an organic waste management process that utilizes specialized bacteria in the absence of oxygen to convert organic materials into biogas. Biogas can then be used as a renewable fuel to generate electricity and heat, among other purposes. The material leftover after anaerobic digestion, the digestate, is rich in nutrients and can be put to beneficial use as compost, fertilizer, bio-based products, and animal bedding.

Quantum Biopower

In 2016, the Green Bank issued a $2 million subordinated loan to Quantum Biopower for Connecticut's first anaerobic digestor facility. The loan financed a portion of Quantum's $12 million food-waste-to-energy facility capable of providing up to 1.1 MW of electricity. The facility accepts organic materials from commercial food processors, restaurants, supermarkets, and municipalities. The Green Bank's investment was made through the state's pilot program and supports the evolution of policy on organic waste management, i.e., Connecticut's Commercial Organics Recycling Law which mandates that commercial or industrial food wholesalers, distributors, and manufacturers generating in excess of 26 tons of source separated organic material a year divert their organic waste to a DEEP-authorized composting or clean waste-to-energy facility.

The Green Bank's investment helped to mobilize additional private sector support for this project from M&T Bank (formerly Peoples United Bank), which issued an $8 million loan to finance the balance of the facility. By financing the state's first anaerobic digester, the Green Bank helped to catalyze innovative organic waste diversion solutions to meet Connecticut's goal of self-sufficiency.

Ag-Grid Energy

In 2020, the Green Bank issued a $850,000 loan to Fort Hill Ag-Grid LLC, a joint venture between Ag-Grid and Fort Hill Farms, for Connecticut's first farm-waste-to-energy anaerobic digestor facility. The loan financed a portion of the $4 million facility, which generates approximately 3,500 MWh of electricity. The system's energy is supplied to the municipalities of New Britain and Middletown, with Eversource facilitating virtual net metering and interconnection to the grid.

The project received additional funding and financing from various sources, including a senior loan from Live Oak Bank as well as grants from the USDA's Rural Energy for America Program ("REAP") and Connecticut's Department of Agriculture. As the state's first on-site dairy digester, the farm realized energy savings by utilizing power generated through the digestor and generated revenue by supplying surplus energy to Eversource, collecting tipping fees from other farmers' organic waste and manure, and capturing Renewable Energy Credits ("RECs").

Fort Hill Ag-Grid LLC was an innovative demonstration of farm waste solutions. Fort Hill, together with Hytone Ag-Grid (an additional dairy digester completed in 2023), Ag-Grid's Connecticut facilities processed 4.8 and 5.8 million gallons of food waste in 2024 respectively, or close to 42,000 tons annually. By financing the state's first farm-waste-to-energy facility, the Green Bank helped to catalyze innovative organic waste diversion solutions to meet Connecticut's goal of self-sufficiency.