2024 Policy Guide to Local Energy Resilience for Connecticut

CIRCA
Connecticut Institute for Resilience and Climate Adaptation

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CIRCA

MISSION

The mission of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is to increase the resilience and sustainability of Connecticut communities vulnerable to the growing impacts of climate change on the natural, built, and human environments.

ABOUT

CIRCA is a multi-disciplinary center of excellence that brings together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to problems that result from a changing climate. The Institute helps coastal and inland floodplain communities in Connecticut and throughout the Northeast better adapt to changes in climate. It also works to make the human-built infrastructure of these communities more resilient; while protecting valuable ecosystems and the services they offer to human society (food, energy and clean air and water). The Institute combines the world-class research capabilities of the University of Connecticut (UCONN) and the progressive policies and practical regulatory experience of the Connecticut Department of Energy and Environmental Protection (DEEP) to translate sound scientific research into actions that ensure the resilience and sustainability of both the built and natural environments of the coast and watersheds of Connecticut.

Climate change is increasing the frequency and severity of flooding and droughts, rendering Connecticut and the Northeast particularly susceptible. Severe storms in the United States in 2023 caused 492 deaths and around $92.9 billion in property damage.[1] Aside from floods, the costliest and deadliest of natural disasters are droughts, pollution of water resources and coastal areas, wildfire events. Climate change affects the water cycle increasing the frequency of abnormal weather, including heavy rains and droughts, around the world with particularly severe impacts in developing countries. While the Institute's immediate attention is focused on Connecticut and the Northeast, it will also develop comprehensive approaches to climate change research at the national and international scales.

In collaboration with local, regional, and national partners, the Institute's multi-disciplinary research, outreach, and education programs will strive to:

- Improve scientific understanding of the changing climate system and its local and regional impacts on coastal and inland floodplain communities;
- Develop and deploy natural science, engineering, legal, financial, and policy best practices for climate resilience;
- Undertake or oversee pilot projects designed to improve resilience and sustainability of the natural and built environment along Connecticut's coast and inland waterways;
- Create a climate-literate public that understands its vulnerabilities to a changing climate and which uses that knowledge to make scientifically informed, environmentally sound decisions;

- Foster resilient and sustainable communities—particularly along the Connecticut coastline and inland waterways—that can adapt to the impacts and hazards of climate change; and
- Reduce the loss of life and property, natural system and ecological damage, and social disruption from high-impact events.

VT LAW AND GRADUATE SCHOOL INSTITUTE FOR ENERGY AND THE ENVIRONMENT

Vermont Law and Graduate School (VLGS) is one of the top five environmental law schools in the U.S. and is nationally renowned in climate change law, restorative justice, criminal law, and clinical education. VLGS leads the nation in equipping students for the clean energy transition. Its energy law and policy program offers the largest selection of clean energy courses in the country, esteemed experiential learning opportunities in renewable energy, new clean transportation classes and research options, and seamless integration with a world-class environmental law and policy program.

The Institute for Energy and the Environment (IEE) at VLGS is a renowned resource – nationally and globally – focused on the energy policy of the future. The IEE combines a research associate program, which serves as a center for graduate research on the transition to a just, clean energy future, with a vibrant student-staffed energy clinic, which works on legal and business models for community energy development. Its unique year-round Energy Clinic works on the cutting edge of renewable energy development, including a project that powers VLGS with over 50% local solar energy.

INTRODUCTION – LOCAL ENERGY RESILIENCE

The modern electric grid, largely constructed in the 1950s and 60s, is hailed as one of the greatest inventions in human history. In a sort of Rube Goldberg fashion, gas, oil or coal was first extracted from beneath the surface, then piped or trucked, sometimes halfway across the country, to centralized power generators. After the power is generated, it is stepped up in voltage; moved long distances over tall transmission lines that cut over mountains and through forests and fields; reconfigured at substations; and stepped down to match the local distribution lines that then carry the electricity overhead along streets to homes and businesses. Unfortunately, as the generation part of this system was designed to be powered almost exclusively by these fossil fuels, this process also results in a massive discharge of CO_2 and other pollutants into the air. These fossil fuel-powered generators now recognized as one of the greatest contributors to climate change—estimated, as of 2020, to contribute approximately 25% of all anthropogenic U.S. greenhouse gas (GHG) emissions.[2] Fossil fuels help power the grid, but their devastating, climate change-exacerbating impacts also weaken it. 2023 was the warmest year on record.[3] The catastrophic storm events triggered or worsened by climate change often knock down the pieces of this same grid that carry the electricity—the overhead distribution lines—which creates a self-perpetuating and vicious cycle. Many utilities have critical infrastructure, such as substations, located within floodplains that is vulnerable to extreme events.[4] From 2010 to 2021, there were 986 weather-related power outages in the United States, nearly twice as many as in the previous 11 years.[5] Smaller, distributed, locally sited renewable energy and energy storage solutions (ESS or batteries) could help break this cycle. Sited correctly, these projects can simultaneously reduce the grid's thirst for harmful fossil fuels and the need to move power long distances on overhead circuits, provide clean and reliable transitional or short-term back-up power if the grid goes down, and set the stage for a cheaper energy supply future. The sun is an inexhaustible resource that can directly power locally sited generation, and therefore will be cheaper in the long run than coal, gas, and oil. Moving power over long distances is costly. When considering favorable factors such as resiliency, energy security, public health, carbon offsets, lesser line losses, power quality, and other ancillary services that renewable energy can provide it is probably cheaper than fossil fuels now.[6] Onshore wind and solar photovoltaics (PV) continue to get cheaper (see Figure 1).

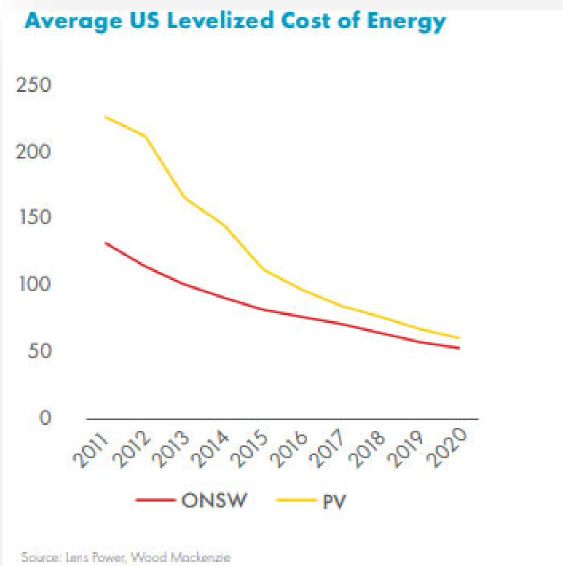


Figure 1

The transition to a more renewable energy based and distributed grid could be particularly helpful to many of Connecticut's low income and minority communities—sometimes referred to in Connecticut respectively as distressed municipalities and environmental justice communities. These areas often lose power in storm events (grid-edge communities) and often do not have the resources or funds to prepare for, or deal with, such emergencies.

The energy burden (the percentage of income spent on energy costs) of low income communities nationally and their residents is often three times higher than in wealthier towns.[7] The low income residents of Connecticut are struggling under an energy burden that is six to seven times higher than the statewide average, with an aggregate energy affordability gap (the difference between an affordable level of spending and actual energy spending) of $450 million.[8] Connecticut's most highly burdened census tracts are also some of the most socially vulnerable. They can often exceed the 90th percentile statewide in at least one of the four social vulnerability index categories (socioeconomic status, household characteristics, racial and ethnic minority status, housing type and transportation).[9] In Connecticut, the retail residential electricity price is often the highest in the continental United States.[10] This past summer there were daily news pieces describing the anger of residents over unaffordable electric bills.[11] The anger was often directed at parts of the bill reimbursing the utility for public and other benefits it provides such as low-income assistance and renewable energy programs, igniting a statewide debate over whether programs such as these should be socialized over the rate base through increased electricity charges.[12]

Not only are distressed and environmental justice communities typically less prepared to deal with grid outages, but they are also often the location of highly polluting peaker (or peaking) plants.

Peaker plants are generally fossil fuel (primarily gas and oil) powered plants that only run when demand is high which in Connecticut typically means hot, muggy summer afternoons when air quality is already poor.[13] They are part of an estimated 10% of grid infrastructure built to supply energy during times of dangerous peak demand, which only make up 1% of the year.[14] Peaker plants command high prices for their on-demand power. They are also often subject to lesser efficiency and emissions standards and as a result they are typically the dirtiest generators on the grid.[15] In Connecticut many of these 19 or so plants are located near distressed and/or environmental justice communities. (see Figure 2).[16] Air quality around these peaker plants is notoriously poor.[17]

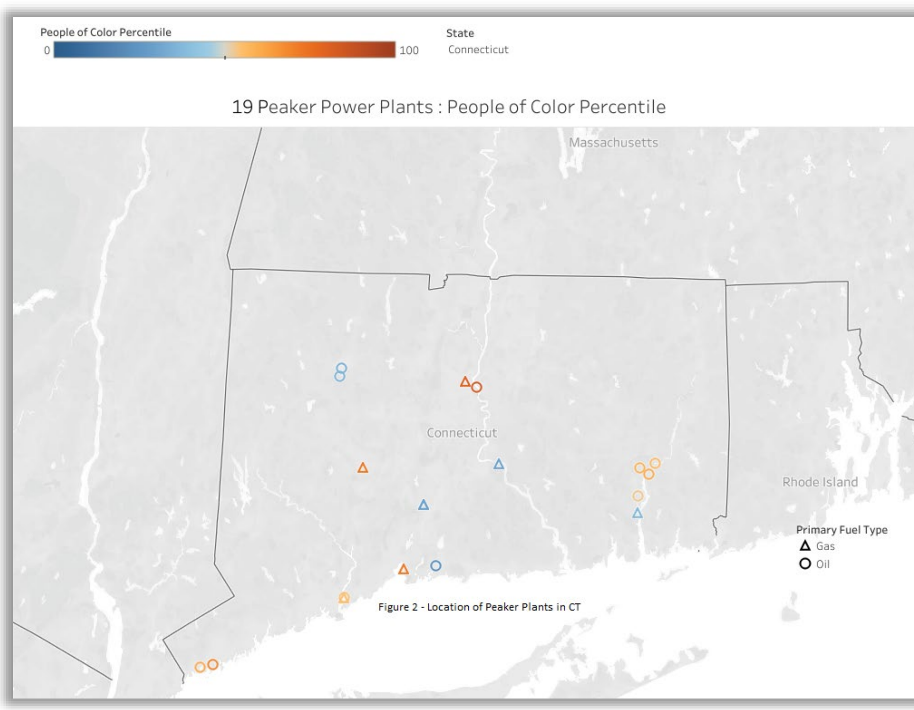
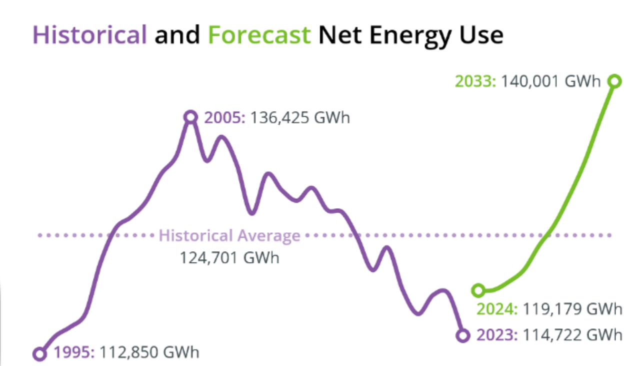


Figure 2 - Location of Peaker Plants in CT

Air quality in these communities would be improved by replacing these plants with energy storage solutions. As Connecticut is a net exporter of power (as of 2021 using only about 66% of the power generated in the state)[18] theoretically it has the power to spare to charge these batteries. More batteries could provide for better grid resilience overall, correct a grave environmental injustice and reduce local air pollution in the communities that suffer the most. Solar PV is at its best and most powerful on hot muggy afternoons which so often require peaker plants; and ESS such as lithium-ion batteries can be used to dispatch power during those same periods—reducing the need for (and eventually replacing) peaker plants. FirstLight Power is expecting to do so —potentially replacing its peaker plant in Preston, CT with 17 megawatts (MW) of battery storage expected to come online in 2025.[19] Furthermore, the combination of the solar PV with batteries along with islanding and other technologies can be managed as a microgrid—creating traditional resilience for communities when the rest of the grid goes out.

Strategically sited renewable energy and ESS can reduce emissions and air pollutants, provide for a more reliable grid, keeping buildings and communities powered during storm events, and eventually reduce electricity bills in Connecticut. Fortunately, the current federal and state administrations have stepped up in these past few years to address some of the root causes and impacts of climate change, especially in light of the failed, non-binding self-made goals in all recent international climate change agreements. There is also an increasing need for more clean generation as electric vehicles (EVs), artificial intelligence/data centers and electric heat pumps put new demands on the grid. A recent ISO-NE report[20] indicated that Connecticut and the New England region's electrical demand will increase by 17% over the next decade. This increase in demand is a dramatic shift from 2005 onward when there was a steady and celebrated decline in demand driven largely by energy efficiency measures.[21] Greenhouse gas emissions are still climbing. There are many new federal and state policies for towns and cities that want to build or host renewable energy projects. These policies will incentivize the development of power generation that uses only or primarily renewable sources of fuel, store power for longer durations, and help communities better prepare for storm events that otherwise could result in grid outages.



The goal of the local energy resilience initiative at CIRCA is to (a) help guide Connecticut communities through the morass of existing federal and state incentives; (b) help municipalities construct microgrids or renewable energy systems that are capable of islanding and operating independently from the grid during outages; and (c) to help municipalities make well-informed choices with respect to selecting and siting renewable energy or ESS generally. Without an understanding at the municipal level of the programs and challenges, the "sustained, cost-effective, affordable and orderly development of Connecticut's clean energy industry"[22] will be difficult, if not impossible, to advance. With the passage of the Inflation Reduction Act (IRA or the Act) on the national level, numerous other federal programs, and the incentive programs in Connecticut, there is no better time for localities in Connecticut to leverage state and federal incentive money to address their local energy needs. This guide summarizes several of the more relevant federal incentives and state programs specific to Connecticut towns and municipalities.

THE INFLATION REDUCTION ACT OF 2022

President Biden signed the Inflation Reduction Act (IRA) into law in August 2022, marking an unprecedented investment in renewable energy and climate change mitigation. Pledging roughly $369 billion to clean energy and climate investment, it is considered "the largest single step that Congress has taken to address the root cause of climate change."[23] Its investments are predicted to reduce emissions in the U.S. to between 31% and 44% below 2005 levels.[24]

SUMMARY – PRE-IRA FEDERAL INCOME TAX CREDITS

Historically, the principal federal incentive offered to renewable energy project developers has been a federal income tax credit, based on either a project's total cost (basis) or annual production. The former credit, called the investment tax credit (ITC), applied to multiple types of energy projects. The latter credit, called the production tax credit (PTC), generally only applied to wind projects, and was based on the amount of energy, in kilowatt hours (kWh), that a project produced. Prior to IRA, these benefits were only available to entities that paid federal income taxes. Often even these tax paying entities could not fully leverage the tax credits (and depreciation) so a relatively complicated tax equity market filled that role. A tax credit is a dollar-for-dollar reduction in the income taxes that the entity that claims the credit would otherwise have to pay the federal government. Therefore, towns and cities (which do not pay federal income taxes) that wanted to transition to clean energy were disallowed from directly participating in this incentive. They often had to attempt to monetize a fraction of this project benefit through a for-profit entity that resulted in no other choice but to lease their land, parking lots or rooftops to private developers. Without these tax credits, renewable energy projects are often unaffordable for non-taxpaying entities like municipalities and non-profits.

ELECTIVE PAY AND TRANSFERABILITY

IRA's elective pay provision[25] attempted to fix the aforementioned problem and allows local governments to directly benefit from IRA's tax credits. It added a new section to the tax code, which allows tax-exempt entities—such as municipalities—to be paid in cash rather than relying on third party taxable entities to make a clean energy project affordable.[26] This provision will allow local governments to build and own renewable energy projects themselves.

IRA also established a new provision attempting to create a simpler process for entities to transfer tax credits as opposed to entering into a complicated tax equity investment structure. Entities eligible for elective pay, however, cannot participate in this program, and would most likely not have any reason to either, as the elective or direct pay process should be more straightforward and provide a better return for a town.[27]

The elective pay (sometimes referred to as direct pay) provision functions as follows. During the tax year in which an eligible project is placed in service, the amount of the tax credit that would otherwise apply to that project will be paid to the tax-exempt entity.[28] This program will be applicable for tax years starting January 1, 2023, and ending at the earliest December 31, 2032. This provision can be applied to the PTC and the ITC and numerous other credits.[29] Elective pay does not include the depreciation value of a project which is captured in the tax equity investment process.

From a practical perspective, the process that a town must undergo to receive the elective pay money is fairly straight forward. The Internal Revenue Service (IRS) publishes a guidance document to assistant towns with the process: IRS: Elective Pay and Transferability. Before beginning a project, a town should double check with a consultant or lawyer to ensure the project should qualify for elective pay and is taking advantage of all of the potential incentives under IRA. Towns must first complete the pre-filing registration to participate in elective pay, which provides information to the IRS on the credits they intend to earn, the location of their projects, and other relevant details about their clean energy investments. Towns do not pre-register until the tax year in which the credit will be earned (when the project achieves commercial operation). Specifically, the IRS recommends "to submit the pre-filing registration at least 120 days prior to when the organization or entity plans to file its tax return."[30] 120 days will give the IRS time to review and respond if they need any more information. The pre-filing registration process does not guarantee that a project will qualify for an applicable credit or be eligible for an elective payment.[31] Compliance is verified on the annual tax return itself.[32] The IRS provides a more detailed step-by-step guide that can be found here: Register for Elective Payment or Transfer of Credits.

Upon completing the pre-filing registration, each project will receive a unique registration number. Towns must eventually include this registration number when filing their tax return the following year to claim the payment. [33] So as detailed below, a town must pay the full cost of the project and take the associated development risk of doing so. For more details on the process of filing for elective pay see IRS: Elective Pay and Transferability Frequently asked Questions. Final rules were published effective May 10, 2024,[34] which largely clarified other applicable entities' ability to access the elective pay option beyond municipalities and traditional non-profit organizations, such as some homeowners associations

DISCUSSION POINT

With this new optionality, many towns will certainly and should consider owning their own renewable energy systems. However, many towns—especially smaller towns with volunteer oversight, and without a planner, town engineer, sustainability director or a particularly knowledgeable public works director—are not equipped to develop, construct, or own larger or more complex energy systems. There are numerous challenges a town may face if it opts for ownership, including but not limited to: potentially raising capital to fund a significant portion of the project (the direct pay check does not come until after commercial operation), the risk of a project failing after town development monies have been expended, and a general lack of in-house expertise in navigating the incentive, construction, legal, interconnection and operational hurdles. Further, some towns can lack the entrepreneurial drive and industry knowledge to maximize a project's efficiency and production over the long term or to take advantage of potential upgrades.

Tracker system stuck facing east - no longer operating

Unmaintained thin film system - no longer operating

Without dedicated municipal staff and attention, projects can fail from operational neglect

Smaller community projects (usually less than 500 kW) that do not present the development risk (including the risk of project-killing high grid upgrade/interconnection costs) of larger projects could be a viable town-owned possibility. If towns can find state or federal grants to fund the portion of the project not taken care of by IRA's direct pay, then town ownership of projects becomes even more attractive. These projects can offset 100% of a town's electric bills instead of only a small percentage if a developer-funded project is involved.

Regardless, towns that desire to own projects should consult with attorneys or energy consultants before proceeding. Even understanding what costs are eligible for the ITC or the direct pay option can be challenging along with accessing other potential funding sources. For instance, some towns have been under the mistaken impression that the ITC applies to everything that touches a project such as a new roof or new electrical equipment. If the structural integrity of the roof is not strong enough for solar PV, the delta to upgrade the structural component can be included as part of the basis for the project and become ITC eligible. This does not necessarily apply to the whole roof.

The often-single digit financial returns for most larger projects are not or should not be enough to incentivize many towns to take on the added risk of ownership. While the option for municipal ownership is more attractive than it was previously, towns should approach this option with caution. Whether owning a project or leasing a rooftop, parking lot or land to a private company, it is important for Connecticut localities to understand the benefits, nuances, and challenges in the industry to better position themselves from a strategic resilience and financial standpoint.

ITC

Perhaps the most important effect of IRA is that it stabilized the ITC itself which was in the process of being phased down at a rate of 4% annually. Under its prior scheduled stepdown the ITC would have been set at 22% for projects starting construction in 2023.[35] As indicated above, the ITC provides a tax credit for certain investments in renewable energy development, including solar, fiber-optic, fuel cell, small wind, offshore wind, combined heat and power, and waste energy recovery.[36] IRA sets the base tax credit for the ITC at 6% of project costs,[37] including interconnection costs for projects under 5 MW.[38] The tax credit percentage can easily be bumped up to 30% of project costs if certain prevailing wage and apprenticeship requirements are met, or if the facility produces less than 1 MW AC[39] of power.[40] It is anticipated that all renewable energy projects, given the need for the 30% tax credit, will strive to meet the prevailing wage and apprenticeship requirements. As discussed in more detail below, many renewable energy projects in Connecticut are already subject to prevailing wage state rules that appear to match IRA wage requirements. So practically speaking the base ITC, absent extraordinary circumstances, can be assumed in Connecticut to be 30%.

PTC

IRA also stabilized and expanded the technologies eligible for the PTC and applied the direct pay provision to it. As indicated earlier, the PTC is a per kilowatt hour credit that applies to energy generated in the first ten years of an eligible project's life. Eligible projects will be able to receive a base credit amount of 0.3 cents per kWh, adjusted for inflation annually by multiplying the base credit amount by the inflation adjustment factor for that calendar year. For projects placed in service prior to taxable year 2022, the PTC, after the inflation adjustment factor, was 2.6 cents per kWh.[41] The PTC is subject to the same wage and apprenticeship requirements and the same domestic content, energy community and other adders as the ITC.

Perhaps the most significant change that IRA made to the PTC is that it is now applicable to solar, as well as wind projects, biomass, geothermal, landfill gas, municipal solid waste, and certain hydropower, green hydrogen and geothermal facilities.[42]

DISCUSSION POINT

Whether or not a town or private developer should avail itself of the ITC or the PTC will require a thorough financial analysis. A municipality or developer must balance factors such as the efficiency or projected production of a project, the cost of construction and whether, due to town financial planning, one would prefer the payment upfront (ITC) or over a 10-year period (PTC). In most circumstances municipalities will elect the to use the upfront ITC rather than spread the payments out contingent upon project production.

SECTION 48E: TECHNOLOGY NEUTRAL TAX CREDITS

The ITC and PTC only apply to projects that go into service by 2024, but IRA provides similar coverage after that in the form of technology-neutral, or clean tax ITCs and PTCs under Section 48E. This new incentive extends into 2034, when it will begin to phase out absent new legislation. Whereas the classic ITC and PTC apply to specific types of projects, the technology-neutral credits run on an emissions-based framework that is “neutral and flexible between clean energy technologies.”[43] If the project has emissions at or below zero, it will qualify for these credits.[44] This 10-year runway for these federal tax credits is seen as one of the most impactful aspects of IRA—providing certainty to an industry formerly vulnerable to congressional whims and expiring or declining incentives.

PREVAILING WAGE AND APPRENTICESHIP REQUIREMENTS

As indicated earlier, the PTC, ITC and technology neutral tax credits drop dramatically (5x) if a developer does not meet prevailing wage or apprenticeship requirements. IRA requires all workers involved in the construction, alteration, or repair of any of these eligible energy facilities to be paid the prevailing wage, as defined by the Secretary of Labor. If this requirement is not met, it can be cured, if the underpaid worker is compensated with the difference between what they were paid and what they should have been paid, plus interest, among other ways.[45] The prevailing wage and apprenticeship requirement only applies to projects over 1 MW in size.

With respect to the apprenticeship requirements, IRA indicates a certain minimum percentage of the work must be completed by a qualified apprentice who is participating in a registered apprenticeship program: 10% of total labor hours for projects that began construction before January 1, 2023; 12.5% for projects that began construction in 2023; and 15% for projects that begin construction on or after January 1, 2024. Like wage requirement violations, apprenticeship violations can be cured by: (1) a penalty payment to the Secretary of Labor of $50 per non-compliant hour (or $500 per hour if the violation is found to be intentional), or (2) establishing that a good faith effort was made to find apprentices, but failed because of a lack of available apprenticeship programs.[46] Towns that desire to construct and own their own projects should review this carefully (with counsel). As the party claiming elective pay, they will be responsible for all the documentation and record-keeping that goes with meeting the apprenticeship and wage requirements.[47]

DISCUSSION POINT

IRA’s prevailing wage and apprenticeship requirements should not represent a huge cost increase for energy developers in Connecticut, who, for post-2021 projects over 2 MW AC, have to meet state prevailing wage requirements.[48] It should be noted that several of Connecticut’s environmental permitting thresholds also sit at 2 MW so there are other reasons for solar PV developers in particular to size projects just under 2 MW—depending on whether or not the benefits of scale outweigh the lesser regulatory scrutiny. Regardless of the project ownership structure, vetting whether a developer will qualify the project for the ITC/PTC benefits is key, especially with respect to the wage and apprenticeship requirements.

DOMESTIC CONTENT

The PTC, ITC and technology neutral credits can be bumped even higher if certain domestic content requirements are satisfied (which adds 10%, for instance, to the ITC).[49] The domestic content requirement is satisfied if (i) 100% of the steel or iron that is a component of the facility was produced in the United States, and (ii) 40% (increasing over time) of manufactured products that are components of the facility were produced in the United States. For manufactured products, such products will be deemed to have been produced in the United States if no less than 40% of the total costs across all such manufactured products of such facility are attributable to products that are mined, produced or manufactured in the United States.[50]

The US Treasury released preliminary guidance on May 12, 2023, to help developers navigate the domestic content waters. Among other things, Notice 2023-38 clarifies that the steel and iron requirement does not apply to components or subcomponents of manufactured product (i.e. nuts, bolts, washers, hinges, etc.) and also applies an Adjusted Percentage Rule to all manufactured projects. [51] Generally, under the Adjusted Percentage Rule, "all manufactured products included in a project are deemed to be produced in the U.S. if the Domestic Cost Percentage of a project equal or exceeds the applicable domestic content adjusted percentage (generally 40%, or 20% in the case of offshore wind projects)."[52] To provide additional clarity surrounding the domestic content bonus credit, the IRS released Notice 2024-41[53] on May 16, 2024. Among other things, the guidance added a new safe harbor that provides classifications and cost percentages that can be relied upon when calculating the domestic cost percentage.

DISCUSSION POINT

Determining whether a project meets domestic content requirements is beyond the capability of most towns. The economics for solar PV projects currently do not favor buying domestically made panels except for the larger projects where the 10% bonus project becomes more meaningful. Depending on various factors (including purchasing leverage) one can purchase solar PV panels for approximately $.25 to $.30 per watt today from foreign suppliers in comparison to approximately $.40 per watt domestically. This spread could potentially widen depending on the effect of recently finalized tariffs on Chinese solar cells[54] and a potential increase with the incoming Trump administration. Even though a relative influx of domestic panels in the market is expected in Q1 2025, most of the panels have already been spoken for as developers often contract in advance in bulk in anticipation of future needs. Due to this short-term unavailability of domestic panels, towns (or developers) should not rely on this incentive for projects expected to go into commercial operation within the next year. It is important, however, for towns to be aware of the eventual availability of this financial benefit to a town-owned project or a privately owned one located in their jurisdiction. At the least there should be a provision in a lease or power purchase agreement (PPA) with a private developer that considers the possibility of the project receiving the 10%

domestic bonus credit and how this extra money should be allocated among the parties.

ENERGY COMMUNITIES

Another new tax incentive provided by Congress through IRA was the potential to add 10% to the ITC or a 10% multiplier to the PTC if a project is in an energy community.

Energy communities include:

1. Statistical Area Categories: A metropolitan statistical area or non-metropolitan statistical area that has (or had at any time after 2009):
    a. 0.17% or greater direct employment or 25% or greater local tax revenues related to the extraction, processing, transport, or storage of coal, oil, or natural gas; and
    b. an unemployment rate at or above the previous year's national average unemployment rate for the previous year;
2. Coal Closure Areas: A census tract (or directly adjoining census tract)
    a. in which a coal-fired electric generating unit has been retired after 2009, or
    b. brownfields.[55]

Brownfield sites are defined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."[56]

There are numerous exceptions under CERCLA to this brownfield definition. Some notable exceptions are sites that are the subject of planned or ongoing removal under CERCLA, facilities otherwise subject to court or administrative orders or decrees issued to or entered into by the parties, facilities to which a permit has been issued by the United States or an authorized state under the Solid Waste Disposal Act, and sites permitted under or subject to corrective action under RCRA.

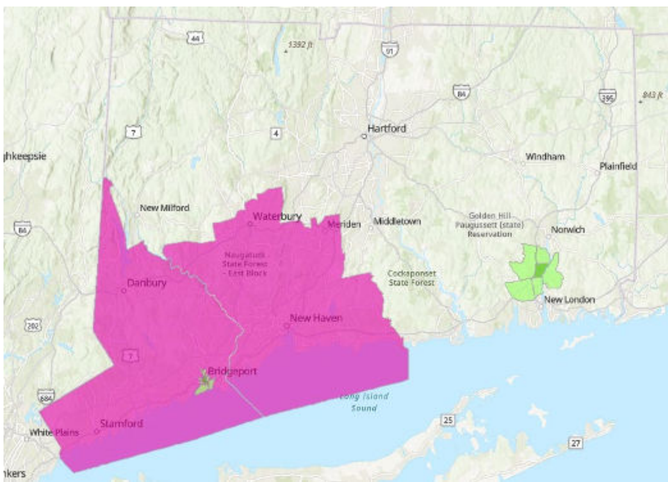
Guidance regarding energy communities released by the Treasury on April 5, 2023, did not narrow this list of exceptions but did provide a safe harbor for brownfields not falling under the list that includes sites:

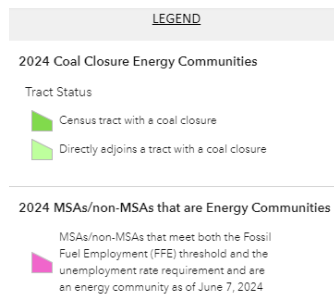
- previously assessed through federal, state, territory, or federally recognized Indian tribal brownfield resources as meeting the definition of a brownfield site under 42 U.S.C. § 9601(39)(A)

- where a Phase II Environmental Site Assessment (ESA) confirms the presence of a hazardous substance, or a pollutant or contaminant on the site; or
- where a Phase I ESA has been completed for projects with a nameplate capacity of 5MW AC or less.[57]

A project also must meet either the nameplate capacity test or the footprint test to be eligible for the additional credit. Under the nameplate capacity test, a project is located within an energy community if 50% or more of the project's nameplate capacity is in a qualified energy community. Under the footprint test, a project is located in or placed in service within an energy community if 50% or more of its square footage is in a qualified energy community.[58]

A map of the non-brownfield Energy Communities in Connecticut can be accessed here: Energy Community Tax Credit Bonus Map and is depicted below in Figure 3 (though the map can change annually).





As can be seen in the map above, projects in Southwestern Connecticut and Southeastern Connecticut can potentially benefit from the Energy Community incentives possibly due tothe shuttering the Bridgeport Harbor Station coal plant and the Thames Generation coal plant, respectively. The IRS released Notice 2024-48 on June 7, 2024[59] in part to provide certainty for developers for projects that potentially fall under the Statistical Area Category or the Coal Closure Category.

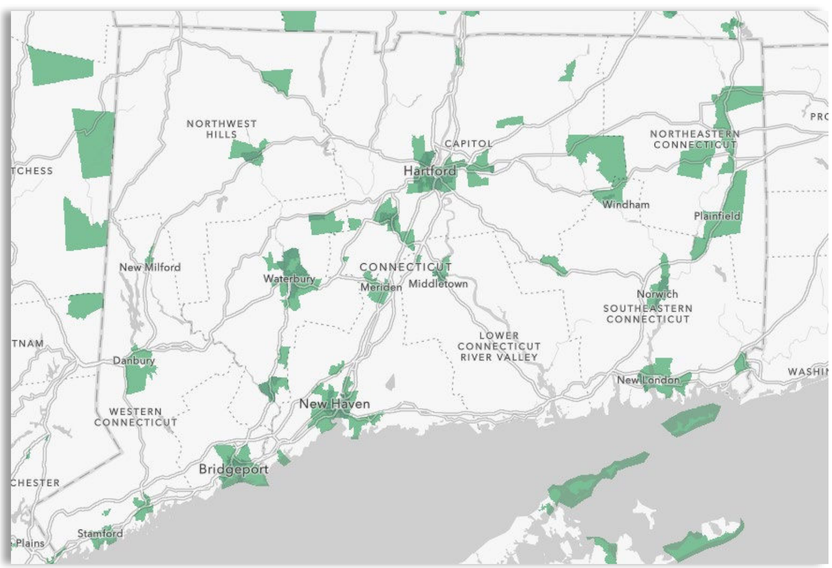
DISCUSSION POINT

Given the fairly extensive list of exceptions to the CERCLA definition of a brownfield, towns should consult with a lawyer to ensure a brownfield within their borders fits within this definition before assuming the 10% adder applies.[60] Developers working on capped landfills in Connecticut often seek written legal opinions from environmental attorneys ensuring their projects fit this definition.

Further, when negotiating leases, PPA or net metering credit agreements, it is important for towns to understand the various tax and state incentives benefiting developers, such as those coming with projects in energy communities. Towns should ensure that they reap some of the benefits of potential additional tax credits that go beyond the base credit such as the 30% ITC. Similar to how towns should deal with the domestic content bonus, a section should be added to a lease or PPA allocating some of this extra benefit to the town just in case, for instance, a project constructed on a capped landfill is considered a brownfield/energy community. A 1 MW ground-mounted solar PV project can cost over $1.5 million, so an extra 10% in tax credits could mean an additional $150,000 to the developer. In these situations, a town could potentially ask for more in the lease or in terms of electricity savings in a PPA.

LOW INCOME COMMUNITY BONUS CREDITS

Under IRA, projects sited in low-income communities could bring an additional 10% on top of the 30% ITC. There could even be an additional 20% if it is part of a qualified low-income residential building or a qualified low-income economic benefit project. Only solar, wind, or integrated storage projects are eligible. They cannot be operating prior to application, must be under 5 MW, and the ITC must be the only tax credit applicable. The 10% bonus for projects sited in low-income communities was capped at 700 MW in 2023. The New Market Tax Credits (NMTC) maps are the guide to whether a community is considered low income. See the [NREL Low-Income Communities Bonus Credit Program Map]() to determine if acommunity would qualify under this program. See also the 2024 Connecticut map below for the federally designated low-income communities in Connecticut in green.



To be eligible for the 20% low-income benefit, also capped at 700 MW in 2023, the project must be installed on affordable housing and the tenants must receive the financial benefits. If not, at least 50% of the financial benefits (which include below market rate electricity) from a project must be provided to low-income households.[61] For 2024 there were 2,128.8 MW available, 1,800 MW allocated for the year plus rollover amounts from 2023. The Low-Income Communities Bonus Credit Program was further refined in 2024 to allocate specific amounts to different categories such as projects on Indian Land, projects in a low-income community, qualified low-income residential building projects and qualified low-income economic benefit projects.[62] Half of the capacity in each category is reserved for projects meeting at least one of enumerated ownership criterion (e.g. a small renewable energy company serving low income communities) or geographic criterion (e.g. a census tract designated in the Climate and Economic Justice Screening Tool as disadvantaged).[63] If any of the categories are oversubscribed, the IRS will use a lottery to determine which projects receive the bonus tax credits.

DISCUSSION POINT

Given the low number of MW allocated nationwide to projects sited in, or benefiting, low-income communities annually, towns should not rely on these benefits in their base financial models. For instance, for the 2024 program year, the Treasury received over 50,000 applications requesting over 6 gigawatts of capacity for clean energy projects.[64] Even if a town's project fits within one of the priority subcategories listed above, the chance of receiving one of the low-income bonus credits is only around 30%. The potential for a project to receive these bonus credits, nevertheless should be captured in a lease or PPA if dealing with a third-party developer.

BATTERIES OR ENERGY STORAGE SOLUTIONS

Prior to the passage of IRA, batteries were only eligible for tax credits if they were coupled with and powered largely by a renewable energy source. IRA changed that and made standalone batteries (and other standalone energy storage projects, like thermal energy storage properties) eligible for the ITC.[65] To be eligible, a battery project must have a capacity of no less than 5 kWh. Batteries are typically measured in either their nameplate capacity (in kW or MW) or for how many hours they can fully dispatch (in kWh or MWh) based on their nameplate. For instance, a 5 MW nameplate capacity battery that can fully dispatch for 2 hours is often referred to as a 5 MW battery or also a 10 MWh battery.

Additionally, any storage property that was placed into service before IRA's enactment and has a capacity of less than 5 kWh, can be modified to increase capacity and thus, be eligible for the ITC.[66] The ITC for standalone storage, or storage coupled with solar, is now 30%, with a 10-year fixed term, including optional add-on benefits, just like the classic ITC structure, explained herein. The new tax credits included in IRA should have monumental impacts on the energy storage industry.[67]

Another driver for energy storage is its potential to turn intermittent technologies into dispatchable ones. Solar PV is an example of an intermittent resource—it only works when the sun is shining. Solar-charged batteries, could supply power on demand, at night or when the solar array is not otherwise generating power.

Similarly, utility scale batteries (stand-alone batteries often tied to the transmission system) also can add to grid resiliency, by supplying on-demand peak power—on hot and humid mid-summer days when the grid is strained. In circumstances where peak power is required, batteries could eventually obviate the need for inefficient, costly, and polluting peaker

plants, which in Connecticut are often located in environmental justice and low-income communities.

Batteries can replace diesel or gas-fueled generators as a short-term or temporary backup source when, for instance, a downed wire disconnects a building from the grid. A common microgrid model involves solar PV coupled with a battery, capable of islanding or disconnecting from the grid through specialty hardware, along with an inverter containing microgrid controls. In a normal (non-microgrid) solar system, the inverter contains an anti-islanding device. This anti-islanding device prevents the solar project from dispatching power when there are grid outages to a downed wire. Without microgrid controls, these systems are essentially shut down until the grid is repaired. However, with the proper inverter and microgrid controls, when in islanded mode, during a grid outage, the solar PV can continue to power the building and the batteries. A thorough understanding of the energy demand of the building, the fluctuation in production of the solar PV, and the capacity of the battery along with other factors is required to successfully manage a microgrid like this and to maximize its duration.

DISCUSSION POINT

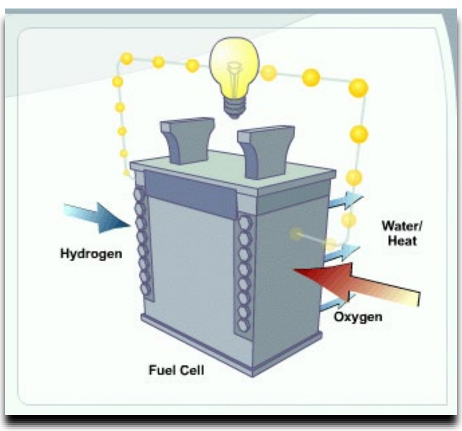
Even though lithium-ion battery prices have dropped significantly over the last decade, particularly in the last year, they are still relatively expensive, and their discharge duration is limited especially considering the expense. For instance, a 10-kWh battery which costs roughly $5,000[68] in 2024 could keep the refrigerator running, some lights on, maintain hot water, and keep computers and phones charged for roughly one day in an average Connecticut home during a power outage. Alternatively, it could power an electric furnace for about an hour, or central A/C for about 3 hours. Solar can recharge the battery during the day, but solar produces significantly less in the winter than in the summer in Connecticut, so the long winter recharge time would negatively impact how much power one could use both during the day and at night. A typical battery also loses approximately 10% of its power between the charge and dispatch of power. In comparison a natural gas generator of a similar size and price, connected to a natural gas service line, could fully power (no demand management required) the average Connecticut home indefinitely with all the appliances and utilities running.

EVs, however, could potentially provide a better solution. The 2024 Tesla Model 3 Long Range electric car has a battery with a capacity of approximately of 75 kWh.[69] In comparison, a Tesla Powerwall 3 has an energy capacity of only 13.5 kWh.[70] Vehicle-to-grid charging—done with specialized hardware and a bidirectional charging station—connects the EV to the home providing valuable back up power during an outage. Further, the technology allows the utilities to access the battery (with a payment to the homeowner) to power the grid during peak periods. The superior capacity of EV batteries alone justifies Connecticut pursuing more aggressive incentives for these vehicle-to-grid programs.

Until longer durational batteries are developed, or it becomes cost effective to daisy chain multiple batteries together, the immediate primary incentive for Connecticut towns to install batteries will probably not be for a long-term back-up power supply. Opportunities to lower their electricity prices or to lessen their environmental footprint may motivate the towns instead. Batteries can provide valuable economic benefits—such as demand price and capacity tag (cap tag) reduction or potentially arbitrage opportunities. Utilities can apply demand charges based on the maximum power a town may use at each of its meters over a 15-minute interval, which can make up a disproportionately large part of an electric bill. Strategically discharging a battery to reduce one's monthly peak demand during high usage periods can reduce utility costs significantly. Further, if batteries can be effectively discharged when the grid is likely to peak (e.g., August 4, 2022)—when cap-tags are set—a town can significantly lower its future supply contract costs associated with capacity. Also, certain Eversource Energy (Eversource) and The United Illuminating Company (UI) rate classes are priced according to a customer's time of use, so there are possible future arbitrage opportunities for battery owners. They could buy cheap power to store and dispatch when prices are high. Although the delta between low off-peak and high on-peak prices is typically not high enough in Connecticut to provide meaningful revenue to a battery operator. As described below, Connecticut also provides significant programmatic financial incentives for towns to install energy storage that also gives the utilities access to the batteries during peak demand periods.

FUEL CELLS

As indicated earlier, fuel cells utilize hydrogen molecules in the fuel source (which primarily comes from reforming natural gas) to produce electricity via electrochemical reaction.[71] The result is highly reliable, combustion-free electricity with accompanying significant life cycle reductions in carbon emissions. Fuel cells provide roughly a 50% reduction compared to a natural gas-powered plant.[72] Electricity, water and heat are the main byproducts.[73] Fuel cells are also often developed as combined heat and power (CHP) projects, where heat generated from the fuel cell operation is captured and utilized to further improve system efficiency and economic benefits by applying that heat to reduce on-site heating costs (e.g., domestic hot water).



Fuel cells have a very high-capacity factor of around 95% especially when compared to solar in Connecticut which is typically around 15%.[74] Capacity factor is generally defined as the ratio of the electrical energy produced by a generating unit for a year as a percentage of the electrical energy that could have been produced at continuous full power operation during the same year.[75] For instance a 1 MW DC solar facility in Hartford, CT could be expected to produce around 1,260,093 kWh[76] per year given average conditions. Operating at full capacity and continuously (through the nights and cloudy weather) for over a year (8,760 hours) it could produce 8,760,000 kWh. Dividing the actual production by the maximum possible energy that could have been generated over the same time period yields a capacity factor of about 14%. The minimum commercial fuel cell size is generally 250 kW although most practical applications are larger than this. A 250 kW fuel cell would generate approximately 2,000,000 kWh per year continuously. In Connecticut the same sized solar PV system would produce (depending on numerous factors) around 400,000 kWh intermittently.[77]

Unlike solar PV, fuel cells operate continuously as long as they are being fed fuel.[78] They are designed to always be on. They are not reliant on ambient conditions, do not need to be re-charged, and feature optimal operating efficiency at maximum output. Because of their dependable nature, fuel cells are typically deployed as the primary or base load power source for a building and can be installed in varying grid arrangements (grid-parallel or microgrid islanding outage protection) depending on the needs of the site. There are several fuel call microgrid operations in Connecticut such as the Bloom Energy City of Hartford facility that powers an elementary school, health center, library, senior center and also a gas station and grocery store during a grid outage. A good video of this facility can be found here: Bloom Energy: Energy Case Study Video: City of Hartford Microgrid.

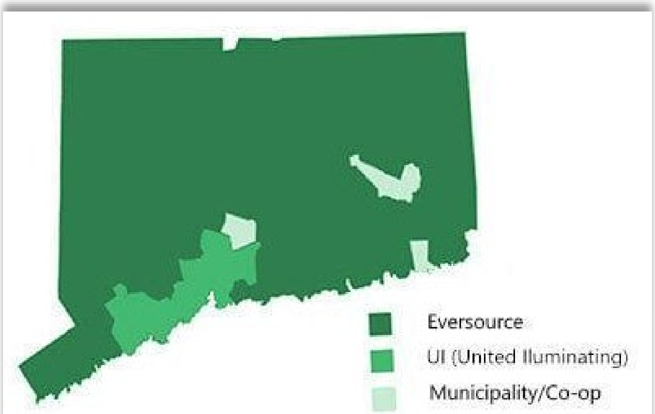
Fuel cells can offer a potential pathway to zero-carbon electricity production, and there are significant incentives in IRA to help get there. Section 45V of IRA extends the PTC to qualified clean hydrogen with the highest credit level set at $3 per kilogram of hydrogen. This could account for 60% of the average total cost of production.[79] IRA defines "qualified clean hydrogen" as hydrogen that is "produced through a process that results in a lifecycle GHG emissions rate not greater than four kilograms of CO2e per kilogram of hydrogen." The Act also introduced the ITC to specified clean hydrogen facilities.[80] To capture these credits, a fuel cell would need to use renewable energy (not natural gas) to power an electrolyzer—the device that splits water atoms into hydrogen and oxygen feeding the fuel cell with the hydrogen it needs to create power.[81] If solar PV is used to power a hydrogen electrolyzer, the PTC would be applicable. As indicated earlier, most current commercial applications in Connecticut are a non-combustion process using natural gas that strips the hydrogen for use in the fuel cell.

DISCUSSION POINT

As part of the process of reforming natural gas into usable hydrogen, a range of C02 is emitted, depending on the technology and size of the fuel cell. As indicated earlier, the requirements of Section 48E go into effect on January 1, 2025. One requirement to receive the technology neutral tax credit is that applicable facilities must have zero anticipated GHG emissions.[82] As a result, it appears that fuel cells (along with linear generators and similar technologies) using natural gas placed into service after December 31, 2024, could be ineligible for the ITC. The effect of this on the fuel cell industry and its manufacturing base in Connecticut remains to be seen but could be consequential.[83]

CONNECTICUT PROGRAMS

The state of Connecticut launched several new programs over the past few years to help accelerate the development of clean hydrogen, fuel cells, energy storage, and solar PV projects. Fuel cells and solar PV are also designated as Class 1 renewable energy resources in Connecticut. Therefore, they are eligible, when available, for the most valuable renewable energy certificates (RECs), which can be a significant portion of the revenue stream for a generator. When operating outside the two main Connecticut incentive programs, these RECs are available for generators, although, as explained below, the two programs fold RECS into the overall bid price. As of the end of 2023, Connecticut had roughly 1,601 MW of solar, around 100 MW of fuel cells, 3 inland wind turbines and a handful of operating ESS.[84] The largest fuel cell in the US (as of 2021) is in Bridgeport and has approximately 16 MW of generation capacity.[85] Offshore wind, nuclear, and other transmission-tied (large) generators are not a focus of this guide.



Connecticut Electric Distribution Company Territory Map

There are two principal programs through which solar and fuel cell power are currently developed and monetized in Connecticut: the Non-Residential Renewable Energy Solutions (NRES)[86] program, and the Shared Clean Energy Facilities (SCEF) program.[87] In both programs the generators bid on a price that includes both power and RECs. The utility retains the RECs. These two programs are aimed at Connecticut's two investor-owned electric distribution companies: Eversource and United Illuminating (UI) but not the municipal electric utilities.[88]

NRES PROGRAM SUMMARY

NRES is a bi-annual reverse auction (the lowest priced bid wins) with program and project-size caps, that is geared towards projects that have onsite power consumption (load) or that are located on state, municipal or agricultural (SAM) land. There are different tranches in the program, one of which allows low emission projects (i.e., fuel cells) to compete against zero emission projects (i.e., solar) up to 5 MW in size and another three, 0-200 kW, 200 kW-1 MW, and 1MW-5MW, for which only zero emission sources are eligible. The highest pricing has been seen in the ≤200 kW zero emission projects, where prices are fixed and projects are selected on a first-come first-serve basis, followed by the middle tranche of 200 kW to 1 MW. The lowest prices typically occur in the 1 MW to 5 MW tranche for zero emission projects and the tranche in which low emission projects compete with zero emission projects between 0-5 MW. As of the date of this guide, there are 3 years left in the NRES program (i.e., the last NRES auction year will be 2027), which is capped at 360 MW, with 110 MW now being granted each year divided among the different tranches and between the two main utilities.

Within this program there are three options for towns or private developers selected by towns: (1) sell power directly to Eversource or UI (called the buy-all option); (2) offset onsite load in a more traditional net metering fashion, or; (3) SAM customers exclusively can participate in virtual net metering, that is, offset some onsite load and allocate the rest (via financial credits) to other electricity bills, using vacant and sometimes unmetered SAM land.

The NRES program has other significant incentives to entice developers to build solar carports, projects on brownfields, capped landfills, or projects behind load in distressed municipalities (or in the case of SAM customers projects that benefit distressed municipalities by crediting electricity savings to these communities).[89] In each of these cases a project developer receives a 20% bid priority (30% in the case of carports) in the auction. So, if a town or a private developer were to bid 10 cents per kWh as a buy-all option in the auction, the bid for the landfill project would be evaluated as if it were 8 cents per kWh, giving it a much better chance of success.

DISCUSSION POINT

Developers approaching towns in Connecticut to lease vacant land are most often doing so in preparation for an NRES bid, as private, vacant, non-agricultural land is not permitted in the virtual net metering portion of this program. Gaining control over state land is often too arduous a process. Though the statute seems to limit this option, in practice, SAM customers have also been able to mix and match with each other.[90] For instance, there can be a large agricultural parcel in the Town of Avon with a meter but limited load onsite. The owner could take advantage of the NRES program by building a 5 MW project (roughly 20 acres) on the property and selling the rest of the power to the City of Torrington. This benefit is not afforded to private non-SAM landowners. If the parcel is not considered agricultural, private developers have worked out arrangements with municipalities where they “host” or lease the land or project in name only. This allows the private developer to use non-SAM land for the program. Program rules and interpretations can change annually and often in the PURA annual review dockets, so it is valuable for towns to consult with experts –groups like CIRCA or a private consultant—before embarking on an NRES project.

It is not clear why there is an NRES program cap on the number of 200 kW and below systems. These are systems that, for the most part, do not materially impact the operation of the grid, and are most often located on rooftops, avoiding the intense land use fights associated with the ground-mounted projects. Further, the pricing in NRES is often less than what the underlying buildings are paying in actual retail electric charges (per kWH) that could be offset by a traditional behind-the-meter system (not enrolled in NRES). Eliminating the cap on these smaller projects may lead to better-sited projects statewide with favorable impacts on ratepayers. 200 kW is a suitable size for a community or town-owned project.

SCEF PROGRAM SUMMARY

The other major program in the state that incentivizes solar and fuel cell projects is called the SCEF program. SCEF is often referred to as community solar but traditional community solar, in the way that most people imagine, does not exist in Connecticut. It is not entirely clear if the traditional community solar model originally envisioned- where a group of neighbors invest in a single array and share in the actual electricity produced (not just the financial benefits)—exists anywhere in the country outside of contained microgrids. In states that allow virtual net metering to private residential customers, communities can develop, build and own an array and allocate 100% of the financial benefits to the community members or members of a homeowner's association. This more closely resembles what most people envision as community solar. In a typical northeastern US community solar program or project, like in SCEF, members of the local community (or in most cases customers of the same utility) share in some form of financial benefit (electricity savings in the form of net metering credits) from a developer-owned project sited in the same community or utility territory. The developer is the entity working directly with the public in these instances, and the utility administers the savings on its behalf. While SCEF involves the allocation of financial benefits from projects ($.025 per kWh) to the public, it differs from typical community solar in that the utility is the sole entity responsible for selecting the community members to receive the savings and administering them. In SCEF, Eversource or UI allocates the financial benefits based on a stakeholder-vetted process[91] authorized in Public Act 19-35[92] prioritizing low-income state residents. In some instances, the local fuel bank, Operation Fuel,[93] is involved in vetting the customers to whom the financial benefits of the SCEF are distributed. For projects selected in years 1-4 of SCEF, 20% of a project's output (times $.025 per kWh) goes proportionately to low-income customers. For projects selected in years 5 and beyond, 50% goes to low-income customers[94] which matches the percentage required under IRA to be considered a qualified low-income economic benefit project (see the discussion herein regarding this). From the local town's perspective, these SCEF projects are just solar PV or fuel cell projects selling power to Eversource or UI with the town receiving new personal property taxes and an increase in real property taxes. Like NRES, SCEF projects sited on brownfields, landfills and projects that involve parking lot solar canopies are all given a 20% or 30% price advantage, respectively, in the bidding process. Like the NRES program, rules and interpretations can change annually, often in response to developers exploiting loopholes in existing regulations. These regulatory adjustments usually happen in the PURA annual review dockets, which are then reflected in the SCEF and NRES guides, so it is valuable for towns to consult with experts—groups like CIRCA or a private consultant—to help review the programs, dockets, and guides before embarking on a SCEF or NRES project.

DISCUSSION POINT

	NRES Program	SCEF Program
Project Maximum Size (MW)	5	5
MW offered per year	110	50
Total Program Size (MW)	500	300
Program Years Remaining	5	5
Different Environmental Rules		No construction in core forest or on slopes > 15°
Structure	Virtual net metering or direct sale to utility	Direct sale to utility w/utilty distributing some financial benefit back to community
Pricing differences based on size	Different tranches/auction for different project sizes	One tranche/auction regardless of size
Special ground siting restrictions	State, farm or municipal land only	
Siting incentives	Distressed municipalities, brownfields, carports and landfills	Brownfields, carports and landfills

Basic Differences between the NRES and SCEF Programs

The pricing under NRES has historically been better for developers as compared to SCEF, so towns should expect better overall financial benefits from this program (higher lease payments, higher negotiated tax payments, and the possibility of electricity savings). It appears as if the pricing of the programs is starting to converge for larger projects. SCEF does offer the advantage to the developers of offering a 20-year PPA with a highly rated utility, a document that can bring it beneficial lending rates which in turn can vastly improve project economics, theoretically allowing developers to bid with lower pricing in the program. Lower bid prices translate to less of an impact on ratepayers. Few projects to date are operating under SCEF, most likely given the general adverse conditions over the past several years– such as high interest rates and high equipment prices—combined with the low, fixed pricing in the auction. The complete ban on projects in core forests and on steeper slopes could also be a factor, consideringsome capped landfills have steep slopes. Further, the rules and nuances of both Connecticut programs can be complicated—and can change yearly with legislation and different interpretations and letter rulings—so it is recommended towns work with entities like CIRCA or hire private consultants early in the process. Some of the siting incentives and restrictions differ in the two programs so understanding the nuances between the programs is important and underscores the importance of working with entities experienced with these programs. Ideally the legislature or the agencies they instruct will make practical changes in the years ahead to these programs, to focus on building good projects in appropriate areas of the state without the need for continual regulatory refinement.

INTERCONNECTION

The new ability to apply tax credits to interconnection costs on projects under 5 MW[95] is one of the most significant new incentives under IRA as high interconnection costs are often project killers in solar saturated markets (like Connecticut) and rural (low load) markets. High interconnection costs, expensive interconnection studies and long interconnection queues are issues nationwide for both small and large generation projects.[96] Costs to interconnect with the grid are borne by the developer, and anything that reduces costs of interconnection will significantly help spur development.

In the past, there was a lack of visibility on where on the grid a developer should look to interconnect—where they can put the most power at the lowest cost. However, in Connecticut, both UI and Eversource have published maps in the last several years showing the amount of new generation they estimate each circuit (or section of circuit) can handle without significant upgrades.

- Eversource Hosting Capacity Map
- UI Hosting Capacity Map

It is important, nevertheless, to remember that these maps only provide rough estimates. For example, a 3 MW project may be economically feasible on a circuit only showing 50 kW of hosting capacity. Figuring this out however, is only possible after a $15,000 to $75,000 impact study is carried out by the utility.

Conversely with fuel cells, there used to be much more publicly available information about where high-pressure gas needed was available, but security concerns have reduced what is in the public domain. To determine natural gas hosting suitability, a town will need to reach out to the gas utility provider with a specific address.

DISCUSSION POINT

Towns can anticipate energy development through an understanding of how much capacity each circuit has in the town. This is because capacity is one of the biggest reasons that a developer will target in an area or parcel. Costs to interconnect to a circuit can range from around $350,000 to $1,000,000 per MW and these costs tend to rise yearly. Eversource also typically charges an annual fee on top of the upfront upgrade cost of $4,000-plus. The latter upfront figure, or anything close to it, makes a project unbuildable. Further, it is not uncommon for larger projects on more crowded circuits to be subject to a system impact study of the potential effects of the project—at the local circuit and transmission level—which can cost a developer around $75,000 and cause significant delays in the project development schedule, especially with the new "cluster study" process pending at the transmission or ISO-NE level. This is typically not the case for projects under 1 MW in size. Further, one has a better chance of manageable interconnection approval timelines and eventual costs imposed on projects when the generation will be used by onsite load most of the time. Large projects on vacant land in rural (low load) areas can run into significant difficulties or face expensive upgrades in connecting to the grid.

From a public policy perspective, siting solar PV projects on the smaller end, next to or close to load also seems to make more logical sense in a state such as Connecticut. Solar PV was invented as a distributed generation source—something to be conveniently placed on rooftops or close to load, and not necessarily as a large, utility scale generation source, especially in the Northeast. Utility scale (grid-scale)[97] scale solar PV projects do not produce enough power (especially in the wintertime) to justify, in most circumstances, the amount of acreage they occupy in the populated

Northeast, especially when it comes to their impacts on prime farmland soils, open field habitat, forests, and biodiversity generally.

SITING INCENTIVES IN MORE DETAIL

LOW INCOME COMMUNITIES (DISTRESSED MUNICIPALITIES)

NRES gives projects with load on-site that are located in a distressed municipality a 20% bid preference. NRES gives SAM projects that allocate the net metering credits to the bills of a distressed municipality the same bid preference.[98] There are no similar low-income-related bid preference incentive for SCEF projects, although as described above, for every kWh produced by a SCEF project $.025 goes to low-income customers which constitute 50% of each project's allocation.[99] Discussions regarding modifications to both programs to potentially include environmental justice community siting incentives could be part of each program's upcoming annual reviews.[100] The Authority has indicated it would consider an update to the distressed municipality bid preference to include environmental justice census blocks if it finds. after the stakeholder process, that such a change will better meet the program objectives. The annual review process exists in part to evaluate these programs for potential changes to help better meet each program's objectives. For a map of Connecticut's distressed municipalities see Figure 4 or the [2023 Map of Distressed Municipalities.] A distressed municipality also includes municipalities that no longer meet the threshold requirements but are still in a 5-year grace period.[101]

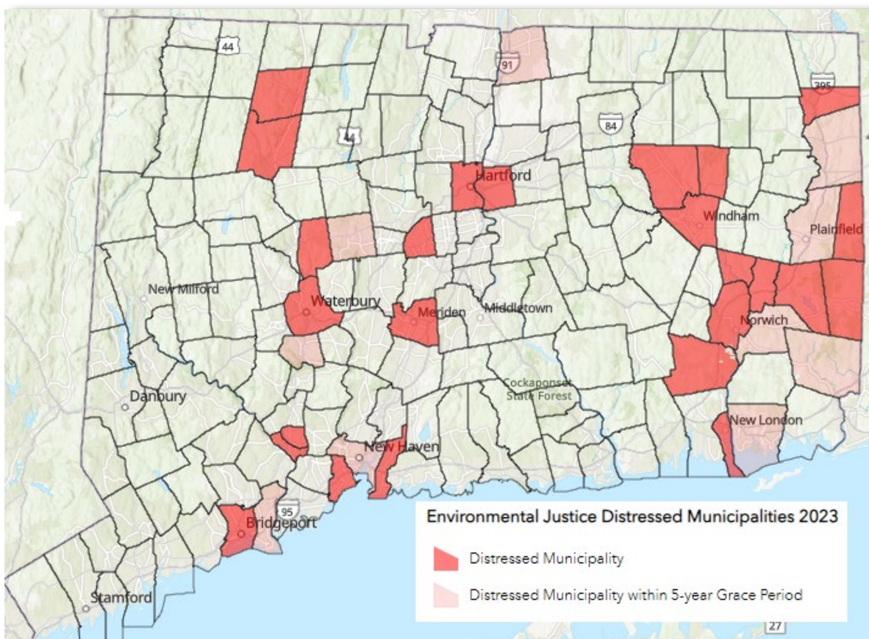


Figure 4 - Connecticut Distressed Municipalities

DISCUSSION POINT

Stacking IRA low-income tax credits with the incentives offered by the state of Connecticut could provide significant savings or income for Connecticut's distressed communities. However, as stated above, given the low number of MW allocated nationwide to low-income projects, towns should not rely on these federal benefits. Together the federal and state programs offer significant enough benefits that towns should at least check whether they are included in the new market tax credit maps or considered a distressed municipality—in which case there is at least the potential to stack significant incentives. The state should align their distressed municipality map to ensure that all of their classifications at least match those under the federal map.

Connecticut should also consider setting up a virtual net metering program for smaller solar projects that solely benefits low-income residents. Under the current tax incentive structures subsidizing residential solar, wealthy households are overwhelmingly the most able to take advantage of tax credits. Between 2006 and 2012, 60% of total residential and individual credits went to the top 20% of households by income, with less than 10% of those credits flowing to the bottom 60%.[102] With these state incentivized programs, communities could own these projects and allocate 100% of the benefits to their low-income residents. The estimated $20 or so that will be allocated to current SCEF low-income customers does not provide meaningful relief in a state where the average electricity bill often exceeds $300.

Connecticut should also set up grant funding similar to New Hampshire's Renewable Energy Fund[103] to allow communities to construct and own these low-income community solar projects without the potential roadblocks of securing outside financing to fill the gap between what IRA would cover and actual construction costs. These smaller projects could potentially leverage up to 70% of IRA funding in the best of circumstances (the base 30% ITC assuming wage and apprenticeship requirements are met, plus 10% if the project is in an energy community or on a brownfield, plus 10% for meeting the domestic content bonus, plus 20% if a qualified low-income residential building project).

BROWNFIELDS, LANDFILLS OR CARPORTS

In addition to the 10% additional tax credit provided under IRA, at the state level, projects sited on brownfields also receive bidding preferences. Both brownfields and capped landfills in the NRES and SCEF programs are offered a 20% pricing advantage in the bidding process. Connecticut also incentivizes solar PV parking lot canopies at a 30% bid preference price.

DEEP has also been working on establishing best practices on the siting of these types of projects as part of its STEPS (Sustainable, Transparent and Efficient Practices for Solar Development) project. Unlike in some states such as Massachusetts, Connecticut does not offer incentives for agrivoltaics projects, but it sets out best practices for developers. In Connecticut, brownfield, for purposes of most energy projects means "any abandoned or underutilized site where redevelopment, reuse or expansion has not occurred due to the presence or potential presence of pollution in the buildings, soil or groundwater that requires investigation or remediation before or in conjunction with the restoration, redevelopment, reuse and expansion of the property."[104] The definition of brownfield governs all NRES projects. In the SCEF program, however, DEEP has limited the types of brownfields available only to those listed in the DEEP Brownfields Inventory. Further, for a project to qualify as a brownfield project, it must be, in most circumstances, at least 75% sited on the brownfield itself. This is different from the restrictions in IRA.

DISCUSSION POINT

With respect to carports, historically high steel prices have offset, in part, the incentives offered for solar PV parking lot canopies.[105] High construction costs are a principal reason there is not an abundance of solar carport projects in Connecticut. People's Action for Clean Energy put out an extensive report in 2021 discussing the benefits of solar carports and demonstrating that Connect had at least the space to fit around 7,000 MW of them: Solar Canopies in Connecticut: Siting Potential, Implementation Guidance, and Policy Considerations. From a public policy perspective, brownfields, carports, and capped landfills are ideal locations for renewable energy projects.

Towns should prepare to address some of the risks associated with building on a landfill or brownfield. Experts, attorneys, and town insurance brokers should be consulted as to whether environmental insurance or contractors' pollution liability insurance is needed or should be required, protective indemnification provisions should be included in a lease, or if access to state and third party liability relief or grant programs are available.[106] Further, different installation methods could be required that would minimize disruption to the soil or an underlying membrane if that is a concern. Often, the solar PV projects have to be ballasted, with no underground infrastructure permitted. These methods can increase costs. In most circumstances, however, none of the above represent insurmountable obstacles to a successful project on a brownfield or capped landfill.

In most cases, given the extra incentives involved, towns could still ask for higher lease prices or greater electricity savings for these projects. Regardless, it is important for towns to understand the incentives and costs that go with these projects to better position themselves before getting too far down the road.

Outside of the federal and state energy-related incentive programs there are other incentive programs related to brownfield remediation and re-development some of them which are summarized here: Siting Clean Energy on Brownfields.

ENVIRONMENTAL RESTRICTIONS, STORMWATER, AND OTHER CONCERNS

Beyond the land use issues and the standard laws and regulations regarding, for instance, protection of wetlands, waterbodies, endangered and threatened species, etc. that apply generally to development in the state, there are special environmental rules in both the NRES and SCEF programs that apply to their projects.

Further, unlike other real estate projects, all electric generating facilities or ESS fueled by renewable energy sources over 1 MW in size apply for a single land use permit from a central quasi-judicial administrative agency, the Connecticut Siting Council (the Siting Council).[107] A brief overview of the Siting Council can be found here: Citizens Guide to Siting Council Procedures. Anything equal to or under 1 MW falls under the jurisdiction of the local planning boards and inland wetland commissions. It is beyond the scope of this version of the guide to go into detail on the Siting Council regulations or to provide an overview of all the environmental restrictions that might pertain to energy projects in Connecticut.

Towns should, however, understand, that there are different laws and regulations in Connecticut that specifically apply in the different incentive programs. For instance, generally projects after a certain date and over 2 MW (as indicated earlier) are subject to enhanced scrutiny by DEEP and the Department of Agriculture, if located in core forest or prime farmland, respectively.[108] Some larger projects, by virtue of legislation, are grandfathered out of some of these project- or program-specific environmental laws and regulations.[109] In the SCEF program projects are not permitted in areas designated as core forest or on slopes over 15 degrees[110], while in NRES these same projects are only subject to a higher level of DEEP review. A helpful environmental mapping resource is the UCONN CT ECO Map.

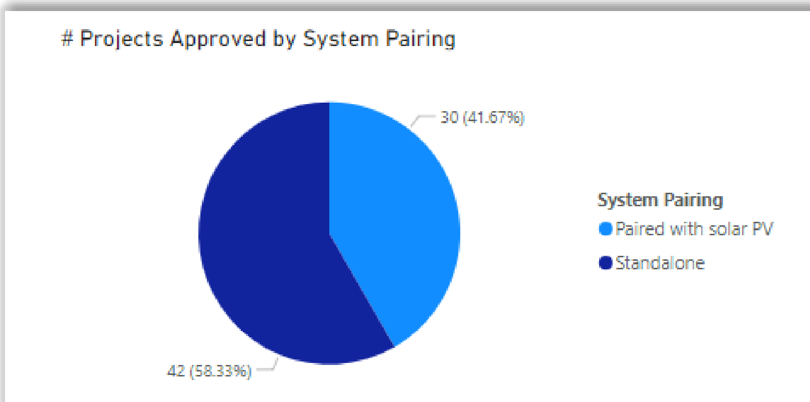
A particular focus of DEEP has been on construction-period run-off from larger solar PV fields. Clearing sites and removing trees to accommodate ground-mounted solar PV can increase the peak and frequency of run-off. Stormwater issues are a particular focus of DEEP on projects constructed on slopes greater than 5 degrees and for projects with more than 5 acres of disturbance. In these circumstances a higher level of scrutiny is applied. There is a special appendix (Appendix I) in the General Permit for the Discharge of Stormwater governing solar array construction.[111] Appendix I, among the various erosion control measures it requires, also can require a letter of credit to be posted by the owner of an array in an amount between $7,500/acre and $15,000/acre depending on the acreage disturbed. For a 2 MW project, which can require roughly 8 to 10 acres of disturbance, a developer (including a town as a developer) could be obligated to post a letter in the amount of or exceeding $100,000 that could be outstanding for approximately 2 years. For some developers, letters of credit must be secured with cash, so this is money not available to them during this period– potentially a significant burden.

On top of this there are areas one should avoid from a practical perspective, such as areas prone to flooding. It is recommended that towns contact CIRCA or a private lawyer or consultant to learn more about environmental restrictions in this area.

CONNECTICUT ENERGY STORAGE SOLUTIONS (BATTERIES)

Prior to the passage of IRA, the Connecticut legislature authorized[112] and the Connecticut Public Utilities Regulatory Authority (PURA or the Authority) designed and launched[113] its first energy storage program, the Energy Storage Solutions program.[114] The program is being run by the Connecticut Green Bank along with Eversource and UI and more details on it can be found here:

Energy Storage Solutions. The program was launched to offer both upfront and operating incentives for batteries. The upfront incentive will decline over time but can currently cover up to 50% of the battery cost, although typically this percentage is lower. Stacked on top of the IRA upfront incentives, the savings on a battery purchase in Connecticut easily exceed half the cost. The performance incentives (guaranteed for 10 years—and declining after year 5) require the battery owner to respond to price signals from Eversource or UI during periods in which discharging the battery would provide benefits to the local and regional grid. The battery owner can manage the battery for its own benefits (for some of the purposes summarized above) outside of some peak periods in the winter and 3-8pm June-August. One does not need to participate in both the upfront and performance incentive programs and depending on one's demand profile it may be worth foregoing one or the other for better operational flexibility.



The program aims to deploy 580 MW of behind-the-meter ESS by the end of 2030, as part of the state's goal to deploy 1,000 MW of energy storage overall in the same time frame.[115] The program does not distinguish between solar/battery systems and stand-alone batteries, but currently focuses on projects sited at residential and industrial and commercial-end users (the battery has to be sited where there is load—also termed behind-the-meter) as opposed to stand-alone batteries connecting directly to the grid and not tied to any load. The performance report for the program can be found here: Energy Storage Solutions Performance Report.

According to the Report since the inception of the program, there have been 587 residential projects completed to date and 72 Commercial and Industrial (C&I) projects.

Notably, 42% of the C&I projects approved so far consisted of batteries coupled with solar PV—a good starter package for a microgrid.

Further, the Connecticut battery program includes a focus on low- and medium-income customers, critical facilities and customers on the grid edge. According to the Energy Storage Solutions project, customers on the grid edge are defined as (1) the top 10% of circuits with the highest number of outages per customer during major storms since July 1, 2012, and (2) the top 10% of circuits with the longest outages due to major storms since July 1, 2012.[116] For a map of the Connecticut grid edge communities click here: CT Grid Edge Communities.

DISCUSSION POINT

As indicated earlier, the program has not yet incentivized front-of-the-meter batteries (a battery tied directly to the distribution or transmission system) and has focused on batteries located at buildings or behind-the-meter. While behind-the-meter batteries promote resiliency primarily at the building level, Connecticut should consider adopting Massachusetts' approach of requiring batteries for all solar PV projects in the NRES or SCEF programs over a certain size—even those that would be in front-of-the-meter. It would provide another, relatively simple, avenue for the state to achieve a more resilient grid. Encouraging the co-development of solar PV plus ESS could also lead to more projects in areas that developers may avoid as they face high grid upgrade costs. The solar could be operated to dump power into the battery at times when the grid does not need it or cannot handle it and release it later in the day or evening when there is demand. These systems are part of a comprehensive strategy employed by some utilities (prominently in Massachusetts) called Non-Wires Alternatives and are something the state of Connecticut should pursue more aggressively

Larger stand-alone batteries– while not directly benefiting building owners—can also provide valuable grid services—including providing back up power during storm events and the aforementioned peaking services. Towns will still see proposals like these, but on or near larger substations or transmission lines as the economics with stand-alone batteries (without state incentives) favor much larger projects that most likely can only tie directly into transmission-sized batteries or potentially into a transmission line itself. CT issued its first request for proposal (RFP) in May 2024 for 450 MW nameplate capacity of mostly front-of-the-meter batteries ranging in size from 5 MW to 250 MW. The stated goals of the RFP were " displacing fossil fuel generation, particularly in Environmental Justice and Disadvantaged Communities, while maintaining reliability; supporting the interconnection of new environmentally beneficial large electrical loads such as EV fleet charging facilities that displace operation of diesel vehicles, particularly in Environmental Justice and Disadvantaged Communities; and supporting reliability with the increasing interconnection of variable resources"[117] Results of the RFP have not yet been announced. Given the legislative mandate for ESS, another RFP is almost certainly to come, especially given the high failure rate expected with this first round of projects.

STACKING INCENTIVES

As indicated earlier, state and federal incentives can also be stacked—meaning one can take advantage of multiple incentives on the same project. The different state incentives in NRES and SCEF cannot be stacked on top of each other, but federal can be stacked on top of state. The maximum additional program benefit one can get in those programs is 20% or 30% in the case of carports. In most instances grants can be stacked on top of the state bid preference and federal tax incentives.

Potential Stacking Value of Projects Under 1 MW	
Federal	**Percentage**
1. Starting ITC Bonus (assuming wage threshold met)	30%
2. Energy Community Bonus	10%
3. Low Income Project or Community Bonus	10% or 20%
4. Domestic Content Bonus	10%
Plus ITC applies to interconnection costs	
Potential Tax Credit or Direct Pay Value	60% to 70% of Project Costs
No Prevailing Wage or Apprenticeship Requirement	
State	
Favorable Pricing in NRES Middle Tranche	20% to 30% (Carports)
CT Low income/Landfill/Carport Bonus Pricing Preference	
Nonfinancial Benefits	
Local permitting (no CT Siting Council)	
Less stringent (less expensive) stormwater compliance	

For example, if a town has a smaller capped landfill or brownfield (5 acres or less of usable space) suitable for a 1 MW solar PV project, it could enter the landfill into the middle tranche of the NRES program with the per kWh pricing on the higher end. Plus, with this project the town would receive a 20% bid adder since a landfill or brownfield is involved. IRA's adder for brownfields could add another 10% savings on upfront project costs. A good tool for helping town's understand what tax credits could be available for a project is the Clean Energy Tax Navigator.

As this is a project under 5 MW, the interconnection costs will count towards the project's basis used to calculate the 30% to 40% ITC. Further, being a smaller project, an expensive utility group or transmission level study will most likely not be triggered by the application.

The project also would not be subject to either the federal or state prevailing wage and apprenticeship requirements, and all the permitting would be carried out at the local level, which can be a less expensive and faster process. Moreover, the stormwater compliance for a smaller project could be significantly less burdensome and costly depending on the town regulations.

By stacking the available incentives, lease prices or returns for towns in this scenario should be *significantly* higher—up to 2x to 4x more than on a site without these advantages.

GRANTS, RFPS AND OTHER RESOURCES

There are countless other federal and state programs that offer grant money, loan guarantees, financial assistance, and incentives for clean hydrogen, energy efficiency, demand response, etc. DEEP can hold and has held in the past, annual RFPs for solar PV, fuel cell, and offshore wind projects of a larger scale than offered in its two primary incentive programs. Based on its remaining authority granted under previous legislation, DEEP could hold another grid-scale RFP, so towns should expect to see large scale solar PV proposals, among others, soon thereafter.[118] DEEP also administers a microgrid grant loan program that has historically, largely been awarded to fuel cell projects and some solar PV/battery projects: Microgrid Grant and Loan Program. Another DEEP program that can be used for planning and development of local energy resilience initiatives is the DEEP Climate Resilience Fund.[119] Towns can apply for grants of up to $250,000 that will help with resilience planning along with grants up to $700,000 for project development that also leverages federal funding.

Given the relative prominence of the fuel cell industry in Connecticut along with the clean hydrogen incentives in IRA, there are reports (Connecticut-Hydrogen-Task-Force-Study) and legislative proposals[120] promoting the growth of the clean or green[121] hydrogen fuel cell industry in the state. However, it is unlikely towns in Connecticut will see proposals regarding green hydrogen fuel cell technology in the short term.[122]

The Connecticut Green Bank offers extensive advice, funding and direction to Connecticut municipalities through programs such as the Community Solutions program and in partnership with the state and the utilities through EnergizeCT. It is worth consulting its website and staff on available opportunities. Further, towns could consider the opportunities presented by SustainableCT.

At the federal level there are numerous funding and loan opportunities administered by the Department of Energy. A good summary of many of them can be found on its Clean Cities and Communities and Federal Financing Programs for Clean Energy pages. More research-oriented opportunities can be found here: DOE Solar Technologies Office Funding Opportunities. The White House published this IRA Guidebook shortly after IRA's passage.

There is also a specific program supporting projects that enable communities to use solar PV and solar PV plus storage to prevent disruptions in power caused by extreme weather events: RACER Funding Program. UCONN's Eversource Energy Center and its project to predict storm severity and potential impact on electricity distribution has been a grantee of these funds. IRA's climate and greenhouse gas-focused provisions also provide assistance to municipalities interested in developing solar PV and other energy resilience projects. It establishes a Greenhouse Gas Reduction Fund, administered by the EPA to provide direct investments in technologies that reduce GHG emissions at the local level in particular in low income communities and funded the Solar for All program which recently allocated $62.45 million to DEEP (which call its program Project SunBridge: Connecting Communities to a Solar Future). According to DEEP, Project Sunbridge is "designed to overcome current barriers for low-income and disadvantaged communities to access solar and storage energy technologies through a combination of financial and technical assistance."[123] Municipalities should reach out to the Connecticut Green Bank, a collaborator on the project for implementation details—to be developed. Other opportunities for low income and environmental justice communities can are available in EPA's Environmental and Climate Justice Program.

The Federal Emergency Management Agency (FEMA) through both its Hazard Mitigation Grant Program (HMG) and its Building Resilient Infrastructure and Communities Program (BRIC) offers microgrid grants, and provided $10.2 million in planning funding for microgrant projects in Culebra and Vieques Puerto Rico.[124] The White House is also developing its Justice40 initiative the goal of which is to ensure that 40% of the overall benefits of certain federal investments to do with, among other things, climate change, energy efficiency, clean energy and energy efficiency, flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution.

This is just a sample of some of the other state and federal opportunities that exist and could be considered by Connecticut municipalities. The object of this guide is simply to highlight the large number of incentives and opportunities for towns in Connecticut to enable them to move forward on local energy resilience. It is a unique time in terms of the amount of federal and state funding available for energy resilience projects at the municipal level. If interested in navigating or taking advantage of any of these resources, municipalities in Connecticut are encouraged to reach out to CIRCA for assistance.

While not a focus of this version of the guide, concurrently with greening the grid, towns should also be focused on the energy efficiency of their buildings and demand management (modifying the level and pattern of electrical usage). Given the high demand, CIRCA is working on a revised version of this guide to include a section on state and federal incentives in the building efficiency sector. One could argue that the only true hope for achieving an emissions-free grid is through a combination of renewable energy projects along with reduced demand or altered demand patterns—especially in light of the increasing demand. There are numerous programs in the state that offer demand management services—in particular SmartBuildings CT—a UCONN administered program. For construction projects (including energy generation related ones) on schools, towns may also be eligible for grant money through this program: School Construction Grant Money.

SOME SUGGESTIONS

As indicated throughout, this guide is not meant to cover everything to do with local grid resiliency, but to provide more of a menu of the state and federal incentives that currently exist to spur localities into proactivity and to help them think more strategically. Some general recommendations are listed below:

1. Prioritize resiliency and microgrids (i.e., fuel cells or solar PV coupled with batteries). Communities are already experiencing the effects of climate change. Renewable energy alone will not solve the climate change crisis. While pursuing various long-term solutions, prepare for increasing storm-related outages and emergencies. The renewable energy transition will take decades, so islanding and microgrid capability for the most vulnerable buildings should take top priority, especially while incentive money is ample and available.

2. Think ahead and prepare for change and improvements. For instance, if one is only doing a rooftop solar project, pick an inverter that could potentially island or connect with a battery, and prepare all of the infrastructure for the eventual coupling of a battery. Do the

infrastructure work (even the little things like putting in the conduit for the wire) now so major modifications are not required for future expansion, innovation, or the emergence of new technologies through different incentive programs.

3. If the project is in an area that sees reasonable car traffic, and as long as one has the engineers and electricians onsite, add car charging stations. Check available maps such as the Eversource CT EV Hosting Capacity Map to better understand If the project is at a location where customers can afford to wait for several hours such as while at work or at school, think about level 2 chargers. In areas of high traffic where chargers are meant to act more like gas stations—think level 3 charging stations—which need to be the dominant level available if electric cars are to take over market share. There are significant federal and state incentives for car charging stations such as Electric Vehicles & Charging Stations | Eversource

4. Stack as many state and federal incentives on top of each other where you can. And do not wait. Incentives rarely improve over time and if there is a cap, the programs are often quickly oversubscribed.

5. Take advantage of the fact that Connecticut is a deregulated market and towns and others have a choice of electricity suppliers. There are numerous consultants that towns can work with to develop a sound procurement strategy to stabilize their energy costs while they are planning these energy resilience projects.

6. Understand the incentives developers are getting so you know what to ask from them. They are not going to do it for you and the state and federal regulators do not often mandate that the incentives trickle down to the towns. If they are getting more from the state programs or the federal tax incentives, some of it should flow downstream to the hosts/municipalities. And understand how scale matters and affects projects—large projects usually receive less money for the power they produce but can be cheaper to build, all of which can affect the benefits that might flow to the town.

7. Understand the tax laws and exemptions. Both personal property and real property taxes are applicable to most of these projects. Pursuant to a legislative mandate,[125] DEEP is in the process of evaluating a uniform capacity tax for solar projects in the state which would set the rate towns can charge solar developers most likely based on their kW AC of capacity (e.g. $8,000 or something similar per 1,000 kW. Towns must balance attracting developers and projects to a community with getting their fair share. In other words, don't tax to penalize—be fair and be attractive to industry if local energy generation or storage is what a town wants.

8. Hire a good lawyer with experience in the industry (and consult with CIRCA). Often the leases or net metering/power purchase agreements associated with these projects are35 years plus and are worthy of extra attention and industry expertise. Plus, the state laws and

rules and interpretations can change almost yearly, making it almost impossible for those on the outside to navigate the programs and associated documents effectively.

9. Try and understand other industry challenges to become a better partner with private developers. For instance, inflationary pressures on panels can easily offset at times the benefits of federal and state incentives. Supply chain issues and long lead times on batteries can add to timelines of projects—at no fault of developers. Permitting can take longer than anticipated. As long as they are diligently and effectively moving forward, maintaining some level of flexibility can be key to a cooperative partnership.

10. Use less power at different times at town buildings; and utilize social media and other messaging to convince major energy users in your town to alter how and when they use power. Demand management is the cheapest and easiest way to reduce the stress on the grid, especially during storm events and peak periods. And it can also reduce one's demand and cap tag charges on the monthly power bill. Not enough attention is paid to the demand side of the equation—which can be an equally, if not more, effective a path towards reducing GHGs as greening the grid—especially in the short run. The recent 4% to 5% drop in CO_2 emissions during the COVID-19 pandemic is a good example of this.[126]

11. For towns already on their way and with the expertise in place, think about moving beyond "volumetric matching" or simply matching its's annual load in kWh to the same volume of annual renewable generation without taking into account factors like timing or location of the generation.[127] For example, a town uses some power at night (e.g. for a wastewater treatment facility), so think about procuring or incentivizing generators or storage facilities that can supply power at night and not just defaulting to solar PV. Ultimately this strategy will result in a more balanced grid and will have a greater decarbonization/emissions impact.

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