Sun Rise New England – Open for Business

SUN RISE NEW ENGLAND
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CLEAN ENERGY
FINANCE AND INVESTMENT AUTHORITY

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FINAL PROJECT REPORT for the U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge prepared by Connecticut's "Sun Rise New England - Open for Business" team

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Acknowledgments

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Each of the project partners provided valuable input and contributed a tremendous amount of time and effort to ensure that the Sun Rise New England project results and products are meaningful and useful. The following is a list of individual contributors that were part of our partners' teams, as well as other individuals who generously gave their time when we called upon them for assistance.

Disclaimer

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Introduction

SunShot Initiative[1]

The U.S. Department of Energy (DOE) SunShot Initiative is a collaborative national effort to dramatically reduce the costs of solar energy, making it cost-competitive with other forms of energy before the end of the decade.

Under the SunShot Initiative, DOE invests in competitive research and development for solar technologies that promise to transform the way we generate, store, and utilize energy. To make solar energy more accessible and affordable, SunShot aggressively drives innovation by investing in private companies, academia, and national laboratories to reduce the cost of solar electricity to about $0.06 per kilowatt-hour. This cost reduction will enable broad deployment of solar energy systems across the country and allow solar-generated power to account for roughly 14% of America's electricity generation by 2030.

SunShot Initiative advancements will ultimately benefit every American by:

- Providing clean, low-cost energy for home owners, communities, businesses, and government;
- Enhancing America's global technology leadership through advanced solar photovoltaic technologies and smart grid innovation;
- Creating U.S. jobs through domestic solar manufacturing and distribution; and
- Reducing greenhouse gas emissions and protecting the environment.

Learn more about SunShot and DOE's efforts to expand deployment of clean, inexpensive solar energy by visiting www.eere.energy.gov/solar/sunshot.

Rooftop Solar Challenge[2]

The U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge is part of the SunShot Initiative, providing funding and resources to regional awardees to address highly varying, time-intensive and costly administrative processes required to install and finance residential and commercial rooftop solar photovoltaic (PV) systems.

Twenty-two Rooftop Solar Challenge teams from across the country are working to streamline permitting processes, update planning and zoning regulations, improve standards for connecting solar power to the electric grid, and increase access to financing for rooftop solar PV. The teams bring together municipal, county, and state officials, regulatory entities, private industry, universities, local utilities, and other regional stakeholders to clear a path for rapid expansion of solar energy and serve as models for other communities across the nation.

Learn more about the Rooftop Solar Challenge at: www.eere.energy.gov/solarchallenge.

[1] www.eere.energy.gov/solar/sunshot
[2] www.eere.energy.gov/solarchallenge

Sun Rise New England – Open for Business[3]

Connecticut Context

As part of the State of Connecticut's commitment to the deployment of clean energy technologies, the Clean Energy Finance and Investment Authority (CEFIA)[4] is developing and implementing new, innovative financing mechanisms for solar PV while also working to reduce installed cost. CEFIA, the successor organization to the Connecticut Clean Energy Fund, was created by the Connecticut Legislature as a part of Public Act No. 11-80 (PA 11-80), effective July 1, 2011.[5] CEFIA's goals are to deploy capital to finance the clean energy goals of Connecticut, develop and implement strategies that lower the cost of clean energy to make it more accessible and affordable to consumers, and reduce reliance on grants, rebates and other subsidies and move toward innovative low-cost financing of clean energy deployment. Public Act 11-80 also specified ambitious targets for deployment of solar energy, including a target to install 30 MW of new residential PV by the end of 2022.

CEFIA is currently working to develop and implement innovative financing products for residential and commercial solar installations while reducing non-hardware or soft costs to make solar PV systems more affordable and accessible. The Sun Rise New England project has made it possible to understand and develop solutions to overcome the inefficient and costly administrative processes and market barriers associated with rooftop solar PV installation in Connecticut.

Although Connecticut ranks the fifth lowest in energy use per capita in the United States, it has one of the highest electricity prices in the continental United States (EIA Feb 2013)[6]. Scaled deployment of clean energy including solar energy is part of Connecticut's strategy for reducing these costs, the emissions associated with Connecticut's electricity usage, as well as meeting the State's renewable portfolio standard of producing 27 percent of electricity from renewable sources by 2020.

The majority of Connecticut's electricity is produced from nuclear energy and natural gas. Although these fuel sources have lower emissions associated with electricity production than other petroleum products and coal, solar energy provides a zero emissions alternative. On average, for every residential solar PV system installed in Connecticut, the U.S. avoids 3.5 tons of greenhouse gas emissions each year. Over the lifetime of a typical system, over 87 tons of carbon dioxide (CO_2) will be offset.

In addition to the environmental benefits of installing solar PV there are significant economic benefits resulting from widespread adoption of solar PV in Connecticut. More business done installing solar PV results in creation of direct plus indirect and induced jobs.

Energy price stability and energy security are benefits. Solar PV has historically been thought of as providing a hedge against possible increases in fossil fuel prices. Though natural gas prices have recently been very low, over the long haul solar energy based systems still rely on a free fuel source. Energy

[3] www.energizect.com/SunRiseNE
[4] http://ctcleanenergy.com
[5] An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future, www.cga.ct.gov/2011/act/pa/2011PA-00080-R00SB-01243-PA.htm
[6] http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a

costs account for roughly 9-17% of homeowner expenses, a 2-5% increase since 2005.[7] Providing a stable, low cost source of energy will increase residents' disposable income and the competitiveness of Connecticut businesses. Diversifying Connecticut's energy supply has also become increasingly important given loses estimated at $2-4 billion each year on power outages and quality issues.[8]

An economic benefit of solar for an owner of a solar energy system is that it can increase the value of a property. Research conducted by the U.S. Department of Energy's Lawrence Berkeley National Laboratory "finds strong evidence that homes with solar photovoltaic (PV) systems sell for a premium over homes without solar systems."[9] The decrease in electric bills associated with solar investment adds an additional premium to a home's value.

As population increases in the Northeast United States, the demand for electricity will rise as well, driving prices up and increasing the demand for energy. Another value of solar PV is the fact that it generates power during parts of the day that are at or around when energy demands are peaking. It is advantageous to be able to access peak power that is not cost prohibitive, as are many peaking plants which are installed and are used specifically for meeting peak power needs. There are other benefits to solar PV as a distributed source of electricity which does not incur line losses as does power traveling long distances.

Lastly, net metering rules in Connecticut have improved over time, with the value of the power produced from solar becoming easier to capture. Proposed virtual net metering provisions would increase this value even further.

Sun Rise New England Partner Communities

Connecticut may be a relatively small state but its 169 municipalities operate under a diverse set of rules, regulations and processes that ultimately result in costs for permitting of rooftop solar PV systems. These communities were asked to participate for various reasons including:

- A strong record in terms of number of installations and capacity installed per capita and/or strong clean energy leadership in other ways such as through the CT Clean Energy Communities (CEC) Program. All 12 towns earned a municipal solar PV system through success as CEC participants in the original version of the Program.[10] A new version of the Program has been launched, so community commitments are in the process of being renewed.
- Diversity in terms of representing large and small populations, various community types (i.e. urban, suburban, rural and low income), and representing both Connecticut Light and Power (CL&P) and United Illuminating (UI) service territories.

The below table presents residential and non-residential solar PV installation data for the 12 participating Sun Rise New England towns. The installation data represent solar PV installations that were supported by CEFIA incentive programs from 2003 through 2013. Residential installations were supported through the Residential Solar Investment Program (RSIP) starting in March 2012, and by both

[7] http://www.americaspower.org/sites/default/files/Energy_Cost_Impacts_2012_FINAL.pdf
[8] Pentland, William "Clean Energy Tops Agenda in Connecticut." *Forbes* (11/09/2010) http://www.forbes.com/sites/williampentland/2010/11/09/microgrids/
[9] http://newscenter.lbl.gov/news-releases/2011/04/21/bright-spot-for-solar/
[10] Of the 12 towns, all have had their municipal solar PV system installed except for Danbury who has earned a system yet to be installed.

solar rebate and lease programs before that. Non-residential installations are captured primarily from 2003-2011, after which only 4 non-residential installations are included in the CEFIA dataset. These non-residential installations are now being incentivized through the competitive Zero Emission Renewable Energy Credit (ZREC) Program, administered by the CL&P and UI. Therefore, the below data does not include and is thus incomplete for non-residential installations in years 2012 and 2013. Given that the 2012 ZREC auction resulted in 45 MW of new solar, the below table likely is missing quite a bit of non-residential capacity.

The following are a few observations:

- As previously mentioned, each town has at least one non-residential installation consisting of a CT Clean Energy Communities Program municipal installation, except for Danbury who has earned such as PV system but has not yet installed it.
- Fairfield overall has the most projects installed and the highest installed capacity. Fairfield is also participating in the Solarize Program, which has great success with deploying record amounts of solar PV in participating communities.
- The two smallest towns, Cornwall and Hampton, also have the highest residential household penetration rates of the 12. Note that the highest residential rate in Connecticut is in Durham, with over 5% penetration, also a small town, and a Solarize town.

More information about each town is provided in town-specific summaries in Appendix I for each of the below towns.

Sun Rise New England Partner Communities in Connecticut

				Non-Residential		Residential				
Rooftop Solar Challenge Community	Population (CERC 2011)	Number of Households (CERC 2011)	Community Type	# Projects	Total Capacity (kW)	# Projects	Total Capacity (kW)	Household Penetration	Total # Projects	Total Capacity (kW)
Bridgeport	146,824	52,261	Urban	5	382	7	39	0.01%	12	421
Cornwall	1,429	643	Rural	1	9	12	93	1.87%	12	93
Coventry	12,572	4,738	Rural	1	76	28	191	0.59%	29	268
Danbury	82,409	29,508	Urban	5	1271	34	229	0.12%	39	1500
Fairfield	59,625	20,556	Suburban	5	621	125	912	0.61%	130	1533
Greenwich	61,983	23,382	Suburban	4	218	37	199	0.16%	41	417
Hampton	1,890	768	Rural	2	19	15	87	1.95%	17	106
Manchester	59,175	25,194	Suburban	5	416	27	181	0.11%	32	597
Middletown	48,041	20,233	Suburban	7	565	43	224	0.21%	50	789
Milford	52,894	21,910	Suburban	2	370	70	447	0.32%	72	816
Stamford	124,908	48,288	Urban	8	1139	39	227	0.08%	47	1366
West Hartford	63,649	25,513	Suburban	6	351	45	266	0.18%	51	617
Totals	**715,399**	**272,994**		**50**	**5429**	**482**	**3094**	**0.18%**	**532**	**8523**

Soft Cost Reduction Opportunity

Solar PV installation levels have increased dramatically in Connecticut over the past 14 months, as a result of clear and ambitious policy goals, effectively designed and well-managed incentive and financing programs, a tremendously effective Solarize campaign (now in its second round), an exciting ZREC market over-subscribed by a factor of 2.75, and increased collaboration between Connecticut agencies, utilities, industry, law makers, and customers to enable unprecedented leveraging of ratepayer dollars and solar PV deployment rates previously unmatched in Connecticut.

In the 10 months of 2012 starting in March when CEFIA's Residential Solar Investment Program (RSIP) began, 5709 kW were installed in Connecticut. That's already almost 6 MW or 1/5 of the 30MW target for 2022 specified in PA 11-80. To date, as of May 10, 2013, 9179 kW have been installed through RSIP since March 2012, bringing us close to the 10MW mark.

As PV module prices have decreased sharply in the last few years, it has become even more critical to understand and develop strategies to reduce soft costs. The Sun Rise New England Rooftop Solar Challenge project is designed to identify and recommend strategies for reducing the soft costs of rooftop solar PV installations associated with processes such as permitting, planning and zoning, and interconnection and financing. Inefficient processes and outdated regulations add time, increase costs and in some jurisdictions may prohibit the installation of rooftop solar PV.

CEFIA and its partners collected and analyzed data focused on the DOE Solar Metrics questions relating to the soft costs of rooftop solar PV specific to permitting, planning and zoning regulations and practices, and interconnection. Through this process, the team identified best practices and developed recommendations for the State of Connecticut and for local jurisdictions. These recommendations are designed to help to make solar PV installations increasingly accessible to Connecticut residents and business owners.

In addition to the Solar Metrics data, the project team also analyzed CEFIA incentive program installation data from years 2004-2012 to see what insights could be gleaned about hard and soft cost trends and market penetration trends. The data shown here is only for residential installations, as CEFIA does not have complete data for commercial installations through 2012 due to commercial installation incentives now flowing through the competitive Zero Emission Renewable Energy Credit (ZREC) Program, whose 2012 auction period resulted in 45MW of new solar installation commitments.

Below is a table showing % hardware ("hard") and %non-hardware ("soft") costs in the CEFIA residential installation data from years 2004-2012. Soft costs are about one third of total costs, with Solarize towns exhibiting lower soft costs.

Year	% Hardware	% Non-Hardware
2004	0.79	0.21
2005	0.73	0.27
2006	0.74	0.26
2007	0.73	0.27
2008	0.70	0.30
2009	0.66	0.34
2010	0.71	0.29
2011	0.62	0.38
2012	0.66	0.34
Non-Solarize	0.65	0.35
Solarize	0.77	0.23

Project Data Collection and Methodology

Data collection for this project was guided by the U.S. DOE Solar Metrics questions and then developed into several different types of surveys including an online Qualtrics survey implemented by Yale, as well as simpler fillable forms, and direct email surveys. The various surveys were sent to towns and installers to better understand processes and opportunities for improvement associate with permitting, planning and zoning, and interconnection for solar PV. In addition, CEFIA and Yale also conducted in person interviews with utility program partners, town staff, and many others. Additional information was obtained via research on websites and by culling information from reports, webinars and conferences.

Permitting Processes in Connecticut

Summary of Results and Preliminary Conclusions

Improving permitting processes in Connecticut jurisdictions can help to reduce costs for solar PV installers, homeowners, business owners and jurisdictions, and will increase economic activity in the municipalities. Jurisdictions in Connecticut have a diverse set of requirements and processes for rooftop solar PV permitting. The Sun Rise New England team has identified several opportunities for improvement in the following areas affecting the permitting process:

1. Information availability
2. Application submission
3. Review and inspection requirements
4. Permit fees

Inefficiencies in each of these areas increase the time taken to approve or deny permits resulting in a slower, cumbersome and costly permitting process. In addition, confusion resulting from inconsistent requirements across the state adds to the difficulties encountered by installers seeking permits for both residential and commercial installations.

Rooftop Solar PV Permitting – Opportunities for Improvement

Information Availability

One of the biggest problems permitting (usually building) departments face is incomplete applications from installers. Although it is the installers' responsibility to submit complete applications, it is often difficult for installers to determine what documents and processes are required for solar PV permits. Complete permit applications reduce the time building department staff must spend on each permit application. Issues include:

- *Lack of Information availability online*—Although many Connecticut jurisdictions have information online pertaining to general permitting

Solutions in Place: Simply Civic

Simply Civic provides a simple, fast and affordable online permitting solution for all of a jurisdiction's permitting needs. The system is now being piloted across the country and in Connecticut allowing the company to refine and improve the permitting system. Simply Civic is free to all Connecticut jurisdictions until December 2014 and at an affordable rate in 2015 and beyond.

processes (including application forms, submission requirements, and contact information), not one of the 12 participating jurisdictions in the project has specific information related to solar PV permitting provided online. Thus installers have no way of determining which applications and documentation are required for rooftop solar PV permitting.

- *Inconsistent requirements*—Each jurisdiction in Connecticut has its own requirements, guidelines and permitting process. This lack of consistency across Connecticut causes confusion among installers and can lead to missing information in permit applications.

Application Submission

The process of submitting an application for solar PV installations can be labor intensive and confusing for installers working in Connecticut. In addition to unclear permitting requirements, installers are often required to make multiple trips to jurisdictions, submit numerous documents and move applications between several departments in order to obtain approval. Installers across the state have reported these application submission issues:

- *In-person Submission*—Although many jurisdictions enable installers to obtain applications online, only five of the participating jurisdictions surveyed allow permit submission online or via e-mail. Requiring installers to travel in order to obtain approval in-person results in unnecessary time and money spent by both installers and local officials.
- *Notarized Documents*—Notarizing documents is time consuming, requires additional travel and is an unnecessary extra step in obtaining a permit for solar PV installation.
- *Numerous Department Approvals and Sign*-off Sheets—Some jurisdictions require numerous departmental approvals and signatures for rooftop solar PV installations. Of the jurisdictions surveyed, the average number of departments requiring approvals was 3 for residential and commercial projects. Some jurisdictions require seven or more approvals in order to obtain a permit. Requiring a large number of approvals delays decisions on permit requests and requires more work on the part of the jurisdiction to process permits.

Multiple Applications—Multiple applications for a single installation can result in confusion and additional work for both installers preparing a permit application and local officials during review.
Number of Departments Requiring Approval

Town	1	2	3	4	5	6	7
Bridgeport							R/C
Cornwall		R/C					
Coventry	R/C						
Danbury			R/C				
Fairfield			R/C				
Greenwich					R	C	
Hampton							
Manchester		R	C				
Middletown	R/C						
Milford	R	C					
Stamford				R			C
West Hartford		R/C					

Review and Inspection Requirements

Permit application review and scheduling and conducting inspections can be arduous and take up more time than necessary. The biggest factors that slow down this process are:

- *Unnecessary reviews: Engineering reviews can be costly and time-consuming and should not be required on every installation, just those that really need it.*
- *Unnecessary Inspections:* Rooftop solar PV systems are sometimes subject to unnecessary inspections due to lack of familiarity or training to know what is most critical to inspect for.
- *Appointment times:* Eight out of the twelve jurisdictions surveyed schedule inspections during one to four hour windows of time. Coordinating these long windows with installers and homeowners can be difficult and time consuming.
- *Multiple Inspections required:* Scheduling with windows of time coupled with requiring multiple inspections throughout a project installation adds even more time that an installer, homeowner, and inspector must coordinate.

Permit Fees

Potential permit fee savings for Connecticut rooftop solar PV installations.

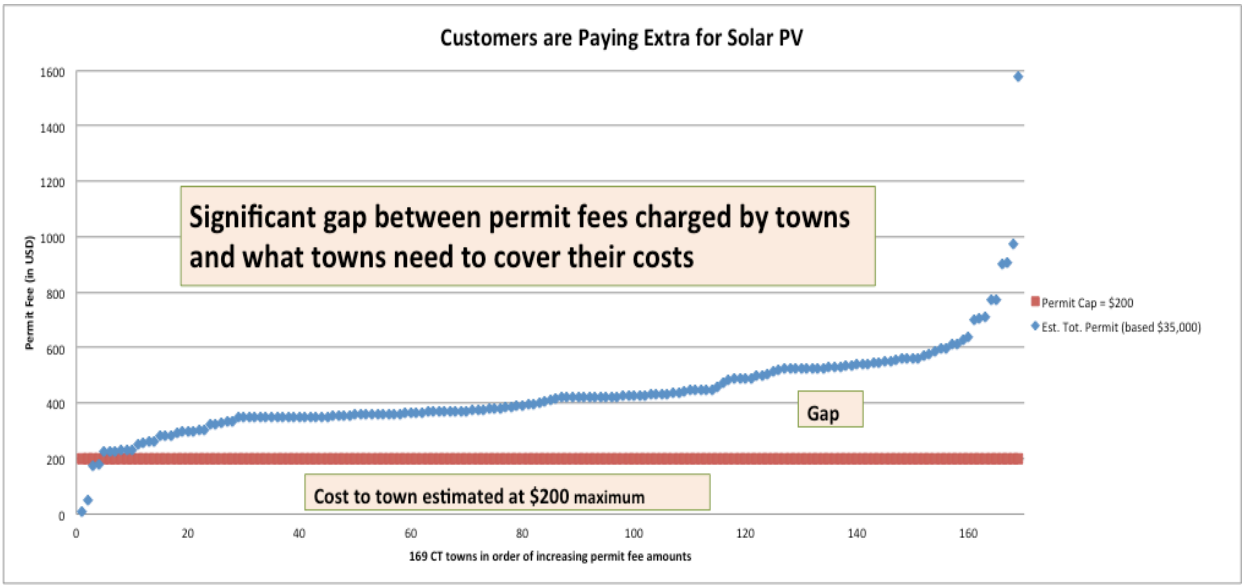
Permitting fees for residential rooftop solar PV range across Connecticut's 169 jurisdictions range from $0 to over $1500, with most jurisdictions using a value-based system. Jurisdictions charging higher than average permit fees for a residential solar PV installation unjustifiably increase the cost of solar PV by collecting fees often much higher than their actual processing expenses. Thus, permit fee structures based on system cost (value based) pose market barriers to solar PV installations in Connecticut by increasing the overall prices customers pay.

The figure below illustrates the variation in permit fees across Connecticut's 169 jurisdictions in comparison to a $200 flat fee—a generous estimate of processing costs for residential

Permit Fee Best Practice: Bridgeport and Manchester

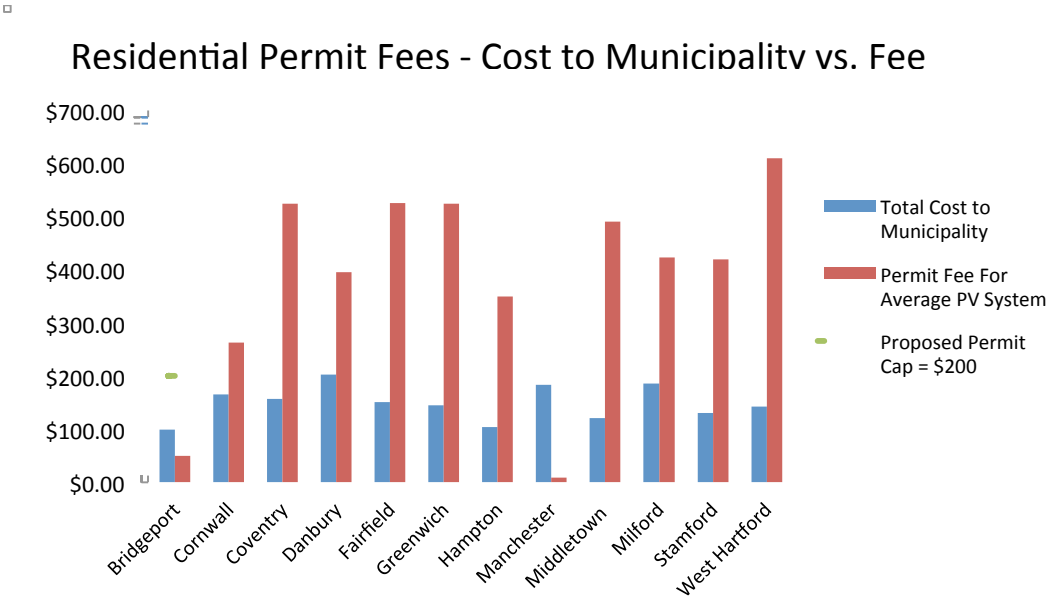
In December 2012, the City of Bridgeport enacted an ordinance to waive all permit fees for Class I renewable energy projects outside of supporting construction such as "footings and foundations."

The town of Manchester also waived its permit fee for all Class I renewables in 2012.



Customers are over charged for rooftop solar PV installations.

The initial twelve Connecticut jurisdictions surveyed as part of CEFIA's Rooftop Solar Challenge project are representative of the issue that is prevalent statewide. Only 2 of 12 jurisdictions surveyed are charging fees at or less than the actual costs incurred during the permitting process.



The Sun Rise New England team identified the following ways jurisdictions increase the cost and difficulty of obtaining a rooftop solar PV permit:

- *Cost based on value of construction*: using the valuation based method of calculating fees can result in high, unpredictable permitting fees.

- *Payment in-person:* Requiring payment of permit fees in-person adds an additional trip for installers to local jurisdictions increasing the cost of installation
- *Permit fees for public buildings:* Some jurisdictions require payment of permit fees for public buildings including schools and town or city buildings. These fees are an unnecessary cost to installers.

Rooftop Solar PV Permitting Recommendations for Jurisdictions

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), has identified some of the best rooftop solar PV permitting practices in Connecticut and nationwide.

Make Information Available

- **Bring Permitting Online:** Make information and resources pertaining to your solar PV permitting process and fee available and easily accessible via your jurisdiction website. Use online permitting software (please see "Adopt Online Permitting" in next section).
- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

"Go SOLAR Chester!"
signage to encourage participation in the CT Solar Challenge

- **Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** Clarify requirements and increase consistency across jurisdictions by adopting a standard rooftop solar PV permit application package as provided in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and *submit* permit application materials through your website, by email, or by regular mail. This change saves installers time-intensive and costly trips to jurisdiction offices.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[6] If not a full waiver, consider a low or flat fee based on cost recovery instead of a value-based fee structure that may not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For

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[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

[4] energizect.com/SunriseNE

[5] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.

[6] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.

- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by regular mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[7]
- **Remove Excessive Reviews**. Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process.** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[8] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired.[9]

Photo by Michael Phillips, Sun Rise New England team

[7] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

[8] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

[9] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm

Permitting Recommendations for the State of Connecticut

As listed above, there are a number of ways jurisdictions can streamline the permitting process for rooftop solar PV reducing the time and expense necessary for installations. The State of Connecticut can play an important role in streamlining these processes.

Recommendations for the State of Connecticut:

Waived Fee or Flat Fee Based on Cost-Recovery Permitting Fee Structure with a Cap

The majority of Connecticut jurisdictions do not have a cap on solar permitting fees and instead calculate the permitting fee based on the value of the system. In order to give installers more certainty when creating project budgets and to ensure a reasonable permitting fee, the Sun Rise New England team recommends that the State legislate a permit fee structure based on cost-recovery in combination with a cap for those jurisdictions that choose not to waive fees based on Section 29-263.[21] Research conducted by states across the country including Connecticut supports implementation of a permit fee structure that allows a jurisdiction to only recover the costs incurred during the permitting process including application review and inspection.

A permit fee cap would motivate jurisdictions to optimize and streamline inefficient solar PV permitting processes to keep jurisdiction costs down. However, a cap alone would not bring about desired permit fee reductions. While some jurisdictions would bring their fees down to the permit fee cap, others could raise their fees up to the cap resulting in the statewide average fee remaining largely unchanged. The combination of waived fee, or a cost-recovery fee structure and a permit fee cap would result in reasonable permitting fees and processes throughout the state.

In addition to a fee cap and change in structure, each jurisdiction should be required to post its cost-recovery fee structure online to increase transparency.

Mandatory decision deadline

The state currently requires jurisdictions to approve or deny permits within 30 days of a completed application submission. A shorter mandatory limit to permitting turnaround time will hold jurisdictions accountable for delays and give installers more certainty regarding the installation schedule. Based on feedbacks from jurisdictions surveyed, the Sun Rise New England team suggests a 14 day deadline from the completion of an application.

Improve Building Energy Codes

Connecticut is already on track to adopt the newest version of the model energy code by January 2013. One way this building code can be improved to support Connecticut's solar efforts is to incorporate a "solar ready" home amendment. This amendment should include provisions for structural requirements of rooftop solar PV and roof orientation so that every new home built beyond the effective date of the 2013 building code is sufficient to host a solar PV system (aside from factors outside of construction such as adjacent buildings and trees).

There are many jurisdictions that are making great efforts to become clean energy leaders in the state. These jurisdictions currently do not have the option to increase the stringency of their building codes except for green building ordinances in public buildings. The Sun Rise New England team recommends the State of Connecticut to create a model "stretch-code" to enable jurisdictions to adopt more stringent codes if desired. A Stretch Energy Code was added to the Massachusetts state building code in

[21] Ibid.

2009. "It provides a more energy efficient alternative to the standard energy provisions of the code that a municipality may choose to adopt."[22]

Allow electronic wet stamps

When jurisdictions require engineer or architect approved plans, these plans must be delivered in person because official stamps are required. The State of Connecticut does not allow these required stamps to be submitted electronically. Other states across the United States, including Pennsylvania, New York, Delaware, Maryland, and California allow electronic submission of wet stamps in order to streamline the permitting process. The Sun Rise New England team recommends the State of Connecticut to allow engineer and architect stamps to be submitted electronically to eliminate the need for installers to deliver these documents in person.

Education & Training

Building departments are responsible for understanding and enforcing a diverse set of codes and standards. Insufficient funding and manpower makes training extremely difficult for most jurisdictions. In order to help building officials obtain the necessary training, the Sun Rise New England team recommends the State of Connecticut to hold several free training sessions for building officials related to rooftop solar PV and other clean energy technologies. An increased awareness and understanding of solar PV systems will help local jurisdictions eliminate any unnecessary requirements currently enforced in permitting processes.

Planning & Zoning

Summary of Results

Through interviews with the twelve Rooftop Solar Challenge partner towns and research, the team was able to form a general picture of the planning and zoning regulations and procedures that apply to solar installations in Connecticut. While ground-mounted systems are subject to a complex series of building and zoning approvals, roof-mounted solar photovoltaic systems outside of design review areas face few regulatory barriers from planning and zoning departments. The process for zoning review in most of the towns surveyed, such as Milford, is to issue a zoning permit over-the-counter or automatically if a building permit application is received for a roof-mounted photovoltaic (PV) system. Commercial or residential installations located in village or historic districts are subject to aesthetic guidelines. Such review is conducted by a by an established Design Review Board or a professional consultant.

On the local level, many towns have incorporated renewable energy into their city plans. However, of the municipalities studied, only Bridgeport and Middletown have solar friendly ordinances. . Middletown grants a 10% real-estate tax exemption for LEED certified properties through its Tax and Business Incentive Program. Bridgeport exempts permit fees for Class I renewable installation under Resolution 162-11, Section 15.08.010.

On the state-level there are three regulations that apply to roof-top solar installations.

- CT Gen. Statute 8-25(b) governing subdivision regulations states: "The regulations shall require any person submitting a plan for a subdivision to the commission under subsection (a) of this section to demonstrate to the commission that such person has considered, in developing the plan, using passive solar energy techniques which would not significantly increase the cost of the housing to the buyer."

[22] http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/stretch-energy-code-information.html

- Connecticut's zoning enabling act (General Statute 8-2) states that: "Such regulations may also encourage energy-efficient patterns of development, the use of solar and other renewable forms of energy, and energy conservation."
- CT Gen. Stat. 7-147f states "No application for a certificate of appropriateness for an exterior architectural feature, such as a solar energy system, designed for the utilization of renewable resources shall be denied unless the commission finds that the feature cannot be installed without substantially impairing the historic character and appearance of the district.

However, several of the officials interviewed for this project mentioned that these regulations are rarely enforced due to either the lack of specific guidance or the capacity of the reviewers to apply the regulations.t is also important to note that these statutes do not specifically establish a homeowners' right to install a solar system, nor do they guarantee access to sunlight or protect against restrictive private covenants. In contrast, Massachusetts has legislation (M.G.L. ch. 40A § 3) prohibits any zoning prohibitions or unreasonable regulations of solar installation except, "where necessary to protect the public health, safety or welfare."

Data Collection and Methods

Members of the Center for Business and Environment at Yale (CBEY) research team interviewed planning and zoning officials from each partner city or town. The interview questions were developed with guidance from the Yale Center for Customer Insights (YCCI), and were designed to develop an organic conversation concerning the data needed for completing the solar metrics questions.

At the outset of the project each town designated an official point of contact for the study, who identified the appropriate municipal officials to interview. CEFIA and CBEY then contacted those individuals to schedule interviews, with the points of contact assisting as necessary. Interviews were conducted over the phone or in person according to scheduling constraints and the preferences of those being interviewed. Interviews ranged from 30 to 90 minutes, and in some cases recorded to facilitate note-taking. Where scheduling permitted, interview teams consisted of at least two people, one to ask questions and one to take notes. In addition to the primary official, interviews were also attended by the point of contact for the town and/or other municipal staff whose presence the official deemed helpful. Officials were asked to provide copies of the solar-relevant ordinances and municipal statutes discussed in the interviews. Notes taken during the interview were used to complete the planning and zoning solar metrics questions.

Research also included a literature search, review of studies by Interstate Renewable Energy Coalition (IREC) and National Renewable Energy Laboratory (NREL), and consulting model ordinances and best practices from other states such as California and New Jersey.

Planning and Zoning Recommendations for the State of Connecticut

Solar access laws do not yet exist in CT but should be considered in anticipation of increased solar PV deployment. The **solar access** issues include solar easements and solar rights. [23]

- **"Solar easements"** refers to the ability of one property to continue to receive sunlight across property lines without obstruction from another's property (buildings, foliage, or other impediment).

[23] A Comprehensive Review of Solar Access Law in the United States Suggested Standards for a Model Statute and Ordinance, Colleen McCann Kettles, Florida Solar Energy Research and Education. http://www.solarabcs.org/about/publications/reports/solar-access/pdfs/Solaraccess-full.pdf; and http://en.wikipedia.org/wiki/Solar_access#cite_note-1.

- **"Solar rights"** refers to the ability to install solar energy systems on residential and commercial property that is subject to private restrictions, i.e., covenants, conditions, restrictions, bylaws, condominium declarations, as well as local government ordinances and building codes.

Common-law in the United States does not include any established right to sunlight. Therefore, specific statutory authority must be established to protect the rights of solar users in terms of both their ability to install a solar energy system on their property and to protect their access to sunlight. Therefore it is recommended that Connecticut undertake the following measures.

Adopt a Solar Easements & Rights Law – Provide a legal framework for granting of voluntary easements to ensure that proper sunlight is available to active or passive solar energy systems or other purposes. A potential model is CA Civil Code §801.5,[24] which recognizes the value of receiving sunlight across real property boundaries and provides homeowners the right to negotiate and enforce solar easements.

> The following land burdens, or servitudes upon land, may be attached to other land as incidents or appurtenances, and are then called easements:… The right of receiving air, light, or heat from or over, or discharging the same upon or over land; …The right of receiving sunlight… shall be referred to as a solar easement. "Solar easement" means the right of receiving sunlight across real property of another for any solar energy system.

Adopt a Statewide Solar Access Law – A statewide solar access law would provide a uniform regulatory structure that developers and property owners would find easier to navigate than a patchwork of different municipal solar access regulations. Such law should be easy to administer and consistent with state goals of encouraging compact and transit oriented development.

An example is California's Solar Shade Control Act (CA Public Resources Code § 25980),[25] which is an example of the solar envelope approach. This law provides that:

> After the installation of a solar collector, a person owning or in control of another property shall not allow a tree or shrub to be placed or, if placed, to grow on that property so as to cast a shadow greater than 10 percent of the collector absorption area upon that solar collector surface at any one time between the hours of 10am and 2pm, local standard time.

The table below summarizes examples of solar access laws in leading and nearby states, illustrating the types of protections that can be provided for solar energy. There is a lot of room to establish new Connecticut laws, in addition to publicizing, enforcing and strengthening Connecticut's existing solar access laws (described in the next section).

Examples of Other States' Solar Access Laws

Description of Law	Statute Language
California – guarantees the right of homeowners to negotiate solar easement contracts with neighboring property owners.	CA Civil Code §801.5
California – the Solar Shade Control Act uses the envelope approach to automatically protect the solar access rights of all citizens who install a rooftop solar system.	CA Public Resources Code § 25980
Rhode Island – authorizes homeowners to negotiate solar easements.	R.I. Gen. Laws § 34-40
New Hampshire – protects the right of homeowners to	New Hampshire Statutes § 477:49

[24] California Civil Code § 801.5: www.leginfo.ca.gov/cgi-bin/displaycode?section=civ&group=00001-01000&file=801-813

[25] California's Solar Shade Control Act, California Public Resources Code § 25980: www.leginfo.ca.gov/cgi-bin/displaycode?section=prc&group=25001-26000&file=25980-25986

obtain solar easements.	
Maine – authorizes the creation of solar easements.	33 M.R.S. §1401
Maine – prohibits municipal bylaws, zoning ordinances, and homeowners' associations form prohibiting or unreasonably restricting homeowners' right to use solar energy devices.	33 M.R.S. §1421
Massachusetts – local governments are authorized to promote solar energy systems through their zoning ordinances, including regulation of street layout and building size and placement. Ordinances establishing systems for solar rights permits are also authorized.	M.G.L. ch. 40A § 9B.; definition of a solar easement found in M.G.L. ch. 187 § 1A.
Massachusetts – prohibits local zoning ordinances placing unreasonable restrictions on solar energy systems	M.G.L. ch. 40A § 3.
Massachusetts – forbids restrictive covenants (e.g., from developers, neighborhood associations) that prohibit or unreasonably restrict homeowners' right to install a solar system.	M.G.L. ch. 184 § 23C.
New York – provides for the creation of voluntary solar easements.	NY CLS Real Property § 335-b
New York – authorizes local governments to create zoning ordinances specifically for the purpose of facilitating solar access and solar energy systems	NY CLS General City § 20 (24); NY CLS Town § 263; NY CLS Vill § 7-704
Vermont – prohibits municipal bylaws, zoning ordinances, and nongovernmental deed restrictions from prohibiting or unreasonably restricting homeowners' right to install a rooftop solar system.	27 V.S.A. § 544; 24 V.S.A. § 2291a; 24 V.S.A. § 4413 (g)

Publicize, Enforce, and Strengthen (where needed) existing Connecticut laws.

CT Gen. Statute § 8-25(b) requires subdivision development regulations to "encourage energy-efficient patterns of development and land use, the use of solar and other renewable forms of energy, and energy conservation." [26] Many towns have taken the first step by adding this language to their subdivision regulations (e.g., Fairfield, Milford), but fewer towns have long-term plans or task forces for renewable energy (e.g., Cornwall, Coventry).

> Sec. 8-25. Subdivision of land.
>
> (b) The regulations adopted under subsection (a) of this section shall also encourage energy-efficient patterns of development and land use, the use of solar and other renewable forms of energy, and energy conservation. The regulations shall require any person submitting a plan for a subdivision to the commission under subsection (a) of this section to demonstrate to the commission that such person has considered, in developing the plan, using passive solar energy techniques which would not significantly increase the cost of the housing to the buyer, after tax credits, subsidies and exemptions. As used in this subsection and section 8-2, passive solar energy techniques mean site design techniques which maximize solar heat gain, minimize heat loss and provide thermal storage within a building during the heating season and minimize heat gain and provide for natural ventilation during the cooling season. The site design techniques shall include, but not be limited to: (1) House orientation; (2) street and lot layout; (3) vegetation; (4) natural and man-made topographical features; and (5) protection of solar access within the development.

[26] http://www.cga.ct.gov/2011/pub/chap126.htm#Sec8-25.htm

CT Gen. Statute 8-25(b) should be strengthened. The current language only requires developers to "consider" passive solar. This is difficult to enforce, because it's difficult to prove that developers haven't fulfilled that requirement. As a result, according to the Hampton interview, most towns don't enforce it. The statute would be easier to enforce if 8-25(b) were amended to *require* developers to incorporate passive solar energy techniques into their development plans rather than simply considering them. Language in the amendment could require developers to document their use of passive solar techniques for municipal building or planning and zoning departments when they apply for building permits. This would require developing a more specific list of passive solar features that would be covered by the statute. The list could make some features mandatory for all developments or provide a range of options for developers to choose from and combine. It is expected that there would be some situations where passive solar would be prohibitively costly or disadvantageous, and exceptions could be granted for projects where the developer could document a valid reason that such techniques would be inappropriate. In such cases the developer would need to provide sufficient documentation and evidence to justify an exception. See the appendices for a sample Solar Orientation Worksheet for a Proposed Subdivision.

Require New Homes to be "Solar Ready" – Amend CT Gen. Statute 8-25(b) such that new homes must have the structural attributes and integrity capable of supporting a rooftop solar system. New homes meeting such specifications could thus be automatically certified as "solar ready," streamlining the installation process for rooftop solar.

CT Gen. Statutes § 8-23 (a) and (d) require planning commissions to prepare, amend or adopt a plan of conservation and development for the municipality, and in preparing such plan, consider energy-efficient patterns of development, the use of solar and other renewable forms of energy and energy conservation.[27]

> Sec. 8-23. Preparation, amendment or adoption of plan of conservation and development.
>
> (a)(1) **At least once every ten years, the commission shall prepare or amend and shall adopt a plan of conservation and development for the municipality. Following adoption, the commission shall regularly review and maintain such plan.** The commission may adopt such geographical, functional or other amendments to the plan or parts of the plan, in accordance with the provisions of this section, as it deems necessary. The commission may, at any time, prepare, amend and adopt plans for the redevelopment and improvement of districts or neighborhoods which, in its judgment, contain special problems or opportunities or show a trend toward lower land values.
>
> (d) In preparing such plan, the commission or any special committee shall consider the following: (1) The community development action plan of the municipality, if any, (2) the need for affordable housing, (3) the need for protection of existing and potential public surface and ground drinking water supplies, (4) the use of cluster development and other development patterns to the extent consistent with soil types, terrain and infrastructure capacity within the municipality, (5) the state plan of conservation and development adopted pursuant to chapter 297, (6) the regional plan of conservation and development adopted pursuant to section 8-35a, (7) physical, social, economic and governmental conditions and trends, (8) the needs of the municipality including, but not limited to, human resources, education, health, housing, recreation, social services, public utilities, public protection, transportation and circulation and cultural and interpersonal communications, **(9) the objectives of energy-efficient patterns of development, the use of solar and other renewable forms of energy and energy conservation,** and (10) protection and preservation of agriculture.

[27] http://www.cga.ct.gov/2011/pub/chap126.htm#Sec8-23.htm

CT Gen. Statute § 7-147f which limits the reasons a certificate of appropriateness can be denied to a solar energy system to features that substantially impair the historic character of the district.[28]

> Sec. 7-147f. Considerations in determining appropriateness. Solar energy systems.
>
> (a) If the commission determines that the proposed erection, alteration or parking will be appropriate, it shall issue a certificate of appropriateness. In passing on appropriateness as to exterior architectural features, buildings or structures, the commission shall consider, in addition to other pertinent factors, the type and style of exterior windows, doors, light fixtures, signs, above-ground utility structures, mechanical appurtenances and the type and texture of building materials. In passing upon appropriateness as to exterior architectural features the commission shall also consider, in addition to any other pertinent factors, the historical and architectural value and significance, architectural style, scale, general design, arrangement, texture and material of the architectural features involved and the relationship thereof to the exterior architectural style and pertinent features of other buildings and structures in the immediate neighborhood. **No application for a certificate of appropriateness for an exterior architectural feature, such as a solar energy system, designed for the utilization of renewable resources shall be denied unless the commission finds that the feature cannot be installed without substantially impairing the historic character and appearance of the district.** A certificate of appropriateness for such a feature may include stipulations requiring design modifications and limitations on the location of the feature which do not significantly impair its effectiveness…

Adopt a "solar ready" home amendment in the next energy code update. Connecticut has adopted the 2009 International Conservation Code (IECC). Upgrading to the IECC 2012 would significantly enhance the energy performance of new buildings. This amendment should include provisions for structural requirements for rooftop solar PV and roof orientation.[29] [30]

Planning and Zoning Recommendations for Connecticut Jurisdictions

Local Policy Recommendations for Removing Zoning Barriers to Solar Energy

Provide information about existing state and municipal laws, regulations and codes impacting installation of solar PV, such as the existing state statutes specified above.

Adopt a solar retrofit friendly ordinance – To clarify when approvals are required and to remove barriers to the installation of solar energy systems from planning and zoning regulations and administrative procedures, adopt a solar retrofit friendly ordinance with elements and code provisions such as:

- **Statement of findings** – The ordinance should begin with a "Statement of Findings" that ties it to the city's comprehensive plan or valid public policy goals.
- **Definition** –The ordinance should include a broad definition of "solar collector" that includes thermal as well as electrical devices.

[28] http://www.cga.ct.gov/2001/pub/Chap097a.htm#sec7-147f.htm

[29] For example Minnesota published the "Minnesota Solar Ready Specification" to be used with IBC 2006. www.state.mn.us/mn/externalDocs/Commerce/Solar_Ready_Construction_Specification_020211035322_SolarConstructionSpec.pdf

[30] For example beginning January 1, 2014 the California Energy Commission will require all new buildings to be solar ready, www.energy.ca.gov/title24/2013standards/index.html

- **Permit as-of-right rooftop installations** – Permit most rooftop installations, for example those under 4-foot in height, without a requirement for zoning or planning permits or review.[31]
- **Establish requirements for historic and village district installations** - Develop clear prescriptive standards that comply with **CT Gen. Statute Section 7-147f** such as allowing flush mounted solar panels on all existing roofs, installation of roof-mounted solar panels not visible from the street, and permitting rear yard ground mounted solar systems of limited height to be approved as-of-right through a no-cost administrative review.
- **Establish standards for accessory structure installations** – Develop clear prescriptive standards that allow most rear yard ground mounted "solar collectors" to be approved as-of-right through a no cost administrative review.
- **Consider solar access** in establishing zoning and planning regulations and review processes such as setback, height, landscape requirements, and building construction. For example roof systems could be required to be solar ready, building limits could consider solar access, planting could be limited to certain height limits near property lines. Connecticut's zoning enabling act **(CT Gen. Statute Section 8-2)** states that: "…regulations may also encourage energy-efficient patterns of development, the use of solar and other renewable forms of energy, and energy conservation."
- **Study the benefits and impediments of adopting a solar access provisions or ordinances** to provide for future solar access and to protect a homeowner's right to sunlight after they have invested in a solar panel. There are two prevalent strategies for enhancing solar-access, each suited to address varying development patterns. These strategies are summarized as follows, with more details provided in the appendices.

  (1) First, an ordinance may create a **permitting and recording procedure** by which a home owner who installs a solar system may obtain a permit that prevents their solar access from being impeded by later construction or vegetation growth. Such a permit can then be recorded in the local land records.

  (2) Second, an ordinance may create a **solar envelope** around each property. Solar envelope ordinances are a more comprehensive form of solar access protection, and preserve a property's access to sunlight even if the property owner has not yet installed a solar collector.

- **Comply with CT Gen. Statute Section 8-25(b),** which requires subdivision development regulations to consider energy-efficient patterns of development and use of solar. Such ordinances and review processes would consider road and lot orientation, building restrictions and subdivision regulations.
- **Implement Incentive-Based Green Building Ordinances** – Such an ordinance would award points, incentives, or bonuses (such as density bonuses) to developers who include energy efficiency features such as solar systems and solar access in their projects.
- **Require solar on every new home**, as required in Lancaster, CA! Mayor Parris announced that his city will institute a first-of-its-kind requirement that solar be installed on every new single-family home built in Lancaster after January 1, 2014.[32]

[31] For example, San Jose, California exempts solar systems from building plan review if they are no more than 18 inches above the roof height and weigh no more than 5 pounds (lbs) per square foot.

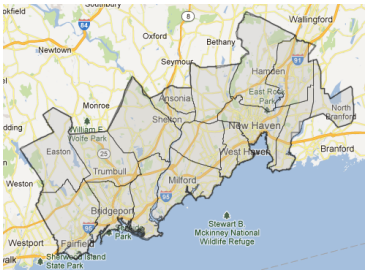
Interconnection

Connecticut Context

Connecticut Light and Power Company (CL&P) and The United Illuminating Company (UI) are Connecticut's two major utility companies, both of which participated as partners on this project. CL&P is the state's largest utility with 1.2 million customers in 149 cities and towns. CL&P is a Northeast Utilities (NU) company. NU operates New England's largest utility system serving more than 3.6 million electric and natural gas customers in Connecticut, Massachusetts and New Hampshire. Companies that are part of NU include CL&P, NSTAR Electric & Gas, NU Transmission, Public Service of New Hampshire, Western Massachusetts Electric Company, and Yankee Gas Services Company.

The map at right is the service territory map of Connecticut. The areas shaded in grey are those jurisdictions not serviced by CL&P, most of which are serviced by UI.[33]

UI[34] is Connecticut's second largest utility, with 325,000 residential, commercial and industrial customers in the Greater New Haven and Bridgeport areas. UI's parent company is UIL Holdings Corporation. UIL Holdings Corporation is an energy delivery company serving approximately 706,000 electric and natural gas utility customers in 66 communities across two states, Connecticut and Massachusetts. UIL Holdings is the parent company for UI, The Southern Connecticut Gas Company (SCG), Connecticut Natural Gas Corporation (CNG), and The Berkshire Gas Company (Berkshire Gas, serving natural gas customers in western Massachusetts).



The map of UI's service territory is shown at right.

To date, CL&P has nearly 3300 distributed generation systems and UI has 525 systems interconnected to the grid and operating safely in Connecticut. These include solar PV systems, as well as fuel cells, combined heat and power systems, wind installations and other distributed generation.

Twelve jurisdictions participated in this project, representing the CL&P and UI territories as follows:

- **CL&P:** Cornwall, Coventry, Danbury, Greenwich, Hampton, Manchester, Middletown, Stamford, West Hartford
- **UI:** Bridgeport, Fairfield, Milford

In addition to CL&P and UI, Connecticut also has municipal electric distribution companies[35] including: Bozrah Light & Power, Groton Utilities, Norwich Public Utilities, South Norwalk Electric Works, and

[32] http://www.greentechmedia.com/articles/read/lancaster-to-require-solar-on-every-new-home?utm_source=Newsletter&utm_medium=headline&utm_campaign=GTMDaily.
[33] www.cl-p.com
[34] www.uil.com

Wallingford Department of Public Utilities (DPU). There is also a Mohegan Tribal Utility Authority. A cooperative agency, the Connecticut Municipal Electric Energy Cooperative (CMEEC),[36] was formed by the state's municipal electric utilities.

The Public Utilities Regulatory Authority (PURA)[37] is statutorily charged with regulating the rates and services of Connecticut's investor owned electricity, natural gas, water and telecommunication companies and is the franchising authority for the state's cable television companies. PURA also keeps watch over competitive utility services to promote equity among the competitors while customers reap the price and quality benefits of competition and are protected from unfair business practices.

PURA replaced the former Department of Public Utility Control (DPUC) and along with the Bureau of Energy and Technology Policy, is part of the Energy Branch of Connecticut's Department of Energy and Environmental Protection (DEEP). DEEP was created in July 2011 and brings together the state's Department of Environmental Protection (DEP), the Department of Public Utility Control (DPUC) and an energy policy group that had been based at the Office of Policy and Management.

Thus PURA regulates CL&P and UI, both investor-owned utilities, but not Connecticut's municipal utility companies. All filings submitted by CL&P and UI are processed by PURA in accordance with applicable statutes and regulations, and address issues such as: distribution, transmission and generation rates, wholesale procurement of electricity, energy efficiency, conservation and load management, cost-of-service, rate design, revenue requirements, metering accuracy, and the safety and reliability of the electric distribution system. In addition, PURA is responsible for the licensing of electric suppliers, registration of electric aggregators, and the oversight of renewable energy and renewable portfolio standards.[38]

Utility Rooftop Solar Challenge Participation

As partners on this project, CL&P and UI supported the Sun Rise New England team by explaining how interconnection of distributed generation works in Connecticut, how they work to ensure customer safety while also enabling interconnection of an ever-increasing number of distributed generation systems, what improvements they have made to their processes and their thoughts on potential areas for further improvement. CL&P and UI managers and staff were very generous with their time and explanations, providing multiple in-person interviews with CEFIA and Yale team members and sharing information to assist the team in identifying possible areas of improvement to the interconnection process, especially as it would impact solar PV installation. Requests for follow up information and review of information were always provided very promptly.

While the goal of the Sun Rise team is to identify possible areas for improvements resulting in soft cost savings for solar PV installations, the team's overall impression was that CL&P and UI are both very knowledgeable in their understanding of and support of deployment of distributed generation. While the common, PURA-approved interconnection guidelines are implemented differently in terms of administrative processes and specific practices, both utilities have impressive staff who clearly know what they are doing and are very efficient. Also, the team recognized that many improvements have been steadily implemented over the past years.

[35] www.ct.gov/pura/cwp/view.asp?a=3352&q=405244
[36] www.cmeec.com/whoiscmeec.htm
[37] www.ct.gov/pura/cwp/view.asp?a=3157&q=404410&puraNav_GID=1702
[38] www.ct.gov/pura/cwp/view.asp?a=3356&Q=405992&puraNav_GID=1702

In addition to interviews with the utility companies, CEFIA, Yale and Solar Connecticut collected installer feedback from open-ended survey questions that were emailed to solar PV installers. A summary of the feedback is provided in a later section of the interconnection discussion in this report.

Connecticut's "Freeing the Grid"[39] Report Card

Connecticut is proud to be steadily improving its "Freeing the Grid" report card, with our utilities making strong efforts in many areas to positively impact deployment of distributed generation. Connecticut's "Net Metering" grade in 2013 is an A, and has been since 2009. Connecticut also scored well on "Interconnection," with a respectable B going back to 2010, having made tremendous progress since scoring a D back in 2009. Our next goal is to achieve an A on Interconnection!

Net Metering

Connecticut ranks among the nation's leaders with respect to net metering.[40]

Connecticut General Statutes Section 16-243h41 changed the way customers who generate electricity from Class I renewable resources with a capacity of 2 MW or less are reimbursed for their net kWh production. Beginning in October 2007, instead of being paid an energy only amount for net kilowatt-hours at the end of a billing cycle, customers operating Class I renewable generation are required to bank or rollover their net kilowatt-hours to be used to offset the full retail value (i.e., delivery and generation rates) of their future electric consumption. This structure significantly increased the customer's reimbursement for the net energy produced by their system. At the end of each annualized period, the electric distribution company or electric supplier shall compensate the customer-generator for any excess kilowatt-hours generated, at the avoided cost of wholesale power.

For example, at present, CL&P's residential retail charges total about $0.18 per kWh, one of the highest in the United States, and more than double the past wholesale average energy reimbursement payment. The reimbursement mechanism established through Conn. Gen. Stat. 16-243h significantly increases the financial benefit of owning Class I renewable generation.

In Connecticut, there is no stated limit on the aggregate capacity of net-metered systems in a utility's service territory.

Virtual Net Metering

A recent enhancement to Connecticut's net metering law is virtual net metering, included in Connecticut Public Act No. 11-80 (PA 11-80), effective July 1, 2011.[42] Under this law, municipalities are eligible for virtual net metering, which allows them to share the billing credit among their electric accounts. For example, a town could install a solar PV system on the roof of a school and share the billing credits the system produces with a fire station. This increases the likelihood that the customer will fully utilize its credits (paid at the retail rate) during a year, and therefore not have any remaining credits at the end of the year, for which it would be paid at the wholesale rate.

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[39] Freeing the Grid 2013. Best Practices in State Net Metering Policies and Interconnection Procedures, freeingthegrid.org.
[40] www.ctenergyinfo.com/dpuc_net_metering.htm
[41] www.cga.ct.gov/2011/pub/chap283.htm#Sec16-243h.htm
[42] www.cga.ct.gov/2011/act/pa/2011PA-00080-R00SB-01243-PA.htm

The bill broadens eligibility for virtual net metering in several ways. It opens the option to state agencies and agricultural customers and increases the maximum size of the renewable resource from two up to three megawatts. It allows virtual net metering for class III resources such as cogeneration, as well as class I resources. It allows municipal and state agency customers to lease the renewable resource or enter into a long-term contract for it.

Under current law, municipalities can share the billing credit with no more than five other municipal accounts. The bill instead allows municipal or state accounts connected to a microgrid to share the credits with up to five additional non-state or municipal critical facilities (e. g. , hospitals, police and fire stations, and municipal centers). It allows agricultural customers to share their credits with up to ten agricultural accounts that use electricity for agriculture.

The new virtual net metering bill would further enhance the value of distributed generation.

Interconnection

In December 2007, the Connecticut Department of Public Utility Control (DPUC), now PURA, approved revised interconnection guidelines [43] for distributed energy systems up to 20 megawatts (MW) in capacity. Connecticut's interconnection guidelines apply to the state's two investor-owned utilities, CL&P and UI, and are modeled on the Federal Energy Regulatory Commission's (FERC) interconnection standards for small generators.[44] [45] The most recent revision to the guidelines was made in 2010.

Connecticut's interconnection guidelines, like FERC's standards, include provisions for three levels of systems:

- **Certified Inverter:** projects 10 kW and less (application fees is $100)
- **Fast Track:** projects up to 2MW (application fees: $500)
- **Study Process:** complex projects over 2 MW (application fees: $1000, study fees).

Note that the interconnection guidelines include "additional process steps" for generators over 5 MW.

Connecticut's guidelines include a standard interconnection agreement and application fees that vary by system type.[46] Connecticut's guidelines differ from the federal standards in several ways:

- Connecticut customers are required to install an external disconnect switch.
- Customers must indemnify their utility against "all causes of action," including personal injury or property damage to third parties.
- Customers are required to maintain liability insurance in specified amounts based on the system's capacity.

[43] Docket No. 03-01-15RE01, DPUC Investigation into the need for Interconnection Standards for Distributed Generation, December 5, 2007. (includes language from Docket No. 03-01-15 which made a decision on the EDS). http://www.dpuc.state.ct.us/dockhist.nsf/(Web+Main+View/All+Dockets)?OpenView&StartKey=03-01-15RE01

[44] FERC's interconnection standards are applicable to generator interconnections subject to FERC jurisdiction, whereas CT's interconnection guidelines apply to state-jurisdiction interconnections, which typically occur at the distribution level. FERC standards apply primarily to facilities that interconnect at the transmission level. However, FERC interconnection standards for small generators serve as a useful model for state-level standards. www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US06R

[45] www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CT06R

[46] www.cl-p.com/generatorInter/Generator_Interconnection/ and UI website Generator_Interconnection

- In addition, the utilities were required to collaboratively submit to the PURA a status report on the research and development of area network interconnection standards. This report was completed in December 2009, and the PURA reached a final decision (03-01-15RE02)[47] on the docket. The PURA has determined that the utilities can interconnect inverter-based generators (up to 50 kW) on area networks.

Connecticut's guidelines address requirements for study fees and include technical screens for each level of interconnection. Utilities and customers must follow general procedural timelines.

Interstate Comparison Table

The table on the following pages compares interconnection policies across five states as well as the 2009 IREC model interconnection procedures[48] based on application review time, application fee, insurance requirements and external disconnect switch requirements. IREC's model procedures have been used by states across the country to improve interconnection laws and policies pertaining to distributed generation. For the purposes of understanding how the DG Guidelines compared to those in other states, the team compared two New England states (Massachusetts and Maine) and the two other tri-state area states (New York and New Jersey) with the Connecticut policies.

The five-state comparison illustrates differences in the interconnection standards, identified and commented on below:

- **Connecticut's interconnection standard allows up to 15 days for application review for systems that are 10kW and less. The other four states allow only 10 days.**

  CL&P has data showing their average review time to be 3 business days for systems of size 10 kW and smaller. UI noted similar, average review periods. Thus, the requirement is less stringent than the other five states but this does not imply that the Connecticut utilities generally use the extra time. The impression from the interviews conducted was that the interconnection staff work quickly and efficiently, and with large workloads. Process and system improvements that help with ever-increasing workloads may be beneficial, as in other growing industry areas, so that efficiency can be maintained even as workloads increase.

- **Connecticut charges a $100 application fee for systems that are 10kW and less. Maine charges $50 while the other three states do not charge fees for small systems.**

  We spoke to the Connecticut utilities about the fee and learned two things. One is that the $100 does not cover the utility's review cost for this size system. In addition, we learned that not charging at least a nominal fee can result in "frivolous" interconnection applications affecting serious applicants who would have a longer wait in line.

- **Connecticut charges a $500 fee for fast track systems that are less than 2 MW. New York charges $350 while in the other three states the fee depends on the size of the project.**

  While some installers have expressed that this $500 fee is too high, Connecticut's flat fee would be less expensive for larger system sizes. For example, Massachusetts charges $3/kW with a minimum of $300 and a maximum of $2500, so a system of size 167 kW or larger would cost

[47] Area networks are low voltage electrical systems served by multiple transformers located in densely populated metropolitan areas to provide large numbers of customers with highly reliable electrical service. www.dpuc.state.ct.us/dockhist.nsf/8e6fc37a54110e3e852576190052b64d/6bafa029ff9f34f78525775100510987?OpenDocument

[48] www.irecusa.org or www.irecusa.org/publications

$501 or more. It would be interesting to research further how fee amounts and structures impact aspects of deployment such as sizes of installations. A flat fee for anything less than 2 MW does not penalize larger system sizes.

- **Connecticut requires proof of insurance for systems of size 100kW and less, whereas other states waive this proof for most systems, or at least smaller systems.**

  The insurance requirement for smaller systems is satisfied by standard homeowner's insurance. CL&P has removed the requirement to renew proof of insurance for systems 10kW and less.

- **Connecticut's interconnection standard requires an external disconnect switch for all systems.**

  Some states do not include this requirement in their interconnection guidelines but leave it up to utility discretion, such as in Massachusetts. The team contacted Western Massachusetts Electric Company, which is an NU company, and they do require the switch. So again, the formal standard is one thing, but practices may not be reflected in those standards/targets.

IREC 2009 Model Interconnection Procedures	Connecticut CL&P and UI DG Guidelines	New Jersey	New York	Massachusetts	Maine
Inverter-Based Generating Facilities 25 kW and Less	**Inverter-Based Generating Facilities, 10 kW and Less**	**Inverter-Based Generating Facilities 10 kW and Less**	**Inverter-Based Generating Facilities 25 kW and Less**	**Single-Phase Inverter of 10 kW or Less, or Three-Phase Inverter of 25 kW or Less**	**Inverted-Based Generating Facilities 10 kW or Less**
Online application requirement **$0-20 fee** **3** days to evaluate application for completeness **7** days to review the application	**$100 fee** (plus potential study fees) **10** days to evaluate application for completeness **15** days to review the application	**$0 fee** **3** days to check application for completeness and respond to applicant via email **10** days to review the application	**$0 fee** **5** days to evaluate application for completeness **10** days to review the application	**$0 fee** (more for spot networks) **10** days to evaluate application for completeness **10** days to review the application	**$50 fee** **5** days to check application for completeness **10** days to review the application
For Generating Facilities Greater than 25 kW and Less than 2 MW	**Fast track for projects up to 2MW**	**For Generating Facilities 2 MW and Less**	**For Generating Facilities 2 MW and Less**	**For All Other Facilities**	**For Generating Facilities 2 MW and Less**
Online Application **$50 fee plus $1 per kW** of generating capacity **3** days to evaluate application for completeness **15** days to review the application	**$500 fee** plus study fee if don't qualify for fast track **10** days to evaluate application for completeness. **15** days to process application through initial screens	**$50 fee plus $1 per kW** of generating capacity **3** days to check application for completeness and respond to applicant via email. **15** days to review the application	**$350** application fee **5** days to check for completeness **15** days to review the application	**$3/kW: min. $300, max. 2,500** **10** days to evaluate application for completeness **10** days to review the application	**$50 fee plus $1 per kW** of generating capacity **5** days to evaluate application for completeness **15** days to review the application

IREC 2009 Model Interconnection Procedures	Connecticut: CL&P and UI DG Guidelines	New Jersey	New York	Massachusetts	Maine
Insurance Requirements	**Insurance Requirements**	**Insurance Requirements**	**Insurance Requirements**	**Insurance Requirements**	**Insurance Requirements**
No insurance required for inverter-based systems less than 1 MW	$300,000 in coverage required for systems less than 100 kW	Additional insurance is not required, unless agreed to by the applicant	Insurance not required	Insurance is not required for facilities that are less than 60 kW and eligible for Class I Net Metering	No insurance required for inverter-based systems less than 1 MW
External Disconnect Switch	**External Disconnect Switch**	**External Disconnect Switch**	**External Disconnect Switch**	**External Disconnect Switch**	**External Disconnect Switch**
Cannot be required if all the necessary conditions are met.	Required for all systems	Cannot be required if all the necessary conditions are met.	Not required for inverter-based systems less than 25 kW	EDC discretion	Cannot be required if system complies with IEEE 1547 and UL 1741
Freeing the Grid 2012 Interconnection Grade	**Freeing the Grid 2012 Interconnection Grade**	**Freeing the Grid 2012 Interconnection Grade**	**Freeing the Grid 2012 Interconnection Grade**	**Freeing the Grid 2012 Interconnection Grade**	**Freeing the Grid 2012 Interconnection Grade**
A Standard	B	A	B	A	A

Recommendations

The Sun Rise New England team identified the below opportunities for improvements to interconnection in Connecticut, from the perspective of facilitating interconnection of solar PV systems, and distributed generation generally. In addition, IREC has released an update to its Model Interconnection Procedures, a useful reference, along with consideration of best practices observed in other states and understanding what makes those practices possible, and lastly and most importantly – utility experience here in Connecticut and collaboration with other Connecticut utilities and organizations working towards common goals.

Recommendations for Interconnection Guidelines

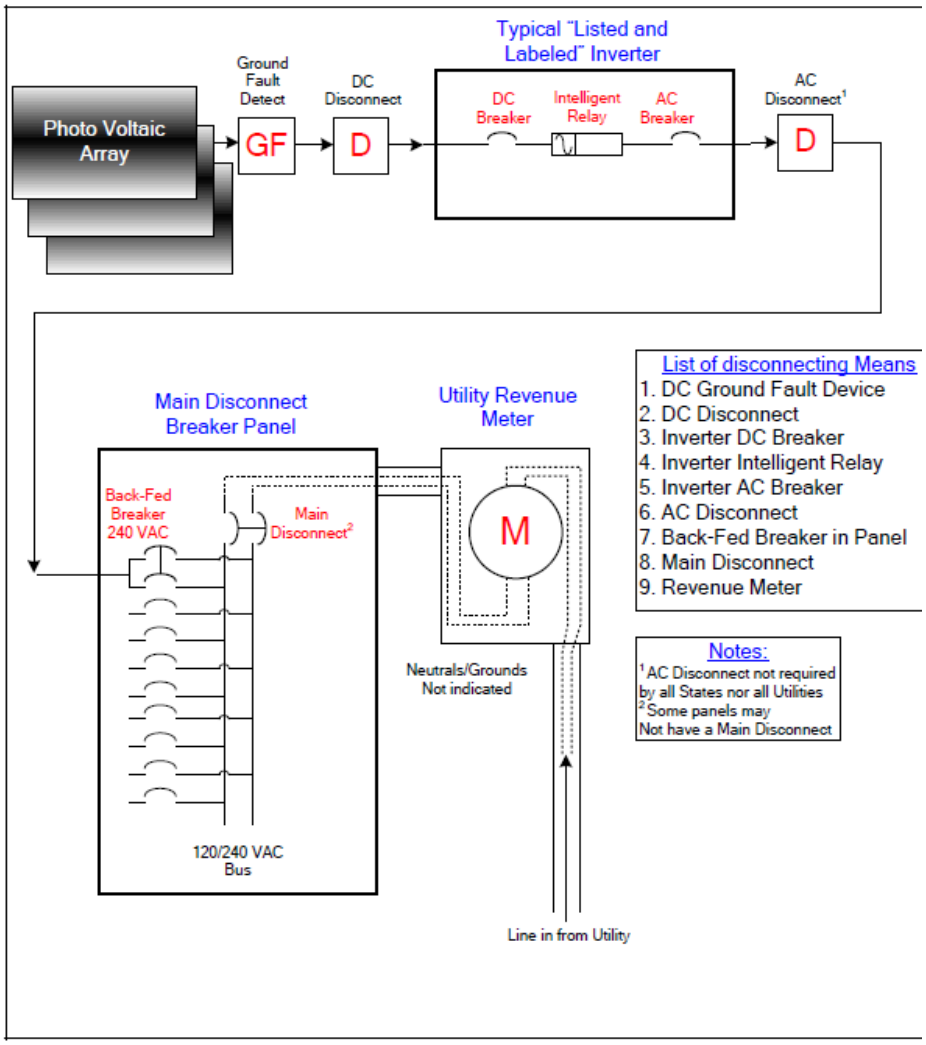
- **Remove the (annual) proof of insurance requirement or consider waiving the insurance requirement altogether** – Consider removing the proof of insurance requirement for certain systems that are UL certified and are under a specified size such as 100kW for which $300,000 of liability insurance is required or 1 MW for which $1 million of liability is required. The customer's insurance coverage for their structures should be sufficient, and the customer should be able to decide how they wish to account for any additional risk. There are other electronic devices in houses and buildings that have been certified to be safe such as UL-certified inverters. Waiving this requirement would alleviate an administrative burden to the utility and the installer. Note: CL&P and UI have already waived the annual proof of insurance requirement for systems of size 10kW and smaller.
- **Consider replacing the 10kW with an up to 25kW certified inverter guideline** – Making this adjustment would allow the majority of residential and commercial systems to take advantage of a faster process and a lower fee. Note that states whose certified inverter guideline apply for systems up to 25kW generally include additional considerations in the review process, so there may be some trade-off here. Additionally, consider re-reviewing size tiers every two years or a time period that reflects the rapid developments in distributed generation.
- **Consider reducing interconnection fees where possible**
    - For inverter-based systems up to 25 kW, consider reducing the $100 fee to $20-50 plus potential study fees (if the system fails certain screens or is located on a spot network). It may be helpful to find out how states with no or lower fees for these smallest systems are able to absorb their costs. For example, is there a pattern of larger states being able to do this more easily because they have a larger volume of activity to make up the difference?
    - For systems greater than 25 kW and up to 2 MW, consider reducing the $500 flat fee to a lower fee such as $50-100 plus necessary cost-based study fees. Again, it would be helpful to better understand what a cost-recovery fee would be, and if it is high, both whether there are ways to streamline processes to lower costs, or understand how some utilities justify fees that do not fully recover their review costs.
- **Reduce application acknowledgement and review periods**
    - For inverter-based systems up to 25 kW, consider an acknowledgement and completeness review time frame of 3 days and a screen review period of 7 days.

- For systems greater than 25 kW, consider an acknowledgement and completeness review time frame of 3 days and the current screen review period of 15 days.

- **Reconsider necessity of the external disconnect switch requirement**
  - Small inverter-based systems automatically disconnect from the grid during outages and can also be manually disconnected from the grid through other mechanisms. The EDS may be a redundant safety feature. This issue is discussed in detail in the next section.

External Disconnect Switch

The utility-accessible (UA) alternate current (AC) external disconnect switch (EDS) for distributed generation, including photovoltaic (PV) systems, is a hardware feature that allows a utility's employee to manually disconnect a customer-owned generator from the electricity grid. Proponents of the EDS contend that it is necessary to keep utility line workers safe when they make repairs to the electric distribution system. Opponents assert it is a redundant feature that adds cost without proving tangible benefits.[49]



Modern small commercial and residential PV systems include UL-listed[50] components that meet rigorous standards. The National Electrical Code (NEC) requires that an inverter de-energize its output upon loss of utility voltage and remain in that state until utility voltage has been restored. Modern electronic inverters are reliable, intelligent, and comprehensively tested to ensure that they do not feed back to the grid during outages.

Arguments made for why the EDS should not be required include:

- Inverters drop off-line during an outage.
- Linemen usually don't have time to use an EDS when restoring an outage.

[49] M.H. Coddington et al., Utility-Interconnected Photovoltaic Systems: Evaluating the Rationale for the Utility-Accessible External Disconnect Switch, National Renewable Energy Laboratory, NREL/TP-581-42675, January 2008, available at: www.nrel.gov/docs/fy08osti/42675.pdf.

[50] UL 1742 applies to inverters. Based on IEEE 1547 requirements, the UL-listed inverters for PV systems require the inverters to disconnect automatically from the grid.

- If there is an issue with the PV system, the DC switch can be locked or "red-tagged."
- IEEE 1547, UL 1741 and the NEC do not require an EDS.
- If the utility is allowed to require the EDS, then this should be added to the switching procedures.

The figure above showing the external disconnect switch (EDS) [51] shows that solar PV systems are currently installed with multiple disconnecting mechanisms serving the same purpose as an EDS.

While those focused on reducing time and cost of solar PV installation emphasize the redundancy of the EDS, utility companies express reasons why it should be maintained as a requirement. One person shared the perspective that the EDS marks the boundary between where the responsibility of the utility ends and where the responsibility of the homeowner starts. Certainly, if one thinks of the EDS as being replaced by multiple other mechanisms, from a functional perspective, then is there another clear line of demarcation, say the inverter?

Another perspective on this issue which Connecticut has to offer is that from the most recent PURA (at the time DPUC) ruling when asked by Aegis, an installation company, to remove this requirement. Aegis made the point that generators have other means of ensuring isolation and also that induction generators are incapable of starting up on their own and inadvertently energizing circuits.

The project team asked PURA about how the decision on this issue came about, and PURA shared that there was at the time considerable debate on the issue, and much thought put into a decision in favor of preserving the EDS requirement. The explanation provided in Docket No. 03-01-15RE01, DPUC Investigation into the need for Interconnection Standards for Distributed Generation, December 5, 2007, was as follows:

> **The disconnect switch is a mechanical device used to isolate the generator's electrical facilities. The disconnect switch is used to either isolate the generator from the Company's facilities for safety reasons, or to isolate the generator from the customer's facilities to enable work on the customer's facilities without de-energizing the customer's loads.** The Revised Guidelines require that an external disconnect switch be provided at the point of interconnection that is easily accessible to Company personnel that can be opened for isolation, for any generating facility rated greater than 1 kW. (Revised Guidelines, Section 3.3.2). The Existing Guidelines require a disconnect switch for all generator interconnections; therefore, the Existing Guidelines relax the disconnect switch requirement for very small generators.
>
> **In the Initial Decision, the Department concluded that the disconnect switch requirement is reasonable, and stated its belief that Company workers should have positive confirmation and control over isolation devices to ensure electrical facilities cannot be energized during maintenance.** (Initial Decision, p.5).
>
> SunEdison notes that some jurisdictions have eliminated the need for an external disconnect switch for certain types of generating facilities, notably, inverter based generation (which is commonly used for solar and wind based generators). Instead, other jurisdictions allow removal of the revenue meter as a means of disconnection. (SunEdison Written Comments, pp. 12-13).
>
> The EDCs oppose removing the disconnect switch requirement. According to the Companies, removal of the revenue meter as an alternate means of disconnection poses a substantial safety hazard. The EDCs

[51] M.H. Coddington et al., Utility-Interconnected Photovoltaic Systems: Evaluating the Rationale for the Utility-Accessible External Disconnect Switch, National Renewable Energy Laboratory, NREL/TP-581-42675, January 2008, www.nrel.gov/docs/fy08osti/42675.pdf.

report that they have had numerous instances of electrical flashes and broken meter socket jaws upon meter removal, presenting both safety issues for employees and property damage liability issues for the Companies. Further, the Companies state that the majority of states still require a disconnect switch. (UI Reply Brief, p.7; CL&P Brief, pp.3-4; Tr. 9/25/07, pp.130-131).

The Department reaffirms its conclusions from the Initial Decision on this matter. No new facts have been presented in this case, other than that some other jurisdictions have removed the requirement, which may have the effect reducing utility worker safety to accomplish energy policy goals. The Department believes that the disconnect switch requirement is necessary for worker protection.

With arguments for and against the disconnection switch, the team's recommendation is to reconsider the necessity of the external disconnect switch requirement if PURA agrees to reopen the discussion.

Utility Strengths and Best Practices

The interconnection guidelines do not establish all of the interconnection application procedures, leaving implementation processes and practices up to the utility. **The following are examples of CL&P and UI's strengths and best practices:**

- To handle the variation in processes for over 140 towns in CL&P's service territory for notifying the utility when municipal building permits are approved, CL&P worked with the municipalities to create a common process across all of the towns. The towns had up to that point (over 10 years ago) all handled permit approvals and the notifications to the utility differently. So a process was developed by which an installer submits a permit application to the town, then an interconnection application to the utility. The utility creates a work request number which is provided to the municipal building inspector. Once the inspection is done and the permit is approved, the inspector notifies the utility using the work request number. This process improvement saved all parties a tremendous amount of time because it was a consistent, clear process used for all the towns. This process is still in place today, with an additional improvement, in that three years ago, online and electronic means were put in place to handle about 90% of the requests and communications electronically. As of one year ago, 100% are processed electronically. As of now, UI has a similar process and does conduct some communications by email (though not yet online).
- CL&P and UI have good websites which provide information and documentation on interconnection requirements and processes.
- CL&P developed and currently uses an online interconnection application submission and tracking system (with tracking accessible to both installers and solar PV customers).
- Interconnection staff at both utilities are highly qualified, knowledgeable and experienced in the processes and subject matter of their roles. They clearly have strong technical skills and know their jobs inside and out.
- Installers new to Connecticut are invited to train with the utilities to help them understand the interconnection processes, saving everyone time in the long run. The utilities are in the business of shepherding installers through the interconnection process.
- The utilities track a lot of useful information about the systems that are installed as well as metrics pertaining to administrative processes.

- Both installers and distributed generation system customers are surveyed regularly to solicit feedback on how the utility can better provide service.

Utility Practice Recommendations

Opportunities for improvement at the utility practice level include:

- **Allow online application, and online fee payment** – This would streamline the application process and shorten the waiting period. CL&P has an online interconnection application submission and online tracking system in place. UI does not yet, but mentioned that it's something one would naturally consider. Neither company offers an online payment option for the interconnection fee. Allowing for online payment has complexities that make it slower to tackle, primarily due to billing system complexities. Payments can be sent in by check in the regular mail.
- **Require only a single net meter** – As observed by "Freeing the Grid" in their report assessing interconnection and net metering across all U.S. states, a common area of improvement for utility companies are improvements to billing systems. For example, UI until very recently required two meters for a solar PV system in order to determine "net" use because of how the existing billing system is structured. Billing systems can be expensive and arduous to change, especially with a large number of customers. The consequence of requiring an extra meter was that the solar PV customer would ultimately pay an extra $270 to the installer (to cover what the installer pays to UI for the second meter). In addition, the installer usually spends extra time installing this second meter, so there is an added labor cost. UI just informed our team that they have found a solution to remove the need for two meters, so this should save about double the $270 in costs, or about $540 in costs per system (the labor portion estimated by an installer to be about comparable to the extra equipment cost).
- **Consider waiving witness tests for repeat installers** – For inverter-based systems under 25 kW, utilities could consider waiving the system witness test if they have worked with a particular installer in the past and are confident in the installer's ability to install the particular system, saving both the installer and utility time and resources, ultimately benefiting customers of distributed generation. CL&P has applied this practice already for systems up to 10kW by waiving witness tests for installers after about the third witness test conducted with an installer. Also, CL&P does not charge a witness test fee for these tests with new installers.
- **Continue to develop and enhance guidance and resources for installers to help them better understand processes and application requirements, leading to more complete applications.** As with permitting, installers providing incomplete applications is a significant source of delays. The practice of training new installers, as mentioned above, is beneficial, as would any additional tools and measures that lead to increased clarity in communicating process expectations and technical requirements for all three review tracks.
- **Standardize procedures for systems that fail fast track screens** – For systems that are large and/or technical complex, it would be helpful if the utilities could provide as much precise guidance as possible to help installers understand the scope of specific studies needed to address response to the failure of certain screens. What will it take to assure that the system is consistent with safety, reliability and power quality standards. Each time the utility and installer work together on an interconnection that is complex, it would be beneficial to apply the lessons

learned in an effort to continue simplifying processes for more complex systems as well as formalize and communicate those processes as clearly and effectively as possible.

- **Take initiative to reach out to jurisdictions** to optimize communication between building inspectors who are approving solar PV permits and then communicating this information to the utility. One or both utilities have an online system in place for building inspectors to provide updated communication about permit approvals. This communication is also done by fax for those building departments that are not online. The more this communication can happen in a coordinated, timely manner, the less delay incurred.

Recommendation for PURA

The interconnection guidelines adopted by CL&P and UI do not apply to the municipal electric companies, for which this project did not conduct research. It would be useful to know what standards, requirements and processes the municipal utilities operate by, what installers' experiences are in these towns, and whether there are any best practices.

Recommendation:

- **Encourage adoption of the interconnection guidelines by all utilities in Connecticut** – PURA could encourage adoption of the interconnection guidelines adopted by CL&P and UI by Connecticut's municipal. This would help standardize interconnection across all jurisdictions in Connecticut.

Data Collected -- Utility Interviews and Installer Survey Responses

CL&P Interview Highlights

- Online interconnection application, but no online payment option
- Typically a small project would only take a day or two to review
- Application approval sent by email to homeowner and installer
- Don't do utility inspection for small projects—rely on town building departments; have right to inspect but waive it after they've done a new installer 3 times; usually working with same cast of characters
- Building inspector will be able to use number to submit approval online to CL&P (handful of 144 towns don't do online system and submit by fax)
- Can check status of interconnection online using work request number and town name
- With new installer will schedule a "witness test" within 10 days, send out a technician to test to make sure inverter cuts off when there's loss of power, make sure equipment is not back-feeding, and make sure it's configured in the right way. Do this about 3 times with a new installer and then no witness tests after that. No witness test fee if system 10 kW or smaller.
- How can the interconnection process be improved? In Connecticut we need, as California has done, a system for when systems fail fast track system screens. Would help to have a defined scope of what studies will be needed based on which screens a project fails; CL&P is working to develop this with UI.

UI Interview Highlights

- 2010 interconnection guidelines are currently in the process of being updated
- Net metering requires two separate meters, one measuring the power flowing into the house from the grid and one measuring the net export of surplus generated power to the grid.
    - There are two ways to accommodate the required second meter:
        - Have the homeowner's electrician install a second meter socket
        - Have UI install an adapter in the original socket that allows a second meter to be connected. This costs $270.00 and only works for systems of 200 amps or less.
    - The meters themselves could be wired so that a single meter could handle both inflow and outflow of power, but the UI billing system can't handle it. Hence the two-meter requirement.
- No online application but supporting documents like site plans and insurance documents can be sent electronically.
- The installer receives an email confirming receipt of the application within three business days of its arrival at UI.
- UI never waives the right to conduct witness tests the way CL&P sometimes does. This is because UI has a much smaller territory than CL&P, so it's not such a stretch for them to personally inspect every PV system.
- UI works with the same installers (about a dozen in the area) over and over and knows them well.
- Installers should submit the application as early as possible even if it's incomplete. That way they can get help with any parts that give them difficulty. Installers who wait to the last minute make UI look bad to the customer if the customer thinks the installer submitted the application much earlier.
- Ideally UI would like to receive an application before the system is installed so any changes can be made to the plans rather than to the physical system.

Installer Survey Highlights

In the feedback from installers below, note that the last three comments listed below pertain to municipal permitting rather than interconnection or to the coordination between these processes (which relies on timely online submission of permit approvals by inspectors)

- CL&P online tracking of application status this is good
- A lot of variation in how long an approval takes
- One installer said that witness test scheduling is a large time expense
- 2 installers said that the process is very costly and very time consuming. Even the utility requires a printed and mailed copy of paperwork and a check. Need faster and simpler process.
- Cost of witness test is too much

- Inspectors have to do an online submittal in a timely manner, this is weakest link
- Inexperienced building inspectors, coordinating with towns is time consuming, and they usually don't know enough about electrical parts
- Main issue across the board is building inspectors being ill prepared for the task of reviewing solar systems

Financing

Connecticut's Innovative Finance Mechanisms

The Clean Energy Finance and Investment Authority (CEFIA) develops numerous innovative finance mechanisms for Connecticut residents that increase the affordability and accessibility of rooftop solar PV and increase demand while lessening the burden on ratepayers. Numerous programs were released in the Spring of 2013 that will enable the residential and commercial sectors to access financing for clean energy including rooftop solar PV.

Green Bank Financing Model

CEFIA was created by the Connecticut General Assembly in 2011 as the successor organization to the Connecticut Clean Energy Fund. As the nation's first "green bank," CEFIA leverages public and private funds to drive investment and scale up clean energy deployment in Connecticut.

Green bank loans can provide lower cost financing from third-parties enabling greater access to capital for households interested in solar PV. The Rooftop Solar PV "Green Bank" Financing Model[52] allows users to stipulate financing cost assumptions as well as revenue source assumptions in order to model scenarios in a given state or region. ***The model quantitatively shows how a combination of lowered installation costs and green bank loans can lower the price paid by consumers for clean electricity to or below the existing retail price as a result of lower cost debt in the capital structure.***

According to the model, various combinations of green bank loans lower the price of solar electricity enough to be competitive with average Connecticut electricity prices (see below figure). The model uses the installed cost of PV, regional capacity factors, state policies and incentives, and the capital structure to determine the resulting retail cost, equity returns, and installed capacity per green bank debt.

Retail Price ($/kWh) as a Function of Solarize Campaigns and Green Bank Loans

Installed Cost ($/W)	% Green Bank Debt in Capital Structure 0%	10%	20%	30%	40%
4.5	0.210*	0.187	0.163	0.140	0.117
4.0	0.174	0.154	0.133	0.112	NA
3.5	0.139	0.121	0.103	0.085	NA
3.0	0.103	0.088	0.072	0.057	NA

Other Assumptions:	
Developer Equity Return	15%
Tax Equity Return	12%
Total Leverage	40%
Commercial Debt Interest	6%
15-Year RECs	$0.030/ kWh
6-Year State Incentives	$0.225/ kWh

The shaded cells in the above table are those with retail price less than the average 2011 CT retail price escalated to 2013 ($0.190/ kWh).
** Base case retail price before any green bank loans.*

This model can be used by any state and is publicly available via CEFIA online at www.ctcleanenergy.com/RooftopSolarPVModel.

Financing Programs

CEFIA is putting the Green Bank Financing Model in practice through several financing programs. The increased availability of longer term, low interest debt results in the need for fewer subsidies, energy savings that exceed debt service and greater access and affordability of rooftop solar PV to Connecticut

[52] Rooftop Solar PV "Green Bank" Financing Model sponsored by CEFIA, the Coalition for Green Capital (CGC) and The Brattle Group.

residents.

Roadmap to Residential Rooftop Solar PV Financing in Connecticut

Program	Type	Term (Years)	Interest Rate (%)	ARRA[53] ($MM = $ million)	CEFIA ($MM)	Private Capital ($MM)
CT Solar Lease Version 2.0	Lease	20	2.9 pa[54]	$3.5MM	$10MM	$52MM ($28MM debt, $24MM tax equity)
SMART-E Loans	Loan	5	< 4.49	$2.5MM	$0	$28MM
		7	< 4.99			
		10	< 5.99			
		12	< 6.99			
Solar Loan Powered By Sungage	Loan	15	6.49	$0.3MM	$1.5MM	$4.5MM
		20	7.49			
Capital Competition	Loan	20	2	$0	$1MM	TBD
Total				$6.3MM	$12.5MM	$82.5MM

Although the debt service payments on loans for the installation of rooftop Solar PV are lower than the energy savings from solar PV over the life of the system, they are not cash flow positive over the terms of the loans currently available. CEFIA is working to further drive down installed costs with programs such as Solarize, and the Rooftop Solar Challenge, while increasing the availability of low cost financing from the private market in order to make financed installations cash flow positive from the outset.

Energize Connecticut Solar Lease Version 2.0

CEFIA launched the award winning Connecticut Solar Lease in 2008 for PV systems in one to four unit owner-occupied residences in Connecticut. The program provided 855 leases to residents in just over three years demonstrating "high borrower fidelity rates."[55] Version 2.0 will include more private investment, including debt providers thus lowering the overall cost of capital into the structure and reducing its reliance on ratepayer funds. It will also include energy assessments and possibly coupons for energy efficiency from solar REC revenue as financing mechanisms to "right-size" and lower the payback period of a rooftop solar PV system and will expand its data collection requirements on hardware and non-hardware costs.

Version 2.0 of this program is set to be released in June of 2013 and will provide over $50 million in capital for residential and commercial rooftop solar PV and result in the return over time of all ratepayer subsidies used to fund this program to Connecticut residents plus a 2 percent return. Twenty-year leases will be available for residential and commercial PV systems and residential solar hot water systems. Monthly payments will be based on installed cost with a 2.9 percent per annum (pa) escalation in the lease payment with an option to purchase the system at year 20. Leases with fixed rates are

[53] CEFIA is using repurposed ARRA-SEP funds as credit enhancements (i.e. loan loss reserves) for various financing programs for rooftop solar PV.
[54] pa = percent annum
[55] Bethany Speer. "Connecticut's Solar Lease Program Demonstrates High Borrower Fidelity." National Renewable Energy Laboratory (NREL) (10/21/2012)

available for higher monthly prices. The eligibility requirements will not include income limitations and will continue to be available to FICO scores above 640 making the product available to 87 percent of single family homes in Connecticut.

Energize Connecticut Smart–E Loans

CEFIA's Smart-E Loan Program offers long-term, low-interest financing through participating lenders to help Connecticut residents access home energy upgrades, including rooftop solar PV. Affordable, simple and easy to access, Smart-E loans enable the implementation of energy upgrades that result in environmental benefits, cost savings, and home improvement to Connecticut residents. Participating local credit unions and community banks are providing up to $28 million in capital for projects undertaken by contractors for energy upgrades, supported by CEFIA's $2.5M Loan Loss Reserve. Unsecured loans of up to twelve years are provided to qualifying residential borrowers to finance comprehensive, qualifying renewable energy improvements (i.e. rooftop solar PV installations), including fuel conversion, renewable energy and efficiency measures.

The program is open to 1-4 unit owner occupied residences or rented units approved by the landlord (varies by lending institution), subject to credit approval. Residences must be serviced by The United Illuminating Company, Connecticut Light and Power, or the Connecticut Municipal Electric Energy Cooperative[56] for electric, and Southern Connecticut Gas, Connecticut Natural Gas, or Yankee Gas for gas.

AFC First Financial will service leases including taking on all applications and maintaining data. AFC First Financial successfully partnered with CEFIA as the servicer for Solar Lease 1, and has experience with many other clean energy programs, including Pennsylvania's Keystone HELP, for energy efficiency.

Energize Connecticut Solar Loan Powered By Sungage

Sungage, Inc. (Sungage) is a privately held company specializing in solar loans that launched in 2012 in Connecticut and Massachusetts. Sungage proposed an innovative loan structure specifically targeted at residential solar ownership. The loan structure enables CEFIA to promote solar ownership in Connecticut with a $300,000 Loan Loss Reserve (LLR) from repurposed ARRA-SEP funds, a subordinated debt term loan component of $500,000 and a revolving loan of a maximum of $2,200,000. Homeowners with FICO scores greater than 680 are able to access the Energize Connecticut Solar Loan program and take advantage of the Investment Tax Credit (ITC), previously out of reach for those who could not afford the entire upfront cost of PV installations. The standard loan rate is 6.49%, and rises to 9.99% if the homeowner does not use the ITC to pay down the loan (Tax Credit Recapture and Reamortization, "TCRR"). The individual loan tenor is 15 years, and the homeowner can choose to extend to 20 years at any point during their loan, resulting in an additional 100 basis points (bp) or 1% added to the homeowner's current rate.

CEFIA's LLR and subordinated debt term loan will support $4,500,000 of private capital.[57] The long-term structure (once the subordinated component reaches a "steady state") leverages private capital to public funds at a rate of nearly 6:1. Sungage provides contractor training, financing tools, and administration of the program. Funds management and loan application / administration responsibilities are handled by LeaseDimensions, an established major consumer loan administrator whose client list includes GE Capital, Volkswagen Credit, Coca-Cola, Hewlett-Packard, and Ford Credit.

[56] www.cmeec.com/whoiscmeec.htm

[57] The $4.5M is pending based on the participation of a proposed Senior Lender. In lieu of a Senior Lender, CEFIA invested $1,500,000 of ratepayer capital in order to jump start the program.

Capital Competition

CEFIA worked with the Coalition for Green Capital (CGC) to issue a Request for Proposals (RFP) for a pilot program to invest $1 million of ratepayer funds in a 20-year 2% interest loan to identify an installer, financier, or third-party that can maximize the deployment of residential rooftop solar PV per dollar of ratepayer funds at risk without the use of subsidies. If the pilot is successful, CEFIA will seek to offer $5-10 million, which can be expanded in partnership with other state or city level green banks to attract additional low cost capital.

Commercial Property Assessed Clean Energy (C-PACE) Financing

C-PACE is a finance mechanism that allows commercial or industrial property owners to access low-cost, long-term financing for energy efficiency and renewable energy improvements and repay the loan as a property tax assessment. The cost of the energy project, funded by special financing arranged through CEFIA, is repaid annually by the property owner through a special assessment on the building owner's property tax bill spread over a period of up to 20 years.

When long-term, lower cost C-PACE debt is used to finance the costs of installing a rooftop solar PV system, lower levels of incentives are needed to make the project viable at current electric rates. For example, as shown in below figure, when 70 percent debt is assumed to finance a project that costs $3/W, the project can be financed with a Zero Emissions Renewable Energy Credit (ZREC) price of as little as $58/MWh while still maintaining a net present value greater than zero. This price is significantly lower than the average clearing price from last year's auction of $135/MWh. The addition of C-PACE debt to the current level of incentives could result in more than twice the number of projects.

Assumptions
System Cost: $3/W
C-PACE Debt: 70%
Financing Term: 20 Years
Financing rate: 5.5%
Avoided Electricity Cost: $0.12 kWh

Net Present Value given varying ZREC Prices

REC Value	$60	$65	$75	$95	$115	$135*
Net Present Value ($)	3,702	18,124	32,546	46,968	61,391	75,813

*2012 ZREC clearing price

Incentive Programs

Zero Emissions Renewable Energy Credit (ZREC)

In July 2011 the Connecticut legislature created[58] the Zero Emissions Renewable Energy Credit Program. The ZREC requires Connecticut's two investor owned utilities, Connecticut Light & Power (CL&P) and United Illuminating (UI), to enter into 15-year contracts for RECs through a "market driven RFP bidding process and small tariff" with electric generation facilities larger than 100 kilowatts (kW) but

[58] CT Renewable Portfolio Standard, *Public Utilities Regulatory Authority,* www.ct.gov/pura/cwp/view.asp?a=3354&q=415186

not larger than one megawatt (MW) resulting in zero emissions.[59] Utilities are authorized to spend up to $8 million on ZREC contracts annually. The first auction under the ZREC Program, held in 2012, was oversubscribed by a factor of 2.75, resulted in an average price of about $135 per ZREC, and about 45 MW of new solar capacity. The statutory price cap for one ZREC in 2012 was $350. The Public Utilities Regulatory Authority (PURA) may reduce the price cap annually by 3% to 7%.[60]

Residential Solar Investment Program (RSIP)

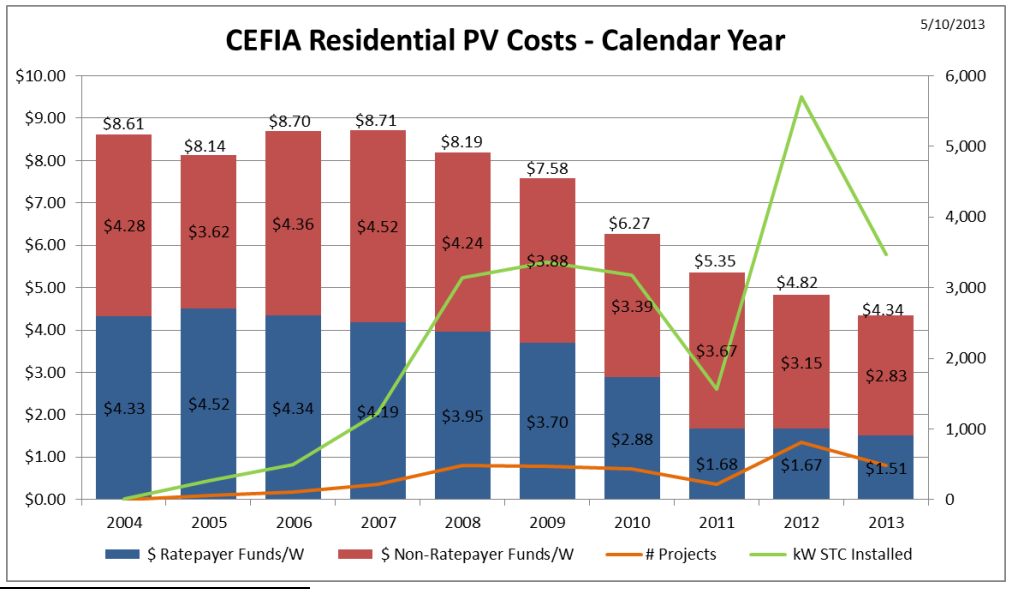
CEFIA's RSIP program provides two incentive models to help customers who want to purchase or lease solar PV systems. The RSIP program is currently on Step 3 of gradually declining incentives.

1. *Expected Performance-Based Buydown (EPBB) Incentive*: The EPBB incentive is a rebate available to consumers who purchase a solar PV system. The EPBB provides one level of incentives for the first 5 kW and a lower level of incentives for the second 5 kW. A 5% bonus is given to projects that use major system components principally manufactured in Connecticut and an additional bonus if these components are manufactured in distressed Connecticut municipalities.

2. *Performance-Based Incentive (PBI):* CEFIA's PBI is designed to allow homeowners to benefit from solar PV systems for little to no upfront cost. Under this model, an Eligible Third-Party PV System Owner owns the system and enters into a contract with the homeowner. The PBI is paid to the System Owner based on actual performance over the course of six years and is used to reduce the homeowner's monthly cost. The PBI model also provides an additional bonus for projects that use major system components principally manufactured in Connecticut.

Step	EPBB Incentive ≤ 5 kW ($/W)	EPBB Incentive > 5 ≤ 10 kW ($/W)	PBI Incentive
1	~~$2.45~~	~~$1.25~~	~~$0.300 / kWh~~
2	~~$2.275~~	~~$1.075~~	~~$0.300 / kWh~~
3	$1.75	$0.55	$0.225 / kWh

RSIP costs the the 2012 cost PV



CEFIA's has reduced installed since its inception and throughout duration of SunShot project. Since March the installed of residential rooftop solar went from $5.35/W to

[59] Noucas, Anna. "Connecticut ZREC Program Faces a Bump in the Road" Renewable Energy World. www.renewableenergyworld.com/rea/blog/post/2012/10/connecticut-zrec-program-faces-a-bump-in-the-road
[60] Ibid

$4.34/W in May 2013 while simultaneously lowering the amount of ratepayer funds used.

Long Term REC Contracts

CEFIA has begun discussions with PURA and public utilities in an effort to partner with the electric distribution companies (EDCs). Under the proposed agreement, the EDCs would purchase all of CEFIA's Residential Solar Investment Program (RSIP) RECs to help Connecticut realize its clean energy goals. In return, all revenues earned through the program would be given back to homeowners as vouchers to promote additional energy retrofits. As a result of a ten year REC contract, at $35/REC, a net present value of $2,316 for 7kW of residential solar PV installed would be generated.

Even with the innovative green bank debt model, states currently need some incentives to deploy rooftop solar PV until the cost of installing solar PV decreases further. The existence of incentive policies such as the ZREC and RSIP programs make rooftop solar PV projects through the "Green Bank" Financing Model feasible at current electric rates.

Solarize Connecticut[61]

Background

Solarize Connecticut (Solarize CT) is a pilot program designed to encourage the adoption of residential solar PV systems by deploying a coordinated education, marketing and outreach effort, combined with a tiered pricing structure that provides increased savings to homeowners as more people in one community go solar.

The Solarize Connecticut pilot is based on a proven residential aggregation model designed to bring down the cost of solar PV when residents sign up for a pre-selected installer's offering. The more residents who sign up to install solar, the more the price decreases for everyone who participates. And because the installer, the technology and the exact price of PV are provided upfront, it is easier for residents to make the decision to go solar.

Solarize Connecticut is a partnership between CEFIA and the non-profit organization SmartPower with support from the John Merck Fund and Putnam Family Foundation. A pilot program was launched by these partners in the summer of 2012 with four Connecticut towns. **Durham, Fairfield, Portland** and **Westport** were selected through a competitive process to participate in the program's first round, which ran through the end of 2012.

In just five months, Solarize Connecticut drove twice as much solar adoption in four pilot communities as those towns saw in the last eight years. All four towns reached the lowest price level available by successfully convincing enough town residents to participate. As more homeowners signed up to install solar through purchase or lease agreements, the price for everyone went down – including those who installed systems earlier in the program before the maximum savings kicked in.

Phase I Program Impacts

Results of Solarize Connecticut Phase 1 exceeded expectations. Highlights of program impacts are as follows (see below table):

- Over 2.2 MW of new solar PV capacity deployed across the four communities, close to triple what was installed in those towns during the preceding eight years;

[61] http://solarizect.com/

- Nearly 300 projects completed, representing at least a doubling in the number of homeowners "going solar" in all towns, with Durham *quintupling* its solar ownership and reaching 5.7% residential solar PV market penetration, the first town in the state to reach over 5%
- Dramatically reduced costs for solar PV, with all towns hitting the lowest tier (Tier 5) pricing and cumulative savings of over $2.2 million on the aggregate of the solar PV installations
- Compelling drops in customer acquisition costs, at < $90/kW from a direct program spend perspective and $135/kW "all-in" – significantly less than both the industry average of $670/kW (per NREL analysis) and local installers' estimates at $250-$500/kW

Pre-Solarize, the average installed cost for solar PV in Connecticut was approximately $5.00/W, with three of the installers chosen to serve Solarize communities in fact having average installed costs above that level. Each installer selected not only bid into the program with pricing well below the industry average, but – in partnership with their host communities – they all achieved the lowest pricing tier possible under the program. Even including "adders" (or extra costs due to steep roofs, higher-priced modules, etc.), which increased prices up to 6% above the base price quoted, all four communities ended up with average installed costs at or below $3.80/W – representing savings of at least 20% from pre-Solarize levels, and more than achieving the program goal of driving installed costs down to $4.25/W through the Solarize pilot.

Customer Acquisition

Based on initial results, we have found that community-based social marketing under a deadline-driven campaign model – together with a tiered discount approach and sufficient public support to make the process of going solar as simple as possible – can drastically reduce the costs of acquiring a solar customer (and thus contribute to lower soft costs overall). Overall, the program produced 1,500 leads and a 20% conversion rate (consistent among all installers), including generating a final customer base of whom 20% had not considered solar prior to program.[62]

Quantitatively, CEFIA committed $100,000 to support Solarize in these initial four towns, matched by grants made to SmartPower, from the John Merck Fund and the Putnam Family. Dividing that $200,000 total by the number of customers acquired, and then again by the average size of a Solarize installation, gives us the average customer acquisition cost per kilowatt of solar PV deployed (see below table). At $90/kW on a direct cost basis, Solarize has delivered a customer acquisition cost figure that is a discount of 86% from the national average of $670/kW, as reported by NREL. Even adding in estimated installers' direct marketing costs across the four towns, plus the value of CEFIA staff time, Solarize still demonstrates tremendous customer acquisition savings at $135/kW. Again, the results we achieved strongly outpaced CEFIA's goal of $190/kW for this metric.

Solarize Connecticut Customer Acquisition Costs

Description	Cost	Acquisition Cost / kW
CEFIA direct contribution	$100,000	$89.72
Foundations' matching grants	$100,000	
Est. installer expenditures	$30,000	$13.46
Est. value of CEFIA staff time	$72,000	$32.30
Total	$302,000	$135.48

[62] According to 218 responses to a post-campaign survey emailed to about 900 households in three Solarize towns

Solarize Phase II

Building on the success of the four initial communities, the second phase of the program began in early March 2013 and includes **Bridgeport, Canton, Coventry and Mansfield/Windham** (two in partnership). The towns are partnering with two experienced Solarize installers and two installers that are new to the program. Two distressed communities are participating in Phase II (Bridgeport and Windham), and CEFIA's new financing products – most prominently, our solar loan and lease offerings – will be available before the campaign deadline. All of these factors will lead to new challenges, new opportunities, and new lessons learned.

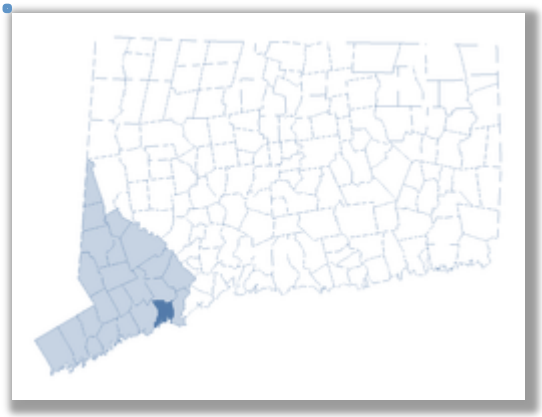
Connecticut Solar Challenge[63]

Solarize is inspiring market innovation – private sector actors want to move ahead on Solarize without CEFIA. One installer has already arranged a similar model, the "Connecticut Solar Challenge," with several communities (Bethany, Chester and Madison), and two other installers have also inquired about running a Solarize initiative. CEFIA is discussing with these installers how best to support them on both administrative and substantive matters, outside of the structure of the formal Solarize Program and associated resources.

[63] http://ctsolarchallenge.com/

Appendix I

Permitting Recommendations Specific to Twelve Partner Towns



Bridgeport

Population: 146,824

Households: 52,261

Region: Greater Bridgeport

bridgeportct.gov/

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- ✔ Solarize (2)
  Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Best Practices

- ✹ Permit fee waiver for Class 1 Renewables
- ✹ Applications can be submitted by email
- ✹ Solarize webpage

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

7 residential projects (39 kW)

Household penetration 0.01%

5 nonresidential projects (382 kW)

[does not include ZREC installations]

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Bridgeport for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions,* found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Bridgeport's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software (please see "Adopt Online Permitting" in next section).

- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents would also want to link to and know about local clean energy projects and activities, policies and incentives, your clean energy task force (if applicable), and successes and participation in programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, the CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online.

Permit Fees

- **Bridgeport is providing clean energy leadership in Connecticut by waiving permit fees for Class I renewable energy systems as enabled in Public Act 11-80.[6]**

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[7]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[8] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.

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[4] energizect.com/SunriseNE

[5] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.

[6] Section 29-263: cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[7] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

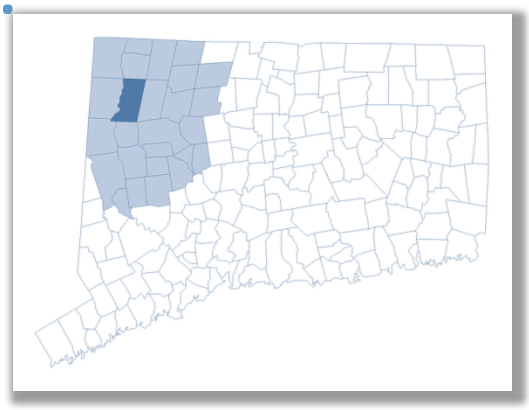
[8] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

- Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.

- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired.[9]

Photo: Lighthouse, Seaside Park at sundown, Andrew Korn, flickr.com/photos/andkorn/1593016190/sizes/l/

[9] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Cornwall

Population: 1,429

Number of residential households: 643

Region: Capitol

cornwallct.org

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Cornwall for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- CPACE
- Solarize
- Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Best Practices

- ✹ Applications can be submitted by mail
- ✹ Scheduled inspection times
- ✹ Quick decisions on solar PV permit
- ✹ Approved permits can be mailed to installers

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

12 residential projects (93 kW)

Household penetration 0.187%

1 nonresidential project (9 kW)

[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Cornwall

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Cornwall's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software (please see "Adopt Online Permitting" in next section).

- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Cornwall residents have created a "Cornwall Energy Taskforce" website: cornwallctenergy.org. Perhaps this initiative can be linked to or integrated with the official town site.

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a CEFIA-endorsed statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[3]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[4] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and submit permit application materials through your website or by email. This change saves installers time-intensive and costly trips to jurisdiction offices.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[5] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Cornwall currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[6]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[7] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the

[3] energizect.com/SunriseNE
[4] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.
[5] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."
[6] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402
[7] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

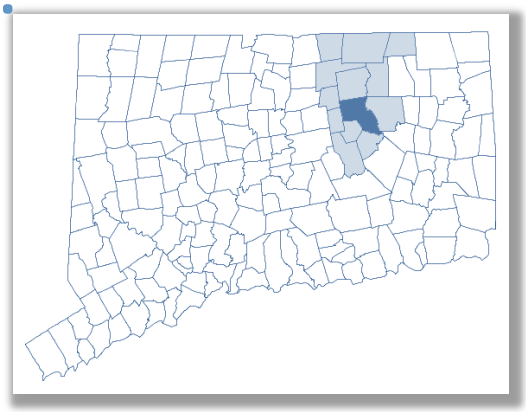
"same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [8]

Cornwall Covered Bridge Photo, Ray Brown ct.gov/photo/scripts/subjectbridge.asp

[8] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Coventry

Population: 12,572

Number of households: 4738

Region: Windham

coventryct.org

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Coventry for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- ✔ Solarize Round Two
  Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Best Practices

- ✹ Clean energy web information
- ✹ Online permitting system
- ✹ Online application submission and payments
- ✹ Single comprehensive inspection

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

28 residential projects (191 kW)

Household penetration 0.59%

1 nonresidential project (76 KW)

[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Coventry

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Coventry's solar PV permitting processes are clearly posted on your town website and updated regularly. Coventry responded to our outreach indicating the use of View Permit online permitting system. Installers visiting Coventry's permit page should be able to easily access a link to the online system. See Manchester's site for a good example.[1]
- **"Clean Energy" Webpage:** Coventry has already created an "Energy Committee" webpage. Make sure to provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[2]
- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[3]

[1] building.townofmanchester.org/building

[2] energizect.com/SunriseNE and more generally, energizect.com

- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[4] If not a full waiver, consider a low or flat fee based on cost recovery instead of a value-based fee structure that may not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.

Streamline Review and Inspection Requirements

- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** Coventry conducts a single comprehensive inspection reducing the amount of time inspectors, installers and homeowners must spend on site. Additional strategies to streamline the inspection process include:
    - Scheduling specific appointment times rather than a window of time. This saves everyone, and ultimately customers/constituents time, money and frustration.
    - Adopting the inspection checklist included in the Connecticut Rooftop Solar PV Permitting Guide ✹.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[5] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE✹.
    - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
    - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities

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[3] energizect.com/SunriseNE

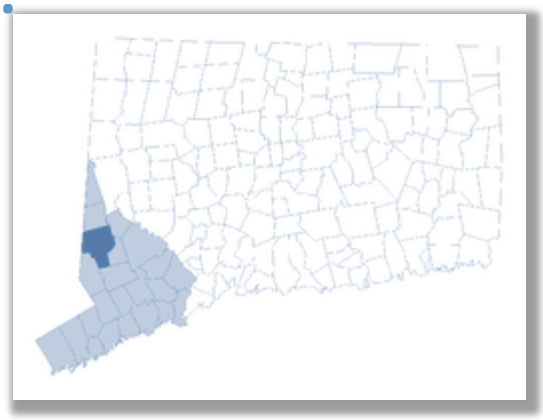
[4] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[5] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [6]

Photo: Visitors Center, coventryct.org/index.asp?Type=B_LOC&SEC={8F02BF33-332E-484B-94D1-40AA20648A15}

[6] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Danbury

Population: 82,409

Households: 29,508

Region: Housatonic Valley

ci.danbury.ct.us

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Danbury for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- Solarize
- Neighbor to Neighbor Program
- CT Clean Energy Communities

Best Practices

- ✹ Online permitting system
- ✹ Permit fee exemption for cultural non-profits and municipal projects
- ✹ Escrow account for certified electricians to allow for quick payments

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

34 residential projects (229 kW)

Household penetration 0.12%

5 nonresidential projects (1271 kW)

[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Danbury

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Danbury's solar PV permitting processes are clearly posted on your website and updated regularly.

- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

Consider creating a webpage on Danbury's website devoted to clean energy. Provide links to your permitting information and to resources such as the Sun Rise New England and EnergizeCT websites.[2] EnergizeCT is a state initiative to provide energy-related information and resources. Constituents would also want to link to and know about local clean energy projects and activities, policies and incentives, your clean energy task force (if applicable), and successes and participation in programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, the CT Solar Challenge, and C-PACE.[3]

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] energizect.com/SunriseNE and more generally, energizect.com

[3] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Online Permitting System:** Make sure entire permitting process (application acquisition, submission and payment) is enabled by the permitting system.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Danbury's solar PV permitting fees are about average for Connecticut. To make solar PV installation more affordable Danbury can encourage solar installations by waiving solar PV permit fees.[5] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Danbury currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[6]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** Danbury requires multiple inspection trips, which are scheduled during open blocks of time. The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[7] However, a shorter timeframe encourages installers to do business in your jurisdiction and

[4] energizect.com/SunriseNE
[5] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."
[6] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402
[7] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

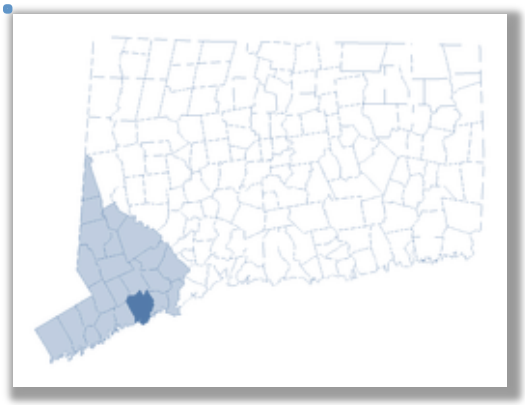
speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired.[8]

Photo: Pond at Rogers Park, http://www.city-data.com/picfilesc/picc49809.php

[8] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Fairfield

Population: 59,625

Households: 20,556

Region: Greater Bridgeport

fairfieldct.org/

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Fairfield for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions,* found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- (pending) CPACE
- ✔ Solarize
  Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Best Practices

- ✹ Applications can be obtained online or by mail

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

125 residential projects (912 kW)

Household penetration 0.61%

5 nonresidential projects (621 kW)

[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Fairfield

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Fairfield's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software (please see "Adopt Online Permitting" in next section).

- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and submit permit application materials through your website, by email, or by U.S. mail. This change saves installers time-intensive and costly trips to jurisdiction offices.
- **Unnecessary Copies:** Consider lifting the requirement for multiple copies of materials such as building plans**.**

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[6] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Fairfield currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[7]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[8] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds

[4] energizect.com/SunriseNE
[5] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.
[6] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."
[7] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402
[8] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

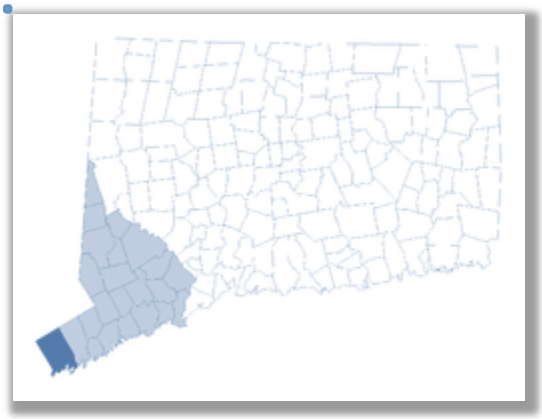
up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [9]

Photo: Sasco Beach, Fairfield CT flickr.com/photos/lvpdesign/7022744263/sizes/l/

[9] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Greenwich

Population: 61,983
Households: 23,382
Region: South Western

greenwichct.org/

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- Solarize
- Neighbor to Neighbor Program
- CT Clean Energy Communities

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Greenwich for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

Best Practices

- ✹ Applications can be obtained online
- ✹ Final permits can be mailed to installers
- ✹ Green building ordinance for public buildings

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

37 residential projects (199 kW)
Household penetration 0.16%
4 nonresidential projects (218 kW)
[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Greenwich

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Greenwich's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software (please see "Adopt Online Permitting" in next section).

- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

[1] energizect.com/SunriseNE and more generally, energizect.com
[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communitiesor ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.
[3] west-hartford.com/government/CleanEnergy.htm and www.westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and submit permit application materials through your website, by email, or by regular mail. This change saves installers time-intensive and costly trips to jurisdiction offices.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[6] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Greenwich currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[7]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Remove Unnecessary Paperwork Requirements:** Consider removing the requirement for homeowner approvals to be notarized. Eliminate the need for particular paper types.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[8] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds

[4] energizect.com/SunriseNE
[5] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.
[6] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."
[7] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

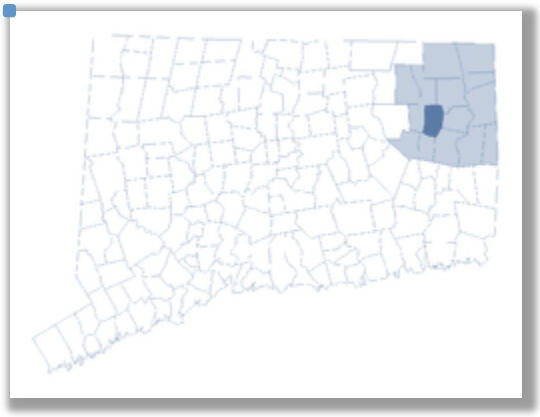
Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [9]

Photo: Long Island Sound at dusk, Carl Raether, flickr.com/photos/carlbock/214843728/

[8] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

[9] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Hampton

Population: 1,890

Households: 768

Region: Windham

Hamptonct.org

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Hampton for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Permitting Recommendations for Jurisdictions,* found CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- CPACE
- Solarize
- Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Best Practices

- ✹ Applications can be obtained online
- ✹ Applications can be submitted by mail
- ✹ Approved permits can be mailed to installers
- ✹ Scheduled inspections
- ✹ "Green Energy" webpage

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

15 residential projects (87 kW)

Household penetration 1.95%

2 nonresidential projects (19 kW)

[does not include ZREC installations]

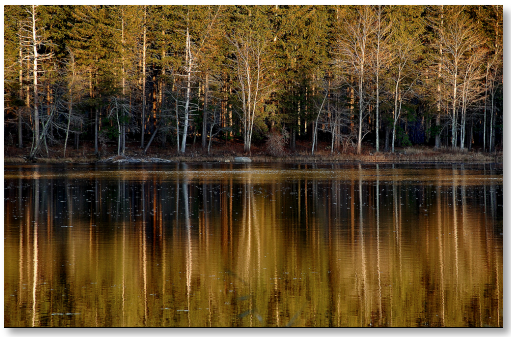
Rooftop Solar PV Permitting Recommendations for Hampton

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Hampton's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software (please see "Adopt Online Permitting" in next section).

- **"Clean Energy" Webpage:** Hampton has a "Green Energy" webpage. Be sure to provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]



- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, www.eere.energy.gov/solarchallenge; SunShot Initiative, www.eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, www.energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, www.c-pace.com.

[3] west-hartford.com/government/CleanEnergy.htm and www.westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and submit permit application materials through your website, by email, or by regular mail. This change saves installers time-intensive and costly trips to jurisdiction offices.
- **Eliminate Tax Clearance Application Requirements**

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[6] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Hampton currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[7]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[8] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day"

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[4] energizect.com/SunriseNE

[5] For examples, see: Simply Civic, simplycivic.com; City View, www.msgovern.com/software/cityview; View Permit, viewpermit.com.

[6] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[7] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

[8] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

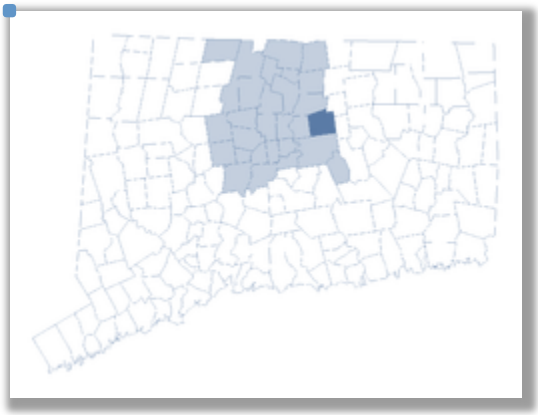
or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [9]

Photo: Goodwin Conservation Area, Don Taylor, flickr.com/photos/donphoto/2076313187/sizes/l/

[9] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Manchester

Population: 59,175
Households: 25,194
Region: Capitol

townofmanchester.org

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Manchester for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- Solarize
- Neighbor to Neighbor Program
- CT Clean Energy Communities

Best Practices

- ✹ Permit fee waiver for Class 1 renewables
- ✹ Online permitting system
- ✹ Applications can also be submitted by email and mail
- ✹ Single comprehensive inspections
- ✹ Software used to help assess need for engineering reviews

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

27 residential projects (181 kW)
Household penetration .11%
5 nonresidential projects (416 kW)
[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Manchester

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Manchester's solar PV permitting processes are clearly posted on your website and updated regularly.

- **Create a "Clean Energy" Webpage** on Manchester's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Application Submission:** Ensure that solar PV permit applications may be submitted online through View Permit in addition to email and mail.
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.

Permit Fees

- **Manchester is providing clean energy leadership in Connecticut by waiving permit fees for Class I renewable energy systems as enabled in Public Act 11-80.[5]**

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[6]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. Manchester shows a commitment to encouraging solar PV installations by using software designed to help determine when engineering inspections are required and when they can be waived.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as scheduling specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[7] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.

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[4] energizect.com/SunriseNE

[5] Section 29-263: cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[6] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

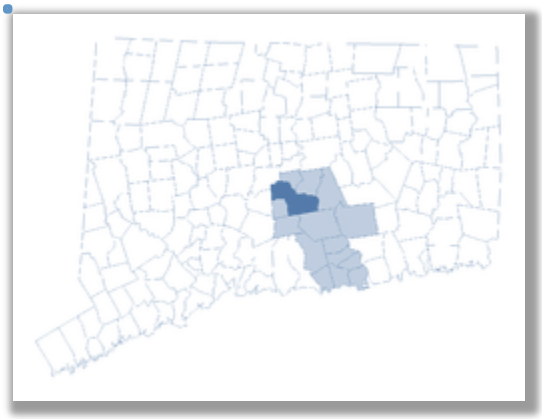
[7] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

- Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.

- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [8]

Photo: Torii Gate, Don Rogers, flickr.com/photos/dsrogers/4758403810/

[8] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Middletown

Population: 48,041
Households: 20,233
Region: Midstate

cityofmiddletown.com

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- Solarize
- Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Middletown for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

Best Practices

- ✹ Single application
- ✹ Single department
- ✹ Single and scheduled inspections
- ✹ Approved permits can be mailed to installers

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]
43 residential projects (224 kW)
Household penetration 0.21%
7 nonresidential projects (565 kW)
[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Middletown

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Middletown's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software (please see "Adopt Online Permitting" in next section).

- **Create a "Clean Energy" Webpage** on Middletown's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

[1] energizect.com/SunriseNE and more generally, energizect.com
[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.
[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and submit permit application materials through your website, by email, or by regular mail. This change saves installers time-intensive and costly trips to jurisdiction offices.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[6] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Middletown currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[7]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[8] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

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[4] energizect.com/SunriseNE

[5] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.

[6] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[7] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

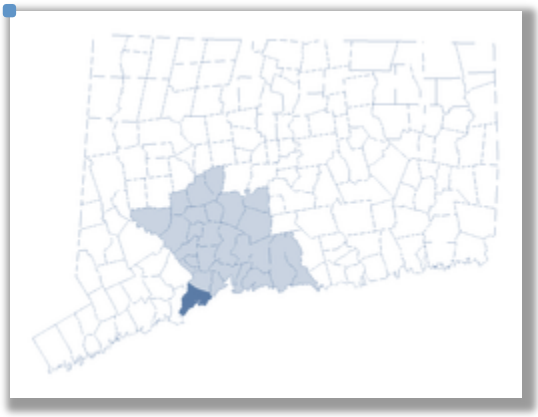
[8] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

- Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
- Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.

- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [9]

Photo: Connecticut River, Victoria Stahl, Sun Rise New England team

[9] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Milford

Population: 52,894

Households: 21,910

Region: South Central CT

ci.milford.ct.us/

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
  - CPACE
  - Solarize
  - Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Milford for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

Best Practices

- ✹ Online permitting system
- ✹ Single comprehensive inspection
- ✹ Inspection schedules posted online

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

70 residential projects (447 kW)

Household penetration 0.32%

2 nonresidential projects (370 kW)

[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Milford

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Milford's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software.

- **Create a "Clean Energy" Webpage** on your jurisdiction's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

[1] energizect.com/SunriseNE and more generally, energizect.com

[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.

[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[5] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Milford currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Train Staff:** Require jurisdiction staff involved in solar PV permitting to participate in relevant solar PV training, at minimum by accessing a free online training course comparable to the "Photovoltaic Online Training for Code Officials" offered on the National Training & Education Resource (NTER) website.[6]
- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as scheduling specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[7] However, a shorter timeframe encourages installers to do business in your jurisdiction and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.

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[4] energizect.com/SunriseNE

[5] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[6] Photovoltaic Online Training For Code Officials: nterlearning.org/web/guest/course-details?cid=402

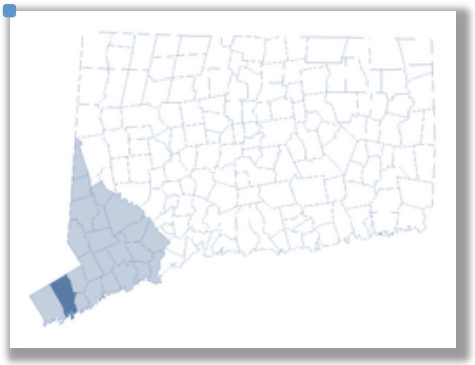
[7] ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

- Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.

- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [8]

Photo: Walnut Beach, Jerry Angelica, flickr.com/photos/jerryangelicaphotography/6213356174/

[8] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



Stamford

Population: 124,908
Household: 48,288
Region: South Western

ci.stamford.ct.us/

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
- Solarize
- Neighbor to Neighbor Program
- CT Clean Energy Communities

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks Stamford for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Best Practices

- ✹ Applications can be obtained online
- ✹ Approved permits can be mailed to installers
- ✹ Trained personnel for permit process
- ✹ Same day turnaround on permit decisions
- ✹ Identification criteria for systems not requiring permits

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

39 residential projects (227 kW)
Household penetration 0.08%
8 nonresidential projects (1139 kW)
[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations for Stamford

Make Information Available

- **Online Permitting:** Make sure all information pertaining to Stamford's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software.

- **Create a "Clean Energy" Webpage** on Stamford's website. Provide links to your permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[1]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[2] Please check West Hartford's websites for examples.[3]

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

[1] energizect.com/SunriseNE and more generally, energizect.com
[2] Rooftop Solar Challenge, eere.energy.gov/solarchallenge; SunShot Initiative, eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, c-pace.com.
[3] west-hartford.com/government/CleanEnergy.htm and westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** The Sun Rise New England team has put together a statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Adopt Online Permitting:** Adopt an online permitting system[5] to enable applicants to obtain and submit solar PV permit application materials online. Otherwise, allow installers to obtain and *submit* permit application materials through your website, by email, or by regular mail. This change saves installers time-intensive and costly trips to jurisdiction offices.
- **Eliminate Multiple copies** of materials, such as building plans.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[6] If not a full waiver, consider a low or flat fee based on cost recovery instead of the value-based fee structure Stamford currently utilizes. Value-based fee structures usually do not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
- **Allow for Payment Electronically or by Mail:** Allow installers to pay permit fees online, electronically, or by U.S. mail to save driving time and cost.

Streamline Review and Inspection Requirements

- **Remove Excessive Reviews**: Jurisdiction staff should identify and remove reviews that are not critical to safe and efficient operation of a proposed rooftop solar PV system. In particular, unnecessary and costly engineering reviews should be eliminated by specifying criteria and a methodology for determining when these reviews are needed.
- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as scheduling specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.

Formalize Best Practices

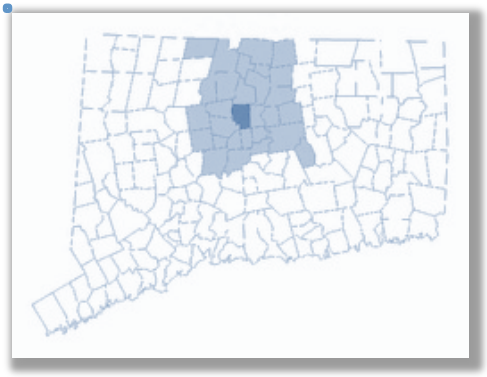
- **Adopt the Solar Friendly Ordinances** offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE✹.
  - Adopting the model municipal permitting ordinance formalizes your jurisdiction's commitment to making rooftop solar PV permitting easier and less costly for everyone.
  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.

[4] energizect.com/SunriseNE
[5] For examples, see: Simply Civic, simplycivic.com; City View, msgovern.com/software/cityview; View Permit, viewpermit.com.
[6] cga.ct.gov/2012/sup/chap541.htm - Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

- **Allow "solar as-of-right" or "by-right":** Eliminate zoning permits for small-scale rooftop solar PV systems (for example by adopting a solar friendly zoning ordinance). Allow installations to proceed without the need for special permission, variance, amendment, waiver or other discretionary approval. This right would pertain to individually owned standalone buildings as well as those in communities otherwise regulated by homeowner associations or other governing boards. Publicize and enforce Connecticut General Statute § 7-147f, which limits the reasons solar energy systems are denied only to installations that substantially impair the historic character of the district. Put the burden of proof on showing that the historic character of the district will be substantially impaired. [7]

Photo: building reflection 02, Monica Arellano-Ongpin, flickr.com/photos/maong/2935963878/

[7] cga.ct.gov/2001/pub/Chap097a.htm - sec7-147f.htm



West Hartford

Population: 63,649

Number of households: 25,513

Region: Capitol

http://www.west-hartford.com/

Clean Energy Commitments

- ✔ Rooftop Solar Challenge
- ✔ CPACE
  - Solarize
  - Neighbor to Neighbor Program
- ✔ CT Clean Energy Communities

Connecticut's Sun Rise New England team, led by the Clean Energy Finance and Investment Authority (CEFIA), thanks West Hartford for participating in Connecticut's Rooftop Solar Challenge project, focusing on improving processes and reducing non-hardware costs associated with permitting, planning and zoning, interconnection, and increasing access to financing for rooftop solar photovoltaic (PV) systems.

Best Practices

- ✹ Clean energy websites
- ✹ Solar PV specific application and checklist
- ✹ Online permitting system

In addition to our specific recommendations, please also consider the general suggestions covered in the *Rooftop Solar PV Permitting Recommendations for Jurisdictions*, found in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹.

Solar PV Installations 2004—April 2013

[data from installations using CEFIA programs]

45 residential projects (266 kW)
Household penetration 0.18%
6 nonresidential projects (351 kW)
[does not include ZREC installations]

Rooftop Solar PV Permitting Recommendations

Make Information Available

- **Online Permitting:** Make sure all information pertaining to West Hartford's solar PV permitting processes are clearly posted on your website and updated regularly. Use online permitting software.

- **"Clean Energy" Webpage**: West Hartford sets a good example for other jurisdictions by providing information about clean energy on the jurisdiction and clean energy task force websites.[1] Make sure web visitors can easily find West Hartford's Clean Energy sites by highlighting links from your homepage. All jurisdictions are also encouraged to provide links to their permitting information/webpage and to resources such as the Sun Rise New England and EnergizeCT websites. EnergizeCT is a state initiative to provide energy-related information and resources.[2]

  Constituents also want to know about local clean energy projects, activities, policies, incentives, your clean energy task force, and participation in relevant programs such as the Rooftop Solar Challenge, Solarize, the Clean Energy Communities Program, CT Solar Challenge, and C-PACE.[3] Again, your "West Hartford and Clean Energy" and "WH is Green" webpages exemplify the spirit of sustainability.

[1] https://west-hartford.com/government/CleanEnergy.htm and http://www.westhartford.org/living_here/green/west_hartford_clean_energy_task_force.php

[2] www.energizect.com/SunriseNE and more generally, www.energizect.com

[3] Rooftop Solar Challenge, www.eere.energy.gov/solarchallenge; SunShot Initiative, www.eere.energy.gov/solar/sunshot; Solarize, solarizect.com; Clean Energy Communities Program, www.energizect.com/communities/programs/clean-energy-communities or ctenergydashboard.com/CEC/CECHome.aspx; CT Solar Challenge, ctsolarchallenge.com; C-PACE, www.c-pace.com.

- **Remember to Promote** your clean energy webpage, timely programs and solar PV adoption with radio and newspaper announcements, newsletters and environmentally friendly signage.

Streamline Permit Application Submission

- **Adopt the Standard Solar PV Permit Application:** West Hartford provides leadership among Connecticut jurisdictions by developing and sharing a solar PV specific permit application/checklist. The Sun Rise New England team has put together a CEFIA-endorsed statewide standard application package for rooftop solar PV permitting, which is now offered in the CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ on the Sun Rise New England webpage.[4]
- **Simplify the Application Process:** Make one department responsible for the rooftop solar PV permitting process and reduce the number of steps and unnecessary requirements asked of installers.
- **Online Permitting:** Allow applicants to obtain and submit solar PV permit application materials online through your CityView portal.

Waive or Reduce Permit Fees

- **Waive or Reduce Fees:** Towns may encourage solar installations by waiving solar PV permit fees.[5] If not a full waiver, consider a low or flat fee based on cost recovery instead of a value-based fee structure that may not accurately reflect the cost of solar PV permit review and inspection. Research in Connecticut indicates that it should cost no more than $200, usually less, for a town to permit a small-scale, rooftop solar PV installation. Streamlining processes can help reduce costs to jurisdictions. For examples, Bridgeport and Manchester waive permit fees for class I renewable energy systems, and Durham has a flat fee for solar PV permits.
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- **Simplify the Inspection Process:** The CONNECTICUT ROOFTOP SOLAR PV PERMITTING GUIDE ✹ offers resources and suggestions for improving inspection processes such as: (1) When an inspection is required, conduct a single, comprehensive inspection instead of requiring multiple appointments. (2) Schedule specific appointment times for inspections instead of windows of time. This saves everyone, and ultimately town residents and business owners, time, money and frustration.
- **Shorten Permit Approval Times:** By Connecticut law, a permitting decision must be made within 30 days.[7] However, a shorter timeframe encourages installers to do business in your jurisdiction

[4] www.energizect.com/SunriseNE

[5] http://www.cga.ct.gov/2012/sup/chap541.htm#Sec29-263.htm, "(c) Any municipality may, by ordinance adopted by its legislative body, exempt Class I renewable energy source projects from payment of building permit fees imposed by the municipality."

[6] Photovoltaic Online Training For Code Officials: www.nterlearning.org/web/guest/course-details?cid=402

[7] http://www.ct.gov/dcs/cwp/view.asp?a=4218&q=305412. The 30 day permit decision time is from the State Building Code, namely the 2005 Connecticut Supplement which includes the 2009 Amendment (effective August 1, 2009) to the 2005 State

and speeds up the time between a customer's intent to generate clean energy and their ability to do so. Consider the best practice of issuing permits in as short a time frame as possible, for example on the "same day" or "over-the-counter" for standard small-scale rooftop solar PV systems that clearly meet your jurisdiction's permit approval criteria.

Formalize Best Practices

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  - Adopting the model planning and zoning ordinance assures that unnecessary barriers to solar energy installation are removed and that solar energy deployment is encouraged in your jurisdiction.
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West Hartford Tulips, from the **West Hartford and Clean Energy** site west-hartford.com/government/CleanEnergy.htm

Building Code. The language of the code amendment also encourages building officials to issue a permit as soon as practicable once the official is satisfied that the proposed work meets all requirements.

[8] http://www.cga.ct.gov/2001/pub/Chap097a.htm#sec7-147f.htm

Appendix II

Municipal Permitting Survey

Sun Rise New England – Open for Business Municipal Survey Data

Last Modified: 02/13/2013

1. Please provide the following:

Name of Municipality/Jurisdiction	Person(s) Completing the Survey	Contact Information for Person(s) Completing Survey	Date Survey Completed
Bridgeport	Ted Grabarz	Ted.grabarz@bridgeportct.gov (203) 576-8439	December 20, 2012
Cornwall	Paul Prindle	(860) 672-0711	July 3, 2012
Coventry	Joseph Callahan	jcallahan@coventryct.org	July 11, 2012
Danbury	Sean Hearty	(203) 797-4526	July 17, 2012
Fairfield	James Gilleran	(203) 256-3036	August 16, 2012
Greenwich	William Marr	(203) 622-7754	January 18, 2013
Hampton	Leslie Davis	860-455-9132	December 26, 2012
Manchester	Jim Roy	(860) 647-3110	July 20, 2012
Middletown	John Parker, Dean Lisitano, Robert Dobmeier, Ron Klattenberg	See contact spreadsheet	August 3, 2012
Milford	Jocelyn Mathiasen	(203) 783-3374	August 20, 2012
Stamford	Rob Demarco	rdemarco@ci.stamford.ct.us	July 17, 2012
West Hartford	Tim Mikloiche, Mary Ann Basile	See contact spreadsheet	July 10, 2012

2. Who are the primary contacts involved in processing permits and inspecting completed systems? Please list important contact persons, their titles, roles and contact information. (Indicate applicability to residential and/or commercial installation)

BGPT	Peter Paajanen (Building Official) (203) 576-7225
CORN	Roof mount - Paul Prindle (Building), Karen Nelson (Zoning) Ground Mounts - Building & health district
COVE	Joseph Callahan (Building Official) (860) 742-4064 jcallahan@coventryct.org / permit review, approval and inspection. Brigit Tanganelli (Permit Tech) (860) 742-4064 btanganelli@coventryct.org / process application and information. schedules inspections
DANB	Sean Hearty (203) 256-3036
FAIRF	James Gilleran (Director of Building Department)
GRNCH	William Marr (Building Official), John Vallerie (Deputy Building Official) Building Inspection Division, DPW - Inspection and clerical staff (203) 622-7755
HAMP	John Berard (Building Official), Lesley Davis (Clerk) (860) 455-9132) building@hamptonct.org
MANC	Greg Smith
MLFD	Christine Angelica (Clerk - Building Inspection) (203) 783-3235, Tom Raucci (Chief Building Inspector) (203) 783-3235, Jocelyn Mathiasen (Director, Permitting and Land Use) (203) 783-3374
MTWN	Dean Lisitano (Electrical Inspector) - dean.lisitano@MiddletownCT.gov, John Parker (Head of Building Office) - john.parker@MiddletownCT.gov, Robert Dobmeier (Deputy Head of Building Office) - bob.dobmeier@cityofmiddletown.com
STAM	Rob Demarco (Chief Building Inspector), Dwight Carlson (Permits), Robert Bounder
W HRT	Tim Mikloiche (Senior Building Inspector & Electrical Inspector), Mary Ann Basile (Supervisor of Inspections)

3. To how many departments does an installer have to submit separate applications? (Choose "1" if one office coordinates for multiple departments. Do not count the interconnection application with a utility)

	1	2	≥ 3
BGPT			R/C
CORN		R/C	
COVE	R/C		
DANB	R		C
FAIRF		R/C	
GRNCH		R/C	
HAMP		R/C	
MANC	R	C	
MLFD	R	C	
MTWN	R/C		
STAM		R	C
W HRT	R	C	

4. Which departments require separate application

	Building	Electrical	Fire	Planning	Plumbing	Structural	Zoning	Other, Specify
BGPT	R/C	C					R/C	R/C Engineering Department
CORN	R/C	R/C						
COVE	R/C							
DANB	R/C	R/C						
FAIRF	R/C	R/C	C		R/C		R/C	
GRNCH	R/C						R/C	
HAMP	R/C							R/C Tax Collector
MANC	R/C	R/C	C					Building only required when Structural changes necessary
MLFD	R/C	R/C						
MTWN		R/C						
STAM	R/C	R/C	R/C	R/C	R/C	R/C	R/C	WPCA and Tax collector. Stamford does not issue permits unless homeowner can prove they paid these
W HRT	R/C	R/C						Only Electrical if no Roof improvements needed

5. Which additional documentation is required?

Document	BGPT	CORN	COVE	DANB	FAIRF	GRNCH	HAMP	MANC	MTWN	MLFD	STAM	W HRT
Insurance Certificate	R/C	R/C	R/C				R/C	R/C				Build Only
Affidavit of Worker's Compensation	R/C	R/C	R/C	R/C	R/C	R/C	R/C	R/C			R/C	Building Only
Copy Of License	R/C	R/C	R/C	R/C	R/C	R/C	R/C	R/C				
Line Drawing	R/C	R/C	R/C	R/C	R/C			R/C	R/C		R/C	R/C
Roof Description	R/C	R/C	R/C	R/C	C		R/C	R/C				R/C
List of System Components	R/C	R/C	R/C	R/C				R/C				R/C
Engineer/Architect Approved Plans	R/C	R/C	C	C	R/C			C	R/C	R/C	R/C	Roof analysis (not 'official')
Building Plans			R/C	R/C	R/C			R/C				R/C
Signed Application Fee	R/C		R/C		R/C		R/C	R/C	R/C	R/C		
Application Sign-off Sheet	R/C				R/C	R/C					R/C	
Consent form from homeowner	R/C	R/C	R/C		R/C		R/C	Only if condo assoc.	R/C	R/C	R/C	
Other			Letter from electrician if electrician not signing	Mounting Detail			Tax Clearance R/C					

6. Through which departments or what types of approvals are required for a typical installation? (Check all that apply even if coordinated through one office/department)

	Building	Electrical	Fire	Planning	Plumbing	Structural	Zoning	Other
BGPT	R/C	R/C	R/C	R/C	R/C	R/C	R/C	(see note)
CORN	R/C						R/C	
COVE	R/C	R/C	C			R		
DANB	R/C	R/C					R/C	
FAIRF	R/C	R/C			R/C			
GRNCH	R/C	R/C		C	R/C	R/C	R/C	
HAMP	R/C							R/C
MANC	R/C		C				R/C	
MLFD	R/C		C					
MTWN	R/C							
STAM	R/C	R/C	C	C		R/C	C	R/C
W HRT	R/C	R/C	C		R/C	R/C	R/C	R/C

7. What is the total number of departments that require approval?

	1	2	3	4	5	6	7
BGPT							R/C
CORN		R/C					
COVE	R/C						
DANB			R/C				
FAIRF			R/C				
GRNCH					R	C	
HAMP		R/C					
MANC		R	C				
MLFD	R	C					
MTWN	R/C						
STAM				R			C
W HRT		R/C					

8. You selected Other. Please specify which departments permits are processed through.

STAM	Tax Department
W HRT	Historical if designated as such by town or state

9. Describe the permitting process, listing departments and types of approvals as they are involved. Provide links to relevant websites which supplement this information. (Indicate whether requirements pertain to residential and/or commercial installations)

BGPT	For both residential and commercial permits, you will need two sets of documents, completed permit application, certificate of worker's compensation for contractors, and state licenses. For residential building permits (one and two family), the order of necessary approvals is: zoning, engineering and building departments. For commercial building permits, the order of necessary approvals is: zoning, engineering, fire and building. If the work requires only an electrical permit, then the order of necessary approvals is: zoning and building.
CORN	1st step - roof mount - goes to zoning first. If there are any original non-conformance, zoning approval first, then goes to buildings. Only two steps. 99% of installations are residential. Ground mount systems must also be approved by the Health Department. Professional Engineers are only required for specific installations - it depends on the age of the building, what records exist for the building, etc.
COVE	Submitted application reviewed for code compliance. Building permit for structural, electrical for PV components for both residential and commercial projects, ground mounted systems would require zoning, wetlands and Health Department review.
DANB	Danbury has one central "Permit Center" location. Working at the office are 3 customer reps and one manager. The initial PV application is sent to zoning for initial approval. After zoning as approved, the application and plan are sent to the electrical and building inspectors. Eligible installers are able to submit their applications online after having first signed up (involved depositing an escrow with the permitting office, which in turns gives the eligible contractors a CD that they can then use to submit the application online. Solar installers, due to their low quantity of work, do not use this online application system.
FAIRF	Applicant must submit electrical permit and in most situations, a building permit (could potentially be avoided if the house is new or has up to date roof construction). Applicant must also receive P&Z approval, which in most cases can be done very quickly - with a quick approval across the hall. If the applicant is in on of Fairfield's historical districts, they must also receive approval from the chairman of that board. Professional engineer-approved structural design diagrams are generally required (Fairfield's proximity to the ocean creates potentially dangerous wind uplift situations). Commercial installations required fire marshal approval.
GRNCH	A sign-off sheet is given to the applicant who is required to have other Town agencies review and sign the plans and sheet prior to our Dept. accepting the application. Typical agency sign-offs are, Health Dept., IWWA, Highway and Sewer Depts., DPW, Fire Marshal, Zoning, Tax Collector.
HAMP	Both the Building Department and Tax Collector require separate application for a rooftop solar PV system for both residential and commercial
MANC	Residential - Building/Zoning Dept. - Buildingdept@manchesterct.gov Commercial - Building/Zoning Dept./Fire Marshal Fire Marshal - Ltalbot@manchesterct.gov
MLFD	Department of Permitting and Land Use Fire Department http://www.ci.milford.ct.us/Public_Documents/MilfordCT_Building/BuildingIndex
MTWN	For rooftop PV installations, there is one application for both building & commercial. If it's a historical building, then the P/Z dept. must also approve. Applications can be filled out online, but the contractor/owner must physically come into the office in order to submit payment the necessary signatures. A one-line electrical diagram and a structural diagram are also required.
STAM	Start with building department for application, which is checked by staff who will then direct applicant to where they need to go for signatures, permits and approvals. Most departments are within the

	Stamford Government Center building The exception is areas with volunteer fire departments (Longridge and Turner River). Applicants would have to go to those departments directly. Usually the flow order is Tax department->Environmental Protection->zoning and then back to building
W HRT	westhartford.org. Town website-> Community Services-> Building Department Building and zoning applications- see drop down menus for forms.

10. What approvals from Professional Engineers are required as part of the permit package for a typical installation? (Check all that apply)

	Civil	Electrical	Environmental	Fire Protection	Mechanical	Structural	Notes
BGPT		R/C			R/C	R/C	
CORN						R/C	Only needed on some occasions
COVE						C	
DANB		R/C				R/C	
FAIRF						R/C	
GRNCH		R/C				R/C	
HAMP						R/C	Only needed on some occasions
MANC		C				C	
MLFD					R/C	R/C	
MTWN		C				R/C	
STAM		R/C				R/C	
W HRT						R/C	

12. In addition to state licensing requirements, does your city/town require any additional licensing for contractors working on a solar PV installation? (Indicate applicability to residential and/or commercial installations)

BGPT	No
CORN	Installer has to be licenses - either PV1 (can install, but requires an electrician) or PV2 (can install, but can't get permit). Electricians require an E1. (Note from Joe - this seems to be the standard procedure for all of CT)
COVE	No
DANB	No
FAIRF	No
GRNCH	No
HAMP	No
MANC	No
MLFD	No
MTWN	No
STAM	Yes - installers must be registered and licensed with Consumer Protection for the state of CT. In structural cases (commercial)- major construction contractors license and registration is also needed. For residential, Home Improvement Registration for contractor for single family home (up to 6 units).
W HRT	No

13. What do you estimate to be the average time it takes for an installer/customer to complete a permit application ? (This refers to the original application submission) Provide answer in terms of hours (e.g., 5 business days should be entered as 40 hours)

	R	C
BGPT	.25	.25
CORN	1	1
COVE	1-2	2-4
DANB	.5	.5
FAIRF	.25	.25
GRNCH	40	80
HAMP	<4	<4
MANC	0.5	0.5
MLFD	20	20
MTWN	< 24	< 24
STAM	2	3
W HRT	2	5

14. What do you estimate to be the average time it takes for an installer/customer to provide revisions to or additional information requested to complete a permit application? Provide answer in terms of hours (e.g., 5 business days should be entered as 40 hours)

	R	C
BGPT	16	16
CORN	0	0
COVE	0.5	0.5
DANB	40	40
FAIRF	.25	.25
GRNCH	16	32
HAMP	<4	<4
MANC	24	24
MLFD	40	40
MTWN	16	16
STAM	10	15
W HRT	20	40

15. What are the options for obtaining an application? (Check all that apply)

	Online	Email	In person	Mail
BGPT			R/C	
CORN	R/C		R/C	
COVE	R/C		R/C	R/C
DANB	R/C	C	R/C	
FAIRF	R/C			R/C
GRNCH	R/C		R/C	R/C
HAMP	R/C		R/C	
MANC	R/C		R/C	R/C
MLFD	R/C	R/C	R/C	R/C
MTWN	R/C		R/C	
STAM	R/C		R/C	
W HRT	R/C		R/C	

16. What are the options for submitting an application? (Check all that apply)

	Online	Email	In person	Mail	
BGPT			R/C		
CORN			R/C	R/C	
COVE	R/C		R/C	R/C	
DANB	R/C		R/C	C	
FAIRF			R/C		
GRNCH			R/C		
HAMP			R/C	R/C	
MANC	R/C		R/C	R/C	
MLFD	R/C	R/C	R/C	R/C	
MTWN			R/C		
STAM			R/C		
W HRT			R/C		Has City Permit – capable of online submission, but are not fully utilizing

17. What forms, design documents or other paperwork are required for applicable permit approval? (Indicate applicability to residential and/or commercial installations)

BGPT	For both residential and commercial permits, you will need two sets of documents, completed permit application, certificate of worker's compensation for contractors, and state licenses.
CORN	Insurance certificates, affidavit of workman's comp (this depends on whether an established contractor is doing the work). If it's a new contractor, a copy of the license is required. PV systems require a line drawing, descriptions of the roof type, and listing of the system components.
COVE	Copy of valid license or registration for all contractors. Certificate of workers compensation for all contractors with employees. OF WORKERS COMPENSATION FOR ALL CONTRACTORS WITH EMPLOYEES.
DANB	In addition the application, engineer/architecture-approved plans are required. This used to no be the case, but Danbury found that some plans were not submitting the correct structural info for roofs.
FAIRF	Workman's comp, state license, 3 copies of building plans
GRNCH	Permit application form Workman's Compensation Affidavit Permit sign-off sheet Copy of State license Forms associated with Town Drainage Manual Above for both Residential and Commercial
HAMP	For both residential and commercial: insurance certificate, affidavit of worker's compensation, copy of licence, roof description, signed application fee, consent form from homeowner, and tax clearance
MANC	The more information the faster plan review for both residential and commercial.
MLFD	Require stamped, engineered drawings showing that solar installations are installed in a way that can sustain 110 mph winds.
MTWN	Signed application fee, consent form signed by homeowner giving installer permission to apply on their behalf. Engineer-approved plans are only required for particularly large installations.
STAM	Two sets of drawings, with a professional engineer approved design. Completed application (sign-off sheet, through different departments), application for electrical permit, owner's form (for owner of property), worker's compensation form.
W HRT	See attached documents. Additionally, you can submit mail for electrical permits, but for Building you must submit in person.

18. Do you have an online permitting system in place already?

	No	Yes
BGPT	R/C	
CORN	R/C	
COVE		R/C
DANB		R/C
FAIRF	R/C	
GRNCH	R/C	
HAMP	R/C	
MANC		R/C
MLFD		R/C
MTWN		R/C
STAM	R/C	
W HRT	R/C	

19. You selected Yes. What is the name of the software?

COVE	View Permit Automated Permit Management
DANB	HTE Permitting System (computer management system) - a secondary platform is used to allow eligible contractors to submit applications online via email.
MANC	View Permit
MTWN	PWPermit (developed in-house)
MLFD	View Permit

20. Can you accept permit application data electronically, particularly in a format that may expedite the process? If so, please specify the types of files and data formats you are able to accept (email, spreadsheet, PDF, CSV, etc.) (Indicate applicability to residential and/or commercial installations.) What types of files are you able to accept?

BGPT	No
CORN	N/A
COVE	All – also accept e-mail. Issues with Paypal online payment methods but do allow mail in check
DANB	Pdf, email, spreadsheet
FAIRF	No
GRNCH	No
HAMP	No
MANC	View Permit, PDF, email
MLFD	Applicants can attach files in all formats. However, engineered documents require a wet stamp/seal under Connecticut State Law. There is no electronic stamp format accepted in Connecticut (there is in other states), therefore we need the original stamp and seal on the documents. We can conduct the review on electronically submitted documents but to issue the permit we need a wet stamp.
MTWN	Yes – still must come to office
STAM	No
W HRT	No

21. Specify the best persons to contact (and their contact information) for further questions about electronic submission capabilities.

BGPT	N/A
CORN	N/A
COVE	Brigit Tanganelli (860)742-4064 btanganelli@coventryct.org
DANB	Sean Hearty
FAIRF	N/A
GRNCH	IT Dept. (203) 622-6448
HAMP	John Berard & Lesley Davis
MANC	Debbie Bowen (860) 647-3184
MLFD	Jocelyn Mathiasen (203) 783-3374
MTWN	John Parker & Dean Lisitano
STAM	No contact
W HRT	Mary Ann Basile

22. How is information describing the permitting process accessible? (Check all that apply)

	Online and easily accessible	Online	Email	In person	Mail	Phone
BGPT	R/C	R/C	R/C	R/C		R/C
CORN		R/C		R/C		R/C
COVE	R/C	R/C	R/C	R/C	R/C	R/C
DANB	R/C			R/C		R/C
FAIRF				R/C		R/C
GRNCH	R/C		R/C	R/C	R/C	R/C
HAMP		R/C		R/C	R/C	
MANC		R/C	R/C	R/C	R/C	
MLFD	R/C	R/C	R/C	R/C	R/C	R/C
MTWN	R/C					
STAM		R/C		R/C		R/C
W HRT		R/C		R/C		

23. Is there an accessible designated point of contact (POC), with contact information available online, for questions about the PV permitting process?

	No designated POC	Yes, there is POC but contact info not online	Yes, POC info is online
BGPT			R/C
CORN	R/C		
COVE			R/C
DANB	R/C		
FAIRF			R/C
GRNCH	R/C		
HAMP			R/C
MANC	R/C		
MLFD			R/C
MTWN	R/C		
STAM		R/C	
W HRT	R/C		

24. Is there a policy to issue/deny PV permits within a specified number of business days from submission of application?

	No	Yes, ≤ 3 days	4-10 days	> 10 days	30 days	Notes
BGPT					R/C	
CORN					R/C	
COVE					R/C	Usually 1-2 weeks
DANB					R/C	
FAIRF					R/C	
GRNCH					R/C	
HAMP					R/C	
MANC					R/C	
MLFD					R/C	
MTWN					R/C	
STAM					R/C	
W HRT					R/C	

25. Specify the applicability of the time limit. Does the time limit apply to full process resulting in permit issuance/denial, or just response time to original application which may include notice about revisions or additional information required? (Indicate applicability to residential and/or commercial installations)

FAIRF	Standard state guidelines - must approve within 30 days
MANC	Action on application is 30 days to either approve or deny CT State Building Code Section 105.3.1.
STAM	State building code, 30 day requirement to issue/deny permits
W HRT	State building code requires permits be issued or denied within 30 days. The time limit applies to the response time to the original application.

26. If there is a time limit, is there an opportunity to shorten the existing time limit, and why or why not? If there is no time limit, would it be feasible to set a time limit, and why or why not? (Indicate applicability to residential and/or commercial installations)

MANC	Typically permits are approved in 1 to 2 weeks.
STAM	Stamford doesn't have its own time limit outside of the state's guidelines.
W HRT	If all required info available, including structural, will expedite.

27. What are the biggest factors impacting permit processing time? (Indicate applicability to residential and/or commercial installations)

BGPT	Tax collection searches, historical district
CORN	There is no policy, but verbal approvals are done almost instantaneously. They are required to make a decision within 30 days (unclear if there's ever a delay anywhere near that long). If the contractors are difficult and don't submit full paperwork, etc., then the process can take longer. Quality of the application is the single most important determinant. The office is usually never too busy to take and process permits.
COVE	Incomplete applications (has not been a problem with solar); building department workload
DANB	Quality of the original plan. If drawings are complete, the building inspector can give a verbal approval within 10 minutes or so.
FAIRF	Application fullness
GRNCH	Incomplete applications - both
HAMP	hours of building department & incompleteness of forms
MANC	Lack of information
MLFD	1) Overall volume of work in the office / 2) Available staffing / 3) Quality of materials submitted to us
MTWN	Nothing really. Clerical staff usually processes permits quickly.
STAM	Depends on departments permits are processing through. Zoning or Environment have tendency to be slower. If construction documents are in order, then things move quickly. Issues with design can slow things down.
W HRT	Lack of structural approvals

28. What are the biggest factors impacting the decision to issue/deny permits? (Indicate applicability to residential and/or commercial installations)

BGPT	Compliance with code
CORN	Permits are never denied, but are sometimes received as incomplete and require additional follow-up.
COVE	Incomplete applications – has not been a problem with solar
DANB	Quality of the original plan. Revisions are asked for fairly often.
FAIRF	Full application
GRNCH	Permits are not denied by building department but are sometimes delayed due to lack of information or code violations that need to be corrected on plans. Zoning is the agency that usually denies applications.
HAMP	hours of building department & incompleteness of forms
MANC	Amount of detailed information or lack of information
MLFD	Materials must show code compliance. #1 issue on solar is fastening details and 110 mph wind rating.
MTWN	Only reason permit may be denied is if the application is missing some major information.
STAM	Completeness of application and appropriate construction documents.
W HRT	Structural approvals missing

29. Does the jurisdiction track the number of days each permit takes to process?

	No	Yes
BGPT	R/C	
CORN	R/C	
COVE		R/C
DANB		R/C
FAIRF		R/C
GRNCH		R/C
HAMP	R/C	
MANC		R/C
MLFD		R/C
MTWN		R/C
STAM	R/C	
W HRT		R/C

30. What data pertaining to the permit application, if any, is recorded? Is the information recorded on paper or saved electronically? (Indicate applicability to residential and/or commercial installations)

BGPT	Construction documents and item list on paper, then indexed in database
CORN	A hard copy of each permit is kept on file. An additional hard copy is sent to the tax assessor.
COVE	All data is entered electronically into ViewPermit and saved indefinitely. Any paper records are kept for at least two years for Residential and indefinitely for commercial.
DANB	All applications and plans are stored electronically using their HTE system. However, there is not an easy way to analyze the data (each permit would have to be manually identified as being a solar PV installation. 8
FAIRF	All application info electronically input into Mitchell Humphrey management system
GRNCH	Application date/ issue date, CO date recorded electronically date for both
HAMP	Create spreadsheet of permit data
MANC	All data, both residential and commercial, is recorded on paper.
MLFD	Our software indicates date of submission, date of initial review completion, date of resubmission, date of issuance, etc. This isn't the software, but currently it is very difficult to run results that aggregate this information. We are working on this.
MTWN	Clerical staff time-stamps the application when it comes in. Permit is open for 180 days (6 months).
STAM	Is tracked by date manually when the application is submitted (dated envelopes)
W HRT	Since 2008, all stored in electronic file.

31. What is the average number of business days between application submission and decision (issuance or denial) regarding permits? Provide answer in terms of hours (e.g., 5 business days should be entered as 40 hours)

	Residential	Commercial
BGPT	24	24
CORN	8	8
COVE	40	40
DANB	16-32	16-32
FAIRF	24	24
GRNCH	40	80
HAMP	40	40
MANC	40	75
MLFD	Building (80-120), Electrical (24)	Building (80-120), Electrical (24)
MTWN	<24	<24
STAM	80	80
W HRT	80	80

32. If the permit application is incomplete upon original submission, what is the average number of business days between application submission and response to applicant including notice about need for revisions or additional information? Provide answer in terms of hours (e.g., 5 business days should be entered as 40 hours)

	Residential	Commercial
BGPT	16	16
CORN	0.5	0.5
COVE	24	24
DANB	8	8
FAIRF	<24	<24
GRNCH	16	32
HAMP	0	0
MANC	15-40	30-40
MLFD	80-120	80-120
MTWN	< 24	< 24
STAM	20	20
W HRT	80	80

33. How many hours does it take to review an application (hours)?

	Residential	Commercial
BGPT	0.5	0.5
CORN	1	1
COVE	1	2
DANB	1-1.5	1-1.5
FAIRF	1	3
GRNCH	0.5	0.5
HAMP	0.5	0.5
MANC	1	2
MLFD	1	1
MTWN	0.5	1-3
STAM	0.5	1
W HRT	0.5	2

34. How much time does an inspection take? Include all inspections – electric, structural, fire, mechanical etc. (Hours)

	Residential	Commercial
BGPT	0.5	0.5
CORN	0.5	0.5
COVE	0.5	0.5
DANB	0.5	0.5
FAIRF	0.5	1
GRNCH	0.5	0.5
HAMP	0.5	0.5
MANC	0.75	2
MLFD	1	1
MTWN	0.5	1
STAM	0.5-1	1
W HRT	1	2

35. Are there mechanisms in place for accelerating PV permitting processes under certain conditions (e.g., expedited process for standard residential systems meeting certain criteria, option to pay for expedited issuance, or expediting for experienced installers with a track record of code compliance)?

	No	Yes
BGPT	R/C	
CORN	R/C	
COVE	R/C	
DANB	R/C	
FAIRF	R/C	
GRNCH	R/C	
HAMP	R/C	
MANC		R/C
MLFD	R/C	
MTWN	R/C	
STAM	R/C	
W HRT	R/C	

36. You indicate there are options for accelerating the PV permitting process. Please specify.

MANC	A $79.00 additional fee for immediate review.

37. How is information on permit fees made available? (Check all that apply)

	Online	Email	In person	Mail	Phone	Not Available
BGPT	R/C	R/C	R/C		R/C	
CORN	R/C		R/C		R/C	
COVE	R/C	R/C	R/C	R/C	R/C	
DANB	R/C		R/C		R/C	
FAIRF			R/C		R/C	
GRNCH	R/C		R/C			
HAMP		R/C	R/C	R/C	R/C	
MANC	R/C		R/C		R/C	
MLFD	R/C	R/C	R/C	R/C	R/C	
MTWN	R/C		R/C			
STAM	R/C				R/C	
W HRT	R/C		R/C			

38. What is the average total amount charged for the applicable permit fee(s) for typical residential installations?

	≤ $250	$251-$500	> $500
BGPT	R (as of 12/2012)		
CORN		R	
COVE		R	
DANB		R	
FAIRF	R		
GRNCH			R
HAMP		R	
MANC		R	
MLFD	R		
MTWN			R
STAM			R
W HRT		R	

39. Specify an exact amount in dollars and specify the contributing components of this fee.

BGPT	As of Dec 2012, ~$50. The cost of the class-1 renewable system is not included in the permit fee calculation
CORN	$25 for first $1,000 (minimum), then $7 for each $1000 or part there-of
COVE	Varies based on construction value at $15.00 per $1000.
DANB	$22 for first $1,000, then $11 for each additional $1,000; no ceiling
FAIRF	$50.26 for 1st $1k, then $12.26 for every additional $1k, then $6 for every $k over $10M
GRNCH	$13.26 per $1,000 Res
HAMP	$10 per $1,000
MANC	$20 first $1,000 and $15 per each additional $1,000
MLFD	$15 for the first $1,000 in value; $12 for each subsequent. $0.26/$1,000 goes to the state.
MTWN	$15.26 for first $1,000 then $14.26 for each additional $1,000
STAM	$12 per 1,000
W HRT	$32.26 for first $1,000 and $17.26 for each additional $1,000

40. What is the average total amount charged for the applicable permit fee(s) for typical commercial installations?

	≤ $1000	$1001-$2000	> $2000
BGPT	C		
CORN	C		
COVE		C	
DANB	C		
FAIRF	C		
GRNCH	C		
HAMP	C		
MANC		C	
MLFD	C		
MTWN	C		
STAM			C
W HRT		C	

41. Specify an exact amount in dollars and specify the contributing components of this fee.

BGPT	A bit higher than residential at ~$150
CORN	$25 for first $1,000 (minimum), then $7 for each $1000 or part there-of
COVE	Varies based on construction value at $15.00 per $1000.
DANB	$18 for each $1,000, no ceiling
FAIRF	$50.26 for 1st $1k, then $12.26 for every additional $1k, then $6 for every $k over $10M
GRNCH	$15.26 per $1,000 Commercial.
HAMP	$10 per $1,000
MANC	$20 first $1,000 and $15 per each additional $1,000
MLFD	$15 for the first $1,000 in value; $12 for each subsequent. $0.26/$1,000 goes to the state.
MTWN	Same as residential
STAM	$16 per 1000
W HRT	$32.26 for first $1,000 and $17.26 for each additional $1,000

42. Is/are the permit fee(s) structured as flat, cost recovery, valuation open ended, valuation capped, valuation with exclusions, or other structure?

	Flat	Cost Recovery	Valuation Open Ended	Valuation Capped	Valuation with Exclusions	Other
BGPT		R/C				
CORN			R/C			
COVE			R/C			
DANB			R/C			
FAIRF			R/C			
GRNCH			R/C			
HAMP			R/C			
MANC		R/C				
MLFD			R/C			
MTWN			R/C			
STAM			R/C			
W HRT			R/C			R/C

43. You selected Other. Specify what type of permit fee structure you use.

W HRT	Commercial requires fire marshal plan review fee

44. Please elaborate on how this fee is calculated, providing an example(s). (Indicate applicability to residential and/or commercial installations)

BGPT	Based on value of the work. If it is a building permit then a certificate of occupancy will be required and thus the fee
CORN	Fee is based on "true" value of construction. Occasionally an affidavit of value is required.
COVE	Permit fees based on construction value – materials and labor $15 per $1000 for both residential and commercial
DANB	Residential: $22 for first $1,000, then $11 for each additional $1,000; no ceiling Commercial: $18 for each $1,000, no ceiling
FAIRF	1st $1,000 is $50 + $0.26 rounded up = $51 and $12 + $0.26 for every thousand after rounded up to the nearest $
GRNCH	$15.26 per $1,000 of valuation for Commercial. $13.26 per $1,000 of valuation for Residential.
HAMP	Valuation - $10 per $1,000 of value
MANC	Fee schedule
MLFD	$15 for the first $1000 in value; $12 for each subsequent. .26/$1000 goes to the state. For zoning approvals there is a flat $85 fee of which $60 goes to the state.
MTWN	$15.26 for 1st thousand; $14.26 for every thousand thereafter; same for residential & commercial
STAM	$12 per 1000, residential, $16 per 1000 commercial. Certificate of approval $25 (residential), $75 (commercial)
W HRT	$32.26 for first $1,000 and $17.26 for each additional $1,000

45. Are there any conditions for which there is an exemption or discount on the permit fee? If Yes, what are the conditions and how much? (Indicate applicability to residential and/or commercial installations)

BGPT	The only fee exemption is for city projects done by city employees
CORN	Not really, but the selectman can waive the fee for certain projects (e.g. - school projects). Paul mentioned "only the rich can afford PV"
COVE	Town property is exempt but State Education Fee is still required. State Education Fee is 0.26 per $1000
DANB	City projects and cultural projects (cultural non-profits)
FAIRF	Town projects
GRNCH	No
HAMP	Town Buildings
MANC	Town projects 0.26 per 1,000
MLFD	Municipal projects are exempt but by statute the state fees must always be paid.
MTWN	City projects (must still pay state fee)
STAM	If solar system can be installed without building permit and only needs mechanical, electrical and/or Plumbing (MEP), then there is no fee.
W HRT	Only town-owned properties.

46. Are there any situations in which a fine may be issued for non-compliance, and if so what are the conditions and fines? (Indicate applicability to residential and/or commercial installations)

BGPT	R: Double fee for work being done without permit. The City adheres to the State of Connecticut penalties
CORN	$200 additional charge/fine if construction begins before permit is accepted. Fine rarely occurs and never has for PV work.
COVE	Work done without a permit will add $100 to the permit fee. There is also a $25 re-inspection fee for failure to cancel inspection if work is not ready for scheduled inspection.
DANB	No, but a stop work order can be issued and a contractor can be required to tear out all prior changes made to a structure and re-start after the permit is granted.
FAIRF	$700-$1,000 fine for work started w/ out permit
GRNCH	$200 investigation fee for work started w/o a permit - both
HAMP	No
MANC	Double fee for work started without a permit.
MLFD	Technically, we can issue a fine for violation of the state building code but I cannot recall any time when this has been done. We do not issue zoning fines.
MTWN	No fines. Not much in terms of non-compliance because CL&P needs Dean Lisitano's approval before system can be powered on.
STAM	Only time would charge during inspection process is if they call an unneeded inspection or if they did not correct errors that were identified before final inspection. In both cases, the fine is $50.00.
W HRT	Work without a permit- fine is 2 times permit fee with maximum of $100 fine.

47. To what degree do you use the Solar ABCs expedited permitting process template for typical residential installations? (Please see Survey Instructions)

	Default Template	Optional Template	Have Reviewed and Considered	Unaware/ Reject
BGPT			X	
CORN				X
COVE			X	
DANB				X
FAIRF				X
GRNCH				X
HAMP				X
MANC				X
MLFD				X
MTWN				X
STAM				X
W HRT				X

48. Comment about use of Solar ABCs expedited permitting process template (Indicate applicability to residential and/or commercial installations)

COVE	Statewide acceptance of this template process would certainly help expedite the approval process.

49. What is the average number of business days from inspection request to actual inspection? Provide exact answer in terms of hours (e.g., 5 business days should be entered as 40 hours)

	Residential	Commercial
BGPT	16-56	16-56
CORN	24 (max)	24 (max)
COVE	24-48	24-48
DANB	8	8
FAIRF	72-96	72-96
GRNCH	24	24
HAMP	40	40
MANC	24	24
MLFD	24	24
MTWN	40	40
STAM	40	40
W HRT	24	24

50. Is the installer provided with a specific appointment time for the final onsite inspection, or a window of time?

	Specific Appointment Time	Window of Time
BGPT		R/C
CORN	R/C	
COVE		R/C
DANB		R/C
FAIRF		R/C
GRNCH		R/C
HAMP	R/C	
MANC		R/C
MLFD		R/C
MTWN	R/C	
STAM		R/C
W HRT		R/C

51. Specify the window of time in terms of hours. (e.g., 5 business days should be entered as 40 hours)

BGPT	0.5 hour
COVE	2 hour window
DANB	2 hour span, to occur the next business day after the inspection is requested/approved
FAIRF	1 hour (if contractor calls day of appointment, they can get a more specific time)
GRNCH	2 hours
MANC	2 Hours – can be more specific day of inspection
MLFD	2 hours
STAM	4 hours
W HRT	9-12 PM or 1-2 PM. However, if you book first AM or 1PM, then window is only 40 minutes or so.

52. How is information on inspection requirements made available? (Check all that apply)

	Online	Email	In person	Mail	Phone	Not Available
BGPT	R/C	R/C	R/C		R/C	
CORN			R/C		R/C	
COVE	R/C	R/C	R/C	R/C	R/C	
DANB	R/C		R/C		R/C	
FAIRF		R/C	R/C	R/C	R/C	
GRNCH	R/C			R/C		
HAMP			R/C		R/C	
MANC		R/C		R/C		
MLFD						R/C
MTWN	R/C		R/C			
STAM	R/C				R/C	
W HRT	R/C		R/C	R/C		

53. How many separate inspection trips are required? (Check all that apply)

	Single Comprehensive Inspection	Electrical Rough-in	Electrical Final	Roof Penetrations (pre-install)	Structural/ Building Final	Other
BGPT		R/C	R/C			
CORN			C	R/C		
COVE	R/C					
DANB			R/C	R/C		
FAIRF				R/C	R/C	
GRNCH		R/C	R/C		R/C	
HAMP	R/C					
MANC	R/C					
MLFD					R/C	
MTWN	R/C					
STAM		R/C	R/C	R/C		
W HRT	R	C	C		C	All in one trip

54. How many people do you employ and subcontract to for conducting inspections? (Enter numbers in blank spaces). (Note: An FTE amounts to 2000 hours per year, or 40 hours per week times 50 weeks per year)

	FTE (R)	FTE (C)	# Subcontractors (R)	# Subcontractors (C)
BGPT	5	5	0	0
CORN	0	0	0	0
COVE	1	1	0	0
DANB	8	8	0	0
FAIRF	5	5	0	0
GRNCH	8	8	0	0
HAMP	1	1	0	0
MANC	5	5	0	0
MLFD	1	3	1	0
MTWN	2	2	0	0
STAM	5	5	0	0
W HRT	4	4	0	0

	Part-Time (R)	Part-Time (C)	Total # Subcontracted Hours Per Year (R)	Total # Subcontracted Hours Per Year (C)
BGPT	0	0	0	0
CORN	0	0	0	0
COVE			0	0
DANB				
FAIRF				
GRNCH	2	2		
HAMP	0	0	0	0
MANC	1	1		
MLFD				
MTWN				
STAM	1	1		
W HRT	1 (1000 hrs.)	1 (1000 hrs.)		

55. Comment on how you estimated residential versus commercial workforce.

BGPT	Same – based on first come, first serve
CORN	Same person does both
COVE	Same person conducting residential and commercial
DANB	8 total full-time inspectors, which cover both commercial and residential
FAIRF	no split
GRNCH	Don't understand the question
HAMP	Same
MANC	Same staff covers both when necessary
MLFD	We don't specialize but we do a lot of residential projects.
MTWN	Same staff cover both. Two total, but Middletown is in the process of hiring one additional FTE.
STAM	Everyone shares. No one works on exclusively residential or commercial projects
W HRT	Our inspectors are cross-trained and do both commercial and residential.

56. Do the utility and local jurisdiction coordinate regarding inspection requirements and on-site inspection times for the permit and interconnection inspections?

	No	Yes
BGPT		R/C
CORN	R/C	
COVE	R/C	
DANB	R/C	
FAIRF	R/C	
GRNCH	R/C	
HAMP	R/C	
MANC		R/C
MLFD		R/C
MTWN	R/C	
STAM		R/C
W HRT	R/C	

57. You selected Yes. Specify how the utility and local jurisdiction coordinate on inspection and interconnection.

FAIRF	Once permit approved, building office calls automated utility service to confirm.
MANC	Direct access to utility tech assigned to area.
MTWN	CL&P has an inspector website that they go on and Dean Lisitano makes his approval/denial. Calvin Hart (CL&P employee), also lives in Middletown, is the City's contact person. CL&P approval process make take the longest time.
STAM	Need release from municipality saying applicant has been approved before proceeding with scheduling

58. What are the benefits of and what are the difficulties of coordinating these inspections? (Indicate applicability to residential and/or commercial installations)

BGPT	UI marches to own time table, not all there at one time
CORN	The installers coordinate directly with the utilities (building office has no direct role)
COVE	The building official calls CL&P to approve installation. The interconnection by the utility can take quite a bit of time. Not really anything that muni can do to speed up the process.
DANB	N/A
FAIRF	None
GRNCH	Inspections are scheduled by the permit applicant
HAMP	N/A
MANC	A quicker service connection; there are no difficulties.
MLFD	N/A
MTWN	Yes; CL&P has an inspector website that they go on and Dean Lisitano makes his approval/denial. Calvin Hart (CL&P employee), also lives in Middletown, is the City's contact person. CL&P approval process make take the longest time.
STAM	Don't usually have a problem. They coordinate scheduling in accordance with approval of permits.
W HRT	N/A

59. Is there any communication between the utility and local jurisdiction that is aimed at expediting interconnection? (Indicate applicability to residential and/or commercial installations)

BGPT	Depending on nature, we'll coordinate appointments, but very little communication
CORN	No
COVE	No
DANB	N/A
FAIRF	N/A
GRNCH	Inspections are scheduled by the permit applicant
HAMP	N/A
MANC	Yes, both residential and commercial
MLFD	N/A
MTWN	No
STAM	No
W HRT	Once inspection is completed and approved, inspectors send in OK via e-mail to utility

60. How long did it take you to complete this survey? Incorporate time spent gathering data and information into your figure.

BGPT	2.25 hours
CORN	1.5 hrs.
DANB	1 hour
GRNCH	Too Long
MANC	3.5 hours
STAM	45 minutes
W HRT	2.75 hours including research

Appendix III

Installer Permitting Survey

Installer Survey Report

The CEFIA Sun Rise New England team distributed a survey to 14 solar PV installers working in the State of Connecticut. The questions below contain feedback given by installers on the current state of the permitting and inspection process for rooftop solar in Connecticut. Text answers have been edited for grammar and spelling.

1. In which of the following Connecticut towns have you installed rooftop solar PV systems? (Check all that apply)

Town	Residential	Commercial	Responses
Cornwall	3	0	3
Coventry	3	0	3
Danbury	5	2	7
Fairfield	7	3	10
Greenwich	5	2	7
Hampton	5	2	7
Manchester	4	1	5
Middletown	7	2	9
Milford	5	1	6
New Haven[64]	7	3	9
Stamford	5	3	8
West Hartford	5	0	5

2. Compared to other towns in CT, where do these towns stand in terms of the amount of time required to secure a permit (including completing the application and receiving approval)?

Town	C/R	Significantly Slower than Average	Slower than Average	Average	Faster than Average	Significantly Faster than Average	N/A
Cornwall	Res.			1			
	Com.						
Coventry	Res.			2	1		
	Com.						
Danbury	Res.		1	1			1
	Com.			1			1

[64] Bridgeport replaced New Haven as a project participant but it was after this installer survey had already been conducted. We received a completed permitting survey directly from Bridgeport, so obtained a lot of information from that survey. Additionally, the findings from the installer survey were largely aggregated to help identify overall opportunities for improvement.

Fairfield	Res.		1	1	2	1	
	Com.		1				
Greenwich	Res.	1		1			1
	Com.			2			
Hampton	Res.			2	1		
	Com.			1	1		
Manchester	Res.						
	Com.						
Middletown	Res.	1		1	1	2	
	Com.						
Milford	Res.	1	3	1			
	Com.						
New Haven	Res.	1		2	1		
	Com.	1					
Stamford	Res.	2		1			
	Com.		1	1			
West Hartford	Res.			1			
	Com.						

3. Please comment on the time required to secure a permit. Are there reasons why this town is faster or slower to process permits? Please comment on issues such as the number of visits required to permit offices, the number of different departmental approvals required, and your travel time. Please indicate the applicability of your comments to residential and/or commercial installations.

Town Name	Text Response
Cornwall	• Permitting is quick and straightforward. Everything can be done by mail.
Coventry	• Town is typical of many smaller towns. The applicant goes to the building department, fills out an application and leaves it with the secretary along with the appropriate documents and payment. The inspector then reviews the application at a later time and the permit is mailed to the contractor.
Danbury	• Danbury requires permitting to be done in-person. Getting information for required documents is inaccurate or incomplete. Hence, multiple trips were taken before we fully understood that we were misinformed. • Permits were still required despite the project being for two Danbury schools. Two trips for each commercial installation were required.
Fairfield	• Although permits are issued on the same day, the applicant needs to go around the Town Hall to collect various signatures. In addition, there are usually long lines at the building department. • This town requires multiple visits because you have to obtain signatures from multiple departments in multiple buildings. Unlike a simple electrical permit which they will sign off on right away, solar rooftop permits require multiple departments which take time, especially since it is not guaranteed that the necessary contacts are in the office. In addition, there is only a limited time to get permits which is in the morning maybe around 8:30 to 10. • The requirement of an engineer stamp letter for load and wind lift is the biggest hassle. You do not need this letter when building a second story addition or roofing but you need it to install a solar system weighing less than a layer of shingles. On the other hand I am starting to see and be called for spotty workmanship and can see the point. • There needs to be continuity in the permit process throughout the state. Some towns such as Cheshire require two weeks of review. Some towns do not require any review • Fairfield needs no appointment AND they give you the permit the same day
Greenwich	• Took about two weeks and the permit was mailed. Lack of interest and knowledge of PV slowed down process. • 2 visits with not much effort required - school under construction so we just piggy backed on the existing electrical permits • Took 3-4 weeks to obtain permit
Hampton	• Town of Hampton building inspector is only available one night a week for 2 hours. This makes obtaining a permit an inconvenience sometimes. • Due to part time building department it may take extra time

Middletown	• Middletown issues permits same day and the applicant need not gather signatures from other offices. • Online portal had a tremendous positive impact on securing the permit. However the inspection schedule was significantly and unexpectedly bad. Two weeks out. When normally you can have a system inspected same day. Definitely room for a SIP.
Milford	• Permit is issued same day but the applicant needs to collect many signatures from other offices. The Tax Collector and Zoning take significant time. • Permit process seems arbitrary, Permit hours are very limited , lines of up to one hour long will form and if you exceed the time window for permit application submittal you may have to come back again. • There is no continuity from town to town. It is challenging to obtain a permit when the installer does not know the requirements from town to town. • Some towns require approval from multiple departments, some unnecessary.
New Haven	• Permit is issued same day. • This again takes multiple trips and a long time frame to get the permits. The electrical inspector must review the materials and he is usually not in the office. So you have to come back in person to drop off the files, review the paperwork and pay the fees. You can't do it all in one trip. • In the past only Electrical permit application have been required for roof mounted systems where sealed structural engineering plans are provided. The chief electrical inspector David Kaplan is knowledgably, friendly, and helpful.
Stamford	• Even though the permit is issued on the same day, the applicant must collect a myriad of signatures (Tax Collector, WPCA, EPB, Zoning) and it can take 3-5 hours because lines are so long. • Process is refined, and requires a plan review on all projects. Plan review must be scheduled in advance and has set hours. The plan review process could be expedited if a list of criteria, drawings types and document required was provided by the building department. • Residential permits much more difficult to obtain than large commercial installations. Now working on small solar project for the City and permits were very difficult for their own project!

4. Compared to other towns in CT, how reasonable is the permit fee amount?

Town Name	R/C	Significantly Below Average Fee	Below Average Fee	Average	Above Average Fee	Significantly Above Average Fee	N/A
Cornwall	Res.			1			
	Com.						
Coventry	Res.			1	1		
	Com.						
Danbury	Res.			1	1		1
	Com.			1			1
Fairfield	Res.		1	2		1	
	Com.					1	
Greenwich	Res.				1		1
	Com.						1
Hampton	Res.		1	2			
	Com.		1	1			
Manchester	Res.						
	Com.						
Middletown	Res.			3			
	Com.						
Milford	Res.			3	1		
	Com.						
New Haven	Res.			1	1	2	
	Com.				1	1	
Stanford	Res.			1	2		
	Com.			1	1		
West Hartford	Res.			1			
	Com.						

5. Please comment on the permit fee amount and how fairly you believe the fee is calculated. Please indicate the applicability of your comments to residential and/or commercial installations.

Town Name	Text Response
Cornwall	• Fee reasonable compared to surrounding towns. Usually .8% of pre-rebate system cost.
Coventry	• I think all permit fees are a bit high in CT
Danbury	• City should not have permit fees for school buildings.
Greenwich	• High for the cost of the system. Especially, in light of the difficulty in getting the permit. • No fee on school project
Fairfield	• The permit fee is based on full value of solar, not taking into account what the actual customer is paying after rebates which can be 70% less. VALUE means what the person is willing to pay. It does not mean full cost of the project. • No different from when obtaining an electrical or building permit. Solar is not higher or lower than these permits.
Hampton	• I feel any fees for a solar PV permit are too much.
Middletown	• We have no visibility into how the fees are calculated and therefore cannot comment. Ultimately the fees are passed onto the customer. We would like to see them reduced to a flat rate per job and not calculated on the value of a job.
Milford	• Towns would benefit from setting fees based on kW capacity. Then it would not be a guessing game on "contract Value." The problem with contract value calculations is that the value must account for Building permit fees which means you're paying a fee on a fee. In addition, many times we sign a lease contract where the construction does not actually have a value in the contract document. • Fee is fair, calculated by total job cost
New Haven	• Very expensive compared to other towns! • Very High Permit fee even for a small residential project. The cost can exceed $500 for a small 5 KW project.
Stamford	• Fees in the CT cities are quite a bit more than in your more common town.

6. Compared to other towns in CT, please indicate your overall experience in acquiring permits in this town.

Town Name	R/C	Significantly Harder than Average	Harder than Average	Average	Easier than Average	Significantly Easier than Average	N/A
Cornwall	Res.			1			
	Com.						
Coventry	Res.			2			
	Com.						
Danbury	Res.		2				1
	Com.			1			1
Fairfield	Res.	1	1	1	1		
	Com.	1					
Greenwich	Res.	1					1
	Com.				1		
Hampton	Res.			3			
	Com.			2			
Manchester	Res.						
	Com.						
Middletown	Res.			1	1	2	
	Com.						
Milford	Res.	2	1	1			
	Com.						
New Haven	Res.		1	2	1		
	Com.		1		1		
Stamford	Res.	2		1			
	Com.		1	1			
West Hartford	Res.			1			
	Com.						

7. Please highlight any best practices that make the overall permitting process in this town more efficient and streamlined. Are there other aspects that are particularly burdensome or difficult? Please indicate the applicability of your comments to residential and/or commercial installations.

Town Name	Text Response
Coventry	• This town is nice to work with because the applicant just fills out an application and drops off paperwork. However, it can be annoying to have to drive all the way out to the town just to be there for less than five minutes. • Having to include a PE stamped structural letter in the submitted application packet is burdensome.
Danbury	• They always require a Building permit and Electrical permit. Many towns will only require an Electrical permit for roof mounted PV systems when a Sealed Engineering letter/plans are provided for the structural component of the project. The building permit process in most towns is typically much more drawn out and costly.
Fairfield	• Harder given the process of gathering signatures from multiple offices takes time and the long lines at the building department can be time-consuming. • For rooftop solar, there should be a one page application just like electricians use for an electrical permit. There should be one department you have to go to, not multiple departments and multiple trips. You should also have an online application that you can upload all the files and pay by credit card. • Educate the inspectors. Most are not comfortable because there is no continuity between towns in the inspection process. • Applicable to residential: quick, one-stop process.
Greenwich	• More knowledgeable staff with regards to solar PV.
Hampton	• One night a week is difficult and slows down the project
Milford	• The scavenger hunt for signatures is annoying; the town requires engineering which adds significant cost to the project; inspections are difficult to schedule. • More continuity from town to town on requirements. Educate the inspectors • Plumbing and zoning -> burdensome when installing on the roof. Streamline when town has specific guidelines for solar installations
Middletown	• Permit issued same day; no long lines; no scavenger hunt for signatures. • Online permitting definitely adds efficiency. • Positive factor includes standard requirements that are posted on the town's web site so that an installer is well prepared and can secure the permit in one visit. • Merchant account capabilities are definitely a problem for towns. Checks and cash are such outdated methods of payment. We utilize Square, not sure why the town cannot adopt the same technology. • Many of our experiences seem to indicate that the towns are out of touch with standard ITIL practices and rather than continuously improve their services, they remain the same and do not adapt to the needs of their customers. This can be very discouraging for new startups as it presents a logistical challenge that is avoidable.

Stamford	• Very long permitting process. After the job is complete, inspections are very difficult to schedule. Once the inspection has passed, the contractor has to go back to City Hall to close-out the permit. This entails going back to all departments for signatures - like securing the permit, this process takes a few hours. They also require a final as-built letter from the engineer, which along with the required engineers report to pull the permit, adds even more cost that has to be passed on to the homeowner. • Electrical inspectors are very knowledgeable and "up to snuff" on PV systems

8. Please estimate the total number of man-hours required to secure a rooftop solar PV permit in CT (excluding travel time).

Fast Permit Process		Average Permit Process		Slow Permit Process	
Res.	**Com.**	**Res.**	**Com.**	**Res.**	**Com.**
2	2	30 minutes		8	12
10 minutes	-	6	8	hours, days	-
2	2	3	-	16	30
2	-	1	2.5	8	-
0.25	1	10-20 min	10-20 min	3	4
2	3	4	-	5-6	7
0.5	-	3-4	5	>2	-
-	-	2	-	-	-
-	-	7	6	-	-

9. Regarding the amount of time required to secure permits, please comment on best and worse practices you have observed both in and outside CT. When applicable please include the towns/states that employ these practices.

Text Response
• See notes about Stamford. In addition, Stamford requires two forms of the building permit application to be notarized and two forms be signed by the homeowner - very inconvenient! • Greenwich requires a form be signed by the homeowner and notarized - this can be difficult to coordinate with the homeowner. • Lebanon allows contractors to mail permit applications and then the town will mail the permit to the contractor when approved - this is the easiest and most time-saving of all. • Newtown is similar to Stamford in that the applicant needs to get many signatures. They also require that the applicant pick up the permit after it is approved - they will not mail it. After the job is complete, the contractor has to go back to the building department in person to close-out the permit. • Norwalk permits are issued by appointment only, and the applicant needs to gather many signatures beforehand. This can be difficult to coordinate if the applicant does not want to make two trips to City Hall. • Southbury requires applicants to apply for a zoning permit first. After that has been approved (can take a few weeks), the applicant must come back to Southbury to apply for the electrical permit in person. They also require a notarized form. • Waterford is the same as Southbury. • Making two separate trips to a town hall is very inconvenient and a waste of time. • There are many towns similar to Coventry that the applicant fills out the permit applications and leaves it with the documents and once the inspector approves them, the permits are mailed. This is the easiest, except it can be annoying to have to travel long ways just to be there for less than five minutes. • These towns should be like Lebanon and accept mailed-in permit applications.
• Best practice: Submit the application package, pay the clerk and within a few days you have the permit. • Best practice: Fill out the form online, pay online and the permit is issued within a week. • The worst practice is requiring in person applications during a short morning period and requiring multiple trips to acquire multiple signatures from different departments. • Trumbull is a worst case example. • Durham and East Haddam are the best examples.
• The best experiences to date have been with Bristol, Middletown and E. Windsor. • The most challenging practice we have observed was a W. Hartford permit. • Regarding fees: Fees are based on the value of the contract, therefore we cannot present the average or highest fee for obvious reasons.
• This would account for time spend in building dept/town hall. This does not include permit application rejections for discrepancies or subjective matter.
• Some towns require a health department permit (Woodstock for a ground mount system). This slows down the process since the average time takes a week to obtain this permit.
• The inspectors need to be educated and more comfortable with solar PV. Some take up to two weeks to review a simple residential plan. This is mainly due to under staffed departments
• No consistency
• We mail all our permit packets to the towns
• Stumbling blocks more often come from the lack of understanding of PV systems or oddball interpretation of rules. For example, Falls Village requires a P&Z sign-off roof-mounted PV (costs $75) to determine that the system does not cause the home to exceed height regulations. Doesn't matter how many times you tell them a properly designed system sits below the ridgelines.

10. Regarding permit fees, please provide the following information to the best of your knowledge.

Average permitting fee in CT		Highest Fee and Town(s) with highest fee(s)		Lowest fee and Towns(s) with lowest fee(s)	
Residential	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
$300	$600	$650	$1,500	$150	$200
$400	$800	$600 New Haven	$1,200 New Haven	$200 Durham	$300 Durham
unknown	unknown	unknown	unknown	Unknown	Unknown
Depends on cost of project		$27/$1,000, New Haven	Bridgeport	$6/$1,000 Kent	$12/$1,000 Trumball
$13.50/$1,000	$14/$1,000	$25/$1,000		Litchfield	
$15/$1,000				$8.50/$1,000	
$15/$1,000					

11. Regarding permit fees, please comment on best and worst practices that you have observed both in and outside of CT. Have you observed whether different fee structures are more/less effective (e.g. flat fees, cost recovery, valuation open ended or capped, etc). Where possible, please include the towns/states that employ these practices and indicate applicability of your comments to residential and/or commercial installations.

Text Response
• Flat fees seem to work the best for residential-MA & FL towns seem to have more of a flat fee structure. A flat fee would be great for commercial projects. Currently fees are uncertain adding difficulty to planning the project and creating a budget.
• In my experience, every town has permit costs that are a certain amount of money per thousand dollars. This rate varies between towns. A small PV system in New Haven can cost the same as a large PV system in another town that is not as expensive. Since the contractor does not know the rates when closing a sale, the permit fees are usually under-estimated.
• A town with a limited fee is Durham. They are very good with permit processing and reduced fees. • The worst towns are New Haven, Trumbull and some small towns in Fairfield County.
• There are no primary standards, again making it very difficult to navigate and accurately prepare customer proposals.
• Fixed fee based on System Capacity would be an effective way to build permit fees into project costs and eliminate the guessing game.
• All towns I have obtained permits in have been based on the cost of the job. The Town of Shelton CT requires a roof analysis by a PE
• It is dictated by the Municipality and I have no comment on their budget
• No. All towns calculate the permit fee the same way. Regulating these fee schedules would be the most advantageous
• Having basic knowledge of PV system requirements greatly speeds up the process. Even if additional departments need to weigh-in or approve. Knowing who to contact, what the process requires and how much it costs on the phone prior to the appointment or waiting in line, greatly speeds up the process. Building department personnel that are unfamiliar with PV slow things down.

12. Have you used online permitting systems for solar PV permits (or other types of permits) in CT or elsewhere? If so, please indicate the town/state and comment on how they have helped or hindered the permitting process. If possible, please also provide the name of the online system.

Text Response
• We have not done online applications as we need to hand in documentation.
• I believe the online permitting system is for regular building permits only, not for solar.
• Yes, North Haven has an online application but they did not process it properly and still required the electrician to come into the office, which negated the point of having the online application. But the process of filling out everything online and uploading documents and paying online was a step in the right direction.
• Yes, Middletown. A very good experience
• Litchfield and Harwinton I believe. Online process is nice because Permits and Signoffs are all emailed out. Cuts down on lag time between inspection and signoff's

13. Please provide an overview of the best and worst practices for rooftop solar PV permitting both in CT and elsewhere. What methods or systems help/hinder the most in securing permits?

Text Response
• Requiring structural engineering for residential homes is too much money and time. This is required by West Hartford.
• For rooftop PV systems, allowing an Electrical permit application only when structural engineering plans/letter is provided is simplest way to obtain proper technical information and also have the properly qualified Structural engineer sign off and assume liability.
• Best practices: Have all your paperwork ready (electrical diagrams, site plans, system specs) • Town of Shelton required a PE stamp for a roof analysis. This caused a major delay and added expense to the homeowner. In my opinion this was not needed. Any building inspector knows that a solar system will not compromise the structure with a 2x10 rafter 16 in on center with a 45 degree pitch.
• Help = Educating the inspectors Hinder = not educating the inspectors
• Help: Speaking with building inspector beforehand to go over required documentation. If town has experience with PV= good. If doesn't have experience with PV= bad/slow Hinder: Planning and Zoning approval for roof-mounted systems prolongs permitting process Planning and zoning fees increase cost of permitting
• No consistency between towns and projects

14. From your perspective, what aspects of the solar PV business in Connecticut (either residential and/or commercial) could be improved? While this project is focused on reducing non-hardware costs (and in particular, permitting), we welcome additional information that may inform other initiatives.

Text Response
• Uniform permit application, documentation required and fee structure
• Solar standard form just like an electrical permit form used in CT. There needs to be a streamlined program that all towns understand and use for ROOFTOP solar. This is not complicated. Electricians have simplified their permit process and they get permits on the spot using a simple yellow form.
• Speaking from experience as a grass roots organization, we are pleased with how CT's PV practice has evolved in just the last three years. That said, there is always room for improvement. Therefore, streamlining the rebate process is one opportunity. • Increased CEFIA PV marketing would certainly help educate the general population and drive our joint PV objectives. • Providing more lead time on RFP's would be helpful and improved ZREC program • Awareness/education towards our CT commercial community would help take the explanation out of our presentation decks so that we can focus on the design and installation side of the project.
• Sunset the PV license it is electrical work
• Do not require sealed engineering for residential systems: Installers assume responsibility
• Focus on market wide programs and efforts, not town or installer specific. There is a very strong market in CT that CEFIA was instrumental in getting ramped-up. All programs/efforts should leverage this by providing access to all approved installers. It is probably impossible to create a more efficient process than a strong market to best protect ratepayers and incentivize competition. The economic road is strewn with the wrecks of market manipulation.
• A better ZREC program - need more frequent auctions to have a stable industry
• A standardized permitting process, mandated by the state is the only way towns will change. As frustrating as the permitting process can be…the expense is relatively insignificant and typically accounts for less than 1% of the total project cost.
• Open Secret that the fees based on construction value are high relative to the burden placed on inspectors.

15. Please provide a rough estimate of how many people you employ and subcontract to for your solar PV installation work in Connecticut. If unsure of your residential versus commercial workforce, please estimate.

Full-Time Employees		Part-Time Employees		Sub-Contractors	
Residential	Commercial	Residential	Commercial	Residential	Commercial
4	2	5	2	6	8
10		2		1	
4	4	0	0	6	6
2	2	0	Mix	4	10
18	Mix	2		2	Mix
1		1	0	2	
4		5		1	2
3	5		2	3	
2				1	3
	5				

Appendix IV

Planning & Zoning – Example Solar Access Ordinances

Permitting and Recordation Ordinance

Permitting and recordation ordinances protect a home owner's investment in a solar collector by creating a "first-in-time, first-in-right" system that preserves the solar collector's access to sunlight. If the owner of solar collector successfully obtains and records a solar access permit, future construction will not be allowed to obstruct solar access. Such an ordinance should include the following elements:

- **Record solar agreements:** The ordinance should provide a recordation procedure that provides for documentation of solar easements, agreements, and permits in the local land records.
- **Establish Guidelines for Permits:** The ordinance should issue solar access permits based on a "first-in-time, first-in-right" concept, and should not place any restrictions on vegetation or structures that predate the collector. The ordinance should provide for a permit to be revoked if it is not put to beneficial use—i.e., the owner removes its solar panel or the panel falls into disrepair. The ordinance should provide for a maximum time period of non-use before the permit is terminated. The ordinance should provide an exception for de minimis obstructions of a solar collector that arise after recordation, and should define what level of obstruction qualifies as de minimis.
- **Establish Procedure for Obtaining Solar-Access Permits:** The ordinance should create a clear procedure for obtaining a solar-access permit, which includes, at a minimum, notification of potentially affected property owners, ability for affected property owners to request a hearing on the issuance of the permit, and opportunity for appeal. The ordinance should provide for criteria for when the permit will or will not be granted. For example, the ordinance may provide that the permit will not be granted if a neighboring land owner can provide evidence of pre-existing plans to build a structure that will obstruct the solar panel. This procedure may also include a mechanism for cost-allocation or recovery to affected property owners.
- **Outline Access Reconciliation Procedures**: The ordinance should provide a remedy for interference with a permitted solar collector. For example, if a neighboring property owner's tree obstructs a pre-existing solar panel, the neighboring property owner should be responsible for the costs of trimming the restricted vegetation. Permits should not be granted to neighboring property owners for structures that will obstruct a pre-existing permitted solar collector.

Solar Envelope Ordinance

Solar envelopes provide a more comprehensive form of solar rights protection, and place more restrictions on neighboring properties than the "permit and recordation" ordinance model. For this reason, the "permit and recordation" model may be preferable for some towns. Solar envelope ordinances work by creating solar overlay zones that impose solar fences around a property on the property line. Shadows from structures on neighboring properties may not exceed a shadow that would be cast by the hypothetical solar fence on a certain day and time of the year. For example, Boulder, Colorado's solar envelope ordinance creates two different solar overlay zones, which create either a 12 foot or 25 foot solar fence that neighboring properties must comply with (i.e. the shadow from any building or structure on a neighboring property, may not exceed the shadow cast by a 12 ft or 25 ft fence on the property line, between 10-2pm on the winter solstice). Boulder combines the solar envelope model with the permit and recordation model by creating a third zone where no fence is

imposed because such fences might unduly burden development. In these no-fence overlay zones, solar access permits are available. It is thus possible to combine the solar envelope model and the permit and recordation model, depending on the needs and pattern of development of the municipality. If a town chooses to adopt a solar envelope ordinance, we recommend that it should include the following elements:

- **Define Applicable Structures:** The ordinance should exempt pre-existing structures from complying with the ordinance and should create an exemption for de minimis breaches of the solar fence, and should define what level of obstruction qualifies as de minimis.
- **Develop Calculation Method for Solar Envelope:** The ordinance should clearly define the scope and method of calculating a solar envelope. A variety of solar envelope models exist other than the solar fence model adopted by Boulder. Ashland, Oregon, for instance, uses a formula to ensure that buildings on properties on the south facing side of a property are a certain setback distance from their northern property line.
- **Specify Duration of Envelope:** The ordinance should specify the time frame for which the solar envelope is in effect. Many existing solar ordinances enforce the envelope to protect solar access from 9am to 3pm on the Winter Solstice—the day on which the longest shadows occur.
- **Determine Appropriate Envelope Overlay Zones:** The ordinance should only use solar envelope overlay zones where such zones are feasible in light of the development pattern of the underlying zones involved. Some neighborhoods may be well positioned to adopt such an envelope, while heavily developed neighborhoods or neighborhoods with a high-development potential may be ill-suited to the solar envelope model. Close evaluation of the development characteristics of a municipality's neighborhoods is required to determine whether this model is feasible.

Appendix V

Solar Orientation Worksheet for Proposed Subdivisions

Provide information below to describe the ways the proposed subdivision meets solar access requirements.

Street and Lot Layout

☐ Home lots are arranged on streets that run within 20 degrees of east/west to maximize solar exposure.

☐ Alternate compliance (describe below include attachments if required)

_____

_____

_____

_____

_____

_____

House Orientation

☐ Homes are designed or required to be designed in a manner that the longer axis of the house is aligned within 20 degrees of east/west in order to maximize solar exposure.

☐ Alternate compliance (describe below include attachments if required)

_____

_____

_____

_____

_____

_____

☐ Homes are designed or required to be designed so that at least one-third of roof surfaces receive unobstructed sun between 10 am and 2 pm as shown in attachment.

☐ Alternate compliance (describe below include attachments if required)

_____

_____

_____

_____

☐ Homes are designed or required to be designed so that primary living spaces include a southern exposure.

☐ Alternate compliance (describe below include attachments if required)

_____

_____

_____

_____

_____

_____

☐ Homes are designed or required to be designed so that at least 50% of window area contributes to passive heating during the heating season and are shaded in the cooling season. (attach calculations)

☐ Alternate compliance (describe below include attachments if required)

_____

_____

_____

_____

_____

_____

Vegetation

☐ Plantings support solar access as described below (include attachments if required).

_____

_____

_____

_____

_____

_____

Protection of solar access within the Development

☐ Subdivision regulations protect solar access including as-of-right rooftop solar installation as described below (include attachments if required).

_____

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_____

_____

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