Energy Sprawl in Connecticut

Why Farmland and Forests are Being Developed for Electricity Production; Recommendations for Better Siting

A Special Report of the Council on Environmental Quality **February 3, 2017**

One industry that continues to grow in Connecticut is the installation of photovoltaic equipment that converts sunlight to electricity.

Not all solar installations yield equal benefits. Solar panels on commercial rooftops, industrial lands and old landfills can be sustainable home runs. Unfortunately, Connecticut adopted laws and policies that encourage utility-scale solar photovoltaic facilities* to be developed on farmland and forest land. Connecticut was, and still is, unprepared to guide the placement of solar facilities to minimize their environmental damage.

Laws that encourage utility-scale solar facilities should remain in place but be corrected. Drawing on hindsight and five years of other agencies' experiences, the Council on Environmental Quality (CEQ) has identified two critical deficiencies and offers three recommendations to correct them.

Two Deficiencies, Three Recommendations

Deficiency: Selection criteria for renewable energy projects value short-term price above all else. DEEP selects renewable energy projects which promise to deliver electricity at the lowest cost while effectively excluding environmental siting considerations and long-term indirect or external costs. As a result, solar facilities are directed by the market to farmland and forest land and away from previously-developed land.

> **Recommendation 1: The General Assembly should amend renewable-energy procurement statutes (CGS Section 16a-3j) to require DEEP to give meaningful weight to non-price factors, including impacts to agricultural land, forest, grasslands and other natural resources.** (Note: The CEQ is not recommending that agricultural or forest landowners be prohibited from leasing their land to energy producers; the CEQ's recommendations are aimed at changing the manner in which state agencies steer projects to particular sites.)
>
> **Recommendation 2: Solar developers should realize substantial incentives if they use previously-developed land.** DEEP should be authorized to give substantial weight to projects that will fulfill state policy objectives such as redevelopment of previously-developed land. For brownfield sites, DEEP should coordinate with the Department of Economic and Community Development to determine what other incentives could be provided.

*Solar photovoltaic panels convert sunlight to electricity. This report considers "utility-scale" photovoltaic facilities to be those capable of generating more than two megawatts (MW) of electricity (after conversion to alternating current, or AC). A two MW facility usually will have about 8,000 panels across ten acres.

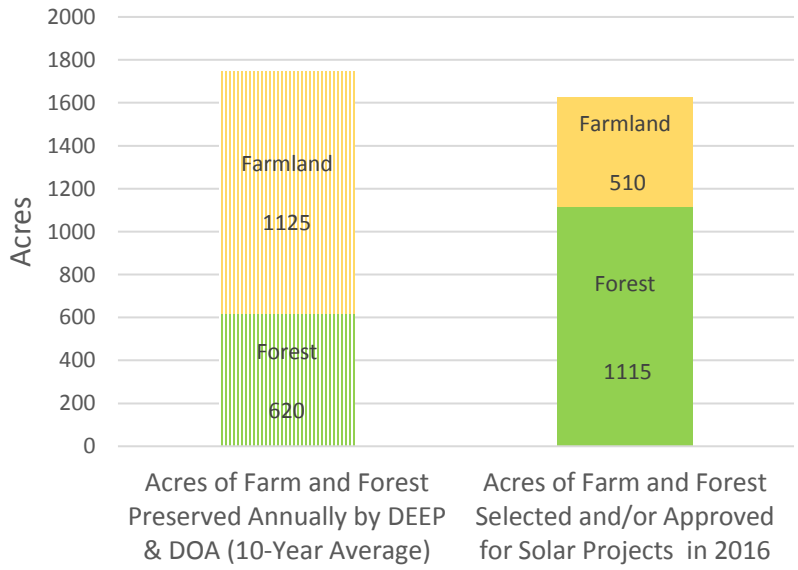
Deficiency: Utility-scale photovoltaic facilities must be approved by the Connecticut Siting Council (CSC) with very limited discretion. The CSC, required to approve solar facilities by declaratory ruling, cannot deny approval if a solar project meets DEEP's air and water standards. Except where wetlands are affected, forests and other natural resources are not factors in siting approvals. (Municipal regulation is pre-empted.[1])

> **Recommendation 3: Utility-scale solar developments should be required to obtain a Certificate of Environmental Compatibility and Public Need from the Connecticut Siting Council.** Current statutes (CGS Section 16-50k) require the CSC to approve such projects by declaratory ruling. The Certificate is the approval tool for most facilities regulated by the CSC, from power plants to cell towers. In addition, the General Assembly should amend the statute to require the CSC to consider impacts to agricultural land in all decisions.

Hindsight

Important laws to encourage renewable energy development were adopted in 2005, 2011, 2013 and 2015. Probably few residents in 2005 realized that, by 2016, solar photovoltaic facilities would become the largest single type of development consuming agricultural land and forest land in Connecticut. In 2016, the area of farmland and forest selected and/or approved for development of solar facilities nearly equaled the area of such lands preserved by the state in an average year.

Figure A: 2016 Solar Development on Farm and Forest vs. Average Annual Land Conservation



"Selected" means selected by DEEP for renewable-energy procurement. "Approved" means approved by the Connecticut Siting Council (CSC). Any project that was selected AND approved was counted only once. The 2016 figures do not include the 25 small-scale (less than 20 MW each) projects selected in November.

The category of land – farmland or forest – was determined from information provided by the project developers to DEEP and/or the CSC. Zoning was not considered.

The trend toward placement of solar photovoltaic facilities on farmland and forest is accelerating, with 1600 acres selected and/or approved in 2016 (Figure A), up from 200 acres in 2015. There is an irony in the state's spending millions of dollars to preserve agricultural and forest land and to encourage private forest management and conservation while, with another hand, encouraging conversion of similar lands into electricity-generating facilities.

In 2011, DEEP made its first foray into selecting large solar projects to provide renewable power to the major electric distribution companies (EDCs). After soliciting bids from 21 projects, DEEP selected two. One has been built on (formerly) active farmland in Somers and one on inactive agricultural soils in East Lyme. DEEP awarded points for non-price criteria, but the weighting was done in a way that caused pricing criteria to completely overwhelm non-price considerations. Several projects were proposed for brownfields or other developed sites but were not selected. Predictably, the proposed electricity price from some of those projects was higher than from farmland-based projects, but that was not true in every case. Either way, the differences in price were small, and the actual impact, if any, of the price differential to retail electricity customers was not determined prior to selection.

Even if the selection criteria had been designed so that siting criteria *could* have made a difference, DEEP did not intend to disadvantage farmland. The projects proposed for farmland received three out of a possible five points awarded for siting criteria (a very small percentage of the overall selection criteria) because farmland was scored as "otherwise reclaimed

Corn & Birds vs. Kilowatts?
Or Corn, Birds *and* Kilowatts?

Connecticut operates a Department of Agriculture to "foster a healthy economic, environmental and social climate for agriculture by developing, promoting and regulating agricultural businesses; protecting agricultural resources…" To accomplish this mission, Connecticut spends more than ten million state dollars every year, much of which is matched or boosted by federal, municipal and private funds. In 2011, the General Assembly directed the Governor's Council for Agricultural Development to recommend ways to increase consumer spending on food grown in-state to five percent of all food spending (double its current share). Does it make sense for another agency to promote industrial development of productive farmland?

Until the past decade, housing and commercial development were the biggest sectors converting land out of agriculture. Then, according to land-cover data presented in *Environmental Quality in Connecticut*, the acreage of land used for agriculture remained fairly steady during and after the recession that began in 2007. It now appears that development of energy facilities is the largest single factor driving land out of agriculture. While agricultural landowners benefit from leasing land for energy production, other farmers lose leased acreage essential to their business. Farmers looking for replacement lands could find rents increasing as available land diminishes. Connecticut long ago concluded that support of the agricultural sector and conservation of productive land was worth state investment. When the state selects energy facilities solely on the basis of their electricity price, it neglects the costs incurred elsewhere in the economy. Farmland and forest land provide important ecosystem services, including dampening the effects of a changing climate, that benefit Connecticut residents.

space;" there was very little opportunity for the brownfield projects (getting all five points) to gain any advantage. As noted above, the pricing criteria dominated the point system completely; the siting points were effectively meaningless.

In 2016, DEEP worked with Massachusetts and Rhode Island to issue a three-state Clean Energy Request for Proposals for large (at least 20 MW capacity) renewable energy projects. From 27 proposals, which included solar, wind, fuel cells, hydroelectric and interstate transmission lines, the winners were overwhelmingly solar farms proposed for farmland and forest (see Figures B and C, next page).

Even though the selection of projects is ostensibly neutral with regard to generation sources (solar, wind, fuel cells, etc.), the outcome of the 2016 selection process could have been predicted to result in a preponderance of solar photovoltaic power facilities on farmland and forest. Reports from as long ago as 2012 explain very clearly why developers of such facilities prefer farmland.[2] Also, it has been reported to the CEQ that the site-selection criteria of some solar development companies clearly favor flat, cleared land away from ledge and shallow bedrock that can be developed rapidly. One of the criteria – proximity to transmission facilities – means that some farmland that was adjacent to transmission lines was selected for solar development and probably was not in jeopardy of being developed for other purposes and therefore would have remained productive farmland.

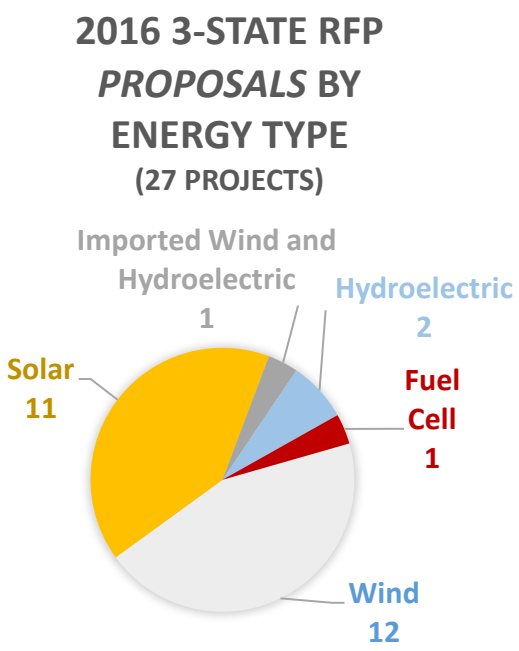
Energy facilities are no exception to the general rule guiding development: it is nearly always cheaper to build on agricultural land and clean forest land than it is to remediate a parcel that might be contaminated or in some way complicated by previous land uses. Without policies that guide solar photovoltaic power facilities toward brownfields, industrial lands and other disturbed areas, the market will place them on farmland and forest.

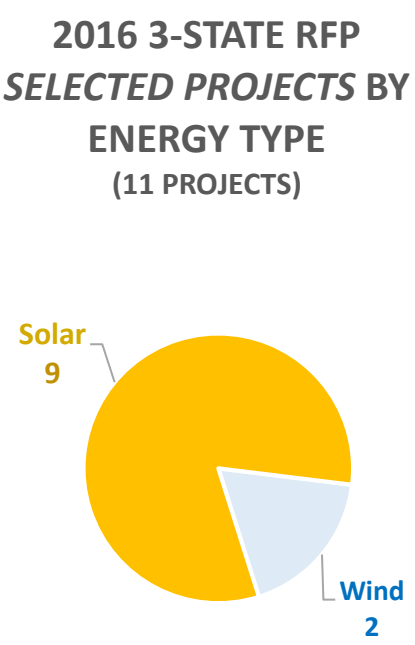
A surprising result (to the CEQ) of the 2016 three-state RFP process is that two of the six solar photovoltaic power facilities selected for Connecticut were selected by Massachusetts and Rhode Island but not Connecticut itself. Nevertheless, the projects probably will be constructed here.

There are More

In late November, 2016, DEEP selected 25 smaller-scale (between two and 20 MW) renewable energy projects out of 105 proposed. Some of the selected projects are proposed for landfills or other previously-developed sites, but the locations of others are not yet available to the public, as bidders (and DEEP) are allowed to keep the proposed locations confidential. No further analysis of the November selections is possible at this time.

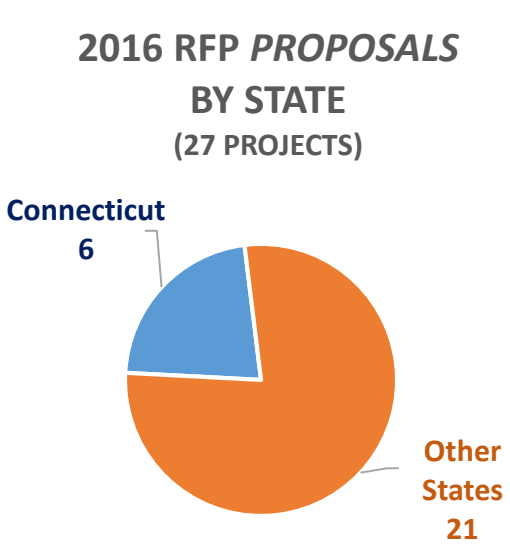
Figure B: Types of Utility-Scale Renewable Energy Facilities, Proposed vs. Selected in 2016

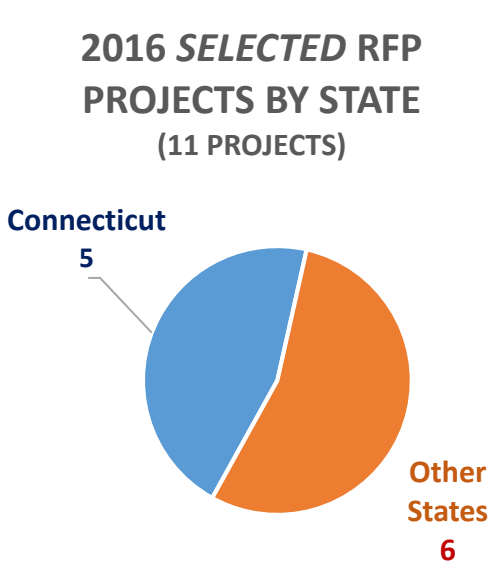




Conclusion: The use of price criteria alone strongly favored solar over other project types.

Figure C: Location of Utility-Scale Renewable Energy Facilities, Proposed vs. Selected in 2016





Conclusion: The 2016 project-selection process resulted in a disproportionate number of projects in Connecticut. All of the projects selected for Connecticut (unlike other states) were proposed for farmland or undeveloped land.

What is Driving the Push for Solar on Farms and Forests?

The Need for Renewables

For nearly 20 years, Connecticut's electric distribution companies, or EDCs – Eversource, United Illuminating, etc., or what we used to call utilities – have been required by statute to certify that a certain percentage of the electricity sold to customers is from renewable sources (solar, wind, and 13 other types). Each year, that percentage escalates; it is 22.5 percent in 2017, rising to 27 percent in 2020. Since 2011, and especially more recently, the state, through DEEP, has assisted the EDCs by selecting renewable-energy projects to supply the EDCs. Generally, as this report documents, the selected projects in Connecticut are solar photovoltaic facilities on farmland and forest land.

Connecticut's EDCs are not expected to meet the minimum required renewable-source electricity this year; they must pay fees (compliance payments) for missing the target.

Large-scale Waste

Much of the electricity generated in Connecticut, including that generated by solar panels, is wasted. This is true because many of the devices using the electricity – air conditioners, heating units, appliances, computers and televisions – are old and/or inefficient, meaning they use measurably more electricity than necessary to get the job done. If Connecticut's residential consumers and companies used more efficient equipment, then the amount of electricity needed from all sources, including renewable sources, would decline.

Energize Connecticut aptly advises residential solar purchasers that "it's important to make your home as energy efficient as possible" first. Meanwhile, utility-scale generation is fed into a system that wastes electricity throughout.

Successful Projects Away from Farm and Forest

The unimpeded rays of the sun that fall on several Connecticut landfills have been exploited successfully, and more landfill-based systems are under development or consideration. DEEP has encouraged municipalities to develop closed landfills for energy production. It maintains a list of 17 municipalities and other entities that are seeking developers interested in solar projects, and offers some incentives. At least two of the 17 are among the sites of smaller-scale projects selected by DEEP in November 2016 (see "There are More" on previous page).

The Hartford Landfill 1 MW solar array started production in 2014

Several large companies have installed significant solar arrays on their roofs. (See below)

What Are the Options?

State Lands – The CEQ has received numerous comments from Connecticut residents who have noticed the prominent solar arrays along the Massachusetts Turnpike (I-90). They are indeed prominent, but not truly significant in terms of power production: their total generation capacity is about six MW. (If on farmland, that capacity would consume approximately 30 acres.)

Could Connecticut identify non-conservation state properties that might be suitable for solar photovoltaic facilities and lease them to bidders? To do so might conserve private forest and farmland and generate revenue for the state. Potential lands might include highway corridors and institutional land. It is an opportunity to explore, but the CEQ is not aware of many large state properties that would be available. (There is more discussion of state property on page 14.)

Landfills – The typical landfill solar installation in Connecticut is between one and two MW (but generally toward the lower end of that range). Most of the 17 closed landfills mentioned on page six are small, but three exceed 50 acres. Based on gross acreage, development of all 17 landfills mentioned above could perhaps yield up to 80 MW of clean electricity – worth pursuing, but not the major portion of Connecticut's goal for Class I renewable energy generation, estimated to be 2,000 MW by 2030. (For perspective, Connecticut's peak electricity demand on a hot summer day reaches about 7,000 MW.) Because nearly every municipality has one or more closed landfills, there likely are additional ones suitable for solar photovoltaic development.

Brownfields and Industrial Lands – If effective incentives were offered to develop solar generating facilities on brownfields (which include derelict or underused contaminated properties but not landfills), could the electricity generation be significant? The National Energy Research Laboratory answered that question for the nation as a whole: only a small fraction of disturbed and contaminated lands are suitable for utility-scale solar photovoltaic facilities, but even those sites would yield enough electricity to meet federal solar-energy goals without disturbing any agricultural or forested lands at all![3]

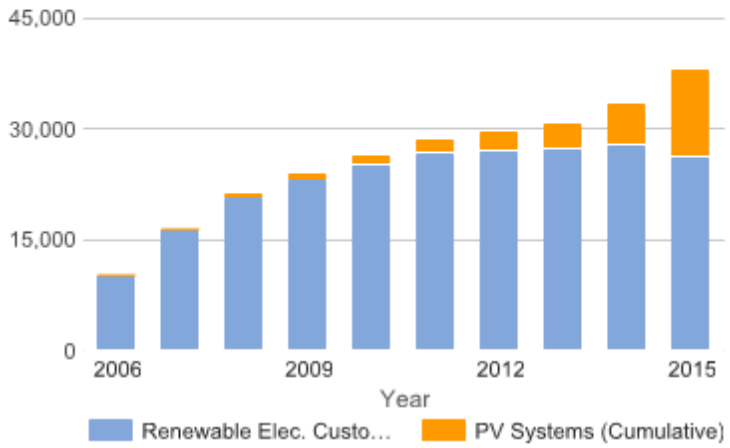
The national data reveal that the largest contaminated and disturbed sites are well west of Connecticut. For a more local projection, the Unites States Environmental Protection Agency (USEPA), through its Re-Powering America's Land project, estimates that the solar photovoltaic capacity on brownfields and certain other potentially-contaminated industrial lands in Connecticut is about 2,000 MW, an astounding amount that would nearly equal the potential output of Millstone nuclear generating station (which in 2015 produced 46 percent of the electricity generated in Connecticut). However, review of the site-by-site data shows that many of those industrial sites, whether currently contaminated or not, are in use for regular commercial or industrial purposes; the actual area of abandoned or underutilized brownfield properties would yield far less electricity. Nobody knows how many brownfield sites in Connecticut would be suitable. Despite these weaknesses in the USEPA data, the composite potential of these currently unproductive brownfields, of which there are hundreds, could be significant and worth pursuing.

Rooftops – The potential is enormous. Dozens of companies have installed solar photovoltaic panels on their extensive rooftops. These companies stand to benefit financially, in part because of

incentives offered through tax credits and successful financing mechanisms adopted to spur the adoption of solar energy. Dozens more manufacturing firms expressed interest in a 2016 incentive program administered by the Connecticut Green bank.

More than 12,000 single-family Connecticut homes sport photovoltaic panels. The growth in residential systems has been rapid (Figure D, below), and the growth potential is even greater: more than 70 percent of Connecticut homes could benefit from solar photovoltaic systems, according to a 2013 study commissioned by the Connecticut Green Bank.[4] In total, those properties could generate nearly 4,000 MW of electricity during the day. Complementary battery storage systems will satisfy part of the nighttime demand. If homeowners who do not have favorable conditions for their own photovoltaic systems were allowed to partner with others through community systems, the potential would be greater still.

Figure D: Households Buying Renewable Electricity and Households with Solar Photovoltaic Systems



The yellow (upper) portion of the bars represent Connecticut homes with solar photovoltaic systems. (The chart is reproduced from Environmental Quality in Connecticut. The blue (lower) portion of the bars tracks customers who buy renewable electricity through a program that was discontinued in 2016.}

In sum, the potential for solar development on rooftops is so great that development of farm and forest land for electricity production could be redundant. The National Renewable Energy Laboratory estimated in 2012 that the generating capacity of solar panels on all suitable rooftops (including residential, industrial and commercial) in Connecticut would be 6,000 MW, equivalent to photovoltaic facilities on nearly 30,000 acres of rural land.[5] Assuming this estimate of technical potential to be wildly optimistic (and bringing it in line with the 2013 study of residential solar potential, discussed above), an estimate of 60-percent development of the rooftop potential would yield electricity generation equivalent to 18,000 acres of installations on rural fields and forests.

Despite the potential for rooftop solar generation to dwarf what is being developed on farms and forests, the latter cannot simply be cast aside in favor of more rooftop generation until state policies and statutes are adjusted. Rooftop generation generally is developed “behind the meter” to

The corporate and manufacturing headquarters for Polamer Precision, Inc., in New Britain

reduce the occupant's own electricity purchases, not to supply the grid and EDCs with a stream of renewable electricity for their portfolios. Nonetheless, rooftop generation helps the state achieve its renewable-energy goals by reducing the amount of electricity that EDCs need to purchase from generation sources of all types. For the future, the CEQ recommends that DEEP's 2016 revisions to the Comprehensive Energy Strategy include an expansive strategy for rooftop solar.

Connecticut's Sustainable Economy

Achieving Connecticut's goals for stability, efficiency, land conservation, economic opportunity, health and happiness requires more than a fixation on the lowest price for a commodity. To choose a supplier solely because its product is the cheapest ignores the costs that its production imposes elsewhere in the economy. In the case of solar photovoltaic generation, widespread use of farmland and forest is likely to result in several costs that should be considered in decision making: the reduction in available farmland and consequent rent increases; the loss of jobs in agriculture and forestry; the continued costs of carrying brownfields and under-utilized lands that could be hosting energy facilities if those facilities were not built on green fields; the additional costs of finding alternate uses for the brownfield sites; the loss of jobs in one renewable-energy industry that is based in Connecticut if another technology built with imported materials is selected instead; the additional costs of making up lost progress toward the state's goals for Connecticut Grown food and wood; and ecological costs such as habitat fragmentation and destruction .

The Balance Trap

The simultaneous pursuit of two state goals which appear to be in conflict is often portrayed as a balancing act. Unfortunately, the "balancing" approach usually results in the diminishment of both pursuits. In the case of renewable energy and the conservation of land – two goals in which the state has invested much – the solution is to integrate or harmonize the two: find a way to stimulate the development of renewable energy on appropriate sites while continuing policies that conserve productive lands. An integrated approach will require accurate evaluation of all costs and benefits.

In future rounds of renewable project selection, **the Council recommends that DEEP be required by statute to give meaningful weight to siting considerations; this likely would require DEEP to create a point system that awards substantial points for siting a project on land that is not farmland, forest, grasslands or other land of ecological value. DEEP should consult the Department of Agriculture and the Council on Soil and Water Conservation. (In comments to the CEQ, the latter expressed a willingness to assist in such an effort.)**

Incentives?

The Connecticut Green Bank manages powerful incentives for solar development. However, its successful efforts to spur solar development by homeowners and corporate consumers have not eliminated the push for utility-scale solar photovoltaic facilities that consume farm and forest. If Connecticut continues to seek utility-scale solar photovoltaic generation, incentives will be needed to overcome the market's bias toward farmland and forest.

The Department of Economic and Community Development periodically awards competitive grants to municipalities to assess and/or clean up brownfield properties. Points are awarded for projects that include renewable energy production, but the total (five out of 130) probably is too small to be a powerful incentive. Developers will need something more substantial to abandon farm and forest for brownfields, especially brownfields that might be small and scattered.

Major impediments to siting generating facilities on brownfields are the same ones that impede other types of development: the cost, time and uncertainty inherent in cleaning up contaminated property. As long as it is faster, cheaper, and more certain to develop on uncontaminated properties, the results are predictable: Connecticut residents will watch productive green lands be converted to industrial uses while the abandoned properties sit idle, untaxed and possibly blighted. **The CEQ is recommending adoption, perhaps through a pilot program, of incentives that would lead to use of brownfields for solar development.**

The Massachusetts Department of Energy Resources is proposing a new solar incentive program that would reward projects proposed to be developed on brownfields and landfills.

Regulation of Location

Under current law, there are only two major governmental decision points that influence the siting of utility-scale solar photovoltaic facilities: 1) DEEP's selection of renewable-energy projects for electricity procurement, discussed above, and 2) approval by the Connecticut Siting Council.

Most large fossil-fueled electric generating facilities proposed in Connecticut must obtain a Certificate of Environmental Compatibility and Public Need from the CSC. Most other types of facilities regulated by the CSC, including telecommunications facilities (i.e., cell phone towers), also must obtain such a certificate. The application process for obtaining a certificate affords each project a high level of scrutiny and grants the CSC considerable decision-making discretion. However, neither is true for utility-scale solar facilities. Because of a law adopted in 2005,[6] years before the current solar boom, renewable energy projects less of less than 65 MW generating capacity need not obtain a certificate:

> **"Section 16-50k** – Notwithstanding the provisions of this chapter or title 16a, the [siting] council **shall approve by declaratory ruling** [that no certificate is required for]… the construction or location of any customer-side distributed resources project or facility or grid-side distributed resources project or facility with a capacity of not more than sixty-five megawatts**, as long as such project meets air and water quality standards** of the Department of Energy and Environmental Protection." [emphasis added]

In Connecticut, utility-scale solar photovoltaic facilities are always less than 65 MW. As long as a project avoids significant impact to wetlands and watercourses, it will be approved. There are several deficiencies evident in this limited oversight required by statute; examples include:

- A 65 MW solar facility approved by declaratory ruling will affect more than 300 acres.
- If an entire project is proposed to be developed on prime agricultural soils, the CSC has no option but to approve it by declaratory ruling.
- If a project eliminates the upland habitat of a very rare species, the CSC has no option but to approve it by declaratory ruling.
- Impacts to historic or cultural sites cannot be considered.

The CEQ concludes that the 65-MW exemption is ill-suited to utility-scale solar photovoltaic installations (while being potentially useful to less land-intensive technologies). **The General Assembly should amend the CGA Section 16-50k to require utility-scale solar photovoltaic facilities to obtain a Certificate of Environmental Compatibility and public Need and should require the CSC to consider the full range of environmental impacts it normally considers when evaluating energy projects as well as the impacts to agriculture and agricultural land.**

Determining What is at Stake: the Need for Careful Siting

Potential impacts to agriculture are discussed on page three. It is important to note that more acres of forest land than farmland are being transformed into energy facilities.

According to Environmental Quality in Connecticut, the birds that inhabit mature forests and young forest have been declining over the long term, even as the total area of forest in the state stabilized during the recent recession and recovery period. The birds inhabiting mature forests are affected greatly when the forests are fragmented into smaller parcels, and the young-forest birds face numerous challenges.

Some areas with no trees, potentially ideal for solar energy production, can harbor even more threatened species than forests do. Several rare grassland bird species have benefitted over the last decade from a targeted initiative by DEEP and its partners, but others declined. Conservation of grasslands remains a formidable and high-priority challenge for Connecticut.

The habitat potential of many non-wetland areas is often underestimated. Even lands that appear at first glance to be no more than sandy wastelands can harbor very rare species that depend exclusively on such lands. Does this mean that there are no suitable sites for large-scale energy facilities, or that all sites should be treated equally? No. It means that each site should be subject to a thorough review of its natural resources, and that the CSC should have the authority to

act on that information. The desired outcome is development of energy facilities where the impacts are least.

The CSC collects information from petitioners about trees and wildlife but cannot do much with it except where wetlands and watercourses are involved. (There could be consequences if a petitioner documented federally-listed species on the land, but that is a rare occurrence.)

Conclusion

Connecticut's 2013 Comprehensive Energy Strategy (CES) envisioned careful siting: "It is important that each renewable power project be considered in light of other state policy objectives, such as optimizing the way land is used in the state." (p. 90, CES) That same strategy, in discussing the large potential for utility-scale solar, adds the phrase "ideally on underutilized lands." (p. 91)

Under current laws, such land-use objectives cannot be realized or even considered.

Can Utility-Scale Solar Photovoltaic Electricity Generation be *Good* for Agriculture?

In the long-term, probably not. Solar developers have asserted that photovoltaic generation could be regarded as a temporary use of land that, once restored 30 years hence, could be returned to growing crops. Information submitted to the Connecticut Siting Council by the Commissioner of Agriculture disputes that assertion, noting the trenching, mixing of soil layers and other disruptions of the land.[7] For one solar development, much of the topsoil reportedly was removed from the site, while a storm washed much of the remaining soil into nearby streams. Clearly the placement of solar arrays and associated equipment has the potential to damage soils; that potential is not evaluated by DEEP or the CSC.

Other arguments have been made to the effect that farming is an uncertain business for which leasing some land for electricity production could be a stabilizing force, and in some cases essential to the long-term prospects for a farm's success. CEQ does not recommend that such farms be prohibited from leasing their land for electricity production. However, the CEQ notes that the potential benefit to individual farms is not evaluated by DEEP when it selects renewable-energy projects, nor does DEEP consider the impacts to individual farms that might *lose* critical leased farmland. Furthermore, it appears that many solar facilities could be expanded easily to consume more of the farm. One cannot conclude, without further research, that utility-scale energy facilities are good for the overall agricultural sector in Connecticut. In any event, there should be no need to sacrifice agricultural production to increase electricity production.

Looking Ahead

The National Renewable Energy Laboratory is studying ways to integrate agriculture with solar facilities as an alternative to "balancing" the two.

Minnesota has adopted laws and policies to encourage solar photovoltaic facilities to be planted with pollinator-friendly plants. For Connecticut, this would appear to be a beneficial approach to solar facilities, but not a reason to place the facilities on farmland.

Connecticut offers "virtual net metering" policies that offer incentives for the placement of renewable energy facilities on farms *when they benefit the agricultural business*; these policies are beneficial and could be expanded beneficially if they do not take prime agricultural soils out of production. Even without virtual net metering, agricultural businesses can benefit from installation of solar arrays for their own consumption; such development is very different from utility-scale development and should not be impeded by the CEQ's recommendations.

How Have Other States Responded?

Many states, counties and municipalities have recognized the contradiction inherent in sacrificing valuable natural and economic resources for renewable electricity production. The following is a very small sample of legislative responses, included here to illustrate the challenge nationwide; they should not be confused with the CEQ's recommendations for Connecticut action.

- The Massachusetts Department of Energy Resources announced, in January 2017, a proposal to overhaul its solar incentive programs. The proposals would reward proposals to use landfills, brownfields, rooftops and parking lots and impose a fee on proposals to use undeveloped lands.

- Wright County, Minnesota, enacted a six-month moratorium on applications in 2016, while Stearns County convened a work group to recommend ordinance revisions, adopted in December, that require solar facilities to include habitat for pollinators.

- Santa Clara County, California, specifically prohibits facilities on certain agricultural lands and allows them on others that are deemed to be of marginal quality for farming purposes (Ord. NS–1200.331, adopted in 2010).

- The New Jersey Energy Master Plan 2015 Update states: "The State should continue its policy of discouraging the development of solar farms on farmland and undeveloped open spaces, such as forests, and encouraging their placement on or above impervious surfaces or on landfills, brownfields or areas of historic fill."

- Monson, Massachusetts approved a bylaw amendment restricting large solar facilities to industrial and commercially-zoned districts.

- Talbot County, Maryland enacted a six-month moratorium on solar arrays larger than two acres to "consider the impact of solar array energy systems on environmentally sensitive areas and agriculturally productive lands."

Good Questions & Interesting Ideas for Future Research and Action

The CEQ posted a draft version of this report on its website in January 2017 and received dozens of excellent comments. Many of the suggestions were applied to the text of the report above. Some of the suggestions struck the Council as very worthwhile, but time did not allow for their full evaluation. Here is a sampling of suggestions for future research and action:

- State lands: Conducting an inventory of state-owned non-conservation lands for their solar potential would take too long. Could DEEP simply issue a Request for Proposals (RFP) that invited solar developers to propose specific state lands for case-by-case consideration? The state potentially could reap lease revenue while the private sector shoulders the cost of identifying the best lands.

- Reportedly there are municipalities that might wish to participate in procurement rounds but are precluded from large-scale project procurement because the available land is not in one parcel. Could future RFPs allow for an assemblage of projects that in combination exceed the minimum 20 MW threshold?

- Which utility rights-of-way, which already consume considerable acreage, could accommodate solar photovoltaic generation? Could the benefit of the generation's proximity to the grid (in the case of electricity-transmission rights-of-way) help to overcome problems inherent in using the transmission corridors for generation?

- What types of land not discussed in this report also should be considered for solar development?

- There is considerable research underway in other states on co-location of solar energy and agricultural production, as well as pollinator-friendly vegetation, that could be applied to Connecticut.

- The concept of steering energy facilities toward previously-developed land and away from farm and forest is a good one; it should be included explicitly in the State Conservation and Development Policies Plan and should apply to other state-supported projects.

- Invasive species, including fast-spreading *Phragmites* (Common Reed), follow land disturbances in Connecticut. The CSC should include mandatory requirements for post-construction maintenance of properties, including effective control of invasive species.

- Connecticut should pursue renewable-energy sources that consume less land.

- Some of the recommendations in this report could be included in DEEP's ongoing update to the Comprehensive Energy Strategy.

Notes

1. Connecticut Siting Council procedures provide for input from affected municipalities, but the local zoning, inland wetlands and other regulatory agencies do not have decision-making authority. Municipal agencies do have enforcement authority when there is a violation of inland wetlands and watercourses regulations and the impacts go beyond the solar development's boundaries.

2. *Solar Siting and Sustainable Land Use*, Association of New Jersey Environmental Commissions, 2012, available at http://www.anjec.org/pdfs/SolarWhitePaper2012.pdf

3. *Solar Development on Contaminated and Disturbed Lands*, National Renewable Energy Laboratory, December 2013, available at http://www.nrel.gov/docs/fy14osti/58485.pdf The estimates in this document are based on a conservative formula where one MW of photovoltaic generation needs 10 acres; most estimates use a ratio of one MW to five acres.

4. *The Addressable Solar Market in Connecticut*, prepared for Connecticut Clean Energy Finance and Investment Authority (now the Connecticut Green Bank) by GeoStellar, Inc., 6 December 2013, available at http://www.ctgreenbank.com/wp-content/uploads/2016/03/Total_Addressable_Market_CT_Final.pdf

5. *U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis*, National Renewable Energy Laboratory, July 2012, available at http://www.nrel.gov/docs/fy12osti/51946.pdf

6. The legislation that exempted facilities up to 65 MW from the certificate requirement was not the subject of a public hearing at the Connecticut General Assembly; the exemption was inserted via a floor amendment.

7. Commissioner of Agriculture Steven K. Reviczky, letter to Connecticut Siting Council Re: Petition No. 1224, May 11, 2016, available at http://www.ct.gov/csc/lib/csc/pending_petitions/2_petitions_1201through1300/pe1224-deptagriculturecomments.pdf

About the Council on Environmental Quality

The duties of the Council on Environmental Quality (CEQ) are described in Sections 22a-11 through 22a-13 of the Connecticut General Statutes.

The Council is a nine-member board that works independently of the Department of Energy and Environmental Protection (except for administrative functions). The Chairman and four other members are appointed by the Governor, two members by the President Pro Tempore of the Senate and two by the Speaker of the House. The Council's primary responsibilities include:

1. Submittal to the Governor of an annual report on the status of Connecticut's environment, including progress toward goals of the statewide environmental plan, with recommendations for remedying deficiencies of state programs.
2. Review of state agencies' construction projects.
3. Investigation of citizens' complaints and allegations of violations of environmental laws.

In addition, under the Connecticut Environmental Policy Act (CEPA) and its attendant regulations, the Council on Environmental Quality reviews Environmental Impact Evaluations that state agencies develop for major projects. The Council publishes the *Environmental Monitor*, the official publication for scoping notices and environmental impact evaluations for state projects under CEPA. The *Environmental Monitor* also is the official publication for notice of intent by state agencies to sell or transfer state lands.

Council Members

Susan D. Merrow, *Chair*	Lee E. Dunbar	Kip Kolesinskas
Janet P. Brooks	Karyl Lee Hall	Matthew Reiser
Alicea Charamut	Alison Hilding	Charles Vidich

Contact the CEQ

Website: www.ct.gov/ceq (for this and all Council publications)

Mail: 79 Elm Street Hartford, CT 06106

Phone: 860-424-4000 (messages can be left 24 hours a day)

E-mail the Council's Executive Director: karl.wagener@ct.gov