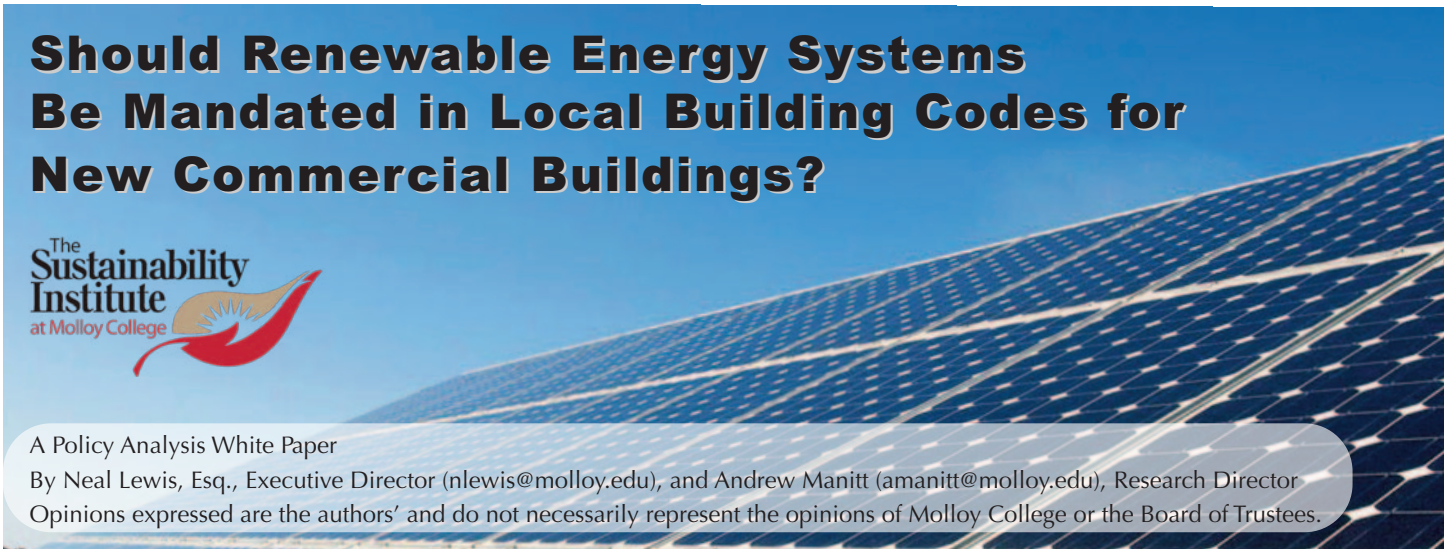
Should Renewable Energy Systems Be Mandated in Local Building Codes for New Commercial Buildings?



The Sustainability Institute at Molloy College

A Policy Analysis White Paper
By Neal Lewis, Esq., Executive Director (nlewis@molloy.edu), and Andrew Manitt (amanitt@molloy.edu), Research Director
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Mandating Solar

This white paper looks at the proposition that building codes, which are always in a dynamic process of being re-evaluated, improved and updated, should now **mandate** that all new commercial building construction include renewable energy systems. Such a proposed mandate would be appropriate if it is consistent with public policy goals to mitigate global warming; is within local governments' authority to adopt; would advance good planning principles for mitigating the environmental impacts from new buildings; would advance other social and economic benefits; and would avoid creating an unreasonable hardship.

Local Stretch Codes

Building codes are an important and sometimes overlooked tool in advancing the goals of New York State's Clean Energy Standard (CES) (of 50% of electricity generated from renewables by 2030[1]) and the efficiency goals of the New York State Energy Plan[2]. The NY State Codes Council sets statewide building codes, however in regards to the energy codes, local governments are permitted to treat the state's standards as a floor, or minimum, and to adopt **"stretch codes"** for residential and commercial construction, that are *more stringent* than the state energy conservation construction code requirements[3].

As a home rule state, New York provides towns and villages a powerful tool to drive the adoption of energy efficiency and renewables. Long Island towns have a history of driving clean energy adoption with local energy conservation construction stretch codes. Beginning in 2006, most LI towns adopted **ENERGY STAR®** standards, and required independent HERS ratings for all new homes[4]. LI municipalities were the first to adopt a uniform fast-track permit for residential solar PV, developed collaboratively with industry and promoted by incentives from LIPA[5]. Now, Long Island municipalities could provide leadership and be the first in NYS to adopt innovative local laws that require renewables for new commercial construction.

50% Renewables By 2030

The IPCC (Intergovernmental Panel on Climate Change) 2018 special report warns that urgent action is needed to avoid the most catastrophic climate effects of global warming[5]. To keep the global temperature from rising more than 1.5ºC, the IPCC indicates that the world will have to cut CO2 emissions 45% by 2030 (from 2010 levels), and reach net zero CO2 by 2050.

In 2016, the NYS Public Service Commission adopted the **Clean Energy Standard,** which requires 50% of energy provided by utilities in New York to be generated from renewable sources[1]. This was seen as necessary to ensure achieving the goals set out in the NY State Energy Plan and the Reforming the Energy Vision (REV) process, of reducing statewide greenhouse gas emissions by 40% by 2030 (from 1990 levels) and 80% by 2050.

Long Island's goal for renewable energy generation, consistent with New York's Clean Energy Standard, is calculated as 12.3% of the statewide requirement of 29,000 GWh, that is 3,567 GWh for LI, in 2030. The PSEG/LIPA Integrated Resource Plan proposes to meet this goal in large part through the installation of 800 MW nameplate capacity of offshore wind power, part of the 2,400 MW offshore wind development goal that has been announced by Governor Cuomo. LIPA has already contracted with Deepwater Wind to procure up to 130MW of offshore wind, and NYSERDA has issued an additional procurement for up to 800MW.

However, to meet the CES goal, PSEG also projects a reduction in annual demand of about 2,200 GWh, through 'behind the meter' initiatives including energy efficiency and rooftop solar. Other initiatives have also been proposed under the Utility 2.0 Plan. Meeting this very ambitious demand reduction goal will be made even more challenging in the face of the tremendous demand for electric vehicle charging and the electrification of home and commercial heating that must occur to decarbonized as part of broader plans to meet the State's 2050 goals.

Solar Needed for Clean Energy Standard

Offshore wind has tremendous potential to supply the LI region with renewable energy. As environmental studies proceed, planning is currently underway for investments in offshore wind farms in the New York Bight that could be significant in size, with hundreds of turbines that would each be 600+ feet tall. However, even if NY's offshore wind potential is maximized, the energy generated will likely be shared with other parts of NY State, and as large as the Governor's goal of 2.4 gigawatts is, by itself, it will not satisfy the Clean Energy Standard.

Rooftop solar remains a vital element of energy planning, as recognized in the PSEG Integrated Resource Plan[7]. It is important to encourage solar energy and maintain a diverse, distributed electric grid. Wind and solar are complementary technologies that help compensate for each other's intermittency. Policies that promote distributed solar generation increase grid resiliency. Encouraging the installation of solar PV also promotes the local solar industry and creates green jobs. Because maintaining open space is vital to the Island's wildlife, drinking water protection, and quality of life, renewable energy development should be channeled as much as possible to the built environment.

Reasonable Requirement—Environmental Planning

Each new building impacts the electric grid and increases the demand for electricity. In some cases, new electric infrastructure investments are required, which in turn must be maintained. These demands on our electric grid represent a cost to all ratepayers of Long Island. *An instructive analogy to consider:* it is commonplace for proposals for new buildings going through planning and environmental review to be required to construct—at the builder's expense—new traffic lights or road expansions to mitigate traffic impacts likely to result when the buildings go into operation. This paper proposes that it is similarly reasonable to also require new buildings to mitigate their impact on the electric grid by meeting some of their electric needs through clean, distributed, renewable energy generation.

The applicability of this analogy is more than merely theoretical. Recent revisions to the NYS State Environmental Quality Review Act (SEQRA) regulations have now established a requirement that when reviewing a proposed action, climate change mitigation must at least be included in the scope of the review. In cases where full environmental impact statements (EIS) are prepared, then the applicant must disclose "impacts of the proposed action on the use and conservation of energy" and should also demonstrate how the proposed project includes "measures to avoid, or reduce... impact on climate change."[8] So, as is the case for traffic and parking, during SEQRA review for proposed buildings, it is reasonable for the lead municipality to require measures to mitigate the amount of greenhouse gases attributable to the new building.

Reasonable Requirement—Fiscal Impact

Although this paper does not include real estate analyses, we do take note that the market for new commercial building construction appears to be strong on LI today, and the vast majority of new buildings that are approved do not include any renewable electric energy generation systems. This represents a tremendous missed opportunity, as the design and construction phase for new buildings is the most cost-efficient time to plan and implement the incorporation of efficiency measures and renewable generation systems. Before installing solar on older buildings, there is often a need to repair the roof, and some roofs lack the strength needed for solar. When designing a new building to include solar, stronger and more durable roofing materials can be specified in order to handle the added weight from a solar system. Locating mechanical equipment so that the space available for solar PV is maximized, is only an option when a building is designed and before mechanicals are fixed in place. As a high cost region, it is important for LI to adopt policies that direct developers to choose the right building designs and materials and optimize available roof space for solar, so that buildings will control energy costs and therefore help business to be successful and keep money in the local economy for decades to come.

There are a myriad of financing options available to building owners for solar projects, including the newest tool in the toolbox, *Commercial PACE*[9].

Investments in solar at the time of new building construction will produce long term fiscal benefits. According to the National Renewable Energy Laboratory, the benchmark cost for commercial PV from 10 kW – 2 MW was $1.85 per watt in the first quarter of 2017[10]. At that cost, a 40 kW system would increase the initial cost of a 20,000 sq. ft. building by $74,000. Based on an average sales price of $157.26 per square foot for office space[11], that would be *less than 2.5% of the building's sales price*. Under the new VDER tariff (value of distributed energy resources), the value of the electricity produced by the solar PV varies depending on how much electricity is used on-site, the location of the facility, and the time of day and year that it is produced. Since the LIPA trustees adopted VDER to parallel State policy, there is concern that the adoption of large commercial solar projects is slowing on LI, because the VDER formula's variability makes returns more complex to calculate, and makes some installations not as financially advantageous as was the case under the prior net-metering or feed-in-tariff offerings[12]. However, when considered as a requirement for new building construction, the installation of solar PV will easily generate positive savings over the life of the building. As battery technology and costs improve, the use of battery storage with solar PV will become more attractive to allow businesses to reduce peak demand and potentially greatly reduce demand charges on their electric bills.

Incentives vs. Mandates

Mandates should only be used for compelling policy objectives. Utility incentives serve an important role in advancing clean energy, however they are not free, as they are paid for by all ratepayers, and they are being eliminated for solar PV as that market transforms. Using local density bonuses to incentivize solar would introduce complications and would lack a logical nexus to sustainable energy goals.

Mandates are appropriate due to a market failure in the often complex commercial real estate sector. This sector usually operates with split incentives between building developers/owners, who may not pay electric bills, and occupants/tenants who usually do. This sector also lacks a standard approach to pricing and assigning PV's benefits in transactions between building owners and tenants. Mandates are appropriate when the policy goal is clear and the challenge is big enough to warrant industry-wide compliance. (NYS provides an opt-in for municipalities to require homes to be built *solar ready*[13]. For commercial buildings, this opt-in provision is not available, and would be insufficient to overcome the split incentive driven market failure.)

Solar Codes Elsewhere

Some Long Island towns have implemented residential energy conservation stretch codes that set high standards and could be seen as models for other regions to consider adopting. For example, Southampton and East Hampton have among the most stringent energy performance codes for new home construction, which not only require diagnostic testing by qualified third parties for all new homes, but also have increased efficiency standards for larger homes[14]. Nevertheless, when it comes to the use of stretch codes for solar installation, we can learn a lot by considering what has been done elsewhere. The state of California has garnered media attention for adopting a requirement for almost all **new residential construction** to include sufficient renewable generation capacity to meet the full expected electric demand of the residences—beginning in 2020[15]. This paper focuses instead on requirements for renewable generation on **new commercial construction** that have been adopted in California cities including Culver City[16], Sebastopol[17], San Francisco[18], and Santa Monica,[19] which represent a greater opportunity for LI towns to treat as *model ordinances* and consider adopting similar requirements to balance the need to preserve open space with efforts to promote significant clean energy projects on Long Island. Such a requirement is often called the "Merton Rule" after the Borough of Merton in England, the first municipality to adopt a requirement for new commercial development to include solar PV. Our research has not found any similar law/policy currently in place anywhere in New York, so if Long Island municipalities provide leadership, spearheading adoption of this important principle in the State, they would be true *municipal solar pioneers*.

Proposed Commercial Building Solar PV Mandate

Solar Wattage Per Square Foot (SWPSF)

POLICY	5,000 sq. ft. Building [1 floor] 5,000 sq. ft. Footprint	10,000 sq. ft. Building [1 floor] 10,000 sq. ft. Footprint	50,000 sq. ft. Building [1 floor] 50,000 sq. ft. Footprint	150,000 sq. ft. Building [3 floors] 50,000 sq. ft. Footprint
2019 — 2 watts per. sq. ft. of Building *Footprint*	10 kW solar PV (may be exempt in yr. 1)	20 kW solar PV	100 kW solar PV	100 kW solar PV
2021 — 3 watts per sq. ft. of Building *Footprint*	15 kW solar PV	30 kW solar PV	150 kW solar PV	150 kW solar PV
2023 — 4 watts per. sq. ft. of *Floor Area* of Total Conditioned Space	20 kW solar PV	40 kW solar PV	200 kW solar PV	600 kW solar PV

The approach that this paper recommends, is to use a simple requirement of a set kilowatt nameplate capacity ratio to the square footage of the building's footprint (or total floor area of conditioned space). For example, Santa Monica requires 2 Watts of PV per square foot of building *footprint* for all commercial construction. Culver City requires 1 kW of PV per 10,000 square feet of *total floor space*, for buildings over 10,000 square feet. The advantage of these requirements is simplicity. Another approach is to require projected PV generation to meet a percentage of the building's expected energy or electric consumption. Sebastopol, CA has a hybrid system that allows the developer to choose either installing 2 watts per square foot of conditioned space, or sufficient PV to meet 75% of projected annual electric consumption. Rules based on projected energy use could drive greater efficiency, since the developer will have an incentive to increase efficiency and reduce projected energy use, in order to reduce the amount of renewables required. The down side is that this approach will introduce some additional complication during site plan review.

Model Solar Code

Past experience of working to change local building codes suggests that a new requirement should be simple and clear. Therefore, this paper recommends that towns should pass a straightforward requirement of solar PV capacity per square footage of building footprint. This requirement would increase and then be transitioned to a floor area basis, after a number of years. As the prescriptive requirement increases, an alternative performance path of meeting a percentage of projected electric consumption may become attractive for more buildings, particularly once the floor area basis becomes effective.

This paper recommends starting with the formula **2 watts of solar PV per square foot of building footprint.** This would be technically simple both to administer by town building departments, and to comply with by developers. In the first year (2019), the requirement would be 2 watts (DC name-

plate capacity) per square foot of building footprint. Then every two years, phase in higher requirements: 3 watts per foot in 2021; 4 watts per square foot in 2023. In the 4th year, also apply the formula to the floor area for the **building's total conditioned space**. For most buildings, this requirement can easily be met with rooftop solar*. (See *note* below for spatial needs to meet the mandate, and see *chart* on p.3 for summary of model code phase-in requirements.) An optional performance path of meeting 75% of projected annual electric consumption could be available. To ease administrative adjustment, during the first year of the requirement, buildings smaller than 10,000 square feet could be exempted. However, stakeholder feedback indicates that there is no practical reason to restrict the solar mandate to a particular building size. This phase-in timeline could be accelerated after evaluation of policy implementation.

Alternative Compliance Paths

In order to ensure that a policy requiring solar for new commercial building construction is not unduly burdensome, the developer should have available alternative compliance paths that achieve the same goals.

- If the developer prefers not to locate solar on the building's roof, then the town code should allow construction of a solar carport over their parking lot on site.
- If the applicant can demonstrate that the roof design is not conducive to solar installation and cannot be easily altered, or that the roof design was important to a community engaged planning process where design features that are not conducive to solar PV were included as part of an adopted plan, or interconnection to the grid at the location of the new building would be technically or financially infeasible for the required amount of on-site solar PV, then some or all of the solar PV requirement can be met by *new, **off-site** installations of solar PV* through remote net metered or community-shared-solar. Alternatively, the developer could document equivalent annual energy generation using a different renewable energy technology.
- Rather than comply with the full PV requirement set out in the new policy, the developer may bring forth appropriate documentation to demonstrate they could install on-site a lesser amount of solar PV, but that it will be enough to satisfy *75% of the building's projected annual electric usage*.
- If the applicant can demonstrate unavoidable *hardship*, such that complying with the requirements of this law would make a particular project economically unfeasible, the capacity requirement may be lowered (variance) at the discretion of the Zoning Board of Appeals.

Conclusion

A solar mandate will mitigate climate change in a way that puts a premium on preserving open space and directing renewables into the built environment. LI municipalities are well positioned to be regional climate action leaders by adopting a solar mandate for all new buildings. As a home rule state, New York's local municipalities are empowered to adopt energy stretch codes for new building construction (previous local efforts to adopt stretch codes for new homes on LI that started in 2006, are working well).

Long Island is ready for a paradigm shift in the approach to new building construction. Under this standard a message is sent that renewables must be included in new buildings. A solar mandate will be straightforward to enforce by town building departments, it will create local green jobs and boost regional economic development. It will be a reasonable mandate for builders to implement as it will either result in savings for businesses that enventually occupy the new buildings or a revenue stream for building owners.

Note: A rule of thumb is that solar PV modules that are commonly available have nameplate capacities around 15 watts per square foot (wpsf), although there are both more and less efficient products available. Assuming a building has roof space roughly equal to its footprint, the requirement for 2 watts/sq ft of building footprint could take up less than 14% of a building's roof space. At 3 watts/sq ft, it would take about 20%, and at 4 watts/sq ft, 30% of the roof space. Once the requirement becomes 4 watts/sq ft of conditioned space, as proposed in our model code recommendation for 2023, the roof space required would be about 27% for a single story building, 54% for a two story building, and 81% for a 3 story building. Taller buildings may require solar car ports, or off-site PV.

[1] New York State Clean Energy Standard. https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard

[2] New York State Energy Plan. https://energyplan.ny.gov

[3] New York Consolidated Laws, Energy Law - ENG § 11-109. Municipal regulations

[4] Long Island Towns Successfully Strengthen Residential Energy Codes https://www.molloy.edu/Documents/Sustainability/longislandtownsgreenpaper.pdf

[5] https://icma.org/documents/long-island-unified-solar-permitting-initiative-suffolk-nassau-county-planning-commission

[6] I.P.C.C. (2018) Global Warming of 1.5ºC – Headline Statements. http://www.ipcc.ch/report/sr15/

[7] 2017 Integrated Resource Plan: PSEG Long Island Analysis Summary (April 10, 2017) http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=17-00696

[8] 6 CRR-NY 617.9 Preparation and content of EIS.

[9] http://commercial.energizeny.org/energize-ny-finance

[10] U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017 (September 2017) https://www.nrel.gov/docs/fy17osti/68925.pdf

[11] Cadwell Banker Commercial, Long Island Office Market Report. http://www.cbcli.com/Info-Center/Market-Reports/Office-Market-Reports

[12] Newsday "Commercial solar market sees drop after new compensation adopted" by Mark Harrington. (November 10, 2018) https://www.newsday.com/long-island/solar-sales-decline-1.23180441#user=5abd9be705e94e5bc62b71c5&utm_source=newsletter&utm_medium=email&utm_campaign=Morning-Update

[13] Appendix U of the Residential Code of New York State

[14] Southampton Town Code - §123-37 Home energy rating index requirements https://ecode360.com/8694502 East Hampton Town Code- § 102-24East Hampton Town Energy Savings Program. https://ecode360.com/12555667

[15] NY Times (May 9, 2018) https://www.nytimes.com/2018/05/09/business/energy-environment/california-solar-power.html

[16] Culver City Municipal Code Section 15.02.1005. http://library.amlegal.com/nxt/gateway.dll/California/culver/title17zoningcode/article3siteplanningandgeneraldevelopmen/chapter17330signs?f=templates$fn=default.htm$3.0$vid=amlegal:culvercity_ca$anc=JD_CHAPTER17.330

[17] Sebastopol City Code, Chapter 15.72 MANDATORY PHOTOVOLTAIC SYSTEM REQUIREMENTS. https://www.codepublishing.com/CA/Sebastopol/ - !/Sebastopol15/Sebastopol1572.html

[18] San Francisco Building Inspection Commission (BIC) Codes, Section 5.201.1.2. Renewable Energy and Better Roofs. http://library.amlegal.com/nxt/gateway.dll/California/sfbuilding/sanfranciscobuildinginspectioncommission?f=templates$fn=default.htm$3.0$vid=amlegal:sanfrancisco_ca$sync=1

[19] Santa Monica Code Ch 8.106.080 Non-residential, high-rise residential, hotels and motels solar requirement https://www.qcode.us/codes/santamonica/