

Utility-scale Solar Strategy

Concord Municipal Light Board
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This is a summary of the Concord Municipal Light Plant long-term strategy for *Utility-scale* solar power. It is part of a larger strategy for renewable energy sources being developed by CMLP and the Light Board that is discussed in a separate document. This document is intended to provide additional context for the Article 64 discussions regarding large solar arrays within the Town of Concord.

An overall goal of the Concord Municipal Light Plant is simple — to obtain as much of its electrical energy as possible from renewable sources, subject to the constraints of cost, reliability, and availability. Achieving this goal will take a long time — several decades or more — and there are many obstacles along the way. One area in which Concord can do something proactively and practically on its own initiative is installing photovoltaic arrays within of the Town's borders to capture the solar energy.

The term *utility-scale* is used to refer to arrays of solar panels measured in units of megawatts (millions of watts) of electrical power. This is in contrast to residential rooftop and backyard units, which are usually a few kilowatts (thousands of watts), and also in contrast to arrays on municipal, commercial, and institutional roofs and parking lots that are measured in tens of kilowatts. Rooftop solar is a complement to utility-scale solar, not a substitute. It is also part of the CMLP renewable energy strategy but not part of this document. Likewise, wind power is also part of the renewable energy strategy but not part of this document.

Utility-scale Solar Strategy

The CMLP long-term utility-scale solar strategy is

TO DEVELOP APPROXIMATELY 25 MEGAWATTS OF SOLAR GENERATING CAPACITY IN CONCORD IN UNITS OF APPROXIMATELY 5 MEGAWATTS DEPLOYED INCREMENTALLY AT INTERVALS OF ABOUT FIVE YEARS.

Twenty-five megawatts would power more than half of Concord's peak electrical load on the hottest days of the year and most of its midday load on cooler sunny days. This will go a long way toward providing firm capacity to meet Concord's peak demand, thereby mitigating the need to upgrade or supplement the Forest Ridge substation and the transmission lines from Sudbury to Concord.

Incremental deployment at regular intervals has many advantages:—

- It helps to manage the financing, so that the funds (and risk) are not committed all at one time but are spread out over time. This will keep the average cost per kilowatt-hour low and will avoid spikes in the electricity rates.
- It allows Concord to take advantages of new technologies as they emerge. Obviously, an already installed array is frozen at a particular technological state, but all future arrays can benefit.
- Not all of the solar generating capacity would reach the end of useful life at the same time, so that when an old array needs to be replaced, it can be replaced with very modest impact on rates and the newest technology.

- Incremental deployment gives the Light Plant a chance to build up the organizational expertise in accommodating solar power into its systems, its operations, and its rate-setting policies.

Intervals of about five years fit nicely with the projected 25-year lifetimes of solar arrays, and they provide the Light Board and CMLP staff a reasonable break after deploying one increment before preparing for the next increment.

Five megawatts per increment is large enough to amortize the staff and committee effort of preparing Requests for Proposals, evaluating bids, and negotiating contracts. A smaller increment would require the same amount of effort but would produce correspondingly less electrical energy and capacity for that effort. Larger increments would require larger blocks of financing at one time and would tend to reduce the benefits of incremental development.

Financial Considerations

Almost the entire cost of electricity from solar panels is in the capital cost of the installation. Operating costs are estimated to be negligible. In late 2010, the installed cost per watt of large-scale solar arrays is just under \$5 per watt, but this is mitigated by government subsidies and by Solar Renewable Energy Credits (S-RECs) funded by fossil fuel customers of investor owned utilities. Subsidies come and go with politics, legislation establishing the S-REC market is currently valid for ten years, and the S-REC market could easily become quite volatile and could expand to public power utilities. Therefore, it is recommended that *for the time being*

UTILITY-SCALE SOLAR ARRAYS BE FINANCED BY LEASING AND POWER PURCHASE AGREEMENTS SIMILAR TO THOSE PROPOSED FOR ARTICLE 64.

This puts all of the risk and uncertainty of subsidies and S-RECs onto the vendor in exchange for the ability to profit by their upside potential.

When the price of solar panels drops below a certain threshold — say, \$2 per watt — it becomes financially attractive for Concord to own and operate its own solar arrays with little risk. In Concord’s climate and latitude, each watt of capacity produces about 1¼ kilowatt-hours (kWh) of electrical energy per year. Assuming a 25-year life, depreciation would cost about 6.4¢ per kWh and interest on debt service would add about 2.5¢ per kWh to the average cost over the life of the array. This cost is unsubsidized and is well within what CMLP currently pays for electrical energy.

Therefore, it is recommended that when the capital cost of solar arrays drops below a threshold to be established by the Light Board

FUTURE UTILITY-SCALE SOLAR ARRAYS MAY BE OWNED AND OPERATED BY CMLP AND BE FINANCED BY BONDS AUTHORIZED BY TOWN MEETING.

S-RECS AND OTHER SUBSIDIES ACCRUING FROM IN-TOWN SOLAR GENERATION SHOULD BE USED TO PAY DOWN THE DEBT, THEREBY REDUCING INTEREST COSTS AND THE AVERAGE COST PER KILOWATT-HOUR.

It should be noted that solar generation within Concord will reduce transmission charges paid to ISO New England and will also reduce Concord’s obligation to make forward capacity purchases. These reductions are *not* figured into the cost of owning and operating our own arrays, but they will benefit the Town when CMLP rates are established.

Finally, when we start implementing Town-owned solar generation, depreciation should be set up in order provide for the renewal and replacement of arrays as they reach the ends of their useful lives. Until more experience is obtained, the depreciation rate should be set at 4%, representing a 25-year useful life per panel. By collecting depreciation every year and by accelerated payments of bonded debt, Concord will gradually build up an asset base of solar generation capability that will eventually fund its own replacement from its depreciation charges.

Land Requirements

Solar arrays currently require about five acres per megawatt of capacity. This might drop slightly with improved technology, but it will not change dramatically. Therefore, twenty-five megawatts of solar capacity will require about 125 acres of land, preferably not all in one location. Currently, there seem to be two immediate options:–

- The W. R. Grace land in the southwestern end of Town. This former Superfund site is particularly attractive because it is large and flat, and there are few, if any, others in Concord interested in this land.
- The Massport land located in the eastern end of Town. Massport has a priority of keeping residential developments away from flights path of aircraft, but they seems to be open to considering other low-level uses of the land.

The Town Manager, the Board of Selectmen, the Light Board, and other committees need to collaborate on acquiring or gaining access to these sites and/or identifying other suitable properties. Some longer term options include:–

- The Landfill. While attractive, this is located close to Walden Pond and would interact with the Walden Woods group's long-term vision for the area. Even if agreement could be reached with the Walden Woods interests, permitting would require 1-5 years.
- The Starmet Superfund site in the southwestern end of Town. The cleanup of this site is not nearly so far along as that of the W. R. Grace property. Also, the property is more hilly.
- Town well sites. We should pursue the question of dual-use of these sites with the state. If they eventually allow passive solar arrays in combination with well use, we might consider it. However, the study and analysis would take years before a reasonable conclusion could be reached, and state regulators are understandably cautious about drinking water supplies.