

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

Pursuant to a notice duly filed with the Town Clerk, a meeting of the Municipal Light Board was held on Tuesday February 28, 2023, at 6:30 PM, at the Town Hall Public Meeting Room and via a Zoom. Present were Board Members: Brian Foulds (Chair), Wendy Rovelli, Alice Kaufman, and Warren Leon. Also in attendance were David Wood, CMLP Director; Carole Hilton; CMLP Customer Service Administrator; Joe Repoff; CMLP Assistant Director, Kerry Lafleur; Town Manager, Karin Farrow; CMLP Sr. Admin, Rob Erb; SDA Sr. Project Manager, Chris White; SDA Electrical Engineer, residents: Pamela Dritt, Andy Puchrik, Mark Howell, Charlie Parker, Bev Ridpath, Michael McAteer, Malcolm Bryant, Mark Rovelli, Cynthia, Dean Banfield, Kelly Walters, Suresh Bhatia, Gail Dowd, Lyell Slade, Christine Reynolds, Matt Root, Bill Herring. Phil Thayer, Bob Kusik, Don Kupka, Murtaza Cherawala, Kim Slack, Linda Nieman, Terri Ackerman, Linda Escobedo, Gail Hire, Janet Rothrock, Parashar Patel, Lois Surgez, Matt Johnson, Forrest Perry, John & Ann Schummers, Kathy Cuocolo, Luke Burnham, Dinos Ganatos, and Doug Sharpe

Note definitions for acronyms used in these minutes:

- **CMLP:** Concord Municipal Light Plant
- **CMS:** Concord Middle School
- **SDA:** Solar Design Associates

#### **CALL TO ORDER**

Mr. Foulds called the meeting to order at 6:30 PM. Meeting recording will be posted to the Minuteman Media Website as soon as it is available.<sup>1</sup>

#### **Concord Middle School Solar/Storage Project**

*Background: Concord Light is requesting to issue a bond that will fund an in-town solar installation at the 2023 Town Meeting under Article 21 "Light Plant Solar Expansion – Middle School". The community through Town Meeting has established many clean energy goals for Concord Light. Notable is the ATM 2010 Article 64 and ATM 2015 Article 36 Authorization of Long-term Lease for Solar Energy on town owned properties, the ATM 2013 Article 57 and STM 2016 Article 1 approving Concord Light two existing utility scale solar arrays, ATM 2017 Article 51 establishing Concord's Energy Goals, and ATM 2022 Article 38 Development Plan for Municipal Solar Generation. Additionally, many town committees have established clean energy and in-town renewable energy goals. Notable is the 2007 Comprehensive Sustainable Energy Plan, the Light Board's 2010 Utility-scale Solar Strategy, 2011 Concord Municipal Light Plant Renewable Energy Strategy, the 2011 Solar Siting Committee, the 2018 Final Envision Concord Plan 2030, and the 2020 Climate Action and Resilience Plan. Utility scale solar generation require large land areas and the community has expressed a desire through Town Meeting and committee reports that in-town projects should not clear forests and are developed using a dual land use strategy such as on buildings or over parking lots. Concord Light feels this project helps meet in-town solar generation goals in a way that the community desires at a fair price.*

*Purpose: To share with the community all details related to Concord Light's in-town solar energy project and listen to community feedback. The presentation will cover 1) how this project helps Concord Light meet goals set by the community including the ATM 2019 Article 14's "all-electric/ZNE building design", 2) provide a sense of how the project will look when completed, 3) design specifics related to solar production and battery capabilities, 4) an explanation of a "Front-of-Meter" project, 5) a simplified ratepayer cost benefit analysis, and 6) a summary of presentation topics followed by public feedback listening session.*

Intro by Mr. Foulds - We're here tonight to talk about the solar project that is going to be done at the new middle

---

<sup>1</sup> <https://www.youtube.com/watch?v=h30oELDFOAK>

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

school. Although coordinating with the Middle School Building Committee the Solar Project, a CMLP project, is separate and will be funded by CMLP. We have a slide presentation to review the whole project and then listen to comments and answer any questions.

Presentation<sup>2</sup> the following topics were covered:

- \*Town Goals
- \*CMS solar plus storage project scope
- \*Who will own the Project?
- \*Visual rendering
- \*Capital cost
- \*Quantifiable costs and benefits
- \*Summary Financials
- \*Comparables
- \*No resiliency benefit
- \*Non-quantifiable benefits

A review of the solar related progress on the Town goal to add more in-town generation that is renewable.

The middle school project scope is a roof top array, a canopy array, and a storage system. The electrical output from the array is expected to exceed the middle school's needs. The storage system is designed to absorb the solar and then use the solar energy that charges the battery at a different point in time. The combined energy production is designed to be just over 1.2 megawatts. The annual production is about 1.5 million. The architect puts the school needs as just over a million, so it is big enough to handle the net zero desire.

CMLP is going to be an owner of the solar system and battery for storage, and in addition to providing the desired net zero design for the middle school represents progress toward the in-town solar generation goal. This is not a tax-based project, it is a rate-based project. It is estimated the impact to ratepayers will be \$0.50-\$1.70/month, year 1 and decrease to a net savings by 2029 or 2035.

This rendering provides a good scope of the magnitude of the project:



Middle School Photovoltaic System technical overview of the system provided by SDA.

<sup>2</sup> <https://www.concordma.gov/DocumentCenter/View/41156/Public-Forum-MS-Solar-Storage-Presentation-230228-BFDW30>

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

The project consists of the 500Kw rooftop system, the 700+ Kw canopy system and the storage system. The rooftop system is a ballasted system (most used system for this size array) with the PV module attached to a racking system and held on the roof surface via the weight of the panel and concrete ballast blocks. This design addresses the lifting force of wind and removes the need for a lot of punctures which makes the roof integrity better. The Rooftop Inverter will take the energy from the PV module and manipulate it so that it can be connected to the grid in a usable form. The model being used is self-ballasted and has rubber feet which will sit on the roof. The output from the inverter over the roof to the transformer in the CMLP equipment corral.

The canopy system being suggested consists of a three-foot diameter concrete footing that will be embedded within grade, right off of the parking area. On top of that a steel column will be attached vertically and on top of that tilted steel substructure or superstructure will be attached on top of that in which the modules will be mounted. The design allows for snow and other materials to be shed off the panels into bioswale. The structure is designed at a height (13'10" minimum) which allows the clear passage of the busses with the inverter mounted to the canopy steel at a height well above a middle schooler's reach. As with the rooftop, the production will travel from the module through the inverter and into the transformer in the Equipment Corral.

The current design for energy storage system is 4 megawatt hours and that level of energy density, it would probably be looking at two 20-foot containers. Battery manufacturers generally buy a standard shipping container, 20' by 8', put in battery cells, track equipment, safety equipment and the control systems, inside, seal it, and deliver it to the site.

**Capital Cost** - The original article was asking for 13 million, it has been revised down as the battery storage capacity has been reduced from 8 megawatts to 4 and we worked closely with SDA to understand the market better and what they're seeing in costs. The current design is a two-megawatt inverter with a four-megawatt hour storage capacity which offers a better financial value for that size and scale. Article 21 should be revised to \$7.5 million.

**Quantifiable Cost and Benefits** – It's a clean project that meets our goals of reducing emissions. Located in Concord and behind our substation reduces some of our expenses for bringing energy from generators that are located around New England to Concord. It also allows us to have more control when we have peaks in our demand for electricity. When our expenses get high, this battery can discharge and that's very helpful. We can do energy arbitrage if we've contracted for a lot of energy and we don't need it, we can still use it to charge up the battery or we can discharge it when we need to go out to the market and prices are high. The ongoing cost of this installation would be any kind of maintenance in addition to the capital and financing and capital.

**Summary Financials** - The financial summary calculation shown was without any federal incentive shows a declining cost to ratepayers until 2035 when the projects financial gain out-weights the costs. A 25% federal incentive as well as the possibility of some ARPA funding could reduce the financial impact on ratepayers. With CMLP carrying the entire cost the monthly rate cost to a resident is about \$1.70/month for year one, decreasing each year until about 2035. That same math with the 25% credit from the Fed as well as the ARPA funds, the monthly rate cost only extends to 2029.

**Resiliency Benefits** - As this project has been designed for the utility (front of meter system there is no resiliency benefit. The battery will operate to absorb the solar production and to offset costs like an open field system where production goes to storage, and it feeds into our distribution system. We see the benefit by charging up that battery during the day and discharging it during the times when our expenses are the highest. As the design process of the connection to the grid and how this battery, solar and the building all connect to the distribution systems hasn't been finalized it is unsure if it will be designed to isolate the Middle School so that the battery could power it. Even in a scenario where it could power the Middle School the charge/discharge schedule may have depleted the battery as

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

the plan is based on reducing the rate payers' expense not for resiliency.

**Non-quantifiable Benefits** – A way to add solar in Concord without having to clear forests or take up farmland. We want to put these projects where it makes sense, on the on top of roofs, on top of parking lots. It's a bit more expensive but has financial value in a short number of years. Putting it at a school is a way of us demonstrating our values to our children. They can ride an electric bus to school, they can see the solar array and it's generating clean energy and they can see that we're not just talking the talk. We're actually doing it here in Concord, and we believe in these things. The design of this array sheds snow and rain into the swale protecting the parking area so it may reduce the amount of snow in the parking lot and ensure that no avalanches fall onto cars.

**PUBLIC COMMENTS/QUESTIONS** (Timestamp 24:54)

Michael McAteer - What an extraordinary step forward. I think about how this fits into the Climate Action Plan and this is an integral important piece of that strategy, particularly as we look to achieve Article 51. Is the Light plant thinking strategically how we can then apply what we learned here and go back to all the other schools with the same principles, the same goals, and the same intent?

Mr. Foulds response - So we're going to need to find more sites to bring us to our goal of 20 megawatts. But we need to make sure that we do it in the interest of the ratepayers, meaning that it is not raising rates over the life of the project. This project is well timed is they're building a new school. While they are reworking the property and making major investments in it, that's a good time to do projects like this. The filtration beds with the Water Department, when they rework those, we'll be looking at that site. The high school is still rather new, and we can look at that or the Beede, there's many of these properties around town and what we don't want to do is try to meet a goal by clearing the forests around our wells that we had in our solar siting program. We've learned a lot in preparedness and will have firsthand knowledge of how to do best practices.

Mark Howell - What's the actual timeline of the project?

Mr. Foulds response – Assuming we get approval at Town Meeting to take out the Bond we will coordinate with the building of the school with the goal of completion when the school is open and ready for students.

Doug Sharpe - Who's maintaining the system? Are the people from the school going to be involved at all or will be strictly CMLP?

Mr. Foulds response - The maintenance and operation of the system will be CMLP coordinating with the school on access and timing. There is going to be a memo between the schools and the Light Plant to clarify all the specifics.

Doug Sharpe – Can you say more about how the system will fit into the grid and the design issues you mentioned?

Mr. Wood response - Part of the project has a switch that a consultant designed for us so that when it's time to purchase, the designs will already have been specified. It provides protections for the array, protections for the school, and protections for the battery. When you design something like that you have protective devices in there, and that's the part that consultant hasn't finished with yet. The design will determine if we are able to back feed into the school with just the battery during an outage.

Mr. Foulds – Lacking the proper protections in the system could allow back feeding into the system that linemen had de-energized to make repairs.

Dinos Gonatas - I'm an Electric Utility Consultant, primarily with projects in solar and storage. The cost assumptions for the canopy solar versus the rooftop solar I reviewed with some of my clients, and they thought that they were middle of the road, \$3.50 per watt for the canopy \$2.50 for the rooftop. Adding if you did a ground mount that would probably be around \$1.50 per watt. There is quite a bit of savings that could be achieved if either the project was configured as entirely as a ground mount or even just to remove the canopy piece of it and do ground and rooftop. Is there not a scenario where the goal could be reached without having to pay the premium for canopy generation?

Mr. Foulds responded that it is a value decision within the community covered by many town meeting articles.

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

Specifically, the feasibility study for the Middle School, there was a net zero requirement and a requirement not to take down trees.

Dinas Gonatas - The second piece is the storage piece. I've analyzed rates for different areas, and storage can be a winner with really large demand charges, ISO New England has sort of a middleish demand charge. So two points of caution and one is that today's that demand charts you have to have a dispatch algorithm for the battery that is very precisely tuned to the current market conditions because you can't always tell exactly in advance when the highest demand per month is going to be and if you're also trying to minimize the annual capacity charge from ISO New England that's the 6 or so up top peak hours per year. Requiring a lot of intelligence and a lot of flexible dispatch in there. How would that work? And would it make sense to wait until that business case develops itself and a battery can be clearly shown as profitable, separate from the other pieces.

Mr. Foulds - the battery will be providing a return as we also have a substation that is in threat of running backwards, which isn't designed for. We have so much solar today in town that there are times in the spring and fall when we have solar saturation, where our load at this 70-megawatt substation threatens to go backwards. As for hitting the peaks, we're working with Energy New England to make sure that we operate it as cost effectively as possible to get that value out of that peak shape. Now we're not going to pay play in the regulation markets doing the frequency regulation, but we are going to do other cost avoidance operations.

Don Kupka - Thank you for such a thoughtful, well-designed presentation. Big picture question. If we were to have a master plan, to have renewable power generation on a town owned building what would we be doing differently? Would it be more cost effective for the ratepayers to plan for rooftop solar arrays across the school buildings prior to installing the canopies? Secondly, I think it is key to coordinate the life expectancy of the membrane of the roof before installing solar. As the Alcott school is 20 years old, would we get a better bang for the buck with more solar power to the town for the same expenditure if we looked at the roof of the Middle School and the roof of the Alcott school?

Mr. Foulds - we're looking at doing this project but there's going to be many more projects to come. All of the municipal rooftops are being looked at. You know some of the buildings are older and we need to look at the roof structure, some of the buildings are quite small and may or may not have a higher cost for what they produce. Article 38 from last year's town meeting, asked us to create a list of locations and a timeline for meeting the increase of in-town solar generation goals. We're still working on that because we've got to figure out the distribution side of this. How do we manage this oversupply of electricity when demand is low? Once that is sorted, we'll be able to determine the next project and the value of adding solar to each of the municipal owned properties.

Murtaza Cherawala - Thank you for the presentation and for sharing the capital costs. Are the operational costs and the maintenance costs going to be funded by the Light Plant or taxpayer funded?

Mr. Foulds - It's a utility project and any maintenance costs will be borne by the utility, not from the taxpayer, and operational expenses will be covered primarily with the depreciation within the budgeting process.

Murtaza Cherawala - Will the project cause raising fees in the future or just those costs outlined today?

Mr. Foulds - Shown was the projected monthly cost to the ratepayer with the first years of the project being more expensive while we're paying down the capital and the debt expense.

Kim Slack - Thank you for a great presentation. This not only fits into the town's Climate Action Plan, but also with the State. Will it be possible to charge vehicles directly from the panels at the school?

Mr. Foulds - There will be conduit in the ground. Any kind of charging infrastructure is planned for the schools to provide so the energy from the building would charge those vehicles, that way they can set the terms on any kind of fee structure.

Kim Slack - The view of the arrays appears very near the baseball field, is there some kind of protection from errant baseballs?

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

Mr. Foulds - You could go through the process of trying to protect it with big fences and barriers and whatnot. But I think that's more costly than swapping out the panel. So, let them play and if something breaks will replace the panel. Solar panels are not as fragile as they may look, I have seen installers walk across these all the time. They have hail ratings for when you have a hailstorm. They're quite durable.

Gail Hire - Thanks for the great presentation. I would like to urge caution in building these power plants out at schools where children will be spending a good chunk of their time. Solar panels and inverters in particular are known to cause electrical noise, also called in nonscientific terms "dirty electricity", which is known to cause detrimental health effects. And this includes nausea, headaches, and fatigue. And the people who are electro hypersensitive are especially susceptible to ill effects from photovoltaic systems. It is possible to measure and remediate this radiation and there are several consultants who do this scientific and engineering work. Please be very conscious of electrical noise issues when designing and implementing this project. There's school design guidance called the Northeast CHPS (Collaborative for High Performance Schools), and they have a whole section of their guidance regarding low EMF best practices. And that best practice with respect to electrical stuff says to position electrical supply rooms and building power supply adjacent to low occupancy areas, among other strategies.

Christine Reynolds - Why were the numbers for Net Present Value tonight different from those previously discussed at the Light Board Meeting?

Mr. Foulds – We had some small changes based on input from a meeting with some solar people in town.

Mr. Wood - We had initially used a 20-year debt term which we reduced to 15 years, and we increased the inverter size which made the battery more effective in terms of payback.

Christine Reynolds – As a potential hazard are there any issues with the siting of the battery?

Mr. Foulds - The area is going to be fenced off. It's not something the public will be able to access. And it is designed with safety in mind.

Chris White (SDA) - Specifically for the basis of design that we currently have for the battery system that it will have undergone large scale fire testing per the NFPA requirements. Meaning that the battery manufacturer is going to in a lab, assemble one of these containers and look at a worst case scenario of a thermal runaway of a battery cell, and they're going to show for citing purposes that that thermal runaway is not going to jump to the next cell, it's not going to cause a thermal event for the battery as a whole or it's going to try to show that would be minimized. Any fire risk within the container is going to be minimized and then further, any fire risk outside of that is going to be but close to nil. The battery energy storage systems will have integrated fire suppression systems.

Pamela Dritt - I think this is so wonderful, because we're going to have clean energy produced here, and it'll save us money, and it'll make us healthier, and it will not increase the fossil fuel infrastructure that's killing the world. And none of that is included in the cost savings that we got there. Are we maximizing the solar and battery, or are we holding back for financial reasons?

Mr. Foulds - I think we're maximizing the solar on this on this site and the battery is appropriately sized. In the future if there is value in enlarging it there is space.

Pamela Dritt - Will there'll be infrastructure to add electric bus battery vehicle to grid capability to supplement the school battery and help balance the grid?

Mr. Foulds - That's my dream for the bus depot. I don't think we need to spread the fleet out across town.

Pamela Dritt - Mobile emergency shelter systems and electric bus.

Bill Herring - I think you scored a bull's eye on a moving target. 10 years ago, we wouldn't have thought of a battery. You're talking about dispatch rates, demand management, that you've got substations that are approaching running backwards. It's wonderful to see we're going to get this power.

Concord Municipal Light Board Minutes  
February 28, 2023  
Public Forum

Mr. Foulds - I don't see any other questions. Thank you for your time and thank you for all coming out on a Snowy Evening. Please come support the article when it comes to Town Meeting.

**The meeting was adjourned at 7:30PM.**

Respectfully submitted,  
Alice Kaufman, Acting Clerk