



CONCORD MUNICIPAL LIGHT PLANT

ELECTRIC | BROADBAND | ENERGY MANAGEMENT

Date: April 5, 2024
To: Municipal Light Board: Brian Foulds (Chair), Alice Kaufman, Warren Leon, John Dalton, and Bianca Taylor
From: Jason Bulger, CTO, Interim CMLP Director
Subject: Agenda for Virtual Light Board Meeting **April 10, 2024, 7:30 A.M.** (Zoom link below)

- 7:30 AM 1. **Call to Order**
- 7:30 AM 2. **Meetings and Minutes** 5 Minutes Chair
 April 10, 2024, April 24, 2024*, May 8, 2024, June 12, 2024, July 10, 2024, August 14, 2024, September 11, 2024, October 9, 2024, November 13, 2024, & December 11, 2024.
 *For consideration to prepare for Town Meeting
- 7:35 AM 3. **Chairs Update** 5 Minutes Chair
- 7:40 AM 4. **Directors Update** 20 Minutes Director Information
- 8:00 AM 5. **Broadband Update** 5 Minutes Director Information
- 8:05 AM 6. **Special Town Meeting Utility Scale Battery** 55 Minutes Chair Discussion/Vote
Background: On April 1, 2024, the Select Board opened a warrant for a Special Town Meeting to take place on Wednesday, May 1, 2024 at 7:10pm. The Town Manager has submitted an article that is a request to borrow up to \$10.4 million for a utility-scale battery in Concord for CMLP.
Purpose: To discuss and vote to take a position on the article.
- 9:00 AM 7. **Liaison & Public Comments** 5 Minutes Chair
- 9:05 AM 8. **Adjourn**
 Distribution: Select Board (1 copy)
 Kerry Lafleur Carole Hilton Joe Repoff Matt Cummings
 Jan Aceti Laura Scott Chris Carmody Eric Simms
 Jason Bulger Mary Hartman Michael Hale

Join Zoom Meeting

<https://us02web.zoom.us/j/83853970051?pwd=akVzemJRQk8vNTJRUnNlOS9NNDlFudFk0T09>

Meeting ID: 838 5397 0051

Passcode: 661712

One tap mobile

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+13017158592,,83853970051#,,,,*661712# US (Washington DC)

Find your local number: <https://us02web.zoom.us/u/kbA1MReajb>



Link to view recordings of previous Light Board Meetings:

<https://www.youtube.com/@MinutemanMediaNetwork/search?query=Concord%20Light%20Board>

Link to view the Director's Updates:

<https://concordma.gov/1106/Municipal-Light-Board>

Link to view the Broadband Monthly Updates:

<https://www.concordma.gov/3148/Monthly-Updates>

Concord Municipal Light Plant Updates

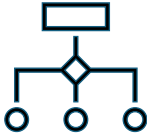
April 10, 2024

Contents

- Organization and Transition 1
- Energy Management.....2
- Special Town Meeting.....3
- Power Supply and Rates3
- Middle School Solar4
- Advanced Metering Project Updates4
- Finance Division Updates5
- Customer Service / Metering5

Organization and Transition

- The Senior Leadership Team has been meeting weekly to cover operational topics and advance initiatives. We have been dealing with daily items and special projects as well as advancing long-term goals and establishing organizational values.
- I’m thrilled to announce the promotion of Laura Scott, our former Power Supply and Rates Administrator, to the position of Assistant Director of Power Supply and Energy Management. Laura has been instrumental in creating a cost-effective, reliable supply portfolio that includes new wind and solar resources built in New England.
- Regarding the transition and selection of a permanent Director, the Town Manager has provided an update the Light Plant staff and offered to meet with people to get more direct feedback. Several people took her up on this offer over several days at the Light Plant. The Town Manager has also set up meetings to discuss the governance structure and continues to perform analysis on the most effective construct.
- We held a luncheon for staff in mid-March to celebrate spring. Thank you to Carole, Josh and all others who helped make this happen. After the food, we had a fun round of trivia with both real and funny prizes for winners.
- As Interim Director, I continue to attend division meetings and also meet individually with staff and Light Board members to understand their concerns and priorities.



Energy Management

- The Climate Action Committee, Concord Sustainability, and CMLP recently hosted a series of Concord Green Home Tours to encourage residents to see firsthand how their neighbors have taken action to reduce their greenhouse gas emissions through electrification. Featured technologies included air source and ground source (geothermal) heat pumps, solar arrays, induction stoves, heat pump hot water heaters, and electric vehicles & chargers. The tours were held on two separate dates (March 9th and 23rd) and each date featured a choice of three Concord homes that provided participants with a range of home ages, sizes, and technologies. Approximately 100 Concord residents participated in the tours, giving them an opportunity to hear directly from multiple homeowners about their successes and challenges with electrification, and the opportunity to engage with CMLP heating/cooling coaches and electric vehicle specialists from Energy New England. The Green Home Tour idea was the brainchild of CMLP heating/cooling coach Ethan Herberman, who felt that experiencing the warmth in homes heated solely by heat pumps is important for homeowners contemplating a switch away from fossil fuel heating. The Concord Bridge [covered the Tours](#), featuring CMLP heating/cooling coach Kim Slack in their article. Requests for coaching and for EV support are coming in from Green Home Tour attendees.
- CMLP’s Energy Efficiency & Electrification Specialist, Pamela Cady, has produced and posted a solar explainer called “[SOLAR in Concord](#)” to CMLP’s website. The goal is to provide customers and solar installers with a user-friendly guide to the “Why,” “Where” and “How” of home solar. Having a home solar array installed is a complex task, and Pamela has often found herself having lengthy conversations with homeowners and installers to explain the considerations, steps and incentives involved. By directing people to the solar explainer, the Energy Management Division hopes to improve the service we provide to our customers and to expand our capacity, freeing up Pamela’s time for other tasks.
- ENE’s EV Specialists recently met with residents of Concord Village, a condominium complex on Staffordshire Lane, and provided them with detailed recommendations for installing dedicated or shared EV charging infrastructure on their property.



Figure 1: Concord Bridge article on home tours.

Special Town Meeting

- On Monday, April 1, 2024, the Select Board voted to open a Special Town Meeting warrant through Friday, April 5, 2024 at 12 noon.
- On Thursday, April 4, 2024, Light Plant staff, including Jason, Laura, and Kerry, the Town Manager, made a presentation to the Solar Implementation Task Force that recommended a \$10.4 million borrowing request to build grid-scale battery storage within the Town of Concord.



- The Solar Implementation Task Force voted unanimously to support the article, and later indicated they would take no action on Article 33 in the Annual Town Meeting warrant.
- The Light Board will be meeting on April 10, 2024 to take up discussion of the article.
- A public hearing will be held by the Finance Committee, likely at 7pm on April 16, 2024.
- The Special Town Meeting will take place at 7:10pm on Wednesday, May 1, 2024.
- The light plant will begin preparing materials for these meetings as well as other planned information sessions.
- We thank the Solar Implementation Task Force for their efforts in expanding solar, adding batteries, and supporting this article.

Power Supply and Rates

- We received informal notice that the Mason Bay Wind Project due online 6/30/2024 will be delayed.
- CMLP has hired a company to conduct a feasibility analysis of building solar on the landfill slope. We expect their findings in approximately 6 weeks.
- We are getting close to hiring a company to assess the feasibility of putting solar panels on the High School roof, but we may be postponing this indefinitely after feedback on the economic analysis of this project showing it may be >\$0.15/kWh.
- We have begun the process to hire a consultant to prepare preliminary financial analyses of the Middle School solar plus battery and potential new projects under Elective Pay. They will help us maximize the tax credit.
- We have organized a task force of ENE, CMLP, and Town staff to fix the inconsistencies with pricing and payment options at the new Level 3 FLO chargers.
- The GRIP grant application that CMLP has joined along with a number of other Massachusetts MLPs will be submitted on 4/17/2024. If awarded, CMLP could receive between 25 and 50% of the cost to install the Middle School Project and potentially the landfill expansion. It's a long shot, but it was worth a shot.



Middle School Solar

- On March 26, we brought on board a new part-time limited status employee to work 8-16 hours per week as a project manager for the Middle School solar project. Her name is Mary Bulso, and she has a wealth of school and solar construction project management experience. Welcome, Mary!
- CMLP staff attend weekly planning and construction meetings.
- To address concerns from Griffin, the electrical contractor, and CTA, the construction company, CMLP staff attended a couple meetings to pin down next steps on the permanent power plan.
- The original design required a concrete pour with conduits for the switchboard, but the manufacturer of the switchboard still did not have the specs, both because of delays in manufacturer response and changing requirements with the battery power (from 1 to 2 megawatts).
- The new plan uses an off-the-shelf manhole to collect conduit and cabling to sit directly in front of the switchboard pad. All contractors have signed off on the design and materials have been procured. Griffin will help with this process, and CTA will be installing the manhole system.
- The variance request was signed by the Building Commissioner, and the application was stamped by the Town Clerk ahead of the 3/29 deadline. It will be heard at the May meeting.



Figure 2: Approximation of underground vault (6'x12'x7')

Advanced Metering Project Updates

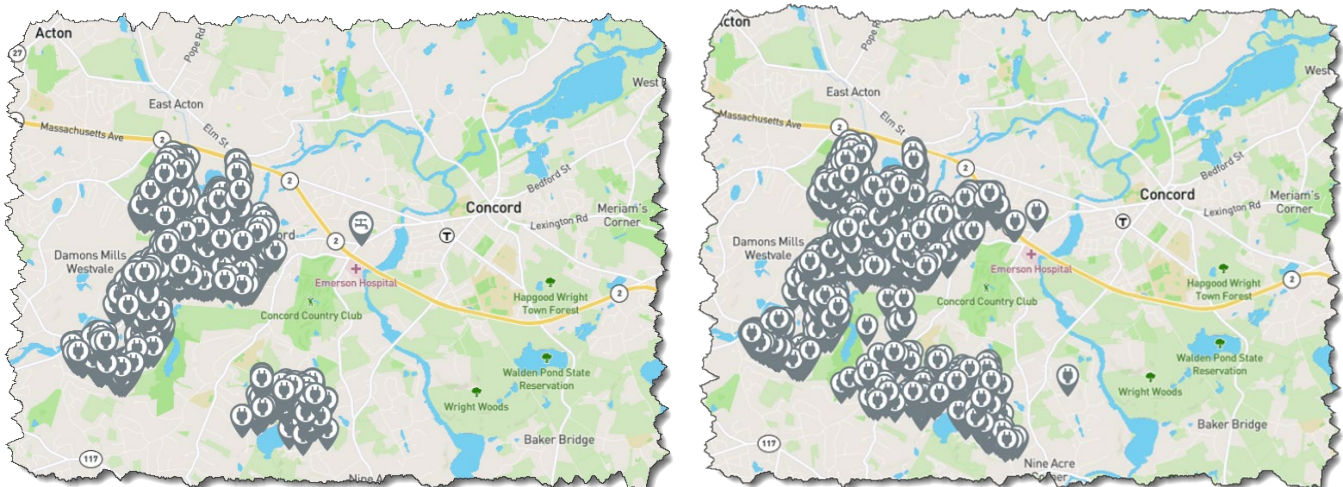
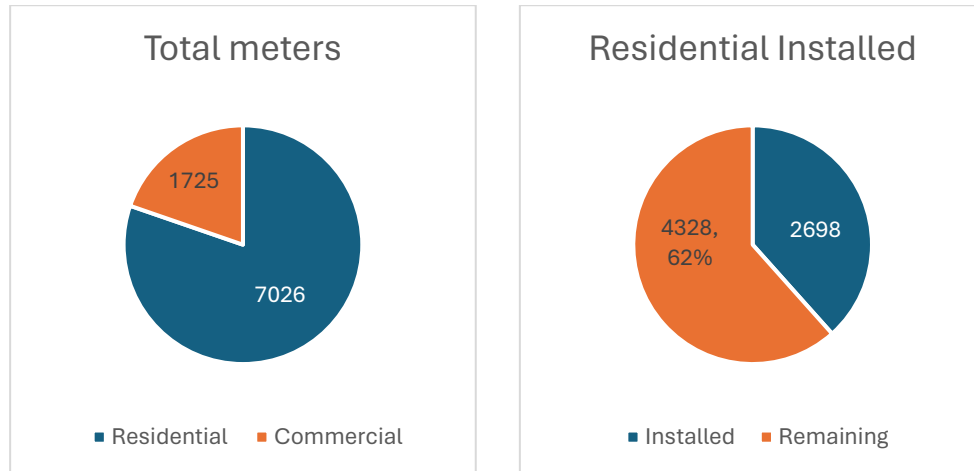


Figure 3: Current advanced meter locations in Concord – March 2024 (left) vs April 2024 (right)

- We have between one and two external crew of two electricians installing advanced meters.
- Recent rain and snowstorms have slowed deployments, but we are excited for warmer and sunnier weather ahead!
- We have installed over 500 meters since last month's Light Board meeting.



- Eaton conducted onsite Yukon training for end users (Metering, Engineering, Line Crew, Customer Service, Power Supply) during the week of 04/04/2024.
- CMLP's electrician has installed approximately 76 load control relays for customers who participate in our load control programs (roughly 420 customers) including water heaters and electric thermal storage heaters. We're finding several customers are no longer interested in participating; homeowners may have changed, and the new homeowner is not aware they are participating; and a few devices not working.
- Twenty-four customers have opted out of receiving a new AMI meter.

Finance Division Updates

- The Finance Team has closed the calendar/fiscal year for 2023 and is moving on to the audit preparation.
- Audit fieldwork is scheduled for the week of April 22, 2024.

Customer Service / Metering

Customer Survey

- CMLP will be conducting a digital customer survey of our residential customers during May. Our last comprehensive customer survey was done in 2017. Previously, we did these surveys every two years and were scheduled for a survey in 2019 but were not able to move forward with it due to the pandemic. GreatBlue Research LLC will be administering the survey. GreatBlue is a Public Power market research firm who has worked closely with Municipal Electric Association of Massachusetts (MEAM) members to develop core

questions applicable to Massachusetts municipal utilities. As a MEAM member, this affords CMLP preferential pricing and allows for our survey results to be compared to our peers. The digital survey will take about 10 minutes for a CMLP customer to complete.

Residential Assistance Renewals

- January is the annual renewal time for the customers on our Residential Assistance rate.
- The CSRs send out renewal letters to the customers enrolled requesting updated financial information and application. The CSRs also called or emailed customers twice to remind them to send in their application.
- For 2024 (after annual application renewals), we now have 153 customers on residential assistance rates—126 Electric customers and 27 Water.
- For 2023, we had 177 customers on residential assistance rates—149 electric customers and 28 water customers.

Accounts Receivable

- March 15 is the official date for the winter moratorium on disconnections to be lifted per the DPU. As the DPU did not postpone the date due to weather conditions, we started our full disconnection process as of mid-March using updated past due notices and process documents.
- The first two disconnection cycles done in March began with 20-25 potential electric customers and dropped to 2-4 customers disconnected for each cycle. We expect the initial number of potential disconnects to drop as past-due customers realize the winter moratorium is lifted.
- We no longer make several attempts at collection calls and emails. We now place tags on customers' doors the day prior to disconnection giving them time to pay before we cut off power. We started this practice last summer and have found it is much more effective and resulting in more customers paying their past due amounts prior to disconnections.
- Two of the customers disconnected had the new AMI meters and we were able to successfully disconnect/reconnect their power remotely ensuring Meter technicians safety and greatly improving efficiency.

Donate Your Solar RECs to CMLP Program

- Program design details and the application process is complete. Direct mail (snail mail and email) pieces being finalized.
- Proposed: those customers who qualify based on DOER records will receive a \$9 per month bill credit no matter the size of their array.
- Line item credit is created in the billing system, and NISC has completed bill print programming changes.
- Data received from DOER is not “clean” so the comparison with NISC data is a manual, line-by-line comparison.



TOWN OF CONCORD MUNICIPAL UTILITIES

ELECTRIC | WATER | SEWER | TELECOMMUNICATIONS

March 2024 – Broadband Updates

Concord Broadband is pleased to share the following updates and information from the past month. Please do not hesitate to contact us at broadband@concordma.gov should you have any questions, concerns, or feedback.

Operations

We are happy to report that **we have hired a new Senior Network Engineer** who will start working on Tuesday, April 16th. This individual worked for CMLP for a little over a year starting in mid-2021. He ended up leaving due to commute and life circumstances, but he finds himself in a position to spend a few months working with the Broadband team again. We will continue to work hard to recruit another regular or Senior Network Engineer to reach fully staffed levels.

Multi-dwelling units

It has long been a goal of Concord Broadband to expand into Concord's multi-dwelling units (MDUs) at a much higher rate than we have access to today. Historically these buildings have faced the following challenges:

- Many were built prior to Concord Broadband's existence, so they lack adequate conduit to the building and to each unit to run fiber.
- They may be managed by a board that needs to vote to authorize expenditures to gain access to install fiber.
- Internal unit wiring may be owned by a different internet service provider.

Concord Broadband staff have had meetings with Concord Greene and other MDU representatives to discuss expanding into these areas.

One very promising area of development underway for planning is the expansion of fiber at the Concord Housing Authority's properties at Everett and Stow streets. Through the [Residential Retrofit program](#) administered by the Massachusetts Broadband Institute, we may receive 100% reimbursement costs for getting high speed internet to these units.

Broadband Manager Dale Hartling has had several meetings with the Executive Director of the Concord Housing Authority and the Program Development Director at the Mass Broadband Institute and has responded to a Request for Information. He is obtaining quotes from vendors that can perform all of the actions required to hopefully prevent bottlenecks that result from needing to coordinate with CMLP overhead and underground crews.

Upcoming Maintenance

No scheduled service-impacting maintenance is planned for the month of April.

We continue to test our next-generation equipment to prepare for future procurement and projects.

You can learn more about maintenance windows here:

<https://concordma.gov/3144/Broadband-Maintenance>

There may also be conversations about providing fiber to low-income housing in surrounding communities. We are extremely excited about these opportunities to expand access to more customers!

Business modeling and analysis

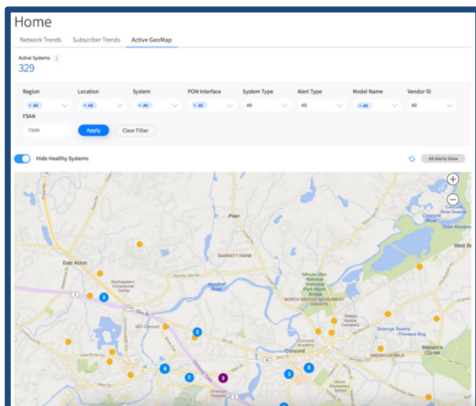
Back when Mark Howell was interested in utilizing CMLP's SmartGrid fiber as a backbone for a municipal fiber service, it was necessary to convince voters that this would be a sound business proposition. To do that, financial models were needed to show what the cost of doing business would be initially and five years into the future.

Those models were useful in proving that Concord Broadband would be cash flow positive in a few years, but the data and assumptions that fed those models were not kept up over the next 10 years of operation.

I'm pleased to report that **Concord Broadband has retained the help of the individual who constructed those models to provide updates to the underlying data and recalibrate assumptions with a decade of real-world experience.** We will also work to create clearer financial independence between the broadband and electricity divisions of CMLP and produce regular financial reports with more granular detail than we have today. These new models will allow us to put together comprehensive capital plans to outline expansion into underserved areas of Concord.



Operations Cloud software



We have held a series of meetings with Calix, the vendor that makes the ONTs and switches for our network, to cover the result of our implementation of Operations Cloud. These were learning opportunities for staff to become familiar with the platform and also get some outstanding issues fixed.

So far, only a few hundred of our ONTs are showing up on the outage map. The vendor has identified an issue with their software, and they are applying a patch on the week of April 8th to fix the problem.

We have been able to setup unique alarms and even stage software to be applied on a reboot – things not possible on our previous iteration of software. This new cloud platform is being enhanced monthly, which is a welcome change over our previous platform that had not received substantive updates in nearly a decade.

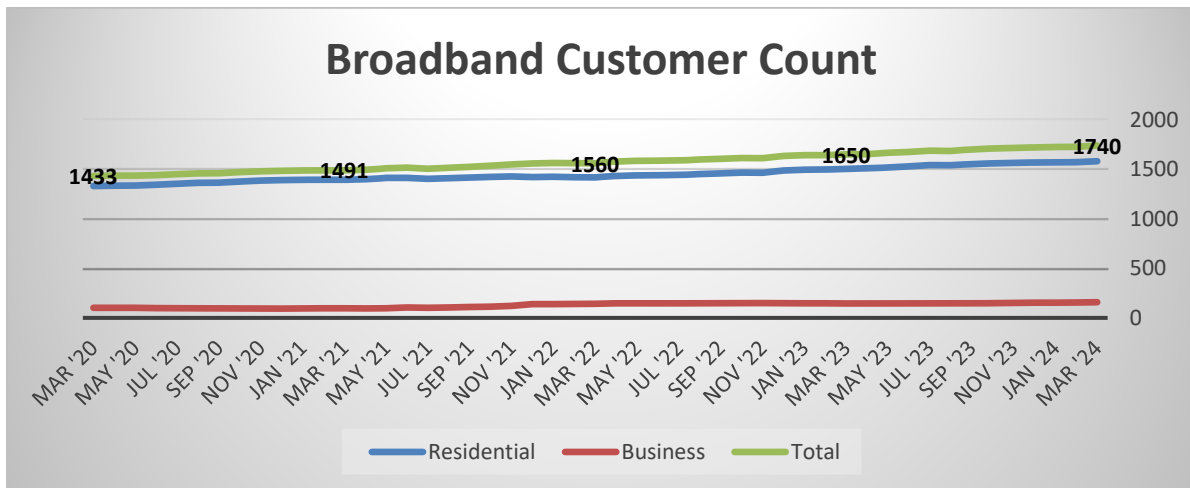
Affordable Connectivity Program

The Light Board has approved a flat \$20 per month credit for any customer that is eligible for the electric rate assistance program. We are confirming with counsel the process and will be reaching out to eligible customers to notify them of the savings.

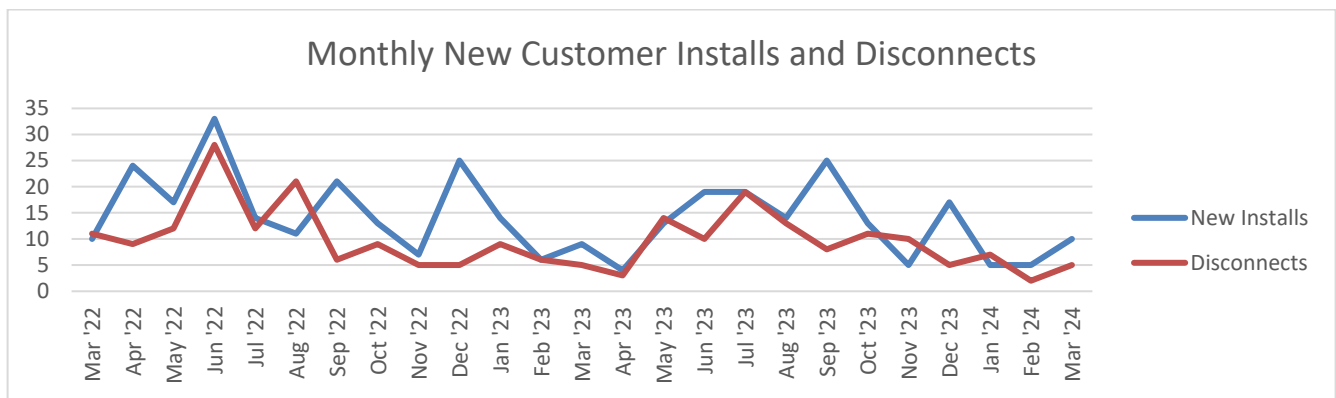
We also have learned that there are customers who have Broadband but whose multi-dwelling unit may handle their electricity, so while they may qualify for the electric rate assistance, they are not enrolled in the program. **After understanding how many of these customers exist, we will come to the Light Board at a future meeting to reframe the request for a credit to make sure these people can be eligible for the credit.**

There is still no identified funding of the Affordable Connectivity Program once it runs out of funding in April of 2024.

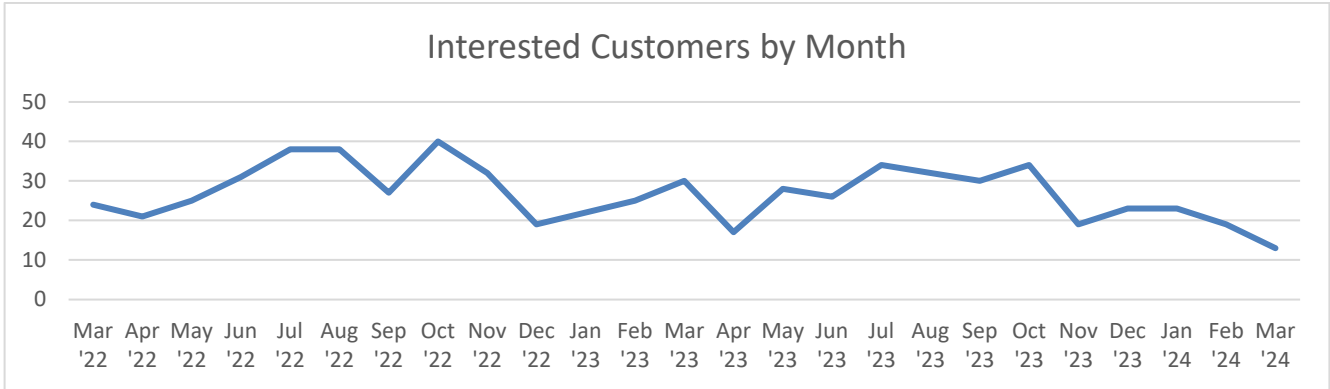
Monthly Metrics and Business Data



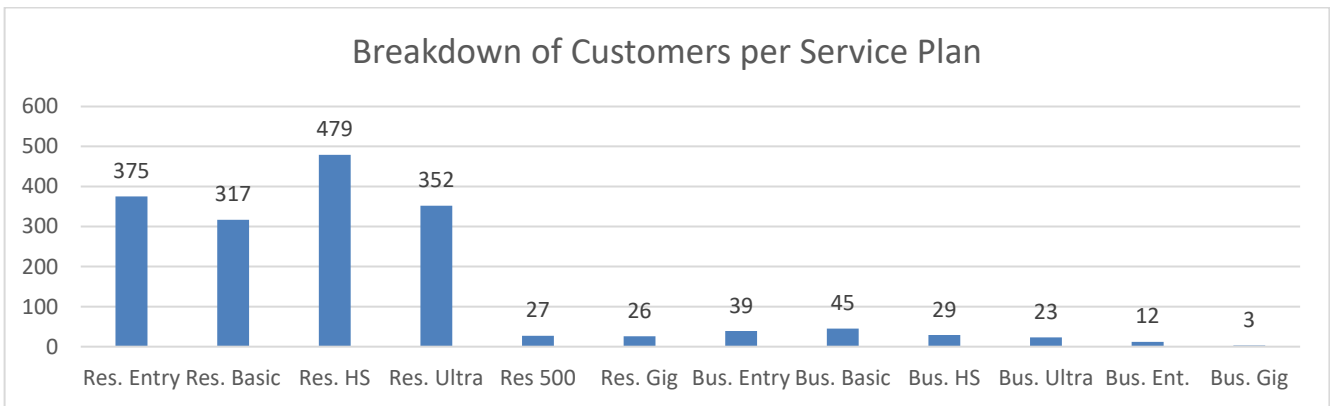
(Customer count: March 2020 – March 2024)



(The number of new installations and disconnects completed each month.)

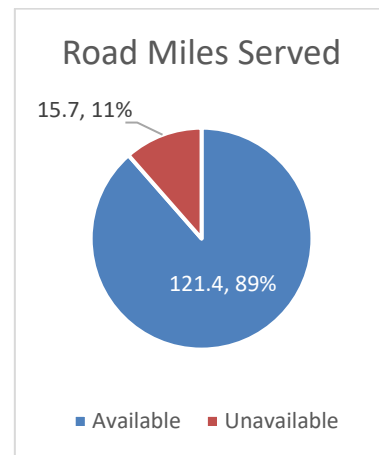
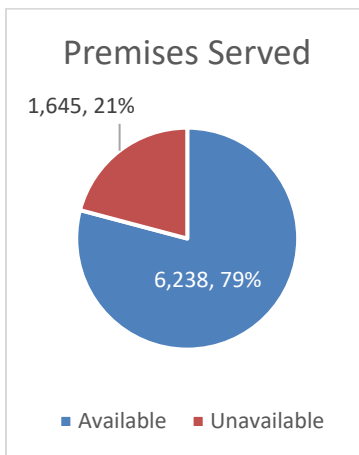
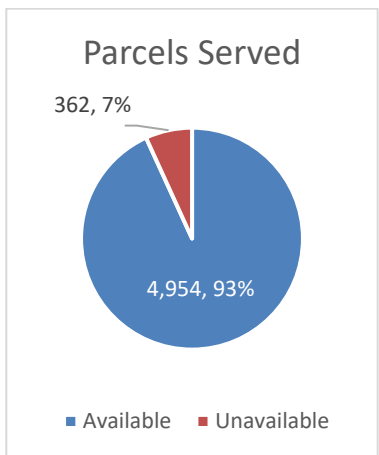


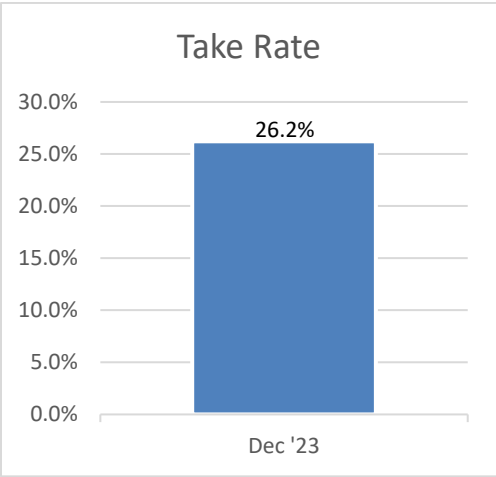
(This is the number of individuals who submit the Broadband interest form, whether they are in the current service area or not.)



(This is the number of each customer on our different service plans as of 3/31/2024.)

Other Metrics





(As of 12/1/2023)

Appendix

Fiber Broadband Completion Task Force's Draft Report Goals

Goal	Type	Priority	Responsible Party	Additional Info.
Policies (p.39)				
<ul style="list-style-type: none"> Universal Access 	Policy	Highest	Select Board/Town Meeting	
<ul style="list-style-type: none"> Expansion outside current territory 	Policy	Low	Select Board/Town Meeting	Conversations happening
<ul style="list-style-type: none"> Support Economic Vitality, Sustainability, Equity & Inclusion 	Policy	High	Select Board/Light Board/TM Economic Development	Rate subsidy planned
<ul style="list-style-type: none"> Affordable Housing 	Policy	Medium	Select Board/Housing Groups	Rate subsidy planned; working on Concord Housing Authority properties
<ul style="list-style-type: none"> Public Safety 	Policy	Medium	Select Board/Town Manager	
<ul style="list-style-type: none"> Education 	Policy	Medium	Select Board/School Dept.	
<ul style="list-style-type: none"> Government Access (PEG) 	Policy	Medium	Select Board/PAAC	
Recommended metrics for tracking (p.41)				
<ul style="list-style-type: none"> Parcels served 	Metric	Medium	Town Staff/Light Board	Complete; will report quarterly
<ul style="list-style-type: none"> Premises served 	Metric	Medium	Town Staff/Light Board	Complete; will report quarterly
<ul style="list-style-type: none"> Road miles served 	Metric	Medium	Town Staff/Light Board	Complete; will report quarterly
<ul style="list-style-type: none"> Subscribers 	Metric	High	Town Staff/Light Board	Complete; will report monthly
<ul style="list-style-type: none"> Take rate 	Metric	Medium	Town Staff/Light Board	Complete; will report quarterly
<ul style="list-style-type: none"> Churn 	Metric	High	Town Staff/Light Board	Complete; included in monthly report
<ul style="list-style-type: none"> Installations 	Metric	Highest	Town Staff/Light Board	Complete; will report monthly
Governance (p.39)				
<ul style="list-style-type: none"> Track progress against completion 	Metric	Highest	Light Board/Town Staff	We have been cleaning up the Master Address Table and will have something new to report soon. (3/2024)
<ul style="list-style-type: none"> Rate of return policy 	Policy	High	Light Board/Town Staff	
<ul style="list-style-type: none"> Financial goals with regular reporting 	Policy	High	Light Board/FinCom	Working on this
<ul style="list-style-type: none"> Retained earnings and reserve policy 	Policy	High	Light Board/FinCom	

Goal	Type	Priority	Responsible Party	Additional Info.
Strategic Planning Goals (p.43)				
• Marketing and growth	Metric	High	Light Board/Town Staff	
• Business return	Policy	High	Light Board/Town Staff	Working on this
Budgeting Process for Fiber Expansion (p.41)				
• Expand to fill existing opportunities	Planning	High	Light Board/Town Staff	
• External funding sources	Research	Medium	Light Board/Town Staff	Working on this
• ARPA Relief Funds Allocation, incl. Lost Revenue	Finance	Highest	Select Board/Town Manager	Complete
• Review/Confirm Internal Loan Findings	Finance	Highest	Financial Audit Comm/Staff	Complete
• Review and Rescind PILOF to MMN	Finance	High	Select Board/Town Manager	Complete
Capital Planning Process (p.42)				
• Review/Revise Debt financing schedule	Policy	Highest	Light Board/Town Staff	In progress; due to positive financial situation, anticipating being able to repay faster.
• Quantifying cost of expansion	Planning	Medium	Town Staff	Working on this
• How to fund expansion	Planning	Medium	Light Board/Town Staff	Working on this
• Revise/refine methods for computing ROI	Planning	Medium	Light Board/Town Staff	
Construction and Logistics (p.42)				
• Vibratory plow – direct buried fiber cables	Operations	Medium	Town Staff	Working on this
• Revise/Refine Communication conduit construction standards and guidance	Policy	Medium	Town Staff	
• Integrate Fiber construction with the Roads Program – focus on Streets without fiber that already have underground electric	Planning	High	Town Staff	Working on this

Battery Project Considerations

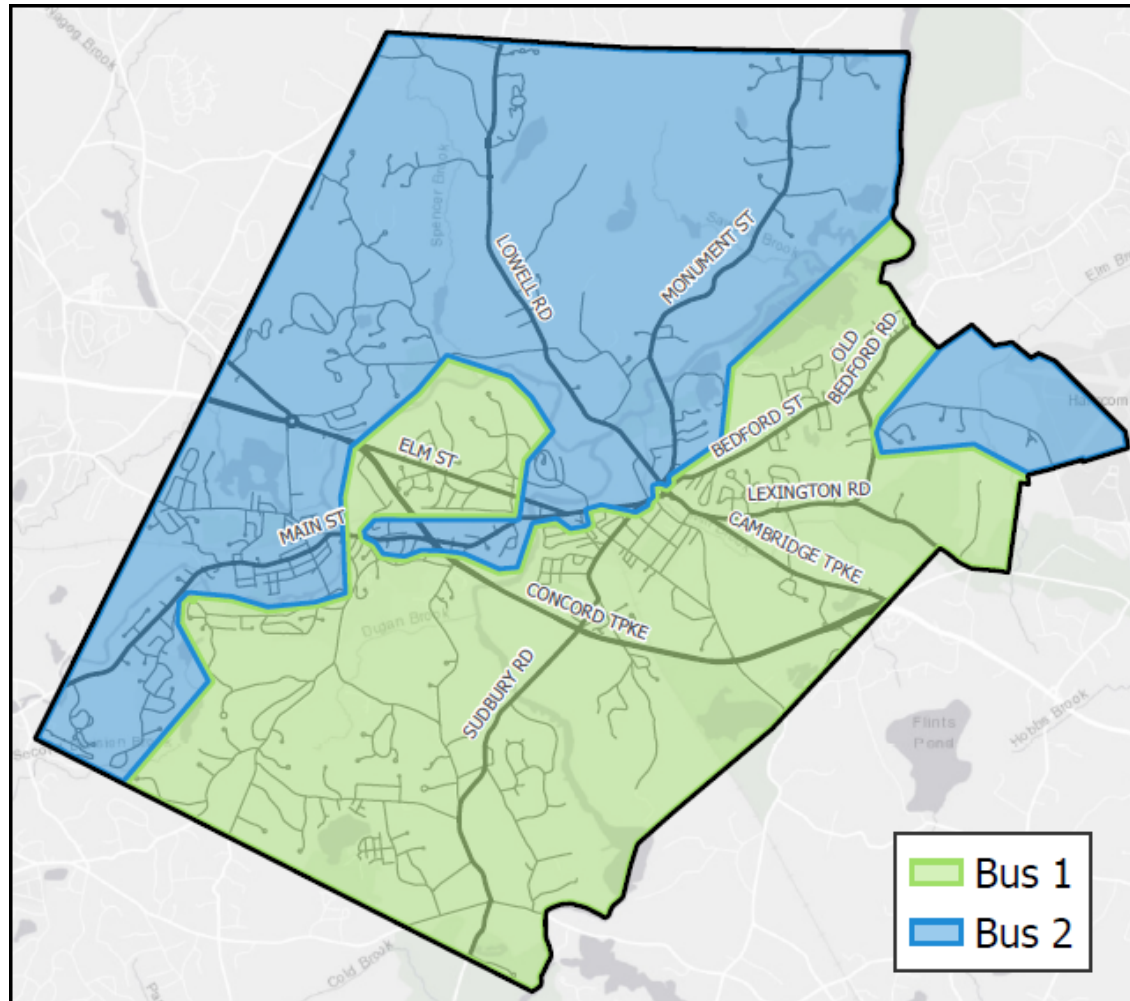
April 4, 2024 Solar Task Force Meeting



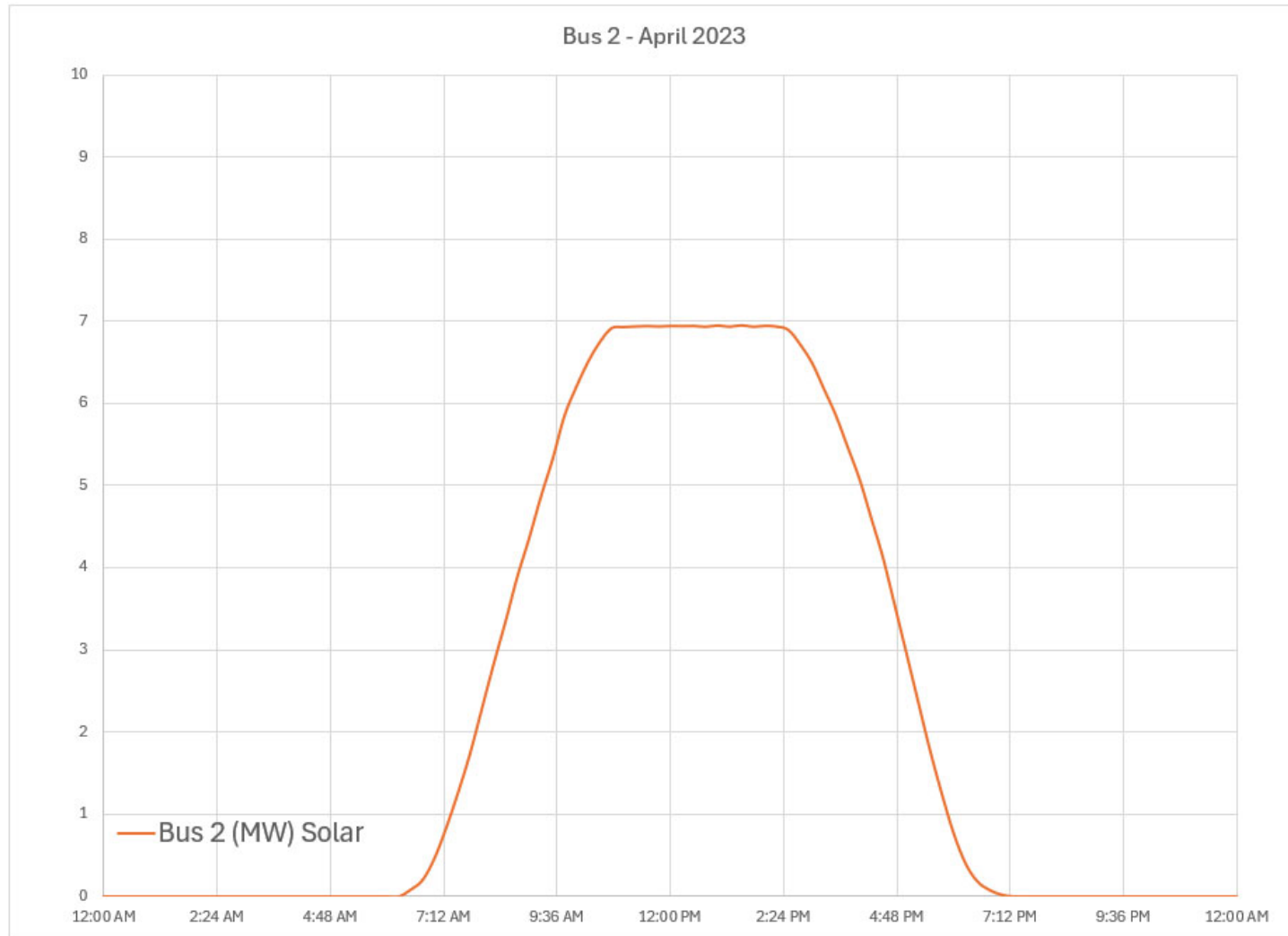
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We're here to serve you

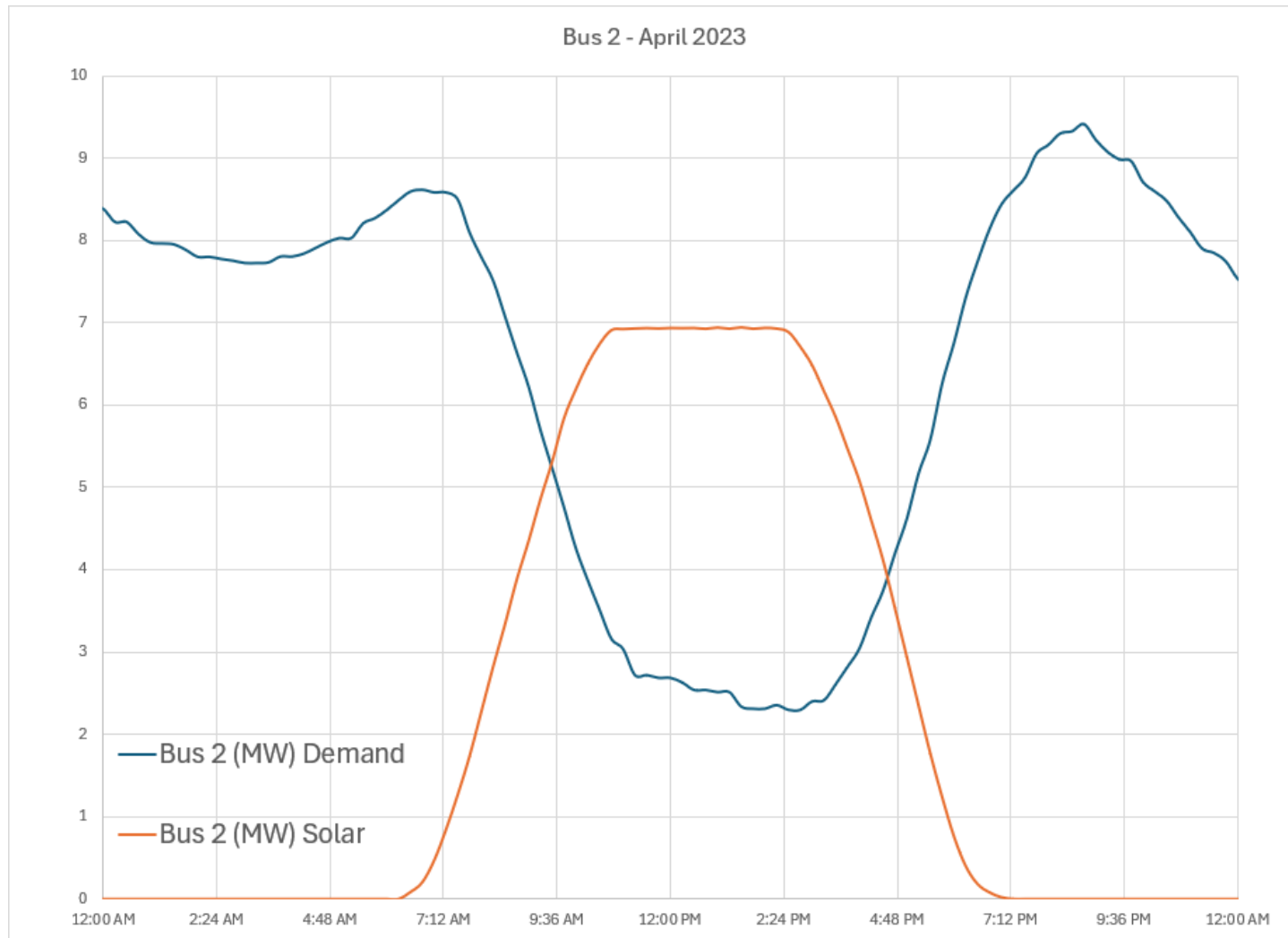
Transforms and Bus bars



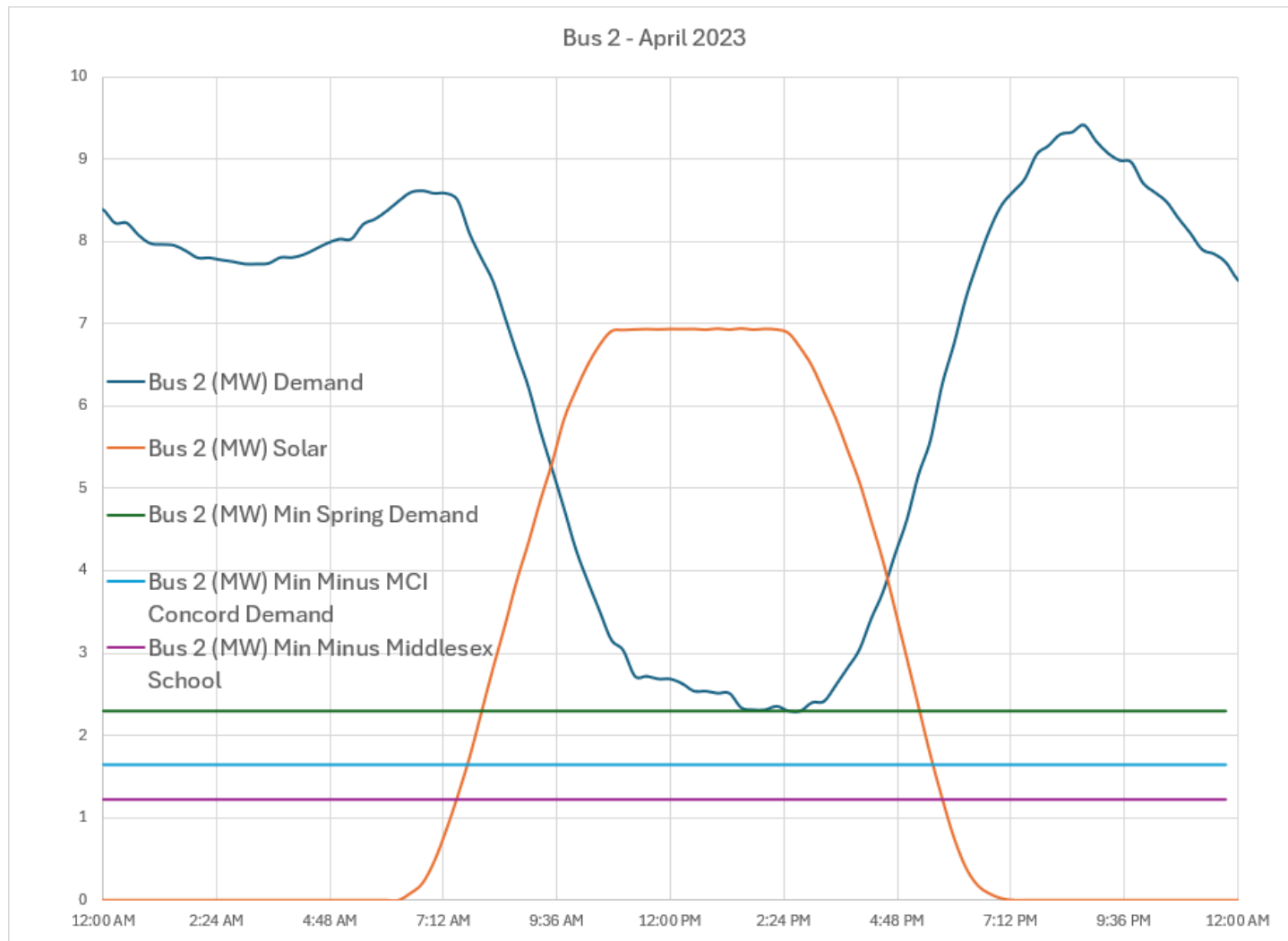
Current solar on Bus 2



Current solar and demand on Bus 2



Current solar on Bus 2



MCI Property

- Steadily uses 0.65-1.0MW
- Closing on 6/30
- Shares wastewater treatment with Northeastern Correctional Center
- Likely will be redeveloped using heavy electrification plus solar

Solar growth



Concord went from 3.8MW of solar in 2020 to 4.95MW in 2023 – a 1.15MW increase.



The IRA is likely to increase the requests we get for residential and commercial solar development.

Solutions

Can we curtail solar?

- Not possible with current contracts and is contrary to the Town's goals

Metering domain

- Two years away; costs/hurdles unknown

Battery storage

- Capital intensive but with big payback

Other MLPs

- Wellesley – 5MW/
15MWh battery
- Holyoke – 3MW/ 6MWh
and 4.99MW/ 10MWh
batteries
- Groton – 2 x 2MW/
9MWh
- Holden – 5MW/ 22MWh
- Sterling – 2MW/
3.9MWh



Goals

1. Protect the distribution system to ensure electricity can flow.
2. Allow for continued expansion of in-town solar.
3. Save emissions and money by shaving the peak.

Battery Characteristics

- Power (MW)
 - The maximum amount the battery can charge or discharge at any given time
- Energy (MWh)
 - The length of time over which the MW can be stored

Battery Value Drivers

- Power (MW)
 - Reduces financial peak expenses
- Energy (MWh)
 - Maintains grid stability by absorbing solar saturation
 - Allows more solar capacity to be added to the system

Compare Sizes

Smaller Battery

- Better manages technology investment risk
- Lower debt issuance/ payments
- A high power (MW), low energy (MWh) configuration produces the best financial returns on a dollar per MW basis

Larger Battery

- Higher energy (MWh) configurations better manage solar saturation
- Allows rate payers to invest in more solar capacity
- Makes more progress towards Town's 20MW/60MWh storage goal
- Lower capital cost per MW due to economies of scale
- Larger IRA credit in dollars
- Higher cashflow in dollars

Financials

Capacity	MW	2	3.9	4.99
Storage	MWh	4	7.7	14.97

Assumptions

Energy Storage System	\$	\$2,628,800	\$4,734,600	\$9,032,300
Engineering	\$	\$100,000	\$100,000	\$200,000
Managed services	\$	\$30,000	\$30,000	\$30,000
Insurance	\$	\$25,000	\$25,000	\$40,000
Shipping + Duties	\$	\$100,000	\$100,000	\$374,250
Installation & BoP	\$	\$500,000	\$500,000	\$750,000
RNS forecast accuracy	%	67%	67%	83%
ICAP forecast accuracy	%	80%	80%	90%
BESS cost	\$/kW	\$657.20	\$607.00	\$603.36

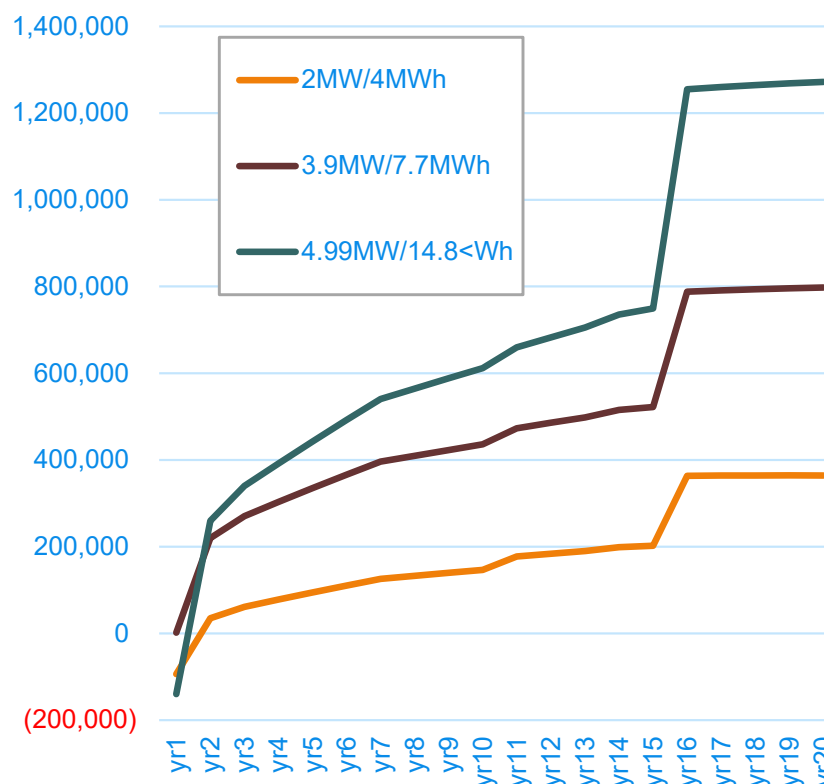
20-yr NPV **\$1,837,376 \$5,293,704 \$7,457,023**

5-yr NPV \$133,387 \$946,879 \$1,065,342

10-yr NPV \$574,875 \$2,319,365 \$2,953,856

15-yr NPV \$1,079,096 \$3,642,486 \$4,825,435

Battery Annual Cash Flow Scenarios



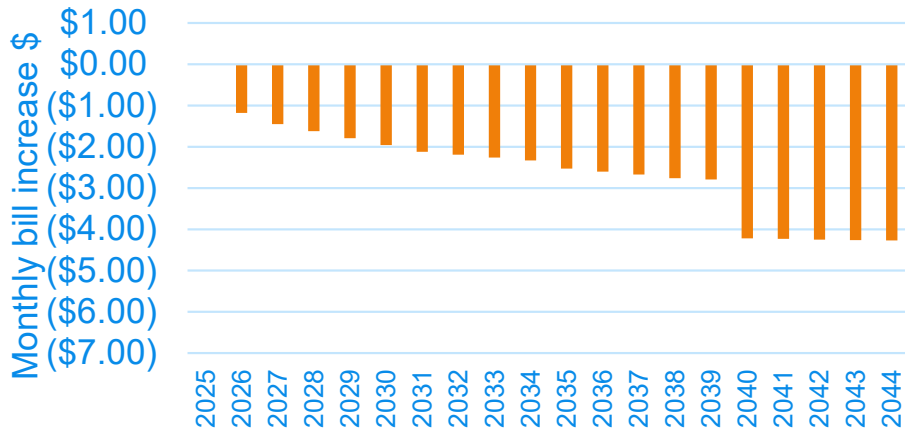
Rate Impacts

3.9MW / 7.7MWh

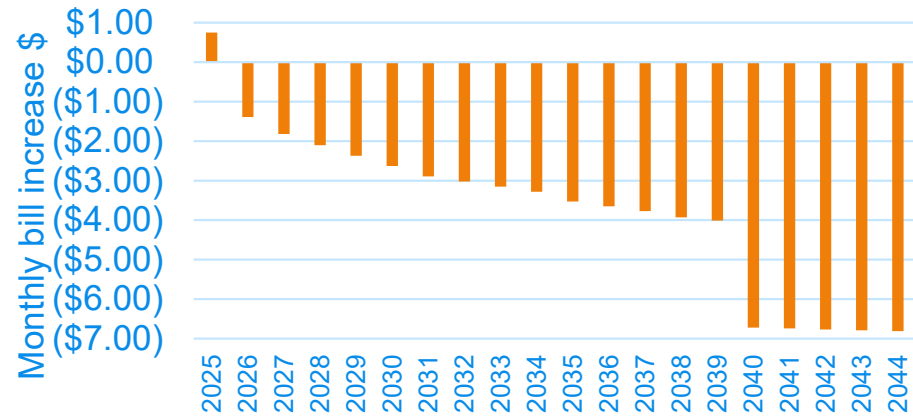
X 1MM	Capital Cost
Capital Cost	\$5.4
IRA Credit	\$1.4
20-yr NPV	\$5.3

4.99MW / 14.97MWh

X 1MM	Capital Cost
Capital Cost	\$10.4
IRA Credit	\$2.6
20-yr NPV	\$7.5



Average customer 883 kWh/mo.



Average customer 883 kWh/mo.

Assumptions

- 15-year loan; 3.4% borrow rate
- IRA credit is used in year 2 to reduce the loan balance
- One inverter replacement in year 10
- Battery is dispatched by a third party for an annual fee
- O&M escalation: 2.5%
- Electricity market price escalation: 1.5%
- Annual battery degradation: 1.5%
- Discount rate for net present value: 5%

Alternatives

Things we have explored:

- Curtailment
 - Illegal or unsafe
- Tying bus bars together
 - Short-term emergency only; you lose power protection and resilience
- Third-party battery construction
 - Their priority on peak shaving does not solve our resilience issue or future solar expansion.
- Adding load (clean hydrogen)
 - Early stages; can load be guaranteed?