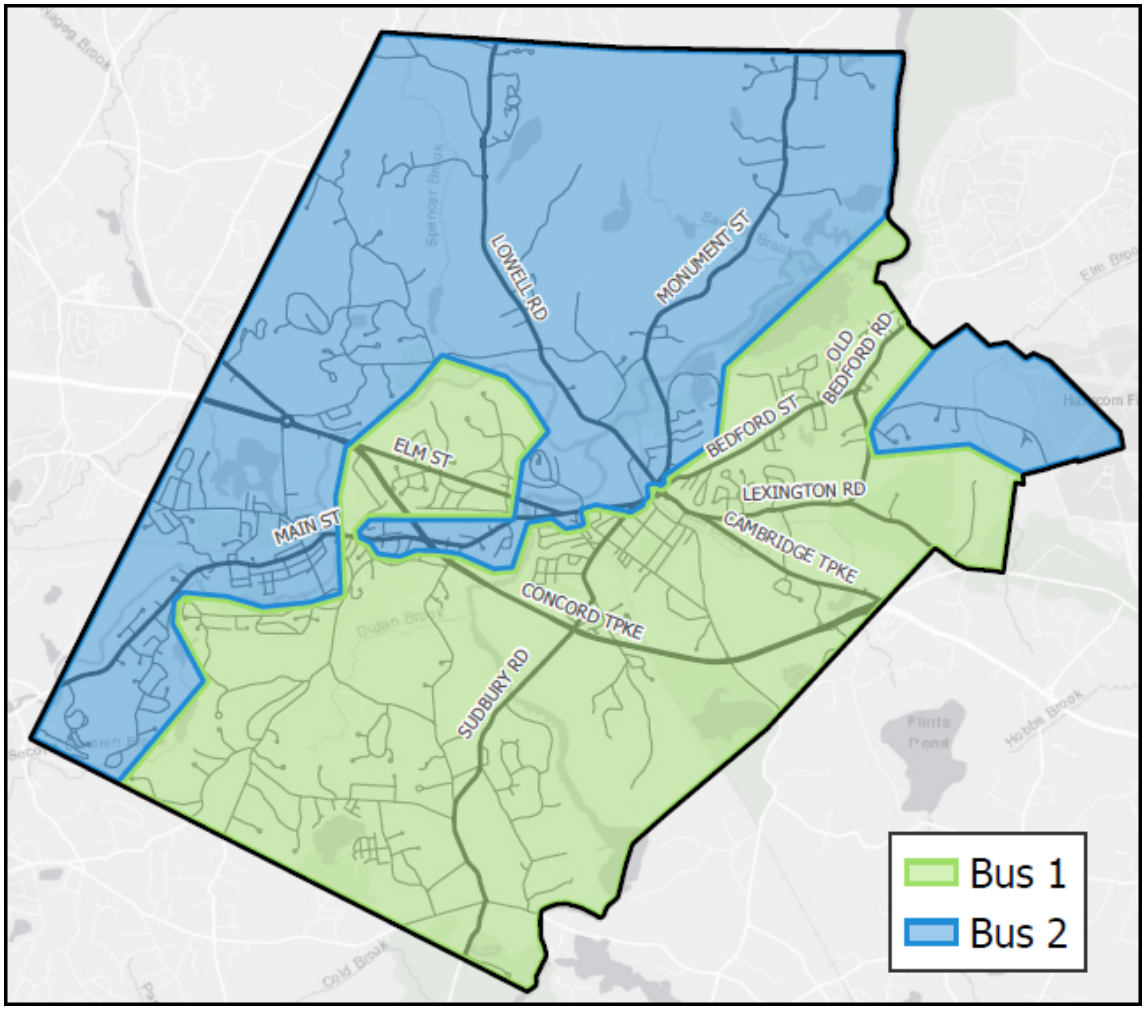
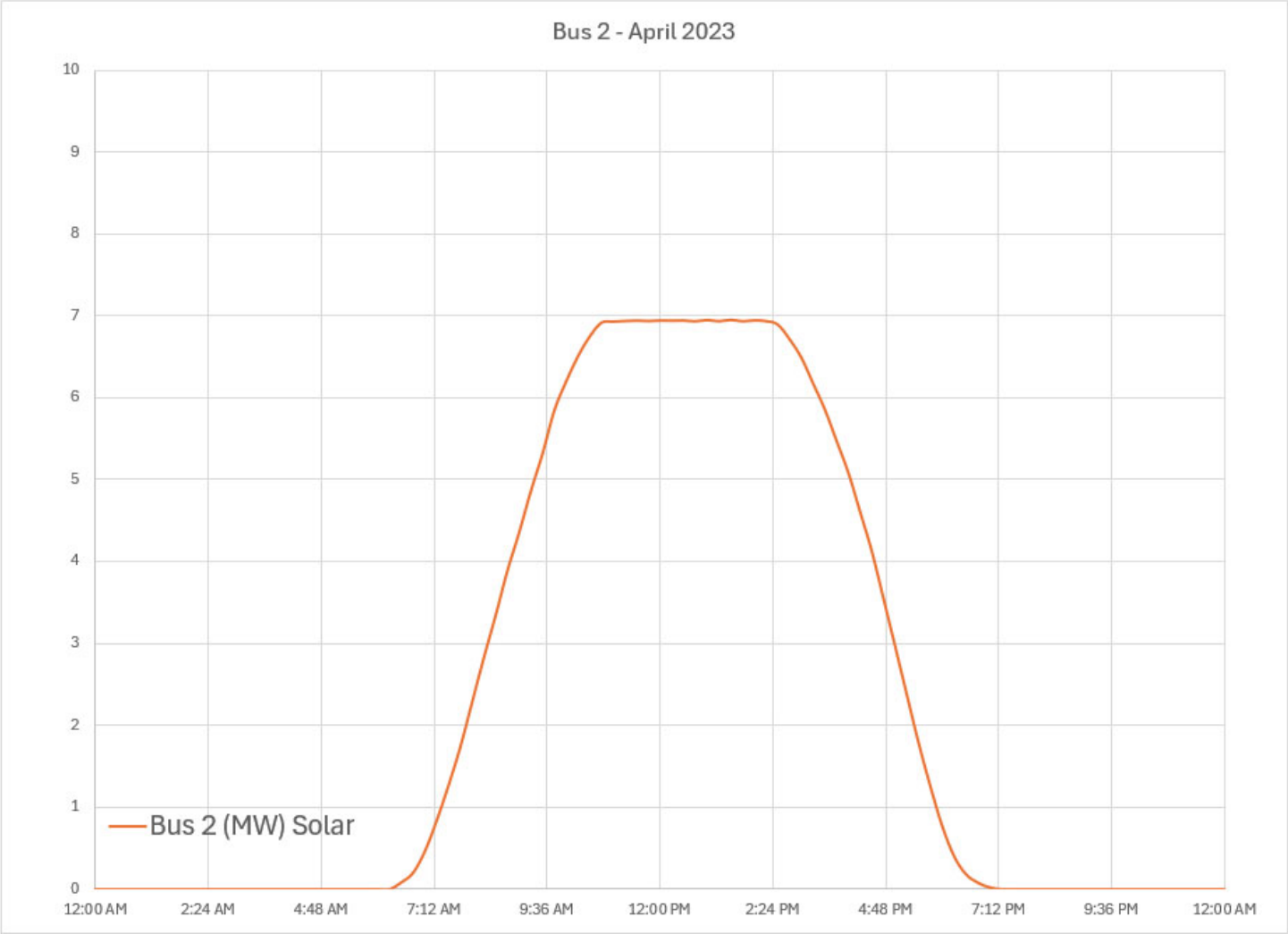
Battery Project Considerations

April 4, 2024 Solar Task Force Meeting

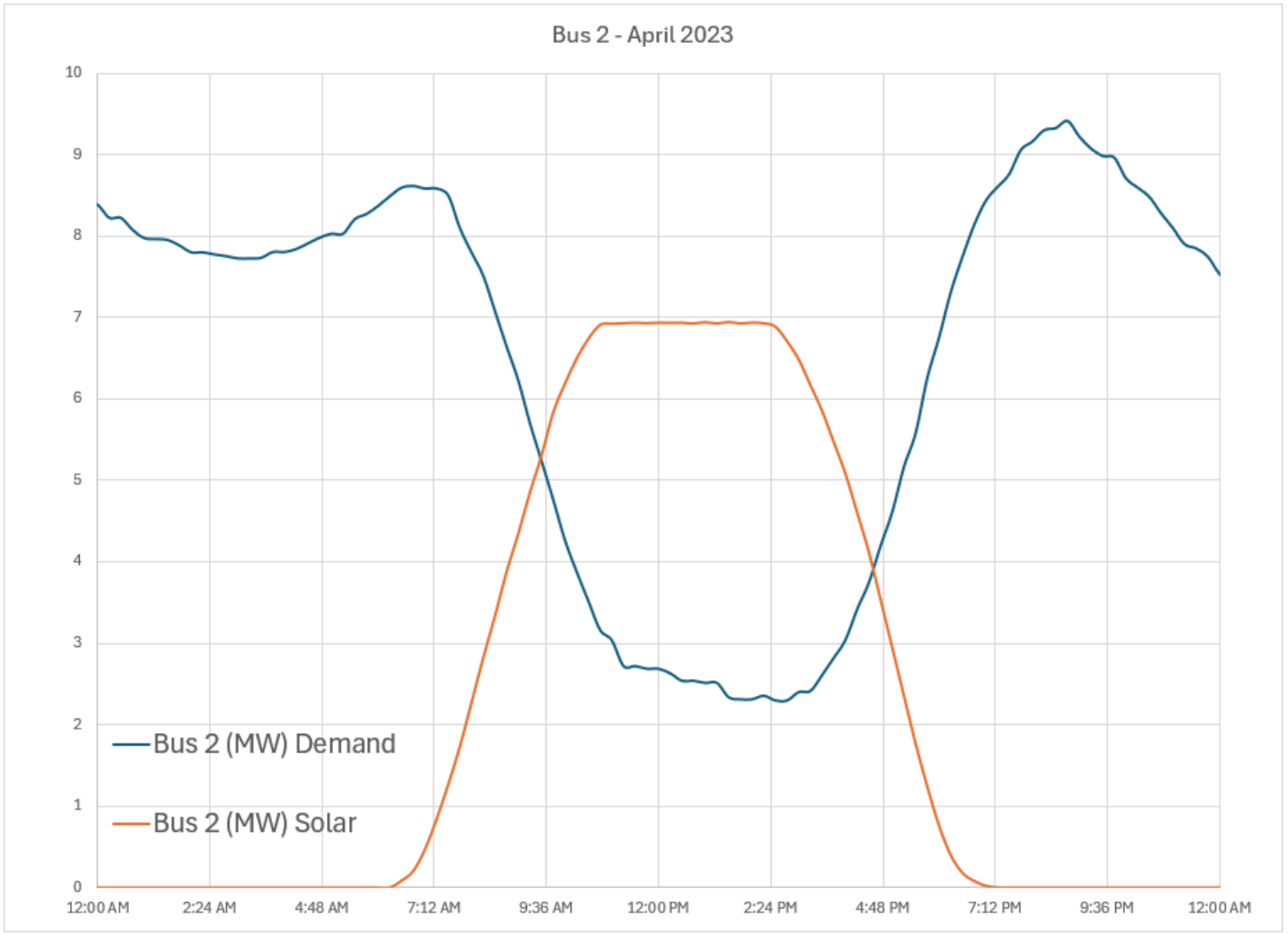
Transforms and Bus bars



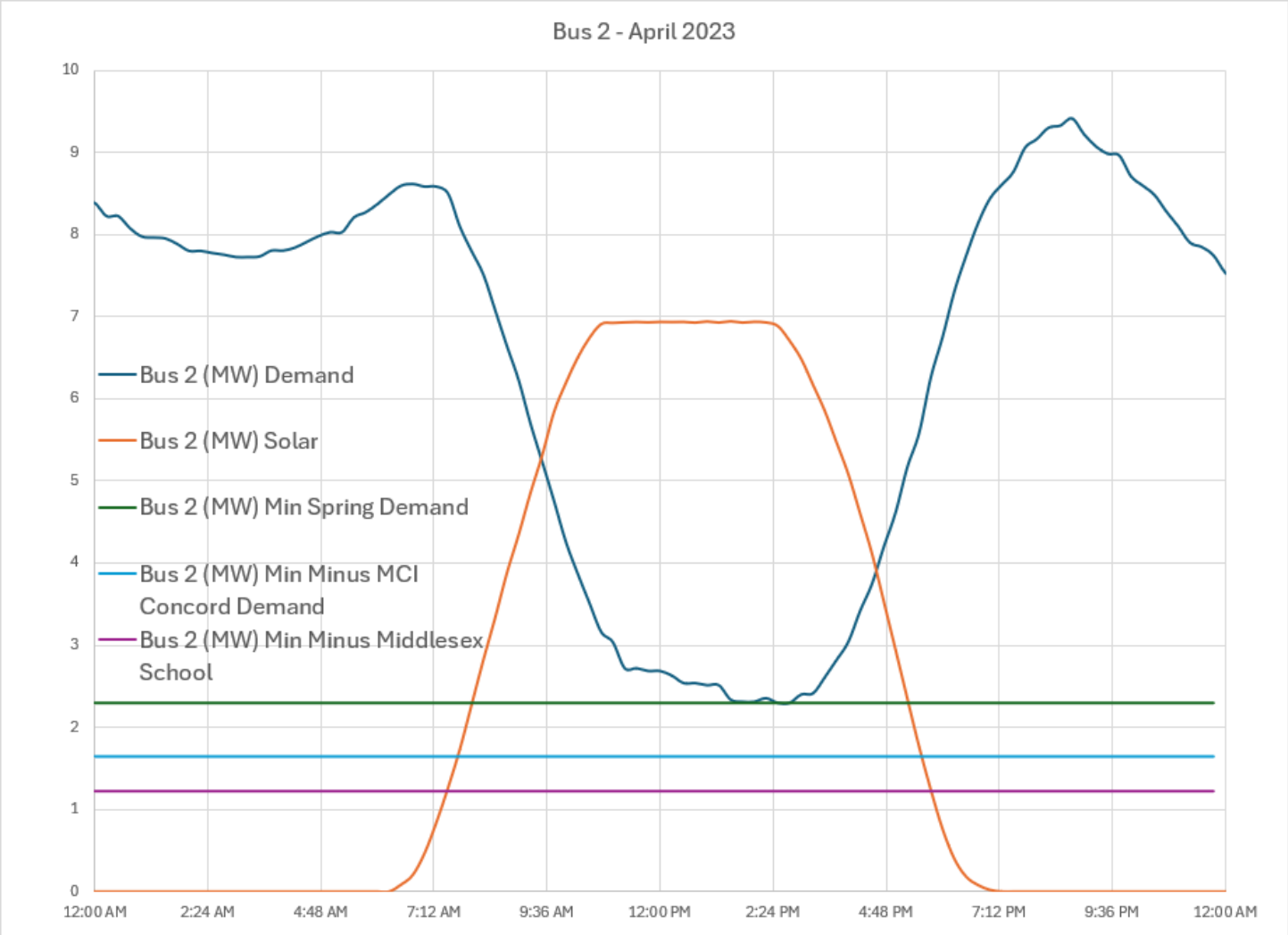
Current solar on Bus 2



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

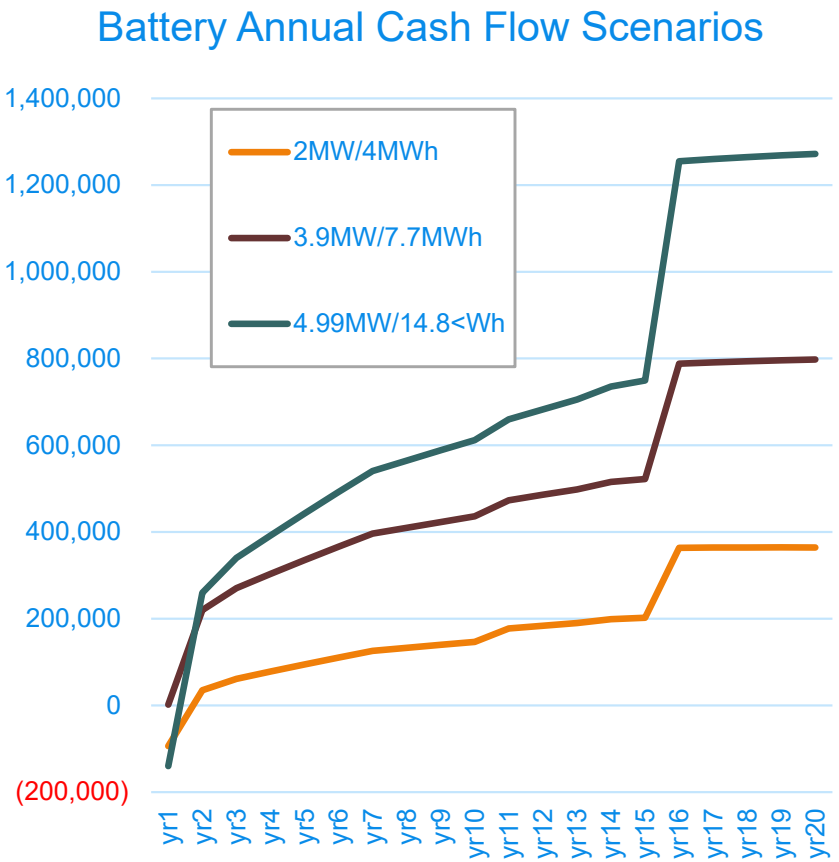
- Better manages technology investment risk
- Lower debt issuance/ payments
- A high power (MW), low energy (MWh) configuration produces the best financial returns on a dollar per MW basis

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

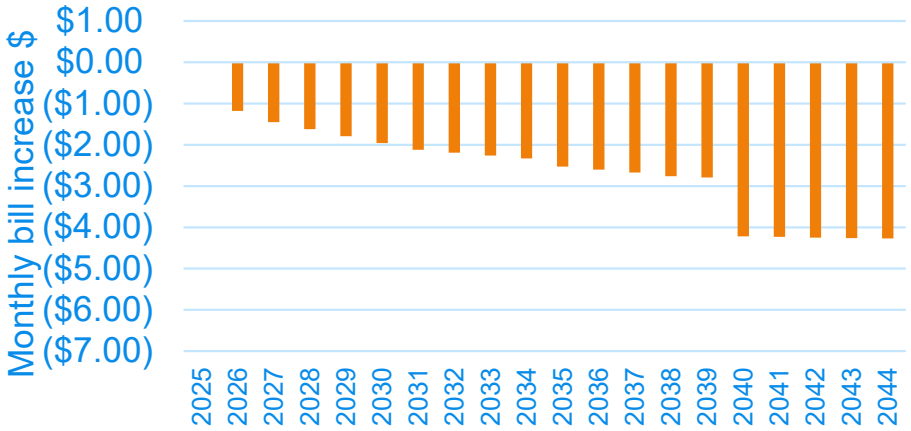
Capacity	MW	2	3.9	4.99
Storage	MWh	4	7.7	14.97
Assumptions				
Energy Storage System	$	$2,628,800	$4,734,600	$9,032,300
Engineering	$	$100,000	$100,000	$200,000
Managed services	$	$30,000	$30,000	$30,000
Insurance	$	$25,000	$25,000	$40,000
Shipping + Duties	$	$100,000	$100,000	$374,250
Installation & 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



Rate Impacts

3.9MW / 7.7MWh

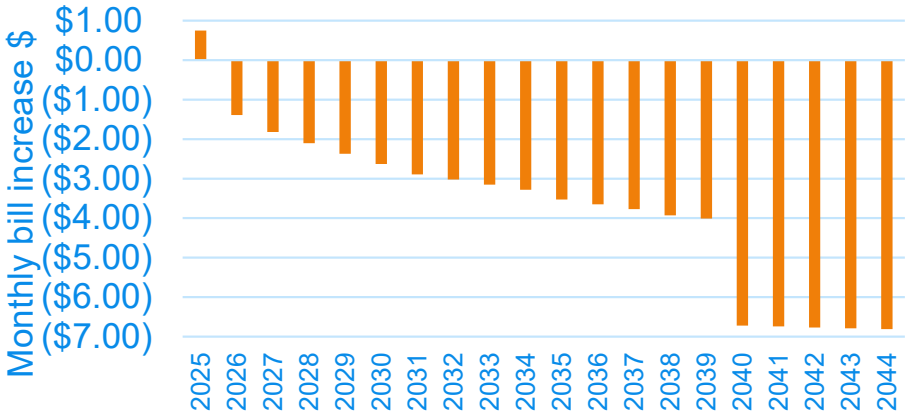
X 1MM	Capital Cost
Capital Cost	$5.4
IRA Credit	$1.4
20-yr NPV	$5.3



Average customer 883 kWh/mo.

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.

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?