Cape Elizabeth Energy Committee
Report and Recommendations
for the
Cape Elizabeth Town Council
on
Committee Activities,
Solar PV and Energy Efficiency

October 2, 2019

Agenda

- Report on Committee Activities since formation in April 2019
- Large Scale Solar PV Array at Transfer Station and/or other sites – Near Term - Immediate Action Recommended
- Energy Efficiency Options – Medium to Long Term
- Questions

Report on Committee Activities Since Inception

Internal discussions

- 8 Committee meetings since March 2019
  - Hosted Rick Smith, former Cape E Ad-Hoc Energy Committee Member
  - CEEC member shared energy and sustainability activities from Newtown, CT
  - Analyzed Carbon Dividend Act and recommended Council publicly support it
- Collected and analyzed relevant Cape Elizabeth energy data
  - Annual electricity bills for all Town buildings
  - Annual oil and propane delivery to all Town facilities
  - Electricity interval data for School buildings
  - Vehicle fleet information

Capturing insights from beyond Cape

- Hosted Troy Moon, City of Portland's sustainability director
- Met with Julie Rosenbach, South Portland sustainability director
- Outreach to Ben Lake, GPCOG sustainability manager
- Hosted visit by Ameresco, an energy service provider & PV developer/operator

Insights gathered

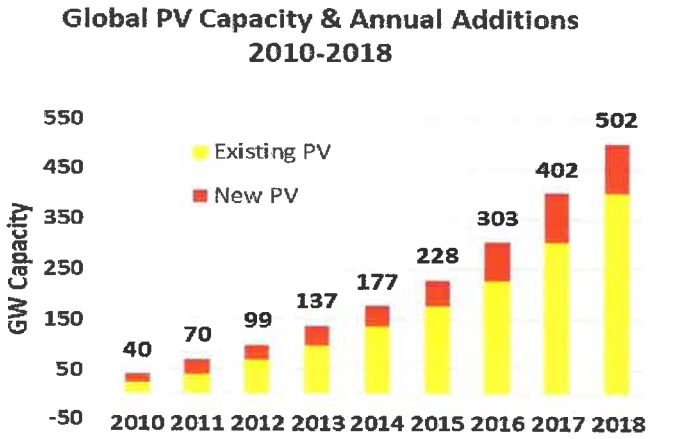
- High-level
  - Engage Town Council early and often; communication is key
  - Sync specific recommendations with Town budget and procurement processes
  - Establish goals: develop an energy plan and/or carbon reduction targets
  - Public engagement / awareness is important: press releases, student participation helpful

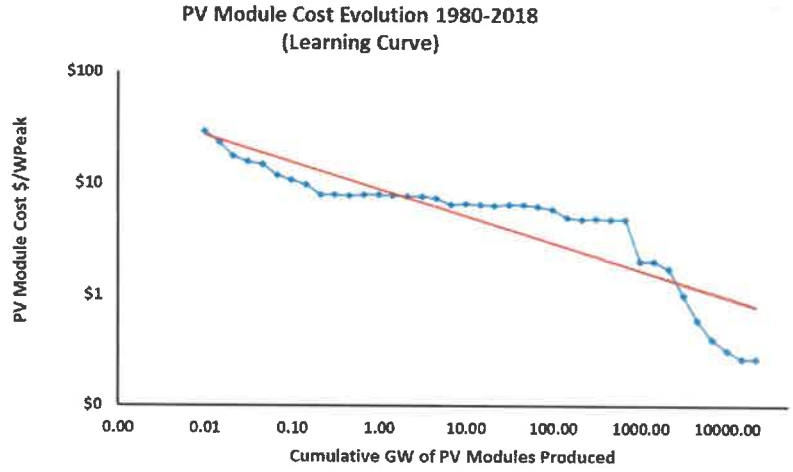
- Project-level
  - Some work germane to the Committee is already underway
    - EV charging station proposal complete
    - Streetlight replacement project RFP out for bid
  - School buildings provide an enormous opportunity for energy efficiency savings
  - State solar legislation, declining equipment prices and previous committee's work sets stage for possible solar project(s) in Cape

Solar

Solar Power for Maine Municipalities - Solar 101 – Technology and Cost

- Solar photovoltaic (PV) works by photons striking a semi-conductive material, usually silicon, which frees electrons from the material which is then converted to useable power.
- Solar PV panels have existed since the late 1950s, when they were developed for powering satellites.
- Solar PV is the fastest growing source of new power installations globally
- High growth rates and technical advancements have dramatically lowered the cost of Solar PV as the industry matures and achieves economies of scale/
- Though solar PV prices may continue to fall, China Import tariffs (China is the global leader in panel production), and flattening falling price curves combined with reductions in Federal Tax incentives means waiting for further price falls may not produce benefits





Source: REN 21 Fraunhofer Institute for Solar Energy,
Bloomberg New Energy Finance, U.S. National Renewable Energy Lab (DOE).

Solar Power for Maine Municipalities - Solar 101 – Solar Project Technical Basics

- Solar PV projects are power plants that connect to an electric grid
- Basic PV Project components
  - PV Modules – silicon solar plates, generally about 8 inches square, that are the core power generation component.
  - PV Panels – a group of PV modules arranged on frame and covered with glass, typically 3' x 5', the basic building block of PV Projects
  - Inverter – PV modules generate "direct current" (DC) power. The electric grid and appliances, etc. use "alternating current" (AC) . Inverters convert DC power to AC power
  - Racking systems / mounts. PV Panels are mounted in three ways:
    - Fixed – Panels are installed on frames that do not move.
    - Single Axis Trackers – Panels are mounted on frames that rotate right to left and left to right to track the sun across the sky
    - Dual Axis Trackers – Panels are mounted on frames that rotate left to right and up and down to track the sun across the sky. The solar panels at Green Spark farm on Route 77 are dual axis trackers
    - Tracked systems produce more power than fixed systems. The decision to use fixed or tracked systems is based on whether the solar resource justifies the increased cost of tracked panels
  - Grid Connection or Interconnection – the point at which the project connects to the grid and exports power; it is also the point at which output is metered. The substation on Spurwink road near the Town Landfall would be the most likely grid connection
  - Net Meter – a two way meter which measures power generated by a solar array and power consumed by the array owner, with the "net" amount being the difference between the two

Solar Power for Maine Municipalities - Solar 101 – Incentives

- Since the late 1970's the US Federal and State Governments have provided incentives for renewable energy, including tax credits, long-term contracts and other arrangements.
- Federal incentives today: Investment Tax Credit (ITC)
  - Equal to 30% of capital investment in the year following installation – the ITC is used by banks and other investors to offset tax liabilities. The ITC declines over next several years based on construction start date:
    - 2019: 30%
    - 2020: 26%
    - 2021: 22%
    - >2022: 10%
- Maine incentives
  - Net metering, which allows owners of certain solar facilities to offset their electric bills by solar generated by them – this is an established program and is in effect
  - "Block grant" tariffs
  - Renewable Portfolio Standard. Maine has required that CMP and other utilities procure increasing percentages of power from renewables, which is evidenced by "green certificates" which have a market value

Municipal solar in Maine

Current municipal solar landfill projects in Maine:

- Waldoboro
- Tremont
- South Portland
- Portland
- Belfast

Solar array on the top of Waldoboro's capped landfill

Solar potential in Cape Elizabeth

- Cape Elizabeth is a great place for solar
  - Favorable solar resource
  - Flat terrain and open farmland reduces shading losses
  - Ocean cooling effect increases efficiency (heat reduces inverter efficiency)
  - Town Landfill site can take a substantial solar array
  - Nearby substation on Spurwink Road makes for lower interconnection costs

Schematic of solar panels on portion of Town landfill, courtesy Ameresco

Changes to relevant state law affecting solar

- Recent legislation (LD1711) makes solar more attractive option for Town
- The legislation created two options for us:
  - Net Energy Billing (a.k.a. net metering)
  - Declining block program
- Net Energy Billing would give the Town a bill credit for solar generated
  - Compensation rate set to Supply + 75% of Transmission and Distribution Charges for Small Commercial Customer (~13 cents/kWh)
  - 5 MW Max, but also limited by Town load
- Declining block program
  - Would allow certain Maine solar projects to bid for and receive fixed cash payments for 20 years – this is a new program for which rules are being written. It will be available in 2020
  - Blocks are limited to 250 MW
  - It is expected that the program will be oversubscribed.

How does Net Energy Billing Work?

- Cape would contract with a PV developer / operator under which:

- <u>The Developer would</u>
  - Design and build a PV project on the landfill, including securing necessary permits and conducting environmental studies
  - Provide 100% of the financing
  - Operate the site for up to 20 years
  - Managing the power sales and net metering arrangements
- <u>We would</u>
  - Make the landfill site available to the developer
  - Grant the necessary permits (subject to appropriate studies, comment, etc.)
  - Purchase power generated by the project under a 20- year Power Purchase Agreement (PPA)
  - Receive a credit from CMP for power generated at estimated rate of approximately $0.13/kWh
  - Purchase power from the site for a price less than $0.13/kWh for 20 years under a Power Purchase Agreement with the Developer (PPA)
  - Economic benefit to town is (Net Metering Compensation Rate – PPA Rate)*kWh generated
- No upfront cost to town

Cape Elizabeth should move quickly

- The 30% ITC is declining from 30% to 10% as follows:
  - 30% for projects starting construction in 2019
  - 26% for projects starting construction in 2020
  - 22% for projects starting construction in 2021
  - 10% for projects starting construction in 2022 and thereafter
- As the ITC falls, the cost of the PPA will increase, as the main cost of PV is the upfront capital cost and not the operating cost
- To qualify for the 30% credit the Town would need to commit to a PV Project by 15-31 October
- Committing for the 26% 2020 credit the town should commit by mid-2020 at the latest
- Import Tariffs. The Trade war with China and potentially other countries could result in higher import tariffs, which would increase the PPA price; moving quickly can lock in current levels
- The Maine net energy billing and block grant programs will be very attractive to the PV industry; applications are likely to exceed both program capacity and grid connection capacity
- The Maine electric grid can be constrained. Also, the number of grid connection applications will be huge, and there will be backlogs in both approving connections and constructing grid connections. The Town would be well-served to act promptly to secure a place in the interconnection queue and to make sure that no other project seeks to connect at Spurwink

Cost savings to Cape Elizabeth

- Each 500 KW of Town Solar can save the town $10-30,000 per year in electric bills with no upfront costs. Landfill potential 1500-2500KW. Other town sites (e.g., school roof) could add 1000 - 2000KW
- The savings to the Town depend on the size of the project and the PPA price. Based on standard costs radiation data, the following chart shows the range of annual savings based on data received by the committee.
- The savings are based on a CMP / Net Energy Billing price of $0.13 per KWH
- The most likely range is highlighted in green

KW OF PV PANELS INSTALLED	ESTIMATED ANNUAL SAVINGS (LIKELY RANGE)								
3600	$ 289,014	$ 264,930	$ 240,845	$ 216,761	$ 192,676	$ 168,592	$ 144,507	$ 120,423	$ 96,338
3400	$ 272,958	$ 250,211	$ 227,465	$ 204,718	$ 181,972	$ 159,225	$ 136,479	$ 113,732	$ 90,986
3200	$ 256,901	$ 235,493	$ 214,085	$ 192,676	$ 171,268	$ 149,859	$ 128,451	$ 107,042	$ 85,634
3000	$ 240,845	$ 220,775	$ 200,704	$ 180,634	$ 160,563	$ 140,493	$ 120,423	$ 100,352	$ 80,282
2800	$ 224,789	$ 206,056	$ 187,324	$ 168,592	$ 149,859	$ 131,127	$ 112,394	$ 93,662	$ 74,930
2600	$ 208,732	$ 191,338	$ 173,944	$ 156,549	$ 139,155	$ 121,761	$ 104,366	$ 86,972	$ 69,577
2400	$ 192,676	$ 176,620	$ 160,563	$ 144,507	$ 128,451	$ 112,394	$ 96,338	$ 80,282	$ 64,225
2200	$ 176,620	$ 161,901	$ 147,183	$ 132,465	$ 117,746	$ 103,028	$ 88,310	$ 73,592	$ 58,873
2000	$ 160,563	$ 147,183	$ 133,803	$ 120,423	$ 107,042	$ 93,662	$ 80,282	$ 66,901	$ 53,521
1800	$ 144,507	$ 132,465	$ 120,423	$ 108,380	$ 96,338	$ 84,296	$ 72,254	$ 60,211	$ 48,169
1600	$ 128,451	$ 117,746	$ 107,042	$ 96,338	$ 85,634	$ 74,930	$ 64,225	$ 53,521	$ 42,817
1400	$ 112,394	$ 103,028	$ 93,662	$ 84,296	$ 74,930	$ 65,563	$ 56,197	$ 46,831	$ 37,465
1200	$ 96,338	$ 88,310	$ 80,282	$ 72,254	$ 64,225	$ 56,197	$ 48,169	$ 40,141	$ 32,113
1000	$ 80,282	$ 73,592	$ 66,901	$ 60,211	$ 53,521	$ 46,831	$ 40,141	$ 33,451	$ 26,761
800	$ 64,225	$ 58,873	$ 53,521	$ 48,169	$ 42,817	$ 37,465	$ 32,113	$ 26,761	$ 21,408
600	$ 48,169	$ 44,155	$ 40,141	$ 36,127	$ 32,113	$ 28,099	$ 24,085	$ 20,070	$ 16,056
	$ 0.070	$ 0.075	$ 0.080	$ 0.085	$ 0.090	$ 0.095	$ 0.100	$ 0.105	$ 0.110
	POWER PURCHASE AGREEMENT PRICE $/KWH								

Considerations and next steps

Questions for Cape Elizabeth:

- Is there land available?
- If so, what is the permitting process?
- What, if any, special consultation process is needed in order to publish an RFP?
- What would be the Town's legal costs associated with signing a solar contract?
- How fast can the Town move?

Energy Efficiency

Energy Efficiency
Mid to Long Term Action Required

- The Town is making progress in the Energy Efficiency Area
  - LED streetlighting tender
  - Phased LED light conversion at Schools
  - Newer boilers at the schools
  - EV charging station(s)
- Initial review shows Town Schools are the main energy user
  - An energy efficiency retrofit does not make sense apart from the planned school renovation project
  - Energy efficiency should be included in the scope of the Schools Needs Assessment and planning; once that is known it may be worthwhile to combine with other town sites (e.g. Town Hall, Community Center), but the Schools will drive the process.
  - We strongly recommend early energy committee involvement in the Schools project.
  - We also recommend requesting energy efficiency companies (e.g. Ameresco, Noresco, Johnson Controls, Siemens) make free assessments of the Schools and other facilities. Several of them will do this. (see next page)

Energy Efficiency
Mid to Long Term Action Required

- There are energy efficiency financing methods that would allow the Town to have no cash upfront payments for energy retrofits including any school renovation.
  - Under energy performance contracting an Energy Service Company, or ESCO , finances all energy retrofits (e.g. lighting, boilers, solar panels, battery storage, HVAC). The customer (Town) sees its energy bill fall and repays the ESCO over 15-25 years out of the savings.
  - To make performance contracting viable for the Town and the ESCO there needs to be a mix of short-term payback retrofits (boilers, insulation) and longer term (motors, control systems). Hence best to get early assessment so ad hoc changes do not affect overall financing.
  - ESCO Financing structures can either reduce up front renovation costs, or free up capital for other actions.
    - For example, if the Schools renovation is $27 million of which $4 million is energy retrofits, ESCO financing could reduce the capital cost to the Town to $23 million, or $3 million in other School improvements could be considered.

Surplus material

Net Energy Billing

- Under the "Net Energy Billing" Option, Cape Elizabeth would enter into agreements with a solar developer under which the Town and the developer would have the following roles and obligations:
  - Developer
    - Finances (100%), designs, constructs and operates project, including all net metering reporting
    - Receives all green benefit, net metering benefits and tax credits (which the Town cannot use anyway)
  - Cape Elizabeth
    - Provides land and permits, supports application process
    - Agrees to purchase (via a "Power Purchase Agreement" or "PPA") all of the electricity produced by the Project (Note that town residents or other towns could also agree to purchase) for 20-25 years.
    - The town reduces its electricity bill by the difference between the PPA price and the CMP price for electricity – SEE NEXT PAGE
    - Potential to negotiate options to purchase the project or to claim a share of the green benefits, but this would reduce annual cash savings and would require town cash in the future
    - No Cost To Town