

# Town of Thomaston

Solar/Electric Systems

# Thomaston Electric Program

In 2020 Thomaston began a 3-phase plan to reduce and control electric costs.

- 1 – Enter long-term contract to purchase electricity
- 2 – Purchase streetlights from Central Maine Power (CMP)
- 3 – Install a solar array to produce about 90% of power used

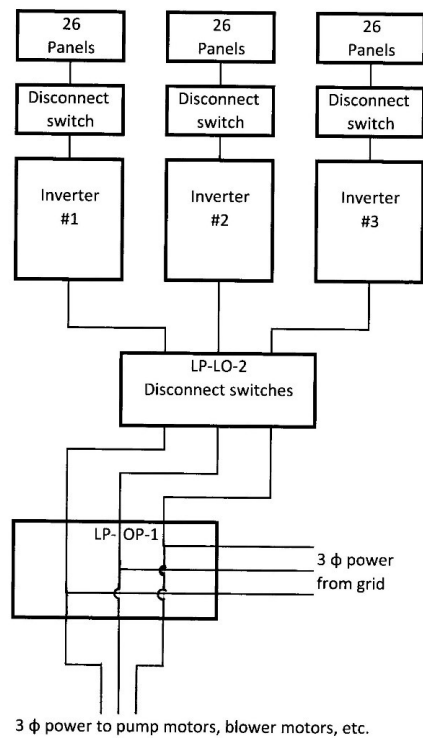
# System A

<i>Location:</i>	Roof of Control Building
<i>Year Installed:</i>	2010
<i>Design Size:</i>	17.16 kW
<i>Design Capacity:</i>	22,900 kWh/year
<i>Panel Number:</i>	78
<i>Panel Wattage:</i>	220
<i>System Cost:</i>	\$83,377
Grant from Efficiency Maine	\$77,273
Local Share	\$6,103

This system is connected to the grid and covered by a Net Energy kWh Credit Agreement with Central Maine Power.



# Converting DC power from the solar panels to AC and feeding it into the plants electric system



## System B

*Location:* Roof of Icefluent Building  
*Year Installed:* 2016  
*Design Size:* 0.84kW  
*Design Capacity:* 900 kWh/year  
*Panel Number:* 3  
*Panel Wattage:* 280  
*System Cost:* \$2,147

This system is not connected to the grid.



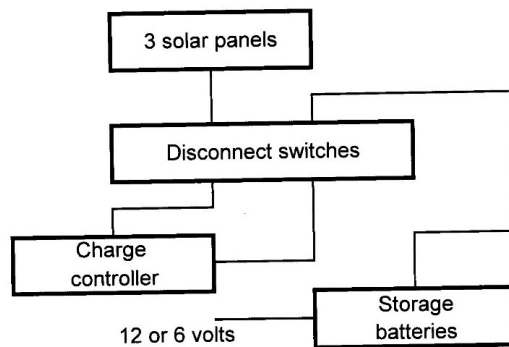
Provides all power for the ice making operation.

The whole building runs on DC power.

The solar panels produce DC current that is stored in the heavy duty battery system.

The lights, radio and small valves operate on 12 volts.

The large valves operate on 24 volts.



Two heavy duty batteries store the power for use when the solar panels are not generating power. The motors (red) on the valves run on 24 volts DC power. The small valves (by white elbow) are also DC current.



# System C

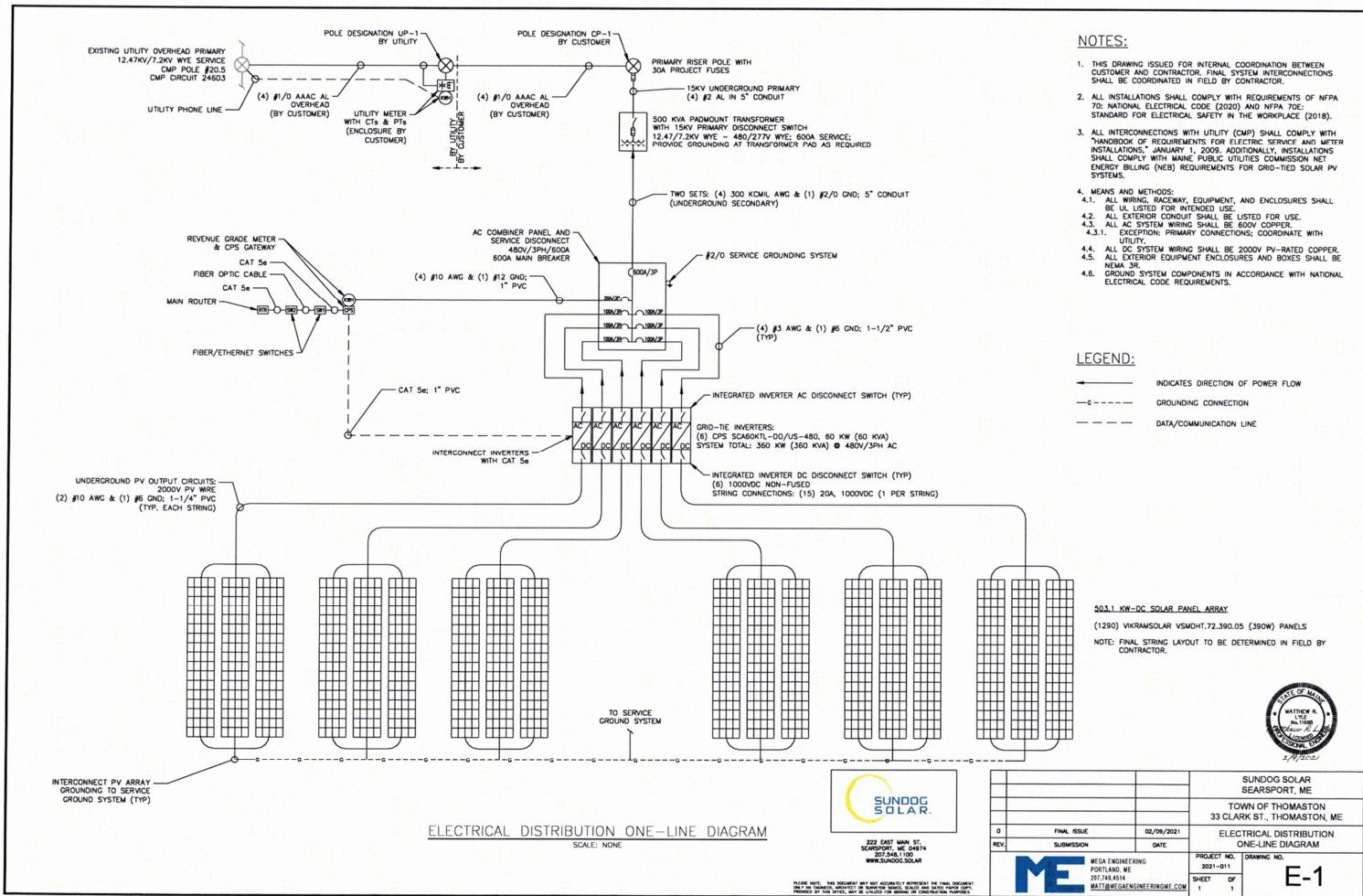
*Location:* Southeast of Lagoon #1  
*Year Installed:* 2020  
*Design Size:* 496.65 kW  
*Design Capacity:* 628,140 kWh/year  
*Panel Number:* 1,290  
*Panel Wattage:* 385  
*System Cost:* \$1,116,506

Paid from \$1.2M, 15-year, 1.6768% MMBB Loan

This system is connected to the grid and covered by a Net Energy Dollar Credit Agreement with Central Maine Power.







**NOTES:**

- THIS DRAWING ISSUED FOR INTERNAL COORDINATION BETWEEN CUSTOMER AND CONTRACTOR. FINAL SYSTEM INTERCONNECTIONS SHALL BE COORDINATED IN FIELD BY CONTRACTOR.
- ALL INSTALLATIONS SHALL COMPLY WITH REQUIREMENTS OF NFPA 70: NATIONAL ELECTRICAL CODE (2020) AND NFPA 70E: STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE (2018).
- ALL INTERCONNECTIONS WITH UTILITY (CMP) SHALL COMPLY WITH "HANDBOOK OF REQUIREMENTS FOR ELECTRIC SERVICE AND METER INSTALLATIONS," JANUARY 1, 2009. ADDITIONALLY, INSTALLATIONS SHALL COMPLY WITH MAINE PUBLIC UTILITIES COMMISSION NET ENERGY BILLING (NEB) REQUIREMENTS FOR GRID-TIED SOLAR PV SYSTEMS.
- MEANS AND METHODS:
  - ALL WIRING, RACEWAY, EQUIPMENT, AND ENCLOSURES SHALL BE AS LISTED FOR INTENDED USE.
  - ALL EXTERIOR CONDUIT SHALL BE LISTED FOR USE.
  - ALL AC SYSTEM WIRING SHALL BE 600V COPPER.
    - EXCEPTION: PRIMARY CONNECTIONS; COORDINATE WITH UTILITY.
  - ALL DC SYSTEM WIRING SHALL BE 2000V PV-RATED COPPER. ALL EXTERIOR EQUIPMENT ENCLOSURES AND BOXES SHALL BE NEMA 3R.
  - GROUND SYSTEM COMPONENTS IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE REQUIREMENTS.

**LEGEND:**

- INDICATES DIRECTION OF POWER FLOW
- - - - - GROUNDING CONNECTION
- - - - - DATA/COMMUNICATION LINE

**500.1 KW-DC SOLAR PANEL ARRAY**  
(1280) VIKRAMSOLAR VSM0HT-72.390.05 (390W) PANELS  
NOTE: FINAL STRING LAYOUT TO BE DETERMINED IN FIELD BY CONTRACTOR.



222 EAST MAIN ST.  
SEARSPORT, ME 04874  
207.548.1100  
WWW.SUNDOG.SOLAR

PLEASE NOTE: THIS DOCUMENT MAY NOT ACCURATELY REPRESENT THE FINAL DOCUMENT. ONLY THE VERSION APPROVED BY THE APPLICABLE AGENCIES SHOULD BE USED FOR PERMITTING. PRINTED BY THE OFFICE. MAY BE UPDATED FOR REVISIONS OR CORRECTIONS.

**ELECTRICAL DISTRIBUTION ONE-LINE DIAGRAM**

SCALE: NONE

		SUNDOG SOLAR SEARSPORT, ME	
		TOWN OF THOMASTON 33 CLARK ST., THOMASTON, ME	
0	FINAL ISSUE	02/09/2021	ELECTRICAL DISTRIBUTION ONE-LINE DIAGRAM
REV.	SUBMISSION	DATE	
		PROJECT NO. 2021-011	DRAWING NO. E-1
		SHEET 1	OF 1



MEGA ENGINEERING  
PORTLAND, ME  
207.748.4514  
ME@MEGAENGINEERING.COM

## System D

*Location:* Roof of Garage Building

*Year Installed:* 2022

*Design Size:* 21.75 kW

*Design Capacity:* 22,739 kWh/year

*Panel Number:* 50

*Panel Wattage:* 435

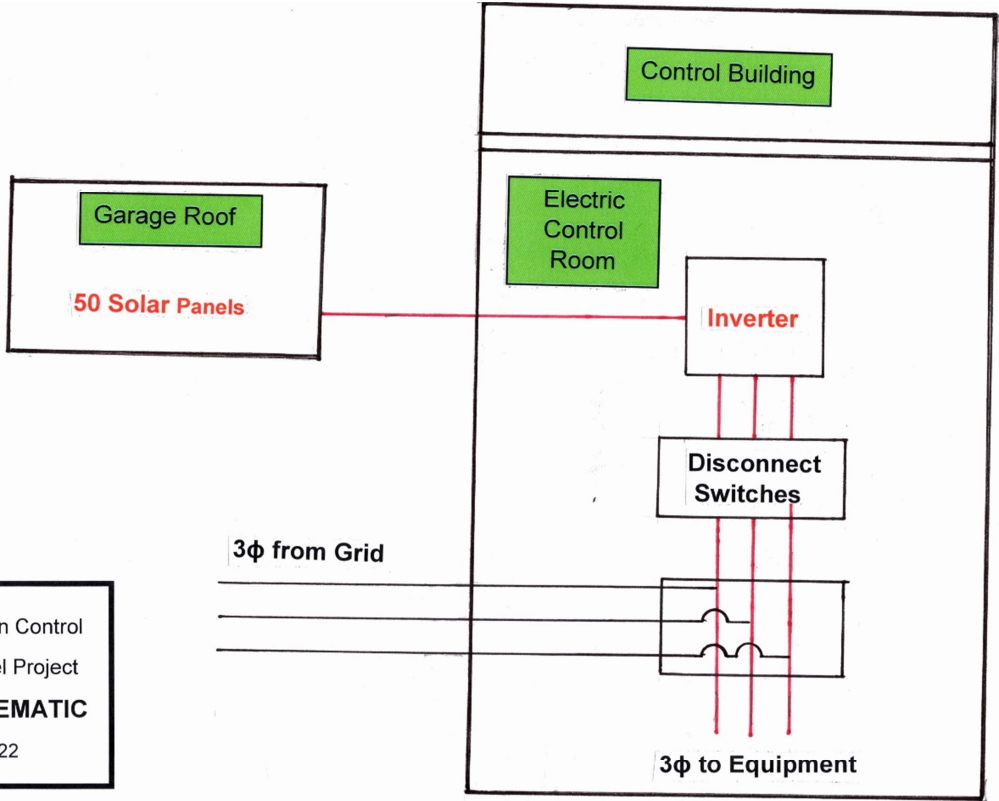
*System Cost:* \$64,541

Paid from \$1.2M, 15-year, 1.6768% MMBB Loan

This system is connected to the grid and covered by a Net Energy kWh Credit Agreement with Central Maine Power.



Thomaston Pollution Control  
Garage Solar Panel Project  
**ELECTRIC SCHEMATIC**  
November 2022



# System D Inverter and Main Disconnect



# CMP Net Metering Agreements

- **Billing Credit Agreement**

All power generated by the solar array is fed into the grid.

All power fed into the grid is metered by CMP.

A dollar credit is issued against all accounts on the cascading allotment list.

The value of the credit is set by the Maine Public Utilities Commission.

**This agreement applies to System C**

- **kWh Credit Agreement**

Power generated by the solar array is used within the building where it is generated.

Any excess power generated is fed to the grid through a two way meter.

At the end of a billing cycle any kWh sent to the grid is credited, as kWh, only to that account.

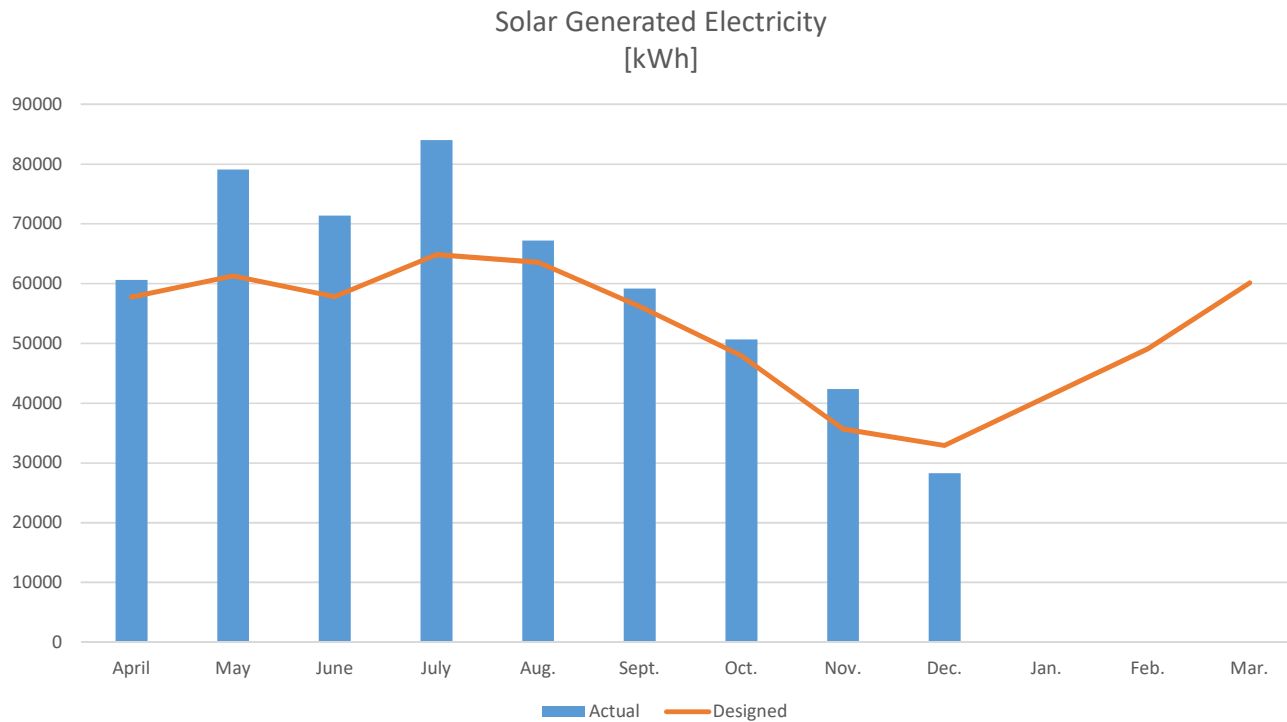
**This agreement applies to both System A and D**

# Performance of System A

- System has been in operation since December 2010.
- No funds spent on system in 12-years of operation.
- This system was designed to produce 22,900 kWh annually
- In 2020 it produced 22,538 kWh or 98.4% of design.
- In 2021 it produced 22,262 kWh or 97.2% of design.
- In 2022 it produced 23,268 kWh or 101.1% of design.

**Has saved over \$40,000 in electric bills.**

# Performance of System C



# Generation to Use Ratio **2022-92%**

SYSTEM ACTUAL GENERATION												
System A	783	998	1,830	2,514	2,695	2,684	3,082	2,407	2,280	1,543	1,423	1,029
Cumulative		1,781	3,611	6,125	8,820	11,504	14,586	16,993	19,273	20,816	22,239	23,268
System C				60,616	79,076	71,348	83,996	67,163	59,139	50,640	42,350	28,293
Cumulative			150,248 Assumed	210,864	289,940	361,288	445,284	512,447	571,586	622,226	664,576	692,869
System D											1,317	1,314
Cumulative											1,317	2,631
Annual Total				213,378	298,760	366,671	459,870	529,440	590,859	643,042	688,132	<b>718,768</b>
ELECTRICITY USED												
PCD	50,761	58,905	49,023	51,916	44,638	38,287	38,803	31,971	34,083	35,523	44,892	46,432
Town	27,320	32,562	22,687	18,682	15,307	17,139	18,475	19,828	18,132	18,544	20,275	24,521
Total	78,081	91,467	71,710	70,598	59,945	55,426	57,278	51,799	52,215	54,067	65,167	70,953
Cumulative	78,081	169,548	241,258	311,856	371,801	427,227	484,505	536,304	588,519	642,586	707,753	<b>778,706</b>



# What we get from System C

## Electric Power

- Actual electricity is generated and goes to the grid.
- Credit from CMP for all electricity produced that is used to reduce the cost of power purchased.
- For 2023 this is **24.69¢** for each kWh fed to the grid and used in our small accounts and **23.55¢** for each kWh fed to the grid and used in our medium accounts.

**In 2023 we will pay 14.82¢ per kWh.**

## Renewable Energy Certificates

- Each megawatt hour of power produced gives the Town one REC.
- RECs are proof that the power has been generated with renewable energy such as solar or wind and without burning fossil fuels like coal, oil or natural gas.

# Renewable Energy Certificates

- 1 REC is created for each 1,000 kilowatt-hours of renewable electricity generated and delivered to the grid.
- The New England Power Pool Generation Information System (NEPOOL GIS) issues and tracks RECs for New England.
- RECs are issued quarterly.
- Thomaston has an account with NEPOOL and stores its RECs there.
- Thomaston will produce over 600 RECs a year.
- RECs have value and can be sold.

# Renewable Energy Certificates

- RECs are purchased and sold on the energy market.
- Value goes up or down based on supply and demand.
- After purchase RECs are used and “retired”.
- RECs must be sold/used within one year after generation.
- Who buys RECs:
  - Power Companies – required to have some percentage of renewable energy in their mix.
  - Firms that want to claim they are “green” but lack their own solar facilities.
  - Individuals who want to use renewable energy not fossil fuels.

# Renewable Energy Certificates

- A Maine REC is currently worth about \$30.00.
- Annual income will be about \$18,000.
- Income put into the Solar/Electric Reserve account to be used to:
  - Pay for maintenance or repair of solar array.
  - Pay for maintenance, repair or expansion of streetlights.
  - Pay for other municipal costs of owning an electric utility.
  - Help reduce cost of long-term debt of the solar array.

# Economic Benefits of Solar for Thomaston

## Costs before Solar

	<u>P.C.D.</u>	<u>Municipal</u>	<u>TOTAL</u>
2018 -	\$74,137	\$65,737	<b>\$139,874</b>
2019 -	<u>\$78,285</u>	<u>\$91,181</u>	<u><b>\$169,466</b></u>
Ave. -	\$76,211	\$78,459	<b>\$154,670</b>

**All paid to C.M.P.**

## Estimated 2023 costs

Solar Bond	\$90,748	
Streetlight Bond	\$21,431	FY 24/25
Maintenance	\$4,500	
Reserves	<u>\$4,943</u>	
Total Expense	\$121,622	
Less REC Income	<u>\$18,000</u>	
Final Cost	<b>\$103,622</b>	

## Solar/Electric Reserve Account

Fiscal Year	Maintenance	Replacements	Annual Cost	Annual Contribution	Reserve Balance
2023/24	\$2,610	\$0	\$2,610	\$4,943	\$4,702
2024/25	\$2,610	\$500	\$3,110	\$4,943	\$6,535
2025/26	\$2,610	\$6,500	\$9,110	\$4,943	\$2,368
2026/27	\$2,610	\$0	\$2,610	\$4,943	\$4,701
2027/28	\$2,610	\$0	\$2,610	\$4,943	\$7,034
2028/29	\$2,610	\$0	\$2,610	\$4,943	\$9,367
2029/30	\$2,610	\$6,500	\$9,110	\$4,943	\$5,200
2030/31	\$2,610	\$0	\$2,610	\$4,943	\$7,533
2031/32	\$2,610	\$0	\$2,610	\$4,943	\$9,866
2032/33	\$2,610	\$0	\$2,610	\$4,943	\$12,199
2033/34	\$2,610	\$6,500	\$2,610	\$4,943	\$8,032

# Solar Array – Future Considerations

- Electric usage is about 780,000 kWh per year and expected to go up.
- Electric generation is designed for 674,000 kWh or 86% of usage.
- Purchasing electricity is going up and unlikely to go down.

**Installing more solar panels or replacing existing ones, should be planned for.**

- Floating solar panels on the lagoons is one option.
- A Community Solar Project would be a way to help Thomaston citizens get the benefit of the savings from solar.