



2018 Hot Water Forum
March 22, 2018

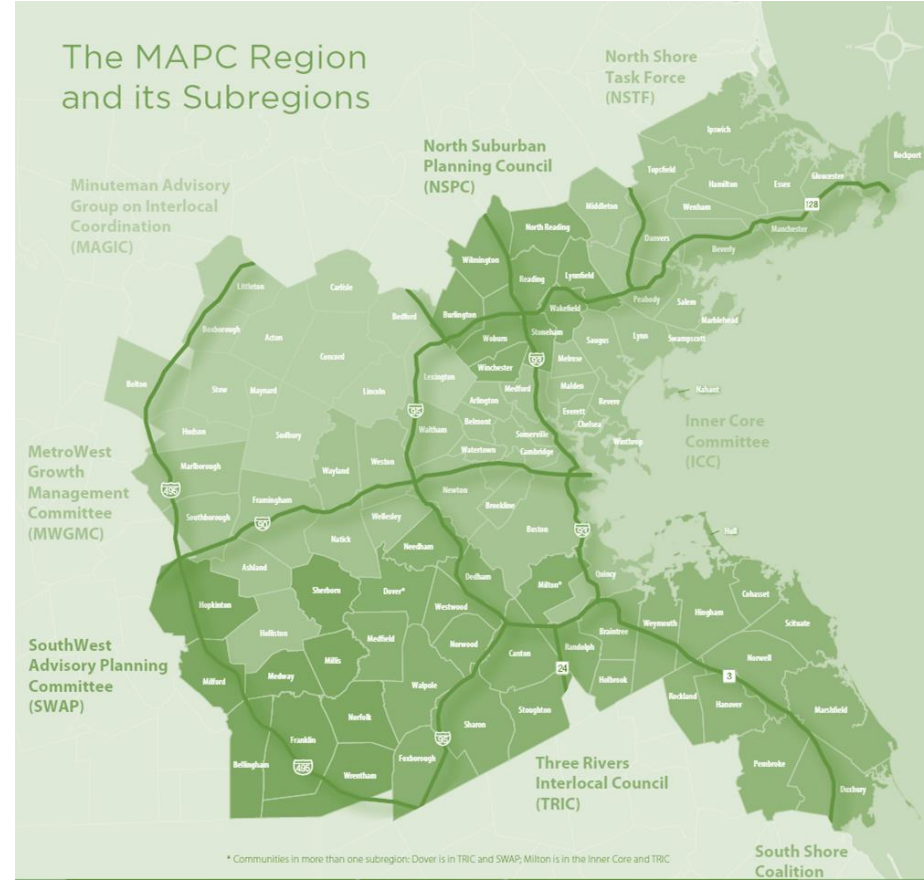
Solar Hot Water for a Cooler Climate:
Massachusetts Campaigns for the Municipal
and Residential Sectors

Program

- 1 Solar Hot Water Landscape
- 2 MA: Municipal Campaign
- 3 MA: Multifamily Campaign
- 4 MA: Single-Family Campaign
- 5 Q & A

MAPC: About Us

- Regional Planning Agency for Greater Boston
- Since 1963
- 101 cities and towns
- 90+ employees
- Wide range of planning expertise



MAPC: Clean Energy

Regional Energy Projects

- ESCO Procurement
- Regional Solar Initiative
- LED Streetlight Purchasing Program
- Community Aggregation
- Green Mobility Technology
- Climate and Energy Resiliency

Local Energy Action Program

- Connecting municipalities with incentives + plug-and-play programs
- Community energy and climate baselining, planning, and strategizing
- Outreach programming and education
- Net Zero Planning

Energy Technical Assistance

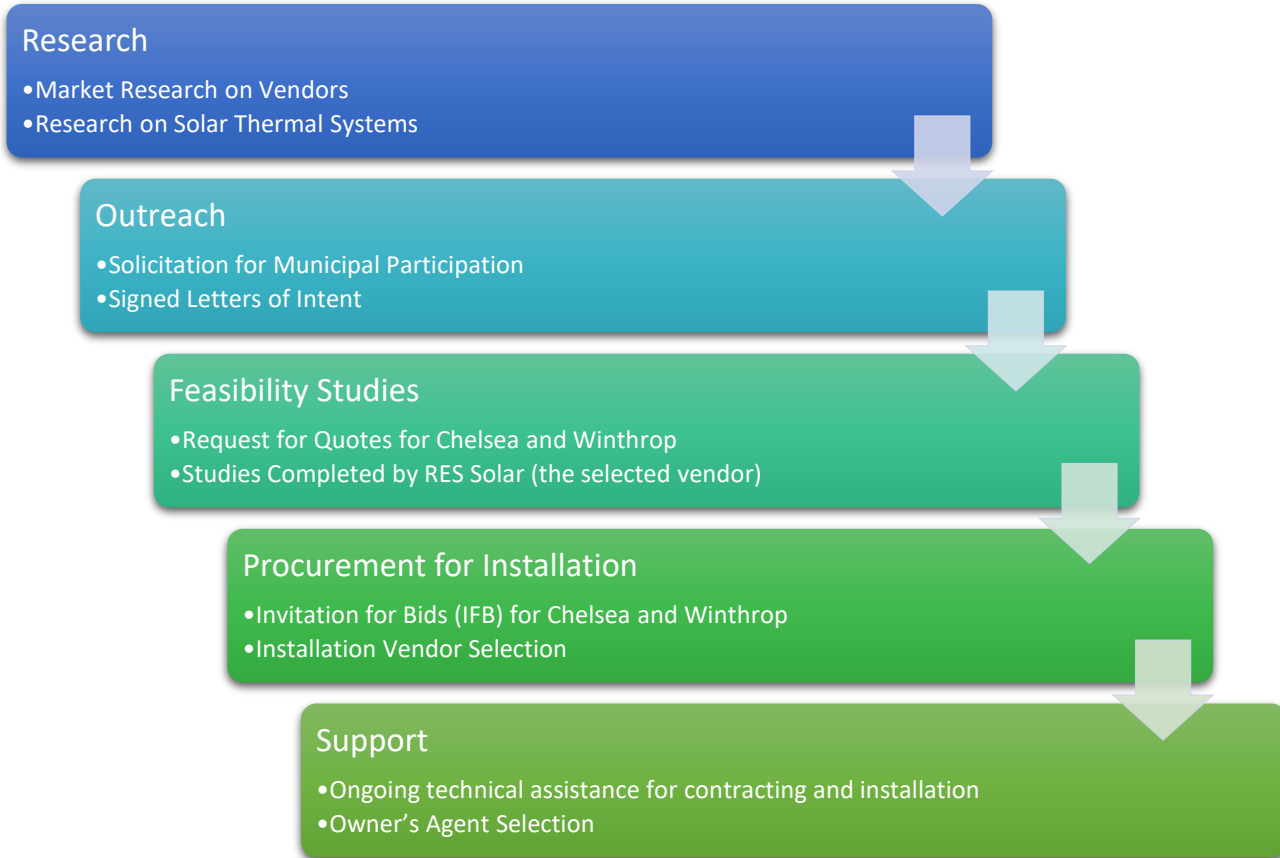
- Grant Writing
- Green Communities Designation
- Methane Leaks
- Solar Permitting and Zoning
- State and Local Policy
- Net Zero Guidance and Education



Agenda

- 1 Solar Thermal Campaign Process
- 2 New Procurement Models
- 3 Takeaways from Feasibility Studies
- 4 Lessons Learned

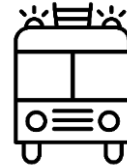
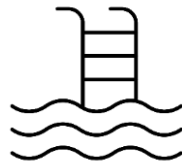
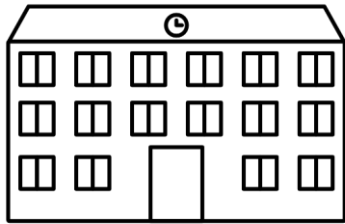
Municipal Solar Thermal Procurement Pilot



Good Candidates for Solar Thermal Systems:

Looking for:

- Building with high hot water use
- Consistent hot water needs throughout the day
- Ideally uses some hot water year-round

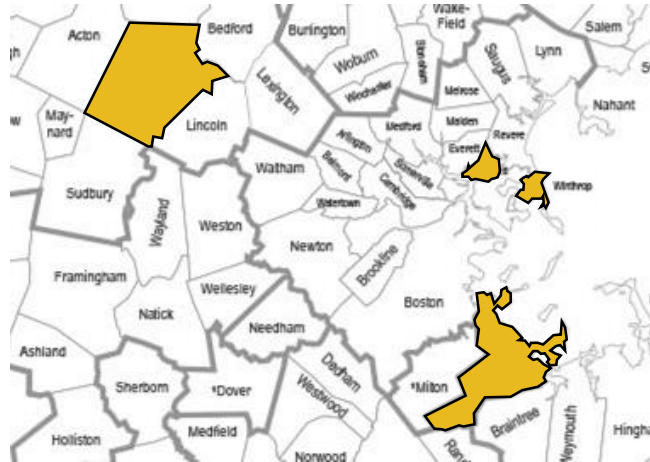


Good Candidates:

- A building with a gym or showers
- Rec center with a pool
- Ice skating rink (showers and Zamboni)
- School buildings with pools or gyms
- Police and Fire Stations

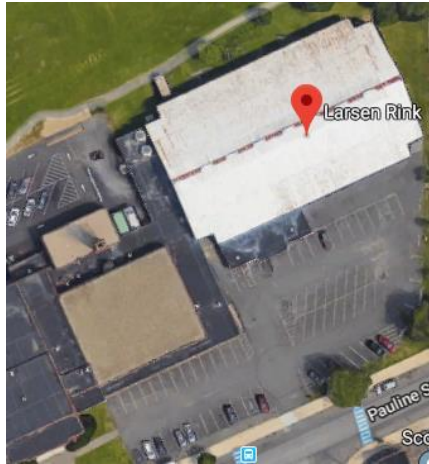
Solicitation for Interest

Chelsea, Winthrop, Concord, and Quincy



- ❖ Four **municipalities** interested in installing solar thermal on municipal buildings
- ❖ Procurement for both feasibility studies and installation contracts
- ❖ Small-scale and commercial-scale systems

Feasibility Studies



Winthrop Ice Rink



Chelsea Central Fire Station



Chelsea Police Department

Feasibility Study RFQ

		November						
		Sun	Mon	Tues	Wed	Thur	Fri	Sat
					1	2	3	4
		Outreach to vendors						
Post Procurement	5	6	7	8	9	10	11	
	12	13	14	15	16	17	18	
Deadline for Quotes	19	20	21	22	23	24	25	
	26	27	28	29	30			

Questions Due (Arrow points to Friday, Nov 10)

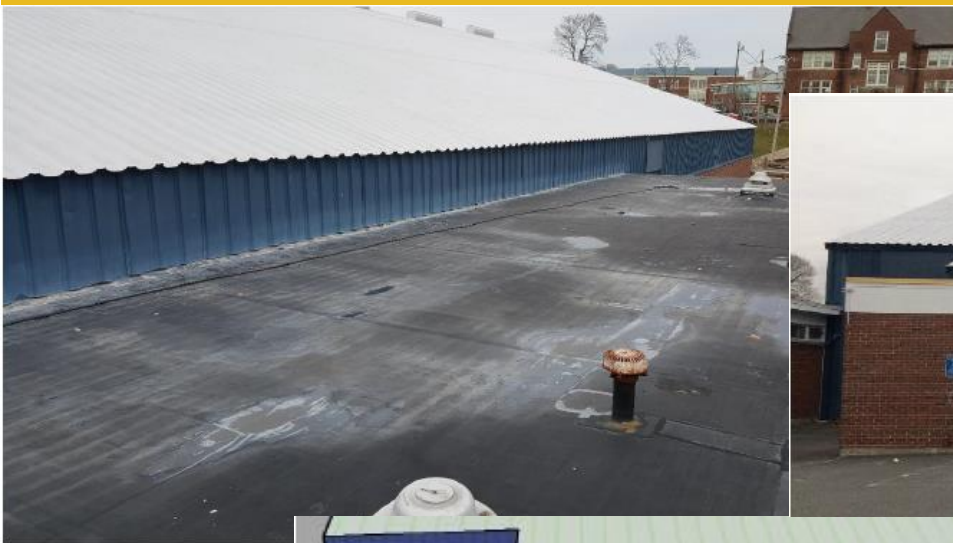
Answers Posted (Arrow points to Tuesday, Nov 14)

Selection Committee Meeting (Arrow points to Monday, Nov 20)

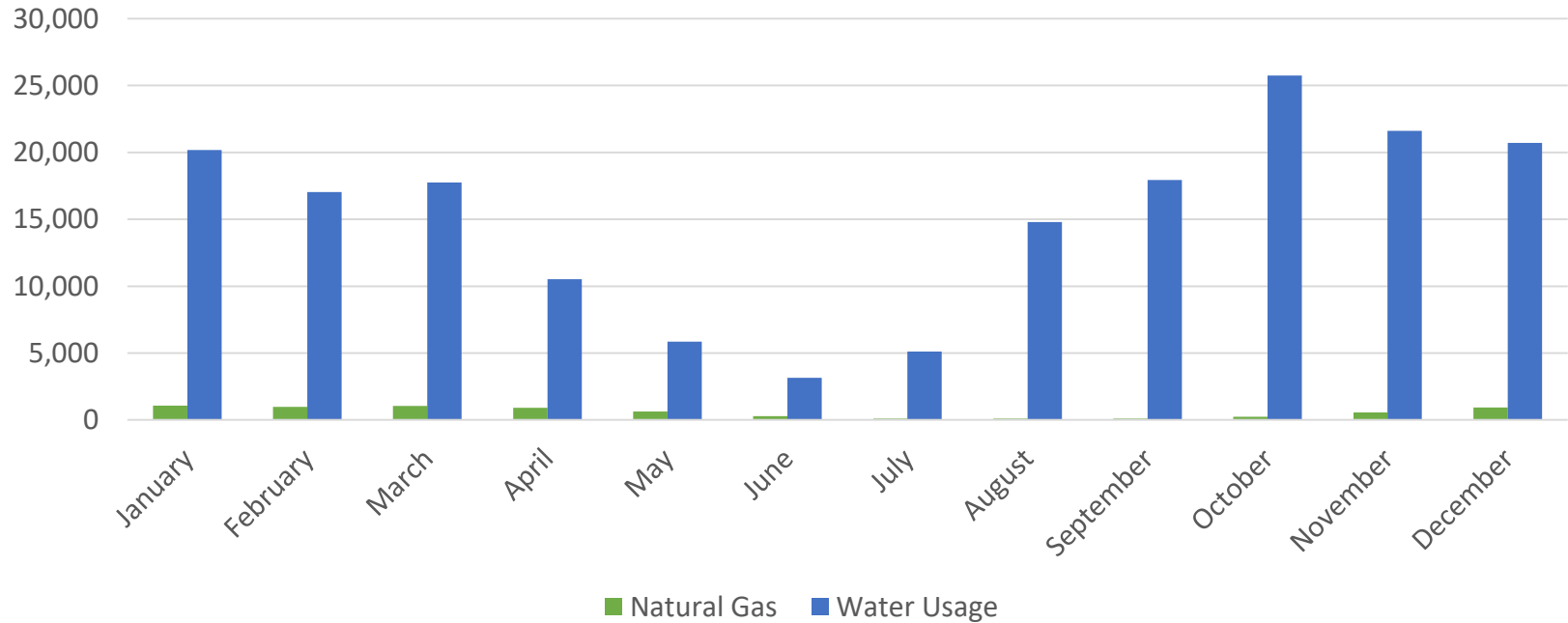
Feasibility Study: What to Expect:

- ❖ A **preliminary walk-through**
- ❖ A **few hours on site** to:
 - Measure roof supports
 - Install water metering
 - Assess current equipment and measure space
 - Assess roof quality and measure solar insolation on site
- ❖ Flowmeter testing for **one week** on-site for data collection
- ❖ An analysis and energy model with **RETScreen, T-Sol**, or **PolySun** tools
- ❖ An **economic model** including applicable incentives
- ❖ Vendor to **apply** for feasibility study rebate

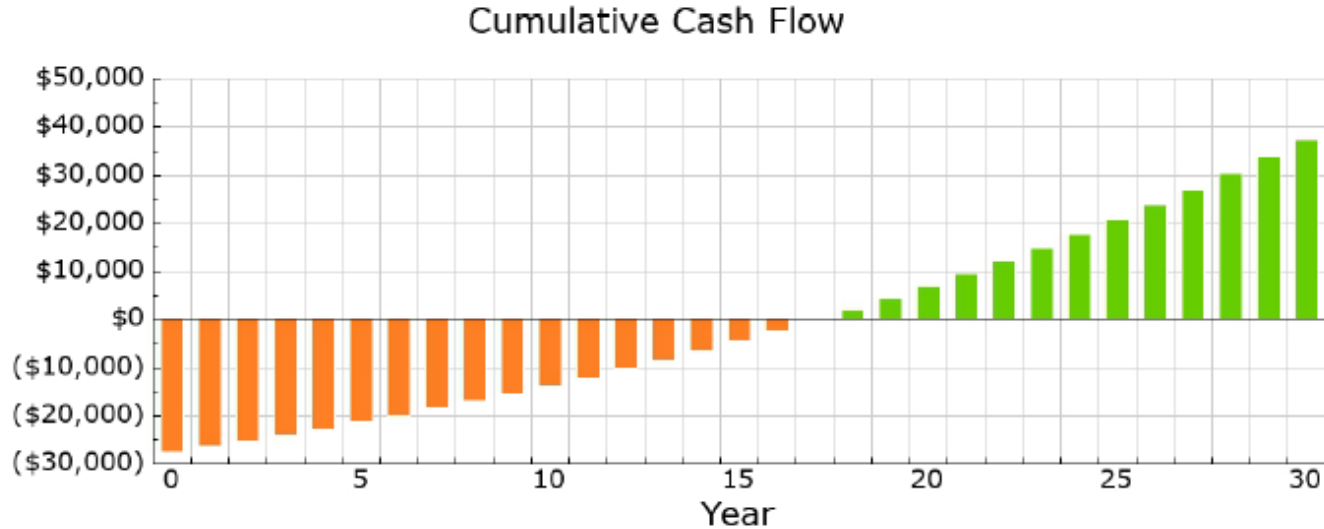
Winthrop, MA: Ice Skating Rink



Skating Rink With Showers

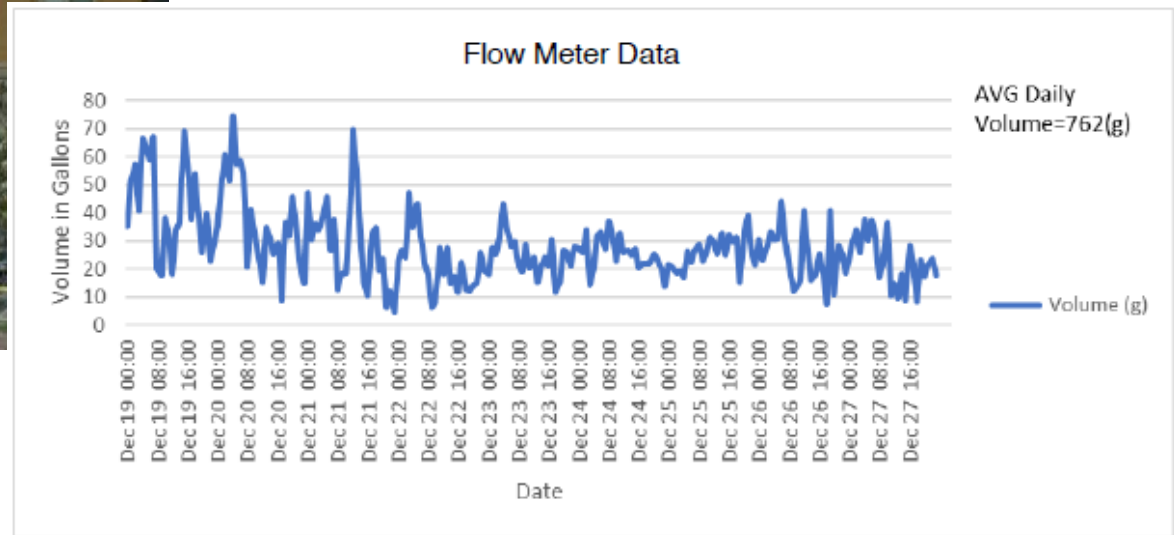


Winthrop, MA: Ice Skating Rink



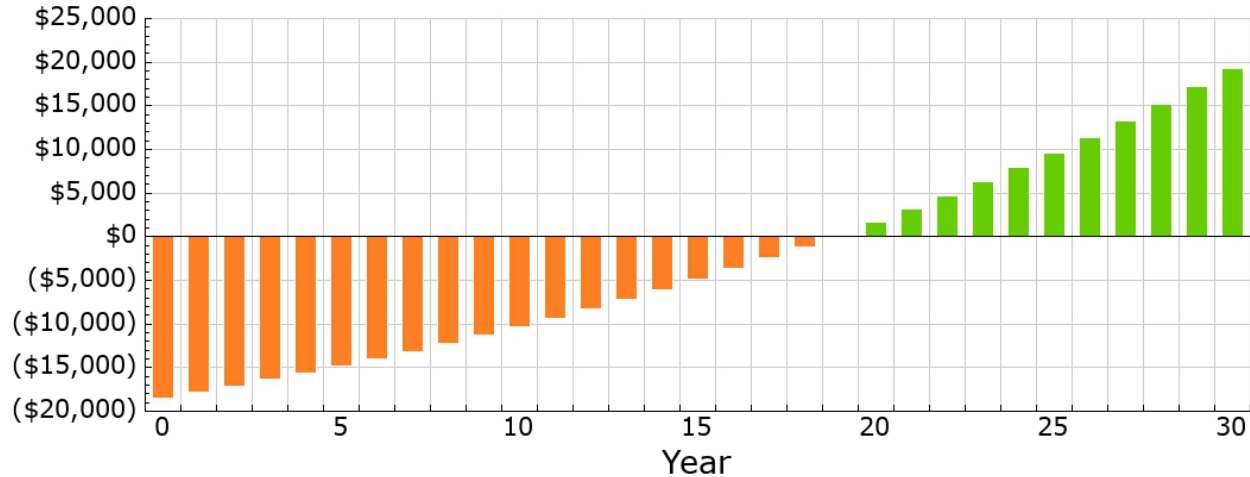
- ❖ Over 30 years, annual utility savings are anticipated to average \$2,635, for a **total utility savings of \$79,058**.
- ❖ Solar Water Heating System: **43,150 kWh/Year** (1,472 Therms Natural Gas)
- ❖ Cashflow payback: **17.1 years**
- ❖ Internal Rate of Return (IRR): 5.4%
- ❖ CO2 Saved over System Life: **435 tons**. (Equivalent to 870,000 auto miles/10,136 trees)

Chelsea, MA: Police Station



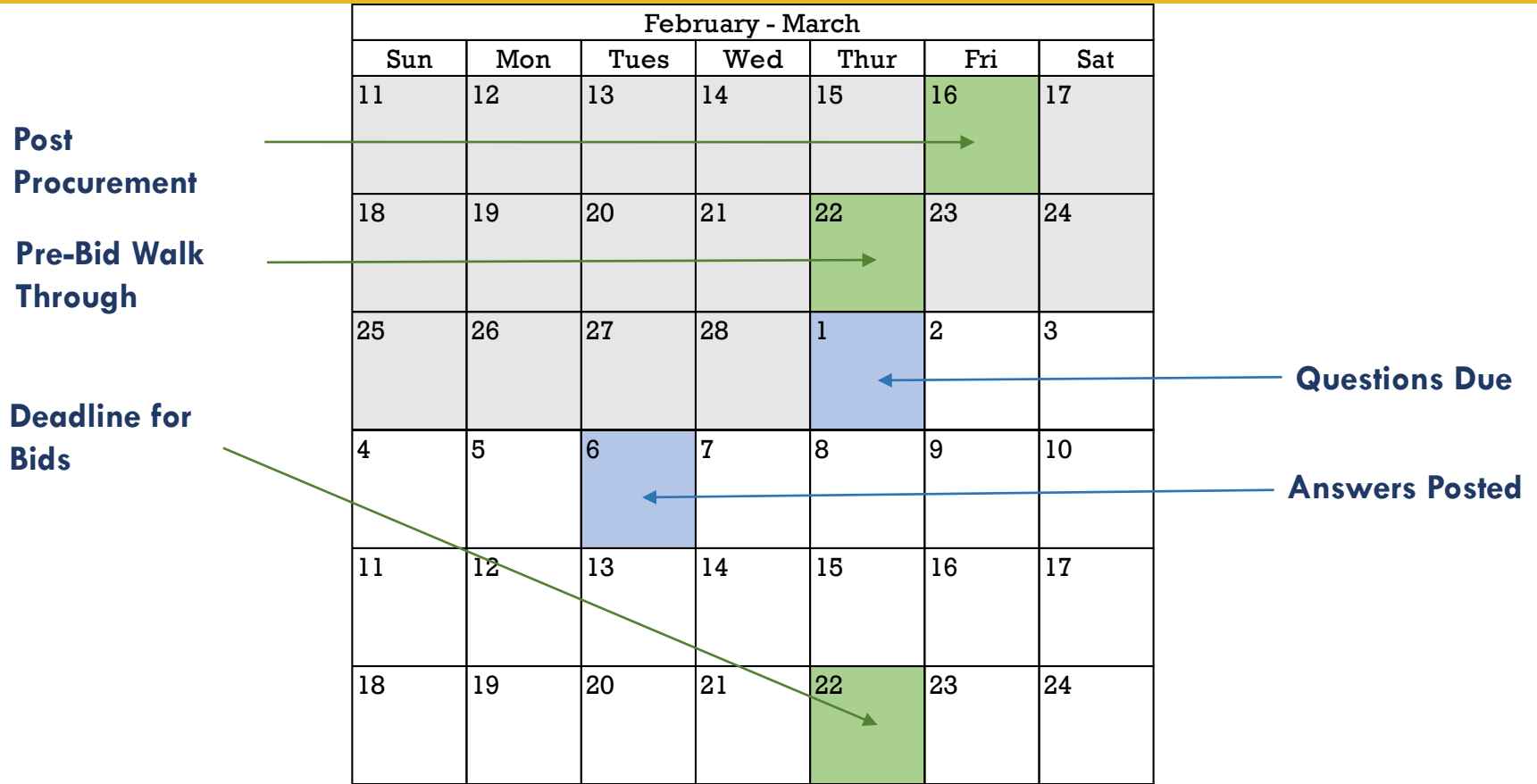
Chelsea, MA: Police Station

Cumulative Cash Flow



- ❖ Over 30 years, annual utility savings are anticipated to average \$1,450, for a **total utility savings of \$43,487**.
- ❖ Solar Water Heating System: **21,625 kWh/Year** (738 Therm Natural Gas)
- ❖ Cashflow payback: **18.8 years**
- ❖ Internal Rate of Return (IRR): 4.4%
- ❖ CO2 Saved over System Life: **228 tons**. (Equivalent to 456,000 auto miles/5,312 trees)

Installation IFB:



Ch. 30 §39M : Construction and Materials

Contracts for Construction and Materials; Manner of Awarding

- ❖ Between \$25,000 and \$100,000 in cost
- ❖ Awarded to the lowest *responsible and eligible* bidder
- ❖ Bidders submit a 5% bid deposit.
- ❖ Material specifications detailed. Description of material that can be met by a minimum of 3 manufacturers or producers.
- ❖ “Material” means any article, assembly system, or any component part thereof.

Solar Thermal Incentive Calculator

Solar Thermal Incentive Calculator

Directions: **Fill out all yellow fields**, including: 'Installation Cost', 'Number of Collectors', 'Surface Orientation Factor', and The OG-100 SRCC ratings. The MassCEC Installation Rebate and AEC's incentive will populate. To see the methodology for an incentive, click on the tab for that incentive to see the individual calculations.

Project Name

Winthrop Ice Rink

Project Address

45 Pauline Street Winthrop, MA

Number of Collectors

10

Surface Orientation Factor *

0.98

(.98 for Winthrop Ice Rink, .92 for Chelsea Police Station)

Annual, Average Solar Shading

1

Fill the three fields below from the corresponding fields in the chosen collectors' OG-100 SRCC Rating. Ratings for collectors can be found here:

<https://secure.solar-rating.org/Certification/Ratings/RatingsSummaryPage.aspx?type=1>

COLLECTOR THERMAL PERFORMANCE RATING

Kilowatt-Hours (Thermal) Per Panel Per Day

Thousands of Btu Per Panel Per Day

MassCEC Rebate:

		Non-profit / Public Entity Rebate	
Rebate Amount:	\$26,650.00	Rebate Formula	Average SRCC OG-100 rating x # of collectors x \$100
		Maximum % Rebate	50%
Inputs:		Maximum Total Rebate	\$100,000.00
Number of Collectors	10		
SRCC-C Rating*	29.8		
SRCC-D Rating*	23.5		

* Use the OG-100 SRCC ratings in kBtu per panel per day for the medium radiation scenario
 SRCC ratings for collectors can be found at:

<https://secure.solar-rating.org/Certification/Ratings/RatingsSummaryPage.aspx?type=1>

COLLECTOR THERMAL PERFORMANCE RATING							
Kilowatt-hours (thermal) Per Panel Per Day				Thousands of Btu Per Panel Per Day			
Climate -> Category (Ti-Ta)	High Radiation (6.3 kWh/m ² .day)	Medium Radiation (4.7 kWh/m ² .day)	Low Radiation (3.1 kWh/m ² .day)	Climate -> Category (Ti-Ta)	High Radiation (2000 Btu/ft ² .day)	Medium Radiation (1500 Btu/ft ² .day)	Low Radiation (1000 Btu/ft ² .day)
A (-5 °C)	8.1	6.1	4.2	A (-9 °F)	27.8	21.0	14.2
B (5 °C)	7.4	5.4	3.4	B (9 °F)	25.1	18.3	11.6
C (20 °C)	6.1	4.2	2.2	C (36 °F)	20.9	14.2	7.6
D (50 °C)	3.5	1.8	0.3	D (90 °F)	12.0	6.1	1.0
E (80 °C)	1.2	0.1	0.0	E (144 °F)	4.1	0.2	0.0

A- Pool Heating (Warm Climate) **B-** Pool Heating (Cool Climate) **C-** Water Heating (Warm Climate)
D- Space & Water Heating (Cool Climate) **E-** Commercial Hot Water & Cooling

Alternative Energy Credits

		Standard Equation for Small Solar Thermal RTGU's	
Rebate Amount:	\$13,145.33	$E_{\text{net, out}} = \frac{R}{1,000} * C * \text{SOF} * S * t$	
Inputs:			
Number of Collectors	10	Where: $E_{\text{net, out}}$ = Net Thermal energy output equivalent (MWH/year) R = OG-100 Solar Collector Rating for Category D, Medium Radiation C = Number of solar thermal collectors SOF = Surface Orientation Factor, calculated based on the azimuth and tilt of the solar thermal collectors S = Annual, average solar access, as determined by a Solar Pathfinder or comparable device t = Time, 365 days	
SRCC-D Rating*	6.9		
Surface Orientation Factor**	0.98		
Average Solar Access	1		
$E_{\text{net, out}}$	730.296		
AEC Multiplier	3		
AEC rate	\$18.00		

* Use the OG-100 SRCC rating in kWh (thermal) per panel per day for the medium radiation scenario
 SRCC ratings for collectors can be found at:

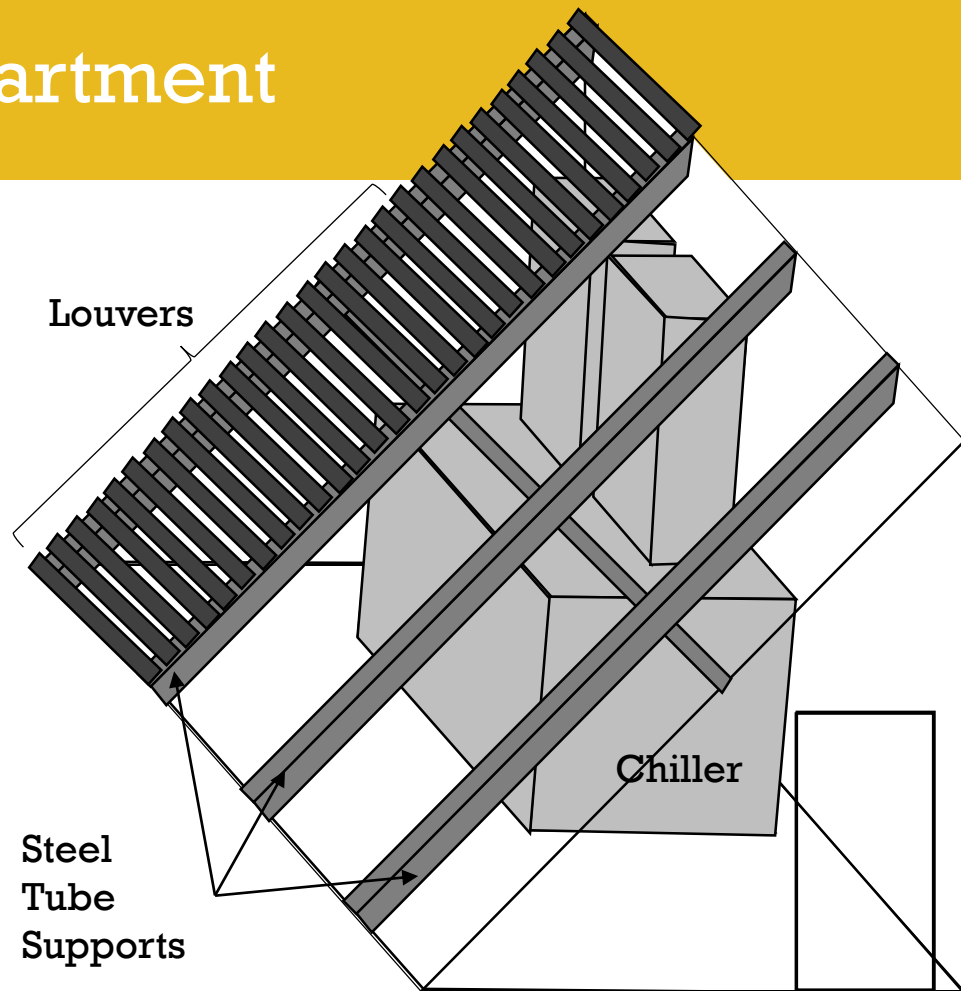
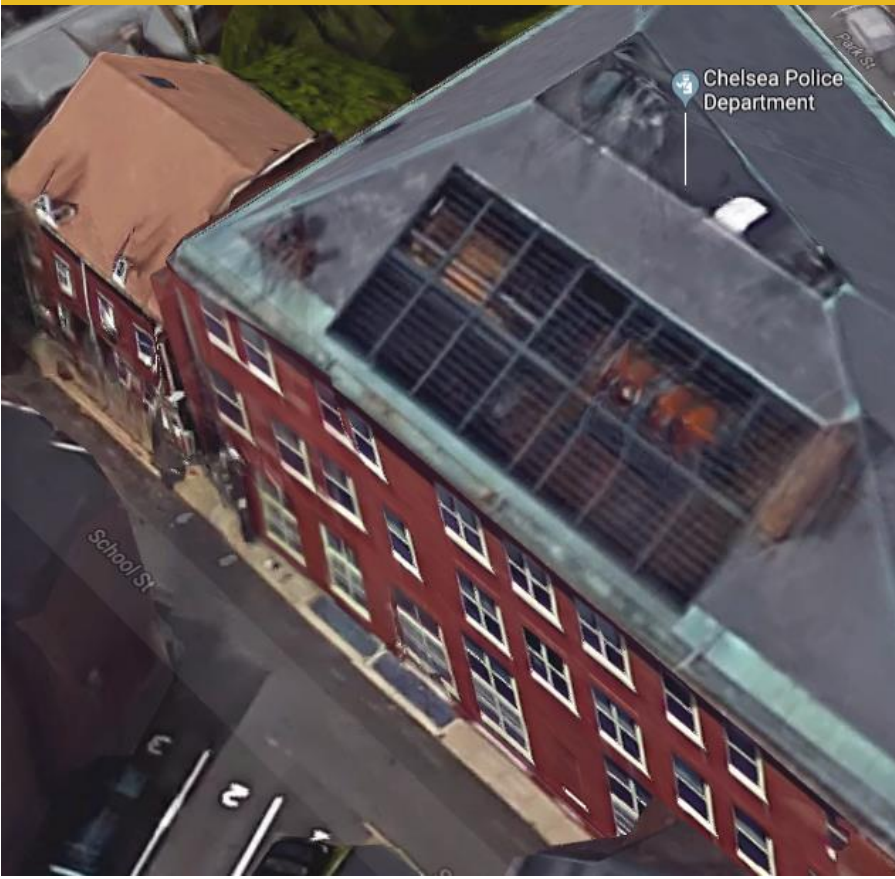
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COLLECTOR THERMAL PERFORMANCE RATING							
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Category (Ti-Ta)				Category (Ti-Ta)			
A (-5 °C)	8.1	6.1	4.2	A (-9 °F)	27.8	21.0	14.2
B (5 °C)	7.4	5.4	3.4	B (9 °F)	25.1	18.3	11.6
C (20 °C)	6.1	4.2	2.2	C (36 °F)	20.9	14.2	7.6

Room for Storage Tanks:



Chelsea Police Department



Takeaways

- ❖ Review feasibility studies carefully for potential risks & challenges
- ❖ Make walk-throughs and measurements mandatory
- ❖ Brief facilities staff early; get diagrams
- ❖ Weigh the pros and cons of different procurement vehicles
- ❖ Incentives for both feasibility study and install highly important
- ❖ Keep up-to-date on applicable incentives and rebates
- ❖ SHW can be an option where PV didn't make sense, and can fit well into climate toolbox

Contact

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