Medford High School

Sustainability and MEP Systems
Advisory Team Meeting #7

10/01/2026



smma

LeftField

Agenda

- Vote to Recommend HVAC System
- Net Zero Energy & Minimizing Cost of Ownership
- Preliminary Solar PV Assessment
- Red List Free Materials - *deferred to a future meeting*
- Embodied Carbon & Mass Timber - *deferred to a future meeting*
- Water Efficiency & Stewardship - *deferred to a future meeting*

- Next Steps

Preliminary Solar Photovoltaic (PV) System Assessment

Sustainability and MEP Systems – SD Preliminary Solar PV System Assessment

Roof Solar Photovoltaic (PV) System

Low Ballasted System



SMMA Project: North Middlesex Regional High School

High Canopy System



Solar Design Associates Project: Clark University

Parking Solar Photovoltaic (PV) System

Long Span Canopy System



Solar Design Associates Project: Oberlin

Parking Space Cover System



SMMA Project: The Lincoln School

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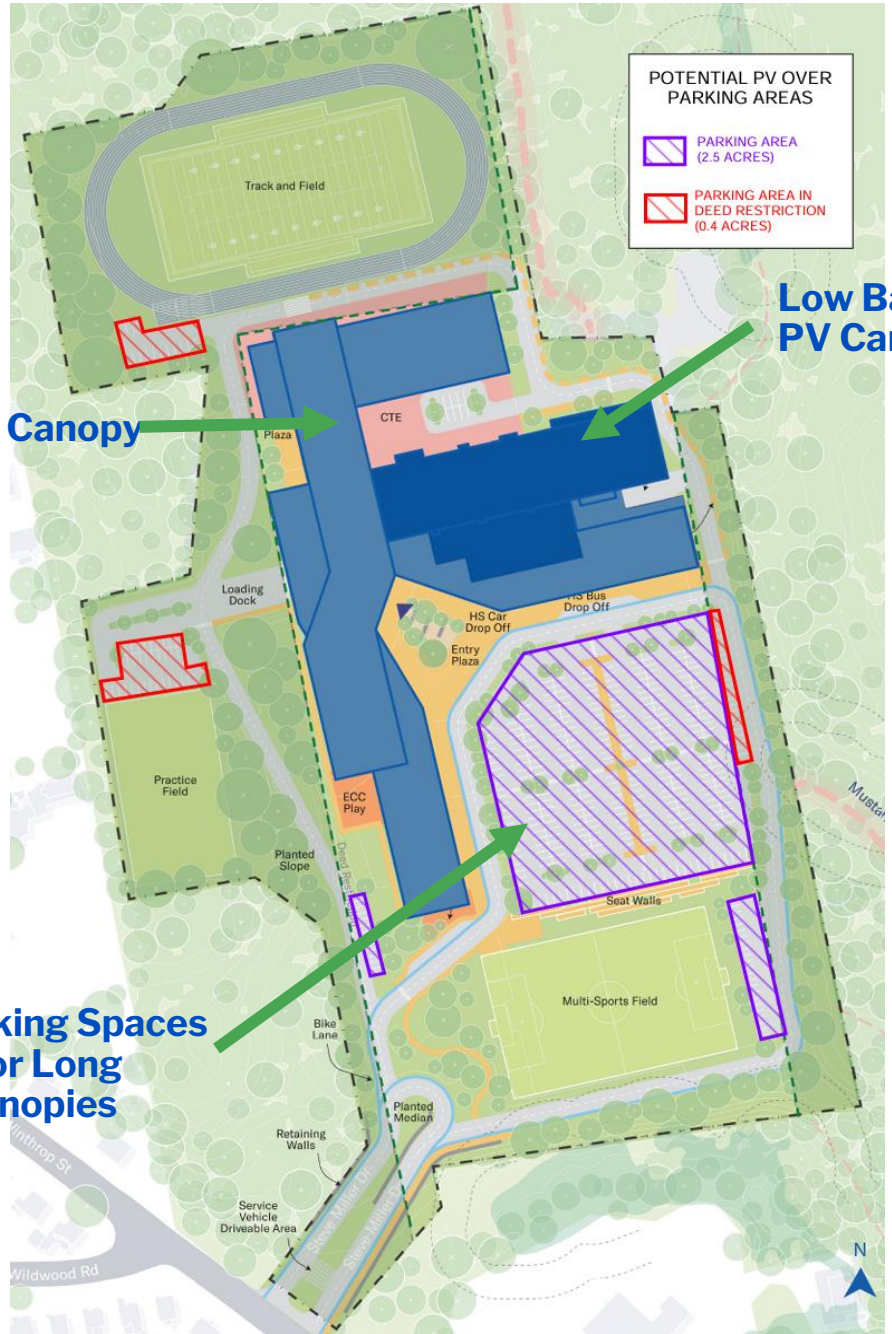
Sustainability and MEP Systems – SD Preliminary Solar PV System Assessment

Solar PV System	Estimated NZE contribution
	(%)
ROOF Hybrid Solar PV High Canopy /Low ballasted systems	~50%
PARKING Hybrid Solar PV Long span/parking space canopies	~50%
Total	~100%

100% Net Zero Energy (NZE) Site Capacity Assessment

~5.5-6.0

MWh



Low Ballasted Roof PV Canopy

High Roof PV Canopy

Hybrid: Parking Spaces Cover and/or Long Span PV Canopies

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Solar PV System Ownership vs. PPA (Power Purchase Agreement) Options

Solar PV Procurement Options	Ownership Criteria		Financial Benefits		Comments
	PPA	**Building Owner**	**PPA**	**Building Owner**	
Power Purchase Agreement	Design, Procurement, Installation, Maintenance and operational management, Replacement and utility coordination by PPA. Includes Solar PV parking canopy structure. Will likely include battery storage system*	Solar PV readiness at roof and parking + Electrical Utility Infrastructure	Owns and benefits all energy production grants/incentives, peak load reductions, etc. [may own RECs, pending contract agreement*]	Negotiated 20 yr. Fixed utility rate*	LEEDv4: Renewable energy points requires Owner own the RECs and full Cx of PV systems [Precedent challenges with PPA process]
School/City Ownership		Design, Procurement, Installation, Maintenance and operational/management, Replacement, infrastructure and coord. with utility. May elect with or without battery storage system.		Owner benefits from all grants/incentives, peak load reductions and RECs.	LEEDv4: 3-5 points - must include Cx of PV system for Renewable Energy/Green Credit points

**Notes:*

1.Subject to PPA contractual negotiations, which may results in a reduction on the utility $/kWh of up to $0.10/kWh [see cost of ownership slide below for estimated annual utility savings].

Sustainability and MEP Systems – SD Preliminary Solar PV System Assessment

Solar PV System	Estimated PV Systems Size		PSR PV System Scope
ROOF			
Total Esitmated Annual Energy Production	**2.7 MW** (or 2,749 kWdc)	2,991,000 kWh	
Total Estimated Costs ($)	$19,677,000		PV 1-PSR Alternate-50% low ballasted : $3,274,000
NZE %	~50%		~20%
PARKING			
Total Estimated Annual Energy Production	**2.2 MW** (or 2,180 kWdc)	2,682,000 kWh	
Total Estimated Costs ($)	$20,979,000		PV 2-PSR Structure Only (100% NZE PPA): $28,792,000
NZE %	~50%		100% PPA
TOTAL			
Total Estimated Annual Energy Production	**4.9 MW** (or 4,920 kWdc)	5,673,000 kWh	
Estimated Costs($)	**~$40,656,000**		PV 3 – Ownership PV/Structure (100% NZE): $59,352,000 [Incl. Battery Storage/Micro-Grid]
	~100%		100%
Battery Storage/Micro-Grid	**~$4,900,000**		

**Notes:*

1. *Roof: Combination High Canopy/Low Ballasted PV systems – Parking: Combination Long Span/cover parking space only Solar PV Canopies*
2. *Costs includes market rates structure and panels.*

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Sustainability and MEP Systems – SD Preliminary Solar PV System Assessment

System Type	NZE (%)	Solar PV System Size (MW)	Battery Storage	Estimated Installation Costs ($)	Estimated Annual Savings/Revenues	Estimated Payback (Yrs.)	Estimated Cash Flow [Debt savings]
PV1 – Solar PV Low Ballasted Roof System	20% (Owned)	~1 MW	Not Included	$3,274,000	$360,000	8.7	***TBD** –by City of Medford**
PV2 – Solar PV Parking Canopy Structure	100 % PPA	~5.5 MW (PPA)	May be Included	*$4,319,000**	$303,000*	14.3	
PV3 – Solar PV Roof and Parking Canopy System	100% (Owned)	~5.5 MW	Included	$45,556,000	$1,568,000	29	

Notes:

1. *PPA: Power Purchase Agreement: 20 yr contracted agreement. Solar PV system and benefits owned by PPA. PPA Utility fix rate estimated at $0.15/kWh. Battery storage is optional. However project may be required to install battery storage readiness.*
2. *PV2's original PSR estimate adjusted to remove the cost of the structure, as structure costs are included in the PPA contractual negotiations. SD estimate to further confirm the owners costs for additional electrical and site infrastructure over BOD..*
3. *PV3 Option: Using recent estimates vs. the PSR $59,352,000*
4. *Costs of additional structure upgrade for existing gym and pool not included.*
5. *Stretch Energy Code requires 40% of usable roof be Solar PV ready, which is equivalent to the PV1 system 20% NZE. Only the electrical infrastructure (readiness) for 20% NZE is included in the BOD.*
6. *Estimated Annual energy costs savings and revenues include estimated kWh savings, estimated peak charges savings, estimated Mass Save Connected Solutions program as well as estimated DOER RECs revenues. Programs and current rates/incentives are subject to change by the time of system installation.*
7. *The estimated cash flow debt savings impact calculation would be required to be conducted by the City of Medford.*

Sustainability and MEP Systems – SD Preliminary Solar PV System Assessment

System Type	NZE (%)	Solar PV System Size (MW)	Estimated Installation Costs ($)	Estimated DOER SMART Incentives ($)	Estimated 20 yr System Costs ($) [Maintenance/replacement]	Estimated 20-yr Annual Savings/Revenues ($) [Connected Solutions/peak reductions/RECs]	Estimated Total 20 yr System Costs ($)	Estimated Cash Flow [Debt savings]
PV1 – Solar PV Low Ballasted Roof System	20% (Owned)	~2 MW	$3,274,000	$145,000	$143,000	$5,356,000	($2,084,000)	***TBD** –by City of Medford**
PV2 – Solar PV Parking Canopy Structure	100 % PPA	~5 MW PPA	*$4,319,000**	$0 (to PPA)	$0 (to PPA)	$4,508,000	($189,000)	
PV3 – Solar PV Roof and Parking Canopy System	100% (Owned)	~5.5 MW	$45,556,000*	$804,000	$393,000	$23,328,000	$21,817,000	

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Sustainability and MEP Systems – SD Preliminary Solar PV System Assessment

PV1 Option – Roof Solar PV (Low ballasted) 20% NZE

- May benefit long-term with the addition of additional PV readiness (NZE) for roof and parking, as well as battery storage readiness. Without the readiness, any additional PV upgrades in the future would require costly electrical infrastructure upgrades and utility process.

PV2 Option - PPA (Power Purchase Agreement) 100% NZE

- Initial PSR estimated costs reduced with structure being included within PPA agreement.
- Note that electrical infrastructure, underground conduits and some site foundation components will remain a cost to owner.
- Options to buy or own following 20 yr contract.

PV3 Option – 100% NZE Owned

- Most expensive option over 20 yr., with Considerable annual revenues may further impact City of Medford School debt financials (cash flow/debts savings) long-term.
- Maintenance and utility net metering management by owner.

Electrical Utility and ISO New England coordination:

- Please note that the project will require considerable utility coordination throughout the design, construction and post-construction phase, with the support of the PPA/owner and the design team (electrical engineer and Solar PV consultant), regardless of the PV option selected.
- We have seen projects go up to 1.5+ yrs. of coordination, following occupancy, prior to the full functional grid connection and start up of the system.

Next Steps



Sustainability and MEP Systems – Next Steps

Next Steps

- Advisory Team will provide recommendations to the SBC to consider and adopt the recommendations including:
  - Solar PV and Battery Storage Extent and Approach
  - Confirm Preferred All-Electric Heating/Cooling System Option:
    - 9.23.2026 meeting: Advisory voiced preference for the school building 100% AtWHP system.
  - Pool LCCA (Life Cycle Cost Analysis) Results:
    - In progress
    - Meeting date to be discussed and scheduled
  - Mass Timber Approach to Addition Structure

Next Meetings:

- **School Building Committee (SBC) Meeting**
  - Tuesday October 6th, 6:00pm

Thank you.

