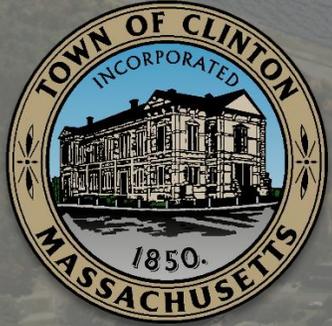


PERMANENT BUILDING COMMITTEE SCHOOL BUILDING SUB-COMMITTEE MEETING AGENDA



Meeting Date: January 30, 2024
Meeting Time: 6:30 PM
Project Name: Clinton Middle School
Project Number: 202000640305
Meeting Purpose: SBC Meeting No. 022
Location: ZOOM
Meeting Link: <https://us06web.zoom.us/j/83692330688?pwd=PkM0wg3z2hjuXlcWYZfhka2sMKhgwf.1>
Meeting ID: 836 9233 0688
Passcode: 263692
One Tab Mobile: 16468769923,,83692330688#,,,,*263692# US (New York)
Prepared By: Elias Grijalva

1. Call to Order & number of voting members present.
2. Geothermal & PV Systems Discussion/Vote
3. COA Carriage House Designer Services Award
4. Other Topics not Reasonably Anticipated 48 hours prior to the Meeting
5. Public Comment
6. Next Meetings
7. Adjourn



Clinton MIDDLE SCHOOL BUILDING PROJECT



Massachusetts School
Building Authority



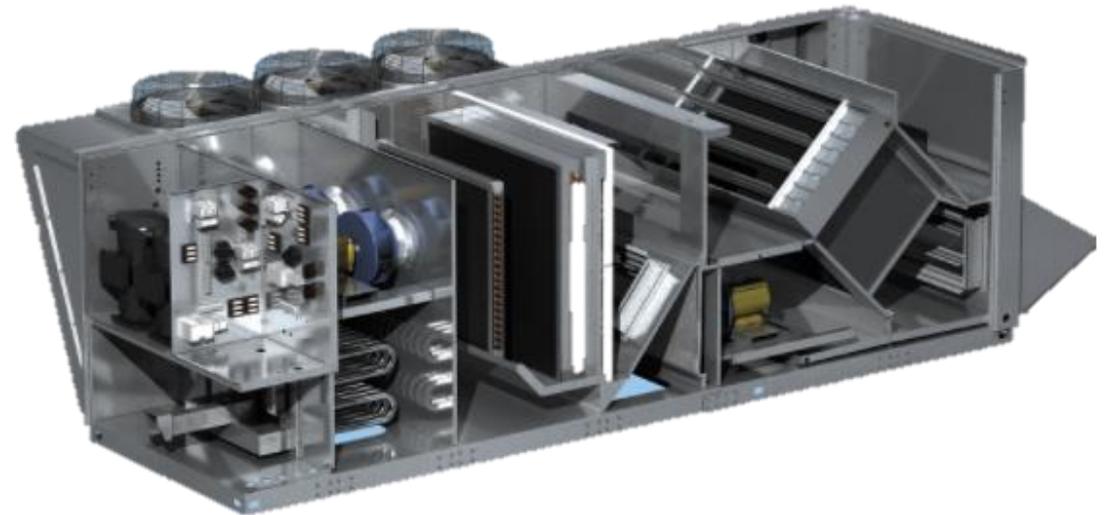
January 30, 2024
Geothermal and Photovoltaic Systems Discussion

1/12/24	SD DRAWINGS AND SPECIFICATIONS TO COST ESTIMATORS
2/01/24	COST ESTIMATES ARE DUE
2/02/24	COST ESTIMATE RECONCILIATION
2/06/24	SBC/PBC PRESENTATION (COST ESTIMATE)
2/09/24	SUBMIT PRESENTATION and ESTIMATE TO THE TOWN
2/13/24	ALL-BOARDS MEETING
2/20/24	SBC VOTE TO SUBMIT SCHEMATIC DESIGN TO MSBA
2/23/24	SUBMIT DESE AND SD PACKAGES

SCHEMATIC DESIGN SCHEDULE

PACKAGED AIR SOURCE HEAT PUMP

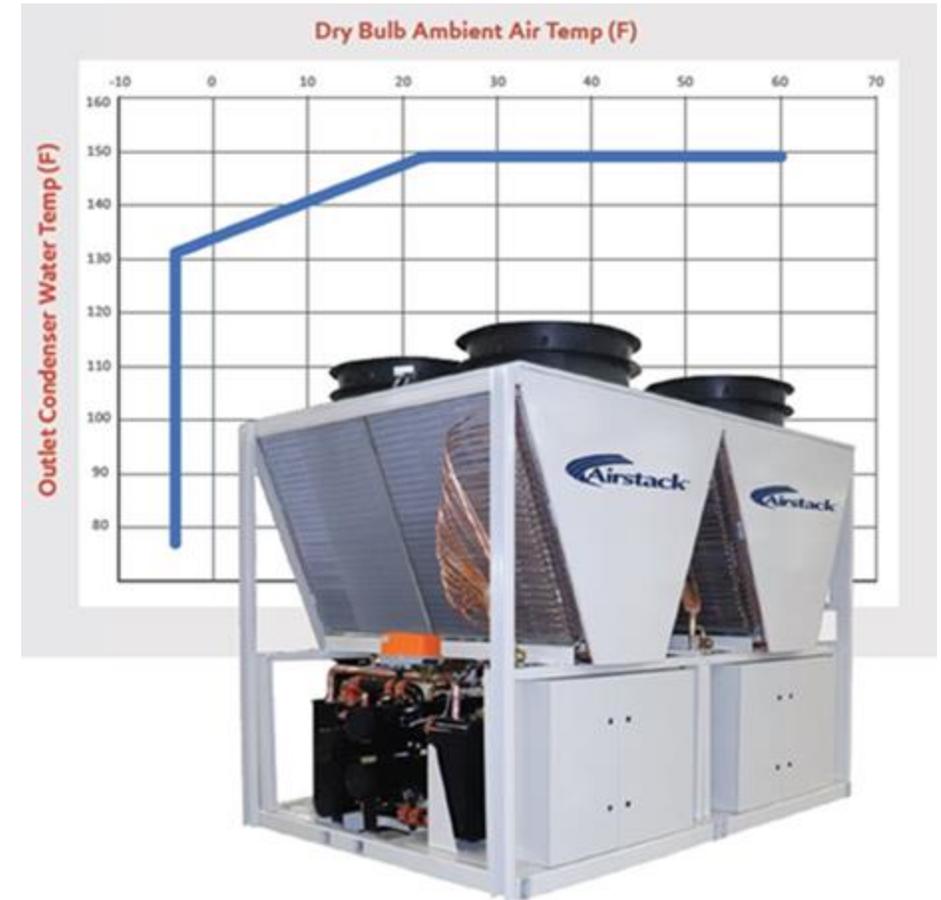
- **Dedicated Outdoor Air Systems (DOAS)**
- **Packaged HVAC Systems**
- **Inverter Variable Speed Compressors**
- **Energy Recovery (ERV) Wheels or Core**
- **Hot Water or Electric Back-up Heat**



AIR SOURCE HEAT PUMP SYSTEM

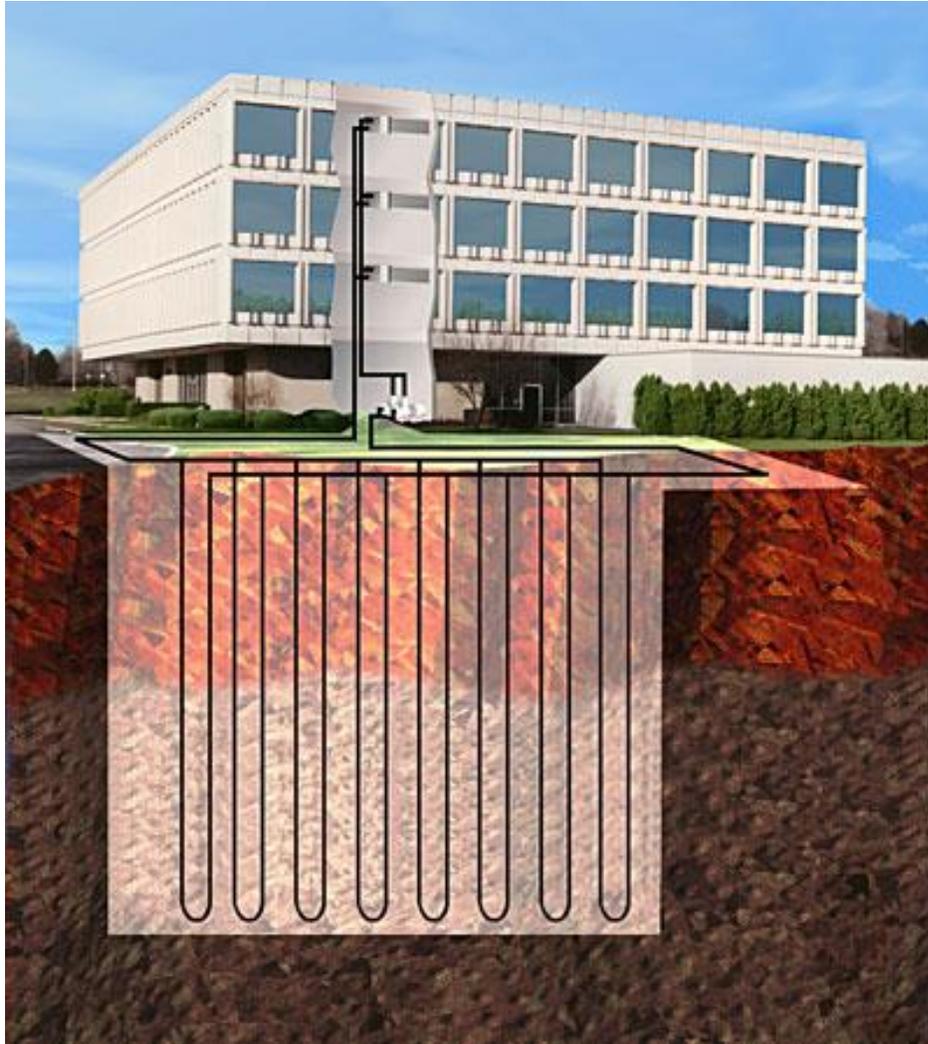
HEAT RECOVERY CHILLER/HEATER

- **Generates both chilled water and hot water simultaneously**
- **Operation down to 0F with 130F water**
- **Multiple 30-ton modules (est. 150-ton+)**

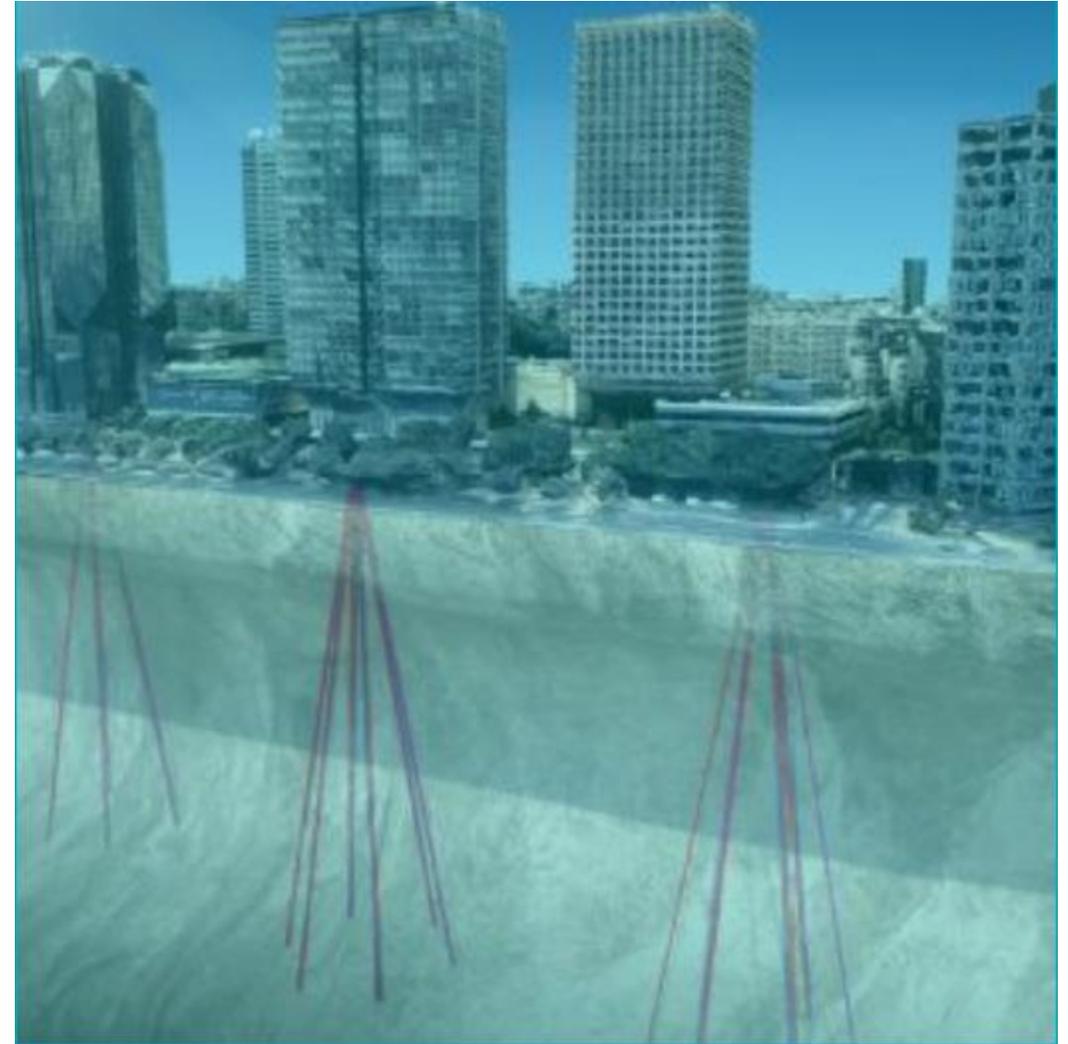


HEAT RECOVERY CHILLER/HEATER

TRADITIONAL

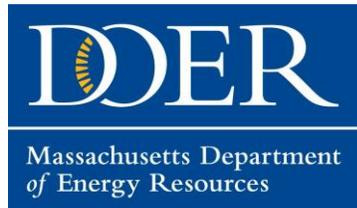


PROPRIETARY



GEOHERMAL SYSTEM TYPES

nationalgrid



	Est. Current System (ASHP only)	Est. Geothermal System (partial)	Delta
Mechanical Scope (direct cost only)	\$11,400,000	\$11,650,000	\$250,000
Geothermal Wells and Site Work	\$0	\$3,000,000	\$3,000,000
Subtotal	\$11,400,000	\$14,650,000	\$3,250,000
Mass Save Rebates (275 tons)	(\$220,000) \$800/ton	(\$553,000) 90 tons at \$4500/ton 185 tons at \$800/ton	(\$333,000)
IRA (est. 34%)	\$0	(\$4,981,000)	(\$4,981,000)
Estimated Total Const. Costs	\$11,180,000	\$9,116,000	(\$2,064,000)

*All values listed in chart are estimates only and are subject to change as the project develops.

**Values do not include design fees and other ancillary fees such as test wells, etc.

***Values do not include required added square footage to building to accommodate geothermal equipment.

GEOHERMAL COST COMPARISON

- **The Annual Heating Energy Consumption is estimated to be 190,800kWh/year.**
- **The Annual Heating Energy Cost is ± 190,800kWh (.22 Cents) =\$42,000/year.**

System	Annual Costs	Median Service Life
Air-Source Heat Pumps [76,320 kWh/year]	\$16,790	15-20 years
Ground-Source Heat Pumps [76,320 kWh/year]	\$10,494	20-25 years
	(\$6,296)	(5-10 years)

- **The savings of using geothermal equipment is estimated to be \$6,300/year**

Points to Note:

- A geothermal system is expected to be 25-50% (37.5%) more efficient than equivalent air-source system.

GEOHERMAL COST COMPARISON

As of the schematic design phase (SD), the estimated available square footage for photovoltaic (PV) cells is the following:

- **Roof PV array** | 28,830sf | +/-400kW array*
- **Parking Lot Canopy PV array** | 7,350sf | +/-100kW array*
- **TOTAL** | 36,180sf | +/-500kW array



PHOTOVOLTAIC SYSTEM ON NEW SCHOOL:

- 500kW estimated generation = 405,000kWh/year
- 405,000kWh/year x \$0.22/kWh =
\$89,100/year*

By comparison, the existing school uses:
~444,000kWh/year

POINTS TO NOTE:

- New school is 6,000sf bigger
- New school is fully electric
- Utility rate will likely increase in future

*These numbers are estimates only and are subject to change due to factors such as early design phase and not having the opportunity to meet with the Town Fire Chief.

PHOTOVOLTAIC SYSTEM



Installation Rule of Thumb- \$3500/kW

BUDGETARY NUMBERS:

SCHOOL ROOF (~400kW) \$1,400,000

PARKING LOT CANOPY (~100kW) \$ 350,000

PARKING LOT CANOPY FRAMING \$ 750,000

PV SYSTEM BUDGET \$2,500,000

ESTIMATED Town Share After Incentives (30%): $\$2,500,000 \times 70\% = \$1,750,000$

PHOTOVOLTAIC SYSTEM



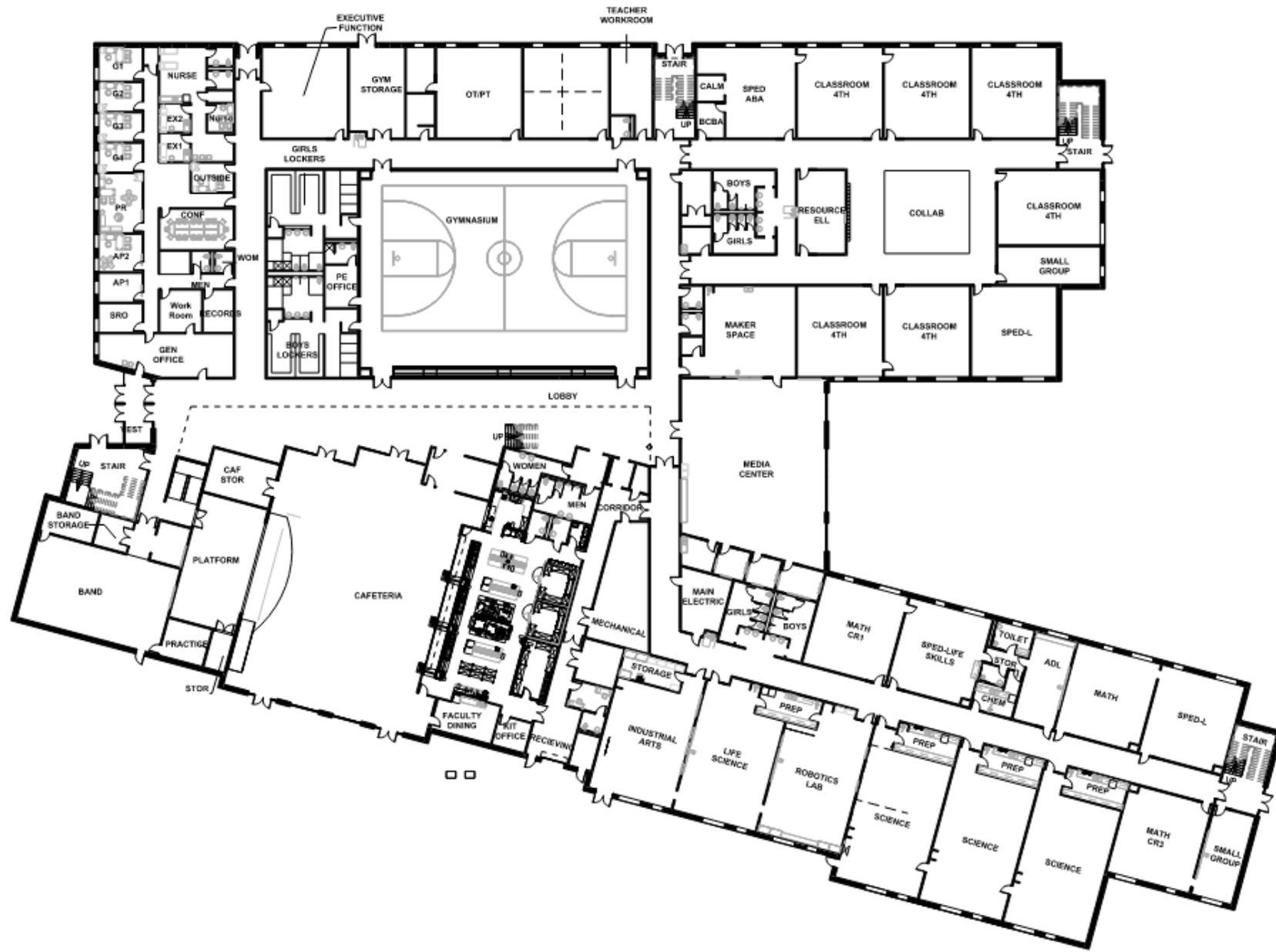
UPDATE VIDEO

	Current System (ASHP only)	Hybrid System (Geothermal)	Delta
Annual Energy Consumption (kWh/year) 190,800 total	76,320 (40% of 190,800)	76,320 (40% of 190,800)	
Energy Cost per Year (\$0.22/kWh) • Air-Source Heat Pumps Only • Hybrid System (40%)	\$16,790	\$10,494	(\$6,296)
1-Year Payback			(\$6,296)
10-Year Payback			(62,960)
20-Year Payback			(\$629,600)

Points to Note:

- A geothermal system is expected to be 25-50% (37.5%) more efficient than equivalent air-source system.
- Due to volatility with future electrical energy costs, values may increase.

GEOHERMAL COST COMPARISON



FIRST FLOOR PLAN