

MEMORANDUM
 EMAC P&Z Subgroup Review Comments
 Energy/Renewables Narrative

TO: P & Z staff
 FROM: EMAC P&Z Subgroup, Javier Aleman
 DATE: October 11, 2023
 RE: 9 Indian Rock Lane, PLPZ 2023 00388, 389
 Life Cycle Analysis by Thornton Tomasetti, September 29th, 2023

| Energy Efficiency Modeling & Metrics | Existing | Proposed ¹ | Recommended “Good” | Recommended “Better” |
|--|----------|---------------------------------|-------------------------------|--------------------------------|
| Site Energy Usage Intensity (Site EUI – annual kBtu/ft ²) ² | NA | 38.8 for Base Case | Residential <45, Non-res <35 | Residential <35, Non-res <25 |
| Home Energy Rating System Score (HERS) (residential) | | NA | <52 | <42 |
| ENERGY STAR score ³ (any building) | | 65 or > | >80 | >90 |
| Air Leakage (Blower door test) | | Not provided | <0.3cfm/ft ² @50PA | < 0.1cfm/ft ² @50PA |
| Energy Source | | Base Case: Boilers and Chillers | HVAC All Electric | All Electric – no fossil fuels |
| Use of Renewables | | Not in Base Case | Yes | Yes + battery storage |
| Level 2 or higher EV Charging Station ⁴ | | Not provided | Greater of 1 or 20% of spaces | Greater of 1 or ≥30% of spaces |

I. Project Description

The applicant’s building project is a new building to replace the existing Central Middle School. The existing building was constructed in 1957 and has served the community for 66 years. This should be a noteworthy metric as the town considers design choices for the construction of the new building. The new facility will likely be in operation for many decades into the future – we should take great care to ensure its longevity and ability to perform efficiently while also eliminating fossil fuel emissions. If done right, the building could serve as a teaching tool on energy efficiency for the student population; this has the potential to enhance the teaching curriculum with on-site assets.

¹ As a reminder, all applicants must comply with the CT 2022 Building Code and the incorporated IECC 2021. For a summary of *Key Changes in the 2021 IECC for the Northeast and Mid-Atlantic* please see link [here](#).

² Site EUI is equal to the annual energy equivalent of all electricity, natural gas, fuel oil or propane consumed on site, divided by building square footage (gross floor area).

³ A building’s Energy Star score is derived from modeling using Energy Star Portfolio Manager, a free, easy to use software program from the Department of Energy. Learn more [here](#).

⁴ Please refer to the Greenwich Municipal Code, new Section 162.1, ELECTRIC VEHICLE OFF-STREET PARKING REQUIREMENTS, an amendment to Sec. 6-5(a) which can be found [here](#).

II. Energy efficiency and overall performance

The applicant performed a Life Cycle Cost Analysis for three HVAC options:

1. Base Case – Chillers and Gas-Fired Boilers
2. Alternative 1 – Ground-Source Heat Pump (GSHP) system
3. Alternative 2 – Variable Refrigerant Flow (VRF) system

The base case was projected to have an Energy Use Intensity (EUI) of 38.8, Alt 2 – VRF had a projected EUI of 35.3, and Alt 1 – GSHP had a projected EUI of 27.7. The best-performing option analyzed was the GSHP system, which was projected to result in a 29% better energy efficiency compared to the base case.

Among the three options, Alt 1 GSHP also had the lowest up-front cost for installation with a savings of \$2.7 million dollars when compared to the base case.

With the addition of Photovoltaic Panels (Solar PV), the projected Alt 1 GSHP building EUI would drop by another 20.7 to a near net-zero 7.0 EUI. This would be a commendable achievement and an example of what can be done on other future new build and renovation projects in Greenwich.

When factoring in Solar PV through a Power Purchase Agreement (PPA), Alt 1 GSHP w/Solar PV PPA had the lowest up-front cost for installation with a savings of \$5.7 million dollars when compared to the base case. This option was also the best performer over a 50-year period and was projected to result in additional savings of \$5.4 million, a number we believe to be highly conservative based on the operating performance of other comparable new school buildings in Connecticut.

EMAC would strongly encourage the applicant to consider the Alt 1 GSHP w/Solar PV PPA option as the lowest upfront cost option and the only option that can deliver a building with near net-zero energy efficiency. This option will also provide the most significant cost savings over a 50-year projection. The Alt 1 GSHP building option will also eliminate local emissions of dangerous pollutants like nitric oxides, carbon monoxide, and PM 2.5 (fine particulate matter) that contribute to poor local air quality and ground-level ozone. We think CMS's students and neighbors deserve the cleanest air possible.

III. Project features and systems driving energy efficiency minimizing greenhouse gas emissions

If the base case is chosen, Greenwich would be choosing a more expensive option that would result in more emissions, both those mentioned above and greenhouse gas emissions. Why would Greenwich pay more in capital costs, operating costs, and endure increased emissions?

Choosing the Alt 1 – GSHP w/Solar PV PPA option will result in an all-electric, fossil-fuel free school building. This system is also expected to have the lowest maintenance costs as well. A GSHP-based school building will deliver significant energy efficiency savings, lower operating expenses, and dramatically lower emissions. Selecting this system option is a choice to save more and pollute less.

IV. Potential and proposed use of renewable energy systems

The solar system potential of the building is 587 kW. EMAC strongly endorses the architect's design for the inclusion of solar PV to reduce the energy demands of the new facility on the electrical grid and to provide enhanced resilience of the facility.

The applicant should bear in mind the new Greenwich municipal code requirements for the installation of EV charging stations equal to a minimum of 20% of parking spaces.