

LHS WATCH

What sustainability features are in the works for the new high school building, and are they worth the cost?



by **Gerry Yurkevicz**
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A solar canopy over the parking lot at Jonas Clarke Middle School / Credit: Lauren Feeney

LexObserver Columnist Gerry Yurkevicz will be providing regular updates and analysis related to the Lexington High School building project.

Recent discussion on the [Lexington High School Building Project \(LHS\)](#) has focused on location, cost, and enrollment issues. Somewhat lost is a discussion of the sustainability investments planned for LHS. No matter what option or location is chosen, LHS will include investments that make the new building healthier for students, greener for the environment, and more resilient for everyone. Sustainability investments are much broader than just solar panels: they are at the core of the mechanical, electrical, and plumbing (MEP) systems that make buildings tick. From preliminary analysis, the investments also make economic sense. Sustainability at LHS appears to be a winner for the Town and its taxpayers.

Why Is Lexington Investing in Sustainability for LHS?

A host of Commonwealth and Town requirements and policies drive sustainability measures for LHS. Lexington's [Integrated Building Design and Construction Policy \(IDP\)](#) for its municipal buildings shapes design choices for LHS. IDP's purpose is to ensure that the Town designs and constructs its buildings to achieve the highest reasonably attainable and economically viable performance standards for health, energy and resilience. Cindy Arens, Chair of the [Sustainable Lexington Committee](#) added, "the IDP also calls for an iterative process that will continue to prioritize better health and energy use outcomes as the design progresses, while still optimizing for cost."

Lexington is not making these choices unilaterally. [Massachusetts' building codes](#), which Lexington is required or has opted to follow, mandate improved energy efficiency and either all-electric or minimum solar energy generation. The [Massachusetts School Building Authority](#) (MSBA) has established sustainable green standards and programs for all MSBA-funded projects, with an increased emphasis on reducing energy consumption and improving indoor air quality. In the end, Lexington's Select Board (SB) and School Committee (SC), as well as the School Building Committee (SBC), adopted these policies and established goals for LHS. Where choices are being considered, the Town is seeking to maximize incentives that may be available through Massachusetts and its utilities ([Mass Save](#)), the MSBA, and the federal government to drive down both the cost of construction and annual operation for a new LHS.

The current physical state of the high school shapes design considerations. LHS badly needs to be modernized and upgraded. According to the [Preliminary Design Program](#) submission to the MSBA earlier this year, large portions of LHS "do not meet current standards of energy efficiency and weather tightness. Existing buildings consume vast resources due to energy losses through poorly insulated walls, while draining [facilities management] resources through continual repairs to keep spaces habitable for students and staff. These facilities are far from suitable to support the high sustainability and wellness expectations of the Lexington community. Meanwhile, many of the plumbing; heating, ventilation and air conditioning (HVAC); and electrical systems have reached the end of their useful life expectancies and are in need of replacement."

Just to bring these systems up to code would cost millions. A healthier and more resilient LHS building should create a more productive environment for students and staff. The MSBA has emphatically endorsed the Town's conclusions.

What Can Taxpayers Expect?

Lexington is still in the **Feasibility Study phase** of the LHS project — which means that current sustainability discussions are conceptual and preliminary. However, as the project moves forward with the design process, expect to see:

- **Indoor Air Quality and Building Design:** Design efforts will focus on providing clean and healthy air, temperature comfort, humidity control, and natural sunlight to enhance students' health and performance. Both Lexington's IDP and Project architect **SMMA's** design philosophy places the health of students and staff before energy efficiency. Expect to see some type of **Dedicated Outside Air System** (DOAS) to help provide clean and healthy air.
- **All-Electric:** The HVAC and hot water design will be all electric, either air-source (ASHP) or ground-source (GSHP) heat pumps, or a mix of the two.
- **Energy Efficiency:** The target is to achieve excellent energy efficiency, often measured by a building's Energy Use Intensity (EUI), in terms of British thermal units per square foot per year.
- **Renewable Energy Production:** The design will maximize onsite solar energy production. Much design effort has already occurred to find enough space for solar panels to meet the building's energy use and target EUI. Onsite renewable energy production should meet or exceed consumption at LHS.
- **Battery Storage to Maximize Ongoing Savings:** As with most buildings, the energy demand in the new LHS will go up and down daily. Billing from Eversource is based on these up and down peaks. Solar production, which depends on the sun, does not match well with this demand profile. Therefore, the design will include enough electric battery storage to better match energy supply and demand, as well as **meet restrictions that Eversource imposes** on renewable energy supply feeding into the electric distribution system.
- **Compliance:** The design will comply with the IDP, MSBA, state, and municipal requirements and policies.

Do All of These Measures Make Economic Sense?

The answer is most likely yes, but we just do not know exactly how much yet. Preliminary estimates from SMMA suggest that the cost for the HVAC and building envelope systems may range from \$67 to \$88

million, depending on the choice of HVAC system. The total cost includes the DOAS, the HVAC system, and costs to meet energy use efficiency and electrification targets, plus the related mechanical, electrical, and plumbing needs. The cost of the solar and battery systems is estimated to add another \$10-\$18 million to the total, before incentives. In total, sustainability measures may represent about 12-17% of the total LHS estimated cost before rebates and incentives.

As shown in the table below, estimates suggest that the fossil fuel system has the least initial cost and the ground-source heat pump (GSHP) system the highest. However, the expected Massachusetts and federal rebates and incentives are the key. After incentives, the upfront cost position is reversed: the GSHP system is now lowest. There are substantial incentive dollars available to install GSHPs. The MSBA Green Schools Program may represent additional funding potential for Specialized Code compliance and for indoor air quality

Currently, LHS spends over \$1 million annually for natural gas and electricity. An all-electric LHS expects to achieve operating cost savings against the fossil fuel alternative. Both GSHP and ASHP systems will have better energy performance than fossil fuel systems. Since the capital cost, and thus the amount to be borrowed, is the lowest with GSHPs, the debt service for taxpayers also is the lowest, generating additional savings.

Both the Town and SMMA have performed life-cycle cost analysis (over 30- and 75-year time horizons). The initial analysis is very encouraging with the all-electric options generating significant life-cycle cost savings, positive “net present values” or very short paybacks on investment versus the fossil fuel alternative. Sustainability makes sense: it has both lower initial and lower ongoing costs. Furthermore, a fossil fuel system does not come close to meeting efficiency targets or reducing operational greenhouse gas emissions.

New LHS: Sustainability and MEP Investments
Conceptual and Preliminary as of October 2024, \$ millions

| | Fossil Fuel HVAC with Target EUI | Electric Heat Pumps with Target EUI | Ground-Source Heat Pumps with Target EUI |
|---------------------------------------|-------------------------------------|--|---|
| Conceptual & Preliminary Initial Cost | \$ 67.0 | \$ 72.0 | \$ 88.0 |
| Expected State & Federal Incentives | \$ - | \$ 0.6 | \$ 30.8 |
| Net After Expected Incentives | \$ 67.0 | \$ 71.4 | \$ 57.2 |
| | | | |
| Life-Cycle Savings (30 Years) | | | |
| Energy Savings vs. Fossil Fuel | \$ - | + | ++ |
| Debt Service Savings vs. Fossil Fuel | \$ - | \$ - | +++ |

Note: EUI is Energy Usage Intensity; Initial Cost excludes solar/battery cost which is the same in all three cases.
Source: SMMA, Mark Sandeen, LexObserver analysis

As Mark Sandeen, Select Board Member, said at a recent [LexCAN community meeting](#), “Higher design standards for all-electric, exceptional resilience, better cognitive performance can deliver over \$100 million in lower total cost of ownership at LHS.”

How About Construction?

Lexington will also focus on constructing the high school without using harmful materials. Lexington will try to use materials that exclude substances on the “[Red List](#).” The Red List is a list of chemicals representing “worst in class” substances prevalent in the building industry that pose serious risks to human health and the environment. The new police station focused on eliminating Red List substances in four areas: concrete, thermal moisture protection, finishes and furnishings. With the new police station, Lexington appears to have been successful at sourcing healthy materials without paying significant price premiums. For the new LHS, specifications addressing Red List materials will be developed in the next phase of the project, the Schematic Design.

Where Does LEED Fit In?

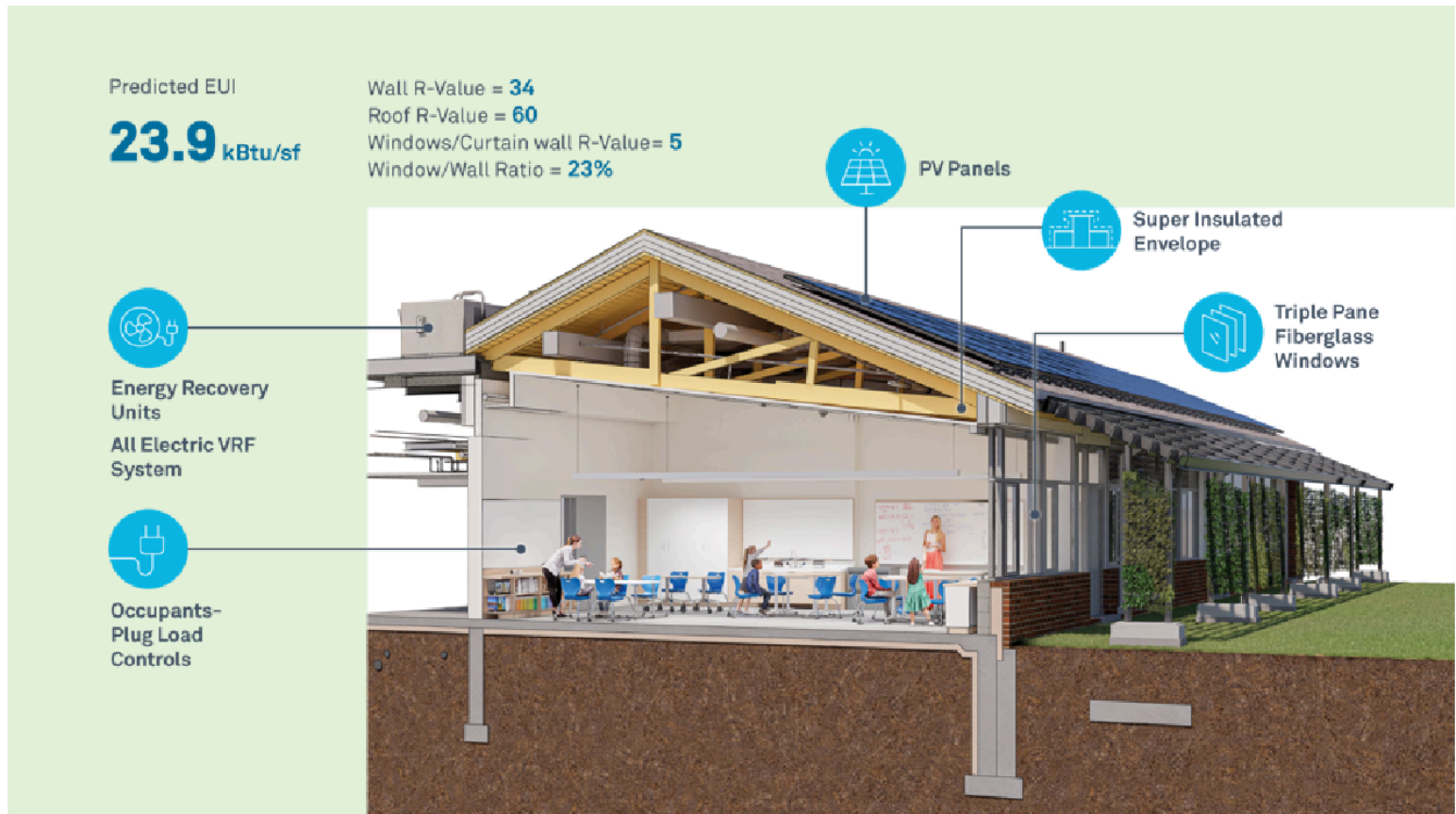
You may have seen plaques displayed at entrances to many new buildings, touting achievement of LEED Silver, Gold, or Platinum status. [LEED](#) (Leadership in Energy and Environmental Design) is the world’s most widely used green building rating system. More than plaques and symbols, LEED certification provides a framework for healthy, highly efficient, and cost-saving green buildings. It is not about the plaques: LEED provides a common sustainability framework that architects understand across key design areas (e.g., Energy, Indoor Environmental Quality, Materials, etc.). The LEED framework meshes well with Lexington’s IDP.

The LHS project is registered with the LEED organization. The design of LHS should result in Gold Certification, with a goal for Platinum.

Is LHS Unique in Its Approach?

Lexington is not at all unique in Massachusetts with its approach to sustainability. The MSBA lists many **all-electric schools** as well as **schools** using GSHPs, including Lexington's Hastings Elementary School. A number of communities are **turning to GSHP** since the incentives are so attractive. The Lincoln School, also designed by SMMA, in Lincoln has been touted for its sustainability features. It switched from fossil fuels to solar, generates as much electricity as it consumes, and is all electric. Lincoln School became the first public school to achieve this level of sustainability with a renovation project.

Lincoln School Sustainability Measures; Lincoln, MA



Source: Town of Lincoln

Concluding Thoughts on Sustainability Investments

As Lexington moves from the conceptual to actual design and construction, sustainability measures and cost will continue to represent key issues for taxpayers. There are a number of considerations:

- **Community Participation:** Energy is not an easy topic to understand. The SBC most likely will continue to [provide opportunities for the public](#) to chime in on sustainability and MEP issues. Consider diving into a very interesting topic.
- **Possible Incentives and Economics:** Incentives, rebates, and ongoing revenue programs drive the preliminary positive economics of sustainability investments. Some of these programs may change, even in the near-term, which will impact the economics. A change in administration may alter monies available for GSHPs at the federal level through the Inflation Reduction Act. Massachusetts may end or alter programs that provide ongoing dollars to support renewable energy. The LHS Project Team has significant sustainability experience to understand and adapt the design to future uncertainty. Taxpayers should expect updates to the upfront cost estimates, available incentives, ongoing savings, as well the life-cycle-cost analysis during the next phase of the project, Schematic Design.
- **Tell the Sustainability Story:** To sell the LHS Project to taxpayers and voters, the SBC as well as the Town will need to tell a simple story. Planned sustainability measures are an important part of the overall story. The sustainability measures included in Hastings Elementary School may represent a compelling case study to support LHS. Hastings has [solar panels](#) and a GSHP system, including 80 wells. It is different than the proposed LHS: Lexington does not own the solar system but buys the output from a third-party, limiting its savings; the current level of incentives was not around when Hastings was built. However, performance and lessons learned from Hastings might help better sell LHS.

Pingback:

With an estimated price tag surpassing \$600M, Lexington's new high school could be the most expensive in the country - The Lexington Observer



Adam Smith

October 18, 2024 at 3:47 pm

This article omits quantifiable information about the costs and benefits of avoiding Red List materials, including soft costs. When the Police Station was designed and built, was any information gathered about the cost of using standard building materials? If not, how do we evaluate the statement, "Lexington appears to have been successful at sourcing healthy materials without paying significant price premiums?" What is "significant"? This statement has no meaning without hard facts to support it.

I applaud the goal of healthy buildings, but every engineering decision requires a cost/benefit analysis, and we have no data on either. We shouldn't increase total building costs by X% if we can't meaningfully evaluate the benefits. I would note that no other municipality in Massachusetts requires its buildings to avoid Red List materials (and they all love their children and teachers, too).

The new Hastings School was built without consulting the Red List. Does anything think students are at risk there or do not have an optimal learning environment?

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