

Hollis Schools Energy Project

At A Glance

What's proposed in Article 1, 2017 Hollis School District Warrant?

Comprehensive heating and energy efficiency retrofits for Hollis Primary School (HPS) and Hollis Upper Elementary School (HUES)

HPS:

- **New air source heat pumps** to replace oil as primary heat source
- **100 kW solar photovoltaic installation** on rooftop to provide electricity; electrical infrastructure improvements throughout school
- “Wrap” building to **tighten envelope and improve insulation** to reduce heat loss
- Reduce window area and replace all windows with **new efficient windows** to reduce glare, heat loss/gain and provide better natural lighting
- Phase change materials in classroom ceilings to **reduce temperature swings and save energy**
- **New heat-recovery ventilation** to save energy
- **Efficient LED lighting** throughout building to improve light levels and save electricity
- New building management control system to **reduce energy consumption and improve comfort**



HUES:

- New **highly efficient propane boilers** to replace end-of-life oil boilers and reduce costs
- **100 kW solar photovoltaic installation** on rooftop to provide electricity
- Insulation of wall-to-ceiling “gaps” in building to **tighten envelope and reduce heat loss**
- **Efficient LED lighting** throughout building to improve light levels and save electricity
- Improvements to building management control system to **reduce energy consumption and increase comfort**
- Phase change materials in classroom ceilings to **reduce temperature swings and save energy**



Summary of Heating & Energy Efficiency Challenges in HPS

- **Oil Boilers** – two very old, one new; in two boilers rooms that should be consolidated
- **Heat distribution system** – pumps, pipes & radiators 34-65 old years would need significant upgrade to support a new heating system
- **Moisture condensation** – potentially serious problem in walls due to wide temp and humidity swings in and outside the building, poor insulation, and no capillary break between foundation and walls
- **Building energy management system (heat, light, pumps, fans, CO2, etc.)** - antiquated and needs to be replaced to optimize energy use and improve building comfort



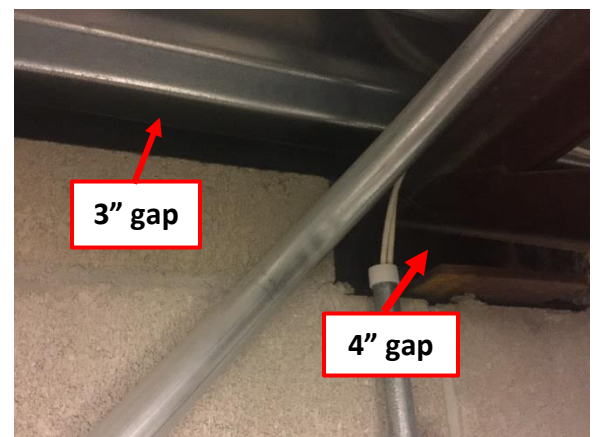
Poorly insulated walls, old windows and excessive window area, exposed slab edge make HPS expensive and inefficient to heat

- **Walls** - extremely low R-values (below code) – older part of building is 75% windows
- **Windows** – leaky, difficult to open and close, excessive window area in 1952-1969 sections of building
- **Slab edge** - exposed above ground makes floors cold in winter

- **Air ventilation** – one-time pass through, no heat recovery, no demand control – costly and energy inefficient
- **Inefficient fluorescent lighting** – LEDs much more energy efficient; no flicker; no hum; ‘warm’ color for vision comfort; quick payback
- **Roof R-value** - below code (but not as bad as walls) and can be upgraded over time during normal roof maintenance/replacement

Summary of Heating & Energy Efficiency Challenges in HUES

- **Oil Boilers** - at end of life, must be replaced; chimney not to code for oil
- **Large gap** - between wall and roof on 1997 section of the building – significant cold air leakage
- **No demand control ventilation** – costly and energy inefficient
- **Building Management Controls** - need to be upgraded and recommissioned
- **Inefficient fluorescent lighting** – LEDs much more energy efficient; no flicker; no hum; “warm” color for vision comfort; quick payback
- **Roof R-value** - below code but can be upgraded over time during normal roof replacement



A 3-4" gap extending about 1,100 feet around perimeter of 1997 addition to HUES allows heat to escape the building, cold air to enter

Project Benefits

- ✓ **Improve the physical learning environment**
- ✓ **Reduce overall energy costs** of electricity and heating fuel by approximately **69%**
- ✓ **Significantly improve comfort and lighting** in both buildings
- ✓ **Solar PV will provide about 41% of total cost savings;**
beneficial state incentives; clean renewable energy
- ✓ **Lower maintenance costs**
- ✓ **Extend the useful life** of both buildings by decades

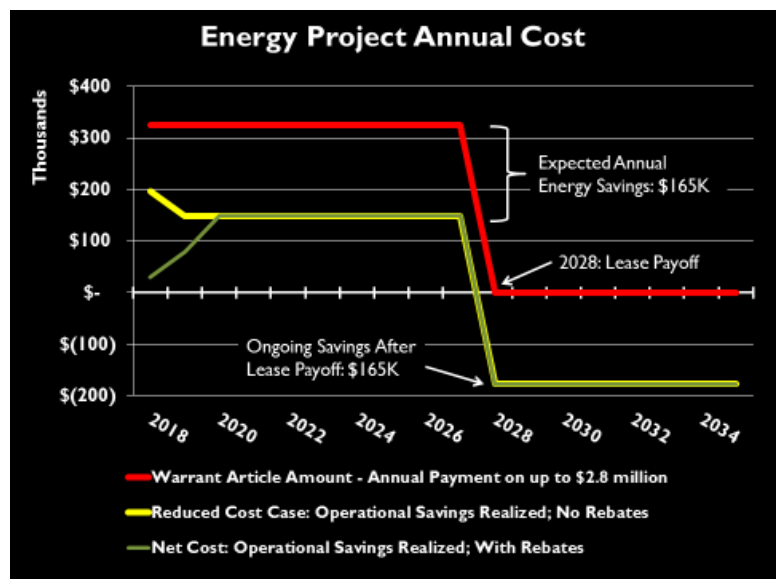


What are the Consequences of Inaction?

- **Continuing high energy expenditures** in school operating budget - average \$238,700/year over past five years – due to poor building performance
- **Lose out on valuable solar incentives** (net metering, rebates) and **efficiency rebates** from Eversource
- **Building shell and infrastructure maintenance become more expensive in future;** HVAC maintenance costs increase; delay in electrical service upgrade in HPS could cause kitchen service disruption; potential boiler/heat delivery system failure in both schools
- Physical environment in buildings remains **sub-optimal for learning**
- **Potentially higher interest rates on borrowing** to finance future projects
- **Continued dependence on price volatile heating oil**

Financing, Tax Impact and Operating Cost Savings

- **Total Project Cost** not to exceed **\$2.8 million**
- **Proposing 10 Year Municipal Lease Purchase** agreement at **2.87%** interest rate
- **Total financing** not to exceed **\$3.26 million**, including finance charges
- **Renewable energy and energy efficiency rebates (up to \$330K)** will be applied to MLP principle
- **Tax Impact:** In year one **\$0.27/\$1,000** assessed value or **\$108 on \$400,000 home**
- **Operating cost savings** estimated at **\$130,000 in year one** and increasing over two years as project is fully implemented to about **\$165,000 per year** (current 5 yr. average bill has been \$238,700/yr); ultimate annual energy bill for both schools about **\$73,000**



Background and Study Process

- Article 4 (2016 district meeting) authorized energy study of schools, provided up to \$100,000
- Energy Study Working Group – Hollis School Board and Hollis Energy Committee members
- Assistance from energy, mechanical & electrical engineering specialists
- In depth analysis of heating options (oil, propane, wood, geothermal, air source heat pump) and efficiency measures to reduce energy consumption
- Energy modeling of impact on improved energy efficiency of various measures to estimate cost savings
- Cost/benefit analysis on wide range of options as specified by Article 4 led to these project recommendations as most cost effective package with greatest long-term value

Heating Technology Evaluated	Key Factors in Consideration
<i>Oil</i>	Price volatile; future underground tank replacement costs; would require upgrade of hydronic heat distribution in HPS; would require rebuild of HUES chimney
<i>Wood chip central heating plant for both HPS, HUES</i>	Second most expensive capital cost; could not install until 2018 construction season; would require costly upgrade of hydronic heat distribution in HPS
<i>Dedicated wood chip or pellet heating plants for each school</i>	Third most expensive option; could not install until 2018 construction season; would require costly upgrade of hydronic heat distribution in HPS
<i>Geothermal heat pump</i>	Most expensive capital cost; would require costly upgrade of hydronic heat distribution in HPS
<i>Air source heat pump (proposed for HPS)</i>	Combined with solar provides least expensive heating choice for HPS; eliminates need to upgrade hydronic distribution in buildings; provides year round temperature control and dehumidification
<i>High efficiency propane (proposed for HUES)</i>	Less expensive than oil; avoids costly rebuild of chimney to meet code for oil and underground oil tank replacement; 95% efficient condensing boilers; very clean

Attend and Vote

Hollis School District
Annual District Meeting
Tuesday, March 7, 2017
7:00 PM
Hollis/Brookline Middle School



Questions or More Information?

<http://www.sau41.org/hollis-school-board>
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