

## CMS Sustainability Subcommittee

### Conceptual Design Pricing Recommendations - Net Zero Energy Ready Package

- The following package is a set of design recommendations based on the conceptual design pricing information released to date that combine to best balance the net zero energy ready goals of the project with costs. This set of recommendations is not an “a la carte” menu of options, but must be advanced as a package in order to maximize offsetting costs/savings (e.g. a better enclosure with smaller mechanical systems). At present, based on initial energy modeling by SMMA, this package provides a 9.1 year simple payback when compared to the baseline (stretch energy code and LEED silver) with a natural gas boiler and a 5.6 year simple payback when compared with an electric air source heat pump.
- This package is energy efficient, but more importantly it will improve the educational learning for all students, and it will provide a healthier environment for all of the building’s occupants. It will also reduce the operational and maintenance costs and provide a more comfortable space as well as a more resilient building.
- We believe this package will set the project on a path to achieve the energy goals called for by the community, as listed in the amendment to the approval for the funding of the design work approved at last year’s Town Meeting, and also as outlined in the Project Charter.
- Unless otherwise noted, the following enhanced sustainability options and associated cost estimates come from the Summary CMS Reconciliation dated 04-17-2020 for Option #3.
  1. A1 – Roof Insulation: Accept increase in insulation from 8” to 10” (+\$205,000).
  2. A2 – Wall Insulation: Accept increase in insulation from 6” to 8” (+\$152,000).
  3. A3 – Air sealing: Accept increase labor in taping (+\$80,000).
    - a. Increased air sealing is critical to performance. Recommend doubling the initial air sealing forecast to a total of +\$160,000 to ensure achievement of a stringent airtightness metric – 0.08 cfm75/square foot of shell area.
    - b. Enhanced enclosure commissioning and construction mockup air leakage testing will be critical to achieving this air tightness metric.
  4. A4 – Under slab insulation: Accept increase in insulation from 2” at the perimeter and 1” in the middle to 3” everywhere (+\$238,000).
  5. A5 – Windows: High performance windows will be critical to maintaining occupant comfort and allowing the mechanical system to be downsized (cost savings). The right balance between cost and performance will be fully explored, but carry option A5 for now (+\$600,000).
    - a. Under no circumstance will the Sustainability Subcommittee advocate for an option that costs in the ballpark of A7 (\$3,000,000).
    - b. Window estimates appear high and the expectation is that prices will come down between now and bidding.
    - c. Efforts will be made to minimize the cost associated with windows. For example, tuning the amount of glazing to balance daylighting and efficiency. A maximum window to wall ratio of 30% is acceptable for now, with the expectation that the

Design Team may reduce this ratio as the design is developed. A8 identified a cost savings of -\$307,000 at a widow to wall ratio of 25%, a savings which is not included in the current NZE Ready Package.

6. M1 - All-electric HVAC design: Accept Air Source Heat Pump (ASHP) and commit to an all-electric HVAC system. This step provides significant first cost savings over a natural gas boiler system (-\$1,000,000). Insulation and air sealing is critical to ensure the operating costs of the ASHP system are not significantly higher than a boiler system.
  - a. A Ground Source Heat Pump (GSHP), or hybrid ASHP/GSHP, can be explored as the project progresses in design.
  - b. A radiant floor distribution system (included in M2) is not recommended as it is too expensive and is not the right mechanical system type for a high-performance building.
7. M3 – HVAC Downsizing: Accept credit for reducing the size of the HVAC system because of the smaller loads that result from accepting A1-A5 (-\$95,000).
8. E1 – Plug Loads: Accept increase in plug load controls from 50% to 75% (+\$57,000).
  - a. Recommend increasing plug load controls from 75% to 90% - extrapolate cost estimate = +\$35,000 (+\$92,000 for total enhancement).
9. E4 Higher Efficiency Equipment: Needs clarification. What equipment does this cover?
10. E5 – Generator Requirements: Accept as an apparent cost increase for an all-electric HVAC system (+\$466,000)
  - a. Appears to be an opportunity to reduce the cost from the initial estimate – a super-efficient building does not have a lot of heat loss and therefore does not need a lot of backup capacity.
11. Design Review:
  - a. Accept high-performance design support, including Passive House energy modeling and thermal bridging analysis.
  - b. Schematic Design: +\$26,150<sup>1</sup>
  - c. Design Development: +12,000<sup>1</sup>
  - d. Construction Documents: +\$27,000<sup>1</sup>
12. Commissioning:
  - a. The baseline is carrying \$200,000 for commissioning. Further information on the level of commissioning this includes is required.
  - b. Accept +\$50,000<sup>1</sup> for “construction review/testing”, which we interpret to include enhanced enclosure commissioning and mockup air leakage testing.
  - c. Accept +\$15,000<sup>1</sup> for whole building air leakage testing (blower door testing).
13. Certification
  - a. Passive House registration: +\$20,000<sup>1</sup>
  - b. Passive House certification: +\$20,000<sup>1</sup>

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<sup>1</sup> Pricing based on the Feasibility Study Pricing Options Memorandum issued by SMMA on 4/13/2020 v2

## Summary

	<u>Package Items</u>	<u>Option</u>	<u>AM Fogarty Cost</u>
M1	HVAC	ASHP/DOAS	\$ (1,046,972)
A1	Roof insulation	10"	\$ 204,100
A2	Wall insulation	8"	\$ 151,241
A3	Air sealing	10% additional	\$ 79,601
A4	Under slab insulation	3"	\$ 237,055
A5	Glazing	Triple glazing	\$ 596,605
M3	Adjustment to A1-A5	Package	\$ (95,763)
E1	Plug Load Controls	75% coverage	\$ 56,525
E5	Generator	500kW	\$ 465,000
	<u>Incremental to package</u>		
	Additional air sealing	Target metric 0.08 cfm75/sq.ft.	\$ 79,601
	Additional plug load controls	90% coverage	\$ 34,200
	<u>Testing and Review</u>		
	Soft costs and certification fees	SMMA (4/13)	\$ 170,150
	<b>Grand Total</b>		<b>\$ 931,343</b>

## Next Steps

1. Model Option #3 in the Passive House software
2. Further develop ventilation conceptual design options
3. Investigate Plumbing Enhanced Sustainability Options
4. Review cost estimate for enhanced enclosure commissioning