HVAK Engineering Inc. Letterhead

July 19, 2018

Amit Kulkarni
Program Administrator Name
PA Address 1
PA Address 2

RE: Generic Lab
Technical Assistance Study
City/Town, Massachusetts
Energy Engineering Services Proposal

Dear Amit Kulkarni:

HVAK Engineering Inc. is pleased to provide you with this proposal for energy engineering services for the Generic Lab located in the City, Massachusetts. This project is currently in Schematic Design and is expected to complete construction by MM/YYYY.

This facility will be served by Utility1 for electricity and gas Utility2. This project is targeting LEED™ Platinum Certification.

Generic Lab owner is requesting to be considered for the Mass Save - Whole Building Program, Large Buildings Path through a Technical Assistance Study.

Background and Project Description

The purpose of this study is to find potential savings that are economically viable. Energy savings is a priority for Generic Lab owner and quantifying the return on investment will allow them to implement the most cost-effective strategies.

The Generic Lab consists of the following:

1. The building is ground up new construction comprised of office space, lab space, a cafeteria, and data center. The combined square footage will be approximately 490,000.

2. Standard hours of occupancy are from 7:00 a.m. to 9:00 p.m., Monday – Friday.

3. Mechanical Systems:
   The proposed HVAC system for the office spaces consists of active chilled beams. Two (2) dedicated outside air systems with energy recovery wheels provide ventilation air to the spaces. A hot water loop provides heating to the chilled beams and AHUs throughout the building. The hot water loop is a primary-only loop with three (3) variable speed pumps. A chilled water loop provides cooling for the chilled beams and AHUs. It is equipped with chillers with a COP of 6.181. The primary chilled water loop consists of three (3) variable speed pumps.

   The lab space will be served by VAV air handlers. Laboratory air will be exhausted via two exhaust air plenums (containing glycol heat recovery coils), each of which will be equipped with three mixed flow (induction) fans. The fans will be staged, and fan speed will be modulated, to maintain the duct static pressure set point and to maintain the required stack velocity; no outside air bypass will be provided.

There are four (4) condensing boilers with a tentative capacity of 2,700 MBH each. Due to the low return water temperature, these operate at over 90% efficiency.

4. Electrical systems:
   a. Proposed Lighting and associated controls are based on architectural reflected ceiling plans and Lighting Schedule.

   b. Building site lighting and dock lighting.

   c. Mechanical Equipment Schedule including building controls.

   d. Data Center metrics.
      1) Day One of 10,000 SF of white space with approximately 750kW of UPS scalable up to 1,000kW.
      2) The data center will be designed to be 100 watts/SF.
      3) The rack density expected will be up to 20kW/rack

   e. 70 MW CHP 

Project Design and Construction Schedule

1. MM/YYYY – 100 % SDs
2. MM/YYYY – 50% DDs
3. MM/YYYY – 100% DDs
4. MM/YYYY – 50% CDs
5. MM/YYYY – 100% CDs
6. MM/YYYY – Construction Begins
7. MM/YYYY – Construction Completes

Project Approach

In order to estimate the potential energy savings, a whole building energy model will be created using DOE-2 based eQuest Version 3.65 in accordance with the Mass Save Simulation Guidelines. This will be performed through Mass Save's **Whole Building Program, Large Building Path**. The baseline model will be based on IECC 2015 with amendments from the Mass Save Baseline Document. The proposed model will incorporate the initial existing design and any energy conservation measures (ECM) proposed by the engineering team. Separate parametric runs will be created for each ECM in the proposed models. Each of the ECMs will be described in detail within the report, including descriptions of the baseline and proposed systems, model methodology, and all associated energy savings and incremental costs. All parametric runs will be simulated in a cascading manner, in which ECM 1 is evaluated against the baseline, and each consecutive ECM thereafter is run against the previous ECM, thus final ECM is also the combined run.

Savings from data center will be calculated using an Excel spreadsheet and resulting savings will be imported back to the model. The baseline data center model will be standard underfloor air distribution and constant volume supply air / temperatures and follow guidelines as outlined within Mass Save program baseline document. Additional calculations will be performed as needed to

determine associated energy savings for data center specific ECMs that fall outside the capability of the eQuest model.

Project Deliverables and Delivery Dates

1. MM/YYYY – An interim report at the end of DD
2. MM/YYYY – Draft final energy model, report and associated Minimum Requirements Documents (MRDs) following the Mass Save templates will be delivered to the Program Administrator(s) (PAs) at end of CDs
3. MM/YYYY – Final energy model, report, and MRDs following review of draft by PAs. Completed prescriptive or custom application(s) for all ECMs approved for implementation

NOTE: Only utility companies can approve incentives and they do so in writing. An application is required and an approval letter sent after utility review.

Scope of Basic Services

Per Mass Save's updated policies on the Whole Buildings Programs, the energy modeling will include ALL ECMs, regardless of incremental cost. The models will reflect all savings and penalties associated with energy systems so that the model accurately reflects the whole building as it was designed. HVAK Engineering will obtain incremental cost data for each ECM and will present that data in the report. Program Administrators will screen the project based on savings shown in the combined run of the model. If the combined run passes the Benefit Cost Ratio (BCR) then all the savings will be supported. If the combined run does not pass the BCR, then the ECM or ECMS that are causing it to fail will be removed and savings recalculated. The order of parametric run will be in the order listed below.

HVAK Engineering Inc.'s proposed scope of services and basic modeling methodology for this project will be:

ECM #1: High Performance Glazing
This measure provides a building envelope with overall performance exceeding the minimum requirements of Mass Save program. Note that fenestration comprises approximately 40% of the total vertical wall area.

Base Case: The opaque and vision areas of the envelope have thermal performance corresponding to the minimum values listed in Mass Save program.

Proposed Case: Windows will be low-e triple-glazed. The main envelope constructions will exceed code.

ECM #2: High Efficiency Lighting
This measure provides an energy efficient lighting system for the building. It appears that the proposed lighting system will consist mainly of LED fixtures. The measure will save electricity due to lower fixture power consumption for given lighting levels, and lower cooling loads due to reduced heat gain. A corresponding natural gas penalty is associated with the heat gain reduction.

Base Case: The average lighting power density (LPD) for the building is the maximum allowed by Mass Save program baseline.

Proposed Case: The average installed LPD target is 0.73 W/sf.

ECM #3: High Efficiency Active Chilled Beams
This measure provides an energy efficiency solution for the HVAC system of the building compare to the traditional VAV system. The office space of this building will use active chill beam to heat and cool the building.

Base case: The office areas are equipped with a variable air volume AHU with hot water reheat. The AHU is equipped with chilled water coils and supplies air at 55-65°F to the VAV boxes serving the spaces. The air is then reheated at the VAV boxes to provide a discharge air temperature of 90°F when heating is required. The minimum flow has been established to be 0.4 CFM/SF per Mass Save program baseline document. Chilled water will be supplied at 44° to the AHU.

Proposed Case: Active chilled beams will be installed in all office spaces. Chilled beams use natural convection rather than fans to heat and cool the building. The chilled beams will be equipped with chilled water and hot water coils to provide space conditioning. The chilled beams will be supplied ventilation air via a rooftop air handling unit. The chilled beams will maintain space set points of 70°F during occupied heating and 75°F during occupied cooling. Due to possible condensation issues, the chilled water temperature supplied to the chilled beams must maintain a set point that is greater than the dew point within the space.

ECM #4: High Efficiency RTUs
The building will be equipped with RTUs with higher efficiency than the Mass Save program baseline requirement.

Base Case: Based on Mass Save program
Proposed Case: The RTUs used in this building will exceed code

ECM #5: High Efficiency Boilers
The building will be equipped with four 2,375-MBH output hot water boilers. This measure provides high-efficiency condensing boilers in place of standard code-compliant non-condensing boilers. The hot water supply temperature will be maintained at 140°F; the design return temperature is 110°F.

Base Case: Based on Mass Save program
Proposed Case: The boilers are of condensing type exceeding code

Data Center (located in the basement)
The energy model will be utilized in conjunction with supplemental energy analysis (outside capability of eQuest model) to determine and validate energy savings for ECMs outlined below.

ECM #6: Passive Chilled Door Rack Level Cooling via Water to Water Heat Exchanger

Base case: Data center is cooled with traditional computer room air conditioning units at the perimeter.

Proposed Case: The proposed data center will utilize local rack cooling system. Heat generated from server is removed at its source, therefore minimizing the amount of hot exhaust air from entering common space and optimizing data center thermal and energy performance.

Prescriptive Applications
In addition to the measures listed above, there is expected to be opportunities for a compressed air system with refrigerated storage. HVAK Engineering will complete this application and submit with the final deliverables.

Basic Services Engineering Fee
Our proposed fee for the basic scope of services described herein will be as noted in the fee table of Mass Save Engineering Services application attached, which includes reimbursable expenses.

Reimbursable Expenses
Reimbursable expenses include photocopies, plotting, outside printing, mileage, travel, and overnight mail and are included in the fee stated in the fee table.

Thank you for the opportunity to present this proposal. If you have any questions or need additional information, please feel free to call.

Sincerely,

HVAK Engineering Inc