University of Pittsburgh
Mascaro Center for Sustainable Innovation

Engineering for Humanity Certificate — Example Student Proposal

Title: Environmentally Sustainable Roof Usage of 134 Main St., Vandergrift, PA

Advisors: Smith & Adams; Community Partner – Vandergrift Improvement Program

Introduction

As part of their Main Street Revitalization plan, the community of Vandergrift, PA has committed to transforming to an ecomunicipality, where eco refers both to ecology and economy. One of the Main Street buildings requiring significant renovation has been purchased by the Vandergrift Improvement Program (VIP). The intent is to (1) physically renovate the building per sustainable practices, and (2) ultimately populate the building with incubator businesses, with preference being given to those adopting sustainable practices. This proposal addresses the physical renovation.

Potential Solutions

Sustainable building renovation spans a range of activities including but not limited to HVAC strategies, raw materials selection and installation, and power. In some instances, the renovation may be subdivided according to specific building components. Consider for instance, the case of the roof. While installation of photovoltaics may be the first option that comes to mind, it may or may not be the most effective option for the geographic location and end-use of the specific building. For instance, if hot water usage is expected to be high, installation of solar hot water heating may instead be advised. Alternatively, if rainwater runoff results in high costs to the municipality, a green roof may be advised. Or, there may be compelling reasons to explore micro-wind power systems, or some combination of the foregoing. Our project team will assess sustainable roof renovation options and provide a report to VIP that will enable them and any interested community member to make an informed investment-vs-payback-and-impact decision.

Proposed Study

Relying in part on the results from previous student reports, especially on the effectiveness of photovoltaics in Southwestern Pennsylvania, as well as team member previous experience, the team will develop an estimate of the installation cost versus benefit and payback time for photovoltaics, solar hot water, green roof, and micro-wind energy harvest. In order to generate a deliverable that has usefulness to the community at large, the community report will include explanations of estimates' origins and easy-to-understand strategies to adapt the results to other typical cases (for instance, creation of simple algebraic equations that enable reconsideration of the recommendations for buildings with higher hot water but lower power usage). The intent is to enable other community businesses and residents to adapt the results of our study to the details of their case.

The final report to be submitted to Drs. Smith and Adams will also include the technical details required to appropriately make these assessments. These will include life cycle analysis of each technology (CEE 1209) with particular attention to the variations in the heat transfer through the roof as a function of technology (MEMS 1052 and 1065). In the micro-wind case, a prototype device will be installed and monitored (MEMS 1041 and 1042).

Our Team

The table below summarizes the team members and their proposed roles. As team leader, Pat Alcot will be the point of contact for VIP; this will occur primarily through VIP's sustainability chair, Jesse Salensky, but also includes interaction with local high school key club members. Pat will also bne responsible for coordinating meetings.

Team Member	**SSOE Standing**	**Role**
Pat Alcot	MEMS Senior	Team Leader Prime on wind assessment (MEMS 1041 & 1042)
Alice Beach	CEE Senior	Prime on LCA (CEE 1209) and collection of vendor/contractor information
Ben Calvert	MEMS Junior	Prime on Heat Transfer (MEMS 1052 & 1065) and report layout

Timeline

Produce a gantt chart indicating each task and when the task is to be completed.