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Research Update--Energy  
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## On-Site Energy Production and Funding It

On-site energy production should be a consideration of every new building built in this country and around the world. Energy conservation, from materials, lights, insulation and fenestration considerations are all vital to reducing each and every new building's eco-footprint but these are aspects of being "less bad,"<sup>1</sup> using William McDonough and Michael Braungart's language in *Cradle to Cradle*. Being less bad is important but not a final solution considering the challenges facing the planet. Again from *Cradle to Cradle*, the goal must be one of "eco-effectiveness"<sup>2</sup> with its aims for buildings and everything else produced by humans, to have positive environmental footprints.

The proposed SIS Building is going to be less bad than many new buildings and if it can meet the LEED Silver certification it will be a great deal less bad than comparable new structures. The current agreement between the architects and the school is that this is good enough, given the one unavoidable constraint, the budget. \$45 million seems like a huge amount of money and getting everyone's wants into the building seems feasible considering this constraint. It is not. In order for the SIS building to become a generator of power, funding will have to be acquired through grants or donations of materials.

An assessment of the amount of energy that can realistically be produced and what costs and benefits would occur must be the precursor to asking for money to pay for this project. There is not a straightforward way of punching in a couple of building specs and the answers to these questions appearing. Many characteristics must be addressed and accounted for to get a sound estimate. Even the terminology is inherently vague; the best that can be done is a good "estimate." One of the characteristics that determine the amount of on site energy production is what type of generation is going to be used. Solar, wind, micro hydro or fuel cell are all possible choices and within each of these there are variations. Considering solar, next would be to look at the differing mechanisms for solar arrays, from traditional roof mounted Photo Voltaic (PV) silicon based panels to thin film or Building Integrated Photo Voltaic (BIPV) to Concentrating Solar Collectors (CSC). The scope of this paper will focus on the most widely used accepted form, silicon based PV panels or modules.

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<sup>1</sup> William McDonough and Michael Braungart, *Cradle to Cradle*. Island Press. 2002. New York. p 45

<sup>2</sup> William McDonough and Michael Braungart, *Cradle to Cradle*. Island Press. 2002. New York. p 157

Roof mounted systems make the most sense for the SIS building due to the square footage available there and the lack of desire to build in green spaces. The panels are attached to a steel structure to allow for following of the sun throughout the day and if a double axis is installed during different seasons. This would allow the green roof to exist as well as opposed to placing the panels directly on the roof. The building footprint, on the ground, not the ecological and social meaning this term has come to mean, is set to be approximately 20,000 square feet<sup>3</sup> and if panels could cover the entire area, which is not feasible, but will work as a starting point, a solar array of about 260 kW would be possible using between 1300 and 1500 panels.<sup>4</sup> These numbers came from looking at a similar sized solar installation at California State University, Hayward, done by PowerLight Corporation.

Next was a look at how much a system like this might cost. Given the wide range of rebates and incentives in different parts of the country this can be difficult to estimate. According to Katherine Grove and Kevin Burke during the meeting with them at McDonough + Partners, Washington, DC has almost nothing to offer anyone trying to reduce the cost of on-site energy production. Solarbuzz is a solar industry group that tracks the average price of solar modules or panels over time<sup>5</sup> and the average cost of solar modules for February 2006 is \$5.32 per watt<sup>6</sup> for a cost of \$1.4 million for 260 kW. Also stated on Solarbuzz, “The module cost represents around 50 - 60% of the total installed cost of a Solar Energy System”<sup>7</sup> for an estimate of \$2.8 million. These estimates were within the expected range according to an On-Site Project Manager for PowerLight Corp. The additional costs over the price of the panels come from the inverter, the steel for the mounting cage, the electrical equipment and the installation. As a point of reference, the Cal State Hayward system, which was of similar size, cost under \$1.5 million, installed, with the majority of the difference due to California’s rebates for solar installations.<sup>8</sup>

Now that the approximate amount of funding or material needed is known, formal requests can be made. BP Solar has a program where they donate PV modules that “were subjects of environmental and/or process development tests.”<sup>9</sup> There is a formal request proposal to file with BP Solar and they want information concerning the number and type of modules, specific use and an explanation of how they would support education or

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<sup>3</sup> William McDonough + Partners. *Basis for Design Report*, Part 3. Aug. 2005 pg 3, 15

<sup>4</sup> “Power Light” ([http://www.powerlight.com/case-studies/education/csu\\_hayward.shtml](http://www.powerlight.com/case-studies/education/csu_hayward.shtml)). Feb. 19, 2006

<sup>5</sup> “Solar Buzz” (<http://www.solarbuzz.com>). Feb. 19, 2006

<sup>6</sup> “Solar Buzz” (<http://www.solarbuzz.com/ModulePrices.htm>). Feb. 19, 2006

<sup>7</sup> “Solar Buzz” (<http://www.solarbuzz.com/ModulePrices.htm>). Feb. 19, 2006

<sup>8</sup> Interview with Ely Alexander, On-Site Project Manager, PowerLight Corp. Berkeley, Ca. Feb. 18, 2006

<sup>9</sup> “Request Form: Solar Photovoltaic Module Donation” (<http://bpsolardonations.com/>). BP Solar. Feb. 13, 2006

enterprise.<sup>10</sup> This is an interesting way to work with the manufacturer of panels to get materials donated but the additional cost, approaching 50 percent, would still be borne by the University if this method were to prove successful.

Foundations are another source of funding for a project of this scale. The Rockefeller Brothers Fund has Sustainable Development as one of their programs of interest. The criteria they consider to be important are, first, that the grantee must be a tax-exempt, educational or charitable organization. If this is met, they then request information concerning the nature of the project, does this fit one of their programs, a background of the organization that is undertaking the project, intended outcomes and a synopsis of the budget, with an indication of the amount requested from the Fund.<sup>11</sup>

In theory on site energy production is a must have. In practice, it is costly and doesn't always pay for itself, especially in a regulatory environment that is not conducive to promoting energy independence and giving the very real constraint of a budget, the money can be more effectively spent. On the other hand, energy is one of, if not the most important of global issues, not just environmentally, and extra consideration must be given to decentralized and the clean production of it. Businesses in the alternative energy field and donor foundations realize these facts and therefore are willing to fund a project that might not make the most economic sense, at least in the narrow, neoclassical meaning of that term. Solar powered schools are a compelling story and the benefits can have emergent properties, the sum being greater than the total of the parts. If a commitment to the necessity of sustainable energy is made and the proper channels are taken to fund the project the new SIS building at American University can have clean on-site energy production.

Additional research still needs to be done in some areas. A deeper look at the other forms of energy production should be considered. Looking at the amount of energy the building is expected to use and how much of this could be produced by on-site generation in actual numbers as well as a percentage of the overall usage is a key aspect. The current price and expected future prices of electricity would be a significant component of this as well. These were not specifically addressed in the funding proposals noted above but could be important to the judging of whether or not the foundations or organizations undertake the request. More sources of funding are also a place to further research, both in similar types of organizations and expanding to governments and a wider range of donor agencies.

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<sup>10</sup> "Request Form: Solar Photovoltaic Module Donation" (<http://bpsolardonations.com/>). BP Solar. Feb. 13, 2006

<sup>11</sup> "Rockefeller Brothers Fund" (<http://www.rbf.org/programs/howapply.html>). Feb. 20, 2006