

Photovoltaic Electrical Generation – in English!

The new monastery building will be “green.” It will utilize “photovoltaic electrical generation.” So, in simple English, “How does that work?”

There are usually two different types of basic “solar panels.” The panels you see for heating water or air are much easier to understand than the ones used for electrical generation. The former are panels through which either water or air is pumped, heated and used for some purpose. This application generally is used for heating domestic hot water or swimming pool water or air circulated within a structure.

Generating electricity is a more complex use of solar power. The new building at Holy Wisdom Monastery is being designed to use photovoltaic (PV) generation. Computer modeling and analysis of the future electrical needs of the building show that about 100,000 kilowatt hours of electricity will be needed annually to operate the building (including what will be needed to operate the heat exchangers for the geothermal heating).

With help from a grant from *Focus on Energy*, an analysis of the geography and site characteristics provided data on sun angles, shading, climate and PV panel efficiency.

The word photovoltaic has two parts: *photo*, derived from the Greek word for light, and *volt*, relating to electricity pioneer Alessandro Volta. So, *photovoltaic* could literally be translated as *light-electricity*. And that's what PV materials and devices do — they convert light energy into electrical energy, as French physicist Edmond Becquerel discovered as early as 1839.

Individual PV cells are electricity-producing devices made of semiconductor materials. PV cells come in many sizes and shapes — from smaller than a postage stamp to several inches across. They are often connected to form PV *modules* that may be up to several feet long and a few feet wide. Modules, in turn, can be combined and connected to form PV *arrays* of different sizes and power output.

Covering most of the southwest facing pitched roof of the new building with PV arrays will generate about 20% of the annual electrical needs of the building.

To generate enough electricity annually for the total needs of the new monastery building, the entire southwest facing chapel roof *plus* all the available flat roof space of the new building combined with the *entire* south facing roof of the existing monastery building need to be covered with PV modules.

When this is financially possible, sometime in the future, the new building will have a “zero carbon footprint.” This means that the building will generate 100% of its own energy needs.

–Neal Smith, executive director of administration
March 2009