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Solar Energy on Campus

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Big IDeas at SMU

Solar Energy on Campus

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Statement of Problem:

For centuries, fossil fuels have been the world's major sources of energy since they are inexpensive and easy to get. Unfortunately, they can have substantial hidden costs, many of which are transferred to future generations, such as global warming and air pollution. The large amount of the output of greenhouse gas (GHG) emissions into the biosphere, specifically carbon dioxide (CO2), is the major reason of global warming and climate change. Nowadays, the concept of a Low-Carbon Economy (LCE) becomes more and more popular, which refers to an economy that has a minimal output of GHG. Since climate change has negative impacts on humanity in the foreseeable future, it becomes a globally issue and every nation has the responsibility to make efforts to avoid catastrophic climate change and build a renewable energy economy.

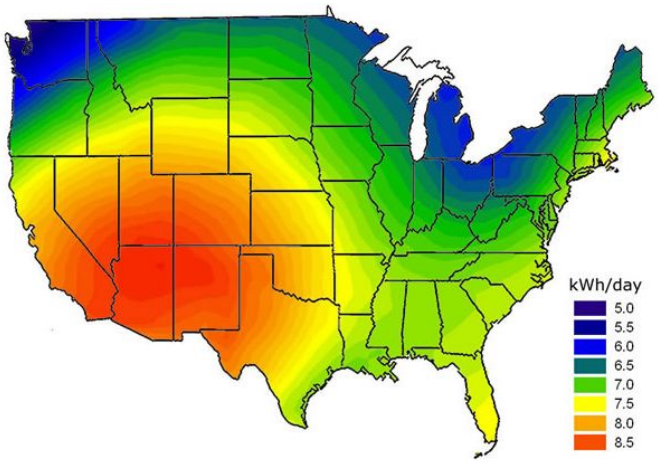
As one of the alternative renewable energy, solar energy is different from fossil and nuclear fuels because it is perpetually available; we will run out of solar energy only when the sun's nuclear fire burns out. The advantage of solar energy is very obvious: First, solar energy is dispersed over Earth's entire surface rather than concentrated in highly localized areas; Second, it is very clean and generates no GHG; Finally, it is a safe form of energy since it will not leak any pernicious gas to the biosphere. While at the same time, it also has some problems. Solar radiation varies in intensity depending on latitude, season of the year, time of day, and cloud cover. It is not widely used largely in the world because the initial costs associated with

converting to solar power are high. However, the long-term energy savings of solar power may offset the high start-up costs.

Provided that we can use solar energy to heat buildings and water, generate electricity, solar power is one of the best substitutes of fossil fuels. So far, some universities, such as University of New Mexico in Taos, have already tried to use solar power to provide electricity. As a leader in the Dallas community, SMU should try to build its own solar energy program. This project would be a feasibility study of solar energy on campus, and we are trying to make contributions to building a sustainable world.

Proposed Methodology:

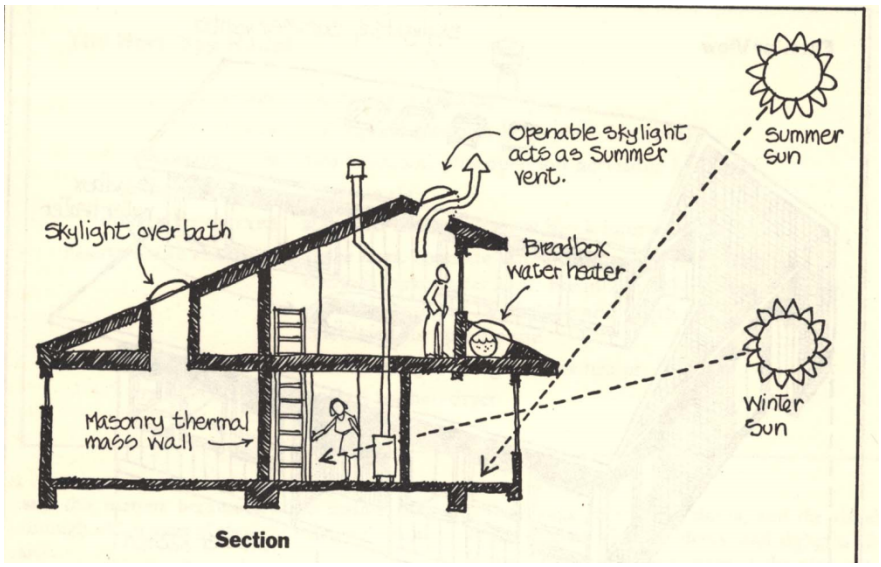
According to the map of solar energy distribution over the United States, Dallas gets 7.5 kWh/m² of solar energy on an average daily basis, and is located in the second best area in the United States for solar energy collection.

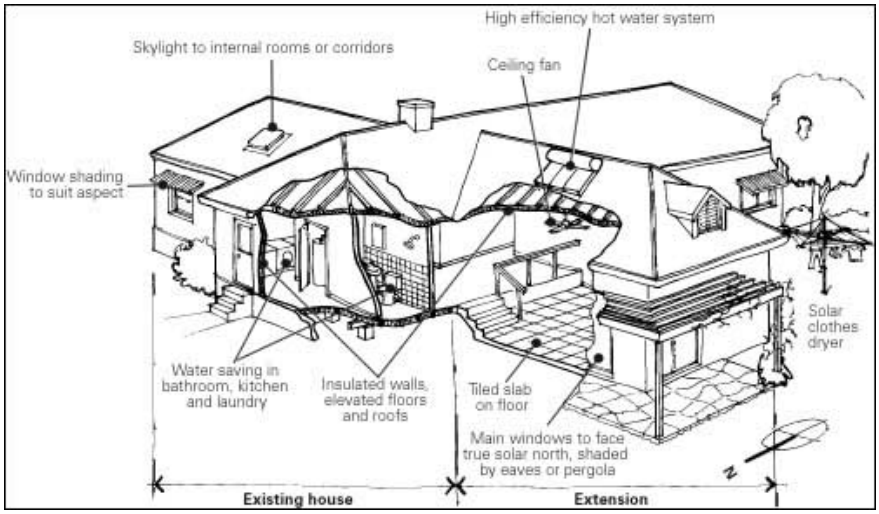


Based on the information above, there is a probability of building solar energy system on campus. To further study this issue, the following steps should be followed:

Passive solar heating buildings

In passive solar heating, solar energy heats buildings without the need for pumps or fans to distribute the heat. Certain design features are incorporated into a passive solar heating system to warm buildings in winter and help them remain cool in summer. In the Northern Hemisphere large south-facing windows receive more total sunlight during the day than windows facing other directions. The sunlight entering through the windows provides heat that is then stored in floors and walls made of concrete or stone, or in containers of water. This stored heat is transmitted throughout the building naturally by convection, the circulation that occurs because warm air rises and cooler air sinks. Depending on the building's design and location, passive heating saves as much as 50% of heating costs. Currently, about 7% of new homes built in the United States have passive solar features. Here are some examples:





In this project, we will study the several passive solar heating designs of buildings, including designs for new buildings and designs that can be added to existing buildings. We will give suitable solutions for the buildings on campus, including the dorm halls, and calculate the expenses that can be saved every year.

Active solar heating water

Active solar heating is a system of putting the sun's energy to use in which a series of collectors absorbs the solar energy, and pumps or fans distribute the collected heat. Because approximately 8% of the energy consumed in the United States goes toward heating water, active solar heating has the potential to supply a significant amount of the nation's energy demand.

In this project, we will do a survey on the expenses of buying, setting up and maintaining active solar energy collection facilities. In addition, we will measure how much water can be heated on

a regular daily basis, and the temperature that amount of water can reach. Then we can calculate the expense to heat the same amount of water to the same temperature using electricity, which is also the expense that can be saved if we have solar energy power plant on campus.

Solar Electric Generation

In solar electric generation electricity is produced by several different systems. Solar Panels help collect solar energy and transfer it to electricity. Since the demand of electricity is highest during the day, and particularly when air conditioning demand is high, the fact that solar systems only work during the day is not a serious disadvantage. In this project, we will measure the average electricity that the solar panels generate every day, and we can calculate the cost of that amount of electricity.

In order to store electricity, there are two possible ways: one is to buy photovoltaic solar cells that can store solar energy for night and for other uses; the other is to connect the electricity transportation line with local electricity-provide company, so that the additional electricity would be transported directly to local electricity-provide company. These two ways will be analyzed and evaluated in the report.

Rationale:

This project could help provide a solution to the substitution of fossil fuels and testify the possibility of building a solar energy power plant on campus. In the final report, the expense of building the power plant, the economical and environmental benefits, as well as other benefits will be addressed.

By doing this, SMU may be able to start new environmental and economical programs and this can also serve as an education center for middle school and high school students in Dallas area.

Proposed Timeline:

February: Research all options as stated above and any new insights garnered from faculty and staff cooperators

March - April: Organize funding and begin implementation, including any necessary changes

May: Finalize details of project to maintain sustainability, including possibility of expansion; begin evaluating actual social, economical and environmental impact

Anticipated Budget:

Supplies and equipment (e.g., pH meter, video camera) ____$4750_____

Travel ____$100_____

Copying or printing expenses ____$100_____

Mailing expenses _____$50_____

Total anticipated budget: _____$5000_____

Person responsible for funds: Huanlu Chen