Solar-Powered Bus Shelters

A Demonstration Project Proposal
submitted February 26, 2007

Town of Chapel Hill
Million Solar Roofs Steering Committee

Demonstration Project Proposal:
Solar-Powered Bus Shelters

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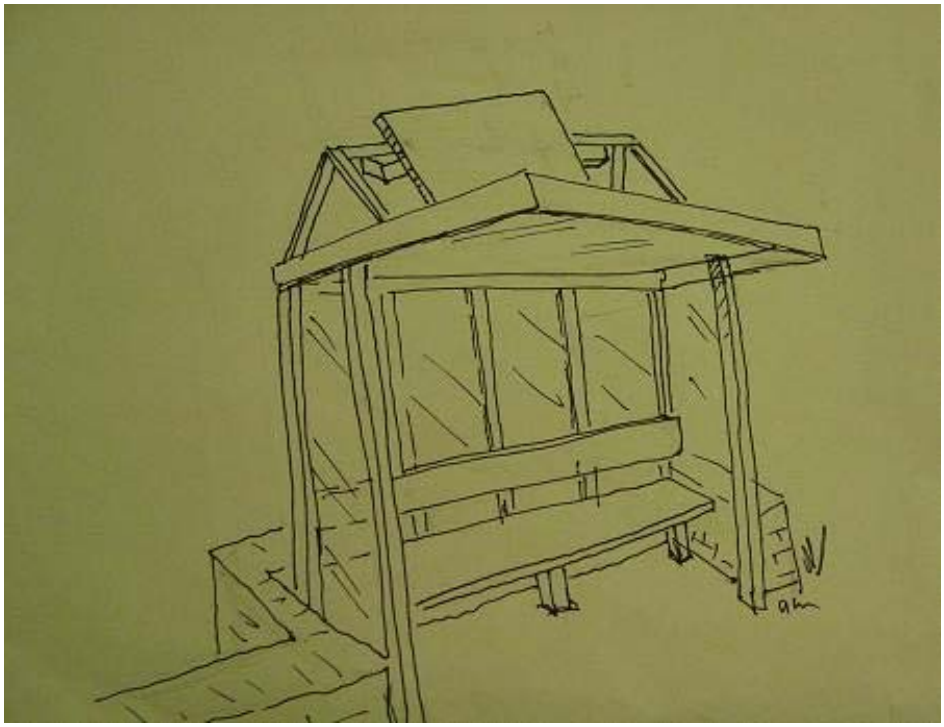
I. Introduction

The Chapel Hill Million Solar Roofs Committee proposes to design and construct a solar electric lighting system, to be installed on the bus shelter located downtown on Franklin Street outside Caribou Coffee. This stand-alone solar electric system will provide electricity for bus stop lighting as well as power for the existing LED information sign. We will also provide an LED Solar information kiosk.

Our plan is to design a 'package' system that can be replicated and installed on many of the bus stops served by Chapel Hill Transit Authority. We estimate that as many as 25% of the bus stops are suitable locations for a solar electric system. In some cases only lighting might be needed, in which case the solar panel and other components would be sized accordingly. Our goal is to provide a practical and cost effective use of solar energy that will give the public an opportunity to learn about the feasibility of utilizing solar energy in our town, our homes and businesses.



Members of the committee have contacted local businesses for donation of components and funds, so that the material costs for this initial project have been met.

II. System Requirements

The most important element for choosing a site for one of these systems is access to unobstructed sunlight. Photovoltaic panels work optimally in direct sunlight, and are not at

all shade tolerant. Any shadows cast on the solar panels will significantly reduce their power output. For this initial system we are also looking for a highly visible location in order to get as much public exposure for the project as possible.

After looking at several bus stops around town, we recommend that this initial solar lighting system be installed on the bus stop located downtown on Franklin Street, outside Caribou Coffee. This location has good solar access, is well used, and is highly visible to the public.

III. Power Requirements

We have monitored the power usage of the LED display at this bus stop. We have also researched the power requirements for LED lighting. Each component uses about 300 watt-hours (.3 kilowatt/hours) of electricity per day. We have designed a system with five days of uninterrupted power capacity capable of charging one day's power needs within 5 hours of direct sunlight.

IV. Components

*Photovoltaic panels (either one or two 3'x 5' +/- panels, depending on if the system will be powering lights only or with LED displays.

*Mounting structure: An aluminum 'A' frame with all stainless steel hardware will be integrated into the existing bus stop structure.

*Charge controller and lighting controller: This device prevents the solar panels from overcharging the batteries. It also provides lighting control to turn the lights on and off automatically.

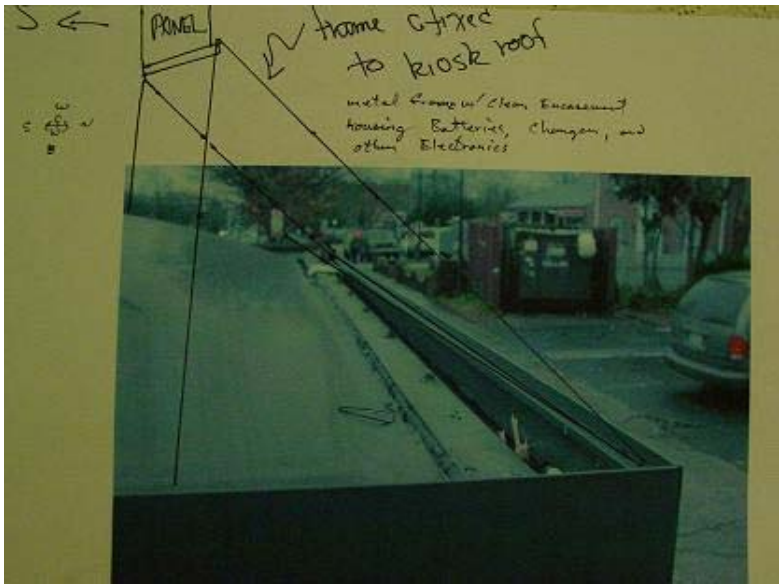
*Batteries: Sealed, maintenance-free batteries will be used. Depending on the size of the system the battery bank will be located either above the shelter in a sealed enclosure, or under the bus stop bench, also in a sealed enclosure.

*Optional battery charger. At bus stops that have existing utility power available, an AC battery charging circuit can be incorporated into the system. This can help reduce the size of the battery needed, and will also be an additional example of how a solar power system can integrate in our homes and businesses.

V. Design and operation

We suggest that the components be located above the shelter, so they are out of harms way. The solar electric panels will be mounted on a frame that will be connected to the existing frame of the bus stop. The controls for the system will be installed in a weatherproof enclosure under the solar panels. Ideally this enclosure will be clear Plexiglas, which will allow the public to see the various components of the system. As mentioned above, the batteries will be installed in a sealed enclosure under the solar panels, or under the bench of the bus stop.

The operation of the system will be automatic. When the sun is shining the solar panels will convert the sunlight into electricity. The system wiring will carry the power through the charge controller and to the batteries. The light controller will turn the lights on at dusk and turn them off at dawn. The LED displays will get their power from the batteries continuously throughout the day.



VI. Costs and installation

1. <u>Lighting only System:</u>

   1-190 watt solar panel $900

   1-Mounting structure $250

   1-Charge/lighting control $150

   2-Batteries: Sealed 12 Volt 200 amp-hour. $375 each $750

   1-Conduit, wiring, battery box $400

   1-LED lighting string 65' roll _$299_

   Total lighting system materials $2450

2. <u>Additional materials and costs per LED display</u>

   1-190 watt solar panel $900

   2-Batteries $750

   1-Additional wiring and battery box $400