**PV system Design**

PV system designs can be made with different levels of complexity. For a first approximation the STC performance of the PV modules and the performance of the other components (like the inverter) at STC conditions and the number of Equivalent Sun Hours (ESH) at the location of the PV system are sufficient. The notion of ESH will be discussed below. In a more detailed approach, performance changes of the modules and the other components due to changing irradiance and

weather conditions are taken into account. Since these performance changes can be quite high, they can alter the optimal system design considerably.

There are two main paradigms for designing PV systems. First, the system can be designed such that the generated power and the loads, i.e. the consumed power, match. A second way to design a PV system is to base the design on economics. We must distinguish between grid-connected and off-grid systems. As we will see, grid-connected systems have very different demands than off-grid systems.

A simple approach for designing off-grid systems

In this section, we will design a simple off-grid system. The design presented here is based on very simple assumptions and does not take any weather-dependent performance changes into account. Nonetheless, we will see the major steps that are necessary for designing a system. Such a simple design can be performed in a six step plan:

1. Determine the total load current and operational time

2. Add system losses

3. Determine the solar irradiation in daily equivalent sun hours (ESH)

4. Determine total solar array current requirements

5. Determine optimum module arrangement for solar array

6. Determine battery size for recommended reserve time