Re: How to calculate a battery capacity

Source: http://sci.tech−archive.net/Archive/sci.electronics.basics/2006−09/msg01246.html

- *From*: Jonathan Kirwan <jkirwan@xxxxxxxxxxxxxx>
- *Date*: Mon, 18 Sep 2006 19:36:18 GMT

On 18 Sep 2006 11:12:57 −0700, "Simon Dice" <bitxbit@xxxxxxxxxxx>
wrote:

> I'm working on a project in wich I need to have a system running 24hrs
> a day , power supply will be solar panels feeding a battery. Can any
> one share with me formulas on how to calculate de Amp/hr for the
> battery and the power of the solar panel?
> Systems will consume average 80watts and need to keep running on a few
> clowdy days as well.
> Thanks for the assistance!

I think Lewin can respond well to this. But in the meantime, what latitude? Will it have exposure to the entire sky? Etc. Can you add more information here?

My vague memory says that in the US, over an entire year's use, you can get as little as 1 MWh m^−2 yr^−1 of insolation in the north. I think the figure is about double that in the south. With thin film efficiencies of about 6%, that's 60 kWh m^−2 yr^−1 in the north. At 12% for polycrystal, about 120 kWh m^−2 yr^−1. Again, about double that in the south. You are looking for an average of 80*365*24 or 701 kW h yr^−1. But if you are only planning on supplying battery support for night time, you will need to find the minimum average for the lowest energy day of the year and cover that. That figure will be less than the average by a fair amount, especially if you are including worst case conditions with precipitation and heavy cloud cover.

And if you are at the poles, you need to think about battery storage for 6 months −− so latitude has a lot to say about what you need to do.

I think you can already see several square meters in your future, even with relatively high efficiency panels.

I'm ignorant of all the details, but general theory tells me:

(1) Examine the site and latitude to find the better orientation for
your panel. You may not be able to slant it optimally, or you may be
able to include tracking the sun so that the panel efficiency is
optimal all the time. I don't know. Keep also in mind that you will
get increasing reflections as the sun moves and if your panel is fixed
in position, losing usable light in the process.
(2) Then estimate how much ground−level, visible wavelength light you
are likely to get per meter^2 on the weakest day of the year with
worst case cloudy conditions and precipitation −− include
obstructions, trees, and varying angles as the sun crosses across the
sky. You will need to consult gov't or industry figures for your area
−− perhaps contact the local power company about this.
(3) Apply your estimated solar panel efficiency (6% for thin film,
say 12% for polycrystal) and compute your average daily energy.
(4) You will need 2kWh per day, so work out the number of square
meters of area you will now require to achieve this average on the
weakest day of the year. This number will be painful to see.
(5) Decide how much time your batteries will have to support your 80W
system −− probably should size this for at least 24 hours of use, or
about 2 kWh.

I didn't include figures on how much efficiency you can expect in
delivering the power to your load from the panel or from the battery,
but there will be losses here. Also, there will be losses when you
are charging batteries AND supplying power, during the day. Overall,
those panels will just be getting larger and larger and your batteries
bigger. It's going to hurt.

Jon
.