

PowerViews

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Don't Waste 25% of your Already Expensive Solar Energy



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Power Channels: Energy Efficiency, Renewable Energy, Smart Grid Power

Photovoltaic solar energy is an environmentally friendly, low maintenance and easy to install source of infinite energy. Once installed, you can more or less forget about the solar panels as they will just sit there and produce energy for the coming 20-30 years. The Earth will be happy, your electric bill will be happy, however, unfortunately the banker financing the loan for your solar installation will also be there for the next 5-10 years.

In countries with very high electricity costs your investment payback time will be a lot shorter, and in some countries government subsidies will take some of the financial burden off your shoulders, but if not, you will be alone in taking the full cost of your CO2 reduction project.

The electric utility companies often want you to put your energy back on the AC grid (with a fee) in order to sell the energy to a customer without solar panels, and at the same time make money in measuring, transporting and billing "your" energy to another customer on the AC grid. (In some countries you will now be classified as an "energy producer" and even have to pay tax for the energy you put back on the grid).

Putting energy into the grid involves a lot of conversions between DC (direct current) and the grids AC (alternating current) as the solar panels produces DC power and not AC as required by the grid.

At the load end the energy is most likely consumed by a DC load as are most computers, TV sets, LED lamps and other electronic loads that use DC. Even your low cost vacuum cleaner has an electronic motor control today and therefore can be run on DC power. INTEL corporation claims that more than 80% of the electronic equipment produced today are actually DC loads and the AC grid is only there because of historical reasons.

Looking in to the chain of conversions from the solar panels to a consumer (a PC) the chain looks like this:

DC/AC (solar inverter) ► AC grid (transport) ► AC/DC (PC power supply)

Every conversion stage and transport has losses: 5-10% in the solar inverter, 4-6% in the grid cables/transformers and additionally 8-20% in the PC power supply. In total, the losses will be in the range of 17-36%, with an average of 25%.

Of course, wasting 17-36% of the already expensive solar energy is not the best way of using money when making an investment.

If we try to make a new design approach with “local production & local use” and instead install the solar panels on data centers, school buildings, hospitals or shopping malls where we have direct use of the energy produced, the energy can then be used locally to feed lighting systems, fans, computers or maybe even electric car charging stations.

Now the chain of conversions from the solar panels to the consumer will look like this:

DC/DC (solar charge regulator) ► DC cables (transport) ► DC/DC (power supply)

In this case the conversion steps will be much more efficient: 1-2% in the solar charge regulator, 1% in cables and 4-9% in the power supply and then the losses will be in the range 6-12% or 1/3 of the losses in a conventional AC distribution chain.

An argument against implementing DC power networks is of course the incompatibility with existing AC loads. Instead of focusing on incompatibility issues let's try to find loads that can be used on DC power. Most LED and low-energy light bulbs can be run on DC power, in fact a standard low-energy light bulb from IKEA works perfectly well on DC power, as well as with most PC or server power supplies.

By taking the AC grid out of the equation your business case will be stronger and easier to forecast as you don't have to rely on the generosity of the power company to give you money back for the energy you put back into the grid. You simply use the energy produced yourself in your own "micro grid" and when there is not enough power coming from your solar installation to feed your loads, you just buy the remaining amount of power you need.

Compare this with a car. If you go to a gas station and the station owner tells you, "You can't fill up until we have emptied your tank. You will get half the gas value back and then we will charge you the full amount to refill the tank." – you probably would think twice.

Until the number of solar panels in your installation reaches the stage that the energy produced can no longer be used locally, the design approach with "local production & local use" will be the most energy efficient and at the same time have the strongest business case.

About the Author

BSc in Electronics from University of Umeå 1990. Background in Ericsson, Saab and Transmode Systems. Founder of the Swedish consultant company Tanker AB, a successful expert group in the network management area. At Ericsson Mr Lidström led the design of the Ericsson 3G radio basestations power and antenna-near systems. At Transmode Systems Mr. Lidström was VP, Network management and also architect of the network management system at Transmode, a successful company and global player in the fiber optic area, 2011 listed on NASDAQ OMX. Netpower Labs was founded as a reserach company in year 2000 and from 2006 Netpower Labs was changed into a product company and soon became one of the pioneers in 380 volt DC power systems.

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