Running ac with solar panels

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First, let"s look at the energy consumption of an air conditioning unit itself. Is it all that different from a toaster or a computer? The sheer numbers show that it is. An average american house spends around 10,812 kW a year, according to the U.S. Energy Information Administration. An AC unit requires 20% of this amount -- it uses around 2,000 kW every year. In hot places, like Arizona or Texas, this number goes even higher.

Exact energy consumption highly depends on the size and type of the AC unit you"ve chosen. The cooling capacity of an AC somewhat translates to its wattage like this: 1 ton of cooling power requires slightly more than 1,000 W. Central air conditioning systems that can take care of the whole house use around 3,500W. A medium-size AC unit requires around 1,000-1,500 W. Small units for tiny rooms can have a wattage of 500W.

To get a daily energy consumption of an AC unit you need to multiply its wattage by the estimated number of working hours. However, the whole calculation gets messy because:

o Presence of people and animals in the room where an AC unit is working increases the energy it consumes. o An air con tries to cool every object in the room: the more there are different things around, the more electricity it takes. o An AC unit requires extra energy to start working, but then spends much less energy maintaining the desired temperature, rather than actually cooling the air.

Therefore sometimes it is suggested to halve the amount of energy you"ve got from calculation. What you"ll receive in the end is the power that additional solar panels would need to generate daily to support your air conditioning unit.

First, let"s think of the most simple situation: an AC unit works only during daytime at the same time as solar panels. Ideally, we would like to simply divide the power usage of the AC unit by the wattage of panels. However, the AC production of a solar system rarely matches its DC rating. Lots of energy gets lost because imperfect angle and positioning and in the process of transfer and conversion. These losses may amount to 20-30%.

Let"s say we have 3000W AC unit. We would need about 3,750 watts of DC from a PV system if we include a 25% correction. This aircon would require nine 400W solar panels. However, we should take into account the fact the AC consumption decreases when an aircon maintains the temperature. If we halve the continuous consumption, then five 400W solar panels would be able to power an AC unit.

Let"s move on to a more complicated example. We"ve decided to install a central air conditioning system in a house somewhere in LA. Its rated wattage is 3,000 W. We"ll set 6 hours as an estimated daily work time. This time though, running times of a PV system and AC wn"t be aligned. We"ll instead rely on a battery and make sure that a solar system can charge it enough so that it can power an AC in return. First. let"s first figure how

energy an AC needs daily:

This is the cost of running an AC unit for one day in Los Angeles. This amounts to $56 a month and $682 a year. Quite a lot. Given the fact that an average AC unit costs a little over $4,000, it"s like purchasing a new one every 5-6 years. Solar panels in Los Angeles, to the contrary, pay for themselves in about 6 years. Running your AC on solar energy contributes to speeding up this process.

We established that to run the AC unit on solar we need to get approximately 9 kWh from PV modules every day. The average number of peak sun hours in Los Angeles is 5.6 - this is the time when irradiance reaches 1000W/m2 and panels operate at their maximum. Let"s figure of a solar array that can provide us with this amount of power.

You can get those additional 700 W by extending your solar panel system with two extra 350W paneIs. But is it mandatory to add them if they are not going to be all that useful in fall, winter and spring? Well, not necessarily.

The AC unit is only needed in summer when solar panels receive more sunlight during the day than usual and, therefore, produce more electricity. On average a solar panel system generates 50% more electricity in July and August than in December and January. So, if the existing solar array produces enough power to cover your energy needs in winter, leave it as it is: that small AC unit won"t be much of a burden.

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