



Electrical energy storage boosts small-scale solar power production

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Abstract [*Full text available in Finnish, see: <https://el-tran.fi/analyysit/>*]

Small-scale solar power production is a potential part of the solution when the power system of Finland goes climate-neutral and becomes more resource-efficient. Photovoltaic (PV) systems do not necessarily need any support as they are currently profitable. If the energy produced were used for home consumption it would become even more profitable.

However, there are many technical, legal and energy policy problems connected to solar power solutions and their ramifications extensively affect the power system. These problems include high consumption peaks of heat pumps, timing differences between PV production consumption, and shared ownership of solar panels in condominiums preventing private use in households without transfer fees and taxes. There are also problems in relation to net metering and the profitability of storage.

In this analysis we discuss solutions to these problems, especially regarding electrical energy storage. The solutions we propose are: 1) form energy communities, 2) use inter-phase net metering, 3) introduce hourly and later quarter-

hourly net metering, 4) re-evaluate distribution fee limits on surplus energy feed-in to the grid, 5) adopt year-round summer time to maximize coherence of load and production profiles, 6) introduce incentives to reserve a room for batteries at the construction phase of buildings, 7) introduce dynamic electricity taxation, 8) introduce power-based distribution tariffs, 9) offer financial support for battery investments and innovations.

Energy communities make possible community-wide use of PV systems, e.g. in apartment buildings. Without an energy community surplus energy must be fed into the grid and apartment owners have to pay distribution fees and electricity taxes even though the energy comes from a PV panel. Inter-phase net metering avoids the problem of customers simultaneously buying and selling electricity through different phases and net metering while the time units used avoid the problem of customers buying and selling energy in the same metering interval.

The distribution fee for selling surplus energy is limited to make PV production more profitable and this may cause a rise in distribution prices to electricity consumers. Re-evaluation of limits for distribution fees for selling surplus energy will be timely. Production of PV energy occurs around midday, but the household's energy consumption peaks in the afternoon and evening. Year-round summer time would slightly reduce this difference. If battery space were free of tax at the construction phase such rooms would be made for later battery installation.

Dynamic taxation will increase the profitability of demand response and the battery can be used for this, thereby increasing the profitability of energy storage. Using power-based distribution tariffs, the profitability of energy storage will increase. If energy storage is profitable, this will become more common. A battery installed alongside a PV will increase the cost optimal size of the PV panels.

Battery prices are high but decrease very fast. Early financial support for battery investment and innovation will speed up the installations of energy storage facilities. This will lead to the further development of systems.