Neighbors can save money by suspending car charging for 30 seconds, Norwegian researchers say

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A lot is happening these days in the Norwegian electricity grid. The Nordic countries are experiencing increasing levels of variability in

electricity generation from new wind and solar power plants, combined with decreasing production from plants fueled by fossil coal and gas.

Electricity generation from traditional power plants, including most hydropower facilities, can be regulated regardless of the weather. But new, renewable energy supplies are hostage to hour-by-hour changes in weather conditions.

This makes it more difficult to balance the electricity grid, thus creating an opportunity for initiatives that can serve to maintain balanced electricity distribution.

A grid balancing act

In 2022, Statnett, which is responsible for operation of the Norwegian electricity grid, went on the offensive in order to meet this challenge, and established a new market for grid balancing services. This market is creating opportunities for several actors, including neighborhood communities, to provide valuable grid balancing services.

Perhaps the most remarkable aspect of all this is the fact that the residents in your neighborhood can contribute simply by suspending charging their cars for up to 30 seconds at a time. Amazingly, this will help maintain stability in the system and make you money at the same time.

In order for a neighborhood to save money, the grid system needs a guarantee that vehicle charging can be suspended at precisely one second's notice. This requires ultra-reliable communication between the grid and the electric vehicle charger.

The principle is straightforward enough. The neighborhood will receive a payment for standing ready to suspend vehicle charging during certain

periods, even though this will happen only very rarely. The need will be greatest in the summertime, so the market only operates from spring into autumn.

However, Statnett, which regulates the flow of electricity, says that if this is to be of any real help, as many neighborhoods as possible have to contribute together. A single neighborhood on its own will never be enough.

When several neighborhoods collaborate, the combined effort will help to keep electricity supplies constant and the grid system stable. This is one way that enables the general public to make a contribution and collaborate to resolve our grid supply challenges.

So how much will they save by doing this?

Many opportunities for savings

As part of a research project currently being carried out by SINTEF and NTNU as part of the Zero Emissions Neighborhoods (ZEN)/CEER research initiative, our team has been calculating how much money residents in a typical Norwegian neighborhood can save by becoming 'smart' electricity consumers.

To achieve this, we have constructed a special data model that helps us to identify the smartest ways for a neighborhood to save money on its collective electricity bill in the course of an entire year. This is a complicated exercise because there are in fact many ways for electricity consumers to save money.

For example, we can use electricity most when it is least expensive. We can also save money by distributing our consumption more evenly over the 24-hour day. Our data model helps us to see how savings can be

impacted in other ways, such as by consumers being willing to turn off their vehicle chargers.

The "neighborhood" that we have modeled in our study is a college in Innlandet county. The college has a number of electric car chargers and a battery that can store electricity. As well as charging vehicles, some of the chargers can also send electricity back into the grid as and when necessary.

We have been using our data model to find out how the college can charge its cars and use its storage battery in the most cost-effective way throughout the year. Modeling has been based on examining trends in electricity consumption and prices during the years 2019, 2020, and 2021.

Major savings

Initially, we looked into how much money a neighborhood might save by managing its consumption intelligently without being a member of the new grid-balancing market. We found that it can achieve between 10% and 15% in savings on its annual electricity bills. This is because it focuses on using electricity most at off-peak periods when it is least expensive.

It also saves money on grid tariff payments by distributing consumption more evenly over the 24-hour day.

Then we investigated how much money a neighborhood might save by becoming a member of the new grid balancing market. Participation in the market means that the neighborhood must plan so that it can guarantee that one or more devices, such as vehicle chargers, can be switched off at very short notice during certain time periods.

Our findings showed that participation in the market resulted in even lower electricity bills. We also discovered that it was in fact a little less beneficial to distribute consumption more evenly during the day because this limits the savings made on grid tariff payments. However, in this case, a neighborhood is able to reduce its total annual electricity bill by up to 20%. Participation in the grid balancing market effectively provides an income equivalent to between 5% and 7% of their total bill.

Two things must be in place

Currently, there are virtually no neighborhoods participating in the new grid balancing market, even though there is money out there just begging to be made.

Two things are needed if we are to succeed in encouraging neighborhoods to adopt smart electricity consumerism in practice.

Firstly, neighborhood communities must come together to create a large enough collaborative system. It helps, of course, to be a large community in the first place, such as a housing cooperative. Smaller units can participate by joining a larger collaborative effort. In Norway, companies organizing collaboration of this kind already exist. A good example is Flextools.

Secondly, if a neighborhood is to participate in the market, its devices, such as vehicle chargers, have to be qualified. This can be done by testing to see whether chargers can be switched off fast enough when required. To do this, the neighborhood must obtain a suitably accurate measurement device. Participation must also be approved by the grid company that supplies electricity to the neighborhood. Norwegian neighborhoods should now be looking to grasp this opportunity because in the future there will be an increasing need for the services offered by the grid-balancing market.