

Zero sun

Participants: Skellefteå kraft AB, Schneider Electric, Green Exergy and A-hus

Category: Renewable and distributed generation integration

Time plan: Started 2018

Web: www.zerosun.se

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Location: Skellefteå

Possible to visit: Yes

Background

Zero Sun is a real-time experiment where smart technologies work together in a house as a unique system aiming to make solar technology more accessible. To increase solar energy generation is an integral piece in switching the society over to 100 per cent renewable energy, and this project aims to analyze some aspects of that transition. In the project consists a house has been built for a specific experimental challenge – to be completely self-supporting with solar energy in a place where the solar influx is very low for several months a year.

By finding ways to solve this challenge, facilities and houses in areas with high electricity consumption will be able to contribute to lowering peak loads and a more efficient use of the electric system.

Implementation of the project

The house is fitted with solar panels on the roof that generate electricity that is primarily used for the direct energy consumption of the house. Any leftover energy is then stored in batteries. Once the batteries are full, the surplus energy goes into producing hydrogen by way of an electrolyser, and the hydrogen is stored in a tank. During the darkest time of the year, in the winter, the stored hydrogen is used to produce electricity via a fuel cell. That way, the house is running on energy originally produced in its solar cells all year round.

In addition, the fuel cell is cooled by water, which is an important function when connecting fuel cells to a house. The reason for this is that when operational the system generates hot water, which is brought back into the house to be used for heating, washing, etc. All of this is installed in an equipment box in the garage, a solar roof and storage of seasonal energy in the form of hydrogen on the property.

As a part of the system, the house can also fuel cars on the property as needed. It allows for both charging of electric car and filling up fuel-cell vehicles with hydrogen.

A control system monitors and controls all technology in the house. The purpose of the control system is to use sensors to monitor all energy being produced and consumed in the house. The energy system of the house is custom-made to allow lighting and household appliances to connect seamlessly to it. The system collects and analyses data in real time, which gives it better security, efficiency, reliability and sustainability

Benefits

The project explores new possibilities for solar power integration as well as energy storage in both batteries and hydrogen. Such solutions will be vital to be able to cope with peaks in power demand in the future, as well as the transition to a more diverse energy system with an increase of micro producers.

Skellefteå kraft believes that this project can help them learn important lessons about energy provision of and for the future. This also tests the energy provision to our homes and truly challenges using the sun as a renewable energy source. All of which is in accordance with the company vision and with EU climate objectives.

Scalability

Zero Sun is a modern one-storey house from the standard range of the Swedish construction company A-hus.

The only customizations are a small upgrade of the window energy class and the fact that the garage space is not a place to park the car but instead holds the technology system on which the entire experiment depends.

Interoperability

A system like Zero sun is interoperable with any grid.

Investment horizon

The economic feasibility of the setup is one of the important aspects to be investigated during the run of the project.

International potential

Technical potential is not limited to Sweden, but the specific dimensions and set-up of the solution is most economically motivated in the northern hemisphere.