Smart technology optimising power generation

The University of Sydney

Model predictive control of Hybrid PV / storage systems

Teaser / Summary – This new software system improves energy stability and minimises costs by learning the energy demand for a household and considering weather forecasts, battery capability, age and grid prices to optimise the charge and discharge cycle for that home.

"Energy for a household can be stored or used optimally, shaving consumption peaks, improving energy efficiency and saving electricity costs" ~ Professor Anthony Vassallo, The University of Sydney

This technology helps users make the most of renewable energy sources when they are available. Image: Alan Lam

What is the technology?

When powering our homes and lifestyles in the future, it's likely we will draw from a portfolio of sources to maximise energy generation capability while minimising waste and cost.

New technology from The University of Sydney enhances the charge / discharge cycle for grid connected hybrid PV / storage systems. This works by having a computer cloud system consider the multiple influences involved in optimal energy production and use.

The Model Predictive Control technology learns the troughs and peaks of energy use for a household and maps the most efficient charge and discharge cycle with consideration for other important factors such as the best energy making weather, the cost of drawing from the grid at different times, and the functionality of the batteries themselves.

Allowing for these considerations, “energy for a household can be stored or used optimally, shaving consumption peaks, improving energy efficiency and saving electricity costs,” says lead researcher, Professor Anthony Vassallo.

This technology works by attaching a local monitoring device to the solar panel and battery system to measure consumption and generation. This data is uploaded using an inbuilt 3G modem and servers use the data in conjunction with weather information to forecast consumption and generation for the next 24 hours. A mathematical model calculates a battery charge and discharge schedule that yields the lowest cost, which is downloaded and put into action by the battery charger.

Importantly, the device continues monitoring the generation and consumption and reports any changes back into the system, to continuously update and optimise the schedule.

Who is the project team?

Led by Professor Anthony Vassallo, **XXX**

What challenge is this research helping to solve?

Energy consumption has peaks and troughs over the course of a day while the generation of energy from popular renewables such as solar is also dynamic, and dependant on sunshine. This can contrast with our energy demands, which commonly peak after the sun goes down.

One solution is the addition of a battery to a solar power system. To make it cost effective, the system needs to be capable of taking advantage of the battery, charging it to minimise waste during times of low consumption, and discharging it to provide a stable power supply at night or during cloudy weather.

“A further challenge arises due to the limited capacity of the battery. If the battery is completely discharged prematurely, the output will lose its stability, or if it is completely filled, the renewable energy from the sun will simply go to waste,” Says Professor Vassallo.

What is the benefit?

Combining solar power and battery storage makes a lot of sense, and adding machine intelligence and smart control provides even better use of the hardware, to lower energy costs.

The smart software optimally manages the elements to enhance power generation and use, minimise costs, ensure energy stability and extend equipment life.

This technology supports the transition to renewable energy by giving customers a practical solution to some of the associated logistical and wastage problems, it does the clever thinking to deliver an energy generation solution that is highly efficient, consistent and affordable.

Farzad and Yousif presenting a mockup of grid connected PV with battery storage. With special thanks to Sarkis Keshishian.

This project was created by

THE UNIVERSITY OF SYDNEY

To find out more

Visit http://sydney.edu.au/

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