

Watt's Happening? #125

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Building a virtual power plant



Here two Hudson's Hope highschool students are helping to install a solar array on the roof of the Bullhead Mountain Curling Club. Interconnecting networks of roof-top solar arrays like this one but equipped with smart battery systems will create vast "virtual" power plants that will make the grid more reliable and efficient while reducing electrical costs for millions.

In South Australia, 50,000 homes will receive free solar panels and Tesla batteries over the next four years in a groundbreaking plan to create the world's largest virtual power plant.

Virtual power plant?

This idea has been growing rapidly over the last few years, driven by "smart" battery technology developed by Tesla (among others). Smart batteries not only store the energy produced

by a solar array, but link with other solar/battery systems scattered over vast areas of the grid, creating, in essence, a giant, interconnected power plant.

WORRIED

South Australia is worried. In 2016 a vast "unprecedented" storm caused a statewide blackout that has sent them scrambling for a more reliable energy source. Also,

several of their aging coal plants have closed, and gas drilling is either facing restrictions or most of the gas is slated for export.

So Australia is turning to renewables like solar and wind, which now supply 14% of their power. South Australia is already home to the world's largest battery system (Tesla again) that supplies power to 30,000 homes. Now they're taking it to the next level.

"We will use people's

homes as a way to generate energy for the South Australian grid,” said Premier Jay Weatherill, “with participating households benefitting with significant savings in their energy bills.”

The trial phase will begin with 1,100 public housing properties, each supplied with a 5 kW solar system and Tesla battery. Interconnected via the existing grid, the solar/battery systems will share both power and storage while exporting excess power to the grid, becoming a net generator: a vast, reliable and resilient “virtual” power plant.

The project is being funded by a loan from their taxpayer renewable energy fund, and by the sale of excess electricity generated by the network, some 250 megawatts of solar energy plus 650 megawatt hours of battery storage.

A VIRTUAL SITE C?

South Australia, of course, has a great solar resource, but the idea can work almost anywhere, because solar energy will work almost anywhere (look at Germany, a world leader in solar but not exactly a bright sunny place).

Just for fun, I have run some rough numbers (yes, very rough, but conceptually accurate), to see what we could do if BC built a virtual solar power plant instead of destroying another pristine river valley.

Bear with me, here come the numbers...

The Site C dam is rated at about 1000 megawatts, but with a “power capacity factor” of 60% (BC Hydro figure) it will actually produce about 600 megawatts of reliable power averaged over any given year.

How many 5kW roof-top solar arrays would we need to make this much power? About 120,000 to reach that peak of 600 megawatts, but since solar is

more intermittent, let’s be generous and multiply that by 4, for a total of about 480,000 roof tops arrays. (sounds like a lot, and it is, but lets recall that Japan put up a million solar roofs in the last two years, Australia already has three million, Europe a million, the US is expected to hit a million this year, and China? Zillions).

Assuming economies of vast scale, each solar/battery system would cost about \$20,000 installed. Total cost? \$9.6 billion. Hmmm, about the same cost as Site C!

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BIG BENEFITS

Benefits besides the clean electricity? Lots.

1) Tiny environmental footprint, since only existing roofs would be used;

2) Half a million BC residents receive a direct and immediate financial benefit, reducing their electrical costs for decades, plus a valuable solar asset for their home or business;

3) The province gets a thriving solar industry, employing tens of thousands of electricians, engineers, truckers, roofers, carpenters, manufacturing facilities etc. all across the province, for decades;

4) A decentralized, distributed energy source that is resilient

and reliable, hardened against the ravages of climate change;

5) A decrease in the need for new energy sources, since every kilowatt of energy these households produce is a kilowatt that BC Hydro does not have to create, while excess generation is still available for sale and export.

Truly clean energy is distributed and phased in as needed, not mega-project boom-bust centralized. Driven by necessity and basic economics, virtual power plants will soon become the norm where there is the political will and wisdom to implement them.