

Watt's Happening? #251

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100% RENEWABLE ENERGY *Is it POSSIBLE?*



Crickey! that's a lot of solar! One in every three households in South Australia has rooftop solar. On some sunny days, that's enough to power all of South Australia, a world record! But more and more roof top solar is not all South Australia is doing as they speed toward 100% renewable energy.

There is a popular myth that says “we will always need fossil fuels to power our grids.” Twenty years ago that may have seemed likely, but we know better today. Around the world the switch to 100% renewable energy is already in full swing.

South Australia, (population just under 2 million) is leading the world in several key aspects of the energy transition to renewables. They have gone from a coal powered electricity grid with virtually no renewables in 2008 to 70% renewables

and zero coal plants, all in just 15 years.

Impressive, and in a moment we'll look at just how they plan to get to 100%, but first let's look at a few other shining examples.

ALREADY THERE

Iceland is 100% renewable made up of hydro and geothermal. Norway is 99%, mostly hydro and wind. Sweden in 98% with about two thirds hydro, one third nuclear. Paraguay, Bhutan, Lesotho and Nepal are all in the high 90's mostly from hydro.

These countries are blessed with excellent hydro and/or geothermal resources, which are easy to incorporate into a grid, as they behave just like coal, gas or nuclear generators that traditional electricity grids use: steady, controllable power.

Unfortunately all these traditional, highly centralized energy sources are all dangerously polluting and getting more and more expensive, especially at the immense scale we'll be needing to electrify all our grids to halt climate change.

South Australia has had to do it the hard way. Their 70% renewables is made up entirely of variable wind and solar, the highest proportion of variable renewables in the gigawatt scale grid anywhere in the world.

DENMARK: ALMOST THERE

Denmark is making it work with lots of variable renewables too, now at 84% renewables, 55% from wind and 6% from solar. But most of the rest comes from bioenergy, that is, burning organic material to run steam generators.

Unfortunately, most countries cannot follow the lead of Iceland or Norway, because around the world hydro is mostly tapped (and has its own suite of environmental problems) and geothermal, biomass and nuclear each have their own issues with location, scalability and cost standing in their ways.

So as South Australia pushes towards 100% variable renewables it is blazing a trail that most other countries will have to follow. How do they plan to do to it?

Until 2008 they relied almost entirely on a blend of coal and gas to power their grid. But in 2016 the state closed it's last big coal power plant and now, just seven years later they are up to a grid supplied by 70% renewables, 45% wind and 25% solar (mostly rooftop).

But some days the sun is not bright or the wind does not blow. What then?

DEALING WITH VARIABILITY

Well, on good sun and wind days, they are 100% renewable and even have to export some of that clean power. But on the worst days the shortfalls are being made up with gas and a bit of imported coal energy, mostly from nearby Victoria.

South Australia is shifting that by using energy storage (batteries) and better interconnections. They have now installed about 500 megawatts (MW) of battery storage. These have met about 15% of demand for short periods of time during evening peaks. Hundreds of more megawatts of storage are under construction. Battery storage is working.

Expanding interconnection infrastructure with neighbouring states is also big, and as these states also transition away from coal (which they are rapidly doing) this energy will get cleaner too.

A MORE RELIABLE GRID

Expanding the interconnection area also reduces the chances of climate related black outs, that is, it creates a more reliable grid. More interconnection also means South Australia can add more wind and solar for export on really sunny and windy days.

And yes, more is on the way, big time. Just one project, the Goyder Renewable Zone, is currently under construction and will supply 1,200 MW of wind, 600 MW of solar and 900 MW of storage.

This is more than South Australia will actually need, so it's intended mostly for export. As well, more rooftop solar and more EV-to-grid programs are part of their expanding transition program.

All across Canada we are rich in solar and wind resources. If South Australia can, clearly any province in Canada can do it too. So what's stopping us?

BATTERY STORAGE IS WORKING