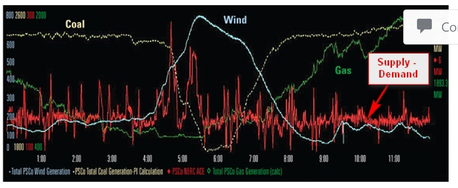
« Profit aus forcierter Angst
There will be no climate wars »

Energy storage for intermittent producers

Renewable energy sources like wind and solar are intermittent, and can not deliver the mandatory base load electrical power without any storage solutions. POWER news has an interesting article "Energy Storage Enables Just-in-Time Generation" which covers in a non technical manner several storage possibilities.

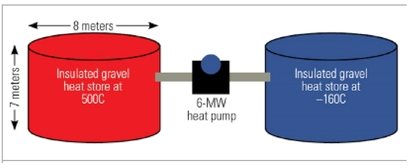
Very telling is a figure showing the various energy sources from PSCo (Colorado) at a certain day, and the problems caused by "excessive" wind power at a time of the day when it is not needed:



The red curve shows the difference between Supply and Demand: ideally it should be flat zero! Being able to store excessive wind (or solar) produced electricity gets more and more urgent. The absence of affordable storage possibilities is the biggest obstacle in implementing a larger share of these energy sources.

The POWER news report presents half a dozen storage techniques, some well known, and some very interesting. Absent is the Redox flow battery, which was much hyped a couple of years ago as THE solution for wind energy storage (see here).

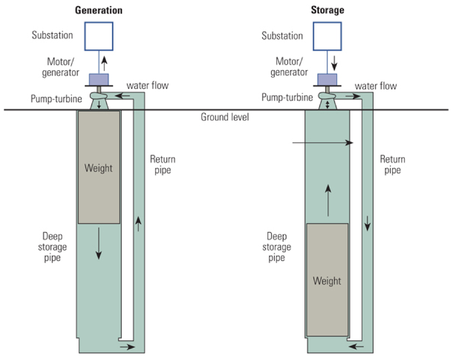
I like the simplicity of the **Isentropic PHES System**, which is simply two vast tanks filled with gravel: one will be heated by compressed argon up to 5oo°C, the other cooled down to -150°C. The temperature gradient will drive a heatpump-generator combination to generate energy; during storage the generator works like an electrical motor and the heat-pump as a compressor:



According to an interview with the director of Isentropic, such an assembly could deliver the same storage capabilty as a pumped storage reservoir requiring 300 more land area.

I remember well that using rocks to store heat from thermal solar collectors was fashionable in Sweden, up to the moment where the inhabitants became aware that these granite rocks delivered large quantities of radon gas too!

Another somewhat "sexy" system uses a 500m deep, 6m large bore-hole containing water and a large weight, which will push up the water into a turbine to produce electricity; for storage the turbine reverses as a pump (more here).



Whereas the price of a pumped storage installation is given as 100 $/KWh, those of the Isentropic sytem are said as low as 10 to 50 $/kWh; Power Gravity's system should be about 150 $/kWh.

Here in Luxembourg the SEO is augmenting its pumping storage reservoir by adding an 11th turbine rated 200 MW. Estimated cost is 150 million Euro (about 210 million US$), for a working time of about 4 hours, delivering 0.8*200*4 = 640 MWh per cycle (0.8 is the overall efficiency, slightly better of that of the solutions presented above): this would amount to approx. 328 $/kWh, so I am somewhat dubious on the costs given above. Anyway, as space is at premium in most European countries, small footprint storage solutions will probably be the only way to go to make wind and solar electricity more reliable and acceptable.

Related

Wind and Solar: Intermittency, storage and backup (part 1).
August 7, 2017
With 1 comment

CO2 avoidance by wind power
December 7, 2014

TIR_Lëtzebuerg 2016: the Rifkin report (part 1)
November 16, 2016
With 5 comments

This entry was posted on April 21, 2011 at 20:13 and is filed under Uncategorized. You can follow any responses to this entry through the RSS 2.0 feed. You can leave a response, or trackback from your own site.

Leave a comment