

Re: Research: Wind power pricier, emits more CO2 than thought

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On Jul 18, 12:36 pm, disgoftunwells <disgoftunwe...@xxxxxxxx> wrote:

On 18 Jul, 17:01, "rlbell.ns...@xxxxxxxx" <rlbell.ns...@xxxxxxxx> wrote:

– Nuclear – if you look at the cost models, the overriding cost driver is cost of capital. The French Government had a low cost of capital is therefore able to supply very cheap electricity. The next biggest variable is uncertainty over construction costs. I would expect nuclear to be cheaper than the current cost of wind power. However, Britain is not going to build more than a dozen nukes, which could provide a maximum of 40% of the electricity supply.

Did they pass laws banning the construction of more than dozen?

For better or for worse, in effect and by default, yes. (Except on the other side of the channel).

So, in truth, the UK has not irreversibly banned further construction.

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– Gas: Cheap to build, but very expensive to operate. Given current gas prices, on shore wind is cheaper. In future, gas should be used for peaking units (or for home power generation – where its efficiency can approach 100%).

When you talk about CHP and electricity production, at the same time, you must separate the heating efficiency from the conversion efficiency. You must also separate the electrical output from the heat output. As a heat source, they are expensive, but thermally competitive, however, their heating efficiency goes down when they are also producing electricity (but it does produce electricity). As a generator, they are comparable in output to a portable gasoline powered generator, except that they are less efficient and more costly (way, way too much waste heat). Their only excuse for existing is producing heat and power at the same time. Getting electricity out of them when they are not producing heat is really expensive.

I was looking for a cost competitive successor to the whispergen. That could be a fuel cell or a small gas turbine, producing about 25% electricity, 70% usable heat, and perhaps 5% waste (which is more than a condensing boiler).

Going by the spec/info (and interpreting them as optimistically as possible), the whispergen has an electrical conversion efficiency of (1kw electric and 7.5 kw heat) 12%— with a Sterling cycle! Sterlings are actually a really good choice, as a well designed installation, with appropriate duct work, can supply heat and electricity, draw power and pull heat in from outside, or draw power and pump heat out of the house. Another interpretation of the specs puts the efficiency up to ~18% (0W electricity and 7.5kW heat to 1kW electricity and 12.3kW of heat). While not as good as a Carnot engine, the Sterling is as good an engine as can be built (unless you care about size— they are very large for their output).

The words 'small', 'gas turbine' and '25% efficiency' do not go together. Much of the losses in a gas turbine arise from air slipping past the blade tips. Large gas turbines get around this by having a tiny clearance, relative to their blade length, but the smallest possible clearance gap is not that different for a two foot blade, as a two inch blade (once both units are at speed and up to normal operating temperature). Another loss is heat passing through the wall of the combustor, and out of the engine, before the working fluid gets to the turbine, which also unfairly penalises small units.

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I would like to be wrong, but does anybody make a gas turbine CHP unit under 50kW?

- Oil: Similar analysis to gas, but more expensive.
- Wind: On shore can supply competitively, but is space constrained.
Offshore not yet competitive, but the cost curve (ref discussion above about immaturity) is looking promising.
- Solar: Hugely expensive, but has the most promising cost curve, but mainly for countries with a lot of sun and where maximum demand correlates with maximum sun,

So I could see a rosy scenario where the UK electricity mix is 1/3 nuclear, 1/3 wind, 1/3 gas, with most of the gas being micro CHP. And a high capacity line to Norway, where surplus wind is used to pump water up mountains.

No, the ratios, as you describe them, are 1/2 nuclear, 1/2 wind, and 1/2 gas turbines (50% overcapacity);

Electricity supply 1/3, 1/3, 1/3. Small scale CHP is important in the winter, when the heat is used, making its effective/combined efficiency close to 100%. In summer, it's only used when the wind doesn't blow.

How is this implemented? The utility is being given the right to stop me exporting power when the wind blows in winter and to force me to export power when it is economically disadvantageous to me, in summer. If I have invested in CHP, what do I get out of it?

unless you are advocating both

really expensive peaking power and importing up to a third of electricity demanded at any given time. The norwegians are only going to buy surplus wind power kilowatt*hours if they are sold at less

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than the cost of hydro–electric kilowatt*hours, but they will sell the power back at peaking rates (that's the free market, for you).

No – less than the price of HEP KWhrs. The marginal cost of HEP is close to zero.

Norway will import surplus wind because for every KWhr they import (or produce), they can export about 0.8KWhrs. Obviously they have to make a margin on this, and there they have to compete with other storage means.

To add> insult to injury, if the high capacity line does not run directly to

Norway, under the North Sea, every utility along the way will charge for wheeling the power (as it reduces their transmission capacity, but does not supply them with power).

There would need to be a European, or North Sea HVDC grid. Nice thing is that laying HVDC at sea is cheaper than on land.

I can see a rosier picture with 100% nuclear producing hydrogen for fuel cells during the off–peak periods, and the fuel cells supply any needed peaking power (not as cheap pumped storage, but way cheaper than oil/gas peaking). Everybody pays less for electricity and there is hydrogen for their fuel cell cars.

Except Electricity to Hydrogen to Electricity is about 40% efficient, which is why most of the world is giving up on hydrogen.

Two and a half times the cost of a nuclear generated kWhr is still less than the cost of a peaking unit kWhr.

There are schemes like this

though: <http://www.vrbpower.com/technology/ess-specifications.html>

It would be interesting see what the cost is per GWhr of storage. If you were designing a HVDC grid (as a CEGB / French Government might, rather than having economics dictate it), it might make sense to have a few GWhr storage plants at the ends of the HVDC net.

Storage of real energy is less important for HVDC systems than a solid source of reactive power. Once you get past driving large motors, you really do not want to use inverters— they are too inefficient, so the receiving end of the HVDC link has to have enough reactive power to

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excite the rectifier bridge. HVDC links cannot transfer reactive power and both ends of the link are heavy reactive loads. Also, there is no coupling between the ends of the HVDC link, so weakness at one end cannot be assisted by stiffness at the other and the large inductance of the HVDC line will prevent fast power responses.

So if I was designing an HVDC grid, there would be large synchronous reactances to provide reactive power, and their rotational inertia would stiffen the grid long enough to adjust power distribution (alternatively, a diesel engine helps keep the system frequency from falling).