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

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- *From*: "rlbell.nsuid@xxxxxxxxx" <rlbell.nsuid@xxxxxxxxx>
- *Date*: Sat, 19 Jul 2008 16:26:54 −0700 (PDT)

On Jul 19, 2:27 pm, disgoftunwells <disgoftunwe...@xxxxxxxxxxx> wrote:

> On 19 Jul, 19:48, "rlbell.ns...@xxxxxxxxx" <rlbell.ns...@xxxxxxxxx>
> wrote:
>
>> On Jul 18, 12:36 pm, disgoftunwells <disgoftunwe...@xxxxxxxxxxx>
>> wrote:
>>
>>> On 18 Jul, 17:01, "rlbell.ns...@xxxxxxxxx"
>>> <rlbell.ns...@xxxxxxxxx>
>>> 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 that 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.

− 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 sperate the heating efficiency from
the conversion
efficiency. You must also seperate 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.
>>
>> I would like to be wrong, but does anybody make a gas turbine CHP unit under 50kW?

> Not sure. I've seen quite a few whispergen type units at about 10KWe − good for blocks of flats and small factories.

I went to Whispergen's website−> Homes −> on−grid and all they mentioned was the 1000 We unit.

> You mentioned earlier you expected a hydrogen economy. A better goal might be domestic fuel cells. These can convert gas to electricity at about 40%. Capturing the vast majority of heat should be trivial.

The only problem with the domestic fuel cells that you suggest is that they are dependant on a fossil fuel, natural gas, for their fuel supply.

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

> Gas would have to go up a lot more for that.

I said peaking power, not gas−fired combined cycle plants which are almost as bad at load following as nuclear plants. Generators that you can afford to switch on at a moments notice and turn off again after less than an hour are expensive per kilowatt and per kilowatt*hour

> And for storing energy a VRB unit will be much more cost effective than hydrogen.

If there is a market for hydrogen, the back−to−back conversion efficiency is less of a problem, as peaking power comes from temprorarily halting hydrogen production.

>>> 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 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).

> As I understand HVDC beats AC for lengths of more than a few hundred kilometres, or under water.

There are even special situations where it beats out AC for lengths of approximately zero km−− connecting 50Hz regions of Japan to the 60Hz regions (previously done by motor−generator sets that run at the same mechanical speed for the different electrical frequencies).

> The transfer of power is controlled by computer, rather than reactively following loads.

Not even a computer. There is effectively a knob that adjusts the trigger pulse for the thyristors. For steady state operation, the knobs at each end have to be at equal and opposite positions (after accounting for losses at the driving end). Not following loads is a feature when you want to avoid power wheeling, but a bug when trying to dynamically maintain system stability during an event.

> Any distribution system is limited in the power it can transport, so a storage system at either end can be useful.

Storage is usually some combination of limited availability (pumped storage), low efficiency, or high cost. For stability purposes, spinning reserve is good, sheddable loads are better, but fast responding peaking units will do

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