The Oil Drum: Europe
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

HYDROGEN - grease to the elbow of Scottish power?

Posted by Euan Mearns on October 15, 2006 - 10:49am in The Oil Drum: Europe
Topic: Alternative energy

In this short post I am inviting input from the TOD community on Scottish plans to become a "tour de force" in hydrogen fuel cell technology and as a hydrogen producer and exporter.

This is an excerpt from an article that appeared in The Press and Journal (October 11th 2006), a newspaper serving Aberdeen and northern Scotland.

> The vast economic and energy potential of hydrogen was revealed yesterday in a report which found that it could earn £500million a year for Scotland and sustain 10,000 jobs.
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> Hydrogen and fuel-cell technology will almost certainly have to be exploited if Scotland is to reach its target of 40% of energy coming from renewable sources by 2020, according to the report by the Hydrogen Energy Group.
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> Despite this, it warns that investment in the sector in Scotland, and the UK as a whole, has been "comparatively negligible" in stark contrast to the US, Japan and some other European countries.
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> The report states that the hydrogen economy urgently needs about £2.5million a year over the next three years. It recommends support for projects, including those for remote communities, and an inter-university research centre to create fuel cell and hydrogen-based intellectual property.
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> The group has submitted its report to the Forum for Renewable Energy Development in Scotland and Deputy First Minister Nicol Stephen, who is chairman of the forum, was keen about the prospects it set out.
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> He said he was committed to establishing Scotland as a European leader in renewables and eagerly anticipated making more progress.
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> The report estimates that the number of people directly employed in this sector will rise tenfold in a decade, from about 1,000 in 2010 to 10,000 in 2020. Some of the jobs will be in research and development and industry but there is also potential to work in community-led projects.
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> It adds: "To sustain this level of employment, Scotland will have to become a net exporter of hydrogen and fuel-cell skills and technology very similar to the level of expertise in the offshore oil industry that is in high demand from developing countries."
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> Hydrogen Energy Group chairman David Sigsworth said the report had identified ways in which Scotland could make "a unique contribution" to developing hydrogen and fuel cell technologies.
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> "Our renewables potential allied to the research undertaken in Scotland gives us the chance to develop technologies and systems which will have environmental and

> economic benefits," he said.
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> In a speech to the British Wind Energy Association's conference in Glasgow, Mr Stephen said the report further highlighted the potential for hydrogen.

Nicol Stephen: Deputy First Minister for Scotland; Minister for Enterprise and Lifelong learning; Leader of the Scottish Liberal Democrat Party. Committed to renewable energy and a hydrogen economy?

I am no expert on hydrogen fuel cells, which is why I invite input from the numerous renewable energy experts that post on TOD.

This much I do know:

The Second Law of Thermodynamics:

> The entropy of an isolated system not at equilibrium will tend to increase over time, approaching a maximum value.

Applied to any process of transforming energy from one sort to another, the second law states that some of that energy will dissipated as heat leading to an increase in entropy. In running hydrogen fuel cells, energy is lost during the manufacture of hydrogen from water or natural gas and more energy is lost during the fuel cell operation. What I've been told is that whole process may be at best 40% efficient meaning that 60% of the renewable energy input is dissipated and may be lost as heat.

So the key question is whether the production of hydrogen from renewable electricity combined with fuel cell technology is the most energy efficient and cost efficient way of mitigating the effect of variable power production from renewable sources?

The variable production of power from renewable sources may be mitigated in three different ways:

1) Storing energy

* Renewables - hydro pump storage schemes

* Fly wheels and compressed air

* Batteries (e.g. V2G - vehicle to grid)

* Domestic storage such as hot water

* Hydrogen fuel cells

2) Balancing power with existing generating capacity

* Renewables balanced with hydro

* Renewables balanced with coal*

* Grid interconnectivity - allowing for cross border balancing

3) Using energy on supply and not on demand

* Smart appliances - programmed to consume when supply is available

* Smart industrial consumption - energy intensive manufacturing using power on supply

* perhaps not ideal for reducing CO_2 in the first instance, but a potential way of allowing large penetration of renewable energy into a grid system.

It always struck me as odd when I started to read TOD that fuel cells were hardly ever discussed, and since, I have learned the reason for this is their high cost combined with poor efficiency. Ideal perhaps for spacecraft, but not very practical for every day use?

So why are we Scotts so keen on hydrogen? One reason might be that it was "The Hydrogen Energy Group" that wrote the report recommending more money be spent on hydrogen research.

Is the statement from the Hydrogen Energy group true?

> Hydrogen and fuel-cell technology will almost certainly have to be exploited if Scotland is to reach its target of 40% of energy coming from renewable sources by 2020

I am very interested to here the views of the TOD community on hydrogen fuel cell technology and how this measures up against the other strategies that are available for mitigating variable power out put from renewable energy sources.

Right now I have the very strong feeling that our government may be squandering resources and opportunities that would ensure the future security of our energy supplies and transport infrastructure. Unlike many of our politicians, Nicol Stephen is genuinely committed to renewable energy and to ensuring that we benefit from renewable energy and renewable technologies. Now is the time to ensure that the correct strategies are put in place.

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