

# analyst view

## Electrolysers for Renewable Energy Efficiency

22 MAY 2013



*Electrolyser stacks (Source: ITM Power)*

Faced on one side with [scientific consensus](#) on the cause of climate change and on the other by the [unchecked growth](#) of carbon dioxide emissions, the question of the moment is whether we will cut fossil fuel use in time to prevent unacceptable levels of climate disruption. But another question must be answered first: *can we?*

It just isn't possible to accomplish this solely through a simple substitution of coal, oil and natural gas with alternative energy sources. Fossil fuels have supported progress ever since the industrial revolution and they underpin the society we have today. This is a society that is accustomed to an abundance of cheap, concentrated energy and not one that has traditionally given much thought to careful husbandry of energy resources or to energy efficiency: it is incredibly wasteful. No other energy source can compete on this basis, so society must in effect reinvent itself in order to move away from fossil fuels.

How? By not only substituting sustainable energy for fossil energy, but by greatly increasing energy efficiency – especially pressing in the face of rapid population growth – and by maximising the benefit obtained from alternative energy resources. This requires a suite of new measures and technologies, within which I think fuel cells and their counterpart, electrolysers, will prove to be very valuable tools. In the case of fuel cells we have enumerated their advantages many times, but in essence it comes down to the efficiency and versatility of the technology. Our ancestors in the Palaeolithic had to rely on burning stuff for light and heat but we now have a more effective means to access the energy in chemical bonds and we should use it.

As for electrolyzers, they have a crucial role to play in harnessing renewable energy efficiently:

Part of the problem with phasing out fossil fuels is that these fuels are a massive reservoir of stored energy and we do not have equivalent reservoirs of renewable energy to draw on at will. The result is the bizarre situation we have today where electricity generated from wind and solar power – potentially our most valuable sources of sustainable, renewable energy – frequently goes to waste while fossil-fuelled capacity is growing. While there may be such a thing as excess renewable electricity, we need every bit of renewable *energy* we can get (as discussed in a [previous Analyst View](#)). But energy cannot be used efficiently if it can't be stored.

As we have discussed before, the problem is compounded by the variability and unpredictability of wind and solar power. The lack of a way to store this energy means that in practice the use of these sources will be severely restricted and we will have to rely more heavily on biomass and nuclear power, far beyond the point where these can be said to be 'sustainable'. There is no way around the fact that we need a carbon-free way to store energy in appreciable quantities for extended periods and to carry it to the point of demand. Far from being a speculative solution, hydrogen generated by renewably powered electrolysis of water is probably the only viable candidate here. Furthermore, the technology is available and can be implemented today.

While in my view any debate on the question of cost is not valid unless fossil fuel subsidies are taken into account, the use of electrolysis in this way is likely to pay for itself. This is because it will allow for a greater return on investment in renewable energy capacity on the ground. Typically, wind farms have capacity factors below 50% (often very far below), which reflect the limited useful capacity of these plants. Electrolysis could offer a way to increase this factor, generating more useful energy for the same investment in capacity. Upgrading of biogas or gasified biomass is another example: as-produced, these gas mixtures contain a significant amount of carbon dioxide which is valueless in energy terms. By reacting this CO<sub>2</sub> with hydrogen from electrolysis, the energy content of the gas is increased in a fully renewable way.

Electrolysis is thus at the heart of an integrated renewable energy solution that will allow us to significantly cut carbon in the near future. This is the subject of our latest report, '[Water Electrolysis & Renewable Energy Systems](#)', which we are launching today at [All-Energy 2013](#) in Aberdeen, Scotland – so come and pick up a copy from our stand (G60) if you are here, or you can download the PDF of the report from the Analysis section of our website.

This is my last Analyst View as I will be leaving Fuel Cell Today at the end of May after two-and-a-bit stimulating years, so I'll take this chance to wish you all well and thank you for your support.

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