

Energy in a Changing Climate

Addicted to Fossil Fuels

The recent oil spill catastrophe in the Gulf of Mexico could be an energy game changer. In a [speech](#) from the Oval office two weeks ago, President Obama urged a transition away from fossil fuels and towards clean energy. This raises three very important questions. What is clean energy? Which clean energy can really replace fossil fuels? And how much will it cost?

Our new prime minister might want to ask herself these questions as she plans her own actions on climate change.

The world is not only addicted to fossil fuels; it's addicted to a high standard of living delivered by cheap energy. Replacing fossil fuels means deciding on big changes to two large energy related sectors, electricity generation and transport. Poor decisions will seriously undermine our standard of living.

Let's look at each of those three questions in turn.

What is clean energy? Most people think of it as renewable energy. Some, particularly in the electricity generation sector, consider gas and "clean" coal to be clean energy. It is true that both gas and clean coal will produce much lower greenhouse gas emissions than black or brown coal. But are they clean enough?

The Treasury doesn't think so. Not if we want to stabilise greenhouse gases at 450 ppm. In its [Low Pollution Future Report](#) in 2008, the Treasury indicated that electricity emissions need to be below 50 kg per megawatt-hour globally by 2050. Based on current industry estimates, both gas and clean coal will fail this test.

Many forms of renewable energy will pass this test, depending on how they are used. But can they replace fossil fuels?

The simple answer is yes they can if they are used with plenty of expensive electricity storage. The tricky part is probably in transport where replacing oil will be a major challenge because of its high energy density. It seems likely that electricity will be the answer for transport either directly (as in light vehicles) or indirectly to artificially produce synthetic fuels for heavy vehicles. The problems to be solved are really all in the electricity sector.

What about the cost?

The most promising and mature renewable energy option for high capacity electricity generation is concentrated solar thermal power with adequate heat storage. It can technically replace both coal and gas – except perhaps over extended days of cloud. The issue is cost.

Recent estimates from The Australian Bureau of Agricultural and Resource Economics ([ABARE](#)) put the cost of solar thermal at six times the cost of coal. The solar thermal industry believes these cost will fall over time and ABARE has the cost dropping 25 percent by 2030 so it will only be 4.5 times the cost of coal – admittedly without a price on carbon. A carbon price of \$75 will lower the difference to 2.5 times.

These solar thermal costs do not include any additional reserve generation or electricity storage capacity needed to cope with extended, widespread cloud cover when a number of solar thermal plants may need to be taken offline.

We have other promising renewable energy options to replace coal. According to ABARE, hot rocks geothermal could be half the price of solar thermal by 2030 – if we ever get it working. This is anything but mature technology, so delivery and cost are somewhat uncertain but it's certainly worth keeping in the kitbag.

Other renewable technologies like wind and solar PV are mature but will probably be restricted to a relatively minor role because of the need for expensive storage. Energy efficiency and conservation can also help reduce demand for energy which will assist in the fossil fuel replacement process.

Managing reliability in an electricity network relying on variable renewable technologies will require a much smarter grid and extensive storage. Careful analysis will be needed to ensure sufficient storage is available to handle extreme adverse weather events such as widespread, persistent cloud over solar thermal plants. These will all add to the cost.

So where does that leave us?

We can possibly replace fossil fuels with renewable energy but we will pay a big price to make it work reliably. We could see electricity costs at least quadruple in real terms by 2030 and probably more. If geothermal comes good we might get away with less storage but the cost will at least double by 2030. Do we need to pay this price?

Well no. We have another mature technology which passes the emission test as well as any renewable energy option. Based on a recent analysis of 15 separate studies performed over the last 10 years, this mature technology will do the same job as new coal plants for about the same electricity cost with no future cost increase from a carbon price.

So why aren't we planning to use this technology? Most of the world already does and has plans to build a lot more plants to replace coal. The technology, of course, is nuclear power. No emissions in operation. Very low fuel cost. High reliability and no significant increase in energy costs. It really does not make any sense for this technology to be ignored in Australia.

Pursuing a 100% renewable energy option (with its inherent risks of failure) to replace fossil fuels could burden our grandchildren with significantly higher energy costs and a flow-on effect to their standard of living. Australia is a low-cost energy country. Why would we want to give up this commercial advantage unnecessarily? I don't think our grandchildren will thank us for it.

Written by Martin Nicholson and first published in On-line Opinion 6 July 2010