

REDUCING EMISSIONS IN THE ENERGY SECTOR

Discussion Starter by Dr Robin Batterham

Background/Context

There is a broad public dilemma with climate change: do we invest now or wait until the need is clearer? A focusing point here is that to stabilise CO₂, such that the rate of uptake by the planet and the total outputs are balanced, will require quite significant cuts to anthropogenic CO₂ output – of order 20% by 2020 and 50-60% by 2050. So, today's discussion is really about how to get there, with reasonable economics and timescales and, in particular, what should we do here in Victoria.

Globally, people talk about wedges, (see fig 1) where a wedge represents a reduction in CO₂ emissions of 4 GT CO₂/y by 2050 on a global basis. Arguments abound, but just to stabilise CO₂ so that inputs = outputs will require of order 8 such wedges. On a global basis, these wedges will be efficiency of use (especially new buildings), minimising use, clean hydrocarbon use (ie with carbon capture and storage), renewables such as wind, wave and tidal, solar, and in some places, nuclear.

Whether we like it or not, the wedge arithmetic says we will need all of these and on some fairly short timescales.

The Victorian situation

Considering energy efficiency and how people use energy (eg public transport and bicycles rather than cars), there is clearly a lot of scope in Victoria. That said, we need to look especially at the stationary power sector as:

- Distributed systems are but one of the wedges and the demand for stationary power is likely to continue for the foreseeable future.
- Over 95% of our electricity in Victoria comes from brown coal with its correspondingly high CO₂ emissions.
- Most of the plant still has a long economic life left and, we are likely to need at least one major plant to be started within the next 5 years.
- Carbon capture and storage (CCS) may mean that it is faster to decarbonise the power industry than the transport industry or the rebuilding of our houses and buildings.
- Closing some of the base loads to reduce Victoria's emissions is pointless if it merely shifts production to other parts of the globe.

So a focussing question:

How can Victoria decarbonise its power industry economically and on a time scale compatible with climate concerns?

In answering this question, some generic as well as Victorian factors are relevant.

Most of the wedges involve new technology. We need to speak the language of the Grubb curve (fig 2), which shows how costs (or estimates of costs) vary as one moves from research to development to demonstration to deployment to maturity.

While R&D and Demonstration at significant scale are important, the lesson of history for any major new technology is that the first few full commercial scale applications are much more expensive and carry much higher risks than subsequent plants – the learning by doing factor. This all suggests we have to discount some of the optimism of those who are pushing new technologies and equally, discount some of the forward projections of cost reduction from those that have been in the market place for many years.

A key question for Victoria, is:

What is the role of the Victorian Government in bringing on new clean power technologies (given ETS)?

There is little doubt that an Emissions Trading Scheme (ETS) is going to put signals in the market place that will change how we use energy and how we generate electricity. But will it be enough to drag the new technologies through the Grubb maxima? Prof Mazzotti gave the EU position at the Global Roundtable on Climate Change in New York, Feb, 2008, noting “ the first full scale demonstration plants will not happen without extra funding.” Equally, Socolow represented the US position in that while a CO₂ price will drive investment decisions, further enticements are needed to overcome first mover costs at full scale.

My own view is that if prices on carbon are \$40 – 50 per tonne of CO₂, the incentives for individual companies to enter the field are insufficient , even with carbon trading – is this a State matter or shared between industry, Australian Government and State Government? How do we drive transformation here in Victoria - even given ETS - to effect change and to avoid stranded assets (whether they be brown coal, wind, solar or whatever)? Perhaps there is a role for Victoria to drive an agenda through COAG or a Summit to bring in economic measures that will drag investment through the peak of the Grubb curve (full scale implementation), perhaps through accelerated depreciation?

Options for moving forward

A lot of the debate on options comes with promissory notes from providers of new approaches, caution from investors (including government) over picking winners and a certain amount of zeal as to the imperatives driving the selection process. Applying the sobering blanket of economic rationalism suggests that cost comparisons are central to the choices we make. Unfortunately, costs of generation have risen so much in recent years that comparisons become very difficult. Even so, EPRI suggest that there is little difference between most of the options.

Building standards, renewables for desalination, encouraging the use of public transport, support for solar installations, for Carbon Capture and Storage (CCS) and others are all on the Victorian Government list for support, in line with the principle of backing timely and economic options.

But there is an elephant in the room: Victoria has a cheap, large, long life brown coal base for its power industry and as well would appear to have a terrific reservoir for CCS in the depleted oil and gas fields and saline aquifers of Bass Strait.

CCS is thus a key technology for Victoria and the demonstration scale activities at the CRC for CO₂ capture and the Monash project are highly relevant. Capture and storage has many issues which will require time to be addressed - delineation of reservoirs, permitting, public acceptance, safe operations, monitoring, long term sealing.

What partnerships are needed to make this happen in the timeframes and at the scale required? Where you have a very large resource offshore which can handle multi-permitted projects, what is the best model to fast-track development in the national interest? Given the public benefit involved, what is a reasonable position for the holders of existing petroleum leases? These questions need to be addressed and will require co-operation between the Victorian and the Australian Government and various companies. Is there a need for a National Carbon Regulator? How does Victoria best tap into and support other initiatives such as Futuregen?

Finally, CCS for coal fired power plants has a cost advantage for a new plant (IGCC) compared with retrofitting to existing plants. This stems from the reactions and separation being carried out under pressure, hence in smaller equipment and obviating final compression costs when compared with retrofitting. The key technology elements for new plants (IGCC) are also further along the Grubb curve. Given Victoria's current reliance on brown coal, this raises the question:

Should carbon capture and storage be mandatory for existing and new power stations?

The answer will be determined by what economic incentives can be put in place to drag the technology through the peak of the Grubb curve. Without incentives there is little chance of implementation without a price on carbon much higher than that discussed here. It will be simpler to concentrate initially on new plants as the technology on the capture side is more advanced and the exercise will allow the unknowns on the storage side to be worked through. Overseas there are moves to make capture mandatory for new plants in a few years time, not just "capture ready".

Finally, there is the topic of what alternatives over and above CCS should be used to reduce emissions in the power sector. Given the costs of first plants at full scale and the number of alternatives, it is clear Victoria must limit its choices or, sit back and wait until the rest of the world goes through the learning by doing exercise. This is hardly a responsible position. One way forward is to concentrate on areas where Victoria has some competitive advantage: inland solar may be an example, as is our leading edge expertise in solar ponds. Finding a reasonable geothermal resource (probably hot wet rocks) near to a significant energy load would make sense, e.g. the Otway Basin. So while it is legitimate to ask the question:

Should Victoria focus on brown coal or spread its effort more broadly (across alternatives)?

The answer is likely to be limited if we seek solutions that give us competitive advantage.

Critical questions for Victoria

- Q (1) How can Victoria decarbonise its power industry economically and on a time scale compatible with climate concerns?
- Q (2) What is the role of the Victorian Government in bringing on new clean power technologies (given ETS)?
- Q (3) Should carbon capture and storage be mandatory for existing and new power stations?
- Q (4) Should Victoria focus on brown coal or spread its effort more broadly (across alternatives)?

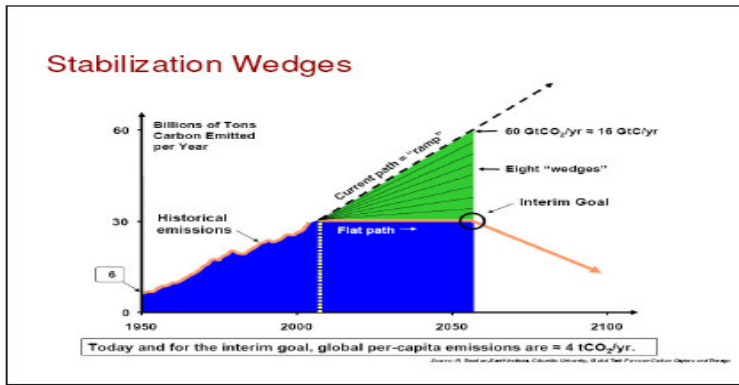


Fig 1 - Definition of a wedge

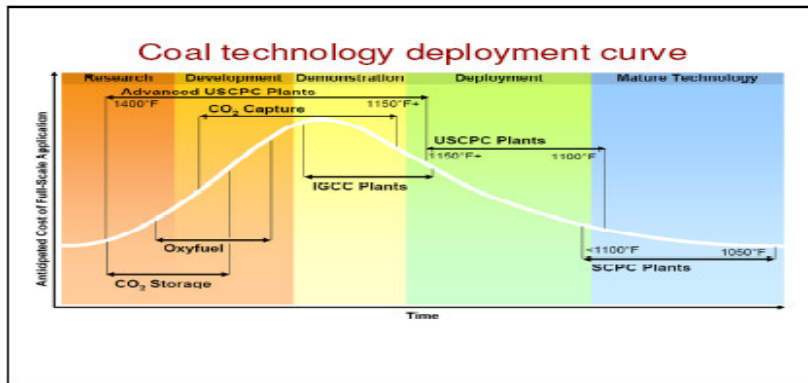


Fig 2 - Grubb curve for technology deployment

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This discussion starter has been prepared by Dr Robin Batterham to stimulate ideas and debate at the Victorian Climate Change Summit. It is not a statement or policy paper by the Victorian Government.