Feedback re Infrastructure Victoria Towards 2050 Gas infrastructure in a zero emissions economy – interim report

Submitted by Alan COUCHMAN, [redacted]

[1] In Victoria the regulations regarding the installation of flues for gas heater etc. and the cost of gas fitters make a central space heater a poor and expensive choice when upgrading domestic heating. So, as a renter, when the gas-space heater in our rented house was deemed to be producing unacceptable levels of carbon monoxide, I volunteered to install four reverse cycle air-conditioners (two console units and two conventional, up-on-the-wall units) in the bedrooms of our rented house. The old space heater was disconnected from the gas supply but left in place, o there was no removal cost. My personal experience is that, while the floor-level console units are twice were twice as expensive ($1600 versus $800 per air-conditioner), I would never again install a conventional, up-on-the-wall unit. For winter heating purposes the floor-level console units are definitely far superior, because, unlike the up-on-the-wall units, the action of the floor-level console units is to take in the coldest air (the air sitting at the bottom of the room), heat it and circulate it. This is most important for humans, who often feel cold when their feet or ankles, or legs are cold. This action of the console unit both removes the coldest air from the bottom of the room and circulates warmed air quickly. Instinctively, the two young women in our household were adamant that they had to have the bedrooms with the console heaters. They appreciate a good heater.

My first submission is that, while domestic gas use is only 20% of total use, a scheme that enables landlords and tenants to cooperate in replacing gas space heaters with reverse cycle air-conditions would be a win-win strategy. In that replacing a central gas space heater with individually air-conditioned in bedrooms in rental tenancies, would (1) substantially lower the risk of fire, (2) replace consumption of gas with consumption of electricity, [3] make more efficient use of the heat; as separately regulated units can meet the individual needs of the occupants (bedroom), rather than attempting to do so while heating an entire dwelling, and [4] would raise the quality of life/standard of living of people who rent their living space.

[2] My second submission is that, a retrospective labelling/certification (by linking brand, make, model to identify the heavy metal content of panels) could simplify the end-of-life disposal as it would facilities correct disposal combat cross contamination.

Solar panels are clean in as far as they convert solar energy to electricity, but their end-of-life disposal is problematic, because as I understand it, solar panel wafers use heavy metal cadmium and lead in their construction. Heavy metal pollution from end-of-life disposal of solar panels is an example of Herbert Marshall McLuhan's "the medium is the message": the heavy metal pollution in solar panels is an unintended and unanticipated consequence of the adoption of the technology. We need to recognise and plan for end-of-life disposal at outset.

[**Why is cadmium in solar panels?** Benefits. The benefits of CdTe thin-film solar cells include: High absorption: **Cadmium telluride** is a direct-bandgap material with bandgap energy that can be tuned from 1.4 to 1.5 (eV), which is **nearly optimal for converting sunlight into electricity** using a single junction.]

[**Why do solar panels have lead in them?** Lead is the ideal material for this process because of its **melting point**. **The presence of lead allows for a lower process temperature** during stringing, which reduces the stress placed on cells.]

[The industry standard life span is about 25 to 30 years, and that means that some panels installed at the early end of the current boom aren't long from being retired.]

Solar Panel Waste: The Dark Side of Clean Energy By Conor Prendergast Dec 15, 2020 5:28 AM
https://www.discovermagazine.com/environment/solar-panel-waste-the-dark-side-of-clean-energy
Tons of solar panels installed in the early 2000s are reaching the end of their lifecycles, posing a serious problem for the industry to contend with. Current solar panel disposal practices are far from being environmentally friendly.

California Rule Facilitating the Recycling of Solar Panels Takes Effect January 1, 2021
https://www.jdsupra.com/legalnews/california-rule-facilitating-the-40963/
This is the first rule in the country to identify solar panels as universal waste to reduce management burdens and facilitate recycling. Starting on January 1, 2021, decommissioned solar panels will be regulated **like other universal wastes** in California, **which include batteries, electronic devices, mercury containing equipment, lamps, cathode ray tubes, and aerosol cans**. The new rule will make it less expensive and burdensome to collect, process and recycle them. The new CA regulation that will become effective January 1, 2021 is posted on Department of Toxic Substances Control (DTSC)'s website at https://dtsc.ca.gov/regs/pv-modules-universal-waste-management/.

May 9, 2019, 12:45 am
https://www.insidewaste.com.au/index.php/2019/05/09/unsw-examines-barriers-and-opportunities-in-recycling-end-of-life-pv/
CheeMun Chong, co-author of the UNSW study, titled A techno-economic review of silicon photovoltaic module recycling, and professor at UNSW's School of Photovoltaic and Renewable Energy Engineering, said that a lot of countries are now starting to catch on to module recycling.

Conditions identified for improving the viability of recycling include:
Regulations that discourage landfill as an option;
Simplified and improved recycling processes focused on increasing rates of materials recovery, particularly of silver and intact silicon wafers;
Potential changes to module design that better facilitate recycling;
A co-ordinated approach by governments and recyclers to building the recycling network; and
Consideration by manufacturers of how to incorporate second-life materials into their production lines.

[3] My third submission is that the quantities of carbon dioxide (CO2) released during extraction and production of liquid Liquefied natural gas (LNG) should be assessed and monitored.

https://www.abc.net.au/news/2020-11-03/fact-check-is-gas-just-as-dirty-as-coal-adam-bandt/12838066

Adam Bandt says gas is just as dirty as coal. Is he correct?
RMIT ABC Fact Check
Posted Tue 3 Nov 2020 at 8:59am Tuesday 3 Nov 2020 at 8:59am, updated Fri 6 Nov 2020 at 8:49am
Greens leader Adam Bandt says coal is just as dirty as gas. RMIT ABC Fact Check finds that claim to be oversimplified. (ABC News: Nicholas Haggarty)

Gas extraction can also involve the release of significant amounts of carbon dioxide. In Australia and elsewhere, there has been significant debate about fugitive (and deliberately released) emissions linked to gas extraction, processing, storage and transportation. An October 2016 study conducted by the Melbourne Energy Institute, at the University of Melbourne, warned there was "significant uncertainty" surrounding estimates for methane emissions from gas production, with "no comprehensive, rigorous, independently verifiable audit of gas emissions".

Hugh Saddler, an associate professor at the Crawford School of Public Policy and a research associate at the Centre for Climate Economics and Policy, said the question of whether gas was just as dirty as coal depended partly on the question of how much gas leaked into the atmosphere during the extraction and transformation of gas. "I've not ever seen any data which suggests leakage from wells or pipelines or processing is large enough to offset the advantage that gas has compared to coal when it is burned," he told Fact Check. But Associate Professor Saddler said it was difficult to get accurate measurements, with there being a lack of scientific work to measure leakage into the atmosphere in an Australian context.

However, Santos's Barossa gas project which will extract gas from under the Timor Sea, 300 kilometres north of Darwin, was the subject of an abc news reported, that revealed that the gas from the Barossa had exceptionally very high level (18 per cent) of carbon dioxide, CO2, which does allow us to put a figure on the volume of CO2 that is likely to be released to the atmosphere by the average LNG gas extraction process here in Australia, of 1.5 x 0.35 / 1.6 = **0.23 tonnes of CO2 equivalent for every tonne of LNG.**

https://www.abc.net.au/news/rural/2021-06-24/santos-barossa-gas-carbon-emssions-twiggy-forrest/100224254
ABC Rural / By Daniel Fitzgerald
Posted Thursday 24 Jun 2021 at 8:17am, updated Thu 24 Jun 2021 at 9:58am

Santos bought the Barossa project from US gas giant ConocoPhillips in May 2020. Before it sold Barossa, ConocoPhillips filed its project proposal to the federal regulator, **which predicted the gas field would produce 1.5 tonnes of CO2 equivalent for every tonne of LNG**. But chief executive Kevin Gallagher told a news conference last week the company's plans for Barossa would reduce its estimated carbon emissions 25 per cent on ConocoPhillips' estimates.

https://reneweconomy.com.au/santos-signs-off-on-nt-gas-project-labelled-a-carbon-emissions-factory/

According to analysts, the Institute for Energy Economics and Financial Analysis (IEEFA), the Barossa gas field contains so much carbon dioxide that the mere extraction of the gas will result in the release of a greater volume of greenhouse gases than the volume of useable fossil gas produced from the gas field. IEEFA estimates that the Barossa gas field will directly result in **the release of 3.38 million tonnes of carbon dioxide each year**, along with a further 2.05 million tonnes of carbon dioxide released from the Darwin LNG plant during the processing of the gas. "Barossa gas has 3 times the CO2 content that the Darwin LNG plant facility can handle," **IEEFA analyst John Robert** said. "[Barossa's carbon emissions] would be **about twice the current Australian LNG industry average**," he said. "But, if a 25 per cent reduction in emissions could be achieved, Barossa would **still be about 60 per cent higher than the average today**."

Added note regarding carbon capture and sequestering technology in Australia.

The Callide Oxfuel Project was technologically the best attempt at clean-coal and the practicality of carbon capture and storage (CCS), and it found to be uneconomical.

https://www.csenergy.com.au/what-we-do/generating-energy/callide-power-station/callide-oxyfuel-project

Carbon capture and storage in Australia
https://en.wikipedia.org/wiki/Carbon_capture_and_storage_in_Australia

The Callide Oxyfuel Project (near Biloela in Central Queensland) demonstrated the production of electricity from coal with almost no power station emissions to the atmosphere by capturing a major portion of the flue gas CO2 as liquefied gas. The project demonstrated more than 10,000 hours of oxy-combustion and more than 5,000 hours of carbon capture. The project was a joint venture partnership comprising CS Energy, ACA Low Emissions Technologies (ACALET) (now called COAL21), Glencore, Schlumberger Carbon Services, and Japanese participants J-Power, Mitsui & Co., Ltd and IHI Corporation.

Carbon dioxide captured during the Callide Oxyfuel Project was also used in a test CO2 injection of at Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC)'s Otway Project site in South Western Victoria. These tests are being used to evaluate the geochemical and physical behaviour of CO2 within the storage rock.

In 2017, Martin Moore, chief executive officer of project proponent CS Energy said of the Callide project: We proved that technologically it's possible to retrofit CCS to existing coal-fired plants, **but commercially, the numbers don't stack up** … It's unlikely there will be [a commercial operation for CCS in Australia], I think that technology may well be bypassed … **simply because of the economics**. … If you could decarbonise coal by capturing and sequestering the emissions, then you'd have clean coal. It sounds easy if you say it fast enough, but it's not that simple.