Input from Victorian Bioenergy Network to the draft Gencost 2021/22 report

The Victorian Bioenergy Network has provided input to several of the past Gencost draft reports and in these has provided information on biomass fueled generation plants, mainly in Europe and Australia, plus capital cost estimates from at least one of the world major players in biomass-fueled combined heat and power.

The VBN has also highlighted the issue that only woodchip is used as a biomass feedstock in Gencost reports to date, ignoring the other significant feedstocks available in large volume and low cost of straw, putrescible wastes to anaerobic digestion, and non-recyclable combustible municipal waste.

While previous reports have highlighted hydrogen, they have ignored biogas and biomethane, and the biofuels including ethanol, HEFA diesel, DME and pyrolysis oil (all of which are either in wide use overseas as low emission fuels or are in commercial development).

So it was good to see in the early draft of the 2021/22 report that some of these omissions were being looked at, and that the biomass capex figure is slightly closer to real figures demonstrated by recent industrial examples. We sent in some comments on this. We note that continued use of inaccurate capex figures does still result in LCOE figures that are significantly higher than those used by NREL, IEA and IRENA. This is a major failing of this report.

One issue the VBN has had with the figures in the Gencost report is that the capex figures given are for $/kW-e capacity, and capacity factor is usually not given or the capex for kW-e produced (i.e., $/kW-e capacity divided by capacity factor). Figure 2.1 shows that this is ongoing in this report, and it is likely to suggest to the less technically trained readers that the costs for wind, solar, etc., are far less than the costs of generation of power from coal. This is particularly relevant considering the variable and/or intermittent nature of wind and solar PV, and the capital costs of equipment and system critical in providing balancing power at short notice. This system of showing only the installed capacity capex continues in B.1. Notably biomass-to-power is absent over the years of reports despite its mature development around the globe, while solar thermal (CSP) is included despite its low take-up around the globe.

Another issue has been the apparent lack of understanding of the different capex figures in $/kW-e for biomass plants designed to run in condensing mode vs combined heat and power mode. The capex per unit of power produced is far lower (30-50%) for condensing plants.

In response to the questions posed:

Do the scenarios adequately explore the plausible range of outcomes with regard to technological change of known technologies? *The various mature biomass-to-power technologies are ignored other than the woodchip-fueled furnace/boiler/turbine option*

Are the updated current capital cost assumptions reflective of recently deployed project costs*? No. Real-world capex for biomass power is significantly lower.*

Are the inputs and assumptions for the currently capital cost projection model reasonable? *Not for biomass to power*

Are the inputs and assumptions for the levelised cost of electricity calculations reasonable? *Not for biomass-to-power*

In the Dec 21 draft report the assumptions that underlie some points in the Executive Summary are most questionable (it is stated later that these are used in IEA reports), including that achieving global NZE 2050 necessarily relies on widespread use of hydrogen and transport electrification (the examples of many countries show this is not the case, with Finland aiming for carbon neutrality by 2035 without reliance on either hydrogen or vehicle electrification. Sweden is similarly advanced, as are Latvia and Austria. None of these countries see electrification of all energy as being the solution).

General comments

Figure 0-1 still seems to show biomass to power LCOE being calculated under old capex figures that are up to double the real figures of $3500-$4500/kW-e. Biopower LCOE should be in the range $90-110/MWh, depending on fuel cost. Where the fuel is a valueless by-product of the industry (sawdust, chip, bagasse, nut shells) then cost per MWh is at the low end of this range or even less.

In section 4.2, biomass with CCS is mentioned but that it is not being developed. Frankly it is nonsensical that it is mentioned regardless of its inclusion by IEA in their work. As said previously in input to draft Gencost reports, biomass to power is already nearly carbon neutral, and this is the technology (usually as combined heat and power plants) that is widespread around the world. When the feedstock is a by-product of something like sawmilling or sugar production the supply of the feedstock (bagasse or sawdust) essentially has no carbon 'cost' to its sourcing. When the feedstock is linked to something like expanded farm forestry or reforestation, then the sequestered carbon in the feedstock annually removed is only a tiny fraction of the net carbon being sequestered in the growing trees (which is a low cost form of bio-CCS). I'd suggest CCS in connection with biomass power should be better replaced with better information on biomass-fueled combined heat and power.

In the Appendix Data Tables, Table B.1 gives a capex for small biomass (30 MW-e) of about $7000. Yet, on a number of occasions VBN has supplied data showing capex of current installations in Australia of between $3500-4500/kW-e, for plants of this size or smaller. One of the Australian sugar industry's latest bagasse-fueled CHP plants had a capex of under $3600/kW-e. It needs to be noted that this is a CHP plant, and if all heat energy went to power production, the output would be significantly higher, and so the capex/kW-e significantly lower. Completed in mid-2018, the MSF Tableland plant puts out 24 MW-e and cost $86 million. https://www.msfsugar.com.au/tableland-green-energy-power-plant/.

It also has to be noted that in Table B.8 the capacity factors used for the biomass plant of 60% or 40% are not sensible and normal commercial biomass CHP plant are commonly showing CFs of 80-95%. Similarly the efficiency figure given of 29% is lower than normally found in plants of this size, with 30-35% being common for ultra-super-critical CHP plant, and 40-45% for similarly high efficiency biomass fueled plants in condensing mode.

In C.3 (Has the potential to be either globally or domestically significant). Biomass to power is left out despite biomass being the source of 12.5% of Denmark's power, up to 19% of Finland's, and 10% of Germany, Sweden and Austria's. In most of these countries biomass-to-power is being developed to provide up to 15% or more of power demand by 2030, and to help balance supply from the variable renewables. Biomass is also being used as a significant source of renewable power in China, India, Spain, Brazil, and many other countries.

Puzzlingly, again biomass as a source of power yet again is given little consideration here in this report, despite Australia having very large amounts of economically available and sustainably sourced biomass, despite biomass providing over 15% of Queensland's renewable electricity (plus major amounts of industry heat and transport biofuels), despite the various bioenergy technologies being able to provide dispatchable power - including relatively low cost peaking power, despite the fact that the main bioenergy technologies have been proven, including in Australia, for over 50 years, and despite the fact that the feedstock can be put in an energy-densified, readily transportable and storable form.

It was hoped that this 2021/22 draft report would finally include some information on anaerobic digestion to biogas/biomethane (source of over 5% of Germany's power, and replacing all natural gas in Copenhagen's gas grid by 2022, and being developed on a major scale in the UK, France and China), on biofuels (providing over 20% of all transport fuel in Sweden and Finland), and on waste-to-energy (source of 4-8% of power across the industrialised EU countries, with at least half of this waste fuel being biomass (www.cewep.eu)). All these technical options are mature, are cost-effective ways to produce low emission power, are developed to a large scale elsewhere, yet are continuing to be overlooked in this report.

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