

From: Louis Wibberley
Sent: Wednesday, June 25, 2014 2:12 PM
To: Paddy Manning
Subject: BREE LCOE data

Paddy this is a grab from the 2012 BREE report - being used by the IEA who are presently assessing MRC-DICE.

The capital cost data includes a high contingency factor because of the newness of the technology - and is around 20% higher than MAN's more recent estimates. But gives a good result even so. DICE is 6th from left in top graph.

While BREE was a good first attempt, there has been a lot pressure on them to value energy security and flexibility, to cost backup, and increase the escalation of gas prices. Maybe in the next update.

Note that I think that the Variable op & maintenance cost value should be 10, not 10%.

BREE

In 2012, the Bureau of Resources and Energy Economics (BREE), of the Australian Government, conducted a techno-economic assessment of MRC-DICE, assuming that it has been commercialised by 2020. Using CSIROs capital cost of 1,600 A\$/kW for a 100MW engine, the balance of capital costs, including local equipment, labour and owners costs, increases the turnkey capital cost to 2,285 A\$/kW. Table 1 lists the assumptions made for DICE. Assumptions for MRC? (BREE, 2012).

Table 10 - Assumptions in BREEs techno-economic analysis of DICE (BREE, 2012)

Capital cost

2,285 A\$/kW net

Local equipment/construction costs (includes commodities)

22%

International equipment costs

70%

Labour costs

8%

Engineering procurement contractors (EPC)

95%

Owners costs

5%

Construction profile % of capital cost

100% in year 1

First year available for construction

2020

Typical new entrant size

300 (3 x 100MW units)

Economic life

25-30 years

Lead time for development

1 years

Average capacity factor

83%

Thermal efficiency (sent out - HHV)

50%

Thermal efficiency learning rate (sent-out HHV)

0% improvement per annum

Auxiliary load

5% (assumes no fuel processing)

Fixed operational and maintenance costs (\$/MW/year) for 2012

150,000

Variable operational and maintenance (\$/MWh sent out) 2012

10%

Percentage of emissions captured

0%

Emissions rate per

700 kgCO₂/MWh

The techno-economic analysis based on using Victorian LRC shows that the levelised cost of electricity (LCOE) in Victoria should be 129 \$/MWh in 2020, which increases with time as shown in Table 15.

Table 11 - Current and forecast gas prices (BREE, 2012)

LCOS (A\$/MWh) for Victoria

2020

2025

2030

2040

2050

Without carbon tax

89

90

92

96

99

With carbon tax

129

143

157

184

Figure 1 shows the projected LCOE for DICE and other technologies for New South Wales (Australia) with a carbon price. DICE has a LCOE of 105-145 \$/MWh, which is the 7th lowest out of 29 technologies that were assessed.

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Figure 1 - LCOE for DICE and other technologies for 2020 in Australia (BREE, 2012) Figure 2 shows the projected LCOE for DICE and other technologies in Australia in 2025 without a carbon price. DICE has a LCOE of 75-110 \$/MWh, which is the 4th lowest out of 40 technologies that were assessed.

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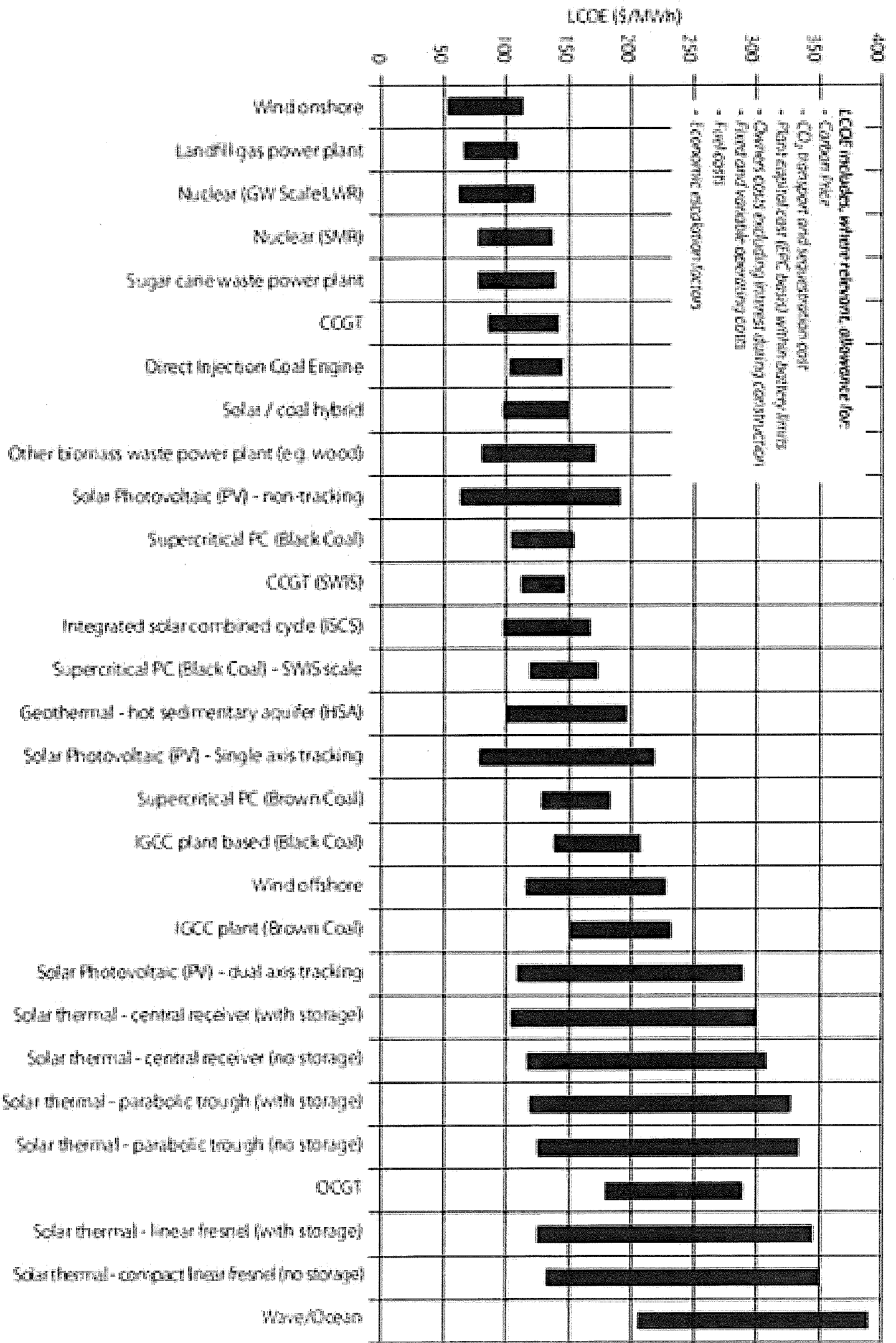
Figure 2 - LCOE for DICE and other technologies for 2025 in Australia (BREE, 2013) Figure 3 shows the projected LCOE for DICE and other technologies for New South Wales in 2050, where DICE has a LCOE of 152-235 A\$/MWh, which is the 19th highest out of 40 technologies that were assessed. Supercritical black coal is projected to cost 148-240 A\$/MWh. This figure assumes carbon taxes which commercialise CCS, thus favouring low carbon technologies, such as solar, nuclear, gas and coal with CCS.

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Figure 3 - LCOE for DICE and other technologies for 2050 in NSW (BREE, 2012) Figure 4 shows the projected LCOE for DICE and other technologies in Australia in 2050 without a carbon price. DICE has a LCOE of 80-130 \$/MWh, which is the 10th lowest out of 40 technologies that were assessed. Despite no carbon tax, solar energy is projected to have the lowest costs.

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Figure 4 - LCOE for DICE and other technologies for 2050 in NSW with no carbon price (BREE, 2013)



LCOE FOR 2050 TECHNOLOGIES (NSW*)

* Note: Default region is NSW except brown coal technologies (VIC) and SWIS scale (as specified)

