



CARBON INTENSITY OF SOUTH AUSTRALIA'S NEW ELECTRICITY GENERATION

DISCUSSION PAPER

1. Context

Governments around the world are pursuing multiple strategies to de-carbonise their economies. Most of these strategies revolve around moderating demand growth by making consumption more efficient and making supply cleaner by supporting renewable and other clean forms of energy generation.

One strategy for supporting cleaner energy generation is to reduce the levels of carbon intensity of electricity generation. This can be achieved as part of a strategy for achieving overall national carbon limits such as those set by the European Commission or by regulating emissions intensity directly such as California is doing with its limit of 0.5 tonnes of CO_{2e}/MWh.

In Australia, four jurisdictions have indicated an intention to intervene in this area – the Commonwealth, Victorian, Queensland and South Australian Governments.

On 30 November 2010, the Commonwealth Government released its Interdepartmental Discussion Paper on the carbon intensity of electricity from coal-fired plant¹.

The previous Victorian Government proposed to set a specific level of 0.8 tonnes of CO_{2e}/MWh for new coal-fired power stations. The Queensland Government also foreshadowed setting limits for new coal-fired electricity generation.

The aim in all three cases is essentially to ensure the carbon intensity of the performance of new coal-fired electricity generation meets international best practice.

South Australia's case is different. On 6 December 2010, Premier Mike Rann announced that the South Australian Government would be initiating consultation over an emissions intensity limit which would effectively prevent the construction of new coal-fired electricity generating plant in the State.²

The Government's announcement reflected both its determination to de-carbonise the State's economy and important differences between the configuration of its electricity generation compared with the Eastern States.

¹ Commonwealth Government "A Cleaner Future For Power Stations – Interdepartmental Task Group Discussion Paper" 30 November 2010.

² "Carbon Limit for New Electricity Production", News Release from Premier Mike Rann, Monday 6 December 2010

**Electricity Generation by Fuel
(000's of GWh – 2009/10 – scheduled and semi-scheduled)**

	Coal	Gas	Wind	Other
NEM (excl SA)	166.0 (86%)	14.2 (7%)	-	12.0 (6%)
South Australia	4.7 (34%)	6.6 (48%)	2.5 (18%)	-

Source: AEMO Electricity Statement of Opportunities 2010

South Australia's proposed maximum standard is significantly tougher than those specified by the Commonwealth and Victoria. It is also more comprehensive as it applies to all forms of electricity generation, not just coal.

The overall objectives are to:

- support the State's renewable energy target of having 33% of domestically-generated electricity coming from renewable sources by 2020; and
- create a comparative advantage for the South Australian economy in terms of the carbon intensity of its products.

Electricity is only one of the factors in the production process. However, it is generally one of the most carbon intensive. It is also the carbon variable over which producers of goods have least control.

By Australian standards, South Australia is already relatively well-positioned as a result of its heavy reliance on gas-fired electricity generation and wind power. This trend can be expected to continue to work in the State's favour as the State continues on its path to have 33% of its electricity coming from renewable generation by 2020.

A study commissioned from McLennan Magasanik Associates (MMA)³ included the following projection:

**Emission Intensity – Australia and South Australia
(tCO_{2e}/MWhso)**

	2008	2020
Australia	0.88 ²	0.79 ¹
South Australia	0.67 ³	0.53 ¹

¹ MMA : "Projected Carbon Intensity for South Australia Renewable Energy Target in 2020." CPRS 5 scenario. February 2010.

² IEA Statistics: CO₂ Emissions from Fuel Combustion – 2010 Edition

³ Inferred from data supplied to AEMO (SA Supply and Demand Outlook 2010) and DCCEE (State Greenhouse Gas Accounts)

³ "Projected Carbon Intensity for South Australian Renewable Energy Target in 2020" by McLennan Magasanik Associates, February 2020

The projected outcome for South Australia in 2020 would bring the State into line with the average for the developed world at present⁴.

Carbon Intensity of Stationary Energy Generation¹
(tCO_{2e}/MWhso 2009)

World	0.507
OECD	0.564
Australia	0.987

¹ IEA Statistics: CO₂ Emissions from Fuel Combustion – 2010 Edition

The South Australian Government considers that there is a competitive advantage to be established for the State's economy from increasing renewables and constraining the carbon intensity of fossil fuel electricity generation.

To that end, the Government is setting an emissions intensity limit on new generation and adopting an emissions intensity target for all electricity generated within the State. That target is 0.5 tonnes of CO_{2e}/MWh by 2020. The consulting advice received suggests that this is a credible but stretch target.

Achieving that target will require more than growing the renewable energy sector. It will also need greater carbon efficiency in electricity generation from fossil fuels. Setting a limit of 0.7 tonnes of CO_{2e}/MWh for new, utility-scale power generation is a first step towards achieving that goal.

2. Setting the Limit

Premier Rann's announcement of 6 December 2010 indicated that the Government intended setting an emissions intensity limit and that the starting point for consultation would be 0.7 tonnes of CO_{2e}/MWh.

The announcement also advised the Government's intention to apply the limit to all forms of new utility-scale electricity production and that it would be a transitional measure pending the introduction of a national carbon policy.

In determining its position for consultation, the Government was guided by advice received from WorleyParsons Ltd. That advice is attached to this paper (*Attachment 1*).

The first consideration for the Government is its preference for setting an emissions intensity limit as distinct from a ban on new coal-fired plant, the other practical option.

The use of a limit has three advantages over an outright ban:

- Comparability with other jurisdictions;
- Taking a more comprehensive approach than those jurisdictions; and
- Flexibility to accommodate exceptional circumstances.

⁴ "CO₂ Emissions from Fuel Combustion" report by International Energy Agency, 2009 edition

The principal finding of the WorleyParsons analysis is that:

“A significant gap exists for emission intensities between coal- and gas-fired technologies. The lowest emission intensities for coal-based projects are approximately 0.94 t CO₂/MWhso. This would restrict the new build to IGCC-technology (Integrated Gasification Combined Cycle) for unit sizes below 300 MW. However, high capital costs and lower plant availability would in consequence lead to an increase in cost of electricity.

An emission intensity as low as 0.6 t CO₂/MWhso would enable the implementation of efficient open and combined cycle gas turbine power stations and exclude the new build of coal based power generation.”

For reasons explained in the preceding section, the South Australian Government considers that setting the emissions intensity level at a maximum of 0.7 tonnes of CO_{2e}/MWh would meet its carbon constraint requirements while preserving the critical role of gas as a transition fuel to a lower carbon economy.

3. Methods and Scope

The advantages of using an emissions intensity maximum have been set out previously. Taking this approach requires determining a measurement method as well as coverage of the limit.

The principal methodological issue is the choice of calculating emissions intensity on total power used in the generation process (“as generated”) on only power dispatched from the generating plant (“sent out”). The latter takes into account power consumed within the plant as part of the generation process.

The Commonwealth’s paper states that:

“In terms of setting the emissions-intensity threshold, the ITG intends to continue to use an ‘as generated’ standard, rather than ‘sent out’.” (Page 7)

The WorleyParsons advice argues for using “sent out” as the correct measure and notes that this is the approach used in the World Resources Institute Emissions Intensity Methodology and that the Australian Greenhouse Office used an almost identical approach.

WorleyParsons concludes that a methodology based on sent out power and which omits emissions from fugitives and construction:

“adequately reflects the power station efficiency by considering in-station auxiliary power requirement, does not penalize fugitive emissions of a specific fuel source and therefore reflects market conditions of a mix of fuel supply. The Australian DCC Technical Guidelines Methodology Method 2 calculations follow in principle the same standard, if the optional consideration of fugitives is not considered.” (Page 22).

As an illustration of the differences, the WorleyParsons data indicates that an IGCC operating on Victorian coal could have an emissions intensity of 0.94 on a generated basis which becomes 1.19 on a sent out basis. Operating that plant in South Australia using domestic coals would achieve an intensity of 0.87 on a generated basis and 1.05 on a sent out basis. The differences between the two States are driven by the lower moisture content coal in South Australia compared to Victoria.

Another important aspect of the “sent out” methodology is that it can be applied across the board to all forms of electricity generation. For South Australia, this versatility is important. The “sent out” methodology allows for better comparability to both coal- and gas-fired operations. This comparability is important for South Australia because coal-fired plant does not dominate electricity generation as in a higher proportion of the State’s electricity mix than all other States.

Using “sent out” not only allows for more meaningful comparisons between gas and coal but also provides a basis for international comparison as “sent out” is the dominant international measure.

Another methodological issue is the exclusion of Scope 2 emissions from the calculations. Scope 2 emissions are those associated indirectly with the electricity generation process such as the release of fugitive methane emissions and carbon dioxide removed from the gas stream at upstream processing from coal mining plant.

These are not included in the emissions intensity ratio as they are not required for the purposes of international comparability and are factors which are mostly or entirely outside of the control of power generators.

The size of plant to be covered is also a consideration. The Government recognises the special circumstances of communities and businesses operating in locations which are either not on the grid or not serviced adequately by it. A number of these communities and businesses rely on diesel power generation which can have a relatively high carbon emissions ratio. To accommodate these circumstances, the Government proposes to fix a minimum limit of 30 MW for its new standard.

In his announcement, the Premier also referred to the case of syngas and coal-to-liquids projects:

“The Government recognises that its approach may have implications for specific projects such as off-grid diesel projects as well as syngas and coal-to-liquids projects where power generation can form part of a larger process. Cases such as these will be considered in detail in the consultation process.

As a starting point, the Government intends to provide sufficient flexibility in its legislation to be able to recognise and respond to unintended outcomes. This will also take into account innovative approaches for managing carbon emissions that are being planned by project developers.”

A methodological issue that arises when calculating the emissions intensity of the power generation component of these projects. Essentially, the issue is the need to determine what proportion of total carbon emissions from the project are attributable to its electricity generation.

There are several prospective coal-to-liquids projects in South Australia, including Altona Energy’s Arckaringa Basin project, Linc Energy’s Walloway Basin project and Hybrid Energy’s Kingston project.

The WorleyParsons advice argues that the allocation of total carbon emissions across the product slates of the projects – liquids, briquettes, electricity – is necessarily arbitrary as the electricity generation is so integrated with the other processes as to be inseparable. WorleyParsons has provided a subsequent advice to support this view. This advice is also attached. (*Attachment 2*).

The Government accepts that it is not possible to reliably allocate an emissions industry to electricity generation for these projects. Accordingly, it is proposed that the emission intensity threshold for these projects will be considered on a case-by-case basis. In this context, it is noted that the Government intends to implement its emissions intensity by amending the Electricity Act. Section 80 of that Act provides for making exemptions to conditions set out by that Act Section 80 (3) allows the exemption and attendant

conditions to be waived or revoked at a later stage, subject to administrative law due process.

This would appear to provide sufficient scope for addressing the specific and unique circumstances of individual syngas and coal-to-liquids processes.

4. Consultation Arrangements

Comments should be submitted by either email or mail using the details below:

Email: climatechange@dpc.sa.gov.au

Mail: Commissioner for Renewable Energy
Level 17, 31 Flinders St
Education Building
Adelaide SA 5000

The deadline for comment is 2 December 2011