AUSTRALIAN SENATE

SELECT COMMITTEE ON FUEL AND ENERGY

PUBLIC HEARING

Western Power Submission

The purpose of this paper is to highlight some of the challenges and opportunities of the Carbon Pollution Reduction Scheme (**CPRS**) and national Renewable Energy Target (**RET**) on the Western Australian South West interconnected System (**SWIS**).

In particular it will address section 1.d. (the impact of an emissions trading scheme on the fuel and energy industry) of the Senate Select Committee on Fuel and Energy's (**Committee**) terms of reference, including but not limited to sub-sections iii) (domestic energy supply) and iv) (future investment in fuel and energy infrastructure).

Western Power is the largest transmission and distribution electricity network operator in Western Australia, and is responsible for operating and maintaining the electricity network in the SWIS. The SWIS extends from Kalbarri to the North, to Albany in the South, and Kalgoorlie to the East.[1]

While Western Power is not directly impacted by the CPRS and RET, the indirect implications of the CPRS and RET will be significant in the period during which the electricity industry adjusts.

As the nature of energy demand and consumption changes, the electricity network must adapt to include increased levels of intermittent and renewable generation. Western Power owns and operates a network which was planned around the traditional concept of large, baseload power stations located a long way from demand centres. The SWIS currently incorporates a small proportion of wind generation.

The combined forces of the CPRS and RET will place significant pressure on the SWIS for increased penetration of renewable energy generation in the period to 2020, much of it intermittent. Western Power's transmission and distribution networks must adapt at a very fast pace.

The combined impact of the CPRS and RET will also have a major influence on the shape and direction of energy markets. Western Power is of the view that many issues relating to this change may manifest in the SWIS much earlier than in the National Electricity Market (**NEM**). Therefore, Western Australia may need to be prioritised in any Federal Government response, in order to facilitate greater levels of renewable energy sources without compromising reliability standards.

[1] Further information on Western Power is provided in Attachment 1 to this submission.

Western Power considers it vital that the impacts of increased new, renewable generation technology penetration, and specifically the impacts of intermittent generation on the SWIS, are recognised and understood.[2] These include issues related to:

- Generator dispatch;
- Load following and frequency control;
- Other operational requirements for the maintenance of voltage control and fault recovery capabilities, and to acquire and transmit the operational data needed to efficiently run the turbines and integrate them in the power system; and
- Network management and investment.

A number of these topics are already being covered by the Australian Energy Market Commission in their "Review of Energy Market Frameworks in light of Climate Change Policies" report due out in September 2009.

Incorporating increased renewable generation into the SWIS introduces a number of challenges to Western Power. Western Power believes there are a greater number of opportunities and potential for new, clean energy solutions to be trialled in Western Australia due to its relatively small size, islanded nature and maturing electricity market.

From an objective analysis of Federal environmental initiatives it becomes apparent that Western Australia requires separate consideration to the NEM in terms of infrastructure capacity and electricity network requirements. Electricity transmission and distribution networks are key parts of the enabling process for new climate change policies.

Western Power considers the Committee's inquiry to be very timely and important for the practical outcomes of climate change policy and electricity networks infrastructure implications.

Western Power understands that the goal of the Committee is to make recommendations to assist strengthening policy with a view to ensuring the necessary level of energy supply that is economic, socially responsible and within an overall environmentally sustainable framework.

Western Power is strongly supportive of the Committee's mandate and welcomes this opportunity to assist in developing positive outcomes, whilst overcoming one of the biggest policy challenges Australia is currently facing as a nation.

For further information, please contact Gavin Forrest on (08) 9326 4700, or gavin.forrest@westernpower.com.au.

[2] Further information on the impact of increased intermittent energy sources is provided in Attachment 2 to this submission.

Overview of Western Power

Western Power is the largest transmission and distribution electricity network operator in Western Australia, responsible for operating and maintaining the electricity network within the SWIS. The SWIS extends from Kalbarri to the North to Albany in the South and extends to Kalgoorlie to the East. The SWIS includes:

- In excess of 140 zone and terminal substations;
- 6,750 km of transmission lines and cables; and
- 83,000 km of overhead and underground distribution lines and cables.

Western Power is owned by the Western Australian Government but, as a corporation, makes commercial decisions based on regulation, and has an independent Board of Directors providing strategic direction to the business.

Western Power is responsible for:

- Maintaining the electricity network within the SWIS;
- Restoring power after interruptions;
- Developing the electricity network within the SWIS to meet the needs of customers and developers, and to bring electricity to new areas; and
- Providing generators and retailers with access to the SWIS.

Western Power provides more than 900,000 customers with a safe, reliable and efficient supply of electricity.

Strategic Direction

To address current and future challenges and opportunities of energy supply in Western Australia, Western Power has developed a Strategic Plan for 2008-2010 and a Strategic Direction Statement to 2016, both of which will assist the development of the energy industry in the State.

The foundation of Western Power's strategic direction remains operational excellence – a commitment to the safe, reliable and efficient transmission and distribution of electricity through efficient work practices, commercially focused business operations, achieving a challenging capital works and maintenance program, and improving our support systems and processes to deliver quality programs and services.

To build on our operational excellence, other themes recognise and anticipate the need for sustainable development and the changes occurring in government policies, community expectations and technological changes.

We have embarked on the need to engage with our communities and our stakeholders to develop energy solutions that meet the needs of our customers, communities and industry.

Western Power intends to broker better relationships in the delivery of energy solutions and the ensuing greater level of understanding of issues will improve the prospects for consensus in developing optimum energy solutions.

This will minimise the risk of asset stranding, reduce the long-term costs of supply and facilitate the most sustainable energy sources.

Western Power will think and act beyond 'poles and wires' by working with industry and the community to develop alternative options for energy development.

We look forward to working with all our stakeholders to develop energy solutions that contribute to sustainable development, security and reliability of energy supply and competitive energy prices in Western Australia.

Impact of increased penetration of intermittent generation on the SWIS

Generally and unless specified, the comments provided relate to intermittent sources of supply, notably wind generation, as this is the most likely type of new renewable capacity in the short to medium term.

Intermittent sources of energy, such as wind, can have significant impacts on the management of an interconnected system and create additional costs and potential risks to the security and stability of supply. These costs should be identified, appropriately attributed to causers and users and efficiently recovered, with implications for the market rules, technical codes and funding arrangements.

Western Power suggests that the main impacts of increased penetration of intermittent generation will be as follows:

- **Generator dispatch:** Except during times of peak demand, intermittent unscheduled generators can only be dispatched by displacing other plant. This can be a particular problem overnight when cogeneration units and baseload plant normally supply the load. As this plant is designed for continuous operation above certain levels of output, reducing production to accommodate intermittent generation will generally increase total generating costs in the short and long-term and will result in lower efficiency of production.

- **Load Following and Frequency control:** In order to maintain system frequency, within the prescribed limits, aggregate generation and load must be kept in balance in real time. Consequently, instantaneous changes in highly variable sources of generation, such as wind, must be balanced as they occur. Being an isolated grid the SWIS is not able to alter tie line import levels to assist with frequency control. Baseload generation plant being slow acting is only partially able to carry out load following duty.

  Load following is generally achieved by maintaining additional gas turbines in reserve to provide sufficient fast response capability to accommodate the positive and negative changes in wind generator production. Given the spasmodic operational requirements of the load following plant, it runs at very low efficiency and hence high cost, compared to more regular use. Based on data from the wind farms in the SWIS, Western Power estimates that for current levels of almost 200 MW of wind capacity, around 60 MW of gas turbine capacity would be required for load following purposes.

  Load following capacity must be made available at all times. The necessary gas turbine plant also adds to the displacement of baseload generation plant overnight. This can be reduced by restricting the maximum allowable output of the windfarm but the energy foregone reduces the production of Renewable Energy Certificates. This not only impacts the economics of windfarm operation but also reduces the abatement of greenhouse gases which would otherwise be achieved.

Energy storage could help enable higher penetration of intermittent renewable generation in a number of ways:

1. Increasing the base load, so the need for taking generation offline overnight is reduced;
2. Allowing energy produced at a time non-coincident with system load peaks to be stored and recovered at a time when system load is peaking; and
3. Providing fast acting load following and frequency control through the storage and release of energy counter to the changes in intermittent renewable generation output.

- **Other operational requirements:** Intermittent generation will also have specific requirements in order to maintain voltage control and fault recovery capabilities and to acquire and transmit the operational data needed to efficiently run the turbines and integrate them in the power system. These costs are typically borne by the project developers, but must be included in determining the overall financial impacts.
- **Network management and investment:** Locations for new plant are usually based on the availability of fuel sources, and in the case of renewable generation, these are typically in areas that have either constrained transmission capacity or are electrically "weak" (i.e. have limited ability to withstand additional power flows without producing large voltage variations or power quality disturbances). Virtually all of the areas where projects have been proposed will require significant capacity upgrades.

Given the potential magnitude of these impacts, it is vital that they are assessed through detailed system modelling. Based on the results of this, the market rules and regulatory arrangements should also be reviewed to ensure that they are consistent with and will support increased renewable penetration.

Western Power suggests that some savings could be made by assuming that intermittent generators and scheduled generators are not simultaneously operating at full output. However, this would involve the development and management of network constraints, which would require a market mechanism to determine which generator runs if both intermittent and scheduled generators were available.

Western Power suggests that the increased penetration of intermittent renewable generation will also require an increase in the level of spinning reserve. Increased wind penetration will also tend to force off conventional generation overnight, which will increase the cost of generation as conventional generators would require a restart on the next day to cover system load.

At the distribution network level, increased penetration of distributed microgeneration (e.g. photovoltaic systems) will impact voltage profiles along the network. Western Power suggests network infrastructure upgrades will be required to facilitate multi-directional power flows (including tap changing transformers) and increased information flows (enabled by Advanced Metering Infrastructure, including smart meters).

The nature and impact of these changes should be identified, appropriately attributed and efficiently recovered.

Further details can be found in the following Western Power submissions:

- Western Australian Office of Energy on the proposed RET scheme design for WA, available online at http://www.sedo.energy.wa.gov.au/pdf/ret-western_power.pdf.
- CoAG Working Group on Climate Change and Water consultation paper on the design options for an expanded national RET scheme, available online at http://www.climatechange.gov.au/renewabletarget/consultation/pubs/076westernpower.pdf