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INQUIRY INTO THE ECONOMICS OF ENERGY GENERATION

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Joint Submission to the Public Accounts Committee

Inquiry into the Economics of Energy Generation

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Total Environment Centre's National Electricity Market Campaign

Established in 1972 by pioneers of the Australian environmental movement, Total Environment Centre (TEC) is a veteran of more than 100 successful campaigns. For the last forty years we have been working to protect this country´s natural and urban environments: flagging the issues, driving debate, supporting community activism and pushing for better environmental policy and practice.

TEC has been involved in National Electricity Market (NEM) advocacy for eight years, arguing for greater utilisation of energy efficiency and demand side participation to meet Australia's electricity needs.

Inquiry into the Economics of Energy Generation

We thank the Public Accounts Committee for the opportunity to make a submission to the Inquiry into the Economics of Energy Generation.

At the outset, we note that the political, economic or environmental imperative and motivation for this inquiry is not clear. Nor is it clear how the Inquiry's outcomes are intended to relate to other NSW Government policies including the State Plan and the Energy Efficiency Target, or existing initiatives including the D-factor mechanism and the NSW Energy Savings Scheme.

In addition, the use of the term "alternative" energy, rather than the usual term, renewable energy, suggests a mindset in which renewables are regarded as being outside the mainstream of energy supply. In view of the growing challenge of climate change and the necessary transformation of NSW and Australia's energy sector required to create a low carbon economy, the contribution of renewables must be regarded as central rather than peripheral.

Finally, we note that to date the current NSW Government has a poor track record in supporting the renewables sector. It has removed the solar feed-in tariff without replacing it with another mechanism to support this fledgling industry, and drafted wind farm planning guidelines which impose some of the world's most stringent approval criteria. Such onerous criteria are not applied to coal mines or coal- or gas-fired power stations.

The following submission concentrates primarily on demand side participation rather than the renewables sector, as this is where our primary expertise lies.

Generation vs. Demand Side Participation

In assessing the economics of energy generation, greater attention must be paid to the simple and low cost actions that can effectively reduce the need for additional generation capacity.

Demand side participation refers to range of mechanisms that are designed to manage and reduce energy consumption on the consumer's side of the meter, rather than building additional generation and infrastructure capacity to meet ever-increasing demand. These mechanisms include energy efficiency, demand management and distributed generation. Energy efficiency activities reduce the amount of energy consumed in meeting the needs of electricity consumers. Demand management better distributes demand for electricity, for example by reducing demand at peak times. Distributed generation refers to electricity generation that is connected within a customer's or distributor's network rather than within the transmission network.[1]

The Benefits of Demand Side Participation

Demand side participation lowers the demand on the electricity network, lessening the need for investment in energy generation and infrastructure.

Investment in electricity networks over the current five year regulatory period is at "historically high levels".[2] Network companies across the NEM are forecasted to invest over $7 billion in electricity transmission and $35 billion distribution.[3] This level of investment is greater than that for the entire National Broadband Network. These forecasts represent an increase in investment on the previous regulatory period of around 82 per cent in electricity transmission and 62 per cent in distribution.

Demand side participation saves consumers money by lowering their consumption of electricity and avoiding or deferring investment in energy networks, the cost of which is ultimately passed on to consumers.

Demand side participation can be particularly effective if used specifically to reduce peak demand. It is estimated that 25% of retail electricity costs are a result of periods of extremely high demand that occur for less than 40 hours per year, i.e. 0.45% of the time.[4] Demand side participation options could prevent these peaks in demand occurring and reduce the need for costly generation and infrastructure.

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[1] Distributed generators are sometimes located close to electricity loads, e.g. residential rooftop solar panels, or may be linked to industrial processes, e.g. cogeneration. Distributed generation can also refer to generation that is not permanently connected to the network.

[2] See AER, *State of the Energy Market* (2011) 6.

[3] Ibid.

[4] Fraser, R., 'Demand side management', presented at Australian Institute of Energy symposium, 'NSWs Electricity Future 2020 (and beyond): What will it look like and how do we get there?' (Sydney, 24 May 2010) 18.

Particularly illuminating in this regard is the cost to the network as a whole of the prevalence of air conditioning units. A Queensland Government report estimated that the installation of a 2kW reverse cycle air conditioning unit costs a consumer an average of $1500 year, yet imposes a cost on the electricity networks as a whole of up to $7000 due to its addition to peak demand.[5]

Demand side participation is also important for reducing demand generally: energy efficiency measures alone could reduce demand by one third by 2050,[6] while the International Energy Agency states the "most important contribution to reaching energy security and climate goals comes from the energy that we do not consume."[7]

Demand side participation can also be used as a tool to increase the reliability and security of supply of electricity and can allow demand to be responsive to fluctuating supply, facilitating the integration of intermittent renewable generation into the grid.

Demand Side Participation Opportunities in NSW

There are a range of demand side participation opportunities available in NSW that can offer a cost-effective and environmentally friendly alternative to increasing supply. A recent review of demand side participation in the NEM found that the following options, which could be implemented in NSW, are currently being used to reduce electricity demand:[8]

- Peak load management
    - Load curtailment arrangements, which includes 25 NSW smelters that agree to interrupt their electricity use at times of peak demand;[9]
    - Hot water shifting — already 1.04 million customers in NSW;[10]
    - Dynamic Peak Pricing/Critical Peak Pricing;[11]
- Whole-load management
    - Energy efficiency and conservation;[12]
    - Fuel substitution;[13]

[5] Department of Employment, Economic Development and Innovation, *Queensland Energy Management Plan* (Queensland Government, Brisbane 2011).

[6] Hameed Nezhad, 'World Energy Scenarios to 2050: Issues and Options' (2009) 6 available at http://www.nezhadpmd.com/worldenergyscenarios.pdf.

[7] IEA, *World Energy Outlook* (2011) 3 available at http://www.worldenergyoutlook.org.

[8] See Futura Consulting, 'Power of choice – giving consumers options in the way they use electricity: Investigation of existing and plausible future demand side participation in the electricity market' (2011).

[9] Ibid 44.

[10] Ibid 45.

[11] Ibid 46.

[12] Ibid 48.

    - Power factor correction;[14]
- Distributed generation
    - Standby generators (current installed level equivalent to 400-500MVA in NSW);[15]
    - Small-scale renewables.[16]

NSW already has some demand side participation capacity. In 2010 there were two instances where the spot price for electricity on the whole sale market exceeded $5000. The demand side response to these events resulted in the retraction of demand and a decrease in the spot price from $5,500 and $12,500 per megawatt hour to $282 and $19 respectively.[17] Both of these events were a result of supply constraints and evidence that demand side participation can be dispatched to meet demand, rather than investing in new generation capacity. Making use of this response at peak times means that there is a reduced need to invest in expensive peaking power plants and additional network infrastructure.

D-factor

NSW operates the successful D-factor mechanism, which has encouraged some increase in demand side participation to date. This mechanism could be expanded and improved in order to further encourage the investigation of cost-effective demand side participation options by Distribution Network Service Providers (DNSPs). This scheme allows NSW DNSPs to recover costs and foregone revenues associated with demand side participation projects, i.e. the regulated revenue that they spend on reducing demand rather than increasing supply.

The D-factor mechanism has resulted in a reduction of the average annual growth in summer peak demand of about 7% and 3% in 2004/5 and 2005/6 respectively. The total cost of this reduction was $5.1million, compared to the avoided network costs of $19.3 million.[18]

In 2008 TEC commissioned a report on the D-factor mechanism which concluded that:

> *although the D-factor is an important precedent in supporting [demand side participation] and should be built upon, the D-factor is not a cure-all… without reform and complementary measures, it is very unlikely to deliver an efficient level of [demand side participation] activity.*[19]

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[13] Ibid 50.

[14] Ibid 52.

[15] Ibid.

[16] Ibid 53.

[17] Ibid 43.

[18] Dunstan, C. et al., 'Win, Win, Win: Regulating Electricity Distribution Networks for Reliability, Consumers and the Environment' (TEC and Institute for Sustainable Futures 2010) 6.

[19] Ibid 5.

We therefore call upon the NSW Government to consider expanding the D-factor mechanism in order to further capture the economic benefits that are available to NSW consumers.

Energy Savings Scheme

NSW also has the Energy Savings Scheme (ESS), which places an obligation on liable parties to procure and surrender energy savings certificates, representing energy savings.

A recent Cost Effectiveness Analysis Report for the ESS shows how efficient demand side participation can be. The report found a net benefit of almost $25 is provided by each energy savings certificate created under the scheme. Energy savings are predicted to be 7.5TWh over the life of the scheme, mitigating 7.6Mt CO2e.[20] As such, the report concludes that, "the scheme makes both financial and environmental sense with an overall net resource benefit across all types of activity".[21]

Harmonisation with the Victorian counterpart of the ESS and the currently ongoing consultation on a National Energy Savings Initiative present a good opportunity to evaluate the ESS, strengthen its provisions and ensure that NSW is a leader in energy efficiency.

NSW Energy Mix

In the past, NSW has relied heavily on coal for its energy generation needs. In 2008-09 NSW's generation capacity consisted of: 13,015MW of black coal, gas and oil; 4,293MW of hydro; a mere 184MW of wind and solar; and 162MW from other renewables.[22]

More utility-scale wind and solar power projects are currently in the pipeline. However, there is still more investment occurring in fossil fuel energy generation.[23] While gas may be a lower emission fuel source than coal, it is a significant and increasing contributor to NSW greenhouse emissions, constituting 9.4 per cent of total state emissions in 2009.[24] The expansion of gas limits the extent to which NSW can reduce its overall emissions. As the Climate Group notes,

> *NSW's emissions are 26.3 per cent above 1990 levels and 9.3 per cent above 2000 levels. This is the equivalent of an additional 21.0 million tonnes and 8.55 million tonnes emitted last year compared with 1990 and 2000 respectively.*[25]

[20] IPART, 'Cost Effectiveness Analysis Report' (2011) 3.

[21] Ibid.

[22] ABARES, *Energy in Australia* (2011). Generation capacity may be quite different to the energy dispatched from any source at any time.

[23] See NSW Trade & Investment, 'Electricity generation' available at http://www.trade.nsw.gov.au/energy/electricity/generation.

[24] Climate Group, *Greenhouse Indicator Annual Report* (2010) 13.

[25] Ibid 14.

We therefore consider that the NSW Government needs to do more to reduce emissions. We recommend that the commissioning of new coal-fired power stations be prohibited and existing, inefficient coal-fired power stations, such as Munmorah, be phased out. We also recommend that greater support is given to the renewables sector, for example by reinstating a feed-in tariff for small-scale distributed generation to provide a consistent and long-term incentive for localised generation.

'Hidden Costs' of the Current Energy Mix

While the current energy mix is superficially cheap, there are a number of costs that are not accounted for in traditional analyses. Including these costs is particularly important in the context of a carbon price and an energy system where consumption is dropping but peak demand and prices are increasing.[26]

Infrastructure Costs

Large-scale centralised generation, both fossil fuel and renewable, is itself reliant upon the expensive and expansive infrastructure that supports it. Costly distribution and transmission networks and interconnectors are needed to deliver electricity from remote power stations to consumers.

The costs of building, maintaining and upgrading this infrastructure must be borne in mind when considering the economics of different generation options. Large-scale power stations and increasing supply require extensive network augmentation, while other generation sources, such as rooftop photovoltaic (PV) systems and suitably located wind farms, can be integrated into the network with relatively less difficulty.

In NSW, the three Distribution Network Service Providers[27] are investing an average of 80% more in their networks in the current regulatory period than in the previous period, while TransGrid, NSW's Transmission Network Service Provider, is investing 73% more.[28] These increases are the primary driver of increasing electricity prices.[29]

Environmental Costs

The environmental costs of cheap coal-fired generation are well-known. Carbon emissions are the primary contributor to anthropogenic climate change, as well as ocean acidification. Electricity generation in NSW is responsible for the emission of 86,000,000 tons of CO2

[26] See AER, *State of the Energy Market* (2011) 6.

[27] Ausgrid, Endeavour Energy and Essential Energy.

[28] See note 26 above.

[29] Ibid 4.

annually. This is approximately the same level of emissions of the whole of the Philippines,[30] a country with 13 times the population of NSW.

The Renewable Energy Target (RET) and the carbon price, part of the Clean Energy Future package, are specifically intended to alter the underlying economics of energy generation in order to replace carbon-intensive generation with renewable energy. However, modelling shows that the price on carbon is unlikely to affect energy generation in the short term.[31] This means that NSW will suffer the environmental impacts of existing coal fired generation, as well as any new generation, for some time to come.

Health Impacts

It is essential that the negative health impacts of traditional generation be considered. These impacts have largely been ignored to date, yet a number of recent studies have highlighted the scale and cost of these health impacts. Dr Eugenie Kayak notes:

> *Every stage in the coal lifecycle costs our health, but we do not know the true financial costs of the coal industry to the Australian taxpayer.*[32]

Physicians for Social Responsibility have catalogued the negative health impacts, ranging from asthma to lung cancer, in an extensive report entitled Coal's Assault on Human Health.[33] The report stated that: "A medically defensible energy policy must take into account the public health impacts of coal while meeting our need for energy".[34]

We urges the NSW Government to duly account for the health impacts of traditional fossil fuel generation in considering the economics of energy generation in NSW.

Consumer costs

Demand side participation can reduce the increase in costs currently being imposed on electricity consumers. Demand management and distributed generation can not only reduce the need for networks to invest in new infrastructure as discussed above; they can also reduce the price of electricity at peak times in the NEM pool from the regulated ceiling of $12,500 per MWh.

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[30] See Millennium Development Goals Indicators, 'Carbon dioxide emissions (CO2), thousand metric tons of CO2 (CDIAC)' available at http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749&crid=

[31] See and Taylor, L., 'A decade before carbon tax influences electricity sector' *Sydney Morning Herald* (5 August 2011) available at http://www.smh.com.au/environment/climate-change/a-decade-before-carbon-tax-influences-electricity-sector-20110804-1idh6.html#ixzz1lHiiOZne.

[32] 'Health costs of coal well hidden' *The Age* (25 February 2011) available at http://www.theage.com.au/national/letters/health-costs-of-coal-well-hidden-20110224-1b74f.html#ixzz1lXlikWi1

[33] Lockwood, A. et al., *Coal's Assault on Human Health* (Physicians for Social Responsibility, Washington, DC 2009).

[34] Ibid 44.

Two demand side participation options can achieve this:

- Demand management projects. These usually involve medium and large businesses turning off energy-intensive equipment on demand, thereby reducing the peak demand in the NEM.
- Distributed generation. Solar and wind energy, which have a marginal cost of almost zero (i.e., electricity costs almost nothing to produce at any given time once the infrastructure is in place) displace the need for peaking gas plants, which are relatively expensive. This is known as the 'merit order effect'.

Long Term Energy Security

Demand side participation can make a significant contribution to ensuring the security of NSW electricity supply. Demand side participation is not dependent on external factors, and so is not affected by adverse events such as floods, which affects coal supply, or drought, which affects hydro power. By reducing overall demand, it ensures that the need for new infrastructure is deferred or eradicated entirely, thereby reducing the likelihood that infrastructure will not keep pace with demand. Furthermore, it can reduce the incidence of blackouts, as peak load management can take pressure of the network at times when it is at capacity, ensuring that supply is not affected.

Interstate Energy

We are of the opinion that sourcing energy from other states is not the most economically or environmentally beneficial option for NSW. The interconnectors between states have limited capacity and there are significant transmission losses involved in the transportation of electricity over long distances,[35] resulting in higher costs and higher greenhouse gas emissions than intrastate transmission. Currently around 10 per cent of electricity is lost in transmission, which would increase if more energy was imported.[36]

A report produced for the Federal Government concluded that transmission congestion is "expected to become a significant issue in the NEM"[37] under a range of carbon price scenarios, while research for the Clean Energy Council suggests that congestion issues can be exacerbated by the increase in intermittent generation that is not thoughtfully sited. This modelling concluded that centralised generation and transmission augmentation to allow export of energy is not an efficient way of increasing generation capacity. Instead the report recommends that the best way to integrate renewables in a cost effective manner is "through a distributed

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[35] AEMO, 'Introduction to Australia's National Electricity Market' (2010) 16.

[36] Ibid.

[37] Vanderwaal, B., et al. (ROAM Consulting) 'Modelling of carbon pricing scenarios' (Department of Climate Change 2008) II.

arrangement of wind farms around the NEM with incremental maintenance of the existing high voltage transmission backbone."[38]

Given the foregoing, we submit that increasing the share of large scale renewable energy generation in NSW's energy mix and encouraging wider adoption of distributed generation is the economically preferable alternative to energy imports.

Barriers to Renewable Energy

The key barriers to the utilisation of renewable energy sources in NSW include:

- A mindset and culture which focuses on fossil fuel driven, large-scale, centralised supply of electricity. IPART has noted:

  > *To a large extent, one of the major obstacles continues to be a culture which favours traditional ´build´ engineering solutions and which pays little more than lip service to alternative options.*[39]

- The National Electricity Market, National Electricity Objective and National Electricity Rules are biased against small-scale renewables and demand side participation:

  > *National grids are usually tailored towards the operation of centralised power plants... most grids are not suited to receive electricity from many small sources.*[40]

- Lack of government policy support and inconsistency in the provision of support. For example, the fluctuating feed-in tariffs for solar PV in NSW.
- Policies and regulations that hinder renewable energy development and support conventional energy development. In particular subsidies for fossil-fuels and complex zoning and permitting processes for renewable energy, both large scale and distributed.
- Inadequate financing options i.e., insufficient access to affordable financing for developers, and consumers.
- Imperfect markets that fail to account for all the costs of conventional energy or the benefits of renewable energy.
- Lack of workforce skills and training, coupled with uncertainty created by policy inconsistency.

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[38] Vanderwaal, B. et al. (ROAM Consulting), 'Transmission Congestion and Renewable Generation' (Clean Energy Council 2010) I.

[39] IPART, *Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services* (Final Report 2002)

[40] Stern, N., *Stern Review on the Economics of Climate Change* (HM Treasury 2006) at 355.

Demand Side Participation and Renewable Energy Best Practice

We note that there are a number of jurisdictions that have successfully and cost-effectively integrated high levels of demand side participation capacity and renewable energy generation into their energy systems. Two examples are given below.

Decoupling in California

Decoupling refers to a method of utility regulation where profits are not dependent upon the amount of energy sold. In Australia, the companies that own the electricity networks have an incentive to increase supply because their profits are based on their level of investment in network infrastructure. As noted above, NSW network companies are currently investing in network infrastructure at historically high levels and drastically increasing their profits.

In California, however, revenues have been decoupled from throughput since the early 1980s. As a result of this policy, the average resident of California uses approximately a third less total energy than the average American, emitting just over half as much carbon dioxide.[41]

Renewables in Germany

Germany provides an excellent example of how renewables can be incorporated into electricity systems. Germany has become one of the world's leaders in installed renewable energy capacity, without making significant use of hydro power. German produces 36.5 TWh per year of wind energy, 33.5 using biomass and 12 using solar.[42] Despite its mild climate, Germany has the highest installed capacity of solar electricity in the world. By comparison, Australia as a whole only produces 684.4 GWh from solar each year.

Germany has achieved these impressive uptake rates through a combination of longstanding and stable feed-in tariffs, which has increased solar production from 1 GWh in 1990 to the present rate, strong governmental support through R&D funding, and a culture that is more accepting of renewable energy technologies.

[41] See California Public Utilities Commission, 'California's Decoupling Policy' available at http://www.fypower.org/pdf/Decoupling.pdf.

[42] Böhme, D., 'Zeitreihen zur Entwicklung der erneuerbaren Energien in Deutschland' (Federal Ministry for Environment, Nature Conservation and Nuclear Safety 2011) available at http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_zeitreihe.pdf [Time series on the development of renewable energies in Germany].

Recommendations

Total Environment Centre and the Nature Conservation Council of NSW urge the Committee to:

1. Include all negative externalities of fossil fuel generation and all benefits of renewable energy sources when comparing the economics of different generation types;
2. Ensure that preference is given to the cost effective and environmentally friendly alternatives to new power stations and network infrastructure when considering the future of NSW's energy needs;
3. Adopt policies to provide consistent, long term incentives to the generation of energy in NSW at every scale from renewable energy sources;
4. Request that the Standing Committee on Energy and Resources to make changes to the National Electricity Rules and the National Electricity Objective to favour demand side participation, lower cost energy solutions and improved environmental performance.

TEC staff would be happy to present or answer questions at any public hearing related to this inquiry.

Yours sincerely,

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