Central West Environment Centre

THE REAL SOLUTIONS FOR NSW'S ENERGY

THE NEXT DECADE and BEYOND

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THE REAL SOLUTIONS FOR NSW's ENERGY

Electricity consumption is currently growing at around 3% per year, and NSW is considering building costly and polluting coal fired power stations. Fortunately, there are cheaper and cleaner alternatives. By pursuing aggressive energy savings and implementing renewable energy, NSW can avoid wasting billions of dollars on unnecessary, polluting power.

The energy supply and savings projects identified in this report can meet NSW's energy needs for the next 15 years. All supply projects outlined are already in development or are in the process of gaining approval. Savings projects will be achieved with the Energy Savings Fund. All projects, however, would benefit from the correct policy settings.

Growth can be dramatically reduced through energy efficiency. Renewable energy can meet additional supply needs over the longer term as well as the need to significantly reduce greenhouse emissions. In the short term, efficient gas generation can meet any temporary shortfalls in peak demand.

The energy supply and savings projects identified in this report can conservatively increase current capacity by 50%, providing over 6000 MW of capacity. However, this represents just a tiny fraction of the renewable resources and potential energy savings in the state. Wind, solar, and bioenergy alone could supply the same amount again by 2020 so that a minimum of 25% of our electricity is generated by renewable energy.

The National Electricity Market projections show NSW may need another 1100MW of peak capacity by 2016. The projects outlined in this report easily provide this capacity in energy savings and clean energy supply. Ignoring the clean energy potential will make it extremely difficult and costly to meet the NSW target of 60% greenhouse emissions reductions.

These energy supply and savings options present the most timely, cost-effective and low-risk solution for NSW's energy future. Implementation will allow incremental development of the state's energy infrastructure. This prudent response avoids problematic reliance on large and cumbersome blocks of generation.

The NSW Government has taken a national leadership role towards facilitating a smarter approach to energy supply and demand. The new Premier must now implement the real solutions for NSW's energy future, energy savings and renewable energy and rule out any new coal-fired power.

	Peak-load Contribution	Total
Energy savings, demand savings	1305 MW	1864 MW
Renewable energy generation	631 MW	1655 MW
Cogeneration	570 MW	570 MW
Gas generation	2697 MW	2697 MW
Total	5203 MW	6786 MW

Recommendations

The signatory environment groups call on the NSW Government to plan for a clean energy future. The projects identified in this report represent the most prudent, cost-effective and responsible energy future for NSW. In order to ensure they are realised the NSW Government should implement the following recommendations and rule out any additional coal-fired power:

Energy savings

- Extend the life of the Energy Savings Fund for 20 years and secure it against use for any other purposes
- Facilitate introduction of peak pricing and remote load control by the roll-out of smart meters.
- Implement a mandatory 5 star energy efficiency target for commercial buildings
- Maintain the 40% greenhouse reduction under BASIX due to come in June 2006
- Set a timetable to phase out domestic electric water heaters outside niche applications and replace electric water heating with solar or heat pump systems on public housing.

Energy supply

- Implement a NSW Renewable Guarantee for 15% of renewable electricity by 2012 and 25% by 2020.
- Implement additional support policies for solar PV.
- Set a maximum emissions intensity of 0.4 tonnes CO2/MWh for all new base load electricity generation (without allowance for offsets)
- Make a clear statement that the Government will not provide indemnity for any new power plant, including any future exposure to a carbon regime

Carbon price

- Commit to introducing a price on carbon, through a carbon levy and/or by participating in an emissions trading scheme with caps to reduce greenhouse emissions by at least the NSW target of 60% by 2050.

THE REAL SOLUTIONS

FOR NSW's ENERGY DEMAND AND SUPPLY

1. Introduction

NSW can meet its energy requirements over the next decade with the projects outlined in this report. These projects include energy savings, cogeneration, renewable energy, and the selective use of gas.

Total NSW generation capacity is currently around 12,800MW with access to 4,000MW from Snowy hydro-electricity taking the state's total capacity to around 16,800MW.[1] NSW energy demand reached its highest peak of 12,840 MW in 2004, and peak demand is growing at around 2.8% per year.[2] This means that NSW could need an additional 1100MW of peak capacity by 2016.[3]

This report identifies energy projects which can reduce demand growth and expand generation capacity while minimizing greenhouse pollution. Implementing these projects would meet NSW energy needs beyond the next decade, allowing time for NSW to progressively develop sustainable responses to the state's energy needs. Importantly, it allows the Government to rule out new, coal-fired power.

More than 6000MW of energy savings or supply are identified which are available for implementation over the next 10 years. Over 5000MW of this is available for periods of peak demand.

These energy supply and savings options are the most prudent, timely, cost-effective and low-risk solution for NSW's medium term energy future. They allow for the incremental development of a sustainable energy infrastructure. They enable the market to respond progressively, avoiding reliance on large and cumbersome blocks of generation, and provide maximum flexibility to meet the greenhouse targets which NSW has set.

The alternative, more coal-fired power, brings with it the financial and environmental risks of creating an expensive over-supply, destruction of incentives for energy efficiency, the creation of future carbon liabilities and the likelihood of stranded assets as emissions limits are introduced.

With the correct policy settings, however, NSW can achieve a smarter, cleaner mix of energy technologies and services. This report details the projects which can secure NSW energy supply until 2020 while reducing our greenhouse emissions.

[1] *New South Wales Government Energy Directions Green Paper,* December 2004, p. 11.
[2] TransGrid, *NSW Annual Planning Report 2005*, Appendix 3, Table A3.1. The NSW Government's Energy Green Paper used a higher demand growth rate of 3.8% based on historic growth rates reported by TransGrid. The NSW Department of Energy and *The Real Solutions Report,* however, use TransGrid's summer peak demand projection of 2.8% for the next decade.
[3] NEMMCO, *Australia's National Electricity Market 2005 Energy and Demand Projections*, July 2005, p. 8.

2. Energy and Demand Savings 1864 MW

Peak load reduction program (including smart meters with remote load control)	645 MW
Smart meters without load control but with in home information	660 MW
Energy savings contributions to base-load demand	315 MW
BASIX minimum contribution	244 MW

Total Energy and Demand Savings	1864 MW

NSW could easily reduce energy demand by more than 1864 MW over the next 10 years. This is a conservative figure that includes reductions both at times of peak demand and times of average demand. The reductions are achievable through a combination of energy savings programs, peak demand reduction programs and the use of 'smart' meters combined with critical peak pricing and direct load-control.

The framework for reducing peak and average demand growth is already in place with the recently established Energy Savings Fund and Energy Savings Actions Plans, required under the Energy Administration Amendment (Water and Energy) Act 2005. To ensure that these reductions occur, the Energy Savings Fund should be increased, extended and secured against use for other purposes.

2.1 Peak Demand reductions

Reductions in peak demand of at least 645MW can be achieved through programs administered through the Energy Savings Fund. From 2001 to 2004, similar peak reduction programs in California delivered 1291MW of savings.[4] If equivalent energy savings programs were applied to NSW, 645MW would be delivered over 10 years.[5] Reducing peak demand is the most cost-effective way to tackle energy use at peak times as it avoids unnecessary and expensive network infrastructure which is often used for only a few hours per year.

Measures to reduce peak demand include: use of standby generation; interruptible customer contracts; smart meters with remote control of air-conditioners; more efficient appliances and buildings to off-set wasteful energy use at peak times.

2.2 Smart Meters

Smart meters without remote load control but with in-home information display could deliver another 660MW in peak demand savings. International experience[6] and recent trials by Country Energy[7] show that these in-home 'smart' meters typically reduce demand at critical peak times by around 30%.

[4] Mike Messenger, California Energy Commission, 'Summary of Recent Increases in Electricity Savings' June 6, 2005.
[5] Based on NSW economy and population at 20% of California's
[6] Florida reduced load in critical periods by 44%; France's peak-pricing program delivered 20% reductions, International Energy Agency, *The Power to Choose: Demand Response in Liberalised Electricity Markets*, 2003, p2
[7] *Personal communication with Country Energy.*

2.3 Energy Savings

Energy savings of 315MW average demand can also be achieved through programs administered through the Energy Savings Fund. From 2001 to 2004, California halved demand growth and delivered 628MW reductions in average demand. These savings were above and beyond savings achieved by stringent building and appliance standards and peak load reductions. If equivalent investment in energy savings were applied to NSW, 315MW would be delivered over 10 years.

Energy savings measures include: cogeneration; fuel switching (for example, from electricity to gas for heating and cooking, or from electricity to solar for water heating); advanced controls for air conditioning and lighting; upgrading inefficient industrial equipment; and more efficient appliances and buildings.

These are highly conservative estimates as the simplest energy savings in California have already been achieved over a decade of aggressive peak demand and energy savings programs. The potential for peak demand and energy savings in NSW is much greater than in the US as the most economical energy savings, the 'low hanging fruit', have yet to be taken advantage of.

2.4 BASIX

BASIX is the new NSW Government planning requirement for a 25% reduction in greenhouse gas emissions for all new residential dwellings, increasing to 40% in 2006. The Department of Planning estimates that greenhouse emissions will be reduced by 9.5 million tonnes over 10 years.[8] Around 44,000 new residential dwellings are built in NSW every year.[9] By 2016 the annual reduction in electricity consumption from BASIX would be approximately 1.4 million MWh, equivalent to about 244 MW.[10] The growth in summer peak will also be substantially reduced as BASIX applies a stringent cap on cooling loads.

2.5 Further Energy Savings

Further energy savings measures could reduce demand growth by more than half over twenty years. If demand growth is halved, as has been achieved in New York and California, NSW would have until at least 2027 to harness even more energy savings and implement effective renewable energy projects.[11] Importantly, by pursuing these aggressive energy savings, NSW can avoid billions of dollars being spent on unnecessary, polluting power.[12] Energy savings are more than 5 times cheaper than electricity from fossil fuel generation.[13]

[8] At www.basix.nsw.gov.au/information/common/pdf/quick_facts.pdf
[9] Australian Bureau of Statistics, Building Approvals 8731.0, trends between 2002 – 2005, table 7, p. 14.
[10] Based on the NSW average residential consumption of 7.4MWh per year, assuming BASIX reduces electricity use by 40%. MW are calculated by assuming constant load and dividing by NSW average load factor of .67.
[11] See Total Environment Centre, *New Coal or Energy Savings? The True Costs for NSW Consumers*, p. 8.
[12] The full costs of 1500MW of new coal-fired generation would be $9.4 billion when capital, network, fuel and greenhouse emissions costs are included. This compares to $1.2 billion for energy savings that halve demand growth over 20 years, in Total Environment Centre, *New Coal or Energy Savings? The True Costs for NSW Consumers*, p. 3.
[13] Total Environment Centre, *New Coal or Energy Savings? The True Costs for NSW Consumers, 2005;* California Electricity Commission, *Funding and Savings for Energy Efficiency Programs for Program Years 2000 through 2004*, Cynthia Rogers, Mike Messenger, Sylvia Bender, July 2005.

2.6 Improving the efficiency of current coal-fired power stations

Increasing the efficiency of coal-fired generators currently operating in NSW could increase output without increasing greenhouse emissions provided there is no additional throughput of coal.[14] Proposed upgrades could potentially increase NSW generating capacity by 750MW. These upgrades are not included in this report as further investment in existing greenhouse intensive power stations is likely to increase cumulative emissions by extending operational lifetimes. NSW needs to phase out existing coal fired power stations in order to meet greenhouse reductions targets.[15]

3. Renewable Generation 1655 MW

Renewable Generation[16]	Rated Capacity	Availability Factor	Equivalent Capacity Available[17]
Bagasse cogeneration	60 MW		60 MW
Agricultural and green waste	32 MW		32 MW
Landfill	37 MW		37 MW
Solar Thermal	219 MW	40%	88 MW
Photovoltaic[18]	100 MW	15% (see note)	15 MW
Sewage gas	3 MW		3 MW
Wave[19]	1 MW	20%	0.1 MW
Wind	1080 MW	30%	324 MW
Geothermal [22]	20 MW		20 MW
Hydro[20]	103 MW	50%	52 MW

Total Renewable Generation	1655 MW		630 MW

Note: where availability factor is the same as coal, availability is taken as 100% to simplify comparison, although coal power station availability is rarely greater than 85%. For PV the 15% relates to overall output, but generation generally corresponds to peak times; summer peak availability is usually in excess of 60%. [21]

3.1 Renewable generation currently in development

There are currently over 50 major renewable energy projects in the public domain which are in construction, development or evaluation stage in NSW.[22] Together, these offer over

[14] *For example, Liddell Power Station increased the output of all units from 500 to 540MW for the same coal consumption by modifying LP cylinders, improving the efficiency of HP/IP cylinders and replacing low-pressure turbines. Hwww.greenhouse.gov.au/ggap/successfulprojects/liddellpower.htmlH; www.macgen.com.au/news/news_050404.htm*
[15] AMP Capital Investors Limited. 2005. *Implication on Power Sector Investment of Climate Change Policy*.
[16] Unless otherwise noted, all renewable generation projections are from Business Council for Sustainable Energy, *personal communication,* 25th October 2005*.*
[17] The *equivalent capacity available* indicates the amount of electricity delivered after allowing for generation patterns of different technologies. Photovoltaic generation will make a greater contribution to peak demand than its equivalent capacity as generation times are aligned with peak load.
[18] BP Solar February 2005, Response to the NSW Government's Energy Directions Green Paper, pg
[19] http://www.energetech.com.au/index.htm?http://www.energetech.com.au/content/port.html
[20] Availability factor taken as average capacity factors for prospective NSW sites listed in Redding Energy Management, 1990 *2% Renewables Target in Power Supplies* for AGO Hwww.greenhouse.gov.au/markets/mret/pubs/4_small.pdfH.
[21] Watt M et al. 2005. *Photovoltaics and peak loads. Summer 2003-4.*
[22] Australian Greenhouse Office. *Proposed renewable energy sites* (excel spreadsheet). Downloaded 13/4/2005.

1600MW of clean energy, equivalent to more than 600 MW of firm capacity. These projects require appropriate policy settings to ensure that NSW achieves a vibrant renewable energy sector. This will enable NSW to take the least cost emissions reduction path and achieve a smooth transition to a clean energy supply.

3.2 Further renewable potential

While the projects listed demonstrate a substantial increase in capacity, they represent only a fraction of the potential for renewable projects in NSW. Wind power could supply another 2,000 MW of electricity for NSW, without major modification to the supply infrastructure.[23] The potential for bioenergy is 1,577 MW,[24] and for realisable photovoltaic capacity by 2020 is more than 1700 MW. Together, these technologies alone could supply close to the same amount again by 2020. There is also the potential for at least another 1000 MW solar thermal.[25]

3. Cogeneration 570 MW

Cogeneration	Potential Capacity
Bluescope cogeneration plant with supplementary natural gas firing at Illawarra.[26]	220 MW
Alise cogeneration plant at Kurnell.[27]	350 MW

Total Cogeneration	570 MW

Current cogeneration projects in development could provide at least 650MW of capacity to the NSW grid. Cogeneration uses a single fuel to generate multiple types of energy by harnessing heat that would otherwise be wasted. Generating electricity onsite also reduces capacity constraints on networks. The two large cogeneration projects are well advanced but these represent only a fraction of the potential for cogeneration projects in NSW. A multitude of other small cogeneration plants are also achievable.

[23] Hugh Outhred. 2003. *National Wind Power Study. An estimate of readily accepted wind energy in the National Electricity Market*. Australian Greenhouse Office.
[24] Rutovitz J and Passey R., *NSW Bioenergy Handbook*, DEUS, 2004.
[25] Solar Heat and Power, Submission to NSW Energy Directions Green Paper, February 2005.
[26]
[27] National Institute of Economic and Industry Research for NEMMCO, *Projections of embedded generation in the NEM, 2005*, June 2005, p. 25

4. Gas 2697 MW

Tallawarra (combined-cycle gas turbine)	400 MW
Tomago (Phase 1 & 2 - open-cycle peaking)	520 MW
Uranquinty (open-cycle peaking)	600 MW
Munmorah[28] (open-cycle peaking)	600 MW
Bamarang[29] (Phase 1 - open-cycle peaking)	280 MW
Marulan[30] (Phase 1 - open-cycle peaking)	280 MW
Coal seam methane generation at Bellambi, West Cliff, and Teralba[31]	17 MW

Total Gas	2697 MW

Recently announced gas-fired generation for periods of peak demand could provide 2680 MW of generation capacity.

Reducing demand is more cost-effective than using gas to meet demand at peak times. Reducing demand also decreases, rather than increases, greenhouse gas emissions. Open-cycle gas turbines are only slightly less polluting than coal-fired power generation. It is therefore essential that the use of gas is limited to periods of peak demand and that closed-cycle gas turbines are installed whenever base load capacity is considered.

Coal seam methane is also a growing and viable source of gas supply for NSW. There is potential for much greater capacity than the specific projects listed below.

The following gas-fired generation projects, suitable for meeting peak demand, are at the development stage and have acquired in-principle approval from the NSW Government.[32]

[28] Delta Electricity Submission to NSW Government Energy Directions Green Paper, February 2005, p. 21.
[29] Personal communication with Delta Electricity.
[30] Personal communication with Delta Electricity.
[31] Australian Greenhouse Office, GGAP Project reports downloaded 4/8/05.
[32] Speech by Premier Bob Carr at NSW ALP State Conference, 11 June 2005.