A Sustainable Energy Future for Australia

fact sheet
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There are real low-carbon options to generating electricity, including baseload capacity, rather than nuclear power.

Demand growth has to be aligned to sustainable energy solutions.

Federal and State Governments are putting their money on unproven technologies that will not be commercially available for decades, if ever: the capture and underground burial of carbon dioxide emissions from coal-fired power stations and a new generation of nuclear power stations that only exists on paper. Meanwhile, governments are neglecting genuine sustainable energy solutions, which are ready now.

Efficient energy use

Foremost is the myriad of cost-effective technologies for using energy more efficiently in the residential, commercial and industrial sectors. They are not being widely implemented, because of market failures and other barriers: for instance, inadequate information, the split incentives between landlords and tenants, and the lack of an institutional structure for delivering energy services (e.g. hot showers, cold food, clean clothes and a warm home in winter) at least cost to society.

Governments could overcome these barriers by implementing energy performance standards for buildings (existing as well as new), appliances, equipment and industrial processes. Energy labelling and energy audits have to be part of the improvements in energy productivity.

Cleaner energy supply

On the supply side there is a mix of renewable energy technologies at various stages of commercial development and price. The cheapest and one of the most environmentally sound is wind power. In the UK wind is already less expensive than new nuclear power, while in the USA it is cheaper than both new nuclear and gas power. According to the national scenario study, *A Clean Energy Future for Australia*, wind power could supply 20% of Australia's electricity by 2040, with large contributions in all States except Queensland and the Northern Territory.

Wind power's success has fostered much misinformation from the coal and nuclear industries and NIMBY ('not in my backyard') groups that are often led by big property owners. Contrary to the fallacies that are being disseminated, bird kills and noise problems are rare; wind power, with some additional peakload plant, can substitute for baseload coal, and the land area actually occupied by wind turbines and access roads is much less than that occupied by an equivalent coal-fired power station and its open-cut mine.

Residues from existing agricultural crops (e.g. wheat and sugar) and from plantation forestry could supply about 30% of Australia's electricity by 2040, without competing with food production. The plantation of oil mallee, a type of eucalyptus, in the wheat belt could provide crops for energy, eucalyptus oil and activated carbon, while simultaneously reducing dryland salinity and erosion. A network of small power stations in rural areas would create much local employment.

To further develop the wind and bioenergy industries, an immediate extension and expansion of the Mandatory Renewable Energy Target (MRET), and an expansion of the electricity network, are needed.

With wind and bioenergy providing over half of stationary energy, gas will still be needed as a transitional fuel, while solar electricity and other renewable sources are further developed. Gas is versatile, fuelling efficient combined cycle power stations, highly efficient cogeneration of electricity and heat at the point of use, and also providing back-up for solar hot water, solar thermal electricity and wind power. Therefore, Australia must not export all of its gas reserves.

In addition to MRET, Australia needs a comprehensive system of carbon pricing, such as a carbon tax or emissions trading scheme with cap, to increase the price of electricity from conventional dirty coal-fired power stations, thus enabling gas (a much cleaner fuel) to compete. In the early years of a carbon pricing scheme, it is unlikely that the price would be sufficiently high to assist any renewable energy source to compete with dirty coal. That's why a strengthened MRET is needed as well, as an interim measure. Furthermore, until carbon pricing has been implemented, a ban on all new conventional coal-fired power stations is essential.

Although solar electricity is still expensive, excellent research advances have been made in Australia, with the result that a new generation of solar cells, that require much less silicon, is coming onto the market. UNSW's crystalline silicon on glass (CSG) cells are being manufactured in Germany and ANU's Sliver cells are being manufactured by Origin Energy in Adelaide. Solar thermal electricity is experiencing a revival too. However, to build the market for solar electricity in Australia, special assistance schemes are needed.

Energy efficiency and renewable energy are partners in a sustainable energy future and must be implemented together. Indeed, in replacing a coal-fired power station with a mix of energy efficiency, wind power, bioenergy and gas, the economic savings from energy efficiency will be so large that they could pay for the additional costs of renewable energy.

The baseload fallacy

Opponents of renewable energy, from the coal and nuclear industries and from NIMBY groups, are disseminating the fallacy that renewable energy cannot provide baseload power. Even Government Ministers and some ABC journalists are repeating this conventional 'wisdom', although it is false. it it were true, renewable enrgy would always have to

remain a niche market rather than a set of mainstream energy supply technologies.

A baseload power station is one that is in theory available 24 hours a day, seven days a week. Baseload stations have high capital costs and low fuel costs. In practice even baseload power stations break down from time to time and, as a result, can be out of action for weeks. To cope with breakdowns and variations in electricity demand, an electricity supply system has reserve plant and also peakload plant (gas turbines and/or hydro-electricity).

Renewable energy can provide several different baseload technologies:
- bioenergy, based on burning crops and crop residues, or gasifying them first and then burning the gas;
- hot dry rock geothermal power, which is being developed in South Australia;
- solar thermal electricity, with heat storage in hot water or hot rocks; and
- large-scale, distributed wind power, with a small amount of occasional back-up from peakload plant.

The inclusion of large-scale wind power in this list may be a surprise to some people, because it is often described as an ‘intermittent’ source, one that switches on and off frequently. Although a single wind turbine is indeed intermittent, this is not generally true of a system of several wind farms, separated by several hundred kilometres and experiencing different wind regimes. The total output of such a system varies smoothly and only rarely experiences a situation where there is no wind at any site. As a result, this system can be made as reliable as a conventional baseload power station by adding a small amount of peakload plant (say, a gas turbine) that is only operated when required. Since the gas turbine has low capital cost and low fuel use, it may be considered to be reliability insurance with a small premium.

Of course, if a national electricity grid is connected by transmission line to another country (for example, as Denmark is connected to Norway), it does not need to install any back-up, because it can purchase supplementary power from its neighbours, when required.

Because a renewable energy system would consist of a mix of different types of technology with different variabilities, it could in theory supply 100% of electricity for the national grid. However, there is one constraint on a renewable energy future. Growth in energy demand has to be levelled off, so that there will always enough land for wind and bioenergy. In the long run, this means a change in the national economic structure and limits on population growth.

About the author:

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About our organisation:

energyscience.org.au is a co-operative production by a group of concerned scientists, engineers and policy experts that seek to promote a balanced and informed discussion on the future energy options for Australia.
With increasing concern over the looming impact of global climate change the community needs to be aware of the issues involved. energyscience aims to provide reliable and evidence based information to our whole community

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