

**Submission to the 2014 ENERGY WHITE PAPER
Sustainable Energy Now, Feb. 2014**

The following submission is from Sustainable Energy Now (SEN). SEN is a voluntary organisation of 160 members and hundreds of associates, many of whom are professionals in engineering, science, educational, business and IT fields. SEN conducts research, education, holds regular talks and seminars, lobbies government, writes media articles and produces strategies to promote renewable energy in Western Australia. This submission addresses the Energy White Paper Issues Paper:

1. General comments

At this pivotal time when the World faces the dire consequences of anthropogenic global warming, Australia needs to decarbonize its economy to rapidly reduce greenhouse gas emissions and reap the benefits of the transition. Australia is currently in the top three per capita emitters in the world. (The Australian, 2012) The European Commission's Joint Research Centre (JRC) stated in 2012 "If the current global trend of increasing CO₂ emissions continues, cumulative emissions will surpass this limit (UN goal to limit the rise in global average temperatures to 2C) within the next two decades."

Sixty eight percent of Australian greenhouse gas emissions are from energy use (35.3% from electricity generation) and a further 7% are fugitive emissions from fossil fuel extraction (ERF Green Paper, 2014). SEN believes the Energy White Paper needs to provide strong direction for the transition to a sustainable low carbon economy. To achieve this, energy policy must have two over-arching aims: optimizing energy efficiency and replacing aging fossil fuelled energy sources with increasing amounts of integrated renewable energy, capturing the vast benefits of this multi-billion dollar industry

This submission presents strategies for reducing Australia's carbon intensity and reliance on fossil fuels in both stationary and transport energy by a combination of methods including:

- Increased energy efficiency,
- Increased use of abundant renewable energy resources for electricity generation and liquid fuels
- Improved electricity grid capability.
- Low carbon transport technologies

This would provide the following benefits to Australia's economy:

- Reducing electricity generation costs. Wind, solar and biomass are already competitive with new coal and gas generation, and will become increasingly more so as capital costs continue to decline. Conversely, world oil and gas prices are rising due to depletion of reserves and the cost of carbon emissions will rise in the long term (see section 8). A recent report from Bloomberg New Energy Finance has concluded that electricity from some wind and solar technologies is already cheaper than electricity from new-build coal and gas-fired power stations in Australia, even without subsidies (<http://reneweconomy.com.au/2013/renewables-now-cheaper-than-coal-and-gas-in-australia-62268>). LCoE's of renewables have dropped 25-30% since the original report was issued in 2012. (BREE AETA, 2014).
- Security and robustness of energy supply by use of multiple and dispersed renewable energies. "Renewable energy offers more than just a positive for the environment. It offers also a diversity of energy supplies and enhances energy security." Maria van der Hoeven, IEA executive director (<http://reneweconomy.com.au/2012/iea-says-renewable-energy-growth-to-accelerate-76483>)
- Reduced reliance on imported petroleum fuels and for transport and electricity generation.
- Plentiful, safe, and perpetual energy supplies using readily available commercial technology.
- Potential for Australia to earn significant export revenue by supply of solar electricity to Asia by undersea HVDC power cable.
- Diversified growth in agriculture through biomass crops such oil mallee, hemp and algae.
- New industries producing biofuels (potentially for export) and biomass fuelled electricity generation power plants.

- Increased employment and income, particularly in rural areas. One of the positive outcomes of pursuing renewable energy policies is the potential to create jobs. Globally, an estimated 5 million people work directly or indirectly in renewable energy industries. Governments globally acknowledge the benefits of energy efficiency and renewable energy as central elements of any green economy strategy. (REN21. 2012. Renewables 2012 Global Status Report). The Australian clean technology sector boasts revenue of \$29 billion a year and employs 53,000 people, making it larger than Australia's automotive manufacturing industry and one quarter the size of the country's entire manufacturing sector (<http://reneweconomy.com.au/2013/australian-cleantech-sector-tips-30bn-outranks-car-making-38503>).
- Reducing billions of dollars of externalized environmental and health costs by:
 - Reducing carbon emissions
 - Reducing air pollution from hydrocarbons, particulates and oxides of sulphur and nitrogen.
 - Less depletion of fresh water supplies for cooling
 - Reduced water pollution from activities such as fracking and disposal of coal fly ash.
- Low carbon transport options such as shifting road freight to rail, mass transit electric rail for passenger and freight, electric vehicles and more efficient combustion-engined vehicles using bio-fuels.

To illustrate the abundance of renewable resources available, the following theoretical land areas are all that would be required to provide for Australia's present electrical energy consumption:

- Solar thermal: 50 km x 50 km (CSIRO)
- Wind: 130 km x 130 km (Derivation from A. Blakers)
- Wave: wave resource along southern half of Australia enough to provide 5 times current needs (Carnegie Corp)
- Geothermal: 1% of known resources sufficient for 26,000 yrs + (Geoscience Australia, 2014)

Wind , solar PV solar CST and biomass plants are mature technologies and wave, geothermal hot rocks tidal and oil mallee biomass are in the demonstration phase of development. If supported by regulatory and financial incentives, such the current ARENA and CEFC, these renewable technologies have the potential to provide all of Australia's stationary electricity generation.

2. The Security of Energy Supplies

Ensuring reliability and long-term energy security

SEN notes that Australia is 85% dependent on oil imports for transport and is currently becoming more dependent on gas for electricity generation when world gas prices have risen 2 to 3-fold recently and are forecast to continue to rise. (Business Spectator, 2014)

Australia's centralised fossil-fuelled generation was built in the 20th century with low-cost abundant coal and gas, government funding of power stations, a favourable regulatory environment, and a lack of cost-accounting for externalities such as greenhouse gas emissions and other pollution. SEN asserts that that modern dispersed electricity grids provide energy security because fossil fuel supply and price factors are eliminated and there is less impact in the event of a large generator failing. Modern smart grids integrating multiple, dispersed renewable energy generation reduces the frequency and severity of large generator trips.

International agreements and emergency response measures

Maximising the uptake of renewables around the world will result in a less risky future relative to the alternatives of nuclear and coal with carbon capture and storage with their as-yet unresolved issues, in a geopolitically unstable world. Many other countries are far ahead in their transition to renewable energy systems:

- In the USA, the EPA enacts rules regulating carbon dioxide emissions under the Clean Air Act. The US Government's Climate Action Plan limits greenhouse gases emissions from both existing and proposed coal-fired power plants. Production tax credits and additional incentive payments have provided incentives of

more than 4 c/ kWh for wind and other renewable energy projects since 1992.

(http://en.wikipedia.org/wiki/United_States_Wind_Energy_Policy). The US Government's Department of Interior continues its work on environmentally responsible development of utility-scale renewable energy projects on public lands (over 30 projects including several large-scale solar thermal projects approved on public land, particularly in California and Nevada) as part of the Administration's efforts to diversify the Nation's energy portfolio. A ruling by the Federal Energy Regulatory Commission (FERC) enables energy storage to be connected to the grid, as renewable energy ancillary services.

- Germany has been at the forefront of transitioning to renewable energy using energy market incentives and reducing their domestic reliance on fossil fuels and nuclear energy. The German Government has a target of 55-60 per cent renewable energy by 2035 and the German Energy Agency has proposed a 95 percent reduction of greenhouse gas emissions by 2050.

- France has announced an alliance with Germany to move towards renewable energy and reduce its dependency on aging nuclear plant, thereby undertaking major transformations of their electricity grids.

- In our region, the World Bank Group is committed to facilitating the shift to a more environmentally sustainable energy development path, providing focus and support through scale up investment and analytical and advisory activities in sustainable energy to support the East Asian governments.

Globally, the International Energy Agency states that further growth of renewable energy is essential for a secure and sustainable energy system (<http://www.iea.org/aboutus/faqs/renewableenergy/>).

- China has implemented the China Renewable Energy Scale-up Program (Ref:

<http://www.cresp.org.cn/english/about.asp>), and passed a Renewable Energy Law in 2005, in order to promote the exploitation of renewable energy, increase energy supply, improve the energy structure, ensure energy safety, protect the environment, and attain the sustainable development of the economy and society (http://www.npc.gov.cn/englishnpc/Law/2007-12/13/content_1384096.htm).

- At the end of 2012, Indonesia had the third highest total capacity of geothermal electric generating capacity in the world (1.3GW), and has announced a geothermal energy investment programme with significant international backing, and plans for a geothermal risk mitigation fund which will provide loans to developers in an effort to jumpstart the industry. Indonesia targets 12.6 GW of geothermal capacity by 2025. Indonesia has increased its total renewable electricity target to 26% by 2025, and set individual technology targets for wind, solar pv, hydro, pumped storage, geothermal and biofuels. (http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf)

Addressing infrastructure and supply constraints and barriers to emerging energy sources

SEN proposes that Australian policy be directed at encouraging the use of our renewable energy resources and developing the capacity and technologies to participate in the clean energy economy and markets in our region and the world. This requires Government facilitation of:

- Planning electricity grids to enable increasing replacement of centralised fossil fuel generation with the abovementioned renewable energy sources.
- Developing biofuel and solar renewable fuels industries, with potential for export of fuels and technology

SEN's 2013 design study for a 100% renewable-energy powered Western Australia's South-West electricity grid (SWIS) by 2029 (<http://sen.asn.au/media/reports>), indicates that a renewable-powered electricity supply is technically feasible and cost competitive against continued growth of fossil-generated electricity. (Note that it used conservative costs from the BREE AETA 2012 report and that the AETA update in Dec 2013 has significantly reduced renewable energy costs). SEN is currently using software such as the US Dept. of Energy's National Renewable Energy Laboratory "System Advisor Model" to model optimum renewable energy electricity generation and grid transmission configurations. SEN is using hourly meteorological data for the past 10 years from the NASA "MERRA" and Australian Bureau of Meteorology to conduct this modelling.

SEN sees several **barriers to integration of renewables** into the electricity system, each of which can only be overcome by Government action:

- Lack of grid access. One reason is that old coal fired power stations are being operated beyond their normal operating life. This keeps wholesale electricity prices artificially low (<5c/ kW when the cost of electricity from new fossil or renewable plant would be at least double this. It also fills the existing transmission lines with electricity from highly polluting generators. For the reasons given in the submission,

State Governments should write off and retire aging coal and gas fired power stations and replace them with renewable generation.

- The need for to modernize Government owned electricity distribution grids with 'smart grid' technologies to expand the capability for bidirectional energy and demand-side control, thus enabling peak loads on the grid to be reduced.
- The need for integrated State and Federal Government plans identifying and designating optimum, renewable electricity generation regions and potential storage such as pumped hydro. Transmission infrastructure needs to be planned and constructed, connecting to these regions, to enable expansion of these fuel-free energy sources.
- Need for finance to modernize and extend the electricity distribution and transmission grids. SEN suggest that this be funded by government bonds to enable investment by superannuation and other funds.
- Market deficiencies identified in section 3 should be rectified.

Note: Now that solar PV and wind electricity generation are competitive, feed-in tariffs are generally no longer necessary for these projects providing that the RET is retained.

3. Regulatory Reform and Role of Government

From the Senate Inquiry into matters relating to the gas explosion at Varanus Island, one of the Economic Committee's recommendations was:

"Recommendation 4 - Increasing competition in the WA energy markets: The Western Australian Government should actively engage with the alternative energy industry in Western Australia in order to progress energy diversification through increased alternative energy capacity." This recommendation should apply to the whole of Australia; increased reliance on increasingly expensive gas is a security risk to energy supply. All of the renewable energy alternatives proposed by SEN do not require imported fuels and do not rely on any single fuel source.

Greater price transparency Improving market competition

Electricity markets need to be modified to address issues of:

- Large 'gentailers' with 20% or more of the market being able to influence prices by withholding energy
- 'Dumping' energy at very low prices from old polluting power plants that have exceeded their design life, were paid for by taxpayers and should be written off to make way for new clean renewable generation that is competitive in cost with new coal.
- Excessively generous, bilateral contracts (the details of which are secret), in particular between State Governments and energy intensive resource industries such as aluminium smelting, that were provided to entice these industries to establish by providing power at below real cost.

Remove subsidies for fossil fuels

Part of the structural reform and price transparency needed to create a competitive energy market is to remove hidden or indirect fossil-fuel subsidies. SEN calls for rapid phase-out of Australia's fossil fuel subsidies estimated to be about \$6 billion/yr. in direct subsidies to coal fired generators, oil and coal extractive industries and several billion more in tax exemptions for diesel and aviation fuels. (ANAO, 2010-11; <http://paidtopollute.org.au/ptp-fossil-fuel-subsidies>) The Energy White Paper should address the commitment at the OECD G20 Summit in Pittsburgh in 2009 to phase out fossil fuel subsidies, which was reaffirmed at the Saint Petersburg Summit last year, and work with the road map to phase out fossil fuels in the joint report prepared by the IEA, OECD, OPEC and the World Bank (<http://www.oecd.org/ctp/fossilfuelsubsidies.htm>).

Environmental safeguards

In order to maintain environmental safeguards, the Australian Government should introduce a low greenhouse emission trigger in the Environment Protection Biodiversity Conservation Act (EPBC), ensuring Federal oversight of developments which are liable to have a significant impact on domestic or global greenhouse emissions.

4. Growth and Investment

Supporting growth

Planning the energy future for Australia needs to include the strategic direction of adopting renewable energy, building sustainable economic growth by taking advantage of the downward price pressure that renewables can offer. For example the 8% wholesale price reduction of electricity in South Australia in 2013 is due to the displacement of higher priced gas generation by the high penetration of wind energy which presently supplies about 26% of SA electricity, and lower demand. (<http://reneweconomy.com.au/2012/wind-solar-force-energy-price-cuts-in-south-australia-39705>)

Australia has among the best solar, wind and wave resources in the world and the energy potential to harness from these renewable resources is many times more than Australia's domestic consumption.

A recent report by Clean Edge Inc. showed 2012 to be a record year for renewable energy deployment and projected growth rates that could double total market value within a decade.

Their 12th annual Annual Trends Report, which tracks developments and expected expansion in clean energy markets. This projects that global biofuel, wind, and solar markets will nearly double in total value from \$248.7 billion in 2012 to \$426.1 billion by 2022. Australia needs to integrate planned growth and development of renewable energy industries into its economy over the coming decades to be able to participate and benefit from this trend.

The Australian and the global fossil fuel industry have been given stark warnings by two leaders of the international finance sector, Deutsche Bank and Standard & Poor's, that their future will be constrained by political decisions to limit emissions and also limited and rising finance costs. Financial institutions will realize that there is a real risk of fossil energy companies being left with stranded resource assets, as it impossible to exploit the world's coal and gas reserves while keeping global temperature rise to a 'safe' 2 degrees C. Now is the time to transition to renewable energy to avoid these issues.

SEN notes that the WA Government recently spent over \$300 million refurbishing a 46 year old coal fired generation plant, encountering expensive problems with the aged boilers. Using these funds on new solar and wind plant would have provided new, reliable, clean energy for at least 25 years and more jobs to the local region.

Encouraging investment

The Clean Energy Finance Corporation (CEFC) provides 'seed funding' loans to de-risk commercial projects that have very low or negative carbon abatement costs; (<http://reneweconomy.com.au/2013/cefc-could-deliver-half-australias-co2-cuts-and-make-money-12268>) The CEFC is essential to support growth in renewable energy. Clearly it is needed or else the private sector would already have funded such projects. The CEFC has demonstrated net positive revenue to the Federal Government in loan repayments to date; it is effectively a government development bank like those set up last century, but with the purpose of funding carbon emission reduction projects. Its long term costs would be operating / administration only; most of the \$10b in funding is essentially 'revolving loans' that are paid back and the money re-loaned. The only net costs are administration and bad loans. (This is more cost effective than grants and subsidies to industries under the proposed Direct Action Plan, which are costly to administer and not recoupable). It is simply not logical to terminate an agency with this capacity.

SEN holds that the CEFC is and will continue to be essential towards:

- Installation of dispatchable renewable electricity such as solar CST, pumped hydro, woody biomass, geothermal and wave, which are operating commercially in other parts of the world but not yet in Australia.
- Implementing innovative energy efficiencies in Australian industries

SEN believes the scope of the CEFC should be expanded to include planning, developing and installing innovative smart grid technology in Australia to ensure modern dispersed electricity grids, control systems and electricity markets that will enable 100% renewable electricity generation by 2050.

The Renewable Energy Target (RET) of 41,000 GWh aims for 20% of Australia's electricity to be generated by renewable means by 2020. It is the major support mechanism for growth of the RE industry and its associated knowledge and downstream support industries. It has provided certainty for investors in renewable power generation and is crucial to continuing investment in the sector.

With establishment of the above-mentioned renewable energy zones, continuing the current RET, plus increased targets beyond 2020 and supportive Government policy and regulation, Australia can continue to capitalize on the multi-billion dollar global renewable energy industry.

Community engagement

The massive take-up and growth of renewables in the residential sector, and which is now ramping up in the commercial and industrial sector, demonstrates the popularity of renewables with Australians and business communities. With this support, it is natural to encourage renewable energy implementation, particularly as it is cost-competitive with retail electricity prices. Complimentary measures to assist grid stability and reduce transmission infrastructure costs, such as implementation of energy storage, demand-side management to reduce peak demand and 'time of use' electricity tariffs, will provide further benefits to reduce electricity costs. An example of this is that BYD China is installing 12MWhr batteries in their industrial grids to reduce transmission infrastructure costs. (www.byd.com/energy/ess.html, and presentation to the Sustainable Energy Assn of Australia, by BYD distributor FE Batteries Australia, 2012-13)

Other methods which can reduce costs to the economy, improve quality of living and engage the community include:

- Improving energy efficiency of electrical devices
- Expanding public transit systems
- Transferring freight from road to rail or shipping
- Electrification of transport such as passenger vehicles, buses, rail
- Implementation of simple forms of renewable energy use, such as solar hot water systems and solar-passive building design, which have massive potential to displace demand for increasingly expensive electricity and gas.

5. Trade and International Relations

Growing export markets including value-added products and services

The Energy White Paper should link to the Northern Australia White Paper. Geopolitical discussions are needed around exporting renewable electricity and fuels:

- Electricity from concentrated solar thermal with storage, and pumped hydro, from northern Australia to South-East Asia. (<http://reneweconomy.com.au/2013/north-australias-electrifying-future-powering-asia-with-renewables-80382>). By using high voltage direct current transmission, and bundling infrastructure with natural gas / telecommunications between nations, Northern Australia can have a bigger role to play in the growth of its northern neighbours than as a northern outpost of the continent.

The solar resources of the northern region are enough to provide all of Australia's and much of Asia's electricity. Projects to provide renewable energy to South East Asia could attract significant investment in Australia. N. Africa-Europe Desertec project plans to provide solar energy from North Africa to Europe via several sub-sea HVDC cables. Such a project would generate significant export revenue, thousands of high-tech jobs, establish industry knowledge base and promote Australia as a leader in the rapidly growing, green technology energy sector. It would also secure sustainable energy and low carbon futures for the SE Asian region, which, reducing the risk of energy conflicts and energy poverty and mitigating climate change. A recent paper by Andrew Blakers from the Australian National University proposes construction of 100 GW of solar capacity in Northern Australia, to be exported via a HVDC sub-sea power cable to Indonesia. SEN estimates that this could generate about \$30 billion annual revenue (based on a 25% capacity factor and an electricity price of \$80 per MWh).

- Liquid fuels from solar produced hydrogen and biomass-derived organic fuels. (refer to section 8.)

Attracting foreign investment

Encouraging open and transparent international energy markets

SEN urges the Federal Government to investigate with Indonesia and other Asian nations the feasibility and possible future joint development of projects to export solar electricity to Asia via sub-sea cable as mentioned above.

Enhancing energy supply security

Developing domestic renewable energy systems in Australia to displace fossil fuel energy will also secure and stabilise energy supply for Australian consumers and business, as they do not carry the risks of increasing gas and carbon prices. SEN believes that it would be economic for Australia to maximise development of its renewable solar and wind resources for domestic use and potentially for export in preparation for the transition of global energy from fossil to renewables. In that way, Australian jobs will be created, further export income will be generated and Australia will be equipped for the coming era, high world gas, petroleum and carbon prices. Some Middle Eastern oil exporting nations already starting down this path. Abu Dhabi, which has just opened a 100 MW solar CST plant and Saudi Arabia announced late last year that it is seeking \$100 billion in investment to build enough solar energy capacity to supply a third of the nation's electricity demand. (qz.com, 2013)

6. Workforce Productivity

- **Increasing workforce productivity**
- **Addressing skills shortage**
- **Addressing long-term training and skills development needs**

A significant benefit of renewable energy is the potential to create jobs. An estimated 5 million people work directly or indirectly in renewable energy industries world-wide. (REN21. 2012. Renewables 2012 Global Status Report). In Australia, renewable energy already generates increased employment, particularly in rural areas.

Projections by the International Renewable Energy Agency (IRENA) indicate that there is huge potential for job creation in renewable energy. Even though labour productivity evolves through time, studies have shown that renewable energy technologies are currently more labour-intensive than fossil fuel technologies, with solar PV technology accounting for the highest number of job-years per GWh over the lifetime of the facility. While the extent of employment effects may be debated, most studies indicate that renewable deployment can be associated with net job creation (http://www.irena.org/Renewable_Energies_and_Jobs). SEN points out that the higher labour intensity of renewables is offset by the zero cost of the renewable energy resources (with the exception of biomass).

Australia needs a strategy to increase research, development and manufacturing capacity in renewable energy technologies and attract leading researchers in innovative renewable energy industries from overseas. This is beginning to happen under the current CEFC legislation. Repeal of the Clean Energy Act including the carbon price, ARENA and CEFC and / or reduction or removal of the SRET and LRET, would remove incentives for further industry investment in renewable energy and thus would threaten Australia's employment growth.

Building skills for emerging and alternative energy technologies

Training and education in renewables is crucial. Consideration on how best to address renewable energy skills development should be included in the forthcoming national education curriculum review. Continued job creation also depends on stable and predictable government policies that support growing sustainable industries.

7. Driving Energy Productivity

Supporting Energy Productivity:

The cost of renewable electricity generation technologies is continuing to decline and is now in some cases competitive with fossil fuel generation. (www.reneweconomy.com.au/2013/wind-at-wholesale-price-parity-in-worlds-major-markets-52906). For example, South Australia's wholesale electricity price has reduced by 8% in 2013, due to the displacement of higher priced gas generation by the large penetration of wind energy which presently supplies about 26% of SA electricity, and lower demand (<http://reneweconomy.com.au/2012/wind-solar-force-energy-price-cuts-in-south-australia-39705>). Government policies (as noted above) which provide long-term certainty for the investment will promote the growth and productivity of this industry.

Electric-powered vehicles are 4-5 times more efficient in their use of energy than internal combustion engines. A shift to electric trains and other vehicles (passenger and cargo) will dramatically reduce the need for imported liquid fuels, thereby improving our balance of payments.

Furthermore, electrified transport has the capacity to reduce pollution and offer electricity generation ancillary services such as 'Vehicle-to-grid' options. These services include electricity load stabilization (balancing) and even the ability to provide storage to reduce peak demand on our transmission infrastructure by serving as 'embedded' storage.

Electric cars are set to boom globally as the major manufacturers are all going into production. This could be an opportunity for Australian ingenuity to utilise the otherwise declining auto industry to create innovative products, as has already occurred in Australia, i.e. Batrium Technologies, Blade Vehicles, EV Works, EV Power Australia.

As Australia is dependent on imported oil and petroleum products (<http://theconversation.com/australias-growing-oil-imports-are-an-energy-security-issue-7749>), reducing reliance on imported liquid fuels would greatly improve Australia's fuel security and improve the balance of trade. This would aid the transition to cleaner more efficient and productive transport sector. (see transport section below).

SEN highlights that **Concentrated Solar Thermal (CST) energy is potentially a cheaper, more secure source of energy** for mining and resource projects than diesel or gas. CST electricity technologies currently being deployed by Solar Reserve in Nevada offer the potential for cheaper electricity and co-generated heat at lower cost than the typical \$200/MWh for small gas generators and the \$300-500/ MWh cost of generation by diesel plants. Solar Reserve is developing a semi- portable 20 MW scale solar CST power plant that can be relocated at the end of a mine's life.

Maximising social and economic benefits

Pollution from coal and gas lifecycle activities result in significant externalised health costs, (Crisp, G, 2012) mainly from air and water pollution. Coal mine-dewatering and power station water cooling requirements impose pressures on water supplies. New forms of 'unconventional' gas extraction via hydraulic fracturing methods carry the risk of permanent damage to aquifers and other surface water bodies, agricultural productivity and our significant environmental heritage areas.

On the other hand, renewable-energy carries none of the above issues. Claims of health issues from wind turbine noise have been demonstrated to have no credible basis. Several scientific studies have found that the complainants (a small minority of populations near a few wind farms) are likely describing psychosomatic symptoms arising from dislike of wind turbines for aesthetic or other reasons.

SEN believes that equity issues should be carefully addressed when planning wind and solar farms, to ensure that the local community has some financial stake in them. Other issues such as lack of reliability of wind and solar have been disproved by the reliability of the existing commercial installations. Variability of wind and solar can be overcome by flexible renewable backup, dispersed location of generators, curtailment of wind in some circumstances and wireless operation of transmission grids.

Encouraging demand-side participation (DSM) and energy efficiency to reduce peak energy use

SEN fully supports the implementation of demand-side management (DSM) for cost efficient supply balancing. Expanding and increasing DSM is significantly more economic than building more open cycle gas turbine and diesel peaking plants, which are inefficient and expensive as they are operated for only a few days a year

The WA SWIS grid market operator (IMO) has recently offered expanded financial incentives to demand side participants and education to large consumers on variable tariffs; this has resulted in increased curtailment of some operations / reduction of load in others. Overall peak demand of these industrial and commercial sectors has reduced significantly since the introduction of the improved incentives. There is obviously significant potential to extend telemetry-controlled load reduction/ curtailment in these sectors and also willing residential consumers.

The WA IMO has also come to an agreement with wind generators to reduce or curtail load rather than incur high negative prices when demand is low (windy nights), to reduce problems with ramping down large old coal fired generators. SEN asserts that this highlights a need for Governments both State and Federal to have a plan for coal fired power stations to be retired as soon as possible and replaced with flexible dispatchable backup such as CST with storage, biomass and pumped ocean hydro to complement wind and solar PV, which are increasingly more economic than new coal or gas.

Energy Efficiency

Energy efficiency has played a major part in the decreasing electricity demand in spite of new industrial projects, increasing population and a robust economy. SEN urges the Government to maintain and expand the successful Energy Efficiency Opportunities program, which is an evolution of the Mandatory Energy Efficiency Assessments introduced by the Howard Government in 2004. The EEO has identified potential reductions of greenhouse gas emission equivalent to 2.6% of the nation's total emission in 2011. (EEO, 2013) Many of these efficiencies have already been achieved, delivering savings of some \$800m to industry. There is scope to include many smaller businesses in EEO.

There is still more potential for residential energy efficiency measures and installation of smart grid technology e.g. smart meters that can be used to control specific loads and charge variable tariffs to reduce peak energy demand. This would obviate the cost to consumers of building more expensive peaking power infrastructure to be used for very brief periods of high demand.

Programs such as Living Smart and Travel smart should be expanded, with TV and media campaigns to further encourage community adoption of energy efficient living

Increase energy efficiency within the transport sector

The main issue for Australian transport sector is the increasing price of oil and Australia's almost total reliance on imported oil and petroleum fuels. As the world has reached 'peak oil' 5 years ago, cost and risk associated with supply of petroleum fuels can only increase. This is of particular concern to Australia as about 40% of our petrol and diesel fuels are imported (AIP, 2012) and Australian refineries are highly dependent on imported crude. Overall, Australia is over 85% dependent on imported petroleum fuels for transport (Blackburn, 2013). Fuel imports increased by 30% in the 4 years to 2008 (Jamison Group, 2008). Petroleum fuels contributed over \$18 billion to Australia's trade deficit in 2011 (The Conversation, 2011).

A Comprehensive plan to reduce oil dependence is crucial to Australia's economic future. This plan should include both energy efficiency and development of new propulsion technologies and renewable fuels for cars and trucks:

- more stringent car and truck fuel economy standards
- incentives and facilities for commuters to move to public transport and bike / walk when possible
- transferring freight from road to rail
- investment in progressive conversion of part of the vehicle fleet to electric and hybrid-electric, including electric charging stations,
- investment in synthesised renewable organic fuels from solar energy, woody biomass and algae (not grain ethanol)

'User Pays' methods should be considered, such as increasing fuel taxes (which have remained static since the GST was introduced and are the 4th lowest in the OECD) from 38c/ L to be more in line with OECD average of \$1 per litre, to cover the externalised health and pollution costs. Insurance should be levied as part of fuel taxes rather than on license. A carbon price should be extended to fuel, only imposing an additional tax of several cents at a price of \$25/ tonne CO₂. Road user charges should be considered for heavy truck roads and congested urban areas.

Rail transport is several times more energy-efficient and much more infrastructure-efficient than road transport for heavy freight, due to the very low rolling resistance of rail rolling stock. Rail (tram and train) is also more energy efficient than diesel buses for urban passenger transport and should be adopted wherever passenger numbers justify it and it is feasible. In the early days of transport, when trucks were small or non-existent, the benefits of using the most efficient methods, such as rail and shipping, were realised and used. With development of more powerful truck engines and cheap oil, freight has been increasingly moved onto roads. However, there are increasing issues with heavy trucks on roads, including truck-related road deaths (over 200 in the last year), road trauma, increasing road degradation and community health issues arising from noise, dust and diesel emissions.

8. Alternative and Emerging Energy Sources and Technology

Encouraging competitive renewable, low-emission technologies and alternative energy sources

Some low-emission, renewable technologies, for example wind and solar PV are already competitive with fossil fuel energy sources. Dedicated biomass fuels (from oil mallee or other woody biomass) can be produced at costs competitive to gas, which has increased threefold in cost over the past 3 years and is projected to become increasingly expensive.

The Energy White Paper should create a vision towards much larger-scale deployment of renewable energy to realise the employment, trade, economic and environmental benefits the multi-billion dollar industry is already generating globally. A rigorous, triple bottom line assessment of various scenarios of business as usual, or increased renewable energy should be conducted as part of the scope of the Energy White Paper to provide justification for chosen policy directions.

A national strategy for a de-carbonized energy system should identify prime zones for renewable energy development based on factors such as optimal wind, solar, wave geothermal and hydro resources, transmission capacity, and avoiding significant potential environmental impacts and land use conflicts. This would enable energy industry and finance corporations to plan and deliver energy projects, with a minimum of 'red tape'. Some examples of renewable energy zones around the world include Canada, western states of USA, and UK.

Canada and USA

Western Renewable Energy Zones: a joint initiative of the Western Governors' Association & U.S. Department of Energy
(www.westgov.org/wga/publicat/WREZ09.pdf)

USA

U.S. Department of the Interior – Renewable Energy Zones on public lands
(www.doi.gov/news/pressreleases/secretary-salazar-finalizes-plan-to-establish-renewable-energy-zone-on-public-lands-in-arizona.cfm)

California, USA

Renewable Energy Transmission Initiative (RETI)
(www.energy.ca.gov/reti/)

Utah, USA

Utah Renewable Energy Zone
(<http://mapserv.utah.gov/urez/>)

United Kingdom

National Renewable Energy Action Plan for the United Kingdom

(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47871/25-nat-ren-energy-action-plan.pdf)

SEN has completed a technical, costed study which indicates that 100% renewable electricity system for WA's Southwest Electricity Grid (SWIS) would be cost-competitive or cheaper than continuing with the business-as-usual case of renewing the 90% fossil fuelled generation plant in the existing grid. Construction of mature renewable technologies for generating dispatchable electricity such as biomass, pumped ocean hydro, solar thermal and battery storage, could enable this as soon as 2029 if aging coal plants were retired sooner and the grid extended to enable more dispersed wind and solar generation. (SEN technical and costed report "100% Renewable Energy for the SWIS by 2029" <http://sen.asn.au/media/reports>) SEN asserts that cost competitive wind and solar alone could contribute over 30% of Australia's energy needs within a few years.

Supporting research and development for emerging technologies

There is a need for finance to commercialize newer renewable technologies such as is ARENA's remit, and as such, it or a similar vehicle should be retained, and its funding expanded.

There are many areas of research and commercialization in which Australia should be more involved. Two significant examples particularly relevant to Australia's energy future are:

- Oil mallee for energy, char and oils – a demonstration plant in Narrogin WA has been mothballed; there is a need for a new commercial plant and establishment of an oil mallee biomass industry
- Solar organic fuels- Israeli university BGU has developed an effective process producing hydrogen from water, which is mixed with carbon dioxide. This green feed mixture is placed into a reactor that contains a nano-structured solid catalyst, also developed at BGU, to produce an organic liquid fuel and gas. (Nanowerk, 2014).

Other feedback (briefly add comments if applicable)

Additional processes relevant to the Energy White Paper:

- **Repeal of Carbon Tax and Mining Tax** (incl. scrapping of CEFC)
SEN opposes the repeal of the carbon price on the basis that the polluter incurs the cost of carbon pollution (polluter pays), which is normal business practice. SEN believes that a predictable carbon price, adjusted to achieve annual caps in accordance with emissions reduction targets, is necessary for industry to reduce emissions. SEN concurs with the existing Clean Energy Future Legislation's provision of compensation for some vulnerable industries and community sectors (Clean Energy Future, 2013). The existing carbon price of price of \$23 - \$25.40 per t CO₂ has been working well, with vulnerable households being adequately compensated and trade exposed industries being given free permits until market competitors also face a carbon price.

The Clean Energy Finance Corporation

Scrapping of the CEFC would have an enormous negative impact. It is successfully providing 'seed finance to new energy efficiency projects and commercial renewable energy projects. It has demonstrated emissions reductions at negative cost (i.e. savings to the company). As it is essentially a Government development banks, loans are repaid and the money can be re-lent to other projects. Its only costs would be administration and bad loans. As part of its operating rules, it does not provide finance to projects such as conventional wind and solar which are easily financed by private sector banks. It generally provides some low interest finance in conjunction with other banks and lenders. To terminate the CEFC would not be logical economics.

Effect of carbon price on energy intensive resource industries

SEN notes that Point Henry Alumina smelter is already slated to close due to its excessively cheap coal generation contracts running and alumina production at Nhulunbuy is closing due to increasing gas and diesel prices. Fuel costs, combined with a persistently high AU\$ exchange rate are the reasons for these plants closing, not the relatively small impact of the carbon price. (Alumina smelting receives 95% free carbon emission permits) . It is inevitable that energy intensive smelting industries will eventually move to locations where there is cheap clean energy such as hydro; there are many such locations in South America and Africa. Emissions incurred from shipping alumina and beneficiated ores to these locations are minor compared with the emissions of fossil fuelled smelting.

SEN also notes that Western electricity prices (IMO) have decreased to around \$45/ MWh in spite of the \$24 carbon price on coal and gas fired generators, due to improved efficiencies in the balancing market

SEN believes that Australia's future lies in less energy intensive, more energy efficient manufacturing and development and commercialization of new technologies. Renewable Energy industries fit both of these criteria.

- **Renewable Energy Target (RET) Review**

SEN believes that the current fixed 2020 target should be retained and not reduced by changing to a percentage of decreasing electricity demand. Furthermore, the target should be increased over a longer term to provide energy businesses with more certainty for planning. SEN notes that at a growth rate of 10%/yr, the RET targets would be 35% by 2025 and 50% by 2030.

- **East Coast Gas Strategy to 2020**

SEN policy is to encourage use of renewable electricity in place of gas where possible, to reduce gas price and supply risks and carbon emissions. SEN sees the Australian gas price as being linked to increasing world gas prices into the future.

SEN points out that fracking for gas extraction carries environmental risks, chiefly methane emissions and pollution of ground and surface waters, for only short term benefits. SEN points to warnings from the WA Water Corporation on the impacts of gas fracking on potable water supplies. For this reason SEN opposes fracking for shale and coal seam gas particularly in populated and agricultural areas, on the basis that renewables can provide the same functions. SEN notes that the decline of production from fracked wells is rapid and the benefits often short-lived.

- **Direct Action Plan (including Emissions Reduction Fund.** While SEN does not oppose an ERF per se, it believes the DAP/ ERF alone is inadequate to achieve even the current target of 5% emissions reductions by 2020. Many regulatory and financial measures will be necessary to achieve ongoing emissions reductions to 80% by 2020 that will be necessary for Australia to fulfil its responsibilities towards global action to limit global temperatures to 2 degrees C. Measures must include a downward cap on emissions, supported by a stable price on carbon sufficient to achieve the caps (SEN submission to the Senate Committee Inquiry into the Direct Action Plan).

SEN has evidence that abatements under this mechanism will generally cost in excess of \$30 / tonne CO2 and the funding allocated to it will not be sufficient to achieve anywhere near the required abatement of 430 million tonnes by 2020. SEN believes that under the DAP, this level of abatement can only envision that this can be achieved, given the low level of funding, by either; a recession (unlikely) ,the closure of several emissions intensive resource refining industries and/or injection of more than \$10billion in taxpayer funds to the ERF in its last three years of operation.

- **Review of Competition Laws and Policy**

No Comments

- **Northern Australia White Paper**

SEN believes there is potential to use the enormous solar resources of the North to produce renewable electricity for export to SE Asia. A Northern Australia White Paper should include strategy to develop sustainable energy export industry to Southeast Asia, namely renewable energy in the form of solar photovoltaic and possibly solar CST. A study by Andrew Blakers, Joachim Luther and Anna Nadolny on a supergrid to connect northern Australia to the Southeast Asian countries of Timor-Leste, Indonesia, Singapore and Malaysia predicts an estimate of one third of energy demand in 2050 (517TWh/year) could be provided by solar energy from northern Australia (supported by pumped hydro storage) (Ref: <https://www.dropbox.com/s/rmduirwkyz8pn1e/Supergrid%20Blakers%20Luther%20Nadolny.pdf>).

- **Vocational education and training (VET) Reform**

As mentioned previously, Australia needs a strategy to develop research and development and manufacturing capacity in renewable energy technologies and attract leading researchers in innovative,

renewable energy industries from overseas, as has been the case when conditions encouraging renewables have been in place. Training and education in renewables is crucial.

Consideration on how best to address renewable energy skills development should be included in the forthcoming national education curriculum review. For example, SEN offers observations on the WA Science book reviewed 1-2 years ago: the section on renewable energy had several 'units' mistakes; it had relatively dated information; the information provided still holds to many of the myths about reliability and limitations without providing information on how those can be addressed. SEN would welcome any opportunity to engage with the curriculum process to share the benefit of our research and knowledge in this area.

- **Five Year Offshore Petroleum Exploration Acreage Release Strategy**

SEN believes that further development of gas and petroleum resources both on-shore and off-shore is irresponsible in regard to global warming/climate change, regardless of which countries use them. The European Commission's Joint Research Centre (JRC) stated in 2012 "If the current global trend of increasing CO2 emissions continues, cumulative emissions will surpass this limit (of 2 degrees C temperature rise) within the next two decades. (<http://www.carbontracker.org/> and report: <http://www.carbontracker.org/wp-content/uploads/downloads/2012/08/Unburnable-Carbon-Full1.pdf>).

Much of Australia's contribution to global GHG emissions comes from export. The Australian Government should introduce a stringent 'greenhouse emission trigger' in the Environment Protection Biodiversity Conservation Act (EPBC) to enable Commonwealth assessments requiring that emissions intensive projects be modified to utilize best practice to minimize emissions.

Australia's fossil fuel –based export economy must change if we are to protect our economy from the ever-increasing effects of climate change and the consequential global transition away from fossil fuel usage.

- **Ability to achieve abatement target by 2020**

Refer to comments on the Direct Action Plan above and SEN's submission to the Senate Committee Inquiry into the Direct Action Plan.

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