

RENEWABLE AND SUSTAINABLE ENERGY TECHNOLOGY



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Executive Summary

This report has been compiled in response to the growing need to transition to 100% sustainable way of life. Achieving such an outcome involves a new way of thinking, conducting business and selecting sustainable technologies which are required in the face of a growing 'climate emergency' and the globe's need to move towards being 'fossil fuel free' as a matter of urgency even under the current global financial crisis.

There are increasingly insistent voices from the scientific community asking all decision makers in government and business to recognise that humankind faces a 'climate emergency', a code red situation and that we must act decisively and intelligently regarding sustainable solutions.¹

It is not difficult to see that there are other equally, if not more pressing and urgent challenges regarding '*peak oil*', '*peak gas*' and '*peak coal*' and '*nil net energy*' from fossil fuels, all converging with the *climate emergency*. In considering this point, Professor Charles Hall of New York State University and others, have demonstrated that currently net energy from oil and gas is on a steep decline towards zero in about ten years. They also state that coal supplies will peak globally by about 2020 and that net energy from all fossil fuels are expected to be about nil well before 2030.²

Given the current predicted future status of supplies it is essential to pursue sustainable technologies to ensure future wellbeing within a global context. Supporting the exploration and development of solar, wind, geothermal and other emerging technologies is paramount to our future sustainability.

Considering that all technologies are made up of discrete components and these components need to be manufactured and distributed, and all of this activity takes energy and oil, while oil supplies are getting severely constrained, net energy and oil is what the world is quickly running out of.

All technologies renewable, or otherwise, embody energy. The components were created using energy in the first place, so if we are looking to discover a point when they create 'clean, green energy', the energy payback is near enough to the equipment's complete life cycle. In other words, it costs energy to make energy and this must be considered when assessing our future and technologies.

Substantial quantities of oil are consumed in transporting these components to Australia as the majority of these renewable technology components are manufactured overseas, in Europe, the USA, China and Japan. With the current considerations for a carbon emissions trading scheme planned for implementation in Australia within the next few years, who will carry the costs of carbon emissions on these components, the manufacturer or the importer?

An immediate response strictly focused on a 10-year time frame is vital. The technologies to be used in this response must be carefully selected and lead to high net energy solution. Australia needs an inspiring vision, one which remains firm through successive governments, regardless of which party is in power for any given term.

¹ Climate Code Red, David Spratt and Philip Sutton, 2008

² Peak Oil, EROI, Investments and the Economy in an Uncertain Future by Charles A. S. Hall, Robert Powers and William Schoenberg

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There are a number of outstanding examples where European cities, despite the government of the day, put into action visions that have now made them leading sustainable cities.

One such city is Växjö, in Sweden, where the vision is to be a 'fossil fuel free' city. This vision has focused Växjö's citizens' thinking and innovation into achieving the goals that will make theirs a 'fossil fuel free' city. Another city is Freiburg. Known as the 'eco city' of Germany, it is a city that in 1975 fought against Nuclear Power plans. A vision was created that inspired them to be a 'solar city'. This vision has literally put them on the map, as many visitors and tourists from around the world have visited Freiburg in the hope of replicating some of the ideas and innovations back in their own countries as the race towards 20% by 2020 takes hold.

Australia is a unique country. Geographically we are located far from the rest of the older industrialised countries such as Europe and USA, or emerging industrialised countries like Brazil, India and China. Manufacturing in this country has not been sufficiently fostered nor encouraged, and as such we find ourselves importing much of our consumable goods.

De la Torre believes this past legacy must not continue as the status quo if we are to ensure our future. Australia needs to re-engineer, re-establish and re-invent our manufacturing capacity if we are to meet our climate change target of 20% by 2020. We may be playing a 20-year catch up game, therefore we need to take a different approach and implement a unique solution.

There have been past attempts to re-establish some manufacturing and assembly of wind components within Australia. Vestas Australia established two plants, one in Wynyard, Tasmania, a nacelle assembly plant and another in Portland, Victoria, manufacturing blades. These two plants employed and trained local people in the manufacturing and assembly processes. Unfortunately both plants closed their doors by late 2007.



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This was a great blow for the development of wind power in Australia, and de la Torre believes we have not yet recognised the significance of this loss to the nation. This belief is supported in this report. At the European Wind Energy Conference 2008, it was reported that there is a major Supply Chain issue for wind components. In other words, there is more demand than supply for wind energy technology, mainly due to two factors:

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1. The incredibly ambitious and inspiring plans by the European Union to increase the capacity of energy generated by wind from 56GW in 2007 to 180GW in 2020 for 'onshore wind', whilst simultaneously increasing the 'offshore wind' capacity from 1.08GW in 2007 to 35GW in 2020.³
2. The European Union is a mature wind energy region and some of its earliest installations are close to twenty years old. These installations are nearing the end of their life cycle and are due to be 're-powered'. This means dismantling, discarding and replacing most of these existing systems.

Out of all the current renewable energy technologies, wind has offered the best option from a cost/watt perspective for production of so called 'clean energy', so long as we do not account for the embodied energies. However, if there is a global demand for these components, what does this mean for countries that do not manufacture wind components?

It is common that the rest of the globe considers Australia to be a sun-burnt and sun-filled country. Solar PV and thermal technologies were developed, trialled and tested here, but we have lost most of the manufacturing and commercialisation technology to Europe, USA, China and Japan. On many occasions during the Fellowship de la Torre was questioned as to why Australia was not the leader in this field. The answers can be wide and varied, but the fact still remains that we have lost the vision to manufacture and commercialise here in Australia.

An example of this loss of vision is that the only operational PV module assembly plant in Australia (BP Solar) was closed down and moved to China in late 2008.

This report highlights the achievements Spain has made in a relatively short period of time. In the past 10 years, and more specifically in the last few years, Spain has been visionary in both the implementation and manufacturing of wind, solar PV and solar thermal. The Spanish people were inspired by the level of government policy, financial and research and development commitments in order to build up their renewable energy capacity. Spain now leads Europe in both these technologies and are in the process of developing some of the largest scale solar thermal farms. The main incentive mechanism was the commitment to the introduction of the 'Gross Feed-in Tariff' by the Spanish Government.



Courtesy: Solucar Energia SA

Geothermal in Europe, takes two paths; that of district water and space heating, and also production of electrical power

³ EWEA – Annual Report 2007

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Once a geothermal plant is established and producing heating and/or electricity, it has a long life expectancy, such as can be seen with Larderello Geothermal plant in Italy. But the challenges are the enormous risks, costs of exploration, establishment costs and embodied energy required. In addition, the unknown side effects such as test boreholes have been known to cause harmless, but nevertheless noticeable earth tremors - as recently occurred on the boarder of Germany and Switzerland and suspected due to geothermal explorations.⁴

The European countries included in this report have successfully created a strong renewable industry mainly driven by strong long-term visionary government policy. The most effective policy being the 'gross feed-in tariff' policy guaranteed over at least 20 years for all renewable systems without limitation to system sizing. The success of this policy alone is documented and proven.⁵ The formula exists to achieve energy security from renewable resources without disadvantaging any business or citizens, regardless of income status.

Other considerations for Australia include the implementation of strict national energy efficiency measures. The underlying philosophy is "If we can save energy then there is less that has to be produced". Energy efficiency is the first step to the implementation of renewable energy technologies and by far the most cost effective.

This report provides a comprehensive overview of the steps taken by some of the world's leading energy efficient cities, from new solar designed and meticulously constructed buildings, to retro-fitting and refurbishing of existing building stock.

The Victorian Energy Efficiency Target (VEET) was introduced in Victoria in 2009. The exemplary visionary city of Freiburg not only exceeded the German Energy Efficiency Targets, but created and implemented three levels of energy efficiency higher than that which was set by the country. This initiative has set a new standard in energy efficiency for the city, Germany and the rest of the world.

In this Fellowship report, de la Torre has documented the formulated and innovative examples of the outstanding results in the area of renewable, sustainable and energy efficiency achieved by many countries in Europe over the past 10 to 25 years. This knowledge and experience is important to ensure Australia can more easily fast track beyond many years of trial and error to achieve and exceed these results, and get to a position where we can be 100% sustainable within a much shorter time frame.

⁴ www.dw-world.de/dw/article/0,,2312857,00.html and www.iran-daily.com/1385/2764/pdf/i8.pdf. Also see Attachment A

⁵ Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, (2007) EEG – The Renewable Energy Sources Act, The success story of sustainable policies for Germany.