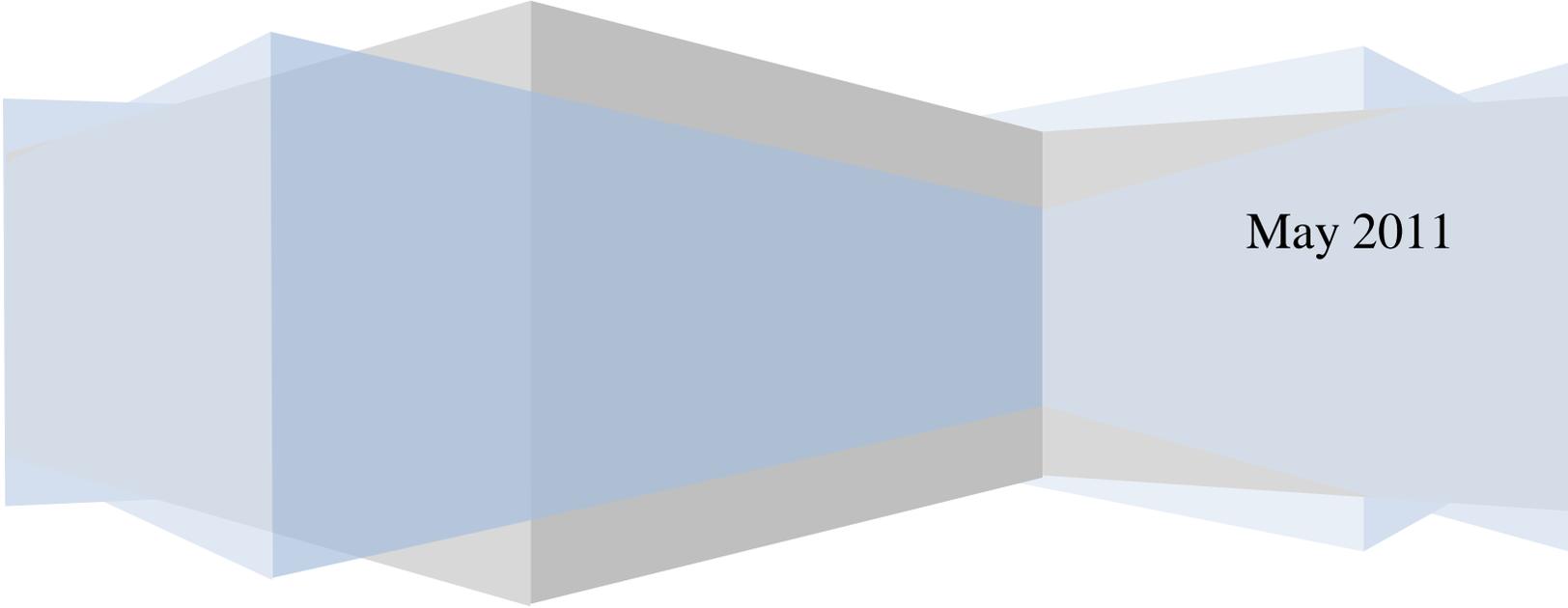


Discussion Paper – Don't Sell Australia Short

Commentary on Correspondence

On letters sent to and replies from Federal Government Members between 2006 and 2009 on Australia's future for renewable energy

By David Holland



May 2011

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Executive Summary

This is a discussion paper about renewable energy and how Australia is placed to act on reforms to improve the uptake of renewable energy. The paper also comments on a series of letters sent to Federal Government Members and Ministers from 2006 to 2010.

The commentaries on the letters add additional information not given in these letters to the federal government. This additional information has been added with a contemporary nature relating to the year 2010.

This discussion paper has within its appendix list the actual letters sent to the federal government. In addition it has the two replies from two federal departments received from the final letter written in 2009. These letters are from the Minister for Resources and Energy and the Department of Infrastructure, Transport.

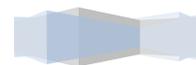
These replies outline some interesting plans for the direction of the then Rudd government and actions containing exciting programs underway. The commentary on the letter from the Minister for Resources and Energy analyses information presented in the letter that explain the government's promoting of the 'hydrogen economy', and the continuation of research into carbon abatement programs. Some interesting results are emerging from this program that may be environmentally friendlier than the simple carbon capture and storage concept.

The commentary on the reply from the office of the Department of Infrastructure, Transport, makes two important points. Firstly the government is continuing the planning for coal extraction by providing additional rail infrastructure for the coal mining industry. Secondly, though the introduction of Infrastructure Australia a range of much needed infrastructure within Australia can be planned, This will ensure proper investment in future infrastructure provided consideration is given to issues surrounding the impacts of climate change and peak oil. These should include best practice planning for the use of renewable fuels and renewable energy.

The commentaries on the letters are detailed, adding to the information contained in the letters. When reading these commentaries the original letters should be referenced to get a better picture of how the subject has evolved over the 2 to 3 year period between the letters and the commentary.

Some of the subjects canvassed by the letters include; 'the future of fuel cell technologies', 'the hydrogen economy', 'using hydrogen as a energy carrier', 'the efficiencies of heavy freight rail' and that a move towards higher levels of public transport use will help reduce carbon emissions and reduce government spending on high cost infrastructure such as roads.

The letters cover, as does the commentary, the issue of a carbon trading system or carbon tax. It outlines in brief the need for some market based system to line up with world's carbon trading systems or programs that provide ways to give disincentives for producing greenhouse gases by



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manufacturing enterprises. These enterprises utilize the 'public good' resources such as a balanced gaseous air mix in our atmosphere and clean seas that still have a capacity to absorb carbon dioxide. However many industrial and transport processes are impacting on the percentage of CO₂ in the atmosphere which is tending to cause changes to other economic systems reliant on stable weather patterns. These economic systems such as food production and other systems including natural systems rely on stable climate and weather patterns. When these systems are impacted the world's population and general economy can be drastically affected. High levels of CO₂ impact the very wellbeing of human life on earth and any compensation by manufacturing and industry is meaningless. However, these externalities explained above are considerable and morally they should somehow be accounted for in the manufacturing process. With these externalities accounted for by an artificial but morally sound price signal, it then may be that a cheaper and more economically sound (assuming the pure economics of a level playing field) process may be found that is better for the manufacturer. This is where a price on carbon helps to artificially price the damage these externalities are causing and attempts to give industry some impetus to find more carbon neutral forms of energy production.

One of the most important areas the commentary covers is that of a future change in energy sources from a fossil fuel driven economy to a renewable energy economy.

This move must be accompanied by a government planned response to supporting infrastructure. It is one thing to drive a renewable energy industry and connect it to an existing grid, but another to plan for and encourage infrastructure development by private industry to build plant in areas away from the grid.

Similarly, an organized plan is needed for the infrastructure needed to support a move away from fossil fuels in the automotive industry. Without government initiatives and proper planning to a standardized type of automotive support infrastructure, private investment will continue to identify a move towards renewable automotive fuels too risky.

With no standards for a supply route for a renewable energy fuel, private industry will find it a mammoth task to provide both a vehicle to run on a particular renewable energy source as well as provide the infrastructure, this with the high possibility that the whole new type of renewable energy system, including the vehicle and infrastructure, will not be embraced by the public due to its initial costs or lack of convenience etc.

The paper makes no apologies for being prescriptive. Although many of the concepts in the paper have been thought through by government experts, there is always the danger that assumptions can be made about the detail of what is being explained in a paper. So to avoid this some level of detail in some of the concepts and processes are present in the document.



The Renewable Energy Report Card

Don't Sell Australia Short

Discussion Paper

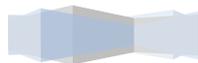
Introduction

When thinking about renewable energy generation we realize that Australia in the large part uses non-renewable energy for most of its energy needs. We acknowledge the Snowy River hydro scheme and The Hydro Tasmanian electricity generation and some other hydro power plants dotted around the country like the Hume Weir in northern Victoria on the Murray River. But for Australia overwhelmingly coal fired power stations are used for the bulk of our generation of electricity.

Again when Australians think of the energy used for automotive uses they think of diesel and petrol fuels. However we should acknowledge that most city train and tram networks operate by electric power. These networks use electric power often generated from small power plants using gas or oil as the fuel. An example of this is the Melbourne tram and tram network that use a gas turbine to power the electric generator.

However, as more and more energy is needed to accommodate Australians lifestyle and a realization that a continued use of non-renewable energy sources cannot continue into an indefinite future, many are starting to become alarmed and make a concerted effort to come up to the challenge of producing a high proportion of our energy needs from renewable sources.

Concerns not only about the threat of climate change and our need to reduce carbon emission, but concerns about the fact that we have just about reached the point with oil production that we call peak oil, where the rest of the oil still in the ground will be more expensive to retrieve than previous year's costs of retrieval. This fact points to a future of the rising costs of petroleum products, chief among them being petrol which much of our economy relies on for the transportation of goods.



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But we also should be concerned about the health of our nation and the amount of carbon particulate pollution being put into the air we breathe by these hydrocarbon fuels.

We should also be concerned about reductions in the world's biota brought about by deforestation by developing countries to provide a cheap energy source where oil based fuels are simply too expensive.

It is about time we take a good hard look at how we produce energy on this planet to further our life styles and consider what we are leaving our children in tomorrow's world. Let's earnestly consider looking for renewable sources for our energy needs.

As part of the familiarization process of renewable energy sources, this paper will investigate ideas for the renewable energy economy.

The paper will be broken up into two distinct sections.

1. A commentary on letters sent to Government –

Part of this will cover the conversion of the power won from the renewable environment, into a product capable of holding energy within it. This product will still be suitable for transportation. The energy would be able to be released at a destination where the energy would be converted into electrical power. This is called the hydrogen economy.

2. Letters sent to the various Federal governments over the last 5 years by the author.

The specific kind of energy harvesting that is the concern of this paper is renewable energy.

The kind of clean energy discussed in this paper is to be compatible with the world's need to cut green house gases. The paper discusses non carbon dioxide producing processes to produce power.

The first part of the discussion paper discusses issues raised in parts of letters sent to Members of Parliament including the Prime Minister by David Holland over a period of three years.

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The Second part of the discussion paper responds to relies by the government to the last letter sent by David Holland in 2009.

The first letter is to a Federal Local Member of Parliament for a Central Coast seat, and whose party was in power.

In 2006 the then Federal member for Dobell, Ken Ticehurst (Liberal) mailed out a general letter to the electorate. He asked for comments on what the community thought were important for the government to do and achieve over the next year or so.

He was taken at his word and the suggestion of Energy reform was considered to be a high priority by the constituent.

Mr. Ticehurst wrote back writing that he agreed the issue of energy was important.

Not to be deterred by the thought of, 'who would listen', David wrote the letter now copied in Appendix A back to Mr. Ticehurst.

The letter explains the possibility of using any viable Australian energy source to produce Hydrogen from water. The letter explains the versatility of hydrogen and explores viable ways to transport hydrogen.

The letter explains how by using technologies we currently have or could have given the opportunity to research solutions through government seed funding, canvases an opportunity for Australia to make large trade surpluses by trading in energy.

Hydrogen transported to capital cities could be converted into vehicle fuels such as fuels used by fuel cell technology.

The idea foisted by the previous Prime Minister, Mister Howard, that Nuclear power was the only clean way to make electric power was questioned and demonstrated to be untrue by the letter.

The letter suggests that anywhere the hydrogen compounds can be transported; electrical power or fuel Cell fuel can be manufactured.



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It suggests for the first time, in the series of letters, that transported hydrogen can be burnt to create heat and be incorporated into conventional steam turbine power plants.

However, the letter indicates that the challenge is to provide infrastructure for the new technologies to be able to be used by the general public.

Fuel cell stations instead of petrol station, power plants without open cut coal mines, the flexibility to build a power station in a convenient location close to the population that will use the power rather than by a coal field.

Economists will become busy advising government on how to build a market based system to best build this infrastructure.

Ports for shipping will become more important to ship in or out hydrogen energy products.

Lastly the letter shows that the state government in Queensland has already sponsored a new hydro-solar technology that uses the sun to produce super heated steam that can be feed straight into a steam turbine.

Mr. Ticehurst writes back in response to this letter and tells that he was so impressed with the concepts in the letter that he had passed the letter on to the Howard government Minister for the Environment.

Unfortunately, no reply was received from that Howard government Minister.

The Second letter, a letter to Shadow Minister for Environment

This letter was to Mr. Garrett MP the then Shadow Minister for the environment. The letter was writing him in an election year and hoped to have influenced his thinking on issues around the climate change debate.

Previous letters had had zero impact on the Howard government and David had given up on achieving any reform to address climate change increasing research funding on renewable energy.

He turned to the opposition, who he felt would at least read my letter.

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He felt that much that needed to be said about base load renewable energy was encapsulated in the first letter to Mr. Ticehurst so he included the letter as a reference for Mr. Garret MP.

However some things had changed since the first letter. Petrol prices had moderated, the auto gas rebate was starting to bite and people were starting to get more complacent about the need for renewable energy.

But at the same time a heightened awareness of the effects of climate change was sweeping the government along with a love affair by the Howard government on the 'clean coal technology' which held a lot of promise but little substance.

As in the first letter David made comments relating to the need for some type of arrangement to encourage polluters to pay for the externalities they were producing as part of their product production processes.

By the second letter the carbon trading system was being considered and it was expected to help reduce these externalities. However, this trading system has become an integral part of the reduction of CO₂ in the air. It was designed to offset the effects of climate change and to make manufacturers pay for the damage to the earth they make, having no cost imposed on them, or no reparation costs imposed on them for not using available technologies that do not produce so much waste, the earth must then accommodate.

But to put a positive spin to the letter, it suggests that instead of exporting coal, Australia should take the initiative and start to export energy in the form of hydrogen and hydrogen energy products.

He did receive a letter of reply from the Shadow minister thanking him for his letter. For this he was partially satisfied, however Mr. Garret was not in office at that time and therefore a subsequent letter had to be sent at a more opportune time to get action on the matter.



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The third letter, a letter to a new Prime Minister written in late 2007

This was probably the hardest hitting letter of the series. It is supported by the letter to Mr. Ticehurst and it heavily plagiarizes the letter to Mr. Garrett, however it hits hard at the previous government's emphasis on the development of clean coal technology and nuclear power generation.

It champions the role of renewable energy as a viable alternative to coal fired power stations for base load power generation.

The letter also brings something new into the technology mix. It identifies the process of using low heat conditions powered by the sun to raise the temperature of water to temperatures just below boiling by laying it in black plastic and then transferring it to the more expensive hydro-solar arrays to get the water to super heated temperatures using less energy from the sun enabling a faster process to have the product available for the steam turbine generator.

This concept has now been further developed by proponents of solar power being able to provide base load power by using oil heat accumulators that hold heat overnight.

The energy stored in these accumulators can be tapped at night by using heat exchangers to heat already hot water exhausted from the steam turbines to super heated temperatures again, thus giving a 24 hour supply of steam for the steam turbine generators.

By producing both oxygen and hydrogen using some electric energy produced during the day, power generators could then use these flammable gases at night to power their generators. Using this configuration or any number of others, power can be generated 24 hours a day, debunking the argument that nuclear energy is the only way to gain climate change friendly power for base load uses.

The letter observes the price of petrol coming down and slams the big producers for manipulating the price to reduce the price scare on the cost of energy and petrol which was designed to quiet the debate on renewable energy development for motor vehicles. But highlights the need for government to take control of the unwarranted effect of a market and guide the market by using market incentives appropriate to combat large market player who want the status quo to sell their products in a monopoly created over the years by themselves and supported by



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government relying on tax revenues derived from the sale of the produce. Principally these produces are oil derivatives which generally have a high tax component to the consumer.

Governments will need to wean themselves off this cash cow and take initiatives to plan for a reduced carbon future by providing real incentives to build the new age infrastructure needed for the renewable fuel revolution for automobiles that must happen before oil product become too expensive due to peak oil and the ever increase burning of fossil fuel adding to increasing levels of CO₂ in the atmosphere.

(In this debate I am not going to consider the question about the level of human introduced CO₂ that is contributing to the overall effects of climate change. Let's just say that it seems a large amount considering we have burnt so much of the earth's carbon reserves over the years since the start of the industrial revolution.)

The letter again recommends that we develop hydrogen as a base for the storage of energy and goes so far as to suggest that we use the process of storing energy in hydrogen based compounds as a way to export energy to other countries less fortunate to have such vast areas to collect sunlight, wind and wave/tidal energy.

The letter goes on to suggest that in time the export of coal will be replaced by this renewable energy export.

It criticizes the policy and money spent on research on carbon dioxide sequestration process, suggesting that it is fatally flawed in two ways.

1. There can never be enough sequestration sites to accommodate the process continuing into the future.
2. Any site being pumped into will never be usable for any reason ever again. The process effectively sterilizes large areas of our underground resources. The process is not renewable and by quarantining sites is no better than a nuclear waste site.

Lastly the letter advocated that Australia should use its natural economic competitive advantage in the potential to develop sustainable energy sources and export energy to the world.



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The 2nd Letter to the Prime Minister of Australia Mr. Kevin Rudd Early 2009

The letter is rather poignant, although on the one hand is encouraging the government on dropping any ideas of producing power by the means of nuclear energy, it criticizes the government for continuing to foster the idea of pushing ahead with what has become known as clean coal technologies. These technologies are as yet unproven and limited research has been done to understand how the CO₂ will react to the subterranean environments the scrubbed gaseous effluent from the power stations is pumped into.

The letter commends the efforts the government has made in putting together a cap and trade system to address the emissions of various gases including CO₂ by industry and power generation using coal, and then outlines the way forward for the power industry by describing the types of systems that should be encouraged by government to produce power.

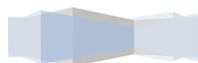
The letter concedes that some moves towards renewable power generation has happened over the year since the last letter, but suggests that not enough has been done yet to ensure fast progress towards Australia moving away from coal fired generation of electricity. However it highlights a window of opportunity for the Rudd government in the economic downturn then upon Australia to use the unallocated money in the last budget, which was held back from the budget due to other constraints, to support research and give seed funding to projects that are able to forward the technologies associated with the collection of renewable energies from the natural environment.

In hind sight unfortunately this opportunity was not used to its fullest. The government was only interested in spending money that had a short lead time in the planning so that money allocated could be used quickly to stimulate the economy and keep jobs.

Some efficiency to power generation were achieved by the insulation program, the solar panels program and solar heating program. These programs did stimulate the economy to some extent.

But the letter asked for structural change, and to some extent this would have been achieved by the carbon trading scheme proposed by the Rudd Government, however more should have been considered.

The letter criticizes the government for encouraging motor vehicle companies to build more petrol; cars, howbeit small ones, and continuing to encourage hybrid



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cars which have to use petroleum products only marginally less intensively than conventional small cars.

What the letter was asking was that the government set in motion standards in new and even unperfected technologies, like fuel cells, electric plug in and /or hydrogen powered motor vehicles.

By being visionary and investing in research at the same time as making plans to implement one of these technologies for motor vehicle propulsion, this revolution would now be well underway.

The market sometimes needs a kick start to change the way we do things so money should have been allocated to kick start a standardization of refueling stations and industries to support new renewable fuels.

Currently we have no effective and detailed planning for infrastructure to provide access to these types of new renewable fuels for our domestic vehicles.

In many parts of the world technologies are being used and supported by infrastructure. In the United States the electric car is supported by charging stations in various locations throughout the cities.

It seems that people think that we would be only using electricity from the wall to power our cars derived from coal sources. Currently South Australia is using 20% of its power from renewable sources and this figure is rising. Other states are also moving rapidly to higher percentages of power derived from renewable sources.

Australia must become more visionary and plan for a low carbon future by providing infrastructure appropriate for that future. If this infrastructure is not built by government or private enterprise, vehicle manufacturers will not make or sell new technology cars.

The letter goes into detail about how the infrastructure components of renewable fuels could be implemented.

Public Transport

This section of the letter introduces planning of public transport networks. The main argument is that planners tend not to plan these networks ahead of the release of land. As a consequence roads are not specifically designed to carry



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heavy vehicles such as buses. Often the roads are not comfortably wide enough for these vehicles to pass and bus stops are not designed so as to allow the bus to stop on the roadway, completely out of the way of the general traffic flow.

It suggests that good planning for public transport has a spine and feeders for this form of people movement.

The letter gives the example of the Central Coast of NSW, which has a high expectation of large growth over the next 25 years, that with a good and reliable public transport network people will start to move from using their cars to public transport, thus reducing our carbon footprint and reducing the use and reliance on fossil fuels.

It outlines the concept that by governments investing in good public transport systems and actively encouraging the use of public transport for everyday commuting, governments are not only creating efficiencies in fuel by illuminating road congestion, but saving money on widening the road network to accommodate the many more cars expected without a well run, efficient, safe and reliable public transport system.

Conversion of Public transport to Renewable energy sources

The letter then advocates that the current way we power our public transport systems be changed to renewable sources. For the electric rail network this is probably a simple change. With many States in Australia approaching 20 percent of their power coming from renewable sources, the conversion of all electric rail and tram systems being powered by renewable power sources should be a simple stroke of the pen. By State legislation all transport Authorities could easily buy Green power tomorrow.

However, both State and Federal governments should follow this up by providing seed funding for projects that will provide at least as much power that is needed for these electrically powered public transport systems in as short a time frame as possible after the introduction of this legislation.

The provisions for powering buses by other means other than diesel is somewhat more of a challenge and probably more expensive, however the letter attempts to

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tackle this by suggesting State governments consider natural gas powered buses similar to at least two major cities in Australia.

It suggests a better possibility may be to develop electric buses, using battery or fuel modules that would last the length of a shift that would be replaced before the vehicle was put on the road again for the next shift.

Freight Transport

This section of the letter is concerned with the bias of funding away from rail infrastructure and towards road infrastructure. This bias has caused a disproportionate increase in the use of truck transport for freight.

It is well known that the main northern rail line is at or near capacity, particularly around the Central Coast region. The passage of passenger trains and freight trains must be timetabled carefully. If any new stations were included in the Sydney to Newcastle line timetable planners would be hard pressed to find openings for these extra stops. A proposed new station at a proposed new town Centre at North Warnervale may yet replace the existing station at Warnervale to the dismay of many Warnervale residents.

New infrastructure is urgently needed in this growing region to provide extra capacity for both freight rail and for needed expansion of the domestic Central Coast rail services.

This region as with many others is bypassed with a 4 to 6 lane freeway. However to travel quickly from one end of the Central Coast to the other many commuters use this freeway regularly. The freeway is an important regional and interregional transport corridor for the regions commuters.

The Central Coast is not unique in this. The Illawarra, the Gold Coast and the Sunshine Coast have similar situations.

A dedicated freight line in these regions is important for several reasons:

- Commuter traffic both rail and motor vehicle will continue to grow in these fast growing areas outside the main city hubs and when freight is



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competing for both road and rail space, the system becomes congested and inefficient.

- Rail can be electrified more easily in a rail freight system of transport. This means that with an electric freight line system, electric power from renewable sources can more readily be used, thus reducing the impact markedly freight transport has on the production of fossil fuel pollution and CO₂ emissions in the atmosphere.

Following is a link to an NSW government briefing paper that argues some way towards this position.

[http://www.parliament.nsw.gov.au/prod/parlment/publications.nsf/0/A0CB255101944015CA257663000E781A/\\$File/Rail%20Freight%20Transport%20in%20NSW.pdf](http://www.parliament.nsw.gov.au/prod/parlment/publications.nsf/0/A0CB255101944015CA257663000E781A/$File/Rail%20Freight%20Transport%20in%20NSW.pdf)

However, the briefing paper is mostly interested in bulk freight like coal transport to duplicate freight lines and reopen country regional lines in NSW.

Without a modern efficient and imaginative approach to rail freight, few trucks will be removed from the roads and the gain to the reduction of CO₂ will be minimal.

The new proposed rail lines must be designed to carry trucks and new drive on drive off freight handling systems must be built in the capital cities.

The advent of a carbon trading system that will put a price on carbon externalities emitted may force many trucks off the road, or prohibitively increase the price of road freight. Governments must act to accommodate this change and provide efficient services for freight today.

Chemical Carriers

This part of the letter is devoted to the transport of energy. One of the biggest issues of producing power in Australia is the availability of the energy, and its closeness to where it will be used as electric power.



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Although large networks of electricity power lines have been laid out over the years, one of the considerations of producing renewable energy to keep the costs down is to build them close to the transmission grid. That is why the wind farms of the south coast of Australia work so well.

Not only do they have abundant wind available to them, they have a major power grid line under 50 kilometers from their location.

When Australia starts to tap the vast energy source of the deserts for solar power and the North West coast for tidal and wave energies, either new high voltage power lines must be built or some way of transporting the energy by road or ship must be devised.

In the mid 1970's the concept described in the letter of using hydrogen to carry the energy in chemical carriers was identified and given the name "the hydrogen economy".

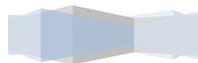
Presumably the name was coined because by expending energy to produce hydrogen that could at a later time be recovered, gives a value to the hydrogen produced. Thus a trade in the core produce of the process could be made, and thus making hydrogen valuable, similar to gold and other commodities, which are traded around the world.

As with gold markets today this trade would be done virtually, due to the relatively non portability of compressed hydrogen. However hydrogen locked in a chemical compound could be extremely portable.

So as explained above, hydrogen, in a number of forms can carry energy. It cannot be considered a ready to use fuel because you need to put more energy into producing it than you get out of it.

Therefore you can say it is not efficient. The question must be asked, is efficiency a good attribute or is sustainability a better one?

Ulf Bossel in his paper "Does a Hydrogen Economy Make Sense?" investigates the energy losses associated with hydrogen as an energy carrier. However to understand this concept of a carrier we must liken it to a battery.



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With energy sources often in remote locations, i.e. solar, tidal, wave energy generation, this could be a viable process to undertake to get energy to where it will be needed.

This is a complex question and Bossel does a good job at giving the facts as he understands them.

If we consider hydrogen in nature as having zero energy and we have to supply energy to make it work as an energy source and the energy comes from the sun via wind, tides and solar then we should consider this, that all the energy originally comes from the sun.

Coal was formed by many years of solar energy falling on ancient forests. Coal is just a residual of the energy expended on the forests that form the coal under certain conditions under the ground.

In the 1800's the industrial world was happy to burn this residual in steam driven engines powered by coal at an efficiency of 12%. 12% today is not considered efficient; however the coal was readily available and useful to drive industry at the time.

Unlike energy more directly derived from the sun, coal is not a renewable commodity. Or to explain, we use coal much faster than it is formed in the ground; therefore the current use of the commodity is not sustainable.

Hydrogen, on the other hand, used just as a means to carry energy can be borrowed from the environment for a short period and replaced as water vapour, after the energy captured in it from its production is released to do work.

I accept Bossel's considerations or caution in the inherent losses of the rough energy by producing hydrogen, converting to a chemical carrier and then taping the energy from the chemical carrier. But with the right application, perhaps for transportation of energy in the short term, before electricity lines or other means are found, hydrogen could be a player in the transport of energy and certainly a player in the export of energy.

Bossel suggests that electricity transmission lines would be his preference in the transportation of electricity over the vastness of Australia. He feels that the cost will be outweighed by the extra energy that would need to be collected to produce the hydrogen carriers and bring them to the market within Australia.



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This is possibly why one of the major political parties in the 2010 federal election is promising to provide funding for an electricity transmission line to the inner desert parts of Australia.

The Australian Government has embarked on such mammoth projects before. The Snowy River Hydro Scheme, the Perth to Kalgoorlie water pipe line and the Darwin to Adelaide train link. It is not an impossible feat, and would be a good start to a larger grid needed to harness the energy hot spots around the country.

Some draw backs to such a scheme, would be:

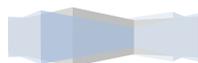
- Energy development in the Central parts of the Country would be restricted to the physical location of the transition line.
- A single transmission line would be vulnerable to breakdown, adverse weather conditions affecting the line and sabotage.

Much of the paper of Bossel, is dedicated to an assumption that the hydrogen economy is the savior to the energy problem and a way forward for portable fuels for motor vehicles.

Much more research must be made to get close to finding systems to propel motor vehicles. Bossel's assessment is right to say that hydrogen is not a new source of energy for the world. He is cautious and explains that much more energy must be expended to produce hydrogen fuels than you can get out of them. He suggested through practical calculations under various scenarios that car type vehicles would not have an acceptable range and/or not be able to carry, with any utility, the amount of fuel required for general domestic use compared with today's fossil fuel vehicles.

But why should we consider the Hydrogen economy, if it is inefficient and not easily adapted to the auto industry?

Today Australia exports coal, a non renewable energy source that is used in ways more efficient in general than the days of the old steam engines, but still comparatively inefficiently. In addition the end produce of the extraction of the energy from the material produces what has come to be known as a green house gas, Carbon Dioxide.



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The export of coal today has a huge amount of infrastructural investment associated with it and provides some useful income for the country.

With the inertia that has been created by this export business and state governments planning still more infrastructure to support the industry in the form of rail lines and coal loader facilities at the various ports, the export of the material is becoming difficult to stop politically. More coal mines are being planned by overseas investors who recognize the market is growing in the Asian region for the commodity.

A deliberate policy by government to grow the hydrogen economy in Australia would potentially replace this export of coal. Coal that's by product is both polluting and dangerous to the earth's climate.

The value added to energy by producing hydrogen energy products could be considerable. The export of these compounds would allow a similar income to the Australian economy as coal but would not be subject to heavy penalties associated with a carbon cap and trade planned by Australia and other schemes to control carbon planned by other countries.

The reality check

The letter proposes some technologies or chemical designed compounds that can carry hydrogen, but many have some short comings. The reality check is on several levels:

1. There is currently no clear technology that will allow a cheap and convenient way to carry hydrogen in a chemical compound that has some efficiency and is easy to transport. In the letter there are some tantalizing possibilities, however, it must be recognized that research dollars coupled with development dollars must be available before a viable chemical carrier can be standardized upon by Australia or the World.
2. A large amount of planning for the production of the hydrogen and for the processes to produce the hydrogen carrier would need to be undertaken for the export of the energy.
3. Other infrastructure for the transportation of the compounds would need to be planned and constructed. Some existing infrastructure used for coal

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should be considered to be adapted to a new material. This may include electricity transmission lines, turbines and electrical generation plant and appropriate transport links.

Conclusion

Planning for supporting infrastructure to new renewable energy systems must be planned for. New renewable ways to power rail, road and public transport systems must be supported by refueling systems and fuel transport links from various energy collector systems like solar power stations and hot rock thermal power generator to name just two.

Replies from Government as a response to the 2009 letter.

Reply from:

The Office of the Hon. Martin Ferguson AM MP

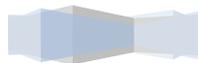
Minister for Resources and Energy, Minister for Tourism

The letter opens with a statement that the Rudd Government believes renewable energy will play an important role in meeting Australia's energy needs.

The letter points to the introduction of the Carbon Pollution Reduction Scheme (CPRS) and asserts that this scheme will help a fundamental shift of our energy generation systems towards a lower CO₂ emissions pathway, which is the way the Rudd Australian government proposes to meet a renewable energy target of 20% by the year 2020.

The letter announces that the Rudd government had released this year (2009) the Hydrogen Technology Roadmap, providing detail on research and development challenges facing hydrogen technologies. This road map outlines the potential role of Australian governments, industries and researchers in the possible development of the hydrogen economy.

<http://www.coag.gov.au/reports/docs/hydrogentechnologyroadmap.pdf>



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The letter explains that the government has established the Energy Innovation fund. The fund will provide 150 million dollars devoted to research for the purpose of encouraging renewable energy research in Australia plus a 500 million dollar to help with the cost of development to fill the gap between the costs associated with research and commercial uptake.

The Hydrogen Technology Road Map shows how coal can be turned into a low cost hydrogen product. The byproduct of this is carbon dioxide.

The letter outlines another government investment of 500 million dollars to help support the National Low Emissions Coal Initiative (NLEC). This fund aims to accelerate the development of technologies that will reduce Carbon emissions from the burning of coal and other uses.

The letter suggests four processes where the effluent gas from the spent coal should be abated by such technologies:

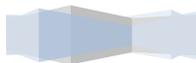
- Coal Gasification (Production of natural Gas)
- Capture technologies for black and brown coal combustion (mainly used in boilers for power generation.)
- Fossil fuel-renewable synergies

The last one of these processes that produces CO₂ related to the production of hydrogen from coal.

One of this paper's core recommendations is not to use coal to produce hydrogen but to use more energy intensive processes such as electrolysis, which gives a byproduct of Oxygen. By producing oxygen as a byproduct, which can be readily stored, it can be sold for a variety of uses instead of venting the gas into the atmosphere.

The letter concludes on two points.

1. The government has provided 100 million dollar to the Global Carbon Capture and Storage Institute of Australia. This institute works with other countries towards practical implementable solutions to capture carbon and



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- store it. Although a lot of effort seems to be made to store this carbon effluent in the ground water deep below the surface of the earth, some research has been commenced in storing this carbon in soils that can improve soils for farming or at least reduce the overall carbon foot print of farms, when considering the large amount of carbon gas produced through animal husbandry.
2. The letter introduces the issues of infrastructure and transport, but considers it outside the Ministry's focus and refers these issues to the Ministry Infrastructure, Transport, Regional Development and Local Government. Unfortunately the reply from this Ministry does not demonstrate a good grasp of the future development of renewable energy infrastructure that is supportive of new fuel technologies like fuel cells, electric propulsion and hydrogen production.



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Reply from:

**The Office of the Hon. Anthony Albanese MP
Minister for Infrastructure, Transport, Regional Development and
Local Government**

The letter announces a 4.7 billion dollar National Building Package for rail, roads and building better Universities and TAFEs

580 million dollars was dedicated to freight rail projects to expand the rail freight capacity of the rail line from Newcastle ports to the Hunter Valley coal mines. This project is an obvious support for the current economic position of the country that rides on the back of the "Coal Miner" instead of the sheep's back.

Continuing on the pragmatic, the letter announces the establishment of Infrastructure Australia. This organization is to help identify infrastructure gaps and bottlenecks that hinder economic growth and prosperity. In doing this it gives priorities to investments in infrastructure needs and helps direct policy and regulatory reforms with regard to infrastructure.

As one of its 7 key themes, the letter continues; public transport through the 'Transforming our Cities' initiative provides a framework for the increase of public transport capacity in cities and make better use of existing transport infrastructures.

http://www.bedp.asn.au/papers/docs/Transforming_Australian_Cities_Report_July_09.PDF

The Ministry has received over 600 submissions from State and Territory governments as well as Local government, business organizations and members of the public for projects and is finalizing a priority for projects to present to the Australian government.

A number of publications from the organization indicate the wide scope of the forward planning being looked at by the organization.

http://www.infrastructureaustralia.gov.au/publications/files/A_Report_to_the_Council_of_Australian_Governments.pdf



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By David Holland

Appendix A

Letter to the Member for Dobell 2006

Date: 31.10.06

**Ken Ticehurst MP
Federal Member for Dobell**

Dear Sir,

I want to thank you for your reply to my response to your form letter which I send to you last month.

The main issue that I had written about and you appreciated was the need for more funding and research into renewable energies for our growing economy and for the need to develop alternative fuels for both domestic and commercial transport.

I believe the time has come to make a concerted effort to make the switch from coal fired power generation and from oil based fuels to a sweet of alternative energy sources now becoming closer and closer to being viable even against fuels though still relatively plentiful but that are able to be exhausted and just as an aside have catastrophic side effects on climate when burnt.

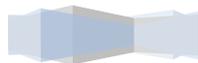
I have been interested in these areas of renewables and other ways of converting power to useful applications such as transport and electricity generation for many years now.

I believe that Australia can lead the world in developing new energy technologies that have not been used extensively before due to problems related to distance of transmission of the energy and the cost of developing new infrastructure being too high compared with the existing supply structures of existing fuels.

However, now is the time to move, with public opinion high due to high petrol and diesel prices and global warming high on the public's mind due to the present drought.

I commend your government on the recent initiative to provide funding for a solar power plant in Victoria that I believe will spur on the technologies needed to provide cheaper solar power generation.

But even more needs to be done.



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I would like to give a bit of an overview of a technology that could be developed that would revolutionize the way we transport power and generate energy but still by and large using renewable processes.

Suppose we could utilize the power of the tide which rises and falls 30 feet every 6 hours in the north west of Australia. Build vast solar power plants in the places where the sun is the hottest and not interfere with agricultural land or impact to greatly on fauna and flora, for example those areas in our deserts or wind farms long distances from major towns. And what about exporting power to other counties and gaining a bonanza from some of our nation's natural attributes.

But, how can we get the power from the power collecting stations to the places we need to use it, and what about fuels for transporting it?

If Australia was able to develop energy sources natural to its geography, power would not be a costly rare resource but abundant.

Hydrogen is the answer.

At present the practicalities and dangers of transporting hydrogen in gas form are too difficult, however, if we had an unlimited source of energy, hydrogen can be split from water and transported by ship, train or truck to various centers and used as a fuel for gas turbines etc. to generate power close to our centers of population.

I have identified the dangers of transporting liquid hydrogen gas, so research needs to be done on other ways of combining hydrogen into chemical carriers stable enough for transport that can release the hydrogen by using a catalyst after transportation. Then the hydrogen can be used in various types of applications including domestic power generation.

But there is one application of energy that the hydrogen can be put to very good use and that is in the production of a fuel that can be used in a fuel cell.

Fuel cell technology is already being used in the United States to generate power in small power plant in remote areas. If the proper infrastructure was invested in, it could be used successfully in powering cars and trucks throughout the country. It could be used in powering the means of transport needed to get the hydrogen chemical carrier to its multitude of destinations, whether by ship, train or truck.

Fuel cell technology works in the following way. A fuel cell produces electricity, but unlike a battery it is not charged by connecting it to an electrical power source. The



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power within the cell is regenerated by pouring in a hydrogen based chemical. The chemical is then used up when an electrical circuit is engaged to the two terminals of the fuel cell. So, to put it more simply, just like a car runs on petrol which runs out over a couple of hundred kilometers, so a fuel cell needs fuel to provide the electrical power to an electric motor that moves the wheels allowing the car to run along the road. Once the fuel is exhausted then some local infrastructure must be in place to provide further fuel for the fuel cell similar to a petrol station.

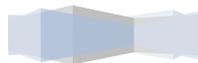
The export of power is just as simple. The chemical carrier for the hydrogen is placed or poured, (depending on what is used as a carrier) into the hold of a ship and transported to, for example Asia, where we then convert the hydrogen to the range of commodities needed in the market place. I.e. For power generation and/or fuel designed for a fuel cell. So that said, and after solving the challenges of the world, now comes the real challenges, the implementation process. Policies and strategies need to be developed to allow seed money to be allocated to put some of the pieces in place. Like your new solar power plant in Victoria. However, I am sure you would agree that government approaches are much more efficient when setting the pace to encourage the market to develop the infrastructure. This means that companies and people have to have some insensitivity to invest time and money with the expectation of a return at some time.

These days it is not essential for the return to be immediate due to the advent of futures markets, and it is fairly obvious that oil will become more scarce in years to come and that externalities due to the internal combustion engine, coal fired power station and even nuclear power station will be taken into account into the costing of the energy produced. At present these externalities are not being taken into account but as the world starts to feel the bite of global warming and fresh water scarcity various countries will put pressure on countries not accounting for those externalities, and the real price of fossil fuels will become much higher than the technology described above.

If you agree with most of what I have outlined and are able to get some political movement on the concept, then I would be happy to involve myself in helping to thrash out the details of the various strategies needed to start the process.

I want to thank you for your patience in reading this letter. I hope you do not think that the above is impossible technically, it may be a challenge practically and it certainly is a challenge politically with the push by the Prime Minister to implement nuclear power universally to provide for base load. Remember, when solar or tide energy is stored in hydrogen then it can be used anytime, day or night.

I have included an information paper I found on the internet about an impressive technology invented and developed in Queensland with Queensland seed funding. I envisage this type of device would be just one of a suite of renewable options that could



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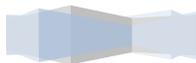
be incorporated in a power plant. This one in particular would dovetail into a large steam turbine hybrid plant designed to power a local small town, produce fuel cell fuels and hydrogen gas to be incorporated into a chemical carrier to be transported to major population centers within Australia and overseas.

Yours faithfully,

David Holland
A Concerned Citizen of Australia

Reference:

Queensland Sustainable Energy Innovation Fund fact sheet – Sustainable Industry Division - Stanwell solar concentrator, Suitable for remote towns - Expected power output of 1-5 MW, Uses conventional steam technology.



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By David Holland

Appendix B

Letter to the then Shadow Minister of the Environment 2007

Date: 15th April 2007

**Mr. Peter Garrett MP
Shadow Minister for the Environment
House of Representatives
Parliament House**

Dear Sir,

I am writing to you now with the firm expectation that you will be in government at the next election.

I know that you are a passionate man for environmental matters and have grave concerns about the future of Australia's energy needs in the context of the global warming threat.

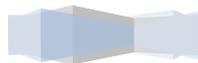
With regard to my concerns I had sent a letter to my local member Ken Ticehurst MP last year outlining some interesting concepts. He wrote back and said that he had found the letter very interesting and had passed it on to the then federal minister for the environment.

I have included this letter with this correspondence.

The challenge as stated in the letter was to overcome the political mindset of the Prime Minister about the only way forward which was to provide base load power by nuclear power generation and with so called clean coal technology, and his assertion that we need to spend money on research for the latter to export the technology to the world.

Well as predicted with the advent of the natural gas conversion for cars and wide public concern for the price of fuel and more people looking for other fuel sources, the price of petrol has moderated. However, again now the price of petrol is creeping up but with less public outcry.

Isn't it the role of government to ignore this market manipulation and provide a clear direction in the public good when it is clear that monopolistic market players are controlling development or in this case the lack of it.



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As far as the dozens of coal ships I see as I travel anywhere close to the beaches on the New South Wales Central Coast, it is obvious that coal has a large place to play in our economic stability. However, this commodity along with others booming commodities at the present time should not be relied upon.

Coal in particular is part of the causes of global warming so the scientists say, and with the advent of the world moving towards a bigger market in carbon trading, it is likely that the demand for coal will diminish over time.

Let's get cracking on solving our own energy problems and start planning infrastructure to make new renewable technologies practical within Australia.

Let's plan for a delivery system for hydrogen technologies that can deliver energy to our transport system. Let us plan for hydrogen based technologies that will deliver power to our domestic and industrial power grids.

Let's research a delivery system of energy that is flexible enough to supply energy to all the Australian needs and have a capacity to export energy overseas, as the demand for coal wanes.

Let us plan for the best future that we can have and use Australia's resources wisely, not burdening our children with challenges of nuclear waste and massive air quality problems due to a carbon dioxide/carbon monoxide cocktail from our transport system in our cities inducing higher health costs.

Yes, in 30 years time we may have cracked the carbon sequestration process, but we still have to live through the time until then and manage the increase in fine particle pollution close to our transport arteries due to the internal combustion engine.

Please have a read of the letter I sent to Ken Ticehurst MP, and if I can be of any assistance in helping form policy to plan a brighter future for Australia please give me a call.

Yours faithfully,

David Holland
A Concerned Citizen of Australia



Commentary on Correspondence

On letters sent to and replies from Federal Government Members between 2006 and 2009 on Australia's future for renewable energy

By David Holland

Appendix C

Letter to the Prime Minister of Australia Late 2007

Date: 29th November 2007

**Mr Kevin Rudd MP
Prime Minister of Australia
House of Representatives
Parliament House
Canberra**

Dear Prime Minister,

I am writing to you after your electoral victory over the Liberal Coalition government with congratulations on your victory.

I am very excited about your promise to develop policies related to planning infrastructure for new energy sources to power our transport industries and domestic consumption.

I think it is of utmost importance that we as Australians think hard and find ways to plan for the future energy needs of this great, fortunate and prosperous nation.

We have many options that could be developed throughout this land to take advantage of energy sources from our natural environments, but importantly without degradation to our sensitive ecologies.

I would like to see policies that enable research to develop a raft of renewable energy sources including, wind, solar, wave, tide, ocean current and geothermal.

I would like to see policies developed that after good research choose technologies that could be standardized to a point that could be used as a basis to build and plan infrastructure that could be used in refueling systems for transport, both commercial and domestic.

I strongly feel that hydrogen producing technologies should be one of the main technologies that should be the basis for planning such infrastructure.

Practically, this would mean planning power collector power plants, including wind, solar and ocean current etc., with hydrogen generators to supply or power both hydrogen based

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domestic power generating plants, transport fuel manufacturing plants and in turn, the hydrogen fuel delivery systems.

We need to develop technologies to make hydrogen portable and safe.

As outlined in a letter included in this package originally sent to the former member for Dobell, I would suggest developing technologies incorporating hydrogen in a carrying molecule or compounds.

I know that you are a passionate man for environmental matters and have grave concerns about the future of Australia's energy needs in the context of the global warming threat.

With regard to my concerns I have enclosed a letter addressed to the then local member Ken Ticehurst MP I sent last year outlining some interesting concepts. He wrote back and said that he had found the letter very interesting and had passed it on to the then federal minister for the environment.

The challenge as stated in the letter was to overcome the political mindset of the then Prime Minister about the only way forward which was to provide base load power by nuclear power generation and with so called clean coal technology, and his assertion that we need to spend money on research for the latter to export the technology to the world.

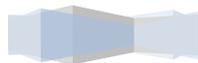
My assertion is that we can provide base load power using renewable technologies.

One way to do this is to build solar plants that use low intensity thermal energy from the sun to heat up large amounts of water to a point below the boiling point of water and use concentrated solar thermal energy to bring the water to a super heated level and run it through ordinary type steam turbine generators to produce electric power.

With some of this electric power, split water into hydrogen and oxygen and use combinations of both gasses to run furnaces at night to produce super heated steam for the steam generators or simply use the hydrogen to run gas turbines to power the electric generators.

Also, by stopping the practice of domestic off peak electricity at night to heat up hot water systems it would dramatically cut the power needs at night for domestic use.

Well, as predicted with the advent of the natural gas conversion for cars and wide public concern for the price of fuel and more people looking for other fuel sources, the price of petrol has moderated for a while. However, again now the price of petrol is creeping up but with less public outcry.



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Isn't it the role of government to ignore this market manipulation by corporations and provide a clear direction in the public good when it is clear that monopolistic market players are controlling development or in this case the lack of it.

As far as the dozens of coal ships I see as I travel anywhere close to the beaches on the New South Wales Central Coast and the Newcastle area, it is obvious that coal has a large place to play in our economic stability. However, this commodity along with other booming commodities at the present time should not be relied upon.

Coal in particular is part of the causes of global warming so the climatologists say, and with the advent of the world moving towards a bigger market in carbon trading, it is likely that the demand for coal will diminish over time.

Let's get cracking on solving our own energy problems and start planning infrastructure to make new renewable technologies practical within Australia.

Let's plan for a delivery system for hydrogen technologies that can deliver energy to our transport system. Let us plan for hydrogen based technologies that will deliver power to our domestic and industrial power grids.

Let's research a delivery system of energy that is flexible enough to supply energy to all our Australian needs and have a capacity to export energy overseas, as the demand for coal wanes.

Let's not be seen by the world community to be adding to the problem by encouraging coal mining within Australia and plan for the best future that we can have and use Australia's resources wisely, not burdening our children with challenges such as mine subsidence near our populated areas and under our sensitive lakes, as is planned on the Central Coast of NSW and risking the quality of life for residents close to mine head operations with noise and coal dust.

Let us not be party to burdening our own country or any other country with nuclear waste by expanding nuclear fuel mining.

Let us be leaders in reducing the massive air quality problems due to a carbon dioxide/carbon monoxide cocktail in our cities from our transport systems which is not only adding to our contributions to climate change, but also inducing higher health costs for the Australian tax payer.

Yes, in 30 years time we may have cracked the carbon sequestration process, but we still have to live through the time until then and manage the increase in fine particle pollution close to our transport arteries due to the internal combustion engine.



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Yes, I have seen a demonstration of the theory of the carbon sequestration process at an open day at Coal Australia on the Central Coast and it sounds plausible provided enough suitable geology is located close enough to our current power stations to be economically viable for the process. However, what about the future? Is this geology limitless? Will not the process quarantine that geology forever for future mining options?

I believe that the only way forward for our smart country is to utilizing our competitive advantage in the world economic arena by adding value to our vast array of ecologically sustainable energy sources.

To this end, I am still eager to help in a process that will plan, promote and legislate the way forward so that business and government can work together to make this smart country even smarter and a leader in renewable energy and fuel technologies.

I am eager to be a part of the planning of new infrastructure needed to provide our growing transport industries and private needs for automotive fuels.

I am eager to be part of the move from coal based power generation to cleaner methods of power generation that do not impact heavily on the environment.

Yours faithfully,

David Holland
A Concerned Citizen of Australia



Appendix D

Letter to the Prime Minister of Australia 2009

Date: 30th January 2009

**Prime Minister of Australia
House of Representatives
Parliament House
Canberra**

To the Prime Minister Mr. Rudd

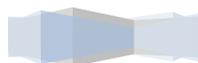
Dear Prime Minister,

Another year is beginning and there are many more challenges this year than even the last year.

After writing to you in November 2007 and encouraging you to deal with climate change in a positive and innovative way, I have seen the ground work for a carbon trading system introduced, grants directly to auto manufacturers to develop more fuel efficient vehicles and an incentive plan for 2009 to enable residences to buy solar power collectors to help offset energy produced by coal fueled power stations.

Although you have agreed with my recommendation to scrap the idea of producing power using nuclear methods, you have continued to embrace research for method relating to carbon capture and storage.

Carbon sequestration is in my opinion, a short term unsustainable solution for Australia. I outlined my reasons for my opinion in my 2007 letter. I understand that the coal industry is a large exporter of product and should be helped to ensure sales in the short term to prop up our balance of trade. This will mean that short term plans for carbon storage may be made in some of our export countries; however any plans to use this technology in Australia should be discouraged when we have such a wide range of alternate sources of energy available to us.



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By David Holland

Energy sources such as electro voltaic solar cell technologies, Solar Hydro technologies, the use of volcanic thermals for producing steam, wave energy technologies, the use of tides where tides have large variations, and wind power.

Liddel power station in NSW has already developed an array of hydro solar collectors that cover an area about 1500m². This produces super heated steam that is fed straight into the current stream turbine thus reducing coal fuel for the station while the sun shines.

In Victoria, somewhere off the south coast near Wonthaggi, I believe there is a pilot power plant using wave energy.

Wind power is being used in more and more locations in both South Australia and Victoria. I am concerned that New South Wales seems to be dragging the chain in the planning for this form of power generation technology.

All this said, I believe with the incentives put in place by your government, we will see over time a conversion from coal fired power generation to renewables. My concern is that it still is not happening fast enough. More capital should be released by government instrumentalities to build new facilities. In this time of economic downturn, state governments should be encouraged to increase spending in all areas relating to reducing carbon dioxide emissions and maintaining employment level. I understand you have addressed this recently by providing some funding to the states for this purpose.

The most pressing concern I have now is the development of the transport industry and its future impacts of climate change. The biggest carbon producer, which is the power industry, is starting to save carbon emissions; however as this happens the transport industry will start to loom large in the carbon stakes.

I expect that your government considers that the carbon trading system will regulate this industry. I feel that the industry will only build into its cost structures the cost of carbon and we will have only peripheral change to the use of fossil fuels.

What the industry needs is structural change. I understand that your government has attempted to kick start this by giving grants to Holden and Toyota to produce more fuel efficient cars. This is great; however I feel that at best, Holden has a very conventional way of looking at conserving fuel. It seems to want to only reduce the fuel consumption of its cars.

This is not the main game for the future!



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By David Holland

Vehicles need to be able to run on a variety of energy sources to produce clean emissions both to reduce air pollution and at the same time carbon emissions.

For this we need to embrace electric motive technologies such as the hybrid, but technologies based around energy produced from hydrogen is the future.

Hydrogen can be burnt cleanly to produce heat and steam.

Hydrogen can be used in fuel cell technology as a chemical fuel.

Hydrogen can be produced from water by using any of the above clean energy sources and be built into a chemical that can be transported to another part of the country or overseas.

Hydrogen can be put into a fuel cell fuel and transported to fueling stations all over Australia.

These technologies need to be refined post haste and implemented as soon as practicable to ensure a clean future for our domestic transport. I.e. everyone that has a car.

In the interim we need to consider electric rechargeable vehicles from the mains with hybrid capability. Eg. Small petrol/ diesel engine powering a generator system.

One of my biggest concerns as a town planner is that planning for the roll out of the infrastructure for hydrogen and electric fueling stations needs to start immediately. Before this can happen some standardization must occur in the way the vehicle converts the energy to motive power. I.e. electric Hybrid or Hydrogen as a fuel or Hydrogen chemical fuel to be used in a fuel cell electric generation system or a thermo steam system.

Maybe initially electric cars could have a system of battery exchange similar to swapping gas bottle for BBQs. Then have the service stations charge the power to it through the power grid.

I believe that using grid power is a good, clean and potentially carbon neutral method of providing energy to the domestic vehicles on the road. The reason is that grid power can come from a multitude of sources and as we move toward more renewable and carbon neutral methods of generation, power obtained in this way becomes more carbon neutral over time.



Commentary on Correspondence

On letters sent to and replies from Federal Government Members between 2006 and 2009 on Australia's future for renewable energy

By David Holland

Public transport

As a planner who is thinking about population growth, renewable energy use and the need to be sensitive to global warming issues, public transport becomes an important consideration for me.

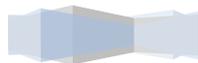
Government has two choices as I see it.

1. Continue to let development pressures determine the way most of the public travel around the suburbs of our towns and cities. Over the last 50 to 100 years populations have grown with a continuing reliance on private ownership of transport. With this trend we have seen an increasing burgeoning of housing design totally reliant on this type of personal transport method. This situation has been exacerbated by Councils & State planners relying on an incremental style of planning. This has meant that public transport has been an after thought, and follows the release of land. Road networks have been the main design feature of new release areas. Bus routes tend to follow after the building of these subdivisions. Many of the roads in the hearts of subdivisions are not friendly to heavy vehicle traffic. So option one is to continue this kind of development and allow pollution levels to climb even as the production of more efficient motor vehicles is happening and continue to increase congestion during longer and longer peak periods, while spending billions on toll roads.
2. Take the initiative and spend prudently to maintain employment levels and re-jig the public transport system and re-educate the public towards a more comprehensive use of public transport while at the same time encourage councils and State governments to re-plan local areas to accommodate bus friendly subdivision that are able to connect to fast rail and fast bus systems.

I pose the question:

How easy is it to use public transport in our outlying areas such as the Central Coast of NSW, the Gold Coast and the Sunshine Coast of Queensland?

These three areas are three of the fastest growing areas in Australia. I expect that I could include the northern suburbs of Perth in the example as well.



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Planning theory suggests that public transport should have a spine and develop feeders to that spine with lighter forms of transport. Our existing rail network is a good start.

Take for example an area I know well, the Central Coast in New South Wales. The main northern rail line runs up its axis and has served well as a conduit for the transport of workers to Sydney over the years, however things are changing. Large population are developing and are planned in the northern parts of the Wyong Shire and instead of large movements to Sydney, as the region develops its own employment centers, commuter travel will become more internal within the Central Coast. It is interesting to note that this region is some 60 kilometers long predominantly on the eastern side of the F3 freeway.

Most of the population travels by car to work and in particular those needing to travel from the north to work in the south of the region. If they wished to, or had no car or license to drive and had to use public transport, they could take a long bus trip with at least one change or a shorter bus trip to Wyong station again with one change, plus the change to the train.

In this situation it is an underutilized rail spine that is lacking more access points particularly in the northern areas. If the question was raised to the NSW government they would respond with the fact that they are intending to put a new railway station at Warnervale when the new town centre is developed. Currently, this will mean not an extra station but a relocation of the existing station. However, even with this station as an extra new station, the location is not close to the major road transport links, another consideration of designing a public transport system.

In this situation, I would advocate a completely new rail interchange at Bluehaven at the most northerly part of the Central Coast taking advantage of an easy link to the Link Road, which links the Pacific Hwy to the F3 Freeway.

I would also like to see a new station southwest of the current Woy Woy railway station to help complete better access to the rail spine of the Central Coast.

Enough of local issues! As a member of the local Sustainable Transport Committee under the Central Coast's Community Environment Network (CEN) I am hopeful for some good outcomes, but it is difficult with a cash strapped State government.

The big picture is that we need to develop good public transport options and plan domestic living so that there is proper planning and good investment by



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governments to ensure outcomes that reduce our carbon footprint, by reductions in the use of fossil fuels.

Some of the solutions to help with these outcomes are:

1. We at CEN have proposed to have a segment of the rail network passing through the Central Coast be powered by green power. That is power produced by renewable and carbon neutral means. I believe that the rail networks in many parts of the country could adopt this approach by deliberately buying green power, thus making a growing market for the production of power derived from wind, solar and wave sources.
2. That bus engines start to be universally converted to natural gas, as in cities like Brisbane and Perth. That new electrical technologies be developed to power these heavy vehicles over the term of their shift so that they become carbon neutral or near neutral by their own means. That state governments slow to a stop the buying of new buses from overseas that are powered by engines running on diesel fuel. (Bio fuels are not an option due to the skewing of the food market by them.)

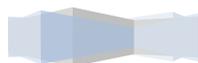
Freight Transport

Many years ago when I was finishing my degree I became interested in the transporting of freight between Melbourne and Sydney. I had traveled the Hume Highway many times and noticed an ever increasing amount of trucks on the road. I also noticed that the road conditions were getting better.

I decided to compare the factors relating to the freight carried by road with the freight carried by rail, and I discovered that in effect road freight was being subsidized by the taxpayer to a significantly larger degree than rail freight.

With the funding of the new roads, road transport was gaining a competitive advantage over rail, which seemed to be undercapitalized in those days.

These days we have much larger trucks traveling the highways, to try to increase efficiencies. Roads are renewed constantly and bigger roads are made mostly because of the need to connect our larger cities with roads that will carry these trucks and to a lesser degree because of higher use by vehicles in general. While at the same time I have noticed much less increase of rail infrastructure specifically for rail freight.



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I hadn't noticed an increase in rail infrastructure spending at the time of writing the report in 1994 and haven't noticed any change in the rate of building new duplicate rail lines to increase capacity since.

The basic problem is the lack of infrastructure at city nodes to put the freight on the rail system and take it off again at the other end.

So we have thousands of B-Double trucks running on diesel puffing out CO₂ all over Australia. Whereas we could have dedicated freight lines between our capital cities on the east coast carrying most of that freight with fewer diesel engines using less fuel.

In fact these trains could be all electric up and down the east coast, using power from green sources.

I propose that we find ways to increase the efficiency of our freight systems and at the same time reduce carbon emissions from it.

The nuts and bolts of the chemical carriers for hydrogen and for fuel cell fuels

At the outset I need to say that I am not a trained chemist and only have chemistry knowledge from year 11 and any knowledge gained through private study over many years; however I can see some very exciting opportunities for the use of hydrogen as a carrier of energy.

Step 1

If we consider hydrogen as a carrier of energy only, at this point, we may be able to solve the problem of the transportation of energy efficiently to our cities without the need for long high voltage power lines strung across the vast expanses of desert from potentially rich sources of energy such as tide power generation facilities in the northwest and solar energy collectors in the vastness of the central deserts of the country.

I propose that we solve the problem of distance by simply using the electrical power generated to produce enough energy to promote the electrolysis process which separates hydrogen from water. The power source would not need to be consistent or in anyway reliable in the short term, just be able to produce large amounts of electrical power when conditions are optimal.



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Locations for these energy resources should be the most critical thing and produce high volume electric power, not necessarily consistent power. Solar, wave and wind energy are well suited to produce this kind of power.

Step 2

Incorporate the hydrogen produced by the electrolysis process into a chemical carrier.

This will mean that this process needs to be done on the same site as the power is produced to reduce power losses and hydrogen leakages due to the porosity of current technology pressure vessels.

Following are some examples from the internet of technologies partially developed to do this application of providing a carrier for the hydrogen. Many of the research in these web sites are attempting to produce portable fuels for motor vehicles, but the technologies would be more suited to this application of a chemical carrier initially.

Science Article No. 1

The first article talks about the difference between slurry chemical carriers and the newer technology hybrid metal carriers, which are carriers in a solid form. These metal hybrid materials would be easy to transport. They would be easier to load onto trains or ships.

Web site reference:

www.osti.gov/bridge/servlets/purl/161464-8lwhs6/webviewable/161464.pdf

Jan. 2009

Science Article No. 2

The second science paper shows how a compound can produce a high amount of hydrogen. If this compound was produced at our source of hydrogen production it would be able to be transported relatively easily, using appropriate safety technology to power stations close to our cities and to power stations overseas producing a nice export market in the place of coal.

From the article:

Two different chemical reactions producing hydrogen from a compound, one using relatively low temperatures (ammonia-borane) having its first reaction

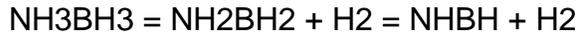


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occurring at 120° C producing 6.1 wt. % hydrogen and its second reaction occurring at 160° C producing 6.5 wt. % hydrogen.



This would mean that out of the total weight of the carrier, you can recover 12.6 % of the weight in Hydrogen, which would be, as a gas quite a large volume increase from the original material.

The remaining material (NHBH) would then be shipped back to the hydrogen factory at the remote solar farm or wind farm and remade into the carrier compound again. (At this stage I have no idea how much energy this would take, but this consideration would be part of the research in choosing an appropriate chemical carrier)

Reference:

www1.eere.energy.gov/hydrogenandfuelcell/storage/chem_storage.html

Jan. 2009

Science Article No. 3

The third article is exciting but may be an initially expensive technology. It uses a chemically constructed tube of carbon and zinc to store the hydrogen. The compound would be in the form of a white powder and seems to need a temperature of -196° C to store the hydrogen which is far warmer than a temperature needed to liquefy hydrogen for transport.

Ref. www.physorg.com/news126355316.html

Jan. 2009

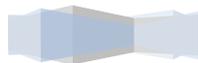
Ref. www.ocsenergy.anl.gov/guide/hydrogen/index.cfm

Jan. 2009

These articles are just a taste of what could be done using chemical carrier technologies to transport energy in the form of hydrogen.

Step 3

Transportation of the chemical carrier to a power station close to where the energy will be consumed is the next and final step.



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After liberating the hydrogen from the carrier it can be used in a number of applications.

1. It can be used as a fuel for a boiler to produce superheated steam and then run the steam straight through into a conventional power station.
2. Liberate the hydrogen in point of sale fuel stations where motor vehicles can fill up using high pressure tank technology (not yet perfected) to run a piston reciprocating engine producing steam as an exhaust.
3. Liberate the hydrogen to manufacture a fuel cell fuel. This fuel would be then transported to service stations similar to petrol of today and fill a tank in the car running the fuel cell. (Fuel cell technology is being used as a remote power source in the United States today; however a new technology of the fuel cell is being developed to reduce the costs of manufacture and the efficiency of the units.

A reality check

These technologies have not been perfected as yet and may seem pie in the sky today. But we have very large challenges with our need to cut greenhouse gases and these ideas will address the need to improve air quality while at the same time drastically cut the large volume greenhouse gas, carbon dioxide.

The reality check is that we need to do something today. Your government has committed to a small reduction in carbon emissions at present to protect our exports and the cost to the consumers and business; however every thinking person knows that more will have to be done.

Let's put money into the research of hydrogen technologies with the goal to provide a viable energy export from Australia and a means to provide clean, carbon neutral power for our domestic use.

In this letter I have advocated several things. The following is a synopsis of the major points made in this letter.

1. Start planning to help the promotion of a market that will enable a new styles of auto service stations to be built all over the country to supply new

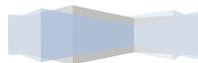


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- fuels like fuel cell fuel, hydrogen, modular battery pack exchange and an electric car and hybrid car plug in services.
2. Heavily fund rail freight services on the east coast of Australia between Adelaide and Brisbane and build:
 - (a) Fully electric high capacity fast rail links between these cities. Including a direct link from Adelaide to the eastern line near Newcastle. Perhaps the first plan for this line should go from Melbourne to Adelaide then to near Newcastle and then to Brisbane avoiding many mountains and rivers that are more costly to cross. The Melbourne to Sydney freight line should be updated to carry these new types of loads with great urgency and electrified as soon as possible.
 - (b) High volume rail freight road freight interchanges at the exits of each city and at some regional centers where the proposed rail freight line passes through. These interchanges should be designed to allow the whole truck load to be loaded on the rail service within minutes. This could mean that specially designed rail trucks would carry the whole truck which drives on. As the new rail lines may have new rail corridors it gives an opportunity for new height and width standards for this rail line to be implemented.
 - (c) So that the electric rail network is able to access and use power from renewable sources or have the power from green power credits during night uses. This would create a larger market for green power in Australia and reduce the amount of heavy vehicles carrying freight where rail can be more efficient.
 3. Plan for a greater utilization of public transport. Greater use of public transport can drastically reduce the carbon footprint of the country even without carbon efficiencies in the transport system. However, greenhouse gas reductions in public transport should be urgently planned for by state planning authorities. The federal government should ensure that sufficient incentives be given to state governments to plan for these efficiencies and for greater utilization of an improved public transport system throughout Australia.
 4. Urge or influence state planning authorities to encourage more prescriptive planning when producing planning documents related to subdivision design and public transport.



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By David Holland

Public transport should have the same consideration in new estates as water and sewage services. It should be considered in a similar way to car access to individual houses. Public transport should be an integral part of the design which means that heavy vehicle bus access to the housing developments needs to be maintained and planned for. This will mean that road widths, roundabouts and turning circles should be considered. In addition services in the subdivisions should include bus shelters at all bus stops and every house having relatively easy access to the public transport corridor.

5. Ensure that funding is available to retrofit public bus routes with appropriately maintained road networks and bus shelters.

This would mean that roundabouts, traffic calming devices, traffic island and road surfaces should be capable of accommodating passenger buses while giving a comfortable ride for patrons of the public transport service.

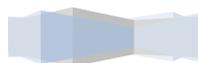
6. Put money into research for the development of hydrogen technologies, including hydrogen energy carriers.

I believe that the above suggestions should be funded as part of the current push to use tax payers money to help keep the economy flowing. If these projects were funded it would set Australia up as a leader in carbon neutral technologies, give Australia an export market in renewable energy and solve some number of environmental issues relating to pollution and curb ever increasing budgets for road transport due mainly to heavy vehicle interstate freight and current planning policies.

I sincerely hope you find my input helpful. Please do not hesitate to contact me if you need any clarifications on the points made in this letter of suggestion.

Yours faithfully,

David Holland
Grad. Dip. Environmental Management
B.A.S. Environmental Planning



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By David Holland

Appendix E

Letters in response to Letter to The Prime Minister Mr. Rudd

Dated: 30th January 2009

From the Minister for Resources and Energy



Commentary on Correspondence

On letters sent to and replies from Federal Government Members between 2006 and 2009 on Australia's future for renewable energy

By David Holland



**OFFICE OF
THE HON MARTIN FERGUSON AM MP
MINISTER FOR RESOURCES AND ENERGY
MINISTER FOR TOURISM**

PO BOX 6022
PARLIAMENT HOUSE
CANBERRA ACT 2600

Min ID: C09/545

10 MAR 2009

Dear Mr Holland

Thank you for your letter of 30 January 2009 to the Prime Minister, concerning renewable energy policies and carbon capture and storage, which has been referred to Martin Ferguson as the Minister responsible for energy issues. The Minister has asked me to reply on his behalf.

The Rudd Government believes that renewable energy generation will play an important role in meeting Australia's energy needs and has introduced a number of initiatives that will significantly increase investment in renewable energy. The introduction of the *Carbon Pollution Reduction Scheme* (CPRS) will put a price on carbon pollution to limit Australia's contribution to global greenhouse gas emissions and fundamentally shift our energy generation system towards a lower emissions pathway.

The Government has also committed to ensuring 20 per cent of Australia's electricity is supplied from renewable sources by 2020. This will provide the renewable energy sector with a cross subsidy worth many billions of dollars and, together with the CPRS, will provide a very strong incentive for investment into renewable energy generation.

In addition to this, the Government has committed well over one billion dollars, through a range of programs, toward the uptake of solar energy in our communities. These include the *Solar Homes and Communities Plan*, *National Solar Schools Program*, *Renewable Remote Power Generation Program*, *Solar Hot Water Rebate Program*, and *Solar Cities*. These programs represent a substantial increase in Government support for Australian families to undertake practical action in their own homes.

Your letter discusses the potential of hydrogen as an important future energy source for Australia. The Government has recently released the *Hydrogen Technology Roadmap*, which provides detail on the research and development challenges facing hydrogen technologies and identifies the potential role of Australian governments, industry and researchers in the possible development of a hydrogen economy. Australia is also a founding member of the *International Partnership for the Hydrogen Economy*, which has been established to advance the transition to a hydrogen economy.

Telephone: (02) 6277 7930 Facsimile: (02) 6273 0434

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To accelerate innovation in renewable energy technologies, such as hydrogen technologies, the Government has established the \$150 million *Energy Innovation Fund*. A \$500 million *Renewable Energy Fund* has also been established to fill the gap between post-research and commercial uptake for renewable energy technologies.

Regarding the development of low emission coal technologies, it's important to recognise the role coal currently plays in generating reliable base load electricity and otherwise supporting Australia's economy. Coal provides around 81 per cent of Australia's grid connected electricity generation needs. Coal mining is also the lifeblood of many of our rural and regional communities. While coal's share of future power generation will decline in favour of renewable energy and less greenhouse intensive fossil fuels such as gas, coal will continue to provide most of Australia's electricity generation requirements well into the future.

Australia is certainly not unique in its use of coal as a fuel source. The International Energy Agency report, *Energy Outlook 2008*, indicates that coal will remain the dominant fuel for global electricity generation for several decades, even with anticipated growth in renewable energy generation. It is therefore vitally important that domestic and international greenhouse gas abatement solutions include policies that support the development and deployment of low emissions coal technologies, as well as renewable energy technologies.

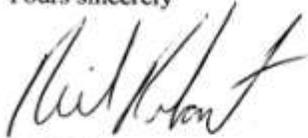
It is for these reasons that the Rudd Government is investing \$500 million to support the National Low Emissions Coal Initiative (NLECI), which aims to accelerate the development and deployment of technologies that will reduce emissions from coal use. These technologies may include coal gasification, capture technologies for black and brown coal combustion and fossil fuel-renewable synergies.

The Government is also providing up to \$100 million a year for a new Global Carbon Capture and Storage Institute in Australia to work cooperatively with other countries and industry in developing and commercialising carbon capture and storage technology to help reduce global CO₂ emissions.

The issues you raise concerning infrastructure and transport are outside Minister Ferguson's portfolio and you may wish to contact the Minister of Infrastructure, Transport, Regional Development and Local Government, the Hon Anthony Albanese MP, to express your views.

Thank you for writing to the Government on these issues.

Yours sincerely



Neil Roberts
Adviser

Commentary on Correspondence

On letters sent to and replies from Federal Government Members between 2006 and 2009 on Australia's future for renewable energy

By David Holland

Appendix F

Letters in response to Letter to The Prime Minister Mr. Rudd
Dated: 30th January 2009

**From the Dept of Infrastructure, transport, Regional
Development and Local Government**



Commentary on Correspondence

On letters sent to and replies from Federal Government Members between 2006 and 2009 on Australia's future for renewable energy

By David Holland



Australian Government
Department of Infrastructure, Transport,
Regional Development and Local Government

Dear Mr Holland

Thank you for your letter dated 30 January 2009 to the Prime Minister, the Hon Kevin Rudd MP, about measures to reduce the impacts of climate change. As the matters raised fall within the portfolio responsibility of the Hon Anthony Albanese MP, Minister for Infrastructure, Transport, Regional Development and Local Government, your letter has been forwarded to him for comment. The Minister has asked me to reply on his behalf.

While your letter covers a range of issues, I will necessarily focus on the transport infrastructure issues raised in your letter, as these are matters for which this Department has responsibility.

The Australian Government recognises that transport infrastructure is a critical to boosting Australia's productivity and creating and maintaining jobs. For example, in December 2008 the Prime Minister announced a \$4.7 billion Nation Building Package, comprising funding for key road and rail projects, as well as for building better universities and TAFES. With respect to freight transport, \$580 million of the rail projects announced was committed to expand rail freight capacity along the rail corridors connecting the Port of Newcastle to the Hunter Valley coal mines.

The Government has also established Infrastructure Australia to develop a strategic blueprint for our nation's future infrastructure needs and to facilitate its implementation, in partnership with the states, territories, local government and the private sector. Infrastructure Australia's role is to provide advice to Australian governments about infrastructure gaps and bottlenecks that hinder economic growth and prosperity. It will also identify investment priorities and policy and regulatory reforms that will be necessary to enable timely and coordinated delivery of national infrastructure investment.

Public transport was one of the 7 key themes (*'Transforming our cities'*) identified by Infrastructure Australia in its December 2008 report to the Council of Australian Governments. These themes are intended to provide the framework for solutions to meet the gaps, deficiencies and bottlenecks in our national infrastructure and the *Transforming our cities* theme concerns measures to increase public transport capacity in cities and to make better use of existing transport infrastructure. The Report identified 94 infrastructure



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proposals for prioritisation from over 600 submissions received from state and territory governments as well as councils, business organisations and members of the public. From these, a final list of prioritised projects will soon be presented to the Government.

A copy of the Infrastructure Australia report is available from this Department's website at http://www.infrastructureaustralia.gov.au/files/A_Report_to_the_Council_of_Australian_Governments.pdf.

Thank you for bringing these matters to the Australian Government's attention and I trust this information will be of assistance.

Yours sincerely



Neil Williams
General Manager
Rail Branch
Nation Building - Infrastructure Investment

16 March 2009

