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Introduction

As a famous song about our country states, the sun and the sea are important assets in our cultural identity. They are also extremely valuable, effectively inexhaustible, and free assets that we could utilise to supply all of our country's energy and water needs, economically. Even in providing surpluses of stored energy product i.e. fuel (Liquefied Hydrogen Gas or L.H.G.) in bulk quantity which could be used as vehicle fuel and to generate electricity, and potentially exported overseas.

Approximately 85% of electricity generation in Australia is by coal fired power stations, producing more than 42% of our greenhouse gas emissions. Desalination plants to create drinkable water from seawater are increasingly prevalent, using electricity to produce water from the oceans. Vehicle fuel emissions account for a considerable portion of the remainder of our carbon footprint, and can also be replaced with a cheap, green and inexhaustible alternative fuel.

All of this pollution and energy consumption can be eliminated in the medium term by the adoption of this policy. And many ancillary benefits would derive from it as well, such as a constant water supply for Australian householders, farmers and industry. The END of water restrictions. It would create sustainable employment, and over time reduce the price of production of both electricity and water, compared to current prices.

A significant expenditure on infrastructure would be required to achieve this objective, but this can be minimised by utilisation of much of the existing infrastructure in these areas, and by a variety of funding options being available. Unlike most infrastructure projects that have a limited lifespan however, this policy provides for infrastructure that will effectively be able to supply power and water until the end of time (when the sun and/or ocean is no longer available.)

The technology is simple, and proven. Archimedes could be considered one of the first proponents of solar thermal technology, and the concept of concentrating and magnifying the suns power, 2500 years ago. Photovoltaic solar electricity generation is currently common, and increasing, but is less than half as efficient as solar thermal generation, and more costly. This system also has the benefit of the side production of potable water, an increasingly important issue not just in Australia, but widely in the world.

Hydroelectric dams and power generation need no explanation. Just think of the J. Edgar Hoover dam in the U.S.A. or the Snowy Mountains scheme at home; during the Great Depression they supported an economic stimulus, green electricity generation, irrigation and created jobs.

The adoption of this policy would ensure that ALL future generations of Australians will have food, and water, and electricity available to them, so that they may lead a more prosperous life than their forebears. It would entail no pollution, and to a degree would mitigate the effects of previously pollutant practices. It would provide for us virtually free of charge for ever, and create foreign markets for Australian goods and services. Mutual benefit could be obtained for all project participants, economic, environmental and political, in terms of pollution levels, sustainability, and cost of power and water.

The System

Comprises in the main of four components that have different emphasis depending on location and local environmental factors, such as average sunlight, demand, land gradient, and rainfall. For example locations that do not support Hydro-electric generation due to the inability to safely create elevated dams would have a greater focus on solar thermal generation, and conversion of water into Hydrogen gas for non-sunlight energy generation. Conversely areas with more suitable dam locations, and/or higher rainfall would have a greater emphasis on Hydro generation with Hydrogen gas station backup. An extreme example could be an unoccupied sunny atoll, where the entire electricity supply generated by the solar thermal plant would be utilised via electrolysis to create Liquefied Hydrogen Gas for export.

-Solar Thermal Power Tower

The power of the sun is used to heat water (seawater/groundwater etc) through glass into steam, which is then used in a steam turbine to create electricity. (More than 80% of electricity generation in the world is via steam turbine, with the heat created via burning fossil fuels, or nuclear reaction). A glass tower and mirror array is erected over a body of water, and solar radiation is reflected and magnified to heat the water through the glass into steam. The steam is then collected and piped through a network of steam turbines in the power plant to create electricity, and is only limited by the area of the network and number of turbines. It is then piped through the transmission pipeline (and further steam turbines) to the condensation plant.

Solar radiation has no cost, is constantly available during the day, even with clouds, and is greater during summer when electricity consumption is high and rainfall relatively low. It is considerably more efficient than photovoltaic solar energy generation (more than double), and has a considerably lower technology requirement, and hence cost.

Currently there are a number of solar thermal power generation facilities in operation, including part of Liddell power station in N.S.W. as well as a large project in the U.A.E. using light crude oil as the energy catalyst. The Cloncurry development in Queensland was initially planned to model graphite energy storage technology, but has been abandoned. Many of the issues raised in scrapping this project (such as local glare) can be simply addressed by plant location and steam pipeline length, and screening foliage reticulated via the pipeline.

In 2006 the CSIRO commissioned a report into the levelised energy cost of different generation technologies in Australia, with no price for carbon pollution. Solar thermal power at $85/MWh is double coal with a cost of only $28-38/MWh, and Small Hydro Electric costs around $50/MWh. These costs for solar thermal are based on outdated, complicated designs largely inflated by the need for effective energy storage systems. Solar tracking is another expensive feature of most systems, to ensure focus of the solar radiation onto the fuel catalyst to ensure maximum heat.

The use of a simple design, with standardized parts and no need for solar tracking would greatly reduce the cost of power generated by this system. Solar efficiency can be obtained by the co-location of towers so that mirrors can focus on more than one tower depending on solar positioning. The necessity for a narrow focus point can be avoided by tower design, as the focus only needs to remain on the water within the sphere to be effective, not a specific point.

Energy storage in this system is considerably cheaper than other solar thermal technologies, as it is achieved through conversion of steam into water to allow hydro electric generation.

Condensation of the steam can be achieved in a sizeable body of water for no cost, with multiple ancillary benefits available for water usage post Hydro generation. If Hydro-electric generation is not available in a particular location greater emphasis can be laid on the creation of LHG for energy storage.

Solar Thermal power generation is a large industry globally, and is rapidly growing. Australia is in a unique position to harness the potential of this emerging industry to transform our economy, and end our reliance on the burning of fossil fuels to generate electricity.

-Solar Thermal Steam Transmission Pipeline/Generation System

The steam from the solar thermal power plant is then piped, through sunlight in glass or steel pipe, ensuring heat and hence steam pressure is retained, through a network of steam turbines feeding the local power grids. Local steam power substations can be placed along the pipeline if required, or steam diverted and condensed to meet local water and/or Hydrogen Gas storage needs. The steam is piped to an eventual destination of a water body, such as a dam, lake, tank or weir, preferably with a degree of elevation for Hydro-electric generation.

The ability to use modular system components will greatly reduce the overall system design, manufacturing and installation costs. The use of only a limited number of optimal lengths of pipe, straight and angular connectors, and a standardized turbine/electricity generator unit make the system cheap and flexible. If further capacity is required in an area a new pipeline can simply be added next to, or on top of previous pipeline. Likewise, any repairs or replacements required could be simply slipped out, and universal replacement parts installed, lowering downtime and cost, and replacement inventory required to be held.

The only variables in installing the pipeline would be the footings and connection points to the local power network, peculiar to each location. The components can be locally produced in Australia, creating sustainable jobs, many in rural areas. Increased demand for local glass, which could be part of a controlled supply chain to manage costs, and steel, would not only increase gainful sustainable employment but could also easily become a manufactured export industry of modular solar thermal energy/water systems.

-Condenser/Hydro-Electric/Irrigation/Water Supply System

This entails the condensation of the steam into pure water in a water body, from the pipe network, which can be partially siphoned off for domestic consumption and irrigation projects. Condensed water in the water body can be released to provide hydroelectric electricity into the grid. Depending on seasons/locations etc the amount of water released during the day can be altered to produce further electricity and to manage water levels in the dams, rivers etc that are part of the network. This can also assist to flush our waterways clear, which seems to be a problem in many of our communities and, to some degree this would also assist in floods management.

During the night the generation of hydro electric power becomes the primary generator of electricity as the solar thermal system is inoperative. Supported by Hydrogen Gas Turbine power for peak loads, the system allows for 100% renewable energy around the clock, even in peak periods, and with rapid demand responsive electricity supply escalation ability.

Hydro Electricity is a long established cost effective technology which has minimal environmental impact. The ability to effectively ‘step’ Hydro dams in locations with sufficient elevation with multiple levels of dam, and water turbine generators, and to constantly restock them when rainfall is low (and hence solar radiation is high) substantially increases their effectiveness. One of the key advantages of this system is that the steam pipe network can effectively supply sufficient water to a ‘dry’ location, such as in a desert, for a Hydro dam to be included in the water and electricity supply networks.

-Hydrogen Gas Creation/Electricity Generation/Storage/Transport

This system can achieve almost 100% electricity generation/distribution network efficiency, by using the process of electrolysis to utilise “spare” electricity to create Hydrogen gas. The system would ideally be set up with considerable excess electricity generation capacity to provide electricity compared to average demand. This would allow the excess electricity to be used to create a renewable, environmentally friendly, storable and transportable energy product in the name of Hydrogen gas which can be liquefied and stored for vehicular consumption, emergency use, peak period gas electricity generation (using cheaply adapted currently operational LNG and LPG turbines), and use in industry.

Renewable sourced electrical current is passed through an electrolytic substance, (saline water) and decomposes the water into Hydrogen and Oxygen. The Hydrogen can be compressed and stored locally, piped or shipped to consumers. Generally Oxygen created would be released into the atmosphere, but if commercial reasons exist this can be easily captured as well. (Salt, or Chlorine, can be harvested as either solid or chemical if sufficient economic markets exist, or diluted in the originating water source.)

A November 2007 report commissioned by the University of Leeds, U.K., estimates that globally in 2004 fifty million tonnes of Hydrogen Gas were produced, with an estimated value of $135bn. Most of this Hydrogen is used to create Ammonia (used in fertilisers) and to ‘crack’ fossil fuels into lighter fractions suitable for consumption. It is suggested that if cleaner and cheaper Hydrogen Gas was available its demand would rapidly escalate for these purposes alone, notwithstanding any new demand for Hydrogen for electricity generation.

Power substations could be designed with both Solar Thermal and Hydrogen Gas Generation/Hydrogen Combustion Electricity Generation dual purpose intent. LHG can be locally created close to demand, and stored under the condenser/electrolyte water source, for additional safety. This would also reduce the cost of production of the Hydrogen gas, and allow point of sale production, and hence the true economic forces of supply and demand to set the bowser price of fuel.

In areas lacking the required elevation to adequately generate Hydro Electric power additional daytime capacity in solar thermal power towers and steam pipe networks could be used to create Hydrogen gas to be used as fuel in power stations. Purpose built facilities that convert all electrical current into Hydrogen gas could be built, allowing export to other locations that do not have sufficient sunlight or space to adopt a similar renewable energy plan. Liquefied Hydrogen gas can be used to store and transport large volumes of energy safely and cheaply, and gas pipelines could be used to supply Hydrogen to fixed demand locations. Whilst similar storage and transportation issues face LHG as the existing LNG and LPG industries, it is considerably safer than hydrocarbons as it is not a pollutant, and exists in a lighter than air gaseous state in its naturally occurring form.

The Primary Benefits
-Electricity Generation

Unlimited green electricity can be produced during all seasons and at all times of the day. Over time it can be produced more cheaply than conventional techniques such as coal fired power generation, without any negative environmental consequences. The supply of solar radiation and [salt] water are effectively limitless, and readily available. The system harnesses the forces of nature, such as evaporation, condensation, and gravity, to provide efficient and sustainable power in a cost effective manner.

When sunlight is in abundance the Solar Thermal Power Towers, and Solar Thermal Power Pipelines will generate more steam and electricity, and supply base load power. During the night the Hydro-Electric or Hydrogen gas fired facilities will fulfil this function. Spikes in demand, peak periods and transition times from Solar Thermal to Hydro can be covered by Hydrogen gas turbines. Different locations would have different 'mixes' of system components to utilise their local advantages such as averages of rainfall, sunlight, and clear skies.

Network distribution efficiency could be greatly enhanced using this system, as any excess electricity at any point in time can be used, through electrolysis, to create storable or saleable Hydrogen gas, rather than earthed. The ability to locate power stations closer to residential areas, due to pollution, safety and economies of scale playing a much lesser part in the decision, would significantly cut down the transmission losses in the network.

Other renewable energy sources could be combined with elements of this system, where they are already in existence, or viable future products. Wave energy and wind energy are particularly complementary to this system, but have not been included in my submission due to their current high costs. Wave energy generation would allow for non-sunlight electricity at coastal solar thermal facilities, and the convection effect of the solar thermal system would greatly increase the efficacy of wind power in close proximity to the solar thermal plants or pipeline.

-Water Generation

Current desalination plants in Australia create drinking water from the sea using electricity, most commonly created by burning coal, and then pump it into their water supplies using more power. This system creates unlimited amounts of water as a by-product of producing cheap, clean electricity, and pipes it using steam pressure created free by the sun into a water supply. There is no real limit to the amount of water and energy that could be created by this system, or the locations in Australia it could be deployed.

Just one example of where this system could be particularly effective is in supplying water to Kalgoorlie, in W.A. Currently the C.Y. O'Connor pipeline supplies water from Mundaring Weir (part of the limited Perth Metropolitan water supply) to Kalgoorlie and the Goldfields in a 108 year old leaky pipe, with eight power consuming pumping stations along the way; a trip of 530km. My proposal is that instead a solar thermal system could be established near Esperance, and pipe steam to Kalgoorlie, a distance of roughly 350km. Some of the many salt lakes in the intervening area could be used for substations, with capacity for diversion of steam/water for irrigation and mining purposes in the region. Both Esperance and Kalgoorlie would have unlimited cheap, green electricity and water, as would the 350km of presently arid land and mines in between.

This proposal could arguably be considered self funded, as forward supply contracts could be easily negotiated with both the cities of Esperance and Kalgoorlie, and many mining companies for green electricity and water supplies. The fact that these essential inputs for mining/industrial purposes would be pollution free, and hence limit enterprises' exposure to the carbon tax would significantly increase their value. Irrigated agricultural leases in currently worthless arid land, and water permits or guaranteed irrigation allotments could be sold to existing communities/farmers within the Goldfields and Wheat belt regions to raise additional revenue. Most of the infrastructure in this proposal i.e. concrete/earth dams and glass solar thermal stations/pipe, has an essentially limitless lifespan, and the "fuel", sunlight and seawater are effectively limitless too, meaning extraordinarily long supply contracts could be offered, limiting the initial capital outlay and risk required to be adopted for the venture promoter (the Government.)

Rainfall is unpredictable, varies according to season and ocean currents, and is often unmanageable when it does come; it never rains but it pours! This system would allow a constant supply of water for all applications all year round, for if it isn't raining the solar thermal system will create more water. Overall management of our waterways and dams would be greatly enhanced, as steam from the solar thermal network could be diverted at any point, and released into the air or condensed back into its' source water if the destination dam was in danger of reaching capacity. Additional water could also be electrolysed into Hydrogen and Oxygen in this event, further reducing the strain on capacity with any natural weather event. Excess steam can also be released into the atmosphere to assist in creating rainfall in dryer weather, whose destination cannot be particularly targeted but may be influenced.

-Hydrogen Generation

Lawrence Jones of the University of Michigan is credited with originating the concept of a Hydrogen economy in 1970. Hydrogen gas is suitable for use for electricity generation, as a vehicle fuel, to bond with atmospheric Nitrogen to create ammonia (for fertilizer and cleaning agent application), Hydro-cracking of marginal fossil fuel reserves, and as a supply of fresh water post combustion. Produced from cheap renewable energy through the process of High Temperature Electrolysis it can achieve a high level of energy conversion efficiency. Whilst Hydrogen gas is not an energy source like fossil fuels but an energy carrier, produced from nothing other than the free and plentiful light of the sun and the boundless sea it is limitless, and virtually free, other than capital costs.

In 2006 the NREL working for the US government calculated the cost of producing Hydrogen gas via electrolysis using wind generated electricity to between $5.55 to $2.27 per kilogram (roughly equivalent to a gallon or 3.78 litres of petrol, or from $0.60/L to $1.20/L). This price could be substantially reduced by using this system, if for no other reason than both hydroelectric and solar thermal generation are cheaper and more reliable than wind. Even if wind power was included in this system it would be considerably more effective due to the effect of the superheated air around the pipelines rising, and causing a corresponding inrush of surrounding air feeding the wind turbines.

The Burrup Fertiliser plant in sunny northwest W.A. is a large consumer of both electricity and natural gas to create Hydrogen for conversion into Ammonia then fertiliser. Both Hydrogen gas and electricity could be created and supplied to industries like this at lower cost and without the negative environmental consequences of fossil fuels, if but only for the need for some investment in the future. World demand for ammonia is considerable, and rapidly expanding, as would Australia's demand for fertiliser if the irrigation aspects of this proposal were adopted. There are strong commercial drivers, and existing markets for a cheaper, and increasing level of production of Hydrogen gas both domestically and internationally, notwithstanding potential use as fuel.

BMW automotives has already designed, manufactured and commercially produced a liquid hydrogen powered motor vehicle, which has zero emissions when in hydrogen mode (it is dual fuel due to lack of Hydrogen refuelling stations.) Many Hydrogen Fuel Cell electric vehicles have been designed and manufactured and Hydrogen powered buses are operated around the world, and were trialled in Perth in recent times. As mentioned above, LHG can be produced cheaper than the current retail price of petrol within Australia, a comparative advantage that will only increase in time as fossil fuel reserves expire, and economies of scale and new technology lower the cost of LHG production and storage.

Offering a Hydrogen engine, with higher power output for engine capacity than petrol equivalent, with a limitless supply of cheap fuel (even cheaper on sunny days when it's nice for driving) and no emissions, would be pretty attractive to most motorists. And LHG can't be used to set fires, or sniff, so it is better for the community's health in addition.

Hydrogen gas can also be used in a gas turbine to create electricity, similarly to LNG and LPG electricity production. Issues in terms of storage supply and transport would additionally be similar, mollified however by the fact that Hydrogen, unlike LNG and LPG, is not a pollutant and therefore the consequences of any incident would not be as severe. The main risks with Hydrogen gas of explosion and combination with atmospheric gases to create acidic compounds can be greatly minimised by locating the compressed LHG storage facilities under a layer of water, ensuring no Oxygen (or Nitrogen) can mix and allow combustion. When 'burnt' to create electricity the by-product of Hydrogen generation is controllably pure water, unlike Hydrocarbon fuels that release toxins into our ecosystem.

Hydrogen storage, transportation and economic viability as an industry are long established, since at least 1980. The problems of Hydrogen storage and transportation are similar to C.N.G., but are already seen to be viable, with around 1500km of low pressure Hydrogen gas transmission pipelines in each of Europe and the U.S.A. in 2004. Companies such as Praxair in the U.S.A. have stored and supplied very large volumes of Hydrogen gas commercially for industrial application for quite some time.

-Sustainability

This system relies on nothing other than the sun and the sea as its sources of fuel, and hence will effectively be available for eternity. Water taken from the sea is utilised within the chain, either for agricultural or industrial purposes or returned to the ocean through the waterways network, or released as steam to increase rainfall. The transmutation of saline water into Hydrogen gas results in either the conversion back into water when combusted with Oxygen for electricity generation purposes, or use as fertiliser (combined with atmospheric Nitrogen) to grow plants, or to increase the efficiency of Hydrocarbon energy reserves, all objectives which have the overall effect of reducing greenhouse gas emissions.

Glass, the major system component, is capable of being produced cheaply and environmentally in a controlled supply chain in suitable locations, utilising locally available raw materials and solar furnaces to limit energy consumption and environmental impact. It has a virtually limitless lifespan (glass artefacts of thousands of years of age have been discovered), and the Solar Thermal Power Towers, and Pipeline, will effectively have a limitless life (excepting turbines, which with moving parts require regular expenditure.) The amortised cost of an asset for a capital outlay of any amount, over a lifetime of infinity is zero. For taxation purposes a life of 40 years and a flat rate of 2.5% depreciation is applied for such capital improvements as this system would entail, but with the miniscule maintenance and operating cost this system requires, a positive return on investment could be achieved in a much earlier timeframe.

No matter what the weather we are faced with, or the El Nino or La Nina effects we confront, this system will allow for electricity and water generation for all time. When it rains, and the sun is not shining, water capture and Hydro-electric generation will supply the network, with excess electricity diverted to Hydrogen gas generation for peak loads and industrial/vehicular use. When it doesn't rain, and the sun is shining, Solar Thermal Generation and steam-water supply will dominate, with excess capacity diverted to Hydrogen generation, and night-time electricity generated with both Hydro and Hydrogen generation.

There is no potential for pollution, or environmental contamination from adopting this system. The natural forces of nature are augmented and enhanced to provide all of our electricity, fuel and water needs. The sun is the primary source of life on our planet; without it we could not exist. This system captures part of its power and converts it into the essentials of modern life; food (newly irrigated land and fertiliser), power, and water. In addition to eliminating greenhouse emissions, this policy, via the promotion of agriculture, would also allow for increased carbon absorption for Australia, meaning we could easily become a Carbon Sink Country within a short period of time. We could also be at the forefront, and hence reap the greatest benefits and economic dividends, from a greater global adoption of solar thermal and Hydrogen powered technologies engineered via Australian innovation.

Harvesting sea water as a fuel will also assist in combating rising sea levels due to the effects of global warming.

The Secondary Benefits
-irrigation of the nation

Steam from the Solar Thermal Power stations and pipelines can be allocated to specific uses, such as agricultural irrigation allotments. Either used as steam in hothouse applications, or condensed into the irrigation network, it would ensure a consistent and reliable source of water for farming application. Currently existing irrigation networks could be supplied at the headwaters, making the direct cost to farmers of these increased water flows zero. Ideally the systems would be designed to produce excess water more often than not, so as to allow steam release to increase latent humidity and hence rainfall in agricultural regions as well.

Some examples of ideal locations for this system are:

i) The aforementioned Esperance-Kalgoorlie solar thermal steam electricity/water network could be expanded to irrigate the entire W.A. Goldfields and Wheat Belt currently serviced by the C. Y. O'Connor pipeline.
ii) Karratha and the surrounding areas, who are now purchasing water off B.H.P. and considering yet another desalination plant, and burning fossil fuels for electricity. The seasonal floodwater and the Ord River could also be integrated into this system for electricity, Hydrogen gas generation, and irrigation purposes.
iii) Short pipelines across the Great Dividing Range could supply the headwaters of the Murray River with a guaranteed flow of water, as well as electricity via both solar thermal and hydroelectric generation to local communities. There would be no need for water buy backs, and drought would largely become a thing of the past across a large swath of agricultural Australia. Flood management would also be significantly enhanced in the region.

Certainly this system will cost a fortune in capital infrastructure costs, but revenue costs are slight and the assets' lives are indefinite. The returns for providing limitless green electricity and water are immeasurable and invaluable, in economic, societal and political terms.

Can you imagine a country, where due to an unlimited supply of irrigated water no farmer could ever whinge about the drought? Or where there is sufficient excess capacity in the water management systems that flooding can be adequately managed to become an insignificant issue? Happy productive, profitable farmers, lower insurance costs, increased certainty, more consistent taxation revenue and no need for disaster levy? I can imagine a country like this, and it could feasibly be called Australia.

-sustainable employment, especially rural Australia

This proposal would create many jobs in agriculture, construction, manufacturing and service industries. It would also support existing business and industry in Australia by providing a cheap and consistent supply of inputs, namely electricity, Hydrogen gas, and water. New markets could be opened up, and many Australian businesses would derive significant benefit from the competitive advantage obtained by cheaper and greener inputs.

Solar furnaces could be set up to make glass components and pipes cheaply and ecologically. This would require supplies of limestone, salt water and sand, as well as some sunlight, and access to transportation. But this includes many rural communities where job creation would be beneficial and these resources are plentiful.

Increased demand for steel for transmission lines, and for structural support of Solar Thermal generation/transmission networks and hydroelectric dams would support a local industry that is looking at shedding considerable jobs. It would also considerably lower the risk of foreign exchange movements affecting demand for the industry, as there would be a much larger and consistent driver of demand domestically. Storage and transportation vessels for the Hydrogen gas would also require steel for production, and may well entail the creation of new industry, such as shipbuilding gas transportation tankers.

There is already a large international market for Hydrogen gas, predominantly for creating Ammonia for fertiliser and Hydro cracking of fossil fuels. As well as creating jobs in the energy and water markets, the expansion of these two industries would create further employment opportunities in Australia. Hydrogen gas is also generally used as a fuel for rocketry and with the available open spaces in this country could potentially open up an interstellar industry in Australia too.

BMW automotives has already proven a LHG car works, but this is not widely promoted as a green vehicle option due to the current 'high' price of Hydrogen gas. By creating this cheaply and sustainably in large quantities for vehicular fuel, it becomes an economically viable alternative. Motor Vehicle manufacturers in Australia could adapt at least part of production to LHG engines and vehicles, greatly stimulating the domestic industry and likely opening up export markets as well. Can you imagine the attraction of an internal combustion engine vehicle that is cheaper to run than a petrol engine, produces more torque, and creates no pollution?

If you check either the Australian, or International BMW websites, it is abundantly clear which source of fuel (i.e. Hydrogen Gas) that this reputable, successful, multinational motoring giant is tying its' long term future to. If intelligent corporate shareholders in one of the worlds' largest companies see a long term profit in Hydrogen, then who are we to argue.

-weather proof economy

If it rains the Hydro-electric system dominates, if it doesn't rain the solar thermal system takes precedence. If there is no sun, and no rain, the Hydrogen combustion system from stored reserves takes over the predominant electricity generation function. This would entail the creation of additional water for Hydro-electric or irrigation functions as a by-product.

As touched on previously, in severe weather conditions this system would greatly enhance our nations' ability to shrug off their effects.

Drought; who cares? We have unlimited water irrigation from the over-plentiful sun, and the sea. When there is no clouds and no rain, we get even more water from it than normal, and cheaper electricity. We create cheaper Hydrogen gas fuel, so any consumers, agricultural, industrial, mining or recreational, get cheaper fuel than normal. The plants irrigated by the solar thermal network grow more due to more sunlight, and provide a greater return to the farmer (and more tax!) than normal as well.

If this system was adopted in its' entirety, and implementation was fully completed, the word "flood" could be deleted from the Australian dictionary. There would be no conceivable need for dams such as the Wivenhoe to be kept anywhere near capacity. If it was sunny unlimited water could be supplied during daylight. If it was raining, or cyclonic, the 25% (new) ordinary capacity could be expanded as well as additional water release and Hydro-electric/Hydrogen gas generation (from electrolysis) could greatly assist in managing the effects of these weather conditions, if not eliminating them.

The Tertiary Benefits
-export and foreign aid potential

The marketing attraction to be able to offer some of our major trading partners' commercial quantities of renewable, green gas energy to consume for insignificant cost difference, (or even lower prices) to LNG or LPG is considerable. This fuel costs nothing to produce but infrastructure and transportation- the process uses the sun, and seawater, to produce electricity, and then the electricity to produce hydrogen gas from the seawater. It could be easily argued that on a commercial scale LHG production via this method in suitable locations would provide much cheaper energy costs than either LPG or LNG, whilst being safer, environmentally friendly and sustainable forever.

It is feasible this policy is capable of "saving" not just Australia, but the world.

The Horn of Africa is currently in drought, with thousands of people dying daily due to a lack of water. Piracy is common in the region, as the people have no choice but to support the criminals who by their illegal activities supply food and water to their local populations to buy their support. A considerable investment would be required to establish a permanent water supply solution to these peoples, but it would also provide electricity, and jobs. This would significantly lower the attraction for these peoples to become criminals or pirates. The United Nations and its members would surely contribute to such an undertaking, but it would also directly reduce Australian costs. The Australian Navy currently has ships deployed in this region, costing considerable amounts of money each day, and the Australian Government has provided more than $100m in foreign aid during the current drought, in addition to private charitable donations from Australian citizens and charitable societies. There would be no future obligations for Australia by helping developing nations become self sufficient, but there may well be found to be a fiduciary or moral obligation adopted by the beneficiaries of such Australian philanthropy to be of unquantifiable benefit to our nation in the future.

The nation of Japan already buys large quantities of gaseous energy products from Australia: Liquefied Natural Gas or Liquefied Petroleum Gas. These are mainly used in Japan's limited fossil fuel powered electricity generation system (it is mainly nuclear). With the problems that Japan has recently experienced due to Nuclear disaster, and the entrenched low economic growth in their economy, it is likely that the Japanese could be easily persuaded to become a customer of, or participant, in this project. The ability to supply their people with unlimited electricity, produced from green sources, until the end of time would be extremely politically attractive to a Japanese government, particularly in the current climate. The available stimuli to Japanese industries, in manufacturing new green Hydrogen motor vehicles and Solar Thermal System components, construction of solar thermal plants and Hydro-electric dams, and obsolescence of previously pollutant technology would add to the attraction of this proposal.

The Chancellor of Germany, Angela Merkel, has decreed in recent times that her country will end its' reliance on Nuclear power. New alternatives are being investigated, and even such farfetched policies as landline transmission of photovoltaic solar power produced in Greece to Germany have been touted. The obvious benefits of cheaper generation, safer and more efficient and reliable storage and transmission of the energy carrier Hydrogen gas rather than electricity, with its' significant transmission losses, would very likely interest the strongest economy in Europe as well. Solar Thermal Plants would be more cost effective, and efficient on the rocky, sunny Greek coastline than Photovoltaic. And if a pipeline was required the Solar Thermal Steam Transmission Pipeline actually generates electricity along its length, rather than powerlines which lose it.

-combat salinity

Salt may be harvested from the system if desired, which may be more commercially viable in some inland lakes where mineral salts are present. Harvesting salt could also be used to reduce groundwater, lake or river salinity. Ancillary options include development of saltbush and seaweed industries in saline inland lakes, which will be guaranteed water with this system. Both human and animal feeds could be produced from these crops. It is claimed sheep raised on some varieties of saltbush, a common edible native Australian plant, have many benefits compared to, and similar consumer appeal to grain fed lamb. Some varieties of saltbush have been consumed by Aboriginal peoples for many thousands of years, and Grey Saltbush is considered to taste much like Spinach (but is a native Australian plant).

The network of hydroelectric dams, and the associated release of water, will assist in flushing clean Australia's waterways. Regions such as the Murray Darling basin will no longer be solely reliant on rainfall, with the ability of a network to be set up to feed the headwaters for any river, from steam generated from a plentiful water source such as the ocean. The awesome power of Australia's floods can be managed, and diverted to provide resources where needed, rather than just too much in one place at one time. Excess salt in our inland lakes and waterways can be absorbed and dispersed in heavy rainfall, and harvested or flushed through the waterways to increase the policy's effectiveness.

Groundwater "fuelled" power stations can be used to manage groundwater levels, and an abundant supply of fresh water from steam will allow crops, trees and plants to flourish. Native Australian trees and plants that are salt tolerant could be emphasized, and potentially tied to the award of increased water allocations. If there is no commercial or industrial demand for the available salt supplies created by this system, these can also be "flushed" to sea with minimal impact; as the rising sea levels caused by global warming and melting icecaps are freshwater, it would be essentially a zero sum game to remove the water, but leave the salt.

New land and water allocations in freshly irrigated regions could be tied to locally environmental and ecological strategy requirements. Requirements that fence lines be planted with appropriate trees would not only reduce groundwater and hence salinity levels, but also greatly reduce soil erosion (in addition to any added esoteric value!). The 'new farmers' could be offered or obliged to undertake anti-salinity farming education, such as using the available gradient of land to allow a graduated diversity of salt tolerant crop. Subsidies or tax concessions could be offered for particularly located crops or plantations that address severe local environmental issues, bearing in mind the lessons learnt from former forestry schemes. Support for the development of industries and markets for the salt resistant crops that are placed at the lowest gradient, and hence receive the most salt exposure, could also be adopted to enhance this policy' effectiveness in this area.

The Commonwealth's "Caring for our Country" strategy, and numerous State programmes to combat salinity would become redundant once this policy was online. Funding, projects and research already underway could be transitioned to achieving an even more successful outcome via cross development with this policy.

-increased carbon absorption

Increased domestic and agricultural use of water to grow vegetation, such as lawns, gardens, crops, plantations and orchards will greatly increase carbon absorption in Australia. The removal of many of the pollutant toxins associated with Fossil Fuels, and replacement with an energy carrier such as Hydrogen, whose by-product of combustion is water, would over time eventuate in a Nett Reduction in greenhouse gas emissions for our country. If the “export” potentials of this policy were adopted, much of the worlds current consumption of Fossil Fuels could be economically eliminated, with the additional side effects of more potable water, and hence the capacity to grow even more plants (mostly food), increasing the overall positive effects.

Unlimited water supply to vast new agricultural areas, as well as a guaranteed water supply to inland lakes and seas, through the ability to grow (even without harvesting) crops and seaweed would pull more Carbon Dioxide from our air. The increased rainfall caused by the release of excess steam, or by the increased evaporation at our lakes etc. used to condense steam from the Solar Thermal Pipelines, would also increase vegetation growth in non-irrigated areas. The before mentioned anti-salinity strategies would increase agricultural output in land already salt affected, and land at risk of being salt affected, and hence reduce greenhouse gasses as well.

Recent research has suggested that hydroelectric dam facilities often end up storing greenhouses gases within their water supply, as organic matter decomposes underneath their surfaces. This problem is not as severe in Australia where the generally warmer temperatures allow this material to decompose and surface or ‘flush’, but is still seen as a major drawback to a reduction in greenhouse gasses via widespread adoption of Hydroelectric technology. As the increased water flows in this system are created either by the combustion of Hydrogen gas, or the condensation of steam, there would be no corresponding increase in the input of organic material to the dams, and the release of increased water flows would overall reduce the amount of carbon stored.

- Complementary technologies

Other renewable energy technologies are complementary to this system. Wind power generation capacity located in close proximity to the Solar Thermal Power Towers or Solar Thermal Pipeline would be greatly augmented by the effect of convection, or hot air rising, during the day when the plant or pipeline is hot. Wave energy at coastal plants could be harnessed to not only create electricity at night, but for excess (normally during daytime) to be used to electrolyse water into Hydrogen gas for sale, storage or use, at the originating fuel source and able to be in close proximity to a transportation network (e.g. jetty).

Liquid and solid animal and human waste could be utilised via this system to create beneficial products for consumption. Anammox bacteria are already used to break down waste products into potable water and Hydrogen based fuel compounds. Different varieties of similar “bugs” could be used to create usable fuels from solid wastes. Solar Furnaces could be used to treat any leftover liquid or solid waste via extreme heat to remove any potential for contamination before recycling said waste into our agricultural systems, increasing their overall sustainability as well. The electrolysis of Hydrogen gas is approximately three times more energy efficient from Urea than it is water, so using the NREL’s figures from 2006 would suggest a price of 1L petroleum fuel equivalent in Hydrogen gas to be from \$0.20 to \$0.40, using urine as the electrolytic compound.

Aquaculture industries would be able to be greatly expanded, with both more water bodies and more water supplies being consistently available. Hydroponics or Hot House industries could take advantage of the availability of cheap irrigated land that receives large volumes of latent solar radiation, as well as the available heat energy from the solar generation and transmission systems.

'Hot Rock' proposals in central Australia are limited in contributing to the national grid due to the tyranny of distance- transmission loss to the major population centres limits the effective contribution made. The system could be integrated with my proposal to produce and pipe steam 24/7 into the national network, or to achieve the same 24/7 production of LHG. Or part of it could be used to add water to the inland lakes and waterways of the central deserts, allowing much greater farming potential and securing water for the many national parks in the region.

The Costs

Both the U.S. and Australian governments (and undoubtedly others) have commissioned reports into the levelised cost of different production methods of energy. Whilst solar thermal is considered one of the more expensive alternatives, Hydro-electric generation is one of the cheapest. This system uses a balance of each, averaging the cost, but also has the ability to store energy much more cheaply than other systems, both by the condensation of steam into water and by the electrolysis of water into Hydrogen gas. This system would also be able to produce Solar Thermal power more cheaply than these previous studies calculated, for some of the reasons below.

The ability to utilise barren coastline, or even offshore facilities to produce energy, Hydrogen gas and water is a key advantage of this proposal. A nice sunny bit of desert on the coast isn't generally too expensive, and a nice sunny piece of desert inland next to a salt lake wouldn't be too pricey either. Once the system was in full swing, the price of the sunny, irrigated former desert inland is fairly likely to have increased substantially, allowing a significant recoupment of costs. Other essential infrastructure, such as the [solar thermal] glass factories to produce the mirrors, pipelines and solar thermal generation stations could also be done in cheap sunny locations, where other benefits like job creation (and hence reduction in welfare payments) would be most beneficial.

The conversion or adaption of current LNG and LPG production and processing facilities and technologies would be a cheap and relatively simple affair. As these Fossil Fuels (or particular reserves) expire much of the infrastructure could be easily adapted to suit L.H.G. consumption. Hydrogen consumption motor vehicles are already commercially available, and the technology is suitable for ALL internal combustion applications, whereas electric powered vehicles are not. (Can you imagine a 400 tonne fully loaded Haulpak on an electric motor trying to get out of an open pit? N.B. Australian mining companies are already spending hundreds of millions of dollars to convert their vehicle fleets to Hybrid LNG/LPG Diesel engines, and claiming the accelerated R & D tax deductions.)

This proposal offers infinite "Time Value of Money". The lifespan of Hydro-electric dams is considerable, and with adequate maintenance almost eternal. Glass too lasts for thousands of years, meaning the only wear and tear on the system will be in the steam turbines and the transmission system- the same issues virtually all other electricity supply systems face. This proposal has an effectively limitless lifespan (infinity), hence mathematically a $0 amortised cost. (i.e. total cost of implementation / infinite lifespan = $0). The Romans built aqueducts and viaducts and cisterns which still serve their original purpose, thousands of years later. Can we not consider similarly providing for the future of our 'empire', as much as we consider ourselves more technologically advanced than these ancestral peoples?

Supply chain management will allow costs to be controlled and minimized. If outright ownership of the component manufacturing networks is not desired, long term contracts could be negotiated with the producers to not only guarantee their future income, but to guarantee the costs to assemble the systems. If part employee ownership, at least in manufacturing plants, is selected, wages growth could be tied to productivity and market conditions, as the employees would be investors in their plant and own profitability. In the construction and installation elements of the projects wages growth, and hence cost could again be alleviated by offering long term full time employment at set prices. Offering a normal four weeks entitlement to paid leave, and sick leave, as well as part roster 'wash out days' in heavy weather, and the improved safety due to the removal of the mega profit motive of big business, would attract employees.

The Modular System Design of this policy would reduce costs considerably. The solar thermal generation facility and pipelines use Universal Parts, meaning a requirement for a more limited inventory of parts need to be held, and standard plans would lower production, installation and network connection costs and system downtime considerably. At least 90% of each installation would be similar, (solar thermal, hydroelectric and Hydrogen creation) meaning again that costs would be limited, and installation efficiency obtained. If more electricity, Hydrogen or water is required in a single location a new network can be easily and quickly added. Likewise if demand in an area drops, the local components could be cheaply and easily redeployed.

This policy requires a comparatively low input/raw materials cost in comparison to other energy and water generation systems – sun, seawater, and the ingredients for glass; dirt, and lime, are all cheap and readily available in Australia. There are no fuel costs- the mobile/storage fuel, LHG, is made from the sun and the sea; both free. The construction of hydroelectric dams is time consuming, but components are readily available, and it is proven cost effective. Unlike the diminishing reserves of fossil fuels, there is no reason for the plentiful ingredients required for this system to ever deplete or significantly rise in price.

With this policy there are no carbon tax implications. Energy produced by this system, either solar thermal steam, hydroelectric or Hydrogen gas fired, is carbon free, and hence obtains a tax advantage over competitive industry. The associated increased potable water supply would mean more plants, and hence greater absorption of greenhouse gasses. It would be reasonable to expect public support for making the polluters help to pay for the new, sustainable future.

Adopting this policy would provide more Australian's jobs, meaning economic growth and more taxation revenue. Non-punitive measures, such as employee share schemes or local government ownership could ensure a more equitable distribution of the wealth generated by this policy, rather than it simply staying in the hands of a few wealthy individuals who hide behind copyrights, trademarks and boys' clubs to exploit the working classes. Regional Australia would greatly benefit, there is potential for Aboriginal engagement, and the reliance of particular communities, (most often regional) on welfare could be largely eliminated.

Savings on other government (federal, state or local) programmes would largely allow for this policy to be funded from existing budgets, or recurrent expenditure. Expensive policies like Farm Support Schemes, Unemployment Benefits, Salinity management policies, W.A.'s royalty for regions scheme (implemented to buy the state National Party's support, for the supply of singing toilets), water buybacks, R & D concessions for renewable energy "research" (such as the non-taxpaying, carry forward losses Geothermal industry) would become a thing of the past. Instead government funding (on all levels) could be used to support long term viable, environmentally friendly, and sustainable policy, such as this proposal entails. In W.A. the current budget allocates $400m to a third desalination plant, and approximately $700m to Royalties for Regions per year. Using the pricing of the abandoned Cloncurry development in Queensland these funds could be used to create a system that generates more than one billion megawatt hours of electricity per year forever, for essentially a once off expenditure. (Ignoring the cheaper costs and greater efficiencies claimed by this system, and the side production of water etc.)

Many of the Australian state governments are building new, and paying large amounts for the operation of existing Desalination plants to supply sufficient potable water for their populations. These plants generally use Fossil Fuel fired power generation to create drinkable water from the oceans. (An exception is in W.A., where Czar Colin is planning on using the Mid-West renewable energy network to power one of his many energy wasteful Desalination projects). The ability to create almost free water, as a side effect of generating electricity, at many locations, and to integrate this water supply into our agricultural, domestic and industrial water supply networks enhances the attractiveness of this proposal. And reduces the overall cost of the benefits received, in terms of current government funding, as the derivative benefits outweigh the costs over time.

There is a multitude of ancillary benefits that would be derived by implementing this system, such as a cheaper and increased electricity and water supply, and irrigated agricultural supplies. Increased irrigation in Australia would result in less government handouts, more jobs, more taxes, greater agricultural output and cheaper mining and manufacturing production. Water is an essential for life, as is electricity supply for the modern generations. Both of these requirements can be met, economically and effectively, by adopting this policy, at a lower cost (both economically and environmentally) than what is currently the case.

There are many funding options available to this policy proposal, and existing commercial markets for all of the resulting commodities (i.e. electricity, Hydrogen gas [stored energy] and water). Even without government support it is likely over time that at least some of these policies would be adopted. There are existing systems all over the world that use some of these proposals, but nothing tying it together overall to create a complete system. It is difficult to quantify ecological, environmental, political and sociological costs and benefits from a proposed project. In this case however, you would assume these factors have been adequately covered, and positively addressed, by the reality of cheaper, greener electricity and fuel generation, and unlimited water supplies, from now until the end of time.

Sustainable export income for the rest of eternity would be inherently available post implementation of this system. There will always be a market for electricity, food, fuel and water, as long as human life survives on this planet. We really are the lucky country, as we can turn our sunburnt country and jewel-sea to our economic and environmental advantage. We can harvest our abundant gifts of nature; our golden soil, our sea girding, and our understanding that wealth is only achieved by sweat, and not only bounty by it, but assist other nations to the path of a bountiful and sustainable future simultaneously.

Funding Options

1. Government Ownership:
   a) Capital finance by issuing “Infrastructure Bonds” or other securities.
   b) Tied funding to the Carbon Tax/MRRT/PRRT/Royalties
   c) General Revenue
   d) Issuing convertible preference shares
2. Government Co-Ownership:

a) Different levels of government i.e. Federal, State, Local
b) Government and Private Industry
c) Government and Public
d) Government and Restricted Public- an example of this would be publicly available shares, which may only be owned by a natural person or superannuation fund that is a resident taxpayer in Australia. This would largely eliminate share speculation, and Australian profits going offshore.
e) Government and Employee (via employee share scheme)

3. Private Enterprise- a large range of incentives could be used, including tax exemptions or discounts, accelerated depreciation or subsidies to induce private investment on the required scale. Large commercial markets already exist for Renewable Electricity, Hydrogen gas and water. New irrigation projects and water in regional Australia would substantially increase many land values, as well as recreational potential of water bodies. Mining companies such as B.H.P. already spend considerable amounts of money to secure their essential water supplies for their operations.
4. Co-Government Ownership- international customer nations, and plant host nations, could be offered part ownership, with a premium for future goodwill.
5. Long Term future supply contracts with substantial upfront payments.

This list is not intended to be exclusive, but indicate just some of the options available to secure the mammoth amounts of capital required to make this transition. Different options may be used for different systems or locations, and depending on the level of co-operation between the different governments and suppliers and customers.

Conclusions

To quote Whitney Houston: “I believe that Children are the future, teach them well and let them lead the way.” Now is the time, and this is the perfect place to make the bold leap into the future of our planet, and human life upon it. Strong leadership is required immediately to lead not just Australia, but the world into a sustainable existence. The Industrial (or Pollution) Revolution, and the “Greed is Good” mentality need to end for life to continue to exist in a form bearing any resemblance to what it currently does. We need to make the change now, and teach the next generations to be much more conscious of our environment, and the symbiotic relationship we have with the planet and everything on it.

Being a leader, and taking the associated risk of failure with any change can reap significant reward, or disaster. Can you imagine a world where I.B.M. said computers? No, too risky, more money in typewriters. Henry Ford said nah, customers want the ‘hand crafted’ touch, and the peasants won’t buy ‘cause they have nowhere to drive to anyway. The Wright brothers flew, but were scared of heights and never got off the ground again? Lord John Forrest, (former Premier of W.A.) agreed C.Y. O’Connor was a nut, and water was still carted to Kalgoorlie via tanker? Time does not stand still, nor does technology, but being at the forefront of innovation ordinarily reaps the greatest reward. It is pertinent to note that not one proposal included in this policy is an invention, but only innovation. All technology is proven, and sizeable markets for all outputs already exist and are rapidly growing. There is “money” (and votes!) in these proposals.

Instead of raping Mother Earth who birthed us, and still gives us our existence, we will harness her bounty and augment her natural forces to provide for our species, and to responsibly fulfil our role as caretaker to her. We can do this beneficially and profitably, as well as sustainably, by adopting this policy. And we can start to do it now.

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