Comments on the Draft Western Australian Sustainability Strategy

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The draft Western Australian State Sustainability Strategy (2002) is an interesting document and proposes many valid and valuable points to help Western Australia move towards achieving sustainability. However I believe there are a number of shortcomings that need to be addressed. I would firstly point out that as my main area of interest is energy and GHG related, most of my comments relate to this and allied topics.

Firstly, a few general points.

- A practice is either sustainable or it is not and in the document there seems to be considerable confusion between the concept of '*sustainability*' and '*progress towards achieving sustainability*'. "Progress towards achieving sustainability" are policies, concepts, technologies, practices etc that are not sustainable but are better than existing methods and may be useful as intermediate and short-term steps towards sustainability.

  This concept was developed by Nathan Malin (now at WALGA) and myself in 2001 in a report prepared for UNEP in which we described three classes of technologies. These are '*remediation*', '*transitional*' and '*sustainable*' methods or technologies. Another way of putting this is '*cleaning*', '*cleaner*' and '*clean*' methodologies or technologies. An example of these in the energy field for example may be the use of sulphur scrubbers in a coal-fired power station as a cleaning (remediation) technology; the use of natural gas to generate electricity as a cleaner (transitional) technology; and the use of wind or solar resources to generate electricity as a clean (sustainable) technology. In the Sustainability document, many of the 'sustainable' practices put forwards are not – but rather are steps towards sustainability but which in themselves are not sustainable.

- As a follow-on from the above point, the obvious confusion in the document between the different classes of methodologies/technologies can result, and are resulting, in the 'greenwashing' or bastardisation of policies and practices which allows non-sustainable practices to be labelled as sustainable.

  This is particularly apparent in the methods of sustainability assessment such as the so-called 'spider's web' decision making diagrams which tries to take into account the so-called 'triple-bottom line' of the economic, social and environmental factors. These are being misused to the utmost to promote non-sustainable project such as the Gorgon Gas project and various Hamersley Iron projects as detailed in the Sustainability document. As mentioned above, either a project or practice is sustainable or it isn't and if a project or practice fails on the environmental and/or social side then it fails the test of sustainability, regardless of the economic benefits to the shareholders of Rio Tinto. (Is the river red because of blood or pollution?)

  The current sustainability assessment procedures being used appear to be simply modifications of Kaplan and Norton's 'Balanced Score-Card' approach. The main problem with these approaches is that a large benefit in one of the three areas can balance out significant detrimental effects on the other aspects. Furthermore, it is very easy to modify the procedure to give the desired results. For example, in the Sustainability

document, one case study mentioned is the Hamersley Iron case and their pastoral leases. It is mentioned that 30 stakeholders were interviewed and that a 'spider's web' diagram drawn up. At first the process did not give the desired result, so the process was modified and re-presented to the stakeholders and subsequently approved. The failing with this method is that all one needs to do is find the 'right' stakeholders (i.e. exclude those that do not give the desired answers) and secondly to only ask those questions that give the response desired.

This procedure was once perfectly expounded by a Zairian politician who stated that 'The only reason to undertake a study is to prove the views that one already has. If the study fails in producing the results you need, then it is even more reason to throw it in the trash.'

Similar sorts of so-called 'sustainability assessment' has also been applied to projects such as the Gorgon Gas project. *Now this fossil fuel project is quite obviously not sustainable – by the very definition of ESD a fossil fuel project cannot be sustainable!* Never the less, it has been through the so-called sustainability process and given the green light to go ahead. Does this mean that the project has now been certified as sustainable? There seems to be something of a contradiction here.

- The document is very parochial. There are numerous statements such as "In Western Australia there are globally significant experiments and demonstrations in renewable energy technologies…. The Albany wind farm…. The new wood-based 1 MW power plant at Narogin (sic)…." and "The innovations in WA…"

  Most of the things mentioned are neither globally significant nor particularly innovative. The Albany wind farm is a decade behind comparably sized wind farms in Europe. The wood-based Narrogin and other similar proposed plants, while they will most likely make a significant contribution to salinity and land degradation issues, from an energy and GHG point of view are so small that they will make virtually no difference. For example, if there were to be 10 x 5 MW plants in the South-West region, the energy generated and the GHG emissions offset would only be equivalent to a single medium-sized (and much cheaper) wind farm.

- There seems to have been little consultation with stakeholders. While submissions were asked for, I believe that this is insufficient and there needs to be a on-going dialogue with community members. For example, in section 1.1, it is stated that: "The Government will: (1.10) Work with Local Government through the State/Local Government Roundtable to..." and "1.12 Support the increased involvement of local government in planning…" In informal discussions with people involved in Local Government, several people have complained there has been virtually no contact with them from the State Government and they feel left 'out of the loop' and are wondering what is happening. I suspect that there has been a similar lack of consultation with other stakeholders.

  It is also important to bear in mind who the actual stakeholders are and from having attended various sustainability workshops, it would appear that the in all cases the most vocal views put forwards were from multi-national corporations and the extractive resources industries, rather than the citizens and public of Western Australia.

  This also carries on from the previously mentioned point about the use of sustainability (or psuedo-sustainability) assessment and the selection of 'appropriate' stakeholders to obtain the desired results.

- The document seems to be very repetitive with sections repeated several times. For example, the much of the section on Sustainable Energy (4.71 – 4.86, pp. 23 – 25) is repeated again on pp. 209 – 211. This repetition considerably lengthens the document.

There are also many specific points that need to be addressed in the document, a few of which I have detailed below.

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- *The Energy Smart Government Program, requiring energy savings of 5% to 12% 2002/3 to 2006/7.*

This is a very commendable action and one that I believe is achievable. However this can only occur with sufficient resources being provided to organisations such as SEDO and individual departments and agencies combined with a clear, concise and directed policy. The resources required include financial, personnel and perhaps most importantly, an organised and coordinated policy and support from the Government, all of which appears to be lacking.

- *Reducing vehicle use through initiatives like TravelSmart.*

As the previous point – resources are required to support this action. In addition, it would appear that many of the initiatives are either ineffectual tokenistic ones designed more for publicity, 'feel-goodness' and vote-buying than for obtaining any real result or for placating the fossil fuel industry, for example by promoting the inefficient use of greenhouse gas emitting CNG. (See the next point.)

- *Improving vehicle fuel efficiency, including converting 25% of the government fleet to LPG and demonstrating the use of gas, hydrogen and biodiesel bus demonstrations.*

It needs to be noted that the extra 'overheads' involved in using LPG as a transport fuel result in there being little, if any GHG emissions reduction occurring, as compared to petrol or diesel. In the case of CNG being used as a transport fuel, there is evidence that shows that GHG emissions are actually *higher* than for petrol or diesel. These increased GHG emissions occur as a result of the high processing overheads and fugitive losses that occur during LPG and CNG exploration, extraction and processing. In the case of CNG, the fugitive losses are of particular significance due to the high GHG warming potential of methane. In addition to the losses associated with exploration, extraction and distribution, the use of CNG as a transport fuel is also very prone to fugitive emissions during refuelling and combustion. There are also very significant overheads due to pipeline pumping losses and the medium-pressure to high-pressure compressor losses at the site of vehicle filling.

The use of hydrogen as a transport fuel also has many problems. In addition to fuel density issues, there is also the significant issue that currently hydrogen is produced from fossil fuel and thus is far from having GHG benefits. Only renewable generated hydrogen will show any GHG emission benefits. Currently it looks as though there are no plans to generate hydrogen from renewable energy, but only from fossil fuels.

It needs to be pointed out that while the use of hydrogen as a (renewable) energy carrier may have a viable future, this is solely dependent on the development of a large-scale renewable energy generating capability. Currently there seems to be no plans for this to occur in Western Australia and the policy of promoting fossil fuel hydrogen is fallacious and will only lead to increased greenhouse gas emissions. Promoting hydrogen as a transport fuel without the (renewable energy) generating capacity is a matter of putting the cart before the horse.

Care also needs to be maintained not to confuse GHG issues with 'other' air quality issues. While the use of LPG, CNG and Fischer-Tropsch diesel as transport fuels certainly leads to lower particulate, sulphur etc atmospheric emissions and hence will be beneficial to a cleaner environment, this must be balanced against increased GHG emissions when these fuels are used for transport. In practice the goals of cleaner air (as against lower greenhouse gas emissions) could be largely obtained using current transport modalities provided that vehicle emissions standards (such as Euro 4) and fuel standards (also Euro 4) were not only instigated but also rigorously applied.

It was noted in the Sustainability Case Study paper 'Gas as a Transitional Fuel – Western Australia's Natural Alternative' by Damian Combes, that there are numerous unsubstantiated and incorrect statements made regarding LPG, NG and in particular F-T diesel. For example it is claimed that "the Fischer-Tropsch process… …converts methane to diesel which is much cleaner and greenhouse friendly than normal diesel." From a LCA GHG emission point of view, F-T diesel is far worse than any other liquid fossil fuel due to the high processing overheads. For more information about this, refer to the numerous reports such as by Beer et al (http://www.dar.csiro.au/publications/Beer_2001a.pdf). It seems that the background paper has been unduly influenced by commercial concerns and this is clearly evident by the very biased looking bibliography and also in the 'Contact' list which lists the bastions of objective thinking, the Alinta Gas Business Development Coordinator and the Department of Minerals and Petroleum Resources. If I was marking this as a student paper, I would have failed it on the grounds of lack of objectivity and bias. Unfortunately, the basic principles of academic though through objectivity and questioning all seem to have been ignored and seem to have carried over into the Sustainability document.

Biodiesel also has numerous problems, but at least is a low life-cycle emitter of GHGs. In the Sustainability document, it mentions in several places (e.g. 4.44 pp.21) the "linkages between air quality issues and Greenhouse issues (potential conflicts or competing interests e.g. biodiesel). I take this to mean that the use of biodiesel may result in higher 'other' emissions such as particulates, NO_x, etc as compared to fuels such as LPG and CNG. As previously mentioned, most of these emissions can be greatly reduced if appropriate standards are introduced and maintained. In Europe, Euro 4 and 5 emissions standard vehicles are now available and when appropriate standard fuel (e.g., biodiesel made to the relevant DIN standards) are used, the emissions of particulates and most other pollutants are similar to, or even lower than emissions from vehicles operating on LPG.

It also seems to me that, at least for CNG and biodiesel, the situation is now past that of 'demonstration' projects. There are vehicles around that have done 50,000 to 100,000 km on biodiesel and probably more on CNG. There has even been at least one, and possible more, trans-Australia trips using biodiesel.

The main problem that I see with using biodiesel is that of the policy issues and in particular, Federal Government (ATO) restrictions placed on biodiesel. Currently, biodiesel is excise free if it is used pure and not mixed with other excisable fuels. However if mixed in *any* ratio with excisable fuel then the biodiesel also becomes fully excisable. Consequently, the sale of biodiesel is currently very difficult and the use of biodiesel is severely restricted on the grounds that a user must guarantee that there is no diesel in a vehicle fuel system – fuel tank, fuel lines, fuel filter etc.

This interpretation of the current taxation laws are rather amazing, in particular as the same interpretation of the relevant laws is not applied to other non-excisable fuels such as LPG, CNG and (until recently) ethanol which may be and are mixed with other fuels, either prior to sale (in

the case of ethanol) or during use in the case of bifuel vehicles running on LPG or CNG and other fuels.

Unless this interpretation of the law changes, the use of biodiesel is severely hampered.

- *Ensure the government vehicle fleet and the electric train system are greenhouse neutral by purchasing equivalent carbon credits from Western Australian carbon sequestration projects.*

This is a very commendable policy – but has anyone actually worked out how many carbon credits this will be?

The combustion of petrol produces 2.25 kg of CO_2 per litre of fuel. If the fuel consumption of a typical car is 10 litres of fuel per 100 km, this means that the car will produce about 0.225 CO_2 kg/km. If each car travels 20,000 km/year, then this is about 4500 kg of CO_2 per year per car. In Western Australia, there are approximately 1,237,100 cars and light vehicles (Australian Bureau of Statistics, Motor Vehicle Census, Australia - 9309.0). Collectively, this equates to about 5.6 MT CO_2 per year. In addition to this are the emissions from an additional 65,000 other vehicles (trucks, buses etc). This 'back of the envelope' calculations compares well with the last published WA Greenhouse Gas Inventory (1995). In that document, it gives a total figure from domestic civil transport of 7.188 MT of which 3.359 Mt was from petrol-powered passenger cars. Allowing for the increased number of cars and including other light vehicles (4-wheel drives, vans etc) then the 5.6 MT CO_2 per year figure is reasonable.

The State Sustainability Strategy proposes that the government vehicle fleet and the electric train system be greenhouse neutral via Western Australian carbon sequestration projects. While it does not explicitly state what form this sequestration will take, it appears that it will most likely be in the form of tree plantations.

The calculation of the amount of carbon sequested in tree plantations is rather complex and depends on many factors. These factors includes the rate of growth and harvesting, the half life decay rate of leaf litter, forest residue, stumps and roots etc. While these can be estimated with reasonable certainty - unknowns such as the eventual use of the timber products can be more difficult or even impossible to determine.

Shea et al in their paper entitled "The Potential for tree crops and vegetation rehabilitation to sequester carbon in Western Australia" (1998) give the total carbon sequested in a hectare of high yielding Maritime Pine (*Pinus pinaster*) over 30 years at 103 tonnes per hectare. The value for Bluegum (*Eucalyptus globulus*) given is 75 T/ha after 30 years and for oil mallee, 31 T/ha. However it must be remembered that in the case of bluegum, most of the forest products will be chipped for paper and have a very short life before the carbon is returned to the atmosphere as CO_2. For oil mallee, the return is even faster as the biomass would be harvested every 2 – 3 years and processed as fuel and activated carbon and would return to the air as CO_2 very quickly. Thus the actual sequestration rates would be less than stated.

However assuming that high yield species such as Maritime Pine are used, that losses through decay is minimal, that the timber products are long lived and the average carbon sequested is actually 103 T/ha over a 30 years period or 3.43 T/ha/y, then we can calculate the amount of land needed to sequester the emissions from Western Australia's car fleet.

As 3.43 tonnes of carbon is equivalent to 12.57 tonnes of CO_2, then to sequester the CO_2 emissions from one car would require approximately 0.35 hectares of Maritime Pine to be

planted per year, or 0.5 ha/y for bluegum or 1.2 ha/y for oil mallee. It needs to be realises that this would need to be planted each year for each vehicle for the vehicle life.

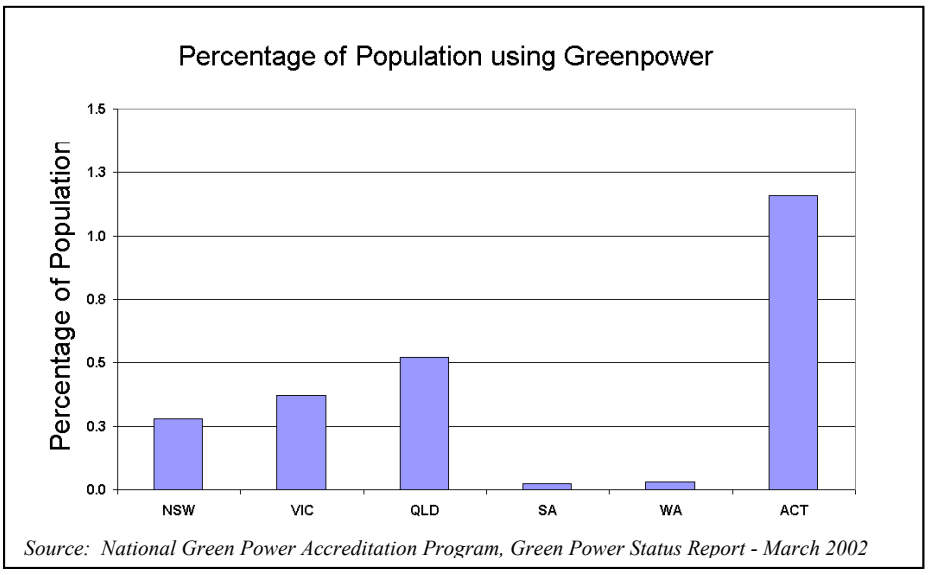
In order to sequester WA's fleet of small vehicles and assuming that losses through bushfire, decay etc are minimised, then about 460,000 hectares per year of Maritime Pine or 650,000 ha/y of bluegum or 1,500,000 ha/y of oil mallee would have to be planted. The total area used for wheat in WA covers about 4,200,000 ha – equivalent to a square area approximately 205 x 205 km - so *the use of oil mallee to sequester WA's car fleet would result in an area equivalent to WA's wheat crop being planted every 3 years*. I'm not sure of the number of State Government vehicles, but I seem to recall reading a figure somewhere that stated that about 10% of vehicles in WA were State-owned. If this is the case, then ***to sequester these State-owned cars would require about 150,000 hectares per year and every year of oil mallee***. In addition to this would be that required by the electric rail system, which I have not yet calculated.

It should be pointed out that this has only been a very rough 'ball-park' calculation and a more in-depth study may need to be done to verify these results. It may prove that the sequestration of carbon using tree crops is actually more viable than these preliminary results would indicate. But then it may show that it is worse.

- *Purchase green power with the aim of 10% in the next financial year, 20% by 2005, 30% by 2010 and 50% by 2020.*

Once again, I think that this is a commendable step to take, although there are problems with green power tariffs. For example, it has been argued by some that the green power premium tariff is inequitable as green power customers pay more that others yet receive no actual benefit in doing so.

Rather, all users of electricity, on any tariff, benefit equally. It is a case of the non-polluter pays, rather than the polluter pays principle. In some places such as in various states in Germany, this fact is recognised and so there is a general tariff increase which is dependent on the quantity and production cost of green electricity fed into the grid. This cost increase has been found to be about 1% (i.e., equivalent to a tariff increase from 13.89 to 14.00 c/kWh) and is sufficient to fund renewable energy projects such as the 100,000 Roofs project and large-scale wind farms through incentive-based rates.



Source: National Green Power Accreditation Program, Green Power Status Report - March 2002

In most States of Australia, the uptake of greenpower is of the order of 0.3 – 0.5%. However in Western Australia the level is an order of magnitude lower at 0.03%.

To the end of the second quarter of 2002, the amount of green power sold by Western Power amounted to 1,473 MWh[1]. At the premium price of 3

[1] National Green Power Accreditation Program, Quarterly Status Report September 2001

c/kWh, this amounts to an extra $44,190 - an amount that probably did not even cover the administrative costs of the program, let alone allowing the use of these funds for the development of new projects.

By the Government stipulating that departments and agencies need to obtain a proportion of their electricity needs from greenpower programs, not only will a strong signal will be sent to the public, but funds may be released to set up new renewable energy systems around the State.

One of the main problems however is that many departments and agencies are effectively tied in to black electricity supply contracts by lessors etc. There are a number of ways around this – by stipulating to the lessor that they must procure minimum amounts of greenpower for the lessee, or by purchasing equivalent numbers or equivalent greenpower cost premiums of RECs.

One query that has been expressed about green power is the scenario in which there is a new and large demand for green power but for which the electricity has insufficient capacity to supply. This is covered under section 3.2.3 of the National Green Power Accreditation Program, Accreditation Document, Version 2 November 2001, which states that "*In states where retailers are in a monopoly position and are not competing with other retailers at the domestic or business levels, these retailers will be allowed an initial lead-time of two years from the date of accreditation prior to a minimum level of 60% coming into effect. This target would then increase to 70% in the next financial year and 80% thereafter*."

Section 3.2.5 of the document makes the provision that "*A Renewable Energy Certificate is surrendered for each MWh of new generation sold through the Product*." This means that the generation source can be sited elsewhere, i.e., not connected to the SWIS and/or the generation plant can be owned and operated by a third party. The green power retailer can purchase Renewable Energy Certificates (RECs) from a third party generator and submit them as proof of green power supply. The problem with this, from a State point of view, is that if the retailer cannot source RECs from within Western Australia, then they will be forced to 'import' RECs from other states. Conversely, this could also be seen as a potential 'export' industry for Western Australia whereby local RECs could be sold to retailers in other states, thus bringing revenue into the State. This may be a particularly attractive option as a large proportion of Australian wind resources are located within Western Australia. It is know that a number of Eastern States utilities are currently investigating the development of wind farms within Western Australia. If east-coast owned wind farms were to be developed in the west, Western Australia would not receive the REC benefits. To maximize the potential benefits from projects such as wind farms within Western Australia, it is important that the RECs be generated and 'owned' by Western Australian businesses.

In the medium and long term, the Government could investigate the replacement of the 'non-polluter pays' inequitable green power tariff with a modification to the existing tariff to reflect the real electricity distribution situation. The extra funds obtained could then be used to develop renewable energy resources. A modified tariff which accounts for the actual flow of green power would only need to increase the cost of the existing tariff by about 0.01%. However a general tariff increase of 0.1% to 1% would raise allow Western Australia to raise sufficient capital to fund many renewable and energy efficiency projects.

One of the other fundamental problems with greenpower in WA is the Western Power monopoly situation that has severely hampered the installation of privately operated renewable energy plants within the State. The Electricity Reform Task Force needs to take this into account in order to allow the development of renewable energy plant within the State. It has been pointed out that if and when the market is freed up, it will be very difficult for locally based companies

to develop renewable energy projects as compared to companies and utilities in the Eastern States who have already been able to develop and refine their procedures for renewable energy projects in their home territory. As they have already gained the experience and resources necessary for project development, they are now able to quickly and effectively respond to new markets. In contrast, local companies have been unable to develop experience and a strong resource base. If the local market is freed up, it is likely that it will be Eastern States and foreign companies that obtain the lion's share of the greenpower market which will result in locally generated capital flows (through RECs and profits) flowing out of the State rather than staying here or being imported.

Moving on to a few other points – and there are many I would like to comment on, but I had better limit myself to no more than a few dozen pages (only joking….).

On page 26, S4.95, pp. 217, S4.95 and elsewhere, it is stated that "The Government will: (4.95) Promote a voluntary 4 star energy rating on all new homes and begin developing a more…." Voluntary standards just do not work. It either needs to be mandatory or else just don't bother. If voluntary standards are desired, then why not just introduce voluntary road speed limits? I'm sure everyone will obey voluntary and non-mandatory 50 km/hr speed limits. (Hey, gotta go. I'm off to test drive a turbo-V8 Brock Commodore…)

On page 227, it is stated that there has been '…innovative land banking approaches that..." and other reasons that have resulted in "why Perth first home buyers are able to purchase homes at a lower price than anywhere else in Australia." I disagree with this – the main reasons why housing in cheaper in WA has got more to do with the fact that one single company almost totally controls the new housing market. As well as owning, having controlling, or at least significant, interests in the building suppliers and contactors– the brickworks, timber, plumbers, electricians etc, they also have adapted the mass production process to the construction industry and thus are able to build very cheap houses - houses that would be illegal to build in many other parts of Australia. This has certainly contributed to Western Australians having the largest ecological footprint and the highest per capita levels of GHG emissions of not only of any state in Australia, but in the World.

Case Studies and Background Papers

The various background papers form an important part of the whole strategy and I am very surprised by the inaccuracies, bias and general low standard of them. It appears that many of these background papers were written by university students and if I was a university tutor or lecturer and a student handed one of such a low quality into me for marking, I would have failed many of them on the grammar alone, not to mention the lack of academic rigour.

As time did not permit it, I have only commented on a few of the papers.

Wind Energy in Western Australia
Author: Jade Carlton

This paper reads like an advertisement for the Western Power Corporation – although if it had been written by someone from Western Power, I'm sure the grammar and syntax would have been substantially better.

The paper has numerous sentences that are unclear, badly structured, ambiguous and in places incorrect from a technical point of view. While my English is far from perfect, I would have expected the Case Studies to have at least been proof-read prior to their publication.

The following is a brief list of comments on the paper.

"Since the first European settlers, wind energy has been utilised by people living in rural areas. ...."
The first European settlers? Settling where? America? Iceland? Sydney? From the very start this paper is unclear.

"According to Fleay, oil production will peak somewhere between the years 2000 and 2010, after which it will decline."
This sentence has two faults – firstly it does not state where production will peak – in Western Australia, Australia, the World? In some places such as continental USA it has already peaked. The second fault is that it is tautological – by definition if production has peaked then it must thereafter decline.

"...if we intend to keep using electricity as much as we do..."
As with many other of the Case Studies, this paper ignores the possibilities of energy efficiency measures in reducing emissions and assisting in achieving sustainability for Western Australia.

"Wind energy is inexhaustible and free, making it economically attractive as a replacement for diesel."
Once again a sentence with several problems. Firstly, while wind energy may be free, there are considerable costs involved in actually using it. It could also be claimed the same for petroleum resources – they too are free, although there are considerable costs involved in extracting and processing them. Likewise, there are high capital costs involved in the utilisation of wind energy resources. The other problem with this sentence is that wind energy is not a replacement for diesel! My car runs on diesel (or rather, it runs on biodiesel). Can I run my car (directly) on wind energy? Of course not. Likewise, the use of wind energy could only replace a small proportion of diesel – that used for electricity generation and perhaps some water pumping and similar uses.

"In recent years, it has been recognized that atmospheric greenhouse gas levels are much higher than they should be and these increasing levels could cause climate change due to global warming."
This sentence, and indeed the whole paragraph to which it belongs, is almost meaningless due to poor syntax and grammar and tautology. For example, the phrase: "*...increasing levels could cause climate change due to global warming*" is incorrect in that climate change in the form of global warming is the result of anthropogenic greenhouse emissions.

"This research led to the first wind farm in Australia in Australia being built at Salmon beach in Esperance in 1987, comprising six 60 watt (kW) Australian made Westwind turbines."
Sixty watt wind turbines? I thought they were larger than that. Also the turbines are Bergey (an American company) turbines which were made in Australia under licence by Westwind.

"Wind turbines can be a visual problem, but can also be designed as an integrated feature of the landscape."
What does this mean? Isn't everything on land part of the "integrated feature of the landscape" – otherwise it is a part of the sea/sky/space/mindscape.

"The rehabilitation involved seed collection when the land was cleared for the turbine sites and access tracks, which have then been sowed so that the original plants regenerate."
A rather clumsy sentence as well as being incorrect, as the only way that the 'original plants' could 'regenerate' would be to temporarily transplant them and then replant them in disturbed areas. It also fails to make sense when one considers that several hectares – the areas immediately around the wind turbine sites as well as the access roads are still denuded of vegetation and will remain that way while the site is being used for the wind turbines.

"Being one of the world leaders in wind power generation is an economic opportunity within the world market."
This sentence is certainly correct – but to what region, location or country is it referring to? Germany or perhaps the USA? Certainly not Australia which ranks 23rd (http://www.wpm.co.nz/) in the world in wind energy generating capacity and probably even lower in manufacturing capability.

"The innovative base that is already part of WA in wind power can become an important part of the WA economy."
Innovation? In Western Australia? The Western Australian electricity industry – in other words the monopoly of Western Power – is considered by many to be perhaps the most conservative and retrogressive of any similar industry sector in the OECD countries. This is why Western Australia lags behind the rest of Australia, which itself lags behind most other OECD countries in the uptake of renewable energy systems.

"There is therefore a health benefit from this technology (i.e. wind) compared to other more traditional forms of power generation."
At best, one could state that the use of wind energy has no negative effects as compared to the more traditional forms of *energy* generation. However I believe it would be difficult to justify that there are health benefits – in other words, positive health attributes – to the use of wind energy.

"...as Western Australia emerges to become a national, as well as a global, leader in this form of renewable energy. In developing our wind energy industry as effectively as we have, Western Australia has become an example for others to follow in sustainable power generation."
What a load of parochial crap! This is an outright lie! Western Australia has become renown for its antagonism towards renewable energy, it's inability to provide resources, support, both political, financial and social, for the development of projects that are sustainable and don't provide an immediate quick buck. Many companies, including Woodside Energy, Stanwell and others, as well as private individuals, have tried to develop renewable energy systems in Western Australia only be to thwarted at every turn by an closed electricity network system and an ineffectual and incompetent political arena which is unwilling to challenge the prevailing energy paradigm.

"Western Australian wind power stations are using state of the art technology and providing world leading integration into the power systems of country towns. This provides an example for the world to follow."
Two words which sum up the above sentence and this paper - parochial wank.

Hydrogen Fuel Cell Buses: The Future for Sustainable Transportation in Western Australia and Around the World
Author: Lisa Garrity

While this case study also has many faults, at least the author has a reasonable grasp of the English language.

The document starts off with "The hydrogen fuel cell vehicle is classified as zero-emission." Are they really zero-emission vehicles on a life-cycle analysis? If they are really ZEVs, then please let me know the reference for who has done the tests and published the result!

Once again, this case study reads rather like an advertisement for the gullible fool. "*Hydrogen is the most abundant element in the universe and can be produced locally through renewable means, thus helping to provide energy security in most regions of the world*."

Well, hydrogen may be the most abundant element in the Universe – but this is entirely irrelevant at the surface of a planet where it ranks only 10th (in a combined stated with other compounds that preludes it use as a fuel) and it amounts to only 1.4% of the total. (Handbook of Chemistry and Physics, CRC Press, 64th Ed.) But I digress with this red herring.

The real issue here is the misrepresentation that "*Hydrogen... ...can be produced locally through renewable means, thus helping to provide energy security in most regions of the world*."

Firstly, through-out this paper there seems to be a consistent misunderstanding that hydrogen is not an energy source, rather it is an energy carrier or a means of storing energy[2]. As such, it cannot "provide energy security", no more than can batteries, compressed air storage or pumped hydro storage. And as a medium of energy storage there are considerable inefficiencies that result in a net increased energy demand.

However it is true to say that hydrogen can be produced locally through renewable energy – if a suitable renewable energy resource exists. But in most cases there are no suitable renewable resources and hydrogen is produced as a by-product of petroleum refining or by the electrolysis of water using coal or nuclear power. At the present time, hydrogen is only produced using renewable energy if there is an excess capacity of hydroelectric generation.

As previously mentioned, the use of hydrogen as a (renewable) energy carrier may have a viable future, this is solely dependent on the development of a large-scale renewable energy generating capability. Currently there seems to be no plans for this to occur in Western Australia and the policy of promoting fossil fuel hydrogen is fallacious and will only lead to increased greenhouse gas emissions. Promoting hydrogen as a transport fuel without the (renewable energy) generating capacity is a matter of putting the cart before the horse.

Over the page the case study states that "*A global consensus is emerging that hydrogen fuel cell technology will replace the internal combustion engine and fossil fuels in the near to mid-term future*." Hey, time for a reality check!! While I agree that the fuel cell powered vehicle may one day – in the long term – and I mean looonnnnggggg term – replace the IC engine, I would suggest that the IC powered car will still dominate the transport landscape in 20, if not 50 years. Certainly, they may not be running on petroleum – perhaps on ethanol, biodiesel, synthetic LPG, diesel or petrol etc made from biomass or renewable produced hydrogen, but there are significant problems facing the fuel-cell that will not be solved within several decades – or perhaps at all.

[2] The only exception to this is the possibility of energy generation through hydrogen fusion – but as yet even with billions of dollars spent, this is still a long way from reality.

Of paramount importance is that of the platinum catalyst required for the operation of the fuel-cell. There is simply not enough platinum available to build hundreds of millions of fuel-cells. There may be enough for a few million buses and trucks and perhaps some left over for home CHP fuel-cells, but that's about it.

"*Hydrogen fuel cells are also being introduced around the world in stationary applications as power sources for buildings and industry; there is a fuel cell operating at Technology Park in Sydney*." Actually, there is a 1.5 kW phosphoric acid fuel-cell at Murdoch University. It was used in the early 1990's as a part of a research project. At the moment it's sitting in disused shed with lots of spiders.

The paper goes on to mention "*various consortium members... members include energy suppliers...*" such as "*B.P. (who) will provide a purified form of hydrogen produced at their Kwinana refinery*" made no doubt, as a waste product from their petrol refining process and producing vast quantities of greenhouse gas emissions. How? Quite simply the hydrogen is produced by stripping the carbon out of hydrocarbons. The carbon of course is released into the atmosphere.

In light of this, I fail to understand how, on a life-cycle basis and even taking into account the increase efficiency of series-hybrid fuel-cell electric vehicles, it can be claimed that "hydrogen fuel cell vehicles will reduce... current levels of greenhouse gas emissions."

Basically, this is nothing more than a case of BP being the Quiet Deceiver and attempting to 'greenwash' their dirty petroleum.

Perhaps the essence of this paper is summed up in the sentence: "*Western Australia is perfectly poised to take advantage of the emerging hydrogen economy considering the ability to produce hydrogen using abundant renewable energy resources in various regions of the state and the significant resources of natural gas in the northwest*." Yes – the use of dirty fossil fuels to generate a false sense of sustainability to a gullible public. But what about the abundant renewable energy resources? If they are so abundant and financially competitive, then why aren't we using renewable energy now in Western Australia? I think the answer to this, while somewhat complex, could be put quite succinctly and would relate somewhat to the vested interests of the fossil fuel industry and the current fossil-fuel based electricity monopoly in Western Australia.

Under the "Sustainability Characteristics" heading, I was even more surprised to see unjustifiable claims such as:

- *Hydrogen is the most abundant element in the universe, capable of providing a virtually unlimited source of power supply.*

The first part of this point is irrelevant, the second part is incorrect on the grounds that, while hydrogen is relatively abundant at the Earth's surface, more energy is required to process it into a form that is usable as an 'energy source' than is available from it – hence the use of hydrogen leads to a net energy loss, not gain.

- *The production of hydrogen by electrolysis using renewable energies will emit no greenhouse gases.*

This is only approximately true as there will always be some embodied energy emissions from production using even renewable energy – methane emissions from hydroelectric plants, CO_2 emission from silicon smelters etc. However I'm willing to pass on this one – although in the

foreseeable future, all hydrogen will be produced using fossil fuels as the primary input and thus will be far from emission free.

- *The use of fossil fuels in the production of hydrogen to power fuel cell vehicles will produce a net lifecycle reduction in greenhouse gas emissions when compared to existing vehicle and fuel technology.*

Has a LCA been done on this? Can I see the results? My calculations show that fossil fuel sourced hydrogen will lead to only marginal, if any reductions. The reason for this is the high 'overheads' involved in converting fossil fuels to hydrogen. These processing overheads absorb any gain from higher vehicle efficiency. In the meantime, the real and existing low emission vehicle technologies are slowly dying due to mega-hype about hydrogen and other unrealistic solutions.

- *Hydrogen fuel cell vehicles produce no smog.*

Maybe not tail-pipe emissions, but certainly there will be smog forming over Kwinana. Or don't the lower socio-economic suburbs count?

- *The introduction of Hydrogen fuel cell vehicles will help countries to reach greenhouse gas reduction targets set out in the Kyoto protocol.*

As per two points above, fuel cell vehicles will lead to virtually no GHG emissions reductions – at least in Western Australia where the hydrogen will be fossil fuelled sourced.

- *Hydrogen may be produced locally based on the resources available in a specific region.*

The available resources in WA? Coal and natural gas. Of course there is plenty of wind and sunshine and tides but as there is not infrastructure or plans to use these, then these can safely be discounted.

- *The trial will help to promote the use of alternative fuels amongst the community.*

Perhaps just like Western Power's advertising that now has a large proportion of people believing that a large proportion of electricity in Western Australia is generated using renewable energy?

- *The project demonstrates an ideal partnership between government, industry, academic, and environmental organizations around the world in the quest to find a clean and efficient energy source for transportation.*

An ideal partnership in which the government, industry, academic, and pseudo-environmental organizations maintain the status quo over a gullible and ill-informed public.

Gas as a Transitional Fuel: Western Australian's Natural Alternative
Author: Damian Combes

I have already mentioned this paper in the main part of my comments above. To briefly restate my comments, this paper is excessively biased and shows an almost unbelievable level of gullibility and lack of critical thinking. It has clearly been unduly influenced by both business concerns (e.g. the US-owned Alinta Gas company, by Wesfarmers and by the Australian Natural Gas Industry Association) and by conservative government agencies (e.g., Department of Minerals and Petroleum Resources).

The Heart of Sustainability
Author: Alix Rhodes

I have just finished reading "The Heart of Sustainability: An encore for the arts and culture" and I must say that I found it an interesting and diverse document. However I have a few comments to make.

The reason that I am commenting on this paper in particular is that I am a Fine Arts student. After having studied for a Postgraduate Diploma in Science (renewable energy) and for a Masters Degree in Ecological Sustainable Development and finding that unless you are willing to forgo any sort of creative thinking and suck up to one's political or financial masters, then employment in these areas is all but impossible in Western Australia. So as a result I have enrolled in Fine Arts where, despite the great deal of wanking, self-gratification and self-promotion that exists in the WA arts scene, at least creative thought (provided you are trendy enough) is looked upon with some sort of positive attitude. Thus as an arts student, I feel that I am at least somewhat qualified to comment on this paper.

The first thing however is that that, like many people, the author of *The Heart Of Sustainability* has fallen into the trap of referring in many places to the state of Western Australia as 'West Australia', which is in fact a newspaper, and not a very good one at that.

However apart from this somewhat pedantic comment, my main comment that I would like to make is that in this paper there seems to have been a total lack of consideration given to the role that the arts education sector (and in particular the tertiary sector) has to play in the progress towards sustainability via the arts and culture.

On the first page it acknowledged the role that a variety of organisations ranging from businesses, art groups and the Government, have in promoting sustainability through the arts but nowhere does it mention the Fine Arts departments at Curtin University, Edith Cowan University, the Western Australian School of Art and Design (WASAD) which is a part of Central TAFE, the Performing Arts Department at Edith Cowan University and other similar institutions. Surely, as the core of the professional arts education scene in Western Australia, these institutions need to be also included in the concept of 'arts for sustainability'?

I believe that this sector of the arts scene – and I purposely use this term in preference to the term 'arts industry' – is a particularly important one as I believe that it is at these places are where a large proportion of Western Australian professional, as well as amateur and community artists learn, experiment and innovate, and thus need to be included in any arts-based State sustainability strategy.

Neither is there any mention made about primary or secondary education and it is here where many members of our society gain their initial exposure to art and cultural interchange.

But then perhaps this is not particularly surprising. Support for the tertiary arts sector has been in decline for some time now. An example includes the closure last year of studies in studio ceramics at both Curtin University and Edith Cowan University and glass work at Curtin University. Now the only place in Western Australia that teaches studio ceramics is WASAD and the last few years has seen the teachers' and the technician's hours reduced, the space available reduced and general support withdrawn. In the past, final year students had their own studio space in which to conduct their research and develop their ideas but now even this has been taken away.

With such a reduction in the resources available it has become difficult for courses such as these to attract enough students to remain viable and to provide them with the necessary facilities to address social issues such as sustainability, let alone address the traditional core areas of art and design.

Recently I was attending a lecture at WASAD about 16th Century ceramics from Iznik (now in north-west Turkey), which were at their pre-eminence during the reign of Süleyman the Magnificent. The lecturer said that 'Whenever there is a stable political system and economic prosperity, then the arts flourish and receive a great deal of support resulting in innovation and the development of new ideas.' To this I asked "So what does that imply about our political system?" There was some laughter about this and the lecturer continued on.

My other main concern about this background paper is the author's support for the involvement of business or 'sustainable partnerships' as the author of the paper calls it.

In the paper, the author gives the example of Wesfarmers' involvement with Craftwest in their support of fine woodcraft and furniture making. As previously mentioned, Wesfarmers and its subsidiaries such as Bunnings and CSBP, is perhaps not the most environmentally benign businesses in Western Australia, despite their claims otherwise. One only need look through the environmental records and at the fines that have been handed out by the WA EPA to realise this. It would thus appear that as well as trying to greenwash through frequent and often strategically timed 'gifts' and donations to so-called 'green' research institutes, community groups and now – by the looks – to art organisations.

Both science and art are about innovation and need support from not only the community and government, but also from business. But there is a difference between *support* and *interference* and what we have generally seen from business is interference for the purpose of self-interest and not community interest. In both the science and arts, this leads to, if not 'politically correct' science and art, then certainly 'business-friendly' and un-innovative and in the long-term, unsustainable and second-rate 'innovations'.

Conclusion

The WA State Sustainability Strategy is at least a start. Unfortunately it has used background work that is riddled with technical errors and in which many show lack of objectivity, understanding and vision.

The document and the background work is frequently parochial, lacks conciseness and offers few, if any real objectives or timelines. Without concrete and achievable objectives and timelines, it has little usefulness. Perhaps even worse, the document offers no long-term and visionary and democratic objectives and potential solution. While perhaps these are may appear unrealistic in the short to medium term, they would at least delineate the ultimate goals of where we, the people of Western Australia – and not the multinational corporation – want to be.