PARLIAMENT OF AUSTRALIA
HOUSE OF REPRESENTATIVES

HON WILSON TUCKEY MP
MEMBER FOR O'CONNOR

- 3 DEC 2008

1 December 2008

Naomi Bleeser
Secretary
Senate Select Committee on Fuel & Energy
Parliament House
Canberra ACT 2600

Please find enclosed graphics of my power point presentation on the production and transmission of tidal electrical energy from the Western Australian Kimberleys to the Australian network which I submit as a formal submission and for which I am prepared to make verbal comment if the committee desires.

As is recorded both the technical, environmental and costing aspects are all sourced from reliable agencies.

Yours sincerely

Wilson Tuckey.

Hon Wilson Tuckey MP

Can: JG

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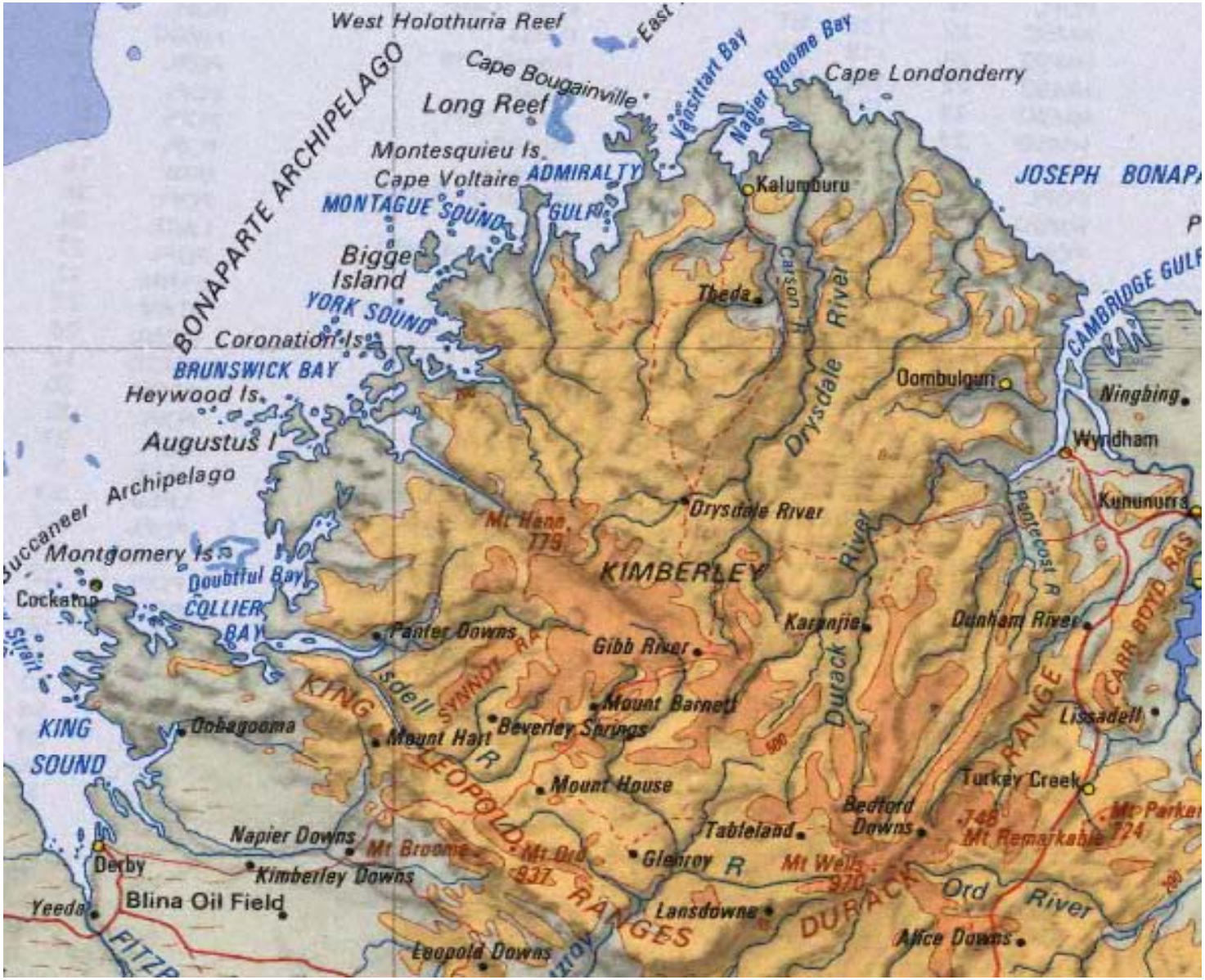
Securing Australia's Energy & Environmental Future

Hon Wilson Tuckey

- There is no unilateral action that Australia can take to protect our continent from the threats of GLOBAL warming.

- We must therefore look to a response that will deliver benefits such as long term, environmentally friendly energy security whatever the international response.

- To respond to these problems the Government should take an up front role investing in and developing Australia's only significant and predictable renewable energy resource which is to be found in the tides of the Kimberley.


West Holothuria Reef
Cape Bougainville
Long Reef
Montesquieu Is.
Cape Voltaire
BONAPARTE ARCHIPELAGO
ADMIRALTY GULF
MONTAGUE SOUND
Bigge Island
YORK SOUND
Coronation Is.
BRUNSWICK BAY
Heywood Is.
Augustus I
Archipelago
Buccaneer
Montgomery Is.
Doubtful Bay
COLLIER BAY
Cockatoo
KING SOUND
Derby
Yeeda
Blina Oil Field
Napier Broome Bay
Cape Londonderry
Kalumburu
JOSEPH BONAPARTE
Theda
Carson R.
Drysdale River
CAMBRIDGE GULF
Ningbing
Oombulgurri
Wyndham
Kununurra
Pentecost R.
Ord River
Mt Hann 779
KIMBERLEY
Drysdale River
Durack River
Karanjie
Dunham River
CARR BOYD RAS
Panter Downs
Gibb River
Isdell R.
KING LEOPOLD RANGES
Mount Barnett
Beverley Springs
Mount Hart
Oobagooma
Mount House
Lissadell
Turkey Creek
Bedford Downs
Tableland
Napier Downs
Mt Broome
Mt Ord 937
Glenroy
Kimberley Downs
Mt Wells 970
Mt Remarkable 724
Lansdowne
DURACK RANGES
Alice Downs
Leopold Downs

Climate expert urges Britain to go tidal

(27 February 2007)

- One of Britain's leading climate experts, Sir John Houghton, has said that Britain can potentially source a fifth of its electricity from (tidal) power.

- Sir John, who is Co-Chair of the Intergovernmental Panel on Climate Change, told the Western Mail that Wales could play a major part with barrages in the Severn Estuary, and by backing proposals for tidal power in Swansea Bay and off the north Wales coast at Rhyl.

- He said: "We should get on with it because we could get 20 per cent of our electricity from tidal energy."

- Complaining that the government "has not seemed very interested in tidal for reasons that I don't understand," Sir John argues that: "Tidal power is an obvious resources and the Assembly should be putting their back into it now."

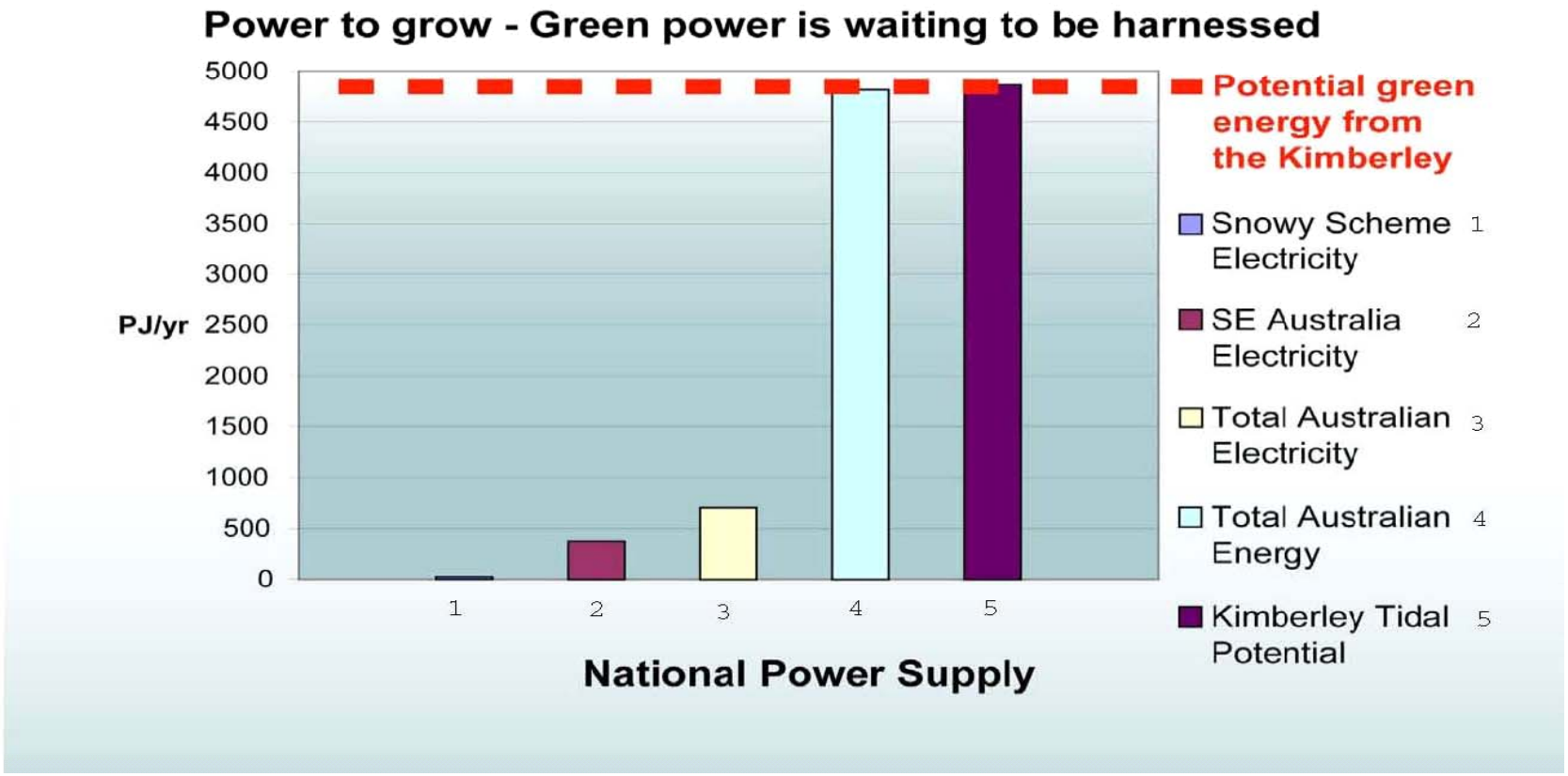
- The call for Wales to do more on wave power comes in a week when the Scottish executive has awarded £13 million in grants for wave power projects, with the largest project being the Orkney collaboration between Scottish Power and wave energy experts Ocean Power Delivery.

Source (1) : http://www.financenewsonline.co.uk/articles/Climate-expert-urges-Britain-to-go-tidal-18072714.htm

Kimberley Map

Estimates of the Kimberley energy resource are best identified by this

bar graph prepared by CSIRO



The harvesting of tidal power has been practiced in France at La Rance at a magnitude of 240mw for over 40 years.

Source (2): La Rance Tidal Power Station during and after construction (Image courtesy of Popular Mechanics).

Further advances in this technology now provide a range of options.
The proposal of Canada's Blue Energy Group to construct a 2.2gw tidal generation facility at the San Bernardino Straits Philippines at an estimated cost of US$2.8b was based upon their Tidal Fence technology (fig 5). This has been delayed only on account of regional instability.

Figure 6 The Philippine Dalupiri 2.2 GW Blue Energy Project Copyright ©1997-2004 Blue Energy Canada Inc.)

Source :

Murdoch University

rise
Research Institute for Sustainable Energy

assisting the development of the Australian sustainable energy industry

Source (3): http://www.rise.org.au/info/Tech/tidal/index.html

The Tidal Fence Concept

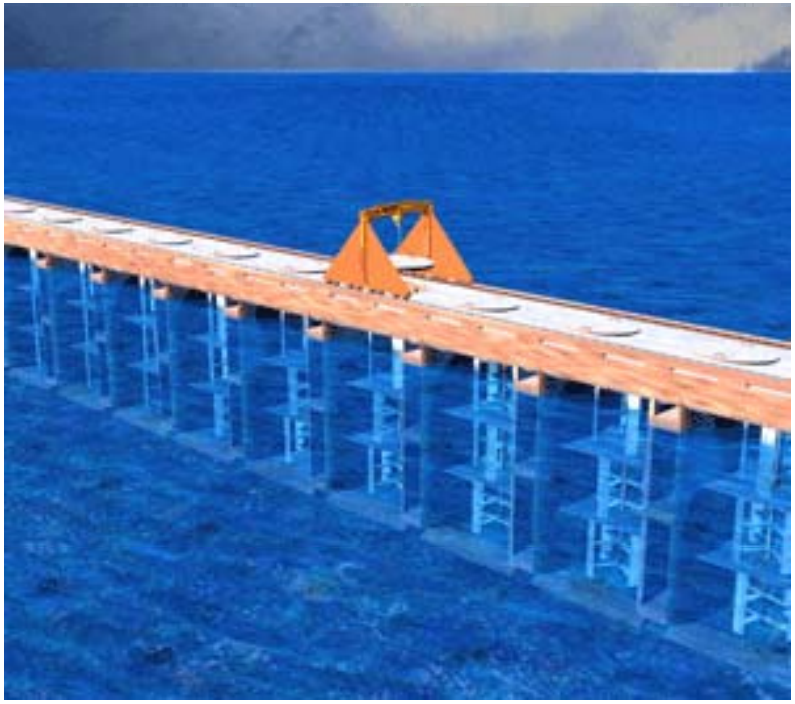


Figure 5 Artists impression of a tidal fence in operation Courtesy of Blue Energy Canada

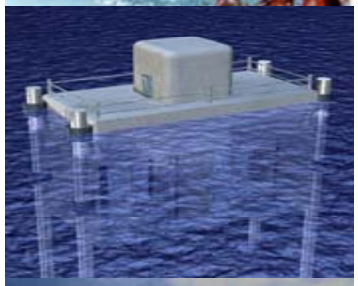
- As is obvious this form of generation can be introduced incrementally and can allow for shipping channels, marine species entrance and egress.
- By maintaining the free tidal flow as compared to the use of barrage walls, the problems of siltation and interference with marine animal breeding and feeding programmes and even access for vessels is significantly eliminated.

Source (4): http://www.rise.org.au/info/Tech/tidal/index.html

The technical aspects of this technology includes a range of generating capacities

available from 5kw through to major projects

Micro Power System - This is a 5 to 25kW assembly to service the remote domestic consumer.



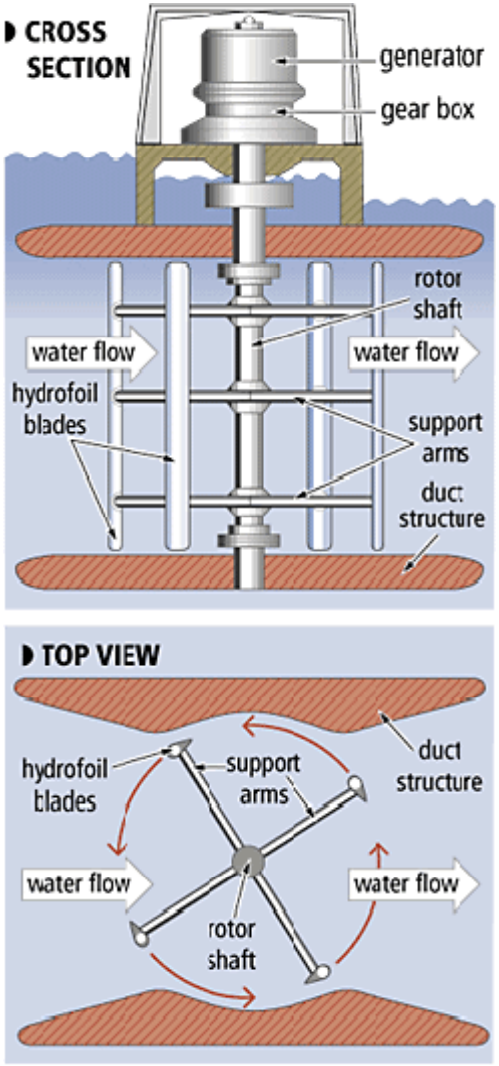
Midrange Power System - Using two 250kW Blue Energy ocean turbines, this unit will be off-grid competitive initially, and grid competitive within three to four years time. Suitable for use in remote communities, industrial sites, and resorts in regions with net metering policies or dependence on costly and polluting diesel generation.

Blue Energy Power System - For large scale power production, multiple turbines are linked in series to create a tidal fence across an ocean passage or inlet. These are large scale, site specific, custom engineered energy installations which will vary in size and output by location. These structures have the added benefit as a **transportation** solution.

Mega Power System - A scaled-up version of the Blue Energy Power System, the mega class is a tidal fence capable of producing thousands of megawatts of power. These tidal fences can be many kilometres long and can operate in depths of up to 70 metres.

Source (5) :Renewable Energy and Ethical Investment.

Tidal Turbines



- The mechanical construction of the actual generators is as shown.
- The concept of a vertical turbine allows for the generator to be located well above high water levels thus simplifying servicing.
- The hydrofoil blades allow for fish etc to pass – much like a revolving door.
- Australia could become a world leader in manufacturing this technology as compared to competing in the overcrowded market of wind power technology.
- Australia has all the raw materials required.

Source (6) : Renewable Energy and Ethical Investment.

Third-Party technological evaluations of the Davis Hydro Turbine being commercialized by Blue Energy Canada

Harold Halvorson Halvorson Engineers, Victoria B.C.

- "The technology appears to be best suited for tidal applications. Many sites in B.C. and worldwide have the required conditions, deep, fast currents, to utilize the Davis turbine to produced commercial quantities of electricity." "In suitable sites, and many seem to exist, significant quantities of electricity might be generated on scales comparable to conventional power plants (hydro, thermal, and nuclear)." "The technology is also suited to power generation in free running rivers."
- "The tidal application appears to have sufficient potential both in terms of power generation and turbine manufacturing to justify further study by project investors."

- from "Evaluation of Nova Energy Ltd.'s Hydro Turbine*,
by Harold Halvorson (Halvorson Marine Engineers [Victoria]);
62-page report completed for BC Ministry of Employment and Investment, 1994

Gouri Bhuyan, Ph.D., P.Eng.Powertech Labs

- Powertech Labs is very supportive of your effort and will be glad to assist your pilot project team, particularly for monitoring electrical, mechanical and power quality performance as well as net metering, interconnection related issues for the first 500kW pilot project.

– email correspondence from Gouri Bhuyan, Ph.D., P.Eng. Director, Civil Infrastructure & Alternative Energy Technologies Business Unit
Powertech Labs Inc., August, 2004

US ARMY Corps of Engineers

- "The proposal (by Nova Energy for a Davis turbine installation on the Cape Cod Canal) was reviewed by this office and found to be technically sound."

– letter from Joseph L. Ignezio, Director of Planning, Dept. of the Army, New England Division, Corps of Engineering; to Nova Energy Ltd., 1994; cited in Halvorson, 1994

Bruce D. Pratte
Director of Coastal Engineering Program, Canadian National Research Council

- "In summary, the Davis Hydro Turbine is based on the Darrieus cross-flow turbine, a concept proven through laboratory and field trials. It is suitable for extracting energy from fast flowing waters in tidal, river, canal and dam spillway applications, providing the conditions of velocity and depth are sufficient. ... The prototype efficiencies or power coefficients were very close to those predicted from the laboratory model tests. Generally, small scale tests are a good measure of the performance to be expected for the full size units. In fact, full size turbines generally perform slightly better than model tests, with efficiencies 1-5% greater. … the next step in its evolution should be market driven, requiring investment by the private sector, utilities, or other governments."

– from 'General Comments on Nova Energy Ltd's Davis Hydro Turbine'; letter, 1994

Jim Fulton Executive Director David Suzuki Foundation

- "It certainly appears that Nova Energy has an all Canadian device that could meet the highest environmental standards while producing large volumes of electricity. The potential for B.C. electrical sourcing and for water turbine production for export appear to be considerable."

- Jim Fulton, Executive Director, David Suzuki Foundation
(1994 letter to B.C. Premier Mike Harcourt

World Energy Council

World Energy Council

:: Nature of Business :: General Information :: Products/Services :: Related Organisations :: Events :: Directors/Managers :: Contact Information

Nature of Business

:: Update :: Upgrade

Founded in 1923, the World Energy Council (WEC) is the leading global multi energy organisation. It covers all types of energy, including coal, oil, natural gas, nuclear, hydro, and renewables.

WEC is comprised of over 90 autonomous national Member Committees around the globe, and its members include most of the largest energy producing and consuming countries worldwide.

The mission of the World Energy Council is "to promote the sustainable supply and use of all forms of energy for the greatest benefit of all".

General Information

:: Update :: Upgrade

Organisation Type/Location: Organisation in United Kingdom

Nick name/Abbrev.: WEC

Previous Name: World Power Conference

Business Sector(s): Electrical Power - Electrical Power Generation
Oil and Gas - Oil and Gas (General)

Find Related: [News Items | Pages]

Products/Services

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Raw Material

Petroleum and distillates

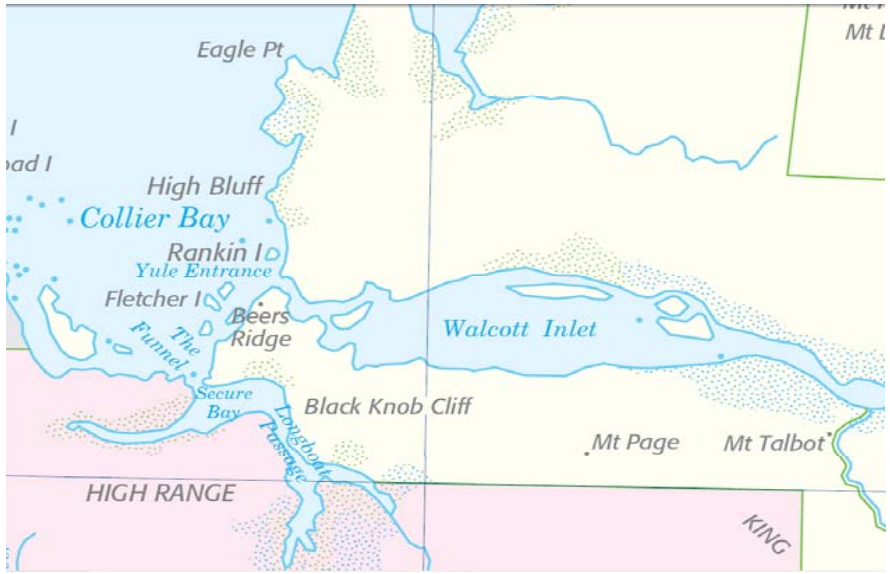
- This table prepared by the World Energy Council naming two adjoining inlets just north of Derby, namely Walcott Inlet and Secure Bay are ideal locations and have the following potential -

Prospective Sites for Tidal Energy Projects

Country		Mean tidal range (m)	Basin area (km2)	Installed capacity (MW)	Approximate annual output (TWh/year)	Annual plant load factor (%)
Argentina	San Jose	5.8	778	5 040	9.4	21
	Golfo Nuevo	3.7	2 376	6 570	16.8	29
	Rio Deseado	3.6	73	180	0.45	28
	Santa Cruz	7.5	222	2 420	6.1	29
	Rio Gallegos	7.5	177	1 900	4.8	29
Australia	**Secure Bay (Derby)**	**7.0**	**140**	**1 480**	**2.9**	**22**
	Walcott Inlet	**7.0**	**260**	**2 800**	**5.4**	**22**
Canada	Cobequid	12.4	240	5 338	14.0	30
	Cumberland	10.9	90	1 400	3.4	28
	Shepody	10.0	115	1 800	4.8	30
India	Gulf of Kutch	5.0	170	900	1.6	22
	Gulf of Khambat	7.0	1 970	7 000	15.0	24
Korea (Rep.)	Garolim	4.7	100	400	0.836	24
	Cheonsu	4.5	-	-	1.2	-
Mexico	Rio Colarado	6-7	-	-	5.4	-
UK	Severn	7.0	520	8 640	17.0	23
	Mersey	6.5	61	700	1.4	23
	Duddon	5.6	20	100	0.212	22
	Wyre	6.0	5.8	64	0.131	24
	Conwy	5.2	5.5	33	0.060	21
USA	Pasamaquoddy	5.5	-	-	-	-
	Knik Arm	7.5	-	2 900	7.4	29
	Turnagain Arm	7.5	-	6 500	16.6	29
Russian Fed.	Mezen	6.7	2 640	15 000	45	34
	Tugur	6.8	1 080	7 800	16.2	24
	Penzhinsk	11.4	20 530	87 400	190	25

Source (7): Potential Tidal Power Projects - World Energy Council

Walcott Inlet & Secure Bay



Whirlpool in Walcott Inlet

Prospective Sites for Tidal Energy Projects

Country	Country	Mean tidal range (m)	Basin area (km2)	Installed capacity (MW)	Approximate annual output (TWh/year)	Annual plant load factor (%
Australia	Secure Bay (Derby)	7.0	140	1 480	2.9	22
	Walcott Inlet	7.0	260	2 800	5.4	22

Table 1 Potential Tidal Power Projects (courtesy of World Energy Council).

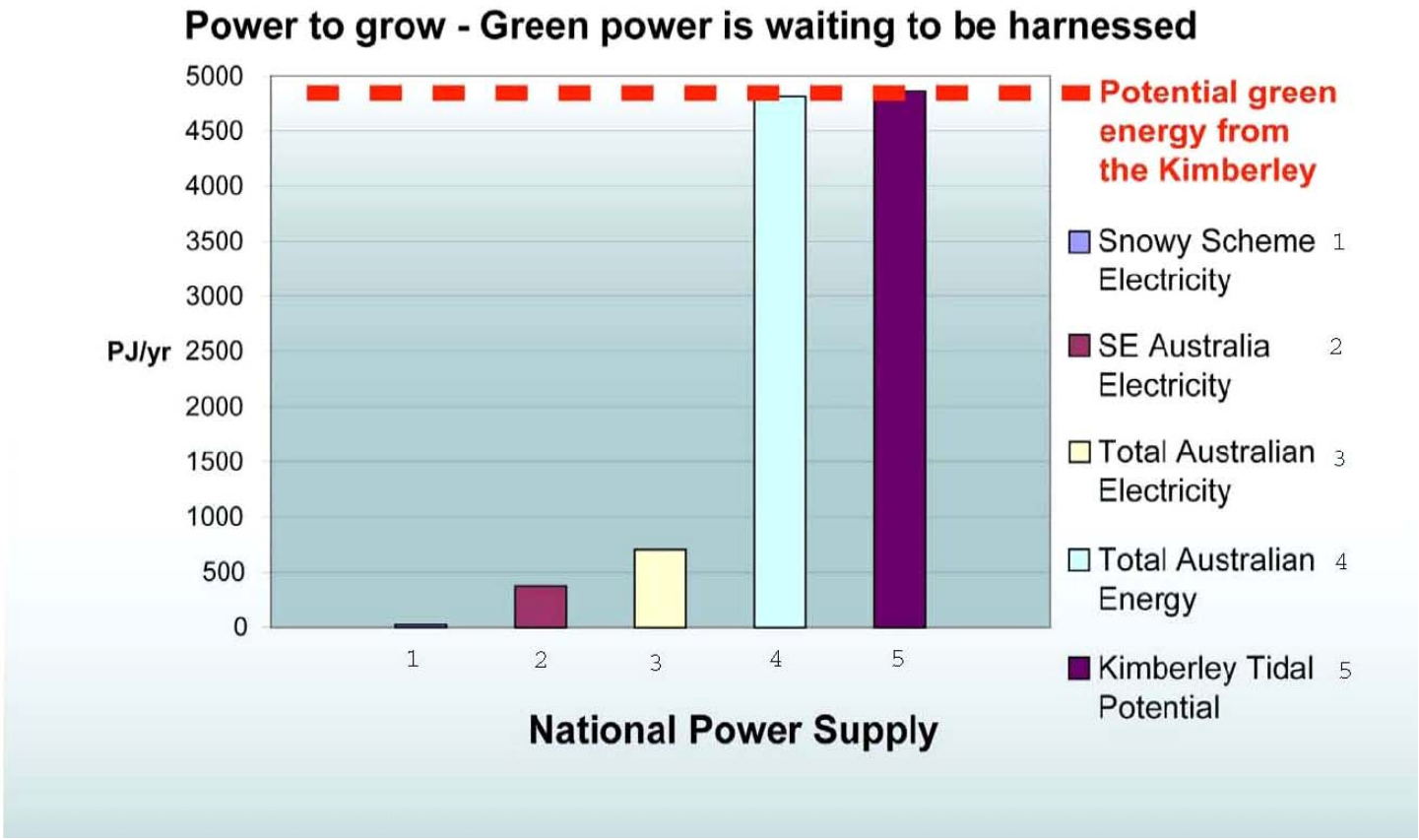
Comparison of “Installed Capacity” of these two inlets with Australia’s Total “Grid” based generation

	Australia Source: ESN (Australian Energy Supply Association	Tidal Project Source: WEC	% of National Grid Total
Installed Capacity	50GW	4.3GW	(8.6%)
Total Generation pa	226TWh	8.3TWh	(3.7%)

- One TWh = 1million million watts hours.
- The projected revenue at 5c per KWh (unit) bulk contract rate would be A$415 million pa.
- Were the total generation figure also at 8.6% this revenue figure would be approximately A$830 million

Source (8): World Energy Council

Potential for expansion



There are numerous other areas that could be developed including the massive King Sound

Details of Walcott Inlet & Secure Bay

Ord River / Cambridge Gulf

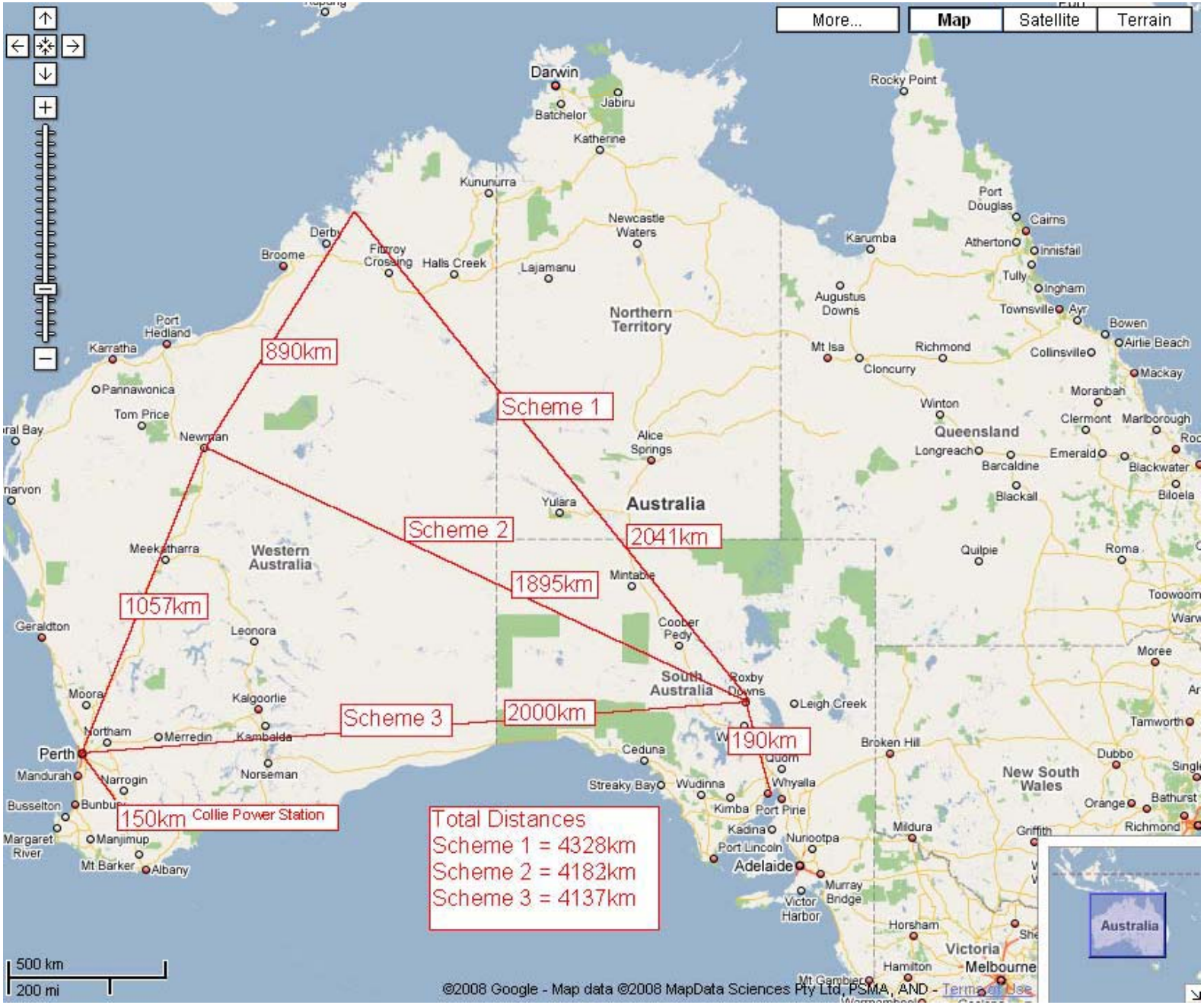
PARTNERING AUSTRALIA'S ESTABLISHED COAL AND GAS FIRED GENERATING CAPACITY WITH TIDAL POWER

- Setting the scene for massive growth in renewables.

- Including schemes such as wind and geothermal which can connect into this network.

Australian Grid

- The map which follows displays potential routes and distances from the tidal power resources necessary to connect it to the national grid network.
- ABB Australia has confirmed that transmission over these distances can be achieved by use of High Voltage Bipolar DC (HDVC) power technology.
- This technology has the capacity to carry electricity in both directions.
- This creates a genuine partnership between coal and tidal generation as coal fired energy could be transmitted on the same network to all remote areas of high demand now using diesel.
- As tidal movements are totally predictable from day to day and year to year therefore the coal fired generator operators will know exactly what their contribution to a National Grid will be at any point in time which is not possible with wind and solar power.


More...
Map
Satellite
Terrain
890km
Scheme 1
2041km
Scheme 2
1895km
1057km
Scheme 3
2000km
190km
150km
Collie Power Station
Total Distances
Scheme 1 = 4328km
Scheme 2 = 4182km
Scheme 3 = 4137km
Darwin
Perth
Adelaide
Broome
Geraldton
Kalgoorlie
Alice Springs
Western Australia
Northern Territory
South Australia
Queensland
New South Wales
Victoria
Melbourne
Australia
500 km
200 mi
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Unpredictable nature of Wind Power article in the Australian

Excerpt: “A six months study by Transpower showed output from the 150 megawatts of turbine varied widely and was difficult to forecast. Peak output was virtually identical even though the sites were more than 8km apart, and could jump by as much as 100 megawatts in five minutes, straining the grid”.

Australian
4/11/05

Warning of wind blow-out for NZ

Power

NEW Zealand wind power generators could face greater controls to ensure fluctuation in their output did not disrupt the country's electricity supply, national power lines manager Transpower New Zealand said.

A study of the country's two largest wind farms showed their output at times varied more quickly than output from other generators could be adjusted and sometimes pushed Transpower's lines to capacity. Transpower is seeking changes to the nation's power market rules to give it greater control over when wind farms operate and how their power is priced.

"If you're considering investing in wind at the moment, you need to be thinking very carefully as to whether you're actually going to be able to get your power away," Transpower chief executive Ralph Craven said.

A shortage of natural gas finds in New Zealand has prompted generators, including Meridian Energy, Trust Power, Mighty River Power and Genesis Power, to consider building an eightfold expansion of capacity to deliver as much as 1300 megawatts of wind power in the next five years to help meet rising demand.

Government-owned Meridian and publicly traded Trust Power operate the country's two largest wind farms on hills east of the city of Palmerston North on the country's North Island.

A six-month study by Transpower showed output from the 150 megawatts of turbines varied widely and was difficult to forecast. Peak output was virtually identical even though the sites were more than 8km apart, and could jump by as much as 100 megawatts in five minutes, straining the grid.

Transpower is contributing to a two-year study led by the New Zealand Electricity Commission to determine how best to integrate more wind power into the nation's power system. The commission has already sought comment from power companies on what rule changes might be needed.

"The current rules are not going to continue," said Transpower system operations manager Kieran Devine. To use wind, "the power system must compensate and that usually has a cost", he said.

In its report, Transpower said better wind forecasting would be needed for planning power generation, and wind power might need to lose its preferential status over other "must-run" plants such as river-based hydropower.

Some controls on the pace at which wind farms could change their output should be considered, and Transpower might need to be given the power to turn off some wind power to prevent it overloading the grid, the report said.

Bloomberg

With the Compliments of
HON WILSON TUCKEY MP
MEMBER FOR O'CONNOR

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Source (9): The Australian, 4th September 2005

When the wind doesn't blow, power doesn't flow – even in Denmark

Excerpt: "In the early hours of Saturday morning, two weeks ago, Denmark achieved something that makes John Howard's goals for lifting the use of renewable energy in Australia look pretty modest".

"At 12.17am, as steady winds swept in from the North Sea and most Danes were in their beds, the nation's wind farms churned out 70% of the electricity being consumed across the country" (Peter Wilson).

"Well actually no." "Peter Wilson doesn't manage to get around to detailing how barely 48 hours later, those wind farms were supplying all of 2% of the electricity being consumed across Denmark".

When the wind doesn't blow, power doesn't flow – even in Denmark Aust 6-9-07

"IN the early hours of Saturday morning, two weeks ago, Denmark achieved something that makes John Howard's goals for lifting the use of renewable energy in Australia look pretty modest.

"At 12.17am, as steady winds swept in from the North Sea and most Danes were in their beds, the nation's wind farms churned out 70 per cent of the electricity being consumed across the country."

That's how The Australian's European correspondent Peter Wilson began a glowing piece on wind energy last week.

Where do I sign? Hallelujah! The world is saved. Just roll out the turbines. A future of clean, green, carbon-free electricity beckons.

Well, actually no. Wilson didn't manage to get around to detailing how barely 48 hours later, those wind farms were supplying all of 2 per cent of the electricity being consumed across Denmark.

From a bracing 2300MWh/h or so — the output of two largish conventional power plants — to less than 100 MWh/h, barely enough to keep the night lights burning. When the wind don't blow, the power don't flow.

So when that happened, where did the electricity come from? From Norway, from Sweden and from Germany.

All up, around 1500MWh/h for some hours. In effect, the three neighbours jointly running a very large conventional power station just to keep the lights on in Denmark.

There, in a nutshell, is the twin problem with wind. On average, across a year, you might get 30 per cent of its theoretical capacity, but often you get zero or so close to zero as not to matter. It happens frequently and at any time, and when the wind chooses, not you.

"Somebody", therefore, has to keep unused surplus capacity in some other form of generation equivalent to all the wind generation capacity. And keep it either operating, or able to at the flick of a switch.

Now, no, I didn't have those figures fed to me by the "competing power industries like coal and nuclear power", as Wilson's piece asserted, attacking an earlier critique I had written on wind power.

I have spoken to no one from the coal or nuclear industry, or indeed any other lobbyist, or indeed had any communication, before writing.

In contrast, Wilson quoted no fewer than four spinmeisters for wind and the huge taxpayer and consumer dollars that flow so evenly and strongly to the industry around the world, unlike the electricity flowing from it.

They were Anders Dalegaard, a project manager at the Danish [illegible] Isabelle

Ignore the hot air: in Australia, wind power is nothing more than an expensive vanity

TERRY McCRANN

Valentiny, communications director of the European Wind Energy Association; Stefan Gsaenger, secretary general of the World Wind Energy Association; and "(wind) industry association spokesman" Peter Rae.

Surprisingly, all of them thought wind was the absolute bee's knees.

Analyse the data on the Danish power network's website — energinet.dk — and you should be able to see clearly the two problems with wind power. The first is its low capacity factor.

As I had earlier noted, Germany's biggest power grid operator, E.ON Netz, over the year got an average of just 18 per cent of the rated capacity of its wind network.

This produced an interesting response from one of the windmeisters: the German windmills weren't in the right places. In contrast, other networks were over 30 per cent, with Denmark claiming 45 per cent for its offshore turbines.

The much bigger problem, which the wind-meisters neatly sidestepped, is that at times you get almost zero power out of the *entire* network.

As noted, 2500MWh/h one minute, less than 100MWh/h two days later. Another example, less than 10MWh/h — effectively zero — across all of Denmark for four hours straight. Back in February, less than 100MWh/h for 36 hours straight. If you were relying on wind, a day and a half with no power.

The obvious point about this is that power has to come from somewhere else to make up the difference. The less obvious but far more crucial point is that you need permanent surplus power-generating capacity somewhere for the full wind capacity. In your own grid or one to which you are hooked up.

So if, say, in Australia we opted for the next 10,000MWh/h from wind, we wouldn't just have to build 7000MWh/h of coal or nuclear or gas to "cover" for the 70 per cent on average that wind doesn't provide relative to its sticker capacity.

We would have to build the full 10,000 MWh/h of conventional power generation anyway, for when the wind doesn't blow at all! You can't rely on the wind blowing "somewhere" to cover for the wind not blowing somewhere else.

Alternative gas power could be turned on when needed, but if you went for coal and nuclear they would essentially have to be ticking over all the time anyway. You can't just fire up the boilers the moment the wind stops blowing. Now, obviously, some games could be played at the margin. We might not need the full 10,000 MWh/h of conventional, we could probably get by with, say, 7000MWh/h — another three Loy Yangs. We'd still essentially be getting one power station for the price of at least two.

Denmark has the biggest wind component in its power generation in the world. The reason it sort of works in Denmark, price aside, but can work only in Denmark, is that the country is small and connected to Norway, Sweden and Germany.

Indeed, Denmark's wind works rather well joined to Norway's hydro, because the hydro can be turned on and off.

But if the wind don't blow, it's still drawing power from Sweden's hydro and nuclear and Germany's coal and nuclear.

The key point is that extra power Denmark might need at points in time could be huge in its own terms — 40 or even 50 per cent of total consumption.

But it will be tiny when spread around Norway, Sweden and Germany. They can accommodate a small neighbour hooked on wind. But there's no way they could accommodate a Germany with the same wind intensity. Without someone building surplus conventional power stations.

Indeed, when the wind doesn't blow in Germany — which now gets high single digits of its total power from wind — it goes to nuclear France.

And some of this touches on the grid challenges from having 2000MWh/h suddenly dropping to, say, 10MWh/h.

Nor does it explain how it would "work" in Australia. Yes, you can connect all the state grids; but if you had a huge investment in wind in, say, Victoria, you would still need equivalent coal/nuclear/gas somewhere — as essentially idle surplus capacity.

Unless you were prepared to literally turn off the lights, and everything else, when the wind didn't blow.

Yes, Denmark's wind story has a huge lesson for Australia. That there is no way wind can make a sensible major contribution to mainstream power generation in Australia.

Or even to the very objective it is purportedly directed at, greenhouse gas abatement. It is just an expensive, feel-good vanity.

Source (10): The Australian, 6th September 2007

Alternative available technologies

- Geo sequestration technology is available for coal fired power stations, however…..
- The Laws of physics require that approximately 20% of energy output of the station is required for this process.
- Thermal Energy generation must not be confused with LNG sequestration as separation occurs during liquification process.

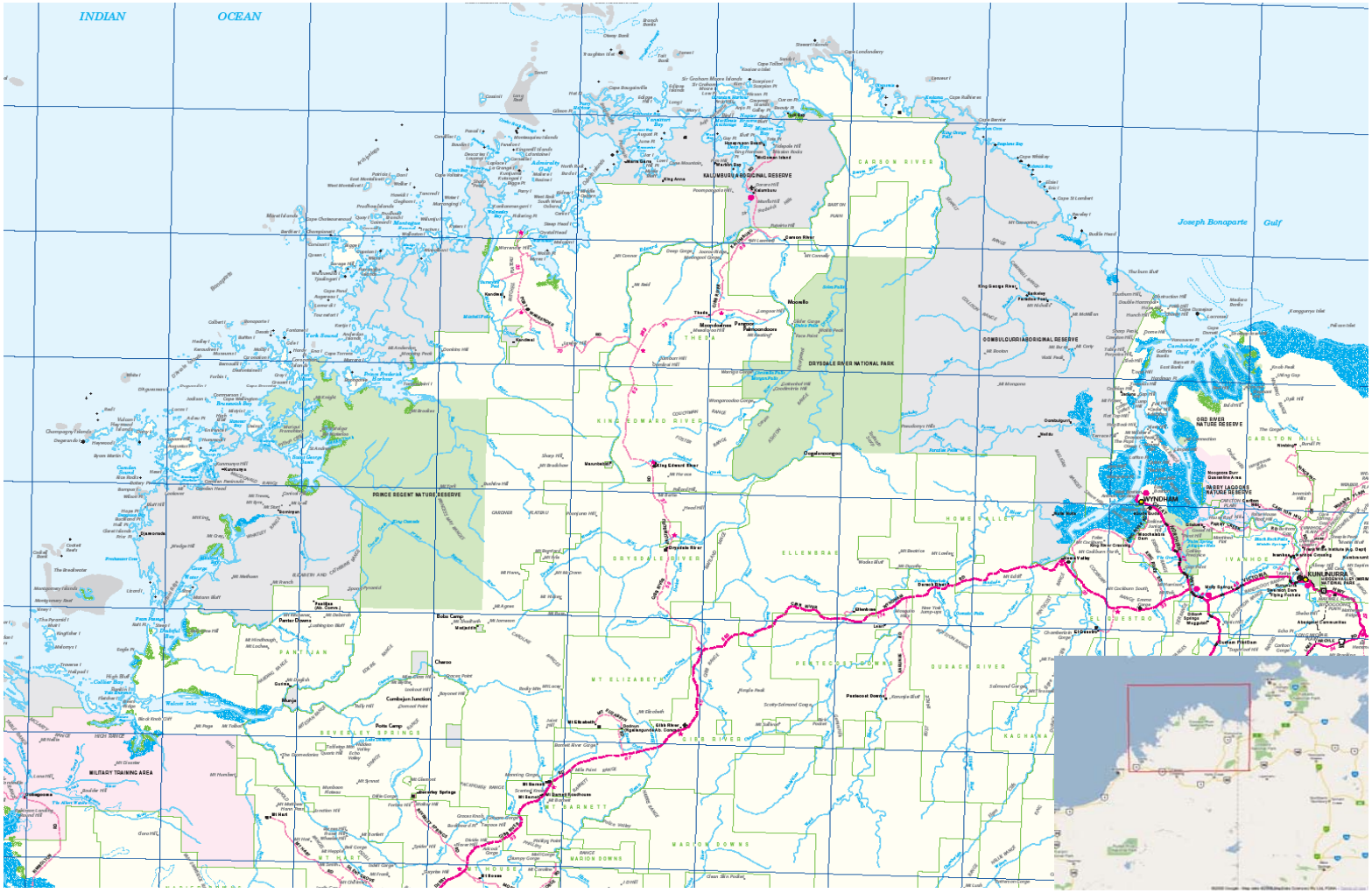
Additional Benefits

- Interconnection of the National Grid across Australia will provide an efficiency benefit of sustaining base load by meeting alternating consumption peaks arising from national timing differentials between the states.

- Instead of Australian consumers being taxed though ETS upon 100% of their coal fired base load power consumption, the ever increasing tidal component will progressively dilute the emissions burden.

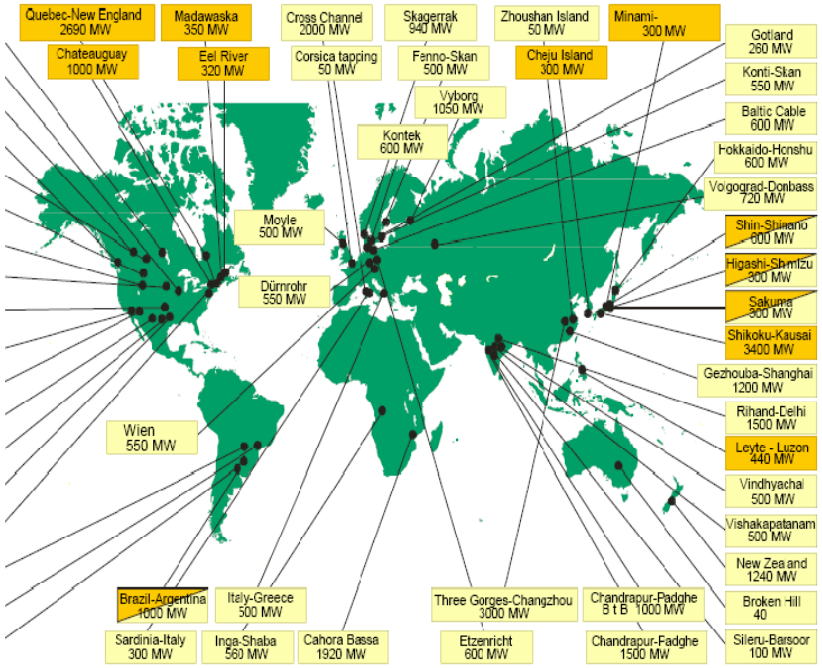
- HVDC systems have special capacity to absorb and even out generation variabilities such as occur with wind generation making this medium more attractive, particularly in South Australia where excellent wind velocities are available.

The tidal peaks and troughs vary by approximately 1 hour between King Sound and Cambridge Gulf



High Voltage Direct Current

- Some 80 major HVCD systems are in operation in the world implemented since 1945. The longest is the INGA-SHABA network operating between Kolwezi and Inga in Zaire which is 1,700 km in length and presumably is installed in more difficult terrain than that which would confront the proposed transmission lines in Australia.



Source (11): http://www.worldbank.org/html/fpd/em/transmission/technology_abb.pdf

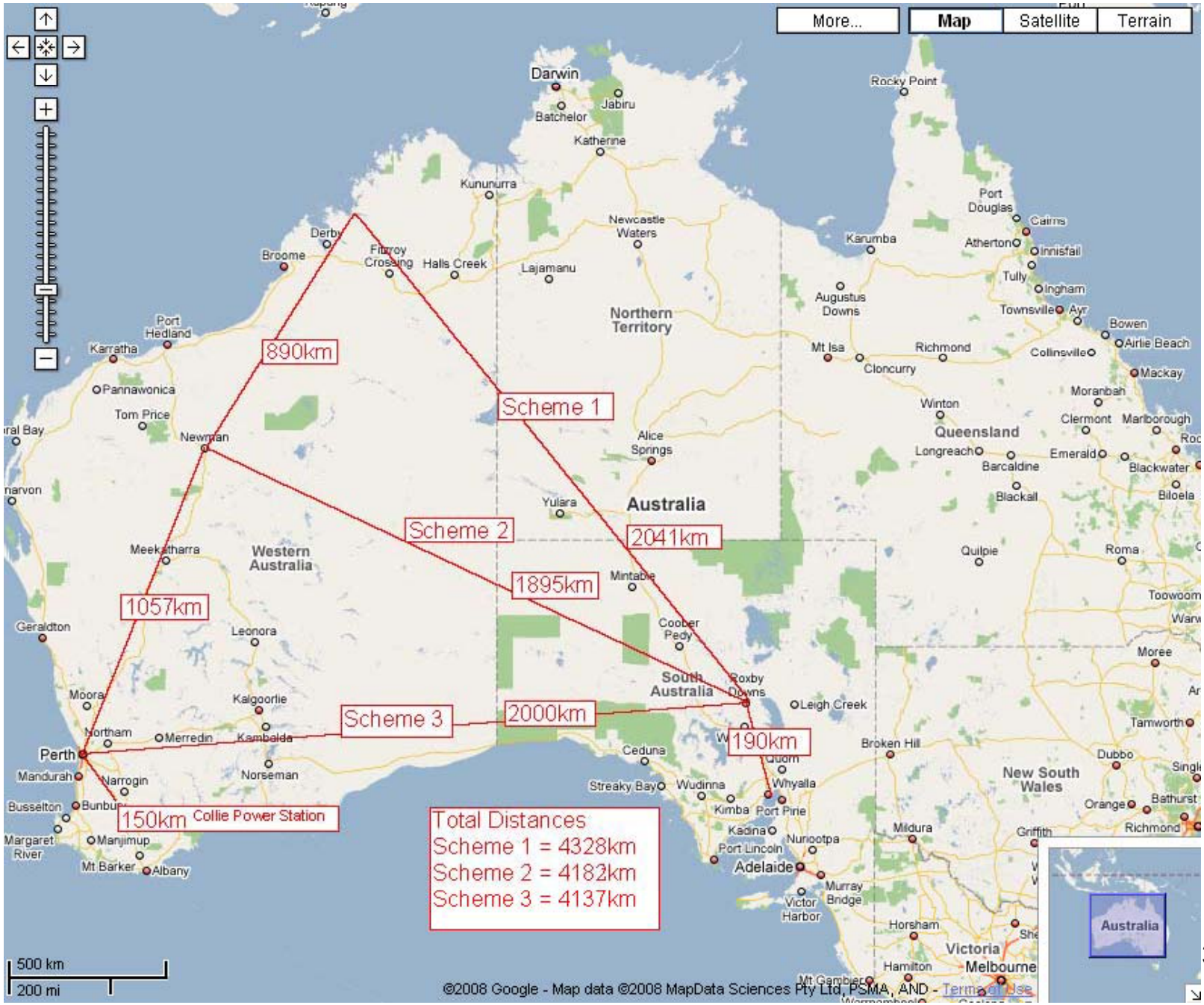
Tidal Energy Grid

- To connect the tidal energy province based on Walcott Inlet through to Perth with the Collie coal fields of WA and the Eastern States grid network at Port Augusta in South Australia would require two separate links of approximately 2,000kms respectively.

- The features of HVDC power requires converter stations at the beginning and end of the line to convert AC power to DC and back again.

- The diagram as shown proposes a connection from Walcott Inlet to the Pilbara mining town of Mount Newman and then onwards to Perth and Roxby Downs / Port Augusta in South Australia.

- My preferred Scheme is Scheme 3.


More...
Map
Satellite
Terrain
Darwin
Jabiru
Batchelor
Katherine
Kununurra
Derby
Broome
Fitzroy Crossing
Halls Creek
Lajamanu
Newcastle Waters
Northern Territory
Rocky Point
Port Douglas
Cairns
Karumba
Atherton
Innisfail
Tully
Ingham
Townsville
Ayr
Bowen
Airlie Beach
Collinsville
Mackay
Augustus Downs
Mt Isa
Richmond
Cloncurry
Winton
Moranbah
Clermont
Marlborough
Queensland
Longreach
Emerald
Barcaldine
Blackwater
Biloela
Blackall
Quilpie
Roma
Toowoomba
Moree
Tamworth
Dubbo
Orange
Bathurst
Richmond
Griffith
Mildura
Broken Hill
New South Wales
Port Hedland
Karratha
Pannawonica
Tom Price
Newman
Alice Springs
Yulara
Australia
Meekatharra
Western Australia
Mintabie
Coober Pedy
Leigh Creek
Roxby Downs
South Australia
Geraldton
Leonora
Moora
Kalgoorlie
Northam
Merredin
Kambalda
Perth
Mandurah
Narrogin
Norseman
Busselton
Bunbury
Margaret River
Manjimup
Mt Barker
Albany
Ceduna
Streaky Bay
Wudinna
Whyalla
Kimba
Port Pirie
Kadina
Port Lincoln
Nuriootpa
Adelaide
Murray Bridge
Victor Harbor
Horsham
Victoria
Melbourne
Hamilton
Mt Gambier
890km
Scheme 1
2041km
Scheme 2
1895km
1057km
Scheme 3
2000km
190km
150km
Collie Power Station
Total Distances
Scheme 1 = 4328km
Scheme 2 = 4182km
Scheme 3 = 4137km
500 km
200 mi
Australia
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- Additional converter stations to service other localities might be required, which in the case of the Pilbara, could electrify the rail freight system and connect the LNG network, whilst BHP Billiton would be further encouraged to maintain their copper smelting facility at Roxby Downs.

- Scheme 3 proposes a single direct link and converter at Perth, then utilising established AC transmission to Collie. The HVDC connection to Roxby Downs / Port Augusta would then recommence at Perth.

Remote area consumers that could be serviced from these power routes

- The Pilbara - minerals – rail electrification
- North West – LNG
- Mid West – Iron Ore -Square Kilometre Radio Telescope
- Roxby Downs – Olympic Dam

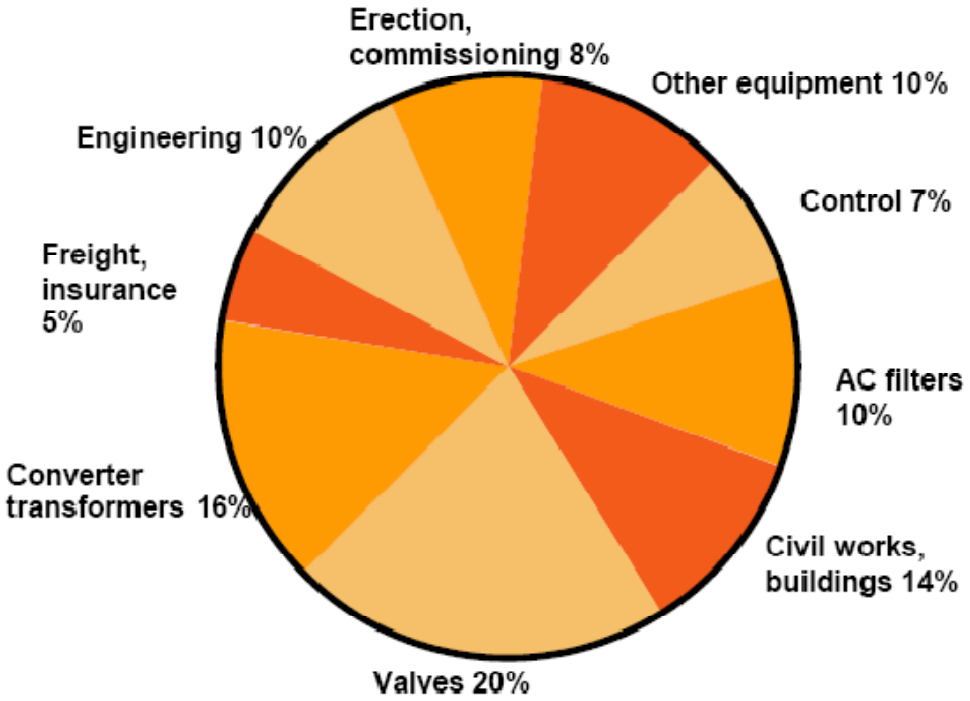
Costing of HVDC

High Voltage Direct Current (HVDC)Transmission Systems
Technology Review Paper

Roberto Rudervall
ABB power Systems
Sweden

J.P. Charpentier
World Bank
United States

Raghuveer Sharma
ABB Financial Services
Sweden



Source (12): http://www.worldbank.org/html/fpd/em/transmission/technology_abb.pdf

High Voltage Direct Current (HVDC)Transmission Systems
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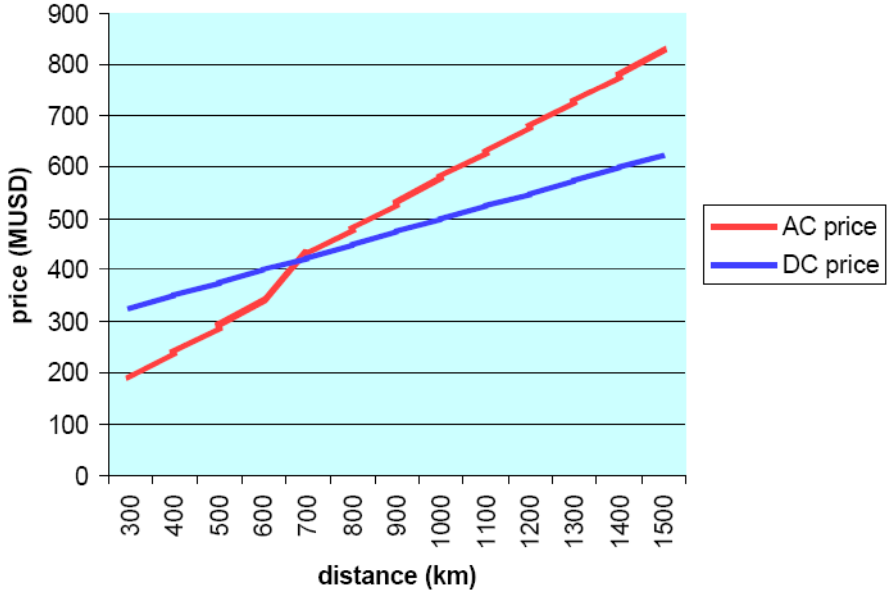
United States

Raghuveer Sharma
ABB Financial Services
Sweden

As a guidance, an example showing the price variation for an AC transmission compared with an HVDC transmission for 2000 MW is presented below.



Assumptions made in the price calculations:
For the AC transmission a double circuit is assumed with a price per km of 250 kUSD/km (each). AC substations and series compensation (above 600 km) are estimated to 80 MUSD.
For the HVDC transmission a bipolar OH line was assumed with a price per km of 250 kUSD/km, converter stations are estimated to 250 MUSD.

4,000 kms x US$250,000 per kilometre = approx US$1Billion

Costing Variations

- Inflation and exchange conversion could increase these estimates by 30%.

- New technology such as Carbon Nano Fibre (CSIRO) and relatively simple terrain enroute compared to other examples could nevertheless reduce costs.

Total Project Cost

- Project cost for manufacture and installation of a 4.2GW “Fence Line” tidal generation facility. Construction of approximately 4,000 km of 3,000MW HVDC Bipolar transmission lines plus 4 converter stations

4.2GW Fence Line Generators at US$1.2bn per GW	US$5.04 billon
4,000 km HVDC transmission	US$1 billion
4 Converter Stations @ US$250m	US$1 billion
Total (approximately)	US$7 billion
+ Potential Contingency of 30%	**AUS$9 billion**

RETURN ON GOVERNMENT CASH OUTLAY

- As the tides are free, approximately 90% of revenues could be identified as a notional repayment of the original outlay.

Funding

- This project should be funded by the Australian Government from general revenue consistent with infrastructure initiatives of past Governments (Snowy Scheme / Telecommunications / The WA Court Government's initiative to open the north west gas field etc etc).

- The annual capital expenditure for this project should not exceed A$3 billon.

Administration & Implementation

- The Government must create an independent Statutory Authority with extensive powers to implement and manage this project.

- Its legislated powers should include it own environmental assessment section with a special set of guidelines consistent with the task at hand but adequate to ensure good policy.

- The project must be considered a Public Work of the Commonwealth with its own regulatory powers.

- This Board must be made up of persons experienced in the task at hand.

Recommendation

- That the Coalition promote a Partnership of Tidal Power and Coal delivered through a new HVDC national transmission system as its response for the reduction of Australia's greenhouse emissions and…
- to guarantee future generations low cost perpetual domestic energy security.

Appendix: References

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Source (2): La Rance Tidal Power Station during and after construction (Image courtesy of Popular Mechanics).

Source (3): http://www.rise.org.au/info/Tech/tidal/index.html

Source (4): http://www.rise.org.au/info/Tech/tidal/index.html

Source (5): Renewable Energy and Ethical Investment.
Copyright ©1997-2008 Blue Energy Canada Inc.. All rights reserved.

Source (6): Renewable Energy and Ethical Investment.
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Source (7): Potential Tidal Power Projects - World Energy Council

Source (8): World Energy Council

Source (9): The Australian, 4th September 2005.

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Source (11): http://www.worldbank.org/html/fpd/em/transmission/technology_abb.pdf

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