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Inquiry into modernising Australia's electricity grid

A Submission by Barrie Hill to the Inquiry into modernising Australia's electricity grid

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Executive Summary

Technical and commercial leadership is missing from the Australian electricity sector. There is clearly no management of the sector as a whole short term or long term for the benefit of the Australian community.

The consequence is a spiral of falling utility for industry and the community.

The spiral of increasing cost and falling reliability must be stopped.

The "leave it to the market" experiment for the electricity sector has become dysfunctional and needs substantial reform or preferably to be abandoned.

Private players have been gaming the market, shades of Enron, to the serious detriment of Australia's electricity consumers and industry.

The obsession with renewables is just one dysfunctional factor through the introduction of subsidies and lack of good system engineering design.

Private players local and overseas have clearly flagged no new investment and no substantial upgrades for the the electricity sector generation assets.

Approximately \$180B of investment will be required to replace about 30,000MW base load generation in the period through to 2050 starting now.

This submission recommends the establishment of a public sector Australian Electricity Commission modelled on Reserve Bank principles

Only an independent statutory authority of government can take over and provide sound leadership initially for new investment and overall market control.

Only an independent government authority can manage the funding at low rates and the planning that will be required for new base load generation assets.

Zero emission nuclear power generation must be part of the future and there is growing public awareness and understanding of this fact given the failure of other options.

The legislated prohibition of nuclear power is ingenuous and needs to be repealed.

New coal investment in any shape or form is dead in the public perception.

Intermittent solar and wind generation needs additional backup in the Australian system which makes the combination about twice the cost of nuclear power.

Such backup substantially negates any solar or wind emission reduction outcomes.

Stand alone pumped storage and batteries are inefficient "dead investments" in the grid hugely adding to cost without any generation advantage.

Additional large scale grid interconnections are similar dead investments.

The United Arab Emirates will achieve nuclear power plant startup in 9 years after a standing start.

Australia already has in place the engineers and key government institutions for control which the UAE did not have so can do better with appropriate leadership.

Inaction is not an option in the face of the deteriorating state of the Australian electricity sector and the level of industry and community concern over cost and uncompetitiveness.

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Introduction

Reliable and competitively priced electricity is the foundation of modern society and the Australian economy. That foundation is now facing serious threat with falling reliability and huge electricity cost increases impacting industry viability and Australian jobs. Over the past few decades a carefully orchestrated economic strategy has seen the Australian electricity sector move from public benefit to private exploitation in a market distorted by selective subsidy. Within this period acceptance of sound operating procedures and environmental principles underpinning international agreements for the sector have all been compromised. No new large scale private investment is now possible and the long term viability of the sector is under serious threat. Australian industry leaders are warning of looming catastrophe. This Inquiry provides a window of opportunity to initiate a complete step change of leadership philosophy for the sector.

By any significant measure the public utility of the Australian electricity supply system has deteriorated over the past few decades and no clear improvement is forecast. No single authority can be held responsible for managing the system as a whole for the benefit of the Australian community. Falling utility and system failure has been brought on by inappropriate economic concepts and technical compromise, but principally by leadership ambiguity within the sector,

Acceptance of advocacy for the operation of market-based principles promoted directly by the international financial community has led to a classic economic outcome "Tragedy of the Commons". Individual market players in some cases encouraged by subsidy are gaming the national electricity supply system for their own benefit with little thought of the overall system utility or benefit for Australian consumers. The end result has been diminishing benefit for all and deterioration of what was the national electricity asset. The myth that privatisation of the electricity sector would lower costs has been clearly demonstrated to be just that, a myth as it has in the airports sector.

In addition the introduction of subsidised renewable energy generation investment and operation into a free market system without appropriate engineering design and regulation has destroyed any possibility of a competitive market. A simplistic obsession with solar and wind renewable energy with no regard for overall system engineering design has added huge cost and unreliability with little emission reduction benefit, when less expensive and more secure options to meet environmental targets are available.

This submission advocates the immediate establishment of an independent Federal government authority - the Australian Electricity Commission or similar to progressively take over the responsibility for all future grid level electricity supply, implementation of direct new investment where required, and possibly a managed reversal of some asset privatisation if this proves advantageous.

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This submission also advocates the transition of Australian grid level electrical generation to nuclear power over the next 30 years to achieve long term national electricity sector utility, that is, cost, reliability, long term security, and zero emissions through the progressive introduction of small modular reactors for power generation. The Reserve Bank has noted that this is the perfect time for such productive investment given very low interest rates available to government.

Two alternate low cost and enhanced power security options, existing asset upgrades and the use of refined coal in combined cycle and diesel power stations are noted as possible short term solutions. These options have significantly higher emissions than small modular reactor power generation plants but less than conventional coal fired power stations.

Submission Detail

Over the past few decades the international financial sector has been focused on the world electricity sector for a number of reasons. Foremost is a need to settle investment in areas with a good record of monetary return and low risk of default compared with previous high risk whole of country investments. Some countries have been saddled with massive debt through accepting grossly over engineered electricity upgrade systems for reasons beyond that noted above. Australia has avoided the latter outcome but has in general accepted the economic propaganda advocating the transferring of public electrical utilities to private ownership. There is no example of privatisation leading to better service and lower long term cost. A few other more astute countries have rejected all privatisation pressure and have retained public ownership and control of the electricity sector and other critical infrastructure. They now do not face many of the problems Australia currently faces.

The outcome we now see in Australia is the normal result of corporate and personal action in any free market. Australia has not reached the "Enron Scenario" in electricity market exploitation although early warning signs are evident. While competition based economics have generally served communities well in other sectors, the relatively small Australian electricity sector does not exhibit sufficient competitive flexibility to balance exploitation outcomes with public utility. An ever increasing framework of rules and regulation is required in an attempt to manage the secure supply and low cost outcomes previously achieved by skilled engineers and public funding. In fact the generation sector is all but completely inflexible because of the high level of fixed investment, generally difficult to modify, and the long lead times for any new generation deployment. This partly explains why punitive economic/environmental vehicles such as emission penalties or carbon taxes and the like can have little effect beyond raising costs and shutting older high emission generators but cannot facilitate new investment at significant level. The low level of competitive flexibility and

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few market players has opened up the opportunity for substantial gaming of the market to maximise profit levels as is seen in other monopolistic sectors.

Free market concepts, complex regulation, and ineffective levels of control have reached a stage where effective long term management of the national electricity sector in it's current configuration is not possible. No single competent authority can be held responsible for managing the national electricity system commercially and technically long term for the benefit of the Australian community or in fact for causing the current problems.

By any significant measure the public utility of the Australian electricity supply system has deteriorated over the past few decades and no improvement can be foreseen. That falling utility may be measured in terms of costs, security short-term and long-term, reliability, and environmental outcomes as noted below.

Utility As Cost

Fragmented privatisation, selective subsidies, and economic gaming have caused electricity prices for consumers and industry to rise well above inflation, in some cases doubling over the past year, when benchmark rises in other countries indicate around half inflation increases. Poorer households being disconnected is a national disgrace. Heat related death increases particularly in South Australia is completely unacceptable in a so-called modern society. Overall the sellers of Australian electricity public assets have missed the point that the Australian electricity sector is not the same as those in USA or Europe. The sector cannot operate in the same economically competitive manner as for example the supermarket sector or air conditioner supply businesses.

Given the volatility of the market place and low generation margins it is also currently not possible for industry to negotiate long-term electricity supply agreements at sustainable cost. This makes conventional debt investments in energy intensive sectors such as mineral or metal processing impossible unless they are independent of the grid. Energy intensive business investment has all but collapsed and existing operations such as aluminium smelters are closing capacity.

Private operators need to allow for cost of capital values around 12% compared with government funding around 2%. This effectively doubles capital return requirements for any private power investment and is passed on to consumers as higher charges.

Electricity cost increases beyond those of other countries, well above inflation and no indication of future price stability for the business sector is a cancer eating out Australia's economic prosperity and stable future. This has led to a recognition by local and overseas industry investors that energy costs in Australia are out of control and the economy has become less competitive. The electricity consumer sector is also fragmenting into three groups; residential poor, residential wealthy, and industrial,

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over cost issues to the overall detriment of rational management of the national supply system itself.

Utility as Long Term Secure Energy Supply

For the past few decades the free market style experiment has resulted in wholesale electricity generation prices which provide no margin for re-investment and no margin for falling plant utilisation. In some cases even acceptable maintenance has been compromised which bodes ill for the future. The only effective investment margin has been provided by direct subsidy for wind and solar installations albeit at insignificant levels relative to long term grid capacity requirements.

The current economic mantra 'leave it to the market' has resulted in a situation that ensures no new power generation system investment can be made without subsidy. Without subsidy or direct public investment the electrical generation system will progressively become even less secure.

Clearly generation plant investment subsidy in one form or another from taxpayers or consumers is acceptable to the Australian public as long as the investments do not generate carbon emissions. Subsidies direct and indirect were at a level of \$3B last year. Even so there is a slow awakening that subsidies for small scale solar and wind generation with backup system costs in total as high as 5 times alternate low emission technologies with consequent high electricity costs are patently ridiculous and unsustainable. Some minor rationalisation is taking place through falling residential feed in tariffs. A similar national economic waste is household water storage investment which has been costed at 10 times that of large public utility water storage options for the same specific capacity.

The Utility of Supply Reliability

System reliability cannot be simply linked to any purely economic formulae or simple market driven process. Operational reliability is a complex matter of engineering judgement balancing system technical requirements, generation sources, reserve plant availability, potential load, cost, and risk.

Recent examples of failure of the current partially regulated market system has seen the closure of potential reserve base load capacity in South Australia with subsequent disastrous system reliability results. The closure of generation capacity in Victoria will inevitably lead to the same falling system reliability.

Synchronous generation has detuned its governor control systems, increased governor deadbands or even switched off speed governing altogether in order to avoid the possibility of dispatch errors and incur a possible financial penalty.

Reliance has increased on Area grid control to regulate system frequency which is a much slower control loop compared to previous arrangements which relied more

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heavily on local speed droop governing. Due to communication delays this has led to control system hunting behaviour resulting in a continuously oscillating system frequency which can be easily confirmed by viewing the FCAS causer pays four second data.

Large uncontrolled penetration of rooftop solar power generation particularly in Southeast Queensland is causing serious problems with domestic voltage reliability. Renewable electricity sources are forcing out established sources of system inertia and frequency control leading to fragile networks and operational vulnerability.

Pricing reliability has been compromised in Queensland and now New South Wales with large price increase swings for unusually long periods. Up to 70% increases in wholesale pricing are predicted for Victoria.

Utility As Greenhouse Gas Reduction

Wind and solar installations have been widely promoted as lowering greenhouse gas emissions. On an item by item stand alone basis they clearly do. However integrated into the Australian electrical supply system they have generally created more greenhouse gas emissions than if they were not there. This is through the need for inefficient quick response fossil fuel backup generation to cover intermittent operation as now seen in South Australia. The technical reasons for this are not well understood and the myth of zero emissions continues to be promoted through ignorance or deliberate misinformation. For most Australian states the total system support required to accommodate these renewable installations is more costly, less secure, and generally fails the stated objective to lower emissions. This is usually not the case in much larger more diverse electricity grids outside Australia. The installation of grid level thermal or electrical battery systems or stand alone hydro pumped storage to partially overcome renewable electricity generation intermittency problems would more than double possibly treble the cost of electricity to consumers from the combined sources. These technology investments at grid level are essentially dead money in the system as they do not actually generate any electricity for the investment made. Existing pumped storage assets are currently under-utilised to hold market prices higher in the privatised market.

The implications of the use of renewables in the electricity system from an emissions perspective are complex and have been beyond the understanding of all but a few power system engineers. Consideration of the use of nuclear power as a reliable 24/7 zero emissions generation source has been difficult for most of the Australian community to fully accept because of ideological misinformation. Understanding is growing and attitudes are now changing. This option should not be overlooked.

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Utility Summary

The South Australia system failures together with South Australia, Victoria, and Queensland cost issues along with industrial load shedding in New South Wales have clearly illustrated that the current market based administrative procedures in place for the Australian electricity supply sector have not served the community well and are in fact failing. Ambiguous leadership and responsibilities, a focus on short term unit costs, economic gaming, and evidence of risk management issues, compounded by a seeming obsession with renewables all indicate that significant change is required.

Recent events in South Australia are really a foretaste of what is to come for the whole ageing system under the private control of a few major players if change is not implemented quickly. The risks have been predicted and documented for a number of years but rectification action has not been possible in a free market operation distorted by selective subsidy and fragmented responsibility. There is nothing new in this situation. There are a number of well-documented similar electricity supply failure situations evolving around the world. Not exactly the same scenarios but providing good lessons on the situations that Australia must avoid. The United Kingdom electricity sector provides an extensive failure example, with Germany and Spain also exhibiting extensive mismanagement problems. Great care and considerable experience is needed when interpreting electricity grid information from other countries and attempting to relate such information to the Australian situation.

It is interesting to note that Australian media attention on electricity issues has risen from 15 to 20 articles per day a few years ago to now up to 80 per day. There is now unprecedented coverage on primetime television and radio. Most media coverage articulates problems and reflects community disquiet but none propose sound solutions. This is not surprising given the complexity of the problem and the low technical/economic literacy of the Australian media. There are some insightful exceptions;

- Opinion by ANU's Crawford School of Public Policy, Professor John Hewson: The NEM has become the National Electricity Mess, nee Market – more broadly, power mess – a national embarrassment. The market is clearly failing and its management rules are archaic. Major players are gaming the system, exploiting the consumer by “gouging” excessive prices and profits, while supply is no longer guaranteed. Genuine reform is being undermined by incessant, irresponsible, short-term, partisan politics. It cannot just be patched up. Reform must begin with a blank sheet of paper, preferably with bipartisan support... Another major weakness of the NEM is that AGL and Origin are generators and retailers. As such, they have been able to operate old coal-fired power plants, not having to cover capital costs that have already been written off, while being able to charge excessive retail margins, and also exploit the generosity of the RET. (SMH, syndicated to Canberra Times)

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Recommendations

Through the establishment of this Inquiry Australia has been provided with a one off window of opportunity to provide sound leadership advice in the national interest in a sector of crucial national importance. In reality the choice for the Inquiry outcome recommendations is quite simple;

Either - continue with the existing free market based approach with increasing rules and regulation for the short-term economic benefit of a decreasing number of Australian and overseas investors,

Or - progressively move to a fully managed electricity supply sector led by a single independent and competent Federal authority for the benefit of all Australians.

The first option will suffice for a while albeit with deteriorating utility. In strategic management terms continuing to incrementally apply more legalistic band-aids to an operational concept that has by all measures outlived its usefulness and is now being exploited, does not serve Australia well. This is business school 101 level learnings from world economic history.

It has to be accepted that apart from rising costs and some outages, the full extent of deterioration and problems in the national electricity supply sector is not immediately obvious to all but few industry specialists. Under these circumstances and given the need to balance a complex set of objectives it is recommended that all aspects of Australia's electricity generation and supply need to be brought together under the leadership and management of one independent authority. All should ultimately extend from generation asset ownership to all subsidy allocation and all research and development expenditure within the sector. One independent authority is the only option able to carry through rational commercial and technical solutions in the face of single interest group misinformation, confusion, and the strategic inaction problem Australia now faces. Electricity sector gaming also needs to be totally eliminated to ensure the system as a whole is operated to provide lowest possible cost. This is a once in a generation opportunity to regain control of a vitally important energy supply sector now and into the future for all Australians.

A careful analysis of current and future requirements by an independent authority to develop an effective ongoing strategy is needed. The focus must be on establishing what the future electricity system will look like to ensure maximum long term utility and regaining current utility balancing all key objectives.

- What should the electricity system look like now and how will it operate in 2,10, and 30 years?
- How can Australia benefit from a thoughtful electricity sector approach that underpins business activity and consumer confidence now and into the future?

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- What is the best strategy for transition to management by a central authority
- What could also underpin our role in South East Asia in terms of support intelligence and potential export material?

It is recommended as a matter of principle that an independent Australian Electricity Commission or similar Federal government corporation be established to take over the responsibility for all grid level electricity supply now and into the future, implementing new investment as required, and possibly undertaking progressive reversal of asset privatisation if that proves advantageous. An independence mandate similar to the Reserve Bank of Australia is recommended.

Private investors have recently confirmed that they will play no part in future new base load generation investments of any type in Australia given the current market arrangements. The replacement of approximately 30,000 MWe of installed base load capacity by 2050 will require between \$170B and \$190B.

Given the economic issues noted above the only way ageing generation infrastructure can be replaced and national utility regained, particularly for a low or zero emissions outcome is by either government guarantee power purchase agreements or direct government agency investment, possibly through public/private arrangements. Only an Australian government agency can manage the required level of investment to ensure maximum benefit for the Australian community and minimum risk. The Reserve Bank has noted that this time of unprecedented low interest rates is the perfect opportunity for massive government investment in productive new assets such as power stations. Only government can secure low cost funding for such a high level of capital intensive investment. The secure cash flow arising from electricity sales provides an initial range of attractive investment options leading to eventual self funding. Reliance on private investment with cost of capital return requirements of around 12% effectively doubles the capital investment component of electricity costs.

A fully detailed transition strategy supporting this recommendation is not appropriate for this submission but general discussion has not identified any issues that would make the framework for this recommendation difficult to achieve within two years. However key points are that the authority must have a general board and a technical board and must be a single purpose organisation not diverted by other national energy issues. A collation of submissions to this inquiry may give sufficient guidance for an appropriate commencement strategy. There is already some indication that this concept is tentatively accepted in principle at government levels with investment proposals flagged by the SA and Federal governments.

Any questioning of a reigning economic mantra is sure to draw harsh response from many directions. It is accepted that what would amount to a complete reversal of the current national electricity sector management concept will draw criticism from the

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international financial sector, some academics, and the current beneficiaries. However given falling asset values in the sector (Hazelwood potentially less than \$1 given current liabilities) and no major reinvestment possibility the change could be a welcome escape from a deteriorating situation for many international investors. There are already indications of further generation asset sales as more concerned investors attempt to exit the sector.

This recommendation is not a new concept. A similar transition was made in the early stages of state electricity supply for a range of similar community interest reasons. Only the scale has changed. The outcomes at that time eventually led to a world class national electricity supply sector which attracted massive flow on industry investment. All national advantage established by highly experienced engineers in the past has now been lost for the reasons noted above. Clear leadership as recommended provides the opportunity for reversal of the current totally unacceptable situation.

Future Generation Options

A fully detailed generation option analysis has not been carried out but review of previous investigations and inspections of local and overseas electricity generation installations indicates the following guidelines for a low emissions future.

Coal - While technical advance has continued to ultra supercritical units the cost of low emission outcomes through higher thermal efficiency and partial carbon capture and storage makes this option expensive. There is little coal available for such units in Australia because of ash fusion problems. The carbon dioxide capture technology at the power station is proven but not the liquified gas transport and storage at scale. When fully evaluated the problems associated with high volume long distance carbon dioxide transport and storage is the highest risk component of any power generation option and is fundamentally unacceptable. Airborne emissions remain a serious health issue with conventional coal combustion. Heavy metal pollution into ground water from ash disposal is also emerging as a very serious issue for all coal fired power stations. Solutions are available but depending on location can be expensive. Coal combustion has been effectively demonised in the Australian community as is seen in the current very negative reactions to some proposals.

Gas - Burning gas for electricity generation in Australia is very convenient and marginally cost-effective in modern combined cycle power stations. Ultimately it is an economic issue as rising gas costs impact significantly on this option already causing the shutdown of existing capacity and the sale of gas into more attractive markets. Market gaming and exploitation is clearly in play in this sector at a level already requiring government intervention to protect the electricity sector and local businesses. The use of refined coal in combined cycle gas turbines is a viable cost reduction alternative noted below. The problems associated with carbon capture and storage are the same as noted above albeit on a marginally smaller scale. Australia's dimin-

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ishing gas reserves (if this is true) should be best allocated for ongoing and longer term use as chemical feedstock and more efficient thermal energy utilisation in commercial applications.

Intermittent Renewables. - There is a place for solar photovoltaic and wind generation options where system flexibility and cost can accommodate these options. Current system technology limitations indicate that up to 20% of total grid capacity may be possible but smaller load following nuclear plant may extend this limit. Intermittent power generation can involve an additional 30 to 40 % of integration costs to achieve system reliability and stability. These cost are not allocated to renewable electricity supply at the moment but must be in the future. Few studies recognise these additional system costs but some European grids are now requiring these additional support investments from renewable generation proponents. Synchronous wind turbines could provide some additional system stability but the current market process allows no margin for the higher investment cost. Grid scale battery storage combined with intermittent renewable generation while technically feasible would be overall two times more costly than nuclear power installations. This concept remains viable for smaller off grid situations particularly if replacing diesel generation.

Solar heat storage in graphite blocks feeding high efficiency steam turbines is a viable option to overcome intermittent solar energy recovery and provide synchronous stability but is probably limited to 2 to 3 day operation when conditions are unfavourable. In good locations cost is only marginally greater than nuclear power generation and up to 30% less than current molten salt technology. Solar heat storage does have great flexibility for load following and a major advantage is that about 80% of installation costs can be locally sourced. Stand alone thermal storage batteries currently under development are an extension of these plants.

Nuclear - It remains weirdly ingenuous that Australia can continue to hold illegal and try to ignore long proven engineering technology utilised to advantage by 30 other advanced economies and now generating 12% of the world's electricity, while at the same time exporting uranium. Political gaming on this subject since the mid 70's for wholly ideological reasons principally driven from outside Australia has caused a serious gap to emerge in Australia's technological and industrial development, the underlying strategy, in addition to the loss of a secure low emission generation option.

The development of small modular reactors for power generation provides a cost effective, safe, and reliable option for progressive replacement of the current Australian base load generation fleet. Progression towards a zero emissions generation outcome would provide international credibility and eventually resolve all of Australia's emissions obligations. In many cases direct replacement on existing sites would be possible with significant savings. Sufficient experienced nuclear engineering staff are currently available to commence an immediate program for a build time of 3 to 5

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years after site approval. The UAE has developed a large nuclear power program in a short period of time, 9 years from first analysis to startup, with far less initial institutional resources than Australia already has in place so we could improve on these outcomes.

Australian engineers and support staff would have no problems meeting world's best practice benchmarks given our mining and mineral processing history and experience from the construction and operation of the OPAL research reactor, a more complex project than current SMR designs. World's best practice for engineering and operating culture for the implementation of nuclear power programs is also readily available through a number of international agencies. Investigation into a possible Australian nuclear power plant equipment supply chain by the Westinghouse organisation has indicated a good potential for widespread industry involvement within Australia and possible export potential given support to improve some aspects of quality management.

It is recommended that at least the groundwork for an inevitable future nuclear power program is put in place beginning with the removal of legislated prohibition and increased support for familiarisation and training programs. A relatively straight forward start could be made by the installation of a 50MWe small modular reactor at ANSTO Lucas Heights for local grid support, industry participation, familiarisation, and training purposes.

A more comprehensive recommendation supporting the introduction of small modular reactors for power generation is provided at;

- The Transformation of Australia's Power System. A Submission by SMR Nuclear Technology to the Review of the Security of the Australian National Electricity Market.

Alternate Concept A - Improving materials science and engineering development opens up the possibility of holding generation costs low and improving system security by the progressive refurbishment of existing coal fired power stations where coal reserves can support this option. Partial rebuild up to full unit replacements can substantially extend the economic life of generation assets at costs on existing sites half or less of equivalent new build and in much shorter timeframes. This is already occurring but on a very small scale. The failure of private investors to undertake this option on a larger scale for the Northern power station 250MW units in South Australia highlights the many issues noted above which could have been resolved by effective single Authority leadership for the benefit of the South Australian community as recommended in this submission. This is a short term recovery option.

Alternate Concept B - All grades of coal can be refined using fluorine acid technology originally developed in Germany in 1940 to produce 99.5% refined coal, high purity silica, and alumina. More recent development has demonstrated that refined coal

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can be used as a direct substitute for gas in combined cycle power stations and for heavy oil when mixed 50/50 with water in diesel engine power stations. All of the technology is essentially proven but has not been commercialised for market competition reasons and while traditional fossil fuels have been available at low cost.

Increasing gas prices make the option of both power generation types very attractive for Australia in the medium term with the added benefit of lower emissions than any other coal burning alternative. By using low grade coal and offsetting production costs by selling high purity silica and alumina, power generation fuel cost can fall to zero. Remote operated coal/water diesel power stations at branch ends of the national grid would resolve most local supply issues such as low voltage and restricted capacity while eliminating the need for transmission line upgrades. This option is not commercially viable under the current free market system but has many strategic benefits for the ongoing development of the Australian grid and rural based businesses.

Conclusion

By any measure the current national electricity management arrangements and ambiguous leadership have not served the Australian community well and step change is required to avoid a deteriorating situation. Increasing commercial and legalistic pressure on market participant companies and their directors will only accelerate the sector demise. Base load reinvestment is currently not possible unless directly public funded, a situation now seemingly understood and articulated by government.

This submission recommends the establishment of an independent electricity sector leadership authority - the Australian Electricity Commission, to take over and manage all aspects of future and current electricity supply in Australia.

A further recommendation is that Australia moves to achieve long term national electricity sector utility in terms of cost stability, system reliability, long term security, and zero emissions through the progressive introduction of small modular reactors for power generation. The future introduction of nuclear power cannot simply be dismissed without well researched factual information or the credibility of the Inquiry outcome will be substantially diminished.

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