The industrial & Community Energy Group

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Inquiry into modernizing Australia's electricity grid

Preamble

Nearly ten years ago I tried to steer Australia's renewable energy conversation towards an integrated 'Climate Change' and 'Energy Security' solution. In 2016 I revisited this conversation. Australia needs a zero carbon economy 'Roadmap 2050'. There has never been any question about it. Australia's 'Roadmap 2050' requires a 'National Energy Master Plan' that models itself on a 21st energy system. This 21st century energy system must be modelled along different lines to its European counterpart. Australia is a country of vast geographical distance and widely dispersed low population densities.

During the last 150 years the nation's major infrastructure development focus has been on a few sprawling population centres along the east coast. Even though Australia is advantaged by vast natural wealth, the critical economy of energy infrastructure is determined by the cost of the resource and a per capita capacity to pay for it. As a consequence, Australia's centralized fossil fuel based energy industry has concentrated on servicing the eastern states. Vast subsidies have been squandered on remote mining centres and isolated high energy use industry without any attempt at designing an efficient energy transmission infrastructure. Much of our resource wealth has been shipped overseas with little or no real long term benefit to the people of this continent. Even now we are focused on delivering cheaper gas to Asia and Europe then we can buy for our own needs. This policy approach has evolved into a state based energy market characterized by transmission inefficiency, aging infrastructure and poor national service integration.

As the distance from the point of generation increases to the consumer, transmission line energy loss increases. For decades we have tolerated average transmission loss ratios of 18 to 26%. In Queensland, Western Australia and the Northern Territory transmission line inefficiency exceeds that of India in some cases. Cheap coal and the lack of investment in remote areas, has allowed us to ignore transmission line inefficiencies and remote region diesel dependence. We have needed centralized base load power to overcome transmission line energy loss, energy waste, and related transmission line inefficiencies. Generating more energy than we needed to produce has always been at enormous cost to consumers. Some people have formed an almost religious fixation on base load power, not because it is actually needed in a 21st century energy system, but because they believe it is necessary to get ripped off by the energy cartels. We have burnt more coal and pumped more hydro at relatively low marginal cost because no one bothered to price the cost of pollution,

human health and the environment. Why does the consumer have to pay for the generation of excess energy that will never be consumed? No one has ever provided an intelligent answer to this simple question?

Professional opinions changed during the 1970's. Expert opinions changed again with the privatization of state electricity assets during the 1990's. Perhaps we can argue that; without the price shock of privatization; no one would have noticed the benefit of distributed renewable generation and grid embedded energy storage. When AEMO adopted the 95% EU transmission grid efficiency standards six years ago no one noticed that it was an unachievable standard without serious transmission grid investment. Imposing an energy wholesale market onto an ancient and inefficient energy transmission infrastructure during the late 1990's was the routine creation of yet another semi-autonomous government authority for a private business interest group. No one bothered to ask why consumers are paying for energy they would never consume. No one seriously considered the need for planned energy transition. The unshakeable faith in the artificial wholesale and retail markets we created assumed that energy companies would act rationally. Acting in the best interest of consumers has never been a strong point in a substantially unregulated market owned by overseas interests. Why should we assume rational market behaviour? Twenty years ago no one gave the idea of building a fully integrated HVDC national energy transition network any thought. No one in Australia had even heard of HVDC technology. Twenty years ago only a few thought of electricity as a basic public good and its supply an essential public service.

Constructing a NEM with this level of inherent political bias under the pressures of ill-considered long term state privatization plans demonstrate the most basic of truth's. The national electricity is broken. It has always been broken because it was designed for a 19th century technology without any consideration for consumers. The NEM was designed for electricity cartels and state governments to sell excess energy across state boarders. No one ever thought that all states must build a state electricity network that will meet all of its own energy needs first. There has never been any consideration for transmission efficiency, let alone technical proficiency and standards compliance for any privatized transmission asset. It is true that the later has involved its share of wishful thinking. For twenty years the discussion between NEM partners has been about state interconnectors. Even here the squabbles have been more about who pays. The discussion has never been about how best to achieve high quality service integration or designing a NEM for international double redundancy engineering standards. Pursuing a vague policy hope that the private sector would invest in the transmission grid must have involved hours of prayer to the god's of miracles. Hoping that the private sector would invest in state based distribution networks from efficiency dividend gains proved another privatization myth. For the last few years we have seen interconnectors between Tasmania and South Australia fail repeatedly. We have witnessed numerous transmission line failures from Queensland to South Australia. We have seen gas power stations, substations and distribution line failures at such alarming rates and frequency, that we have to ask; where have all the taxpayer subsidies, grants and ex-gratia payments gone? Surely, we have paid for those privatized state electricity assets twice over by now?

Divesting itself from a perceived distribution grid maintenance problem remains a popular state government priority. We still have the same toxic right wing economic theorists influencing conservative business groups and government policy. Ongoing privatization debates in New South Designing sustainable solutions for resilient communities

Wales and Western Australia stand in testimony to this failed policy agenda. The pro-privatization lobby for essential services remains brazenly oblivious to the utter failure of their agenda and the policy mess they refuse to take any responsibility for. There is only one thing that is clear about the electricity privatization experiment. Keeping the NEM going through storms and bushfires; on taxpayer grants, subsidies and emergency cash handouts for the last 25 years; is a miracle of emergency bush engineering. This has nothing to do with good policy or intelligent economic planning. It has more to do with dumb luck! It is too late to acknowledge that public ownership of key national assets are sacred and immutable government trusts. Few would dare to follow the Greens down that political path because wishing for the 'good 'ol days' is a luxury only minor parties can afford.

How do we fix the mess we have created at the most cost effective and in the most efficient way possible? Technically it is too late for a national gas energy transition consensus. It is regrettable that such a plan was not developed during the Howard government era when the principle of reserving sufficient domestic supply would have made good political sense. This would have at least addressed the problem of how we retire aging coal plants without significant generation loss. In a few months Australia will face a 1600 MWH minimum energy shortage. Building 1600 MWH's of new gas power plants in 12 month is simply not going to happen. Victoria's idea of bringing on line at least 1200 MWH of wind and solar ignores the question of grid embedded storage once again. Even Mr. Turnbull's 2000 MWH Snowy Mountain Hydro extension is unlikely to address the short term energy price affordability and security question in time. Everyone agrees that pumped Hydro is a good long term solution. Introducing a Snowy Hydro plan at 5 minutes to midnight has the desperate ring of a knee jerk political reaction by a Prime Minister facing electoral irrelevance. Neither the South Australian government, nor the Turnbull federal government are thinking clearly about the problem. They are both thinking elections. To put it simply! The problem is fixing the transmission grid and creating a minimum of 1600 MWH of new generation, whilst putting downward pressure on both the wholesale spot price and the average retail price. Everything else that politicians, the energy industry lobby, the Chief Scientist, or any other lobby group are trying to sell, is either complete rubbish, or self-interested hog wash. So how do we fix the problem? The answer is surprisingly simple.

Every building in Australia is a potential energy generator and self-storage facility. Every government building, school, crèche and hospital has the capacity to at least generate some of its own operating expenses, as the buildings reduce state electricity demand and contribute to Australia's emission target. What is perhaps even more perverse to Scott Morrison's Neo-classical accounting practices is the simple truth that long term budget savings are achievable as growth in employment and GDP filter through the economy. Let's agree on a national 20% government building energy self-generation and energy storage minimum. Let's agree on a 20% industry self-generation and energy storage minimum for all companies earning over $10 million per annum. This simple policy would fix our perceived energy shortage. This single policy would make the gas transition debate irrelevant. This policy would buy Australia time to fix our transmission network and build the Snowy Hydro project. This policy would also fix our wholesale energy spot price and put downward pressure on retail energy prices. Let me give you one simple example:

Australia's National Energy Master Plan

Australia has approximately 16000 government schools. 400 solar panels on each of them would produce 16000 GWH's of energy per annum. It would deliver this at about the same price as Mr. Turnbull's Snowy Hydro project. The difference is that we could install 16000 GWH of school rooftop solar in less than half the time of a Snowy Hydro. With an ROI of 4 years and a 15 cent per KWH FIT this program can be supplemented with both grid embedded and private energy storage. Not only will this simple policy reduce state energy demand and put downward pressure on prices, it will also stabilize the grid and add additional generation capacity. It also adds up to one hell of a 'Gonski' down payment. So why does the South Australian government bother with a Gas power station option? Why does the federal government think that a Snowy Hyrdo extension plan is a quick and cheap fix? Neither option is cheap or quick. Neither option addresses the critical issue of fixing the transmission grid or addresses the critical issue of energy price affordability. A 20% government building self-generation and energy storage solution reduces transmission failure risk through a localized self-generation policy. No insurance company can deny that the risk of storms, bush fires and floods are lower under a local self-generation and energy storage policy. No rational government can deny the long term cost savings this simple policy brings to the table. So why is no state or federal politician even talking about this simple, cost effective and highly desirable energy policy? The energy companies themselves are now adopting my 2012 proposal. They have worked out that higher profit margins and lower operating costs add significantly to their bottom line under the existing market regulatory environment. Once again we have a federal government offering grants for what is sold to the public as a world first virtual power station. How gullible is Josh Frydenberg? Truly frightening! Let us all join in prayer for the arrival of 'smartgov.au' sometime in our life time.

Executive Summary

Australia's 21st century National Energy Plan recognizes that the vast majority of the energy we consume will be generated a few hundred meters from the point of generation. As every building becomes both a small scale distributed power plant and an energy storage facility, Australia's international emission obligations will become a past memory. Embedded grid storage at substation level will be supplemented by mandated wind farm storage. Even the idea of separate wind and solar farm facilities will become redundant, as Australia adopts India's policy of building combined solar and wind farm facilities with mandated molten silicon or other suitable storage options on site. A national pumped hydro scheme will provide the backup electricity supply for power hungry manufacturing plants. The transmission grid will be extended to cover all states and territories with a mandatory high efficiency HVDC or other suitable transmission network technology. Far from being an essential supply aspect, the 2050 transmission network will perform the function of supplementing local state supply. Energy routing and load shifting between smaller localized grid embedded smart-grids will become the norm rather than the exception. Load sheading will be confined to the annals of history as energy companies recognize their expensive and inefficient past. Energy security and price affordability will be defined by a dual pricing system. This pricing system will differentiate between the lower cost of local smart-grid generation and storage, and compare it to long haul transmission from remote distributed generators. This dual pricing system will force high energy users to enter into local renewable supply purchases or invest in self-generation and off peak storage supplements. A gas to renewables transition policy will become evidently redundant as demand side electricity capacity markets fully integrate with Australia's 100% emission reductions

Designing sustainable solutions for resilient communities

policy under a full national energy security and price affordability market framework. Breaking up the existing state owned cartels into smaller self-generating smart-grids produces no market losers, as energy companies reap the profits from lower operating expenses and lower market volatility.

The notion that an ETS (Emission Trading Scheme), EIS (Emission Intensity Scheme), FCP (Fixed Carbon Price), LET (Low Emission Trading) scheme, C&T (Cap and Trade) scheme to facilitate a coal and gas transition will be relegated to outmoded economic thinking. Much has been said about the need to provide national investment clarity through some type of artificial subsidy scheme. Any type of reverse subsidy is only necessary if we are considering a coal to gas and gas to renewable transition policy. Jumping across the gas transition gap directly to a distributed localized self-generating smart-grid option makes these types of schemes largely irrelevant. It makes them irrelevant because local smart-grid 'prosumers' will deal directly with their respective energy distributors. This will eliminate the entire retail end of the market and force down prices by up to one third immediately. The practice of supplementing smart-grid self-storage with cheap off peak grid supply further reduces costs to consumers and ads to energy security. The introduction of a NZE (NET Zero Emission) scheme for industry and a NCE (Negative Carbon Emission) scheme for self-generating localized smart-grids, is a far smarter policy then any ETS, EIS, LET, Fixed Carbon, Cap & Trade or any other reverse subsidy scheme. This is especially true when the NZE and NCE schemes are structured under a low interest Green Bond as well as a federal tax credit that rewards emission reductions under a recognized fixed term project maturation plan. Industry benefits are clear. Lower electricity costs combine with additional income streams that deliver gains under properly managed international carbon market obligations for developed nations. As existing fossil fuel subsidies are transferred into the NZE business market, large institutional investors and insurance companies will rapidly scale up their valuations of Net Zero Emission businesses. Institutional investors have no appetite for future stranded assets. They do have an appetite for companies that offer better returns by reducing risk and lower operating cost. In the same token, they have an interest in community smart-grids because they are Negative Carbon Emission projects. It doesn't even matter whether these Negative Carbon projects are jointly owned between community groups, private investors and energy companies under a national rule based market regulatory framework. What is important is that each closed self-generating smart-grid offers a secure long term return on investment as each delivers multiple value add benefits to communities and the nation as a whole.

This is Australia's Roadmap 2050. It is a roadmap for a sensible lower cost renewables transition plan then any state or federal government option on the table right now. It is the best solution for a sensible and inevitable 21st century energy system that takes into consideration national productivity, jobs and growth. It is the only National Energy Plan that will deliver long term energy security and price affordability now.

Submission assumptions

This submission to the 'Senate Inquiry into modernizing Australia's electricity grid' will focus on providing coherent and economically responsible solutions to the problems of energy security, price affordability and grid integrity within a national investment, growth and jobs framework. Several assumptions underpin this submission.

- Regardless of whether the Turnbull government achieves some type of industry consensus on LNG supply security; any agreements on new gas exploration, subsidies, or state government by-back of previously nationalized generation infrastructure; will not impact on transmission and distribution grid integrity. Any expenditure on coal to gas conversion generation or securing new sources of CSG or LNG supply does not solve the integrity and energy security issues facing the transmission and distribution grids in the NEM, Western Australia, the Northern Territory or remote areas in Australia. No new clean coal construction projects will impact on transmission and distribution grid integrity. This submission assumes that irrespective of whatever coal or gas transition strategy is adopted, both options will force up energy prices without any impact on supply security.

1.) The practice of re-commissioning or purchasing new diesel generation by farmers and industry as a means to address supply and price affordability issues will not be sustainable in the long run. This strategy will undermine Australia's international emissions obligations and leave regional Australia vulnerable to international petroleum market fluctuations. This submission assumes that Australia will attempt to buy international carbon credits in order to meet its international obligations to offset unmet emissions targets. It is further assumed that neither state or federal governments will be able to address the regional energy supply and price affordability issues using the existing AEMO 'steady as she goes' energy supply side strategy that AEMO promotes for the benefit of its own energy cartel stakeholders. This submission assumes that all government attempts to deal only with the energy cartels to address supply security will fail unless a comprehensive wholesale and retail energy market regulatory framework is put in place with the support of all state governments.
2.) State governments aiming to meet coal power station supply shortages by ramping up large scale wind and solar farm approval without mandating an energy storage policy for new and existing wind and solar farms will find themselves locked into long term PPA agreements that are payable under load shedding conditions during transmission network failures and technical outages. PPA agreements are forward purchasing contracts payable regardless of whether the energy produced is supplied to customers. The inefficient and costly Western Australian energy stands in testimony to this. In a marginal energy growth market these PPA agreements can see wind farms idle and solar farms wondering where to sell their energy as state inter-connectors fail or are offline for maintenance. Since PPA contracts still require to be paid regardless, NEM states can face the prospect of paying wind and solar farm operators for energy that is not produced because it simply can't be sold. Without a national plan to upgrade and maintain a national transmission network that complements the roll out of distributed wind and solar farms, there is no supply or price affordability guarantee. Without mandating grid embedded energy storage to strengthen national transmission networks there is no energy supply guarantee. There is only a guaranteed energy price increase without energy security. This submission assumes that no agreement on upgrading the NEM or extending it to Western Australia and the Northern Territory will be reached during the Turnbull government tenure.
3.) This submission assumes that state governments will be reluctant to support any reform of the energy markets under their jurisdiction. In particular, reforms that impact on the revenue they are collecting in the form of taxes, royalties and hidden fees and charges. This

includes all daily charges and supply charges currently levied to domestic and industrial customers. This submission assumes that state governments will only agree to wholesale and retail market reforms that will not threaten their current energy income streams.

4.) This submission assumes that energy companies will be reluctant to offer solar rooftop customers a better return on their investment. This includes any changes to retail market conditions that will lower energy costs and allow for greater market competition through a mandated unrestricted 3rd party grid access policy. Both federal and state governments will be reluctant to enforce anti-cartel and anti-competition policies in the fear of a mining and energy company electoral scare campaign; or worse, a Californian style denial of service campaign.

5.) This submission assumes that a federal government clean coal energy security option will fail. The cost of clean coal technology and the public's unwillingness to accept outdated generation solutions that do not address energy price affordability and supply security will remain a ball and chain around the Turnbull government's neck unless the national LNP coalition can silence its ultra-conservative right wing. We assume that the Turnbull government national executive will attempt to grasp at partial compromise solutions without addressing the core of the energy price affordability and supply security problems as key industry lobby groups will flex their muscle behind closed Canberra doors.

6.) This submission will assume that a federal government Hydro energy security option will remain a long term investment solution that will not fix Australia's 2018 energy security and price affordability issues.

Recommendations to the Senate Inquiry

It is recognized that some of the recommendations below will be harder to implement then others. States that have entered into long term energy supply agreements, following the privatization of their electricity networks, may find considerable resistance under existing contract restraints. This is despite the fact that all recommendations are designed to provide electricity companies with substantial lower operating cost advantages and new business opportunities. Investment clarity arising from the recommendations outlined below is no threat to individual Utility company market share and underlying profitability.

Changes to COAG renewable energy rules

Current COAG rules restricting private solar installations to 100 KWH's and small wind to 10 KWH's. Both rules should be scrapped because they are irrelevant. These rules enforce electricity company cartel behaviour including the implied restriction to network access. Rule interpretation by state public servants and energy executive insistence on the grounds of network instability are nonesense. A COAG rule that provides unrestricted grid access to any 3rd party proposing a distributed hybrid self-generation and storage solution in an urban or rural smart-grid setting should replace the existing COAG rules. This policy would reduce overall Utility company cost structures without restricting market share. The removal of these COAG rules do not reduce or threaten market share because excess domestic rooftop solar and small wind generators would still be supplied to distribution companies even if returns for domestic 'prosumers' are increased to 15 cents per KWH.

Reduced transmission costs and energy purchases from remote generators will deliver enormous cost savings to energy distribution companies even if they purchase locally produced power at a higher price. The increased availability of domestically produced power under lower transmission cost conditions will put downward pressure on the wholesale energy spot price, increase energy forecasting reliability and stabilize the energy market during high demand periods. US and the EU modelling demonstrate that short term extreme wholesale spot price volatility produce lower profit returns to Utility companies in the long term even under extreme short term spot price conditions. The reverse is true under stable long term energy supply conditions. The greater availability of locally produced renewable power eliminates the outmoded practice of load shedding. Better grid management practices such as load shifting, load sharing and load routing are available with the addition of grid embedded storage as distribution companies manage supply between closed smart-grids over shorter distances. The inclusion of smart-grids and embedded storage facilitate better grid managed practices whilst demonstrating higher long term marginal returns to Utility companies. This is achieved by enabling enhanced supply security under intelligent distribution grid integrity standards. The outmoded practice of load shedding common in Australia is a low long term profit option for Utility companies. It is also unacceptable, entirely unnecessary and very costly to consumers and business. The fact that AEMO continues to use this method as a means to protect grid infrastructure, merely highlights AEMO's culpability and the utter failure of responsible energy policy at all levels of the national energy market.

Anti-Cartel and Competition Reform

1. The wholesale spot price bidding process time period should be reduced from a half an hour to 5 minutes. The most critical change is the wholesale spot price payment authorization period. This time interval should be reduced to five minutes. This will restrict spot price market manipulation and open the market to a variety of energy storage solutions such as battery, heat exchange or other rapid ramp up technologies.
2. Unrestricted 3rd party distribution grid access will allow community groups and local councils to put downward pressure on spot prices by lowering the daily energy demand extremes whilst providing an energy storage reserve for high demand periods. Self-generating and self-managed smart grids with embedded storage will not only increase grid integrity and supply security; they will also address issues of cyber security, transmission and distribution outages due to maintenance, storm failure, spot price manipulation and other reasons. Unrestricted 3rd party grid access guarantees will provide federal and state governments with the necessary time to upgrade and extend Australia's aging transmission networks. This will allow for proper long term investment planning without undue stress on current state and federal budgets.
3. Regulating 3rd party distribution grid access will require independent oversight of grid usage and data rules. A distribution grid leasing price scheme for all 3rd party smart-grid users should be mandated under a new independent federal energy security and pricing commission. Current state regulations are inadequate and subject to undue AEMO and NEM (NEO) stakeholder influence. Removing the influence of energy company influence on these semi-autonomous government departments is a fundamental regulatory reform requirement.

4. Even though it is recognized that some self-generating smart-grid communities may wish to make a management agreement with their respective distribution company, rules that protect smart-grid communities from stored energy syphoning must be mandated. This includes a national guaranteed minimum return for all excess energy sold to energy distribution companies. A separate pricing arrangement that more closely reflects spot price reality should be mandated for Utility access to all storage energy reserves so that energy storage owners receive a fair return on their investment.
5. Smart-grid management software by definition manages supply and demand within a closed mini grid. The removal of all smart-meters from inside closed smart-grid communities will ensure data integrity, privacy and billing data ownership for all smart-grid customers. A Utility owned smart-meter should only exist at the edge of the closed smart-grid to allow communities to export excess energy to supplement supply during self-generation and storage shortages. This will allow communities to charge batteries and other storage devices from the grid during low demand / off peak periods, whilst maximizing their energy export during peak demand times. This will enable more efficient distribution grid management and lower consumer electricity charges.
6. Limiting smart-meter location to the edge of a closed smart-grid will dramatically reduce data management and data warehousing costs for Utility companies. This will further enforce electricity price stabilization trends and lower Utility company costs.
7. Community owned smart-grids will eliminate the fake energy retail market. Smart-grid customers will negotiate directly with distribution companies. This will make the current retail market irrelevant. This will immediately reduce energy prices by up to one third.
8. Fundamental reform of the Australian electricity market and competition review must precede the introduction of any emissions subsidy scheme regardless of the form it takes. Introducing an emissions subsidy program of any type without reforming both the wholesale and retail electricity markets first is simply nuts.

Consumer Affairs Laws

Smart-meters have nothing to do with smart-grids. Smart meters are designed as a billing leakage device. They are also not very smart. Smart meters do not adjust for summer daylight savings periods. This robs customers of an additional 8-14 cents per day without their knowledge for approximately 100 days every year (US data). In a closed smart-grid environment they are regarded as an illegal and entirely unnecessary third party device. Smart- meters are also a cyber security risk. There are several existing devices that can be plugged directly into any power point that can detect smart-meters within a 1 km radius. In fact, two weeks ago I was offered an Australian device that can be embedded into a distribution grid by attaching it to existing power polls. The vast majority of smart-meters installed in Australian domestic and commercial premises are manufactured in India for less than $80 USD. Their Australian installation costs, not including ongoing charges, often exceed $500 AU per premise. The ICE-group in association with an Indian University conducted a student research project in 2012 -1014. Undergraduate electrical engineering students produced a simple device that can not only detect any grid connected device within a 1 km radius, but they discovered a relatively simple procedure to hack smart-meter firmware. Even though it is unlikely that we are likely to gain an import license for this device; for which we own an Indian patent; the exercise demonstrated the cyber security threat smart-meters pose to Australia's electricity grid.

Smart-grid management software manages all data and electricity demand between all smart-grid members in real time. Typically smart-grids are firewalled from the wider distribution grid by a variety of security precautions. As a consequence, smart-grid members own their billing data. Joint cyber security tests conducted by Indian, EU and US/ Canadian Smart Grid Inter-operability panels in 2016 demonstrated no cyber security threat to current smart-grid software and hardware despite a substantial prize offered to international and Indian hacker groups.

Under current Utility billing arrangements customers do not own their billing data. This makes billing dispute resolution problematic. This is particularly true when customers require fully itemized billing information. At present, Utilities issue bills that contain daily charges, connection and supply charges as well as half hourly usage charges. However, the cost for these daily charges as well as connection charges etc., are never itemized. As consequence, consumers are left in the dark about what these charges are and their true amounts. Issuing bills that contain undisclosed billing items is contrary to Consumer Affairs best practice. Concatenating multiple hidden billing items under a common billing label without itemized clarification of what constitutes these billing items is misleading. It is a practice that must stop. Consumers have no guarantee under the present billing practices that labelled billing items are not duplicated under separate charge categories.

1. It is recommended that that Utility customers own their own billing data.
2. It is recommended that Utilities fully itemize their bills including all daily charges, connection charges and all other hidden fees and charges currently unspecified on Utility bills issued to customers.

In fact, the immediate authorization of independent community and council owned smart-grid implementation would automatically solve both these problems. It would also reduce Utility data management and data warehousing costs whilst enabling the establishment of new services. For example:

Utilities could offer E-credits for excess 'E'nergy sold to the grid. These E-credits could be used for a variety of new services. These services can include the payment of council rates, water and gas bills, aged care and home services. The implementation of an integrated E-credit banking service would not only assist our most vulnerable community members by reducing billing stress, it would also provide councils with a better way to managed aged, disability and home care services through a guaranteed payment services. Other examples for an integrated E-credit banking facility are shopping and petrol vouchers among many others.

The Turnbull government is currently implementing a budget strategy that rips the heart out of essential services. The implementation of an E-credit banking facility can easily provide a better value proposition for future federal social service expenditure, whilst addressing the needs of the working poor and Australia's most marginalized community groups. Better and more efficient management of federal and state budgets are the current Federal Treasurer's mantra. Thinking, innovatively and delivering sustainable budget solutions must be a necessary part of this paradigm shift in intellectual sophistication. Self-managed and self-generating smart-grids with energy storage can deliver a 2050 Roadmap to better services and lower emissions now. It can be delivered with existing technology much faster and at a lower cost then all other alternatives. Australian's are in

desperate need for a 'smartgov. au' National Energy Master Plan that makes sense. We need long term investment certainty,energy security and price affordability. What is the problem? We know what needs to be done. Why is it not getting done?

Transmission Grid Upgrade

Despite adopting EU transmission grid standards, years of neglect and poor redundancy planning leave many Australian's wondering what happened to all the money we have spent on gold plating the NEM. There is little doubt that a second interconnector between Victoria and Tasmania is badly needed. The same can be said for an interconnected between South Australia and New South Wales. Extending the NEM from South Australia to Western Australia would further enhance South Australia's energy security as the difference in time zones between the two states brings online cheap solar and wind power. By 2050 the NEM will encompass the Northern Territory and remote Queensland Aboriginal communities. This long term HVDC 2050 Roadmap for Australia's transmission grid will provide necessary connection capacity for conventional wind and solar farm and hydro projects. It will replace our ancient centralized coal and gas facilities as the national transmission grid assumes it's proper role as a national electricity supply backup service.

It is not a question as to whether this will happen. It is more a question of how to plan the staggered investment over time to make it happen. It is a question of taking care of the most urgent upgrade tasks first, before committing taxpayer resources to secure the long term vision of the national NEM. We can buy time by dividing the various state based grids into smaller self-generating and self-managed smart-grids. This will allow Australia time to stagger both the cost of transmission grid embedded energy storage solutions as well as key upgrade options, whilst stabilizing energy supply security and price affordability. Stressed state and federal budgets require intelligent and responsible infrastructure investment decisions. All energy infrastructure planning is by necessity long term. Strained government budgets demand responsible budget management. Western Australia's royalty for regions program clearly is not a good example of responsible budget management. In the same token, federal fossil fuel subsidies, state government red tape and waste, need urgent attention. The endemic state practice of using energy infrastructure as a cash cow will simply not cut it. Running cap in hand to the federal government to fund transmission grid upgrades is simply poor policy planning. Even the idea of re-nationalizing key generation and grid infrastructure is a laughable option. How often does the Australian taxpayer have to bail out privatized state electricity suppliers, when these same companies repeatedly demonstrate no commitment to maintaining a quality infrastructure standard. AEMO has adopted an EU transmission standard without any commitment to enforcement or compliance. Which government has allowed this irresponsible and incompetent organization to flourish? Under these circumstances it is understandable that the federal government is reluctant to provide funds for transmission grid upgrades.

There are options:

Instead of nationalizing the transmission grid, any future state and federal government transmission infrastructure funding agreement might focus on retaining key transmission grid elements in public hands. These are:

1.) Inter-connectors and
2.) Substations.

By retaining overall ownership / management of both inter-connectors and substations government effectively controls the national electricity market. This will provide considerable regulatory leverage in the management of the electricity market. If the federal government considers a joint private and state investment transmission grid infrastructure upgrade plan, retention of strict audit oversight conditions should be mandated as part of any joint investment proposal. This option is more palatable if all smart-grid recommendations proposed in this submission are implemented. The reasons for this should be obvious by now. The weakness of the entire Australian electricity market is that all state and federal governments have done nothing in addressing the demand management side of the electricity market. Assuming that energy companies are capable of self-regulating without exploiting market loopholes is a pipe dream. Allowing state governments to set their own market regulatory standards when they are beneficiaries of market manipulation practices; as well as constrained by long term electricity privatization contract agreements; is not only a conflict of interest, but a legal nightmare. The most efficient compromise that offers a wining solution to all stakeholders at the lowest cost is dividing state grids into smaller smart-grid units and installing grid embedded energy storage at the transmission / substation level.

How do we pay for it all

The Federal Treasurer appears to have ruled out a 30% tax reduction in return for a 20% renewable self-generation, energy storage / industry and community smart-grid energy demand management program. It is uncertain whether the Federal Treasurer has also ruled out the introduction of a green bond infrastructure scheme. There are rumours that a social housing bond scheme will be introduced during the first quarter of the 2017 budget period. Whether the federal government is thinking that this bond scheme can be extended to include a community owned energy self-generation smart-grid program is unclear. It certainly seems stupid not to mandate a zero carbon housing option if the government intends to introduce a government housing bond scheme. Anecdotal evidence suggest that governments of any persuasion or not very good at delivering integrated solutions that offer multiple outcomes to multiple portfolio problems. It is simply a no brainer to mandate that all new housing built under a proposed government bond market scheme must also deliver a substantial Climate Change, energy security and price affordability benefit. However, I may be wishing for too much here!

Nevertheless, there are several other funding options that can accelerate the above outlined solutions. These are:

1.) Progressively shifting/ phasing out existing fossil fuel subsidies.
2.) Implementing a green bond infrastructure scheme to pay for electricity transmission grid upgrades under market price conditions instead of a government low interest guarantee.
3.) Implementing a green community smart-grid bond scheme that will allow local governments and community groups to build their own smart-grids through a state managed bond market scheme

4.) Encouraging institutional investors to invest in regional and urban smart-grid projects secured by council rates and existing housing stock values under market bond rates under a state green bond scheme
5.) Introducing a carbon export levy on all coal, gas and related mining exports. It makes no sense that Australia should subsidize these exports so that international customers (eg. India) can impose a carbon import levy on Australian commodities. Exporting Australian subsidies simply makes no sense at all. (Note: This option would probably cause the mineral council to go into an apoplectic fit. So I don't think it will ever be considered.)
6.) The implementation of some type of ETS or EIS emissions liability program should be considered after all of the above mentioned regulatory loopholes have been fixed. The difference between an ETS and an EIS compliance mechanism is marginal. An EIS scheme is a compliance penalty. An ETS scheme is a liability deferment method. Introducing an ETS or EIS scheme without fixing the wholesale or retail market regulatory loopholes is stupid. It will not work. It will only increase energy prices. It will reward energy companies for doing nothing about energy security and price affordability because neither is measured as an emission liability. It is therefore bad policy. Neither scheme should be considered until a comprehensive wholesale and retail national energy regulatory framework has been implemented. However, if the Turnbull government implements all of the above recommendations, there is no reason why an ETS scheme cannot be front loaded onto these recommendations. There is also no reason why an EIS scheme cannot be loaded to the backend of the above recommendations as a compliance and emissions enforcement penalty. If the government would include a 20% self-generation carrot in return for a 30% tax deduction, front loading an ETS emissions deferment scheme would automatically entail an EIS penalty. Thus, nullifying the 30% tax credit. In the same token, EIS none compliance would force an automatic loss of the 30% tax credit as well as incur an additional non-compliance penalty. In short, the system would be self-reinforcing as each 20% self-generation project period set for e.g. a 4, 6, 10, 15 or 20 year bond maturation term, entails the mandatory emissions target obligations defined under the contracted green bond investment mechanism. Since the Federal Treasurer has ruled out a 20% self-generation option in return for a 30% tax deduction, we can only assume that the government may be thinking about a government guaranteed low interest bond scheme similar to the muted social housing investment idea. Implementing an ETS, EIS /fixed carbon pricing (any other scheme) under a subsided bond scheme amounts to little more than a subsidy merry go round without any real investment teeth. Emission compliance has to contain some type of enforcement option in order to be effective. A government subsidized low interest green bond scheme could run the risk of attracting projects that are eligible for a federal low interest loan, whilst duplicating emission reductions targets subsidized under an ETS or EIS (or other arrangement). For example: A company eligible under a state based scheme qualifying for an additional federal subsidy under the Gillard government fixed price carbon was a subsidy duplication across two jurisdictions. It was therefore an inefficient, ineffective waste of money. Another example would be a mining company proposing an emission reductions programs. This program could attract a state electricity subsidy, a federal low interest green bond as well as an EIS kick back whilst the company sells its ETS liability into

an offshore forestry project. This makes a low interest federal bond scheme not very smart economics. A low interest government guaranteed green bond scheme on top of a 30% tax break is also not smart economics. A low interest loan scheme without a self-regulating emissions compliance mechanism is an unworkable joke because there is no compliance or emission enforcement mechanism. A 30% tax rebate option linked to a market based bond rate would provide a more realistic indication of the market viability of the project under standard investment risk analysis. Why? Because institutional investors could make a realistic risk assessment of the project by factoring into the equation the tax deduction for the bond maturation period at market bond price value. This method of funding would also have a lower overall federal budget impact.

7.) A mandatory 20% self-generation, energy storage or clean energy purchase policy would demonstrate the government's renewable energy commitment to the markets. The program must cover all federal, state and local owned buildings in the first instance. For this policy initiative a government low interest backed green bond scheme may be more appropriate then a market rate bond option. The benefits of the emission reductions, energy savings and new clean energy income stream impact on future reductions in federal budget expenditure as well as government efficiency and productivity gains. Let me give you an example: 11 years ago the department of education conducted a carbon impact audit. The department assume a $10 per ton carbon price and estimated its total national carbon liability in excess of $50 billion per annum. A simple round number calculation that assumes the installation of 400 rooftop solar panels per government school with 15 cents per KWH FIT on a four year ROI delivers an annual income of $75,000 per school. This does not include energy savings, carbon credits or asset repayments. However, this simple example is sufficient to demonstrate the point I am trying to make. The state of Victoria has roughly 3000 public schools. There are approximately 16,000 public schools nationally. The national projection of this simple example produces an annual energy self-generation output of 16,000 GWH and a total education department income over 1 billion dollars per year every year. Naturally I don't want to wake the pink batts and school halls ghosts. Careful planning and appropriate checks and balances coupled with clear project management oversight should leave those skeletons well and truly in the cupboard. What is far more important is that this simple example represents a substantial annual 'Gonski' down payment. The plan has additional Climate Change, jobs, growth and national productivity implications whilst lowering electricity demand, increasing energy security and tackling price affordability. Mandating a 20% self-generation, energy storage or clean energy purchase mix for all local, state and federally owned government buildings, represents a serious shot in the arm for the Australian economy. It also demonstrates Australia's international carbon commitment.

8.) A mandatory 20% industry self-generation, energy storage and green energy purchase policy in return for a 30% tax cut for the duration of the green bond term under both an industry and a government building self-generation and storage policy mandate can deliver real options for Australia's energy security and price affordability mix. This is especially true if we implement a state wide smart-grid program. Call it a virtual power station or embedded mini-grid program. No one cares what we call it as long as we implement a demand side capacity market mechanism that works in the interest of consumers.