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Dr Kerry Schott AO
Chair
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Dear Dr Schott

Ref: Response to the ESB's post 2025 market design issues paper

Thank you for the opportunity to provide feedback on the issues raised in the above paper. This is a joint personal response from Mr Gujji Muthuswamy and Dr Ross Gawler, and does not reflect the views of any organisation. We both strongly feel that, as in the 1990s, the electricity industry is at a transformative moment and this consultation process is an opportunity to look at some basic issues. We hope that the points made in this submission will assist the ESB in its deliberations on the post 2025 market design.

Introduction of the authors

Gujji Muthuswamy has worked in the Victorian electricity industry for about 35 years - before, during and after introduction of competition and privatisation in the electricity industry - in diverse areas such as research, corporate strategy, energy risk and general management, network strategy and tariffs, business planning, carbon markets, micro grids, board membership and consultancy. He has also designed and lectured on carbon pricing in Monash University.

Dr Ross Gawler has 41 years of involvement in the electricity industry as a professional engineer, electricity market consultant, and more recently as a researcher examining the electricity generation and transmission planning process for decarbonisation. He has been involved in developing methods for and applying transmission performance assessment and planning, integrated resource planning, and electricity price and revenue forecasting.

Summary

The post 2025 market design project of the ESB is a welcome and ideal opportunity to consider energy market design issues from a long- term perspective. The recommendations in this submission cover a range of factors to be considered in the market design:

1. ESB should request COAG to enshrine environmental considerations in the National Electricity Law, for example: an additional National Electricity Objective such as "sustainable development and minimal impact on the environment including greenhouse gas emissions" or a Ministerial Council policy guidance, such as "AEMC should take into account government's GHG emissions reduction policies."
2. An independent and comprehensive survey of a wide spectrum of customers across the country should be undertaken by the ESB in order to supplement the inputs it gets from its usual stakeholders consultation process.
3. The ESB should use the Customer Survey to better understand the extent of society's preparedness to accept trade-offs between the potential principles underpinning the post 2025 market design.
4. ESB should consider explicit referencing of societal / customer understanding and expectations when developing different scenarios for analysis.
5. ESB should request the Productivity Commission to conduct an evidence-based research to assess (i) the extent to which the assumptions supporting the 1990s reform of the electricity industry have proven correct, particularly the views of customers and the society and (ii) what lessons might be applicable to the post 2025 market design. (See Attachment 1 for more details)
6. In addition to the proposed computer modelling and other analyses, the ESB should consider running a large-scale Pilot Trial based on a simplified concept of a future market to promote a wider understanding of the working of the energy market and the likely behavioural aspects of the market participants under different conditions.
7. Potential high levels of DERs and storage call for the ESB to:
    a. look at the operational and funding features of two other major infrastructures - gas and road transportation system- to see if there are any applicable lessons for post 2025 market design, in particular the transmission system. It would be best for AEMO to plan and build the transmission augmentation using a competitive tender process.
    b. set up a process to identify the market conditions under which of network services currently provided could be opened to wider participation and competition.
8. ESB should ensure that any post 2025 market design model consider two sub sets for each of its scenarios – with and without carbon price.
9. The use of an administered Climate Change Levy for the energy sector, to fund national climate change mitigation and adaptation efforts, based on the trade weighted carbon prices existing in our 10 top trading partner nations, should be considered as an interim measure until a national consensus over a market-based carbon prices is achieved. (See Appendix 2)

1.0 National Electricity Objectives

The National Electricity Objectives (NEO) in the National Electricity Law (NEL), as quoted in Page 4, Section 1.1. of the report, include price, quality, safety, reliability and security of supply and the system. However, there is no reference to the impact on environment or resource availability. It is implicit that such matters are external to the electricity industry and managed by other mechanisms. Assuming such references do not exist elsewhere in the full text of the NEL, it would be an opportune time to expand the NEO to include "sustainable development and minimal impact on the environment including greenhouse gas emissions". This would support the other existing objectives by providing clarity on the glide path for the decarbonisation transition. It would provide the basis for the AEMC to formulate a carbon trajectory for the industry in the absence of a national policy. It would make the NEO more wholistic in relation to the global responsibilities of the electricity sector.

1.1 Recommendation:

ESB to request COAG to take steps to enshrine environmental considerations in the National Electricity Law, for example:

- An additional National Electricity Objective viz, "sustainable development and minimal impact on the environment including greenhouse gas emissions" or
- A Ministerial Council policy guidance - such as "AEMC should take into account government's greenhouse gas emissions reduction policies"

2.0 Consultation

2.1 Comprehensive customer / community survey

Given the broad scope of issues under Review, it is essential for the ESB to reach out beyond the usual process of stakeholder consultation to get a good understanding of what the society at large wants from, and is willing to pay for, energy supply and services.

This issue is closely linked to the general level of awareness and understanding of the complexities of the issue. Inputs from within the beltway, e.g. the usual cohort of energy businesses, large energy users, residential customer representative bodies and NGOs will not be enough for the ESB to get a handle on what customers at large think about energy.

A comprehensive and independent stratified random survey of a large sample of *customers from different regions, sectors, customer segments and economic strata* to be carried out by the ESB would provide a richer perspective of the Australian community sentiments.

In brief, the survey should help understand where the society stands in matters of trade-off between competing criteria – for e.g. reliability level vs willingness to pay; lower greenhouse gas emissions vs cost; willingness to participate vs complexity of the market design; the mix of public versus private ownership as DER becomes the norm. Above all, such an independent survey would provide a solid evidential base for politicians and policy makers. It can be a combination of on-line, phone, paper surveys plus some face groups and detailed one to one with a few.

2.2 Scenarios description

The features of the five scenarios mentioned in Pages 8 -9, Section 3.3. of the Issues Paper address the customer / societal views only implicitly as, for example, an imputed link between DER penetration and customer perspectives. This may not provide sufficient granularity when comparing the different scenarios at the latter stages of the study. Societal and customer perspectives is an independent variable, while DER penetration is the dependent variable.

ESB should consider, for the purposes of the paper, making explicit reference to societal views in its description of scenarios.

For example, e.g. "Slow Change" could be expanded to add "low societal understanding of, and a high level of disenchantment with, the sector"; similarly "High DER" should include in its description "a medium level of societal understanding and a positive engagement with the industry."

2.3 Assessment Frameworks

The paper lists potential principles in Section 3.5, Page 10, A to L and states that "there are trade-offs between the potential principles" listed points out the trade-offs between these principles. These trade-offs should not be seen as either/or binary choices. It is more about the level of short-term pain the society is prepared to bear for longer term gains in reliability, affordability, clean energy and benefits to future generations. Examples of such trade-offs is:

- Consumer Empowerment G), Transparency (F) and Practicality (B) on the one hand, and Economically efficient markets (A), Appropriate cost allocation (D) and Appropriate risk allocation (E) on the other.
- A carbon price that increases the cost of energy but assists in the society's ability to tackle both climate change mitigation and adaptation over the long term.

The extent of the cost that the society is prepared to accept for long term benefits is a matter for judgement. The proposed stakeholder consultations would help the ESB in making such judgements. The Customer Survey should also help the ESB in getting a much better feel for the societal perspective and its diversity across the range of political and socio-economic positions.

2.4 Have the customers and society benefitted from the NEM over the last 20 years ?

Four key economic orthodoxies drove the 1990s reform of the Australian energy industry:

Private ownership of electric utilities is inherently more efficient than state ownership of the same in delivering lower prices over the long term.

- Private ownership of electric utilities is inherently more efficient than state ownership of the same in delivering lower prices over the long term; this view was more dominant in Victoria in the 1990s than in other States.
- Competing generation and retail entities will ensure the prices are kept at the lowest level due to market pressure.
- Natural monopolies, i.e. transmission and distribution, will be more efficient under private ownership and their market power can be kept under control by light-handed regulation, and

- If the above three are implemented, short and long- term investments by private sector will be driven by market forces and technology costs and customers will enjoy low prices and better services with minimal, if not zero, Government intervention

It is arguable if these have been achieved the last two decades and if customers and the society have benefitted from the market reforms. Significant price increases and the prospect of Government intervention in the market suggest otherwise.

2.4 Recommendations :

- An independent and comprehensive survey of a wide spectrum of customers across the country should be undertaken by the ESB in order to supplement the inputs it gets from its usual stakeholders.
- The ESB should use the Customer Survey to better understand the extent of society's preparedness to accept trade-offs between the potential principles underpinning the post 2025 market design.
- ESB should consider explicit referencing of societal / customer understanding and expectations when developing different scenarios for analysis.
- ESB should request the Productivity Commission to conduct an evidence-based research to assess (i) the extent to which the assumptions supporting the 1990s reform of the electricity industry have proven correct, particularly the views of customers and the society and (ii) what lessons might be applicable to the post 2025 market design. (See Attachment 1 for more details)

3.0 Modelling

The Issues Paper foreshadows extensive modelling and other analyses of different options to understand how a model would work. In addition to this necessary work, the ESB should consider running a Pilot Trial of NEM 2.0 with live participants from across the stakeholder spectrum.

The aim of any Pilot Trial of a simplified NEM 2.0 is largely pedagogical and as a communication initiative in that a large cohort of potential market participants, policy makers, politicians, the public get a broad understanding of how the market might work in a simulated environment that is non-binding financially and also affords the scope for research in behavioural economics. This can be done on a large scale on the internet like many internet-based trading games, as well as face to face in myriads of class room settings, community groups and industry workshops.

The author can recall a similar Pilot Trial of the competitive wholesale market that was done in the early 1990s before the commencement of "Vicpool", that was introduced ahead of the full NEM design. Another example is the laboratory simulation of a cap and trade emissions trading system that run by the author for students in Monash University which made it easy to put across the concept of carbon price discovery under an ascending clock auction mechanism.

It is conceivable that the absence of a bi-partisan policy approach in Australia is due to inadequate pressure from society at large on their MPs as opposed to the views of the cognoscente which the political class is well equipped to bat away. It is also possible that the complexity of the energy market doesn't encourage the public to be anything but passive, customers, somewhat disgruntled with the current nexus between affordable, reliable and clean energy. A well-informed society on these complex, but existential issues of energy and climate change, is a necessary precursor for the development of sustainable long-term energy and emissions policies.

ESB has a role to play in promoting large scale diffusion among the society of how the future energy market could work, and the Pilot Trial of NEM 2.0 is one such method. The pilot trial can be seen as communication/ pedagogical / test bed tool to tease out new aspects of market design.

3.1 Recommendation

> In addition to the proposed computer modelling and other analyses, the ESB should consider running a large-scale Pilot Trial based on a simplified concept of a future market to promote a wider understanding of the working of the energy market and the likely behavioural aspects of the market participants under different conditions.

4.0 Market design

The post-2025 market design should look at some fundamental concepts in addition to the principles mentioned in the assessment framework.

4.1 Paradigm shift due to the advent of electricity storage

The NEM design in the 1990s was based on a unique characteristic of the electricity system, i.e. that electricity could not be stored in any significant quantity. However, with the advent of utility scale energy storage, this uniqueness no longer exists. As such, the post-2025 design has greater opportunities to learn from other systems which do not have the non-storability constraint.

For example, gas transmission system has gas storage facilities (e.g. the Iona underground gas storage and also line pack in the pipelines) which can act to smoothen supply demand imbalances for short periods of time. As the scale of electricity storage in the NEM increases, could its role become akin to the role of gas storage in ensuring supply demand balance? In such a case, are there lessons from the gas market design that might be applicable to the post 2025 NEM design where the system has significant storage capacity? For example, does the gas market practice of both suppliers and customers putting in their bids / offers present a model for adoption in the NEM? Do the two instruments of managing gas pipeline capacity - contract carriage and market carriage – have applicability in electricity networks? One possible enhancement would be to add a two to four hour ahead trading mechanism so that storage owners can adjust their contract positions to reflect unexpected opportunities for the use of energy storage. This may also better support the self-commitment of peaking gas turbines in their interaction with short-term storage.

Another paradigm to consider is the funding of the other major infra structures such as inter-State Freeways and almost all major roadworks, apart from Tollways. The roads are seen as public good and designed, built and maintained by public authorities with tax-payer funds. The question is "What is the difference between the economic utility that the society gets from inter-State Highways and inter-State electricity transmission systems that drive the different modalities of ownership, operation, funding and pricing of the two infrastructures that currently exist?"

4.2. DERs and Distribution Networks

Ultimately, the evolution of storage the DER generally could result in distribution in able to be fully deregulated because network values will progressively transition from asset cost base, as now, to the competitive value with distributed resources. It would be sensible at this early stage for the

post 2025 market Design to anticipate this possibility and to assess what level of DER penetration and cost of distributed resources would begin to devalue existing networks and undermine their revenues based on the depreciated real cost base. The focus should be on redefining the role of Distribution Network Services Providers and which of these services can be opened to broader participation/competition.

4.3 DERs and Transmission Networks

Transmission including interconnectors between jurisdictions would continue monopoly restricted to the bare bones job of 'transporting' large amounts of energy from A to B without constraining anyone (load or supply) off. It would be best for AEMO to become the national system planner and have the mandate to procure the construction of priority projects via competitive tender (i.e. no incumbent advantage) to build a specified capability for a long term contracted revenue not subject to further regulatory determination. It in this regard that the modalities of other transport infrastructure – road, rail, water, air – should be looked into for possible lessons for electricity transportation.

4.4 Recommendations

High levels of DERs and storage make it possible for the post 2025 NEM design to:

- look at the operational and funding features of two other major infrastructures - gas and road transportation system- to see if there are any applicable lessons for post 2025 market design, in particular the transmission system. It would be best for AEMO to become the national system planner and have the mandate to procure the construction of priority projects via competitive tender process.
- set up a process to identify the market conditions under which of network services currently provided could be opened to wider participation and competition.

5.0 Carbon Pricing and post 2025 market

The issues paper says very little about any role for carbon pricing in the post 2025 electricity market, despite the fact that carbon price is a key variable in any investment in energy supply technology.

The logic for a carbon price / tax is simple, in that one pays for the right to emit greenhouse gases into the atmosphere, just as we pay a charge to the Water boards for the right to flush our toilets into the sewerage system and waterways. The term "Climate Change Levy" is used in this submission to denote carbon pricing.

Ideally, an economy-wide, cap and trade emissions trading scheme would provide the appropriate carbon price signals for investment in low emissions technologies in all sectors. However, given the political sensitivities of a carbon price in Australia, a temporary and easier alternative could be to set the Climate Change Levy for the energy sector at no more than the average of carbon prices/ taxes applied in our top 10 trading partners, namely China, the US, the EU, Japan, the UK, Korea, NZ, India, Indonesia and Malaysia, taking into account our level of trading with each of those countries. This would help reduce the loss of competitiveness of the Australian exports and import substitution due to the Climate Change Levy. This is similar to the concept of Trade Weighted Index of the Australian dollar. The revenue collected via the Climate Change Levy should be spent on both mitigation and adaptation efforts.

Importantly, there must be off-setting cost reductions so that there is minimum net increase in the cost burden to the economy. This means removal of levies, incentives, subsidies and regulations that favour a particular technology be it fossil fuels or renewable energy. Climate Change Levy should aim to be cost neutral, like the GST when it was introduced. (See Attachment 2 for more details)

5.1 Recommendation

> ESB should ensure that any post 2025 market design model consider two sub-sets for each of its scenarios – with and without carbon price.

We hope these points will help the ESB in its deliberations on the post 2025 market design.

Acknowledgements

The authors wish to thank Prof Chloe Munro and A/Prof Ariel Liebman of Monash Energy Institute for their suggestions and comments. However, this submission reflects the personal views of the undersigned authors only, and not that of any one else or Monash University.

Thank you again for the opportunity to provide input into the review process.

If any clarification or elaboration is needed on any of the points made herein, please contact Gujji Muthuswamy on 0418 202 162 or e mail falgar24@optusnet.com.au in the first instance. We will be happy to meet your team to elaborate on these points, if necessary.

Yours sincerely

Mr. Gujji Muthuswamy

Dr. Ross Gawler

Appendix 1 : Have the electricity industry reforms of the 1990s worked?

Introduction

Everyone says that our current energy industry problems are due to the lack of energy policy. True, but our current woes may also have their genesis in the 1990s reforms of the gas and electricity sector and not just the recent policy paralysis or the binary "coal or renewables" debate.

Four key economic orthodoxies drove the 1990s energy industry reforms, following the then Industry Commission review of the vertically integrated, State-owned, monopoly utilities:

- Private ownership of electric utilities is more efficient than state ownership.
- Vertical integration must be broken up into competing generation and retail entities to ensure low prices.
- Even natural monopolies, i.e. transmission and distribution, will be more efficient under private ownership and their market power can be kept under control by light-handed regulation.
- If the above three are implemented, there will be minimal Government intervention; and long-term investments by the private sector will be driven by market forces and technology costs and customers will enjoy low prices and better services.

The market design at that time dealt with non-storable electricity with minimal DER.

We need an evidence-based review of how each of the economic assumptions has worked out in the electricity industry over the past 25 years, for e.g. how have these affected prices, long term investments, Government involvement and customer empowerment? Such a review could provide useful insights to the ESB in the design of the post 2025 market.

The above issues have been elaborated below in the form of questions that should be addressed in the Review.

1. What has been the impact of private ownership of energy utilities?

- The assumption in the 1990s was that efficiency improvements under private ownership would exceed the private sector's higher costs of equity and debt, and customers would share the "efficiency dividend" in the form of lower prices and better services. Has this premise worked out in reality over the last 20 years or so? Specifically:
    a. What has been the comparative performance of Government-owned and private owned generators?
    b. What has been the comparative performance of Government-owned and private owned networks, taking into account the population density in service areas, climate, age of plant, legacy investments etc?
- From another angle, why are many inter and intra-State Freeways (outside the major metropolitan cities) in public ownership but the main electricity transmission lines are sold off to become private monopolies? What is the economic rationale in the two cases?
- A privatised energy industry was expected to keep the politicians and bureaucrats one-step removed from all commercial decisions, and insulate them from public pressure when bad things happen such as blackouts, higher prices, lengthy strikes etc. On the face of it however, intrusion by Commonwealth and State Government involvement seems to be much higher these days than when the public utilities such as the SECV, ECNSW, ETSA, QEC and Hydro Tasmania ran the show. Privatised or not, when a major outage

occurs or electricity prices increase markedly, it is the Government that cops the blame, not the privatised players.

- So, what is the optimal mix of the extent and scope of Government involvement and investment in the electricity sector, as DER becomes more widespread? The concept of networks being natural monopolies needs to be re-visited, especially as DER increase their contribution in distribution networks.
    - For example, should Government invest in electricity assets, or some form of underwriting, to be kept in reserve to provide reliability during extreme events? Note that in the water sector, the Victorian Government pays $600 Mil + each year as a standing charge to the Wonthaggi desalination plant whether it draws any water from it or not; essentially an insurance payment to drought- proof Melbourne. Yarra Valley Water, a retailer, has no role in this.

2. How has competition in the energy markets worked?

Vertically integrated monopoly utilities were seen to be hindering the invisible hand of market forces. So, the industry was disaggregated into competing generators, lightly regulated networks, and competing retailers, all operating under a National Electricity Law and the oversight of the Australian Energy Markets Commission (AEMC), the Australian Energy Regulator (AER) and the Australian Energy Market Operator (AEMO). The questions to be addressed are:

- Has the Total Factor of Productivity (TFP) of the disaggregated, competitive electricity supply industry increased over the last 30 years? How much of that could be attributed to disaggregated energy supply industry, and how much to technology improvements?
- While the technology and equipment base of generation and network businesses are obvious, the value added by the retail sector is less obvious, apart from price risk management. It was hoped that retailers would be selling the complete energy efficient service package, not just units (kWh) of electricity. Has the competitive retail market delivered any of these reform aspirations?
- The incumbent generators, networks and retailers operating under the 1990s model have to adopt cost minimisation and sales growth (kW and kWh) to maximise their shareholder wealth. How has this 'commodity' approach to electricity, as opposed to an end use/service driven model, affected the utilities' approach towards promotion of energy conservation and efficient use of energy by customers?
- Is there effective competition in the retail market or is it being stymied by a few large 'gentailers', i.e. big retailers that own large power stations? What is the risk / reward relationship of the retailers and how is it affecting the electricity price?
- Have price signals in the competitive National Energy Market (NEM) been sufficient over the last two decades to bring investment in peaking and base load generation in a timely and orderly fashion? If not, is it due to intrinsic design weakness of a 'gross pool market' or due to other extraneous factors, such as the Renewable Energy Target (RET), Feed-in-Tariff (FIT), the absence of a carbon price etc. or a combination of all the factors?
- Competition will take on new forms as the "*generator-> networks-> retailer → customer*" model is replaced by customers becoming buyers and sellers of electricity, networks and retailers possibly encroaching into each other's domain and other possibilities. What could be the new forms of competition and how they can be encouraged?

Appendix 2: Climate Change Levy

Australia is committed to reducing its greenhouse gas (GHG) emissions substantially by the year 2030, with a target of 26% reduction compared to our 2005 level by 2030. Whether we are likely to meet that target or not depends on who you ask – the Government or its critics. Nevertheless, the Government should adopt a long-term approach to take both energy and climate change policies out of the political battlefield. We need to reduce our GHG emissions and adapt to a more hostile natural environment caused by climate change, among other things, without increasing the tax burden as much as possible. Key points to note are:

First, the recent large-scale supply black outs in South Australia and Victoria show that we do not have an optimum mix of coal, gas, renewable generation, energy storage, transmission interconnection and suitably integrated demand side response to meet demand during extreme weather events. We need more effectively coordinated resources to ensure reliable and affordable clean energy.

Some of these new investments can be stymied by uncertainty over the mechanisms to meet committed carbon constraints. Application of carbon constraints or a carbon tax would result in a charge that one pays for the right to emit GHG into the atmosphere, just as we pay a charge to the Water boards for the right to flush our toilets into the sewerage system. Carbon pricing increases the cost of coal and gas generation since they emit more GHG, but not of renewable generation which do not burn any fuel or emit GHG. This encourages the transition to renewable energy and enables optimisation of the remaining life of fossil fuel assets, thus supporting reliable supply during the transition.

Australia does not have an explicit carbon constraint now, but investors in coal and gas power generation will have to guess if a carbon price might come into play in the next 10 to 15 years, and how much it might be.

This uncertainty about the timing and the quantum of a possible future carbon pricing affects investments in all forms of power generation, be it fossil fuel or renewable sources. Even the reliability of the fossil fuel fleet is undermined by an absence of carbon pricing because the business case for expenditure on plant maintenance for reliability is so vague.

Second, Australia needs economy-wide effort to meet its 2030 target will require, not just in the electricity sector which only accounts for about 35% of the total national emissions. Transport, agriculture, industrial processes, waste sectors also emit greenhouse gases. Faster uptake of low-emissions technologies and practices are needed in these and services sectors as well. Carbon pricing can provide an incentive to reduce emissions from these sectors.

Third, irrespective of what we do in Australia, the global emissions level is likely to go up. This is no excuse to slacken our efforts on mitigation, but we must also be ready to adapt to the effects of climate change, namely a more hostile natural environment. We need money to adapt to more frequent extreme weather-related incidences such as longer droughts, dying fish in rivers, bleaching corals in the Great Barrier Reef, more intense bush fires, drinking water shortages in outback towns, coastal erosions and greater pressure on health services due to extreme weather, to name a few. The demands on the public exchequer to deal with the impact of extreme weather events will increase as years go by.

Where will the money come from?

We need a new economy-wide Climate Change Levy that is cost-neutral, as described below:

1. The levy should be equitable, i.e. apply to all economic sectors, not just the electricity sector. There should be no exemption to any sub sectors or companies.
2. Ideally, an economy-wide cap and trade emissions trading scheme would provide the appropriate carbon price. However, an easier alternative is to set the Climate Change Levy at no more than the average of carbon prices/ taxes applied by our major trading partners, namely China, the US, the EU, Japan, Korea, NZ, India and Indonesia, taking into account our level of trading with each of those countries. This would help reduce the loss of competitiveness of the Australian exporters due to the Climate Change Levy.
3. The National Greenhouse and Energy Reporting (NGER) Scheme, with appropriate enhancements, should be able to provide detailed and verifiable data on GHG emissions to support the implementation of the Levy.
4. Initially, 50% of the Levy collected could be set aside for climate change adaptation, i.e. deal with natural disasters attributed to climate change.
5. The other 50% could be spent on GHG reduction efforts, for e.g. research, development and demonstration of new low-emissions technologies, increasing the skill base of the whole economy, seed capital for new ventures, infrastructure such as battery charging stations, self-sufficient microgrids etc.
6. This % split of funds between emissions reduction and adaptation efforts can be reviewed regularly.
7. Some of the funds might be applied to assist the transition for trade-exposed industries. In extreme cases where Australia faces strong import competition from countries without explicit carbon pricing, a carbon-based import tariff could be applied for competitive neutrality.
8. Clear criteria should be set to allocate these funds to projects based on their merits in science, engineering, economics, equity and skills enhancement. No technology should be ruled out a priori on ideological grounds.
9. <u>Importantly, there must be off-setting cost reductions so that there is minimum net increase in the cost burden to the economy. This means removal of levies, incentives, subsidies and regulations that favour a particular technology be it fossil fuels or renewable energy. Climate Change Levy should aim to be cost neutral, like the GST when it was introduced.</u>
10. The Treasury modelling should help fix an annual Climate Change Levy taking into account the carbon prices in the international markets and the off-setting reductions needed to ensure no net increase in tax burden.

This approach could provide on-going funds to tackle for both mitigation and adaptation efforts without increasing the total tax burden on the economy.

Appendix 3: Specific Questions raised in the Issues Paper

The ESB has asked the following specific questions which are addressed in this Appendix

QUESTION	RESPONSE
What scenarios and shocks should be used? How should these be used to test market design?	The main driver for change is to address greater variability in generation, so the shocks to be considered would be those that accelerate that process such as: • Marked reduction in the cost of solar PV technology which accelerates customer up-take • Accelerated reduction in carbon abatement to say 80% reduction by 2030 and zero by 2040 or similar
How can market and economic modelling best be used to evaluate individual components of market design or the end-to-end market design?	Market optimisation modelling can be used to indicate the efficient outcomes but does not necessarily represent market participant behaviour. It assumes competition is sufficient to deliver efficient prices and participants correctly foresee the future and act in their own best interests. Agent-based economic modelling can supplement market optimisation modelling by identifying how market mechanisms and design may incentivise participant behaviour and result in sub-optimal outcomes. However, such work is more speculative than the former as forecasting participant perceptions and behaviour is challenging at best. At the very least, the modelling work should validate that there are likely to be well informed buyers and sellers for the energy and service products that are to be traded to make the electricity system work in a secure and reliable manner supported by timely investment decisions.
Is the assessment framework appropriate to evaluate the effectiveness of future market designs? What else should be considered for inclusion in the assessment framework?	The assessment framework lacks a focus on the global objective of decarbonisation. This should be explicit with the addition of: "Does it support sustainable development and minimal impact on the environment including greenhouse gas emissions" "Technology neutrality" only works properly in the context of decarbonisation if that objective is explicit. Services to reduce GHG emissions will need to be recognised in the Post 2025 market design if there is no government carbon abatement mechanism to guide the market transformation.

QUESTION	RESPONSE
Have we identified all of the potential challenges and risks to the current market? If not, what would you add?	One additional challenge is that the investment profile of renewables, energy storage technologies and network extension will not reach an efficient market balance with reliable service due to on-going uncertainty in the mechanisms for decarbonisation, and the extreme mismatch in lead-time between network development and renewable energy generation technology. The market design should have an explicit mechanism for co-ordination recognising disparate lead-times for new investment. Another risk is that the current global delay in decarbonisation which is not on track to keep temperatures below 1.5C above the pre-industrial level suddenly results in catch-up with accelerated closure of the fossil fuel industry and rapid growth in storage and DER. Thus the new market design will need to be fully capable of addressing the risk of rapid change.
Which of these challenges and risks will be most material when considering future market designs and why?	This is hard to identify the most material challenges as they are numerous. In the shorter term, the integration of DER and decentralisation of voltage and frequency control to the edge of the network to avoid uneconomic hosting limits in distribution networks and relieve the remaining thermal and hydro plant from bearing the whole burden of frequency control so they can operate to minimise the residual carbon emissions at their most efficient operating level. In the medium-term, redesigning the transmission network process and establishing new easements for the 2050 – 2080 period with complete decarbonisation. Preparing for the deregulation of network services as DER becomes fully competitive with network services will then follow as a major opportunity for market evolution.
Which (if any) overseas electricity markets offer useful examples of how to, or how not to, respond to the challenges outlined in this paper?	Comment here?