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Committee Secretary
Select Committee into the Resilience of Electricity Infrastructure in a Warming World
Department of the Senate
PO Box 6100
Canberra ACT 2600

By email: electricity.infrastructure.sen@aph.gov.au

22 February 2017

Dear Sir / Madam,

Senate Select Committee into the Resilience of Electricity Infrastructure in a Warming World

AGL Energy **(AGL)** welcomes the opportunity to provide a submission to the *Senate Select Committee into the Resilience of Electricity Infrastructure in a Warming World* (the Committee Inquiry)

AGL is one of Australia's largest integrated energy companies and the largest ASX listed owner, operator and developer of renewable generation. Our diverse power generation portfolio includes base, peaking and intermediate generation plants, spread across traditional thermal generation as well as renewable sources. AGL is also a significant retailer of energy, providing energy solutions to over 3.7 million customer accounts throughout eastern Australia. In 2015, AGL established a New Energy Services division, with a dedicated focus on distributed energy services and solutions.

The diversity of this portfolio has allows AGL to develop a detailed understanding of the risks and opportunities presented by energy and climate policy.

AGL regards the role of storage technologies and localised, distributed generation as integral to the transition to a carbon constrained future and a significant avenue for households to be active investors in a secure and efficient renewable energy future. Given the rate of advancement (in both technology and cost) AGL sees the development of an evolved energy market that facilitates effective engagement in the energy future by households as the most impactful action Government can take.

To discuss any aspect of this submission, please contact Cameron Reid at creid@agl.com.au or 03 8633 7201.

Yours sincerely,

Dr Tim Nelson
Chief Economist & Head of Policy & Sustainability, AGL Energy

This submission focusses on the role of energy storage and distributed energy resources in respect of core elements of the transition to a carbon constrained future and the need to better integrate the three key, but sometimes competing objectives: competitiveness; energy security and decarbonisation.

Background & Context

The National Electricity Market (NEM) was created as an 'energy-only' market. Electricity generators are paid for the 'energy' they produce but not the reliable 'capacity' they make available. The energy system requires a range of attributes to be safe, secure, affordable and reliable including energy, inertia, frequency control and other ancillary services. However at present, payment for energy is the mechanism by which participants receive their investment returns. While there exists some market revenue for other services (e.g. FCAS) this represents a trivial and non-bankable revenue stream for investment purposes and there is no value ascribed to capacity being available for dispatch as required.

If the electricity market architecture is not updated, distributed generation and storage has the potential to be more reliant upon policy-based subsidies rather than market revenue. This potential scenario deters new investment, raising costs and risking system security unnecessarily as the NEM increasingly relies on ageing, legacy plant and is unable to provide for the integration of distributed generation in a system enhancing manner.

The role of storage technologies and localised, distributed generation

(a)the role of storage technologies and localised, distributed generation to provide Australia's electricity networks with the resilience to withstand the increasing severity and frequency of extreme weather events driven by global warming;

The trajectory of technology innovations, cost movements and deployment cannot be predicted with certainty, and will be influenced by changing customer preferences and other external factors such as government policy in specific areas (e.g. carbon reduction, tariff reform). Although technical characteristics are known, it is often only when deployment reaches scale, that the full extent of system impacts become apparent.

In AGL's view, effectively managing uncertain system impacts of new technologies (and maximising their efficient deployment) requires commitment to a number of principles including:

- where feasible, using **competitive markets** to deliver and value energy services;
- establishing policy, regulatory and market frameworks that are **technology neutral**;
- establishing **appropriate technology standards** that do not contradict broader policy objectives and are based, where possible, on international standards to avoid unnecessary overheads, promote customer choice, support competition and encourage economies of scale;
- utilising **price signals** to encourage efficient investment and operational decisions;
- **allocating risks** to parties that are best able to manage them;

- introducing **regulation only where necessary to address a market failure**, including to ensure system safety, security and reliability.

Keeping these principles as a guidepost improves the predictability of modifications to existing regulatory and market frameworks when it becomes evident they are required. Open competitive markets and technology neutrality provide firms the impetus and latitude to pursue technology and service delivery innovations that meet system needs at efficient cost. We are already seeing evidence that holding to these principles promotes opportunities for addressing system impacts emerging from one set of technology innovations with technology innovations occurring elsewhere.

For example:

- ***Establishing and opening-up wholesale ancillary service markets:***

  The NEM is now experiencing increased volatility, as well as supply disruptions – particularly in South Australia. This is largely driven by the exit of more traditional plant. However, technological advancement offers new opportunities to face the emerging.

  Opening-up ancillary services markets to a broader range of participants and extending to new ancillary services not previously explicitly valued is something currently being acted on (in the case of frequency services) and examined (in the case of inertia), and AGL supports these developments. Where mechanisms to open-up ancillary services markets are competitively and technology neutral, the market will lead efficient entry – whether this be in the form of large scale transmission connected batteries, aggregation of midscale thermal loads or a multitude of other possibilities – and will naturally be directly correlated with the costs of potential solutions versus the value to be captured by market participation.

  These issues are discussed in more detail later in this submission.

- ***Making renewables 'firm and dispatchable'***

To ensure additional renewable generation beyond the current RET does not impact system security, policy makers may consider adding a requirement for 'dispatchability' to new intermittent generation. Given an energy-only market, the total cost of renewables subsidies will be greater if they are constructed with no reference to their impact on system security. A mechanism whereby renewable generators partner, through direct or indirect means, with complementary 'firm' capacity (such as open-cycle gas turbines, pumped hydro or advanced batteries) has the potential to address such concerns. By allocating risk to the party best able to manage it, and leaving the means for doing so at the discretion of that party, we can expect more efficient and innovative outcomes leveraging new technologies.

- ***Distributed Energy Resources supporting the network***

The increasing availability, declining costs and advancing capabilities of distributed energy resources (DER) are presenting a range of new opportunities for customers to manage their energy needs. Although primarily adopted to meet a customer's own needs, new DER entering the market today also has the potential to provide system-wide benefits. The major factor distinguishing these technologies from 'first wave' distributed generation is their capacity to be intelligently controlled and dispatched according to algorithms that balance multiple needs (e.g. in home comfort, tariff optimisation and potentially participation in the provision of network and wholesale market services).

The increasing uptake of DER will also present challenges to distribution networks, which were originally established to enable one way flows of electricity from centralised generators to customer connection points, and must now increasingly manage reverse power flows, voltage instability and other technical challenges associated with higher penetrations of distributed energy resources. However, DER can also provide many services (such as peak shaving, voltage regulation and frequency response) that address some of these emerging issues. Therefore to minimise such challenges and harness the potential of DER to efficiently support the stable operation of the grid, requires:

- Network pricing that reflects the variable cost placed on the network by different patterns of demand so that investment in and use of DER is efficient and promotes better network utilisation and lower network costs for all users;
- Grid-services markets that allow competitive providers to involve customers in innovative programs which support grid operation and reward them for that participation.

- ***Innovative business models creating value for customers and the system***

As customers increasingly look to 'stack' multiple value streams (personal, network and wholesale), a successful framework will seek to maximise both customer choice and economic benefit across multiple realms. New entrants are seeking to develop products and services that make it easy for customers to decide how and when they produce, use, store and trade energy with each other, or offer energy or support services into wholesale or network markets.

AGL considers it critical that in an environment with rapidly evolving technology and new business model innovations, there is sufficient opportunity to 'test and learn' without prematurely imposing rigid frameworks that might inadvertently stifle innovation.

Case study: AGL South Australian Virtual Power Plant

A recent example of AGL's effort in DER orchestration is the launch of the Virtual Power Plant Trial in South Australia. Over the next 3 years AGL plans to have one thousand smart, connected energy storage devices installed behind the meter at homes and small businesses across Metropolitan Adelaide. When aggregated, the batteries will act like a 5 MW solar peaking plant that will be able to be called upon at times of grid instability to provide support services to the grid. The project will demonstrate at a commercial scale the value that DER (solar and batteries in particular) can provide three groups:

- Consumers are able to use the batteries to self-consume more of their solar power by storing energy produced during the day that might otherwise be exported to the grid;
- Networks are able to benefit from peak load shaving and voltage management services that potentially avoids further infrastructure expenditure; and
- Retailers are able to benefit from their reduced wholesale exposure during peak demand periods, and through the use of the battery to provide synthetic inertia and frequency balancing services.

Importantly, all grid users stand to benefit from such an arrangement through the reduced spending on network infrastructure and improved grid stability.

Recommend measures that should be taken by federal, state and local governments

(b)recommend measures that should be taken by federal, state and local governments to hasten the rollout of such technologies in order to:

(i) create jobs in installation, manufacture and research of storage and distribution technologies,

(ii) stimulate household and business demand for storage technologies,

(iii) anticipate the rapid deployment of localised distributed generation through changes to market rules,

(iv) drive the reduction in technology costs through economies of scale, and

v) seize on the opportunities to be a global leader in deploying

AGL maintains the electricity supply system is required to undergo a transformation to facilitate the modernisation and decarbonisation of the supply system, including resilience. For this to be commensurate with private investment requirements, revenue streams received over the life of any new project must be at levels sufficient to justify the capital expenditure.

This is true of a financial organisation, a utility company, a wind farm developer, a business investing in redundancy or a household investing in a solar and battery system. The current environment, characterised by stagnant demand, policy uncertainty, differential and overlapping state and federal programs and an incongruence between mid and long range emission targets is proving to be a challenge for investment in any form of new generation (renewable or thermal) or other supply side solutions (synchronous condensers or large scale batteries).

As such, effective energy and climate change policy - inextricably linked - reflected within energy market design that considers relevant climate or emission objectives in addition to reliability and affordability is of critical importance.

Component parts of the electricity industry cannot be assessed, nor can their issues be solved, in isolation. A significant challenge currently facing the operation of the NEM is the application of multiple policies to limit greenhouse gas emissions and promote the deployment of renewable energy. While these policies have implications for the sustainable operation of energy markets, they generally fall outside of the regulatory and governance frameworks for the development and operation of these markets.

Integrated policies are required to ensure that these objectives can be jointly pursued over time. The decarbonisation and modernisation of the electricity sector will span several decades, and a long-term vision and trajectory for this transition is essential.

In addition to the policies required to facilitate a transition, complementary efforts will likely be required to facilitate an evolution of the energy market to better provide a basis for investment that meets the needs of the electricity supply system.

Such a market will develop models for appropriate valuation of the characteristics that underpin a secure, reliable system generating electricity with far lower levels of associated emissions.

It is critical that state and Commonwealth policy is coordinated given the overlapping and integrated responsibilities with regards to the energy systems.

Despite the existence of a National Electricity Market it is important to consider that there remain constraints on the extent of energy import and export capability (at a physical and financial level) between regions. As such a

disproportionate shift in one region relative to others is likely to be less desirable than a broader but more gradual shift across the extent of the network.

Therefore, cooperation across all levels of government to facilitate an orderly transition, focussed on outcomes regarding the energy trilemma of reliability, emissions and cost is likely to be the most effective investment of time and resource by government.

AGL sees three core elements of a broader framework that would contribute to the optimal policy settings to encourage cost-effective deployment of storage technologies:

- An **emissions intensity trading scheme** will enable a stable glide path to a lower emissions system to operate, and will improve competition whilst linking climate and electricity policy in a low-cost fashion.

- A rule that requires **new renewable generation to provide firm, dispatchable energy** will ensure that system security is maintained while lower-cost renewables are integrated at a larger scale.

- A market rule which suitably telegraphs the **phase out of legacy power plants**. This will enable market participants to plan and invest in necessary generation and associated infrastructure. Also it will minimise the impacts of short notice periods for closure on wholesale electricity prices such as those experienced with the impending closure of the Hazelwood power station and recent closures of the Northern and Playford B coal power stations.

In addition to these climate change policies and actions, AGL believes we need government to ensure that the following key technology objectives are a focus to enable innovation and investment:

- **Sustainable and efficient network tariffs:** Care in the design of network cost-recovery and pricing frameworks is key to driving efficient network utilisation, efficient adoption of distributed energy technologies and mitigating potential equity issues that arise where those without the ability to adopt distributed generation technologies are left to bear a disproportionate share of remaining network costs. Distribution businesses are currently introducing more cost reflective network tariffs to support the achievement of these outcomes. However, with overall declining grid utilisation and spare capacity in many networks, there is a question as to whether the policy intent behind the introduction of cost-reflective pricing can be achieved without a clear policy on the treatment of the existing regulated asset base.
- **Removing barriers to participation:** The price, product and service benefits that flow to customers from competitive markets are predicated on the ability of customers to participate effectively in those markets. Thus attention should be paid to policy reforms that remove barriers to participation, including reviewing the impact of home tenure on access to products and services, tenancy law reform and improving community outreach to vulnerable parts of the community.
- **Reform of complementary social and energy management policies** – Promoting a fair and just energy market transition requires reform of the energy concessions framework to a percentage-based, or proportionate to bill approach, and the better targeting of energy efficiency and distributed generation technologies to high-consumption, vulnerable households such as customers participating on retailer hardship programs.

- **Technology standards:** Where possible, technology standards applied in Australia should be based on international standards so as to avoid unnecessary overheads, promote customer choice and competition, and encourage economies of scale. There is an immediate need to place high priority on battery safety, specifically to adopt international safety standards and ban the import of products that do not comply with these standards (IEC62619). Establishing a clear liability regime on importers, vendors and installers for faulty or dangerous product.

Additional documentation

Given the interest of the Committee, AGL's recent submission to the Select Committee of the South Australian Legislative Council in its Inquiry into the State-wide electricity blackout of Wednesday 28 September 2016.

AGL is also attaching its submission to the Parliamentary Inquiry on retirement of coal fired power station.

Further reading

AGL economists have published a range of peer reviewed research on impacts associated with energy and climate policy. Links to relevant research are included below and form part of this submission.

Document title	**Location**
AGL Greenhouse Policy	http://www.agl.com.au/~/media/AGL/About%20AGL/Documents/Media%20Center/Corporate%20Governance%20Policies%20Charter/1704015_GHG_Policy_Final.pdf
Climate and electricity policy integration: Is the South Australian electricity market the canary in the coalmine?	http://www.sciencedirect.com/science/article/pii/S1040619016300306
Climate Policy – Where to From Here?	http://onlinelibrary.wiley.com/doi/10.1111/1759-3441.12114/full
Energy-only markets and renewable energy targets: complementary policy or policy collision?	http://www.sciencedirect.com/science/article/pii/S0313592615000156
Inertia Ancillary Service Market	http://www.aemc.gov.au/Rule-Changes/Inertia-Ancillary-Service-Market