



AIRAH ADVOCACY

Thought Leadership

Independent Review into the Future Security of the National Electricity Market

AIRAH RESPONSE

The Future Security of the National Electricity Market

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About AIRAH

AIRAH is the recognised voice of the Australian air conditioning, refrigeration and heating industry. We aim to minimise the environmental footprint of our vital sector through communication, education and encouraging best practice.

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The Future Security of the National Electricity Market

Executive Summary

In this submission AIRAH make the following points:

Australian buildings consume considerable amounts of electrical energy and are typically responsible for the peaks of energy demand. Electricity use in buildings is significantly driven by heating and cooling loads and the associated heating, ventilation, air conditioning and refrigeration (HVAC&R) plant. The electricity sector, property sector and HVAC&R sector should all collaborate and play a central role in helping Australia meeting agreed greenhouse gas reduction targets and improving energy productivity.

Through three key activities; (1) more efficient buildings, (2) more efficient systems combined with (3) cleaner low-carbon energy sources, the emissions associated with HVAC&R, buildings and the cold chain can be dramatically reduced.

Monitoring and improving the energy performance of existing buildings and existing HVAC&R systems is a key action to help reduce peak demand, improve energy security and improve the reliance of buildings and the electricity grid and infrastructure. The electricity sector needs to engage with, and facilitate, owners of existing buildings to address and optimise electricity demands. Buildings need to be viewed as electricity generators (power stations) and energy storage devices that can be used to reduce peak demand on grid infrastructure.

There are many technologies available today that can significantly reduce building cooling and heating energy consumption. Reduced energy consumption and particularly reduced cooling demands on hot days can significantly improve energy supply reliability and security. New and innovative cooling and heating technologies, building integrated renewables, thermal storage and phase change materials will all impact the market in the future.

Innovation to address electricity consumption has the potential to significantly reduce costs to consumers. Innovation, training, skills maintenance and continuing professional development are the key ways to ensure that new high-efficiency and low-emission technologies are adopted and applied effectively and safely. Continuous improvement in this highly technical field also requires a strong research impetus.

The electricity sector has a significant role to play in addressing emission reductions and should engage with the electricity end user sectors through industry initiatives such as PRIME, through organisations such as AIRAH, ASBEC and through government programs such as the National Energy Efficient Buildings Project (NEEBP) and the National Energy Productivity Plan (NEPP).

Good policy must be made based on evidence. The incentivising and support of distributed energy generation and storage is an immediate action that can be taken. New planning frameworks are needed to help planners to consider buildings as energy generators and thermal energy storage devices. There is a need to move away from the idea of buildings as

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stand-alone assets, with town planning playing a significant role in ensuring for instance that waste heat can be used.

Technical frameworks should be developed to support energy retailers to help energy consumers reduce loads and overall consumption including technical and financial assistance to promote tuning and recommissioning programs for existing buildings. HVAC&R demand management programs can also be used to manage peak loads impact on the electricity grid. Resilience should also be a key consideration.

Introduction

Please find the following as AIRAH comments on the questions raised in the Preliminary Report on the Independent Review into the Future Security of the National Electricity Market prepared by the Expert Panel.

These comments are offered in good faith by AIRAH as a constructive submission in support of the Australian Government's efforts to develop and support an effective National Electricity Market for Australians.

AIRAH

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) welcomes the opportunity to work with the Australian Government to promote the development of a secure and reliable National Electricity Market.

AIRAH is an industry-led organisation that represents the entire HVAC&R value chain, from trades people to university-educated engineers, researchers and business leaders. This overarching perspective – and reach to more than 25,000 industry participants – positions AIRAH to promote and develop the most efficient, productive and resilient heating, ventilation, air conditioning and refrigeration (HVAC&R) industry for Australia's future.

The 21st century imperatives of emissions reductions and energy productivity present our nation with significant change, challenges and opportunities. It is important that all stakeholders from the built environment come together to meet these challenges, because all of us have a part to play in the move towards low emissions and in ensuring specific safety concerns and challenges are mitigated.

AIRAH is keen to work with the electricity sector to improve the environmental performance of existing and new HVAC&R (heating, ventilation, air conditioning and refrigeration) systems, buildings and cold-chain refrigeration infrastructure to provide increase electricity security and reduce peak demand challenges.

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AIRAH responses to Consultation questions

1.1 How do we anticipate the impacts, influences and limitations of new technologies on system operations, and address these ahead of time?

Innovation, training, skills maintenance and continuing professional development are the key ways to ensure that new technologies are adopted and applied effectively and safely.

Without a concerted effort to provide effective training to all stakeholders, including suppliers, manufacturers and end users, new technologies and innovative approaches will be seen as attracting increased risk in the mainstream of the industry.

Training and familiarity reduces risk or reduces the perception of risk.

The electricity industry can help promote innovation in building heating, cooling and freezing technology and practices by sponsoring programs that evaluate innovative HVAC&R technologies. Innovation in HVAC&R in Australia has led to successful small businesses start-up and niche manufacturing opportunities. Small businesses often need incentives and financial or resource assistance to make the jump to some new technology or process. For optimum effectiveness HVAC&R technology demonstration and evaluation projects should:

1. Include direct approaches to property owners, to determine the level of interest and the window of opportunity for potential innovative technology projects.
2. Work with property owners and HVAC&R consultants to decide which innovative solution(s) would be most suited to particular situations.
3. Ensure that potential projects and their funding requirements are individually assessed by independent HVAC&R consultants.
4. Ensure that the outcomes from the projects are individually verified and evaluated by independent HVAC&R consultants, and the information is shared with the wider industry (warts and all).

With this approach property owners would install the most appropriate new technology, while clearly understanding the risks involved. Over time property owners and technical service providers would become comfortable with the new approaches, and be more open to considering new technologies and practices. Demonstrating changes in attitude is often as important as demonstrating the technologies themselves, particularly in the risk averse construction industry. The measurement of costs and savings by independent consultants would generate the accuracy of information required.

Living laboratories for product testing, development and evaluation are ideal environments to help prove and improve new technologies. Learnings must be consolidated and shared for maximum impact.

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1.2 How can innovation in electricity generation, distribution and consumption improve services and reduce costs?

Innovation to address electricity consumption has the potential to significantly reduce costs to consumers. Due to the many failures in our imperfect free market in Australia, energy consumers often do not have the knowledge or skills to effectively address consumption issues. Excessive consumption or using more electricity than is needed reduces productivity.

There is no concerted effort in Australia to support innovation in electricity consumption.

There is increasing demand for improved energy performance in buildings and industrial processes and HVAC&R technologies and industry practices will have to continue to drive improvement in energy efficiency and energy productivity outcomes to meet this demand.

Continuous improvement in this highly technical field requires innovation and a strong research impetus in a range of areas such as:

- New refrigerants and associated technology;
- New applications for existing well known low global warming potential (GWP) refrigerants;
- New building design and delivery methods;
- Emerging technologies for HVAC;
- Higher performance standards for buildings and appliances;
- New controls and building monitoring and metering, incorporating fault and energy diagnosis;
- Thermal energy storage and distribution systems;
- Reliable energy estimating software that can be used across a range of skill levels;
- New energy sources to drive HVAC&R systems.

In regards to innovation to address energy consumption AIRAH have the following additional recommendations:

1. Support **low-emission demonstration projects** – The electricity industry can support innovation and commercialisation of low emission HVAC&R technologies by supporting technology demonstration projects and facilitating the development and distribution of independently verified Case Studies of actual delivered innovative HVAC&R solutions, providing the industry with detailed benefit and cost analysis of real installations and construction methods. Learnings must be consolidated and shared for maximum impact.
2. Support **low-emission technology learning** - The electricity industry could collaborate with industry associations and training providers and help to facilitate the delivery of demonstration/training technology to all TAFEs/VET colleges and universities that provide training and education in the sector, so that industry entrants are more technology and innovation aware.

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3. Provide **incentives to reward innovation** - Government and industry should encourage and support new innovative processes by providing incentives in the form of financial tax breaks or accelerated depreciation and encouragement in the form of awards and showcase materials developed to support and promote new innovative processes and materials.

The construction and refrigeration industries are risk averse, and awareness of how innovation has been successfully undertaken can reduce this perceived risk and encourage uptake. Innovation and technology uptake means changes to practices and procedures. These changes and innovations need to be supported in the traditionally conservative construction and cold chain industries.

1.3 What other electricity innovations are you aware of that may impact the market in the future?

Innovative cooling and heating technologies, building integrated renewables, thermal storage and phase change materials will all impact the market in the future.

AIRAH have collaborated with the Australian Sustainability Built Environment Council (ASBEC) on the development of the *Low Carbon, High Performance* report, which provides a roadmap for the transition of Australian property to a zero carbon footing.

Australia's commitment to the Paris Climate Change Agreement demands a transition to net zero emissions by 2050. The built environment presents the greatest opportunity to reduce emissions, at the least cost. Even without any new technology breakthroughs the ASBEC report shows that energy efficiency measures and fuel switching can reduce the projected 2050 emissions from buildings by more than half.

AIRAH advocates for government and all industry stakeholders to commit to achieving net zero emissions buildings by implementing:

1. A **'Towards net zero' buildings plan** with supporting policy frameworks, governance arrangements, clear targets and ministerial responsibilities.
2. **Strong mandatory minimum standards** for new buildings, equipment and appliances with the long-term goal of net zero emissions. This includes better design integration through commissioning and validation testing but also strong minimum standards for the operation and maintenance of existing buildings and infrastructure.
3. **Targeted incentives and programs** to accelerate action, motivate and support higher performance, including incentives and the use of government market power.
4. **Energy market reforms** to ensure that the energy market supports roll-out of cost-effective energy efficiency and distributed energy improvements, including thermal energy storage and distribution

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5. A range of **supporting data, information, training and education** measures to enable informed consumer choice, innovation, commercialisation and deployment of new technologies and business models.

AIRAH are also working with a range of stakeholders to establish a plan of action for energy efficiency improvements in existing mid-tier buildings. The plan intends to accelerate improvements to mid-tier buildings and harness their emissions-reduction potential through the following activities:

1. **Supporting further research** to better understand the number, location, size and performance of mid-tier buildings.
2. Develop a **Building Retrofit Toolkit**, to bring together existing resources and tools and create new ones based on confirmed gaps and needs, together with an informed communications plan for building owners and their trusted advisers and service providers.
3. Advocate for the **expansion of** initiatives such as the **Commercial Building Disclosure** program to apply to smaller buildings and other non-office building types.
4. Promote **innovative financing mechanisms** and Government/industry incentives to encourage existing building upgrades and retrofits.

AIRAH are also supporting the National Energy Efficient Buildings Project (NEEBP) series of projects and support the proposed NEEBP strategies for change. This includes the development of requirements and training for designing and constructing air-tight buildings and for validating construction quality using building pressurisation testing.

3.1 What role should the electricity sector play in meeting Australia's greenhouse gas reduction targets?

The electricity sector should play a central role in helping Australia meeting agreed greenhouse gas reduction targets.

De-carbonising the grid, supporting large and small-scale renewable energy, and incentivising energy efficiency upgrades for both buildings and cold-chain refrigeration infrastructure are all key roles that should be undertaken, either solely or in partnership, by the electricity sector.

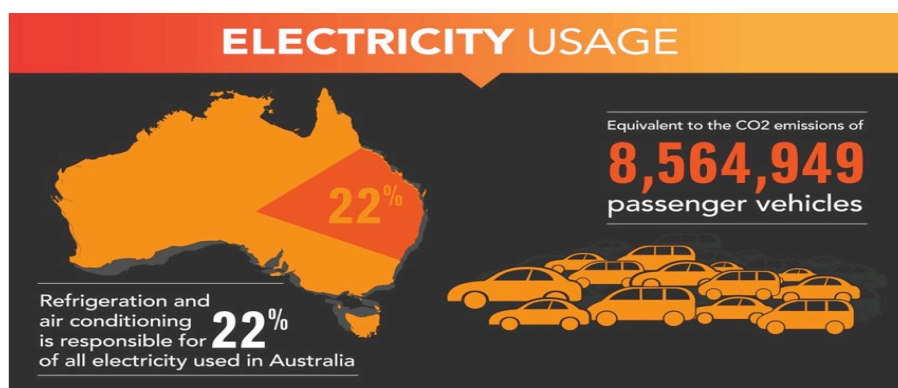
The HVAC&R industry also has a significant role to play in meeting Australia's greenhouse gas reduction targets and the electricity sector needs to engage more effectively with this important end-use industry.

The operation of refrigeration and air conditioning systems consumes about 22 per cent of all grid based electricity in Australia, and is responsible for more than 11 per cent of Australian total national emissions (Cold Hard Facts 2, 2013). Indirect emissions of HVAC&R systems typically represent 90 per cent or more of total emissions so it is clear that energy

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consumption of HVAC&R has a significant impact on Australian emissions. To reduce these high levels of HVAC&R emissions:

1. Buildings and refrigeration infrastructure have to become more energy efficient and more energy productive, this includes higher standards for fabric thermal performance and building sealing, as well as performance benchmarks for ongoing operation and maintenance.
2. HVAC&R systems have to be designed, installed and maintained for high efficiency and low emission. Measurement, monitoring and ongoing maintenance is the key to improving energy efficiency and productivity of the existing HVAC&R systems.
3. The energy used to run high efficiency HVAC&R in highly efficient buildings and the cold chain has to be from a clean low-carbon source.



The electricity sector is well placed to provide monitoring and measurement data for building performance in operation.

Through these three key activities; more efficient buildings, more efficient systems combined with cleaner low-carbon energy sources, the emissions associated with HVAC&R, buildings and the cold chain can be dramatically reduced. Education and training of all supply chain participants in these three areas is key to successfully driving significant emission reductions in all of these sectors.

AIRAH recommend that the electricity sector support the following actions to help promote and improve HVAC&R systems sustainability.

1. Continued improvement, promotion and uptake of the “**Calculating Cool**” building HVAC free online rating tool, including an expansion of the tool to cover low-emission technologies. <http://www.calculatingcool.com.au/#/home>. This tool should be adopted by energy retailers in their role to educate electricity users to be more efficient with energy use.

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2. The development of an emissions or **efficiency benchmarking tool for refrigeration** systems, like Calculating Cool but addressing industrial and commercial cold room and cool room refrigeration systems. There are software tools in existence overseas which could be modified or adapted for Australian use and adopted by energy retailers.
3. A renewed focus on the **maintenance and performance of existing buildings** Energy retailers have a strong role here to help incentivise and facilitate building owners to improve the energy performance of their buildings. Reducing direct and indirect emissions from HVAC&R means optimising life-time system performance and minimising life-time refrigerant leakage rates. This is only achievable through better maintenance and improved system operation which not only improves energy efficiency, but also delivers a range of other benefits, including increased asset values, improvements in worker productivity, process productivity, occupant health benefits, and importantly, improved building and infrastructure resilience. Incentivise and facilitate.
4. More research and training in HVAC&R energy efficiency. Education and skills are critical if Australia is to have safe, sustainable, healthy and comfortable built environments and resilient efficient refrigeration infrastructure in a low-carbon economy. Research programs need to develop and disseminate **information on low-emission HVAC&R strategies** such as thermal storage, solar cooling, integrated phase change, integrated PV etc.
5. The development of climate zone specific energy policies requiring measurement, benchmarking and disclosure of energy use are essential to drive change. The absence of this data is a barrier to change. The electricity sector should promote and facilitate the expansion in scope and coverage of the **Commercial Building Disclosure program** to cover smaller buildings and all building sizes and types (classifications). This would be a significant driver for change as would a similar benchmarking standard for refrigeration applications such as cool rooms and refrigerated warehousing. The widespread use of electrical resistance based heating in many applications needs to be addressed.

PRIME and the HVAC&R industry

PRIME is an initiative developed by a coalition of stakeholders from within the Australian heating, ventilation, air conditioning, and refrigeration (HVAC&R) industry. The industry has been under pressure to help reduce the environmental impact of HVAC&R. Key stakeholders have taken a step back and spent some time evaluating exactly what needs to be done to develop low-emission solutions for the essential HVAC&R services we all depend upon.

PRIME stands for the five pathways to transition: Professionalism, Regulation, Information, Measurement, and Emission abatement. All of the industry-sourced emission-reduction solutions have been allocated into one of these five categories.

Information for PRIME stakeholders is available [here](#).

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AIRAH recommend that the electricity sector engage with the PRIME initiative to develop and deliver projects that improve energy efficiency and increase energy productivity.

Informing government regulation, policy, programs and research is an important element of the PRIME approach. Low emission HVAC&R can improve Australian productivity and competitiveness in international markets, as well as reduce emissions and improve sustainability at home and globally.

PRIME is fundamentally about reducing the direct and indirect emissions arising from the HVAC&R sector, it is a conduit for emission reduction proposals and projects from grassroots and throughout all sectors of the industry.

PRIME offers the electricity industry a transparent and open platform from which to address those issues that are best addressed with a whole-of-industry approach. PRIME improves coordination and removes duplication of effort.

Reducing direct and indirect emissions from HVAC&R means optimising life-time system performance and minimising life-time refrigerant leakage rates. This is only achievable through better maintenance and improved system operation which not only improves energy efficiency, but also delivers a range of other co-benefits, including increased asset values, improvements in worker productivity, process productivity gains, occupant health benefits, and importantly, improved building and electricity infrastructure resilience.

3.2 What is the role for natural gas in reducing greenhouse gas emissions in the electricity sector?

Natural gas has a short-term role in the building sector but in the longer term, as buildings move towards a net-zero energy outcome, low carbon renewable electricity will meet the vast majority of future energy needs.

3.3 What are the barriers to investment in the electricity sector?

Language and understanding is often a key barrier. Stakeholders on one side of the energy meter, (e.g. energy generators and retailers) don't understand the language, drivers and problems of the HVAC and other energy users on the other side of the meter. Stakeholders in the electricity supply industry all the way through to the electricity end user don't understand (or want to understand) the language and issues, and they don't know how to influence change back up the supply chain and with government.

Uncertainty in Australian Government energy and emissions policy, which includes poor incentives and misalignment of drivers/motivation for building energy efficiency and no focus on actual building energy performance are also significant barriers to investment.

Direct Action and the **Emission Reduction Fund** is not readily open to commercial building or commercial refrigeration participation, due to the requirements for aggregation to meet minimum bid sizes.

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The expansion in scope and coverage of the **Commercial Building Disclosure program** to cover smaller buildings and all building sizes and types (classifications) would be a significant driver for change as would a similar benchmarking standard for refrigeration applications such as cool rooms and refrigerated warehousing.

3.4 What are the key elements of an emissions reduction policy to support investor confidence and a transition to a low emissions system?

Good policy must be made based on evidence. In our world of HVAC&R, the refrigeration mechanic has a massive role to play in emissions reductions, as does everyone in the “system” supply chain. Nobody within government policy departments understands the coal face evidence well, no one understands the behaviours exhibited at the coal face (by technicians and end-users), and no one has worked out how to change the emissions reduction story so that behaviour change is not seen as a challenge.

The key elements of an emissions reduction policy to support investor confidence are

- Transparency – including real cost benefit justification and state clear objectives;
- Strong technical background – Provide the technical justification and don’t leave implementation to be worked out;
- Good information – unbiased and honest information is key to investor confidence and government is often reluctant to talk in plain English.
- A focus on measurement helps to ensure program success. Does the project actually reduce emissions and on what basis? Measurement and reporting protocols must be transparent.
- Collection of quality data at all stages is key to developing robust tools that can better estimate future program costs and benefits
- Publication of program learnings and insights (what works and what doesn’t work) is essential if the impact of a particular policy or action is to extend beyond the life of the program.

3.5 What is the role for low emissions coal technologies, such as ultra-supercritical combustion?

Once the expense of construction, operational fuel costs (including mining and rehabilitation), ongoing maintenance and remaining carbon emissions from the technology is taken into consideration it is unlikely that ultra-supercritical combustion will be cost competitive with renewable energy technologies in the future.

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4.1 What immediate actions could be taken to reduce the emerging risks around grid security and reliability with respect to frequency control, reduced system strength, or distributed energy resources?

The incentivising and support of distributed energy generation and storage is an immediate action that can be taken. Buildings can be viewed as energy generators and thermal energy storage devices.

Correct buildings energy policy could see

- Buildings becoming more energy efficient, more productive and less costly to operate;
- Buildings becoming more resilient and helping local electricity distribution networks to become more resilient;
- Planning regulations that consider buildings at the precinct or community level;

4.2 Should the level of variable renewable electricity generation be curtailed in each region until new measures to ensure grid security are implemented?

Employing multiple sources (wind, solar, wave, bio-gen) and a distributed generation base will improve grid security. Energy storage (electric battery, thermal, compressed gas, micro-hydro etc.) now needs to be addressed to improve the ability of these variable sources to meet the local demand.

4.3 Is there a need to introduce new planning and technical frameworks to complement current market operations?

Planning frameworks

New planning frameworks are needed to help planners to consider buildings as energy generators, and energy storage devices, and to help match loads and demands with available supplies. Planning laws could for instance incentivise the co-location of heating demand, cooling demand and thermal storage capacity to provide rounded, flexible and sustainable energy solutions.

There is a need to move away from the idea of buildings as stand-alone assets, with town planning playing a significant role in ensuring for instance that waste heat can be used. A practical example would be planning a swimming pool next to a data centre. Multi-use developments can provide greater ability to utilise waste heat due to simultaneous heating and cooling requirements. Solar access to sunlight, which is particularly important for

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increased levels of on-site renewable solar electricity generation, is also a town planning issue, as is building orientation and configuration.

Technical frameworks

Technical frameworks should be developed to support energy retailers to help energy consumers reduce loads and overall consumption.

Building tuning and re-commissioning - Existing building tuning and re-commissioning programs are becoming more common, and some jurisdictions in the USA have mandated existing building tuning of large commercial buildings through government regulation, (E.G City of Seattle, Office of Sustainability and Environment, Director's Rule 2016-01, Implementation of Building Tune-Up Requirement).

Seattle's Building Tune-Ups policy phases in a periodic tune-up requirement for non-residential buildings 50,000 square feet or larger (excluding parking), beginning in 2018, with buildings 200,000 square feet or greater due first. Tune-ups aim to optimize energy and water performance by identifying no- or low-cost actions related to building operations and maintenance, focusing on actions that typically pay back within 3 years and generate 10-15% in energy savings, on average.

In Australia, Sustainability Victoria's Energy Efficient Office Buildings (EEOB) program demonstrated that the savings potential in mid-tier office buildings is significant, real and feasible. The report *Energy Efficient Office Buildings: Transforming the Mid-tier Sector* by Sustainability Victoria (2016) showed that across the program's 20 participating Victorian buildings, average benefits included:

- 29% reduction in energy use;
- A 1 star NABERS Energy rating improvement;
- Less than 3-year payback on efficiency investment.

Overall, the program is estimated to deliver the following:

- Over 4,000 tonnes CO2 emissions reduction over a 12-month period;
- Over \$1.1m in savings in energy bills per annum;
- Over \$10m in co-investment from building owners;
- Over 90 jobs.

Broadening these types of programs to more buildings and different types of buildings can generate significant energy savings and economic activity.

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The electricity sector should engage with the property and HVAC&R sector to look at incentivising and facilitating energy efficiency interventions into existing buildings (all types).

Demand Reduction Utilising Air conditioning and refrigeration – As significant energy demands air conditioning and refrigeration systems (particularly when combined with thermal energy storage) can also be used to manage peak loads impact on the electricity grid.

4.4 What role can new technologies located on consumers' premises have in improving energy security and reliability outcomes?

There are many technologies available today that can significantly reduce building cooling and heating energy consumption. Reduced energy consumption and particularly reduced cooling demands on hot days can significantly improve energy supply reliability and security.

Major items include better building facades and better building sealing, the more widespread use of solar cooling, greater use of evaporative cooling technologies, building-integrated photovoltaics, batteries and thermal energy storage, natural and mixed mode ventilation systems, non-vapour compression chillers, phase change materials to stabilise building temperatures, better use of waste heat within and between buildings, seawater cooling, and heat recovery.

4.5 What other non-market focus areas, such as cybersecurity, are priorities for power system security?

Resilience should be a key consideration. Constructing large power generation assets provide reliable generating capacity only as long as they are protected from storms and from misadventure. Failure of these assets under any scenario introduces significant risks and instability. To improve security:

- Large generation assets need to be hardened to provide security.
- Distributed energy generation provides a smaller target.
- Combining these system types provides a more resilient and secure system overall.

6.2 What are the alternatives to building network infrastructure to service peak demand?

Reducing the peak demand is the most cost effective option by electricity suppliers addressing (in an innovative way) the demand side of the equation.

Demand management provides a range of benefits to energy supply companies and their customers. Benefits to the electricity sector include:

- Reduces the need for costly infrastructure upgrades;

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- Provides better insight into customer requirements and practices;
- Improves customer satisfaction by decreasing electricity bills.

Benefits to customers and community value include:

- Reduces GHG emissions;
- Improves network utilisation and reliability;
- Reduces energy costs for customers;
- Increases 'value add' for customers through incentives, rebates and in-home consultation;
- Increases community awareness of benefits of energy conservation.

6.3 What are the benefits of cost reflective prices, and could the benefits be achieved by other means?

Electricity is generally priced to suit the retailer and not to generate the most economic benefit from the generated energy.

For example energy retailers could be incentivised to provide low or no-cost electricity to 'charge' local storage devices during times of low grid demand. The stored energy could be then called on to provide the end user with cheap local power to reduce demand during peak consumption periods.

End of submission



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