



3 May 2017

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Dear Sir or Madam

*Submission to Climate Change Authority / Australian Energy Market Commission  
Special Review on power system security, electricity prices and emission reductions*

The Australia Institute welcomes the opportunity to make this submission to the Special Review conducted by the Climate Change Authority (CCA) in conjunction with the Australian Energy Market Commission (AEMC).

The Australia Institute agrees with the AEMC that fundamental market reform is needed, and with the CCA that energy efficiency should be a priority. By making the energy market more flexible we can solve the 'energy trilemma': simultaneously lowering prices, increasing security and lowering emissions. Our three policy suggestions encourage producers and consumers of electricity to respond to periods of high demand, which will lower these peaks and therefore electricity prices overall:

- Five Minute Settlement would help major consumers reduce demand in response to price peaks.
- Demand aggregation could facilitate 'virtual power plants' able to contribute to balancing supply and demand in a similar way to physical power plants.
- Aggregated demand reduction rewards consumers for reducing their energy usage during periods of high demand.

The Australia Institute is a Canberra-based economics and policy research institute which publishes regularly on energy-related topics.

### Beating the energy trilemma

This special review has the task of solving three seemingly opposed goals. The Preliminary report of the Independent Review into the Future Security of the National Electricity Market identifies an 'energy trilemma' of three competing priorities: price, security and emissions.<sup>1</sup>

While this is a powerful model of policy challenges across climate and energy, there are specific measures that that beat the energy trilemma by simultaneously improving security,

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<sup>1</sup> "Preliminary Report of the Independent Review into the Future Security of the National Electricity Market" (Commonwealth of Australia, 2016), p.10.

reducing prices and cutting emissions. Key among them is energy efficiency. Any reduction in demand, particularly at times when electricity prices are high, benefits both the consumer, who buys less of the commodity, and all users, who see prices drop across the market. It benefits the system operator, the Australian Energy Market Operator, by improving security and reliability. It helps distribution network service providers (DNSPs) by lowering stress on critical network elements and allowing costly 'gold plating' to be deferred or avoided altogether.

New ICT systems enable dramatic peak management services to be provided at minimal or negative cost to AEMO and DNSPs. A key issue for policy makers and regulators is that peaks mean profits. The Australian Energy Council submission to the Five Minute Rule change admitted this fact.<sup>2</sup>

High peak prices for electricity in Australia contribute significantly to the profitability of incumbent generators. That fact pits the interests of incumbents against consumers and also companies with new technologies and approaches entering the market, such as Mojo Power, Reposit, Greensync, Wattwatchers and Buildings Alive. As the Productivity Commission noted in 2013, 'in New South Wales, peak demand events occurring for less than 40 hours per year (or less than 1 per cent of the time) account for around 25 per cent of retail electricity bills.'<sup>3</sup>

### Support for AEMC and CCA positions

The Australia Institute supports the CCA's emphasis on energy efficiency dividends and the AEMC's focus on the need for fundamental market redesign. Market reform that encourages energy efficiency and removes barriers to decentralised generation will address the energy trilemma.

As the CCA stated in its 2015-16 Special Review third report, energy efficiency 'offers significant emissions reduction potential at low cost or net savings.'<sup>4</sup> This is the central technological opportunity for the current special review. It is this emissions reduction opportunity that rule reforms can secure.

The AEMC's recently published *Directions Paper* on the Five Minute Rule makes clear that the electricity sector is undergoing a technological transition which requires reform of the market.

As the AEMC noted,

*it is increasingly important that the NEM market design provides the right price signals, as this will affect the incentives for the efficient use of generation assets, the efficient consumption of electricity, and efficient investment in generation and demand-side technologies.*<sup>5</sup>

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<sup>2</sup> Kieran Donoghue, "Five Minute Settlement (ERC0201)," June 16, 2016, p.2.

<sup>3</sup> Australia and Productivity Commission, *Electricity Network Regulatory Frameworks : Volume 1*, 2013, p.16.

<sup>4</sup> "Climate Change Authority Special Review Report Three" (Climate Change Authority, August 2016), p.12.

<sup>5</sup> "Directions Paper : Five Minute Settlement" (Australian Energy Market Commission, April 11, 2017), p.i.



The transition from centralised, baseload generation to distributed, variable renewable generation is an unstoppable technological evolution. This will take place whether or not the Commonwealth adopts a long-term climate policy direction and so needs to be addressed by our energy market institutions.

## Allocative efficiency benefits and barriers

The AEMC has made clear that faster markets increase the ‘allocative’ dimension of efficiency.<sup>6</sup> Large loads (or large networks of small aggregated loads) can reduce their demand when prices are high, shifting this demand to periods of lower price. This aspect of efficiency is a primarily economic phenomenon and does not entail a significant reduction in aggregate, long-term energy demand. But it can significantly reduce the overall cost of energy because it improves the allocation of resources and the balance of demand and supply.

The CCA notes that there are many barriers to energy efficiency, including opportunity costs, skills gaps and the ‘hassle factor’ for firms that are not in the energy business and for whom making energy efficiency decisions is difficult.<sup>7</sup> The CCA makes clear that in order to help break down these barriers, it is important for policies to allow for aggregation, whereby third party service providers with expertise in energy efficiency are able to implement many small projects on behalf of energy end users. This is one of the strong points of the Five Minute Rule as currently framed by the AEMC: it will allow aggregators to participate in the market.<sup>8</sup>

## Five Minute Rule

Wholesale electricity in the NEM is dispatched in the spot market in five minute intervals but the price for these trades is settled over a thirty-minute interval. As Origin Energy has pointed out in its submission on the Five Minute Rule, this mismatch problem has been in debate since the commencement of the NEM in 1998.<sup>9</sup> The Rule change was proposed to the AEMC by Sun Metals. The company is seeking the option to reduce its own demand over five minute periods, when prices are high, in order to control its energy costs.

This proposal is supported by both the Australian Energy Market Operator (AEMO) and the Australian Energy Regulator (AER). The trend towards faster markets is also backed by the International Energy Agency (IEA).

The Australia Institute made a submission to the AEMC over this rule change. We argued that the rule will have significant market and wider benefits. It will:

1. Enable higher levels of variable renewable energy generation
2. Better integrate battery and other storage technologies
3. Moderate wholesale price peaks<sup>10</sup>

If the market supports storage and faster trading, this will help improve system security by reducing the price and technological stresses caused by high demand peaks. When demand

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<sup>6</sup> Ibid, pp.4-5.

<sup>7</sup> Ibid, p.90.

<sup>8</sup> “Directions Paper: Five Minute Settlement.” See p.56.

<sup>9</sup> Steve Reid, “Five Minute Settlement – Consultation Paper,” June 20, 2016, p.1.

<sup>10</sup> Roderick Campbell, “Submission to AEMC 5 Min Settlement Rule,” June 24, 2016.

outpaces supply, this increases prices in the short term due and also increase prices over the long term by requiring distribution network service providers (DNSPs) to build networks to cope with periods of high demand.

Although the Five Minute Rule is primarily focused on fixing a market design flaw, it will also lower emissions at low or negative cost. When demand peaks are lower, there is less need for gas peaking plants or the ramping up of coal-fired turbines. More electricity can be supplied by variable renewables, dramatically lowering the emissions intensity of electricity.

### Virtual power plants

In response to energy security pressures, the Commonwealth and South Australia have proposed that governments return to the business of planning, paying for and owning power plants after two decades of privatisation consensus. These plants will cost hundreds or billions of dollars and will take years to build.

In the meantime, the reforms we are advocating can unlock ‘virtual power plants’ that require no capital investment because they have already been built. Physically, these comprise networks of privately owned assets, ranging in capacity from domestic solar and battery systems to large industrial smelters. These assets are owned and financed for other purposes; the only cost is the minor expense of installing control devices and managing energy dispatch through software.

These virtual power plant networks of discrete physical assets are coordinated by third party operators using cloud software. The system operator, AEMO, can then instruct these assets to generate, store or discharge electricity as needed, just as it would dispatch a gas peaker or order the ramping-up of a coal power station.

A group of prominent Australians recently signed an open letter to Prime Minister Malcolm Turnbull in support of reforms to accelerate these new technologies, which was organised by The Australia Institute.<sup>11</sup> Signatories to the letter, which was published in the *Australian Financial Review*, included

- Former Liberal Party leader, John Hewson
- Chair, Embark Australia, Simon Holmes à Court
- Director, Australian Centre for Advanced Photovoltaics, Professor Martin Green AS FRS FAA FTSE
- Chairman, GreenSync, Neil Gibbs
- General Manager of Keppel Prince, Steve Garner
- Former Industry Commissioner, Emeritus Professor Tor Hundloe AM
- Emeritus Professor, Barbara Pocock.

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<sup>11</sup> Katharine Murphy, “Open Letter Urges Malcolm Turnbull to Deliver Energy Market Reforms,” *The Guardian Australia*, April 5, 2017, <https://www.theguardian.com/australia-news/2017/apr/05/open-letter-urges-malcolm-turnbull-to-deliver-energy-market-reforms>.

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## Aggregated demand reduction

Aggregated demand reduction (ADR) is a core aspect of virtual power plants. It is simply the remote management of consumer demand in order to stabilise the balance between supply and demand. There are no specific provisions in the National Electricity Law for ADR so it is worth explaining the basics of its features and benefits here, to encourage its consideration by the Special Review.

The AEMC's Directions Paper on the Five Minute Rule makes clear that improvements to allocative efficiency benefits consumers and thus support the 'basic law' of electricity in Australia, the National Electricity Objective (NEO).<sup>12</sup> The Five Minute Rule will create an incentive for ADR, which will improve allocative efficiency. ADR delivers economic benefits to the individual families or firms that own the loads which are switched down or off or used to deliver frequency support (see FCAS section below). It lowers peak prices and thus lowers bills for consumers across the NEM region. It also has localised network benefits because it can be used to reduce congestion on key distribution network elements and across interconnectors at times of high demand. This improves system security and lowers the cost of energy services. Over the long term, it can defer or avoid costly 'gold plating', benefiting all consumers on a given network.

For example, the American company EnerNOC claims it can deliver 100 MW to South Australia by 1 December 2017, using pre-existing infrastructure in that state.<sup>13</sup> This is important because the National Electricity Market's latest system security health-check predicts that if rainfall is low and the market does not respond adequately, there could be an energy shortfall (or 'unserved energy') in February 2018 of 816.1 MWh in South Australia and 3987.9 MWh in Victoria.<sup>14</sup>

Greensync, an Australian start-up, claims that it is technically feasible for its generation and demand aggregation system to offer 300 MW of virtual power by next summer.<sup>15</sup> The Victorian government granted \$0.5 million for a trial of Greensync's system on the Mornington Peninsula, with the local distribution network company United Energy.

EnerNOC proposes that the NEM should allow ADR to sell four classes of services (Table 1 below).

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<sup>12</sup> AEMC, "Directions Paper : Five Minute Settlement.", chapter 2.

<sup>13</sup> Giles Parkinson, "South Australia Should Dump Diesel Plan and Think Smarter : Renew Economy," *RenewEconomy*, accessed March 31, 2017, <http://reneweconomy.com.au/south-australia-dump-diesel-plan-think-smarter-83644/>.

<sup>14</sup> "Energy Adequacy Assessment Projection: November 2016 Update" (AEMO, 2016), p.11.

<sup>15</sup> Ben Potter, "Greensync Joins Energy Bidding War," *Australian Financial Review*, March 14, 2017, <http://www.afr.com/news/greensync-joins-energy-bidding-war-20170313-guwz2y>.

**Table 1: ADR services**

#	Type of DR	Rationale for employing DR	In the NEM
1	Network DR	DR employed to manage the peak within a geographically distinct transmission or distribution network	Not enough exists; regulatory incentives should be strengthened
2	Reliability DR	DR employed as an emergency lever during supply emergencies, centrally dispatched to avoid involuntary load shedding and rolling blackouts	Does not exist; should be implemented
3	Economic DR	DR employed to avoid buying electricity during times when wholesale spot prices are high	Not enough exists; barriers to participation should be lowered
4	Ancillary Services DR	DR employed to respond very quickly to brief, unexpected imbalances in supply and demand, to return the grid frequency to 50 Hz	Not enough exists; new A/S markets should be created

Source: “EnerNOC Submission - National Electricity Market Review” (EnerNOC, March 1, 2017), p.6.

### Frequency Control Ancillary Services (FCAS)

Stability of the grid and quality of the supply delivered to consumers are technically intertwined issues, delivered in the NEM through a set of eight ancillary services markets operated by AEMO.<sup>16</sup> These markets, like the wholesale spot market, are subject to peak pressure, which adds to the cost for consumers and can threaten security. For example, the Australian Energy Regulator has announced an inquiry into unusually high prices in South Australia on Tuesday 18 April, when regulation ancillary services exceeded \$5,000/MW h for 32 trading intervals.<sup>17</sup>

In the previous section we flagged that new technologies such as ADR can provide ancillary services and should be allowed to compete against incumbents to provide these in the NEM. Australia has fallen behind in this regard although the South Australian Government flagged in its energy plan that all new utility-scale generators will be required to provide energy security services.<sup>18</sup> For example, in 2005 Québec's grid operator mandated that wind turbines

<sup>16</sup> “Ancillary Services,” *Australian Energy Market Operator*, accessed April 26, 2017, <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services>.

<sup>17</sup> “AER to Report on High Ancillary Services Prices in South Australia,” *Australian Energy Regulator*, April 19, 2017, <https://www.aer.gov.au/communication/aer-to-report-on-high-ancillary-services-prices-in-south-australia-0>.

<sup>18</sup> “Our Energy Plan.”, p.4.

had to provide synthetic frequency services, to support security and quality of supply on the regional grid.<sup>19</sup>

Renewable energy and battery storage can compete with incumbent generators to provide security services. We encourage the AEMC and CCA to explore international best-practice in FCAS regulation, to find market mechanisms that can improve security by encouraging competition against incumbent technologies, lowering costs for consumers.

In summary, new technology provides pressure for market reform and an opportunity to deliver considerable benefits through market mechanisms alone, at no cost to government. We believe that the CCA and AEMC can discover a range of NEM rule changes that can simultaneously solve all three objectives in the energy trilemma. In particular, the Five Minute Rule currently before the AEMC should be supported by the Special Review

We would be happy to expand on this submission in writing or in person. Please feel free to contact me on [danc@tai.org.au](mailto:danc@tai.org.au).

Yours sincerely



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<sup>19</sup> Peter Fairley, "Can Synthetic Inertia from Wind Power Stabilize Grids?," *IEEE Spectrum: Technology, Engineering, and Science News*, November 7, 2016, <http://spectrum.ieee.org/energywise/energy/renewables/can-synthetic-inertia-stabilize-power-grids>.