

Level 16  
461 Bourke Street  
Melbourne  
Victoria 3000

Australian Energy Market Commission  
PO Box A2449  
Sydney South  
NSW 1235

**For the Attention of Mr Sebastien Henry**

22 September 2017

Dear Mr Sebastien Henry,

**National Electricity Amendment**

**(Inertia ancillary service market) Rule 2017**

Reach Solar energy ('Reach') is very pleased to provide its response to the findings described in the consultation paper prepared by the Australian Energy Market Commission (AEMC) titled "National Electricity Amendment (inertia ancillary service market) Rule 2017 dated 5 September 2017.

By way of background, the intent of Reach is to develop 1000MW of large-scale solar photovoltaic (PV) by 2020/21. The driver for this new-build is the existing Renewable Energy Act legislation and a Reach target of structuring solar PV projects such that they can compete with wind and black coal-fired generation without a government grant.

Reach management (see [www.reachsolarenergy.com.au](http://www.reachsolarenergy.com.au)) have a proven track record with operations, development and raising large-scale capital for both energy and infrastructure projects in South Australia, other States in Australia and internationally. It has recently developed and financed 275MWdc of solar PV which is currently under construction near Port Augusta in South Australia.

This response builds on the submission made by Reach to the AEMC on 20 April 2017 on the Directions Paper titled "Systems security frameworks review".

**Background**

Conventional grid-connected generation is magnetically coupled to the grid. This synchronous generation and loads (those that are synchronised to the power system frequency) contain spinning mass that holds kinetic energy. This energy is available to be released (or more absorbed) to counteract a sudden imbalance due to a system disturbance. The more of this energy there is available (called "system inertia"), the less the change in frequency is for a given imbalance.

This system inertia slows the rate of change of frequency (RoCoF) down following an unexpected loss of generation or load. To date system inertia has essentially been a by-product of converting energy to electricity using conventional synchronous generation.

### **State of play**

As more renewable generators enter the electricity market then there is less system inertia being provided by conventional generation such as coal, gas or hydro-electric. The concern is this will reduce the system inertia and increase the potential RoCoF. If the RoCoF increases too quickly (up or down) after a disturbance then there is concern on the consequences to the grid system and synchronous generators (e.g. trip and/ or a pole slip).

Reach continues to consider most investors (equity and debt including the World Bank) are not prepared to invest in any form<sup>1</sup> of coal-fired power plants (in Australia and worldwide), and the fuel remains firmly linked to cyclical global thermal coal pricing.

Gas generation is proven, and greenhouse gas emissions are one third of black coal generation, but fuel supply is complicated by cyclical prices (now linked with LNG export), and finite transport arrangements.

Nuclear is not considered to be viable in Australia (nor in most OECD countries).

Hydro-electric schemes will continue to have a role - and could expand using seawater for pumped storage - but ones that use freshwater (like Snowy Hydro and Tasmania) will continue to be prone to cyclical drought periods and pumped storage only works if there is sufficient margin between the cost of pumping and income from releasing the water (which could be questionable if consumer demand flattens out over time).

The cost of wind and solar generation (especially PV technology) has fallen materially over the past 5 years and is now able to have a tariff which is competitive with gas-fired generation and (for some sites) also black coal i.e. no renewable subsidy is now required to be commercially viable with fossil fuels.

Fast-acting response using inverter technologies is anticipated to dampen the rate of change of frequency under severe network disturbances which in turn is expected to reduce the amount of system inertia required to maintain the frequency within limits.<sup>2</sup>

### **The question is how to respond to this ?**

One approach is to inject more rotating mass into the grid system e.g. multiple synchronous condensers and/ or new coal and/ or gas-fired generation, to maintain a "heavy" rotating mass grid system but this is not straight-forward due to the factors summarised above.

An alternative approach (which Reach favours) is to develop innovative solutions which are able to control a "lighter" more dynamic system which uses a combination of synchronous generation,

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<sup>1</sup> Including high efficiency coal-fired generation due to lack of investor and debt appetite, and a contingent liability on greenhouse gas emissions.

<sup>2</sup> As acknowledged by AEMO commissioned report titled "International Review of Frequency Control Adaption" dated 14 October 2016.



demand side management, sophisticated aggregation using consumer-led technologies, fast-acting inverter technology on wind and solar PV generators, network controls including AC on interconnector lines (not DC interconnectors), and multiple energy storage devices.

### **Are renewables able to assist the grid ?**

The answer is yes. Since 2004 the ancillary service markets have valued ancillary services including frequency regulation at near-zero for most settlement periods. With no commercial incentive to supply, the capability was largely inhibited but during the past two years the ancillary service market has increased in value and market participants have responded positively to this. A number of wind generation and other sources are now providing certain ancillary services to assist the grid.

Renewable sources with inverter technologies are able to remain connected to the grid at very low short circuit ratio (in the order of less than 2), and can provide most ancillary services especially in response to over-frequency events and reactive power.

Australia is not alone in tackling this. Ireland and California are devising market structures to incentivise such a transition and successful trials completed e.g. NREL and First Solar trial using a 300MW solar PV in California is attached here (<https://www.nrel.gov/docs/fy17osti/67799.pdf> dated January 2017). Work is in progress to devise a mechanism which incentivises the generation plant to maximise production or be compensated to “hold back” production to provide reserve for such services.

Within Australia trials are planned by AEMO at Hornsdale 3 wind farm in South Australia and Reach consider large-scale solar PV is also able to provide similar ancillary services.

Reach therefore:

1. consider the ongoing trials at Hornsdale 3 (windfarm) and battery systems, will reaffirm fast-acting inverter technology (used by wind and solar PV) can:
  - (a) operate responsively to automatic generator control by AEMO and provide certain frequency regulation services; and
  - (b) dampen the rate of change of frequency under severe network disturbances which in turn is expected to reduce the amount of system inertia required to maintain the frequency within acceptable limits;
2. continues to consider system inertia is important and will be provided by synchronous generation in the near-term, but will be increasingly provided by even faster acting asynchronous inverter technologies and/or aggregated consumer generation, controlled load shedding (financial options paid to willing consumers), installation of frequency control on Murraylink, and energy storage.

The AEMC approach remains biased to generation and Reach continues to suggest consumer-led offerings should feature more including aggregated consumer generation and voluntary demand-side management.

In addition, AEMO is also able to constrain certain generation and/ or transmission lines in response to system disturbances i.e. avoiding or reducing the additional cost required for what are likely to be infrequent events. There is no mention of this in the AEMC paper.

3. **supports in-principle a market-based** mechanism (Reach has concerns on TNSP procurement of system inertia services)<sup>3</sup> to procure effectively 'instantaneous FCAS' but advocates a **delay to an inertia market** until ongoing trials by AEMO are completed at Hornsdale 3 and energy storage, and the results are known.

A delay also provides more time to draw from international experience from other trials and market mechanisms including California and Ireland; and

4. notes the advice provided by AEMO titled "Advice to the Commonwealth Government on dispatchable capability" dated September 2017, recommended a consultation process with industry and consumers through its Expert Panel and AEMC to "...retain existing investment and incentivize new investment in flexible dispatchable capability in the NEM". This is to be completed for "...consideration by the COAG security Council by mid 2018".

Reach considers this important work overlaps with the inertia market being proposed and underscores the need for a more information to be gathered including the use of a capacity payment. An energy-only market such as the NEM does not encourage a "raise" service i.e. no value to hold-back generation on a "hope" that a raise ancillary service will be required. The NEM is now one of the few energy markets (worldwide) with no reward for capacity in it. Reach continues to advocate that this is unlikely to be sustainable and nor will it encourage a smooth transition over the next 5 to 10 years. The above review by the Expert Panel should consider the same;

Notwithstanding the approach advocated by Reach in item 3 above, if a scheme is put in place, then Reach supports the integration of inertia within FCAS rather than set-up a new market. If this is not done then there is a risk that a new inertia market will turn out to be not fit for purpose and will distract attention from fixing known FCAS issues e.g. "causer pays" methodology and there is no representative FCAS secondary market. Reach supports the alternative set out in section 4.2 whereby proceeds from settlement residue auctions are used to fund inertia payments and recover any additional funds from TNSP's.

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<sup>3</sup> To avoid a repeat of the findings by the Australian Energy Regulator to the COAG Energy Council on 6 February 2017.





I hope this is of interest to AEMC and please do not hesitate to contact me if you have any questions on the same (0447 350 442 or [julian@reachsolarenergy.com.au](mailto:julian@reachsolarenergy.com.au)).

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'JDH' with a long horizontal flourish extending to the right.

Mr Julian Dichiera