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Enlightened Energy.
A New Way.

Rebecca Knights
Director, Energy Policy and Projects
Department of Premier and Cabinet

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ZEN Energy Submission to the SA Energy Security Target Stakeholder Consultation

Dear Rebecca,

ZEN Energy is a new energy solutions provider specialising in the delivery of low carbon energy supply solutions to large energy users. Our business model is to delivery firm supply products backed by the mix of technologies that delivers the lowest risk-adjusted cost. This involves finding the right place for renewable generation, energy storage (battery and pumped hydro), demand response and distributed thermal generation within an electricity supply portfolio designed for the low carbon transition. As part of this model, we are actively seeking to maximise and monetise the contribution of this full range of technologies to grid security.

Our team includes experienced energy traders, renewable developers, business customer sales people and policy leaders who have led the industry in their respective areas of expertise. The comments below reflect contributions from these various areas of expertise.

Our general view is that the Energy Security Target, as framed in the discussion paper, has laudable aims but is unlikely to deliver the broad outcomes desired for two reasons: it offers perverse incentives, and fails to incentivise certain technologies that are likely to deliver system security at lowest cost.

The EST as currently framed is likely to give rise to perverse outcomes such as entrenching the profitability of incumbent generators without incentivising them to increase their availability in the market. Generators are operated by traders, and the job of traders is to maximise profit; a scheme that puts a price on delivering power from local generation based on scarcity will naturally encourage the delivery of scarcity. If one unit of Pelican Point realises a margin of $20/MWh plus a $50/MWh EST payment, and both units of Pelican Point realise a profit of $15/MWh plus a $15/MWh EST payment, then the second unit of Pelican Point will not run.

Any incentive to deliver energy security should equally encourage incumbent and new generation units of all technologies, both front of meter and behind the meter, such that the overall cost of delivering a defined improvement in security will be kept to as low as possible. All forms generation, storage and demand response have some measurable contribute to make to system security. A well-designed scheme will incentivise all these technologies to do so, and more based on available capacity than megawatt hours generated

Please find below a series of points on the EST for your consideration. We will be happy to engage with you further on these or other issues as the plan to implement the scheme develops.

Point 1. It is easy to create perverse incentives

A poorly designed energy security target will have the perverse effect of discouraging non-dispatchable generation rather than encouraging dispatchable generation. The state would then be in the unique position of having the RET to disincentivise new gas, and the EST to disincentivise renewables. This turns the death spiral of thermal generation into a double death spiral.

The target of 4500GWh is too low. Qualifying generators produced qualifying generation of 4528 GWh in 2016. In the financial year to date (25 Mar) they have produced 4700GWh. This means that qualifying generators have almost complete pricing power. Withholding a small amount of certificates would ensure that the market went into deficit, and that the market cap price of $50/certificate would be achieved without any possible competition from new generation sources. This amounts to a **subsidy** for existing generators that would have no effect on wholesale prices. Based on historic generation patterns, AGL would stand to make windfall gains of approximately $125m per year, and this scheme would cost SA energy customers approximately $250m per year with no effect on wholesale prices.

See below for the calculation for 2016 and FY 16/17 to-date

2016			2016/2017		
Company	Qualifying Gen	Scheme Revenue	Company	Qualifying Gen	Scheme Revenue
EA	39.56	$1,978,148	EA	44.82	$2,240,988
Origin	1,265.37	$63,268,416	Origin	1,174.55	$58,727,324
Engie	477.10	$23,855,066	Engie	931.11	$46,555,721
Snowy	14.72	$736,204	Snowy	22.04	$1,102,223

AGL	2,731.66	$136,582,909	AGL	2,509.35	$125,467,692
	4,528.41	**226,420,744**	**Total**	**4,681.88**	**234,093,948**

In the absence of new (non-gas) generation, the only source of additional qualifying generation is existing gas-fired power stations. The limitations on gas as a fuel for electricity generation is highlighted in the GSOO, which forecasts a gas deficit, and is a direct input into the intervention of the Prime Minister in the domestic and export gas industry. Any additional consumption of gas would exacerbate this shortage, and put upward pressure on gas prices, thereby negating any benefit that the production of certificates would have (by acting as a subsidy) for high-cost/low efficiency gas-fired generation.

Coupled with the scarceness of the commodity is the lack of available transportation via the Moomba to Adelaide Pipeline (MAP). Industry sources indicate that pipeline capacity is full until at least the end of 2019 (confirm with Santos). Therefore, while the pipeline capacity remains constrained, it will remain impossible to transport gas south in any significant volume, thereby acting as another constraint to increased generation from existing generators. Furthermore, this lack of capacity will further act as a barrier to entry to prospective new gas-fired generators (regardless of the commodity price of gas) thereby ensuring that the existing generation assets make windfall gains at the benefit of customers for the foreseeable future.

The fact that the target starts rising before there is any possible response from qualifying new generation assets (due to issues identified as above) is just going to increase the windfall gains made by existing generators and/or ensure that the scheme fails as it is likely that qualifying generators will not produce enough certificates to ensure that the market clears.

Existing gentailers will have no incentive but to pass through the maximum allowable price to customers. They will generate more certificates than their customers need, so will have no incentive to seek to optimise the cost of certificates from the market. As such, their customers will be captive buyers of the certificates at whatever price the gentailers choose.

Such a scheme (as designed) may actually act as a disincentive to increase generation from existing qualifying generators. This is because any additional generation would increase the supply of certificates, thereby reducing the market power of each generator in the market. For example, if Engie were to return Pelican Point unit 2 to the market, it may produce as many as 2100GWh additional certificates. This would have a substantial downward effect on the price of certificates, and it is likely that some of the certificates it creates would expire worthless. Unless the total margin it creates from this increased generation is greater than the revenue it would achieve from certificates (in the region of $50m) it would be a rational business decision to not commit that extra unit to the market.

The only sensible market design (in light of above) is to exclude average historic generation by station from the ability to create certificates. This would eliminate the direct subsidy to generation that is already likely to be present in the market, and create the right incentive for generation that would not otherwise be in the market (either by virtue of the fact that it is new, or that a decision has been made to recommit to the market). Some care would have to be taken not to be seen as rewarding recalcitrant behaviour (ie unduly rewarding Pelican Point for returning to the market, or encouraging existing generators to game the regime).

Point 2. Qualifiying generators should be determined by function not type

It makes no sense that there is such an arbitrary definition of generations under the working paper. How is a battery different from an idle peaking gas (or diesel) plant? All such assets are fuel limited. What is more, as you must produce a MWh of electricity to create a certificate under the scheme, peaking generators will generate very few certificates (as they only operate in periods of peak demand or price). The scheme is mixed up in its aims. What SA needs is generation assets that can rapidly respond to generation shortages. It should reward generators for this ability to respond, not for what is actually generated. Instead, it will only marginally reward peaking generators, and will not reward batteries and pumped hydro (not being a qualifying generator under the Scheme) when these are exactly the class of assets that the SA market needs. Note the comment of Danny Price reported in Renew Economy that a technology delivered system inertia, it should be included in the scheme regardless of the technology used.

The criteria for a generator to be accredited under the Scheme include the requirement that it be able to provide ***real inertia*** ($44EC(1)(b)(ii)); that is, the generator must be capable of providing an ***inertial response***. Under the draft regulations inertial response is the “absorption or release of kinetic energy by a rotating mass to arrest a change of frequency”.

This requirement for so-called “real” inertia confuses ends and means. The essential purpose of inertia – that is to say, the *end* – is to enable the electricity system to remain operational in the immediate aftermath of a disturbance, such as that caused by a sudden interconnector or large generator trip. The concept of "synthetic" as opposed to "real" inertia marks a false distinction; the relevant concept here is electricial inertia, which means the ability to deliver power within a certain response time, and it does not matter whether this electrical energy is converted from mechanical, chemical or gravitational potential energy.

Although this security has been traditionally provided via the angular momentum of on-line large turbines, it is not necessarily the only *means* through which such security can be provided. A very fast responding grid-scale battery, for instance, would be also be capable of assisting in the arrest of a change in frequency; through the rapid transformation of chemical (rather than kinetic) energy.

A stipulation that accredited generator must be able to contribute to this aspect of system security *only* through provision of rotational kinetic energy is therefore a violation of technological neutrality. The Energy Security Target should focus on outcomes, and be open to alternate technologies for the delivery of that outcome.

Stepping down into the different technologies:

- there is little functional difference between a 3 hour pumped hydro and a three hour battery storage system. One of the things an EST might do is to incentivise bringing more storage duration into battery storage systems (e.g. pushing a half hour battery into a two hour battery)
- There is a quite a range of even within the narrow category of "real" inertia. Steam cycles (and hydro) have much greater inertia than OCGT's, which in turn have greater inertia than reciprocating engines - and yet all would be considered eligible, despite the different capabilities. In addition, flywheels (increasingly common in data centres) and synchronous condensers (which are intended solely to provide inertia) are effectively excluded the scheme as currently defined, given they don't produce MWh's over the course of the year.
- gas generation can only provide inertia when it is actually on. Annually settling the certificates removes any incentive to be on, and provide inertia when it is actually needed or when there is low inertia within the system. Gas generators also have to run at minimum load (which can be significant) to do this, rather than a battery, flywheels and/or synchronous condensers. Most offline gas generation has T1 (time to synchronization) greater than 5 minutes, and T2 times (time to minimum load) of >10 minutes - which is hardly useful from a system security standpoint (and compared with <100ms for batteries).
- In round terms, a wind farm can provide 10% of its real time operating power as 'real inertia' (by virtue of having a spinning shaft). With a small

battery in a support role, this combination could be considered substantially 'real inertia' and dispatchable. If the meaning of dispatchable is to have a 'sustain' of 1 hour, then a wind farm can meet this criterion. If it means 'indefinite sustain', then not. Retrofit of an existing wind farm is probably too hard, but a new wind farm build could easily incorporate the additional controls to provide this service.

- A solar farm can provide frequency regulation (small signal correction around 50Hz) by de-rating the power station to 90% of real time output and using the 10% headroom to perform raise/lower. That comes at an opportunity cost of lost energy production, so the solar farm would need to be remunerated for the service. A solar farm cannot readily provide arresting energy such as called for by the Energy Security Target. This issue more relevant once there is regulatory reform to provide a premium payment to premium services for Fast Frequency Response, in which case batteries and solar farms compete to provide the service.

Finally, the EST would ideally be designed to be compatible with the new inertia measures that are currently being considered by the AEMC, with respect to the Inertia Ancilliary Service Marker (draft determination set to be made in June 29; see the System Security Market Frameworks Review Directions Paper).

Yours sincerely,

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