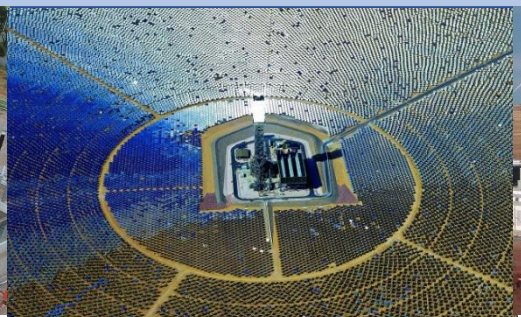


REVIEW OF SOUTH AUSTRALIA'S ENERGY PLANS

A Report for the Australian Energy Council

Allan O'Neil
Wholesale Energy Markets Consultant

February 2018


EXECUTIVE SUMMARY

Energy policy continues to be a key public and political issue in South Australia, with both the South Australian Labor Government and the Liberal Opposition having developed, and in the case of the Government substantially implemented, major policy initiatives aimed at dealing with the State's energy challenges. This review analyses the Government's Plan and progress to date and summarises and compares the Opposition's policy announcements in the context of their effects on the South Australian energy market and the NEM as a whole.

The South Australian Government announced its Energy Plan ("the Plan") in March 2017 amidst widespread concern about the reliability and affordability of electricity in the state and sustained debate about energy policy and the future direction of the National Electricity Market (NEM).

The Government portrayed its Plan as "taking charge" of the State's energy future and as its response to perceived failures of the NEM to deliver reliable and affordable supply. A key theme of the Plan is a push for greater local self-sufficiency in and control over the electricity market, evident in actions by the Government to invest directly in gas-fired generation, sponsor construction of Australia's first – and the world's largest – grid-scale battery storage project, require retailers to source a minimum proportion of power locally, and legislate for local powers over operation of the NEM in South Australia.

The Plan's release preceded – and arguably pre-empted – the outcome of several other key reviews responding to the South Australian Black System event in September 2016 and emerging power system issues more generally, including the Finkel Review's final report and recommendations and actions taken in response. For its part the State Government argued that it was not prepared to wait for other governments and organisations to act, particularly following events in February 2017 when supply to 90,000 premises in Adelaide was curtailed in controversial circumstances.

The pressures on the South Australian Government to respond promptly to these events and debate were real and understandable. In evaluating the Plan, the key questions are less whether the Government should have acted in some fashion, but whether the Plan's objectives and actions are internally consistent, and represent the best set of steps to improve outcomes in the NEM for consumers, through initiatives that are also cost-effective for South Australian taxpayers.

The Plan contains a broad set of actions and policies, some targeting the immediate issues of system reliability and security, others more concerned with longer horizon objectives particularly the transition of the energy system to a low emissions future. As well as the key question of whether Plan is the best or only way to ensure that the lights stay on In South Australia, it also needs to be assessed against longer term criteria.

In the months following the Plan's release many developments on the ground and in the policy sphere have occurred or commenced, and it is now reasonable to ask whether every element of the Plan remains relevant and fit for purpose.

Key observations from this evaluation are that:

- The Plan's focus on South Australian control and "self-sufficiency" is not necessarily the best approach for the State nor for the NEM as a whole. The physical interconnectedness of the electricity system, and the benefits to be gained from greater diversity of supply sources mean that pursuit of self-sufficiency is likely to be less cost effective than enabling greater sharing of resources across State boundaries.

- Imposing greater degrees of local control and regulation risks Balkanisation of the NEM if other States follow this precedent and in the worst case "beggar-thy-neighbour" outcomes at times of system stress, when sharing of reserves and resources is most vital.

- Few initiatives under the Plan itself directly and immediately address South Australia's current power system security challenges – the robustness of the grid to shocks and contingencies. Actions being taken by AEMO and others have been required to lower the risk of further events like September 2016's Black System.

- Government expenditure and financial support under the plan is skewed to projects that are larger or longer term than strictly necessary to achieve the Plan's immediate objectives. By occupying a larger role in the market than appears necessary or desirable, the Government risks deterring other investment necessary for the longer term health of the system.

- Some key elements of the Plan such as Energy Security Target and long term ownership of "emergency reserve" gas-fired generation appear likely to be rendered unnecessary or their supporting logic superceded by developments at a national level.

After the Plan's release and initial implementation of some of its initiatives, the South Australian Opposition released its own detailed energy policy in October 2017. Comparison of the two sets of policies further highlights some of the issues raised above, identifies areas where recent events have created ambiguity around the Opposition's proposals as originally stated, and in the case of the Opposition's larger scale investment proposals finds that there are some general weaknesses not dissimilar to those identified in elements of the Government's Plan. Clarification of some of its proposals by the Opposition would be very helpful in establishing clearer directions or policy alternatives for the South Australian electricity sector.

While some actions taken so far under the Plan cannot easily be reversed, and other elements remain worthwhile, it would be prudent for whichever party or parties form government after the forthcoming South Australian election to review the Plan in the light of developments since its release. By taking these into account and adjusting its policies and initiatives, this would ensure that the Plan remains relevant, makes a positive contribution to the health of the NEM, and achieves the best possible value for South Australian customers and taxpayers.

SECTION 1: OVERVIEW

Genesis

The South Australian Energy Plan[i] ("the Plan") was announced in March 2017, following a series of events that highlighted strains on the South Australian electricity system and wholesale market, including the September 2016 Black System event[ii], load shedding and curtailment in December 2016[iii] and February 2017[iv], and volatile and rising wholesale prices seen through the second half of 2016 following closure of Northern Power Station. The Plan was developed during a period of sustained and at times febrile public and political debate about the future direction of the National Electricity Market (NEM) and appropriate policies for addressing the "trilemma" of energy security, affordability, and emissions reduction.

The South Australian State Government ("the Government") characterised the Plan as its response to the perceived "failing" of the NEM framework and a means for the state to "take charge of its energy future".

Objectives

The key objectives of the Energy Plan can be summarised as follows (pages references are to the Plan energy policy document):

- Increase **self-reliance** by sourcing, generating and controlling more electricity supply within South Australia (p.2)
- Increase the **security and reliability**[1] of electricity supply in South Australia (p.7)
- Accelerate the **energy transition to low-carbon** and **"next generation" renewable technologies** (p.12)
- **Increase competition and lower prices** in the South Australian wholesale market (p.6)

Whether all these objectives are mutually consistent can be questioned. Pursuit of self-reliance could run counter to moves to strengthen interconnectivity between NEM regions and to increase the diversification of generation sources – particularly renewable generation where greater, not less, geographic diversity of sources across the NEM is important in smoothing production profiles and reducing requirements for expensive energy storage or reserve generation[v]. Pre-emptive regulatory interventions with an objective of increasing security and reliability in the near term may both increase costs and dissuade further private investment necessary for maintaining energy security in the longer run. The precedents set by South Australia's Plan could motivate similar actions by other State governments leading to "Balkanisation" of the NEM and arguably a less economically efficient and reliable outcome than working coöperatively towards nationally agreed and consistent frameworks and policies.

The effectiveness of the Plan and avoidance of potential conflicts in its objectives or unintended consequence of its operation ultimately depend on the specific actions taken to implement it, which are grouped into a set of key Plan components, discussed below.

[1] In the context of the electricity system, **security** specifically refers to the system's ability to withstand short term contingencies and shocks such as loss of a major transmission line or generator, while **reliability** means the availability of sufficient operating capacity to meet demand at all times up to a given reliability threshold. The term "energy security" generally has a broader meaning concerning confidence in and resilience of the overall energy supply chain.

SECTION 2: SOUTH AUSTRALIA'S ENERGY CHALLENGES

As highlighted by the events leading up to the development of the Plan, the South Australian energy sector, particularly the electricity system, has faced significant challenges in recent years. In assessing the targeting and effectiveness of the Plan, its responses to these challenges are important. Three key areas are outlined below.

System Security

System security of the power grid means its electrical resilience to shocks and disruptions, including contingencies such as the sudden tripping of major generators, transmission elements, or in South Australia's case, loss of the interconnection to the rest of the NEM. The South Australian electricity network is an extended and in electrical terms relatively weak grid which has been challenged by the recent retirement of synchronous generators providing significant inertia and fault current, electrical characteristics which help stabilise the system in response to contingencies.

This has been highlighted by studies and reviews both preceding and in response to the Black System in September 2016 and other events such as the "near miss" in March 2017 when several major generating units tripped in rapid succession[vi]. Work by AEMO and Electranet has identified urgent needs for better management of power system frequency excursions and the risk of cascading failures, through additional system and network services and protection schemes[vii]. Studies by AEMO have resulted in revised market operating protocols and constraints to maintain minimum levels of online synchronous generation providing adequate system strength[viii].

At the level of the National Energy Rules (NER) the AEMC has undertaken a Power System Security Review[ix] and made new rules[x] in relation to maintenance of adequate levels of inertia, system strength, and technical parameters of generators.

Reliability

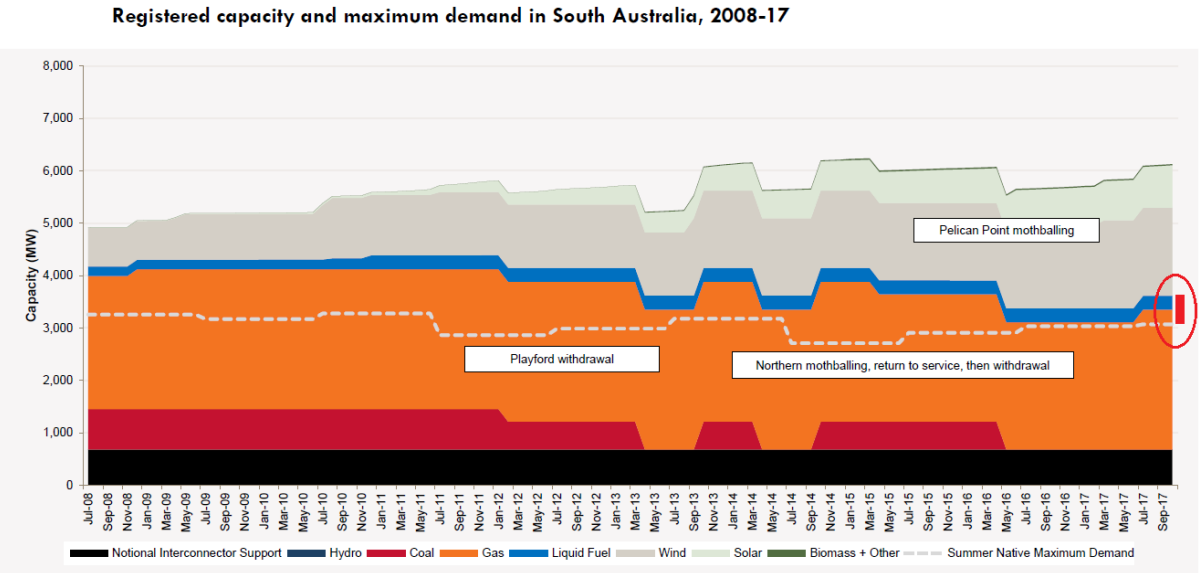
Power system **reliability** is distinct from system security and means the availability of sufficient online supply capability to meet demand at all times, up to a given threshold[2]. In this context reliability does not encompass the more common localised supply interruption risks due to distribution system equipment failure, storms, or bushfire. The load curtailment event in South Australia on 8 February 2017 was an example of total demand being unable to be supplied due to insufficient online generation capacity.

Concerns about reliability in South Australia have been driven by the retirement or withdrawal of generation capacity and instances of tight supply-demand balance due to capacity constraints on the interconnection from Victoria coupled with low output levels from the State's windfarms. With the retirement of Hazelwood in Victoria, reliability across the combined South Australia-Victoria regions has been a topic of concern for the current summer[xi], with a large part of AEMO's summer readiness preparations[xii] including Reliability and Emergency Reserve Trader and Demand-Side Participation programs having been directed towards reliability in these two states.

While AEMO's formal reliability assessments use sophisticated modelling approaches to quantify supply adequacy and unserved energy risks, the simple illustration of South Australia's supply-demand balance provided in AEMO's Summer 2017-18 operations report yields insight into recent trends, and the nature of the reliability challenge:

[2] The NEM Reliability Standard is that no more 0.002 per cent of annual energy demand should be at risk of not being supplied due to insufficient supply or demand-side resources being available.

Figure 1: South Australian Supply-Demand Balance



This chart shows supply capacity (coloured areas) versus maximum demand (dotted line), with supply grouped into support from interconnectors, thermal capacity, and non-dispatchable[3] renewable sources. Each of these supply sources is subject to variation or derating due to constraints, outages, weather and climatic conditions, so while total installed capacity is nearly twice maximum demand, the actual level of supply available will almost always be considerably lower. The contribution of wind and solar sources at times of maximum demand can vary greatly and for planning purposes AEMO assumes 9.4% of registered wind capacity, or 128 MW. The margin between maximum demand and non-renewable capacity, highlighted at the right-hand end of the chart, is roughly indicative of the system's underlying reliability level. The chart shows that installed dispatchable capacity in South Australia of about 3,000 MW (excluding supply from interconnectors) is roughly equal to maximum demand. Under high demand conditions, reductions in this thermal capacity, derating of interconnectors (or reduced flows due to tight supply-demand balance in neighbouring Victoria), and low output from windfarms could clearly combine to leave a precarious balance in South Australia.

Competition and Price Outcomes

As the smallest mainland NEM State and with a frequently constrained interconnection, South Australia's wholesale markets – both forward and spot – have tended to exhibit greater volatility and often higher prices than the rest of the NEM. Lack of contract liquidity and concentration of supply, both for energy and for certain ancillary services, have been concerns. The relatively extended size and low customer density of the transmission and distribution networks mean that unit costs and prices for these services are higher than in more compact, higher density regions, adding to retail price pressures.

While the State's excellent wind and solar resources have led to the highest penetration of renewable generation in the NEM (including small scale rooftop PV), output from windfarms tends to be strongly correlated across the South Australian region, contributing to the volatility of price outcomes.

[3] Dispatchable sources are those whose capacity, while still subject to outage or derating, can be directed to turn on when needed to balance supply and demand.

SECTION 3: PLAN ELEMENTS, ACTIONS, AND RELATED DEVELOPMENTS

Plan Components

The Plan as originally announced comprised a set of actions and policies grouped into six major components, with a seventh - development of a "Hydrogen Roadmap" – effectively added to the Plan in September 2017. These are summarised briefly in Table 1:

Table 1: SA Energy Plan Components

Component	Summary
Battery storage and renewable technology fund	Establishment of a $150 million Renewable Technology Fund (RTF) providing financial support for selected "next generation" renewable technology projects, commencing with "Australia's largest battery" – a 100 MW grid connected battery storage facility.
State-owned gas power plant	Construction of up to 250 MW of new gas-fired generation to be owned by the State government and held as emergency reserve to be dispatched only to prevent supply shortfall. Short term procurement of ~200 MW "emergency generation" to improve reliability for the 2017-18 and 2018-19 summers.
Local powers over national market	South Australian Minister for Energy to be given powers to direct participants in the NEM and AEMO "in an emergency situation or when market forces fail". Imposition of special generator licensing arrangements and technical conditions on development assessments for new South Australian generators.
New generation for more competition	Tendering of State government electricity supply for 10 years from January 2018, to support new privately-owned and dispatchable renewable generation in South Australia. 25% of supply supported by dispatchable renewables and 75% by any generation type.
South Australian gas incentives	Support for additional gas exploration and development in South Australia, including a Plan for Accelerating Exploration (PACE) grants fund, and a Royalties Return Scheme (RRS) offering 10% of royalties to landowners where new gas is brought into production.
Energy security target	Regulatory obligation on retailers in SA to purchase target quantities of energy (~36 – 50 per cent of annual load) from qualifying local generators, essentially dispatchable generation providing "real inertia and fault current".
Hydrogen roadmap	Strategy and related initiatives to support trials of and investment in elements of the hydrogen production, usage and export cycle within South Australia.

These components, proposed initiatives and their current status are analysed and evaluated individually in Section 4. Table 2 below maps the alignment between the Plan's components and its stated objectives:

Table 2: Mapping Plan Components to Objectives

Component \ Objective	Self-Reliance	Security & Reliability	Increased Competition	Low Carbon Transition
RTF				●
Battery		●	○	●
State Generator	●	●		
Local Powers	○	●		
New Generation	●	○	●	○
SA Gas Initiatives	●			○
EST	●	●		
H_2 Roadmap	○			●

Key: ● Primary aim of plan component; ○ Secondary or indirect aim

This matrix illustrates the prima facie intent of each component in seeking to address the Plan's objectives, not how effectively they may do so. Questions of effectiveness, efficiency, value for money and potential unintended impacts are discussed in the evaluation of each Plan component in Section 4.

Plan Costs

The overall costing of the Plan was stated as being $550 million, without full explicit allocation of this amount to individual initiatives or into capital and operating components. The 2017-18 SA Budget Papers subsequently provided the following breakdown[xiii] of overall budgeted spending on the Plan:

Figure 2: Plan Budget Information

2017–18 Budget initiatives ($000s)

	2016–17 Estimate	2017–18 Budget	2018–19 Estimate	2019–20 Estimate	2020–21 Estimate
Memorandum items — initiatives prior to the 2017–18 Budget Across Government					
Operating initiatives					
Our Energy Plan	-5 127	-113 815	-71 110	-27 198	-32 750
Investing initiatives					
Our Energy Plan	—	-75 000	-175 000	-50 000	—

It is not clear whether these figures include all financial support provided under the Plan, for example the contractual arrangements for State Government electricity supply under the "New Generation" component may or may not involve an implied subsidy provided via the total cost of capacity and energy supplied.

Where full or partial costings for individual components of the Plan are known or have been estimated, these are given and discussed in Section 4.

Other Market Developments

Important developments have occurred in the NEM generally and in South Australia specifically since the Plan was developed and released. A number of these were in train prior to release of the Plan. This raises the question of whether these have rendered elements of the Plan redundant or less important, or whether actions under the Plan may conflict with or pre-empt initiatives undertaken or planned by third parties.

Relevant developments during 2017 included the following:

- Announcement of return to service of both units of Pelican Point[xiv] and contracting of additional gas[xv]
- AGL's announcement of the new Barker Inlet gas plant to partially replace TIPS A[xvi]
- Actions being taken by AEMO, including RERT and DSP initiatives for additional capacity in summer 2017-18 and 2018-19, as well as operational interventions to maintain system security[xvii]
- Commencement of construction of additional generation and storage projects including Bungala Solar (220 MWac PV), Willogoleche Wind Farm (119 MW), and Lincoln Gap (Stage 1 126 MW wind, 10 MW storage)[xviii]
- Progression of numerous other renewable generation and storage proposals by proponents including SIMEC Zen Energy, DP Energy, EnergyAustralia, Equis and others totalling several GW of capacity[xix]
- Release of the final report of the Finkel Review[xx]
- The Federal Government's proposed National Energy Guarantee (NEG) framework for addressing emissions reduction and reliability objectives[xxi]
- Numerous ongoing reviews and rule change proposals aimed at enhancing security and reliability mechanisms in the NEM, including[xxii]:
    - The AEMC's Reliability Frameworks and Frequency Control Frameworks Reviews
    - The Reliability Panel's review of the NEM Reliability Standard and associated market price settings
    - Implementation of recommendations arising from AEMO's SA Black System review
    - Work on improving Emergency Frequency Control schemes
    - Rule change proposals on generator technical standards and frequency operating standards being progressed by AEMC and AEMO

Considering these developments, some elements of the Plan as originally announced could now be seen as redundant, superceded by, or at cross-purposes with actions "on the ground" and work in progress at NEM-wide level.

This has already been recognised by the Government in the case of the Plan's Energy Security Target (EST), whose commencement date has been deferred from the originally proposed 1 July 2017 until at least 2020. As the fundamental design paradigm and objective of the EST appears similar to the proposed reliability element of the NEG, if the NEG proceeds to implementation then there would no justification for activation of the EST mechanism.

The case for the government's long-term ownership of its own reserve gas generation capacity has also been weakened by the level of actual and potential physical capacity build in South Australia including dispatchable renewables and storage, and by AEMO's near term RERT and DSP initiatives, with work proceeding on a longer term Strategic Reserve mechanism. By exercising the purchase option under the original two-year lease of this generation, the Government has now committed a large share[4] of the overall funds allocated for the Plan to this single initiative, which is arguably an overallocation of scarce financial resources and may have various impacts on the market and its participants which are outlined in Section 4.

[4] The total cost of this generation is reported to exceed $360 million (see Section 4) out of the Plan's total budget of $550 million.

Other impacts of the Plan on third party developments and vice versa are also discussed further in the evaluation of individual Plan components in the following section of this report.

SECTION 4: EVALUATION OF PLAN COMPONENTS

This section individually describes and evaluates each component of the Plan against the following set of criteria:

- Does the initiative have clear objectives?
- What are its possible impacts on the system security and reliability challenges outlined in Section 2?
- What impact on market outcomes – short and longer term – might be expected?
- What are the potential customer impacts (particularly on price and affordability)?
- Is there a cost to taxpayers?
- What are the likely effects on different market participants?
- How consistent and compatible is the initiative with the NEM framework and with actions being undertaken by other participants and stakeholders?

The evaluations also consider the interaction of Plan components with key subsequent and third-party developments undertaken or announced since the Plan's establishment, identify and discuss any other relevant issues, and provide conclusions on each component.

Initiative	Battery Storage and Renewable Technology Fund

Summary

Establishment of a Renewable Technology Fund (RTF) providing financial support for selected technology projects, commencing with "Australia's largest battery" – a 100 MW grid connected battery storage facility.

Objectives

To support new projects providing or facilitating supply of dispatchable renewable energy through large-scale "next generation" storage technologies.

Costs

$150 million fund to be disbursed as $75 million in grants and $75 million in loans "to support private innovative companies and entrepreneurs"[xxiii].

Progress to date

- Tender for 100 MW / 129 MWh battery storage facility awarded in early July to Neoen / Tesla Hornsdale Power Reserve (HPR) project in Jamestown, adjacent to Hornsdale Wind Farm.
- HPR commenced operation in late November; its capacity is partly contracted (70 MW) to the state government for system security and reliability functions (FCAS, emergency reserve), the balance available to proponents for energy market dispatch[xxiv]. Since commissioning HPR has been providing primarily FCAS services (both regulation and contingency) to the market.
- Costs of the battery and associated contract to SA taxpayers are unclear but have been reported as "$50 million" over 10 years[xxv]. Capital cost of the battery was reportedly in the range of USD 33 – 50 million.
- Additional RTF grants totalling $8.2 million to support four renewable + storage projects (~10 MW / 14 MWh) were announced in late November 2017[xxvi].
- RTF funding is also available for Hydrogen Roadmap initiatives (see p.24)
- Tesla may establish up to 50 electric vehicle charging stations across SA as part of its successful tender for battery provision – an EoI seeking submissions from premises to host these closes on 19 Jan.

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	Whilst the RTF is clearly focused on projects incorporating storage technologies paired with or complementing renewable energy sources, it is less clear where the balance lies between rapidly bringing material quantities of storage into the market versus supporting demonstration or early stage technologies.
System Security	The impact of HPR on the supply and cost of system security market services – Regulation and Contingency FCAS – is likely to be more material than its contribution to reliability, as total market requirements for these services are smaller than demand for energy, and it constitutes an additional competitor in a relatively concentrated market. The physical characteristics of battery response also make it well suited to provide capacity across all FCAS markets. The battery will not provide additional

	physical inertia or fault current to the system, but its fast response capabilities[xxvii] may be of value in emergency frequency control schemes of the type anticipated in AEMO's Power System Frequency Risk Review[xxviii] for South Australia.
Reliability	The size and storage capacity of projects supported so far (~110 MW), relative to system demand and dispatchable capacity (around 3,000 MW), will make a small contribution to supply reliability in the near term.
Market Impact Short-term Long Term	HPR is likely to lower FCAS prices particularly for the Regulation service by introducing greater competition into local supply of these services. Energy price impacts are likely to be minimal as the 30 MW dispatched in this market represents only ~2 per cent of SA average demand. Demonstration of and learnings from the NEM's first grid-connected battery will influence future developments and investments but how materially cannot yet be assessed. Commercial confidentiality arrangements in the contract between the Government and HPR may reduce the extent to which such learnings are made publicly available. Smaller scale projects supported by the RTF may also influence future capacity investment options choices and costs but again the extent cannot yet be quantified.
Customer Impact	Lowering of FCAS costs will have a marginal impact on customer bills, as these services account for only a small proportion of total delivered energy costs.
Taxpayer Cost	It is unclear exactly what costs the RTF has and will incur for support of HPR and other projects. The 100 MW scale of the battery investment at HPR appears significantly larger than necessary – a smaller less expensive project (say 25-50 MW) would have equally well served the technology demonstration and learning objectives sought, while still materially improving competition in FCAS supply, at lower cost to taxpayers and with very little difference in the overall level of system reliability.
Market Participant Impact	The principal near-term impacts will be on competition for supply of FCAS services with other providers of these services. Overall market impacts will be limited.
Consistency with NEM Framework	State-subsidised investments in or financial support for material quantities of market-oriented capacity are generally inconsistent with the NEM framework in which participants are principally responsible for investment decisions based on price signals.

Conclusions

Support for demonstration projects and early stage technologies relevant to the energy transition is a justifiable allocation of public expenditures, particularly given South Australia's high renewables penetration. However, funding through an agency such as ARENA which explicitly sought to maximise technology learning and transfer impacts would have been another model to consider.

In the case of the RTF's Battery investment another question is the size of the financial commitment to a single, utility-scale project which is large even by global standards when a smaller facility (or several smaller scale projects) would have served the objectives of the initiative and achieved very similar outcomes at lower cost.

Initiative	State-Owned Gas Power Plant

Summary

Construction of up to 250 MW of new gas-fired generation to be owned by the State government and held as emergency reserve to be dispatched only to prevent supply shortfall.

Objectives

Enhancement of system **reliability** through additional reserve supply capacity, and **system security** through continuous supply of inertia.

Costs

Reported as $360 million plus relocation and set up costs of $73 million, and operating costs to 2021 of $20 million[xxix].

Progress to date

- Procurement of nine aero-derivative dual-fuelled turbines with nominal capacity of 276 MW. Originally leased for two years but purchased in November 2017 via pre-negotiated option arrangement.
- Temporary installation as short-term diesel-fuelled "emergency generation" at Elizabeth and Lonsdale sites to the north and south of Adelaide, commissioned in November 2017.
- Capacity has been fully contracted under AEMO's Reserve and Emergency Reliability Trader (RERT) powers, for summer 2017-18 only.

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	Objectives appear to be enhancing short term physical reliability and security (principally summer 2017-18 and 2018-19), and in the medium term increasing confidence that a repeat of recent supply shortfalls and attendant risks will not occur.
System Security	From the available public information it is unclear whether the temporary generation as installed is technically capable of providing grid support and security services via continuous supply of inertia even when not in-service and dispatched – one of the Government's stated objectives for this investment. This objective was based on the originally intended installation of the more advanced capability GE LM6000 gas turbines with co-located 10 MW battery support, however the generating units actually installed are older design GE TM2500 mobile generating units with no battery support. AEMO's protocols for system strength and inertia do not presently refer to this generation, either when on-line or off-line for the provision of grid security services in the same way as other gas turbines in South Australia are referred to when on-line and dispatched. It would be very unusual for smaller sized (31 MW) lightweight aero derivative modular gas turbine generation units of the type installed to have capability to supply grid support services when off-line and may supply little in the way of grid support services even when on-line and dispatched.
Reliability	Will enhance system reliability (reduce expected Unserved Energy) as noted in AEMO's June 2017 Energy Supply Outlook modelling[xxx]. The

	installed capacity of 276 MW nameplate (although derated to ~200 MW for summer conditions) is material in the context of South Australia's existing dispatchable capacity. But see the comments below about the "spillover" of these benefits to Victoria.
Market Impact Short-term Long Term	Contracting under RERT for summer 2017-18 is aimed at minimising impacts on market prices while reducing risks of load curtailment, however the practicalities of dispatch and pricing under the Direction mechanisms inherent in RERT will lead to some potential impacts. Questions over how this generation will ultimately be operated and participate in the market, or potential for its later sale by the current or subsequent government will inevitably create some overhanging uncertainty and risk for proponents of alternative generation projects. The need for gas transportation capacity to be allocated to or reserved for the generation when relocated and converted to gas-firing, but which is to be used only very rarely, may reduce quantities or increase costs of transportation capacity available to commercial generators, increasing overall fuel supply costs.
Customer Impact	Enhanced near term reliability.
Taxpayer Cost	Purchase relocation and operation of this generation will consume well over half of the overall $550M budget allocation for the Plan to 2020-21. It is not clear that its permanent acquisition – as opposed to short-term lease – yields value for money, particularly considering the numerous other relevant developments discussed in Section 3.
Market Participant Impact	Limited near-term impact but see comments above on longer term market impacts.
Consistency with NEM Framework	Inconsistent – cuts across reliability framework and mechanisms established under the NER. AEMO's RERT / DSP program for summers 2017-18 and 2018-19 has demonstrated a number of arguably lower cost alternatives for acquisition of capacity reserves.

Other Considerations

The lease and then purchase of this generation effectively combined two distinct elements of the original Plan initiative, which envisaged procurement of separate short-term emergency capacity and a longer lead time project for construction and commissioning of the state-owned gas power plant.

An important point about the contribution of this generation to system reliability is that in scenarios of tight supply-demand across South Australia and Victoria jointly, its benefits in terms of load shedding avoided, or at least reduced in severity, would not be retained entirely within the state of South Australia. Under the National Electricity Rules' so-called "pain-sharing" provisions[xxxi], when there is a combined supply deficit across two regions and controlled load shedding is required, regional load is curtailed pro-rata. This would mean that the emergency generation could not be operated to wholly avoid load shedding in South Australia[5] if Victoria was simultaneously experiencing a supply deficit and customer load in that state were being curtailed. Instead AEMO would be required to curtail load pro-rata across the two states. This mechanism would effectively

[5] Except in the unusual case of interconnector flows from South Australia to Victoria already being at maximum levels.

transfer about two thirds of the emergency generation's capacity for the benefit of Victorian customers.

In theory the Government could seek to use its powers of direction (see below) to instruct AEMO to reduce interconnector flows or otherwise avoid load-shedding in South Australia in these circumstances, but this would risk retaliatory actions and run strongly against the NEM's coöperative basis.

Conclusions

At the time of the Plan's development there was arguably some justification for sourcing of temporary reserve capacity to address the near-term reliability challenges in South Australia and Victoria arising from retirement of Northern Power Station and Hazelwood. Short term leasing of liquid-fuelled generation was one credible mechanism for achieving this, and AEMO's RERT and DSP initiatives have since demonstrated complementary mechanisms and sources of capacity reserve.

It is far less clear that acquisition and permanent ownership of this generation by the State government makes financial or economic sense. Its costs will consume more than half the total budget allocation for the Plan. Alternative mechanisms for provision of capacity reserves such as demand response and storage are developing rapidly. The plant will require access to gas transportation capacity which would otherwise be available to commercial participants in the market. The prospect that a future government may decide to sell the generation or operate it regularly in the energy market, converting it from a "strategic reserve" to another market competitor, potentially creates a level of overhanging uncertainty for participants and potential investors in the South Australian market. Its acquisition may have a negative impact on the economic case for new or enhanced interconnector capacity between South Australia and other NEM regions.

And as noted above, under the NEM's "pain-sharing" provisions, a major share of the benefits of investment in this generation, paid for by South Australian taxpayers, could effectively flow to Victorian customers at times when combined supply across the two regions is insufficient.

Initiative	Local Powers Over National Market

Summary

Legislation to provide South Australian Minister for Energy with strong powers to direct participants in the NEM and AEMO "in an emergency situation or when market forces fail"[xxxii]. Imposition of special licensing arrangements[xxxiii] and technical conditions on development assessments[xxxiv] for new South Australian generators over 5 MW to be administered by Essential Services Commission of South Australia (ESCOSA) and Office of the Technical Regulator (OTR).

Objectives

The new powers of direction appear to be motivated by concerns that market and AEMO processes may increase the risk of load curtailment and disruption in SA, however the circumstances and manner in which they may be used are not clearly defined. The additional licensing and development approval technical requirements (relating to inertia and fast frequency response) for new generators in SA are explained in the Plan as being needed to cover gaps and weaknesses in the current National Electricity Rules framework that become material for regions with high levels of variable or non-synchronous generation.

Costs

No material budget costs. Additional licensing requirements and required technical capabilities will increase costs for some new generation projects. Exercise of Direction powers at times of system stress and high market prices can lead to very significant costs for affected participants.

Progress to date

- Amendments to the Emergency Management Act proclaimed in April 2017, providing Minister for Energy with ability to declare an Electricity Supply Emergency and exercise powers of direction and information gathering.
- Additional generator licensing and development assessment conditions finalised by ESCOSA and OTR in August and July 2017 respectively.

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	Primary objective of direction powers appears to be "keeping the lights on" but it is quite unclear when and how powers would actually be exercised. The technical objectives of SA's special licensing and DA conditions are clear, it is the extent to which they overlap or pre-empt broader national arrangements which need to be kept under review.
System Security	The additional generator licensing and technical conditions are broadly directed towards increasing system security by mandating capabilities such as increased fault tolerance, ancillary services, inertia and fast frequency response capabilities etc. As they will apply (initially) only to new SA generation they will yield limited system security benefits in the short term.
Reliability	Whilst the powers of Direction given to the SA Minister for Energy appear in part to be motivated by increasing reliability of supply to SA customers (eg avoidance of controlled load shedding), it is not clear whether this would have the claimed effect, as it would generally require the Minister

	to somehow have better information and foresight than the system operator. Furthermore, as highlighted in the case study below, there are times when a Direction aimed at increasing reliability for some customers may worsen outcomes for a larger number of other customers across the NEM, or risk retaliatory actions from other jurisdictions.
Market Impact Short-term Long Term	Unlikely, as powers of direction expected to be used only in extreme cases and licensing / technical requirements apply only to new generation. Greater risks to longer term efficiency / integrity of NEM framework if other jurisdictions seek to impose their own local powers over the market.
Customer Impact	Marginal
Taxpayer Cost	Marginal
Market Participant Impact	Powers of Direction introduce additional risks and potential costs; some additional costs for new entrants to comply with licensing and technical requirements – potential for these to be extended to incumbents
Consistency with NEM Framework	State-based powers and requirements are generally inconsistent with the national NEM framework. Potential for other jurisdictions to follow precedent increases overall risks to a nationally consistent approach.

Other Considerations

As noted in the evaluation above, it is not clear that a local Minister for Energy will have access to better information than the market and system operator AEMO on which to make decisions to intervene in the market and issue Directions to participants. If the motivation for powers of direction were perceived failings in the market Rules, or shortcomings in AEMO's approach to applying those Rules or competence as an operator, then a more logical response would be to seek reform of the relevant rules or to push for improvements in AEMO's processes, performance, and / or governance.

A risk of the South Australian Government's approach in possessing and exercising local powers of Direction is highlighted by the following case study, drawing on events of last summer:

Hazards of Local Intervention – An Example

In February 2017 it was reported that electricity supply to some customers in regional Victoria had been "put at risk" in order to transfer more power over the interstate interconnection from Victoria to NSW, which was experiencing heat wave conditions and very tight supply-demand balance. In response the Victorian Energy Minister "made it very clear that our government would not tolerate AEMO prioritising NSW over Victorian customers"[xxxv].

The facts of the situation were that by operating certain Victorian regional transmission lines at their so-called "5-minute ratings", AEMO could securely enable higher power transfers from Victoria to NSW. However this mode of operation required pre-arming of protection relays which would automatically disconnect some Victorian regional customer loads served by these lines in the event of a transmission element tripping, to prevent rapid overload of remaining lines and potentially severe damage. (Such an event would have also significantly reduced transfer limits from Victoria to NSW and very likely have led to load shedding in that State as well.)

Automatic load tripping mechanisms are quite widely deployed across the NEM as last lines of defence to maintain system integrity in the event of severe disturbances such as sudden outages of multiple transmission lines or generation units. It is less common but still accepted practice for

such schemes to be used to enable higher power flows on critical lines during times of system stress, as is the case with operation at 5-minute ratings.

Had a Victorian Energy Minister with powers of direction over AEMO in these circumstances decided that it was unacceptable to put any Victorian customers at higher than normal (but still relatively low) risk of supply interruption, they might have directed AEMO not to operate the relevant Victorian lines at their 5-minute ratings. This would have marginally improved security of supply for some Victorian customers, but it would also have significantly reduced the level of transfers possible to NSW, increasing overall supply costs and quite possibly curtailing supply to customers in that state[6].

This example illustrates how possession and use of local powers of Direction could constitute a double-edged sword for customers across the interconnected NEM – marginal improvements in reliability for some could come at the cost of much greater risks to supply continuity for others.

Another hypothetical and potentially even more perverse outcome would be conflicting directions given to AEMO by neighbouring state governments during a period of two-state supply deficit, with each state seeking to minimise impacts on its own customers (see the discussion concerning "pain-sharing" in the evaluation above of the State-Owned Generation initiative).

Conclusions

It would generally be preferable if management of the technical concerns addressed in the special licensing and development approval conditions for new generation in South Australia were achieved through development of appropriate competitive frameworks for provision of relevant services such as inertia, system strength, and fast frequency response, since the costs of service provision and compliance capabilities are likely to vary considerably across different generation technologies. Failing that an alternative would be amendments to NEM-wide standards (AEMO's generator registration requirements), even if some jurisdictional carve-outs or derogations were required in implementation. This would reduce regulatory and administrative overhead associated with additional licensing and compliance requirements.

However, given the circumstances applying in South Australia, the need to develop appropriate competitive frameworks, and AEMO's support for the approach, imposing additional local licensing requirements as a transitional step may be justified.

On the other hand the case for reservation and use of local powers of direction is far weaker and potentially risks unintended or undesirable consequences in the exercise of such powers, and the setting of precedents for other jurisdictions to also move away from the coöperative arrangements underpinning the NEM.

[6] In fact supply to NSW's largest electricity consumer, the Tomago smelter, was curtailed later the same day to maintain system security following a generator failure in NSW.

Initiative	New Generation For More Competition

Summary

Tendering of State government electricity supply for 10 years from January 2018 to suppliers anticipated to construct new privately-owned and dispatchable renewable generation in South Australia. Originally specified as 25 per cent supported by dispatchable renewables and 75 per cent by any generation type.

Objectives

Increase wholesale competition and put downward pressure on prices.

Costs

Not explicitly specified. Quoted electricity price of "no more than $78/MWh" for SolarReserve contract backed by $650 million "Aurora" CST project (see below).

Progress to date

- Award of 100 per cent of South Australian state government electricity purchases[7] (~500 GWh per year, 125 MW maximum demand) for a 20-year contract period to SolarReserve announced in August 2017. Contract to be supported by construction of "Aurora" concentrating solar thermal (CST) power project at Port Augusta, construction expected over 2018-2020[xxxvi].
- Award of 80-100 per cent of State government load for 2018 – Nov 2020 (period prior to commissioning of Aurora / commencement of SolarReserve contract) to SIMEC Zen Energy announced in December 2017[xxxvii].

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	The balance between support for new generation / increased competition / value for money is unclear.
Security & Reliability	New generation if dispatchable and capable of providing appropriate ancillary services will increase reliability and security of supply.
Market Impact Short-term Long Term	 Unlikely to impact market outcomes in the short term, prior to construction of new generation, since the State Government load will effectively be supplied by one or more existing generators – through hedging contracts – regardless of the retail supplier selected. Will introduce additional physical capacity and competition to the market, possibly at the cost of some level of subsidy inherent in the supply contract structure. However will correspondingly reduce contracts available to other existing generation in the state so overall impact on the financial viability of generators and supply-demand balance may not be so clearcut.
Customer Impact	Depends on overall impact on market supply-demand balance – see above.
Taxpayer Cost	Total costs of supply contract and Generation Project Agreement structure are unclear. No comparative analysis of alternatives for supplying the

[7] This has been misreported frequently as 100 per cent of "total South Australian supply"!

	State Government load has been presented. It is also unclear which parties bear risks relating to the cost or performance of this relatively new form of dispatchable renewable generation technology.
Market Participant Impact	Will reduce demand for contracts from existing market participants given that the State government load would otherwise be supplied from some combination of existing generation.
Consistency with NEM Framework	Subsidies, explicit or implicit, for specific new generators or technologies are generally inconsistent with the framework for capacity investment in the NEM – see comments on Battery / RTF initiatives.

Other Considerations

Third party information and analysis additional to the official announcements on this initiative suggest that $78/MWh may be the strike price of a cap contract for energy provided under the supply agreement but that there may be additional fixed costs not included in this figure via a capacity payment stream under the Generation Project Agreement[xxxviii]. If this is the case then the effective all-in cost of the energy supplied may be materially higher than $78/MWh, with an unclear degree of subsidy inherent in the overall structure.

Conclusions

The lack of transparency around the financial elements of this arrangement complicate its overall evaluation, particularly whether the arrangement provides an implicit subsidy for specific project and technology choice.

While the initiative certainly supports entry of new dispatchable renewable technology, the award to a single project is an all-eggs-in-one-basket approach. Other generators will see a lower demand for hedging contracts backing supply to the SA government's loads which may impact on their financial viability.

Initiative	South Australian Gas Incentives

Summary

Support for projects to explore for and develop additional gas resources in South Australia including Plan for Accelerating Exploration (PACE) grants fund, and a Royalties Return Scheme (RRS) offering 10% of royalties to landowners where new gas is brought into production.

Objectives

Incentivise exploration for and development of additional gas resources in South Australia, with the aim of meeting increased need for gas in electricity generation.

Costs

PACE grants fund $48 million. Cost of royalty returns not specified.

Progress to date

- First round $24 million PACE grants awarded to five projects in March 2017[xxxix].
- Expressed intention to conduct second round of funding but no further announcements.
- New exploration tenements to be offered, including one in South East South Australia to which PACE RRS royalty arrangements will apply.

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	Aimed at increasing gas available for electricity generation with gas from accelerated exploration / development projects under PACE required to be first offered as to South Australian generators. Appears to target wide range of stages in exploration -> development -> production cycle.
Security & Reliability	No direct impacts.
Market Impact Short-term Long Term	 No short term impacts due to lead time on gas exploration and development projects. Unclear but unlikely to be material due to small scale of projects and financial support.
Customer Impact	No immediate impacts.
Taxpayer Cost	$48 million, plus value of royalties foregone.
Market Participant Impact	Marginal potential impact on gas available for generation if projects lead to
Consistency with NEM Framework	n/a

Conclusions

The relatively small scale of this initiative and projects supported, and the long lead times between gas exploration, development and production reaching market mean any immediate impacts on the electricity market will be at best marginal.

Initiative	**Energy Security Target**

Summary

New certificate-based scheme obliging retailers in South Australia to purchase specified annual target quantities of energy (~36 – 50 per cent of load) from certain local generators, essentially dispatchable generation providing "real inertia and fault current"[xl].

Objectives

Stated as "to boost energy security and increase local competition".

Costs

No explicit costing but certificate costs (capped at $50/MWh) would impose an additional impost on retailers and their customers, and differential gains or losses on market participants.

Progress to date

- EST regulations developed and finalised in June 2017
- Scheme start date deferred twice from 1 Jul 2017, initially to 1 Jan 2018 and then to 2020 in view of "a number of significant changes [that] have occurred in the energy market that are delivering system security outcomes in South Australia"[xli].

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	Consistent criticism of the EST during consultation[xlii] on the Regulations was lack of clarity around precise objectives (security, price, reliability etc)
System Security	Questionable effectiveness in ensuring real-time security (eg maintenance of online inertia and system strength). Because the target is specified as an annual **energy** obligation it does not provide any direct incentive for generators to stay online at times of low spot price.
Reliability	Not clear that there would be any material impact on reliability, unless the subsidy provided through the certificate mechanism deferred closure of generation that might otherwise retire.
Market Impact Short-term Long Term	 No impact given deferral to 2020. Unclear – potential to lock-in specific existing generation technologies at the expense of alternatives.
Customer Impact	Additional impost via certificate costs paid by retailers. The nominal value of a 50% obligation at the certificate cap price of $50/MWh is roughly $300 million annually. Assumptions underlying analysis predicting offsetting falls in spot price may not be met in practice.
Taxpayer Cost	No explicit cost to budget.
Market Participant Impact	Significant costs and benefits, potentially non-technology neutral, to different generation participants
Consistency with NEM Framework	Potential to suffer from some of the same defects and inconsistencies ascribed to schemes with similar mechanics eg LRET. As a single-jurisdiction scheme, potential to distort economically efficient outcomes and cut across developing National mechanisms to enhance security and reliability.

Other Considerations

Consultation on the regulations proposed to effect the EST also highlighted operational and practical concerns around the design and implementation of the scheme.

The EST's objectives and broad design parameters also appear very similar to those of the proposed reliability element of the National Energy Guarantee (NEG). Should the NEG, on which detailed design work is currently being undertaken, proceed to implementation then there would be no justification for the SA Government proceeding with the EST.

A further impact of the EST (and other "self-sufficiency" elements of the Plan) may be on the economic case for additional interconnection between South Australia and other NEM regions, for example the proposed SNI interconnector to NSW. A justification for the EST was that it would replace a level of energy imports from Victoria over the Heywood interconnector with locally-sourced generation[xliii]. Reducing utilisation of interconnectors would generally weaken the economic case for expansion of interconnector capacity.

Conclusions

The EST as originally framed was subject to considerable criticism over its timing, costs, market impacts and lack of consistency with the national NEM framework and ongoing developments. Deferral of its introduction acknowledges some of these criticisms and it seems quite likely that the EST will be superceded by other nationally consistent mechanisms, which would be a positive outcome. To increase investor certainty, it would be beneficial for the Government to clarify its ultimate intentions for the EST as soon as practical.

Initiative	Hydrogen Roadmap

Summary

Strategy and related initiatives to support trials of and investment in elements of the hydrogen production, usage and export cycle within South Australia.

Objectives

To "accelerate the State's transition to clean, safe and sustainable producer, consumer and exporter of hydrogen."[xliv]

Costs

Initial investment of $9 million over four years focussed on transport-related projects. Potential support for hydrogen infrastructure projects from Renewable Technology Fund.

Progress to date

- Hydrogen Roadmap announced in September 2017.
- Call for proposals for hydrogen infrastructure projects under the RTF, submissions closed October 2017.
- Tenders to supply at least six hydrogen fuel cell buses and supporting infrastructure called, closed October 2017.

Evaluation

Evaluation Criteria	Comments
Clarity of Objectives	Adequate.
Security & Reliability	No near-term impacts
Market Impact Short-term Long Term	 Nil Will depend entirely on whether relevant elements of the hydrogen fuel cycle become commercialised in SA
Customer Impact	No near-term impacts
Taxpayer Cost	$9 million budgeted
Market Participant Impact	No near-term impacts
Consistency with NEM Framework	n/a

Conclusions

Development of a hydrogen fuel cycle, elements of which are being investigated by many organisations and governments world-wide, could have a significant impact on the electricity sector in the longer run. This will depend on many technical and economic factors largely outside the control of the SA Government. It is reasonable for the government to engage with and provide early-stage support for this potential growth sector through the Roadmap program, but it will have no immediate impacts on electricity security, reliability, or affordability in South Australia.

SECTION 5: OVERALL PLAN ASSESSMENT AND CONCLUSIONS

Some key observations and conclusions from the above evaluations are that:

- While there is broad justification for elements of the Plan, its financial priorities and commitments appear skewed to projects that are larger or longer-term than necessary – particularly the size of the battery investment, purchase rather than short-term lease of the new dual-fuelled generation units, and possibly the State government electricity supply arrangements.
- Certain other elements of the plan such as the EST and reservation of local powers of direction over the market are inconsistent with a more coöperative and coördinated national approach, and might inhibit the development of greater resource sharing and interconnection between regions of the NEM.
- Few initiatives under the Plan itself directly and immediately address South Australia's current power system security challenges. These are being dealt with largely through actions and interventions by AEMO and ElectraNet.

Overall, at the time of its development and announcement, the Plan constituted a broad set of initiatives and actions, some of which sought to respond to immediate market issues and concerns of the SA government arising from recent events, and others which address longer term challenges such as the transition of the energy system to a low carbon future.

The Plan objectives in themselves are generally reasonable although there are valid concerns about "self-sufficiency" as an appropriate goal in a physically interconnected system in which more, not less, diversity of supply and sharing of resources, as well as cooperation between jurisdictions, is likely to be the most efficient direction for the market to move in.

It is now also clear that some original elements of the Plan are either redundant or likely to be at cross-purposes with, or less effective than, ongoing initiatives at the level of COAG and the NEM regulatory and operating bodies. Other elements of the Plan, particularly the higher-cost investments or investment support (whether explicit via loans/grants or implicit as contractual subsidies), are arguably over-scaled or in some cases may be unnecessary given third-party developments, and thereby consume disproportionate levels of limited Government financial resources.

As the Plan approaches its first anniversary, it would be sensible and prudent for the South Australian government itself to review the basis for the Plan, and the steps it has taken and plans to take from here, in the light of the many developments in the market and broader policy arena over the past year. The Government should then make appropriate adjustments to ensure that Plan provides a positive contribution to evolution of the NEM and maximises value for South Australian taxpayers and customers.

SECTION 6: THE STATE LIBERAL OPPOSITION'S ENERGY POLICY

In October 2017 the South Australian Liberal Party Opposition released its own set of policies[xlv] to address the State's energy challenges, under the rubric of the "Liberal Energy Solution" (LES), accompanied by modelling of wholesale electricity prices commissioned from consultancy ACIL Allen[8].

The key elements of the LES and its initiatives outlined in the Opposition's policy document[xlvi] are:

Element	Initiatives
single comprehensive national energy strategy	Support development of an integrated grid plan by AEMO. Abolish state-based Renewable Energy Target. Support establishment of a 'Renewable Energy Zone' between SA and NSW.
strengthening the network	Establish $200 million Interconnection Fund to support new and augmented interconnectors, first priority South Australia NSW Interconnector (SANI). Retention of 276 MW emergency diesel generation until summer 2018-19 but replaced thereafter with competitive reverse tender for reserve capacity (ie no long term state ownership of generation). Supporting AEMO / AEMC to review and improve forecasting, FCAS and system restart capabilities.
making storage work	$100 million Household Storage Subsidy Scheme to support battery installation in 40,000 homes. $50 million Grid Scale Storage Fund (GSSF) to support large scale storage projects providing dispatchable capacity and technology demonstration / cost reduction benefits. Support Finkel Review's recommendation of a Generator Reliability Obligation.
modernising the NEM	Support AEMC 5-minute pricing proposal. $10 million contribution to trials of technology for market integration of distributed generation and storage.
improving retail competition and protecting vulnerable consumers	Work with COAG Energy Council and AEMC to ban exit fees on retail contracts and require minimum notice periods for changes to contract prices and conditions.
rewarding consumers for managing their own electricity demand.	$20 million support for trials of demand response and demand response aggregation technologies and initiatives. Work with COAG EC and stakeholders to enable differential retail tariffs rewarding demand responsiveness.

Other than in its explicit proposal not to proceed with acquisition and relocation of the then-leased emergency generators (which have since been purchased by the State government), but instead to procure capacity via a reverse auction process, the LES is largely silent on whether other policies, commitments, and actions under the government's Energy Plan would stand, or would be dropped

[8] Analysis of this modelling is outside the scope of this review, but it projects an expected fall in South Australian wholesale prices even under "status quo" assumptions – driven by entry of already committed new generation – and a somewhat larger fall under the LES due to assumed construction of the SANI interconnector.

or reversed after a change in government. It is therefore unclear whether some of the LES's initiatives are additional to, modifications of, or replacements for elements of the Energy Plan.

While noting this uncertainty, the differences between the government's Energy Plan and the LES can be summarised as follows:

Policy Area	Government Energy Plan	Opposition LES Policy
Objectives	Focus on self-sufficiency	Emphasis on greater physical integration and policy cooperation with rest of NEM, increased sharing of lowest cost resources.
	Common goals of affordability and facilitating energy transition – different mechanisms.	
Nominal Budget	$550 million	$400 million but not fully clear which Government initiatives would be continued / reallocated / cancelled.
Local Powers & Regulation	Energy Security Target (deferred). Local direction powers. Generator licencing conditions.	Drop SA renewable target. (silent on EST, direction powers, local licencing conditions)
Government owned / sponsored generation	276 MW emergency diesel generators leased for summer 17-18 & 18-19.	
	State owned gas generator (now via purchase & redeployment of emergency generators).	No long term generation ownership. Reverse auction for "buffer capacity" • integrate with AEMO Strategic Reserve proposal if implemented.
	SA Government supply contract. (supporting new private generation).	Silent
Storage & renewables integration	$150 million Renewable Technology Fund (includes Battery).	$50 million Grid Scale Storage Fund. $100 million Household Storage Subsidy Scheme. $10 million for distributed generation / storage integration trials.
Interconnectors	$0.5 million for ElectraNet SNI feasibility study (prior commitment).	$200 million Interconnection Fund (SNI priority). Support for Renewable Energy Zone.
Demand response / aggregation	Silent	$20 million support for trials.
NEM Enhancements	Silent	Explicit support for Finkel recommendations. Support for 5-minute pricing, operational and ancillary services reviews and enhancements. Push for retail contract conditions & tariff reforms.
Gas Initiatives	PACE grants and royalty return initiatives.	"Encourage continuing exploration" – no specifics.
Hydrogen	Roadmap and RTF grants.	Silent

Some of the LES's specific initiatives such as the Grid Scale Storage Fund and support for trials of renewable integration and demand response / aggregation can be viewed as variations on similar policy philosophies expressed in the Government Energy Plan. In areas of the Government Plan

where the LES is silent such as contractual support for the HPR battery, the state electricity purchase contract and local regulatory conditions, it seems more than likely – in the absence of contrary commitments – that actions taken to date will not be unwound. The LES's proposal to drop the South Australian renewable energy target[9] is not likely to be material, as this policy objective is a goal not enforced through any binding regulatory mechanisms.

This leaves the key differences between the two sets of policies as:

- the Energy Plan's "self-sufficiency" goals and actions versus the LES's focus on stronger coöperation with NEM-wide initiatives and institutions
- the LES's strong financial support for one or more new interconnectors (principally SNI / SANI)
- long term government ownership of "reserve" generation under the Energy Plan, rejected in the LES for a reserve capacity auction mechanism (effectively an outworking of the previous philosophical difference). The Opposition's stance on continued ownership of this generation is unclear, now that the Government has exercised the option to purchase[10].
- significant subsidies for rollout of household battery storage under the LES.

Discussion and Conclusions

Analysis in earlier sections of this review highlighted concerns with the Energy Plan's self-sufficiency objectives and policies, as these can lead towards less economic and in some cases potentially dysfunctional outcomes in a physically and economically integrated system like the NEM. From that perspective the LES's focus on greater integration and working with NEM stakeholders and institutions to improve the NEM's operation and pursue benefits, where economic, from a stronger national grid with more interstate sharing of resources is welcome.

However the proposed allocation of $200 million to an Interconnection Fund with an initial focus on a particular interconnector (SNI / SANI) raises questions about how the Fund would be used to "expedite delivery" of specific projects, and the extent to which a direct or indirect investment by government distorts existing NEM mechanisms for investment assessment and cost recovery of transmission investments. Although concerns have been raised about the RIT-T investment test for transmission, subsidisation of politically-favoured projects is not likely to be the most effective response to these concerns and may have unintended effects on investment cases for new generation or alternative transmission options, and on investment certainty more generally. While the details differ, some general cautions about government involvement in generation investment raised in the context of the Energy Plan's state-owned generator also apply to government subsidisation or investment in transmission assets.

The LES's proposed rejection of the option to acquire the emergency diesel generation and convert it to state-owned gas-fired reserve capacity was announced prior to the South Australian government effecting this purchase. This has rendered the LES policy moot, regardless of its

[9] This "target" is an overall goal for the percentage of electricity generated in South Australia from renewables, not the Energy Plan's Energy Security Target.

[10] The Opposition has stated that if elected it would undertake a "special investigation" of the purchase but has not determined whether it would retain ownership of this generation. See http://www.abc.net.au/news/2017-11-28/sa-liberals-foreshadow-inquiry-into-power-plant-purchase/9200740

soundness or otherwise. The current statements in the LES simply increase uncertainty over how this generation will be owned, managed, and operated in the longer term. To resolve this uncertainty for market participants, stakeholders and potential investors the Opposition should clarify its intentions for this generation capacity as soon as possible.

At the level of retail customers, the LES's proposals around support for trials of demand response and aggregation technologies and pursuing NEM-level reforms to contract and tariff structures are unexceptional, however given its substantial size the proposed $100 million rollout of 40,000 household batteries does not appear to have a particularly clear focus on either South Australia's system-level security and reliability challenges, general energy affordability, nor technology demonstration and cost reduction. Although the proposed subsidies would be means tested, the policy provides no supporting analysis of the net benefits achieved from this taxpayer-funded investment either for individual householders (who would still contribute to the cost of a system) or for electricity consumers more widely. The current cost of household battery systems is such that the strict investment case (eg payback periods) for typical households appears relatively weak[xlvii], particularly if retail electricity prices were to fall from their present high levels.

Overall, the LES presents points of difference from the Energy Plan which are worth serious consideration, but also leaves ambiguous its stance on other important aspects of and actions already taken under the Plan. Resolving these ambiguities would greatly help in assessing its likely overall impacts. Finally its "big ticket" expenditure items are open to criticisms not dissimilar to those applying to the Energy Plan's signal initiatives.

REFERENCES

[i] ourenergyplan.sa.gov.au; http://ourenergyplan.sa.gov.au/sites/default/files/public/basic_page_attachments/4/24/441088034/our-energy-plan-sa-web.pdf

[ii] http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf

[iii] http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Final-report---SA-separation-event-1-December-2016.pdf

[iv] http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/System-Event-Report-South-Australia-8-February-2017.pdf

[v] See e.g. Andrew Blakers, Bin Lu, Matthew Stocks 2017, '100% renewable electricity in Australia', Energy, vol. 133, 15 August 2017, pp. 471-482, ISSN 0360-5442, https://doi.org/10.1016/j.energy.2017.05.168 http://www.sciencedirect.com/science/article/pii/S0360544217309568

[vi] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Report-SA-on-3-March-2017.pdf

[vii] For example, see https://www.aemo.com.au/Stakeholder-Consultation/Consultations/Power-System-Risk-Review-Consultation

[viii] https://www.aemo.com.au/Media-Centre/South-Australia-System-Strength-Assessment

[ix] http://www.aemc.gov.au/Markets-Reviews-Advice/System-Security-Market-Frameworks-Review/Draft/AEMC-Documents/Final-report.aspx

[x] http://www.aemc.gov.au/Major-Pages/AEMC-work-overview/System-security-review

[xi] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEM_ESOO/2017/2017-Electricity-Statement-of-Opportunities.pdf

[xii] https://www.aemo.com.au/Media-Centre/AEMO-releases-summer-readiness-report-for-2017-18

[xiii] State Budget 2017-18 Budget Paper 5: Budget Measures Statement, p.9. https://service.sa.gov.au/cdn/statebudget/budget201718/pdfs/budget/2017-18_budget_measures_statement.pdf

[xiv] http://www.gdfsuezau.com/media/newsitem/Pelican-Point-to-return-to-full-capacity

[xv] https://www.originenergy.com.au/about/investors-media/media-centre/origin-works-with-engie-to-help-boost-energy-security-in-south-australia.html

[xvi] https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2017/june/agl-announces-development-of-$295m-power-station-in-sa

[xvii] https://www.aemo.com.au/-/media/Files/Media_Centre/2017/AEMO_Summer-operations-2017-18-report_FINAL.pdf

[xviii] Public announcements, see also AEMO Regional Generation information page https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Generation_Information/December-2017/Generation_Information_SA_22-Dec-2017.xlsx

[xix] AEMO Regional Generation information page, see link above

[xx] Independent Review into the Future Security of the National Electricity Market – Blueprint for the Future, June 2017

[xxi] http://www.coagenergycouncil.gov.au/publications/energy-security-board-update

[xxii] Summarised in the Energy Security Board's "The Health of the National Electricity Market Report", http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/The%20Health%20of%20the%20National%20Electricity%20Market_19122017.pdf

[xxiii] http://ourenergyplan.sa.gov.au/content/battery

[xxiv] http://www.abc.net.au/news/2017-12-01/tesla-giant-battery-officially-launched-in-sa/9215318

[xxv] See previous reference

[xxvi] https://www.premier.sa.gov.au/index.php/jay-weatherill-news-releases/8371-next-wave-of-energy-storage-projects-announced

[xxvii] http://theconversation.com/a-month-in-teslas-sa-battery-is-surpassing-expectations-89770

[xxviii] https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/Electricity_Consultations/2017/Power-System-Frequency-Risk-Report---Multiple-Generator-Trips---FINAL.pdf

[xxix] http://www.abc.net.au/news/2017-12-21/cost-of-sa-state-owned-power-station-finally-revealed/9279852

[xxx] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEM_ESOO/2017/2017-Energy-Supply-Outlook.pdf

[xxxi] See the Reliability Panel's "*Guidelines for Management of Electricity Supply Shortfall Events*" published at http://www.aemc.gov.au/Australias-Energy-Market/Market-Legislation/Electricity-Guidelines-and-Standards?type=1

[xxxii] http://ourenergyplan.sa.gov.au/content/local-powers

[xxxiii] http://www.escosa.sa.gov.au/projects-and-publications/projects/inquiries/inquiry-into-licensing-arrangements-for-inverter-connected-generators

[xxxiv] https://www.sa.gov.au/topics/energy-and-environment/electrical-gas-and-plumbing-safety-and-technical-regulation/compliance-and-enforcement/generation-applications; https://www.sa.gov.au/__data/assets/pdf_file/0003/311448/Generator-development-approval-procedure-V1.1.pdf

[xxxv] http://www.smh.com.au/business/energy/victoria-demands-answers-from-aemo-for-blackout-risks-during-nsw-heatwave-20170223-gujkud.html

[xxxvi] http://www.afr.com/business/energy/electricity/solar-reserve-to-build-new-650m-solar-thermal-plant-in-sa-20170814-gxvu2m

[xxxvii] http://reneweconomy.com.au/s-a-govt-fast-tracks-switch-to-renewables-with-zen-contract-96108/

[xxxviii] http://www.solarpaces.org/port-augusta-cheapest-solar-thermal-power/, https://www.energycouncil.com.au/analysis/sas-courageous-csp-project/

[xxxix] http://ourenergyplan.sa.gov.au/content/sa-gas-incentives

[xl] http://dpc.sa.gov.au/what-we-do/services-for-business-and-the-community/energy-resources-and-supply/south-australias-energy-supply-and-market/energy-security-target

[xli] http://ourenergyplan.sa.gov.au/content/energy-security-target

[xlii] http://dpc.sa.gov.au/__data/assets/pdf_file/0014/18113/Energy-Security-Target-Stakeholder-Consultation.pdf

[xliii] http://dpc.sa.gov.au/__data/assets/pdf_file/0018/20259/FrontierEconomicsESTmodellingnote.pdf

[xliv] http://ourenergyplan.sa.gov.au/content/hydrogen

[xlv] http://www.saliberal.org.au/liberal_energy_solution

[xlvi] "*LIBERAL ENERGY SOLUTION. A Real Energy Solution for South Australians*" accessed from http://www.liberalenergysolution.com.au/

[xlvii] For example see analysis by SolarChoice at https://www.solarchoice.net.au/blog/home-solar-battery-storage-worth-it-2018