MO 190003
Document 2

s22

From: John Short s47F @sasgroup.net.au]
Sent: Saturday, 8 December 2018 2:39 PM
To: s22 @energy.gov.au>; s22 @energy.gov.au>
Subject: FW: Visit to Australia by the Head of s47G(1)(a) - 10th to 14th December

CFYI

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From: Trevor St Baker s47F @stbenergy.com.au>
Date: Friday, 7 December 2018 at 12:44 pm
To: Hon Angus Taylor MP Federal Minister fof Energy Member For Hume s22
Senator Hon Matt Canavan s22
Cc: John Short s47F @sasgroup.net.au>, s47F @de.com.au>, s47F
s47F @de.com.au)'" s47F @de.com.au>
Subject: FW: Visit to Australia by the Head of s11C(1)(b) - 10th to 14th December

Ministers,

We appreciate the opportunity to meet each of you and advisers, separately, next Tuesday 12th December in Melbourne to introduce our GENCO partners examining the invitation for expressions of interest in the partial underwriting of debt finance for new dispatchable generation developments in Australia.

We will be introducing you to the s47G(1)(a) s47G(1)(a) the largest Hong Kong listed mainland China power generation company, along with the GM and Deputy GM (also Australian representative) of s47G(1)(a) nternational Business Development Department, with whom Sunset Power has entered into an MOA to jointly plan new generation project responses to the government's invitation for expressions of interest in developing new firm dispatchable generation in the National Electricity Market.

s47G(1)(a) have agreed to visit Australia at this top-level, next week, to join with Sunset Power in discussions on this process and our proposed solutions for South Australia and Victoria, and prospectively in NSW, with major cornerstone business energy customers in each State, with State and Federal Government representatives, and with Federal Opposition representatives.

Given the top-level of interest that s47G(1)(a) is giving to this joint Aus/Chinese GENCO partnership, I thought it appropriate that we take advantage of the confirmatory advices, below, that we have given to the Australian Ambassador to China, her Chief Trade Commissioner, her Consul-General to Hong Kong and our Trade Commissioner to Hong Kong, about the MOA with Sunset Power s47G(1)(a) visit to Australia next week, as well as the interest that both s47G(1)(a) one of China's and the world's largest HELE power station EPC contractors, have expressed in jointly offering to jointly host a multi-party visit by Australian Parliamentarians to China to understand better the advances in cleaner HELE coal-fired generation technology as well as in wind and solar generation in China's expanding electricity sector.

s47C

As set out in the objectives and itinerary of this Aus/Chinese GENCO 3-State Capital Visit, attached, we are planning to mount proposals for least-cost and "cleanest" multi-technology solutions that we believe will best meet the needs for essential repair of electricity supply reliability and security of supply with least-cost wholesale pricing under the current ACCC-recommended "later-year" long-term debt-finance underwriting expressions of interest currently being sought by the federal government, in two and possibly three States, as follows, representing a total capital cost of some s47G(1)(a) for the three prospective projects, with s47G(1)(a) s47G(1)(a) has been entered into to facilitate:

For South Australia:

- A 240MW Goat Hill Hydro Pumped Storage project, north of the former Northern power station site in Port Augusta, represents what we believe is the optimum lowest-cost solution for the Over-Build of Wind & Solar generation in that State, at a total budget capital cost of s47G(1)(a) including transmission costs, for 8-hours' full-load storage. (This is a fraction of the relative unit cost of the Snowy 2.0 pumped storage proposals, which don't even have a wind and solar over-build to remedy.)
- The business case is built on low-Strike-Priced Cap Contracts with 240MW of large business energy off-takers, which will better shore up their forward business planning, and Floor Contracts with 240MW of existing wind generators at a valuable s47G(1)(a) Floor Strike Price protection against curtailment by AEMO and negative dispatch prices at times of strongest wind and solar generation.
- In addition, the Goat Hill Pumped Storage Project offers significant benefits to all mass residential and small business customers, free of charge, as indirect beneficiaries of this substantial additional generating capability protecting a low Cap contract strike price, as well as offering protection for all 1,800MW to 1,900MW of large-scale wind and solar generators in the State from curtailment and negative pricing, free of charge, as the large 240MW of additional pumping load is incentivized to take advantage of pumping whenever low pool prices occur,
- All electricity consumers would benefit from the greatly reduced costs of direction by AEMO to more expensive lower-merit generating plant to operate to provide system security at times of excessive 'Variable Renewable Energy'.

For Victoria:

- a 1,600 MW new 'Brownfield" Latrobe Valley HELE Coal-Fired Station represents what we believe is the most cost-effective solution for Victoria.
- Replacement of the previous firm Hazelwood generation supply capability with a "Brownfield" HELE plant would benefit from the cost-savings from utilisation of existing transmission and other project inputs, as well as from a shorter development approval timetable, based on a 32% more efficient power station than under the Hazelwood development approval, and a lower-than-base-load business case as all thermal generation backs full[load dispatch when wind and solar generation is strongest.
- A serious shortfall in low-cost generation available in Victoria to replace the Hazelwood power station, from within the State or from the interconnected States, has resulted in consistent high wholesale electricity prices, more than double previous prices, and significantly higher than in NSW and Queensland, notwithstanding that other States have suffered increases in their State wholesale prices as a result of the closure of Hazelwood.
- Clearly, there has not been significant reserve base-load coal-fired generating capability in the NEM to replace Hazelwood's prior 1,600 MW base-load production on week-days, at any time of the year, and gas supply sources have not been available to replace the approx. 10 million MWh's per annum generation lost with Hazelwood's closure, As a consequence replacement generation has been made up largely by diversion of peaking hydroelectricity to supply at least 1.000MW during most week-day peak periods, 16-hour per week-day, at gas-fired marginal generation costs, and worse when unplanned coal-fired generating unit outages occur or water storages decline.
- Replacement of the 10MMWh/a dispatchable output by the most cost effective means is clearly required to support internationally-competitive industry in the State, and in an open & competitive market we believe that a 1,600MW HELE coal-fired power station on the Latrobe Valley would prove by far the most cost-

effective, and win business energy customer support, subject to partial-underwriting of debt-finance over as long-a-period as possible to reduce costs to electricity consumers.
- Replacement of the 10TWh/a by a new "Brownfield" HELE coal-fired power station on the Latrobe Valley would restore an adequate generation reserve margin in Victoria, and in the NEM generally; the restoration of an adequate generation supply/demand balance would restore competitive price setting at marginal coal-fired generation costs, and will be crucial to having any chance of Victoria having any possibility of offering Alcoa internationally-competitive electricity supply pricing to avoid the closure of the Portland aluminium smelter.

For New South Wales:
- We believe that a 700MW to 2,000MW new "Brownfield" HELE coal-fired solution would be the most effective solution in the event of a future retirement of the existing Liddell power station, , with planning and approvals processes commences at least five years ahead of such a retirement.
- The most cost-effective and reliable solution, with reduced GHG emissions, would be a "Brownfield" HELE coal-fired redevelopment at Liddell, under the previous Liddell power station approvals, at some 12% improved efficiency than the existing Liddell power station
- A 700MW "Brownfield" HELE coal-fired power station on the site for the former Vales Point 'A' power station is a back-up new generation option in the event of a Liddell closure without replacement at Liddell.
- Closure of Liddell without such replacement would result in the same or worse negative impact on reliability and security of supply and on wholesale electricity prices, with direct impact on the viability of the Tomago aluminium smelter and other energy-intensive industries in NSW.

We are technology-agnostic in our energy business development aspirations, and we are motivated totally to support businesses in Australia with the most internationally-competitive wholesale electricity pricing. More than 80% of our present wholesale electricity production in Australia is tied to long-term contracting with business energy customers, providing them with business certainty into the future for as long as they seek to have this certainty. We believe that this ACCC recommended approach, from such an experienced ACCC Chairman as Rod Sims, is a very positive circuit-breaker to the trend towards shorter business energy contracting lately due to forward price uncertainty.

We look forward to our meetings next Tuesday.

Best regards

Trevor St Baker AO
Chairman
Sunset Power Pty Ltd

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Sunset Power

From: Trevor St Baker
Sent: Wednesday, 5 December 2018 9:12 PM
To: s22 @dfat.gov.au; s22 @dfat.gov.au;s22 @austrade.gov.au>
Cc: s47F @sunsetpower.com.au>; 'John Short s47F @sasgroup.net.au)' s47F @sasgroup.net.au>
Subject: Visit to Australia by the s47G(1)(a) - 10th to 14th December

Your Excellencies s22 et al,

s47G(1)(a) has accepted an invitation to join with Sunset Power in meetings and presentations in Australia next week, accompanied by his international Business Development CEO and Senior Officers, with policy-makers (government Ministers and Shadow spokespersons and advisers in federal and States), government and departmental representatives and prospective business energy customers in South Australia, Victoria and New South Wales, in relation to the current invitation by government for expressions of interest in developing new firm dispatchable generation to restore reliability and more competitive electricity supply in the three States.

This is such a senior level Chinese electricity industry mission to Australia that we felt it might be appropriate to inform you to ensure that DFAT and the government are aware of the visit' We would certainly welcome any advice you may wish to offer to us as to any necessary formalities we should observe to ensure that their visit is acknowledged appropriately.

Attached is the latest draft of the objectives, itinerary and other details for this very important visit to Australia.

s47G(1)(a) and three of his most senior executives in their International Business Development department, are visiting Australia to present jointly with Sunset Power, under an MOA s47G(1)(a) and Sunset Power, details of proposed project solutions to the Australian Government's current request for EoI's in response to their offer of partial debt-finance underwriting of new firm dispatchable generation project solutions to the current and projected electricity supply reliability shortfalls in State regions of the National Electricity Market (NEM).

Also attached are drafts of a presentation being prepared of the imost authoritative history and projections of the uptake of Wind & Solar VRE (Variable Renewable Energy), globally and for key "Island electricity systems", like Australia, and for the three key States currently affected by shortfalls in available dispatchable generation capability identified. Also attached is today's report in the Australia by the Paris-based IEA Chief on the critical importance of ensuring adequate dispatchable generation capability to support uptake of Wind & Solar VRE. Both relate to the importance

Both s47G(1)(a) are expressing interest in offering to jointly host a multi-party visit by Australian Parliamentarians, albeit with the short notice given to us by s47G(1)(a) for their visit to Australia, we are still considering how best to assist them in this, and your advice and assistance would be welcome, if you thought that appropriate.

Since any new electricity generation project we propose to develop would be under a 50'50 partnership between the 100% Australian-owned Sunset Power s47G(1)(a) we expect that the venture will be welcome by both Australia and by China. We understand the processes necessary to secure project and investment approvals, but are proceeding with some enthusiasm that there is mutual interest in this proposed Chinese/Australian business collaboration

Best regards

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Three Capital City Mission by s47G(1)(a) Exec Officer and Sunset Power Chairman, with s47G(1)(a) business development teams

New Multi-Technology Firm Dispatchable Generation Solutions for NEM States

- **Responses by Leading Australian/Chinese GENCO Partnership**
- **To Federal Government call for EoI's in Govt partial debt-finance underwriting of long-term debt financing for new firm dispatchable generation supply prepared to be contracted by private sector business energy customers for shorter initial terms**

1. Objectives of Mission:

- To present facts on global uptake of Wind & Solar to the present time, and as projected to 2030 and beyond.
  - To demonstrate the miniscule proportions of Wind & Solar generation annually to the present time, and IEA projections to ~2030 to not greater than 15% annually in Island Electricity systems.
  - To demonstrate the reliance globally on firm dispatchable generation to meet peak demands when wind and solar are not available.
  - To demonstrate the global and regional reliance into the long-term future on all available generation technologies, each developed with best-practice low GHG emissions.
- To present facts on current and projected uptake of Wind & Solar generation in Island electricity systems throughout the world, to generally less to a maximum of 15% annually, and to no more than 25% annually in any island electricity system in the world, with reference to the IEA Handbook for electricity market operators on "Getting Wind & Sun onto the Grid."
- To present outline descriptions of the different generation technology developments being planned as best new firm generation solutions for each of the NEM mainland States by this leading global Aus/Chinese GENCO in response to the proposed bi-partisan-supported partial debt-finance underwriting of such capital-intensive new firm generation solutions to existing and projected system reliability shortfalls in the respective State.
- To present the indicative benefits that the bi-partisan federal Govt supported initiative to implement the ACCC Rec#4 that have incentivised this leading global Aus/Chinese GENCO Partnership to step up its development of technology-agnostic new firm generation solutions for SA, Victoria and NSW..
- Another Mission objective being considered is to offer to host a multi-party Parliamentarian visit to China, to better understand the global-leading clean technology developments in China for all firm generation technologies, to meet reducing GHG emission intensities in the on-going growing Chinese electricity generation, to meet not only growing Chinese manufacturing electricity demands, but also the electrification of the transport sector in China, and the clean-up of atmospheric pollution in Chinese cities..

2. Proposed firm dispatchable generation solutions being planned by th Aus/Chinese GENCO Partnership for the respective States

- **For South Australia:**
  - We believe that the 240MW Goat Hill Hydro Pumped Storage is the most cost-effective solution for SA.
  - Optimum lowest-cost solution for the Over-Build of Wind & Solar generation in that State, with Cap Contracts with business energy customers, significant new pumping demand equivalent to ~10% of the SA annual peak demand, available to AEMO in lieu of curtailment of excess proportions of 'variable renewable energy" and directions to more expensive gas-fired generation, possible guaranteed floor price for existing wind generation, and firm dispatchable low-cost spinning reserve standby to intermittent wind and solar generation.

- Subject to a Higher pool prices when wind and solar generation strongest, with Goat Hill pumping, possibly in return for possible "causer-pays" ancillary service payments by intermittent wind & large-scale solar generators, and for the avoidance of curtailment of wind or solar generation, to pay for this essential back-up of wind and solar with firm dispatchable generation dispatch and standby.
- Significant reductions in the wholesale costs to supply mass-market residential and small business electricity customers, from the significant increase in the generation supply/demand balance and capped peak pool prices.

- **For Victoria:**
  - We believe that a 1,600 MW new 'Brownfield" Latrobe Valley HELE Coal-Fired Station is the most cost-effective solution for Victoria.
  - Replacement of the previous firm Hazelwood generation supply capability with a "Brownfield" HELE plant would benefit from the cost-savings from utilisation of existing transmission and other project inputs, as well as from a shorter development approval timetable, based on a 32% more efficient power station than under the Hazelwood development approval.
  - A serious shortfall in low-cost generation in Victoria available to replace the Hazelwood power station, from within the State or from the interconnected States, has resulted in consistent high wholesale electricity prices, more than double previous prices, and significantly higher than in NSW and Queensland, notwithstanding that other States have suffered increases in their State wholesale prices as a result of the closure of Hazelwood.
  - Clearly, there has not been significant reserve base-load coal-fired generating capability to replace Hazelwood's 1,600 MW base-load previous production, especially on week-days, at any time of the year, and gas supply sources have not been available to replace the approx. 10 million MWh's per annum generation lost with Hazelwood's closure, As a consequence replacement generation has been made up largely by diversion of peaking hydroelectricity to supply at least 1.000MW during most week-day peak periods, 16-hour per week-day, at gas-fired marginal generation costs, and worse when unplanned coal-fired generating unit outages occur.
  - Replacement of the 10MMWh/a dispatchable output by the most cost effective means is clearly required to support internationally-competitive industry in the State, and in an open & competitive market we believe that a 1,600MW HELE coal-fired power station on the Latrobe Valley would prove by far the most cost-effective, and win business energy customer support, subject to partial-underwriting of debt-finance over as long-a-period as possible to reduce costs to electricity consumers.
  - Replacement of the 10TWh/a by a new "Brownfield" HELE coal-fired power station on the Latrobe Valley would restore an adequate generation reserve margin in Victoria, and in the NEM generally; the restoration of an adequate generation supply/demand balance would restore competitive price setting at marginal coal-fired generation costs, and should be capable of offering Alcoa an internationally-competitive supply price to the Portland aluminium smelter without government subsidy.

- **For New South Wales:**
  - We believe that a 700MW to 2,000MW new "Brownfield" HELE coal-fired solution would be the most effective solution in the event of a future retirement of the existing Liddell power station, , with planning and approvals processes commences at least five years ahead of such a retirement.
  - The most cost-effective and reliable solution, with reduced GHG emissions, would be a "Brownfield" HELE coal-fired redevelopment at Liddell, under the previous Liddell power station approvals at some 12% improved efficiency than the existing Liddell power station
  - A 700MW "Brownfield" HELE coal-fired power station on the site for the former Vales Point 'A' power station is a back-up new generation option in the event of a Liddell closure without replacement at Liddell.
  - Closure of Liddell without such replacement would result in the same or worse negative impact on reliability and security of supply and on wholesale electricity prices, with direct impact on the viability of the Tomago aluminium smelter and other energy-intensive industries in NSW.

3. Audiences to be targeted in one-day Mission Visits to Adelaide, Melbourne and Sydney.

- Invited large-scale business energy consumers in the respective State which are prospective core contract off-take customers to underwrite the first few commercial operating years of business cases for the proposed new firm dispatchable generation developments being considered for the bi-partisan partial debt-finance underwriting of such capital-intensive new firm generation solutions to existing and projected system reliability shortfalls in the respective State.
- Possible invitations also to other smaller business energy customers seeking certainty of long-term reliable and internationally competitively priced wholesale power pricing for their businesses.
- Government representatives responsible for State development, business growth and employment growth in the State, energy policy, climate-change policy, and power station planning and development approvals.
- Arranged meetings with relevant State Ministers or Senior Ministerial Advisers as can be arranged at this short notice, and busy pre-Xmas time.

4. Proposed One-Day Mission Schedule in each of the three State Capitals.

- **9.00 To 10.30am:**
  - 1Hr presentation to invited large-scale business energy customers and other interested smaller business energy consumers, plus interested Parliamentary and government representatives, and Q&A.

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- **10.30 To 11.30am:**
  - Introduction of Mission representatives to invited representatives of relevant government departments and relevant State Ministerial advisers, statement of Mission objectives in the State, and Q&A.

- **1200 Noon to 2.00pm:**
  - Arranged meetings with relevant Ministers or senior Ministerial Advisers.

- **Afternoon:**
  - Arranged meetings with the 2 or 3 most prospective core contract off-take customers with potential to underwrite up to half of the contract off-take for the first few commercial-operating years to meet the commercial business case for the new firm generation solution being planned for that State by the GENCO Partnership.

5. Itinerary

- **Monday, 10th December 2018: Adelaide**
  - Proposed 1Hr presentation with prospective business energy customers & government representatives, followed by meetings with State Government representatives & Ministerial advisers, relevant State government department representatives, and potential core electricity off-take customers.

- **Tuesday, 11th December 2018: Melbourne**
  - Meetings with Federal Govt Ministers and advisers, State Government representatives, Energy Market Operator, and Industry Associations, and Official Welcoming Dinner for Chinese delegation.

- **Wednesday, 12th December 2018: Melbourne**
  - Proposed 1Hr presentation with prospective business energy customers & government representatives, followed by meetings with State Government representatives & Ministerial advisers, relevant State government department representatives, and potential core electricity off-take customers.

- **Thursday, 13th December 2018: Sydney**
  - Proposed 1Hr presentation with prospective business energy customers & government representatives, followed by meetings with State Government representatives & Ministerial advisers, relevant State government department representatives, and potential core electricity off-take customers.

- **Friday, 14th December 2018: Sydney**
  - Possible meetings with Energy Market Commission, Energy Market Regulator, and industry associations..

6. The (PowerPoint) Presentation

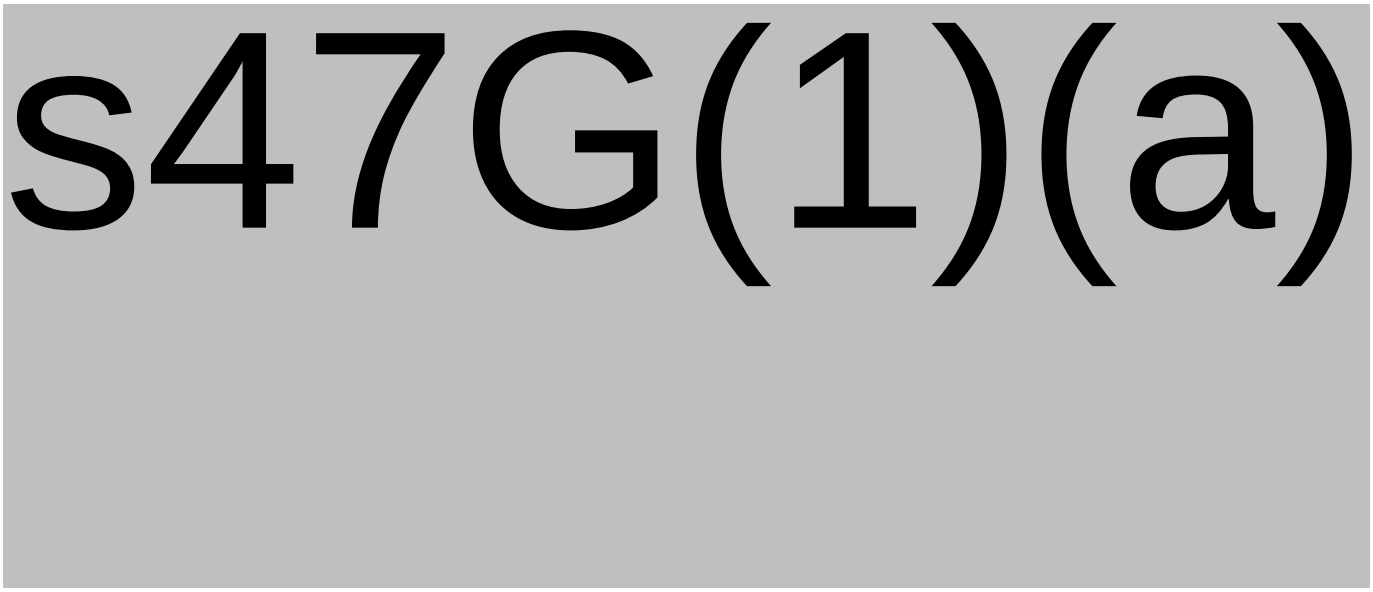
(i) Global generation primary energy source breakdowns (aka IEA) of Wind & Solar, Coal, Gas, Nuclear, and Hydro, from 2000 to present, & projections to 2040.
(ii) same for Ireland; (iii) same for Japan; (iv) same for Korea; (v) same for China
(vi) Same for NEM; and (vii) Impact of VRE's and Coal Plant Closures in the NEM.
(viii) Typical weekly primary energy source breakdowns in the 3-State (SA/Vic/NSW) system
(ix) Typical weekly primary energy source breakdowns for NSW'
(x) Typical weekly primary energy source breakdowns for Victoria.
(xi) Typical weekly primary energy source breakdowns for SA.

7. The Aus/China GENCO Partnership & 'top-level' Mission Representatives

The Heads of both s47G(1)(a) and of Sunset Power are leading this Aus/China GENCO Partnership mission to the three States and to policy-makers in all three State and Federal level, to establish the level of bi-partisan support for solutions to the reliability & security of supply issues and high wholesale electricity prices in the Australian National Electricity market. It is a privilege to have the head of one of China's major power generation companies, and the largest Hong Kong listed companies operating in this sector in Mainland China.

Sunset Power Pty Ltd:

- Sunset Power, the holding company for the investments by Trevor St.Baker in SPI/Delta Electricity (50%), ERM Power Limited (~30%), and StBaker Energy Innovation Trust (100%).
- Sunset Power developed six major gas-fired power stations, across three States of Australia, in the 2000's, and established ERM Power Pty Ltd to construct and operate the power stations, successfully venturing into business energy retailing, becoming listed on the ASX as ERM Power Limited, and for some years now had been the 2nd largest electricity retailer to commercial & Industrial customers across Australia, and the third-largest electricity retailer by energy MWh sales in Australia
- Sunset Power established Sunset Power International in 2012 to develop or acquire power generation projects and businesses, and after unsuccessful ventures in Myanmar and in Victoria, successfully acquired the Delta Electricity business of the NSW Government, operator of the 1,320MW Vales Point power station on Lake Macquarie, which supplies approximately 10% of the electricity generation demand in the State.
- In 2020, Sunset Power renamed its new-start venture fund StBaker Energy Innovation Fund, which has now grown to a large financial investor and pro-active supporter of the commercialisation of a range of new energy-related new-start R&D companies, the currently-most successful being Tritium Pty Ltd, now the world leading electric vehicle DC fast-charge technology and manufacturing company.
- Sunset Power representatives will be:
- **Mr Trevor St.Baker AO, Chairman of Sunset Power,**
- **Mr Wayne Moulday, Executive General Manager Business Development, SPI/Delta Electricity, and**
- **Mr Tony Callan, Executive General Manage, Marketing, SPI/Delta Electricity.**



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Three Capital City Mission

s47G(1)(a) and Sunset Power

s47G(1)(a)

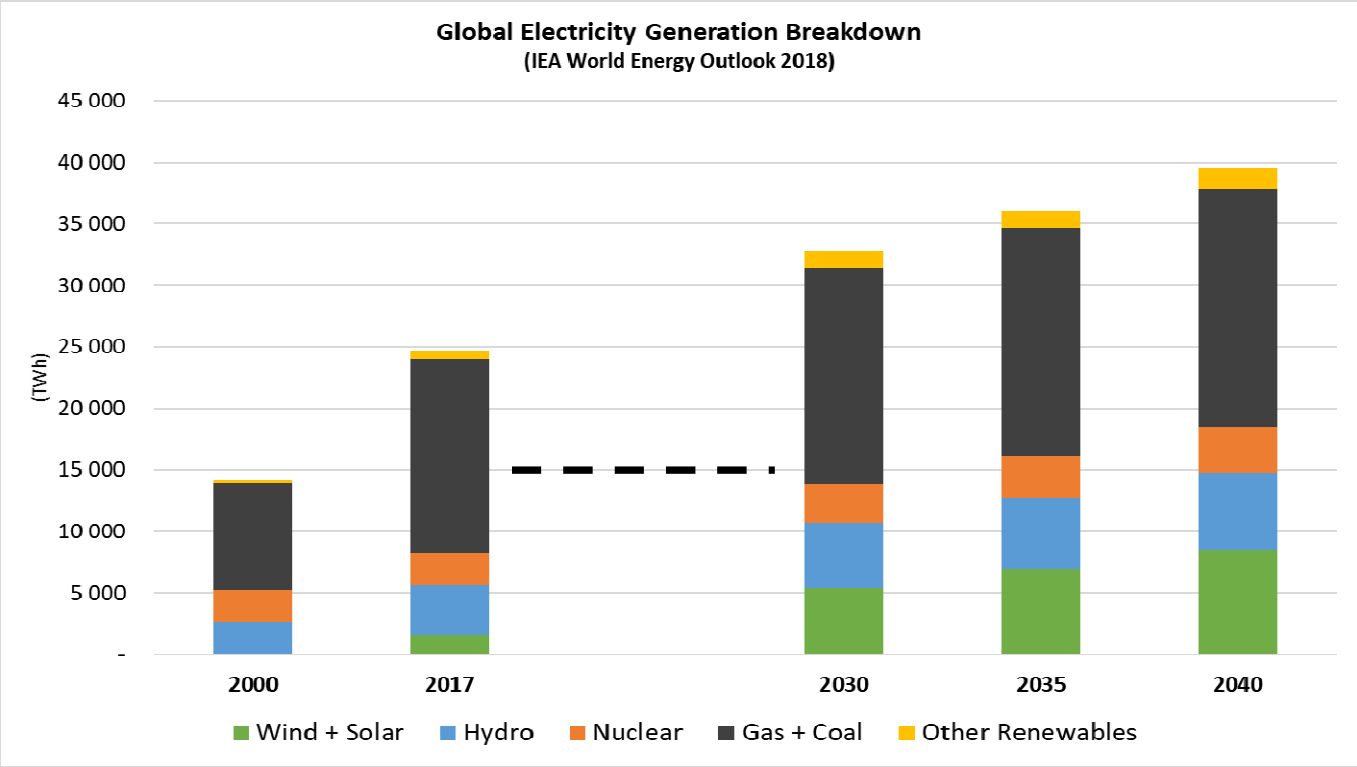
Mr Trevor St. Baker - Chairman of Sunset Power

Objectives of Mission

- To present facts on the global uptake of wind and solar.
- To demonstrate the reliance globally on firm dispatchable generation to meet peak demands when wind and solar are not available.
- To demonstrate the global and regional reliance on all available generation technologies, each developed with best-practice low GHG emissions.
- To outline descriptions of the different generation technology developments being planned as best new firm generation solutions for each of the NEM mainland States:
  - SA: 240MW Pumped Storage Hydro facility;
  - VIC: 1,600 MW new 'Brownfield" Latrobe Valley HELE coal-fired station; and
  - NSW: 700MW to 2,000MW new "Brownfield" HELE coal-fired

Global Electricity Forecast

According to the IEA, variable renewables (Wind and Sun) will just exceed 20% globally by 2040. Coal continues to increase in India and SE Asia with coal generation steady in China. Globally, coal and gas generation will continue to increase. In a standalone power system, achieving ~20% wind/sun requires advanced technologies (Note 1). No country has exceeded this level without substantial interconnection to countries with reliable dispatchable generation.

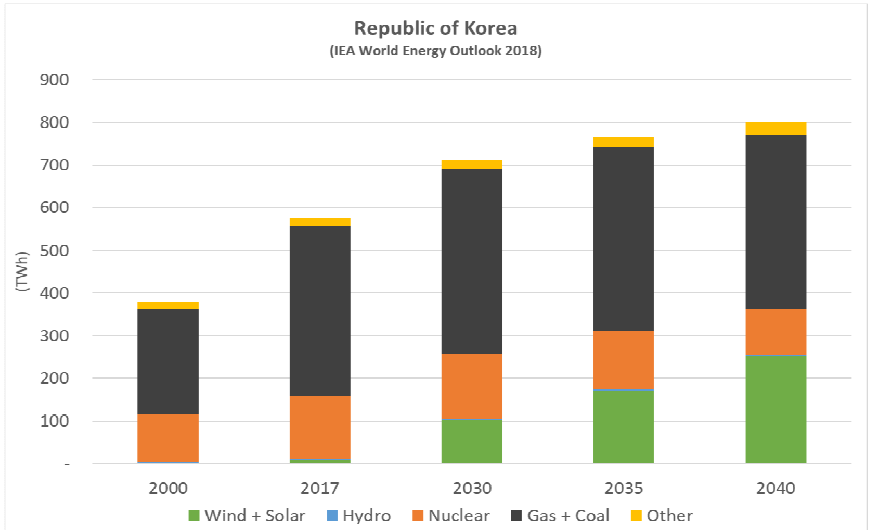


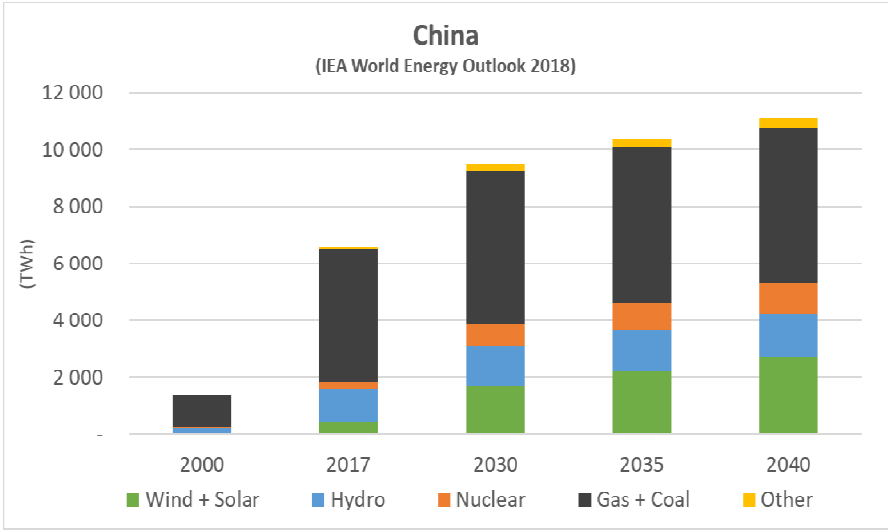
Note:

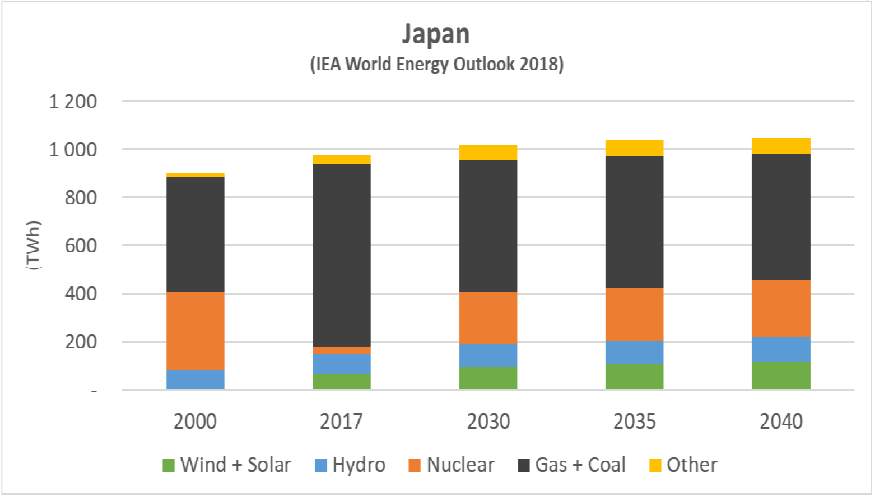
1. Ireland has achieved 22% wind by applying higher technical performance standards on existing plant and implementing new market mechanisms that include a large range of advanced system security services.
2. The IEA forecast includes existing energy policy and announced policy intentions.

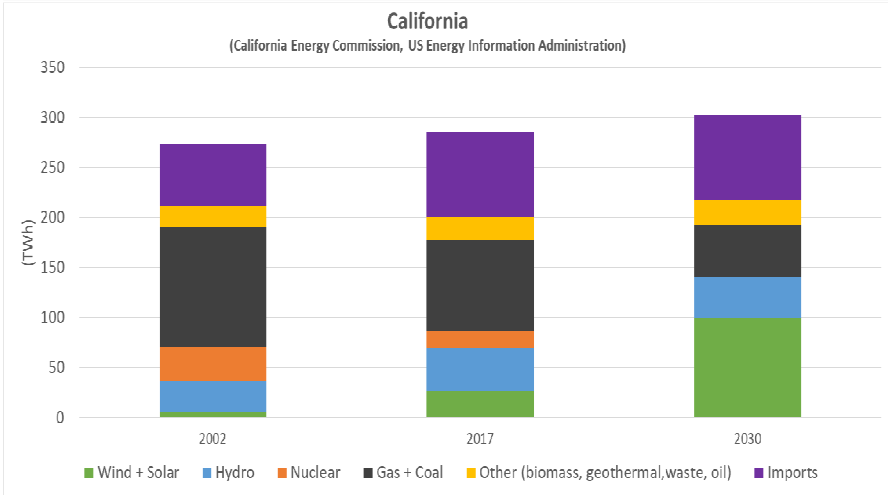
Coal and Gas Forecast (largely stand-alone systems)

The need for reliable dispatchable plant in stand-alone power systems provides a role for coal and gas well in to the future. The mix of coal and gas depends on relative costs. California is targeting 50% of energy supplied by 2030 to be renewable but has hydro, geothermal and imports from neighbouring states.







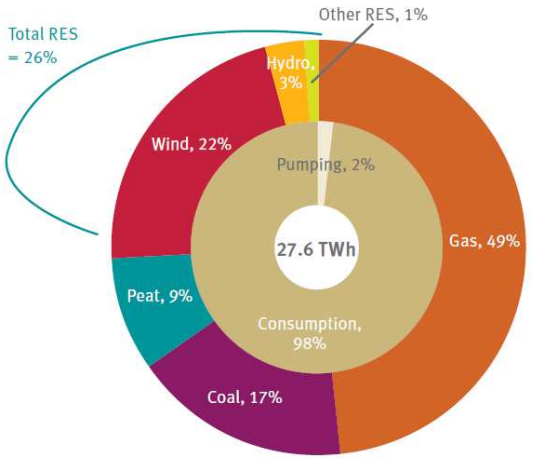


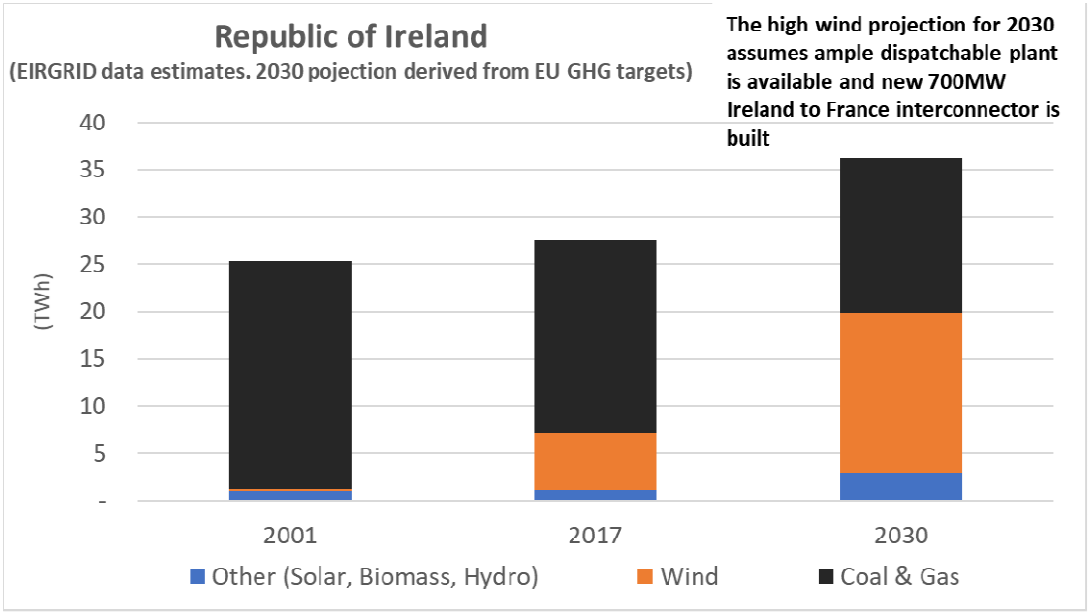
Note:

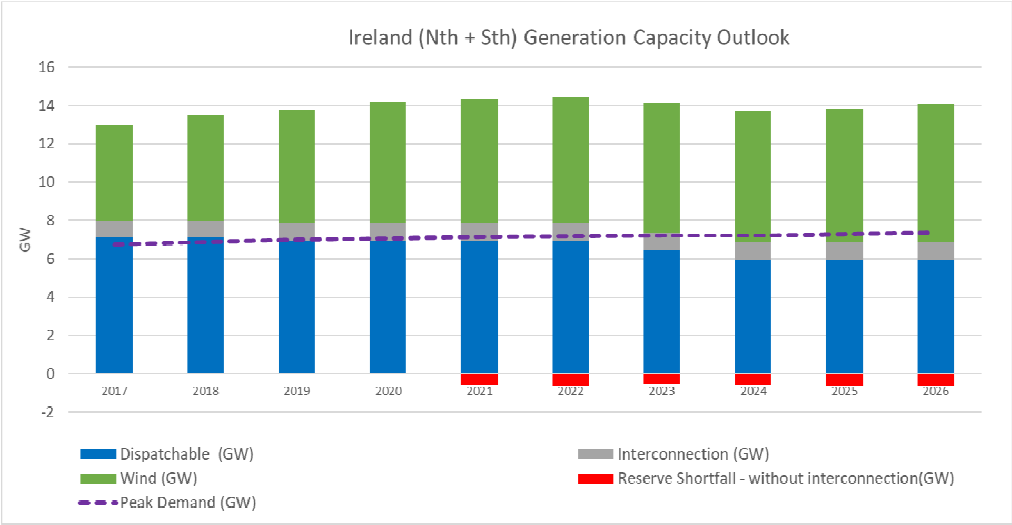
The IEA forecast includes existing energy policy and announced policy intentions. The California 2030 projection has ben constructed from the US Energy Information Administration assuming hydro generation and imports remain the same as 2017.

Ireland – a case study in integrating large scale variable renewable generation

2017 Electricity Generation Mix (Republic of Ireland)







- Ireland can be viewed as a largely stand-alone power system
- 1000MW of dc interconnection to Britain supports system reliability
- Ireland has established an advanced market operating regime that allows the market to accommodate around 60% wind dispatch
- Wind is being curtailed, but has reached 22% in 2017
- Ireland requires sufficient dispatchable plant to cover peak demand (mainly coal and gas)
- A 700MW interconnection to France is planned to further support a reliable power supply with a modest increase in wind capacity

Data source: All-island Generation Capacity Statement 2017-2026 report, EIRGRID GROUP, April 2017

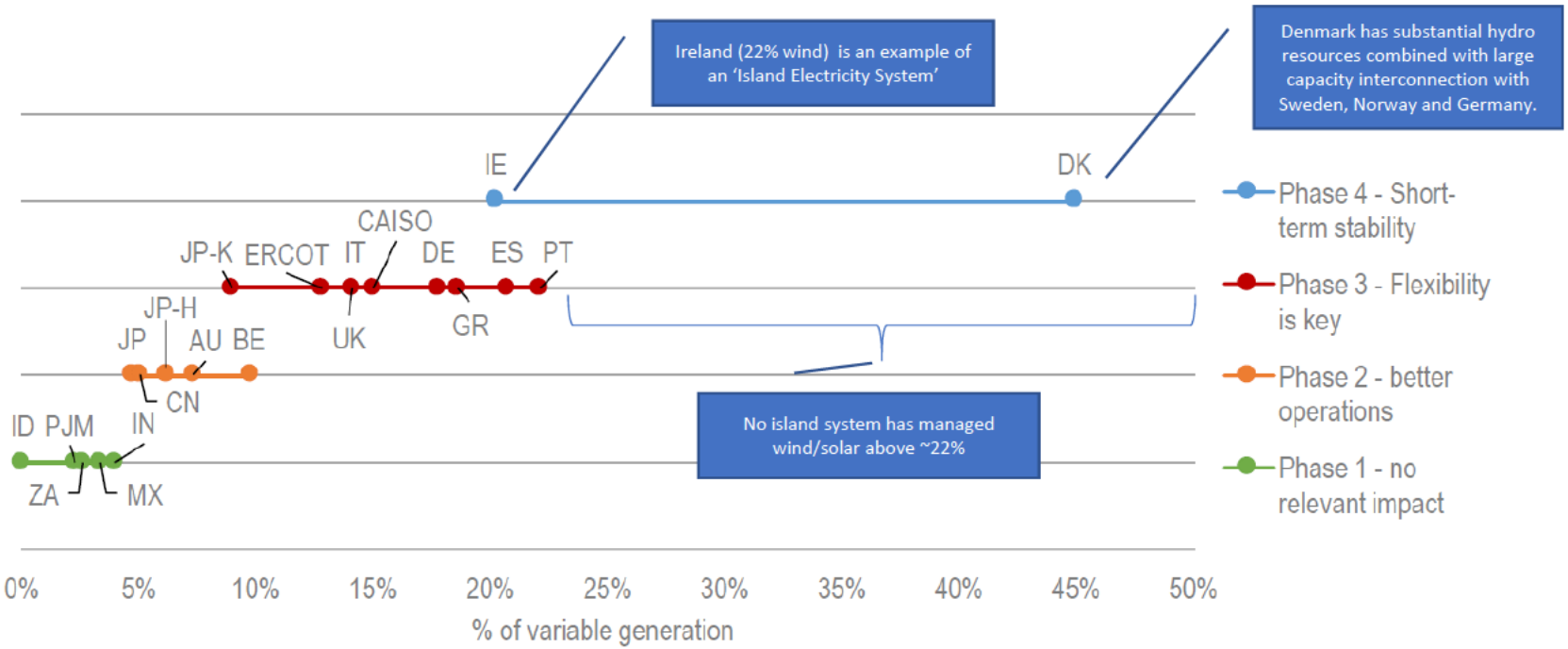
IEA – System Integration of Renewables

Phase 4 (20% variable renewable energy)[1]:

"…high shares of VRE have broad implications for the power system at all timescales, ranging from several years to days, hours, minutes and seconds."

"One of the main technical issues for small and isolated power systems [e.g. NEM] *with high shares of VRE is low levels of synchronous inertia"* [causes high rates of change in frequency which places the power system at risk of collapse]

"Storage is recognised as a technology that can provide greater flexibility and help to maintain the security of the grid, particularly during Phase 4 of VRE deployment. Pumped hydropower storage currently accounts for the majority of storage deployed."



Notes: AT = Austria; AU = Australia; BR = Brazil; CL = Chile; CN = China; DE = Germany; DK = Denmark; ES = Spain; GR = Greece; ID = Indonesia; IE = Ireland; IN = India; IT = Italy; JP = Japan; JP-H = Hokkaido (Japan); JP-K = Kyushu (Japan); MX = Mexico; NZ = New Zealand; PT = Portugal; SE = Sweden; UK = the United Kingdom; ZA = South Africa. PJM, CAISO and ERCOT are US energy markets.

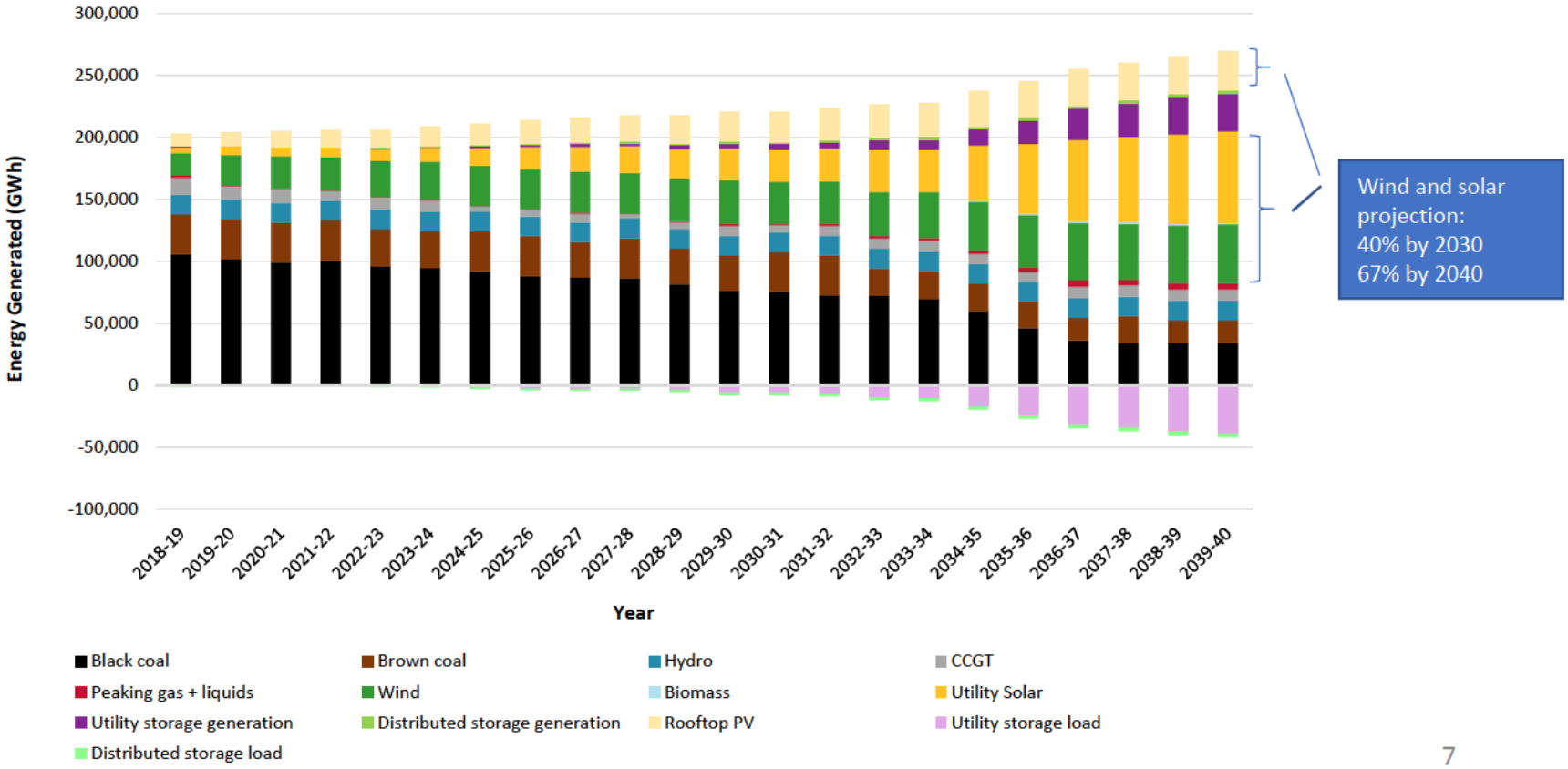
Source: Adapted from IEA (2017a), *Renewable 2017.*

1. Source document : IES System Integration of Renewables – An update of best practice 2018

NEM – Generation forecast

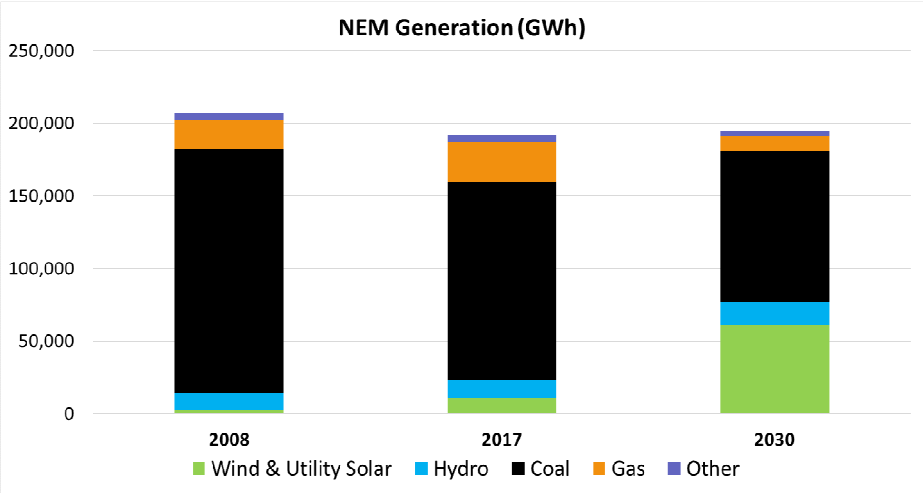
The NEM has relied on low cost firm dispatchable coal fired plant to deliver affordable and reliable electricity. The displacement of coal (Northern and Hazelwood) by renewable energy has increased prices not lowered them and resulted in market interventions and the use of AEMO's reserve trader function. AEMO's NEM projection of wind/solar energy for 2030 (~40%) is beyond the capability of the system to accommodate based on international experience.

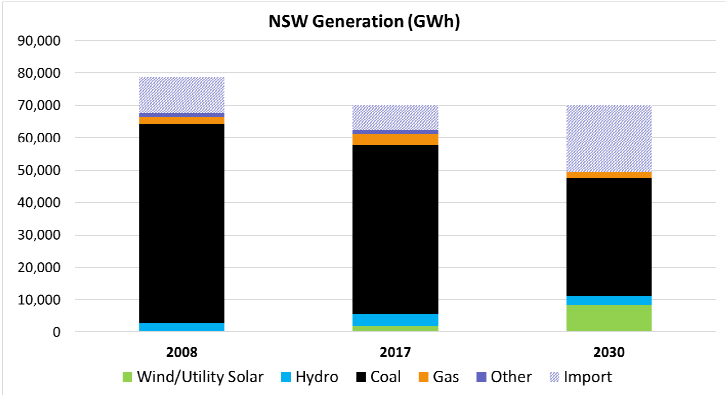
AEMO's 2018 Integrated System Plan (ISP) – NEM neutral scenario energy generation projection

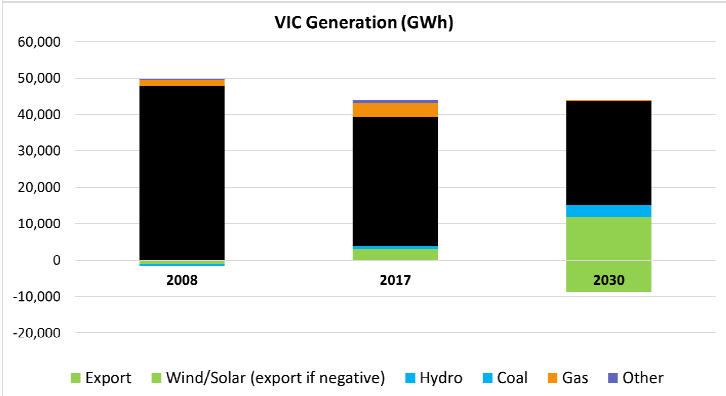


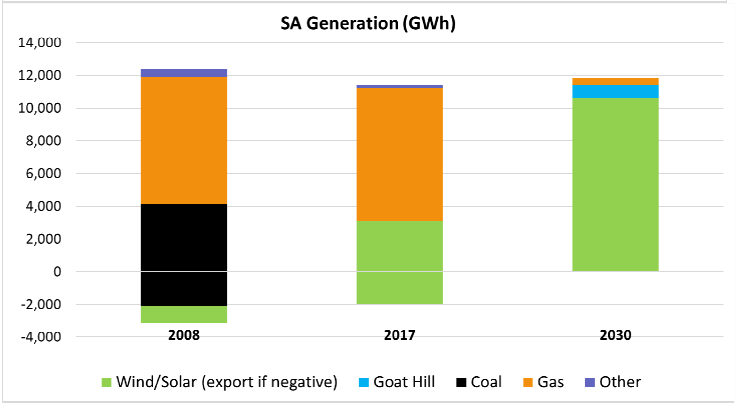
NEM Regions – AEMO ISP generation forecast

The ISP projections suggest NSW will be overly reliant on interconnection (QLD and VIC), VIC will have a shortage of dispatchable generation and Goat Hill could be the only dispatchable plant in SA (assuming gas has been displaced by wind/solar)

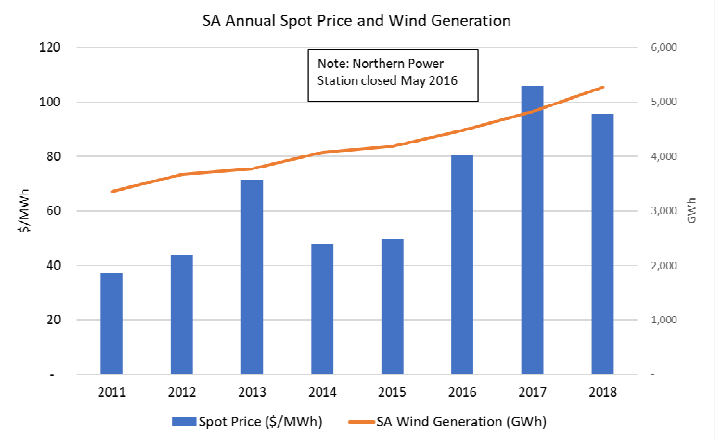


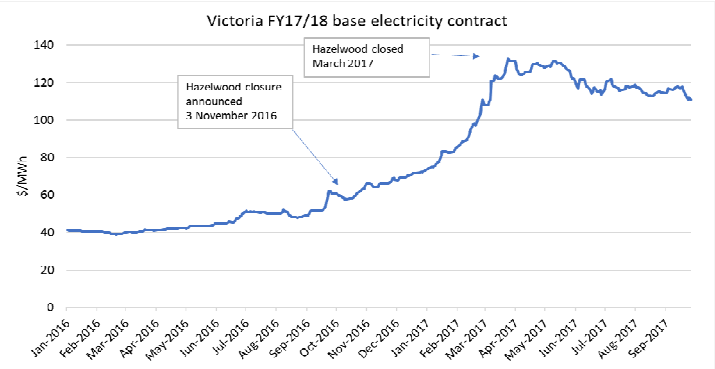


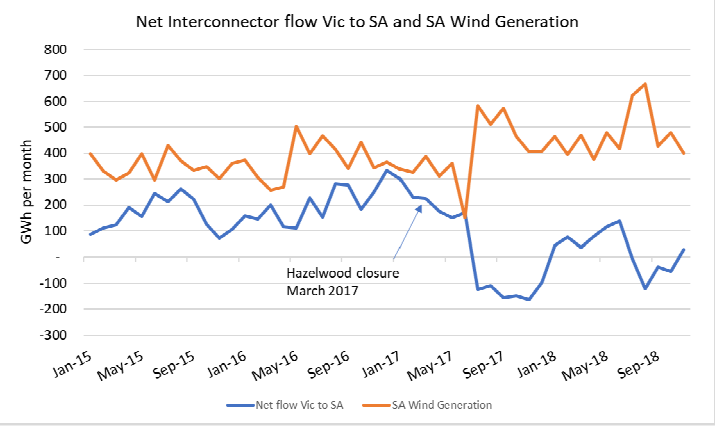




NEM – Impact of VRE and coal plant closures







Northern Power Station (520MW coal fired power station) was commercially unviable as wind generation caused falls in spot and contract prices.
Station closed in May 2016 with loss of firm supply and system security support. HIGH LEVELS OF WIND HAS CAUSED PRICES TO RISE NOT FALL.

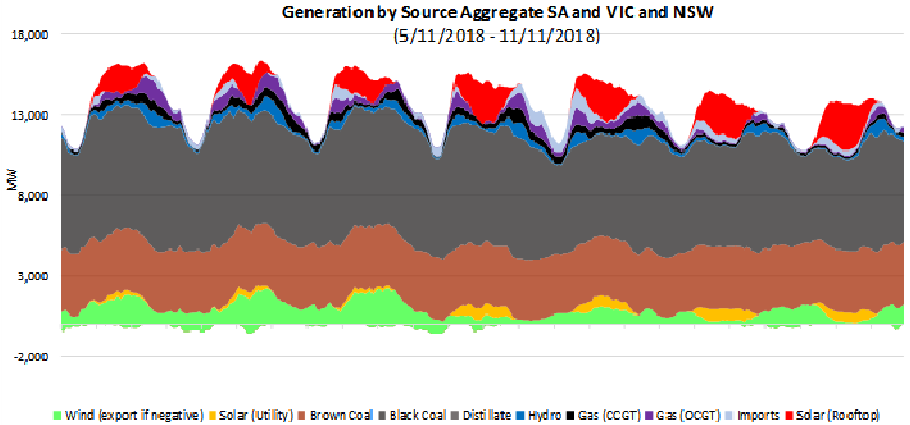
Hazelwood's (1600MW coal fired power station) closure resulted in gas plant and hydro setting much higher prices. No Northern power station and increasing SA wind resulted in power flow from SA to VIC.

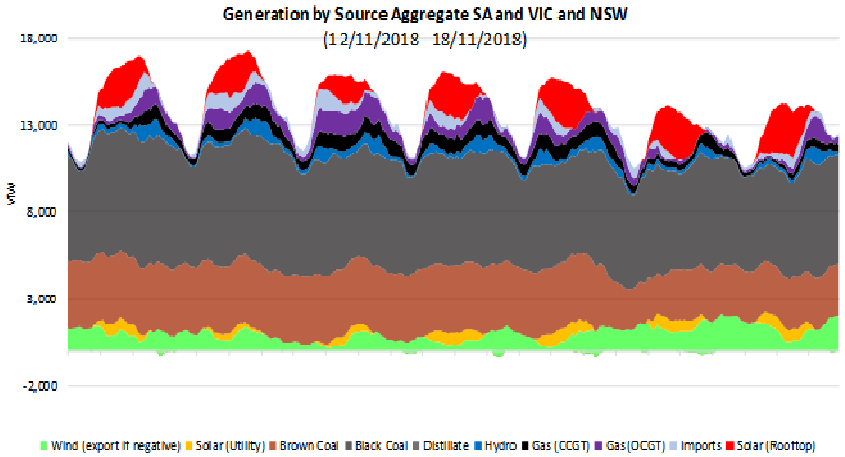
AS EXISTING COAL FIRED PLANT EXITS, PRICES RISE, EVEN AS SUBSTANTIAL NEW WIND/SOLAR IS COMMISSIONED.

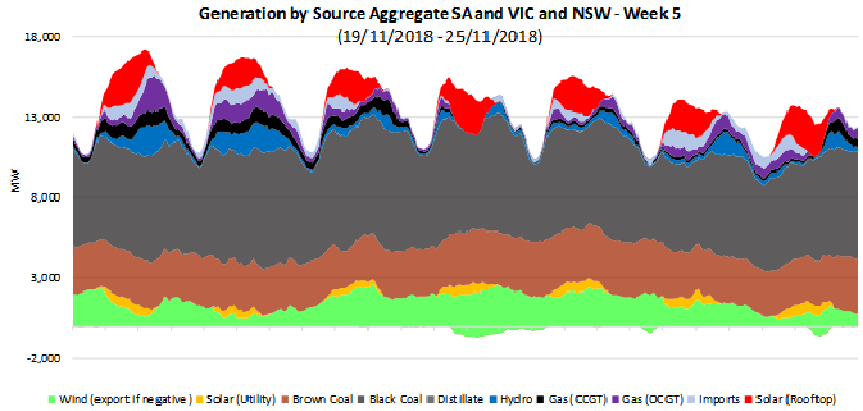
Liddell (2000MW coal fired power station) will close in 2022. Gas peakers will likely be the price setters (at $100/MWh plus)

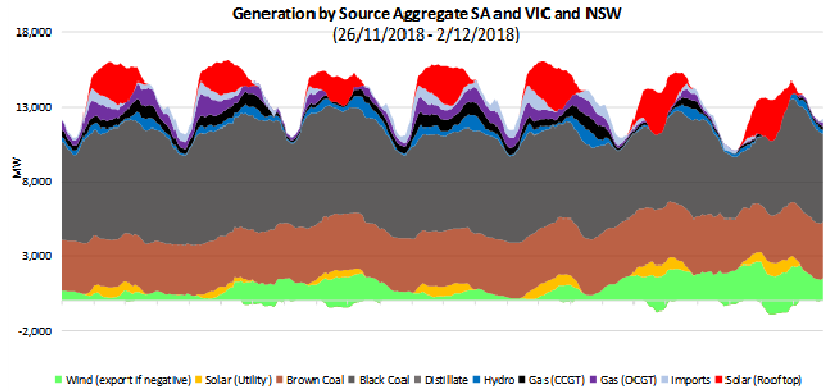
NEM regional dispatch – NSW/VIC/SA -recent

Across NSW/VIC/SA, the system is heavily reliant on coal plant. The closure of Northern and Hazelwood has shifted the supply curve such that day time demands are often set by gas (or shadow pricing hydro).

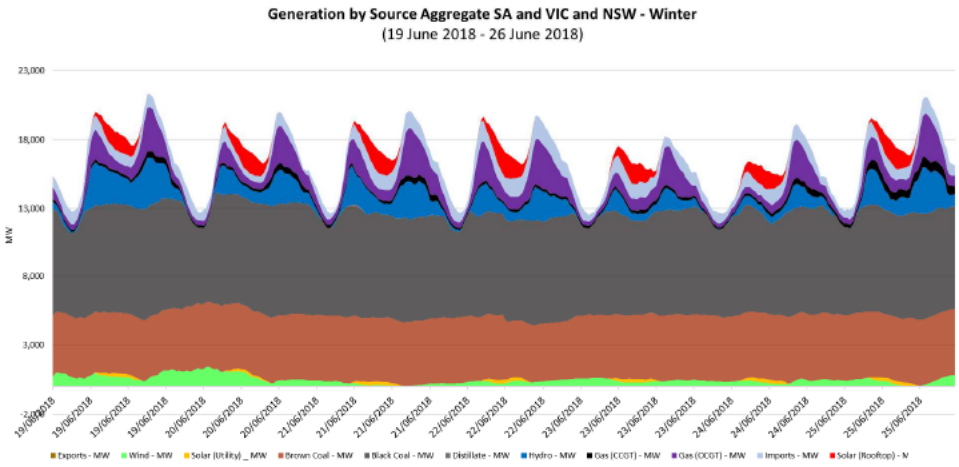


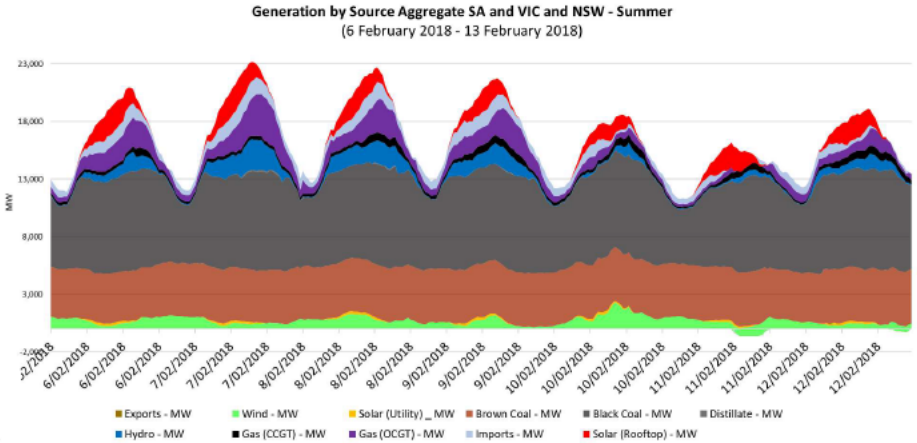


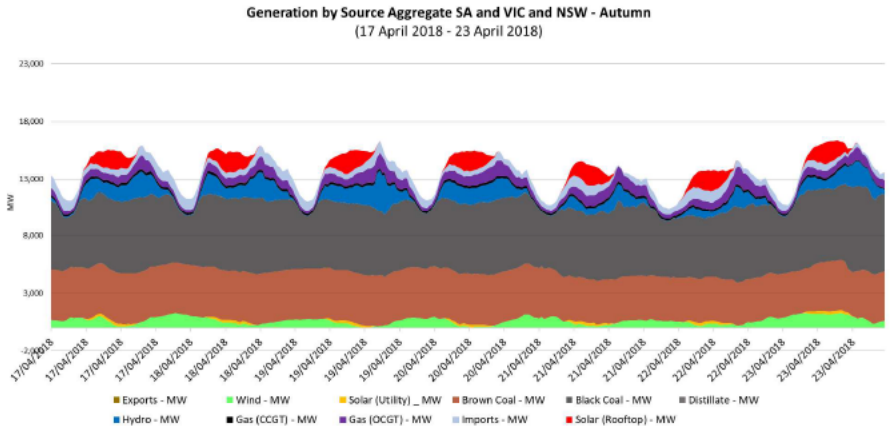




NEM regional dispatch – NSW/VIC/SA - seasonal

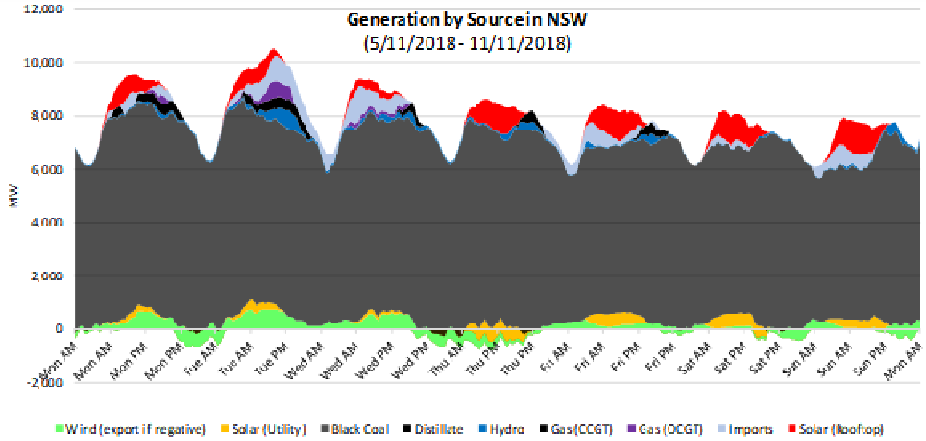


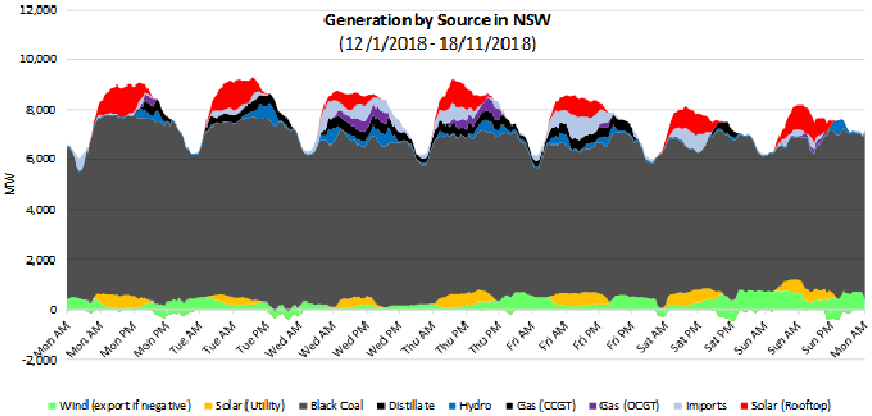


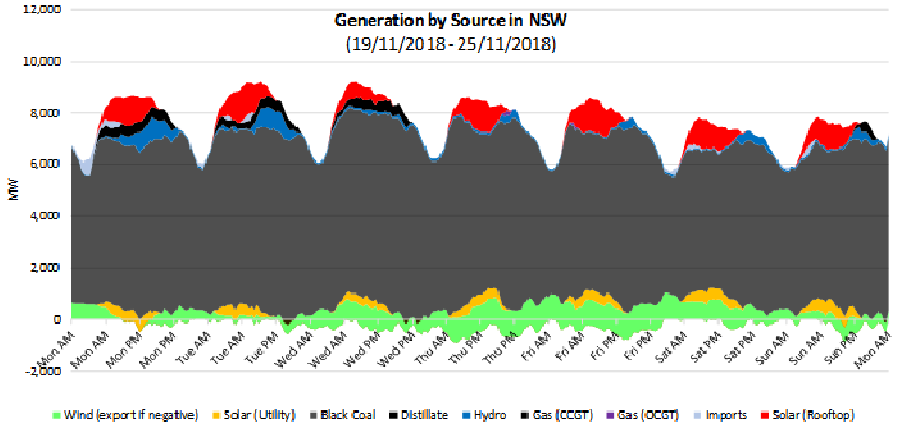


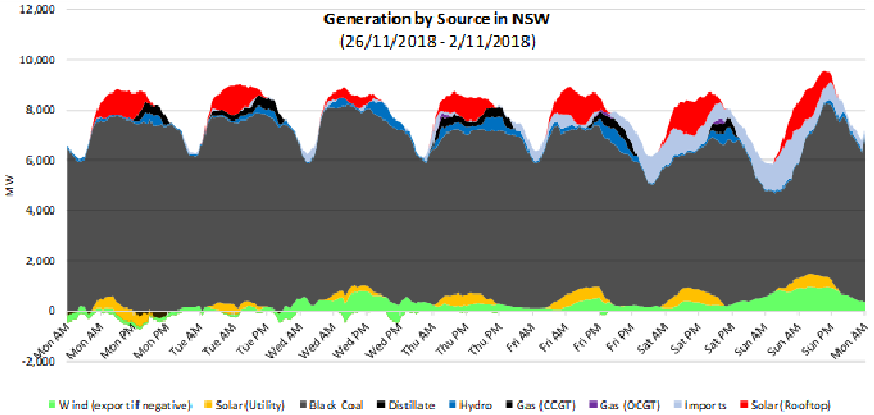
NEM regional dispatch – NSW -recent

A 700MW to 2000MW 'brownfield' HELE plant is the most cost effective solution to the impending closure of Liddell in 2022.

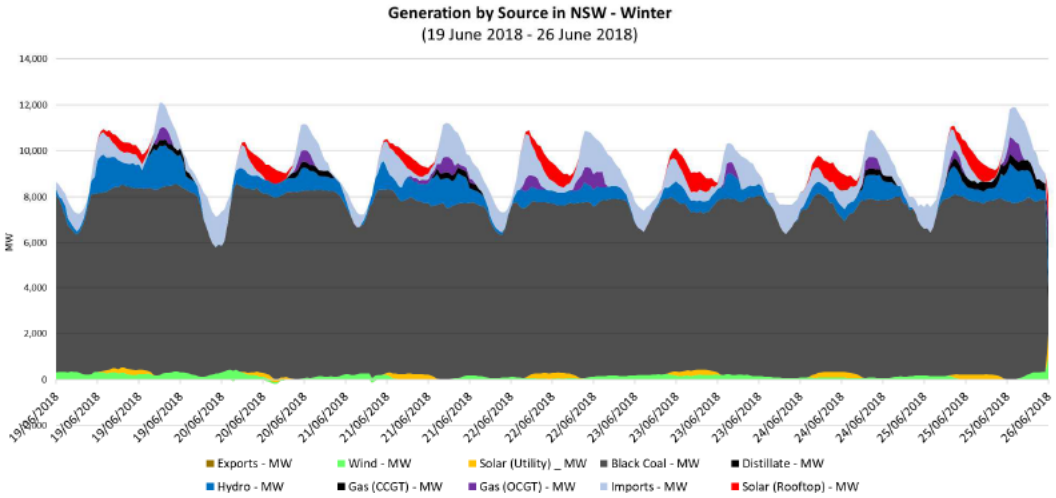


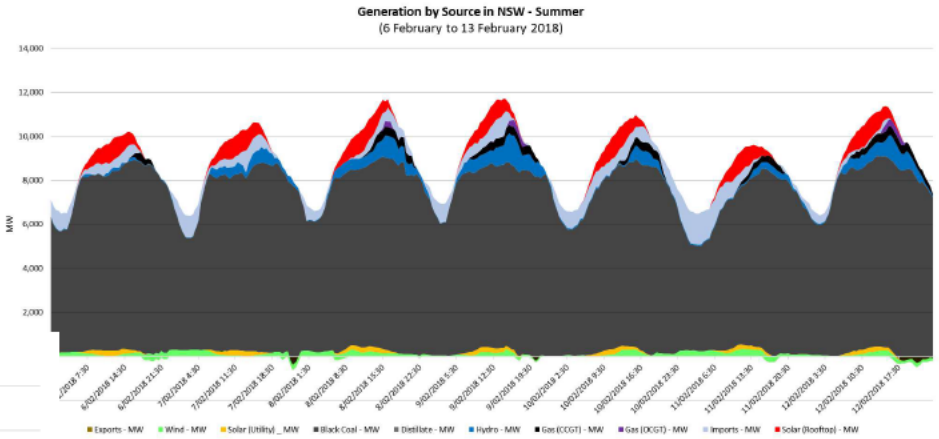


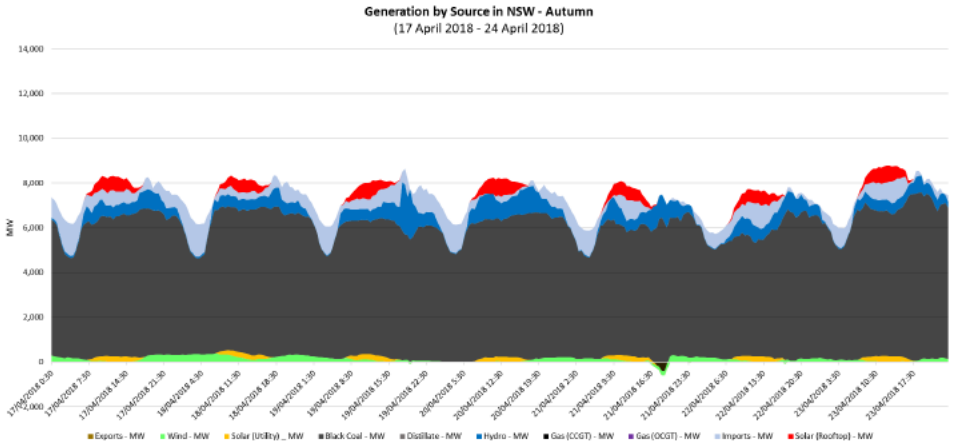




NEM regional dispatch – NSW - seasonal

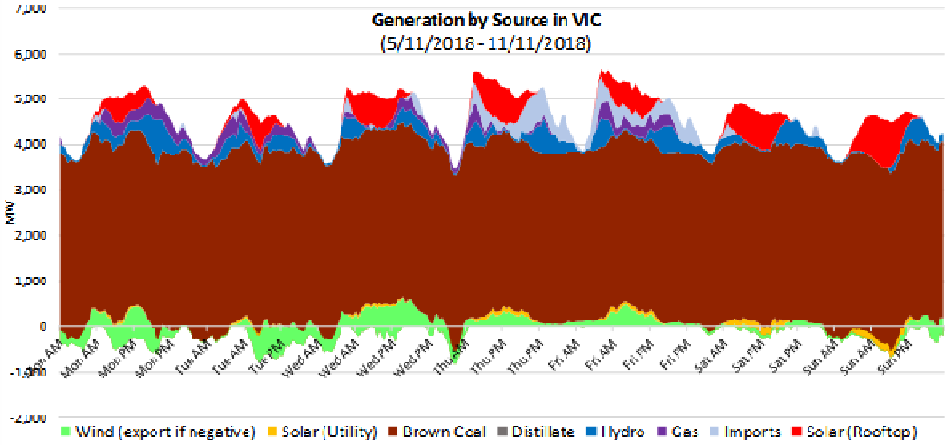


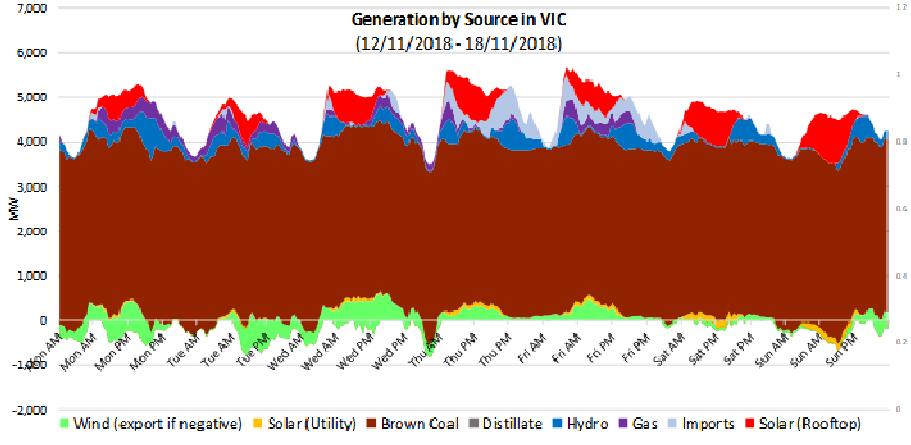


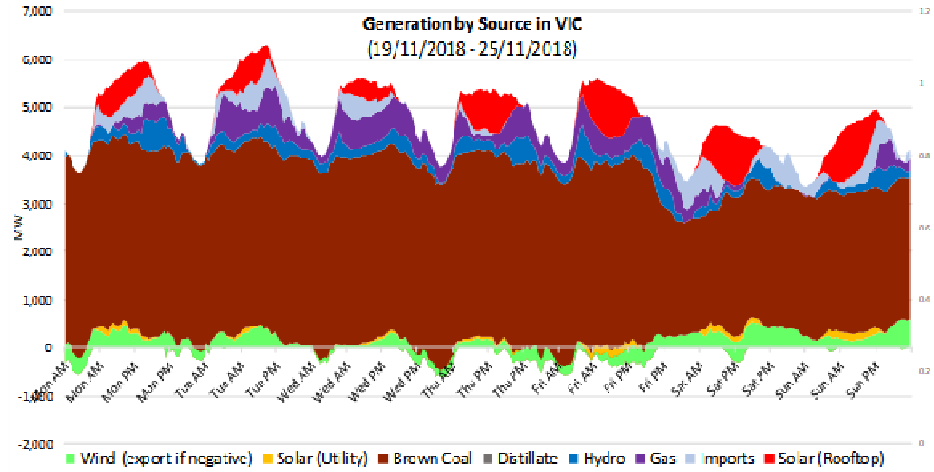


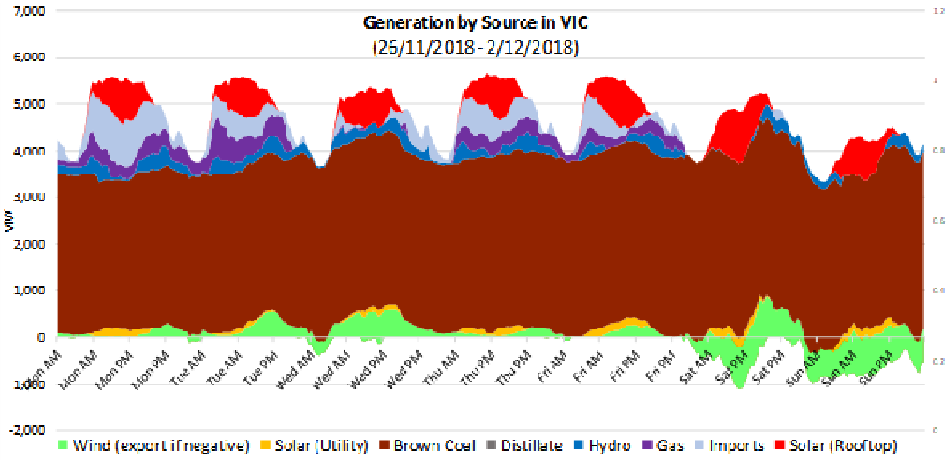
NEM regional dispatch – VIC - recent

VIC day time prices set by gas peakers or shadow pricing hydro. A 1600MW 'brownfield' HELE plant is the most cost effective replacement for Hazelwood to bring down prices and restore reserve margins (to avoid AEMO reserve trader intervention)

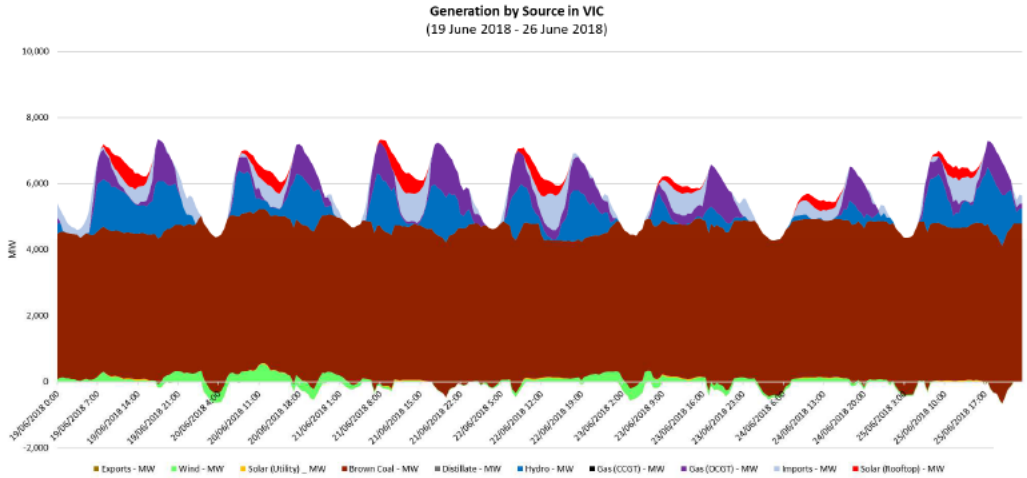


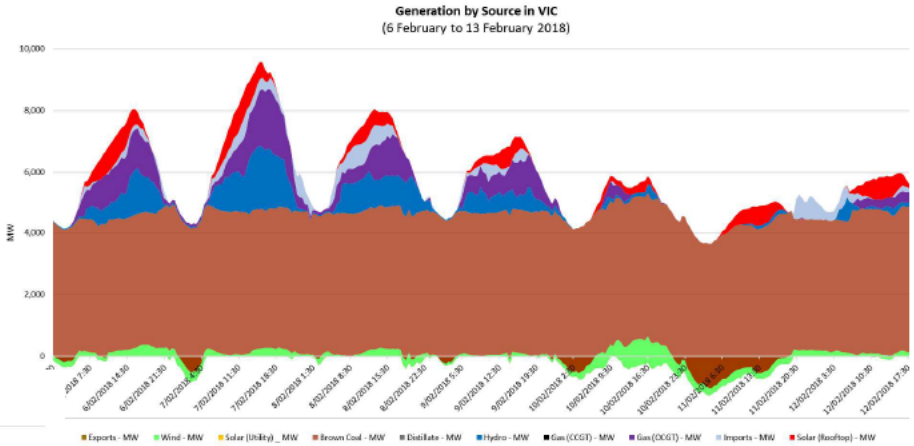


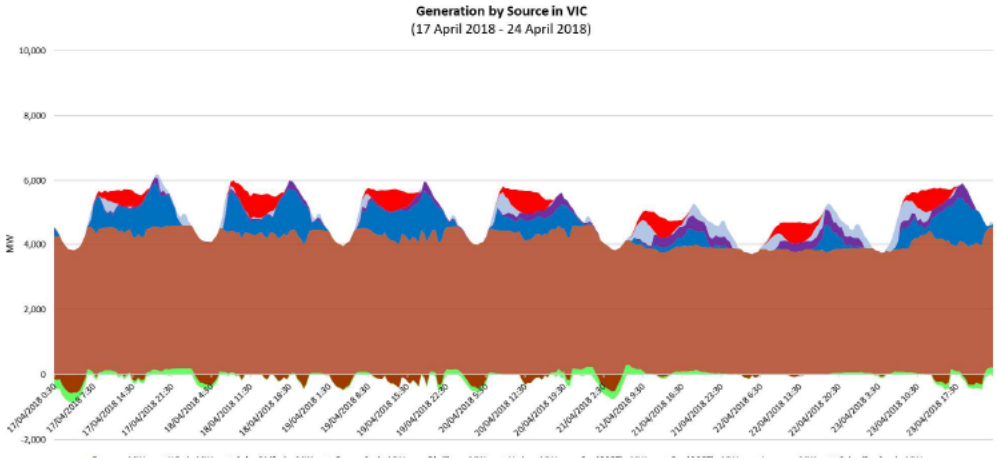




NEM regional dispatch – VIC - seasonal

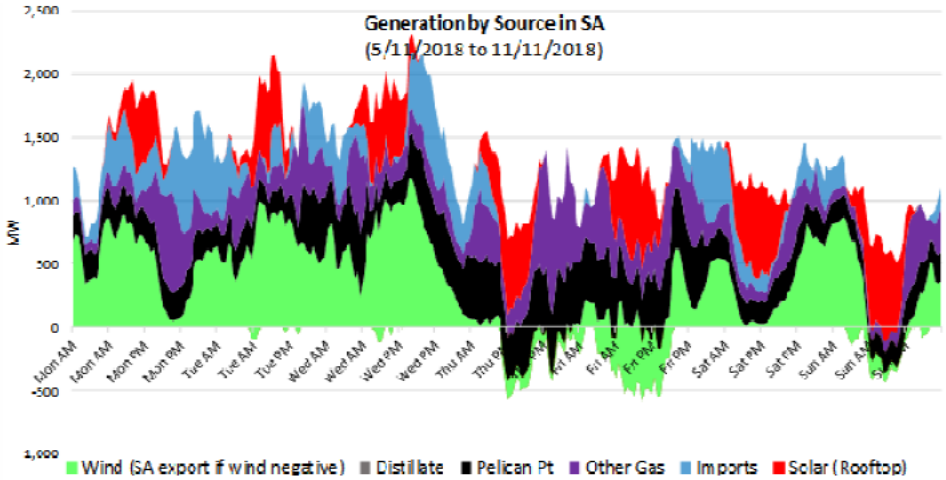


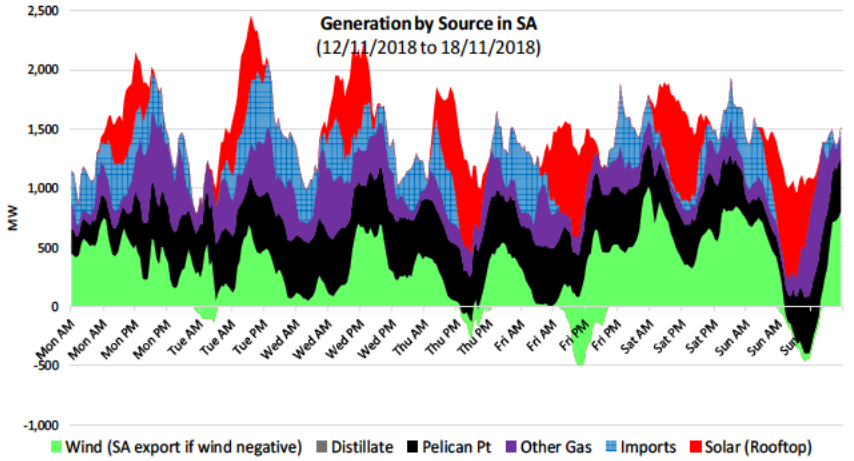


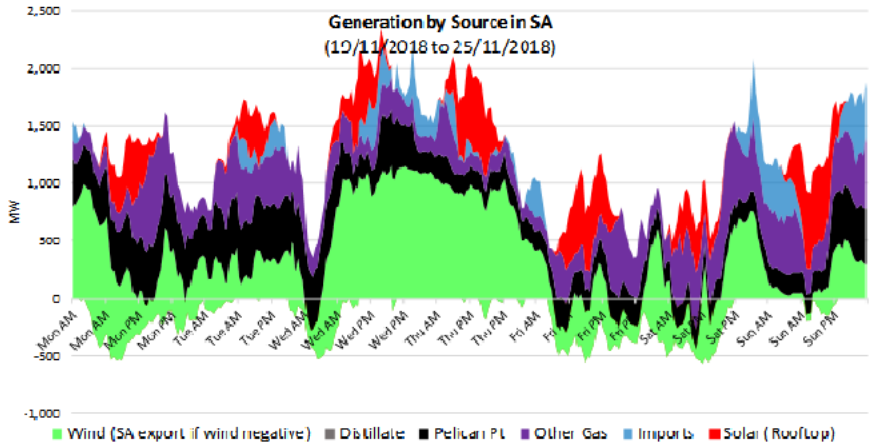


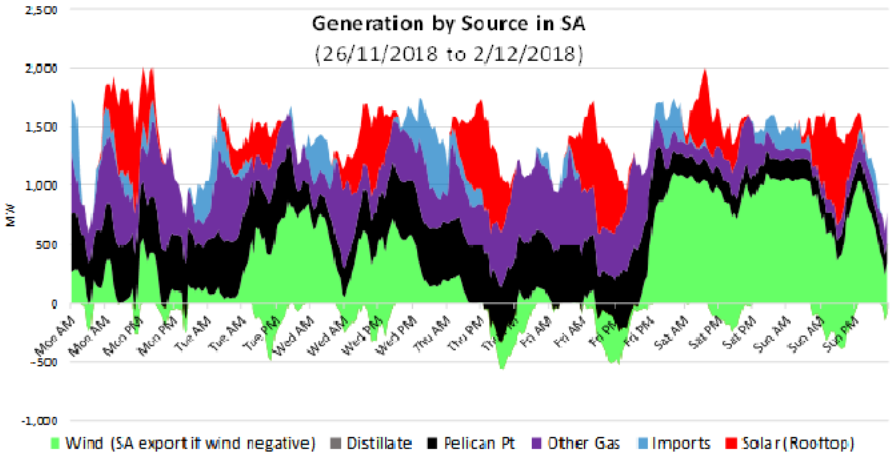
NEM regional dispatch –SA - recent

Goat Hill (240MW) is an optimal solution to the over-build of wind and solar in SA that has resulted in regular intervention by AEMO.

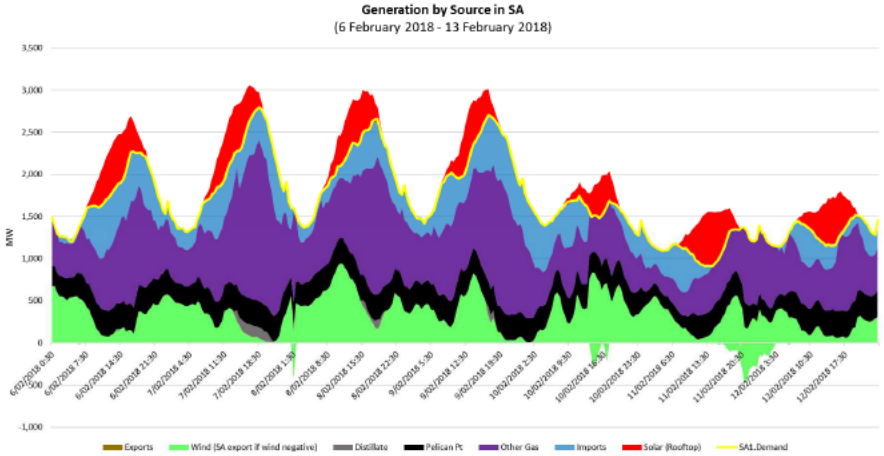


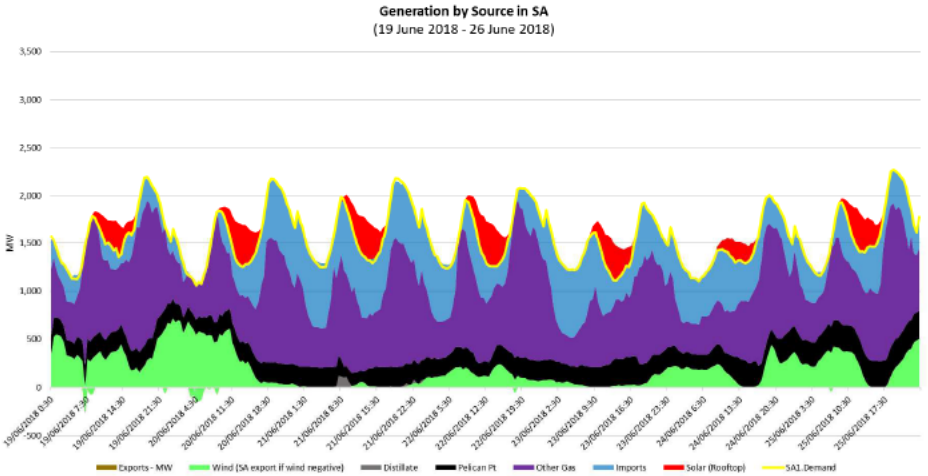


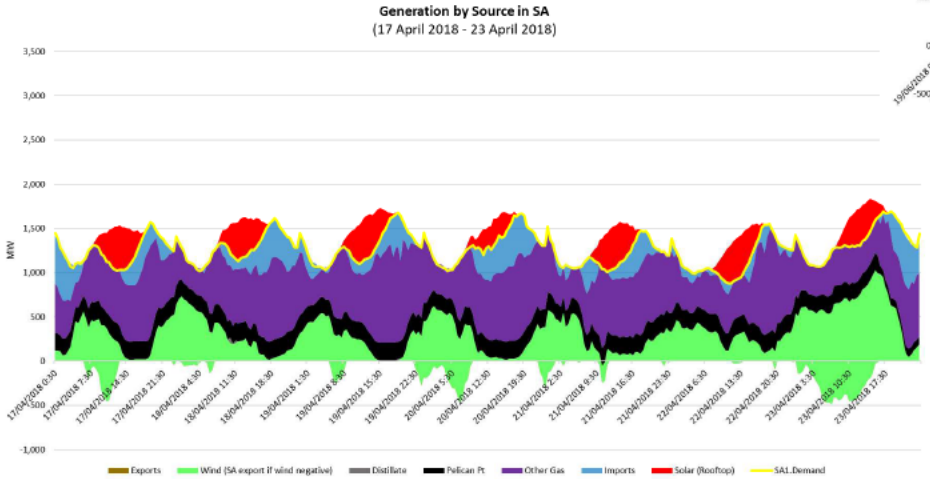




NEM regional dispatch – SA - seasonal



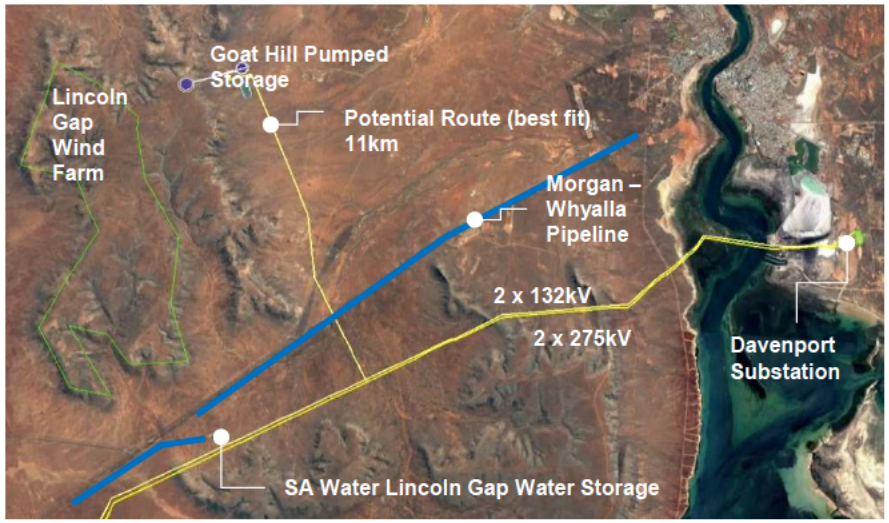




Goat Hill Project

Goat Hill – Overview

- A new entrant in the South Australian power sector
- 230MW with 8 hours of storage and less than 5 minutes changeover
- Less than 36 months construction, with target commercial operations s47G(1)(a)
- Estimated total direct cost of s47G(1)(a) or total project cost of s47G(1)(a) (including funding)
- Project is further advanced than competing projects
- Direct economic benefits, particularly during construction, leveraging the strength of South Australia's civil contracting industry
- Significant contribution to resolve energy security and reliability challenges, representing the lowest cost grid scale energy storage

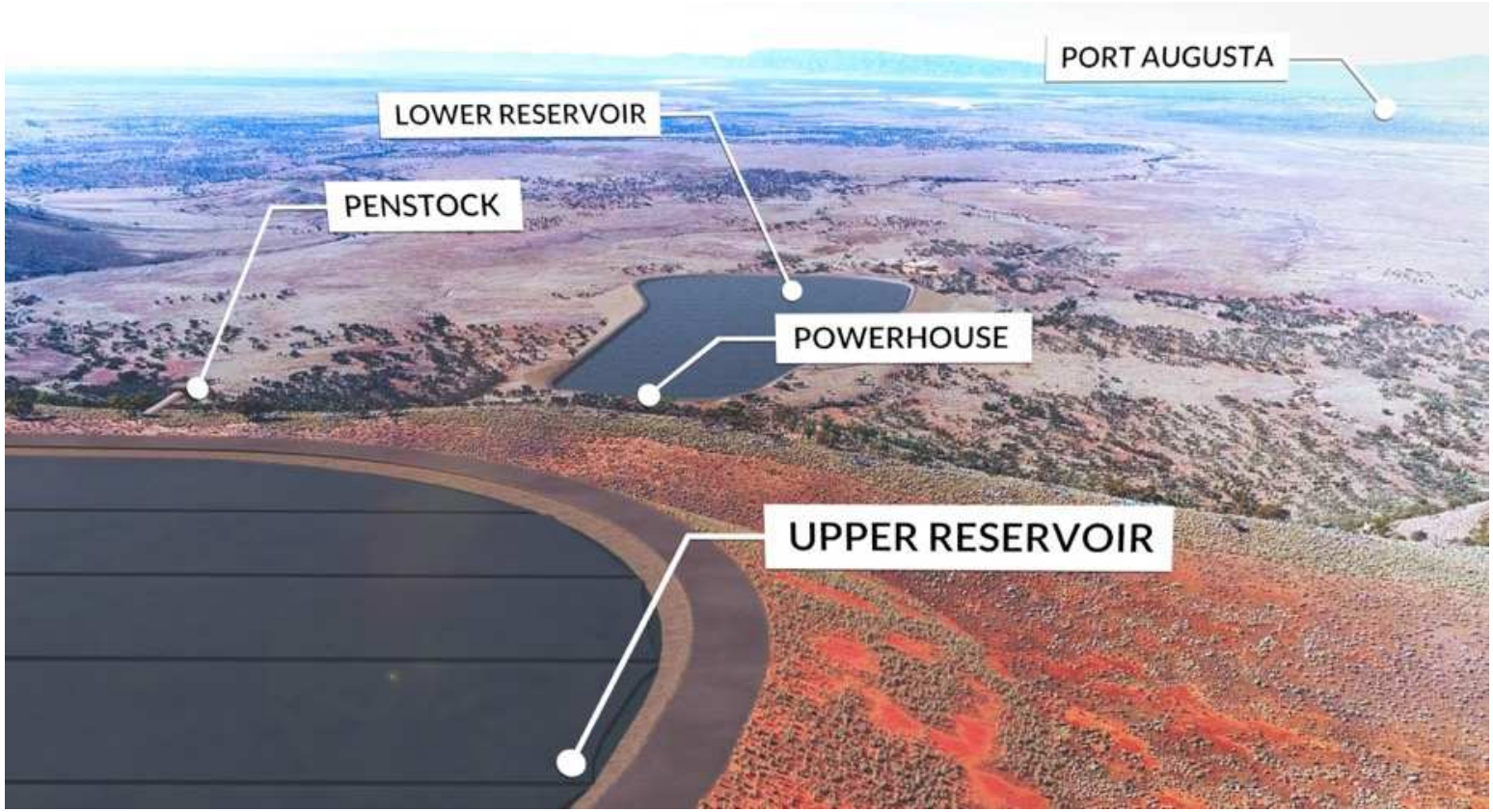


Key attributes:

- Increases of supply at time of high price putting downward pressure on volatility and electricity prices for SA customers
- Enable SA to increase use of wind and solar, resulting in further local investment and strengthening broader economy, with potential to increase energy flows into Eastern States
- Uses existing infrastructure for competitive advantage (275kV network near Davenport & SA Water Morgan Whyalla Pipeline)
- Energy Security – avoiding network costs for voltage support. Voltage support requirements of SA met by this project.
- 30 km from Port Augusta and 350 km from Adelaide
- Currently Low Density Livestock Farming with other renewables on site

Goat Hill – Status

- Land – s47G(1)(a)
- Development approval – granted.
- Water Supply – MOU executed with SA Water. Further work under way with SA Water for upstream water infrastructure for increased water supply security.
- EPC – contract is pen-ultimate with two potential EPC Contractors.
- Grid Connection – all grid connection studies complete, and ready for final application.



Goat Hill – A low cost alternative to Riverlink

	Goat Hill	RiverLink
Cost	s47G(1)(a)	s47G(1)(a)
Net Economic Benefits	Avoided gas fuel costs: s47G(1)(a) using SRMC differential between Goat Hill and OCGT.	Avoided fuel cost benefit is s47G(1)(a) s47G(1)(a) s47G(1)(a)(Central case) Utilisation is very low
Life of clear economic benefits	s47G(1)(a) technical life	s47G(1)(a)
Hurdles	• s47G(1)(a)	• NSW customers paying for 60% of cost with no economic benefit • Economic benefits uncertain • Potential asset stranding with reducing coal fired generation in NSW/VIC and REZ are not developed as forecast

- Post Liddell closure there will be no excess coal fired energy available to support SA
- Local generation is a less risky and more affordable solution for SA
- s47G(1)(a)

1. Electranet RIT-T Project Assessment Draft Report. Avoided fuel costs from replacing gas electricity generation with coal fired generation after 10 years are highly uncertain given thermal plant closures.

Goat Hill – Competitive with alternate generation options

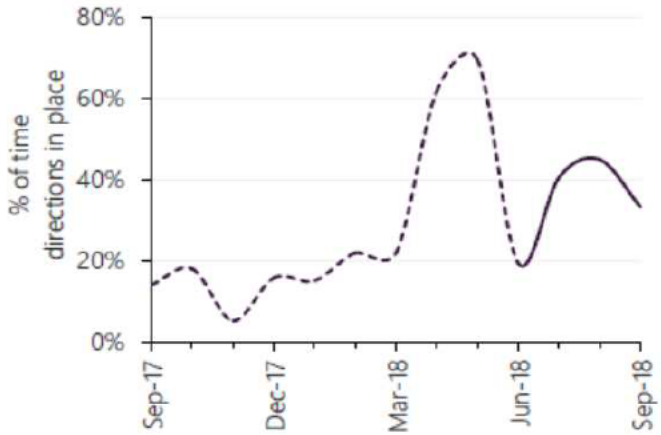
In SA where there has been an over-build of wind/solar, Goat Hill effectively firms existing wind or solar to deliver an equivalent LCOE below alternative local generation.

	Goat Hill	Gas Peaker (generic)	Hornsdale Battery	Solar Thermal
Capability	50 year plus life 230MW Sent-out Storage:1840GWh/8h	25-year life 280 MW Sent-out	10 to 15 year life 100 MW Storage:129MWh/1.25h	25 year + life 135 MW Sent-out Storage: 1100GWh/8h
Capital Cost	s47G(1)(a)			
New Entrant LCOE				
Other	Suitable for 5-min market. Long-life asset. Zero emissions.	Requires ongoing sourcing of competitive gas and gas shaping for firming function. Carbon intensity ~0.6.	Suitable for 5-min market. Quick to market but limited life. Zero emissions.	Long lead time to market. Zero emissions.

1. Goat Hill firming a wind or solar PPA at s47G(1)(a) with offpeak spot purchases at s47G(1)(a) to provide a flat 230MW load.
2. For 30% annual capacity factor or energy of 710GWh pa, s47G(1)(a) 25 yr life, WACC of 7.1%.
3. For 38% annual capacity factor or energy of 495GWh pa, s47G(1)(a) 25 yr life, WACC of 7.1%.

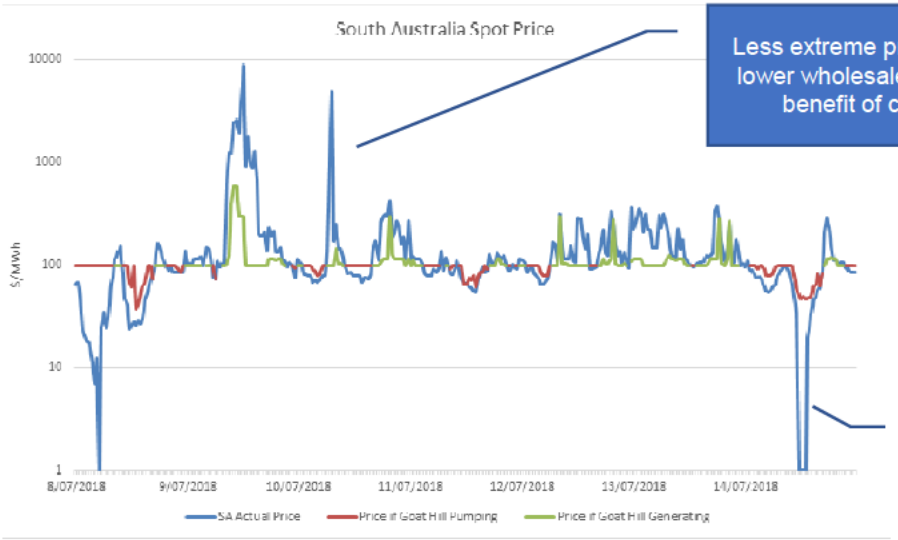
Goat Hill – Benefits both wind/solar and customers

AEMO SA Interventions



All market participants will benefit from system security support:

- Assist in reducing market intervention and curtailment of existing wind and solar farms
- High ramp rate (50MW/min compared to 12MW/min for gas plant) to respond to large changes in wind and solar
- Inertia for frequency management (when generating or in synchronous condenser mode)
- System MW reserve during no solar and wind drought
- Very fast start and black start capability
- Spinning reserve for times of low wind
- Reduces spot market volatility and market trading risk



Less extreme price spikes will lower wholesale prices to the benefit of customers

Less negative prices will reduce risk and costs for all generators

Goat Hill – Cost effective solution for SA

Beneficiaries

- Residential, commercial and industrial customers will see lower prices from Goat Hill generating to protect cap contracts (240MW or ~10% of peak demand)
- Existing wind/solar farm production supported from additional when Goat Hill is pumping

Federal Government contract:

- Long term underwriting contract for financing

Goat Hill revenues:

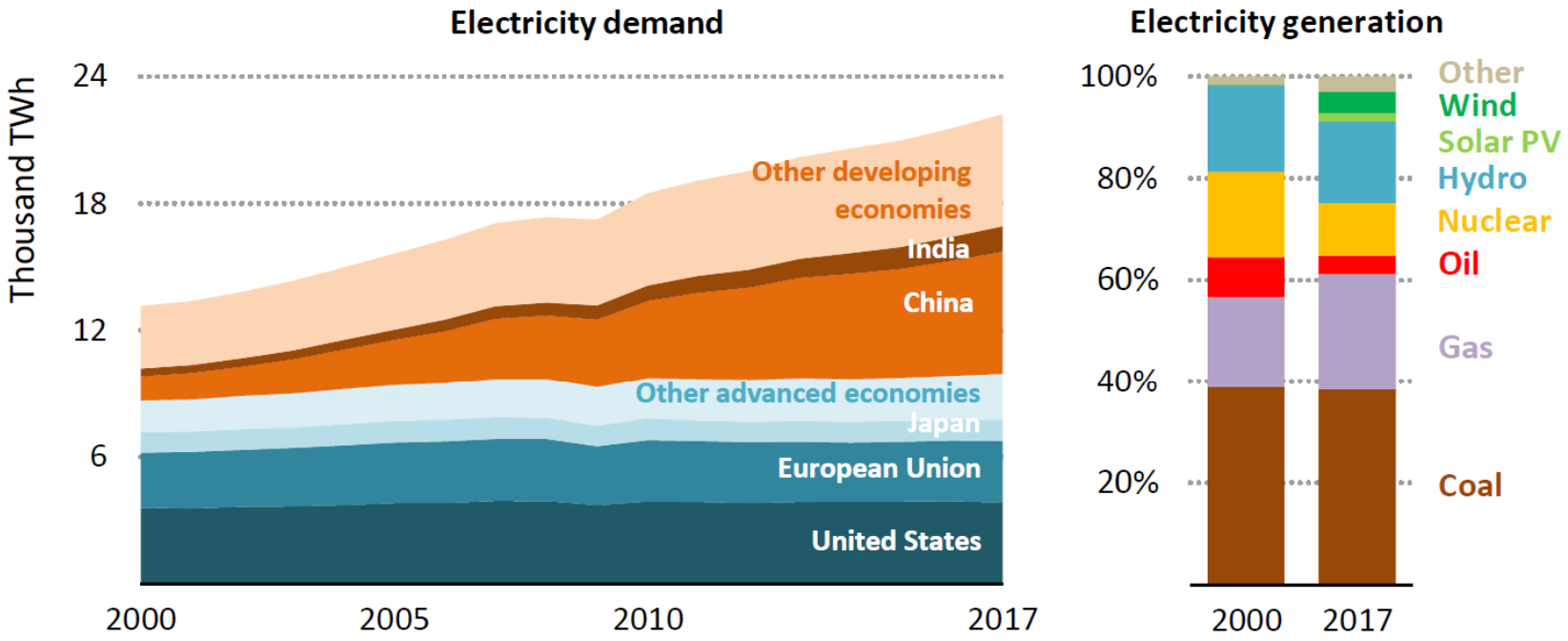
- Cap product with a low strike s47G(1)(a) – for large customers
- Floor product s47G(1)(a) – for existing generators
- Opportunistic under cap revenue

Other potential Government support :

- SA Government Grid Storage Fund (registered);
- to support existing and committed wind/solar, following international best practice, ancillary services markets need to be broadened and enhanced, to provide economic signals for long-term least cost generation investments, e.g.
  - spinning and standby reserve as back up times of no wind/solar; and
  - inertia to keep rate of change of frequency manageable.

Global Electricity Growth

Coal fired generation has increased in line with demand growth over the last 17 years (% unchanged). Gas and variable renewable generation has displaced oil and nuclear.

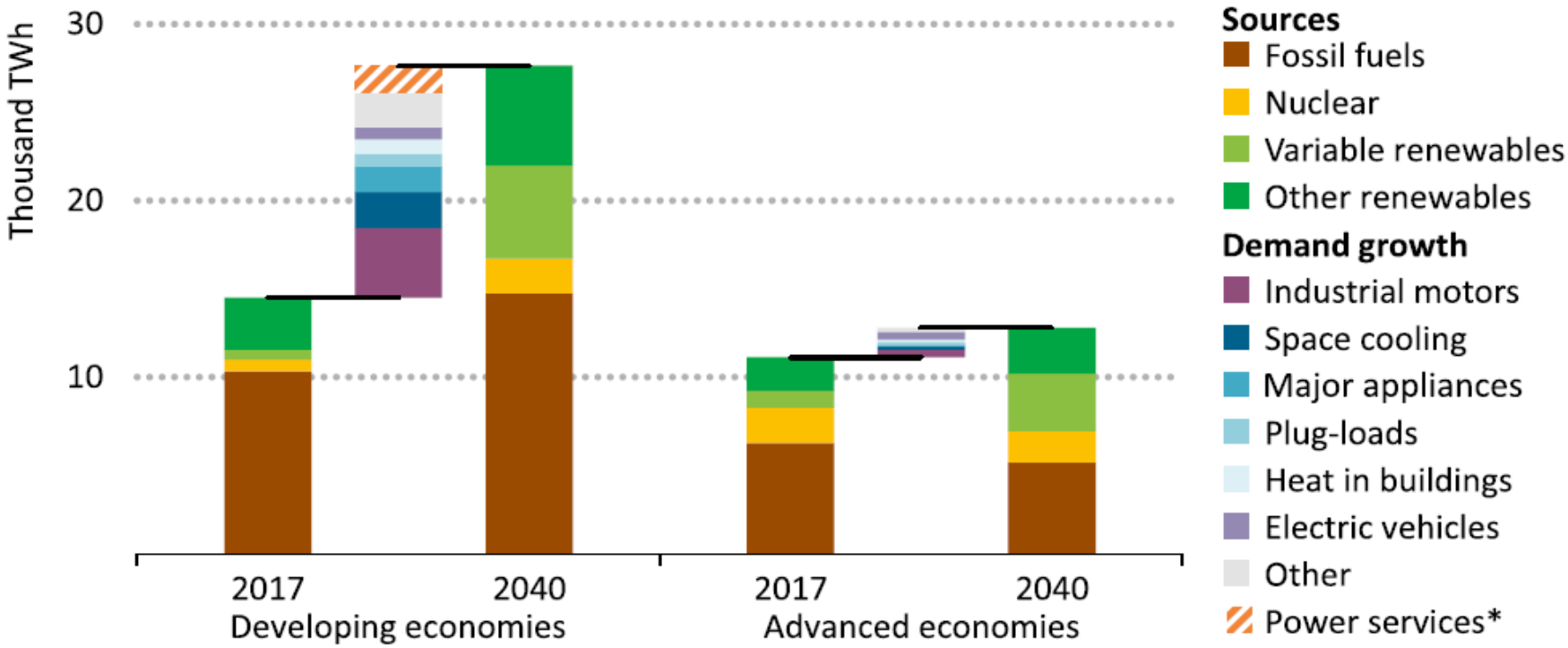


Electricity demand has increased by around 70% from 2000 to 2017, while the power mix remains dominated by coal and gas, even with growth in renewables

Source: IEA World energy Outlook 2018, p.281

Global Electricity – Enduring role for coal

The significant increase in developing economy demand will be met by coal, gas and dispatchable renewables such as hydro.



IEA: "Globally, coal-fired generation … remains the largest source to 2040." ** Network losses and consumed within power station.*

Source: IEA World energy Outlook 2018, p.323.