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The Future of the WA Electricity System

The Policies, Reforms and Initiatives that could help ensure the
Electricity System Transformation is Secure, Reliable, Affordable and Sustainable

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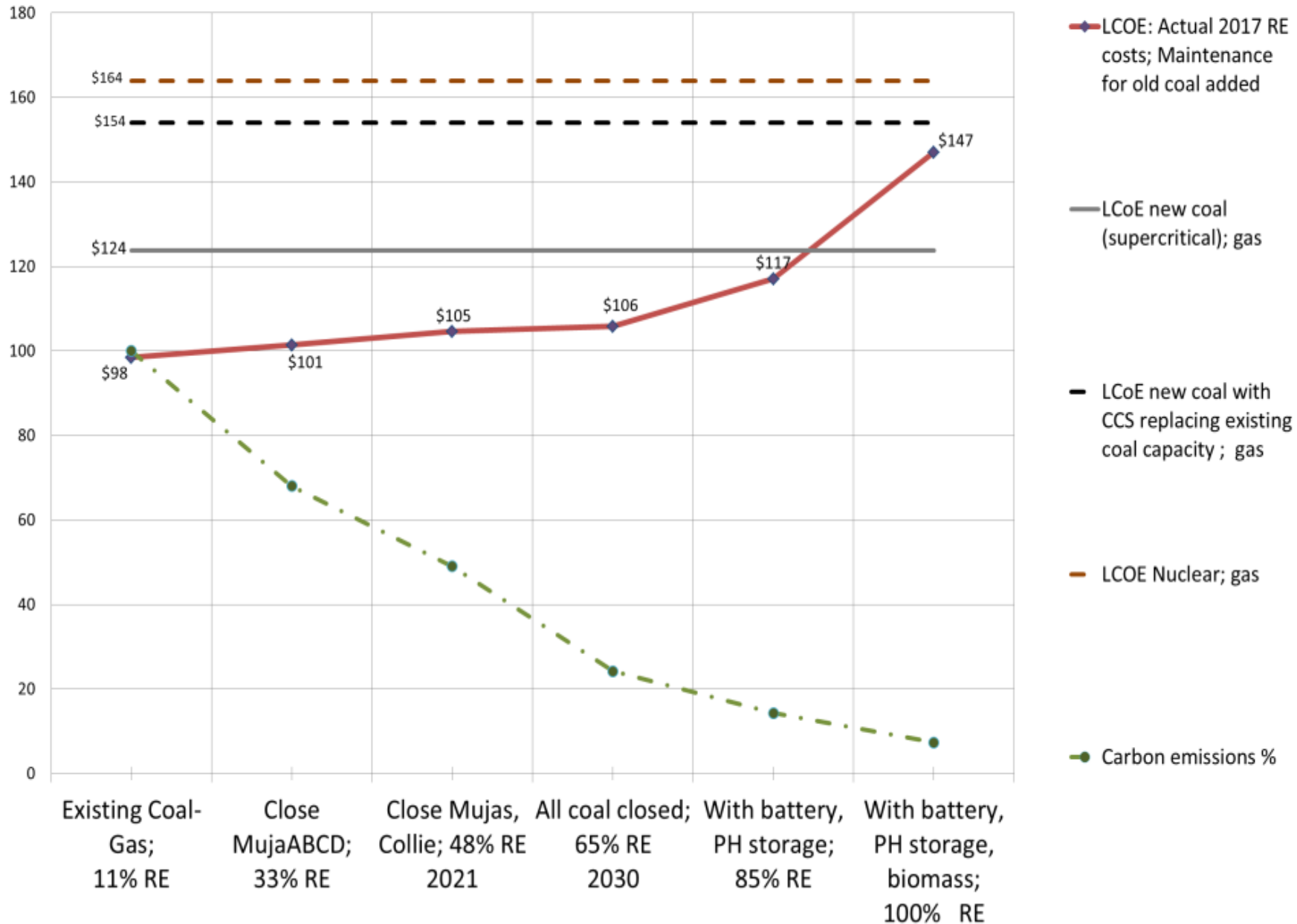
Introduction

- The world's energy systems are transforming as a result of the arrival of Renewable Energy (RE)
- Radically different technical and policy/regulatory/market issues arise with RE
- WA has excellent solar/wind resources: we'll have failed if energy costs keep rising.
- Years of modelling and examining the issues by SEN have resulted in some insights to the problem in WA and the needed changes.

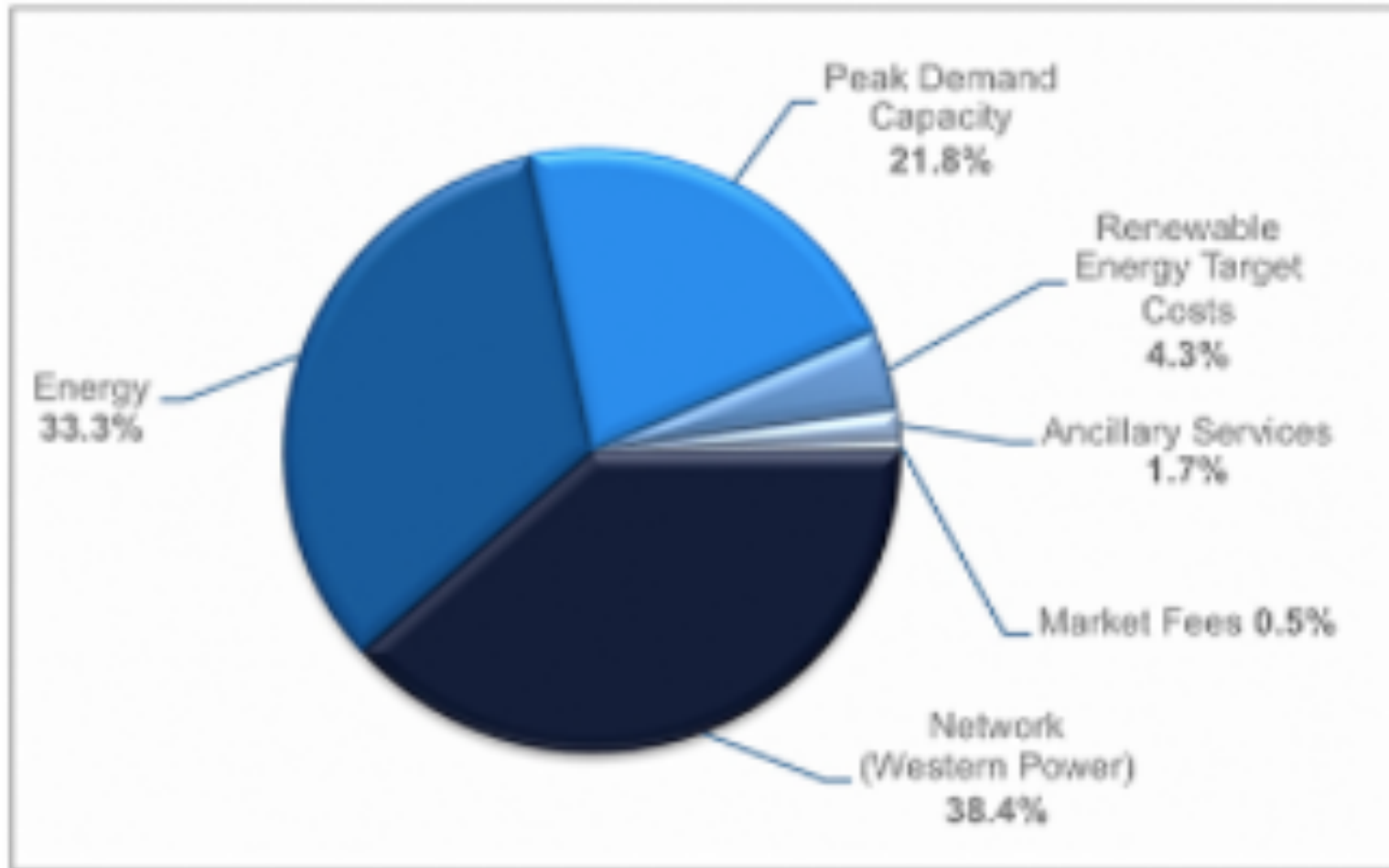
SEN modelling

- Modelled several transition cases, step by step
- The models shown make up our 85% RE by 2030 roadmap
- Started with SWIS load, hour by hour.
- As coal based energy is retired new RE is added on a competitive price basis.
- Infrastructure is added as and when required.
- Best public information available has been used for cost assumptions.

TRANSITION TO RENEWABLE ELECTRICITY ON SWIS BY 2030



WA Power Cost Breakdown



Transition modelling lessons

- Careful transitioning in **steps** can ensure secure reliable power
- Our assumptions show materially the same (inflation adjusted) cost at the beginning (2018) and end (2030).
- Analysis indicates that more wind energy is the short term strategic need.
- Our gas resources and infrastructure helps (backup/firming).
- We do not address WP transmission changes which are the highest cost part of electricity. WP is transitioning to lower costs and better coordination with Synergy will help this.

WA Position

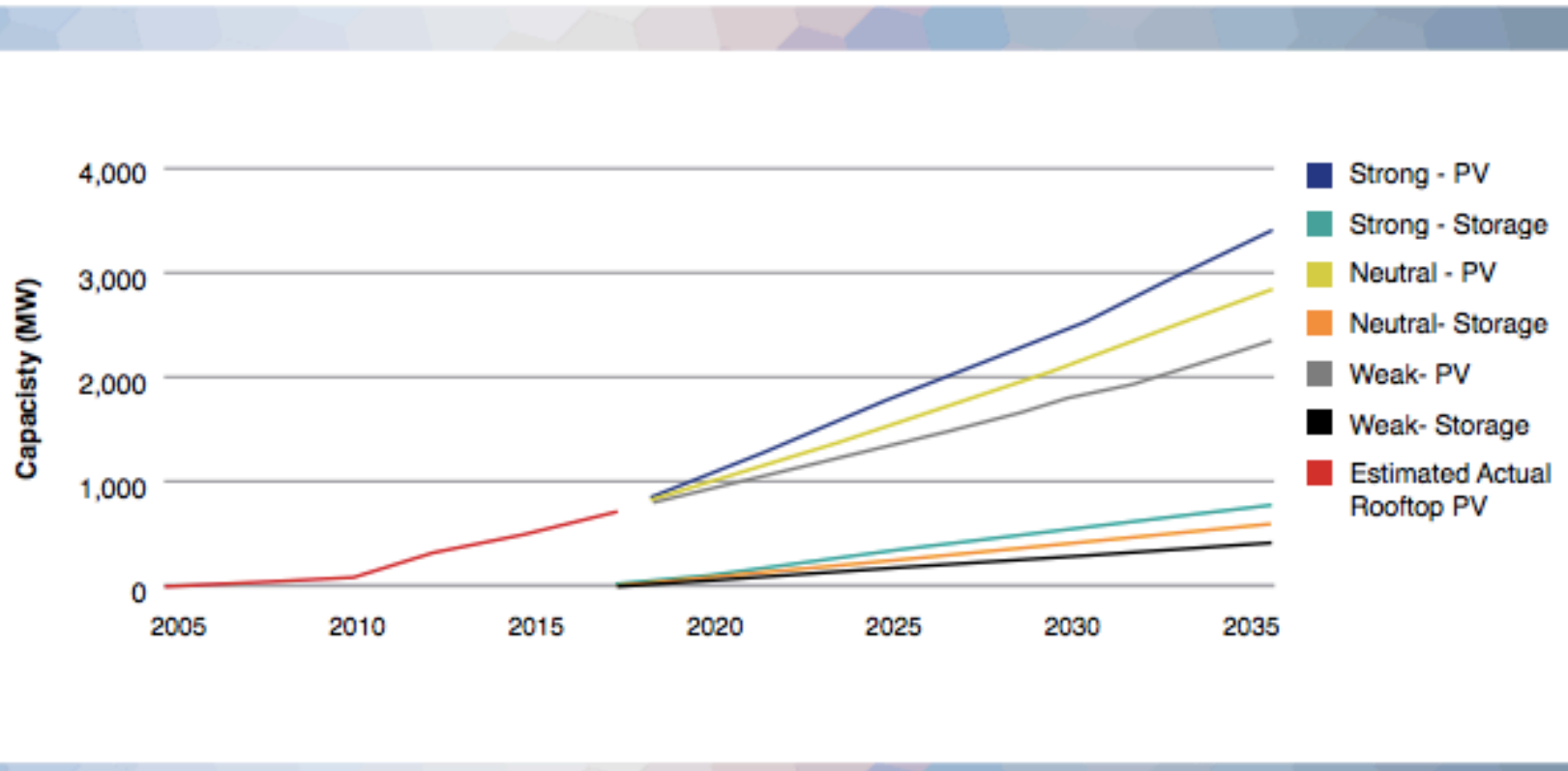
- Fortunate to have an advanced gas infrastructure, gas supply and generation for firming.
- Gas is an effective balancing fuel source to support an economy transitioning to greater renewables and is successfully being used as such in other countries.
- No inter-connector(s)
- WA is heavily exposed to national and international treaties and rules forcing unplanned emissions cuts.

The Way Forward

There are a number of risks that lie ahead of WA in the transition the core of which are:-

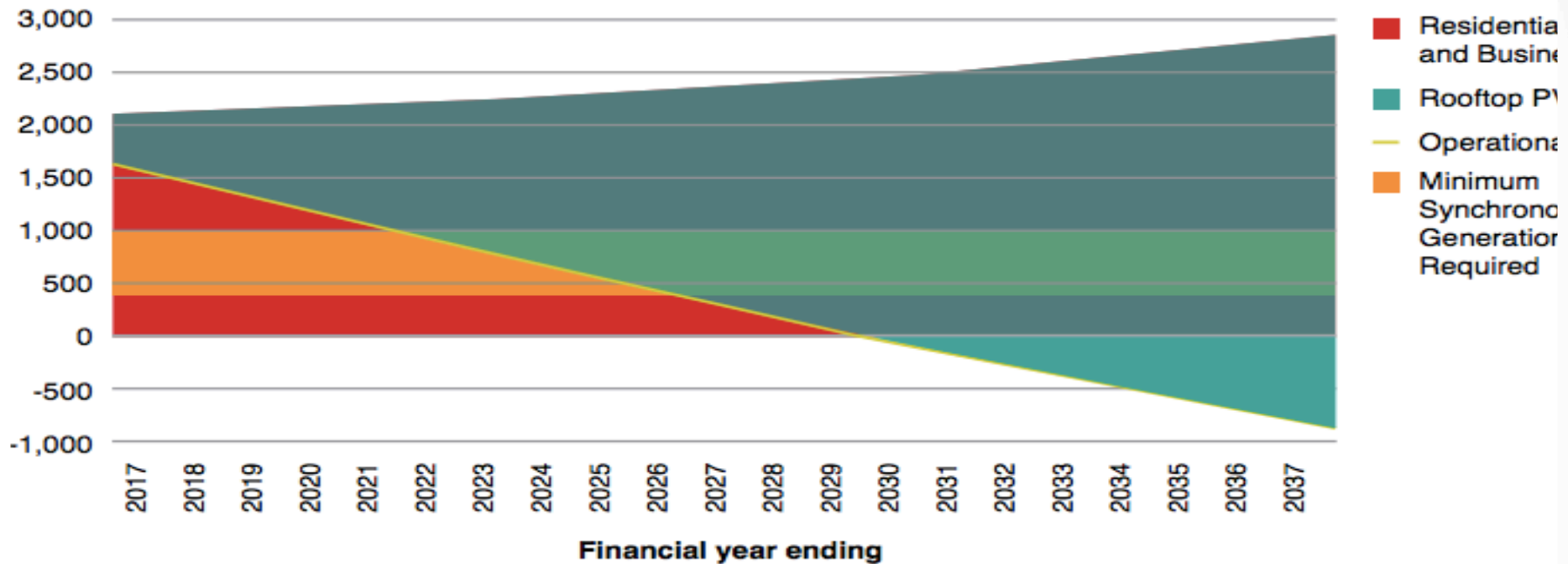
- Lack of resources in preparation, planning, on-going coordination
- Issues and barriers that need to be addressed and balanced against each other to have successful transition.
- We are particularly concerned that we do not get power as cheaply as we should through anything other than reliability and economics being considered.

Switch to solar has only just begun



Source: AEMO

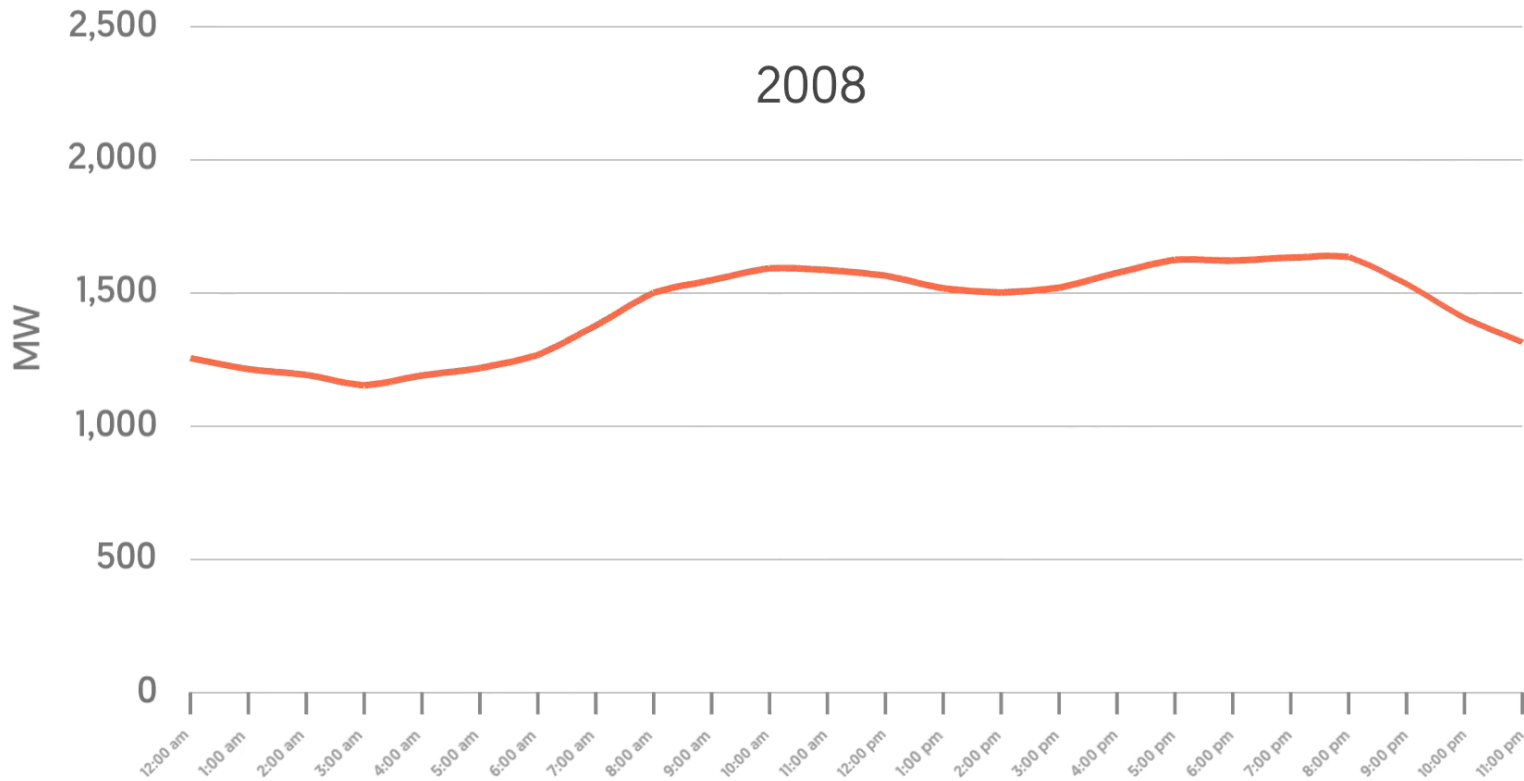
Min SWIS demand: by Solar PV



Source: AEMO

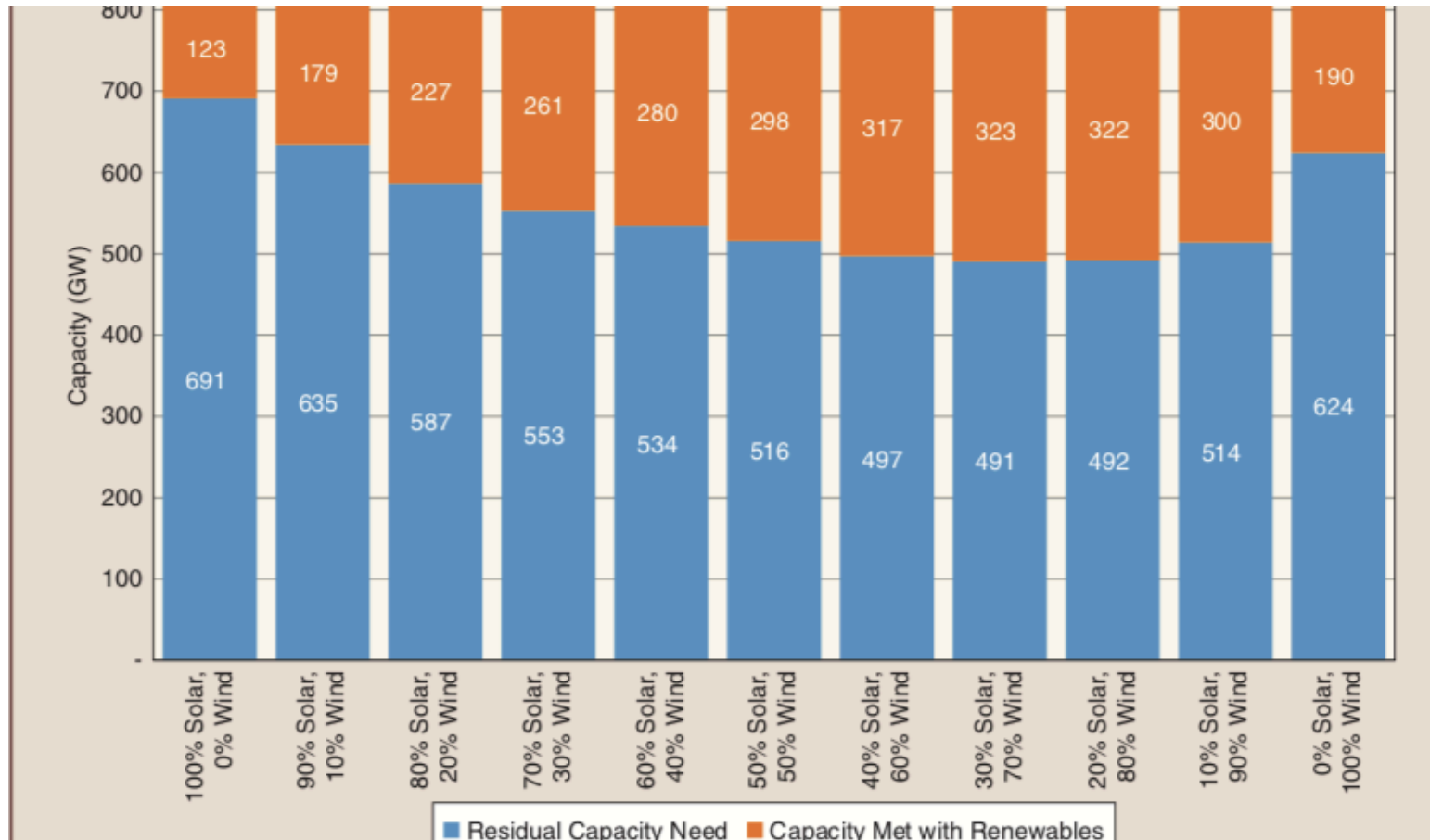
The urgent need for energy transition

Grid Demand Minimum on SWIS with Increasing Solar Penetration



- Source: SEN

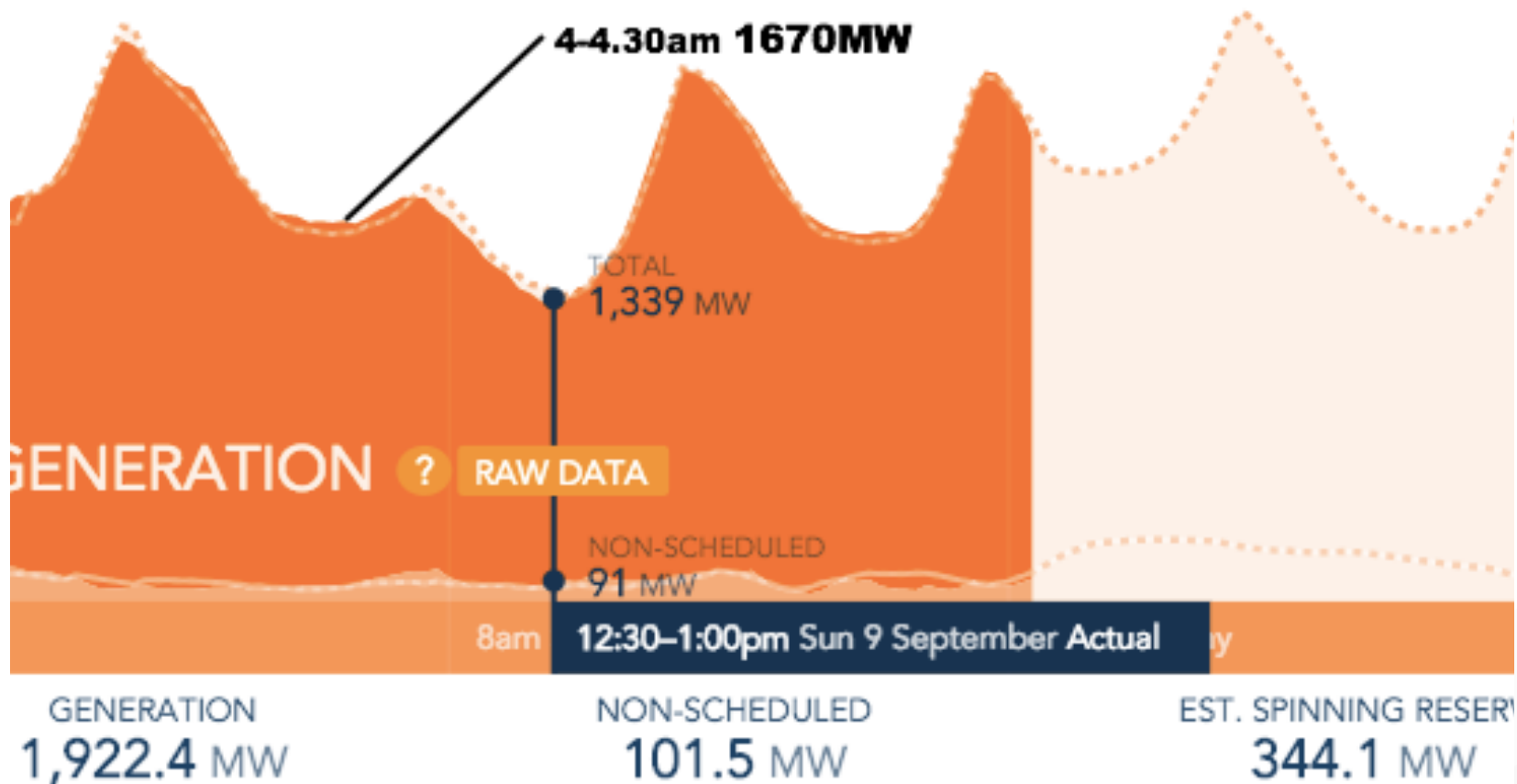
More wind needed in the SWIS



Capacity met with 100% renewables by energy in the U.S. Eastern Interconnection with different wind/ solar compositions

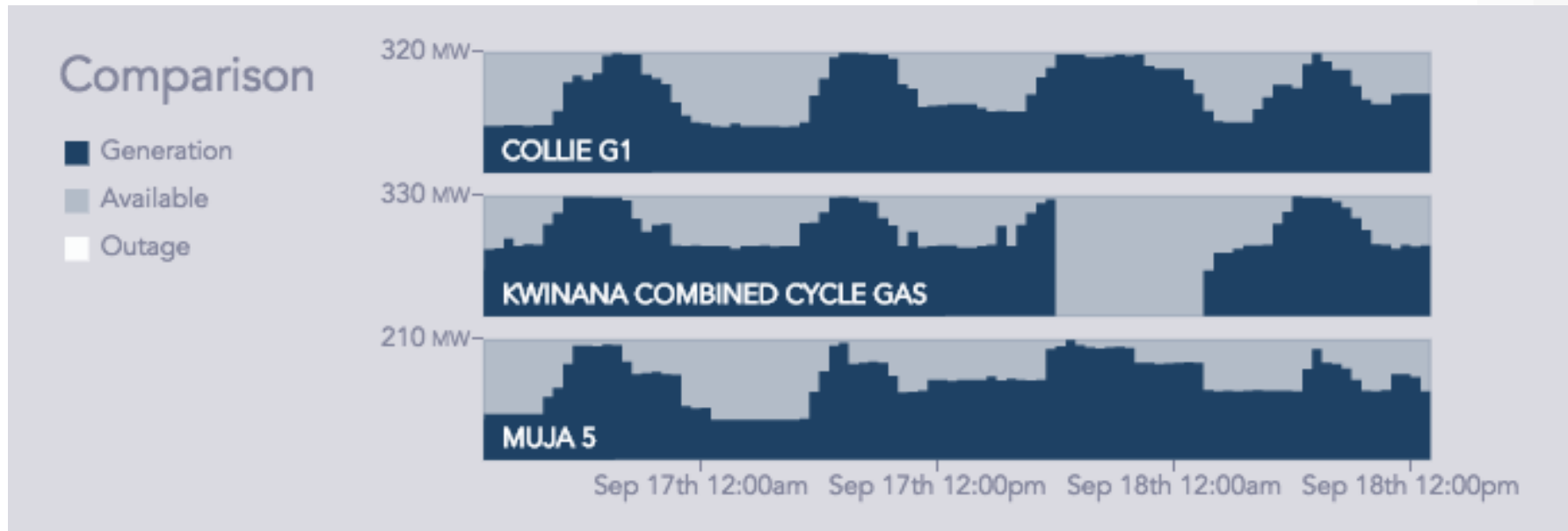
Source: IEE

Duck curve impact is now high



Source: AEMO

Urgency of energy transition



Source: AEMO

- Popular solar energy increasing coal unit ramping intensity and frequency.
- SEN analysis: ramping extent increases as 'duck curve effect' deepens.
- SEN engineers anticipate shorter coal unit life.

Coal end of useful life is coming FAST

- Our estimate of how much it cost to run Muja AB after the big refurbishment was \$250 – 300 MWh.
- Deloitte's 2017 report on Muja AB grossly overestimated the planned end of life in 2021.
- Closed in 2017. \$320m wasted.
- Consequences for Muja CD being operated as a seasonal peaking plant.
- If Muja CD fails as AB did what happens?

Organisations have firewalls and differing and sometimes conflicting interests

- Blockages, conflicts of interests, etc hamper a coherent well planned transition
- Synergy as monopoly gen-tailer means absence of competition
- Each organisation has it's own KPIs and objectives.
- Is a bigger Synergy the best way forward? Are large %age of assets stranded?

Funding of energy transition

- WA government: budget constraints inhibit substantial investments in new energy supply.
- Global trend: Use of international open tender PPA agreements for all energy supply. No financial cost to gov't.
- Instead of investing in infrastructure, the government can focus on maintenance of energy sources in the transition and connecting up to new energy sources.
- WP in government hands - can fund grid upgrades
- Dividend could be used to fund

Near term commercial needs

- Negotiate appropriate terms for end-term coal supply contracts. Risk: Too much coal contracted for, wastes money as coal power ends.
- Negotiate gas agreements so there is enough gas but not too much given gas is needed as the interim power system leveller.
- Risk: Too much gas is locked in contracts, restricting speed of change to RE sources and reduction in costs.
- The right terms in PPA tenders.
- Urgent need for battery storage: subsidies?

Technical points of note

- Demand Side Management should be re-implemented
- Firming and system strength issues need to be in step with RE intro
- Greater use of Micro-grids needed to reduce remote servicing costs
- Planning location, energy diversity consideration issues
- Insolation and wind forecasting to play bigger future role
- Energy security expected to improve with RE intro
- Behind meter battery program: “Subsidy in return for control”
- EV’s benefit to the network cannot be ignored
- Market design is not agnostic to resource type
- Market participants must not bear the planning role
- Regulator and markets: Each have their place

Key Policy changes required

- The constrained access transition completion (Oct 2021) must be brought forward if possible. Compensation issues associated with existing contracts.
- Short term program of subsidy for installation of behind the meter renewables in regional areas
- Short term program of renewable microgrids in regional towns
- Introduction of 5 minute settlement periods
- Legislative barriers to network battery storage on the SWIS removed. Market rules are required!
- Enhanced application procedures for connection of generation to the grid

Expertise needed

- As you transition and take out coal there are expert decisions required on what replaces it.
- A poor process will create a poor result.
- Issues :-
 - When do you use wind, solar, batteries?
 - At what location should you use them?
 - How long should these agreements be for?
 - How big should these contracts be?

Benefits for the Economy of WA

- The trend in RE power cost is downward.
- The economics of increasingly rare raw materials like coal and gas is that price rises over time, while the economics of RE being tech based with free resources is that the cost is reducing.
- Renewables jobs are of significant benefit
- Regional income and revitalisation
- Health benefits, air & water quality
- Impact on climate change and state contribution to obligations

Core recommendations

- Planning of transformation to be focused and accelerated.
- ERA rule change to drive Integrated System Plan (per NEM)
- Trends in costs of energies require a move to RE for Synergy and Horizon to compete.
- Tariff reforms, time of use, incentivisation
- Coordination of Synergy, Western Power and Horizon objectives is required. They are trying to work together but struggling.
- Some Constitution changes of those organisations may be required to allow them to work effectively together.

Closing comments

The Transformation task is complex and difficult.

It will not be optimal unless:-

- The planning role is elevated with flexibility incorporated
- A transformation planning authority is well resourced and empowered
- Flexibility of planning more important than long term targeting
- Reserve Capacity Mechanism has served the SWIS well. More reasons for it's retention
- Demand Response Mechanisms will play a significant role