

# CLEAN ENERGY SECURITY

Finkel Independent Review into the Future Energy Security in the NEM

Summary of CEC submission

May 2017





# SPONSORING MEMBERS





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# THE ENERGY MARKET IS CHANGING

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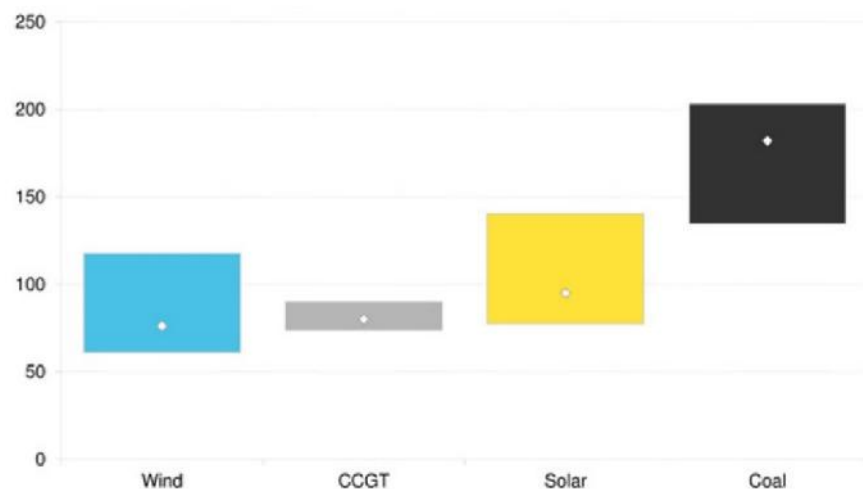


Investors in the nation's energy infrastructure are looking to governments to establish stable policy settings in the next two to three years that will deliver for the next two to three decades

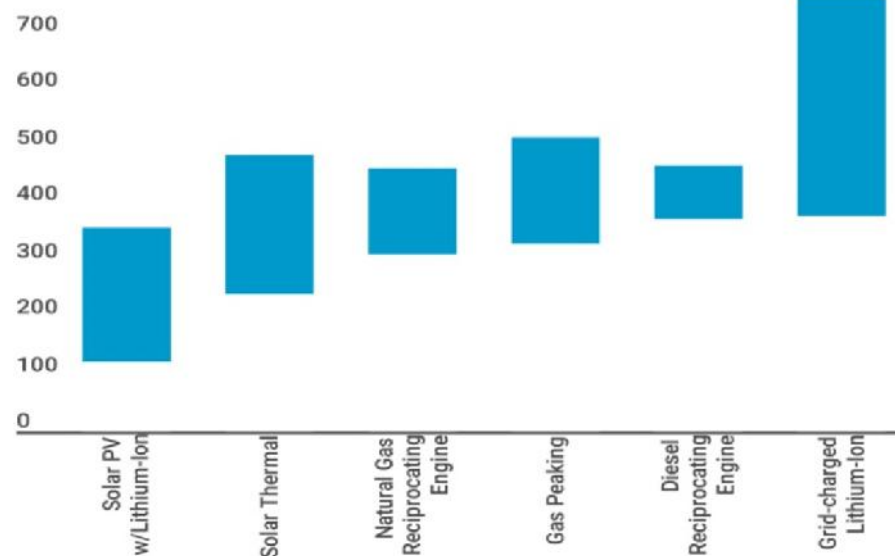
Finkel Review objective is to create a roadmap to deliver a secure, clean and affordable energy system

# NEW TECHNOLOGIES ARE COST COMPETITIVE

LCOE of new generation



LCOE of storage vs conventional generation



# CEC PERSPECTIVE OVERVIEW

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- Renewable energy and power prices
- Investment
  - The need for investment-grade policies
  - The need for investment-grade electricity market design
- Security
  - Security and new technologies
  - Security and control of frequency
  - Security and consumer-led infrastructure
  - Security and diversity
- Elements of an energy strategy

# RENEWABLE ENERGY AND POWER PRICES

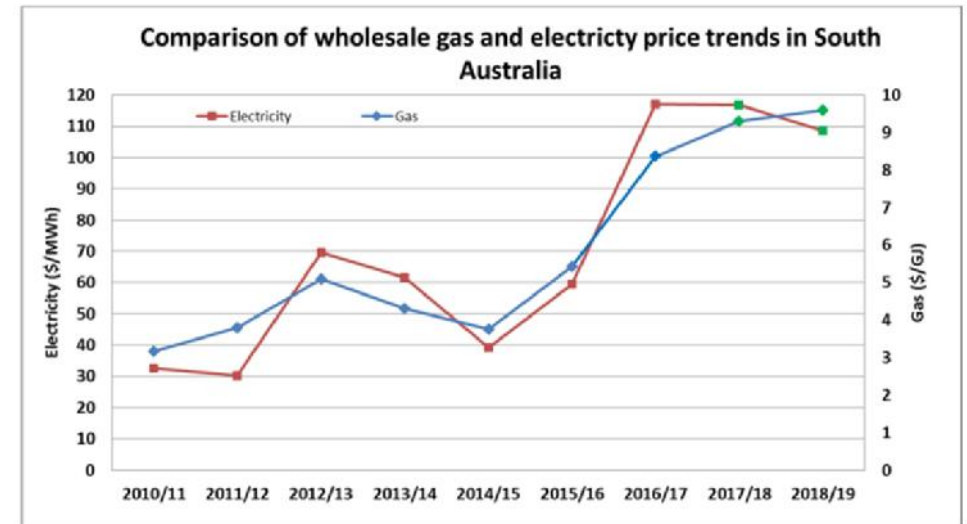
## POWER PRICE INCREASES VS POWER FROM WIND AND SOLAR



Source for change in electricity bill data: ANU Centre for Social Research and Methods, ABS CPI/National Accounts/Demographic Statistics

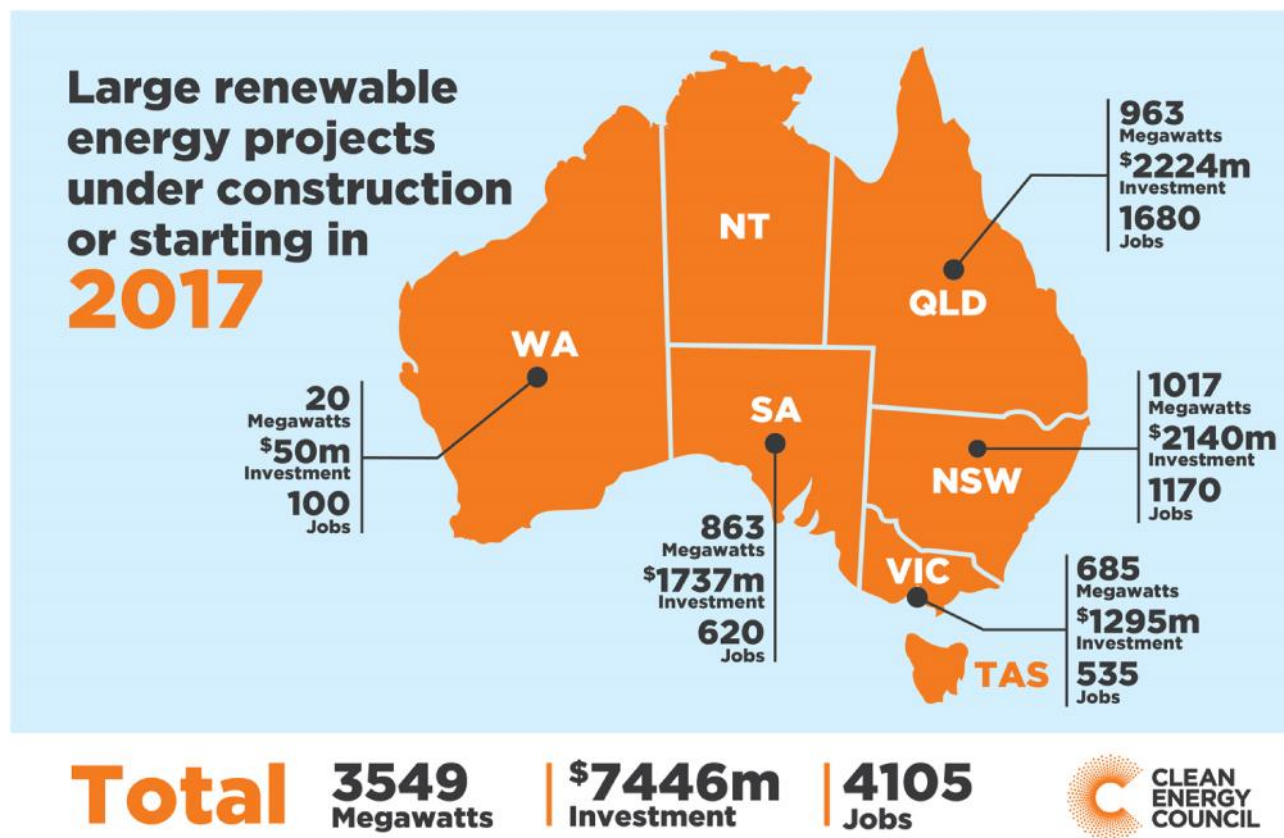
# RENEWABLE ENERGY AND POWER PRICES

- Only three real options for electricity generation in gas, coal or renewables
- Large users already feeling pain, price dominated by gas and coal generation
- Renewables only other competitive pressure going forward – measures to enable this:
  - Large-scale and consumer investments in renewable energy bringing cheaper and more reliable solutions
  - Network tariff reform important, but benefits realised when consumers can control consumption with renewable and energy storage technologies
  - Aggregation of consumer storage and generation needs to be enabled





# INVESTMENT-GRADE POLICIES NEEDED



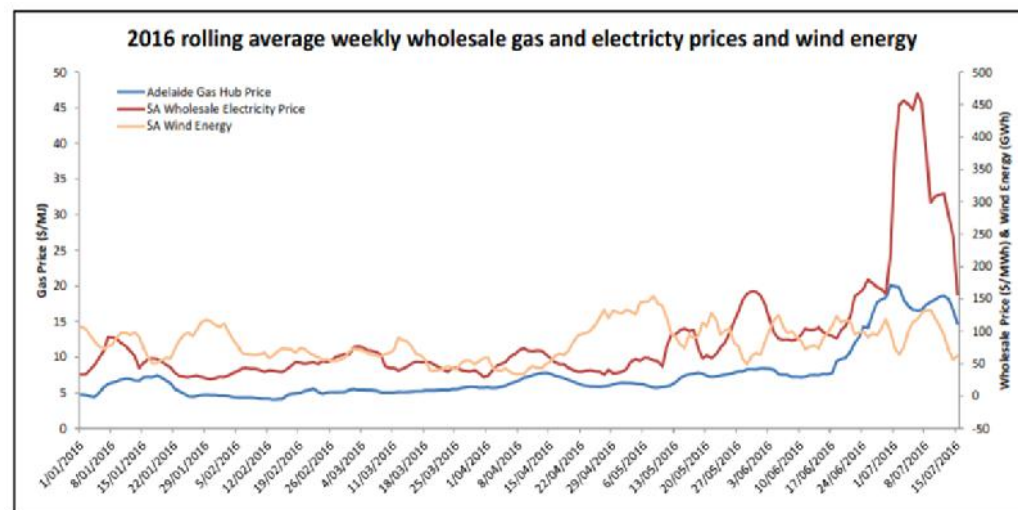
# INVESTMENT-GRADE POLICIES NEEDED

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- Largest risk to energy security is an investment freeze - clear investment and divestment signals will be necessary to achieve COP21 targets
- Push mechanism like EIS can only do so much:
  - Emissions abatement mechanism will require time to deliver investor confidence
  - Major displacement of supply-demand as coal exits will drive wholesale price up
  - Wholesale electricity market is designed for incremental growth, not major transition
- Pull mechanism like RET needed to bring generation online ahead of EIS-driven closure
  - Investment certainty will reduce cost
  - Lowest impact, stable and controlled emissions reduction towards 2030
  - Planned power system transformation towards zero-emissions operating capability

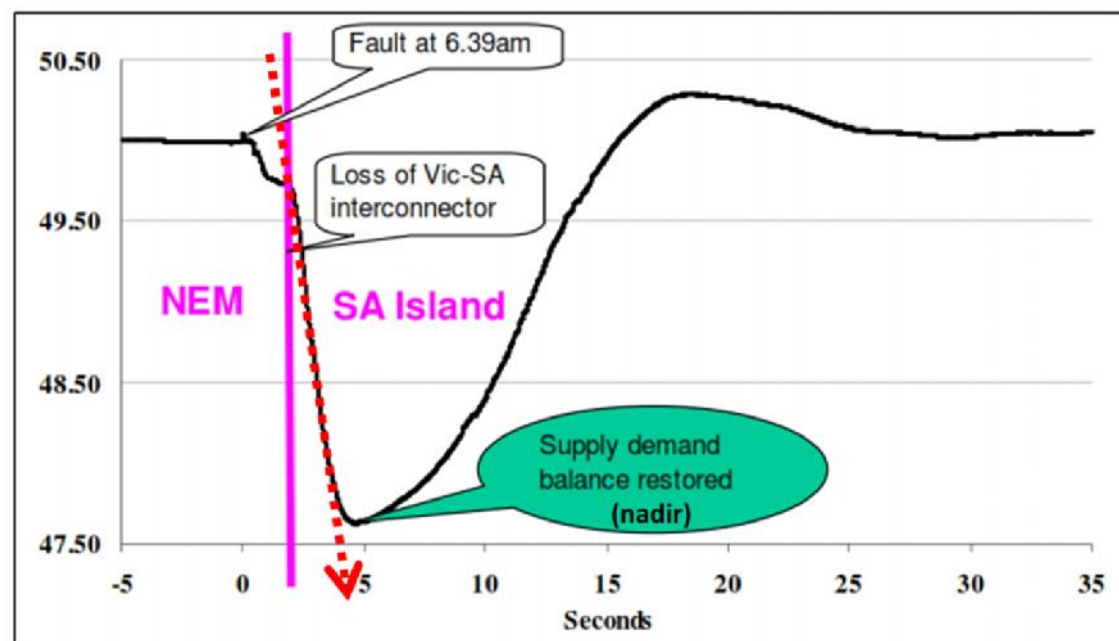
# INVESTMENT-GRADE MARKET DESIGN NEEDED

- NEM governance arrangement needs a mandate to adapt to technological change and plan a transition *towards* zero-emissions
- Market designs must support firm and flexible generation and demand to maintain contracting availability
- Volatility is inevitable in an energy-only market, increases as low/zero cost energy generation grows
- Need to bring more flexible generation, demand and storage into the market to manage volatility – align dispatch and settlement (5 minute settlement rule change)
- Need comprehensive review and revision of the renewable energy forecasting systems and their integration into AEMO's systems



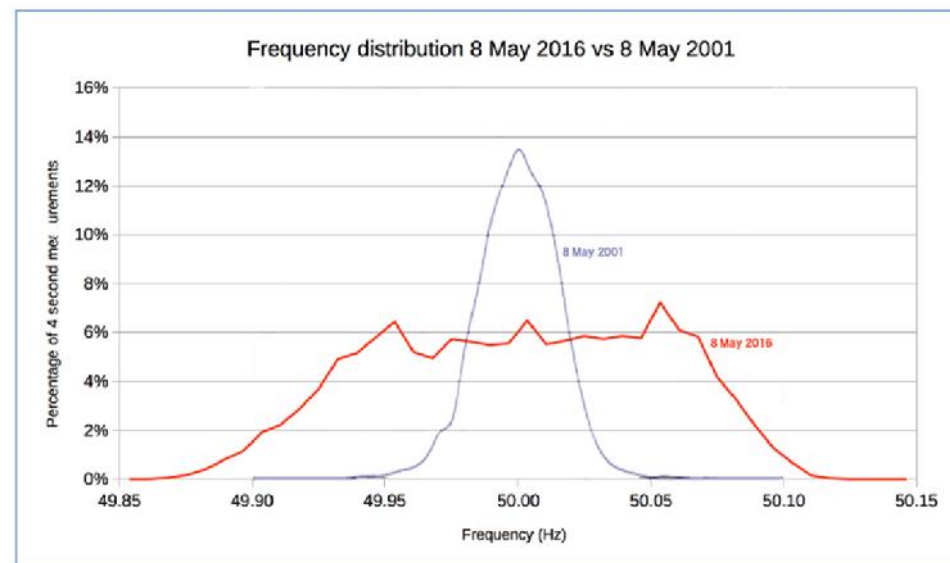
# SECURITY AND NEW TECHNOLOGIES

- *Inertia* is about buying time to bring other primary and/or emergency control systems online to restore supply-demand balance and return to normal 50 Hz frequency.
- 21<sup>st</sup> century grid will require all technologies to support the grid:
  - Wind turbines have been providing Fast Frequency Response (FFR) in Quebec since 2011
  - Inverters used in batteries can provide a very fast frequency response to lift supply very quickly
  - The technology is ready but has been discouraged to date



# SECURITY AND CONTROL OF FREQUENCY

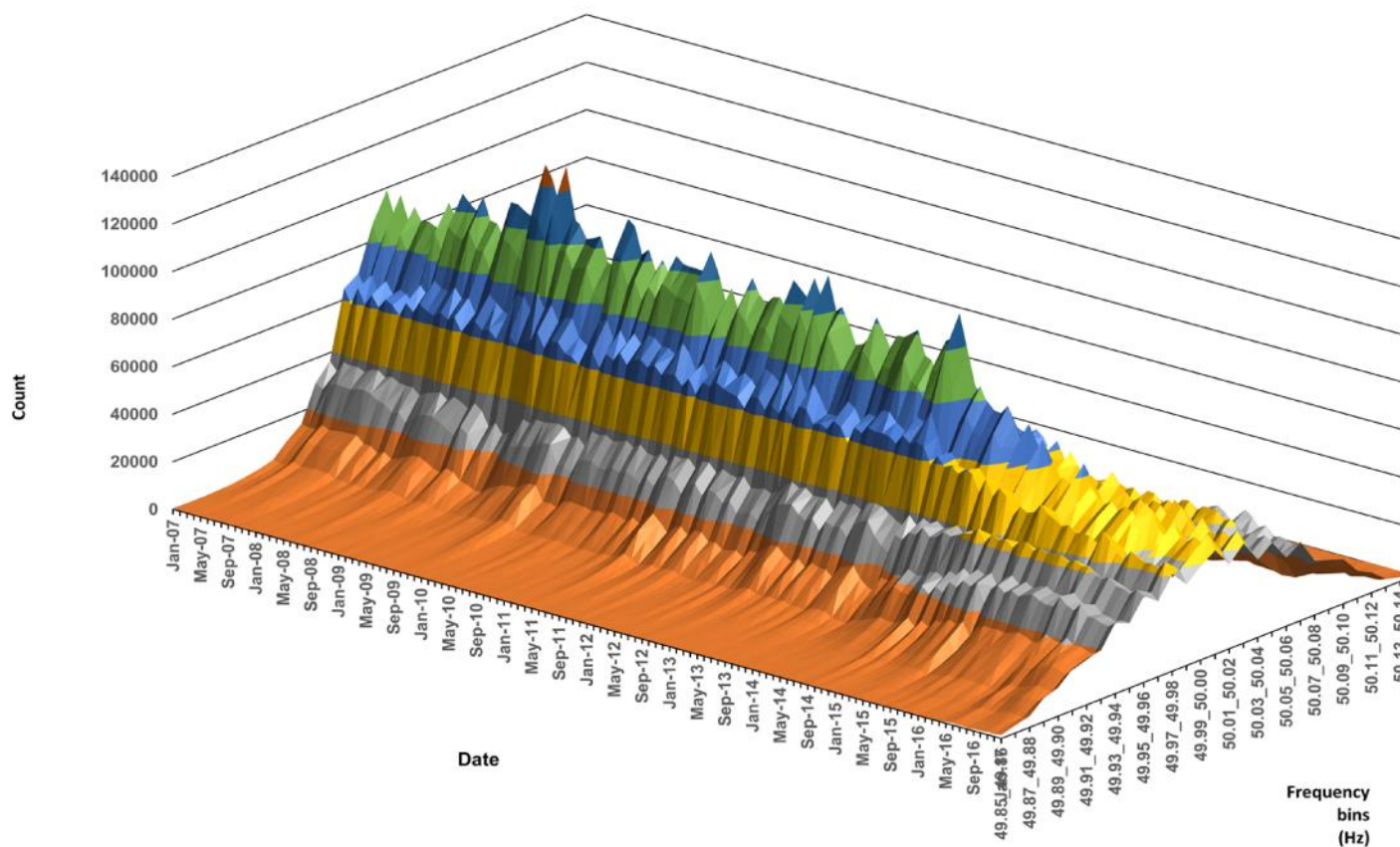
- Frequency control cost skyrocketed over the last 2 years from \$5 million to over \$90 million
- Synchronous generator settings have degraded control, increased reliance on synchronous inertia and increased risk of blackouts – this is not about renewable energy
- Maintaining system security is about all the parts working together, but a level playing field is required for new technologies to participate
- Major and urgent review and redesign of the frequency control regime critical to address current issues and ensure that all technologies are participating on the provision of good frequency control



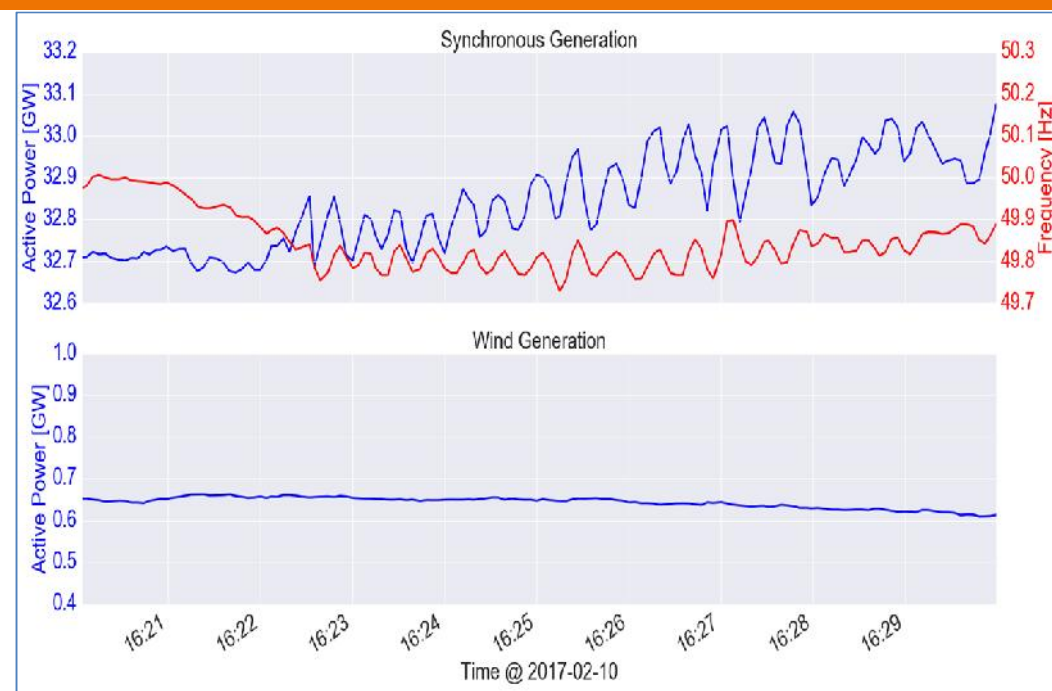
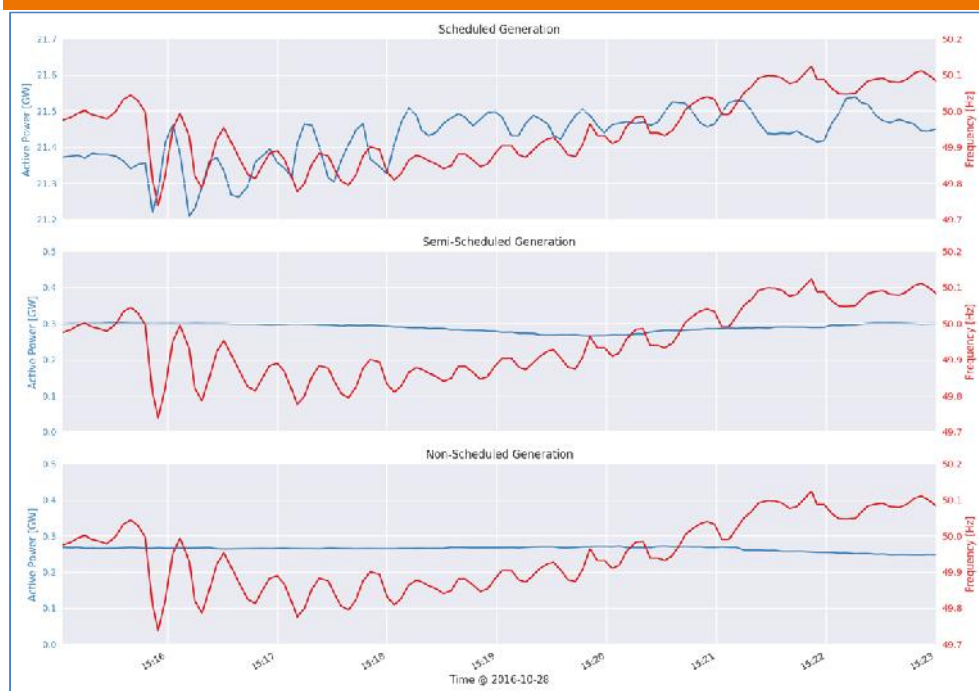


# GRID SECURITY: FREQUENCY CONTROL?

Mainland frequency monthly histograms through time



# GRID SECURITY: FREQUENCY CONTROL?



- Frequency control outcomes under this regime are not consistent with good practice and causing extremely unstable power system operation – reliance on synchronous generation.

# SECURITY AND CONSUMER-LED INFRASTRUCTURE

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- More than 1.6 million Australian homes and businesses have invested in electricity infrastructure such as solar PV and battery storage and this will continue
- Need to ensure this infrastructure is deployed and used efficiently and effectively:
  - Consistent national grid-connection standards would relieve regulatory burden and risk (cost benefit ~ \$180 million NPV over 10 years)
  - Transparent information on network capability with independent assessment of connection by solar installers would reduce risks and costs, increase innovation and grid utilisation
  - Installation integrity framework will ensure consumer confidence and safety

# SECURITY AND DIVERSITY

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- Changing nature of generation means we need to move away from reliance on high emission synchronous generation
- Renewable (non-synchronous) technologies are advanced and more flexible than conventional synchronous generation
- Existing power system control requires revision
  - Renewable energy forecasting requires refinement to better integrate with existing systems
  - Current grid frequency management regime is fundamentally broken and has placed energy security at risk, redesign needed to control frequency and bring new fast-acting technologies online
  - Integration and aggregation techniques needed for small scale generation and storage to support grid security

# SUMMARY: ELEMENTS OF AN ENERGY STRATEGY

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- Investors in electricity infrastructure are already setting the direction but confidence needed to keep building after 2020
- Transition planning will require strong and long-term policies and governance mandates to ensure medium and long-term objectives can be met efficiently
- Technology is available today to deliver a zero-emissions electricity system, must focus on refining current grid and market
- Diversity in renewable energy, energy storage and ancillary services will create a more secure and resilient grid and market
- Australia has the best renewable energy resources in the world which gives us a competitive advantage in a carbon-constrained global economy
- Transition implies opportunity in the creation of major skills and technology adaptation