

# Challenges Facing the Australian Electricity Market

2pm  
26<sup>th</sup> June 2023

Joint Graduate School of Energy and Environment

King Mongkut University of Technology Thonburi

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# A quick recap of previous lectures with JGSEE



## ·August 2019 – Managing Solar in the Grid

- Discussed the NTEM, blackouts at Alice Springs
- (At which time I was working as Manager, Energy Market Reform for NT Power & Water)

## ·July 2020 – Opportunities in the energy transition (ASEAN ENERGY WEEK)

- Discussed flow of investment into data services, forecasting, grid control, the near blackouts in Darwin, attempt to introduce firm bidding for renewables in the NTEM

## ·June 2022 – The Suspension of the Australian NEM

- Discussed the suspension of the NEM and the government market interventions

## ·June 2023 – The challenges have arrived... and going forward



# This week at JSGEE

Going to be a busy week....

- **Monday 26<sup>th</sup> June (this lecture)**

- Challenges in the Australian Electricity Market

- **Tuesday 27<sup>th</sup> June**

- Survey of Environmental Finance

- **Wednesday 28<sup>th</sup> June (AM)**

- Introduction to the Taskforce Nature related Financial Disclosures

- **Wednesday 28<sup>th</sup> June (PM)**

- Market examples from biodiversity markets

- **Thursday 29<sup>th</sup> June (AM)**

- Global energy transformation issues, and the IEA reports



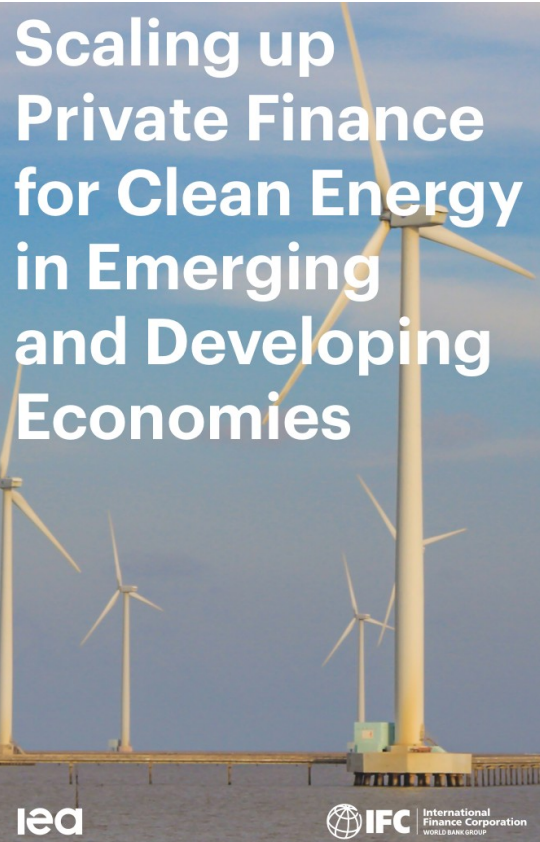
# Thursday's lecture – global issues

<https://www.iea.org/reports/world-energy-investment-2023>

<https://www.iea.org/reports/scaling-up-private-finance-for-clean-energy-in-emerging-and-developing-economies>

<https://www.iea.org/reports/renewable-energy-market-update-june-2023>

World Energy  
Investment 2023





# The big issue

The extent to which government is the explicit driver of the exact investments being made.

- Market reform occurred due to historically poor investment decision making and an unfriendly environment for innovation.
- When market implemented in Australia electricity prices reduced dramatically.
- However prices are now going back up, and there are real questions about the rate and nature of investments being made.
- The pendulum is swinging a long way back towards heavy government planning at detailed levels.....

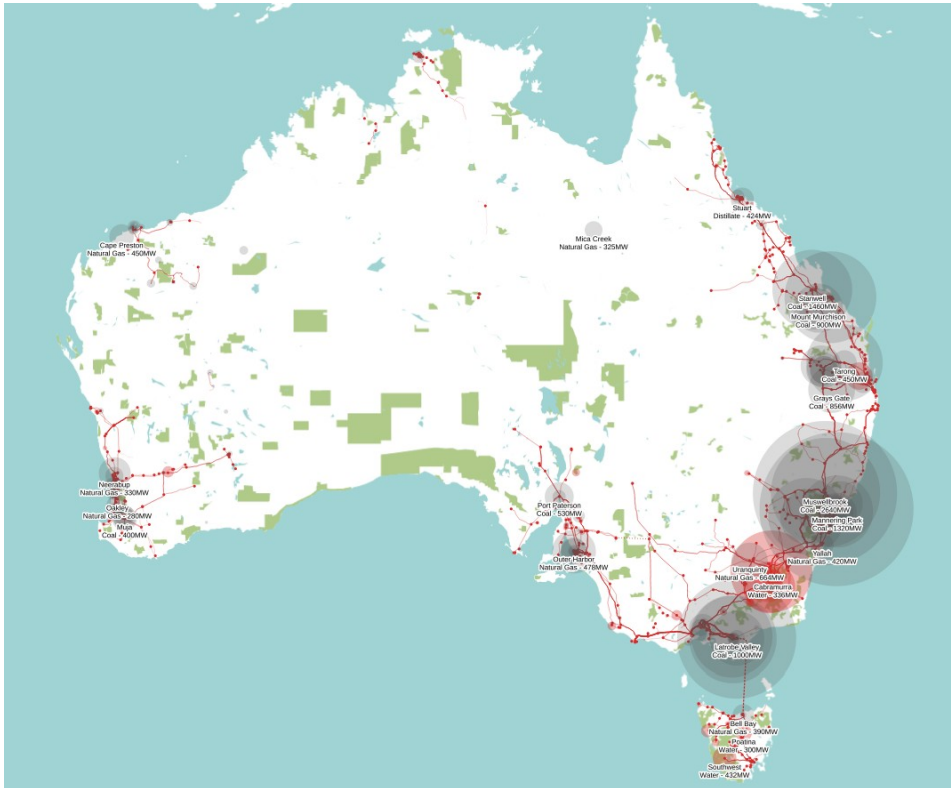
# An extremely compressed history of the Australian Electricity Industry



- **Constitutional issues**
- **Post World War II**
  - State Electricity Commissions
- **The 70's**
  - County Councils Everywhere
- **The 80's**
- **The 90's**
- **And today....**



# A bit of context...



<https://thinkmoult.com/assets/electricity-australia-map.png>

## Annual generation capacity and peak demand - NEM



Download graph



# What is the target that has been set by the Australian (and state) governments?

Governments are aligned across the country to reach a net-zero economy by 2050.

various interim targets, including the federal 2030 targets of 43% emissions reduction, and a grid fed by 82% renewables.

(The grid is currently about 60% fed by coal & gas)



Which is leading to headlines like this one....



# THE AUSTRALIAN BUSINESS REVIEW

Sunday, June 25, 2023 | Today's Paper | Mind Games

## **Australia's energy industry was once optimistic but now it's nervous and sceptical**

The most pressing exit on the near-term horizon is Origin Energy's Eraring coal power station – Australia's largest generator, accounting for about 25 per cent of NSW's energy needs – which is due to retire in 2025, stoking alarm within the industry about what will replace the generation.

# Lets do a quick recap of where we were when I last visted JGSEE in June 2022



Energy

### ACCC to probe potential gaming of energy market, 'distorting prices'

The national competition watchdog will conduct a forensic investigation into spiralling energy prices, including an urgent assessment of companies accused of gaming



In another casualty of the energy crisis, EnergyAustralia owner CLP Group issued a profit warning in Hong Kong last night, blaming "the challenging and extreme energy market conditions in Australia".

It said EnergyAustralia would suffer a loss of \$HK7.2 billion (\$1.3 billion) for the first five months of 2022 on unfavourable forward energy contracts.

# Victoria energy drought alarm


State accused of 'hypocrisy' after Yal...

big energy users want coal, gas in 'capacity market' EnergyAustralia loss

The Daily Telegraph We're for you

Netball close to collapse

Extraordinary powers given to Energy Minister in bid to keep the lights on in NSW and avert a state crisis



**OLD KEAN COAL**

TV STAR REVEALS: WHY I'M SPOILT

LONG MY ACHIEVEMENTS

## THE AUSTRALIAN

WWW.THEAUSTRALIAN.COM.AU | FOR THE INFORMED AUSTRALIAN

**WORLD BEATERS**  
Aussie swimmers look to conquer the world again  
SPORT (P22)

**WEAR & TEAR**  
Marilyn's JFK dress damaged  
WORLD (P8)

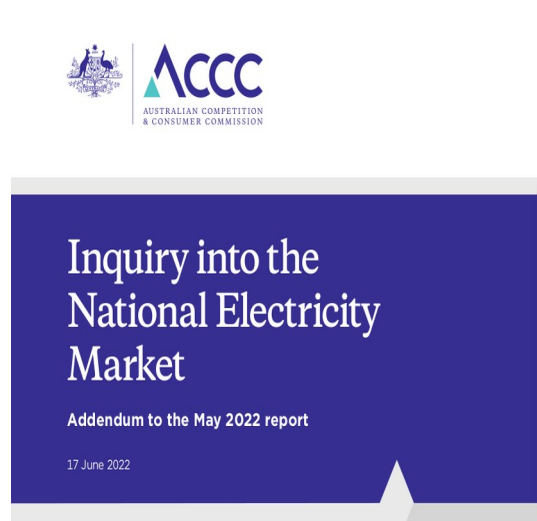
**PETA CREDLIN**  
Nuclear subs will test Albanese  
COMMENTARY (P11)



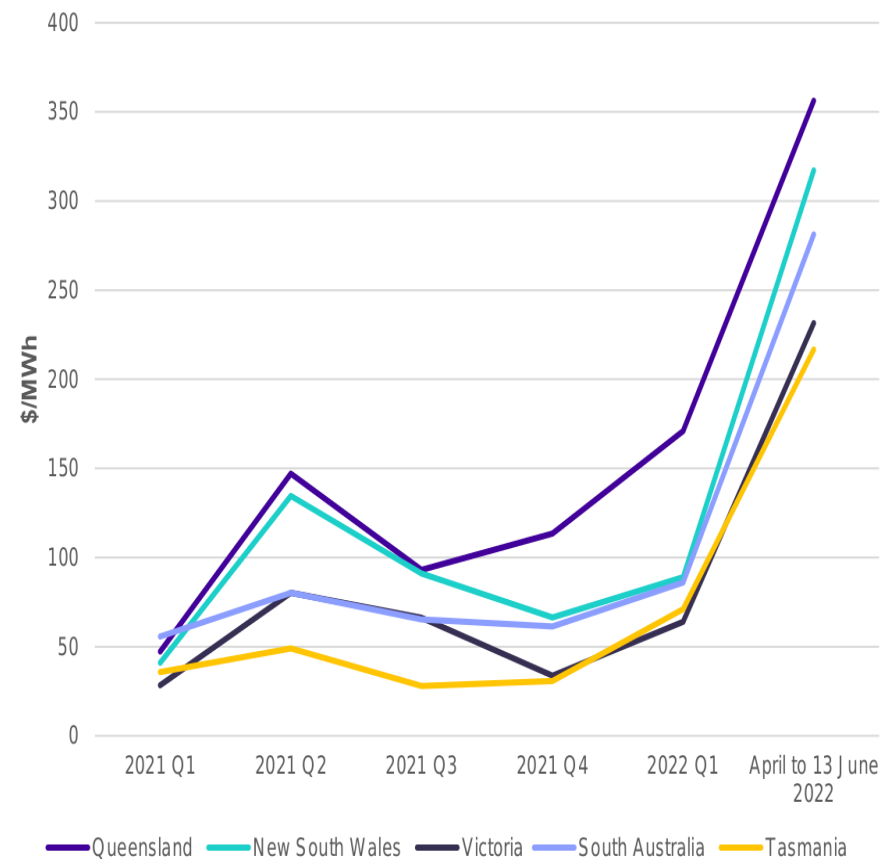

RESIDENTS URGED TO CUT ELECTRICITY USE FOR THIRD NIGHT | PM, BOWEN TO HOLD EMERGENCY TALKS WITH INDUSTRY

## Power crisis: market shut down

# A good primer....



- First two weeks of June extreme high price events
- Average prices \$340/MWh to \$590MWh  
– 5x higher than during Jan-March 22



# And then....

- High spot prices trigger automatic price caps to \$300 between 12-14 June
- Reduction in generator supply being offered to market (but not to administrative dispatch)
- AEMO directs 5GW of generation (about 20% of total) on 14 June 2022.
  - Total installed cap of about 65GW
  - Current demand around 35GW



# And finally....

- AEMO concludes there isn't enough generation being offered to run the market.
- On 15 June 2022 announces market is suspended.
- Suspensions remain until Friday 24 June 2022.
- Multiple notices of potential shortfalls.
- This will likely cost \$x00 Million in compensation payments.
  - Directed prices based on 90<sup>th</sup> Percentile past 100 days

# But the crisis has been going for longer....

- High prices throughout the last quarter.
- Retailers going into administration
- Customers being transferred
- Forward market prices about \$150/Mwh for much of 2022
- EnergyAustralia announces \$1.35B losses
- Origin Energy announces closure of Eraring in 2025 (7 years early)
- State and Federal “Crisis Meetings”
- Default electricity tariffs up 20% in NSW.



# And where are we now (June 2023)

**AGL and Origin Energy report strong profits**

**Further large increases in retail tariffs (10-20%)**

**Liddell Power Station Shutdown (one of the largest coal fired powerstations)**

**Eraring schedule for shutdown in 2025**

**Major issues about new build of generation and transmission**

**Reliability continues to be an issue**



**Large amounts of \$\$ being directed to directed cash handouts to customers.**





# New on-line course released by AEMO

<https://www.aemo.com.au/learn/industry-courses/nem-operational-forecasting-overview>

 **Australian Energy Market Operator (AEMO)**  
60,405 Followers  
2d • Edited • 

AEMO has today launched a new on-demand 'Operational Forecasting Overview' course, to provide insight into the unique role and functions performed by our short-term Operational Forecasting team to operate the National Electricity Market (NEM).

Since the start of the NEM in 1998, there has been a drastic change in the uncertainty, variability and scope of control in how we operate the NEM, making operational forecasting more important than ever.

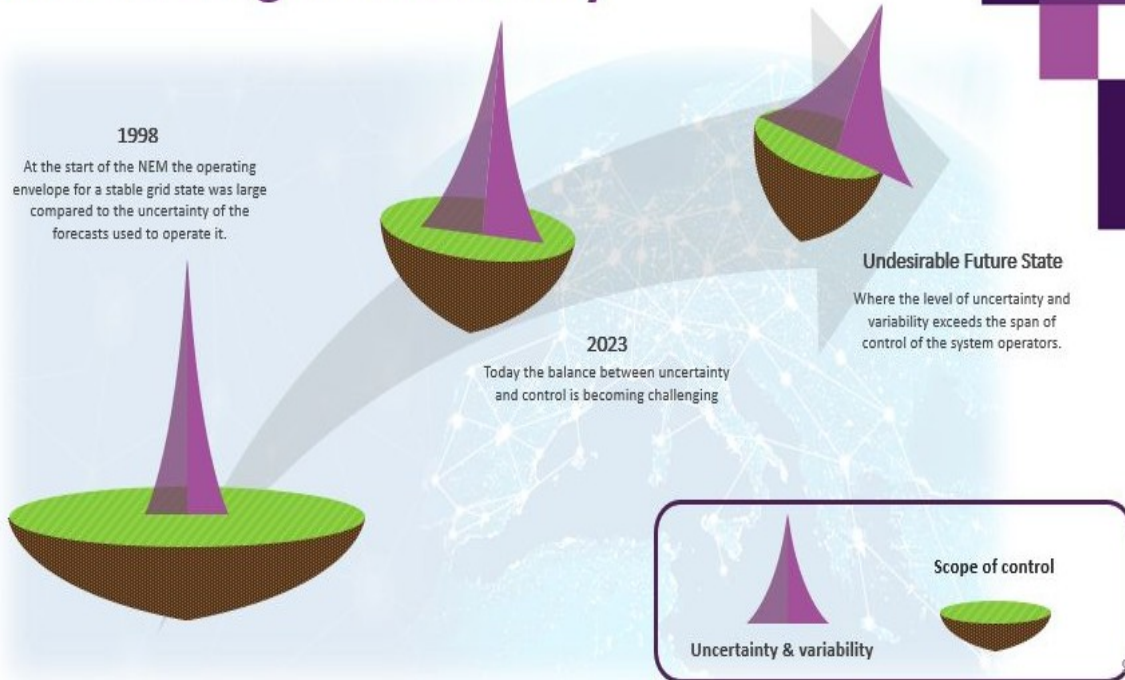
The two-hour online course comprises of seven modules, helping you to learn more about:

- Operational forecasting, its growing importance and trends in the NEM
- The systems producing forecasts for variable renewable energy, distributed rooftop PV and regional electricity demand
- The day-to-day management of operational forecasts, and the evolving landscape increasing the complexity of short-term forecasting, and
- The future of operational forecasting, including upcoming reform, and system uplifts

Designed for a wide audience, those new to the energy industry, as well as those with good knowledge of the NEM and its systems would benefit from taking this course.

For more information and how to enrol, please visit: <https://bit.ly/3XhQnPv>

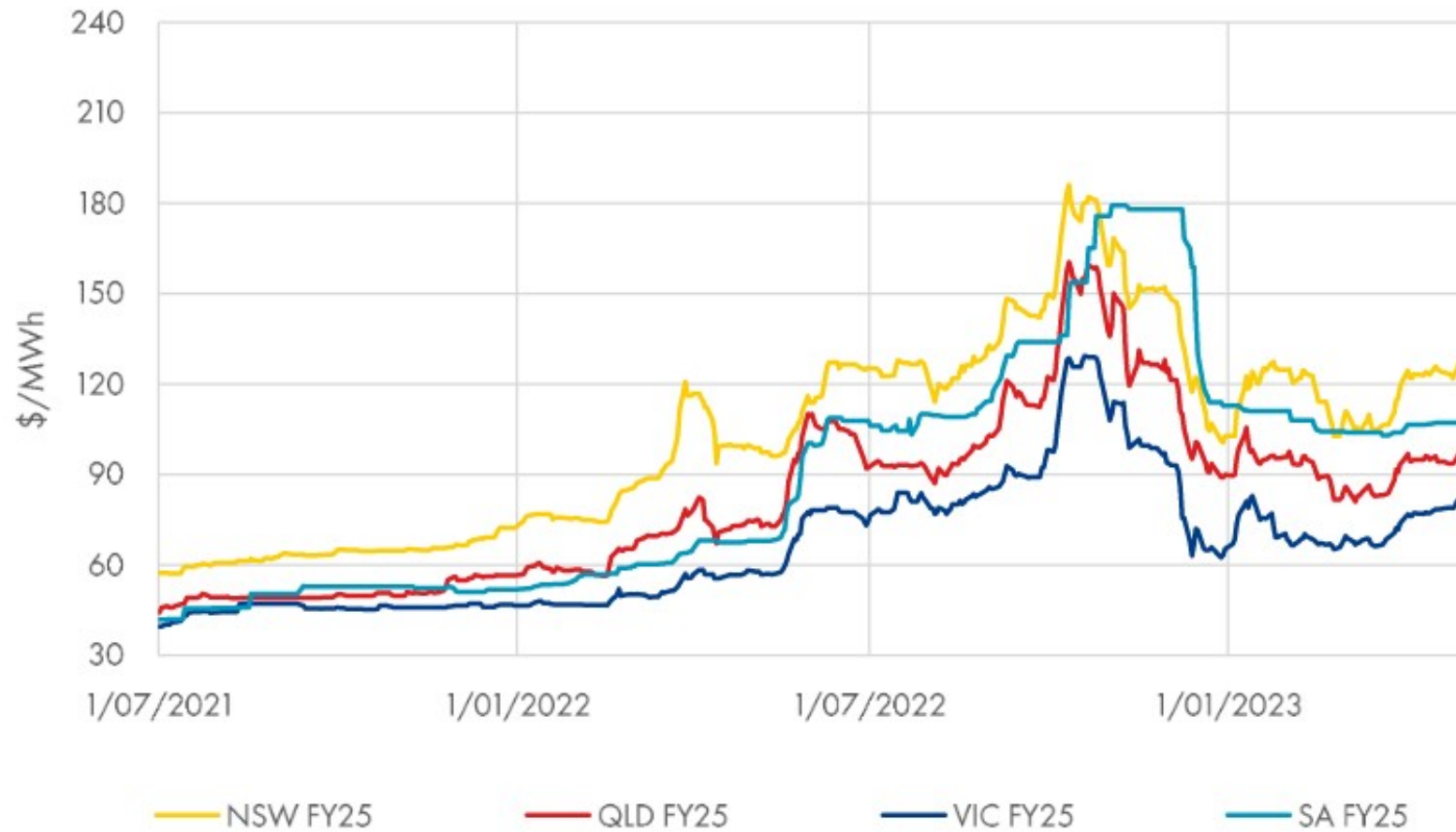
## Embracing Uncertainty





# And wholesale prices have....

FY25 Flat



# The challenges are now routine front page news....



EnergyAustralia's price increases mean that the country's four biggest energy retailers – AGL, Origin Energy, EnergyAustralia and Snowy Hydro's Red Energy – have all advised customers this week of steep increases in tariffs from mid-year.

They follow [increases last year of more than 30 per cent in some cases](#), and illustrate the limited impact of the Albanese government's [intervention in the energy market](#) aimed at reining in prices. **The \$3 billion energy bill rebate scheme, co-funded by the Commonwealth and state governments, and announced in May, will reduce the impact on some households that are already feeling the pressure from 12 interest rate rises since April last year.**

**FINANCIAL REVIEW**

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## Power bill prices to rise more than 50pc for some

Electricity tariff increases of up to 51 per cent are set to hit some households this winter as retailers advise of price rises that far exceed the ones in regulated benchmark tariffs announced last month.

This week, AGL Energy advised customers of increases in peak and off-peak tariffs for power that will begin on July 1. While the average rise for AGL's household customers in NSW on variable rate market contracts is 29.7 per cent, some face increases of as much as 51 per cent.

**Tariff increases advised to one AGL Energy customer in NSW**

| Electricity usage | Unit  | GST excl. | GST incl. |
|-------------------|-------|-----------|-----------|
| Peak              | c/kWh | 16.50000  | 18.150000 |
| Shoulder          | c/kWh | 16.50000  | 18.150000 |
| Off peak          | c/kWh | 16.50000  | 18.150000 |

| Electricity usage | Unit  | GST excl. | GST incl. |
|-------------------|-------|-----------|-----------|
| Peak              | c/kWh | 24.98000  | 27.478000 |
| Shoulder          | c/kWh | 24.98000  | 27.478000 |
| Off peak          | c/kWh | 24.98000  | 27.478000 |

**51.4% increase**

Updated: Jun 18, 2023 - 2:41pm. Data may be delayed.

View AGL related articles →

ORG \$8.480

## The energy transition is far too slow, AEMO warns



**Angela Macdonald-Smith**  
Senior resources writer

Jun 20, 2023 - 5:00am

Investment in new, clean electricity supply is not happening fast enough to replace closing coal power stations and the grid build-out lags what is needed for the energy transition, the head of the Australian Energy Market Operator will warn on Tuesday.

Daniel Westerman will say that investments are also urgently needed in "firming" technologies – such as pumped hydro, batteries and gas – to fill in the gaps when renewable energy is not available, with storage needing to expand by a factor of 30 by 2050.

AGL said the average electricity price increase for residential customers on variable rate market contracts was 25.5 per cent or \$341 in Victoria; 26.4 per cent or \$447 in Queensland, 29.7 per cent or \$540 in NSW; and 29.8 per cent or \$565 in South Australia.



# And from the CEO of the AEMO (the market operator)



Clean energy falls behind as more coal power to go

## Transition far too slow, says AEMO

Angela Macdonald-Smith  
Investment in new, clean electricity supply is not happening fast enough to replace closing coal power stations and the grid buildout lags what is needed for the energy transition, the head of the Australian Energy Market Operator will warn today.

### Mission critical



First Brookfield and now Macquarie show there is value in owning an electricity provider

with a big customer base.

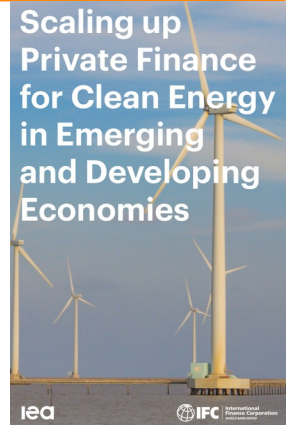
- “Urgent investment required in firming”
- Storage needs to expand by factor of 30x by 2050
- No new renewable projects reached final investment decision in the march quarter.
- Generators owners have announced 30% of coal capacity in NEM will close by 2030
- Volume of solar/wind curtailed due to lack of transmission capacity has grown by 40% in the past 12 months.
- Price offered to landholders to accept a power line across their property has been doubled to AUD\$400,000 per km (over 20 yrs)
- Reforms required in transmission planning, and the planning of state Renewable Energy Zones.





# IEA Reports released 21 June 2023

## Points out the large increase in govt \$\$ being directed to energy rebates.

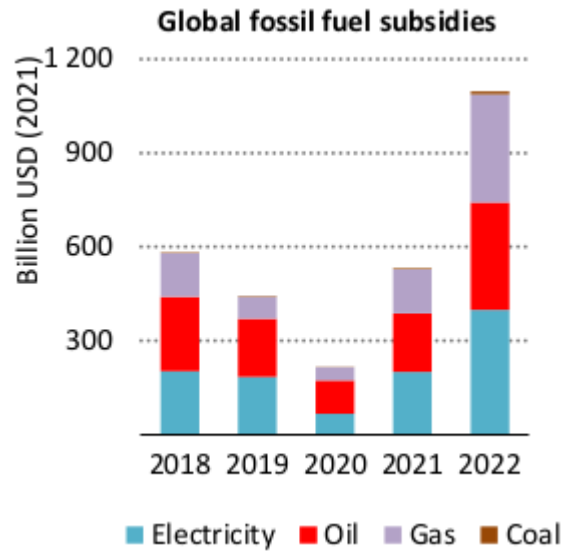
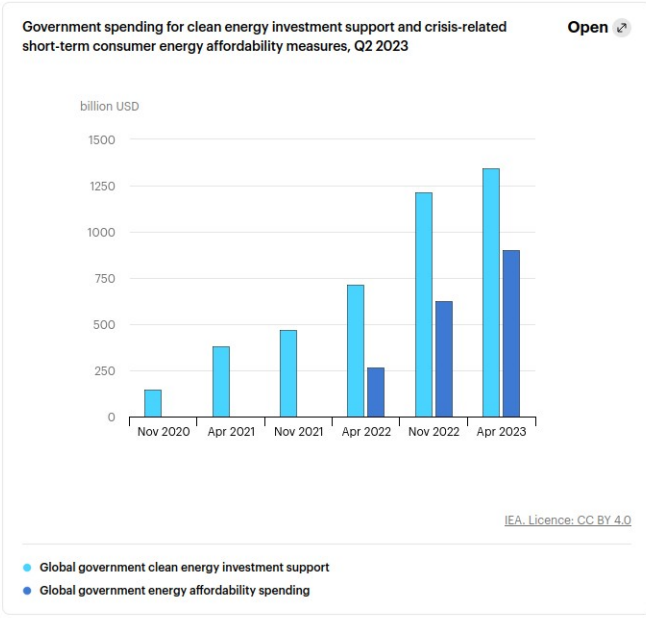


### Governments have allocated USD 1.34 trillion to clean energy since the pandemic

Since the start of the Covid-19 crisis, governments have enacted USD 1 343 billion in clean energy investment support. This amount is unprecedented, but also heavily imbalanced as advanced economies account for nearly 95% of it.

In addition, policymakers have spent a further USD 900 billion in efforts to protect households and businesses from rising energy bills since autumn 2021. Only about 25% of these short-term affordability measures were targeted toward households most in need of support or businesses most exposed to the effects of high energy prices. Without better targeting, new affordability measures will further contribute to rising levels of government debt.

[Learn more in the Government Energy Spending Tracker](#)





# And Australia is no exception...



Budget 2023–24

## Energy price relief

### Easing pressure on households and small businesses

Households and businesses have been facing unacceptable energy price rises because of Russia's invasion of Ukraine. The Government's Energy Price Relief Plan shields Australians from the worst impacts of price increases and provides immediate help with power bills.

### Energy bill relief

The Government is partnering with state and territory governments to deliver up to \$3 billion of electricity bill relief for eligible households and small businesses.

From July 2023, this plan will deliver up to \$500 in electricity bill relief for eligible households and up to \$650 for eligible small businesses.

### Price caps and gas market reforms

The Government acted decisively by putting a temporary price cap on wholesale gas contracts, working with the states to cap the price of coal used for electricity generation and introducing a mandatory code of conduct for gas sales.

These actions ensure Australians can access energy at a fair price and gives our industrial gas users a more level playing field in negotiations.

These reforms, along with energy bill relief are expected to reduce inflation by 3/4 of a percentage point in 2023-24.

a federal coal price cap - cap on coal producers of \$125 a tonne, and reimburses coal-fired power generators for coal they buy which exceeds that price.

# Which lead to this contradictory outcome....



## Compensation for coal price cap could near \$1 billion



ALEXANDRA EASTWOOD  
January 5, 2023, 10:27 am



Federal and state governments could face massive compensation payments for coal power stations in New South Wales and Queensland.

The Federal Government's [cap on coal prices](#) may lead to compensation of [\\$500 million for power stations in NSW](#) and [\\$450 million for the Gladstone power plant](#) in central Queensland, various reports have stated.

NSW Government sources have indicated that recipients for the \$500 payment would include the Origin-owned Eraring power station south of Newcastle, as well as stations in Bayswater, Liddell, Mount Piper and Vales Point B.





# REC (LGC) Market

- RET was legislated in 2000.
- New investment was (in absolute terms) quite small until about 2016.
  - Grow in market volumes is over approximately 10 years
- Note that against a statutory target of 33,000 GWh a further 5,800 GWh of LGCs were voluntarily cancelled. (Voluntary market being approximately 20% the size of the compliance market) [13] Total value of  $39 \times 10^6 \times \$30 = \$1.7B$
- New generation being committed at about 3GW pa (call it about max 4 million LGC)
  - This rate of growth is already very challenging, but significantly (by a factor of 5x-9x) less than what would be required to meet stated targets. (AEMO Integrated System Plan “Step-Change” Scenario requires a 9x increase rate of installation of large scale renewables to a total around 150 GW by 2050.
  - AEMO “step change” assumes practical upper limit around 83% of electricity produced by LGC eligible plant. This would put primary issuance at around \$6B pa. (150 GW of installed renewables, assumed {Aton} to produce around 200 TWh of electricity, which at an LGC price of \$30 is about \$6B of LGCs pa) However, it is unlikely that the LGC market as currently formulated could achieve this.

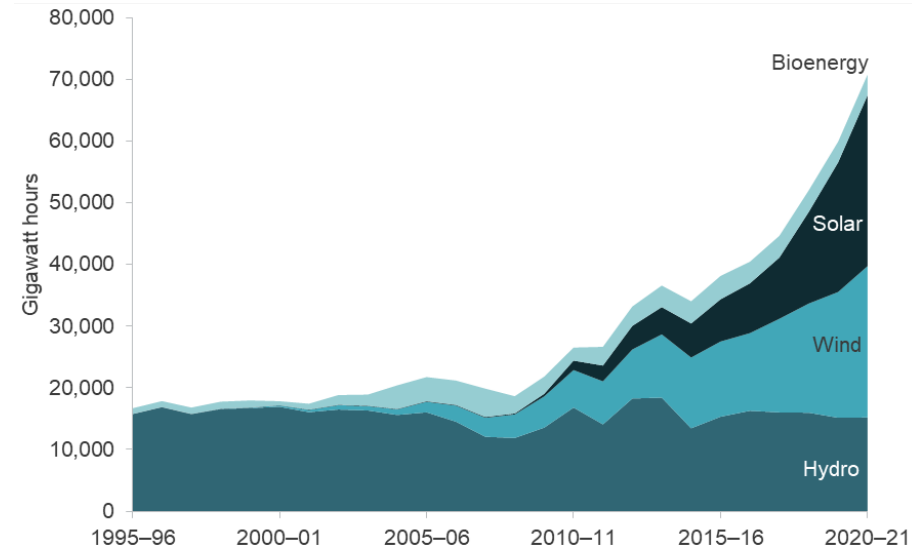


Figure 12 Growth and share of utility-scale solar and wind capacity, all scenarios

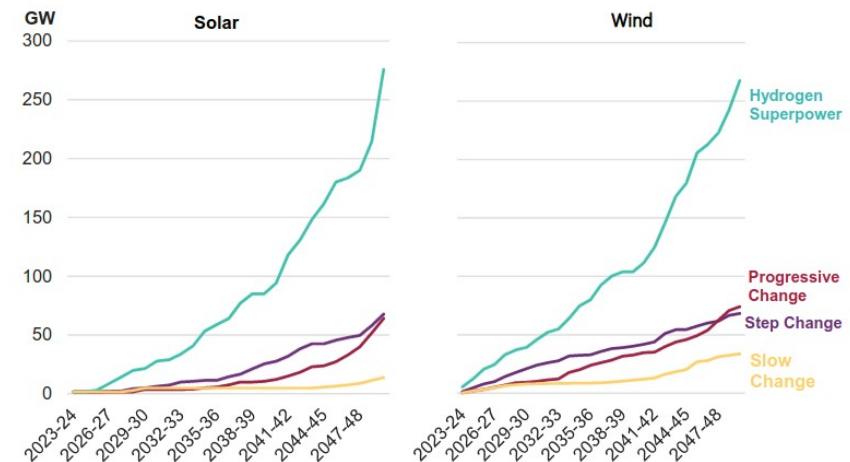
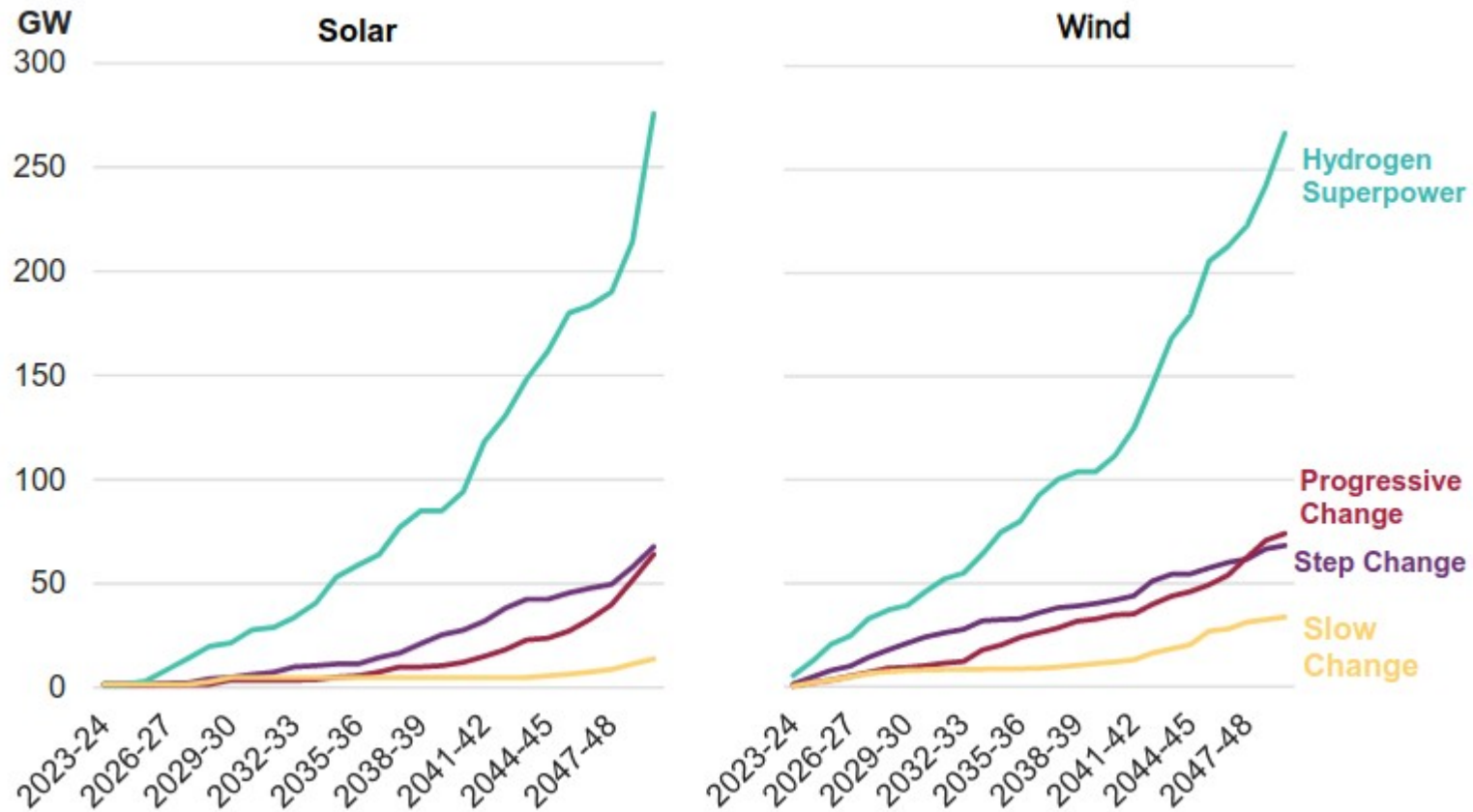






Figure 12 Growth and share of utility-scale solar and wind capacity, all scenarios

[12]





# Snowy Hydro 2.0

**Expansion of the existing Snowy Hydro Scheme**

**Originally costed at \$2B in 2017 and to be operation in 2023**

**Now anticipated to cost \$6B, and online in 2027.**

**To meet stated targets implies 8x “Snowy 2.0s” by 2030.**



# There is an irony that....

**Originally,**  
the market reform was to separate the vertical stages, put competition at each stage, and have markets operating between them....

**But now,**  
volumes traded in the contracting market are decreasing, and companies are increasingly vertically integrated and using their own customer base as a natural hedge....

(It would seem to be evidence that the market fundamentally isn't efficient)

# The challenges have been building for a long time....



The NEM is predominantly coal / gas powered, but an aggressive timeline set for move to “renewables”.

The grid wasn't designed for this, leading to issues with constraints, and even in some locations power flowing “backwards”.

Transmission Investment is increasingly the issue – renewables are not located where coal power stations are, and a very large buildout (some reports suggest 10,000 km + of new HV transmission lines)

Various proposals for how to attract investment

June 2022 – Energy Security Board Capacity Mechanism (abandoned)

# Challenging (and contradictory) trends at play...



**ACT has banned installation of gas appliances into new housing.**

**Large rampup in demand for copper, lithium**

**Focus is increasingly moving into issues of grid planning**

**Historically grid was built to move from large coal fired plant to local cities**

**(So initial solar / wind farms took advantage of that)**

**But that capacity was quickly build out, and securing new capacity became much harder.**



# The grid investments are at a considerable scale

Designated renewable energy zones will require 10,000km of transmission to be constructed.

Victoria and NSW Govts are offering landowners affected by new transmission \$200,000 per KM (annual instalments, over 20 years, inflation adjusted). Qld is offering \$300,000. (And “progress remains slow”)

On 19<sup>th</sup> June Transgrid announced it would double the offer to \$400k....



# Changes in regulatory arrangements

**Removal of the Energy Security Board (ESB)**

- responsible for proposing arrangements and initiatives
- receiving regular requests for policy work.

**Replaced by Energy Advisory Panel (EAP)**

- advisory only

**States are again taking a larger role**

**New capacity mechanism being discussed (Capacity Investment Scheme)**

**Based on NSW Renewable Roadmap auctions recently held, and which have become the model picked up in Victoria and South Australia.**

**Energy Ministers have agreed program to accelerate connections processes.**

# The February Energy Ministers' Communique



- Ministers agreed a way forward on the complex issue of transmission access reform.
- Ministers agreed to immediately implement 'enhanced information' reforms to provide east-coast market participants with better information on the optimal location for new generation and storage.
- Ministers requested the Energy Security Board (ESB) to work with Senior Officials and stakeholders to develop the voluntary Congestion Relief Market (CRM) and the priority access model and to bring forward a detailed design for consideration by ECMC in mid-2023.
- Ministers decided not to further develop or consider the congestion management model and congestion fee options, ruling out any models using locational marginal pricing. The CRM and priority access model reforms, if approved later this year, are estimated to yield net benefits for industry and consumers of up to \$5 billion (NPV) and lower emissions by 23 million tonnes by 2050.





# The May Energy Ministers' Communique

- AEMO advice that significant investment in storage and VRE will be required to maintain reliability to 2030 while major transmission and pumped hydro projects are completed.
- first stage of the CIS, comprising a tender in South Australia and Victoria and partnering with New South Wales on the NSW Electricity Infrastructure Roadmap tendering arrangements to enhance reliability.
- Ministers agreed to consult on the detailed design of the national scheme to incentivise investment in NEM jurisdictions,
- Energy Advisory Panel (EAP) to coordinate market bodies' advice to governments under the National Energy Transformation Partnership, on issues relating to the security, reliability, and affordability of Australia's east coast energy system. The EAP will include the heads of the three energy market bodies, and the Energy Commissioner of the Australian Competition and Consumer Commission (ACCC) as an observer. Expanding the membership to include ACCC will enable better consideration of issues relating to gas supply, retail markets and consumer protections. The new arrangements will take place from 1 July 2023. \
- Approved amendments to the national energy laws to implement their previous decision to incorporate an emissions reduction objective into the National Electricity Objective, National Energy Retail Objective, and National Gas Objective, with amendments expected to take effect by September 2023;



# More forthcoming regulatory changes....

## AEMC

- Changes in emergency price settings
- Noted need for coordination between states and AEMO on siting of REZs, and to avoid “inefficient construction” (of which there will be a lot)
- Increased market monitoring
- Changing the NEO



# Changing the NEO

## The National Electricity Objective (NEO)

The National Electricity Objective as stated in the [National Electricity Law \(NEL\)](#) is:

“to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:

- price, quality, safety and reliability and security of supply of electricity
- the reliability, safety and security of the national electricity system.”

## The National Energy Retail Objective (NERO)

The National Energy Retail Objective as stated in the [National Energy Retail Law \(NERL\)](#) is:

“to promote efficient investment in, and efficient operation and use of, energy services for the long term interests of consumers of energy with respect to price, quality, safety, reliability and security of supply of energy.”

## The National Gas Objective (NGO)

The National Gas Objective as stated in the [National Gas Law \(NGL\)](#) is:

“to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.”

<https://www.aemc.gov.au/regulation/neo>



# And more regulatory changes...

*On 24 February 2023, “the Energy and Climate Change Ministerial Council (ECMC) agreed to expedite a package of carefully designed measures expanding the Australian Energy Regulator's (AER) gas and electricity market monitoring powers, an essential function for a well-regulated and stable east-coast electricity market, with a view to passing this legislation as soon as feasible.”*

*The AER is currently limited in its ability to assess competition in the wholesale energy markets due to:*

*restrictions around obtaining and using information*

*a lack of visibility over electricity contract markets ←----- BACK TO THE FUTURE !!!*

*the lack of a comprehensive gas market monitoring role.*