The transition to clean energy in the NEM: some institutional questions

Melbourne Economic Forum, 24 April 2024

Professor Bruce Mountain

Victoria Energy Policy Centre

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Outline

- Stock take
- Governments' roadmap: AEMO's Integrated System Plan (ISP) and its "actionable projects" (interconnectors).
- Reason, evidence to suggest ISP is not credible
- Possible institutional improvements

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Investment summary

- In 12 years from start 2012 to end 2023:
  - + 7.5 GW wind (+61 farms), + 8 GW farmed solar (+105 farms), + 20 GW of rooftop solar (+2.1 million homes and businesses).
  - Total outlay in VRE of ~ $82bn, $.6.7bn per year (more than half in rooftop solar, by homeowners)
  - $20bn for interconnector expansion is largely locked away although mostly not yet incurred (about $4bn already incurred).
  - ~ $1bn in battery and $5bn in pumped hydro already incurred.

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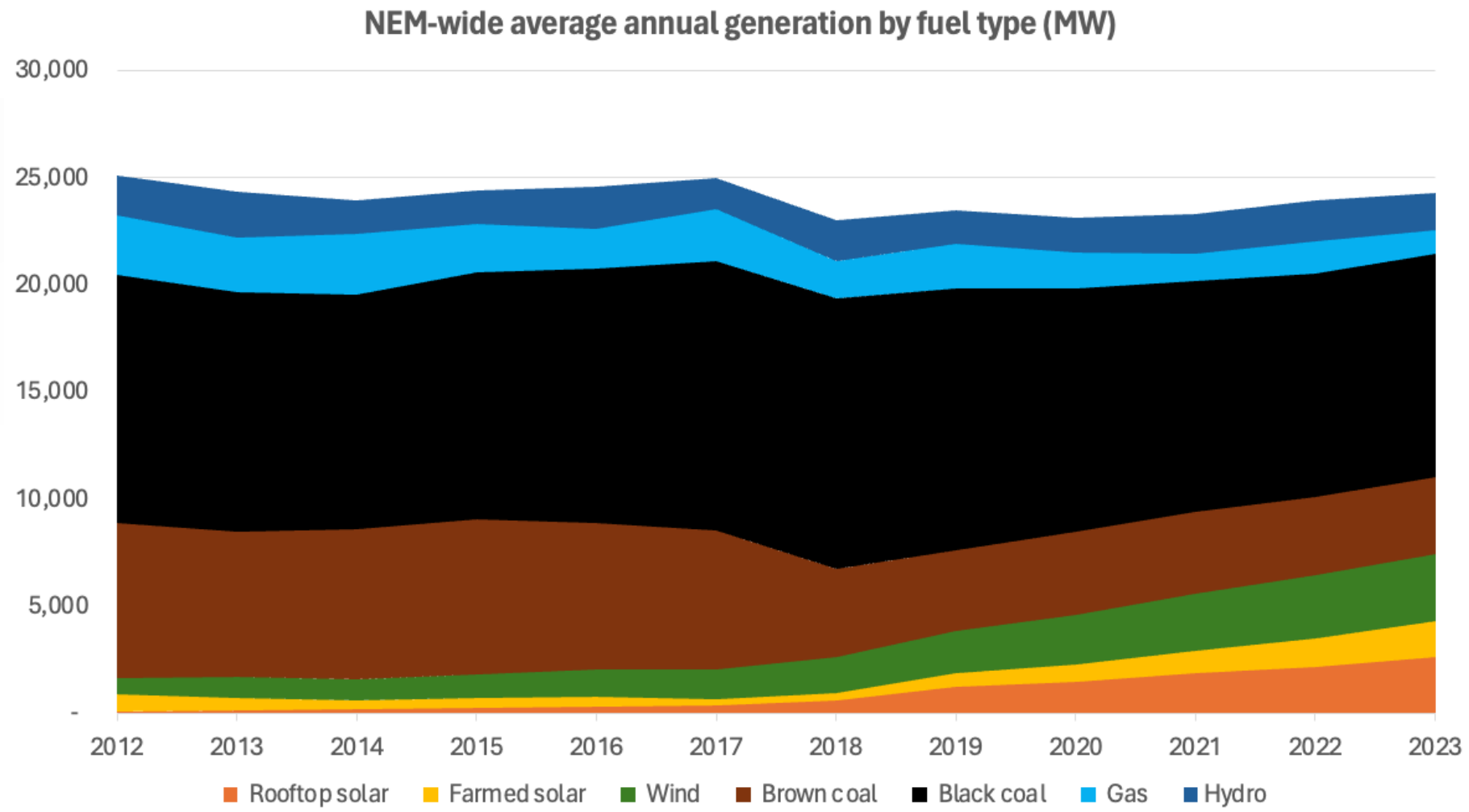
Stocktake: are we at the end of the beginning?



RE targets

- National: 82% (RE production) by 2030 (faster rate of change than targeted in any other OECD/G20 country).
- Also various (mostly conditional) state targets/aspirations:
  - SA: “100% net” by 2027
  - TAS: 200% (of TAS demand) RE by 2040
  - VIC: 95% (as % of Vic production) by 2035
  - NSW: +12 GW of VRE by 2030
  - QLD: 80% RE by 2035
- Achieving national target will require average annual VRE expansion at ~ 3X the average rate from 2012 to 2023, and massive storage expansion.

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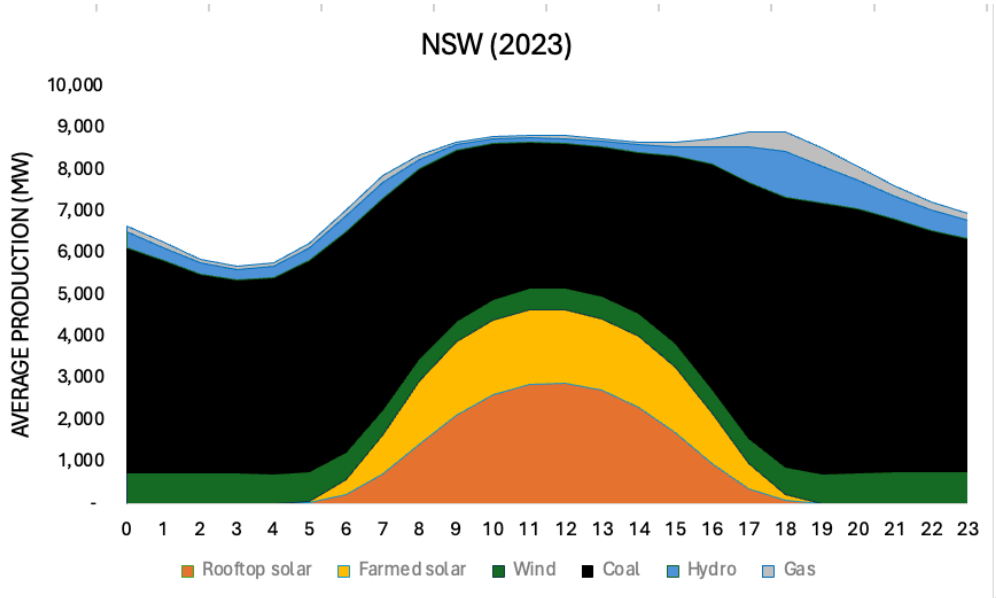
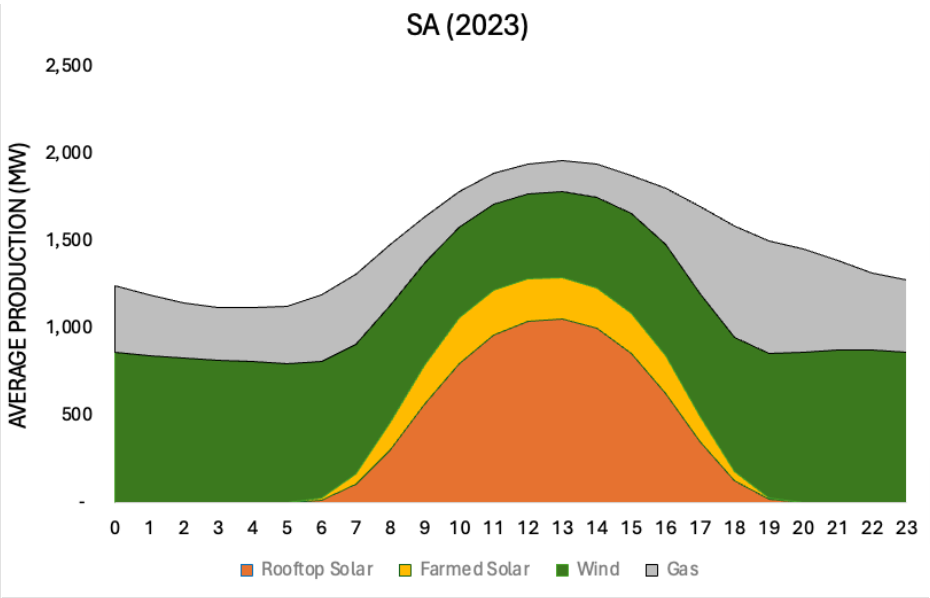
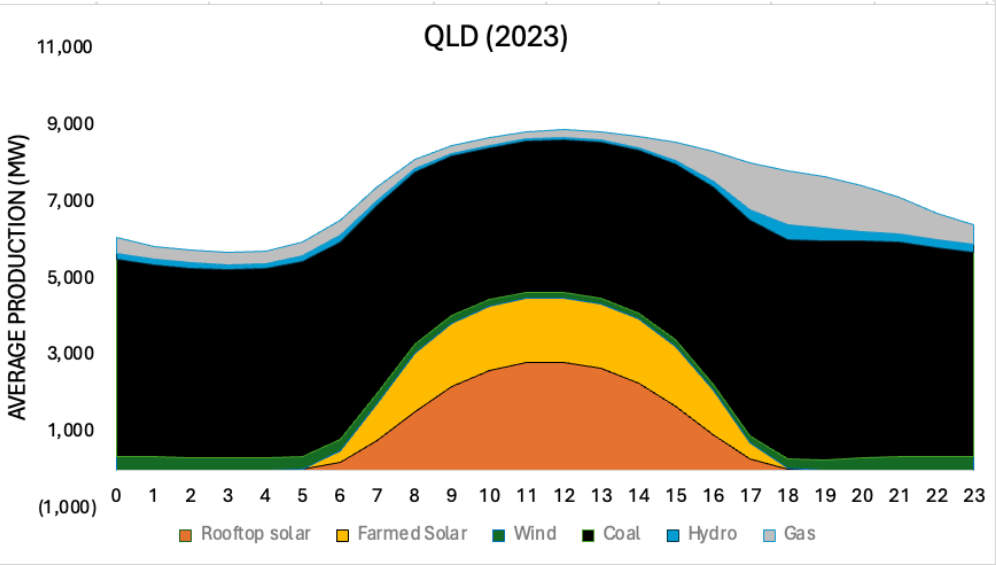
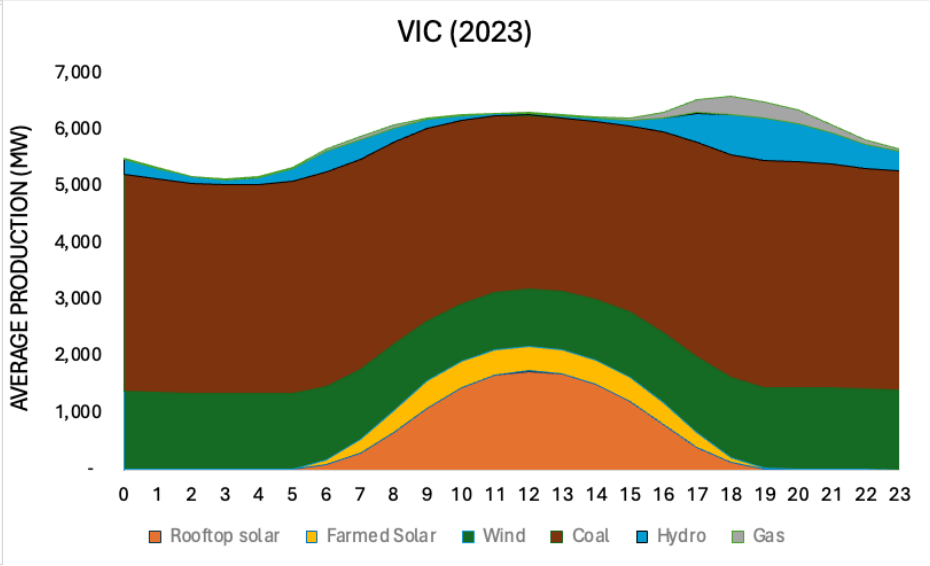
Here is our challenge









Does Australia really have a competitive advantage in clean energy?

AEMO's ISP is the official roadmap. How did it arise?

- 2010 AEMO created, floats "NEMLink": 500 kV Hobart to Brisbane "backbone"
- 2017 Finkel Review: "integrated grid plan … signal to investors about the future of the network"
- 2017 Snowy 2.0: can you imagine a worse location for a power station?
- 2018-20: AER irritates ministers and bureaucrats by questioning costs and benefits of interconnection
- 2020: "No transition without transmission": "Actionable ISP rules" – put AEMO in charge
- 2020-24: And so, central planner that can ensure its plans are delivered, not just "signal to investors", is born.

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The ISP (and its “actionable projects”): Gosplan strikes back

- The promise: “Optimal” quantity of generation, transmission and storage and so “lowest cost” system-wide expansion and operation.
- The reality:

1. Simplified network, power system characterisation (unavoidable)
2. Supply and demand uncertainty assumed away (unavoidable)
3. The market is assumed away (unavoidable):
    a) Missing money
    b) Geographic supply diversification ignores price impact
4. Opaque and not replicable (AEMO unable to specify objective function – largely unavoidable)

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Our work, in collaboration with others, has also identified various important (but subsidiary) errors of calculation

- Biased counter-factual
- GHG emissions not properly valued
- Salami slicing
- Under-costing
- Local social and environmental costs excluded
- No recognition of transmission outages

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What is the “missing money” critique ?

1. Wind/solar resource (not market dispatch) used to identify optimal quantity and location.
2. Modelling ignores actual network-driven curtailment in least cost calculation e.g. even after VNI-West is built (35% curtailment on average in SW NSW REZ and similar in West Vic and Murray REZs in Vic from 2030 to 2050).
3. Wind/solar received prices in these REZs must be 54% higher to compensate for curtailment (or 81% higher after counting 0.85 marginal loss factor).
4. So, (huge) missing money … customers and tax-payers will have to fill the hole if new projects are to be built.
5. AEMO’s response? Not our problem, our plan is optimal (”least cost”) and we don’t need to include this missing money in our plan … “NEM reform activities” will sort out.

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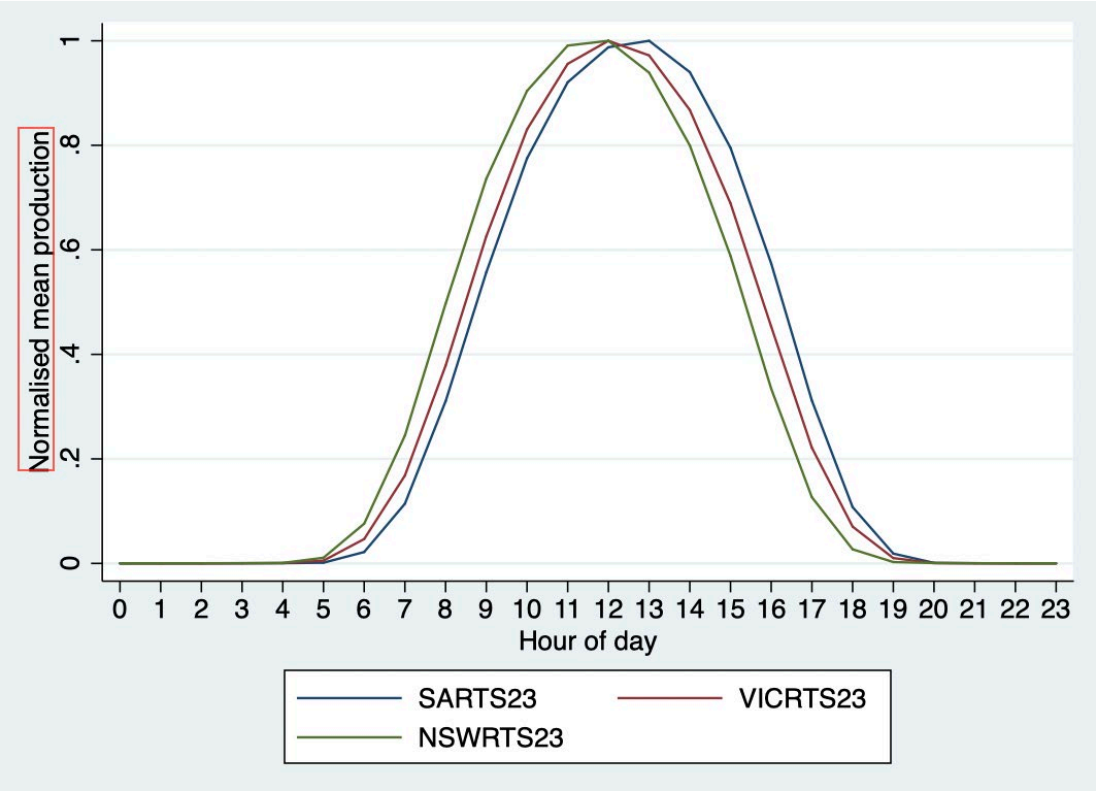
What is the diversity critique ?

Interconnection between NEM regions can be valuable if resources are plentiful in one region when they are scarce in another.



Rooftop solar (RTS) in NSW, SA and VIC is highly correlated. Expected.

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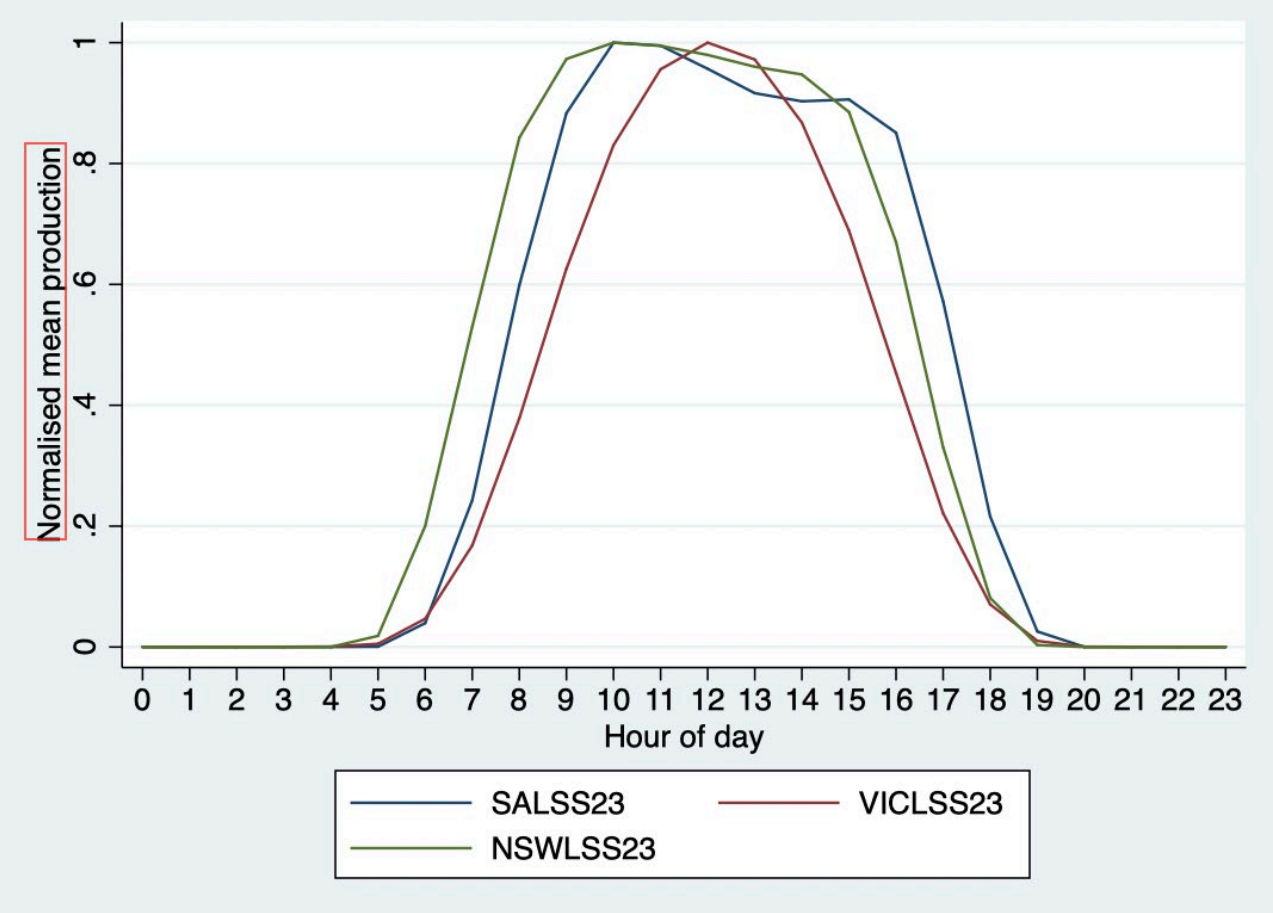
What about diversity in large scale solar (LSS) ?



Not much. Again, expected

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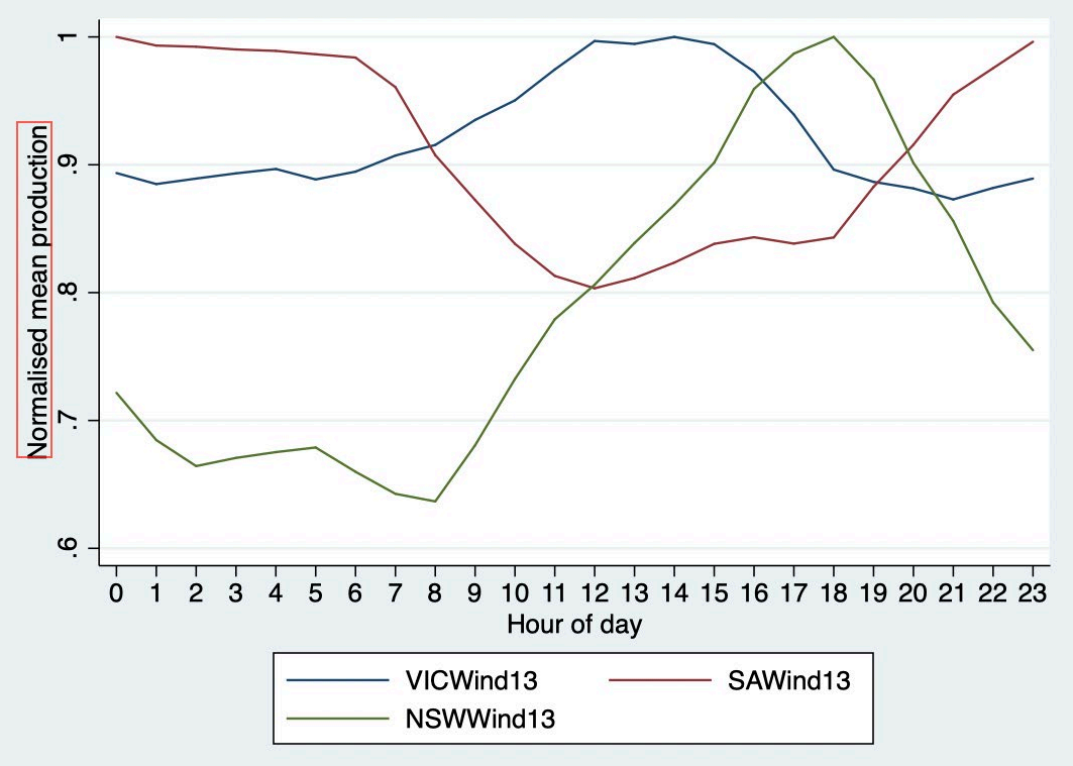
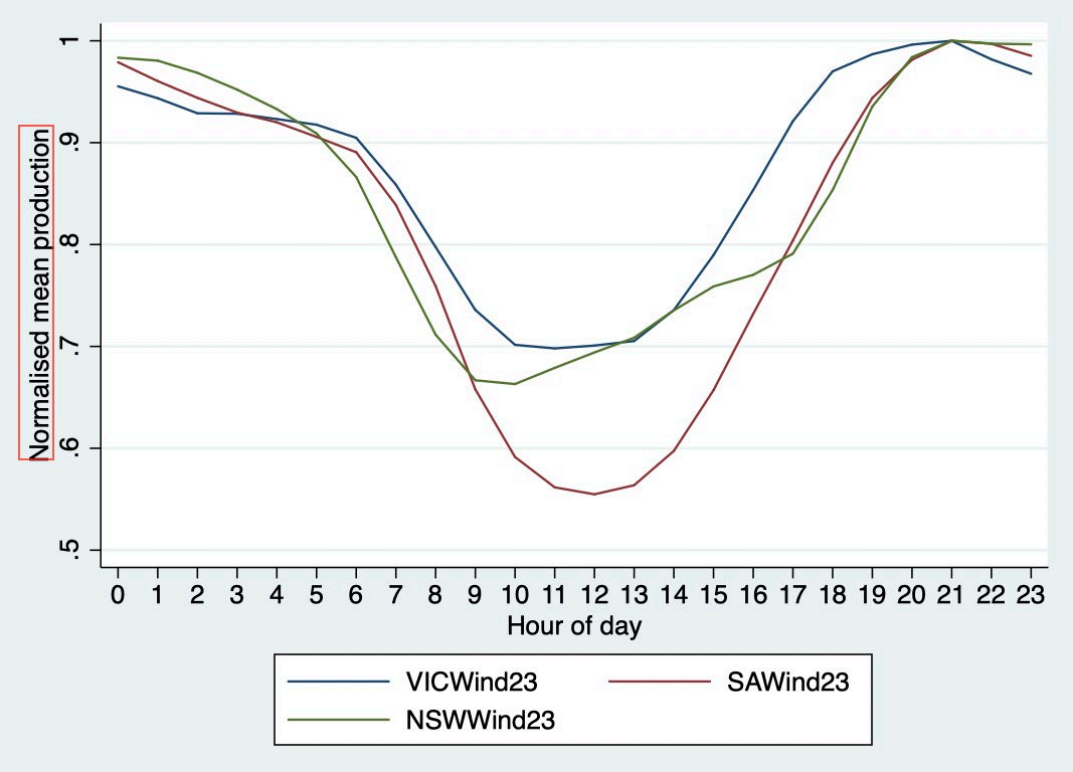
What about diversity in wind?





Looking at 2013 (left chart), prima facie evidence of regional diversity, may justify some interconnection. But by 2023 (right chart): wind farms now singing from same song-sheet.

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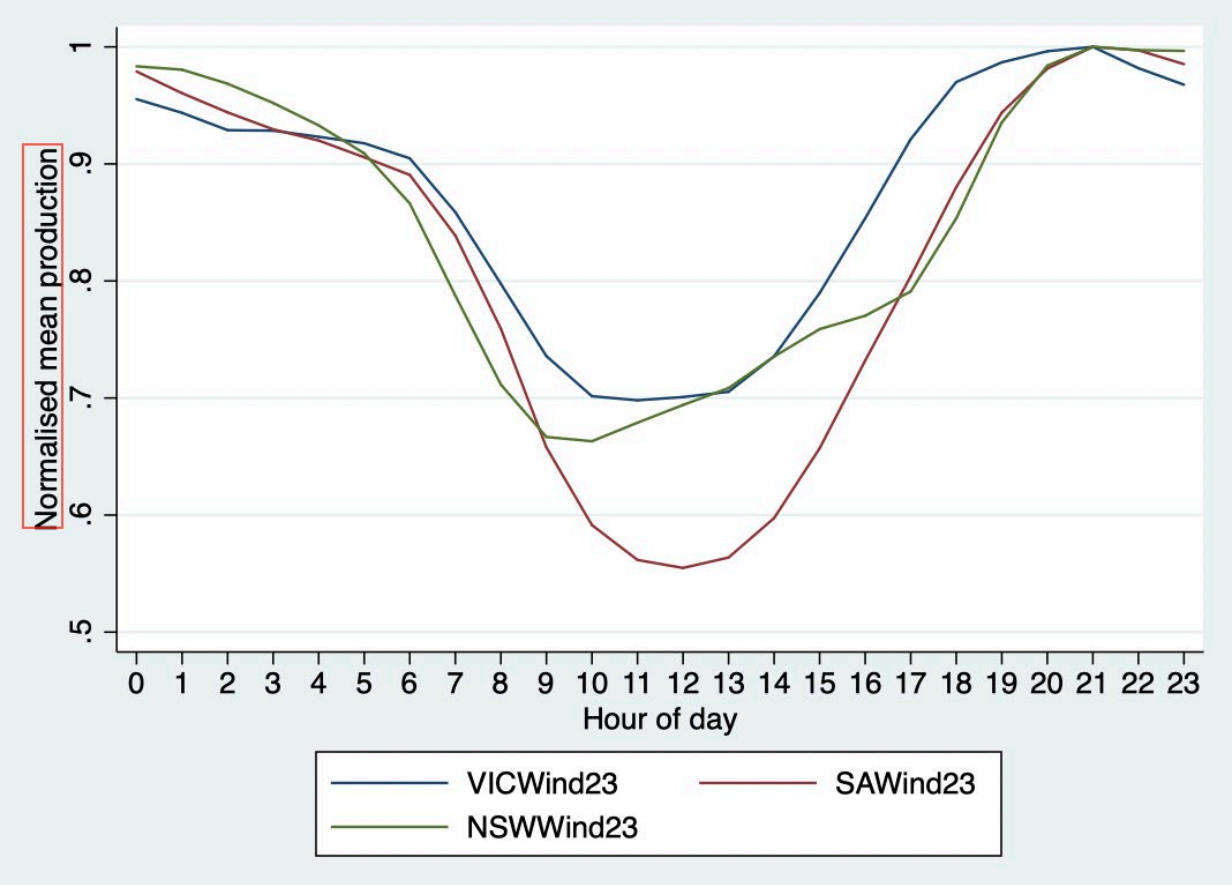
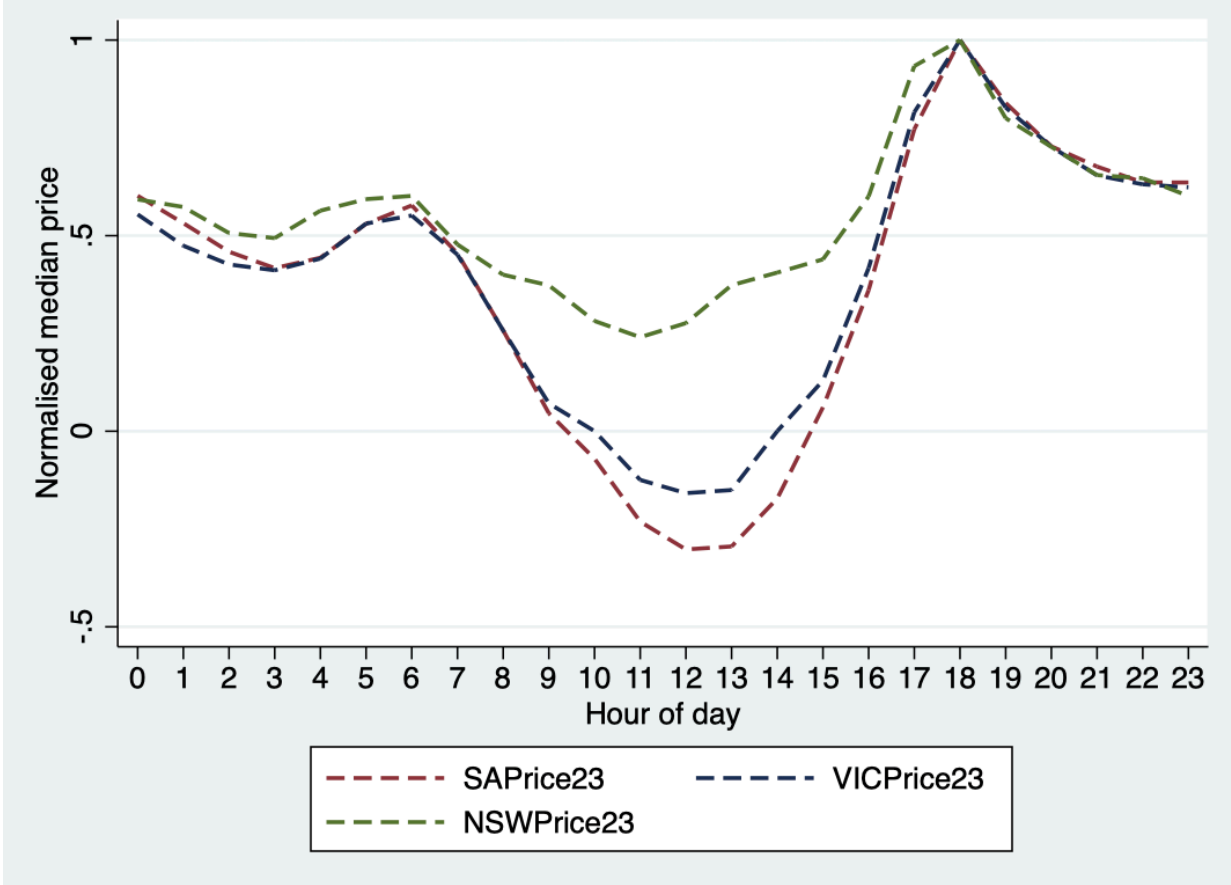
Q: But why do the wind farms now sing from the same song-sheet?
A: They respond to prices





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Wind farms (left chart) dispatching in response to prices (right chart). Wind diversity likely to reduce further as RTS grows and RET ends (no more LGCs to encourage production even when $P_{spot} < 0$).

Implications and suggested (re)direction

1. Does the faulty AEMO modelling matter? Yes, because the higher cost solution (and big doubts about feasibility) has (big) implications for everyone. But AEMO rejects criticism of its plan. Why?
    a) A national planning body is necessarily more remote from the interested and concerned parties.
    b) Rising panic by governments: private investors sitting on their hands … "government needs to act" … "time for talking is over".
    c) Deepening clientelism (industry on govt; jurisdictions on Cwlth) stifles industry & inter-government critique.
    d) Increasingly polarised public debate: critique = criticism. And so, barricades go up and shutters come down.
2. Is there a better way? Effective policy development here is extremely difficult (technology changing very quickly; much is only discovered in the course of implementation). In this context:
    a) Smaller planning entities offer better ability to involve all interested parties and to work out a mutually acceptable way forward.
    b) Allowing a variety of different planning entities to develop their own approaches increases the chances of finding the best approach, from which others can learn.

Some specific suggestions

a) Shrink AEMO back to its original core: power system operation only.
    a) Spin out market operation to a not-for-profit association accountable to market participants;
    b) State-based authorities to be responsible for generation connection to transmission;
    c) States to be responsible for transmission expansion planning, transmission and distribution economic regulation, in their states.
b) States to agree amongst themselves on interconnection and how costs/benefits are to be shared.
c) Revive the “inter-regional planning committee” and ask it to periodically offer perspectives on inter-regional transmission development.
d) Federal Government to involve itself through Capacity Investment Scheme or similar to deliver nationally-determined emission reduction objectives.

There does not seem to be an appetite for any such changes.

Resources

- Data: all data is sourced from NEMWeb accessed via www.v-nem.org. Data (and Stata code) is available from the author on reasonable request.
- Humelink: https://www.vepc.org.au/humelink
- VNI-West: https://www.vepc.org.au/vni-west
- MarinusLink: https://www.vepc.org.au/marinus-link
- Related policy and economics: https://www.vepc.org.au/australian-electricity-markets-policy-and-economics

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