Interconnectors versus batteries: the case of South Australia

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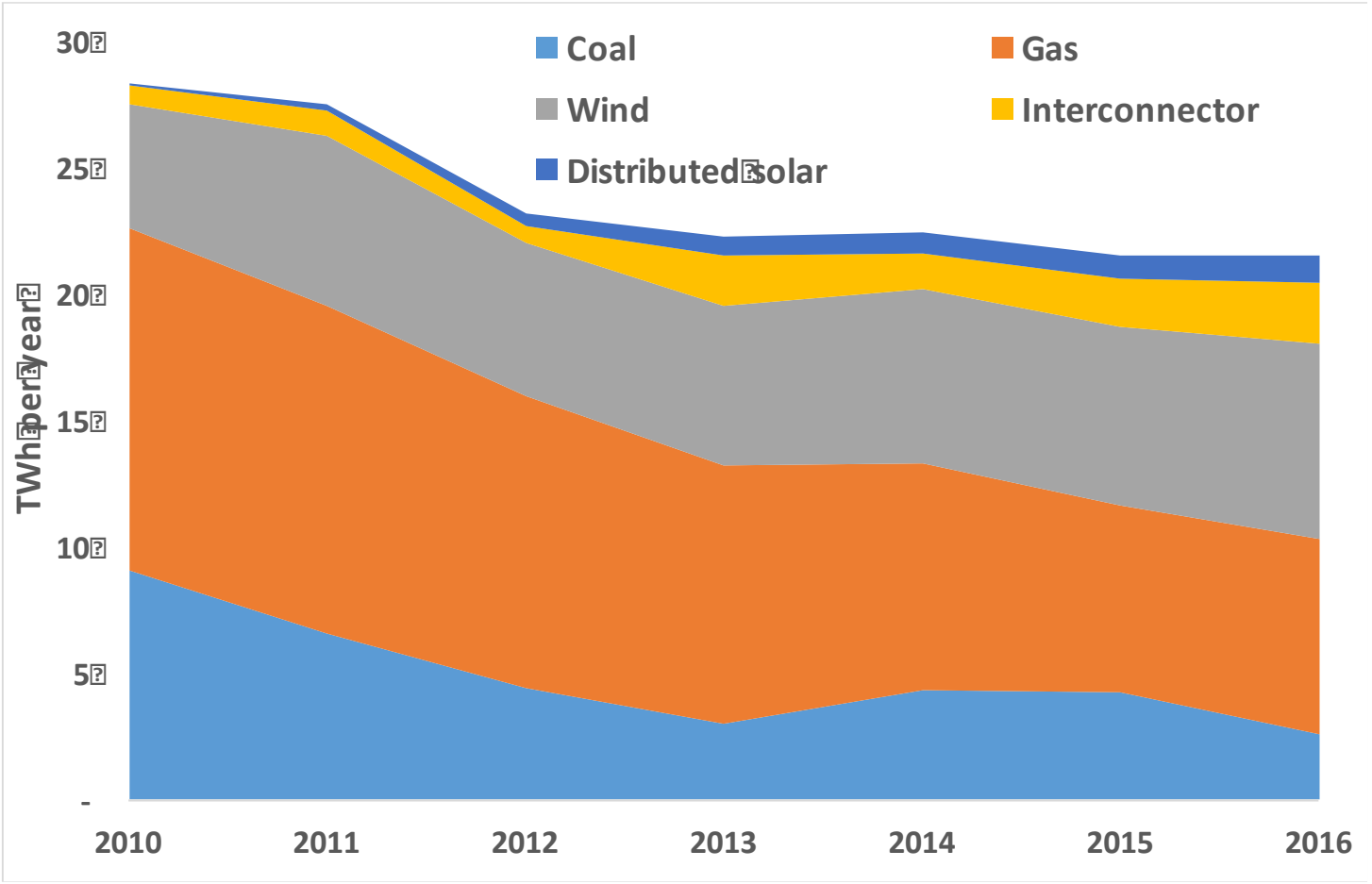
Outline

- Context – the situation in South Australia
- Transmission versus battery: the challenge of substitutes and complements
- Arguments for and against independent transmission planning
- Arguments for and against contestable contracts for transmission development
- Synthesis

First, a bit about South Australia (SA)

- SA one of Australia's six states; land mass a little over 1000 times bigger than Singapore.
- SA population is 1/3rd of Singapore's. Adelaide, the state capital is Australia's fifth largest city (and has population that is 20% higher than Birmingham, Britain's second largest city).
- Electrically isolated - at the one end of a long, stringy power system, with an AC and DC interconnector to the neighbouring states.

SA's electricity production is rapidly decarbonising



- All coal generation closed by end of 2016.
- Wind now largest source of electrical energy, measured annually

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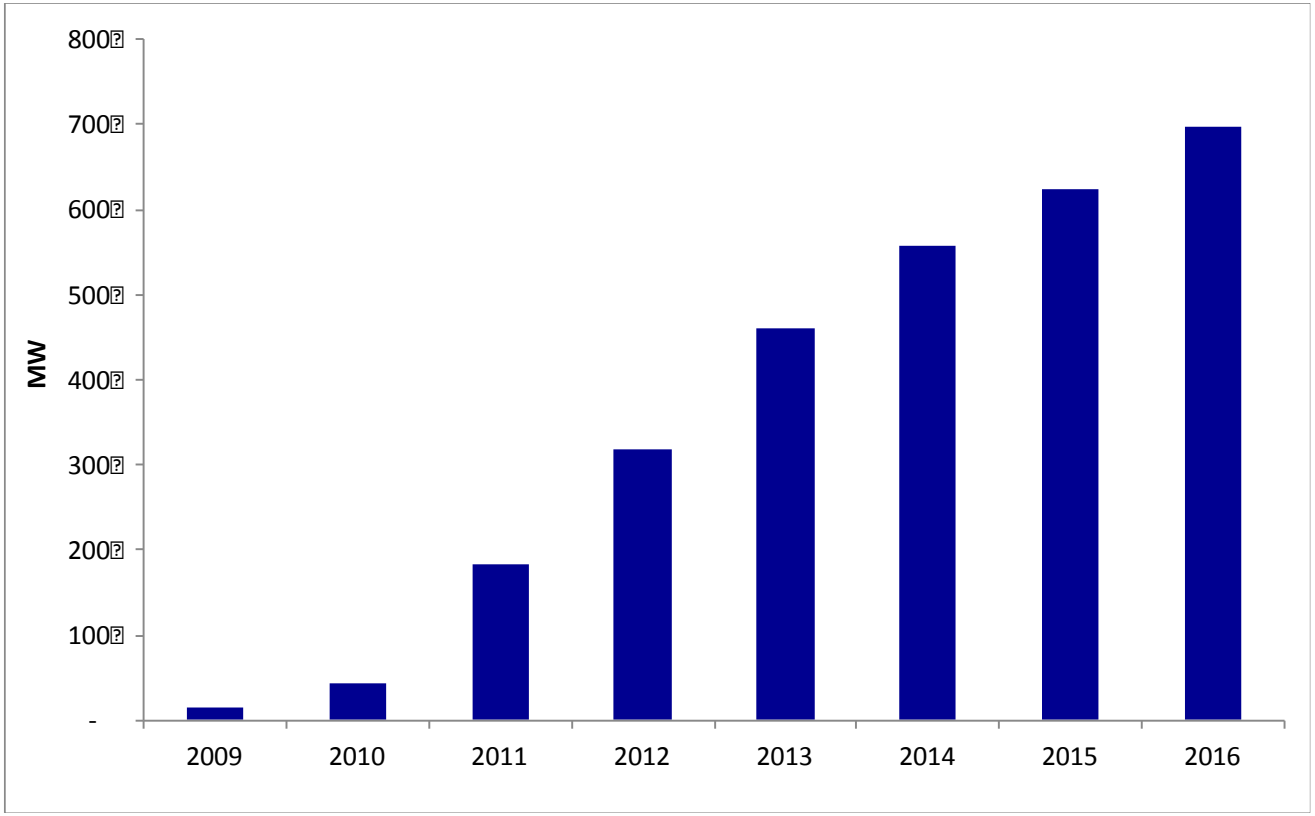
Distributed solar has expanded rapidly and this is continuing as retail prices rise



Battery + PV combination likely to expand quickly: 5 kW PV + Tesla Powerwall 2 now less expensive than grid-only supply for households

Demand for grid-supplied electricity declining at 1.5% per year

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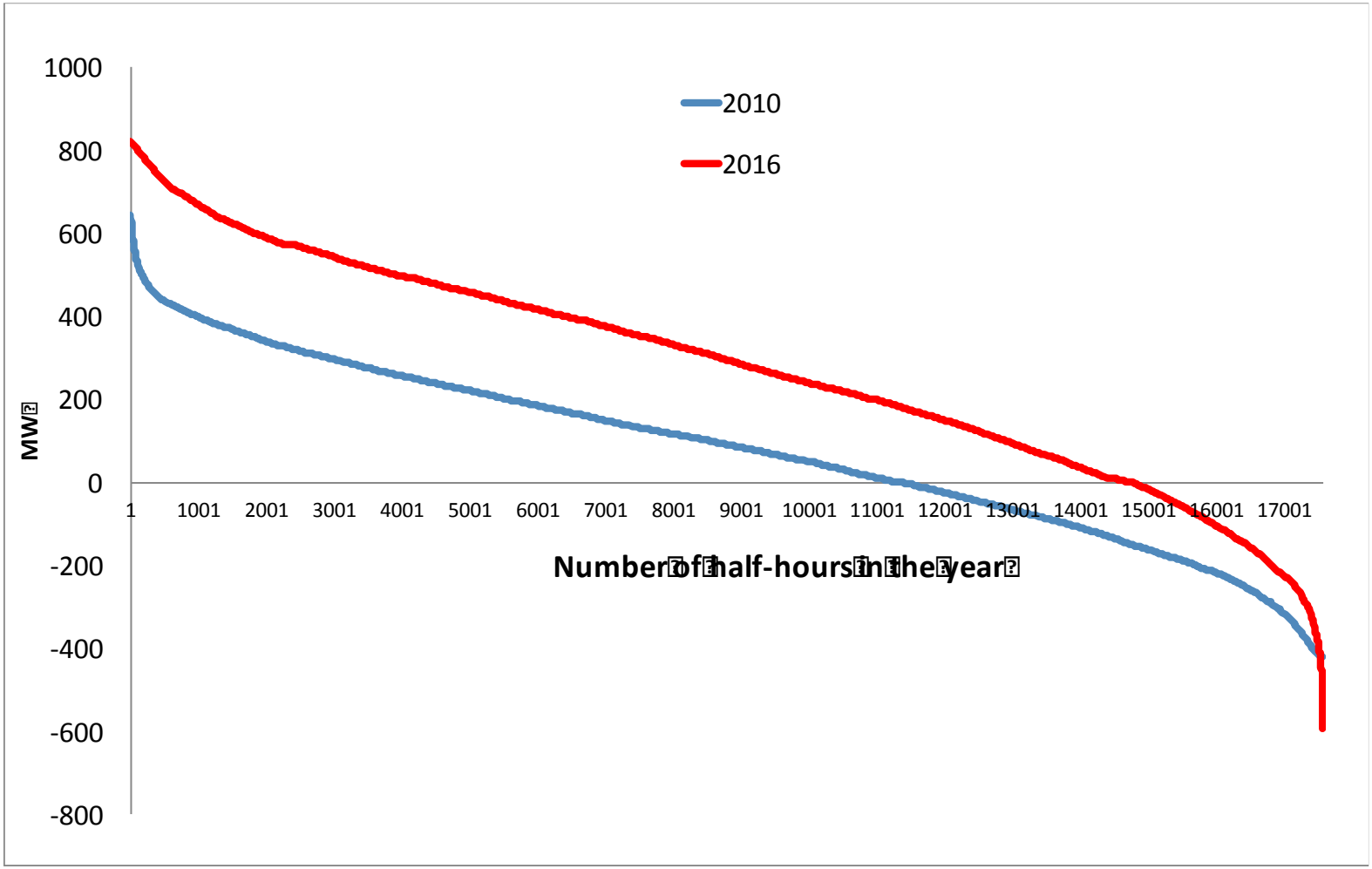
The rise of renewables and decline of coal is resulting in much greater reliance on interconnectors



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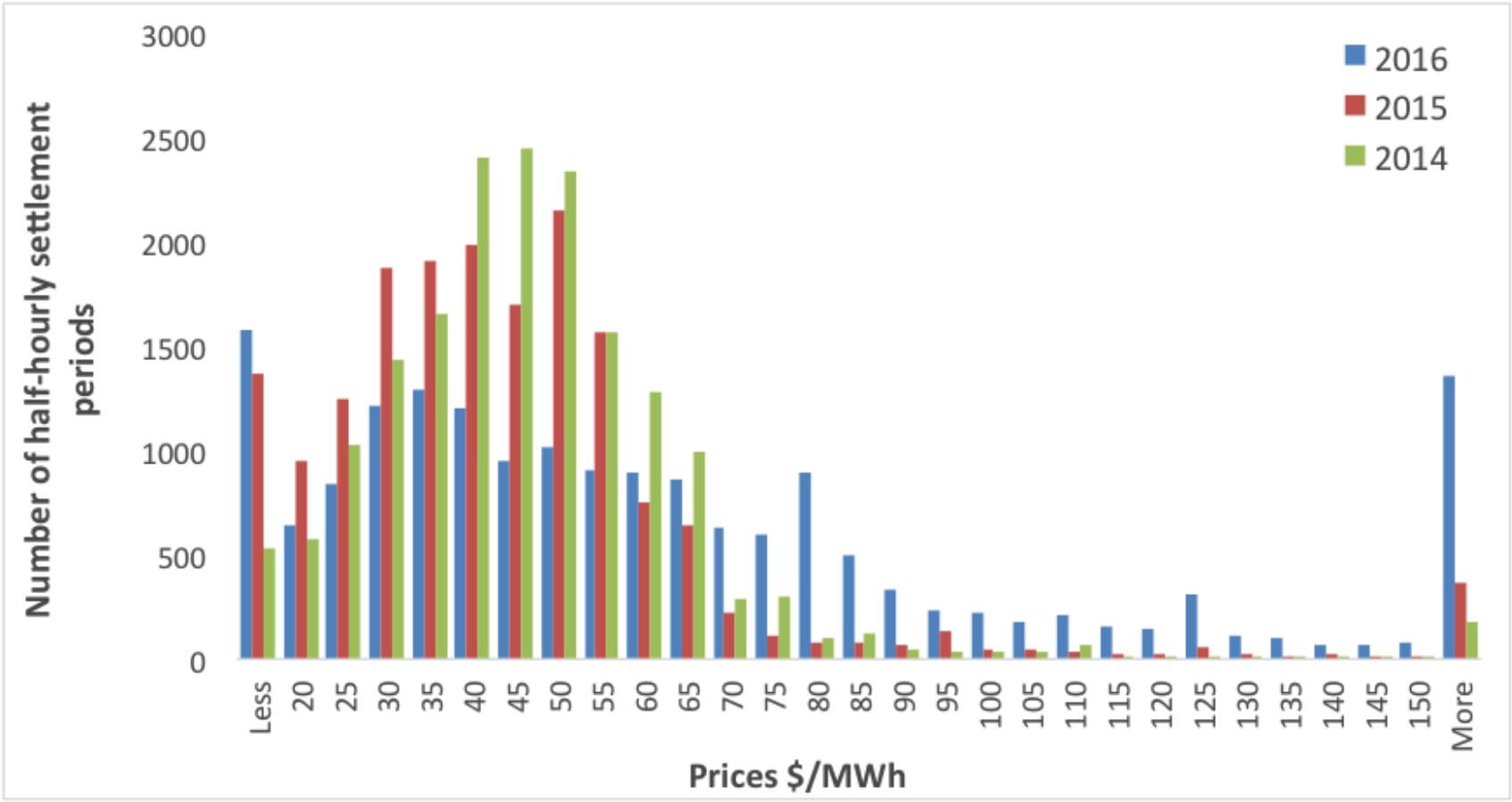
Concurrently with decarbonisation, the growth of LNG export has meant gas prices have more than doubled. This has driven up spot and contract prices in electricity markets



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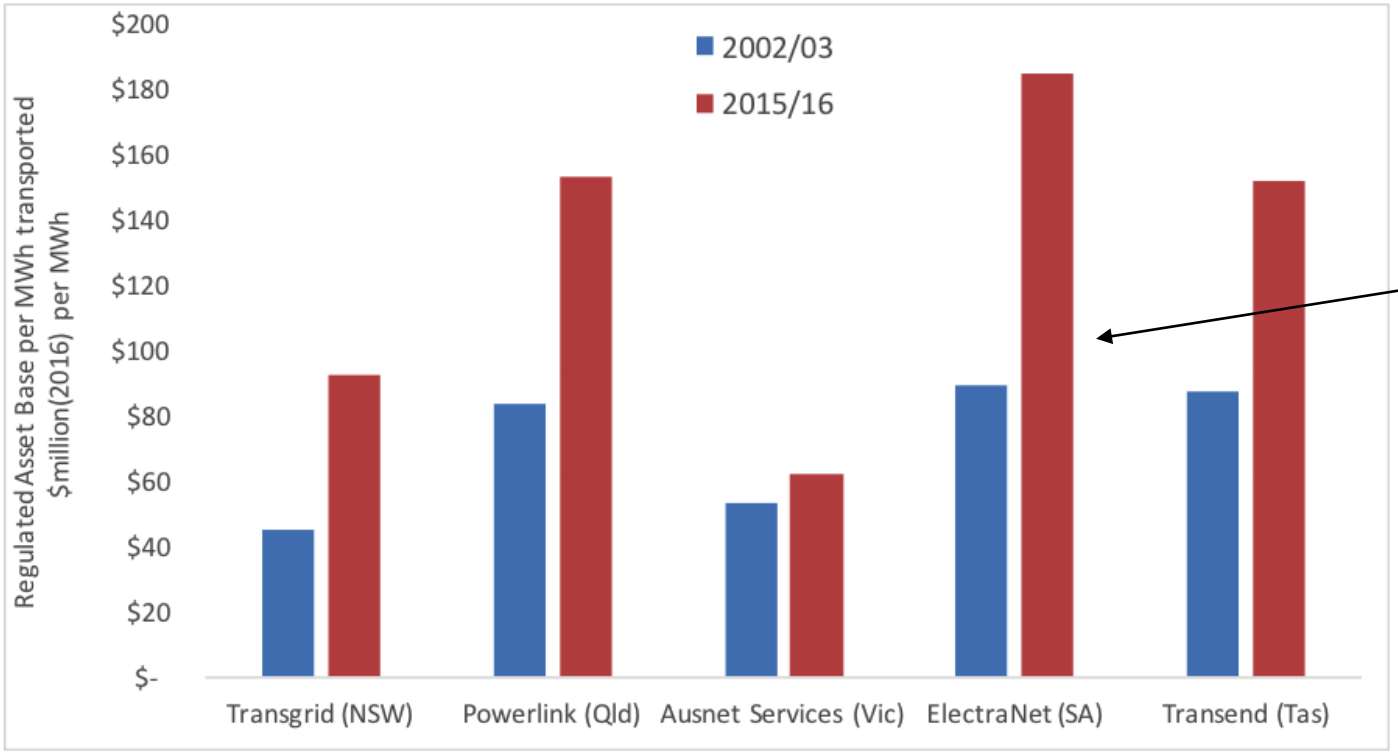
Networks have also become very expensive, largely reflecting regulatory failure



In SA regulated asset value per MWh transported has doubled over last 12 years

But transmission system is not secure against extreme weather: in 2016 severe weather led to major failure on three circuits resulting in 18 hour black out

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In the context of rising renewables, declining fossil and consequential system security concerns there is agreement on need for storage or substitutes/complements (i.e. generation or transmission)

- Sea-water pumped hydro in SA (along lines of decommissioned Okinawa plant) being examined;
- State government tendering for 100 MW battery (and Tesla's Elon Musk offers money-back guarantee to build 100 MW battery in 100 days)
- State government intervening in market to develop gas generation capacity;
- State government funding interconnection expansion studies.

Choosing between transmission and storage raises challenge of substitutes and complements

- Transmission line/substation, generator, pumped hydro, battery and price-responsive demand are substitutes and often complements. How to choose which one or combination?
  - Markets can resolve substitutability/complementarity between battery, pumped hydro, gas-peaking, price responsive demand.
  - But substitutability/complementarity between battery and transmission raises policy question: should regulated transmission providers be allowed to own batteries and recover costs through regulated charges?

And so, the key question

- Separation of transmission from generation reflects assumption that gains from competition more than off-sets loss of economies of co-ordination between transmission and production
- ***Should transmission be prevented from owning batteries for same reason?***
- ***If so, will separation of transmission planning from ownership facilitate co-ordination between transmission and batteries?***

In the context of rapid battery development, there is a logic for separating transmission planning from transmission asset ownership

1. Batteries can be excellent substitute and complement to transmission.

2. Transmission companies have incentives to expand regulated assets and so may be less likely to choose batteries before more expensive transmission alternatives

3. Therefore transmission asset owner that has exclusive right to plan transmission network may crowd out less expensive batteries.

4. History suggests regulators will be ineffective in preventing this.

5. Separating transmission planning from ownership presents a solution that allows of co-ordination of battery and transmission to be realised.

Counter-arguments seem hard to sustain

1. Integration of ownership and planning provides information not available to an independent planner ? Maybe, but if integrated owner&planner prioritises own interests, informational advantage will not produce outcomes in customers' interests.

2. Joint ownership and operation improves performance accountability? Maybe, but performance also affected by exogenous factors. Performance incentives can be applied even if planning separated from ownership.

3. Integration of ownership and operation allows regulatory incentives to reduce the cost of operation and development? Maybe, but Australian experience not supportive – better outcomes seen in Victoria where transmission ownership and planning is separated, compared to the outcomes elsewhere in Australia where ownership is integrated with planning.

Contract theory explains the dominance of regulation rather than contestable contracts in transmission development

- Transaction Cost Economics (TCE) says regulation is more efficient than contracts if:
  - future demand is uncertain,
  - large future capital outlays are needed,
  - assets are specific or relationship-dependent.
- TCE says, equivalently, where sufficiently complete once-off contracts are not possible, what starts out as a once-off contract turns into a contractual negotiation process that is akin to regulation.

But argument and evidence undermines case for regulation; contestable contracts starting to become common

- Transferring whole-of-life risk under long term contracts provides strong incentives for innovation and minimisation of development & operating costs.
- Consumers pay prices that reflect successful tenderers' revenue requirements rather than regulator's determination.
- TCE arguments less relevant in contracts for relatively unmeshed infrastructure such as interconnectors. In Britain, Ofgem's transmission tenders are proceeding along these lines.
- Concern about market power through asset-specificity and future relationship-dependent investment in one-off contracts, must be weighed against imperfect regulation.
- Transmission has been effectively procured through contract in the UK, Brazil, Chile, India, Peru, the United States and Canada. Setting availability targets - the main performance measure – has been uncontroversial.
- In Australia, evidence of contestable transmission is encouraging.

Summary

- South Australia is at leading edge of decarbonisation in Australia. Combination of renewables, rapid development of batteries & regulatory failure is motivating search for transmission arrangements that deliver benefit of co-ordination and preserve competition in production.

- Separation of transmission planning from transmission asset ownership has a compelling logic. Counter-arguments seem unconvincing

- Transaction cost economics explains the dominance of regulation rather than contestable contracts in transmission. But evidence of regulatory failure in Australia and of successful transmission tenders internationally (and in Australia) suggests greater use be made of contestable contracts for transmission development.