

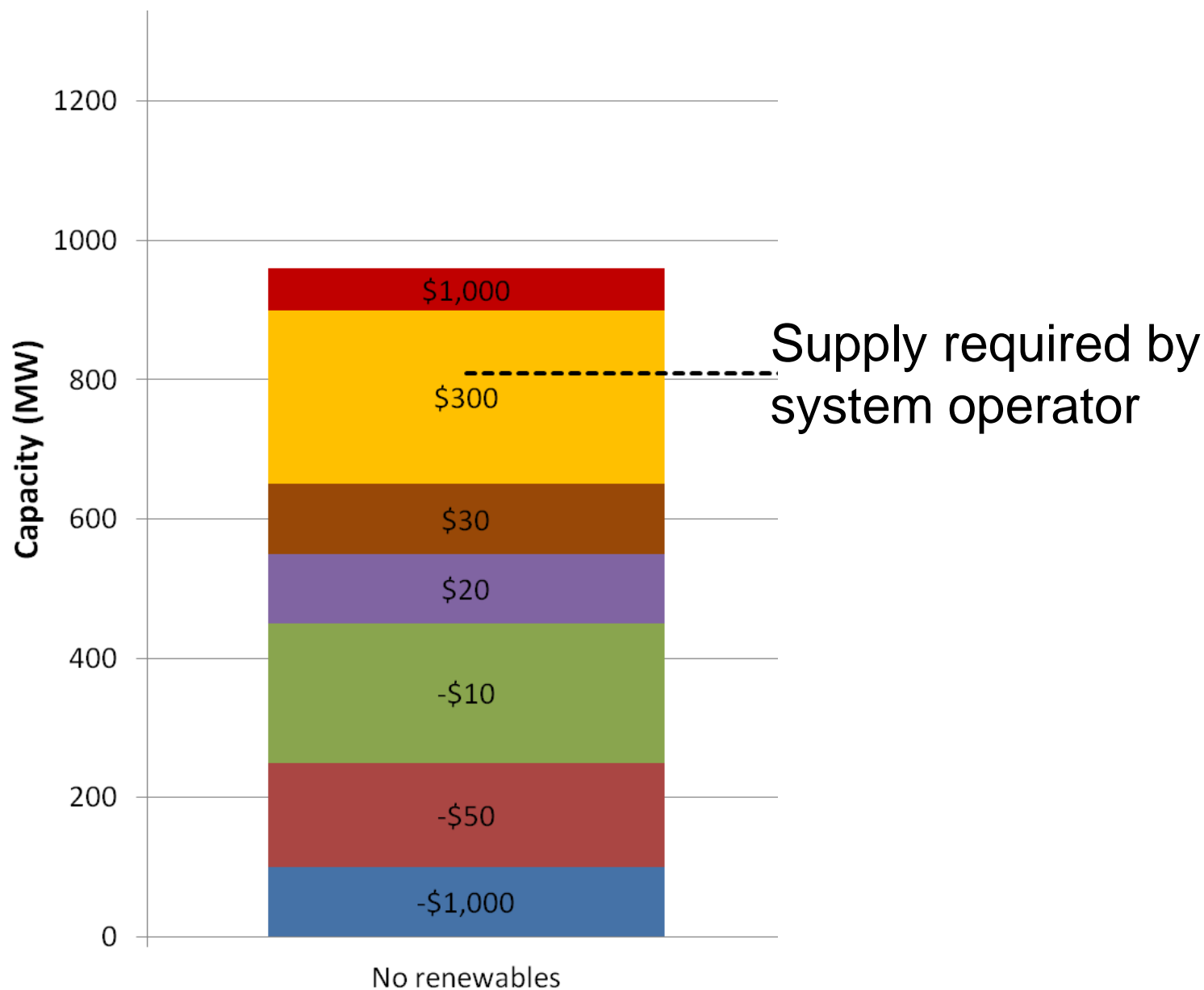
The “Merit Order Effect”

July 2012

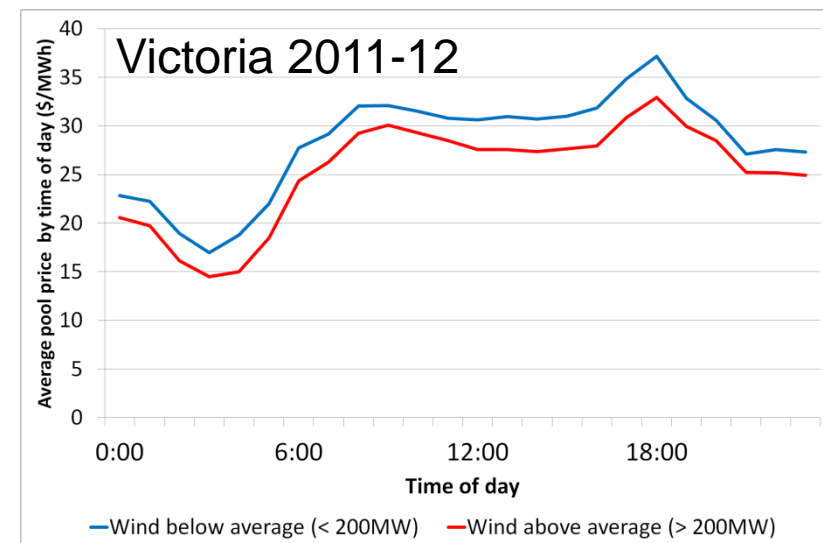
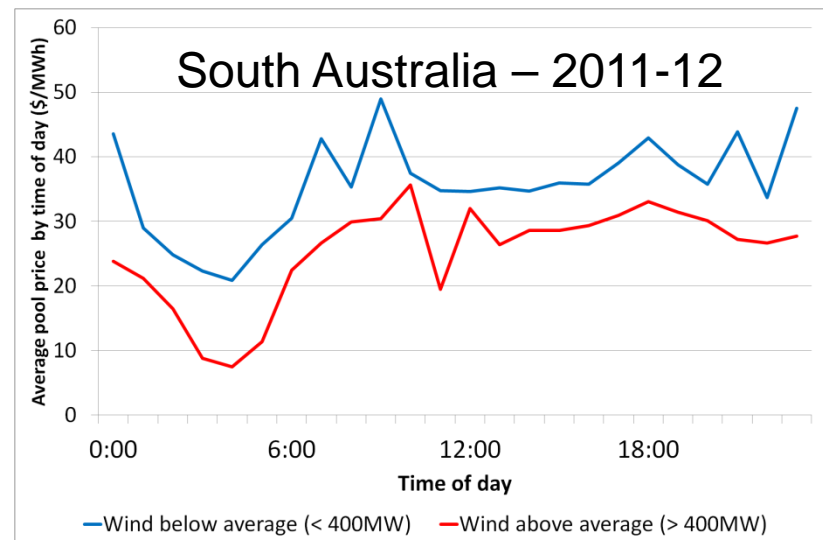
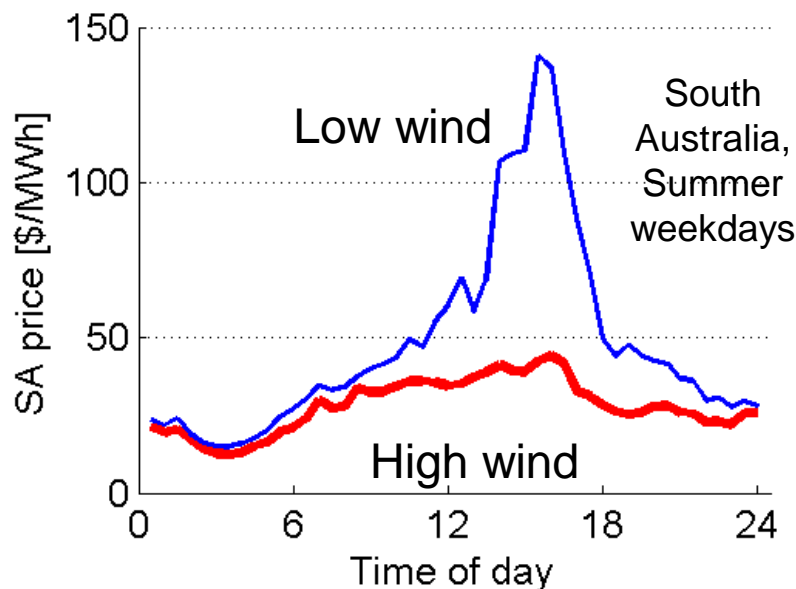
Dr Joel Gilmore
Dr Richard Bean

Clean Energy Week

The “Merit Order Effect”

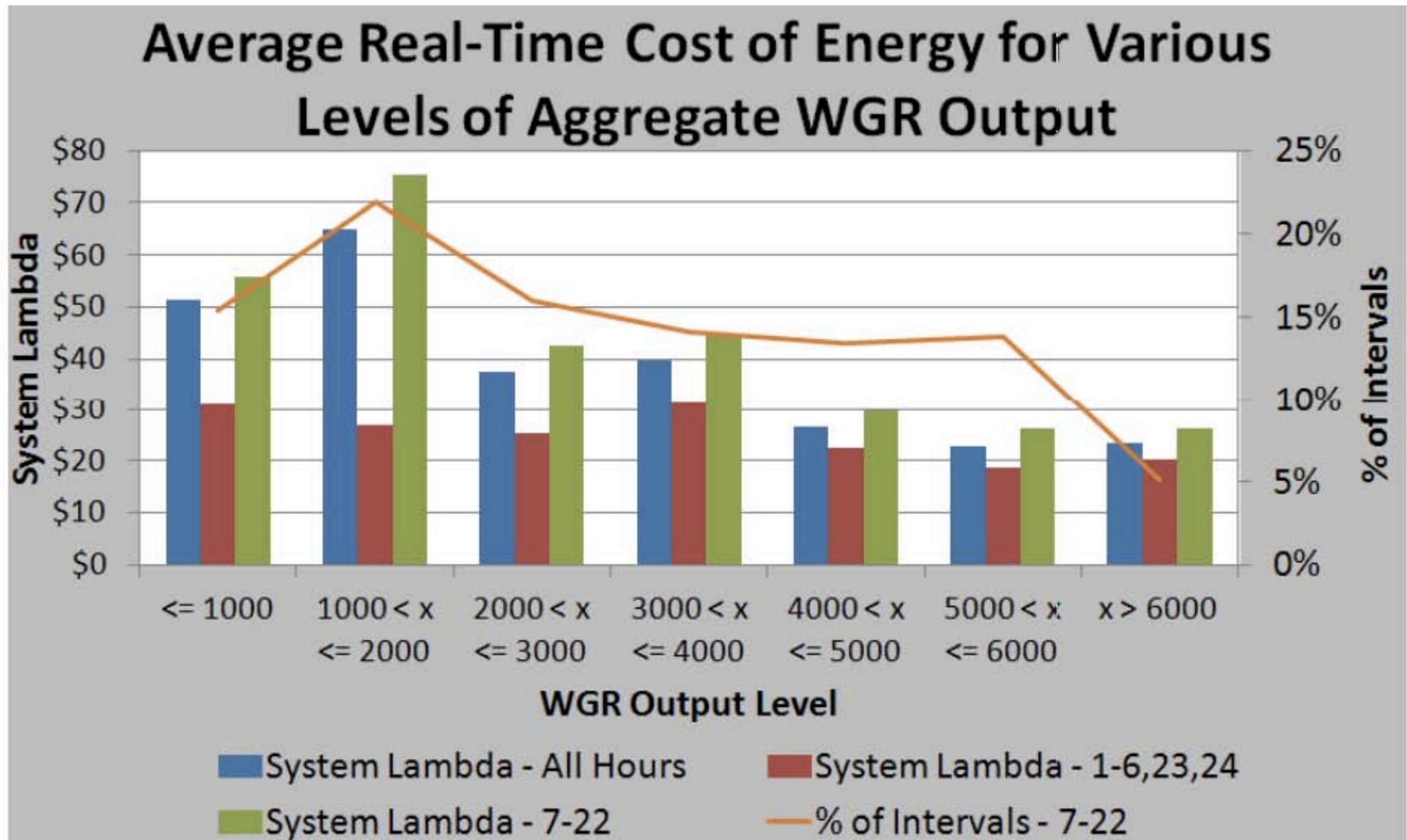


Merit Order Effect is already observed



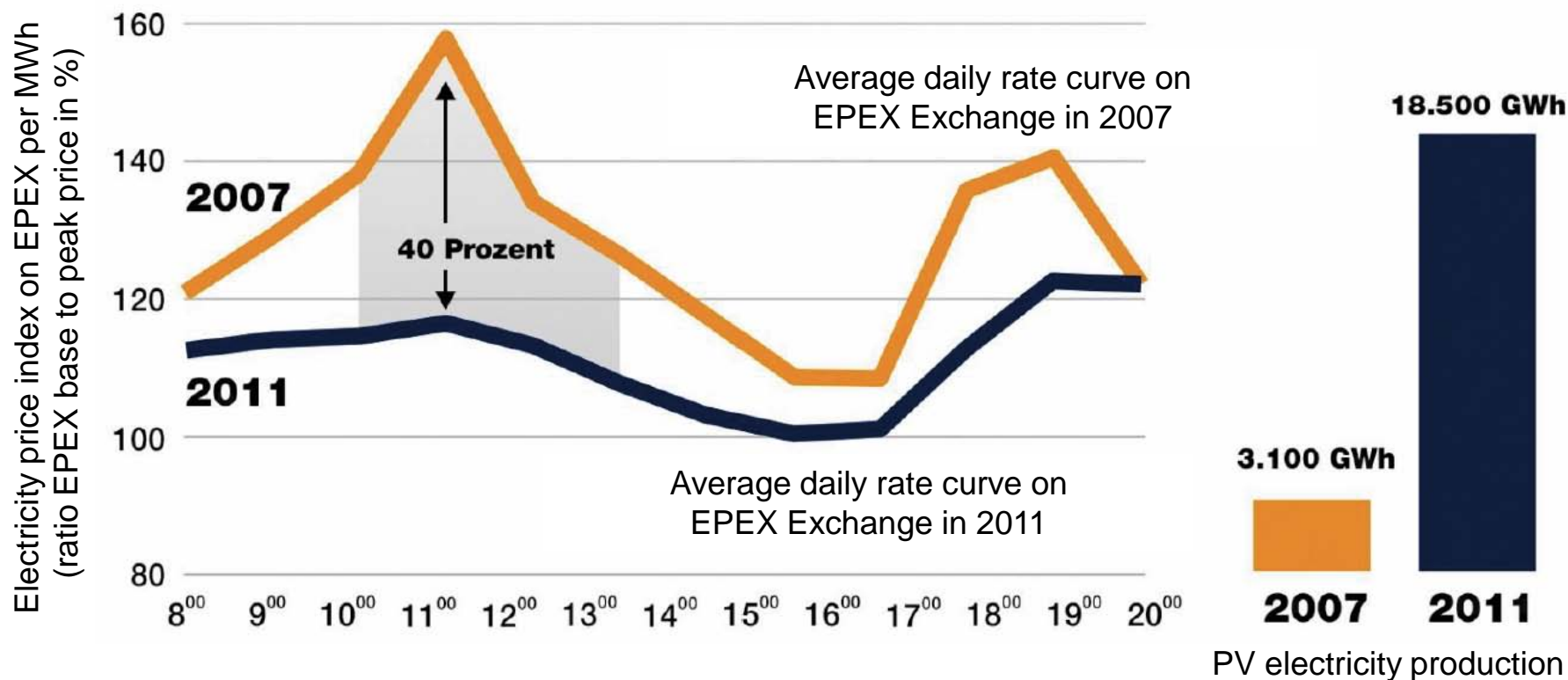
- Also in international markets
 - Texas (ERCOT), Denmark, Spain, Ireland

ERCOT



Also for solar in Germany

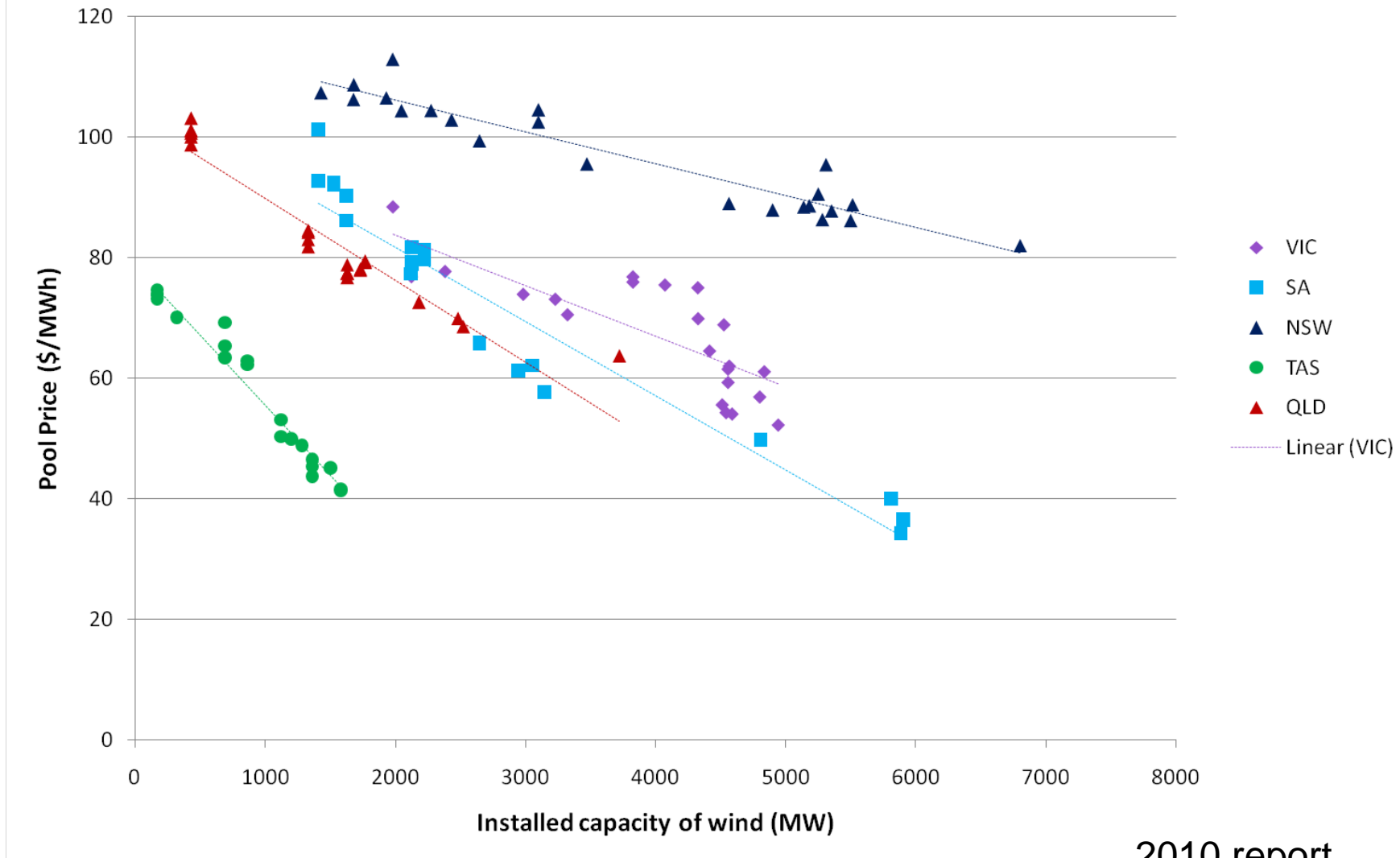
Solar photovoltaics in Germany



ROAM modelling - methodology

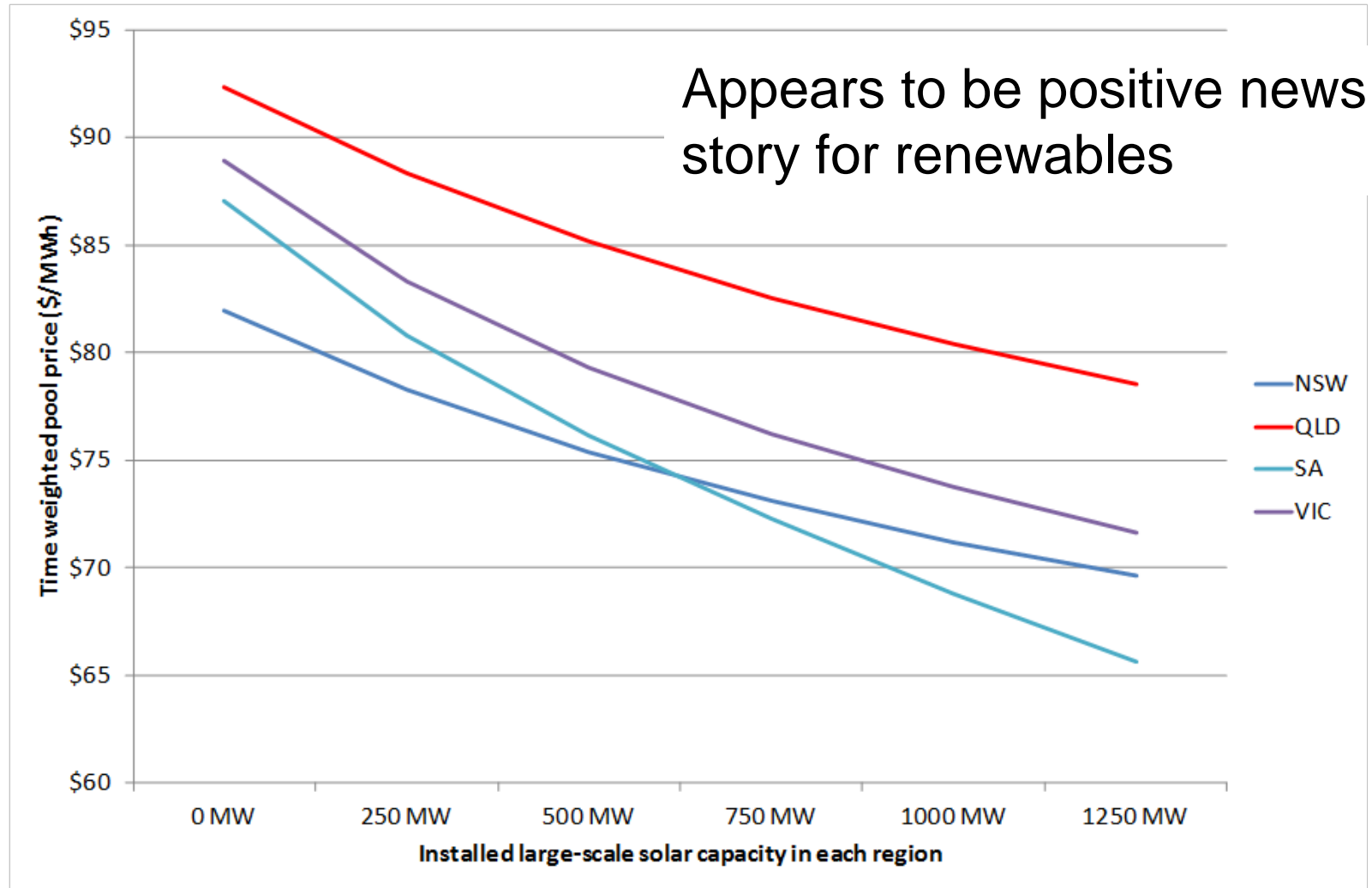
- Simulations with 2-4-C dispatch model
 - Forecast of 2019-20
 - Based on historical half-hourly bids for each generator
- Renewables modelling
 - Bureau of Meteorology hourly gridded solar data
 - Historical weather station wind speed data
 - ROAM's Wind and Solar Energy Simulation Tools
- Generation development plans from ROAM's market and least cost modelling

ROAM's modelling – wind in 2019-20



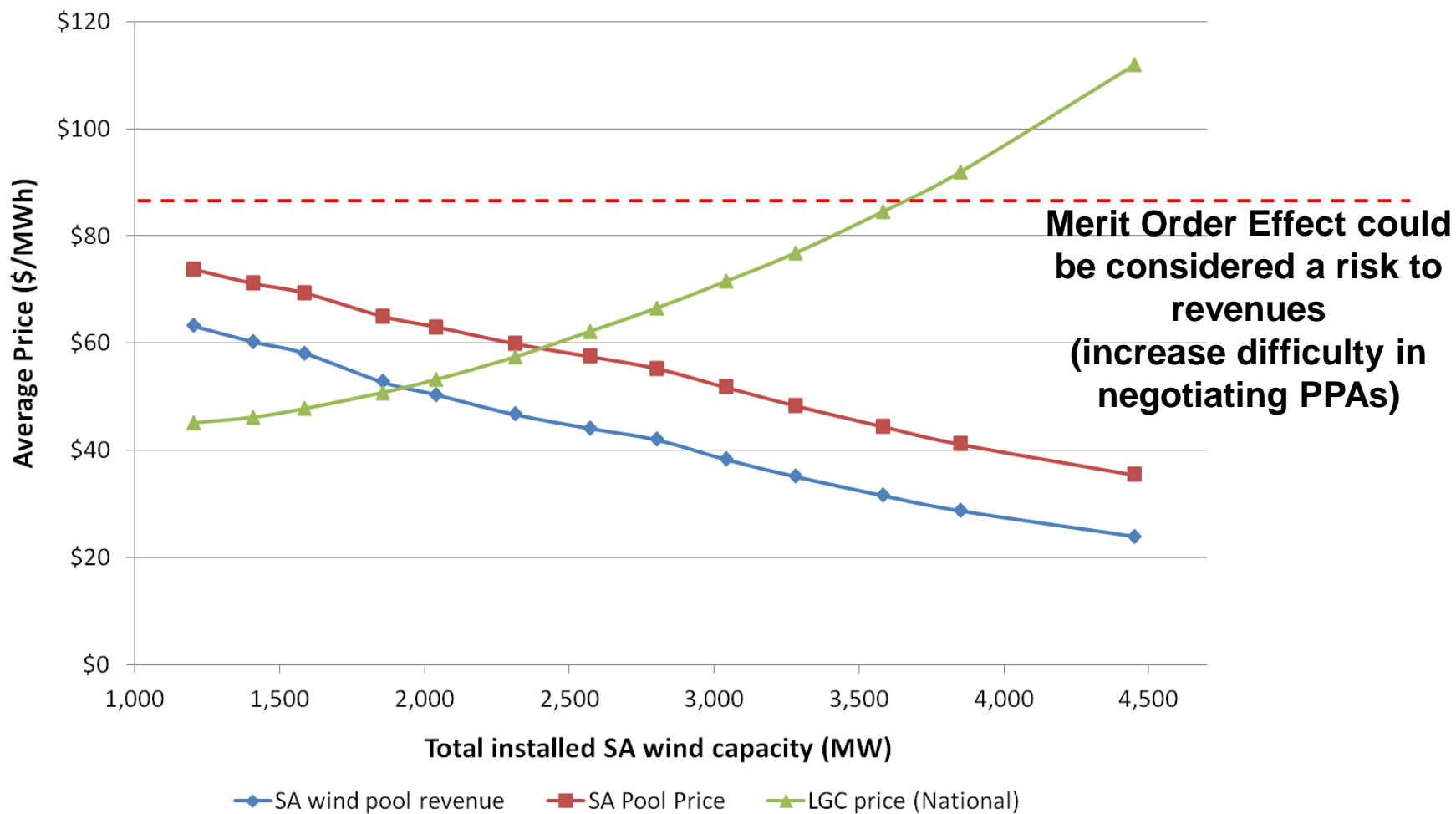
2010 report

Large-scale solar in 2019-20

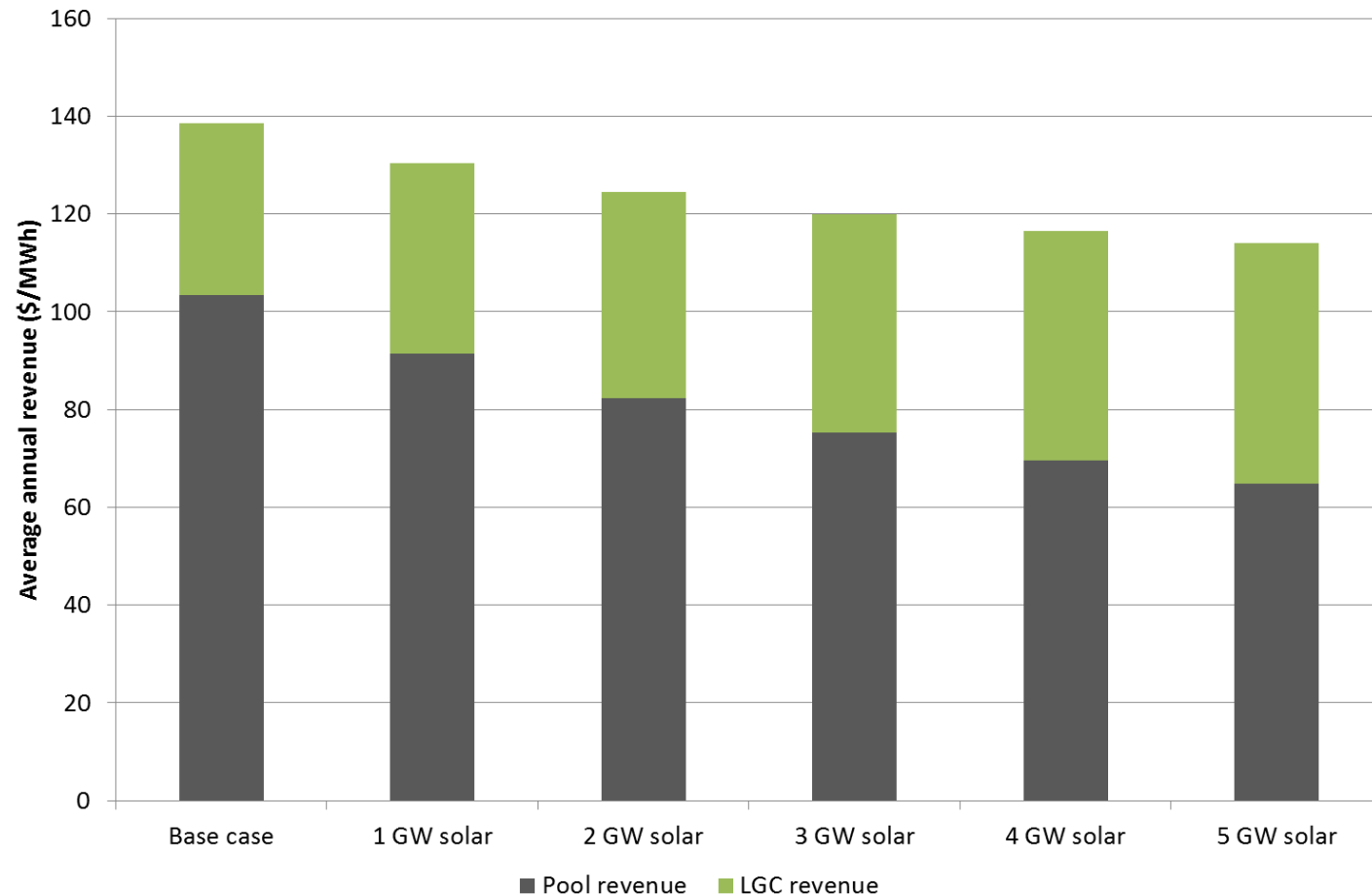


Solar Generation Australian Market Modelling, available from <http://www.australiansolarinstitute.com.au/reports/>

Renewable energy revenue at risk



Solar plant in particular

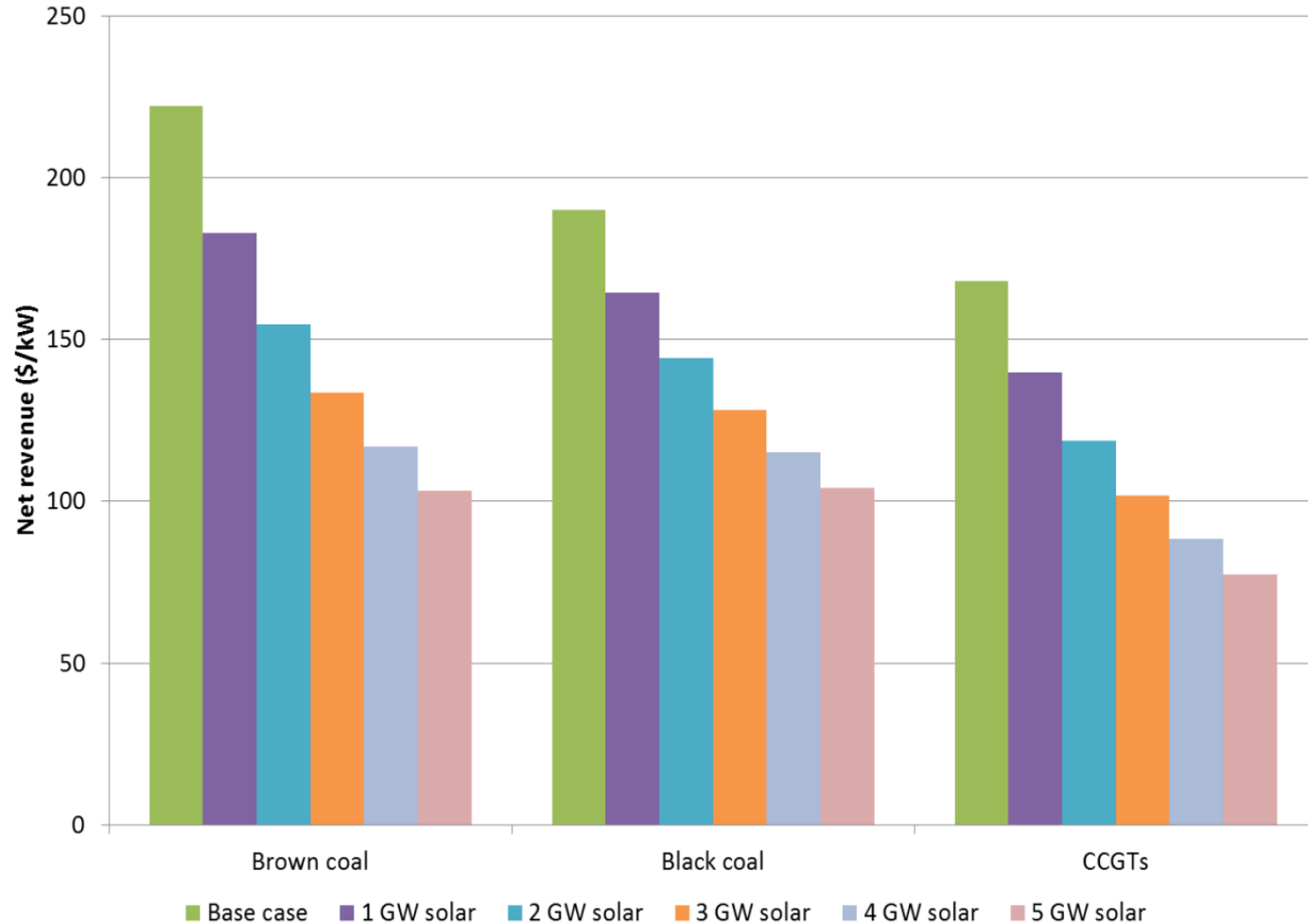


LGC price doesn't rise enough to compensate solar generators

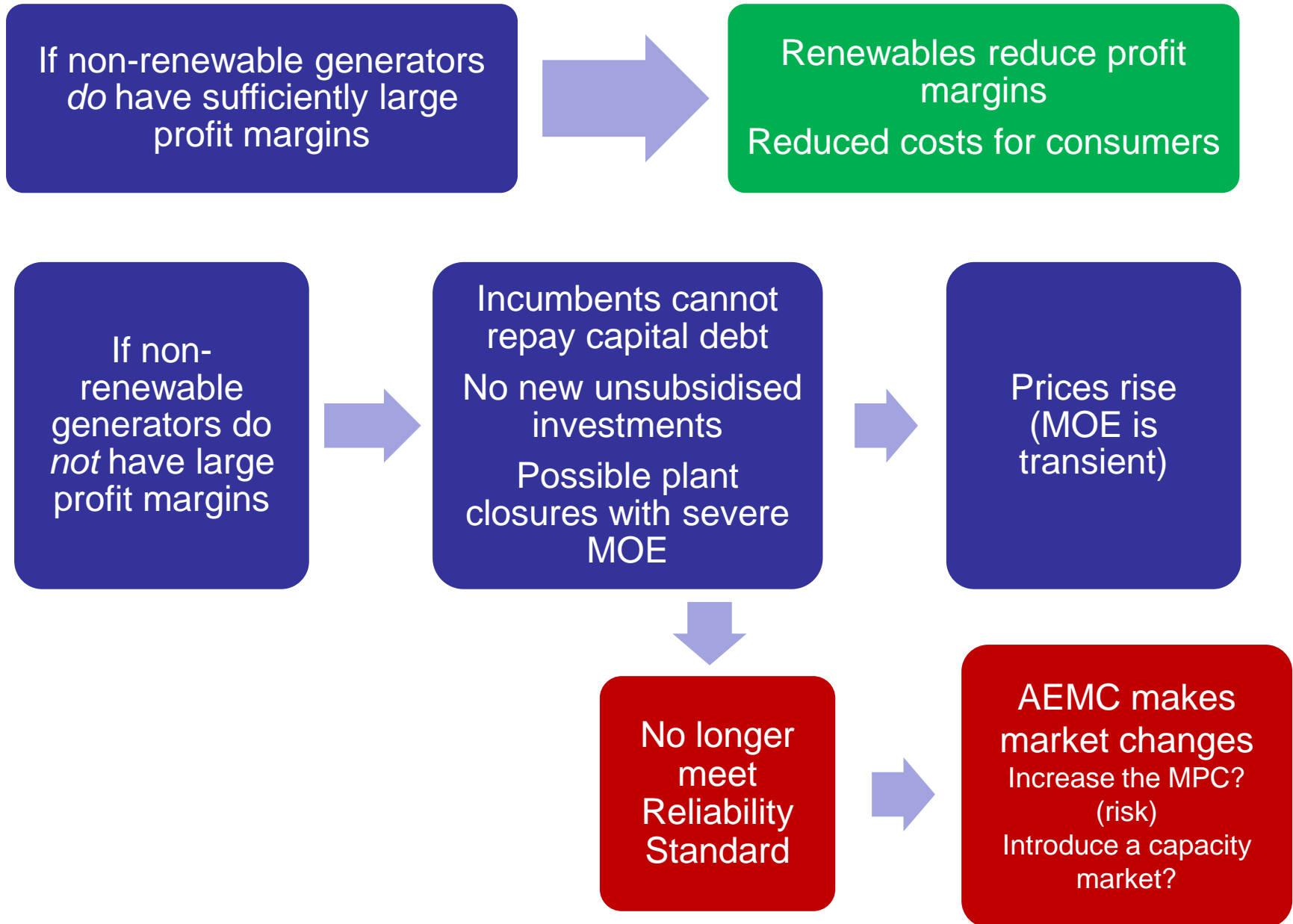
Merit order effect is a positive outcome
for renewables, with caveats

But is it permanent?

Generator revenues also reduced



Revenues net of variable costs
Must be sufficient cover fixed costs



Issue: Market Power

“We have seen generators exercising market power to drive up prices in New South Wales, South Australia and Tasmania over the past couple of years”
(AER 2009)

“Hydro Tasmania has substantial market power”.
“They are almost always the marginal bidder and can choose to set the spot price” (Electricity Supply Industry Expert Panel, 2011)

"Price spikes have become a recurring summer event in South Australia. There is limited transmission capacity to import electricity from Victoria, allowing AGL to set prices in peak periods around the \$10,000/MWh cap" (AER 2009)

- Vertical integration - owners of generation assets don't want extreme prices (also operate as retailers). Set the price to a reasonable level that covers costs.

Market Power Indicators

- 4-Firm Concentration Ratio
- Pivotal Supplier Indicator
- Residual Supply Index
- Hirschmann-Herfindahl Index

Tend to not capture presence of market power at times of tight supply-demand balance.

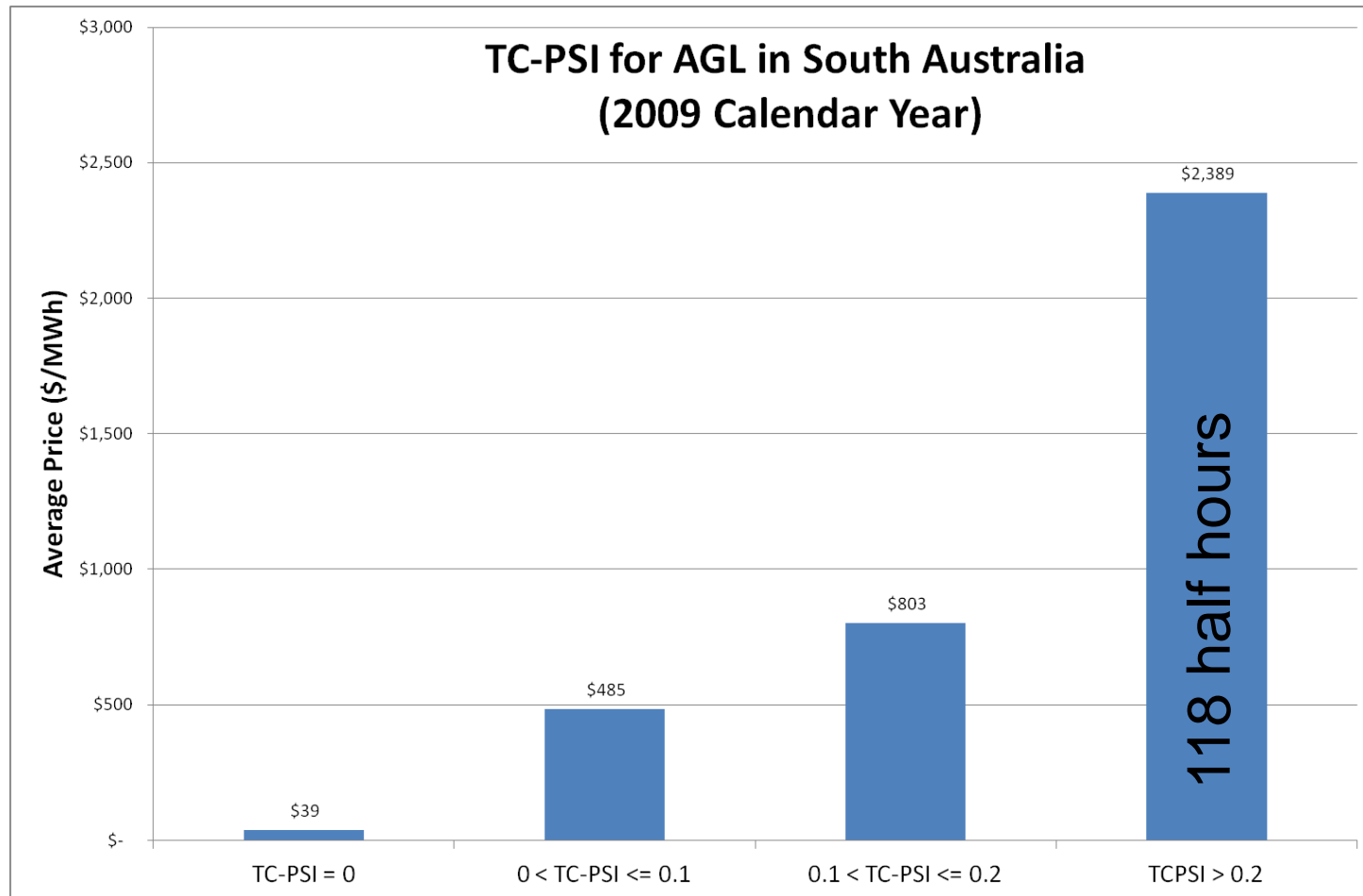
TC-PSI Indicator

- The transmission-constrained pivotal supplier indicator (TC-PSI) of Hesamzadeh et al (2011) addresses these weaknesses
- “Pivotality” measures the extent to which the output of a generator is required in order to satisfy the physical limits of the transmission system

TC-PSI Indicator (2)

- Takes transmission limits into account
- Modelling distinct generation firms in the NEM
- Measuring the “zonal must-run ratio” of a plant taking into account the import capacity of a zone
- Torrens Island power station in South Australia demonstrates use of indicator

Example of TC-PSI



SA: 2009 vs 2012

- For AGL in SA, in order to have the same number of periods in 2012 (summer) with $TC-PSI > 0.2$, would need extra 330 MW of scheduled demand
- Need long periods with high TC-PSI, but
- Significant growth in non-scheduled and semi-scheduled wind in SA since 2009

Market power conclusion

- The merit order effect is unlikely to be negated in the medium term by market power effects (in terms of demand growth)
- SA operational demand figures (10% POE) forecast by AEMO to be below 3,500 MW until 2020; plus Heywood upgrade being considered
- Plant retirement or mergers of significant participants would be required to affect market power indicators

Summary

- Merit Order Effect probably will reduce wholesale prices as more renewables are integrated, could be sufficient to offset low FiT costs on consumer bills
- But there are reasons to be cautious about pushing the “good news” story:
 1. Likely to be transient
 2. If not transient, may necessitate market restructure
 3. Could be perceived as a risk to renewables, making negotiation of PPAs more challenging
 4. Models may overstate the effect
 5. There are other renewable integration costs
 6. Market power may offset the effect