

The Future is Coming

What will the capacity market look like in the next 5 years
What issues will exist

Capacity Market Evolution

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What are capacity markets about

- The point of a capacity market is to assure adequacy of resources to maintain a reliable and secure power system
- Energy and ancillary markets influence the choice of capacity -- supporting tradeoffs between cost and various performance attributes
 - How much to pay for higher efficiency
 - How much to pay for greater flexibility
 - How much to pay for faster start or faster ramping
 - How much to pay for access to a particular location
- Policies (such as RE support) also matter but can be completely separate from the market
- In principal capacity markets deal with a seemingly simple problem, and perhaps often have not received the nuanced attention they require to function well
- But, a large amount of value is at stake

The biggest challenge is to reconcile resource adequacy and quality against forces and policies that are always evolving

- What are the conditions under which supply and demand resources are equivalent
- What are the specifications that render a resource eligible for a full vs partial vs no capacity payment
- How is “capacity” verified and/or penalised if it does not do what it was expected to do?
- What if capacity is in the wrong location?
- What are the assumptions about what the energy and ancillary services markets are doing
- What are the assumptions about the policy environment and the commercial risk framework

Not all of the problems with capacity markets start within the capacity market....

Considerable concern about excess capacity

- Need to separate the existence from the cost
- Who bears the cost of excess
- What is the purpose of the capacity market
 - Obviously to support timely capacity
 - But realistically it is a value management mechanism as well – it reshapes the financial risk of excess and shortage
 - It addresses the question of how much we are willing to pay to avoid shortage – and what type of payment that is
 - It also offers protection to investors against certain types of policy risks such as the entire renewable energy situation which takes place largely outside of the design of the electricity market

Energy systems are becoming more capital intensive and the transition has been a rocky road

- The move from coal and gas to solar, wind, and batteries represents significant capital intensification of each kWh generated
 - At the same time the minimum scale of each capacity increment is decreasing, as panels, wind farms, and batteries come in a wide range of sizes, much smaller than the traditional thermal power station
- But no country has figured out how to properly modulate the addition of RE capacity to match demand
- Instead, thermal capacity, and the shareholders of traditional power systems, have, in many cases, provided the cushion
- They don't like it. They won't be able to do it forever.



Too much capacity at once, not modulated by market forces -- funded often and substantially by tariff avoidance and material value transfers

Does Nevada's Controversial Net Metering Decision Set a Precedent for the Nation?



What Nevada's decision could mean for other states

by Julia Pyper

February 04, 2016

Regulators said the order was designed to make solar customers pay their fair share for use of NV Energy's grid. Solar companies warned that the changes make rooftop solar economics unworkable.

Stakeholders take sides that suit them -- who represents the "overall market"

Federation of German Consumer Associations sees no Need for Capacity Market

Published on October 4, 2013 in Conventional, Electricity and Grid. 1 Comment

Tags: bdew, capacity market, consumer association, grid reserve, security of supply, vzbv.

The Federation of German Consumer Associations (Verbraucherzentrale Bundesverband, vzbv) opposes the introduction of a capacity market in Germany and therewith directly rejects the request of the Federal Association of the Energy and Water Industry (BDEW). Vzbv believes that the current instruments are presently sufficient to guarantee security of supply. The establishment of a capacity market only would result in higher costs for the German customer.

Pricing structures that invite distortions, create conflicting markets, and redistribute (as much as, or possibly more than) they create wealth

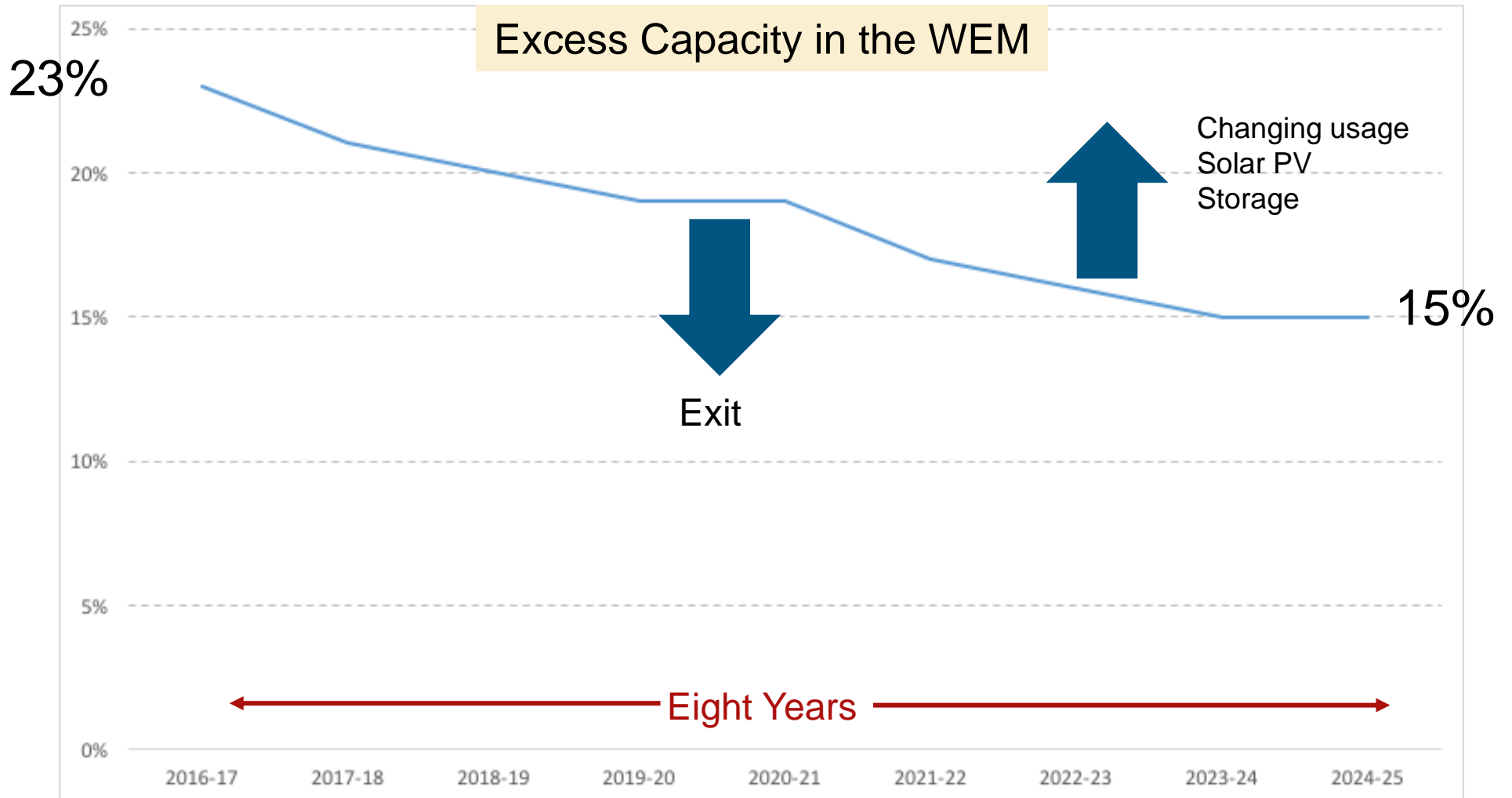
- Markets work when they subsume all the relevant inputs and outputs within the market itself – no externalities and no leaky buckets, exceptions, free-riders, or other distortions

The signs of reform fatigue were never starker than when the COAG Energy Council, the central body comprising all energy ministers, recognised the urgent need for network tariff reform to produce fairer and lower prices, and the Australian Energy Market Commissions set about delivering it. Now state ministers seem to be retreating because the changes are complex and **removing unfair cross-subsidies creates losers.**

Josh Frydenberg must clean up Australia's energy policy mess
by [Tony Wood](#)

- The idea of a capacity market of the future starts with cleaning up the present. Until then, don't expect too much...

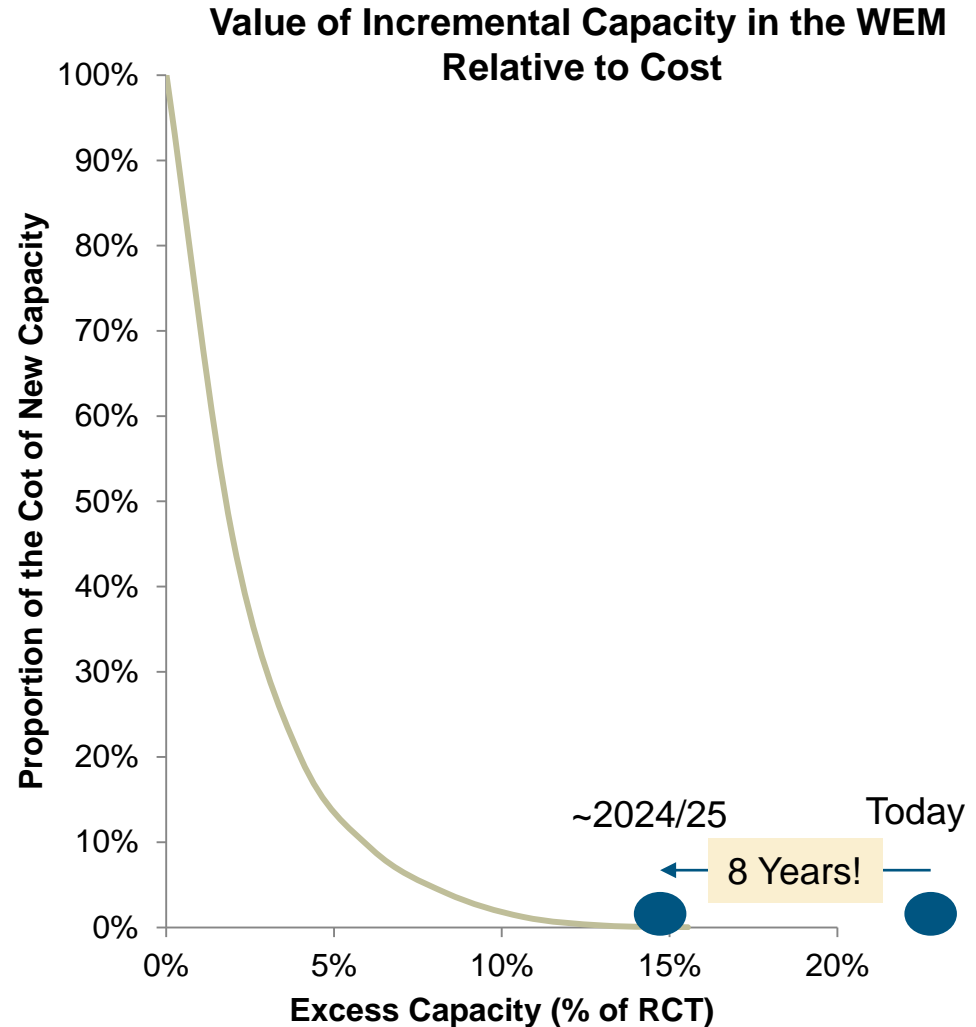
A lengthy transition



Current as of mid 2015

But transitioning from a capacity mechanism to a capacity market is tricky

- The starting point in WA is extreme
 - Substantial excess capacity
 - Low (if any) growth in electricity demand
 - Continuing growth in solar panels and distributed energy systems that largely operate outside of the economics of the energy market
- An instant transition would bankrupt the industry
- So what are we looking at?



What has to happen

- The energy market and the environmental and technology agenda are out of sync
- The presumption is that the environmental and technology agenda can overlay the market and the market will sort it out underneath it all – a balancing mechanism
- The energy market no longer supports new investment, as there is none needed – it has become a rationing mechanism whose purpose in economics seems more to be to usher the least efficient out rather than the most efficient in
- Many countries – including Australia – have enjoyed a period of disruptive policy which has contributed material amounts of capacity, reshaped the daily load curve, redefined the timing of traditional peak demand, introduced much greater demand for ancillary services
- What does this all mean for capacity markets?

A capacity market 10 years from now may be quite different

- We will learn more about loads and controllability from experience with demand response and distributed generation and technology
- We will see an explosion of new forms of capacity suitable for different situations
 - Much wider participation of capacity types including many more forms of (actively or passively aggregated) demand response
 - The market will pay the clearing value of capacity whatever that is
- We may need locational signals for capacity markets or at least locational adjustments to capacity that is not in the right place
 - It's hard to see the value of locational pricing signals until (after) someone has put something in the wrong place
 - Energy markets without locational pricing at least provide some signal through the prospect of being constrained off without compensation
 - But if you are constrained off, should you still get a full capacity payment? Or should there be some adjustment based on the effectiveness of your capacity at your location?

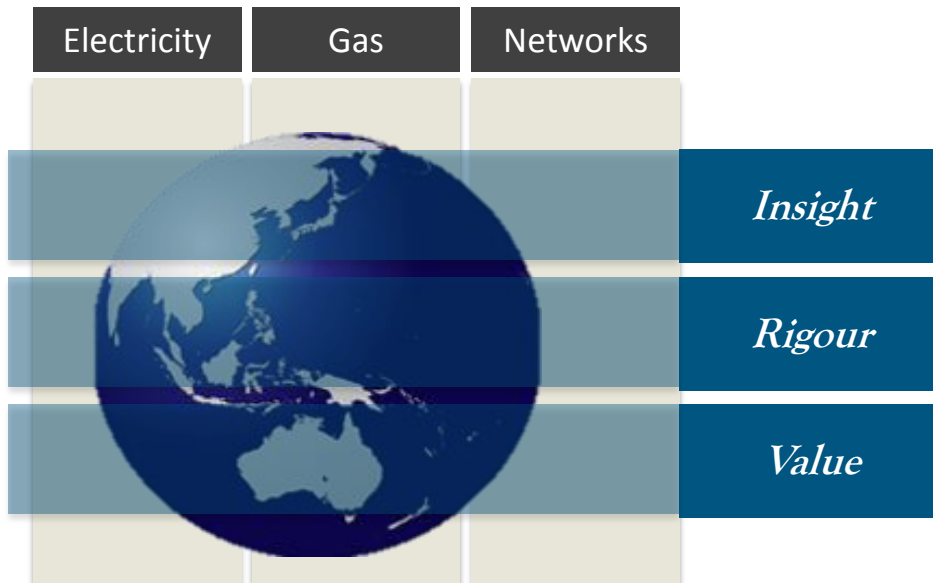
Features of a future capacity market

- Demand response will become more important and will shift in terms of when it is most valuable
 - Capacity is a broad church. In less than 2 percent of all hours would incremental capacity have material value.
 - RE resources are likely (particularly solar) to compete with natural gas for day time generation, leaving responsiveness and the evening peak to receive more attention – how will this align with industry?
- Ancillary services markets will more greatly influence the choices of capacity additions
- The value of capacity will become more volatile
 - Making the environment riskier for retailers and investors in larger capacity – the efficiency benefit will have to be big enough to overcome this
 - More friendly in the longer term to DR, supported by technology and information systems to better integrate intermittent RE
- Energy and environmental objectives will need to become more aligned and consistent
 - What is the risk environment in which stakeholders are supposed to operate fairly and transparently?

A view

- “The ambitious objectives set by Denmark and other countries in terms of renewable energy penetration in existing power systems will inevitably induce a paradigm shift in the design and operations of such power systems.
- **Owing to the changes in key features of electricity production and demand, not only hardware-related advances are necessary: it is of utmost importance to rethink the way electricity is exchanged and priced through markets. Future electricity markets must be able to optimally deal with the dynamics and uncertainties of renewable energy generation, as well as with dynamic and flexible offers on the demand side.**
- They should fairly re-distribute the increase in social welfare while **providing enough returns to electricity producers for them to make appropriate investments**. It is the core objective of the ‘5s’ project to forge the scientific and technical core for such future electricity markets to become a reality. This will be in order for the Danish power systems (and others to follow) to have the proper market mechanisms to cope with 50% (and more) of renewable energy in the power systems. In that objective, the ‘5s’ project will propose new market mechanisms in an advanced optimization framework, from the base methodological developments to the practicalities of their implementation requiring a parallel computing environment.

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