EDITED TRANSCRIPT OF PROCEEDINGS

ENERGY SECURITY BOARD WEBINAR #1

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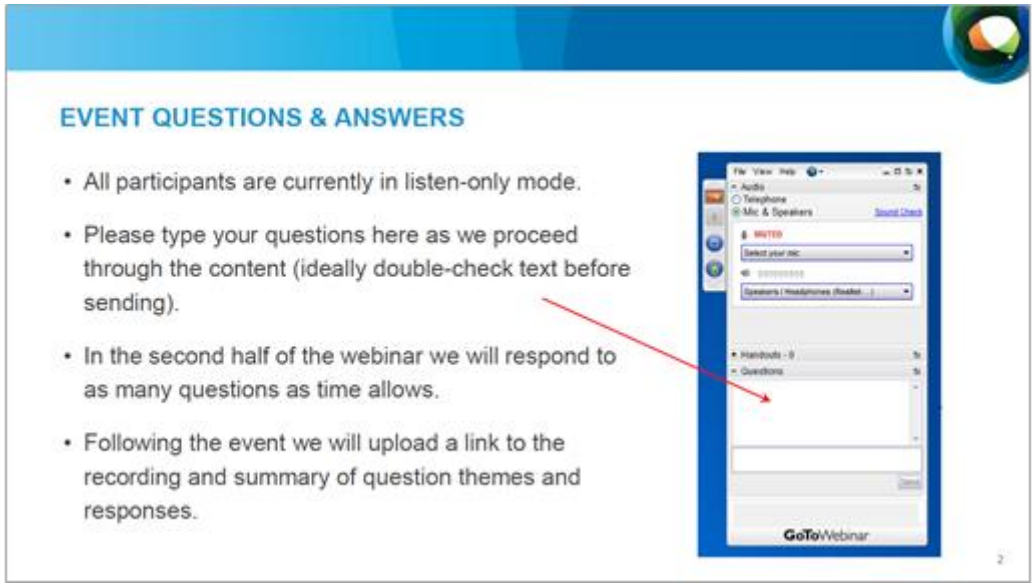
SYDNEY
TUESDAY, 30 SEPTEMBER 2020

MR PATERSON : Good morning everybody. I appreciate you being with us today as we present the consultation paper for the Post 2025 electricity market design program. The speakers on today's session are Kerry Schott, Chair of the Energy Security Board, David Swift, Deputy Chair of the ESB and Matt Garbutt, Project Director for the Post 2025 program



We will aim to deal with as many questions as time allows in today's session. Please type in questions as we go through the content into the panel that you can see on the right-hand side of the screen and we'll seek to address as many of those questions as we can. Following the event, we'll upload the major themes of the questions themselves and respond to any of the questions that we haven't been able to get to today.

I wanted to mention that we do have some media with us. Welcome Giles Parkinson. So, without further ado we'll hand over to David Swift just as a quick welcome and we'll come back to Dr Kerry Schott shortly as well. Thanks David.

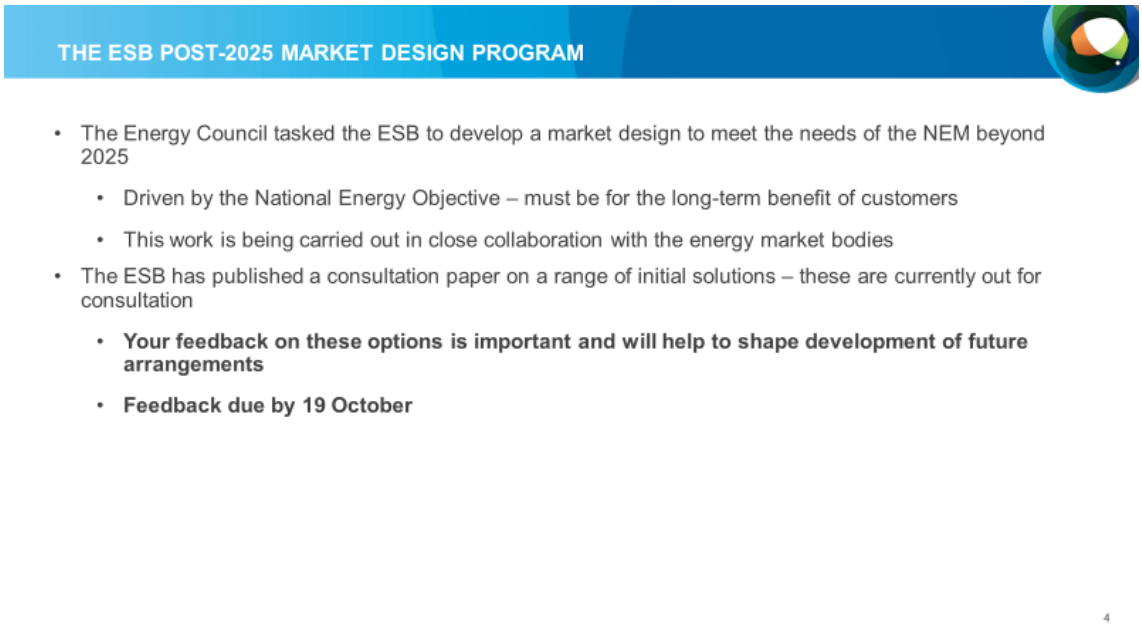
MR SWIFT: Thanks Mark, and welcome everybody. Next slide?

What we wanted to do today is to take you through the Post 2025 electricity market design consultation paper that's out at the moment. We particularly want to highlight the challenges that we see and the issues that need to be addressed and then highlight the range of areas where the ESB has set out its thinking on reform options. Kerry, can we hear you now?

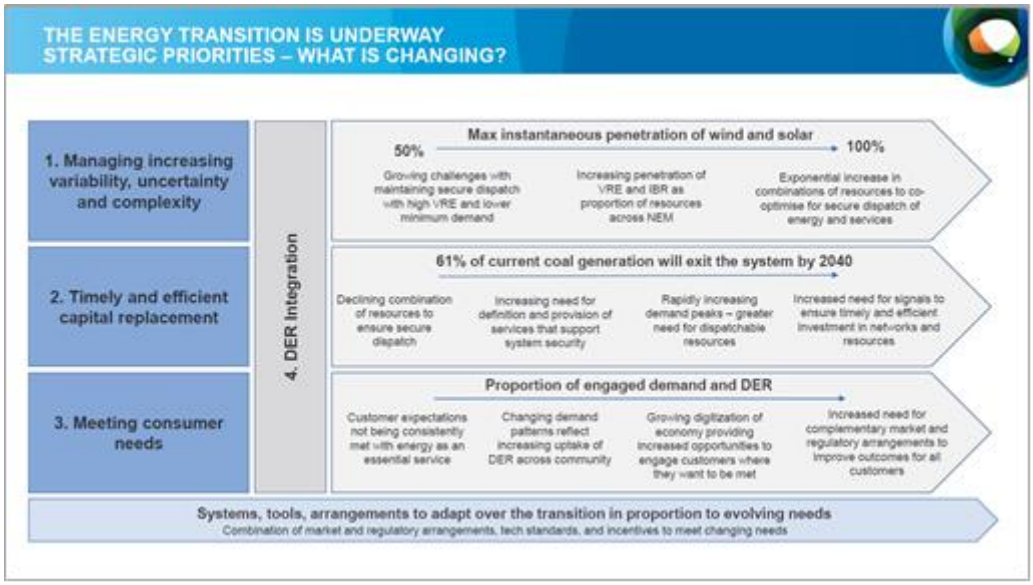
DR SCHOTT: Yes, I hope so.

MR SWIFT: Very good, excellent, I'll hand back to you then Kerry.

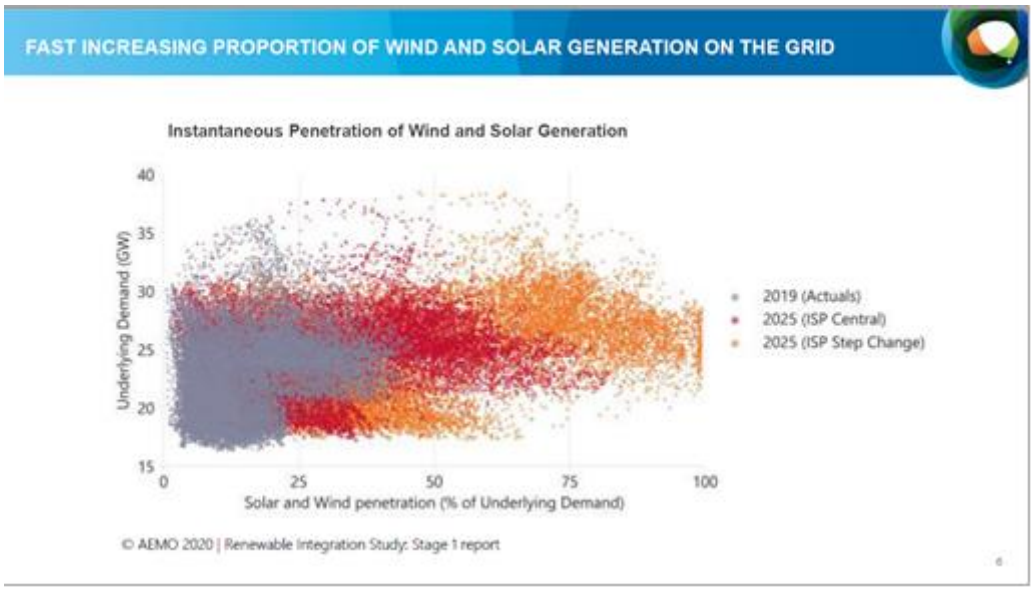
DR SCHOTT: Thanks David. I'm just going to quickly run through the changes that have happened in the market and why the Council of energy ministers asked the ESB to look at a new market design for the national electricity market (NEM), or changes to the existing design for the NEM.



This just basically says that the market design - and we do not need to dwell on this slide - the market design is based on the National Energy Objective which is basically the long-term benefit of consumers so we're very focussed on achieving that goal. Your feedback on where our work is up to is due on 19 October and we really want that feedback as David said. Next slide.



This just basically sets out the main changes that have been happening in the market. We're seeing increasing volatility, certainty and complexity. It's making life very difficult for the operator and also the market participants in the industry. We want to see timely and efficient capital replacement as generators retire and we want to meet consumer needs, and consumers have been changing in the terms of their engagement from what it used to be. On top of all of that we've got distributed energy resources (DER) integration required. Rooftop solar and other smart appliances behind the meter are really causing quite a revolution at the business and retail customer end. Next slide.



This is a picture out of the study that AEMO did of renewables integration and this is about large-scale wind and solar penetration. The grey part of this graph is where we were up to with wind and solar penetration last year. The red is where we anticipate we'll probably be in 2025, in five years' time. So, by the time our market design work is really starting to be fully implemented, we're anticipating that we'll be having days where the NEM is running on 75 per cent wind and solar. If we have more renewables in the system than is currently in the central scenario that we're anticipating, then we will have periods where that 75 per cent is much greater, and obviously, that's got huge implications for how the system needs to be run. Next

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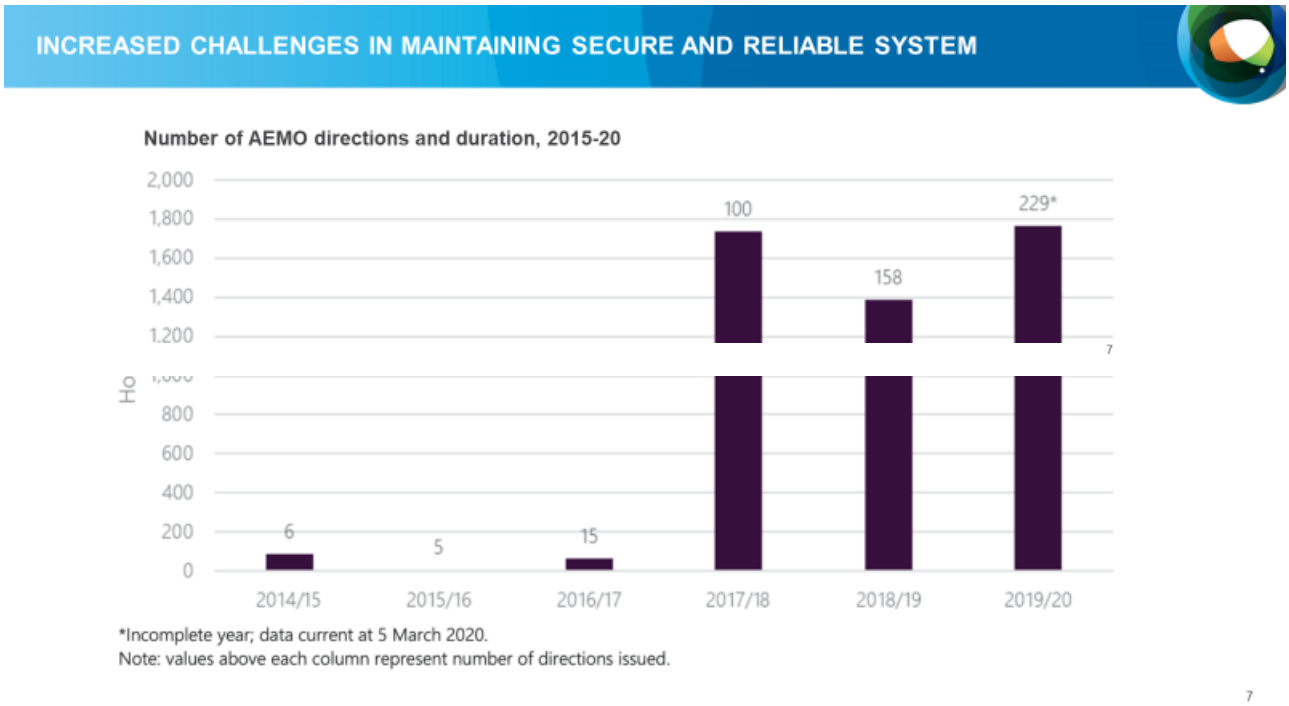
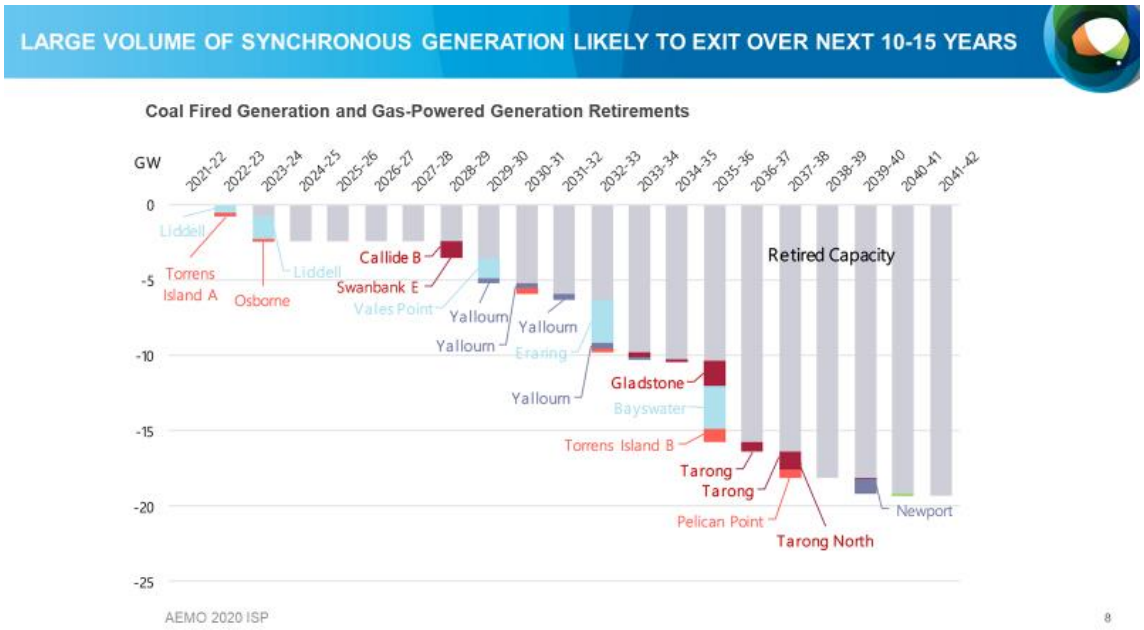
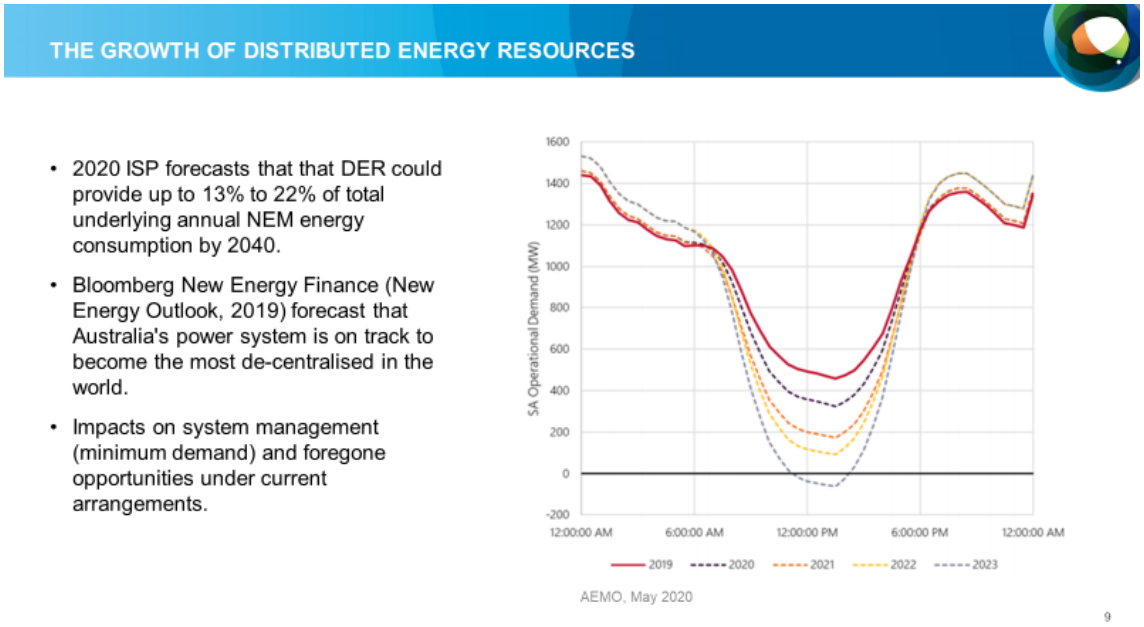


The problem that we're having as we've indicated in the Health of the NEM, the biggest problem that we're having is around system security and that involves maintaining frequency, and inertia, and system strength within acceptable ranges. This chart just shows how since 2015, AEMO has been intervening in the market and it used to not intervene very much at all, only in emergencies. It is now intervening up to 230 times a year and rising. The important thing is that those interventions and directions are actually almost 100 per cent concerned with system security. They are not concerned with any shortage of capacity. They are largely related to system strength, inertia, and frequency issues. Next slide.

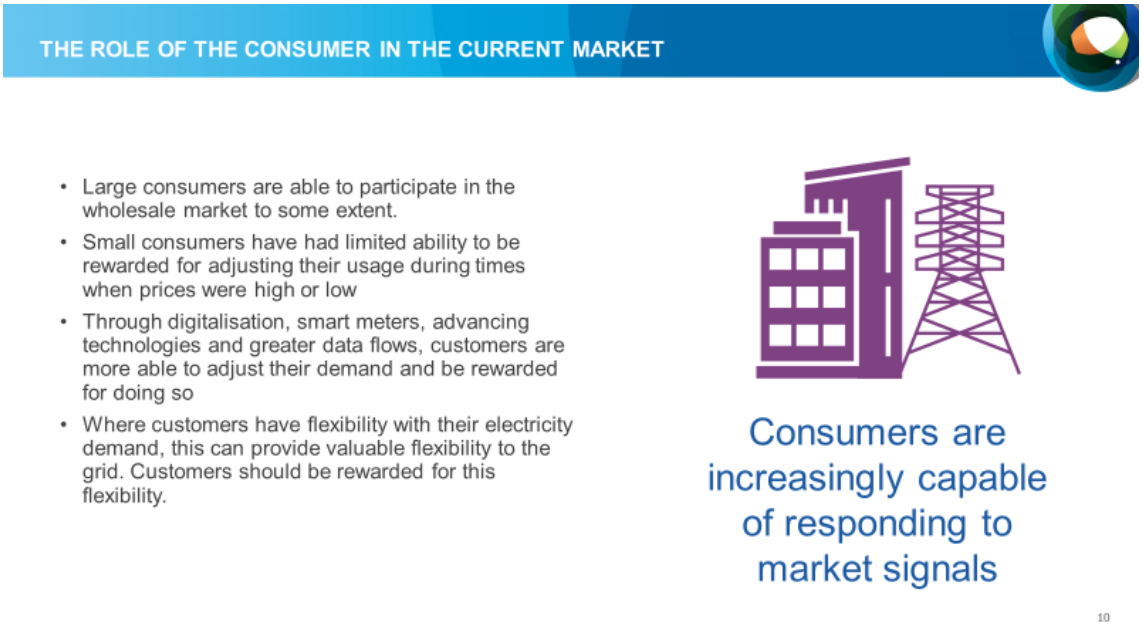


Here we have the chart that you would have seen before, about capacity that's retiring from the NEM. It starts at 21/22, next year, from June next year out to 2041 and over that period of time we are going to be losing about 20 gigawatts, and as we all know that's largely coal fired generation, mainly black coal initially, then brown. I would stress that while we look at this in terms of the technical life, we know that the plants will be retired when they're no longer commercial and it really doesn't matter whether they're privately owned or publicly owned; if they're not making any money, they're not going to have a long life.

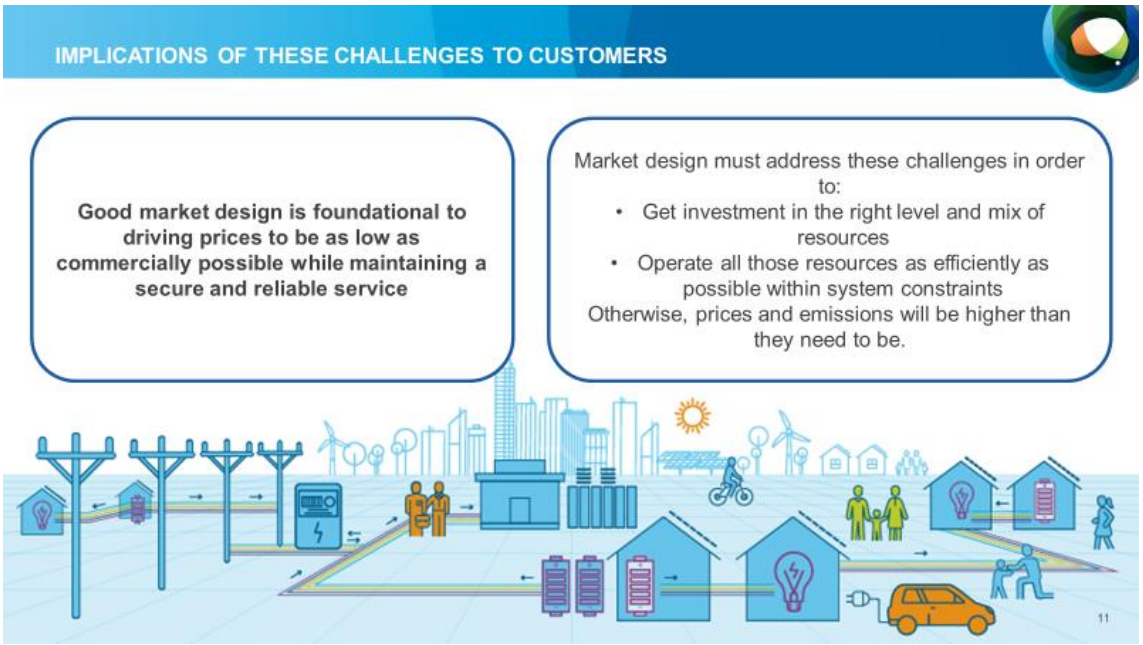
The order in which these plants retire will be dictated by that commercial reality not by their technical life. There are some plants on this chart, like Gladstone, which tend to be relatively flexible in their operation so they will probably last a bit longer. There are some other plants which are going to need particular large amounts of maintenance, or new ash dams, or some major expenditure and that large expenditure is not likely to happen. So, the moral of this story is that by about the mid-2025, there's going to be some very large retirements. That capacity does need to be replaced both for the security it provides but also for the dispatchable megawatts. Next slide.



This is the famous duck curve. This is a graph of South Australia going through the course of one day. You can see, the red line there is last year. So, last year in the middle of the day the demand from the grid, for grid power in South Australia, was extremely low and we're anticipating over the course of the next few years - like three - that demand is going to be negative. Now, the impact that that has on the distribution system and trying to maintain the system strength within the system overall is a real challenge. You will have noticed that recently AEMO now has the power to cause a lot of the behind the meter solar to be turned off, which is not the most efficient way to use this power, but necessary to maintain system security at the moment. So, Australia is leading the world with rooftop solar and distributed energy resources and we really do need to make sure that we get it integrated and used efficiently. Next slide.



The other thing that is happening in the NEM is that with digitalisation, the consumers are changing in their relationship to their retailers. It used to be the case that consumers, basically, had very little to do with retailers apart from paying their bill and sometimes switching. That's no longer the case. It's not that we anticipate consumers are going to start becoming nerds that manage their energy in all sorts of smart ways. But they are going to be able to save money on their bills through much smarter use of the appliances they've got and through understanding their data flows and doing deals with various retailers and others. So, the relationship with consumers is very important now. They can influence their demand and the time of that demand much more than they used to. That's quite valuable and we need to be able to realise that value both for them and for the system. Next slide.



This really is about the implications of all of that for consumers. We really want to be using our market design to drive prices as low as we can get but at the same time keep the system secure and reliable. We've got to recognise the changes that are happening both at the large scale and wholesale market level, but also within homes and businesses and anticipated greater take-up of electric vehicles and other smart appliances. Next slide.

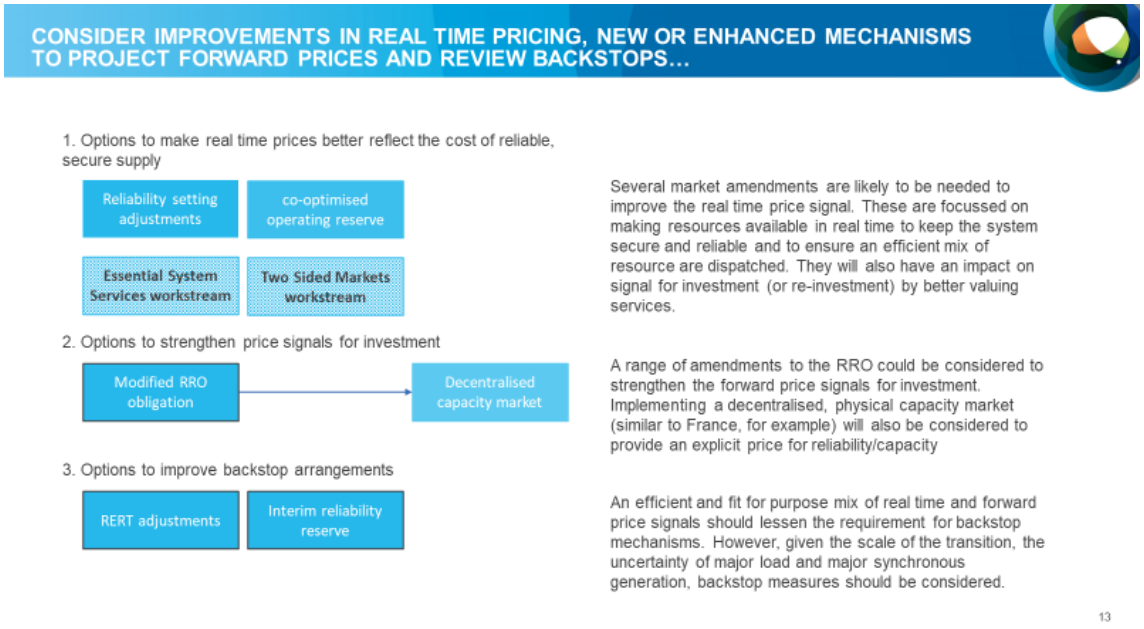
Now what all of that has led us to do is to have a think about what changes are needed and just to grapple with the changes. They've all got to be brought together as a totality but to grapple with it we split things up into seven, what we call, "market design initiatives", but they're basically seven work streams.

David and Matt will take you through those and tell you about the options that we've thinking about for each of them - but also the options that, at the moment, the Energy Security Board is inclined to not pursue any further. So, we have done some preliminary thinking on this and we'll share that with you. So, Matt, I think you're going to run through the first couple of these?

MR GARBUTT: Yes, thanks Kerry. Hi everyone. Matt Garbutt, the Project Director for the Post-2025 project. So, the first market design initiative that I'll speak to is the one we've called, "resource adequacy mechanisms". This initiative canvasses changes to the NEM's resource adequacy mechanisms which look to ensure there's sufficient generating capacity and mix of the right type of generating capacity to meet demand. So, this market design initiative involves examining the signals that drive investment in flexible dispatchable resources, in particular.

So, in the consultation paper we invite comments on a framework and set of options that seeks to improve price signals in the real-time market for all of the services that are required. Strengthen longer duration price signals for investment and that will provide an efficient backstop, or backstop arrangements, if the first two lines of attack fail. That's the frame-work that we've set out on the slide here. In terms of improving the real-time market, the key mechanism that we propose to explore further is an operating reserve that explicitly prices reserves, co-optimised with energy and FCAS markets.

This would provide an explicit evaluation of reserves and may provide a separate revenue stream for flexible resources. It's about ensuring resources will be available when they're needed and, in the future, potentially providing an incentive for firm resources that are less capital intensive and have shorter lead times than others. In terms of the real-time market there's - we'll come to - David will talk to it a bit later, but there's a bunch of potential other reforms in the Post-2025 project that we're looking at and even outside of the project that will help improve the real-time signal as well which will need to be part of our considerations.

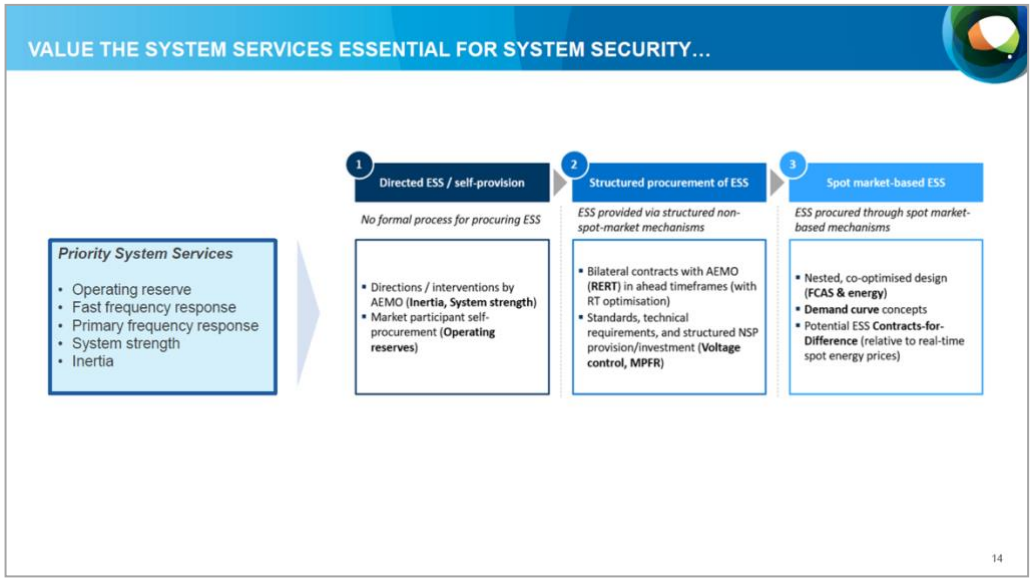


So, the second rung, the options to strengthen long-term price signals for investment, we propose to explore two main options. The first one is amendments to the RRO or the retailer reliability obligation, that will encourage contracting. These amendments could include removing the trigger so that it's always on, so to speak, and examining the required contracting level or the types of contracts that qualify under the scheme. So, each of these amendments would leave a scheme that still fundamentally relies on future expectations of energy prices as the primary signal for investment.

We'll also explore what we've called, "a decentralised capacity market" which is akin to a physically backed, always on, RRO. I guess one of the key differences is that it would set up a separate price, or could set up a separate price for reliability from the energy price or expectations about the energy price and in doing so, give policy makers the ability to lengthen the duration of the signal for investment. So, for both of these options we'll invite stakeholder views on how policy priorities around reliability and renewables could be reflected through such schemes if they were to be implemented which I know is an important issue for jurisdictions.

In terms of the backstop arrangements, we note that wherever we end up in terms of the real-time price mechanisms and the incentives for investment a backstop mechanism like the Reliability and Emergency Reserve Trader (RERT) or the interim reliability reserve will still be needed, and we'll have a look at whatever consequential amendments need to be made both in

terms of the changes, the market reforms we might put through, and in terms of the changes to the grid in the future as the generation mix evolves. Next slide, please.



"System Services" - "Essential System Services". As Kerry mentioned, system security is probably the most critical issue that we need to address facing the NEM at the moment. This really speaks to how we arrange for what we call, "essential system services". So, we received some advice on a framework to help us think through how the various services that the NEM needs might be procured and how we can establish market arrangements that will allow us to evolve over time. We focussed on operating reserves which I've spoken a little bit about just before, frequency services, system strength and inertia.

We looked at these services because they're most material to the energy transition. Inertia and system strength are currently predominantly provided by thermal generating plants which, as Kerry mentioned, many will be departing over the next couple of decades. So, the framework we develop in the paper involves three categories for provision of these services. The first one is directed or self-provision. So, the provision of operating reserves in our current market is a good example of this and directions for system strength another example.

At the other end of our model in the third column we've got spot market-based mechanisms. The current FCAS market is a good example. Then, in the middle we've got what we've called, "structured procurement of system services" which is kind of a halfway house between the directed or self-provision arrangements and full market provision, and this could be through bilateral contracts for example.

So, the idea here is that ideally, we would value and price and procure system services using a spot market approach using real time prices to efficiently dispatch services and send investment signals. This approach is preferred because it is most likely to drive innovation and dynamic efficiency over time which will be in the long-term interest of consumers. But a challenge we face is that a market approach isn't always possible for system services, particularly inertia and system strength, but what this framework does allow us to do is identify where we are now and

what technical and market improvements might be possible over the 2025 timeframe that will allow us to evolve to a more market-based approach for procurement.

So, for each service where have we ended up? We think there's an opportunity to investigate spot market provision for operating reserves to meet a predefined demand curve, so that's procuring slightly above the minimum requirement where it's efficient to do so and makes sense for the system and consumers. So, procuring operating reserve through this way has a range of potential benefits. It will allow co-optimisation with energy and FCAS which is likely to lead to lower overall costs. The use of a demand curve will also potentially help with resilience, so make sure we're not always hitting the minimum requirements.

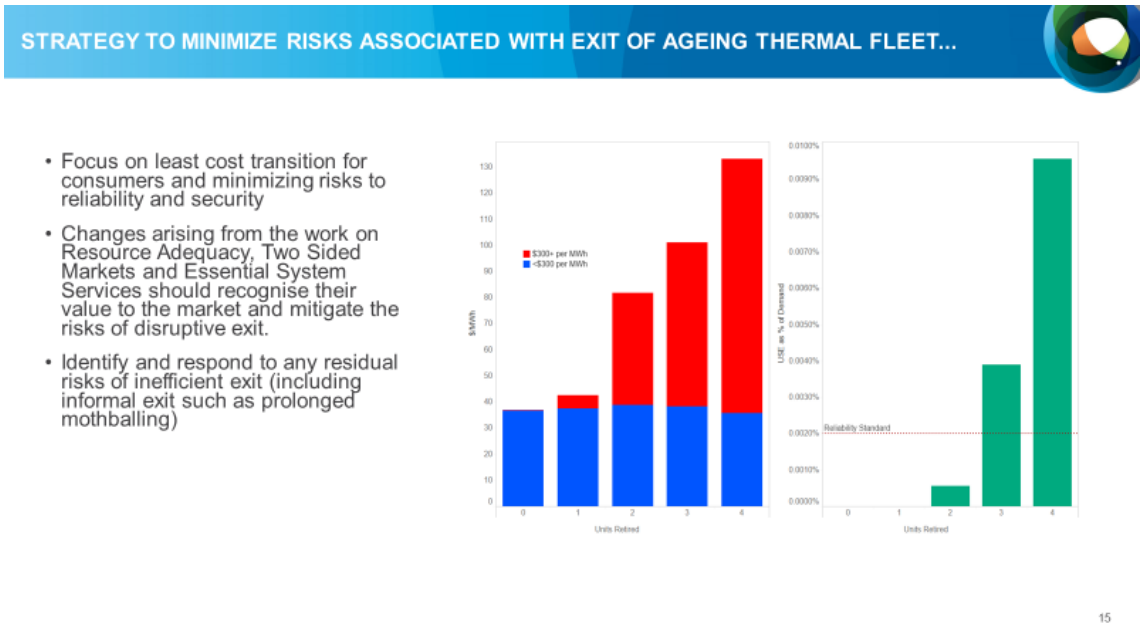
An explicit price signal for reserves, as I mentioned before, might send appropriate investment signals and encourage additional providers to enter the market, possibly using new technologies. But I guess, introducing a new market for reserves does add to complexity and I guess that trade-off is something where we'll be focussing on in the next phase of work and looking for feedback on.

For frequency control, as I mentioned, we already have a spot market-based approach but there are opportunities to, I guess, improve. The mandatory primary frequency response, this could involve introducing a formal procurement process and there's a rule change before the AEMC currently to look at this, and similarly, there's a real change proposal for a fast frequency response product that the AEMC will examine consistent with this framework.

I think the most interesting work in the ESS, bases around what can be done for inertia and system strength. So, for inertia we think there's the potential to move towards a market-based approach by defining a product and demand curve which, you know, offers some of the benefits we went through in the operating reserve proposal, so efficient dispatch, investment signals, innovation and so on. There are challenges in trying to establish a market for inertia, but I think the team thinks that this is a long-term option worth exploring and we'll do that.

I guess the more immediate option that we'd like to develop is the structured procurement of inertia and system strength through some sort of a hedge/hedging approach. So, one form this could take would be for AEMO to run, essentially, reverse auction for inertia and system strength services when they project supply to be inadequate. In such an approach compensation is a little tricky. There are some resources that provide these services and also provide energy. One way to go could be to cover start-up and activation costs if necessary, with different payments based on the energy price where energy was also provided. This is, I guess, a good example of a structured procurement approach so it does bring some of the benefits of a market that still allows some certainty that the services will be there when they're needed.

Another option in a similar vein that we'll explore could be through the activation of bilateral contracts with providers whether they be network service providers or others. We'll look at all of these options in the next phase of work. I guess in each case they generally involve some form of activation ahead of time and this will be an important tie-in with the ahead mechanisms work that David will speak to in a moment. I think, next slide, please.



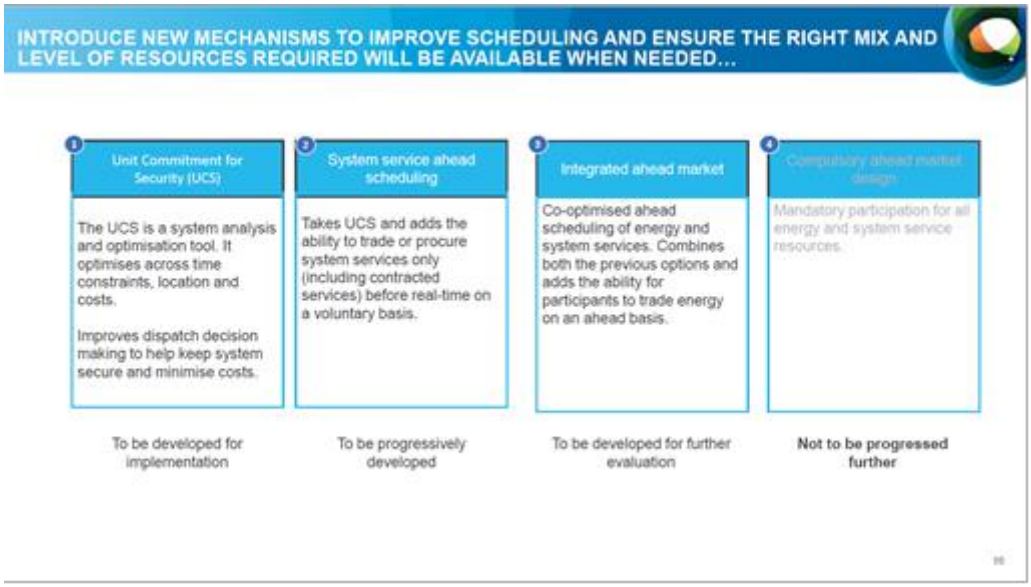
Related to the ESS that is the system services work and the resource adequacy work, we had a specific look at the exit of ageing thermal generators. So, given the volume of capacity due to leave and then as these plants retire, we examined potential risks to reliability, security, and consumer costs that might arise during this transition. So, it's really an orchestration and risk management issue. The market needs to orchestrate the timely replacement of very large capacity plants with a number of smaller resources with quite different operating features and different capabilities.

The perspective we took is the exit of these thermal plants is not an undesirable outcome so long as it's in response to efficient market signals. So, that is when the services they provide are no longer valued by the market at a price that's economical for them to remain. So, it's not necessarily a bad thing but we note there are risks of inefficient early exit that may not be in the consumer's or the market's interests and this might arise because of the system services that we just spoke to earlier, particularly if inertia and system strength are not properly valued, and they're not valued properly at the moment, or alternatively, if the market has not had sufficient time to react to an anticipated market exit.

The approach we took is that many - or our thinking at the moment is that many - of the changes we're exploring in the other market design initiatives, particularly around resource adequacy, system services and two-sided markets that we'll come to a bit later, should reduce the security and reliability risks associated with the exit of coal. These changes should fully value all services needed in the market and provide additional mechanisms for long term contracting and in doing so, give greater certainty around these plants' availability.

So, what we're seeking stakeholder feedback on under this market design initiative is if, having made all these design changes and improvements to the market, are there any residual risks after these that could warrant further reforms, such as improvements to the notice of closure arrangements, or arrangements for regulated exit, and so on, and we note a few of those in the paper. We think the market changes we explore in the other MDIs will do a lot to help manage this transition and are really seeking feedback on whether or not there are additional risks that

either market or regulatory responses need to manage beyond those. I think this is where I hand over to David to talk to "ahead markets". Next slide please.



MR SWIFT: Thanks Matt. One of the other market design initiatives we've been looking at is the need for ahead mechanisms or how we might introduce mechanisms that can improve the scheduling and ensure that the right mix and level of resources required will be available when needed. A lot of these synchronous services are supplied by slow start plant which needs to be committed ahead of time. What work is focused on in the first instance, is a run-on of what we're calling a "unit commitment for security".

So, this would be an analysis or a tool that would be used ahead of time and would actually optimise across the time and across the various constraints in the market at that time, and ensure that the pre-dispatch is showing a secure system outlook. If it's not, it would help you optimise the additional dispatch of resources that you'd need to actually keep the system secure and minimise the cost of operation. So, that sort of thing we've done quite a bit of work on. There'll be more work done on that over the next little while and ESB is of the mind that that's an important and worthwhile reform that will help ensure security.

When you start doing this there's the opportunity to start adding the ability to trade some of those services, particularly as I say, some of these synchronous services and slow start plant involved in that. So, looking at if AEMO had, for example, a set of contracts to supply inertia or system strength, the UCS could identify a need and could also calculate out what the most optimal way of obtaining those services are, could even allow a pop-up market to occur which could actually fill that gap, and I note that there is already some proposed rules being assessed by the AEMC that would work in that space.

Also, look, you could take it further and of course, there'd be benefits for parties in having the ability to trade other services and perhaps even, energy, because they are all linked and obviously, someone providing inertia or system strength also has to run at minimum load so would have to provide energy, but it could also be providing frequency services or operating

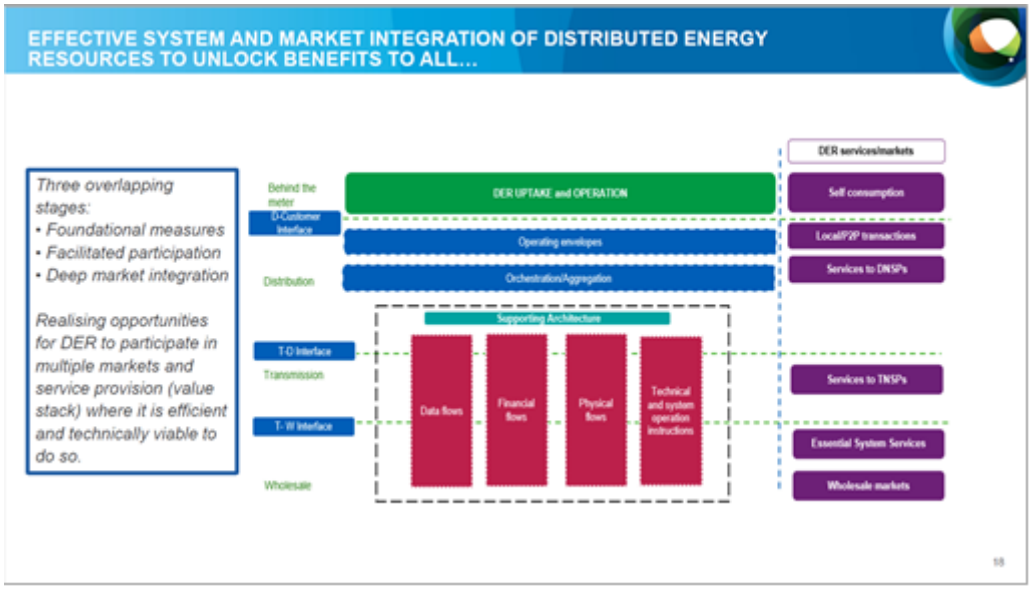
reserves and so on. So, an ability to be able to trade early could be a benefit to them to enable them to co-optimise their whole operation.

It would also provide an ability for other parties, particularly perhaps, the demand side to be able to trade on an ahead basis giving them time to take the action required if they secure a contract. What we have decided at this stage is that we won't be moving to a mandatory day-ahead market. All the options that we're looking at under three are various forms of voluntary trading in those services and potentially, energy. The next slide please.

The traditional electricity markets are one-sided markets which is rather unusual. We, kind of, set the demand and then take whatever action is required to meet that demand. That's missing a big opportunity, especially in a market with a lot more volatility and we believe we should be moving towards a two-sided market that values both supply and demand resources the same, and there's an amount of work going on in this space. You'll find a section in our consultation report discussing it.

The focus is really on how we can remove barriers and provide incentives for traders to participate in dispatch. We can reinforce the existing and introduce some new arrangements to get some price responsive information in the market processes so that we can actually grow the ability of parties to participate. A two-sided market would then be informed by both quantity and price from the supplier but also the quantity and price from demand and how we match those off against each other.

It certainly provides some new opportunities to lower the cost of achieving reliable supply and even some security services, potentially, as well. Maximising the participation by removing barriers and providing incentives for traders would be a key part of that, but we're also looking at the consumer side and what additional protection and assistance they would need to make sure that they have the choice but they don't have to participate in the wholesale market. Next slide, please.

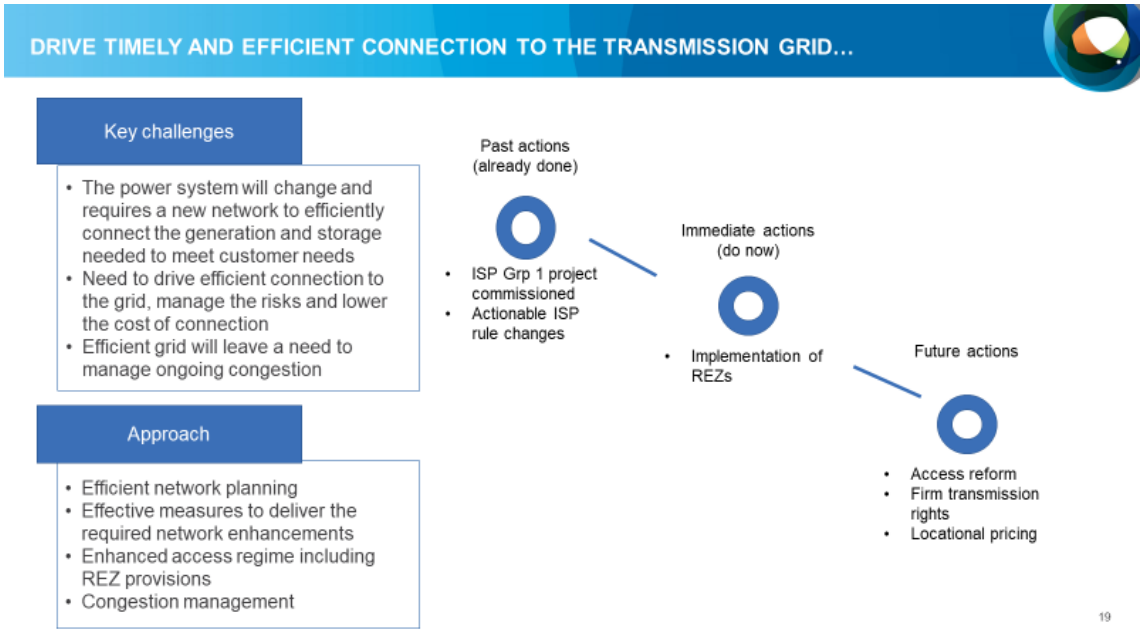


Kerry highlighted the scale of DER growth and some of the problems that's causing in terms of minimum demand, but also, it's a tremendous opportunity and we can't see DER anymore as just an adjunct to the market. It is actually a significant part of the supply mix. So, looking at how we actually integrate that and unlock benefits both to the parties who own the distributed resources, but to all customers through more efficient outcomes.

We're looking at three overlapping stages. We understand there needs to be some foundational measures. Some of those are happening already, like technical standards for DER and new roles and responsibility definitions. A lot of the rules, of course, were written in an age where distribution was a one-way business, so we really need to actually, put in place a whole range of measures through the rules and regulatory arrangements that recognise the importance of distributed energy and provide a platform for its operation.

We certainly will look for ways that we can facilitate participation by DER in a full range of markets including those essential system service markets and energy markets, potentially, capacity markets if they exist, but that would then be just facilitated participation, it would still require operation through a third-party, a retailer or aggregator and have some limitations. So, ultimately, you know, there's a thought, "Do you actually move to a deeper market integration, a layerised optimisation that truly integrates from the distributed through the wholesale?"

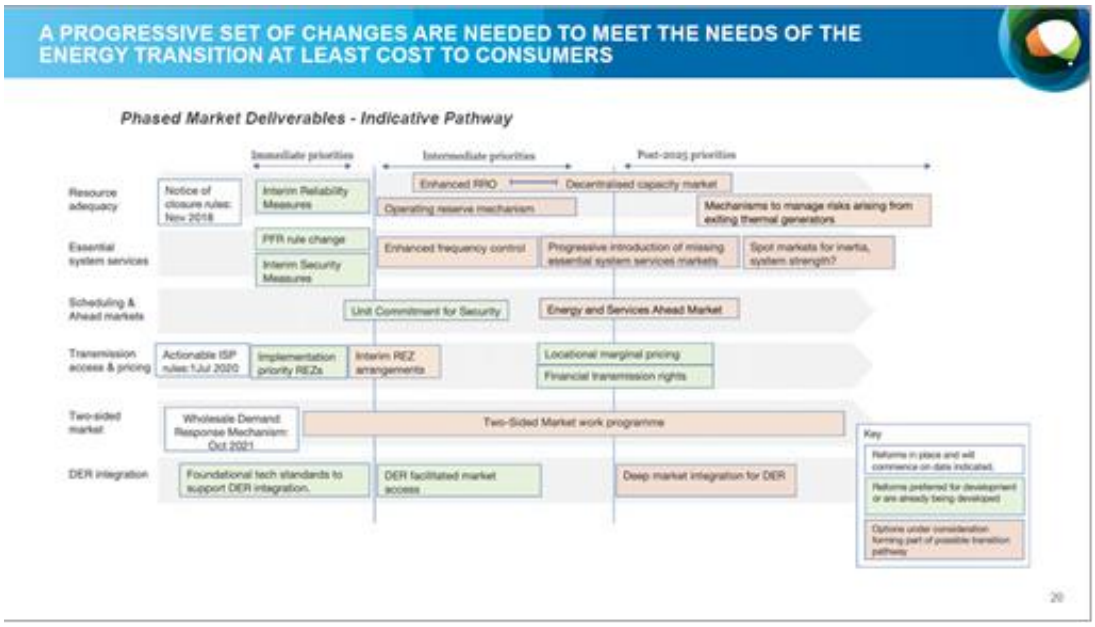
That's an open question and we're seeking people's input into how far we should be moving along that spectrum. But certainly, looking at the DER services and the different markets that it could participate in, there are some real opportunities for DER to provide a whole range of different services we call "value stacking", between services to networks, services to other local customers, and services up to the wholesale market. And we'd like to see opportunities for DER to participate in all those markets where it's efficient and technically viable to do so. The next slide, please.



The grid is really facing a big challenge too in terms of its location and its capabilities. The power system is really going to change a lot over the next decades, and it requires a whole new network to efficiently connect the generation and storage needed to meet customers' needs. Now, a lot of that is laid out in the Integrated System Plan and the ESB has been working with the market bodies to actually put in place effective measures to deliver those network enhancements and that would then give us an efficient grid.

However, we do need to then look at what mechanisms we have to drive efficient connections for the grid and to manage the risks and lower the costs of connection. At the moment the costs of connection and the risks associated with connection are increasing and that is having an impact, not only on parties who seek to connect, but eventually, that will impact on customers in terms of prices higher than they need to be.

So, we need to make sure that we are driving efficient connection and we're doing a lot of work on an enhanced access regime including arrangements for renewable energy zones. Once we fix all that though, we've still got an efficient grid, not an uncongested grid, so what we need to do is work on what mechanisms are going to be used to manage congestion in the grid of the future. And the AEMC have recently, also released more material on their transmission access (COGATI) proposals which use a particular form of access reform using locational marginal pricing and firm transmission rights. We certainly need an effective regime in this area and welcome people's input into that. Next slide.

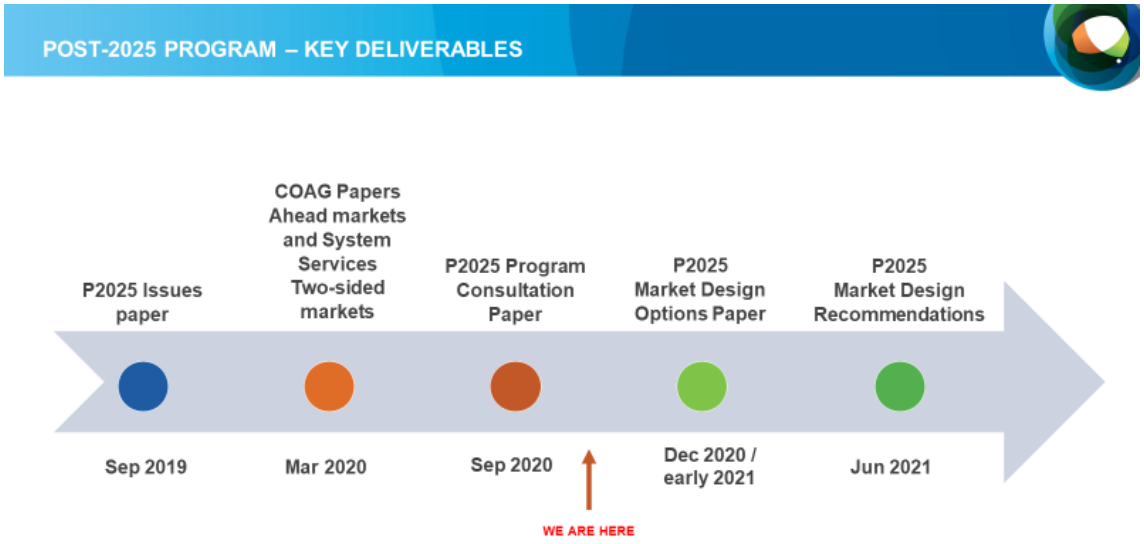


One important thing to say is, that although this is called the Post-2025 market design, it

certainly is not in the mind of the ESB as a sort of a big bang for 1st January 2025. Rather, we're looking at a pathway of reform some of which actually needs to be done ASAP, some of which will be happening over the next few years and some may even occur when you reach certain hurdle points or milestones when you get a certain penetration of DER or of renewable energy. This is an indicative layout of the phased deliverables that we're thinking of at the moment and we certainly welcome your input on that. I'll hand back to Kerry to wrap us up.

DR SCHOTT: Thanks David. We are now at the spot the arrow is at. The consultation paper is out. Please have a good look at it, particularly those areas of it that are of interest to you and let us have your feedback. We're planning to get a market design paper out, hopefully, December or early January and that will basically form the basis of the Post-2025 design and by the middle of the year we'll be making much more detailed presentations, but the guts of it should be done by the end of this year.

The next slide is just basically, 19 October is the date for feedback and we haven't left much time for questions because we've all talked too much but Mark, back to you to see if we can get some questions done.



MR PATERSON: Thanks so much, Kerry, David and Matt. So, we've got great questions coming through. We'll deal with what we can in the time remaining, but as we mentioned at the top of the call, we'll do our best to summarise the key content from today and tomorrow's sessions and provide that to you all after the event. Okay so jumping into the questions: "How can market design incentivise community batteries and share the benefits between networks and consumers?"

DR SCHOTT: I think David is the best one on this. There are some pilot trials going on with community batteries, particularly in Perth, actually, which we're watching with interest. David?

MR SWIFT: Yes, we certainly want to see arrangements which can allow community batteries to arise. The whole idea of the two-sided market is very important here because that's where we

can actually have parties offering both to supply and their demand, so it's an active area of work through that program.

MR PATERSON: Thanks David, and maybe I'll jump to a further question regarding two-sided markets. The question is: "What can be achieved by a two-sided market that cannot be achieved by a one-sided market with demand reduction bids?" The question then continues, "Micro-prudential regulation would be difficult with a two-sided market," in their view. Any comments you wanted to make on that David?

MR SWIFT: Yes. In a sense, what you're talking about is a form of a two-sided market. You're taking an offer to reduce demand as a way of doing that. I think as a general direction we do need to get the demand side in and those sorts of mechanisms are one way of doing it. The ability to actually engage more fully with that demand side and bring through whole new technologies, I think, is important. There are new opportunities available through digitalisation, through parties having storage through the growth of electric vehicles, so we're certainly looking at the various practical design details of that and I expect that the recommendations that we come up with will be a progressive thing and may well start with that sort of approach.

MR PATERSON: Thanks David. Another question: "Are you seeing the operating reserve as a dynamic requirement request reflecting forecast uncertainty, contingency sizes, for example?"

MR SWIFT: Yes. The operating reserve could be one; it could be two co-optimised markets which would be only open to parties who could meet a certain specification which would be around their responsiveness and their speed of action, whether they could deliver their output within 10, 15 minutes, that they could ramp up at a certain rate. Those sorts of measures. So, it's actually, specifically for parties who can provide that sort of responsive service.

It would be co-optimised with energy and potentially, other frequency services and would be open to all resources including, potentially, demand side resources and batteries and storage, and the amount that you purchased would be derived from an analysis of the need based on those sorts of probabilities. It's not - in a sense, the approach would be similar to what's used with the form in today's market where we're actually looking at the probable range of outcomes for tomorrow.

MR PATERSON: Thank you. Next question: "Given the challenges of the capacity market in the short-term energy market, for example, it's stated, increasing system costs for consumers and creating inefficiency, why would we want one in the NEM?"

DR SCHOTT: We've got one in the NEM. The short-term spot price market, actually, works pretty well and has driven prices down at a wholesale level quite well. Where the failures in the market are, are around the other services that we need and that we've been talking about, but also, possibly in the longer-term, responses for new investment, particularly in generation but also investment in essential services.

Whether or not having a very efficient short-term market gives you those responses is quite debateable and we've seen issues in the market where there really isn't a long-term price signal

and that really is causing difficulties for investors. Not so much in renewables because there are other rewards for investing in renewables, but for investment in dispatchable and more flexible load and essential services, those long-term signals are really very confused, I think, is probably what I'd say. The short-term market does work well.

MR PATTERSON: Great, thank you, and we'll deal with one more question before we move to close, just given the time. So, comment four: "Essential system services, inertia, and fast frequency response cannot be dealt with independently and any approach whether direction structured procurement or spot market-based solutions should be using a co-optimised mechanism. Has this aspect been considered?"

DR SCHOTT: I'd say, that's exactly what we are considering and pass over to David on that.

MR SWIFT: I think that is exactly why you eventually want to go to these, sort of, spot market arrangements where you can use full co-optimisation. What we do need to do though, is come up with pragmatic measures which can work straight away and which can cut back on those level of directions that we've outlined in the opening of this session. So, the initial co-optimisation, I expect, will be mixed and would be using the UCS process to dispatch contracted resources, and co-optimisation to optimise a range of other services. Certainly, you'd like to get to the total co-optimisation but at the moment, that's not possible with either inertia or system strength because of their characteristics.

DR SCHOTT: I might just add there's some very complicated algorithms going to get involved here, so it's going to take a while I think for everybody to learn, actually, how this will work.

MR PATTERSON: Absolutely. Well, thanks again to Kerry, David and Matt for taking us through the content today. Just to reiterate that we will be circulating a copy of the slides, a link to the recording from today's session and also subsequently, a summary of the questions, themes and response as well so that you have that as a pack, and so, just a reminder that plenty of information is available online at the address that's contained in the slides. So, thank you again for your participation.

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