

solarZero's submission MDAG Report focused on 100% renewable generation

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Background to solarZero

solarZero (sZ) is a flexibility trader. We have some 6000+ solar and battery systems in market which we actively manage. The systems report on a range of parameters every 5 minutes providing unparalleled visibility into the low voltage network. Panasonic is our technology partner.

Overview

The power system will need to go through an unparalleled period of innovation as society asks the electricity industry to step up and power much of the economy. The next thirty years will be the biggest step change for the electricity industry since the industry was created in the 1880s.

The discussion document implies that markets are key to encouraging innovation. Our experience is that is a very simplistic view and quite wrong. The regulation that underpins the market is critical for innovation. For example, as of March this year batteries are not allowed to provide ancillary services. No amount of market tweaking can change the fundamental regulations that create the barrier to enabling batteries.

An end to end, systematic review of the electricity code, rules and regulation is needed. This will take time so the Electricity Authority needs to become adept at granting exemptions and doing so rapidly. Via the exemptions process learnings can be gained and the structure of new clauses for the Code can be tested and finalised.

Rules in other parts of the electricity system need to rapidly change also. For example, the solar industry is working under a gazetted 2012 standard but that standard has been updated twice (2014 and 2020) but these updates have not been gazetted. So the industry is stuck with a standard that is 10 years old in an industry where technology is rapidly evolving. This is a completely unacceptable situation.

There will need to be an unparalleled amount of cooperation across the electricity industry. For example, household batteries will play an important role in power system stability, yet their deployment is in the distribution network and subject to various rules that different distribution networks have. From the national perspective the power system will no longer end at grid exit points and disappear into invisibility at that point. Instead the power system will be seamless from the national grid through to behind the meter. The physics of the power system will not distinguish between arbitrary jurisdictional boundaries. Lines companies and Transpower will need to work together in ways they have never done to date to ensure that the benefits of flexibility services, which are very local, are available to the whole power system.

As an example, we hear lines companies claim that they will control EV charging. Yet EV charging is a flexibility service that could meet a range of needs, such as power system stability, grid level and different distribution levels. It is important that customers and flexibility traders have the opportunity to maximise value - which will result in maximising the value for the whole power system.

One of the report focuses on overseas jurisdictions and the evolution they have made in electricity markets. The report concludes that because of the unique nature of our electricity system we will

need to develop our own pathway to 100% renewable. What the report does not answer is why the development of electricity regulation in New Zealand is so slow compared to other areas. For example, rules enabling batteries in the NZ power system should come into effect this year, but similar rules were implemented by PJM Interconnection nearly a decade earlier. Why so slow?

1. Do you agree with the broad conclusions that emerge from the simulations in relation

to spot price levels and volatility, in particular:

(a) significantly more spot price volatility is likely with a 100%RE system, especially shorter-term weather driven volatility?

(b) New Zealand's sizeable hydro generation base is likely to moderate the growth in volatility to some extent, making extreme oscillations between zero and shortage spot prices relatively unlikely?

2 If you disagree what is your view and reasoning for it?

The report misses the role that flexibility services will play. Flexibility services will substantially reduce the volatility of prices. Rule changes and industry-attitude changes are needed to enable flexibility services to develop to their full potential. The report mentions hot water as demand response/a flexibility service. Over time there will be a substantial amount of flexibility available from batteries, EV charging, appliances etc.

3. Do you agree that in a 100%RE system there will be many diverse and disaggregated resources to coordinate, and that a wholesale market will be the preferred mechanism to coordinate plans and actions among all the resource owners? If you disagree, what is your view and the reasoning for it?

There will be substantially more diverse and disaggregated resources to coordinate. Whether the wholesale market will be the preferred mechanism remains to be seen. If market rules do not change quickly enough, there could be a proliferation of off-market agreements, for example, between a flexibility service provider and directly with the System Operator or the Grid Owner or distribution companies. We are already starting to see these agreements being formed. The challenge is for the Electricity Authority to lead market development and keep the regulation at pace or ahead of technological developments. To date the EA has failed in this respect and regulation is now well behind the technology frontier. Therefore, in our view there is no guarantee that the wholesale market will become the preferred mechanism for coordination.

The EA needs to decide whether it wants to lead or risk seeing the market dissolve to some extent into a set of uncoordinated contractual arrangements between parties. This is a strategic decision for the EA to take: To lead or not to lead.

4. Do you agree that these are the key issues in relation to real-time coordination? If you disagree, what is your view and the reasoning for it?

The key issues as identified in the report are:

- (a) Will forward scheduling processes be effective in a future environment where short term system conditions change more rapidly (e.g. will there be a need to adopt more frequent cycles of schedules, different publication timeframes, new information content such as confidence intervals)?
- (b) Will demand forecasting processes be effective with an increasing prevalence of electric vehicles, and behind the meter storage devices?
- (c) Will the range of resources subject to dispatch by the system operator be appropriate?
- (d) Will there be an efficient mechanism to allocate dispatch rights when the volume of generation seeking to run at a zero price exceeds demand?

- (e) Will there be a need for new mechanisms (such as a short-term commitment market) to coordinate resources that require a lead time to get ready, such as batteries which need to be charged, or production processes which need to be modified on the demand side?
- (f) Will downstream parties such as aggregators be able to interact efficiently with the spot market (for example via adopting new mechanisms beyond the coming 'dispatch notification' product being introduced with real-time pricing)?

Our answers are as follows:

- (a) Forward scheduling processes may need to change due to more weather related variability (wind/sun). But there will also be much more flexibility available. The trick will be to develop the mechanisms/rules that unleash the benefits of flexibility services within the wholesale market framework, or allowing a range of off-market agreements to achieve the same results.
- (b) There is no reason why demand forecasting should be any worse or better than at present, irrespective of the kinds of loads in the future, such as EV. What will improve substantially is visibility of load, if rules/regulations are adapted to encourage this.
- (c) Dispatch may change significantly. For example, a myriad of devices may watch frequency and adjust demand/supply/storage accordingly. The whole concept of dispatch may change.
- (d) An efficient mechanism is the domain of the EA and its leadership role.
- (e) Potentially. As mentioned in other parts of this submission, a possibility is that if the market does not evolve quickly enough a slew of off market agreements might be developed. These would be very hard to unwind. We would probably prefer a market-based framework but that depends on whether the EA is prepared to step up and lead.
- (f) As above, the market needs to evolve quickly and must not become a barrier to the deployment of newer, more efficient technologies.

5. Do you agree that these are the key issues in relation to ancillary services with 100%RE? If you disagree, what is your view and the reasoning for it?

The key issues are:

- (a) Are there services that are currently provided freely as by-products that will become scarce under 100%RE?
- (b) Will new ancillary services such as inertia, standby reserves on a longer time scale than current instantaneous reserves, ramping duties and reactive power be required?
- (c) How can these new products be priced in a way that sends the correct operational and investment signals? Can or should they be integrated with the dispatch objective to allow automated dispatch and co-optimisation?
- (d) How can decentralised distributed resources and new technology be sourced and used to provide current and new ancillary services?

Our response:

- (a) Potentially, for example, governor response and inertia
- (b) Possibly, see this report on inertia in the power system by Transpower and Canterbury University: <https://ir.canterbury.ac.nz/handle/10092/16918>.
- (c) The area of ancillary services will require a rapid evolution. The 50-100+ year old approaches need to be retired (e.g. tail water suppressed hydro) and allowed to do what they were designed to do – generate electricity. These technologies need to be replaced by flexibility services, batteries and the like. Rules, regulation, pricing all needs to be rapidly evolved.

- (d) Easily is the short answer. Provide the right market mechanisms. Work with industry to develop these and look overseas where developments are more advanced.

6. Do you agree that these are the key issues in relation to price signalling with 100%RE as summarised in paragraph 3.42 above? If you disagree, what is your view and the reasoning for it?

The key issues are:

- (a) Whether higher prices (occurring with greater frequency) signalling genuine scarcity of supply will be accepted in the wider political economy of the market; and
- (b) Whether the five elements set out in paragraph 3.38 above are required for an energy only pricing regime to work; and
- (c) Whether you agree that fulfilling (d) and (e) in paragraph 3.38 above is highly influenced by whether (a) to (c) are satisfied

Our response:

- (a) Market design is critical. If the market design is not got right there could be very high volatility which could result in political intervention.
- (b) Confidence is key. Confidence in the market and the ability of the EA to develop new rules/regulations in a timely manner is not high. Confidence will need to be increased significantly and quickly to head off possible political intervention.
- (c) Conditions a-c must of 3.38 be met. Key will be evolving market rules in a timely manner. Evidence is not great that the EA has the capacity/willingness to do this – other jurisdictions seem much more adept at evolving market rules more quickly. The slowness in NZ is puzzling.

7. Do you agree that the preconditions in paragraph 3.38 would need to be in place for an energy-only market design to be effective? If you disagree what is your view and the reasoning for it?

As above, confidence in the market is key. If that confidence is lost anything can happen in terms of interventions. The EA needs to be ahead of the curve in terms of new market approaches, rules and regulations. To date it has not demonstrated this capacity to be ahead of the curve. The equivalent of the EA in other jurisdictions has demonstrated the capacity to be ahead of the curve and the government needs to understand what conditions are holding the EA back from being as effective as other equivalent agencies overseas, i.e. what is holding the EA back from taking a leadership role?.

8. Do you agree that we should take forward to the next stage of the process (options identification and analysis) the measures referred to in paragraph 3.43 above? If you disagree, what is your view and the reasoning for it?

No. This approach will not build confidence in the market. A host of new products and initiatives need to be developed to enable companies to hedge, trade, develop derivative products etc. The document implies that businesses exposed to spot are essentially stupid and that if they understood the market better they would behave differently. This view is patronising to the point of being bizarre. MDAG/EA need to look at the fundamental market design rather than the suggestion in the document which amounts to shouting at people and telling them they are stupid.

We suggest careful analysis as to why a suite of sophisticated financial products have not been developed in the NZ market. The fault would clearly seem to be with the rules, regulations and market structures given that other electricity markets have developed a suite of sophisticated financial products.

9. Do you agree that these are the key issues in relation to demand-side flexibility with 100%RE? If you disagree, what is your view and the reasoning for it?

The key issues identified in the document are:

- (a) What are the wholesale market features necessary to fully realise the benefits of DSF [demand side flexibility] under 100% RE?
- (b) Are the wholesale market features identified in (a) likely to be present as the shift to 100% RE occurs?
- (c) What are the actions needed to put the necessary features in place to the extent that the wholesale features in (b) are unlikely to develop naturally?

Firstly we fully concur that DSF is going to be really important in the future. There are a range of market features needed to accelerate the uptake of DSF. Many of these relationships will be at the distribution level and not at the wholesale market level. It is critical that lines companies are encouraged to explore DSF and that learnings about the application of DSF are shared across the industry.

In terms of (a), proposed changes to the ancillary services (enabling batteries) should be very helpful to DSF. It remains to be seen whether the implementation of the TPM will help or hinder (e.g. excessively complicated) DSF – the design detail is really important.

In relation to (b) new product and services are likely to be needed to take account of, for example, more variable energy sources like wind and solar. As discussed elsewhere in this submission, this is not about “the market”, rather it is about how the market evolves, the changes to regulations, the new products and services that are developed that enable DSF. Put simply, the current market rules and regulations need a massive and rapid overhaul to ensure the benefits of DSF are realised. If this refresh does not happen to EA risks:

- Less than optimal uptake of the technology.
- The market becoming less relevant and a range of off-market agreements being made that could undermine overall confidence in the market.

In relation to (c) the idea that the necessary market features will develop naturally is deeply troubling and suggests a lack on understanding in MDAG about the fundamentals of the electricity market. The market is an artificial creation and the way it works is determined by the various rules and regulations. Off market approaches could develop naturally, but these will be developed *despite* the market. We are guessing that the EA would not want to see a suite of arrangements developed outside the market because the market has not evolved rapidly enough.

10. Do you agree that these are the key issues in relation to contracts markets with 100%RE? If you disagree, what is your view and the reasoning for it?

The key issues are:

- (a) What are the contract market features necessary to ensure participants will have reasonable access to the risk management products needed under 100%RE?
- (b) Are the contract market features identified in (a) likely to be present as the shift to 100%RE occurs?
- (c) What are the actions needed to put the necessary features in place, to the extent that the contract market features in (b) are unlikely to develop naturally, for example by building on existing regulatory tools or developing others?

As outlined earlier in this report, a suite of market approaches are needed. Our suggestion is to do a more thorough analysis of the markets in other jurisdictions and ask the key question: **How come**

these other markets can develop new products and services much more quickly than we can in New Zealand?

The products and services will not develop naturally. The market is governed by a set of rules and the Code that are constraining.

11. Do you agree that these are the key issues in relation to transition to 100%RE? If you disagree, what is your view and the reasoning for it?

The reasons relate to the decommissioning of thermal plant and the lumpiness associated with that.

Clearly, decommissioning of New Zealand's 3 major thermal plants (Huntly, E3P, Taranaki Combined Cycle Plant) is going to be lumpy. These are big plants in a small system. We need to acknowledge this fact and come up with a sensible, pragmatic exit plan that recognises the "physics" of the situation: Small power system + big plants existing = lumpiness and therefore market volatility.

12. Are there any other 'lumpy' issues that warrant specific consideration in the transition to 100%RE?

Not that we can think of.

13. Do you agree that we should analyse how competition in the wholesale market is likely to be affected by a shift to 100%RE, in particular, in competition for seasonal flexibility services? If you disagree, what is your view and the reasoning for it?

Anything that leads to the development of more and better market products is to be welcomed.

14. What other key areas of opportunity or challenge (if any) will arise in the wholesale electricity market with 100%RE that are likely to have a significant impact in relation to achieving the statutory objective of the Authority, which is to "promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers?"

The final question (above) also needs to cover the final section of the report: "New Zealand's situation is unique and we need our own solutions". What is unique about New Zealand is the very slow pace of amending market rules and regulations. An obvious reason for this lack of pace is elusive. We need to move quickly to develop new rules and regulations learning from other jurisdictions. While every power system is unique, the physics of the power system is not. Let's not use our "uniqueness" as an excuse for a continuation of the very slow progress in developing new rules and regulations.

A challenge that MDAG needs to address is set out in paragraph 3.48 which begins with: "Over the last 10 years, the contracts market and risk management practices have evolved considerably." That is a debateable point. No evidence is provided to support this assertion. It would be interesting to collect the evidence and compare that with other jurisdictions. The challenge for MDAG is to recognise and openly acknowledge that the evolution of the market in New Zealand is slow, ad hoc and other jurisdictions have moved more quickly. Then the challenge for MDAG is figure out why New Zealand has been so slow.