Via email fsr@ea.govt.nz

25 July 2023

Consultation Paper: Ensuring an Orderly Thermal Transition

Mercury welcomes the opportunity to submit on the Electricity Authority's (Authority's) consultation paper *Ensuring an Orderly Thermal Transition*, 13 June 2023 (Consultation Paper).

Mercury supports the work the Authority is undertaking to review the current market settings through both the Future Security and Resilience project and the work of the Market Development Advisory group. Furthermore, in relation to the Consultation Paper, Mercury supports the Authority's focus on ensuring the transition of thermal generation plant is orderly. These are important processes to evolve the market settings to deliver a secure and reliable transition.

Mercury agrees in general with the Authority's conclusion that "*the risk of disorderly thermal exit is low at present*".[1] We also agree in general with the Authority's assessment of a range of options for ensuring an orderly thermal transition.[2] The assessment concludes that some options are being progressed in terms of the Winter 2023 work, some are potential options should the risks of disorderly thermal transition increase, and other options are not recommended.

The Consultation Paper, however, goes beyond considering matters related to ensuring the transition of thermal generation is orderly to presenting forecasts regarding the expected state of thermal generation in the future. These forecasts may be taken as the Authority's definitive view, and therefore may have an unintended adverse effect on an orderly transition and the security and reliability of electricity supply. Placing security of supply at risk not only would directly impact consumers but any loss in general confidence in the broader electricity system could adversely impact the electrification and wider decarbonisation of the economy.

Ensuring consumers have a secure and reliable electricity supply as New Zealand transitions to higher proportions of renewable energy use across the economy is a fundamental strategic issue for the sector. The Boston Consulting Group (BCG) report "The Future is Electric"[3] highlighted the pressing need to consider market mechanisms to improve energy and capacity assurance during the transition. Delivering reliability is a key principle of the Powering Change public commitment Mercury and other energy sector companies have made to deliver a more sustainable future for Aotearoa.

This submission, therefore, focuses on Mercury's concern regarding that the thermal generation forecast presented in the report, particularly if this is taken as the Authority's definitive view regarding thermal generation in the future.

Focus on the reliability risks to consumers in the transition rather than premature exit

The Consultation Paper states that Concept's projections indicate that "*[t]he potential for investment in additional fast-start capacity to become economic appears unlikely in the base case. A mix of existing fast-start and some slower-starting thermal plant appears to be capable of meeting the demand for thermal generation to at least 2032 under base-case assumptions."*[4]

[1] Consultation Paper, page iii.
[2] Consultation Paper, summarised on Table 3, page 34.
[3] BCG report, Climate Change in New Zealand: The Future is Electric, 25 October 2022, page 16.
[4] Consultation Paper, page (iii)

In addition to existing fast and slow start thermal generation, flexible hydro generation, emerging demand response and battery storage technologies are also expected to contribute to security through this period. Primarily the analysis is based on the assessment that existing thermal generation is likely to earn enough spot market revenue to continue to operate and not prematurely exit the market.

Mercury considers modelling of whether existing thermal generation is likely to earn sufficient revenue is just one factor or risk to addressing the strategic question: "What are the risks to reliability for consumers in the transition to higher variable renewable generation and how certain are the options to maintain reliability?".

As the paper also notes that reliability in the electricity generation sector is becoming more dependent on ageing thermal equipment that is having to respond to increasingly volatile pricing as intermittent wind and solar generation enters the market. This is exacerbating the stress on thermal equipment not designed to operate flexibly, as well as the risk of unplanned outages[5]. The larger problem, however, is the need for sufficient reliable assets to ensure security of supply over a range of timeframes from instantaneously through to weeks and months. Fast-start thermal generation is a proven and reliable solution to this large problem and therefore should not be discounted.

As such, the promotion of reliable supply as a core component of the Authority's statutory objective is not given sufficient weight.

Risk of a "black swan" event could materially impact confidence in the market

A black swan event is a high impact event which is difficult to predict under normal circumstances but in retrospect appears to have been inevitable. Within the market, the signs of stress are starting to show. Transpower has issued 12 notices warning the market of low residual situations in 2022 compared with 10 half-way through June this year.[6] Furthermore, at the time of writing, Genesis had extended the outage of Unit 5 at Huntly by a month, from 31 July to 31 August, during the high winter demand period, while parts are sourced overseas.

The Consultation Paper recognises in several places that the conclusion that there is sufficient thermal generation to prevent disorderly exit is highly sensitive to assumptions around the ongoing flexibility and failure risk of existing thermal generation:

> *"Concept made some caveats. First, the analysis of start-up costs and operating restrictions for the slower-starting units is based on publicly available information. It is possible there is other relevant information known to thermal plant owners that is not reflected in the analysis. For example,* ***if slow-start thermal were even less flexible than modelled, then more investment in new, more responsive plant might be efficient."***[7]

> *"…the analysis incorporated the effects of short-term random plant outages on the efficient plant mix but* ***assumed that none of the existing thermal plants suffers a major failure that renders it permanently inoperable****. Were such an event to occur, that could* ***alter the economic benefit*** *equation for investment in new flexible thermal plant."*[8]

Mercury is increasingly concerned that the risks of a "black swan" type event are accumulating, where a range of factors coincide with an unplanned thermal outage, such as a "cold snap" high peak demand period with low wind and solar generation output and/or a period of high inflows which limits the flexibility of hydro generation to respond which places security of supply at risk.

A prolonged outage would result in significant consumer cost which would undermine confidence in the market during a critical phase of the low carbon transition. The risks of reduced flexibility and/or permanent failure of ageing thermal

[5] The BCG analysis noted a positive correlation in Australia between age of generation and the number of outages See exhibit 70 page 86

[6] Transpower sector briefing as report in Energy News, *Transpower warns of growing procurement risk, winter peaks,* 22 June 2023.

[7] Section 3.15 page 17 - emphasis added

[8] Section 3.17 page 17 - emphasis added

generation assets is increasing and the risks to consumers from decreased reliability should be the focus for the Authority and other energy policy makers.

New thermal peaking generation essential to provide firm reliability and faster decarbonisation in the period to 2030

The BCG analysis identified the need for new fast start capacity to support increased peak demand and intermittent supply. While batteries and demand response were highlighted as potential contributors to flexible capacity, the high capital costs of batteries and lack of smart system enablers for dynamic demand response were viewed as limiting the potential of these technologies to meaningfully contribute in the period to 2030.

BCG estimated that a total of 400MW of battery storage and 700 MW of gas peaking capacity would be needed to meet the highest 2030 demand peak[9]. Around 1.3GW of new supply side peaking resources was identified in the pipeline but the significant majority (1.1GW) was identified as being in the early concept stage[10]. Similar conclusions on the need for additional thermal generation have been found in various analyses by the Climate Change Commission, Transpower's Te Mauri Hiko and the energy scenario work by the Business Energy Council.

In comparison, the Concept analysis found that investment in new thermal peaking generation was neither economic nor revenue adequate in or before 2032 on the basis that:[11]

> *"…the flexibility available from existing peakers plus projected battery growth plus the existing hydro system is very substantial. This flexibility, in conjunction with the slower start flexibility of Rankine or CCGT units (which have significant sunk costs) is a lower cost solution than additional thermal capacity (which requires significant upfront capital expenditure)."*

This analysis along with the others noted above highlights that there is a diversity of views regarding the forecast for additional thermal generation, which highlights the need to take into consideration the economic costs to consumers of 'black swan' events outlined above.

Investment in new flexible thermal peaking generation also provides benefits in addition to reducing the impact of risks to the electricity system. As well as enhancing security of supply, it would provide firm and reliable back-up and promote economic efficiency and decarbonisation by enabling the retirement of less efficient, more emissions intensive and increasingly unreliable thermal plant. It is also capable of providing capacity over much longer time frames than battery storage, the costs and supply chain availability of which is far less certain than gas peaking generation - a proven reliable technology with existing skills and capability to implement in the relatively short time frames to 2030.

The ability to rely on existing hydro generation as a firm source of flexibility is an assumption that Mercury continues to see raised in various forums. Investment in new intermittent wind and solar generation is increasing ahead of demand which is positive for emissions reduction but is increasing the requirements on existing hydro generation to provide flexibility to firm this variable output. Further, in a wet year, the ability of hydro generation to provide flexibility is substantially constrained as hydro schemes operate at full capacity. The net effect of increasing intermittent renewable generation is to reduce the overall resilience of the electricity system as existing thermal generation is "squeezed out" by making it harder to commit units to meet winter peak demand while also increasing the demand for existing flexibility of the hydro generation.

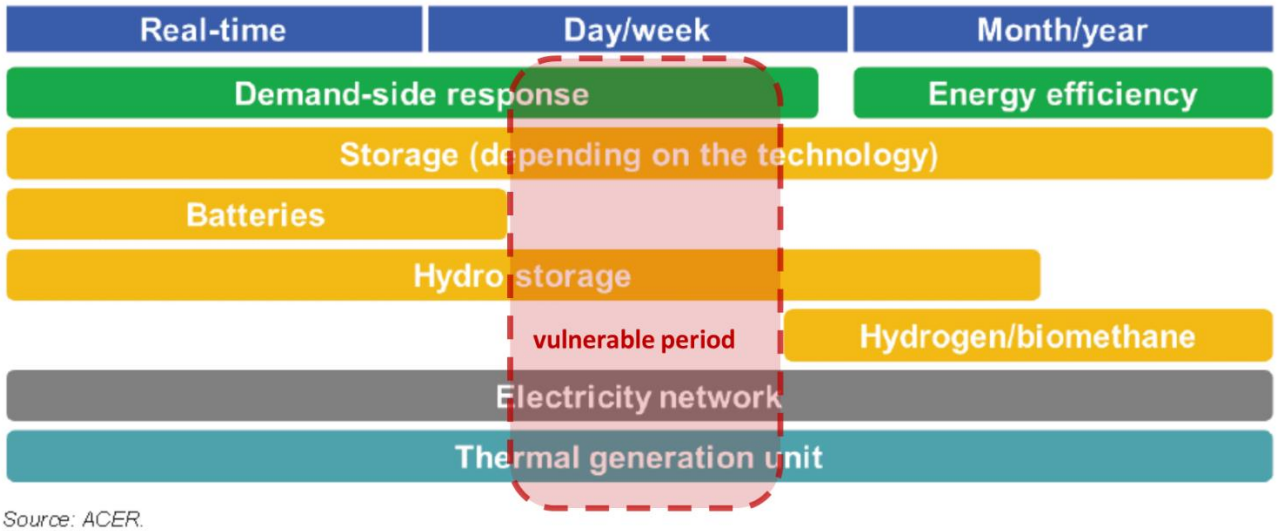
[9] BCG report pg 124 see Exhibit 79.
[10] *Ibid.* pg 15
[11] Concept Consulting "*Potential demand for thermal generation in the transition to a renewables-based electricity system*" prepared for the Electricity Authority May 2023 page 6.

Provide certainty for investment in thermal generation to maintain reliability in the transition

The diagram below highlights Mercury's view that thermal generation is the only firm and reliable technology currently able to provide flexibility across all relevant time periods.[12] The diagram illustrates different flexibility services provided by different technologies, across different timeframes. While over time the reliability, operational and cost characteristics of new technologies will become known with greater certainty, red box highlights how vulnerable the system is to outages that may last longer than a day.

In addition to managing 'black swan' reliability events, the system currently faces the dual challenge of having to compensate for a sustained reduction in intermittent wind and solar generation. Mercury is seeing swings of around 500MW during periods where intermittent generation falls away and expects this figure to increase through the transition. Prolonged periods of cold, windless and cloudy periods will significantly reduce the ability of battery storage to provide capacity and energy into the system. The key takeout is that batteries and gas peaking capacity are not directly interchangeable across all time periods in terms of the flexibility services they provide. Currently thermal generation is the only known and firm technology able to provide security in the period to 2030.

Flexibility services provided by various technologies



Source: ACER.

Mercury is concerned that the Authority's conclusions will have the effect of excluding consideration of the safeguard provided by investment in additional, more efficient and reliable thermal peaking generation. This is particularly critical in the period to 2030 to ensure market confidence and to support the rapid deployment of additional renewable generation that will be needed to drive emissions reduction in other sectors of the economy.

The main barriers to the development of further efficient thermal peaking generation are not related to economic costs or revenue adequacy but rather uncertainty around policy settings for the role gas in the transition. Whether the Government's proposed Gas Transition Plan and MBIE's Electricity Market Measures work will explicitly address this is one source of uncertainty as is the proposed review of the existing government target of 100% renewables by 2030.

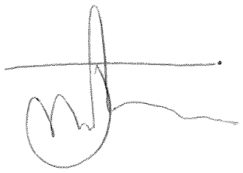
Mercury's concern is that the Authority's framing of the problem in the paper does not adequately address the reliability limb of its statutory objective but instead focuses on an efficiency assessment which may underestimate

[12] European Union Agency for the Cooperation of Energy Regulators, ACER's Final Assessment of the EU Wholesale Electricity Market Design, April 2022, page 31, Figure 18.

risks to consumers. This constrains the ability of the Authority to advocate for policy settings which could support a more reliable and secure transition for the sector and faster decarbonisation for the economy. Mercury would support the Authority providing further clarity on how the modelling has assessed reliability risks and how the economic benefits shift when adjusted for lower flexibility and prolonged thermal outages which are called out as potential of the current approach.

Mercury looks forward to engaging with the Authority and stakeholders on measures that promote an orderly thermal transition.

Yours sincerely,



Nick Wilson
Head of Government and Industry Relations

Annex: Consultation Paper questions with Mercury's response

Consultation Paper questions	Mercury response
1. Do you agree with the desired outcome as described? If not, what do you think is the desired outcome in respect of thermal generation during the transition?	The Authority's proposed desired outcome of its workstream is that the right (efficient) level and type of thermal generation capacity is available during the transition to a renewables-based system. That is, it should avoid the adverse outcomes of poor reliability (if there is insufficient back-up resource such as thermal generation) or excessive costs and emissions (if there is too much thermal generation). Mercury, furthermore, supports the Authority's focus which is to ensure an orderly transition of thermal generation plant. However, the Consultation Paper goes beyond considering matters related to just ensuring the transition is orderly which may result in the unintended outcome of raising potential risks that impact an orderly transition. That is, the Consultation Paper also presents the results of modelling analysis that concludes, for instance: *by 2032 … there is unlikely to be sufficient demand for thermal generation to support the retention of all existing thermal units.*[13] Such statements may influence investment decisions as being the view of the Authority.
2. Are there any other aspects of thermal transition risks that should be considered by the Authority?	As noted above, one of the main barriers to the development of further fast-start thermal generation is not related to economic costs or revenue adequacy but rather uncertainty around policy settings for the role gas in the transition. Whether the Government's proposed Gas Transition Plan and MBIE's Electricity Market Measures work will explicitly address this is one source of risk as is the proposed review of the existing government target of 100% renewables by 2030. In addition, the Authority defines the *[r]isk of delayed or inadequate thermal investment – this refers to the possibility that investment in new thermal capacity would be beneficial but does not occur in a timely way.*[14] The risk of delayed or inadequate thermal investment is crucial as the Authority's desired outcome should recognise the asymmetric impact of delayed or inadequate thermal investment on reliability and security particularly as it relates to fast-start thermal generation vis-à-vis currently uncertain alternative back-up services. That is, investing in additional fast-start thermal capacity now may in the future turn out to be more than required, but this may be preferable to not investing now and finding out in the future there is a resulting reliability and security issue because the current uncertain alternative services do not eventuate as expected.
3. Do you agree with the above expectation of the likely role of thermal generation throughout the transition? If not, what is your view and reasoning?	Mercury considers that framing the role of thermal generation throughout the transition as an "expectation" *per se* may not appropriately address the asymmetry described above.

[13] Consultation Paper, page iii.
[14] Ibid. paragraph 2.8(b)

Consultation Paper questions	Mercury response
	An "expectation" based approach to thermal generation capacity which takes the form of forecasts results in a view that investment in additional fast-start thermal capacity "appears unlikely".[15] The analysis is in effect picking a "winner", or more precisely a "loser" which may have an unintended impact on an orderly thermal transition.
4. What (if any) improvements could be made to information to aid decision makers in relation to thermal transition risk?	Mercury supports initiatives that improve the availability and quality of information and data that would enhance investment decisions and efficient market-based outcomes.
5. Are there any aspects in current spot market arrangements that are likely to undermine incentives to make efficient decisions in relation to back-up resources? If so, what are they?	Mercury agrees with the Authority that efficient spot prices play a critical role for informing efficient thermal transition decisions. Mercury also agrees that there are no mechanisms in current market arrangements that would artificially distort spot prices and erode suppliers' incentives to make efficient decisions in relation to provision of back-up resources
6. Do current arrangements provide balanced incentives to conclude forward contracts to manage thermal risks of transition appropriately? If not, what are the reasons for your view?	Mercury agrees with the Authority that wholesale purchasers and sellers have strong natural incentives to forward contract to reduce exposure to financial risk arising from spot price volatility. Looking forward, Mercury considers that these incentives will remain at similar levels or increase particularly if periods of spot market volatility occur more frequently, as the Authority suggests.
7. Do current arrangements ensure reasonable availability of forward contracts related to back-up services – such as dry year cover? Please explain your reasoning.	Yes. As the Authority notes there is a relatively long history of participants entering into back-up contracts underpinned by thermal generation. Mercury also notes that the Authority with the industry has prepared a *Voluntary code of conduct for participants in New Zealand's over the counter (OTC) electricity market* that aims to improve the efficiency and performance of, and conduct within, the OTC market.
8. To what extent do current arrangements create potential for misaligned incentives between retailers and consumers in relation forward contracting with adverse impacts on thermal transition risk? Please explain your reasoning.	Mercury considers that retailer and customer incentives are presently align, and that the risk of forced demand curtailment is factored has much as feasible into wholesale contracts. It should be noted that forced demand curtailment in general is likely to involve "black swan" events discussed above.
9. To what extent do current arrangements relating to use of ripple control in periods of tight supply affect thermal transition risk? Please explain your reasoning.	This is an example of uncertainty in a demand-side flexibility service provided by ripple control that currently does not deliver same level of security and reliability as fast-start thermal generation. Mercury supports enhancing the capability of ripple control but also notes that there is uncertainty regarding the level and timing of this capability.
10. Do you agree with the Authority's view above that lumpiness does not (at present) threaten to disrupt an orderly thermal transition? If so, or if not, please explain your reasoning.	Mercury agrees with the Authority that lumpiness does not at present threaten to disrupt an orderly thermal transition. Mercury also agrees in general with the Authority's rationale, which can be summarised as being there is visibility of the status of large thermal generation assets, as Concept Consulting's analysis illustrates, and market participants maintaining open, flexible positions which enable them to reach agreements even if earlier negotiations have not succeeded.

[15] The Authority suggests "*The potential for investment in additional fast-start [thermal] capacity to become economic appears unlikely in the base case.*" - Consultation Paper, paragraph 3.29(e)

Consultation Paper questions	Mercury response
11. To what extent are there any selective support mechanisms paid outside the wholesale market that could pose a challenge to achieving an efficient thermal transition? Please explain your reasoning.	Mercury agrees with the Authority that the thermal transition risk is likely to be lower if renewable and thermal generation compete in, and are paid from, a common revenue pool, which is the wholesale market. Mercury considers that selective support mechanisms paid outside of the wholesale market may raise coordination issues that increase the risk for an orderly thermal transition.
12. To what extent is thermal generation providing a service that is needed but not explicitly priced and rewarded? Please explain your reasoning.should the accuracy standards be based on the percentage of installed capacity rather than a certain amount of MW?	As a general point, Mercury considers that hydro and geothermal generation already and will continue to provide services that in other markets may almost exclusively be provided by thermal generation. These services may not be explicitly priced, however developing markets for these services may not be cost effective. An implicit pricing signal may be more effective should the system operator have minimum requirements for system inertia or strength.
13. To what extent will thermal retirement/investment decisions be driven by non-financial factors? Please explain your reasoning.	As noted above, the main barriers to the development of further fast-start thermal generation are not related to economic costs or revenue adequacy but rather uncertainty around policy settings for the role gas in the transition. Whether the Government's proposed Gas Transition Plan and MBIE's Electricity Market Measures work will explicitly address this is one source of uncertainty as is the proposed review of the existing government target of 100% renewables by 2030.
14. What (if any) other factors could undermine an efficient thermal transition? Please explain your reasoning.	
15. Do you have any views on the options discussed above, and how useful they might be if thermal transition risks increase in future?	Mercury agrees in general with the Authority's options and preliminary assessment.
16. What other options (if any) could be explored to mitigate thermal transition risks, should these risks increase in future? Please explain your reasoning.	