

27 June 2022

CONFIDENTIAL

Draft BCG proposal to Mercury, Genesis Energy, Meridian and Contact Energy to develop a roadmap for a low carbon energy system

Dear Mark, Barbara, Prue and Rob,

It has been a pleasure to engage with you and your teams on this important agenda for New Zealand's energy sector. As discussed, it is intended that Mercury, Genesis Energy, Meridian and Contact Energy (the "**Companies**") will be our clients for the purposes of this engagement, and will collectively acquire the services from us, and be party to the contractual terms giving rise to the engagement.

That said, we acknowledge that other third parties may make a financial contribution to the Companies to assist to pay BCG Host's fees (on the basis that those third parties will also be benefitting from the collectively acquired services), and / or contribute confidential information to inform BCG's work. While those third parties are not parties to this agreement giving rise to the engagement:

- Those third parties shall have visibility of the terms of this engagement.
- BCG shall treat the confidential information of those third parties in the same way it treats the confidential information of the Companies (including in accordance with the terms of this Agreement).

This memo outlines our draft proposal for us to develop, and your companies to collectively procure, an independent BCG report on the "pathways" towards a low carbon energy system in New Zealand and a "roadmap" to deliver the most desirable pathway. For clarity, what is meant by the terms above is BCG collating and assimilating information in relation to current / future / potential energy sector investments and developments, and current / future / potential regulatory, policy, legislative, and market setting frameworks, to identify possible pathways towards a low carbon energy system and possible impediments to that ("**pathways**"), and a set of elements that would need to be true in order to achieve the desired pathway ("**roadmap**").

For the avoidance of doubt reference to a "roadmap" or "pathway" in this context, is not reference to a prescriptive set of actions or a prescriptive, sequenced roll out of identified technologies or specific identifiable future investments. Rather those terms refer to outlining at a higher "whole-of-electricity-sector" level an independent view on the best ways to achieve the best low carbon energy system for New Zealand, including views on the framework of the right policy, regulations, legislative, and market settings to achieve that.

We have structured this memo along the following sections: (1) Our understanding of the context and the problem; (2) Objectives of the engagement and proposed deliverables; (3) Scope of proposed report; (4) Proposed timeline; (5) Methodology.

We reiterate from the outset that both BCG, and your Companies, are very conscious of the competition law (Commerce Act) sensitivities inherent in an industry group procuring a report. Accordingly, it is acknowledged that:

- No competitively sensitive information (such as pricing or specific generation retirement or investment initiatives) can be exchanged or disclosed between competing energy sector participants. BCG will put in place information protocols to meet this requirement;
- The outputs included in BCG's report will not include any recommendations in relation to specific commercial or investment decisions by competing energy sector participants, but rather will outline at a higher "whole-of-electricity-sector" level an independent view on the best ways to achieve the best low carbon energy system for New Zealand;
- There is no contract, arrangement, or understanding between energy sector participants as to any action (if any) that will be taken in response to BCG's report, with each energy sector participant to determine its own response in its own unfettered discretion.

We have included an appendix document that describes BCG's proposed project delivery approach, commercial proposal and proposed next steps. It also includes relevant energy and climate change expertise to accompany this memo. Also included is our approach to protecting confidential and commercially sensitive information, and our standard terms and conditions.

1. Our understanding of the context and the problem

Domestic decarbonisation context:

The New Zealand Government is seeking to decarbonise the economy to achieve its 2030 Paris Climate Target and net zero 2050 target. The Government has recently released the Emissions Reduction Plan which outlines carbon budgets to 2035 and a set of actions and proposed policies to achieve this plan.

We understand that the electricity sector is strongly supportive of meeting New Zealand's climate change objectives. The electricity sector is a critical enabler to achieving emissions reductions in the broader energy sector. It can contribute to decarbonising the energy sector in New Zealand in two ways:

1. Through direct decarbonisation of the electricity sector, which represents ~5% of national emissions
2. Through electrification of the transport, industry and building sectors, which represent ~30% of national emissions. This is the most significant contribution that the sector can make.

The sector has made a significant head start on ensuring a strong pipeline of renewable generation projects. ~650 MW of generation projects are currently under construction, ~900 MW are in mid-stage development, and a further ~18,000 MW are at early/enquiry stage. The sector is also prioritising security and reliability

of electricity supply by investing in energy storage systems, flexible generation and investigating flexible demand response for projects such as data centres and green hydrogen projects.

The electricity system is 82-85% renewable today. Projects under construction and currently committed are likely to achieve 90-95% renewable electricity by 2025. There is also a large pipeline of consented renewable electricity projects that will further increase this proportion of renewable electricity and meet increasing demand from electrification.

Electrification is also beginning to ramp up. EV registration rates are three times higher since the introduction of the Clean Car Discount and continue to climb. The Government Investment to Decarbonise (GIDI) fund has incentivised projects that will deliver ~7.5 million tCO₂-e of emissions reductions across their lifetimes, much of which will come from projects that electrify process heat. The electricity sector is supporting electrification through provisioning sufficient supply and working closely with customers.

Problem statement:

The challenge of decarbonising New Zealand's energy system is complex and requires public and private actors across the sector to work constructively to ensure the best outcome for New Zealand.

While there is an incredible amount of positive activity occurring across the electricity sector to enable increased renewable electricity and electrification, there is not a coherent **whole-of-electricity-sector view** that clearly articulates this activity.

Having visibility of a **whole-of-electricity-sector view** of activity is a key element that would enable the bringing together of an independent **view of the best pathway¹ to a low carbon energy system** for New Zealand.

The pathway would be converted into a **credible roadmap² for decarbonisation of the energy system from 2025 to 2040**, bringing together the **whole-of-electricity-sector view**, to form an independent view on an overall framework to achieve a low-carbon energy system that delivers the best energy trilemma outcomes for New Zealand.

Broader energy system context:

The domestic decarbonisation context is further complicated by recent events in energy markets both globally and locally, which have demonstrated that the energy transition to support a low carbon energy system is not always going to be smooth³.

¹ See the definitions of "roadmap" and "pathway" on page 1 for clarity on the use of these terms.

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³ In 2021 in New Zealand there was a 9 August blackout, higher than average wholesale electricity prices and the highest level of coal burned since 2013. Many of these events were out of the control of sector participants (e.g. due to low lake levels, high gas prices and high carbon prices).

Recent global events have also demonstrated the impact of elevated energy prices. In Europe electricity and gas prices had remained significantly elevated in 2021, even before the Russia-Ukraine conflict.

We understand that the New Zealand electricity sector is very cognisant of the potential issues that can arise through the transition to a low carbon energy system. We understand the electricity sector is keen to address these issues to ensure the best outcomes for New Zealand through the transition.

The best transition pathway to a low carbon energy system is likely to be one that will achieve accelerated decarbonisation while delivering affordable, reliable and secure energy for consumers. Today there is a lack of consensus of what this pathway looks like across the private and the public sectors.

In government there is an aspirational target of 100% renewable electricity by 2030 and an investigation into the New Zealand Battery Project to identify a renewable solution for managing dry years. These policies are likely viewed by government as part of the best pathway to transition to a low carbon energy system. Within the electricity sector there are numerous initiatives underway to investigate various dry year solutions, develop renewable electricity and enable electrification. Despite this, there is not an aligned whole-of-electricity-sector view on what the best pathway to a low carbon energy system is.

2. Objectives of the engagement and proposed deliverables

This work will develop an independent BCG report that creates a **whole-of-electricity-sector view** to enable the bringing together of an independent **view of the best pathway to a low carbon energy system**.

This independent report will develop a credible roadmap for the transition to a low carbon energy system, that outlines the best outcome for key stakeholders, including the government, business, consumers and society.

It will seek to assess **the most powerful contribution that the electricity sector can make to decarbonisation of the New Zealand energy system**. This framing will ensure that the report maintains a positive rather than defensive tone.

This will investigate emissions reductions that can be made within the electricity sector and those that can be enabled through electrification of transport, industry and buildings. It will consider this contribution in the context of managing affordability, reliability and security of supply. The report and accompanying materials will seek to develop greater consensus among key stakeholders and the electricity sector on the best pathway to a low carbon energy system.

The roadmap will collate a wide range of existing information from industry participants and key stakeholders like the Climate Change Commission. It will involve rigorous analysis and consideration of energy trilemma implications, including affordability, reliability and security of supply for consumers. It will also involve extensive electricity market modelling and analysis to identify the best pathway to deliver a low carbon energy system.

The independent BCG report will be communicated via a number of mediums to maximise reach and to resonate with different stakeholders, including:

- A BCG report that outlines a credible roadmap for the development of a low carbon energy system

- A short-format brochure version of the BCG report
- An interactive short-format web version article on BCG's website
- An infographic to outline the key findings of the BCG report in a digestible manner
- An animated BCG video communicating key findings
- BCG LinkedIn outreach
- A detailed compendium of modelling methodology and findings

Notwithstanding anything to the contrary in BCG's terms and conditions (as included in Appendix Five), it is expressly acknowledged and agreed that the outputs described above will all be made publicly available when complete (i.e. the final copy of BCG's report, the short-format brochure version of the BCG report, interactive short-format web version article on BCG's website, the infographic, the animated BCG video, the BCG LinkedIn outreach and the detailed compendium of modelling methodology and findings).

3. Scope of proposed report

The **target outcome** of this report would be to develop an electricity sector-wide roadmap for a low carbon energy system. This will include independent recommendations for a framework that will enable the electricity sector, government and regulators to enable the best transition to a low carbon energy system.

Low carbon energy roadmap deliverable:

This report will include the following:

Context: Articulate the context for decarbonisation and frame the position of the sector to deliver a low carbon energy system

- Outline the importance of the transition to net zero
- Outline the New Zealand Government's climate change commitments and actions
- Demonstrate the importance of the energy system in achieving these commitments and actions
- Position the role of electricity in supporting the transition both in terms of reducing sector emissions and enabling electrification of other sectors
- State the sector's position in delivering this

Whole-of-sector view: Outline the work underway and the action being taken by the electricity industry to achieve the transition to a low carbon energy system, including:

- Renewable projects:
 - Recently commissioned
 - Under construction
 - Reached final investment decision

- Consented
- Enquiry / early stage
- Renewable and non-renewable solutions for addressing resource adequacy (dry year risk and/or peaking capacity) including consideration of:
 - The role of gas generation in the energy transition
 - Large-scale industrial demand response
 - Hydrogen demand response
 - Pumped hydro energy storage
 - Biomass generation
 - Batteries
 - DER/flexibility
 - Other forms of short, medium and long-duration energy storage
- Networks:
 - Transpower's work programme to enable electrification and renewable generation - e.g. Net Zero Grid pathways
 - Distribution companies' work programmes to enable electrification, distributed energy resources and flexibility – e.g. The ENA's Network Transformation Roadmap and the sector wide update of asset management plans in light of the Emissions Reduction Plan
 - Impacts to electricity networks that may arise from DER integration and electrification and how this can be effectively managed by networks
- Broader sector initiatives to enable distributed energy resources and flexibility
- Broader sector initiatives to enable electrification of transport and process heat

Framing the solution: Articulating what a successful transformation to a low emission energy system looks like

- Outlining how accelerated decarbonisation is desirable, how the electricity sector can enable this, and if it can be done while balancing other trilemma elements
- This will incorporate an articulation of the trilemma and the benefits of a transition that maintains affordability, reliability and security of supply

Roadmap: Develop an integrated New Zealand electricity sector roadmap for decarbonisation of the energy system:

Analysis of various credible transition pathways to 2050, including:

- Supply and Demand by pathway
 - Supply by generation type
 - Demand by demand source
 - Incorporating work from the Climate Change Commission, Transpower and others
 - Storage and system flexibility
 - Identify different storage and system flexibility options to achieve resource adequacy for capacity (peaking) and energy (dry year) and align them to the appropriate pathway, including the role of DER and demand shifting in each pathway
 - Identify, at an aggregated, high-level,⁴ the scale of the potential enabling investment in energy transmission and networks in each pathway to support whole of system trade offs
 - Options to transition away from fossil fuelled generation that also considers the role of gas generation in the energy transition
 - Identify pathways including consideration of timelines, and localised implications on supply and capacity to transfer away from fossil fuelled generation
 - New technologies
 - Explore the economic feasibility of new technologies in generation, storage, peaking capacity and networks
- The implications of each pathway can then be analysed in terms of outcomes at a whole of sector level:
 - Emissions Reductions, including contribution from the electricity sector to the decarbonisation of the energy system
 - Affordability / cost
 - Reliability of supply / resilience
 - Security of supply / dry year risk
 - Assessment of key risks of each pathway, including, for example:
 - Investment uncertainty (e.g. caused by policy uncertainty or misaligned regulation)
 - Market failures
 - Misalignment of market incentives
 - Information, coordination and agency issues
 - Broader narrative integrating these trilemma outcomes

⁴ Assessment will include an aggregate investment number for the distribution sector, but not for each individual network

- This pathway analysis will seek to outline **the most powerful contribution the electricity sector can make to reducing emissions in the energy sector.**

Once modelling for each pathway has occurred and the implications for each pathway have been assessed, then BCG's independent view on desirable pathways can be determined. This will likely include an independent view on the most desirable pathway which will include the most powerful contribution the electricity sector can make to reducing emissions in the energy sector. For the most desirable pathway, consideration of the required capacity of the workforce / skills to deliver the pathway will be considered.

Recommendations:

The recommendations section will investigate what would need to be true for the desirable pathway to be achieved. It will establish a framework for this pathway to be achieved. This will be done by assessing⁵:

- What would be required of the sector to achieve these pathways⁶:
 - Incorporating a whole-of-electricity-sector view of work underway and future work required to achieve this pathway
 - Required investment and timing of investment, taking into account investment already committed
 - Workforce / skills development required, including required policy, to deliver on the pathway
- What would be required of Government and regulators to achieve the desirable pathway:
 - Policy, regulations and market settings. This will consider these settings for generation, transmission, distribution, and retail to deliver the desirable pathway⁷
 - Direct investments, if at all required

The framework will consist of a set of clear, concise independent recommendations that will outline what needs to occur for the electricity sector to make the most powerful contribution to reducing emissions in the energy sector.

4. Proposed timeline

⁵ Note that there is an option to have a check in here at this point to ensure that there is value in analysing the most desirable pathway. For example, in the instance where this is being tested through other workstreams then it may be worth considering.

⁶ This is not going to outline prescriptive actions (e.g. X company needs to invest in X power plant at X date) that could lead to some view of potential sector coordination. Rather it will seek to outline broader overall sector investment requirements (e.g. \$X billion by 2030) and themes (e.g. increased investment being required in enabling transmission infrastructure).

⁷ For example, this will consider the regulatory framework for distribution companies to ensure that required investment can be made to enable the integration of DER and other flexibility resources

Note the following timeline is draft only and is subject to shift due to timing of reaching contractual agreement between parties. We propose a 4 month engagement:

- Project commencement date: Monday 20th June 2022
- Draft BCG report for review: Friday 19th August 2022. Note that the review is only for the purposes of factual error checking. To maintain the independence of the report the reviewers will not be able to make comments that are based on opinion or subjective interpretations of facts. The draft report will not be made public. It is intended that the process by which the draft report is reviewed will be independently verified by an independent verifier to validate the independence of the report.
- Final BCG report complete Friday 14th October 2022 including:
 - A short-format brochure version of the BCG report
 - An interactive short-format web version article on BCG's website
 - An infographic to outline the key findings of the report in a digestible manner
 - An animated video communicating key findings
 - BCG LinkedIn outreach
- Release of Report: Monday 24th October 2022
- After the release of the report, BCG will also be present at a launch event and at 1 to 2 meetings per week for the subsequent 4 weeks. These meetings will be with key stakeholders to discuss the findings of the report.

5. Methodology

BCG will work collaboratively with the electricity sector participants involved, but in a way that maintains strict independence of the report and upholds BCG's integrity. BCG will only attend meetings where more than one electricity sector company is present if an appropriate legal representative is also present.

Data and presentation of insights:

The success of this project will be integrally tied to the quality of the data we receive from electricity sector participants to enable the development of an independent 'whole-of-electricity-sector' view and identification of the best roadmap to achieve a low carbon energy system.

We will leverage all relevant publically available information including electricity sector modelling (e.g. Transpower's Whakamana i Te Mauri Hiko, Climate Change Commission's modelling, MBIE EDGS and others), proposed network investment information (e.g. via Asset Management Plan updates supplied by participating networks), investments from independent generation companies (e.g. from press releases, aggregated data released by Transpower) and public announcements from gentailers (e.g. via investor presentations and press releases).

Despite this we still expect there will be an information gap. We will require sector participants to provide us with confidential information that will be subject to BCG's stringent confidentiality obligations. We will

require any information sent to us to also be shared with the legal representative. More information on our approach to protecting confidential and commercially sensitive information can be found in Appendix 3.

The analysis derived and presented from this information will need to be aggregated in such a way that individual projects or companies' proposed future generation portfolios are unable to be derived. We will take utmost care to ensure that no competitively sensitive information can be gleaned from these aggregated analyses, and that one energy sector participant's competitively sensitive information is not disclosed to another. We will share aggregated analyses with the legal representative first to ensure that no competitive information can be gleaned. The aggregated analyses will only be shared once the legal representative has identified that it is OK to do so. We will also ensure that the aggregated analyses still serve as insightful in developing a whole-of-electricity-sector view.

How we will work together with Concept Consulting

The intention is for BCG to have Concept Consulting as a sub-contractor to perform electricity market modelling and broader energy system modelling (e.g. electrification estimates and whole-of-economy decarbonisation estimates). It is also the intention for Concept Consulting to release a separate technical modelling report that will outline their modelling methodology and findings. This will also provide insights and interpretations of the modelling. The work will also seek to leverage the extensive work that Concept Consulting has already done across the sector, where that work is able to be shared.

BCG will work with Concept Consulting over the coming week to seek to agree this working model. We understand the the Concept Consulting timeline is 4 months from Monday 20th June, which aligns with the BCG timeline.

The BCG team will work in collaboration with the Concept Consulting team to:

- Leverage the extensive work that Concept Consulting has already done across the sector
- Frame key assumptions for quantitative analysis that Concept Consulting will perform
- Frame pathways for quantitative scenario analysis that Concept Consulting will perform
- Discuss and understand Concept Consulting's interpretations of the analysis
- BCG will then conduct quantitative and qualitative analysis to derive key insights from Concept Consulting's analysis (e.g. trilemma implications)
- BCG will then clearly articulate the findings of our analysis that is supported by quantitative modelling performed by Concept Consulting

A detailed scope of the Concept Consulting modelling is available in Appendix 4.

BCG also has proprietary modelling tools that may be used to support this analysis, outlined in appendix 2.2.

Yours sincerely,

François Tibi

Phil Hirschhorn

Richard Hobbs