

Future security and resilience

Phase 2 draft roadmap

Discussion paper

29 March 2022



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1 Our motivation: the low-emissions energy transition

- 1.1 New Zealand has committed to achieving net zero emissions by 2050. As signalled in the Climate Change Commission's final advice earlier this year¹, and the Government's recent consultation on the first emissions reduction plan², transitioning to a low-emissions energy system will be critical to New Zealand meeting that goal.
- 1.2 Based on current projections, the most likely means of reducing emissions from the energy sector will be electrifying as much of the transport and industrial heating sectors as possible, and meeting the increased electricity demand with material quantities of new renewable generation. Operation of existing, high-emitting fossil-fired thermal generation will have to decrease.
- 1.3 At this point in time, the most economic forms of new renewable generation are projected to be wind and solar. These are often referred to as *variable, intermittent* and/or *non-dispatchable* technologies, in that they generate electricity when the wind is blowing or sun shining, but not otherwise. They are being deployed in New Zealand at a variety of scales, from several kilowatts (kW) for rooftop solar, to hundreds of megawatts (MW) for large-scale wind farms. Solar farms in the order of thousands of MW are being planned overseas³.
- 1.4 Large increases in variable renewable generation will present new challenges to the operation of and investment in the electricity system, and to maintaining a secure, reliable and resilient electricity supply. However, new technologies also provide significant opportunities. Energy storage systems like batteries (including in electric vehicles), and controllable demand (like electric vehicle chargers), can be harnessed to provide the services to the power system that have traditionally been delivered by just a handful of existing technologies. A key shift is the move from a largely centralised system to a decentralised system, with the number of controllable devices connected to New Zealand's power system set to increase exponentially. This will provide significant diversity benefits, however it will also give rise to new coordination challenges.
- 1.5 Factors outside electricity systems are also providing new challenges to the operation of power systems worldwide. Climate change may increase the occurrence of extreme weather events, testing power system resilience, and the threats to operation from cyber security breaches increase every day.
- 1.6 The Authority's *Future security and resilience* workstream is examining how to ensure the electricity system remains stable, secure and resilient as it evolves in the coming decades. A secure and resilient power system is important to electricity consumers, to all participants in the electricity system, and to all New Zealanders more broadly.
- 1.7 In 2021 we consulted on a draft report on future challenges and opportunities. We have recently released a final version of that report incorporating feedback from stakeholders. The focus of this consultation paper is the draft roadmap set out in Appendix B that identifies the work that needs to be done to address those challenges and opportunities,

¹ See <https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/inaia-tonu-nei-a-low-emissions-future-for-aotearoa/>

² See <https://environment.govt.nz/publications/emissions-reduction-plan-discussion-document/>

³ See, for example: <https://suncable.sg/>

and the proposed sequencing of that work. We want to make sure we hear from you on your views on this next phase.

2 Authority workstreams supporting the transition

- 2.1 Facilitating an efficient transition to a *low-emissions energy* system is one of the key ambitions set out in the Authority's strategy⁴, alongside maintaining *trust and confidence* in the reliability of the system through the transition.
- 2.2 The *Future security and resilience* workstream is one of a number of significant, transformational and interrelated Authority workstreams supporting New Zealand's transition. These initiatives are set out in the Authority's *Energy Transition Roadmap*⁵. Other initiatives include:
- (a) Examining wholesale market operation under 100% renewables
 - (b) Updating the regulatory settings for electricity distribution networks
 - (c) Implementing real-time pricing in the electricity wholesale market
 - (d) A new Transmission Pricing Methodology
 - (e) Faster reform to efficient electricity distribution pricing
- 2.3 The Authority is also undertaking several significant reviews of the electricity market currently, including:
- (a) Phase 2 of the review into the events of 9 August 2021⁶
 - (b) The wholesale market competition review⁷
 - (c) Review of the events of early 2021, driven by low hydro inflows and the tight gas market.
- 2.4 Each of these reviews will be considering issues critical to the low-emissions transition, and has the potential to give rise to a number of important workstreams.

Future security and resilience⁸

- 2.5 The multi-year *Future security and resilience* workstream is investigating challenges and opportunities to maintaining a secure, stable and resilient power system in the face of technological and other changes. Alongside affordability and sustainability, reliability (which encompasses security and resilience) is a key component of the energy trilemma.
- 2.6 This project forms part of the Authority's response to the Government's Electricity Price Review⁹ – in particular, recommendation G2, to examine the security and resilience of electricity supply.

⁴ See <https://www.ea.govt.nz/about-us/strategic-planning-and-reporting/statement-of-intent/> for further information.

⁵ See <https://www.ea.govt.nz/assets/dms-assets/29/Roadmap-Transition-to-Low-Emissions-Energy-System-v1.0.pdf>

⁶ See <https://www.ea.govt.nz/monitoring/enquiries-reviews-and-investigations/2021/electricity-authority-review-of-9-august-2021-event-under-the-electricity-industry-act-2010/>

⁷ See <https://www.ea.govt.nz/monitoring/enquiries-reviews-and-investigations/2021/wholesale-market-competition-review-2/>

⁸ See <https://www.ea.govt.nz/development/work-programme/risk-management/future-security-and-resilience-project/>

⁹ See <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-consultations-and-reviews/electricity-price/> for more information.

- 2.7 The focus of the *Future security and resilience* workstream is on maintaining security, stability and resilience of the power system in and close to real time. In other words, it is not assessing the power system's ability to maintain a balance of demand and supply over periods of longer than a few days (often referred to as "adequacy"). This is in part due to a request from the Minister of Energy and Resources in her letter of expectations for the Authority for the 2021/22 year¹⁰, which requested that the Authority sequence this aspect of the review after Phase 1 of the New Zealand Battery Project had been completed.
- 2.8 There are key interrelationships between *Future security and resilience* and the following workstreams:
- (a) Examining wholesale market operation under 100% renewables (undertaken by the Authority's Market Development Advisory Group, MDAG)
 - (b) Updating the regulatory settings for electricity distribution networks.
- 2.9 In particular, the first of these is the primary workstream addressing spot market operation and adequacy as New Zealand transitions towards 100% renewables. The MDAG has recently completed consultation on a discussion paper on the issues involved. Once the MDAG has completed considering and analysing submissions, it will begin work on the options to address those issues.
- 2.10 *Updating the regulatory settings for electricity distribution networks* is the Authority's primary workstream addressing the future security and resilience of distribution networks in the coming decades. In 2021 the Authority consulted on a discussion paper launching this workstream¹¹, and received many submissions. Analysis of the feedback received will inform the direction of that work, and of any work relating to distribution networks to be undertaken under the *Future security and resilience* workstream.
- 2.11 Work undertaken under the *Future security and resilience* workstream will form the basis of the *Joint development programme*¹² between the Authority and Transpower as the system operator for the coming years.

3 The future security and resilience workstream

- 3.1 Electricity systems worldwide, including New Zealand's, have been designed on the assumption that a material proportion of generation is fuelled by fossil fuels. Achieving New Zealand's climate goals will likely require a material increase in variable renewable generation, presenting new challenges to the operation of and investment in the electricity market, and to maintaining a secure, reliable and resilient electricity supply.
- 3.2 However, the move towards 100% renewables, and the uptake of new technology, present opportunities for other technologies to provide the services that are typically supplied predominantly by hydro generation and supported by fossil fuels, particularly when insufficient hydro is available.

¹⁰ Available online at <https://www.ea.govt.nz/about-us/who-we-are/responsible-minister/>

¹¹ Available online at <https://www.ea.govt.nz/development/work-programme/evolving-tech-business/updating-regulatory-settings-for-distribution-networks/>

¹² See <https://www.ea.govt.nz/operations/market-operation-service-providers/system-operator/joint-development-programme/> for more details.

We are working with the system operator to identify opportunities and challenges

3.3 As part of this workstream, the Authority has commissioned advice from Transpower as the system operator. This work is taking place in three phases as set out below.

Phase 1 – identifying challenges and opportunities

3.4 **Phase 1** involved producing an initial report on future security and resilience challenges and opportunities based on current understanding. The phase 1 draft report was published in November 2021 and three workshops were held in November to December 2021 to discuss its content. The Authority received fourteen submissions on the draft report. The phase 1 report has been refined in response to the feedback received at both the workshops and in submissions, and the final version of the phase one report accompanies this consultation paper in Appendix A.

3.5 As the system operator notes in its final Phase 1 report, after taking into account feedback on the draft, the following changes have been made from the draft report:

- (a) the following two changes were made to the priority of identified opportunities and challenges as compared to the draft report:
 - (i) The priority for leveraging new technology to enhance ancillary services was increased from low to medium.
 - (ii) The priority for maintaining cyber security was increased from medium to high.
- (b) Further consideration of the three key themes, opportunities and challenges resulted in the following minor renaming and recategorisation from the draft report:
 - (i) ‘Other challenges’ was renamed to ‘Foundational opportunities and challenges’.
 - (ii) ‘Loss of control due to cyber security’ was renamed to ‘Maintaining cyber security’.
 - (iii) ‘Leveraging new technology to enhance ancillary services’ was recategorised into the ‘Foundational opportunities and challenges’.
 - (iv) ‘Coordination of increased connections’ was recategorised into the ‘Rise of DER’.

Phase 2 – developing a prioritised roadmap for delivery

3.6 **Phase 2** of the project builds on sector contributions from phase one and involves the development and publication of a detailed 10-year roadmap of investigations and related technical and regulatory work needed to transform the electricity system over the next ten years.

3.7 The draft roadmap is set out in Appendix B to this consultation paper. We seek your feedback on this draft roadmap. We invite you to attend one of the workshops to discuss the roadmap scheduled to be held on Thursday, 7 April 2022. Details on how to register to attend the workshops are set out in paragraphs 4.10-11.

3.8 We also seek submissions on the roadmap, the closing date for which is Tuesday, 10 May 2022. Following analysis of submissions, the Authority will decide on the final roadmap. This phase is expected to conclude by the middle of 2022.

Phase 3 – delivery of the roadmap

- 3.9 From mid-2022 onwards, **phase 3** will start by publishing a prioritised plan for monitoring and addressing the challenges and opportunities identified through phase two.
- 3.10 This final phase will include delivery of a multi-year programme of studies and solutions to address the challenges and opportunities identified.
- 3.11 It is important to note that the focus of phase two is on identifying and sequencing future work. No decisions are being made at this point on any solutions for addressing the challenges and opportunities identified in phase one.
- 3.12 Each of the subsequent initiatives in phase three addressing challenges and opportunities identified in phase one, and especially those considering amendments to the Code, would be subject to the Authority's usual consultation processes.

The initial focus of this workstream is on the transmission network

- 3.13 The initial focus of the *Future security and resilience* workstream is on addressing the challenges and opportunities across the broader transmission network. This includes issues such as system strength, and wholesale ancillary services, that impact New Zealand's electricity network at a multi-regional or national level.
- 3.14 As discussed above, issues relating the future security and resilience of distribution networks are being addressed primarily through the *Updating the regulatory settings for electricity distribution networks* programme of work.
- 3.15 The two areas clearly overlap. For example, DER can provide services to the distribution networks on which they're located, but also to the broader system (for example through ancillary services, such as instantaneous reserve or frequency keeping). Effective aggregation and coordination of many smaller resources is an important factor in realising this opportunity.
- 3.16 The scope of the Authority's workstreams has to be defined somehow, and monitored accordingly. We will ensure consistency and cohesiveness between the multiple Authority workstreams addressing the transition.

4 We are seeking your views on the draft roadmap

- 4.1 Release of the phase 2 draft roadmap is the second key milestone in the *Future security and resilience* workstream.
- 4.2 The roadmap appended to this discussion paper is a draft. The roadmap will not be finalised until we have heard and taken account of stakeholder feedback.
- 4.3 As discussed above, the roadmap is focussed on the work required to address the challenges and opportunities identified in phase 1 in relation to maintaining security, stability and resilience at the transmission system level. This is an area in which Transpower as system operator has significant expertise, and has undertaken numerous studies in the past.
- 4.4 Areas outside of their expertise, for example in relation to distribution networks, are being investigated and addressed primarily in other Authority workstreams. We will engage other expertise to assess these issues, as required.
- 4.5 As noted in the draft roadmap, the intent of the roadmap is to provide:

- (a) a clear understanding of the activities associated with each opportunity and challenge identified in the report
 - (b) a succinct desired outcome for each issue identified in the report
 - (c) a schedule of when those activities can be carried out based on the urgency of the issue
 - (d) an indication of the primary enabler for the activities required.
- 4.6 The roadmap also highlights interdependencies across the multiple activities, allowing for greater efficiency in delivering outcomes and an indication of the resourcing required.
- 4.7 The roadmap is intended to be a living document: as opportunities and challenges emerge faster or slower, or as technology advances change expectations, activities may prioritise or deprioritise.
- 4.8 The Authority has worked closely with Transpower through the development of the draft roadmap, and provided feedback on earlier drafts, supported by our own independent experts.

We will be holding workshops to explain and discuss the draft roadmap

- 4.9 It is critically important that the industry has a shared understanding of the work required to address the future challenges and opportunities, and the reasons for the proposed sequencing of this work. Further, testing the draft roadmap publicly and gathering feedback are some of the key controls we are employing to ensure that the right pieces of work are done and in the right sequence.
- 4.10 We will be undertaking two workshops to present and discuss the draft roadmap, with the details of these posted on our website¹³. The workshops will be interactive, giving participants the opportunity to discuss the proposed work to address the issues and opportunities that have been identified, and the sequencing of this work, and to raise any work they think may have been excluded.
- 4.11 You may register for one of the workshops on the roadmap by emailing fsr@ea.govt.nz.

We are seeking feedback on the draft roadmap through submissions

- 4.12 We seek feedback on the draft roadmap through submissions. Written feedback can be provided via email to fsr@ea.govt.nz, no later than **5pm on 10 May 2022**. Please note that we intend to publish all feedback we receive, as per standard Authority practice, unless expressly requested not to do so.

5 Next steps in the process

- 5.1 As noted above, the phase 2 roadmap appended as Appendix B is draft, and we are gathering feedback on it before it is finalised. It is our intention to finalise and publish this paper, along with a summary of feedback received, later this year.

¹³ Details are available at <https://www.ea.govt.nz/development/work-programme/risk-management/future-security-and-resilience-project/>

- 5.2 Following finalising the roadmap, the Authority and the system operator will discuss and seek agreement on the approach to governance, management and funding implementation of the activities in the roadmap.
- 5.3 Phase 3 of *Future security and resilience*, the implementation of the activities in the roadmap will commence in the forthcoming financial year, which begins July 2022. The activities in the roadmap will be prioritised for delivery alongside and amongst the rest of the Authority's activity over the coming years.

Appendix A Phase 1 final report prepared by the system operator

Appendix B Phase 2 draft roadmap prepared by the system operator