Electricity Authority
Level 7, Harbour Tower
2 Hunter Street
PO Box 10041
Wellington 6143
New Zealand
By email: fsr@ea.govt.nz

17 May 2022

Re: AWS Comments on the 'Consultation Paper: Opportunities and challenges to the future security and resilience of the New Zealand power system'

Dear Sir/Madam,

In response to the call for public submissions from the Electricity Authority, Amazon Web Services New Zealand (AWS) welcomes the opportunity to submit comments on the 'Consultation Paper: Opportunities and challenges to the future security and resilience of the New Zealand power system' phase 2 draft roadmap.

By way of introduction, AWS is the cloud computing arm of Amazon.com Inc. AWS has been operating in New Zealand for the past 9 years. We have offices in Auckland and Wellington, and employ more than 150 New Zealand staff in roles such as solutions architects, account managers, sales representatives, professional services consultants, and cloud experts and engineers. In September 2021, AWS announced that it would establish an AWS Region in Auckland in 2024, which will bring world-class cloud computing infrastructure onshore to New Zealand. Our Economic Impact Study[1] that accompanied the AWS infrastructure announcement estimated that this investment of NZ$7.5 billion will create around 1,000 new jobs and contribute approximately NZ$10.8 billion to New Zealand's GDP over the next 15 years.

AWS cloud technology allows New Zealand customers to innovate and scale in a highly secure environment. Our forthcoming AWS infrastructure in Auckland will enable our thousands of New Zealand customers – from large enterprises to government to small businesses and individuals already on the AWS global infrastructure – to leverage our advanced cloud services using infrastructure located in New Zealand. Just a handful of the impressive New Zealand customer success stories built on AWS are outlined in our Economic Impact Study, including customers in the energy sector.[2]

Globally, AWS works with many customers in the power and utility sector and we see the positive transformative effects for utilities and industries from harnessing data and applying analytics to make better decisions, improve their resiliency and be more responsive to consumers.[3] The Attached AWS publication *Leveraging the Cloud for a Resilient, Secure and Customer-Centric Utility* (Attachment 1)

[1] AWS Economic Impact Study, New Zealand Region
[2] Ibid. see p.5
[3] https://aws.amazon.com/power-and-utilities/

provides more information on how cloud technology is supporting the emergence of resilient, secure, and customer-centric utilities and more efficient and effective utility industries as a result.[4]

We look forward to remaining engaged in supporting New Zealand policy makers and our customers in their efforts to achieve ambitious national climate goals. AWS works with a number of customers in the New Zealand electricity industry, and we believe that innovation enabled by advanced digital technology will play a substantial role in New Zealand's energy transition and to the achievement of New Zealand's climate change goals. Amazon is also committed to achieving our own ambitious climate targets and we are on a path to powering its own operations with 100% renewable energy by 2025—five years ahead of its original target of 2030. Recently we announced 37 new renewable energy projects around the world. These new projects extend Amazon's leadership position as the world's largest corporate buyer of renewable energy. In 2019, Amazon co-founded The Climate Pledge—a commitment to net zero carbon across our business by 2040, 10 years ahead of the Paris Agreement. Addressing our Scope 2 emissions through purchase of renewable energy has been one of our highest priorities, and Amazon is now the largest corporate buyer of renewable energy globally, with 15.7 GW total renewable capacity and 42 TWh renewable energy enabled so far.

Please find included in Appendix A the AWS submission on the 'Consultation Paper: Opportunities and challenges to the future security and resilience of the New Zealand power system'. Thank you for the opportunity to comment on the consultation paper. We would be pleased to engage with the authors further on any of our comments, and we are eager to remain active contributors in future public consultation and industry engagement.

Yours sincerely,

Paul Keating
Senior Manager, Public Policy, New Zealand
Amazon Web Services

[4] AWS-White-Paper-Leveraging-Cloud-for-Utility-Resilience_Security-and-Customer-Service.pdf

Appendix A

AWS comments on the 'Consultation Paper: Opportunities and challenges to the future security and resilience of the New Zealand power system'

Globally, innovation in the energy sector is moving rapidly and with increased renewable energy generation and consumption of 'Distributed Energy Resources' so too will the complexity of regulating the electricity market. As Phase 1 of the consultation process states 'This complexity will result in a need for the System Operator and distributors to exchange real-time information to ensure operational coordination and ongoing system security'. AWS welcomes the continuing focus of the New Zealand Government on developing a conducive regulatory environment for a decarbonised, modernised electricity industry of the future. As outlined in the AWS Whitepaper 'Leveraging the Cloud for a Resilient, Secure, and Customer-Centric Utility' (2021)[5] we see three major drivers of change in this industry: Decarbonisation, decentralisation and digitalisation. These are discussed further below.

Enhancing resilience and security

Because of the increasing reliance on data management, automation and direct consumer engagement, the changing 'national grid' needs to be optimised for security and resilience. Electric utility customers and security partners using AWS are able to use cloud-based services to meet their resiliency and security requirements including identity and access management, data privacy protection, patching and vulnerability management, security event monitoring, and incident response. The cloud offers utilities transformative opportunities to optimise their information technology (IT) systems and operational technology systems costs and also enhance resilience and security. Resiliency, as defined in Phase 1 of the report includes operational (including contingency management and demand fluctuation) and infrastructure (including failover strategies) components.

Through the lens of scalability – the ability to draw up and down to meet demand – traditional utility systems may not be equipped to provide the required scale and flexibility to respond with their IT needs in the event of a cybersecurity event. Scaling from hundreds to millions of assets that must be monitored and coordinated requires advanced data ingestion and compute capabilities, and these needs will vary by orders of magnitude between blue-sky days and emergency peaks. Attempting this with on-premise systems would result in expensive overprovisioning that would still be insufficiently agile to be meeting fast-changing needs. With data centres in multiple geographic regions, AWS offers a much higher level of resilience and system recovery than a single on-premise data centre. We have the most extensive global infrastructure which spans 84 Availability Zones within 26 geographic regions, with announced plans for 24 more Availability Zones and 8 more AWS Regions in Australia, Canada, India, Israel, New Zealand, Spain, Switzerland, and the United Arab Emirates.

Future Security and Resilience: Maintaining cybersecurity

The Roadmap's Phase 1 and 2 publications ranks cybersecurity as 'high' and 'enduring' amongst the opportunities and challenges following feedback from the industry after the Phase 1 discussion process. We agree with the re-classification to 'high' and believe that the government's cyber security action plan will need to be both focused and long-term. Phase 2 mentions cybersecurity as not having interdependencies with other initiatives outlined in the roadmap, however we contend strongly that cybersecurity is an independent factor to be addressed explicitly in the roadmap. In order to address

[5] AWS-White-Paper-Leveraging-Cloud-for-Utility-Resilience_Security-and-Customer-Service.pdf

cybersecurity concerns, reviews of cloud and network security to underpin the various electricity related technologies should not be undertaken in isolation from other initiatives in the Roadmap.

Decarbonisation and decentralisation

Promoting cloud-first policies and cloud migration has immediate decarbonisation benefits. A recent study by 451 Research estimates that cloud infrastructure is five times more efficient than on-premise data centres in the region, such that moving information technology workloads to the cloud would immediately reduce energy use and associated carbon emissions by 78% across companies surveyed in the Asia-Pacific region. Customers benefit from the sustainability of our cloud infrastructure when migrating to AWS Cloud.

AWS works closely with customers to help them not only architect and run their IT workloads sustainably in the cloud but we also support them in the use of cloud-enabled tools to drive more sustainable outcomes throughout their business. To dramatically and rapidly reduce the carbon footprint of public and private sector IT workloads, policy makers are urged to prioritise clear and effective cloud-first, cloud-native, and cloud migration policies today. In the Asia-Pacific region, AWS already supports many examples of cloud-enabled, customer-led sustainability innovation, including in power grid management. Our New Zealand customer Vector's use of AWS Internet of Things, Machine Learning and Big Data analytics to facilitate efficient grid management and greater integration of clean energy across Australia and New Zealand is a good example of this. Furthermore, energy-efficient backend systems should be recognised for the increased role they can play in enabling Distributed Energy Resources (DER) services for efficient power systems.

Digitalisation: Developing new standards and guidelines for commissioning and testing new generation and energy technologies like BESS

The Phase 1 and Phase 2 reports recognise the importance of new energy technologies like Battery Energy Storage Systems (BESS) in addition to the need for standards around such technologies. BESS and other energy-related technologies are interconnected through a web of technology. BESS for example operate in conjunction with 5G and cloud technology in order to connect distributed BESS, cloud integration of energy storage system (ESS) and data edge computing.[6] We encourage policy makers to assess this wider scope of inter-related technologies in developing any standards and to do so in conjunction with the technology industry and in line with international standards.

Cloud-enabled transformation

Emergence of digital platforms

As New Zealand continues to pursue energy transition and decarbonisation, adaptations to regulatory approaches for emerging technologies can foster the needed innovation in support of those objectives. Through our support to cloud-enabled transformation across utilities globally, we have seen the benefits to consumers, industry and regulators alike. The emergence of digital platforms in the electricity industry can provide opportunities to deliver broad benefits for consumers, support greater reliability of electricity supply and enable the efficient and healthy functioning of the industry. As described in a 2020 report by Deloitte[7], data openly available to more industry participants and consumers through digital platforms, supports demand side management of power and active consumer participation in an increasingly decentralised grid. The IEEE Task Force on Cloud Computing for Power Grid, after extensive research,

[6] Battery Energy Storage System Integration and Monitoring Method Based on 5G and Cloud Technology, Xiangjun Li, Lizhi Dong, and Shaohua Xu, E3S Web of Conferences 243, 01007 (2021)

[7] Deloitte_operating-an-energy-platform/DI_Operating-an-energy-platform.pdf

concluded cloud computing offers fault-tolerant system design capabilities which benefits grid applications. Other benefits identified include load forecasting, improved operational efficiency, predictive maintenance and asset optimisation.[8] It also found that the cloud can benefit the entire power industry if adopted securely and reliably, and AWS supports its customers in this regard using the Well-Architected Framework.

Making sense of the increased data

Digital platforms that can deliver data across the grid's operations can provide invaluable insights, including in real time, that are simply not available in the silos of many utility industries today. For example, AWS's customer General Electric (GE) can gather, monitor, analyse, and act on all its turbine data—anywhere in the world—by using the AWS Cloud. GE engineers have built virtual versions of its wind turbines that gather data and insights from their physical counterparts. These "digital twins" consider a variety of scenarios, such as what would happen to power production from the physical turbine if the wind blew harder, longer, or not at all. This information helps engineers in the field operate the actual turbines more efficiently.[9] The emergence of platforms that can provide end-to-end data and insights present opportunities to radically improve the efficiency of the industry in responding to consumer demand and in managing resilient and responsive grid operations. Better data and analytics across the grid will improve the position of regulators through access to rich sources of information and insights that support industry oversight. The availability of more data about operations across the grid also provides opportunity to improve competition through opportunities for new market entrants with offerings responding to increasing consumer expectations for a responsive industry.

With the increase of data, grid operators will need to balance technology needs to keep up and maintain systems which provide predictive insights. AWS has been working with Greenko Energies[10] a leading renewable energy company with a vision to use digitalisation to support India's shift toward carbon-neutral electricity. The company needed a solution to host data from 3,000 megawatts of wind turbines and leverage machine learning and artificial intelligence to make use of long-term investments in renewable energy. Through AWS technology they've been able to achieve this. AWS has other use cases which we would be happy to share with the Electricity Authority to discuss further applications cloud technology can have in the future security and resilience of New Zealand's power system.

[8] Practical Adoption of Cloud Computing in Power Systems – Drivers, Challenges, Guidance, and Real-world Use Cases, IEEE Task Force on Cloud Computing for Power Grid, 2021.

[9] AWS is How: GE Renewable Energy Increases Wind Energy Production, June 2021.

[10] Greenko Revolutionizes the Energy Market with AWS, 2022.