SUBMISSION ON OFGEM'S CALL FOR INPUT: THE FUTURE OF DISTRIBUTED FLEXIBILITY

Introduction

We appreciate the opportunity to respond to Ofgem's call for input on the Future of Distributed Flexibility.

Vector Ltd (Vector) is an innovative New Zealand energy company that runs a portfolio of businesses delivering energy and communications services to more than one million homes and commercial customers across Australasia and the Pacific.

Vector is well-positioned to enable decarbonisation within New Zealand, the Asia Pacific region, and globally. We are guided by our vision, which is to create a new energy future. Despite the challenges of climate change today, our integrated Group strategy we call Symphony is preparing us to seize the opportunities of a decarbonised future. Symphony aims to transform the traditional one-way energy chain into an intelligent, multi-directional energy system that gives the customer more choice and control. Fundamentally, it is about creating a decentralised energy system that opens future possibilities, delivering decarbonisation consistent with safe, reliable and affordable energy solutions for customers.

Vector Technology Solutions (VTS) is a subsidiary of Vector with a mission to accelerate the transition to the new energy future by enabling infrastructure transformation through our innovative digital solutions[1]. With the continual evolution of challenges facing the energy industry (decarbonisation, decentralisation, democratisation, and digitisation), organisations are reaching the limits of legacy energy data platforms.

Drawing on decades of solving critical infrastructure challenges with technology, we build advanced solutions to accelerate decarbonisation and support the global shift to renewable energy sources. Diverge, our cloud-native platform is fast and flexible to configure, delivering higher-performance data processing and storage at a lower cost. Diverge is now being made available commercially to large utilities and energy market participants globally.

VTS is keen to support Ofgem in this work and are happy to share our international experiences in deploying technology solutions for the energy sector. Please contact Adam Douglas, UK Business Development Lead, at Adam.Douglas@vts.energy or +447950769175 for more information. We are happy to elaborate on our submission or to offer advice and counsel on how arrangements work in other geographies such as New Zealand and Australia, to help inform the UK reform agenda.

1 The imperative, potential, and challenges of flexibility

***Q1**. What do you think distributed flexibility could contribute to the energy system?*

Vector's distribution network business is delivering our group Symphony strategy by working with the premise that non-network solutions will enable an affordable and fair transition. Symphony aims to optimise distribution network costs into the future as customers deploy distributed energy resources to decarbonise the economy.

In Auckland, the major decarbonisation shift is the electrification of transport, resulting in the proliferation of residential and public electric vehicle (EV) chargers, leading to our distribution business' focus on EV Smart Charging[2] and collaborating to electrify public transportation in Auckland[3]. As noted in the call for input, DER have the potential of being either parasitic or symbiotic loads and depending on which pathway DER take there will be significantly

[1] https://vts.energy/

[2] https://www.esig.energy/event/webinar-ev-smart-charging-trial/

[3] https://www.vector.co.nz/articles/vector-powers-up-nz%E2%80%99s-first-electric-bus-depot

different outcomes on distribution network investments to continue to meet network performance criteria.

Vector has forecasted potential load growth futures as part of developing our Symphony strategy and came up with two potential scenarios shown in the figure below. “Disorderly Decarbonisation” in the blue reflects the distribution network’s peak demand if DER act as parasitic loads whereas “Orderly Decarbonisation” in the green reflects the network’s peak demand if DER act as symbiotic loads.

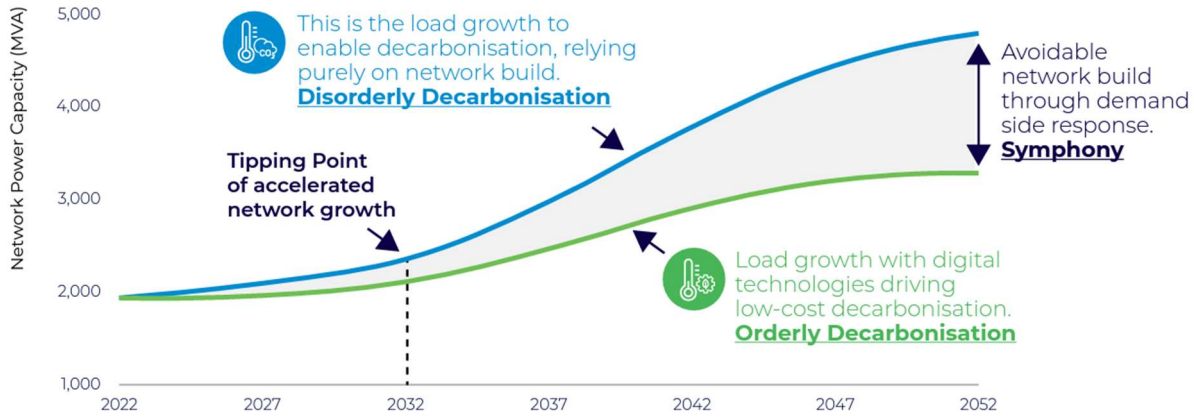

Figure 1 - Forecasted growth on the Auckland Network under different scenarios (from Vector Group's 2022 TCFD (Task Force on Climate-related Financial Disclosures[4])

These forecasts highlight a significant opportunity to integrate and enable demand side management that shifts demand away from peak times so that Vector’s electricity distribution network can reduce the investments in physical infrastructure necessary to support mass electrification.

Recent studies in New Zealand, like global studies, show significant whole of system value from enabling flexible demand (Sapere – *Cost-benefit analysis of distributed energy resources in New Zealand*)[5] & (BCG – *The Future is Electric*)[6]. However, these reports have assumed that flexible resources are able to respond to prevailing market conditions without any constraints at the local (distribution network) level. As technology and policy solutions for enabling CER develop it will be critical to understand the full context of CERs in each region, because the operation of the underlying networks must obey the laws of physics.

Vector Technology Solutions (VTS) was created to solve some of these challenges for Vector’s metering and distribution businesses. Our partnership with AWS is focused on coordinating the vast amounts of data from smart meters and edge network devices so that we can add the context about real-world physical network systems and improve distribution network operations and planning. This work is now being commercialised under the Diverge brand and made available to utilities and energy market participants worldwide.

***Q2**. Will a focus on CER flexibility also help enable other forms of flexibility, especially distributed flexibility?*

[4] Vector Group, Task Force on Climate-related Financial Disclosures, 2022. https://blob-static.vector.co.nz/blob/vector/media/vector-2022/tcfd-report-2022-vector-limited.pdf

[5] https://www.ea.govt.nz/documents/1742/Sapere_CBA.pdf

[6] https://www.bcg.com/publications/2022/climate-change-in-new-zealand

Tackling CER first may increase the risk of transition given the number of barriers and market failures that will need to be overcome to create a compelling consumer value proposition and increase adoption. Adoption of DER flexibility may have fewer initial hurdles to overcome and could result in some quick wins because existing frameworks can be extended, but this may result in creating more significant, potentially disruptive, work to address the other hurdles associated with CER flexibility in the future.

We agree, if the mass adoption and integration of CER flexibility is prioritised and is successful, it will most certainly enable other forms of flexibility such as commercial DERs. Many of the technical and commercial barriers to adoption will be reduced or removed, because CER flexibility will commoditise the technology and systems which also enable DER flexibility. CER flexibility would form a market that DER can participate in using the same mechanisms as a CER (or aggregation of CERs). For example, DERs will be able to leverage the same information provision, asset registration, coordination of access and operations, and governance mechanisms as proposed for CER adoption.

2 An approach pivot: The case for change

***Q3**. Is there a 'case for change' and a need for a common vision for distributed flexibility?*

The Ofgem call for input paper has made a strong case for change, that the do-nothing (BAU) option is a poor outcome for consumers; that rising demand from new "parasitic" energy system loads will add cost to the energy system, and especially punish those consumers who do not benefit from the new assets.

As such a common vision for distributed flexibility makes sense, and given the scale and complexity of the problem, we agree that the solution should be inherently digital.

Vector is making the electricity distribution network's Symphony strategy a reality through the judicious deployment of digital solutions to improve the flexibility of our business to respond to the challenges of the energy transition. Vector has aggressively adopted cloud technology from AWS to accelerate our journey. Some examples include:

- An Outage Application built on Amazon Web Services (AWS) to better to communicate with our customers during an outage event;
- Deployment of a Distributed Energy Resource Management Systems (DERMS) on AWS;
- Vector are the first utility in the world to deploy the GE PowerOn Advanced Distribution Management System (ADMS) on AWS Outposts; a connected appliance that brings the power and flexibility of the cloud to a utility on-premise data center;
- The Diverge energy data platform has been developed in an alliance with AWS, and is now being made available by VTS to utilities and energy system participants globally.

VTS propose that the vision for distributed flexibility is focussed on outcomes as opposed to prescriptive technical solutions. We imagine a system of systems that are interconnected by a thin digital spine of common APIs, where the implementation of each participating system is independent and can evolve and innovate independently to ensure the best outcomes at the lowest cost.

***Q4**. What is your vision for how to accelerate the delivery of accessible, coordinated and trusted markets for distributed flexibility?*

VTS agree with the Ofgem position that there is a strong case for a common digital vision for flexibility. Given the volume of CERs and the scale of the systems required to enable distributed flexibility there is no alternative. VTS further propose that the digital solution should be cloud-based to ensure the solution can scale up (and down) dynamically; can respond in a flexible manner to evolving requirements; and is resilient and secure.

VTS consider there are three layers required to enable the common digital energy infrastructure, which can be delivered in phases and build on each other:

1. Visibility: registration of CER assets, remote monitoring and measurement;
2. Management: the ability to invoke actions to remotely manage the CER assets;
3. Orchestration: where the assets become a coordinated part of the energy market and can be controlled based on market or energy system conditions.

As such, VTS believe that Ofgem should move rapidly to enable the first layer, and ensure future compliance for the second layer, such that future flexibility markets have access to as many CERs as possible when the orchestration layer is eventually enabled in the future.

Market orchestration of distributed flexibility will be complex, which can be clearly seen by the expected delivery dates and varying approaches to the implementation of FERC Order 2222 to integrate DER in the wholesale electricity markets in the United States[7]. Ofgem doesn't need wait for all three layers to be ready before starting work on registration, remote monitoring, and management of CER assets so that initial value and learnings are gained from those actions.

***Q5**. Will certainty of an end vision help accelerate enabling work and make it cohesive?*

The vision for a common digital energy infrastructure cannot be fully brought to reality unless many of the necessary enablers are established. This includes data standards, consent frameworks, smart meter data repositories and associated reforms.

A common digital infrastructure will become an enabler for critical market wide capability including CER/DER asset registration, LV network visibility, network constraint data etc. It is expected the DNOs will play a key role in providing a data set to the broader energy system using consistent APIs and data standards, even when the underlying implementation varies by DNO.

Done right, the common digital energy infrastructure will enable markets for new products and services based on clean energy and new electrified products fuelled by renewables.

***Q6**. When should a common digital energy infrastructure be in place? And therefore, when should development begin?*

A common digital energy infrastructure must constantly evolve over time. It is not something that will "be in place" and then will continue to solve all problems moving forward. It will be beneficial for Ofgem to identify the key outcomes that are needed by certain dates or milestones and ensure that the common digital infrastructure can deliver those outcomes on-time. If the infrastructure is set up well, new features and services can and should be added on and modified as markets evolve.

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[7] https://www.icf.com/insights/energy/ferc-2222-der-market-participation

phases and build on each other: Visibility: registration of CER assets, remote monitoring and measurement;

2. Management: the ability to invoke actions to remotely manage the CER assets;
3. Orchestration: where the assets become a coordinated part of the energy and/or flexibility markets and can be controlled based on market or energy system conditions.

As such, VTS believe that Ofgem should move rapidly to enable the first layer, and ensure future compliance for the second layer, such that future flexibility markets have access to as many CERs as possible when the orchestration layer is eventually enabled in the future.

Orchestration layers and future markets can be enabled over time.

3 What the future could look like

***Q7**. What should a common digital energy infrastructure look like, and why? Please consider the archetypes or develop your own proposition.*

VTS consider the "Thick" archetype to be too complex and risky to try and implement with a single system, particularly if the vision focusses on delivering flexibility from CER as the initial priority which requires overcoming additional barriers and challenges.

VTS propose that the common digital energy infrastructure is best implemented with a combination of the "Thin" and "Medium" archetypes, consisting of a collection of systems operated by multiple market participants that are interconnected and accessible via common APIs and data standards. This will allow the common digital infrastructure to continue to evolve and innovate alongside the energy system's evolution and adapt as new technology emerges.

The common digital energy infrastructure should include:

- One or more Smart Meter Data repositories such that smart meters can be read once and then the data (both consumption and power quality data) is available to all the parties that need it[8];
- Analytics engines based on artificial intelligence (AI) and/or machine learning (ML) algorithms that use the digital infrastructure to identify patterns in data that could for instance identify customers that may benefit from new products and services;
- One or more distributed asset registers accessible via common APIs and data standards, depending on what is suitable to deliver across the spectrum of location and asset types;
- DNOs able to expose topology-aware local network constraints and communicate available operating envelopes using common APIs and data standards;
- Markets that expose pricing signals for generation and discretionary loads that

[8] The optimal configuration of smart meter data repositories will need to consider the relationships between market actors and their varying data access needs. The infrastructure behind these repositories must be able to accommodate the increasing scale of data, for example the recent shift from 30-minute to 5-minute market settlement in Australia created a 6-fold increase in data created per day. The infrastructure should also be adaptable to gathering and providing real-time or near real-time data services to parties that would benefit from that information. Fundamentally, this is why VTS has developed the Diverge cloud-native platform.

enable new products and services to identify the consumers and businesses who can benefit;

- Consent and security mechanisms that protect the privacy of individuals but find pragmatic ways to allow access to critical energy system data that market participants require to efficiently fulfil their role in the market.

***Q8**. What is your view on the desirability and feasibility of the archetypes or your own alternative proposition?*

A mix of thin and medium archetypes provides the most space for adaptable, resilient systems. These two archetypes provide enough regulation and coordinated direction to enable the outcomes desired from flexibility without creating burdensome overhead and locking in infrastructure that becomes too difficult to modify; a likely outcome for the "Thick" archetype.

Furthermore, the common digital energy infrastructure can be delivered in phases as noted in our responses to questions 4 and 6 to reduce risks and deliver valuable capability sooner. Creating an asset registration capability for remotely monitored and managed CER (and DER) assets would be an important first step and enabler for additional capability in the future.

4 Delivery considerations

***Q9**. Should a common digital energy infrastructure be new-build, or should it build-out from existing infrastructure?*

With a vision to focus on CER, the existing suite of digital tools and infrastructure cannot be built-out to accommodate that level of complexity. A new build of this "digital spine" would be our recommended approach to meeting the aspirations set forth in this paper.

While the term "new build" sounds like creating something entirely new, there are opportunities to leverage international learnings and best practices to kickstart efforts in UK, as was already noted in this paper, "…digital technologies can be deployed and redeployed across multiple geographies. The core software, hardware and networking approaches can and should be designed to enable scalable deployment globally. This will likely require the use of international data standards and communication protocols."

We encourage the UK to explore developments from other markets worldwide. This should include solutions for smart meter data repositories and DER asset registers. For example, the Australian energy market has now moved to 5-minute settlement for all customers (large and small) and the Diverge energy data platform now provides a smart meter data repository containing 5-minute interval data for all meters. New Zealand has been one of the world leaders in smart meter adoption.

The Japan market is undertaking a second-generation smart meter rollout, starting in 2025/26 with the Japan government agency for Natural Resources and Energy, Ministry of Economic, Trade and Industry (METI) forming a study group to agree common objectives[9], concluding that the rollout should deliver societal benefits related to:

- Strengthening resilience of the grid,
- Facilitating wide scale deployment & adoption of renewables, Stability of supply and

[9] https://www.meti.go.jp/shingikai/energy_environment/jisedai_smart_meter/index.html

demand on the grid, and

- Improved customer benefits.

The common digital infrastructure should be built to reflect modern, secure, modular, interoperable principles. As there are many existing digital platforms used within the electricity sector actors, the common digital infrastructure must be designed to be sufficiently adaptable and scalable to work with legacy systems alongside more modern ones. The infrastructure must be designed to scale with demand and expand and contract with the changing demand patterns. A cloud-native serverless solution provides such capability inherently.

***Q10**. What are the important areas for consideration when designing institutional delivery models for a common digital energy infrastructure?*

VTS propose that regulation should focus on service outcomes as opposed to specific technical solutions. Solutions should evolve based on the latest technology and how to make a solution more efficient and cost-effective over time.

Solutions should be divided into different categories and the most natural owner identified to take responsibility for the delivery of the solution.

Ofgem and government should take responsibility for the digital spine aspects, including the thin common APIs that bind all the different repositories together.

The delivery model should take into account the current infrastructure and key parties to ensure a smooth and effective transition into a new digital space to mitigate against any system disruption and to encourage broad stakeholder involvement.

***Q11**. What are the important areas for consideration when designing financial delivery models for a common digital energy infrastructure?*

Like many energy system investments, especially those that take place in regulated businesses, investments in a common digital infrastructure for the UK energy system will in some form be passed on to energy consumers.

Educating consumers will be required, for this to be successful. Consumers should know where to go to get information about what is being asked of them, why investments are necessary, what challenges and barriers may emerge, and what value they should see from these investments in the future.

The common digital infrastructure envisioned by this paper can enable improved data quality and access, leading to better transparency about the electricity system, and it creates the framework enabling consumers to benefit from investments in CER that happen in their communities. This focus on education will continue to build trust with consumers as the common infrastructure is built.