intellihub

Potential solutions for peak electricity capacity issues – Intellihub Consultation Response

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ELECTRICITY AUTHORITY
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Intellihub

About Us

Intellihub Group is an Australia and New Zealand utility services company that delivers innovative metering and data solutions to utilities to enable digital and new energy services with a focus on driving an exceptional customer experience. It is an experienced and leading provider of multi-utility services across electricity, gas and water networks for residential, commercial & industrial, embedded network, solar metering, and distributed energy customers. Intellihub is a growing business with over 300 employees working across 8 ANZ office locations.

Intellihub currently has over two million advanced meters under management.

We are focused on creating business value for energy retailers through the best customer experience for installing advanced meters and afterwards maximising the digital and 'new energy' services that this technology can enable.

To achieve this, we have built a proven business model of partnering closely with our customers. The Intellihub business has created a distinctive culture based on blending the industry 'must haves' on safe and reliable practises with the latest thinking in adopting new technology. Our technologies are designed to facilitate innovation across our whole business covering meters, communications, edge computing, IoT and cloud application hosting.

Our 'Intelli-Suite' enables broader innovation beyond-the-meter, and we believe it forms a strong basis for new products & services in the electricity industry – particularly where it relates to distributed energy resources (DER) including solar, batteries, hot water heaters and electric vehicle charging. Intellihub is the only ANZ metering provider that is developing and delivering these innovative metering and distributed energy resources services at scale. Since our inception, we have been investing in foundational infrastructure and capabilities to enable the transition to a decentralised and digitised energy system.

Response to the Authority’s Consultation Paper

Introduction

1) Intellihub is pleased to submit a response to the Authority’s January 2024 consultation paper *‘Potential Solutions for peak electricity capacity issues*.

2) Intellihub applauds the Authority recognising the crucial role that flexible resources like battery energy storage (BESS) and demand response will play in meeting the challenges posed by the transition to meet net zero carbon targets by 2050. Particularly, Distributed Energy Resources are a component of a more flexible electricity ecosystem which is affordable, reliable, and sustainable. However, efficient, and effective participation of such resources will not happen organically. For new flexibility markets to thrive, policy and regulatory intervention will be required to address barriers to aggregator investment.

3) Intellihub supports the Authority’s initiatives to evaluate the security of supply over the near-, medium- and long-term by taking a holistic approach which acknowledges the important role Distributed Energy Resources (DER) will play in capacity management.

4) As a leading provider of metering equipment and data solutions, we understand the valuable insights and opportunities that can be unlocked through digitalisation and democratisation of energy in New Zealand. Participants in the electricity market will be able to develop and use new data solutions to increase the efficiency and resilience of New Zealand’s electricity infrastructure, better manage the capacity crunch, and deliver better outcomes for consumers.

5) We are excited to be able to contribute to bringing benefits to consumers in New Zealand, and we welcome the opportunity to work alongside the Authority and other participants in the electricity industry to support the development of distributed flexibility in New Zealand.

Structure of this submission

6) This submission provides responses to a sub-set of the questions for which the EA has sought feedback and is structured as follows:

   a) Paragraphs 7) to 16) provide our views incentives for demand response and critical criteria we think are key to enabling demand response to participate at scale. This addresses Question 2 from the consultation paper.

   b) In response to Question 3, paragraphs 17) to 41) discuss various other initiatives required to enable greater participation of demand response.

   c) We identify potential technical issues that need to be addressed due to the unique nature of consumer owned DER in paragraphs 42) to 53). These include both technology and market integration issues and is our response to Question 4.

   d) Paragraphs 54) to 65) address Question 13, where we identify the circumstances that might warrant procurement of additional resources out-of-market.

   e) Finally, paragraphs 66) to 69) summarise Intellihub's recommendations.

Question 2: Do you agree with our assessment of the incentives for demand response? If not, what is your view? Are there other criteria that the Authority should consider?

7) Intellihub largely agrees with the Authority's assessment of the financial incentives for demand response. That is:

   a) Retailers have an incentive to use demand response to influence spot prices and mitigate their spot exposure with respect to uncontracted energy volumes[1].

   b) Consumers have an incentive to participate in demand response schemes to reduce their electricity bills, assuming that:

      (1) Robust price signals exist that accurately communicate the true cost of electricity (energy, ancillary services, and network costs) to the consumer. In short, the consumer's incentives should be aligned with the incentives of the retailer/aggregator.

      (2) Adequate consumer protections exist to ensure the benefits that flexible consumer devices provide are actually passed down to the participating consumer.

8) However, Intellihub notes that a holistic approach is needed to enable distributed flexibility to occur at scale.

   a) The ability to value-stack will be critical to incentivising aggregator entry and therefore increasing DER participation to provide demand response. While the Authority's paper

[1] This assumption holds true for independent retailers. Gentailers may well be incentivised to keep spot prices high while subsidising their retail arms. Removing vertical integration or requiring gentailers to operate their retail businesses at arms' length would likely strengthen the incentives to reduce spot prices.

focuses on demand response to meet peak energy demand and touches on the provision of ancillary services as well, aggregator entry and subsequently aggregated demand response will be limited unless there is a well-functioning market for network flexibility services as well.

b) Therefore, any initiatives aimed at incentivising DER participation in wholesale markets must also consider regulatory and policy changes needed to introduce markets for network flexibility services.

9) For network flexibility services to be used by distributors, the regulatory framework must have the right incentive structures in place. In particular, if the current regulatory framework incentivises capital expenditure over operational expenditure, then distributors will be incentivised to build out their network instead of spending operational funds to defer or avoid investment. Moreover, substantial investment in network digitalisation will be required to enable network flexibility services to be procured, scheduled, dispatched, and financially settled at scale. The regulatory framework must also enable distributors to make loss leading investments, for example, through the use of innovation funding. Moving forward, it will be important to scrutinise the existing regulatory framework to assess whether it provides the right incentives to distributors to invest in and use flexibility.

10) There are 29 Electricity Distribution Businesses (EDB) in New Zealand with a large variation in the size of their asset base and the load that they serve. EDBs in New Zealand are at varying stages of maturity with respect to developing Distributor System Operator (DSO) capability. For example, the Northern Energy Group (NEG) has recently published its evolution plan to develop DSO capability which sets out a phased approach to enabling greater network visibility, implementing Dynamic Operating Envelopes (see also paragraphs 35) to 41)), procuring network flexibility services and facilitating DER orchestration in the wholesale electricity market.

11) The NEG's plan correctly depicts the increasingly complex nature of relationships that will arise in a decentralised future. For distributed resources to be coordinated effectively, Business to Business (B2B) and Business to Market (B2M) interfaces and rules will need to be defined. This requires identifying what the roles and responsibilities of different parties will be.

12) Particularly, it will be important to clearly define what the roles of the DSO (separate from the DNO), SO and retailer/aggregator will be with respect to coordinating and orchestrating DER. The NEG DSO model envisages DER orchestration or control as a DSO capability along with other participants and/or 3rd parties. On the other hand, markets such as the United Kingdom and Australia have created market structures where only aggregators can control DER. This has been driven by a concern that allowing a monopsony procurer of network flexibility services to also become a monopoly provider of those services may stifle innovation and ultimately result in poorer outcomes for consumers.

13) EDBs progressing DSO strategies in silos may result in inconsistent practices and models across different network franchise areas. A fragmented approach may result in:

a) Inconsistent practices with respect to the DER data management which may impede or add cost to aggregators wanting visibility of DER data. A centralised approach to collecting and disseminating data is preferable. It is critical for the Government to provide a clear vision on the approach to DER data sharing to ensure technology investments are appropriately directed. For a more detailed discussion of the importance of DER data visibility and the benefits of mandatory registration of devices, see paragraphs 18) to 28).

b) Inconsistent procurement practices with product definitions, asset qualification and technical requirements varying by network. This will add transaction costs for aggregators. Clear guidance from the Government on the approach to procurement is needed. This includes but is not limited to:

i) Clear specification of the roles and responsibilities of the DSO, the SO and aggregators as it pertains to procurement and control/orchestration of network and wholesale electricity market flexibility services.

ii) Standardised service definitions

iii) Procurement processes.

See also paragraph 14) below.

c) Inconsistent approaches to allocating available hosting capacity to consumers and aggregators – see paragraphs 35) to 41) for a more detailed discussion on this.

14) Moreover, expecting aggregators to individually contract with different EDBs is not realistic and poses a material barrier to entry. Rather, a centralised approach is preferable:

a) In the United Kingdom, network flexibility procurement activities are delegated to an independent provider. Piclo Flex is an independent marketplace that provides asset qualification services, flexibility service tendering services and information to drive increased participation in the UK flexibility market. Piclo Flex provides an interactive map that identifies the precise location that flexible assets will be required in the short-term, alongside information on which service that will be required – all UK DNSPs can procure four defined services with standardised terms and conditions. Effectively, the centralised platform is a one-stop shop for providers of flexibility services.

b) In Western Australia, network and wholesale electricity market flexibility services are not yet defined and standardised. Instead, a centralised procurement mechanism is administered through the market rules to enable both the System Operator (AEMO) and the transmission and distribution network company (Western Power) to test the market for the availability of and to procure flexible resources as needed. Over time, the information from these ad-hoc procurement efforts will enable services to be defined. For more information on the Western Australian approach, see paragraphs 56) to 63).

15) It will be important for Government to indicates its preferred approach to procurement of network flexibility services sooner rather than later. Intellihub recommends a centralised approach to procurement as this will reduce aggregator transaction costs and facilitate greater entry.

16) Intellihub recommends a holistic and national approach to policy and regulation development to prevent the types of inconsistencies noted above. Particularly, it will be important to standardise the approach to DER data management, procurement activities for network flexibility services and network capacity allocation to DER. We reiterate the importance of Government providing direction on the approach to be taken in these areas.

Question 3: Other than financial incentives, what are the other barriers to entry for demand response participation in the wholesale market that you have identified?

17) Financial incentives alone will not enable DER participation at scale in the existing wholesale market and in new flexibility markets. In this section we set out some key barriers to DER participation in existing and new markets, as well as the development of new markets.

Low friction data sharing mechanisms will be critical to mitigate the adverse impacts of information asymmetries.

18) Distributed flexibility at scale will require transparent and low friction processes to share accurate and credible information while ensuring customer consent is captured, and any customer data meets all regulated privacy requirements. The following information will be needed to drive efficient decision making:

    a) What DER exists, where it exists and its functional capabilities. This information would enable aggregators to recruit capable DER and can support compliance monitoring activities where standards are regulated. Mandatory DER asset registration would enable visibility of asset capability and location.

    b) Customer consumption information including AMI meter data and device behaviour. This information would enable aggregators to create aggregation products to offer to consumers, and to develop baseline profiles which will be critical to measuring service delivery. Additionally, this information will be critical for financial settlement of flexibility services.

19) Investors cannot build accurate and optimised business cases for market entry without access to a wide range of historical market data.

Digital solutions for DER data access in New Zealand

20) While 're-purposing' the meter Registry to provide a digital solution for DER data access might seem a low-cost solution prima facie, it is not an optimal solution. The Registry has functional limitations which would prevent the full advantage of technology developments and could give rise to unintended consequences if there is too much transparency, at the expense of consumer consent, privacy, and incentives to invest.

21) Some challenges we have identified in repurposing the Registry are as follows:

    a) **Current registry processes provide unreliable DER data and cannot scale.** While the Registry currently provides some visibility of DER (namely distributed generation resources connecting to ICPs), the process is inefficient and subject to material inaccuracies. This is because accuracy of information provided depends on installers who have limited incentives to comply and use manual processes to input data which is then passed to EDBs to populate the Registry. Currently, very limited information about distributed generation is required by the Registry. In the future, the volume and complexity of data needed will increase as the uptake of DER accelerates and more devices (e.g. EV chargers, demand-flexible devices such as smart appliances) need to be made visible to multiple parties. The existing processes and systems will no longer be fit for purpose to meet varying information requirements for multiple parties with varying permissions. Particularly, collection of accurate information will require minimisation of manual input and the ability to validate data. As indicated above, distributed generation data in the Registry is subject to material error due, in part, to the manual processes used by installers. Moving forward, it will be important to ensure that data collection activities by installers are automated with the source of the data being the OEM back-office as opposed to manual entries.

    b) **The Registry cannot be a control platform.** While the Registry will provide some visibility of DER, we understand that it will not function as a platform which enables the transparent remote control of DER assets. The development of secure 'controllable DER' technology has created a significant opportunity to enhance the efficient operation of the New Zealand energy sector. In particular, controllable DER enables improved coordination and utilisation of DER across networks, reducing costs across the system. The ability to transparently and securely control DER will assist distributors to deliver peak demand reduction by balancing generation across the network. As the uptake of DER gain's momentum, distributors will be able to take advantage of these tools to facilitate the aggregation and coordination of DER devices, to manage congestion and reduce the need for investment and augmentation of the network.

c) **The Registry is not built to facilitate active consumer consent.** Intellihub acknowledges the importance of making available data that allows consumers, retailers, distributors, and other energy sector participants to encourage innovation and the development of new products and services. However, the opportunities enabled by smart metering raise questions about the protection of data and consumers' rights to privacy. As the granularity of energy consumption data being accessed increases, so do potential concerns regarding privacy and the sensitivity of the data[2]. As a result, access to granular consumption data by retailers, distributors and third parties such as flexibility traders will require active consumer consent. These requirements place the onus on the party seeking consent to communicate clearly with the consumer, highlighting the benefits that will arise from granting them access to the data.

d) **The registry is not built for permissioned data access within an ICP.** Without having greater functionality than what the existing Registry system provides, there is a risk that excessive transparency could have unintended and adverse effect on competition and innovation. Putting aside privacy concerns, certain participants having open access to detailed DER information at ICPs could discourage innovation. For example, flexibility traders may be reluctant to invest in new technologies if commercially sensitive data about their services is available to their competitors (e.g. information on which customers are utilising those services could be used by other flexibility traders to promote competing products).

22) Intellihub recommends leveraging existing platform technologies to develop an automated data exchange that not only facilitates the registration and visibility of DER assets, but also manages consumer consent issues and enables remote control of DER to facilitate planning and operational requirements. In particular, there are existing specialist products that already offer key functionality, and which could be utilised to provide a more comprehensive solution for the New Zealand electricity industry.

23) For example, GreenSync's[3] Decentralised Energy Exchange (known as the 'deX') creates a digital record of consumer consents to the transfer of smart meter data, register and enrol multiple DER devices at each ICP, and provide detailed visibility and control over distributed energy resources, at scale. This integrated system enables networks to support more renewables faster, without compromising on important considerations such as the protection of sensitive data. It also simplifies the complexity of relationships in the electricity industry (commonly referred to as a 'many-to-many' problem) by facilitating transactions and communication between distributors, generators, retailers, flexibility traders and consumers, as well as DER devices.

24) The deX platform is already proven in Australia. The technology has been deployed and stress tested to provide both a DER registration function which reached 3,000 DER systems registered per month by the end of 2022, and also to be used as a foundational tool to facilitate the secure exchange of data.

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[2] Detailed energy consumption data from smart meters is likely to be 'personal information' for the purposes of the Privacy Act 2020 ('Privacy Act'). For this reason, the Electricity Authority will need to be mindful to ensure that any regulation introduced to address the processing of energy consumption data is designed to comply with the Privacy Act. We also consider that other smart metering data, such as power quality data and other data related to the ICP (e.g., unique identifiers, and any data that can be linked to these identifiers and which relates to identifiable individuals), may also be considered personal information, and in these circumstances data processing must also be conducted in accordance with the Privacy Act.

[3] GreenSync is a subsidiary of CrescoNet, the technology development arm of the Intellihub Group

25) The UK has also established a feasibility study between a consortium of key industry partners, including the Data Communications Company (or 'DCC', the centralised UK entity that oversees electricity sector data transfers), to develop a solution for an automated, standardised, secure data exchange process for registering small scale energy assets. Phase 2 is supporting the "LCT Connect" project, which is developing a solution to automatically register small-scale energy assets in an accompanying Central Asset Register.

26) The LCT Connect project leverages GreenSync's proven deX technology and experience in Australia, and will innovate on the existing deX software platform, tailoring and extending its capability to reflect the United Kingdom context. The core project team, led by GreenSync and guided by Energy Systems Catapult's regulatory advice, is supported by a broad and diverse range of companies from across the energy sector. This includes LCT manufacturers, installers, distribution network operators, energy retailers and flexibility providers as well as cybersecurity specialists and innovators. Collectively, the team will develop and test in a real-world environment an innovative automatic asset registration and central asset register solution that enables LCTs to be digitally and securely registered and visible to all market participants with ease and accuracy.

27) The project will also identify and assess sustainable commercial and operating models that will best support implementation in the United Kingdom energy system; and will seek input and insights from other stakeholders such as end -consumers, local authorities, and government institutions to explore the admissibility, regulation and policies, data privacy and other relevant requirements for building and managing a nationwide automatic asset registration and central asset register solution.

28) Intellihub supports a similar feasibility study in New Zealand to investigate:

   a) Automatic device/asset registration. Intellihub also recommends mandatory DER asset registration to ensure the location and capability of controllable DER assets is visible to aggregators.

   b) Collection and secure exchange of DER data across multiple parties with varying permissions.

Device standards

29) To enable DER participation to occur at scale, we need:

   a) a deep pool of controllable and capable DER

   b) with the necessary capabilities

   c) in the right locations

   d) that can be accessed by aggregators providing flexibility services.

30) Device standards are technical specifications that define the functionality of the device.

   a) Technical specifications may define minimum functionality required to ensure network and power system operators can operate their systems securely, reliably, and safely.

      i) For example, the AS 4777.2 inverter standard enables secure reliable integration of distributed solar and battery storage through autonomous Volt-Watt and Volt-Var responses to network conditions and Voltage Disturbance Ride-through (VDRT) capability. This standard is mandatory in Australia.

   b) Technical specifications may also define functionality required to provide flexibility services. For example:

      i) Devices providing network flexibility services to EDBs must have communications functionality to enable aggregators to send instructions to devices.

ii) Devices providing frequency response services to Transpower will require autonomous functionality that can detect system frequency and respond autonomously.

iii) Devices providing market services will require measurement functionality to enable service verification and settlement.

c) Communications functionality is critical as it enables aggregators to communicate instructions to devices but also obtain both static and dynamic device data.

i) Communications functionality necessarily comes with cyber-security risks. Device standards will need to cover such risks.

ii) Proprietary standards are problematic. They limit the parties and systems that devices can communicate with, ultimately stifling innovation and competition. Interoperability of devices is therefore a critical requirement.

d) In its 2022 Green Paper, EECA proposed core functionality for residential EV chargers that would enable them to be deployed to provide flexibility services and enable better visibility. This included proposals for:

i) 'Smart functionality' to mitigate the impacts of en-masse charging during peak periods and to enable vehicle to grid (V2G) capability.

ii) Power quality and control requirements.

iii) Communications requirements covering cybersecurity and interoperability.

iv) Functionality to enable monitoring the use and location of chargers and of electricity consumption.

31) Provision of ancillary services by DER can have adverse impacts on power system operations due to unexpected disconnections which may prevent DER from responding if a contingency occurs or from delivering frequency keeping services. Inverter standards such as the AS 4777.2:2020 standard can mitigate this risk due to the VDRT requirements in the standard.

32) There are currently no regulated standards for inverter connected systems or EV charging equipment to distribution networks in New Zealand. The lack of regulation means there is a risk of devices proliferating that:

a) Cannot receive or respond to price or control signals.

b) Do not possess functional requirements to provide flexibility services including lack of interoperability.

c) Pose cybersecurity risks.

d) Do not meet minimum requirements to ensure safe, secure, and reliable operations of networks and the power system. While this risk may currently be immaterial in New Zealand, as DER uptake increases, the risk will become more significant. As seen in Australia, this change can happen very quickly.

33) Without regulation, there is a credible risk that consumer investment in DER will be misdirected towards devices that are not functionally capable of having their flexibility harnessed for the benefit of consumers in New Zealand as a whole. Worse still, there is a credible risk that the combination of high uptake of DER and lack of regulation could lead to serious network and power system operations risks.

a) For example, in Australia, the combination of favourable subsidies and lack of regulated standards has resulted in unintended consequences of a legacy fleet of rooftop solar whose export cannot be controlled. This is causing security issues both for network operators and AEMO as power system operator. State governments in Australia have since mandated the AS 4777.2 inverter standard. The standard in combination with the adoption of the CSIP-AUS communication protocol will enable the deployment of Dynamic Operating Envelopes (DOEs) with all Australian states having imminent plans for DOE implementation.

b) Additionally, the South Australian and Western Australian Governments have implemented solar curtailment schemes that enables the remote curtailment of rooftop solar systems if 'minimum demand' conditions create a material power system security risk. This is an emergency measure and undesirable from customer utility maximisation and emissions minimisation perspective. Instead, regulating devices to ensure controllability coupled with measures to enable distributed flexibility to occur at scale will prevent the need for such draconian measures.

34) Intellihub therefore recommends a review of DER devices with a view to determining which devices should have regulated standards and what those standards should be. In the first instance, the regulation of standards for inverter connected systems to distribution networks and EV chargers should be prioritized. This should consider the type of functionality such devices will require to provide both flexibility services and respond to DOEs.

Dynamic Operating Envelopes will be critical to increasing network hosting capacity.

35) Dynamic Operating Envelopes (DOEs) are a principled method of allocating access to network capacity; they define the limits that an electricity customer can import and export to the electricity grid, with these limits varying by time, location, and network conditions. Dynamic limits enable network hosting capacity to be maximised.

36) To incentivise investment in DER by consumers and aggregators, distributors must have the ability to accommodate large quantities of DER on their networks while still operating their networks in a secure, reliable, and least cost manner.

37) Export DOEs (or flexible exports) are a mechanism by which EDBs can do so – thereby enabling more DER to connect. South Australia is implementing flexible exports in 2024, with all other Australian states planning to follow suit in the next two to three years.

38) Increasing network hosting capacity will increase the pool of DER that aggregators can access to provide both wholesale energy market and network flexibility services.

39) We note that some EDBs are already planning to implement DOEs in the future. For example, the Northern Energy Group's DSO evolution plan includes the use of static and dynamic operating envelopes to support network capacity management and DER orchestration.

40) Developing DOE frameworks in a fragmented way without policy and regulatory guidance may result in inconsistent approaches that may ultimately result in poor customer outcomes. For example, the Australian Distributed Energy Integration Programme (DEIP) workstream on DOEs noted that while it is reasonable for different Distribution Network System Providers (DNSPs) to have different approaches to estimating network hosting capacity and identifying constraints, common principles are required with respect to allocating that capacity. Specifically, the DOE working group's Outcomes Report developed the following draft hosting capacity allocation principles:

a) DNSPs should be responsible for setting DOE limits, with the calculation methodology used to determine the limits being transparent and subject to stakeholder consultation.

b) Allocation should seek to maximise the use of network export hosting capacity while balancing customer expectations regarding transparency, cost, and fairness.

c) Capacity allocation can initially be based on net exports and measured at the customer's point of connection to the network.

d) Capacity should be allocated to small customers irrespective of the size or type of customer technology (e.g. solar or batteries) at the customer premises.

e) In the near term, DOEs should be offered on an opt-in basis with capacity reserved only to make good on legacy static limit connection agreements, with efficient incentives provided for customers to transition to DOEs over time.

41) Intellihub supports exploring the use of DOEs in New Zealand to enable network hosting capacity maximisation. However, we recommend that such an initiative be undertaken in a holistic manner underpinned by regulation at the national level to ensure DOEs are implemented in a nationally consistent manner including consistent capacity allocation principles and communication protocols.

Question 4: Do you agree that the Authority should focus its resources on identifying and lowering barriers for BESS and demand side flexibility to participate in the wholesale and ancillary services markets? If so, where do you think the Authority should focus first?

42) Integrating DER into the spot market will require addressing certain technical issues due to the unique and decentralised nature of consumer owned DER.

Technology integration issues

43) The flexibility inherent in DER devices makes them a good candidate for the provision of instantaneous reserves. However, there are challenges associated with technology integration that must be resolved to facilitate the provision of instantaneous reserves from aggregated DER.

44) Instantaneous reserves performance is measured using high speed data recorders. Response is autonomous; the generator control system monitors local frequency and responds when the frequency goes outside a defined range. High speed recorders measure response at a highly granular sub-second level.

45) It is unlikely that aggregated DER can be measured to this level of granularity. The Australian Energy Market Operator's (AEMO) Market Service Ancillary Services Specification (MASS) trials in the NEM used one second granularity to measure contingency reserve response. Measurement at this granularity can lead to over-estimation of service delivery (i.e. the measurement exceeds actual service delivery). Additionally, unexpected responses due to oscillatory behaviour as a result of voltage or frequency disturbance cannot be detected at coarser measurement granularity.

46) To enable aggregated DER to provide instantaneous reserves in the New Zealand electricity market, approaches to measuring performance will need to be investigated. It will be important to trade-off the benefits of highly granular measurements against the costs of mandating such requirements.

47) Likewise, dispatch compliance (for energy) of generators and dispatch capable load stations is currently monitored via SCADA. SCADA monitoring is inappropriate for DER aggregations. Instead, AMI data could potentially be used for dispatch compliance

monitoring. However, this could potentially require enormous quantities of data to be transported through communication networks to a MEP's head-end.

48) To ensure the appropriate technology infrastructure investments occur to enable energy and ancillary services provision by DER, technology providers need transparency on what the technical requirements will be for DER providing energy and ancillary services.

49) DER will usually be installed as a site component rather than having a dedicated Installation Control Point (ICP). Similarly, demand side flexibility may be associated with only some elements at ICP. This means that the location at which a service should be measured may be different than the network connection point for the site. Many DERs come with a dedicated built-in measurement device, and it will be more efficient to use data from these devices rather than requiring additional meter equipment within an ICP. The current Electricity Industry Participation Code does not allow this.

50) Market trials will be an essential tool to develop solutions for the issues identified above. Lessons can be leveraged from Ara Ake's Multiple Trading Relationships trials, as well as Australian Project EDGE and Project Symphony trials.

Market integration issues

51) Transpower (as System Operator) conducts Real Time Dispatch by dispatching the market every five minutes. Dispatch instructions are sent to generators and demand-capable load stations just prior to the start of a five-minute dispatch interval. Meeting such timeframes is not an issue for generators or demand-side participants in the industrial sector who will have fit for purpose control systems. However, meeting five-minute dispatch targets may be challenging for aggregated DER. This is because the communications and dispatching infrastructure for DER aggregations will be completely different to traditional control systems. Once an aggregator receives a dispatch instruction for its Virtual Power Plant (VPP), it needs to optimise that instruction across its VPP portfolio before communicating the instructions to the devices that make up the VPP. There may be latency issues that prevent a VPP from being able to meet five-minute dispatch instruction. As such, lowering barriers should consider alternative dispatch models that accommodate latency issues. For example, the Project Symphony pilot in Western Australia trialled a model whereby DER was dispatched off the pre-dispatch schedule instead of the real-time dispatch schedule.

52) Value stacking is important for aggregator investment to be economically viable. This will mean that DER aggregations may provide energy and ancillary services to the Power System Operator while also providing network flexibility services to EDBs. This will require coordination between the Power System Operator, aggregator and EDBs who will be operating as Distribution System Operator (DSO). Robust coordination protocols will need to be developed to ensure the Power System Operator has visibility of any DER trading activity that can impact on power system operations. Standardised communication protocols governing information transfers between various parties will need to be specified[4].

53) We reiterate the importance of ongoing market trials to address market integration issues.

[4] For example, the IEEE 2030.5 protocol has gained traction in Australia and has been applied in South Australia to govern DOE communications between aggregator/retailer and distribution companies. The protocol has additional use cases beyond communicating DOEs.

Q13: Do you agree with our assessment of the issues associated with procuring additional resource out of market? If not, what is your view and why?

54) Intellihub broadly agrees with the Authority on issues associated with the procurement of out-of-market resources in the very near-term. In the early days, while standardised services to manage peak capacity are undefined and participation of DER aggregations is nascent, it makes sense to enter into contractual arrangements with individual providers.

55) However, out-of-market contracts are best suited for one-off infrequent procurement. In the medium to longer-term, it is highly desirable that services be defined, standardised, and procured through transparent market platforms.

56) Amending wholesale market service definitions and addressing the various technological, market and informational barriers may take some years. In the short-term while these challenges are being addressed, out-of-market contracts may be the most efficient way of procuring peak capacity management services. As such, there may be value in introducing a contracting framework for procuring ad-hoc flexibility services. An example is Western Australia's Non-Cooptimised Essential System Services (NCESS) framework used to procure ad-hoc services while ensuring transparency.

57) The NCESS framework allows for the ad-hoc procurement of reserves to meet system and network needs. The mechanism can be triggered by policy maker (Energy Policy WA), AEMO (as power system operator) or the transmission and distribution network operator. The mechanism is triggered if one or more of the following conditions apply:

    a) Congestion rentals reach an uneconomic level and impose unreasonable costs on the market indicating a network constraint could be relieved via a locational network control service.

    b) Integrated system planning indicates lower cost alternative options for network augmentation may exist.

    c) Frequent manual interventions in the real-time market to relieve non-frequency constraints (e.g. reactive power or system strength) indicate a potential need for a locational network security service.

    d) Changes to power system security and reliability standards in network planning timeframes necessitates the need to procure a network control service.

    e) Ancillary services prices are unreasonable for a sustained period due to, for example, existing service specifications not being fit for purpose.

    f) A significant threat to power system security or reliability exists or is emerging that cannot be addressed using the existing market mechanisms.

58) When the NCESS mechanism is triggered, Energy Policy WA specifies the party who must procure the contract: network related services must be procured by the network operator while power system security and reliability services must be procured by the system operator.

59) The procuring party must administer an Expression of Interest (EOI) process which contains a clear service specification of the NCESS being procured. The purpose of the EOI is to assess whether capable resources exist to provide the service required before commencing the actual procurement process. The service specification may be modified because of EOI responses.

60) Providers wanting to bid must provide pricing and cost information including:

a) Fixed costs

b) The highest price at which the facility or equipment would provide NCESS.

c) Any other payments required to provide the NCESS.

61) The system or network operator (depending on the procuring party) selects winning NCESS submissions based on the extent to which the submissions meet their requirements and maximise value for money.

62) Parties providing NCESS do not have to meet the onerous technical requirements for wholesale electricity market participation as the contract between the procuring party and the provider can include bespoke arrangements.

63) Since 2022, AEMO has procured NCESS through the framework twice and has contracted with Plico Energy to provide power system services from a VPP.

64) A similar framework in New Zealand would enable the System Operator to procure peak capacity management services competitively. Moreover, the EOI process provides transparency to potential providers on what opportunities exist and the requirements they must meet.

65) Intellihub therefore recommends that the Authority consider developing a formalised contracting process that provides transparency to providers and enables competitive procurement.

Summary of Intellihub recommendations

Recommendations relating to Question 2

66) Intellihub reiterates that a holistic approach is needed to enable distributed flexibility to occur at scale. While the Authority's paper is rightly focussed on the pressing need to identify peak capacity management options, DER participation in wholesale energy and ancillary services markets is likely to be limited unless aggregators can value stack by also providing network flexibility services. As such, any initiatives at lowering barriers to DER participation must consider how DER can access the full range of flexibility services across both network and wholesale markets.

67) Policy makers and regulators must provide guidance to the industry to ensure consistent practices emerge with respect to DER data management and procurement practices. Particularly Government must provide a clear vision with respect to:

a) How DER data will be managed going forward taking into account the complex multi-party relationships that will emerge in a future where energy is decentralised and democratised.

b) Procurement approaches. We reiterate the benefits of a centralised approach to procurement with defined services and standardised terms and conditions.

c) The roles and responsibilities of DSOs, the SO and retailer/aggregators in a future where distributed flexibility is orchestrated at scale.

This needs to occur sooner rather than later to ensure aggregator and technology provider investment is directed appropriately.

Recommendations relating to Question 3

68) Low friction data sharing mechanisms will be essential to ensure visibility of DER:

a) Aggregators will need to know where to access controllable and capable DER so they can undertake investment and product development planning.

b) EDBs need visibility of DER to enable better estimation of network hosting capacity and to identify the need for network flexibility services.

c) The System Operator may also need visibility of DER to inform operational planning activities.

Intellihub therefore recommends:

a) Mandatory registration of DER. Consideration needs to be given to the types of devices that should be subject to registration requirements. In the first instance, solar PVs, household batteries and Electric Vehicle charging equipment should be subject to registration requirements. Overtime, further demand flexible devices such as heating and cooling systems and pool pumps may also need to be added.

b) Exploring fit for purpose digital solutions to enable automated exchange of DER information to multiple parties with varying permissions. We reiterate the importance of leveraging existing platforms instead of repurposing the Registry.

66) Intellihub recommends regulating device standards to ensure aggregators can access controllable and capable DER and to mitigate the adverse impacts of proliferation of uncontrollable DER. As above, the immediate priority is regulating inverters and Electric Vehicle charging equipment. Regulations should be flexible enough to regulate additional device standards as needed over time.

67) Enabling large quantities of DER to connect to distribution networks will ensure aggregators have access to a deep pool of demand side resources in the right locations. EDBs will therefore need to be able to optimise their network hosting capacity to accommodate increasing quantities of DER connecting to their network. As such, Intellihub, recommends investigating a national framework for the use of Dynamic Operating Envelopes. As above, such an initiative be undertaken in a holistic manner underpinned by regulation at the national level to ensure DOEs are implemented in a consistent manner.

Recommendations relating to Question 4

68) Intellihub advocates for the use of market trials to address the various technical and market integration issues addressed in paragraphs 42)53) of our submission. The issue of measuring service performance is particularly critical from both a system security and financial settlement perspective.

Recommendations relating to Question 13

69) Finally, Intellihub acknowledges that until new wholesale electricity market services are defined and standardised, and existing service definitions are amended to enable DER participation, it will not be possible to procure these services through the existing spot market. As such, in the short-term peak capacity management services will likely need to be procured contractually. Rather than adopting an ad-hoc approach to such service procurement, Intellihub recommends formalising the contracting process and adopting a similar approach to the NCESS framework in Western Australia. This will enable DER participation through the specification of bespoke technical requirements while also providing transparency to service providers through the EOI process.