

Data and data exchange for market transactions

What changes to the data system might promote innovation and participation?

Consultation paper

Submissions close: 5pm on 7 November 2017



Executive summary

The Electricity Authority wants your views on whether any changes to data and data exchange arrangements may be required to promote innovation and more participation in the electricity industry. Our objective is to promote competition in, reliable supply by, and efficient operation of the electricity industry for the long-term benefit of consumers.

The electricity industry, and electricity markets, collect, process, store and exchange significant volumes of data each day. The data is essential for the physical exchange of electricity and the exchange of electricity services between industry participants across the supply chain.

The current data system—the way data is collected, processed, stored and exchanged—is largely decentralised. All industry participants, such as retailers, large consumers, generators and distributors, each collect and produce data as part of their everyday activities. They must also exchange data between themselves and through market operation service providers (MOSPs) to enable transactions between participants. The Authority contracts with a range of MOSPs which provide the platform for the electricity market and the exchange of electricity services between participants. An example of a MOSP is the reconciliation manager, which is responsible for ensuring that participants (electricity generators or buyers) are allocated their correct share of electricity generation or consumption.

This paper is about the data collected and exchanged as part of operating the market

The overarching purpose of the data system is the efficient operation of the electricity market and to ensure that participants pay or are paid the correct amount for the electricity and electricity services they use and produce.

The data system also supports competition, reliability and efficiency across the supply chain. Competition is promoted by the data system reducing barriers to entry and making it easy for parties to enter and operate in the electricity industry. Reliability is promoted to the extent the data system assists coordinating the physical flows of electricity across the electricity system and distribution networks. Efficiency is promoted by the data system reducing the transactions costs of industry arrangements and working in a well-organised manner.

We have several data-related projects across the Authority's work programme. These include: *Data and data exchange*, *Multiple trading relationships*, *Default distribution agreements*, and an *Operational review of electricity information exchange protocols* (EIEPs). Table 1 outlines key focus of each project.

Table 1: The focus of the Authority's data-related projects

	<i>Data and data exchange</i>	<i>Default distribution agreements</i>	<i>Multiple trading relationships</i>	<i>Operational review of EIEPs</i>
Data accuracy and errors	✓			
Timeframes for exchanging data	✓			
Formats for storing and exchanging data	✓			✓
Dealing with more participants and transactions	✓			
Security and privacy of data	✓			
Information exchange protocols	✓			✓
Contractual arrangements for sharing information		✓		
Access to consumption data			✓	

The focus of this paper is on the data, and the processes for exchanging that data, for participants to pay or be paid the correct amount for the electricity and electricity services they use and produce. The paper is not considering arrangements relating to accessing consumption data by consumers or consumer agents—this will be a focus of a forthcoming consultation on *multiple trading relationships*.

The *Data and data exchange* project represents a high-level check whether more fundamental change to the data system could promote the long-term benefit of consumers.

The electricity industry is changing

The electricity industry is changing fundamentally. Technologies such as solar panels, batteries, electric vehicles and smart controls for equipment and appliances—such as ‘smart’ hot water cylinders—are creating more rapid change to the electricity industry and market.

The change is analogous to what has happened in telecommunications, transport, accommodation and banking. Each of these sectors has experienced significant change as technology and new business models change the consumer experience and the level of competition.

Household, business and industrial consumers have more options than ever before about when and how they use electricity. Consumers can use solar panels and batteries to participate directly in the market as sellers of electricity and related services. New and existing suppliers are developing and offering to consumers’ innovative products and services that assist consumers to realise the benefits of things like batteries.

All of this may require changes to the data system. In particular, the data system may need to deal with more parties wanting to interface with the data system, more transactions and more data. We want to make sure the data system can better support new and existing ways of doing business that provide long-term benefits to consumers. We also want to make sure that the data system continues to support existing ways of doing business and is ‘backwards compatible’ to the extent this achieves long-term benefits for consumers. The Authority is aware that there can be significant costs of change and these will need to be carefully weighed against the benefits.

What changes may be required to make sure the data systems can manage the expected changes to the industry?

We want to make sure data and data exchange arrangements can manage more parties wanting to interface with the data system, more transactions and more data and continue to promote competition, reliability and efficient operation of the electricity industry for the long-term benefit of consumers.

We want to identify what changes could be made to improve data and data exchange arrangements. We have identified some possible barriers to innovation and market entry and the potential to improve the way data is recorded, processed, stored and exchanged. Some of these matters come from comments previously received from participants.¹

This paper discusses the following matters:

- 1. Inaccurate data is sometimes exchanged between participants and through the MOSPs.** Inaccurate data can be stored and exchanged. One reason is human error in

¹ We have received comments regarding data in related consultations. See *Summary of submissions: Default agreement for distribution services*, 20 December 2016. Available at: <https://www.ea.govt.nz/dmsdocument/21611>. Also see submissions in response to *Enabling mass participation in the electricity market*, 30 May 2017. Available at: <https://www.ea.govt.nz/zipcontroller/download/c90002e94e7999ed4f68a7b2ee2bc8d2>.

the process. Inaccurate data reduces competition and efficiency by increasing the cost of doing business and leads to poor decisions by participants.

2. **Data exchange timeframes are based on monthly invoicing and settlement of participant transactions.** The data system was designed for monthly invoicing and settlement of participant transactions, for example in the wholesale electricity market. More frequent data exchange, invoicing and settlement could promote competition and efficiency.
3. **Data is exchanged in a variety of formats using a variety of processes.** The formats for exchanging some data are set out in the EIEPs and in the functional specification documents used by MOSPs. However, participants exchange data using a variety of formats (eg, spreadsheets, .csv, or .txt files). The data is exchanged by email, file transfer protocol, secure file transfer protocol, or via a webpage using secure hyper-text transfer protocol. Data can also be exchanged through an application programming interface (API). Using more standardised approaches promotes competition and efficiency by reducing the cost of doing business. More standardisation of formats and processes, in particular, would minimise barriers to entry by making it easier to interface with other participants in the data system.
4. **Transactions are not settled using the most accurate available data.** The data system was designed for a time when the most accurate available data for invoicing participants and billing consumers was collected at monthly to quarterly intervals. The approach means consumer bills have been calculated using estimates and 'profiles' of their use, rather than actual consumption. However, most electricity meters are now 'smart' and able to collect half-hourly data and deliver that data daily. This means competition and efficiency benefits may be lost because consumer bills are not calculated using the most accurate available information on the cost of wholesale electricity and other services.
5. **The data system will need to deal with more participants and transactions.** We consider the current data system can deal with more participants and transactions. However, it is not possible to say exactly how the market and industry will evolve over time. It is likely there will be more transactions between more participants. Making it easy for participants to interface with the data system is likely to promote competition and efficiency, for example by reducing the cost of doing business.
6. **Using more detailed data may require updating security and privacy arrangements.** In the future, more participants will be exchanging more data in an environment with a greater likelihood of cyber-attacks and increased consumer interest in how the privacy of their data is protected. Making sure the data system is designed to minimise the risk of successful cyber-attacks and privacy breaches will promote competition and reliability.

We want your comments

We want your comments on what improvements may be required to reduce inefficient barriers to innovation and more participation. We also seek your input on how you think the issue should be addressed. For example, whether a matter could be considered by the Innovation and Participation Advisory Group or a technical industry working group. Your comments will inform further development by the Authority of the market arrangements and data systems.

We are particularly interested in your experiences of processing and using electricity industry data, and the ease of exchanging electricity industry data. After receiving all submissions, we

will have a better understanding of the problems, the materiality, and what options are available to deal with the problems. This may result in one or more matters being developed for further consideration and addressed.

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1 We want your comments

The Electricity Authority wants your views on whether any changes to data and data exchange arrangements may be needed to promote innovation and more participation in the electricity industry. Specifically, we want your views on the way data is recorded, processed, stored and exchanged for operating the market.

We are seeking your comments on the matters we've identified and also asking whether there are other matters to consider in data and data exchanges. We also seek your input on how you think these matters should be addressed. Your comments will inform the Authority's ongoing consideration of data and data exchange arrangements.

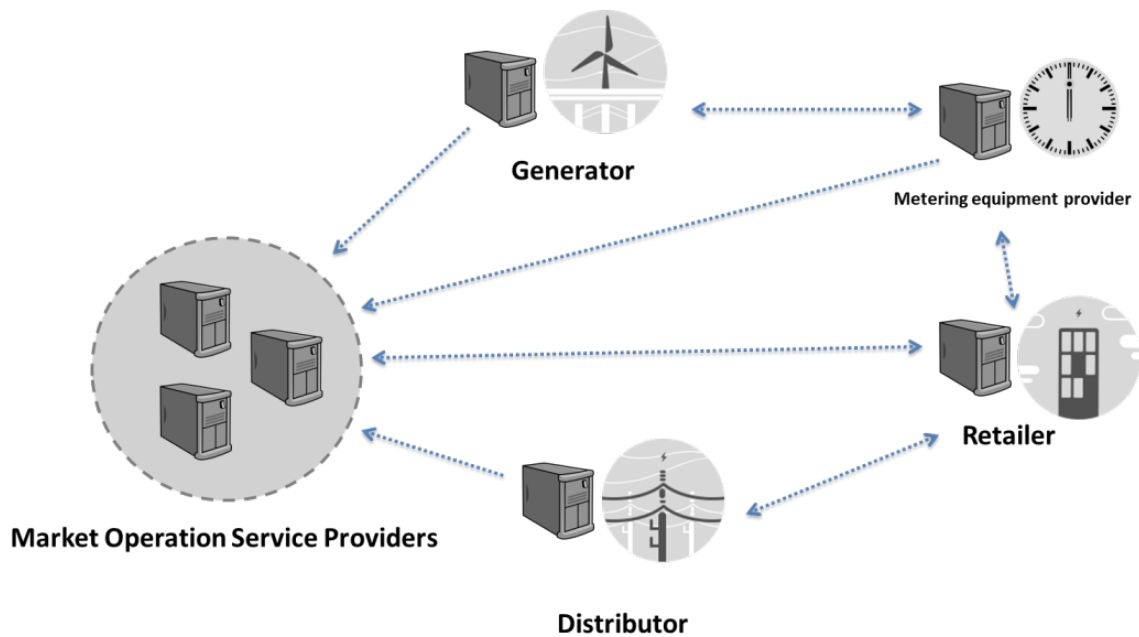
- 1.1 The Authority wants your views on whether any changes to data and data exchange arrangements may be needed to promote innovation and more participation in the electricity industry. Our objective is to promote competition in, reliable supply by and efficient operation of the electricity industry for the long-term benefit of consumers.^{2,3}

We want to make sure the data system promotes innovation and participation

- 1.2 The electricity industry and markets collect, process, store and exchange significant volumes of data each day. The data is essential for the physical exchange of electricity and the exchange of electricity services between participants across the supply chain.
- 1.3 The current data system—the way data is collected, processed, stored and exchanged—is largely decentralised. Industry participants, such as retailers, large consumers, generators and distributors, each collect and produce data as part of their everyday activities. They also must exchange data between themselves and through MOSPs to enable transactions between participants. The Authority contracts with a range of MOSPs to provide the platform for the electricity market and the exchange of electricity services between participants.

² Section 15 of the Electricity Industry Act 2010 (the Act).

³ The Authority's interpretation of its statutory objective is available here: <https://www.ea.govt.nz/dmsdocument/9494>

Figure 1: Overview of the data system and data exchanges

Source: Electricity Authority

- 1.4 The overarching purpose of the data system is the efficient operation of the electricity market and to ensure that participants pay or are paid the correct amount for the electricity and electricity services they use and produce.
- 1.5 The data system also supports competition, reliability and efficiency across the supply chain. Competition is promoted by the data system reducing barriers to entry and making it easy for parties to enter and operate in the electricity industry. Reliability is promoted to the extent the data system assists coordinating the physical flows of electricity across the electricity system and distribution networks. Efficiency is promoted by the data system reducing the transactions costs of industry arrangements and working in a well-organised manner.

This paper complements other projects within the Authority

We have a comprehensive work programme focused on innovation and more participation

- 1.6 The *Data and data exchange* project is part of a suite of projects focusing on more participation in the electricity industry. The *Data and data exchange* project focuses on market systems, processes and rules relating to the data system. Other data-related projects are:
- (a) *Enabling mass participation*. The *Enabling mass participation* project identifies any 'gaps' not being addressed by other projects on the work programme.
 - (b) *Multiple trading relationships*. The *Multiple trading relationships* project examines what changes to the existing systems and processes are required to enable a consumer to obtain electricity services from multiple parties at the same time. For example, what changes are needed to allow a consumer to buy electricity from one retailer and sell any surplus electricity produced to a different retailer? This includes matters relating to accessing consumer's consumption data.

- (c) *Default distribution agreement*. The *Default distribution agreement* project is intended to make sure the distributor and retailer contractual relationship established through the use-of-system agreement does not prevent long-term benefits for consumers. One aspect of the distributor and retailer relationship is the information sharing arrangements relating to exchange of distribution services.

We have a number of data-related projects underway

- 1.7 We are considering data-related matters through a range of projects.
- 1.8 The *Data and data exchange* project represents a high-level check whether more fundamental change to the data system could promote the long-term benefit of consumers. The purpose of the project is to check whether changes to the existing data system, and data and data exchange arrangements, are required to reduce inefficient barriers to participation and innovation.
- 1.9 Separate to the *Data and data exchange project*, the Authority has also published a consultation paper entitled *Operational review of EIEPs*, which proposed incremental changes to the EIEP overview document and EIEPs 1 to 12. The review addresses potential improvements to EIEPs identified by participants and the Standing Data Formats Group. The review also provides the opportunity to align terminology with that recommended in the Electricity Networks Association's November 2016 guidelines: "Pricing guidelines for electricity distributors".

We want your comments

- 1.10 We want your comments on what improvements may be required to reduce inefficient barriers to innovation and more participation that arise from data and data exchange for market transactions. We also seek your input on how you think these matters should be addressed. For example, whether a matter could be considered by the Innovation and Participation Advisory Group or a technical industry working group. Your comments will inform any further development by the Authority of the market arrangements and data systems.
- 1.11 We are particularly interested in your experiences of processing and using electricity industry data, and the ease of exchanging electricity industry data. After receiving all submissions, we will have a better understanding of the problems, the materiality, and what options are available to deal with any problems identified.

Structure of this paper

- 1.12 This paper is organised as follows:
- (a) Section 2 provides an overview of how and why we exchange data. It also discusses the roles and responsibilities of various participants, and the major service providers who manage the majority of data exchanges in the industry.
- (b) Section 3 outlines how the electricity industry is changing. The section discusses how innovation in technology and business models has the potential to require changes to data and data exchange arrangements.
- (c) Section 4 discusses reasons for making changes to data and data exchanges to reduce inefficient barriers to innovation and more participation.

How to make a submission

- 1.13 The Authority's preference is to receive submissions in electronic format (Microsoft Word) in the format shown in Appendix A. Submissions in electronic form should be emailed to submissions@ea.govt.nz with "Data and data exchange consultation paper" in the subject line.
- 1.14 If you cannot send your submission electronically, post one hard copy to either of the addresses below, or fax it to 04 460 8879.

Postal address

Submissions
Electricity Authority
PO Box 10041
Wellington 6143

Physical address

Submissions
Electricity Authority
Level 7, ASB Bank Tower
2 Hunter Street
Wellington

- 1.15 The Authority wants to publish all submissions it receives. If you consider that we should not publish any part of your submission, please
- (a) indicate which part should not be published
 - (b) explain why you consider we should not publish that part
 - (c) provide a version of your submission that we can publish (if we agree not to publish your full submission).
- 1.16 If you indicate there is part of your submission that should not be published, we will discuss with you before deciding whether to not publish that part of your submission.
- 1.17 However, please note that all submissions we receive, including any parts that we do not publish, can be requested under the Official Information Act 1982. This means we would be required to release material that we did not publish unless good reason existed under the Official Information Act to withhold it. We would normally consult with you before releasing any material that you said should not be published.

When to make a submission

- 1.18 Please deliver your submissions by **5pm on 7 November 2017**.
- 1.19 The Authority will acknowledge receipt of all submissions electronically. Please contact the Submissions' Administrator if you do not receive electronic acknowledgement of your submission within two business days.

2 The data system is essential for operating the market

Significant volumes of data are collected, processed, stored and exchanged each day as part of the exchange of electricity services between participants and the operation of electricity markets. Data is also exchanged to enable the physical operation of the electricity system and networks.

Many of these data exchanges occur between participants. There are also MOSPs that are responsible for handling and processing major data exchanges. Participants connect to these MOSPs to complete their everyday operations. To support this structure, there are a number of information exchange protocols and functional specification formats which provide a set of cost-effective standardised formats for information exchanges.

- 2.1 Significant volumes of data are collected, processed, stored and exchanged each day as part of the exchange of electricity services between participants and operation of electricity markets.
- 2.2 Data is also exchanged to enable the physical operation of the electricity system and networks.

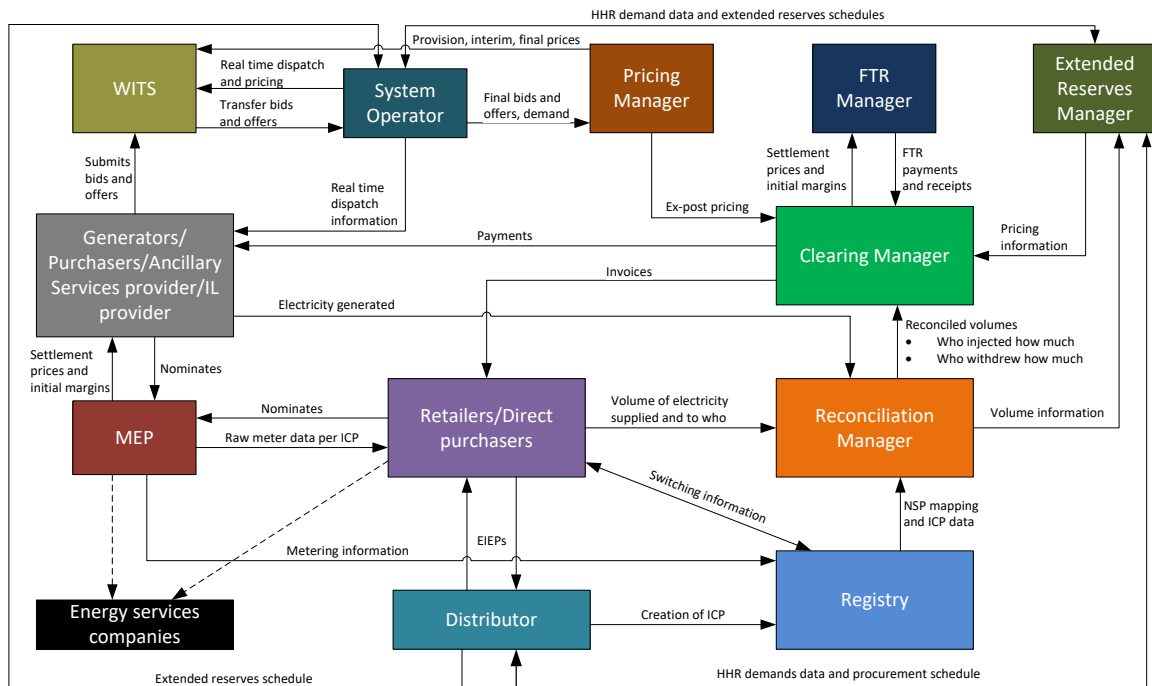
Data is used to calculate who pays how much for what

- 2.3 Data is used to record which products or services have been supplied. The same underlying data (or derived data) is used to ensure payments match the products or services consumed.
- 2.4 For example, all generators must collect the volume of electricity exported at each of their points of connection. This data is provided to the reconciliation manager.⁴ The reconciliation manager confirms the volume submitted is accurate. Separately, the clearing manager, which acts as a clearing house for wholesale electricity transactions, matches the reconciled volume data with the relevant spot price data to calculate the amount to be paid to each generator and by each purchaser.

The data system provides the platform for exchange of electricity services

- 2.5 The current data system—the way data is collected, processed, stored and exchanged—is decentralised. All industry participants, such as retailers, generators and distributors, each collect and produce data as part of their everyday activities. They then exchange data between themselves and through MOSPs to enable transactions between participants. The market operates as it does due to the way data is exchanged.
- 2.6 The Authority contracts with a range of MOSPs to provide the platform for the electricity market and the exchange of electricity services between participants. An example of a MOSP is the reconciliation manager, which is responsible for ensuring that participants (eg, electricity generators or buyers) are allocated their correct share of electricity generation or consumption.
- 2.7 A view of the data system, the parties involved and the main exchanges, is shown in Figure 2.

⁴ Volume data is aggregated in accordance with clause 8 of Schedule 15.3 of the Electricity Industry Participation Code 2010 and includes, if relevant, any profile shape or control times associated with a profile.

Figure 2: A view of the data system⁵

Source: Electricity Authority

- 2.8 Most data is channelled through a MOSP. Each MOSP performs specific functions necessary for the operation of the market. Buyers and sellers of electricity products and services transact through these MOSPs. This means the industry operates a decentralised system for key data exchanges which participants plug in to.
- 2.9 There is also a major data exchange between retailers and distributors. Most of this data is formatted using EIEPs and exchanged via the registry's EIEP hub.
- 2.10 Each participant designs their own data systems, which are used to coordinate all actions and tasks with one or more other participants. Data storage (and some processing) is mostly distributed, meaning it is stored on a participant's server and exchanged between participants when needed.
- 2.11 To facilitate these exchanges the Authority has published a range of information exchange protocols and functional specifications intended to standardise data formats and exchanges.
- Market operation service providers**
- 2.12 The general duties and processes each MOSP must fulfil are set out in a functional specification document. Each MOSP functional specification represents a key function which is necessary for transactions in the electricity market. Appendix B provides an overview of each MOSP role. Table 2 outlines the eight roles and the current entity which is contracted to fulfil the role.

⁵ This figure excludes traders, who have a similar position to retailers but are also responsible for populating the registry.

Table 2: Current MOSP roles and contracted parties

MOSP Role ⁶	Contracted or assigned to
Clearing Manager	NZX Limited
Extended Reserves Manager ^A	NZX Limited
FTR (Financial Trading Rights) Manager	Energy Market Services (EMS) - a division of Transpower
Pricing Manager	NZX Limited
Reconciliation Manager	NZX Limited
Registry Manager	Jade Software Corporation
System Operator	Transpower ^B
WITS (Wholesale Information Trading Systems) Manager	NZX Limited
^A Appointed and awaiting operational agreement	
^B Assigned by the Act	

- 2.13 Outsourcing the operation of bits of the data system and the market platform is not usual. Most electricity markets have one overarching regulatory body or not-for-profit organisation to operate the data system. However, the purpose of designing eight MOSP roles was to separate the core data exchanges into individual contestable contracts and provide for competition for the service.⁷ The approach is intended to provide fit-for-purpose market services that increase market efficiency, ensure effective market operation, and facilitate market development. Any company can bid for a MOSP contract when it goes to tender. A party can fulfil one or more of the MOSP roles (excluding the system operator role).
- 2.14 To understand the size of the potential data exchange challenge, the MOSPs are collectively responsible for managing a total of 364 industry processes.⁸ These are specific actions or tasks each MOSP must perform to fulfil its duties. These processes make sure the industry operates quickly and efficiently. The processes can be broken down further, into 1,832 smaller sub-processes. Appendix C provides an overview of these sub-processes. This excludes industry processes that require data exchange directly between participants, therefore not involving the MOSPs.
- 2.15 The sub-processes may take the numerous types of data inputs, which can themselves take many data forms (letters, words or numbers) and data formats (different file types). The sub-processes turn these into new outputs, which are used by other participants to complete operations.

EIEPs are an important part of the data system

- 2.16 The Authority has introduced a number of EIEPs over the years. EIEPs cover a diverse range of electricity information routinely exchanged between traders and distributors, and retailers and third party providers.
- 2.17 The EIEPs have been developed and revised over a period of many years, supported and coordinated by the Authority, and informed by industry consultation and a panel of

⁶ This paper does not include the market administrator MOSP role, which is currently being consulted on.

⁷ Except for the role of system operator which is assigned to Transpower in Section 8 of the Act.

⁸ Note this figure does not include processes and sub-processes for the recently added extended reserves manager.

industry representatives.⁹ EIEPs are designed to provide standardised formats and associated business requirements that support low cost, standardised and reliable exchange of business-to-business information. Appendix D provides a summary of the EIEPs.

- 2.18 Some EIEPs are regulated. These include important topics such as exchange of volume and billing information, exchange of consumer consumption information, and distributor delivery price change information.
- 2.19 Other EIEPs are non-regulated and voluntary.¹⁰ In this case, information exchange arrangements are agreed between industry participants. However, the Authority published a number of example EIEPs and encourages industry participants to use the latest versions of these EIEPs.
- 2.20 The information covered by the EIEPs (and any other information) may be exchanged using the registry's EIEP exchange hub. Data is exchanged using a secure file transfer protocol, which allows the encrypted exchange of information directly between participants.

⁹ This panel is the Standing Data Formats Group – the SDFG.

¹⁰ Regulated EIEPs include EIEP1, EIEP2, EIEP3, EIEP12, EIEP13A, EIEP13B and EIEP13C.

3 The industry is changing

The electricity industry is changing. Household, business and industrial consumers have more options than ever before about when and how they use electricity. Consumers can use solar panels and batteries to participate directly in the market as sellers of electricity and related services. New and existing suppliers are developing and offering to consumers' innovative products and services that assist consumers to realise the benefits of things like batteries.

The data system may need to deal with more parties wanting to interface with the data system, more transactions and more data.

- 3.1 The electricity industry is changing fundamentally as technology makes it possible to do things differently. The change is analogous to what has happened in telecommunications, transport, accommodation and banking. Each of these sectors has experienced significant change due to technology change and new business models. For example, technology change has enabled businesses like Uber and AirBnB to compete for transport and accommodation services. These firms are using technology to provide low cost methods for matching buyers and sellers with spare capacity, such as a spare room or infrequently driven vehicle.
- 3.2 In the electricity industry, technology change is expected to lead to similar outcomes. It will provide low-cost opportunities to bring to market new sources of generation, storage and consumer or demand response.¹¹ For example, technology could make it cost-effective to use back-up generation for many commercial buildings, commercial-scale heating, ventilation and air conditioning systems or commercial refrigeration systems to help maintain the reliability of the transmission grid or a distribution network by reducing peak demand.
- 3.3 Similarly, solar panels, batteries, and remote communication and sensor devices will change the traditional relationship consumers have with the electricity industry. Consumers will have more choice and control over how they use electricity.

The change is well underway

- 3.4 There are many examples from New Zealand, and internationally, of how the electricity industry and markets are changing. Some local examples are:
- (a) A peer-to-peer (P2P) electricity trading platform was launched in early 2016. It matches owners of solar panels that want to sell surplus electricity with consumers that want to buy locally.¹²
 - (b) More than 19,000 residential consumers buy electricity from retailers at the spot price plus network and other charges. Arrangements like this have become

¹¹ Demand response allows electricity consumers to reduce their electricity use for a period of time in response to changes in electricity prices or in exchange for compensation. Demand response is intended to alter the timing or level of instantaneous demand or total electricity consumption.

¹² P2 Power is available to consumers connected to the Vector network. Go to <https://p2power.co.nz/> for more information.

possible because most households now have smart meters.¹³ Several other retailers offer innovative pricing, for example one retailer offers a free hour of power every day. Another retailer sells electricity in ‘packs’ of electricity.

- (c) A retailer started a trial offer to commercial customers in September 2016 which involves installing multiple 8 kWh batteries. The battery system includes a management platform which allows the retailer to aggregate and remotely control the batteries. Consumers can take advantage of lower time-of-use rates to recharge the batteries and automatically respond to distribution price signals.¹⁴
 - (d) A firm aggregates the electricity used by industrial and commercial consumers across the country which it sells into the instantaneous reserve market.¹⁵ The consumers supplying the demand response reduce their consumption or take their operations off the grid for short periods of time. In doing so, they help maintain system frequency and avoid the lights going off.
 - (e) A distributor started trialling a 1 MW battery in early 2016 to better understand the impact of the commercial application of battery technology, including the opportunity to reduce the distributors operating.
 - (f) The grid owner operates a ‘demand response programme’ that enables consumers to be paid to reduce demand for grid-supplied electricity for a period of time when asked. The grid owner benefits from access to flexible ways to reduce congestion on the grid at peak times. This allows the grid owner to reduce or postpone investment in the grid.¹⁶
- 3.5 Technology is providing more opportunities for consumers to become participants by selling electricity products and services directly to other parties, thus competing with existing businesses. Consumers that inject their excess electricity into the grid, or provide services for others, may expect payment. This means they may seek to interface with the data system to settle financial transactions.
- 3.6 The data system should be able to deal with this increasing number of financial transactions and continue to ensure the right participants pay the right amount at the right time.
- 3.7 The data system may need to manage different participant types and relationships, new data types, and greater volumes of data while continuing to perform its core function of providing the platform for the market. As more consumers step into the supply chain, they will likely enter the market with low market sophistication. Data systems and processes will need to cater for these new participants.

¹³ Most smart meters record the amount of electricity your household is actually using at half hourly intervals, and sends the data daily to your retailer using similar technology to text messages or a radio network. Go to <https://www.ea.govt.nz/consumers/what-are-electricity-meters/> for more information.

¹⁴ Go to <http://www.energynews.co.nz/news-story/30486/contact-testing-battery-aggregation> for more information.

¹⁵ Instantaneous Reserves (IR) enables the electricity system to respond to the loss of the largest single supply asset (generally a generator) without interrupting supply to load (frequency to stay above 48Hz).

¹⁶ Go to <https://www.transpower.co.nz/keeping-you-connected/demand-response> for more information.

We want to make sure the data system doesn't raise inefficient barriers to innovation and more participation

- 3.8 In the same way the range of mobile phone apps you can access may be limited by your operating system, some businesses might not offer the full potential of their product or services because they are not supported by the data system.
- 3.9 We want to make sure the data system provides a platform that accommodates different ways of doing business and minimises inefficient barriers to participants entering or exiting the industry. These systems need to be able to accommodate increasing and different forms of business models and be flexible to change. We need to consider whether current data systems and access to data rules may limit the roll-out of even greater products or services. Some products and services may not be developed altogether because the data system cannot accommodate new ways of doing things. Any potential inefficient barriers need to be identified and reduced, or eliminated, to allow consumers to realise the long-term benefits of innovation and more participation in the electricity industry.
- 3.10 We also want to make sure that the data system continues to support existing ways of doing business and are 'backwards compatible' to the extent this achieves long-term benefits for consumers. By backwards compatible we mean existing or legacy systems are not automatically made redundant. We do not want to unduly restrict existing products and services, the delivery of which provide long-term benefits to consumers. For an existing participant, innovation could mean improving on existing business models – rather than creating new ways of doing business. For example, a retailer may want to develop deeper insights into the various needs of its customers, adding new services consumers want and removing services consumers do not want. In such cases, the advancements in technology and business models will be incremental – a small change in operation, which fundamentally uses the same underlying systems and processes.

We are aware there will be costs to change

- 3.11 The Authority is aware that changing aspects of the data system could lead to significant costs. These costs would need to be weighed against the benefits that would arise from any change. If it is apparent after considering submissions that changes appear to be required, the Authority will fully investigate the costs and benefits of any proposed changes.
- 3.12 Changing the data system could impose costs in many areas of the industry. For the Authority, for example, there would be costs associated with amending the Electricity Industry Participation Code 2010 and potentially costs imposed on our market operation service providers. For industry participants, there could be costs that arise from consequent changes that need to be made to upgrade or replace business, information technology and market systems.
- 3.13 We are not asking participants to make any changes at this time. At present, we seek to identify what changes may be required and the potential types of costs and benefits.

4 What changes may be required to data and data exchanges to remove inefficient barriers to innovation and more participation?

Many of the industry's current data arrangements are based on the decades-old electricity supply model, with large-scale and specialised participants. We want to make sure data and data exchange arrangements continue to promote competitive, reliable and efficient operation of the electricity industry. We consider the current data system can deal with more participants and transactions. However, we have identified some possible barriers to innovation and market entry and some opportunities to improve the way data is recorded, processed, stored and exchanged.

- 4.1 We want to make sure data and data exchange arrangements can manage the expected innovation and participation and continue to promote competition, reliability and efficient operation of the electricity industry.
- 4.2 We are considering whether there are any changes that need to be considered to improve data and data exchange arrangements to remove inefficient barriers to innovation and more participation. We are seeking to ensure that data and data exchange arrangements are designed and operated so as to promote competition, reliability and efficiency.
- 4.3 The following sections discuss some possible barriers to innovation and market entry and some opportunities to improve the way data is recorded, processed, stored and exchanged. Through submissions on a related consultation project, the Authority was alerted to the fact that there matters relating to data exchanges today.¹⁷ Other matters have been identified by the Authority.
- 4.4 We have provided an overview on the matters identified and our initial assessment on how they may impact the Authority's statutory objective. Table 3 provides a summary of our initial impact assessment on the matters. We have identified six matters with data and data exchanges. The first four represent possible matters occurring today. The last two represent potential matters which may occur in the future. The matters identified are not exhaustive.
- 4.5 We are seeking your comments on the matters we've identified and also asking whether there are other matters to consider in data and data exchanges. We also seek your input on how you think these matters should be addressed. Your comments will inform the Authority's ongoing consideration of these matters and how to address them.

¹⁷ See *Summary of submissions: Default agreement for distribution services*, 20 December 2016. Available at: <https://www.ea.govt.nz/dmsdocument/21611>. Also see submissions in response to *Enabling mass participation in the electricity market*, 30 May 2017. Available at: <https://www.ea.govt.nz/zipcontroller/download/c90002e94e7999ed4f68a7b2ee2bc8d2>

Table 3: Summary of the Authority's impact assessment of possible matters with data and data exchanges

● High Impact ● Medium Impact ● Low Impact			
Possible matters to be considered with data and data exchanges today	Competition Impact	Reliability Impact	Efficiency Impact
Inaccurate data is sometimes exchanged between participants and through the MOSPs	●	●	●
Data exchange timeframes are based on monthly invoicing and settlement of participant transactions	●	●	●
Data is exchanged in a variety of formats using a variety of processes	●	●	●
Transactions are not settled using the most accurate available data	●	●	●
Possible matters to be considered with data and data exchanges in the future	Competition Impact	Reliability Impact	Efficiency Impact
The data system will need to deal with more participants and transactions	●	●	●
Using more detailed data may require updating security and privacy arrangements	●	●	●

Possible matters with data and data exchanges today

Inaccurate data is sometimes exchanged between participants and through the MOSPs

- 4.6 Inaccurate data is being exchanged between participants and through the MOSPs. This can affect all limbs of the Authority's statutory objective: competition, reliability and efficiency. The greatest potential impact is on efficiency, as errors in data are both time-consuming and expensive for the receiving party to deal with. Errors also have an impact on competition, as they increase the cost of doing business for any new entrant seeking to enter the market and represent an inefficient barrier they must face.

Table 4: Impact assessment on inaccurate data being exchanged

● High Impact ● Medium Impact ● Low Impact			
	Competition Impact	Reliability Impact	Efficiency Impact
Inaccurate data is sometimes exchanged between participants and through the MOSPs	●	●	●

- 4.7 Errors occur for a number of reasons, but a major contributing factor is human intervention and judgement. Even with the best training, human error in any working environment cannot be fully eliminated. A few examples of data-related errors humans make are: errors in data entry, errors in data exchanges, data loss and/or failure to

- remedy data problems. Staff will make temporary or 'makeshift' corrections themselves to complete the tasks at hand, but this does not fix the underlying problem.
- 4.8 The difficulty is that many of these errors are only noticed further up the value chain when the error is encountered. Decision-makers, managers and workers must accommodate these errors in their everyday work. The participant who receives the error is often the party who shoulders the cost of the error. Work is required each month to ensure the errors are cleaned and the data is processed correctly. This means a higher cost of labour as additional work must be done before the data is ready to use.
- 4.9 The Authority has identified real-world examples where we know data with errors is being exchanged. One example would be errors in register content codes throughout the country.¹⁸ Register content codes describe the functionality of a meter at the Installation control point (ICP), which determines the price plans available to a consumer.
- 4.10 These errors affect both participants and consumers. For example, a retailer will programme their data system to handle a variety of register content codes. The data system will identify an invalid register content code as an error since the system was not designed to accept the entry (for example, an 'uncontrollable' load which is also registered as 'controllable'). The retailer incurs extra costs in having to manually revise and process the register content code.
- 4.11 In this example, the consumer will also have a negative experience. The consumer may have decided to switch retailers based on a tariff discount for offering controllable load. Once the error is identified, the retailer must then contact the consumer and inform them that the price plan they hoped for is not available. The customer must then select an alternative price plan (which may surrender any discounts for controllable load) or return to their original retailer.
- 4.12 The inaccuracies in content codes could also prevent consumers from accepting innovative products and services. For example, an inaccurate register content code could describe a consumer's meter as having 'communicable' functionality. Communicable meters are necessary to offer half-hourly price plans. If a consumer sought to switch to a half-hourly plan, a retailer's decision to accept the customer would be based on the (inaccurate) register content code which states the meter is 'communicable'. On that basis, the consumer would appear to be eligible for a half-hourly plan. The retailer would then discover that the meter cannot communicate and the field code was inaccurate. Unfortunately, the retailer switching processes would already be underway. The retailer would need to revise their decision to accept the consumer, charge the consumer to manually change the codes, or shoulder the cost themselves. The retailer, and sometimes the consumer, would then need to remedy the situation by reconnecting the consumer to their previous retailer. For the retailer, this would represent a direct cost to their business, despite receiving no revenue from the consumer.
- 4.13 We are seeking your views on why these inaccuracies occur and what can be done to reduce them. There may be numerous examples of data and data exchange errors in the industry which have not been brought to the Authority's attention. The Authority and

¹⁸ One clear example of a register code breach includes the code 'X-UN-12'. This register code simply does not exist. We have been made aware that there are other meter registry codes which are in use, but do not exist. See *Data on metering configurations released*, 02 October 2016. Available at: <http://www.emi.ea.govt.nz/Forum/thread/data-on-metering-configurations-released/>.

the industry must examine methods to keep inaccuracies to a minimum and reduce human intervention where it is not necessary.

Q1. What inaccuracies in data and data exchanges have you experienced, for what reasons, and with what impact?

Data exchange timeframes are based on monthly invoicing and settlement of participant transactions

- 4.14 The industry's current data exchange timeframes are based on monthly invoicing and settlement of participant transactions, for example in the wholesale electricity market. The term "data exchange timeframe" means the time taken to collect, process, store and exchange data with another industry participant.
- 4.15 The industry's electricity metering equipment has significantly changed in recent years. This has provided an opportunity to reconsider all aspects of market systems, processes and rules. We have identified this as a good opportunity to reconsider invoicing and settlement practices. We are doing so because we recognise that data exchange timeframes can affect both competition and efficiency in the industry.
- 4.16 Data exchange timeframes affect industry competition as some participants are limited in the products and services they can offer due to the length of exchange timeframes. More frequent data exchanges will allow participants to offer innovative products that consumers may want; for example, real-time pricing.
- 4.17 Data exchange timeframes also affect industry efficiency. For example, shorter data exchange timeframes could:
- (a) lead to reduced participant prudential requirements
 - (b) reduce the cost of doing business
 - (c) enable participants to bill consumers more regularly using actual consumption, rather than estimates.

Table 5: Impact assessment on data exchange timeframes

	Competition Impact	Reliability Impact	Efficiency Impact
Data exchange timeframes are based on monthly invoicing and settlement of participant transactions	●	●	●

- 4.18 We have previously consulted on the topic of reducing settlement periods between participants from one month to one week under different circumstances.¹⁹ The proposal considered matching participant settlement periods to weekly billing cycles. This would be achieved by settling transactions between participants based on quantities estimated by the clearing manager. Our cost-benefit analysis at the time concluded that there was

¹⁹ See: *Settlement and Prudential Security Review*, 18 June 2013. Available at: <https://www.ea.govt.nz/dmsdocument/15149>

- no benefit of shorter settlement periods, especially for vertically integrated generator-retailers, but we would retain the option to reconsider this in the future.
- 4.19 The Authority thinks moving to short settlement periods may promote innovation and more participation, and the issue can be reconsidered in this new context. We are considering this topic in the context of innovation and more participation because we have seen a number of retailers offer more frequent billing cycles to their consumers. These new billing cycles are fortnightly and weekly bills. They are able to do so because they bill consumers on actual consumption, using half-hour (HHR) consumption data records, rather than using estimates which make assumptions about consumption.
- 4.20 The move to shorter settlement periods would result in lower prudential requirements for new and existing traders. In some cases, it may also reduce the need to cover prudential requirements with bank guarantees. These benefits could reduce inefficient barriers to entry in the retail market. But there are also benefits to generators too. Generators will be paid weekly for electricity injected, rather than wait for monthly billing cycles.
- 4.21 Increasing the frequency of data exchanges, for example short settlement periods, could be implemented quickly with little change to existing arrangements if needed. A number of other industries have implemented straight-through-processing (STP) and machine-to-machine data communication channels. STP is a method of automating many processes within a company. Implementing STP means data exchanges can be even faster and occur on a more regular basis. Automated systems can also immediately process data and make the data (and sometimes output) immediately available between participants. Machine-to-machine communication channels could also be achieved using API or the blockchain technology to record transactions.^{20,21}
- 4.22 We are interested in the industry's view whether there are any benefits to implementing more regular data exchanges in the industry, especially in the context of innovation and more participation.

Q2. What are the types of benefits and the costs of being able to reduce settlement periods between industry participants?

- Data is exchanged in a variety of formats using a variety of processes**
- 4.23 Participants are able to exchange data using any formats for business-to-business arrangements (eg, spreadsheets, .csv, or .txt files). The data is exchanged using different processes: by email, file transfer protocol, secure file transfer protocol, or via a webpage using secure hyper-text transfer protocol.
- 4.24 We are considering whether there are more opportunities for more standardisation in data and data exchanges. We are considering this issue now as data exchanges can directly impact competition, reliability and efficiency.

²⁰ API is a set of functions, procedures, and defined methods of communication that allow access to some features or data in a data system. API does not provide access to the whole data system.

²¹ The blockchain can be thought of as a ledger or account book that is updated in near real time with the account balance theoretically accessible to all parties to a transaction. The blockchain technology is already being used by some participants in the electricity industry for electricity exchange, settlement and audit purposes.

Table 6: Impact assessment on more standardisation of data and data exchanges

	Competition Impact	Reliability Impact	Efficiency Impact
Data is exchanged in a variety of formats using a variety of processes	●	●	●

- 4.25 More standardisation in data formats and processes is likely to improve competition. A barrier to entry is that new participants are required to have data systems which must accept many different formats. Participants must either purchase proprietary data systems or build bespoke systems which can interface with existing, and sometimes complex, data arrangements. This can be an inefficient barrier to entry as it increases the initial capital needed to enter the market. It is more cost-effective to design a data system using standardised data exchanges and data formats.
- 4.26 More standardisation in data formats and processes is likely to improve reliability. More standardisation means agreeing on a set of formats and processes which support the reliable exchange of information between participants. This will be important under more participation. Innovative and new participants will bring different ways to do business to the industry. The data system must be able to accommodate these new participants. More standardisation in data formats and processes can provide consistent, more reliable means of communication between industry participants.
- 4.27 More standardisation in data formats is likely to increase efficiency. Participants bring a wide variety of ways to complete tasks. Examples of these include a variety of load profiling technique, or different billing practices. In some cases, this can be inefficient as it results in inconsistencies between participants' data records. This requires a 'wash-up' – a process that revises invoices when the information it was calculated on has been amended. More standardisation in formats and processes provide a more cost-efficient method to collecting, processing and exchanging large volumes of information between participants. Similar to reliability, this will become increasingly important as we transition towards more participation and transactions in the industry.
- 4.28 More standardisation may be required because the current arrangements lead to inconsistencies between participants. Data is collected, processed and stored by a single participant, through their metering equipment providers (MEPs) contracts, which has two impacts on the industry:
- (a) Different processing methods can create inconsistencies in data definitions, formats and values. These inconsistencies make it difficult to reverse-engineer data to identify the underlying error, which is carried throughout the data value chain.
 - (b) Different processing methods and protocols create an 'information silo' - a data system which is unable to freely communicate with other data management systems. This means it can be difficult or impossible to work with other systems without work-arounds.
- 4.29 Any inconsistency in data can mean that participants may be required to pay, or be paid, amounts which are different to their expectations. One example of this problem occurs in

the reconciliation process, where some participants choose to use non-half-hourly data in reconciling consumption and generation data.

- 4.30 When faced with incomplete datasets, some participants must temporarily estimate missing values or estimate monthly consumption based on their own methods (see paragraph 4.7). The trader has up to 14 months to replace the estimate with actual data, but this still means datasets are not as accurate as they could be. Traders must make assumptions about how a consumer will consume electricity, which may not be consistent with actual consumption patterns. The trader hopes the actual consumption pattern matches the assumed pattern. The trader can average-out errors across a large number of consumers or across multiple billing periods. However, the inconsistency is ultimately borne by the consumer. Some consumers are cross-subsidising others higher electricity consumption, or missing out on saving opportunities.²²
- 4.31 Standardising data formats improves the efficiency of data exchanges. The benefit of standardising data formats is twofold:
- (a) Standardising data formats facilitate process automation, which improves system efficiency and reduces processing time in the industry.
 - (b) Standardising data formats also serves as a *minimum data standard* for the industry to adopt.
- 4.32 The Authority seeks to understand what steps can be taken to improve consistency in data collection, processing and exchange. This will reduce the need to continually cross-check data across various sources, as we can be more certain that we will get consistent results regardless of how the data is transformed.

Q3. What are the types of benefits and costs of more standardisation in data and data exchanges?

Transactions are not settled using the most accurate available data

- 4.33 Transactions are not settled using the most accurate available data. Detailed consumption data is available which would allow more accurate invoicing of participants using actual consumption data and reconciling electricity balances using real-figures. Instead, some participants aggregate the HHR data which is provided for settlement purposes. This means that participants are being invoiced on estimated figures which must be washed up at a later date. This is inefficient, as we can eliminate the need for most of this correction by using HHR data which is already available today.
- 4.34 Reliable supply is affected as some data systems are limited by the amount of HHR data they can send or receive. The ability to leverage existing technology which uses HHR to respond to system changes will be important in developing and operating an electricity

²² For example, Consumer A is a standard user but Consumer B uses less electricity during peak hours (6-9pm). Consumer B *should* be classified as a low-peak consumer (but isn't). This is an inconsistency and inefficiency. Consumer A uses relatively more electricity during peak hours and contributes to system stress during peak hours. Consumer B is not being rewarded for reducing system stress. As such, Consumer B is forfeiting savings on their electricity bill, and Consumer B is partly subsidising higher electricity consumption for Consumer A.

system which can manage security and reliability in ways that minimise total costs, whilst being robust to adverse events.²³

4.35 Efficiency is affected as:

- (a) At the individual level, consumers may still be paying for estimated consumption as outdated data systems cannot handle HHR. This is necessary for consumers to pay for actual consumption. In addition, consumers are not enjoying the benefits advanced metering infrastructure (AMI) could provide.
- (b) At the industry level, outdated data systems may limit other participants' abilities to exercise functions in ways that will increase the efficiency of the electricity industry, including considering transaction costs of having to interface with an outdated data system and increased labour costs from errors and delays arising from these interactions.

Table 7: Impact assessment on using more accurate available data

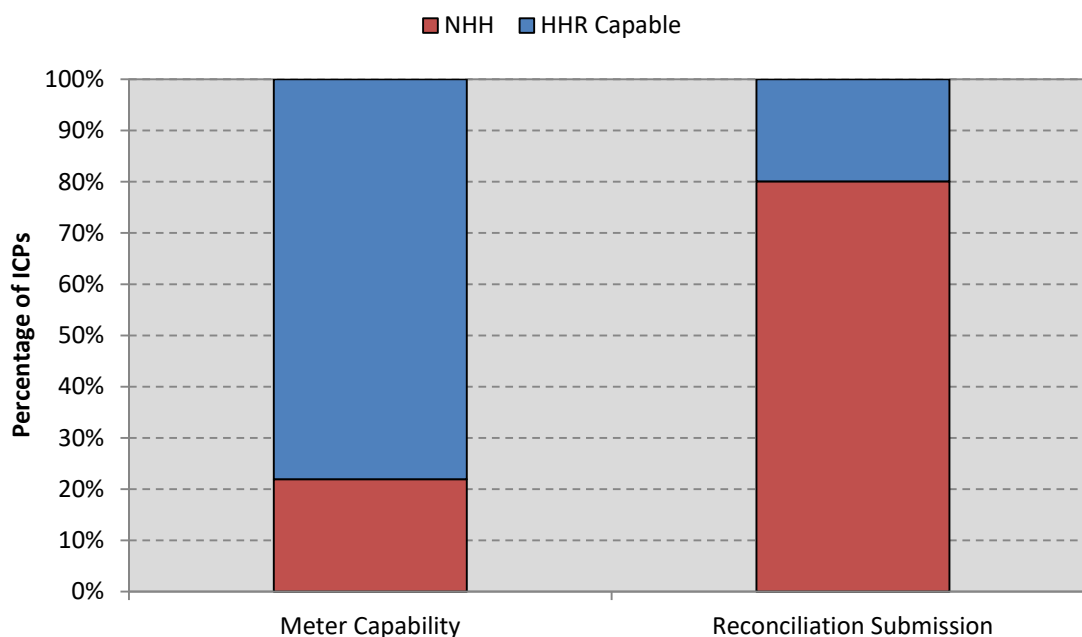
	Competition Impact	Reliability Impact	Efficiency Impact
Transactions are not settled using the most accurate available data	●	●	●

4.36 Using data from July 2017, we have seen that much of this better information is not being used to settle transactions (see Figure 3). The majority of active ICP meter installations (78%) are capable of providing some form of HHR data.

4.37 Despite the roll-out of HHR-capable meters, half of all data submissions to the reconciliation manager are in non-half-hourly format. This means that many of the HHR-capable meters are being used as cumulative register meters. Only 20% of all submissions to the reconciliation manager are HHR format.

²³

The Authority notes, as expressed in Paragraph A.49(b) of our *Interpretation of the Authority's statutory objective* document, that it is not possible to accurately estimate the marginal cost of additional security supply. This is often because security of supply deals with low probability but high-impact events which simply have not occurred. This does not preclude us from considering reliability problems. See: *Interpretation of the Authority's statutory objective 2011*. Available at: <https://www.ea.govt.nz/dmsdocument/9494>.

Figure 3: ICP meter installations vs. ICP reconciliation submissions (July 2017)

- 4.38 This has large efficiency and cost implications for the industry and consumers. For the industry, it means participants must rely on estimation techniques to fill data gaps and apply profiling. This does not reflect actual underlying consumption patterns. For consumers, it means that many who are paying for AMI meters through their electricity bills do not enjoy substantial benefits from AMI meters. This reduces the efficiency of the historical AMI investment. It also means that many are still paying for estimated consumption rather than actual consumption, meaning consumers may be paying an inefficient price for electricity (see footnote 22).
- 4.39 The Authority also recognises that there is little commercial incentive for some existing participants to invest in expensive systems if most of their consumers do not need or want these changes. Some participants hold the view that, despite having AMI HHR-capable meters installed in their premises, there is little consumer demand for HHR consumption to be metered. This is especially true if a consumer is on a flat tariff rate, which only requires aggregate monthly meter readings.
- 4.40 Participants may be reluctant to update their data systems if the cost of doing so outweighs the benefits of accepting more frequent data transactions. For example, a minority of retailers will have data systems that are designed to only accept aggregate consumption figures for each ICP. Even if the MEP has half-hourly consumption data for the retailers' ICPs, the retailers may request their MEPs to only provide an aggregated consumption figure once per month as is this is compatible with the design of the retailer's data system. The more detailed HHR data is aggregated when provided to retailers or purchasers, and is never submitted further up the value chain.
- 4.41 Further, the legacy data systems are programmed to accept specific file formats, and through pre-programmed information exchange protocols. There is no need to upgrade systems to change data formats if the retailer's suppliers and consumers do not demand this change. Effectively, these legacy systems become a barrier to new business models and deter the use of new technology.

- 4.42 The Authority seeks to understand what are the benefits and costs of using more accurate and available data. For example, are there contractual arrangements which prevent the use of HHR? Are there limitations in data systems which cannot handle HHR? Are there data access issues?

Q4. What are the types of costs and the benefits of using more accurate available data for settling transactions?

Possible matters with data and data exchanges in the future

The data system will need to deal with more participants and transactions

- 4.43 The industry is changing and we are considering whether the current data system can promote innovation and more participation by handling more participants and transactions. The Authority seeks to understand the limits of the industry's data system and under what scenarios these limits may be reached.
- 4.44 It is not possible to say exactly how the market will evolve; however, it is likely there will be more participants and more transactions. More participants mean there will be more buyers and sellers of electricity products and services. We also expect an increase in data flows and increasingly complex data exchanges between participants and with the MOSPs.
- 4.45 The Authority undertook a review of the MOSPs and concluded their systems are scalable and can handle an increase in participation.²⁴ We have identified some possible problems that could occur over the coming years. We're seeking to address these problems now as more participants and transactions will affect both the competition and efficiency.

Table 8: Impact assessment of more participants and transactions

	Competition Impact	Reliability Impact	Efficiency Impact
<p>● High Impact</p> <p>● Medium Impact</p> <p>● Low Impact</p>			
The data system will need to deal with more participants and transactions	●	●	●

- 4.46 Impediments to access the data system could be an inefficient barrier to competition. Until recently, the main participants in our data systems have been retailers, large consumers (that directly participate in the market), MEPs, generators, distributors and a few specialised ancillary service providers to provide network support. The existing data system was built with these specialised participants in mind. We need to ensure all new and existing parties seeking to buy and sell products and services have access to the data system.
- 4.47 The data system should also accommodate different ways of doing business and increasingly complex data flows. Some products and services may not be developed altogether because the data system cannot accommodate new ways of doing things. By

²⁴ See *Electricity Authority of New Zealand: Review of the market operation service provider roles undertaken by NZX and Jade Software Corporation*, 16 May 2014. Available at: <https://www.ea.govt.nz/dmsdocument/18800>

ensuring the data system is flexible, market participants can bring innovative and new products and services to market, which is for the long-term benefit of consumers.

- 4.48 Innovative and new participants bring different ways of doing business, and perhaps introduce different ways to exchange data with other participants, and the data system should accommodate these changes. How consumers use electricity is changing and participants may need to separate and bill participants for individual products and services.²⁵ For example, a consumer may buy electricity from a retailer, charge their battery from a neighbour's solar panels, sell the battery's electricity supply to a frequency-keeping services provider and contract for controllable load (for example, hot water heating) to a home energy management company. Separating individual products and services will allow participants, who may be more competitive and efficient agents, to out-compete the inefficient agents, increasing the overall efficiency of the entire electricity industry. This is in the long-term benefit of consumers.
- 4.49 As new participants seek to interact with the market, they may also bring a range of new products and services to the market which may require access to some data sources which currently is not available to them. For example, a P2P trading platform may need to access detailed consumption data from multiple households to coordinate electricity exchanges and financial transactions. Participants may also seek access to real-time prices in order to develop new ways of doing business. The Authority has already received requests of this nature from participants.²⁶ We need to consider whether any changes are required to allow more buyers and sellers of products and services can access our data systems in the future.

Q5. What changes may be required to allow more buyers and sellers of products and services can access the industry's data systems in the future?

Using more detailed data may require updating security and privacy arrangements

- 4.50 More participation and transactions means more data will be exchanged between more parties. This potentially increases the risk of cyber-attacks. The key types impacts of cyber-attacks are: privacy, reliability (ie, disrupting electrons) and financial (ie, disrupting financial transactions). Participants need to consider where there are weak-points in security and privacy arrangements.

Table 9: Impact assessment on security and privacy arrangements

	Competition Impact	Reliability Impact	Efficiency Impact
Using more detailed data may require updating security and privacy arrangements	●	●	●

²⁵ See an upcoming consultation on *Multiple trading relationships*.

²⁶ See *Timeliness of real-time pricing data*, July 2016. <http://www.emi.ea.govt.nz/Forum/thread/timeliness-of-real-time-pricing-data/>

- 4.51 The ability to access data and data privacy standards has some impact on competition. Access to data and authorised uses for the data through contractual arrangements is important in determining what products and services an innovative or new participant can bring to market. However, the data- and cyber-security has a large impact on the ability to maintain reliability in the grid.
- 4.52 Under more participation, more detailed data will also be exchanged more often and participants need to consider data system vulnerabilities. There is a clear reputational and commercial incentive for participants to build robust and secure data systems.
- 4.53 The use of AMI means far more detailed data is being collected for each ICP in New Zealand. AMI is raising some complex problems about what consumer data is collected and the definition of personal information. This matter was also highlighted by the Privacy Commissioner, who recently released an open letter regarding privacy and the disclosure of AMI data.²⁷ There are many matters we need to consider regarding data collection, processing and storage.
- 4.54 We need to ensure our information protocols are appropriate for the detailed consumer data being recorded and exchanged today. We may need to reconsider who has access to potentially private, detailed consumer data and more narrowly define how data may be used. Detailed data has a lot of value to participants. They may want to use detailed data to build innovative and new services. This may be outside of the scope of what the consumer consents to. The terms and conditions which define how the data may be used are not be clearly defined, or were more appropriate for monthly and less-detailed data only.
- 4.55 The potential for data to be used maliciously if the wrong person gains access raises concerns about system reliability, data security and security of electricity supply. It also raises concerns about the security of participants and consumers, who may be vulnerable to attacks and exploited. Data security needs to be a priority in developing a new data system, for all participants in the electricity industry.
- 4.56 These are relevant questions in the industry, as cyber threats to the electricity industry are ongoing. Participants need to consider the level of security provided by all participants and service providers in the data system.
- 4.57 Notable examples are the numerous cyber-attacks on Ukraine's electricity industry between 2015 and 2017. The attacks:
- (a) gained control of supervisory control and data acquisition (SCADA) software
 - (b) remotely turned off substations, resulting in a loss of power to 225,000 citizens
 - (c) destroyed files stored on servers and workstations
 - (d) held some computer systems at ransom
 - (e) forced one nuclear power plant to shut down its computers and manually track radiation levels.

²⁷ Privacy Commissioner, Public statement about bulk disclosure of smart meter data, 26 May 2017: <https://www.privacy.org.nz/assets/Uploads/Open-letter-to-retailers-and-distributors-re-smart-meters-A504260.pdf> Note, 'AMI' and 'smart meters' is often used synonymously outside the electricity industry.

- 4.58 Internationally, we have also seen a large number of data breaches over the past few years.²⁸ Some attacks exposed sensitive consumer or participant data. These attacks have occurred either through forceful hacks or poor security systems.
- 4.59 Cyber threats to the electricity grid are real, and New Zealand should pay close attention to the international experience to ensure its data systems are not exposed to the same vulnerabilities.

Q6. What are the risks to security of data exchange and consumer privacy from more participants exchanging more data?

- 4.60 We are seeking your comments on the matters we've identified in this paper. We are also asking whether there are other matters to consider and how you think the issue should be addressed. We have provided an impact assessment template in Table 10 (in Appendix A) of this paper for your convenience. Your comments on this issues paper will inform the Authority's ongoing consideration of data and data exchange arrangements.

Q7. What is your view of the Authority's overall impact assessments of the potential problems facing the electricity industry today and in the future (Table 3)? Use the Impact Assessment template in Table 10 (Appendix A) to note any changes.

Q8. What other potential problems do you think impact data and data exchanges for market transactions? Use the Impact Assessment template in Table 10 (Appendix A).

²⁸ Information is Beautiful provides an interactive and dynamic infographic on the scale of the attacks: <http://www.informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/>

Glossary of abbreviations and terms

AMI	Advanced metering infrastructure
API	Application programming interface
Authority	Electricity Authority
EIEPs	Electricity information exchange protocols
HHR	Half-hour
ICP	Installation control point
kWh	Kilowatt-hour
MEPs	Meter equipment providers
MOSPs	Market operation service providers
MW	Megawatt
P2P	Peer-to-peer
SCADA	Supervisory control and data acquisition
STP	Straight-through-processing
The Act	Electricity Industry Act 2010
WITS	Wholesale information trading system

Appendix A Format for Submission

Submitter	
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Question	Comment
Q1. What inaccuracies in data and data exchanges have you experienced, for what reasons, and with what impact?	
Q2. What are the types of benefits and the costs of being able to reduce settlement periods between industry participants?	
Q3. What are the types of benefits and costs of more standardisation in data and data exchanges?	
Q4. What are the types of costs and the benefits of using more accurate available data for settling transactions?	
Q5. What changes may be required to allow more buyers and sellers of products and services can access the industry's data systems in the future?	
Q6. What are the risks to security of data exchange and consumer privacy from more participants exchanging more data?	
Q7. What is your view of the Authority's overall impact assessments of the potential problems facing the electricity industry today and in the future (Table 3)? Use the Impact Assessment template in Table 10 (Appendix A) to note any changes.	
Q8. What other potential problems do you think impact data and data exchanges for market transactions? Use the Impact Assessment template in Table 10 (Appendix A).	

Table 10: Impact assessment template for submission

<ul style="list-style-type: none"> ● High Impact ● Medium Impact ● Low Impact 			
Possible matters to be considered	Competition Impact	Reliability Impact	Efficiency Impact
<i>Example of matter one</i>	● / ● / ●	● / ● / ●	● / ● / ●
<i>Example of matter two</i>	● / ● / ●	● / ● / ●	● / ● / ●
<i>Example of matter three</i>	● / ● / ●	● / ● / ●	● / ● / ●

Appendix B Summary of MOSPs' roles

Participant	Role
Clearing Manager	Responsible for ensuring that the industry participants pay, or are paid, the correct amount for the electricity they generated or consumed and for market-related costs
Extended Reserves Manager	The extended reserve manager is responsible for supporting the project to transition the North Island automatic under frequency load shedding (AUFLS) scheme from the current 2-block AUFLS scheme to the new 4-block extended reserve scheme.
FTR Manager	Responsible for the creation and allocation of financial transmission rights (FTR)
Pricing Manager	Responsible for calculating and publishing the spot prices at which electricity market transactions are settled. Over 12,000 spot prices every day are published by the pricing manager to industry participants through WITS
Reconciliation Manager	Ensures that industry participants (generators or buyers) are allocated their correct share of electricity generation or consumption. The reconciliation manager is a key role in operating an efficient market.
Registry Manager	Oversees the registry, including maintenance and validation of ICP information.
System Operator	Responsible for co-ordinating electricity supply and demand in real-time in a manner that avoids fluctuations in frequency or disruption of supply.
WITS Manager	The wholesale information system manager runs the wholesale information and trading system (WITS) used by industry participants to upload their bids and offers

Appendix C Total number of data processes for the MOSP

Table 11: Breakdown of seven MOSP processes and sub-processes

Functional Specification	Process Count		Input Count		Sub Process Count		Output Count		Business Requirements	
	No.	%	No.	%	No.	%	No.	%	No.	%
Clearing Manager Functional Specification	83	23%	456	43%	627	34%	234	37%	658	33%
FTR Manager Functional Specification	11	3%	43	4%	33	2%	40	6%	40	2%
Pricing Manager Functional Specification	15	4%	27	3%	41	2%	41	6%	133	7%
Reconciliation Manager Functional Specification	79	22%	201	19%	377	21%	109	17%	259	13%
Registry Manager Functional Specification	97	27%	148	14%	580	32%	97	15%	623	31%
System Operator Functional Specification	0	0%	0	0%	0	0%	0	0%	0	0%
WITS Manager Functional Specification	55	15%	191	18%	174	9%	117	18%	281	14%
Total	364		1,066		1,832		638		1,994	

Note, this table does not include the processes and sub-processes of the recently added Extended Reserves Manager.

Appendix D Electricity information exchange protocols

Format Name	Description	Regulated?	Last Updated
EIEP1	Detail ICP billing and volume information	Regulated	30 May 2014
EIEP2	Aggregated volume information	Regulated	30 May 2014
EIEP3	Half hour metering information	Regulated	30 May 2014
EIEP4	Customer information	Non-regulated	20 Dec 2013
EIEP5A	Planned Service Interruptions	Non-regulated	20 Dec 2013
EIEP5B	Unplanned Service interruptions	Non-regulated	20 Dec 2013
EIEP6A	Fault notification – initiation	Non-regulated	20 Dec 2013
EIEP6B	Faults and Service Requests – initiation file	Non-regulated	20 Dec 2013
EIEP7	Installation status change	Non-regulated	20 Dec 2013
EIEP8	Notification of network price category and tariff change	Non-regulated	20 Dec 2013
EIEP9	Customer location address change notification	Non-regulated	20 Dec 2013
EIEP11	Detail consumption information	Non-regulated	20 Dec 2013
EIEP12	Tariff rate change information	Regulated	20 Dec 2013
EIEP13A	Detailed electricity consumption information for consumers	Regulated	1 Feb 2016
EIEP13B	Summary consumption information	Regulated	1 Feb 2016
EIEP13C	Electronic request format for EIEP 13A or EIEP 13B	Regulated	9 Jun 2015
EIEP14	Retailer tariff rate notification	Non-regulated	20 Sep 2016