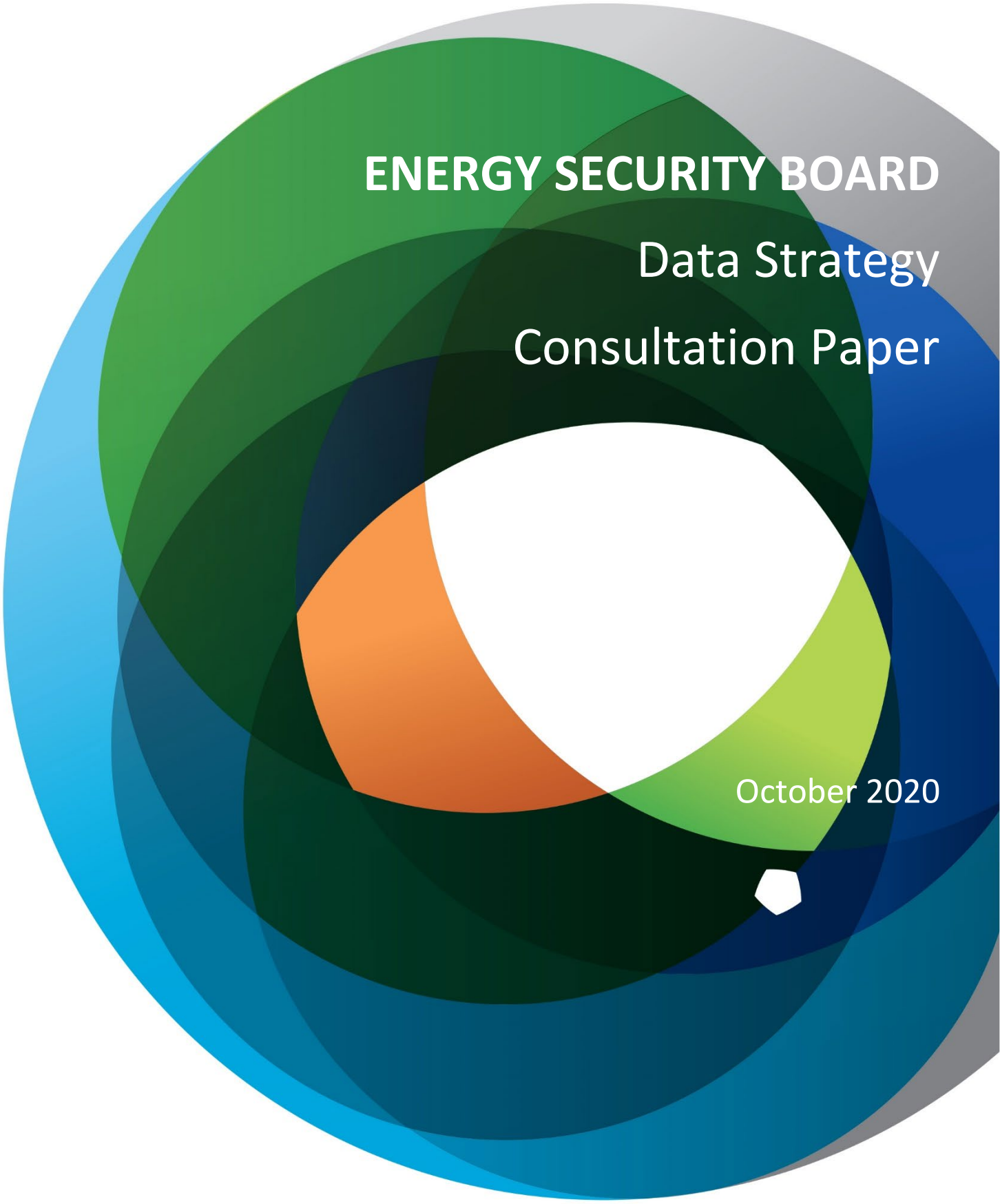

ENERGY SECURITY BOARD

Data Strategy Consultation Paper

October 2020

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EXECUTIVE SUMMARY

Why a Data Strategy?

Digitalisation and changes in the energy market are driving the need for more flexible and timely access to data. Greater variability, diversity and fragmentation in both supply and demand is increasing the challenge of coordination and managing the market. Data volumes are growing exponentially, creating ongoing challenges for data management. Data privacy, protections and security concerns are also under pressure with growing data volumes and innovation in technologies and services; they must be actively managed and progressed to remain robust.

Ensuring that consumers continue to receive reliable, secure and affordable energy depends on data reform, to provide: greater transparency across the market to support effective competition and protections; more informed planning by many parties to ensure efficient infrastructure and costs; and more responsive and controllable technologies throughout the system to support coordination and optimisation of resources.

Digitalisation and data also provide new opportunities for better consumer outcomes, through innovation in services and systems, efficiencies along the energy supply chain, and mobilising and valuing flexible demand.

Realising these opportunities will require better ways to access, protect, share, integrate and use data in an effective and timely way. The Data Strategy must give the community, regulators and market participants the tools to address emerging data needs efficiently and effectively.

Many parts of the energy system are not yet designed for this future, with gaps in current data needs; constraints in data rights and regulations; gaps in protections; diverse interpretations and treatments of privacy and security arrangements; limits on organisational resources and capabilities; and challenges for innovation and adaptation. This requires a major rethink of energy data frameworks and how supporting capabilities evolve.

Digitalisation is not an energy issue but an economy-wide, global phenomenon. Rapid growth of data across all aspects of the economy is changing the needs and expectations of consumers and challenges for data managers. National and international data policy is evolving. A future energy sector must also keep up with a future digital economy.

The Data Strategy

The Energy Security Board (ESB) is consulting stakeholders on a new Data Strategy for the energy sector. This Strategy seeks to ensure that core agencies and policy makers can drive the digital evolution needed to support the energy market transformation; that stakeholders across the sector have the access, data, systems and protections they need; and that most importantly consumers have better outcomes, with reliable, safe and affordable services, and access to data they need to manage them.

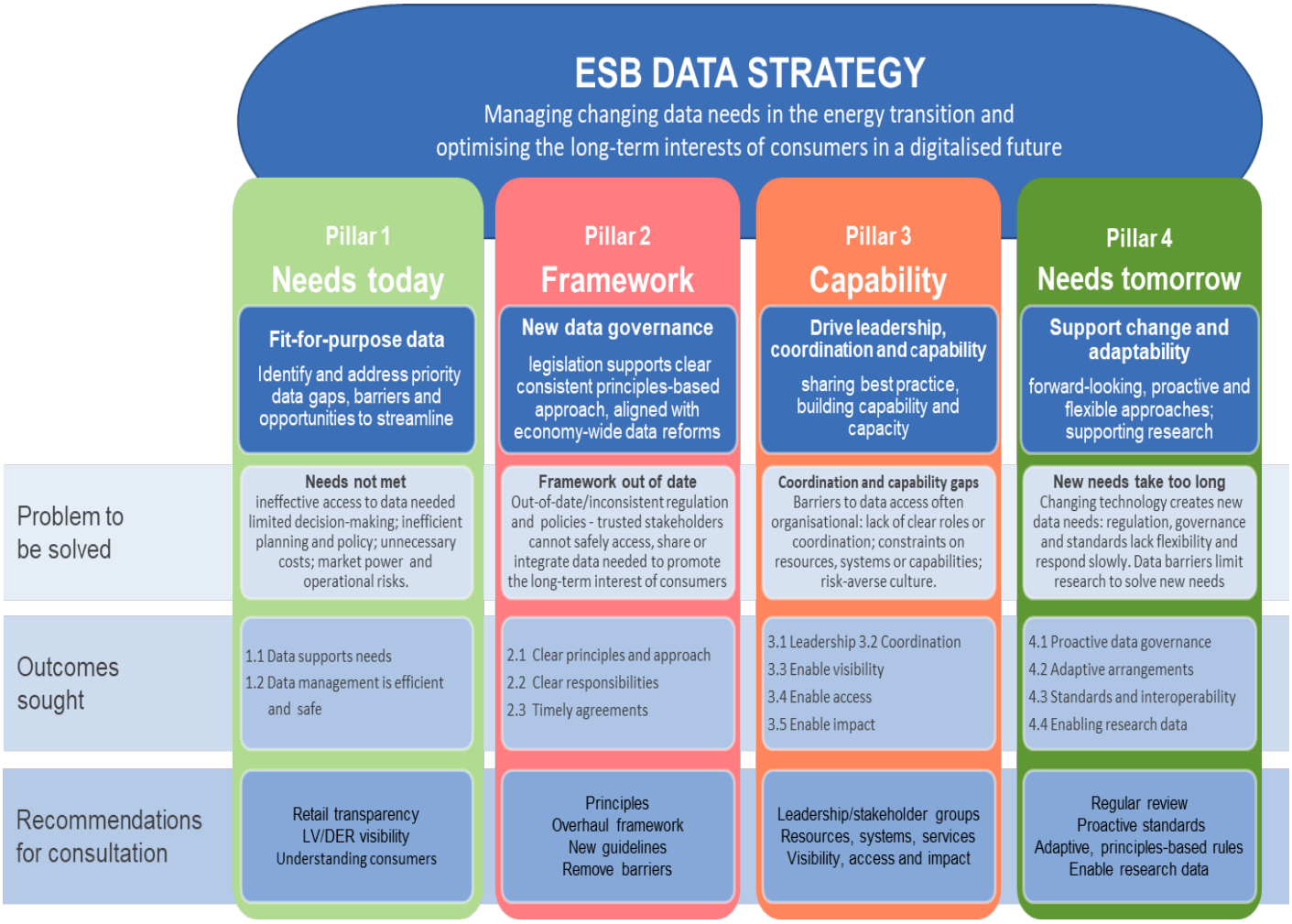
This Strategy has been developed by a working group across ESB agencies and the Australian Government, with input from a range of wider stakeholders. ESB welcomes wider input and engagement through this consultation process.

The defined objective of the Strategy is that **effective data management in the National Energy Market supports market objectives and drives better consumer outcomes**, by: fostering innovation

and flexibility; ensuring accountability/trust; fostering competitive markets and better consumer outcomes; assisting effective operations, planning and decision-making; driving better policy and regulatory reform.

The Strategy's approach is to address four Pillar issues: today's data needs; challenges in the energy data regulatory framework; the capabilities and data organisation required; and adaptability to manage tomorrow's needs.

For each of these four Pillars, the Strategy defines the problem to be solved, the outcomes sought, and proposes a range of initial recommendations, as summarised in the figure below. Given the pace of change, the Strategy provides a framework to manage ongoing change, with recommended reforms being the foundations and first steps.



PILLAR 1: NEEDS TODAY

Fit-for-purpose data

Identifies and addresses priority gaps in the data needed for energy sector actors to undertake their roles effectively and efficiently. Analysis undertaken included consideration of a range of recent reviews and reforms under way. The following steps are proposed to progress current data needs:

1. **Retail transparency**:
    - improving transparency to regulators of retail plans and 'what energy consumers actually pay' to support more effective price monitoring, competition and consumer protections
    - expanding powers for the Australian Energy Regulator to effectively monitor and understand the contracts markets and retail margins.

2. **Understanding consumers and demand**:
    - enabling safe analysis of meter data for planning and research, capturing consumer benefits while still ensuring consumer protections
    - improving current surveys and consumer research
    - working to improve data on vulnerable consumers and the commercial sector.

3. **Visibility of low voltage (LV) networks and distributed energy resources (DER)**:
    - proposing a pathway to better transparency for DER investors and service providers on network constraints and hosting capacity
    - furthering work on overvoltage risks to better understand monitoring needs
    - progressing network models through collaborative research
    - reviewing metering data management to ensure consumers are getting maximum value and
    - furthering analytical work to ensure the growth and behaviour of emerging DER are understood.

PILLAR 2: FRAMEWORK

New data governance

Reviews the current regulatory frameworks for energy data in the context of international case studies of data reforms, identifying a range of issues limiting effective data management and proposing a significant package of reforms.

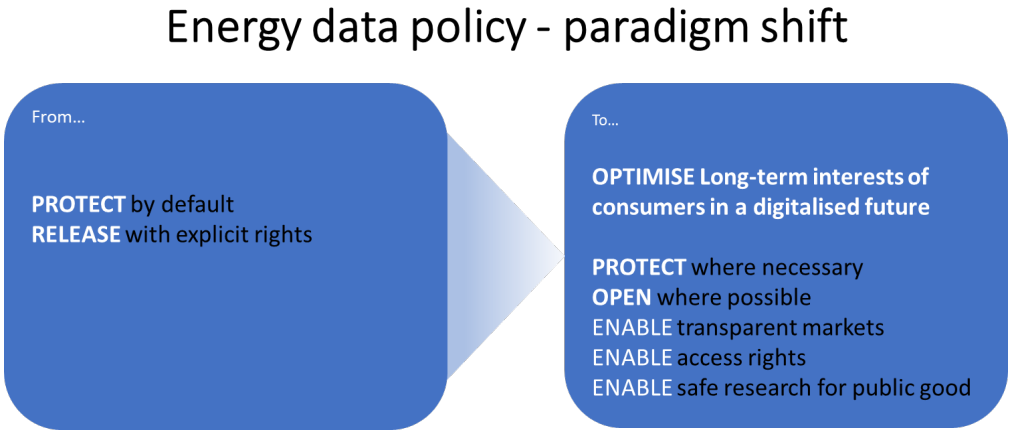
The review was undertaken by a legal team across the market bodies and Commonwealth working with King & Wood Mallesons (KWM) and Galexia and is provided in full (Appendix D) for stakeholder review and comment. Key issues identified included:

- complexity leading to uncertainty
- an unworkable public interest test
- constraints in the way privacy and commercial sensitivities are being managed.

Based on cases studies of best practice and national reforms, the review proposes a need to shift from a regime which prohibits all data disclosure by default, to one which authorises protected data sharing where there are safe controls and clear benefits for all Australians.

The review identified a range of incremental changes which can improve outcomes, including common guidelines for data collection, the removal of some constraints, and expansion of 'prescribed agencies' to support trusted data sharing. However, the review also identifies that incremental reforms will not be enough to effectively manage risks, consumer protections and provide a flexible data framework. An 'overhaul' of energy data regulation is needed, building on the directions of national reforms in the Commonwealth's proposed Data, Availability and Transparency Bill (DAT Bill).

Based on these findings, the ESB recognises the need for a paradigm shift in energy data policy to optimise data management for the long-term interest of consumers.



To drive the paradigm shift, the ESB proposes new principles to guide reforms, that:

1. drive outcomes consistent with the long-term interest of consumers, ensuring appropriate privacy and security safeguards while also capturing the benefits of a more transparent, innovative and informed digitalised energy market
2. be fit-for-purpose, flexible and streamlined in a digitalised market
3. be compatible with wider national reforms on data.

The ESB supports the recommendation for an **'overhaul' of the energy data framework** which introduces a fit-for-purpose regime to support effective data management in a digitalised energy sector. This should include:

- defining purposes for which protected data sharing is clearly authorised and/or constrained
- clear frameworks for managing privacy, security, access and outputs, including flexibility for changing needs
- clear frameworks to manage governance and risk, particularly resolving the current uncertainty for data holders
- supporting frameworks for data sharing agreements
- supporting frameworks for managing accreditation of trusted data users.

The new framework should align broadly with national reforms and should consider the approach of the DAT Bill, once implemented.

In addition to the proposed overhaul, the ESB also proposes to implement a package of **incremental reforms**, including:

- expanding 'prescribed agencies' to assist data sharing (including for the National Energy Analytics Research (NEAR) program which is a partnership between the CSIRO, Commonwealth and Australian Energy Market Operator (AEMO))
- resolving constraints identified
- resolving some of the priority data gaps under Pillar 1
- developing common guidelines for data collection and sharing.

This incremental package is complimentary to the recommended framework overhaul but brings forward short-term benefits and resolves specific barriers and datasets. This should be progressed in parallel with design work on the wider framework and be coherent with reforms already under way to support the Consumer Data Right (CDR).

PILLAR 3: CAPABILITY
Drive leadership, coordination and capability

Proposes ongoing leadership structures and services required to deliver the Strategy over time and drive change in data management. This should include:

- a **Data Leadership and Coordination Group** (DataLAC) across core agencies to lead delivery of the Strategy, coordinate data management, share best practice and capability, and deliver supporting resources and services
- a **Data Users Group**, to ensure data needs and opportunities across the sector are identified and met in a timely, well-targeted manner
- supporting services which need to be developed to provide:
    - **Data Visibility** of data available and access requirements to improve access and streamlining
    - **Data Access** facilitated through protected systems and services
    - **Data Impact** through delivery of new analytical capabilities and services.

PILLAR 4: NEEDS TOMORROW
Support change and adaptability

Considers flexibility needed to manage changing data needs in a timely manner, critical to effective management of the energy transition, and proposes:

- **proactive ongoing review** of needs for data and related standards by the DataLAC
- **guidance for future Rules** and reforms on aligning with the high-level data principles and allowing for adaptability
- **improving research data** through new guidance for research projects and work to make research data more visible and accessible.

Next steps

The ESB welcomes feedback and input on this proposed Data Strategy from all interested parties, both as a framework and on specific recommendations, with consultation open until **27 November.** As an ongoing framework, this Strategy is expected to evolve over time with input and guidance from leadership and stakeholder groups, and as innovation continues to emerge.

The ESB will provide recommendations to Energy Ministers in early 2021 on key reforms to support the Data Strategy, to ensure the energy sector is well positioned to meet emerging needs of the energy transition and capture the opportunities of a digitalised future. As consumer and market needs continue to change, advanced data capabilities with effective privacy safeguards will be core to continuing to provide secure, reliable and affordable energy services.

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LIST OF ABBREVIATIONS

ACCC	Australian Competition and Consumer Commission
ACOSS	Australian Council of Social Services
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
APP	Australian Privacy Principles
AREMI	Australian Renewable Energy Mapping Initiative
ARENA	Australian Renewable Energy Agency
C4NET	Centre for New Energy Technologies
CCA	*Competition and Consumer Act 2010*
CDR	Consumer Data Right
CER	Clean Energy Regulator
COAG EC	Council of Australian Governments Energy Council
COGATI	Coordination of Generation and Transmission Investment
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAT	Data Availability and Transparency Bill/Act
DataLAC	Data Leadership and Coordination group
DEIP	Distributed Energy Integration Program
DER	Distributed Energy Resources
DERR	Distributed Energy Resources Register
DNSP	Distributed Network Service Provider
DR	Demand Response
WDRM	Wholesale Demand Response Mechanism
DUG	Data Users Group
ECA	Energy Consumers Australia
ENA	Energy Networks Australia
ESB	Energy Security Board
EV	Electric vehicle
KWM	King & Wood Mallesons
LIEEP	Low-Income Energy Efficiency Program
LV	Low voltage
NBN	National Broadband Network
NEAR	National Energy Analytics Research program
NECF	National Energy Consumer Framework
NEL	National Electricity Law
NEM	National Electricity market
NEO	National Electricity Objective
NER	National Electricity Rules
NERO	National Energy Retail Objective
NEL/ NGL	National Electricity Law/National Gas Law
NERL	National Energy Retail Law
NGO	National Gas Objective
NOM	Network Opportunity Map
PV	Photo-voltaic (solar panels)
RACE CRC	Reliable Affordable Clean Energy for 2030 Cooperative Research Centre
REPI	ACCC's Retail Electricity Pricing Inquiry
RIS	Renewable Integration Study
SAPN	SA Power Networks
SRES	Small-scale Renewable Energy Scheme
WEM	Wholesale Electricity Market

SUMMARY OF RECOMMENDATIONS

1. INTRODUCTION

The Energy Security Board (ESB) is developing a Data Strategy (the Strategy) for the Australian energy sector. It seeks to ensure the energy market has fit-for-purpose data capabilities to support reliable, secure and affordable energy systems, while maintaining robust data privacy and protections, and improving consumer outcomes through capturing the growing opportunities of digitalisation.

The Data Strategy was identified as a need in the Independent Review into the Future Security of the National Electricity Market ('Finkel Review', recommendation 7.14)[1]. The Finkel Review saw the Data Strategy as a critical governance requirement in the context of rapid change and digitalisation in the market. It also identified a wide range of barriers to effectively accessing data, which are already creating challenges and costs across the market.

Digitalisation is an economy-wide issue that extends well beyond the energy sector, and national data reforms have actively progressed since the Finkel Review recommendation. Key reforms include the Australian Government Consumer Data Right (CDR) and the Data Availability and Transparency (DAT) Bill which is in advanced stages of development. Many related energy reforms have also progressed, including data issues identified by the Australian Competition and Consumer Commission (ACCC) Retail Electricity Pricing Inquiry (REPI)[2] and recent work on the Distributed Energy Resources (DER) Integration Workplan[3] and Post 2025 Market Design[4].

This consultation paper brings together a proposed Strategy and supporting reforms and identifies 32 recommendations. This has been developed by a steering group across the ESB agencies and Commonwealth energy officials, with a broad range of expert stakeholder engagement.

The Strategy was also informed by an in-depth legal review of data regulation within Australian energy frameworks and a review of case studies in international data reforms (undertaken by King & Wood Mallesons (KWM) and Galexia, Appendix D). It builds on earlier work undertaken by the Australian Energy Regulator (AER) with the Brattle Group, reviewing gaps in data requirements in an initial consultation paper[5].

The ESB is seeking stakeholder views on these proposed reforms and input on related questions.

1.1 Consultation process

Stakeholders and interested parties are invited to make submissions on the issues raised in this consultation paper.

There are specific questions associated with each of the key recommendations, including detailed issues in the Appendices. A summary of questions is provided (Appendix E).

[1] Independent Review into the Future Security of the National Electricity Market, Blueprint for the Future, June 2017
[2] ACCC Retail Electricity Pricing Inquiry here, Relevant recommendations discussed in Appendix A
[3] DER Integrated workplan October 2019 here
[4] Post 2025 market design consultation paperm September 2020 here.
[5] NEM Data Strategy Consultation Paper, 20 March 2018 here

At a higher level, ESB seeks feedback related to:

1. The strategy's coverage of the key issues for data reform in the energy sector - are there concerns un-addressed?

2. The strategy's framework and the proposed leadership arrangements to drive the change required - are there alternatives to make this transition more effective?

3. Many recommendations to resolve specific data issues are initial proposals, requiring further detailed design, analysis of costs/benefits and development through usual processes. Early stakeholder views on design issues, evidence to support costs/benefits analysis or proposed alternatives are welcome.

4. There is a great deal of reform under way and many interlinkages between recommendations and issues in this Strategy and ongoing workstreams. Are there further workstreams or interlinkages not identified which the Strategy should engage with?

The ESB invites comments from interested parties on this consultation paper by **27 November 2020.** Please respond to the Questions for Stakeholders (Appendix E) in your submission.

Submission close date	27 November 2020
Lodgement details	Email to: info@esb.org.au
Format of submission document	Must be in Word
Naming of submission document	[Company Name] Response to Data Strategy Consultation Paper
Late submissions	Late submissions will not be accepted
Publications	Submissions will be published on the COAG Energy Council's website, following a review for claims of confidentiality

Stakeholder webinars will be organised (dates to be advised) and enquiries can be directed to Sarea Coates at the Energy Security Board (sarea.coates@esb.org.au).

2 WHY A DATA STRATEGY IS NEEDED

Digitalisation and changes in the energy market are driving the need for more flexible and timely access to data. Greater variability, diversity and fragmentation in both supply and demand is increasing the challenge of coordination and managing the market. Data volumes are growing exponentially, creating ongoing challenges for data management. Data privacy, protections and security concerns are also under pressure with growing data volumes and innovation in technologies and services; they must be actively managed and progressed to remain robust.

Ensuring that consumers continue to receive reliable, secure and affordable energy depends on data reform, to provide: greater transparency across the market to support effective competition and protections; more informed planning by many parties to ensure efficient infrastructure and costs; and more responsive and controllable technologies throughout the system to support coordination and optimisation of resources.

Digitalisation and data also provide new opportunities for better consumer outcomes, through innovation in services and systems, efficiencies along the energy supply chain, and mobilising and valuing flexible demand.

Realising these opportunities will require better ways to access, protect, share, integrate and use data in an effective and timely way. The Data Strategy must give the community, regulators and market participants the tools to address emerging data needs efficiently and effectively.

Many parts of the energy system are not yet designed for this future, with gaps in current data needs; constraints in data rights and regulations; gaps in protections; diverse interpretations and treatments of privacy and security arrangements; limits on organisational resources and capabilities; and challenges for innovation and adaptation. This requires a major rethink of energy data frameworks and how supporting capabilities evolve.

Digitalisation is not an energy issue but an economy-wide, global phenomenon. Rapid growth of data across all aspects of the economy is changing the needs and expectations of consumers and challenges for data managers. National and international data policy is evolving. A future energy sector must also keep up with a future digital economy.

This is not a new problem or future need; it is an ongoing practical concern. Existing data gaps and constraints in how data is managed already limit effective management of the market transition, creating significant costs and risks for consumers. This data deficiency creates inefficiency, with barriers to data sharing among agencies contributing to a lack of coordination and confusing duplication.

Agencies and stakeholders are aware of data gaps that need to be closed and have devoted considerable effort to the task. Many ongoing reform processes are seeking to address data gaps, expand digital capabilities or improve the granularity and efficiency of how data is used within the market framework. Examples include competitive metering reforms, the Distributed Energy Resources Register (DERR), the CDR, Global Settlement, Five Minute Settlement, Open Networks, the DER Integration Workplan, recent retail pricing reforms and many more.

Governments have also invested in this space, with the $20+ million National Energy Analytics Research (NEAR) program, jurisdictional approaches such as Victoria's Centre for New Energy Technologies (C4NET) and many funded trials seeking data for the sector to assist transition.

Examples include the $100 million Smart Grid Smart City trial, the Powershift program from Energy Consumers Australia (ECA) and Australian Renewable Energy Agency (ARENA) funded programs such as the Australian Renewable Energy Mapping Initiative (AREMI), Demand Response trials and Distributed Energy Integration Program (DEIP).

Despite this effort, many of these activities highlight how difficult improving data management and access is within the energy sector. Persistent challenges include:

- regulatory frameworks which are out-of-date with market need and lack flexibility to respond to rapid change. This frequently creates risks and barriers to data access, even where use of the data is aligned to the long-term interest of consumers and the wider public good[6].
- a lack of clear principles and guidelines. For example, consent processes vary widely and cause constraints, and application of Commonwealth, state and Territory privacy laws can be unclear and/or inconsistent. This contributes to a risk-averse culture and delays in negotiated outcomes.
- limited capacity to invest in data projects with longer-term benefits due to short-term pressures on agency resourcing and capability.
- split incentives, incumbent interests and lack of coordination, which can result in those holding valuable data being unable to manage risks or support a business case to share data, even where consumers would clearly benefit.

Some examples below are illustrative of the issues.

Example 1: Data challenges create real consumer costs

There are many examples where data gaps or lack of transparency have already created material direct costs for consumers. To draw out just a few:

Competitive markets

Lack of visibility over consumers' retail tariffs and bills has allowed many consumers to be moved over time to less advantageous tariffs. This was a key concern of the ACCC REPI[2] and particularly affects vulnerable and passive consumers, who are less active in the market. The ACCC has also raised concerns that lack of transparency in retail prices and contracts has contributed to higher retail margins, creating higher prices for all.

Management of new technologies

Currently lack of visibility of the low voltage (LV) network and DER is directly contributing to constraints on DER owners exporting power, either through export limits or voltage tripping. Recent estimates[7] suggest that in most cases these losses are not yet material (in the order of $3-12 per annum), however, for a small number of DER owners they can be up to 30-90 per cent of export and they are likely to grow without improved ways to manage DER integration. Further, many DER owners face losses through a lack of basic data showing that their system is functioning correctly, with recent studies finding a significant proportion of systems not operating as expected.

Forecasting and Planning

Changes in consumer technologies and energy use patterns over the past two decades significantly impacted aggregate electricity demand, which fell for the first time. These changes began with rapid uptake of affordable air-conditioning, then energy efficiency standards for home appliances and

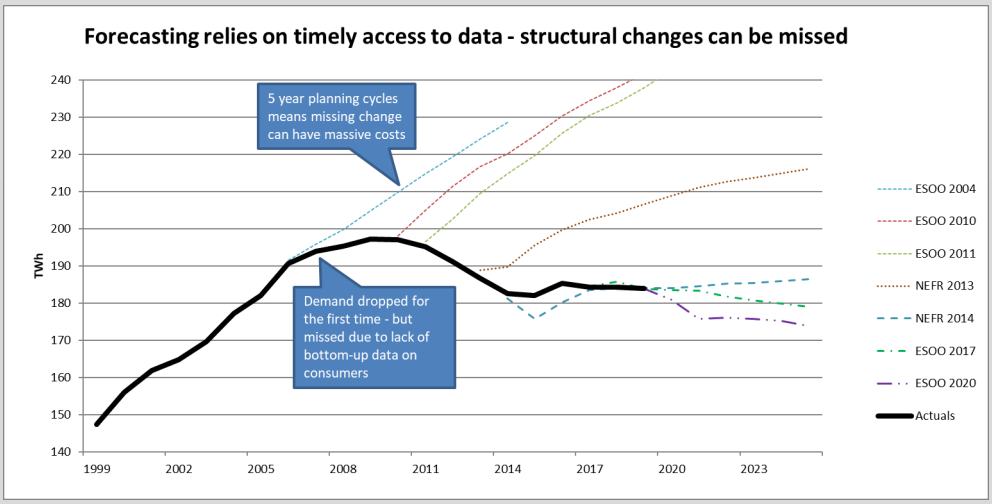
[6] This is further explored in the KWM legal review Appendix D

[7] UNSW Voltage study link

more recently DER technologies. Limited bottom-up visibility of consumer demand, particularly prior to smart meters, meant these changes created many challenges in forecasting (Figure 1). With five-year network planning cycles, forecast over-estimates materially contributed (among a range of factors) to major increases in network infrastructure costs and significant consumer price rises.

In response to this, forecasting approaches have changed significantly, with AEMO has taking a stronger role (where previously forecasts depended on aggregated network forecasts) and major efforts in improving data inputs. However sufficient data to understand consumer change remains an ongoing risk. Future challenges include: batteries and electric vehicles, internet-of-things (IoT) and demand response, and major shifts in the home and the economy due to the COVID pandemic.

Figure 1: Forecasts with limited data struggle to predict consumer change



Example 2: Data gaps impact basic metrics on market performance

The Strategic Energy Plan, released by Energy Ministers in early 2020, sets out their vision for the next five years around six key outcomes, supported by defined objectives with explicit metrics. These metrics, reported annually in the Health of the NEM report, are often challenging to define with available data. There are gaps around core policy issues, such as lack of real data for domestic retail tariffs and bills, commercial and industrial energy prices over time and uptake of storage.

Lack of data also leads to metrics defined by a limited proxy, including using the proportion of customers on a market offer versus standing tariffs as a proxy for being able to identify the 'best deal', and using the proportion of hardship customers on a market plan as proxy for 'vulnerable customers on a suitable plan'.

Example 3: Energy agencies have gaps in powers to capture and share data

The ACCC was asked to undertake the Retail Energy Pricing Inquiry (REPI) in part due to an inability of energy agencies to address transparency concerns in the retail sector. The ACCC successfully used its stronger data-gathering powers under section 95ZK of the *Competition and Consumer Act 2019* (Cth) to shed light on a range of issues which energy agencies with more limited powers could not resolve. It recommended a wide range of reforms, including many that addressed the need for better ongoing retail monitoring, contract market monitoring, and for streamlined reporting.

Considering the timeliness of response to these concerns, the ACCC was then asked to undertake an extended inquiry over seven years which includes this monitoring role. This was not the approach the ACCC had recommended as, while quick to initiate, it is unlikely to be the most effective ongoing solution to retail monitoring. Data gathered using the ACCC's section 95ZK powers is subject to strict confidentiality provisions that limits the ACCC's ability to share data with other parties, including the energy regulators. This requires energy regulators to continue to undertake separate investigations, despite limited powers and limits complementary analysis and wider benefits to the sector.

Example 4: New technologies can create new data needs across the market

Integration of new DER technologies into the historically blind LV networks has created new data needs for many stakeholders. Issues impacted by a lack of data include:

- networks trying to manage increasing DER export around local constraints
- DER investors and aggregators facing inefficient export limits, with no visibility on where the networks are constrained
- AEMO needing to forecast and manage reliability and security risks of DER
- AER assessing proposals for DER integration network investments
- researchers seeking to trial new LV network management methods
- policymakers seeking to understand the impacts of DER policies and support.

There are some useful commercial sources of data, but they are under-utilised and many have associated barriers to access. Barriers to resolving network visibility include lack of clear obligations around supporting DER, lack of rights around access to data, mixed commercial incentives and limits in industry capability. Much work is under way seeking to resolve these issues, but delays are already limiting the benefits of existing DER and risk inefficient integration investment. Both these outcomes may have significant impacts on consumer costs[8].

Example 5: Regulatory constraints limit critical public-good research

NEAR employs advanced data science to resolve data gaps in the rapidly changing energy sector and undertake new types of analysis to support better forecasting and planning, operations and policy. Innovation in these areas could support potentially billions of dollars in consumer benefits, for example through more efficient infrastructure investment and better tools for managing bills.

NEAR is a voluntary partnership between the Australian Government, AEMO and CSIRO, designed to bring together fragmented energy data sets within a secure and trusted environment. It was originally expected that a joint-project between trusted public data-holders, working on protected systems for clear public-good purposes, would make effective data sharing achievable.

However, after extensive work over 4 years and a range of approaches attempted, regulatory barriers continue to cause complexity, delay and significant constraints. Some sharing has been achieved, through de-identified data in dedicated secure environment. This requires funded resources independent from researchers to do linking and preserve privacy. While a common solution, this is adds cost and delays. It also constrains many analytical opportunities, including

[8] Further discussed in Appendix C

development of new methods to de-identify these datasets, to make them more accessible to researchers as intended.

These learnings raise many questions as to how (structurally, legally and analytically) to best develop data capabilities to allow innovation to better support consumers.

Beyond energy, digitisation is driving national and international transformation in data policy. Information on consumers held by both governments and the private sector is growing at exponential rates. There is increasing consumer awareness of data security and privacy. All organisations are under pressure to ensure they are more transparent in how they use and protect data. At the same time recent reforms in many countries have reflected the community is also seeking greater benefits from data, through 'consumer data rights', 'open data' and greater 'data sharing' for public benefits[9].

All these concerns and reforms are directly relevant to Australian energy consumers. With smart meters and new technologies, energy consumers are aware of their growing digital footprint. Privacy remains a central and growing concern, along with worries over cyber security. At the same time, energy consumers expect greater services:

- a system supporting more diverse new energy sources but with the same reliability
- the ability to easily adopt any new technology or service
- online billing
- better tools and advice to manage new options.

New Commonwealth data reforms are under way and already impacting the energy sector. Australia's CDR is currently being implemented in energy[10], and is expected to provide greater transparency and personalised services in retail energy markets. The Australian Government has also released its draft DAT Bill[11] for consultation, to enable safer ways for Commonwealth agencies to share data for greater public benefit. If passed, it will apply to relevant Commonwealth energy agencies such as the AER, the ACCC and the Clean Energy Regulator (CER) and the ARENA, among others, and may assist in some types of energy data sharing. But it will not apply to other key energy data holders such as AEMO and the Australian Energy Market Commission (AEMC).

Given the complexity and inconsistency of how data is managed across energy frameworks and governance, the Data Strategy aims align with the principles and operation of these national data reforms and is critical to ensure the energy sector has a coherent and effective data framework that keeps pace with Australian and international reforms. The energy sector must ensure it has legal and regulatory frameworks that help seize new opportunities created by digitalisation and technology and create benefits for energy consumers; meet changing consumer expectations for greater access and control over their own data; and provide greater transparency of energy systems.

[9] The KWM legal review in Appendix D summarises further a range of international data reforms.
[10] ACCC - CDR in in the energy sector here
[11] Consultation on the Data Availability and Transparency Bill, here

3 DATA STRATEGY

The proposed Data Strategy is an ongoing framework to allow the AEMC, AER, AEMO, the ESB and wider policy makers to identify and address changing data needs across the sector in a more efficient and timely way, and ensure that energy data management and protections remain aligned with the long-term interests of consumers and national data reforms.

3.1 Scope

The Strategy covers data needs across all aspects of the energy market, including electricity, gas and retail markets, as well as data needs on market influences across the economy and environment (such as weather, resources, user behaviour, the built environment, industrial and transport sectors, financial markets, etc.). It may also consider data outside the NEM regions where it is relevant to the roles of the market bodies or wider Commonwealth arrangements.

3.2 Objectives of the Data Strategy

Effective data management across the energy market supports the Market Objectives (National Electricity Objective (NEO), National Gas Objective (NGO) and National Energy Retail Objective (NERO)) and drives better consumer outcomes, by:

1. **fostering innovation and flexibility**: to allow researchers and market participants to develop new insights and services and ensure data barriers don't continue to slow innovative approaches.
2. **ensuring accountability/trust:** to demonstrate the performance of the energy market and its participants.
3. **fostering competitive markets and better consumer outcomes:** to drive economic efficiencies, improved services and lower consumer bills.
4. **assisting effective operations, planning and decision-making:** assist market bodies and market participants to make decisions on operations, managing reliability and risks, future investments, plans and future policies based on the best possible information.
5. **driving better policy and regulatory reform:** support reforms to be evidence-based, well-targeted and effective with clear benefits, and then monitored and tested for impact.

3.3 Data management objectives

Data sets are collected, managed and shared in a way that aids:

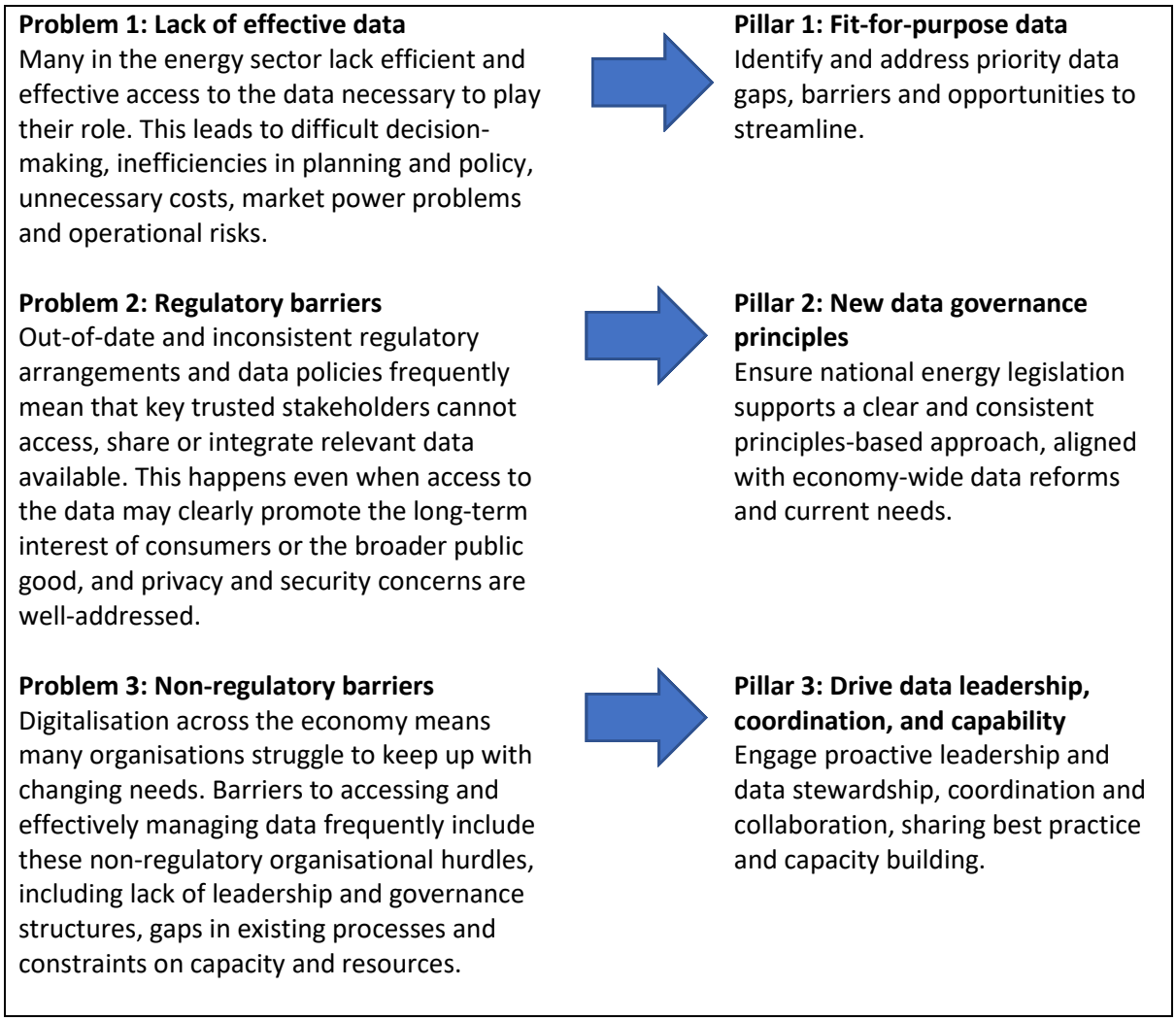
- **Efficiency and usability:** making sure the right data is available and easily accessible in a timely manner and useful format. Better coordination, sharing and technologies reduce duplication and costs of data management across industry stakeholders.
- **Flexibility:** designing for flexibility to make it less disruptive to adapt and update how data is managed and shared as innovation opens up new opportunities and challenges.
- **Trust and safety:** making sure systems remain protected and that approaches to privacy and security are robust and transparent, and community confidence is obtained and maintained.
- **Impact and usefulness:** making sure that data managed has clear purpose and is actively used for positive impact and benefits.

3.4 Approach

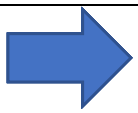
The Data Strategy focuses on practical outcomes that can provide near-term tangible and measurable improvements a cost-efficient way. To this end, the Strategy identifies four key problems to be resolved, which drive the four Pillars of the Data Strategy approach.

These problems draw on earlier consultation and a data review by the Brattle Group[12], a more recent Request for Information process with core agencies and analysis from a range of ongoing reforms and workstreams.

Figure 2: Four Pillars of the Strategy



[12] ESB NEM Data strategy consultation paper, March 2018, here

Problem 4: Keeping up with change Changing technologies and needs create new data challenges, but current regulatory and non-regulatory arrangements can be slow to respond and lack flexibility. Lack of governance or ownership of a problem can often delay policy changes and standards until long after they were needed. Managing change also requires active contribution from research, but data availability on new approaches is often delayed and data constraints frequently limit research and collaboration.		**Pillar 4: Data supports ongoing change and adaptability** Embed forward-looking, proactive and flexible approaches that support research.

The structure of the Data Strategy and this consultation paper are aligned with these four Pillars.

Supporting each Pillar, the paper identifies:

- specific outcomes to be achieved in addressing the problem
- case studies highlighting the problem
- recommendations to address both immediate needs and to embed ongoing foundations for a digitalised future.

4 PILLAR 1: NEEDS TODAY - Fit-for-purpose data

Identify and address priority data gaps, barriers and opportunities to streamline.

Key points:

- Identify gaps in the data needed for energy sector actors to undertake their roles effectively
- Prioritise areas for action, after considering reforms already underway
- Recommend reforms to support:
  1. **Retail transparency**:
     - improve visibility of retail plans and 'what energy consumers actually pay' to support more effective price monitoring, competition and consumer protections
     - expand AER's powers to effectively monitor and understand the contracts markets and retail margins.
  2. **Understanding consumers and demand**:
     - enable safe analysis of meter data for planning and research, capturing consumer benefits while still ensuring consumer protections
     - make better use of surveys and consumer research
     - work to improve data on vulnerable consumers and the commercial sector.
  3. **Visibility of low voltage (LV) networks and distributed energy resources (DER)**:
     - propose a pathway to better transparency for DER investors and service providers on network constraints and hosting capacity,
     - undertake further work on over-voltage risks to better understand monitoring needs,
     - progress network models through collaborative research and reducing data barriers
     - review metering data management to ensure consumers are getting maximum value
     - undertake further analytical work on the growth and behaviour of emerging DER

4.1 Problem 1: Lack of effective data

Many in the energy sector lack efficient and effective access to the data necessary to play their role. This leads to difficult decision-making, inefficiencies in planning and policy, unnecessary costs, market power problems and operational risks.

4.2 Outcomes sought

1.1 Data supports needs: Energy sector agencies, policy makers, consumers, market participants, service providers and related researchers have appropriate access to the data they need to support their functions, make effective decisions, manage their risks and capture new opportunities for better outcomes, in line with the energy market objectives (NEO, NGO and NERO) and the broader public good.

1.2 Data management is efficient and safe: Energy data is accessible and managed in a transparent, efficient and appropriate way, with data-gathering costs minimised, and privacy, confidentiality and security needs well supported. Sufficient supporting capability and resourcing is available to ensure data is useful and contributes to better market outcomes and the broader public good.

4.3 Review of data gaps and priorities

Gaps and insufficiencies in data have been a concern across the energy sector for a long time.

There have been a number of previous reviews on data gaps, including in the earlier stage of this Data Strategy undertaken by the AER and Brattle[5]. Prior to NEAR, the Commonwealth undertook an in-depth consultation across more than 50 stakeholders to identify where data gaps were a problem[13]. Negotiating the NEAR annual workplan (which looks to fill current and emerging data and analytics needs) also requires significant consultation across a range of stakeholders.

Many recent workstreams and reforms identify or seek to resolve data priorities. These include (but are not limited to):

- Energy Minister's Strategic Energy Plan[14], including metrics and ESB's related Health of the NEM report
- gas market transparency reforms[15]
- Electricity Retail Code establishing Default Market Offer (DMO) and reference price reforms, with supporting AER information powers[16]
- ACCC REPI recommendations on price monitoring, contract markets, business energy users and consumer transparency
- Energy Minister's Vulnerable Consumers workstream, reviewing energy equity metrics and barriers to DER access
- Energy Minister's consumer access to data work[17] and the Energy CDR[18]
- AEMC's Rule changes on DERR, Five Minute Settlement and Global Settlement
- ESB's DER Integration Work Plan and related Standards Governance reforms[19]
- ARENA's DEIP with many related workstreams, including the current AEMC Rule change projects on DER access and pricing
- Energy Networks Australia's (ENA) Open Networks work with AEMO and related research programs on LV networks
- AEMO and CSIRO's proposed Australia Energy Simulation Centre
- ESB's work on Post 2025 market design[20]
- AEMC regular and ongoing reviews and reporting, including the Electricity Network Economic Regulatory Framework Review, Retail Energy Competition Review and annual Residential Electricity Price Trends reports.

Each of these processes and many more were reviewed to capture data priorities identified, related recommendations and an assessment of progress made.

Given these workstreams have been undertaken over a number of years and the rate of change, a further survey was undertaken with many of the core agencies[21], seeking the most recent advice on

[13] Energy Use Data Model, scoping study (Energia)
[14] COAG Energy Council, Strategic Energy Plan, January 2020 here
[15] Gas market transparency report here
[16] Media release on Default market offer launch 2019 here
[17] Facilitating consumer access to data, March 2018 here
[18] CDR in the energy sector, ACCC, here
[19] ESB DER integration workplan here and Standard Governance here
[20] Post 2025 Market Design here
[21] This was a Request for Information process coordinated as part of the KWM legal review. Further detail on this is found in Appendix D

current challenges and frustrations in accessing data. This aims to ensure the Data Strategy is as up-to-date as possible on key issues.

Figure 3 below brings this previous work together at a high level to summarise energy data sets, with a traffic-light assessment of their current accessibility. This highlights the breadth of data requirements and that there are many areas with significant gaps. The nature of the markets to date has meant that while detailed data is publicly available from large central systems, data gaps grow as the system reaches down towards consumers and goes behind commercial curtains. This was workable while consumers were a largely passive part of the market, managed by only one service provider. But as retail competition and DER technologies make this sector more complex to predict, manage and serve, the gaps become evident.

Data gaps more critically, however, are defined by use cases and the impact of the lack of data. Summary examples are provided below (Example 5) of specific gaps in terms of agency roles and use cases, highlighting potential impacts on decision-making.

Figure 3: Illustrative summary of data gaps

Example 6: Agencies and stakeholders often lack the data and analytics they need

AEMO

- Is implementing a string of major reforms (led by AEMC) that seek to drive efficiencies in wholesale markets and price signals, reliability measures and market settlement, through more granular data, digitalisation and transparency. These include Five Minute Settlement, Global Settlement, DERR and the wholesale demand response mechanism (WDRM).
- Continues to work on improving visibility of changing consumer technologies and behaviours to improve forecasting and operational models. Prior to recent roof-top solar concerns this included uptake of air conditioning and the impact of standards driving more efficient equipment and buildings.
- Looking forward has gaps in visibility of emerging technologies and economic trends impacting forecasting and operations, such as battery storage systems, electric vehicles, electrification of gas loads, and sectoral impacts of the global pandemic.
- is trying to develop a step change in modelling and simulation capabilities for coordination and planning of a rapidly growing number of smaller generators with greater variability, more exposure to extreme weather, and increasingly complex connections.
- has been driving a string of reforms that involve access to better data to settle and manage an increasingly complex market, including Five Minute Settlement, Global Settlement, DERR and the demand response mechanism (DRM), now under implementation by AEMO
- is currently managing the implementation of the Five Minute Settlement and Global Settlement reforms. These reforms will improve the settlement of energy in the NEM and by default will also significantly improve the granularity and efficiency of how energy data is used within the market framework.
- continues to work on improving visibility of changing consumer technologies and behaviours to improve forecasting and operational models. Prior to recent rooftop solar concerns this included uptake of air-conditioning and the impact of standards driving more efficient equipment and buildings.
- recognises the need to consider the visibility of emerging technologies such as battery storage systems, electric vehicles and electrification of gas loads.
- struggles with less reliable generation forecasts, as renewables grow and old generators age.
- is trying to develop a step change in modelling and simulation capabilities for coordination and planning of a rapidly growing number of smaller generators with greater variability, more exposure to extreme weather, and increasingly complex connections.
- is the recipient of sensitive data in order to perform its role as market operator. Accordingly, AEMO must comply with the provisions in the National Energy Law(NEL) for management of 'protected' data and is therefore restricted in who can access held data.
- Due to the value of data held, supports a range of reporting and analytics, including through the NEAR program and a number of jurisdictional work programs. However restrictions on protected data and resources often make many analytic requests unworkable.

AER

- like most regulators has limited transparency of the networks they regulate and markets they monitor, limiting their scope to identify efficiencies and consumer risks.
- must assess proposals to integrate DER and wider innovation based on limited research and standards
- has prescribed roles they must undertake with explicit constraints on their ability to gather data, such as monitoring financial and wholesale markets based on only public data

- has growing requirements for retail monitoring given increasing complexity in pricing, competition and consumer protections and the new DMO
- has a range of prescribed roles in consumer information and retail market advice (such as Bill Benchmarking, consumer surveys and Energy Made Easy tariff comparison services), with limited flexibility and funding to keep up with changing data needs and consumer requirements
- has a range of prescribed data-gathering processes which are often very manual, leading to consequential problems with costs, quality and untimely data

AEMC

- has statutory roles in price forecasting and competition reviews, but has insufficient transparency of retail markets, contracts markets and prices that customers actually pay to support these roles
- regularly requires wider data and analytics to inform wider Rule-making, market development and strategic reviews, such as in transparency of cost-reflective pricing, competitive metering uptake and consumer impacts but is reliant on stakeholders providing data necessary for the Rule or review analysis
- has faced limits on its ability to access data from other agencies, leading to concerns around coordination, inconsistencies and duplication

ACCC

- has been directed by the Australian Government to undertake monitoring of the energy market over the medium-term. It uses its information-gathering powers to provide insights into customer outcomes in the NEM, but cannot easily share data with energy or related policy agencies due to strict confidentiality provisions that apply to information gathered through the use of those powers.

ECA

- has identified lack of data as a core problem for consumers, particularly data about consumer needs, data accessible to consumers about themselves, and data about retail markets and wider cost drivers
- undertakes a regular survey to try to address a range of gaps in understanding consumer concerns and needs
- funds a wide range of research seeking better data and understanding on consumers and their protections

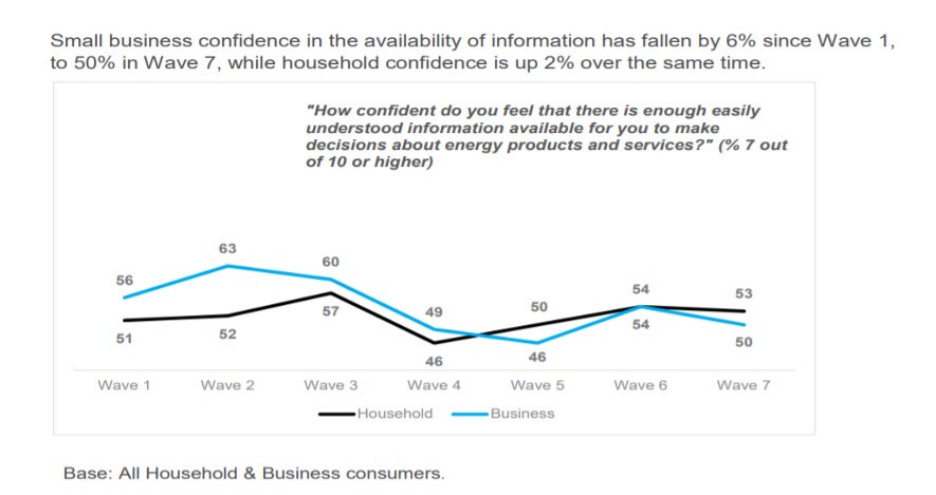
Policy agencies

- have gaps in the basic, ongoing metrics needed to understand the performance of the energy sector, such as many of those identified in the Strategic Energy Plan and the annual Health of the NEM report.
- have wide gaps in the data required to develop evidence-based policy, particularly in retail markets, consumer change and impacts, large use change and impacts, energy efficiency, gas markets, financial markets and impacts of new technologies. Policy analysis is frequently required to depend on the best experience and theory rather than robust evidence or analytics. This is particularly difficult as the rate of change increases in the energy transformation, with traditional sources of data often out-of-date or lacking sufficient granularity.

Consumers

- can increasingly access information on managing their bills in the market, with recent reforms such as the DMO reference price and upgrades to government comparator sites
- the information and tools they need to assess complex decisions and new options are often not available until long after required (for example, being unable to assess time-of-use or demand tariffs without data on their own usage profile)
- can face technical barriers in accessing data, such as a lack of a smart meter
- have a range of regulated tools which could be more effective but are hard to update (for example complex billing and the Bill Benchmark)
- according to ECA's Consumer Sentiment Survey still show limited confidence in making choices on energy product and services (Figure 4)[22]

Figure 4: Only around half of consumers are confident in the information they have to make decisions



New technology and service providers

- are frequently disadvantaged against large incumbent retailers and monopoly networks who have access to much greater data, creating barriers to entry and limiting their ability to compete and innovate
- frequently face uncertainty in standards and requirements, delaying innovation and limiting interoperability with existing systems

Networks

- with growing DER face new data needs to be able to monitor, model and/or control large parts of their network which were previously blind, to manage risks to reliability and security. This problem is central to how the future role of networks evolves.
- lack clear requirements to support DER or provide data transparency around any constraints or requirements they place on new DER.
- frequently face contractual limitations in accessing wider benefits from new competitive metering.

[22] ECA Consumer Sentiment Survey June 2019 here

- lack visibility of some types of DER, such as uptake of electric vehicles (EVs).
- are required to provide consumers with their meter data but lack common standards or processes to manage related risks or make this useful.

Retailers

- face ongoing changes in data requirements and obligations which drive major system upgrades, such as smart meters, Global Settlement, Five Minute Settlement, Energy CDR and the Wholesale DRM. These are often external requirements and may not align with their business interests.
- face growing reporting requirements for retail monitoring, frequently using quite manual processes.
- face prescriptive information requirements on retail bills, including for consumer protections and bill benchmarks, which lock in costs and are costly if changed, but are also likely out of date in terms of consumer service preferences

Researchers

- are seeking to play an active role in developing and testing new technologies and methods to manage a transformed system, with many trials under way. These trials frequently face delays or limited access to the data they need, even when working in partnership with industry players, delaying the innovation and solutions the market needs.

To understand whether known data gaps and issues will be addressed, as many ongoing processes as possible (many of which are listed above) have been considered and included. This Pillar is seeking to address gaps beyond the current work, or where progress has stalled, and not duplicate effort.

Future reforms also need to be considered, such as the Post-2025 market design processes and related work, including the two-sided market and the AEMC's transmission access reform work. Many of these future directions depend on increasingly being able to see, control and coordinate many more energy market actors. Data needs will grow, not just in terms of specific data sets but also in the technology to capture the data, its portability and ability to be shared among a greater number of market players.

Example 7: Future market reforms will change data needs

In a proposed future two-sided market, data needs will continue to rapidly expand to support management and digital control of an active 'scheduled' demand side. In considering options to resolve current data priorities it is important to look forward to how they may change in the medium-term.

Forecasting: If demand becomes effectively scheduled, understanding consumers and DER behaviour to forecast behind-the-meter may become *less* critical for operational managers or central markets. Rather than predicting demand, demand would bid into the market and respond in a controlled way to scheduling instructions.

But will that also reduce needs for other forecasting roles such as demand aggregators, who may be managing scheduling and trading? Or for longer-term forecasters, planning beyond operational timeframes or planning for a demand segment that remains passive/unscheduled?

Multiple service providers: In future markets how will control at the appliance/service level coordinate with aggregate meter billing point? What data will need to be shared between different service providers in the same home? Does one service provider need visibility to control net demand bid into the market? Will the CDR need to enable access to a broader set of consumer data for a range of in-home services into the future?

Retail transparency: To orchestrate DER incentives, pricing or related aggregate contracts will likely be increasingly complex, with greater need to be cost-reflective and vary on local factors. This will likely increase the need for transparency of impacts on consumers and how consumer protections are working or not. Independent decision support tools or comparators may also become more important.

Networks: The network businesses will need to be able work in a much more transparent way to ensure that aggregators and demand coordinators have the market signals or information to optimise local constraints as well as wider market. How will constraints and dynamic operating envelopes be visible to local markets and many service providers?

Coordination: Today's markets already require improved computational and modelling capabilities. Future two-sided markets will be orchestrating greater numbers of scheduled elements, increasing computational demands; will better algorithms and predictability simplify these processes? Or will supercomputer capabilities resolve this complexity?

4.5 Priority data gaps to be addressed

Based on the input and analysis discussed above, three areas of data needs are proposed as priority gaps to be closed in this initial phase of the Strategy:

1. retail transparency
2. understanding consumers and demand
3. LV-DER visibility

As these priority gaps are complex policy issues, they are further explored in Appendices A-C. A summary of recommendations is provided here.

4.5.1 Retail transparency

Transparency of prices, contracts and retail performance has been a key concern in affordability of energy market for some time. There are significant gaps in the ability for energy regulators to understand what consumers, large and small, actually pay and how efficient retail markets are in providing competitive prices. The ACCC used its greater information gathering powers to investigate many of these issues in its 2018 Retail Electricity Pricing Inquiry[2] (REPI). Its finding was that there was a need for greater ongoing retail transparency and price monitoring, and they made a range of recommendations to achieve this. Since the REPI, some progress has been made but ongoing solutions are not yet in place.

APPENDIX A: RETAIL TRANSPARENCY further explores these challenges and proposed the following recommendations (in summary).

Recommendation 1: Retail plans and billing

Provide transparency for retail price monitoring, review of competitive markets and affordability policy by requiring retail plans to be identified against meters, and supporting privacy-protected, de-identified retail monitoring, analysis and reporting.

Recommendation 2: Streamlining price reporting

Using new retail monitoring, core agencies must work to streamline current reporting and provide more up-to-date tracking of retail metrics and affordability.

Recommendation 3: Tracking commercial and industrial prices

Provide greater transparency of large energy user prices by expanding AER's information-gathering powers and requiring it to monitor and report on contract pricing arrangements for large energy users.

Recommendation 4: Contract market monitoring

Provide greater transparency of contract markets and enhance wider wholesale market monitoring by expanding AER's information-gathering powers and requiring it to review and report on contract market performance.

Recommendation 5: Retail margins

Provide greater transparency of retail margins and market power concerns by expanding AER's information-gathering powers and requiring it to include retail margins in their wider retail performance monitoring.

4.5.2 Understanding consumers and demand

Visibility of changes in the underlying drivers of demand remains fundamental to effective forecasting, with major costs at stake for consumers in infrastructure planning and reliability. This is well demonstrated: changing trends in air-conditioning, then energy efficiency standards and finally rooftop solar all initially misdirected forecasts and contributed to rising infrastructure costs over the last two decades.

Looking forward, uncertainty in how aggregate demand patterns will change has never been greater. Forecasting and policy must consider the economic impacts of COVID-19 in business and lifestyle, high penetration of DER technologies with emerging aggregator arrangements and decarbonisation driving electrification of vehicles, gas and other technologies.

Ongoing research into how many factors affect demand is vital to protect consumers against future risks to costs and reliability. For the first time, new metering and data science capabilities allow for the potential of systemic ongoing visibility of demand changes. However, it will depend on putting reforms and systems in place to support safe, de-identified analysis, while supporting research and innovation.

APPENDIX B: UNDERSTANDING CONSUMERS AND DEMAND explores these data gaps further and provides the following recommendations (in summary).

Recommendation 6: Access to meter data for public-good research

Support greater access for safe protected analysis of meter data for public-good research, planning and policy. Implement this through regulatory reforms (proposed in Pillar 2) and supporting analytic resources (proposed in Pillar 3).

Recommendation 7: Gas meter data

Gas is a direct substitute for many large sources of electricity demand but with even less transparency. Support more holistic energy forecasting and understanding of affordability by exploring options to provide transparency of gas metering and linking electricity meters which have access to gas.

Recommendation 8: Review of consumer surveys and Bill Benchmarking

Support better consumer research through more effective consumer surveys. Bringing together key organisations currently undertaking surveys, including the AER Bill Benchmarking work, review and recommend a preferred approach to a regular program of baseline survey(s) that meet a wider range of objectives, are more accessible and reduce duplication.

Recommendation 9: Data on vulnerable consumers

Pursue improved data and metrics on vulnerable consumers, building on research under way through the Energy Ministers' work on energy equity and drawing on wider recommendations on retail transparency and consumer research.

Recommendation 10: Commercial consumers

Improve analysis of business energy use to assist forecasting and understanding of sector costs and impacts, particularly during economic disruption. Draw on wider recommendations on retail transparency, consumer research and data sharing, as well as ongoing work under NEAR.

4.5.3 LV-DER visibility

One of the most widespread data concerns across the energy sector is the lack of visibility of the performance of the LV segments of the distribution network as it integrates DER. In most places the LV network has little coordinated monitoring and is effectively blind. Integrating high levels of DER will depend on new ways to manage and coordinate data across the LV network, DER and metering. Much work is already under way, with ongoing processes and trials developing reforms and new tools. Focusing on data, the Strategy considers work under way and identifies barriers and opportunities in resolving LV visibility.

APPENDIX C: VISIBILITY OF THE LOW VOLTAGE NETWORK AND DER explores these data gaps and provides the following recommendations (in summary). Full recommendations are provided in the Appendix.

Recommendation 11: Research impacts of current voltage levels

LV visibility has a range of benefits which should be considered in supporting investments, including management of overvoltage risks which recent findings suggest may be under considered. Support further study on the impacts of current voltage levels on consumer equipment, DER and losses.

Recommendation 12: Sharing network data for research

Many networks are working with researchers on new tools and trials, but often struggle to effectively share data. Clarify guidelines and options to reduce barriers for network businesses and other market participants sharing data with research partners, using suitable privacy frameworks and protections.

Recommendation 13: Building analytic capability in LV data and modelling

Networks have critical needs to build new tools and analytic capabilities to support LV visibility and DER. Consider options to accelerate development of LV data sets, tools and analytical capability across networks through a broader collaborative research effort.

Recommendation 14: LV reporting to provide transparency for DER investors and planners

DER investors and service providers currently have little visibility of network capacity. Networks should be required to publish their estimated DER hosting capacity, and related contextual data, to help inform stakeholder investments and engagement in a range of decisions around DER connection requirements, optimisation and any related incentives.

Recommendation 15: Review of metering requirements and roll-out

Metering is a key source of data to support greater LV and DER visibility, but this data is currently being under-utilized due to commercial barriers and out-of-date requirements. The upcoming AEMC review of competitive metering should consider LV-DER visibility issues (as part of its broader scope) including: metering data access rights for networks, network connection points, voltage reporting,

gross metering, DER minimum requirements and opportunities for improved uptake of competitive metering to assist LV visibility.

Recommendation 16: Evolving the DER Register to wider needs

AEMO should clarify the processes to update DERR over time and consider a range of data gaps already raised, including network connection points and export constraints.

Recommendation 17: Electric vehicle data

EV data needs remain complex, crossing several sectors, and are not included in wider DER requirements at this stage. DEIP's EV data requirements workstream is developing recommendations on short- and medium-term EV data requirements. Wider recommendation in the Data Strategy may create opportunities to accelerate these needs.

4.6 Data gaps to be revisited

A range of further data gaps have been identified as important but are not developed in this paper as specific recommendations at this stage. This is generally because there are ongoing processes which may either resolve the gaps or influence the way forward. These issues should be revisited by the ongoing work of the Data Strategy in future reviews (discussed under Pillars 3 and 4). These data needs include:

Data for consumers

Data gaps for consumers in managing their own bills has long been a key issue. Past reforms to provide access to consumer smart meter data had limited success and competitive provision of smart meters has been slow. There are concerns about the usability of data on bills and related Bill Benchmarking. Recent evidence suggests that many consumers are missing the necessary data to ensure their DER is performing as expected and there is limited transparency on network constraints and exports limits. Some of these issues could be solved by the market, but technical constraints are also material.

There is a wide range of reforms under way that have the potential to resolve some of these issues, but require time to fully implement and have impact:

- introduction of DMO reference price
- government price comparators (Energy made Easy, Victorian Energy Compare and NSW Switch) have undergone recent development to use consumer data to personalise advice
- Energy CDR is currently being implemented and is a core structural reform enabling market services
- recent reforms have been proposed for consumer bills
- the AEMC review of competitive metering is expected this year.

Gas market transparency

Gas markets are widely recognised as needing to improve transparency and asymmetry of information, particularly with greater linkages to international gas markets. In March 2020, Energy Ministers endorsed a range of measures to improve transparency in the eastern and northern Australian gas markets, with new reporting obligations across the gas wholesale, transmission, storage and retail supply chain. Building upon the existing Gas Bulletin Board and Gas Statement of Opportunities, the reforms include a range of measures (similar to some considered in this Strategy) relating to gas and infrastructure prices, supply and availability of gas, gas demand, infrastructure used to supply gas to end-markets, and wider powers for AER to monitor gas contract markets and

large gas users. These measures have been endorsed but are still being implemented. They build on extensive previous reviews including the 2018 Joint ACCC and Gas Market Reform Group 2018 Report on Measures to Improve Transparency in the Gas Market, and the 2016 AEMC East Coast Wholesale Gas Markets review and the 2018 AEMC review into the scope of economic regulation applied to covered pipelines.[23]

Market visibility for integration of renewable energy

AEMO's recent Renewable Integration Study[24] identified a wide range of data-related issues to be resolved, including:

- the need for greater computational and modelling capabilities
- additional targeted NEM high-speed monitoring
- better modelling of new technologies such as VRE, DER, batteries and VPPs
- updated standards, visibility and controllability of new technologies
- the need to increase confidence in generation forecasts.

AEMO is currently progressing many of these issues and recommendations in RIS Stage 1 with stakeholders, and work on RIS Stage 2 has commenced.

AEMO has also identified a critical need for greater simulation and market modelling capabilities, primarily to enable more efficient real-time responses during major security events (such as regions islanding). However, the same capabilities could resolve a range of other needs, such as delays in connection applications for a growing number of new generators and more complex scenario modelling for planning. AEMO is currently pursuing a range of options.

Embedded networks

Embedded network customers are a major gap in market visibility and consumer protections, with historically no visibility of meters, prices paid or consumer protections and limited or no ability to switch providers. The AEMC recently completed a review[25] and recommending significant law and Rule changes to address these issues. Data-relevant recommendations include a requirement for market-compliant meters that are registered within AEMO's systems to enable embedded network customers to switch more readily and to help AEMO to forecast usage patterns, improved financial and data transfer processes and improvements in billing information and reporting on consumer protections (such as disconnections).

These recommendations are yet to be implemented. Victoria, which has separate arrangements, is currently undertaking a similar review. Assuming these recommendations go ahead, it is likely that further consideration should be given to including these customers in wider data reforms, such as proposed retail transparency measures. Other services, such as the CDR, will also be of interest to these consumers over time. Future reviews of the Data Strategy should review progress in this area.

Cyber security

AEMO is continuing to develop the Australian Energy Sector Cyber Security Framework (AESCSF) and reporting annually on cyber security preparedness in the electricity sector. In August 2020 the

[23] Measures to improve transparency in the gas market, decision, COAG EC here
[24] AEMO Renewable Integration Strategy here
[25] AEMC embedded network final report here

Australian Government released Australia's Cyber security Strategy 2020[26] which highlights a range of new work, including an enhanced regulatory framework for the security of Australia's major critical infrastructure and systems of national security to assess their networks for vulnerabilities and to enhance their cyber security maturity. It also highlights a voluntary Code of Practice concerned with security of the Internet of Things that will make the devices used by households and businesses more cyber secure. This will be highly relevant in the energy sector as household energy management becomes more active in DER.

Question 1: Data gaps and priorities

The list and scope of issues presented in this paper is extensive.

Are there key data gaps that we have not identified? Do stakeholders have views on which data issues take priority? Will some of these data issues be resolved by existing processes?

Do stakeholders support the recommended actions? Are there alternative options?

Further detailed questions are proposed in Appendix A-C.

[26] Australia's Cyber Security Strategy 2020 here

5 PILLAR 2: FRAMEWORK - New data governance

Ensure national energy legislation supports a clear and consistent approach to data aligned with economy-wide data reforms and current needs

Key points:
Consider a legal review of the current energy data regulatory framework as well as international and national data reforms. Recommend:

- New **high-level principles** to drive a paradigm shift in data policy and align data reforms with the long-term interest of consumers.
- An **'overhaul' of energy data regulation** to introduce a fit-for-purpose regime for a digitalised energy sector, aligned with national data reforms, with clear frameworks for data sharing while managing privacy, security and risk.
- An '**incremental' package of reforms** to provide immediate improvements, addressing specific barriers, priority gaps and 'prescribed agencies' for trusted sharing.
- Common guidelines on data collection to address barriers such as appropriate consents and confidentiality.

5.1 Problem 2: Regulatory barriers

Out-of-date and inconsistent regulatory arrangements and data policies frequently mean that key trusted stakeholders cannot access, share or integrate relevant available data, even when access to the data may clearly promote the long-term interest of consumers or the broader public good, and privacy, confidentiality and security concerns are well-addressed.

5.2 Outcomes sought

2.1 Clear principles and approach: The high-level principles applied in protecting, accessing, sharing and releasing energy data are clear and agreed. They align with market objectives, privacy and security needs, national data reforms, the broader public good and are fit-for-purpose for a future digitalised energy sector.

2.2 Clear responsibilities: Regulatory frameworks apply these principles in an unambiguous way, resolving uncertainties and providing clear data access arrangements.

2.3 Timely agreements: Energy data holders and seekers can efficiently agree on rights to access, share and release data, in line with the agreed data principles and standardised agreements, and implement these arrangements in a streamlined timely way, without extended negotiation due to uncertainty or diverse interests.

5.3 Context – National Data Reforms

Both nationally and globally, the underlying principles of data policy are being overhauled. Digitalisation and the availability of ever-growing volumes of data have led to a rethink of the effective management and use of this data. Much of this has been driven by recognition that data has become a major national strategic asset and there is a growing requirement that data gathered by the public sector should support better outcomes for the public. The goal of modern public sector data reforms is to maintain security and privacy protections, while also supporting greater consumer benefits and public-good research through more effective use and sharing of consumer data.

Australia is well-advanced in progressing national data reforms. In 2015 the Australian Government released the Australian Government Public Data Policy Statement, committing to shift to 'open data'. The 2017 Productivity Commission Report Data Availability and Use[27] found Australia's use of data was falling behind that of other countries and recommended a substantial package of reforms to unlock the full potential of public sector data. It estimated that data-driven innovation could add up to $64 billion to the Australian economy. This led to the establishment of a National Data Commissioner to progress legislative reforms for sharing public sector data, as well as the new CDR.

These national data sharing reforms are well-advanced, with the Data Availability and Transparency Bill (DAT Bill) Exposure Draft recently released for consultation.

Extract 1: National data reforms

Data Availability and Transparency Bill (DAT Bill) Exposure Draft (Sep 2020) [28]

The Data Availability and Transparency Bill will authorise sharing of public sector data by data custodians with an accredited user, only for the permitted data sharing purposes and only if effective safeguards are in place.

…..

The Bill provides an optional and alternative authority for the Australian Government to share public sector data. The authority is considered optional as **there is no obligation to share;** and alternative as existing pathways may continue to be used to authorise sharing where they are working effectively for all parties. Data sharing means providing controlled access to data and does not include open data release

…

Permitted data sharing purposes for sharing data are **for delivery of government services, to inform government policy and programs, and for research and development**. The Bill does not authorise sharing for precluded purposes, including enforcement-related purposes, for example for law enforcement, compliance and assurance purposes.

…

The Bill provides layers of safeguards, including the Data Sharing Principles, which are based on an internationally recognised framework for managing risks associated with sharing data.

Data Sharing Principles[29]

The five Data Sharing Principles provide a privacy-by-design approach to help government agencies to share data safely by balancing public benefits with risks. When agencies are considering whether data can be shared safely, they need to consider multiple factors, including:

1. **Why** the data is being used (Projects Principle)

[27] Productivity Commission Report: Data Availability and Use: here

[28] Data Availability and Transparency Bill 2020 Exposure Draft Consultation Paper September 2020 here

[29] Data sharing principles here

2. **Who** is using the data (People Principle)
3. **Where** the data is being used (Settings Principle)
4. **What** data is appropriate (Data Principle)
5. **How** the results of the project are used (Outputs Principle)

Privacy impacts of reform

As with any core data reform, privacy will always remain a central concern. The DAT Bill has actively focused on privacy, with a 'privacy-by-design' approach, considering privacy impacts at every stage of legislative development. There have been two stages of independent Privacy Impact Assessment[30], one to inform the Bill and then a second assessment to assess the Bill, to assess its privacy impacts and make recommendations about how to minimise and mitigate those impacts, and strengthen the privacy safeguards in the scheme. These have been released with the Bill for consultation and will be revised as the Bill in finalised.

Findings of the second assessment are that: "the draft DATB framework is strong. Its layers of defence have the potential to work together to identify and carefully manage privacy risks associated with any data sharing project". It also identifies however that as a principles-based reform it will depend on effective implementation and support. A range of further recommendations to ensure robust privacy protections are included which are being considered, along with public consultation, in further developing the proposed reform.

National data reforms and energy

These national reforms are directly relevant for the energy sector. They will apply to Commonwealth bodies[31], which includes several energy agencies (the AER, ACCC, ARENA and CER). This will provide a new option to authorise (but not oblige) data sharing from these agencies, within the strictly defined public-good purposes and safe data sharing guidelines.

These reforms set important precedents in:

- being clear that publicly held data should be managed to create benefits for the public good
- allowing data sharing *where there is a clear beneficial purpose for the public good*, so long as appropriate and clear safeguards are in place.

This is a shift from the current state of Australian energy regulation (and regulation in many other sectors) where the focus on privacy and confidentiality safeguards, while critically important, has not included consideration of how to also access wider benefits in the long-term interests of consumers. This has led to inflexible, cautious frameworks. While consumers' privacy has been protected, constraints on consumer data restricting effective research and planning has in many cases contributed to negative impacts on consumers, such as higher prices, poor services and gaps in consumer protections.

For example, regulatory restrictions and caution in the use of meter data and consumer data (even fully de-identified and protected) has hampered forecasting, planning and better consumer policy for many years, contributing to real inefficiencies in infrastructure investment (in the order of many billions of dollars) and resulting in higher consumer energy costs (Example 1). This is a common issue internationally in energy data, with countries like the United Kingdom, the United States of America,

[30] DAT Bill Privacy impact assessments here

[31] Commonwealth bodies –captures all bodies under the standard PGPA Act definitions of Commonwealth entities and companies, as well as other bodies under the FOI Act, such as statutory office holders and judicial bodies.

Singapore and much of the European Union already ahead in progressing data reforms specific to the energy sector.

5.4 Review of current regulatory arrangements

A starting point in the Data Strategy was a wide recognition that many recent barriers and frustrations in the better use and sharing of data lie in the complexity of data arrangements in energy regulation. Even where projects have been designed specifically to assist access to, or sharing of, data in trusted environments, such as the NEAR program (Example 4), these efforts have struggled to resolve regulatory barriers.

An in-depth review of data management in Australian energy regulatory frameworks is therefore a key element of this Strategy, to identify reforms that support more effective access, sharing and use of data. Led by King & Wood Mallesons and data policy specialist Galexia, a review was undertaken on how data and information rights are managed and interpreted within the different layers of energy regulation, including the National Electricity, Gas and Retail laws and Rules, as well as interacting legislation like privacy and competition law, and to some extent state specific arrangements. To guide this, a range of workshops were held with core agencies to explore cases studies of data challenges. Galexia also undertook a review of policy case studies in other sectors and in international energy markets, to explore best practice in these reforms.

KWM and Galexia were asked to provide recommendations for reforms towards a fit-for-purpose data regime in energy regulation. A summary of findings and recommendation is provided here but the full report and a range of stakeholder questions can be found at Appendix D for independent review and comment.

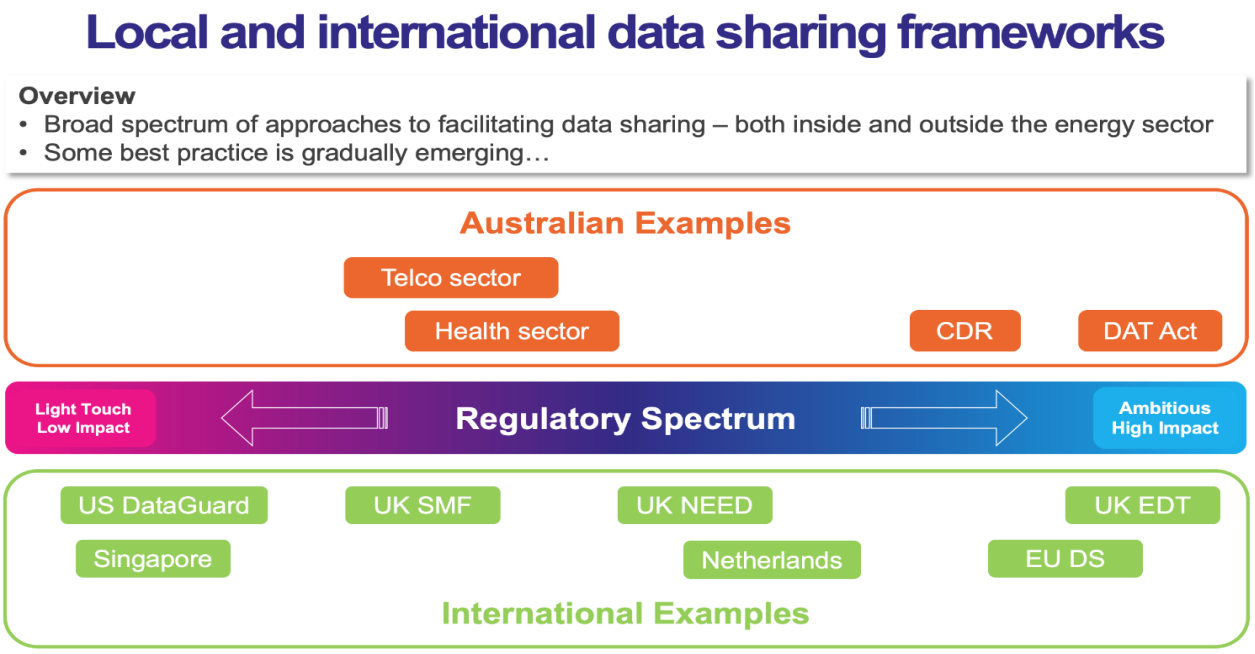
Extract 2: KWM report: key findings[32]

This report identifies that public bodies face three broad challenges to greater sharing of energy data between themselves and with other public interest bodies. These are:

- **complexity of legislative regime** – the law starts with a prohibition on data sharing, followed by various, sometimes inconsistent exceptions. This complex legal landscape, developed in a past-era, leaves data holders uncertain about how to interpret the law and how to safely share energy data with other public bodies;
- **unworkable public interest test** – the current framework contains a public interest data sharing regime, however, the public interest test within it is vague and the regime itself is difficult to implement; and
- **privacy concerns and commercial sensitivities** – these have been the driving concerns, limiting the sharing of energy data under the existing regime.

[32] Appendix D, p4

Extract 3: Galexia case studies on data reforms (Appendix D, p49)



In reviewing the above range of international approaches to energy data regulation, Galexia identified emerging best practice for the Rules and conditions that should be applied to data sharing activities, in order to strike a balance between protecting privacy and facilitating use of data for a public benefit. These are summarised in the table below and in the KWM Galexia report. Usefully, much of this best practice is aligned with the proposed direction of the Commonwealth data sharing reforms (DAT Bill). As several energy market bodies and related agencies will be covered by these Commonwealth reforms, there is significant merit in considering coherent approaches.

Extract 4: Galexia learnings from case studies (Appendix D, p52)

Best Practice Approach	
1.	**Providing a list of permitted purposes for use**
2.	**Providing a list of prohibited purposes for use**
3.	**Applying a robust set of principles for privacy and security** – with a consensus forming around the use of the Five Safes Framework[33] 1) Safe **People** – approved / accredited researchers 2) Safe **Projects** – all projects approved by an oversight body

	3) Safe **Settings** – identifiable or sensitive data restricted to secure environments 4) Safe **Data** – where data is de-sensitised to the extent appropriate for the relevant People/Project/Settings 5) Safe **Outputs** – results checked for compliance with approved disclosure protocols[34]
4.	**Requiring vetted or accredited access to data**
5.	**Restricting onward disclosure**
6.	**Managing de-identification and the risk of re-identification**

Note that Galexia references the international 'Five Safes' framework. The national Data Sharing Principles developed by Office of the National Data Commissioner are adapted from the Five Safes Framework as a set of principles to emphasise the broad set of considerations related to data sharing in Australia.

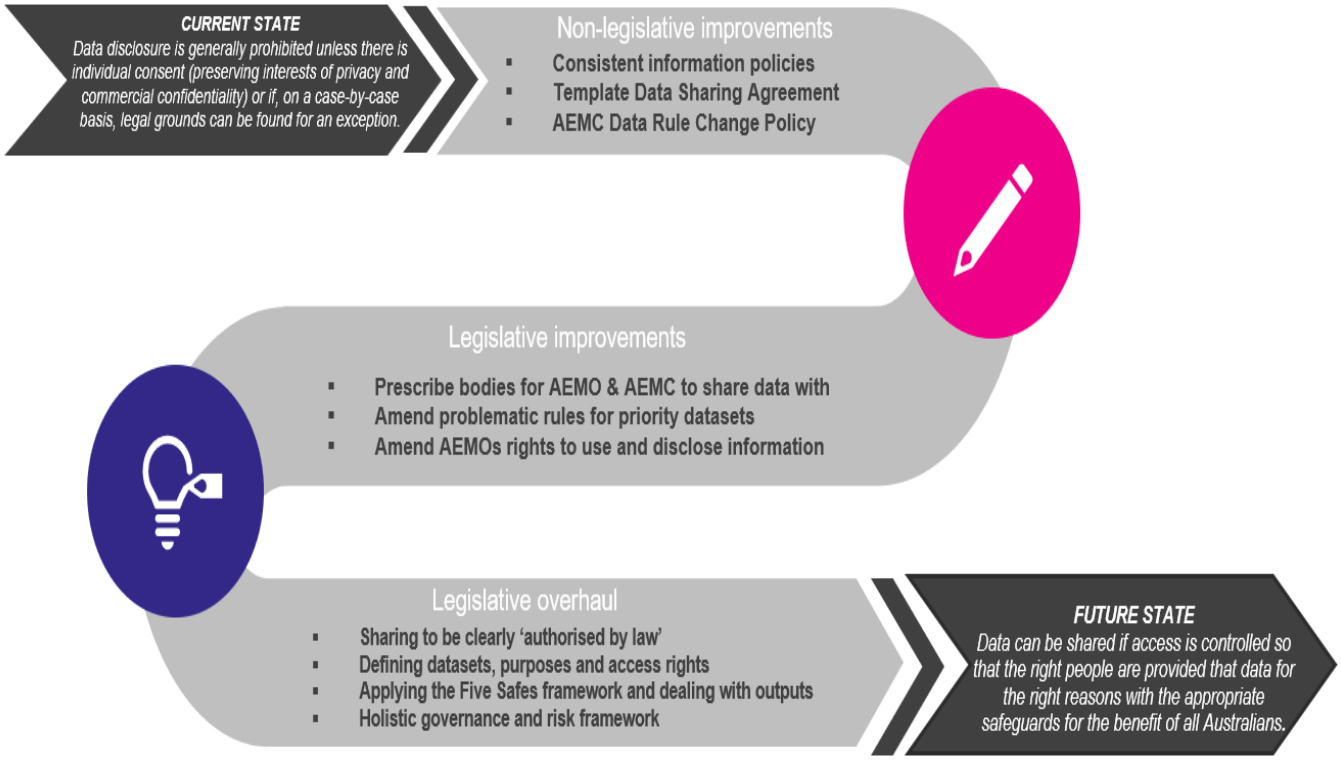
KWM and Galexia proposed a range of reforms which address different barriers within energy regulation, legislative and non-legislative, which could be undertaken in a range of packages:

- **non-legislative improvements** – a reform package that uses non-legislative mechanisms to address some of the key issues with data collection and sharing
- **legislative improvements** – a legislative reform package that addresses some of the identified regulatory barriers, without departing from the overall structure of the current regime
- **overhaul –** fundamental, principled changes to the existing confidential information and public interest data sharing regimes to create a new, fit-for-purpose public benefit data sharing regime.

These recommendations are summarised in Extract 5. Full details of these reforms can be found in Appendix D; stakeholder comments are welcome.

[34] The Five Safes framework is already being used to enable data sharing projects in the energy sector overseas. For an overview refer to: UK Data Service, *Legal and ethical challenges surrounding big data: energy data* (2020) https://www.ukdataservice.ac.uk/media/604999/ukds-case-studies-ethical.pdf

Extract 5: KWM-Galexia summary recommendations (Appendix D, p10)



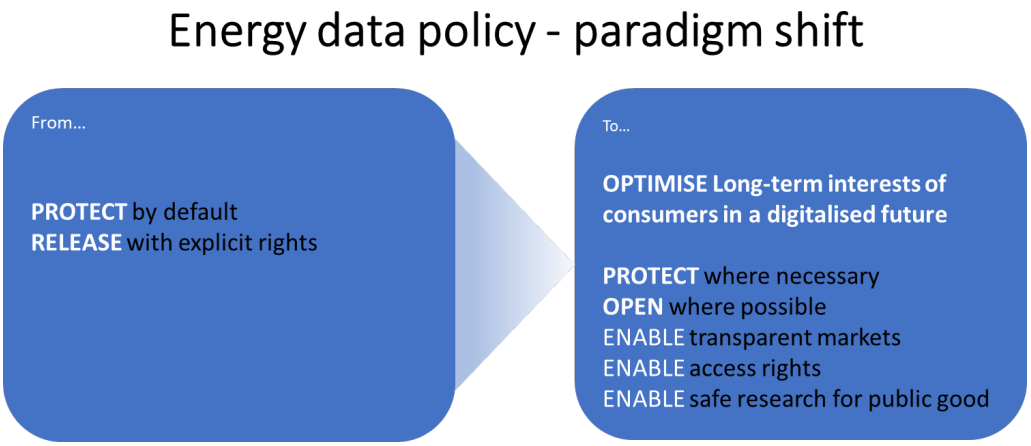
The proposed reform path is not necessarily sequential but implies a greater degree of underlying reform. There is some ability to select different elements. For example, some of the proposed guidelines hold merit regardless of whether other reforms are pursued or delayed. However, a 'fit-for-purpose' objective in a future digitalised market would not be achieved without undertaking the 'overhaul' recommendations, which broadly align with the Commonwealth data sharing reforms. Incremental improvements can be made to support targeted data needs without reforms, but it is difficult to resolve the underlying risks for data holders and inconsistencies which drive caution without these more comprehensive reforms.

5.5 Proposed regulatory reforms

ESB has considered the KWM/Galexia findings and proposes to pursue a range of related reforms.

The reform path in Extract 5 highlights a paradigm shift in underlying energy policy: moving from one which *prohibit*s disclosure by default, to one which *authorises controlled disclosure* for approved purposes where safeguards are in place.

Figure 4: Energy data policy paradigm shift



Authorising disclosure does not, and should not, 'mandate' data provision. It will be important to ensure clear guidance on the purposes for which data not just *can* be shared but *should* be shared to support data holders in these decisions. Given uncertainty and constraints in current data arrangements, energy data holders show clear caution in interpreting their current authorisation in use of data.

Driving a paradigm shift in culture and consistency across many diverse reforms over time will be challenging. ESB considers that there is value in agreeing a set of principles at the highest level as an ongoing guide to energy data reforms and to guide decisions of data holders. These should clearly align with the energy objectives, long-term interests of consumers and efficient outcomes in a digitalised future. More broadly, they should also support the objectives of the Data Strategy (Section 3.2) and ensure that energy market governance is efficient.

A proposed set of principles are provided in Recommendation 18.

Recommendation 18: High-level energy data principles

To improve consistency across complex energy reforms and support a shift in culture, Energy Ministers should agree to clear policy principles for energy data regulation, proposed as:

Regulatory and governance frameworks and discretionary decisions controlling access, use and management of data across the energy sector should:

1. drive outcomes consistent with the energy market objectives (NEO, NGO, NERO) and the long-term interest of consumers, ensuring appropriate privacy safeguards while also capturing the benefits of a more transparent, innovative and informed digitalised energy market
2. be fit-for-purpose, flexible and streamlined in a digitalised market
3. be compatible with wider national data reforms, including:

- supporting Open Data through optimising the use and default release of non-sensitive data
- enabling consumer data rights
- supporting data sharing for clear public-good purposes where safeguards are maintained.

Consideration will be given to where, within the governance and regulatory framework, these principles should be implemented to drive wider reforms.

Overhaul reforms

ESB supports the KWM proposal for an 'overhaul' of energy data arrangements in line with the proposed Commonwealth data sharing arrangements, as these will provide much more flexible and 'fit-for-purpose' data arrangements over time with much clearer protection and privacy arrangements. ESB agrees that 'prescribed agency' arrangements currently used and proposed as a short-term alternative, while potentially appropriate for some purposes, do not support the same level of clarity over data protection arrangements as formalised Data Sharing Principles, or the flexibility required to support changing market arrangements and public-good research over time. Proposed 'overhaul' arrangements will have greater capacity to manage underlying data holder risks and therefore enable greater safe sharing. This will depend however on effective design and robust consideration of privacy in every part of the design.

Recommendation 19: Overhaul of the legislative framework

Design and implement a fit-for-purpose regime to support effective data management in a digitalised energy sector.

This new regime will seek to bring energy arrangements in line with national data reforms policy, including the five Data Sharing Principles and the Commonwealth *Data Availability and Transparency Act*, once these reforms are passed into law. This includes:

- defining purposes for which data sharing is clearly authorised and/or constrained
- clear frameworks for managing privacy, access, security and outputs, including flexibility for changing needs and wider trusted users
- clear frameworks to manage governance and risk, particularly resolving the current uncertainty for data holders
- supporting frameworks for data sharing agreements
- supporting frameworks for managing accreditation of trusted data users.

The design process should take a "privacy by design" approach to ensure robust privacy protections are inherent in the approach and include independent assessment of privacy impacts.

Incremental reforms

These overhaul arrangements are the appropriate model for the future but will take time to put in place. They will need to consider the final agreed form of the Commonwealth DAT Bill, and undertake a detailed design process.

While these reforms are being developed, ESB agrees that a separate package of reforms can address a range of specific barriers to data benefits can be resolved to provide immediate benefits. This "incremental" package of reforms will be developed, in parallel with the overhaul design, to unlock some priority areas in the Rules. These reforms should be progressed as quickly as possible within appropriate reform processes.

Recommendation 20: Incremental regulatory changes

Undertake an initial package of regulatory reforms as proposed by KWM, particularly:

- expand 'prescribed agencies' to allow for more efficient data sharing between trusted bodies in the short term. This should include sharing with core agencies, the NEAR program and some jurisdictional policy bodies, contingent on ensuring those agencies appropriately manage the data in a secure protected environment.
- clarify AEMO's data rights and a range of Rules which create inconsistencies.
- support targeted Rule changes to resolve priority data gaps (consistent with proposals under Pillar 1).

Guidelines

While these two packages of reforms will unlock many regulatory issues, many of the challenges remain in practical and consistent interpretation and use of data arrangements. Many users of data are experts in data policy.

To further support practitioners across the energy sector working with energy data and related regulation, and to reduce risks inherent with poor data management, ESB agrees with KWM there is a need for a clear set of guidelines and consistent policy.

Recommendation 21: Common guidelines for data collection and sharing

Develop and agree a set of common guidelines and data policy for use in data collection and sharing across energy agencies, supported energy research and the wider energy sector. These guidelines will support the new data principles and improved data sharing. They will also aim to reduce the known cost risks associated with gathering data in a manner that creates barriers to its intended use.

These should be a set of practical tools to use in a range of situations, including:

- appropriate terms and conditions and consent requirements for a range of voluntary data-gathering (such as consumer and business surveys, voluntary information from participants and data gathered under funded research such as ARENA trials)
- clear data policies which minimise voluntary data provided under 'confidential' arrangements except where unavoidable
- template data sharing arrangements to provide consistent terms for data providers.

Question 2: Regulatory reforms

Do stakeholders support the proposed reforms and guidelines, noting they require detailed design and would go be developed and undergo further consultation through usual processes?

Further detail questions are proposed in the legal review at Appendix D.

5.6 Consumer Data Right (CDR) in energy

The energy CDR is a related reform already under way. This is fundamentally a competition and consumer initiative. It empowers consumers to access more personalised and relevant advice by allowing them to choose to share their data with service providers, and facilitating this through easy and timely digital processes.

The energy CDR fills a critical need, where growing complexity in energy services is limiting consumers' abilities to make informed choices without access to digital tools. CDR will allow portable smart meter data, retail plans and billing data to be used to tailor personalised advice to consumers on the best retail plans for them or new DER services.

Previous reforms in the Energy Rules had attempted to achieve this but struggled to be effective.

Example 8: Standards and usability arrangements matter

Prior to CDR, Energy Rules were introduced in 2014 to allow consumers to access their meter data from their retailer or distributor and similarly provide consent for third-party service providers to access this data on their behalf. These arrangements have not had a large impact due to a lack of standardised arrangements for identification and authentication, explicit informed consent and data formats. Retailers and distributors, with diverse advice on privacy requirements and limited incentives to collaborate, developed diverse authentication and consent arrangements which sometimes required faxing personal signatures. As a result, these arrangements were unable to support online services and there was almost no third-party access. Consumers who did access their data received it in a range of inconsistent formats, some even in a printout or pdf of over 17 500 data points.

The Victorian government sought to provide access to smart meter data on their Victorian Energy Compare price comparator site, using additional licensing requirements to access data from distributors. They ended up supporting seven different data formats from distributors and multi-stepped consent arrangements where consumers were diverted to distributor websites. Uptake of these arrangements remained low. Many consumers found them too hard to use.

In late 2019, new arrangements with AEMO allowed Victorian Energy Compare to access smart meter data through a more streamlined consent arrangement, leveraging Victorian legislation and the fact that consumers did not receive private data, only advice/analysis based on data. Consumers only have to provide their National Metering Identifier, postcode and retailer. This has allowed much wider access.

As a Commonwealth reform, the CDR has been implemented though Commonwealth legislation with amendments to the *Competition and Consumer Act* 2010 (passed in July 2019). The Federal Treasurer has been afforded the power to designate sectors and datasets under the CDR and the regime is intended to be applied sector by sector across the whole economy, beginning in the banking and energy sectors. Energy data sets were designated by the Federal Treasurer in June 2020[35]. The ACCC is responsible for developing the CDR Rules and CSIRO's Data61 is the designated CDR standards body, responsible for the creation of the technical standards for the sharing of consumer data.

Energy data sets designated in the first phase of energy CDR include electricity metering data (active power consumption), generic and tailored retail plan information, billing data, consumer-provided

[35] CDR designation instrument, Treasury, June 2020 here

information (account details) and data held in the DER Register. This is expected to expand to further data sets in the future.

The ACCC is currently developing Rules to account for the introduction of CDR in the energy sector, with the initial consultation on the initial Rules Framework just complete[36]. This includes arrangements to implement access to data through a designated gateway (a role to be performed by AEMO, building on existing data sharing systems) to minimise costs and barriers to entry for third-party service providers and improve competitive outcomes. It also includes arrangements for identification of energy consumers, authorisation of and consent to data sharing, and accreditation of data recipients.

ACCC's consultation raised a range of key design questions specific to energy (rather than the existing banking model) still being developed. Based on past experience with energy consumers (Example 7), some of these issues have potential to impact the eligibility, usability and uptake, therefore benefits, of CDR. Examples include:

- whether consumers who do not have an online account with a retailer are eligible CDR consumers, and related design challenges for authentication.
- whether particular customers should be excluded, such as larger commercial and industrial customers, which would exclude uses such as energy data for commercial buildings assessment.
- models to allow authentication by only the current retailer, rather than all relevant data holders.
- treatment of active/inactive accounts, which impacts past retailers and switching.
- lower tiers of accreditation that could allow parties to receive less sensitive CDR data across CDR sectors, subject to appropriate restrictions. This could be relevant for smaller service providers developing innovative models.

Data61 is also well under way in developing related standards, with AEMO and a range of wider energy stakeholders actively involved in this process. There is also significant ongoing consumer research.

While CDR is in Commonwealth legislation, which overrides state-based national energy laws, energy policy officials also are considering supporting reforms in energy frameworks to ensure that they remain consistent. Examples include specific Rules around meter data access and support for AEMO's gateway role.

Given CDR is well under way, issues for the Data Strategy on CDR broadly relate to coherence in data reforms over time and working with CDR to maximise synergies and co-benefits, such as:

- considering CDR impacts/opportunities in any changes to energy consumer data requirements over time (such as changes in metering, DERR or billing requirements, or requirements for consumers in embedded networks) and broader consistency issues between standards
- ensuring that any consumer digital tools or information developed by core agencies over time (such as revisions to Energy Made Easy, consumer bill benchmarks or survey tools) can derive maximum benefit from CDR
- considering any impacts or inconsistencies when designing wider energy data reforms

[36] ACCC CDR Energy , Energy Rule Framework consultation, here

- considering synergies in any system developments required to minimise costs and stakeholder impacts.

Recommendation 22: Support coherence with the CDR

Design and implementation of Data Strategy regulatory reforms should consider coherence with related energy law and Rule reforms being developed by officials to support CDR.

Core agencies should continue to prioritise engagement with ACCC and Data61 in developing timely CDR arrangements.

Consideration of synergies with CDR should be core to ongoing development of the Data Strategy and related reforms over time, including through:

- high-level principles driving the data reforms (Recommendation 18)
- Data Strategy coordination arrangements (Recommendation 23)
- future reviews (Recommendation 28)
- consideration of any necessary interactions between proposed DER Standards Governance arrangements and Data61 standards processes.

6 PILLAR 3: CAPABILITY - Drive leadership, coordination and capability

Engage leadership and data stewardship, coordination, best practice and capacity building

Key points:
Propose ongoing leadership structures and services required to deliver the strategy over time and drive change in data management, including:

- A **Data Leadership and Coordination group** (DataLAC) across core agencies to lead delivery of the strategy, coordinate data management, share best practice and capability, and deliver supporting resources and services.
- A **Data Users Group**, to ensure data needs and opportunities across the sector are identified and met in a timely, well-targeted manner.
- Supporting services which need to be developed to improve:
    1. **Data Visibility** allowing transparency of data available and access requirements to improve access and streamlining,
    2. **Data Access** managed through protected systems and services, and
    3. **Data Impact** through delivery of new analytical capabilities and services.

6.1 Problem 3: Non-regulatory barriers

Digitalisation across the economy means many organisations struggle to keep up with changing needs. Barriers to accessing and effectively managing data frequently include non-regulatory organisational hurdles such as: gaps in governance structures or processes; and constraints on capacity and resources.

6.2 Outcomes sought

3.1 Leadership: There is clear ownership and leadership of developing strategic data access and analytics across the energy sector.

3.2 Coordination: There is sufficient coordination and collaboration across energy sector agencies to:

- capture synergies, efficiencies and shared learning
- ensure common protections, policies and processes, and
- ensure general transparency and agreement on common datasets.

3.3 Enable visibility: Data seekers can transparently identify available key datasets and analytics services and understand where and how to access them in a useful and usable way.

3.4 Enable access: Key data holders are identified and have clarity on any requirements to support data access, including protected sharing with trusted parties and wider public release. Any such requirement must consider adequate resources, systems and analytical capabilities to support this sharing in a safe, timely, cost-effective and usable way.

3.5 Enable impact: Datasets are valuable, contributing to timely and improved metrics and reporting, operational and planning capabilities, accessible analytical services and wider research and policy.

6.3 Leadership and coordination

Data is increasingly a part of all aspects of the energy sector and fundamental to most new technologies and reforms. Arrangements to access, manage and share data are embedded across agencies and businesses and entwined in many other processes. This makes change often complex and slow.

The shift in principles and rights proposed under Pillar 2 (as well as some of the new data arrangements suggested under Pillar 1 and Pillar 4) will take significant implementation and re-alignment of many assumptions and expectations. Changes in practices, policies and culture at this scale will require clear leadership and alignment of the new principles with internal governance and reforms. It is likely to be gradual and will require substantial effort to identify opportunities to demonstrate benefits and support examples of best practice.

Further, improving coordination and collaboration will not happen without support. There are currently many diverse processes and players managing data according to their own priorities and responsibilities across the sector, publishing some aspects but often with significant constraints on sharing. By its nature this leads to silos, duplication, inconsistencies, mixed incentives and lack of transparency, with nobody having a clear view of all data or related activities. The Finkel Review noted a lack of 'one source of truth'. In an environment where everyone is busy, with diverse roles and priorities, collaboration and coordination does not happen without a strategic approach.

No one agency can drive this kind of change. It will require a strategic coordinating group, tasked to deliver specific achievements in data reforms, drive cultural change and capacity development and engage directly with the leadership group of agencies and government.

Improving data access, transparency, sharing and use requires engagement of both data holders and data seekers. Generally, data seekers must make a use case, but that is not possible without transparency. Meanwhile, data holders generally make decisions, while bearing the risks and many of the costs. Currently, most energy agencies are both data users and holders to a lesser or greater extent.

Example 9: Data holders and data users

AEMO is the largest data holder of the central agencies with extensive operational, market and settlement data. Most agencies and market participants depend to some extent on AEMO public datasets.

Both AER and ACCC also hold extensive data from retailers, networks and surveys, with powers to request data and statutory requirements to publish.

AEMC, ESB and the jurisdictional policy bodies and a wide range of research bodies hold some data but are more often data users than data holders.

Jurisdictional regulators and agencies also hold key data sets, such as CER reporting, appliance registries and Australian Bureau of Statistics (ABS) surveys. They also hold data related to specific government programs and trials, such as ARENA trials, AREMI and NEAR.

ECA and other consumer advocates are strong data users, as they lead and support consumer-focused research. ECA's regular surveys are also a core source of data tracking.

Market participants, both networks and retailers, hold extensive datasets which inform much of the agencies' data-gathering. They also have a wide range of systemic data sharing processes and

obligations to support settlement, customer switching, services and regulatory obligations. They can also be data users, for example seeking value-added data on DER and alternative services.

New types of service providers and smaller retailers can have valuable datasets, particularly for DER. They also tend to operate at a data disadvantage to incumbent retailers and regulated networks, so are often also data seekers.

Metering Coordinators hold highly valuable data, often with value-added data services well beyond meter settlement data. However, they are restricted by the Rules frameworks in addition to commercial contracts in how they can share this data.

There are some strong interdependencies: some core responsibilities of one agency depend on the required publications of another. For example, both AEMC and AER depend on AEMO market and settlement data for a range of reporting obligations. Government also has some international reporting requirements (such as Australian Energy Statistics, International Energy Agency reporting obligations, and the National Greenhouse Gas Inventory) which depend on data from energy agencies.

To improve the way data is gathered and managed, data holders must be sufficiently engaged and aligned with incentives, as they bear most of the risk and many of the costs. Many of the risks for data holders are perception-based as much as legal, with significant concerns over being perceived to protect data effectively. Most data coordination currently relates to existing roles and requirements of the core agencies, which also have statutory obligations to support better consumer outcomes. For this reason, the ESB proposes that the Data Strategy must be led by the core agencies, with strong expectations of reporting public progress.

Recommendation 23: Data Leadership and Coordination group

Form an ongoing Data Leadership and Coordination group (DataLAC) across the core agencies (including ESB, AEMC, AER, AEMO and ECA) that is effectively resourced to provide strategic advice and review to improve data management across core agencies.

Energy Ministers should agree on clear terms of reference and a forward plan for the group, including regular public reporting on progress to Energy Ministers. Forward plans would link to wider energy market coordination, such as the Regulatory Implementation Roadmap.

This role would be as expert advisor, providing input into planning and decisions, but not duplicating existing decision-making roles and processes.

Responsibilities should include:

- implementation of the Data Strategy
- negotiating collective processes improving visibility, access and impact of data sets held by core agencies
- fostering best practice and capability development
- seeking synergies, efficiencies and alignment of protections, policies and processes
- active engagement with Data Users to ensure their needs and priorities are understood and effectively progressed
- proactively identifying new data needs and gaps; identifying and implementing the most efficient and effective way to address data gaps collaboratively and implement related reforms

Wider engagement and representation will also be needed. If other data users and seekers are not sufficiently involved, sharing and transparency is likely to remain limited and risk-averse, with limited additional benefits for policy makers or research.

Engaging industry data holders may also be advisable to ensure a focus on streamlining and more efficient data-gathering practices. However, care must be taken to ensure that individual interests that are not aligned with greater openness do not seek to limit change and consumer benefits.

This wider engagement could be undertaken through normal stakeholder consultation processes, but some form of standing reference group may provide better results. If competing priorities mean core agencies struggle to make rapid progress on data reforms, a Data Users Group (DUG) may lobby for greater progress, access and shifts away from a risk-adverse approach. Ongoing engagement of individual stakeholder representatives who can work collaboratively with the implementation may also assist with developing common processes and sharing arrangements that work effectively.

Recommendation 24: Data Users Group (DUG)

Form a supporting DUG, which includes representatives from:

- major data holders: ACCC, the Commonwealth, CER, ABS, ombudsmen
- jurisdictions: both policy and regulators
- consumers: ECA
- market participants and service providers
- research community: ARENA, public universities, CSIRO/NEAR

Responsibilities include:

- annual reporting to Energy Ministers on progress on the Data Strategy from the perspective of Data Users
- supporting identification and review of data priorities and providing input on their implementation
- reviewing and providing input into new arrangements to support greater transparency and access, including for example common data sharing guidelines. Representatives chosen from the DUG should sit as observers on the DataLAC.

Question 3: Leadership and Coordination

Is a Data Leadership and Coordination group the right approach to drive change? Are there alternatives within existing arrangements?

Should it be limited to the core agencies or have a wider representation (for example the ACCC, representatives of Energy Ministers or consumers)?

Is a collaborating group, with identified terms of reference and public deliverables to Energy Ministers, sufficient? Or is a more formal governance arrangement necessary?

Is the DUG likely to be necessary and/or effective? Are there other alternatives to a formal reference group, such as regular stakeholder engagement processes?

What else is required to ensure wider stakeholder needs are met?

6.4 Enable visibility

To improve transparency and data access, a necessary first step is to ensure that existing data is visible. This means key stakeholders are aware of it, and/or it is discoverable in an open forum, and any access arrangements are clear.

The DataLAC and DUG proposed above are intended to improve data visibility by establishing forums to bring data sharing interests together. This is likely to be the most critical visibility forum in the near term.

There are a range of existing public places to access energy data:

- The major bodies (AEMO, AER and AEMC) have statutory reporting requirements and publish a range of data sets and reports. All have invested in their online accessibility.
- AEMO also has a range of industry-specific online services.
- AER has Energy Made Easy, which provides data and services on retail tariffs, and supporting data such as the Bill Benchmarking advice.
- other energy sites, such as ECA's survey data and ACCC energy publications.
- the NEAR program has a portal which brings together large amounts of research data and reports, and supplies a range of visual tools to use and analyse the data.
- AREMI is an ARENA/Data61 project that shares mapping data relevant to a range of energy industry stakeholders, based on the National Maps platform. It is a portal to access a range of geospatial energy data, such as infrastructure, wind and solar resources and land restrictions. It seeks to support planning for investment in renewable energy projects.
- a range of jurisdictional sites also have data, such as the Australian Bureau of Statistics, CER, data.gov.au, energy efficiency programs and state regulators and programs.
- a range of industry and research sites, including ENA, AEC, CEC and individual network and retail businesses, that publish data (such as planning reports).
- sites releasing research outcomes, such as ARENA's Knowledgebank and ClimateWorks.
- a range of sites that provide consumer advice and services. These include advocates like Choice and Australian Council of Social Services (ACOSS), the Victorian Energy Compare, New South Wales's Energy Switch and a wide range of commercial service providers, such as price comparators.

Despite this breadth of available data, in many cases key energy data users are unaware of, or unable to find, many existing data sets. The NEAR program has worked with a range of policy, research and operational stakeholders seeking data and has identified this as a major problem.

New datasets often appear unannounced, particularly those related to new approaches or research. Duplication also often occurs between agencies. Very often one activity is well-advanced before the related work comes to light.

The existence of so many providers is part of the problem: it can be unclear where to start. Any website attempting to be all things to all people would undoubtedly fail, as these different sites are targeted at different stakeholders and needs. However, some streamlining or better linking could be achieved and meta-portals (such as Trivago) are an option to direct users to appropriate sites.

Not all useful data is found online, and some cannot be openly published. A lot of data held inside core agencies may be protected such that researchers or other agencies do not know it exists, even if this is unintentional. Better transparency of such data could be useful as a first step towards some form of appropriate access and could also avoid duplication. There are also a range of commercial

providers of data services to the industry (such as monitoring through commercial meters or DER services) where even networks may not know what is available.

Some facilitated coordination of data availability may be an important element of improving data management, at least initially. It could also support discussions around greater access, streamlining and reduced duplication and to help identify further data gaps.

This would imply some curation of:

- available, relevant data sets
- their accessibility and restrictions
- known data gaps
- upcoming activities to expand, update or improve on them (such as upcoming surveys to industry or reports).

This kind of exercise would not be trivial. To be useful it would need to be dynamic and regularly updated. It would also require careful consideration of how to make such a process workable, cost-effect and ultimately useful.

Recommendation 25: Common data portal

Explore options to make energy data sets, related reports and advice more findable, transparent and usable in a cost-effective way.

This would require significant design work focused on usability and stakeholder needs.

Question 4: Data visibility

Should the DataLAC and DUG be tasked with curating/managing a list of relevant data sets and activities? What could be done to ensure that this is helpful rather than a burden?

Is a meta-portal worth considering? Could an existing site be expanded to play part of this role (such as one of the core agency sites, NEAR or AREMI)?

How could this be resourced and funded?

6.5 Enable access

Pillar 2 presents a range of reforms to improve rights to access in regulation. However, the 'right' to access is usually not enough; it must also be enabled.

Even with regulatory support, establishing a 'right' is often a lengthy process, which requires supporting resources in data holders to manage requests. Existing negotiations for access are already a substantive burden for legal teams. Considerations include:

- Does the data request meet the appropriate legal and ethical tests? Is the data seeker 'trusted', accredited or eligible? Is the project/use appropriate? Are there risks of forward use or re-identification?
- Who is available with the appropriate skills, processes and seniority to make the decision and approve the access, and test that any risks have been managed?
- As the data holder, is it in my interests and do I have a supporting internal policy? Can I prioritise the resources needed?

These processes could be streamlined through a standard data access agreement. However, potential barriers, such as the availability of an appropriate decision-maker or technical advice on risks and internal policies, must be addressed.

Once the 'right' to access is agreed, there remain potential technical and practical challenges, particularly if they must be managed in a protected environment.

While modern big data datasets create new opportunities, their size also creates difficulties with sharing, particularly if they need to be managed in a protected environment. Datasets held by AEMO are good examples. These can include 'real-time' data across thousands of points in the grid, or multiple years of national meter data (more than 10 million meters under Five Minute Settlement) or complex market scheduling data sets with a growing number of participants.

Accessing and extracting datasets from these systems to allow them to be shared requires skilled analytical resources within the data holder's organisation. These expert staff must have sufficient understanding of the data to manage any risks in extraction of the data, which may require aggregation, de-identification or linking.

Appropriate skills and systems are also critical at the data receiver's end, with demonstration of an appropriately protected system usually a key requirement for data access.

Example 10: Enabling access requires resources

As discussed in Example 5, CSIRO and AEMO required extensive collaboration over multiple years to facilitate access for NEAR to AEMO-held protected meter data. Expert resources needed in these negotiations and developments were material.

Beyond legal constraints, technical resources needed for the proposed solutions are significant. The physical scale of the data and security concerns are such that a dedicated secure environment within AEMO systems is required, which allows CSIRO access without transferring data. Resources supporting linking and de-identification require specific skills and need to available to collaborate responsively with researchers. Availability and competition for these skills creates project risks and potential delays, so the optimal option was for NEAR to fund dedicated resources within AEMO.

NEAR is a highly skilled and well resourced project and yet these arrangements caused challenges and delays. In many cases research partners will have less resources to support these arrangements so they remain a risk to timely access.

AEMO is currently the largest source of meter data. Meter data and related datasets are vital for much of the high-value analytics in the energy sector, including forecasting, visibility of DER and the LV network, understanding consumer behaviour and consumer bills. Working with AEMO, NEAR has been adding value to this data, including identification of behavioural clusters in meter data, identification of DER and gas based on pattern in electricity meter data, and linking to datasets which can impact use such as building characteristics. Reforms underway (including competitive metering, Global Settlement, Five Minute Settlement and DERR) further enhance the analytical value of this data, including creating the first largely complete set of meter data. Proposed reforms in this Strategy for retail transparency, consumer analysis and DER integration could enhance it further, making this dataset a unique asset of enormous value in improving consumer outcomes from competition and pricing reforms to increasing value from DER.

AEMC, AER, policy makers and wider researchers will increasingly value analysis from this data to support the long-term interests of consumers through market monitoring, design work and Rule-making. Given the potential value to consumers, consideration should be given to alternatives to support this access, comparing costs and benefits and suitability for different purposes. Alternatives include:

- creating trusted facilities and capabilities in alternative agencies (such as AER, AEMC, CSIRO or another research facility) and allowing data to be transferred
- extending 'secure digital lab' facilities within protected AEMO systems to allow approved external analysts to undertake approved work
- supporting analytical services, either through AEMO or a service provider with access, potentially as a cost recovery service
- limiting analytics to a range of reporting or dashboard services, provided by AEMO.

Several of these options could leverage or extend the current capabilities and roles of existing research programs, such as NEAR.

In any of these scenarios, skilled resources will be required. AEMO already has a range of internal requirements and their own analytical needs are growing. Each year it receives numerous ad hoc analysis requests and, despite their willingness to assist, often lacks the internal resources to meet these requests. A range of external events in recent years (bushfires, COVID-19, major storm events) have added to this challenge.

While cost recovery services are an option, a range of base system costs would need to be covered. AEMO's capacity to prioritise support for other agencies over their internal responsibilities is an ongoing challenge. Given the increasing value of access to this data for consumer outcomes, consideration should be given to formalising AEMO's role in supporting these services and/or ring-fencing of resources into a separate service.

To some extent, all agencies will need to develop their own analytical capacity to support both their internal needs and requests for sharing. While AEMO has some of the largest datasets, a range of market participants and networks have datasets which create similar challenges. Even agencies with less cumbersome datasets often need internal analytics to aggregate or de-identify data to allow them to share with other users, as well as for their own needs. This will be a growing capability in a digitalised market.

Recommendation 26: Resources and capability to support access

Ensure that AEMO, AER and other trusted data holders have the resources and capabilities to support appropriate access and sharing of priority data sets, including developing streamlined transparent processes to manage approval of data access or analytics requests.

Develop systems and/or processes to access data, including managing any required levels of protection or analytics for extraction.

Consider the governance requirements that will allow these bodies to support and prioritise high-value uses for a range of public-good stakeholders.

Question 5: Data access and supporting resources

How do we ensure that systems and analytical capabilities are available to support better data access? Who is best placed to support this capability?

How do we ensure that stakeholders eligible for appropriate data access don't find resourcing a barrier?

For access to outcomes from high-value AEMO datasets, does AEMO need specific obligations or support to ensure resourcing or prioritisation are not a barriers?

6.6 Enable impact

Few of these datasets will be of benefit without sufficient analytics to fully maximise data value. These resources remain constrained across all agencies. We have discussed the need for technical resources purely to access and manage the data, but further consideration is needed of how to support high-value analytics and outcomes. The worst outcome would be to bear the costs and related risks of digitalisation without any of the benefits for consumers because the data was not used effectively to improve policy and services.

As priority data gaps are addressed and datasets increase in potential value, DataLAC and DUG should have continuous targets to identify and prioritise ways to demonstrate and leverage this value. Considerations may include:

- support for priority data gaps through better reporting, analytics tools or data dashboards such as retail monitoring dashboards or a Health of the NEM dashboard
- updating of data-gathering methods to reduce costs and manual processes where possible
- streamlining of reporting through shared resources
- supporting greater access for researchers, policy and public-good data services.

Example 11: Resourcing analytics

NEAR resourcing has focused on developing long-term research capabilities and related IP to better understand demand and forecasting. Priorities are negotiated and balanced across annual workplans.

However, NEAR has also had many requests for ad hoc and reactive analytics, in response to emerging needs. NEAR has often responded to these requests to demonstrate value but has struggled manage it outside of pre-agreed workplans. Examples of these reactive requests have included:

- the Smart Cities program seeking to monitor changes in energy use in different regional areas (not reported anywhere else)
- requests from states on localised use related to building efficiency trials
- linking solar uptake to regional demographics
- confirmation of basic usage trends to cross-reference with national energy reporting
- work required for the ACCC REPI review that tested a range of tariffs against meter profiles.

Many of the recent high-value data needs and contributions to policy and operations in recent times have been urgent or short-term queries, which the NEAR program was not effectively positioned to provide. Agencies and market participants attempted to redirect internal capability to fill many of these gaps. They included:

- monitoring energy demand at local levels or different economic segments during COVID-19, particularly in gauging recovery

- reviewing events during bushfires or other disasters, and related recovery
- monitoring the impact of DMO on pricing on different segments.

Resourcing of analytical services needs to consider both longer-term development priorities and capacity for more flexible work responsive to short-term queries and emerging needs.

AEMO and distribution networks are often asked to undertake analysis like these and usually attempt to assist, but generally it is outside of their current role and resourcing.

While all agencies have internal analytical needs and need to build capability, active consideration should be given to leveraging shared datasets, shared resources and building learnings and best practice. This also has the potential to reduce duplication.

Key to deciding on the best model for analytical capability is considering how these analytical teams will access priority datasets, particularly high-value AEMO datasets. While some trusted bodies could probably be provided safe direct access (such as CSIRO, AER or key government analytical teams), there may be a range of bodies for whom research outputs may be valuable but direct data access may be less appropriate (such as commercial service providers or market participants).

Options could include:

- Where skilled resources are required to support access to AEMO datasets (discussed in the previous recommendation), scale these resources to allow for an analytical services team to support priority reporting and services for core agencies, and/or wider services on a cost recovery basis. These resources would need to be scaled beyond AEMO's internal needs to support parties outside of AEMO and/or ring-fenced, to ensure that needs beyond AEMO could be met. In this scenario there may be a need to clarify AEMO's statutory role in supporting wider analytical services to the energy market.
- Expand on a model similar to NEAR, providing for a dedicated third-party analytical service provider who has access to core dataset and can meet a range of needs. This could build on the current NEAR partnership with CSIRO or consider a new arrangement. Consideration should be given to nimble, responsive services and basic data management as well as longer-term research.
- If AEMO develops a 'secure data lab' to allow direct access and analytics by a range of trusted parties (for example AER, AEMC and CSIRO), build a community of practice between these separate analytical teams to share learning and build capability.

Recommendation 27: Reporting and analytics capabilities

Task DataLAC/DUG to demonstrate high-value uses of new data capabilities and provide recommendations on building capability and resourcing required.

This should include:

- identification of common reporting needs and resources/responsibilities to deliver these
- identification of expertise within core agencies or third parties with access to data who are available to support analytical services in the interest of core agency needs, consumer outcomes and the public good.

Question 6: Data impact and resourcing analytics

How do we ensure that key research and analytical needs can be met, to maximise consumer outcomes?

Who is the best party to support analytical services and build capability? Is this best undertaken internally by all parties or is some central or third-party expert capability advised?

7 PILLAR 4: NEEDS TOMORROW - Support change and adaptability

Embed forward-looking, proactive and flexible approaches and support research

Key points:
Consider the flexibility needed to manage changing data needs in the energy market transition, in a timely and strategic manner, and propose:

- **Proactive ongoing review** of needs for data and related standards by the DataLAC
- **Guidance for future Rules and reforms** aligning with the high-level data principles and allowing for adaptability
- **Improving research data** through new guidance for research projects and work to make

7.1 Problem 4: Keeping up with change

Rapidly changing technologies and needs in the energy market transition create many new data challenges, but current regulatory and non-regulatory arrangements can be slow to respond and lack flexibility. Lack of governance or ownership of a problem can often delay policy changes and standards until long after they were needed. Managing change also requires active contribution from research, but data availability on new approaches is often delayed and data constraints frequently limit research and collaboration.

7.2 Outcomes sought

4.1 Proactive data governance: Responsibility of ongoing review of data requirements in the sector is clear, with regular and forward-looking requirements.

4.2 Adaptive arrangements: Regulation, Rules and processes impacting data and related technologies are designed to be adaptive to ongoing change and enable timely updates.

4.3 Standards and interoperability: Data standards and supporting common processes are managed in a proactive way, with a focus on timely development, forward requirements, adaptability and interoperability. They are supported by clear governance and resourcing.

4.4 Enabling research data: Energy research is supported by appropriate ways to access sector data. Public funding support for new technologies and trials includes clear requirements for capturing and sharing data under common arrangements. Available research datasets are curated to be visible, accessible and useful, with support for research collaborations.

7.3 Proactive governance

As the pace of change increases in the energy sector, many emerging problems in data access, common standards and related processes are not being resolved quickly enough. This creates risks and costs in the market transition. Clear ownership of identifying and resolving data gaps, and looking forward to plan for data needs, is critical to ensure that the market transition is least cost and optimised.

Recent data gaps (such as smart meter data, DER data and LV visibility) have highlighted the challenges of changing needs and time required for the energy sector to collectively resolve these problems. Some delays result from the need to coordinate many organisations around the solution, while others are due to a lack of clarity on who should resolve it or drive the needed coordination.

Timeliness is a key issue. Technology is a moving target: by the time a solution emerges, the problem has often changed. But at the same time, while technologies are changing quickly, they can also last

a long time, creating inertia in the energy system. This can slow capacity for some change, such as improving visibility and control, or improving efficiency and reducing emissions.

Example 12: Technology renewal rates create inertia, slowing capability upgrades

Once invested, newly-installed equipment can be part of the energy system for decades. Renewal rates can limit ability to upgrade standards and capability. As an example:

- a rooftop solar system installed today will likely be there in 20 years' time (2040)
- its accompanying top-of-the-line inverter lasts around eight years (2028)
- the new meter installed with it could be there for 15 years (2035)
- the distribution line it is connected to is probably already 40-60 years old and not due for upgrades for any time soon
- the energy inefficient house under the solar panels might have been built 40 years ago and be still standing in 40 years (2060).

There are more than 2.4 million solar systems currently installed, which is around 20 per cent of homes. Most of these will need to be managed into the future with their current inverters and meters, neither of which are likely to be designed for dynamic operating envelopes and interoperable communications (or in many cases, any communications or inverter control). It is estimated over a million still have only an accumulation meter.

Over the last three years around 200 000 on-roof solar systems were installed annually[37], so any standard or digital capability that takes years to resolve has material implications.

What percentage of homes will have an electric vehicle will be before there are agreed standards or minimum requirements for smart charging?

Example 13: Data reforms responding to new technology needs take time

DER Register

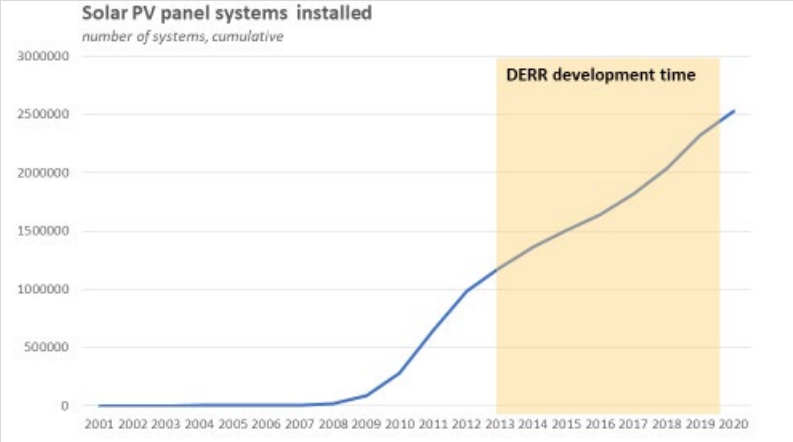
Prior to DERR, on-roof solar data was collected from CER through the Small-scale Renewable Energy Scheme (SRES) subsidy. This dataset was always at risk of the subsidy being removed, and it does not capture related DER data, like batteries or EVs. DERR was developed as an alternative permanent reporting requirement, working with stakeholders for around five years through policy case, design, Rule and technical development. The system went live in March 2020.

During this time on-roof solar went from 10 per cent of homes to 20 per cent of homes (around 1.2 million systems)[37]. SRES continued to capture data from on-roof solar so this dataset is fairly comprehensive. Batteries have been more challenging, as CER captures these voluntarily. CER has captured data for around 27 000 batteries but estimated this may be only around 30 per cent, suggesting a possible 60 000 unidentified.

The DERR Rule has been designed to evolve, facilitating new data collection guidelines to support emerging technologies and information gathered through other processes such as the Demand Side Participation Information guidelines.

[37] Clean Energy Regulator, published data on the Small-scale Renewable Energy Scheme. here

Figure 5: Uptake of roof-top solar



Consumer access to data

Consumer access to their smart meter data was first recognised as important around 2007-8 when the Victorian smart meter roll-out and related standards were being developed. Most of the debate then involved options for in-home displays; smart phones were not yet common (first basic iPhone launched in 2007).

Around 2012, Victorians began to have a range of time-varying (peak/off-peak) retail plans to select from. However, consumer usage profiles are complex and highly variable across days and seasons. Consumers cannot effectively estimate whether they would be better off on various time-varying tariffs without access to their smart meter data and tools which will allow them to compare tariffs using their own data.

A Rule change in 2014 gave consumers the right to access their meter data for the first time, through a request to their retailer or distributor. However, this Rule did not establish common processes for retailers or networks to check consumer identification or gain consent and data formats varied. Lack of these common processes proved to be a major hurdle with limited uptake. The Victorian government provides a price comparator tool, Victorian Energy Compare, and worked for many years on alternative arrangements to allow consumers to access their smart meter data for use on the site. But these alternatives proved difficult and not usable enough for most people.

COAG EC recognised this key problem and began a workstream to resolve it in early 2017. In late 2017 the Productivity Commission, reviewing data policy, proposed the economy-wide CDR.

Energy datasets were formally designated under CDR legislation recently in June 2020. The solution is currently being implemented but is not yet operational.

At the same time, AEMO and the Victorian government have also established a means to share electricity metering data with Victorian Energy Compare. The new service, launched in November 2019, provides an easy and timely way to do a bill estimates based on actual usage data, but using only estimates, not the raw metering data. The comparison site hosted by the AER, Energy Made Easy, is also now leveraging the same service to offer data-based comparisons to consumers.

Consumers now have some effective access to tools to select a time-varying tariff, around 8-10 years after time-varying tariffs began to be introduced.

Recently many detailed data and standards issues in DER integration have been progressed by the DEIP process. The DEIP is a collaboration of 15 bodies, (from government agencies, market authorities and industry and consumer associations) aimed at maximising the value of DER for all energy users. DEIP workstreams are considering a range of data issues. For example, the Interoperability and Standards working Group (led by AEMO) is considering communication standards. The EV working group (jointly led by AEMO and ARENA) is considering EV data needs and EV charging standards.

DEIP emerged to address the increased need for collaboration between diverse stakeholders to resolve these issues. It seeks to complement existing institutional processes by building industry capacity and consensus and accelerate the effective integration of DER into the electricity system. ARENA has played a leading role by initiating DEIP, in response to a range of workshops on industry challenges, and resourcing key activities.

DEIP demonstrates the strength of a voluntary collaborative approach, as it is clearly progressing well and addressing many crucial current needs. However, it may also demonstrate a weakness in underlying systems - DEIP emerged to do work that otherwise were not happening. DEIP member participation is currently on a volunteer basis with no dedicated funding. ARENA's involvement is valuable, but demonstrates them being proactive and responsive rather than meeting a clearly defined responsibility. DEIP priorities are developed on a consensus basis and activities are designed to be time-limited and fit-for-purpose. While this approach has been effective and made significant progress in a range of areas, limited resources mean other workstreams have taken a long time to get started. In many cases these issues were already overdue for resolution and it is not clear which body would have done so if DEIP had not emerged organically.

Many initiatives in the energy sector are progressed through collaboration. While this is often necessary, substantial momentum can be required for such collaborations to begin and can result in delays. Funding collaboration can be reactive and cause delays; often participation requires individual organisations to eke out funding from existing budgets and priorities, resulting in under-resourcing and a slow process.

While collaboration is undoubtedly powerful on many issues, collaboration on data can be difficult. Regulated access constraints, lack of clarity on privacy and ethics and commercial concerns often limit well-intended efforts to share. This was well demonstrated by the NEAR joint venture (Example 4), which sought to use collaboration between trusted agencies and public funding to overcome data barriers, but still resulted in multiple years of negotiations and limited success in data sharing.

Clear ownership of identifying and resolving data gaps is needed, as well as looking forward to plan for data needs and appropriate resourcing. As the pace of change increases in the energy sector, many emerging problems in data access, common standards and related processes are not being resolved quickly enough.

Recommendation 28: Forward review of Data Strategy against outcomes

Task DataLAC to undertake an annual stocktake of performance against the outcomes identified in this Strategy, identifying emerging or persistent gaps in data requirements and access, and opportunities to streamline data management.

There may also be benefit from an independent review at year three. This should be included in any terms of reference for the DataLAC (Recommendation 23).

Question 7: Proactive governance and forward review

Do we need more proactive approaches or clear responsibilities to resolve forward-looking technical challenges in data? Whose responsibility should it be?

7.4 Data Standards and interoperability

The challenge of proactive governance is a particular issue for standards. Standards to date have faced a range of diverse collaborative processes, with unclear ownership of issues, mixed incentives and slow progress.

The rapid development of new DER technologies, and the increasing need for them to be coordinated and interoperable, means a range of new data and communications standards are now required, with likely future needs continuing to emerge. These standards will be necessary to support emerging arrangements such as dynamic operating envelopes to manage constraints and coordination by market aggregators. Delays in these standards can be costly as new systems continue to roll out rapidly.

Many existing data standards in the NEM are coordinated by AEMO, to support coordination of data through central market systems. However, until recently DER had little interaction with central systems, with requirements instead imposed by networks through connections arrangements and varying between networks.

DER standards were identified as a key concern of the ESB DER Integration Workplan. In December 2019, the ESB commissioned a review into the governance of DER technical standards[38] which found:

> "to date the governance of DER technical standards has been fragmented and uncoordinated. The pace of change in the governance area is slower than needed and more resources need to be dedicated to the setting of standards given the rapid deployment of DER, across the National Electricity Market (NEM) and the Wholesale Electricity Market (WEM) in Western Australia."

Responding to this, the ESB consulted on DER Standards Governance and has proposed a Rule change to support new DER Standards Governance arrangements. The proposed process would make AEMC the decision-maker, who would be required to, among other things:

a. *"monitor, review, develop, consult on and set a vision and work program for DER technical standards for the national electricity system (updated annually);*
b. *update or develop new DER technical standards as needed"* [39].

This arrangement provides an opportunity for AEMC to set a more proactive and timely approach.

[38] Review of governance of Distributed Energy Resource (DER) technical standards Energy Security Board, Sapere Culter Merz, December 2019, here

[39] Governance of distributed energy resources technical standards, Rule change proposal, here

Along with this new governance process, a range of supporting technical work is under way to propose new DER Standards. AEMO is consulting on proposed standards for inverters[40]. The DEIP Standards, Data and Interoperability working group has initiated a DER Device Standard Taskforce to undertake a range of technical advice. It will work closely with related taskforces including:

- DER Cyber Security Taskforce
- DER API and Data Taskforce
- EV Standards Taskforce
- EV Data Taskforce

It will also interact with various Standards Australia committees identified throughout the development of work packages.

The new CDR process has also created a new standards body within CSIRO's Data61, which is developing new standards needed for CDR, with input from a technical working group. This will include a range of data standards and related requirements, such as security and consent processes.

These new and emerging arrangements, once fully implemented, will hopefully resolve timely development of most data-related standards. Should gaps remain, DataLAC could raise these issues as part of their forward review.

Question 8: Standards governance

With the introduction of the proposed DER Standards Governance arrangements, DEIP processes and the new CDR standards body, many standards needs will be actively progressed.

Will these arrangements likely support most ongoing needs for data standards? Are there gaps or wider issues which need to be considered?

7.5 Adaptive Rules, procedures and guidelines

Energy regulation with related Rules and processes are complex and often necessarily prescriptive. Where there are issues of compliance, risk of misinterpretation, or diverse incentives and concerns, industry and regulators have preferred clarity and a certain level of prescription provided in the Rules. However, a downside of prescriptive regulation is that it can limit the ability for regulation to adapt flexibly to changing needs over time or potentially create unintended interactions. While this is a general issue across all types of regulation, including the Energy Rules, the rate of change in technology and related digitalisation makes over-prescription and lack of adaptability a particular concern in the context of Data Strategy.

Example 14: Prescription can challenge adaptation

National Energy Consumer Framework (NECF): the AEMC's 2020 Retail Energy Competition Review considered future consumer protections as the market digitalises and moves to DER and two-way flows of energy. They found some key issues related to existing NECF regulations, which were prescriptive and could be improved in a more digitalised market. Retail billing requirements and notification of contract changes were key examples: bills must contain 24 different items, and many notices of contract changes must be issued by mail or email. Given that new phone applications and

[40] Distributed Energy Resources - Initial Standard, AEMO, August 2020, here

smart meters allow customers to access information in new and more convenient ways, there is an opportunity for the Rules to be updated to reflect increased digitalisation in the market. They concluded that this could be achieved through a principles-based approach to regulation and suggested industry engagement in developing guidelines. They also highlighted other areas where prescription remains important for consumer protections, such as disconnection notices.

Bill Benchmarking: residential consumption benchmarking data (Rule 169 of the NERR) is an example of a Rule with limits on adaptability. This Rule specifies the types of information and data that must be used to determine benchmarks (i.e. household size and localised zones) and who the data is to be collected from:

Rule extract:
NERR 169(3) "The electricity consumption benchmarks must be based on the following:
(a) electricity consumption information received by the AER from distributors pursuant to rule 171;
(b) localised zones as determined and notified to the AER by the relevant jurisdictional Minister;
(c) household size."[41]

While these requirements were based on the best understanding at the time of what would be useful to consumers, , the Rule limits updated or innovative approaches that may take advantage of new data sources or better ways to develop a benchmark (ie: by factors other than household size, such as gas, DER and building type). The obligation does not include a review cycle for AER to assess the impact of the bill benchmark since introduced and its overall effectiveness, which is certainly worthy of review as evidence is limited as to its current impact. It also specifies that retailer must provide it on the Bill, which raises issues when moving to electronic billing apps etc. Lack of in-built flexibility means the AER is required to undertake Rule changes to update their approach and make it fit-for-purpose, which requires an extensive investment in time and gathering of evidence.

Meter data access
National Electricity Rules Chapter 7[42] prescribes access to meter data and related meter data security requirements. As originally perceived as security'' arrangements the terms of use are prescriptive rights and obligations: "*only* the following persons may access or receive metering data" (7.15.5 (c)). These Rules were originally designed around meters read manually providing only four numbers a year.

As metering data has grown in value and needs have evolved, the specificity in these Rules has caused challenges. There are increasingly important purposes for which access to metering data is not provided, such as protected de-identified analysis for forecasting or aggregate research (discussed further in Example 14 and Appendix B, Recommendation 6).

AEMO can also not provide data to an individual meter owner (or their representative with consent), who have to access it from their own retailer or distributor. This previously made sense, as AEMO data is de-identified as a meter point, with no relationship with the consumer to authenticate access. But it is cumbersome now that consumers can switch and they may be accessing data from many retailers, who do not have standard arrangements or formats. AEMO coordinates retail

[41] National Energy Retail Rules, here
[42] National Electricity Rules here

competition and settlement, so it has systems already in place which could be better leveraged as a single coordinated access point[43].

AEMO and the Victorian government spent some years seeking an option for AEMO to assist with Victorian Energy Compare, so a consumer could access personalised bill estimates through a trusted government site, without having to coordinate all Victorian distributors or retailers in real time. Similarly survey processes (even regulated ones such as Bill Benchmarking or the ABS) gain consent from survey participants to access meter data but currently waste months coordinating that access from 17 distributors in different format rather than a single access point at AEMO.

Considering CDR arrangements, the ACCC has proposed to change this, instead making AEMO an access gateway and a holder of meter data. Energy officials are considering NER changes that may be needed to better align with CDR.

Consumer access to meter data: prior to the CDR, regulatory obligations for energy retailers and distributors were established in 2014 to provide meter data to consumers and their service providers. These were largely ineffective as the Rule *was not prescriptive enough* in requiring *common* standards for data formats, identification and consent. Mixed incentives in releasing data meant common standards were not addressed by industry cooperation. The Rule also explicitly allowed 10 days to provide the data, due to stakeholder concerns over non-digital delivery mechanisms, making it ineffective for online services and smart meters. As a result, introduction of these obligations did not lead to the expected expansion into new data-driven services. CDR is a potential solution to this.

DER Register: provides a recent example of a flexible, outcomes-based approach. The DER Register Rule change required AEMO to:

- establish a register with a broadly defined purpose and contents. The DER Register stores information about a DER device installed on-site at a residential or business location in the NEM.
- issue DER Register Information Guidelines on the data to be included in the register, subject to consultation and other requirements. The Rule does not specify data fields, reporting timeframes or formats, providing flexibility for these to be defined in guidelines following consultation.
- report DER statistics quarterly.

Prescriptive approaches are a natural outcome of consultative processes that must address many competing concerns, with detail providing clarity on a range of perceived risks.

Alternatives, such as principles-based approaches or referring to sub-ordinate technical guidelines, usually require stakeholders to trust a core agency or similar decision-maker with greater discretion. Stakeholder comfort can still be managed, however, through clear definitions around the objectives or constraints, or directing consultation requirements.

[43] Particularly as with Global Settlement reforms AEMO will hold all meter data. It currently already holds most meters (over 70 per cent) including all smart meters, all larger scale meters and any meter which has ever been on a market contract (required for settlement). The main areas with significant gaps are where there is still limited retail competition – such as Tasmania and north Queensland.

The issue of balancing prescription has been raised in recent processes considering complexity in Energy Rules, including the AEMC's recent 2020 Retail Energy Competition Review and the KWM review (Appendix D).

The AEMC is currently considering principle-based approaches, among other issues, as part of a drafting philosophy which will guide its approach to Rule-drafting.[44]

7.6 Consistency of new Rules, guidelines and procedures with new Data Principles

With reference to future Rules, KWM considered drafting guidance requirements around data policy reforms more generally. KWM's raised issues where different levels of prescription could lead to inconsistent interpretation between different areas of the Rules and higher-level principles in law. These challenges partly emerged due to complexity, with the energy framework comprised of many layers and interacting with wider frameworks such as privacy law and competition law. They can also emerge over time due to incremental reforms focusing on specific issues.

Extract 6: Prescription can create problems in interpretation

KWM raised issues where prescription in Rules provides less clarity or potential contradictions. (Appendix D, p62).

"…we discussed AEMO's broad rights under section 53D of the NEL and section 91FD of the NGL to **use data it obtains in any way for any purpose related to its statutory functions.** One issue AEMO faces relying on these rights, as discussed above, is their potential to be 'read down' by the level of prescription found in the Rules."

The Rules below have in the past been interpreted by some as implying AEMO can only use metering data for settlements, not other purposes in their role such as forecasting and planning.[45] This would significantly limit forecasting, putting consumers at risk of higher costs through infrastructure and market inefficiencies.

Rule	Description / extract	Issue
7.10.1(a)(7)	**Metering data and NMI standing data** "*Metering Data Providers must provide … the delivery of metering data and relevant NMI Standing Data to AEMO for settlements*"	▪ Imply that use by AEMO for any other purpose is prohibited. ▪ Suggest that disclosure of this data to Core Bodies under the NEL is prohibited, as those Core Bodies do not fulfil settlement functions.
7.11.1(f)	**Settlements ready data** *"The settlements ready data held in the metering database must be used by* AEMO *for settlements purposes*"	

[44] The drafting philosophy is being developed as an outcome of a recommendation in the 2017 Finkel Review to review the NER "with a view to streamlining them in light of changing technologies and conditions"
[45] Attachment D, KWM p62

High-level principles intended to avoid this are proposed in Pillar 2, along with range of up-front Rule and law changes. These principles must be considered along with proposed reforms in terms of how they might be recognised by core agencies in their functions, including AEMC's Rule changes.

KWM suggested that published guidance for Rule change proponents be updated to provide more specific approaches on data, in line with high-level data principles and revised approaches. However, AEMC's current Rule change guidance materials are relatively high-level and do not contain subject-specific guidance. The AEMC's guideline on submitting Rule changes could reflect the drafting philosophy.

Recommendation 29: AEMC Rule guidance

AEMC should update external guidance to Rule change proponents to be consistent with the wider principles on data policy and consideration of more adaptive approaches.

Recommendation 30: Forward Rules advice

As part of their proactive role advising on future data requirements, the DataLAC should have an ongoing role to consider proposed new Rules, guidelines and procedures for their consistency with new data principles, approaches and adaptability to change. Any issues of concern should be identified and referred to the relevant core agencies developing these approaches.

This, like all other roles of the DataLAC, is proposed as an advisory role only. It should be included in any terms of reference for the DataLAC (Recommendation 23)

Question 9: Adaptable arrangements

Do stakeholders have views on how to ensure the design of Rules, guidelines and procedures consider the new data principles and the need to adapt more flexibly as technology and data requirements change?

Do stakeholders think more detailed Rules guidance, as proposed by KWM, is necessary? Are there alternatives?

Other processes have proposed a default to non-prescriptive approaches for certain types of Rules – is this workable in the case of data-related Rules?

Should the DataLAC have a role in providing advice on data issues and approaches in new Rules, guidelines and procedures? Could this be part of contributions in normal consultation processes or would it need a more formalised function (noting additional requirements may lengthen the time it takes to consider a Rule change)?

7.7 Enable research data

Given the visibility of challenges in the energy sector, there has been extensive investment in public research and trials in recent years which either creates or relies on extensive energy data. This includes:

- direct energy data projects such as NEAR and Victorian C4NET
- DER data-related trials funded by ARENA, bringing together industry and researchers
- several related Cooperative Research Centres (CRCs), including the recently-announced Reliable Affordable Clean Energy for 2030 Cooperative Research Centre (RACE for 2030 CRC)
- many jurisdictional grant programs, such as battery trials in the ACT and South Australia
- industry-led research, such as work by ENA with CSIRO
- universities that have invested in a range of specialist groups, such as Solar Analytics, the Australian National University Battery to Grid Storage integration program and the University of Queensland Centre for Energy Data Innovation, among many others.

Data is central to most of this research but remains a core challenge and constraint. Research has often been delayed or sub-optimal due to regulatory barriers to accessing relevant data, even when working directly with industry partners. Data from trials has also often been restricted, impossible to share or underused, even when data-gathering was a core aim of the project. Core datasets, like meter data, remain difficult to release to research groups due to concerns such as re-identification and a lack of processes and system to share data safely.

This is a material concern, as many millions of dollars are invested in these programs[46]. Where data access issues constrain outcomes or limit utilisation of the work, this represents under-leverage of public funds. Empowering researchers with greater access could also accelerate many projects and open new ways to address challenges. This could make a major difference in the sector's efforts to manage growing risks and capture new opportunities.

Example 15: Data access creates research risks

Data is frequently a key research risk which is underestimated, with many projects delayed or having to change scope due to unforeseen barriers to data access, often reducing the impact of millions in research funding.

Even when working with active and willing industry partners, access to data has been difficult. This has happened in many projects, with examples including: NEAR (Example 4); *evolve* DER[47] where concerns over re-identification of NMI data created barriers; and several of the ARENA DR trials. Often the industry partner initially thought the data was available and able to be shared with the research partner, but hit hurdles during the process.

These can be technical problems with the data or regulatory problems once lawyers examine the detail of a data-sharing agreement. Frequently there are delays while solutions are negotiated or limitations on research outcome. Lack of clarity in the Rules (as discussed above) or different ways to interpret principles can often be a hurdle here, with different lawyers providing contradictory advice. Where one project accessed data another is told the same data is out of bounds. Clearer guidelines would save time and money.

The C4NET[48] group provides a counter example, by adding value through data expertise to these industry-research partnerships and facilitating guidance. Through experience working closely with Victorian distributors, C4NET has developed data access models which work and support contacts in

[46] Examples of government-funded programs include, but are not limited to: NEAR: $20+ million, DER-related ARENA projects: estimated almost $1billion, Low Income Energy Efficiency program: $55.3 million, Smart Grid Smart City: $100 million, new RACE for 2030 CRC: $68.5 million in government contributions.

[47] *evolve* DER here

[48] C4NET was established as a not-for-profit collaboration between industry, governments and researchers with a key objective to address barriers to accessing energy data.

the businesses. They are helping to apply them to a range of research projects and facilitating re-use of research data sets once established.

Example 16: Data sharing constraints limit research value

Trials and research often have reduced impact due to a lack of clear and coordinated guidelines in data sharing, with millions in public funding often underutilised.

Many government grants for pilots seek to support learning in new energy products while explicitly gathering data for the wider industry to use (such as Smart Grid Smart City, Solar Cities, the Low Income Energy Efficiency program and many ARENA projects). Much funding is also directed into explicit data research, such as surveys.

Despite the clear up-front goal of sharing this data with a range of stakeholders, it has often proven challenging, due to unforeseen problems in the way it was gathered. Problems can include: insufficiencies in the wording of consents, complex ethics board approvals, unforeseen commercial constraints, gaps or quality issues in the data limiting analysis, or lack of agreed formats or mechanisms for de-identification.

Many of these issues could have been avoided with clearer initial agreements and guidelines on data sharing requirements. Most grant managers, project managers and researchers lack specific expertise in data policy, and seek and receive minimal guidance.

One of ARENA's clear objectives is to "build knowledge that can be shared openly to help industry and government better navigate the energy transition". Sharing a range of learnings including data, outcomes or tools, is part of requirements for their project agreements and much of this data is accessible through their online open source Knowledge Bank. While many of these projects are highly valued, much of the data still suffers constraints on sharing or a lack of visibility, so is underleveraged as a resource. As with other government grants, early guidance in data sharing could better inform how data is gathered. One mechanism ARENA has increasingly used to improve sharing and usefulness of project data and outcomes is requiring projects make more use of up-front formal expert advisory or reference groups. This approach could also be undertaken more widely in government or be part of an up-front guideline.

NEAR's portal publishes much energy research, both from the program and wider sources, but it is hard to navigate and lacks visibility. One of NEAR's goals was to facilitate better data sharing with the wider research community, and there was also quite a lot of early engagement regarding these user needs. However, challenges in accessing data (even within NEAR) has meant data that could be shared with wider researchers has not met expectations.

Improving data sharing and access to open data is a common theme across many research communities, not just energy. Related processes in Australia include support for development of eResearch platforms through Australian Research Data Commons (ARDC). These open research platforms often avoid data privacy issues through a range of methods to 'synthesis' data through algorithms trained on real data. There has been a range of proposals for these kinds of platforms for energy research, with synthetic/modelled data to investigate LV/DER integration. Current research datasets could be coordinated to become less fragmented.

Several aspects of the KWM recommendations in Pillar 2 relate directly to supporting better data sharing to support research:

- *Data sharing guidelines* – in the first instance, even prior to reforms, KWM proposed developing common guidelines for data gathering and sharing to support better navigation of current arrangements. This would be particularly useful in providing more consistent guidance to funded research projects up-front to ensure that the data gathered errors (such as in consent processes or data access agreements) do not create unnecessary barriers to sharing.
- *Overhaul - Purpose of the data use* – permissions for data sharing will link directly to the *purpose* of the data use, with a range of defined purposes supported. Research to support the public good (as well as energy market objectives etc.) is proposed as a priority supported purpose. This is consistent with wider 'open data' reforms to derive better value from publicly held data.
- *Overhaul - Trusted data users* – trusted users can be accredited, ensuring that a range of security and trust measures are met and imposing clear obligations for the treatment of any shared data. This will allow a more flexible path to share data with a wider range of trusted parties, with public-good researchers in robust institutions like universities and jurisdictional agencies likely to be key beneficiaries.

Recommendation 31: Guidelines for research data and related reforms

Actively progress the reforms proposed by KWM (Pillar 2) to support greater data sharing for defined purposes, and specifically public-good research.

DataLAC and/or DUG will to work to support the development of energy data sharing guidelines for research projects, including legal guidelines to support greater data sharing, common consents and leveraging KWM-proposed reforms, such as:

- technical guidelines to support open source approaches and relevant data standards
- engagement guidelines to promote collaborative arrangements up-front, such as a project data reference group, to ensure that data outputs from the project are well-targeted and utilised.

These guidelines should be a requirement for publicly funded projects but also applicable to wider energy research projects and institutions.

This process should engage with key research stakeholders, including ARENA.

Recommendation 32: Improve accessibility of research data

Review options to make current research data more visible, accessible and usable, through either:

- some form of the proposed portal (Recommendation 8)
- leveraging and improving an existing research portal, such as NEAR, AREMI or the ARENA Knowledge Bank
- considering the need for more specific eResearch tools and approaches, such as that considered under the ADRC open platforms.

Question 10: Energy data for research

Are there energy data challenges for researchers not effectively represented in this paper?

How are researchers' interests best represented in the DataLAC/DUG? Do they require specific representation in the group, a focused sub-group or leveraging of a wider existing process? Are there sufficient levels of interaction and engagement in the existing research community regarding these issues?

If reforms proposed under Pillar 2 to allow more research access to data are progressed, would protected access to more real data be more useful than synthetic open data sets (as proposed in a range of ARDC ePlatforms)? Or do synthetic open datasets have alternative value through less constraints and sharing of tools?

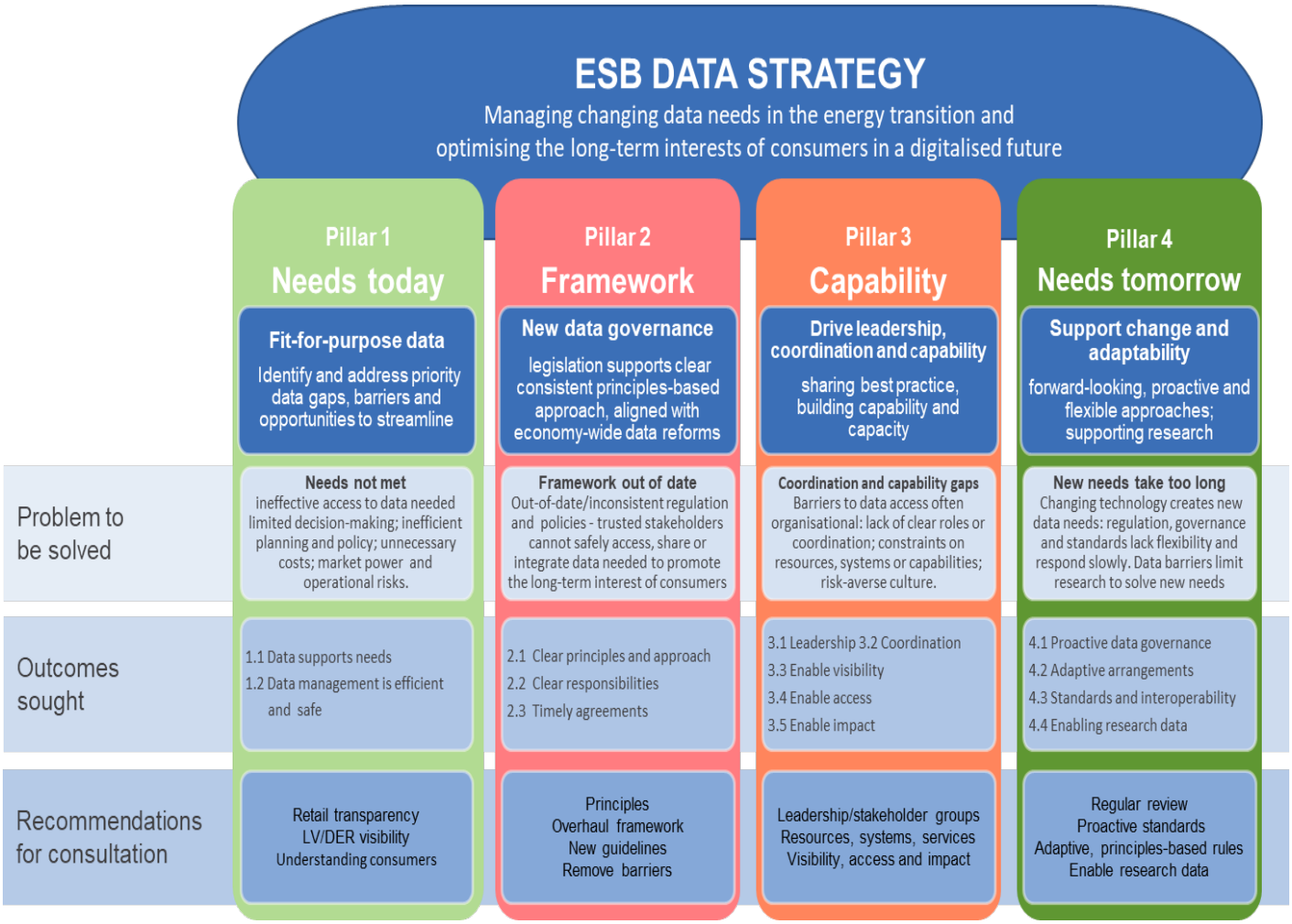
Current data portals for energy research data seem limited in their usability and visibility, with much useful research and data getting underleveraged. Are there examples in other sectors of better ways ensure research is visible, easier to navigate and integrate?

8 CONCLUSION AND NEXT STEPS

The Data Strategy is key to driving a paradigm shift in how the energy sector meets growing challenges with data management and digitalisation, with clear principles and framework and acceleration in data capabilities. This shift is critical to ensure the energy sector is well positioned to meet the emerging needs of the energy transition and capture the opportunities of a digitalised future.

The Strategy is very broad, with links into many aspects of wider ongoing reforms, reflecting that data is integral to modernisation of the energy market. It aims provide a longer-term framework to drive change while also achieving tangible near-term outcomes. Figure 5 below summarises the Strategy: four key Pillars, each solving an explicit problem, with identified outcomes and initial recommendations.

Figure 6: Summary of the Data Strategy



The ESB welcomes feedback and input on this proposed Data Strategy from all interested parties, both as a framework and on specific recommendations (see section 1.1 Consultation process). As an ongoing framework, this Strategy is expected to evolve over time with input and guidance from leadership and stakeholder groups, and as innovation continues to emerge.

After considering stakeholder input, the ESB will agree on a final Data Strategy to be progressed in early 2021, including recommended reforms for Energy Ministers. Implementation will have a range of phases, with regulatory reforms expected to be implemented in two stages and many recommendations requiring further detailed development. The proposed leadership group across core agencies will drive this workplan, while collaborating with related ongoing reforms.

APPENDICIES

9 APPENDIX A: RETAIL TRANSPARENCY

Retail affordability remains the energy issue of most concern to most people, following price pressures over the last two decades. The Australian energy retail market in most jurisdictions depends to some degree on competition to keep prices down. Effective competition depends on informed consumers and transparent markets. Currently there is no regular source of real data on energy prices and what consumers, large or small, actually pay on their bills. This limits effective price monitoring and any ability to understand distributional effects on different consumer groups and provide better targeted solutions to consumer needs and protections.

One of the key motivations for the ACCC 2018 REPI was that a persistent lack of retail transparency meant policy makers and regulators could not resolve growing concerns about retail competition and affordability. The ACCC's involvement was critical as it has strong data-gathering powers than any of the energy agencies, and is able acquire greater data from market participants, including customer billing data.

The ACCC's findings confirmed many concerns in the market and supported a need for greater retail monitoring. Key recommendations focused on improving retail transparency, including:

- retail price reporting
- large energy user price monitoring
- contracts market monitoring
- retail margins

The ACCC's proposed approach was to extend the powers of energy agencies; but these reforms would take time. With immediate concerns on affordability to address, the Australian Government directed the ACCC to undertake a further seven year inquiry titled 'Electricity Market Monitoring 2018-2025'.

This solution fails to resolve many of the systemic concerns raised by the ACCC REPI. Data gathered by the ACCC under its statutory powers is highly restricted, which limits its capacity to share data with any of the energy agencies for complementary analysis and to support their ongoing statutory reporting functions in retail market monitoring, market design and competition analysis. It also reduced benefits for wider policy work in the jurisdictions, such as understanding impacts on vulnerable consumers. This limits improvements in transparency, increases inconsistencies and increases duplicate reporting costs for both energy agencies and industry stakeholders. The ACCC's inquiry also ends in 2025, so does not create a permanent solution.

Many of ACCC's wider REPI recommendations have since progressed. Some of these reforms create new opportunities to improve retail transparency. These include:

- implementation of the Australian Government's DMO[49]enforced by the ACCC, along with the Victorian Government's Victorian Default Offer (VDO)
- implementation of the CDR

[49] Part XICA of the Competition and Consumer *Act 2010* (Cth), introduced through the *Treasury Laws Amendment (Prohibiting Energy Market Misconduct) Act* (Industry Code – Electricity Retail) Regulations 2019

9.1 Retail price monitoring

The ACCC examined the wide range of exiting price monitoring activities and identified a range of concerns which could not be resolved within the current energy agencies information powers.

Extract 7: ACCC REPI findings on price monitoring[50]

Some deficiencies in the current approach include:

- none of the reports provide transparency around what consumers are actually paying. Current price reporting only provides estimates of consumer bills based on benchmark usage amounts
- the way pricing is constructed (including the applied assumptions and methodologies) by the different reporting bodies varies and pricing results are not readily comparable
- none of the reports are supported by effective information-gathering powers to allow regulators or governments to have a full understanding of retail costs and margins, and other complementary information like what types of offers consumers are on
- while there is duplication of effort around residential prices, there are also significant gaps, particularly around business customer price reporting and outcomes.

A large part of the REPI has been about collecting and analysing data to 'fill in the gaps' and to provide insights into the market that are not available through the current price reporting arrangements. The ACCC was able to obtain price and market information that allowed the Inquiry to determine:

- what electricity customers are actually paying and where consumers are not benefiting from retail electricity competition
- what factors are driving price, including where benefits are unevenly distributed between different types of consumers.

This analysis was only possible as the ACCC was able to obtain significant information and data using its compulsory information-gathering powers under section 95ZK of the *Competition and Consumer ACT 2010* (CCA).

The information obtained throughout the Inquiry has allowed the ACCC to uncover the full range of factors that have driven price increases in the last 10 years. Other information obtained from retailers provided insights into revenue generated for retailers by particular types of offers and discount levels and a consumer survey, combined with billing data from retailers, has provided insights into outcomes for different demographics. The ACCC considers that these types of insights are required for governments and policy makers to make informed decisions about the future of the electricity market.

…….

The ACCC considers that price monitoring that includes the ability to observe retailer costs and gather information on the offers consumers are on, and what they are actually paying, is necessary to observe whether consumers are seeing the benefits of the competitive market.

The main source of retail prices in the market (outside of the ACCC inquiries) is prices reported to the AER to support the Energy Market Easy price comparator (EME). To support this consumer information site, retailers are required to report all plans 'readily available in the market' to the AER,

[50] ACCC REPI review 2018, p320

except in Victoria where the Victorian Energy Compare website plays a similar role. Every retailer reports many plans, with hundreds available in some markets. Most price monitoring activities track changes in these available plans, following movements of the lowest or median plans available by retailer. These can be weighted by retail market shares and shares of consumers on standing versus market offers (which are reported in aggregate through the AERs retail performance monitoring). Bill calculations depend on an estimate of consumer usage, provided either by distributor estimates of residential averages or AER's Bill Benchmarking survey which is updated every three years.

These methods provide some sense of how price offers are moving over time, but they do not effectively reflect the bill consumers actually pay. Most consumers will not change plans for many years, so current offers in the market do not reflect the spread of consumers' historical plans. They do not reflect the real distribution of consumers over retail plans, which is likely far from the median or minimum. They also do not reflect that consumers with different usage patterns and demographics have different preferences in plans or likelihood of switching plans, so average usage varies between different plans.

Currently retailers are not required to report the plan an individual consumer pays to anyone, except on the consumer's bill. Consumer surveys struggle to get better insight into consumer prices as consumers rarely know what plan they are on and so must be willing to provide a copy of their bill (covered in personal information) to the surveyor. Seasonal variations in usage also mean they need to provide at least four bills to the surveyor, or else provide them with consent to access their meter data, which remains a difficult process until CDR is implemented.

Example 17: Existing Retail Price reporting processes

- **ACCC Electricity Market Monitoring 2018-2025** - the ACCC reports on prices, profits and margins in the National Electricity Market every six months. The ACCC's recent reports have analysed advertised electricity prices and retailer cost data, and its upcoming report will analyse what customers are actually paying using retailer billing data. Due to the use of the ACCC data gathering powers to obtain cost and billing data from retailers, the granular data is not readily available to other energy agencies, however the ACCC publishes detailed analysis and aggregate data. For the REPI, the ACCC undertook a consumer survey to look at distributional price impacts across different consumer classes.
- **ABS Consumer Price Index (CPI)** measures electricity costs, including retailer surveys relating to electricity prices in capital cities. The ABS consumer price index for electricity is the longest running electricity price series in the NEM. It captures a theoretical broad average, with no ability to translate to how consumers are impacted by the range of offers or their usage.
- **ABS Householder Expenditure Survey** captures total electricity bills once every 3-6 years. The most recent analysed 2015-16, and was released in 2017. This cannot be linked to usage and has considerable lag. It is also only released in aggregates of energy costs included electricity, gas and petrol, with limits on access to more disaggregated data.
- **AEMC Residential Electricity Price Trends Report** provides advice on the factors driving changes in electricity prices in the near term. To estimate price changes, the AEMC uses offer data reported on AER's Energy Made Easy comparator. AEMC estimates are based on minimum market offers weighted across retailers' market shares and representative consumer usage based on AER's Bill Benchmarking analysis undertaken once every three years. AEMC estimates price trends for the next three years based on publicly available data and wholesale market modelling.

- **AEMC Retail Energy Competition Review** analyses market factors in retail electricity and gas markets, including customer activity (switching and consumer sentiment), consumer outcomes (typical savings achieved when switching retailers), ease of market entry and exit, independent rivalry and prices.
- **AER Affordability in retail energy markets/Annual report on compliance and performance of the retail energy market** reports retailer market performance information and residential prices based on the AER's Energy Made Easy offers and annual data provided by distributors on average residential usage. It bases estimates on median market offers and compares bills to income estimates to provide affordability metrics. Low income bills estimates are adjusted for state-based subsidies but not for measured differences in usage and prices of low income households.
- **AER State of the energy market** includes information on retail prices using pricing for residential single rate offers published on the Energy Made Easy and Victorian Energy Compare websites.
- **State regulators and comparators** provide their own information on prices or offers including: New South Wales through Independent Pricing and Regulatory Tribunal (IPART) reporting and NSW Service comparator, Victoria through Essential Services Commission (ESC) Victoria— Victorian Energy Market Report and Victoria Compares comparator; South Australia – ESCOSA South Australia Energy Retail Offer Prices; Queensland - QCA price-setting, monitoring and annual report based on a survey; Tasmania – OTTER reports based on adjusted annual consumption data.
- **St Vincent de Paul Tariff Tracking project** reports at least annually on retail electricity prices on a state-by-state basis across the NEM, looking at standing and market offers by retailer and highlighting differences between network regions.
- **ECA SME Retail Tariff Tracker project** collects retail offers available to small businesses from the AER's Energy Made Easy website and directly from retailers (commenced 2017).

The figure below provides examples of different price/bill estimates used as the basis for the most recent annual price reporting by different bodies[51]. The variations demonstrated different methods used estimate a 'representative/typical consumer bill'. None of these approaches are incorrect, but they reflect the diversity in the usage and prices of consumers and means that a 'representative' consumer provides little clarity on real consumer costs. Differences in usage assumptions[52] and the spread of market prices mean that different methodologies may not provide consistent trends between years.

[51] ACCC inquiry into the NEM 2019 here AER affordability in Retail Energy Markets, September 2019, here AEMC Residential electricity price trends 2019 here

[52] ACCC's method is based on average revenue across all consumers, which reflects retail plans all consumers are on rather than latest plans available. The AEMC and AER methods seek to model a "typical" consumer (with different definitions) and use different methods to consider minimum/median retail plans available and weight them across retailers market shares. These approaches are all reasonable but measure different things.

Figure 7: Examples of bill estimates from recent price reporting[51]

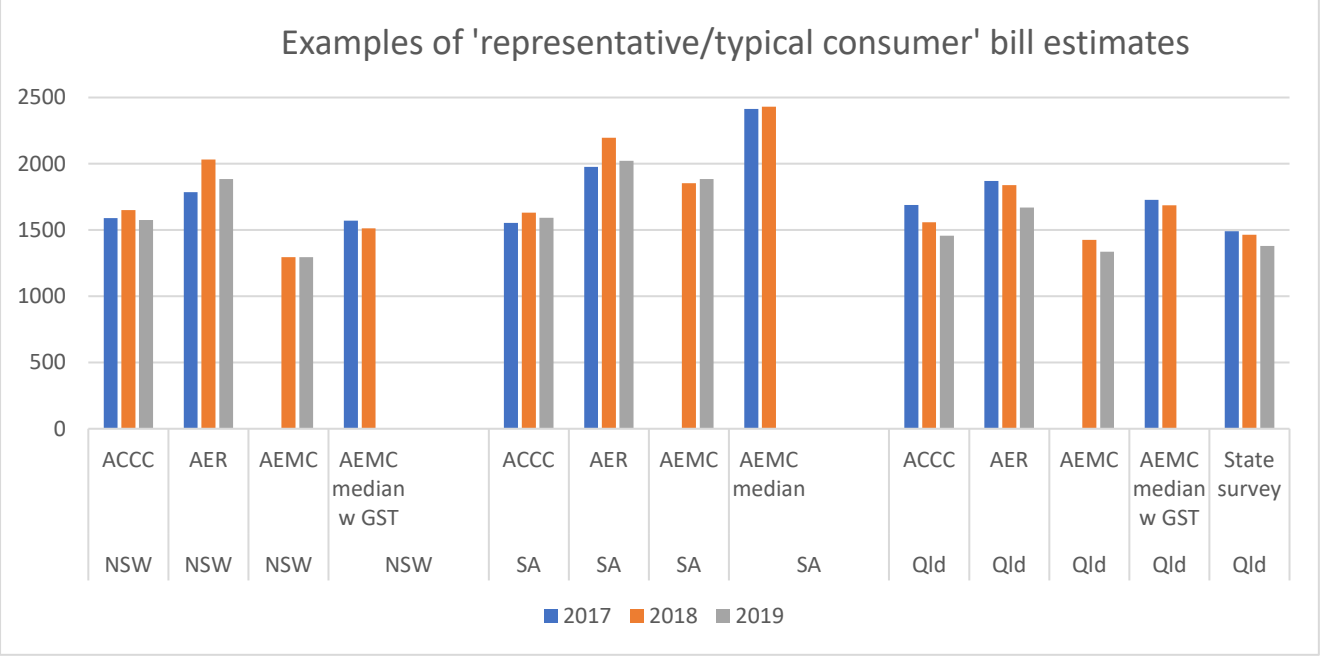
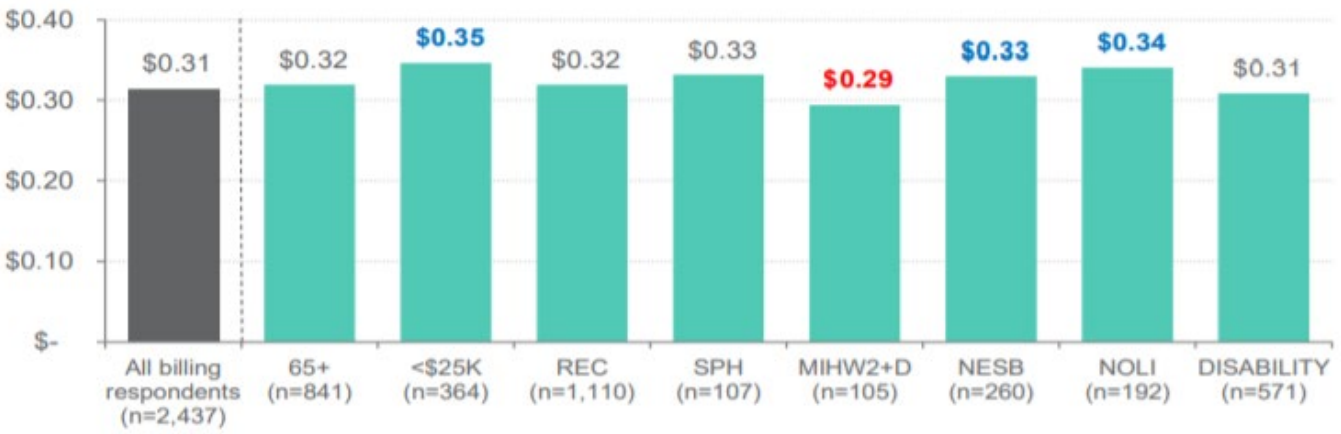


Figure 8: Effective prices for different consumer group



Base: All in scope respondents with billing data (n=2,437)

Analysis of the wider consumer survey in the ACCC REPI report[53]**Error! Bookmark not defined.** (shown in Figure 7) demonstrates that average prices vary across consumer classes significantly, with around 20 per cent variations between some consumer classes, even *excluding* differences in usage. Demographics have been shown to affect the likelihood of switching and tariff preferences. In addition to this, changes in consumer usage are increasingly impacted by DER uptake and wider improvements in underlying energy efficiency and these impacts have been felt differently across consumer classes more or less able to invest in new technology. This further demonstrates the limited value in a

[53] Colmar Brunton Consumer Outcomes in the National Electricity Market, ACCC REPI report, here

'typical/representative consumer' bill analysis which does not track how price and usage trends affect different classes of consumers.

The current ACCC Electricity Market Monitoring successfully contributes additional data, using stronger data gathering powers to uncover revenue associated with consumer bills, generally as aggregated analysis across retailers. This likely better reflects "average consumer costs" but may provide less insight into *recent p*rice movements, as most consumers switch or have tariff updates at variable times and are on a range of *historic* plans. It also provides little insight into cost variations across consumer types. ACCC has limited capacity to share underlying data obtained using its strong data gathering powers with third parties.

Recent reforms to introduce the DMO provided the AER with wider powers to gather data on energy prices from retailers, through Commonwealth competition law rather than energy laws. This power was explicitly limited to their role in supporting the DMO, despite their ongoing wider role in retail price reporting. This means not only limited sharing with other agencies, but different reporting tasks undertaken by the AER will have different access to data, resulting in likely ongoing variations in estimates provided.

New options for consumer to access their own retail plans and billing

The CDR will, for the first time, allow consumers to access and share their own retail plan, along with their metering and billing data, in a portable digital way with a range of accredited service providers. This will make it much easier for consumers to voluntarily share their retail plan, metering and billing data, supporting not only a range of better services and advice, but also potentially better survey data and research. Retail tariffs will also be widely portable under CDR as product data from the AER.

To support this, CDR will create a new digital method or API to describe retail plans, such that it can be interpreted by any accredited service provider. Retailers will need to be able to link these new digital retail plans to their individual consumers, to allow consumers to access them through CDR. The approach to describing retail plans will need to be flexible as retail plans are expected to continue to diversify and innovate as metering, DER and related technologies develop. Retailers also regularly vary individual retail plans upon negotiation so many consumers are not on a plan 'readily available in the market'. Complexity in how retail plans are described has to date been one of challenges posed by retailers to more comprehensive price reporting.

Retailers will be the data holder of retail tariffs under CDR, and this is not in question. However, once retail tariffs are more digitally identifiable and portable, this creates a wider range of options to improve price monitoring.

New options to understand "what consumers are actually paying"

One option to improve retail price monitoring, putting downwards pressure on consumer prices by ensuring effective competition, would be to link retail plans to meters in some way. If these new digital retail plans, or even some simplified summary of them such as the closest 'readily available' plan or a classification of 'tariff type', were linked to meter standing data (the way network tariffs already are) the prices and bills consumers are actually paying would be statistically transparent, while still protected and de-identified. Statistically robust average prices and bills, distributional impacts and many other aggregate statistics could be reported in an automated fashion on a near-live dashboard. It could apply to all small consumers, both residential and small business.

As with all current settlement data, access would be protected and strictly limited such that privacy and competition are preserved. The network tariffs, usage and retailer at each meter are already captured in protected systems to support settlement and retail switching. Central meter data

explicitly limits any details of the customer, focusing on the meter point (location). Even internal analysis would be de-identified.

This approach could create much wider benefits, not only ensuring effective competition and price monitoring to reduce prices, but also improving research and policy work aiming to reduce consumer bills, ensure consumer protections and better support vulnerable consumers. By understanding how consumers and new technologies respond to price signals and how those signals are changing, it will also improve demand forecasting and planning to reduce energy costs for all and help the energy system transition to modern more sustainable technologies .

New evidence could resolve unsolved questions such as:

- How do new policies or market changes impact consumer bills (such as the introduction of DMO or COVID-19)? How are different types of consumer impacted? How does this impact vary over time?
- What is the spread of consumers across different types of plans and tariff structures? How is this changing with competition and innovation?
- How are bills and retail plans distributed by consumer classes? For example, are lower-income suburbs paying more? How is this changing with increasing DER and new technologies?
- How many consumers are on a plan which suits their usage type? Are consumers effectively selecting better retail plans?
- When consumers switch retailer or plan do they save? How much/often?
- How often do consumers change retail plan without switching retailer? Are they better off?
- Are cost-reflective network tariffs influencing retail offerings and consumer choice?
- To what extent do retail plans or tariff structures drive consumption patterns? When consumers change tariff structure does it impact their usage patterns?
- Are DER consumers responding to retail price signals (particularly those with active DER such as batteries)?

The last question creates a further case for meter-level retail plan transparency, supporting wider options to manage energy security. Active DER, such as batteries, load control and smart charging can respond to price signals and can synchronise behaviours around common price shapes. As active DER penetration grows, with local grids and distributed markets coordinating a vastly larger number of responsive elements, unpredictable and synchronised behaviours become security challenges. A degree of transparency on the drivers of DER behaviour, such as time-related tariffs and export limits, will be increasingly valuable in informing a range of coordinating arrangements.

A range of existing systems and work could minimise implementation costs. Settlement data already links individual meters to a responsible retailer and processes are in place to update retail data when switching. Settlement data and related systems are already undergoing upgrades, both centrally and in retailers, to support reforms including CDR, Global Settlement and Five Minute Settlement and the recent review of MSATs standing data. Additionally CDR work to make retail plans more standardly identifiable will assist.

There may also be offset savings. AER currently undertakes quarterly retail reporting of performance statistics which is a relatively manual data-gathering processes across 50 retailers. ACCC also gathers similar data. Some aspects of this could be automated, streamlining costs, timeliness and improving accuracy.

Strategic Energy Plan metrics

Putting this in context further, when Energy Ministers recently agreed and published a Strategic Energy Plan[54] they developed metrics to monitor progress towards the identified objectives. These retail and affordability metrics clearly reflect the available data rather than providing real insight into the questions. Table 1 below shows some examples of how this could be improved, and monitored in a more timely manner, with proposed improvements in transparent retail plans.

Table 1: Example alternatives for Strategic Energy Plan metrics

OUTCOME: AFFORDABLE ENERGY AND SATISFIED CONSUMERS

Current metrics[55]	***Challenges due to lack of data***	***Alternatives with retail tariff transparency***
Objective: Energy is increasingly affordable for all consumers, supported by adequate consumer protections and access to dispute resolution		
Representative domestic retail tariffs and bills in each NEM-region over time	'Representative' bills do not reflect 'average' consumers and different estimate methodologies can affect trends. Distribution of bill costs across different customer demographics and incomes is also a key concern in affordability.	Statistically calculated total annual bills and 'effective price' for a range of consumer classes, showing both averages and a measure of distribution.
		Bills indexed against average incomes - by consumer classes from regional census data
Objective: Consumers are able to easily identify and secure the best deal for their circumstances		
% customers on standing and market offers over time	Being on a market offer could still mean a poor tariff or a retail plan which has not been changed in years. DMO/VDO has changed dynamics on standing offers. Current evidence suggests likelihood to switch is heavily driven by demographics.	% customers on a standing tariffs overtime, split by regional demographics/consumer classes.
		% customers who have not updated their tariff (including within same retailer) in 2 years
Number of clicks it takes for a customer to switch retailers online	Qualitative and variable. Many customers do not switch online.	Switch rates, by regional demographic consumer classes
	There is no current measure (and little evidence) of whether consumers save money through switching or switch to 'better' deals	% of switchers who moved to a deal which will save them money
Objective: Vulnerable consumers are on suitable pricing plans, receiving concessions when needed, and can benefit from distributed energy and energy efficiency schemes		
	No measure of what vulnerable consumers are actually paying.	Average 'effective price', usage and bills in lower-income regions versus other regions.
		Switch rates in lower-income regions versus other regions.
		% hardship customers on a standing offer

[54] COAG EC Strategic Energy Plan here

[55] Limited to a subset of relevant metrics as examples

% hardship customers on market vs standing offer	'Not on a standing offer' is a limited measure of a suitable plan.	% hardship customers who could be placed on a better advertised offer by the same retailer
Number of customers receiving concessions over time	Eligibility criteria usually outside of energy (e.g. customer has a health card). Changes measure wider economic changes (like COVID).	% of customers receiving concessions
	Hardship customers are often middle-income families in mortgage stress or recent crisis.	% hardship customers receiving concessions - by socio-demographic region.
Support programs for low income households to access DER and energy efficiency	Qualitative. Programs may not be scaled to need or accessible. Lower energy use not always desirable in low income homes - energy rationing with wellbeing impacts	% DER uptake in lower-income regions and high rental regions, compared to wider average. [56]

Recommendation 1: Retail plans and billing

Provide transparency for retail price monitoring, review of competitive markets and affordability policy by:

- requiring retail plans for individual meters to be reported with settlement meter data for all small energy users (residential and small business), along with current network tariffs and other retail competition and switching data
- ensuring that retail plans and metering data are accessible for privacy-protected, de-identified retail monitoring and analysis
- supporting a range of aggregate reporting or dashboard services on retail plans and consumer bill trends to increase transparency for wider audiences on a regular and more timely basis
- exploring opportunities in related retail monitoring to reduce manual data costs and improve accuracy. This could include additional flags on retail plans identifying meters associated with key programs, subsidies or protections.

Question 11: Retail price reporting

How will consumers benefit from keeping retail plans and costs hidden?

Can you provide evidence around costs, barriers or benefits for linking digital retail plans to standing meter data?

Streamlining price reporting and retail monitoring

The diversity of price reporting discussed above creates a range of duplication in costs, especially where there are multiple processes for data collection and analysis. The difficulty of comparing methodologies and reported outcomes also creates potential confusion, misinterpretation and inconsistencies. Even without improving the source of retail data as proposed, there are opportunities to reduce costs and improve consistency through greater sharing of data, alignment of methodologies and streamlining of reporting obligations. This was proposed by the ACCC and some

[56] This could be done now with CER/DERR data

progress has already been made in this direction by agencies, with timing and scope changes to key reports to improve their complementarity.

Extract 8: ACCC Recommendation 40

Retail price monitoring should be streamlined, strengthened, and appropriately funded to ensure greater transparency in the market, reduced costs and allow governments to more effectively respond to emerging market issues. This should be done by:

- COAG Energy Council agreeing to streamline price reporting and monitoring to the AER and the AER receiving all the necessary powers to obtain information from retailers about price, offers, customer billing data and retail costs
- COAG Energy Council agreeing to extend price reporting for retail electricity services to small to medium business customers
- State governments agreeing to close their own price reporting and monitoring schemes in favour of an expanded and strengthened NEM-wide regime.

A NEM-wide price reporting and monitoring framework should include a combination of price monitoring with full EBITA data (including standardised costs to serve, attract and retain consumers, and margins), and consumer expenditure surveys. This reporting should be done on a regular basis and include customer expenditure data, based on representative customer surveys and retailer billing and offer data, and be reflective of demographic information.

The ACCC's current monitoring inquiry, while improving some available data, does not contribute to the recommended streamlining. Limits on the ACCC's ability to share data gathered using its statutory powers means that energy agencies cannot fully leverage the ACCC data to support their ongoing statutory reporting functions in retail monitoring and competition analysis. This limits improvements in transparency, increases inconsistencies and increases duplicate reporting costs for both agencies and industry stakeholders.

If the proposed improvements in transparency of retail plans are progressed, the current processes for analysing and reporting retail price data should be rethought entirely and optimised to a timely and streamlined process. Annual reports currently based on non-current data could be replaced by almost-live dashboards. It could better inform new processes to estimate the DMO/VDO. The AER's wider retail performance monitoring also has a range of potential synergies. This could create cost savings, even for retailers, as well as better consistency and more useful outcomes.

Recommendation 2: Streamlining price reporting

Using new retail monitoring, core agencies should work to streamline current reporting and provide more up-to-date tracking of retail metrics and affordability.

The DataLAC should collaborate with AEMC, AER, AEMO, ACCC and policy officials and provide further recommendations to support improved data in retail price reporting. This should consider:

- as up-to-date as possible tracking of real retail prices and performance metrics. This could be a retail dashboard.
- streamlining data requests to industry to reduce cost burdens
- ensuring that agencies are providing any reporting from a broadly consistent dataset, with transparency over methodology.

Question 12: Streamlining price reporting

What options exist to maximise retailer benefits in reducing reporting costs? Can you provide estimates/evidence of existing costs?

Which elements of current price reporting arrangements are important to retain?

9.2 Large energy user electricity prices

Linked to both price monitoring and contract markets (discussed below) is the issue of the prices larger businesses pay, across both electricity and gas. The scale of a relatively smaller number of large commercial and industrial energy users means that these users can have greater influence over Australia's energy demand and productivity than millions of small users. Yet this is an area of even greater opacity than small consumer retail plans.

Bilateral commercial contracting arrangements mean the prices and terms of medium-to-large energy users are largely unknown. Most medium-to-large energy users still purchase through a retailer rather than develop the expertise to trade directly in energy markets. Medium energy users can be disadvantaged in these negotiations with large retailers and distributors but report some improvements as retail markets diversify and innovate. Some very large users choose to engage in their own energy trading in the wholesale and financial markets and manage their own price risk or through a retail partner. Increasingly a number of commercial and industrial customers are contracting with renewable generators through power purchase agreements and managing the residual risk through traditional retailers.

Larger energy users have seen major pressures on prices in recent years, driven by many factors including greater linking to international gas markets, disruptions in commodities and disruptions in the wholesale market with the transition away from carbon-intensive generation. However, long-term contract arrangements, opaque markets for commercial and industrial contracts and limitations in comparing different customers mean that the real impacts of these changes are difficult to assess. There is currently no effective public reporting of prices in these sectors. This can create many challenges in forecasting changes in large energy loads and behaviours, forecasting wider economic impacts and risks on these large industrial players, and responding with effective energy market planning and wider industrial policy. Some large energy users choose to invest in their political influence.

These issues were raised by stakeholders in the early work for the ACCC REPI and has been recognised as a problem in the Strategic Energy Plan and the Health of the NEM. But it has yet to be resolved.

Extract 9: Commercial energy users prices

ACCC REPI – preliminary report (p22) [57]

"Submissions from businesses in commercial sectors, including retail, light manufacturing and agriculture, noted that when they sought offers from retailers there was little or no competition between offers. Medium to large business users in South Australia reported that the limited choice of commercially sustainable retail offers had resulted in those businesses changing their buying arrangements to directly source their electricity from the wholesale spot market. Their resultant exposure to the spot price has typically been unhedged due to the lack of financial products in South Australia, over the past two years in particular, to efficiently manage the price risk. These same medium-sized to large sized users (those between 5-60 MW) highlighted that in entering the wholesale electricity spot market they were concerned that developing the necessary expertise required to participate in the wholesale market was outside their core business. Therefore their general preference was to be able to access longer term and affordable retail contracts.

Submissions from a number of peak industry bodies for small to medium commercial and light industrial sectors have called for greater transparency of pricing including more detailed bills (breaking down peak and off peak consumption, retail charges, environmental schemes, network charges), regular price reporting for small, medium and large users, and a tailor made online comparator service or a similar tool for business to help them compare offers and track the market more effectively."

Health of the NEM 2019 (p13)[58]

"It is a major concern that the ability to monitor commercial and industrial energy prices is poor. The ACCC has identified further work to survey and monitor energy prices in this sector but this recommendation has yet to be implemented. The Energy Security Board strongly supports the ACCC view on this matter and will work with large commercial and industrial sector and the broader industry during 2020 to develop benchmarks and the surveys required to reliably report against this important metric."

Strategic Energy Plan – metrics (p13)[59]

"Representative real commercial and industrial energy prices over time

Work with large C&I customers to develop benchmarks and survey required to reliably report against this metric.

Provides estimated energy costs as an input to business activity which impacts business profitability and competitiveness. International comparisons to be considered as context.

There is large variation in C&I energy prices, particularly between transmission connected and other C&I customers. Separate benchmarks to be developed for these two categories to the extent possible. Commercial and Industrial users might also have different capacity to manage their energy demand and therefore to the extent possible some differentiation based on sector/activity would be useful."

[57] ACCC, Retail Electricity Pricing Inquiry Preliminary report 22 September 2017, p22 here

[58] ESB, Health of the NEM 2019, p13 here

[59] COAG Energy Council, Strategic Energy Plan, November 2019, p13 here

Challenges for transparency in this sector continue to grow as the demand response begins to play a more visible role in a more diverse and volatile wholesale market. Large energy users can reduce energy costs if they have flexibility in their load and can bid into the market. In June 2020, the AEMC made a rule that introduced a wholesale Demand Response Mechanism (DRM)[60]. This mechanism increases visibility of this part of the market and is a step towards two-sided markets. To support better forecasting as well as the new wholesale DRM, AEMO requires a range of information on demand side participation which does capture some of the influence of large energy users in the market. However, this does not include energy users managing their own energy costs in the wholesale market and just responding to higher prices.

Recommendation 3: Tracking commercial and industrial prices

Provide greater transparency of large energy user prices by expanding AER' s information-gathering powers and requiring them to monitor and report on contract pricing arrangements for large energy users.

Request that the AER develop a framework for ongoing monitoring and review of contract arrangements for large energy users, split by sectors or classes of consumers, to track prices, trends in contract cycles, liquidity, and additional terms and services, such as reliability requirements and demand response arrangements.

These arrangements could be supported by wider proposals to expand AER's powers to monitor contract markets. Related data should be captured in a way to support sharing with key trusted agencies for planning and policy analysis and publication of de-identified data.

Question 13: Large energy user prices

Can large energy users highlight challenges with contracting arrangements and options they face? Are large users' arrangements most effectively investigated working with retailers or large energy users?

9.3 Contract market monitoring

Retailer costs and behaviours in wholesale markets are driven less by the physical spot markets than by the more complex financial contracts markets. Retailers are generally incentivised to hedge when they offer fixed prices to customers. Transparency in the contracting arrangements of retailers has been an ongoing concern, as regulators seek to understand the true costs and whether prices are efficient.

Data for standard contracts, the majority of which are traded on the Australian Stock Exchange (ASX), is readily available and transparent. However, the more bespoke, complex and diverse arrangements that are traded bilaterally and brokered as 'over-the-counter' contracts (OTCs) remain relatively opaque, similar to the bilateral supply contracts between retailers and large energy users. The influence of these opaque contracts on the competitive dynamics in the retail market is largely unknown, and the lack of transparency may hinder views on the structure of forward prices.

The AER is responsible for monitoring the wholesale market, but its information-gathering powers are restricted such that is cannot require information on commercial contracts unless it can identify

[60] AEMC Wholes Demand Response Mechanism, Final determination, June 2020 here

market concerns through public information. This limits the AER's ability to understand behaviours in the contract market, the interactions with the spot market and any market power concerns. Overall supervision of the market as a whole currently lacks a view of the total picture, which could impact assessment of wider market efficacy and efficiency.

The lack of this information may also hinder analysis in the AEMC's reviews of retail competition and forward price forecasts. Greater transparency in forward contracts could also support AEMO in forecasting changes in generation behaviour (for example, potential expansions or reductions in capacity) and active demand response.

In the REPI, the ACCC used its statutory powers to obtain information about historic OTC contracts. After a detailed review, the ACCC concluded that the OTC market is too opaque and a source of information asymmetry in the market, raising concerns about impacts on smaller retailer's ability to compete. It made recommendations to expand AER's compulsory powers and require reporting of OTC contracts through a registry and release of de-identified information.

Extract 10: ACCC REPI on contracts

ACCC REPI Recommendation 41.

The AER's wholesale market monitoring should be expanded and appropriately funded to include monitoring, analysing and reporting on the contract market. This should include analysing the data reported to the OTC repository (recommendation 6), ASX data and data gathered directly from generators and retailers (including through the use of compulsory information-gathering powers).

ACCC REPI Recommendation 6

The NEL should be amended so as to require the reporting of all over-the-counter (OTC) trades to a repository administered by the AER. Reported OTC trades should then be disclosed publicly in a de-identified format that facilitates the dissemination of important market information without unintentionally revealing the parties involved. The requirement should be implemented to align with (or be eligible for) any OTC reporting requirements under the National Energy Guarantee. The AER, AEMC and AEMO should have access to the underlying contract information, including the identity of trading partners.

Since these recommendations were made, ESB has undertaken further consultation with stakeholders on this issue (in late 2018 and Feb 2019) and continues to support the proposed expansion of AER's powers and removing limits on AER's ability to gather contract information. The ESB considers that the link between physical and financial markets in the NEM necessitates a comprehensive approach to monitoring wholesale market competition.

The recent reforms agreed to improve gas market transparency[15] also have some synergies with this approach, allowing for AER to undertake greater review of gas contract and release aggregate information.

However, support for the proposed contract registry has faced a range of challenges, in considering compliance costs for industry due to the relatively small size of the OTC market compared to exchange traded volumes, capacity to usefully interpret diverse bespoke contracts, and challenges raised in the design and operation of similar registries internationally. Further analysis of this option

and alternatives is needed but cannot sensibly be undertaken prior to expansion of the AER's powers.

The AER and AEMC have also pursued other sources of information, including discussions with the Australian Financial Markets Association (AFMA) on whether their voluntary survey of contracts could be enhanced. However, after exploring the issues with AFMA, there are significant limitations on the information that could be gathered this way.

Rather than delay further, it seems clear that removing constraints and expanding the AER's compulsory information-gathering powers is a necessary first step. The AER will then be able to develop capacity in reviewing and interpreting the contract market and resolve arguments over time about whether a registry, or some other alternative, would be of benefit beyond the costs involved.

The AER's wholesale monitoring more broadly should be also expanded and appropriately funded to include monitoring, analysis and reporting on the contract market. This should be supported through data collected directly from generators and retailers.

It is also critical that the AER be able to share information gathered effectively to support the AEMC and AEMO roles, as well as related policy and research requirements.

Recommendation 4: Contract market monitoring

Provide greater transparency of contract markets and enhance wider wholesale market monitoring by expanding AER's information-gathering powers and requiring them to review and report on contract market performance.

This should include legislative amendments in the NEL to:

- Remove the restriction limiting the AER to public sources of information when undertaking its wholesale market monitoring function.
- Provide the AER with powers to require information from energy participants, financial traders and related parties to support their monitoring of the wholesale market, retail markets and wider contracts markets.
- Ensure that the AER has the rights and capacity to share this (appropriately protected) data with relevant energy agencies and jurisdictional policy bodies.
- Ensure that the AER has the rights and capacity to publish anonymised contract data, in a range of forms, to support price discovery in the market.
- Support and fund the AER to enhance its wholesale market monitoring, including developing internal expertise in the contracts market, working in collaboration with the AEMC and related policy bodies.
- Request that the AER undertake a review on contract market performance and concerns, including recommendations for any further monitoring requirements and regular reporting. This initial review should take place within 18 months of gaining its information-gathering powers.

Question 14: Contract market monitoring

Contract markets are complex in their nature. What is needed to support the AER in developing the most effective form of contract market monitoring? Are there effective sources of information that have not yet to be included?

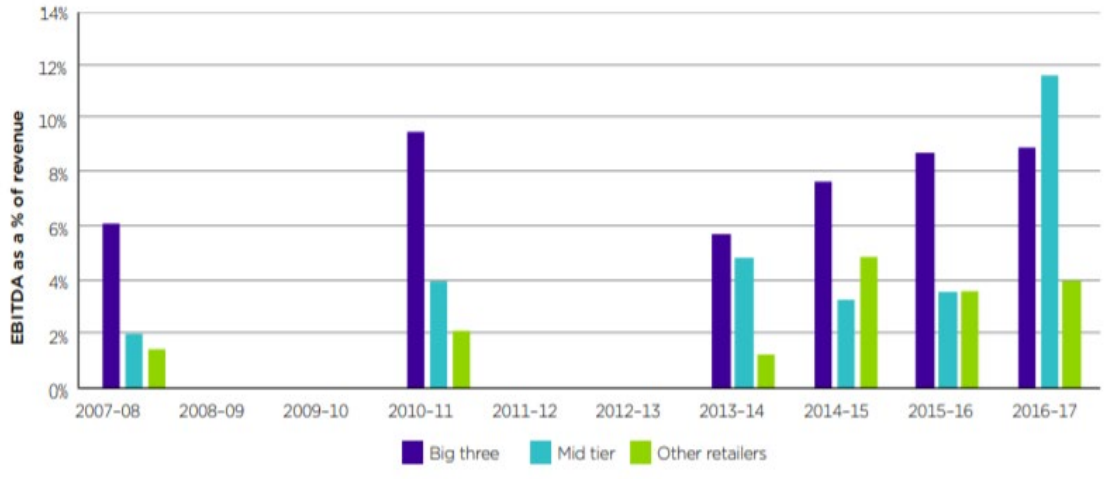
Is 18 months an appropriate time for the AER to review and develop recommendations for forward monitoring arrangements?

9.4 Retail margins

One of the key questions in testing effective competition in the sector is whether industry returns reflect an effectively competitive market, or is there evidence of persistent excess returns being earned? Retail margins have been contentious for some time because Victoria (the Australian region with the most active competition) has not readily demonstrated competitive price pressures, and in fact has seen apparent retail costs rise.

The ACCC REPI review reported these margins may be among the highest in the world[61] and demonstrated rising margins over time, particularly in large incumbent players. The three large incumbent retailers have a much lower cost structure than their smaller competitors, with significant scale efficiencies and vertical integration, putting them at a significant advantage. In the original creation of the market they also inherited a customer base heavy in passive 'sticky' consumers, which they maintain with relatively high margins, whereas new retailers have largely more active switching customers. Analysis by Finncorn Consulting[62] has proposed that this market structure allows the big three players to not compete aggressively, letting smaller higher-cost players set prices and providing for larger margins.

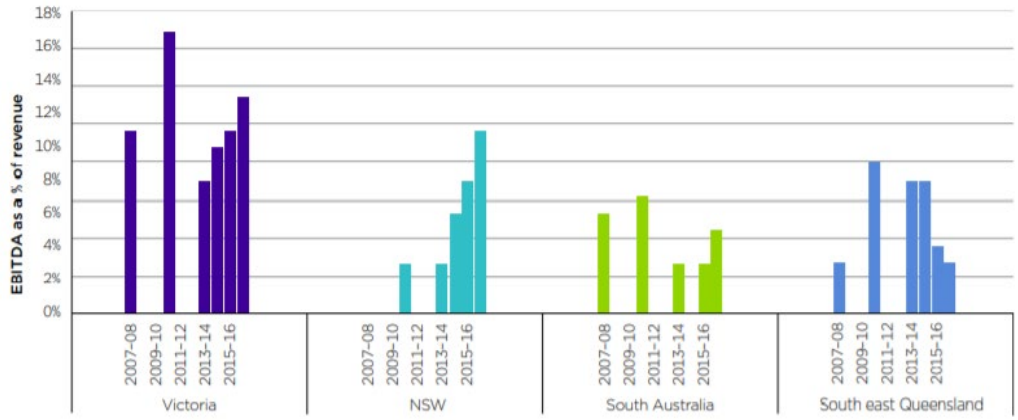
Figure 9: NEM-wide EBITDA as a percentage of revenue over time, by retailer, 2007-08 to 2016-17, residential customers[63]



Source: ACCC analysis based on retailers' data.

[61] ACCC REPI Chapter 1
[62] Finncorn consulting
[63] ACCC REPI figure 6.4

Figure 10: EBITDA as a percentage of revenue over time by state, 2007-08 to 2016-17. Residential customers[64]



Source: ACCC analysis based on retailers' data.

Note: Retailers reported negative margin for NSW in 2007-08. As noted in Chapter 1, the ACCC considers that this reflects a new entrant retail margin.

Extract 11: Retail margins

ACCC REPI

The average revenue per residential customer is almost 10 per cent higher for the big three compared to other retailers. This is nearly $150 per customer of additional revenue each year. The substantial additional revenue earned by the big three, combined with their significant cost advantages (set out in chapter 10), contribute to the higher margins accruing to the big three compared to other players (as set out in section 6.3.1 below). In combination, these factors give the big three an important advantage over smaller players and we see this advantage playing out in their behaviour in the market.

Grattan Institute: 2017 report Price Shock: Is the retail electricity market failing consumers?

Retail electricity prices in Victoria have been deregulated since 2009. Since then the price of electricity has risen dramatically. The only explanation for this price increase is that the amount of money paid to retailers has increased. The result is that some consumers are paying more for their electricity than they need to.

ECA summarising the Finncorn Consulting report 'State of Play'

The current state of play suggests that the new costs introduced by competition (and price deregulation) to acquire and retain customers have not been offset by greater operating cost efficiencies by retailer businesses. Further, the profitability of the larger retailers has been underpinned by the overall price levels being set in the market by their smaller, higher-cost competitors.

In reviewing effective competition and predicting forward price trends, the AEMC has previously sought to estimate retail contributions to the electricity price stack and to some extent retail margins. This has largely been through estimating retail prices/revenue and extracting other known contributions in network and wholesale energy costs, as well as environmental schemes and other

[64] ACCC REPI figure 6.3

market fees. In addition the AEMC has received voluntary information from some retailers. Unlike the ACCC, the AEMC does not have the power to compel this data from the retailers.

Most recently ECA has proposed a Retail Market Transparency rule change to the AEMC which seeks to provide for standardised regular retail cost and revenue reporting, including reporting of EBITDA, to be widely shared and published. This rule change request is currently pending and will be considered by the AEMC. [65]

Recommendation 5: Retail margins

Provide greater transparency of retail margins and market power concerns by expanding AER' information-gathering powers and requiring them include retail margins in their wider retail performance monitoring.

This should include legislative amendments to:

- Provide the AER with powers to require information from energy retailers more generally to support their monitoring of retail margins. This could be incremental to changes proposed to the AER's powers to monitor contracts markets.
- Ensure that the AER has the rights and capacity to share this (appropriately protected) data with relevant energy agencies and jurisdictional policy bodies. This should explicitly include the AEMC's role in undertaking its statutory functions.

Question 15: Retail margins

If much more granular revenue and cost data is available to key agencies through the proposed reforms for price reporting and contract markets monitoring, do we also need retail reporting to expose retail margins? Could this be estimated through other data?

[65] See AEMC website: Retail market transparency, Rule pending, here

10 APPENDIX B: UNDERSTANDING CONSUMERS AND DEMAND

Visibility of changes in the underlying drivers of demand remains fundamental to effective forecasting, with major costs a stake for consumers in infrastructure planning and reliability. This is well demonstrated: changing trends in air-conditioning, then energy efficiency standards, and finally rooftop solar all initially misdirected forecasts and contributed to rising infrastructure costs over the last two decades. Emerging changes challenging to predict include:

- DER management arrangements and batteries
- electric vehicles
- the Internet of Things and new energy management technologies
- electrification of gas appliances
- more innovative retail plans and energy services
- decarbonisation policy
- an unexpected recession
- potentially permanent social shifts following the COVID-19 pandemic, such as changing work from home and travel patterns and shifts in the growth of different economic sectors.

Uncertainty in how aggregate demand patterns will change has never been higher.

Even less visible to date is diversity in energy user demand patterns. A better understanding of different types of consumers, with different demand profiles and needs, is critical to providing meaningful advice and targeted policy and services to improve consumer outcomes. As CDR seeks to improve individual data access and personalised advice on different services, analysis of the background of consumer diversity remains a key input to developing better service options and targeting demand peaks. This is particularly true for vulnerable consumer groups, a sector likely to grow in the recession, and commercial businesses who are far more diverse and less well understood. The policies or advice appropriate for any given consumer to reduce their bills can vary wildly, depending on their current demand pattern, retail plan, buildings and equipment and market access to wider options.

The fragility of current knowledge of different consumer types was highlighted by the COVID-19 pandemic as the energy sector scrambled to understand and adjust for huge shifts between residential and commercial loads. The value of energy data as an economic indicator has also been highlighted, as economic forecasters seek energy demand data to track activity recovery. Looking forward in the COVID pandemic, all forecasts remain unstable, with a need for more flexibility to model, plan for and respond to a wide range of scenarios.

Seeking to unlock demand visibility, governments, industry and researchers have invested heavily in recent years trying to improve these datasets. Projects include:

- the $20+ million NEAR program
- widespread surveys from regulated Bill Benchmarking, NEAR, ABS, ECA, jurisdictions and ad hoc research
- funded trials to gather data, such as the Low Income Energy Efficiency Program (LIEEP) and Power Shift, and
- attempts to improve program data, such as through CER processes and energy efficiency schemes.

These projects have had only modest impacts, with a range of slice-in-time insights against a rapidly changing background. Barriers in regulation and lack of coordination have continued to limit the capacity to share data, increased costs and limited systemic solutions.
The discussions below highlight the steps required to make systemic data-driven demand visibility a reality including:

- access to analyse electricity meter data
- visibility of gas meter data
- consumer characteristics and surveys
- vulnerable consumers
- commercial energy users

10.1 Access to analyse electricity meter data

Smart meters and modern data science provide new opportunities for systemic solutions to understand consumers and be ahead of new demand trends, without infringing on the privacy of individuals or creating large costs in gathering new data.

Working with AEMO, NEAR has demonstrated that machine learning on de-identified (and protected) meter and network data can provide key insights to planning and policy. For example, identifying many technologies (such as solar, gas and space heating) and estimating their total use and growing impacts across substations, showing how few consumers may benefit from 'better' tariffs currently available; and identifying and understanding important behavioural clusters, such as vulnerable communities limiting their heating and cooling. Meter data is becoming one of the most powerful tools in managing coordination across growing complexity in demand and DER integration.

Meter data is available to a range of parties within the sector for this kind of analysis (networks, retailers and meter providers all hold data for their own customers) each with different levels of access and visibility and with different rights and constraints on what they can do with it. All of these parties are to some extent developing internal capabilities to get more value from this data, for their own purposes. Networks are experimenting with more localised forecasting, operational tools and DER models. Retailers are developing new products and profiling their consumers.

However, none of these parties have the incentives or capacity to innovate with this data for wider consumer benefits. This is the role of policy and research, which currently has very little access to the data to do this. Currently these groups are largely limited to select pools of survey data where consumers have allowed access to meter data. This approach is expensive, limited in sample size and only provides a 'slice-in-time' which is rapidly out-of-date.

Individual consumers have the right to access their data (from networks and retailers) and to share it with service providers, however, this remains constrained by a lack of effective facilitation processes. The recent energy CDR commitment will address this problem and, once implementation is complete, will provide more capacity for consumers to see direct benefits from this data. With consumer consent, service providers will be able to use the data to tailor personalised offerings. However, being limited to direct customer engagement and consent will limit these service providers in undertaking wider statistical analysis to learn about their diverse customers, unlike the incumbent retailers they will often be competing with.

AEMO increasingly holds the largest pool of meter data, managing sharing of data across the sector for settlement, billing, forecasting, planning and operations. With growing smart meters and digitalisation, AEMO's volume of data under management is growing exponentially. A wide range of reforms are already under way enhancing these datasets for operational purposes and at the same

time making them even more valuable for consumer analysis. These reforms include Gross settlement, Five Minute settlement, DERR, CDR, NEAR, the AEMO review of Meter Standing data[66] and the upcoming AEMC review on competitive metering. Over the next few years this will create the first largely complete set of meter data, with visibility of demand across the NEM.

Linked to the proposed increased retail transparency (Recommendation 1) it is likely that safe, protected analysis of meter data can unlock systemic solutions to much more robust prediction of demand patterns and better advice for consumers, as well as retail competition monitoring and consumer protections to improve affordability.

Importantly, while facilitating data exchange to support retail competition, settlement and the new CDR gateway, AEMO still has limited visibility of individual consumers and no direct relationship with them. Meter data is largely de-identified to a location and unique meter identifier, with consumer details and relationships managed by retailers. This means AEMO datasets can allow valuable statistical analysis across classes of consumers, behavioural clusters or locations, held within an already protected de-identified environment in a regulated, non-commercial central agency. The depth of this dataset means a wide range of correlations can provide further insight without any need to impinge on more personalised data (as in a survey), for example using ABS regional demographic data to support analysis of impacts on lower-income sectors.

The value of this dataset for better consumer outcomes has endless potential, only limited by analytical resources able to access it in a protected environment. While AEMO's operational and planning interests in this data are broad, the analysis of value to consumer outcomes will extend much further, beyond AEMO's priorities and capacity to develop alone. The AER and AEMC will be able to develop greater insights into the effectiveness of retail competition, what consumers actually pay and related consumer impacts, consumer responsiveness to price and consumer protections. AER would be able to access alternatives views on demand growth proposed by networks. AEMC and ESB would be able to better inform reviews and test range of market development scenarios. Jurisdictional policy agencies will have strong interests in new evidence and more efficient ways to test policies and their impacts (for example, DMO). If protected access is possible for the public-good research sector, it will also have critical value for understanding emerging technologies and the market transition.

However, this analysis is currently out of reach. AEMO operates under highly prescriptive regulatory arrangements for how it accesses and manages meter data, which were developed prior to smart meters when this data had much less value for planning and research. Attempting to access data, (even in close partnership with AEMO) leads to costly legal arrangements, competition for resources and constraints on analysis. NEAR demonstrated this well, taking almost four years of negotiations to make any real progress in accessing meter data for analysis, with resulting arrangements still limited and constraining potential research.

Meter data access arrangements are already being reformed to some extent to support CDR, with Energy Ministers aligning NEL/NER arrangements to support Commonwealth-driven CDR reforms. The AEMC will also consider a range of metering data issues in their upcoming review of competitive metering. However, these reforms are unlikely to address consumer benefits from metering analytics.

The KWM legal review (Appendix D) has reviewed these challenges in detail and proposed reforms to resolve access to public-good research, in line with consumer interests and wider national data reforms. These include:

[66] MSATS Standing data review 2020 link

- short-term, allowing NEAR/CSIRO and select trusted agencies better access to AEMO data by making them 'prescribed entities'
- longer-term, overhauling the regulated framework for energy data to introduce a more flexible regime that can support protected data sharing, for approved public-good projects in a protected environment with accredited trusted parties.

To support these proposed reforms, access would also have to be facilitated through development of protected systems or/and related analytical services (discussed in Sections 6.5-6.6)

Example 18: Accessing meter data for consumer analysis

NEAR access to meter data
The NEAR program has worked for four years to resolve data sharing capabilities with AEMO key datasets, despite AEMO being a partner in NEAR. Regulatory barriers and uncertainty continue to make data sharing difficult, creates inefficiencies in handling shared data and limits potential research outcomes. This is despite operating in a safe and protected environment with trusted, willing partners and potential for billions of dollars in benefits to consumers.

AER's Bill Benchmarking surveys have to date been one of the best sources of meter-linked consumer data. The regulated processes prescribed in the NECF require AER to gain consent from the consumer during the survey, then access the meter data from the relevant network business. There are 17 network businesses, which have diverse processes, formats and timelines. Even with the AER's information-gathering powers and a clear regulated requirement, this process has previously taken months and been costly. Hence, it is only undertaken once every three years and is rapidly out-of-date given increasingly dynamic consumers. Even with this process, the Bill Benchmarking data lacks key data that is too difficult to obtain, including the retail tariff and actual billing data, so what consumers actually pay remains unknown.

ABS and meter data: The ABS has undertaken a similar process to the AER Bill Benchmarking survey to seek meter data (with consent) to support various surveys, including its Household Expenditure Survey (HES) Even with consumer consent, the much stronger ABS powers to compel data, and the fact that ABS is the most highly protected statistical agency in Australia, the ABS struggled to negotiate with networks to release data. ABS's confidentiality requirements meant they couldn't give the networks a list of consumer households who had given consent to access meter data, as it would identify to networks the survey participants and risk re-identification of published survey data. Instead the ABS requested data from all meters so they could extract the required meters and then delete the rest. Given the networks also have confidentiality obligations, some were concerned at giving the wider data to the ABS, because they only had consent to access a subset. ABS had to formally compel the data. Working with all 17 networks, this was expensive and took months. ABS has also made attempts to work with AEMO on a range of research but this has faced similar challenges.

NEAR Pilot Survey (2016): CSIRO undertook a similar survey, seeking to gather meter data from networks with consent from consumers in 2016. However, without the authority of the AER or ABS, CSIRO struggled to get multiple network businesses to agree to a common process for consent. In the end, CSIRO limited their survey to one Victorian Distributor, as this was the only distributor at the time they were confident would agree to provide the data, despite a legal obligation on network to release data with consent. This limited the scope of the research.

Recommendation 6: Access to meter data for public-good research

Support high-value analysis of protect meter data to support the long-term interests of consumers and the wider public good, including for better planning and forecasting, research of consumer needs, behaviour and impacts and market monitoring.

This should be implemented through KWM recommendations to:

- implement an overhaul of energy data regulation: a new framework which supports sharing of data for identified public-good purposes, where protections are in place with trusted accredited parties, in line with national data reforms
- as this will take time, support short-term benefits within the current regulatory framework through making NEAR/CSIRO and selected trusted agencies 'prescribed agencies'.

Develop cost-effective arrangements to facilitate protected access to this dataset and/or related analytics services. Initially this could leverage existing NEAR arrangements, but scaling access to these services will need further consideration (link to Recommendation 26).

NEAR's forward funding is currently limited to mid-2022, however, options exist within NEAR's governance for a range of funding and fee-for-service models to be explored to expand on this resource.

Question 16: Access to meter data

Can you provide wider discussion on the benefits or challenges in access to meter data for research and analysis? Can you provide alternative ways to capture similar insights?

10.2 Visibility of gas meter data

AEMO has a role in forecasting both demand for electricity and gas, but data available and subsequent approaches vary greatly. Gas usage and forecasts are less time sensitive, with storage in pipelines leading to less need for supply-demand balancing. Subsequently, gas metering has not progressed as rapidly.

However, one of the clear holes in how electricity demand is analysed is gas data. Gas is a direct substitute for many uses of electricity, including heating in buildings, hot water and industrial processes which are all major drivers of electricity demand. Homes with gas generally use around 20-45 per cent less electricity[67] and in some climates whether or not you have gas it is the largest influencer on the electricity bill, as shown in Figure 7. In industry, gas use can be an even higher percentage of energy costs, particularly industries with large heating elements, and it can also be a non-energy feedstock to chemical processes.

Current meter data sets cannot associate electricity and gas usage at the same sites, or even whether an electricity meter site has access to gas, to allow separate analysis of with and without

[67] ACIL Allen's October 2017 report Energy Consumption Benchmarks for residential customers – Electricity and Gas here

gas. This means that current estimates of 'average' electricity usage or bills (as provided in retail price reporting) can be somewhat misleading (as shown
Figure 11). It does not effectively represent usage in either an average house with gas or an average house without gas, so it represents no-one.

Figure 11: Examples of considering gas bills[68]

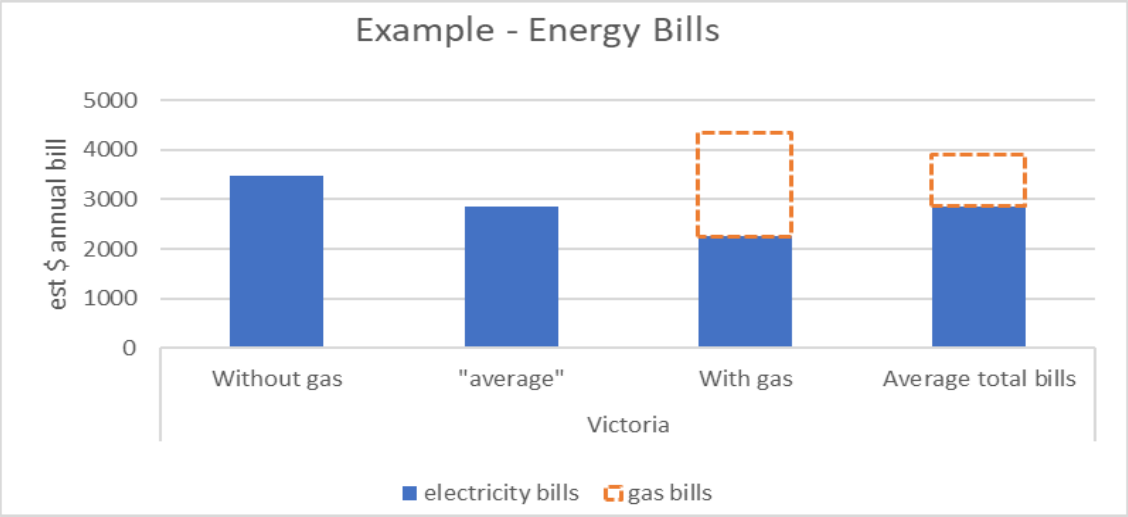
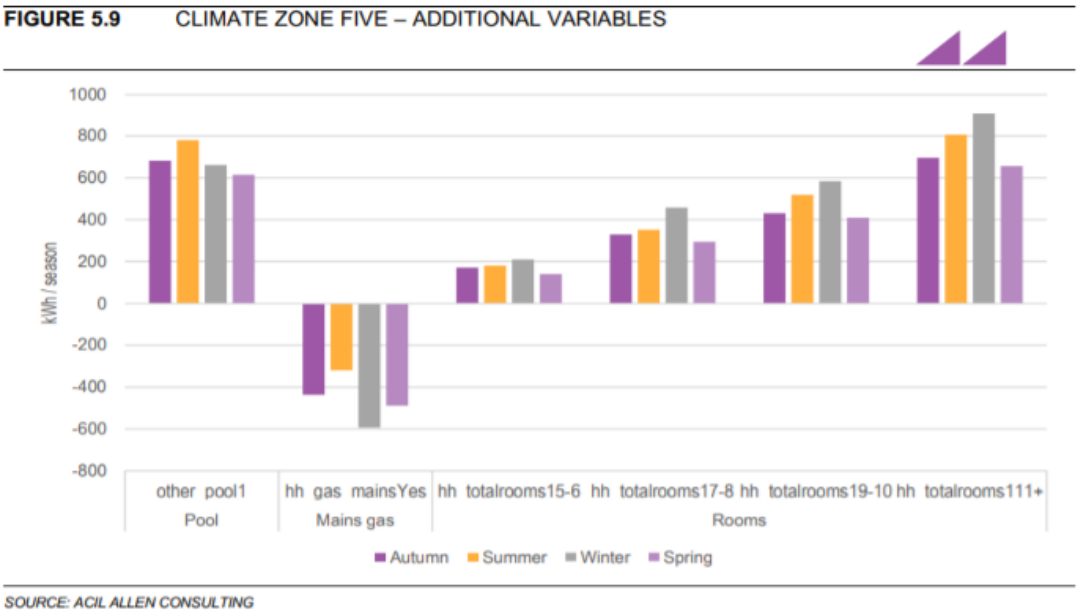


Figure 12: Bill benchmarking 2017 analysis – influence of different variables



[68] Examples are illustrative – based on usage rates in the 2017 Bill benchmark[67] - for three person households in Zone 4 Victoria (Western regional Victoria) using median 2017 tariffs as reporting by St Vincent de Paul's tariff tracker report 2018 "The NEM - No guarantee for consumers." here

Note impact would be larger in Zone 5 which has 2.25 million homes across half of Sydney, however Acil Allen does not provide complete data to estimate.

Bill Benchmarking has started to include gas[69], but as a separate benchmark. The detail reported on the interaction is limited. NEAR has also attempted to identify whether homes have gas based on their usage, with good results for homes with gas heating but less so results for homes with some gas usage but no heating.

For industrial sites, the National Greenhouse and Energy Reporting Scheme (NGERS, operated by CER) requires all large energy users to report both. Until recently there was little ability to analyse this data year-on-year to spot trends in usages or electrification, as company reporting was not effectively tracked or consistent between years. Some work is under way to improve this.

Does this matter? As electricity de-carbonises and heat-exchange technologies continue to improve, it expected that gas appliances and industrial equipment will start to be replaced by electrical ones. This could reverse of some trends around falling electricity use. In terms of understanding impacts and advice for individual energy users, the focus should be total energy costs. Any discussion of electricity costs to the exclusion of gas costs underestimates consumer costs significantly and excludes many of the options to reduce bills.

A key consideration is how gas meter data might be captured. Currently AEMO receives some gas meter data associated with competitive markets, where gas users have switched to an alternative gas supplier. Unlike electricity meters, AEMO does not have a complete set of gas meter standing data with meter location. Some of the data provided to AEMO for settlement is also aggregated and inconsistent across different gas providers.

To understand complete energy usage at a given site, AEMO would need a complete set of gas meter standing data and reporting of usage, as with electricity. This is a more material change to both AEMO systems and gas retailer systems and costs would need to be estimated and considered against benefits. As an alternative, sampled surveys could be used to estimate gas impacts, but this would provide only slice-in-time analysis which would need to be repeated regularly to investigate a changing trend in gas usage. Some exploration could also be made to link industrial-scale meters to NGERS, which may create some reporting cost savings for large companies. These alternative approaches should be further explored and costs compared.

Recommendation 7: Gas meter data

Gas is a direct substitute for many large sources of electricity demand but with even less transparency. Support more holistic energy forecasting and understanding of affordability, by: exploring options to provide transparency of gas metering and linking electricity meters which have access to gas.

Options and cost should be explored to achieve this, including:

- requiring more complete reporting of gas meter data in settlement systems, equivalent to ongoing reforms in electricity data
- linking energy use at the same site across electricity and gas meters
- considering more effective survey and sampling of gas usage.

[69] Voluntarily – as this goes beyond current regulation which only covers electricity

Question 17: Gas metering

Can you provide wider discussion on the benefits or challenges in improving gas demand transparency? Is gas data critical to understanding electricity demand, and well as total energy and gas demand?

Can you provide alternative ways to capture insights into changes in gas demand? Can you provide evidence on costs/benefits to implement a gas meter dataset?

10.3 Consumer characteristics and surveys

Some consumer data can only be captured by survey, including individual consent to access meter data. Given widespread interest in better understanding consumer energy bills and demand, and limited alternatives to date, there have been a range of surveys.

The ACCC, AEMC[70], AER, NEAR, CSIRO, ECA, ABS, DISER and a range of state government entities (Example 20) have in recent years all undertaken separate and similar (but inconsistent) primary consumer surveys to seek transparency on consumer bills and drivers of usage. While often useful, these tend to be varied in scope, inconsistent and ad hoc in timing. The level of detail able to be shared varies greatly and in many cases is limited, which contributes to duplication of effort. They have also had mixed levels of linking to meter data, which has been challenging and sometimes depend on self-reported data with limited accuracy.

Agencies also have a range of ad hoc energy user datasets related to specific programs, such as equipment uptake, standards or grants programs. AEMO has frequently used these datasets to fill gaps in their data for forecasts, such as appliance uptake from energy efficiency standards programs. Many of these were opportunistic, one-off datasets from programs or based on consultant assumptions which are not repeatable, resulting in the need to seek new forecasting approaches each year. AEMO also commissions direct research in a range of areas to tackle data gaps, both directly and through NEAR.

Example 19: Surveys

AER Bill Benchmarking survey: This a three-yearly survey to support the development of average consumer use benchmarks. Retailers are regulated to provide these "bill benchmarks" on consumers bills, to give them a sense as to whether they are a high or low energy users. These benchmarks and the subsequent survey have a range of prescriptive requirements in regulation: benchmarks must be calculated against number of people in homes, must be split by climate zones set by state ministers (which vary in methodology between states), meter data must be provided by distributors, timelines for update requirements are regulated, etc.

AER has considered a Rule change to update the Bill Benchmarks to better meet consumer requirements and streamline the process. However, the detailed review and evidence needed to support a Rule change required means this update has been delayed. While the 2017 Bill Benchmark data was shared with NEAR, the 2011 Bill Benchmark data could not be shared for policy research due to constraints in the consent arrangements. The 2020 survey is taking a different approach to accessing meter data which may reduce costs but create new constraints.

NEAR consumer surveys: In 2016-17, NEAR undertook a range of pilot surveys, including Victoria and Western Australia, seeking to close research gaps and also test methods to improve consumer

[70] AEMC has already streamlined their activities with ECA's surveys.

responses to the survey. NEAR later replaced this with access gained to the 2017 Bill Benchmark survey and the alternative CSIRO 'Energised' app. 'Energised' sought ongoing information from a voluntary panel of engaged consumers through 'micro surveys', which provided more in-depth information than a traditional survey but was limited in its ability to be statistically representative or be linked to meter data. In 2019 NEAR discussed collaborating with AER on development of the 2020 Bill Benchmark survey but through a range of timing issues (the Bill Benchmark has regulated timelines) this was not achieved.

ACCC retail surveys: During the original REPI, the ACCC undertook an extensive consumer survey, and with consent, linked it to billing data, publishing findings as an attachment to the REPI with Colmar Brunton. An advantage for the ACCC in undertaking the survey is its ability to compulsorily acquire data from market participants, including customer billing data from retailers, using its information-gathering powers under section 95ZK of the CCA. However, the ACCC operates under strict confidentiality requirements if information is collected under section 95ZK of the CCA. The ACCC has been constrained in its ability to share data with the energy market bodies and processes seeking to resolve this can take considerable time.

ECA surveys: ECA undertakes a regular biannual Consumer Sentiment Survey to act as a metric in the energy market on consumer views. ECA has released much of this data and has undertaken some effort to work with other bodies to broaden its scope to cover wider needs. However, it does have a range of limitations as it is largely qualitative in nature and a relatively small sample. ECA also supports a range of other surveys, such as its Small business survey and many of its grants support in-depth consumer research.

State survey: A range of jurisdictional energy bodies have undertaken ad hoc or regular consumer surveys, mostly publishing summary results but not detailed data. Examples include: Queensland's Household Energy Survey[71] undertaken annually since 2009; NSW IPART's Household Survey of Electricity, Gas and Water[72] undertaken seven times between 1993 and 2015; and Victoria's Utility Consumption household survey[73] undertaken four times since 1996. In many cases this is to support State interests in price monitoring, but also a range of other concerns in vulnerable consumers and energy efficiency. Many ad hoc programs and grants funded by states have also undertaken similar consumer research. Some state processes to review network prices have also undertaken similar surveys.

Wider surveys: A range of wider household surveys also pick up information on energy bills, including the ABS HES and ABS CPI surveys and HILDER[75]. ABS surveys usually take 18 months to release data. Recently ABS has improved its ability to release micro-data sets to approved users, which can provide for more in-depth data analysis. However, the scope and expense of ABS surveys mean that they have limited capacity to add additional energy questions or be updated, and the data is usually already dated by the time it is released.

Grants programs: A number of energy grants programs have undertaken in-depth consumer surveys (costing many millions of dollars) to research consumers and new energy services. Examples include pilots under the LIEEP, Smart Grid Smart City, Solar Cities and many more. Frequently, despite this data being a key research goal and the need to share this data being contractually explicit, challenges in the survey process have made sharing limited or impossible. Issues have included poorly worded consents, data that proved too re-identifiable, research ethics boards who had not

[71] Queensland Household Energy Survey here

[72] IPART Household Survey here

[73] Victorian Utility Consumption Household Survey here

considered the sharing processes, and data captured in ways which did not allow wider analysis due to gaps or lack of controls.

Energy equipment programs: A range of national and jurisdictional energy equipment programs also capture in-depth dataset on households or appliances. Some are based on the subsidies or credit schemes and capture data as consumers are eligible, such as the CER SRES, the NSW Energy Saver Scheme and Victorian Energy Upgrade program. These programs can often be linked to the recipient and there have been some attempts, but with limited success, to undertake analysis as to their impact by linking to meter data. Other programs are based on sales figures of equipment, such as under the appliance Energy Rating scheme[74] and while these can provide more comprehensive data on uptake and are a frequent input into forecasting they have limited ability to link to a location or impact below a state aggregate.

Many of these surveys could gain value from more effective access to meter data, which is often left out due to the difficulty in gaining access to this data even with consent. CDR may assist by providing a clear process for consents and meter data access, but how this may operate in a survey context is unclear and will likely require a range of innovation in online survey processes. Wider data analysis undertaken by programs such as NEAR could also gain value from access to surveys, to allow targeted research to confirm wider results.

Bill Benchmarking is concerning as a regulated requirement which is clearly out-of-date and unlikely to be maximising consumer benefits. State jurisdictions could gain value from greater access to the Bill Benchmarking survey results or analysis of the meter datasets, particularly if retail transparency recommendations are implemented.

Recommendation 8: Review of consumer surveys and Bill Benchmarking

Support better consumer research through more effective consumer surveys. Reduce duplication and improve effectiveness of consumer research by undertaking a more regular but flexible base survey and providing for outcomes to be widely used, by:

- bringing together key organisations currently undertaking surveys to review and recommend a preferred approach to a regular program of baseline survey(s) that meet a wider range of objectives. This should include a review of AER's Bill Benchmark survey, ECA's Consumer Sentiment Survey, NEAR, ACCC, ABS, wider resources like the HILDER[75] panel survey, and a range of jurisdictional activities.
- undertaking a Review and Rule change to revise current survey requirements, including for Bill Benchmarking[76]. By removing prescriptive detail and allowing for an updateable guideline (managed by the AER), any new Rules should allow for new survey recommendations to be adapted over time to meet emerging needs.
- seeking consent to link survey data to meter data, to allow better analysis of consumer trends in a protected environment.

[74] Energy Rating scheme here
[75] Melbourne University's *Household, Income and Labour Dynamics in Australia (HILDA) Survey*
[76] It may be prudent to link this to a wider review of Bill Benchmarking, including its benefits for consumers and alternative approaches. However, the survey process could be improved even without changing the wider policy requirement.

- requiring any supported survey, including research programs supported by public funding, to meet common guidelines for consent and data sharing, as proposed by KWM's legal review (Appendix D) to ensure that its value can be maximised.

Note the goal of this process is not to limit or prevent other surveys but to support a more coordinated, useful, regular and accessible central survey program (which may have diverse elements). This may also allow other survey resources to be more focused and targeted to specific needs.

10.4 Vulnerable consumers

As an essential service with rising prices over recent decades, affordability for vulnerable consumers is always at the top of energy policy concerns. Many reforms and programs[77] have been driven by these concerns in recent times, which appear to have provided some improvement. There have also been a range of trials[78]. However, there remains limited data on how effective they have been to better inform further policy responses.

Concerns that vulnerable consumers see fewer benefits from retail competition have driven recent reforms such as the DMO/VDO. There is some evidence vulnerable consumers are less likely to switch retailer[79] and the ACCC REPI survey found evidence of vulnerable groups having higher average prices[80]. However, due to poor retail transparency and mixed ad hoc surveys, there is still little visibility as to what retail plans vulnerable consumers are on, and what they pay. Key datasets specific to vulnerable groups, such as accessing a particular subsidy or hardship program, are impossible to link to wider data (outside of a retailer or the subsidy program) unless self-reported in a direct survey.

AER now undertakes further reporting on these metrics from retailers and gained greater powers with relation to the DMO/VDO, but new data remains in aggregates with limited scope. AER's Affordability report[81] attempts to compare energy bills to income to test affordability. This adjusts average estimated bills for state low income subsidies. However, lack of available data means it doesn't adjust for the differences in usage patterns and retail tariffs of these groups.

Falling bills due to decreased energy use are also a concern. While many consumers are using new energy efficiency and DER technologies to reduce their bills, some vulnerable groups of consumers are less able to access these services, such as low income groups with limited capital, renters with limited control over their homes, or those who struggle with complex decisions or technologies (such as those with disabilities or language barriers). Yet there is little evidence available on how energy use is changing for different vulnerable consumer groups compared to average homes and whether uptake of new technologies are creating an ongoing regressive problem.

Further, there is a lack of agreed metrics to measure energy disadvantage, with debate across academia. There are many gaps in data, especially on wider wellbeing such as testing links between energy use, heating/cooling and health. The Energy Minister's Strategic Energy Plan lacks adequate measures on vulnerable consumer affordability (See Appendix A, Section 1.1)

[77] Including the DMO and VDO and a range of targeted subsidy programs for DER
[78] Such as the Low Income Energy Efficiency Program, and a range of jurisdictional programs
[79] Unpublished analysis by the Commonwealth Department of Industry, Science Energy and Resources
[80] Link Colmar Brunton
[81] AER affordability in retail energy markets, Sept 2019, here

The Finkel review recognised these problems, particularly around access to new technologies[82]. Energy Ministers have initiated a workstream to further investigate these issues, with a broad research collaboration now under way studying energy equity. An important aspect of this study is reviewing current data and metrics on vulnerable consumers, identifying gaps and problems with the metrics, and making recommendations on improved metrics.

The recommendations discussed regarding retail pricing transparency and understanding different classes of consumers (Recommendation 1, Recommendation 6 Recommendation 8) seeks to resolve some of these problems. However, large data gaps remain, including whether existing subsidies and hardship programs genuinely help combat energy poverty. The links between energy poverty and wider wellbeing and health impacts are also unclear.

Recommendation 9: Data on vulnerable consumers

Pursue improved data and metrics on vulnerable consumers, building on research under way through the Energy Ministers' work on energy equity and drawing on wider recommendations on retail transparency and consumer research.

Question 18: Vulnerable consumers

Are there sources of data and research on vulnerable consumers and their challenges in the energy market that the Energy Ministers workstream may not have considered?

Can wider recommendations proposed (such as Recommendation 1, Recommendation 6, Recommendation 8) some challenges for vulnerable consumer metrics?

10.5 Commercial consumer data

Across energy consumer types, arguably the least understood are commercial-scale energy consumers and how they are changing, despite this being in aggregate the largest sector of energy use. Some of the largest opportunities to improve forecasting are in this sector. Similarly, there is much further policy work to be done in this sector in improving energy efficiency and competitiveness.

Current forecasting tends to focus on households as a more homogenous modelling problem, and then targets the very large lumpy industrials individually. The wide group in between (small business and medium-to-large commercials) are usually the mathematical remainder. Different types of businesses and diverse scales makes this group impossible to model as a single group, but also diverse enough that large amounts of data are needed to take a more targeted approach. While there is some ability to split small energy users between householders and small business, this can be challenging when many small businesses work from home. Medium-to-large businesses in most data sets are not identified by sector or use-pattern, only grouped by scale and sometimes location.

Supporting a range of needs in energy efficiency policy, NEAR has undertaken some useful analysis in this sector. Commercial building energy efficiency policy, in particular, has progressed analysis, with targeted policy for different classes of building (like offices, hotels, retail etc.) supported by

[82] Finkel review[1], Recommendation 6.6

investment in a 'building stock model'. There are a range of opportunities to attempt to link data to public data on buildings, sector types, local government zones, etc.

Commercial data, while often sensitive, does not have the same privacy issues as personal data, with many existing requirements to publish data. This creates potential opportunities to link data, for example capturing broad classes of data like ANZSIC codes or linking to satellite analysis of building stock. Data science analysis of usage patterns also provides a range of opportunities to improve our understanding of demand in this sector.

The COVID-19 pandemic provided a key example of the value of better understanding this sector. When lockdowns began, widespread economic shifts between sectors sent forecasters scrambling to predict requirements to ensure reliability. Any ability to split energy metering, particularly smart meters, between sectors was suddenly valuable, to monitor both what was happening to energy usage and understand wider economic impacts as businesses in different sectors reduced activity. In the short term (absent productivity changes), energy use is a good proxy for activity. It would be possible to turn energy metering data into an economic activity indicator. This could also be used to provide insights into regional forecasting and growth, as well as disaster monitoring and recovery, or tracking vulnerable sectors like small business. DER-related trends are also growing in this sector, providing major opportunities for active control and system balancing. Large heating/cooling systems in commercial-scale buildings are a major opportunity in load control, particularly if regionally coordinated, with smart-building technologies growing rapidly. Solar and battery systems are becoming increasingly attractive to commercial investors. Trends such as cloud data centres are shifting demand, driving major new centres of large-scale demand while reducing in-house energy use in some other sectors. Shifts between gas usage and electrification are also likely to be significant in this sector, with potential to shift forecasts. For distributors seeking to undertake regional forecasts and balancing, this research is particularly valuable.

Data science opportunities opened up by greater access to meter data will be equally relevant in the commercial sector. Opportunities should be pursued to target high-value early analysis in this sector to improve forecasting, particularly given current economic shifts.

Recommendation 10: Commercial consumers

Improve analysis of business energy use to assist forecasting and understanding sector impacts, particularly during economic disruption. A research program could build on existing NEAR analyses and be further supported by recommendations on large user contracts (Recommendation 3) and wider reforms supporting public-good research. Consider:

- linking business classification and meter data where possible. This could leverage existing work (NEAR, ABS and others)
- integrating data across key sectors to better understand price impacts, productivity changes and demand response potential. Useful data could include related findings from CER, ABS, ClimateWorks and AER analyses
- building on the commercial building stock model and wider building datasets, linking meter data to commercial building types
- targeting research on commercial sectors and equipment types, particularly equipment impacting reliability concerns such as large scale motors.

Question 19: Commercial consumers

Can you provide evidence of cost and benefits in improving analysis of energy data in the commercial business sector? Are there opportunities in improving commercial energy use data which are not considered?

11 APPENDIX C: VISIBILITY OF THE LOW VOLTAGE NETWORK AND DER

The ESB's objective for DER integration[83] is to optimise the benefits of DER for all electricity system users, regardless of whether they own DER or not. The potential benefits of efficient integration DER are substantial and the timely development of supportive technical standards and requirements, regulations, and market design are essential.

The ESB's DER Roadmap and Workplan[84] ties together, as clearly as possible within a rapidly changing system, how the ESB envisages the future for DER integration will unfold and what needs to be done to ensure the benefits of DER are unlocked in a timely manner. The DER Roadmap emphasises the importance of developing systems in place to provide visibility of DER, communication and interoperability standards and protocols, together with the development of dynamic 'operating envelopes' to expand the access of DER to the grid.

Managing high penetrations of DER will depend on data and digitalisation, requiring some level of visibility of the distribution low-voltage (LV) network and, ideally, communication with DER. Neither of these capabilities are currently in place. The aging, largely blind low-voltage system needs to be able to observe and actively communicate with, and support the opportunities or where necessary, manage the impacts of new technologies. This means monitoring, predicting and, where beneficial for consumers, coordinating the behaviour of a rapidly growing number of new, independent elements within system and network constraints.

This is not a future challenge: rooftop solar generation is already facing export limits and being challenged by local network constraints in some areas[85]. Falling technology costs means more active DER technologies are being purchased, such as batteries, home energy management systems and EVs. All future market designs will depend on some level of LV-DER visibility and communication. Visibility, communications, data and related standards must be progressed now, in parallel with wider design work.

This is widely understood and work is well underway, with ongoing processes and trials developing reforms and new tools. This includes:

- Current Rule changes being considered to provide incentives for networks to integrate DER, proposed by members of the DEIP access and pricing working group and currently being considered by the AEMC
- Inverter standard AS 4777 being developed with major support from AEMO
- Communication and interoperability and wider data requirements being developed by under the DEIP Standards working group
- The ESB's Rule change proposing new DER Standards Governance arrangements
- Trials of Dynamic Operating Envelopes, which a foundational for integrating and optimising DER within network constraints.
- Trials of alternative approaches to modelling the LV network and related tools
- Guidance being developed by the AER on business cases for investment and the Value of DER (VADER).

[83] ESB DER integration workplan, October 2019, here
[84] ESB's DER Roadmap and Workplan, September 2020, here
[85] UNSW Voltage report: Voltage Analysis of the LV Distribution Network in the Australian National Electricity Market, UNSW, Centre for Energy and Environmental markets, May 2020 here

Much of this is being coordinated by the ESB DER Integration Workplan and the DEIP collaboration which involves many diverse stakeholders. Many network businesses and DER service providers are also developing their own tailored strategies and capabilities and many collaborative trials.

A range of challenges remain, particularly around where and how existing data is accessed. The Data Strategy is seeking to identify where barriers may remain and seek to address them.

This attachment considers four levels of DER-network integration data:

- LV network visibility
- Metering data requirements
- Visibility and control of DER
- Electric vehicle data and standards.

11.1 Low voltage (LV) network visibility

In most places, the LV network has little coordinated monitoring and is largely blind (with the exception of Victoria where smart meters have been rolled out). The scale of the LV network means investing in wide-spread monitoring and management infrastructure would be expensive and in many places far from efficient.

A key challenge in transition is not all the network needs greater visibility – yet. Or at least not wide-spread active monitoring. In many places existing models continue to predict the performance of the network effectively within allowable margins.

However, greater data on network performance is needed, to identify and target any areas with emerging challenges, and to optimise the benefits of DER.

Eventually new technologies may provide much greater visibility across the system. In the immediate term the key question is: what combination of existing data, sampling, trials, standards and new investment will move the system most efficiently forward and balance risks of over-spending and under informing?

Export limits and managing DER penetration

As DER export grows parts of the LV grid will meet capacity constraints, leading to risks of voltage rise and breaching thermal limits of equipment. Without visibility or some way to actively manage DER (such as dynamic operating envelops) , most Distribution Network Service Providers (DNSPs) currently manage DER risks through static export limits. These are relatively simple and are managed through DER Connection Agreements. Applied limits vary by location and tend to increase over time with DER congestion, creating a range of challenges in forecasting and equity.

Networks currently have no obligations to increase DER “hosting capacity” and do not need to seek approval for export limits. They also have not obligation to provide transparency on network constraints, DER penetration or voltage and network performance.

Static export limits are inefficient, as they limit export whether or the not the network is constrained, resulting in losses for DER owners and demand shifted to other generators in the market. CSIRO working with ENA estimated continuing to integrate DER using only current methods, such as export limits or expanding the grid, without additional network visibility or active

management could cost around $100 billion by 2050[86], equivalent to 10 per cent of all network costs and around $415 per year on each household bill.

However, the DNSPs' primary responsibility is to keep the network operating safely and reliably. As identified by the AEMC review[87], DER can creates risks for networks, and there may insufficient incentive to invest in network visibility or work to increase DER hosting capacity. Existing regulatory arrangements did not predict a need for incentives or requirements to support DER.

Some areas of the grid are rapidly reaching DER penetrations high enough for the DNSPs to discuss imposing zero export limits. This is largely about risk management; limited visibility and lack of clarity on future market arrangements mean DNSPs are cautious and hesitant to commit DER export capacity. However it is widely recognised (including by the networks) that zero export limits will be unacceptable to the community and better DER integration options and rules around access will therefore be needed.

Current solutions proposed are new incentives for networks, and dynamic export limits, known as "Dynamic Operating Envelopes".

Network incentives and obligations

Workstreams are well-advanced in addressing network incentives and requirements to support DER integration. The AEMC is currently consulting on a package of network access and pricing Rule changes to:

- update the regulatory framework to reflect community expectations for distribution networks to provide efficient DER export services
- promote incentives for efficient investment in, and operation and use of, export services
- enable export charges as a pricing tool to:
    - send efficient signals for future expenditure associated with export services
    - reward customers for actions that better utilise the network or improve network operations
    - allocate network costs in a fair and efficient way.

These Rule changes are the result of recommendations from the DEIP Network Access and Pricing workstream[88]. The DEIP collaboration has brought together a broad collection of stakeholders, including the Rule change proponents SA Power Networks, the St Vincent de Paul Society (Victoria), the Total Environment Centre and the Australian Council of Social Service (jointly).

Should these proposed Rule changes (or similar incentive arrangements) be progressed, they would be intended help to clarify appropriate DNSP business cases for new monitoring and DER management systems, and support the AER to drive efficient outcomes for consumers.

Dynamic Operating Envelopes

Dynamic Operating Envelopes (DOEs) replace static export limits with dynamic export and import limits, adjusted over the day and from day-to-day, to ensure that DER is only constrained where and

[86] Electricity Network Transformation Roadmap: Final Report, April 2017
[87] AEMC ENERFR 2019 pxi "The network regulatory framework currently imposes no consequences on DNSPs for constraining off DER generation, and similarly provides no benefits for increasing DER hosting capacity where this is in the longterm interests of consumers."
[88] DEIP Access Pricing here

when congestion exists. This supports greater benefits for all consumers, through reducing losses from unnecessary DER constraints and supporting greater levels of DER penetration and, in future, coordination.

DOEs could also be the main tool for communicating between local network management and the system and markets as a whole. Dynamic operating envelopes will allow VPPs and other aggregators to optimising DER within markets or contracted procurement, within local network constraints.

Trials of dynamic operating envelopes are well underway and could involve a range of technologies. The DEIP is initiating a workstream to explore the potential value that DOEs could offer to the energy transition. This workstream will aim to:

- build an agreed definition of the opportunities and challenges
- share insights on approaches currently under investigation, and
- identify reforms that could be implemented to establish dynamic operating envelopes.

The first step in this workstream is discussions with a broad range of industry stakeholders to identify the potential benefits, barriers and approaches to the implementation of dynamic operating envelopes across Australia. A DEIP Working Group of representatives from ARENA, ESB, AEMO, AER, AEMC, ANU and SA Power Networks is convening a series of webinars and workshops to begin this work.

Workshop one will focus on the process, consumer experience and social licence considerations for DOEs while the second workshop will focus on standards, regulations and costs benefits analysis to support the least-cost adoption of DOEs.Following these workshops in October and November, the DEIP Dynamic Operating Envelope Working Group will compile the feedback and look to develop actions to support the timely, effective and equitable rollout of DOEs across the NEM.

Consideration of data issues is central to this work.

Options to improve network data and visibility

LV data and visibility can be achieved through a range of still emerging technical options and does not necessarily require widespread monitoring. To date most networks have relied to some extent on predictive models of the network condition, without monitoring, and these can be enhanced with further data on the physical network and/or trained with sampled or monitored data from a range of sources.

Most DNSPs would prefer to gain visibility of the LV grid through network-owned and -controlled monitoring assets[89] which allows them to most easily develop integrated systems and control risks While this may be appropriate in targeted areas to manage particular risks, the scale of the network and a range of existing data and alternatives means that widespread new monitoring is unlikely to be the most cost-effective solution in the short term. Careful consideration of alternatives and cost-benefits must be taken before allowing consumers to pay for unnecessary investment.

Non-network data sources already exist, to a lesser or greater extent in different areas, which do not require dedicated new hardware. These include data from advanced meters, DER monitoring and other utilities such as the National Broadband Network (NBN). With the ongoing roll-out of DER and

[89] ENA Open Networks here

competitive metering, these data sources will grow, but barriers remain to DNSPs accessing and using these data sources.

Investing in data systems

A range of networks have already struggled to develop well supported and approved monitoring investment business cases. Many of the benefits of network monitoring accrue to consumers and markets through greater optimisation of DER, but there is no standard approach to estimating these benefits. Recent investment proposals have taken diverse and inconsistent approaches to estimating this Value of DER, due to the lack of common guidance and a range of local difference in systems, data and policies. This not only makes these business cases difficult to develop, but also for AER to assess and for stakeholders to engage with and provide input, as expected in pricing proposals.[90] To address this challenge, the DEIP access and pricing working group recommended development of a standard method to calculate the Value of DER (VaDER). A consultation paper on Methodology for VADER[91] has recently been released by the AER.

There are also internal network benefits from LV monitoring, as detecting voltage issues helps pre-empt maintenance problems, reduce costs and improve reliability. Estimating these benefits also requires a range of assumptions and granular internal data, which many networks do not have. ENA has recently been surveying networks on data gaps to provide further advice.

Business cases to expand the use of existing non-network data can also be challenging. There are a range of barriers to accessing this data as well as diverse assumptions about its future availability. Significant investment may be required in data analytics and systems, as well as ongoing operational costs in accessing the data. These trigger challenges associated with different treatment of capex and opex in network regulation, making options with greater opex costs more difficult.

To help resolve some of these problems the AER is well-advanced in developing a guide for *Assessing DER Integration Expenditure*[92]. DNSP business cases need to draw on the range of benefits from network visibility and monitoring. One challenge that seems to have been widely underestimated to date is high and over-voltage.

Overvoltage

High voltage levels[93] can create significant costs for consumers, including:

- reducing the life of many types of equipment and appliances
- losses in solar generation constrained off
- increasing total energy demand (and carbon emissions).

[90] Better regulation - Consumer engagement guidelines for network service providers: When developing pricing proposals network regulation requires service providers to describe how they have engaged with consumers, and how they have sought to address any relevant concerns identified as a result of that engagement here

[91] Value of Distributed Energy Resources: Methodology Study: Consultation Draft Report, CSIRO here

[92] AER *Assessing DER Integration Expenditure* Consultation draft here

[93] Exceeding technical standard AS61000.3.100

A recent University of New South Wales study[94] on voltage levels (undertaken for the ESB DER Integration Workplan using Solar Analytics inverter data), found significant levels of high voltage across all networks in all NEM states. In the vast majority cases this was an underlying issue, likely due to the historic load of air conditioning and the transition from 240 to 230V, and was not driven by DER.

Depending on the extent of high voltages across the LV networks, the benefits of reducing voltage levels is likely to be material. Annual consumer spending on appliances is well into the billions and a one per cent reduction in energy in the grid would save around half a billion dollars. Trials at United Energy and Electricity North West in the UK suggest energy savings could be several times this, with United Energy reporting a three per cent saving in energy demand through improved voltage management.[95]

The UNSW study also found constraint costs on most rooftop solar systems were estimated to be modest on average (in the order of $3-12 per annum). However, this cost was found to be highly variable and localised, with the worst impacted systems losing 30-90 per cent across the year.

Testing the scale of the problem and its impacts requires further investigation. If these benefits prove material, guidance could be developed on how to estimate them (for example a method similar to VADER or broader advice in AER's DER Integration Expenditure guideline). That would assist networks and the Regulator in assessing efficient investment options to improve LV visibility and voltage management.

Recommendation 11: Research impacts of current voltage levels

LV visibility has a range of benefits which should be considered in supporting investments, including management of high voltage and over-voltage risks which recent findings suggest may be under estimated and insufficiently considered.

Support a study to investigate the impacts of current voltage levels on consumer equipment, DER and losses, building on recent findings in the UNSW Voltage Report. This study should engage with relevant stakeholders, including the AER, jurisdictional regulators and related ongoing research projects.

If findings suggest that high and over-voltage impacts are material, the AER should consider how to include the benefits of managing these risks in assessing relevant investments (including for LV visibility) and provide related advice to networks.

Question 20: Overvoltage

Is there further evidence or other studies of existing voltage levels and related consumer impacts that should be considered before undertaking further investigations?

[94] Energy Security Board, May 2020, *ESB cover note on the UNSW Voltage Report*, available here
UNSW Voltage report: Voltage Analysis of the LV Distribution Network in the Australian National Electricity Market, UNSW, Centre for Energy and Environmental markets, May 2020 here

[95] United Energy Demand Response Project available here Energy North West trial available here

Which body in the energy sector would be most appropriate and effective to lead this work?

Given the role of jurisdictional regulators in network performance, how are these bodies best engaged?

Non-network LV data

There are many sources of LV monitoring data which are not owned by networks. Understanding what is available as well as its accessibility, costs, and likely future availability, is critical for short-term options to improve LV visibility.

The options must be considered prior to any additional DNSP investment to avoid consumers paying for unnecessary investment.

This data includes existing advanced meter data, DER data and utility data. The extent of data and its ease of access will vary widely by network location. A range of possible barriers exist:

- **Advanced meters, type 1-3:** these are existing larger meters on commercial and industrial sites which can provide voltage data, though their configuration to do this will vary. Some networks have partnered with commercial-scale meter owners to improve reliability through sharing data; for example, partnering with large supermarkets to improve reliability of power to their refrigeration systems, where any power loss can cause massive damages in perishable stock.

- **Household smart meters:** these are being rolled out on a competitive basis (with the exception of Victoria), but current penetration is limited and variable across the networks. Smart meters are expected to roll-out over the next decade, and they may provide a solution to much of the LV visibility problem. However, there are a diverse range of views on how fast this might occur, with some evidence take-up is still mostly limited to new-and-replacement meters.

  There are also more significant barriers to accessing smart meter data. Retailers control competitive metering and by many reports have placed contractual constraints on metering providers limiting data services to networks or third parties like VPPs. Retailers impose diverse conditions and limits but generally must approve any data services. In some network areas, providing data services to the network could require negotiating approvals with 15+ retailers, even when working with one metering provider. This creates negotiation difficulties with costs, delays and risks, and make networks reluctant to depend on this data. This reduces the potential value of meter data and risks duplication of infrastructure as networks seek alternatives. It is not clear this is in the "long-term interests of consumers".

- **DER data:** a range of DER providers offer consumers advanced monitoring of DER technologies and/or household demand. This usually allows for voltage and other reporting via the inverter. Proposed new inverter standards are likely to make this capability a minimum requirement[96]. There are a range of additional monitoring services which are already common (such as Watt Watchers, Solar Analytics, Reposit and Redback) and can provide a range of data. To improve consistency in minimum levels of data provided across these systems, there has been recent development of a DER Visibility and Monitoring Best Practice Guide[97]. Virtual Power Plants

[96] Initial DER Minimum Technical Standards – for consultation, AEMO, August 2020 here

[97] DER Visibility and Monitoring Best Practice Guide available here

(VPP) and other DER aggregators also generally have advance control and monitoring; these data sets are diverse and have mixed levels of penetration in different areas. Networks must negotiate with a range of providers for coverage.

- **Utilities data:** the NBN (and possibly other utilities) has remotely-read voltage monitoring and related capabilities on its service nodes. This allows for problem-solving of outages on their own service and investigating problems with local power supply. As their own service reliability depends on the reliability of the grid, they are motivated to partner with networks to improve services and are already undertaking data sharing trials with some network businesses. Given the coverage of the NBN, this could be a valuable monitoring addition particularly in areas with poor smart meter coverage.

Beyond challenges in accessing data, there are a range of critical technical capabilities needed to bring data together to provide useful LV monitoring. Diverse datasets from different systems require a range of analytics and modelling tools to collate and address synchronisation issues. Exactly how much data is needed (and which monitoring points are important) also varies with the ability to model the local grid physically and local data.

While many networks are seeking to expand their internal data capabilities, few could resolve these analytical problems without collaboration with wider experts. With rapid changes in technologies, digitalisation and the changing roles of networks, analytical resources within network businesses must grow rapidly. This is one of the largest risks to integration and optimisation of DER.

A range of existing ARENA projects and wider industry trials are seeking to develop such tools, but this remains a work in progress. Examples include: Evolve/Converge and SAPN/CSIRO.

Most of these projects are working in partnership with the networks, yet still frequently report that access to data is a problem. Partly this reflect gaps in the networks internal data. Many projects install targeted monitoring as part of the project, others leverage existing external data sources (often as this is a key aspect of the models to be tested).

However, projects also face the wider barriers to data, particularly around confidentiality and privacy limitations on meter data and networks responsibilities in this regard. These challenges face many of the problems discussed under Pillar 2's regulatory review, with different legal teams providing different advice on options to manage privacy, de-identification and confidentiality. Use of data for public good research to be considered under the regulatory "Overhaul" recommendations and research guidelines needs to consider the ability of networks and other service providers (such as DER providers) to release of data to trusted research partners, as much as that of central agencies. Networks and DER providers hold a wide range of critical data not held by any other party. The issues for this data can be as much about commercial terms as it is about privacy arrangements. Wide recommendations on research data may also assist.

Recommendation 12: Sharing network data for research

Many networks are working with researchers on new tools and trials, but often struggle to effectively share data. Clarify guidelines and options to reduce barriers for network businesses and other market participants sharing data with research partners, using suitable privacy frameworks and protections. This should be linked to wider work on the research guidelines (Recommendation 33) and the overhaul of regulatory reforms (Recommendation 21)

Recommendation 13: Building analytic capability in LV data and modelling

Networks have critical needs to build new tools and analytic capabilities to support LV visibility and DER integration. Consider options to expand/accelerate development of LV data sets, tools and analytical capability across networks through a broader collaborative/coordinated research effort.

Goals should include:

- identifying and accessing available data sources across the networks (including NBN, inverter data and existing advanced metering)
- identifying barriers to accessing existing data and proposing resolutions to policy makers
- reviewing existing analytical systems and tools for network modelling and managing these datasets
- developing new tools to integrate datasets and improve network models
- identifying key gaps and areas that require more data to resolve

This project should also consider opportunities in existing data to support recommendations around network transparency (Recommendation 14) and monitoring over voltage (Recommendation 11).

Ideally all existing funded research projects in this area should be involved, along with most networks and key data holders such as metering providers, DER services and the NBN. At least an exploration of existing data should be undertaken in all network areas led by the network.

This may be appropriate to be linked to DEIP or an alternative research collaboration. Exploring the appropriate governance for this collaboration will be critical to its success.

Question 21: Analytical capabilitiesto support DER integration

Is the proposed collaboration to acceleration network analytics, datasets and tools workable? What barriers or concerns does it raise? Could most networks engage in this process?

Who should lead this work and what is required to maximise its success?

LV visibility for non-network stakeholders

Much of the discussion on LV visibility and DER integration is driven by those with reliability responsibilities, such as the networks and AEMO. However, to effectively integrate and optimise DER value over time, stakeholders across the energy sector need some level of visibility of LV network constraints and performance, including consumers, DER service providers, energy retailers, regulators, policy makers and related researchers.

DNSPs currently have limited obligation to make this data available, even where data on LV constraints and performance are available (as in Victoria). Networks publish detailed Annual Planning Reports (APR), including a review of constraints, but generally these do not include details below the sub-station level. To make APR information more usable, 'network opportunity maps' (NOMs) have been developed and are voluntarily published through AREMI, providing information on constraints to larger users and generators, but again only at higher levels in the grid.

The information of most relevance to DER stakeholders is the local network "DER hosting capacity" and how that may impact DER investment and costs over time, including decisions on export limits or proposed export pricing. While networks (as regulated monopolies) are required to engage actively with stakeholders on network tariff proposals and release a range of supporting information, the same is not true for network connection arrangements and therefore does not apply to export limits (although it may to proposed export pricing). This does not allow consumers (or their advocates) significant opportunity to engage with a range of issues, such as how export limits may vary between regions, change in an area over time or impact equity between consumer groups. DER aggregators and services providers are not afforded the opportunity to target areas less constrained, with greater hosting capacity, reducing collective costs and their forward risks.

Some level of published LV/DER network data would provide a range of other benefits in the short term. These include improved forecasting of DER exports, more transparent network performance monitoring, and support estimating local impacts and benefits of DER. Business cases to improve network visibility or more advanced control options would be informed and strengthened by improving data inputs and targeting problem areas. It would also help identify emerging consumer risks, such as voltage issues.

Any obligation to report LV data would immediately change the incentives for regulated monopoly networks to solve at least some aspects of network visibility problems. However, a blunt obligation could allow networks to justify higher-than-efficient levels of investment to achieve that obligation. To avoid this risk, any obligations should be phased in and limited to providing data agreed with the AER, and appropriate to each network's situation.

A range of data does exist which if brought together could provide a path towards greater transparency. Existing NOM maps could be gradually improved with lower-level network data over time. This could be linked to existing export limits and the networks current estimate of "hosting capacity". Related contextual data could be added such as regional penetration of different classes of DER (already released in some form by the DERR register) as well as other factors like smart meters.

Victorian networks have existing access to greater data and rapid expected growth in DER, so could lead the way in development of optimal local maps.. Elsewhere, the AER could require the initial release of available data then negotiate when different aspects of further information will be provided. Datasets like the NBN data could also be considered to provide initial metrics of network performance.

One effect of a requirement to publish estimated hosting capacity or dynamic operating envelopes would be to expose the different ways in which these are estimated/calculated. Similar to VaDER, there is not yet a common or agreed method of estimating "hosting capacity", or related decisions like setting export limits. This has been raised in the current VaDER consultation paper[98] which proposes development of common methods. These estimates have financial implications, not just to DER proponents but as the baseline against which proposed DER integration investments are compared. Different approaches may be appropriate within current incentive-based regulatory approaches, if incentives are aligned with optimising benefits. Incentives-based approaches are also consistent with requirements for transparency.

The DEIP workstream on dynamic operating envelopes is also looking at the different methods by which DOEs are calculated and how to provide consistency in outcomes for consumers within the

[98] Value of Distributed Energy Resources: Methodology Study: Consultation Draft Report, CSIRO here

needs of each DNSP's systems. As noted above, calculating DOEs will require data systems to provide granular data on export (and import) limits, as they change over the day and over time, which are transparent to a range of market players to allow for network constraints to be managed coherently with market. These kinds of capabilities will likely allow monitoring of factors such as levels of DER constrained, which could be included in incentives-based approaches.

Recommendation 14: LV reporting to provide transparency for DER investors and planners

DER investors and service providers currently have little visibility of network capacity. Networks should be required to communicate to stakeholders their estimated DER hosting capacity and/or dynamic operating envelopes, as agreed with the AER, to help inform stakeholder investments and engagement in a range of decisions around DER connection requirements, optimisation and any related incentives.

The form of this requirement should reflect consideration of diverse levels of data across regions, costs and limit risks of driving inefficient investment. It should be designed to require improved information over time as data becomes available, as a pathway towards LV visibility. An example may be a guideline with an approvals process.

The form of information published should consider a broad range of stakeholders and usability, ideally including localised maps and linked to a readily found central location. It should include transparency over input data and assumptions and a range of useful local contextual data on the LV network and DER, much of which is available, to assist with wider engagement and stakeholder planning including:

- any current local DER connection requirements, including technical requirements, export limits, dynamic operating envelopes or export tariffs
- local aggregates of related LV network and DER contextual information, such as regional penetration of different classes of DER and meter types, aggregate export capacity of existing DER (under any export limits that apply), regional load growth/shape etc
- relevant information from higher levels in the local network, such as already provided in Network Opportunities Maps and related planning data
- any additional information on LV network constraints and performance, to the extent they are available and/or inputs into hosting capacity estimates.

Question 22: LV reporting

What additional benefits, barriers or concerns does the proposal for LV network reporting requirement raise? Can you provide further evidence of benefits or costs to inform further consideration of this proposal?

11.2 Meters and getting value from metering data

Earlier sections discussed the importance of access to metering data for consumer analysis, as well as for LV visibility. However, there remain a range of challenges in the current roll-out of competitive metering, as well management of meter data.

The AEMC is due to commence a review of metering by the end of 2020. It has already acknowledged there are many issues, both strategic and operational and expect the review to be comprehensive. Issues raised in this discussion will be referred to the AEMC for review.

There is a range of opportunities to improve the usefulness and consumer benefits from existing metering; while costs must be considered, in many cases existing assets and related processes could make these expansions cost-effective.

Minimum meter data access rights

As discussed above, access to meter data services is often limited by the contractual requirements placed on commercial meter providers, and this may not be consistent with better outcomes for consumers. This can lead to reduced transparency and value from the data, duplication of infrastructure, inefficiencies in data-gathering and market power issues.

Data rights or required access arrangements for networks and third-party service providers should be explored. This should not seek to limit commercial innovation in more advanced services but to ensure that core metering services are optimised for consumer outcomes, including support for LV visibility and DER management.

Such arrangements could also allow networks the right to require some specific local metering services to be included in minimum requirements (where there is a case to meet local needs). An example could be neutral detection; this would seek to optimise benefits for consumers and minimise duplication of infrastructure.

Network connection point

A key issue raised in using meter data as a proxy for LV monitoring is an understanding of where the meter is connected to the grid electrically, rather than at a physical location. Meter standing data currently includes only a physical location/address, which cannot be linked to the local LV circuit without the networks own detailed mapping of its LV circuits. This means that meter data can be difficult to interpret in terms of network interactions.

The DER Register links DER to meter data, so consequently also only has data on physical location, not electrical.

A key challenge in this data is that it is not clear that networks can always identify where meters sit electrically within their system, due to a number of limitations in this historic network models and ongoing maintenance activities.

There are two primary use cases identified for this data:

1. To use meter data to inform detailed network models, to help identify performance issues and constraints
2. To understand where DER output may be impacted by network constraints, based on where it is in the network, to support forecasting.

Meter data used for network modelling may be tolerant of this challenge as not all meters are required, as long as some meters can be identified on the feeder. This could be considered further in looking at improved modelling approaches with existing data (Recommendation 13).

Operating Envelopes, if well-defined and communicated, may support the second use case, in allowing for a range of stakeholders to estimate likely export of DER. Similarly, past metering data

may be able to estimate DER output, although if other local factors have affected constraints like further DER investment, this could be an extensive machine learning task. Networks however, probably need to resolve this issue internally, at least for DER meters, in order to define Operating Envelopes. This should be considered by work developing operating envelopes.

The AEMC could consider whether meter standing data should include the meter's location in the in the LV (i.e. feeder/circuit) to allow for greater transparency and forecasting of DER in relation to constraints. This would have to consider the costs associated with this inclusion, noting while some networks would currently struggle with this data, it may also need to be solved for internal purposes.

Voltage reporting

It will be important to investigate the case for all smart and advanced (T1-3) meters capable to provide voltage data along with settlement data in Market Settlement and Transfer Solutions (MSATS), such that this is visible to networks, forecasters and regulators. This should be informed by the above consideration of access rights and trials on existing data monitoring, as well as the research concerning consumer impacts of current voltage levels. Additional costs for this reporting may be modest if aligned with related requirements on settlement data and limited to new meters and those with existing capability.

DER generation – gross metering

Further, there may be a case for investigating meters with DER to be required to report gross metering of DER generation. Many existing commercial meters can already achieve this and it could resolve a range of issues in DER visibility, including identification of consumers with system problems, improved forecasting and modelling of DER outputs, and improved visibility of DER constrained and consumer losses. Additional costs for this reporting may be modest if aligned with related requirements on settlement data and limited to new meters and those with existing capability.

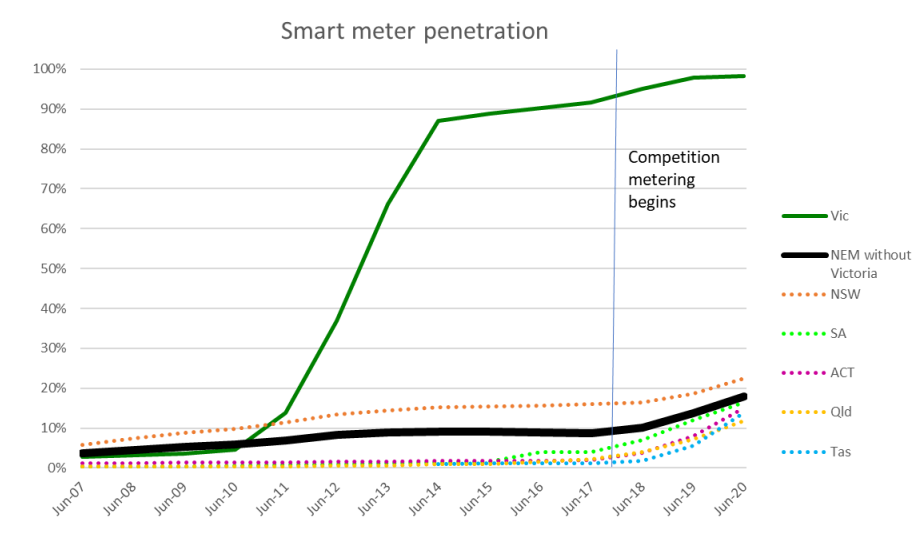
Wider approaches that are being developed for DER management, such as communications standards on inverters and dynamic export limits, are likely to lead to alternative, more granular data on DER performance. In developing these arrangements, how this data is managed and shared will be core issues.

Review of metering roll-out

There is little dispute that supporting wider consumer choice, cost-reflective pricing, integration of DER and a move towards a two-way market will all require more advanced metering. Currently the expectation is the competitive meter roll-out will solve a range of problems by providing additional data, transparency and capabilities. However, the roll-out to date has been slow in most areas. There are diverse views on how quickly the roll-out will progress and the impact of current incentives and challenges. These views can be debated, but they indicate a level of uncertainty and can impact planning, particularly as we trade off other ways of solving the same problems. This is a central issue for AEMC's upcoming review of metering.

Example 20: Competitive metering roll-out challenges

Since the competitive metering roll-out began meter uptake has increased, with around 400 000[99] smart meters installed in 2019 (outside of Victoria). Smart meter penetration in the NEM (excluding Victoria) has increased from around 10-18 per cent smart meters, with many of these new-and-replacement meters. For context, if this rate continued the roughly 8.5 million accumulation meters remaining would be replaced in around 16 years (2036).



The AER estimates a possible competitive metering uptake of around 50 per cent penetration by 2025[100], based on network estimates on introduction of cost-reflective pricing.

Metering businesses suggest most new meters are still installed on a new-and-replacement basis, which means patchy coverage until around 2040[101].

As Distributed Network Service Providers (DSNPs) derive limited benefits from losing old meters, there are some indications they have slowed their identification of meters due for replacement, despite there being at least 2 million meters over 30 years old.

Incentives for retailers to accelerate meter uptake are not clear. Smart meters have always suffered from a range of split benefits in Australia's vertically-disaggregated industry structure. While retailers continue to trial innovative options for prosumers, they also traditionally receive greater margins from passive consumers. Networks currently receive few benefits from competitive metering, with a loss of assets and limits on data access.

There have been recent adjustments to reduce some barriers to competitive meters, focused on reducing hurdles to speed up installation. A range of further options have been raised in recent submissions to increase momentum in the roll-out. These include:

- changes to asset exit fee arrangements, which may not reflect value to consumers given the age of many old metering assets
- introducing a firm age for meter replacement, as there is a high proportion of type 6 meters over 30 years old

[99] Based on numbers of meters released by AEMO.
[100] AER Network tariff reform here
[101] Submissions from meter providers

- targeted meter upgrades for identified consumer classes such as existing solar or load control homes, public housing or regional areas
- negotiated industry approaches such as agreeing voluntary roll-out targets with dates and published tracking and reporting, as a preference to less light-handed approaches.

Recent advances in metering technologies and costs have also raised the question of the current minimum standard. This may require review to confirm that they reflect optimal value for consumers. For example, modern meters have greater capacity for 'real-time' reporting.

There is also a range of views about the role of meters versus advanced DER monitoring devices which undertake similar functions, often at much lower cost, but do not meet current metering technical standards. Some expect these technologies to overtake meters while others expect their functions to merge. This can also impact motivations to accelerate the roll-out, as different players consider optionality in the market.

Recommendation 15: Review of metering requirements and roll-out

Metering is a key source of data to support greater LV and DER visibility, but this data is currently being underutilised due to commercial barriers and out-of-data requirements.

The upcoming AEMC review of competitive metering should include consideration of LV-DER visibility- issues (within the wider scope for the review), including:

- metering data access rights for networks
- network connection points
- voltage reporting
- gross metering
- DER minimum metering requirements
- opportunities to accelerate uptake of competitive metering to assist LV visibility
- updated metering requirements, to ensure consumers are getting optimal value in terms of LV visibility and wider DER integration
- opportunities to provide the sector with more certainty on meter uptake rates.

AEMC is currently developing the wider scope for this review, due to initiate by the end of 2020.

Question 23: LV visibility through metering

Are these suggestions regarding additional metering reporting requirements workable?

Can you provide supporting evidence of related costs or benefits to support further investigations?

Is the problem of locating meters within the grid critical to resolve to support wider monitoring, coordination of DER or planning? Will processes developing dynamic operating envelopes and better network models either resolve it or identify it as a further problem?

Are there additional issues or options that the AEMC should consider in their upcoming metering review?

11.3 Visibility and optimisation of DER

Optimising DER benefits for consumers will necessarily requires some level of visibility and ideally communication with DER.

But as discussed standards arrangements for the services, markets and network models to manage this coordination are still developing. While some elements are well advanced, such as Operating Envelops and minimum communication standards on inverters, many trials and reform processes are underway and new technologies are likely to continue to emerge.

Many DER technologies are already available in the market which support advanced monitoring and control, with aggregators already active in controlling some DER around different market signals. They can also provide many other benefits such as supporting network monitoring, as discussed above. But with standards and requirements still emerging, these capabilities are highly variable.

The existing roof-top solar fleet has many systems (estimated at around a third) with only an old-style accumulation meters and older inverters where a lack of reliable standards make them unpredictable under voltage or other disturbances. Given the life span of many DER systems (which for some components can be upwards of 20 years – see Example 13) and the rate at which DER is being installed, PV visibility and management needs to be reviewed.

A key aspect to development of the future models is to consider is also who needs visibility and management of DER in different scenarios. For example:

- Do networks need to see individual DER if they can monitor their aggregate impact with circuit level monitoring? Or is it more efficient for them to monitor the local grid through aggregating existing DER monitoring than roll-out their own monitoring? Dynamic operating envelopes imply a level of management of DER import and exports, but visibility may be limited to compliance. Will this always be the most efficient model?
- Does the market operator need to better see or predict DER if we move to a two-sided market where demand will bid and respond to scheduling? Will someone always need to predict a passive part of the market or long-term changes in demand? Or will forecasting become the role of retailers, aggregators and network planners? What about system protections in extreme events?
- Will demand forecasters need to understand different types of DER behind-the-meter and what drives their behaviour? Or will they model everything from the net behaviour of aggregate metering points (effectively what has been done to date)? Will this give them enough visibility of changes in market signals, behaviour and technology? Does this depend on whether the market allows for a consumer to have many different service providers or will all consumers require multiple services through a single retailer?
- Do individual consumers need to be able to monitor different DER services in their home to ensure they are operating correctly and optimally? Or will they rely on aggregators to manage and optimise this for them? Recent work suggests many systems already stop operating efficiently without consumers becoming aware of it, due to lack of visible data on the systems operation. DER visibility is not just needed by networks, but also by market operators, DER service providers and aggregators, policy and researchers. In some cases, it is also critical for other service providers such as emergency workers and local planning.

Example 21 Visibility of current DER

While all new rooftop solar systems require a smart meter, some estimates suggest around one million early solar owners have only traditional accumulation metering. This contributes to limited visibility of their behaviour, for both network managers and the owners themselves.

There is some evidence of high levels of on-roof solar underperformance[102] due to a system problems which are not identified and resolved by the owners. Often this can be due to lack of effective monitoring systems or data provided to owners as part of the system. In these cases DER owners can forgo months or years of benefits from their investment before the problem is identified and resolved. In South Australia, where minimum load is now usually in the middle of the day, there are around 140,000 homes with ageing hot water load control. Their traditional role of raising overnight demand for baseload fossil fuels no longer makes sense. These systems could provide much greater value as flexible load which can be a solar-soak when needed, but this would require revisiting ways to control them.

Identifiable DER

An obvious precondition to predicting, monitoring or controlling DER is knowing it exists. Until recently there was no systemic approach. Different networks captured varied and limited information on connection, had little need to share this information, and some types of demand services did not need to notify the network at all (such as expansion to an existing system, remote load control or EVs without a wired-in fast charge).

Sales information is sometimes available but generally fragmented and lacks key information such as regional locations. The most reliable source on uptake has been from government subsidies. The CER (managing the SRES) has been the most useful with coverage of most on-roof solar and capturing information such as basic system specifications and location. However, CER data depends on a subsidy which is unlikely to continue indefinitely, and could not resolve a growing number of wider DER identification problems, such batteries (CER voluntarily captures some information, but estimates suggest only around 30 per cent) and EVs.

Remote identification approaches have been developed using data analytics, both by NEAR and overseas, and can successfully identify many technologies, like homes with solar generation. These methods use meter data to identify patterns against other things like weather and daily cycles. There have also been methods using satellite photos to identify on-roof solar and solar hot water. NEAR successfully used similar methods on substation data to estimate regional contributions of solar and heating-cooling load. Over time, these approaches will likely become central to forecasting DER. However, in the near term these methods are limited by the 60-70 per cent of Australian homes without smart metering and not being able to see all technologies from space. They also depend on identifying early sample data of homes with the technology you are looking for (say EVs or batteries) to train the models against, and this remains challenging.

The need for a reliable longer-term mechanism to capture DER data led to the development of AEMO's DERR, which began operation in March 2020. This includes obligations for networks and

[102] UNSW Voltage report: Voltage Analysis of the LV Distribution Network in the Australian National Electricity Market, UNSW, Centre for Energy and Environmental markets, May 2020 here

installers to capture defined information on installation and share this data through a central registry. It includes arrangements for how networks and installers can access different types of data, and an obligation for AEMO to publish aggregate reporting on DERR penetration rates.

DERR is still in the early stages of operation and is improving its dataset on known systems. There remains a range of known gaps:

- Based largely on SRES data, it has fair coverage of solar but limited coverage of existing batteries
- It doesn't yet capture all types of DER, such as EVs or load control (discussed in section 11.4).
- It links to the relevant meter, providing usage data and standing data like a physical location and network tariff. But it does not capture electrical location in the distribution network, which may be required as a shared information between networks and aggregators seeking to provide a service.
- It also does not capture specific data on connection arrangements or constraints applied to DER, like any relevant export limits.
- Wider commercial incentives which may drive behaviour, such as tariffs or aggregator arrangements, as these would be subject to change and DERR processes focus on data captured at connection.

Some related issues were considered in AEMO's meter standing data review and the issues of retail contract are considered in-depth as part of retail transparency.

Recommendation 16: Evolving the DER Register to wider needs

DERR will need to continue to be reviewed and updated overtime, as new relevant technologies emerge and data needs become clearer. AEMO manage this through DER Register Information Guidelines. Further needs in DERR have already been raised for consideration, including electrical location in the grid and export constraints. Clarification could be sought on the criteria and processes to trigger and managing these revision.

Question 24: DER identification and DERR

Are there appropriately clear mechanisms to expand and evolve DERR coverage over time?
Are there priorities in DERR data which need to be addressed?
Are the gaps in DER data not captured in DERR of concern?

Predictable DER

To predict DER's impacts on overall demand balance data required includes some combination of:

- the technology and its capabilities
- its drivers (like weather, prices, export limits or aggregator arrangements)
- its past behaviour under a range of conditions (such as meter data).

The current rate of installation of rooftop solar challenges this, as regional aggregates of behaviour change as the number of systems grows and technologies diversify.

Prior to export limits and congestion, this was relatively simple for on-roof solar: they were broadly predictable with location and weather and background aggregate demand patterns. As DER

diversifies with more constraints and more active/responsive technologies such as batteries, load control and EVs) predictability becomes harder. Their behaviour is driven by the constraints on them and incentives from unseen retail tariffs or aggregators.

Most of this data is not held by forecasters or networks. Earlier recommendations raise these issues, with proposals for further transparency of tariffs (Recommendation 1) and potentially better transparency of export limits (Recommendation 14, Recommendation 16).

Tracking aggregates in past behaviour can smooth these impacts over time to an extent, and this has been the forecasters' approach to date. But this approach struggles to keep up with change, and this may become an increasing challenge as aggregators and tariffs become more market-driven and DER more coordinated.

As operating envelopes become standard practice across the NEM this may also solve some of these issues. While DOEs don't predict DER output, they ensure that DER output is within known bounds.

Unexpected synchronised behaviour is a key risk. AEMO observed significant tripping after studying recent disturbance in South Australia from old PV inverters which don't include disturbance ride-through. Other unexpected synchronised behaviour could result from a VPP changing its contracting in the market and altering the behaviour of many systems at once, or a retailer rolling out an attractive new tariff-structure with high uptake. Forecasting over aggregates can also miss localised challenges, which remains a risk as LV grid constraints are invisible to forecasters and markets. All of these factors may become more or less important through the transition from predicting DER, to monitoring it and managing it.

AEMO has released a consultation paper on Initial DER Minimum Technical Standards[103] , which addresses ride-through and proposed adoption of updated inverter standard AS/NZS4777.2 across NEM jurisdictions. This is currently being considered by the AEMC through the *Technical standards for distributed energy resource* rule change[104]. It also raises the issues of wider DER data standards, communication and interoperability, and proposes further work needed. This work is being coordinated with wider work on DER Standards being undertaken under the DEIP. The ESB's rule change for DER standards governance aims to ensure that as DER technologies quickly evolve, standards are actively reviewed and progressed.

Visible and manageable DER

As DER is increasingly active, with growing batteries, demand response and EVs, monitoring and communication becomes more critical.

DER currently has widely diverse levels of monitoring. All new solar systems require at least a smart meter and there is a range of commercially available advanced monitoring systems, providing metrics and controls. At the other extreme, around a third of solar systems pre-date the requirement for a smart meter, resulting in many systems potentially underperforming without the owner being aware of it. And installing batteries or EVs does not yet trigger the need for a smart meter.

[103] Initial DER Minimum Technical Standards – for consultation, AEMO, August 2020 here
[104] Technical standards for distributed energy resources, AEMC, June 2020,here

Currently available advanced monitoring services and devices are diverse, and the data they capture does not always include all the data required for metering or DERR. Recently some advanced monitoring providers have worked to develop a DER Visibility and Monitoring Best Practice Guide[105] outlining the data they should seek to cover to promote easier work across stakeholders and the sector. This is a first version of a voluntary collaboration and expected to evolve in future versions. Not all providers meet the recommended datasets, and some DERR data is also not yet 'required' in the Best Practice Guide.

How these systems will interact with emerging minimum communications standards on inverters and changing metering requirements over time is yet to be seen. And while DEIP and Operating Envelope trials are progressing many of these standards and arrangements, others are leaping ahead.

South Australia, with high level of existing penetration, is already introducing new requirements. New technical standards and requirements for smaller generating systems, such as rooftop solar, are in effect as of 28 September 2020[106], including:

1. Voltage ride through standards for generating systems connected via an inverter
2. Remote disconnection and reconnection requirements: that systems are capable of being remotely disconnected and reconnected
3. Export limit requirements: all new systems to be capable of export limitation to provide for fair sharing of network capacity.
4. Smart meter minimum technical standards: to be able to separately measure and manage generation and controlled load.
5. Tariffs to incentivise energy use in low demand periods

Beyond basic capability to communication and manage these system, a key data question for the DER Roadmap and future market models is the interaction/optimisation of multiple DER devices on the same site, such as EVs, batteries and solar in the same home. How these interactions will evolve will be influenced by many factors and debates on wider market design. Central to these designs will be not only what data is required and the technology, but who can see it and how is it managed and protected. This is a core area of change and fundamentally why the Data Strategy needs to be a forward-looking, evolving process.

Question 25: Visible and managable DER

Are there particular data challenges in future market model designs which have not been recognised? Are there future areas in LV-DER data the Data Strategy should consider?

In future models, are there considerations about the point of monitoring and control, or who manages data, that have not been raised or considered?

[105] DER Visibility and Monitoring Best Practice Guide here
[106] Regulatory changes for smarter homes here

11.4 Electric vehicle data and standards

Electric vehicle data and standards pose new problems for the sector and a useful case study of DER challenges which continue to emerge with future technologies.

Currently EV data is not widely available or captured outside of commercial EV providers. This is a challenge, given the anticipated uptake of EVs and the uncertainty in timing. Planning for this increased uptake is difficult without data or trials to help understand their behaviour and system impacts. A number of trials are underway, but many gaps remain.

EVs demonstrate a range of challenges from new technologies to energy data policy:

- Interaction of multiple factors to find, predict and control
- Early access to data for planning
- Data holders and service provider outside of the energy sector and energy regulation
- Lack of clear ownership of data and standards issues.

EVs – visible, predictable and manageable?

EVs come with a range of components, with separate data needs and behaviours to predict:

- The charger, (or more broadly Electric Vehicle Supply Equipment (EVSE)) which has the direct impact on the grid and can be influenced by grid installation requirements and standards, as well as smart charging incentives. It could be regulated in a similar way to batteries, but with a different demand profile.
- The car, which drives the demand profile. This is more complicated to predict and is influenced by travel behaviour, efficiency of the vehicle and range of charging locations. All are relevant to the demand on a home charger.
- Service apps. Cars have in increasingly complex data environment, with most EVs supporting a range of on-board service apps like GPS and entertainment. Some of these may be useful in predicting or managing EV behaviour, but are also likely to be private data protected by a range of service relationships. The data governance model of a car may be most like a mobile phone.

Predicting EV uptake, and capturing the data needed to do so, remains challenging, as it is largely influenced by international and non-economic factors. Many international markets where car manufacturers are based have EV targets or subsidies, usually driven by climate or energy security rather than costs. Will uptake in foreign markets drive norms and promote EVs everywhere? Or will the uptake in Australia be slowed as availability of vehicles is diverted?

EV popularity will be driven by some economic factors, like costs for vehicle, fuel and electricity. But it will also be driven by a range of less tangible factors harder to gather data on or model, related to social norms, such as perceived vehicle performance, convenience of charging options and social status of new models. As with current cars and the latest smart phone, it is likely that popularity trends could defy rational economic modelling.

One of the key concerns in EV growth is that EV charging behaviours could further aggravate existing evening demand peaks: consumers arrive home and plug in their car just before turning on the air conditioning and cooking dinner. To avoid this, there is a wide assumption that EV chargers will be actively controllable or at least responsive to smart tariffs, but that depends on standards and interoperability that are yet to be developed. DEIP has working groups currently progressing both EV charging standards and DER interoperability.

Even if EV charging is manageable through standards, there is uncertainty as to the range of incentives (retail plans or aggregators) they may be responding to. Some transparency of retail incentives or similar arrangements with DER aggregators will help predict this behaviour.

Predicting EVs behaviour will remain complex. Even with controlled charging and some understanding of incentives, charging behaviours will depend on diverse travel behaviours. Where vehicles also acting as a home battery, the battery would be connected and available at sometimes but not others. Machine learning and similar technique may provide better way to predict EVs based on past behaviour, assuming EVs can be identified against meter data.

Alternatively, if well integrated in a digitalised world, EVs may be highly predictable. EVs carry a range of service apps, most with a range of GPS tracking, and may communicate with home energy devices to indicate when they will arrive and be connected. This moves into the world of third-party service providers coordinating home usage.

Planning data for new technologies

Planning time horizons in energy mean that there is always a challenge for new technologies - planning often needs to start considering the new technology long before there is significant uptake and populations to observe, and this is certainly the case in EVs.

Demand forecasters could seek to identify EVs and their charging behaviour through researching meter data, avoiding many problems for data access. However, these techniques remain dependent on trial data as an input to train models.

Some trials are underway which could help resolve this, although they suffer many of the usual problems of accessing research data. There is an additional challenge in these kind of trials across all technologies, that early adopters may not be a great predictor of future behaviour. Early technology adopters tend to be more technology savvy and rarely represent average users. Factors such as available charging options will likely change as EVs grow in penetration.

Therefore, for most new technologies some level of population or sampling data over time will be needed to continue to adjust planning. This means seeking access to ongoing data sources to indicate take-up.

Data holders outside of energy regulation

One of the largest issues concerning EV data is that many of the data holders are outside of current energy regulation, such as vehicle manufacturers, charging services and state vehicle registration. To understand localised demand growth, it will be essential to access vehicles sales and registered address data; new arrangements will be required to link these processes, and diverse jurisdictional arrangements make this challenging.

Many types of charger might be appropriate for regulation through connection agreements, standards and installation requirements. Chargers currently lack standards and common installation arrangements and are not covered by the DERR processes. There are also other charging options (like a normal plug and potentially commercial charge point arrangements) which may not meet any of these criteria. A DEIP working group is looking at charging standards.

On-board EV app service providers could develop relationships with customers in energy management or energy services to coordinate with home energy management systems. Will this require another range of standards for APIs, driven by pre-existing standards in EVs? Will EVs

become covered by CDR are sometime in the future? Much of this data will be highly unique and prone to privacy and re-identification challenges.

Ownership of solving data and standards problems

Similar to the wider data and standards problems, EV data and standards lack a single owner within the energy market, and certainly none across the energy and transport sectors more broadly. International standards are still emerging and are unlikely to be tailored to Australian markets while take up is low and other market remain ahead. The coordination of standards and interoperability across borders and sectors will need to be considered.

To deal with EVs unique challenges, two DEIP workstreams are underway: EV data requirements and EV charging standards. These are timely and must progress rapidly to ensure the required data and standards are in place prior to further growth.

Once these groups make their recommendations, their implementation will require a clear owner to progress them in a timely way. This could be provided by the new governance arrangements for DER technical standards proposed in the ESB rule change.

Recommendation 17: Electric Vehicle (EV) data

EV data needs remain complex, crossing several sectors, and are not currently included in the DER register. DEIP's EV data requirements workstream will provide recommendations on short- and medium-term EV data requirements, with early findings expected by the end of 2020. Opportunities should be explored to include aspects of these recommendations in early implementation of the Data Strategy.

Recommendations on EV charger standards are also being developed under the DEIP workstreams. These should be considered by under the proposed new DER governance arrangements, to ensure implementation has a clear owner.

Question 26: Data for EVs

Is more support needed to progress EV issues? Are current voluntary DEIP processes sufficiently resourced to resolve current EV data challenges? What else could assist in ensuring these challenges are resolved?

Are sufficient systemic resources and governance focused on managing emerging new technologies and challenges like EVs? Are we well-placed to respond in a timely way to future technologies?

12 APPENDIX D: Preliminary Legal Report - King &Wood Mallesons/ Galexia

Provided in a separate document

13 APPENDIX E: SUMMARY OF QUESTIONS FOR STAKEHOLDERS

HIGH LEVEL QUESTIONS

a) The strategy's coverage of the key issues for data reform in the energy sector - are there concerns un-addressed?

b) The strategy's framework and the proposed leadership arrangements to drive the change required - are there alternatives to make this transition more effective?

c) Many recommendations to resolve specific data issues are initial proposals, requiring further detailed design, analysis of costs/benefits and development through usual processes. Early stakeholder views on design issues, evidence to support costs/benefits analysis or proposed alternatives are welcome.

d) There is a great deal of reform under way and many interlinkages between recommendations and issues in this Strategy and ongoing workstreams. Are there further workstreams or interlinkages not identified which the Strategy should engage with?

PILLAR 1: NEEDS TODAY - Fit-for-purpose data

Question 1: Data gaps and priorities

The list and scope of issues presented in this paper is extensive.
Are there key data gaps that we have not identified? Do stakeholders have views on which data issues take priority? Will some of these data issues be resolved by existing processes?
Do stakeholders support the recommended actions? Are there alternative options?
Further detailed questions are proposed in Appendix A-C.

PILLAR 2: FRAMEWORK - New data governance

Question 2: Regulatory reforms

Do stakeholders support the proposed reforms and guidelines, noting they require detailed design and would go be developed and undergo further consultation through usual processes?
Further detail **PILLAR** questions are proposed in the legal review at Appendix D.

PILLAR 3: CAPABILITY - Drive leadership, coordination and capability

Question 3: Leadership and Coordination

Is a Data Leadership and Coordination group the right approach to drive change? Are there alternatives within existing arrangements?
Should it be limited to the core agencies or have a wider representation (for example the ACCC, representatives of Energy Ministers or consumers)?

Is a collaborating group, with identified terms of reference and public deliverables to Energy Ministers, sufficient? Or is a more formal governance arrangement necessary?

Is the DUG likely to be necessary and/or effective? Are there other alternatives to a formal reference group, such as regular stakeholder engagement processes?
What else is required to ensure wider stakeholder needs are met?

Question 4: Data visibility
Should the DataLAC and DUG be tasked with curating/managing a list of relevant data sets and activities? What could be done to ensure that this is helpful rather than a burden?
Is a meta-portal worth considering? Could an existing site be expanded to play part of this role (such as one of the core agency sites, NEAR or AREMI)?
How could this be resourced and funded?

Question 5: Data access and supporting resources
How do we ensure that systems and analytical capabilities are available to support better data access? Who is best placed to support this capability?
How do we ensure that stakeholders eligible for appropriate data access don't find resourcing a barrier?
For access to outcomes from high-value AEMO datasets, does AEMO need specific obligations or support to ensure resourcing or prioritisation are not a barriers?

Question 6: Data impact and resourcing analytics
How do we ensure that key research and analytical needs can be met, to maximise consumer outcomes?
Who is the best party to support analytical services and build capability? Is this best undertaken internally by all parties or is some central or third-party expert capability advised?

PILLAR 4: NEEDS TOMORROW - Support change and adaptability
Question 7: Proactive governance and forward review
Do we need more proactive approaches or clear responsibilities to resolve forward-looking technical challenges in data? Whose responsibility should it be?

Question 8: Standards governance
With the introduction of the proposed DER Standards Governance arrangements, DEIP processes and the new CDR standards body, many standards needs will be actively progressed.
Will these arrangements likely support most ongoing needs for data standards? Are there gaps or wider issues which need to be considered?

Question 9: Adaptable arrangements
Do stakeholders have views on how to ensure the design of Rules, guidelines and procedures consider the new data principles and the need to adapt more flexibly as technology and data requirements change?
Do stakeholders think more detailed Rules guidance, as proposed by KWM, is necessary? Are there alternatives?
Other processes have proposed a default to non-prescriptive approaches for certain types of Rules – is this workable in the case of data-related Rules?

Should the DataLAC have a role in providing advice on data issues and approaches in new Rules, guidelines and procedures? Could this be part of contributions in normal consultation processes or would it need a more formalised function (noting additional requirements may lengthen the time it takes to consider a Rule change)?

Question 10: Energy data for research

Are there energy data challenges for researchers not effectively represented in this paper?
How are researchers' interests best represented in the DataLAC/DUG? Do they require specific representation in the group, a focused sub-group or leveraging of a wider existing process? Are there sufficient levels of interaction and engagement in the existing research community regarding these issues?
If reforms proposed under Pillar 2 to allow more research access to data are progressed, would protected access to more real data be more useful than synthetic open data sets (as proposed in a range of ARDC ePlatforms)? Or do synthetic open datasets have alternative value through less constraints and sharing of tools?
Current data portals for energy research data seem limited in their usability and visibility, with much useful research and data getting underleveraged. Are there examples in other sectors of better ways ensure research is visible, easier to navigate and integrate?

APPENDIX A: RETAIL TRANSPARENCY

Question 11: Retail price reporting

How will consumers benefit from keeping retail plans and costs hidden?
Can you provide evidence around costs, barriers or benefits for linking digital retail plans to standing meter data?

Question 12: Streamlining price reporting

What options exist to maximise retailer benefits in reducing reporting costs? Can you provide estimates/evidence of existing costs?
Which elements of current price reporting arrangements are important to retain?

Question 13: Large energy user prices

Can large energy users highlight challenges with contracting arrangements and options they face?
Are large users' arrangements most effectively investigated working with retailers or large energy users?

Question 14: Contract market monitoring

Contract markets are complex in their nature. What is needed to support the AER in developing the most effective form of contract market monitoring? Are there effective sources of information that have not yet to be included?
Is 18 months an appropriate time for the AER to review and develop recommendations for forward monitoring arrangements?

Question 15: Retail margins

If much more granular revenue and cost data is available to key agencies through the proposed reforms for price reporting and contract markets monitoring, do we also need retail reporting to expose retail margins? Could this be estimated through other data?

APPENDIX B: UNDERSTANDING CONSUMERS AND DEMAND

Question 16: Access to meter data

Can you provide wider discussion on the benefits or challenges in access to meter data for research and analysis? Can you provide alternative ways to capture similar insights?

Question 17: Gas metering

Can you provide wider discussion on the benefits or challenges in improving gas demand transparency? Is gas data critical to understanding electricity demand, and well as total energy and gas demand?

Can you provide alternative ways to capture insights into changes in gas demand? Can you provide evidence on costs/benefits to implement a gas meter dataset?

Question 18: Vulnerable consumers

Are there sources of data and research on vulnerable consumers and their challenges in the energy market that the Energy Ministers workstream may not have considered?

Can wider recommendations proposed (such as Recommendation 1, Recommendation 6, Recommendation 8) some challenges for vulnerable consumer metrics?

Question 19: Commercial consumers

Can you provide evidence of cost and benefits in improving analysis of energy data in the commercial business sector? Are there opportunities in improving commercial energy use data which are not considered?

APPENDIX C: VISIBILITY OF THE LOW VOLTAGE NETWORK AND DER

Question 20: Overvoltage

Is there further evidence or other studies of existing voltage levels and related consumer impacts that should be considered before undertaking further investigations?

Which body in the energy sector would be most appropriate and effective to lead this work? Given the role of jurisdictional regulators in network performance, how are these bodies best engaged?

Question 21: Analytical capabilities to support DER integration

Is the proposed collaboration to acceleration network analytics, datasets and tools workable? What barriers or concerns does it raise? Could most networks engage in this process?

Who should lead this work and what is required to maximise its success?

Question 22: LV reporting

What additional benefits, barriers or concerns does the proposal for LV network reporting requirement raise? Can you provide further evidence of benefits or costs to inform further consideration of this proposal?

Question 23: LV visibility through metering

Are these regarding additional metering reporting requirements workable?

Can you provide supporting evidence of related costs or benefits to support further investigations?

Is the problem of locating meters within the grid critical to resolve to support wider monitoring, coordination of DER or planning? Will processes developing dynamic operating envelopes and better network models either resolve it or identify it as a further problem?
Are there additional issues or options that the AEMC should consider in their upcoming metering review?

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APPENDIX D: Preliminary Legal Report - King &Wood Mallesons/ Galexia
See appendix for a range of design questions

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