Submission to Australian Energy Regulator

Network Performance Reporting Priorities and Objectives

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Table of Contents

1 Executive summary

The 2020 calendar year has swept in broad changes in energy usage patterns across Australia. Some residual degree of these changes will persist in the long term as workers and learners discover some of the advantages of working and learning from non-traditional (residential) locations.

As a result, these locations will evolve from being places of shelter, food preparation and entertainment into revenue- and tax-generating locations for workers and places of learning for residential occupants. For many occupants, these locations take on new importance in their value chain and become, critical to their earning an income.

Energy providers are potentially faced with new challenges when providing services to distributed places of work and learning. Energy supply networks must support not only the residences themselves and their occupants, but also provide energy to power the communications networks essential to enabling these new patterns of work and learning.

A larger proportion of the working populace can be expected in the future to rely on a place of residence as mission critical to their ability to earn a living and, hence, it becomes critical to support their ability to pay for the supply of energy to this place of work. Reliable energy supply to these location becomes critical to the ability to pay for that energy supply and is somewhat circular in that regard.

Approximately 37.5% or more of GDP could be expected to be earned using residences in the medium-long term (into 2021 and beyond), representing ~USD544B or more of earnings and the associated taxes. Similarly, additional learners could also be expected to use residences as places of learning and preparation for future earnings and tax gathering in the medium-long term[1].

Energy generators, producers and distributors will be crucial to the economic recovery in the post-pandemic period.

Monitoring metrics previously associated with revenue generating activities at commercial locations must now be extended to residences and should focus on the ability of the network to support increasingly-widely-distributed income-, revenue- and tax-generation[2].

1 The simple model used is based on an average GDP per capita based on the 2018 GDP figure of USD1,450B and workforce headcount. An average value of work is assumed per capita and per worker. The COVID-19 pandemic event will change the gross GRP figure, its USD equivalent value and the size of the workforce and a more detailed analysis would be needed to determine more accurate figures. Suffice to say, with these three factors conceivably varying considerably from their previous estimates, the rough figures used in this document will be only of use in demonstrating the points raised.

2 ‘Income’ is used to refer to incomes earned by energy subscribers and ‘Revenue’ to refer to incomes earned by energy distributors and retailers. Both contribute to tax and to the national fiscus.

2 Background and Introduction

Working from Home, telecommuting and the “gig economy” are not entirely new, however their adoption has accelerated in recent years. Some workers will, however, always need to attend a particular place of work.

Shops, materials and product distribution, places of in-person service, manufacturing activities, sales and maintenance of fixed assets, installations on customer premises and various forms of transport provide good examples of modes of work where physical travel to a central outlet, depot, consulting suite or other premises are required. Other forms of work, however, are not tied to a specific place.

Some forms of professional consultancy, distributed sales and support including call centres, design and engineering, software and systems designs and deployments have led the way in these areas. Indeed, in the case where clients and suppliers in these sectors are themselves remote (eg. overseas and in different timezones), remote working is expected or the only viable option.

Some ‘traditional’ industry sectors have moved towards actively discouraging office work as a cost containment measure, providing only “hot desks” in central locations and, thereby, encouraging remote work. More recently, these locations have increasingly also included shared workspaces.

The 2020 period has, however, seen an explosion in flexible working arrangements. Many workers and learners will find the “social distancing” and isolation in this period as an imposition of the most egregious kind, however a portion of the population can be expected to adapt to remote working as providing welcome flexibility in their work and study arrangements.

This document aims to explore the potential implications for changes in energy supply and usage patterns resulting from accelerated migration towards flexible working and the implications for network planning into the future where a higher proportion of workers’ incomes are generated from residential areas and residences. The implication for learning is also explored, as a proportion of parents may decide that their childrens’ exposure to others in a school environment presents an avoidable risk[3].

In either case, places of residence take on new significance. They become components of critical infrastructures for the purpose of earning a living in the case of workers or for the preparation for future earnings in the case of learners.

In both cases, dwellings become an element in the value chain for the resident to earn an income which is then, in part, used to pay for the energy consumed in generating the income in the first place. It also becomes an element in the value chain required for the residence to generate income to be paid across to the national fiscus.

This differs from a work & office environment, in which business expenses (including energy charges) are effectively ring-fenced based on location and billed separately from residential consumption. Monitoring and reporting of the ability of the energy production infrastructure and delivery network(s) should now consider portions of the network delivering services to residential areas as constituting revenue-generating enablement.

3 Some parents may have experienced loss of their own parents, friends, colleagues, spouse or children during the pandemic and their capacity for further loss may be exhausted

Some economies of scale realised through the concentration of workers together in offices and factories and learners in classrooms, including aggregation of lighting, HVAC[4] and food preparation & storage loads, no longer apply when providing lighting, HVAC and food preparation & storage in residences. Residence spaces may not be as energy efficient as office, factory and classroom locations and may result in an overall increase in load.

Reporting should include the ability of the network to deliver energy as an input towards the generation of income and taxes. The network's success in either achieving that goal or its failure to achieve that goal due to outages, damage to revenue-generating equipment and the ability of the resident to efficiently operate in their residential Working From Home environment become reportable elements.

Encouraging community generation would provide benefits, including an improved ability to provide supply in outlying and rural areas and reduced reliance on distribution networks. The establishment of attractive entry and operating conditions through capital incentive schemes, amortised maintenance costs and tariff offsets through revisited feed-in tariff structures would be an essential component of such an approach.

Such offset amounts could appear as credit line items on bills, making the benefits visible to subscribers invested in rooftop and community generation schemes.

Overhead electricity distribution remains a significant cause of quality issues. Supply events related to overhead supply include spikes, surges and outages linked to trees, tree branches and tree bark falling onto overhead lines, high winds, animals and birds bridging phases and High Voltage Injection ('HVI') events.

An active programme of redeployment of overhead lines into trenches would resolve supply quality issues while at the same time reducing bushfire risks. While Residual Earth Fault Current Limiter ('REFCL') devices can provide some degree of fire protection, their action on the line still allow (and, potentially, cause) spikes, surges and 'brownouts', which can interrupt income-, revenue- and tax- generating activities and result in economic losses.

The end state of moving supply lines into trenches eliminates all these issues, better provides stable, clean power supply and better supports income-, revenue- and tax- generation.

For subscribers highly dependent on clean electrical supply for economic gain, a subsidised and / or amortised programme for the installation of protection devices would enable appropriate protection of devices critical to revenue- and tax- generation. Protecting incomes and contributions to the national fiscus in this manner will help to protect the USD73.8B of earnings and taxes produced through the use of residential locations for economic gain.

The success of such schemes would ultimately be shown as a net increase in revenues and taxes earned attributable to improvements in energy quality. To show such correlation, energy quality measurement and monitoring is essential, along with appropriate data matching and analysis.

4 Heating, Ventilation and Air-Conditioning

3 New and changing places of work and learning

Places of work and learning have been changing over time, supported and enabled by developments in technology. These developments include the ability to perform computerised video and audio meetings, training sessions and classrooms, collaboration and document sharing.

3.1 Changing places of work

An Australian Bureau of Statistics estimate in 2016 indicated that 3.5M Australians worked from home. Over the preceding 15 years, this number had risen from 20% to 30% of the workforce[5].

Extrapolating this trend as a straight line, it could be estimated that ~32.5% of the workforce would have been expected to work from home in 2020. This number has been distorted considerably due to the ongoing COVID-19 pandemic.

A result of the pandemic is that a considerably higher than projected proportion of the workforce is working from home in the interim. Prohibitions on unnecessary travel to and from work, shops, consulting offices and inconsistent application of restrictions between states has resulted in wide-reaching uncertainty and confusion.

At the time of writing, it is impossible to determine what residual proportion of the workforce will choose to work from home in 2021 and beyond, however it is reasonable to expect the rate to be higher than the projected trend would otherwise suggest. All sectors of the economy are impacted and a proportion in the vicinity of 75% of the workforce may be forced to use their residences as workplaces during the pandemic.

Business energy users are commonly able to provide for continuity of supply. This may be through the installation of Uninterruptible Power Supplies and / or rooftop Photo Voltaic generation and some businesses reliant on gas supplies may have the foresight to have alternate burners on site, and be able to switch between Methane and Propane gas burners relatively quickly in order to provide Business Continuity.

Residential energy users are less likely to be able to justify standby energy facilities. If up to 75% of the workforce are required to operate under conditions where continuity of energy supply are subject to characteristics of domestic supply (ie. in residential areas, without UPS or generator backup, and with perfunctory quality monitoring), a far greater proportion of GDP is potentially vulnerable to disruption due to poor quality of delivered energy product during the pandemic. This will then continue in the post-pandemic period and has the potential to impact the economic activities of the 37.5% of the workforce who are forced or who choose to work from their places of residence.

A potential complicating factor is that demand patterns may reduce in commercial zones and increase in residential zones in the longer term. The ability for the networks to steer supply towards changing demand areas and to have sufficient agility to adapt to such changes should be considered as part of the planning and reporting activities for the networks.

Expanding demand response programmes may assist in providing capacity to ensure continuity of supply for income-, revenue- and tax- generating activities. Formalisation and extension of this programme may provide further supply stability.

5 https://www.abs.gov.au/ausstats/abs@.nsf/lookup/6333.0Media%20Release1August%202015 (consulted 2020-04-12)

The precise change in both percentage and raw headcount terms will only be determined in the fullness of time, however the above assumptions may be reasonable at the time of writing. Undoubtedly, more sophisticated analysis is required, based on more sophisticated models and input data, as previously noted.

While promising fast, reliable internet connectivity, the reality of Australia's National Broadband Network falls far short of this ideal, due to the extensive reuse of conductive copper-based last mile transmission circuits. Poor quality electrical supply may result in spikes and surges present on power networks being injected into copper communications circuits and finding a path to ground via data network equipment, causing equipment damage or loss, lost time, lost revenue and lost tax to the national fiscus.

As the proportion of residence-based workers increases over time, these losses will only increase, resulting in overall loss of competitiveness at a national level in a recovering post-pandemic global economic environment.

3.2 Changing places of learning

A figure of around 24,000 primary and secondary students could have been expected to be home schooled in the 2020 year, based on previous years and allowing for expected growth. In the 2020 year, however, a significant proportion of the primary and secondary student cohort has been forced to home school, resulting in from~ 3.5M to ~4.5M additional students being schooled at residences using online ("Flexible Learning") delivery modes during the pandemic.

A rough estimate would indicate that around 2M+ households in Australia could be pressed into service as places of learning during the pandemic. Parents tend to be protective of their children, so a 5%+ long-term increase in home schooling might also be expected.[6]

Some learners may be placed in the unfortunate position of entering the workforce earlier than modelled due to COVID-19 related loss of one or both parents. The majority of primary and secondary learners can, however, be expected to return to contact learning.

In the tertiary sector, 1.1M Australian learners and 500,000 international full-fee-paying students have been forced to learn online via similar flexible learning facilities. These students will eventually either graduate or return to contact classes at learning institutions in time.

An unknown number of tertiary students may also preferentially choose to learn from home using existing distance learning programmes. In 2017, 204,591 students enrolled for "multi-modal" tuition involving online and distance learning.

It is notable that quality issues and interruptions to energy supply would constitute impacts to larger numbers of individuals in the case of online learning. A single supply outage or event may impact equipment used for online presentation, communications and cause significant disruption to learning programmes.

As the proportion of residence-based learners increases over time, these losses will only increase, resulting in overall loss of competitiveness and marketability of Australian education products in a recovering post-pandemic global economic environment, particularly in the tertiary education sector, which has become disproportionately reliant on full-fee-paying foreign enrolments.

6 The long-term psychological impacts of the current pandemic are as yet unknown, however parents losing one or more of their own parents and / or a spouse or partner and / or a child, extended family members or friends is currently inestimable, along with the associated behavioural responses.

4 Changing economic opportunities

Many Australians will lose their jobs and be forced to find new ways of earning a living or supplementing their income. Many of these opportunities will be found in a new economic landscape, where new pressures on businesses and governments must be considered.

Workers attempting to reenter the workforce may find a lack of salaried positions available. As a result, they may have little option than to turn to contracted work as Sole Traders contracting to several organisations, for both local and overseas organisations.

Such modes of work are generally “at risk” - the consultant assumes the risk for completion (and non-completion) of work units and meeting (or missing) deadlines. A characteristic of this type of engagement, especially in the “Gig Economy” is to link completed work units to payments.

Non-completion of a work unit to a specified quality and within a specified timeframe often results in non-payment to the contractor and / or imposition of a penalty on the contractor. Energy supply interruptions and poor quality of delivered product can result in interruptions to workflows, loss of generated product (eg. software code, design documents and data sets), damage to equipment and result in loss of income and ultimately compromise the ability to pay for the energy supply.

Procedures exist for claiming for losses of material assets, however, losses of intangible assets (eg. Information Assets, program code assets, etc.) or temporary loss of access to these assets largely go unreported. The impact to the revenue generating capability of the contractor, however, can be considerable and can result in a net loss, depending on contractual arrangements.

Data storage devices do not react well to energy distribution events such as “auto reclose”[7] events and data corruption and subsequent losses can result. Redundant disk arrays and journalling filesystems can provide limited protection to devices experiencing power cycling.

The end result is data loss, time lost to rework, opportunity costs associated with lost time and rework, time lost to replacing damaged equipment, lost revenues, lost taxes, lost reputation and lost future business opportunities.

Power supply issues can also result in damage to equipment outside a contractor’s purview, including communications infrastructure equipment required to communicate work products to clients. Again, being unable to communicate results and an inability to produce a work product to the agreed quality and timeframe and can result in lack of payment and / or activation of contract penalty clauses.

Contractors often have little leverage in negotiating contract terms and are forced into accepting the terms as presented, regardless of their reasonableness. In a post-pandemic environment, competition for work can be expected to strengthen and contractors more likely to agree to increasingly unfavourable agreement terms.

Such conditions may result in decreased ability to comfortably earn a living income. It becomes critical to the contractor to receive a reliable energy supply as part of the input service stack, fit for the purpose of powering sensitive electronic and computerised equipment, in turn critical to the delivery of contracted work product to the client.

7 Reported as a single event however actually consisting of several automated break-make-break-make cycles in quick succession. Such repeated make-break cycles have been positively linked to data corruption events.

Other businesses may determine that unreliable power supply is sufficient cause to cancel contracts. For example, call centre operatives in distributed call centres may suffer repeated call disconnection due to power interruptions, spikes and surges.

For call centres implementing Key Performance metrics based on, eg., call duration, number of calls taken, number of customer issues resolved, these operatives may be unable to successfully conclude calls, not meet their targets and be removed from work rosters, resulting in loss of income and loss of taxpaying capacity.

5 Residual post-pandemic changes

Post-pandemic, the proportion of workers utilising their residences as revenue-generating places of work would fall, but likely to a level higher than the ~32.5% straightline-based estimate. If we accept the Australian Bureau Of Statistics figure of 13.015 million people participating in the workforce as at 2020-02, it is possible that an additional 5% of the workforce will choose to work from home, resulting in an enduring step change from ~4.23M to 4.88M; an additional ~650,000 or more workers choosing to work from home into 2021 and beyond.

Similarly, the longer-term changes in home schooling might result in an additional 1,532+ school-age students learning from homes in the medium to long term. Applying organic growth and a 5% step growth, 22,609 primary and secondary students or more might be expected to continue home schooling beyond 2020.

If we again apply the ~6% organic growth and 5% step increase in distance learners, this might result in a total of 244,160 tertiary enrolments via distance education[8], some 11,626 more than expected due to organic growth alone.

Aggregating these numbers, an additional 650,000 workers, 1,532 primary and secondary students and 11,626 tertiary learners could be expected to continue to work and learn from residential locations, producing a step change over and above organic growth projections. This would represent a rough estimate of ~663,158 additional Australians working and learning in residential locations in the medium-long term.

This step change equates to a rough increase of ~5.1% of GDP, or a potential increase in value of the additional work and learning activities performed in the longer term in places of residence approaching USD73.8B. The total value of work and learning being performed at places of residence in the longer term could then approach ~USD544B, based on 2019 figures[9].

Energy suppliers will be required to support up to ~USD544B of value generated from residences and alternative places of work for an extended period of time and increasing year on year. Energy providers should be able to report on their overall effectiveness and the efficacy of their product in supporting this significant portion of the Australian GDP while the economy recovers from the severe disruption experienced during and after the pandemic.

This reporting must also include reporting on the support provided by energy providers to communications networks crucial to supporting remote working generating these amounts of GDP. For an economy recovering from the twin disasters of COVID-19 and the most destructive bushfire season in Australia's recorded history, energy delivery to workers, regardless of their location, takes on a national significance.

The ability to accurately and transparently report on the success or failure to deliver and to be sufficiently agile to act upon such reports and correct issues quickly takes centre stage.

8 Derived from: https://docs.education.gov.au/system/files/doc/other/2018_section_2_-_all_students.pdf

9 These figures assume that the value (current or future) of the work performed by each worker or learner is equivalent, that the value of work attributable to each worker is approximately equal and that 2019 GDP figures are a valid benchmark for use in this context. GDP figures are customarily published in USD. A more detailed modelling is required of these figures and the assumptions made must be verified or altered as required. https://www.focus-economics.com/countries/australia

6 Implications for network performance reporting

6.1 Rationale

New or enhanced network performance measures would be based on the network's success or failure to support gainful economic activities. Given that the simple model elsewhere in this document shows that a step increase of 5% or greater (to approximately 37.5%) can be expected in a post-pandemic economic environment, the reliance on distributed energy supply to distributed geographical regions becomes critical in the medium-term as the economic recovery occurs and in the longer-term as energy users adapt to more permanent patterns of distributed work and learning.

These metrics are intended to focus energy providers' recognition of and attention to the evolving role in value generation supported by residential spaces. These metrics are intended to gain visibility of the impact on revenue- and tax- earning activities caused by challenges encountered due to poor quality energy supply and standards non-compliance encountered in residential settings, leading to loss of earnings.

These metrics also attempt to provide visibility into the impact on revenue- and tax- earning activities caused by challenges encountered due to poor quality energy supply and standards non-compliance causing telecommunications network and transmission disruptions. These networks and their functionality become critical to the revenue- and tax- generating capabilities resulting from the use of geographically distributed residential locations as places of work and of learning and derive their power sources from the energy supplier networks.

An attempt has been made below to provide a first analysis of SMART metrics for reporting purposes. Spot and trend analyses should be performed for these metrics and energy suppliers' relative performance should be benchmarked against these metrics where benchmarking provides meaningful comparisons.

Australia will be able to ill afford energy providers' inability to adequately support these revenue- and tax-generating activities in the environment of economic recovery during and after recession (or depression) and the associated economic and societal uncertainty.

As the global economy rebuilds in the post-pandemic period, the international status of Australia as a preferred supplier of work products is likely to be eroded due to the perception of high labour costs. Under such global circumstances, Australia's success in this new era will be highly influenced by its ability to deliver quality product (including intangible products, software and engineering outputs) quickly and reliably.

This in turn demands a high quality supply of energy. Monitoring and reporting provides visibility into the quality of the delivered energy product.

6.2 Earnings-based metric examples:

These metrics set baselines for earnings and contribution to GDP and may be measured and reported on a national and state / territory basis:

- Estimated percentage of GDP supported by the supplier / network provider
- Percentage of GDP lost per reporting period due to:
    - Energy supply issues and interruptions

    - Energy quality issues and standards non-compliance
- Lost working days per reporting period due to:
    - Energy supply issues and interruptions
    - Energy quality issues and standards non-compliance
- Reduction in interruptions to revenue-generating activities attributable to relocation of overhead supply lines into trenches; by
    - Incident count; and
    - Value
- Value of revenues protected through activation of demand response
- Value of revenues protected by pro-active energy quality monitoring and problem resolution

6.3 Loss-based metric examples:

Metrics related to financial losses, translating into losses of earnings and tax revenues generated:

- Equipment damage claims granted by the network operator per reporting period, by:
    - Value
    - Count
    - Percentage of supported GDP
    - Claim settlement percentage
- Equipment damage claims serviced by insurers per reporting period, by:
    - Value
    - Count
    - Percentage of supported GDP
- Lost earnings attributable to energy supply issues per reporting period expressed in:
    - Number of cancelled contracts
    - Value of cancelled contracts
    - Number of contracts awarded to competing contractors in alternate supply areas
    - Value of contracts awarded to competing contractors in alternate supply areas

6.4 Costs-to-Government metric examples

Some of these metrics represent potential secondary impacts of energy supply issues and may contribute to credit ratings changes.

- Employee layoffs due to energy supply issues per reporting period
- Estimated cost of social security support due to lost employment

- Income support payments
- Government-sponsored job seeker retraining costs

6.5 Taxation-based metric examples

Metrics relating to impacts to tax revenue to the national fiscus:

- Lost taxation revenue attributable to energy supply issues per reporting period expressed in:
  - Estimated value of lost taxation, by:
    - Company income;
    - Company payroll; and
    - Individual income
  - Estimated value of taxation preserved or supported through income insurance claims approvals
  - Estimated value of taxation preserved or supported through equipment damage claims approvals paid to subscribers by energy suppliers
  - Number of cancelled contracts
  - Value of cancelled contracts
  - Value of income insurance claims attributable to energy supply issues
- Estimated value of lost taxation awarded to competing contractors, by:
  - Alternate domestic supply areas (ie. work lost to an alternate location within Australia); and
  - Alternate international supply areas (ie. work lost to an international location)
- Reduction in interruptions to tax-generating activities attributable to relocation of overhead supply lines into trenches; by
  - Incident count; and
  - Value
- Value of taxes protected through activation of demand response
- Value of taxes protected by pro-active energy quality monitoring and problem resolution

6.6 Costs-to-individuals metric examples

Costs to individuals (generally hidden from reporting):

- Lost earnings per reporting period due to:
  - Energy supply issues and interruptions
  - Energy quality issues and standards non-compliance
  - Loss of communications capabilities due to energy supply issues and interruptions
- Replacement of self-insured equipment

- Replacement equipment with value below insurance claims excess threshold

6.7 Subscriber-centric metrics examples

Metrics related to subscriber-facing reporting and communications:

- Pro-active communications to subscribers detailing:
  - Generation and distribution capacity issues and possible interruptions to supply
  - Programmed maintenance
- Responsiveness to energy subscriber requests for energy quality monitoring and troubleshooting, including:
  - Availability of energy quality monitoring devices at point of use
  - Time-to deploy energy monitoring devices on subscriber request
  - Degree of correlation between energy quality events detected at substation or distribution points vs. energy quality events detected at point of use
- Transparency in reporting supply quality anomalies
- Successful resolution of supply quality issues expressed in:
  - Time to resolve
  - Number of re-opened supply-quality-related issues
- Number of persistent long-term supply quality and continuity issues
- Effectiveness of supply assurance equipment in preventing lost work, lost revenue and lost taxation, including:
  - Localised Open-cycle gas turbine or diesel generation
  - Community-based generation
  - Subscriber-based generation (eg. battery-backed Rooftop Photo Voltaic generation)
  - Uninterruptible power supplies
- Value of income insurance claims attributable to energy supply issues
- Value of income protected through activation of demand response
- Value of income protected by pro-active energy quality monitoring and problem resolution

An additional series of metrics relating energy suppliers' ability to support income-, revenue- and tax-performance to:

- the operating and holding entities' ability to service interest and capital repayments on borrowings for Infrastructure and Operating capital; and
- pressure to return profits to holding shareholders

given the abnormal pandemic and post-pandemic operating conditions. The intent here would be to identify the economic costs to where profit distributions to shareholders is results in a sufficient lack of energy operators' treasury reserves resulting in an erosion of Australia's ability to operate in and recover from the current COVID-19 pandemic.

These could be of particular concern where energy network operators' shareholding profiles exhibit significant foreign ownerships. Foreign exchange fluctuations may also further erode profitability and influence credit ratings adjustments in the energy operating entities and prove detrimental to cost of money to the operators.

This impact could become cyclic with a lengthy tail and / or result in changes in shareholding and market disruptions, potentially resulting in operating disruptions and / or reduction in quality of delivered product. This phenomenon could, in itself, become cyclic in extreme circumstances, although moderated by industry regulatory requirements and structures.

7 Potential information sharing requirements

In order to perform the suggested reporting, information sharing may be required between:

- Australian Energy Regulator
- Australian Taxation Office
- Energy subscribers
- Energy network operators
- Energy network holding entities
- Energy retailers
- Insurers
- Telecommunications network providers

Data elements derived from these sources may be required in order to verify the accuracy of claimed incidents and losses (including those with tax implications). With the exception of the Energy Retailer's identity along with their place of residence, the data elements required would likely fall within "reasonable usage" guidelines of the Privacy Act (1998) and the Australian Privacy Principles.

Reports would be de-identified, unless their use in case studies or longitudinal problem investigation is warranted and appropriately protected.

Subscribers unwilling to allow their energy subscription related data to be used in this manner would waive their ability to utilise reports to substantiate claims and claimed performance.

8 Conclusion

Some economic and societal changes resulting from the COVID-19 pandemic will likely be enduring many years after the conclusion of the pandemic itself. An opportunity exists to prepare for these changes through early orientation of the Australian Energy Sector towards providing for the energy demands resulting from changing places of work and learning and future non-traditional demands on workers' patterns of work.

In order for organisations to regain their market valuations, a need for shorter product development cycles will be required in order to demonstrate ongoing viability and, in turn, permit access to funding at lower interest rates and costs. In order for Australia to successfully participate in the reinvented post-pandemic market, Australian workers may find themselves unable to earn a living wage if poor quality and unreliable energy supplies present them with additional productivity challenges.

The perception of the performance of energy networks to deliver clean, usable energy from the subscribers' perspectives differs to the perception of the network operators' perspectives. Greater accuracy and common understanding of the challengers imposed on subscribers can only be gained with a significant deployment of monitoring devices at subscriber premises, intended to expose residual supply quality issues.

Exposing these quality issues is the first step to justifying remedial CAPEX programmes required to support distributed revenue- and tax- generating activities in suburban, peri-urban and rural areas.

Energy generating, distribution and retailing activities may be required to support economically valuable activities approaching 37.5% of more of GDP (~USD544B) earned through the leverage of residential locations into 2021 and beyond. The energy sector must equip itself to support this level of economic activity, be integral to the success of these activities and integral to resolving shortcomings in the delivery of stable, usable, fit-for-purpose energy to these revenue- and tax- generating subscribers.

The power sector's long-term viability and profitability depends on their ability to create and sustain conditions that enable the generation of incomes, revenues and taxes.

The AER's consideration of these factors and the reporting and monitoring requirements required to support this evolving orientation is crucial to success. The author urges the AER to consider the points contained herein and to conduct further analysis as may be required to implement the monitoring and reporting activities suggested.