Sense Response to AEMC Review of the Regulatory Framework for Metering Services

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Re-igniting Smart Meter Rollouts: turning to real time intelligence on smart meters to deliver the energy transition, lower bills for consumers, and reach 100% smart meter adoption by 2030

Smart meters are integral to the cost-effective delivery of the energy transition. With growing electrification, distributed generation, and non-dispatchable renewables, managing the grid will be tough. But without data from smart meters, it will be impossible. And yet penetration of smart meters in Australia remains low. In parallel, consumers are facing ever higher bills, residential carbon emissions are stubbornly high, and the support of bill payers for the energy transition remains both fundamental and fragile.

At the heart of the problem are limited and under aligned incentives and costs across customer, retailer, and network provider. However, Sense is proposing a solution which adds new value, reconciles these sometimes competing needs, and delivers a cost-effective energy transition. Next generation smart meters, with enhanced capabilities, create new revenue streams and reduce costs for retailers, which in turn transforms their smart meter business case from negative to positive. These same capabilities create demand for meters from consumers, who can make reductions in their energy bills and participate in new and emerging services. Distribution Network Service Providers (DNSP's) can access the data they need to manage the grid of the future and lower their operating costs.

This submission outlines the benefits of this approach for all market participants: for consumer, retailer, and DNSP. The combination of next generation smart meters and Sense software, helps to transform a literal zero-sum rollout to a win:win:win. Whether the rollout becomes mandated or not, this approach improves the smart meter business case for all and will serve to accelerate deployment.

**The System of Incentives to Reignite the Smart Meter Rollout**
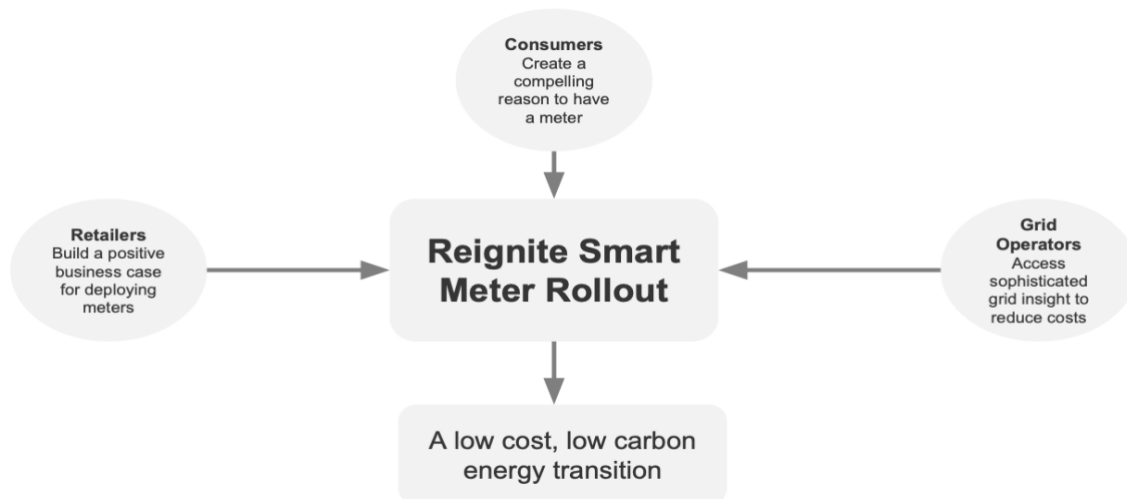
Introduction to Sense

The age-old trilemma still haunts regulatory choices in the global energy sector. How do you deliver security of supply, lower bills, and reduced carbon emissions simultaneously? With global energy bills reaching unprecedented levels, this question has never been more prevalent for regulators. Smart meters are a large part of the answer, but historic uptake can be slow in many countries. A major contributor to this problem is that current generation smart meters aren't quite smart enough. But with a few tweaks, next generation smart meters can run much more sophisticated applications. These capabilities deliver value across the energy value chain from consumers to retailers and to network operators.

In particular, grid edge intelligence and real-time, appliance-level load disaggregation (a.k.a NILM) are generating significant interest in the energy sector. Advances in technology and AI mean that this long-heralded technology is now a compelling proposition, and it now runs on smart meters. This means it can be rolled out very cost efficiently to entire markets at the marginal cost of software. Testament to its potential, Sense has recently closed the largest funding round yet in the sector - a $122m Series C. Over half of all smart meters now being contracted in North America come equipped with Sense. And with millions of next generation smart meters rolling out with Sense in 2023, regulators worldwide are now giving the technology serious consideration when looking to turbocharge future rollouts.

So how does Sense intelligence work? By analysing high resolution energy data, Sense's AI software is able to spot patterns and anomalies in the voltage and current. Sense doesn't make meters, but it does develop intelligent machine learning software that runs within third party next generation smart meters. Its pattern recognition capability can be used to identify the unique power signatures of different devices in the home and determine how much power they are using in real time. Device detection and two-way communications are shared with the consumer via an app. It can also be used to spot faults on the grid or in the home. No other hardware or smart connections are required. This high-resolution processing takes place in the meter itself at the grid edge, so cloud costs and latency are low. Granular insights can be issued on demand into Retailer and Network backend systems. The real time, rich consumer app experience and time critical industry insights are surfaced via Wi-Fi, whilst non-real time, packaged insights can be shared via AMI into utility backend systems. For an overview of the Sense proposition watch these two videos here: Sense Utility Proposition and Sense Customer Experience
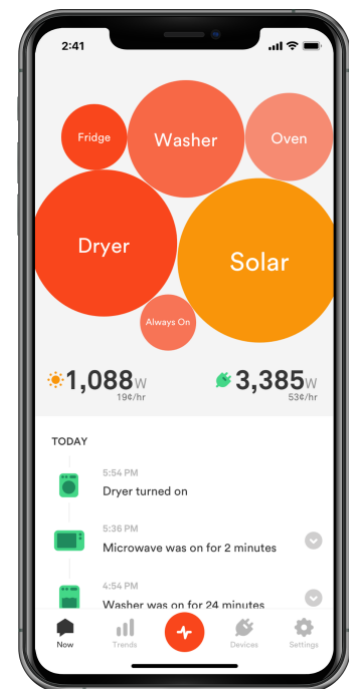
Benefits of Sense

The benefits to consumers, retailers, and DNOs, and the energy transition are clear. Sense intelligence represents a powerful tool for reducing consumers energy bills and their carbon footprint in ways that are not possible using older smart meters. For Retailers, consumers become more engaged, acquisition and retention improve, and power purchasing can be finessed. For DNOs, it reduces the overall cost of managing, maintaining and balancing the energy system.

When comparing AEMC objectives for an accelerated rollout to what Sense can deliver, the strong match is clear:

Table 1: AEMC meter objectives versus Sense value proposition (see Attachment 2 for detail)

1. Providing consumers with visibility and control of electricity consumption and costs	
Benefit	Sense fit
Accurate bills based on actual meter reads	High
More accurate flexible billing options	High
Greater choice of products and services tailored to individual customers	High
Improved energy literacy and understanding of energy usage patterns	High
Improved control over energy cost	High
Apps that can improve access to information	High
Faster switching and quicker realisation of contract benefits	Low
Development of new services and participation in new markets e.g energy storage, VPP's	High

2. Improving network operation, investment, security and reliability	
Benefit	Sense Fit
Support more efficient operation of the network	High
Improved data for network planning and investment	High
Innovative tariffs to manage peak demand and drive behavioural change.	High
Improved outage mgmt through faster detection of outages and restoration of supply	High
Improved visibility and management of network assets such as transformers and fuses	High
Improved visibility of the low voltage network toward dynamic voltage management	High
Improved management of controlled load.	High

3. Improving safety outcomes:	
Benefit	Sense Fit
Neutral fault detection and Identification of other safety issues such as a hot joint	High
Improved pinpointing of outage location.	High

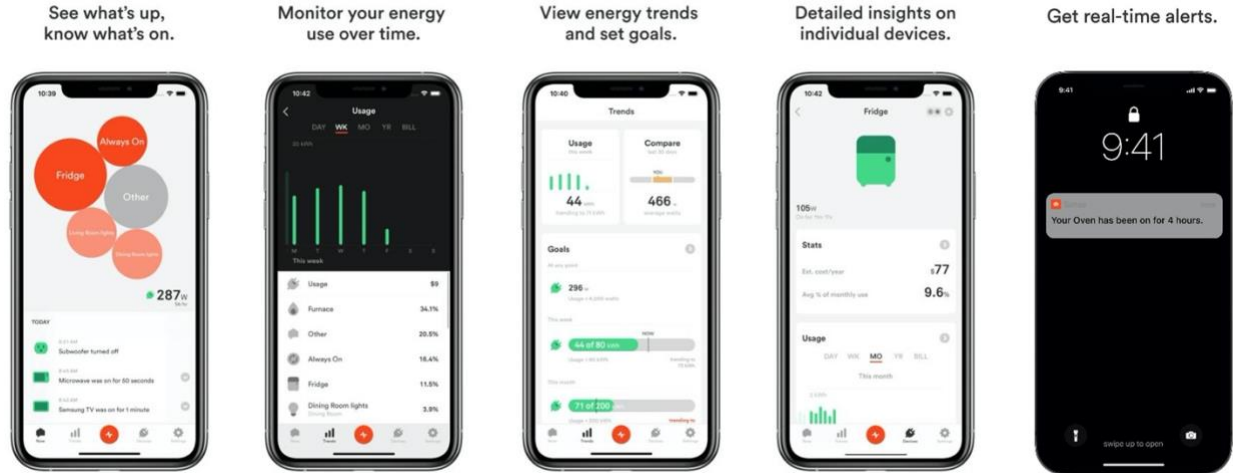| 4. Improving DER integration:	
Benefit	Sense Fit
Support dynamic operation of network to better manage more distributed energy system	High
Better understanding of LV DER hosting capacity, export limits to manage peaks	High
Improved management of DER allowing more customers to connect DER to the grid.	High

5. Data provided by MCs, Data Access, privacy	
Benefit	Sense Fit
Data Privacy issues are important	High
Introduction of new market participants via new technologies	High
Safer reconnection/disconnection for those carrying out reconnection/disconnection	Low
Aggregators require smart meters to provide their services	High
Better data and visibility for policymakers	High
Better data and visibility for researchers	High
Better street light management for Councils	Low
Data use for police operations.	Low

(Based on AEMC Directions Paper Review of Metering Services 16 September 2021)

Next generation smart meters with Sense software can deliver the energy transition, reduce carbon and costs, and accelerate the smart meter rollout to full penetration. It does this by creating value and incentivising all the key stakeholders across the energy value chain. Below we outline how Sense & Next Gen meters unlocks this value.
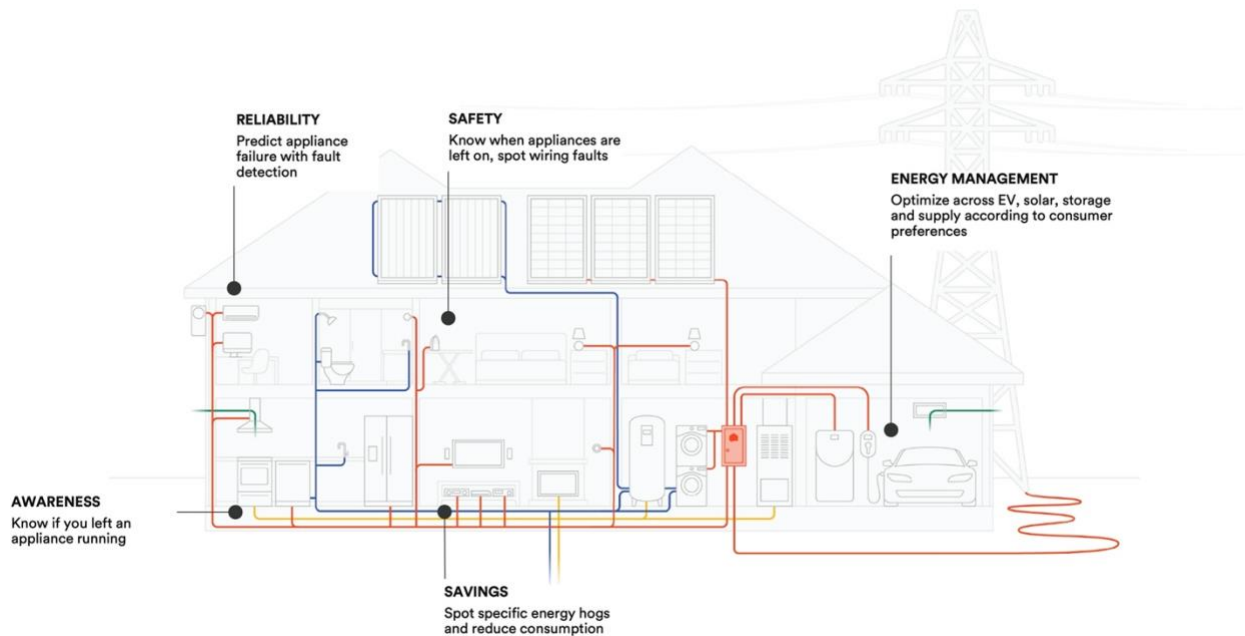
Motivating Consumers to consent to meter installation and engage in the energy transition

Helping reduce carbon and costs for consumers: The Sense app is a powerful way to reduce domestic energy costs for consumers. It does this by providing consumers with an innovative new technology - at no charge - that is able to identify how much consumption individual appliances are using, historically and in real time. People can see instantly whether they've left an energy-hungry heater on, identify an old, inefficient water boiler, or understand the behaviours contributing to big energy bills. Energy consumption is broken down to individual appliances in the home, with instant feedback when it's turned on or off. With this insight, users find it easy to reduce their consumption. On average they save 9% on their bill - about $150 a year in Australia. With the marginal cost of software being so low, Sense is the most cost-effective energy efficiency investment available today - more cost effective than insulation, a new thermostat, new boiler, solar panels…anything.

See what's up,
know what's on.

Monitor your energy
use over time.

View energy trends
and set goals.

Detailed insights on
individual devices.

Get real-time alerts.

Staying safe, engaged, and primed to provide flexibility to the energy system: Householders stay engaged too so the benefits are enduring. They benefit from a range of home awareness tools. They can get custom notifications to make their lives simpler and safer. Did they forget to turn the iron off? Is someone at home? Is the air conditioning or clothes dryer faulty? Sense can even spot dangerous wiring faults in the home, such as problems with neutral integrity (aka floating neutral). All of this is enabled by AI analysis of electrical supply into the home. As a result, a typical householder opens the Sense app two to three times a week, even after a year of usage. With all this additional value, consumers are not only more likely to consent to having a smart meter installed, but they are also much more likely to actually benefit. As described later in this submission, Sense also enables both behavioural and connected demand side response. It maximises the impact of both implicit and explicit flexibility. In so doing, consumers can benefit from the rewards and lower tariffs that this implies.

Consumer Benefits

RELIABILITY
Predict appliance
failure with fault
detection

SAFETY
Know when appliances are
left on, spot wiring faults

ENERGY MANAGEMENT
Optimize across EV, solar, storage
and supply according to consumer
preferences

AWARENESS
Know if you left an
appliance running

SAVINGS
Spot specific energy hogs
and reduce consumption

The prospect of lower energy bills, flexibility rewards, smart home awareness and safety features is a great way of motivating consumers to partake in the energy transition. They are more likely to want a

smart meter and where required, consent to their data being shared with authorised energy market participants.

Providing great value to bill payers, maximising the return on investment: Sense provides its application to consumers at no charge. They already pay enough for their energy. And with the marginal cost of software on a smart meter being so low, Sense is the single most cost-effective energy efficiency investment available today. It's more cost effective than insulation, a new thermostat, new boiler, solar panels… anything.
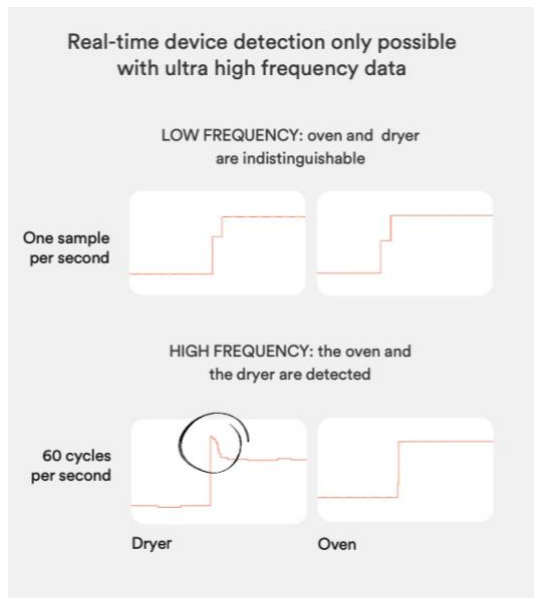
Creating a positive smart meter business case for retailers, helping to boost deployment

Improved margins based on better customer relationships: Retailers working with Sense have the opportunity to engage more positively with their customers. Too often communication with their customers can be negative - when the bill arrives in their inbox, or a complaint prompts a telephone conversation. However, with Sense, there are myriad opportunities for regular, welcome engagement. When a retailer is seen to help a customer, either by reminding them they've left the oven on or by materially reducing their bills, perceptions begin to change. High bill complaints are readily managed, with clear appliance level explanations of what's happened to drive up their costs. Consumers are surprised and delighted. The relationship can be transformed - and the result is a happier and more loyal customer base.

Importantly, retailers that offer Sense to their customers can acquire customers without relying on loss-making tariffs. All customers want lower energy bills. However, to compete and acquire customers, retailers have had to cut the price they charge per KWh. As a consequence, retailers are surviving on wafer-thin margins. Instead, with on average 9% lower energy bills, retailers using Sense can compete on total bill size rather than cost per KWh. To match those bills, competing retailers would need to operate on negative margins of minus 5-10%. Retailers working with Sense can establish a clear competitive advantage over discounters who offer poor service and engagement.

Lower power costs with flexibility at the grid edge: Managing the grid is going to become extraordinarily challenging in the coming years. The electrification of heat and transport will trigger a surge in load. A grid dependent on renewables will be unable to dispatch sufficient supply to balance it. The spikes in demand will exacerbate peak pricing. Energy suppliers that are able to limit consumption during those times will reduce their costs and grow their margins. However, most domestic flexibility solutions in the market today are prohibitively expensive and difficult to scale. They require the installation of connected batteries or replacement of legacy appliances. Time of use tariffs have poor uptake and customers struggle to cut enough consumption at the right times. However, with an engaged and informed cohort of customers, flexibility can be secured at much greater scale and much lower cost.

Sense enables a different type of domestic demand side response that doesn't rely on expensive in-home installations or ineffective time of use tariffs. Using real-time device detection, Sense can detect the highest consuming appliances on the grid at any time, and issue messages to consumers requesting they turn down specific devices. The same technology makes time of use tariffs much more effective. Immediately before a change in pricing, consumers can be messaged with a reminder and provided with suggestions on the precise appliances they should consider turning down. The flexibility and immediacy mean even dynamic time-of-use tariffs become viable.

Real-time device detection only possible with ultra high frequency data

LOW FREQUENCY: oven and dryer are indistinguishable

One sample per second

HIGH FREQUENCY: the oven and the dryer are detected

60 cycles per second

Dryer   Oven

One caveat: the load disaggregation must be accurate, real time and appliance level. Other load disaggregation technologies using lower resolution data have been shown to be too unreliable, late and clumsy to be effective. However, if the disaggregation is real time, householders are then able to turn off the most impactful appliances that are using power at that moment. They don't waste time and effort on minor appliances, such as laptops or low energy light bulbs. By showing consumers precisely what to do, natural inertia is overcome. Customers retain agency and choice, so the threat of a damaging backlash against the industry is removed. By doing the hard work for them, retailers can substantially increase satisfaction, participation rates and flexible load. When homes without Sense are asked to shift load, an average of just 2-4% of peak consumption is typical. In homes equipped with Sense, this soars to 18%.

Crucially, this form of domestic flexibility requires only a software application on next generation meters. The software can be affordably rolled out, downloaded on a new meter, and distributed to an entire customer base with minimal marginal cost. Once at a reasonable scale, load under control becomes predictable and reliable. For a medium sized country such as Australia, Sense on smart meters would be the equivalent of cutting 2.4GW from peak load. That's as much as two nuclear power stations!

Improve insight and forecasting with better data: With appliance level data, energy retailers can derive significant benefits. The most direct advantage is enhanced forecasting. By supplementing demand forecasting models with appliance level insight, future load can be more accurately predicted. Power purchasing can be finessed, and hedges optimised. With more accurate buying, supply margins can expand. The same appliance level insight can be used to better understand customers and their needs. Service and support can be enhanced with richer customer segmentation and insights.

Creation of new revenue streams founded on clear competitive advantage: As part of this proposition, consumers are asked to share their data with authorised market participants, including the retailer. Their permission is sought in a GDPR-compliant, clear and transparent manner with the broader benefits of doing so laid out. Personally identifiable information (PII) is held separately from their energy data, with the highest security standards applied. Consumer data is not shared with any third parties without the express permission of the customer, and only in circumstances which are to the benefit of them and the energy transition.

However, once approval is acquired, new business models can be created. If the customer consents to share their appliance and fault data, energy retailers can offer new proactive services. They can offer to repair or replace a faulty appliance before it breaks. They can identify older, energy inefficient appliances and sell more environmentally friendly replacements, helping customers save money on their bills. By identifying and pre-empting risk in the home, insurance can be made more price competitive.

Energy retailers have always been in the data business. That data may have been analogue rather than digital, collected by an army of meter readers, processed, and then billed back to consumers. Their advantages lay in data collection and processing, anchored to a unique metered asset in the home, and

the infrastructure and relationships to communicate with millions of consumers. These new business lines leverage those core capabilities. Unlike many diversified lines of business, energy retailers have genuine competitive advantages in these new services and are therefore much more likely to generate material and sustained margins.

Retailers can defray their costs and share in the revenue opportunity unlocked by grid edge intelligence: Data services have been identified in the draft report as a primary revenue stream. It's not just retailers and consumers that can benefit from load disaggregation and grid edge intelligence. Other authorised energy market participants, consented to by the customer, can also generate substantial operational savings and broader benefits. For instance, distribution networks and demand aggregators can source flexibility as well as measure and verify load shifts. Sense technology can spot faults on the low voltage distribution network. This is powerful data, which can create major savings for grid operators. These services all have substantial value to those other parties. As an independent third party, with consent from consumers and a contract with the meter buyer, Sense can mediate the flow of data to other authorised market participants. That's why, when a retailer specifies a Sense-ready meter, they can share in these incremental revenues on an ongoing basis, even if the original customer churns away.

Helping retailers build a strong business model for a digital, low carbon grid: Energy retailers play a vital role in both the global economy and in the energy transition. However, their business models have experienced substantial pressure for several years, long before the crisis in Ukraine. But with Sense, energy retailers can build a new, sustainable business model fit for a low carbon, digital grid. By improving customer satisfaction, churn falls. By enhancing forecasting and shaving wholesale price peaks, power costs fall. Reducing demand will become as value creating as increasing supply. Instead of giving away margin by competing with discounters on pence per KWh, customers can be offered lower consumption, carbon and bills. New services can be provided, founded on a rich digital relationship with end consumers, that can outlive the original supply agreement. With Sense, retailer margins and revenues can expand based on a clear and enduring competitive advantage.

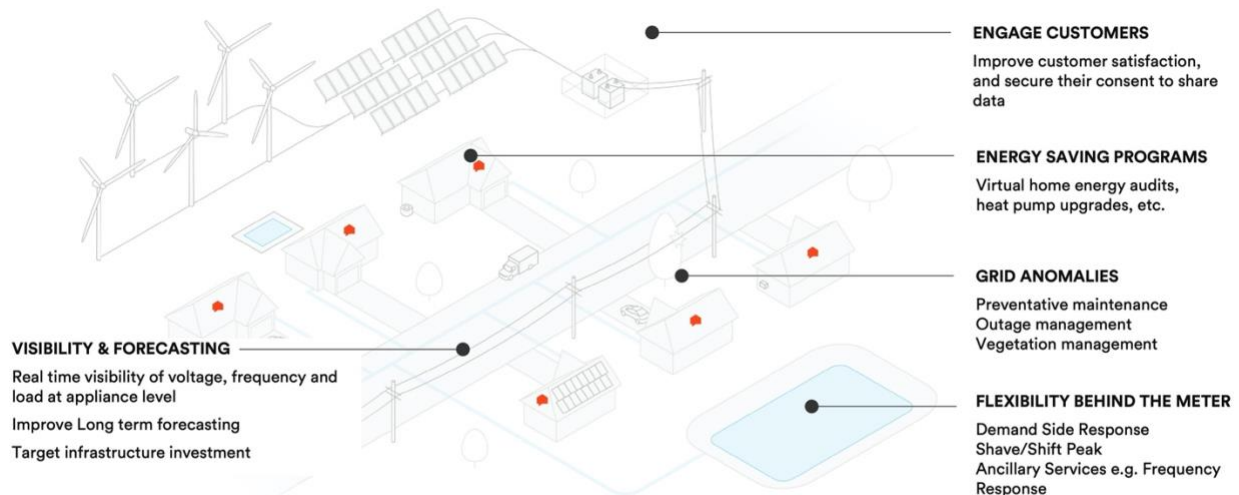## Unlocking data for DNSP's and lowering their operating costs

Sense creates positive incentives to share data amongst all parties: To manage an increasingly complex grid, DNSP's will need access to granular smart meter data in a reliable and standardised format. Moreover, additional value will be unlocked if this data is provided in real time, and in some cases, it may necessitate consumer consent to access it. That means engaging consumers to both secure their consent but also encourage them to connect their meter to Wi-Fi. However, herein lies a challenge for networks. They are not allowed to contact customers. However, this is where Sense as a third party, can provide this capability on their behalf. By creating incentives for all parties to share data, Sense can ensure that the DNSP receives the data it needs. Retailers are encouraged to share by receiving some recompense for doing so. Furthermore, the consumer app engages customers on behalf of network operators, secures their data consent, and establishes a data link over Wi-Fi. It does this by giving consumers a product of genuine value.

As part of the customer journey, consumers are clearly and transparently asked to share their data with authorised energy market participants, including the DNO and Retailer. Their permission is sought in a GDPR compliant, clear and transparent manner with the broader benefits of doing so laid out. Personally identifiable information (PII) is held separately from their energy data, with the highest security standards applied.

Reduce overall power and network costs with domestic demand response at scale: Managing the grid is going to become extraordinarily challenging in the coming years. The electrification of heat and transport will trigger a surge in load. A grid dependent on renewables will be unable to dispatch sufficient

supply to balance it. There will be severe operational challenges when additional infrastructure can't be deployed fast enough to mitigate congestion. Involuntary curtailment will prompt a consumer backlash, and limits to the deployment of EV charge points will be unpopular with policy makers and the public alike. The alternative is to have more control over demand at the grid edge. However, most domestic flexibility solutions in the market today are prohibitively expensive and difficult to scale. They require the installation of connected batteries or other appliances. With an engaged and consenting cohort of customers though, flexibility can be secured at much greater scale and much lower cost.

Utility Benefits

ENGAGE CUSTOMERS
Improve customer satisfaction, and secure their consent to share data

ENERGY SAVING PROGRAMS
Virtual home energy audits, heat pump upgrades, etc.

GRID ANOMALIES
Preventative maintenance
Outage management
Vegetation management

VISIBILITY & FORECASTING
Real time visibility of voltage, frequency and load at appliance level
Improve Long term forecasting
Target infrastructure investment

FLEXIBILITY BEHIND THE METER
Demand Side Response
Shave/Shift Peak
Ancillary Services e.g. Frequency Response

As described earlier in this submission, Sense enables a different type of domestic demand side response that doesn't rely on expensive in-home installations. Using real-time device detection, Sense can detect the highest consuming appliances on the grid at any time, and issue messages to consumers requesting they turn down specific devices. Of course, the load disaggregation must be accurate, real time and appliance level. Other load disaggregation technologies using lower resolution data have been shown to be too unreliable, late and clumsy to be effective. When homes without Sense are asked to shift demand, an average of just 2-4% of peak capacity is typical. In homes equipped with Sense, this increases to 18%.

Grid Edge Intelligence can help reduce maintenance costs: Maintenance costs for grid operators can be cut. The machine learning software is able to lock on to and locate anomalies in the power supply. Problems as diverse as vegetation brush, corroding transformers, and floating neutrals can be identified, located and the grid operator notified. This can transform the maintenance programme for network operators from time to condition based. Rather than send engineers and maintenance crews to look for faults on a regular schedule, they can be directed to the source of known issues. This reduces truck rolls and costs. The location of failures can be identified rapidly, reducing time to fix, improving customer satisfaction, and ultimately lowering bills.

Real time insight can improve decision making and forecasting at the grid edge: With enhanced processing within the smart meter, grid operators can receive an on-demand or continuous feed of power quality, voltage, waveform, total harmonic distortion, and frequency with a granularity previously only seen at the substation level. This can be provided in a standard format, accessible by the parties that need it. With Wi-Fi connectivity in the home, this data can be relayed in real time with as much richness as the DNSP wants to see. Crucially Sense's grid edge capability processes this vast amount of data in the meter, ensuring that data volumes into backend systems can be tightly controlled, limited and

calibrated. With greater penetration of distributed generation and heavy loads, this meter level insight will be a vital tool for managing the grid. Sudden dips and peaks in solar generation as clouds pass will be visible, allowing the DNO to respond with demand response. A wave of EVs being charged simultaneously can be seen and reacted to. Clarity over EV or heat pump penetration will help finesse decisions on where to invest in additional infrastructure.

Concluding thoughts: re-igniting the smart meter rollout and achieving 100% by 2030

To ensure that Australia benefits from a cost-effective energy transition that delivers cuts to both carbon and cost, it is imperative that smart meter penetration ramps up substantially.

However, to do that, all market participants must benefit. Consumers must see their bills fall, distribution networks must get the tools to run their infrastructure efficiently, and retailers must get a fair return on their investment.

Sense is uniquely positioned to reconcile those needs and help make that happen. With next generation smart meters, equipped with Sense software, all stakeholders can help support and accelerate that transformation.

With the extraordinary device detection capabilities of Sense's AI, consumers will find it easy to curtail their consumption, whilst enjoying a smarter and safer home. Network operators will access new tools that help them ease congestion, finesse balancing, identify and locate faults, and access the high-resolution grid edge insight that is imperative to managing the system of the future. Retailers will unlock new revenue streams, reduce their power costs, engage and delight their customers, and reposition their business models for the energy transition.

To make this happen, the future waves of smart meters in Australia need to be equipped with next generation capabilities. Smart meter makers have already risen to the challenge and are adding the modest technical improvements needed to run applications such as Sense.

So, for regulators and policymakers considering how to boost the rollout of smart meters, this is a moment of opportunity. By encouraging the deployment of next generation meters with the capacity to run software like Sense, they can accelerate the energy transition, reduce the cost of the energy system, improve customer experience, and cut bills.

Attachment 1: Responses to draft report questions

	Topic	Responses
1	Accelerate the smart meter deployment to be complete in 2030	Application software such as Sense AI software on next generation smart meters can significantly enhance uptake of next generation smart meters
12	Require retailers to provide important information in a clear, streamlined, and consistent way to small customers before any smart meter upgrade	Building consumer familiarity and trust is crucial for consumer energy engagement whether adopting energy efficiency applications, or even requesting a new smart meter upgrade, or participating in demand response initiatives. Providing positive customer communication and promotion of benefits before installation and activation is an essential part of a successful Sense customer rollout, including providing up-front and customer friendly information to customers to support the deployment of smart meters and empower customers to make the best of their meter upgrades under all meter deployments.
13	Additional energy efficiency web resources	Providing energy efficiency online resources is essential. A resource website is a good starting point, but energy consumers want much more. Sense utilises multiple communications mediums to provide energy efficiency information, dialogue, hints, tips, reminders, nudges, and invitations for engagement and participation.
18	Power quality monitoring and reporting for consumers	Power quality grid edge monitoring is incredibly important per individual home, and across groups of homes to monitor grid health and grid safety. Power quality varies as grid load changes, and with sufficient density of homes with Sense, it is possible to triangulate the location of grid health issues and malfunctioning grid components based upon comparison and differentiation of power quality readings across multiple homes. Sense captures and reports power quality voltage and frequency variances for all Sense application users as part of their standard user application. This is provided in real time where required. Power quality monitoring is far more detailed when used for grid analytics and when provided as part of data services.
	Supplemental point: Next Generation Smart Meter characteristics versus legacy smart meter characteristics	Next generation smart meters have several important enhancements that are critically important for supporting the emerging residential customer energy transition adoption use cases. ■ Higher frequency sample rates, sampling electrical supply to each home 15K times a second and higher to create a high resolution electricity wave form of aggregated whole home energy load. ■ Greater edge computation resources and support

		multiple energy data applications such as Sense AI.
		▪ A wider array of secure communications that can utilise consumer Wi-Fi bandwidth as well as AMI mesh networks. These next generation smart meter capabilities together provide applications such as Sense, the necessary grid edge high resolution electricity waveform to identify individual fingerprints of the devices and appliances in the home, and also to analyse grid energy supplies to monitor power quality, faults, transient events, and anomalies on the grid. The business case for next generation smart meters is far more attractive than legacy smart meters, as the modest uplift in cost is dwarfed by the new revenue streams, customer engagement, and operational, balancing, and power cost savings.
	Supplemental Point: Applications on Smart Meters create business case justifications	Next generation smart meters are capable of running several applications at once, unlocking important benefits and business case justifications that older smart meters simply cannot provide, with just a modest uplift in technology and cost. Sense AI software is used in this paper as a representative example of energy related applications running on next generation smart meters that support compelling business cases.

Attachment 2: AEMC meter objectives versus Sense value proposition
(From AEMC Directions Paper Review of Metering Services 16 September 2021)

1. Providing consumers with visibility and control of electricity consumption and costs

Benefit	Sense Fit	Description
Accurate bills based on actual meter reads	High	Sense customers see real time view of consumption and generation by device on a time of day, week, month, year to date basis, expressed in tariff amounts and percentage of total consumption
More accurate flexible billing options	High	Sense customers have real time device level consumption on which to base tariff and load shift participation
Greater choice of products and services which may be more tailored to individual customers	High	Sense customers can very easily and quickly identify which tariff packages make sense when presented with many choices
Improved energy literacy and understanding of energy usage patterns	High	Sense customers with no prior energy management knowledge or experience quickly learn surprising device patterns and levels of consumption, both common but also unique to their homes and personal energy behaviours.
Improved control over energy cost	High	Because Sense is real time, customers are able to instantly identify energy hogs and switch off or change scheduled times or behaviours.
Apps that can improve access to information	High	Sense extracts key data from electrical signals and produces easy to understand energy information via mobile engagement app.
Faster switching and quicker realisation of contract benefits	Low	Sense is a contract benefit; however, Sense is not involved in switching
Development of new services and participation in new markets such as energy storage, virtual power plants (VPPs) etc.	High	Sense is a trusted engagement tool for consumers. Trust and engagement are the foundations for consumer consented adoption of new services such as DR, storage, virtual power plants and other novel lines of business.

2. Improving network operation, investment, security and reliability

Benefit	Sense Fit	Description
Support more efficient operation of the network	High	Sense grid analytics data provides 1 second interval high frequency power quality V+F data, power quality, and operational, safety, reliability analytics insight data.
Improved data for network planning and investment	High	Sense device level data gives unparalleled granular views of adoption trends over time of new DER loads and microgeneration behind the meter. This improves forecast accuracy during periods of unanticipated accelerated growth in adoption of DERs.
Innovative tariffs to manage peak demand and drive behavioural change.	High	Participation and load is far higher. This is because behavioural change requires that consumers know which devices are right to turn on and off make a difference during peak demand events. They may not be able to turn off the preferred devices to reduce by 3kw, but instead of dropping out, they may see several devices that cumulatively make an impact of 1.5kw and can participate in energy moments in some way.
Improved outage management through faster detection of outages and restoration of supply	High	Sense software provides high frequency monitoring and when deployed across multiple homes on the same transformers, substations, or feeders, Sense grid monitoring can indicate transient anomalies that occur prior to outages, often half an hour before an outage, and by comparing which homes are experiencing the same anomaly and which homes are not, help to pinpoint the outage possibly before and as it occurs, and which homes and areas are affected, and which homes and areas are not.
Improved visibility and management of network assets such as transformers and fuses	High	Sense provides constant grid monitoring and detects the specific signatures of transformers that often have corrosion and oxidation issues or failing subcomponents such as tappers that are degrading gradually and cannot be detected with visual inspection, but require maintenance, adjustment, or replacement before they fail.
Improved visibility of the low voltage network toward dynamic voltage management	High	Sense measures supply voltage and frequency at each home 15ks/s able to report at 1 second intervals on an as needed basis.
Improved management of controlled load.	High	Sense is able to be used for both behavioural demand response where 'energy moments' are participated in through the Sense engagement app, as well as automated demand response where device control of controlled loads is delegated through an IFTT or other integration with a smart plug or smart breaker device that manages delegated control between the consumer and the DR initiative.

3. Improving safety outcomes:

Benefit	Sense Fit	Description
Neutral fault detection • Identification of other safety issues such as a hot joint	High	Sense provides high frequency real time monitoring for floating neutral issues, issuing alerts when identified. Sense also can identify other anomalies caused by failing equipment starts and stalls often associated with hot joint or other wiring faults.
Improved pinpointing of outage location.	High	Sense software provides high frequency monitoring and when deployed across multiple homes on the same transformers, substations, feeders, Sense grid monitoring can indicate transient anomalies that occur prior to outages, often half an hour or more before a catastrophic outage, and by comparing which homes are experiencing the same anomaly and which homes are not, help to pinpoint the outage possibly before and as it occurs, and which homes and areas are affected and which homes and areas are not.

4. Improving DER integration:

Benefit	Sense Fit	Description
Support dynamic operation of the network to better manage a more distributed energy system	High	Sense high frequency power quality data and granular device level consumption and solar generation data services are provided on a need-to-know basis at 1-minute intervals.
Better understanding of LV DER hosting capacity, dynamic export limits to help manage network peaks.	High	Sense is particularly valuable as a data service providing high granularity device level DER loads and generation data from behind the meter, when updating DER hosting capacity. Sense uses 15ks/s high frequency sampling, with updates per minute as needed. Sense high frequency granular data with 1 second reporting interval supports dynamic export limiting approaches.
Improved management of DER Allowing more customers to connect DER to the grid.	High	Sense data services increases the accuracy clarity and timeliness of DER data available to the grid operator, which ideally is fed into the identification of available capacity on the existing grid locations for connecting DER to the grid meaning more customers can connect. Conversely, although unlikely, more accurate and timely Sense data may also indicate that the part of grid where the DER is to be added is more congested and less reliable than previously thought.

6. Data provided by MCs, Data Access, privacy

Benefit	Sense Fit	Description
Data Privacy Issues are important	High	Sense provides compelling energy engagement apps to Consumers who in return provide Sense with consumer consent to share data with limited authorised parties for the essential business purpose of making improvements to the energy related services they provide to the Consumers. Sense is very protective of the strong goodwill and trust of its users and protects PII data accordingly.
Introduction of new market participants via new technologies	High	Home energy management technologies such as Sense software that enable consumer demand response and load shifting will continue to scale and in time move towards participation with local flexibility markets.
Safer reconnection and disconnection for those carrying out the reconnection and disconnection	Low	This is not a use case that Sense is currently working on.
Aggregators require smart meters to provide their services	High	Next generation smart meters have all the necessary resources to enable multiple applications to run concurrently. Sense is a very useful separate monitor on the meter that can be used by aggregators to help them identify anomalies in paid participation in the aggregation activity.
Better data and visibility for policymakers	High	As a critical mass and density of next generation smart meters with Sense activations is reached, a wide variety of real time updated energy consumption data at a device and category level in homes is possible. And across the entire national fleet of Sense instances, the impact and outcomes of behavioural and automated energy efficiency programmes will be possible to display in real time as the impacts and outcomes occur.
Better data and visibility for researchers	High	Sense data services enable device level visibility of energy intervention outcomes with before, during, and after Sense data. The granular nature of the Sense data, coupled with the immediacy of real time updates ensures reported data is as current as possible.
Better street light management for Councils	Low	This is a difficult challenge for Councils. There are likely to be far better more concise methods to set light schedules. However, as a community use case, Sense would always have a look at the use case and identify if there is any help Sense data might contribute.
Data use for police operations.	Low	Sense has not identified this use case as a focus or priority. Sense is focussed on working with close energy partners and government to achieve climate change goals and consumer energy savings and cost savings. Sense always complies and cooperates with all legal requirements in each country that Sense operates.

Attachment 3: Further responses relevant to this report

Australian Energy Market Commission   Directions Paper Review of metering services 16 September 2021

	Topic	Responses
B. 2.1	As of 2021 Data Captured doesn't yet include device level consumption data	Next generation smart meters with applications such as Sense can now include device level consumption data on the list of essential data that is possible to capture. This has only become generally possible on next generation smart meters over the course of 2022, with sufficiently high frequency sample rates to identify individual device signature waveforms. Device level consumption data in real time, has quickly become a top consumer unmet need and demanded capability as consumers grapple with reducing energy costs since the energy crisis in 2022.
B.2.2	Power Quality Monitoring	Next generation smart meters with applications such as Sense enable each home to become a grid edge power quality monitoring point. Sense provides significantly higher frequency v+f power quality monitoring of 15ks/s at each home reported once a second on a need-to-know basis, using secure cloud APIs. Sense AI provides real time waveform analytics that identify anomalous signatures of events and issues that reduce power quality. Sense recognises vegetation brushes and pinpoints the location for operations. Sense recognises transformers that are beginning to exceed specified variance parameters and require maintenance, or adjustment of a tapper, or replacement with a new transformer. Often there is no visual indication of the transformer issue and impossible to diagnose with the naked eye. Each Sense consumer app displays a power quality variance counter and power quality data is available through Sense data services on a need-to-know basis.
B.2.2	Power Quality Data Cost	Sense offers high frequency consumer consented PQ V+F data at 1-minute intervals on a need-to-know basis at very reasonable costs.
B.2.2	Floating Neutrals Safety	Floating neutrals are a significant hazard and risk of death, associated with incorrect wiring installations that result in neutral wires carrying voltage and current due to an incorrect connection to a live wire. Sense detects the tell-tale anomaly signatures of floating neutrals and reports them as safety alerts as a data service.

Attachment 4: Helpful links for further detail

1. An article describing the future role of energy management technologies like Sense in Australia
   Link here:
   https://international.blog.sense.com/australia-energy-management/

2. An article describing challenges and considerations of Regulators. Link here:
   https://docs.google.com/document/d/1_G85_l-GTnkt8XSeh_PGfa-j0NR0B58FQpYytsx9ImQ/edit

3. An article describing the benefits to Retailers. Link here:
   https://international.blog.sense.com/real-time-revenues-and-retailers/

4. An article describing the benefits to DNO's. Link here:
   https://international.blog.sense.com/customer-cooperation-and-cutting-costs/

5. A brief video infographic on our technology. Link here:
   https://drive.google.com/file/d/1YMal0hJomweFZZPVLKPdRvo4A9TD1UR4/view

6. For an overview of the Sense proposition Video Links here:
   Sense Utility Proposition and Sense Customer Experience