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INTELLIHUB GROUP
SUBMISSION TO CONSULTATION ON REGULATORY CHANGES FOR SMARTER HOMES:

Smart Meters: Creating value and system security for South Australia

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Smart Meters: Creating value and system security for South Australia

Advanced digital meters, or smart meters, are the most cost efficient, reliable and scalable solution to help manage the risks associated with minimum demand in South Australia.

Intellihub appreciates the potential severity of this risk to system security and the urgency for a solution by Spring 2020. We believe that dynamic hot water load control can mitigate the minimum demand risk in the necessary timeframe while providing better outcomes for consumers. Smart meters enable dynamic hot water load control. This solution is preferable to the emergency disconnection of solar generation as it creates value for consumers and the energy market, rather than eroding value.

We have proposed a four stage solution:

1. **Require metering providers to work with AEMO to implement a dynamic hot water load control system for existing smart meters and replace legacy meters** with smart meters at all sites with off-peak hot water in SA. This will mitigate the short term minimum demand risk.

2. **In consultation with stakeholders, and in conjunction with a broader solution design activity, develop a set of requirements** that sets out functionality, reliability, cyber security and scalability to which any solar generation flexible export mechanism must comply.

3. **Require dynamic export limits in new solar installations from Q4 2021** to ensure SA has a strong energy system able to support continually increasing renewables into the future. Allow the market to select the best mechanism to provide this outcome.

4. **If an additional short-term backstop is deemed necessary, then replace legacy manually read meters at existing solar sites with smart meters having a solar disconnect capability** and require all new solar sites to have remote disconnect capability in an emergency minimum demand scenario. Allow the market to select the best mechanism to provide this outcome for new solar sites.

Smart meters can combine hot water load control and dynamic export control with other layers of operability to help unlock benefits to consumers, support the use of energy rather than loss of energy, and help maintain grid security across the state.

When combined with other benefits such as remote meter reading and connection/ disconnection services, dynamic tariffs and other innovative retail products, we estimate that consumers could be better off by $30 to $50 a year as a result of a wide scale smart meter deployment.

Hot water load control: The better, bigger battery

The Australian Energy Market Operator states that there is a required minimum operational demand of 450MW in South Australia and that this demand may not be met at any one time from September 2020.

Intellihub analysis indicates that there are approximately 200,000 electric hot water systems across South Australia representing a potential combined demand of 720MW. With intelligent scheduling and staggering enabled by smart meters, these systems can deliver a continuous aggregate demand of 200 to 300MW to help maintain grid stability when solar generation is highest.

These hot water systems can be used as one large coordinated battery energy storage system in exchange for a cheaper, lower cost or even zero tariff solution. Consumers benefit with low cost hot water. Energy is used, not wasted; and grid stability is maintained.

It is entirely consistent with the SA Power Networks solar sponge tariff and the intent of the National Electricity Objective. Intellihub is about to begin field tests for the use of smart meters to operate hot water load control in cooperation with multiple retailers and a local grid operator in NSW. We expect it to be both technically feasible and efficient – ready for deployment for the AEMO September 2020 deadline.

If required replace dumb meters still connected to existing solar sites

We estimate that conventional or dumb electricity meters are still used to measure solar generation at as many as 150,000 sites across South Australia. These are mainly manually read meters, installed before Power of Choice Reforms.

These solar sites are an existing source of demand/supply response that can be tapped during minimum demand periods. However they require a smart meter with required operability to turn this solar energy into a manageable and usable resource.

It makes sense to leverage an existing resource if an additional backstop solution is required, by simply bringing forward smart meter installations at these sites.

Opportunity to maintain South Australia's reputation as energy innovation central

Smart metering with state-of-the art dynamic export limit capability is now a reality and is ready to be deployed in S.A. This consumer friendly and low cost solution is far more preferable than any wide scale load shedding of solar sites.

Intellihub has developed a contemporary IoT platform, conceived and built in Australia, to enable smart meters to manage and enforce dynamic export limits in a reliable, secure and scalable manner via a direct data link to solar inverters.

This represents a proven reliable, secure and low-cost solution for the 21st century. Any regulation mandating emergency generation shedding must permit and encourage this type of solution, delivered by the Metering Coordinator.

Tackling 21st century problems with last century technology

At present, smart meters are not being deployed at sufficient rates to effectively contribute to a solution to the South Australian energy conundrum. There are an estimated 700,000 manually read dumb meters in SA, almost one quarter of a million of those meters are more than 30 years old.

They provide poor last century service levels, and yet consumers still pay 21st century prices for them. Outside of Victoria, Australia has one of the lowest levels of smart meter adoption in the OECD and one of the slowest deployment programs in the world.

At present rates, full deployment of smart meters will be achieved by the middle of the century in Australia. This will severely inhibit the ability to fully leverage both DER technology and large-scale renewable energy generation. In comparison, most other countries completed smart meter deployments in five to seven years

Policy intervention is now due to help unlock the benefits of smart meters to help make a positive contribution to the South Australian energy system.

South Australia has forged a world leading reputation for innovative solutions to the energy transition underway across the globe. A deployment of smart meters will solve the grid security issues facing the state, while providing another innovative and world-first solution.

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Who we are

The Intellihub Group (Intellihub) is an Australian and New Zealand based utility services company focussed on electricity, gas and water metering services. We are a leading provider of electricity smart meter services in Australia and are currently deploying advanced digital meters to residential and business customers in most states and territories in Australia. We partner with electricity retailers, distributors and other energy sector participants to utilise smart metering technology to deliver data and services that improve the affordability, reliability and security of the electricity sector.

Background

Intellihub recognises the high probability of South Australia experiencing operational demand below the required minimum threshold needed to maintain system security in Spring 2020 and increasing over the next 1-3 years. Should operational demand fall below this threshold, the required levels of inertia and frequency control may not be met, and the dynamic stability of the system is not guaranteed while South Australia is operating as an island.

Intellihub recognises the urgent need for intervention to ensure the security of South Australia's electricity supply is maintained over this critical 1-3 year period before longer term strategic initiatives begin to take effect.

Overview

This submission responds to the Consultation on Regulatory Changes for Smarter Homes released by the Department for Energy and Mining, South Australia. Our submission covers aspects from three of the five consultation topics:

1. The proposed remote disconnection and reconnection requirements for distributed solar generating plants in South Australia
2. The proposed smart meter minimum technical standards in South Australia
3. The proposed export limit requirements for distributed solar generating systems in South Australia

We have also provided our views on an alternate approach to the problem of minimum operational demand through the dynamic creation of demand, rather than the disconnection of excess supply.

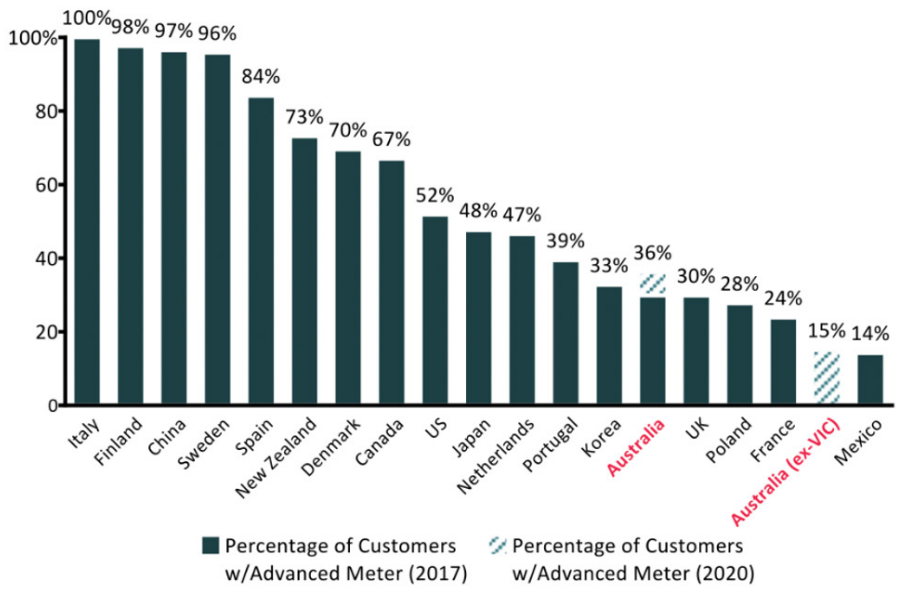
Smart meters are an essential enabler of this solution.

Australia currently has one of the slowest smart meter deployment programs in the world

Smart meters are an established and cost-effective technology that can be quickly deployed to help solve the issues facing the South Australian energy system.

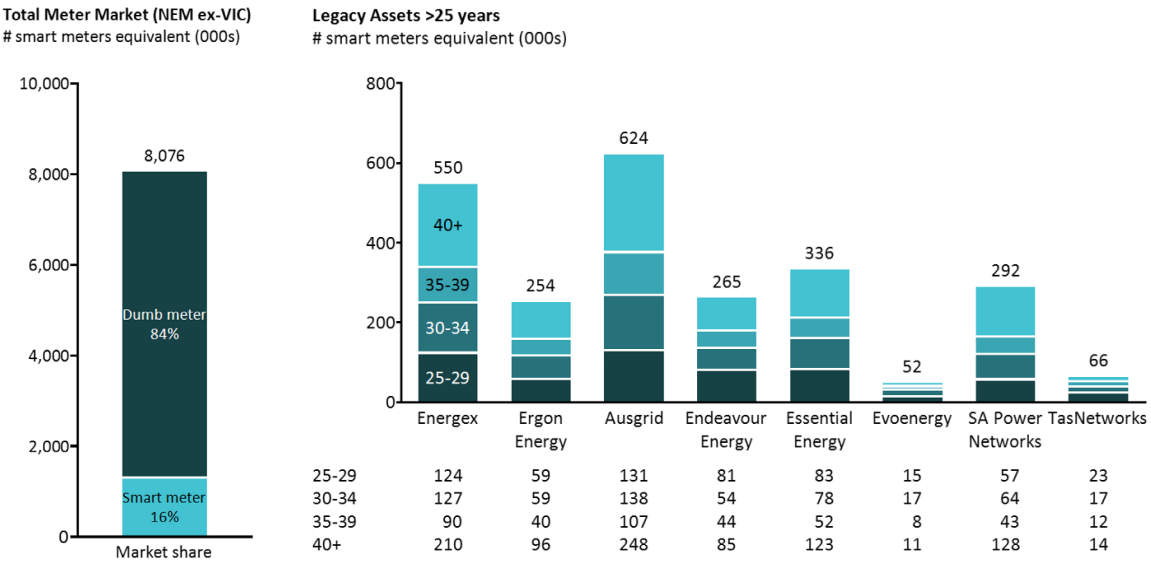
However, the current level of penetration of smart meters and current deployment rates in Australia are extremely low. Outside of Victoria, Australia has one of the lowest levels of smart meter adoption in the OECD and one of the slowest deployment programs in the world.

Figure 1: Advanced meter penetration by country



The vast majority of customers currently have old manually-read mechanical meters that can only record the customer's total consumption and are only read once every three months

Figures 2 and 3: Total meter market penetration (NEM ex-Victoria); Accumulation Meters over 25 years old



Almost two million meters across the National Electricity Market are more than 30 years old. Incredibly, there are still an estimated 365,000 old dumb meters in use that are 50 years or older. This is one of the last major legacies of the analogue era remaining in the electricity system. They are well beyond their stated asset life and consumers are continuing to pay their network provider for maintaining these meters, despite the fact they have already earned an appropriate return over their 50-year life.

The AEMC changed the national electricity rules from December 2017 as part of its Power of Choice reforms to enable the deployment of smart meters and require all new and replacement meters to be smart meters. However, only around 5% of meters are being replaced with these meters each year, mainly for new houses or for customers who need them to install solar PV.

Retailers can offer advanced digital meters to customers on an “opt-out” basis, however the benefits of smart meters accrue to the entire energy value chain; customers, networks; and system security needs as outlined in this consultation yet the entire cost is incurred by retailers. Retailers are further penalised by having to pay an ongoing ‘asset fee’ to networks for these legacy meters once they are replaced even for these c.2 million meters which are over 30 years old and well past their economic life.

Intervention is required from policy makers to help realise the full benefits of smart meters and to help solve South Australia’s energy conundrum.

Alternative proposal – managing minimum demand with dynamic hot water load control

Key Message

Dynamic hot water load control will have greater short-term effectiveness in mitigating minimum operational demand risks than proposals involving the curtailment or disconnection of solar generation.

Key Message

Rather than eroding the value of solar generators, dynamic hot water load control is a value creator.

Recommendation 1

Initiate a programme for the rapid deployment of smart meters for all SA homes and businesses with electric hot water systems.

Recommendation 2

Require that metering providers work with AEMO to implement a dynamic hot water load control system for smart meters in SA.

Proposed Approach

There are approximately 200,000 electric hot water systems across South Australia representing a potential combined demand of 720MW.

The load control relay in smart meters is used today in South Australia to turn on these hot water systems at off-peak periods overnight, based on a pre-programmed schedule.

Approximately 30% of sites in SA with controlled load hot water are controlled via a smart meter today. The remaining sites will eventually have their metering upgraded to smart meters, however not in the critical 1-3 year timeframe needed to manage minimum demand.

Solution

Intellhub proposes a policy intervention requiring that all existing and new sites with hot water systems controlled by smart meters in South Australia be made available for dynamic control by AEMO.

We recommend initiating a targeted programme to replace legacy (non-smart) meters with smart meters having capability to dynamically control hot water load at existing sites across South Australia with existing electric hot water heating and where no smart meter presently exists.

The shifting of demand to match supply results in better outcomes for the consumer, is better aligned with the NEO and NERO and creates rather than erodes value when assessed against the disconnection of solar generation.

Intellihub is of the position that all avenues for shifting demand should be exhausted before the last-resort measure of disconnecting or curtailing solar generation is used. No requirement for an emergency solar generation disconnection mechanism should be created in the absence of action on dynamic hot water load control.

Intellihub notes that a system capable of scheduling and staggering individual hot water systems will be required in order to maintain the required demand continually over several hours. It is expected that 200-300MW of hot water heater demand can be shifted to critical times of high solar generation and maintained at this level for several hours. There are commercial offerings in the market available today that provide this scheduling and staggering functionality.

The required minimum operational demand can be boosted and maintained by dynamic hot water load control covering the critical 1-3 year period, negating the likelihood that any solar generation needs to be spilled.

The use of dynamic hot water load control will reduce the frequency and extent to which an emergency solar generation disconnect mechanism is called into action. This will, in turn, minimise solar spillage for South Australia.

Timeline Feasibility

Intellihub considers a 12-month timeline is feasible for an accelerated deployment of smart meters to the estimated 140,000 sites with controlled load hot water which do not already have a smart meter.

Intellihub has existing systems in place to facilitate on-demand dynamic hot water load control.

Technical Feasibility

Intellihub considers that dynamic hot water load control is technically feasible, with virtually no technical risk. Intellihub has proven, through several trials, that its smart meters can dynamically and remotely switch on and off hot water on-demand.

Merits

The implementation of a dynamic hot water load control scheme delivers the following benefits:

- Represents a rapid and cost-effective mechanism to manage minimum demand in the short-term
- Leverages existing incentives:
    - Respond to SAPN solar sponge tariff
    - Respond to wholesale pricing signals
- Creates value, avoids spilling solar
- Helps better manage network voltage rise issues than the disconnection of solar
- A smart meter upgrade program would quickly bring large amount of megawatts of demand under dynamic control to increase demand at high-supply times
- A smart meter upgrade program would create jobs in SA
- A smart meter upgrade program would allow SA to realise the broader benefits of smart meters earlier
- A smart meter upgrade program would bring economic efficiencies for smart meter deployment through scale to SA

Proposed remote disconnection and reconnection requirements for solar generating plants

Key Message

The best consumer outcomes will be realised by allowing the market to select the technical mechanism used for remote disconnection by specifying the outcome alone, however any mechanism should comply with performance and security requirements.

Recommendation 3

Develop a set of requirements, covering aspects of functionality, reliability, cyber security and scalability to which any emergency solar generation disconnect (or curtailment) mechanism must comply.

Recommendation 4

Use of a contactor controlled by an on-market smart meter should be deemed a compliant mechanism for the emergency disconnection of distributed solar generation systems.

Recommendation 5

Any requirement for an emergency solar generation disconnect mechanism should apply at the site or installation level, and not to a device class (eg inverter or smart meter).

Proposed Approach

The Department has proposed that distributed solar generation is required to be capable of being remotely disconnected and reconnected. An agent would be required to be appointed and registered for each site to perform the function on the customer's behalf.

The Department intends for the mechanism to be technology neutral, allowing the competitive market to determine the most efficient way of meeting the requirement.

The Department intends that the requirement will be mandatory for all new and altered installations of distributed solar generation from September 2020.

Solution

Should it be determined by the Department that mandating the requirement for an emergency disconnect mechanism for distributed solar generation installations is appropriate, Intellihub supports allowing the market to select the most cost-effective and appropriate mechanism. If the mechanism is prescribed, consumers lose the flexibility to select the lowest cost or most appropriate compliant mechanism for every site.

Intellihub considers it appropriate to develop a set of requirements, covering aspects of functionality, reliability, cyber security and scalability to which any emergency solar generation disconnect or curtailment mechanism must comply. Such requirements would provide assurances that the system operates reliably and as designed when required in an emergency and has robust safeguards against cyber-attack. These aspects should not be compromised when energy system security is in question.

Intellihub considers that the use of an on-market smart meter should be deemed a compliant mechanism for the emergency disconnection of distributed solar generation systems. This will provide a default technology to fall back on, should no other compliant technology provide the lowest cost solution or additional features required by the consumer.

Intellihub considers it appropriate that any requirement for an emergency disconnect mechanism of solar generation should apply at the site or installation level, and not to a device class (eg inverter or smart meter). This allows for flexibility in how the site complies with an emergency generation disconnect requirement and enables innovative approaches.

Timeline Feasibility

Intellihub considers this approach to be feasible within the proposed timeline.

Intellihub recognises that it is not feasible for the development of the set of minimum requirements for an emergency disconnect mechanism, as described above, to be completed before the September 2020 timeframe.

Smart meters with an additional contactor could be installed with every new solar system from September 2020 to meet the requirement for an emergency disconnect mechanism while the set of minimum requirements is developed.

Intellihub's core infrastructure and IT systems support and are configured to enable on-demand remote operation of the load control relays (contactors). This capability has been proven through several dynamic hot water load control trials.

It is however unlikely that the required systems integration and testing between AEMO and metering coordinators could be completed by September 2020. Depending on the agreed B2B specification, completing this integration work by Autumn 2021 is realistic.

Technical Feasibility

Intellihub considers the use of an additional contactor on a smart meter to disconnect solar generation systems to be technically feasible.

Specifically:

- The smart meters used by Intellihub are available with the additional contactors as required
    - Some more complex configurations, such as a three-phase site with off-peak hot water, may require an external contactor driven by a control output on the meter
- Intellihub systems have the capability for on-demand remote operation of the load control relays
- Issues with physical installation arrangements are likely to be rare
    - While some installations may not have a large enough meter board to accommodate a larger meter, our experience tells us that this situation is rare. In this case the meter board would need to be upgraded for the solar installation to meet the emergency disconnection requirements.
    - The circuit for the solar needs to be run back to the meter board, however this is common practice.

Merits

The above approach of a market led implementation of remote disconnection and reconnection mechanisms for solar generation, governed by a set of performance and security standards delivers the following benefits:

- Minimum requirements provide assurances on the reliable operation of the emergency disconnect system
- Flexible, technology agnostic, market lead-solution
- Allows smart meters to be leveraged where they provide the lowest-cost compliant option
- Meets urgent timeline to mitigate minimum demand risk using smart meters as a default interim solution
- Minimises technology duplication
- Smart meters provide the added benefit of visibility of native demand by unmasking gross solar generation

Proposed smart meter minimum technical standards

Key Message

The use of a contactor controlled by an on-market smart meter to disconnect solar generation is free of material technical barriers.

Recommendation 6

Consider a targeted programme to replace legacy (non-smart) meters with smart meters capable of disconnecting solar generation at the 150,000 existing solar sites in SA to provide an emergency backstop.

Proposed Approach

The Department has proposed that all smart meters installed in South Australia from September 2020 have a minimum of two elements with a contactor in each element.

This requirement is intended to allow a customer's solar generation to be wired to the second element to be measured and controlled separately from a customer's load.

Solution

Smart meters are undeniably a critical component in any robust energy system supporting high DER penetration. It is widely accepted that broad adoption of smart meters provide a positive cost-benefit outcome.

Intellihub does not foresee any material technical barriers to the use of an additional contactor in smart meters to disconnect solar generation systems.

The typical cost for metering services (covering the cost of the meter, its installation and ongoing operation) is increased by about $10-15 per site per year for the addition of a second element.

Intellihub considers that the approach of requiring a smart meter to measure and control solar generation may be particularly cost-effective for retrofit scenarios on existing solar installations for the following reasons:

- The specifics of the solar system, such as the make, model, vintage and capabilities of the inverter, need not be considered

- Regulations are in place for access arrangements for meter exchanges, no such regulation exists for access to solar inverters – a meter exchange can usually be completed without the site owner being present
- A meter exchange is a relatively quick process, that can be done at scale in a manageable timeframe

There is a sizable (estimated at up to 150,000) cohort of solar installations in South Australia at sites for which the metering is legacy (non-smart). The solar systems at these sites will typically have been installed prior to Power Of Choice coming into effect in December 2017. These sites will eventually have their meters upgraded to smart meters as the legacy meters age and fail, however this timeline will be unacceptable to contribute to the critical 1-3 year timeline to manage minimum demand.

Intellihub recommends considering a targeted programme to replace legacy (non-smart) meters with smart meters having capability to disconnect solar generation at existing sites across South Australia where no smart meter presently exists. This represents a rapid and cost-effective approach to bring significant megawatts (400-500MW) of generation under an emergency disconnect scheme. If an additional backstop is necessary.

Timeline Feasibility

Intellihub considers that it is feasible for every new smart meter installed in South Australia from September 2020 to have a minimum of two elements each with a contactor.

Should a targeted programme for the replacement of all legacy meters with smart meters at existing solar sites be carried out, Intellihub expects that the bulk of replacements could be completed by Spring 2021.

Technical Feasibility

Intellihub considers the use of an additional contactor on a smart meter to disconnect solar generation systems to be technically feasible, subject to the comments made in the previous section of this submission.

Merits

Using a relay in a smart meter to provide an emergency disconnect capability for solar generation has be following benefits:

- Smart meters provide a proven reliable, secure and scalable mechanism of control
- Agnostic of the solar system installation particulars; the make, model, vintage and capabilities of the inverter need not be considered
- Smart meters can provide managed restoration of distributed generation in a black start scenario
- A retrofit program would quickly bring large MW of solar generation into an emergency disconnect scheme by bringing forward smart meter upgrades at specific sites
- A retrofit program would create jobs in SA
- A retrofit program would ensure the broader benefits of smart meters are delivered to SA earlier
- A retrofit program would bring economic efficiencies for smart meter deployment through scale to SA

Proposed export limit requirements for distributed solar generating systems

Key Message

Dynamic export limits represent a preferable solution, leading to better consumer outcomes, than the hard disconnection of solar generating systems.

Key Message

Intellihub's smart meters can provide a reliable, secure and cost-effective means to manage and enforce dynamic export limits via a data link to the inverter.

Recommendation 7

Installations supporting site-level dynamic export limits should be encouraged and considered compliant for emergency use if the requirements for functionality, reliability, cyber security and scalability described in recommendation 3 are met.

Proposed Approach

The Department has proposed introducing a technical standard which would require all new distributed solar generation installed from January 2021 to be capable of being dynamically export limited.

Solution

Delivering dynamic export limitation capability using the smart meter is the most cost-efficient way to manage both minimum demand and local network constraints in SA.

Intellihub agrees that dynamic export limits represent a preferable solution than the hard disconnection of solar generating systems. Dynamic export limits provide the following benefits:

- Better customer outcomes as only the minimum amount of solar generation required to maintain system security is spilled.
- Permits site-level orchestration of DER by giving a site level controller freedom to decide how to best achieve and imposed export limit. This avoids creating barriers for other DER such as batteries.

- Economic efficiency – those sites exporting the most are required to reduce their export the most. Self-consumers are not penalised.
- Contributes to the management of local network constraints.
- Increases DER hosting capacity of the grid.
- Aligns with SAPN's flexible exports service

Intellihub supports policy intervention that requires dynamic export limits for new distributed solar generation installations at small sites.

Implementations of site-level dynamic export limits should be considered compliant for emergency use for system security however appropriate functionality, reliability, cyber security and scalability requirements as described in recommendation 3 must be met.

Technical Feasibility

Intellihub's state-of-the-art metering platform employs a contemporary IoT architecture, providing managed connectivity to both smart meters and behind the meter DER as well as edge application enablement.

A utility grade sub-GHz RF mesh network provides behind the meter connectivity to DER with a bulletproof interference rejection, excellent range and best-in-class security. This ensures a high-availability communications link to carry out activities critical to system security and reliable grid operation, such as dynamic export control.

This platform enables edge applications resident on the smart meter to monitor and control on-site DER. Remote control commands to DER are delivered through Intellihub's proven reliable, secure and scalable smart metering infrastructure.

By leveraging the smart meter's measurement and communications capability, this platform represents the lowest-cost mechanism to enable the wide area orchestration of fleets of DER as needed by integrated high-DER power systems such as in South Australia.

Timeline Feasibility

Dynamic export limits managed and enforced by Intellihub smart meters will be available in 2021.

Merits

Dynamic export limits, enabled by the Intellihub smart meter platform, bring the following benefits:

- Dynamic export limits deliver better consumer outcomes aligned with the NEO
- Technology agnostic approach – connect to inverters from most vendors using standard protocols
- Wireless link to the inverter avoids complexities with site installation and wiring arrangements
- The service is delivered through existing proven smart meter infrastructure, meaning it is reliable, secure and scalable
- Delivers the lowest cost outcome by leveraging smart meters:
    - No need for second export meter
    - No need to add additional comms capability to inverters
    - Marry up net and gross data to enable analytics