Consumer
Challenge
Panel

Response to the Value of Distributed Energy Resources stakeholder engagement workshop held by Cutler Merz and CSIRO, June 2020

AER Consumer Challenge Panel – DER workgroup

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Confidentiality

To the best of our knowledge, this advice neither presents nor relies on any confidential information.

The AER's Consumer Challenge Panel (CCP)

The AER established the Consumer Challenge Panel (CCP) in July 2013 as part of its Better Regulation reforms. These reforms aimed to deliver an improved regulatory framework focused on the long-term interests of consumers.

The CCP assists the AER to make better regulatory determinations by providing input on issues of importance to consumers. The expert members of the CCP bring consumer perspectives to the AER to better balance the range of views considered as part of the AER's decisions.

This is the second opportunity for the CCP to provide advice regarding the AER's consultation paper *Assessing DER Integration Expenditure.* In January 2020, CCP14, in conjunction with other CCP members, prepared advice to the AER's consultation paper of November 2019.

1 Introduction

The AER's Consumer Challenge Panel (CCP) is pleased that the AER is undertaking this 'lateral' review of assessing the expenditure requirements of electricity distributors to integrate Distributed Energy Resources (DER), and welcomes the opportunity to provide this submission in response to the *Value of DER* Stakeholder Engagement workshop held with CutlerMerz (CM) and CSIRO on Monday 15 June 2020.

Throughout this advice, references are made to the CM and CSIRO presentation *Value of DER – Stakeholder engagement workshops / interviews – 15 to 29 June.* A copy of this presentation is attached as Appendix B.

In January 2020, the CCP sub-panel CCP14, in conjunction with other CCP members, prepared advice to the AER's consultation paper of November 2019.[1] That advice highlighted several key issues, based on observations of the approach to DER by consumers and the wider community.

The scope of the Value of DER (VaDER) work and the recent workshop is focused primarily on establishing a framework for Distribution Network Service Providers (DNSPs) to consider the value that DER can provide through access to markets or autonomous functions. Many of the points made in the January 2020 advice are relevant to elements of the current CM and CSIRO engagement.

The key points from both the earlier advice and this current workshop are summarised below:

1. DER involves accepting uncertainty. It is unlikely that one correct answer will be found, with consideration of location, range of beneficiaries and the like being reflected in the 'states of the world'. Sensitivity analysis, multiple scenarios and contingency considerations will be part of assessing the value of DER.
2. Ongoing, proactive engagement with consumer interests is crucial in progressing DER in the face of uncertainty and rapid change. While developing a value of DER will necessitate significant qualitative market analysis, any assessment of prudent and efficient investment by DNSPs to integrate DER must include a robust consideration of how utilities have engaged with governments, policy makers and communities, as well as those with the greatest influence on the growth and application of DER – consumers.
3. Transparency remains critical. Beyond the technical complexities of integrating DER, it is important that DNSPs are able to demonstrate their processes and strategies for ongoing engagement with all relevant stakeholders, the assumptions that underpin the value, and how the components of value are assigned, quantified and verified.
4. Forecasts of DER uptake and application need to be verified in the public arena by independent parties with a clear consideration of the National Electricity Objective (the NEO).[2]
5. The effect of tariff reform will remain a key consideration when developing DER integration expenditures.
6. Expanding DER should not mean expanding cross-subsidies to those who are most able to install DER, particularly when those who are not benefiting from DER (and may be paying for a cross

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[1] See https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/assessing-distributed-energy-resources-integration-expenditure/initiation

[2] This is set out in the National Electricity Law as being to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to (a) price, quality, safety and reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system.

subsidy) are vulnerable customers, perhaps renters, or unable to afford DER investments. It should be clear in the engagement processes that a wide spectrum of community is engaged, and that there are likely to be 'net winners and losers'.[3]

7. We advocate for the consideration of a total expenditure framework (totex) approach to assessing DER integration expenditure (i.e. covering capex and opex).
8. Networks will need to be explicit in their interpretation of customers' expectations regarding DER application and feed-in capability, to help justify their proposed expenditure.
9. Each DNSP should present a coherent and coordinated approach to DER integration across its expenditure plans, tariff strategy and demand management strategy in future regulatory proposals. We encourage each network business to prepare a clearly-articulated 'network future', which presents its forecasts, challenges, opportunities for innovation, and risk assessments related to DER. This should include the impact on the segments of the customer base that would incur any increase in network costs, and may not benefit as much from reduced wholesale costs.
10. Access to dynamic, up-to-date data for networks and customers alike to respond efficiently and effectively to DER is critical. Action by the AER is needed to encourage the development of interchange standards, and efficient low-cost access to data. We advocate for open standards and accessibility to AMI data, and other information necessary to consider the value of DER. This includes PV and battery storage location and capability, uptake of electric vehicles, and the strategy and acceptance of passive demand response across customer cohorts.
11. We understand that this advice will contribute to the AER developing an attachment to the existing Regulatory Investment Test – Distribution (RIT-D) Guideline, with the objective of providing a consistent framework for valuing the market benefits of DER. We consider that the principles and evaluation steps set out in the RIT-D Guideline have served to considerably improve the regulatory capital expenditure (capex) proposals by the DNSPs. It is important that this same rigour is included in the assessment of market benefits for DER.

[3] That is, while there may be an overall benefit to the community as a whole (however the community is bounded geographically), there may be sectors where the estimated benefits in wholesale prices are more than offset by the shared increases in network prices.

2 General comments on the workshop

A. The use of the term 'hosting capacity'

The term 'hosting capacity' is a proxy for the ability of a distribution network to accept and transport feed-in energy from residential and small business consumers, with that excess energy being considered part of the wider energy market. However, this term is not well defined, and establishing an agreed definition would be very useful.

A recent (June 2020) report *Future Grid for Distributed Energy* by ENEA Consulting for CitiPower and Powercor [4] suggests that hosting capacity can be defined as (paraphrased):

> *The PV penetration level when power quality (predominantly voltage) first exceeds permitted levels, where PV penetration level is the percentage of the reference theoretical maximum penetration level (kW).*
>
> *The reference maximum PV penetration level (in kW) is reached when every residential and commercial and industrial (C&I) customer on an LV network has a 5 kW and 25 kW PV system installed, respectively. This is also referred to as '100% PV penetration' or 'saturation'.*

While this is not an unreasonable definition, one critical element is unclear. It is unclear how much of the output from each installed system is assumed to be exported to the network. It seems that the ENEA Consulting report considers that 100% penetration occurs when a full 5 kW or 25kW of generation is fed into the network, with no self-consumption at the customer's premises.

100% penetration is therefore a highly theoretical level, which never actually occurs in practice. The actual generation export will in all cases be significantly less, perhaps even as low as 40% in typical suburban areas:

- Not all customers will choose to invest in PV.
- The vast majority of the time, each PV system will not be generating at its maximum rated capacity, and there will be some diversity of generation at any given time.
- Self-consumption levels will reduce the level of residual energy available for feed-in, and introduce a further level of diversity in the amount and timing of feed-in energy.

We see an opportunity for a logical analogy with network demand planning, where the value of after-diversity maximum demand considers the diversity of customer energy use.

As hosting capacity becomes a more widely-used parameter in electrical network investment planning, we have concerns regarding the gathering momentum of the suggestion that customers will choose to export a large proportion of their rooftop energy (in some cases, maximum output) to participate in new markets such as wholesale price arbitrage or network support.[5] This places a focus on increasing hosting capacity, whereas an equally useful response that should also be considered is the encouragement of consumers, including those without PV in the same LV area, to use energy in a way that makes best use of the available hosting capacity, as shown in Figure 1 below.

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[4] https://arena.gov.au/assets/2020/06/future-grid-for-distributed-energy.pdf

[5] Noting that customers in some states remain on now-superseded generous feed-in tariffs that encourage maximum energy feed-in.

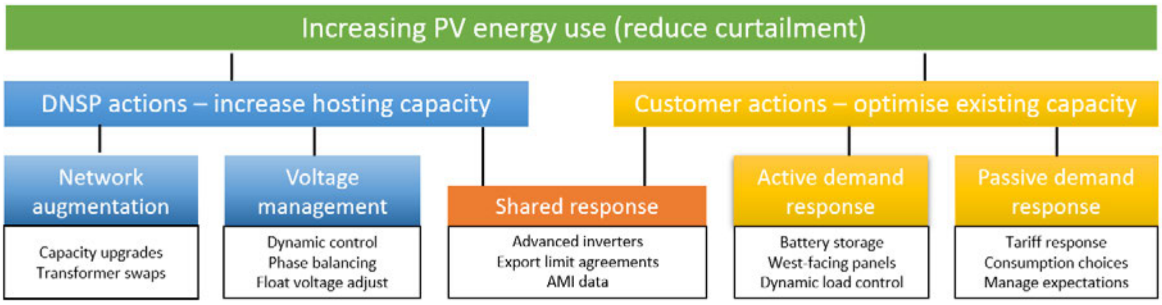

Figure 1: Methods to reduce energy curtailment (Source: CCP)

Much of the community feedback in recent engagement by the DNSPs found that many consumers believe that the export of energy is a right, and a necessary beneficial component of the new energy landscape. However, that in no way suggests that customers are likely to see full energy export as a reasonable proposition in regard to their PV investment. Customer-owned DER will for the foreseeable future be primarily for the purpose of reducing that customer's energy costs, and to provide a level of independence from what is presently a poorly trusted industry.

Figure 2, from recent research by AusNet Services as part of its recent regulatory proposal, is a typical response.

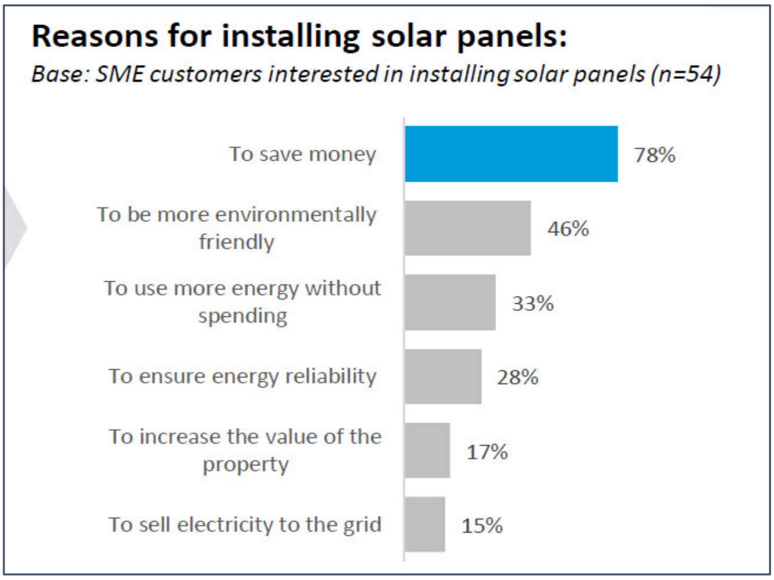

Figure 2: Customer research – reasons to install solar PV
(Source: AusNet Services Customer attitudes Survey, Quantum Research, May 2018)

B. The context of value of energy in investment business cases

In recent regulatory investment proposals, most DNSPs have taken a similar approach in determining the value for expanding hosting capacity, being

> *Incremental increase in energy to be fed into the grid, multiplied by the value of that energy per unit of energy*

While the focus in the AER's current review is on the 'value' of the energy, our experience suggests that it is equally important to consider the process for estimating the 'incremental energy'. There is much conjecture about the estimation of how much excess energy is 'constrained' by a hosting capacity limit at any point in time, which will become available to the wider markets should the constraint be removed. In its advice to the AER on the Victorian DNSPs' regulatory proposals, CCP17 highlighted this term as being subject to significant risk and variability over the lifetime of any investment that is intended 'remove the constraint'.[6] We would hope that further analysis in this area will be the subject of a specific piece of work by the AER.

Regarding the value of the 'constrained' energy, we see this as the primary consideration of this current work by CM and CSIRO. Recent DNSP regulatory proposals have engaged consultants to inform their proposals:

- SAPN engaged Houston Kemp, January 2019.[7]
- CitiPower and others engaged Jacobs, August 2019.[8]

Each has considered the value of the reduction of wholesale generation costs, plus the value of carbon abatement, and they tend towards a total value of around $40 per megawatt-hour.

We support this approach in principle, recognising that many other parts of the value to consumers of feed-in energy are relatively small, and highly variable. There is value in considering a carbon price, as it reflects the bulk of community sentiment regarding the importance of a low-carbon future. However, this is a qualitative benefit, as there is no clear link between the value of carbon and the actual benefit to consumers in relation to the energy price.

C. Considering 'benefit' and 'value'

The process outlined in slide 5 of the workshop presentation (evaluation process) is supported.

We see three issues to consider in the evaluation of benefit and value.

1. The value of DER means different things to different parts of the community, and can be both quantitative and qualitative in nature. We suggest that there are five classes of beneficiary from the application of DER:

   a) *Customer with DER* – Individual customers who have decided to invest in DER capability, installed and operated to meet differing customer priorities, where excess feed-in energy is generally a bi-product after the generated energy has been consumed at the premises. The customer may also operate a PV / battery combination, or 'passive DER' such as off-peak load control of water heating.

   b) *Market benefits* – Potentially, reduced wholesale generation prices, opportunities for deferred network augmentation and other network services that benefit all energy customers.

   c) *Local communities of energy users* – Excess energy from each premise with rooftop generation is shared locally as a community resource. Micro-grids, 'thinly connected' communities and peer-to-peer energy trading is active to a level beyond that of individual customer systems, but not yet at a level that is significant enough to warrant management by the bulk energy system operator.

      Included in community benefit is the broader acceptance of the transition to a low-carbon economy. This can be considered both qualitatively and quantitatively.

   d) *The wider community,* who benefit from a low-carbon future, and the opportunity for energy sharing. This benefit is a qualitative, as it is difficult to assign a value to this benefit. It may be

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[6] See for example https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/ausnet-services-determination-2021-26/proposal

[7] Houston Kemp, *Estimating avoided dispatch costs and the profile of VPP operation,* SAPN, January 2019

[8] Jacobs, *Market benefits for Solar Enablement,* August 2019

significant however, depending on the way renewable energy generally is viewed by the community.

e) *Electricity distributors*, who obtain a return on investment in regard to the assets which facilitate the connection and energy transfer.

2. From our point of view, the value of DER framework must deliver ***net*** benefits to all energy customers, on the assumption that the investments will be funded by the DNSPs and recovered through Distribution Use of System costs, which all energy customers pay.

   The consideration of 'all energy customers' is highly dependent on the definition of the universe that applies to the proposal. It is important to define the universe of the costs and benefits in the business case, as the people who are benefitting may not be the same base as those carrying the cost. For example, one distributor in Victoria may propose an investment that benefits customers outside their distribution area but is funded by their own customers.

3. There must be a reasonable 'line of sight' between any element of the value from energy feed-in and the cost components of a consumer's electricity bill, with that relationship being timely and transparent.

D. Classifying DER

When considering the value of DER, it is useful to be clear what is meant by DER. This study appears to consider active DER; that is, customer equipment that is capable of feeding electrical energy into the network. We prefer a more technology-agnostic approach to classifying DER.

Generically, we see three types of DER, each with their own characteristics.

a) '*Solar feed-in'*, the excess energy that flows to the network as a consequence of the generation of rooftop PV energy not being fully consumed at the premises at any point in time. It is generally non-dispatchable, other than as a consequence of changing the level of self-consumption.

b) '*dispatchable feed-in' or 'active generation'*, being the output of battery storage that can be activated 'on call' to meet customer or network requirements as they arise. Vehicle-to-grid and co-ordinated Virtual Power Plants (VPPs) are examples in this category.

c) *'passive DER'*, which are appliances such as water heaters, electric vehicle charging, pool pumps and air conditioners that can be reasonably controlled by the customer or basic automation to operate at particular times to meet the network, market or the resident's requirements.

There is a close relationship between solar feed-in and the operation of customer equipment. Being able to adjust local demand, whether through direct control or by customer incentives, will significantly influence the amount of excess generation that exists at any time in the network segment, and hence determines the hosting capacity that is required.

The columns in slide 12 of the presentation (value streams) could be adjusted to represent these three more general categories of distributed energy resource. See our answer to Question 5 as an example of this suggestion.

E. Parallels with demand-related augmentation

As rooftop generation and energy storage proliferate, the opportunity exists to develop parallels between the well-understood network design and operation to meet peak demand and the expansion of hosting capacity. Terms such as 'demand diversity' and design criteria such as 'after-diversity maximum demand (ADMD)' can also include the concept of generation feed-in diversity.

Calculating the amount of energy that can be made available to the market can reflect the risk of unserved energy, using probabilistic forecasting. The valuing of that feed-in energy to the market may in general reflect the way unserved energy (Value of Customer Reliability – VCR) is considered.

Importantly, the application of demand management as a concept to reduce the investment needed to meet demand peaks can be extended to reduce coincident generation peaks that lead to network congestion due to too much embedded generation. The application of a 'solar sponge' tariff or incentives for customers to use energy during times of high solar generation must precede investment in more network peak capacity.

CCP sub-panels have often encouraged DNSPs to prepare a broader Future Energy Strategy that considered demand response, network access pricing, contribution to connection costs and other parameters as a holistic view of optimal use of existing network capacity. Such a strategy must be in place before a case for greater hosting capacity – equivalent to network capacity augmentation to meet demand peaks – can be made.

F. Recent consumer engagement

In the recent consumer engagement associated with the DNSP revenue resets, all the DNSPs consulted widely to understand consumers' approach to DER.

All found that their consumers valued the ability for networks to accept feed-in energy. There is a clear overarching premise in the community that supports renewable energy supplanting non-renewable sources, as well as a sense of community in a form of 'self-sustainability' in sharing energy.

Each DNSP tended to present a similar set of scenarios, being:

- 'comprehensive upgrade' – a significant investment in network capacity, removing all constraints to carry a significant level of feed-in energy
- 'no upgrade' – no investment, leading to broad scale denial for new generators to connect, or the likelihood that existing generators will have their output curtailed frequently
- 'dynamic upgrade' – some form of cost-benefit analysis of the investment in network and ICT capability to grow the hosting capacity

The engagement tended to avoid consideration of the negative effects of DER development; in particular, those who are unable or unwilling to participate in DER such as those in homes with shaded rooves, renters and those on low income.

CCP sub-panels have previously highlighted that not all investment should proceed as being 'good' investment, even if the investment carries a positive payback. Reasons not to proceed include the interest of keeping prices low, especially in the long term through reducing RAB growth.

Consumers' role on evaluating the 'best method'

It is important to consider consumer support in the methods to establish value. Consumer engagement is a necessary part of the determination of value, considering the diversity of consumer perspectives.

Any method must consider flexibility; over a day, seasons, years and in responsiveness to changes in technologies and policies that may apply over the life of the investment.

3 Response to Questions

3.1 Q1 – Projects subject to formal assessments

In your view, what types of DER integration projects should NSPs be investing in and should they all be subject to formal cost benefit assessments?

Ultimately, prudent and efficient investment is needed to meet customers' need for lower energy bills.

The Regulated Asset Base (RAB), and consequently the allowed economic return to be earned from those assets, forms a major component of electricity costs for consumers. A growing RAB will lock in costs for decades ahead, with the underlying risk of significant price rises should the allowable rate of return increase. Investment that contributes to an increase the RAB should be considered carefully, in regard to demonstrated requirement as well as efficiency.

While investment to meet increases in network capacity has waned somewhat in recent years due to lower growth rates in peak demand, networks must keep an eye to the challenge of extracting as much benefit as possible from existing assets, before opting to invest in more long-lived assets such as poles, wires and substations. Addressing the falling utilisation of existing assets must be a priority.

To some extent, even shorter-lived investments such as ICT and metering capability should be avoided where possible. The shorter-lived assets will lead to higher annual depreciation costs, and higher customer bills. However, there is less chance of investments being 'stranded', and they may reduce some operating costs and risks through reduced complaints and more efficient customer interactions.

Our expectation is that all network investments should be subject to an appropriate level of formal cost benefit analysis, noting that there may be shared benefits with other aspects of augmentation. Those investments that exceed the threshold of $6m should be subject to the AER's RIT-D process, including non-network investments.

More specifically, we expect that this current review will allow the AER to provide more guidance on assessing the market benefits to be included in the investment business case and, whether over or under the RIT-D threshold, contribute to a more systematic and consistent evaluation of DER integration investments and other non-network solutions.

Given that hosting capacity and the ability to accommodate local load increases (infill development) are 'two sides of the one coin', we support projects that initially provide more inherent benefit than just DER hosting. For example, phase balancing and enhanced network modelling is likely to support better decisions to meet load increases such as increases arising from infill development or optimal asset management.

In its response to the Victorian DNSPs' regulatory proposals, CCP17 saw four stages of investment, in order, as representing value to consumers, with the cost / benefit proportion being greatest in the first stages. All should be subject to a form of cost benefit analysis along the lines of the AER's existing RIT-D Guidelines.

The stages are:

1. *Tidy up the backyard*

Low voltage and 'last mile' network segments have traditionally been under the lowest level of scrutiny in their lifetime by DNSPs, largely only attended to 'if someone complains'. Therefore, prior to the introduction of solar PV, ensuring LV segments are operating efficiently has not been a priority.

Investments by networks that seek to ensure that low voltage and 'last mile' systems are operating optimally, and in a manner that best meets challenges of changing customer load factor and energy requirements, are likely to be of significant benefit. Upsides for customers include the ability to absorb new incremental levels of DER, as well as to meet new loads (residential infill development), and changing quality of supply requirements.

These projects will require a level of cost / benefit analysis, and the benefits are likely to extend beyond DER hosting capacity. The actions to address optimal operation of low voltage systems include:

- Load and generation rebalancing across supply phases;
- Optimal voltage setting of local and substation transformers for contemporary conditions; and
- Encouraging the effective use of any existing load control or demand response offerings.

2. *Gain a better understanding of low voltage and 'last mile' networks using new tools*

We support Investment in technology that provides a platform for new DER growth, such as modelling the low voltage networks. Data gathering in the form of customer equipment, location of embedded generations and the development of controlled load facilities are all useful as well (see Q10).

3. *Develop direct and indirect control systems to efficiently integrate DER*

Implement advanced voltage management using Advanced Metering Infrastructure (AMI).

Consider low-involvement control systems to facilitate demand response and inverter dynamic control systems either directly or through third parties.

Develop tariffs and signals to encourage self-consumption.

4. *Network augmentation*

Upgrade network capacity though augmentation as a last resort, including replacement of equipment that cannot support modern asset operation (e.g. tap limitations). Investment using shorter-lived assets is generally preferable to traditional poles-and-wires augmentation.

3.2 Q2 – Guidance for NSPs

To what extent do NSPs require guidance to assess the economic benefits of investing in DER integration projects?

We support the development of a transparent and consistent framework for the assessment of the benefits of DER-related investments. Much of this consistency and transparency for network investments is now achieved through the detailed cost benefit assessment process developed by the AER, namely the RIT-D, and equivalent RIT-T for transmission investment.

The current RIT-D Guideline is an important foundation for the development of the cost benefit of DER investment, as it provides for the comparison of any physical network investment (whether augmentation or replacement), with the option of adopting a DER as a whole or part solution to the defined "problem".

However, this in turn raises the key issue facing the AER, networks and consumers, namely, how is DER to be defined and valued. Traditionally, this may have been assessed in relatively simple terms, such as what local capital augmentation investment could be avoided.

However, as DER has expanded in its reach and complexity, this simplicity is no longer appropriate, and the AER and consumers are faced with a range of approaches by different DNSPs to valuing both the benefits and the costs of additional DER. More recent debates in this evaluation process have centred on:

- Costs to the networks of undertaking various strategies;
- Risks and costs to consumers in general of increased interruption to supply due to high voltage issues;

- Risks and costs to the generating consumer of increased constraint on the export 'rights'; and
- Changes to wider market parameters such as wholesale costs and FCAS, which ultimately impact on consumer prices.

With respect to the need for and level of guidance on each of these issues:

- Networks are best placed to understand the cost to their own business of various strategies to 'remedy' the situations (subject to AER oversight).
- The risks and costs to consumers in general of loss of supply can be captured using the public VCR estimates and frequency, by way of AEMO supply / demand modelling.
- The risk to the generating consumer requires modelling of the expected volume of export, and foregone income due to inverter shutdown (simplistically), which depends on the regional feed-in tariff regime.
- The wider market impacts of increased solar input remain a source of difficulty and inconsistency, and an area where more specific AER guidance is clearly required.

We have mentioned above two studies that have attempted to model the market benefits of a reduction in wholesale prices due to the increased export of PV systems within particular jurisdictions (SA and Victoria). This is an important area for the AER to establish some guidelines to implement for future reviews, so that consumers have confidence that the estimates provided by the networks as part of their engagement are based on a consistent and agreed methodology.

However, another major component in determining the total market benefits of investing in DER integration projects is the assessment of the likely increase in energy that will be fed in under various conditions. This is a complex analysis, which we understand is outside the scope of this current task, noting that the table for evaluating the best method includes different levels of market modelling. We nonetheless reiterate that overstating the likely export levels can distort the cost benefit analysis – for instance, by increasing the perceived risk of over-voltage events.

Overall, and given the variability and risks to changes on assumptions that will occur in assessing economic benefit, a probabilistic approach with appropriate sensitivity analysis would be helpful to reflect this uncertainty. This does not negate the value to consumers of the AER providing more specific guidance, for instance on the estimates of wholesale prices.

We support guiding the NSPs regarding the likely limitations of the benefit cases, such as requiring consideration of external factors, such as the possibility of broader AEMO market curtailment.

3.3 Q3 – Issues so far

What are the high-level issues in VaDER methods you have seen adopted to date?

The DNSPs have traditionally outsourced to consultants the calculation of a value of DER in \$/kWh. The consultants generally take the value of displaced market generation, plus a benefit in reduced carbon emissions where appropriate

For example, for the benefit calculations in the recent Victorian distribution price reset, Jemena adopts the Essential Services Commission (ESC)'s single-rate feed-in tariff of \$0.10/kWh. Powercor adopted \$0.47/kWh, based on a consultant's advice. AusNet Services applied the 2019 single rate feed-in tariff of \$0.12/kWh, being between the shoulder rate (\$0.116/kWh) that applies from 7am to 3pm on weekdays and the peak rate (\$0.146/kWh) that applies from 3pm to 9pm on weekdays.

We see these numbers as unrealistic over any reasonable period of time. Feed-in rates are set from time to time, but more generally they will become subject to pressures to reflect retail or pool pricing, which has to consider the fact that over the life of the customer's PV system – and certainly over the life of the network assets – it might be zero or negative as has been the case in other states.

In the case of at least one DNSP, the assumed value of rooftop solar exports used in the capex modelling is over the life of the network asset. We do not consider this to be an appropriate assumption, given that the life of the customer's PV system is generally little more than 10-15 years. Refer to Q6 below.

We view the businesses' counterfactual or base cases of 'do nothing' as being somewhat unrealistic. We propose that any reasonable utility (supported by any reasonable regulator) would at least take some steps to address such a situation within existing regulatory allowances. Therefore, the magnitude of the benefit from the proposed investment may be overstated both in the way they were presented to consumers and in the proposals themselves.

Again, the existing RIT-D Guidelines provide guidance on how to develop a realistic counterfactual. We see this study as supporting the existing RIT-D Guidelines but with a specific focus on the current "gap", which is assessing in a consistent way the value of the exported energy and/or the value of the energy displaced from traditional sources.

As stated earlier in this advice, the focus of the business case development was the ability to maximise energy export and the potential constraints to export, rather than consider the most likely use of embedded generation or modes of operation that reflect the optimum 'stacking of local benefits'. Risk analysis of likely outcomes was not adequate. Investment NPVs were considered over the life of the network assets, with no consideration as to the possible changes to the shorter-lived customer investments.

3.4 Q4 – Trade-offs

How should the AER guidance on VaDER Methods trade-off requirements for practicality / accuracy / flexibility / repeatability?

In response to this question, we ask what is the most important consideration of the four features above, and what is their relative importance? Our view is that transparency and repeatability are essential. It is critical that customers and the regulator can see how a case is established, what variables have been considered, and what sensitivities exist to those assumptions. Repeatability allows the case to be replicated and a body of evidence established to assist others.

Accuracy is not a critical component early in the establishment of any case, as it is likely that some inputs will be subject to variation. We have commented elsewhere in this advice that the value of feed-in energy is highly variable over the short term (hourly), seasonally, and over the long-term life of the assets involved.

It is unlikely that there will be a 'one size fits all' methodology that will be most appropriate for all projects and at all stages of the project lifecycle. At the early conceptual stages of a project, a simple, set-value approach may be sufficient to provide an order-of-magnitude outcome. Subsequent project stages would require higher levels of accuracy, and more complex calculation tools. The choice of methodology could also be dependent on the project value, with a low-cost, practical approach adopted for low value projects, and more complex methodologies being required for projects of significant value. From a customer perspective, the most critical criteria are cost effective/practicality (fitness for purpose) and transparency.

Regarding practicality, we do not suggest that a 'single number' would be useful. Our suggestion is that NSPs are guided as to the value streams that need to be considered, and how they may be assessed, but leave it to the NSPs to determine the actual inputs based on their own calculations, locational issues and consumer feedback.

3.5 Q5 – Costs and values table

Do you agree with the values / costs we are proposing to consider?

Thank you for putting 'customer' at the top. DER is essentially a customer investment to meet individual requirements, with the value streams for networks and the market being largely secondary. The way the customer chooses to meet their energy needs has a significant bearing on the wider benefits that may arise.

As stated in section 1, we have suggested an update for the table on slide 12 – Value Streams. It is unclear why electric vehicles and V2G are highlighted. We see the forms of customer equipment that may deliver benefits as being in three classes that were described earlier in this advice.

A revised version of the value streams table is shown below, which we propose may be a useful framework for further discussion.

Value streams for exported energy		Solar feed-in	Active generation	Passive DER
Customer	Increased payback	Small	Low	moderate
	Decreased energy bill	Small	High	moderate
	Larger generator permitted	No	Small	Large
	Reliability / autonomy / resilience	No	High	Low
Community	Microgrid / thin connection	Moderate	High	High
	Sustainability expectations	High	Moderate	Moderate
	Energy sharing expectations	High	Moderate	Moderate
Market	Lower wholesale price	Low	Moderate	Moderate
	Reduced peak prices	No	Yes	Yes
	FCAS / grid stability	Low	High	Moderate
	Demand Response capable	No	High	High
Network	Avoided augmentation	Low	Moderate	High
	Network reliability	No	Low (as DR)	Low (as DR)
	Utilisation	Low	Moderate	High
	Loss reduction	Yes	Yes	Yes
Environment	Avoided GHG	High	Low	Low
	Aligned with government objectives	High	Low	Low

The tariff regime that applies to the customer will have a large bearing on the benefits. Avoided augmentation is clearly occurring, as a result of factors including energy efficient devices.

3.6 Q6 – Uncertainty

How should the VaDER Methods deal with uncertainty in energy markets?

The value of DER needs to consider short and long-term risks to value.

The state of the economy is a major factor in projecting adoption of small-scale technologies.[9] There is risk of significant change in customer perceptions of the key economic drivers which influence the outlook for rooftop solar and battery storage adoption and the value of feed-in energy. Specifically addressing the value of DER, we suggest the key risks to be considered include:

a) Current and perceived future levels of retail electricity prices

b) The structure of retail electricity tariffs or other incentives available to that residence or business.

c) The nature and level of feed in tariffs (FiTs) which are paid for exports of rooftop solar electricity.

d) Wholesale (generation) prices which may influence the future level of FiTs.

e) The incentives and ability for the customer to influence the shape of their load curve, optimising self-consumption for greatest personal economic benefit.

f) The sense of 'energy independence' in challenging times, ultimately 'going off grid', and

g) The benefit of energy self-sufficiency in times of network stress, such as being able to tolerate networks switching off power at times to areas of high bushfire risk.

h) The emergence of a viable peer-to-peer energy market to be embraced by consumers.

i) Solar / battery packaging in new homes encouraging arbitrage or active involvement in DER markets.

j) Proposed rule changes to enable DER export pricing, for example the current rule change proposal to Rule 6.1.4 that may require networks to charge generators for using networks.

We believe that the VaDER methods should include:

- Scenario analysis, considering several possible outcomes.
- Sensitivity analysis to key assumptions.
- Probabilistic analysis where firm data is not available.
- Risks to delivery of any value.

The timing of investment is also an important consideration in the longer term. Risk can be mitigated by a staged approach. For instance, our previous comments on staging investments beginning with "putting the house in order first" are generally lower risk and leave space for future investments to better reflect changing circumstances.

[9] *Projections for small scale embedded energy technologies*, CSIRO, June 2019

3.7 Q7 – Timescale

*Over **what time scale should the VaDER Methods apply? What are the benefits of a shorter / longer timeframe?***

As discussed in Q6 above, the environment and market in which DER is currently operating is subject to a great deal of uncertainty. Over the next 5 to 10 years there are prospects for significant change in the regulatory environment (moving to a post-2025 market), DER technologies, political positions and customer adoption of technology. Although the anticipated life of network assets installed to increase hosting capacity will generally be of the order of 40 years, DER equipment at the customer premises has a much shorter lifecycle, typically 10 to 15 years. Consequently, we consider that it would be unrealistic to apply to VaDER methods using a timescale of more than 15 years.

Using a longer time scale would result in a higher likelihood of a positive business case for the network investment, increase in the regulated asset base and the possibility of stranded assets, however the longer the timescale, the higher the risk of change in the investment assumptions.

In addition, it is useful to build a formal review/update process into the guideline. For instance, this could require AER to review its approach and assumptions (if these are specified in the guideline) every 3 years, with the right for earlier review if significant change in circumstances arise. This is similar to the AEMO forecast processes.

3.8 Q8 – Granularity

What level of granularity should the VaDER methods apply (temporal and spatial)?

It may be reasonable to use VCR study parameters as this provides VCR values by region and customer class. Consistency with the VCR outputs will simplify and make more transparent the cost / benefit analysis.

Regarding the features of DER value, we suggest:

a) It must be time varying

The time that 'constraint' is likely is the time that the value of the constrained feed-in energy is likely to be at its lowest, even negative. By definition, feed-in energy is at a maximum when solar resources are abundant, and a household's demand is low. At other times, hosting capacity and the value of feed-in energy in the late afternoon, closer to the system peaks, is more valuable across criteria including wholesale price and network congestion.

b) It is source dependent

Conversely, energy from active customer generation can be made available at times of network stress or congestion, when the value streams are significantly higher than feed-in. Hosting capacity at 5pm on a hot summer afternoon is much more valuable than the value of the hosting capacity at 11am on a mild Tuesday morning.

c) There is no need to use highly granular data, which may just complicate the analysis. However, the data should be sufficiently detailed to pick out any significant variation in locational benefit (such as a constrained network), or issues particular to local customer preferences (such as an environmentally sensitive community or local microgrid valuing DER energy highly).

d) A high likelihood exists that the inputs to the value calculation will change over the life of the asset. The granularity should adequately reflect the trends in value.

e) There is a high risk of over-investment and stranded network asset.

f) The counterfactual 'do nothing' case that is often presented is not a realistic scenario. Granularity should reflect its difference from 'business as usual' trends.

g) Any value must have a reasonable likelihood to result in lower costs for all consumers.

Over a day, then over the year, then over the life of the asset, apply a benefit calculation of

$$\sum Likely\ increase\ in\ energy\ exported\ at\ time\ x\ *\ the\ value\ of\ that\ energy\ at\ time\ x$$

(where x is, say, hourly).

The value of wholesale energy price reduction has been to date the predominant factor in the calculation of DER feed-in benefit, with that value a constant over time.

Our key point is that the value is not constant – it varies during the day, then seasonally, then over the long term (the life of asset investments of 10 to 45 years).

The VaDER curve could then look a lot like the wholesale price curve, plus the values of the other items on the value stack.

For simplicity, the value could be averaged across each region.

3.9 Q9 – Non-incremental value and costs

How should the VaDER methods deal with non-incremental value/costs (i.e. value / costs that only materialise at a certain threshold of aggregate DER)?

Transparency is the key to consideration of non-incremental, non-linear value and costs. These may be market-wide (such as AEMO emergency curtailment powers), or network, location or technology specific (such as the need for upstream augmentation of the transmission network). It is essential that the existence of particular non-incremental components of the VaDER methods be recognised as part of the process, and the relevant thresholds identified. The non-incremental value/costs can then be dealt with either as:

- An investment risk, and managed under the appropriate risk management framework; or
- Value/cost apportioned to each of the incremental steps.

3.10 Q10 – Accommodating NSP data limitations

How should the AER guidance on VaDER Methods accommodate NSP data limitations (which will differ by NSP)?

Access to dynamic, up-to-date data for networks and customers alike to respond efficiently and effectively to DER is critical. Action by the AER is needed to encourage the development of interchange standards, and efficient low (or no)-cost access to data. We advocate for open standards and accessibility to AMI data, and other information necessary to consider the value of DER. This includes PV and battery storage location and capability, uptake of electric vehicles, and the strategy and acceptance of passive demand response across customer cohorts.

While access to AMI data is well-established in Victoria, access to AMI and network quality of supply data outside Victoria is maturing. There is a requirement for non-Victorian jurisdictions to accelerate the rollout of advanced meters to support the modelling and analysis required to effectively implement VaDER Methods.

Appendices

A. Acronyms and abbreviations

Acronym/Abbreviation	Meaning
ADMD	After Diversity Maximum Demand
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AMI	Advanced Metering Infrastructure
Augex	Augmentation expenditure
capex	Capital expenditure
CCP	Consumer Challenge Panel
DER	Distributed energy resources
DB / DNSP	Distribution Network Service Provider
DM / DR	Demand Management / Demand Response
DUOS	Distribution Use of System
DVMS	Dynamic Voltage Management System
EDPR	Electricity Distribution Price Review
EV	Electric Vehicle
FCAS	Frequency control ancillary services
GWh	gigawatt hours
HV	High voltage
ICT	Information and Communication Technologies
LV	Low voltage
MW	megawatt
NMI	National Metering Identifier
NSP	Network Service Provider
Opex	Operating and Maintenance Expenditure
PV	Photovoltaic (Solar PV)
RAB	Regulatory Asset Base
Repex	Replacement capital expenditure
TUOS	Transmission Use of System
VCR	Value of Customer Reliability
VPP	Virtual Power Plant

B. CutlerMerz presentation – Value of DER, Stakeholder engagement workshop

Australia's National Science Agency

Value of DER

Stakeholder engagement workshops/interviews

15 June to 29 June

Objectives

The purpose of the Study is to identify a framework for DNSPs when considering the value that DER (VaDER) can provide through access to markets or via autonomous functions. Specifically, the services are to:

- Develop standard methodologies for networks to determine the value of a marginal increase in DER hosting capacity (VaDER Methods)
- Test the VaDER Methods in different network contexts
- Develop options, such as input into AER guidelines, which could assist industry stakeholders streamline the market benefits test for increases in network hosting capacity and deliver a near-optimal level of investment.
- Incorporate stakeholder views into the final recommended VaDER Methods presented in the final Study report

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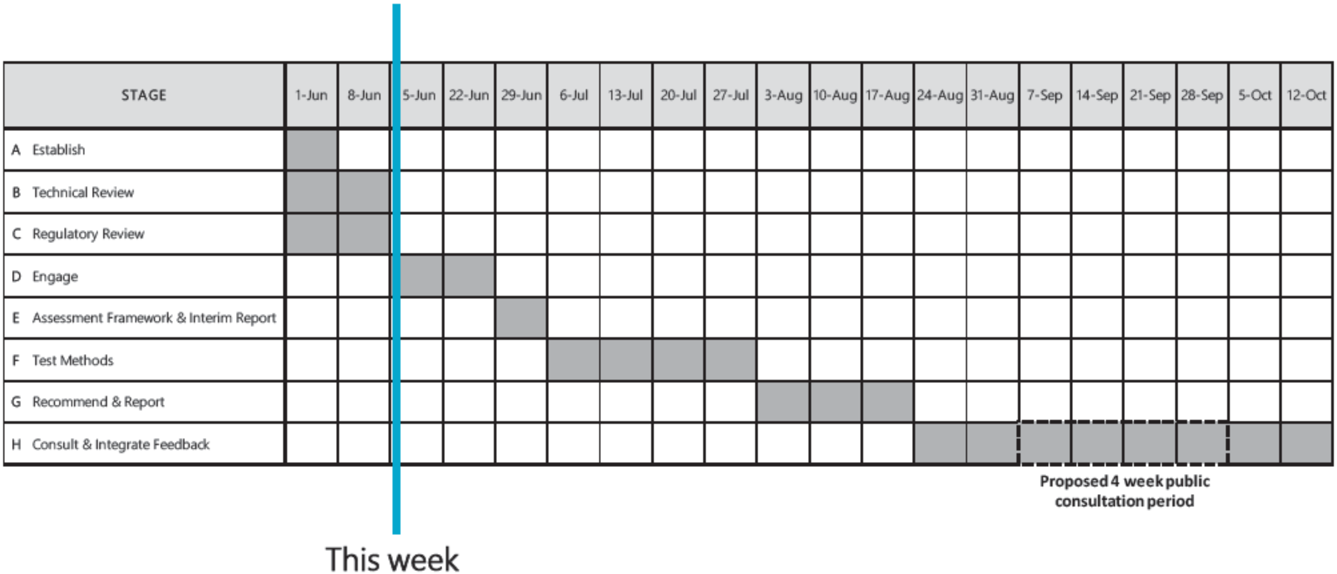
Timeline


STAGE
1-Jun
8-Jun
5-Jun
22-Jun
29-Jun
6-Jul
13-Jul
20-Jul
27-Jul
3-Aug
10-Aug
17-Aug
24-Aug
31-Aug
7-Sep
14-Sep
21-Sep
28-Sep
5-Oct
12-Oct
A Establish
B Technical Review
C Regulatory Review
D Engage
E Assessment Framework & Interim Report
F Test Methods
G Recommend & Report
H Consult & Integrate Feedback
Proposed 4 week public consultation period
This week

Types of investment

- Investments which <u>enable export and/or import from DER systems</u> beyond the current capacity of the network.
- This includes investments which enable:
  - Increased solar hosting capacity
  - Increased export/import from DER during system/market events
  - EV charging needs to be met
- The investment must be shown to <u>increase the sum of consumer and producer surplus in the NEM.</u>
- The investment may be capital expenditure in the network and/or operational expenditure to procure non-network options
- The benefits must accrue to more than one customer and are <u>recovered from the broader customer base</u>

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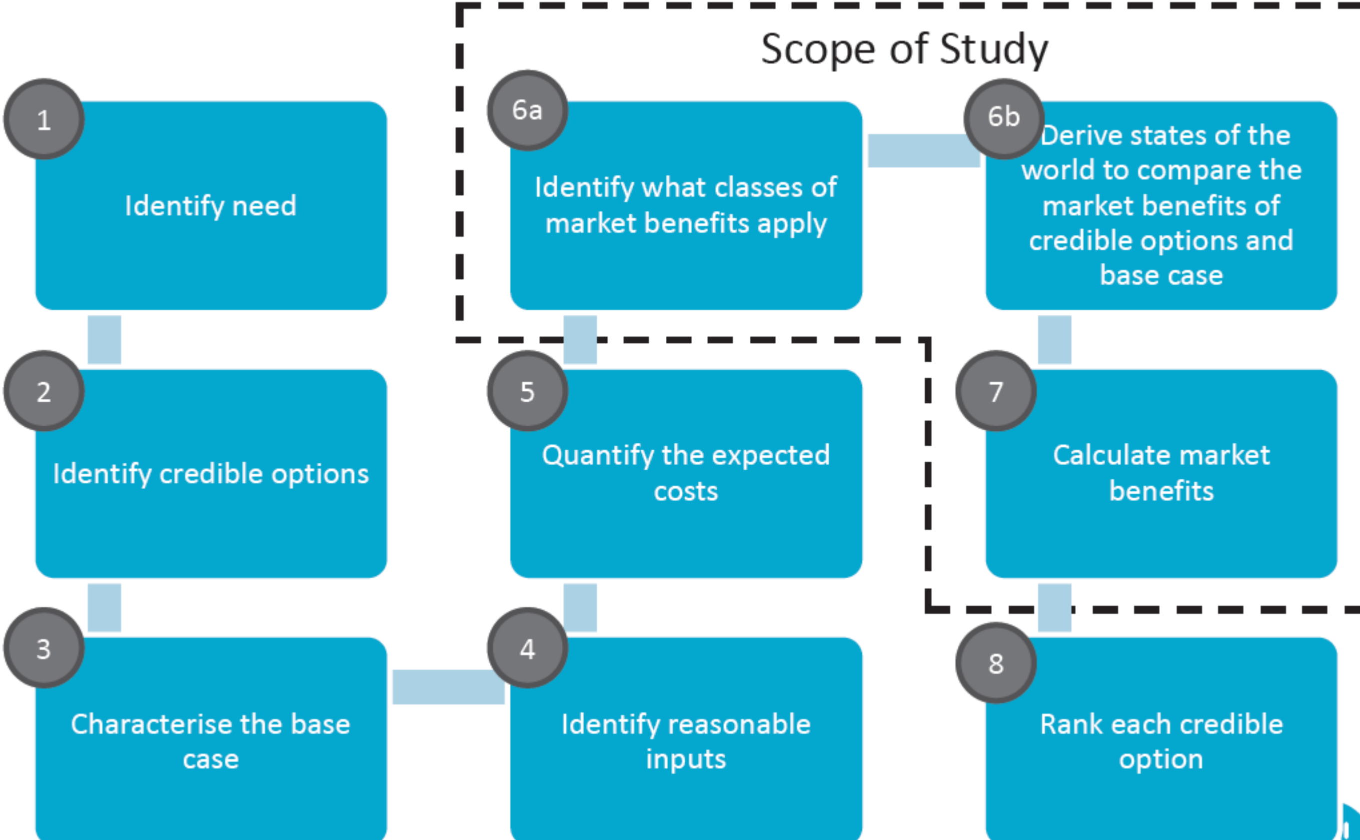
Evaluation process



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Questions - General

1. In your view, what types of DER integration projects should NSPs be investing in and should they all be subject to formal cost benefit assessments?

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Questions - General

1. In your view, what types of DER integration projects should NSPs be investing in and should they all be subject to formal cost benefit assessments?
2. To what extent do NSPs require guidance to assess the economic benefits of investing in DER integration projects?
3. What are the high level issues in VaDER Methods you have seen adopted to date?
4. How should the AER guidance on VaDER Methods trade-off requirements for practicality/accuracy/flexibility/repeatability?

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Criteria for evaluating “best” method

Type of guidance	Practical/low cost to implement	Accurate	Transparent/ Repeatable	Flexible (able to be applied to any foreseeable DER investment over next five years)
Set value or values for value of DER export ($/MWh)	🟩	🟥	🟩	🟨
Calculation tool (Excel based with simplifying assumptions to avoid market modelling)	🟩	🟨	🟩	🟨
Methodology statement – Simplified (assumptions based to avoid market modelling)	🟩	🟨	🟨	🟨
Methodology statement - Detailed (requiring market modelling)	🟥	🟩	🟨	🟨
Principle based guideline	Depends on interpretation	Depends on interpretation	🟥	🟩

Questions - Technical

1. Do you agree with the values/costs we are proposing to consider?

Value streams

	Value stream	Solar PV Hosting Capacity	EV Charging	V2G Discharging	Battery Export Capacity
Customer	Increased Return on Investment	✓		✓	✓
	Decreased household costs		✓		
	Increased solar hosting capacity		✓		
Wholesale market	Avoided generator SRMC/Reduced prices	✓			
	Avoided peaking generator SRMC/Reduced peak prices	✓		✓	✓
	Reduced FCAS Prices			✓	✓
	Synthetic inertia			✓	✓
Network	Avoided/deferred distribution augmentation	✓		✓	✓
	Avoided/deferred transmission augmentation	✓		✓	✓
	Cheaper access to DM (to avoid augmentation)		✓	✓	✓
	Distribution network reliability			✓	✓
	Distribution network utilisation		✓		
	Transmission network utilisation		✓		
	Avoided transmission losses	✓			
	Avoided distribution losses	✓			
Enviro	Avoided GHG emissions	✓	✓	✓	✓

Questions - Technical

1. Do you agree with the values/costs we are proposing to consider?
2. How should the VaDER Methods deal with uncertainty in energy markets?

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3. Over what time scale should the VaDER Methods apply? What are the benefits of a shorter/longer timeframe?
4. What level of granularity should the VaDER Methods apply (temporal and spatial)?

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Thank you

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Australia's National Science Agency