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20/12/2018

Mr Mark Feather
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Lodged via email: aerinquiry@aer.gov.au

Dear Mr Feather

Consultation Paper: Values of Customer Reliability

TransGrid welcomes the opportunity to provide a supplementary submission to the Australian Energy Regulator's (AER) consultation paper on Values of customer reliability (VCR).

TransGrid is the operator and manager of the high voltage transmission network connecting electricity generators, distributors and major end users in New South Wales and the Australian Capital Territory. TransGrid's network is also interconnected to Queensland and Victoria, and is instrumental to an electricity system that allows for interstate energy trading.

Australia is in the midst of an energy transformation. This is primarily driven by changing community expectations and choices, advances in renewable energy technologies, retirement of existing generation, and the adjustments required in Australia's economy to meet our international climate change commitments. These changes raise complex issues in relation to the design of the National Electricity Market (NEM) which must adapt to these changes and provide the basis for low emissions, reliable supply at the lowest cost to consumers over the long run.

TransGrid supports the AER's development of a nationally consistent Values of customer reliability (VCR) methodology, with the first VCR estimates to be calculated and published by 31 December 2019. The development of a consistent and robust VCR methodology that delivers consistent and stable VCR estimates is essential to facilitate efficient network capital expenditure. TransGrid appreciates the opportunity to provide further comments on the AER's VCR consultation paper. In particular, the appropriateness of VCR values for prolonged and extensities outages envisaged by high impact low probability (HILP) events.

The VCR methodology must contain an appropriate approach to value the effect of HILP events. Consumer surveys are unlikely to provide robust VCRs that accurately reflect the value of avoiding a HILP event – most consumers have little to no experience of a prolonged and widespread power system outage and, as such, may not fully understand the extent of its impacts. TransGrid recommends that the AER considers alternative approaches for establishing VCRs for these events.

It is important that the approach or approaches adopted accurately reflect both the direct and wider economic and social implications of HILP events, including direct costs, 'flow-on' impacts and intangibles – this is considered necessary to accurately reflect the true cost placed on these events.

If you would like to discuss this submission, please contact Rebecca El-Khoury, Regulatory Analyst on 02 9284 3299.

Yours faithfully

Caroline Taylor

Caroline Taylor
Acting Executive Manager, Policy and Corporate Affairs

TransGrid supplementary submission

Consultation paper: Values of customer reliability (VCR)

1. Introduction

TransGrid is the operator and manager of the high voltage transmission network connecting electricity generators, distributors and major end users in New South Wales and the Australian Capital Territory. TransGrid's network is also interconnected to Queensland and Victoria, and is instrumental to an electricity system that allows for interstate energy trading.

Australia is in the midst of an energy transformation. This is primarily driven by changing community expectations and choices, advances in renewable energy technologies, retirement of existing generation, and the adjustments required in Australia's economy to meet our international climate change commitments. These changes raise complex issues in relation to the design of the National Electricity Market (NEM) which must adapt to these changes and provide the basis for low emissions, reliable supply at the lowest cost to consumers over the long run.

TransGrid supports the AER's development of a nationally consistent Values of customer reliability (VCR) methodology, with the first VCR estimates to be calculated and published by 31 December 2019. The development of a consistent and robust VCR methodology that delivers consistent and stable VCR estimates is essential to facilitate efficient network capital expenditure.

The VCR methodology developed by the AER must be fit for purpose – it must reflect the different dimensions that significantly alter the VCR values during an outage reliability event, such as:

> Locational and customer types (by size and activities undertaken)
> Duration and frequency
> Time of day and day of the week
> Season and temperature.

TransGrid welcomes the opportunity to provide further comments on the issues identified by the AER in its consultation paper and at its stakeholder forum held in Sydney on 5 December. More specifically, the appropriateness of VCR values for prolonged and widespread outages envisaged by high impact low probability (HILP) events.

TransGrid has contributed to an industry response through Energy Networks Australia and agrees with the recommendations outlined in that response.

This submission sets out further information on the issues related to prolonged and widespread outages envisaged by HILP events. It is structured as follows:

> Section 2.1 sets out our comments on the current and potential uses of VCRs for HILP events.
> Section 2.2 sets out our comments on defining HILP events, including the factors that should be considered.
> Section 2.3 sets out our comments on the alternative approaches for deriving VCR values for HILP events.

2. High impact, low probability events

Increasing the resilience of critical power infrastructures to HILP events, such as extreme weather conditions, is becoming increasingly important for maintaining a reliable and secure power system. Changes in weather patterns, shifts in the generation mix, and evolving consumer expectations have meant that further consideration beyond the traditional reliability principles of adequacy of supply is needed.

Planning the network into the future requires power infrastructure that can maintain high levels of performance under the most "common" outage reliability event, but is also resilient to less frequent, severe and prolonged events[1]. Resilience in power system infrastructure is likely to reduce vulnerabilities, lower the extent of impacts, and provide quicker recovery following an HILP event.[2]

2.1 Application of VCRs for HILP evets

VCRs form an important input into network planning and decision making processes for augmentation and asset replacement investments undertaken by network service providers (NSPs). The VCR values are intended to reflect consumer impacts of an outage from a reliability event, providing a risk quantification of the reliability component in modelling investment options.

The regulatory investment test for transmission (RIT-T) requires transmission network service providers to assess the economic impacts of HILP events using scenario analysis. Capturing changes in market benefits across differing scenarios relies on applying appropriate VCR values to reflect the range, duration, and customer types affected by the HILP event[3].

In this context, the VCR methodology must contain an appropriate approach to value the effect of HILP events. Without this, VCR estimates are likely to be understated.[4] This is particularly important at the transmission level – under the NER, transmission network service providers are required to assess the risk of a HILP event on power system security.

In its submission to this consultation paper, the Australian Energy Market Operator (AEMO) also calls for widespread and prolonged outages to be better assessed to include the wider economic and social costs. The AEMO notes that some of these widespread costs are likely missed or understated in its 2014 VCR review.[5]

Jurisdictional regulators, such as the Independent Pricing and Regulatory Tribunal (IPART) of New South Wales (NSW), are responsible for monitoring the compliance of NSPs in accordance with the relevant reliability standards. These regulators also review and provide recommendations on the appropriateness of the standards, taking into consideration the VCR values at each bulk supply point. For example, in 2015, IPART was asked by the NSW Government to recommend reliability standards for electricity transmission in NSW.

In this review, IPART noted that AEMO's 2014 estimates did not accurately represent the value customers place on reliability, partly a result of not adequately capturing HILP interruptions. It also expressed the need for further work on VCR values as these values are a key input into its optimisation model.[6] IPART adopted the higher VCR value estimated by Houston Kemp for the Power Sydney's Future project, noting that 'substantial reductions in transmission reliability have the potential to create widespread and costly outages so the implications of setting the allowances for expected unserved energy too high could be significant'[7].

Greater flexibility in VCR values and consideration of HILP events is required. This will better inform network planning and decision making processes, as well as setting the appropriate reliability standards for NSPs.

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[1] Blockley, D., Agarwal, J., Godfrey, P. 2012, *Infrastructure Resilience for High-Impact Low Chance Risks*, ICE Proceedings Civil Engineering, 165(CE6), 13-19, November, available at: https://www.researchgate.net/publication/259363879_Infrastructure_Resilience_for_High-Impact_Low_Chance_Risks

[2] Panteli, M., Mancarella, P. 2015, *A Stronger, Bigger or Smarter Grid? Conceptualizing the Resilience of Future Power Infrastructure*, May, IEEE Power and Energy Magazine, Manchester, United Kingdom, available at: https://www.research.manchester.ac.uk/portal/files/21327680/POST-PEER-REVIEW-NON-PUBLISHERS.PDF

[3] AER 2018, Application guidelines – Regulatory investment test for transmission, 14 December, Melbourne, available at: https://www.aer.gov.au/system/files/AER%20-%20Final%20RIT-T%20application%20guidelines%20-%2014%20December%202018_0.pdf

[4] Houston Kemp 2016, *CBD and Inner Metro VCR estimates - A final report for TransGrid on research, methodology and results*, 28 July, Sydney, available at: https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/consultant-report-transgrid-vcr-estimates-july-2016.pdf

[5] AEMO 2018, *Submission to AER Values of Customer Reliability Consultation Paper - November 2018*, 16 November, Melbourne, available at: https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/values-of-customer-reliability-vcr/initiation

[6] IPART 2016, *Electricity transmission reliability standards*, Energy – Supplementary Final Report, 22 December, Sydney, available at: https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/supplementary-final-report-electricity-transmission-reliability-standards-november-2016.pdf

[7] IPART 2016, *Electricity transmission reliability standards*, Energy – Supplementary Final Report, 22 December, Sydney, pages 22-25, available at: https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/supplementary-final-report-electricity-transmission-reliability-standards-november-2016.pdf

2.2 Defining HILP events

At present there is a lack of clarity and consistency of what constitutes a prolonged and widespread outages envisaged by high impact low probability, and this is likely to cause inconsistencies in interpretation across regulating bodies, network service providers, and other industry participants.

TransGrid recommends the AER provide a clear definition of what is considered a HILP event, as well as the spectrum of possibilities within a classified HILP event. In developing this definition the AER should consider key factors including the regional extent, duration and frequency of an event. It should also consider the potential size and extent of the resulting economic and social impacts (including wider impacts which are not captured under the RIT-T).

The factors that TransGrid recommends the AER considers in defining HILP events are discussed in more detail below.

2.2.1 Regional extent of HILP events

Interconnection in transmission networks means that a HILP outage reliability event could have wider spread reliability and security impacts such as loss of interconnected grid in one or more NEM Regions. These impacts may spread across an entire NEM State (such as the 2016 South Australia Black System Event) or flow into other NEM Regions and States (such as the 2018 double-circuit lightning strike on Queensland/New South Wales Interconnector (QNI) and the 2007 Tatong Victoria bushfire).

As such, there is a need to distinguish HILP events by the regional extent of the event. HILP events and their impacts will differ depending on whether it is 'localised' (i.e. a large scale distribution and/or local transmission reliability outage event) or an 'interconnected transmission' HILP event.

2.2.2 Duration and frequency

TransGrid recommends that VCR estimates consider HILP events and other prolonged power outages for periods of 24 hours or longer. Prolonged power outages beyond 24 hours have greater costs in comparison to shorter disruptions, for example the cost of food spoilage versus the cost of inconvenience of restricted access to food preparation or use of appliances.

The use of back-up generation arrangements would also likely be increasingly restricted as their effectiveness in prolonged outages is limited. Further, running emergency generators for extended periods can become unsafe (as seen in the 1998 Auckland power outage).[8]

An example of a recent prolonged event is the April 2015 super storm event across the Hunter and Central Coast region of New South Wales. The storms resulted in fallen power lines across the region, resulting in approximately 240,000 customers, or 14% of Ausgrid's total customer base, being without power. An estimated total of 369,000 customers, or 22% of AusGrid's total customer base, experienced ongoing supply interruptions from 20 to 25 April 2015. Ausgrid's restoration work lasted through to close of business on 1 May 2015, with 300 customer sites remaining without power on 30 April 2015.[9]

2.2.3 Size of impact

To distinguish between different HILP events within the spectrum of potential future events, the size and severity of the impacts needs to be considered carefully. This includes consideration of wider consequential costs such as emergency management, lack of access to transport, safety risks and economic losses beyond the customer(s) paying for the energy. This is discussed further in section 2.2.4.

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[8] Houston Kemp 2016, *CBD and Inner Metro VCR estimates - A final report for TransGrid on research, methodology and results*, 28 July, Sydney, available at: https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/consultant-report-transgrid-vcr-estimates-july-2016.pdf

[9] Ausgrid 2015, *Cost pass through application – April 2015 storms (PUBLIC VERSION)*, 21 August, Sydney, available at: https://www.aer.gov.au/system/files/Ausgrid%20-%20Cost%20pass%20through%20application%20April%20storms%20-%2021%20August%202015.pdf

The varying degree of impact size can be seen in the April 2015 super storm. Ausgrid estimated that it incurred almost $40 million in restoration costs as a result of the April 2015 super storm event[10]. Other economic and social costs were incurred, such as[11]:

> More than 50,000 people claimed the federal government's one-off disaster recovery payment ($1,000 for adults and $400 for children), totalling more than $60 million.
> Impact costs on the agricultural, aquaculture and fishing industries in these regions estimated at more than $105 million, which included loss of livestock and extensive damage to farm machinery and infrastructure.
> Losses in tourism to the Hunter region estimated to be in the order of $110 million.

The Insurance Council of Australia announced it received more than $1.55 billion in insurance claims following the super storm event.[12]

2.2.4 Other considerations

HILP events are most likely unforeseen and involuntary. As such, the different dimensions of unplanned or unprepared power outages should also be considered to provide the most meaningful VCR values, such as:

> Time of day
> Day of the week
> Season
> Temperature
> Customer type
> How far into the demand stack you are (i.e. a total power outage that occurs at peak demand would be considered more costly than at off-peak hours when power demand is usually low).

The modelling of VCR estimates needs to be sophisticated and provided in a way suitable for its application in network modelling. This is particularly important when considering probabilistic modelling techniques. Probabilistic modelling techniques over different intervals of the day (e.g. 30 minute periods) allow for the possibility to apply a different co-efficient to better reflect the different dimensions listed above. For example, it is likely there is more value in reliability if the temperature is at 40 degrees than at 20 degrees.

2.3 Approaches to deriving VCRs for HILP events

Consumer surveys are unlikely to provide robust VCRs that accurately reflect the value of avoiding a HILP event. This is because most consumers have no experience of a prolonged and widespread power system outage and, as such, may not fully understand the extent of its impacts.

TransGrid recommends that the AER considers alternative approaches for establishing the relevant VCRs for these events. Alternative approaches may include one or more of the following:

> Direct cost approach
> Scenario analysis and risk thresholds
> Ex-post case study assessment (i.e. costs of past events)
> Insurance value assessment.

It is important that the approach or approaches adopted accurately reflect both the direct and wider economic and social implications of these events. These includes direct costs (e.g. damage to property and infrastructure), indirect or 'flow-on' impacts (e.g. loss of revenue, spoilt food), and intangibles (e.g. risk to safety, travel and transport disruptions, potential implications on long term decision making such as a jurisdiction having a

[10] Ausgrid 2015, *Cost pass through application – April 2015 storms (PUBLIC VERSION)*, 21 August, Sydney.

[11] Brigadier Naumann, D. (AM), *Recovery Cordinators Summary Report East Coast Storm and Flood – April 2015*, 14 August, The Hunter and Central Coast Regional Recovery Committee.

[12] Insurance Council of Australia, Media Release, June 2, 2015.

perceived poor electricity supply). Consideration of the wider economic and social impacts is necessary to accurately reflect the true value placed on avoiding or reducing the severity of a HILP event.

In its submission to this consultation paper, the AEMO also highlighted the limitations of survey responses as input into VCR estimates for HILP events. AEMO suggests that a wider consideration of economic and social impacts through a similar method applied in insurance and risk mitigation assessments may better achieve this objective. An insurance value assessment would allow for a net present value assessment of the wider costs associated with high impact events, such as extreme weather conditions and public service disruptions (such as restricted access to transport and water supply).[13]

Deloitte Access Economics (DAE) applied an ex-post case study assessment of the 2007 Victoria bushfires as input into a cost benefit assessment of resilient electricity transmission lines. It applied AEMO's 2014 VCR values to estimate a national cost of $234 million in lost supply. However, the report noted that the reliability of electricity supply for public infrastructure is not captured in these VCR estimates. It estimated that this represented an additional cost of $59 million per major disruption event, which is considered an added 'avoided' cost or benefit of investing in resilient transmission infrastructure. Further, DAE applied a risk threshold assessment which allowed for a more target approach in network decision making – that is, there are likely net benefits from this additional resilience measure in some high-risk areas.[14]

3. Next steps

TransGrid appreciates the opportunity to comment on the AER's consultation paper on VCR. We look forward to ongoing and meaningful consultation with the AER on the issues and recommendations made above.

If you would like to discuss this submission, please do not hesitate to contact Rebecca El-Khoury, Regulatory Analyst on 02 9284 3299.

[13] AEMO 2018, *Submission to AER Values of Customer Reliability Consultation Paper - November 2018*, 16 November, Melbourne, available at: https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/values-of-customer-reliability-vcr/initiation

[14] Deloitte Access Economics 2016, *Building resilient infrastructure*, 2 March, Sydney, available at: https://www.iag.com.au/sites/default/files/Documents/Announcements/ABR_Report-Building-resilient-infrastructure-020316.pdf