Meeting Date: 4 August 2021

THE VALUE OF LOST LOAD

SECURITY AND RELIABILITY COUNCIL

This paper gives an overview of the arrangements used in the New Zealand electricity industry to estimate the value that different types of consumers place on avoiding interruptions to their electricity supply.

Note: This paper has been prepared for the purpose of assisting the Security and Reliability Council to understand the value of electricity to consumers. Content should not be interpreted as representing the views or policy of the Electricity Authority.

Contents

1. Understanding the value of electricity to consumers

1.1 The value of lost load

1.1.1 The function of the Security and Reliability Council (SRC) under the Electricity Industry Act 2010 (Act) is to provide independent advice to the Authority on:

a) the performance of the electricity system and the system operator, and

b) reliability of supply issues.

1.1.2 To assist it to fulfil its function, the SRC needs to understand the value that consumers place on avoiding interruptions to their electricity supply. The value of lost load (VoLL) is the term commonly used to describe this value.

1.1.3 VoLL is a measure of the economic value (cost) given to an amount of electricity not delivered to consumers (i.e., the electricity is 'unserved') because of an outage of one or more components of the electricity supply chain. VoLL is commonly expressed as a dollar amount for each MWh ($/MWh) of electricity (load) not delivered.

1.1.4 The purpose of this paper is to provide the SRC with:

a) key estimates of VoLL for different categories of consumers, and how these compare with other jurisdictions against which the New Zealand electricity industry usually compares itself

b) a view on the suitability of current arrangements for calculating VoLL.

2. Uses of VoLL

2.1 Uses of VoLL under the Code

2.1.1 Under the Electricity Industry Participation Code 2010 (Code), VoLL[1] is used as a default value as follows:

a) under the benchmark (transmission) agreement,[2] when Transpower is assessing whether a transmission connection asset should be replaced or enhanced[3]

b) in assessing increased services and reliability, or decreased services and reliability, under a transmission agreement[4]

c) when Transpower applies the net benefits test specified in Part 12 of the Code when assessing whether to:

---

1 The Code refers to VoLL as 'value of expected unserved energy'. However, 'VoLL' is used here since it is the more commonly used term internationally.

2 The benchmark agreement referred to in the Code is intended to provide a basis for Transpower and designated transmission customers to negotiate transmission agreements. It becomes the default transmission agreement in the event that parties are unable to agree a transmission agreement.

3 Refer to clause 40.2 of the benchmark agreement incorporated by reference into the Code.

4 Refer to clauses 12.35 to 12.37, and 12.39 of the Code.

i. remove or reconfigure shared connection assets[5]

ii. permanently remove interconnection assets[6]

d) when Transpower applies the net benefits test specified in the outage protocol to assess proposed planned outages, connection asset variations, and interconnection asset variations.[7]

2.2 The Authority's uses of VoLL outside the Code

2.2.1 The VoLL is also relevant to the Authority's continuing functions. In particular, the VoLL is relevant to the Authority's objective of promoting competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers,[8] and its function of undertaking industry and market monitoring.[9]

2.2.2 To regulate the reliable supply of electricity and efficient operation of the industry,[10] the Authority must understand the value consumers place on the reliable supply of electricity, and the costs incurred by those consumers if their demand for electricity is not met due to a power outage.

2.3 The Commerce Commission's use of VoLL

2.3.1 Perhaps the most important use of VoLL occurs outside the Code. VoLL (whether it be the figure stated in Part 12 of the Code or some other figure) is a fundamental input to calculating the estimated reliability benefits associated with proposed transmission investments. The Commerce Commission's capital expenditure input methodology determination for Transpower requires VoLL to be used in cost benefit analyses for proposed transmission investments.[11]

2.3.2 The Commerce Commission also uses VoLL as an input to:

a) revenue-linked incentives on Transpower in relation to the number and average duration of unplanned interruptions[12]

b) revenue-linked incentives on electricity distribution businesses subject to price-quality regulation in relation to the duration of planned and unplanned outages.[13]

---

5 Refer to clauses 12.41, 12.42 and 12.43 of the Code.

6 Refer to clause 12.117 of the Code.

7 Refer to the outage protocol incorporated by reference into the Code, which specifies the circumstances in which Transpower may temporarily remove any national grid assets from service or reduce their capacity. The outage protocol also specifies procedures and policies for Transpower to plan and carry out outages.

8 Refer to section 15 of the Act.

9 Refer to section 16(1)(g) of the Act.

10 Refer to section 32(1) of the Act.

11 Commerce Commission, 29 January 2020, Transpower Capital Expenditure Input Methodology Determination 2012 (Principal Determination) (consolidated version), p. 69.

12 Commerce Commission, 29 August 2019, Transpower's individual price-quality path from 1 April 2020, Decisions and reasons paper, p. 165, 174.

13 Commerce Commission, 27 November 2019, Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, p. 426, 430.

2.4 The electricity industry's use of VoLL

2.4.1 The Authority is aware that electricity distribution businesses also use VoLL (although not necessarily the VoLL specified in the Code) when determining the economic value of proposed distribution network investments.

2.4.2 The Electricity Engineers' Association refers to the Authority's work on VoLL in its 'Guide for Security of Supply' in New Zealand.[14]

2.4.3 Transpower has noted its intention to use the VoLL it estimated in 2018 for each of its points of supply to help refresh the criticality values Transpower has estimated for its assets. These criticality values are Transpower's quantification of a range of risks, including service performance, safety, environmental, and direct cost. The VoLL for each point of supply helps inform the service performance risk associated with Transpower's assets.[15]

3. Current arrangements for calculating VoLL

3.1 VoLL is specified in the Code

3.1.1 Currently, VoLL is specified in the Code as being $20,000/MWh, or such other value as the Authority may determine.[16] The default value dates from early 2005, when it was inserted in the former Electricity Governance Rules 2003.

3.1.2 The $20,000/MWh figure is generic. It does not, for example, factor in:

a) specific classes of electricity consumer

b) specific locations within New Zealand

c) times of the day

d) seasons of the year; or

e) certain durations of power outage.

3.1.3 If the Authority determines a different VoLL, the Authority must publish its determination.

3.2 The Transpower capex input methodology permits another VoLL for assessing proposed transmission investments

3.2.1 The Commerce Commission's Transpower capital expenditure input methodology determination says the VoLL[17] to be used in cost benefit analyses for proposed transmission investments is:

a) the VoLL specified in the Code, or

14 Electricity Engineers' Association, August 2013, Guide for Security of Supply.

15 Transpower New Zealand, November 2018, Value of Lost Load Study, p. 26.

16 Refer to clause 4 of schedule 12.2 of Part 12 of the Code, noting again that the Code refers to VoLL as 'value of expected unserved energy'.

17 The Transpower capital expenditure input methodology determination also refers to VoLL as 'value of expected unserved energy', consistent with the terminology in the Code.

b) another appropriate VoLL.[18]

3.2.2 Transpower must give reasons for the use of a VoLL that differs from the VoLL specified in the Code,[19] explaining why the alternative VoLL is appropriate.[20]

3.3 The VoLL for DPP3 came from a Transpower study

3.3.1 The VoLL used by the Commerce Commission in its third default price-quality paths (DPP3) decision was informed by a VoLL study undertaken by Transpower.[21]

4. New Zealand studies of VoLL

4.1.1 The SRC's attention is drawn to three New Zealand studies of VoLL:

c) one commenced by the former Electricity Commission and completed by the Authority

d) one undertaken by Transpower

e) one undertaken by Powerco.

4.2 The Electricity Commission's / Authority's VoLL study

4.2.1 In 2008 the former Electricity Commission began an investigation into the appropriateness (fitness-for-purpose) of the $20,000/MWh VoLL and its application under the Electricity Governance Rules (now the Code).

4.2.2 The Authority completed this study in 2013.

4.2.3 The VoLL study was undertaken because:

a) the 1992 and 2004 work underpinning the $20,000 / MWh VoLL was not based on a comprehensive study of New Zealand electricity consumers, and

b) submissions during the consultation process regarding the VoLL indicated a wide range of views on what the appropriate VoLL should be. Industrial groups and retailers/distributors with urban customers favoured a higher value, while distributors with rural customers favoured a lower value. Although most submitters supported a central value, a significant percentage of submitters either opposed a central value or believed that further research into the appropriateness of multiple VoLLs was required.

4.2.4 The VoLL study was divided into three stages:

a) Stage 1: planning, conceptual analysis and research into the concept of the VoLL and its application in New Zealand and internationally

b) Stage 2: research using a combination of mail-out surveys and face-to-face interviews, and analysis of the feedback

---

18 Commerce Commission, 29 January 2020, Transpower Capital Expenditure Input Methodology Determination 2012 (Principal Determination) (consolidated version), p. 21.

19 *Ibid*, p. 87.

20 *Ibid*. p. 100.

21 Commerce Commission, 27 November 2019, Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, p. 426.

c) Stage 3: surveys of electricity consumers predominantly in Canterbury, Taranaki and Wellington using internet-based surveys, followed by consultation with stakeholders on the findings of the VoLL study. The intent of these further surveys was to validate and where possible improve upon the findings of the 2010 mail-out survey, building on the lessons learned from the 2010 survey.

A single VoLL is inappropriate

4.2.5 Analysis of the results from the mail-out and face-to-face surveys undertaken in Stage 2 of the VoLL study concluded that a single VoLL figure is an inappropriate measure of the value that New Zealand electricity consumers place on unserved energy. This is for the following reasons:

a) *the VoLL varies considerably across and within consumer classifications*

organisations within the same industrial classification may have quite different tolerances to outage durations, and therefore significantly different VoLLs

b) the VoLL varies across regions

the VoLL for a given region in New Zealand will be sensitive to the type and range of consumers within that region

c) a consumer's VoLL is dependent on the duration of the power outage

although the cost can be the same for both a 10 minute and an 8 hour outage, the amount of unserved energy (MWh) can be significantly different, meaning different $/MWh values for the different duration outages.

4.2.6 Analysis of the results from the internet-based surveys undertaken in Stage 3 of the VoLL study also concluded there is considerable variability in the value placed on unserved energy, and hence that a point estimate of VoLL is inadequate to capture that variability. Instead of a single VoLL, there is in fact a range of values that are best represented by a distribution, with parameters to describe the average and the spread of these values.

4.2.7 The value that electricity consumers place on avoiding a power outage varies in complex yet predictable ways, not just by the number and length of outages, but by interactions between attributes of a power outage such as the length of outage and the season (summer/winter).[22]

4.3 Transpower's VoLL study

4.3.1 In 2018 Transpower published a VoLL study, which took guidance from the 2008–2013 VoLL study undertaken by the Electricity Commission and the Authority. Transpower undertook the VoLL study to inform its expenditure decisions and regulatory applications.[23]

22 Electricity Authority, 23 July 2013, Investigation into the Value of Lost Load in New Zealand, Report on methodology and key findings, p. 9.

23 Transpower New Zealand, November 2018, Value of Lost Load Study, p. 3.

4.3.2 Surveys commissioned by Transpower as part of its study also suggested that VoLL varies significantly across different types of consumers and across a range of different attributes (eg, length of power outage). Consistent with Authority's earlier conclusions, Transpower concluded that viewing VoLL as a single figure is very simplistic and does not reflect reality.[24]

4.3.3 As part of its study, Transpower calculated a weighted average VoLL for each of Transpower's points of supply on the transmission network. The VoLL estimates generally varied between $17,000 / MWh and $40,000 / MWh, centering around $25,000 / MWh. Transpower noted that, overall, the results were broadly consistent with inflating the 2004 VoLL figure of $20,000 / MWh to a present-day (2018) figure. However, points of supply with a higher proportion of residential consumers had a lower VoLL than points of supply with a higher proportion of business consumers.[25]

4.4 Powerco's VoLL study

4.4.1 In 2016–2017, Powerco engaged PwC to calculate an estimated VoLL for Powerco's customers. This was done as part of Powerco's application to the Commerce Commission for a customised price-quality path.[26]

4.4.2 The estimated VoLL for Powerco's residential customers was $16,400 / MWh. The estimated VoLL for Powerco's business customers was $39,300 / MWh.[27]

5. Comparison of VoLLs

5.1.1 Table 1 compares the current VoLL in the Code with estimated VoLLs across all consumer types in New Zealand and several overseas jurisdictions.

Table 1: Comparison of VoLL in Code with a selection of estimated VoLLs[28]

Source of VoLL	NZD/MWh	Year implemented / estimated	Notes
Electricity Industry Participation Code	$20,000	2005*	
Electricity Authority	$58,000	2013**	Load weighted, adjusted for inflation
Transpower NZ	$25,500	2018**	Load weighted, adjusted for inflation
Australian Energy Regulator	$44,500	2019*	Load weighted, adjusted for exchange rate
Electric Reliability Council of Texas	$13,000	2014*	Adjusted for exchange rate
Midcontinent Independent System Operator	$5,000	2006*	Adjusted for exchange rate

* Year implemented
** Year estimated

24 *Ibid*

25 *Ibid*, p. 4.

26 Powerco, 12 June 2017, Customised price-quality path (CPP) Main Proposal, p. 38.

27 *Ibid*, p. 48.

28 New Zealand inflation rate sourced from https://www.rbnz.govt.nz/monetary-policy/inflation-calculator
United Kingdom inflation rate sourced from https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator

5.1.2 As can be seen, some of the VoLL estimates are now quite dated. On this point, the Midcontinent Independent System Operator (MISO) is reviewing its VoLL, as the current value may understate the value of involuntary load reduction.[29]

5.1.3 Table 2 compares estimated VoLLs for different consumer types in New Zealand and several overseas jurisdictions.

Exchange rates used: NZD/AUD: 1.075; NZD/GBP: 2.00; NZD/USD 1.43.

29 MISO Market Subcommittee, 9 April 2020, Emergency & Scarcity Pricing Evaluation (IR077) (IR071), p. 16.

Table 2: Comparison of VoLLs across different consumer types[30]

Source of VoLL	NZD/MWh	Year estimated	Notes
Electricity Authority: Residential and business consumers	$18,000	2013	Load weighted, adjusted for inflation
Electricity Authority: Very large distribution-connected industrial	$9,500	2013	Load weighted, adjusted for inflation
Electricity Authority: Transmission-connected consumers	$89,500	2013	Load weighted, adjusted for inflation
Transpower NZ: Residential consumers	$7,500	2018	Load weighted, adjusted for inflation
Transpower NZ: Small commercial consumers	$56,000	2018	Load weighted, adjusted for inflation
Transpower NZ: Large commercial consumers	$27,000	2018	Load weighted, adjusted for inflation
Transpower NZ: Small industrial consumers	$47,000	2018	Load weighted, adjusted for inflation
Transpower NZ: Large industrial consumers	$19,500	2018	Load weighted, adjusted for inflation
Transpower NZ: Small agricultural consumers	$73,500	2018	Load weighted, adjusted for inflation
Transpower NZ: Large agricultural consumers	$36,000	2018	Load weighted, adjusted for inflation
Powerco: Residential consumers	$17,500	2017	Adjusted for inflation
Powerco: Business consumers	$41,500	2017	Adjusted for inflation
Australian Energy Regulator: Residential consumers	$26,000	2019	Load weighted, adjusted for exchange rate
Australian Energy Regulator: Commercial consumers	$48,000	2019	Load weighted, adjusted for exchange rate
Australian Energy Regulator: Industrial consumers	$68,500	2019	Load weighted, adjusted for exchange rate
Australian Energy Regulator: Agricultural consumers	$40,500	2019	Load weighted, adjusted for exchange rate
Australian Energy Regulator: Transmission-connected consumers	$28,500	2019	Load weighted, adjusted for exchange rate
Office of Gas and Electricity Markets: Residential consumers	$40,000	2013	Load weighted, adjusted for inflation and exchange rate
Office of Gas and Electricity Markets: Small and medium enterprise consumers	$103,500	2013	Load weighted, adjusted for inflation and exchange rate
Office of Gas and Electricity Markets: Commercial and industrial consumers	$3,500	2013	Load weighted, adjusted for inflation and exchange rate
Electricity North West: Residential consumers	$36,500	2018	Load weighted, adjusted for inflation and exchange rate
Electricity North West: SME consumers	$99,000	2018	Load weighted, adjusted for inflation and exchange rate

5.1.4 Care needs to be exercised in comparing the values in Table 2. For example, the VoLL estimates in the VoLL studies of the Authority, the Office of Gas and Electricity Markets (Ofgen) (in relation to residential and SME consumers) and

30 New Zealand inflation rate sourced from https://www.rbnz.govt.nz/monetary-policy/inflation-calculator.
Great Britain inflation rate sourced from https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator.
Exchange rates used: NZD/AUD: 1.075; NZD/GBP: 2.00.

Electricity North West used what is known as 'willingness to accept' in estimating VoLL. In contrast, the Transpower and Australian Energy Regulator (AER) studies use the 'willingness to pay' approach.[31]

5.1.5 It is to be expected that VoLLs estimated using the 'willingness to accept' approach will most likely be higher than VoLLs estimated using the 'willingness to pay' approach.

5.1.6 Also, the study undertaken for Ofgem used a gross value added (GVA) per unit of electricity / value-at-risk (VAR) approach,[32] whereas all the remaining VoLLs in Table 2 were estimated using a stated preference approach. The latter approach involves asking consumers their valuations or preferences among goods, situations, and prices or payments.[33]

6. Matters for consideration

6.1 Potential impact of climate change on VoLL

6.1.1 To provide framing for SRC members' discussion on this question, this paper draws on a 2019 study from the UK, which covers a key point.[34] Note that the study was carried out for a distribution network operator. The "LCTs" mentioned in the quote below refer to "low carbon technologies":

> *"One of the key objectives of this study was to investigate potential changes in VoLL in a low carbon future. The analysis established that VoLL for domestic customers using LCTs is significantly higher than the average and this was particularly apparent for users of electric vehicles (EVs) who expressed a VoLL of almost 25% above the average. This is a significant finding and has important implications for future network investment strategies and design policy as it suggests that VoLL is set to increase in line with the projected uptake of LCTs."*[35]

6.1.2 This finding about electric vehicles (EVs) is perhaps unsurprising, as UK consumers evidently place a high value on transportation fuel and transfer that to electricity as the new fuel source. A more recent stage of the same study suite further concluded that customers that use:

- low carbon technologies report a VoLL that is ~10% higher than the average equivalent user

---

31 As the names imply—

- under the willingness-to-accept approach a consumer is asked how much compensation they would be willing to accept to experience an outage
- under the willingness-to-pay approach a consumer is asked how much they would be willing to pay to avoid experiencing an outage.

Refer to PWC, March 2018, Estimating the Value of Lost Load in New Zealand, p. 5.

32 London Economics, July 2013, The Value of Lost Load (VoLL) for Electricity in Great Britain, Final report for OFGEM and DECC, p. xiii.

33 *Ibid*, p. 3.

34 Electricity North West, 31 July 2019, *Value of Lost Load to Customers – Closedown report*.

35 *Ibid,* p. 6.

- heat pumps for space heating report a VoLL that is ~15% higher than the average equivalent user.

6.1.3 For the purpose of facilitating discussion, it is proposed that there will be two countervailing forces driving changes in VoLL as consumer adoption of low carbon technologies increases:

- VoLL will tend to increase as traditional carbon-based fuel sources transition to low carbon alternatives, particularly in the early stages of the transition as consumers factor uncertainty associated with unfamiliar technologies into their views (e.g. range anxiety in EV switchers). This could be summarised as consumer anxiety over placing more eggs in the one basket.
- VoLL will tend to decrease as consumer confidence with the performance of new technologies improves over time. In time consumers may adopt even newer technologies that provide additional benefits such as electricity generation self-sufficiency, augmented with on-site back-up (e.g. battery energy storage systems and smart grids that grow to span (and protect) communities.

6.1.4 Finally, it is proposed the ongoing adoption of a single average VoLL will become increasingly inefficient as the technologies available to consumers and generators grow increasingly diverse.

6.2 Does VoLL promote or inhibit network alternatives?

6.2.1 SRC members will likely have a range of views on this question. For the purpose of facilitating discussion, it is proposed the way that the VoLL is factored into distribution network expenditure plans is likely (or somewhat likely) to influence the development and deployment of network alternatives.

6.2.2 VoLL values that are set—

- with insufficient precision in respect of segmenting customer groups may inefficiently promote network alternatives in some parts of the network while inefficiently inhibiting network alternatives in others
- at a level that is too high on average may inhibit the use of network alternatives, as more familiar, traditional network build options may be seen as providing the lower risk (easier?) option
- conversely, at a level that is too low on average may promote the use of network alternatives.

6.2.3 However, options exist for engagement with stakeholders to set an alternative VoLL.

6.2.4 The Code also contains a process for specifying an alternative VoLL for use in specific projects that are required to use the Code specified VoLL. This facility has been used once recently.

6.2.5 If there is in fact a link between the VoLL used and outcomes in terms of network alternatives, other drivers may be more determinant.

6.3 Potential effect of emerging technologies on VoLL

6.3.1 Transpower notes (at p. 25 of its VoLL study) the following:

> "*In the longer-term new technologies, like home batteries, may alter a consumer's willingness to pay to avoid an interruption on the grid. However, it is important to recognise a battery will affect the amount of power that is lost because of an interruption on the grid but may not change the value of avoiding a power interruption. A consumer with a battery may well utilise their battery up until a certain duration to reduce the amount of energy they lose when the grid is unable to supply power. However, it is less certain how they would cope once the battery had run out and they had no electricity supply. It is conceivable an increasing reliance on electricity may significantly increase the value they see in avoiding this type of interruption. In this way, future consumers could have a higher VoLL but a much lower level of unserved energy. While we recognise this could be the case, without any way of quantifying this change, we intend to assume (for now) VoLL remains static into the future.*"

6.3.2 Views on emerging technologies are expected to evolve over time as experience is gained by consumers, regulators, and service providers.

6.3.3 SRC members may wish to consider this topic.

6.4 Suitability of current arrangements for calculating VoLL

6.4.1 As noted above, the 2008–2013 study of VoLL undertaken by the Electricity Commission and Electricity Authority highlighted the inappropriateness of applying a single VoLL to all consumers.

6.4.2 The Code provides for the Authority to determine alternative values to the default value of $20,000 / MWh. However, this has not occurred in practice. Therefore, the default value continues to be applied to various activities governed by the Code that affect reliability of supply—refer to section 2.1 of this paper.

6.4.3 Again, however, as noted in 6.2.3 above, options exist for engagement with stakeholders to determine a different VoLL. Given this, there does not appear to be a need to make any changes at this stage unless other factors prompt a review.

6.5 The Commerce Commission's views

6.5.1 We obtained brief informal comment on the use of VoLL from Commerce Commission senior advisers in addition to formal views set out in recent major capex decisions and reasons papers.

6.5.2 In respect of the Commerce Commission's use of VoLL for reviewing major capex applications from Transpower that affect multiple GXPs across whole regions, the approach adopted has been to use the original $20,000 / MWh value inflated to present day dollars. The Waikato and Upper North Island (WUNI) voltage management major capex project is an example of this approach.

6.5.3 For more GXP-specific projects, Transpower has used a value derived from consulting with local stakeholders. The Bombay – Otahuhu major capex upgrade project is an example of this approach. Transpower selected and

consulted on a non-standard VoLL equal to $26,400/MWh for Bombay and $27,800/MWh for Wiri.

6.5.4 The Commerce Commission's informal views express comfort that these approaches meet the capex IM and noted that they would not necessarily use Transpower's GXP based VoLL when assessing future major capex proposals as all major projects should be reviewed on their specific merits.

6.5.5 The four customised distributor price-quality path (CPP) applications to date have used the following values for VoLL:

- The Orion CPP (2013) used a VOLL calculated using $6,970 per MW for the initial interruption and $16,260 per MWh thereafter
- The Powerco CPP (2018) used a VoLL of $20,000 / MWh.
- The Wellington Electricity CPP (2017) took the approach of starting with $20,000 / MWh in 2005 and inflating that by 2.7% p.a. to get $28,278 / MWh in 2017.
- The Aurora CPP (2018), covering 2 separate networks used values of $12,000 / MWh for the Central Otago network and $20,000 / MWh for the Dunedin network.

6.5.6 Other comments observed that individual capex proposals don't typically swing on the VoLL used in the analysis; there are typically secondary reasons that drive the expenditure timing. Each distributor typically has its own security criteria underpinning the timing of capex upgrades and the Commerce Commission has not disagreed or pushed back on these.

6.6 Transpower's views

6.6.1 At its March 2020 meeting the SRC considered a paper on the understanding the value of electricity to consumers. That paper also appended Transpower's paper summarising Transpower's 2018 VoLL study.

6.6.2 The March 2020 paper[36] gives further background information and, for those interested, is linked below, but is not expected reading for this meeting.

6.6.3 From their 2018 study Transpower concluded:

"We consider that the results of this investigation are a step towards a better understanding of VoLL. Our study addresses some of the [Authority's] concerns that a single VoLL is inappropriate and provides a basis on which to account for consumers valuing lost load differently. However, we do acknowledge that VoLL is difficult to determine with certainty."

6.6.4 The secretariat understands Transpower is comfortable with the conclusions from its 2018 study and its current approach to using VoLL and is not planning any further work at this stage.

[36] https://www.ea.govt.nz/assets/dms-assets/27/2700612-Understanding-the-Value-of-Electricity-to-Consumers-Appendix-Combined.pdf