AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Summary of consumer risk preferences project

December 2023

Supporting document for the Draft 2024 Integrated System Plan for the National Electricity Market

Executive summary

AEMO's *Integrated System Plan* (ISP) is a roadmap for the transition of the National Electricity Market (NEM) power system, with a clear plan for essential infrastructure to meet future energy needs. The ISP's optimal development path (ODP) sets out the needed generation, firming and transmission, which would deliver significant net market benefits for consumers and economic opportunities in Australia's regions.

When preparing the ISP, AEMO must consider the long-term interests of consumers in accordance with the National Electricity Objective[1], and must consider risks to consumers arising from uncertainty[2]. These risks may include the impacts of over-investment, under-investment, and risks associated with the timing of investments in energy infrastructure[3]. AEMO must explain why any consumer risk preference chosen to inform selection of the ODP is a reasonable reflection of consumers' risk preferences.

Consumers are exposed to uncertainty, and therefore risk, regarding the expected value and the volatility of their future electricity bills. The ODP is selected from a range of candidate development paths (CDPs), each of which provides an expected level of net market benefits but also exposes consumers to a level of bill volatility risk. For the ISP, AEMO considers 'consumer risk preferences' with regard to how the timing of investment in the types of electricity infrastructure that have long lead times (for example, transmission network projects or pumped hydro schemes) would affect consumers' exposure to the risk of volatility in their annual electricity bills.

In 2023, AEMO met in person with residential consumers across the NEM through focus groups, and undertook an online survey, to better understand consumer risk preferences as they relate to infrastructure decision-making in the ISP. This exploratory research has allowed a metric to be developed, which can be used to estimate residential consumers' risk preferences in the context of the ISP.

Initial research shows that residential consumers generally prefer earlier investment in electricity infrastructure, rather than later, if it only has a modest near-term bill impact (not 'too much' in addition to their current bills) and reduces the risk of future volatility in their bills.

Importantly, the research showed that residential consumers are not homogenous in their views on what constitutes 'too much'. Some participants expressed they were happier to pay more than others to mitigate their bill risks, and some are not willing or able to pay anything additional now.

In the remainder of this document: Section 1.1 gives the background for the consumer risk preference research project; Section 1.2 explains the design and delivery of focus groups and an online survey; and Section 1.3 provides the research results and next steps.

Detailed consultancy reports on the consumer risk preferences research can be found on AEMO's website[4] - Attachment 1 'Deloitte report consumer risk preferences' and Attachment 2 'Antenna report consumer risk preferences'.

[1] The National Electricity Objective is in section 7 of the National Electricity Law (NEL). AEMO must have regard to it when carrying out its functions referred to in section 49 of the NEL, which include its functions in respect of national transmission network planning.

[2] Australian Energy Regulator. Cost Benefit Analysis Guidelines. October 2023. At: https://www.aer.gov.au/system/files/2023-10/AER%20-%20CBA%20guidelines%20-%20final%20amendments%20%28clean%29%20-%206%20October%202023_0.pdf

[3] National Electricity Rules 5.22.10(a)(5)(ii)

[4] Attachment 1 from Deloitte and Attachment 2 from Antenna can be found at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation.

1.1 Context for consumer risk preferences research

Consumer representatives recommended engaging directly with consumers

The 2022 ISP Consumer Panel recommended that AEMO improve its understanding of consumers' risk preferences by engaging directly with consumer representatives[5]. The 2022 ISP Consumer Panel suggested that AEMO "build deeper understanding of the ISP amongst consumer and community stakeholders so they are able to engage more confidently and participate in the decision making". This could be through targeted risk assessment workshops to test whether the ISP investments satisfy the risk appetite of consumer stakeholders[6].

As a result of this recommendation, AEMO engaged with its Consumer Forum[7] in March 2022 to examine how the Draft 2022 ODP reflected consumer risk preferences, which was highly informative for the finalisation of the 2022 ISP. Consumer Forum participants also commented on the importance of engaging directly with consumers on risk preferences as part of the 2024 ISP[8]. Comments included:

- "…no one has effectively engaged [residential and small business consumers] on the risk issues and asked them what their preferences are … [Energy Consumers Australia] supports the next ISP spending time and resources to better identify consumer risk preferences through consultation with households and businesses."
- "…the relevant consumer preferences regarding progressing HumeLink are the trade-off between energy bills that are lower on average but more volatile (without HumeLink) and bills that are less volatile, but higher on average (with HumeLink). To [the Public Interest Advocacy Centre's] knowledge, consumers have not expressed informed preferences of this nature in an appropriate targeted forum. It will be necessary to undertake engagement to understand this preference for different types of consumers for future ISPs."

AEMO agreed with the Consumer Forum's view that quantification of consumer risk preferences could be improved, and as a result, engaged Deloitte Financial Advisory Pty Ltd (Deloitte) and their sub-contractors to conduct consumer research using in-person focus groups and an online survey to quantify risk preferences as they relate to infrastructure decision-making. AEMO also discussed the project regularly with the 2024 ISP Consumer Panel. This research is the first of its kind.

Residential consumers were asked about their risk appetite for earlier versus later investment

Consultancies Deloitte and Antenna worked with AEMO to design a questionnaire for the in-person focus groups and an online survey to gather data that could inform a consumer risk preference metric. The objective of both the focus groups and the online survey was to determine consumers' preferences between investing 'too early' or 'too late' in electricity infrastructure when considering how this would impact their exposure to volatility in their annual electricity bills. In conducting this research, AEMO was conscious that the Draft 2024 ISP has been developed in a context of rising cost-of-living pressures, emphasising the importance of understanding risk and cost trade-offs.

[5] 2022 ISP Consumer Panel. ISP Consumer Panel report on AEMO's Draft 2022 Integrated System Plan. Section 4.3 'Build a community of practice around the ISP and its inputs'. February 2022. At https://aemo.com.au/-/media/files/major-publications/isp/2022/isp-consumer-panel-report-on-draft-2022-isp.pdf?la=en

[6] The complete set of recommendations made by the 2022 ISP Consumer Panel can be found at: https://aemo.com.au/-/media/files/major-publications/isp/2022/isp-consumer-panel-report-on-draft-2022-isp.pdf?la=en

[7] AEMO's consumer forum is open to all interested parties seeking to attend and participate in meetings. Information about the forum and its meetings is at https://aemo.com.au/en/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/consumer-forum.

[8] AEMO. 2022 ISP Appendix 1. Stakeholder engagement. Pages 17-18. At https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/a1-stakeholder-engagement.pdf?la=en.

Consumers' preferences regarding earlier or later investment, and how this influences ODP selection, are important because timing of electricity infrastructure investments can expose consumers to risk related to annual electricity bill volatility through the potential for over- or under-investment[9] (investing 'too early' or 'too late'):

- **Under-investment (or investing too late)** is said to occur if actual events, such as an unexpected early retirement of a large coal generator, result in new major electricity infrastructure[10] being required before it can be delivered. In this situation, consumers may incur higher costs for a period before new infrastructure can be delivered, if their demand in the meantime is met by more expensive types of generation or storage. As a result, consumers may face greater volatility in their electricity bills.
- **Over-investment (or investing too early)** is said to occur where new major electricity infrastructure has been delivered before it is required. In this scenario, consumers incur the costs of delivering infrastructure earlier than is needed or fully used, and therefore will have paid more for electricity than if the new infrastructure was delivered at the 'perfect' time.

[9] NER 5.22.10(a)(5)(ii).

[10] Large projects that have long lead-times. Examples include new transmission infrastructure or pumped hydro schemes.

1.2 Research through focus groups and an online survey

Deliberation on a complex topic in focus groups, and greater reach in an online survey

In collaboration with AEMO, consultancies Deloitte and Antenna engaged with 2,422 residential consumers, through:

- **Focus groups** – these three-hour, in-person sessions, were conducted to allow for a more deliberative style[11] of engagement, with each session involving 10-12 participants. At the start of each session, 40-60 minutes were taken to educate participants about the NEM and the risks considered as part of electricity infrastructure decision-making. Following this, participants would begin to complete the questionnaire in the remaining time, with pauses made to allow for questions to be asked by the participants and for facilitator-led discussions of their answers. Participants were encouraged to engage with these discussions.
- **An online survey** – this enabled a greater number of residential consumers to provide responses to the questionnaire about their risk preferences, although deeper deliberation and discussion with others was not possible through this format. Participants were provided approximately 15 minutes to respond to the questionnaire.

Table 1 summarises the number of consumers engaged and number of responses received. By its nature the electricity sector is complex, and the concept of risk preferences as they relate to electricity infrastructure investment decision-making is additionally complex. The number of invalid responses for the survey in particular could be seen as a reflection of the amount of deliberation and time required to understand and provide informed answers on such a questionnaire.

Table 1 Number of residential consumers engaged and structure of each engagement type.

Engagement method	Number of participants	Number of valid responses[A]	Time for specific learning about the NEM	Number of sections in questionnaire[B]	Time provided to answer questions
Focus group	82[C]	46	40 - 60 minutes	4	1.5 hours[D]
Survey	2,340	555	N/A	4	15 minutes

A. Please see Deloitte's report for a detailed explanation of how the validity of responses was determined.
B. This count does not include sub-sections.
C. 83 consumers were engaged, however one of these participants did not meet the recruitment criteria and was excluded from the data set.
D. Approximate time, focus group participants were encouraged to engage in discussion between questions.

[11] A deliberative process of engagement emphasises information processing (meaning/sense-making) as much as information exchange (communication of information), and encourages people to critically test, weigh-up and grapple with a range of perspectives, inputs, and evidence. The process seeks to elicit informed decisions or recommendations from its participants.

Participants were selected to represent a cross-section of NEM residential consumers

Residential consumers in the NEM are a large and diverse group of people. Care was taken to consider the demographic make-up of participants in both the focus groups and survey, against the diverse demographic make-up of NEM consumers. Table 2 sets out the recruitment criteria for the focus groups, while the survey participants were selected to align with Deloitte's assessment of the NEM's residential consumer demographic composition.

Figure 1 shows the locations for the seven in-person focus groups (with three follow-up online sessions held with a sub-set of those participants). Alignment between the demographic composition of those who provided valid responses and the broad demographic composition of NEM consumers cannot be controlled. As a result, Deloitte re-weighted the focus group responses to align with the urban-regional split and state composition of NEM consumers, while online survey results were re-weighted to align with the age composition of NEM consumers[12]. The impact of re-weighting is discussed further in Section 1.3.3.

Figure 1 Locations of focus group sessions

Table 2 Focus group recruitment criteria

Demographic characteristic or group	Criteria
Gender	Equal representation of male and female
Living in a shared household arrangement	At least 1 participant
Single-person household, no children	At least 2 participants
Two-person household, no children	At least 2 participants
Parent of young family	At least 2 participants
Parent of older family	At least 2 participants
'Empty nesters' (parents whose children have left home)	At least 2 participants
Household with rooftop PV	At least four participants

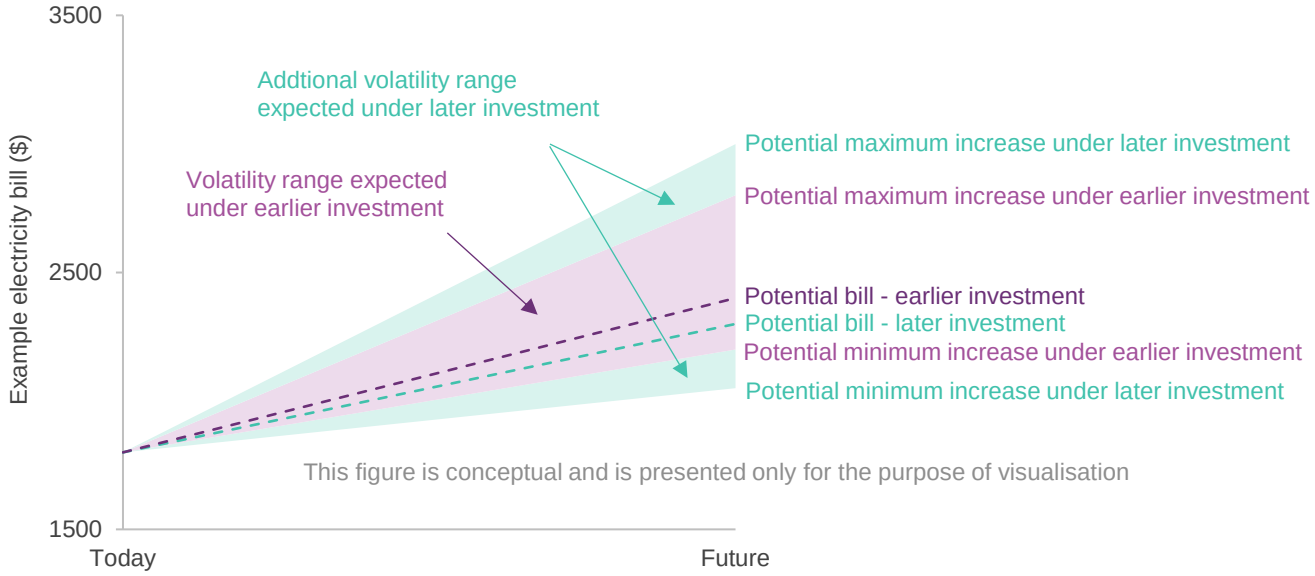
[12] For further detail on the re-weighting process, see Section 5.4 of Deloitte's report, at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation

A questionnaire was designed to determine consumers' risk preferences

The questions presented to participants in both the focus groups and the online survey provided insight into:

- **The broader sentiment towards the decision to invest earlier if it reduces the risk of future annual electricity bill volatility.** Focus group and online survey participants were asked to select a preference between an "early investment" or "wait and see" approach to investing in electricity infrastructure by considering the impact on their bills over time.
- **The maximum amount they would be willing to pay[13] to limit the potential range of volatility in their future annual electricity bills around a potential future bill.** In this context, the volatility range is characterised as the difference between the maximum and minimum bills that a consumer could expect to face in the future. Participants were asked to respond to a set of scenarios. Figure 2 shows how in each scenario, their future bills would fall between a minimum increase and a maximum increase (relative to a typical bill); the difference between these represents the future volatility range. They would then provide their willingness to pay to reduce the volatility range around an expected future bill. Table 3 indicates the format of the question, with each of the five scenarios. The 'willingness to pay' question evolved between the focus groups and online survey in such a way that willingness to pay data from the focus groups cannot be directly compared with willingness to pay data from the online survey[14].

Figure 2 Visualisation used to ask participants to consider future volatility ranges in the willingness to pay question



[13] Willingness to pay refers to the maximum amount that an individual is willing to pay for a good or service. In this context, the 'service' is a reduction in the risk of annual electricity bill volatility, which is quantified as a volatility range.

[14] In focus group sessions, it was emphasised that participants should view their nominated willingness to pay as a once-off payment to limit their exposure the risk of volatility. By contrast, in the online survey, no emphasis was placed on the idea of a once-off payment. Please see Deloitte's report for further detail.

Table 3 Indicative format of the focus group willingness to pay question

Scenarios	A	B	C	D	E
Range of future electricity bills relative to a typical bill today ($) (Volatility range)	+ 250 to +1,300 (1050)	+315 to + 1,100 (785)	+375 to +900 (525)	+440 to +700 (260)	+500 to +500 (0)
Participant's willingness to pay to reduce the risk of volatility ($)	Response A	Response B	Response C	Response D	Response E

- **The risk premium required for a consumer to accept volatility in their annual electricity bills**[15]. This value represents the amount a consumer must be compensated by to bear a given level of volatility in their future annual electricity bills. While AEMO recognises that no mechanism exists for consumers to be compensated directly for bearing risks, consumers' risk premium provides an alternative method to estimate risk preferences. This was determined by conducting a modified Holt-Laury test[16]. Participants were asked to select a preference between pairs of options, with each option providing a different risk of price volatility. An indicative format is shown in Table 4 below. The risk premium question remained the same between focus groups and the online survey.

Table 4 Indicative format of the question designed to elicit consumers' risk premiums.

	Option A	Option B	Participant's preference
Decision scenario 1	Option A description…	Option B description…	A or B
Decision scenario 2	Option A description…	Option B description…	A or B

Qualitative observations were also recorded from the focus groups

The use of focus groups also allowed for qualitative observations to be made about consumers' risk preferences, either through direct quotes recorded from the participants or from the focus group facilitator's synthesis of the views expressed by participants. Qualitative observations included gauging consumers' broader sentiment towards the bill risks posed to energy consumers by electricity infrastructure decision-making, as well as their tolerance towards, and understanding of, those risks.

Three online focus groups were also held after both the in-person focus groups and the online survey, with a sub-set of the original focus group participants, to gain qualitative views on the focus group and survey results, to confirm whether insights reflected participants' views on the insights given during the in-person sessions, and to understand any sentiment changes since the initial in-person sessions.

[15] Risk premium is typically defined as an excess return that is required by an agent to compensate them for being subjected to an increased level of risk. In this context, it refers to the compensation required by a consumer to tolerate a given level of uncertainty.

[16] For further detail, please see Deloitte's report, at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation

1.3 Results and next steps

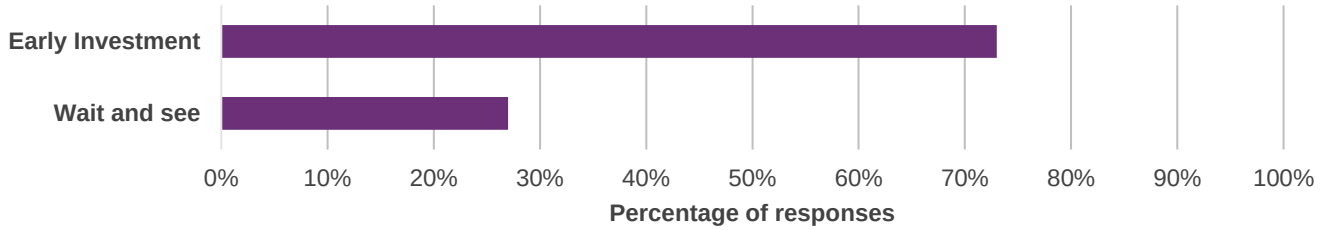
1.3.1 Quantitative results

Currently, AEMO has only used the focus group results, rather than the online survey results, to develop an initial consumer risk preference metric. Reasons for this are outlined in Section 1.3.3. Consequently, the following subsections outline key results from the focus groups[17].

Most focus group participants preferred "early investment" over "wait and see investment"

In the scenario question participants were asked to select a preference between an "early investment" and a "wait and see" approach to investment in the types of electricity infrastructure that have long lead-times, for example: transmission network projects and pumped hydro schemes. Most participants selected the "early investment" option. It is not possible to use this data to derive a risk preference metric. However, this data provides a gauge of consumers' broader sentiment towards the decision to invest earlier in order to mitigate the risk of electricity bill volatility.

Figure 3 Focus group participants' preferences between "early investment" or "wait and see" approaches



On average focus groups were willing to pay a modest amount to reduce risk of bill volatility

The willingness to pay question was intended to be interpreted as a once-off payment made 'today' which would reduce the risk of volatility in the future. Qualitative insights recorded in the follow-up focus group sessions revealed that there had been variation in how participants had interpreted the question. These insights suggested that most participants had interpreted the payment as a once-off payment, though a minority had thought it would re-occur (though not necessarily annually). Participants also differed in how long they had thought the payment would reduce the risk of volatility, with most of them expecting the 'effect' of their payment to last indefinitely, while a minority expected it to be a 5 to 10 year (or longer) timeframe. The once-off payments reported by participants have been converted into a constant annual amount paid over 15 years. Importantly, while this alters the willingness to pay values presented in Figure 4 (left), it does not alter the trend in the responses. This is discussed further in Section 1.3.3.

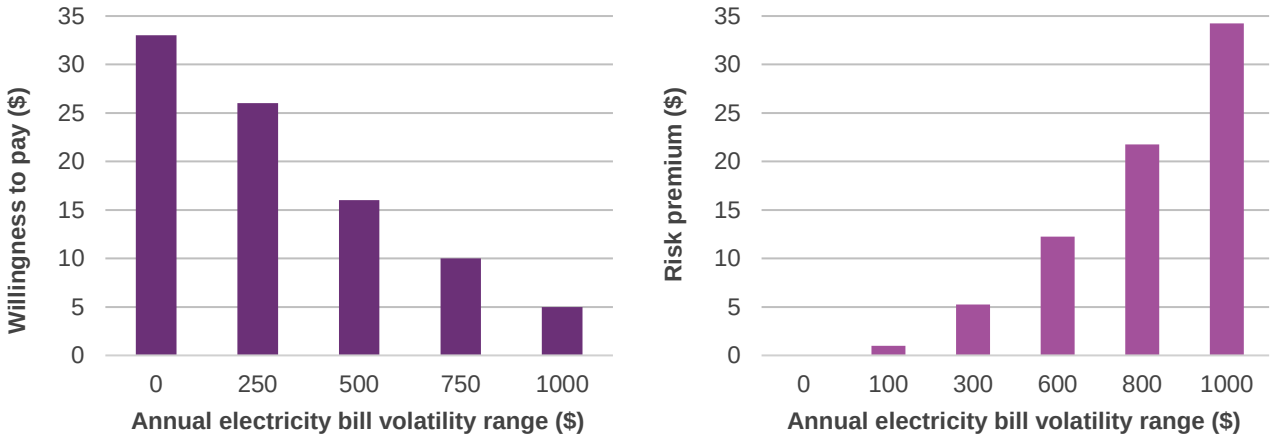
In general, participants were willing to pay an increasing amount as the risk of volatility (quantified by the volatility range) was reduced in the question. Figure 4 (left) presents the median amount a participant was willing to pay annually, over a period of 15-years, to reduce their exposure to volatility to a given amount over that same period. For example, Figure 4 (left) shows that participants were willing to pay an annual amount of approximately $30

[17]Results gathered through the online survey can be found in Deloitte's report, at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation

(above a typical annual bill amount), to reduce their volatility range to $0[18]. Their willingness to pay reduces to approximately $15 if the future volatility range they are exposed to is increased to $500.

Figure 4 (right) shows that the median risk premium derived from focus group participants' responses increases as the risk of volatility increase, meaning that participants require a higher-level compensation to accept a higher risk of volatility. These values were of a similar magnitude to their median willingness to pay. Therefore, AEMO considers that focus group responses were reasonably consistent across the question types.

Figure 4 Focus group willingness to pay (left) and focus group risk premium (right) reported by participants*.



*The results presented here are the median of valid responses from the focus groups.

In recognition of current cost-of-living pressures, a sensitivity was conducted to assess how focus group participants' willingness to pay might change if the cost of living rose in the future[19]. As anticipated, this sensitivity revealed that participants' willingness to pay for a reduced volatility range on their annual electricity bill decreased as the broader cost of living increased. That is, as the cost-of-living increases, participants were less willing to pay to support earlier investment.

1.3.2 Qualitative observations

Qualitative observations were recorded during each focus group session to capture key elements of the discussions between participants and facilitators. The focus group facilitator identified that cost volatility was the most common concern for focus group participants after learning about the risks they are exposed to if limited new network infrastructure is delivered whilst the NEM transitions from fossil-fuel based generation to renewable generation.

When discussing the "early investment" and "wait and see" approaches, participants generally expressed willingness to incur additional costs (to an extent) to reduce annual electricity bill volatility – that is, supporting some degree of earlier investment. One participant commented that:

"It's just that risk factor of waiting and seeing, especially if we need to develop our system, I just think it's a big risk. So I think early investment, as long as you're not paying too much more."

[18] AEMO recognises that achieving a volatility range of $0 is not possible, and that no volatility range can be guaranteed. However, for the purposes of eliciting their willingness to pay, focus group participants had to be given clear volatility ranges.

[19] This sensitivity was not conducted in the online survey.

Other participants acknowledged that while they preferred earlier investment, some may not have the same capacity to afford earlier investment:

"If you ask me, it would be early investment, because I'm probably at a stage in my life where I can afford to spend a little bit more because I don't really have any kids or anything yet, but a few years down the track, it may change."

However, some participants preferred the "wait and see" approach. One participant argued that:

"Bills have gone up quite substantially already, and it's not that great. So, I'm still in the wait and see."

Another noted that:

"A few of us were saying, what's the point? It's 50 years away. So… we're paying it for the other people in 50 years."

These qualitative observations from the focus groups align with the quantitative data collected from the focus groups: that participants are (on average) willing to incur some additional cost to mitigate electricity bill volatility, but that the amount varies greatly depending on what participants consider to be "too much".

1.3.3 Discussion of results

AEMO considers that the median willingness to pay responses acquired from the focus groups are the most appropriate for developing an initial consumer risk preference metric. Table 5 outlines AEMO's rationale.

Table 5 Rationale for use of median responses to the focus group willingness to pay question.

Consideration	Discussion
Logical coherence of the results gathered from focus group participants.	Focus group participants expressed an increasing willingness to pay in exchange for decreasing volatility and that an increasing risk premium was required to compensate them as the risk of volatility increased. Further, the magnitude of the median willingness to pay and risk premium values are quite similar. These factors suggest that participants were reasonably consistent in their decision-making across the two question types. By contrast, data from the online survey is less consistent across the questions and is particularly challenging to interpret within the willingness to pay question. In the set of valid responses, the median willingness to pay value was highest for volatility ranges of $250 and $500 – they were willing to pay more for these ranges than for either a $0 range or a $750 range.
Participants' understanding and consideration of the questions.	The selection criteria for the focus groups excluded anyone from within the power industry who may have brought certain industry biases into the results. However, this means that participants did not have a deep understanding of the power system (comparable to an individual working in the industry). AEMO recognises that the power system is complex, and that understanding risk preferences as they relate to investment decision in the power system is additionally complex. While not comprehensive, focus group participants were given an opportunity to become more informed about the NEM prior to responding to the questionnaire, had the opportunity to discuss their responses and thoughts in facilitated discussions, and to gain clarification on the questions. AEMO also notes that focus group participants had a substantially longer period over which to consider their responses when compared with the time that online survey participants took (on average) to respond. This makes it more likely that focus group responses were more considered than those provided through the online survey.
The median is less sensitive to responses which skew the data set (positively or negatively).	The standard deviation of the focus group willingness to pay data is high, and in each scenario the mean response is higher than the median. This means that participants provided a wide range of responses, and that the data is positively skewed. AEMO considers that the median of focus group responses is more appropriate as it is less sensitive to those responses that skew the data.

While AEMO considers the willingness to pay data from the focus groups is most appropriate for developing an initial consumer risk preference metric, Table 6 sets out several factors that inform how the results should be interpreted, and impact the degree to which they should be relied on.

Table 6 Factors for consideration

Factor	Discussion
Sample size	In the focus groups, valid responses were provided by only 46 participants, who comprise a small fraction of NEM residential consumers. AEMO recognises that this is a small sample size for the number of NEM residential consumers. AEMO may, or may not, apply its estimated consumer risk preference metric in the 2024 ISP as part of AEMO's broader professional judgement regarding consumer risk preferences. If the estimated consumer risk preference metric is applied for the 2024 ISP, AEMO will maintain awareness of this factor (of a small sample size).
Trade-off between sample size and level of understanding held by participants.	It is important that results from the focus groups and online survey are considered in parallel, with a clear recognition of the sample size of each participant group and the understanding held by each participant group. In the focus groups, valid responses were provided by only 46 participants, who comprise a small fraction of NEM residential consumers. However, focus group participants were given a unique opportunity to become better informed about the risks the energy transition may expose them to in terms of volatility in annual electricity bills, and how early investment might mitigate those risks. By contrast, 555 valid responses were provided through the online survey. While a larger sample size generally provides greater statistical validity (noting the re-weighting process undertaken by Deloitte which is discussed below) it is important to recognise that survey participants were not given an opportunity to become better informed about the risks associated with the energy transition to inform their responses.
Variation in focus group participants' interpretation of the willingness to pay question	In the focus groups, it was intended that participants would interpret the willingness to pay amount as a once-off payment made 'today' to reduce volatility risk over a future period. Qualitative observations revealed that most participants had viewed it this way, but a minority were sceptical of this and expected that a similar payment would be required 5-10 years in the future. There was also variation in how long volatility risk would be reduced by the payment; most participants expected the effect to be permanent while a minority saw it as a five-to-ten-year period. As a result of this, the median results were converted from a once-off payment to a constant annual payment over 15-years amount giving the same net present value as the once-off payment[20].
Re-weighting of focus group and online survey responses to improve the extent to which a 'representative sample' is used to inform results.	Valid responses from focus group responses were re-weighted by Deloitte according to the urban/regional proportional composition of NEM consumers, while survey responses were re-weighted according to the age composition of NEM consumers[21]. However, AEMO notes that the resulting income distribution of valid online survey responses is composed of a high proportion of high-income earners. Use of the median (as outlined above) is intended to partially mitigate against the bias that may be introduced by a high weighting towards higher income households.
High degree of variance in participants' risk preferences.	Large differences are observed in the responses provided through the focus groups and through the online survey. This suggests that while participants generally preferred earlier investment, there was limited agreement on how much they were willing to pay for this.
Omission of risk preferences held by commercial consumers.	This study has only considered the risk preferences of residential consumers. By number, most NEM consumers are residential, or non-commercial. However, large industrial and commercial consumers have the greatest demand of electricity supplied in the NEM, and consequently pay for a large amount of the electricity traded in the NEM. As a result, they would be expected to bear the majority of the cost of earlier investment in electricity infrastructure. AEMO notes that the risk preference metric determined through this study can only be considered to be applicable for residential consumers.
Potential impact of cognitive bias on results	AEMO notes the potential impact of cognitive bias on participants' responses. AEMO considers that cognitive bias is likely to have had a stronger impact on responses provided in the online survey, due to the shorter time frame and lack of information regarding risks in the electricity industry, than on focus group responses.
Willingness to pay versus capacity to pay.	AEMO is conscious that this work has been carried out in the context of increasing cost-of-living pressures, and that this is impacting consumers' capacity to pay for all items, and that among cost increases to other items, the cost of electricity to consumers has increased significantly between 2022-23 and 2023-24. As a result, AEMO is aware that participants' capacity to pay, as well as their willingness to pay, for earlier investment was not fully interrogated.

[20] The discount rate used was taken from AEMO's 2023 Inputs, Assumptions and Scenarios Report Workbook, at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation

[21] For further detail on the re-weighting process, see Section 5.4 of Deloitte's report, at: https://aemo.com.au/consultations/current-and-closed-consultations/draft-2024-isp-consultation

Observations from the 2024 ISP Consumer Panel

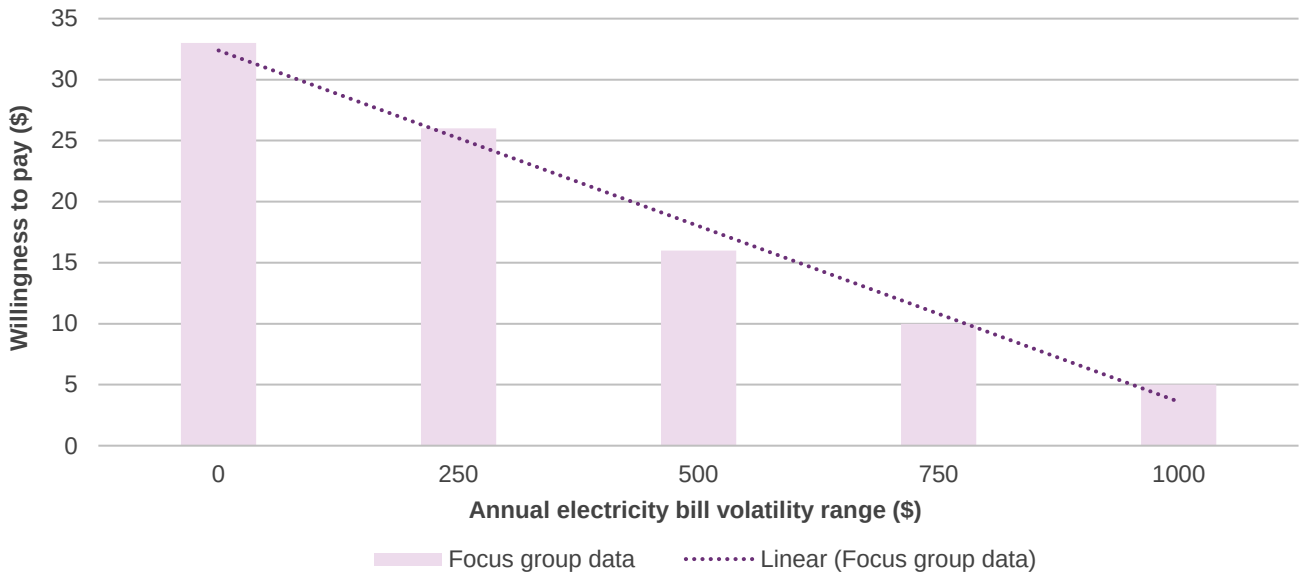
In the 2024 ISP Consumer Panel's view:

- Understanding consumer risk preferences is crucial for ISP development, and the Panel commends AEMO for its commitment and effort to deliver on the 2022 Panel recommendation.
- Ascertaining consumer risk preferences that can be quantitatively applied is challenging and novel. While good progress has been made during the development of ISP 2024, there is no data that can be confidently applied at this early stage.
- The initial 'metrics' from this data can usefully be tested using 2024 ISP outputs, as a test to better understand how a metric might be applied to future ISP processes and the likely materiality of applying risk preferences.
- More work is needed for the 2026 ISP, particularly around measuring preferences of commercial and industrial customers, learning from the process and possible metrics identified in the 2024 ISP development process.
- We observed that initial results suggest residential consumers, on average, prefer to accept some uncertainty and are willing to pay only a modest amount to reduce the risk of future volatility.

1.3.4 Data set selected to inform the initial consumer risk preference metric

Focus group responses have indicated an individual consumer's typical willingness to pay for set volatility ranges. To use a consumer risk preference metric, AEMO must be able to determine an individual consumer's willingness to pay for a volatility range that sits between those set amounts. A linear fit to the willingness to pay data enables this to be done and is shown in Figure 5. Section 1.3.5 outlines how the gradient of this linear fit can be used to compare investment decisions with respect to consumers' risk preferences.

Figure 5 Linear fit to focus group willingness to pay data



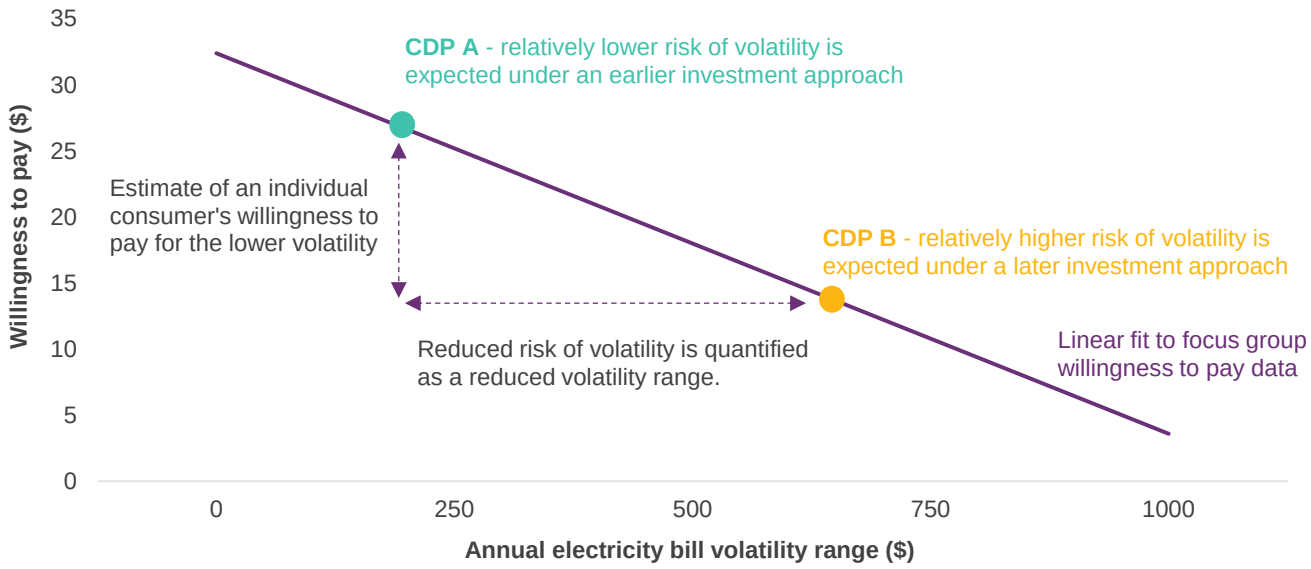
1.3.5 Proposed application in the ISP

The ISP Methodology outlines that AEMO may consider consumer risk preferences through application of a consumer risk preference metric[22]. The following section provides a hypothetical example to demonstrate how the developed metric can be used to estimate consumer risk preferences in a comparison of two CDPs, which may then inform the professional judgement AEMO's applies when selecting the ODP. It is important to note that for the Draft 2024 ISP, AEMO has not used this metric to select the ODP.

Figure 6 considers two example CDPs, with CDP A reflecting earlier investment in electricity infrastructure, thereby enabling more renewable energy capacity to connect to consumers. This increased connection of new renewable generators and utility-scale storage, spread over a more geographically diverse area, could be expected to reduce volatility in residential consumer bills – particularly in the case of pro-longed weather events, major generator outages or transmission failures. By contrast, such events are expected have a greater impact on consumer bills under CDP B, which reflects later investment in electricity infrastructure.

By calculating estimated typical residential bills under each CDP, each example CDP is estimated to have an associated 'amount' of volatility, measured along the horizontal axis. Figure 6 outlines how AEMO's consumer risk preference metric allows the difference in volatility between CDP A and CDP B to be converted into a 'willingness to pay' for the reduced volatility under CDP A versus that under CDP B.

Figure 6 Example comparison of two CDPs with respect to consumers' willingness to pay for reduced volatility.



This value indicates the amount a typical NEM residential consumer is willing to pay annually over 15-years for reduced volatility over that period. By considering the projected number of NEM residential consumers across the modelled period, AEMO can estimate the present value of NEM residential consumers' aggregate willingness to pay for the reduced risk of volatility offered by CDP A over CDP B. This aggregate willingness to pay value can then be compared with the difference in the cost to consumers under each CDP. The expected cost to residential consumers is calculated as the present value of consumers' bills across the modelled period. If aggregate willingness to pay for the difference in volatility is larger than the difference in cost to consumers between CDP A and CDP B, then CDP A is preferred in the context of consumer risk preferences.

[22] AEMO. ISP Methodology. June 2023. At https://aemo.com.au/en/consultations/current-and-closed-consultations/consultation-on-updates-to-the-isp-methodology.

1.3.6 Future work

AEMO is very pleased to have undertaken this innovative project to estimate consumer risk preferences as they relate to electricity infrastructure decision-making, the first project of its kind to inform power system planning.

AEMO would like to thank:

- Deloitte and Antenna for their delivery of the research and assessment.
- The 2024 ISP Consumer Panel for their advice and insights throughout the process.
- The residential electricity consumers who participated through focus groups or the online survey.

The exploratory nature of this work has enabled AEMO to identify several areas of potential future work which could be investigated to inform any future application or enhancement of consumer risk preference metrics. These areas are set out below:

- Expansion of the research to include **industrial, commercial and small business** electricity consumers.
- Investigation of whether **willingness to pay or a risk premium** is the more appropriate metric for representing consumers' risk preferences.
- How and if a range of metrics could be derived and applied to **better represent the diversity of residential consumers**, particularly with a view to better representing low-income households.
- Additional and more expansive use of **deliberative engagement methods**, for example through delivery of deliberative forums which include more participants and include additional time to facilitate informed discussions and arrival at informed recommendations.
- Expansion of focus groups or forums to ensure a larger and fully representative sample size from focus group results, noting that budget and time considerations would need to be balanced with this approach.
- Finessing the questionnaire to consumers based on the results of this initial research set to fine-tune the communication of complex concepts relating to electricity infrastructure investment.

AEMO is open to considering further work on consumer risk preferences for use in future ISPs and will continue to engage with the ISP Consumer Panel on this matter.