2022 Integrated System Plan – Transmission Cost Database Webinar Q&A

This document provides responses to all questions raised at the Integrated System Plan (ISP) Transmission Cost Database webinar held on 20 January 2021.

AEMO hosted a virtual stakeholder webinar to outline proposed changes to the process for estimating transmission costs for future ISP projects. A new Transmission Cost Database is being developed, which will be used by AEMO to estimate costs for candidate future ISP projects, and to cross-check costs for Transmission Network Service Provider (TNSP) estimates for current Regulatory Investment Test for Transmission (RIT-T) projects.

In response to feedback received after the webinar, AEMO will be holding a second Transmission Cost webinar in April, to consult on how the cost estimates produced by the new database and by the TNSPs will be incorporated into the ISP modelling. Extended time will be planned at this webinar to allow stakeholders to discuss their concerns and questions directly with the AEMO team.

The Draft Transmission Cost Report will be released in May, and will be followed by a four week consultation period, which will provide further opportunity for stakeholder input. A third webinar will be held in June prior to publication of the final Transmission Cost Report, which will accompany the Inputs, Assumptions and Scenarios Report (IASR) in July.

Where can I find more information?

For further enquiries, please email isp@aemo.com.au

#	Question	Answer
1	It is common to see transmission line costs quoted as $ per kW per km. This does not take into account the economies of scale. For example, doubling of capacity does not double the cost. How will your methodology take economy of scale into account?	The proposed approach considers the size of the project to account for economy of scale. Projects with short runs of transmission line will generally have a higher per km unit cost due to the fact that the fixed costs are spread across a shorter length. Furthermore, the cost database includes a large variety of conductor and voltage types, allowing the user to select the most appropriate line rating for the project requirements.
2	Long distance HVDC lines offer great potential for connecting Australia's REZs. How do you propose to develop the cost database for long distance HVDC? If by reference to overseas projects, how will you account for FX volatility, regulation and labour cost differences?	There has been only one overhead HVDC line built in Australia (a section of Basslink), so we researched several overseas HVDC line projects. We relied mainly on project cost information and unit cost estimating models from North America and Europe which we believe have similarities with Australian labour and safety rules and regulations. We also used one project in China with sufficient depth of cost data. We used forex rates to convert overseas project cost information into AUD, and adjusted for labour cost where relevant. Regulatory differences were not considered significant at this level of estimate.\n\nWith respect to forex volatility, we note that the database will produce Class 5-4 estimates. Market volatility (such as forex, labour supply etc) is accounted for by allowing the user to choose appropriate risk factor.
3	Why does AEMO believe the proposed accuracy level class as assigned are reasonable. I have never seen costs for a transmission project reduce as it proceeds through the approval process, they only ever increase. In my view all the assigned class levels are too low.	AACE class estimates are commonly used across multiple sectors to recognise that the accuracy of cost estimates increases as more detailed design information becomes available.\n\nIn developing the database we have used data from projects at Class 5 level estimates (least mature) to Class 2 (advance/tendered position), and the intent is to

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		ensure that the database includes sufficient adjustments and allowances for risk to produce future estimates that fall within the Class 5/4 accuracy levels.
		The accuracy levels shown for the RIT-T and CPA stages reflect AEMO's current understanding of recent industry practice. AEMO considers that it is the AER's role to determine what cost estimation accuracy is acceptable in the RIT-T and the CPA. The AER is currently consulting on a new guidance note for the regulation of large transmission projects.
4	Given we are moving energy rather than voltage, will the database include estimates of seasonal MW limits for line voltage?	The database will have building blocks that have an assigned capacity (MW or MVA) for each voltage level.
5	If the database is confidential and retained by AEMO there is NO transparency. All transmission costs are fully transparent as part of economic regulation of networks. There is NO need for confidentiality.	The database will be published. Where unit cost estimates are derived from confidential information, that information will be aggregated and de-identified to retain commercial confidentiality.
		AEMO believes this is aligned with Australian regulatory and competition practices.
6	Given the proposed range of cost increase that could occur post the ISP, what $ value will AEMO use in the cost benefit analysis in the ISP. In my view a simple midpoint value would not be suitable.	AEMO is presently reviewing options for the use of the database results in the ISP modelling. The database aims to incorporate adequate risk factors (as outlined in the presentation) to provide an improved estimate for future ISP projects.
		Based on feedback from this session, AEMO will schedule a separate webinar to consult further on the calculation of an expected project cost for ISP modelling purposes. AEMO will then seek feedback on a preliminary position for this approach in the Draft Transmission Cost Report consultation.
7	Using Project EnergyConnect as a case study, use of AACE Class 4/3 at PACR can lead to a major blow out in costs when move from RIT-T sign off to CPA stage - which is not in the interest of consumers. So how does AEMO justify use of Class4/3 at PACR stage? Why isn't it using Class 3/2 at that point	The accuracy levels shown for the RIT-T and CPA stages reflect AEMO's current understanding of recent industry practice. AEMO considers that it is the AER's role to determine what cost estimation accuracy is acceptable in the RIT-T and the CPA.
		The AER is currently consulting on a new guidance note for the regulation of large transmission projects. AEMO encourages ISP stakeholders to participate in that forum.
8	How will AEMO be using class 4/5 estimates within the ISP itself? Specifically, how will AEMO be including the -50%/+100% uncertainty ranges (and reporting the results / implications of the large cost range?)	The -50% to +100% uncertainty ranges in the AACE Guideline Recommended Practice No 96R-18 is the pessimistic range of estimating tolerances. There is a much narrower band of optimistic range of estimating tolerance in the AACE Guideline (-20% to +30%) and a tailored range likely if based on actual recent Australian transmission project estimates (-30% to +30%).
		AEMO proposes to align to the latter range (-30% to +30%) by using the actual cost progression data from the industry and basing our estimating model on what the industry has experienced.
		Based on feedback from this session, AEMO will schedule a separate webinar to consult further on the calculation of an expected project cost for ISP modelling purposes. AEMO will then seek feedback on a preliminary position for this approach in the Draft Transmission Cost Report consultation.
9	So how does the proposed risk approach prevent risks simply being transferred to consumers as networks seek fixed price contracts?	The AER has current guidelines on the types of risks allowed to be included in CPA estimates (for revenue setting).
		The AER is currently consulting on a new guidance note for the regulation of large transmission projects. AEMO encourages ISP stakeholders to participate in that forum.
10	Given that the RIT-T process is designed to assess network vs non-network options, how will the relative risk position of different options be handled given I expect the risks for non-network are much less than for network options? So PACR network Class 4; non-network class 2?	Project risk in a non-network solution will not necessarily be less than a network solution (this depends on the actual transmission project and the actual non-network solution).
		This database will only include network solution cost estimates and the associated risks. Some non-network options are costed under the GenCost program, and there is an added uncertainty for these newer technologies in how fast these costs change with time as the technology becomes more established. This uncertainty can be addressed through the use of sensitivities in the modelling.

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		However, it is important to recognise that the transmission cost database is for estimating projects that have not yet commenced the RIT-T or preparatory activities. AEMO will initiate a non-network consultation for any actionable ISP project. The appropriate TNSP is then required to assess these projects under the RIT-T. This enables a more robust assessment against the transmission option, including their comparable risks.
11	With the IASR and the ISP will AEMO include AACE class and the potential cost range in publication so consumers others can understand the risk associated with various projects	AEMO will include or assign AACE estimate class qualification and corresponding accuracy bands with the cost estimates generated by the database for use in the ISP. AEMO similarly requests that TNSPs qualify their respective cost estimates with AACE estimate class levels and/or stated accuracy bands.
12	Is it a Transmission Cost Database or a Transmission Cost Model? Natasha just answered this I think but the database alone doesn't deliver the aims - it only delivers the inputs to the transmission cost model that delivers those aims.	The final 'database' is intended to have the functionality of a database (in that it includes a wide range of data across interconnecting categories, and can be updated with additional real project information over time). It also provides modelling functionality in that it will allow users to select the most appropriate adjustments and allowances to produce a cost estimate for a given project. The output from the database will become an input to the overall ISP model.
13	What are AACE Guidelines?	The American Association of Cost Engineers produces several Guidelines and Recommended Practices on cost estimating methodologies, and their research provides the range of estimate accuracies historically across different industry sectors. We have referred to Recommended Practice No. 96R-19 and tailored it using Australian project cost information as the projects progress to advance stages.
14	Does AEMO aim to introduce a common CBS/WBS up to a certain level to improve consistency in cost estimates?	A common cost/work breakdown structure (one layer) is included in all of building block estimates that together make up the network elements estimate. This structure can be used for comparative purposes (with transparent outputs) and is also used for application of adjustment/risk factors, as well as for consistency and review.
15	To what extent will TNSP estimates be made only by the Primary TNSP?	AEMO expects that the relevant TNSP will provide the cost estimates for all projects that have already started the RIT-T or where AEMO has triggered preparatory activities. In the Draft IASR, AEMO noted that it "reserves the right to add offsets to prices advised by TNSPs to ensure that uncertainty and risks are applied consistently across investment options."
16	I am confused - we are talking about the database but are now actually doing modelling. It is meaningless to talk about known and unknown risks - the only risk parameter that should be used is the AACE categories - they cover known and unknown risks.	While our document and presentation refer to it as 'database', it will also include functionality (modelling) for users to interact with it to input their project specific information (scope, quantities etc.) to generate cost estimate specific to their project. The approach to known and unknown risks is comparable to AACE and other approaches to account for allowances and contingencies in scoping studies and pre-feasibility studies. We are aiming to provide a reasonable approach for users of various backgrounds.
17	Would the database be available publicly, if so, how can we access to it?	Yes, the database is intended to be made publicly available at the time of the May/June consultation on the Transmission Cost Report. It will be published in the form of a macro-enabled Excel file. Further details will be provided at that time.
18	Actual cost data already included risks (both known and unknown) occurred. For developing a database and benchmarking, how differentiating between known and unknown risks help benchmarking?	It is necessary (and a challenge) to ensure there is no duplication when users apply the project specific attribute adjustments and risk factors, and also when project data is used for benchmarking by AEMO in the future. Notes on differentiating between the various risks will be included in the user manual to be supplied along with the database. The building blocks are targeted to represent a base estimate of costs before known and unknown risks are added (the sum then can be benchmarked with project data with market-based costs of higher accuracy). The benchmarking methodology will consider the cost breakdown structure and the accuracy of comparative estimates (and inclusions), indicative or binding market data (and inclusions), actual completed costs etc to provide a valid comparison.

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19	What is the point of trying to allocate unknown risks derived from the AACE why would you then want to portion it across the categories?	We don't propose to apply a blanket unknown risk based on the relative level of scoping completed. Rather, a different unknown risk amount can be applied to different portions of each network element as appropriate (e.g. the 'productivity and labour related risk allowance' is applied to the electrical and civil installation works, and not to the plant and material costs).

The AACE data is a starting point only. We will be tailoring/deriving the risk allocation limits using data from recent Australian transmission projects. |
| 20 | Shifting risk to consumers seems inevitable when you still have Class 4 at PACR; even a class 3 at CPA still shifts a lot of risk to consumers as the AER pointed out in its preliminary decision on the PEC CPA | The accuracy levels shown for the RIT-T and CPA stages reflect AEMO's current understanding of recent industry practice. AEMO considers that it is the AER's role to determine what cost estimation accuracy is acceptable in the RIT-T and the CPA.

The AER is currently consulting on a new guidance note for the regulation of large transmission projects. AEMO encourages ISP stakeholders to participate in that forum. |
21	The project is confusing 'project contingency' with 'project risk.' The contingency usually allowed is a weighted average of risks.	The terminology selected for this project is to use "Known Risks" and "Unknown Risks". Both are based on the standard concept of the sum of probability of an event occurring times the consequence (costs). For Unknown Risks the events relate to uncertainties causing scope change, labour cost changes, procurement cost changes and indirect cost changes.
22	Will the database be updated for actual incurred costs of projects? Or will it only be possible to update the database with estimated costs from something like the CPA?	AEMO will be requesting TNSPs to provide actual cost data from completed projects where possible to update the database in the future.
23	Have you discussed the project with the AER? I see you have in December but classically driven by TNSP discussions.	Yes - Discussions between AEMO and the AER have been progressing since October 2020.
24	Substation major plant costs and imported transmission line steel cost are significantly affected by movements in exchange rates. Will the cost data base reference the key dates of the input data?	The building block estimates in the database are current as of Jan 2021 and are in AUD. Where applicable, some estimates (such as overseas projects) used forex rates. We will list the economic variables and date used in our report.

However, please note estimates from the database will be Class 5/4 estimates and will not produce definitive quotes listing all economic variables and relationships. |
| 25 | How will the elemental building block costs be updated to reflect things like FEX, labour, raw materials and equipment, and what margins are assumed? | Each elemental building block is consistently broken down into a standard cost breakdown structure (i.e. material, civil work, electrical work, secondary system etc.).

AEMO will update building block costs if necessary/relevant in the future as part of the continual improvement of the database. |
| 26 | The TCD 'complete' - are you delivering only cost estimates of already known transmission projects or a tool for modelling costs of alternative transmission projects. | The primary purpose of the database is for estimating costs for transmission projects that may be considered as part of the ISP least cost optimisation. It will also be used to cross-check TNSP estimates for known transmission projects that are in more advanced stages of development.

Completed projects and advanced project estimates will be used for benchmarking the building block costs, adjustment factors and risk allowances. |
| 27 | How schedule risks been modelled? | There is a Known Risk factor included for schedule pressures which will increase or decrease the relevant network element estimate. The user will be able to vary the value of this parameter to test the impact of available settings before making the most appropriate selection. |
| 28 | What is the basis of the core building blocks - historical project costs or more recent quotes from NSPs or service providers? | Recent market tested prices for projects have been used to establish the initial building block costs where possible (limited). These costs have also been used to adjust historical project costs for other building blocks. The Transmission Cost report will outline the basis of the building blocks. It will describe how the range of data, including historical and recent quotes, international and OEM data, and completed project costs have been used within the initial setup and will be used for updates. |

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29	Will AEMO source and make public the competitiveness of tendering for major packages of projects?	AEMO's Class 5/4 estimates for Future ISP projects will not typically involve tenders. Tenders are used by TNSPs at more advanced project stages. However, AEMO does not typically have visibility or authority over these tendering processes.
30	Major Greenfield ISP projects carry a substantial risk that the least cost transmission option does not have acceptable impacts from a planning or environmental perspective. How well is this understood and factored into unknown/known risks?	It is a challenge to address these risks, given the changes over the last few years to planning and environmental legislation. GHD are using the knowledge gained from providing independent verification work on recent proposed interconnection projects in NEM to estimate these risks for the database.
31	Will the database also include actual costs once projects are delivered, and these be used to inform AEMO's ISP estimates? Post completion data can improve ex-ante cost estimation / forecasting, and was a focus of Grattan Institute's recent Megaprojects report	AEMO plans to improve and update the database for future ISPs by using new project cost data as it becomes available.
32	What is AEMO's selected confidence level for estimates, I.e. P80, P50, etc.?	The targeted confidence level for the estimates will be stated as a +/- accuracy band. This approach is still being developed, but the accuracy bands will be stated in the IASR for each project. We note that the use of 'P-' estimate terminology may mislead users and stakeholders into thinking that probabilistic modelling/simulation is involved in generating a range of estimates for each project (with the 'P-' estimate value denoting a point in the probability distribution/density function). This is not the case as the estimate output will be calculated in a deterministic or parametric fashion with user input choices.
33	For transmission lines, costs per kilometre for items such as access, clearing and foundations can have a wide variance in cost depending on geography, geotechnical conditions and vegetation how will this be dealt with in the database.	Project attributes to be selected by the user include geography, geotechnical conditions and land use, which will adjust the costs per km. These adjustments are made to the relevant cost breakdown structure in each building block (such as civil works for clearing and access cost). Benchmarking will also assist in tuning the adjustment factors.
34	Change of Scope is the largest driver of cost movements from concept to execution. An apples for apples comparison of cost modules becomes problematic across the various phases. I am not sure how the current benchmarking is addressing this.	It is not possible to directly allow for significant and particular changes in scope. One of the unknown risk allowances is for scope not fully defined at early stage. Where possible, the data used to inform the Unknown Risks will include a review to determine the cause of the relative change in costs across the stages of a given project.
35	The NSW PEC cost appears to have included a large sum for plant and equipment. This may be structured as a usage charge but perhaps contractor's capital equipment investment is being passed on excessively to the first project? This would give first project an unfair advantage for future tenders.	This is a valid observation. Tenderers in a competitive procurement process will be somewhat encouraged not to overvalue the residual risk of future stranded plant and equipment. This is a good point to take into account while benchmarking and comparing data from different projects.