GHD Advisory

Transmission Cost Database Tool: User Manual

Australian Energy Market Operator Limited

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→ The Power of Commitment

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1. Introduction

This manual has been updated to help the Transmission Cost Database (TCD) Tool users to interact and navigate through the TCD Tool (from version 3.0 onwards) and the steps to compile early stage capital cost estimates of transmission network capital project options. The user must refer to the report titled 'ISP Transmission Cost Database' dated 19 March 2021 (the 2021 inaugural TCD report[1]) to gain additional understanding of the TCD, its development, cost organisation and the associated details underpinning its feature. The user is also encouraged to refer to the report titled 'ISP Transmission Cost Database Tool: 2025 Update' dated 20 May 2025 (the 2025 TCD update report[2]) to further understand how the changes made to the TCD Tool impacts the interaction and navigation of the TCD Tool from user perspective.

This user manual is subject to and must be read in conjunction with these two reports and the assumptions and qualifications contained in these reports.

These two reports also contain dedicated appendices of abbreviation and glossary of common industry acronyms and terminologies used throughout the TCD Tool and the embedded Cost and Risk Data file within the TCD Tool.

2. User Prerequisites

A user of the TCD Tool should be aware of the assumed prerequisites necessary to develop a cost estimate with it. It is expected that the user of the TCD Tool be well versed with the electricity transmission network industry in Australia, especially the National Electricity Market (NEM). The user:

– Should be familiar with various asset types and the capital project development and delivery of such assets that forms the electricity transmission network infrastructure
– Should have general knowledge of industry practices and standards with respect to asset description and specifications, procurement arrangements, network design, regulatory approval processes, construction management and safety protocols
– Does not need to be an expert in all these areas but is expected to have access to resources to inform the use of the TCD Tool and be fully aware of topics discussed above
– Has carried out professional work experience in the industry such that they would meet the prerequisites outlined above.

The user's approach must consider a range of input information which defines the project scope and determines the maturity of the project. The user of the TCD Tool should define or have access to the scope of work in order to compile the cost estimate. The information outlined in the scope should be objective and without bias to choose appropriate risk exposure and network element components known at the time of compiling the cost estimate. Useful sources of information the user can rely on include:

– Preliminary investigation, option and scoping reports (internal business documentations)
– Work briefs
– Single line diagrams which depict the project design
– General arrangement diagrams
– TNSP infrastructure asset or construction standards, Australian Standards
– Asset specifications (size, fault level, maximum demand)
– Access route map (desktop analysis)
– Preliminary environmental investigation
– Any other information available.

[1] **Microsoft Word - AEMO TCD report (FINAL 2021-05-07).docx**
[2] **FINAL - 2025 Transmission Cost Database Update Report.docx**

As the project development matures and advances through to final investment approval gates, such information will be re-evaluated and will also be supplemented by further project information. Re-evaluation of the project scope is dynamic and ongoing from a preliminary cost estimate all the way to the final cost estimate and it is the responsibility of the TCD Tool user to conduct these regular updates.

Use of the TCD Tool is not recommended if the user has advanced and definitive project scope details that can identify and easily itemise comprehensive scope of work at bespoke and granular level, such as for Class 3, 2 or 1 estimate levels. In this case, the cost estimate should be compiled using dedicated cost estimation software and a comprehensive risk analysis approach, including expert peer review.

3. Breaking down network infrastructure project into multiple network elements

Network infrastructure project and its overall cost estimate can be disaggregated into multiple distinctive cost estimates grouped by their project attributes and risk characteristics. Each distinctive grouping is a unique 'network element' and a project is made up of multiple network elements. A network element is a group of transmission elements (asset building blocks) which share identical project attributes and risks. At a minimum, and if applicable, a project is disaggregated into the following network elements, corresponding to respective asset categories:

– Station
– Overhead line
– Underground cable.

Determination of a network element's project attributes and risks is based on the scope of work of the project and the unique characteristics of that particular group of asset building blocks. For example, a network element which defines a station may contain a number of asset building blocks, such as switchbays and transformers, which share common project attributes (for e.g., Contract Delivery Model) and risks (for e.g., Environmental Offset Risks). Stations which do not share the same site should be treated as separate network elements.

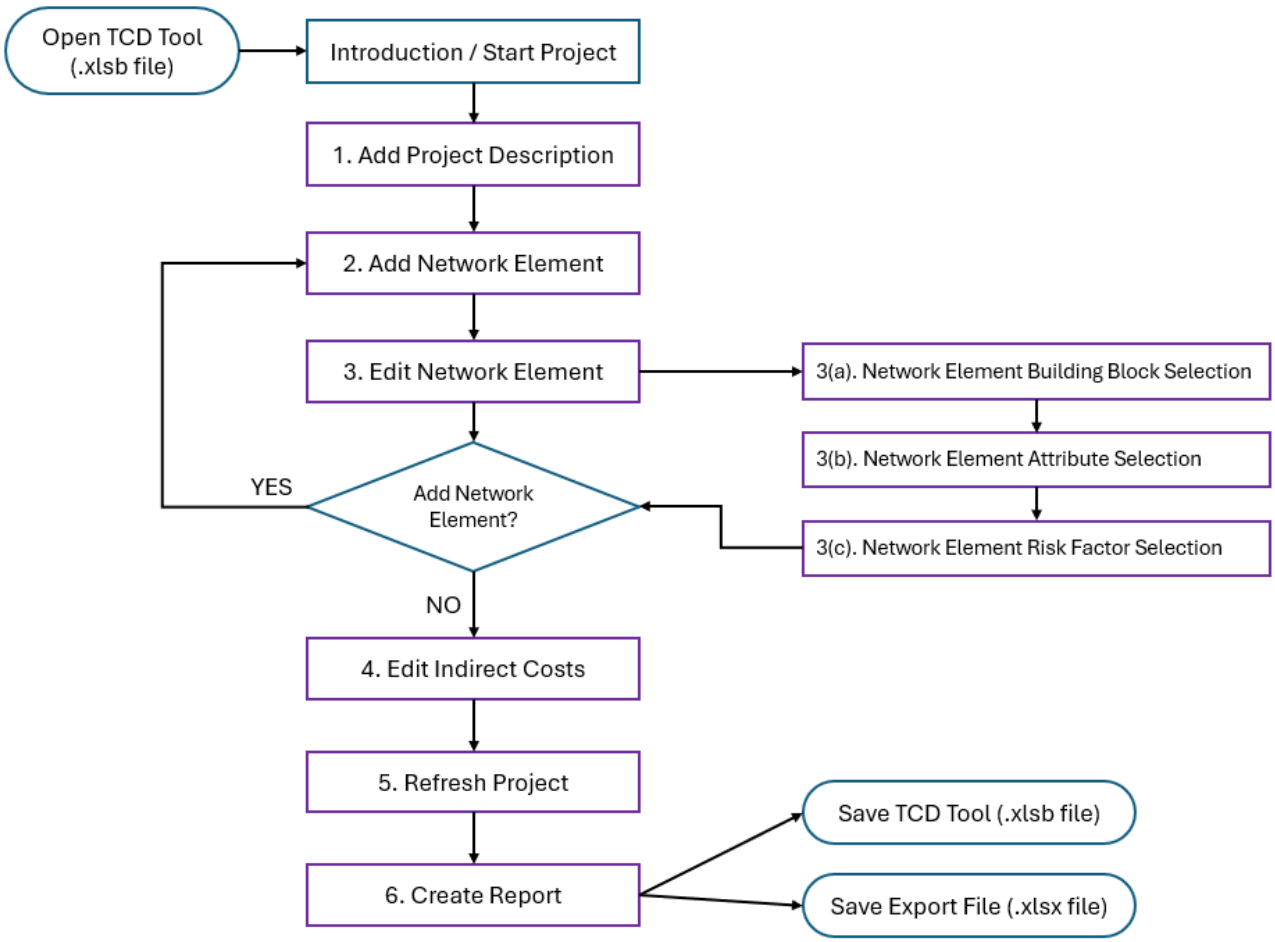
Additionally, where an overhead line can traverse more than one terrain type or jurisdiction. Multiple network elements are required to estimate the full length of the overhead line.

Typically, maturation of a project scope would result in re-evaluation of the number of network elements necessary to develop a project cost estimate. The more defined a project scope is the more likely the user may choose or be tempted to disaggregate the project into more, smaller network elements. Disaggregating a project into multiple network elements is an accuracy vs effort trade-off exercise.

4. Estimate compilation workflow

Compiling project capital cost estimate using the TCD Tool follows a structured workflow which guides the user from opening the TCD Tool to generating a project cost estimate. It is critical that the user follows the TCD Tool's intended workflow to ensure that the project cost estimate is fit for purpose. Figure 1 illustrates an overview of the intended TCD Tool workflow as a flowchart.

Figure 1 TCD Tool workflow



The following section will provide detailed user instructions for each stage to generate a project cost estimate using the TCD Tool.

5. Step-by-step TCD Tool guide

5.1 Step 0: Introduction / start project

1. Enable content

Upon opening the TCD Tool, an Excel security warning popup will appear as shown in Figure 2.

Figure 2 Security warning for enabling macros

It is critical that the user enables content to allow the macros to function. This warning popup may appear repeatedly after closing and reopening the file – please enable each time.

Note: The security warning popup may look different depending on the MS Excel version of the user. Please read the message to ensure that content/macros are enabled.

2. Read introduction message

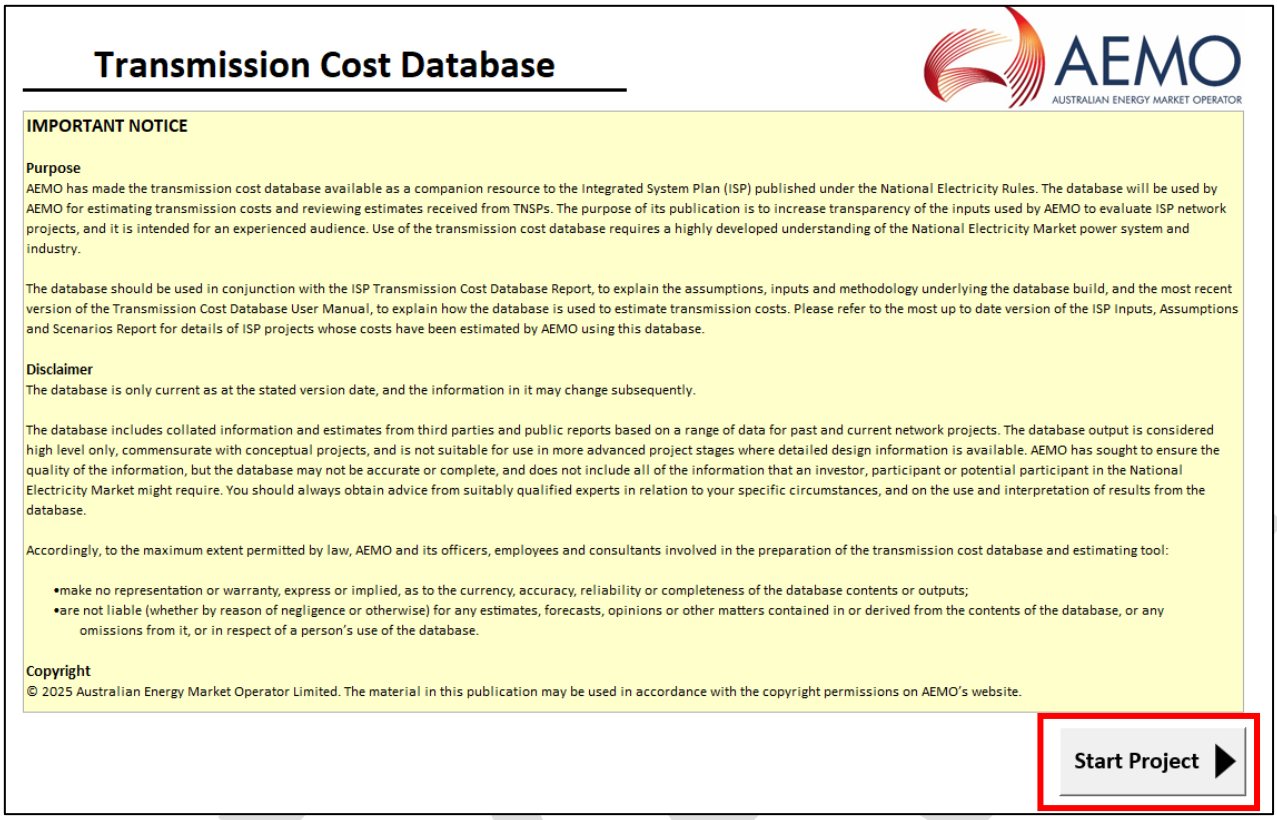
After enabling macros, the TCD Tool will take the user to the *Intro* tab. The page details important information including the purpose, disclaimer and copyright statement.

3. Start project

Note that at any point in this process, the user can save the file and return to it later to complete.

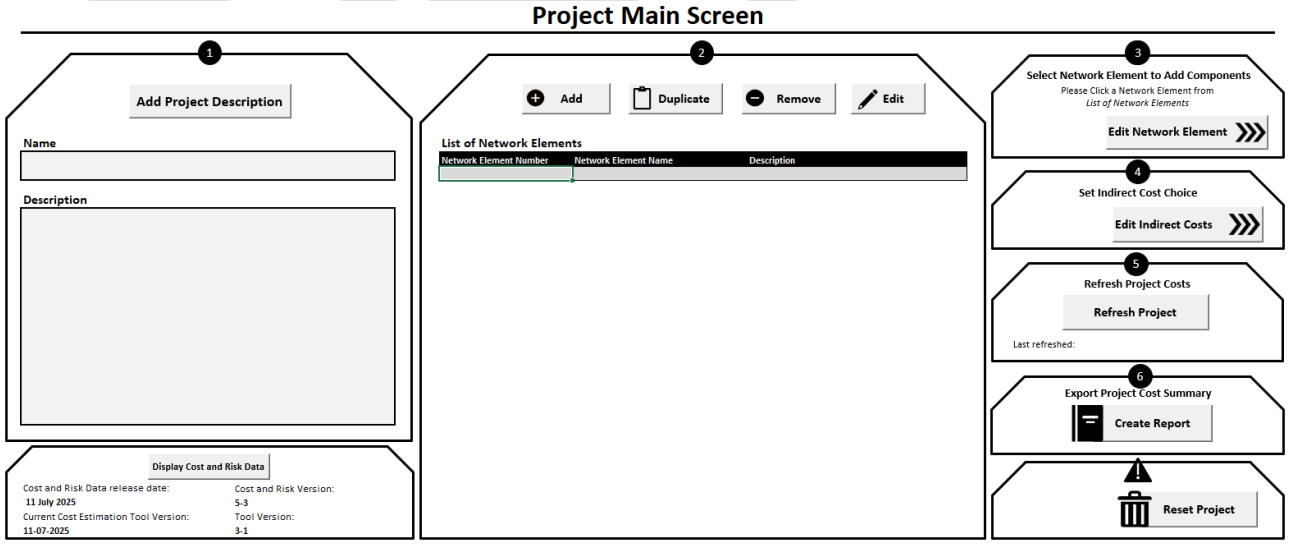
To start building a project, click on the *Start Project* button as shown in Figure 3.

Figure 3 Introduction page



Clicking the *Start Project* button will take the user to the project main screen shown in Figure 4.

Figure 4 TCD Tool main screen

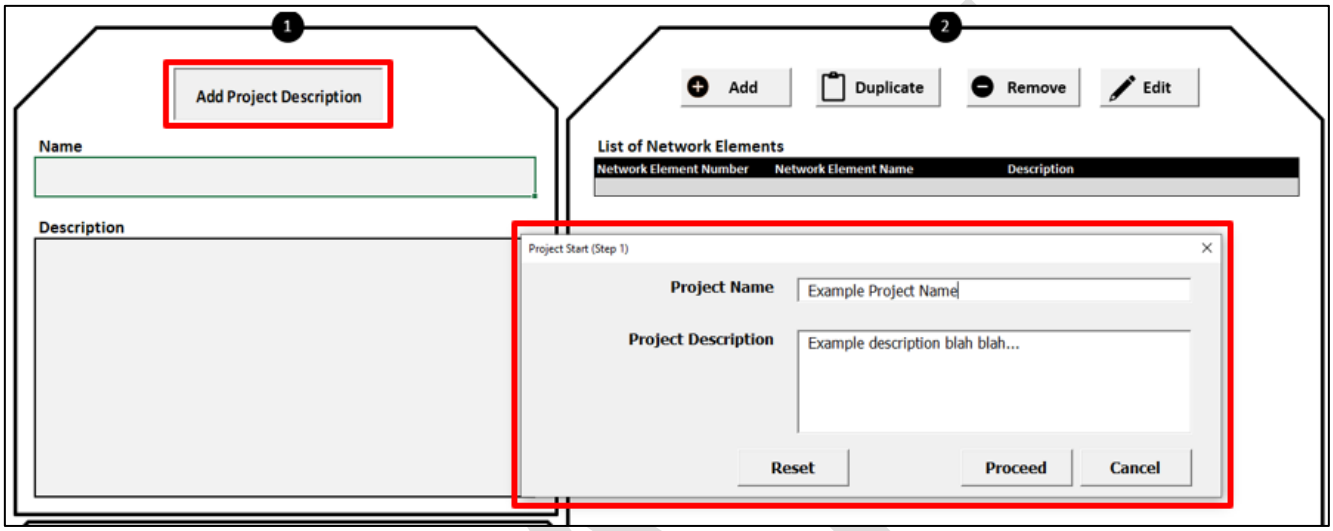


On the project main screen, each section is numbered to help the user navigate the TCD Tool in compiling and creating a project cost estimate.

5.2 Step 1: Add project description

Click on *Add Project Description* to assign a name and description for the overall project. A user form will appear for the user to input the project name and description, as shown in Figure 5.

Figure 5 Adding project description



Click *Proceed* after filling out the name and description fields. The user can clear the current inputs by pressing the *Reset* button. To edit the name and description at a later point, click *Add Project Description* and make amendments. *Note: the project name and description will appear on the generated output reports.*

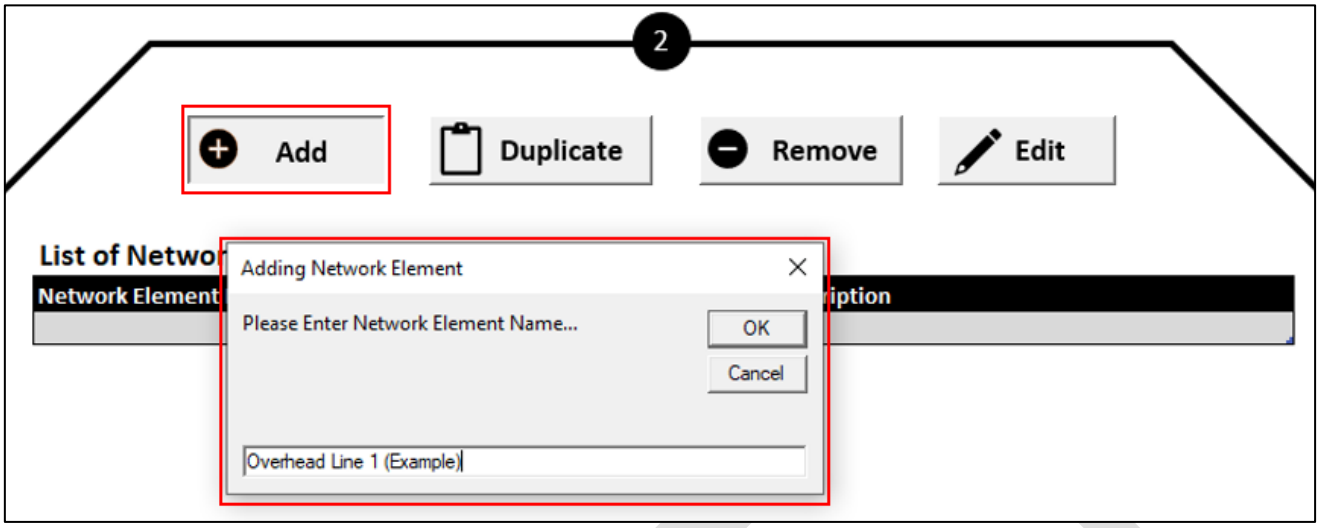
Please refer back to the guidance provided in Section 3 in this user manual at this stage. It is important for the user to appreciate the entirety of the network infrastructure project and note the diversity of asset categories involved and the different project attributes and risk characteristics that the project is exposed to. Based on this knowledge the user is advised to breakdown their network infrastructure project into multiple distinctive network elements. This will allow the user to appropriately enter the relevant and distinct input information for each network element one by one in the TCD Tool.

5.3 Step 2: Describe each network element

1. Add network element

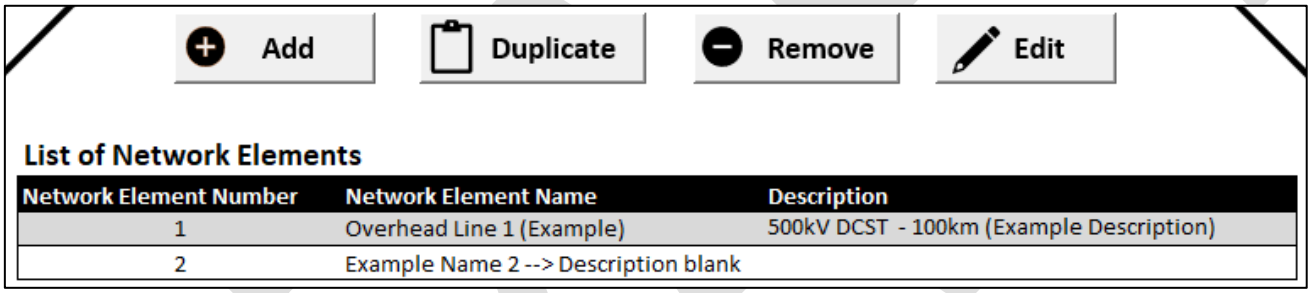
Click *Add* to add a new network element. Two input boxes will appear one after the other, requiring the user to input the network element name and description. Enter an appropriate name and press *OK* – repeat for description. An example is shown is shown in Figure 6.

Figure 6 Adding network elements



After completing the input boxes, the user's entry will appear in the table *List of Network Elements* and a network element number will be assigned as shown in Figure 7.

Figure 7 Table of network elements added



Note: a name must be assigned when adding a network element, a popup will show if a name is not entered. The name does not need to be unique as the tool reads/references the unique Network Element Number. The description can be left blank, however, it is recommended the user enters a description for completeness.

The user has the option to add all network elements at this stage. Alternatively, the user can progressively add and edit network elements. It is suggested that the user complete all entries for the first network element, this is particularly important if the user plans to employ the duplicate functionality discussed below.

2. Duplicate network element

The duplicate functionality of the TCD Tool allows the user to replicate an existing network element and its associated inputs or entries assigned by the user in *Step 4: Edit Network Element*. This functionality is useful in cases where the user has one or more network elements that have largely similar inputs. Instead of adding and editing an entire network element again, the user can duplicate an existing network element and make small amendments to the duplicated network element.

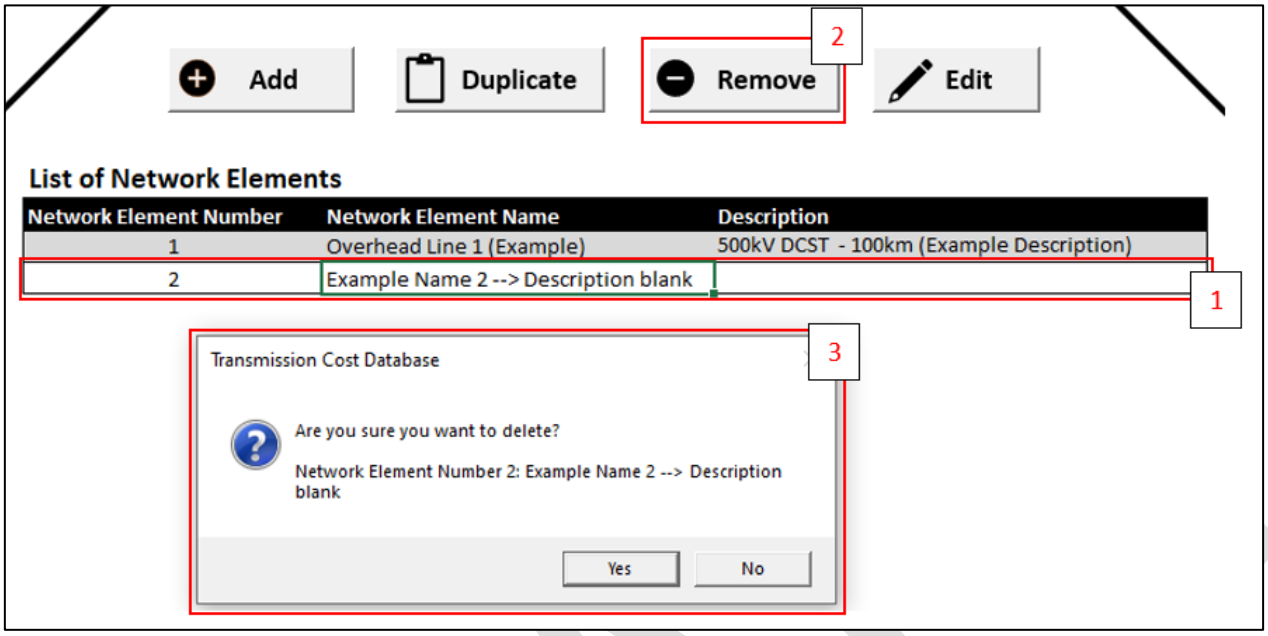
Select the network element to be duplicated by clicking on the corresponding row within the table *List of Network Elements* (can be any column). After selecting the network element, click on *Duplicate*. Two input boxes will appear similar to that of the *Add* functionality. The user will be required to assign a name and description to the new network element.

3. Delete network element

Select the network element to be deleted by clicking on the corresponding row within the table *List of Network Elements* (can be any column). After selecting the network element, click on *Remove*. A confirmation warning will

appear before deleting the network element. Confirm the appropriate network element has been selected and click *Yes* to proceed with the deletion. If the user made the wrong selection or no longer wishes to delete the network element, click *No* to cancel. This is shown in Figure 8.

Figure 8 Removing network elements



The network element and all user inputs that had been assigned to this network element number in *Step 4: Edit Network Element* will be permanently deleted. The user must be cautious when removing network elements, as the cost estimation tool cannot recover the network element and associated entries once deleted.

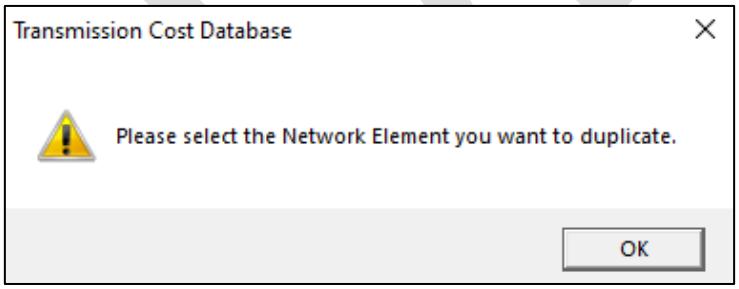
4. Edit network element

Select the network element to be edited by clicking on the corresponding row within the table *List of Network Elements* (can be any column). After selecting the network element, click on *Edit*. The input boxes from the *Add* button will appear. Make changes to the name and description and press *OK*. The changes will be updated within the *List of Network Elements*.

5. Tips / caution

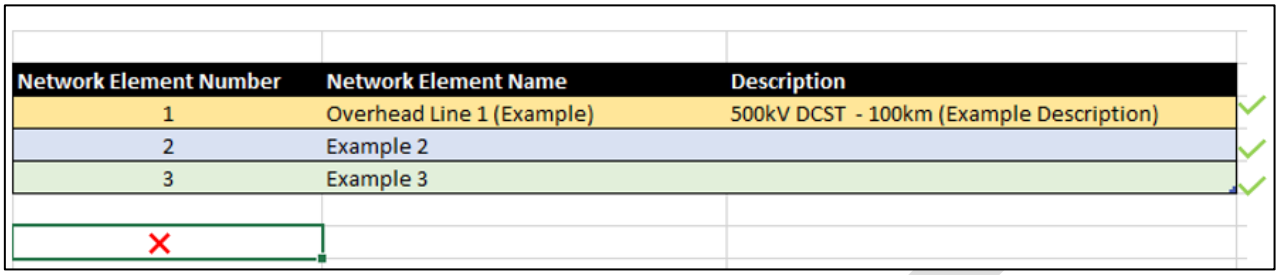
For the *Duplicate, Remove* and *Edit* buttons, an error will occur if the user has not selected an appropriate cell within the *List of Network Elements*. The error message can be seen in Figure 9.

Figure 9 Invalid cell selection warning



In the example shown in Figure 10 below using three network elements, to duplicate/remove/edit the user must click on any of the yellow cells Network Element 1 (blue cells for Network Element 2 and light tan for Network Element 3). Any other cell selection will lead to the above error. Press *OK* on the error message to proceed and click the appropriate cell before using the duplicate/remove/edit functionalities.

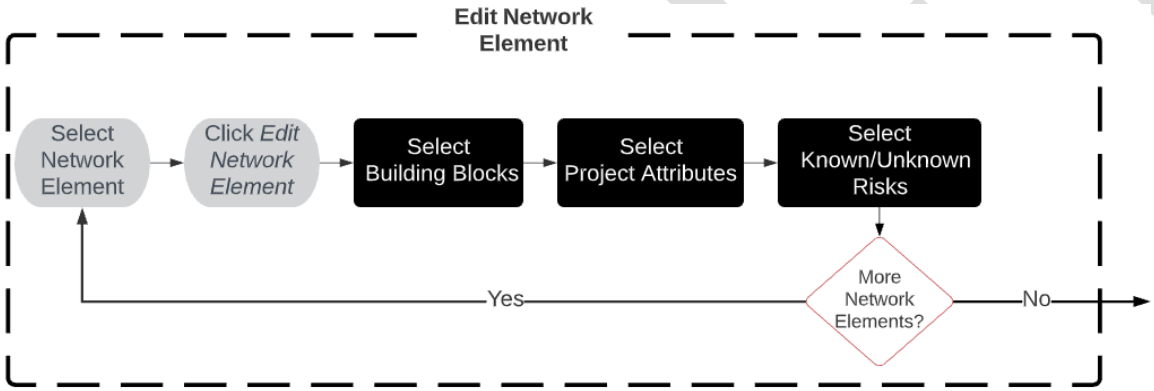
Figure 10 Example of valid and invalid cell selection



5.4 Step 3: Edit network element

This step involves choosing the appropriate asset building blocks that forms the network element, inputting the quantities, selecting project attributes and risk factors for the nominated network element in the table *List of Network Elements*. This step will guide the user through different screens for each assignment. The workflow of this stage can be seen in Figure 11.

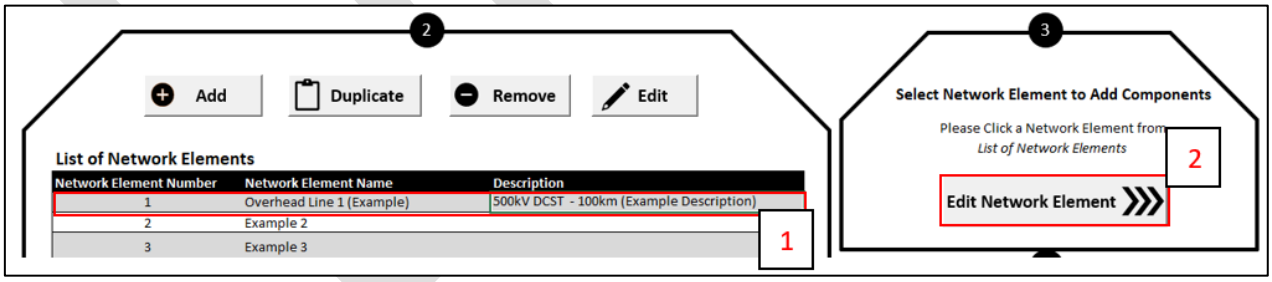
Figure 11 Editing network elements flowchart



1. Select network element to edit

Select the network element to be edited by clicking on the corresponding row within the table *List of Network Elements* (can be any column). After selecting the network element, click on *Edit Network Element* as shown in Figure 12.

Figure 12 Selection of network element to edit



The TCD Tool screen will switch from the *Project Main Screen* to *Building Block Selection* screen.

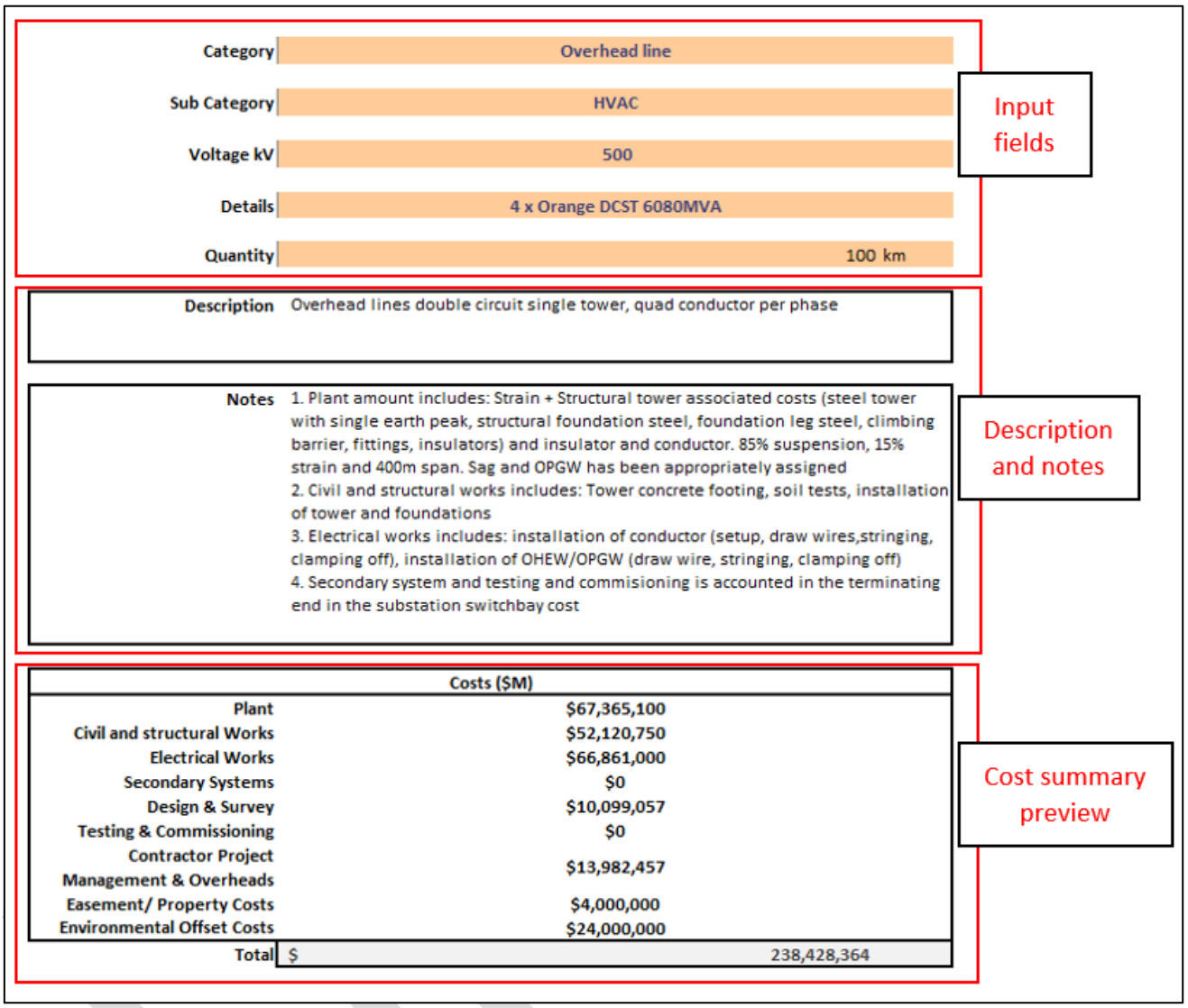
2. Select asset building blocks

a) The selected network element number, name and description will appear on the top left of the screen. The user should verify that the appropriate network element has been selected prior to assigning inputs.

b) The five orange cells are user input fields and a dropdown list will appear upon clicking within the cells. The user must select the inputs from top to bottom (i.e. starting with *Category* and ending with *Quantity*). Upon

selecting an input for each input field, a description and set of notes will appear for the corresponding selection. The description and notes serve the purpose of aiding the user with the selection process. Furthermore, the cost summary preview table on the bottom-left will be populated based on the selected building block and quantity. This is shown in Figure 13.

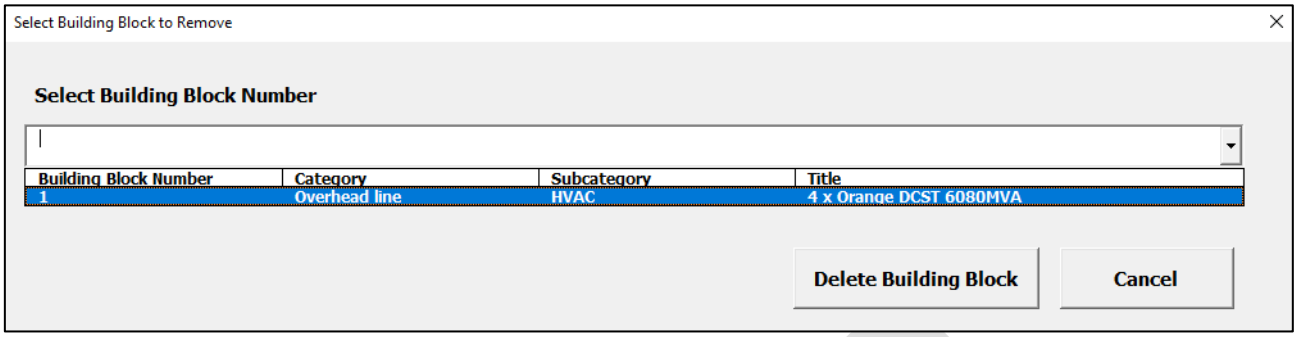
Figure 13 Asset building block selection



c) After filling out the input fields and verifying that the appropriate selection has been made, click on the ⊕ button. The selected asset building block will be added to the user selection table on the right of the screen. Repeat *step a)* to *step b)* to add all relevant asset building blocks to the selected network element.

d) To delete a selected asset building block, click on the ⊖ button. A popup will appear as shown below in Figure 14.

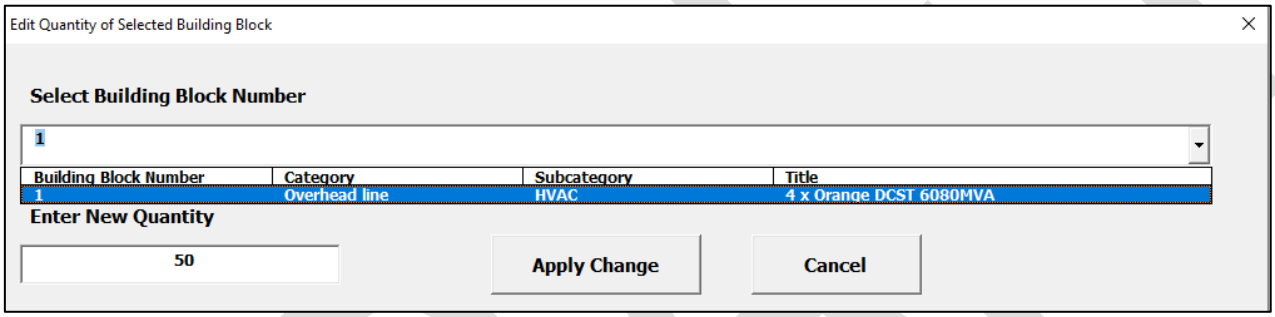
Figure 14 Removing a selected asset building block



Select the asset building block from the dropdown list to be deleted and click *Delete Building Block*. A confirmation popup will appear, click *OK* to proceed delete the selected asset building block.

e) To change the quantity of a selected asset building block, click on the ✎ button. A popup will appear as shown in Figure 15.

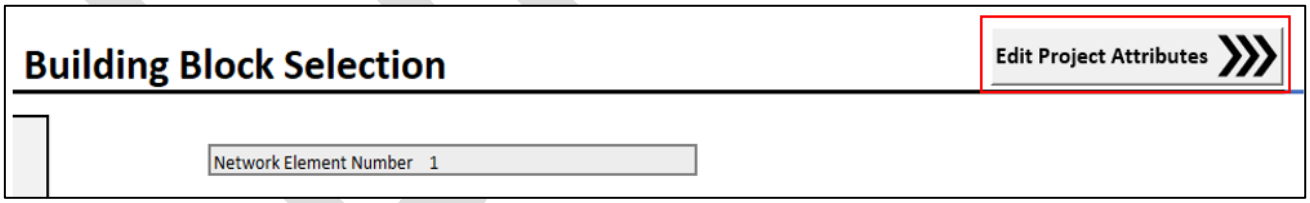
Figure 15 Changing the quantity of a selected building block



Select the asset building block and enter the new quantity to be applied for the asset building block. Click *Apply Change* and click *OK* on the confirmation popup. The quantity and total cost for the edited asset building block will be updated in the list of selected asset building blocks on the right. *Note: If an asset building block is no longer needed, it is recommended to delete the building block, avoid setting the quantity to zero. If the quantity is set to zero, it cannot be edited to a non-zero quantity in the future.*

Once the user has entered all asset building blocks to the selected network element click on the *Edit Project Attributes* button on the top-right of the screen as shown in Figure 16.

Figure 16 Progressing to next screen/step (to editing project attributes)



The TCD Tool screen will switch from the *Building Block Selection* screen to the *Network Element Attribute Selection* screen.

3. Select project attributes

Adding project attributes to the selected network element follows a similar process to adding asset building blocks. Refer to the steps in *Select Building Blocks*. The key differences are that there is:

– Less input fields
– No edit quantity button

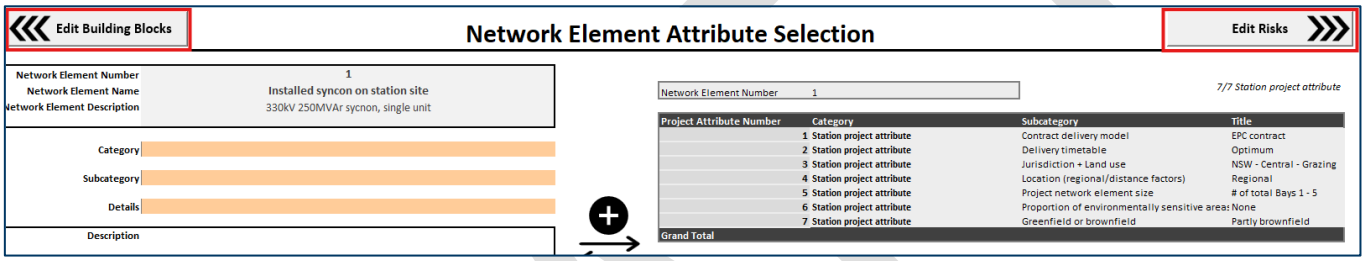
– A progress update is available above the table of included project attributes which assists the user to know how many project attributes have been assigned and how many have not yet been assigned.

It is important to refer to the most relevant sources of project information describing the characteristics of the network elements and the environment it is being built on objectively and accurately.

The user should also consider the overall project size (for e.g., length of line, number of bays) when making judgement on the 'project network element size' project attribute (i.e., economy of scale factor) for each individual network element. For example, consider the entirety of the overhead line project size, instead of focusing only on a specific segment (i.e., network element) of the project if the project is being delivered in entirety by contracted parties.

Once the user has entered all project attributes to the selected network element click on the *Edit Risks* button on the top-right of the screen. The user also has the ability to return to the previous step to *Edit Building Blocks* if they need to. This is shown in Figure 17.

Figure 17 Progressing to next screen/step (edit risks) or returning to previous screen/step (edit building blocks)



4. Select known / unknown risks

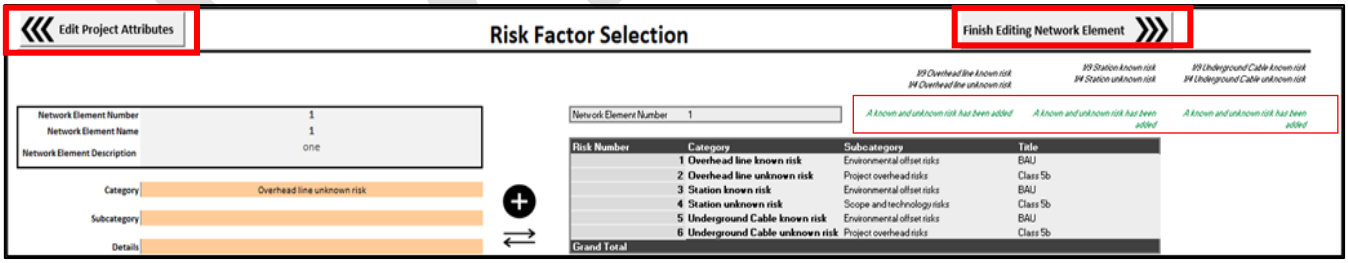
Adding risks to the selected network element follows a similar process to adding project attributes. Refer to the steps in *Select Project Attributes*. The key differences are that there are:

– Two categories for each of station, overhead line, and underground cable (known risks and unknown risks)
– Two progress counters above the inclusion table.

It is important to objectively choose the most appropriate level of risk exposure, considering all the available information at the time of compiling the cost estimate.

Once the user has entered all relevant risk factors (i.e., all set known risks and all set of unknown risks for the given asset category) to the selected network element click on the *Finish Editing Network Element* button on the top-right of the screen. The user also has the ability to return to the previous step to *Edit Project Attributes* if they need to. This is shown in Figure 18.

Figure 18 Progressing to next screen/step (finish editing network elements) or returning to previous screen/step (edit project attributes)



Note: The TCD Tool requires at least one known and one unknown risk to be added per network element. When both are present, green text will appear to confirm that the requirement has been met. If only one type of risk is entered (either known or unknown), red text will appear to prompt the user to add the missing risk type.

5. Repeat Steps 1 – 4

To edit another network element, repeat steps 1 – 4.

Note: The user can re-edit a network element by clicking on the network element on the main screen and clicking the Edit Network Element button.

6. Guidance on selection of project attributes/risk factors

The TCD Tool provides detailed descriptions and notes to assist the user to select the appropriate project attribute and risk factors for each network element.

Each project attributes have multiple choices that describes, either qualitatively or quantitatively, the various aspects of the given scope of work such as the size of the work, site geography, interface issues, delivery timing, contractual arrangements etc. that have impact on costs.

Most known risk has three levels of choice, one defined as 'Business as Usual' and two others for varying levels of risk. The use of BAU for such known risks is considered the default selection where the user has no additional information about these risks. The environmental offset risk has four levels of choice with the use of BAU choice considered the default selection where the user has no additional evidence that specifically suggest otherwise.

For unknown risks, the default selection is Class 5b, as the TCD has been developed primarily for production of Class 5b estimates that is commensurate with early stage conceptual network option to inform the development of Integrated System Plan (ISP). Class 5a or Class 4 may be selected for unknown risks if additional engineering design work, site survey, corridor route analysis etc. has been carried out thereby providing more mature project specifications, environmental constraints and risk exposure descriptions. Such relatively mature project knowledge should enable the TCD Tool user to compile project scope with well-defined and distinct network elements and asset building blocks itemised with greater level of confidence and accuracy. The TCD Tool user is advised to refer to Appendix A1 Cost Classification Checklist of AEMO's 2021 Transmission Cost Report[3] to seek guidance on which class of estimate to compile (i.e., unknown risk factor choice selection) for a given project scope details.

Class 3/2/1 is intended for AEMO use only, for internal cross-checking of TNSP estimates of projects at advanced stages. These classes of estimate should not be selected by non-AEMO TCD Tool user, especially when the network infrastructure project scope is known or described in a mature and definitive fashion.

The TCD Tool user should read and understand the factor and choices available to them and choose the most appropriate one that closely matches their project. Given the prerequisites as stated in the beginning of this user manual, and the detailed descriptions and notes provided for every project attributes and risk factors and their choices, the TCD Tool user is expected to select the appropriate choices accurately reflecting the characteristics of their project. The phrasing and style of the provided descriptions and notes are intuitive and includes commonly used industry wordings to allow this.

5.5 Step 4: Edit indirect costs

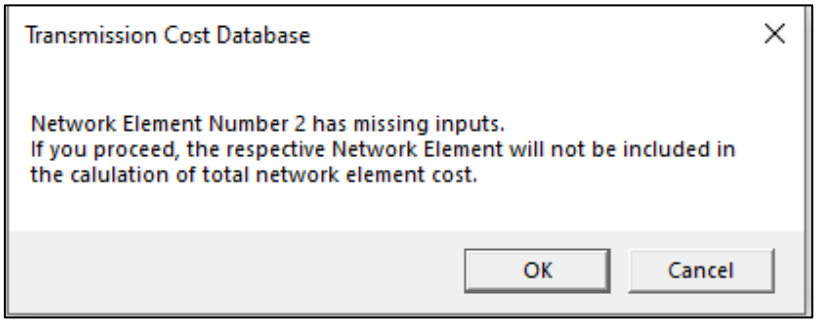
1. Edit indirect costs

Once the user has finished editing all network elements, click on *Edit Indirect Costs* in the TCD Tool main screen. The TCD Tool will load the *Indirect Cost Selection* screen. The time taken to load will vary depending on the number of network elements and associated inputs for the project.

Note: If the user clicks Edit Indirect Costs and has not assigned at least one entry for building blocks, project attributes and risks, a warning message will appear as shown in Figure 19.

[3] **transmission-cost-report.pdf**

Figure 19 Indirect cost warning message



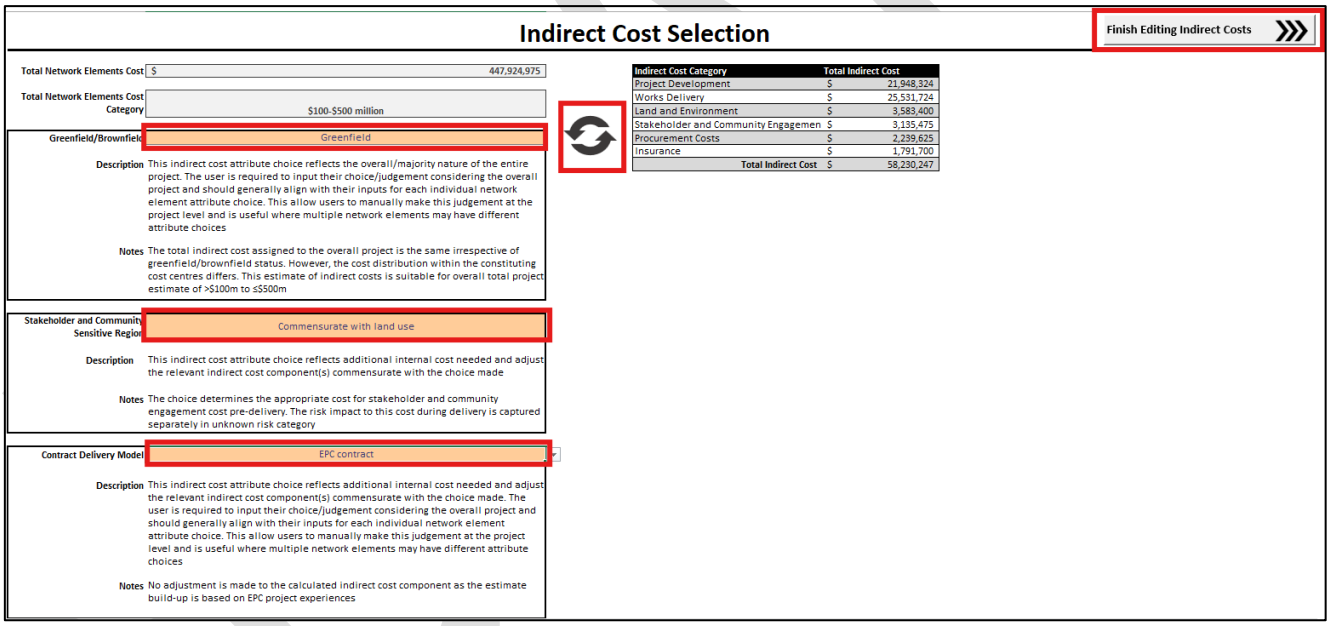
The user has the option to proceed and exclude the network element from being included in the cost estimate, or to cancel and finish assigning inputs.

Note: If the clicks 'Edit Indirect Costs' and a known and unknown risk has not been assigned to each network element, an error pop-up will display. This indicates the user must assign a known and unknown risk for each network element.

2. Select indirect cost fields

On the *Indirect Cost Selection* screen, select the appropriate inputs from the dropdown list in a similar manner to *Add Building Blocks*. The choices selected should reflect the overall network infrastructure project in general. This is shown in Figure 20.

Figure 20 Indirect cost selection input fields and choices



After inputting all fields, click on the button to refresh the indirect costs. The summary of the indirect cost categories will be updated on the right of the screen.

IMPORTANT – If the user makes ANY changes to the network element inputs (asset building block/project attributes/risks) in a later revision, the user MUST click the refresh button again to update the indirect costs. The exported project cost summary WILL NOT reflect the correct indirect costs if the user does not update the values prior to exporting.

Once the user has updated the indirect costs, click *Finish Editing Indirect Costs* to go back to the *Project Main Screen.*

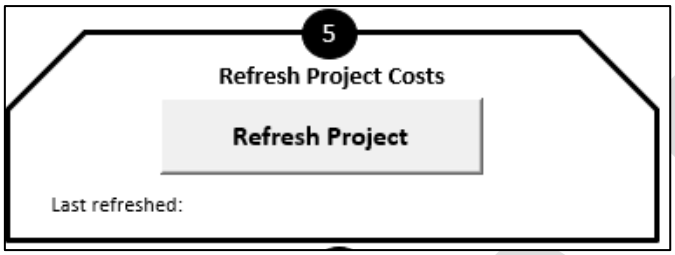
5.6 Step 5: Refresh project

The Refresh button, located on the main screen, updates all cost and risk values based on the current user inputs. It checks that each network element includes at least one known and one unknown risk, then recalculates building blocks, adjustments, and indirect costs.

Users should click Refresh Project button after making changes to quantities, risk selections, or indirect cost inputs to ensure the project outputs are up to date. Any issues found when this button is clicked will be listed to guide corrections.

Note: When a user clicks 'Refresh project' and a known and unknown risk has not been assigned to each network element, an error pop-up will display. This indicates the user must assign a known and unknown risk for each network element.

Figure 21 Refresh project button on TCD Tool main screen



5.7 Step 6: Create report

When the user has finished adding network elements, editing every network element (with project attribute and risk factors), and updated the indirect costs, click *Create Report* on the *Project Main Screen* as shown in Figure 22. The button will create a project cost estimate in a separate Excel workbook based on the user's inputs.

Figure 22 Create report button on TCD Tool main screen

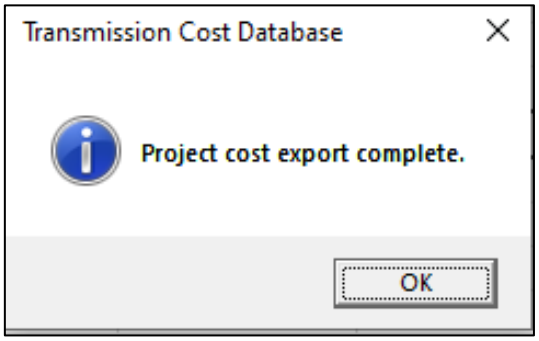
The time taken to load will vary depending on the number of network elements and associated inputs for the project.

Note: A similar warning message associated with the Edit Indirect Costs button will appear if the user has not assigned at least one entry for building blocks, project attributes and risks. If the user chooses to proceed, the exported project cost summary will omit any network element that has missing entries.

Note: If the clicks 'Create Report' and a known and unknown risk has not been assigned to each network element, an error pop-up will display. This indicates the user must assign a known and unknown risk for each network element.

When the TCD Tool has finished processing the data, a user alert message will appear as shown in Figure 23.

Figure 23 Alert message indicating completion of exporting outputs



Click *OK* to view the exported Excel workbook containing the project cost summary. The exported file will consist of three different project cost summary formats: *Output A, Output B* and *Output C*. It is recommended that the user reviews their entries for each network element by referring to *Output C* which is a detailed cost breakdown of each network element, prior to the addition of indirect costs. *Output A* is a summary view showing the total cost for each network element, inclusive of adjustments and risks, with the addition of indirect costs. *Output B* is a summary view showing the total baseline cost for the project, adjusted baseline cost (which modifies the baseline cost based on project attributes), known risk allowance, unknown risk allowance and indirect costs.

It is also recommended that the user saves both the TCD Tool workbook and the exported project cost summary workbook for future reference. Furthermore, the saved TCD Tool workbook can be edited by the user to add/remove entries in future revisions to create new project cost estimate reports.

5.8 Checklist

The checklist in Table 1 provide prompts to the user before and while using the TCD Tool to compile their network infrastructure project capital cost estimates.

Table 1 TCD Tool user checklist

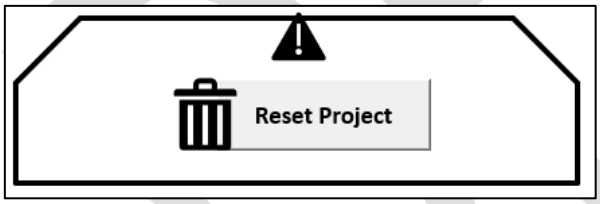
Prior to using the TCD Tool		
1	Define project scope	– What is the scope of the network infrastructure? For e.g., to transfer MVA from location A to location B and involves an overhead line and switchyard and voltage transformation works at the two ends
2	Define key inputs and design	– Where are the station sites located? This will include a conceptual or preliminary single line diagram – Overhead line route? The general characteristics of the easement and the terrain it traverses through from desktop observation
3	Identify key network elements	– Segregate the project scope by asset categories (stations, overhead lines and/or underground cables) – Within the same asset category, segregate and organise the project scope by distinctive characteristics between them (different site, different terrain type, different work type, different risk exposure etc.)
4	Determine the maturity of the input information	– Appreciate the state of the project development and the certainty of the available input information – Refer to paragraph 6 in Section 5.4 (titled “Guidance on selection pf project attributes/risk factors”) of this user manual – Determine the appropriate unknown risk factor to apply to the compiled cost estimate commensurate with the available input information
Using the TCD Tool		
4	Have you added the project network elements?	– Check that you have added each key network element on the project main screen
5	Does your cost estimate include overhead lines?	– Check that you have added all associated overhead line asset building blocks that describe the scope of the given network element. Note that asset

		building blocks within the overhead line asset category is summarised in an overall $/km, except for line diversion asset building block which is summarised in lot – Check that you have only applied overhead line project attributes to this network element – Check that you have only applied overhead line known and unknown risk factors to this network element
6	Does your estimate include station components?	– Check that you have added all associated station asset building blocks that describe the scope of the given network element. Note that majority of asset building blocks within the station asset category is summarised logically based on asset class – Check that you have only applied station project attributes to this network element – Check that you have only applied station known and unknown risk factors to this network element
7	Does your estimate include underground cable components?	– Check that you have added all associated underground cable building blocks that describe the scope of the given network element. Note that asset building blocks within the underground cable asset category is summarised in an overall $/km – Check that you have only applied underground cable project attributes to this network element – Check that you have only applied underground cable known and unknown risk factors to this network element
8	Have you applied all project attributes and risk factors?	– Check that you have correctly applied project attributes and risk factors for each network element
9	Have you updated the indirect costs prior to exporting?	– Check that you have selected the appropriate indirect cost categories and that you have refreshed the costs
10	Did you click the *Refresh Project* button prior to exporting?	– Click the *Refresh Project* button on TCD Tool project main screen prior to creating and exporting the output estimate result

5.9 Reset project

At any point the user can clear all inputs to TCD Tool by clicking the '*Reset Project'* button as shown in Figure 24.

Figure 24 Reset project button on project main screen



Numerous warning messages will appear requiring user confirmation to proceed with resetting the project workbook.

IMPORTANT – Once the project has been reset, the user CANNOT recover the data.

6. Qualification of generated cost estimates

The description below is copied from Section 10 of GHD's 2021 TCD Report[4] for ease of reference.

Given the characteristic and basis of the underlying variables that constitute the Cost and Risk Data workbook, the TCD Tool generated cost estimate is made up of the following:

[4] **Microsoft Word - AEMO TCD report (FINAL 2021-05-07).docx**

– Selection of a number of asset building blocks which are described at a reasonably high level (e.g. $/km of underground cable infrastructure, instead of dollar per every individual cost item that constitute the underground cable infrastructure). Diligent care has been taken to document such unit rates at a high level and in a standardised manner by removing allowances for site/project specific design, bespoke scope elements and risks
– The cost estimate for these asset building blocks or baseline estimates are adjusted based on specific project characteristics or project attributes of the network elements as selected by the user
– Known risk allowances are added to the adjusted baseline estimate to match the project risk exposure as considered by the user for each network element
– Unknown risk allowances are added to the adjusted baseline estimate to compensate for the accuracy offset commensurate with early stage costs recently observed in NEM transmission project estimates
– Indirect costs are then added to the sum of all network element cost estimates which are inclusive of their respective project attribute and risk adjustment factors based on the nature of the overall project.

As the project planning matures, its capital cost is compiled at Class 3/2/1 estimate levels and correspondingly the accuracy range starts to narrow (i.e., estimate becomes more definitive). Many uncertainties from the early stage becomes known and can either be defined as a new scope of work or new set of building block or contracted to the party best able to handle it. Advanced stage estimates will also likely need new sets of unique asset building block unit rates commensurate with such Class 3/2/1 estimate levels that captures site/project specific designs, bespoke scope elements, and allowances to own and manage identified risks. Such a new set of asset building block unit rates also needs to be treated with new and definitive sets of quantity inputs. Accordingly, a new set of asset building block costs need to be treated with refreshed adjustment factors that may not been previously incorporated in the new asset building block unit rates. It is for these reasons the use of the TCD Tool is not recommended if the user has advanced and definitive project scope details that can identify and easily itemise comprehensive scope of work at bespoke and granular level, such as for Class 3, 2 or 1 estimate levels.

The TCD Tool is presently set-up with inputs to produce Class 5b/5a/4 cost estimates only. The user needs to diligently input and choose their selections in the TCD Tool accordingly.

Provided the inputs to the TCD Tool are carefully entered and the variable choices diligently selected so that they are compatible with the intended use of the TCD Tool, the generated cost estimate comes with the following qualifications:

– The output is a Class 5b/5a/4 cost estimate and therefore suitable for conceptual or early stage of project development
– The output is a point estimate calculated in a deterministic or parametric fashion. In other words, it is not a ‘P-’ estimate and does not have any associated statistical qualification (confidence level, probability distribution functions, standard deviation etc.). No stochastic simulation is involved in the TCD Tool estimation process
– The output has ±50% (Class 5b) or ±30% (Class 5a) or ±20% (Class 4) accuracy range
– The output is the ‘best estimate’ with an aim of being equally under and over the expected costs in an advance cost estimate. The early stage cost estimate output aims to align itself closely to the 0% cost accuracy axis. Refer to Section 8.4 of GHD’s 2021 TCD Report[5] and Section 2.4 of GHD’s 2025 TCD Update Report[6]
– The output should be applied as a mid-point estimate with the above qualifications for the ISP modelling purpose
– The asset building block costs are in Australian dollar in a specific year real term value. Refer to the Cost and Risk Data version history in the TCD Tool project main screen to note the date/year for real term value. Accordingly, the output is in that year Australian dollar term
– The output represents contemporary Australian construction environment, asset and design standards, industry and business practices, regulatory framework, commercial rules, labour laws and safety regulations
– The output represents stable social, political and environmental conditions that Australia has experienced in recent years

[5] **Microsoft Word - AEMO TCD report (FINAL 2021-05-07).docx**
[6] **FINAL - 2025 Transmission Cost Database Update Report.docx**

– The output represents efficient preliminary investigation, project development, project management, competitive tendering, site management and contractual arrangements.

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