Connections Simulation Tool

Connections Simulation Tool Industry Working Group (CSTIWG)

Session 2
9th December 2021

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

We pay our respects to their Elders past, present and emerging.

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Agenda

#	TIME	TOPIC	PRESENTER
1	5 mins	Welcome	Siham Knowles
2	10 mins	Feedback received	Alistair Wells
3	15 mins	Features	Alistair Wells
4	15 mins	Process	Alistair Wells
5	15 mins	Demo	Chris Graham
6	15 mins	User experience and functionality	Alistair Wells
7	10 mins	Technology and results	Alistair Wells
8	15 mins	Pricing structure	Dave Lenton
9	15 mins	Network visibility	Elliott Kuhlmann
10	5 mins	Next steps and close	Alistair Wells

Online Forum Housekeeping

Please mute your microphone, this helps with audio quality as background noises distract from the information being shared.

Join the conversation or use the “raise hand” function for any questions or comments

Be respectful of all participants and the process.

We will record this session for note taking purposes.

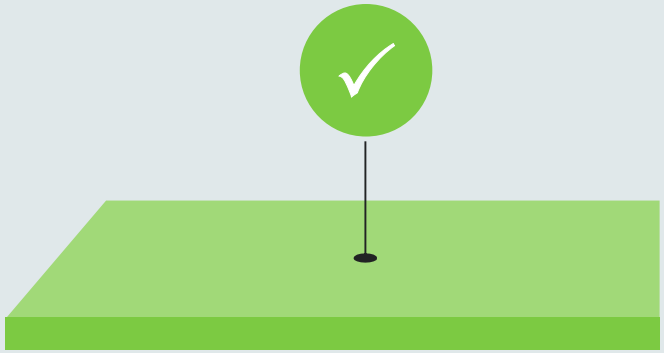
This presentation and the associated high-level summary of the meeting will be uploaded to the AEMO website

The meeting will adhere to the AEMO Competition Law Meeting Protocol outlined in the appendices

Information in this presentation is indicative and subject to change throughout the development of the solution and into operations

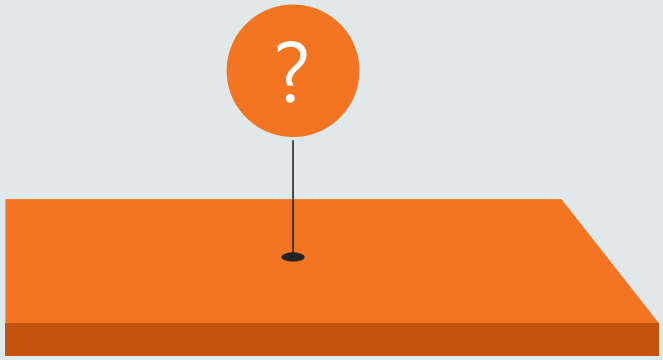
Your Feedback

Thank you for your feedback from the last session. An assessment was undertaking and is summarised below.



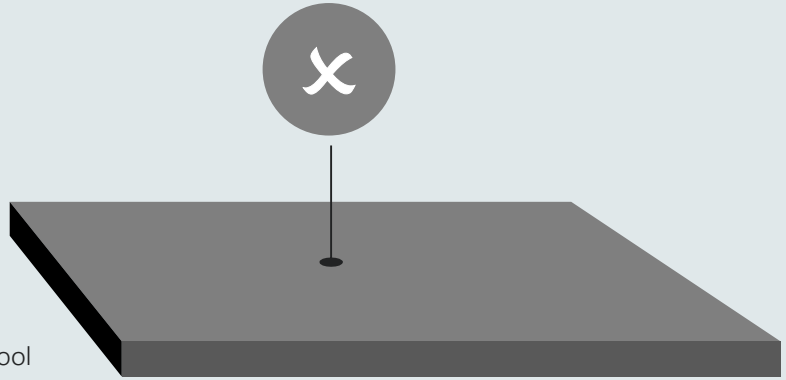
Supported in Release 1 (R1)

- Studies on plants in the early development a project
- Studies on changes to existing plants
- Projects that are high risk, large or of long duration
- Tool fees are being calculated on a cost recovery basis and consider a number of factors including complexity of submitted model and duration of the use of the tool.



Currently under assessment for R1

- Ability for OEMs to test equipment
- Set up time (eg time lapsed between request and the tool being available for studies) to be within 2 weeks
- We are working with NSPs to determine
  - Parameters of the network that are visible and adjustable (particularly load flow)
  - The ability to undertake studies in different grid situations (eg strong, medium or weak grid)
  - Provide users with a PSSE snapshot that mimics the PSCAD wide area model network conditions



To be considered in future releases.

- NSPs as a user of the tool
  - They would require the ability to update model data per their own records.

For more details see Appendix 2

Connections Simulation Tool Survey – Facts and Figures

Industry agree with the value of the tool. The survey reinforced and added substance and data to the direction AEMO was already taking. Highest priorities relate to network visibility options that we are determining in conjunction with NSPs

Survey Responses

10 responses over 8 organisations

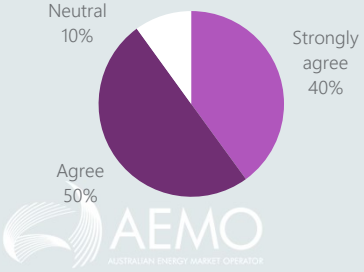
Current Process

Models: 2-12 iterations

Connections process: 6 mths -4 years

Value

Perceived industry value of the tool

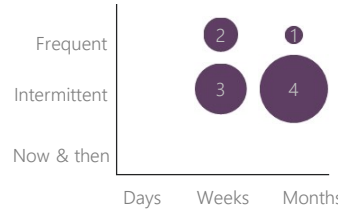


Predicted Use

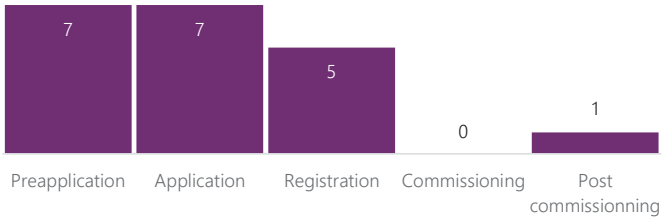
Desired availability: 6 weeks to 6 months (average 11 weeks) per project

Average users per organisation: 2

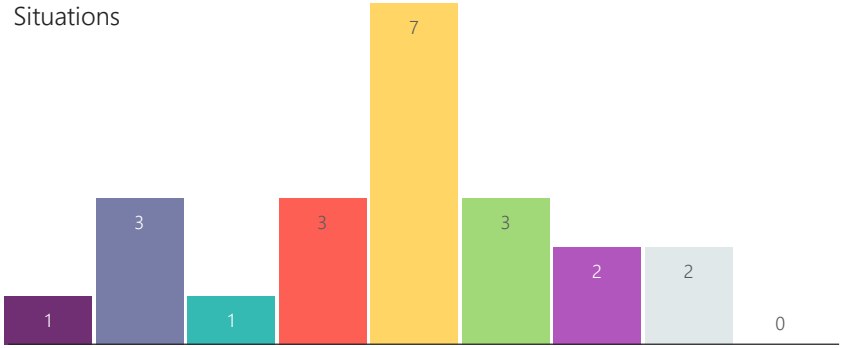
Usage pattern



Alignment to Connections Stage



Situations

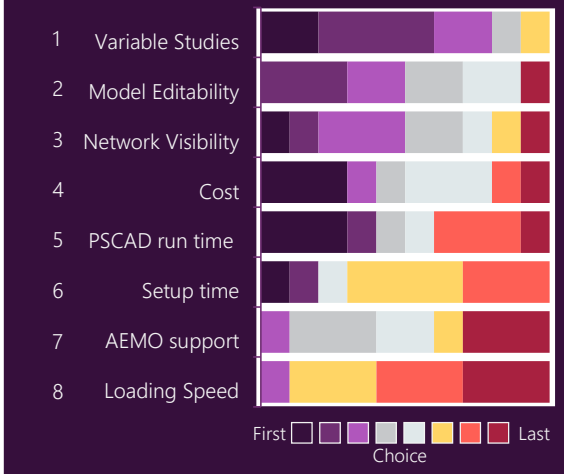


- All projects
- High risk projects
- Large projects
- Technical complex projects
- Projects with low SCR connection
- When using novel technology
- Upon client request
- Validate operational changes
- None of the above

Purpose

- Preapplication proof of concept work
- Connections studies work (GPS assessment)
- Model tuning and validation
- Connections process risk mitigation
- Support of RIT-T process

Priorities



Desired Features

- Ability to set up specific study cases
- Ability to manipulate network conditions
- Plotting functionality
- Study automation

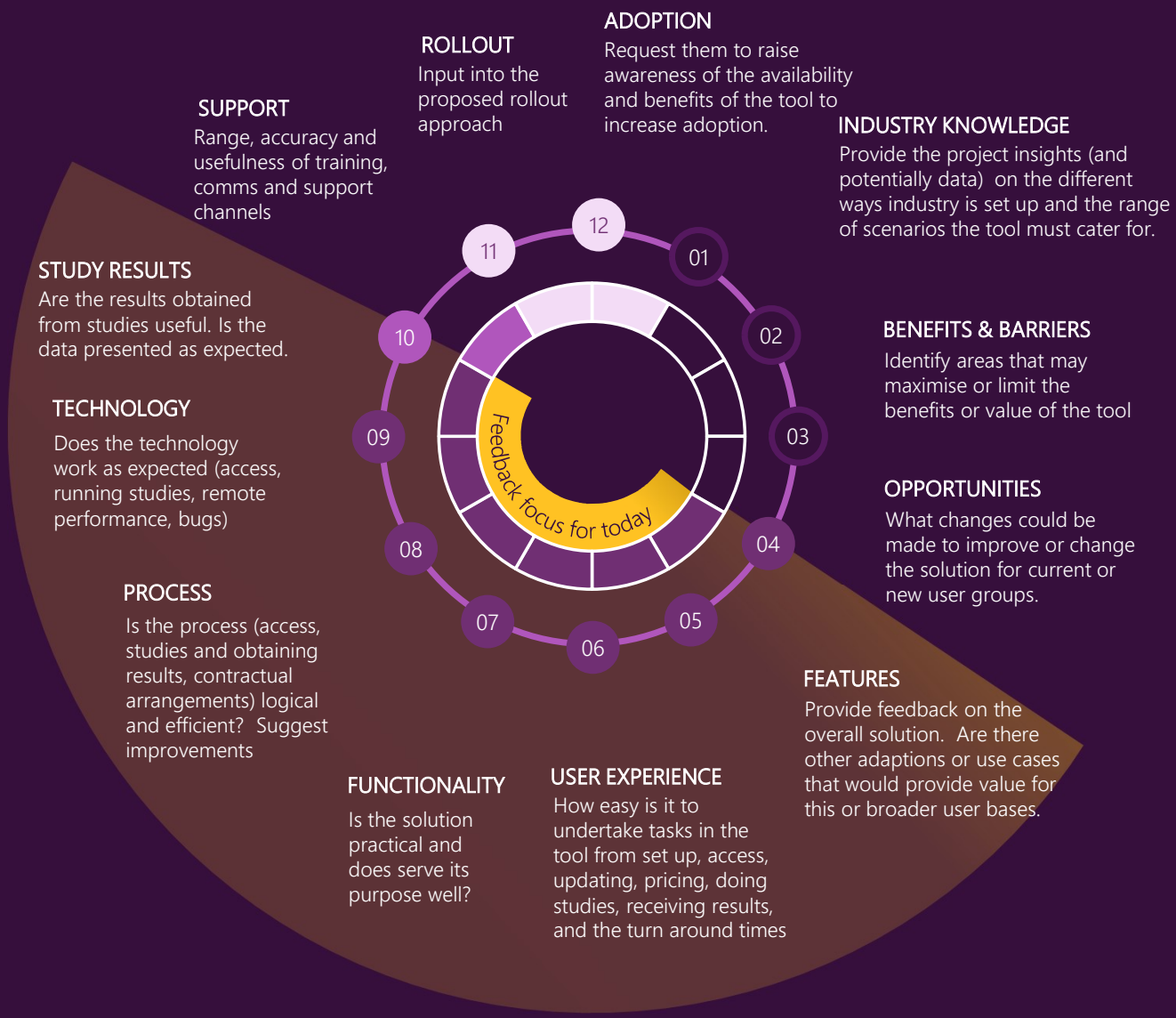
Concerns

- Confidentiality obligations must be met
- POC quantities of non-committed generation should be hidden
- No access beyond a generator's POC

Feedback

1. Do you have further feedback following the last session
2. Today please consider the following feedback areas
   - Features
   - Process
   - Functionality and User Experience
   - Technology
   - Results

We will also look at the pricing model and network visibility options



Features and The Broader Connections Process

Industry Working Group Feedback Sought

The Connections Process:

Preapplication | Application | Registration | Commissioning | Post commissioning

The Connections Simulation Tool is, independent of, but aims to support the Connections Process

The Connections Simulation Tool

The following optional use cases will be available at Release 1

Primary use

This is the main purpose of the tool. Priority will be given to projects requested for this purpose

Model tuning

Conduct connections studies on plant models to increase model quality and investigate specific anomalies. This aims to reduce the number of iterations required for approval of Connections applications

Secondary uses

The tool will also be available for other purposes dependant on demand.

Preliminary insights

Conduct preliminary studies early in the development prior to developing detailed designs

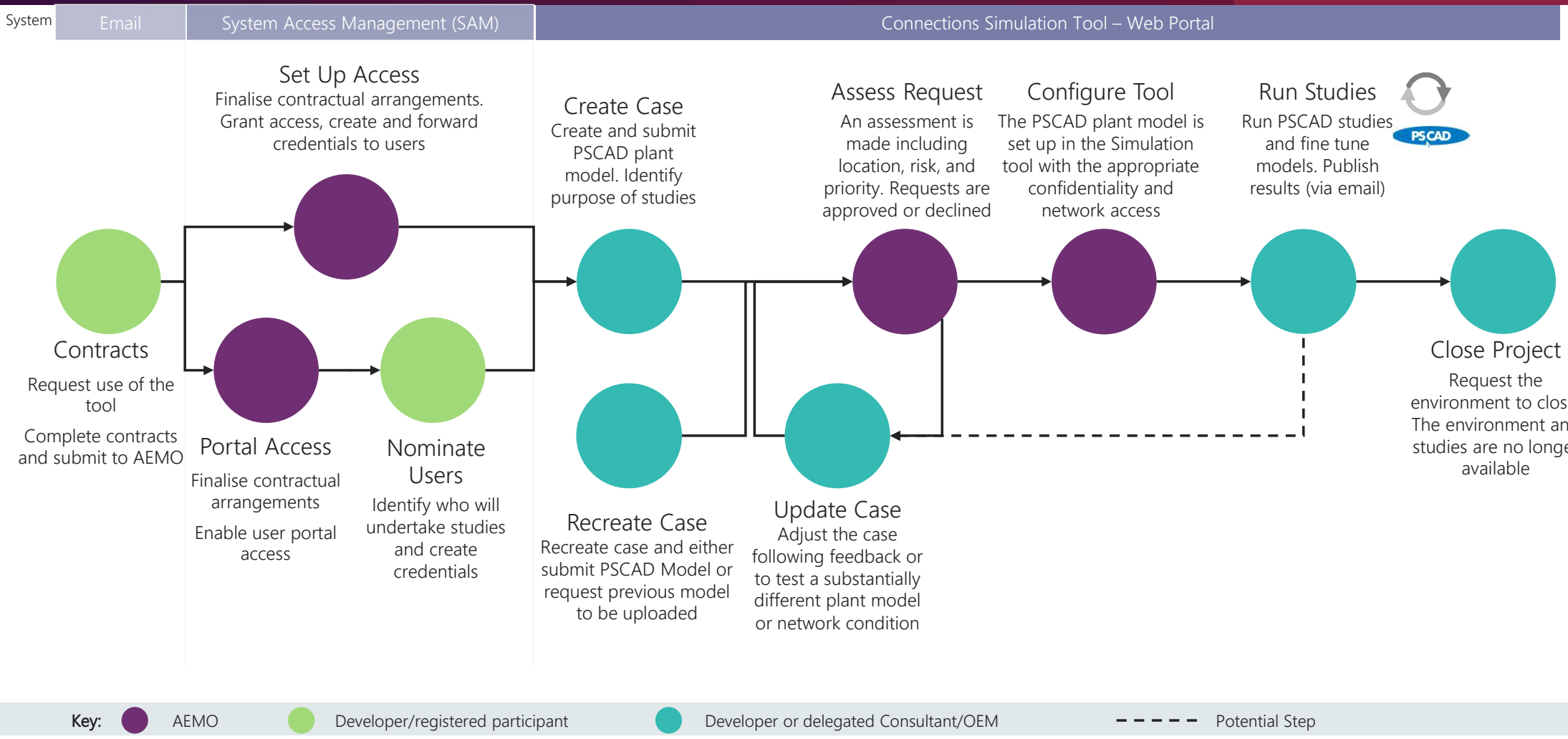
Plant upgrade

Study impact of changes to existing equipment and control systems.

No use has been identified during the Commissioning phase

Proposed End-To-End Process

Industry Working Group Feedback Sought



Web Portal Demo

The demo will provide a visual on the steps and options for users. Following the demo we will discuss functionality and user experience

We will cover the following areas

- Create a draft case
- Submit a case
- Update or edit a case
- View cases

Other Feedback Areas

Industry Working Group Feedback Sought

Technology

Browser Based Solution
The Connections Tool is designed to be used across operating systems and devices

Access
Available in any global location for authorised users.

Performance
Users will be able to select three server performance levels (low, medium, high) which will support faster processing at different price levels

Maintenance Windows
The system will be shut down for regular weekly maintenance

PSCAD Versions
The service will transition to PSCAD 5 in line with the industry transition

Number of Users
Multiple users will be able to use the tool for each project

Results

Retrieval Process
Users will request their results to be published. This automatically triggers an email to them with results

Receivers
The results will be sent to the person who requested the results

Proposed Format
Users can export results or export the updated model. This is the native PSCAD output file format

Archiving
When closing the project all environments and associated files will be deleted. They will no longer be accessible by users. AEMO maintains the model that was created initially such that it can be recreated

Pricing Structure

Industry Working Group Feedback Sought

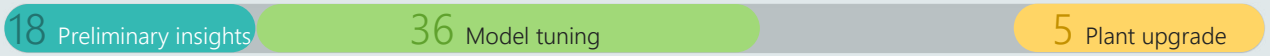
Scalable Costs

- Maintaining Network Models and Connections Tool Service
- User set up and management
- User support
- Continuous improvement

- Virtual Machines
- PSCAD maintenance
- Performance
- Availability

Demand

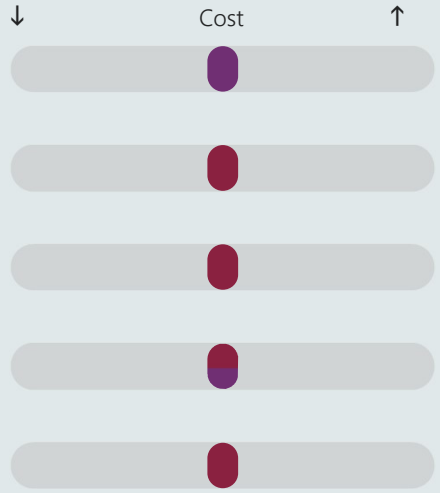
Preliminary view of anticipated demand (# projects) per year based on use type.



24 - General models available during the Connection Process
12 - Specific simulations established to replicate problems in the connections process

Variables

A number of variables will shape costs. Some of these will be user driven, others will be decided as part of the project solution



Network Visibility
Complexity of network model visibility solution

Project Complexity
Some locations or models will be more complicated to set up

Duration of Use
The length of time the connections tool is available to run studies.

AEMO Support
The level of support required based on complexity and availability

Computing power
The server performance selected within the tool

Price Structure Options

Three charging options are being considered

		Alignment to Survey
1	**Fixed fee:** A registration fee and fixed fee permitting access and AEMO assistance within a specific time frame	30%
2	**Variable fee:** Registration fee with all costs of set up and usage/support charged on a variable basis.	30%
3	**Fixed set up with variable usage fees:** Registration fee and a fixed setup fee with variable charge for usage/support	20%

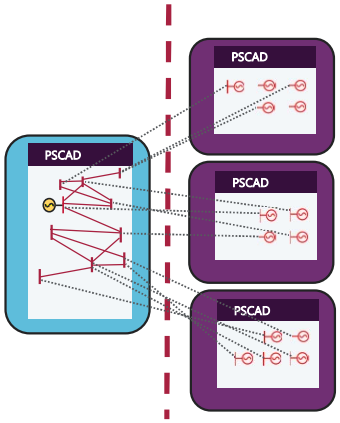
Unsure: 20%

Network Visibility Options

Industry Working Group Feedback Sought

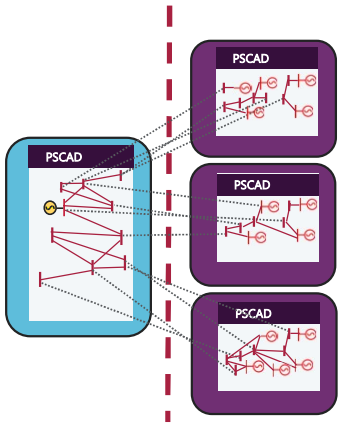
Incorporating feedback from the CSTIWG, trial users and industry stakeholders, AEMO and NSPs are determining the network elements that will be visible within the tool. Five options are under consideration that balance security, commercial sensitivity, and creating a valuable solution.

Full Region Accessible Solution – Allowing Full Access to POC Buses



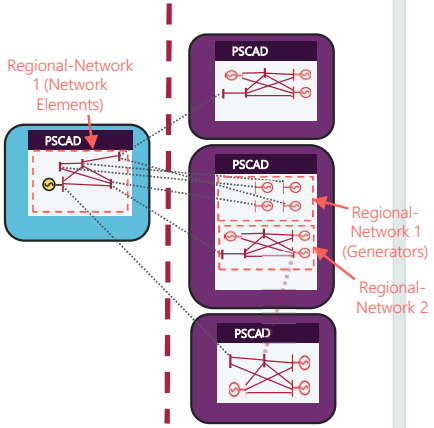
Individual plant models moved into new workspace and ENI connections updated to be cross-server

Full Region Accessible Solution - Restricting Measurement Access to POC Buses



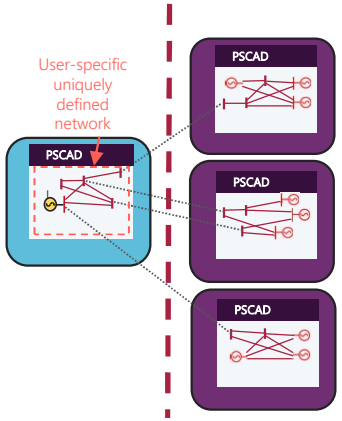
Plant local networks broken into many sub-networks to protect POC buses, with ENI connections created between sub-networks and the remaining network

Limited Local Area Accessible Solution - Allowing Access to POC Buses



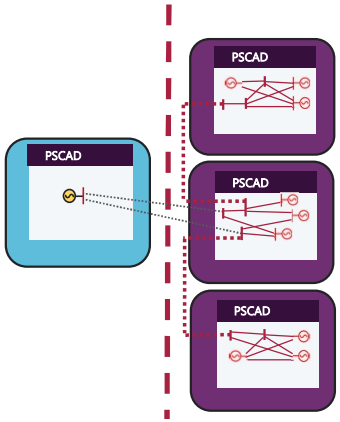
Single regional-network broken into its own model, with its individual plant models moved into new workspace and ENI connections updated to be cross-server

Limited Local Area Accessible Solution - Restricting Access to POC Buses



A limited, user-specific sub-network defined which protects all other plants POC's, with ENI connections added between uniquely defined sub-network and the wider network models

Point of Connection (POC) Accessible Solution



ENI connection created between user's POC and wider network models

Key:
- Full Network & External User model — External user has full visibility and access
- Confidential Generator Models — External user has no visibility or access

Network Visibility Implications to Operating Costs

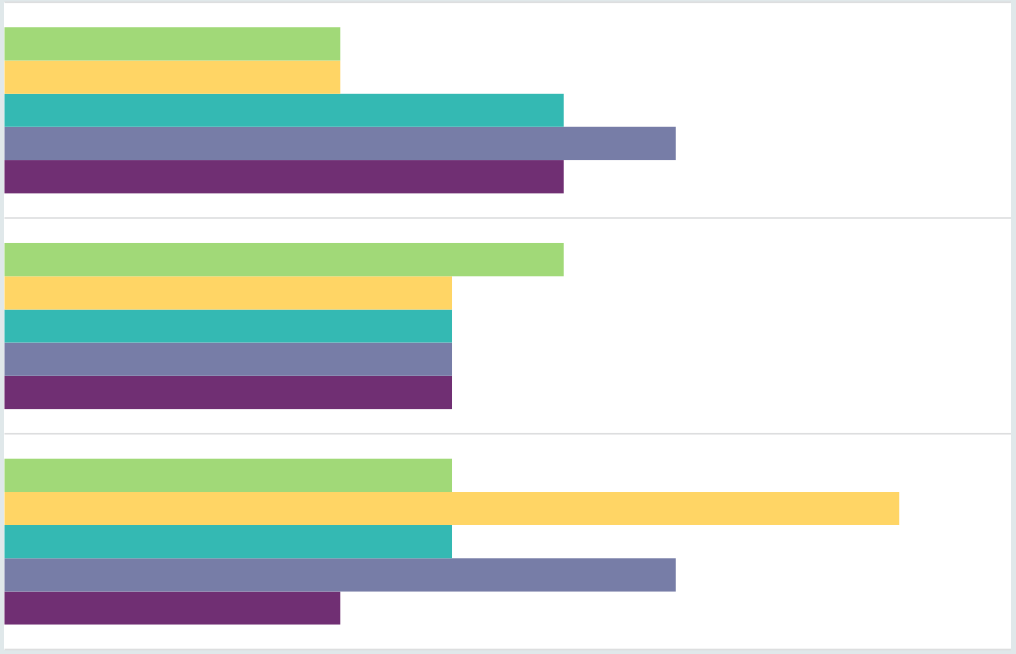
Industry Working Group Feedback Sought

A trade off for greater network visibility and complexity is the effort required to set up and manage the service.

Maintaining Model
Ongoing overhead required to manage and maintain 4 state model within the Connections Tool

User Support
Estimated effort required to support users as they use the tool

User Set up
Initial set up of the environment and models per requested project



Indicative Workload / Effort

POC Access | Partial Access - No POC | Partial Access - POC | Full Access - No POC | Full Access - POC

Greater complexity = Greater costs
All costs are to be recovered from users and impacts the service offering

Number of users
Greater support requirements may reduce the number of projects that can be run concurrently in the tool.

Next Steps

If you have further feedback from today's session please email us at connectionstool@aemo.com.au.

You will be sent a high level summary of the meeting notes from this session in the next week - prior to uploading to the AEMO website.

Next session

- Earmarked for **Thursday 10th February 2022, 10am - 12 midday AEST**
- The focus on this session will aim to include
  - Support
    Range, accuracy and usefulness of training, comms and support channels
  - Rollout
    Input into the proposed rollout approach

We may also reach out to you prior to the next session regarding cost structure.

Questions and further feedback
Thank you

For further information visit
https://www.aemo.com.au/initiatives/trials-and-initiatives/connections-simulation-tool-project
or contact ConnectionsTool@aemo.com.au

Appendices

Appendix 1
AEMO Competition Law Meeting Protocol

AEMO is committed to complying with all applicable laws, including the Competition and Consumer Act 2010 (CCA). In any dealings with AEMO regarding proposed reforms or other initiatives, all participants agree to adhere to the CCA at all times and to comply with this Protocol. Participants must arrange for their representatives to be briefed on competition law risks and obligations.

Participants in AEMO discussions **must**:

- Ensure that discussions are limited to the matters contemplated by the agenda for the discussion
- Make independent and unilateral decisions about their commercial positions and approach in relation to the matters under discussion with AEMO
- Immediately and clearly raise an objection with AEMO or the Chair of the meeting if a matter is discussed that the participant is concerned may give rise to competition law risks or a breach of this Protocol

Participants in AEMO meetings **must not** discuss or agree on the following topics:

- Which customers they will supply or market to
- The price or other terms at which Participants will supply
- Bids or tenders, including the nature of a bid that a Participant intends to make or whether the Participant will participate in the bid
- Which suppliers Participants will acquire from (or the price or other terms on which they acquire goods or services)
- Refusing to supply a person or company access to any products, services or inputs they require

Under no circumstances must Participants share Competitively Sensitive Information. Competitively Sensitive Information means confidential information relating to a Participant which if disclosed to a competitor could affect its current or future commercial strategies, such as pricing information, customer terms and conditions, supply terms and conditions, sales, marketing or procurement strategies, product development, margins, costs, capacity or production planning.

Appendix 2a

CSTIWG Working Group Session 1 Feedback: Users of the tool

Your feedback	Available in Release 1	Notes
Preliminary Studies The tool could be used by Developers, OEMs and Consultants to conduct preliminary studies very early in the development process for a project. This would be to investigate options for a project prior to developing detailed designs	Yes	This will be available for registered (and intending) participants (eg Developers and their nominated Consultants). Use by others is currently being considered.
OEMs Equipment test OEMs could use the tool to test equipment under certain circumstances (in a weak area of the network). AEMO could provide system strength studies to be used for this purpose.	TBD	We are reviewing viability of this option within AEMO
Incumbent Generator The tool could be made available to enable studies to be conducted on an existing plant that plans to extend or change equipment.	Yes	This will be in scope. This is a use case
NSPs NSPs could reduce internal work by using the tool (they would not need to maintain their models). A feedback mechanism on improving the model where discrepancies are found would help build trust in the model.	No, Future Development	This has been targeted as a future development item

Appendix 2b

CSTIWG Working Group Session 1 Feedback: Value

Feedback	Included in Release 1	Notes
High Risk projects Connecting to a part of the network that is less resilient.	Yes	-
Projects of long duration The tool would help mitigate risks in projects that take many years to develop	Yes	-
Large projects Larger projects would likely warrant the spend on the tool.	Yes	-
It was noted that good experience using the tool may result in wider use of it.	N/A	-

Appendix 2c

CSTIWG Working Group Session 1 Feedback: Barriers

Feedback	Included in Release 1	Notes
Set-up time : Time is required to set up the environment for each site. If the time lapse between requesting and accessing the tool was too long it may not be worthwhile. 1-2 weeks was considered reasonable. Longer than a month was considered a barrier.	TBD	This is a major consideration. We are defining the AEMO Tool Model Structure Will also influenced by the number of clients we take on.
Set-up Requirements: Developers might not want to use the tool if they cannot influence the setup parameters of the network (particularly load flow), and have some flexibility to alter the conditions they are studying	TBD	We are in the process of determining what is possible in conjunction with NSPs
Connection to the Distribution Network: If the plant is connected to the distribution network, it is expected additional set-up time would be required for the provision and integration of local network data into AEMOs models.	Yes	This will remain true in the final solution
Ease: Developers might not want to use the tool if they feel they need to do endless studies. Sometimes it's easier to get AEMO/NSP to undertake the studies.	-	Noted
Certainty: Developers want certainty the tool will result in fewer iterations.	No	This is the main driver for developing the tool
Costs : Tool fees would need to take into account the balance between effort, risk and time.	-	The fees are being calculated on a cost recovery model. And are based a number of factors including complexity of submitted model and duration of the use of the tool.
Visibility: If a sufficient level of visibility is not provided (whether through measurements, direct network visibility, or other means) the tool would be less useful and its use-cases would diminish.	TBD	We are in the process of determining what is possible in conjunction with NSPs
Alignment of Network Data in 4 state model If NSPs become users, they would require the ability to update model data per their own records. Without a way to update models where it is deemed required, confidence in the tool would be reduced.	No	Noted for future development

Appendix 2d

CSTIWG Working Group Session 1 Feedback: Opportunities

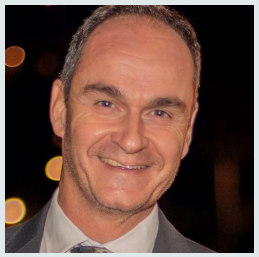
Feedback	Included in Release 1	Notes
Variable Studies A value was seen on enabling users to run studies on their plant in different situations (eg strong, medium or weak grid).	TBD	We are in the process of determining what is possible in conjunction with NSPs
Provision of Matching PSSE case A value was seen in providing users with a PSSE snapshot that mimics the PSCAD network case that is not visible to them (or a similar method to increase the visibility of the network configuration).	TBD	We are in the process of determining what is possible in conjunction with NSPs We have had consistent feedback indicating this is important and tat this stage we believe it is possible to provide this.

Appendix 3
The AEMO Project Team

Siham Knowles
AEMO Business Sponsor

Alistair Wells
Project Lead

Elliott Kuhlmann
Technical Advisor



Bertrand Etchepare
Program Manager

Dave Lenton
Pricing Model Development

Sarah Squire
Change Manager

Appendix 4

Industry Working Group Members

Name	Organisation	Industry Sector
Thai Vo Patrick Rossiter	GE Renewable Energy	OEM
Sylvain Grandidier	Siemens Energy	OEM
Charbel Antoun	TransGrid	TNSP
Hieu Nguyen Corey Chin	Powercor	DNSP
Amir Mehrtash	Power System Consultants	Consultant
Scott Partlin (Apology) Natasha Thompson Ronny Schnapp	NEOEN	Developer
Wai-Kin Wong	AGL	Developer

Appendix 5
Connections Simulation Tool Rollout*

* Dates are indicative

Kickoff
Apr 2021

Commence portal development
Cloud and Security design
Engage trial participants

Connections MVP
Oct 2021

MVP field trials and enhancement
Engage a small number of Trial Users to participate in an MVP trial

Users to expand over the trial

Connections Beta
Q1 2022

Beta version release
Launch a Beta version of the Connections Tool, providing access to a larger group of users including applicants and potentially an NSP - Incorporate their feedback in regular updates

Connections Release 1 – PSCAD
Q1/Q2 2022
Next Generation Connections Tool V1 release - PSCAD Available to an initial set of users, to be expanded over the following 12 months

Connections Release 2 – HYPERSIM
(TBD)
Next Generation Connections Tool V2 – HYPERSIM
Add HYPERSIM platform as alternative EMT simulation tool

2021 Q2 | 2021 Q3 | 2021 Q4 | 2022 Q1 | 2022 Q2 | 2022 Q3

Industry Working Group (indicative focus and timing)

Session 1
- Terms of Reference
- Industry scenarios
- Benefits / Barriers
- Opportunities

Session 2
- Features
- User Experience
- Pricing Model
- Functionality
- Process

Session 3
- Support
- Rollout

Session 4
- Close
- Adoption (TBD)
- Reporting inputs (TBD)
- AOB