

Large-scale solar connection responsibilities matrix

Network connection for large or utility scale solar application >1MW

(Up to the point of common connection for Alpine Energy Limited's (AEL) network)

This matrix provides a high-level overview of the key activities, studies, agreements and responsibilities typically required when connecting a utility-scale solar generation project greater than 1MW to Alpine Energy's network.

Requirements may vary depending on project size, location, network impacts and Transpower requirements.

Also refer to Electricity Industry Participation Code 2010 - Schedule 6.1 - Part 2

Task/activity	Required state	Required tasks with outcomes	Responsible party	Review/ accepted by
Concept feasibility stage - Preliminary Services Agreement (PSA)				
Development of early works agreement	Required	Development of Preliminary Services Agreement.	AEL	
Negotiate an agreement to PSA	Required	Negotiate Preliminary Services Agreement and schedule.	Applicant and AEL	
Concept feasibility stage				
Development of single line diagrams	Required	Applicant to provide a detailed single line diagram of the solar farm and intended connection point and provide to AEL.	Applicant	AEL
Concept design	Required	- AEL to agree and confirm applicant SLD - Develop concept design - Develop equipment and site layout - Propose connection topology - Compile pricing schedules for construction contract.	AEL	Applicant
Network model creation	Required	Provide power system model for network and provide to applicant or their nominated consultant.	AEL	Applicant
Model update and confirmation	Required	Developer to include and verify combined power system model for proposed generating systems to enable network studies to be undertaken.	Applicant	AEL
Power flow study	Required	- Carry out load flow studies - Confirm proposed generation output can be achieved at the point of connection - Confirm proposed connection topology is suitable.	Applicant	AEL
Short circuit and fault contribution study	Required	- Carry out short circuit studies - Confirm short circuit ratio at point of connection - Confirm any requirements for reactive plant to remediate system strength shortfall.	Applicant	AEL
Reactive power capability and control study	Required	- Carry out reactive power flow studies - Confirm proposed inverter system can provide required reactive power at point of connection.	Applicant	AEL

Task/activity	Required state	Required tasks with outcomes	Responsible party	Review/ accepted by
Grid code compliance report	Required	- Investigate code requirements - Provide report describing the performance of the solar farm including a summary of code compliance requirements including effects on instantaneous reserve requirements.	Applicant	AEL and Transpower
Protection scheme design and protection report	Required	- Carry out protection coordination study - Confirm distribution network protection co-ordination requirements between distribution network and solar farms - Provide protection settings report.	Applicant	AEL and Transpower
Wide area protection study & report	May be required depending on project size, location or network impacts.	- Confirm protection coordination requirements between transmission system and distribution network - Confirm requirements for any special protection schemes - Provide protection settings report.	Applicant	AEL and Transpower
Fault ride through study	Required	- Carry out fault ride through study - Confirm proposed inverters / generator is capable of remaining connected to the grid under typical transmission and distribution network disturbances.	Applicant	AEL and Transpower
Voltage regulation & tuning study	Required	- Confirm generation system voltage control strategies so that network voltages can be maintained within acceptable limits - Model the effects of generation changes caused by cloud cover - Define control strategy to prevent hunting of tap change systems on the network.	Applicant	AEL and Transpower
Frequency regulation & tuning study	Required	Confirm ability of generating system to respond to network frequency disturbances and remain in compliance with the requirements of Code.	Applicant	AEL and Transpower
Transient stability study	May be required depending on project size, location or network impacts.	- Confirm generating system can remain stable and connected under credible system contingencies - Define generation control strategy requirements during fault contingencies that result in distribution network line overload or over/undervoltage.	Applicant	AEL and Transpower
Harmonic distortion study	Required	Confirm harmonic injection at point of connection is within acceptable tolerance bands as defined by the Transpower and AEL's Network Code and if harmonic filters are required.	Applicant	AEL and Transpower
Resource consent assessment				
Connection interface resource consenting/ easement agreements	Required	- Dependant on the site impact it may be necessary for AEL and the Developer to agree the requirements for the resource consent process at the connection interface. This may require: - Site layouts	Applicant	AEL

Task/activity	Required state	Required tasks with outcomes	Responsible party	Review/ accepted by
		○ Geotech studies ○ Key civil design considerations.		
Connection interface resource consenting/ easement Agreements	Required	● AEL will require the Applicant to address the easement, or third-party easement needs dependant on land ownership.	Applicant	AEL
Contract development and agreement stage				
Development of CC and DSA	Required	● Confirm all technical details for inclusion in the Construction Contract and Delivery Service Agreement.	AEL	
Negotiate and agree to CC and DSA	Required	● Negotiate and agree contract between parties.	Applicant and AEL	
Delivery stage				
Development of detailed design of the point of common connection	Required	● Confirm all technical details and development of the detailed design to the point of common connection.	AEL	Applicant
SCADA System design (Applicant side)	Required	● Applicant details the design for the SCADA including any control requirements and SCADA address lists.	Applicant	AEL
SCADA System integration assessment (AEL side)	Required	● AEL will consider the integration needs for the SCADA following the Applicant design.	AEL	Applicant
Installation to the point of common connection	Required	● Install the asset to the point of common connection	AEL	Applicant
Site acceptance and commissioning plans (solar farm)	Required	● Applicant certification of pre-commissioning, site acceptance testing and commissioning to verify the site is ready to be connected to the network.	Applicant	AEL
Site acceptance and commissioning plans (up to POCC)	Required	● Confirm all the requirements relating to pre-commissioning, site acceptance testing and commissioning up to the point of common connection.	AEL	Applicant
Post commissioning	Maybe required by AEL	● Confirm during an operational period the performance and reliability of the plant over an agreed post commissioning period.	Applicant and AEL	

(*) Note it is the Applicant responsibility to communicate with Transpower and assess their specific requirements for applications > 1MW and ensure the required studies are carried out and approved. This matrix is intended as a high-level guide only. Additional studies, approvals, agreements or technical assessments may be required depending on the nature of the project and network conditions. Alpine Energy is responsible for ensuring new connections do not adversely affect the wider electricity network, including Transpower's transmission system and the Applicant is required to ensure all obligations of the System Operator (SO) are met. See the comprehensive guidelines on Transpower Website [Commissioning generation | Transpower](#)

Glossary of terms

Acronym	Meaning
AEL	Alpine Energy Limited
Applicant	The customer, developer, generator owner or organisation seeking to connect a project to the Alpine Energy network
CC	Construction Contract
DG	Distributed Generation, such as solar, wind, battery storage or other electricity generation connected to the network
DSA	Delivery Services Agreement
EDB	Electricity Distribution Business (Alpine Energy)
GIP	Grid Injection Point, where electricity is transferred between Transpower's network and a distribution network
POCC	Point of Common Connection, the agreed point where the customer's generation equipment connects to the Alpine Energy network
PSA	Preliminary Services Agreement
SCADA	Supervisory Control and Data Acquisition system used to monitor and control electrical equipment remotely
SLD	Single Line Diagram, a simplified electrical drawing showing the proposed network and equipment layout
SO	System Operator (Transpower)
TP	Transpower New Zealand Limited
Transmission Network	The national high-voltage electricity network operated by Transpower
Utility-scale Solar	A large-scale solar generation project, generally greater than 1MW in capacity
Network Reinforcement	Upgrades to existing network assets required to accommodate additional load or generation
Reactive Power	Power used to maintain voltage levels and support efficient operation of the electricity system
Fault Ride Through	The ability of a generating plant to remain connected and operating during short network disturbances or faults
Transient Stability	The ability of a power system to remain stable following a major network disturbance
Harmonic Distortion	Electrical waveform distortion that can affect equipment performance and power quality