

# Switchyard construction – Nyngan Solar Plant

*Knowledge type: Construction*

*Knowledge category: Technical*

*Technology: Solar photovoltaic*

## Key learning

The construction of electrical infrastructure (e.g. substations, switchyards, or overhead lines) assets needs to consider the specific requirements of the Network Service Provider (NSP) as the ultimate owner of these assets. Essential Energy is the NSP for the Nyngan Solar Plant.

Power distribution and transmission infrastructure varies across regional Australia, so the impact of connecting a solar plant will have a unique impact on the performance of the local electricity grid. Not every solar plant will require a switchyard, but many may require some other form of local augmentation, and most will require an overhead line.

Unlike other assets constructed at the solar plant, the electrical infrastructure required by the NSP to connect to the solar plant and reinforce the grid, specifically as a consequence of the generator connecting to the grid, are Contestable Works, meaning that either the NSP may construct and operate the asset or that they are built by the generator and gifted to the NSP. This will also include the provision of leases for any associated land. The governance of this is contained within the National Electricity Rules (NER) and associated Regulations.

## Implications for future projects

Key learnings from the construction of the electrical infrastructure – Essential Energy's assets – for the Nyngan Solar Plant that could be used on future projects:

- Scope of construction – The solar plant owner is expected to take responsibility for augmenting the grid so that the solar plant can be connected while only affecting the performance of the grid as per the NER. The NSP, with responsibility for the performance of the grid, will expect to direct the scope of the additional assets, which would ultimately be their assets. The whole life cost of these assets must be considered as part of the feasibility study for the project.
- NSP requirements – The additional electrical assets will need to comply with the NSP's:
  - Technical requirements –the electrical design will need to comply with the NSPs internal standards and specifications. The designer and construction contractor will need to have a working understanding of these and also allow for all the processes required to gain approval from the NSP. Prior experience by the contractor with the NSP is essential.
  - Procurement policies and standards – some NSPs have approved suppliers, materials and equipment so the construction contractor should consider the cost and timing implications of procurement processes unfamiliar to them.
  - Construction procedures and processes – the NSP may want to impose design approvals or hold points on the construction or undertake their own parallel Quality Assurance processes. The construction contractor should consider the cost and timing implications of the NSPs involvement as a key stakeholder in the design and construction of the assets.
- Agreement – the NSP's requirements for the additional assets need to be clearly defined and agreed between the solar plant owner and the NSP the basis being the NSW Department of

Resources and Energy’s “Service and Installation Rules” as modified by the NSPs specific requirements. The agreement(s) between the owner and the designer and constructor of the grid augmentation works must be aligned with the NSP’s requirements, and the designer and constructor must be accredited by the NSP to undertake the work.

- Construction – the ideal location for a solar plant is usually on an area of flat land. If the area is prone to flooding or inundation then specific attention to hydrological and drainage issues will be needed. At Nyngan the NSP switchyard and AGL substation were constructed on a bench to ensure that these assets were elevated above the surrounding land and water would drain away.

## Knowledge gap

There is no real knowledge gap concerning the construction of assets such as switchyards and substations or installation of electrical infrastructure to augment the grid. However, satisfying the NSP’s requirements is a critical aspect in delivering a solar project and needs to be managed to avoid delay in connecting the solar plant to the grid.

## Background

### Objectives or project requirements

The Nyngan Solar Plant is connected to the grid via the connection works that included the new 132kV switchyard and approximately 3km of 132kV transmission line. In addition to the switchyard and transmission line, AGL also gifted new reactive plant at the Nyngan 132kV substation to Essential Energy.

### Process undertaken

The process for connecting embedded generation is governed by the NSW Department of Resources and Energy’s Service and Installation Rules as augmented by the NSP requirements.

AGL applied to Essential Energy for a high voltage connection as a potential large embedded generator. This preliminary connection enquiry initiated a process that culminated in Essential Energy preparing the design requirements for the connection and committing to the connection subject to the design criteria being met.

AGL engaged an ASP3, an Essential Energy accredited designer, to prepare and eventually construct the design under an EPC contract (the contractor is also ASP1 accredited for construction).

Following approval of the design by the NSP, and other compliance with the development consent conditions, construction of the assets commenced. Essential Energy was actively involved in monitoring the construction of the assets and carrying out its own quality assurance processes and inspections.

## Supporting information

- NSW Department of Resources and Energy – Service and Installation Rules  
<http://www.resourcesandenergy.nsw.gov.au/energy-supply-industry/pipelines-electricity-gas-networks/network-connections>
- Essential Energy – HV connections and large embedded generators (CEOP8079)  
<http://www.essentialenergy.com.au/asset/cms/pdf/contestableWorks/CEOP8079.pdf>
- Essential Energy – Connecting to the network information pack  
[http://www.essentialenergy.com.au/asset/cms/pdf/Reg/CTNIP\\_FINALv1.pdf](http://www.essentialenergy.com.au/asset/cms/pdf/Reg/CTNIP_FINALv1.pdf)