



V A S T S O L A R

THE REGULATORY ENVIRONMENT AND THE CONNECTION PROCESS – ISSUES ENCOUNTERED AND IMPLICATIONS

Vast Solar Knowledge Sharing Events and Activities –
Narrative Reports, Table 1, Item 7.

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The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained herein.



1 Our Story

The Australian Renewable Energy Agency (ARENA), and its predecessor the Australian Solar Institute, has provided grant funding and other valuable support to Vast Solar since 2012. This support has assisted Vast Solar to develop the world's first modular concentrated solar thermal power (CSP) technology that uses sodium as the heat transfer fluid.

This journey has involved the development of three substantive sites at which different elements of Vast Solar's unique CSP technology have been trialed, tested, refined, scaled and ultimately, delivered. This journey culminated in the delivery of the Jemalong CSP Pilot Plant, which incorporates five CSP modules.

Vast Solar completed commissioning of the 1.1MWe Jemalong CSP Pilot Plant in June 2018, having first delivered power to the grid from the Pilot in January 2017. The Pilot Plant is a fully realised proof of concept of Vast Solar's CSP technology. It is an Australian world-first.

The journey to realise the CSP Pilot Plant would not have been possible without the support of ARENA who supplemented private sector investment.

Knowledge Sharing forms part of Vast Solar's agreements with ARENA. Vast Solar has undertaken to share information via events and activities as documented in the Knowledge Sharing Plan agreed with ARENA.

This narrative report presents an overview of issues encountered and learning drawn from Vast Solar's journey with regard to the regulatory environment and the connection process as we have worked to develop new CSP technology, build a world-first CSP Pilot Plant in regional Australia and advance plans to construct a utility scale 30MW Reference Plant.



2 Introduction

2.1 The Regulatory Environment and The Connection Process

This report provides a summary overview and discussion of some regulatory issues encountered and resolved by Vast Solar as the company undertook the journey to develop and build the 1.1MWe Jemalong CSP Pilot Plant in western New South Wales. The report includes discussion of the development and approvals process as part of the regulatory environment. This report first provides an overview and discussion of the regulatory environment and standards and regulations encountered and implications of these before turning to look briefly at the connection process and some issues that arose in association with that process.

3 The Regulatory Environment

3.1 The Development Approval process

Given the scale and nature (footprint and construction value) of the Pilot Plant the relevant development planning and approval authority was Forbes Shire Council. Forbes has a single Development Control Plan (DCP) that applies to the Shire. Within this DCP there are a number of chapters specific to the planning and management of development within the Forbes Shire. The DCP complements Council's statutory planning controls the Forbes Local Environmental Plan (LEP) 2013.

Vast Solar submitted a Development Application and accompanying Statement of Environmental Effects to Council on May 21 2013, that included a detailed site layout map and described the proposed project as below.

Nature of the proposed development and relevant works

The works proposed, to which our application for Development Consent relates, will deliver a 1.1MW solar thermal power generating RD&D facility. The main elements of the development works are:



1. Installation, using the traditional fence-post piling approach, of galvanised steel tube heliostat foundation posts, and installation of galvanised steel tube lateral connectors, low-voltage power supply and electronic control systems
2. Assembly of heliostats (mirrors and the small mechanical drives for their operation)
3. Installation of completed heliostats by their mounting on the foundation posts
4. Installation of 5 galvanised steel lattice-frame towers, each less than 30m in height, each mounted with a thermal energy receiver approximately 1.5m square
5. Installation of a thermal energy transfer system connecting each of the 5 modules, comprising a central bank of stainless steel storage tanks, along with associated insulation, piping and control systems, and foundations
6. Erection of concrete slab foundations for the turbine and generation plant and associated control and management equipment, contained within a galvanised steel machinery shed
7. Erection of a pre-fabricated galvanised modular office unit to serve as a site office during construction, and as an office and control room after completion of construction
8. Installation and operation of a low level evaporative cooling tower (approximately 5m in height) and associated piping and control systems, supplied with cooling water drawn from Twynam Agricultural Group's existing bore at the adjacent Twynam Horse Complex site. (Note: Application has been made by Twynam for relevant approvals from the NSW Office of Water).
9. Construction of internal access and service tracks, and a perimeter security fence.

Vast Solar received a Notice of Determination of a Development Application with consent granted subject to Conditions of Consent on the 19th September 2013. The Conditions of Consent were straight forward and required development and construction of the site to comply with standard Building Code of Australia (BCA) standards and regulations and requirements of the workplace health and safety authorities Authority. Further reference was made in the Consent Conditions to matters specific to the Forbes Shire Council Environmental Planning instruments that include regard to the Lachlan Valley floodzone that the site is located within. Vast Solar had anticipated and addressed design of the project and layout on the site with due consideration of the 1952 flood levels so meeting these Consent Conditions was not problematic. See excerpt from Vast Solar's Statement of Environment Effects below:-

Compliance with Development Standards; DCP Design guidelines

The development will not comprise a 'solar energy system' as defined in the State Environmental Planning Policy (Infrastructure) 2007 (No. 641/2007); the definition of 'solar energy system' excludes systems using mirrors for the concentration or reflection of solar energy.

The development may include 'energy generating works' as defined in that SEPP, however energy generation is ancillary to the primary research, development and demonstration functions of the development.



Zoning of the site is Rural. Our understanding is that the development proposed is permitted with development consent under both Council's DCPs as applicable and under the 2007 SEPP.

We believe that the proposed development is also complying development for the purposes of DCP 7 (Exempt and Complying Development). We note that the property on which the development is proposed forms part of the Lachlan floodplain. Please refer to the letter (attached) from Karl Lupis Surveyor, confirming that the site is 0.98m below the 1952 Flood Level.

Civil works will be undertaken so that structures to be erected as part of the development will be raised above the 1952 flood levels, including:

- Switch yard, control room and facilities
- Power island (turbine/generator shed), cooling and auxillary systems
- HTF central control systems and storage tanks.

Vast Solar nominated Council as the Principal Certifying Authority and duly supplied to Council technical details and roof and wall frame manufacturer and Structural Engineer reports as required by Council.

A community information session, along with personal meetings with the owners of neighbouring properties were undertaken as part of community consultation for the project. No major issues were identified or arose other than reasonable requests for some landscape plantings to provide visual screening to two neighbouring properties. Council provided requirements for the landscape screening plantings as part of the Consent Conditions. These requirements were modified following further discussion involving Vast Solar, Council and our near neighbours in order to seek and incorporate their specific requests to enhance overall amenity and stakeholder satisfaction. This resulted in an extension of plantings along a neighbouring fenceline as well as dedicated fencing of a particular area near a neighbour's house to allow for several lines of trees and shrubs to be planted. Vast Solar was happy to go above and beyond what was required via the Consent Conditions to ensure good community relations.

Forbes Shire Council and Council's Environmental Services and Planning team have provided professional and helpful assistance in the project planning development and approvals process and as the Principal Certifying Authority.

As noted in other narrative reports submitted by Vast Solar, doing business in regional Australia can be logistically difficult. In terms of complying with regulatory planning and approvals issues, we have encountered some difficulties associated with churn in and coordination of personnel familiar with the status of the project. This relates to personnel both within Vast Solar and within Council. The lack of continuity has led to delays with regard to some matters that either may require correspondence and/or a site inspection to finalise documentation in some areas.



However, Certificates of Compliance in key areas such as those relating to High Voltage Compliance, Fire Rating Compliance of Design and Materials and related BCA and OHS matters have been duly obtained or are in process.

3.2 Workplace Health and Safety Regulations

Vast Solar has built and implemented robust workplace health and safety policies and practices and this has involved learning from and addressing challenges as part of the journey. Being smart and safe in everything we do is integral to Vast Solar's culture and these values are clearly articulated in Vast Solar WHS policies and procedures and HR policies.

Robust WHS is built around a culture of safety and continuous improvement and Australian Standards provide a thorough framework to support these processes. Vast Solar sought and received AS 4801 accreditation, initially in 2015, and was re-accredited in 2018 subsequent to semi-annual audits and in line with triannual accreditation. AS 4801 is the Australian Standard that covers Occupational Health & Safety (OHS) pertaining to the typical equipment used at the Pilot Plant. The standard also covers our provision of onsite maintenance, service and repairs.

The accreditation process was useful and constructive process and has assisted Vast Solar in its development of its comprehensive WHS system that is appropriate for the risks and size of the organisation. SafeWorkNSW was constructive and pragmatic in its dealings with Vast Solar which interacted with representatives from the regional office of SafeWorkNSW as well as specialists from SafeWorkNSW head office who were focused upon issues relating to Vast Solar's use of sodium. Technical Major Hazards Facility (MHF) issues were encountered and were dealt with by Vast Solar providing undertakings to SafeWork as a sensible and pragmatic solution to the technical breach identified.

General certification processes and WHS infrastructure are expensive and complicated to maintain but they are all necessary and appropriate given the nature of our business.

Our WHS system supports the Vast Solar team undertaking novel and experimental activities while also ensuring that all applicable Australian standards are followed and other requisite certification secured. Pressure Vessel and High Voltage (HV) certifications were significant milestones as was the journey to develop internal standards to ensure the safe and effective



use of sodium in CSP. These sodium management standards were developed in-house as they don't exist otherwise nationally or internationally for CSP.

3.3 Environmental Regulations

Vast Solar's core business is to develop and to deploy new generation CSP technology that will deliver clean, renewable power generation and storage. We take our duty of care for the environment very seriously and, as with all new industries, possible environmental impacts need to be identified and environmental issues that may be perceived by the public to be an issue need to be respectfully addressed.

Vast Solar anticipated some environmental issues that may have been associated with our technology and proactively took action to study the potential issue and possible associated impacts. Findings from our reports have been communicated and/or incorporated into management procedures and protocols. Standards and regulations did not drive this activity but we were mindful that adverse outcomes could potentially generate regulatory risks.

3.3.1 Birds and Bats (avifauna), Snakes and our Wildlife Policy

The Forbes Shire is home to the Lachlan River and associated wetlands and animal species. These much loved features are specifically referred to in the Forbes Shire Council Local Environmental Plan 2013 (LEP) that includes the aim:

'To protect, enhance and conserve the natural environment, including the Lachlan River, Lake Forbes, wetlands, native vegetation, environmentally sensitive land and other natural features that provide habitat for fauna and flora, provide scenic amenity and prevent or mitigate land degradation'

In addition to wishing to care for fauna and flora on and proximate to our site, Vast Solar was also aware that the impact to avifauna (birds and bats) due to highly concentrated solar radiation close to the receivers is a known environmental risk in the CSP industry. Accordingly, Vast Solar developed and disseminated to all on site staff a Wildlife Policy and Management Procedure. The Policy was proactively developed in response to public perceptions (some neighbours and members of the public) about possible death or injury to birds and other animals. The policy drew



on other studies about the intensity of the flux zone and relative 'danger' zone dimensions or exposure periods within the flux zone.

By virtue of the Vast Solar modular configuration, the risk envelope is considerably reduced when compared to other CSP tower based technologies. Our small scale receivers have a smaller flux risk zone and birds generally fly through it. A register of all avifauna incidents is maintained on site and monitored. Specialist on-site staff are trained in the treatment of injured birdlife and relationships have been established with local wildlife rescue authorities. As at the time of writing (April 2019), there have been no observed bird or bat injuries from solar radiation, although two dead birds have been found at the base of the receiver towers. Their deaths appear to be the result of collision with the towers.

Our Wildlife Policy instructs staff not to approach snakes and to care for them in accordance with NSW Environment and Heritage requirements. During the Pilot Plant's construction snake handlers were called to site to catch and remove snakes some 8-10 times.

3.3.2 Glint and Glare

For the Pilot Plant, glint and glare issues were investigated and modeled with a focus on potential impacts to staff and neighbours.

Glint and glare hazards occur due to reflections from the heliostat facets and the highly illuminated receiver. Any potential impact from these hazards is greatly reduced since the Pilot Plant site is located in a rural area. Additional measures have been taken to reduce the impact on local residents such as planting screening trees and modifications to the tracking patterns of the heliostats. The site is also located and the modules oriented so that small planes approaching or leaving the Jemalong airstrip do not have a line of sight or exposure to either heliostats or receivers. Staff on-site follow dedicated procedures that control exposure to glint and glare hazards and these procedures are included in our WHS documents and staff induction procedures.

This report does not address preparatory studies done for the 30MW Reference Project EIS that includes a study on Glint and Glare and potential risks to aviation. The study found that with correct plant siting, Vast Solar plants do not pose glint and glare risks to aviation or land based transport.



4 The Connection Process

The connection process was relatively straight forward given the small size (1.1MWe) of the generator and the capacity of the Essential Energy network to which the Pilot Plant's generator was connected. This meant that extensive grid modeling was not required.

That said, the process is costly, complicated and lengthy and consequently it was necessary to run a diesel generator to provide site power for a period longer than originally anticipated.

The connection agreement and physical connection to the grid were developed and put in place by late 2016. The Pilot Plant first sent electricity to the grid via this connection in January 2017. Receiver re-design and recommissioning work that took place throughout 2017 meant that electricity was not sent to the grid again until early 2018. All aspects of commissioning of the Pilot Plant were completed in June 2018 and the grid connection has been serving the Pilot Plant well throughout 2018 to the present.

As a small company with no previous power plant experience Vast Solar had to learn about and fully address all relevant standards and certification requirements, including an Essential Energy requirement for certified HV management personnel. Vast Solar engaged Great Southern Electrical (GES) to provide third party maintenance support for the project at significant cost, particularly as we have the necessary skills, knowledge and expertise in-house.

Ends.