AGL Energy Solar Project – Nyngan and Broken Hill

Engineers Australia Sustainable Engineering Society

> Presented by – Sarah McLeod

Date -9 Nov 2015

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Energy in action.

Agenda



Creating the Largest Solar Plant in Australia



NY – project data / facts



NY – project partner First Solar



NY – progress / performance



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NY – Industrial Relations











1. Creating the Largest Solar Plant in Australia

- > Finding, creating, building and managing new, sustainable and environmentally sound projects for the future is a complex task
- > Nyngan, in NSW, receives strong and consistent solar radiation –an ideal location for a solar power plant. The site is flat, with a good buffer between the plant and nearby residents, and there is significant demand for electricity from Dubbo and surrounding areas.
- > ARENA and NSW Govt partnered with AGL on the Nyngan solar power plant











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1. Creating the Largest Solar Plant in Australia

- > What are the key aspects about developing a solar plant?
 - » Strong solar resource
 - » Grid connection
 - » Project approval environmental constraints
 - » Community acceptance
 - » Flat, cleared land and flood free









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1. Creating the Largest Solar Plant in Australia

AGL developed, owned and managed the project, including:

- Civil work (surveying, grading, fencing and roads)
- Structural work (installation of posts, rails, and tables)
- Substation work (construction of substation and installation of transformer)
- Electrical work (installation of modules, inverters, transformers, and cabling)
- Overhead line work (construction of a new section of 132kV power line)
- Communications (First Solar power plant controller and interface with AGL SCADA (alarms and control)
- Solar system maintenance during commercial operation







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2. Nyngan Solar Plant – project data

- > Location:10k west of Nyngan
- > Capacity: 102 MW
- > Generation: 233 GWh
 - > Approx 33,000 average NSW homes
- > Cost: \$290 million
- > Construction Start: Jan 2014
- > Construction Finish: Jun 2015
- > Connection: 132kV (Essential Energy)
- > Number of PV modules: 1.35 million
- > Number of inverters: 144
- > Number of arrays: 77











2. Nyngan Solar Plant – project facts

- Interesting information about the Nyngan Solar Plant
 - » Solar plant site = 250 hectares → ~134 Sydney Cricket Grounds
 - » First Solar frameless glass-to-glass laminate modules
 - » 60 x 120 cm; 12 kg
 - 1.35 million modules would stretch from Nyngan to Uluru (as the crow flies)
 - » 150,000 posts installed
 - » Approximately 1,600 km of cable installed
 - » Ten times bigger than the next largest solar plant in Australia



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3. Project partner (First Solar)

- First Solar (FS) is our project partner delivering the solar plants under an Engineering Procurement and Construction (EPC) arrangement.
- FS's thin film module technology uses cadmium telluride (CdTe) as the semiconductor for converting sunlight into electricity
 - » Cd waste product of zinc refining
 - » Te by product of copper refining
 - » Lowest manufacturing costs
 - » Greatest efficiency potential (research 19% to theoretical 30%)
 - » Superior energy yield advantage



First Solar's Series 3 CdTe Thin Film Module



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Post installation (structure foundation)

Post driving machine



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Tilts (25 degrees) installed

Tables (IXL) installed with harness wiring



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Solar PV module installation (commenced 8 Oct 2014)

Solar PV module installation workers



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Solar PV module installation (working in teams)

Solar PV module installation (module spacing guide)



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PVIS building – cables installed from transformer

Section 1 inclement weather (Aug 2014)



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33kV AC Feeder cables from Section 1 and 2 (PVCS)

Testing at PVCS1 (Section 1)



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Trench for 33kV AC Collector cable in Section 1

PV module storage area



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5. Nyngan Solar Plant – industrial relations

- Construction Forestry Mining and Energy Union (CFMEU)
 - » Entry notice provided under the Fair Work Act 2009
 - » CFMEU claims
 - » snakes
 - » Worker amenities
 - » Unsafe electrical situations
 - » Low wages

THE militant CFMEU is putting the hat around for a \$1.2 million war chest to fight the Federal Government's proposed building industry code.

VICTORIA'S militant construction union, the CFMEU, has struck an enterprise agreement with the company building part of the Government's \$1.6 billion Port of Melbourne expansion.

Brian Parker's phone calls

CFMEU NSW secretary Brian Parker at the royal commission into trade unions, where he is played recordings of conversations in which he spoke of wanting to 'bash' union colleague Mario Barrios.

King Brown Gwardar

Gwardar or Western Brown





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- > AGL was responsible for providing the Connection Works
 - » Consolidated Power Projects (CPP) mobilised in early Jan 2014
 - » Grid available to First Solar end of Aug 2014
- > Scope of works
 - » 132kV transmission line ~3.2km
 - » 132kV Switchyard
 - » 132/33kV Substation
- Connection works mechanically complete by July 2014







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132kV transmission line (PowerServe)

Installation of OPGW to 132kV transmission line



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132kV transmission line energisation (EE asset)

132kV transmission line energisation (EE asset)

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132kV transmission line energisation (EE asset)

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132kV Switchyard

Connection Works



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132kV conductor issue

- > 132kV transmission line energisation
 - » Energisation occurred on Saturday, 30 August 2014
- > Supplier Testing
 - » Electrical integrity maintained and met required breaking load
 - » Strand strength reduced by salt testing
 - » White residue was CaCO3 + silicon dioxide





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AGLC and First Solar communication services (Essential Energy town substation)



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- > Generator performance standards
 - Network Services Provider (NSP) is required to approve as part of AEMO Registration
 - » AGL Connections Manager
- > AEMO Generator Registration
 - » Australian Energy Market Operator (AEMO)
 - » AGL Wholesale Market Regulation
 - » Required before any generation is allowed
- > CER RET Power Station Accreditation
 - » Clean Energy Regulator (CER)
 - » AGL Settlements Carbon Compliance
 - Required in order to reduce Renewable Energy Certificates (RECs)









6. Nyngan Solar Plant



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7. Stakeholders

Local community

> Nyngan Solar Plant

- » Nyngan Community Consultative Committee Meeting (CCC).
- » AGL established construction community fund with CCC.
- » AGL presented to the Far West Country Women's Association
- » Community opening event held 13 Sept 2015.
- » AGL participated in NAIDOC week and sponsored the Nyngan Ag Expo 2015
- » Broken Hill Solar Plant
- » Broken Hill Community Information Meetings
- » Aruma Lodge Aged Care visited site on 15 Jul 2015
- » 2nd round of construction community fund









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7. Stakeholders

Government Affairs

- > Nyngan Solar Plant
 - » NSW Greens, Jeremy Buckingham MP visited site with John Connor (CEO) from the Climate Institute Jun 2015.
 - » NSW Greens Senator, Lee Rhiannon visited site Jun 2015.
 - » Minister Macfarlane advisor (Ms Jessie Foran) and ARENA Advisory members visited site Jul 2015.
 - » U.S. Consul General and Mark Coulton MP visited site July 2015
- > Broken Hill Solar Plant
 - » ARENA Strategic Knowledge and Marketing (Damir Ivkovic) visited site June 2015









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7. Stakeholders

Knowledge Sharing

 Knowledge Sharing Activity Program No.6 – Commissioning and Testing

- » Agreed with ARENA on 1 June 2015
- > Industry participation (EIF) operational data request
 - » AGL Gatton EIF Strategic Advisory Board Meeting
- > Recent knowledge sharing activities
 - Connection point commissioning lessons learnt from Nyngan transferred to Broken Hill
 - » First Solar US attended Broken Hill supported testing, commissioning and pre-functional checks for SCADA & IT.
 - » Numerous site visits of stakeholders.
- > Knowledge Sharing Activity Program No.5 Construction
 - » Draft tasks for Generator Performance Standards (GPS) and AEMO Registration submitted for ARENA review











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8. Broken Hill Solar Plant – project data

- > Location:5k SW of Broken Hill
- > Capacity: 53 MW
- > Generation: 126 GWh (at revenue meter)
 - » Approx 17,000 average NSW homes
- > Cost: \$150 million
- > Construction Start: Jul 2014
- > Construction Finish: Nov 2015
- > Connection: 22kV
- > Number of panels: 650,000
- > Number of inverters: 80
- > Number of arrays: 40







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8. Broken Hill Solar Plant – project facts

- Interesting information about the Broken Hill Solar Plant
 - » Solar plant site = 140 hectares → ~75 Sydney Cricket Grounds
 - » First Solar frameless glass-to-glass laminate modules
 - » 60 x 120cm; 12 kg
 - ~650,000 million modules would stretch from Broken Hill to Canberra (as the crow flies)
 - » 75,000 posts installed
 - » Approximately 800 km of cable
 - Fives times bigger than the next largest solar plant in Australia



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8. Broken Hill Solar Plant – project progress



Landowner's house relocation in progress

Break Hit meldenta Leonle and Geoffrey Lake watches dans the first menutes and the first metalet and the firs

Landowner house relocation lift



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8. Broken Hill Solar Plant – project progress





22kV overhead line prior to house relocation

22kV u/g line relocation (trenching)



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