Knowledge Sharing Report-Milestone 5

RATCH-Australia

Collinsville Solar Thermal Power Station

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RATCH-Australia Corporation

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Introduction

RATCH-Australia Corporation Limited (RAC), in partnership with Transfield Infrastructure Pty Limited, and The University of Queensland (UQ), is undertaking all the preparatory development work to assess the viability of converting an existing 180MW coal fired power station to a 30MW hybrid solar thermal / gas power station at the Collinsville Power Station (CPS) in Queensland (the Project).

As part of the Project, RAC will also examine the feasibility of using Novatec's Supernova Linear Fresnel Solar Thermal technology to generate superheated steam to be supplied directly to a steam turbine to provide grid connected electricity. The dual-fuel boiler will also be designed to use natural gas to enhance grid reliability from the Project.

The Australian Government, through an Australian Renewable Energy Agency's (ARENA) Emerging Renewables Program Funding Agreement, is partly funding the feasibility study.

This **Knowledge Sharing Report for Public Release** contains a summary of the learnings and knowledge gained during this phase of the Project, including publicly-releasable information from the following reports provided to ARENA:

- Technical Cost Estimate;
- Network System Studies;
- Development Approval process/documents; and
- Formal Network Connection application to Ergon Energy

Technical Cost Estimate

Technical Tender Review Report

This report prepared by PB Power outlines the basic review of the technical sections of the engineering procurement and construction (EPC) bids received for the Collinsville 30MW Solar Thermal Power Station (CSTPS). The report includes a summary of abridged technical evaluation and identifies a provisionally preferred bidder.

Learnings and Knowledge gained

All bidders have only partially covered the scope required by RATCH as set out in the works specification and this varies between the bids. In particular, they have been silent or severely limited the extent of performance tests and associated guarantees due to uncertainty in Government support towards the construction of the project. The prices provided are currently budget prices and will have to be revalidated once a financial commitment from Government is obtained.

Contractor Selection Report

Capital Costs and O&M Cost Reports

This report provides estimates of the capital and operating (O&M) costs for the Collinsville Solar Thermal Power Station (CSTPS) by updating the existing project cost estimate with more recent information based on the basic evaluation of the EPC bids received in reply to the RATCH invitation to tender, dated 16 October 2013. This EPC based price is assumed to represent the full capital cost of the power station and ancillary plant including:

- power block, solar field and gas boiler
- all associated plant, buildings, civil works, drainage and road access including the Hoffman's Road diversion
- water supply from the existing raw water tank, waste water disposal to the existing disposal pond
- step up transformers and connection to a bay at the Ergon substation
- cooling tower and piping
- Gas connection at the boundary of the site.

Learnings and Knowledge gained

Deviations to the Cost estimate

Based on the information provided by the EPC tenders, the total capital cost estimate is $286 Million. The previous budget project cost estimate, prepared in May 2013 was 84% ($ i.e. $ 130 Million) below the current capital cost estimate. The following sections explain possible reasons for the difference between the pricing and the previous estimate.

Exchange rates

When comparing the cost of equipment between the previous estimate and now the difference in the AUD to USD exchange rate should be considered. When the previous estimate was completed, the exchange rate AUD to USD was 1.04 and is currently around 0.91. This adds 16.5% to the cost of the equipment and may account for the price difference seen for most of the equipment.

Solar field

The solar field cost is around 26% higher than the estimate after subtracting 16.5% for the difference in the exchange rates. Previously the RATCH estimate was based on Thermoflex software. The current Thermoflex data shows that the estimated cost for the solar field has increased by 32% so the pricing is not that far from the estimate based on the current Thermoflex data. Another reason for the increased price is the specification selected by Novatec for the evaporator tubes being the same as the superheater tubes.

The civil works pricing is around 500% higher than the estimate. We assume that this is due to the inclusion of an increased solar field civil scope and road upgrades; a further price break down might explain this.

Balance of plant

Balance of Plant items were not included in the previous estimate and some items such as diesel tanks have been added since the estimate was completed.

Buildings

Buildings other than the steam turbine were not included in the previous estimate. A workshop, admin building and water treatment plant area have since been included. At the time of the estimate it was assumed the some of the old buildings could be re-used.

O & M Costs

Parsons Brinkerhoff has reviewed the O&M costs provided by the bidders. Costs provided are budgetary estimates with limited detail of the scope. Bidders have excluded major overhaul work costs; it is not clear if any major overhaul work would be required within the five year period as it would depend on the equipment provided.

Supplier's input should be considered when planning the major overhauls and manning for the power station and this information is not available at this stage.

Network System Studies

The detailed technical performance of the plant cannot be determined until the final makes and models of equipment are selected. This selection will not be completed until after the tender process and potentially during detailed design of the plant. This makes it difficult to confirm whether the plant will meet the technical performance standards required by the NSP and AEMO, and/or whether any extra equipment would need to be installed, such as external reactive plant, to improve technical performance.

Such extra equipment would affect the business case for the project, but equipment suppliers and EPC contractors are reluctant to provide detailed performance information until there is more certainty that they will be preferred supplier for the project. As such, the developer is between a rock and a hard place in terms of agreeing to performance standards in order to advance the connection process, but without certainty as to what equipment may be required to meet such standards. It is also difficult to provide all the data requested by AEMO in the Design and Settings Datasheets as part of the Connection Application without having finalised the equipment suppliers.

Cost of Connection

The construction cost varies greatly according to the connection voltage level. It would not be financially viable to connect a 30 MW plant to a network voltage of 132kV or above, however the planned connection to the Collinsville 33kV network is not prohibitively expensive.

Development Approval Process

Final DA submission documents

RAC engaged their environmental advisors to prepare the required Environmental and Regulatory Assessment Studies and Development Application (DA) submission documentation.

The Development Application (DA) seeks Whitsunday Regional Council's approval for a Material Change of Use (Impact Assessment) for a Major Utility (hybrid solar thermal and gas power station). The proposal involves:

· Use of the premises for the purpose of generating electricity using solar thermal technology, hybridised with a dual fuel boiler. Proposed capacity of the power station is 30MW.

· Built form consisting of a solar thermal mirror field, and associated power generating plant (turbine hall, cooling tower, transformers, and ancillary operational buildings such as workshop, administration, control room, etc.).

· The solar thermal mirror field consists of 174,000m² of linear Fresnel mirror, covering a land area of approximately 32 hectares. The total area of the development site including the solar mirror field and associated plant and operational areas is subject to final detailed designed, but is estimated to require a maximum of 60 hectares.

· Closure of part of the existing Hoffmans Road alignment, and creation of new road reserve to divert Hoffmans Road around the proposed development.

· Clearing of some remnant vegetation within the area required for the solar thermal field and associated plant. The remnant vegetation is all of 'least concern' status, as shown on the certified Property Maps of Assessable Vegetation for the subject properties.

· Installation of a protective fence to isolate the plant from the general public. The fence shall be constructed enclosing the entire perimeter of the plant. The perimeter fence shall be a chain link fence, with a height of at least 1.8 m.

· Integration of the proposed development into the existing Major Utility use of the site. The CPS site is continuing to be operated and managed in accordance with existing approvals and site management conditions. Once operational, the proposed solar thermal power station may include use of existing facilities on site, such as car parking, offices, water storage and supply infrastructure, fuel storage facilities and other ancillary operational areas which support the site's power generation function.

· Community benefits in the form of regional employment opportunities, skill development and diversification for the region's economic base, through the establishment of a new industry – solar powered electricity generation.

The DA submission, supporting documents and reports have been finalised and are ready for submission. The technical reports supporting the development include:

· Town Planning Report.

· Proposal Plans.

· Civil Design Report (preliminary).

· Traffic Management Plan.

· Road Impact Assessment.

· Detailed Construction Method.

· Noise Impact Assessment.

· Air Quality Impact Assessment.

· Water Treatment Report.

· Draft Site Based Environmental Management Plan.

· Fire Management Plan.

· Visual Impact Assessment Report

Learnings and Knowledge gained

Coordination / facilitation of State interests by the Department of State Development, Infrastructure and Planning (DSDIP)

The project made initial contact with the Department during February 2013 via the Development Facilitation Services for Major Projects. RATCH nominated the project for 'development facilitation' in March 2013. Due to changes in government legislation, July 2013, the project was not afforded facilitation via the Development Facilitation Services, Major Projects (DFS).

A formal pre-lodgement meeting was held with the State Assessment Referral Agency (SARA) on 18 September 2013, with attendance from various government agencies from

DSDIP, Department of Transport and Main Roads (DTMR), Department of Environment and Heritage Protection (DEHP), Department of Agriculture, Fisheries and Forestry (DAFF) and Department of Natural Resources and Mines (DNRM).

SARA conveyed their desire and intention to help understand and resolve issues for the project. The key outcomes of this meeting were:

· Comprehensive understanding of the project across various State agencies with potential interests affected by the project.

· Confirmation the vegetation clearing required for the project is covered by the exemption for community infrastructure which came into effect on 2nd August 2013.

· Confirmation RAC could apply for a simultaneous road closure and opening under the Land Act 1994 as an adjoining land owner to the portion of Hoffmans road proposed to be diverted, and the required State land owner's consent for the development application would be considered having regard to this road closure application.

· Confirmation no water allocation was required for the project due to the existence of a substantial water supply contract for the site.

· Advice the State's mapping shows the waterways on the site could potentially trigger referral for Fisheries Act matters, namely waterway barrier works that could impact on fish passage. It was agreed a DAFF officer would undertake a site inspection in order to advise further prior to lodgement of the application.

· Confirmation the development does not trigger assessment for matters impacting on State-controlled roads, as it is not considered to fall within one of the types of development included in Schedule 9 of the Sustainable Planning Regulations 2009.

· Confirmation the development requires an Environmental Authority for the following prescribed Environmentally Relevant Activities:

» ERA14 Threshold 1 – generating electricity by using gas at a rated capacity of 10MW electrical or more

» ERA14 Threshold 2(a) – generating electricity by using a fuel, other than gas, at a rated capacity of 10MW to 150MW electrical.

In practice, the experience of the coordination role may result in the dilution of technical issues and potential loss of direct contact with technical / decision-making officers.

<u>Road closure/opening approval</u>

Initial concerns were raised by the project with DFS and SARA regarding the potential long lead times for the assessment of the road closure / opening process. Further queries were raised regarding the inability to provide land owner consent, until receipt of DNRM approval of the associated road closure/opening.

RAC believes that the two processes (simultaneous road closure / opening & provision of land owner consent for the DA) could occur in parallel, rather than requiring a linear sequence of events.

An application for simultaneous road closure/opening was lodged 16th October 2013. DNRM offer to open / close road was provided February 2014. This required DNRM land owner consent to be provided upon acceptance of DNRM offer to open / close road.

Clearing Vegetation Property Maps of Assessable Vegetation

The clearing associated with the development has been determined to be 'exempt' from assessment against the Vegetation Management Act 1999, due to the project being for Community Infrastructure. This was confirmed with the State Assessment and Referral Agency (SARA) during formal pre-lodgement meeting. This exemption reflects a high-level policy decision by the Queensland State government to support important infrastructure developments despite where clearing of vegetation is required.

Network Connection Application

To arrange the grid connection for the project, Ratch followed Ergon Energy's connection process. Ergon has a reasonably well-defined connection process, beginning with a Connection Enquiry, and then involving a Planning Study, a Scoping Study, a Connection Application and finally an Offer to Connect. The proponent provides information about the project but the process is led by Ergon Energy and is dependent upon their timeframes and availability. Each stage of the process involves the proponent paying a fee to Ergon and Ergon providing a report, and the timeline for each phase appears to be somewhat arbitrary. In addition to the technical studies, commercial contract terms were negotiated for both the Construction Contract for the construction of the network connection infrastructure and a Connection Agreement for the ongoing operation of the network connection infrastructure over the life of the plant.

Performance standards were drafted to reflect the expected technical performance of the plant, which will be negotiated with the Australian Energy Market Operator as part of the connection process. The performance standards at this stage are not able to be finalised as they will be dependent on the final equipment selected for the plant, and that final equipment will be dependent upon the EPC contractor selected to construct the plant.

AEMO's Design and Settings Datasheets were completed as much as possible given the limited information available at this stage about the detailed performance of the specific pieces of equipment that will comprise the generating plant. Again, this equipment will not be finalised until the EPC contractor has been selected. As per AEMO's process, the datasheets will need to be updated with "R1 Data" prior to construction of the plant, and then again with "R2 Data" after commissioning and testing of the plant.

Learnings and Knowledge gained

Ergon Energy has a reasonably well-defined connection process, beginning with a Connection Enquiry, and then involving a Planning Study, a Scoping Study, a Connection Application and finally an Offer to Connect. Unfortunately, however, the timing of this process is almost entirely in Ergon's hands and is difficult to estimate, and yet the Offer to Connect, when it is made, is extremely rigid in that it has a 30-day acceptance period.

This short acceptance period means that the proponent would need to commit to the construction of the connection assets without necessarily having certainty about other aspects of the project, such as ARENA funding, construction contracts, offtake agreement, etc. Ergon advises that if the Offer to Connect is not signed within the acceptance period, the project will be pushed to the back of their work queue and will have to start again from the beginning of the connection planning process, leading to an expected delay of 12 months. This makes it extremely difficult to plan a timeframe for the connection process during the development of this project.