Opunake Farm Solar Project

Work Phases and Job Creation

GreenEnco

Document Management system

Revision	Change log	Prepared	Reviewed	Approved	Date
R0	First Release	JM	SR	JR	26/10/2022

Disclaimer

This report has been prepared for the named project and should not be used for any other project without an independent check being carried out as to its suitability and prior written authority of GreenEnco being obtained. This report has been prepared based on the information provided by Harmony Energy (NZ) Limited. GreenEnco accepts no responsibility or liability for the consequence of this document being used for a purpose other than the purposes for which it was commissioned.

GreenEnco is not responsible for any mistake or error in any of the documents and information provided. GreenEnco will not be liable to you in respect of any business losses, including without limitation loss of or damage to profits, income, revenue, use, production, anticipated savings, business, contracts, commercial opportunities or goodwill.

Contents

1 Executive Summary

The proposed Opunake Solar Project will employ the following labour hours during phase 1.

Phase 1: Engineering, procurement and construction

System design and engineering	2280 labour hours
Construction project personnel	25688 labour hours
Installation	528000 labour hours
Testing, commissioning and technical	1296 labour hours

Phase 2: Operation, maintenance and asset management

The proposed Opunake Solar Project will create the following jobs for the life of the project (34 years) throughout phase 2.

Operations & maintenance and asset management	10728 labour hours per year for 34 years

2 Introduction

GreenEnco Limited ("The Consultants") has been appointed by Harmony Energy (NZ) Limited ("The Client") to:

(i) undertake an assessment of the number of jobs that will be created by the development of the proposed Opunake Solar Project ("Project"); and

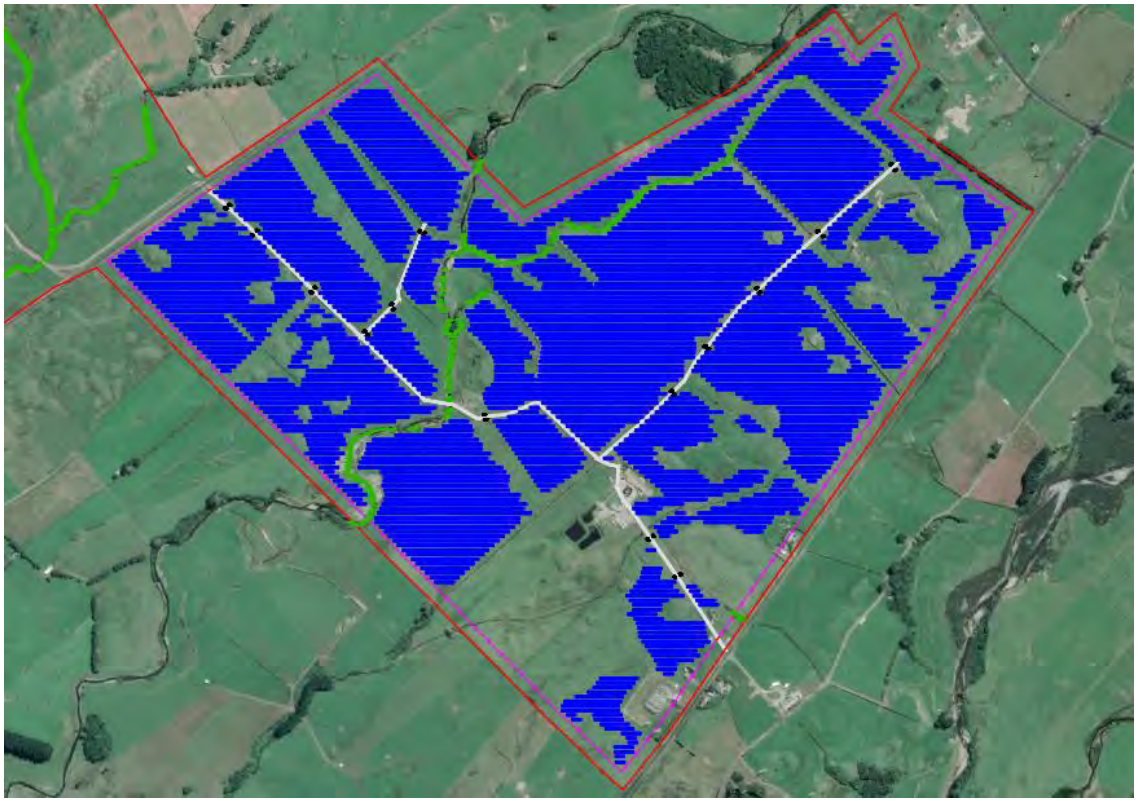
(ii) detail the labour hours that will be employed during the engineering, procurement and construction work phase of the Project and the operations, maintenance and asset management work phase of the Project.

The Consultants is a Technical Advisor with over 5 GW global experience advising clients in connection with utility scale solar photovoltaic (PV) and battery storage projects in 15 countries in 4 continents.

The Consultants is providing The Client with design optimisation services in connection with the Project and has a detailed knowledge of the work that will be involved during the construction and operational phases.

2.1 The Project

The Consultants has been informed by The Client that following an initial investigation into a few sites to the South-West of Mount Taranaki, The Client has identified a suitable site for solar development at Opunake due to its proximity to the Opunake sub-station, its topography and its size. The Project site is located the West of Wiremu Road, Opunake, New Zealand, as shown below.



Energy from solar farms is yet to be a part of New Zealand's energy mix; however, they offer many advantages over other forms of energy generation. It is also expected that the solar farm construction is expected to grow in very near future and help to create socio-economic development locally and nationally. Solar farms provide a natural and inexhaustible source of energy that is clean and low impact, their benefits include:

- Emissions-free electricity generation
- Noise-free electricity generation
- Very low technology risk
- Low maintenance requirements
- Lower environmental impact than wind, hydro and geothermal
- Less weather dependent than wind and hydro (solar works on cloudy days)
- Restoration of farmland
- Enhancement of biodiversity
- Low impact on public amenity
- Diversification of New Zealand's energy mix
- Contributing to New Zealand's 100% renewable energy targets

3 Scope of Works

3.1 Engineering, Procurement and Construction Phase

Engineering & Design

- Plant conceptual design
- Resource assessment
- Civil design
- Instrumental engineering
- Supervision systems
- Electrical and mechanical design
- Environmental engineering
- Social assessments
- Capital estimating
- Supplier technical offer Evaluation
- Permits and licensing
- Technical data archive
- Site Studies and Surveys, System Studies and Calculations
- Geotechnical Study and investigation
- Pull-out Test
- Detailed Topography
- Final Design (Issued for Construction Designs - IFC)
- Bill-of-materials (BOM) development
- AC works/grid code compliance
- QA/QC for construction design
- Field review when installed
- Support during Construction

Project and Contract Management

- Project budgeting, planning, cost control and progress tracking
- EPC tendering and contracting
- Contract award and kick-off
- Contract and order management
- Expediting and logistics follow up
- Quality control
- Grid connection agreements
- Claims prevention and response
- Risk management
- Health & safety
- Field review when installed
- Support during Construction

Construction and Handover - Civil Works

- Vegetation Suppression (Site Cleaning)
- Land Levelling
- Land Levelling Disposal
- Internal Access
- Access Maintenance
- Fence
- Low Voltage Trenches
- High Voltage Trenches
- Drainage System
- Mounting structure Pile Driving (or pre-drilling), subject to soil investigation report
- Civil Foundation for Inverter Station

- External Access
- Modules cleaning at end of construction
- O&M Building
- Other Civil Works Items

Electromechanical Works

- Mounting System Installation
- PV Module Installation
- Inverter Installation
- String box Installation
- DC Cables Installation (PV Modules to String box)
- DC Cables Installation (String box to Inverter)
- MV Cables Installation
- Security System Installation (per fence meters)
- Grounding System Installation
- Meteorological Stations
- Monitoring Supervisory Control and Data Acquisition (SCADA) System
- Other Electric/mechanical Items

Project Management

- Site Mobilisation and provision of site offices, warehouse welfare and CONTRACTOR's preliminaries
- Project Management including site supervision, security, HSSE, interfaces, documentation and signage
- Contractor Insurances
- Special Tools

Supervision

- execution monitoring
- Site construction monitoring
- Material Receipt and quality Check
- Warehouse management
- Grid interconnection management
- Health and safety monitoring

Handover

- Plant commissioning
- Handover to O&M
- Testing and Commissioning

3.2 Operations, Maintenance and Asset Management Phase

Operational and Maintenance (O&M) is a common good practice for smooth operation of the system. The O&M scopes contains a list of preventatives, predictive and corrective maintenance works.

A data driven technical analysis of the plant performance comes under asset management scope. Asset Management is an essential scope of utility scale solar PV projects ensuring the system performance to its optimum level and help the O&M contractor to be more proactive in their job scopes.

The jobs that need to be done during this phase will last for the life of the Project, which is planned to be 34 years.

During this phase sheep farming will be integrated into the solar farm which will create 2 additional long-term jobs.

4 Jobs To Be Created and Job Durations

The Consultants consider that the total duration for engineering, procurement and construction will be in the range of 15 – 18 months. The jobs required to deliver the Scope of Works are listed in the table below.

System Design and Engineering			
Job Title	**Weeks**	**Hrs/Week**	**Labour Hours**
Civil 1	8	40	320
Civil 2	3.2	40	128
Structural 1	3.6	40	144
Electrical 1	9.6	40	384
Electrical 2	9	40	360
Electrical 3	7.6	40	304
Draftsman	16	40	640

Construction Project Personnel			
Job Title	**Weeks**	**Hrs/Week**	**Labour Hours**
Project Director	3.2	40	128
Project Controls	16	40	640
Office Administrator	10	40	400
Process Support	10	40	400
Project Manager	54.6	40	2184
Construction Manager 1	54.6	40	2184
Construction Manager 2	54.6	40	2184
General Superintendent	54.6	40	2184
Project Engineer	54.6	40	2184
Civil/Structural Superintendent	31.5	40	1260

Mechanical Superintendent	31.5	40	1260
Electrical Superintendent 1	48	40	1920
Electrical Superintendent 2	48	40	1920
Commissioning Manager 1	6	40	240
Commissioning Manager 2	6	40	240
Quality Engineer - Structural/Civil	30	40	1200
Quality Engineer - Electrical	30	40	1200
Quality Manager	18	40	720
Safety Manager	21	40	840
Quality Inspector	7	40	280
Safety Inspector	7	40	280
Logistics Manager	28	40	1120
Purchasing Coordinator	18	40	720

Installation				
Job Title	**Number of people**	**Weeks**	**Hrs/ Week**	**Labour Hours**
Mechanical installation team	150	20	40	120000
Civil installation team	105	50	40	210000
Electrical installation team	90	55	40	198000

Testing & commissioning and Technical Advisor			
Job Title	**Weeks**	**Hrs/Week**	**Labour Hours**
Testing and commissioning engineer 1	7.2	40	288
Testing and commissioning engineer 2	7.2	40	288
Testing and commissioning engineer 3	7.2	40	288

Testing and commissioning engineer 4	7.2	40	288
Technical Advisor	3.6	40	144

The personnel listed below are required for the life of the Project (34 years).

Operation & Maintenance and Asset Management			
Job Title	**Weeks**	**Hrs/Week**	**Labour Hours**
Full Time – calculated on yearly basis			
Operation & Maintenance Technician 1	36.4	40	1456
Operation & Maintenance Technician 2	36.4	40	1456
Data monitoring	52	40	2080
Asset Manager -Commercial	52	40	2080
Asset Manager -Technical	52	40	2080
Part Time – calculated on yearly basis			
HV Engineer (Part time)	36.4	10	364
Module cleaning 1 (Part time)	10.5	30	315
Module cleaning 1 (Part time)	10.5	30	315
Grass cutting 1 (Part time)	4.2	30	126
Grass cutting 1 (Part time)	4.2	30	126
Testing Engineer (Part time)	7	30	210
Technical Audit (Part time)	1	30	30
Thermal inspection surveyor	3	30	90