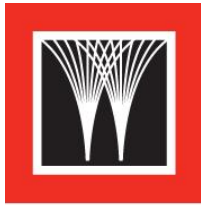


Mine Site Village Carbon Emissions & Engineering Offset Solutions



WorleyParsons

resources & energy

EcoNomics



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Executive Summary

This report aims to investigate solutions for carbon neutrality in mine site village developments by assisting David Goodfield (DG) in undertaking several essential tasks associated with his PhD, using Mount Magnet Gold (MMG) village as a case study.

In order to assess the potential of Renewable Energy (RE) as a carbon offset solution in the current power system, software called REMAX was specially developed. HOMER was used to assess the potential of RE in standalone power systems. A standalone study was undertaken, as major capital cost savings were identified if the transmission line between the mine power system and the village was removed (\approx \$250,000 per kilometre). The sensitivity of MMG village's power system, being the mine's power system was found to be somewhere between 50 and 100 kW. Due to these sensitivities and the small ratio of the village within the load (2.46%), it was found that the potential of RE in the current power system would be very low. The standalone configuration was found to be more economically viable than the current power system, if the village is located more than 4 kilometres (km) away from the mine power system (assuming cost of the line \approx \$250,000 per kilometre). Findings also show that a wind diesel hybrid power system is more economically viable than the diesel, only if the project life is more than 7, 5, 4 and 3 years for a project starting in January 2012, 2014, 2016 and 2018 respectively. However, in the situation where the standalone system is powered by only diesel generators, the carbon emission was found to be higher and was not suitable for this project.

Given the high energy usage of mining villages' air conditioning (AC) systems, the potential of using a Ground Source Heat Pump (GSHP) system instead of currently used standard reverse cycle AC systems was also investigated. GSHPs were found to have a high potential as a carbon offset solution in mine site villages, with payback period under six years possible. Nevertheless, the system needs to be sized appropriately and used in high demand locations (\approx 20 hours a day).

Another task associated with this project was to undertake the village's energy audit and monitoring system commissioning which were successfully undertaken during a site visit in the third week of October 2011. Also, the calculation of the embodied energy of two buildings (donga and kitchen) from the village was undertaken using a life cycle assessment software (eTool), that was previously investigated.

Nomenclature

| | |
|---------------|--|
| AC: | Air conditioning |
| BOM: | Bureau of meteorology |
| DG: | David Goodfield |
| CAPEX: | Capital expenditure |
| CO2: | Carbon dioxide |
| COP: | Coefficient of performance |
| E: | Enercon |
| FWS: | Four Wind Seasons |
| GSHP: | Ground source heat pump |
| LGCs: | Large-scale generation certificates (RECs) |
| OPEX: | Operational expenditure |
| MM: | Mount Magnet |
| MMG: | Mount Magnet gold |
| NPC: | Net Present Cost |
| NPV: | Net Present Value |
| PL: | Project life |
| PV: | Photovoltaic |
| RE: | Renewable energy |
| WT: | Wind turbine |
| WTP: | Water treatment plant |
| WWTP: | Waste water treatment plant |

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