DeGrussa Solar Hybrid Project

Essential Information

27 June 2017
Neoen, a leading international IPP

Neoen has installed or is currently constructing more than 1.1GW of renewable energy projects globally:

- **Solar**: 665 MW
- **Wind**: 445 MW
- **Generation capacity**: ~1.13 GW

Countries in which Neoen operates:
- Mexico
- El Salvador
- Jamaica
- Portugal
- Egypt
- Jordan
- Mozambique
- Zambia
- Australia
- France
Neoen owns the 10.6 MWp hybrid solar plant at the Sandfire Resources DeGrussa mine in a remote area of Australia

The key characteristics of the project:
- 10.6 MWp solar PV with single-axis tracking system
- 4 MW / 6 MWp battery to provide support and spinning reserve
- Hybrid solution integrated with the 19 MW diesel plant
- 21GWh annual generation (20% of mine electrical demand)
- 20 hectares of land required for the installation
- Power Purchase Agreement for 6+ Years

The key stakeholders of the project:
- Sandfire Resources is the Energy Offtaker
- Neoen is the owner of the Solar Hybrid, an IPP holding a PPA with the mine
- Juwi acts as Developer, EPC and O&M
- ARENA provides recoupable funding
- CEFC provides project finance

The largest project of its kind in the world (offgrid hybrid solar PV with battery storage)
DeGrussa project structuring

Neoen acquired the project from juwi in mid-2015 and managed the project structuring including the arrangement of debt finance with the CEFC.

The project was funded by a combination of Neoen equity, an ARENA grant and CEFC debt financing. No capital investment was needed from Sandfire for the project to be built.
Neoen timeline of key moments in the materialisation of the DeGrussa Solar Hybrid Plant

- **Decision to acquire the project (March 2015)**
- **PPA / EPC Signed-off (July 2015)**
- **Start of Production (June 2016)**

**Project Development**

**Engineering, Procurement, Construction**

**Operation & Maintenance**
The greatest advantage is that the solar farm reduces diesel consumption for Sandfire Resources.

On a typical winter sunny day at the DeGrussa mine, a significant part of the mine electricity demand is covered by solar energy:

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**Important**

The technical solution at the DeGrussa mine allows a high penetration of solar energy to increase diesel savings related to solar PV generation.
Renewables have a great potential for mining companies based on the experience with Sandfire

Here are 3 main benefits that Sandfire realised after the installation of the solar PV plant, all of which could be applied to other mining companies:

1. **Optimisation of power cost:**
   - The power cost is competitive with (or cheaper than) diesel and will decrease after the initial PPA period
   - Very little capital requirements for the mine as the project CAPEX is provided by Neoen
   - 5M litres annual diesel savings (20% of diesel required for power generation)

2. **Mitigation of risk of fuel cost rising and implementation of any Emission Trading Scheme:**
   - Hedge against anticipated volatility of diesel prices
   - Hedge against possible introduction of Emission Trading Schemes
   - Hedge against reduction of Fuel Tax Credit

3. **Reputation of Sandfire as a sustainable mining company**
   - Saving of diesel results in 12,000 tonnes annual reduction of CO2 emissions
   - Creation of additional work places for local communities during the solar plant life-time
   - Worldwide recognition as an innovative green company
Other improvements to increase solar penetration can be envisaged in the short and medium term

Neoen and Sandfire will work on further increasing the performance of the system and this should lead to further diesel offsetting:

- Optimise diesel generator minimum load to increase PV penetration
- Optimise the “solar PV coverage” (Spinning Reserve requirement) which is responsible for how much diesel generation kW should be available for each solar generation kW
- Evaluate the potential of cloud monitoring and weather prediction systems
- Testing different capabilities of the batteries to optimise use for providing spinning reserve
- Optimise the start/ synchronization time of diesel generator to enable most efficient use of the generators for spinning reserve
- Provide additional services to Sandfire, leveraging battery capabilities: network support overnight (active power, reactive power, black start)
- Allow early battery transformer energization, which will increase availability of support for the network (active / reactive power) and increase availability of the solar facility

**Important**

*Neoen is building a strong expertise to optimise the operation of an off-grid solar hybrid solution. Neoen aims to increase solar penetration at the DeGrussa mine, and therefore further increase diesel offset.*
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