HOW CAN MINING CATALYSE THE DEPLOYMENT OF OFF-GRID SOLAR ENERGY?

Framework Step:

STEP 1 - Adopt a comprehensive long-term vision and implementation strategy to build competitive and diversified economies and create in-country shared value out of natural resources.

1 A. *What can host governments do:*

- Develop sustainable options for energy production and consumption, also assessing trade-offs and combined use of renewable and non-renewable resources.

STEP 3 – Unlocking opportunities for in-country shared value creation

3.2 Shared infrastructure

3.2.1 Shared power

3.2.1.B *What can extractives industries do?*

Where there is no grid or the grid is too remote so that grid-supplied electricity is more expensive or excessively unreliable compared with self-supply:

- Develop electricity self-supply plans that align with government's plans for electrification and local contexts.
- Enable a sustainable strategy for leveraging extractives sector energy generation, by assessing the feasibility of renewable energy power generation options.
- In consultation with donors, governments, and utilities, assess the feasibility of installing a renewable energy-based mini grid instead of isolated generators and explore implementation and cost-sharing arrangements.

STEP 4 – Support and contribute to innovation leading to new products and services

4. B *What can extractives industries do?*

- Leverage extractives sector operations to increase use of renewable energy, as appropriate. This could be done for example by either linking production to renewable energy (e.g. making use of solar and wind power to reduce the contribution of fossil fuels and green-house gases to mineral and oil & gas production, while reducing high electricity costs associated with the use of decentralised diesel generators) or by developing green supply chains (e.g. mining rare earths and supporting local manufacturing of magnets for wind turbines to provide clean energy or mining lithium to manufacture electric batteries for incorporation into green products).

Tags: *In addition to the Framework step(s) that they fall under, examples will also be tagged by crosscutting issues. Please select all applicable tags.*

☐ local employment
☐ local supplier participation and development, including SMEs
☐ marginalised groups (women, indigenous people)
☐ skills development and upgrading
☐ access to credit
X shared infrastructure (transport, water, power)
☐ technology transfer
X innovation
X economic diversification
☐ Other: _____

Problem Statement:
Mining projects require substantial energy, and remote areas of Australia are off-grid and rely on trucked-in diesel fuel, leading to high costs.

Parties Involved:

- Government of Australia
- Australian Renewable Energy Agency, ARENA (recoupable funding)
- Sandfire Resources NL (mine owner)
- Neoen (project owner and equity provider)
- Clean Energy Finance Corporation (debt finance)
- Juwi (Project developer, EPC and O&M contractor)
- KPS Power Generation (diesel power station owner and operator)

Common ground:
Sandfire Resources NL had an interest in reducing its energy costs and increasing reliability of power supply, while the Australian government had an interest in supporting the development of renewable energy projects that could be further deployed to supply power to remote communities.

Actions taken*:*
Sandfire Resources NL's DeGrussa copper mine is located about 900 km north of Perth, in a remote area without access to the electricity grid. The mine was powered initially by an on-site 20 megawatt diesel generation station that requires substantial amounts of diesel fuel to be trucked to the site. In order to reduce the use of diesel fuel and lower both costs and emissions, Sandfire decided to employ the use of a large solar power generation (10.6 megawatts) and storage (6 megawatts) facility. It is one of the largest integrated off-grid solar and storage facility on a mining site in the world.

Renewable energy firm Juwi partnered with construction firm OTOC to construct the project, which is owned and operated by the French renewable energy firm Neoen. Construction began in June 2015 and the project was commissioned in May 2016. Sandfire has guaranteed that they will purchase power from the plant for at least the next 5.5 years, which is the current expected operating life of the mine, although there is potential for further discoveries to extend the life of the mine. The recoupment of ARENA's costs is subject to the mine's life being extended.

The diesel generation is fully integrated with the hybrid plant. During the day, power is largely drawn from the solar panels, with the battery acting to make up for short term drops due to cloud cover. During this time, some percentage of the power is still supplied by the diesel power generators. During the night, the diesel generators provide full power. A possibility is envisaged that the battery will be used during night time to help smoothing out fluctuations and support system reliability. In total, it will result in an offset of over 20% of the mine's annual diesel fuel use.

The project is intended to be a world-leading example that increases confidence and drives further advancements in the use of renewable energy at mine sites. The project's knowledge sharing plan aims to release operational performance data summaries to assist mining companies evaluate the risks of renewable energy integration into diesel power plants. It also aims to illustrate the potential diesel and cost savings achievable by renewable energy in a mining setting and analyse the cost curve and key events that could enable high penetration solar PV opportunities to be economically deployed in Australia without subsidies. This will help drive down first-of-a-kind costs and change perceptions

about the risks associated with high penetration and critical load off-grid projects. Components for the project were sourced from a variety of countries, including Australia, China, South Korea, New Zealand, USA, Vietnam, and Estonia.

Obstacles:

- Different companies with different expertise had to collaborate closely together in order to integrate new solar PV and battery storage technology into the existing diesel power generation set-up (KPS Power Generation) in a way that enhanced reliability at the mine (Sandfire Resources NL).
- The remote location of the mine meant that materials needed to be brought together from substantial distances and that proper resource management was key to ensuring Health and Safety as well as reasonable productivity.
- There were design challenges in terms of combining diesel and solar, especially in a context where the existing diesel assets already physically formed part of the mining production site.
- Based upon the above, given the project complexity and significant schedule constraint (7 months), implementation of the project needed to be coordinated with a high level of transparency between all stakeholders to avoid further communications challenges. Neoen ensured that appropriate meetings were set up on a daily, weekly and monthly basis.
- Project management support, both directly and through engineers working for the mining company, was heavier than on "typical" projects in order to ensure proper coordination and early detection of potential issues.

Enabling factors:

- The project was supported by repayable finance options from two Australian federal government agencies - the Australian Renewable Energy Agency which provided almost 21 million AUD in a recoupable grant, while the Clean Energy Finance Corporation provided 15 million AUD in debt finance. ARENA also worked with the project proponents to deliver relevant and timely knowledge to the market.
- Location played an important role - the region of Australia that the DeGrussa mine is situated in has high levels of solar irradiation, providing strong potential for solar power generation. At the same time, its remote location meant that it was off-grid, raising the costs of transporting diesel.

Lessons Learned:

- The mining sector can provide a springboard to test new energy technologies that can potentially supply power to off-grid communities. New technologies tend to be expensive, and communities in off-grid areas often lack the funds to trial them. The cooperation between the project proponents and ARENA supported the implementation of a new technology that could potentially be of great benefit to off-grid communities who are currently reliant on diesel fuel. By implementing it in a commercial operation, the technology can be subject to rigorous and long-term study to assess viability and understand how it can be used in other off-grid contexts.
- This was a first of its kind project, and its success depended on the government taking a bespoke approach to supporting its development.
- Government can play an important role in filling the "risk gap" for new projects, when it can be difficult to access finance.