Renewable energy generation at mine sites: Current state and trends in Australia

Mining is an energy intensive industry, accounting for a considerable share of Australia’s energy consumption. The industry increasingly faces pressures to reduce greenhouse gas emissions and to address rising energy costs from fossil fuel sources. An approach to address these challenges is the generation of renewable energy for mining operations – often in remote locations without access to grid electricity. Research conducted at QUT’s Centre for METS Business Innovation, in collaboration with CRC ORE, has mapped the current state of renewable energy technology adoption at Australian mine sites – providing a comprehensive overview of projects, trends and technologies.

What is the current state of renewables in mining?

34 mine sites are currently powered or planned to be powered with renewable electricity, equal to 8.8% of all mine sites in operation and under-development – most of which are in Western Australia. Of the 34 renewable energy projects identified, 16 systems are currently operating, 5 are under-construction, and 13 are in the planning or evaluation phase. Their size varies from as little as 0.1MW to as much as 1000MW for on-site applications. Renewable energy systems contribute between 15% and 90% to the energy demand of a mine.

On-site or off-site electricity generation?

27 of the renewable energy systems are on-site applications while only 6 projects are located off-site. On-site applications are of two types: permanent installations and re-deployable systems. To date, permanent installations account for the majority of the projects, with 23 mines having adopted this model.

What are the technology preferences?

Solar PV is the preferred renewable energy technology. Solar PV systems are operational or planned at 32 of the 34 sites with renewables, with 21 projects comprising of solar PV-only and 11 comprising of solar PV in hybrid configuration with wind turbines. Of the 21 solar PV-only projects, 15 are permanent installations and 4 are re-deployable systems. In 2021, 2 mine sites with existing on-site solar PV systems announced the expansion of those systems.
Want to learn more?
Visit our website to explore more data about renewable energy projects in mining, including an interactive map with all projects identified, and interactive charts with key data about the projects.

research.qut.edu.au/cmbi/

What about energy storage?
Battery storage is a crucial component of the renewable energy systems located on-site. Of the 28 on-site systems, 20 have either a battery storage unit already included (17) or a battery storage unit is planned (3). Batteries are essential to capture the energy spilling due to the intermittent nature of solar PV and wind and increase the economic viability of renewable energy options.

How is renewable energy supply contracted?
Renewable energy systems in mining are developed in partnership with energy companies, which usually own and operate the plants, and supply the energy to the mine sites under mid- to long-term power purchase agreements (PPAs). Under a PPA, miners agree to purchase electricity directly from an energy generator rather than the traditional model of buying energy from licenced electricity suppliers. PPAs eliminate the barrier of sustaining the up-front costs of RE systems for mining companies while providing financial certainty for renewable energy project developers.