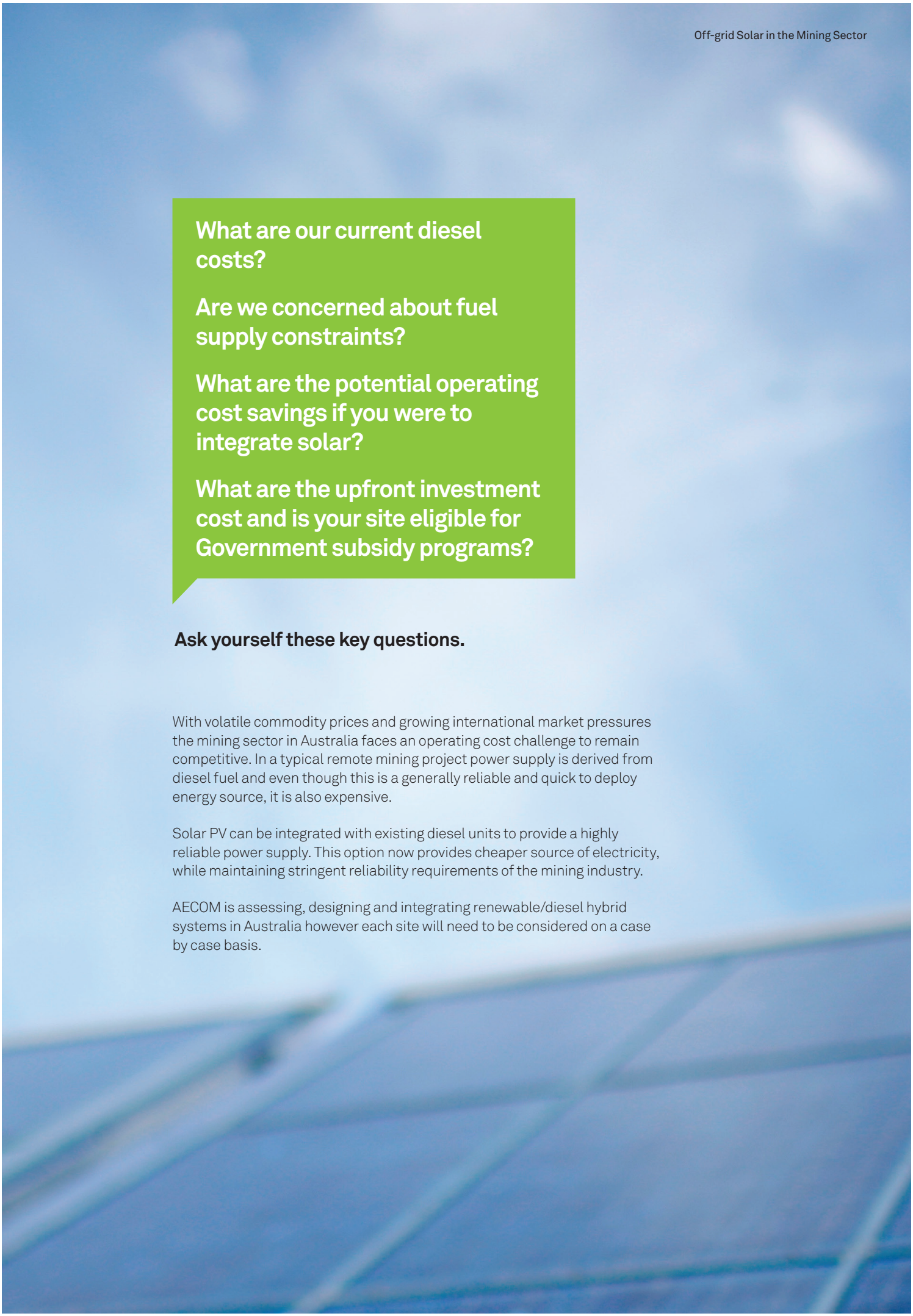
AECOM

Off-grid Solar in the Mining Sector

Can renewable energy reduce your operating costs?



What are our current diesel costs?

Are we concerned about fuel supply constraints?

What are the potential operating cost savings if you were to integrate solar?

What are the upfront investment cost and is your site eligible for Government subsidy programs?

Ask yourself these key questions.

With volatile commodity prices and growing international market pressures the mining sector in Australia faces an operating cost challenge to remain competitive. In a typical remote mining project power supply is derived from diesel fuel and even though this is a generally reliable and quick to deploy energy source, it is also expensive.

Solar PV can be integrated with existing diesel units to provide a highly reliable power supply. This option now provides cheaper source of electricity, while maintaining stringent reliability requirements of the mining industry.

AECOM is assessing, designing and integrating renewable/diesel hybrid systems in Australia however each site will need to be considered on a case by case basis.

Why consider solar?

Many mines in remote locations source their electricity from diesel generation.

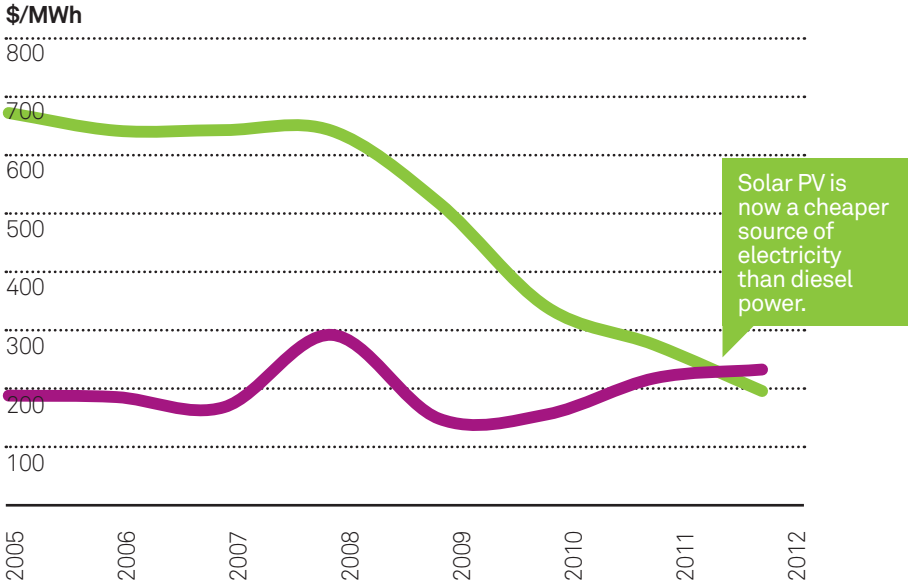
- Diesel energy although reliable is expensive – many mines are likely to be paying over $300/MWh in fuel and Carbon only (ie. excluding CAPEX)
- Diesel costs are expected to rise over time and are vulnerable to price shock events in international markets.
- The cost of solar photovoltaics (PV) has reduced dramatically in recent years.
- PV can be used in a hybrid system to reduce fuel usage.
- Solar PV is now cheaper than diesel power, supplying electricity at approximately $226/MWh.
- Reduced exposure to the uncertainty of the carbon price.

A 1.2 MW solar installation could reliably supply 5% of the electricity for a 5 MW mine, reducing diesel consumption by 600,000 litres per annum, saving around $6 million in diesel costs over ten years.

Historical comparison of electricity generation cost from solar PV and diesel.

Solar PV – Total system costs

Diesel – Fuel and carbon only



Other benefits

- Insulation against rising fuel costs and the potential for fuel price volatility in international markets.
- Reduced exposure to the uncertainty of the carbon price.
- Excellent opportunities for public relations and community engagement, improving the environmental credentials of the business.
- Increased system redundancy, providing an increased level of reliability.

There is an unprecedented opportunity for the mining sector to reduce costs, and insulate projects against future fuel price volatility. The higher the cost of diesel, the more money you will save by integrating PV. ARENA funding will be committed over the next 2-3 years, with priority for projects that can commence promptly.

Why act now?

Significant funding and concessional rate financing have recently become available to support the development of remote solar-diesel hybrid systems. This includes:

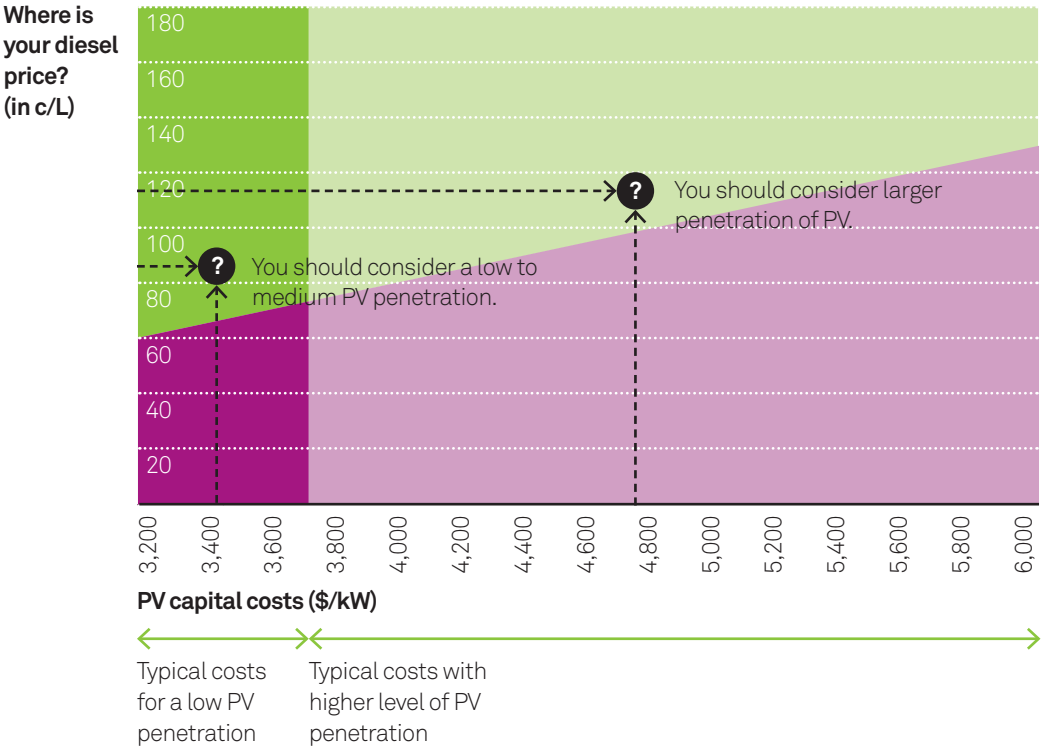
- Up to $2.2 billion of as yet uncommitted grants through the Australian Renewable Energy Agency (ARENA) (now seeking mining industry partners).
- Up to $10 billion of concessional financing for emerging renewable technologies through the Clean Energy Finance Corporation (CEFC), commencing from July 2013.
- Ongoing revenue support through the Renewable Energy Target scheme.

Looking at your site

All sites will have different characteristics and each case for PV hybrid systems depends upon the delivered cost of diesel fuel at your sites.The figure below provides a comparison of the costs of energy from PV and in comparison to the delivered diesel price.

Use the vertical axis to find the price that you pay for diesel at your sites. f you are in the green zone (on the vertical axis) you could reduce costs by installing PV. At low levels of penetration (~5% of energy) PV can be integrated into most systems with minimal integration costs. Where diesel costs are higher, you should install more PV with the inclusion of batteries and short term flywheel storage.

Comparison of the cost of solar PV with diesel generation, as a function of PV capital costs.
Integrate solar to save energy costs
Continue using diesel



Overcoming the challenges

Challenge	Solutions
Reliability	Solar PV hybrid systems can be designed to meet an extremely high level of reliability.
Intermittency	At low levels of penetration, solar ramping will remain within the load following capability of the diesel units.
Short project timeframes	Higher delivered diesel prices and Government Subsidy programs such as ARENA now justify the integration of PV into projects with shorter lifetimes.
Technology maturity	Successful examples of remote towns being powered by solar hybrid systems do exist. Several Australian examples are provided below.
Extreme climatic conditions	High temperatures decrease the efficiency of all generation types, including diesel units.
Cyclone risk	PV installations can be designed to withstand cyclone conditions
Operating costs	Ongoing operations and maintenance costs can be maintained at a low level with remote monitoring.
Dust	Dust collection on panels can be minimised with use of frameless modules and anti-soiling coatings, and by mounting at an appropriate angle.

Case studies

Marble Bar	Supply a 0.7 MW peak load with 0.3 MW of solar PV 1.28 MW of diesel capacity (four 320 kW units). Fly-wheel technology is used to manage power quality and assist the management of fast ramps. The town sources 35-45% of energy from the solar units, with an instantaneous peak of 90% from solar.
Nullagine	Peak load 0.4 MW, with 0.2MW of PV installed, achieving 35-45% of energy from solar.
Coral Bay	Sources 50% of energy from three 275kW wind turbines. Uses flywheel storage to reduce the need to run an extra diesel unit for spinning reserve.

Next steps

AECOM is able to provide services in investigating the feasibility and viability of integrating solar into the power mix of a mine site (or any other remote facility).

To discuss this possibility further, please contact:

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Forecasting is not a precise science. It relies on complex sets of data inputs and assumptions, and in a large and rapidly developing market such as renewables, there are inevitably uncertainties about future installations and capacity. Projections are only a prediction of what might happen in the future and may not be achieved.

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