



# **Solar, storage and mining: New opportunities for solar power development**

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## CHAPTER 1. Introduction

The world of energy production is in a transition phase, shifting from conventional to renewable energy sources to deliver power. At the UN Climate Change Conference which took place in Paris at the end of 2015, the global community committed to ambitious climate change efforts, which will only be achievable with a quick and focused roll-out of renewable energy all over the world. Solar is going to be a key part of this equation.

Solar energy has become a cost-effective and clean alternative to conventional energy sources. In many countries, electricity prices from large PV parks are in the same range as those for coal power. However, solar power has many more advantages. Solar is a decentralised energy, which is an excellent means to deliver power for remote consumers. The annual installed capacity of solar power has quickly reached a surprising level, and we are still at the beginning of the story.

On the energy consumption side, it can be observed that a huge amount of energy is used worldwide to extract and process raw material. The mining industry is one of the biggest overall energy consumers. In recent years, the mining industry has been facing many challenges above all with falling commodity prices. Energy is one of the most important cost factors for mining companies. In addition, cost cutting for energy is normally possible with far less resistance than reducing the second big cost factor, which is labour.

Mining companies can improve their cost position and environmental footprint by including solar power into their energy mix. Large-scale solar projects for powering mines have already been realized in various countries. However, the potential is almost untapped. Solar power allows mining companies to reduce their cost position. This means that the mines that use solar power will have competitive advantages and outperform mines fully relying on conventional energy sources.

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## **CHAPTER 2. Solar solutions are creating competitive advantages for mining companies**

### **2.1 Energy consumption of the mining sector**

Approximately 20% of the energy that the mining industry consumes and approximately 10% of world energy consumption is used for extraction and processing of mineral resources.<sup>1</sup> This figure makes it clear that power supply in the mining industry is part of the solution in the energy transition process toward a low-carbon economy, as it is one of the main emitters. From an ecological perspective it is important that energy consumption in the mining industry is reduced efficiently and that the minerals that are used for renewable energy infrastructure have a low carbon footprint.

From the mining companies' perspective, costs will be the main driver for changing toward renewable energy. Depending on many factors, the energy consumption typically is in the range of 20-35% of the total operating costs of a mine. Energy costs are normally the second biggest cost factor, directly after labour costs.

From the solar industry perspective mining applications are a good fit, because:

- Mining companies often have to deal with high electricity costs due to remote locations
- In many developing countries mining companies have to deal with unreliable electricity infrastructure which makes it receptive for new solutions
- High energy consumption carries extraordinary potential for large scale solar power plants
- Solar energy is helpful for mining companies regarding their sustainability efforts

It becomes obvious that the mining industry could become a highly attractive customer segment for solar companies with a broad range of possible solutions. Solar power can add value to mines for grid-connected and off-grid mines.

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<sup>1</sup> Conti, John et al., International Energy Outlook 2013 (US Energy Information Administration, 2013); [http://www.eia.gov/forecasts/ieo/pdf/0484\(2013\).pdf](http://www.eia.gov/forecasts/ieo/pdf/0484(2013).pdf) (date: 18.01.2016).

## **2.2 Solar power for grid-connected mines**

In recent years, we have seen that mining companies close long-term power purchase agreements (PPAs) for renewable energy in regions with high electricity prices or unstable supply from the grid. We find examples, amongst others, in Chile and South Africa.

Some mining companies have also invested in renewable energy infrastructure and generated a part of the energy themselves. Most of the mines have 24/7 operations. In these cases, the mining companies tend to source the rest of their energy requirements from the grid. In grid connected regions, investment into renewable energy or long-term renewable energy commitment through PPAs is very often considered as a hedging mechanism against increasing energy prices. In grid-connected scenarios there are often good economic reasons for mining companies to source solar energy.

## **2.3 Solar power for off-grid mines**

In many cases, remote mine sites are not grid-connected and generate their electricity onsite, typically with large diesel gensets. The remoteness of these mines leads to high transportation costs for the diesel fuel. Losses during transportation and theft are other factors which drive the costs for diesel up. Normally, solar power is less expensive than electricity from diesel in these remote locations. The cost advantage of solar solutions always depends to some extent on the oil price. Even with the low oil price at the beginning of 2016, solar energy is often up to 50% less expensive than diesel electricity.

In a simple scenario solar power is only used during the daytime and diesel gensets constantly run at partial load, but the fuel consumption is reduced to a large extent. In situations, when the solar power generation drops, the diesel gensets can provide back-up power by increasing their output to full-load. The solar-diesel hybrid business case consists of reducing the diesel consumption which is needed to power the mine.

In advanced scenarios, the diesel gensets can be switched off during the daytime if there is enough irradiation from the sun. Fluctuations of the solar output are balanced by storage solutions. During bad weather periods or during the night, the mine is powered by diesel gensets and the remaining energy is taken from the storage solution in place.

So far, no project example exists for a mine that is fully powered by solar, or wind, energy. The main reason is that storage prices still need to fall in order to make this solution economically viable.

The topic of renewables and mining has gained more importance recently. The first large commercial solar projects, in the MW scale, have already been built and more are under construction – amongst others a 10.6 MWp PV power plant for a mine in Australia. For many mining companies the topic is still rather new and typical project development cycles are one year and more. It can be expected that many projects that are under development in the moment will be built in the near future.

In the meantime, the finance sector has developed sophisticated solutions for mining companies. Independent power producers (IPPs) are, just like grid connected scenarios, more willing to offer long-term PPAs for off-grid mines. The uncertain lifetime of the mines and a new potential threat for investors in the form of the off-taker risk, slowed down the development for some time.

In remote locations, the IPPs depend on a single off-taker. If the off-taker does not fulfill the PPAs, there is often no other off-taker for the solar energy. In the meantime, the investors have gained a better understanding of the off-taker risk and are more willing to invest. The worst case scenario consists of dismantling the plant and rebuilding it in a completely different location.

## **2.4 Marketing and sales as one of the main challenges for solar companies**

In the past, solar companies mainly differentiated themselves through technical aspects. Marketing and sales did not have the same value as for other industries. For realizing the solar potential in mining markets it is important to provide tailor-made solutions and to address mining companies through efficient communication.

Market-entry or “go-to market” strategies based on market analysis will be one of the key success factors. For solar companies who want to enter the market it is necessary to understand their potential mining customers, to “speak their language” and to use their communication channels.

Market research including market segmentation and market sizing lay the foundation of successful target market strategies.

Mining companies receive intense attention from conventional power plant manufacturers and energy suppliers. It is obvious that this is a challenge for market entrants and that marketing efforts are needed to tap the huge potential that mining markets present for solar solutions. In the solar sector, SolarPower Europe can play an important role in developing the topic in a way that many players benefit.

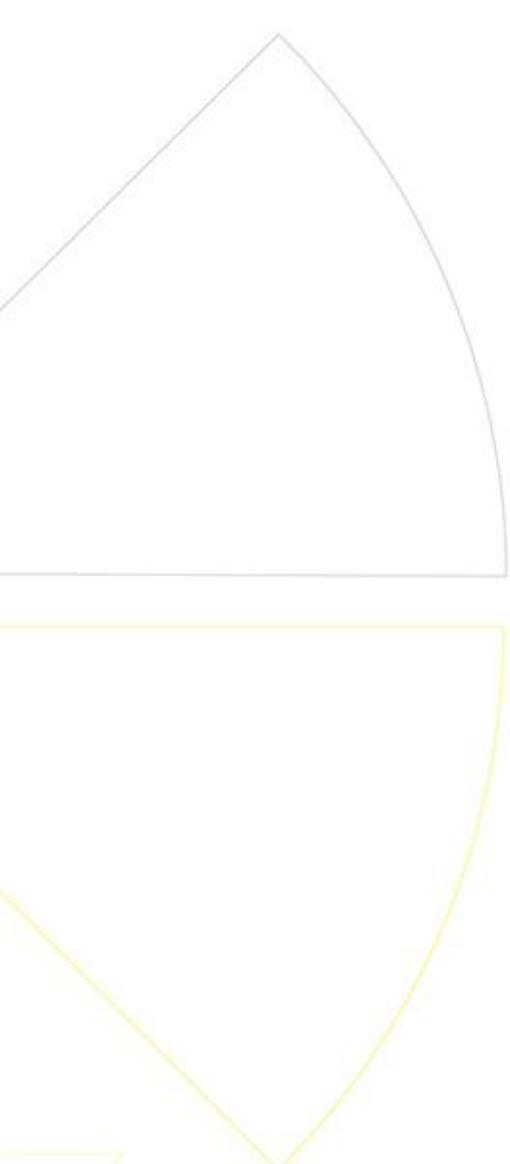
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## CHAPTER 3. Outlook

Solar Power is an excellent opportunity for mining companies. As energy is one of the main cost drivers for mining companies, mining companies can benefit from renewables through considerable cost savings. There are already large-scale projects for grid-connected solar parks. In remote locations, the cost savings might be highest for diesel displacement solutions.

“Solar for mining” is, at the moment, still a relatively small niche. Growth of the solar sector and the falling price of solar and storage solutions will be a main driver for further installation. Resources for solar will turn into an even more important multi-billion dollar market. The mining segment could soon develop into a multi-billion market for solar companies. However, it is important to increase marketing efforts to be able to compete with conventional power plant manufacturers and energy suppliers.

In order to create the biggest possible benefits for the whole industry it is important that the industry acts in a coordinated way.



### **About Dr. Thomas Hillig Energy Consulting (“THEnergy”)**

THEnergy assists companies in dealing with energy-related challenges. Renewable energy companies are offered strategy, marketing and sales consulting services. For industrial companies THEnergy develops energy concepts and shows how they can become more sustainable. It combines experience from conventional and renewable energy with industry knowledge in consulting. In addition to business consulting, THEnergy advises investors regarding renewable energy investments in changing markets. It is also active in marketing intelligence and as an information provider in select fields, such as renewables and mining, through the platform [th-energy.net/mining](https://th-energy.net/mining) or renewables on islands through the new platform [th-energy.net/islands](https://th-energy.net/islands).

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