



Barrick Gold Sees 'Perfect Storm' Brewing Around Cost-Effective Renewables

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Renewable energy sources have reached the stage, where they can reduce energy costs as well as emissions, Barrick Gold's Senior Manager of Energy and GHG, Russell Blades, tells Energy and Mines.

"We are seeing a 'perfect storm' brewing around renewables. Solar and energy storage are improving in efficiencies and reducing in costs. Renewables are already cost-effective in many areas compared to traditional fossil fuel power options," Blades says. "In terms of further reducing our energy costs and emissions, we see that renewables have an important role to play alongside our energy management and fuel switching initiatives."

Moreover, with governments, investors and stakeholders more focused on carbon emissions, pricing and climate change, mines are moving more towards electrification and automation. "Barrick recognizes this global trend and is trying to get ahead of the curve to be a market leader to benefit our shareholders and other stakeholders," Blades notes.

The gold mining leader sees the benefits of power price stability that renewables offer, along with a host of other key attributes. "Although price stability is a major driver, we equally see the benefits of lower energy prices, reduced emissions and improved sustainability," Blades says.

Barrick Gold's Energy Program

As a senior manager at one of the world's largest gold mining companies, Blades' responsibilities include effectively managing the company's energy portfolio in order "to reduce operating costs and impact on climate change."

Barrick's energy program looks at how energy management, fuel switching and renewable-based strategies can reduce energy usage, costs and GHG emissions, Blades explains.

"The majority of our GHG emissions come from our choice of energy sources (diesel, electricity, natural gas, HFO, explosives, bio-fuels, renewables, etc). Not only does my work involve improving our active mine sites, but new mines and legacy sites as well. We try to incorporate sound energy management and renewable strategies into our new mine designs and are looking to develop renewable energy projects at our closed mine sites," Blades reports.

When addressing carbon exposure, Barrick Gold examines various energy options for existing or future mines, calculating GHG emissions as well as the capex and opex costs associated with these options. "To help select the best option we also run sensitivities on various projected prices for carbon to see what the impact might be to the project's economics," Blades adds.



Almost 18% of Barrick Gold's power was sourced from renewables in 2015, but the company hopes to see that number climb in the future. "We have just finished a study that looked at all our sites (operating, legacy and new projects) and provided preliminary assessments for renewable resources at those sites and their potential economics."

Moreover, Blades says that Barrick Gold is looking at renewables not just for power. Instead, the company adopts a much broader application of renewables, including heating and biofuels.

"It's important to also understand that renewables for us isn't limited to just electrical power. We also see the benefits of using renewables to provide heat to our processes like electrowinning (electrolyte),

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cathode wash water and heap leaching (solutions) and biofuels to replace diesel and HFO in our haul trucks, UG vehicles, power plants, lime kilns, etc. For example, we operate our UG vehicles at our Nevada mines on B50-B75 in order to reduce GHG and Particulate Matter emissions."

There are many positives to replacing diesel trucks and equipment with electrical counterparts, including better air quality and reducing ventilation and cooling requirements in the underground mines.

"For open pit, the use of electrical-based material movement technologies like conveyors, Railveyor and Ropecon can cost-effectively replace traditional diesel haul trucks. We are also seeing some interesting development in large-scale electric vehicles

that would provide us with another electric-based option to move materials at the mine site. Electric-based systems are much more efficient (electric motor 90% vs diesel engine 36%), have lower rolling resistance and improved payload to total weight ratios than diesel haul trucks," Blades says.

Barrick Gold is also interested in "better leveraging mine design, topography, elevation and gravity at the mine site to produce regenerative energy and storage."

Barrick Gold's Investment in Renewables & Future Plans

Barrick Gold has invested in various renewable projects such as a solar plant at Western 102, located around 15 miles (24 km) east of Reno, Nevada, and a wind farm at Punta Colorada in Chile's Coquimbo Region.

The Western 102 115 MW natural gas power plant houses the 1 MW solar PV plant. The solar facility began commercial operation in 2008 and currently powers the plant's internal loads (i.e. generator oil recirculation and heating pumps, HVAC and lighting). "It also provides valuable Renewable Energy Certificates (REC) that are used to help meet our Renewable Energy Portfolio Standard obligations," Blades adds.

Meanwhile, the 20 MW Punta Colorada wind farm, which began operation in 2011, provides renewable power to the national grid

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in Chile. "Eventually, we are hoping that if we did some of our projects there, like Pascua Lama, which has been on hold, then we'll be able to claim that power to apply as renewable power to the site."

Lessons learned from the two projects are that it is crucial to have the right partners throughout the process whether it be design, development, construction or operation, Blades shares. "Experience, bench strength and a strong balance sheet go a long way to ensuring a well-designed and successful project. Even if you have to pay a bit of a premium it's well worth the investment to maximize the value of these long-term and critical assets."

Aside from these two projects, Barrick Gold is also looking at a potential solar plant at the Vela-dero mine, located in the San Juan Province of Argentina.

Moreover, Barrick Gold is looking into the possibility of growing Camelina and Jatropha to produce biofuels with Global Clean Energy. The idea is that these crops would grow close to Barrick's mine sites.

"The straight oil can be used in our power plants and process systems like lime kilns and the biodiesel could be used in our underground vehicles and haul trucks. Our preliminary analysis suggests that these fuels can be produced at a lower cost than diesel and HFO, and even what we currently pay for biodiesel. Growing our own biofuels

would also create new local jobs, reduce our carbon footprint and importation of fossil fuels and enhance our license to operate while minimizing the effect of future fossil fuel price volatility," he says.

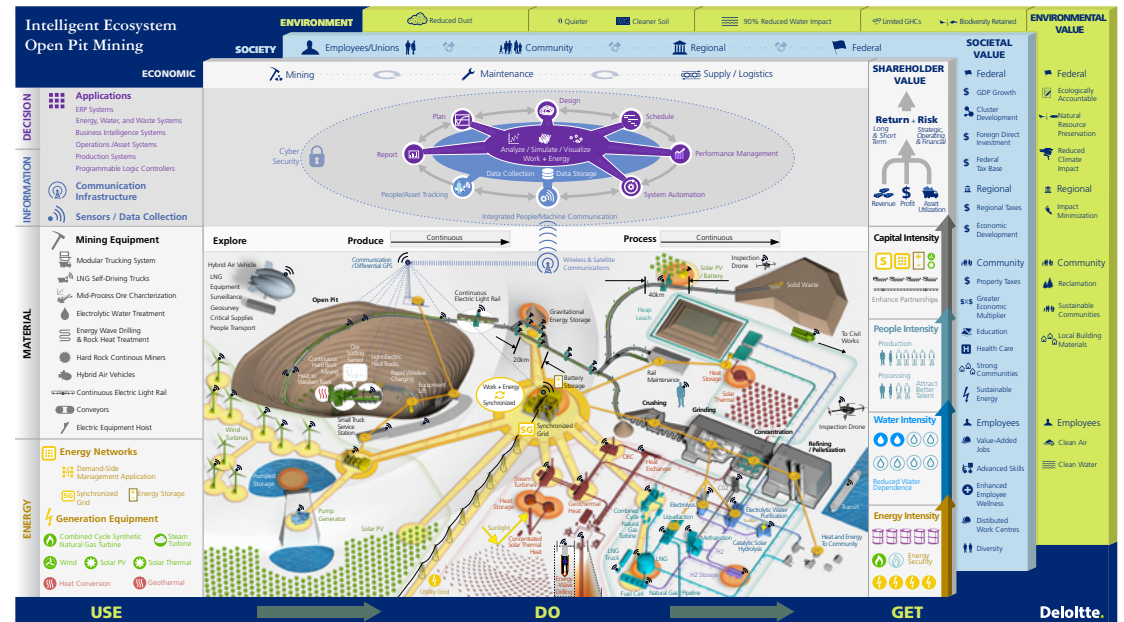
Another very interesting area Barrick Gold is researching is a future mine design for an energy system.

"We have been working closely with Deloitte on various 'Mine of the Future' concepts, including how energy management and renewables can play an integral part in this transition. For example, you can effectively integrate a lot of these systems and technologies to minimize costs, our carbon

footprint and potentially be self-sufficient from an energy perspective. This last benefit is very important especially in remote areas where energy infrastructure does not exist," Blades says.

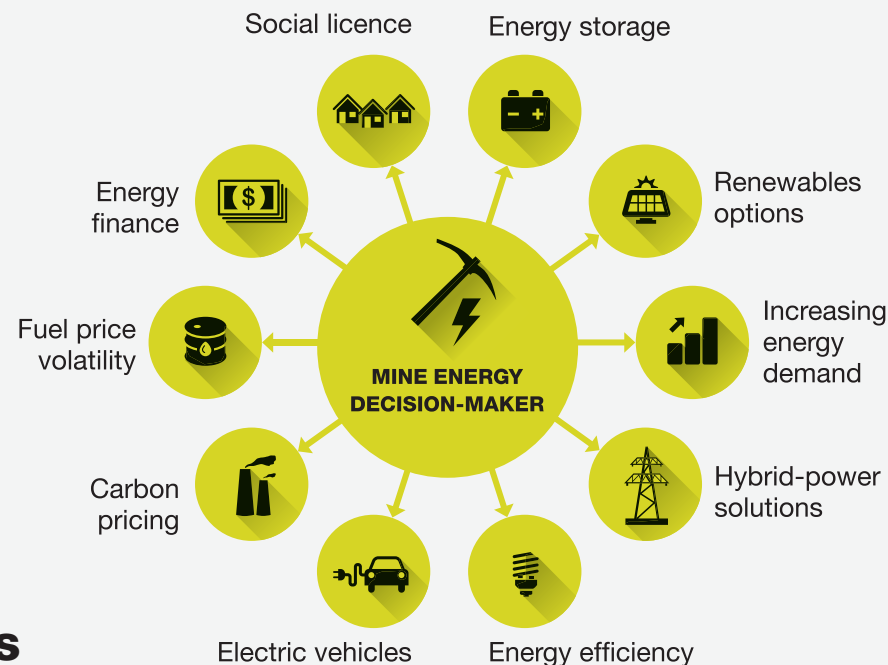
In order to achieve this, Barrick looks at sound energy management design principles and incorporates renewables, storage (pumped hydro, battery, mass, etc) and regenerative technologies into the design. The idea is to help the company control costs and ensure that energy is available 24/7.

Below is an example of a diagram, showing how a mine of the future might look like (Source: Deloitte). ■



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