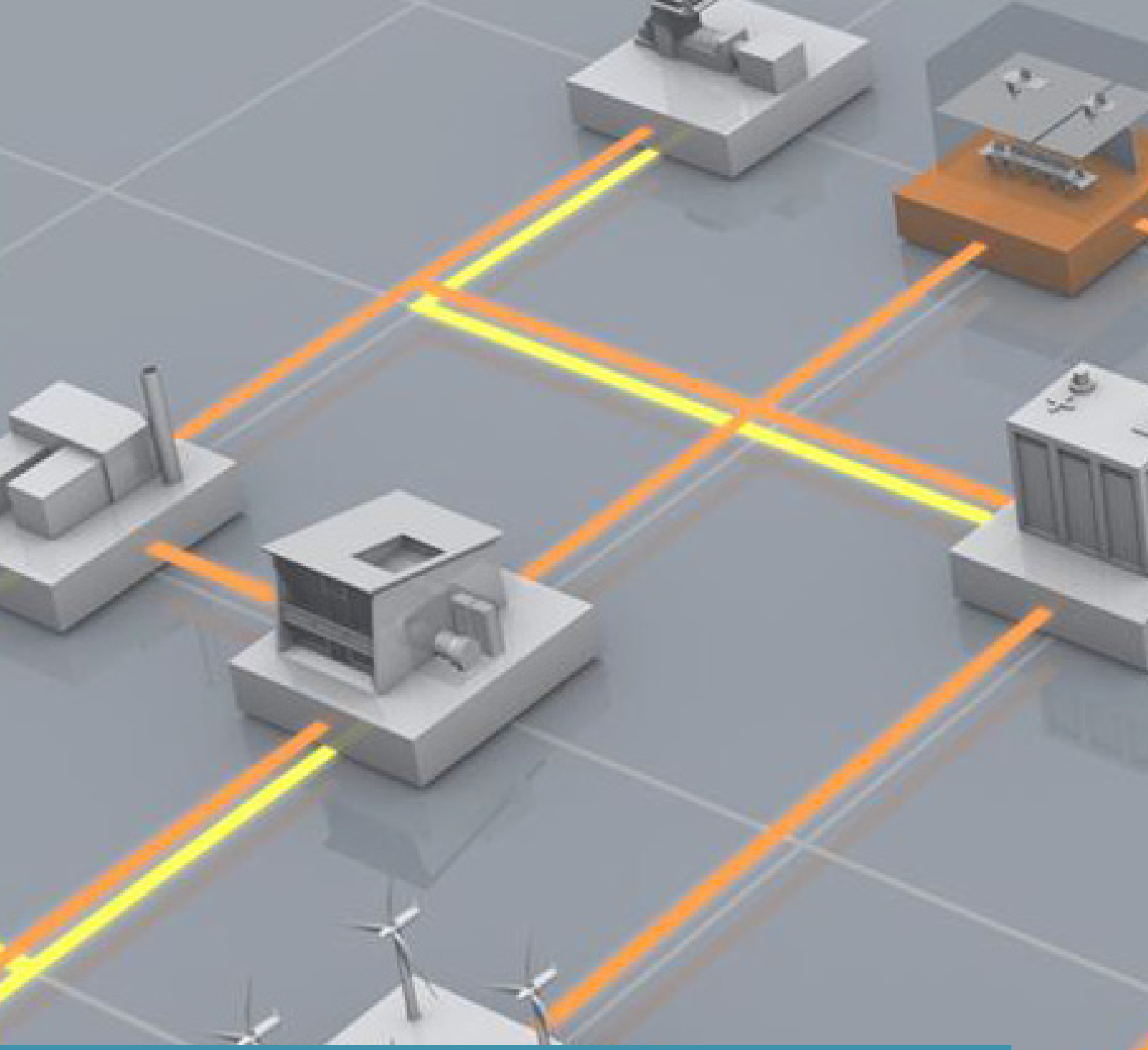

THE POTENTIAL FOR RENEWABLE-HYBRID POWER SYSTEMS AT NORTH AMERICAN MINES SITES

BY ELIZABETH JUDD, EXECUTIVE CORRESPONDENT, **ENERGY AND MINES**

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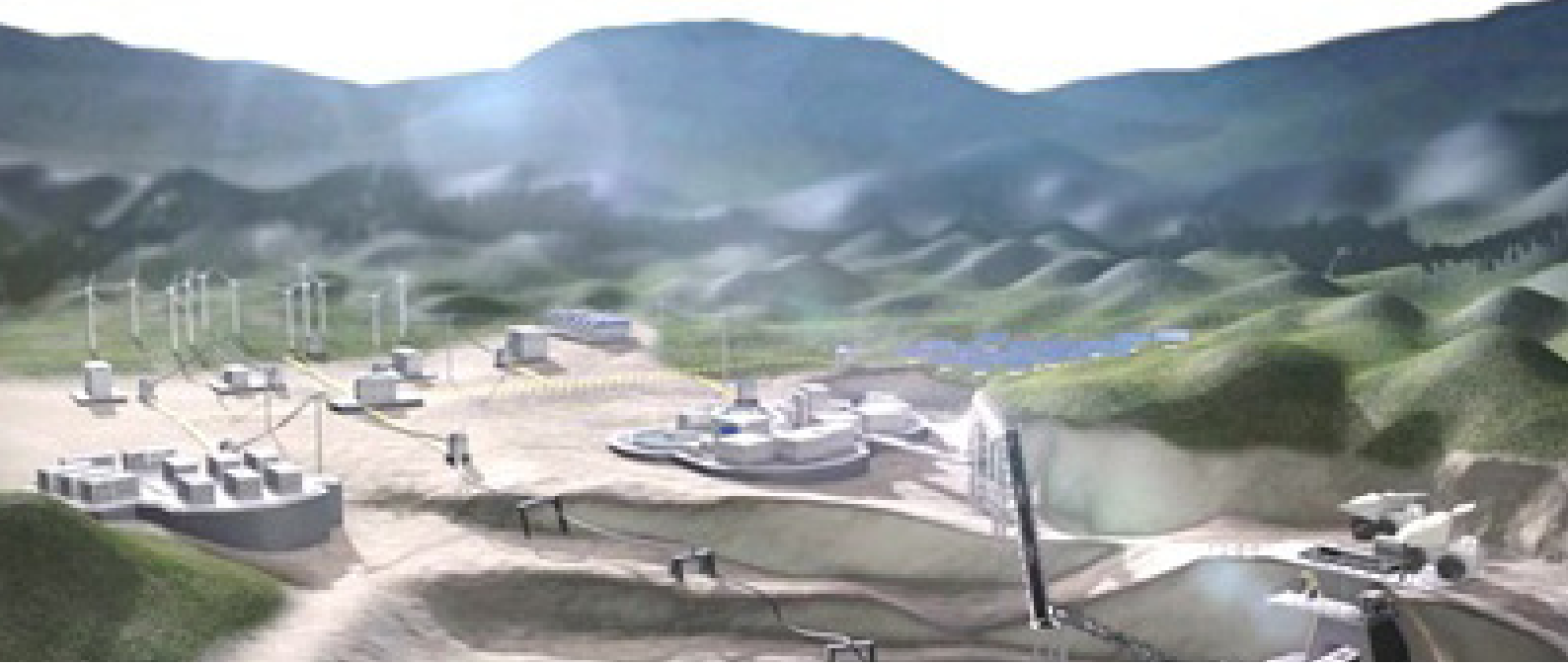

Till Krumbholz
Sales manager, Energy Sector's Smart Generation Solutions
SIEMENS AG

> We guarantee either a certain number of megawatt hours that the renewables provide into the grid or a specific amount of fuel that will be saved for certain load patterns and weather conditions.

Till Krumbholz, sales manager for the Energy Sector's Smart Generation Solutions at Siemens AG, discusses the landscape for powering mines with renewable energy hybrid solutions in North America and Europe. He also lays out Siemens' vision for hybrid power plants with high renewable penetration rates, sometimes over 100%, and its performance guarantee program.

Q. We recently heard from Siemens regarding the opportunities and potential for powering African mining operations with 100% renewable energy. How do you see the landscape evolving for powering mines with renewable energy hybrid solutions in North America and Europe?

In the ideal case, high fuel costs for diesel are met with optimal conditions for renewable energy, such as [appealing] wind and sun resources. This is the case in many regions such as Africa.

For Europe, things look a little different as the existing grid infrastructure enables the mining industry to use the local grid for its electricity supply. However, in North America, especially in rural areas, grid availability and stability are an issue. From a mid-term perspective we do see a high potential for our hybrid solutions with mining companies in remote locations as the cost of oil rises and the cost of renewables and storage decreases. This is a great opportunity for the North American mining industry to closely evaluate "off-setting" its conventional, diesel-generator-based power supply with hybrid power plants.

At Siemens, our optimized layout for a hybrid power plant that focuses on the daily load profile of the mine enables us to power the mining process with a high renewable penetration rate. Here, we have calculated cases where an over-penetration beyond 100% of renewable energy-- together with a battery-- produced the most economical scenario for the remaining lifetime of the mine. We also take the customer's financial situation and equity costs into consideration. So you see, the attractiveness of hybrid solutions depends on local conditions and the desired financial parameters for each customer.

Q. What is the business case for moving to renewables for mines in regions where the price of electricity is of less of concern?

In these areas, grid stability might still be an issue. You want stable processes through a stable power supply. Depending on the situation and production layout, independence from the local grid can be critical in the case of a power outage.

Further, we see potential in offering ancillary services to the grid

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SIEMENS

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and selling power reserves or reactive power as an extra revenue source. In California, it's possible to use the state feeder tariffs to sell battery storage, more or less using the overload of pure energy to sell energy to the grid.

In places where CO2 abatement is a target, a high penetration from the hybrid solution can also dramatically assist in achieving reduction goals.

Q. What are some of the particular challenges that arise when developing a hybrid solution for a mine in a remote northern region?

Where rough climates meet low temperatures and extremely lengthy and challenging transportation routes, the requirements for a hybrid solution project need to be adjusted….

This could be addressed by choosing a larger back-up diesel engine when the weather is too extreme to ensure performance of the plant. Also, a control system and hybrid plant monitoring solution have to be adopted for alarm management and maintenance intervals.

Q. What additional benefits beyond diesel abatement and energy security do renewables solutions offer?

Employing the local workforce of a community to build advanced infrastructure is definitely an advantage. Also the abatement of CO2 emissions and a cleaner local environment are added bonuses.

From a technical perspective, even if renewable energy sources, especially wind, are more volatile on average, they are available all the time and are not affected by damaged roads [that can hamper] diesel transport.

Q. What types of performance guarantees are you developing to ensure mines and developers are comfortable with the technology, fuel-savings and operation of hybrid systems?

Under the conditions for our optimized plant layout, we guarantee either a certain number of megawatt hours that the renewables provide into the grid or a specific amount of fuel that will be saved for certain load patterns and weather conditions.

Q. When do you think we will see a widespread move from small-scale renewables to larger-scale projects for mines?

Our solution today does include large-scale renewable energy solutions as we already see a widespread demand for projects of this size. When load and supply grow, the economic benefit of high penetration solutions gets more attractive.

In general, I think that after installing a first industrial large-scale hybrid plant that provides reliable benefits over time, we will see even more hybrid plants become part of the investment planning of our customers. Right now, we have to wait for the first mover really buying, installing, and running a big hybrid plant.

The second wave of demand for hybrids relies on real market feedback. Customers have to rate operational data, economic effects, and the reliability of our technology, which will be seen over time. Once higher and more optimized renewable energy penetration rates become common, the trust in our approach and our advanced hybrid solutions will grow.

The miningard to reconnecting with my peers, both in the renewable energy and the mining industries. ■