



Black & Veatch Project Highlights

Electrified, Decarbonized and Sustainable Mining and Metal Processing

More goes into infrastructure than most might think, but you cannot miss the difference it makes in the world. Black & Veatch makes the Invisible, Invaluable.

As the mining and metal processing industries embrace more impactful and meaningful sustainability commitments, greater urgency is placed on innovation throughout the lifecycle of mines and metal processing facilities. Operators are focused on reducing environmental impacts, lowering carbon footprints and improving water use practices.

The projects compiled here demonstrate the broad range of solutions that Black & Veatch has delivered and is developing for the mining and metal processing industry. It includes a selection of projects that could be adapted to advance the industry's decarbonization and sustainability goals.

Please connect with us to learn more about how we can bring the full range of Black & Veatch's portfolio of solutions and expertise to your projects and the mining and metal processing industries.

What's Inside

- Page 2 [Electric Vehicles](#)
- Page 3 [Hydrogen Storage](#)
- Page 4 [Water Resilience](#)
- Page 5 [Renewable Energy Systems](#)
- Page 6 [Combined Cycle and Carbon Capture](#)
- Page 7 [New Directions: Sustainable Fuels and Mine Electrification](#)

Connect
With Us



BLACK & VEATCH

Electric Vehicles

Electric Island: Future of Heavy Vehicle Electrification

Black & Veatch designed, engineered and built Electric Island, a first-of-its-kind, high-capacity public charging station designed for medium- and heavy-duty electric vehicles, and a template for electrifying vehicles and equipment at mine and industrial sites.

The self-contained site features nine charging stations and will serve as a testing and innovation location, with plans for more chargers, on-site energy storage, solar power generation, a product and technology showcase building, and chargers capable of up to 1 megawatt (MW) of charging capacity. That charging capacity is more than four times faster than today's fastest light-duty vehicle chargers.



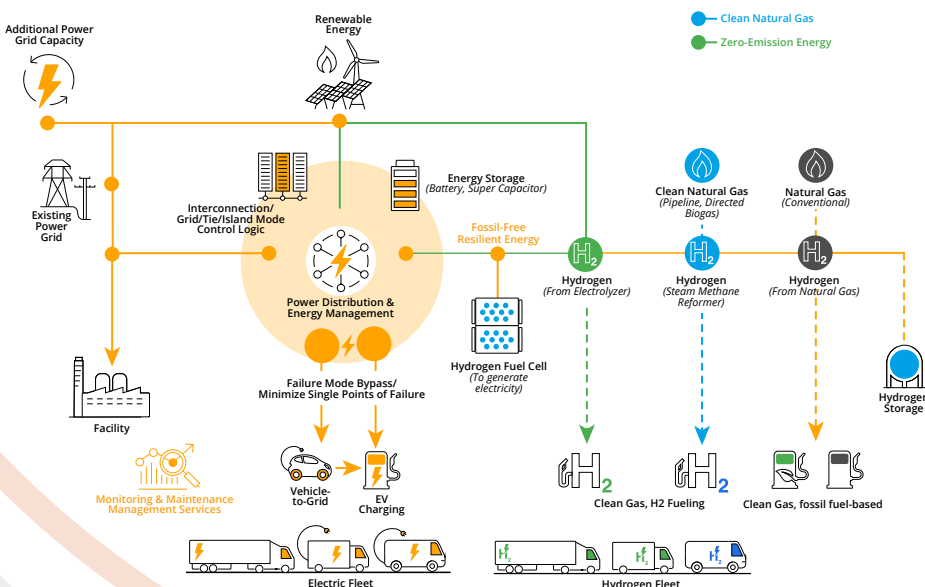
The Portland, Oregon, project is a collaboration between truck manufacturer Daimler Trucks North America and public utility Portland General Electric (PGE). Electric Island has earned an honorable mention in the sustainability category of *Fast Company* magazine's 2021 "Innovation by Design" awards.

Electric Vehicle Technology Readiness for Mining Operations

Black & Veatch conducted an E-Mobility study for a pilot project for BHP Chile. In collaboration with Chile's University of Santa Maria in Santiago, Black & Veatch performed a study to define routes and select electric vehicle charging types and their locations. Capital investment and operational cost were estimated as part of the study.

Black & Veatch worked directly with electric vehicle (EV) factories to implement factory safety standards and potential autonomous drive applications on vehicles to be used by BHP. The pilot project was implemented with two light-duty vehicles and two buses selected with original equipment manufacturer (OEM) availability in Chile. Charging stations were deployed as part of the pilot project.

Black & Veatch believes that advancing standardized electric vehicle charging systems is crucial to widening EV adoption across the transportation value chain — from passenger drivers to public transit and enterprise-scale medium- and heavy-duty fleets. The company joined CharIN, the Charging Interface Initiative (CharIN e.V.), to promote standards for all types of battery-electric vehicles.



Black & Veatch's Zero Emissions Multi-Energy Hub proprietary design. A vision for decarbonized mobility considers energy generation, storage and sourcing across both electric vehicles and hydrogen fuel cell vehicles as well as how this integrates with communications and data center infrastructure.

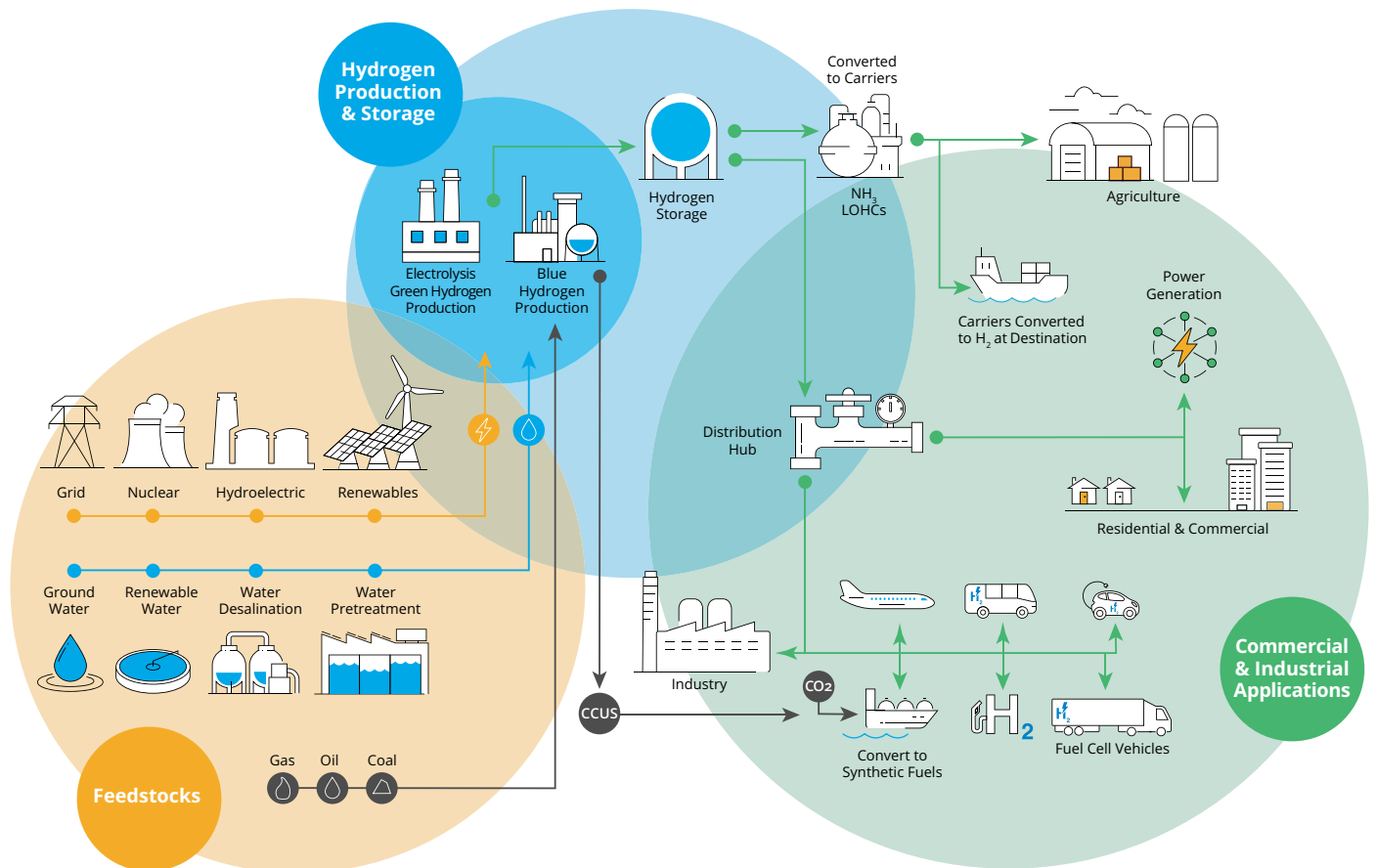
Hydrogen Storage

Utility-Scale Hydrogen Storage Facility for Zero-Carbon Energy Future

Black & Veatch is providing engineering, procurement and construction (EPC) services for what will be the world's largest industrial green hydrogen production and storage facility, the Advanced Clean Energy Storage (ACES) facility, in Delta, Utah.

Co-developed by Mitsubishi Power Americas and Magnum Development, the hydrogen storage hub will support Intermountain Power Agency (IPA) IPP Renewal Project's 840-MW, hydrogen-capable gas turbine combined cycle power plant.

Hydrogen will be produced continuously and stored, providing essentially seasonal storage that can be used for backup power, limited only by storage volume capacity. This presents a pathway for hydrogen as a good alternative for reducing operational energy risk and supporting energy-intensive processes, such as those in the mining and metal processing sectors.



Black & Veatch works across the entire hydrogen value chain. Leading the adoption of hydrogen technologies at scale, the company understands the revolutionary capabilities of hydrogen to reduce carbon emissions and pave the way for a greener future.

Water Resilience

Desalination Plant Ensures Water Resilience in Chile

The Atacama Desert of Chile's Antofagasta Region is one of the driest places on earth and home to the world's largest copper mine. Through both the initial Escondida Water Supply Project (EWS) and the Escondida Water Supply Expansion (EWSE) commissioned one week ahead of schedule in December 2019, Black & Veatch enabled BHP's Minera Escondida mine to self-supply 100 percent of its needs with desalinated water. By tapping water from the ocean, it saves freshwater resources for the local community and ecosystems while ensuring a more sustainable, resilient and reliable water future.

On EWS, Black & Veatch served as the engineer of record to lead the design, procurement, project controls, resident engineering, pre-commissioning and commissioning for the marine works



and desalination components. While on the EWSE project, as client needs evolved, Black & Veatch served as engineer of record for the water production, water conveyance and high-voltage components of the project, providing engineering, procurement, construction management services, pre-commissioning and commissioning services.

In 2017, the EWS project won the Industrial Desalination Plant of the Year honor at the Global Water Summit.

Innovative, Non-conventional Tailings

Black & Veatch conceptualises non-conventional tailings for mining companies through partnerships with process specialists like Paterson & Cooke and SRK Consulting. The company is responsible for the design of infrastructure associated with water management, cost estimation of alternatives and project management. It conducts studies on water recovery through horizontal drilling and works on tailings dam upgrades.



Black & Veatch is a world leader in deploying innovative water treatment solutions, often designing systems that convert waste to energy or create biogas used in facility operations. Pictured is the Biosolids and Energy Recovery Facility for the Irvine Ranch Water District, designed by Black & Veatch, which won an Honor award in the Design category of the American Academy of Environmental Engineers and Scientists' (AAEES) 2022 Excellence in Environmental Engineering and Science™ Awards.



Gordon Butte Pumped Storage Hydro Project.

Renewable Energy Systems

Closed-Loop System for Remote Deployment

Black & Veatch is planning a pumped storage scheme for Absaroka Energy LLC in Montana. The scheme will store and deliver renewable energy while balancing supply and demand.

The closed-loop system works like a rechargeable water battery and benefits industries that operate in remote areas, such as mining. The facility will store enough energy to power approximately 300,000 homes per year.

The facility will feature two new, off-system man-made reservoirs. One on top of Gordon Butte and another 1,000 feet [300 meters (m)] lower at the toe of the Butte.

The powerhouse that sits on the edge of the lower reservoir supports the regional electrical grid through the Colstrip Transmission Line. A shaft, tunnel and penstocks connect the reservoirs. The excess energy flows from the transmission line to the powerhouse, powering the pumps to lift water from the lower reservoir to the upper reservoir. Excess energy is transferred and stored at the upper reservoir.

To accommodate the variability of wind and solar power while maintaining grid reliability, water from the upper reservoir is released through the turbines to the lower reservoir, generating power. Water at the lower reservoir waits to be lifted again to the upper reservoir.

Renewable Energy Integration at Remote Locations

Nestled between the Dixie National Forest and Bryce Canyon National Park, the rural town of Panguitch, Utah, benefits from more than 250 days of sunshine annually, an abundance of solar energy like at many mining locations throughout the world.

By integrating battery energy storage with a solar energy facility, the residents of Panguitch enjoy carbon-free energy day and night, 365 days a year.

Black & Veatch provided EPC services for the project, designing the energy storage system to react to the fluctuations in demand for power throughout the day. The project enables PacifiCorp to improve the safety, quality, reliability and resiliency of service without upgrading traditional grid poles-and-wires infrastructure.

Integrating renewable energy into hybrid energy systems or microgrids can achieve a more sustainable supply of power that reduces fuel costs and increases the resilience of power supply for mining operations throughout the world.



Battery energy storage system at Panguitch's 650 kWac monocrystalline photovoltaic (PV) plant.

Combined Cycle and Carbon Capture

On-Site Power for Mine and Metal Processing Operations

Operating copper mines and smelter facilities in Sonora, Mexico, Grupo Mexico engaged Black & Veatch as an owner's engineer to explore generating on-site power as a reliable and lower-cost alternative to sourcing energy from the Mexican state-run electrical provider.

Critical to the project was translating decades of market knowledge from utility and independent power producer projects to guide the mining company through the development of its own one-on-one, 250-megawatt combined cycle facility. Black & Veatch provided conceptual design and engineering, navigating challenges such as the site's hilltop location, while also providing procurement support that helped Grupo Mexico realize the best value from its investments in critical equipment such as the combustion turbine, heat recovery steam generator and steam turbine before handing over the EPC delivery of the facility to Siemens.

Black & Veatch applies its wealth of experience across renewable and conventional power facilities to modify existing mining and metal processors' infrastructure or design and build these facilities from scratch, lowering costs and emissions and improving operational reliability.

Carbon Capture

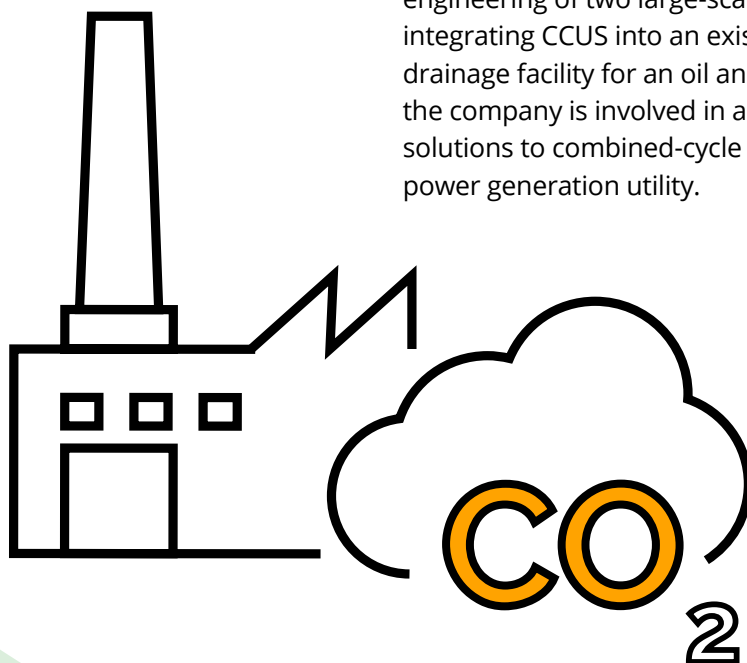
Carbon capture, utilization and storage, or CCUS, is an emissions reduction technology that can be deployed by miners and metal processors to lower carbon emissions of their cogeneration plants.

CCUS solutions can also deepen the decarbonization efforts of the downstream metallurgical sector, such as cement, steel and aluminium industries, where pyrometallurgical processes such as calcining, roasting, smelting and refining generate significant amounts of off-gas. Deploying customised CCUS solutions will allow the metallurgical sector to more effectively manage off-gas that are different in compositions and more varied than power station flue gas.

Black & Veatch is a leader on the forefront of studying and developing plans to implement CCUS technology and infrastructure. The company has been a market leader in studying and implementing carbon capture technology for more than 30 years. With extensive experience in the analysis and detailed design of CO₂ capture, as well as CO₂ compression and handling systems, Black & Veatch helps clients optimise and integrate systems that satisfy regulatory and sustainability criteria.

Today, Black & Veatch is working on a major U.S. government research and development project directed at capturing 100,000 tons of CO₂ per year through the advancement of direct air capture (DAC) technology.

Black & Veatch is also responsible for front-end engineering of two large-scale CCUS projects in Canada, integrating CCUS into an existing steam assisted gravity drainage facility for an oil and gas client. On top of that, the company is involved in adding large-scale CCUS solutions to combined-cycle plant operations for a power generation utility.





New Directions: Sustainable Fuels and Mine Electrification

Sustainable Fuels for Mining

Most mines consume large quantities of diesel fuel for haulage and remote site power generation. Replacing diesel with sustainable fuels such as biodiesel or synthetic equivalents, such as dimethyl ether, is a pathway to reduce carbon emissions.

Black & Veatch is recognized as a diverse and broad-ranging provider of bioenergy systems and services. The company has utilized a wide variety of biomass and waste fuel types and conversion processes to generate biofuels products for our clients. This experience includes biofuel generation such as ethanol, biodiesel, and second-generation biofuels like bio-based renewable gasoline, diesel or jet fuel.

From high-level and detailed resource assessment through to conversion technology and gas cleaning and upgrading experience, Black & Veatch can guide mining clients to successfully adopt alternative, sustainable fuels on site. Currently, Black & Veatch has several biofuel options studies and biofuel facility implementation projects underway with clients.

Mine Electrification – Partnership Solutions

Combined with sourcing green energy supply, electrifying mines will reduce mining companies' emissions footprints while also opening pathways to many other health and safety benefits for their workforces. For example, electrification of mining machinery will reduce diesel exhaust impact on workers and enable a pathway for vehicle collision avoidance technology.

Given the scale of integration — planning, designing, deploying and operating — the all-electric mine requires new levels of partnership across existing and emerging technologies and systems. Black & Veatch brings broad multi-industry sector knowledge (such as a proven ability in partnership with multiple vehicle OEMs) alongside strategic, global partnerships that allow our clients to access fully integrated mine electrification solutions across power generation, electrical distribution, charging infrastructure and other critical mining systems.

Black & Veatch has also teamed up with a global provider of mining electrical infrastructure to provide the mining sector with a focused partnership for delivery of mine electrification solutions.

Let's Talk

Black & Veatch brings a full view across the mine lifecycle. Our consultants, engineers and EPC contractor teams work with you from conception stage through operations and end-of-mine life, helping you move further, faster. As your mining partner for power, water and integrated infrastructure solutions, let's find ways to help achieve more value and better outcomes from your sustainability journey.

Connect with us and learn more [here](#).

