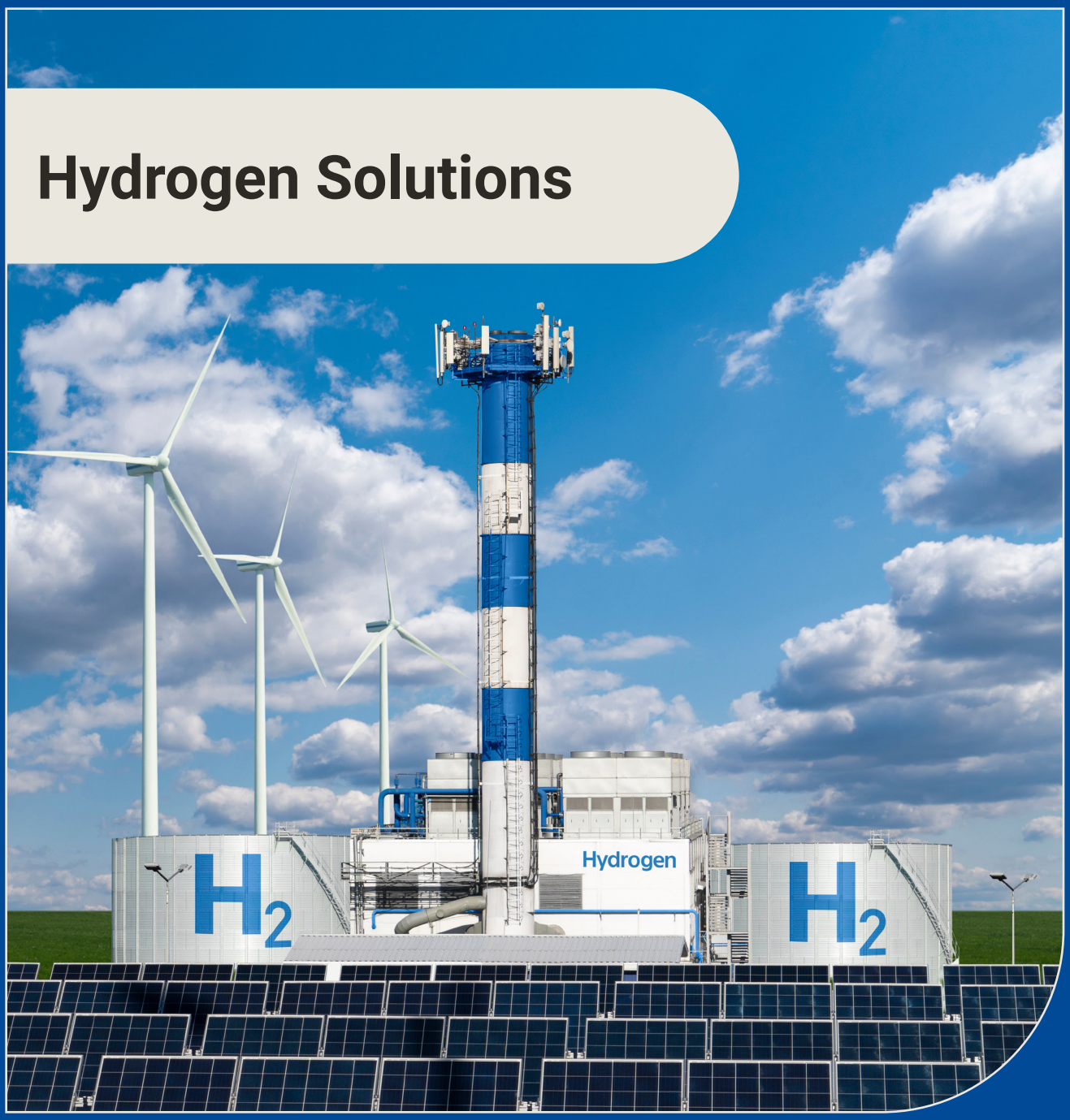
BLACK & VEATCH

Hydrogen Solutions



Black & Veatch helps clients transform their energy requirements sustainably and reliably.

The transition to net-zero is unfolding fast. Organizations are investing in sustainable infrastructure to operate clean versions of their essential systems and meet emission reduction goals. Hydrogen is emerging as a versatile energy solution, either alone or its derivatives, to decarbonize hard-to-abate sectors and advance global sustainability.

From providing cleaner energy to paving the way for more sustainable transportation, hydrogen is a tiny element with vast opportunities.

We Know Hydrogen

For more than 100 years, Black & Veatch has been a leader in sustainable infrastructure. This experience along with our culture of innovation led us to be at the forefront of the hydrogen revolution. We developed the first hydrogen power generation conversion project and the first major hydrogen fueling station deployment in the United States. Since then, our experts have continued to push the boundaries of hydrogen technology, delivering reliable innovation and first-of-a-kind solutions across the hydrogen value chain.

We're Technology Agnostic

That means we're focused on making the project bankable, not selling a technology. Which is why we've formed relationships with established technology providers and innovative disruptors across the hydrogen and ammonia value chain. We excel as experts in integration, aligning strategy across key stakeholders to deliver a project that meets your capital requirements and sustainability goals.

Solutions

Hydrogen Production

Hydrogen Purification

Hydrogen Compression

Hydrogen Storage

Hydrogen Liquefaction

Hydrogen Refueling

Strategy & Planning

Permitting/Siting

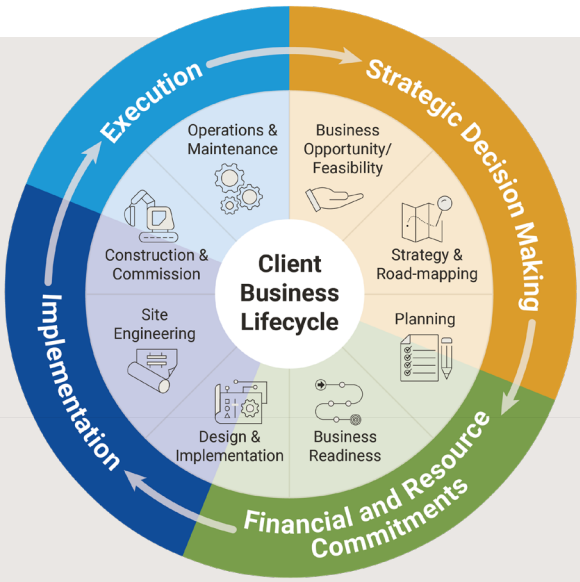
Rate & Regulatory Affairs

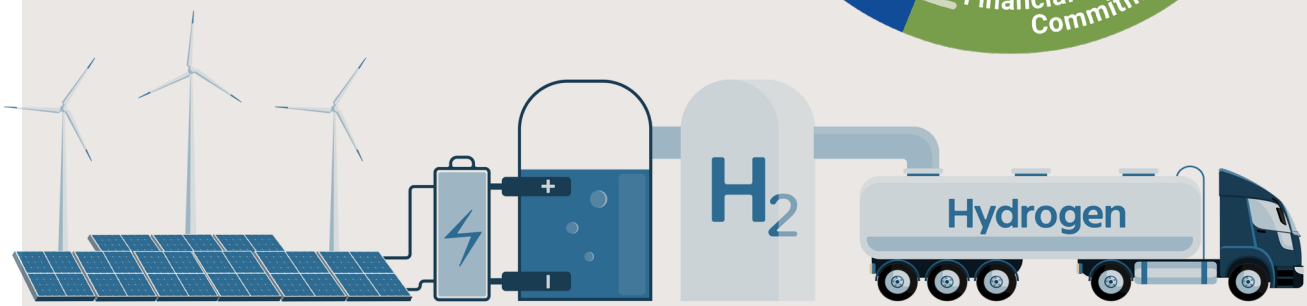
OEM Bankability Analysis

Power-to-X

Your Partner From Beginning to End

Solving today's sustainable infrastructure challenges demands a broader approach — thinking beyond the "project" — for optimization across the entire lifecycle. From investors and utility operators, industrial and transportation leaders to city planners and regulators, we can help you at every stage of the hydrogen journey as it reshapes markets and economies as the foundation of a decarbonized world.





We're Experts in Sustainable Systems

Hydrogen's versatility integrates well with other clean solutions to form a sustainable system, which means it's often the missing link for utilities, commercial businesses, and industries seeking to operate sustainably while remaining profitable.

With a long history in sustainable infrastructure, Black & Veatch has the expertise to plan, design and build energy systems that enable business growth while reducing carbon footprints and improving resilience and sustainability.

Whether you're interested in hydrogen, its derivatives or complimentary decarbonization solutions, our team of experts are here to help you realize your goals.

Carbon Capture, Utilization & Storage

Black & Veatch has been a market leader in carbon capture technology for more than 30 years. Our technology agnostic approach and extensive experience helps clients optimize and integrate systems that satisfy regulatory and sustainability criteria.

Distributed Energy/Microgrid

Our integrated DER and microgrid solutions and global project experience deliver system-wide solutions to connect, visualize, and optimize the grid for long-term growth.

Water Supply & Sustainability

Backed by a century's worth of experience in water, our experts thoroughly understand the critical elements of a reliable and sustainable water supply for clean hydrogen production.

Energy Storage

With extensive experience building large-scale grid assets, including projects for the Department of Energy, Black & Veatch provides a range of energy storage solutions integrating across equipment suppliers.

Sustainable Fuels

With experience in methanol, methanation, RNG and sustainable aviation fuels, as well as other waste, fuel and conversion processes, our technical experts work with multiple technology providers to deliver an integrated design through the entire project lifecycle.

Renewables

We work at all scales and stages of renewable infrastructure planning and deployment. Our integrated technology team provides a turn-key solution that optimizes schedules, achieves cost efficiencies and ensures quality.

Ammonia

Black & Veatch has over 50 years of experience in ammonia production with a focus on project bankability. As a capital project integrator, we build and maintain strategic stakeholder relationships to deliver your project successfully from feasibility to EPC.

CENTER FOR Hydrogen SAFETY
Executive Member

Hydrogen Council

Black & Veatch is an active industry advocate for the hydrogen economy, including membership in the Hydrogen Council, Fuel Cell Hydrogen & Energy Association, California Hydrogen Business Council and the Ammonia Energy Association, as well as status as an executive member of the Center for Hydrogen Safety.

Black & Veatch Hydrogen Project Experience

Hydrogen | Hydrogen & Ammonia | Hydrogen Fueling

IPP Renewed Project
Delta, Utah
- BV Role: Owner's Engineer
- Blending 30% hydrogen by volume from ACES in combustion turbines

Advanced Clean Energy Storage Hub
Delta, Utah
- BV Role: EPC
- 220 MW of renewable energy to 100 metric tonnes of hydrogen stored in salt caverns

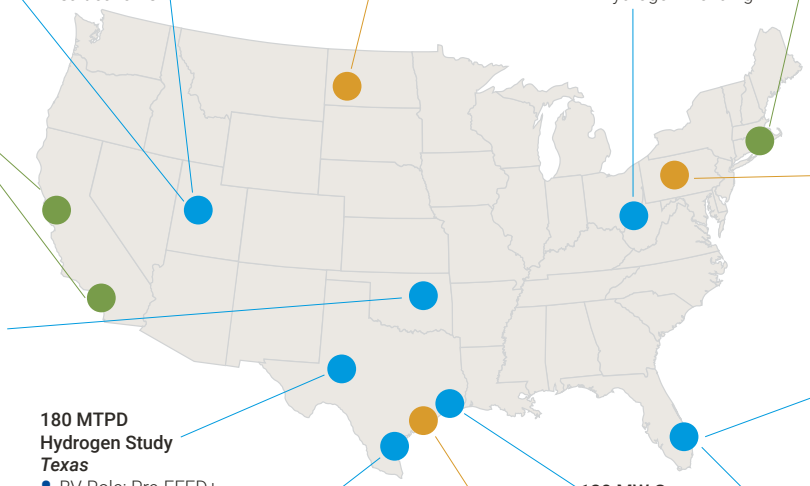
Hydrogen & Ammonia Hub
North Dakota
- BV Role: FEL-1, FEL-2 and FEL-3
- Electrolysis plus hydrogen reforming technology to ammonia synthesis

Industrial Neighbor Hydrogen Integration
Hannibal, Ohio
- BV Role: Conceptual Design, Cost Assessment, Detailed Design, Construction Integration
- Hydrogen Blending

5 Hydrogen Fueling Stations & Depot
Connecticut, Massachusetts, New York and Rhode Island
- BV Role: Site Layout, Civil & Site Development, Electrical & Instrumentation, Mechanical Piping, Permit Support, Civil Construction, Utility Coordination, Tenant Improvements

19 Hydrogen Fueling Stations
Irvine and Livermore, California
- BV Role: Civil, Structural, Mechanical and Electrical Engineering, Permitting, Construction

Natural Gas Synthesis Plant
Pennsylvania
- BV Role: Pre-FEED
- 950 TPD ammonia, 2200 TPD of DEF, 100TPD LH2 with carbon capture



40 MTPD Hydrogen Study
Oklahoma
- BV Role: FEL-2 (Pre-FEED), PEM and Alkaline technologies
- Hydrogen Production Facility

180 MTPD Hydrogen Study
Texas
- BV Role: Pre-FEED+, significant optimization studies
- Hydrogen Production Facility

280 MW Green Hydrogen Project
Texas
- BV Role: FEL-2 and FEL-3
- 280 MW of electrolysis and all product hydrogen will be compressed and injected into a new pipeline

120 MW Green Hydrogen Hub
Texas
- BV Role: EpCM
- 50 metric tonnes of hydrogen supplying local industrial end users

1000 MTPD Ammonia Study
Texas
- BV Role: FEL-2 (Pre-FEED)
- Hydrogen provided via pipeline with onsite storage to supply an ammonia production facility, truck/rail loading, and pipeline

25 MW Green Hydrogen Hub
Florida
- BV Role: EPC
- Blend hydrogen with natural gas for combined cycle power plant

22 MTPD SNG Study
Florida
- BV Role: FEL-1
- Hydrogen provided via pipeline to produce SNG. SNG to feed a nearby power plant. Project includes CO2 supply studies

Green Hydrogen & Ammonia Hub
Nova Scotia, Canada
- BV Role: FEED to EPC
- First two phases will produce a combined 1MMTPA green ammonia for export

Hydrogen Production and Storage Facility
Humber, United Kingdom
- BV Role: FEL-1, FEL-2, FEL-3 to EPC
- 35MW of hydrogen production with a 50MW SGT-800 gas turbine and including cavern storage of hydrogen

2 Hydrogen Mobility Project Pilot Facilities
India
- BV Role: Detail Design
- Each station includes both H35 and H70 dispensing for a capacity of 600-1600 kg/d to serve public LDV/HDV fleets

Contact us to learn more about the hundreds of hydrogen projects we're executing across the globe.

bv.com