

Oil and Gas Facilities and Pipelines

Delivering revenue, logistics and sustainability in challenging locations



KBR



To avoid venting gas into the atmosphere, KBR along with In Salah – a joint venture between Sonatrach, BP and Statoil – designed facilities in Algeria to capture carbon dioxide and inject it into a brine formation a mile below the surface.

Delivering Complex Logistics and Swift Revenue Streams

As hydrocarbon resources become scarce, national and integrated oil companies rely on their engineering, procurement and construction (EPC) contractors to deliver constructability, operability, safety and cost savings through engineering design. Extreme climates and remote locations present major execution, logistics and environmental challenges. These implementation risks raise important questions:

- Is the project timeline realistic and feasible to predict revenue streams?
- How will you confidently balance logistics, safety and sustainability?
- Which issues are likely to become threats to project success?

It's one thing to understand the issues that affect risk. It's another to foresee and solve them. With over 30 years of project successes, KBR mitigates risk from project concept, to design and through every detail of your implementation.

Many companies recognize the issues that create risk. Few anticipate and resolve them. With over half a century of upstream oil and gas success, KBR mitigates risk from project concept to FEED to every detail of your implementation and beyond.

Choosing High-Performance Technology

Getting solutions that move your company's projects ahead without locking into an EPC contractor that only uses proprietary technology is tricky. Project execution today requires international companies with global engineering capabilities, systems, procedures and communications to match the right process technology to your upstream facility or pipeline needs. While we have a number of proprietary technologies that outperform competitive solutions in terms of reliability and cost-effectiveness, we are neutral when it comes to technology and can work with nearly all licensors and equipment suppliers.



Understanding client needs and offering innovative solutions that reduce risk in onshore and pipeline projects across the globe is a differentiator that KBR brings to every project.



Overseeing rigorous process simulation, modeling, feasibility studies, process optimization and early production design and procurement support has granted KBR a reputation of solving "first of its kind" challenges.



Visualizing the most efficient, cost effective and environmentally sound project is how KBR approaches every project.

Maintaining Cost and Schedule

Risking a massive onshore facility or pipeline project by contracting with an inexperienced EPC outfit could cost your reputation. The fact is that the criteria affecting your ability to achieve monthly objectives depends on getting systems and a strong EPC team aligned with your vision and focused on your goals. KBR will assemble the right team to meet your production targets and local requirements. Proactively trending construction materials and equipment occurs early in our projects and continues during design through procurement, shipping and installation with our proprietary Integrated Project Management System (IPMS). Esso Exploration and Production chose KBR when needing an EPC company to generate four times Chad's existing power supply in the Chad - Cameroon Development Project.

Managing Execution Risks

With fast-tracked timetables, environmental compliance and tight capital budgets, KBR's effective project management takes you seamlessly from an initial idea to revenue stream. Averting risk during concept, feasibility, front-end engineering and design (FEED), detailed design, construction and commissioning is an area in which we are well equipped. For example, Perez Companc turned to KBR when they needed complex logistics

and field development in an environmentally sensitive area. Operating in rain forests and national preserves with no infrastructure, our team delivered a feasibility study and FEED. The project also included reservoir description, field exploitation plans, well construction, field water separation, connector pipelines, central processing facilities, export pipelines, pump stations and reception facilities.

Putting Safety First

Creating an organizational climate that practices safe behavior, rewards safety performance, records lost time incidents (LTI) and minimizes environmental and social impact is a differentiator when choosing an EPC contractor. Each year our commitment to health, safety and the environment is evident as we implement proven standards and processes, hold ISO 9001, ISO 14001 and

OHSAS 18001 certifications, and continue our world-class record of training. Achieving project success means continuously improving safety records and removing health and environmental hazards that could stall production. Further proof of our pledge to put safety first includes achieving over 32 million hours on the Chad - Cameroon Project without an LTI.



Having one of the best safety records in the industry and a solid reputation of managing resources shows why companies like Shell, BP and Chevron come to us for repeat business.



From initial conceptual studies, FEED and construction, KBR has contributed to every phase of the In Salah Gas Development project, adding to the company's 30-plus year project experience in Algeria.

Rejecting Proposals Built on Promises

More than likely you have received proposals that seem too good to be true. To put matters into perspective, loss of production from just one missed project milestone easily outweighs the perceived savings promised by a low-bid contractor. Bids from KBR are competitive, so when you evaluate and weigh our quality personnel,

expertise, training, logistics, execution and exceptionally high safety record, there is really no comparison. For example, many of the capabilities outlined earlier prompted BP to choose KBR when needing EPC services for seven natural gas fields at the In Salah Gas project in Algeria.

Creating Jobsite Employment Opportunities

Leading EPC companies create job opportunities in the areas where they work to enrich and sustain local communities. Besides holding a notable safety record, the contractor you hire needs experience training workforces of all sizes and must have in-depth understanding of cultural issues to work well with various governments and

communities. Not only do we oversee thousands of workers at project sites, our local content numbers are significant. For example, KBR managed a peak construction workforce of over 10,000 on multiple sites during the Chad – Cameroon project in Africa, and helped create new service companies in Chad.

Balancing logistics, reducing emissions and safeguarding lives is how we operate on a daily basis



Chad-Cameroon, In Salah, In Amenas and numerous other massive desert projects show how KBR has the expertise, negotiating power and flexibility to match materials and services to your vision, cost and schedule needs.



Partnering with our clients, KBR's vision and planning in FEED packages provides a state of readiness for final designs, a measure of accuracy for capital budgets, successful developments and on-time profitable production for our clients.



Commercial residuum oil supercritical extraction (ROSE®) units have demonstrated overall savings of up to 50 percent compared to conventional solvent-extraction processes that use evaporation, compression and condensation.

Delivering Successful Outcomes

Deploying tools, systems and procedures globally combined with our advanced project management software allows for borderless work sharing and increases the success of your project. Ensuring that standards and project requirements are aligned with your vision, our experts communicate and monitor progress using business execution tools such as IPMS, project portals, 3D conceptual engineering, project dashboards, geographic information systems and object engineering. For example, our experts relied on extensive project management tools to communicate work progress while working on Agip Kazakhstan North Operating Company's (Agip KCO) Kashagan onshore/offshore project located in the seasonally ice-bound North Caspian Sea.

Processing, Upgrading and Transporting to Compete

The high cost of light sweet crudes is forcing refiners to invest in bottom-of-the barrel processing, upgrading and conversion capabilities to be competitive. Stringent environmental requirements and a dwindling supply of quality crudes make upgrading a logical choice. Offering economic and efficient solutions to process and transport difficult crudes, KBR is a leader in heavy oils and tar sands through

our differentiated resid processing and upgrading technologies that include our patented ROSE, coker and visbreaker technologies. Managing the handling, treatment, removal and disposal of sour gas at sites in the Gulf of Mexico, the Caspian Sea, Asia and North Africa allow us to provide in-depth solutions to low-quality gas and crude.

Designing and constructing major processing plants on schedule with an exemplary health, safety and environmental record is a KBR differentiator



Not only did KBR create and globally deploy our Program Management Suite in six months while delivering project management for over 20 major contracts in Agip KCO's drilling and production project in Kashagan, we also scoped and deployed the initial phase of the project's Integrated Management system simultaneously.

Desert/Arid Regions



Rapid execution and no disruption to operations during onshore and pipeline projects result from our comprehensive in-plant work knowledge.

Delivering Unique Solutions in Desert/Arid Regions

From dealing with moving sand dunes to the creation of new water sources, projects in arid regions require tailored solutions. As engineering, procurement and construction management (EPCm) contractors for desert projects, we develop and design detailed environmental management plans including solid waste disposal systems, wastewater and dust mitigation among others. Providing logistics for equipment and materials, hiring and training local workforces in remote locations, our experts streamline processes, institute comprehensive health and safety programs and utilize businesses and suppliers near worksites to boost local economies.

Mitigating Complex Logistics in Chad and Cameroon

Esso Exploration and Production turned to KBR to build a power plant that would meet the needs of a growing population and generate four times the country's existing power supply. Through FEED and EPC, KBR met this challenge by hiring a workforce greater than 10,000 representing more than 10 nationalities to deliver a 120 MW power plant. Project execution involved constructing numerous systems and facilities in both Chad and Cameroon, and

an oil and gas gathering system to produce one billion barrels of crude over 25 – 30 years. Limited infrastructure, complex logistics and multiple sites covering 1,400 square kilometers made developing oil reserves in Chad and exporting it to the Atlantic coast of Cameroon a challenging undertaking. ExxonMobil acknowledged the schedule and performance on this project, and as a result honored the team with "Safe Contractor of the Year" award.

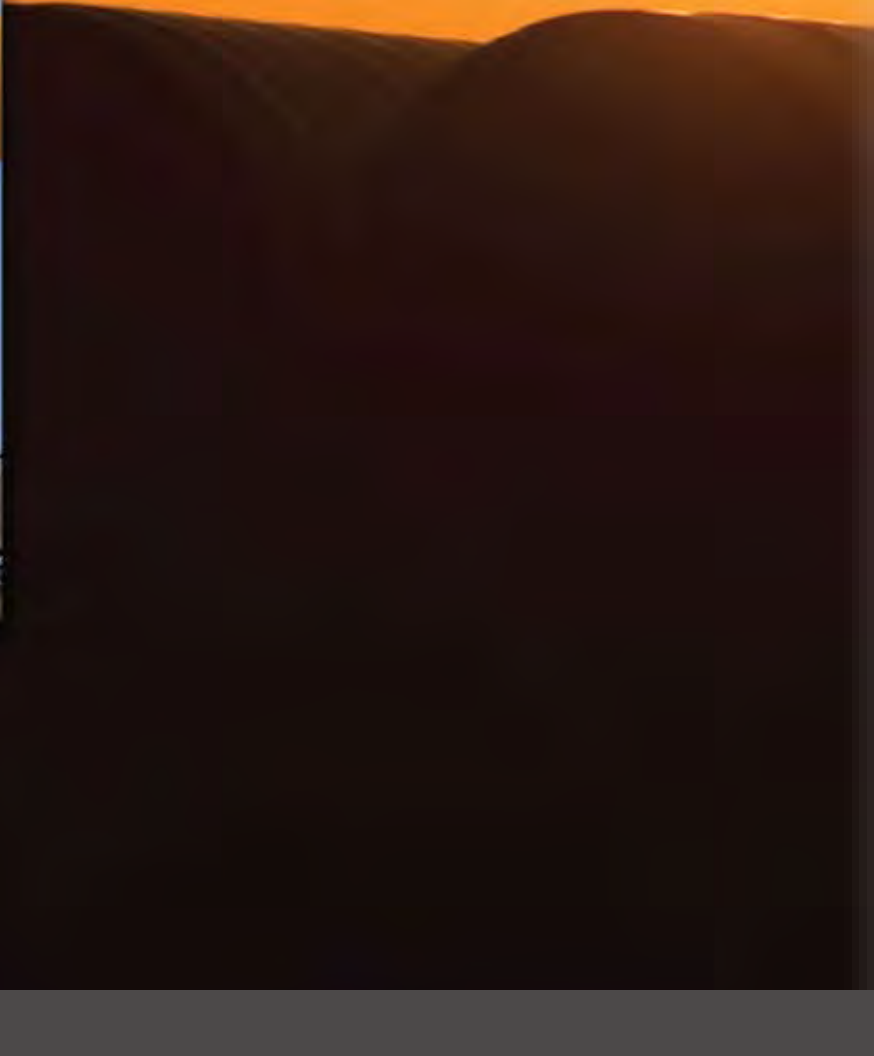
Delivering Extensive Geological Reconnaissance at In Amenas

BP/Sonatrach enlisted KBR to provide FEED and full EPC services for a gas production project at the In Amenas region of southern Algeria. Covering an area greater than 1,000 square miles, the project team delivered full facility scope of work from the wellhead to the tie-in with the gas transmission line and this includes all supporting infrastructure. Extensive geological reconnaissance of soil and ground conditions enabled our project

team to build a ground model that depicted geotechnical properties of the pipeline route. This capability alone prompted BP/Sonatrach to choose KBR and JGC when needing FEED and EPC for a gas development project that spanned four production fields. Besides delivering the gas gathering facilities, our JV also delivered the pipelines and infrastructure including roads, accommodations and offices.



Integrating construction and commissioning activities is one way KBR provides better installation with fewer punch list items once your project is complete.



Creating the infrastructure to make remote projects feasible often means turning an isolated landscape into a working town complete with everything from running water to satellite communications.

Injecting CO₂ beneath the Surface at In Salah

BP chose KBR to deliver FEED, full EPC services, infrastructure and construction management for the largest dry gas project and export pipeline in Algeria. The gas facility spans four main sites across seven natural gas fields covering 23,000 square kilometers south of Algiers. The project team designed this gas gathering and export project for 850 million square cubic feet per day (scfd). Some of the challenges of a project of this scale included transporting

100,000 tons of freight in 4,500 truck movements covering nine million kilometers. In Salah is the largest dry-gas joint venture in Algeria, and has one of the largest CO₂ sequestration systems in the world. To avoid venting gas into the atmosphere, KBR and JGC along with the joint venture between Sonatrach, BP and Statoil—designed facilities to capture carbon dioxide and inject it into a brine formation a mile below the surface.



On-stream since July 2004 with the help of KBR and its joint venture partners, In Salah Gas project produces around nine billion cubic meters of gas per year.



Delivering the FEED and full EPC of the world's first full-scale carbon dioxide capture project at a gas field, KBR and its joint venture partners are helping the environment by making it possible to inject about one million tons of CO₂ into a reservoir each year.



In Salah Gas, the largest dry gas joint-venture project in Algeria, involves the development of seven proven gas fields in the southern Sahara, 1,200km south of Algiers.

Arctic/Cold Regions



Designing, building and managing every type of onshore oil and gas development project from the equatorial forests, river deltas and deserts to the Arctic has enabled KBR to deliver complex logistics and resolve risks that impede revenue streams.

Addressing Complex Cold-Climate Conditions

Module and subassembly prefabrication, thermal protection for personnel and equipment and electrical heat tracing on exposed lines are a few of our solutions to cold weather challenges. Designing cold-region facilities based on our environmental philosophy of zero discharge to protect delicate tundra vegetation and marine environments is a KBR differentiator. In terrestrial environments, we typically construct facilities when soil is frozen. Another safeguard we take in environmentally sensitive areas is to design onshore facilities on engineered gravel and sand pad foundations.

Delivering Project Management in Kashagan

Agip KCO chose KBR to deliver FEED and project management for an onshore/offshore development of a high-pressure, sour oil and gas field. Kashagan is one of the larger discoveries in this decade with an estimated 30 billion barrels of oil. The project is located in shallow and environmentally sensitive water, and required drilling and production islands with several inter-field pipelines, pipelines to shore, onshore processing facilities and terminal and

export pipelines. The team developed and delivered web-enabled global information management systems to provide consistency in standards, plans, processes and procedures. With over 20 major contracts with teams around the world, we verified compliance using our program management systems. Planning took into account that the North Caspian Sea is icebound during winter months.



Safeguarding lives, communities and environments where we operate is a fundamental principle that KBR embraces.



Community involvement at KBR takes many forms either by training local work forces, hiring local vendors, preventing infectious diseases or even constructing schools, roads and medical clinics in some cases near project sites.



Helping oil and gas companies monetize their energy resources is a well established KBR strength.

Optimal Arctic Design for Mackenzie Delta in Canada

When Imperial Oil Limited needed to engineer a 30-inch diameter pipeline spanning 1,220 kilometers from the Mackenzie Delta to just north of the Alberta, Northwest Territory border, they turned to KBR. This immense project will gather natural gas and natural gas liquids (NGLs) from three onshore natural gas fields including gathering pipelines, natural gas and NGL trunk lines and associated

processing and separating facilities. This project included conceptual and preliminary engineering and the initial design capacity consisted of 1.2 billion cubic feet per day (cfd) expandable to 1.9 billion cfd. Additionally, the project required an Arctic design and permanent infrastructure including access roads, airstrips, helipads and communication systems to support construction and operations activities.



Whether it's commercializing remote natural gas reserves or creating the infrastructure to produce hydrocarbon reservoirs onshore, KBR has the expertise and experience to help customers derive the greatest value from their assets.



By providing a full complement of engineering, procurement, construction and commissioning/start-up (EPC-CS) services, we continue to develop innovative technologies and project execution methods, enabling us to deliver facilities in some of the most challenging environments on earth.

Upgrading the Karsto Development in Norway

Statoil chose KBR's subsidiary, MW Kellogg, when they needed detailed engineering to upgrade and develop their gas treatment facility in Karsto, Norway. Karsto is a hub for gas production from 30 large and small fields in the North Sea and Norwegian Sea. Statoil awarded the contract to KBR's subsidiary on behalf of Gassco and Gassled. Besides detailed engineering, the upgrade contract calls for assistance in procurement and construction. The upgrade will allow the complex to send more gas through the Europipe II pipeline to Dornum, Germany. By improving regularity and flexibility, the facility will operate with greater efficiency. KBR through MW Kellogg was the main contractor on three previous major expansions at the Karsto facility, and has worked with Statoil for a quarter century.



Improving efficiency of operations, conserving natural resources, safeguarding lives and reducing emissions is how KBR operates on a daily basis.



The Karsto gas treatment facility in Norway is another example of KBR's ability to design and construct major processing plants on schedule and with an exemplary health, safety, and environmental record.

Jungle/Tropical Regions



Development of onshore and pipeline facilities start with KBR designers and engineers' visualization of the most hyper-efficient, cost-effective and environmentally sound project.

Mitigating Environmental Challenges in Jungle/Tropical Regions

Few EPC companies can deliver fast-track development in rain forests without roads or pipeline networks. This handful shrinks when environmental restrictions are extensive and indigenous groups must approve land use agreements for development. Overcoming access issues, lack of infrastructure and environmental challenges such as preserving native tribal hunting grounds, national parks and tree canopies has made us part of a select group of EPC companies that deliver oil field and central processing facilities in rainforest environments successfully.

Recommending directionally drilled pipelines for river crossings is one way KBR helps minimize adverse effects to the environment

Expanding the Highlands Gas Development

The project required completing the FEED for a 700 million scfd gas processing facility for ExxonMobil's subsidiary, Esso Highlands Limited, in Papua New Guinea. Besides delivering the FEED for the future liquefied natural gas (LNG) facility, the project team designed a gas gathering system, a 26" gas export pipeline, additional facilities as well

as improvements to existing site structures including base camp, loading dock bulkheads and the expansion of warehousing, helicopter landing facilities and a nearby airfield. Some of the risks encountered on this project included safeguarding personnel and equipment against fast flowing rivers.



Navigating the logistics of buying, shipping and controlling a massive amount of equipment, materials and people are areas where KBR has earned a solid reputation.



Choosing KBR has helped numerous integrated and national oil companies improve their country's future through technology transfer, sustainable development and swift monetization of natural resources. Why wait?

Upgrading Facilities while Negotiating Difficult Terrain in Cusiana and Cupiagua

BP turned to KBR when they needed EPCm for process facilities, well pads and a gathering system at Cusiana and Cupiagua, two of the largest oil fields in Colombia. Besides EPCm, the project called for crude oil production, gas re-injection and water disposal. Located in the eastern Andes foothills, the dual fields are the largest discovery in the Western Hemisphere in 20 years and largest in the 80-year history of the Colombian oil industry. The project team upgraded the central processing facility (CPF) at Cusiana from 185,000 to 320,000 barrels of oil per day (bopd), and developed the Cupiagua CPF greenfield site to process 200,000 bopd. The project team successfully negotiated difficult terrain, including a 10,000-foot elevation pipeline crossing of the Andes Mountains and five major drilled river crossings in addition to establishing security and work practices in a challenging region.

Meeting strict environmental, permitting and access requirements are several challenges we face when executing onshore and pipeline projects

Largest Diameter Gas Transmission Pipeline in Cross-Island Project

Trinidad National Gas Company relied on KBR for EPCm for a 77-kilometer gas transmission pipeline that spans the island of Trinidad from Beachfield to an LNG facility on the island's southwest coast. The 56-inch-diameter pipeline transports up to 3.85 billion scfd (2.4 billion scfd without

compression) and is the largest diameter gas transmission pipeline thus far in the Western Hemisphere. The project overcame a number of challenges with respect to confined right-of-way, adjacent pipelines, swamps and routing through existing plant areas.

Generate Revenue Stream. Manage Logistics. Deliver Sustainability. Maintain Schedule.

Experience delivering revenue streams quickly following construction of complex facilities in harsh, remote environments is a benefit that KBR brings to every project. Mitigating risk on your multi-billion dollar onshore facility and pipeline project is how we help you derive the greatest value from your assets. Ingenuity in designs, flexibility in approach and confidence in execution are three reasons so many companies turn to the industry expert for safe, environmentally friendly EPC: KBR.

To learn more, visit: kbr.com/onshore or contact onshore@kbr.com

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