MEGAPROJECTS

KMG develops global-scale projects through partnerships with international oil and gas companies.

TENGIZ

The largest gem in Kazakhstan's oil and gas industry, a world-unique supergiant oil field

The agreement for the Tengizchevroil LLP project was signed between the Republic of Kazakhstan and Chevron Corporation on 2 April 1993, with a 40-year hydrocarbon exploration and production licence granted to Tengizchevroil in 1993. Tengizchevroil focuses on the exploration, production and sales of hydrocarbons from the Tengiz and Korolevskoye fields in the Atyrau Region.

Tengizchevroil LLP (TCO) operates a license that includes the unique, supergiant Tengiz field and the adjacent, smaller but still significant, Korolevskoye field. The Tengiz oil field was discovered in 1979, and it is the world's deepest supergiant oil field.

Currently, oil production and processing are carried out at modern, highly reliable operating facilities: complex technology lines (CTL, throughput: 12.41 mln tonnes of processed oil in 2020), Second-Generation Plant (SGP, throughput: 14.05 mln tonnes of processed oil in 2020) and sour gas injection (SGI, 3.07 bln m^3 in 2020). The well stock currently comprises 160 production wells and 8 gas injection wells.

Highlights:

Oil production (total)

26,457 ths tonnes (576 ths bbl per day)

Oil production (net to KMG) (20%)

5,292 ths tonnes (115 ths bbl per day)

Development perspective

The implementation of the USD 45.2 bln Future Growth Project/Wellhead Pressure Maintenance Project will boost oil production from the Tengiz field by 12 mtpa

2P oil reserves life

Over 20 years

Associated gas production (total). Includes gas consumed in operations and gas reinjection

14,75 bln m^3

Interests

KMG (20%), Chevron (50%), ExxonMobil (25%), LUKOIL (5%)

Operatorship

Tengizchevroil LLP

Tengizchevroil's operational highlights

Year	Oil production, ths tonnes	Associated gas production, mln м³	Dry gas production, mln m³	Liquefied petroleum gas (LPG) production, ths tonnes	Sulphur production, ths tonnes	Gas injection, mln m³
2018	28,622	15,625	9,186	1,343	2,574	3,186
2019	29,791	16,290	9,471	1,348	2,589	3,655
2020	26,457	14,748	8,674	1,482	2,451	3,069

In 2020, oil output fell by 11.19% year-on-year to 26,457 ths tonnes (including KMG's share of 5,292 ths tonnes) while gas output was down 9.47% year-on-year to 14.75 bln m³ (including KMG's share of 2.95 bln m³). The production decline was primarily driven by commitments under the OPEC+ agreement.

Progress on the Future Growth Project and the Wellhead Pressure Maintenance Project

Tengizchevroil is implementing two integrated projects – the Future Growth Project (FGP) and the Wellhead Pressure Management Project (WPMP). The two projects make a significant contribution to the national economy: the FGP–WPMP has already created about 48 thousand jobs in Kazakhstan, with about 1,000 more permanent jobs to be added to support the operation of the FGP–WPMP. The implementation of the projects will boost oil production from the Tengiz field by 12 mtpa.

A technical inspection of the FGP/WPMP facilities was conducted in February–April 2020, resulting in proposals sent to TCO to optimise the project cost and recommendations on improvements to its project management practices. The additional cost optimisation for the project confirmed by TCO is about USD 1 bln.

At the end of 2020, the cost of the FGP/WPMP project was USD 34.3 bln, with the overall project progress at about 80.6%.

On 28 October 2020, the last module with process equipment arrived at the site of the Tengiz field, marking the end of the project's offshore transportation.

COVID-19

Between March and June 2020, about 27 thousand people were demobilised from the Tengiz field. As of 1 September, TCO began mobilising its personnel back to the FGP/WPMP construction sites in monthly increments of 4,500 to 5,000 employees, bringing the Tengiz workforce to 34 thousand employees by the end of 2020.

TCO set up an Emergency Response Team, developed tactical plans for a range of scenarios and the Tengiz Field Security Plan. A list of critical personnel at the Tengiz field was drawn up to ensure its uninterrupted operation.

1,131 employees of Tengizchevroil were asked to work from home. A fly-in fly-out (FIFO) plan was prepared and approved by the Akimat of the Atyrau Region and the Kazakhstan Government, with workers allowed to work only after a certain period of isolation and a negative PCR test.

TCO allocated USD 8 mln to the Atyrau Region to support its fight against COVID-19 and also started the construction of a 200-bed USD 14 mln modular hospital in Kulsary.

KASHAGAN

The giant Kashagan field is the largest discovery in the last four decades and one of the most complex offshore deposits globally.

The Production Sharing Agreement in respect of the North Caspian Sea (NCSPSA) was signed by the Republic of Kazakhstan and an international consortium on 18 November 1997. North Caspian Operating Company N.V. is the project operator, acting on behalf of the project contractors.

Highlights:

Oil and condensate production in 2020 (total)

15,141 mln tonnes (328 kbopd)

Oil and condensate production net to KMG (8.44%)

1,253 ths tonnes (27 kbopd)

Outlook

Oil production from Kashagan can reach 700 kbopd within the next decade, provided a number of investment projects are approved and carried out.

2P oil and condensate reserves life[1]

Over 120 years

Natural gas production (total)

9,152 bln m³

Interests

KMG Kashagan B.V. (16.88%), Eni (16.81%), ExxonMobil (16.81%), Shell (16.81%), TOTAL SA (16.81%), CNPC (8.33%), and INPEX North Caspian Sea (7.56%)

Operatorship

North Caspian Operating Company N.V. (NCOC)

NCOC's operational highlights

Year	Oil production, ths tonnes	Natural and associated gas production, mln m³	Sulphur production, ths tonnes	Gas injection, mln m³
2018	13,219	7,697	1,340	2,235
2019	14,127	8,453	1,323	3,148
2020	15,141	9,152	1,228	3,807

The North Caspian project is the first major offshore oil and gas project in Kazakhstan. It includes five fields: Kashagan, Kalamkas-Sea, Kairan, Aktoty and Kashagan South-West. The Kalamkas-Sea field was returned to the Republic of Kazakhstan in November 2020.

The Kashagan field lies in an offshore location 75 km from Atyrau at water depths of 3 to 4 m. The field reservoir lies at a depth of over 4 km and is characterised by high pressures (over 700 bar) and high hydrogen sulphide (H_2S) concentration. At the same time, sour gas reinjection at high pressure improves oil recovery.

Kashagan is one of the most challenging industry projects globally due to harsh environmental conditions at sea and significant design, logistics and safety challenges. Located in the subarctic climate, the North Caspian Sea is covered with ice for about five months a year, requiring innovative technical solutions. KMG, together with international partners, is successfully implementing the project, having achieved sustainable production rates with further growth potential.

The Kashagan field infrastructure comprises onshore and offshore facilities. Onshore facilities include the Bolashak Onshore Processing Facility (an integrated oil and gas treatment plant) while the offshore facilities comprise a range of manmade structures including an operations and process complex on Island D, Island A, and early production islands EPC-2, EPC-3 and EPC-4. A total of 40 wells were drilled on the Kashagan field, 6 of which are injection wells and 34 are production wells.

Currently, KMG (through Cooperative KazMunayGaz U.A.[1]) jointly with JSC Samruk-Kazyna on a parity basis (50%/50%) owns KMG Kashagan B.V. which, in turn, has a 16.88% interest in the North Caspian project. Thus KMG indirectly owns 8.44% of the project. KMG also has an option to acquire another 50% in KMG Kashagan B.V. between 2020 and 2022.

Oil production from the North Caspian project was 15.141 mln tonnes of oil and 9,152 mln m³ of natural and associated gas in 2020. KMG's share in Kashagan production grew by 7% year-on-year

1. Reflects the current relatively low oil production level, which has an upside potential.

to 1,253 ths tonnes of oil and 758 mln m^3 of gas. Oil and gas production increased as a result of the overhaul carried out in 2019 (which boosted the operational efficiency of offshore and onshore facilities), an increase in the number of injection wells from four to six, and installation of additional reboilers on oil processing lines. Kashagan's targeted 2020 annual production of 1,332 ths tonnes of oil was not achieved due to OPEC+ restrictions.

The produced oil is mostly exported to Europe, East Asia and India via Novorossiysk, where the oil is delivered by the CPC pipeline. During the period of very low oil prices, between March and June 2020, CPC Blend crude's liquidity dropped, with discount as large as USD 10 per bbl. In that environment, rapid action was taken to redirect exports to a destination offering the most attractive margins – for sale FOB Ust-Luga. The Company has alternative destinations to sell its crude in the event such situations happen again in the future.

KazTransGas (KTG) is the sole buyer of gas from all contractors at the Kashagan field, with whom a single gas purchase and sale contract has been signed.

Outlook for Kashagan

Once sustainable production rates are achieved, two projects are under consideration in phase 1 to ramp up to plateau production with the potential to grow oil and condensate production to 450 kbopd in the medium term.

- Bundle 1
- Project to supply raw gas to a third party

Two separate projects, A and B, are considered for phase 2 to increase oil and condensate production to 700 kbopd over the next 10 years.

- Phase 2A
- Phase 2B

Bundle 1
The project will enable oil production increase by 15–20 kbopd (1,900–2,500 tonnes per day) by upgrading existing injection compressors and expanding their capacity. Bundle 1 was split into two phases: raw gas injection compressor upgrade (to be completed in 2022) and an ultra-high pressure pipeline with well conversion (2026). A final investment decision (FID) for the raw gas injection compressor upgrade project was taken in July 2020, with the project estimated at approximately USD 207 mln scheduled for completion in 2022.

Project to supply raw gas to a third party
The project will provide for increasing oil production by 17–20 kbopd (2,100–2,500 tonnes per day) by delivering additional volumes of associated raw gas to KazTransGas's planned new gas processing plant (GPP) with raw gas processing capacity of 1 bln m^3 per year. Key gas supply terms were agreed with KazTransGas, and with the FID taken in December 2020, the project was moved into the implementation phase. The project is scheduled for completion in 2023.

Phase 2A
The project aims to increase oil production to 500 kbopd (63,000 tonnes per day), with the selected supply option providing for an additional annual supply of 2 bln m^3 of raw gas to KazTransGas's gas processing plant. Currently, this option undergoes technical review and optimisation as part of a pre-FEED study. An FID is expected in 2023, with the project start-up in 2026.

Phase 2B
The project aims to increase oil production to 700 kbopd (88,000 tonnes per day). An option to build a multi-phase pipeline and a new onshore plant and to supply 6 bln m^3 per year of raw gas to Tengizchevroil or KazTransGas was selected in Q3 2020. Currently, this option undergoes technical review and optimisation as part of a pre-FEED study. An FID is expected in 2024, with the project start-up in 2030.

COVID-19

As part of its COVID-19 response, the operator of the North-Caspian project has been implementing an effective COVID-19 prevention and control programme in order to protect operational staff while taking steps to minimise impact on operations and curb further spread of the virus.

Quarantine facilities compliant with all applicable sanitary requirements have been rolled out. Only a skeleton staff has been operating, with 28- and 56-day FIFO schedules introduced in August 2020. Extra contact-free operation measures were put in place to reduce interaction between independent work areas, with 10- or 14-day quarantine and PCR-testing across several stages introduced before starting work at production sites.

1. A wholly-owned subsidiary of KMG, with the direct ownership of 99.7440256% and indirect ownership via KMG Kumkol LLP of 0.2559744%.

KARACHAGANAK

One of the world's largest gas and condensate fields

The Final Production Sharing Agreement (FPSA) in respect of the Karachaganak oil and condensate project was signed by the Republic of Kazakhstan and an international consortium on 18 November 1997. Royal Dutch Shell and Eni are the joint operators of the Karachaganak project (development via Karachaganak Petroleum Operating B.V.).

Highlights:

Production of liquid hydrocarbons (stab.) (total)

10.9 mln tonnes (235 kbopd)

Production of liquid hydrocarbon (stab.) net to KMG (10%)

1,094 ths tonnes (23 kbopd)

Outlook

The implementation of investment projects to maintain the achieved liquid hydrocarbon production plateau levels

2P oil and condensate reserves life

Over 20 years

Gas production (total)

20.2 bln m^3

Interests

KMG (10%), Eni (29.25%), Shell (29.25%), Chevron (18.00%) and LUKOIL (13.5%)

Operatorship

Royal Dutch Shell and Eni are the joint operators of the Karachaganak field (Karachaganak Petroleum Operating B.V.)

Karachaganak Petroleum Operating B.V.'s operational highlights

Year	Gas production, mln m^3	Liquid hydrocarbon production, ths tonnes	Gas injection, mln m^3
2018	18,913	10,953	8,589
2019	18,615	10,147	8,711
2020	20,214	10,941	10,362

Karachaganak oil and condensate field is one of the largest oil and condensate fields in the world, located in the West Kazakhstan Region and covering an area of over 280 sq km. The field was discovered in 1979, with pilot development started in 1984.

The Karachaganak project has three core process facilities, comprising a single system of interrelated and interdependent process units within the Karachaganak field's production process:

- KPC – the Karachaganak Processing Complex, located in the northwestern part of the field and processing liquid hydrocarbons coming from wells as well as feedstock transported from Unit 2
- Unit 2 – a gas treatment unit located in the southeastern part of the field, which separates and reinjects raw gas at high pressure and feeds liquid hydrocarbons to the KPC for stabilisation before shipment for export
- Unit 3 – a gas treatment unit located in the northeastern part of the field, which separates and partially stabilises liquid hydrocarbons and gas before shipment for export

During 2020, three new wells were added to the field's operating well stock, which now includes 158 producing wells and 19 injection wells.

Liquid hydrocarbon production from Karachaganak increased by 7.8% year-on-year to 10,941 ths tonnes in 2020, including KMG's share at 1,094 ths tonnes. Gas production was up 8.6% year-on-year at 20,214 mln m^3 in total, with KMG's share at 2,021 mln m^3. The increase in production was due to higher operating performance of KPC, Unit 2 and Unit 3 following preventive maintenance in September and October 2019, as well as an increase in gas injection volumes in the summer after new gas injection wells came online along the 5th Trunk Line.

Outlook for Karachaganak

The Karachaganak oil and condensate field is in Phase 2 commercial development (phase 2M), which includes a number of major capex projects (Production Plateau Extension Projects and the Karachaganak Expansion Project) aimed at increasing raw gas

1. A conversion factor of 0.9 is applied to total oil and condensate production to estimate stable liquid hydrocarbons.

treatment and reinjection capacity to extend the duration of the liquid hydrocarbon production plateau at the achieved rates.

Production Plateau Extension Projects (phase 2M)

- Installation of the additional 5th Trunk Line (5TL) – the project will increase the annual volume of gas injection to 10 bln m^3 in order to maintain reservoir pressure and add 2.6 mln tonnes of liquid hydrocarbons in incremental production over the remaining life of the FPSA
- KPC Gas Debottlenecking (KGDBN) – the project envisages commissioning of new glycol gas-dehydration and low-temperature gas separation units with a total capacity of 4.0 bln m^3 per year to increase the volume of gas treatment for reinjection and/or export to the Orenburg Gas Processing Plant (OGPP), as well as add 9.1 mln tonnes of liquid hydrocarbons in incremental production over the remaining life of the FPSA
- Installation of Unit 2 4th Injection Compressor (4ICP) – the project will install a network of process pipelines to maintain reservoir pressure and the liquid hydrocarbon production plateau by increasing annual gas injection volumes from 10 bln m^3 to 13 bln m^3, as well as add 6.8 mln tonnes of liquid hydrocarbons in incremental production over the remaining life of the FPSA
- Installation of the additional 6th Trunk Line (6TL) – the project will optimise the injection process by shifting gas to new parts of the field while adding 2.2 mln tonnes of liquid hydrocarbons in incremental production over the remaining life of the FPSA

The 5TL project was commissioned in 2019, with the KGDBN and 4ICP projects scheduled for start-up in Q4 2021 and the 6TL project coming online in Q2 2024.

Combined, the Production Plateau Extension Projects will maximise the benefits through:

- increased gas treatment capacity
- incremental liquid hydrocarbon production
- upgrades to existing liquid hydrocarbon treatment units
- reduced rates of reservoir pressure declines.

Karachaganak expansion Project (KEP)

A major expansion of production units is an option to further extend production plateau post phase 2M. This expansion, phased in two stages – for 2025 and 2026, will be pursued through the KEP project which will enable a further boost in gas treatment and reinjection capacities through the phased commissioning of the 5th and 6th injection compressors to sustain oil production at 10 mln to 11 mtpa.
The project cost is estimated at USD 1.8 bln. In December 2020, a final investment decision was taken for the 5th Injection Compressor Project (5ICP), and a FID for the 6th Injection Compressor Project (6ICP) is expected later.

Digital projects to transform operations

As part of the Digital Kazakhstan innovative development state programme, Karachaganak Petroleum Operating B.V. has developed a roadmap for a digital transformation and technology innovation. The current work streams are focused on the areas of production optimisation, well surveillance, smart plant and digital transformations for project delivery, minimisation of paper-intensive processes and maximisation of the automated workflows, warehouse management, improvement of the monitoring and intervention activities.

Digitising key field parameters will enable Karachaganak Petroleum Operating B.V. to make timely decisions maximising productivity through automated integrated data analysis tools.
With progress at 47%, the project's expected completion year is 2022.

COVID-19

COVID-19 response at the Karachaganak field included the following crisis response measures implemented early on:

- Suspension of drilling until 2022
- Curtailing well operations not using drilling rigs, postponing non-essential well operations from 2020 to 2021
- Partially postponing preventive maintenance activities from 2020 to 2021
- Shifting employees to work from home
- Increased shifts for Karachaganak Petroleum Operating B.V. employees and contractor personnel
- Regular PCR tests for Karachaganak Petroleum Operating B.V. employees and contractor personnel
- Frequent cleaning and sanitation protocols, etc.