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<td></td>
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<td></td>
<td>BROWNFIELD WORKS FOR MAJNOON OIL FIELD DEVELOPMENT</td>
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<td>SAKHALIN I CHAYVO ONSHORE PROCESSING FACILITY (OPF) PROJECT</td>
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<td></td>
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</table>
INTRODUCTION

ENKA’s experience in the oil and gas industry dates back to 1970s with its involvement in construction of various petrochemical plants, refineries, tank farms and pipelines in Turkey and neighboring countries. Since 1990s ENKA has successfully undertaken oil and gas projects in the Russian Federation, Kazakhstan, Iraq, Libya, Georgia and Azerbaijan for international oil & gas giants such as BP, Chevron, Shell, Gazprom, ExxonMobil, Lukoil with an overall contracted value of over US$ 9 billion to date.

ENKA’s proven capabilities and success in challenging environments like remote locations with lack of infrastructure and under extremely harsh climatic conditions give our clients the confidence to call us for integrated solutions for their greenfield and brownfield projects, irrespective of scale and complexity.

ENKA Oil, Gas and Petrochemicals business group by directly utilizing in-house resources delivers:

• Detailed Design Engineering
• Procurement
• Fabrication of all Structural Steel, Piping, Static Process Equipment, Process and Rack Modules and Skids
• Transport, Logistics and Management of all Project Equipment & Materials
• Site Construction and Installation Services in all disciplines
• Commissioning and Start-up Services

Embracing the “Zero Accidents” philosophy as a core value, professionals of ENKA Oil, Gas and Petrochemicals utilizes the vast experience, innovative methods and best practices gained over the years on many oil and gas projects worldwide to improve performance and quality ensuring top value. With access to a human resource pool of over 30,000 construction personnel, and a construction equipment and machinery park of over 3,000 pieces, ENKA is able to mobilize rapidly to any location on the world map and start providing services in the highest quality.
**PROJECT DESCRIPTION**

Senimdi Kurylys LLP, an equal joint venture between ENKA and Bechtel, was awarded the contract for the Mechanical, Electrical and Instrumentation installation works for the Third Generation Project (3GP) in Tengiz, Kazakhstan.

The 3GP is part of TCO’s Future Growth Project (FGP) which is an integrated project being developed primarily to increase the production capacity of the Tengiz Oil Field by an additional 12 million tons per year (260,000 barrels per day) and its gas production capacity by an additional 27 million m³ per day.

The project is being carried out using a modularized construction strategy, with modules constructed both at Kazakh coastal fabrication yards and at other fabrication yards in Europe and the Far East.

The project includes construction work for the crude processing plant, as well as the module stacking, sour water stripper and utilities areas.

**PROJECT DETAILS**

**LOCATION:** Tengiz - Kazakhstan  
**OWNER / CLIENT:** Tengizchevroil (TCO) (a Joint Venture between Chevron, ExxonMobil, LukArco and KazMunayGas)  
**PROJECT DURATION:** May 2018 – Apr 2022  
**CONTRACT TYPE:** Unit Price  
**CONTRACT VALUE:** Confidential

**CIVIL AND UNDERGROUND SERVICES WORKS WORKS ON 3GI PLANT**

**PROJECT DESCRIPTION**

A joint venture in which ENKA and Bechtel hold equal shares was awarded the contract for the civil works and underground services of the Third Generation Gas Injection Plant (3GI), which is part of the Future Growth Project (FGP) in Tengiz, Kazakhstan. Upon completion of all phases, the FGP will increase the Tengiz field’s annual oil production capacity by an additional 12 million tons (260,000 barrels a day), gas production capacity by an additional 960 million standard cubic feet a day, and the field’s overall oil production capacity to approximately 39 million tons per annum.

The project covers the infrastructure works, such as pile cropping and head treatment, earthworks, road works and terracing, concrete works and installation of underground utilities systems including piping, drainage wells and duct banks, and the installation of underground cables – and grounding works for site areas 45, 47A, 47B, 49, 57 and 58, which are integral parts of the TCO FGP project.

**PROJECT DETAILS**

**LOCATION:** Tengiz - Kazakhstan  
**OWNER / CLIENT:** Tengizchevroil (TCO) (a Joint Venture between Chevron, ExxonMobil, LukArco and KazMunayGas)  
**PROJECT DURATION:** May 2017 – July 2019  
**CONTRACT TYPE:** Unit Price  
**CONTRACT VALUE:** US$ 118.5 million

**FDP 3GP MECHANICAL, ELECTRICAL & INSTRUMENTATION INSTALLATION WORKS**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UoM</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Earth Works</td>
<td>m³</td>
<td>12,422</td>
</tr>
<tr>
<td>Concrete</td>
<td>m³</td>
<td>7,118</td>
</tr>
<tr>
<td>Structural Steel</td>
<td>ton</td>
<td>12,608</td>
</tr>
<tr>
<td>A/G Piping</td>
<td>ton</td>
<td>5,358</td>
</tr>
<tr>
<td>Cabling</td>
<td>lm</td>
<td>1,088,894</td>
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<tr>
<td>Insulation &amp; Paint</td>
<td>m²</td>
<td>38,374</td>
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**CIVIL AND UNDERGROUND SERVICES WORKS ON 3GI PLANT**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UoM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>m³</td>
<td>33,360</td>
</tr>
<tr>
<td>Filling Material</td>
<td>m³</td>
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<tr>
<td>HDPE Pipework</td>
<td>km</td>
<td>151</td>
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<tr>
<td>Cabling</td>
<td>km</td>
<td>248</td>
</tr>
<tr>
<td>Manholes and Underground boxes</td>
<td>ea</td>
<td>406</td>
</tr>
<tr>
<td>Gravel Roads</td>
<td>m²</td>
<td>210,000</td>
</tr>
</tbody>
</table>
**LOCATION:** Tengiz - Kazakhstan

**OWNER / CLIENT:** Tengizchevroil (TCO) (a Joint Venture between Chevron, ExxonMobil, LukArco and KazMunayGas)

**PROJECT DURATION:** Mar 2001 – Apr 2021

**CONTRACT TYPE:** Unit Price

**CONTRACT VALUE:** US$ 638 million

**PROJECT DESCRIPTION**

Since the beginning of 2001, the ENKA-Bechtel joint venture, in which ENKA has a 50% stake, has been awarded contracts for projects with a total contract value of US$ 638 million.

The scope of work awarded consists of engineering, procurement and construction work including but not limited to: pipe spool and precast fabrication works, infrastructure works, piling and drilling, earthworks, structural works, piping / pipeline-repair work, electrical and instrumentation works, tank erection works, turnaround services and maintenance of the client’s oil and gas processing facilities.

The works carried out under the project include the following:

- SGP LP Flare Header Upgrade Pre-TA and TA works
- SGP Amine tank - Main piping and structural works
- Field new flow line and hook-up works
- Field flow line rollback & reinstatement Works
- Field pump and piping system upgrade works
- Field pipeline repair works
- MS-17 Manifold Upgrade civil, mechanical, electrical and instrumentation works
- Main Diesel Fuel Storage Area Expansion works

**PROJECT DETAILS**

**LOCATION:** Tengiz - Kazakhstan

**OWNER / CLIENT:** Tengizchevroil (TCO) (a Joint Venture between Chevron, ExxonMobil, LukArco and KazMunayGas)

**PROJECT DURATION:** Jul 2017 – Jul 2019

**CONTRACT TYPE:** Unit Price

**CONTRACT VALUE:** US$ 49 million

**PROJECT DESCRIPTION**

Tengizchevroil has been undertaking a major expansion of its existing facilities through the development of the Future Growth Project (FGP), a component of which is the Wellhead Pressure Management Project (WPMP). A joint venture in which ENKA and Bechtel have equal shares was awarded the contract for the Core Substation ME&I Installation project.

**ENKA SCOPE OF SERVICES**

The work carried out under the project included the installation of a new 110 kV core substation and the interconnection of the facility’s new and existing generating stations. The core substation operates as the hub for the distribution of power.

The core substation comprises 32 prefabricated and pretested modules, and includes 6 units of 110kV BAAH GIS main switches and associated control and protection equipment, 10kV/400V distribution transformers, low voltage switchgear, UPS systems, FLS, ECS and SRC system control equipment panels and automatic synchronizing units.

The scope of the works also includes the following:

- The laying, testing and terminating of the 110 kV underground cables and the associated intermediate underground cables
- The assembly of 2 units of 40/60/20MVA buffer transformers, overhead line disconnector mechanisms and post insulators and supports
- Assembly of 2 units of 245MVA, 110kV series reactors, overhead line disconnector mechanisms and associated post insulators and supports
- Assembly of 2 units of standby diesel generators and associated staircases, platforms, piping, electrical control panels, switchyard grounding and lightning rods
- 11 units of 110 kV overhead line gantries, associated cable support structures and surge arresters
PROJECT DETAILS

LOCATION
Tengiz - Kazakhstan

OWNER / CLIENT
Tengizchevroil (TCO) (a Joint Venture between Chevron, ExxonMobil, LukArco and KazMunayGas)

PROJECT DURATION
Nov 2015 – Jan 2019

CONTRACT TYPE
Unit Price

CONTRACT VALUE
US$ 104.5 million

PROJECT DESCRIPTION

Tengizchevroil (TCO) has been undertaking a large-scale expansion of its existing facilities through the development of the Future Growth Project (FGP) / Wellhead Pressure Management Project (WPMP). The expansion resulted in the signing of a new contract for the construction of new greenfield processing plants and some brownfield facilities in the same area.

Under the project, the following activities have been carried out by the ENKA-Bechtel joint venture, across 18 different work sites: road construction, work site clearance and grubbing, site preparation, excavation works, installation of grounding lines, construction of wellhead cellars and auger and precast concrete pile installations, pile testing and cropping, construction of pile cap and precast foundations, construction of emergency flare pits, construction of reserve and technical water pits, and construction of HDPE technical water lines.
TENGIZ CRUDE SHIPMENT CAPACITY (CSC) PROJECT

PROJECT DETAILS

LOCATION:
Tengiz - Kazakhstan

OWNER / CLIENT:
Tengizchevroil (TCO) (a Joint Venture between Chevron, ExxonMobil, LukArco and KazMunaiGas)

PROJECT DURATION:
July 2014 – Dec 2019

CONTRACT TYPE:
Lump Sum

CONTRACT VALUE:
US$ 436 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• 16 million hours worked without a Lost Time Incident

PROJECT DESCRIPTION

Tengizchevroil (TCO) LLP awarded the Crude Shipment Capacity (CSC) Project scope to Bechtel and ENKA Joint Venture (BEJV). The Crude Shipment Capacity (CSC) project is to add storage and pumping capacity in the Tengiz Crude Tank Farm (CTF) to reliably deliver TCO crude oil production to the Caspian Pipeline Consortium (CPC) pipeline system.

CSC EPC Onshore Contract (1134328)

The contract encompasses onshore procurement and construction activities for the CSC project that are required to provide Tengizchevroil’s existing Crude Tank Farm with additional storage and export capabilities through the addition of new crude oil storage tanks (3 x 50,000 m³ floating roof and 1 x 30,000 m³ fixed roof), switching manifolds and export pumps, along with all their associated piping systems, utilities and control systems. The project is to establish an optimal crude tank farm and export system, so that the existing and planned volumes of crude can be delivered to the Caspian Pipeline Consortium and Crude Rail Loading without any loss of product quality or interruption in availability.

CSC EPC Offshore Contract (1206904)

The contract encompasses engineering and offshore procurement activities for CSC Project.

UNIQUE CHALLENGES

Remote location and hostile climatic conditions with temperatures ranging from +45 Celsius in summer to below -35 Celsius in winter created unique challenges for the project’s multi-national workforce. ENKA utilized construction best practices, its vast winterization experience, and extensive planning to address the challenges.

Aggressive local content targets and back-to-back working regime.

Working with Brownfield conditions and working under permitting system that is under control of Client’s Operations group.

ENKA SCOPE OF SERVICES

The scope includes the expansion and upgrading of the existing Crude Tank Farm storage and export facility of Tengizchevroil in Tengiz, Kazakhstan. BEJV was contracted to carry out the engineering, procurement, construction and pre-commissioning works of the CSC project.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UoM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil Storage Tanks - Floating Roof</td>
<td>ea</td>
<td>3</td>
</tr>
<tr>
<td>Crude Oil Storage Tanks - Fixed Roof</td>
<td>ea</td>
<td>1</td>
</tr>
<tr>
<td>Reinforced Concrete</td>
<td>m³</td>
<td>9,000</td>
</tr>
<tr>
<td>Excavation</td>
<td>m³</td>
<td>235,200</td>
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<tr>
<td>Electrical Cabling</td>
<td>m</td>
<td>145,200</td>
</tr>
<tr>
<td>Electrical Cable Tray Installation</td>
<td>km</td>
<td>13,300</td>
</tr>
<tr>
<td>Structural Steel Erection</td>
<td>ton</td>
<td>830</td>
</tr>
</tbody>
</table>

Major Quantities
ACCOMPLISHMENTS:

SIGNIFICANT FEATURES:

- Call-off based on unit price rates
- US$ 1.5 billion

PROJECT DURATION:

- Operating Company N.V.
- Agip Kazakhstan North Caspian

OWNER / CLIENT:

- Kazakhstan
- Kashagan, North Caspian Sea -

LOCATION:

- KASHAGAN OFFSHORE CIVIL CONSTRUCTION WORKS
- Kashagan, North Caspian Sea - Kazakhstan

OWNER / CLIENT:

- Agip Kazakhstan North Caspian Operating Company N.V.

PROJECT DURATION:

- April 2005 - Oct 2012

PROJECT DESCRIPTION

The Kashagan field is located in the Kazakhstan sector of the Caspian Sea and extends over a surface area of approximately 75 kilometers by 45 kilometers. The reservoir lies some 4,200 meters below the shallow waters of the northern part of the Caspian Sea.

The use of conventional drilling and production technologies, such as concrete structures or jacket platforms that rest on the seabed, is not possible due to the shallow water and cold winter climate of the northern part of the Caspian Sea.

To ensure their protection from harsh winter conditions and pack ice movement, offshore facilities are being installed on artificial islands. These are two main types of island - small unmanned 'drilling islands' and larger manned 'hub islands'. Hydrocarbons will travel from the drilling islands to hub islands via pipeline. The hub islands will contain processing facilities to separate recovered liquid (oil and water) from the raw gas, as well as gas injection and power generation systems.

During Phase I, around half of the gas produced will be re-injected back into the reservoir. Separated liquid and raw gas will be taken by pipeline to the Bolashak onshore processing plant in Atyrau oblast, where export quality oil will be produced. Some of the processed gas will be sent back offshore for use in power generation while some will be used to generate power at the process plant itself.

UNIQUE CHALLENGES

The northern part of the Caspian Sea is a very sensitive environmental area with abundant and diverse fauna and flora, including a number of endemic species. Due to "Zero Discharge Policy" ENKA worked hard to prevent and minimize any impacts on the environment that the operations may have.

In addition to environmental sensitivity of the northern part of the Caspian Sea, it is a difficult location to supply essential project equipment, materials and required manpower. Logistical challenges are amplified by limited access to waterways, such as the Volga Don Canal and Baltic Sea-Volga waterways, which are only navigable for approximately 320 km away from jobsite. Significant planning and resource management within very enclosed environment were required for the successful transportation of oversized cargo.

Remote location and high temperatures during summer months created unique challenges for the project workforce peaked at 1,900 people. ENKA set up and maintained a safe and high quality job site in offshore via huge accommodation vessels inclusive of recreational areas and provided high quality catering services. In addition to challenging summer conditions, ENKA managed to execute construction works time to time in very harsh winter conditions as per Client request. Not only cold weather decreasing -20°C, but also freezing sea water pushed ENKA to work under very extreme conditions.

Over 12 million tons of haulage materials, 266 thousand tons of precast elements, 90 thousand of sheetpile had been shipped from onshore facilities approximately 320 km away from jobsite. Significant planning and resource management within very enclosed environment were required for the successful transportation of oversized cargo.

Unlike to the ordinary construction works, personnel transfer was also another challenging part of the work for ENKA due to remote location of job site. In order to overcome this issue, ENKA had utilized special type of crew transfer vessels including high speed catamaran.

The development of Kashagan, in the harsh offshore environment of the northern part of the Caspian Sea, represents a unique combination of technical and supply chain complexity. The combined safety, engineering, logistical and environmental challenges make it one of the largest and most complex industrial projects currently being developed anywhere in the world.

ENKA SCOPE OF SERVICES

<table>
<thead>
<tr>
<th>Commodity</th>
<th>D Complex Construction</th>
<th>A Complex Construction</th>
<th>3 ea. EPC Islands</th>
<th>11 ea. Berms</th>
<th>3 ea. DC Islands for FFD</th>
<th>15 ea. IPS (Ice Protection Structures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haulage (Total)</td>
<td>ton</td>
<td>10,923,233</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Haulage (HDR)</td>
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<td>1,100,032</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation</td>
<td>m³</td>
<td>1,944,302</td>
<td></td>
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<td></td>
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<tr>
<td>Sheet Pile</td>
<td>ton</td>
<td>90,337</td>
<td></td>
<td></td>
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<tr>
<td>Precast Transportation</td>
<td>ton</td>
<td>266,143</td>
<td></td>
<td></td>
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<tr>
<td>Precast Installation</td>
<td>ton</td>
<td>280,419</td>
<td></td>
<td></td>
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<tr>
<td>Precast Fabrication</td>
<td>ton</td>
<td>67,098</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>In-situ Concrete</td>
<td>m³</td>
<td>72,639</td>
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<td></td>
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<tr>
<td>Geomembrane / Geotextile</td>
<td>m²</td>
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<td></td>
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<tr>
<td>UG Piping</td>
<td>m</td>
<td>23,397</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skid Beam Installation</td>
<td>ton</td>
<td>7,752</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remote location and high temperatures during summer months created unique challenges for the project workforce peaked at 1,900 people. ENKA set up and maintained a safe and high quality job site in offshore via huge accommodation vessels inclusive of recreational areas and provided high quality catering services. In addition to challenging summer conditions, ENKA managed to execute construction works time to time in very harsh winter conditions as per Client request. Not only cold weather decreasing -20°C, but also freezing sea water pushed ENKA to work under very extreme conditions.

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The development of Kashagan, in the harsh offshore environment of the northern part of the Caspian Sea, represents a unique combination of technical and supply chain complexity. The combined safety, engineering, logistical and environmental challenges make it one of the largest and most complex industrial projects currently being developed anywhere in the world.
TENGIZ SECOND GENERATION PLANT PROJECT (SGP)

PROJECT DESCRIPTION

The Second Generation Plant (SGP) Project was the main component of Tengizchevron’s Asset Development Project, one of the largest and most complex projects undertaken in the oil & gas industry, to expand the crude oil production capacity of the Tengiz field by approximately 12 million metric tons per year and significantly increase the production of associated dry gas, propane, butane, and saleable sulfur products.

The Second Generation Plant Project (SGP) added 39 new producing wells and upgraded crude oil production and export infrastructure at Tengiz. Major new surface facilities included a field production gathering system, crude stabilization and gas processing plants, a new product export infrastructure (gas export pipeline, additional crude storage, and LPG storage), and a sulfur forming plant (to convert sour gas reserves to usable sulfur products for export such as elemental sulfur pellets or sulfuric acid).

UNIQUE CHALLENGES

Remote location and hostile climatic conditions with temperatures ranging from +40 Celsius in summer to below -40 Celsius in winter created unique challenges for the project’s multi-national workforce. ENKA utilized construction best practices, its vast winterization experience, and extensive planning to address the challenges. Aggressive local content targets, high personnel peaks (up to 7,000) due to challenging schedule objectives and back-to-back working regime that is dictated by law were managed through a substantial craft training program. The brown field experiences into productive industry professionals.

ENKA SCOPE OF SERVICES

ENKA, through its local entity “Senimdi Kurylys LLP”, successfully executed the two main multi-discipline construction components for the SGP under a single contract at Tengiz inclusive of civil, structural, mechanical, piping fabrication and installation, electrical, instrumentation, insulation, painting and building works.

PROJECT DETAILS

LOCATION: Tengiz - Kazakhstan
OWNER / CLIENT: Tengizchevron IOC (a joint venture between Chevron, ExxonMobil, LukArco and KazMunayGas)
EPC CONTRACTOR: PFD International LLP
PROJECT DURATION: Dec 2003 - Nov 2008
CONTRACT VALUE: US$ 588 million
SIGNIFICANT FEATURES /
ACCOMPLISHMENTS:
• Up to 18.2 million hours worked without a lost time incident
• The Second Generation Plant is the largest single sour crude processing train in the world. It not only has increased produc-
tion, but the expansion has also helped to increase environmental efficiency through the use of advanced technologies.
• Achieved 70% Kazakh content.
• Provided significant training opportunities and turned many local professionals.
• Developed a robust HSE program by law were managed through a substantial craft training program. The brown field
experiences into productive industry professionals.
• Installed a gas fabrication facility that is the largest capacity shop not only in Kazakhstan but in the region with 500 tons/month capacity with state of the art technology.
• boasted an efficient utility system including a 450 tons per hour of steam at 370°C and a pressure of 72 bar, using gas turbine exhaust gas and full supplementary firing, an electric switchyard, a combined substation and control building, and associated pipe racks. The control building contained the control room for the entire SGP facility while the substation contained the main power distribution equipment for the entire SGP facility.

Second Generation Plant Project Crude Stabilization and Gas Processing Multi-discipline Package

The crude stabilisation unit included facilities for inlet separation, crude desalting, crude stabilization, gas compression, and condensate stabilization. The gas processing unit included facilities for management of high-pressure sour gas, upstream removal of condensed liquids, and removal of the saturated outlet vapor stream plus a molecular sieve unit for removal of water.

Second Generation Plant Project Power Generation and On-plot Utilities Multi-discipline Package

Major facilities in the power generation area included a gas turbine hall with two GE Frame 9E gas turbine generators, each with a nominal rating of 123 MW, including all associated electrical, control and instrumentation equipment, and two supplementary-fired Heat Recovery Steam Generators (HRSGs) each capable of generating a maximum of 450 tons per hour of steam at 370°C and a pressure of 72 bar, using gas turbine exhaust gas and full supplementary firing, an electric switchyard, a combined substation and control building, and associated pipe racks. The control building contained the control room for the entire SGP facility while the substation contained the main power distribution equipment for the entire SGP facility.

ENKA also performed the site preparation and early civil works, and construction of site temporary facilities works under separate early works contracts prior to the main SGP construction contract awards.

 Major Quantities

<table>
<thead>
<tr>
<th>Commodity</th>
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<tr>
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<tr>
<td>Cable Laying Works</td>
<td>m</td>
<td>2,600,000</td>
</tr>
<tr>
<td>Instruments</td>
<td>ea</td>
<td>57,000</td>
</tr>
</tbody>
</table>
TENGIZ SOUR GAS INJECTION PROJECT (SGI)

PROJECT DESCRIPTION
The Sour Gas Injection (SGI) Project was one of the two main components of Tengizchevroil’s Asset Development Project, a world-scale US$ 6.9 Billion program to expand the crude oil production capacity of the Tengiz field by approximately 12 million metric tons per year and significantly increase the production of associated dry gas, propane, butane, and saleable sulfur products.

The SGI Project utilized state-of-the-art gas injection technology to enhance oil recovery and maintain reservoir pressure by reinjecting produced sour gas back into the reservoir. Major new facilities included a sour gas injection plant and eight injection wells with associated equipment and facilities.

The SGI project was divided into two stages: Stage 1, was performed to inject sweet gas from the processing facilities into the reservoir to prove the operation of the compressor and validate the predicted response of the reservoir. Stage 2, expanded the installation, permitting injection of high pressure sour gas (17% H₂S) from SGP and providing the opportunity to process an additional 3 million tonnes of oil within the oil/gas separation area of SGP. The SGI project established a compressor and associated piping systems capable of delivering sour gas into the 7,000 m deep reservoir at 10,000 PSI in a way that is both safe and dependable.

UNIQUE CHALLENGES
Remote location and hostile climatic conditions with temperatures ranging from +40 Celsius in summer to below −40 Celsius in winter created unique challenges for the project’s multi-national workforce. ENKA utilized construction best practices, its vast winterization experience, and extensive planning to address the challenges. Aggressive local content targets, challenging schedule objectives and back-to-back working regime that is required by law were managed through a substantial craft training program. High operation (10,000 psi / 690 bar) pressure requirement to boost the H₂S gas into 7,000 m reservoir dictated heavy wall (42~62 mm) thicknesses for 10~14 inch diameter pipework. These spools were welded and installed with special high technology automatic welding equipment. The installation and pre-commissioning of the Injection Compressor required specialized expertise. ENKA’s specialized operations team had successfully implemented the pre-commissioning of the compressor in two stages as explained above.

ENKA SCOPE OF SERVICES
ENKA, through its local entity “Senimdi Kurylys LLP”, successfully executed multidiscipline works under six separate contracts, as per the client’s contracting strategy, inclusive of site preparation, piling, civil, structural, mechanical, electrical, instrumentation and building works. ENKA had also successfully executed turnaround works that converted the sour gas injecting plant into an operational plant working with sour gas.

<table>
<thead>
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<tr>
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<tr>
<td>Heavy Wall Welding</td>
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</tr>
<tr>
<td>Instruments</td>
<td>ea</td>
<td>3,600</td>
</tr>
</tbody>
</table>

“Installed a compressor and associated piping systems capable of delivering sour gas (17% H₂S) into the reservoir at 10,000 PSI.”
SOUTH CAUCASUS PIPELINE EXPANSION (SCPX) EARLY WORKS & FACILITIES

PROJECT DESCRIPTION

The South Caucasian Pipeline Expansion (SCPX) Project was designed to increase the capacity of the South Caucasian Pipeline System. The existing 690 km pipeline, which transports gas from the Sangachal terminal in Azerbaijan to markets in Georgia and Turkey, is 42" in diameter and has a system design capacity of 7.4 bcm/a.

The expansion involves laying a new 48” pipeline which is to increase the capacity of the system by approximately 16 bcm/a and connect it to the Trans-Anatolian Natural Gas Pipeline.

A joint venture between Bechtel and ENKA (BEJV) was awarded the SCPX Early Works and Facilities contract on February 7th 2014. The client, the South Caucasian Pipeline Company (SCP Co.), is an international consortium owned by BP (United Kingdom - 28.8%), TPAO (Turkey - 19%), SOCAR (Azerbaijan - 16.7%), Petronas (Malaysia - 15.5%), Lukoil (Russia - 10%) and NICO (Iran - 10%).

The contract was worth USD 878 million, and the project was fully completed and demobilized in October 2019.

UNIQUE CHALLENGES

The project sites are located remotely, requiring BEJV to set up pioneer camps to accommodate the project personnel and construction equipment while construction of access roads and carrying out early civil works. CSG-1 site was a large, flat, straight sided pastoral field with heavy, loamy clay soil that is susceptible to seasonal flooding.

CSC-2 consisted of four gas turbine driven compressors (20.4 MW) and three gas turbine generators (4.5 MW). A portion of the gas received from Azerbaijan is to be filtered and heated to be used as fuel gas for the compressor turbines and gas turbine generators and the rest is to be compressed up to 50 barg to be exported into the SCPX Pipeline. The Georgian Offtake is also located at the MS-72 facility that is adjacent to CSG-1. The facility also has an 80 m high-pressure vent stack in an emergency and for maintenance. ENKA scope of work includes erection of 18 process buildings, a gate house and installation and pre-commissioning of piping, E&I, Telecomms and all process equipment.

CSP-2 consisted of four gas turbine driven compressors (21.6 MW) and two gas turbine generators (4.5 MW). The portion of the gas received from Azerbaijan is to be filtered and heated to be used as fuel gas for the compressor turbines and gas turbine generators and the rest is to be compressed up to 50 barg to be exported into the SCPX Pipeline. The Georgian Offtake is also located at the MS-72 facility that is adjacent to CSG-1. The facility also has an 80 m high-pressure vent stack in an emergency and for maintenance. ENKA scope of work includes erection of 18 process buildings, a gate house and installation and pre-commissioning of piping, E&I, Telecomms and all process equipment.

Through carefully prepared management plans and method statements, BEJV was to ensure minimum disruption to the wild life, environment and communities surrounding the project locations. Temporary works areas were reinstated to near original condition upon completion of construction.

ENKA SCOPE OF SERVICES

Under the contract, BEJV was responsible for all related early civil works and facilities construction for the two Compressor Stations (CSG-1 and CSG-2) and a pressure reduction and metering station (AREA 81) at three different locations in Georgia. The early works stage for Compressor Station 2 (CSG-2) included the construction of a 15 km access road between the existing Millennium Highway and the Compressor Station. In addition to the construction of new facilities in three different locations, the scope of works also included brownfield work at the existing facilities located inside the Pumping Station Georgia (PSG-1), at Gardabani and the Pressure Reduction & Metering Station (AREA 80) at Vale.

CSP-2 consisted of a pig traps capable of launching and receiving 48” pipeline integrity gauges (PIG), four gas turbine driven compressors (21.6 MW) and two gas turbine generators (4.5 MW). A portion of the gas received from Azerbaijan is to be filtered and heated to be used as fuel gas for the compressor turbines and gas turbine generators and the rest is to be compressed up to 50 barg to be exported into the SCPX Pipeline. The Georgian Offtake is also located at the MS-72 facility that is adjacent to CSG-1. The facility also has an 80 m high-pressure vent stack in an emergency and for maintenance. ENKA scope of work includes erection of 18 process buildings, a gate house and installation and pre-commissioning of piping, E&I, Telecomms and all process equipment.

CSG-2 consisted of four gas turbine driven compressors (20.4 MW) and three gas turbine generators (4.5 MW). After-coolers, a high pressure vent stack in emergency and for maintenance and, two storage tanks for storing diesel and potable water. CSG-2 is located after the SCPX Pipeline combines with the existing SCP Pipeline therefore does not include pig launchers/receivers. ENKA scope of work includes erection of 10 process buildings, installation and pre-commissioning piping, E&I, Telecomms and all process equipment and construction of a gate house and an accommodation building for operations phase.

AREA 81 is an extension to the existing SCP PRMS facility, known as AREA 80. It consisted of four water bath heaters and a pig launcher that will connect to the Trans-Anatolian Natural Gas Pipeline (TANAP). Once completed AREA 81 will merge with the existing AREA 80 Facility. ENKA scope of work also included supply and fabrication of all structural steel and fabrication of all piping including the pipeline connection sections to the SCPX Pipeline.

The SCPX pipeline and compressor stations are normally be operated from Sangachal Terminal in Azerbaijan, but facilities have local emergency shutdown and safety systems that enable turbines and compressors to be shut down or started up locally.
PROJECT DESCRIPTION

On October 31, 2019, ENKA signed an agreement with ExxonMobil Iraq Limited to construct a Produced Water Treatment Facility with a capacity of 210,000 barrels of water per day, located within the West Qurna-1 oil field near the city of Basra in Iraq. The project includes the detailed engineering, procurement, construction, and commissioning of three water treatment trains, one produced water tank, one local equipment room, transfer pumps and all associated systems.

The treated produced water will be sent to the Water Injection Storage Tank that feeds the High Pressure Water Injection Pump System for injection wells.

The Produced Water 2 Treatment Facility project is scheduled to begin operation in April 2022.

ENKA SCOPE OF SERVICES

The project includes the detailed engineering, procurement, construction, and commissioning of three water treatment trains, one produced water tank, one local equipment room, transfer pumps and all associated systems.

<table>
<thead>
<tr>
<th>Commodity</th>
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</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Instrumentation Cables</td>
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</table>
PROJECT DETAILS

LOCATION:
West Qurna 1 Oil Field, Basra - Iraq

OWNER / CLIENT:
ExxonMobil Iraq Limited

PROJECT DURATION:
Aug 2015 – Feb 2020

CONTRACT TYPE:
Lump Sum Turn Key

CONTRACT VALUE:
US$ 202.5 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• ENKA fully supported EMIL in its efforts to develop programs to promote education, health and infrastructure in the country.
• Provided significant training opportunities for many local craft employed for the Project.
• The increase in production is to provide revenue that could help further regenerate Iraq.
• Awarded with the "Distinction" prize by British Safety Council in "International Safety Awards 2019".
• Selected as Engineering News-Record (ENR) Global Best Project 2020 in the Power / Industrial Category.

PROJECT DESCRIPTION

West Qurna is one of the largest oil fields in Iraq with an estimated 43 billion barrels of recoverable reserves. In January 2010, ExxonMobil Iraq Limited (EMIL), an affiliate of ExxonMobil Corporation, signed an agreement with the South Oil Company of the Iraq Ministry of Oil to rehabilitate and redevelop the West Qurna I field. Located approximately 50 kilometers north-west of Basra, the Field currently produces around 400 kbopd through existing facilities located at D5-6, 7 and 8.

EMIL envisaged and initiated the Initial Oil Train (IOT) Project to add oil production facilities capable of safely producing and exporting an additional 100,000 stock tank barrels of crude oil from the Field. The Initial Oil Train Facility was designed to process full well stream fluids from the production wellhead area and separate them into associated gas, untreated produced water, and stable product crude for export. IOT was constructed adjacent to existing DS-8.

UNIQUE CHALLENGES

The Owner performed Unexploded Ordnance (UXO) and Explosive Remnants of War (ERW) clearance activities to ensure safe operations in and around the plot selected for the Facility. ENKA brought its "Zero Accidents" philosophy to its execution first and foremost and build a strong safety and security plan to be strictly implemented throughout the project duration to protect our workforce, our customer, as well as the environment and communities surrounding the Project. Safety was ENKA’s top priority.

The plant was designed based on the concept of modular packages and modular erection as reasonably as practical within logistics constraints. The majority of the equipment was designed and fabricated in modular skids. The pipe racks were designed and fabricated in modular sections including stuffing of pipe rack modules with pipes, pipe supports and cable trays.

Multiple project offices such as the main field office at the WQ1 jobsite, multiple engineering excellence centers including Main Project Office in Abu Dhabi, UAE, fabrication and module yards in Turkey and UAE were utilized for the project. With extensive planning and proper interface management, ENKA was to minimize the disruption and ensure seamless execution.

ENKA SCOPE OF SERVICES

ENKA and its regional partner have supplied front-end engineering design (FEED), detailed design engineering, procurement, fabrication, construction, commissioning and start-up services. The new facility is capable of producing an annual average of 100,000 stock tank barrels of crude oil per day. The final customer of the new facility constructed adjacent to the existing degassing station facility DS8 is the Basra Oil Company (BOC) of Iraq.

<table>
<thead>
<tr>
<th>Commodity</th>
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<tr>
<td>A/G Piping</td>
<td>ton</td>
<td>1,500</td>
</tr>
<tr>
<td>Cabling</td>
<td>lm</td>
<td>178,887</td>
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<tr>
<td>Mechanical Equipment</td>
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WEST QURNA 2 FUEL GAS TREATMENT, POWER GENERATION & DISTRIBUTION

PROJECT DESCRIPTION
West Qurna – 2 is a giant oil field in Iraq and the second largest undeveloped field in the world in terms of its hydrocarbon reserves. Recoverable reserves contained in two major formations, Mishrif and Yamama, are estimated at 13 billion barrels. In 2009, a consortium lead by LUKOIL won a tender for the development of the field. As part of the oil field development, Lukoil Mid-East Limited, the lead operator on behalf of the operating consortium has envisaged a Gas Turbine Power Plant (GTPP) to supply power to all oil production facilities. GTPP Project scope consisted of engineering, procurement, construction, commissioning and start-up of a 3x42 MW Simple Cycle Power Generation Plant and Power Distribution System. Project included three (3) GE MS6001B API Class Heavy Duty Dual Fuel Gas Turbine Generators-Simple Cycle 42 MW each at ISO conditions, associated balance of plant, a gas treatment and compression system, a liquid fuel unloading, storage and distribution system, 33 kV / 132 kV GIS switchgear and yard, power management system, buildings, utilities and infrastructure.

UNIQUE CHALLENGES
The Project has higher level of operational intelligence and reliability compared to a standard power plant due to being the single source of electric power for a giant oil field. Plant is designed under strict oil and gas standards and specifications (API) with significant design margins and redundancy requirements. Project started from a farm land being cultivated by farmers. ENKA, while executing the work, successfully managed cultural relations with locals to avoid any clashes, maintained good relations with the neighboring villages. Plant was located adjacent to the 400 kbdp Central Processing Facility (CPF) and construction was partly performed during commissioning of the CPF in a high hydrocarbon environment.

Remote location and high temperatures during summer months created unique challenges for the project workforce peaked at 925 people. ENKA set up and maintained a safe and high quality job site inclusive of a good camp with recreational areas and provided high quality catering services. A robust safety and security approach was deployed and implemented by ENKA throughout the project duration to protect our workforce, our customer, as well as the environment and communities surrounding the Project. Project was completed with 3.6 million workhours without a loss time incident indicating the fact that measures taken were effective.

ENKA SCOPE OF SERVICES
ENKA has self performed the full front end engineering design (FEED), detail engineering, procurement, construction, commissioning, start-up and performance testing scope for the project utilizing in-house resources on a lump sum turn-key basis. Specific content of the plant included, three (3) GE MS6001B Heavy Duty Dual Fuel Gas Turbine Generators - Simple Cycle - 42 MW each - ISO conditions; one complete set of 132 kV Gas Insulated Switchgear; one complete set of 33 kV Gas Insulated Switchgear; one complete set of 6.6 kV Air Insulated Switch Gear; step up and step down power transformers; a Black start system, PMS (Power Management System); a Central Electrical Control Room; a Gas Treatment Plant (45,000 Nm³/hour capacity) and compression system included with fuel gas buffer storage in order to allow automatic fuel switchover without having any power interruption or load reduction on gas turbines; liquid fuel tank storage and transfer system; a water treatment plant; firefighting and protection systems; utilities’ networks; all associated buildings including a maintenance shop, all roads and other paved areas including hard and soft landscaping; all security fencing, gates and gate house, CCTV cameras and perimeter lighting. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

WEST QURNA 2 FUEL GAS TREATMENT, POWER GENERATION & DISTRIBUTION

<table>
<thead>
<tr>
<th>Type of Plant</th>
<th>Simple Cycle Power Plant</th>
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<tbody>
<tr>
<td>Capacity</td>
<td>126 MW</td>
</tr>
<tr>
<td>Type of Fuel</td>
<td>Primary: Raw Gas, Back-up Diesel</td>
</tr>
<tr>
<td>Configuration</td>
<td>3x42 MW</td>
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</tbody>
</table>

Commodity Generator  General Electric, Unit: 3 Sets, Model: MS6001B API- Class Heavy Duty, Rating Per Unit: 42 MW

<table>
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<tr>
<th>Commodity</th>
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</thead>
<tbody>
<tr>
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<td>A/G Piping</td>
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<td>300</td>
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<tr>
<td>Cabling</td>
<td>lm</td>
<td>385,000</td>
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<tr>
<td>Mech Equipment</td>
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<tr>
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**PROJECT DESCRIPTION**

Majnoon is one of the richest oil fields in the world with an estimated 38 billion barrels of oil in place located 60 km (37 mi) north of Basra City, in southern Iraq. In January 2010, the Iraqi Ministry of Oil awarded Shell, Petronas and Missan (state owned company) a 20-year contract to provide technical assistance in the development of the Majnoon field. Shell Iraq Petroleum Development (SIPD) B.V envisaged a two phase development for the field. Phase I consisted of reaching First Commercial Production (FCP) and Phase II focused in the development of the full field (FFD). As part of First Commercial Production, a new 100k bopd Central Processing Facility (CPF) composed of 2x50k bopd trains, four new well pads, various new wells, and storage facilities were planned.

**UNIQUE CHALLENGES**

Majnoon is located close to the Iranian border, and given the history of the area, the project site was characterized by high level of unexploded ordnance (UXO) and Explosive Remnants of War (ERW). The Owner performed mine clearance activities to ensure safe operations and ENKA performed construction activities in strict compliance with the UXO clearance and de-mining sequence of the project site.

A robust safety and security approach was deployed and implemented by ENKA throughout the project duration to protect our workforce, our customer, as well as the environment and communities surrounding the Project.

The Owner have divided the construction works into multiple contracts such as “Earthworks and Roads”, “Concrete, Piling and other Civil Works”, “Pipelines”, “Heavy Lift”, etc. ENKA, as the “Mechanical, Piping, Structural Steel, Electrical and Instrumentation” works Contractor, have interfaced with SIPD Operations, Owner’s engineer as well as all other contractors during the execution of the project.

The plant was designed based on the concept of modular packages and modular erection as reasonably as practical within logistics constraints. The majority of the equipment was designed and fabricated in modular skids. The pipe racks were designed and fabricated in modular sections including stuffing of pipe rack modules with pipes, pipe supports and cable trays. Extensive coordination and planning efforts between Owner’s engineer, vendors, civil works contractor, heavy lift contractor, pipeline contractors as well as sound materials management were required.

**ENKA SCOPE OF SERVICES**

ENKA was contracted by Shell Iraq Petroleum Development B.V to carry out structural, mechanical, piping, electrical, instrumentation and telecommunication, painting and insulation works for the Project, covering areas for the Central Processing Facilities and Well Pads Facilities. Scope included construction of underground pipe and cable trenches, installation of all underground piping and cables, installation, aligning and welding of prefabricated steel structures, modularized packages, process skids, field assembly, erection and installation of various static and rotating equipment and storage tanks, erection of interconnecting piping between pipe racks and skids/equipment, fabrication and erection of piping on sleepers, assembly and installation of modular substations, electrical equipment and instruments, installation of complete electrical and instrumentation systems, performance of all piping and equipment insulation and painting works, pre-commissioning of the plant and all subsystems and providing commissioning support to SIPD Commissioning and Start-Up Team.

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**PROJECT DETAILS**

**LOCATION**
Majnoon Oil Field, Basra - Iraq

**OWNER / CLIENT**
Shell Iraq Petroleum Development B.V.

**PROJECT DURATION**
Jul 2011 – Dec 2013

**CONTRACT TYPE**
All in Unit Rate fixed unit price and Reimbursable with Fixed Day Rates

**CONTRACT VALUE**
US$ 208 million

**SIGNIFICANT FEATURES / ACCOMPLISHMENTS**
- Largest greenfield central processing facility to be built in Iraq in the last decade.
- Commercial production targets planned for the field were achieved, allowing the Owner to begin exports.
- The increase in production is providing revenue that could help further regenerate Iraq.
- 3 million workhours without a Lost Time Incident.
- Provided significant training opportunities and turned many local craft with little or no disciplined industrial construction work experience into productive workers.
- Achieved 51% Iraqi content on project labor headcount.
PROJECT DESCRIPTION

Majnoon is one of the richest oil fields in the world with an estimated 38 billion barrels of oil in place located 60 km (37 mi) north of Basra City, in southern Iraq. In January 2010, the Iraq Ministry of Oil awarded Shell, Petronas and Missan (state owned company) a 20-year contract to provide technical assistance in the development of the Majnoon field. Shell Iraq Petroleum Development (SIPD) B.V., the lead operator on behalf of the operating consortium, has envisaged a two phase development for the field. Phase I consisted of reaching First Commercial Production (FCP) and Phase II focused in the development of the full field (FFD). As part of Phase I, a number of surveys have been carried out to assess the status of the existing process facilities, namely DS-1, DS-2 and associated wells, and several work packages were developed to rehabilitate them to their original design intent of 100k bopd. In addition to the rehabilitation works, DS-1 and DS-2 were planned for various debottlenecking upgrades to increase the production capacity to 120k bopd. Project consisted of implementation of all rehabilitation and upgrading work packages.

UNIQUE CHALLENGES

The Project was executed through separate call-offs for discrete work packages with rehabilitation and upgrading activities performed either in total plant shutdown, partial shutdown or normal operation mode. The plants were isolated wherever required, drained, flushed, purged and prepared to carry out specified works. When complete or partial shut downs were not feasible or allowed, construction works were performed whilst the plants remained operational. ENKA adhered to Shell’s Simultaneous Operation (SIMOPS) procedures strictly to ensure safety of plants and personnel during the execution of discrete scopes. Detailed method statements and construction schedules were prepared for each work package in order not to disturb ongoing operations. ENKA have coordinated all interfaces with SIPD Operations, ERW Contractor, Iraqi authorities and other contractors as required.

A robust safety and security approach was deployed and implemented throughout the project duration to protect our workforce, our customer, as well as the environment and communities surrounding the Project.

ENKA SCOPE OF SERVICES

ENKA was engaged by Shell Iraq Petroleum Development B.V. to provide structural, mechanical, piping, electrical, instrumentation, painting and insulation construction services for the various work packages developed for rehabilitation and upgrading of existing crude oil processing facilities at DS-2. Major tasks included erection and installation of chemical injection, metering, instrument air, foam, nitrogen generator packages, hot and cold flares, several static and rotating equipment, with all associated structural, piping, electrical and instrumentation works, performing tie-ins and hot taps as required, conducting all inspections and testing, and providing support to the Owner for pre-commissioning and commissioning activities.
PROJECT DETAILS

LOCATION:
North Rumaila, near Basra - Iraq

OWNER / CLIENT:
South Oil Company

PROJECT DURATION:
Dec 2013 – Apr 2016

CONTRACT TYPE:
Lump Sum Turn Key

CONTRACT VALUE:
US$ 59 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• 721,000 workhours without a Lost Time Incident.
• Project shall increase oil export capacity from North Rumaila significantly, helping Iraq to reach commercial production targets planned for the field, and generate much needed revenues.
• Highest quality and standards have been targeted for this signature project for South Oil Company with special care to HSE resulting in no LTI since the commencement.

PROJECT DESCRIPTION

PS-1 Depot, located approximately 60 km west of Basra, is one of the major crude oil storage depots in Iraq housing ten storage tanks each with 82,000 m³ capacity. Oil produced at the super-giant Rumaila oil field, which comprises over one third of Iraq's total production, is collected here and pumped to Al Fao Terminal, located 140 km away, for export via a 48” Pipeline. PS-1’s operations are critical for maintaining uninterrupted export of oil to sustain oil sales which constitutes almost all of Iraq’s income.

A modernization and expansion program developed by South Oil Company of Iraq is underway to restore integrity, operability and reliability as well as increase oil export capacity. Main part of this program is the Crude Oil Turbo Pump Station (PS-1) Project consisting of EPC delivery of a pump station adjacent to the existing pump station complete with all balance of plant equipment and systems.

The new pumping station has two 13 MW Gas Turbine Driven Turbo Pump Units, delivering oil 6,100 m³/hr at a pressure of 685 meters at the 42” discharge.

UNIQUE CHALLENGES

The Project has been designed to a high level of operational intelligence and reliability due to being a critical facility for oil exports from a giant oil field. Plant is designed under strict oil and gas standards and specifications (API) with appropriate design margins and redundancy requirements.

Construction works were performed whilst the adjacent existing pump station remained operational. ENKA adhered to respective Simultaneous Operation (SIMOPS) procedures strictly to ensure safety of the plant and personnel during the execution. Detailed method statements and construction schedules were prepared in order not to disturb ongoing operations. ENKA have coordinated all interfaces with SOC’s Operations Team as required. Additionally, connections to existing headers and pipelines were implemented with hot tapping operations without the interruption of shutting down and emptying those section of pipes or manifolds. Existing pump station continued to be in operation whilst tie-ins were being done.

A robust safety and security approach was deployed and implemented throughout the project duration to protect our workforce, our customer, existing facilities as well as the environment and communities surrounding the Project.

ENKA SCOPE OF SERVICES

ENKA Teknik, a wholly owned subsidiary of ENKA, has been awarded the EPC contract for the Crude Oil Turbo Pump Station for PS-1 Depot by South Oil Company. ENKA Teknik provided full detail engineering, procurement, construction, commissioning scope for the new station consisted of: two 13 MW Turbo Pump Units, Fuel Gas Booster Compressing and Regulation Station, Compressed Air System (Instrument and Service Air), Crude Oil Drain Tank, Waste Water Tank, low voltage power distribution and control system, a Station shelter complete with overhead cranes for maintenance.

Project’s engineering and design effort was carried out at ENKA’s main office in Istanbul, Turkey.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UoM</th>
<th>Total</th>
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<tbody>
<tr>
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<tr>
<td>Structural Steel</td>
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<td>Main Equipment Erection</td>
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<tr>
<td>Welding</td>
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<tr>
<td>Cabling</td>
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</table>
PROJECT DETAILS

LOCATION:
Khabarovsk City - Russia

OWNER / CLIENT:
Alliance Oil Company Ltd.

EPC CONTRACTOR:
Technicas Reunidas

PROJECT DURATION:
Jan 2012 – Apr 2014

CONTRACT TYPE:
Lump Sum & Fixed Unit Rates

CONTRACT VALUE:
US$ 123 million

SIGNIFICANT FEATURES /
ACCOMPLISHMENTS:
• First major expansion to the refinery built in 1930s.
• Refining capacity increased to 90,000 bpd.
• Modernization enabled the refinery to capture higher margins on sales of oil products and to preserve its position in domestic and international markets by complying with the high quality standards.
• 6.04 million workhours without a Lost Time Incident.

PROJECT DESCRIPTION

The Khabarovsk Refinery Hydroprocessing Project consists of a major expansion of the existing Khabarovsk refinery to increase plant capacity, improve performance and address international and Russian requirements to reduce sulphur contents in kerosene and diesel products. The Work included a new combined Hydrocracking and Hydrotreating Unit, Hydrogen Unit, Amine Recovery and Sour Water Stripper Unit and Sulphur Recovery with Tail Gas Treatment and a Catalytic Reformer revamp. The Work also included associated utilities and offsites together with the associated upgrades and infrastructure modifications, interconnecting pipe racks, supporting facilities for feedstock supply and storage and product storage. Technicas Reunidas of Spain was selected as the EPC contractor by the Owner.

UNIQUE CHALLENGES

The Project was effectively a ‘brown field’ Project. The Hydrogen Unit was constructed on a Site previously occupied by a crude distillation unit. Brown field nature of the work, compact plot area, rough climate, and performance of works around operating plant created unique challenges for the project team. ENKA utilized construction best practices, its vast winterization experience, and extensive planning to address the challenges.

Khabarovsk Refinery is located near the center of Khabarovsk City, surrounded by heavily populated urban neighborhoods. Very limited area within the jobsite was allocated for laydown and temporary construction facilities. ENKA set up various temporary camps in and around the City and housing and transportation issues were mitigated by establishing a strong team to enhance workforce availability and retention. ENKA has worked in compliance with European as well as Russian norms and standards for the execution of the Project. Several high pressure and high temperature tie-ins have been completed successfully resulting in excellent safety performance.

“First major expansion to the refinery built in 1930s”

ENKA SCOPE OF SERVICES

ENKA was engaged by Technical Reunidas to provide structural, mechanical, piping, electrical, instrumentation, painting and insulation construction services for the Project including pre-commissioning and commissioning of three Units, namely Hydrocracking, Hydro-treating and Hydrogen Production. Project workforce reached to 1,400 people during the peak periods of the work. ENKA installed over 4,800 tons of structural steel, 3,000 tons of mechanical equipment, fabricated and installed 3,200 tons of piping, 55,000 meters of cable tray, over 465,000 meters of cable, performed 87,000 square meters of painting works, and over 55,000 square meters of insulation works.

<table>
<thead>
<tr>
<th>Commodity</th>
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<td>Equipment Insulation</td>
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SAKHALIN II ONSHORE PROCESSING FACILITY (OPF) PROJECT

PROJECT DETAILS

LOCATION:
Sakhalin Island - Russia

OWNER / CLIENT:
Sakhalin Energy Investment Company Ltd (Royal Dutch Shell, Mitsui, and Mitsubishi)

PROJECT DURATION:
May 2003 - Nov 2006 (Phase I)
July 2009 (Phase II)

CONTRACT TYPE:
• Phase I – Lump Sum with Fixed Unit Rates
• Phase II – Reimbursable with Fixed Day Rates

CONTRACT VALUE:
US$ 1.1 billion

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• First combined oil and gas processing facility built in Russia.
• Largest of its kind in the world.
• 31 million workhours in total. 10 million workhours without a Lost Time Incident achieved during construction. 6 million workhours without a Lost Time Incident achieved in operating plant.
• Two successful beach landing operations for the major process equipment.

PROJECT DESCRIPTION

The Sakhalin II Project is an integrated oil and gas field development project designed to enable year-round production from two major offshore fields, namely Piltun-Astokhskoye oil field and the Lunskoye natural gas field, located on the northeastern shelf of Sakhalin Island in the Okhotsk Sea. The project involved installation of two offshore production platforms (PA-B and LUN-A) along with the onshore infrastructure and facilities required for the sustained export of oil and gas. Crude oil and gas from the existing PA-A and the new PA-B platforms is delivered via separate pipelines to an onshore processing facility (OPF) located near the Lunskoye landfall. Gas and condensate from the new LUN-A platform is also delivered to the OPF via two 30-inch multi-phase pipelines. Gas from the OPF is then transported via a single onshore pipeline to a new LNG plant located at Prigorodnoye on the south coast of the island while crude oil and stabilized condensate is commingled and pumped together via a single onshore pipeline from the OPF to a new oil export terminal at Prigorodnoye.

The Onshore Processing Facility (OPF), located in the north-east of Sakhalin Island, 7 kilometers (4.3 mi) inland in Nogliki district, is the key element of the Sakhalin II development scheme. Major components of the OPF included facilities for three-phase inlet separation, condensate stabilization (two trains), gas dehydration, and dewpoint control along with two gas export compressors and two crude oil booster pumps. The OPF occupies a territory of over 62,000 m² and at full capacity is capable of processing approximately 1,800 million scfd of gas (51 million m³/day) and about 60,000 b/d of condensate/oil (9,500 m³/day).

The OPF serves as the control and support center for all Northern Area production operations on Sakhalin Island. Buildings and support facilities at the site include an administration/quarters building, guard house, warehouse/maintenance building/fire station, central control building, utility building, power generation building, main substation, Train 1 and Train 2 substations, compressor building, rich/lean MEG pump house, crude oil booster pump house, open drain system pump house, sewage treatment building, chemical/paint store, and water-well buildings. All buildings are built to withstand the severe seismic loading conditions and harsh climate conditions at the site.

“The facility also includes storage tanks and associated handling equipment for condensate and crude oil, off-spec condensate, fresh water, potable water, fire water, diesel fuel, rich monoethylene glycol (MEG), lean MEG, and oil field chemicals, including demulsifiers, corrosion inhibitor, and neutralizer. Storage tanks at the OPF site are insulated and have rigid roofs capable of withstanding the snow and ice loading conditions of the area. Where required, tanks are equipped with heating coils for liquid viscosity and freeze control.

“First combined oil and gas processing facility built in Russia.”
UNIQUE CHALLENGES

The OPF was located in remote area previously little touched by human activity. Sakhalin Island’s poor infrastructure made all personnel and material transportation to the site a challenging task on its own. Further, transportation was also restricted by harsh seasonal conditions frequently. ENKA mobilized to the Project Site, set up temporary site facilities including a 2,200 people camp and maintained these facilities with constant supply of fuel, water, food, supplies, and raw materials for more than six years without any interruption or problems.

Shortage of skilled and unskilled labor on the Island created a challenge and required ENKA to bring labor from distant and various regions of Russia as well as expatriate personnel from Turkey and Asia Pacific countries. Due to remote location and harsh working conditions, special labor laws and rotational schemes were implemented for labor. ENKA successfully managed these circumstances not allowing any productivity losses due to absence of personnel at any discipline with a strong human resources management program. During the execution of the Project, many local craft with little or no industrial construction work experience have been turned into productive and skilled craftsmen with extensive training.

Transportation of goods and materials to the site was limited not only by the seasonal conditions such as frozen seas, flash floods, or thawed ground water causing roads to sink but also the congestion at the Korsakov Port due to simultaneous execution of many projects for the Sakhalin II development. ENKA developed a transportation and logistics plan complete with proper risk analysis and mitigation measures and successfully implemented it throughout the project duration.

Environmental issues at this highly sensitive region were also addressed with utmost care and the wild life surrounding the project sites was protected with no harm.

ENKA SCOPE OF SERVICES

ENKA, in a joint venture with Bechtel USA and Technostroyexport, a Russian company, was awarded the contract for construction of the OPF. ENKA’s scope of work included the design and construction of buildings, site facilities and access roads; installation of process equipment and piping; all main civil, mechanical, electrical, and instrumentation construction; testing and pre-commissioning of all constructed facilities; and provision of assistance with commissioning. Additional activities included procurement of bulk materials; materials management; transportation and logistics of all process equipment and materials free issued by the Owner.

The main work items completed during the first phase of the project were 1.75 million m$^3$ of excavation, fill and road construction; 90 km of piles with diameters varying between 600-800 mm; 80,000 m$^3$ of concrete; 28 km of underground pipe laying; 7500 tonnes of steel structure production and installation; 185 million m of cable laying; 78 km of piping fabrication, erection, insulation, and testing; and finally 6,000 tonnes of various equipment erection, testing and commissioning of all these systems.

In October 2006, ENKA received a contract for the extension and modification of the facility which is completed by the middle of year 2009.

Heavy Lift Cargoes and Beach-Landing Operations

ENKA has also undertaken the transportation and logistical activities for more than 28,200 tonnes of free-issue material and equipment to the OPF jobsite in 1,932 shipments. Transportation of 4,600 tonnes of heavy lift and oversized cargo, the heaviest piece weighing 325 tonnes, has also been performed via beach landings at Lunskoye Bay, while contending with extreme climatic and environmental difficulties.

After collecting Heavy Lift Oversize (HLO) items from different vendor locations worldwide, these were delivered to cargo marshalling ports in South Korea and Japan and then loaded to ocean-going flat-top barges for delivery to Lunskoye Beach, via Korsakov for customs clearance.

A temporary landing facility was also set up twice on Lunskoye beach, in 2004 and 2005 for beach-lading operations. For heavy haul of HLO cargo from Lunskoye Beach to a temporary lay-down area, and then to the OPF site, self-propelled modular transporters and Nicolas trailers were employed. Environmental concerns and requirements were fully taken into account while these operations were underway.

"Two successful beach landing operations for the major process equipment"
SAKHALIN I CHAYVO ONSHORE PROCESSING FACILITY (OPF) PROJECT

PROJECT DETAILS

LOCATION:
Chayvo, Sakhalin Island - Russia

OWNER / CLIENT:
Exxon Neftegas Limited (ENL)

EPC CONTRACTOR:
Fluor Daniel Eurasia Inc.

PROJECT DURATION:

CONTRACT TYPE:
Reimbursable with Fixed Day Rates

CONTRACT VALUE:
US$ 94 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• Provided significant training opportunities and turned many local craft with little or no disciplined industrial construction work experience into productive workers.
• Raised awareness relating to health, safety, environment, security and quality amongst direct hired personnel and subcontractors.
• Accomplished Stick-Built Scope on time throughout a harsh winter to be ready for major 2006 Sealifts.

PROJECT DESCRIPTION

The Sakhalin-1 Project, operated by Exxon Neftegas Limited, is one of the largest single international direct investments in Russia and an excellent example of how advanced technologies are being applied to meet the challenges of the world’s growing energy demand. Over its years of production operations, the multi-billion dollar project has exhibited exemplary operational, environmental, and safety performance, and has provided significant benefits to Russia and its people.

Located off the north-eastern shore of Sakhalin Island, the Sakhalin-1 Project was developed within the framework of a product sharing agreement signed between a consortium of Russian, Indian, Japanese and U.S. companies and the Russian government. Having taken effect in 1996, the agreement covers the Chayvo, Odoptu and Arkutun-Dagi fields where potential recoverable resources are 307 million tonnes of oil and 485 billion m³ of natural gas.

Oil & gas produced from the Sakhalin-1 fields is transported to the Chayvo Onshore Processing Facility (OPF), which stabilizes oil for shipment to the international market and gas for supply to the Russian domestic market or re-injection to the field to maintain reservoir pressure.

The OPF’s capacity is approximately 34,000 metric tons (250,000 barrels) of oil and 22.4 million m³ (800 million cubic feet) of gas per day.

UNIQUE CHALLENGES

To construct the OPF, a modular approach was used, which helped cut field costs significantly and saved at least 18 months of overall construction time. In less than three years, the OPF team had fabricated 36 modules weighing a total of some 40,000 tons in Busan, Korea and completed two major sea-lifts and off-loads at Chayvo, hooked up the modules and completed plant commissioning and startup.

Meanwhile, OPF site teams achieved an outstanding performance of stick-built works during very harsh two winters, which leaded the Project to the success in association with afore mentioned sealifts.

ENKA SCOPE OF SERVICES

ENKA was the Mechanical & Piping Contractor to Chayvo OPF, where the scope consisted installation of 64 equipment including compressors, generators, heat exchangers, boilers and pumps; field erection of 40,000 tons of pre-fabricated modules weighing between 900 and 2,500 tons and field erection of 4,100 tons of steel as well as 40,000 meters of field piping, including fitting, welding, pressure tests, painting and insulation.

ENKA also performed all scaffolding and winterization works for all disciplines at the OPF Site & Orlan Platform during the Project.

OPF was 50% completed by the end of 2005 and full completion was successfully achieved by the end of 2006. A peak of 683 ENKA personnel including 58 administrative and 57 technical staff as well as 548 workers were employed in the Project by the end of 2005.

SAKHALIN I CHAYVO ONSHORE PROCESSING FACILITY (OPF) PROJECT

ENKA SCOPE OF SERVICES

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OPF was 50% completed by the end of 2005 and full completion was successfully achieved by the end of 2006. A peak of 683 ENKA personnel including 58 administrative and 57 technical staff as well as 548 workers were employed in the Project by the end of 2005.
SAKHALIN I DE-KASTRI OIL EXPORT TERMINAL

PROJECT DETAILS

LOCATION:
De-Kastri, Mainland - Russia

OWNER / CLIENT:
Exxon Neftegas Limited (ENL)

EPC CONTRACTOR:
Fluor Daniel Eurasia Inc.

PROJECT DURATION:

CONTRACT TYPE:
Reimbursable with Fixed Day Rates

CONTRACT VALUE:
US$ 70 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• Provided significant training opportunities and turned many local craft with little or no disciplined industrial construction work experience into productive workers.
• Raised awareness relating to health, safety, environment, security and quality amongst direct hired personnel and subcontractors.
• Accomplished Civil, Structural, Mechanical & Electrical scopes on time throughout harsh & long winters.
• Terminal of the Year with a capacity of shipment of more than 5 million tonnes per year.

PROJECT DESCRIPTION

De-Kastri Oil Terminal is an oil export terminal located 6 km away from the village of De-Kastri in Khabarovsk Krai, Russia. It is one of the biggest oil terminals in the Far East that serves as a hub for crude oil deliveries to Asian markets. The terminal, which started operations in 2006, belongs to the Sakhalin-I consortium led by Exxon Neftegas Ltd., which also includes 20% stake held by Russian affiliates of Rosneft: Sakhalinnomneftegas-Shelf and RN-Astra. The overall capacity of the export terminal is approximately 88 million barrels per annum of oil. Tanker loading capacity is suitable for Aframax tankers up to 110,000 DWT. The five Aframax tankers servicing the terminal are purpose-designed double-hull ice class vessels. The area of the terminal covers nearly 256,000 m².

The construction of the terminal started in 2003 and was completed by August 2007.

In November 2009, during the International congress Oil Terminal 2009 held in Saint Petersburg, De-Kastri terminal won the “Terminal of the Year Award”. The Award for the Terminal of the Year with a capacity of shipment of more than 5 million tonnes per year is presented to an international terminal with best economic, ecological and social indicators once in every three years. De-Kastri terminal was nominated among a total of 34 candidates. Since 2006, nearly 300 oil tankers have transported more than 30 million tonnes of crude oil from the terminal without a single incident or shutdown. De-Kastri’s SBM loading is considered to be the largest in the industry.

UNIQUE CHALLENGES

De-Kastri is located in the far north-eastern mainland of Russia opposite to Sakhalin Island in the Pacific Ocean in the Khabarovsky Region of Russia.

De-Kastri site teams achieved an outstanding performance during very harsh four winters including the mobilization phase, which led the final destination of entire Sakhalin I Project’s De-Kastri Terminal to a successful completion.

ENKA SCOPE OF SERVICES

The first contract signed with Exxon Neftegas Limited included the construction of an offsite camp and temporary site facilities, the clearance and grubbing of trees and shrubbery in an area of 256,000 m², as well as site preparation and earthworks amounting to 1 million m³, surface water drainage, land drainage, fencing works for the entire De-Kastri Oil Export Terminal Area, in addition to slope protection, road construction, stone paving and steel structure erection works for the buildings within Terminal Area. At the request of the client, while these works were underway, the reconstruction of the site access road, the EPC delivery of a sewage treatment plant and the supply and delivery of 150,000 m³ of crushed stone from a crusher plant established by the contractor were also performed.

Following the first contract, other mechanical erection works, spool fabrication and piping works, additional fill and site clearance works have been awarded by the client for the same facility. All works under both contracts, to date, total more than 2 million workhours without any Lost Time Incident (LTI). After putting into operation of the Oil Export Terminal, ENKA continued to provide operation support services to Exxon Neftegas Limited until July, 2007.
PROJECT DETAILS

PROJECT DESCRIPTION
In October 2019, the Master Agreement was signed between ENKA and Baku-Tbilisi-Ceyhan Pipeline Company for provision of civil / structural construction, mechanical fabrication, mechanical construction, instruments control & electrical repair services in Turkey. Within the framework of this agreement ENKA was awarded the contracts TR-108 for Slope Stabilization Activities at KP 387+350 and 388+150 in Tercan/Erzincan) and TR-112 for Ground Investigation Works and Slope Stabilization Activities at KP 369+450 and KP 372+800 in Aşkale/Erzurum.

ENKA SCOPE OF SERVICES
The scope of works for TR-108 includes:
- Surface drainage channel and gully erosion measures
- Slope breaker installations
- Stone transportation
- Placing back removed instrumentations
- Backfill
- Reinstatement and demobilization

The scope of works for TR-112 includes:
- Ground investigation
- Surface drainage channel and gully erosion measures
- Slope breaker installations
- Stone transportation
- Placing back removed instrumentations
- Backfill
- Reinstatement and demobilization

BTC - PROVISION OF FABRICATION AND CONSTRUCTION SERVICES: LANDSLIDE MITIGATION PROJECTS

LOCATION
Tercan/Erzincan (TR-108)
Aşkale/Erzurum (TR-112) - Turkey

OWNER / CLIENT
Baku Tbilisi Ceyhan Pipeline Company Turkey Branch

PROJECT DURATION
Aug 2020-Nov 2022

CONTRACT VALUE
12.8 million TL

PROJECT DESCRIPTION
In October 2019, the Master Agreement was signed between ENKA and Baku-Tbilisi-Ceyhan Pipeline Company for provision of civil / structural construction, mechanical fabrication, mechanical construction, instruments control & electrical repair services in Turkey. Within the framework of this agreement ENKA was awarded the contracts TR-108 for Slope Stabilization Activities at KP 387+350 and 388+150 in Tercan/Erzincan) and TR-112 for Ground Investigation Works and Slope Stabilization Activities at KP 369+450 and KP 372+800 in Aşkale/Erzurum.

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- Backfill
- Reinstatement and demobilization

The scope of works for TR-112 includes:
- Ground investigation
- Surface drainage channel and gully erosion measures
- Slope breaker installations
- Stone transportation
- Placing back removed instrumentations
- Backfill
- Reinstatement and demobilization

STAR REFINERY / IMPROVEMENT OF FLEXIBILITY, OPERABILITY AND PROFITABILITY (IFOP) PROJECT CONSTRUCTION WORKS

LOCATION
Izmir - Turkey

OWNER / CLIENT
Socar Turkey Akaryakıt Depolama A.Ş. (STAD) SOCAR Turkey (Main Contractor)

PROJECT DURATION
Jan 2020-Nov 2020

CONTRACT VALUE
US$ 17 million

PROJECT DESCRIPTION
ENKA & Cimtas Pipe (ENKA’s subsidiary) were awarded Star Refinery/Improvement of Flexibility, Operability and Profitability (IFOP) Project Construction Works in January 2020.

The objective of IFOP Project is the Improvement of Flexibility, Operability and Profitability of STAR Refinery by facilitating additional piping systems in ISBL (In Side Battery Limits).

These additional Pipe Lines are to be built in units and also on interconnecting pipe racks as well. Hot top tie-in connections with live lines are also considered as part of the work.

ENKA SCOPE OF SERVICES
Cimtas Pipe is to perform piping material supply and manufacturing, spool manufacturing and ENKA is to perform site assembly, structural steel, hydrotest, insulation, tracing, E&I and pre-commissioning.
ENKA enjoys a well-deserved international reputation for completing power plants to the highest quality standards within the required project time schedule. ENKA’s success in the world construction league is entitled in 2013, with the “Best Global Project Award” in Power & Industrial Category. ENR (Engineering News Record Magazine) granted this award to ENKA for its 411 MW Yajva State District Power Plant EPC Project. In 2017, ENKA’s Sulaymaniyah 1,500 MW Combined Cycle Power Plant in Iraq was recognized as the Global Best Project by ENR under the same category as well.
INTRODUCTION

ENKA is among the world leaders in the power sector, as an EPC contractor with approximately 20 GW capacity designed and built. Total historical project value of fossil fuel fired plants constructed by ENKA to date is in excess of US$ 10 billion.

ENKA’s Power Plants EPC experience comprises the following:

- 6 Coal Fired Power Plants with a total capacity of 4,070 MW
- 15 Natural Gas Fired CCPPs with a total capacity of 15,404 MW
- 6 Natural Gas Fired SCPPs with a total capacity of 2,836 MW

ENKA Power Plants Business Line can undertake following scopes by directly utilizing in-house resources or solely owned ENKA subsidiaries:

- Detailed Engineering and Design
- Procurement of all Permanent Project Materials
- Fabrication of all Steel Structures and Piping (in Turkey)
- Fabrication of Static Process Equipment (in Turkey)
- Fabrication of Pressure Parts (in Turkey)
- Modularization or Packaging of Process Units
- International Logistics Management of all Project Equipment & Material
- Construction and Installation Services in all Disciplines
- Commissioning and Start-up Services
- Operation and Maintenance Services

Through in-house management of the whole value chain, ENKA is able to minimize interface issues, increase overall safety, quality and schedule management.

This proven method adds considerable value to the clients by completing undertaken projects safely, in time and with high quality, all while minimizing the duration of commissioning & start-up, ensuring highest reliability of operation and significantly reducing maintenance costs of constructed facilities.
ENKA is the largest Turkish Electric Power Producer (IPP)

GEBZE / ADAPAZARI NATURAL GAS CCPP, TURKEY
İZMİR ALİAĞA NATURAL GAS CCPP, TURKEY

ENKA POWER
PLANTS PERFORMANCE
PLANTS UPGRADES
SERVICES FOR ENERGY PROJECTS
**PROJECT DESCRIPTION**

Following a Build-Own-Operate (BOO) tender in 1997, ENKA together with its partner InterGen was awarded the right to build and operate the Gebze Power Plant with a nominal capacity of 1,600 MW, the Adapazarı Power Plant with a nominal capacity of 820 MW and the İzmir Power Plant with a nominal capacity of 1,580 MW. ENKA with its joint venture partner Bechtel was the Turnkey EPC contractor for these three power plants.

Each power island in these natural gas fired combined cycle power plants consists of two combustion turbines/generators; two heat recovery steam generators and one steam turbine/generator. In the Gebze and Adapazarı power plants, natural draft dry cooling towers serve each power island.

**ENKA SCOPE OF SERVICES**

ENKA Bechtel Joint Venture’s scope as the EPC contractor covered all the works including design, engineering, equipment supply, construction, commissioning and putting into operation of these 2 natural gas fired combined cycle power plants.

Over seven thousand workers have participated in the construction of the Gebze and Adapazarı power plants at different times, with peak of 2,220. A permanent technical staff of 81 will remain behind for Operations and Maintenance. Construction of the Gebze and Adapazarı power plants was completed in 2002.

**TURKEY BOO PROJECTS:**

**gebze, Turkey** 1,600 MW & **adapazarı, Turkey** 820 MW Combined Cycle Power Plants

**Location:** Gebze, Turkey

**Owner:** Enka

**Description:**

**PROJECT DETAILS**

**Location:** Adapazarı - Turkey

**Owner / Client:** Adapazarı Elektrik Üretim Ltd. Şti.

**Description:**

Following a Build-Own-Operate (BOO) tender in 1997, ENKA together with its partner InterGen was awarded the right to build and operate the Gebze Power Plant with a nominal capacity of 1,600 MW, the Adapazarı Power Plant with a nominal capacity of 820 MW and the İzmir Power Plant with a nominal capacity of 1,580 MW. ENKA with its joint venture partner Bechtel was the Turnkey EPC contractor for these three power plants.

Each power island in these natural gas fired combined cycle power plants consists of two combustion turbines/generators; two heat recovery steam generators and one steam turbine/generator. In the Gebze and Adapazarı power plants, natural draft dry cooling towers serve each power island.

**ENKA SCOPE OF SERVICES**

ENKA Bechtel Joint Venture’s scope as the EPC contractor covered all the works including design, engineering, equipment supply, construction, commissioning and putting into operation this natural gas fired combined cycle power plant.

Five thousand workers have participated in both the manufacturing of components and construction of the İzmir power plant. During the construction phase, at the peak time, the various companies employ approximately 1,700 workers. A permanent technical & administration team of 124 is now staffed for the plant Operation and Maintenance. Construction of the İzmir power plant was completed in 2003.

**TURKEY BOO PROJECTS:**

**İzmir, Turkey** 1,580 MW Natural Gas Combined Cycle Power Plant

**Location:** İzmir Elektrik Üretim Ltd. Şti.

**Description:**

Following a Build-Own-Operate (BOO) tender in 1997, ENKA together with its partner InterGen was awarded the right to build and operate the Gebze Power Plant with a nominal capacity of 1,580 MW, the Adapazarı Power Plant with a nominal capacity of 820 MW and the İzmir Power Plant with a nominal capacity of 1,580 MW. ENKA with its joint venture partner Bechtel was the Turnkey EPC contractor for these three power plants.

Each power island in these natural gas fired combined cycle power plants consists of two combustion turbines/generators; two heat recovery steam generators and one steam turbine/generator. In the İzmir Power Plant, low profile forced draft wet cooling towers were built, using seawater as a cooling medium.

**ENKA SCOPE OF SERVICES**

ENKA Bechtel Joint Venture’s scope as the EPC contractor covered all the works including design, engineering, equipment supply, construction, commissioning and putting into operation this natural gas fired combined cycle power plant.

Five thousand workers have participated in both the manufacturing of components and construction of the İzmir power plant. During the construction phase, at the peak time, the various companies employ approximately 1,700 workers. A permanent technical & administration team of 124 is now staffed for the plant Operation and Maintenance. Construction of the İzmir power plant was completed in 2003.
ENKA is capable of 32,000 GWh/year with 4 GW gas-fired combined cycle power plants built, owned and operated in Turkey. The three gas-fired combined cycle power plants which ENKA built, owns and operates in Adapazarı and İzmir have an annual generation capacity of 32 billion kWh. Since the commencement of operations in October 2002 and March 2003, respectively, they have generated over 410 billion kWh of electricity.

Meticulous planning and close supervision have enabled the company to complete all planned and unplanned maintenance work on the GE 9FA +e machines in the shortest possible time.

The power plant in Adapazarı achieved a global record of 99.8% availability in F-class gas turbine technology in 2011 and repeated its own record again in 2015. This is nearly seven percentage points higher than the industry average.

In addition, the insurer Factory Mutual Global (FM) has awarded all three power plants “highly protected risk” status in recognition of the company’s commitment to the reduction of potential losses through a stringent program of risk mitigation and prevention.
In 2011, ENKA's Adapazarı Power Plant was selected as the Power Plant of the Year with an availability of 99.8% by the Power Magazine.

ENKA has been continuously improving its power plants with upgrades to ensure higher availability and reliability, lower emissions, better performance and greater flexibility. With this purpose, the power plants implemented below upgrades with the support of in-house engineering services.

- Combustion Remote Tuning: Combustion stability and efficient combustion tuning
- Cooling Optimization Package: Upgrade of hardware and control system
- Compressor Enhancement Package: Enhanced compressor hardware integrity
- Rotor Life Time Management Program: Extended gas turbine life time and optimized maintenance
- Enhanced Hazardous Gas Detection System: Effective and proactive troubleshooting and updated equipment protection level
- Excitation System Upgrade: Hardware and software upgrade, effective and proactive troubleshooting and improved spare part management
- LSB Feathering: Enhanced steam turbine reliability and start-up flexibility

Furthermore, Advanced Gas Path (AGP) and DLN 2.6+ Upgrade, the most recent industry-leading technological upgrade by General Electric (GE), have been successfully implemented to the gas turbines. AGP and DLN 2.6+ technology upgrades significantly enhance operating capability of gas turbines with following performance improvements:

- Higher performance and availability
- Lower CO₂ and NOx emission and smaller carbon footprint
- Extended parts life with industry's longest gas path maintenance intervals
- Greater operational flexibility
- Additional peak output capability
- Broader operation range
- Increased start-up reliability and efficiency
- Reduced start-up time
- Extended turn-down for off-peak fuel savings and fast dispatch
ENKA Power holds 2 world records in Power Generation Industry: Highest Availability & Highest Operational Safety

SERVICES FOR ENERGY PROJECTS

ENKA Power provides support for various projects, both at the tendering stage and during their implementation, in the form of:
- Review of detail for engineering works
- Factory acceptance tests of instrumentation and control, electrical and mechanical equipment in accordance with design requirements
- Power plant and oil and gas facility start-up activities:
  - Start-up organization and budgeting
  - Punch list preparation during the transition from erection to cold commissioning
  - Pre-commissioning procedures for systems for flushing, blow-out, passivation, chemical cleaning, oil and gas pipe flushing, etc.
  - Loop checking of electrical systems and instrumentation and control systems
  - Commissioning of electrical systems, such as switchyards, switchgear, UPS&DC
  - Instrument calibration (transmitters, valves, switches, etc.)
  - Alignment and final checks for mechanical equipment
  - Turnover package preparation and plant performance test evaluation
- Establishing operation and maintenance teams and operation and maintenance budgeting
- Operation and maintenance plans

Accordingly, ENKA Power provides pre-commissioning, commissioning and start-up services to ENKA’s local and international power plants and oil & gas facility EPC projects:

- **Power Plants**
  - Rijnmond CCPP (790 MW), start-up and commissioning
  - Zwitina SCPP (570 MW), start-up and commissioning
  - Yayinskaya CCPP (411 MW), EPC, start-up and commissioning
  - Duhoik CCPP (1500 MW), O&M support
  - Erbil & Sulaymaniyah SCPP (1000 MW) & CCPP (1500 MW), Start-up & Commissioning, O&M support
  - Najibiya SCPP (500 MW), Start-up & Commissioning
  - Bazyan SCPP (500 MW), Start-up & Commissioning
  - Bezmaya CCPP (1500 MW), Start-up & Commissioning
  - Awbari SCPP (640 MW), Start-up & Commissioning

- **Oil and Gas Facilities:**
  - Sakhalin-I, pre-commissioning and turnover
  - Sakhalin-II (OPF), pre-commissioning and turnover
  - Tengiz Oil Field Development, pre-commissioning and turnover
  - Majnoon Oil Field Development, pre-commissioning and turnover
  - West Qurna-2, Gas Treatment, Power Generation and Distribution Project, pre-commissioning and turnover
  - Khabarovsk Refinery, pre-commissioning and turnover

GE’s 9F ADVANCED GAS PATH (AGP) TECHNOLOGY
CONTRACTING PROJECTS

FEED-OBCE WORKS - ALAŞA STAR COGENERATION STEAM & POWER PROJECT, TURKEY
ZAINSKAIA 858 MW COMBINED CYCLE POWER PLANT, RUSSIA

NIZHNEKAMSK 495 MW COMBINED CYCLE POWER PLANT, RUSSIA

KAZAN 250 MW COMBINED CYCLE POWER PLANT, TATARSTAN - RUSSIA

SAMAWA 750 MW COMBINED CYCLE POWER PLANT PROJECT, IRAQ

DI QAR 750 MW COMBINED CYCLE POWER PLANT PROJECT, IRAQ

BAGHDAD 1,500 MW CCPP PROJECT, IRAQ

SULAYMANIYAH 500 MW CONVERSION TO CCPP PROJECT, IRAQ

ERBIL 500 MW CONVERSION TO CCPP PROJECT, IRAQ

NAJYBIA 500 MW GAS TURBINE POWER PLANT PROJECT, IRAQ

BAZYAN 500 MW SIMPLE CYCLE POWER PLANT PROJECT, IRAQ

BEREZOVSKAYA 800 MW COAL FIRED POWER PLANT PROJECT, RUSSIA

YAJAVA STATE DISTRICT 411 MW CCPP PROJECT, RUSSIA

ZWITINA 570 MW GAS TURBINES POWER PLANT PROJECT, LIBYA

AWBARI 640 MW GAS TURBINE POWER PLANT PROJECT, LIBYA

RIJNMOND 790 MW ENERGY CENTER PROJECT, THE NETHERLANDS

AFŞİN ELBİSTAN B4 X 360 MW THERMAL POWER PLANT, TURKEY

SOUTHWEST 1,230 MW THERMIC POWER PLANTS, TURKEY

TRAKYA 1,200 MW NATURAL GAS CCPP, TURKEY

BURSA 1,400 MW NATURAL GAS CCPP, TURKEY

SOUTHWEST 1,830 MW THERMAL POWER PLANTS, TURKEY

TRAKYA 1,200 MW THERMAL POWER PLANT, TURKEY

AFŞİN ELBİSTAN 2 X 360 MW THERMAL POWER PLANT, TURKEY

BAGHDAD 1,500 MW CCPP PROJECT, IRAQ
NIZHNEKAMSK 495 MW COMBINED CYCLE POWER PLANT

PROJECT DESCRIPTION
On July 2, 2020, ENKA signed a contract with the JSC Tatenergo for the turnkey construction of the Zainskaya 858 MW Combined Cycle Power Plant.

The construction site is located in the Republic of Tatarstan, Zainsk, the territory of Tatenergo JSC branch Zainskaya State District Power Plant and to the north of the territory of Tatenergo JSC branch.

The project consists of a gas turbine plant with an electric capacity of 577 MW, a steam turbine plant with an electric capacity of 281 MW, booster compressor station with a gas purification unit, a heat recovery steam generator, station auxiliaries for cogeneration. The project will be based on 1×1 configuration, equipped with GE’s 9HA.02 Gas Turbine Generator. When completed, the plant will achieve an output of 858 MW and an efficiency of 64.7% which will be the most efficient power plant of the Russian Federation.

ENKA SCOPE OF SERVICES

ENKA is to perform all necessary works including the design and survey works, construction and installation works, commissioning works, Comprehensive Tests, Performance Tests, Testing of power generation equipment, as well as other activities.

ZAINSKAYA 858 MW COMBINED CYCLE POWER PLANT

PROJECT DESCRIPTION
On July 2, 2020, ENKA signed a contract with the JSC Tatenergo for the turnkey construction of Zainskaya 858 MW Combined Cycle Power Plant.

The construction site is located in the Republic of Tatarstan, Zainsk, the territory of Tatenergo JSC branch Zainskaya State District Power Plant and to the north of the territory of Tatenergo JSC branch.

The project consists of a gas turbine plant with an electric capacity of 577 MW, a steam turbine plant with an electric capacity of 281 MW, booster compressor station with a gas purification unit, a heat recovery steam generator, station auxiliaries for cogeneration. The project will be based on 1×1 configuration, equipped with GE’s 9HA.02 Gas Turbine Generator. When completed, the plant will achieve an output of 858 MW and an efficiency of 64.7% which will be the most efficient power plant of the Russian Federation.

ENKA SCOPE OF SERVICES

ENKA is to perform all necessary works including the design and survey works, construction and installation works, commissioning works, Comprehensive Tests, Performance Tests, Testing of power generation equipment, as well as other activities.
A consortium of ENKA and Siemens have undertaken the Nizhnekamskneftekhim Combined Cycle Gas Turbine Thermal Power Plant (CCGT-TPP) project in the Republic of Tatarstan in the Russian Federation.

The plant is under construction in the industrial hub in the southeast of the city of Nizhnekamsk, on the left bank of the River Kama.

ENKA and Siemens entered into a consortium agreement for the project on January 12th 2017. The works were awarded by Nizhnekamskneftekhim under a contract dated December 18th 2017. The duration of the contract is 40 months from the award date.

The CCGT-TPP will have a configuration of two gas turbines, one steam turbine and two heat recovery steam generators (HRSGs). The main fuel will be natural gas. The associated gas derivatives (syngas) that are by-products of Nizhnekamskneftekhim’s production processes will also be used as fuel.

The basic design documentation package was approved by the Russian Federation State Expertise on November 25th 2019 and the construction permit for the project was issued on November 27th 2019.

ENKA SCOPE OF SERVICES

The works are to be performed on an engineering, procurement and construction (EPC) basis. They include engineering, manufacturing, deliveries to site, erection and painting works and the operation, commissioning, start-up and testing of the plant.

KAZAN 250 MW COMBINED CYCLE POWER PLANT

On October 2nd 2019, Siemens signed a contract with PJSC Kazanorgsintez, a member of the TAIF Group, for the delivery, installation, and commissioning of one SGT5-2000E gas turbine, one SST-600 steam turbine, one heat recovery steam generator and all associated systems for a 250 MW Combined Cycle Power Plant in Kazan (KOS Project) in Tatarstan in the Russian Federation.

ENKA has a “Cooperation Agreement” with Siemens, signed on February 27th 2018, regarding the construction of the plant.

ENKA SCOPE OF SERVICES

Within the framework of this “Cooperation Agreement” ENKA is to perform the engineering, procurement and construction (EPC) works. ENKA will also be responsible for commissioning. Siemens will supply the gas and steam turbines.

The main fuel for the plant will be natural gas. The plant will also make use of the associated gas derivatives (syngas) that are by-products of Kazanorgsintez’s production processes.

As of the end of December 2019, the KOS Project was at the basic design preparation stage. Survey work is due to begin in early January, 2020.

It is anticipated that the basic design documentation package will receive Russian Federation state expertise approval in November 2020 and that construction work will commence in December 2020.

The plant is due to start operating in March 2023.
**PROJECT DETAILS**

**LOCATION:** Samawa, Iraq

**OWNER / CLIENT:** Ministry of Electricity of Iraq

**PROJECT DURATION:**
- Phase 1: Mar 2019 - Mar 2021
- Phase 2: TBD

**CONTRACT TYPE:** Lump Sum-Turnkey

**CONTRACT VALUE:** US$ 562 million

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**PROJECT DESCRIPTION**

ENKA entered into a consortium agreement with General Electric (GE) on January 3rd 2017 to undertake works on the Samawa Combined Cycle Power Plant project which was awarded to GE by the Ministry of Electricity of Iraq under contract No.1 dated February 5th 2017. The contract, which was awarded on an Engineering, Procurement and Construction (EPC) basis, includes design works, manufacturing, deliveries to site, construction and assembly works, operation, commissioning, start up and testing. The gas turbines and generators and their off-base auxiliaries, which were previously acquired by the employer, are to be installed and commissioned by the GE-ENKA consortium in simple cycle mode and then converted to combined cycle through the addition of a steam tail and associated equipment. The power plant has a 4x4x1 configuration and will be capable of using three different fuels, with natural gas as the primary fuel and light distilled oil and heavy fuel oil as back-up fuels. The fuel storage and treatment facilities for the liquid fuels are also included in the scope of the work. The gross output at ISO conditions will be 750 MW. The four 9E gas turbine and generator sets (4x125 MW) and auxiliaries were purchased by the employer from General Electric under the “Mega Deal” project in December 2008. These are to be installed by the consortium as free issued equipment.

In late 2018, the work was divided into two phases to overcome financing and budget challenges. Phase 1 broadly envisages the completion of the simple cycle plant, including the 132 kV air insulated switchyard (AIS) and 400kV gas insulated switchyard (GIS) together with common balance of plant of a size and capacity to accommodate the combined cycle operation. Phase 2 broadly involves the completion of the combined cycle plant by adding on the necessary equipment.

**ENKA SCOPE OF SERVICES**

ENKA is responsible for the conceptual design and detailed engineering of the entire civil works, the piling works and the mechanical and electrical works for Balance of Plant (BoP). ENKA will also procure, manufacture and deliver the BoP equipment and provide construction services including the overall civil works, the piling works, the erection and installation of BoP and power block equipment and the testing and commissioning activities required to achieve successful operation on a turnkey basis.
PROJECT DETAILS

ACCOMPLISHMENTS:
SIGNIFICANT FEATURES:
CONTRACT VALUE:
Lump Sum Turn Key
CONTRACT TYPE:
Oct 2014 – Feb 2018
PROJECT DURATION:
Mass Group Holding Ltd.
OWNER / CLIENT:
Baghdad - Iraq
LOCATION:
BAGHDAD 1,500 MW COMBINED CYCLE POWER STATION PROJECT - BESMAYA

PROJECT DESCRIPTION

The Ministry of Electricity of Iraq contracted Mass Group Holding Ltd. to build a mega power plant to provide the state capital with reliable and sustainable electrical power. The plot selected for the plant is located to the south east of Baghdad around 25 km from the centrum.

Besmaya Combined Cycle Project consists of 2 power blocks which are to produce 1,500 MW of power at 400 kV transmission level. Each block consists of two (2) GE 9F series combustion turbine generators which are to be operated in open cycle or combined cycle via the use of a bypass stack. In combined cycle mode, the exhaust from the combustion turbines is directed to Heat Recovery Steam Generators and the steam produced drives a Steam Turbine Generator. Waste heat is rejected using a combination of fin-fan coolers and wet cooling tower equipment. Other facilities which support the power block operation include oil unloading, storage and transfer system, fuel gas conditioning and pressure reduction, plant electrical system including generator step-up transformers, main control system – DCS, water treatment plant and administrative/O&M areas.

UNIQUE CHALLENGES

The project was designed as a world-class power generation facility utilizing the latest technology in the market. Appropriate level of redundancy is included in each system so that no single failure of an auxiliary plant component results in the total loss of the unit generating capability. ENKA’s engineering team worked on the plant design to satisfy all of Owner’s needs and mitigated design criteria changes due to unforeseen factors.

The city of Baghdad suffered significant damage for the last several decades and just yet rebuilding its infrastructure. It was not possible to rely on the existing infrastructure in the area. Therefore, ENKA had established a self-sufficient temporary construction facilities complex at the jobsite to sustain construction works without any disruption or interruption.

ENKA SCOPE OF SERVICES

ENKA’s scope of work consisted of design, detailed engineering, procurement, shipment/delivery of all project materials, installation and construction, interconnection, pre-commissioning, commissioning & start up, demonstration of parallel operation with the grid at the required net output, performance testing, training of the operating and maintenance personnel, and preparation of integrated operation and maintenance manuals according to the division of works for the power plant.

The simple cycle part of the plant is made up of 4 GE 9F 3-series gas turbines and all auxiliaries. The combined cycle part of the plant consists of four Heat Recovery Steam Generators (HRSG), two nominally rated 250 MW Steam Turbine Generators (STG) incl. condensers, six GSUs, two wet cooling towers, and all the requisite equipment and systems to make the plant a safe, reliable, efficient combined cycle power generating facility.

BAGHDAD 1,500 MW COMBINED CYCLE POWER STATION PROJECT - BESMAYA

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One of the major challenges of the project was to work in a social environment suffering civil violence and instability. ENKA had prepared and implemented a robust security plan based on risk avoidance through careful planning and defensive protection measures. ENKA’s approach to security consists of; good community relations, counter-measures to reduce the risk by deterring, detecting or delaying the threat, and taking extra mitigation measures should any incident occur. The aim of our security system was to provide a secure environment for staff, operators and subcontractors through the effective use of counter-measures, while remaining sympathetic to the facility’s operation, layout and the environmental restrictions.

Over 60,000 tons of project materials and equipment were shipped to the jobsite through congested Umm Qasr port and partially northern routes. Significant planning and route surveys were required for the successful transportation of oversized cargo. The compliance with frequently changing Iraqi customs regulations and bureaucracy involved in timely customs clearance of goods was a major challenge. ENKA leveraged its vast experience in Iraq to clear all project cargo without any disputes with customs authorities with careful planning and strictly adhering to the laws and requirements.

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SULAYMANIYAH 500 MW CONVERSION TO COMBINED CYCLE POWER PLANT PROJECT

PROJECT DETAILS

LOCATION
Sulaymaniyah, Kurdistan Region of Iraq

OWNER / CLIENT
Mass Group Holding Ltd.

PROJECT DURATION
July 2013 – July 2016

CONTRACT VALUE
Lump Sum Turn Key

CONTRACT TYPE
Mass Group Holding Ltd.

OWNER / CLIENT
Sulaymaniyah, Kurdistan Region

LOCATION

PROJECT DESCRIPTION

MGH - Mass Group Holding Ltd. signed an EPC contract with ENKA to convert its Sulaymaniyah Independent Power Project (IPP) from simple-cycle to combined-cycle technology.

The existing simple cycle Sulaymaniyah Gas Power Station was developed by MGH - Mass Group Holding Ltd. with a capacity of 1,000 MW with eight GE - 9E gas turbines. The combined-cycle gas turbines (CCGT) conversion added 500 MW to the project making the overall capacity of 1,500 MW, by using steam turbines manufactured by GE.

Sulaymaniyah Combined Cycle Power Project is designed to work on two types of fuel – natural gas as the primary and diesel as the secondary source and will utilize the exhaust heat produced by the existing Sulaymaniyah Gas Power Station. Each block consists of four HRSGs, a GE steam turbine generator set and a 40-cell Air Cooled Condenser (ACC) System.

UNIQUE CHALLENGES

The project consists of conversion of live simple cycle to a combined cycle power plant project under brown field conditions. ENKA worked under unstable grid conditions nevertheless successfully managed to minimize the negative impacts of the grid on the power plant by implementing tailor-designed control.

One of the major challenges of the project was to work under major civil unrest in the region. ENKA prepared and implemented a solid safety and security plan based on risk avoidance through careful planning and defensive protection measures to cope with the challenges. Our security approach consisted of good community relations, counter-measures to reduce the risk by deterring, detecting or delaying the threat, and an ever ready evacuation plan should any incident occur.

Through this approach, ENKA minimized the potential risk factors and managed to work without interruption and with no effect to contract schedule.

Due to the circumstances, at times, shipments to the jobsite were interrupted and high labor turnovers were experienced causing ENKA to apply and obtain visas for the new workforce multiple times.

ENKA SCOPE OF SERVICES

The major works under the contract are the design, engineering, procurement, shipment/delivery, installation construction, interconnection, pre-commissioning, commissioning and start-up of eight HRSG’s, two nominally rated 250 MW GE STG’s, two GSUs, an air cooled system and all other balance of plant equipment to convert the simple cycle plant into two blocks of 4x4x1 combined cycle configuration as well as demonstration of parallel operation with the grid at the required net output, performance testing, classroom training of the operating and maintenance personnel, and preparation of integrated operation and maintenance manuals. The scope also includes a 400 kV switchyard for which the interconnection point will be a dead-end structure to be erected by the Ministry of Electricity.

ENKA workforce reached to 1,245 employees during the peak periods of the Project. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

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ERBIL 500 MW CONVERSION TO COMBINED CYCLE POWER PLANT PROJECT

PROJECT DETAILS

LOCATION
Erbil, Kurdistan Region of Iraq

OWNER / CLIENT:
Mass Group Holding Ltd.

PROJECT DURATION:
Apr 2012 – Oct 2015

CONTRACT TYPE:
Lump Sum Turn Key

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• “First Conversion Project from Simple Cycle to Combined Cycle” in Iraq.
• “First Combined Cycle Power Plant” in Iraq.
• “Largest Power Plant” in Iraq with its 1,500 MW output.
• The plant is providing approximately 25% power demand of Kurdistan Region of Iraq.
• 5 million work hours without a Lost Time Incident.

PROJECT DESCRIPTION

MGH - Mass Group Holding Ltd. signed an EPC contract with ENKA to convert its Erbil Independent Power Project (IPP) from simple-cycle to combined-cycle technology.

The primary Erbil Gas Power Station was developed by MGH - Mass Group Holding Ltd. as a simple-cycle project with a capacity of 1,000 MW which is Iraqi Kurdistan's largest power plant. The plant is located about 20 km south of the city of Erbil, Kurdistan Region of Iraq.

Erbil Gas Power Station had eight GE - 9E gas turbines at the beginning of the project. Four of them were built in 2009 and the other four gas turbines have been recently completed. All were under operation during project execution.

The combined-cycle gas turbines (CCGT) conversion by ENKA added 500 MW to the project by using steam turbines manufactured by GE.

UNIQUE CHALLENGES

The project consists of conversion of live simple cycle plant to a combined cycle plant project under brown field conditions.

ENKA worked under unstable grid conditions and successfully managed to minimize the negative impacts of the grid on the power plant by implementing tailor-designed control.

During the last quarter of the project execution, ENKA worked under significant civil instability and terror activity in the region without interruption and with no effect to contract schedule. ENKA prepared and organized an ever ready evacuation plan by minimizing the potential risk factors to its employees.

ENKA workforce reached to 2,100 employees during the peak periods of the project. ENKA, further provided training for the O&M personnel who will be operating and maintaining the plant.

Type of Plant
Combined Cycle Power Plant

Capacity
1,500 MW

Type of Fuel
Natural gas as the primary and Diesel as the secondary source

Configuration
2x(4x4x1)

Steam Turbine Generator
General Electric Unit: 2 Sets, Model: C7, Rating Per Unit: 252 MW

HRSG
CMI Unit: 8 Sets, Type: Vertical - Natural Circulation Cold Casing

Cooling Type
Air Cooled Condenser, GEA, Unit: 2 Sets, Type: Each with 40 cells

Commodity | UoM | Total |
--- | --- | --- |
Piping Erection | ton | 1,850 |
Equipment Erection | ton | 36,000 |
Cabling | m | 105,000 |
Concrete | m³ | 45,000 |
Structural Steel | ton | 6,000 |

ENKA SCOPE OF SERVICES

ENKA executed design, procurement, installation and start-up of eight HRSG's, two nominally rated 250 MW STG's, two GSUs, an air cooled system and all other equipment to convert the simple cycle plant into two blocks of 4x4x1 combined cycle configuration, including all civil and erection works. Erbil Combined Cycle Power Project is designed to work on two types of fuel – natural gas as the primary and diesel as the secondary source – and utilizes the exhaust heat produced by the existing Erbil Gas Power Station. Erbil Combined Cycle Power Plant is capable of being dispatched for any combination of base-load operation throughout its design service life. Each block consists of four HRSGs, a GE steam turbine generator set and a 40-cell Air Cooled Condenser (ACC) system. The scope of works under the contract also includes a 400 kV switchyard for which the interconnection point is a dead-end structure to be erected by the Ministry of Electricity.

ENKA workforce reached to 2,100 employees during the peak periods of the project. ENKA, further provided training for the O&M personnel who will be operating and maintaining the plant.
NAJYBHIA 500 MW GAS TURBINE POWER PLANT PROJECT

PROJECT DESCRIPTION

The Najybia Power Plant Project, located near Basra, is part of a master plan developed and implemented by Republic of Iraq’s Ministry of Electricity to increase the power generation capacity to meet the rapid growth of demand in the country after 25 years of war and lack of investment.

The Project consisted of engineering, procurement, construction, commissioning and start-up of a 4x125 MW Power Generation Plant to operate in simple cycle mode of operation with three type of fuel, Heavy Fuel Oil (HFO), Natural Gas and Light Distillate Oil (LDO), complete with all Balance of Plant (BOP) systems to support safe and efficient operation of CTG units. Heavy fuel oil (HFO) is used as main fuel for CTG operation whereas; natural gas and light distillate oil (LDO) are used as back-up fuels. Plant has an overall storage capability of 5 days for both liquid fuels (HFO & LDO). Power is generated at 15 kV in the CTGs and stepped up by main transformers to the grid voltage via 132 kV and 400 kV GIS Substations.

The Project consisted of four (4) each GE Frame 9E Gas Turbine Generator Sets were free issued and delivered to site by the Owner.

PROJECT ACCOMPLISHMENTS

• 1 million workhours without a Lost Time Incident.
• Achieved 40% Iraqi content on direct project workhours.
• On schedule completion of the project providing Iraqis in Basra and on the national grid with many hours of electricity per day.
• Part of largest power investment (Mega Deal) by Iraq government in the post war era.

ENKA SCOPe OF SERVICES

ENKA has self performed the basic engineering, detail engineering, procurement, construction, commissioning, start-up and performance testing scope for the project utilizing in-house resources on a lump sum turn-key basis. Specific scope of services provided by ENKA included; complete basic and detailed design and engineering of the plant, supply of all balance of plant (BOP) systems and equipment, all civil works including GTG foundations.

The Najybiah power plant is expected to address the growing demand for power in the country and supply uninterrupted electricity to the people of Iraq. Due to lack of infrastructure and availability of reliable natural gas supply in the region, the plant was designed to function on three different types of fuel to ensure continuity of operations. Storage and distribution systems for the two liquid fuels were carefully designed by ENKA with appropriate design margins and redundancy requirements.

PROJECT SCHEDULE

LOCATION: Al Najybiah, Basra - Iraq
OWNER / CLIENT: Ministry of Electricity, Iraq
PROJECT DURATION: May 2013 – May 2015
CONTRACT TYPE: Lump Sum Turn Key

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:

1 million workhours without a Lost Time Incident
Achieved 40% Iraqi content on direct project workhours
On schedule completion of the project provision of Iraqis in Basra and on the national grid with many hours of electricity per day.
Part of largest power investment (Mega Deal) by Iraq government in the post war era.

UNIQUE CHALLENGES

The Najybiah power plant is expected to address the growing demand for power in the country and supply uninterrupted electricity to the people of Iraq. Due to lack of infrastructure and availability of reliable natural gas supply in the region, the plant was designed to function on three different types of fuel to ensure continuity of operations. Storage and distribution systems for the two liquid fuels were carefully designed by ENKA with appropriate design margins and redundancy requirements.

Project site is located on the banks of Shatt Al Arab River and surrounded by water canals. Weak soil conditions necessitated significant amount of piling for foundations. As part of the EPC Contract, ENKA through its piling specialist subsidiary Kashtas have installed Ø800mm piles over 65,000 meters in total length.

"1 million workhours without a Lost Time Incident"
BAZYAN 500 MW SIMPLE CYCLE POWER PLANT PROJECT

PROJECT DESCRIPTION

The Qaiwan Group awarded ENKA the Bazyan Simple Cycle Power Plant Project on a EPC Turnkey basis, on 28th August 2014. The project was on a green-field site, located in the Sulaymaniyah Province of the Kurdistan Autonomous Region of Iraq. The power capacity of the plant is 500 MW generated by four GE-9E-3 gas turbines, an air insulated switchyard of 132kV, fuel gas conditioning system, three Distillate Fuel Oil tanks, each of 15,000 m³ capacity, a water treatment plant and all Balance of Plant systems, complete with all accessories, including piping, wiring, instrumentation controls and panels and all other facilities and required capabilities.

UNIQUE CHALLENGES

The main challenge of the project was meeting the 15 month fast-track project schedule. The project mobilization phase took place at the peak of significant civil unrest in the region. Deploying necessary number of employees to the jobsite took longer than originally anticipated in the contract schedule. ENKA with a successful coordination of procurement, logistics and risk management activities managed to bring 1,500 trucks to site in a very short time period and arranged their unloading at an extremely small lay down. In nearly one year, 15,000 tons of project materials were shipped to the site. Double handling techniques were used during earthworks due to the small size of the job site. Delays to transportation plans due to force majeure events near the Turkish – Iraqi border were handled with no effect on contract schedule. In this project, ENKA also successfully managed working with previously identified local suppliers and subcontractors without any bidding process.

ENKA SCOPE OF SERVICES

The scope of the work covers all engineering, design, procurement, manufacturing, shipment/delivery, construction, installation, testing, interconnection, pre-commissioning, commissioning, start-up, demonstration of parallel operation with the grid at the required net output and performance testing activities as well as preparation of O&M manuals and classroom training of the operating and maintenance personnel. As-built documentation and 12 months warranty services were also provided by ENKA. The design supports a plant operation with two types of fuel – liquid fuel gas and liquid fuel oil.

The ENKA workforce reached 1,135 employees during the peak periods of the project.

PROJECT DETAILS

LOCATION:
Sulaymaniyah - Iraq

OWNER / CLIENT:
Qaiwan Group

PROJECT DURATION:
Sep 2014 – Mar 2016

CONTRACT TYPE:
Lump Sum Turn Key

CONTRACT VALUE:
Confidential

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• Utilization of multi-fuel with natural gas as the primary fuel and light fuel oil (i.e. a type of diesel) as the back-up fuel in cases when natural gas is unavailable.
• Ability to supply of 15 days (47,000 m³) fuel oil on site.
• 3.5 million workhours without a Lost Time Incident. (As of January 2016)

BAZYAN 500 MW SIMPLE CYCLE POWER PLANT PROJECT

Commodity | Unit | Total
---|---|---
Piping Erection | ton | 260
Equipment Erection | ton | 12,000
Cabling | m | 395,000
Concrete | m³ | 25,000
Structural Steel | ton | 500

Type of Plant: Simple Cycle Power Plant
Capacity: 500 MW
Type of Fuel: Liquid Fuel Gas and Liquid Fuel Oil
Configuration: 4x125 MW
Gas Turbine Generator

General Electric Unit: 4 Sets, Model: 9E, Rating Per Unit: 125 MW

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BEREZOVSKAYA 800 MW COAL FIRED POWER PLANT PROJECT

PROJECT DESCRIPTION

Berezovskaya Coal Fired Power Plant Project consisted of construction of the 3rd power block with the capacity of 800 MW to increase the overall plant capacity to 2,400 MW. The first and the second blocks were built and put into operation in 1988 and 1991, respectively. The project for the construction of the third block went underway at the beginning of 1990s however was halted due to the collapse of the Soviet Union. E.ON acquired the Berezovskaya power station in 2007, with the intention of resuming its expansion. The project commenced in 2011, included the full construction of a coal fired 800 MW power block (except the main building itself which was already constructed along with 1st and 2nd power blocks) including the boiler, turbine, air preheaters as well as relevant piping, auxiliary equipment, supporting steel structures, dust/gas/air ducts, strengthening of the main building structures, renovation of the building façade.

ENKA's scope as the mechanical erection works contractor for the construction of the Berezovskaya Coal Fired Power Plant Project consisted of pre-installation preparatory works, assembly works (enlarged assembly of the parts of the boiler and auxiliary equipment), installation works, preassembly of wall modules (boiler pressure parts), field welding, pipe touch-up painting works, and hydraulic testing of the boiler. ENKA workforce reached to 1,527 people during the peak periods of the project.

“9.24 million workhours without Lost Time Incident.”
**PROJECT DETAILS**

**CONTRACT VALUE:** US$ 460 million

**CONTRACT TYPE:** Lump Sum Turn Key

**PROJECT DURATION:** Jul 2008 – Aug 2011

**LOCATION:** Yajva District, Perm Region - Russia

**OWNER / CLIENT:** E.ON Russia

**SIGNIFICANT FEATURES / UNIQUE CHALLENGES**
- First Siemens F Class Turbine
- The project is the first to have a Siemens F-Class Turbine in Russia
- The project was completed on time and with the highest quality
- ENKA with this project, has operating records.

ENKA was selected as the EPC contractor by the Owner.

**PROJECT DESCRIPTION**

The Yajva Combined Cycle Natural Gas Power Plant Project consisted of a single shaft Siemens 1xSCCC5-4000F-1S Power Train comprising of a Gas Turbine, Steam Turbine, Generator and Condenser, a vertical natural circulation type un-fired boiler manufactured by CMI as well as all auxiliary equipment such as steam / water cycle, a water treatment plant, controls systems, electrical systems, instrumentation, gas compressors, an administration building, a natural draft cooling tower and a 220 kV switchyard.

**ENKA SCOPE OF SERVICES**

ENKA was selected as the EPC contractor by the Owner. The scope as the EPC contractor of the Yajva Combined Cycle Power Plant Project covered all the works including permitting, engineering, procurement, construction, start-up, testing and commissioning of the plant.

ENKA workforce reached to 860 people during the peak periods of the Project. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

**YAJVA STATE DISTRICT 411 MW COMBINED CYCLE POWER PLANT PROJECT**

ENKA with its vast work experience in Russia, prepared a transportation plan together with a local design institute, in the early stage of the project, having all local authorities involved, in order to avoid any setbacks during operation. During construction, unconventional erection methods utilized to gain schedule advantage. For instance, majority of the HRSG building structural steel erection was completed earlier than the erection of the HRSG itself, consuming more workhours and utilization of larger size cranes, however in return provided one month gain in schedule. For any material with delayed deliveries, alternatives were investigated and second orders were placed. Flexibility in work order was applied during start-up and commissioning of facilities.

In the end, the facility was commissioned and handed over to E.ON Russia, right on the original contract schedule and price, without any claims, without any Lost Time Incident (LTI) and in full compliance with international and applicable Russian norms, standards and permits.

**ENKA SCOPE OF SERVICES**

ENKA’s scope as the EPC contractor of the Yajva Combined Cycle Power Plant Project covered all the works including permitting, engineering, procurement, construction, start-up, testing and commissioning of the plant. ENKA workforce reached to 860 people during the peak periods of the Project. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

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**ENKA SCOPE OF SERVICES**

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**UNIQUE CHALLENGES**

Yajva CCP Project represent a first within the “Privatization and Reform” program of Russia consisting of power plant projects with new generation capacity in excess of 24,000 MWe in total. This strategic investment for the Owner had an aggressive EPC schedule which included development and approval of the permit engineering (to meet TEO and Glasgoevskpertza requirements), in other terms, a feasibility study and full compliance with Russian standards and norms of the project’s technical designs and documents. Under these circumstances, ENKA’s project team did not have any options for rework or recovery from an error during the execution of the project. Committed to delivering the project on time and with the highest quality, the team quickly mobilized, planned and managed this challenging initiative working closely with the Owner as a true project partner consistently responding to their concerns and preferences, as well as complying with the local norms and regulations.

Main plant equipment were manufactured according to European standards and needed approval for compliance with Russian standards and norms. ENKA established a Russian documentation team, in the early stages of the project, working closely with the Owner on applications for various certifications such as Rostechnadzor (RTN) for conformity and permit to use.

Remote location of project and the climate effects on heavy transportation was also one of the major challenges, considering the river channels to be used for equipment transport are open only between May and October. Further, the heavy equipment had to be road transported for 50 km from the unloading point to the jobsite.

ENKA’s work on the Yajva Combined Cycle Power Plant Project earned it the Best Global Project Prize in the Power & Industrial category in 2013 Global Best Projects competition of the renowned Engineering News Record (ENR) magazine.

**PROJECT DESCRIPTION**

The Yajva Combined Cycle Natural Gas Power Plant Project consisted of a single shaft Siemens 1xSCCC5-4000F-1S Power Train comprising of a Gas Turbine, Steam Turbine, Generator and Condenser, a vertical natural circulation type un-fired boiler manufactured by CMI as well as all auxiliary equipment such as steam / water cycle, a water treatment plant, controls systems, electrical systems, instrumentation, gas compressors, an administration building, a natural draft cooling tower and a 220 kV switchyard.

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**ENKA WITH VAST WORK EXPERIENCE IN RUSSIA, PREPARED A TRANSPORTATION PLAN TOGETHER WITH A LOCAL DESIGN INSTITUTE, IN THE EARLY STAGE OF THE PROJECT, HAVING ALL LOCAL AUTHORITIES INVOLVED, IN ORDER TO AVOID ANY SETBACKS DURING OPERATION. DURING CONSTRUCTION, UNCONVENTIONAL ERECTION METHODS UTILIZED TO GAIN SCHEDULE ADVANTAGE. FOR INSTANCE, MAJORITY OF THE HRSG BUILDING STRUCTURAL STEEL ERECTION WAS COMPLETED EARLIER THAN THE ERECTION OF THE HRSG ITSELF, CONSUMING MORE WORKHOURS AND UTILIZATION OF LARGER SIZE CRANES, HOWEVER IN RETURN PROVIDED ONE MONTH GAIN IN SCHEDULE. FOR ANY MATERIAL WITH DELAYED DELIVERIES, ALTERNATIVES WERE INVESTIGATED AND SECOND ORDERS WERE PLACED. FLEXIBILITY IN WORK ORDER WAS APPLIED DURING START-UP AND COMMISSIONING OF FACILITIES."
PROJECT DETAILS

LOCATION:
Zwitina, Benghazi - Libya

OWNER / CLIENT:
GECOL (General Electricity Company of Libya) / GESCO (Global Electricity Services Company of Libya)

PROJECT DURATION:
Apr 2008 – Aug 2010

CONTRACT TYPE:
Lump Sum Turn Key

CONTRACT VALUE:
EUR 89 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• 1.7 million workhours without a Lost Time Incident.
• On schedule completion.
• Project significantly lowered power shortages in the vicinity of project area and the region.
• Part of Strategic Investment by Libyan Government to cover growing Electricity Demand of Libya.

PROJECT DESCRIPTION

Zwitina Power Plant is designed for Simple Cycle Operation. The plant consists of 2 Combustion Turbine Generators (CTG) each nominally rated at 285 MW power producing capacity at generator output terminals at ISO conditions. Base fuel is natural gas while diesel oil is also available as backup fuel.

The CTG’s are Siemens Model SGTS-PAC-4000F.

Overall plant design, sub-systems design and selected equipment are suitable for future conversion into Combined Cycle Operation.

Power island equipment (i.e. Combustion Turbine – Generator packages and their auxiliary packages) have been procured directly by GESCO (Global Electricity Service Company of Libya) while ET was responsible for complete plant engineering, procurement of Balance of Plant (BOP) equipment and material, natural gas pipeline and complete site works (construction and erection), commissioning and start-up.

UNIQUE CHALLENGES

The Zwitina Power Plant has been planned to assist elimination of great power shortage especially in the Eastern Libya as well as to feed newly established 400 kV National Electricity Network all over the Libya territory.

The project site is located just near the sea at a sandy coastal area. Underground water level is just 80 cm below project ground level therefore piling and continuous dewatering is needed during civil construction. Comprehensive insulation systems have been applied against salty sea water absorption to the infrastructure of the facilities.

At the end of successful commissioning and putting into the operation, each unit’s actual capacity is reached to 305 MW. This figure is more than the design capacity (285 MW) and very rare and exceptionally good output compared to the other similar model turbine applications all over the world.
AWBARI 640 MW GAS TURBINE POWER PLANT PROJECT

PROJECT DETAILS

LOCATION:
South West of Sebha City in the Southern Region of Libya

OWNER / CLIENT:
General Electricity Company of Libya (GECOL)

PROJECT DURATION:
Dec 2010 – Nov 2017

CONTRACT TYPE:
Lump Sum Turn Key

CONTRACT VALUE:
EUR 180 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• After the first force majeur occurred in Feb 2011, we were the first Contractor which had resumed site activities in October 2012, not only in the southern region but throughout the whole of Libya.
• Engineering, Procurement and Site Works progress had been ahead of Contractual Schedule by six (6) months and had reached up to 98% physical completion by the time the site had to be evacuated in September 2014 with great effort in lieu of the prevailing circumstances in Libya.

PROJECT DESCRIPTION

In line with Libyan Government’s ambitious target of increasing its power generation capacity to meet the demand of industry and growing population, General People’s Committee of Electricity, Water and Gas (GPCOEWG) has issued several tenders in 2007 for new power plant projects.

Sebha 855 (3x285) MW Gas Turbine Power Plant Project is one of these projects and is awarded to GESCO – ENKA Teknik Consortium by General Electricity Company of Libya (GECOL) in December 2007 and this contract scope is modified in February 2010 to establish 4x160 MW Gas Turbines Project located in Awbari Region. Awbari simple cycle gas power plant project aims for constructing a power plant with total capacity of 640 MW and to be operated by crude oil as main fuel & LFO. The plant is planned to be operated with gas in the future once gas is available in the region.

The project is a turn key project contracted between General Electric Company of Libya (GECOL) and Consortium of the Global Electricity Services Company (GESCO) and ENKA Teknik covering Engineering, Procurement, Delivery, Erection and Testing & Commission of the following:
• 4x160 MW Siemens turbine model SGT5-PAC 2000 E
• All related balance of plant equipment
• Process and non-process buildings
• Roads and fences
• Housing colony
• Crude oil transfer pipeline

AWBARI 640 MW GAS TURBINE POWER PLANT PROJECT

ACCOUNTABLE CHALLENGES

The project had to be suspended first time in February 2011 hence re-started in October 2012 and had to be suspended once again at 98% physical completion in September 2014 both owing to political turmoil in Libya. We were the first contractor who had resumed site activities not only in the southern region but also throughout the whole of Libya under instable conditions of the country. Logistic to the site from other parts of Libya is a challenge where safety at site and for all supplied material are the major concern.

Although power had been utmost importance for safety and limited site activities currently constrained with stocked construction material, ENKA struggled a lot while dealing with diesel supply due to continuous run of generators.

ENKA had successfully managed to continue the site works against the shortage of living and construction material in the project region.

ENKA SCOPE OF SERVICES

Turn-key engineering, supply for BOP parts and complete plant (including 50 km of crude oil pipeline), construction, erection and commissioning of 4x160 MW Simple Cycle Power Generation Plant. Power Island of the plant consists of 4 units of Siemens SGTS-PAC 2000E Combustion Turbine + SGen5-100A Generator sets.

The plant is designed and supplied to operate in simple cycle mode of operation, complete with all Balance of Plant (BOP) systems to support safe and efficient operation of CTG units.

Other Supplies and Services

• Engineering, design and documentation for the complete project scope
• Procurement and transportation
• Construction and erection works (including vendor supervision)
• Commissioning, testing, start-up and handover
• Training services for plant operation & maintenance staff
• Initial operation spare parts.

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RIJNMOND 790 MW ENERGY CENTER PROJECT

PROJECT DESCRIPTION

In 2002, ENKA in Joint Venture with its American partner Bechtel was awarded the Lump Sum Turnkey EPC contract for the Rijnmond Energy Center Project, a combined cycle cogeneration power plant in the Netherlands.

The Rijnmond Power Plant is a natural-gas-fueled facility with a nominal 790 MW net output and consists of two combustion turbine generators (CTGs), two fired heat recovery steam generators (HRSGs), and one lateral exhaust steam turbine generator (STG) in a 2x2x1 configuration. Plant cooling is provided by a mechanical draft, plume-abated cooling tower, with makeup water from the nearby Petroleum Haven, following processing through an Acti-floc clarifier.

ENKA SCOPE OF SERVICES

ENKA Bechtel Joint Venture’s scope as the EPC contractor of the Rijnmond Combined Cycle Power Plant Project covered all the works including design, engineering, equipment supply, construction and commissioning works of 790 MW Natural Gas Combined Cycle Cogeneration Power Plant consisting of a 2x2x1 combined cycle arrangement.

ENKA workforce reached to 860 employees during the peak periods of the Project. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

Type of Plant | Combined Cycle Power Plant
---|---
Capacity | 790 MW
Type of Fuel | Natural Gas
Configuration | 2x2x1
Shaft | Multi Shaft
Gas Turbine Generator | Siemens Unit: 2 Sets Model: V94.3A2 Rating Per Unit: 395 MW
Steam Turbine Generator | Alstom Unit: 2 Sets Model: D2Y22Z- 2H41B Rating Per Unit: 281 MW
HRSG | SFL Unit: 2 Sets Type: Horizontal-gas-flow, Natural Circulation type Three-pressure, reheat, each with 65m exhaust stack. HRSGs are equipped with duct burners to replace lost STG output when exporting steam.
Cooling Type | Wet type mechanical draft Cooling Tower

AFŞİN ELBİSTAN B 4 X 360 THERMAL POWER PLANT

PROJECT DESCRIPTION

In August 1998, EUAŞ, the state owned company for electricity generation, awarded the turn-key construction of a conventional-type coal-fired thermal power plant, with a nominal capacity of 4x360 MW, to the consortium of Mitsubishi Heavy Industries Ltd. (MHI), ENKA İnşaat ve Sanayi A.Ş., Babcock Kraftwerkechnik GmbH and GTT.

The project included the construction and installation of four steam turbojets, flue gas desulphurization plant, slag and ash handling system, raw water supply system, water treatment plant, coal handling system, cooling system, all ancillary plants, generating plants with their auxiliaries, storage facilities and necessary workshops, operation and auxiliary buildings as well as all low, medium and high voltage switchgears, control and monitoring equipment and the power transformers.

The complete implementation of design as well as tests, trial runs, acceptance tests and maintenance until the temporary acceptance date, the training of all operating personnel and the provision of all necessary consumables were also included in the project.

ENKA SCOPE OF SERVICES

ENKA-MHI-BABCOCK-GTT (GAMA/TEKFEN/TOKAR JV) Consortium’s scope covered design, engineering, equipment supply, construction, commissioning and putting into operation of 4x360 MW Afşin Elbistan B Thermal power plant.

ENKA’s scope included the construction of the turbine building, cooling towers, process buildings, 154-380 kV switchyard, pipe and cable trenches; supply and erection of steel pipeline with a length of 2x33 km, high level tank and pump station; construction and erection of ash handling facilities; pipe racks; supply and erection of the cooling water pipes; erection of the turbine-generator units, auxiliary facilities, electro-mechanical erection of the whole supply units (Balance of Plant) and erection of all the external process pipes.

PROJECT DETAILS

LOCATION: Elbistan - Kahramanmaraş, Turkey
OWNER / CLIENT: Turkish Electricity Authority General Directorate, Turkish Coal Authority General Directorate
PROJECT DURATION: Jun 2000-Oct 2006
CONTRACT TYPE: Lump Sum-Turnkey
MAIN QUANTITIES: Total concrete works: 188,000 m³. Total equipment erection works: 45,000 tons
CONTRACT VALUE: US$ 1.6 billion
SOUTHWEST 1,830 MW THERMAL POWER PLANTS IN TURKEY

PROJECT DESCRIPTION

TUNÇBİLEK (1X150 MW), YATAĞAN (3X210 MW), YENİKÖY (2X210 MW) AND KEMERKÖY (3X210 MW)

Following the decision of the Turkish government in the 1970’s to utilize the lignite coal reserves in the southwest of Turkey, ENKA accomplished the civil works, and fabrication and erection of the steel structures of four thermal power plants with a total installed capacity of 1,830 MW.

Each of these plants are heavy industry structures with dams, water intake-discharge, water treatment and transmission systems, huge coal crusher units, several kilometers long coal and ash conveyors, large capacity boilers with coal grinding mills, heavy and sensitive turbine foundations that require a single-one-time construction, stacks built with special sliding form technology and with steel constructions in excess of 10,000 tons. Increasing awareness in environmental protection in 1970’s and 1980’s led to the construction of taller stacks.

Main items of work in these US$ 350 million power plants are 11 million m³ excavation, 1 million m³ concrete, more than 50,000 tons steel construction, fabrication and erection.

UNIQUE CHALLENGES

Yeniköy power plant’s first unit was completed in December 1986. ENKA worked on brownfield conditions for the second unit which has then be synchronized in March 1987.

Kemerköy power plant’s location had been selected to construct on a hilly land due to the sufficient soil carrying capacity, nearby to the lignite coal mines and to the sea for cooling water intake. ENKA successfully prepared the land before the construction by removing the hill and bringing the land to the project ground level as per the design requirement.

Concreting during hot weather has also become a challenge during the construction of 300 m tall stack for Kemerköy Power Plant, nevertheless ENKA completed the stack within only 120 days.

The projects of Tunçbilek, Yeniköy and Kemerköy consequently required the construction of highest tall stacks in Turkey which would also be the highest manmade structures of the country at the time. ENKA successfully managed the construction of the stacks with special sliding form technology. Kemerköy with its 300 m tall stack, it’s still the highest among all coal fired power plants in Turkey.

ENKA SCOPE OF SERVICES

During the 1970’s, when 150 MW Tunçbilek Power Plant construction was undertaken by ENKA in consortium with Elektrim Poland and KWU, it became obvious that Turkey had to make many similar investments in the energy sector. In those days, there were only a few companies in Turkey which could undertake the construction of projects with such difficult and high technology. In full consciousness of this fact, ENKA channeled its study and efforts into this sector. In fact, in a short period of time Yatağan, later Yeniköy and Kemerköy Power Plant sites were planned in the region where there are rich lignite reserves suitable for energy production. The 8x210 MW portion was tendered, three being in Yatağan, two in Yeniköy and three in Kemerköy. ENKA in consortium with Elektrim Poland consecutively converted these projects into energy producing plants. By 1982, one quarter of the total energy needs of Turkey was supplied by these power plants.

The experience and skills gained through these projects enabled ENKA to extend the scope of its responsibility in subsequent turn-key power projects, either as a consortium member or a joint venture partner.

LOCATION: Muğla & Kütahya - Turkey

OWNER / CLIENT: Turkish Electricity Authority

PROJECT DURATION:

Tunçbilek (1x150 MW) Mar 1973 – Aug 1978
Yatağan (2x210 MW) Apr 1977 – Jun 1983
Kemerköy (3x210 MW) Sep 1984 – Jun 1995

(CONTRACT VALUE: US$ 11 million)

CONTRACT TYPE: Lump Sum-Turnkey

PROJECT DETAILS

SOUTHWEST 1,830 MW THERMAL POWER PLANTS IN TURKEY
PROJECT DESCRIPTION

In the late 1970’s, Mineral Investigation and Research Institute (MTA) discovered natural gas resources in Trakya, northwest of Turkey. In early 80’s T.P.A.O., Turkish Petroleum Inc. determined reserves up to 15 billion m³ of natural gas in the same area and soon afterwards the State Planning Organization commenced feasibility studies regarding alternative usages of the exploited gas. The main alternatives were, to use natural gas as raw material in the existing and future fertilizer plants, to change Ambarlı Power Plant from fuel-oil fired to natural gas fired. Finally it was decided to erect a combined cycle power plant to utilize the natural gas in the most favourable way and Turkish Electricity Authority (TEK) called for an international turn-key tender. For their most attractive and suitable offer BBC/Mannheim + ENKA Consortium was awarded with the contract for 1,200 MW natural gas fired combined cycle power plant. Trakya Natural Gas Combined Cycle Power Plant was the first of its kind in Turkey and would produce 7.2 billion kWh electricity per year. Plant consists of 8 gas and 4 steam turbines each having an output of 100 MW and are equipped with 2 Heller System Natural Draft Dry Cooling Tower with a height of 135 m. The plant has a high thermal efficiency of circa 51% and specific installation cost was much lower than the comparable conventional steam power plants.

PROJECT DETAILS

LOCATION
Hamitabad - Kırklareli - Turkey

OWNER / CLIENT
Turkish Electricity Authority General Directorate.

PROJECT DURATION
Dec 1984 – Aug 1989

CONTRACT TYPE
Lump Sum Turn Key

CONTRACT VALUE
US$ 316 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• First Combined Cycle Power Plant Project in Turkey.

Commodity | UoM | Total
--- | --- | ---
Earthworks | m³ | 1,250,000
Concrete | m³ | 80,000
Formwork | m³ | 200,000
Reinforcing Steel | ton | 7,000
Structural Steel | ton | 8,000
Mechanical Equipment | ton | 8,000
Insulation & Paint | m² | 43,000

ENKA SCOPE OF SERVICES

Gas Turbo-sets, Gas Turbine Building, Erection of 8 Gas Turbines and Auxiliaries, Manufacturing and Erection of 8 Exhaust Ducts and Chimneys (each 35 m high), Manufacturing and Erection of 8, 125 MVA 10.5 / 380 kV Step up Transformers and Auxiliary Transformers.


Steam Turbo - Sets, Steam Turbine and Cooling Water Pumphouse Building, Erection of 4 Steam Turbines and Auxiliaries, Manufacturing and Erection of 4, 125 MVA 10.5 / 380 kV Step up Transformers and Auxiliary Transformers, Partial Manufacturing and Complete Erection of Cooling Water System, Detailed Engineering and Construction of 135 m high 120 m base diameter 2 Natural Draft Dry Cooling Tower (concrete).

Water Treatment Plant (4x25 m³/h), Building, Design, Detailed Engineering, Manufacturing and Erection and Commissioning of all facilities and equipment for Treatment of Cooling and Make-up Water.

Central Control Building, Buildings, Complete Erection of all Switchgears and Control Panels and Desks.

380 kV/154 kV Switchyard, Civil works and Steelstructure, Manufacture of Partial Equipment and Erection of the whole Switchyard, 380 kV Switchgear Building.

Infrastructure, Levelling of the Whole Area, Drainage Systems, Fire Fighting System, Cable Ducts including Cabling, Roads.

Auxiliaries, HVAC systems, Raw Water Storage Basin, Fire Fighting Building, Oil Separator, Erection of Natural Gas Pipeline, Equipment Foundations.
BURSA 1,400 MW NATURAL GAS COMBINED CYCLE POWER PLANT

PROJECT DESCRIPTION

The Japanese-Turkish consortium of MHI-ENKA-MC-ITC was awarded the contract to build a 1,400 MW natural gas fired combined cycle power plant in Bursa on a turn-key basis following a tender by TEAŞ in 1995. Using the latest technology, the Bursa Power Plant stood out as the largest and most efficient power plant of its period in Turkey.

The project encompassed all civil works, sub and superstructures, and supply of auxiliary components. The scope of works also included the supply, installation, testing and putting into operation of the mechanical and electrical systems at the power plant. The main components were supplied from Japan by MHI. The project was financed by Japanese EXIM and a number of commercial banks.

The main plant consists of two power blocks. Each has a set of two combustion turbines/generators, two heat recovery steam generators, one steam turbine/generator and one closed cooling water system with a 135 m natural draft dry cooling tower.

The total net output of the combined cycle power plant is 1,409 MW, which is achieved by four gas turbines/generators each with a nominal capacity of 239 MW and two steam turbines/generators each with a nominal capacity of 238 MW. The annual power generation capacity of the plant is 10 billion kWh.

PROJECT DETAILS

LOCATION:
Ovaakça, Bursa - Turkey

OWNER / CLIENT:
Turkish Electricity Generation & Transmission Co.Inc.

PROJECT DURATION:
May 1996-Jun 1999

CONTRACT TYPE:
Lump Sum-Turnkey

CONTRACT VALUE:
US$ 512 million

MAIN QUANTITIES:
Excavation: 1,200,000 m³
Concrete: 92,000 m³
Formwork: 255,000 m²
Reinforcing Steel: 7,500 tons
Structural Steel: 6,000 tons
Mechanical & Electrical Equip. Fabrication: 2,500 tons
Mechanical and Electrical Equip. Erection: 40,000 tons

Commodity | UoM | Total
--- | --- | ---
Earthworks | m³ | 1,250,000
Concrete | m³ | 60,000
Formwork | m² | 200,000
Reinforcing Steel | ton | 7,000
Structural Steel | ton | 8,000
Mechanical Equipment | ton | 8,000
Insulation & Paint | m² | 43,000
Sulaymaniyah 1,500 MW Combined Cycle Power Plant – Iraq

35°39'35.2"N | 44°56'28.7"E