Khabarovsk Refinery - Russia

48°30’02.6”N | 135°03’52.8”E

Derna Desalination Plant Project, Libya
Soussa Desalination Plant Project, Libya
Zawia Desalination Plant Project, Libya
Zuara Desalination Plant Project, Libya

OIL & GAS, PETROCHEMICALS

FGP 3GP Mechanical, Electrical & Instrumentation Installation Works, Kazakhstan
Civil and Underground Services Works on 3GI Plant, Kazakhstan
South Caucasus Pipeline Expansion (SCPX) Early Works & Facilities Project, Georgia
West Qurna 1 Initial Oil Train (IOT) Project, Iraq
Crude Shipment Capacity (CSC) Project, Kazakhstan
Kashagan Offshore Civil Construction Works, Kazakhstan
West Qurna 2 Fuel Gas Treatment, Power Generation & Distribution Project, Iraq
Tengiz Second Generation Plant Project (SGP), Kazakhstan
Tengiz Sour Gas Injection Project (SGI), Kazakhstan
MEI Works for Majnoon Oil Field Development, Iraq
Brownfield Works for Majnoon Oil Field Development, Iraq
North Rumaisa Crude Oil Turbo Pump Station (PS-1) Project, Iraq
Khabarovsk Refinery Hydroprocessing Project, Russia
Sakhalin II Onshore Processing Facility (OPF) Project, Russia
Sakhalin I Chayvo Onshore Processing Facility (OPF) Project, Russia
Sakhalin I De-Kastri Oil Export Terminal, Russia

POWER PLANTS & ENERGY

PJSC Nizhnekamskneftekhim 495 MW CCGT-TPP Construction Project, Republic Of Tatarstan, Russia
Misurata 650 MW Simple Cycle Power Plant Project, Libya
Tripoli West 680 MW Simple Cycle Power Plant Project, Libya
Samawa 750 MW Combined Cycle Power Plant Project, Iraq
Dhi Qar 750 MW Combined Cycle Power Plant Project, Iraq
Erbil 500 MW Conversion to CCPP Project, Iraq
Sulaymaniyah 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
Baghdad 1,500 MW Combined Cycle Power Station Project, Iraq
Bereevskaya 800 MW Coal Fired Power Plant Project, Russia
Yaya State District 411 MW Combined Cycle Power Plant Project, Russia
Zweina 570 MW Gas Turbines Power Plant Project, Libya
Awabani 640 MW Gas Turbine Power Plant Project, Libya
2,420 MW Gebze / Adapazari Natural Gas CCPP, Turkey
1,580 izmir Aliağa Natural Gas CCPP, Turkey
Rijnmond 790 MW Energy Center Project, The Netherlands
Afşin Elbistan B 1,360 MW Thermal Power Plant, Turkey
Southwest 1,830 MW Thermic Power Plants, Turkey
Trakya 1,200 MW Natural Gas Combined Cycle Power Plant, Turkey
Bursa 1,400 MW Natural Gas Combined Cycle Power Plant, Turkey

DESALINATION PLANTS

Demra Desalination Plant Project, Libya
Soussa Desalination Plant Project, Libya
Zawia Desalination Plant Project, Libya
Zuara Desalination Plant Project, Libya

POWERS & ENERGY

PISc Nizhnekamskneftekhim 495 MW CCGT-TPP Construction Project, Republic Of Tatarstan, Russia
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Tripoli West 680 MW Simple Cycle Power Plant Project, Libya
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Southwest 1,830 MW Thermic Power Plants, Turkey
Trakya 1,200 MW Natural Gas Combined Cycle Power Plant, Turkey
Bursa 1,400 MW Natural Gas Combined Cycle Power Plant, Turkey

DESALINATION PLANTS

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Soussa Desalination Plant Project, Libya
Zawia Desalination Plant Project, Libya
Zuara Desalination Plant Project, Libya

OIL & GAS, PETROCHEMICALS

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Crude Shipment Capacity (CSC) Project, Kazakhstan
Kashagan Offshore Civil Construction Works, Kazakhstan
West Qurna 2 Fuel Gas Treatment, Power Generation & Distribution Project, Iraq
Tengiz Second Generation Plant Project (SGP), Kazakhstan
Tengiz Sour Gas Injection Project (SGI), Kazakhstan
MEI Works for Majnoon Oil Field Development, Iraq
Brownfield Works for Majnoon Oil Field Development, Iraq
North Rumaisa Crude Oil Turbo Pump Station (PS-1) Project, Iraq
Khabarovsk Refinery Hydroprocessing Project, Russia
Sakhalin II Onshore Processing Facility (OPF) Project, Russia
Sakhalin I Chayvo Onshore Processing Facility (OPF) Project, Russia
Sakhalin I De-Kastri Oil Export Terminal, Russia

POWER PLANTS & ENERGY

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Tripoli West 680 MW Simple Cycle Power Plant Project, Libya
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DESALINATION PLANTS

Demra Desalination Plant Project, Libya
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Zuara Desalination Plant Project, Libya
OIL & GAS, PETROCHEMICALS

OIL, GAS & PETROCHEMICALS
POWER PLANTS & ENERGY
DESALINATION PLANTS

FEP 3GP MECHANICAL, ELECTRICAL & INSTRUMENTATION INSTALLATION WORKS, KAZAKHSTAN
CIVIL & UNDERGROUND SERVICES WORKS ON 3GI PLANT, KAZAKHSTAN
SOUTH CAUCASUS PIPELINE EXPANSION (SCPX) EARLY WORKS & FACILITIES PROJECT, GEORGIA
WEST QURNA 1 INITIAL OIL TRAIN (IOT) PROJECT, IRAQ
KASHAGAN OFFSHORE CIVIL CONSTRUCTION WORKS, KAZAKHSTAN
WEST QURNA 2 FUEL GAS TREATMENT, POWER GENERATION & DISTRIBUTION PROJECT, IRAQ
CRUDE SHIPMENT CAPACITY (CSC) PROJECT, KAZAKHSTAN
TENGIZ SECOND generation PLANT PROJECT (SGP), KAZAKHSTAN
TENGIZ SOUR GAS INJECTION PROJECT (SGI), KAZAKHSTAN
MEY WORKS FOR MAJNOON OIL FIELD DEVELOPMENT, IRAQ
BROWNFIELD WORKS FOR MAJNOON OIL FIELD DEVELOPMENT, IRAQ
NORTH RUMAILA CRUDE OIL TURBO PUMP STATION (PS-1) PROJECT, IRAQ
KHABAROVSK REFINERY HYDROPROCESSING PROJECT, RUSSIA
SAKHALIN II ONSHORE PROCESSING FACILITY (OPF) PROJECT, RUSSIA
SAKHALIN I CHAYVO ONSHORE PROCESSING FACILITY (OPF) PROJECT, RUSSIA
SAKHALIN I DE-KASTRI OIL EXPORT TERMINAL, RUSSIA
PROJECT DESCRIPTION

Senimdi Kurylys LLP, founded by ENKA İnşaat ve Sanayi A.Ş. and American Bechtel Inc. with equal shares has been awarded a contract for mechanical, electrical and instrumentation installation works in Tengiz, Kazakhstan. The Client is Tengizchevroil (TCO) who operates and develops Tengiz oil field, a joint venture (JV) with shares owned by Chevron (50%), ExxonMobil (25%), KazMunayGas (20%) and LukArco (5%). The project covers the construction works related with the crude processing plant, module stacking, sour water stripper and utilities areas. Contract commenced in May 2018 with a project duration of 45 months. The project will increase the Tengiz oil field’s annual oil production capacity by an additional 12 million tonnes and the field’s overall production capacity will increase to 39 million tonnes per annum. The project will be constructed using a modularized construction strategy with modules constructed both at Kazakh coastal fabrication yards and at other fabrication yards in Europe / Far East.

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<th>Commodity</th>
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<tr>
<td>Structural Steel</td>
<td>ton</td>
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<td>A/G Piping</td>
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<td>5,358</td>
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<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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</table>

PROJECT DESCRIPTION

ENKA, with its JV partner Bechtel, has signed a new contract with TCO for the execution of Civil and Underground Services Works on 3rd Generation Injection (3GI) Plant facilities in Tengiz, Kazakhstan. The Client is Tengizchevroil (TCO) who operates and develops Tengiz oil field, a joint venture (JV) with shares owned by Chevron (50%), ExxonMobil (25%), KazMunayGas (20%) and LukArco (5%).

ENKA SCOPE OF SERVICES

BEJV (Bechtel-ENKA) will carry out following activities on this project: Pile head treatment, Site excavation and fill to the required level, Excavation to the foundation levels including dewatering as required, Construction of foundations, Construction of concrete paved areas, Construction of roads, Installation of the underground utilities systems including: Contaminated surface water sewer, Sanitary sewer, Linear trench soakaway, Fire-fighting water, Technical water, Drain trenches for hydrocarbons, Duct banks for electrical and instrument cables, Installation and termination of underground cables: Power, Instrumentation, Telecoms, Security, Fibre optic, Grounding; Installation of grounding / earthing Materials; All required cable protection.
ENKA

SOUTH CAUCASUS PIPELINE EXPANSION (SCPX) EARLY WORKS & FACILITIES

PROJECT DETAILS

LOCATION
Gardabani, Tsalka, Vale - Georgia

OWNER / CLIENT
South Caucasus Pipeline Company (SCPC) (a Consortium between BP (Technical Operator), SOCAR, TAPCO, Patinoros; Lukoil, and NICO)

PROJECT DESCRIPTION
The South Caucasus Pipeline (SCP) is a natural gas pipeline built to export Shah Deniz gas from Azerbaijan to Georgia and Turkey. The 42" pipeline starts from the Sangachal terminal near Baku and follows the route of the Baku-Tbilisi-Ceyhan (BTC) crude oil pipeline through Azerbaijan and Georgia to Turkey, where it is linked to the Turkish gas distribution system. The length of the pipeline is 691 km, with 443 km in Azerbaijan and 248 km in Georgia and the system design capacity is 7 bcm.

The expansion of the South Caucasus Pipeline (SCPX) is part of the Shah Deniz Full Field Development Project. This expansion involves the laying of new pipeline across Azerbaijan and the construction of two new compressor stations and a Pressure Reduction and Metering Station (PRMS) in Georgia. This will triple the gas volumes exported through the pipeline to over 20 billion m³ per year.

ENKA (with its Joint Venture partners Bechtel) is contracted by SCP Co. for all early works required and construction of Compressor Station Georgia-1 & 2 (CSG-1 & CSG-2) and the Pressure Reduction and Metering Facility (AREA 81) in Georgia. The scope also includes the construction of a 15 km Access Road to CSG-2 and brownfield modifications within the existing facilities of the SCP Pipeline.

UNIQUE CHALLENGES
The Project sites are located remotely, requiring ENKA 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 is a large, flat, straight sided pastoral field with heavy, loamy clay soil that is susceptible to seasonal flooding. CSG-2 site is located west of Lake Tsalka at an altitude of approximately 1,700 m above sea level. The AREA 81 site is located in a valley close to the Georgia – Turkey border. CSG-2 and AREA 81 locations have cold winters with snow cover for about 90 days, long mild summers and moderately high rainfall. Construction works are scheduled carefully considering the seasonal challenges and winterization measures are allowed and planned as required for an uninterrupted execution.

ENKA SCOPE OF SERVICES
Through carefully prepared management plans and method statements, ENKA shall ensure minimum disruption to the wild life, environment and communities surrounding the project locations. Temporary works areas shall be reinstated to near original condition upon completion of construction.

ENKA’s scope comprises of all related early civil works and construction of two compressor stations (CSG-1 and CSG-2) and a pressure reduction and metering station (AREA 81) at three different locations. The scope also includes the construction of a 15 km Access Road from the existing Millenium Highway to CSG-2 and brownfield modifications within the existing facilities of the SCP Pipeline.

CSG-1 will consist of a pig traps capable of launching and receiving 48" pipeline integrity gauges (PIG), four gas turbine driven compressors (216 MW) and two gas turbine generators (4.5 MW). A portion of the gas received from Azerbaijan will be filtered and heated to be used as fuel gas for the compressor turbines and gas turbine generators and the rest will 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 in an 80 m high-pressure vent stack in an emergency and for maintenance. ENKA scope of work includes erection of 8 process buildings, a gate house and installation and pre-commissioning of piping, E&I, Telecomms and all process equipment.

CSG-2 will consist 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. The Georgian Offtake is at the MS-72 facility that is adjacent to CSG-1. 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 will be an extension to the existing SCP PRMS facility, known as AREA 80. It will consist 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 includes 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 will normally be operated from Sangachal Terminal in Azerbaijan, but facilities shall have local emergency shutdown and safety systems that enable turbines and compressors to be shut down or started up locally.
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 Exxon Mobil Corporation, signed an agreement with the South Oil Company of the Iraq Ministry of Oil to rehabilitate and redevelop the West Qurna 1 field. Located approximately 50 kilometers north-west of Basra, the Field currently produces around 400 kbopd through existing facilities located at DS-6, 7 and 8.

EMIL has 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 shall be 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 shall be 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 shall bring 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 shall be ENKA’s top priority.

The plant shall be designed based on the concept of modular packages and modular erection as reasonably as practical within logistics constraints. The majority of the equipment shall be designed and fabricated in modular skids. The pipe racks will be 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 shall be utilized for the project. With extensive planning and proper interface management, ENKA shall minimize the disruption and ensure seamless execution.

ENKA SCOPE OF SERVICES

ENKA, together with its regional partner, shall carry out and complete Front End Engineering Design (FEED), Detailed Design Engineering, Procurement, Fabrication, Construction, Commissioning, Start-up and Handover scopes for the Facility, including process systems such as crude heating and crude desalting, non-process facilities, flare system, fire protection, all required utilities, stand-by power generation, instrumentation and controls, telecommunications and interfaces. Additionally, ENKA shall provide the required support deemed to be necessary with respect to ongoing permitting and regulatory efforts.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UoM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Works</td>
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</tr>
<tr>
<td>Concrete</td>
<td>m³</td>
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</tr>
<tr>
<td>Structural Steel</td>
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<td>396</td>
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<tr>
<td>A/G Piping</td>
<td>ton</td>
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<tr>
<td>Cabling</td>
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<td>178,887</td>
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<tr>
<td>Mechanical Equipment</td>
<td>ton</td>
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</tbody>
</table>
TENGIZ CRUDE SHIPMENT CAPACITY (CSC) PROJECT

PROJECT DETAILS

LOCATION:
Tengiz - Kazakhstan

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

PROJECT DURATION:
July 2014 – Mar 2019

CONTRACT TYPE:
Lump Sum

CONTRACT VALUE:
US$ 440 million

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

PROJECT DESCRIPTION

Tengizchevron (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 Tengizchevron’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 will 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 Tengizchevron in Tengiz, Kazakhstan. BEJV was contracted to carry out the engineering, procurement and construction works of the CSC project.

Commodity | UoM | Total
--- | --- | ---
Floating Roof | ea | 3
Fixed Roof | ea | 1
Crude Oil Storage Tanks | ea | 4
Piping Fabrication and Erection | km | 21
Cabling | km | 640
Cable Tray Installation | km | 25
Structural Steel Erection | ton | 814

Major Quantities
KASHAGAN OFFSHORE CIVIL CONSTRUCTION WORKS

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 jobite. 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>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>
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<tr>
<td>Commodity</td>
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</table>

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. There 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 six months of the year due to thick winter ice.

ENKA İNŞAAT VE SANAYİ A.Ş.

LOCATION
Kashagan, North Caspian Sea - Kazakhstan

OWNER / CLIENT
Agip Kazakhstan North Caspian Operating Company N.V.

PROJECT DURATION
Apr 2005 – Oct 2012

CONTRACT TYPE
Call-off based on unit price rates

CONTRACT VALUE
US$ 1.5 billion

SIGNIFICANT FEATURES / ACCOMPLISHMENTS
• Accomplished the promotion
• Contributed to promotion
• Provided significant training
• Achieved 80% Kazakh content
• Raised awareness relating to communal facilities

UNIQUE CHALLENGES

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ENKA İNŞAAT VE SANAYİ A.Ş.
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 kVpd 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 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.

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.

PROJECT ACCOMPLISHMENTS

- Provided significant design margins and redundancy requirements.
- Achieved 40% Iraqi content
- Provided significant training opportunities and transferred local craft workers with little or no disciplined industrial construction work experience into productive workers.
- Established a comprehensive health, safety, environment, security and quality amongst direct hired personnel and subcontractors.
- Provided significant health, safety, environment, security and quality amongst direct hired personnel.
- Provided significant health, safety, environment, security and quality amongst direct hired personnel and subcontractors.
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PROJECT DESCRIPTION

The Second Generation Plant (SGP) Project was the main component of Tengiz- chevroil’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 features of the area was carefully addressed by implementing a robust HSE program by law were managed through a substantial craft training program. The brown field

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.

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<th>Commodity</th>
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</table>

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

The crude stabilization 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 (HREGs) 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.
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 re-injecting produced sour gas back into the reservoir. Major new facilities included a sour gas injection plant and eight injection wells associated with appropriate 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 (77% 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 reservoir at 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 workforce that was predominantly local craft with little or no disciplined industrial construction work experience, converted the sweet gas injecting plant into an operational plant working with sour gas. ENKA also successfully utilized turnaround works that matured the sweet gas injection plant into an operational plant working with sour gas.

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 sweet gas injection plant into an operational plant working with sour gas.

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PROJECT DETAILS

LOCATION
Tengiz - Kazakhstan

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

EPC CONTRACTOR
PFD International LLP

PROJECT DURATION
Nov 2003 - Nov 2006

CONTRACT VALUE
Lump Sum and Unit Rates

US$ 77 million

CONTRACT TYPE

• Utilized world class operations personnel provided by ENKA Power (ENKA Subsidiary) to install the injection compressor with all the accessories, sealants, etc. and to pre-commission the plant successfully in two stages as described above.

• Provided significant training
• Achieved 75% Kazakh content.
• The SGI/SGP Projects increased the oil/gas separation area of SGP. The SGI project established a compressor and associated piping systems capable of delivering sour gas into the reservoir. Major new facilities included a sour gas injection plant and eight injection wells associated with appropriate equipment and facilities.

• Installed a compressor and associated piping systems capable of delivering sour gas (17% H₂S) into the reservoir at 10,000 PSI in a way that is both safe and dependable.

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

• ENKA had also successfully executed turnaround works that converted the sweet gas injecting plant into an operational plant working with sour gas.

“Installed a compressor and associated piping systems capable of delivering sour gas (17% H₂S) into the reservoir at 10,000 PSI”

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ENKA İNŞAAT VE SANAYİ A.Ş.

ACCOMPLISHMENTS:

- CONTRACT VALUE: US$ 208 million
- CONTRACT TYPE: All in Unit Rate
- PROJECT DURATION: Jul 2011 – Dec 2013
- OWNER / CLIENT: Majnoon Oil Field, Basra - Iraq
- LOCATION: 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.

PROJECT DETAILS

- LOCATION: Majnoon Oil Field, Basra - Iraq
- OWNER / CLIENT: Majnoon Oil Field Development
- PROJECT DURATION: Jul 2011 – Dec 2013
- CONTRACT TYPE: All in Unit Rate
- CONTRACT VALUE: US$ 208 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:

- Largest greenfield central processing facility to be built in Iraq since the last decade.
- Commercial production targets planned for the field were achieved, allowing the Owner to begin exports.
- The increase in production is providing revenues that could enable further regeneration of Iraq.
- 3 million workhours without a Lost Time Incident.
- Provided significant training opportunities and turned many local craft workers into productive labour force.
- Achieved 51% Iraqi content on project labor headcount.

WORKS FOR MAJNOON OIL FIELD DEVELOPMENT

- MEI (MECHANICAL, ELECTRICAL, INSTRUMENT AND TELECOMMUNICATION)
- 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 pre-fabricated 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.

- ENKA SCOPE OF SERVICES

Commodity | UoM | Total
--- | --- | ---
Structural Steel Works | ton | 1,600
Piping | ton | 2,500
Mechanical Installations | ton | 4,000
Module Erection | ton | 1,000
Field Erected Storage Tanks | ton | 1,000
Cabling | m | 1,000,000
Painting & Insulation | m² | 20,000

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.
BROWNFIELD WORKS FOR MAJNOON OIL FIELD DEVELOPMENT

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.

CONTRACT VALUE:

US$ 39 million

CONTRACT TYPE:

Rates Reimbursable with Fixed Day Rates

PROJECT DURATION:

Jul 2012 – Dec 2013

OWNER / CLIENT:

Majnoon Oil Field, Basra - Iraq

LOCATION:

BROWNFIELD WORKS FOR MAJNOON OIL FIELD DEVELOPMENT

• 751 thousand workhours
• Raised awareness relating to health, safety, environment, security and quality amongst direct hired personnel and subcontractors
• 751 thousand workhours without a Lost Time Incident

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.

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**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 m$^3$ 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 6,100 m$^3$/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.
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.

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 450,000 meters of cable, performed 87,000 square meters of painting works, and over 55,000 square meters of insulation works.

**PROJECT DESCRIPTION**

The Khabarovsk Refinery Hydroprocessing 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.

**UNIQUE CHALLENGES**

- 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

ENKA SCOPE OF SERVICES

- Steel Structure Erection: 4,820 ton
- Piping Prefabrication and Erection: 3,180 ton
- Mechanical Installations: 3,000 ton
- Cable Ladder / Cable Trays: 54,950 m
- Cable Laying Works: 466,500 m
- Painting: 89,900 m²
- Pipe Insulation: 57,900 m²
- Equipment Insulation: 4,450 m²

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SAKHALIN II ONSHORE PROCESSING FACILITY (OPF) PROJECT

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 Lunkskoye 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 are delivered via separate pipelines to an onshore processing facility (OPF) located near the Lunkskoye 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 include 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 is designed to be an entirely self-sufficient stand-alone facility. Utility systems installed at the OPF include flares, drainage, instrument/utility air, sewage treatment, potable and utility water, fuel gas and diesel, HVAC, chemical injection, fire water, and waste heat recovery systems. 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.

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."

"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."

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.
ENKA İNŞAAT VE SANAYİ A.Ş.

SAKHALIN II ONSHORE PROCESSING FACILITY (OPF) PROJECT

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 m³ of excavation, fill and road construction; 90 km of pipe diameters varying between 600-800 mm; 80,000 m³ of concrete, 28 km of underground pipe laying; 7,500 tonnes of steel structure production and installation; 1.85 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-landing 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.

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

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 m$^3$ 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 m$^3$ (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 insualtion.

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 663 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.

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 Khabarovsk Region of Russia.

De-Kastri site teams achieved an outstanding performance during very harsh four winters including the mobilization phase, which leaded the final destination of entire Sakhalin 1 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.
PISCU NIZHNEKAMSKNEFTEKHIM 495 MW COMBINED CYCLE GAS TURBINE THERMAL POWER PLANT (CCGT-TPP) CONSTRUCTION PROJECT, REPUBLIC OF TATARSTAN, RUSSIA
MIKHARATA 650 MW SIMPLE CYCLE POWER PLANT PROJECT, LIBYA
TRIPOULI WEST 880 MW SIMPLE CYCLE POWER PLANT PROJECT, LIBYA
SAMAWA 750 MW COMBINED CYCLE POWER PLANT PROJECT, IRAQ
DI DAN 750 MW COMBINED CYCLE POWER PLANT PROJECT, IRAQ
ERbil 500 MW CONVERSION TO CCPP PROJECT, IRAQ
SULAYMANIAH 500 MW CONVERSION TO CCPP PROJECT, IRAQ
NA'YYRA 500 MW GAS TURBINE POWER PLANT PROJECT, IRAQ
BAZ'YAN 500 MW SIMPLE CYCLE POWER PLANT PROJECT, IRAQ
BAGHDAAD 1,500 MW CCPP PROJECT, IRAQ
BEREZOVSKAYA 800 MW COAL FIRED POWER PLANT PROJECT, RUSSIA
YA'AYA 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
GE'ZE' / ADAPAZARI NATURAL GAS CCPP, TURKEY
IZMIR ALIAGA NATURAL GAS CCPP, TURKEY
RIJNMOND 790 MW ENERGY CENTER PROJECT, THE NETHERLANDS
AFŞIN ELBISTAN B 4 X 360 MW THERMAL POWER PLANT, TURKEY
SOUTHWEST 1,830 MW THERMIC POWER PLANTS, TURKEY
TRAKYA 1,200 MW NATURAL GAS CCPP, TURKEY
BURSA 1,400 MW NATURAL GAS CCPP, TURKEY
**PROJECT DESCRIPTION**

The project is located in the Nizhnekamskneftekhim Petrochemical Plant, in the southeastern part of the city of Nizhnekamsk, on the left bank of Kama river, in the Republic of Tatarstan, Russia.

The project aims at turnkey construction of a new 495 MW combined cycle gas turbine thermal power plant (CCGT-TPP) and its power connection infrastructure.

The CCGT-TPP will have a configuration of two gas turbines, one steam turbine, two heat recovery steam generators, and one natural draft cooling tower.

Main fuel for the CCGT-TPP will be synthetic gas that is byproducts from Nizhnekamskneftekhim production processes, and natural gas will be used as standby fuel.

**ENKA SCOPE OF SERVICES**

ENKA scope includes the entire EPCC scope except supply of the Gas and Steam Turbines and high voltage connections of the Plant to the Grid, which are under Siemens OOO scope.

Engineering survey works; site preparation; development of design documentation; state expert review; construction permit with the Customer’s support (representing Customer in authorities and General Contractor’s related documents preparation); development of detailed design; dismantling, demolition and relocation of the existing utility lines, buildings and structures; procurement; certification; transportation; customs clearance; construction, erection, start up, testing and commissioning; training; on-site road construction; landscaping; as-built documentation and operational documentation; certificate of conformance; start up permit with the Customer’s support (representing Customer in authorities and General Contractor’s related documents preparation); defects liability.

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**PROJECT DETAILS**

**LOCATION**
The city of Nizhnekamsk, the Republic of Tatarstan - Russia

**OWNER / CLIENT**
Public Joint-Stock Company “Nizhnekamskneftekhim” (A member of TAIF Group)

**PROJECT DURATION**
Dec 2017 - Apr 2021

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**PROJECT DESCRIPTION**

ENKA and its partner Siemens are to design and build the Misurata and Tripoli West Simple Cycle Power Plants in Libya.

The Misurata plant is to add 650 MW and the Tripoli West plant 680 MW to the grids operated by the state-owned General Electricity Company of Libya.

The Misurata project is located in the area of an existing power plant in Misurata, 200 km east of Tripoli, whereas the Tripoli West project is located in the area of the existing Tripoli West Power Plant, 30 km west of Tripoli city center.

The Misurata project is based on a power island configuration for two SGT5-PAC 4000F Siemens combustion turbine generator units, whereas the Tripoli West project is based on a power island configuration for four SGT5-PAC 2000E Siemens combustion turbine generator units.

The turbines of the plants will be dual-fuel fired with light fuel oil and natural gas. The power generated in the turbines will be stepped up to the grid through main transformers.

As fast track projects, the plants are scheduled to enter commercial operation within 62 weeks of the commencement date.

**ENKA SCOPE OF SERVICES**

Siemens is responsible for the procurement of the gas turbines and auxiliaries, while ENKA is to undertake the overall power plant engineering works, the procurement of all equipment other than the said parts of the main power block, and the completion of all construction, assembly and other works, as well as the commissioning and start-up of the plants.
ENKA İNŞAAT VE SANAYİ A.Ş.

PROJECT DETAILS

January 2017

The contract is signed on 01.01.2017.

ACCOMPLISHMENTS:

SIGNIFICANT FEATURES /

US$ 562 million

CONTRACT VALUE:

Lump Sum-Turnkey

CONTRACT TYPE:

Phase 2 - May 2019 - Feb 2022
Phase 1 - Mar 2019 - Dec 2020

PROJECT DURATION:

Ministry of Electricity of Iraq

OWNER / CLIENT:

Samawa - Iraq

LOCATION:

SAMAWA 750 MW COMBINED CYCLE POWER PLANT PROJECT

ENKA, with its partner General Electric, will design and build the Samawa Combined Cycle Power Plant, which will add 750 MW to the Iraqi Grid. The project is located near Samawa City, 239 km northwest of Basra, in southern Iraq.

The gas turbines were purchased by Ministry of Electricity of Iraq as part of Mega Deal between Government of Iraq from GE and will be handed over to GE-ENKA for installation and commissioning. These units are the last gas turbines of the Mega Deal to be installed. All other materials and equipment shall be purchased and shipped to Iraq by GE-ENKA.

The project will consist of 1 power block, which will produce 750 MW of power at 132 and 400 kV transmission levels. It will include four (4) GE 9E series combustion turbine generators which will be able to fire three (3) types of fuels. The main fuel will be the Heavy Fuel Oil (HFO) and the back-up fuels will be Light Distillate Oil (LDO) and Natural Gas. The design of the equipment will be suitable for operating 24-hours/day, 7-days/week with useful life of 25 years.

The plant will be the first combined cycle project of that will be owned and operated by the Ministry of Electricity. The thermal efficiency will be above 50%, which will help Iraq to save 14 billion m$^3$ of natural gas, and 32 million tons CO$^2$ over 25 years.

The financing of the Project shall be arranged by Overseas Private Investment Corporation (OPIC) and Export Credits Guarantee Department of UK Government (UKEF).

ENKA SCOPE OF SERVICES

Engineering, Procurement of Balance of Plant (BoP), Construction, Erection, Commissioning and Start-up of the power plant, whereas GE will provide the Power Island Equipment (i.e. Steam Turbine Generator (STG), Heat Recovery Steam Generator (HRSG), Air Cooled Condenser (ACC) and Main Transformers), Distributed Control System (DCS) & Switchyard and the plant performance tests.

ENKA, with its partner General Electric, will design and build the Dhi Qar Combined Cycle Power Plant, which will add 750 MW to the Iraqi Grid. The project is located near Nasiriyah City, 230 km northwest of Basra, in southern Iraq.

The gas turbines were purchased by Ministry of Electricity of Iraq as part of Mega Deal between Government of Iraq from GE and will be handed over to GE-ENKA for installation and commissioning. These units are the last gas turbines of the Mega Deal to be installed. All other materials and equipment shall be purchased and shipped to Iraq by GE-ENKA.

The project will consist of 1 power block which will produce 750 MW of power at 132 and 400 kV transmission levels. It will include four (4) GE 9E series combustion turbine generators which will be able to fire three (3) types of fuels: The main fuel will be the Crude Oil (CO) and the back-up fuels will be Light Distillate Oil (LDO) and Natural Gas. The design of the equipment will be suitable for operating 24-hours/day, 7-days/week with useful life of 25 years.

The plant will be the first combined cycle project of that will be owned and operated by the Ministry of Electricity. The thermal efficiency will be above 50%, which will help Iraq to save 14 billion m$^3$ of natural gas, and 32 million tons CO$^2$ over 25 years.

The financing of the Project shall be arranged by Overseas Private Investment Corporation (OPIC) and Export Credits Guarantee Department of UK Government (UKEF).

ENKA SCOPE OF SERVICES

Engineering, Procurement of Balance of Plant (BoP), Construction, Erection, Commissioning and Start-up of the power plant, whereas GE will provide the Power Island Equipment (i.e. Steam Turbine Generator (STG), Heat Recovery Steam Generator (HRSG), Air Cooled Condenser (ACC) and Main Transformers), Distributed Control System (DCS) & Switchyard and the plant performance tests.
ENKA İNŞAAT VE SANAYİ A.Ş.
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e-mail: enka@enka.com | web: www.enka.com

PROJECT DETAILS

ENKA İNŞAAT VE SANAYİ A.Ş.

PROJECT DESCRIPTION

ENKA executed design, procurement, installation and start-up of eight HRSGs, two nominally rated 250 MW STGs, 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.

ENKA SCOPE OF SERVICES

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ERBIL 500 MW CONVERSION TO COMBINED CYCLE POWER PLANT PROJECT

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 Iraq 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.

The US based engineering subcontractor could not send their engineers to the site due to the security concerns. By organizing regular video conferences ENKA kept the designers up to date and involved in the site day-to-day activities. Another challenge was to obtain residency permits, which took more time than originally anticipated.

Logistics was also one of the major challenges of the project, including not only the delays and obstacles in transportation due to force majeure events near the Turkish - Iraqi border but also the frequently changing Iraqi Customs regulations was also successfully managed with no effect to contract schedule although 51 thousand tons of project materials and equipment had been brought to the site.
SULAYMANIYAH 500 MW CONVERSION TO COMBINED CYCLE POWER PLANT PROJECT

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 O&M personnel who will be operating and maintaining the plant.

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.

PROJECT DURATION

July 2013 – July 2016

CONTRACT VALUE:

Lump Sum Turn Key

OWNER / CLIENT:

Sulaymaniyah, Kurdistan Region of Iraq

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:

- Sulaymaniyah Combined Cycle Power Project is designed to run on two types of fuel, mainly natural gas, and diesel fuel as standby. The Natural Gas is reaching the station via pipelines from Khor Mor gas field station, while the diesel is transported to the plant via mobile trucks. Then the diesel is purified and treated before it can be used for the turbines.
- The Natural Gas is reaching the station via pipelines from Khor Mor gas field station, while the diesel is treated and stored before it can be used for the turbines.
- A 3 million workhours without a Lost Time Incident
- Global Best Project of 2017 by Engineering News Record (ENR) under the Power/Industrial category

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 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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NAJYBIAH 500 MW GAS TURBINE POWER PLANT PROJECT

LOCATION
Al Najybiah, Basra - Iraq

OWNER / CLIENT
Ministry of Electricity, Iraq

PROJECT DURATION
May 2013 – May 2015

CONTRACT TYPE
Lump Sum Turn Key

CONTRACT VALUE
US$ 271 million

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 provided Iraqis in Basra and on the national grid with more hours of electricity per day
• Part of largest power investment (Mega Deal) by Iraqi government in the post war era

PROJECT DESCRIPTION
The Najybiah 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.

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

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 northern part of Basra province 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 Kasktas have installed Ø800mm piles over 65,000 meters in total length.

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 and structural steel, fuel gas supply and regulating station, all HFO (raw, treated, certified) and LFO fuel tanks (2 ea x 9,050 m³, 2 ea x 4,540 m³, 2 ea x 1,125 m³, 2 ea x 3,245 m³ steel tanks), unloading, metering and fuel treatment systems, auxiliary boiler system, 400 kV and 132 kV GIS systems with step-up transformers, MV and LV substation with auxiliary transformers, instrument and plant air supply systems, black start and emergency diesel generators, fire protection, detection, alarm and extinguishing systems, water storage, pre-treatment and demineralization plant, plant air and ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), complete piping and field instrumentation, mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant.

ENKA further provided training for the Operation and Maintenance (O&M) personnel who will be operating and maintaining the plant.

Type of Plant: Simple Cycle Power Plant
Capacity: 500 MW
Type of Fuel: Heavy fuel oil (HFO) will be used as main fuel for CTG operation whereas; fuel gas and light distillate oil (LDO) will be used as back-up fuels.
Configuration: 4x125 MW
Gas Turbine Generator: General Electric Unit - 4 Sets, Model 9E Model, Rating Per Unit: 125 MW

ENKA SCOPE OF SERVICES

NAJYBIAH 500 MW GAS TURBINE POWER PLANT PROJECT

Location and high temperatures during summer months created unique challenges for the project workforce peaked at 1,400 people. ENKA set up and maintained a safe and high quality job site inclusive of a good camp 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 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 Kasktas have installed Ø800mm piles over 65,000 meters in total length.

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 and structural steel, fuel gas supply and regulating station, all HFO (raw, treated, certified) and LFO fuel tanks (2 ea x 9,050 m³, 2 ea x 4,540 m³, 2 ea x 1,125 m³, 2 ea x 3,245 m³ steel tanks), unloading, metering and fuel treatment systems, auxiliary boiler system, 400 kV and 132 kV GIS systems with step-up transformers, MV and LV substation with auxiliary transformers, instrument and plant air supply systems, black start and emergency diesel generators, fire protection, detection, alarm and extinguishing systems, water storage, pre-treatment and demineralization plant, plant air and ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), complete piping and field instrumentation, mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant.

ENKA further provided training for the Operation and Maintenance (O&M) personnel who will be operating and maintaining the plant.

Type of Plant: Simple Cycle Power Plant
Capacity: 500 MW
Type of Fuel: Heavy fuel oil (HFO) will be used as main fuel for CTG operation whereas; fuel gas and light distillate oil (LDO) will be used as back-up fuels.
Configuration: 4x125 MW
Gas Turbine Generator: General Electric Unit - 4 Sets, Model 9E Model, Rating Per Unit: 125 MW

PROJECT DESCRIPTION
The Najybiah 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.

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

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 northern part of Basra province on the banks of Shatt Al Arab River in a relatively high populated area. ENKA, while executing the work, successfully managed cultural relations with locals to avoid any clashes and maintained good relations with its neighbors.

"1 million workhours without a Lost Time Incident"
PROJECT DESCRIPTION

The Qaiwan Group awarded ENKA the Bazyan Simple Cycle Power Plant Project on an 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 job site 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.

“Ability to supply of 15 days (47,000 m³) fuel oil on site.”
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 will consist of 2 power blocks which will produce 1,500 MW of power at 400 kV transmission level. Each block will consist of two (2) GE 9F series combustion turbine generators which may 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 will be directed to Heat Recovery Steam Generators and the steam produced will drive a Steam Turbine Generator. Waste heat will be rejected using a combination of fin-fan coolers and wet cooling tower equipment. Other facilities which will 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.

The plant is ready to produce power from the Simple Cycle Phase.

UNIQUE CHALLENGES

The project is being 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 shall result in the total loss of the unit generating capability. ENKA’s engineering team is working on the plant design to satisfy all of Owner’s needs and mitigating 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 is not possible to rely on the existing infrastructure in the area. Therefore, ENKA has established a self-sufficient temporary construction facilities complex at the jobsite to sustain construction works without any disruption or interruption.

PROJECT DETAILS

LOCATION
Baghdad - Iraq

OWNER / CLIENT
Mass Group Holding Ltd.

PROJECT DURATION
Oct 2014 – Feb 2018

CONTRACT TYPE
Lump Sum Turn Key

CONTRACT VALUE
Confidential

SIGNIFICANT FEATURES / ACCOMPLISHMENTS

- First IPP Project in Central Iraq
- The project will help in the Iraqi capital and surroundings.
- Improving the living conditions needs of Baghdad and addressing the urgent power loss of the unit generating capability. ENKA’s engineering team is working on the plant design so that no single failure of an auxiliary plant component shall result in the total collapse of the plant.

TYPE OF PLANT

Combined Cycle Power Plant

CAPACITY
1,500 MW

TYPE OF FUEL
Primary: Fuel Gas; Back up: Diesel

CONFIGURATION
2x(2x2x1)

GAS TURBINE GENERATOR
General Electric Unit: 4 Sets, Model: 9FA.03, Rating Per Unit: 265 MW

STEAM TURBINE GENERATOR
General Electric Unit: 2 Sets, Model: D200 33.5'' LSB, Rating Per Unit: 250 MW

HRSG
CMI Unit: 4 Sets, Type: Vertical - 2 Stages-HP, LP, with diverter damper and by-pass stack (101.48kg/s at 536.53°C Rating: 708kg/s at 242.16°C)

COOLING TYPE
Combination of Fin Fan Coolers and Wet Cooling Tower

Wet Cooling Tower Capacity (52,626 kg/s, 14 cells)

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ENKA SCOPE OF SERVICES

ENKA’s scope of work consists 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 will be made up of 4 GE 9F 3-series gas turbines and all auxiliaries. The combined cycle part of the plant will consist 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.

One of the major challenges of the project is to work in a social environment suffering civil violence and instability. ENKA has prepared and is implementing 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, countermeasures 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 is to provide a secure environment for staff, operators and subcontracts 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 will be shipped to the jobsite through congested Umm Qasr port and partially northern routes. Significant planning and route surveys are 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 is a major challenge. ENKA shall leverage 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.

OVERALL SUMMARY

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

ENKA İNŞAAT VE SANAYİ A.Ş.
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.

ENGAproekt of Russia was initially selected as the EPC contractor, however later in the project, E.ON Russia took the responsibility and self-managed the project until the end.

ENKA SCOPE OF SERVICES

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 joints 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

LOCATION:
Sharypovo, Krasnoyarsk Region - Russia

OWNER / CLIENT:
E.ON Russia

PROJECT DURATION:
Jun 2012 – Sep 2015

CONTRACT TYPE:
Cost Plus Fee

CONTRACT VALUE:
US$ 172 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• 9.24 million workhours without Lost Time Incident
• Construction of the third power block of 800 MW capacity resumed after 20 years of a halt due to the collapse of the Soviet Union.
• Plant capacity increased to 2,400 MW.
• Berezovskaya Power Plant is the only power plant in Russia with 800 MW power units where coal is used as fuel, all the rest of the heat power plants with same power units are operated using gas.
• Being fed with brown coal from the open pit mine that is 14 km away, Berezovskaya Power Plant is vital for development of the Eastern Siberia’s power industry.

UNIQUE CHALLENGES

Majority of the erection works at the Berezovskaya Power Plant Project were carried on inside a 72m x 81m x 117m (height) enclosed building right next to two operating coal fired units. Inevitably; i) the works were executed at extreme heights causing safety hazards and, ii) coal dust from operating blocks was present at the work places, that endanger health of the workers. ENKA overcame these hazards by prioritizing HSE in mutual cooperation with the Owner. Another challenge faced due to working inside an enclosed building was that the work fronts were limited due to specific erection sequences which also brought about interfaces between crews executing different lines of works. ENKA was able to manage this by proper planning of the works. Further, even though the erection was being done inside a closed building, the erection sequence and the erection methods governed that in order to minimize the number of lifts (circa 2,000 ea with weight of lifted blocks differing from 50 kg to 185 tons), the elements were to be preassembled to blocks of maximum liftable weights and sizes. Hence the preassembly works were mainly executed outdoors, which required ENKA to use its vast winterization experience.
ENKA İNŞAAT VE SANAYİ A.Ş.

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e-mail: enka@enka.com | web: www.enka.com

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YAYVA 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, 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.

ENKA has said that the project is one of the nation’s best projects. The project was completed on the original contract schedule without a Lost Time Incident (LTI) and in full compliance with international and applicable Russian norms, standards and permits. ENKA established a Russian documentation team, in the early stages of the project, working closely with the Owner as a true project partner consistent responding to their concerns and preferences, as well as complying with the local norms and regulations.

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.

PROJECT DESCRIPTION

The Yajva Combined Cycle Natural Gas Power Plant Project consisted of a single shaft Siemens 1x3GCCS-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 was selected as the EPC contractor by the Owner.

UNIQUE CHALLENGES

Yajva CCPP 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 Glasgovekspertza 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 Roctestndor (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 was selected as the EPC contractor by the Owner.

PROJECT DETAILS

LOCATION

Yajva District, Perm Region - Russia

OWNER / CLIENT

E ON Russia

PROJECT DURATION

Jul 2008 - Aug 2011

CONTRACT TYPE

Lump Sum Turn Key

CONTRACT VALUE

US$ 460 million

SIGNIFICANT FEATURES / ACCOMPLISHMENTS

- 203 million workhours without a Lost Time Incident
- ENKA with this project, has been awarded the Best Global Project Prize in the Power & Industrial category in 2013 Global Best Projects competition of the renowned Engineering News Record (ENR) magazine.
- The project was completed before the original contract schedule, within original budget as well as in full compliance with international and applicable Russian norms, standards and permits.
- Main plant equipment were manufactured according to European standards and needed approval for compliance with Russian standards and norms.
- ENKA workforce reached to 860 people during the peak periods of the Project.

E N K A

SCOPE OF SERVICES

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

“Best Global Project Prize in the Power & Industrial category in 2013 Global Best Projects competition of the renowned Engineering News Record (ENR) magazine.”

Type of Plant

Combined Cycle Power Plant

Capacity

411 MW

Type of Fuel

Natural Gas

Configuration

1x1x1

Gas Turbine Generator

Siemens Unit: 1 Set, Model: SGTF-4000F, Rating Per Unit: 300 MW

Steam Turbine Generator

Siemens Unit: 2 Set, Model: SST5-3000, Rating Per Unit: 125 MW

HRSG

CMI Unit: 1 Set, Type: Vertical Natural Circulation type Un-fired boiler, 2,367,520 kg/h

Cooling Type

Wet type mechanical draft Cooling Tower (12,620 kg/s, 14 cells)

Commodity

UoM

Total

Structural concrete

m³

11,426

Piling

ea

1,787

Steel Structure Erection

ton

3,074

Piping Prefabrication & Erection

ton

959

Main Equipment

ton

5,906

Other Equipment Installation

ton

249

Siding & Roofing

m²

22,964

Cabling

km

357

Conduits, cable trays, ladders

km

19

Terminations

ea

61,305

Major Quantities
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 SGT5-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.

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ENKA SCOPE OF SERVICES

ENKA Teknik’s (a fully owned subsidiary of ENKA) scope as the EPC contractor of the Zwitina Power Plant Project covered all the works including engineering, procurement, construction, commissioning and start-up of the 2x285 MW Simple Cycle Power Plant. ENKA Teknik’s workforce reached to 430 people during the peak periods of the project. Furthermore, ENKA Teknik provided onshore and offshore training for the Owner’s O&M personnel who will be operating and maintaining the plant.

Specific scope of Services provided by ENKA Teknik included: complete Basic and Detail Design with in-house resources, supply of Balance of Plant system and equipment such as Main Step up, Unit and Auxiliary Distribution Transformers, 16” Natural Gas Pipeline with hot tapping to 36” Gas Pipe, Pressure Reducing and Metering Station, Compressed Air System, Fire Fighting and Detection, Fire Water station with Fire Water ring. Completely Closed CTG Buildings, LDO forwarding Pump Station, LDO Treatment Plant, Ignition Gas Storage, Overhead Travelling Maintenance Crane (130 tons capacity), HV (220 kV), MV and LV systems with cabling. Distributed Control System with Overhead Line Protection and RTU extension to National Control Center of Libya.

ENKA Teknik’s workforce reached to 430 people during the peak periods of the project. Furthermore, ENKA Teknik provided onshore and offshore training for the Owner’s O&M personnel who will be operating and maintaining the plant.

Specific scope of Services provided by ENKA Teknik included: complete Basic and Detail Design with in-house resources, supply of Balance of Plant system and equipment such as Main Step up, Unit and Auxiliary Distribution Transformers, 16” Natural Gas Pipeline with hot tapping to 36” Gas Pipe, Pressure Reducing and Metering Station, Compressed Air System, Fire Fighting and Detection, Fire Water station with Fire Water ring. Completely Closed CTG Buildings, LDO forwarding Pump Station, LDO Treatment Plant, Ignition Gas Storage, Overhead Travelling Maintenance Crane (130 tons capacity), HV (220 kV), MV and LV systems with cabling. Distributed Control System with Overhead Line Protection and RTU extension to National Control Center of Libya.

PROJECT DETAILS

LOCATION
Zwitina, Benghazi - Libya

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

PROJECT DURATION:
Apr 2008 – Aug 2010

PROJECT DURATION:
Apr 2008 – Aug 2010

CONTRACT TYPE:
Lump Sum Turn Key

CONTRACT VALUE:
EUR 89 million

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

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 SGT5-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.

ENKA SCOPE OF SERVICES

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Specific scope of Services provided by ENKA Teknik included: complete Basic and Detail Design with in-house resources, supply of Balance of Plant system and equipment such as Main Step up, Unit and Auxiliary Distribution Transformers, 16” Natural Gas Pipeline with hot tapping to 36” Gas Pipe, Pressure Reducing and Metering Station, Compressed Air System, Fire Fighting and Detection, Fire Water station with Fire Water ring. Completely Closed CTG Buildings, LDO forwarding Pump Station, LDO Treatment Plant, Ignition Gas Storage, Overhead Travelling Maintenance Crane (130 tons capacity), HV (220 kV), MV and LV systems with cabling. Distributed Control System with Overhead Line Protection and RTU extension to National Control Center of Libya.

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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 SGT5-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

GROUNDWORKS

- Earthworks: 95,114 m³
- Concrete: 31,791 m³
- Structural Steel: 5,300 ton
- A/G Piping: 253 ton
- Cabling: 206,500 lm
- Mechanical Equipment: 2,860 ton
- Insulation & Paint: 32,520 m²
- Buildings: 11,000 m²

AWBARI 640 MW GAS TURBINE POWER PLANT PROJECT

UNIQUE 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 has 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 SGT5-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.
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.

Before the completion of construction of the Cooperation Agreement, ENKA Bechtel Joint Venture became the sole owner of InterGen's rights, obligations and interests in the Gebze project. Adapazarı Power Plant was sold to Adapazarı Power Plant (now Adapazarı Elektrik Üretim Ltd. Şti.) at US 325 million in 2001.

Gebeze Power Plant was completed on March 31, 2002. Adapazarı Power Plant was successfully completed in 2003.

PROJECT DETAILS

LOCATION: Gebze & Adapazarı, Turkey
OWNER / CLIENT: Adapazarı Elektrik Üretim Ltd. Şti.
CONTRACT TYPE: Lump Sum-Turnkey
CONTRACT VALUE: US$ 780 million (513+267)
SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• First Build – Own – Operate
• ENKA is the sole owner of the Gebze and Adapazarı Natural Gas Fired CCPPs since December 2005

TURKEY BOO PROJECTS:

GEZBE 1,600 MW & ADAPAZARI 820 MW COMBINED CYCLE POWER PLANTS

Type of Plant

<table>
<thead>
<tr>
<th>GEZBE</th>
<th>ADAPAZARI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined Cycle Power Plant</td>
<td>Combined Cycle Power Plant</td>
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<tr>
<td>Capacity</td>
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<td>1x (2x2x1)</td>
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<tr>
<td>Shaft</td>
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</tr>
<tr>
<td>Multi Shaft</td>
<td>Single Shaft</td>
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<tr>
<td>Gas Turbine Generator</td>
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<tr>
<td>GE Unit: 4 Sets Model: 9FA Rating Per Unit: 281 MW</td>
<td>GE Unit: 2 Sets Model: 9FA Rating Per Unit: 250 MW</td>
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<tr>
<td>Steam Turbine Generator</td>
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<tr>
<td>Alstom Unit: 2 Sets Model: ND41 Rating Per Unit: 281 MW</td>
<td>Alstom Unit: 1 Set Model: ND41 Rating Per Unit: 250 MW</td>
</tr>
<tr>
<td>HRSG</td>
<td></td>
</tr>
<tr>
<td>CMI Unit: 4 Sets Type: Vertical Assisted Circulation, 3 Pressure with Reheat</td>
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<tr>
<td>Cooling Type</td>
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<tr>
<td>Natural Draft Dry Cooling Towers 2 Cooling Towers (Height: 135 m.)</td>
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</tr>
</tbody>
</table>

TURKEY BOO PROJECTS:

İZMİR 1,580 MW NATURAL GAS COMBINED CYCLE POWER PLANT

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 1,580 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.

PROJECT DETAILS

LOCATION: İzmir, Turkey
OWNER / CLIENT: İzmir Elektrik Üretim Ltd. Şti.
CONTRACT TYPE: Lump Sum-Turnkey
CONTRACT VALUE: US$ 505 million
SIGNIFICANT FEATURES / ACCOMPLISHMENTS:
• First Build - Own - Operate (BOO) Power Plant Projects in Turkey
• The power plant was successfully completed on time
• ENKA is the sole owner of the İzmir Natural Gas Fired CCPPs since December 2005

Type of Plant

<table>
<thead>
<tr>
<th>Type of Plant</th>
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</thead>
<tbody>
<tr>
<td>Combined Cycle Power Plant</td>
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<td>Capacity</td>
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<tr>
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<tr>
<td>Multi Shaft</td>
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<tr>
<td>Gas Turbine Generator</td>
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<tr>
<td>General Electric Unit: 4 Sets Model: 9FA Rating Per Unit: 240 MW</td>
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<tr>
<td>Steam Turbine Generator</td>
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<tr>
<td>Alstom Unit: 2 Sets Model: ND41 Rating Per Unit: 282,5 MW</td>
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<td>HRSG</td>
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<tr>
<td>CMI Unit: 4 Sets Type: Vertical Assisted Circulation 3 Pressure with Reheat</td>
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<tr>
<td>Cooling Type</td>
</tr>
<tr>
<td>Low Profile Forced Draft Wet Cooling Towers (using seawater as a cooling medium)</td>
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</table>
RIJMOND 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.

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 Kraftwerkstechnik 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 construction 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.
ENKA İNŞAAT VE SANAYİ A.Ş.

SOUTHWEST 1,830 MW THERMAL POWER PLANTS IN TURKEY

PROJECT DESCRIPTION

TUNCİLÊK (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 under 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 Tuncbilek, 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 consequently 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.

ENKA INŞAAT VE SANAYİ A.Ş.

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e-mail: enka@enka.com | web: www.enka.com

SOUTHWEST 1,830 MW THERMAL POWER PLANTS IN TURKEY

PROJECT DETAILS

SIGNIFICANT FEATURES / ACCOMPLISHMENTS:

• All of these power plants have been completed on or before schedule. ENKA, thus has proved its capacity and capability of providing construction services to highest prevailing international standards.

• By 1982, one quarter of the total energy needs of Turkey was supplied by Yatağan, Yeniköy and Kemerköy Power Plants.

• Kemerköy is not only a lean power plant project but it’s a complex project including also wide range of supporting facilities, such as 350 m long cooling sea water supply system with 2.5 m diameter pipes and pump stations, 3.5 meters long seaward quay, heavy duty harbor with mooring dolphins on the sea supported by steel piles, 16 km high airmooring information, 1.5 km ash conveyors, 4.5 km coal conveyors, process water dam and ash dam at 60 m crest and 45 m crest heights, respectively.

• In Yeniköy Power Plant, a 400 m³ water reservoir was built in only three months.

• 200 m tall stack of Yeniköy was completed only in 80 days.

• 120 m tall stacks of Tunçbilek reached 200 m in Yeniköy, observing the reputation of the tallest man-made structure in Turkey in 1984, which was completed only in 80 days.

• 300 m tall stack construction has successfully completed in Kemerköy which obtained the tallest man-made structure reputation at the time which is still the tallest stack among all coal fired power plants in Turkey.
PROJECT DESCRIPTION

In the late 1970s, 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.

TRAKYA 1,200 MW NATURAL GAS COMBINED CYCLE POWER PLANT

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<th>UoM</th>
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<tr>
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<td>8,000</td>
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<tr>
<td>Insulation &amp; Paint</td>
<td>m²</td>
<td>43,000</td>
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</table>

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.
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.

### Major Quantities

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UoM</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Earthworks</td>
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</tr>
<tr>
<td>Insulation &amp; Paint</td>
<td>m²</td>
<td>43,000</td>
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</tbody>
</table>

LOCATION:
Ovaakça, Bursa - Turkey

OWNER / CLIENT:
Turkish Electricity Generation & Transmission Co.

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   | 250,000 m²   |
| Reinforcing Steel | 7,500 tons |
| Steel Structure | 8,000 tons |
| Mechanical & Electrical Equip | 2,500 tons |
| Fabrication | 2,500 tons |
| Erection   | 40,000 tons  |
DERNA DESALINATION PLANT PROJECT, LIBYA
SOUSA DESALINATION PLANT PROJECT, LIBYA
ZAWIA DESALINATION PLANT PROJECT, LIBYA
ZUARA DESALINATION PLANT PROJECT, LIBYA

OIL, GAS & PETROCHEMICALS
POWER PLANTS & ENERGY
DESALINATION PLANTS

DESALINATION PLANTS
DERNA DESALINATION PLANT PROJECT (SEA WATER THERMAL (MED-TVC) PLANT)

Project site is located in Derna city in the eastern part of Libya in a relatively high populated area. ENKA, while executing the work, successfully managed cultural relations with locals to avoid any clashes and maintained good relations with its neighbors.

Such regional location and high temperatures during summer months created unique challenges for the project workforce peaked at 450 people.

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 foundations and structural steel, Product Water Tanks (2 x 20,000 m³), Make Up Water Tank (1 x 500 m³), HFO Tanks (1 x 20,000 m³, 1 x 5,000 m³), 2 x 40,000 m³/day sea water intake system including 20 kg/hr electro-chlorination system, 2 x 1,000 m HDPE offshore sea water intake piping (dia. 1,400 mm), complete interconnecting piping of the plant, fire fighting system, MV/LV electrical & control and switchgear systems with aux. transformers, instrument and plant air supply systems, Emergency Diesel Generators, waste collection and treatment system, batteries and UPS System, Ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

ENKA scope also covers 9,000 m water distribution DI piping line (dia. 600 mm) with 2 x 10,000 m³ water storage tanks.

ENKA SCOPE OF SERVICES

DERNA DESALINATION PLANT PROJECT (SEA WATER THERMAL (MED-TVC) PLANT)

Project site is located in Derna city in the eastern part of Libya in a relatively high populated area. ENKA, while executing the work, successfully managed cultural relations with locals to avoid any clashes and maintained good relations with its neighbors.

Such regional location and high temperatures during summer months created unique challenges for the project workforce peaked at 450 people.

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 foundations and structural steel, Product Water Tanks (2 x 20,000 m³), Make Up Water Tank (1 x 500 m³), HFO Tanks (1 x 20,000 m³, 1 x 5,000 m³), 2 x 40,000 m³/day sea water intake system including 20 kg/hr electro-chlorination system, 2 x 1,000 m HDPE offshore sea water intake piping (dia. 1,400 mm), complete interconnecting piping of the plant, fire fighting system, MV/LV electrical & control and switchgear systems with aux. transformers, instrument and plant air supply systems, Emergency Diesel Generators, waste collection and treatment system, batteries and UPS System, Ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

ENKA scope also covers 9,000 m water distribution DI piping line (dia. 600 mm) with 2 x 10,000 m³ water storage tanks.

ENKA SCOPE OF SERVICES

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ENKA scope also covers 9,000 m water distribution DI piping line (dia. 600 mm) with 2 x 10,000 m³ water storage tanks.

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 foundations and structural steel, Product Water Tanks (2 x 20,000 m³), Make Up Water Tank (1 x 500 m³), HFO Tanks (1 x 20,000 m³, 1 x 5,000 m³), 2 x 40,000 m³/day sea water intake system including 20 kg/hr electro-chlorination system, 2 x 1,000 m HDPE offshore sea water intake piping (dia. 1,400 mm), complete interconnecting piping of the plant, fire fighting system, MV/LV electrical & control and switchgear systems with aux. transformers, instrument and plant air supply systems, Emergency Diesel Generators, waste collection and treatment system, batteries and UPS System, Ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

ENKA scope also covers 9,000 m water distribution DI piping line (dia. 600 mm) with 2 x 10,000 m³ water storage tanks.
SOUSSA DESALINATION PLANT PROJECT (SEA WATER THERMAL (MED-TVC) PLANT)

PROJECT DESCRIPTION

Soussa Desalination Plant Project, located in Soussa city in eastern part of Libya, was in part of a development plan implemented by General Electricity Company of Libya, in the period of 40th Anniversary preparations of Libyan Leader, to cover high demand of reliable water sources in eastern part of Libya.

The Project consisted of engineering, procurement, construction, commissioning and start-up of a 2 × 20,000 m³/day Water Production Plant with two type of fuel, Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO), complete with all Balance of Plant (BOP) systems. Heavy fuel oil (HFO) is used as main fuel for MED Desalination Plant operation whereas, light fuel oil (LFO) are used as back-up fuels. The project consists of a redundant sea water intake system of which complete basic and detailed engineering was included in EPC scope of the Project.

Main process and equipment, MED evaporators, boilers and auxiliaries are supplied by Siderm (Veolia, FR) as consortium partner of the Project.

UNIQUE CHALLENGES

Soussa Desalination Plant is expected to address the growing demand for water in eastern part of the country and supply reliable water to public. Offshore portion of sea water system was challenge in eastern Mediterranean Sea under unexpected open sea conditions. 2 x 500 m HDPE pipe string was floated and sank in one piece to be installed on sea bed. Design and implementation of offshore portion were performed with appropriate design margins and redundancy requirements.

Project site is located in near Soussa city in the eastern part of Libya. ENKA, while executing the work, successfully managed cultural relations with locals to avoid any clashes and maintained good relations with its neighbors.

Such regional location and high temperatures during summer months created unique challenges for the project workforce peaked at 380 employees.

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 foundations and structural steel, Product Water Tanks (2 × 20,000 m³), Make Up Water Tank (1 × 500 m³), HFO Tanks (2 × 5,000 m³), 2 × 40,000 m³/day sea water intake system including 20 kg/hr electro-chlorination system, 2 × 500 m HDPE offshore sea water intake piping (dia. 1,400 mm); complete interconnecting piping of the plant, fire fighting system, MV/LV electrical & control and switchgear systems with aux. transformers, instrument and plant air supply systems, Emergency Diesel Generators, waste collection and treatment system, batteries and UPS System, ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

Major Quantities

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PROJECT DETAILS

Zawia Desalination Plant Project, located in Zawia city in western part of Libya in 60 km distance to capital city Tripoli, was in part of a development plan implemented by General Electricity Company of Libya, in the period of 40th Anniversary preparations of Libyan Leader, to cover high demand of reliable water sources in eastern part of Libya.

The Project consisted of engineering, procurement, construction, commissioning and start-up of a 4x20,000 m³/day Water Production Plant with three type of fuel, Heavy Fuel Oil (HFO), NG and Light Fuel Oil (LFO), complete with all Balance of Plant (BOP) systems. NG is planned to be used as main fuel for MED Desalination Plant operation whereas; heavy fuel oil (HFO) are used as back-up fuels.

Main process and equipment, MED evaporators, boilers and auxiliaries are supplied by Sidem (Veolia, FR) as consortium partner of the Project.

The project includes a relatively large water distribution network line in 142 km with water storage tanks and pumping stations.

UNIQUE CHALLENGES

Zawia Desalination Plant is expected to address the growing demand for water in western part of the country and supply reliable water to public.

Project site is located in Zawia city in the western part of Libya in a highly populated area. ENKA, while executing the work, successfully managed cultural relations with locals to avoid any clashes and maintained good relations with its neighbors.

Soil improvement has to be performed by means of replacement of subsoil with adequate fill material in the project site for foundations of heavy loads.

Such regional location and high temperatures during summer months created unique challenges for the project workforce peaked at 620 employees.

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 foundations and structural steel, Product Water Tanks (2 x 20,000 m³), Make Up Water Tank (1 x 500 m³), LFO Tank (1 x 2,500 m³), complete interconnecting piping of the plant, fire fighting system, MV/LV electrical & control and switchgear systems with aux. transformers, instrument and plant air supply systems, Emergency Diesel Generators, waste collection and treatment system, batteries and UPS System, ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

ENKA scope also covers 142,000 m water distribution DI piping line with 9 pcs of water storage tanks (2 x 20,000 m³, 5 x 10,000 m³, 1 x 5,000 m³, 1 x 2,500 m³) and 4 pcs of pumping stations.

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PROJECT DESCRIPTION
Zuara Desalination Plant Project, located in near Zuara city within 10 km in western part of Libya, in 100 km distance to capital city Tripoli, was in part of a development plan implemented by General Electricity Company of Libya, in the period of 40th Anniversary preparations of Libyan Leader, to cover high demand of reliable water sources in eastern part of Libya.

The Project consisted of engineering, procurement, construction, commissioning and start-up of a 2 x 20,000 m³/day Water Production Plant with two type of fuel, Heavy Fuel Oil (HFO), and Light Fuel Oil (LFO), complete with all Balance of Plant (BOP) systems. HFO is planned to be used as main fuel for MED Desalination Plant operation whereas; light fuel oil (LFO) are used as back-up fuels.

Main process and equipment, MED evaporators, boilers and auxiliaries are supplied by Sidem (Veolia, FR) as consortium partner of the Project.

UNIQUE CHALLENGES
Zuara Desalination Plant is expected to address the growing demand for water in western part of the country and supply reliable water to public.

Project site is located in coast line of Zuara city in the western part of Libya. Soil was weak to withstand heavy loads of the project structures. So ENKA had to perform piling work with dia. 600 mm drill hole in total of 3696 m in length.

Such regional location and high temperatures during summer months created unique challenges for the project workforce peaked at 280 people.

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 foundations and structural steel, Product Water Tanks (2 x 20,000 m³), Make Up Water Tank (1 x 500 m³), LFO Tank (1 x 5,000 m³), complete interconnecting piping of the plant, firefighting system, MV/LV electrical & control and switchgear systems with aux. transformers, instrument and plant air supply systems, Emergency Diesel Generators, waste collection and treatment system, batteries and UPS System, ventilation and air conditioning (HVAC) systems, overhead cranes and maintenance hoists, power plant distributed control system (DCS), mechanical and electrical erection, complete civil and structural works, supply of spare parts, and start-up and commissioning of the plant. ENKA further provided training for the O&M personnel who will be operating and maintaining the plant.

ZUARA DESALINATION PLANT PROJECT (SEA WATER THERMAL (MED-TVC) PLANT)

Concrete  m³  4,764
Structural Steel  ton  341
Cabling  km  185
Equipment  ton  4,800
Engineering Hours  hrs  28,300
Document Qty.  pcs  720
Sulaymaniyah 1,500 MW Combined Cycle Power Plant - Iraq

35°39'35.2"N | 44°56'28.7"E

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