TEF KUWAIT
Tamilnadu Engineers Forum - Kuwait
5th TECHNOLOGICAL INNOVATIONS
Conference & Exposition
Chart 1: GCC projects market

($) billion

Source: MEED Projects / NBK
BNC Analytics

Market Size Analysis Report
MENA (Including GCC)

Estimated Value (Billion USD)

- Concept: US$3,000
- Design: US$2,000
- Tender: US$1,000
- Under Construction: US$0
- On Hold: US$0

Project Stage
PROJECTS IN KUWAIT
Market Size Analysis Report
Kuwait

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Estimated Value (Billion USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>USD 400</td>
</tr>
<tr>
<td>Design</td>
<td>USD 300</td>
</tr>
<tr>
<td>Tender</td>
<td>USD 200</td>
</tr>
<tr>
<td>Under Construction</td>
<td>USD 100</td>
</tr>
<tr>
<td>On Hold</td>
<td>USD 50</td>
</tr>
</tbody>
</table>

A Subsidiary of Kuwait Petroleum Corporation

(Company logos and names)
### Chart 3: Kuwait’s strategic projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Value (KD billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait Metro (PPP)*</td>
<td>5.6</td>
</tr>
<tr>
<td>Clean Fuels</td>
<td>4.6</td>
</tr>
<tr>
<td>New Refinery</td>
<td>4.0</td>
</tr>
<tr>
<td>Khairan City (PPP)*</td>
<td>3.9</td>
</tr>
<tr>
<td>Al-Zour North IWPP (PPP)*</td>
<td>2.4</td>
</tr>
<tr>
<td>Mubarak Al-Kabeer Port</td>
<td>2.3</td>
</tr>
<tr>
<td>Kuwait National Railroad</td>
<td>2.0</td>
</tr>
<tr>
<td>Kuwait International Airport</td>
<td>1.7</td>
</tr>
<tr>
<td>Jaber Al-Ahmad Causeway</td>
<td>0.7</td>
</tr>
<tr>
<td>Mutla City (PPP)*</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Source: MEED Projects/NBK
KUWAIT METRO PLAN
JAHRA HOSPITAL & CAUSEWAY
POWER & WATER PLANTS

- Gas / Oil-fired Plants
- Gas-fired Plants
- Thermal Desalination Units
- RO Desalination Units
- Desalination Units which Technology remains to be proposed
- IWPP subject of this tender

Map showing locations of Doha West, Doha East, Shuwaikh, Shuaiba North, Shuaiba South, Az-Zour North, Az-Zour South, and Al-Khairan.

KNPC
Kuwait National Petroleum Company
Table 3 – Planned power generation and seawater desalination capacity

<table>
<thead>
<tr>
<th>Facilities (Used Technology)</th>
<th>Power Generating Capacity (MW)</th>
<th>Sea Water Desalination Capacity (MIGPD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Az-Zour North 2 IWPP (Gas-fired CCGT)</td>
<td>1,500</td>
<td>100.0</td>
</tr>
<tr>
<td>Az-Zour North 3 IWPP (To be determined later)</td>
<td>800</td>
<td>51.0</td>
</tr>
<tr>
<td>Az-Zour North 4 IPP (To be determined later)</td>
<td>1,000</td>
<td>-</td>
</tr>
<tr>
<td>Az-Zour North 5 IWP (RO)</td>
<td>-</td>
<td>25.0</td>
</tr>
<tr>
<td>Al-Khairan Phase 1 IWPP (Oil-fired SG &amp; ST)</td>
<td>1,500</td>
<td>125.0</td>
</tr>
<tr>
<td>Al-Khairan Phase 2 IPP (Oil-fired SG &amp; ST)</td>
<td>1,500</td>
<td>-</td>
</tr>
<tr>
<td>Al-Khairan Phase 3 IPP (Oil-fired SG &amp; ST)</td>
<td>1,500</td>
<td>-</td>
</tr>
<tr>
<td>Al Abdaliyah ISCC</td>
<td>280</td>
<td>-</td>
</tr>
<tr>
<td>Doha West (RO)</td>
<td>-</td>
<td>100.0</td>
</tr>
<tr>
<td>Sabiya (Gas-fired OCGT)</td>
<td>500</td>
<td>-</td>
</tr>
</tbody>
</table>
KPC was established in 1980, fully owned by the State of Kuwait
10 specialized Subsidiaries operate in Kuwait and across the world
Position of KNPC in Value Chain of Kuwait

**Feedstock supply**
- Natural Gas & Condensate
  - Sour Gas → Gas Sweetening → Sweet Gas
- Crude Oil

**Domestic Refining**
- Refining 936,000 BPD
- Gas processing 3 X 560 MM SCFD
- Gas for Power Generation
- Oil sector requirements (KNPC, KOC, PIC)

**Fuel demand**
- Ministry of Electricity and Water (MEW)
- Transportation & industrial (domestic & international)
- LNG imports
- Fuel Oil & Gas Oil for Power Generation

**KNPC is responsible for Domestic Refining & Gas Processing to satisfy the local fuel demands from Power Generation, Transportation, Industries & Domestic and supply products for International market**
Current Integration level would be enhanced with increased operational flexibility and additional feed-stocks, to improve Refining Margin and achieve cyclical profitability performance.
Kuwait Oil company (KOC)

Kuwait Oil Company's (KOC) projects in its 5-year plan worth KD 12 billion, the company's Chief Executive Officer Hashem Hashem said on Thursday. In a celebration organized by Oil and Gas World Magazine to select the Man of the Year in Kuwait's oil sector, Hashem said that the KOC's strategic plan to increase oil production has not been affected by the current oil price drop. "It is not the first time that the world is experiencing a decline in oil price. In 2008, Kuwait saw a drop in oil price due to the global economic crisis. After that period oil prices rebounded," he added. Asked about effects of oil price retreat on the KOC's plans, he said that the Gulf Cooperation Council's (GCC) countries have programs for developing oil fields and increasing production. The KOC has a long-run strategy for its projects, he added."Kuwait is currently producing up to 3 million barrels per day," he pointed out. He expected KOC will sign soon deals of heavy oil projects worth about KD 1.3 billion
Kuwait Gulf Oil company (KGOC) - WJO

3D Seismic Acquisition for Onshore PZ
Drilling Deep Exploratory Wells to explore potential of deep formations
Appraisal, Delineation and Development of the existing reservoir
Enhance Oil Recovery Projects (Steam Flood projects)
Ratawi MA Water Injection Enhancement
South Fuwaris Pressure Maintenance Pilot
MGC Revamp
Water Management Project (Al-Khazan)
Central Gas Utilization Project and additional power supply
Pit Remediation
New Main Office Building
Kuwait Gulf Oil company (KGOC) - KJO

Drilling of Khafji Exploration, Delineation/Appraisal & new development wells.
Khafji Capitalized Workover wells.
Khafji field well SCADA.
Installation of the two integrated well jackets.
Installation & Commissioning of ESP wells.
Construction of Khafji Ratawi Water Injection facilities.
Construction of Khafji FDP Oil & Gas projects.
Construction of Water treatment facilities.
To build and commission KGOC gas pipeline for shipping KGOC gas share from Khafji.
Construction of New Control Living Platform (CLP).
Construction of New Desalination plant.
3D Seismic survey over prospective area.
Khafji 3D Seismic Survey.
Hout 3D Seismic acquisition, processing and interpretation. Appraisal wells will be drilled based on the results of 3D seismic.
CLEAN FUEL PROJECT (CFP)

It is one of the strategic projects of Kuwait National Petroleum Company which aimed at upgrading and expanding the existing KNPC two refineries at Mina Abdulla and Mina Al-Ahmadi. The CFP will transform the two refineries into an integrated merchant refining complex that meets the diversified requirements of the world oil market. Carrying out the project will maintain high safety and environment standards in line with KPC directions. Total refining capacity of this complex after the CFP completion will go up to 800,000 barrels a day.

As the company had long time ago received and stored the heavy equipment like the vessels and reactors which need a long time for manufacturing and transportation. The updated and sanctioned budget for CFP is KD 4,680 million. It is set for completion in 2017.
CLEAN FUEL PROJECT (CFP)

- Upgradation and Expansion of MAA and MAB
- Product quality improvement
- To meet Environmental standards
- Expected completion 2017
- KD 4.6 Billion budget

Source: KNPC
AL-ZOUR REFINERY PROJECT (ZOR)

The project is intended to build a grass root refinery at Al-Zour area, south of Kuwait City with a total capacity of 615,000 barrels per day. The Refinery has a strategic goal of supplying low sulfur fuel (less than 1% compared to current 4% sulfur fuel) to the local power plants. This will significantly reduce pollutant emissions and in that sense it constitutes a special importance to the environment.

Al-Zour Refinery which will be one of the largest oil refining plants worldwide, will fulfill the downstream strategy of Kuwait Petroleum Corporation. In addition to its domestic benefits as the prime supplier of feedstock to the power plants, Al-Zour Refinery will enhance competitiveness of Kuwait petroleum products on the world markets on the account of its ability to meet the stringent requirements of those markets.
AL-ZOUR REFINERY PROJECT (ZOR)

- Grass root refinery
- 615000 bpd
- Low sulfur FO to PP
- Significant reduction in emissions
- Enhance competitiveness

Source: KNPC
Other Projects - KNPC

1 Fourth Gas Plant Train at MAA
2 FIFTH LPG TRAIN at MAA
3 NEW NORTH LPG TANK FARM
4 NEW AGRP and REVAMP of EXISTING AGRP
5 LONG TERM LNG IMPORT FACILITIES
6 SULPHUR HANDLING FACILITIES PROJECT AT MAA REFINERY

Source: KNPC
Other Projects - KNPC

7 NEW TGT UNIT at MAA REFINERY

8 FLARE GAS RECOVERY UNIT at MAA REFINERY

9 REVAMP OF EFFLUENT TREATMENT FACILITIES AT THREE REFINERIES

10 CONSTRUCTION OF FOUR NEW FILLING STATIONS

11 EXPANSION AND REVAMP OF AHMADI DEPOT

12 CONSTRUCTION OF A NEW DEPOT AT MATLAA

Source: KNPC
ENVIRONMENTAL PROJECTS
KOC

Construction of associated water injection station in South and East Kuwait
Early production project

To remove hydrogen sulfide from the oil restore the land to even better than its original condition so that it would brim over with the sound of migrating birds, desert plants and animals once again

Restore damage soil from KOC operation

To reduce the burn on associated gas

Installation of air filtration in gathering centers (16,17,19,27,28) and Boosting gas station (BS–170)

To reduce the burn on associated gas

Construct new enhanced gas pressure station in BS – 171 in West Kuwait

Establish Natural reserves (marine and land) in KOC locations

Reduce gas burn in the company

Gathering center and gas injection station (16,24)

Reduce air emissions in order to protect the environment

Constructing a gas sweeting station in West and North Kuwait

To get rid of the associated water by injecting it into the ground in order to protect the wild environment

Create associated water injection system in North Kuwait

Restore damage soil

Shut down drilling rigs in fields

Gathering, separating, treating and disposing of waste generated by KOC

Management of waste generated from KOC facilities, which include the collection centers and boosting stations and gas reservoirs, treatment plants and water injection

Source: KPC
KNPC

Provision of Low NOx burners in boilers/heaters at Mina Al-Ahmadi Refinery

New Facilities for H2S Removal From SWS Flash Drum Off-Gas in Sour Water Stripper Unit U-26 (MAB)


New Flare Gas Recovery Unit at MAA Refinery (KNPC)

Upgrading of obsolete Fire Detection, Alarm and Suppression Systems at KNPC Sites Including the phase – out of Halon System.

Gasoline vapor recovery project in filling stations (Phase II).

Revamp of MAA ground Burnery for smokeless operation

New Acid Gas Removal Plant and Revamp of Existing AGRP

New Tail Gas Treatment Unit at MAA Refinery.

Revamp of Effluent Treatment Facilities at three refineries

Nature Reserve Project at Wafra

PHASE 1 & II

Bio remediation of contaminated soil at Mina Abdulla .

i. Civil and associated works for bio remediation project by M/s Gulfar

ii. Services for Bio remediation of contaminated by M/s KISR

Source: KPC

Reduce the emission of oxides of nitrogen (NOx) to 66 ppmv compared to KEPA norm of 165 ppmv ensure meeting K-EPA norms

To remove H2S from SWS flash drum

To recover the Hydrocarbon gases being flared and thus reduce emissions to the air.

To recover the Hydrocarbon gases being flared and thus reduce emissions to the air.

Replacement of Halon gas with environment-friendly substance

Recovery of gasoline vapors during refueling of vehicles at filling stations in order to reduce emissions.

Eliminate/minimize the smoke from ground Flare at Mina Al-Ahmadi refinery

Improve the efficiency of the unit and reduce the emission of sulfur dioxide

Reduce sulfur dioxide emissions to meet K-EPA norms

Improving the quality of treated effluent to ensure meeting K-EPA Norms

To enhance native biodiversity conservation.

Remediation of Site
<table>
<thead>
<tr>
<th><strong>KOTC</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ship Energy Efficiency Management Plan (SEEMP) by NKK</strong></td>
</tr>
<tr>
<td>PrimeShip- GREEN/EEOI is a service for calculation and analysis of Energy Efficiency Operational Indicator (EEOI). This service consists of two software programs, EEOI - Onboard for data input &amp; EEOI -Web for calculation and analysis of EEOI in the Management company. Implementing SEEMP will encourage reducing fuel consumption and carbon emissions which influence the global environment.</td>
</tr>
<tr>
<td><strong>Installation of Portable / fixed emission monitoring equipment (SOx, Nox)</strong></td>
</tr>
<tr>
<td>Fuels and exhaust gas emissions are subject to international, regional and national controls and standards. As a pro-active approach and with a view of reducing harmful emission we have introduced portable equipment on all our vessels (Except BAH &amp; BND).</td>
</tr>
<tr>
<td><strong>Energy Efficiency Design Index (EEDI)</strong></td>
</tr>
<tr>
<td>IMO mandatory requirement for new build vessels is to have a design index for machinery / energy consumptions onboard.</td>
</tr>
<tr>
<td><strong>Introducing Environmental Ship Index (ESI)</strong></td>
</tr>
<tr>
<td>ESI is a voluntary system designed to improve the environmental performance of sea going vessels calling EU ports. It is an instrument to visualize the environmental performance of ships regarding air pollutants and CO2. The Environmental Ship Index (ESI) identifies seagoing ships that perform better in reducing air emissions than required by the current emission standards of the International Maritime Organization. A comprehensive database of hull structures, defects, inspections, coating condition and repairs has been compiled for 15 existing vessels. This will also ensure to maintain coating of Ballast water tank &amp; ensure hull integrity.</td>
</tr>
<tr>
<td><strong>Hull Integrity Management Plan (HIMP)</strong></td>
</tr>
</tbody>
</table>

Source: KPC
<table>
<thead>
<tr>
<th><strong>KOTC</strong></th>
<th>Company has introduced a tight regime of waste reduction and waste management onboard all vessels, the identified measures are much more than the statutory and international requirements. Our policy now is zero garbage discharge to sea. All hazardous and recyclable waste is landed ashore for safe disposal. As per MARPOL requirements all our vessels are consuming 1.0% sulphur fuels in ECA areas while in EU ports it is further reduced to 0.1% = 2012 January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Management Plan</td>
<td>In order to restrict the flow of cargo vapors from cargo tanks to the atmosphere, we have approved plans for all vessels to monitor and restrict any emissions. Special attention is paid to the PV valves maintenance and operations. We also have introduced vapor discharge manifolds onboard vessels to safely return the vapors to shore during loadings. A tight regime is enforced on existing ships to monitor the ODS, comprehensive logs are maintained for inadvertent losses to atmosphere.</td>
</tr>
<tr>
<td>Fuel in Emission Control Area (ECA) and European Union (EU) ports</td>
<td>Contractor has been assigned for recycling used and old vehicle tires in LPG Filling Branch and Marine Agency Branch Ballast water is essential to manage trim, list, draught, stability, optimum fuel consumption and stresses in the ship's structure. Ballast water may contain aquatic organisms or pathogens, which may create hazards to the sea environment, when transported on tankers from place to place. Therefore vessels have aquired approved plan management for ballast water exchange at deep waters to mitigate the hazards.</td>
</tr>
<tr>
<td>Vapor Emission Control (VOC)</td>
<td>Implementation of best practice covering recycls of waste in industrial compounds.</td>
</tr>
<tr>
<td>Ozone Depleting Substances - Refrigerants and Halons</td>
<td>Water Ballast Management System (WBMS) on ships</td>
</tr>
<tr>
<td>Water Ballast Management System (WBMS) on ships</td>
<td>Renewal of fixed firefighting system at LPG Filling Branch</td>
</tr>
<tr>
<td>Renewal of fixed firefighting system at LPG Filling Branch</td>
<td>Source: KPC</td>
</tr>
</tbody>
</table>
Address HES risks, hazards and reliability issues, Meet current and future base business production requirements and Align near term requirements with long term strategy and Wafra development plans.

CGUP’s main objectives are to bring JO operation to world-class gas management by eliminating continuous routine flaring in alignment with the non-operators’ guidelines. The project will also provide sweet, dry fuel gas for JO users, Reduce Sulfur Oxides (SOx) emissions and Dispose of waste streams in an environmentally acceptable manner.

Manage water disposal capacity to handle the growth of produced water in JO, eliminate surface discharge by expanding the capacity of surface facilities and optimize existing facilities of disposal system.

Reclamation and Restoration of the evaporation pit areas including Oily Sand.

To install Eight new salt water disposal wells

OVL Clean & Recycle 2 will empty approximately 585,000 bbl of net oil from Pits 11 and 13. The 500,000 bbl of weathered oil in Pit 7 will be sold under the Oily Pit Materials Removal Services project.

OVL Clean & Recycle 2 – Design and construct a plant to process OVL from Pits 11 and 13 to meet JO specifications and deliver on-spec oil to MGC. Oily Pit Materials Removal Services – Process and/or remove OVL, weathered oil from Pit 7, the underlying oily sludge, and other available designated oily sludge’s from other JO pits.

To Eliminate the discharge of secondary wastestreams to the pits.

Project aims to meet the short-term/mid-term solutions of reducing gas flaring in WJO by capturing Eocene gas from Sub-Centers 1, 3 & 5 and delivering it to KOC’s BS-170.
<table>
<thead>
<tr>
<th>KGOC - KJO Projects</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of Safety System for Sour/Combustible Gas Dispersion</td>
<td>To provide reliable and effective safety protection systems for personnel working in areas with potential hazards for exposure to Sour/Combustible gas under leak scenarios.</td>
</tr>
<tr>
<td>Re-Construction of fire Station in Process Area</td>
<td>Provide the highest level of firefighting services to the company facilities &amp; Meet the latest standard and the classification of Class A fire stations.</td>
</tr>
<tr>
<td>Upgrade of EDD Explosive Storage Facilities</td>
<td>Provide the highest level of Explosive storage &amp; handling services to the company facilities &amp; Meet the latest standard and the classification of Explosive stores.</td>
</tr>
<tr>
<td>Const. of Gas &amp; NGL Export Facilities</td>
<td>The aim is to achieve the corporate objective of 1% flaring as well as to recover valuable hydrocarbon resources as much as possible.</td>
</tr>
<tr>
<td>Hout (KRL) association Gas Facilities</td>
<td>In order to support the corporate strategy and objective to achieve 1% Gas flaring Policy.</td>
</tr>
<tr>
<td>Sampling Analysis of Source Emissions at KJO</td>
<td>To comply with PME &amp; KJO Environmental Regulations and requirements with regard to the quarterly reporting of source emissions and discharges.</td>
</tr>
<tr>
<td>Installation of artificial Coral Reefs</td>
<td>To help rehabilitate marine life including plants, rich generation of Biomass, provide breading, feeding and resting place for thousands of marine life.</td>
</tr>
<tr>
<td>Clean Up of Hydrocarbon Soil</td>
<td>To clean up of Hydrocarbon contaminated Soil which shall be treated and cleaned as per Saudi Environmental regulations.</td>
</tr>
</tbody>
</table>

Source: KPC
<table>
<thead>
<tr>
<th>PIC</th>
<th>Using CO2 from KNPC refinery</th>
<th>Reduce CO2 venting in KNPC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New Ammonia III high efficiency Boiler to replace existing low efficiency boiler</td>
<td>Reduce CO2 emissions &amp; heat</td>
</tr>
<tr>
<td></td>
<td>Replace / Modify Chillers for K-1303</td>
<td>To reduce the venting of Natural Gases during Summer</td>
</tr>
<tr>
<td></td>
<td>Recovering vent CO2 gas from Compressor house (K-5201/K-5202/K-5203/K-5204 REDUCING CO2 LOSSES IN UREA PLANT-B CO2 COMPRESSOR)</td>
<td>Reduce CO2 emissions</td>
</tr>
<tr>
<td></td>
<td>New Leak Detection System for HP Equipments in Urea Plant (B)</td>
<td>Reduce Emissions and minimize potential human or environmental incidents</td>
</tr>
<tr>
<td></td>
<td>Replacement of Steam traps in Urea Plant A&amp;B</td>
<td>Steam saving &amp; Reduce Energy use which will lead to less CO2 emission</td>
</tr>
<tr>
<td></td>
<td>New Cathdic Protection System</td>
<td>Reduce premature equipments/pipelines failures that lead to human or environmental incidents</td>
</tr>
<tr>
<td></td>
<td>Up gradation of Gas detection system</td>
<td>Replace and Install the new gas detectors across plant A &amp; B and to integrate with Plant A &amp; B Control room as well in EPS Control Room for effective monitoring &amp; control of gas levels in PIC</td>
</tr>
<tr>
<td></td>
<td>Centralized Monitoring of Fire Alarm Control Panels at PIC Safety Building</td>
<td>Monitor all the fire alarm control panels of various buildings at a centralized location i.e the safety building. Provide large screen displays providing information pertaining to the specific device and room location where alarms have originated and permitting quick reaction during emergencies</td>
</tr>
</tbody>
</table>

Source: KPC
Thank you
THANK YOU