

NON- TECHNICAL SUMMARY

BACKGROUND

Kuwait contains an estimated 101.5 billion barrels (bbl) of proven oil reserves, roughly 8% of the world total, and around 1,600 producing oil wells. Currently, Kuwait produces about 2.6 million bbl/d of crude oil. Overall, around two thirds of Kuwaiti oil production comes from the southeast of the country, with about one-fifth from northern Kuwait and about one-tenth from the west.

Kuwait's three domestic refineries currently have a combined capacity of 936,000 bbl/d. The country's largest refinery is Mina Al Ahmadi (MAA), with a capacity of 466,000 bbl/d. The other refineries are Mina Al Abdullah (MAB) (270,500 bbl/d) and Shuaiba (SHU) (200,000 bbl/d). In the long term, total refining capacity is expected to be 1.4 million bbl/d.

Kuwait National Petroleum Company (KNPC), in its continuing commitment to meet changing (and more stringent) environmental requirements and to meet the increased need for clean fuels, is embarking upon an ambitious project, the Clean Fuels Project 2020 (hereafter referred to as CFP), to upgrade and modernize the three existing refineries. CFP will involve major upgrades at Mina Al Ahmadi refinery (MAA) and Mina Abdullah refinery (MAB), while the old processing facilities at Shuaiba refinery (SHU) will be retired.

The Front End Engineering Design (FEED) Phase of the project was completed in June 2008. During FEED, an Environmental Impact Statement (EIS) was submitted by KNPC to the Kuwait Environmental Public Authority (K-EPA). The project is currently under the FEED Update Phase which is intended to meet the new marketing requirements of the Project. Thus, the EIS submitted and presented to K-EPA in 2008 needs to be updated to reflect the new scope of the facilities as per Feed Update Phase requirements. This EIS is an update of the original EIS and covers an assessment of the FEED Update Phase scope of facilities.

THE ENVIRONMENTAL IMPACT STATEMENT

In accordance with the regulatory requirements promulgated by Kuwait's principal environmental regulatory authority, the Kuwait Environment Public Authority (K-EPA), and international 'best practice', Det Norske Veritas (DNV) conducted a full independent EIA process in 2008 for the proposed CFP, following an Initial EIA submitted by Fluor to K-EPA in August 2007. EIA is a process undertaken for certain types of major projects, which are judged likely to have potentially significant environmental effects, it assesses the environmental consequences of a proposed development in advance, with emphasis on the prevention of unacceptable impacts.

The output of the EIA process was an Environmental Impact Statement (EIS), which was prepared by DNV on behalf of Fluor, in accordance with the State of Kuwait Regulations Implemented under Law No. 21 of 1995 as Amended by Law No. 16 of 1996. The EIS also fulfilled KNPC's regulatory and internal procedural (EIA Study procedure SHE-ESHU-03-1407) requirements, as well as the statutory requirements

of K-EPA. This FEED Update Phase EIS has also been prepared in accordance with the above requirements and procedures.

This updated EIS sets out DNV's 3rd-party assessment of the potential environmental effects during the construction, subsequent operation and final decommissioning of the CFP. It is supported by an Environmental Baseline Study (EBS) conducted by DNV in conjunction with two Kuwaiti technical providers, Kuwait Institute for Scientific Research (KISR) and Wataniya Environmental Services (WES) in 2007. The EBS provides an existing environmental 'baseline' of the CFP site and its surroundings allowing DNV to assess any potential impacts posed by the project. WES also provided some assistance with the development of part of this EIS. Public consultation was not within the scope of the CFP EIA.

PROJECT DESCRIPTION

CFP involves modifications at KNPC's three (3) existing refineries: MAA, MAB, and SHU. The MAA and MAB refineries will undergo major upgrades whilst the processing facilities at SHU will be retired. The outcome of this will be the integration of the KNPC Refining System into one merchant Refining Complex with Full Conversion operation with highest Light Ends Products Yields and minimum Fuel Oil production.

The CFP, which is currently under the Front-End Engineering and Design (FEED) Update stage managed by Fluor, will result in a reduction in the overall refining capacity of the three refineries from the current operating levels of 936,000 bbl/d to 800,000 bbl/d. The changes are expected to reduce impact on the environment from the refinery activities. The project will integrate the new and existing process units along with storage, infrastructure, oil movement and shipping. A variety of new Utilities and Offsite (U&O) facilities will be provided.

Environmental Measures Incorporated in CFP

KNPC's objective is that the CFP 2020 will incorporate best environmental practices such as Best Available Control Technologies (BACT) and environmental mitigation measures deemed necessary, so as to meet or exceed all relevant K-EPA emissions criteria. The CFP has been designed to mitigate all environmental impacts, and numerous environmental measures / BACT have been incorporated. BACT is incorporated into the following areas:

- Noise control and abatement
- Air emissions abatement
- Solid waste management
- Management of hazardous chemicals
- Wastewater treatment and disposal
- Environmental monitoring

Assessment of Alternative Sites

It is a requirement of the EIA process to consider alternative site locations when assessing a proposed development. CFP will, however, be based at the existing KNPC refineries and not in a grassroots location and thus evaluating alternative site "locations" is not possible. Thus this EIS examined alternatives to the project itself.

Constructing and operating the new petroleum refining and support facilities within the available space at the existing MAA and MAB refineries was considered the most suitable alternative. This is because it is economically viable, will improve regional air quality by providing low sulphur fuels, and will upgrade current refining capabilities, thus enhancing KNPC's competitive standing within the industry

CFP will not only provide Kuwait and export customers with cleaner burning fuels but will also enhance the safety and environmental performance of the MAA and MAB refineries through modernization and incorporation of current best environmental practice, while the older SHU refinery processing units will be decommissioned.

ENVIRONMENTAL BASELINE STUDY

In support of the EIA process, DNV conducted an Environmental Baseline Study (EBS). The EBS was completed to provide a baseline of the existing environment in order to properly assess any potential impacts posed by this project. The EBS field work was undertaken by two specialist local consultants, WES and KISR.

DNV, WES and KISR conducted the following specialized studies as part of the background studies:

- *Soil characteristics*
- *Ambient air quality*
- *Noise*
- *Land use*
- *Demography and socioeconomic aspects*
- *Geology and seismology*
- *Surface Water, groundwater and water use*
- *Terrestrial and aquatic ecology*
- *Meteorology*

The majority of the EBS work was carried out between March 2007 and August 2007. The main environmental issue identified was that existing air quality in the study area often exceeds criteria.

NOISE

The main purpose of the Noise study was to evaluate the potential community noise impact due to the noise emissions from CFP.

This noise assessment considered noise impacts based on available information at this early stage in the design process, and drew the following findings:

- *There are no exceedences of relevant K-EPA standard predicted at any receptor during daytime due to CFP for both construction and operation.*
- *For the construction phase, night time noise levels will not be affected, since construction activities are not performed during the night hours except under very exceptional situations.*
- *For the operations phase, night time noise levels are expected to exceed the relevant K-EPA standards at several locations.*

Based on the above, the following recommendations are made:

- Construction activities generating significant noise levels should not be carried out during the night time except under very exceptional situations. This is particularly relevant near the beach chalets to the south east of MAB refinery.
- In order to fully comply with K-EPA community noise standards, additional noise attenuation using acoustic enclosures should be considered for significant noise emitting sources located close to the fence lines, particularly for CFP works near the eastern part of the CFP at MAB refinery. Details are provided within the body of the report.
- Noise monitoring will be necessary during both construction and operation to ensure no significant impact upon receptors.

AIR QUALITY

Air modelling was conducted to evaluate the impact of the CFP upon the existing poor air quality in the study area. The air modelling results indicate that the air quality impacts associated with the CFP are acceptable for the following reasons:

- The CFP will decommission the majority of air emission point sources from the SHU refinery (as well as some units at MAA and MAB refineries), most of which have large atmospheric pollutant emission rates. This will help reduce the total pollutants emitted to atmosphere, hence improving the air quality in the area.
- After the completion of CFP, the vast majority of long and short term NO₂, SO₂ and TSP concentrations should improve. This is mainly due to the fact that pollutant emissions from sources that are to be decommissioned far exceed the emissions associated with new CFP sources.
- Although, air quality in the study area improves as a result of the CFP, air quality criteria are still breached in some areas for some parameters.
- Fugitive emissions on site from the tank farms areas satisfy relevant criteria.
- CFP emissions during Sulphur Recovery Unit (SRU) emergency upset conditions satisfy relevant criteria.
- Based on the design data available, the air modelling results for the emergency scenarios associated with new CFP Flares indicated that all scenarios satisfy the occupational exposure standard for SO₂, apart from the new acid gas flare at MAB (Unit 146).

In the absence of any guidelines or criteria from the Kuwaiti regulator for this type of emergency event beyond the refinery fence-lines, the CFP compared maximum ground level concentrations against more stringent US air quality criteria. Maximum ground level sulphur dioxide concentrations beyond the refinery fence-lines generally meet this more stringent criteria (US AEGL-2) apart from emergency scenarios for the flares associated with Units 162, 167, 146, 149 (High Pressure) and Total Power Failure (TPF). The acid gas flare at MAB (Unit 146) will also exceed the US ERPG-2 criterion for sulphur dioxide.

Sensitivity analysis was thus conducted by increasing the flare stack heights for these Units. The revised results indicate that all relevant criteria are met for all cases except the new acid gas flares at MAA and MAB (Units 167 & 146), as well as the TPF Case, which still exceed the AEGL-2 criterion.

Additional, preliminary sensitivity analysis on the aforementioned flare units indicates that with the emission rate of sulphur dioxide halved, the resulting peak ground level concentrations will reduce proportionally. This would result in MAA Unit 167 and the TPF Case meeting the AEGL-2 criterion. MAB Unit 146 would still not meet the AEGL-2 criterion (in order to meet AEGL-2 criterion, the emission rate of sulphur dioxide should be reduced to around 35-40% of its current value).

Consequently, it is recommended that KNPC implement design changes during the EPC phase to reduce the relief loads for the flare systems which have the highest potential impact on the receptors located outside the refinery boundaries.

SOLID WASTE

CFP will produce a variety of solid wastes (hazardous and non-hazardous) during both construction and operational activities. In order to manage waste properly and comply with local and globally recognized waste management practices, a Waste Management Plan (WMP) will be developed by each EPC Contractor in accordance with KNPC policies / procedures as well as K-EPA requirements. Specifically, the WMP will comply with the existing KNPC Procedure for Solid Waste Management (SHE-ESHU-03-1406).

As part of the WMP, a number of mitigating measures will be implemented. These will have the effect of reducing both the amount of waste generated, and the associated impacts on the environment. The greatest potential impact to the environment relates to the storage of hazardous wastes. The impact of the generation, storage, transportation and disposal of non-hazardous and hazardous solid waste during the operation of the CFP facilities is considered to be of small to moderate negative significance. During construction it is considered to be of small negative significance. This is due to the quantities and the nature of the material, the implementation of an Environmental Management System (EMS) and WMP, and the full implementation of all control measures by the EPC contractors as recommended in this report.

HAZARDOUS MATERIALS

The new and modified CFP facilities will handle and / or store a variety of potentially hazardous materials, including finished products, raw materials and catalysts. Hazardous materials being used within the various systems that comprise the CFP will include: water treatment chemicals such as hydrochloric acid, sulphuric acid, caustic, chlorine, catalysts, and water conditioning chemicals such as corrosion inhibitors and oxygen scavengers.

During construction, all hazardous material will be stored and managed in a central location located within each EPC Contractor controlled area. Materials within these

areas will be stored according to compatibility and all flammable materials will be segregated and stored in a flame protected area. All hazardous materials will be contained within temporary or permanent bunding in order to prevent a release to soil and / or groundwater.

Hazardous materials storage during operation of CFP facilities will either be in fixed tanks (at various banded locations on the site), in a compressed gas cylinder storage area, or in the new MAB Chemical Storage Warehouse / Catalyst Storage Area. Material Safety Data Sheets (MSDS's) will be made available at the guardhouse, administration building and control room buildings for the refineries. In addition, MSDS's will be accessible at the new chemical storage warehouse building and catalyst storage facility at the MAB refinery for the materials stored in those buildings.

The impact from the storage, use, transportation and disposal of hazardous materials is considered to be of "small negative" significance during construction and of "moderate negative" significance during operation provided that all recommended management measures are followed. It is important that the management systems will, as proposed, comply with K-EPA requirements for the handling, storage and disposal of hazardous materials. Storage of hazardous chemicals will be in accordance with the provisions in Article 30 of the K-EPA regulations.

WASTEWATER

The CFP development will require large volumes of water for cooling tower, boiler feedwater (BFW) make-up, process water, potable water, sanitation and other refinery services. KNPC plan for as much of the CFP's water demand to be met by wastewater recycling and reuse as possible.

There will be two new Wastewater Treatment (WWT) Systems provided as part of CFP:

- New Wastewater Treatment System at MAB – Unit 156
- New Wastewater Treatment System at MAA – Unit 163.

DNV has assessed the environmental impacts from the collection, treatment and reuse of process and sanitary wastewater effluents generated during both construction and operational phases as having a 'Small Negative Impact'. Overall, it is concluded that the planned new CFP wastewater collection and treatment facilities are state of the art, and constitute best practice and apply a considerable number of BACT elements. The CFP wastewater facilities will be designed, built and operated in such a way as to meet best practice and the applicable K-EPA environmental criteria.

In order to augment the robust approach to addressing and mitigating environmental impacts during the CFP's construction and subsequent operations, this study makes the following additional recommendations:

- The wastewater discharge monitoring results should be audited by an independent party on a regular basis.
- The wastewater, storm water and sanitary wastewater collection / treatment facilities should be made available at the earliest stage possible during construction, and it is recommended that each EPC contractor make this an early priority for the CFP construction.

TRAFFIC

A preliminary Traffic Impact Assessment (TIA) was conducted in the FEED Stage EIA in 2008. It has not been updated as part of this report because a detailed TIA will be conducted for the Ministry of Interior in the near future prior to the start of construction activities.

The 2008 TIA indicated that the CFP could have a significant impact on local traffic conditions during the construction phase, in particular during the seven month period of peak construction activities. The impact on traffic during operation of CFP facilities was found to be acceptable although the overall volume of traffic is expected to increase.

The long term impact should be positive for traffic around the SHU Refinery due to a substantial reduction in the number of employees at the start of the CFP operational phase.

It is recommended that a comprehensive TIA be conducted during the EPC phase to further study local traffic patterns with the objective of determining the current status of local roadways relative to their design carrying capacity. This information should be used as the basis for development of a comprehensive CFP Traffic Management Plan to ensure impacts are managed acceptably via detailed traffic control measures.

MISCELLANEOUS ISSUES

Socio-economics

The proposed CFP will have positive benefits on the regional employment market and local economy, due to the recruitment of approximately 33,000 construction workers (at peak) and approximately 1,500 additional operational staff. In addition, there are anticipated to be positive benefits due to the effects of supply, maintenance and service contracts to local businesses.

There will be some potential negative social impacts from CFP construction staff. The main concerns relate to the impact of the very large construction employees when not working, with some potential impact upon local residential areas owing to cultural differences, and increased strain upon local facilities, and it is recommended that the EPC contractor should develop a plan to handle the potential negative social impacts from such a large influx of construction workers. To counter this, there will also be potential positive impacts upon the local community via local businesses benefiting from increased trade and commerce.

KNPC's Safety, Health and Environmental practice will likely be enhanced through the upgrading / replacing of aging units. This will generally make the KNPC refineries and their surroundings a safer and cleaner place to live and work.

Assessment of Landscape and Visual Impacts

There are no significant landscape impacts from installation of the CFP facilities and receptors at long distances will consider the refinery in context with the existing industrial developments adjacent to the site. Local observers will be visually impacted by the CFP development, especially on the south-eastern edge of the project and mitigation measures have been proposed to minimise visual impacts, in the form of hording or earth bunds. The impact of the CFP development is minimised due to the development being incorporated within the refinery boundaries.

Groundwater Monitoring and Contaminated Land

In the EBS, it was observed that there was no significant soil contamination identified at MAA and MAB, however, soil hydrocarbon levels were higher at SHU where contamination was identified at one location. The soil in this location will need to be carefully removed and disposed of correctly. It is recommended that an independent Environmental Advisor is regularly on site during construction whilst soil excavations are taking place to ensure that the soil is excavated and disposed of in the correct manner, and to help identify other areas of contamination, if any.

KNPC recently commissioned a comprehensive Groundwater Study, which involved the establishment of 47 groundwater wells around the three existing refineries; the report identified a degree of groundwater contamination below the refineries.

DNV recommend that regular checks for fugitive emissions to ground/groundwater from CFP refinery plant and tanks are included as part of the EMS, and that systematic groundwater monitoring is conducted around the CFP facilities and in the vicinity of the tank farms, and analysed against agreed criteria). The CFP will need to provide a groundwater monitoring well system to detect any groundwater contamination from areas where oil or other hazardous materials are normally handled or stored.

It is additionally recommended that soil and groundwater identified as contaminated in the KISR report and overlapping with the CFP location will require remediation prior to the start of CFP construction.

EMERGENCY RESPONSE

The three KNPC refineries, MAA, MAB and SHU, process, store and distribute large quantities of flammable and toxic materials. An incident, such as fire, explosion or gas release occurring within the CFP facilities may have serious consequences, affecting not only the site and the local environment, but also other industries and the public outside the site boundaries.

KNPC is committed to the safety of its employees, installations and the general public. All applicable safety standards, procedures and best practices are followed during process selection, design, construction and operation. However, even with the best safe working practices, it is recognized that emergency incidents may and do still occur. KNPC has developed and implemented a Major Incident Procedure Plan (MIPP) for its existing refineries. Since the CFP is being constructed and

operated within KNPC's refineries' boundaries, the MIPP will apply to CFP. The MIPP provides a procedural framework for responding to emergency incidents such as fire and flammable / toxic releases, and has been approved by the appropriate Kuwaiti authorities.

DECOMMISSIONING AND CLOSURE MANAGEMENT PLAN

At some stage in the future, the CFP will reach the end of its operational life. The future decommissioning and closure of the CFP will be a complex process, especially in ensuring that the sites are rehabilitated to K-EPA's requirements such that the sites can either be handed back to government control, or sold for another private sector use.

KNPC will develop a conceptual Decommissioning and Closure Management Plan (DCMP) for the CFP (which will involve consultation with K-EPA) as closure planning progresses. The DCMP will address all the project stages that CFP decommissioning will include, which are likely to be: pre-decommissioning consents and contracts; decommissioning activity obligations; and post-decommissioning responsibilities.

Specific environmental related decommissioning and closure objectives associated with the CFP are predicated around meeting all Kuwaiti legal and regulatory requirements (including K-EPA criteria), and mitigating any impacts (environmental, public health, safety, social) within the 'impact vicinity' of the site.

The final goal of a successful eventual decommissioning of the CFP should be to ensure that the need for post-closure site maintenance is minimised, and any long-term environmental activities are mitigated.

ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

KNPC has developed and implemented a company wide EMS in line with the requirements of the ISO14001:2004 Standard – Apex Manual for Environmental Management System (SHE-ESHU-04-1401). Since the CFP facilities are within KNPC refinery boundaries, this EMS will also apply to them, ensuring a structured approach to the management of project-related environmental issues.

The implementation of the EMS will commence during the initial stages of construction and will develop as the CFP becomes fully operational.