

REPORT OF THE NATIONAL REFINERIES SPECIAL TASK FORCE

1.EXECUTIVE SUMMARY

The National Refineries Special Task Force was set up by the Ministry of Petroleum Resources to advise on how best to achieve self-sufficiency of petroleum products in Nigeria, within a strong commercial framework, in the shortest possible time. The members of the Task Force understand that the need for this assignment arose from the events, which took place in January 2012, when the general public reacted to the attempt by the Federal Government to remove the existing subsidy on petroleum products and as part of a move to fully deregulate the Downstream Petroleum Industry.

The findings, conclusions and recommendations of the Task Force are outlined below.

1.1.THE NNPC REFINERIES

i.In the last few years, our refineries have operated at an average capacity utilization of about 20%, placing Nigeria at the bottom of the ladder among African refineries. The Task Force is however aware that during the early 1990's, Nigerian Refineries produced enough petroleum products to satisfy national demand and exported the excess.

ii.This Task Force believes that the Nigerian Refining Industry is potentially capable of achieving self-sufficiency in petroleum products and emerging as an export hub for Petroleum Products in the Western Africa sub-region if the root causes of poor performance of the Refineries in particular, and the Industry as a whole, are vigorously resolved.

iii.The most pivotal of the root causes is that the current ownership structure and business model have failed to adequately provide for the safe and efficient performance of the refineries.

iv.The three Nigerian refineries have not been efficiently and safely operated and maintained for more than 15 years. During the same period they have not been able to refine the designed quantities of petroleum products. They have not operated as performance-oriented businesses and are plagued with severe plant maintenance and integrity issues, as well as irregular crude supply and products evacuation. Furthermore, they are beleaguered by poor governance in a non-commercial operating structure, which is considered unsustainable.

v.The Task Force is of the opinion that changes in the ownership structure and business model of the refineries are necessary, in order to turn them around. To this end, it is recommended that the Federal Government should relinquish control of the operation and management of the three Nigerian refineries by divesting a majority of its 100% equity to competent, resourceful and experienced refining private partner(s) in accordance with the Public (Privatisation and Commercialisation) Enterprises Act 1991. This privatisation process should be accelerated in an aggressive but workable time-frame, which should culminate in the transfer of majority ownership and operatorship of the refineries to experienced and capable partners within 18 months.

vi. The privatisation process must accord special attention to staff pensions, severance and other disengagement issues, as well as technical and managerial skills acquisition by Nigerians and local content compliance.

vii. In view of privatization and without prejudice to other plans in the pipeline, full rehabilitation of the refinery plants should be reviewed in all its ramifications. Investment in the proposed Turnaround Maintenance (TAM) and rehabilitation projects for the refineries by the Federal Government should therefore be limited to the minimum required to make the refineries work in a safe and reliable manner.

1.2. PRICING

i. Beyond the issue of poor performance of the refineries is the uniform and regulated pricing policy of the Federal Government for petroleum products. This is one of the most widely adduced reasons by prospective investors and entrepreneurs for the lack of investment in new refineries in Nigeria in recent years. It is also believed to be substantially responsible for waste, distortion and corrupt practices in the industry.

ii. It will therefore be necessary to fully deregulate prices in the Downstream Sector prior to the completion of the privatization process. This should however be subject to putting in place adequate palliatives to ameliorate the attendant social and economic burden on the populace.

1.3. SUPPLY & DISTRIBUTION NETWORK

i. Furthermore, the Task Force found that the PPMC network of crude oil supply and products distribution infrastructure is in very dilapidated state, leading to highly disturbing capacity and material losses. Similar to the refineries, this deplorable situation is also attributed to a combination of inappropriate ownership structure, poor business model and maintenance neglect, as well as rampant breaking of pipelines by thieves and vandals.

ii. The Task Force recommends that a new company, independent of NNPC and operating commercially, should be established to take over the assets and operations of PPMC. The new company will be expected to concession various aspects of the pipeline, depot and terminal operations to franchisees.

iii. In the long term, consideration should be given to privatization of the network in such a way that strategic national interest is protected while attracting adequate investment funds for necessary rehabilitation and upgrade of the facilities and enhancing operational efficiency.

1.4. JV GREENFIELD REFINERY

Of the three joint venture greenfield refinery options under consideration by NNPC, the economics strongly favour Lagos. This option should therefore be explored as a priority. The other options, Bayelsa and Kogi, should be explored subsequently, with careful attention to the stated conditions required to improve the business case.

1.5.REFINERIES LICENSING

i.The process for licensing of new refineries was observed to be cumbersome, ineffective, and in need of reengineering. A revised process has been initiated and reviewed with DPR.

ii.The Task Force also examined 35 greenfield private refinery licensees/applicants and 7 were found to have reasonable potential.

[courtesy: www.elombah.com]

1.6.SELF-SUFFICIENCY

i.The Task Force is convinced that self-sufficiency in petroleum products can be readily achieved within four years if the privatization and structural reforms recommended for the refineries and the supply and distribution infrastructure, as well as the NNPC Greenfield Refinery initiative, are implemented vigorously and faithfully. A significant role is also foreseen for the private greenfield refinery initiatives. They should therefore be encouraged as well.

ii.In addition to the above supply driven measures, there are plausible demand side instruments available for bridging the supply gap and enhancing self-sufficiency in conventional petroleum products. NRSTF recommends that options such as LPG and CNG should be promoted vigorously to substitute DPK and firewood as domestic cooking fuel and PMS and AGO as transport fuel, respectively. Development and blending of bio-fuels such as ethanol and bio-diesel into PMS and AGO respectively could also be plausible options. Given the right investment incentives, these initiatives can be 100% private sector driven. In addition, Fuel efficiency and consequent reduction in demand can be achieved with deliberate government policy in such areas as promotion of use of Bi-Fuel vehicles, fuel-efficient cars, light trucks and mini-buses. The Federal Government can lead by example by insisting on such vehicle specifications, as part of its own Fleet procurement policies, particularly for mass-transit transportation.

1.7.OFFSHORE REFINING SCHEME

i.In the interim however, for a more structured and transparent program for adequate supplies of petroleum products to the Nigerian market, a new offshore Refining Scheme should be initiated. NNPC currently receives 445,000 barrels of crude oil per day. Of this, only a fraction is refined locally. We propose that the total balance of the unrefined crude should be refined by a new independent arrangement to meet the national demand of the regulated products (PMS and DPK). In this regard therefore, the NNPC Refineries should be supplied only crude that they can refine. An accountable specialist team should be instituted within NNPC to implement the scheme, based on clearly defined governance and operating guidelines.

1.8.SECURITY

The Task Force notes that all the recommended reforms can only be meaningful in the context of a secure business environment. Unfortunately, security remains a very serious threat to the

Downstream Petroleum assets and operations presently. Government is therefore urged to deal decisively with the security issues impacting so negatively on the industry within the period of reform.

1.9.IMPLEMENTATION

An implementation plan is proposed which includes timelines and risk mitigation initiatives. It is also recommended that the implementation is driven by a focused team sponsored at the highest level of government and challenged to achieve tangible success in managing all the key recommendations and structural changes.

.2.BACKGROUND

The National Refineries Special Task Force (NRSTF) was instituted by the Honourable Minister of Petroleum Resources, Mrs. Diezani Alison-Madueke (CON), in the aftermath of the strikes and public uproar that followed the attempt to fully deregulate petroleum products pricing in January this year. Essentially therefore, the National Refineries Special Task Force (NRSTF) was created to assist the Ministry of Petroleum in putting in place a plan for ensuring self-sufficiency of petroleum products in Nigeria, within a strong commercial framework, in the shortest possible time.

2.1.TERMS OF REFERENCE (TOR)

The 8-point Terms of Reference (TOR) for the work of the NRSTF is enclosed as APP.2.1A . In summary, our understanding of the TOR is as follows:

- Conduct of diagnostic review of the refineries and advise on the best approach to turn them around.
- Review and advise on private refinery licensing and partnership models for Greenfield refineries.
- Plan for self-sufficiency in petroleum products.
- Review of Refineries Audit.
- Devising an effective Performance Monitoring system for the refineries.

2.2.TASK FORCE MEMBERSHIP

Membership of the NRSTF consists of 22 Nigerians from diverse backgrounds and experiences, and from different part of the country, under the Chairmanship of Dr. Kalu Idika Kalu, OFR, past Minister of Finance, National Planning and Transport, of the Federal Republic of Nigeria. In particular, the Chairmen of the two trade unions in the Petroleum Industry, PENGASSAN and NUPENG, are members of the NRSTF, specifically representing organized Labour. The Group

Executive Director, Refineries and Petrochemicals (GED R & P) of NNPC, as well as the Managing Directors of the three NNPC Refineries, are also members, in ex-officio capacity.

The complete membership list is attached (APP.2.2A).

2.3.The NNPC REFINERIES

2.3.1.PORT HARCOURT REFINERY

The Port Harcourt Refinery consists of two process plants

- Old PH Refinery
- New PH Refinery

Old PH Refinery:This plant was built in 1965, with an original installed capacity of 35,000 BPD. It was subsequently debottlenecked in 1972 to 60,000 BPD. It is essentially a straight distillation unit with very little upgrading facilities for enhancement of yield of PMS.

New PH Refinery: This Refinery was commissioned in 1989, with an installed capacity of 150,000 BPD and a mix of units to enhance the yields of PMS and light products. Crude oil supply to the refinery is by pipeline from the SPDC Bonny Terminal, while evacuation of products is designed to be by a combination of pipeline, marine vessels and trucks. The products slate consists of the standard fuels from a refinery: LPG, PMS, DPK, AGO and Fuel oil.

2.3.2.WARRI REFINERY

Warri Refinery was commissioned in 1978, with a throughput capacity of 100,000 BPD. It was subsequently de-bottlenecked in 1987 to a capacity of 125, 000 BPD. Crude oil is obtained from CHEVRON and supplied by pipeline from the PPMC Escravos Terminal or from SPDC through their Ughelli Quality Control Center (UQCC). Similar to Port Harcourt, products evacuation is by pipeline, marine vessels and trucks.

A Petrochemical Plant, which converts some of the refinery streams to polypropylene and carbon black, raw materials used by the Plastics and Tyre Industries respectively, was added on in 1988.

2.3.3.KADUNA REFINERY

Kaduna Refinery consists of two process plants, namely:

- Fuels Plant
- Lubes Plant

Fuels Plant: Originally commissioned in 1980 with a throughput capacity of 50,000 BPD, the plant was expanded in 1986 to 60,000 BPD capacity. It is designed to process Nigerian light crude supplied by pipeline from the PPMC Escravos Terminal in Delta State into fuels.

Lubes Plant: The Plant was commissioned in 1983 with a capacity of 50,000 BPD to process imported heavy crude into fuels and other heavier products, such as lubricating base oils, asphalt and waxes. The imported crude oil is discharged into a receiving facility at Escravos, Delta State and similarly delivered by pipeline to Kaduna via the Warri Refinery.

Being an inland refinery, there is no provision for the evacuation of products by sea. However, there is provision for evacuation by rail, in addition to pipeline and trucks.

A 91 MTPD Petrochemical Plant, similar to the Warri Refinery, was also added on in 1988. This plant produces linear alkyl benzene (LAB), a vital raw material for production of detergents, as well as other industrial solvents.

2.4.WORK METHODOLOGY

The Task Force split into 3 Sub-Committees (A, B, and C), to address specific aspects of the TOR as follows:

Sub-Committee A:Refineries Diagnostics and Change

Journey Map; Refineries Audit

Sub-Committee B:Performance Monitoring

Sub- Committee C:Private Refineries Licensing, Greenfield

Refineries and Self Sufficiency.

The approach of the Sub-Committees to the work consisted of a combination of:

- Review of past reports and available literature.
- Presentations and submissions from relevant key stake holders.
- Submissions from members of the NRSTF, including the NNPC members.
- Background studies and research work by the Technical Consultants, McKinsey & Co, engaged by the Ministry of Petroleum Resources and made available to the NRSTF to provide support.

All members of the NRSTF visited the Port Harcourt Refinery to obtain a first-hand feel for the status of the plant and the challenges faced. Owing to cost, time and logistics constraints, subsequent visits to Warri and Kaduna Refineries were limited only to select members from Sub-Committees A and B, in consideration of the mandates of these sub-committees.

Coordination and secretarial support for the work of the NRSTF, including the needs of the various Sub-Committees, was provided from the Project Management Office (PMO) manned by BGL Plc as the PMO Consultants.

Mr. Bode Ososami, a Chemical Engineer and Financial Consultant with extensive experience in Energy Consulting, was also assigned to the NRSTF as the Ministerial Coordinator.

2.5.REFINERIES AUDIT

It is noted that PWC, the international firm of Auditors& Accountants, was expected to work with Sub-Committee A on the audit of the refineries for the two years, 2010 and 2011, in line with TOR No 3. PWC was however not available for the work owing to issues associated with delays in their formal engagement for the assignment by the Ministry of Petroleum Resources. Consequently, the Audit aspect of the assignment is yet to be done.

3.FINDINGS & CONCLUSIONS

3.1.NIGERIAN PETROLEUM PRODUCTS DEMAND & SUPPLY

3.1.1DEMAND

i.Demand for petroleum products (in Nigeria) continued to rise steadily over the years, apparently deriving from the rapid growth in population and economic activities as measured by the GDP, as well as other social and lifestyle related issues. This is well illustrated by data obtained from the 2010/2011 OPEC Annual Statistical Bulletin shown in APP. 3.1.1A , highlighting the growth in the last 10 years, from an aggregate demand volume of 29 million litres per day (MLD) in 2001 to about 36 MLD in 2010.

ii.From the same OPEC data, growth in demand of PMS in particular has been spectacular, estimated at an average of 7.5% per annum between 2001 and 2010. PMS remains the dominant product in the petroleum products mix, accounting for over 72% of the total products volume in 2010. It is used mostly in passenger cars and light buses. In addition, it is also used in commercial appliances such as mobile compressors, grinders, wood sawing machines etc., popularly employed by numerous small enterprises across the country.

iii.AGO is used mainly in trucks, buses and large electricity generators. It is also sometimes used as an industrial heating fuel and constitutes about 14% of the total volume of products.

iv.13% of the total volume of the products demand is DPK, used popularly as a domestic cooking fuel and as turbine fuel for aircrafts in the Aviation Sector.

v. Similar data obtained from the Major Oil Marketers Association (MOMAN) indicate that in the period 2009-2011 aggregate demand was in the region of 15-16 billion litres per annum, reducing to 41-44 million litres per day (APP. 3.1.1B).

3.1.2SUPPLY

i. Petroleum products requirements of the market are expected to be met essentially from the three NNPC Refineries in Port Harcourt, Warri and Kaduna.

ii. From design, these refineries are capable of supplying up to 52 MLD of fuels to the market. However, over the years, they have been able to deliver barely 20% of this volume (APP.3.1.2A).

iii. It is pertinent to note that a new 1,000 BPD private refinery producing about 40,000 litres/day of AGO came on stream in 2011. Laudable as this is, this facility is only capable of contributing less than 0.1% of the aggregate fuels demand and therefore does not make an appreciable impact.

3.1.3 SUPPLY GAP

i. Consequent on the low output from the refineries, a large supply gap has emerged, as illustrated in APP.3.1.3A.

ii. This supply gap has been bridged over the years from imports, to the extent that in 2011 as much as 76% of aggregate demand was imported.

iii. Further analysis of the 2011 supply gap with respect to each of the products clearly shows that import dependence factors for AGO, DPK and PMS are 31%, 55% and 86% respectively. By implication Nigeria is almost totally dependent on imports for PMS.

3.1.4 PROJECTIONS

i. Various scenarios have been adopted to forecast future demand and supply for petroleum products, by McKinsey, our supporting consultants. They are:

- Worst Case: Combination of high GDP growth with long span rehabilitation of refineries and low refinery capacity, leading to 3.6% demand growth per annum.

- Expected Case: Medium GDP growth with 3-4 years refinery rehabilitation and refineries at less than full potential, leading to 2.8% demand growth per annum.

- Best Case: Low demand case, accelerated rehabilitation of refineries and capacity restoration, leading to 2.0% demand growth per annum.

These are well illustrated in APP.3.1.4A.

ii. With the Expected Case, total products demand is projected to grow from 43.2 MLD this year (2012) to 56.4 MLD in 2020 and 71.2 MLD in 2030. Notably, PMS demand is projected to grow at an average of 4.0% per annum and attain 53.1 MLD by 2030.

iii. Even with full rehabilitation of the refineries, not more than 46.8 MLD of products are expected to be produced, leading to an expected aggregate supply gap of nearly 10.0 MLD in 2020 and over 24 MLD by 2030.

iv. More specifically, the supply gap for PMS will be 21.7 MLD in 2020 and 32.1 MLD in 2030. Similar figures for DPK will be a supply surplus of 1.1 MLD in 2020 but a shortfall of 2.2 MLD in 2030. A net supply surplus situation is also expected for AGO, to the tune of 10.9 MLD in 2020 and 9.7 MLD in 2030.

v. It is instructive to note that if there is no decisive intervention, from current trends, products import bill for bridging the supply gap will rise steadily from \$9.9 billion this year to \$18.1 billion in 2030.

3.2.1. PREAMBLE

During the early 1990's Nigerian Refineries produced enough petroleum products to satisfy the national demand and exported the excess production. In the process, during two consecutive years, 1991 and 1992, Nigeria earned US\$124million and US\$156million respectively from export of petroleum products . (APP.3.2.1A: Presentation by Engr Ogedegbe, Academy of Engineering, June 11, 2009)

Therefore, the NRSTF believes that given the right conditions, the Nigerian Refining Industry is potentially capable of achieving self-sufficiency in petroleum products.

This Task Force is thus committed to identifying the root cause of the loss of the capability of the Refineries in particular, and the Industry as a whole, from the position of achieving, in a sustainable way, national self-sufficiency in the production of petroleum products.

We have also thought it necessary to provide a layman's definition of a petroleum refinery for the purpose of this report. A petroleum refinery is a complex manufacturing plant designed to convert crude oil feedstock into a definite number and types of petroleum products. The types of products fall into two major categories, namely fuel products and lubricating products. For instance, the refineries at Port-Harcourt and Warri produce only fuel products. The refinery at Kaduna comprises two separate sets of units; one part for producing fuel products and another part for producing lubricating products.

The fuel refinery is designed to produce only five types of products namely:

- LPG (liquefied petroleum gas)
- PMS (Premium Motor Spirits) or Petrol
- DPK (Dual Purpose Kerosene)
- AGO (Automotive Gas Oil) or Diesel
- Fuel Oil

Normal characteristics of a Refinery:

i. Every Refinery is designed and built to produce defined quantities and specifications (quality) of each of these products.

ii. Every refinery is designed to run continuously, without interruption except in emergency, for a minimum period of time, usually 24 months, before it is systematically shut down for a period, to carry out full maintenance.

This periodic maintenance, known as turnaround maintenance, (TAM) usually lasts for 30-40 days, after which the next cycle of continuous operation resumes for at least another 24 months.

iii. Any fuel refinery that does not operate this cycle of continuous production and TAM, and/or does not produce the designed quantities and quality of each of the products is considered deficient.

iv. Most refineries that operate all their major units continuously (90% of the time) for 24 months, at an average 80- 90% of their design capacity, and producing all the designed products on specification, are considered to be operating normally by international standards.

The characteristics of the fuel refinery described above also apply to the lubricating products refinery such as the Lubes Plants of Kaduna Refinery. The Lubes Plant processes imported heavy crude oil, which is not found in Nigeria, to produce a different set of products. These products include Lubricating Base Oils, Waxes and Asphalt. They are used mainly for making engine oils, greases, candles, and asphalt for road paving etc.

3.2.2. APPROACH

The diagnostics of the refineries operations were carried out in the context of the NRSTF's TOR Nos 1 and 2. Members understood that their high level assessment and review of the operations comprised of the study, analysis and evaluation of all relevant routine and special reports submitted by the refineries' managements on various aspects of the three Nigerian refineries. These sets of reports also included the various reports of the NNPC Corporate Headquarters and consultant organisations appointed at various times from 2006 till date to address various corrective policies, technical and other issues for overall improvements. Members undertook visits to each of the three Refineries to have first-hand assessment of the current state of the facilities.

All the documents provided, and utilized by the members for their assessment, reviews and analysis are listed in the Task Force Document Schedule (TFDS), for reference.

A conscious attempt has been made to avoid any undefined technical industry jargon, mindful that the report is directed to the top echelons of Federal Government and the general public.

3.2.3. FINDINGS

The top issues identified in the findings and conclusions of this report are listed below and discussed under various headings in the following sections:

- Poor Operational Performance.
- Maintenance Neglect.
- Organisation & Government Issues
- Comparison of Nigerian Refineries with other Refineries in Africa.
- Refineries Business Model
- Supply Chain Issues.

i.Poor Operational Performance

a)The Task Force found that all the refineries, Warri, Port Harcourt and Kaduna, had failed to meet the normal international benchmarking standards; namely 80-90% capacity utilisation and 90% on-stream time efficiency for continuous operation. This places the Nigerian refineries at the worst rating in Africa, with only 18% average annual capacity utilisation in the period 2006-2009, according to Refineries Survey in the Oil & Gas Journal. (APP. 3.2.3A).

b)A summary of the major parameters of measuring the volume output of the three Nigerian refineries, in the last 2 years, 2010-2011, is tabulated in (APP. 3.2.3B). A more detailed summary of the findings of McKinsey during 2009, for a 14-year period is also reproduced in (APP. 3.2.3C). These figures show a steady decline of performance for the period.

c)Apart from the volume shortfalls, the refineries have consistently been making lopsided products, with a skewed yield of products towards heavier fuels, at the expense of light products, especially PMS, which is in very high demand. (APP. 3.2.3D).

ii.Maintenance Neglect

The deterioration of the maintenance culture and activities over many years has contributed to the non-availability of critical pieces of equipment and systems for continuous operation. This effect was also quite visible during visits to the refineries by members of the NRSTF.

The visits to the refineries revealed a very poor physical state of the plants and some critical equipment. For example, the Old Port Harcourt Refinery was found to have been shut down for over 7 years, for maintenance related reasons. Similarly, the Lubes Plant in Kaduna Refinery has also been largely idle on account of both shortfalls in crude oil supplies and maintenance

constraints.

The findings from the McKinsey refinery interviews in 2009 in respect of the maintenance operations are reproduced in APP.3.2.3E. Our observations coincide with the same findings made three years earlier.

iii.Organizational and Governance issues

There are many organizational and governance issues facing the refineries. Many reasons for frequent and extended periods of shutdown resulting in the poor performance were given to the members of the NRSTF by the management of each of the three refineries during the refinery visits.

These include:

- Irregular and inadequate supply of crude oil, the main feedstock.
- Unstable and inadequate power supply.
- Inability to carry-out TAM on schedule.

Even though these reasons appear to explain the immediate causes of the poor performance of the plants, they are actually symptomatic of very deep and grave organizational and governance problems, common to all the Nigerian refineries.

These serious issues have also been captured by the Federal Government consultant, McKinsey, in their refinery interview summary, conducted in 2009 and reproduced in APP.3.2.3F .

The situation in these refineries has persisted for many years, in spite of the full knowledge of the Owner (The Federal Government). This confirms its inability to effect any positive and lasting changes.

iv.Comparison of Nigerian Refineries with other Refineries in Africa

There are 42 refineries in Africa. Nigeria has 3 and the third largest combined capacity of 445,000 bbl/d. The countries with higher number and capacity are South Africa and Egypt, with 2 and 9 refineries respectively, and corresponding capacities of 545,000 and 774,900 BPD respectively.

Nigerian refineries have the worst performance record among the 42 refineries, with an average capacity utilisation of only 18%, compared to 81% and 85% respectively for Egypt and South Africa in 2006-2009. (APP.3.2.3A).

v.Refineries Business Model

Ordinarily, a business model should derive from the proper exercise of rights by the Owners, to give management clear-cut directives on its overall objectives and priorities. Unfortunately, the Federal Government has traditionally in Nigeria never regarded the refining industry (refineries)

as business i.e. not as profit centres, but as cost centres, for producing petroleum products. The Federal Government policies up till now seem to support importation of products, to plug the supply gap in the face of the inability of the refineries to meet their production targets, rather than relinquish its bureaucratic control for a business model that works elsewhere. Whereas the Federal Government in the 1989 had designated the new Port Harcourt refinery as an export oriented refinery, the objective was achieved only briefly in 1991-92, as local production from these same refineries exceeded national demand for the two years. The opportunity to maintain the refineries in good working order and expand them as necessary was seemingly abandoned thereafter.

The Business Model issue is buttressed by the 2009 McKinsey Report, as shown in APP.3.2.3G .

vi. Supply Chain Issues

There is evidence also that the operations of the refineries have been badly impacted upon by problems associated with supply of crude oil and evacuation of products to the market. Both tasks incidentally are vested in PPMC, the NNPC SBU responsible for the pipelines and products marketing.

The impact of crude oil supply constraints have been that refineries have had to shut down production on account of unavailability of crude oil stock. The impact is most severe in the Kaduna Refinery, where the Lube Plant has been idle with the absence of imported heavy crude oil supplies, as noted earlier.

The refineries are also unable to produce when their storage tanks are full and there is no ullage to enable production, arising from slow evacuation and distribution of products by PPMC.

It is estimated that perhaps nearly 50% of the refinery downtimes were attributable to these logistics and supply chain problems, which are examined further in greater detail in Section 3.5 of this report.

3.2.4. CONCLUSIONS

i. The Nigerian refineries have not been efficiently and safely operated and maintained for more than 15 years, despite the best efforts of the managers. During the same period they have not been able to make the designed quantities and qualities of the products.

ii. Nigerian refineries are not operated as businesses. They operate as cost centres, without clear and achievable objectives. There is no accountability for the performance.

iii. Therefore, any major investment in the proposed TAM and rehabilitation projects by the Federal Government should be reviewed in view of the pending privatization.

iv. From the history of the performance of the refineries, under the full control of the Federal Government in the last 20 years, it is clear that Government, as Owner, has failed to manage and adequately provide for the safe and efficient performance of the petroleum refineries.

v. The profitability of the refining business is a necessary prerequisite for sourcing and sustaining the operations of the plants. Sustaining in this case means good and timely maintenance (improving the systems with new technology and expanding existing facilities or building new plants to meet increasing demands).

vi. The uniform pricing policy of the Federal Government for petroleum products is one of the most widely adduced reasons by prospective investors and entrepreneurs for lack of investment in new refineries in Nigeria in the past years.

vii. Petroleum products must be deregulated to allow for achieving profitable ventures in the Nigerian Refining Industry, such as ameliorating the social and economic burden on the populace through adequate palliatives. The investment conditions should enable the private sector become the driving force of the refining industry. This should not necessarily exclude government participation, as long as its participation is as an equity investor without direct involvement in the management and control activities.

viii. The Task Force notes however the tremendous efforts on the part of the management teams of these refineries to sustain operations, on a best endeavour basis, in the face of these gigantic challenges.

3.3. REFINERIES LICENSING

3.3.1. BACKGROUND

i. Given that all the three existing refineries in Nigeria are essentially owned and operated by the government through the NNPC, Government in the late 1990s, considered it necessary to open the space and grant approval to private Nigerian investors to invest in refinery projects in the country.

ii. From records made available by the Department of Petroleum Resources (DPR), (the government body vested with responsibility for regulation of the Petroleum Industry, including Petroleum Refineries), a total of 35 Nigerian companies have been involved in the licensing process, to varying extents, over the years. The complete submission received from DPR is provided in the Task Force Document Schedule (TFDS), as well as a dossier on details pertaining to each of the applicants.

3.3.2. LICENSING GUIDELINES

i. DPR has developed Guidelines for Licensing of Petroleum Refineries and Hydrocarbons Process Plants. These basically guide the application for, approval of and establishment of refineries and related process plants in Nigeria.

ii. Starting from the original version in 1993, the guidelines underwent changes in 2000 and 2007. New proposals were further developed by DPR in 2011 for update of the procedure. These are apparently still under review and consideration. Effectively therefore, the 2007 Guidelines remain the current and valid basis for licensing. Copies of the 1993 and 2000 Guidelines, are contained in the TFDS, while the current (2007) and proposed 2011 Guidelines are annexed as APP. 3.3.2A .

iii. By consequence, these guidelines therefore provide the framework for processing of the various applications for private refinery licenses.

iv. The current (2007) guidelines consist of the following 3 stages:

(a) License to Establish (LTE), approved by the Honourable Minister

(b) Authority to Construct (ATC), approved by the Honourable Minister

(c) License to Operate (LTO), approved by the Honourable Minister

Besides:

a) The LTE is valid for 2 years only and is not renewable thereafter. Applicants must therefore satisfy requirements for ATC within this period.

b) The ATC is also valid for 2 years, during which at least 50% mechanical erection should be achieved. Otherwise, the ATC will need to be revalidated. An ATC can only be revalidated once and if the necessary milestone is not achieved within the time limit it will be cancelled.

c) A fee of \$100,000 is required for the issue of LTO, which is renewable annually for the same fee. Besides, a \$50,000 fee is required for the LTE

v. The major changes envisaged in the Revised 2011 Guidelines currently under consideration are:

a) The LTE shall be replaced by a Conceptual Design Approval (CDA) to be issued by the DPR, instead of the Honourable Minister.

b) The CDA shall not be time bound.

c) The ATC shall also be approved by DPR instead of the Honourable Minister.

d) 70% project realization shall be achieved within 24 months following the issue of ATC, otherwise the project will be re-assessed by DPR.

e) The LTO which shall be approved by the Honourable Minister, shall attract a scalable fee of \$1.00 per barrel refining capacity per day. The LTO shall be renewable annually for the same fee.

3.3.3.REFINERY LICENSEES

i. The Task Force (NRSTF) invited all the listed private refinery license applicants and licensees to interactive sessions. 21 out of the 35 listed turned up. Another 11 failed to turn up despite at least three invitations extended to each of them. There were no records, including contact information, on the other 3, from DPR, to enable the NRSTF contact them. They were therefore not seen.

ii. The status of all the applicants /licensees is summarized in APP 3.3.3A , with more details in APP 3.3.3B

iii. Niger Delta Petroleum Resources, a Marginal Field Oil Producer, is the only private company that currently has a License to Operate (LTO), having recently commissioned a 1,000 BPD Refinery, producing only AGO at Ogbelle, Rivers State. The Refinery feeds from the crude

oil production of the company and the bottoms are injected back into the crude oil line. This is considered an illustrious example of a successful value – chain related refinery development.

Nevertheless, it must be noted that if such AGO refineries are quickly replicated in many places, the result will be a significant downgrading of the aggregate crude oil quality, with possible consequences on crude oil export and /or local refinery feedstock.

iv. Only the proposed Amakpe Refinery, to be sited at Eket in Akwa-Ibom State, has a valid Authority to Construct (ATC), dating back to 2007. There has however hardly been any progress ever since. Apart from serious funding constraints, the project is evidently caught up in the web of political problems with the Akwa–Ibom State Government (AKSG), which was originally supposed to be an equity partner.

v. 11 licensees have expired or cancelled ATCs and have been unable to revalidate them. Reasons for the failure to progress their projects are believed to principally include the following:

a) Funding constraints

b)Lack of technical depth and operational capability

c) Failure to obtain crude supply agreements

vi. 5 companies have expired License to Establish (LTE) and are also bedevilled by similar problems. They are therefore unable to proceed.

vii. Kainji Refinery and Omega-Butler are currently pursuing LTE approvals. Both have evidently been recommended to the Honourable Minister for issue of the LTE. Kainji, in particular, has been referred to the Nigerian Content Development and Monitoring Board (NCDMB), Yenegoa, for NCD (Nigerian Content Development) clearance.

viii. Akwa Refinery, a spin off from Aqua Refinery, which is listed among the 11 in (v) above, showed up for interaction, even though it was not invited and there were no separate records for it from DPR.

ix. In general it is evident that most of the applicants for a private refinery license do not have the requisite experience and background in petroleum refining and marketing. Their technical capability is rather doubtful and their ability to attract the quantum of funds required for refinery projects, running into billions of naira, is questionable. Besides, in many instances, potential financiers evidently insisted on crude supply agreements at rates below International Market Prices, owing to the prevalent subsidized products pricing regime, as a condition for further consideration of funding applications.

x. Nevertheless, based on the interactions and information provided by DPR some of the licensees were considered to have relatively higher potential for successful project completion, in a fully deregulated environment (APPs. 3.3.3C and 3.3.3D).

3.3.4. LICENSE GUIDELINES UPDATE

i. The current license procedure (2007) and even the proposed 2011 version are not considered to be robust enough to eliminate applications for licenses which are ill-equipped and ill-suited. This evidently accounts for the very high failure rate after securing the initial license.

ii. Consequently, this has necessitated further review of the guidelines by the NRSTF, with the key objectives of:

a)Bolstering the early licensing stage to ensure that capabilities of applicants are well evaluated and sifted early, without further waste of time and effort on the sides of both the applicants and the regulatory agency.

b)Having the Honourable Minister approve the license early in the process. Subsequent approvals shall be in form of permits to be granted by DPR on completion of defined milestones.

c)Retention of time limits for the Refinery License (RL) and granting an increased timeline of 3 years, renewable only once for an additional 2 years, to enable applicants complete all requirements for Permit to Construct (PTC).

d)Removal of the time limit once the PTC has been issued.

e)Streamlining and reducing applicable fees, especially in respect of the Permit to Operate (PTO).

f)Replacement of the LTE/CDA, ATC and LTO with Refinery License (RL), Permit to Construct (PTC) and Permit to Operate (PTO) respectively, to reflect these new concepts.

iii. A copy of the updated Guideline 2012 proposed by the NRSTF is presented in APP.3.3.4A . A summarized comparison with the 2007 Guidelines and proposed 2011 Guidelines is also provided in APP.3.3.4B . It is pertinent to note that this has been reviewed with DPR.

3.4.GREENFIELD REFINERIES/PPP

3.4.1.GLOBAL MODELS

i.A range of equity and operational configurations for cooperation between private and public sector groups are applicable in the Petroleum Refining Industry internationally.

These include:

- NOC Owned
- Service Contract
- Joint Ownership/Operatorship
- Joint Venture Company
- Joint Ownership (IOC/Independent Operates)
- IOC/Independent owned

ii.Details of descriptions and examples of these models are enclosed in APP.3.4.1A , as provided by McKinsey.

iii.Evidently, the ‘NOC Owned’ and ‘IOC/Independent Owned’ options represent the extremes, while the others represent various shades of active PPP.

iv.A further assessment of the models is shown in APP.3.4.1B , indicating that Joint Ownership (IOC/Independent Operates) is the preferred model for Nigeria presently. Instructively, this is in line with the McKinsey recommendation in APP.3.4.1A .

3.4.2.CATEGORIZATION OF REFINERIES

For the purpose of this work, and broadly in line with industry practice, refineries may be categorized as follows, in terms of their crude processing capacities.

CategoryCapacity

Small50, 000 BPD or less

Mediumover 50,000 & up to 200,000 BPD

Large over 200,000 BPD

3.4.3. LARGE REFINERIES

i. Owing to their size and potential impact on the national economy, it is expected that in Nigeria Large Refineries will be of keen interest to NNPC, being the key Federal Government vehicle for participation in the industry.

ii. Foreign investors are also most likely to be interested in this range as it more closely reflects the trend globally.

iii. An appropriate PPP model for large refineries will therefore be expected to reflect these realities.

iv. It may be pertinent to note that the existing NNPC Port Harcourt Refinery falls into this category.

3.4.4. MEDIUM REFINERIES

i. The NNPC Warri and Kaduna Refineries are in this range.

ii. Private Nigerian investors are in general likely to participate more actively in this category, while foreign private investors are a little less likely to be interested.

iii. Otherwise, the applicable PPP model should be similar to Large Refineries.

3.4.5. SMALL REFINERIES

i. Interest of foreign investors in this range is expected to be minimal, while private Nigerian participation is expected to be very strong.

ii. Federal Government is not expected to be involved. However, State and Local Governments are more likely to be interested, mainly providing land and infrastructural development support in exchange for equity.

iii. Indeed, most of the private refinery licensees reviewed in Section 3.3 fall in this category and mirror the PPP model outlined in (i) and (ii) above.

3.4.6. LARGE/MEDIUM/SMALL REFINERIES MODELS

A summary of the PPP models as should be applicable in the various refinery capacity categories in Nigeria is shown in APP.3.4.6A .

3.4.7. PROPOSED GREENFIELD REFINERIES

i.NNPC has initiated studies on new Greenfield refineries for Nigeria, to meet present and future demands of petroleum products.

ii.Detailed feasibility studies have been concluded for the following options, by highly respected international consultants: Wood Mackenzie and Foster Wheeler.

LocationCapacity (BPD)

Lagos350,000

Lagos200,000

Kogi100,000

Bayelsa100,000

Notably, these are all in the range of Large and Medium Refineries.

A summary of the financial indices from the study is presented in APP.3.4.7A .

iii.Lagos (350,000 BPD):

This represents the best option, with a combination of best returns and low risk.

iv.Lagos (200,000 BPD): This option provides good returns, though lower than the 350,000 bpd, and very lower risk.

v.Bayelsa: Represents the lowest return, though still viable. Profitability is affected by high capital cost requirement for development of infrastructure.

vi.Kogi:Feedstock supply inland poses big challenges. Project is however still basically profitable.

vii.Further analysis on the siting and sizing of Greenfield Refineries in the country done by McKinsey is presented in APP.3.4.7B . This also points to a large refinery of over 300,000 bpd capacity, located in the Lagos Area, as the optimum configuration.

viii.The China State Construction Engineering Corporation has expressed interest in providing up to 80% debt financing for whichever option Nigeria elects, backed by a sovereign guarantee, as contained in the MOU executed in May 2010. NRSTF nevertheless understands that these are still preliminary discussions and that full negotiations are yet to commence.

ix.NNPC Greenfield Refineries Division has also indicated a strong commitment to a shared risk approach to the equity side of the investment scheme. In this regard, it is proposed that an international company with experience in refining will be sourced as a technical partner and co-

investor, with a majority shareholding of at least 51%. NNPC and other interest groups will then retain the balance of 49% (APP. 3.4.7C).

3.5.SUPPLY & DISTRIBUTION SYSTEM

The Refineries naturally cannot exist in isolation. They must be supported by facilities and infrastructure for delivery of crude oil feedstock and for evacuation of the various products made, on a continuous basis, for effective and efficient operation.

In line with the subsisting business model applicable to the three NNPC Refineries, responsibility for crude oil supplies and products evacuation, including ownership and operation of the associated infrastructure, rests with the Pipelines and Products Marketing Company (PPMC), one of the Strategic Business Units (SBUs) of NNPC.

3.5.1.FACILITIES/INFRASTRUCTURE

The entire facilities and infrastructure within the PPMC orbit for the supply and distribution of crude oil and refined petroleum products (PMS/DPK/AGO) consist of:

- 5 Terminals
- 21 Petroleum Depots
- 750 kms of Crude Oil Pipelines
- 4,400 kms of Products Pipeline Networks

Spatial distribution of these facilities across the country is illustrated in APP.3.5.1A .

i.Terminals

The PPMC Terminals consist of the following:

- a) Atlas Cove Terminal, Lagos: A products terminal, which serves as gateway for imports of petroleum products into the country.
- b)Escravos Terminal: A crude oil terminal for import of heavy crude oil required by Kaduna Refinery for the Lubes Plant. It is supported by an import Berth Platform (IBP) located offshore, from where crude oil is pumped to the terminal.
- c)Bonny Export Terminal: Facility for export of excess products from Port Harcourt Refinery.

ii.Petroleum Products Depots

There are a total of 21 Products Depots situated across the country, for effective distribution and sales of products to marketers and consumers nationwide. These are well reflected in APP.3.5.1A .

It is noted that PPMC also owns 8 special LPG Depots. These are however not within the scope of the NRSTF work.

iii.Storage

PPMC has a total of 251 tanks across the Terminals and Depots for storage of crude oil and products.

iv.Crude Oil Pipelines

These consist of 5 pipeline sections for delivery of crude oil to the 3 refineries, with total length of about 760kms and diameter range of 16” –24”. Relatively, they are shorter and larger diameter pipelines, designed to ensure adequate throughput capacity for crude oil delivery.

v.Products Pipeline Network

These consist of a web of pipelines interconnecting the refineries and the depots scattered across the country, with total length of about 4,400 kms and diameters essentially in the range 6”–16”.

vi.Pump Stations

PPMC also operates a total of 17 pump stations, out of which 6 are on the crude oil pipelines and the balance on the products pipeline. These facilitate the pumping and movement of crude oil or products, along long distance pipelines.

3.5.2.ADMINISTRATIVE STRUCTURE

For administrative convenience, PPMC operations across the country are grouped into 5 area administrations, namely:

- Mosimi Area
- Warri Area
- Port Harcourt Area
- Kaduna Area
- Gombe Area

Each area administration caters for the facilities and infrastructure installed within its geographical limits.

3.5.3.STATUS OF FACILITIES

From submissions made by PPMC and findings of the NRSTF, the operational status of the various facilities may be summarized as follows:

i.All the crude oil supply and most of the products distribution pipelines are of low integrity, owing to:

- incessant breaking and vandalization by thieves.
- old age
- poor maintenance

PPMC estimates that losses resulting from such tampering in 2011 amounted to about one million barrels of crude oil and over 186 million litres of products, valued at about N105billion.

ii.The IBP offshore Escravos Terminal is severely corroded and is out of use for discharge and transfer of imported heavy crude oil to Kaduna Refinery.

iii.Only 101 out of 251 storage tanks at the Terminals and Depots are in use, mainly due to problems of:

- collapsed Tank Roofs
- failed Bottom Plates
- corroded Shell Plates
- failed Tank Roof Seals

iv.Frequent Failures of the mainline and loading pumps, as well as power generating sets, with availability rates of only 30–50% in most locations.

v.Similar high failure rates and unserviceability of loading arms and metering systems at the various depots, resulting in poor products inventory management.

vi.Obsolete and unserviceable control systems and tank gauging facilities, also leading to inaccurate inventory management and product losses.

In addition to the above operational challenges, very serious HSE issues are noted:

i.Compromised fire fighting systems at various locations with very ominous implications for safety. This is mostly in the areas of:

- unserviceable fire trucks

- corroded hydrant mains

- corroded foam tanks

ii. Severe environmental and safety problems arising from leakage of products, especially at the Terminals and with particular reference to the Atlas Cove Terminal. These issues are further elaborated in APP.3.5.3A .

3.5.4. OPERATIONAL CONSTRAINTS

From the submissions of and interactions with PPMC, the NRSTF believes that the root problems and constraints afflicting the operations of the organization may be summarized as follows:

- Wrong Business Model

- Poor Governance Structure

- Poor Maintenance of Ageing Facilities

- Inadequate Security Protection

i. The issues of Wrong Business Model, Poor Governance Structure and Poor Maintenance were also observed in respect of the Refineries and are of a similar nature.

ii. Inadequate security protection allows repeated break-ins into the pipelines and stealing of products, leading to excessive operational downtime and product losses.

iii. Nevertheless, in a study carried out between January and June 2010 on the Escravos-Warri Crude Pipeline, McKinsey determined that the single most critical causative factor for low pipeline utilization was inadequate stock of crude oil at the Escravos Terminal, owing to bad tanks that were out of use. (APP.3.5.4A).

iv. Similarly, McKinsey also determined that low pumping rates on account of malfunctioning pumps, power generators and other associated pipeline infrastructure accounted for 37% of pipeline downtime, while line breaks accounted for 10% (APP.3.5.4A).

v. In the light of the above, the NRSTF is convinced that though security and line break issues constitute serious challenges to the pipeline operations, the bigger issue is the poor state of the pipeline and depot facilities and the vastly inadequate maintenance attention, deriving substantially from the prevailing poor governance structure and inadequate business model.

3.6. NNPC REMEDIATION PLANS

3.6.1 REFINERIES PLAN

The proposal by NNPC Refineries & Petrochemicals Directorate for tackling the grave problems in the refineries highlighted earlier is contained in the corporation's transformation document (APP. 3.6.1A).

This may be summarized as a three-pronged strategy, consisting of:

- Full Rehabilitation of the Plants
- New Business and Operational Mode
- New Ownership Structure

i.Plant Rehabilitation

It is proposed that fundamental repairs shall be carried out on all the three refineries to restore them to at least 90% of design capacity. Owing to past failures, it is intended this time to engage the services of the original constructors of the plants to undertake the repairs. International consultants are to be engaged to scope and monitor the work, as part of the measures to ensure success.

On an indicative preliminary basis, it is estimated that the full rehabilitation will cost at least \$1.6bn and will be phased over a 3-year period, starting with Port Harcourt Refinery, which is in the worst state. A summary of the costing is provided in APP. 3.6.1B , while the full details are retained in the TFDS.

ii.Business & Operational Mode

This entails a new operating and marketing model which allows each of the refining companies to operate as a Refining and Marketing Company, able to buy its own crude oil, process it and sell the products. It may also refine for other parties for a fee if it has spare capacity.

iii.Ownership Structure

Various options were considered by NNPC, including:

- Management & Technical Service Contract
- Product Sharing Agreement (Strategic Investor)
- Equity Divestment (Strategic Investor)
- Partial Privatization through the Stock Market

Equity Divestment to a competent strategic investor was preferred.

iv.Short Term Plan

The above are evidently long term measures, which were initiated over two years ago but are yet to be implemented. The Directorate has therefore subsequently proposed an alternative short-term plan with a reduced scope for carrying out the most urgent and necessary repairs and maintenance works on the three refineries.

Details of this plan is provided in APP. 3.6.1C and is estimated by NNPC to cost about \$750m. Execution of these works will enable the refineries to be restored to reliable and safe operations fairly quickly.

NNPC also proposes short-term reforms of the business model based essentially on the principles of the long-term proposal, as outlined in (ii) above.

3.6.2 PPMC PROPOSAL

The highlights of PPMC's presentation to the NRSTF for the remediation of their dilapidated infrastructure may be summarized as follows:

- Following a detailed study carried out by AON ENERGY RISK ENGINEERING, a global Risk Consulting firm, in 2010, it was estimated that replacement cost for the PPMC supply and distribution facilities and infrastructure which had been in place for about 30 years amounted to a whopping sum of \$8.94bn (APP.3.6.2A)
- Without the relevant funding, PPMC management has outlined plans for far reaching rehabilitation of its infrastructure, estimated to cost a total of \$2.837bn, over a 24-month period. (APP.3.6.2B).
- Out of this amount, various rehabilitation works totalling \$256m have been commissioned and are on-going. This represents about 10% of the overall rehabilitation estimates. (APP.3.6.2B40).

For the entire report of the Nigerian Refineries Special Task Force, please contact the department of petroleum resources, <https://www.dprnigeria.com/>