in association with

NIGERIA EXTRACTIVE INDUSTRIES TRANSPARENCY INITIATIVE

PROCESS AUDIT 1999 – 2004

REFINERIES AND PRODUCT IMPORTATION

Presented to
The National Stakeholder Working Group

by

Hart Resources Ltd

in association with

SS Afemikhe Consulting Ltd

and

CMA Ltd

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The report and all appendices relating to the report are intended for the use of the National Stakeholder Working Group of the NEITI for the purpose of that initiative and are not to be relied upon by other parties.

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PREFACE

Volumes for refined product imports and movements quoted in this report were provided by PPMC in three batches.

Initially, PPMC returned templates in September – December 2005. Since this information was incomplete, the templates were modified in May 2006 and PPMC returned these templates in June 2006, following a data gathering exercise. Those templates too were subsequently withdrawn by PPMC. New information was provided in December 2006 which has yet to be reviewed. The December 2006 information has been used in preparing this report and is presented as received from PPMC. A supplementary report on this data will be issued in due course.

All data are unaudited. Observations and conclusions are based on the information supplied.

1 EXECUTIVE SUMMARY

1.1 Situation Review

a. The refineries were provided, in the period 1999 – 2004, with as much crude as they were in a position to refine. The process for allocating crude to the refineries was operating satisfactorily and was not a cause of any shortfall in refined product.

b. There were shortages of supply resulting in refinery outages due to vandalism and equipment failures in moving the crude.

c. The refineries utilisation was extremely poor during the period compared to design capability and international standards. The refineries averaged approximately 47% utilisation, which is less than half the average world performance over the same period (approx. 85%). This appears attributable to management processes in the refineries.

d. Had the refineries only operated at their peak level of performance achieved during 2001 and 2002, there would still have been a significant shortfall of production of PMS in the period. However the savings on imports of PMS in 2004 could have amounted to at least $120 million.

e. As a consequence of poor refinery performance, there was a requirement to import DPK and AGO products. With better refinery performance, Nigeria could have been exporting DPK and AGO.

f. The domestic demand for PMS is growing at such a rate that it exceeds even the highest possible domestic outputs; the amount of PMS importation could have been significantly reduced had there been reasonable refinery performance during the period.

g. It is clear that, for a considerable period into the future, Nigeria will have to import a significant proportion of its PMS product needs.

h. The importation process, including the tendering, contracting and procurement practices, fell short of current good practice standards.

i. The large increase in product imports has overwhelmed the jetty facilities that were not designed to support the level of product imports.

1.2 *Mass balance for refined products*

Following discussions with PPMC staff in May/June, PPMC submitted new format templates showing the import, refining, distribution and export of refined products through its pipeline and depot network. These replaced the templates submitted earlier by PPMC in 2005. A mass balance was produced by aggregating the information from these templates and included in our July report. On 21st November 2006, PPMC informed us that they had comments on the mass balance included in our report of 12th July 2006. In particular, they accepted that some of the data they provided must have been wrong. It is accordingly withdrawn from our report. They agreed to undertake a major exercise to rectify this and to report the results and resultant mass balance by 6 December. The templates used in the May/June exercise were to be used again for this latest exercise.

On 15th December 2006, PPMC provided an incomplete mass balance based on the templates completed in December. This is included at Appendix K and discussed in Section 10. There were differences between the data on the template submitted in June and December; no reconciliation has been provided.

1.3 Recommendations, based on a review of 1999-2004[1]

1.3.1 The economic argument for improving refinery utilisation is compelling. There is considerable advantage, even in the relatively short term, in allowing the refineries to spend money on efficiently managed maintenance projects and back-up systems for which a clear economic case can be made to protect refinery output.

1.3.2 The importation processes, including the tendering, contracting and procurement practices, fall short of current good practice standards. A review of the procedures and approvals processes found that, in many areas of the process, there was a lack of written procedures.

We recommend that full written procedures are drawn up, drawing upon international best practice and that these new procedures are introduced before the end of February 2007.

1.3.3 We were provided with details of approved imports for the fourth quarter of 2004 and compared the amounts actually imported against this information. We noted that actual imports exceeded the amounts shown as approved on the information we were given. PPMC have said that in such cases, further approvals are obtained following the normal process; however, we were not provided with any evidence of any such additional approvals relating to the excess. The written procedures we were given do not refer to this. There needs to be a system for monitoring actual imports against authorised imports.

We recommend that the procedures, authorisation process and authorities covering this area be documented and that a statement of actual imports compared to authorised imports be prepared on a quarterly basis, and presented alongside the request for approval of the next quarter's imports.

[1] Developments subsequent to 31st December 2004 may not in all cases have been taken into account.

1.3.4 Discretionary management decision-making exists in the pricing and allocation of importation contracts. Areas of discretion should be reduced (but it is probable that they cannot be entirely eliminated) and replaced by transparent decision-making criteria. These criteria should be subject to regular review and should be publicised.

1.3.5 The levels of authority of Refinery Management are set at too low levels which require reference to higher authorities for (in refining terms) modest amounts of expenditure. This inserts delay into the process of procuring materials and services which tends to increase the probability of refinery downtime.

We recommend that levels of authority are reviewed and set at levels which enable refineries to operate efficiently on a day to day basis.

1.3.6 NNPC, PPMC and DPR should discuss and reach agreement on whether there is a requirement for PPMC to abide by current legislation regarding licensing of product importation.

1.3.7 A review of the NNPC Products Agreement found that there is opportunity to improve on the clarity of the existing wording, in many cases to further strengthen the protection of the Buyer. Detailed recommendations have been made in Section 11. PPMC should take legal advice on the contract wording.

1.3.8 As there is both a structural and a performance deficit in PMS supply and this is expected to persist, there would be merit in assessing whether the existing procurement and price risk management processes are effective and optimal in serving the FGN's interests and meeting NNPC's objectives. There is possibly a case for a more direct NNPC involvement in the supply chain through to the original sources of product.

1.3.9 The large increase in product imports has somewhat overwhelmed the jetty facilities that were not designed to support this level of product imports and do not have the draft for fully laden international product tankers. In the period under review, imports increased sharply and the jetties were generally not able to handle the increased volumes. The net result has been considerable delays to shipping, which caused increased demurrage charges as the ships had to wait longer in port to complete their unloading. As it is clear that, for a considerable period into the future there will be the need to import large quantities of PMS, measures should be put in place at jetties and depots to increase capacity to be able to handle these imports more efficiently and more cost effectively.

1.3.10 Security issues continue. The product distribution network has been subject to vandalism, poor maintenance and frequent and unexpected supply disruptions, which have the knock on effect of requiring more product to be run through a facility than it is designed for since the primary route is not available.

1.3.11 A countrywide refined product mass balance should be produced each month.

1.3.12 Government should consider encouraging increased investment in the use of gas powered vehicles, which might be possible in large urban areas. This would have environmental benefits. The main issue would be the cost to establish a distribution network which might be shouldered by the private sector if gas pricing were appropriate and attractive to consumers. A feasibility study is required. Long term availability of gas suitable for this purpose would need to be reviewed against existing contractual commitments, particularly for NLNG.

1.3.13 Given potential opportunities to improve product procurement processes, we recommend that a more detailed study be conducted. For the detailed recommendations on commercial aspects of product procurement arrangements, see Section 12.3

2 INTRODUCTION AND SCOPE OF THIS REPORT

This report reviews the physical and process aspects of the downstream systems of Crude Supply to the refineries and Product Importation. The report presents a coherent and logical progression through the system from crude oil leaving the terminals, the boundary point with the upstream system, to the supply of petroleum products to the domestic marketers. The report therefore covers all aspects of the physical systems and their associated processes[2].

2.1 Structure

This report is structured in sequence to address the following questions:

Crude Oil Supply to the Refineries:

- What is the system of supply?
- What quantities of crude oil were supplied?
- How are these measured?
- What products were supplied by the refineries and in what quantities?
- What was the performance of the refineries?

Product Import:

- What is the system of product supply?
- What are the primary petroleum products within the scope of this report?
- What is the domestic demand for these products?
- What is the domestic supply of product?
- Why import product and who is responsible for importation?
- What quantities of products are imported?
- What is the cost of these imports and what could be saved by producing more domestically?
- What are the key processes for managing product import, including tendering and decision making?
- How effective are these processes, and what opportunities are there for improvement in the processes, the commercial terms and prices paid?
- What is DPR's role in oversight and regulation of importation?
- What are the supply logistics and associated issues?
- How effective are the supply logistics and what opportunities are there for improvements?

[2] the Physical Gas 'downstream' system, is included as an integral part of the Physical report for reasons of coherence and integrity of reporting. The Process Audit Report on the Marketing of Gas is a separate report.

Throughout the report sections, and where appropriate, specific observations, conclusions and recommendations are made where we consider improvement opportunities exist.

2.2 Methodology

Relevant departments of NNPC and representatives from the downstream oil companies were briefed at a meeting in Abuja in May 2005 on the audit requirements and the need for them to complete data templates that would enable the consultants to assemble a full picture of the downstream industry.

Meetings were held with senior NNPC executives to establish the management controls in place. Consultants visited the refineries and key terminal locations to establish and document the procedures used. Interviews were conducted during June and July of 2005 with PPMC and DPR to establish the process for importing products, both by PPMC and the Independent Marketers.

Data collection templates were designed based on the knowledge gained and issued to NNPC / PPMC for volumes and prices paid for imported petroleum products in the audit period. Following a meeting held with PPMC on to clarify certain points, these templates were mostly returned by 17th December 2005.

Templates for data regarding the Independent Marketers were sent to DPR. However DPR could not produce summaries of products imported by Independent Companies before 2004. The template for 2004 data was compiled from records provided by DPR.

The NNPC PPMC standard contract for importation was reviewed.

Further meetings were held in March 2006 with DPR in Lagos to review the licensing arrangements and with PPMC in Abuja to review the Importation procedures and tendering process.

Meetings were held with PPMC in Abuja in May 2006 to re-visit the collection of information on refined product flows and the data collection templates were modified in consultation with PPMC.

This report benefits from the work of Mr Muhammad Lawan Buba[3].

[3] An extract from Mr Buba's 7th October 2003 Report by titled 'Report on the Recent Crude Oil Products Import and Export Allocations by NNPC' was provided to us. Mr Buba was formerly an Executive Director of NNPC. See Appendix I for a copy of the part of the Report relevant to oil product imports. One page is missing.

3 OVERVIEW OF DOWNSTREAM SYSTEM

The downstream system consists of:

i) The Supply of Crude Oil to the Refineries

ii) The Supply of Product into the Nigerian Markets

Crude Oil Supply

Hydrocarbons in Nigeria are produced from oil and gas wells all over the Niger delta, both on land, in the swamp and offshore, in shallow and deep waters.

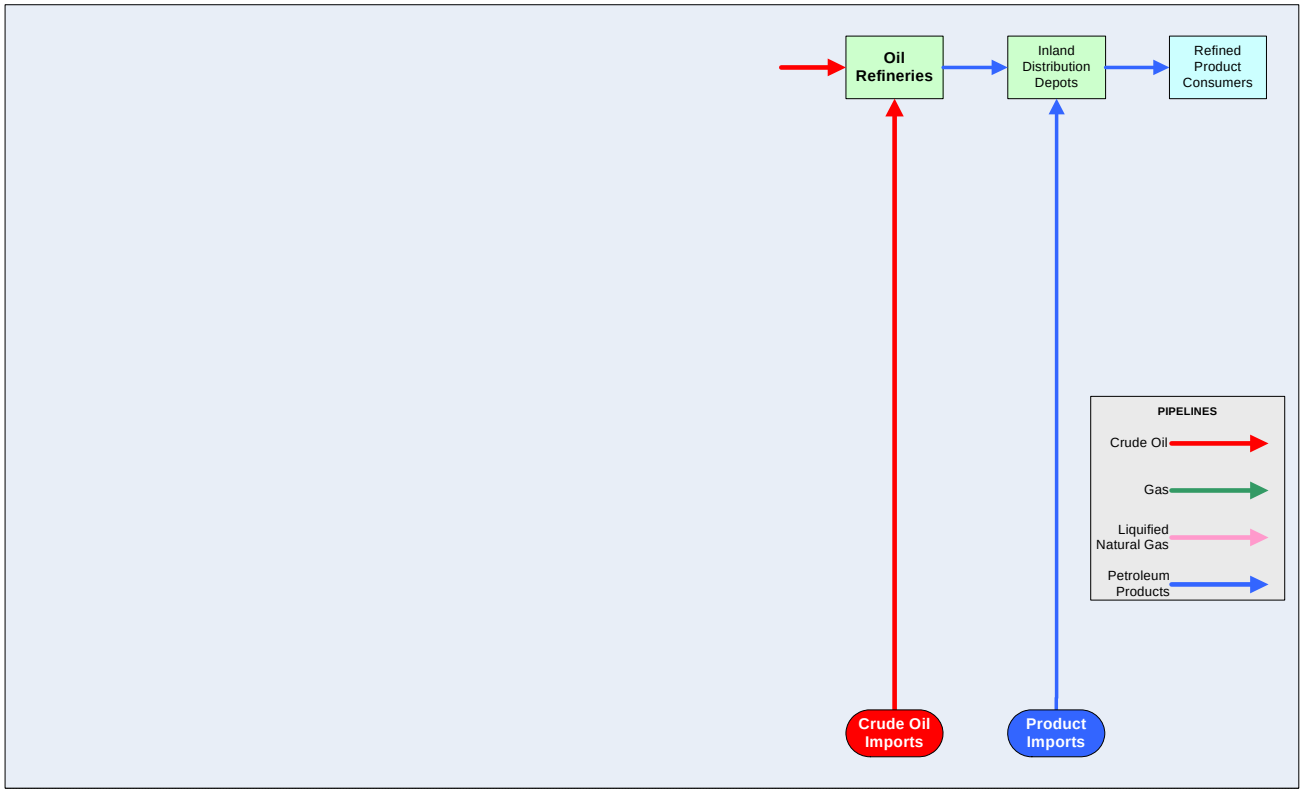
From onshore and shallow offshore wells the liquids are pumped through pipelines to the Oil Terminals. The oil is stored in tanks before being pumped through fiscal meters into an Oil Tanker for export. Some of the “dry” oil is pumped through another fiscal meter to the Refineries where it is refined into products.

Small amounts of ‘sour’ crude oils (see 4.2.3) are imported for use in the Kaduna refinery, as the Nigerian crude is classified as ‘sweet’.

Products Supply

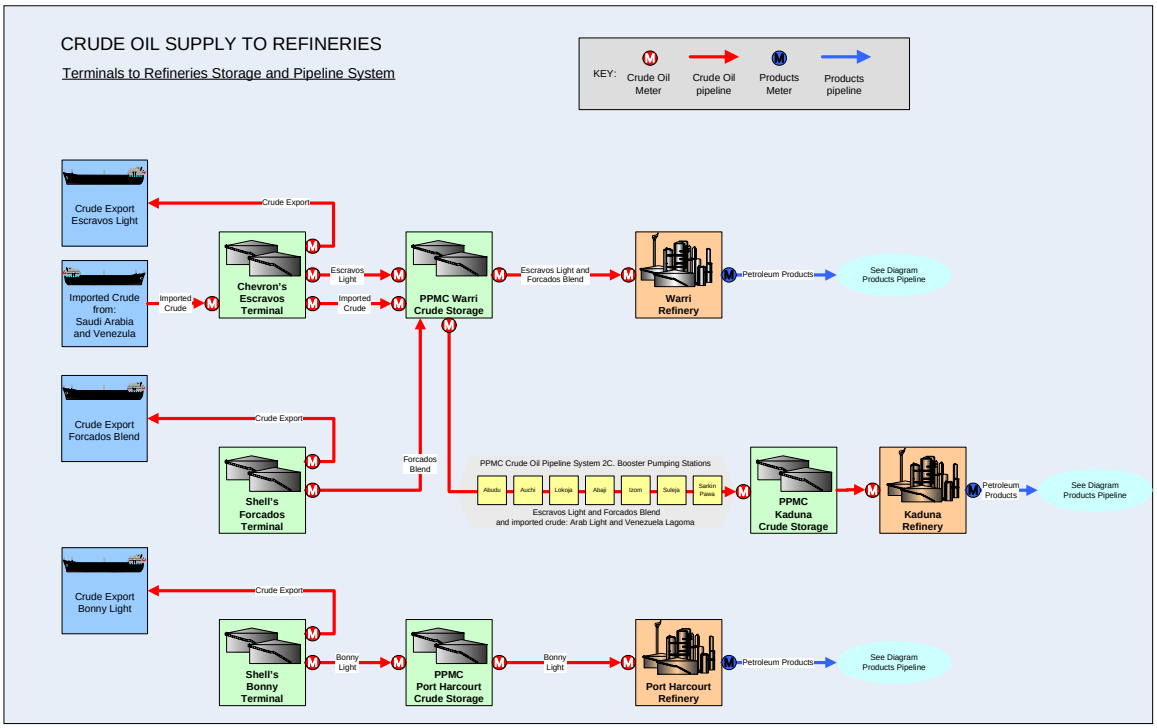
Petroleum products from Nigeria’s refineries at Port Harcourt, Warri and Kaduna together with imported products are distributed through PPMC’s pipeline network to depots where the products are transported by road tankers to the marketers’ outlets.

These downstream systems are represented in the flow diagram below; more detailed diagrams relating to each system are included in the sections below.



4 SYSTEM OF CRUDE SUPPLY TO THE REFINERIES

4.1 Physical System Overview



(See Appendix A for full size schematic and geographic map of terminal and refinery locations).

Nigeria has four domestic refineries; two refineries located at Port Harcourt (PHRC) within the south eastern region of the Niger river delta, Warri (WRPC) located towards the south western part of the Niger river delta and Kaduna (KRPC) which is located in north central Nigeria (see geographic map in Appendix A).

Both Warri and Port Harcourt refineries are sited close to the large crude oil terminals of Forcados and Escravos (into WRPC), and Bonny (into PHRC). Kaduna is situated a considerable distance inland from the oil fields of the delta region and these terminals. Furthermore Kaduna is also designed to produce lubricant oils necessitating the import of crude from overseas. Therefore all crude supply to Kaduna has to be pumped either from the Escravos and Forcados terminals or from large oil tankers through a very long crude oil pipeline; seven booster pumping stations are required along the length of this pipeline.

4.2 Refineries: Brief Description of Design Capacity and Crude Sourcing

4.2.1 Port Harcourt Refining Company (PHRC)

PHRC has two refineries with a combined capacity of 210,000 BPSD (barrels per stream day). The new Port Harcourt Refinery (NPHR) has an installed capacity of 150,000 BPSD; it has Atmospheric and Vacuum Distillation Units, Naphtha Hydro treating and Reforming Units, Fluid Catalytic Cracking Unit, Dimersol and HF-Alkylation Units, The old Port Harcourt Refinery (OPHR) on the other hand, is a simple 60,000 BPSD Hydro skimming plant; with a Crude Distillation, Naphtha Reforming and Liquefied Petroleum Gas Process Units.

The refinery is supplied with crude oil from Shell's Bonny terminal.

4.2.2 Warri Refining & Petrochemical Company (WRPC)

WRPC was incorporated as a Limited Liability Company in 1988 after the merger of the then Warri Refinery and the Ekpan Petrochemical plants. It was built to process 100,000 BPSD (barrels per stream day), but was later expanded to process 125,000 BPSD in 1987, Tile company has a design potential to generate 125MW of electrical power from 3 Gas Turbine Generators, and 3 Steam Turbo - Generators. Like other refineries in the country, WRPC falls under the class of conversion refinery.

The refinery is supplied with crude oil from Shell's Forcados and Chevron's Escravos terminals.

For a more detailed and technical description of the refinery including the procedure for demanding quantities of crude oil for processing see Appendix C.2.

4.2.3 Kaduna Refining and Petrochemical Company Ltd (KPRC)

KRPC was built and commissioned in 1980. The concept was to have a refinery inland in Nigeria with a pipeline supplying crude from the coast (Escravos and Forcados terminals through PPMC's crude pipeline) and product evacuation by road, rail and pipeline supplying the more northerly inland regions of Nigeria. The design of the three modes of evacuation was 200% of refinery output capacity. With this plan, there was to be no backlog of products.

In addition the refinery was built with a lubricants plant, the first and only lubes plant in Nigeria. The lubes plant can produce lube oils and asphalt grades. To achieve this special lube and asphalt producing units were installed, while some sections of this plant were designed to process foreign (sour) crude oils. All Nigerian crude oils are 'sweet'; the main difference between sour and sweet crude oil is the high asphattene content of the sour crude. Therefore crude oil grades other than Nigerian crudes are required. These crudes are imported from Saudi Arabia, Kuwait and Venezuela and are transported through PPMC's crude pipeline.

KRPC started processing 100,000 BPSD (barrels per stream day) 50/50% local/foreign crude oils in 1980. Within seven years it was de-bottlenecked by 10% to process 110,000 BPSD mixed crude oils and few years later the petrochemical section was incorporated. The processing rate of the foreign crude section remains at 50,000 BPSD.

For a more detailed and technical description of the refinery see Appendix C.3.

4.3 Crude allocation

Nigeria receives an entitlement to equity crude from its investments in upstream development and production. Out of that entitlement, an allocation is made for supply to the domestic market.

That allocation has been:

	Bbl / day
Up to March 2001	300,000
From April 2001	445,000

The basis of the increase was to enable NNPC to allocate to the refineries 100% of their design capacity.

This amount is usually available for allocation to refineries, subject to circumstances such as pipeline vandalism or production shortfall.

NNPC purchases the domestic crude allocation from the Federation. The price paid has varied in the period, as follows:

	US$ / Bbl
1999-2001	9.50
2002-2003	18.00
2004	Export Market price

Where the refineries are not in a position to refine the allocated crude, NNPC exports it.

It is clear that, up to 2004, NNPC realised a profit on any exported domestic crude. From 2002 that profit reduced and from 2004 there was no financial incentive to export domestic crude.

NNPC PPMC requires finance to import refined product when the Nigerian refineries do not produce sufficient to meet domestic demand. In the case of PMS, there is a structural shortfall of refining capacity. NNPC notionally applies the proceeds of sale of exported domestic crude to the purchase of product for import[4].

[4] This process is reviewed in the financial audit.

4.4 Receiving crude oil at the Refineries

The process of crude oil receipt can be summarised as follows:

1. The 'domestic crude' allocation is a book allocation of part of the total Government equity crude.
2. NNPC supplies to the refinery in line with the individual refinery's crude oil consumption programme[5]. PPMC takes charge of the crude supply.
3. The PPMC supervisor and his operator, in the presence of DPR representatives, prepares a crude oil tank at the (e.g. Escravos) tank farm in readiness for the crude supply to the refinery (e.g. Warri).
4. Prior to supplying the crude oil to the refinery by PPMC, fiscalisation of the nominated crude tank is carried out using the following tools:
    a. Measuring steel tapes
    b. Tanks calibration charts
    c. Standard crude oil measurement ASTM tables
    d. Thermometer (^{o}C)
    e. 'Thief' can
5. The PPMC operator then performs the following operations:
    i. Dip the steel tape into the crude tank three times, measures the tank level and records the readings on each occasion in meters (m).
    ii. Calculate the average of the three readings and records it as the tank level.
    iii. Draws up a representative sample of the crude oil with the 'Thief can' for analysis of the API gravity and Base Sediments & Water (BS&W).
    iv. Take the temperature of the crude oil in the tank with the Thermometer in degrees Celsius (^{o}C) and records it.
    v. Estimate the quantity (in barrels or tonnes) of the crude oil in the tank using the Tank Calibration Charts and the Standard Crude Oil Measurement ASTM tables.
6. The refinery oil movement operator, in the presence of Production Programming and Quality Control (PPQC), prepares an empty storage tank to receive the crude oil. If an empty tank is not readily available and a tank already containing stock is to be used, a fiscalisation of this tank is carried out prior to receiving crude into it.
7. When all preparations are complete at both the terminal and refining ends of the supply pipeline, the PPMC operator gives the refinery operator the final signal for alertness while the booster pump is switched on to pump the crude oil into the refinery.

[5] Any excess domestic crude that cannot be refined is exported.

8. The PPMC operator and the refinery operator monitor very strictly the crude movement in their respective control rooms and the crude oil tank farms. The operators are mindful of the following:
    a. The pumping rate
    b. The digital volumetric counters
    c. The total for the crude movement
9. At the end of the crude receipt, the refinery operator calculates the quantity received into the tanks and carries out the fiscalisation of the crude in the same manner as above.
10. The refinery PPQC staff sends the representative sample of the crude oil drawn up from the crude received to the laboratory for analysis of the following characteristics:
    a. Specific Gravity at 15 ^{o}C
    b. API Gravity
    c. Salt content (grams / m^3)
    d. Total Sulphur (%)
    e. Kinematic viscosity at 38 ^{o}C (est)
    f. Pour point ^{o}C
    g. Vapour pressure (kg / sq cm)
    h. Water content (%)
    i. Average boiling point (^{o}C)

    In total the above characteristics define the quality of the crude received.
11. The refinery Crude Oil Movement Unit and PPCQ, having determined the quantity and the quality of the crude received, prepare for the crude oil supplied / received reconciliatory meeting with PPMC to resolve any differences between the crude supplied and that received by the refinery.

4.5 Volumetric Summaries

The table below summarises the volumes of crude oil received each quarter by the refineries as reported by each in the June 2006 template Refinery Mass Balance.

Domestic crude inputs to refineries 1999 - 2004 (tonnes)				
Refinery:	**Port Harcourt**	**Warri**	**Kaduna**	**ALL**
Quarter & Year	Input Tonnes	Input Tonnes	Input Tonnes	TOTAL Tonnes
Q1 1999	819,814	828,337	0	1,648,151
Q2 1999	1,385,616	508,813	0	1,894,429
Q3 1999	1,572,590	666,328	2,385,106	4,624,024
Q4 1999	1,298,960	618,403	3,363,626	5,280,989
YR 99 TOTAL	**5,076,980**	**2,621,881**	**5,748,732**	**13,447,593**
Q1 2000	755,984	385,541	894,030	2,035,555
Q2 2000	483,952	0	1,792,999	2,276,951
Q3 2000	708,099	0	0	708,099
Q4 2000	1,275,518	0	0	1,275,518
YR 00 TOTAL	**3,223,553**	**385,541**	**2,687,029**	**6,296,123**
Q1 2001	1,551,638	718,502	515,830	2,785,970
Q2 2001	1,330,924	823,075	461,566	2,615,565
Q3 2001	1,767,742	695,264	454,181	2,917,187
Q4 2001	1,659,064	750,804	385,555	2,795,423
YR 01 TOTAL	**6,309,368**	**2,987,645**	**1,817,132**	**11,114,145**
Q1 2002	1,450,948	796,975	387,432	2,635,355
Q2 2002	1,027,973	979,646	525,709	2,533,328
Q3 2002	1,627,010	689,438	421,271	2,737,719
Q4 2002	1,273,726	868,331	468,126	2,610,183
YR 02 TOTAL	**5,379,657**	**3,334,390**	**1,802,538**	**10,516,585**
Q1 2003	1,325,718	801,886	0	2,127,604
Q2 2003	1,013,364	0	16,930	1,030,294
Q3 2003	965,943	0	26,745	992,688
Q4 2003	1,003,829	1,873	35,581	1,041,283
YR 03 TOTAL	**4,308,854**	**803,759**	**79,256**	**5,191,869**
Q1 2004	668,176	0	0	668,176
Q2 2004	892,523	74,810	0	967,333
Q3 2004	553,204	234,047	0	787,251
Q4 2004	1,010,229	334,636	0	1,344,865
YR 04 TOTAL	**3,124,132**	**643,493**	**0**	**3,767,625**
TOTAL 6 YRS	**27,422,544**	**10,776,709**	**12,134,687**	**50,333,940**

Source: templates provided by the refineries in June 2006 (unaudited)[6]

Port Harcourt received all its supplies from Bonny Terminal

Kaduna received supplies from Escravos and Forcados.

[6] Appendix B contains the September - December 2005 data templates as provided and the combined table including the data from templates 3-08, 3-09 and process reviews.

Warri received supplies from Escravos and Bonny

4.6 Reconciliation between Terminal supplies to the Refineries and Refinery receipts of crude oil.

The following table has been compiled based on three separate sources of information:

a) Crude oil volumes supplied to the refineries 1999-2004 according to COMD

b) Crude oil volumes supplied to the refineries 1999-2004 according to the Oil Companies.

c) Crude oil receipts by Refineries according to the Refineries (see Appendix B: Refinery Mass Balances).

SUPPLIES FROM TERMINALS TO REFINERIES				
	(barrels)			
Year	Per COMD	Per oil company returms	Difference	%
1999	65,779,728	65,993,111	213,383	0.32%
2000	36,209,211	36,209,211	0	0.00%
2001	84,083,832	84,083,832	0	0.00%
2002	78,949,908	77,843,839	-1,106,069	-1.40%
2003	44,228,532	43,273,695	-954,837	-2.16%
2004	37,962,964	38,917,599	954,635	2.51%
Total	**347,214,175**	**346,321,287**	-892,888	-0.26%

REFINERY RECEIPTS COMPARED TO COMD & OIL COMPANIES				
	Refinery receipts (converted from	Difference from oil	Difference from COMD	
Year	tonnes to barrels)	company	Bbls	%
1999	98,301,905	32,308,794	32,522,177	33.08%
2000	46,024,659	9,815,448	9,815,448	21.33%
2001	81,244,400	-2,839,432	-2,839,432	-3.49%
2002	76,876,236	-967,603	-2,073,672	-2.70%
2003	37,952,562	-5,321,133	-6,275,970	-16.54%
2004	27,541,339	-11,376,260	-10,421,625	-37.84%
Total	**367,941,101**	**21,619,814**	20,726,926	5.63%

The table shows:

i) the difference between the COMD figures and the Oil Company returns; over the six years this amounts to 0.26%.

ii) the differences between the receipts as recorded by the Refineries to both COMD and Oil Company recorded supplies; over the six years, PPMC refinery records indicate that their receipts were higher than COMD recorded by about 21.6 million barrels or 2,950,000 tonnes, being 5.63% of the total over the six years.

NNPC has stated that the Warri-Kaduna crude line (system 2C) was converted to deliver white product to Kaduna between 1997 and 1999 and converted back to crude delivery service in 1999. It is suggested that there may have been mis-recording of receipts between crude and AGO during these years.

NNPC also observe that it is to be expected that COMD records higher quantities to the refineries than the refineries show as received because there were several line vandalisations between 2001 and 2004.

The size of the discrepancies – many millions of barrels and up to one-third of the crude throughput – seems too great for this to be the sole reason. It would be unrealistic to seek accuracy for losses due to pipeline vandalisation but there should be a quantitative method which enables reasonable estimates to be given. The explanations given contain no such quantification

(See Appendix B: for the table detailed by Terminal).

4.7 Technical Assessment and Measurement

DPR is responsible for the quantity measurement of crude oil & petroleum products.

Measurements are carried out by the DPR Terminal or Depot operators or their representatives and representatives of the operating companies. The DPR Terminal or Depot representatives report to their various supervisors and Heads of Departments who in turn report to the Director of Petroleum Resources through the operations controller.

This fiscalisation exercise is carried out to ascertain the accurate volume of crude oil and petroleum products both at the production units and custody transfer points.

The basic activities carried out during quantity determination using the dynamic method are flow metering and temperature measurement.

Flow Metering

This is the process of using a flow meter to measure the volume of liquid (i.e. crude oil or petroleum product) as it passes through the pipelines.

A flow meter of the positive displacement type is essentially a piece of equipment designed to measure volume of liquid by separating it into measured quantities (i.e. displaced volume) and counting these quantities. Flow meters of this type can only measure liquid in one direction, hence it is impossible to reverse the flow through such meters.

Temperature Measurement

The temperature effect can account for the largest part of total error in quantity determination of petroleum product and crude oil. It is always necessary to compensate for the effect of temperature of the product.

The purpose of temperature measurement is to determine the temperature of the bulk liquid hydrocarbon (crude oil) in the storage tank.

The temperature so determined is used to calculate the standard volume of the crude oil at $60^{O}F$ and its weight in tonnes. The gauger who measured the level of the crude oil also measures the temperature. The temperature measurement method approved by DPR is the average temperature of the crude oil. The average temperature is obtained from the

average of three (3) level measurements ($^1/_6$ of the crude level below the surface, middle of the crude oil, and $^5/_6{}^{th}$ of the crude level below the surface).

Samples of the crude taken from the stated levels are measured for temperature using mercury in glass thermometer.

See Appendix H for the full description of the measurement process.

4.8 Conclusions

We understand that in general during the audit period, the refineries had been provided with as much crude as they could reasonably expect to refine and that there is no suggestion that poor refinery allocation of crude was a problem.

There were, however, major shortages of crude oil for refining as a result of supply vandalism and poor reliability of equipment to move crude and these issues created a severe problem of supply of crude to the refineries at times. The issue of security is one shared here with the upstream industry.

As is shown in the reconciliation table in the Section 4.5 above, there is a difference of 2,950,000 tonnes (5.63%) of crude oil between the quantity recorded by COMD as supplied to the refineries, and that recorded by the PPMC refineries as received in the period. NNPC has provided no explanation for this difference.

In view of the process as described in Section 4.3, (step 11) the reconciliation meeting between supplier and receiver should provide the basis for accurate and detailed records to be held and aggregated such that a regular review of the totals could take place.

5 PRODUCT SUPPLY BY REFINERIES

5.1 Summary of Product Slate and Output Performance

5.1.1 Port Harcourt Refining Company (PHRC)

The following table shows the expected Product Pattern at Installed Capacity and the actual outputs of PMS, DPK and AGO in the years 1999-2004, together with the actual product output achieved as a percentage of the design capability.

The Product Pattern at Installed Capacity is taken from information provided to us in June 2005, see Appendix C.1 for original data; the actual annual output and product output has been provided by PPMC in June 2006.

	Design		ACTUAL ANNUAL OUTPUT (metric tonnes)					
	Installed Capacity	% of capacity	1999	2000	2001	2002	2003	2004
Feed Crude Processed	9,335,000		4,982,622	3,214,333	6,292,611	5,404,045	4,338,118	3,223,895
Feed crude as % of design capability			53%	34%	67%	58%	46%	35%
PRODUCT OUTPUT								
C3	22,000	0.2%						
C4	34,200	0.4%						
LPG(M)	58,500	0.6%						
PMS	**3,080,350**	33.0%	1,026,119	620,177	1,681,743	1,546,150	678,941	295,799
Output as % of design capability			**33%**	**20%**	**55%**	**50%**	**22%**	**10%**
DPK	**1,416,550**	15.2%	670,786	463,645	958,362	784,331	624,357	413,635
Output as % of design capability			**47%**	**33%**	**68%**	**55%**	**44%**	**29%**
AGO	**2,458,900**	26.3%	1,080,814	736,241	1,496,917	1,329,065	1,047,420	726,191
Output as % of design capability			**44%**	**30%**	**61%**	**54%**	**43%**	**30%**
LPFO	974,500	10.4%						
HFPO	801,300	8.6%						
Fuel Gas	373,400	4.0%						
Flare Loss	25,000	0.3%						
Net Liquids loss	90,300	1.0%						
Total	9,335,000	100.0%						

For the detailed process performance of the refinery and operations expenditure over the audit period, a production process flow diagram and design product yield has been produced, see Appendix C.

From the table above it can be seen that, over the audit period, the refinery never achieved higher than 67% of its design capability and that was in 2001. The average over the six years was 49%. Furthermore the highest output of PMS, the product most required for domestic consumption, never exceeded 55% of design capability and averaged only 32% of design capability over the period.

It has been reported that the performance of PHRC has been greatly disrupted by the following problems:

- The old and the new refineries were last overhauled in 1999 & 2002/2001 respectively. The TAM was executed in a staggered manner and not statutorily
- Frequent failures of turbo generators that supply power.
- Inadequate steam production for the refinery when throughput is beyond 70%
- The Digital Control System (DCS) at the control room especially for NPIIR had become obsolete.
- Lack of metering facilities on product transfer pipelines to Depot. Proper accountability is not guaranteed.

5.1.2 Warri Refining & Petrochemical Company (WRPC)

The following table shows the Design Products Slate and projected annual outputs in metric tonnes based on design quantities per stream day. (The Design Products Slate is taken from information provided to us in June 2005, see Appendix C.2 for original data; the actual annual output and product output has been provided by PPMC in June 2006).

(We are not aware of the total design number of stream days per year, however it would be usual practice in estimating average annual production days to plan for a total shutdown of one quarter every four years and 90% utilisation to allow for ongoing partial plant shutdowns and repairs; this equates to average stream days per year of 308, see note (a) in table).

The table (as with PHRC) also shows the actual outputs of PMS, DPK and AGO in the years 1999-2004, together with the actual product output achieved as a percentage of the design capability.

	Design		ACTUAL ANNUAL OUTPUT (metric tonnes)					
	Design Slate(a)	% of capacity	1999	2000(b)	2001	2002	2003(c)	2004(c)
Feed Crude Processed	5,234,645		2,682,940	311,418	2,977,673	3,420,684	879,785	562,332
Feed crude as % of design capability			51%	6%	57%	65%	17%	11%
PRODUCT OUTPUT								
LPG	63,448	1.2%						
PMS	**1,704,041**	32.6%	422,603	167,578	582,154	618,963	190,340	15,285
Output as % of design capability			**25%**	**10%**	**34%**	**36%**	**11%**	**1%**
DPK/ATK	**550,950**	10.5%	414,077	60,653	455,924	515,466	129,653	63,216
Output as % of design capability			**75%**	**11%**	**83%**	**94%**	**24%**	**11%**
AGO	**1,586,724**	30.3%	538,040	71,025	671,740	786,360	209,109	118,468
Output as % of design capability			**34%**	**4%**	**42%**	**50%**	**13%**	**7%**
Fuel Oil	1,083,418	20.7%						
Fuel Gas	84,977	1.6%						
Polypropylene	32,648	0.6%						
Carbon black	16,786	0.3%						
Flare Loss	15,403	0.3%						
Net Liquids loss	52,348	1.0%						
Total	5,190,742	99.2%						

From the table above it can be seen that, over the audit period, the refinery never achieved higher than 65% of its design capability and that was in 2002. The average over the six years was 34%.

Furthermore the highest output of PMS, the product most required for domestic consumption, never exceeded 36% of design capability and averaged only 20% of design capability over the period.

Apart from the age of the refinery, the following problems have been reported to have an adverse effect on the performance:

- Refinery Waste Water Treatments plant needs to be completely upgraded with modularisation into 4 train system
- Jetty rehabilitation, repair & restoration of cargo and products berthing & metering facilities so as to improve WRPC's capacity to receive and evacuate products.
- Modification & reconstruction of plant drainage structures.
- FP&CB. HFA& PC utilities instruments revamp
- Engineering, procurement & delivery of new monolithic refractory - lined FCCU riser and ATOMAX feed injection nozzles need to be carried out Maintenance workshop equipment upgrade
- New demineralised water should be provided
- CDU feed preheat train revamp should be carried out

5.1.3 Kaduna Refining and Petrochemical Company Ltd (KPRC)

The following table shows the Design Products Slate and projected annual outputs in metric tonnes based on design quantities per stream day. (The Design Products Slate is taken from information provided to us in June 2005, see Appendix C.3 for original data; the actual annual output and product output has been provided by PPMC in June 2006).

(The total number of stream days per year used for calculation of design capacity is taken from the test operational performance equivalent to 310 days per year achieved during commissioning, allowing for 55 days of down-time).

The table (as with PHRC & WRPC) also shows the actual outputs of PMS, DPK and AGO in the years 1999-2004, together with the actual product output achieved as a percentage of the design capability.

	Design		ACTUAL ANNUAL OUTPUT (metric tonnes)					
	Design Slate(a)	% of capacity	1999	2000	2001	2002	2003	2004
Feed Crude Processed	4,476,400		6,758,766	2,626,409	1,799,661	1,990,995	910,985	1,470,789
Feed crude as % of design capability			151%	59%	40%	44%	20%	33%
PRODUCT OUTPUT								
LPG	189,352	4.2%						
PMS	1,195,646	26.7%	1,165,655	461,617	326,812	443,201	162,863	220,206
Output as % of design capability			**97%**	**39%**	**27%**	**37%**	**14%**	**18%**
DPK/ATK	507,176	11.3%	1,218,692	370,762	210,251	242,731	104,186	152,422
Output as % of design capability			**240%**	**73%**	**41%**	**48%**	**21%**	**30%**
AGO	926,615	20.7%	1,028,143	384,061	371,855	413,793	155,707	323,456
Output as % of design capability			**111%**	**41%**	**40%**	**45%**	**17%**	**35%**
Fuel Oil	623,115	13.9%						
Sulphur	3,133	0.1%	*These products are derivatives of asphattene foreign crude.*					
Wax Grades	22,830	0.5%						
Lube Base Oils	209,943	4.7%						
Asphalt grades	556,864	12.4%						
Kerosene Solvent	32,678	0.7%	*These products are Petrochemical products*					
Heavy Paraffin	2,238	0.1%						
Benzene	2,238	0.1%						
Heavy Alkylato	2,238	0.1%						
Linear Alkye Bentzene	28,201	0.6%						
Losses	167,865	3.8%						
Total	4,476,400	99.9%						

Note: according to the test operational performance, total annual stream days allowing for shutdowns is 310 days pa

The 1999 figures (provided in June 2006 by PPMC) are under query with NNPC, to explain how the refinery operated at 150% of design capacity. They are excluded from this analysis pending a response from NNPC.

From the table above it can be seen that, over the audit period, the refinery never achieved higher than 59% of its design capability and that was in 2000. The average over the five years 2000 – 2004 was 39%. This is to be compared with a utilisation over 105% achieved during the commissioning of the refinery.

Furthermore the highest output of PMS, the product most required for domestic consumption, never exceeded 39% of design capability and averaged only 27% of design capability over the period.

Over the years, the refinery has continuously operated at a low capacity utilisation, resulting in a net loss.

The following are some of the reasons given for poor performance and low capacity utilisation:

- Occasional stock-out of local crude
- Non-availability of foreign crude
- Reprocessing of slops (off-specification products)
- Crude oil pump trip at Warri
- Crude oil supply line rupture
- Continuous shut down of FCCU (Fluid Catalytic Cracking Unit)

5.1.4 Domestic Refining Design Capacity and Overall Performance

Design Capacity

Based on the each refineries design, the total installed capability of all three refineries for the three primary products produced working at maximum performance and efficiency, including allowances for properly planned turn around shutdowns and planned partial equipment outages is as follows:

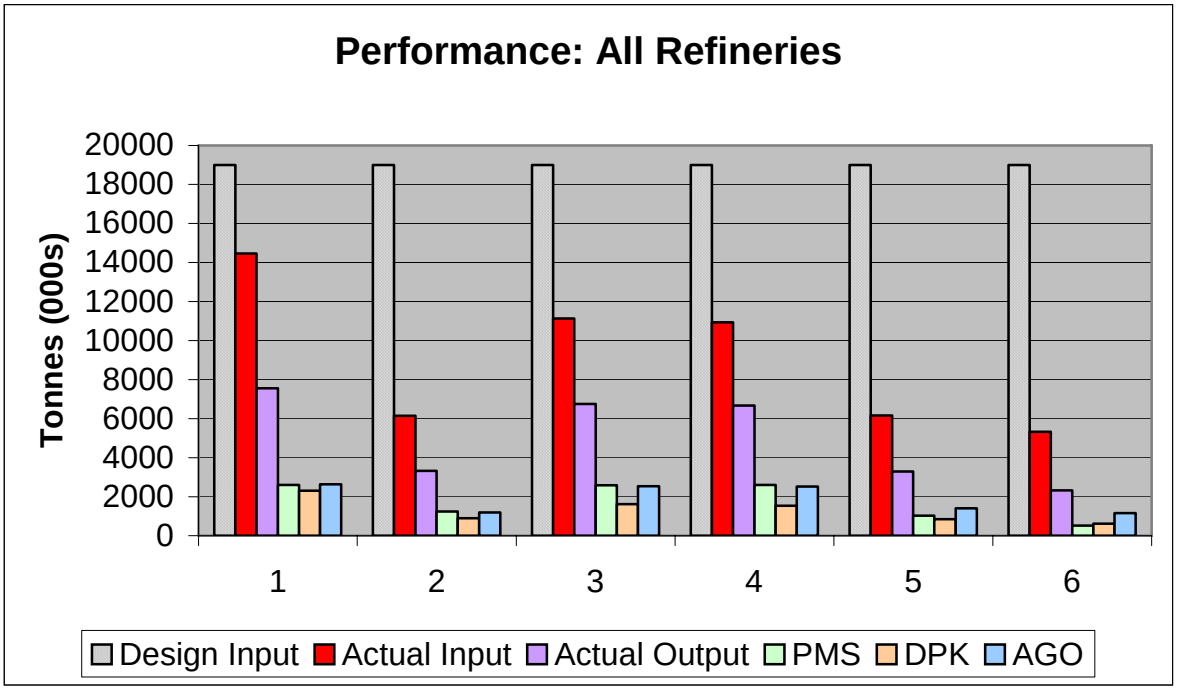
	Installed Annual Design Capacity				% of total capacity
Refinery	Port Harcourt	Warri	Kaduna	**Total**	
Feed Crude Processed	9,335,000	5,234,645	4,476,400	**19,046,045**	
PRODUCT OUTPUT					
PMS	3,080,350	1,704,041	1,195,646	**5,980,037**	31.4%
DPK	1,416,550	550,950	507,176	**2,474,677**	13.0%
AGO	2,458,900	1,586,724	926,615	**4,972,238**	26.1%

Over the six years of the audit period this would equate to:

- Processing up to 114 million tonnes of crude. In fact only 54.1 million tonnes was processed (as table in 4.3) or 47% of total capacity
- PMS domestic production of nearly 36 million tonnes
- DPK domestic production of nearly 15 million tonnes
- AGO domestic production of nearly 30 million tonnes

Performance of Refineries

The actual performance of the Nigerian Refineries is shown in the bar chart below[7]:



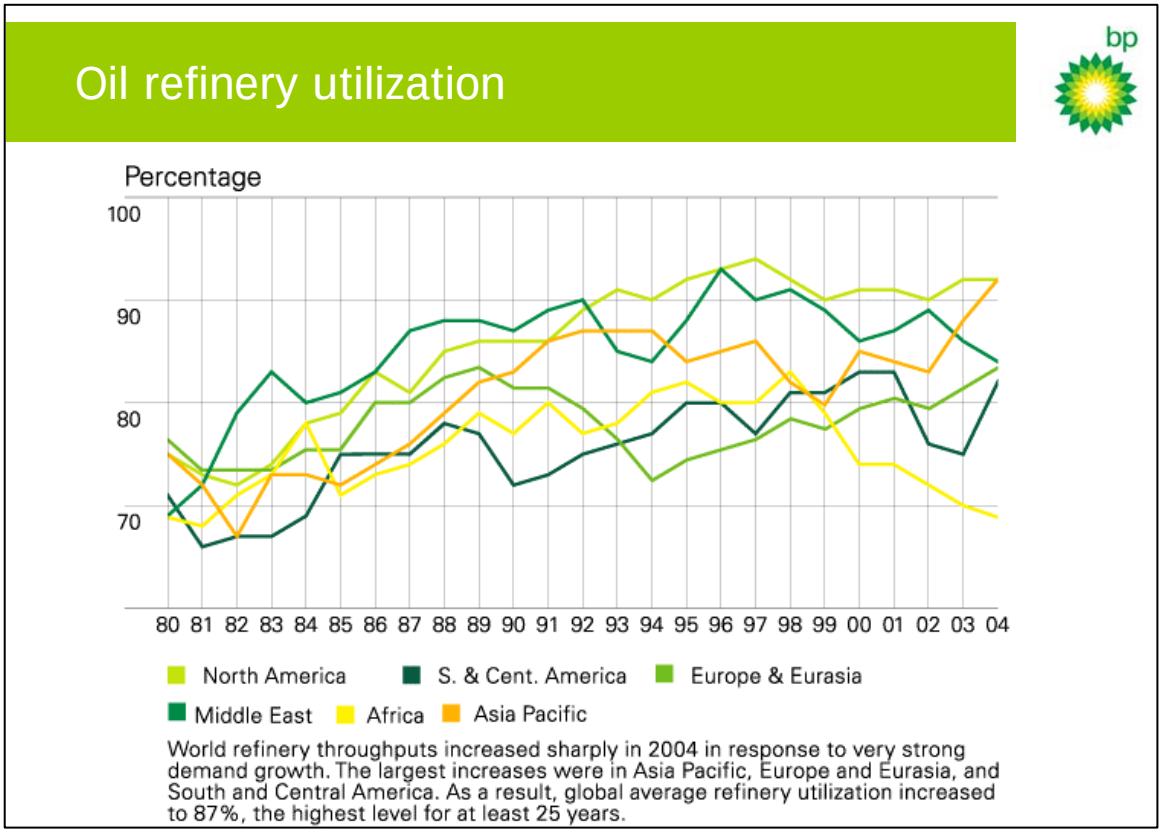
The peak and actual average utilisation performances of each refinery during the period (based on actual input crude processed divided by design and commissioned capacity) were:

- PHRC: peak: 67% (in 2001) average: 49%
- WRPC: peak: 65% (in 2002) average: 34%
- KRPC: peak: 59% (in 2002) average: 27% (excluding 1999)
- ALL: average: 42.7%

This is to be compared with the average actual utilisation achieved world-wide of 87% in 2004, and averaging over 85% in the audit period (source: BP Statistical Review of World Energy 2005, 14 June 2005).

A copy of the graph showing oil refinery utilisations over the 25 year period 1980-2004 is shown below (from BP Statistical Review of World Energy 2005)[8].

[7] The data for this table is taken from the combined mass balance table using data from the individual refinery templates 3-08, as shown in Appendix B.
[8] The report from which this is drawn can be accessed on: http://www.bp.com/downloads



See Section 6 for the consequences and the requirement to supplement the reduced domestic output with imports of these products during the audit period.

5.2 Processing Fees, Bonus and Penalty for Refineries

5.2.1 Processing Fees

With the advent of commercialisation, the funding of the refineries is based on a processing fee concept. Quarterly, the Group Finance & Accounts Directorate, Corporate Planning & Development Division (CPDD) and the Refineries and Petrochemical Directorate meet to agree the processing fee mechanism. Prior to the meeting, refineries are directed to provide their management positions on the following issues

- Plant integrity (available capacity)
- Plant through-put & yields (capacity utilisation)
- Cost profile

Usually, the processing fee negotiation is determined on total cost of recovery on products. Each refinery highlights its projected performance and its cost profile for the quarter. Based on the these, the Gross Products Worth (GPW), based on the ex-depot price of products, is generated and the fixed cost is distributed using the GPW ratios.

Refinery locations in respect to crude supply source vary. In order to encourage the refineries to optimise production of PMS, the variable cost distribution is apportioned to PMS production cost. An example of the last negotiated processing fee is given below:

PRODUCT	KRPC			WRPC			PHRC		
	N/Tonne	N/LTR	ltr/tonne	N/TON	N/LTR	ltr/tonne	N/TON	N/LTR	ltr/tonne
LPG	6,246.02	3.56	1,754.50	3,729.45	2.13	1,750.92	2,024.55	1.15	1,760.48
PMS	5,050.38	3.18	1,588.17	3,062.77	2.33	1,314.49	1,634.33	1.23	1,328.72
DPK	2,865.17	2.35	1,219.22	1,710.77	1.40	1,221.98	928.70	0.76	1,221.97
AGO	2,995.39	2.57	1,165.52	1,788.53	1.54	1,161.38	970.91	0.83	1,169.77
FUEL OIL	1,066.68	1.04	1,025.65	650.04	0.62	1,048.45	352.88	0.34	1,037.88

The data in this table is taken from that provided by NNPC in June 2005. It would appear that the figures for PMS fees to KRPC may be incorrect as the ltr/tonne is not equivalent to WRPC & PHRC for PMS.

5.2.2 Bonus

It is generally agreed that refineries are paid a premium on the agreed processing fee for extra PMS produced above the agreed quantity. The premium fee is also based on variable cost. The applicable premium rate for the period 2005 is stated below:

PRODUCT	KRPC		WRPC		PHRC	
	N/TON	N/LTR	N/TON	N/LTR	N/TON	N/LTR
PMS	1,640.00	1.24	1,04.86	0.79	529.13	0.40

5.2.3 Penalty

If the refineries fail to produce the agreed quality of PMS, both the projected revenue and the premium are lost.

If the refineries are forced to reduce throughput due to crude supply or product evacuation problem, the refineries will be paid the agreed fee, but PPMC will be liable and will be made to pay a penalty for the loss in production.

Conversely, if PPMC incurs demurrage as a result of active shortage or non-availability of product, due to refinery default on an agreed product evacuation programme, the refineries are made to pay for the demurrage and the bridging cost.

Also, in a situation when working capital is not available, refineries will be paid a processing fee for one month in advance.

Reconciliation meetings are held monthly to review the situation by all the parties concerned.

5.3 Volumetric summaries

The table below summarises the volumes of the primary products, PMS (motor spirit), DPK (Kerosene) and AGO (diesel oil) produced quarterly by each refinery, and the totals for each year and all refineries. This table has been compiled based on the data reported by the refineries in the June template Refinery Mass Balance.

Refinery:	Port Harcourt			Warri			Kaduna			ALL		
Quarter & Year	PMS Tonnes	Kero Tonnes	AGO Tonnes	PMS Tonnes	KERO Tonnes	AGO Tonnes	PMS Tonnes	Kero Tonnes	AGO Tonnes	PMS Tonnes	Kero Tonnes	AGO Tonnes
Q1 1999	96,442	97,337	168,909	139,046	131,101	177,375	13,180	41,220	41,860	248,668	269,658	388,144
Q2 1999	238,075	187,649	300,676	47,503	68,056	84,243	74,390	49,570	55,460	359,968	305,275	440,379
Q3 1999	369,550	217,182	308,514	82,295	110,807	126,419	50,830	54,000	32,140	502,675	381,989	467,073
Q4 1999	322,052	168,619	302,715	91,238	104,113	138,886	65,210	44,690	39,630	478,500	317,422	481,231
Q1 2000	110,139	106,784	144,170	70,944	47,800	66,595				181,083	154,584	210,765
Q2 2000	141,839	68,011	107,521	0	0	-2,068				141,839	68,011	105,453
Q3 2000	74,415	102,378	174,626	0	0	-4,977				74,415	102,378	169,649
Q4 2000	293,784	186,472	309,924	0	0	-9,724	64,720	43,430	64,460	358,504	229,902	364,660
Q1 2001	360,824	216,398	369,445	174,186	116,808	166,450	94,452	63,473	98,325	629,462	396,679	634,220
Q2 2001	263,475	195,546	326,209	199,529	135,576	207,468	94,770	68,750	118,700	557,774	399,872	652,377
Q3 2001	539,038	286,075	423,147	120,133	98,886	146,334	73,940	50,610	75,940	733,111	435,571	645,471
Q4 2001	518,406	260,343	378,116	140,092	104,653	163,988	67,670	35,240	59,810	726,168	400,236	601,914
Q1 2002	439,836	197,089	369,299	156,874	129,218	201,715	96,960	57,190	96,090	693,670	383,497	667,104
Q2 2002	272,792	151,619	268,532	184,338	142,227	220,806	105,371	63,197	114,471	562,501	357,043	603,809
Q3 2002	408,532	223,640	383,227	127,358	102,495	154,650	156,558	58,131	107,109	692,448	384,266	644,986
Q4 2002	424,990	211,983	308,007	173,921	141,525	206,838	79,400	54,105	82,787	678,311	407,613	597,632
Q1 2003	368,362	192,134	312,647	150,543	129,652	222,734	125,340	70,470	105,040	644,245	392,256	640,421
Q2 2003	172,570	149,921	257,302	0	0	0	11,000	4,800	11,250	183,570	154,721	268,552
Q3 2003	69,107	146,501	259,796	0	0	0	460	6,010	1,650	69,567	152,511	261,446
Q4 2003	68,902	135,801	217,675	0	0	0	27,330	29,050	43,830	96,232	164,851	261,505
Q1 2004	160,497	109,682	181,923	0	0	-2,951	57,380	38,740	87,730	217,877	148,422	266,702
Q2 2004	127,835	100,652	161,746	8,150	5,986	8,839	59,170	39,080	83,420	195,155	145,718	254,005
Q3 2004	139,687	93,680	176,864	29,737	24,285	71,041	49,100	30,000	64,620	218,524	147,965	312,525
Q4 2004	183,768	130,050	208,236	60,840	32,945	63,667	58,830	44,980	85,860	303,438	207,975	357,763

YEAR	Port Harcourt			Warri			Kaduna			ALL		
Product	PMS	Kero	AGO	PMS	KERO	AGO	PMS	Kero	AGO	PMS	Kero	AGO
1999	1,026,119	670,787	1,080,814	360,082	414,077	526,923	203,610	189,480	169,090	1,589,811	1,274,344	1,776,827
2000	620,177	463,645	736,241	70,944	47,800	49,826	242,810	150,260	237,910	933,931	661,705	1,023,977
2001	1,681,743	958,362	1,496,917	633,940	455,923	684,290	332,100	213,020	353,730	2,647,783	1,627,305	2,534,937
2002	1,546,150	784,331	1,329,065	642,491	515,465	784,009	438,275	232,612	400,447	2,626,916	1,532,408	2,513,521
2003	678,941	624,357	1,047,420	150,543	129,652	222,734	164,130	110,320	161,760	993,614	864,329	1,431,914
2004	611,787	434,064	728,769	98,727	63,216	140,596	224,470	152,800	321,630	934,984	650,080	1,190,995
TOTAL	6,164,917	3,935,546	6,419,226	1,956,727	1,626,133	2,408,378	1,605,395	1,048,492	1,644,557	9,727,039	6,610,171	10,472,171

These product volumes are taken from the templates returned in June. There are differences between these returns and the original templates as shown below. PPMC has been asked to explain the differences.

Kaduna production for 1999 above is based on the throughput declared for that year by the refinery – as stated above, this is under query with NNPC since it amounts to 150% of the refinery's design capacity.

Differences between product volumes according to the June templates (above) and the original templates

YEAR	Port Harcourt			Warri			Kaduna			ALL		
Product	PMS	Kero	AGO	PMS	KERO	AGO	PMS	Kero	AGO	PMS	Kero	AGO
1999	0	-1	0	62,521	0	11,117	962,045	1,029,212	859,053	1,024,566	1,029,211	870,170
2000	0	0	0	96,634	12,853	21,199	396,897	327,332	319,601	493,531	340,185	340,800
2001	0	0	0	-51,786	1	-12,550	-4,020	-7,822	19,080	-55,806	-7,821	6,530
2002	0	0	0	-23,528	1	2,351	4,912	10,108	13,336	-18,616	10,109	15,687
2003	0	0	0	39,797	1	-13,625	-1,267	-6,144	-6,063	38,530	-6,143	-19,688
2004	-315,988	-20,429	-2,578	-83,442	0	-22,128	-4,274	-378	1,826	-403,704	-20,807	-22,880
TOTAL	**-315,988**	**-20,430**	**-2,578**	**40,196**	**12,856**	**-13,636**	**1,354,293**	**1,352,308**	**1,206,833**	**1,078,501**	**1,344,734**	**1,190,620**
	-5.1%	-0.5%	0.0%	2.1%	0.8%	-0.6%	84.4%	129.0%	73.4%	11.1%	20.3%	11.4%

Appendix B contains a full size version of this table and both the original data templates 3-08 and the June templates as returned by the refineries via NNPC.

5.4 Conclusions

5.4.1 Refinery performance

The performance of the three domestic refineries was poor during the period 1999 - 2004, even compared to their own achievements at peak outputs during the period. Measured by world standards, the refineries average performance of approximately 42.7% utilisation is less than half the average world performance over the same period (approx. or greater than 85%). There were no major shortages of supply of crude to the refineries in that period. The main cause of the poor performance appears to have been management, in terms of the allocation of expenditure and resources directed at achieving and maintaining good levels of plant performance and refinery utilisation.

5.4.2 Incentives

There is a practice of allowing PPMC to export that part of the domestic crude allocation if it cannot be refined. During the period 1999 – 2002, this offered an incentive to reduce refinery throughput, since an apparent gain could be made by choosing to sell rather than refine.

The refineries, since 2003 have been charged by the upstream sector for the crude they consume at the opportunity export price. The system of exporting surplus domestic crude continues (it is the only practical option, as storage is limited) but there is no longer a financial advantage in doing so.

5.4.3 Accounting for refinery performance

A transparent system of accounting is required that produces reliable indicators of refinery profitability.

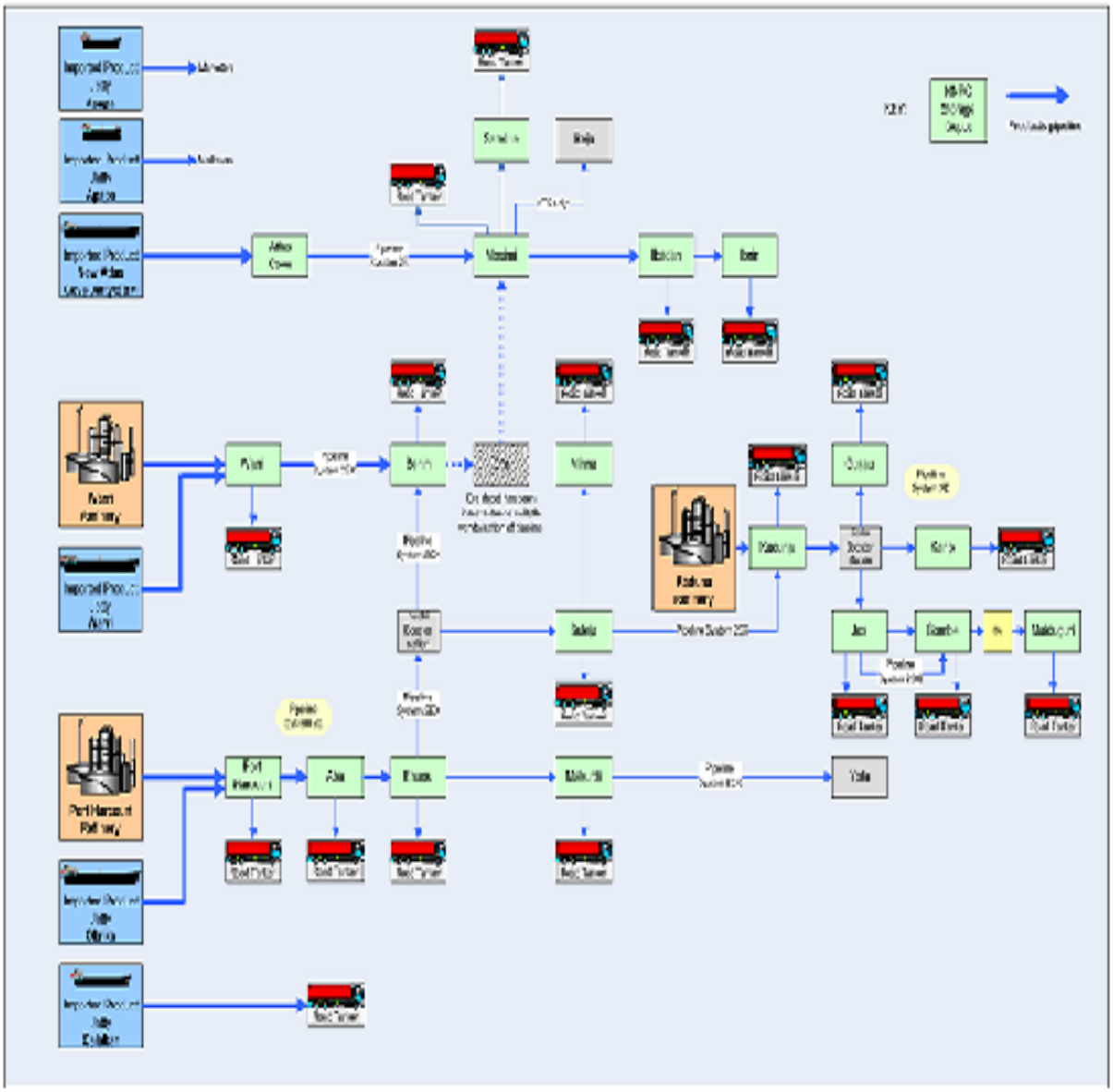
There are two main commercial models: the refinery may purchase crude and sell the product or the refinery may never get ownership of the crude but instead receive a fee for refining. The latter is currently in use.

As a management tool, and without necessarily disturbing the current fee arrangements, the refineries should be credited with the value of products they make, at the average price that PPMC pays for importing product. This indicates to the refineries the gross refining margin. The advantage of this method is that is gives a clear indication of the refineries' contribution to reducing the cost of imported product (see Section 6). On current prices where imported product prices are much higher than crude, this method will show a high gross margin indicating that there is considerable advantage, even in the relatively short term, of allowing the refineries to spend money on efficiently managed maintenance projects and back-up systems for which a clear economic case can be made to protect refinery output.

6 SUPPLY OF PETROLEUM PRODUCTS IN NIGERIA

6.1 System Overview

PPMC Pipeline Distribution System



(See Appendix A for full size schematic and geographic map of inland distribution system).

6.2 Products Supplied

The primary white petroleum products consumed in Nigeria are:

PMS: **Premium Motor Spirit.** This is fuel for motor vehicles.

DPK: **Dual Purpose Kerosene**.

ATK: **Aviation Turbine Kerosene**. Jet Aircraft fuel

AGO: **Agricultural Gasoline Oil**. Diesel fuel.

LPFO: **Low Pouring Point Fuel Oil** - fuel oil

6.3 Product Demand

The average demand pattern used for forecasting product requirements by PPMC in the 4th quarter of 2004 was:

• PMS: 30 million litres / day	equates approx. to:	2,023,000	tonnes / quarter*
• DPK: 10 million litres / day	equates approx. to:	717,000	tonnes / quarter*
• AGO: 12 million litres / day	equates approx. to:	930,000	tonnes / quarter*

See Appendix D: PPMC submission Supply Demand Balance for demand forecasts.

(* see Appendix J for conversion factors)

6.4 Product Supply - Domestic

The three Nigerian Refineries, Port Harcourt, Warri and Kaduna produced the following total outputs in the 4th quarter 2004:

Total Output all Refineries	Shortfall from demand	Domestic supply % of total demand
• PMS: 303,438 tonnes	1,720,000 tonnes	15%
• DPK: 207,975 tonnes	509,000 tonnes	29%
• AGO: 357,763 tonnes	572,000 tonnes	38%

Performance of Domestic Refineries

The actual performance of the Nigerian Refineries is shown in the bar chart in Section 5.1.4 above.

The best overall year of performance for each refinery was 2001 for Port Harcourt, and 2002 for Warri and Kaduna. The following table shows both the actual product outputs in 2004 and the estimated potential outputs if all three refineries operated in 2004 as well as they had done in their best year. An adjustment has been made to the total output to allow for a complete shutdown of one quarter's duration every four years; this is based on best practice industry wide.

		Ouput in tonnes		
		PMS	DPK	AGO
Actual Ouput in 2004				
Port Harcourt	2004	611,787	434,064	728,769
Warri	2004	98,727	63,216	140,596
Kaduna	2004	224,470	152,800	321,630
Total All Refineries		934,984	650,080	1,190,995

Best Years Performance				
Port Harcourt	2001	1,681,743	958,362	1,496,917
Warri	2002	642,491	515,465	784,009
Kaduna	2002	438,275	232,612	400,447
Total All Refineries		2,762,509	1,706,439	2,681,373
Total All Refineries	adjusted *	2,589,852	1,599,787	2,513,787
* adjusted = shutdown of 1 quarter every 4 years; equates to x15/16				

Potential Increased Domestic Product Output			
	1,654,868	949,707	1,322,792
Total Actual Imports for 2004	5,696,199	492,154	170,279
Av price / tonne	*$453.97*	*$387.76*	*$321.22*
Potential reduced PPMC Imports	**4,041,331**	**no need**	**no need**

If the three domestic refineries had only operated at their peak level of performance achieved during the period then these refineries should have been able to produce sufficient quantities of DPK and AGO to meet the needs of the domestic market, and indeed to export DPK and AGO.

Nevertheless, even if these levels of performance had been achieved, there would still have been a significant shortfall of production of PMS in the period.

However if the refineries had operated at their design capacity (see Section 5.1.4) the output of PMS could have reached nearly 6 million tonnes in each year. Based on the amount of PMS actually imported in 2004, this could have reduced those imports to approximately 1 million tonnes.

Moreover, had the refineries operated at their design performances, the excess of DPK and AGO produced over domestic demand (approx. 1.3mt and 3.6mt respectively in 2004) could have been exported.

6.5 Product Supply - Imports

Nigeria has needed to import DPK and AGO and very significant quantities of PMS to meet domestic demand due to this overall extremely poor refinery performance during the audit period.

NNPC has the overall responsibility for managing this importation; see Section 7.1.

A small proportion of products are imported by Independent Marketers; see Section 7.2.

The summary of imports by NNPC PPMC for the years 1999-2004 and the costs are presented in the following table:

NEITI PRODUCT IMPORT TEMPLATE Source: Original Templates

GRADE	PMS			DPK			AGO		
YEAR	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne
1999	1,987,474	425,543,093	*214*	171,482	38,927,285	*227*	465,248	73,306,896	*158*
2000	4,144,348	1,393,775,653	*336*	1,155,399	381,929,238	*331*	1,952,732	590,299,084	*302*
2001	3,857,093	1,098,560,424	*285*	460,764	125,155,868	*272*	148,926	28,646,602	*192*
2002	4,036,484	931,875,291	*231*	404,897	104,044,022	*257*	94,351	23,934,139	*254*
2003	5,404,163	1,676,911,695	*310*	637,621	217,439,734	*341*	1,146,690	334,372,819	*292*
2004	5,696,199	2,585,880,806	*454*	492,154	190,838,962	*388*	170,279	54,696,281	*321*
TOTAL	**25,125,762**	**8,112,546,963**		**3,322,316**	**1,058,335,109**		**3,978,225**	**1,105,255,822**	

NEITI PRODUCT IMPORT TEMPLATE Source: Templates June 2006

GRADE	PMS			DPK			AGO		
YEAR	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne
1999	3,514,500		*0*	1,411,700		*0*	1,635,100		*0*
2000	2,895,300		*0*	778,600		*0*	1,056,700		*0*
2001	2,326,300		*0*	471,500		*0*	717,300		*0*
2002	2,649,500		*0*	399,000		*0*	608,400		*0*
2003	5,265,000		*0*	1,213,500		*0*	914,500		*0*
2004	5,625,200		*0*	347,900		*0*	948,700		*0*
TOTAL	**22,275,800**	**0**		**4,622,200**	**0**		**5,880,700**	**0**	

NEITI PRODUCT IMPORT TEMPLATE **Difference between original templates and June 2006 templates**

GRADE	PMS			DPK			AGO		
YEAR	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne
1999	1,527,026		*0*	1,240,218		*0*	1,169,852		*0*
2000	-1,249,048		*0*	-376,799		*0*	-896,032		*0*
2001	-1,530,793		*0*	10,736		*0*	568,374		*0*
2002	-1,386,984		*0*	-5,897		*0*	514,049		*0*
2003	-139,163		*0*	575,879		*0*	-232,190		*0*
2004	-70,999		*0*	-144,254		*0*	778,421		*0*
TOTAL	**-2,849,962**	**0**		**1,299,884**	**0**		**1,902,475**	**0**	

(See Appendix B: NNPC Product Quarterly Import Tables by Product.)

The importation of AGO by NNPC was nil from mid 2004 due to the Federal Government policy on product deregulation.

NNPC Imports

At the time of our visit in June 2006, PPMC was unable to produce detailed data for years 1999 to 2002 as a result of the incidence of fire in their office, which destroyed all the documents. During late November and early December, PPMC recreated information on imports from the underlying inspectors records and provided summaries to us. These were covered as part of our review of the mass balance provided to us on 15th December and were not therefore reviewed in detail. See Appendix D for the detailed monthly records of oil products imported by NNPC.

These records state for each cargo imported:

- Vessel name
- Company (Contract Holder)
- Product
- Quantity (in metric tonnes)
- Date of arrival
- Arrival jetty (SPM/NACJ, Apapa, ISAF, Port Harcourt, Calabar, Warri)
- Sub-total delivered
- Difference

Plus a monthly summary of imported quantity (mt) by product; PMS, DPK and AGO.

These are summarised into one page record for each product by month of quantity and jetty, with quarterly and annual totals.

Independent Marketer Imports

Prior to 2005, DPR records were kept manually and no summaries of volumes of products imported were produced by DPR.

See Appendix F for the table of oil products imported by independent marketers. We have compiled this table, using data records provided by DPR. The table states for each cargo:

- Name of Importer
- Port of discharge
- Volume discharge by product category (PMS, DPK, AGO and Base Oil)

The tables below are summaries for 2004 drawn from both the original templates and those received in June of:

- estimated annual demand,
- actual refinery outputs,
- PPMC reported imports and jetty receipt data, and
- DPR reported marketer's imports.

The differences between the figures have been queried with NNPC.

NEITI PRODUCT IMPORT TEMPLATE Source: Original Templates

GRADE	PMS			DPK			AGO		
YEAR	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne
1999	1,987,474	425,543,093	214	171,482	38,927,285	227	465,248	73,306,896	158
2000	4,144,348	1,393,775,653	336	1,155,399	381,929,238	331	1,952,732	590,299,084	302
2001	3,857,093	1,098,560,424	285	460,764	125,155,868	272	148,926	28,646,602	192
2002	4,036,484	931,875,291	231	404,897	104,044,022	257	94,351	23,934,139	254
2003	5,404,163	1,676,911,695	310	637,621	217,439,734	341	1,146,690	334,372,819	292
2004	5,696,199	2,585,880,806	454	492,154	190,838,962	388	170,279	54,696,281	321
TOTAL	25,125,762	8,112,546,963		3,322,316	1,058,335,109		3,978,225	1,105,255,822	

NEITI PRODUCT IMPORT TEMPLATE Source: Templates June 2006

GRADE	PMS			DPK			AGO		
YEAR	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne
1999	3,514,500		0	1,411,700		0	1,635,100		0
2000	2,895,300		0	778,600		0	1,056,700		0
2001	2,326,300		0	471,500		0	717,300		0
2002	2,649,500		0	399,000		0	608,400		0
2003	5,265,000		0	1,213,500		0	914,500		0
2004	5,625,200		0	347,900		0	948,700		0
TOTAL	22,275,800	0		4,622,200	0		5,880,700	0	

NEITI PRODUCT IMPORT TEMPLATE **Difference between original templates and June 2006 templates**

GRADE	PMS			DPK			AGO		
YEAR	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne	Tonnes	$	$ per tonne
1999	1,527,026		0	1,240,218		0	1,169,852		0
2000	-1,249,048		0	-376,799		0	-896,032		0
2001	-1,530,793		0	10,736		0	568,374		0
2002	-1,386,984		0	-5,897		0	514,049		0
2003	-139,163		0	575,879		0	-232,190		0
2004	-70,999		0	-144,254		0	778,421		0
TOTAL	-2,849,962	0		1,299,884	0		1,902,475	0	

As from mid 2004 the importation of AGO product by NNPC was nil, due to the Federal Government's policy on deregulation. Independent Marketers imported AGO product, the first delivery into Apapa recorded in the DPR templates was 27th April 2004.

It is also noted in PPMC's demand forecast for the 4th quarter 2004, that Independent Marketers had been importing ATK, and this had reduced the need for PPMC to import DPK in the period.

6.6 Costs of Importing Product

The following order-of-magnitude estimates are based on information supplied by PPMC which we have not independently verified.

6.6.1 PPMC Supply Demand balance 4th Quarter 2004

In PPMC's submission (see Appendix D.1), under scenario 2 assumption of refinery operations and based on the demand pattern as section 3.2 above, the estimated import requirement was:

Product	Number of cargoes	Unit cost $/tonne	Estimated cost per cargo $MM	Total Cost $MM
PMS	60	475	14.25	**855.00**
DPK	6	475	14.26	**85.59**
AGO	Nil			
TOTAL				**940.59**

(based on cargo shipments of 30,000 tonnes)

PPMC estimated that a balance of 23,140,000 barrels (or just over 3 million tonnes) of crude oil entitlement for domestic processing would available for export sale, (through the reduced refinery performance). At $35/bbl, a total of $810 million would have been realised.

This puts the net cost of importing (cost of imports less sales of crude) for 4th quarter 2004 at approximately $130 million. Over one year this equates to a net cost of importing product in the region $500 million. This cost excludes that of operating NNPC's importation programme, PPMC's jetty operations and supply into the inland distribution network.

Not all of these costs could be saved however, as has been described in the section 6.4 above.

6.6.2 Potential Savings in Imports Costs

Based on the analysis in Section 3.3 above, had the Nigerian refineries been operating at their best performance (though still below international standards, which would have implied net output of product of around 88% of crude input), there would have been the potential to reduce the amount of PMS imports in 2004 by 1.6 million tonnes, and not to have to import DPK or AGO at all.

The average price over Platts for 2004 was: $48.5 per tonne.

The crude sold as a result of reduced domestic production would have suffered the export freight penalty, approximated to $12 per tonne, this represents the difference between the value realised in crude sales and the higher value of crude when measured by reference to the sum of the values of products that could reasonably be made from it.

Additionally the refinery gross margin foregone through not refining crude into product would be in the order of $2 per bbl in early years or $15 per tonne (though recently rising to $6/bbl and therefore $45 per tonne).

The combination of these cost penalties totals is in excess of $75 per tonne and in more recent times, considerably more.

On this basis, the net savings to the Nigerian economy had the refineries been operating at reasonable levels of performance and hence require reduced imports of PMS alone in 2004 could therefore have amounted to at least $120 million.

7 IMPORTATION PROCESS

The following process descriptions were obtained by Hart Group consultants in meetings with representatives of NNPC PPMC in June and July 2005. Please see Section 8 below for subsequent discussion of the procedures and recommendations for improvements.

7.1 Importation by NNPC

The Process for Importation of Petroleum Products by NNPC follows these steps:

7.1.1 Preparation Of Quarterly Demand Balance Forecast

The Supply and Distribution unit of the Commercial Department of NNPC produce the Quarterly demand balance. This document is prepared 6 weeks before the commencement of the quarter. The demand forecast takes into account:

a) The 3 refineries production forecast (obtained from the Refineries)

b) Existing inland stock from all the deport

c) Existing stock on board vessels yet to discharge

d) The closing stock

e) Expected National Demand

The output from this process is a statement of product shortfall requirement covering the period of the next quarter.

See Appendix D: Example of Supply Demand Balance for Fourth Quarter 2004

7.1.2 Quarterly Demand Approvals Process

GMC: The quarterly demand forecast document is sent to the General Manager Commercial PPMC, who makes a critical evaluation of the inputs, reconfirms the data and establishes the facts and confirms the accuracy of the forecast. If satisfied, the document is sent to the Managing Director, PPMC.

MD: The document is then scrutinised by the Managing Director PPMC to ascertain accuracy of forecasts, refinery production and all other inputs. If satisfied, the document is passed on to Group Managing Director (NNPC).

GMD: The Group Managing Director finally evaluates the statement of product requirement. If satisfied, the Group Managing Director approves the document, which is then sent down to Managing Director PPMC'S office and a copy to Group Public Affairs Department (Corporate) for public tender publication.

7.1.3 Tender Process, Analysis and Approval

Issue: Once the statement of product requirement is approved by the Group Managing Director, the tender process begins. The office of Group Managing Director (NNPC), Managing Director (PPMC) and Group Public Affairs Department prepare the tender for Importation of Petroleum Products (which quotes all necessary requirements). The tender is published in Newspapers and on the Website

See Appendix D: Example tender advert

Collation: Sealed tenders from different companies are collated and submitted to the Tender Committee.

Committee: The Tender Committee is chosen from all the segments of NNPC – PPMC, Group Managing Director's Office, Legal, Admin, Accounts, etc. This is to ensure transparency in the tender analysis. Tenders are analysed for bid price and assessed with respect to freight, statement of need, status of the company, price and payment terms.

Selection: After tender analysis, the Tender Committee recommends which vendors are to be awarded the term contract to supply products for the quarter. Their analysis and recommendations are sent to the Group Managing Director.

Approvals: The Group Managing Director examines the selected vendors based on previous performance and ability to perform without default. After consideration, the recommended list of vendors is sent to the Minister of Petroleum for approval.

The Minister gives approval based on the recommendation of the Group Managing Director NNPC.

Approval from the Minister is sent to Group Managing Director, the Group Managing Director sends to the Managing Director (PPMC), and the Managing Director sends to General Manager Commercial who informs the Vendors.

See Appendix D: Example of letter of award

See Appendix D: flow diagram of Decision Making Process

7.1.4 Contracting Process For Product Importation

The office of the Managing Director (PPMC) along with the office of the General Manager, Commercial prepare the contract between NNPC (PPMC) and the Vendor. Both parties will sign the contract, which is henceforth binding between them.

See Appendix D: Copy of Contract

See Section 9 below, Review of NNPC Petroleum Products Agreement (2005). This includes comments on the Agreement and recommendations for improvements.

An import order is prepared and signed by the Managing Director (PPMC) and this is also sent to each vendor. Both the contract and the letter of award contain the legal terms, the delivery schedule, the price formula for each product, payment terms, delivery terms, lay time, product specification, general terms and other relevant conditionalities.

7.1.5 Laycan Scheduling

Laycan is the agreed period for the vessel to arrive and discharge her full cargo. The scheduling is done in such a way as to avoid bunching of cargoes. It is evenly programmed among the various vendors for the quarter. The programming is done by the Supply and Distribution unit, as directed and supervised by General Manager Commercial. The programme schedule is then sent to each vendor.

7.1.6 Vessel and Cargo Nomination Procedure

The Vendor nominates a vessel, which he intends to use for product supply, and submits the nomination paper to the Supply & Distribution unit of Commercial Department. Supply & Distribution request MTD (Marine Transportation Department) to evaluate the vessel nominated for compliance with acceptable standards as specified by Marine Transportation Department. If the vessel is acceptable, the vendor is informed via Supply & Distribution office of vessel acceptance. The Vendor thereafter will nominate the cargo.

7.1.7 Product Measurement and Analysis

The PPMC Inspector is responsible for product measurement and product analysis tests to ensure the product meets NNPC specification.

See Appendix D: Example of Inspector's Report

Cargoes that do not meet specification are rejected. Vessels are permitted to discharge after all the conditions are met.

7.1.8 Product Discharge Process

The process for organising, controlling the discharge and receipt of product involves the following steps:

; and:

- Supply & Distribution schedules the ship movement and discharge order.
- For movements into Lagos, which has the capacity for the largest product vessels, the ship arrives at Fairway Buoy Lagos (this is actually an anchorage). The ship tenders NOR (Notice of readiness to discharge) to the Supply and Distribution Unit and the Commercial Department.
- Supply & Distribution issues docking instructions.
- In accordance with this instruction, vessels either discharge part cargoes into the smaller terminals like Apapa Jetty, Warri Jetty, Port Harcourt Jetty or Calabar Jetty or go to SPM (Single Point Mooring) for Pipeline transfer to Atlas Cove Jetty and storage.
- Ships can discharge at Single Point Mooring and the product flow through pipeline into Atlas Cove Jetty storage tanks. Ships up to 30,000 tons cargo capacity can also discharge directly alongside Atlas Cove Jetty.

The discharge process requires the attendance of PPMC and DPR inspectors, the Ship's captain, Customs officials, the Jetty operators, and State Security.

- The discharge process starts when the PPMC Inspectors ullage the cargo to measure the quantity and carry out re-certification analysis with NNPC specification before discharge.
- Jetty selects receiving tank, dip tank and prepare for receipt.

- The hose is attached
- Discharge; inbound jetty meter records receipt (out turn quantity)
- The ship's tanks are dipped
- The receiving tank post discharge are dipped – ullaging
- The quantities discharged and received (the quantity to be paid for) are compared
- A dispute is raised if there is any discrepancy between ship and shore figures.

7.1.9 Invoicing Procedure

- The Vendor raises an invoice based on Bill of Lading quantity on or before vessel arrival.
- Vessel completes discharge.
- Vessel awaits inspection report (4-14) days as reported by PPMC inspector.
- Supply & Distribution (PPMC) evaluates cargo using outturn figure and Platts (10-20 minutes per invoice)
- Batching of invoice after evaluation. A batch consist of 5-12 invoices
- Supply & Distribution dispatch invoices to Abuja.
- Managing Director, General Manager Commercial, Finance and Account Department examined all the invoices before passing it to Finance and Account Department.
- Finance and Account Department prepares payment.

7.1.10 Payment

Duration for payment is not expected to be more than 45 days after submission of Notice of Readiness.

See Appendix D: Payment Procedure process flow.

7.1.11 Demurrage

Demurrage is the amount payable to the vendor through a failure to discharge the vessel within the time agreed. See above section 7.1.5 Laycan; if the vessel is unable to discharge within the agreed Laycan schedule time period and is subsequently delayed then this represents a potential loss of revenue to the vessel owners. Demurrage is the recompense for this loss by PPMC.

Demurrage occurs as a result of inefficiency in the process. These inefficiencies are attributed to the following factors:-

- Frequent pipeline vandalism
- Equipment failure
- Low storage capacity
- Poor state of jetty facilities – loading arms, metering system, EMD, Fenders etc
- Frequent NEPA failure

- Draft limitations at most of the jetties.

7.1.12 Reconciliation Process

This is the process where both parties, PPMC and Vendor representatives, meet to discuss various issues and resolve disputes that affects supplies of cargo. Both parties must properly document every aspect of the transaction as it affects: -

- Demurrage
- Interest on delayed payment
- Quantity supplied
- Quality supplied
- NOR Submission date and time
- Applicable rate etc.

7.2 Importation by Companies other than NNPC

All Companies require a permit from the Department for Petroleum Resources (DPR) to import products into Nigeria.

7.2.1 Permit to Import

- Importers apply to DPR for the permit to import.
- DPR issues the PERMIT to import products if the applicant meets DPR's criteria as set out in Appendix E.
- DPR confirms to CBN that the applicant has been issued a permit to import products.
- CBN approves the foreign exchange amount for payment to the applicant to import product.
- The vessel goes to the designated discharge port of the private importer and discharges the cargo after clearance.
- As a result of draft limitations, there is usually a ship-to-ship transhipment of cargo before subsequent discharge to the marketers' facilities.
- The receiving vessel is measured or fiscalised after cargo receipt to determine the quantity of cargo received.
- After discharge operation into importers facilities, further distribution takes place into the various importers' outlets.

7.2.2 Product Measurement and Analysis

- Vessel arrives at discharge location (off shore or in shore), and is fully berthed.
- Petroleum Inspectors from the vessel's Agent and Government Agents come on board the vessel.
- Petroleum Inspectors take measurement of cargo upon arrival and all parties such as cargo suppliers, vessels charterer, cargo inspectors, DPR etc. participate in measurement of the products cargo in the vessel.

- The same parties fiscalise the facility into which cargo will be discharged (could be smaller coastal tanker or storage shore tank, depending on the location where discharge is taking place).
- The measurement and calculation procedures are applied as stipulated in the API standard 2545 or ASTMD 1085" method of carrying petroleum and petroleum cargo. This is carried out on board the vessel prior to discharge.
- After the discharge operation, the quantity of cargo remaining on board the discharging vessel, is determined by defiscalising the vessel and carrying out the necessary calculation.
- If after discharge, the vessel is found to have discharged all her cargo, a dry tank certificate is issued to the vessel. Otherwise a Remain on Board (ROB) certificate is issued to the vessel.

7.3 DPR LICENSING

All independent companies wishing to import refined products into Nigeria must first obtain a permit from DPR. The permit is valid for 90 days from date of issue. Once companies have this permit, they make their own arrangements for importation of product and must notify DPR 7 days in advance of the arrival of the imported cargo. DPR attends the arrival and confirms the quality of the cargo and the volume of product.

See Appendix D for copy of the DPR Guidelines for the Importation of Petroleum Products into Nigeria.

In order to qualify as an importer, a company must be one of:-

- Pipeline and Products Marketing Company (PPMC) Ltd
- A major Petroleum Products Marketing Company
- An independent Petroleum Products Marketing Company with reception / storage facilities
- An independent Petroleum Products Marketing Company with throughput arrangements with NNPC/PPMC or with any of the major Petroleum Products Marketing Companies

All applications must be accompanied by:-

1. A copy of the certificate of incorporation
2. A copy of the current storage/sales licence issued by DPR
3. A bank reference
4. Tax clearance certificate
5. N 50,000

The role of the DPR in refined product importation is as a regulator. In this capacity, DPR

i. Licenses storage and reception facilities
ii. Grants permits to companies wishing to import
iii. Sets standards which imported products must meet
iv. Tests products before importation to ensure they comply with the standard
v. Certifies the quantity of product

DPR is not involved in forecasting product requirements nor in pricing decision.

Prior to 2005, DPR records were kept manually and no summaries of volumes of products imported were produced by DPR.

The schedule of the licensed import points is:

NNPC	Lagos	Atlas Cove
		Apapa Jetty including New Oil Jetty (NOJ), Petrol Wharf Jetty (PWA) and Bulk Oil Petrol Jetty (BOP)
	Off Lagos	Mt Tuma Vessel used for discharge only and storage until transhipped to a jetty. Not used after 2002
	Port Harcourt	Okrika Jetty (There is a pipeline from the refinery to the jetty, originally used for export of refined product)
	Calabar	Calabar Jetty (aka Eket)
	Warri	Warri Jetty
Private jetties	Lagos	Waziri, Ibafon, Obat, MRS, Dee Jones
	Port Harcourt	Onne, Reclamation – Borokiri
		Koko

8 REVIEW OF IMPORTATION PROCEDURES

8.1 Review of Procedures

We reviewed the Tendering and Contracting Process with PPMC.

Written Procedures.

At our visit to PPMC in June 2006, we requested a copy of the written procedures governing the importation of product. We were not given any procedures and it was explained that written procedures were to be prepared by consultants.

In December 2006, we were given a copy of written procedures which we were informed applied to the importation process. These are marked "Draft". A copy of these procedures is included at Appendix L. We discussed the importation process with PPMC in the light of these draft procedures.

Product Demand

Every quarter, a supply/demand balance statement is prepared, at least 6 weeks before the quarter to which it relates to permit time for approvals to be obtained and orders placed. The NNPC Corporate Planning Division provides demand figures. The basis of the figures has not been reviewed for 2 years (see recommendation 2). The refineries give supply figures and the supply division of PPMC assesses the probable position, usually providing two scenarios.

On occasion, the supply/demand balance turns out differently from the forecast, requiring the ordering of additional product. PPMC said that appropriate approvals under the normal process are obtained; however, this process is not documented (see recommendation 8)

Independent Suppliers

Independent suppliers do not feature in the supply/demand calculations because PPMC no longer imports AGO since the deregulation, and the independents do not import PMS or DPK.

Storage Capacity

Based on experience in 2004, there is storage capacity for 43 days stock of PMS. The usual target is to hold 20 days.

Supplier Pre-Qualification

The procedure for determining which companies should import product was changed in Q4 of 2004[9]. Companies are now subject to pre-qualification and must meet the following specified criteria:-

- The importing company must have a turnover of at least $5 billion, as evidenced in its audited accounts for the previous year end OR it must have a minimum current credit rating of BBB awarded by Standard & Poor; AND
- The importing company must have a global presence; AND
- A relationship with a refinery; AND
- Trading experience with Nigeria of a minimum of 4 years

[9] The procedure before that date was reviewed by Mr Buba and reported on.

The pre-qualification process was carried out in 2004 and has not subsequently been updated (see recommendation 3). PPMC said that the prequalified companies are:-

- Total
- BP
- Shell
- Chevron
- Glencore
- Addax
- Calson / Hyson[10]
- Napoil
- Trafigura
- Acadia
- Vitol

Licence to Import

DPR is responsible for issuing a licence to every company wishing to import refined product. PPMC does not at any stage check that a company holds such a licence.

Selection and Approval

Having agreed the supply/demand balance and the pre-qualified companies, PPMC requests prices for products against a delivery schedule. Companies respond to the GMD, who passes the responses (unopened) to the Head Quarter Tender Committee (HTC), which opens and signs the bids received. They are then passed to the Evaluation Committee to arrive at a recommendation for the bids to be accepted. The process for appointing the individuals on this committee is not included in the draft procedures (see recommendation xx).

The Evaluation Committee undertakes a technical evaluation followed by a Commercial evaluation. The draft procedures state that the bids must be benchmarked but give no criteria for the technical evaluation or the benchmarking.

Under the draft procedures, the Evaluation team is permitted to exercise discretion in selecting the importers – the procedures state “Ultimately, the Evaluation Team has the responsibility to ensure that the price recommended is in the best interest of the company”.

The recommendation from the Evaluation Committee is passed to the GMD, who “may seek the final approval of Mr President” or may presumably exercise his discretion. Once final approval is given, the companies which are to be used for each cargo are notified along with the price to be paid. There are no written procedures covering this area (see recommendation 6). There appear to be no defined criteria for selection of cargoes – we were told that the objective is to seek to ensure an even spread of cargoes. This management decision is not covered by any written procedures, nor are the participants in this decision set out. We understand that suppliers are selected so as to minimise a

[10] Calson and Hyson are separate legal entities but tend to be treated as one. Both are subsidiaries of NNPC.

significant risk of default on delivery (since a shortage of refined product would be likely to have social consequences) and the reliability of supply was a more important issue than the price.

Tenderers are all asked to supply at the same price, being the price set by the GMD. PPMC said that the best price is in practice always accepted and in some cases, a further reduction from the tendered price is accepted based on in-house bench-mark price for the products). There is, however, no written procedure requiring this approach and we did not examine the method for calculation of an in-house bench mark price.

It could be expected that this is an area where inevitably there will be discussion between PPMC and the importing companies. However, PPMC said there is no post tender negotiation. The draft procedures are silent on this point.

Notification

A letter is sent to each tenderer notifying them of the requirements and quoting elements of the contract. There are no written procedures governing the issue of these letters or any subsequent instructions to importers and authorities in this area are not defined (see recommendation 7).

An analysis of the period August – December 2004 is shown below. It appears to show that the agreed PMS requirement was exceeded in terms of actual delivery[11].

Approvals 10 August to 31 December 2004										
	Per supply/demand balance for Q4 2004					Actual deliveries			Variance actual v approved	
					Tonnes			Tonnes		
	Litres	Factor	Tonnes	# cargoes	per cargo	Tonnes	# cargoes	per cargo	Tonnes	# cargoes
PMS	2,132,871,000	1,353	1,576,401	53	29,743	2,297,423	79	29,081	721,022	26
DPK	836,936,000	1,273	657,452	23	28,585	271,927	10	27,193	-385,525	-13
Total	836,936,000		657,452	23	28,585	271,927	10	27,193	-385,525	-13

8.2 Summary of Recommendations

1. There should be written procedures, appropriately approved, setting out clearly:
    a. The process to be followed when assessing suitable companies for the importation of product, tendering for purchase of product, assessment of tenders and the award of contracts for delivery of product by appointed contractors – covering price, quantity and timing.
    b. The criteria to be fulfilled by a company in order to qualify as an import contractor.
    c. The authority levels for approval of pre-qualifying importers, determining prices to be paid for imported product, signature of contracts and award letters.

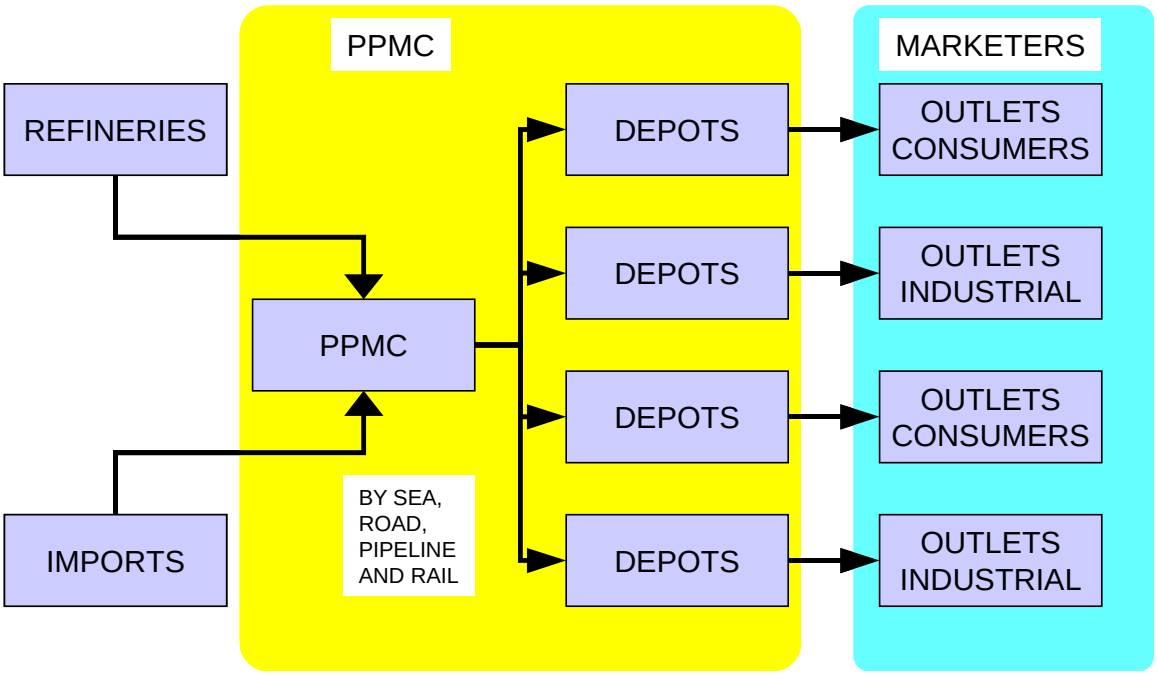
[11] PPMC explained the difference as due to the refineries not meeting their contribution to the supply/demand balance. We were told that the excess had been approved, although no evidence of this was produced.

2. Demand figures for refined products should be reviewed at least annually.
3. The requirements for pre-qualification should be checked annually for those companies on the tender list; and consideration should be given to inviting other companies to pre-qualify periodically, say every two years.
4. PPMC should add to the list of requirements for qualification to import refined products that a company should have a current import licence issued by the DPR, for so long as this is a legal requirement.
5. Membership of the Corporate Tender Committee and the Evaluation Committee and the appointment procedure should be formally written and appropriately approved.
6. The criteria and process for selection of cargoes should be set out in writing and approved by the President.
7. The authority of the GMC and other senior managers in PPMC should be set out in writing and approved by the President, covering such areas as issue of contracts, letters, variation of instructions, demurrage and interest payments.
8. The process for approving product which exceed the approved supply demand balance for a quarter, and the authority levels applying, should be set out in writing.
9. A statement setting out the approved import volumes, deliveries actually made and orders committed but not yet delivered for the current quarter should accompany the quarterly forecast of supply demand. Without such a statement, teeming and lading of product will not be visible to the appropriate executives when they are required to give approval for further product purchases.
10. Approvals given to PPMC for import of products should have end dates, to meet with best practice.
11. Internal audit should perform an independent review of the tendering process and associated documentation at least annually, with a report to the Minister.

9 SUPPLY LOGISTICS

9.1 Products Supply and Distribution in Nigeria

The supply and distribution of products in Nigeria is shown in simplified form thus:



(see Appendix A for a more detailed diagram of PPMC's pipeline system and depots).

9.2 Sources of Petroleum Products

- **Domestic processing of crude oil.** The three refineries, Port Harcourt Co. Limited (PHRC), Warri Refinery and Petrochemical Co. Limited (WRPC) and Kaduna Refinery and Petrochemical Co. Limited (KRPC) are presently subsidiary companies of NNPC, the Nigerian National Petroleum Corporation. Each produce refined product for the domestic market. See Section 5.3 and Appendix B for the reported volume of product output for the Audit period.
- **Direct import of products by PPMC**. The shortfall of product supply from the domestic refineries is made up by imports. See Section 6.5 and Appendix B for the reported volumes of products imported in the Audit period. Importation of Product in the audit period was conducted predominantly by NNPC/PPMC (about 80%), with the remaining imported by independent marketers.
- **Imports by Marketers / Third Parties**. See Appendix F for details of 3rd party marketers imports in 2004 according to DPR records.

9.3 Movement of Products

9.3.1 Transhipment of Imported Products

The import jetties have draft limitations which restrict the size of vessel that can be moored alongside; Atlas Cove (11.0m), Apapa (6.4m), Warri (7.4m), Okrika (9.4m) and Calabar (6.4m).

Consequently larger vessels, typically of average size 45,000 tonnes, are berthed at the Single Point Mooring Buoy (SPM, draft limitation 16m) or Fairway buoy in Lagos, Bonny or offshore Escravos for transhipment.

The products are transferred into smaller vessels of capacity 10-20,000 tonnes for onward delivery to Atlas Cove, Apapa, Mt Tuma, Warri, Okrika or Calabar.

There are no submissions on MT TUMA as the data on transhipments carried out from Jan 1999 to April 2002 were lost in the Dec 2002 fire outbreak that gutted the NNPC Mulliner office building. This was the period when TUMA was in active service. The vessel lost her certificate to operate as a result of not being dry-docked. Consequently TUMA has not been actively engaged since May 2002.

Products are also pumped directly from the SPM to the Atlas Cove jetty.

9.3.2 Jetty to PPMC Storage

Products are pumped from the importing vessel to the inland PPMC storage and depot facilities at Atlas Cove, Warri, Port Harcourt and Calabar. Products are measured and tested as laid out in Section 4.6 and Appendix H.

9.3.3 Evacuation by Pipeline

Nigeria has a pipeline network of about 5,000km operated by PPMC for the distribution of products from the refineries and import jetties to 23 depots across Nigeria. From these depots products are shipped to customers by road. The products pipeline network consists of four systems with three extensions:

SYSTEM	PIPELINE LINKING DEPOTS:	EXTENSION	LINKING DEPOTS:
System 2A	Warri to Benin to Ore to Mosimi (Ore depot has been inactive due to continued pipeline vandalism)		
System 2B	Atlas Cove to Mosimi to Ibadan to Illorin Mosimi to Lagos Satellite Mosimi to Ikeja (Aviation Turbine Kerosene only)		
System 2D	Kaduna to Kanu Kaduna to Gusau Kaduna to Jos to Gombe to Maiduguri	System 2DX	Jos to Gombe

System 2E	Port Harcourt to Aba to Enugu to Makurdi	System 2EX	Makurdi to Yola Enugu to Auchi*

(Note: Pipeline System 2C is the crude oil supply line to Kaduna refinery from Escravos and Warri).

Products pumped are PMS, AGO and DPK. All pipelines are capable of carrying these products, except Mosimi to Lagos Satellite that has dedicated product lines and Mosimi to Ikeja that carries only ATK. Product are pumped in batches of between 15,000 and 50,000 cubic metres through pipelines of various sizes using booster pumps situated normally at on the outgoing pipeline from the depot. Additionally booster stations are situated at Auchi and Zaria.

9.4 Product movements through Jetties and Distribution Depots

See Appendix G: Detail of product import into and out of PPMC jetties, product movements by pipeline and road into and out of inland Depots, over the period 199-2004.

9.5 Distribution Problems

The main problems reported by PPMC in distributing products through the pipeline system and road tankering were:

- Poor state of the jetty facilities
- Ineffective or faulty equipment at the jetties, e.g. loading arms, metering, EMD, fenders
- Low pumping rates into refinery tankage from the jetties
- Frequent failures of electricity supply (PHCN / NEPA) to System 2B Mosimi to Ibadan to Illorin pipeline
- Outage of two strategic pipeline segments Ore to Mosimi and Enugu to Auchi
- Frequent vandalism to the pipelines
- Frequent equipment breakdowns
- Low storage capacities in Atlas Cove Jetty, Mosimi, and Satellite
- Product losses in excess of 0.5% tolerance limit in notable jetties, e.g. Port Harcourt, Warri and Apapa.

9.6 Comments on the Supply System

The large increase in product imports has somewhat overwhelmed the jetty facilities that were not designed to support this level of product imports and do not have the draft for fully laden international product tankers. If the refinery performance were better and product imports lower, it would be reasonable to save money on jetty infrastructure.

However, in the period under review, imports increased sharply and the jetties were generally not able to handle the increased volumes.

The net result has been considerable delays to shipping, which caused increased demurrage charges as the ships had to wait longer in port to complete their unloading. The choice to be made by NNPC management is to consider if the refineries will be brought up to international standards to improve product output, or will local measures be put in place at jetties and depots to increase capacity to that now expected.

It is very difficult to run a product distribution network when it is subject to vandalism, poor maintenance and frequent and unexpected supply disruptions, which have the knock on effect of requiring more product to be run through a facility than it is designed for since the primary route is not available.

10 REFINED PRODUCT MASS BALANCE 1999 – 2004

10.1 Addendum 19th December 2006

On 19th December, PPMC submitted a further mass balance. This has not been reviewed and is included for information only at Appendix K. A supplementary report will be prepared in due course commenting on the new PPMC data.

The present chapter of this report reflects the ongoing presentation and withdrawal of data by PPMC.

At this stage, no comment is made on the losses for the period 1999-2004 which are most recently reported at 3.6 million tonnes.

10.2 Methodology

PPMC has completed templates for import, export and movement of refined products on three occasions.

1. Initially, data was gathered in late 2005. This data was incomplete and it was not possible to compile a mass balance with it.
2. A review of this data and the template formats was carried out in May. The template formats were modified in discussion with PPMC head office and area staff and the new templates were completed during late May and June 2006. The data returns were more complete but contained discrepancies and anomalies, which were brought to the attention of PPMC.

   The refined product flows reported by the various locations, incorporating any comments received following review of the information, were aggregated to produce a mass balance for refined product flows within the PPMC network of jetties, refineries, pipelines and depots. The information was not audited.
3. On 21st November 2006, PPMC informed us that they had comments on the mass balance included in our report of 12th July 2006. In particular, they accepted that some of the data they provided must have been wrong. It is accordingly withdrawn from our report. They agreed to undertake a major exercise to rectify this and to report the results and resultant mass balance by 6 December. The templates used in the May/June exercise were to be used again for this latest exercise.

10.3 Results from the December exercise

a. PPMC have said that a major exercise has been carried out to retrieve the records for the period. These records are all manual and have been entered onto spreadsheets to standardise presentation and enable data summation and manipulation. Certain records were found to be unavailable:

   1. Monthly records at Kaduna refinery for 1999 – 2000 were destroyed by fire. Annual records were found for this period.
   2. Records for imports were lost in a fire. The numbers were now being compiled from the detailed inspectors records.

b. Templates were not completed for Ore depot or Calabar in the 2005 and June 2006 exercises. Templates have now been prepared for these locations.

c. The diagram of depots and pipelines provided to us in May, on which the mass balance was based, was incorrect, omitting the Bonny export jetty and Calabar depot. A revised diagram incorporating all PPMC depots has been requested.

d. There are various discrepancies in the information produced by PPMC. These have been communicated to PPMC and in some cases, they have been resolved

e. No reconciliation between the December templates and the templates previously provided has been produced.

f. Some data has been provided on product imports. However, there is no full reconciliation of imports comparing ship to shore records, nor an analysis of coastal movements. Information is missing in respect of the Apapa jetties. Information in this area has been inadequate in each of the exercises carried out.

g. The entire mass balance requires to be reconciled to the audited financial statements.

10.4 Observations on the process for producing the mass balance(s)

1. The three attempts to complete the data templates for refined products have produced three different results. Possible reasons for this are considered below but PPMC has had difficulty producing consistent information, including information which agrees with previously published NNPC data.
2. The loss of records for the period in respect of imports has made the presentation of meaningful data difficult and it is difficult to assess the control exercised in this area. Suitable document storage procedures and facilities seem to be required.
3. We have been told that a mass balance is produced for each location every month and that these balances do not show major discrepancies. There is, however, no check on movements of product between depots. This is a major omission in terms of exercising control over custody of the product.
4. PPMC acknowledge that there will have been product losses, due to a number of factors including:-
    a. Pipeline vandalism and damage
    b. Tank seepage
    c. Failure to keep adequate records for product which is pumped through a depot instead of being pumped into store at that depot
    d. Build up of slops and off spec product
    e. Mismanagement in certain areas (for example, we understand that some time prior to 2003, the manager and 26 staff at Mosimi depot were sacked for malpractice).
5. We have not examined metering arrangements or depot facilities but it is possible that differences may be caused by
    a. Poor measurement procedures or poor application of measurement procedures

   b. Inadequate metering equipment and maintenance/calibration practices
   c. Poor physical security at depots and other locations

6. Existing management systems are entirely manual. This makes production of summary information on a timely basis more difficult and more open to error than would be the case with a computerised system. We understand that a project to introduce computerised systems is under way; however, in view of the value of product in the custody of PPMC, it is important that the current manual systems are well controlled until such time as the new systems are operational.
7. PPMC comments that there is a well established procedure for depots to produce daily and quarterly mass balances. It is unclear why there should be such difficulty in producing an overall mass balance if this system operates effectively.

10.5 Significant Findings

No comment is made at this stage.

10.6 Recommendations

1. PPMC should complete the mass balance for 1999 – 2004 and submit it for independent review and comparison with other data published by NNPC.
2. PPMC should prepare a mass balance for 2005 and submit it for independent review and comparison with other data published by NNPC.
3. NNPC / PPMC should immediately define a format for data gathering and a mass balance and should put in place a procedure for compilation of such a mass balance on a monthly basis, commencing with January 2007. The mass balance should include:-
   a. Imports
   b. Refinery production
   c. Pipeline flows between locations
   d. Road out, showing bridging separately
   e. Exports
   f. Unaccounted differences
4. The mass balance should show movements by product type by location (including refineries) and in total.
5. Product imports should show:-
   a. Coastal transhipments
   b. Comparison of quantities per bill of lading, ship discharge records and shore receipt records

11 REVIEW OF NNPC PRODUCTS AGREEMENT

A review was carried out of the Agreement Document as 2005 example provided by NNPC. This section contains the observations and recommendations for improvements to this contract.

Overall, this Agreement contains the Clauses that are normally found in contracts for the sale and purchase of petroleum product cargoes in international markets. Most of the comments below are made for clarification of the existing wording, in many cases to ensure as far as possible protection of the Buyer. Attention is however especially drawn to the points noted under **General** below relating to the issues which arise from having a CIF contract with invoicing based on outturn quantity and quality.

11.1 General

This Agreement is stated to be on a Cost Insurance Freight (CIF) basis (Clause 7.1), with risk and property passing from Seller to Buyer at the loading port, as is normal for a CIF contract (Clause 11.1); but the basis of invoicing and payment is outturn quantity and quality (Clauses 5.2 and 13.2). Insurance is to be provided by Seller on behalf of the Buyer (Clause 15.0).

The two most common bases for ship delivered sales are CIF with quantity and quality measured at load port, and DES (delivered ex ship) where risk and property pass, and measurement occurs at the discharge port. Reference can be made to Statoil's general terms and conditions as examples of these.

(http://www.statoil.com/STATOILCOM/SVG00990.nsf/Attachments/FOB_CoS.doc/$FILE/00cos.pdf)

http://www.statoil.com/STATOILCOM/SVG00990.nsf/Attachments/FOB_CoS.doc/$FILE/00cosdes.pdf

Although the CIF outturn contract basis is sometimes used in international trade, it does raise the question of how to deal with losses in transit of more than 0.5%. As the Buyer pays only for the outturn quantity, then it has not suffered from the loss and presumably would not have the right to claim under the insurance. In this case, it may be felt that the Seller should have the benefit of any such insurance claim; the alternative would be for Buyer to claim as provided in Clause 15 and reimburse Seller. We are not aware of a standard contractual practice for covering these points: when the contract is agreed, it is important that the parties should agree how to cover this issue in the contractual documents. The contractually confusing situation would only be an issue in case of abnormal losses.

The price per metric tonne for CIF outturn deliveries will be higher than for normal CIF deliveries but only to an extent to reflect the fact that seller is bearing the normal outturn loss up to 0.5% (i.e. buyer is likely to be paying for less tonnes than if he bought CIF on loading quantity).

11.2 Definitions

It would be normal to include a list of defined terms in a contract of this kind.

11.3 Recommendations for Improvements

Reference is made to the clause number of the copy of 2005 Agreement reviewed.

Clause 3 Termination

3.1 (ii) At the end, delete ";and/or", insert full stop.

3.3 This Clause refers to Force Majeure, which is covered more fully in Clause 18.0. To avoid possible conflict between the two, we suggest that the further sentence "The provisions of Clause 18.0 shall apply." be added to the end of Clause 3.3.

Clause 5.1 Product Pricing

It is important that the clause covering the price of the products should be clear and unambiguous. The wording of the second paragraph appears to be incomplete as we assume that NNPC wishes to use a 5 day Platts pricing period in all cases. If this is correct, we propose it should read as follows (new wording is in italics):

> "In the event that the Bill of Lading date is a Saturday or non Platts publication day other than Sunday, the three (3) quotations immediately preceding the Bill of Lading date and the succeeding two (2) quotation days shall apply. If the Bill of Lading date is on a Sunday, the two (2) quotations immediately preceding the Bill of Lading date and the succeeding three (3) quotation days shall apply. All published corrections shall be taken into account."

In addition, we suggest that the following standard provisions should be included in this Clause:

> "The final price shall be calculated in U.S.Dollars per metric tonne to two (2) decimal places."

> In the event that Platts ceases publication or materially changes the heading or contents of its reports, SELLER and BUYER shall meet promptly to agree an alternative pricing formula to be included in this Clause by mutual consent. In the event that the Parties fail to agree within 10 calendar days, the matter shall be referred for decision to a referee appointed by mutual agreement between the Parties, or failing such agreement, by the President of the Energy Institute in London."

Clause 5.2 Payment

See comments under "**General**" above.

Clause 5.3 Payment – Documents required

As payment is based on outturn quantity at discharge port (Clause 5.2), we suggest that Seller should in addition be required to present a copy of the advice from discharge port inspectors giving the final outturn quantity.

It is normal to provide that the inspectors' address should be advised to seller and, further, that they would be required to advise seller in writing of outturn quantity.

Clause 5.3, Letter of Indemnity

For the benefit of Buyer, we suggest that the reference to a Letter of Indemnity should include the phrase "…. in a format acceptable to Buyer …."

Clause 7.0 Delivery Conditions

As this stipulates CIF delivery, we suggest that an additional sentence should be inserted after the first sentence of Clause 7.1: "For the avoidance of doubt, payment for deliveries hereunder shall be based on outturn quantity at discharge port, in accordance with Clauses 5.2 and 13.2."

Clause 7.0 Delivery Conditions

Page 15 is missing from the document we received, so we have been unable to review from the 5th line of 7.4.2 to 7.5 (inclusive).

Clause 7.1 Delivery Conditions

See comments under "**General**" above.

Clause 9.7 Laytime

The first two paragraphs need some rewording for clarity:

after "SHINC" in the first line, insert "(Sundays and Holidays Included)".

The second paragraph should read "In the case of a Vessel which arrives between 1800 hours and 2359 hours on the last day of its laycan, laytime shall commence when the vessel is all fast at the discharge berth."

Clause 10.3 Maximum Draft

For clarity, we suggest that this should read:

"The maximum draft on arrival shall not exceed …..".

Clause 10.5 Pollution Insurance

In order to give further protection to Buyer, it should be considered whether this clause should contain the full wording used in international practice, as follows:

"SELLER warrants and undertakes that each vessel nominated by SELLER to make delivery hereunder shall be either owned or demise chartered by a member of the International Tanker Owners Pollution Federation Limited (ITOPF). SELLER shall exercise all reasonable efforts to ensure that:

(a) the vessel carries on board a valid certificate of insurance as described in the 1969 Civil Liability Convention for Oil Pollution Damage and the

International Convention on Civil Liability for Oil Pollution Damage 1992;

(b) the vessel has in place insurance cover for oil pollution no less in scope and amounts than the highest available under the Rules of P&I Clubs entered into by the International Group of P&I Clubs.

(c) SELLER warrants that the vessel will have on board a valid ISM certificate, where "ISM" means the International Management Code for the Safe Operations of Ships and for Pollution Prevention

If SELLER's vessel does not meet any of the above requirements then BUYER may refuse to berth or discharge or continue to discharge the vessel."

Clause 10.6 Previous Cargoes

We suggest that the words "(Aviation Turbine Kerosene)" be inserted after "ATK".

Clause 10 Add ISPS Provisions

It is now standard practice for a clause requiring the shipper – in this case the Seller – to comply with the ISPS Code. See the Attachment for standard wording that would be appropriate for this Agreement.

Clause 11.1 Property and Risk

We suggest that the following sentence be added: "For the avoidance of doubt, payment for product delivered hereunder shall be based on outturn quantity and quality as provided in Clauses 5.2 and 13.2."

Clause 12.1 Demurrage

To make clear the limits of Buyer's liability for demurrage, we suggest that the following be added at the end of this paragraph: ", subject to the deductions specified in Clause 7.4."

Clause 12.2 Demurrage – Acceptance of NOR

The times in this Clause (0800-1400 hours) conflict with the times in Clause 9.7 (0600-1800 hours).

Clause 13.2 Inspection

See comments under "General" above.

To make this provision unambiguous, we suggest that the beginning of the last sentence should be amended to read "The report of the Inspector(s) at the discharge port shall be …."

Clause 15.0 and 16.0 Insurance

See comments under "**General**" above.

Clause 18.3 Force Majeure

In line with standard practice, we suggest that the following should be added at the end of the first sentence: "…. and shall thereafter keep the other party informed regarding the forecast duration and/or cessation of the circumstances causing the Force Majeure."

12 PROCUREMENT AND PRICE RISK MANAGEMENT

As has been discussed in Section 5, there is both a structural and a performance deficit in motor gasoline supply from the current number of refineries in Nigeria. This is expected to persist until there is a significant investment in radically improving the existing refineries performance and increasing the overall refining capacity by the construction of major new refineries. Nigeria will have to continue to import up to and possibly in excess of 50% of its PMS needs for many years to come and, in so doing, spend a net amount (purchase of product less sale of crude) in the region of $500 million per year (at 2004 prices, see Section 6)

We therefore suggest, and in view of the sums of foreign exchange USD involved, that there would be merit in assessing whether the existing procurement and price risk management processes are effective and optimal in serving the FGN's interests and meeting NNPC's objectives.

From what we know of the present importation processes, there is possibly a case for a more direct NNPC involvement in the supply chain through to the original sources of product.

12.1 Background

NNPC's current approach to procurement of oil products is to tender periodically for supplies, to be made with delivery from vessels provided by the suppliers, at Nigerian ports. The procedures involved in this procurement process have a number of advantages for NNPC in respect of transparency; the approach does, however, bring other consequences such that the overall result may not be to obtain supplies at the lowest reasonably attainable price level.

12.2 General considerations meriting a further study

The tender process (as opposed to direct negotiation) is likely to produce a high degree of transparency provided that a large enough pool of quality suppliers actually bids for the business.

Issues to be considered in deciding on whether this is an optimal approach for supplying NNPC's product import needs include:

- Volatility and predictability of product demand, seasonally and with variations in domestic supply.
- Grades of product - seasonal? Likely future changes through legislation?
- Benefits of control and potential pricing flexibility to the supplier in ship-delivered contracts. Typically such contracts offer little flexibility in the event of operational incidents occurring in Nigeria. On the other hand an FOB supply contract would give much more flexibility to cater for unexpected demand variations, as well as the potential to capture some of the "profit" that would otherwise go to the C&F/CIF/Delivered supplier. A blend of spot and term supply may be considered.
- Value of contractual ability to supply into a C&F/CIF/Delivered contract by using arbitrage opportunities as and when they arise, or can be created. By having the flexibility to procure supplies on a spot FOB basis from a variety of sources, NNPC could perhaps capture significant price advantage.

- FOB supply would (with the required skill and expertise in-house) also enable NNPC to manage their pricing risk to a much greater extent, yielding greater price competitiveness in import costs or closer to average market prices.
- Traders with blending expertise are sometimes able to significantly increase their profit by taking cheaper gasoline components and blending to a certain specification. NNPC could potentially capture this "blending premium" for themselves (with the necessary expertise) if procuring on an FOB basis.
- If NNPC had this blending expertise in-house, or at least the experience to know what components had gone into a blend, it would give them much tighter quality control of the imported cargoes than perhaps they currently enjoy.
- If NNPC currently procure their supplies on a CIF outturn basis, then there is a likelihood that they are paying for the outturn "guarantee" whether they incur a loss or not. This is because the supplier will have built a margin into the price to cover a loss whether it is incurred or not. The same could be true of demurrage in that if the CIF seller suspects that demurrage will be incurred which he may not always be able to recover from NNPC, then the seller will build into the CIF price an element for demurrage whether it is incurred/recovered or not.

On the other hand, a change to FOB purchasing would bring some disadvantages:

- NNPC would require investment in experienced trading personnel with in-depth knowledge of market dynamics, market intelligence, chartering expertise, marine operations (including ship vetting/safety standards) and risk management skills. This would come at a cost and have control implications.
- FOB supply would mean a greater reputational risk for NNPC in the event of oil spillage/marine incident etc, and would need a capability to respond (or be able to call on an agency) to such pollution incidents wherever they may occur. This would entail extra costs when compared to buying on a C&F/CIF/Delivered basis. However, this would create the opportunity to charter vessels meeting standards NNPC themselves could decide on, rather than being subject principally to the policies of the suppliers and loading terminals.

12.3 Recommendation

Given these considerations and the potential opportunities to improve the procurement processes, we recommend that a more detailed study be conducted. The outline programme for this study would be:

- Gather data as to what grade(s), qualities (current & future), quantities (min/max) are likely to be required at each import location in Nigeria.
- Consider the most likely supply locations i.e. cheapest freight and FOB prices using, for example, shipbroker and Platts price assessment data.
- Consider any foreign currency/procurement financing issues.
- Run historical price series to see what arbitrage opportunities have arisen in the past (including possibility to supply from a variety of sources) and thus might be likely to occur in the future.
- Review the possible supply sources in the preferred locations as to whether they could supply the qualities and volumes required.

- Analyse, based on historic data and, where reasonable, scenarios for future oil product supply and demand, potential for price advantage in a more flexible supply regime.
- Analyse the potential benefits of more active price risk management including participation in the process of price formation at the locations of pricing for the product supply contracts and more closely following an average market price.
- Analyse the potential value and costs of the other aspects identified in 'General Considerations' above.
- Review resourcing implications for alternative procedures: the extent to which skills may be available in-house, that could be harnessed for fulfilling the various tasks. If none can be readily found then can existing personnel with relevant experience be identified and training undertaken to obtain the expertise required in short order?
- Merits or otherwise of joint venture NNPC/third party vehicles to provide the required expertise either on a permanent or interim basis. Associated transparency issues.
- Potential for accessing resources externally for any increased NNPC activity.

The study would generate a report with estimates of potential order of magnitude value that could be accessed by NNPC and to FGN through alternative strategies for petroleum product procurement, together with the likely costs in doing so and the incremental process management and controls that would be recommended.

13 OVERALL CONCLUSIONS AND RECOMMENDATIONS

In summary our conclusions are:

- The refineries had been provided in the period 1999 – 2004 with as much crude as they required (were in a position to refine).
- There were shortages of supply resulting in refinery outages due to vandalism and equipment failures in moving the crude.
- There were discrepancies in the quantities as reported between the suppliers (Terminals) and receivers (Refineries).
- The refineries utilisation was extremely poor during the period compared to design capability and international standards.
- As a consequence there was a requirement to import DPK and AGO products that otherwise probably could have been supplied by the domestic refineries.
- The domestic demand for PMS is growing at such a rate that it exceeds even the highest possible domestic outputs; however the amount of PMS importation could have been significantly reduced had there been reasonable refinery performance during the period.
- It is clear that, for a considerable period into the future, Nigeria will have to import a significant proportion of its PMS product needs.
- The importation process, including the tendering, contracting and procurement practices, fell short of current good practice standards, and it is uncertain as to whether it protected FGN interests.
- The large increase in product imports has overwhelmed the jetty facilities that were not designed to support the level of product imports.
- PPMC should prepare a countrywide products mass balance each month, commencing January 2007.

13.1 Crude supply to the refineries

In general during the audit period, the refineries had been provided with as much crude as they could reasonably expect to refine and that there is no suggestion that poor refinery allocation of crude was a problem. There were, however, major shortages of crude oil for refining as a result of supply vandalism and poor reliability of equipment to move crude and these issues created a severe problem of supply of crude to the refineries at times. The issue of security is one shared here with the upstream industry.

There were discrepancies in the crude received when compared to crude sent to the refineries, the discrepancy indicating losses. The differences suggest that the there should be tighter monitoring and control of the process of recording, verifying and immediately resolving any differences of the crude oil supplied to the refineries between

the oil companies, the refineries, DPR as the regulatory oversight and COMD (who provide a quasi external audit function).

13.2 Refinery performance and product supply

The performance of the three domestic refineries has been extremely poor during the audit period. Measured by world standards, the refineries average performance of **approximately 41% utilisation** is less than half the average world performance over the same period (approx. or greater than 85%). Since there were no major shortages of supply of crude to the refineries, it can only be concluded that there was mismanagement of the refineries and of proper allocation of expenditure and resources directed at achieving and maintaining good levels of plant performance and refinery utilisation.

Had the refineries only operated at their peak level of performance achieved during 2001 and 2002 then these refineries should have been able to produce sufficient quantities of DPK and AGO to meet the needs of the domestic market. Even if this had been achieved, there would still have been a significant shortfall of production of PMS in the period. However the savings on imports of PMS in 2004 could have amounted to at least $120 million.

However if the refineries had operated at their design capacity the output of PMS could have reached nearly 6 million tonnes in each year. Based on the amount of PMS actually imported in 2004, this could have reduced those imports to approximately 1 million tonnes, and enabled exports of excess DPK and AGO.

Recommendation:

The choice to be made by NNPC management is to consider if the refineries will be brought up to international standards to improve product output,

13.3 Refinery Business Management

The levels of authority of Refinery Management are set at low levels which require reference to higher authorities for (in refining terms) modest amounts of expenditure. This inserts delay into the process of procuring materials and services which tends to increase the probability of refinery downtime.

Recommendation:

There is considerable advantage, even in the relatively short term, in allowing the refineries to spend money on efficiently managed maintenance projects and back-up systems for which a clear economic case can be made to protect refinery output.

13.4 Product Import Procedure

The importation process, including the tendering, contracting and procurement practices, falls short of current good practice standards, and it is questionable whether they fully protect FGN interests. A review of the procedures and approvals processes found that, in many areas of the process, there was a lack of written procedures.

Discretionary management decision making on the pricing of importation contracts appears unnecessarily wide. A written procedure should be developed. Alternative models of price setting should be considered, such as calling for bids for specific lots (limited by volume) at specific prices, and building up the supply from the cheapest first (this can be expected to be effective provided that the pool of suppliers is sufficiently large).

There appears to be a difference in view between PPMC and DPR on the requirement to PPMC to abide by current legislation regarding licensing of product importation.

A review of the NNPC Products Agreement found that this Agreement contains the clauses that are normally found in contracts for the sale and purchase of petroleum product cargoes in international markets. There is the opportunity to improve on the clarity of the existing wording, in many cases to ensure as far as possible protection of the Buyer.

As there is both a structural and a performance deficit in PMS supply and this is expected to persist, we conclude that there would be merit in assessing whether the existing procurement and price risk management processes are effective and optimal in serving the FGN's interests and meeting NNPC's objectives. There is possibly a case for a more direct NNPC involvement in the supply chain through to the original sources of product.

13.5 Product Import and Supply System Facilities

The large increase in product imports has somewhat overwhelmed the jetty facilities that were not designed to support this level of product imports and do not have the draft for fully laden international product tankers. In the period under review, imports increased sharply and the jetties were generally not able to handle the increased volumes.

The net result has been considerable delays to shipping, which caused increased demurrage charges as the ships had to wait longer in port to complete their unloading.

Recommendation:

As it is clear that, for a considerable period into the future there will be the need to import large quantities of PMS, measures should be put in place at jetties and depots to increase capacity to be able to handle these imports more efficiently and more cost effectively.

13.6 Pipeline distribution

Security issues continue: it was very difficult to run a product distribution network when it is subject to vandalism, poor maintenance and frequent and unexpected supply disruptions, which have the knock on effect of requiring more product to be run through a facility than it is designed for since the primary route is not available.

13.7 Gas utilisation

Government should consider encouraging increased investment in the use of gas powered vehicles, which might be possible in large urban areas. This would have environmental benefits. The main issue would be the cost to establish a distribution network which might be shouldered by the private sector if gas pricing were appropriate and attractive to consumers. A feasibility study is required.

Long term availability of gas suitable for this purpose would need to be reviewed against existing contractual commitments, particularly for NLNG.

13.8 Product purchasing contract

Recommendation:

Detailed recommendations have been set out for strengthening the PPMC standard purchase contract: see Section 9.3. PPMC should take legal advice on the contract wording.

13.9 Sophistication of product purchasing

Given potential opportunities to improve product procurement processes, we recommend that a more detailed study be conducted. For the detailed recommendations on commercial aspects of product procurement arrangements, see Section 10.3

APPENDICES

A. Schematics
   - A.1 Overview of Downstream System
   - A.2 Crude Supply to the Refineries
   - A.3 Geographic map showing location of refineries and supplying terminals
   - A.4 PPMC pipeline system and distribution network
   - A.5 Geographic map of PPMC pipeline system and distribution network

B. Volumetric Data, original refinery data templates 3-08 & 3-09, plus summaries

C. Refineries: Technical Information

D. Material in PPMC submission plus decision process flow chart

E. DPR: permit to import

F. Independent Marketer's Imports 2004

G. PPMC import and depot data templates

H. Metering Appendix

I. Extract from Buba Report

J. Conversion Factors

K. Refined Product Mass Balance supporting data and templates