NIGERIAN CONTENT DEVELOPMENT AND MONITORING BOARD (NCDMB)

NCDMB FRAMEWORK FOR IMPLEMENTATION OF RESEARCH AND DEVELOPMENT MANDATE

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Document No:01

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1.0 Introduction

The Nigerian Content Development and Monitoring Board (NCDMB) was established in 2010 by the Nigerian Oil and Gas Industry Content Development (NOGICD) Act of 2010 with a mandate to:

- Develop the capacity of the local supply chain for effective and efficient service delivery to the oil and gas industry without compromising standards and;
- Implement and enforce the provisions of the NOGICD Act of 2010

Section 37 to 39 of the NOGICD Act has made specific provisions mandating NCDMB to superintend over R&D activities in the oil and gas industry. The scope of the Board's regulatory role include:

i. Develop capabilities for Research and Innovation in Nigeria along facilities, equipment, personnel and processes
ii. Review and approve R&D plans of Operating Companies
iii. Monitor implementation of R&D projects to ensure:
    a. Execution reflect Nigerian content requirement of domiciliation within Nigerian R&D Centers.
    b. R&D spend is tied to addressing industry technology, material and process challenges.
    c. Application of incentives to ensure research breakthrough are commercially viable.
    d. Deployment of successful products of research in industry Operations

Pursuant to the above we seek collaboration with reputable institutes to strengthen the Board's regulatory role in the R&D space.

Sections 43 to 46 of the NOGICD Act also made specific provisions mandating Operating companies to facilitate technology transfer in the oil and gas industry through licensing agreements between foreign and local service providers. This provision stretches the Board's regulatory oversight to include facilitating technology development in the oil and gas industry.

Based on the forgoing provisions it is apparent that Research, Development and Innovation has a pivotal role in development of sustainable local content in the Nigerian oil and gas industry. This R&D Operating framework seeks to define the agenda for

actualising development of technology, enhanced oil production processes and utilisation of local raw materials for production of material inputs used in oil and gas operations.

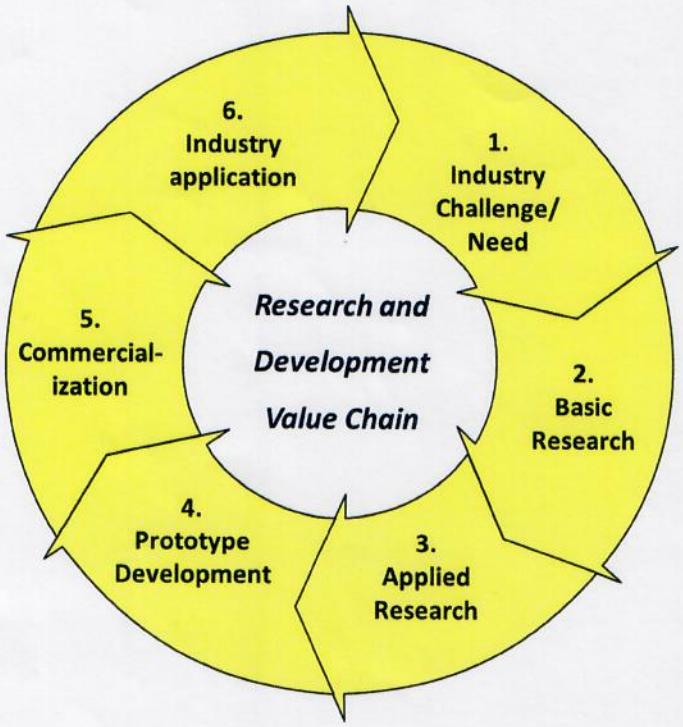
1.1 Definition of Terms:

For the purpose of unambiguous work scope and clarity of purpose, the following are important definitions as construed by the NOGICD Act:

i. **Research and Development**: is any activity (study, investigation, analysis) designed to solve a technology problem, add to a body of knowledge, lead to process improvement or result in a new technology development and geared towards enhancement of Nigerian Content in the oil and gas industry in Nigeria.
ii. **Innovation**: is simply a new idea, device (product) or method that meets certain needs or market.
iii. **Technological Innovation:** refers to the design of a new product or manufacturing process and addition of new functionalities or characteristics to the products or process that leads to incremental improvements and an effective quality or productivity gain.
iv. **Product Innovation**: this refers to improvement of new and/or existing products in the domestic or international markets.
v. **Funding**: is simply provision of grant, project management support, outright purchase of equipment, provision of labs, co-sourcing of venture capitalist/funding partner to match-fund a research, provision of technical regulatory capability support, etc. and not certainly offering of cash.
vi. **Centre of Excellence:** this is a research, demonstration and innovation facility with a collection of intellectuals and Subject Matter Experts (SMEs) who have been pre-qualified and approved to carry out innovations for sustainable growth of Nigerian Content in the oil and gas industry.
vii. **The Board**: this is the Nigerian Content Development and Monitoring Board
viii. **Project**: An investment in the oil and gas activity chain (upstream, midstream & downstream) that is identifiable and requires approval by the Board.
ix. **Operator**: means the Nigerian National Petroleum Corporation (NNPC), its subsidiaries, Joint Venture partners, and any Nigerian, Foreign or International Oil and gas company operating in the Nigerian Oil and Gas industry under any petroleum agreement.
x. **Enhanced R & D activities**: refers to basic research, applied research, experimental development, basic industry technology and technical support industry.

2.0 Research and Development (R&D) Framework

Pursuant to the aforementioned provisions, an R&D framework has been designed to drive R&D implementation as illustrated below



The R&D framework is anchored on the following broad Policy Thrust:

1. Focus on market driven research
2. Establish world class Research and Development (R&D) Centers of Excellence
3. Establish Research and Development Council
4. Provide sustainable funding to support Research and Development
5. Develop stakeholder collaboration matrix for Research and Development (R&D)
6. Provide enablers for commercialization of research breakthrough
7. Facilitate acceptance and utilization of products of research by end users

3.0 Policy Thrust for R & D Framework

Thrust 1- Focus on market driven research

The Board seeks to ensure that across the industry R&D spending is tailored to solve current and future needs of the industry. Accordingly, under this policy thrust the Board intends to establish the following procedure:

i. Build consensus in the industry in the articulation of focus areas for research in the short, medium and long-term horizon.
ii. Prioritization of research areas shall be defined along the 5 thematic areas in the NOGICD Act i.e. engineering studies, technology development, HSSE, local materials substitution, and geological & geophysical studies.
iii. Research spending by Operators, Service companies and NCDMB shall be tied to developmental needs of the oil and gas industry.
iv. Needs of the industry shall be anchored on current and future needs of Exploration, Field Development, Production and Abandonment phases of the industry.
v. Research projects shall be promoted around the following broad themes- technology needs (hardware & software), material needs, environment & sustainability and process improvement.
vi. Take deliberate steps to inculcate the culture of investment in R&D by local service companies as part of their business development and human capital development programs
vii. Measures of success for policy thrust 1 shall be based on the following indicators:
    a. Total spending on R&D projects.
    b. Spending within Nigerian research centers.
    c. Application of research outcomes towards solving industry problems.

Thrust 2 – Establish world class Research & Development Centers of Excellence (CoE)

The existence of a standard R&D infrastructure is the bedrock for undertaking research in any country. Accordingly, the establishment and Operations of world class R&D CoE is a prime focus of the Board and shall be anchored on the following policy thrust:

i. Direct intervention by NCDMB to establish CoE in line with following guiding principles:
    a. Linked to academic institutions in Nigeria to optimize available human resources.

b. Scope of intervention shall cover infrastructure, equipment, personnel development, and process certification.

c. Facilitate alliance formation between CoEs, product developers (local and foreign) and prospective end users.

d. Collaboration with leading international academic institutions with strong pedigree in oil and gas research for capacity development such as Imperial College of London.

e. Establishment of appropriate governance to attract funding and business continuity in the CoE.

f. Focus on broad research thematic areas as illustrated in table 1 below

Table 1: The selected four tertiary institutions and designated areas of R & D thematic areas

S/N	Institution	Thematic area	O&G focus research recommended by NNPC R&D
1	Federal University of Technology, Akure	Geological & Geophysical Studies	**i.** Reservoir evaluation **ii.** Enhanced oil recovery **iii.** Rock physics
2	Federal University of Technology, Minna	Technology Development studies	**i.** Scale up activities from bench through pilot plants to main production facilities **ii.** Natural gas processing, conversion to derivatives & utilization
3	Federal University of Technology, Owerri	Local Raw Materials Substitution	**i.** Catalyst development from local available substrate such as zeolite, titanium, etc. **ii.** Drilling fluid development using bentonite/barites
4	Niger Delta University	Engineering Studies	**i.** Reservoir management & production facilities **ii.** Reservoir fluids behavior (Flow assurance)

ii. Create enablers to facilitate investment in establishment and operation of R&D CoEs by 3rd party industry stakeholders.

iii. Domiciliation of R&D projects within established CoEs as part of local content requirement.

iv. Maintain database of established CoEs and monitor ongoing R&D projects within CoEs.

v. Facilitate progression of research breakthrough from the CoEs through a collaboration model that links researchers with product developers and end users.

vi. Periodic benchmark of similar CoE such as CENPES, SGI to understudy operationalization of CoE.

Thrust 3- Establish Research and Development Council

The R&D value chain illustrated in figure 1 above reveals a broad spectrum of stakeholder groups that must be engaged in the course of transitioning a research idea to a research based product. Accordingly, the Board shall take steps to inaugurate an R&D Council that will encompass the various stakeholder groups involved in the R&D value chain and saddled with the responsibility to advice the Board on policies for the advancement of R&D delivery in the oil and gas industry.

Proposed name: Nigerian Content Research and Development Council (NCRDC)

Purpose: The NCRDC is set up with the sole responsibility of advising the management of NCDMB on matters relating to research and development as a key pillar of local content implementation strategy. The Council shall seek to establish a sustainable and well-coordinated research, development and innovation system in the oil and gas industry.

Membership

S/no	Member	Justification
1.	NCDMB-Chair	Concept owner, regulator and driver of the initiative
2.	National Office for Technology Acquisition and Promotion (NOTAP)	Government agency responsible for patenting Research breakthrough
3.	Oil Producers Trade Section (OPTS)	International Operators in the oil and gas industry, expected to drive articulation of industry needs which should be the basis for R&D projects; funding of R&D projects; establishment of R&D Centers; end users of Research
4.	Independent Petroleum Producers Group (IPPG)	Independent Operators in the oil and gas industry, expected to drive articulation of industry needs which should be the basis for R&D projects; funding of R&D projects; establishment of R&D Centers; end users of Research

5.	Petroleum Contractors Trade Section (PCTS)	International service companies group expected to bring their experience in new product development to the fore, in our quest to develop home grown technology through Research
6.	Petroleum Technology Association of Nigeria (PETAN)	Local service companies to act as focal point in funding and deployment of new technology
7.	National Universities Commission (NUC)	Government agency responsible for regulating the Universities where most of R&D activities will evolve
8.	National Board for Technology Incubation (NBTI)	Government agency responsible for coordinating incubation of new technology
9.	NCDMB- Secretary	Secretariat of the Council

Other stakeholders relevant to R&D:

S/no	Name	Justification
1.	Raw Materials Research and Development Council (RMRDC)	National agency responsible for coordinating R&D on local raw materials
2.	National Office for Technology Acquisition and Promotion (NOTAP)	Government agency responsible for patenting Research breakthrough
3.	Ministry of Science and Technology	Supervising ministry for science, technology and innovation in the country
4.	Ministry of Petroleum Resources	Supervising ministry for the Board and other sister agencies like PTDF, NNPC, PPRA etc.
5.	Ministry of Industry, Trade and Investment	Supervising ministry responsible for registration of Intellectual Property Rights (IPR)
6.	Department for Petroleum Resources (DPR)	Government agency responsible for technical regulation in the oil and gas industry including permit to deploy new technology for oil and gas operations

7.	Nigerian National Petroleum Corporation (NNPC) Research and Development Division	National Oil Company's R&D center
8.	NCCF	Being associated with Manufacturers Association of Nigeria local content group (MANLOC) they are to act as focal point at product development stage of the R&D chain as it relates to manufactured goods
9.	3 No Research Fellow from data base of NCDMB approved Researchers	Act as Subject Matter Experts on R&D

The stakeholders above shall be contacted on need basis.

To ensure fit for purpose representation, the Board shall provide the person specification to the above institutions, to guide the selection of their nominees to the Council.

Functions/ Terms of Reference of NCRDC:

1. Advise NCDMB on matters relating to Research, Development and Innovation strategy for the oil and gas industry.
2. Review progress reports on implementation of R&D Guideline and Regulation, and advice the Board as appropriate.
3. Advice the Board on methodology for prioritizing research projects based on market demand (current needs and future prospects in the oil and gas industry).
4. Advice on strategy and governance framework to attract funding for research.
5. Advice the Board on criteria for awarding Research grants by NCDMB; and review progress on impact of such grants on Research projects, Product development and Innovation.
6. Advice NCDMB on interface mechanism across R&D Centers of Excellence (CoEs) and between Research centers, product developers and end users of research breakthrough.
7. Advice the Board on applicable incentives to support commercialization of patented research products.
8. Advice the Board on a framework for sustainable collaboration between the oil and gas industry, academic institutions and other research centers in the area of

exchange programs and other manpower development interventions aimed at maintaining a healthy pipeline of researchers.

9. Advice the Board on models for cooperation between international partners (research centers, universities, donors, product developers etc.) and local R&D centers.

10. Participate in industry events to promote R&D including R&D Fairs, pitches, quiz, advocacy etc.

11. Advice the Board on communication strategy for R&D.

12. Maintain database of research projects, trademarks and patents out of research efforts in the Oil and Gas Industry.

13. Perform other functions as may be assigned by the ES NCDMB

The NCRDC shall draw inspiration and collaborate closely with the National Research and Innovation Council (NRIC), which was set up to serve as link between research and industrialization in Nigeria.

Scope of Research to be considered by the NCRDC:

As enshrined in the NOGICD Act, the following are the five (5) thematic areas of research where the council is expected to focus on:

i. Engineering studies.
ii. Health safety and environment.
iii. Technology development.
iv. Local materials substitution.
v. Geological & geophysical studies.

The Council may organize its activities and performance reporting around the thematic areas for ease of administration.

Protocol of Council:

i. Meeting – Hold biannual meetings (every 6 months).
ii. Quorum – Two-thirds of members present shall form a quorum for meetings and decisions shall be by consensus.
iii. Tenure of council members – 3 years, renewable twice.

iv. Approval of membership – nominations shall be made by respective agencies based on criteria stipulated by NCDMB. The ES NCDMB shall approve the composition and set up of the Council.

v. Inauguration of Council - The siting Minister of State for Petroleum Resources shall inaugurate the council.

vi. Working procedure - Council may set up sub-committees to examine specific thematic areas. Council may also co-opt other members on ad-hoc basis to provide subject matter expert advice.

vii. Secretariat – the Secretariat of the Council shall be domiciled in Directorate of Planning, Research and Statistics of NCDMB.

viii. Innovation hub - Council shall establish an Innovation hub, which will be domiciled within the premises of NCDMB Head office in Yenagoa.

ix. Budget - The activities of the Council shall be funded through appropriated funds in the NCDMB annual budget for R&D.

x. Key Performance Indicators (KPIs) – activities of the Council shall be measured by the following KPIs:

   a. Number of statutory meetings held.
   b. Number of research projects approved and implemented.
   c. Quantum of funds attracted to support research and development.
   d. Number of exchange programs facilitated between industry and research centers.
   e. Number of research outcomes facilitated for patenting.
   f. Number of business (commercial) entities established out of research efforts.
   g. Number of research based products deployed to industry use.
   h. Number of R&D CoE and innovation hubs established or upgraded with new equipment, infrastructure, researchers or process certification.

xi. Reports - The Council shall generate and publish annual reports of its activities in the preceding year, not later than Q1 of the New Year.

Thrust 4- Provide sustainable funding to support research and development

Research funding comes in many forms depending on initiator, sponsor and end users of the research product. The following are different sources of funds that will be leveraged to finance Research and Development efforts in the oil and gas industry:

i. **NCDMB**: the Board shall set aside at least $50 Million in the first instance out of the NCDF to fund research. The Board's funding support shall be in the form of;

   a. Grants for applied research at doctorate degree level. In this regard Intellectual Property (IP) is co-owned by NCDMB and the researcher.

b. Contract agreement at product development level. IP and production returns shared between NCDMB and, product developer and researcher.
c. Donations for basic research at undergraduate and master degree level. Researcher owns IP.

ii. **Donor agencies**: There are international donor agencies that support research, development and innovation within the oil and gas industry space. They include World Bank, UNIDO, African Development Bank, Oil and Gas Innovation Centre UK etc.

iii. **Venture capitalist**: There are individuals or firms that fund research with high economic potentials. Such high-risk investments anticipate taking equity or ownership of the patent. Example include Dangote Foundation

iv. **Ministry/Departments/Agencies MDAs**: There are MDAs of the federal government that have the mandate to promote research and budget provisions to sponsor R&D related activities are backing this. Their financial contribution will be necessary to technological innovations in aspects of the R&D value chain. Examples include TETFund, PTDF, National Board for Technology Incubation (NBTI), SMEDAN, Nigeria Liquefied Natural Gas (NLNG), etc.

v. **Oil & Gas stakeholder groups**: International oil companies, marginal field producers, international service companies and local services companies are expected to make adequate provisions individually and collectively to support advancement of Research in the Nigerian oil and gas industry.

Criteria for funding industry research:

In funding R&D the Board shall be guided by the following considerations:

i. The research topic must have a high input of local resources i.e. materials, personnel, laboratory.
ii. Research topic must be of economic value to the oil and gas industry and the nation in terms of cost reduction, employment, environmental remediation, technology development, import substitution, enhanced production processes etc.
iii. The research topic must address common or emerging industry problem.
iv. Research breakthrough must be patented and demonstrate high commercial viability.
v. Over 50% market ready solution/ research output.
vi. The research work must have passed proof of concept and must have been tested.
vii. The research project should possess a viable business case/portfolio (business needs is what drives R&D portfolio).

Thrust 5- Develop stakeholder collaboration matrix for Research and Development

A key component of this policy thrust is the need to establish linkage between research centers, product developers and end users of research. In this regard the stakeholder collaboration framework for R&D shall be anchored on strong interface with the following groups;

i. **Service companies**: Local and International Service Companies have a major role to play in R&D value chain. The service companies in this category include fabrication yards, ICT companies, product development operating in the oil and gas industry, i.e. Halliburton, Schlumberger, Baker Hughes/General Electric, etc. the following key areas:
   - **a.** Development of new products on pilot and economic scale.
   - **b.** Deploy prototype to field trials and monitor performance.
   - **c.** Enhance production lines to meet advanced technologies.
   - **d.** Obtain requisite certification to start new production lines.
   - **e.** Obtain favorable fiscal terms for mass production.

ii. **Manufacturers**: Procurement of manufactured materials account for about 54% of typical Engineering, Procurement and Construction (EPC) spend. Operators quest for sustained R&D on materials is to meet the following:
   - **a.** Need for low- cost materials.
   - **b.** Longer material life span irrespective of terrain.
   - **c.** Less maintenance or replacement cost.
   - **d.** Less harm to the environment.
   - **e.** Adaptation of material to difficult terrains in light of ultra-deep water operations.

Therein lies the need for constant research for new or improved materials. Structured collaboration with manufacturers group such as Manufacturers Association of Nigeria (MAN) is therefore a critical success factor in the product development phase of the R&D value chain. MAN is expected to galvanize Original Equipment Manufacturers, chemical & additive manufacturers and other manufacturers to support the Board's R&D strategy

iii. **Financial institutions**: sustainable funding is a very important pillar in R&D delivery. Under the framework it is important that a structured collaboration be developed between researchers and financial institutions for the purpose of accessing various financial products targeted at developing R&D.

Notable financial institutions include:

- **a.** Development banks.

b. Commercial banks.
c. Multilateral agencies.
d. Foundations.

iv. **Academia**: the academia plays a very pivotal role in R&D from its relationship with researchers, product developers, and product end users and for knowledge sharing. The depth of the collaboration are enumerated in table 2 below:

Table 2: University-industry collaboration

Research partnerships	1. Collaborative R&D including consortia and joint projects. 2. Exchange program between academia and industry (sabbatical for lecturers and internship for students in the industry). 3. Professorial chair in universities sponsored by industry.
Research Services	1. Contract Research commissioned to universities by industrial clients. 2. Consultancy services to industrial clients. 3. Quality assurance - quality control, testing, certification, and prototype development.
Shared infrastructure	1. Use of university labs and equipment by industrial clients, Operators and business incubators. 2. Establishment of technology parks located within universities.

Thrust 6- Provide enablers for commercialization of research breakthrough

Applied research that have been registered under Intellectual Property Rights, need to progress to product development phase. Product development activities encompass pilot production, field trials, Quality Control, technical and commercial feasibility studies, establishment of production environment, marketing and promotion of new products, user acceptance test and commercial scale work order.

The forgoing require some level of institutional support herein recommended as follows:

i. Access to fiscal incentives:
  a. Tax holidays.
  b. Duty rebate on equipment imported for the purpose of research activities.
  c. R&D tax credits and other patent related incentives.
  d. Payroll/income tax allowance for researchers.
  e. VAT/withholding tax reimbursements on research expenditure.

ii. Infrastructure development support:
  a. Support new startups to facilitate process and facility certification.
  b. Preferential access to NOGaPS land for new startups.

iii. Market opportunities:

a. Facilitate field trials and test orders.
b. Facilitate attractive order packages by end users.
c. Create awareness of new products at major industry events and publications.

iv. Funding support:
   a. Attract Angel Investors to fund start up with prospects of converting investment to debt or equity.
   b. Grants from NCDF dedicated to sponsor feasibility studies and business plan for new startup.
   c. Equity investment by NCDMB (NCIF) with exit plan.
   d. Partner with other financial institutions to set up R&D funding packages.

v. Ease of doing business:
   a. Leverage Presidential Executive Order 001 to fast track business registration and other regulatory approvals for startups.
   b. Facilitate alliance formation between startups and owners of advanced technologies to transfer know-how.
   c. Structured entrepreneurship trainings on business sustainability.

It is pertinent to mention that the above enablers for commercialization of research shall be accessed in line with well laid down eligibility criteria.

Thrust 7- Facilitate acceptance and utilization of products of research by end users

The underlining objective of the R&D framework is to focus R&D spending towards research projects that address needs of the industry. It is expected that products of research will therefore be embraced and adopted by Operators in their Projects and Operations.

Products of research are largely intended to mitigate the following challenges:

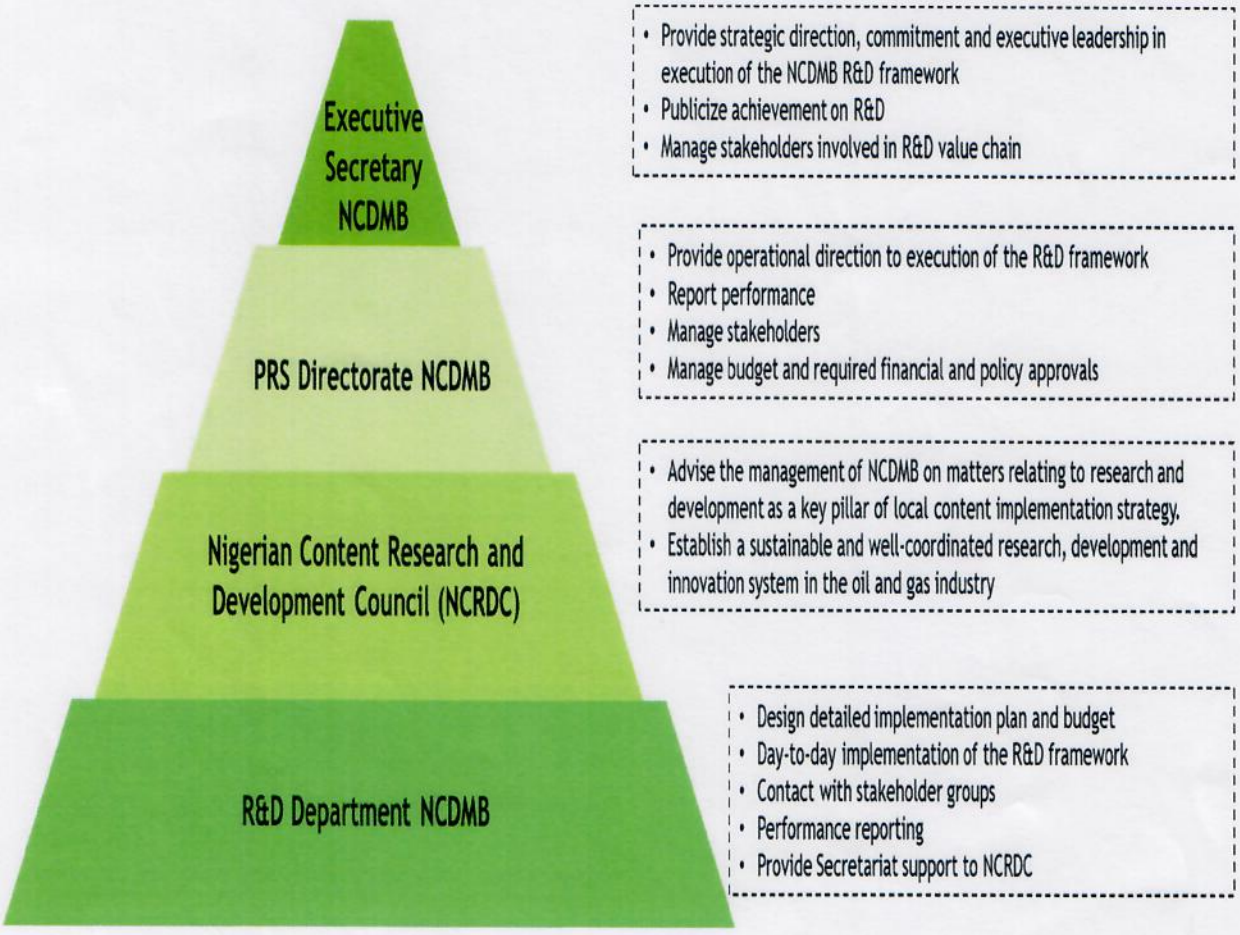
i. Focus on cost reduction per barrel of crude or cubic feet of gas produced.
ii. Optimize oil recovery through improved production techniques.
iii. Prolong acreage/field life.
iv. Deploy home grown technology (software and hardware).
v. Improve quality of the environment through soil, water and air pollution remediation techniques.
vi. Renewable alternative energy sources.

To realize the above benefits the following procedure shall be adopted for adoption of products of research by end users:

i. The research products to be adopted by end users shall proof that they have undergone demonstration routines, trials carried out in oil fields sites.
ii. Detailed feasibility studies conducted showing commercial viability of the solution.
iii. Demonstrate that current or planned installed capacity can meet economic quantity order.
iv. Quality control and quality assurance management system, with applicable product, process and facility certifications from reputable certifying agencies.

4.0 Governance Structure

Implementation of the R&D framework shall be in line with the following governance arrangements;



5.0 Key Performance Indicators (KPIs)

The level of progress/success and effectiveness of the council shall be measured by the following key parameters:

- **i.** The number of research projects approved within a year.
- **ii.** The funds budgeted and released to support research concepts and products.
- **iii.** New technology (hardware and software) developed out of research effort and deployed for application in the industry.
- **iv.** Enhanced or improved process deployed out of research.
- **v.** Local raw materials discovered and deployed to produce materials used in the industry.
- **vi.** Number of research Intellectual Property patented.
- **vii.** Number of new startups established out of research effort.
- **viii.** Environmental remediation carried out using local materials and technology.
- **ix.** Number of successful industry-academia exchange programs.

6.0 Policy Review:

The review of this document shall be on need basis or every two years, commencing from the date of implementation (August 2018).

Approved by: S.K. Wabote

Signature: .....

Effective date: 6/8/18