“Fuel Quality Roadmap for Nigeria

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Fuel as a Pollutant

Fuel becomes a pollutant when products of its chemical reaction to produce energy is toxic to both environment and humans directly or indirectly.

POLLUTANTS IN LOW QUALITY FUELS DURING COMBUSTION

- Carbon Dioxide
- Carbon Monoxide
- Methane
- Nitrous Oxide
- Sulfur Dioxide
- Volatile Organic Compounds
- Particulate Matter
Certification Of Fuels

* High Quality Fuels Produced From The Refineries Undergo Complex Laboratory Analysis In The Plants To Ensure Specifications Are Met Before Release To Pipelines And Products Marketing Company (PPMC)- A Subsidiary Of NNPC For Transportation To Storage Depots Through Pipelines.

* Products Are Further Certified At Depots Before Release To The Public
Quality of Fuel Test

• NNPC Ensures That Only Fuels That Meet International Standards Are Released For Consumption.

• Test Methods Deployed Meets ASTM Standards.

• All Products Produced and/or Marketed By NNPC Must Meet The Set Standards.
Why Are Fuels Important?

- Fuel Constituents Directly Affect Emissions
- Fuel Changes Can Immediately Impact on Emissions/Air Quality
- Fuel Composition Can Enable/Disable Pollution Control Technology
Motivation For Fuel Quality Improvement

- Improved fuel qualities
- Reduced emissions
- Improved air quality
- Environmental benefits

- Gasoline
  - Carbon monoxide (CO)
  - Hydrocarbons (HC)
  - Nitrogen oxides (NO$_x$)
  - Particulate matter (PM)
  - Sulfur (SO$_2$)
  - Polyaromatic hydrocarbons (PAH)
  - Greenhouse Gases
  - Air Toxicity

- Diesel
  - Improved human health
  - Reduced corrosion
  - Improved crop yield
  - Less acidification, eutrophication and forest damage
  - Climate Change
Elements of a Comprehensive Air Quality Attainment Strategy

Better Air Quality

Fuel Efficient Vehicle Technologies

Low Emissions

Clean Fuels

Transport & Land use Planning

Appropriate Maintenance
Clean Fuels

- Gasoline Reformulation
  - Lead Content
  - Oxygen Content
  - Benzene and Aromatic Contents
  - Sulfur Content

- Diesel Reformulation
  - Sulfur Content
Lead Free Gasoline Worldwide 2004

Map showing countries with lead-free and leaded gasoline.
Low Sulfur in Fuel is the Next Priority

• Lower Emissions From Existing Vehicles
  – $\text{SO}_2$ From All Vehicles
  – PM From Diesel Vehicles
  – CO, HC, NOx, Toxics From All Catalyst Vehicles

• Enables Advanced Technologies & Tight Standards For New Vehicles

• Enables Retrofit Technologies To Clean Up Existing Vehicles
The Journey So far

The present quality of fuels is much better than what was obtained Two(2) Decades ago. There is an improved knowledge on fuel quality law.

<table>
<thead>
<tr>
<th>Past</th>
<th>Present</th>
<th>Future</th>
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<tbody>
<tr>
<td>Use of Leaded PMS</td>
<td>Use of Unleaded PMS</td>
<td>• Production of Biofuels for blend with PMS.</td>
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<td>• Use of CNG as fuels for Vehicles</td>
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<tr>
<td>Use of High Sulphur Fuel</td>
<td>Use of low Sulphur Fuel (Sulphur content specification is between 2000ppm-5000ppm)</td>
<td>Review of Fuel Quality standards to have Sulphur content specification of 200ppm max</td>
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<tr>
<td>High Level of Ignorance on Fuel Quality and its effect</td>
<td>Fuel quality law appears not sufficiently enforced. Low level of monitoring and compliance of the fuel quality standards</td>
<td>Enforcement of quality standard</td>
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<td>Develop Biofuels Industry Programme</td>
<td>Phase out Two(2) stroke engine.</td>
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<td>Promotion of CNG as alternative fuel for vehicles</td>
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Biofuels

- Fuel-Ethanol (FE) is emerging as the Octane booster and Oxygenate of choice in Petroleum Refining operations. This has led to the mandatory production of E5 and E10 in Europe and America. It has higher Research Octane Number (RON: 113) than HOG (RON: 97-100). It is environment-friendly and a cheaper Oxygenate.
# Nigerian Biofuels Roadmap

Biofuels enhance octane rating thereby achieving complete combustion

<table>
<thead>
<tr>
<th>Biofuels Type</th>
<th>Time frame</th>
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<tbody>
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<td>Short (2020)</td>
<td>Medium (2025)</td>
<td>Long (2035)</td>
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<tr>
<td><strong>Bioethanol</strong> (demand in billion litres/yr)</td>
<td>1.3 (at 10% blend)</td>
<td>3.4 (at 15% blend)</td>
<td>52.5 (at 50% blend)</td>
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<tr>
<td><strong>Biodiesel</strong> (demand in billion litres/yr)</td>
<td>0.233 (at 10% blend)</td>
<td>1.951 (at 20% blend)</td>
<td>12.7 (at 50% blend)</td>
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NNPC Biofuels Industry: The Journey so far

NNPC has invested significant resources in the promotion of the Biofuels Programme with positive results:

**Policy & Incentives Development**

**Policy**
- Biofuels Policy approved by the Federal Executive Council and gazetted (Gazette No. 72, June 20th 2007)

**Domestic Biofuels Programme**

**Fuel-Ethanol**
- Developed 5 site-specific bankable Feasibility Studies for Sugarcane/Cassava Fuel-Ethanol Projects

**Biodiesel**
- Developed 2 site-specific bankable Feasibility Studies for Palm Oil-Biodiesel projects
Recommendation

- Implementation of National Biofuels Policy and Incentives and subsequent enactment into Law to enforce fuel blends

- Improving air quality management VS Fuel Reformulation

- Efficient Vehicular/Traffic Management through the use of energy efficient vehicles, mass transit and effective vehicular maintenance.

- Action taken to tackle air pollution could also compensate benefits to all sectors of the economy
Thank you for your Attention