Sustainable Energy for All (SE4ALL) Action Agenda for Nigeria

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Presentation Outline

• Summary of SE4ALL Development Process
• Nigeria Overview and Energy Situation
• Nigeria Energy Strategy for 2030
• Nigerian Energy Access
• National Renewable Energy Action Plan
• National Energy Efficiency Action Plan
• Investment Requirements

Highlights of Potential Projects and RE procurement Programmes
<table>
<thead>
<tr>
<th>Event Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick-off Meeting- Abidjan March 2014</td>
<td></td>
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<tr>
<td>Steering Committee/ICREEE Meeting- 6th May 2014</td>
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<tr>
<td>Inception Meeting with Ministers of Power and PS- 15th May 2014</td>
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<tr>
<td>Thematic Working Groups Set Up- 2nd July 2014</td>
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<tr>
<td>Thematic Working Groups Meetings: July - August 2014</td>
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<tr>
<td>High Level Kick-Off of the AP and AA by VP Namadi Sambo- 14th August 2014</td>
<td></td>
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<tr>
<td>Stakeholder Meeting/Validation Workshop- 12th September 2014</td>
<td></td>
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<tr>
<td>Development of Baseline Report - September to October 2014</td>
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<tr>
<td>Submission of Draft Baseline Report, NREAP, and NEEAP to ECREEE- Nov. 2014</td>
<td></td>
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<tr>
<td>Backstopping Expert Review and Feedback- Jan 2015</td>
<td></td>
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<tr>
<td>Development of SE4ALL Action Agenda- February -May 2015</td>
<td></td>
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<tr>
<td>Stakeholder Consultation Meeting- 15th June 2015</td>
<td></td>
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<tr>
<td>ICREEE MET AND ADOPTED THE NAPS &amp; SE4ALL AA – 13TH AUGUST 2015</td>
<td></td>
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<tr>
<td>High Level Validation Planned for 15th &amp; 16th October 2015 in Kaduna, Nigeria</td>
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Nigeria Overview and Energy Situation
Nigeria Overview

Area: 923,770 km²
Population: ~178 million
GDP per capita: ~2920 US$
Electricity Production: ~30 TWh, 20% from Renewables
Installed Capacity: ~8700 MW of which 1800 MW Renewables (~20%)
Access to Electricity: ~40%
Access to Modern Energy for Cooking: ~22%
in 2014, total Nigerian primary energy supply was 135.5 million toe
Energy in Nigeria: Power Sector

- In 2014, total electricity generated was 30 TWh
- The electricity consumption is believed to be around 3 times the level of supply from the grid, up to 110 TWh
- The transmission grid has a maximum capacity of 5500 MW while the connected generation capacity is around 8000 MW

Electricity source

- 80% gas
- 20% hydro
After exports of LNG amounting to 2.45 billion standard cubic feet per day (bscf/day), industry and power generation receive 1-2 bscf/day.

Currently 1 bscf/day delivers 3,000 MW implying an average gas to power conversion efficiency of 27.5% against 33% for open cycle gas turbine (OCGT) prevalent in Nigeria and 40% with best technology OCGT.

Gas flaring has been consistently decreasing but is still around 1 bscf/d.
Nigeria Energy Strategy for 2030
ENERGY ACCESS

• To increase electricity access from the current aggregate level of 40% (urban=65%, and rural=28%) in 2015 to 75% (urban= 90%, and rural= 60%) by 2020.

• By 2030, the population share living without electricity supplies will drop from the current 60% in 2015 of the total population down to about 10%.

• To replace 50% of traditional firewood consumption for cooking by improved cook stove technology by 2020.
RENEWABLE ENERGY

• The electricity generation capacity will increase from the present grid supply of 4,500 MW in 2015 to 115,000 MW by 2030

• By 2030, renewable energy is expected to contribute about 20% share in the available electricity mix

• To achieve a 9% and 13% contribution of hydroelectricity (both large and small hydro) to the nation’s electricity generation mix by 2015 and 2020 respectively

• To achieve a 1% contribution of wind energy to the nation’s electricity generation mix by 2020

• To achieve a 3% and 6% contribution of solar energy to the nation’s electricity generation mix by 2020 and 2030 respectively

• To achieve a 2% power generation capacity using biomass resource by 2020
ENERGY EFFICIENCY

• By the end of 2015, efficient lighting will be used by 20% of the households, 40% by 2020 and almost 100% by 2030

• For high-energy consuming sectors (transport, power and industrial sectors), efficient energy technologies will be progressively introduced as well as other demand side management measures such as peak load management when possible. Compared with the current 2015 level, energy efficiency will increase by at least 20% by 2020 and 50% by 2030

• Achieve 10% biofuel blends by 2020 using locally produced renewable bio-fuel from secondary biomass
The third pillar of Nigeria’s vision 20:2020 is to foster Sustainable Social & Economic Development by:

• Establishing a competitive business environment characterised by sustained macro economic stability
• Developing sufficient and efficient infrastructure to support sustained economic growth
• Preserving the environment for sustainable socio-economic development

To achieve a technology-driven renewable energy sector that harnesses the nation’s resources to complement its fossil fuel consumption and guarantees energy security. It is expected that the electricity supply industry will be private sector led with government providing an appropriate legal and regulatory environment for private capital investment.
Nigeria – Energy Access
Targets on Energy Access

• **By 2020**
  - To increase electricity access to 75% (urban= 90%, rural= 60%)
  - To replace 50% of traditional firewood consumption for cooking by improved cook stove technology
  - 53% of the population will have access to modern energy services for cooking
  - 15% of the population will use Butane Gas (LPG) or compressed natural gas (CNG)

• **By 2030**
  - To increase electricity access to 90%
  - 78% of the population will have access to modern energy services for cooking
  - 25% of the population will use Butane Gas (LPG) or compressed natural gas (CNG)
  - Electrifying up to 90% of community health care centres
  - Provide electricity access and basic energy needs to about 95% rural and semi-urban educational centres
Measures to achieve the target

- Increase the number of households electrified (on grid and off grid) from 0.8 to 3.2 million per year
  - There is a major scale-up between 2015 and 2020
  - In the short term, the largest effort is on increasing rural electricity access
Strategy to achieve the target

- **Create an enabling environment for Discos to develop their customer base**
  - Authorize Discos to build power plants on their concession territory in order to offset long term bottleneck in the national transmission system
  - Rehabilitate the incentive for Discos to extend the grid and connect small customers
  - Develop the capacity of Discos to finance and install electricity meters
  - Improve governance throughout the value chain of the power sector
  - Improve the power market information system

- **Create an enabling environment for gas industry to supply adequate gas quantity to the power generation companies**
  - Revise the gas supply obligation (GSO) regulation as part of the expected new petroleum industry bill
Strategy to achieve the target

- Increase the coverage of electricity supply using workable business models
- Develop off-grid supply for localities that will not be covered by the grid in the short term
  - promote the establishment of Rural Electricity Users Cooperative Society (REUCS) to enable rural communities own, operate and maintain their networks e.g. Renewable Energy Micro-Utility Concept of the Nigeria Operation Light Up Rural Nigeria (OLRN) Programme
  - GIZ- NESP Rural Electrification Accelerator Programme
- Develop distributed energy options (solar kits) for smaller and scattered dwellings
  - NAIJA LIGHT Solar Electrification Programme
  - Rural women energy security initiative (RUWES) with already 2 million women
  - “Solar Nigeria” programme under the Nigeria Infrastructure Advisory Facility (NIAF) funded by DFID
  - Rural Energy Access Project (REAP) initiated by the Federal Ministry of Environment's Renewable Energy Programme Unit
Strategy to achieve the target

- Develop and finalise the rural backbone grid to connect the remaining non-electrified major localities and build secondary light T-off lines to connect minor dwellings in the vicinity or the backbone.

- Strengthen / densify the connections on the existing medium / low voltage distribution grids
  - Promote the connection of households under or nearby the existing LV distribution grid through subsidy and pre-finance of connection costs
  - Connect smaller non-electrified localities under or nearby existing MV grids
Measures to achieve the target

- Butane consumption for cooking will increase up to 1.8 million tonne per year.
- The number of households gaining access to butane will increase from 0.15 to 0.8 million per year.
- 4 million tonne LPG are produced in Nigeria annually which are exported, and NLNG has made 150,000 tonne available for the domestic market.

Butane supply to households

- 2012: 200,000 tonne
- 2015: 350,000 tonne
- 2020: 700,000 tonne
- 2025: 1,400,000 tonne
- 2030: 1,600,000 tonne

kg butane / household / year

Tonne Butane

- Butane (tonne)
- kg butane/ household/ year
Strategy to achieve the target

• Upgrade and secure the sustainable forest management models to slow down the rapid deforestation process while allowing for sustainable charcoal production
  • Participatory and sustainable forest management (PSFM) is the main option contributing to the sustainable use of forestry resources.
  • Accelerate the transfer of forestry management competence towards rural communities and communes, enabling the management of smaller forestry areas
  • Enforce regulation and monitoring of charcoal production

• **Emphasize energy efficiency though the fire wood / charcoal value chain**
  • Develop and promote improved cook stoves
    • Capacity building of the Nigerian Clean Cook stoves Design and Testing Centre at Afikpo, Ebonyi State
    • Standards and labelling
    • Information dissemination
  • Develop and promote improved charcoal kilns and best practices

• **Promote substitution from charcoal to butane and compressed natural gas in urban areas**

• **Promote the development of biogas in rural areas**
Access to electricity

• An enabling environment for off grid solutions implemented by the private sector will permit to build a sustainable commercial infrastructure in order to offer workable off grid supply solutions
  • The Renewable Energy Mini Utility (REMU) initiative driven by the Federal Ministry of Power
  • Mini-grid Regulation developed with GIZ support
• An enabling environment for Discos to develop their customer base will permit to expand on grid connections
• The actions relating to the construction of the grid backbone (and LV extension programme) intending to reach all localities would put Discos in a position to offer a workable on grid supply solution to most localities
High impact actions for energy access

• Access to modern fuel
  • The actions relating to both reductions in firewood demand through massive savings (efficient cook stoves) associated with moving away from charcoal (LPG and CNG penetration), combined with measures to improve production levels would put Nigerian’s biomass sector onto a sustainable track
    • The National Assembly Intervention on Clean Cooking Initiative (NAICCI)
    • The National Clean Cooking Scheme (NCCS) driven by Federal Ministry of Environment Renewable Energy Programme
    • The Nigerian Clean Cook stoves Design and Testing Centre at Afikpo, Ebonyi State
Nigeria – National Renewable Energy Action Plan (NREAP)
Targets on Renewable

By 2020

- To achieve a 13% contribution of hydroelectricity (both large and small hydro) to the nation’s electricity generation mix
- To achieve a 1% contribution of wind energy to the electricity generation mix
- To achieve a 3% contribution of solar energy to the electricity generation mix
- To achieve a 2% power generation capacity using biomass resource

By 2030

- The electricity generation capacity will increase to 115,000 MW
- Renewable energy is expected to contribute about 20% share in the available electricity mix
- To achieve 6% contribution of solar energy to the electricity generation mix
Measures to achieve the target

- The share of renewable generation capacity (including LHP) will increase from 18% in 2020 and should stabilize at around 20% in 2030
  - To reach 115 GW in 2030, 80 GW of fossil fuel/nuclear generation will have to be added on top of existing projects
Strategy to achieve the target

- Promote public private partnership for large scale RE power plants
  - Ownership of neighboring communities to hydro projects
  - Appropriate regulations for grid-connection and wheeling of electricity generated
  - Incorporate environmental externalities in tariff

Create a Public Benefit Fund to finance renewable energy projects

- Promote private investment for small scale RE power plants connected to the grid
  - Develop bankable PPA and rules for tariff revision (FiT policy)
  - Determine a maximum intermittent capacity for grid stability
  - Custom tax waiver on RE equipment and RE generation tax credit

- Reduce the cost of domestic electricity bill (or diesel oil bill for gen-set) by installing kW scale roof-top PV capacities (to be considered under energy efficiency)

- Optimize generation cost using RE modules for mini grids or isolated systems (such as RE only or hybrid schemes)
High impact actions for Renewable

• Increase the share of renewable in the generation mix
  • An enabling environment for private investment in renewable capacity will contribute to mobilize small/mid scale generation capacity;

• Adopt procurement mechanisms and targets that stimulate the market for renewables: Competitive Bid, REFiT etc

• Develop and implement small-scale renewable energy and smart grid solutions for areas where conditions do not allow for large-scale interconnected grids, such as islands or remote areas: Develop Mini-grid Regulations
Nigeria – National Energy Efficiency Action Plan (NEEAP)
Targets on Energy Efficiency

• By 2020
  • Efficient lighting will be used by 40% of the households
  • For high-energy consuming sectors (transport, power and industrial sectors), efficient energy will increase by at least 20% compared to baseline
  • Achieve 10% biofuel blends
  • Improve the efficiency of the bioenergy sector
  • Distribution loss reduction target to 15-20%

• By 2030
  • Efficient lighting will be used by almost 100% of the households
  • For high-energy consuming sectors (transport, power and industrial sectors), efficient energy will increase by at least 50% compared to baseline
  • Curb the firewood demand below supply capacity
  • Distribution loss reduction target to less than 10%
Measures to achieve the targets

- The actions in SE4ALL action agenda/NEEAP will permit to curb the firewood demand below sustainable supply capacity.
Strategy to achieve the targets

- Transmission and distribution grid loss reduction
  - Transmission grid expansion and voltage upgrade
  - Investment in additional MV/LV transformers to develop LV distribution
  - Improve customer database to monitor consumption

- Gas power plant efficiency improvement
  - Ensure that the gas supply is dry
  - Retire obsolete gas turbine technologies
  - Shift from open cycle gas turbine to combined cycle

- Lighting
  - Adoption of Minimum Energy Performance Standards (MEPS) for on-grid and off-grid lighting devices
  - Supporting energy efficient lighting policies and measures through awareness raising campaigns targeting final consumers
  - Establish a system for Monitoring, Verification and Enforcement (MV&E) of Minimum Energy Performance Standards (MEPS) for lighting systems
  - Environmentally sound management through the implementation of a collection and disposal system for energy efficient light bulbs
Strategy to achieve the targets

• **Reduction of electricity consumption at user point**
  • Efficient lighting (residential, public building and street lighting)
  • Efficient cooling (fridge, commercial and industrial)
  • Efficient electrical appliances through labelling
  • Thermal regulation for building
  • Solar water heaters
  • Solar protection of windows

• **Support energy efficient city initiatives**
  • Abuja green city
  • Abuja centenary city
Strategy to achieve the targets

• Improving energy efficiency in road transportation
  • Adopting additional fuel saving technologies specially addressing the lagging improvement in fleet fuel economy as a result of the vibrant second hand vehicle market
  • Improving the road infrastructure, developing public transport and traffic plans
  • Biofuels blending
    • Bio ethanol from cane sugar up to 10% of gasoline mix
    • Straight vegetable oil from jatropha up to 30% of diesel mix
High impact actions for energy efficiency

- Distribution grid loss reduction
- Energy efficient cities
- Adequate regulation and financing schemes will create an enabling environment for energy efficiency solutions implemented by the private sector
  - The NCEAP Nigerian Clean Energy Access Programme will distribute 150 million bulbs over the next five years under the Clean Development Mechanism (CDM)
  - The GIZ driven Nigerian Energy Support Programme (NESP) in cooperation with the FMP, FMLHUD and the FMITI focuses on energy efficiency in the building and industrial sector
  - The Energy Efficient Housing scheme is a partnership between the Federal Ministry of Environment and Aso Savings and Loans Plc, a leading mortgage bank, Kaduna State Government, and Green Carbon Afrique
  - The FMLHUD is working with other Ministries, professional bodies and development partners to develop new building code
Nigeria – Investment requirement
Hydro Projects in the pipeline

- Hydro projects are
  - Mambilla (3050 MW)
  - Zungeru (700 MW)
  - Gurara 2 (360 MW)
  - Gurara 1 (30 MW)
  - Kashambila (40 MW)
  - Dadinkowa (40 MW)
  - Kiri (20 MW)
  - Oyan River (9 MW)
  - Ikere Gorge (8 MW)

- Over 40 S&M HPP already studied ready for investment
RE Projects in the pipeline

- Licensed Projects
  - Katsina (54 MW - Solar)
  - Sokoto (50 MW - Solar)
  - Kaduna (60 MW - Solar)
  - Osun (50 MW - Solar)
  - Bauchi (100 MW - Solar)
  - Abuja (50 MW - Solar)
  - Lagos (504MW – Biomass)
  - Gombe (39MW – Hydro)
  - Plateau (100MW – Wind)

- Several Projects are under Negotiations with Bulk Trader

Location of future RE power plants
Ongoing RE Support Activities

- **Policy Directive** on starting Competitive Procurement of RE & Feed-In-Tariff through the instrument of NREEEP, 2015

- FMP is Conducting preparatory studies with support of Development Partners (e.g. GIZ):
  - **Grid Capacity and Availability Study**: Identify the maximum PV capacity that can be connected to the northern part of the Nigerian 132/330kV system
  - **Investment Process Mapping Study**: Recommendations on how to streamline permitting processes
  - **Regulatory Impact Assessment**: Calculation of an optimal levy curve to cover incremental costs of RE

- **Off-Grid Renewable Energy Policy Framework via Mini-Grid**
  - Development of a private sector driven market for rural electrification based on investor friendly Mini-grid regulation in line with EPSR and draft RESIP
Overall estimation of financial needs to implement the SE4ALL Action Agenda for Nigeria

- The financing requirement for SE4ALL Action Agenda reflecting the national policy objectives amounts to **62 billion €**
- Electricity access and renewable accounts for **78%** of the financing requirement
The annual financing requirement associated to the policy objectives varies from \textbf{2.5 to 4 billion Euros}. 

The chart shows the SE4ALL Action Agenda - Annual Financing Requirement, broken down by time periods and spending categories.
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