WORKSHOP ON THE EMBEDDED GENERATION FRAMEWORK IN THE NIGERIAN ELECTRICITY SUPPLY INDUSTRY

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The Concept of Embedded Generation – Prospects and Challenges

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1. Concept of Embedded Generation
2. Nigerian Power Sector Outlook
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The Concept of Embedded Generation (EG)
Industry Definition of EG

Also known as:

- Distributed Generation
- Onsite Generation
- Dispersed Generation
- Decentralised Generation
- Decentralised Energy

**Embedded Generation** basically is power generated on a smaller scale, not centrally dispatched via the grid and directly connected to a distribution network or customer loads.
# Industry Definition of EG

<table>
<thead>
<tr>
<th>Country</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Connected to the distribution network (up to 132 KV) which is capable of supplying customer load directly</td>
</tr>
<tr>
<td>France</td>
<td>Connected to the distribution network, capable of supplying customer loads directly</td>
</tr>
<tr>
<td>Germany</td>
<td>Used mainly for sun, wind and small hydro projects</td>
</tr>
<tr>
<td>Greece</td>
<td>Connected to the distribution system not centrally planned or dispatched</td>
</tr>
<tr>
<td>India</td>
<td>New renewable energy sources (up to 11KV)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Owned by utilities, industry or a combination (up to 150KV)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Connected to a distribution system (up to 132KV)</td>
</tr>
</tbody>
</table>

*Source: Report of CIRED Working Group No 4 on Dispersed Generation.*
Local Industry definition of EG

The generation of electricity that is directly connected to and evacuated through a distribution system which is connected to a transmission network operated by a System Operations Licensee – *NERC Regulations for Embedded Generation issued in March 2012*
Nigerian Power Sector Outlook
Nigerian Power Sector Outlook – National

- Power Sector Road Map aspiration – 40,000 MW by 2020
- Presidential Taskforce on Power – 30,669 MW by 2020
- Daily Peak Delivery – 4300 MW (±)
- 32 Licensed On-Grid IPPs with a total installed capacity of 1899 MW – May 2012; total licensed capacity 12,324 MW
- 20 Licensed Off-Grid IPPs with a total installed capacity of 111.15 MW (Estimated); total licensed capacity 274.5 MW
- 3 EG Licenses with a total licensed capacity of 374 MW – All Non-Operational
- 10 NIPP Projects with a total installed capacity of 750 MW – May 2012; total licensed capacity 4,180 MW
- 12 FGN Hydro and Thermal Stations with a total installed capacity of 6,504 MW – May 2012; total licensed capacity 10,552 MW (Mambilla, Zungeru and Gurara inclusive)
- Total estimated generating (operating and non operating) capacity – 27,704.5 MW
Nigerian Power Sector Outlook – Hurdles

- Access to gas, gas prices and gas supply framework
- Transmission Network – Losses and dilapidated Infrastructure
- Bulk Trader – Credibility, Standard PPA Template
- Maintenance/Turnaround of existing FGN Discos
- Funding for NIPP Projects
- World Bank Partial Risk Guarantee
- Financing for IPPs
40,000 MW in the next 7 years ?????
Prospects of EG
Prospects - National

- Achieve National Aspirations within a shorter time.

- Reduced technical losses because of proximity to the network

- Discos have access to more power supply = more cash flows + more customers willing to pay

- Opportunity for Discos to improve distribution network (either by themselves or by the EGs) and performance

- Deepen the electricity market – capacity, standards, contracts and more bankable deals

- IPPs with excess power within a distribution network are able to sell their excess power to Discos

- Industrial consumers can have the option of choosing the most suitable suppliers for them

- Introduces competition in the market
Prospects - Sub-National

- States are able to achieve power supply aspirations within their borders without constitutional constraints
- State investment in and ownership of Discos could work to State advantage
- Power to be supplied to strategic state infrastructure and institutions: Water Plants, Hospitals, Schools, Courts, Offices, Street lighting etc
- More Industrial clusters and businesses with better power supply = more business, stronger economy, perhaps more willing tax payers
Prospects - Sub – National – Lagos State

- Population as at 2012 – 20.5 million
- 2,000 industrial complexes, 10,000 commercial ventures and 22 industrial estates.
- Requires over 12,000 MW of electricity
## Prospects - Sub – National – Lagos State

<table>
<thead>
<tr>
<th>No</th>
<th>Area</th>
<th>No. of Locations</th>
<th>No. of Sectors</th>
<th>Installed Capacity (MW)</th>
<th>Number of Generators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Somolu Printing Community</td>
<td>271</td>
<td>15</td>
<td>11</td>
<td>300</td>
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<tr>
<td>2</td>
<td>Matori Industrial Estate</td>
<td>148</td>
<td>20</td>
<td>40</td>
<td>105</td>
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<tr>
<td>3</td>
<td>Ilupeju Industrial Estate</td>
<td>144</td>
<td>18</td>
<td>25</td>
<td>105</td>
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<tr>
<td>4</td>
<td>Ikorodu Industrial Estate</td>
<td>11</td>
<td>4</td>
<td>135</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>Lagos Island (broad street &amp; Marina only)</td>
<td>599</td>
<td>25</td>
<td>100</td>
<td>252</td>
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<tr>
<td>6</td>
<td>Ikeja GRA</td>
<td>789</td>
<td>31</td>
<td>68</td>
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<td>Oba Akran</td>
<td>516</td>
<td>32</td>
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<td>548</td>
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<td>Agidingbi</td>
<td>645</td>
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<td>820</td>
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<td>9</td>
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<td>13</td>
<td>89</td>
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<tr>
<td>10</td>
<td>Omole 11</td>
<td>1531</td>
<td>12</td>
<td>43</td>
<td>2410</td>
</tr>
<tr>
<td>11</td>
<td>Dolphin Estate</td>
<td>1544</td>
<td>12</td>
<td>22</td>
<td>1089</td>
</tr>
</tbody>
</table>

*Source: Presentation on Power Sector Development: Lagos State Economic Summit April 23-25 2012*
Prospects - Power Developers/IPP

- IPPs can sell excess power to Discos
- Cost reflective tariff (different fuel sources and cost of building infrastructure considered)
- Potential market for power supply to Housing Estates, Industrial Estates/clusters, State Governments and Telecom Installations
- Option to also supply power to eligible customers
- No distribution lines ordinarily required when connected to a Disco
- No transmission costs
- No distribution licence required
Challenges
Potential Challenges

- Distribution Network constraints – good or bad thing?
- Credibility/Liquidity of Discos
- Regulatory, Contractual Framework & Capacity
- Eligible Customers – Classes of customers currently undefined, could this be a win-win situation for the Discos?
- Procurement Process – enabler or clog in the wheel?
- Cost Recovery – how will this be structured?
- Licensing hurdles for those with excess power – could there be another way out?
Conclusion

- Embedded Generation evidently has a lot of potential
- NERC has taken the initial step with the regulations
- Stakeholders need to make concerted efforts to build the legal, regulatory, contractual and financing framework
Thank You for Listening