June 2016; Pablo Astorga, Head of Sales Microgrids

Microgrids for industrial applications
Microgrid segments and main drivers
Covering a diverse range of applications

<table>
<thead>
<tr>
<th>Segments</th>
<th>Typical customers</th>
<th>Main drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Social</td>
</tr>
<tr>
<td>Island utilities</td>
<td>(Local) utility, IPP*</td>
<td>P</td>
</tr>
<tr>
<td>Remote communities</td>
<td>(Local) utility, IPP, Governmental development institution, development bank</td>
<td>P</td>
</tr>
<tr>
<td>Industrial and commercial</td>
<td>Mining company, IPP, Oil &amp; Gas company, Datacenter, Hotels &amp; resorts, Food &amp; Beverage</td>
<td>P</td>
</tr>
<tr>
<td>Defense</td>
<td>Governmental defense institution</td>
<td>(P )</td>
</tr>
<tr>
<td>Urban communities</td>
<td>(Local) utility, IPP</td>
<td>(P )</td>
</tr>
<tr>
<td>Institutions and campuses</td>
<td>Private education institution, IPP, Government education institution</td>
<td>(P )</td>
</tr>
</tbody>
</table>

**P**: Main driver
(P): Secondary driver

IPP: Independent Power Producer
Microgrids

Grid Connected Microgrid
Microgrids
Transition to Islanded Microgrid
Microgrids
Transition to Grid Connected Microgrid

Microgrid operating as a single, autonomous grid either in “grid-connected” or “Islanded” mode with respect to the existing utility power grid.
OPEX accounts for ~75% of total costs over ten years of operation, with 20% of OPEX in energy costs. In industry, OPEX is the main cost lever of TCO.
Operational objectives and power system functions drive microgrid technology choices

**Operational goals**

- Maximize reliability
- Resilience in the face of severe weather or natural disasters
- Resilience in the face of unreliable grid
- Meeting environmental targets
- Maximizing renewable penetration
- Shrinking operating expenditures
- Energy independence
- Participation in regulation or ancillary services markets

**Power system functions – “8S”**

1. Stabilizing
2. Spinning reserve
3. STATCOM (static synchronous compensator)
4. Seamless
5. Standalone operation
6. Smoothing
7. Shaving
8. Shifting
Integration of renewables and storage with diesel
Johannesburg, PV/diesel, battery energy storage system and grid

**Project name**
Longmeadow

**Location**
South Africa

**Customer**
Longmeadow Business Estate

**Completion date**
2016

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**ABB solution**

- PV/diesel microgrid with battery-based system to maximize solar contribution and ensure security of power supply at ABB's premises in Johannesburg
- The resulting system consists of:
  - 750 kWdc rooftop PV plant, including ABB PV inverter
  - 1 MVA/380 kWh battery-based PowerStore
  - Microgrid Plus System

**Customer benefits***

- Reliable and stable power supply
- Optimized renewable energy contribution to the facility
- Ability to island from the grid in case of an outage
- CO2 reduction: over 1,000 tons/year
- Up to 100% renewable energy penetration

**About the project**

The microgrid solution is for the 96,000 sqm facility houses hosting ABB South Africa’s headquarters as well as manufacturing facilities with around 1,000 employees. The innovative solution will help to maximize the use of solar energy and ensure uninterrupted power supply.
Integration of renewables and storage with diesel
Western Australia, PV/diesel and storage

**Project name**
DeGrussa Copper-Gold Mine
**Location**
Western Australia
**Customer**
juwi Renewable Energy
**Completion date**
2016

**ABB solution**
- Integration of a new 10.6 megawatt (MW) solar PV field and a battery storage system with existing diesel generation to provide reliable base-load power.
- The resulting system consists of: PowerStore™ grid stabilization solutions (2 x 2 MW), solar inverter stations (5 x 2 MW), solar MV stations, a transformer and the Microgrid Plus System.

**Customer benefits**
- Expected diesel fuel saving is 5 million liters per year, cutting diesel consumption by 20%.

**About the project**
- The new hybrid solar facility will be the largest integrated off-grid solar and battery storage plant in Australia.
- Once fully integrated, the plant will reduce CO2 emissions by 12,000 tons.