Africa Smart Grid Forum 2018

Convergence of ICT & the Energy Sector

Presentation by Walter Waziri

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Kigali, Rwanda
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Overview

• Architecture
• COM Protocols/Standards
• Performance
• Benefits
• Case Study
• Africa is Ready
• Conventional Power Systems
• Conventional Metering

Many Utilities in Africa made all the Good Efforts!
Yet, Electricity Energy Access in Africa remained Dismal

share of population with access to electricity (urban and rural) in %

Source: World Bank, 2017
Sustainable Development Goal 7 (UN)

By 2030

• Ensure universal access to affordable and reliable energy

• Increase substantially the share of renewable energy in the global energy mix

• Double the global rate of improvement in energy efficiency
Into the African Energy Sector

Include:
- ICT & Telecommunication Connectivity
- Increase its Coverage and Utilization

Benefits in Africa
- Optimized Electrical Power Systems:
  - Generation
  - Transmission
  - Distribution
- Increased Access to Electricity
- Increased Power System Reliability & Availability

African Utilities have had to Think Smart & Face the Problem

RTUs, PLCs, IEDs
Servers, Applications
Variety of Architecture

Multiple Servers & RTUs - Cloud Tec

Connectivity

Energy Sector is Represented by Protection Relays/IEDs with Capability for Wide Area Communication

Energy Infrastructure Enabled by ICT Connectivity Using:
- Field Sensors e.g. GridAdvisor™
- Field Actuators
- Synchrophasors
- With Redundancy

In Africa by 2016

no. of mobile base stations

2.4M

0.6M

Urban Rural

Broadband Data

ICT in Wide Area Telecommunication Linking Power Stations, NCC, RCC & CDC
Conventional ICT Enabled

Industry Example by ABB: Industrial IT enabled

Wide Area ICT Convergence
Integrates Electricity & Private Networks Wide Area Big Data Communication onto the African Grid

ICT Enabled with:
✓ Cyber Security
✓ Encryption
✓ Gateways/Firewalls
✓ Access Control
✓ Unused Ports Control
✓ Backup
✓ Redundancy
The COM Protocols/Standards

High Speed Communication

Include for: DCS, SCADA, DMS, EMS: **ICCP - Inter-control Centre Communication Protocol**
Benefits of ICT Convergence in Africa

In Recent years, **ICT Convergence has Enabled Africa to Edge Closer towards SD Goal 7**

1. ICT has Introduced Wide Area Protection, Monitoring & Control of the Energy Sector

*Real-Time exchange of Digital Information for Power System Management*
2. ICT has **Improved System Control, Security & Power Quality in Africa**
3. ICT has Enabled Effective Power Dispatch & has Improved Grid Safety, Reliability & Availability

Cost Effective across Entire Lifecycle
✓ Enables Grid Optimization
✓ Enables Grid Interoperability
✓ Improves MTBF
✓ Reduces Power Losses
✓ Lowers TCO

Smart Metering & Billing
✓ ICT Enables Effective Bulk Energy Metering
✓ Optimizes Bulk & Domestic Energy Billing
4. ICT has Enabled Integration of **Renewable Energy into the National, Mini & Micro Grids**

- Wind
- Geothermal
- Solar
- Biogas

*Can be Connected as:*
- Feed-in-Tariff (National Grid)
- Off Grid (Mini & Micro)
5. ICT has Enabled some African Utilities to **Earn CERs**

*Source: Constructionkenya.com*

*E.g. Geothermal is Green Energy*

i.e. through Effective Data Capture & Analysis from the CDM programs

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**This Creates an Extra Revenue Stream**

**CERs** are Certified Emission Reduction Units earned through the CDM/Kyoto Protocol/IPCC, 2007.
6. **ICT-Energy Convergence** has powered some African **SMART CITIES**!

A **Stronger ICT-Energy Convergence** can Enable Africa to Establish **MORE SMART CITIES**

**Smart City Attributes**
- Energy Reliability
- Renewable Energy
- Energy Efficiency
- Supervised Data Collection, Transfer & Control
- Electric Vehicles-Evs, Trams
- No Carbon Pollution

Cairo – is already POWERED

Konza-Proposed

Lekki Lagos-Proposed
7. ICT has Enabled **Lowering of Auxiliary Consumption & Improving Energy Efficiency**

(i.e. through Effective Workflow **SAP PM: Data Capture & Analysis - Automatic Collection of Information on Auxiliary Power Consumption**)

**Kipevu 1 Auxiliary Consumption - 2001-2013**

![Graph showing the comparison between target and auxiliary consumption](image)

**MWhr**

- **Target Aux cons.**
- **Auxiliary cons.**

Design Consumption Level

8. ICT has Enabled Lowering of Energy Back-feed & Imports from African Grids

(i.e. through Effective Workflow SAP PM: Data Capture & Analysis)

Kipevu I Imports from KPLC - 2001-2013
Kenyan Case Study: **ICT Training & Exposure has created Valuable Internal Capacity**

<table>
<thead>
<tr>
<th>Gitaru U1 PLC-DCS Upgrade – 2017 Internal Capacity Only</th>
<th>Tana U1 PLC-DCS Upgrade – 2016 Foreign Consultancy, Services &amp; Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Cost (USD)</strong></td>
<td><strong>Cost (USD)</strong></td>
</tr>
<tr>
<td>1 Engineering &amp; Commissioning - Administrative cost</td>
<td>1 Administrative cost</td>
</tr>
<tr>
<td>64,168</td>
<td>27,540</td>
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<tr>
<td>2 Training Component</td>
<td>2 Engineering, Commissioning &amp; Training</td>
</tr>
<tr>
<td>19,062</td>
<td>158,691</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>USD 83,230</td>
<td>USD 186,231</td>
</tr>
</tbody>
</table>

*SAVINGS* Approx. USD 100,000

Africa’s Innovativeness is World Renowned!
Africa is Ready Manufacturing!

Africa can Enter the High-End Manufacturing Industry!
Manufacturing of ICT related products and devices is Modular and is done by Industrial Robots on Automated Centres.
These are uploaded with preprogrammed ICT Software Applications & apply Non Proprietary Protocols in order to control:

- Manufacturing
- Assembly
- Functional Testing
- Burn-in Testing
- Routine Testing
- Packaging
- Dispatch

But Robots, Automated Centres, ICT Application Programs and Protocols are NOT necessarily proprietary of the manufacturer! All these can be PROCURED.
AUTOMATED ASSEMBLY - TEST CENTRE
Thank you