Africa Smart Grid Forum 2018

Convergence of ICT & the Energy Sector

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3RD AFRICA SMART GRID FORUM 2018
KIGALI, RWANDA
1ST OCTOBER – 4TH OCTOBER, 2018

Overview

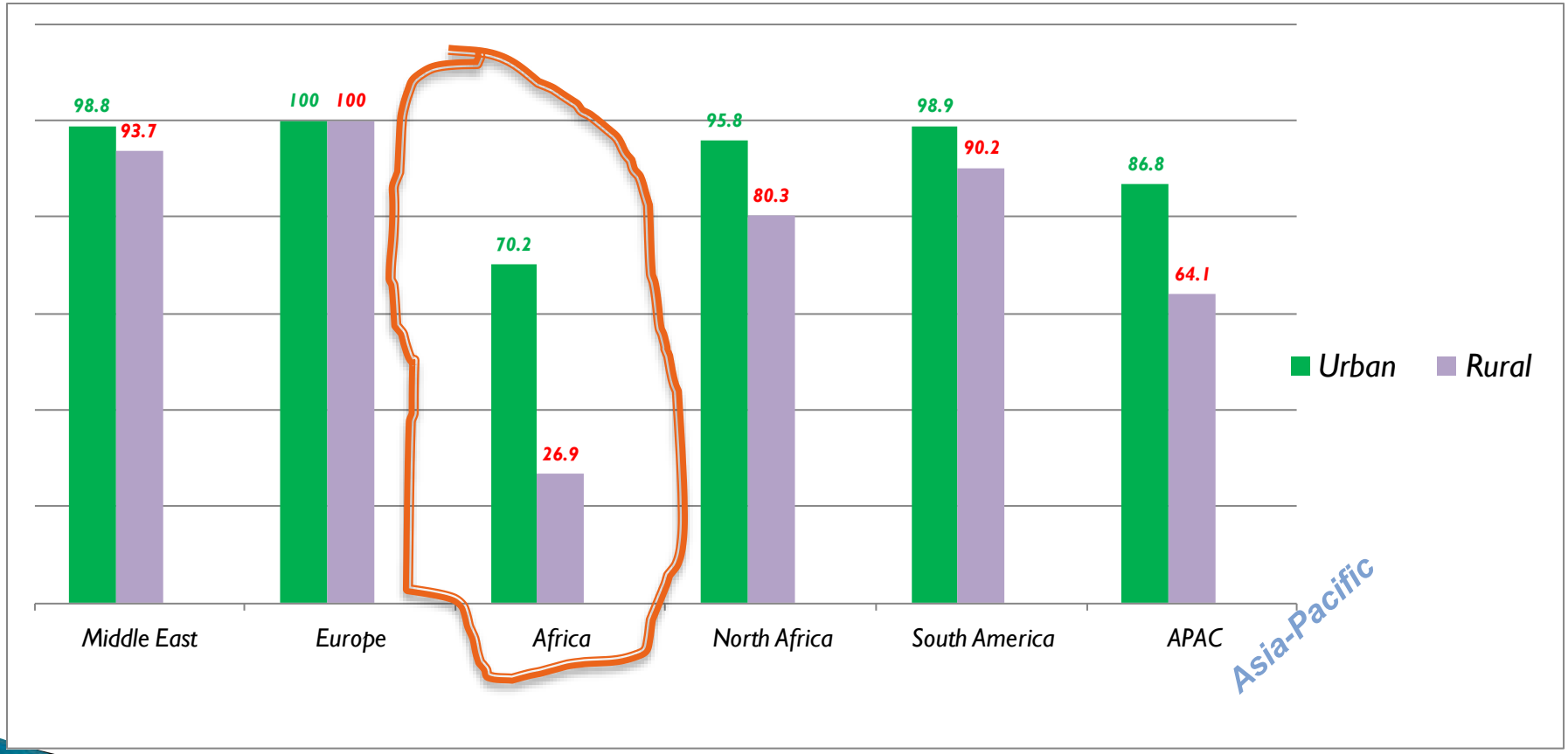
- Architecture
- COM Protocols/Standards
- Performance
- Benefits
- Case Study
- Africa is Ready

- *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*

African Utilities have had to Think Smart

RTUs, PLCs, IEDs
Servers, Applications

Into the African Energy Sector

Include:

- *ICT & Telecommunication Connectivity*
- *Increase its Coverage and Utilization*

Benefits in Africa

✓*Optimized Electrical Power Systems:*

- *Generation*
- *Transmission*
- *Distribution*

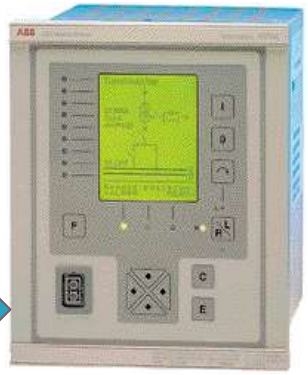
✓ *Increased Access to Electricity*

✓ *Increased Power System Reliability & Availability*

Variety of Architecture

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

Multiple Servers & RTUs -Cloud Tec



Connectivity

Connectivity

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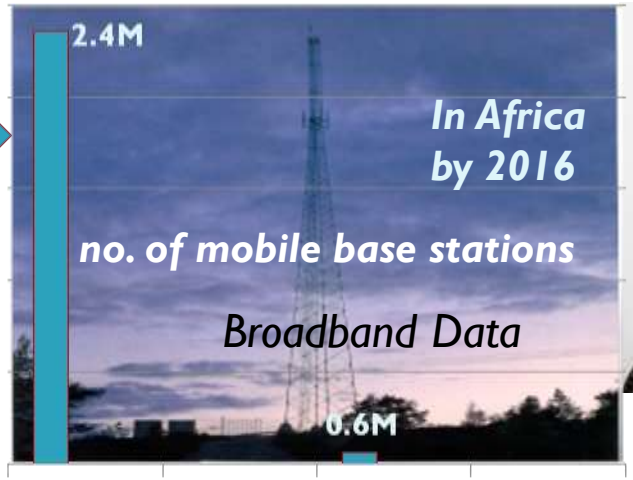
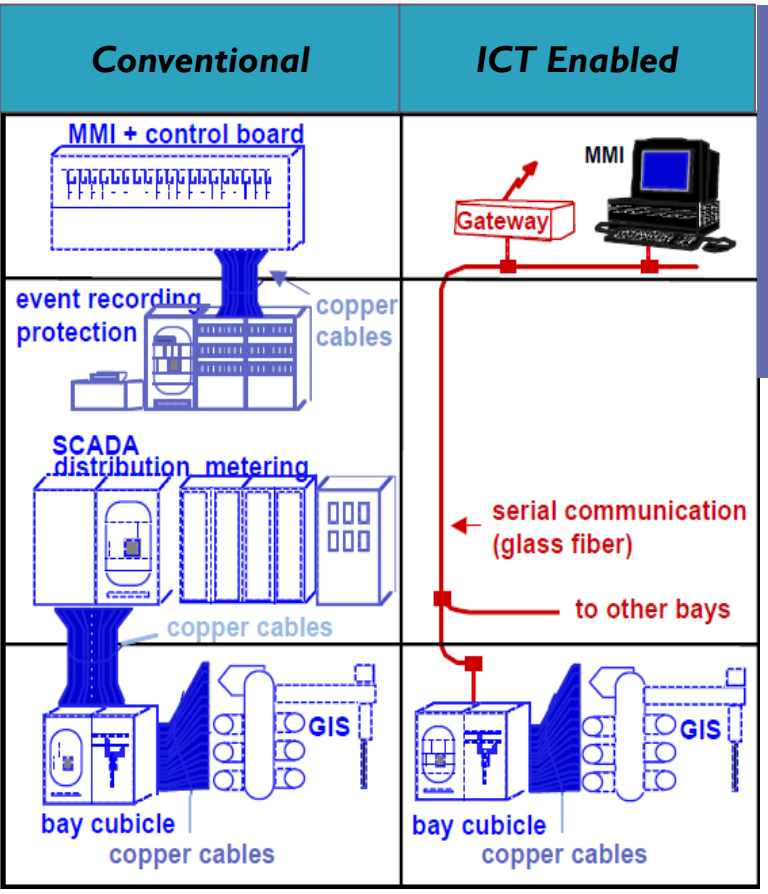


Earth Institute

Energy Infrastructure Enabled by ICT Connectivity Using:

- *Field Sensors e.g. GridAdvisor™*
- *Field Actuators*
- *Synchrophasors*
- *With Redundancy*

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



Industry Example by ABB:

Industrial IT enabled

Wide Area ICT Convergence

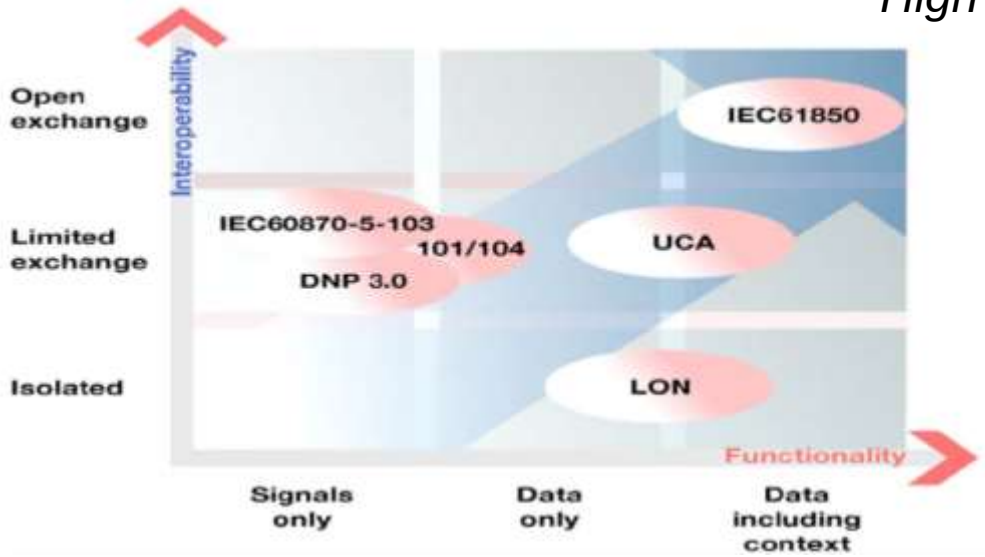
Integrates Electricity & Private Networks Wide Area Big Data Communication onto the African Grid

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

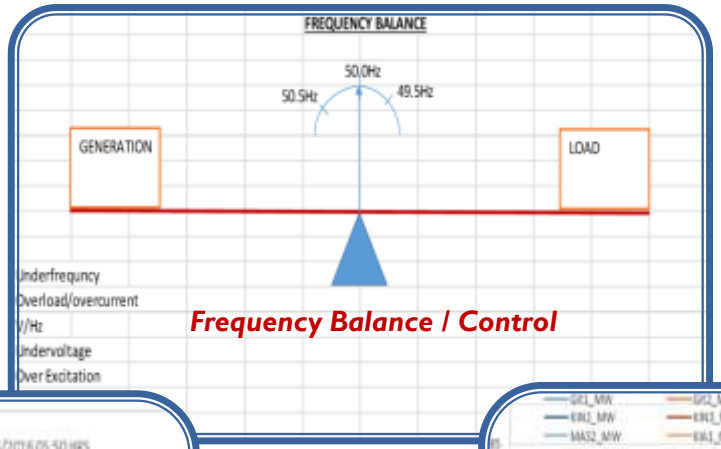
Benefits of ICT Convergence in Africa

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

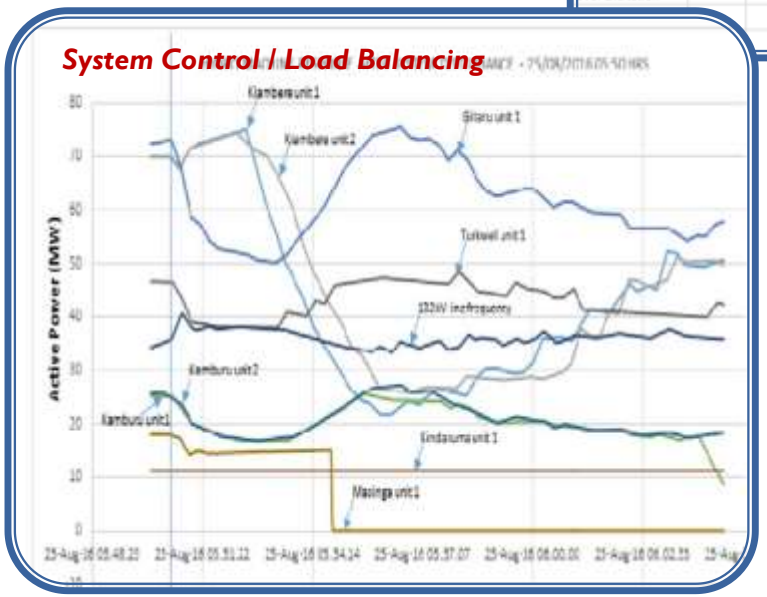
1. *ICT has Introduced Wide Area Protection, Monitoring & Control of the Energy Sector*

Real-Time exchange of Digital Information for Power System Management

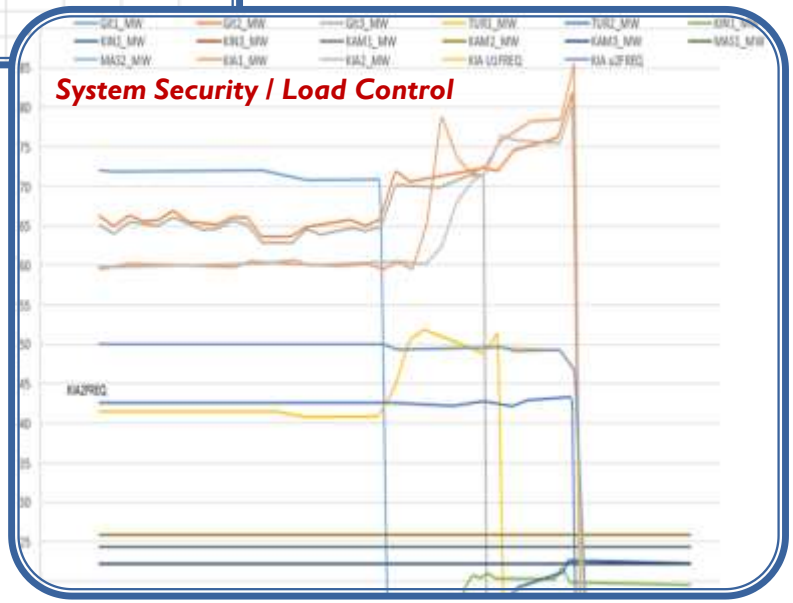
2. ICT has *Improved System Control, Security & Power Quality* in Africa



Frequency Balance / Control

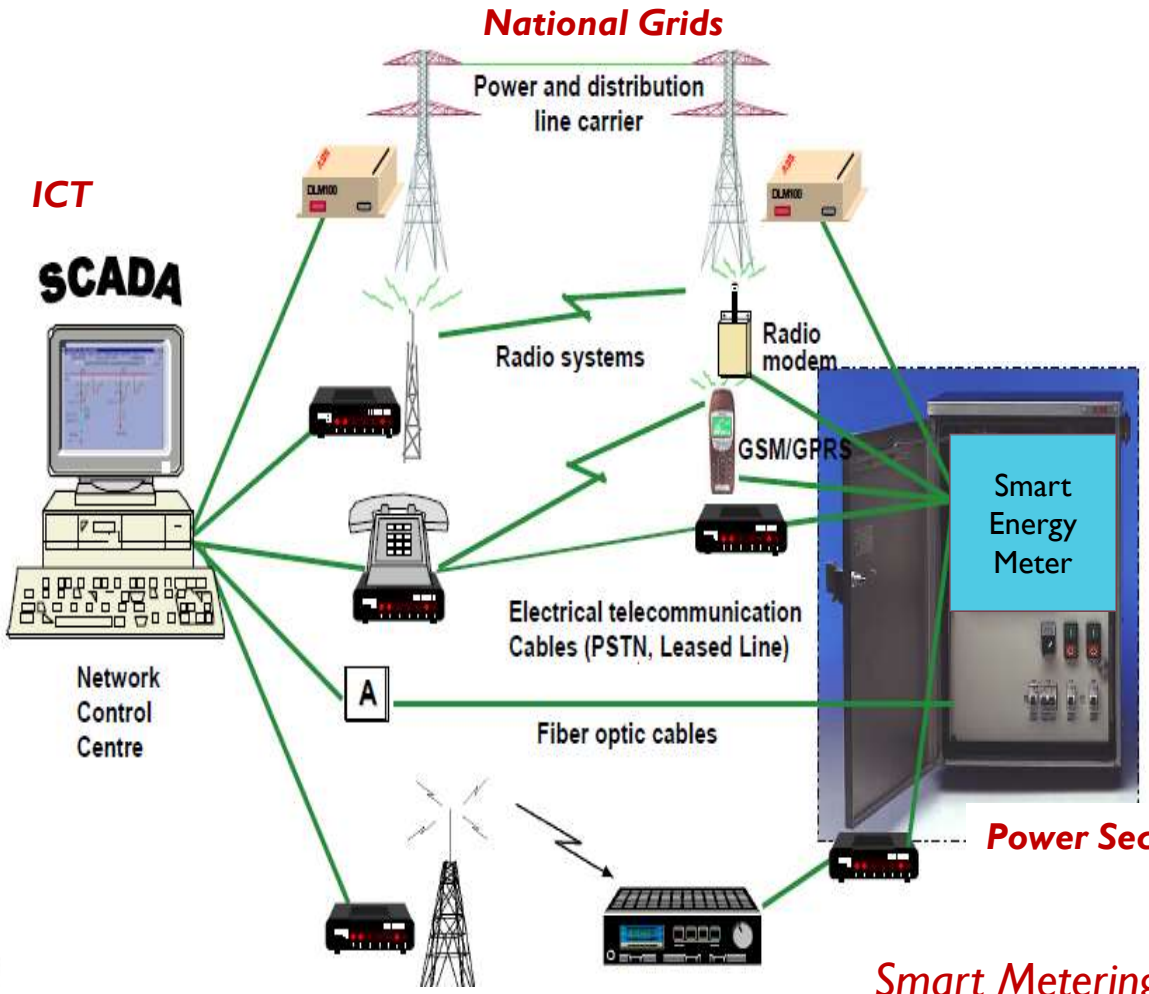


System Control / Load Balancing



System Security / Load Control

3. ICT has Enabled *Effective Power Dispatch & has Improved Grid Safety, Reliability & Availability*



Cost Effective across Entire Lifecycle

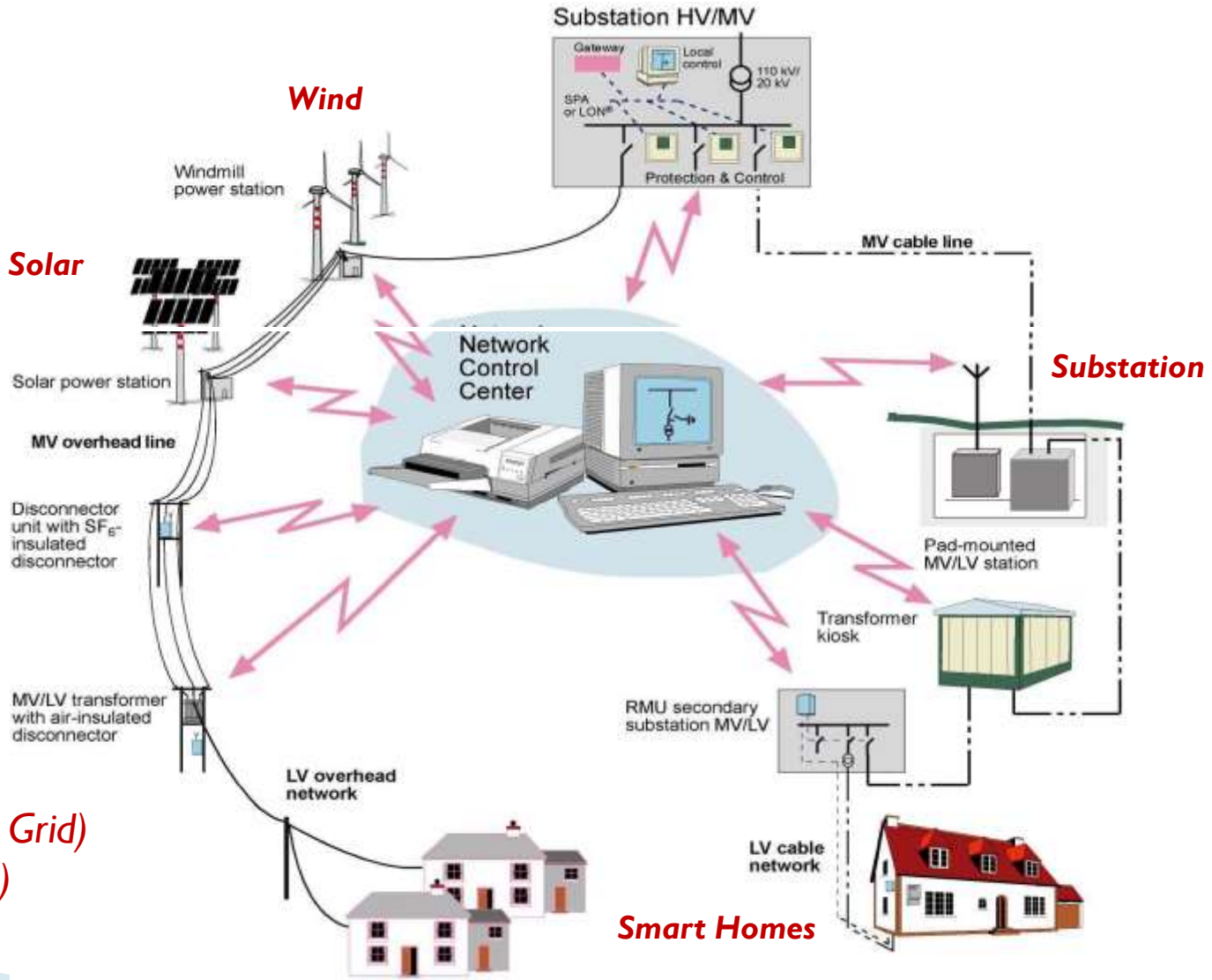
- ✓ *Enables Grid Optimization*
- ✓ *Enables Grid Interoperability*
- ✓ *Improves MTBF*
- ✓ *Reduces Power Losses*
- ✓ *Lowers TCO*

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

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

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

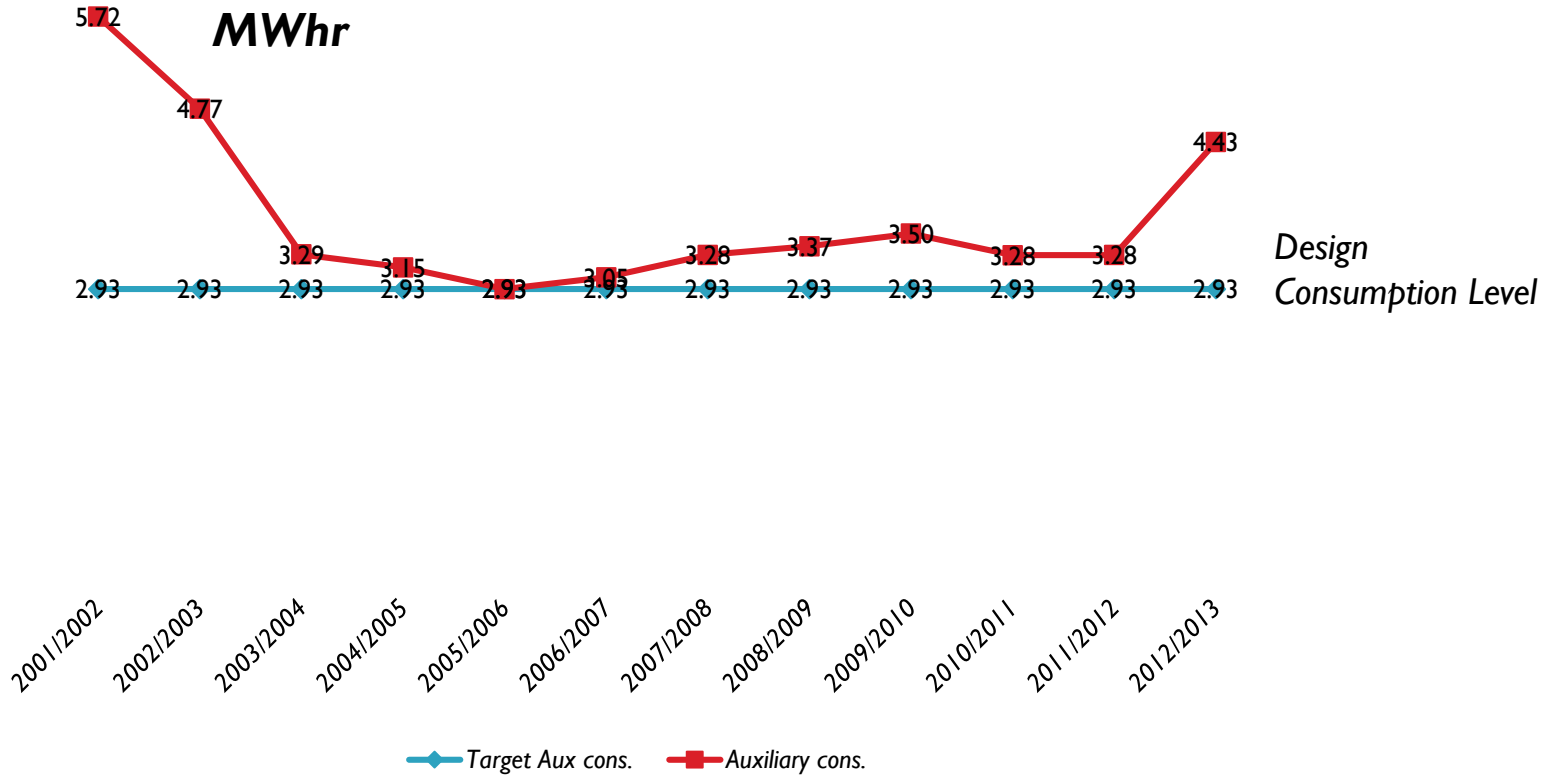
Smart City Attributes

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

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)

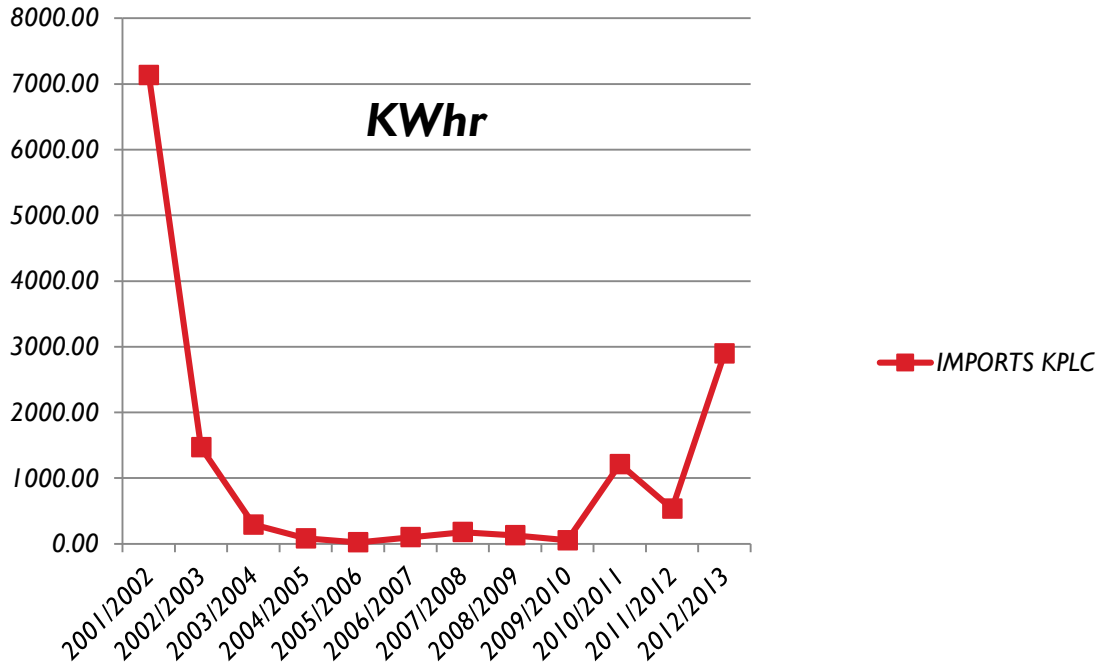
Kipevu I Auxiliary Consumption - 2001- 2013



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

Gitaru U1 PLC-DCS Upgrade – 2017 Internal Capacity Only				*Tana U1 PLC-DCS Upgrade – 2016 Foreign Consultancy, Services & Supervision*	
	Description	*Cost (USD)*		*Description*	*Cost (USD)*
1	*Engineering & Commissioning - Administrative cost*	*64,168*	*1*	*Administrative cost*	*27,540*
2	*Training Component*	*19,062*	*2*	*Engineering, Commissioning & Training*	*158,691*
	Total	*USD 83,230*			*USD 186,231*

SAVINGS
Approx. USD100,000

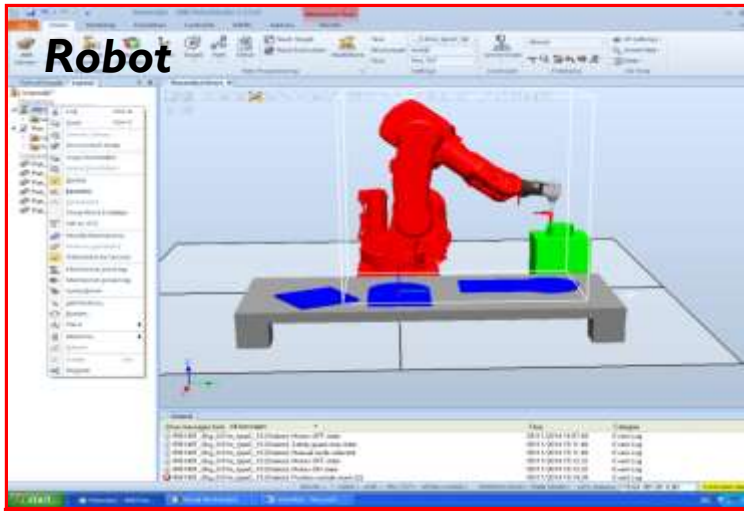
Africa's Innovativeness is World Renowned !

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.



Robot Program

```
PROC main()
MoveJ [[-23.38,533.93,447.35],
[0.384629,-0.652679,0.587987,0.283446],
[1,0,-1,1],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]],
v1000, z50, tool0;
WaitTime 10;
MoveJ [[494.06,220.95,432.87],
[0.4646,-0.175217,0.867993,-0.00587152],
[0,0,-2,1],
[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09],
v1000, z50, tool0;
MoveJ [[496.60,229.82,322.62],
```

AUTOMATED ASSEMBLY - TEST CENTRE

Thank you