SMARTENING GHANA'S GRID TO ACCOMMODATE INTERMITTENT RENEWABLE ENERGY

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Ghana Renewable Energy Fair

Outline

- GRIDCo's Mandate
- Key Technical Challenges
- GRIDCo's Strategy
- On-going Reinforcement Projects
- Smart Systems of the Grid
- Critical Requirements for IRE Integration
- Conclusion



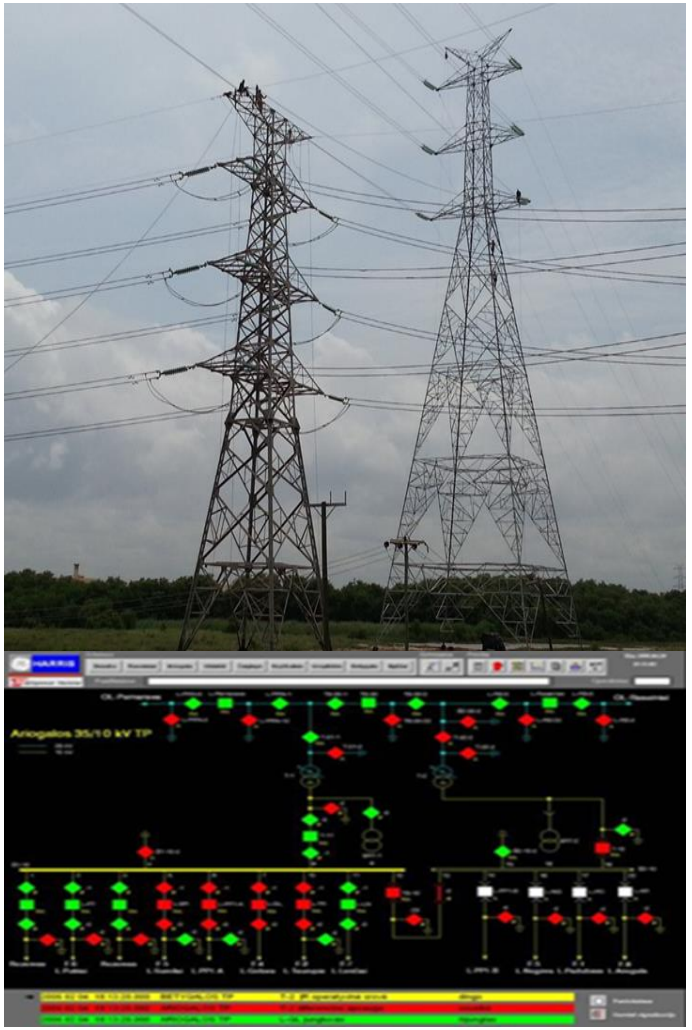

1. Mandate

1. Electricity dispatch from wholesale suppliers to bulk customers
2. Non-discriminatory transmission services to all grid participants
3. Electricity Transmission Infrastructure planning, investments, construction, maintenance and operation
4. Wholesale power market management

NATIONAL INTERCONNECTED TRANSMISSION SYSTEM OF GHANA

CURRENT GRID INFRASTRUCTURE

- Transmission lines 5,440km
  - 330kV – 371km
  - 225kV – 73km
  - 161kV – 4,863km
  - 69kV - 133km
- HV Substations - 65
- Transformer Capacity 4,059MVA (about 40% above current peak demand)
- State of the art System Control Centre (SCC)



2. Key Technical Challenges

1. Sustaining Transmission capacity to meet growing electricity demand
   - (Averaging over 10% p.a. from 2012-2014)
2. Maintaining efficiency, reliability and quality of supply
   - (Losses, Voltage and frequency control)
3. Integrating Emerging Intermittent Renewable Energy Sources

3. GRIDCo's Strategy

- Improve Transmission Infrastructure
  - **(Build a 'strong grid') Satisfy N-1 criteria for Substation Transformers**
  - **Eliminate inadequate firm transfer capability in the system**
  - **Optimize voltage profile, reduce transmission losses**
- Add Intelligent Systems
  - **(Build a 'smart grid') to facilitate IRE integration and enhance operational control**
- Build capacity in IRE Integration
  - **Engineering, Market Operations and Legal Services**

4. Ongoing Projects - Building a Strong Grid

- Substation Reliability Enhancement Project (SREP)
- 330kV & 225kV Projects
  - Aboadze-Prestea 83Km
  - Prestea-Kumasi 185Km
  - Kumasi-Bolgatanga CTB
  - Bolgatanga-Ouagadougou
- 161kV Projects
  - Smelter II-KarPower Barge - 8Km
  - Mim-Asawinso-Juabeso
  - Tumu-Han-Wa

4. Ongoing Projects - Building a Strong Grid

- New Substations
  - Juabeso 161/34.5kV
  - Berekum 161/34.5kV
  - Afienya 161/34.5kV
  - Bolga 330/225kV
  - Tamale 330/161kV

GRIDCo's Capital Projects for 2012 – 2015 exceeds $300MUSD

5. Smart systems of the grid

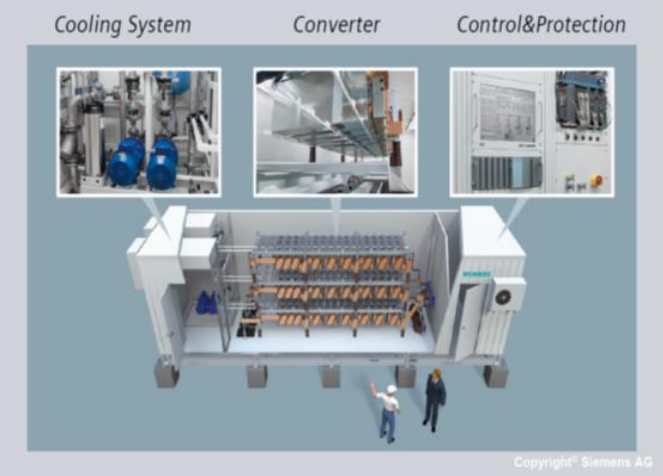
- A state of the art EMS/SCADA system
- Real time data acquisition
- AFLS Schemes
- 40MVAr SVC installed at Tamale
- Substation Automation Systems in some substations
  - **(Smelter II, Kintampo, Mim)**
- Major Substations being automated under SREP to be completed in July 2016
- DLC System to be installed by Q4 2017

SVC Installation (STATCOM)

SVCs at strategic locations for system stability.

Tamale +/-40 MVAr

Kumasi – future +/- 50MVAr

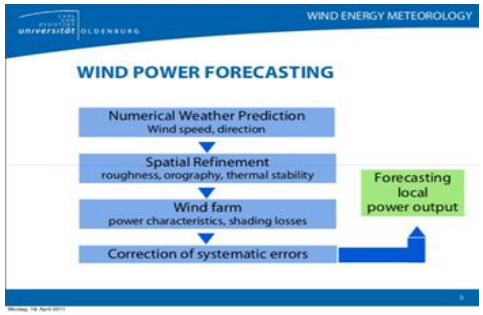


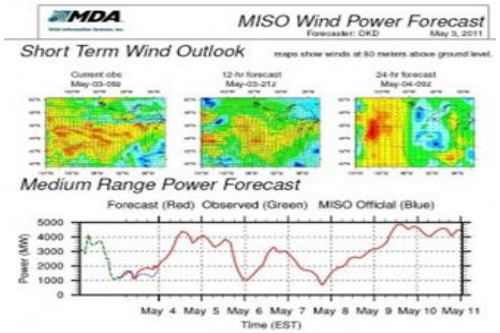
6. Key requirements for increased IRE Integration

- Accurate weather forecasting tools for System Control Centre
- Adequate spinning reserve on fast acting generators in the grid
- Network Security management system
- Adequate Voltage regulatory devices (SVCs) at strategic locations

Weather Forecasting Models for SCC

- System Control Center (SCC) to be equipped with State-of-the-Art weather forecasting tools

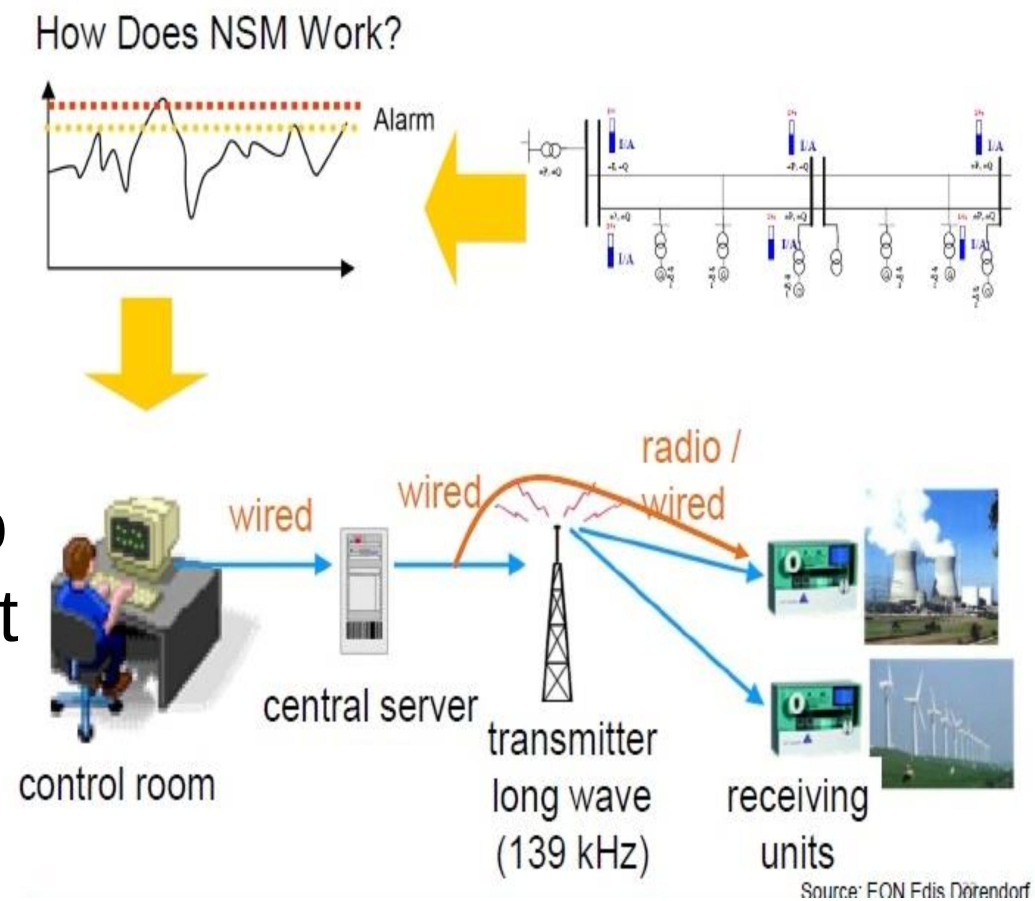




Network Security Management (NSM)

SCC to be equipped with an online Network Security management System(NSM).

NSM allows the System Operator to control power output of REs



7. CONCLUSION

- Sustain efforts at building a strong grid
- Continue to make the grid more intelligent
- Engage Stakeholders on issues related to spinning reserve, frequency and voltage control to facilitate IRE integration
- Continue to build capacity in Smart technologies applications and IRE grid integration

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THANK YOU

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