Basic Design of the Cross-border Power Trading System for WAPP

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Abstract - The West African Power Pool is currently developing the regional electricity market for its member states. As the basic design for the cross-border power trading system for the West African Power Pool, the step-by-step evolution, the Baseline System and the Fullscale System, is estimated. Along with the interconnection project between member countries, the various functions from the data acquisition and processing by the Baseline System to the interchange trading by the Fullscale System will be implemented gradually.

1. Introduction

The West Africa region, despite its abundant energy resources, has an unequal geographical distribution of resources for generating electric power. As a result only a third of across 14 Economic Community of West African States (ECOWAS) countries has access to electricity. Power supply for household and industrial uses is vastly different between each country and distinguished much from the overall regional demand.

The West African Power Pool (WAPP) was established by ECOWAS in order to address the issue of power supply deficiency within the West African sub-region. The vision of the WAPP organization is to integrate the operation of the national power systems into unified, sustainable regional electricity trading, with the ultimate goal of providing the ECOWAS member states with stable and reliable electricity supply at an affordable cost.

The WAPP Information and Coordination Center (ICC) is an organ of the WAPP Secretariat. The WAPP ICC shall promote operational coordination between member countries through actual day-to-day information sharing between WAPP Operational Coordination Centers and facilitate efficient trading of power between entities in the different countries that are interconnected in the region.

In this paper, the basic design concepts of the cross-border power trading system to establish the Information and Coordination Center for WAPP are briefly introduced.

2. Requirement Analysis

2.1 WAPP ICC Objective

The WAPP ICC will promote operational coordination and information sharing regarding electric power exchange between WAPP members.

The responsibilities of the WAPP ICC are collecting, analyzing and providing the information needed to lead the evolution of interconnected electricity generation and transmission systems in the region; monitoring the development of the national electric power sector in WAPP member states in order to forewarn the performance deficiency risks and to provide them with corrective measures; periodically analyzing the economic and technical viability of cross-border electricity trading arrangements among members; facilitating the development of technical norms and standards regarding the collection and treatment of useful information, thus allowing for the efficient operation of the national and interconnected electric networks; Supporting and monitoring the technical performance of the electric utilities; Publishing and distributing printed reports as necessary; developing and maintaining electronic databases of relevant technical information.

2.2 Review of the Requirement

2.2.1 Operational Planning

WAPP introduced the Operational Manual for WAPP Interconnected Power System in September 2006. The Operational Manual Policy 1, Load Frequency Control requires that the secondary control in the load frequency control must be automatic. Each control area must utilize subsystems such as Automatic Generation Control (AGC) to automatically direct regulation reserve loading. During the site surveys at Control Area Centers (CAC), it is found that AGC is not fully operational. So, for the interconnected system operation, it is required that each CAC should improve the infrastructure for load frequency control.

It is investigated that each CAC has its own policy or procedure for operational planning. Most of them are currently applying industry-proven software packages for power system operational planning for day-by-day operation or even for some medium and long term periods.

2.2.2 Interchange scheduling

Almost all of the current interchanges between WAPP member countries are based on long-term bilateral contracts. Whereas the Operational Manual Policy 2, Interchange Scheduling and Accounting between Control Areas, requires the interchanges between member countries should be based on somewhat centralized scheduling. By the current bilateral contract, the exchange program is agreed by control area operators. But the agreed exchange program shall be transmitted to the ICC. Then, the ICC will publish the exchange program to all interconnected control areas.

2.3 Recommendation

For the operational coordination promoting and information sharing between WAPP member countries, it is essential to
have real time monitoring and data exchanging facilities in the WAPP ICC. CACs are the source of the operational data. Therefore, it is necessary that all the CACs should have the capability to provide the data to ICC via the data communication.

Most of the current interchange agreements between WAPP member countries are based on long-term bilateral contracts. Whereas, the final long-term target for WAPP should be the centralized regional electricity market as described in the Operation Manual. Therefore, it is recommended that there should be a step-by-step evolution from the current situation to a final competitive regional electricity market.

### 3. Design Concepts

The WAPP ICC System evolution is estimated into the Baseline System and the Fullscale System according to the data availability via the data link between WAPP ICC and CACs, and the anticipated implementation schedule of regional electricity market in the West Africa. The followings are the summarized estimations for WAPP ICC System’s evolution.

#### 3.1 Baseline System

The current version of Operational Manual for WAPP Interconnected Power System released in September 2006 will be the starting point for the operation of WAPP ICC. In each policy of the WAPP Operational Manual, there are clear descriptions on the responsibility of each task between ICC and CACs.

The Baseline System will be operated until the WAPP ICC Fullscale System is available. The Baseline System shall consist of an early delivery of certain WAPP ICC Fullscale System hardware and software. After the WAPP ICC Fullscale System is commissioned, the Baseline System shall be integrated as a part of the WAPP ICC Fullscale System.

#### 3.2 Fullscale System

In this stage, it is expected that the WAPP interconnected system will be under the electricity market environment. All the conventional concepts in power system operation will be transferred to the market-based competitive status. Even though the Operational Manual itself is a system operational policy, the characteristics for power system operation is still valid in the electricity market. Whereas, most of the issues related to the power trading will be modified by the market design.

#### 3.2.1 System

As the real time monitoring facility, the SCADA system will run in the ICC. The trading and settlement system based on the existing Operational Manual will be operated. The Data Center will run and served as a hub for data manipulation for all WAPP operational data. The software packages for system analyzing will run on the offline application platform.

#### 3.2.2 Functions

#### 4. Conclusion

As the electricity demand grows fast, the amount of power generation in the West African region is also increased. But only a few states have most of natural generation resources and electric power infrastructure. By establishing the Information and Coordination Center, the West African Power Pool is trying to promote the operational coordination through actual day-to-day information sharing between WAPP Control Area Centers.

From the analysis of all the requirements and the physical status of the interchange trading, the step-by-step implementation of the WAPP ICC System has been estimated. Through the step-by-step implementation of the WAPP ICC System, the WAPP will achieve its vision to integrate the operation of the national power systems into a unified, sustainable regional electricity trading.

### References