INTRODUCTION
The moving environment around energy markets is generating border effects up to the control centre about roles, activities, competences and systems. The constant research of higher performances, efficiency and costs reduction are bringing new challenges for energy and network control centre.

Additionally our industry is currently in transition from the system era of departmental-level independent computer applications to the enterprise era, where all these applications need to be integrated to support utility business processes.

In order to manage these new challenges, Groupe E has initiated the process of centralizing control centre’s operations (Network HV, MV; Production and hydraulics waterfalls) into one “services centre” based on a unique SCADA EMS/DMS platform (one integrated system).

CURRENT SITUATION AND KEY DRIVERS FOR CHANGE
On the first of January 2006, Entreprises Electriques Fribourgeoises (EEF) and Electricité Neuchâteloise SA (ENSA) merged into one Company named Groupe E. EEF and ENSA have been managing the existing Neuchâtel and Fribourg networks with distinct SCADA systems. Groupe E is today managing more than 250 000 customers. The total generation capacity is 900 GWh. Groupe E is also used to purchase on the market a large part of its annual energy supply.

Group E owns and operates a complete Transmission & Distribution Network from 125/60/18/16 kV. The main generation comes from hydro plants.

The organisation and decision process is currently decentralized depending of regions and activities. These two aspects with decentralized organisations and different systems are generating a lot of efforts and cost for training, coordinating, forecasting, scheduling and IT systems maintenance.

Groupe E has identified key drivers for the future. Most important drivers are the following:
- Improve performances for both quality and response time when events occurs
- Reduce costs at both technical and organisational levels
- Centralize operation of networks and others process control (hydraulic, generation).
- Standardize operators procedure
- Provide services for the rest of the organisation

VISION OF THE NEW SERVICES CENTRE
The design of the new control centre shall not only be based on a static list of intrinsic capabilities with spare capacity at the delivery time. An essential quality of the new control centre shall be its ability to adapt to an evolving environment in term of technology, business operation and organisation, interfaces and interoperability with other system and application.

This is paving the foundation of the “Services Centre”, where functionalities are grouped according to business processes, thus bringing synergies at both the system and the operation level, with the objective to deliver better performance at a lower cost.

At the system level, the following services shall be available:
- Integrated distribution and transmission SCADA, based on standard communication protocols,
- A fully web-based common graphical user interface, able to integrate multiple application sin the same client
- Real-time distribution and transmission network analysis applications,
- Power generation scheduling, commitment and monitoring,
- Unified modeling in coordination with the existing NIS/GIS system
- System Load Management
- Energy break down time reduction
- Field force engagement management and optimization
- Precise statistics and reports
- Interface and data to other Business Information Systems and applications in Groupe E

At the process level, one of most important challenges to solve is clearly the organization changes imposing new working style (more responsibilities and new procedures …) while human beings are by essence rather reluctant to changes.

Critical success factors can be defined as:
- Resources skills (knowledge) management
- Change management
- Operator polyvalence
- Experiences sharing

A lot of efforts over a long time period is required to reach operator’s polyvalence while keeping the risk of outage and accident as low as possible.

In Groupe E case, the following roles and business processes can be detailed.

**Real time activities (operators)**
- Fault management – alarm management
- Outage management
- Network and process changes
- Planned switch order
- Power plant control
- Hydraulic system supervision

These activities are done by control centre operator with basic knowledge and decision level definition. The full procedure should be well defined depending of situation’s type.

**Non-real time activities (technicians)**
- Elements modeling
- Simulations
- Work order management
- Training organization
- Reports
- Analysis of situations

These activities are realized by experimented operators and dedicated technicians who are able to support the real time activities with added value on systems and procedures.

**GROUPE E PROJECT**

The actual project was initiated in 2006. Both driving aspects standpoints, system and organization, are continuously used to follow-up the overall project, in order to ensure a harmonious output for Groupe E.

Control centre activities can be divided into two main branches, real time activities and non-real time activities.

The organization was thus defined with two dedicated teams, one working 24 hours/24 taking care of real time activities and another one working only on office hours and taking care of planning non-real time activities.

Efficiency, performances and costs reduction are expected benefits for Groupe E. Global architecture was defined with two main areas: real time systems (SCADA EMS-DMS) and non-real time systems (datawarehouse). The datawarehouse (DWH) is realized by Groupe E in parallel to the SCADA project and includes more than 500 millions of values over the ten last years.

**NEW SYSTEM**

**Introduction**

Contract was awarded late 2006 to AREVA T&D for implementation and commissioning of a new control system that will support this new service centre operation vision. The new system provided by AREVA T&D will enable Groupe E, by end 2009, to merge the supervision & control from the three existing systems.

The new system includes SCADA, EMS & DMS functions, and an Emergency system. The e-terra product prepares also the ability for the control centre to be interfaced with the future Energy Market system.

**Architecture**

System is split in two geographical locations: one main control centre and an Emergency control centre. High speed VLANs and WAN supports the communications between control centre, RTUs and remote workstations connections. The system uses unified hardware brand for all servers and workstations, and uses Linux for EMS-DMS/SCADA servers, Windows 2003 for other servers and Windows XP Operator’s workstations.

**Unified MMI**

The new system provides a single unified MMI to cover the different tasks (production, energy scheduling, HV and MV networks management). Flexible permissions management allows separating the system within various areas of responsibility and roles, which can later be updated in order to follow the new service centre organization transition. The single MMI concept will facilitate this transition phase by reducing training requirements.

**Standardized Communication (RTU)**

Groupe E infrastructures for energy production, distribution and hydraulic power production are communicating with the control system through various RTU and protocols. More than 250 RTU are connected to actual systems through a fully owned telecommunication network. The first goal of the project was to upgrade all RTU into five
different RTU types using only standard protocols. The following protocols will be supported:

- IEC 870-5-101
- IEC 870-5-104
- DNP 3.0
- Modbus Ethernet

During system transition period, most important RTUs (100 RTU) will be dually connected with actual SCADA (or supervisor) and with the new system. This new system is able to manage such redundant communications.

**Flexibility and modularity**

The high-changing energy environment requires an evolutive, modular and flexible system. The new system is modular, and provides tools and interfaces that will allow further evolutions and functional adaptations as they are required.

**High Voltage monitoring functionalities**

The EMS package installed at Groupe E includes the following functions:

- Topology analysis: energization determination and source coloring.
- State estimation
- Study Load Flow
- Contingency Analysis

**Optimal Generation Management functionalities**

The installed package includes the following Generation Management functions:

- Load curve monitoring and forecasting
- Power production scheduling: for each production unit with a 15 minutes time interval
- Automatic generation Control for implementation of the programs
- Power and Energy deviation monitoring (actual vs. scheduled)

The new system includes a smart dispatch module for Intra Day Plant Optimization, capable of including multiple constraints in a powerful and flexible optimization environment.

**Medium Voltage monitoring functionalities**

The DMS package installed at Groupe E consists mainly of the following functions:

- Network Diagram representation: the entire distribution network is presented and dynamically updated within the DMS operators’ User Interface. The network topology is updated in real-time allowing quick identification of energized/de-energized areas.
- Management of Temporary Modifications: information about network modifications to the network can be placed (lines cuts, switching devices removed from service or bypassed)
- Fault Location: A fault location algorithm is automatically triggered by circuit-breaker tripping event. This function locates and highlights the probable faulty sections based on fault detection devices SCADA information.
- Work Orders Management System: the work preparation and follow-up workflow is supported through an electronic application.

The system is moreover capable to also include further network analysis functions for the Medium Voltage network part: load flow, state estimation, optimization which could be implemented at a latter stage.

**Data modeling and integration**

As the full MV distribution network is used in the system, the data integration flow has been designed so that Medium Voltage network model is sourced from the existing NIS/GIS system. In order to facilitate the data maintenance, integration with the NIS/GIS supports:

- Full or incremental update of the network model from GIS data into the SCADA DMS modeling environment
- Partial graphical update from DMS modeling MMI by system engineer

**EXPECTED BENEFITS**

Here are the benefits expected from this new organization. Actual benefits of the project will only be measurable after a couple of years of operations, through the evolution of performances and financials indicators.

**Operations synergies**

By essence the “services centre” shall bring synergies at both system and operations levels, provided that a smooth transition period is organised. Most important challenges will be turned around the following axes:

- Human resources – profile change
- Performance during outage
- Systems interoperability

**Integrated “services” organisation**

An integrated organisation is able to deliver “services” for the full organisation or even for external customers. The types of services will be:

- HV services (network monitoring and changes)
- MV services (network monitoring and changes)
- Hydraulic services (system monitoring and mgmt)
- Energy services (production program, exchange, …)
- Reporting services (all areas and activities)

**Reduced Maintenance costs**

The convergence into only one “services” centre will
significantly reduce the costs of operations in comparison of the previous situation. The globalisation of available resources (operators, technicians, manager) and the standardisation of procedure bring advantages to the company in the long term.

Maintenance of a common platform generates synergies and costs reduction. As each application has his own server based on the same technology and basic process, down time and restoration will be shorter and easier for system engineers. Training and knowledge of the system resources can be better managed and leveraged as well as mutual replacement during critical period will be much easier compared with current situation involving many dedicated system and “specialist” per system.

Human resources risks mitigation
Risks like short term replacement, new operator training, holiday’s period, workload peak time on a dedicated service, large outage management will be diluted on a larger team with globally more competencies. Although there is some risks to loose specialist knowledge and specifics experiences, moving from specialist operator to polyvalent operator will globally bring more benefits and flexibility at the end for the company.

Easiest knowledge management
The convergence into one common platform and man machine interface (MMI) gives the first advantage that applications knowledge and training can be easily organized and managed. The philosophy of information presentation will be almost the same over the different types of applications and services.

Alignment with standards of the industry
Considering the growing numbers of RTU and decentralised field automation to control the local processes (HV, MV, hydraulic, power plant,…), the use of well defined and standardised protocols and of standardised signal lists is essential to guarantee homogeneity of same types of infrastructures and growth capability.

Security and audit enhancement
The permission can be correctly managed in order to provide access only to authorize people inside the company, with many systems it is difficult to secure this aspect.

Even if the control centre platform is isolated of the rest of corporate network and Internet, most of the applications will be distributed to users on corporate network using client server mechanism (no client is require on the PC but only an Internet explorer).

Fully integrated workflow
The new platform provides a fully integrated workflow system which is able to trace all planned actions over the Groupe E infrastructure and give a central view of the potentials risks and conflicts.

Figure 1: workflow and responsibilities
Validation and authorization of work order will be done centrally by the control centre with a detailed state of each infrastructure in real time. This principle with different stages for creation, simulation, validation and execution will help to reduce risk of mistake and incident. This application is available to all technicians using his normal corporate network environment. This aspect is important because it should easy to access and use it otherwise his acceptance will stay low.

First step towards smarter Grid management
This new system forms the base architecture for addition of further smart grid components:
- Distributed Resources Portfolios : to efficiently manage distributed generation plants
- Smart Meter Data management and Demand Side response : to integrate dynamic management of loads
- Customer-level Outage management
- Pave the road for Common Information Model (CIM) integration with external applications

CONCLUSION
Standardisation at organisation and technological levels as well as real “services” description per activities brings a lot of benefits for integrated company like Groupe E.