ALSTOM Grid’s solution

- Our customers can rely on e-terra, platform, our advanced Supervisory Control and Data Acquisition and Energy Management System (SCADA/EMS) solution which provides a solid network management foundation and a set of innovative product modules addressing notably:

  1. **Grid reliability and stability issues**
     The new Online Stability Solution is our answer to help you mitigate these risks.

  2. **Renewable Energy Resources integration**
     We are proposing the Renewable Operation Portal to help you integrate Renewable Energy Resources into your operations in a more serenely manner.

  3. **Operational performance of grids close to the edge**
     Information Exchange between Grid Operations and Asset Management Systems within your utility provides a mandatory foundation for streamlined business processes system functionalities, capacity and reducing downtime risks.

**Business challenges**

The world is facing an evolutionary transformation with the development of Smarter Grids. Utilities are exposed to a deep transformation of their business due to:

- pressure to increase transmission efficiency
- global carbon footprint reduction by integrating ever-larger amounts of Renewable Energy Resources (RERs)
- electricity consumption paradigm shift with the development of Demand Response schemes
- game changers like the development of Power Electronics (FACTS, HVDC, …), storage facilities and microgrids

… while preserving the reliability of the grid at all times.

**Customer Profiles**

- Transmission System Operators
- Regional Transmission Organizations
- Independent System Operators
- Transmission Owners
Online Stability Solutions (OSS) for an improved grid reliability

Online Stability Solutions extend steady-state network security analysis (State Estimator, Contingency Analysis) by providing power system stability assessment tools. To mitigate the impacts of inherent limitations posed by the accuracy with which power system models can capture the true power system behavior, Online Stability Solutions also leverage synchrophasor measurement-based approaches.

These solutions not only complement the traditional stability assessment techniques but also offer means to validate their results. An immediate application is real-time monitoring of power system dynamics in order to provide early warning alerts of oscillatory dynamics which could eventually (if not properly damped) degrade system stability margins and lead to serious network incidents.

Key Highlights

- Solution fully leveraging PMU technology standards such as IEEE 37.118 connecting PMU devices such as ALSTOM Grid relay P847 and phasor data acquisition via Phasor Data Concentrator (PDC)

- Integration of synchrophasor data for improved State Estimator solution through the use of actual voltage magnitude and angle phasors within e-terra platform

- Interface with model-based Dynamic Stability Applications (DSA) such as Voltage Stability Analysis (VSA), Transient Stability Analysis (TSA) and Small Signal Stability Assessment (SSSA) information

- New Stability Information System application as part of e-terra platform to provide the operator with comprehensive power system stability information like early detection of poorly damped low frequency system oscillations

- Situational Awareness providing ability of visualizing phasor data, voltage stability information, phase angle differences and oscillations detected by phasor-based analysis

Customer Benefits

ALSTOM Grid proposes an Online Stability Solution (OSS) which takes full advantage of synchrophasor measurements made available by Phasor Measurement Units (PMUs) to improve grid operation. The ALSTOM Grid OSS is designed to provide the following customer benefits:

- Increased transmission corridors transfer capacity while preserving network reliability

- Improved grid reliability and blackout reduction, thanks to early instability detection

- Efficient decision support via advanced visualization for managing the increasing complexity of grid and operations

Figure 1 Phasor Measurement definition

Figure 2 ALSTOM Grid OSS architecture associates PMU data with other measurements for a generalized grid security assessment

Figure 3 Oscillation modes and decay times are presented in a user intuitive way on ALSTOM Grid’s e-terra vision product
Renewable Operation Portal to support renewable energy integration

ALSTOM Grid proposes the Renewable Operation Portal to meet all the functional requirements grid operators may have when integrating Renewable Energy Resources into their operations.

The ALSTOM Grid Renewable Operation Portal has been designed to allow a phased approach:

- Monitoring stage: monitoring information related to Renewable Energy Resources operation
- Control stage: responding automatically to current power balance changes
- Look-ahead stage: anticipating potential problems and providing remedial actions recommendations

Grid can also propose a step-up approach where new modules are added to the current operational systems including SCADA and EMS.

**Key Highlights**

ALSTOM Grid proposes advanced solutions to help Transmission System Operators and Reliability Coordinators integrate Renewable Energy Resources into their grid operation. A full set of modular applications and reliable, field-proven e-terra products are available to address their needs.

- **RER Plan (e-terra\textunderscore renewableplan):** to provide the operator a central repository and advanced data processing and alarming for renewable production conditions and forecast management
- **RER Estimation (e-terra\textunderscore disgen):** to provide an estimate of non-telemetered production (frequent in Distributed Generation) using flexible and field-proven up-scaling algorithms
- **RER Generation Control & Dispatch:** to automatically counteract renewable production power balance disturbances, optimize reserve calculations and provide curtailment facilities
- **Advanced User Interface:** data at user’s finger tips to help the operator efficiently assessing current and future renewable productions and impacts
- **RE Network Security and Simulator:** fed by RER production forecast inputs and taking into account forecast accuracies to support dispatcher training and assess multiple renewable production penetration scenarios
- **Historian:** to support reporting and data archiving

Customer benefits

- Improved knowledge of Renewable Energy Resources (RER) real-time production
- Reduced production uncertainty with RER production forecasts fully integrated into the real-time environment
- Optimized Renewable Energy Resources dispatch and control including reserve determination, generation control actions minimization and, if applicable, RER production curtailment function
- Improved grid reliability with look-ahead network security analysis using up-to-date and realistic RER production forecast
Information exchange between grid operations and asset management systems for utilities

Most of the utilities are facing increasing operational challenges related to the management of their network assets such as:

- Optimizing the use of current assets
- Maintaining and replacing ageing assets
- Managing the aging workforce and knowledge retention
- Improving responsiveness to outages and customer complaints
- Minimizing High cost due to equipment failure and maintenance.

**Solution Overview**

![Solution Overview Diagram]

**Key Highlights**

By combining state-of-the-art solutions in condition monitoring and grid management with asset management solutions, ALSTOM Grid is currently working jointly with utilities to design most valuable use cases for increased consistency and integration between business processes in order to:

- Leverage the available condition monitoring data to improve grid operations and asset management
- Optimize grid operations and asset management by exchanging information between both systems

As part of e-terra platform data exchange interfaces, a customer can already take advantage of the new EMS-Asset Management SOA adapter which leverages international standards such as IEC 61968-4 (CIM based) and web services. This interface enables Asset Management data such as history track records of equipment maintenance work orders to be at the grid operator’s finger tip.

**Customer Benefits**

**Business process improvements**

- Increase consistency and integration between business processes
- Enforce safety rules
- Improve data management scheme
- Provide clear status information

**Operations efficiency**

- Reduce the number of unplanned outages and minimize the impact of all outages
- Maximize the use of assets (push to the limits)

**Financial gain**

- CAPEX reduction: a few percentage improvement represents a huge saving for the TSO
- OPEX and inventories reduction due to optimized maintenance

**Solution Overview**

![Solution Overview Diagram]

**Figure 5** Example of Solution leveraging international standards (CIM interfaces)

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Alstom Grid Worldwide Contact Centre
www.grid.alstom.com/contactcentre
Tel: +44 (0) 1785 250 070
www.grid.alstom.com