Leading coordination for enhanced reliability of supply for Western Europe monitored by the PI Infrastructure

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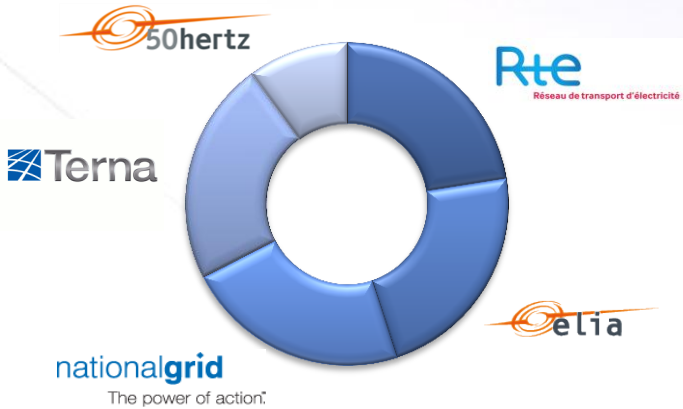
Contents

What is coreso ?

Coreso: a centralized vision of the coordination between TSOs

- 5 shareholders today (Elia, National Grid, RTE, Terna, 50HzT.) and open to new TSOs
- Independent company (SA) with its own employees
- Created December 2008 in Brussels
- Operational since 16th February 2009
- Round the clock operations since 29th June 2009



What is coreso ?

Coreso: a service provider to TSOs

- **Coordination services** (to shareholders)
  - Relaying significant information between TSOs
  - Pro-active assessment of the security level of the network (day ahead, intraday and close to real time forecast)
  - Proposing coordinated actions to TSOs to manage the risks
  - Coordinating the agreement on remedial actions
  - Contributing to ex-post analysis and experience reviews of significant operating events for the appropriate area

- **Data/IT management** (to TSOs of the CWE area)
  - Merging of D-2 files for the Market Coupling
  - Hosting of the common system of TSOs for the Market Coupling

Operational decisions remain with the TSOs

What is coreso ?

Support service in case of large disturbance

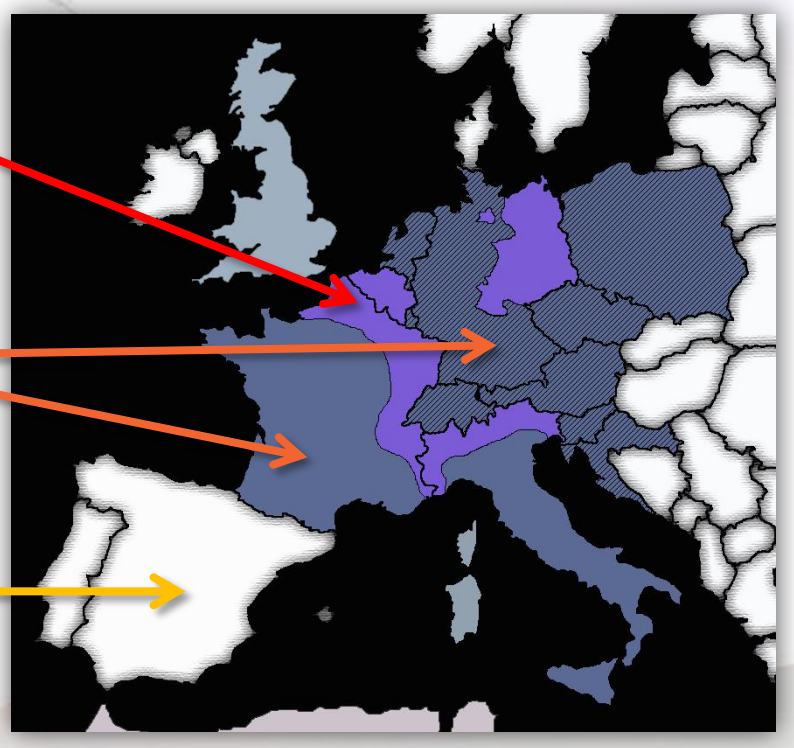
- Main objective of Coreso: avoid large disturbances.
- But it could still happen in case of a series of unforeseen events.

- Coreso operators have:
  - a unique vision of real-time European flows.
  - a unique knowledge of many grids in West of Europe.
- Coreso will provide its shareholders with valuable information in case such large disturbance occurs.
- This service has been in place since Dec 2011.

What is coreso ?

Coreso's area of activities

- **Interest Area** : the grid of its participating TSOs impacted by cross-border flows
- **Observability Area:** security analysis on a larger area including neighbouring grids
- **Data** of the full Continental Europe grid thanks to DACF files.



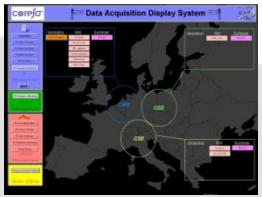
What is coreso ?

Process & tools

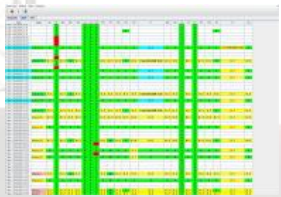
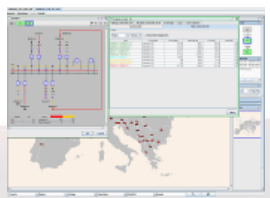
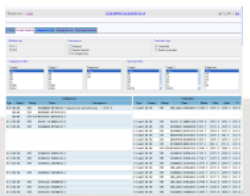
Monitoring

Analysis

Coordination






Business Challenge :

Need an overview of European grid.

Large scale renewable generation

High variability – geographical concentration

Development of the european grid and of cross-border capacities

AC & DC

Market development

Flexibility - Intraday

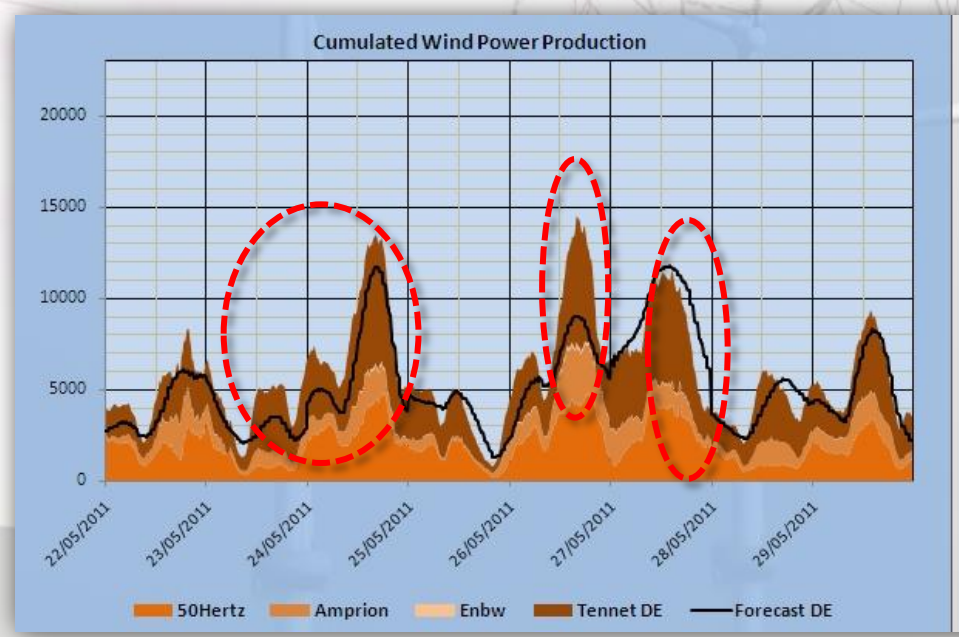
Growing influence of distant electrical systems on local flows

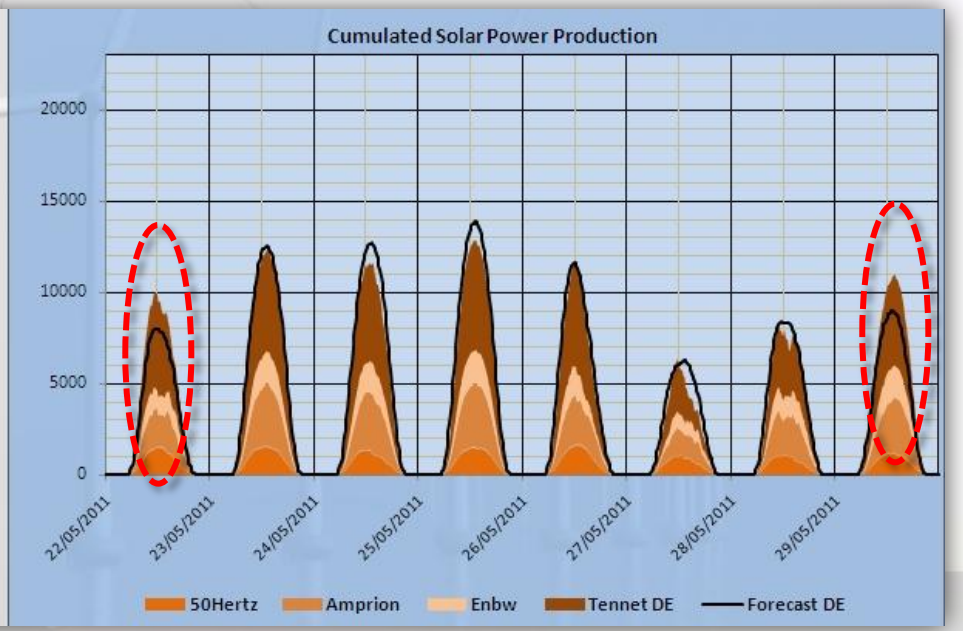
More uncertainties

Increased stress for operations

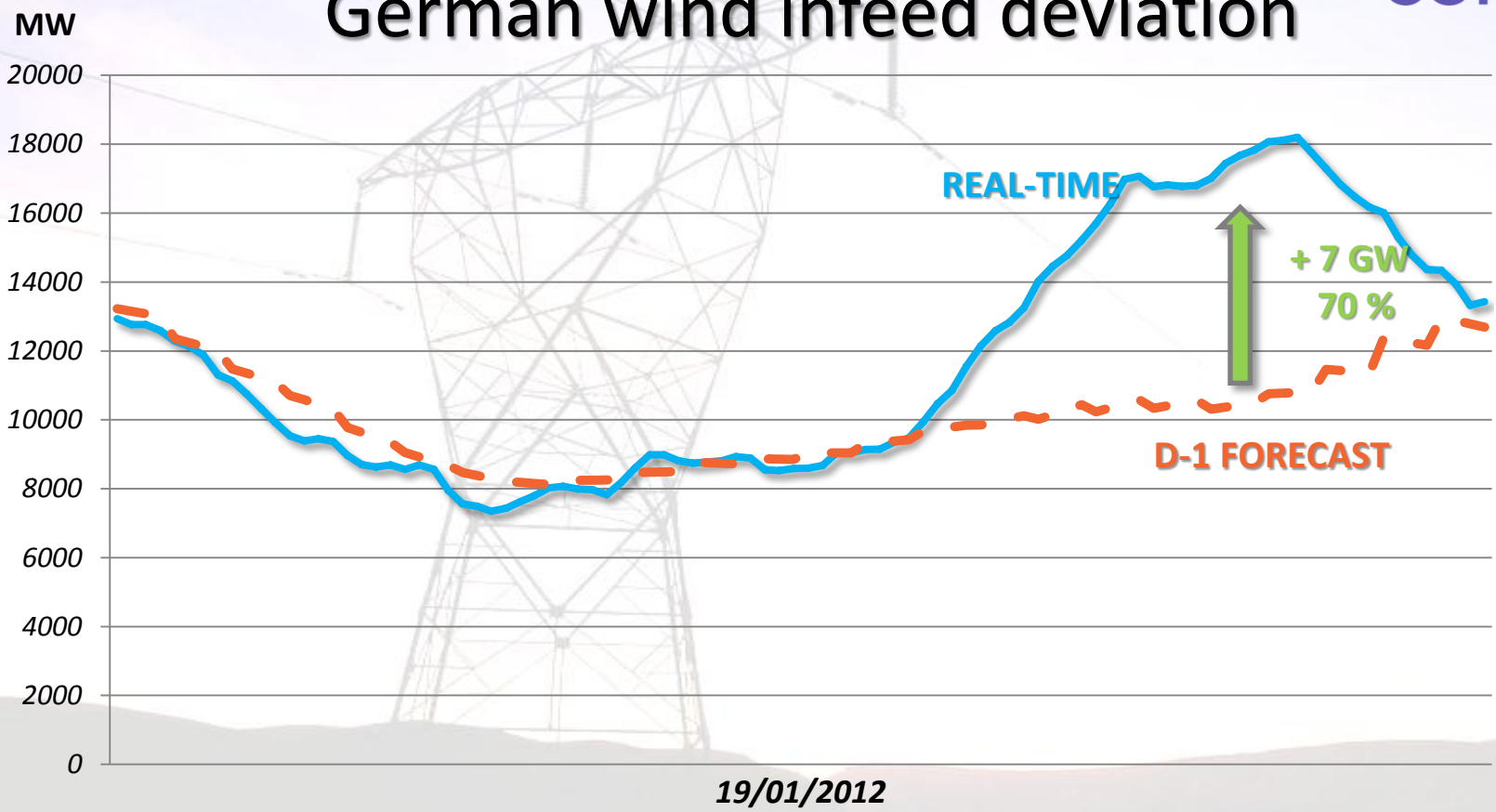
Need for a **coordinated management** of flows at international level to guaranty security of supply

The Renewable Energy Sources are one of the major source of uncertainty in the grid.



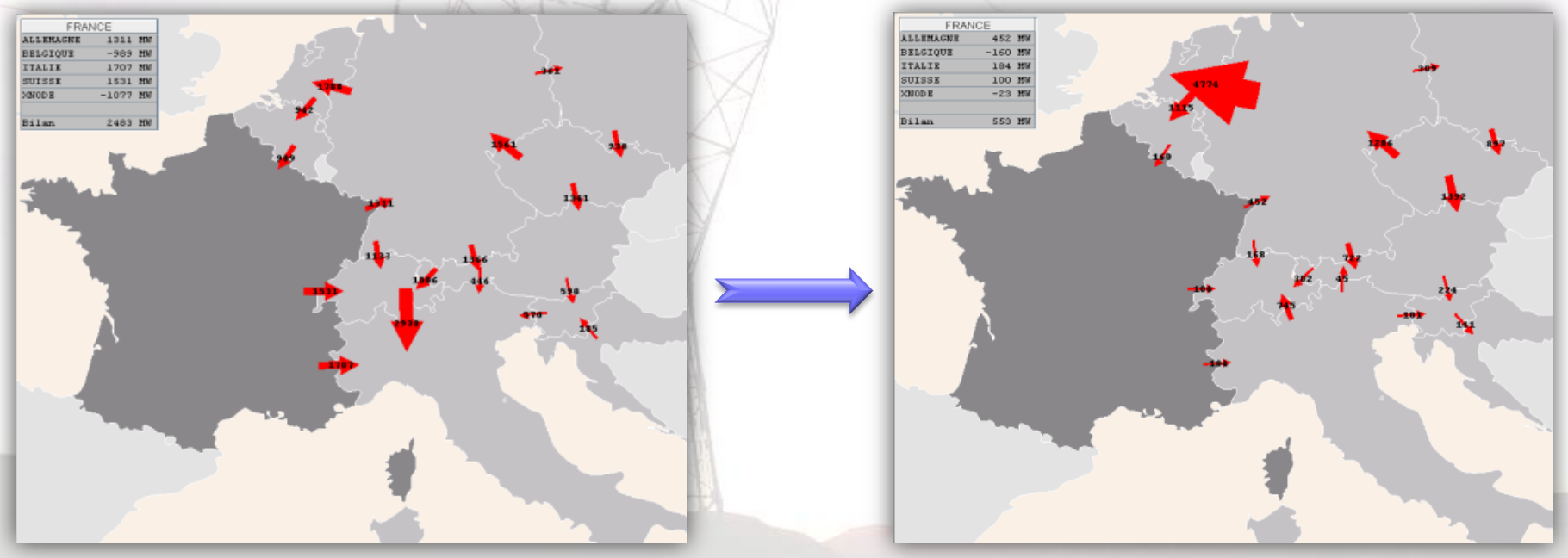


German wind infeed deviation



Need to follow D-1 study deviation

- Big physical flows deviation in 24 hours



Business Challenge :

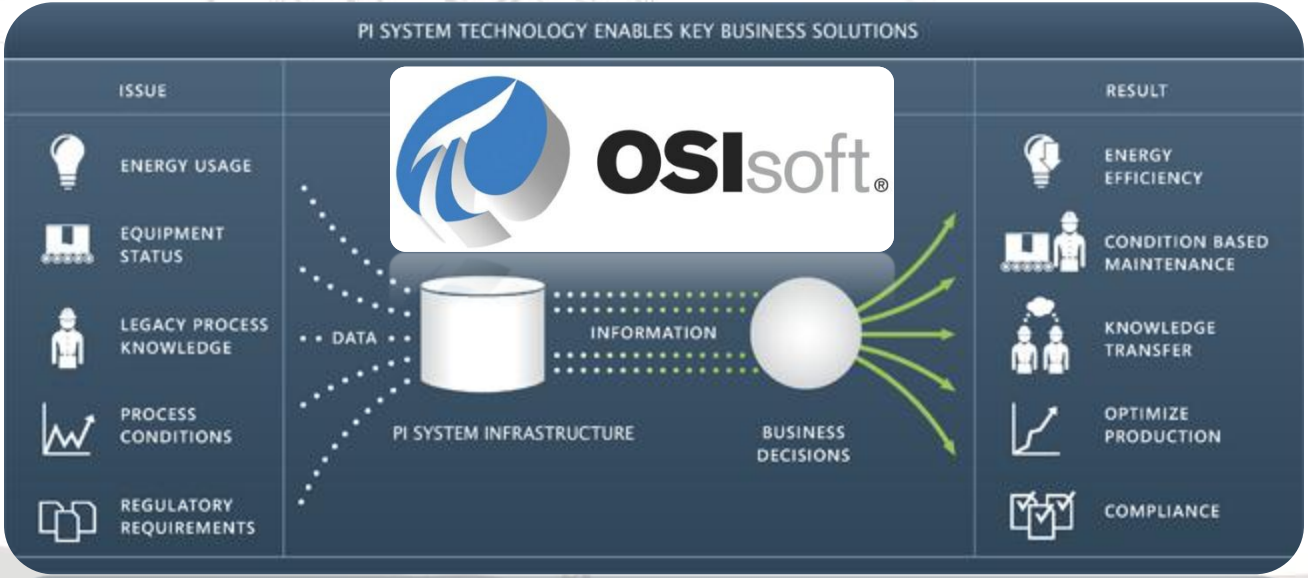
Many data were available

- TSOs already exchanged TASE 2 real time data between them
- Our day-ahead simulator tool was able to provide forecast data
- Wind and solar infeed forecast
- Commercial exchanges programs on tie line
- …

And we needed:

- Acquisition and storage of large amount of data coming from several sources
- Possibility to calculate new data from acquired data coming from different sources
- Dynamic displays
- Dynamic reporting tools
- Many notification/alarm criteria
- Evolvable and easy-to-configure system

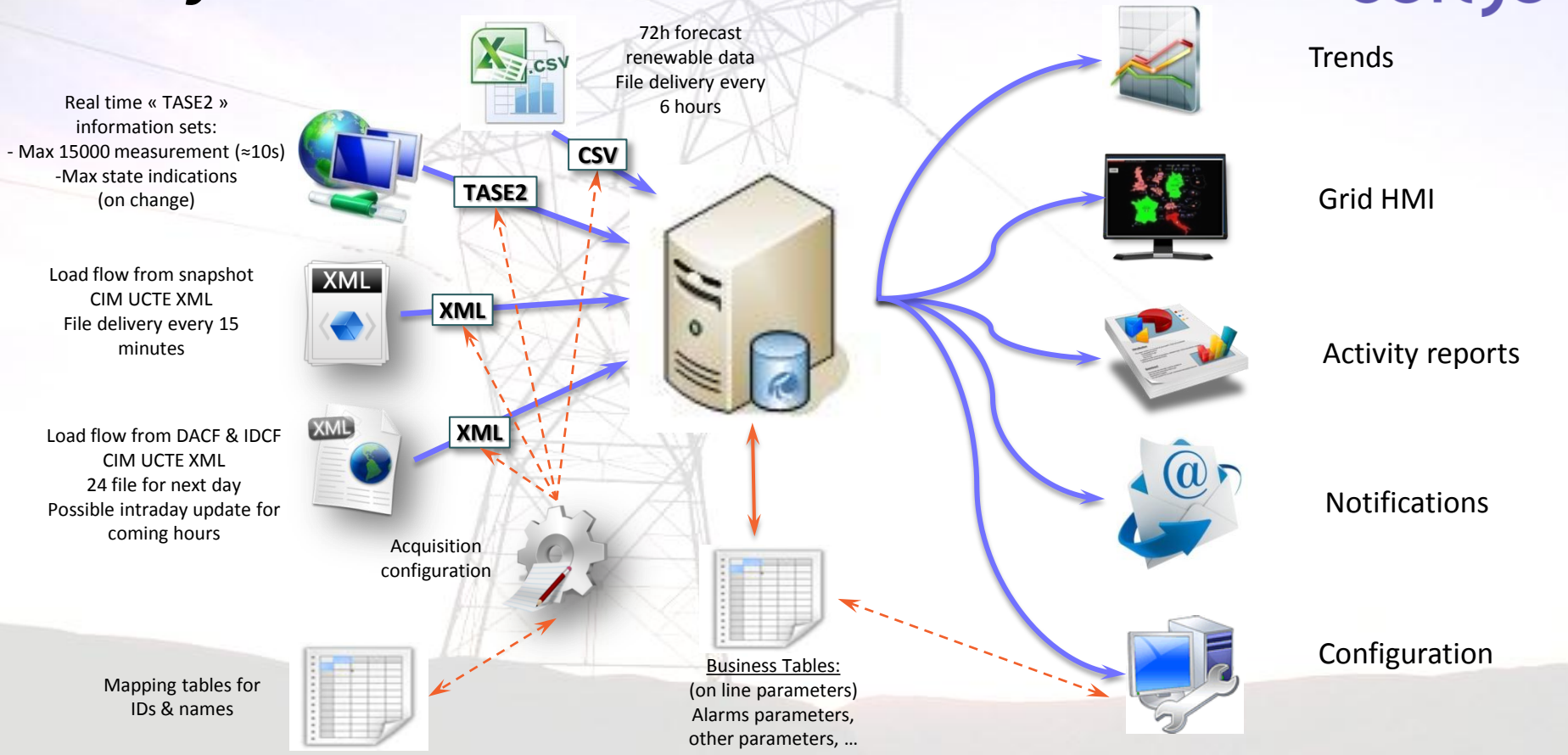
Solution : Use a Real-time data infrastructure to store data and display critical information



PI System Architecture

- Last year Coreso upgraded to PI Server 2012
- Coreso uses:
  - **PI AF** (Asset Framework) to manage data
  - **PI ACE** (Advanced Computing Engine) for Calculation and Analytics
  - **PI COM Connector** to interface with data sources
  - **PI Interface** for Universal File and Stream Data (UFL), to store Day-ahead data
  - **PI Notifications** to inform us about changes on the grid, leading to stress situation
  - **PI ProcessBook** for real-time monitoring
  - **PI DataLink** to use data in Microsoft Excel (Engineering analysis and reporting)
  - **OSIsoft vCampus** (To develop Coreso needs)

PI System Architecture



Information about stored data

Collected real time and forecasted data are :

- Voltages
- Frequencies
- MW and MVAR values :
  - Generations
  - Transmission lines
  - Transformers
- Circuit Breaker and switch statuses
- Phase shifter transformer (PST) taps

Currently use over ***30,000*** tags
Request lot of calculation (sum, average, min, max, gradient, …)

PI AF architecture

Coreso operators create their own displays

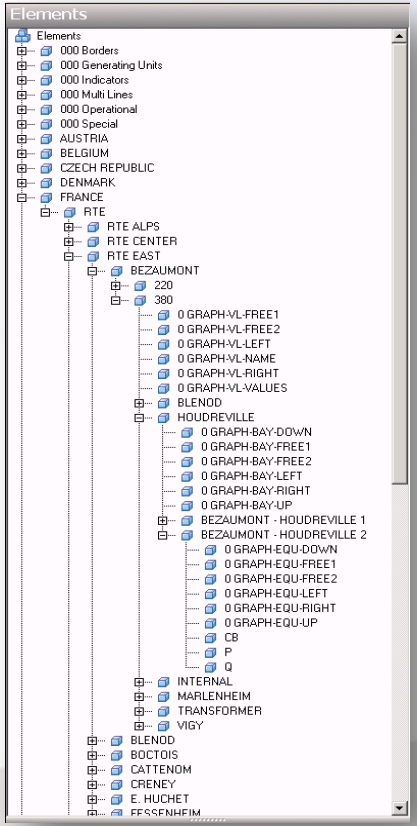
⇨ Need to use templates to increase efficiency for design and maintenance

PI AF architecture is very important for us to work in that way:

- Enable to create templates
- Allow rollup calculations
- Create graphical templates in PI ProcessBook
- Used notifications templates in PI Notifications

Combined with an Excel mapping table, lots of data could be added very quickly in the PI System.

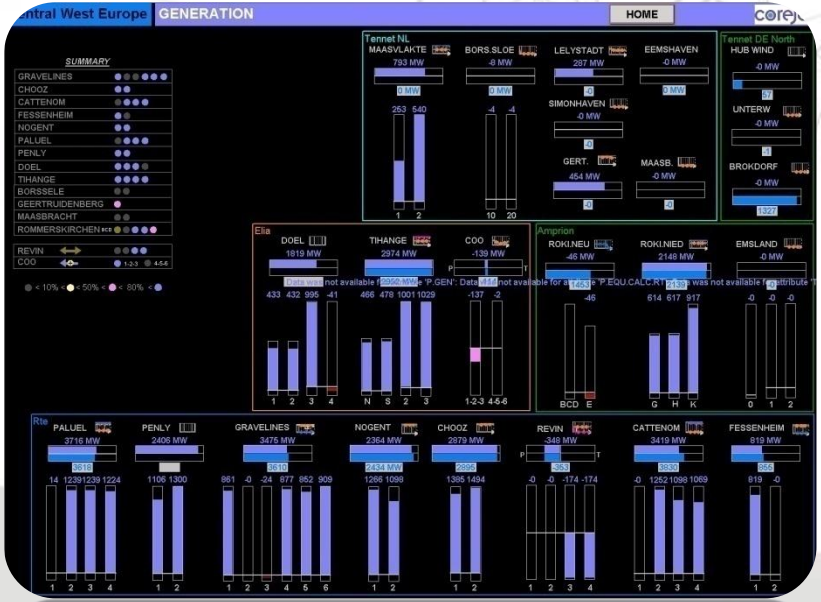
Data organization is one of the keys for achievement !



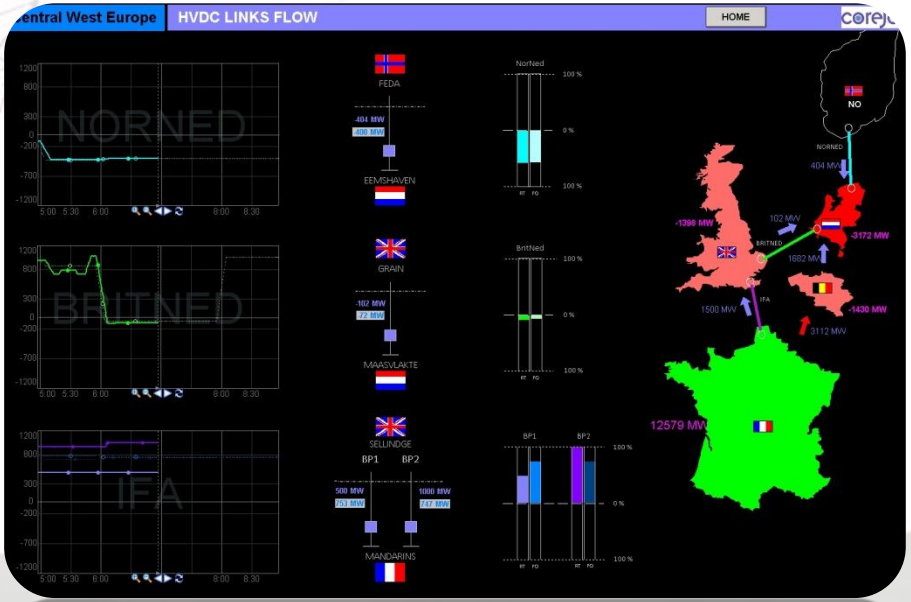
How we use the PI System

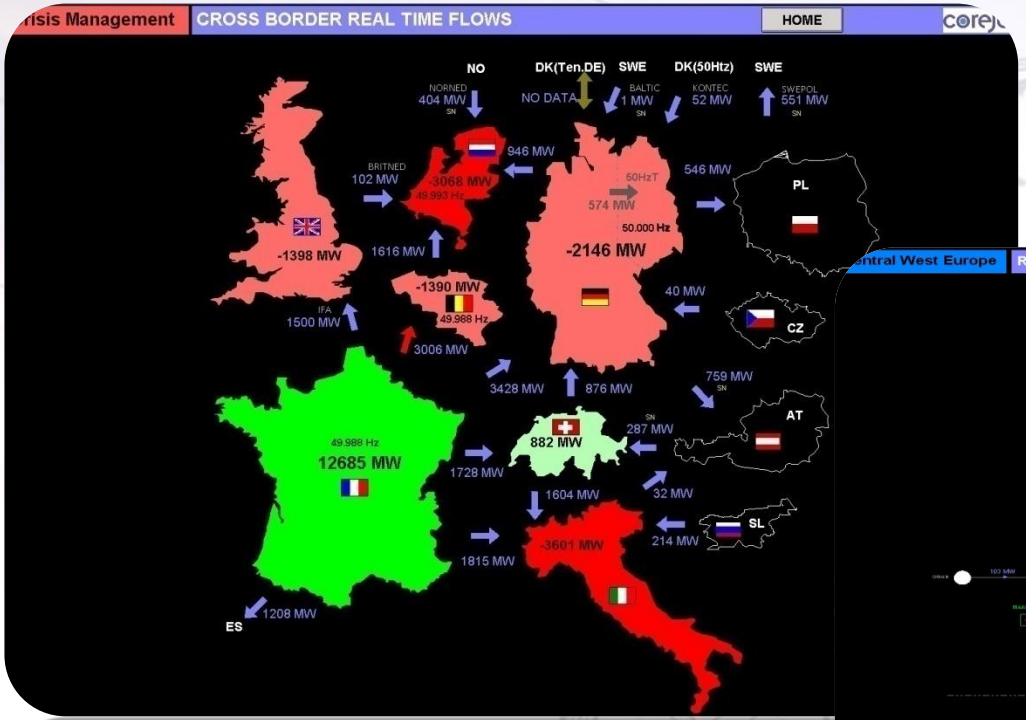
PI ProcessBook

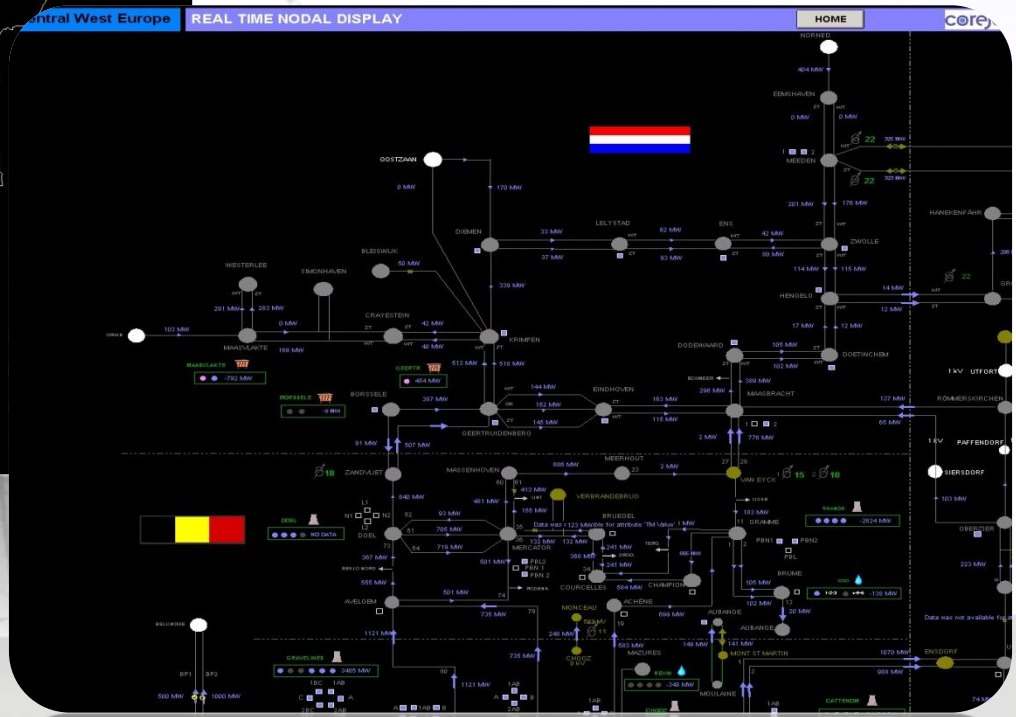
Generation overview:



HVDC cables overview:





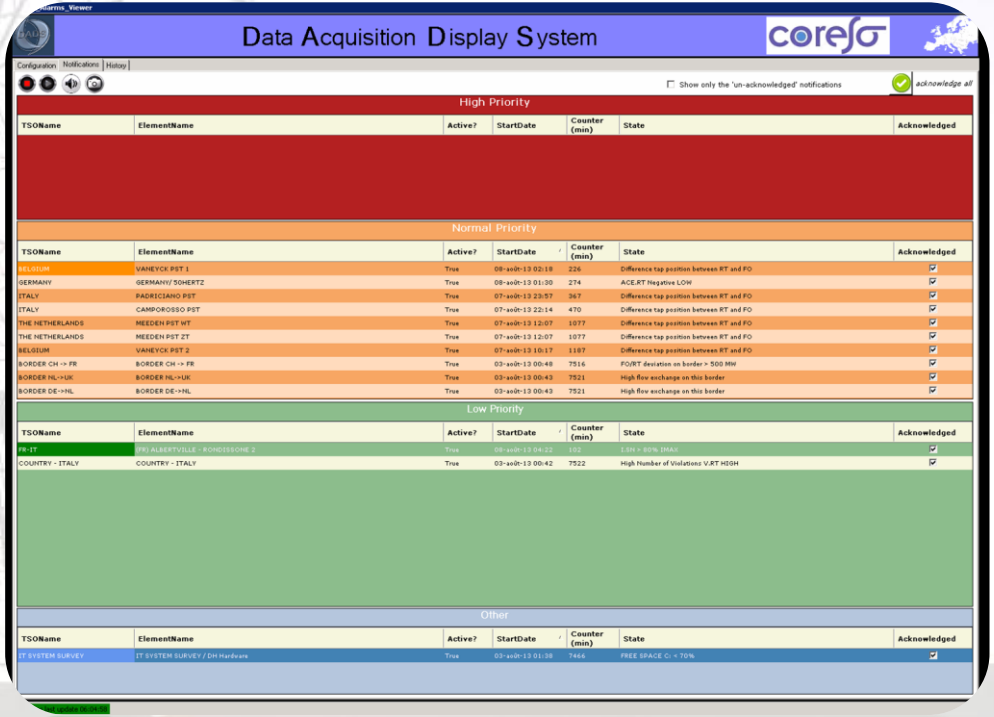


Internal development by using OSIsoft vCampus

PI Notifications is used for alerts for when special events on the grid occur.

Needed a better display than the basic one, to monitor real time notifications :

- Chronological sort
- Priority level
- Several audible notifications
- Acknowledgment strategy



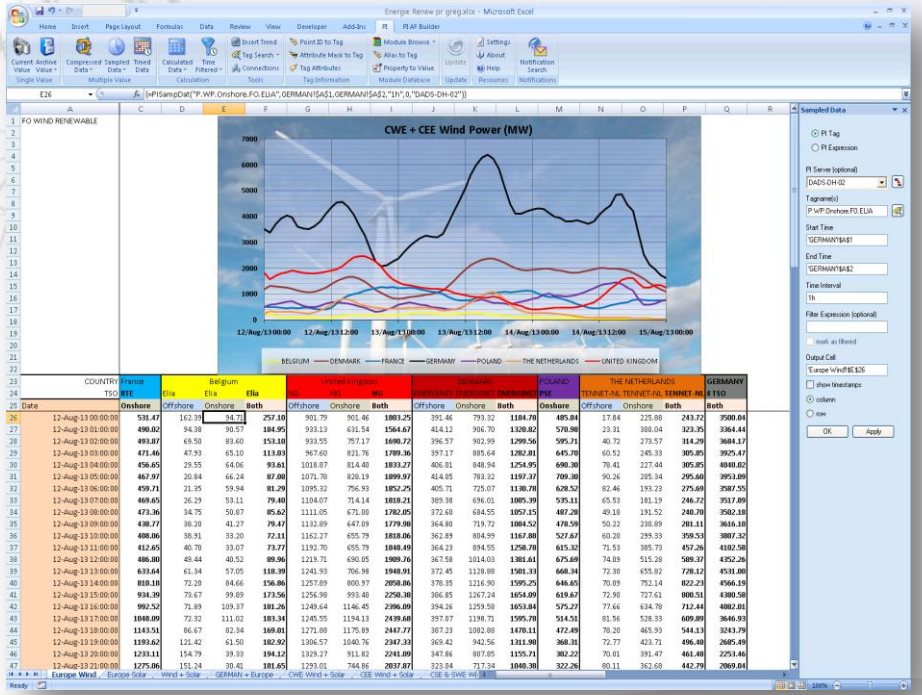
PI DataLink automatic report

- Frequency monitoring needs reactivity.

➪ Develop a specific report to inform TSO about the deviation (first analysis). This should be sent within a few minutes after the detection.

- Example :

- Frequency monitoring report
- Renewable energy forecast report
- Also used for post analysis



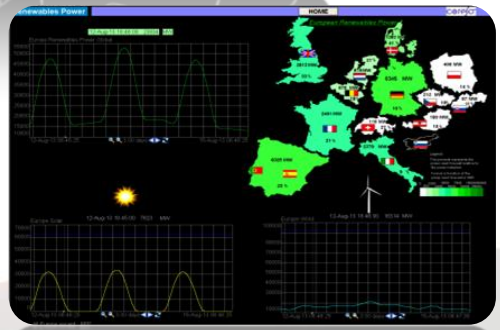
PI DataLink

Future Plans and Next Steps

We need to improve our tool to give more services to TSO's by detecting stress situation, and being quicker.

Examples of development :

- Loopflow influence (exchanges effect from each border in %)
- RT Imax load grid (rainbow colors to see stress area)
- Commercial exchanges schedule (Vulcanus data integration)
- Voltage supply chain on the border (backbone of the grid for blackstart)
- Renewable energy in Europe



Actions planned for improvement :

- Increase the use of « PI DataLink » for automatic report
- Thanks to data storage, Coreso creates more statistical analysis
- Add more TSO's real time data for a better overview
- Create grid stress indicators
- Design new objects like angular gauge to display indicators (not included in PI ProcessBook)
- Continue to make suggestions to OSIsoft to improve the tool (PI ProcessBook, PI DataLink, …)

Conclusion

The Use PI System Real-time data infrastructure provides Coreso the following:

- Ability to integrate all kinds of data
- Simplicity to create global overview displays (No IT department)
- Real time monitoring
- Comparison between day-ahead forecast and real time situations
- Store data for long durations
- Automatic reporting
- PI System is more suited for Coreso business than a SCADA (Supervisory Control And Data Acquisition) system

www.coreso.eu

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