SI² Project: Repowering EDF's Industrial Information System

Presented by

Richard Coutenceau and Pierre Vella

Agenda

- About EDF
- Before the PI System: the early stages of Industrial Information System
- The SI² Project
- PITHER: Core Products & Architecture
- Applications samples
- MDM or how to deal with complexity
- Lessons learned

Agenda

- **About EDF**
- Before the PI System: the early stages of Industrial Information System
- The SI² Project
- PITHER: Core Products & Architecture
- Applications samples
- MDM or how to deal with complexity
- Lessons learned

About EDF

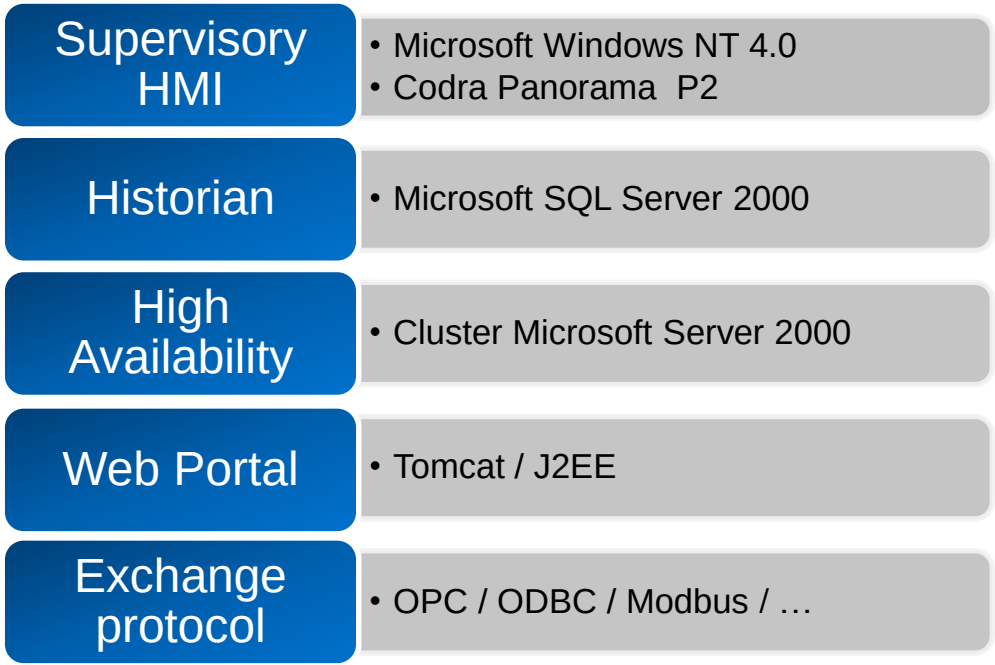
- Founded in 1946
- From Former French state-owned Operator…
- … To World Energy Leader
  - Nuclear: 58 Units (France) / 74,66 GW worldwide
  - Hydro: 20 GW / 440 plants (France)
  - Fossil: 23 units (coal, fuel, GT, CCG) in France, 35% of EDF Group Generation Capacity
- 159,000 employees
- 37 mn. clients worldwide
- 65 bn. € revenue (2010)
- Generation 95% CO_2-free in France

Agenda

- About EDF
- **Before the PI System: the early stages of Industrial Information System**
- The SI² Project
- PITHER: Core Products & Architecture
- Applications samples
- MDM or how to deal with complexity
- Lessons learned

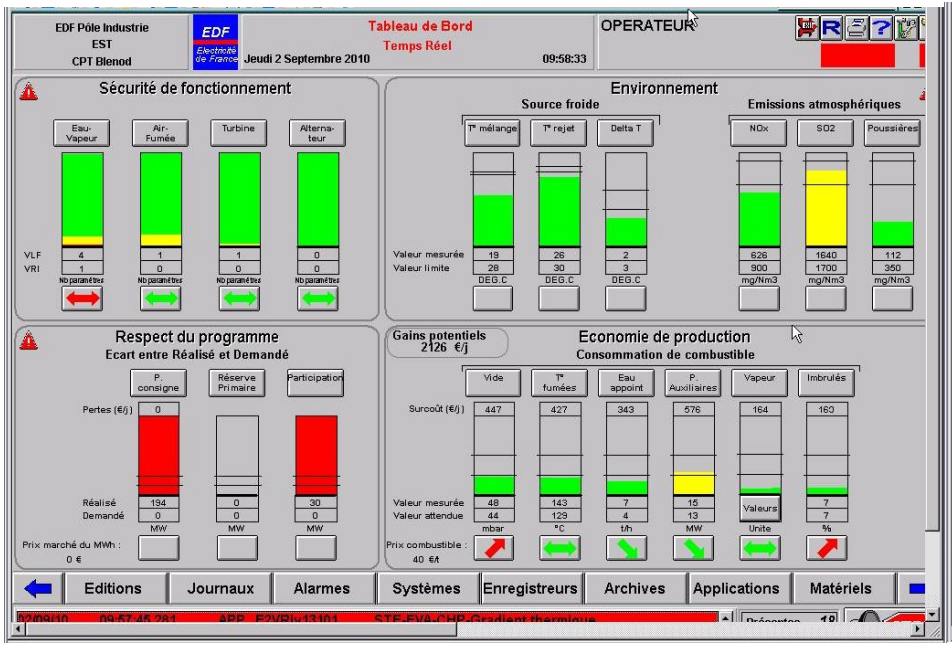
Before the PI System: the “early stages” of Industrial Information System

- **Supervisory HMI**
  - Late 1990’s: **SITHER**
  - All thermal units in France
- **Historian & Web Portal**
  - Early 2000’s: **DIIRECT**
  - All thermal units & Hydro Control Centers in France
  - IPP’s in Mexico, Brazil, Vietnam (Cycle-combined power plants)

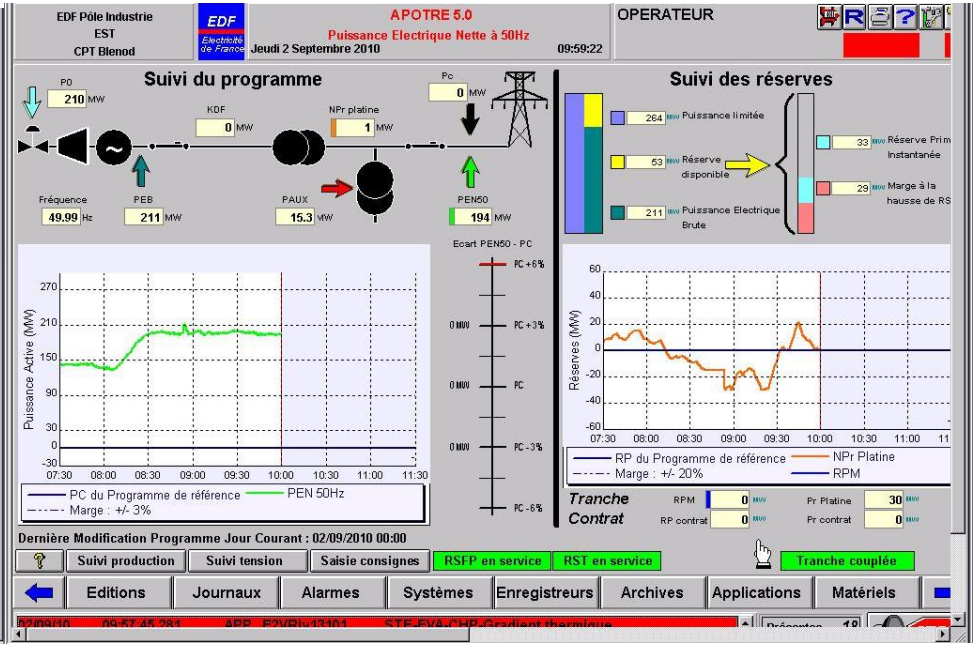


Before the PI System: Supervisory HMI - SITHER

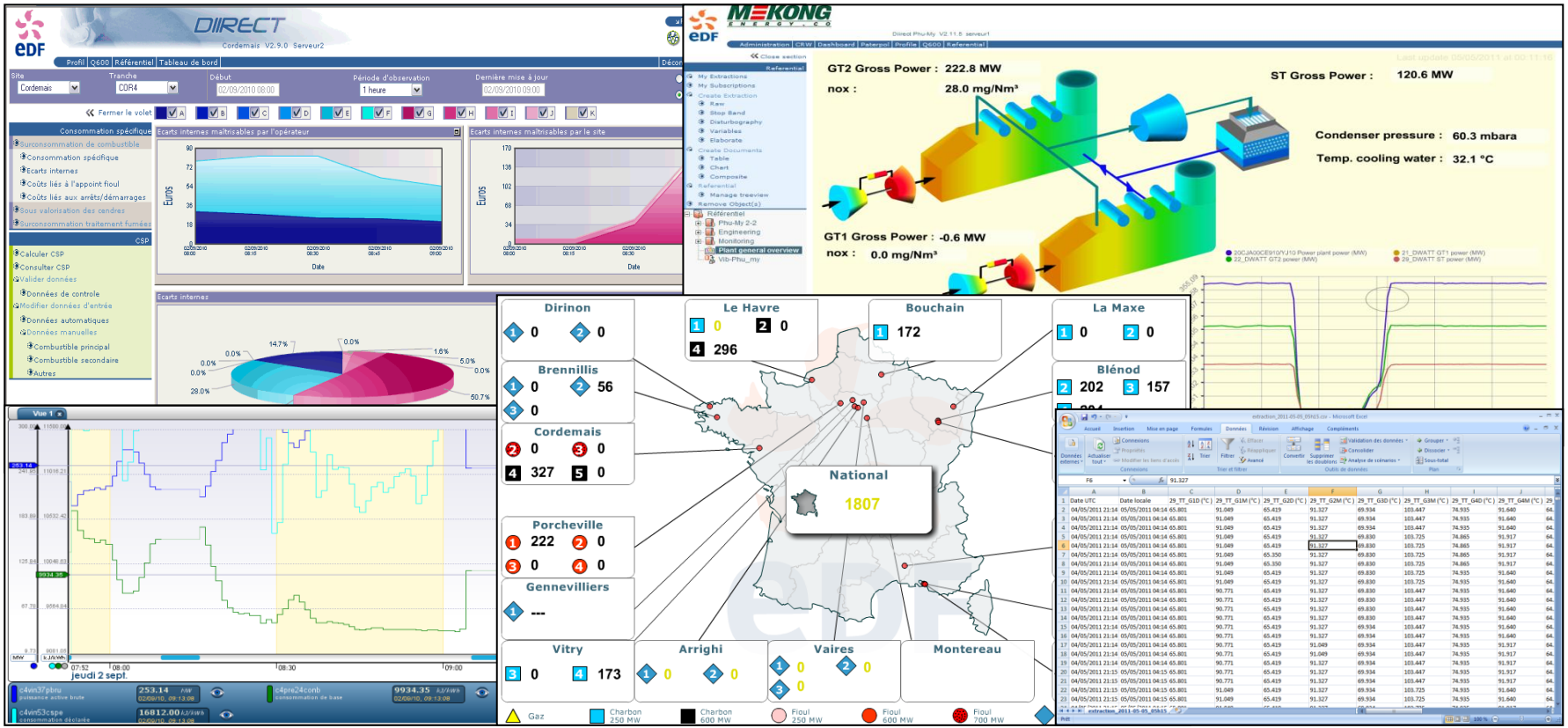
Operator's Dashboard



Generation Program /Services to the Grid



Before the PI System: Data Historian & Web Portal: DIIRECT



Agenda

- About EDF
- Before the PI System: the early stages of Industrial Information System
- **The SI² Project**
- PITHER: Core Products & Architecture
- Applications samples
- MDM or how to deal with complexity
- Lessons learned

The SI² Project

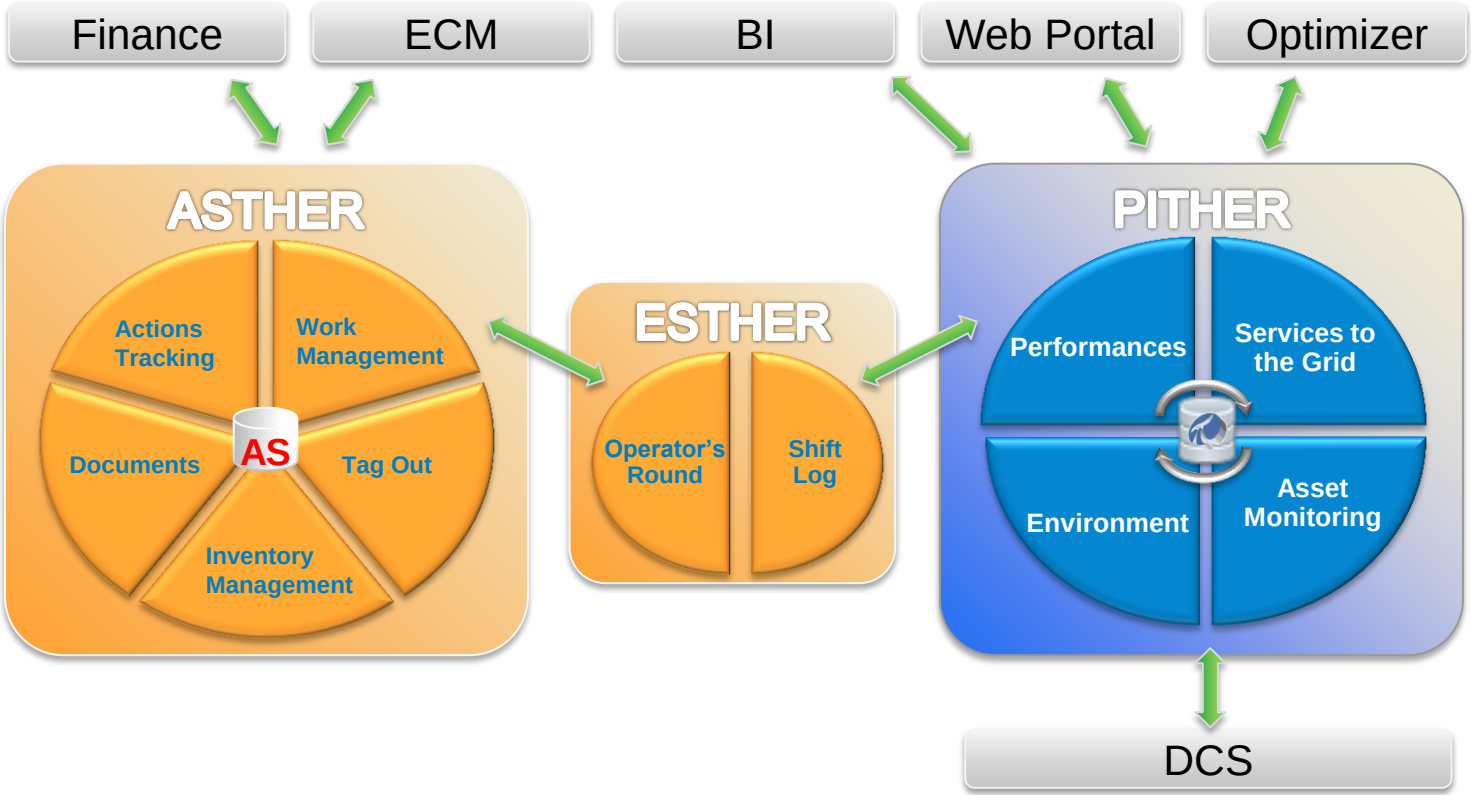
- **Objectives:**
  - to close the gap between Process Control & Corporate Information System
  - to benefit from the best off-the-shelf software for specific purpose (Data Infrastructure, Performance monitoring, Environment monitoring, Vibration monitoring etc.)
  - to share best practices within the EDF Group

- **First decision:** to build a **New Industrial Information System** for the new Units first, then for the remaining & renovated Units

- **Second Decision:** to use **OSIsoft's PI System** as a Data Infrastructure and core solution for the new Information System and as the result of it's leadership for Utilities

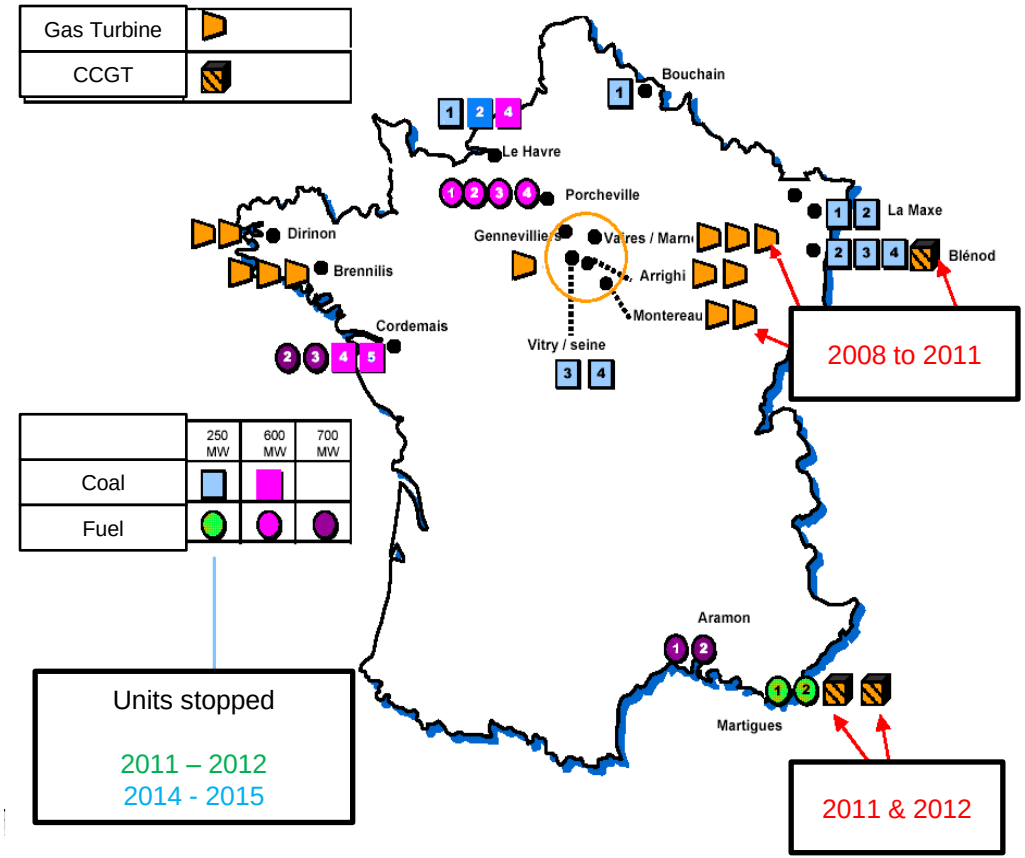
- **Third Decision:** to use an EAM for Maintenance, add mobility for Operation & Maintenance team, and link the different systems together

Scope of SI²: Main Applications



Scope of SI² Project

- French Thermal Division
- **10 Units stopping** between 2011 & 2015
- Erection of **8 new Units** between 2008 & 2012
  - 3 x Cycle-Combined Power Plants (2011-2012)
  - 5 x Gas Turbines (2008-2011)



Agenda

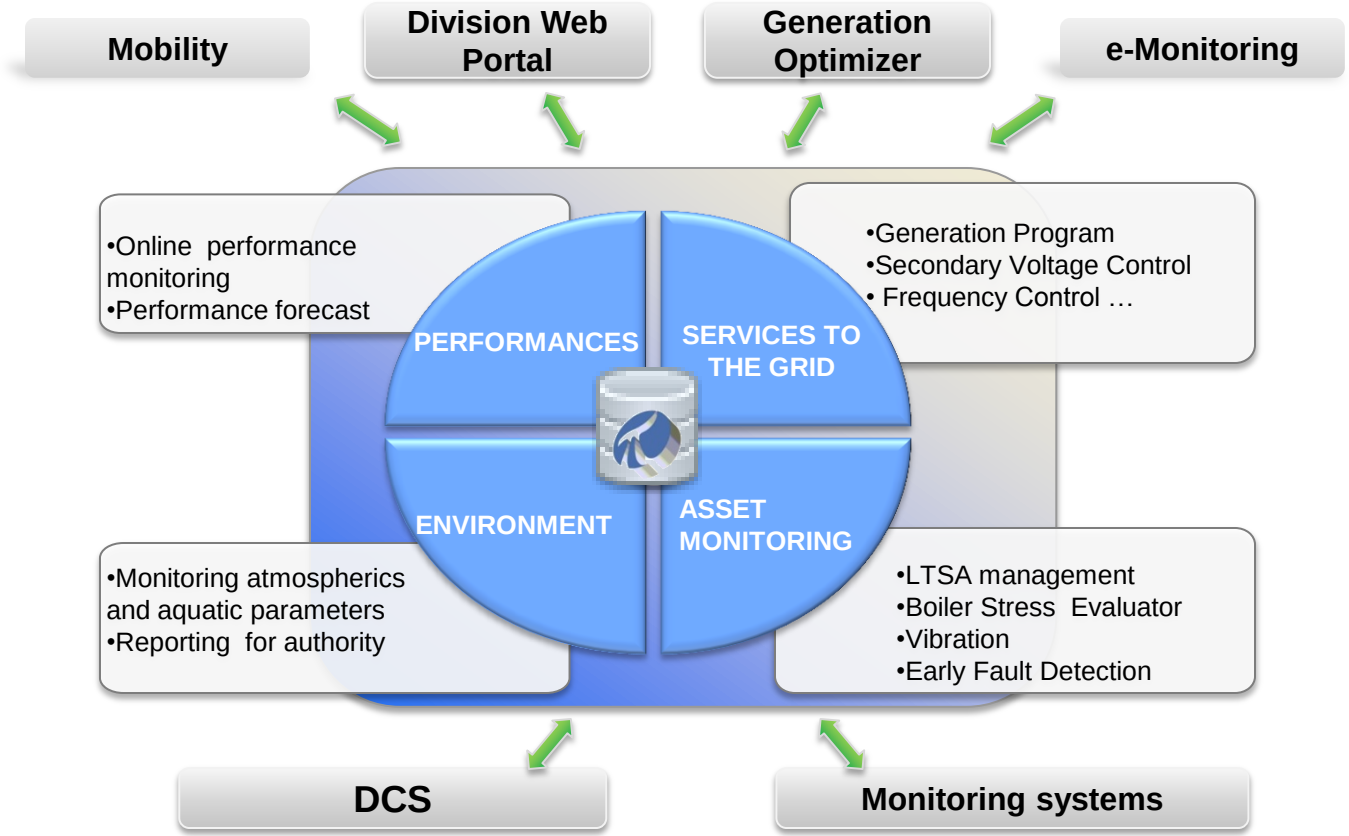
- About EDF
- Before the PI System: the early stages of Industrial Information System
- The SI² Project
- **PITHER: Core Products & Architecture**
- Applications samples
- MDM or how to deal with complexity
- Lessons learned

PITHER: Core Products

- One product: **PITHER**
  - Historian & Web Portal
  - Supervisory HMI
- 3 Cycle-Combined Power Plants
  - Blénod: 1 x 440 MW
  - Martigues: 2 x 400 MW
- 8 Gas Turbine
  - 180 MW units

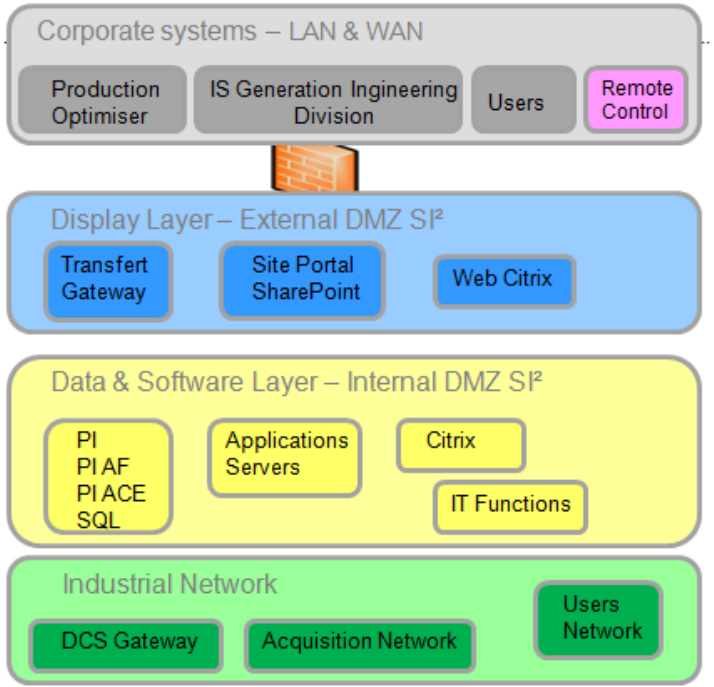
Data Infrastructure	• PI Server 2010
High Availability	• Cluster Microsoft Server 2008 • VMware
Web Portal	• Microsoft SharePoint 2010
Additional databases	• SQL Server 2008
Model Management	• PI AF • Home made MDM tool
Exchange protocol	• OPC
Supervisory HMI	• .Net (C#) Development • CITRIX XenApp Server

PITHER: Main functions



SI² Project: work in progress

- **Design of a new architecture: done**
- **Connection to DCS: done**
- **Deployment: done**
- **Integration of off-the-shelf software:** in progress
- **Development:** in progress



Agenda

- About EDF
- Before the PI System: the early stages of Industrial Information System
- The SI² Project
- PITHER: Core Products & Architecture
- **Applications samples**
  - Services to the Grid
  - Asset Management
  - Environment (dealing with the integration of off-the-shelf software)
  - Generic applications
- MDM or how to deal with complexity
- Lessons learned

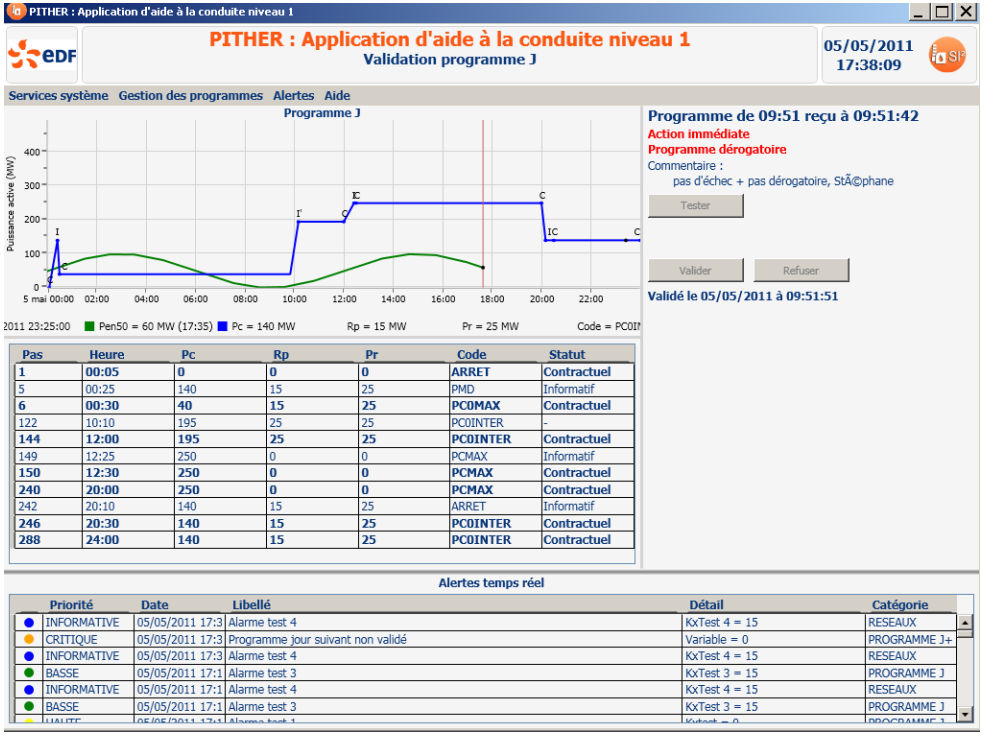
Services to the Grid

A set of applications for the Operator to monitor:

- The fulfilment of **Grid requirements** (Frequency, Voltage)
- Status of Operation with **Power diagrams**:
  - X-Y Diagram for Active/Reactive Power
  - X-Y Diagram for Voltage/Reactive Power
- **Power Generation** according to the Optimizer requirements:
  - Display of day D and D+1 Generation Program
  - Control of feasibility
  - Changes management
  - Real-time Dashboard

Services to the Grid: Program Management

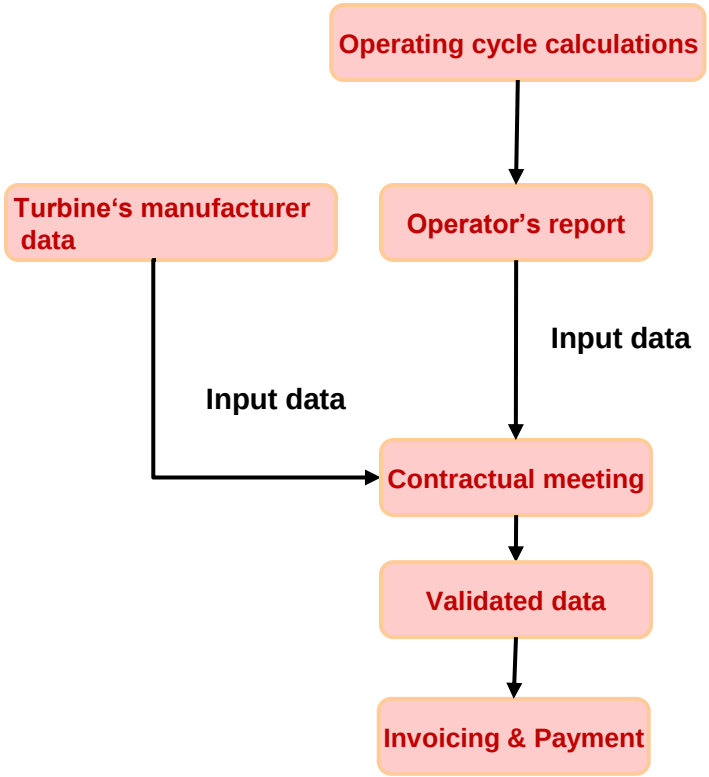
- Specific HMI and graphical needs led to the creation of an home-made PI SDK based client (.NET)
- Alerts sent to DCS through PI OPC Interface
- Model in PI AF
- PI Totalizers
- Use of additional SQL database



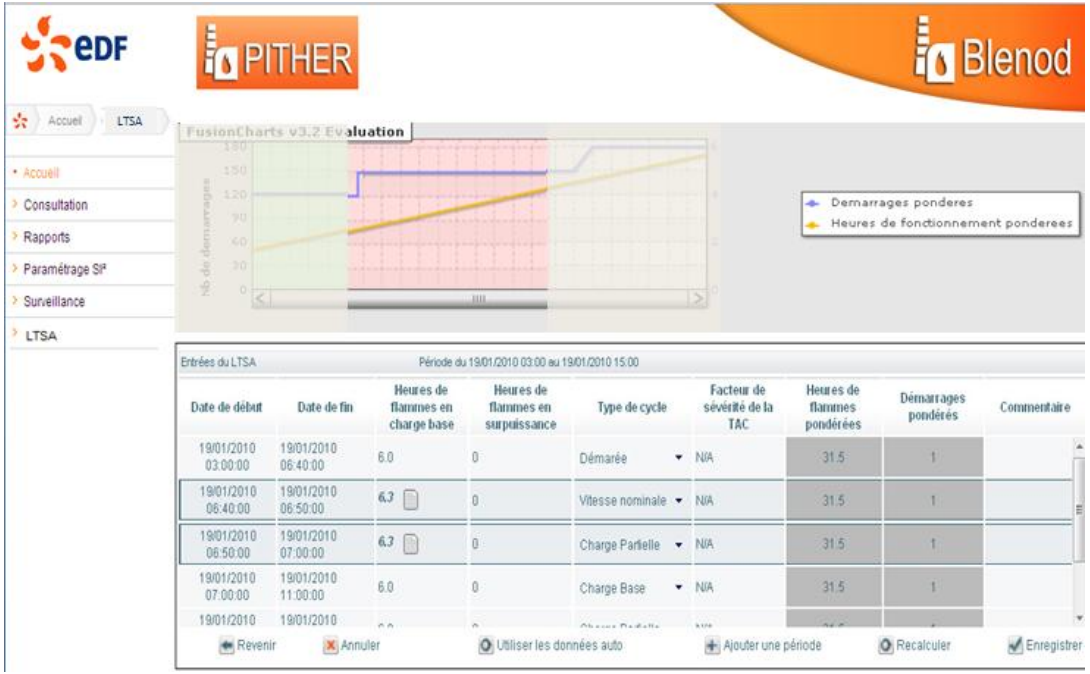
Asset monitoring: LTSA management

- LTSA: **Long Term Service Agreement** with Gas Turbine manufacturer for maintenance.
- Requires the calculation of « **Equivalent Hours of Operation** » and « **Equivalent Starts** »
- These calculations are key for maintenance events and warranty of the machine
- **Contractual meeting** with turbine manufacturer on a monthly basis to review events, operation (through these calculations), maintenance activities, and terms of payment of this contract.

Asset monitoring : LTSA management



- Specific Web App using PI SDK & PI AF SDK
- Calculations in PI ACE, model in PI AF



Environment

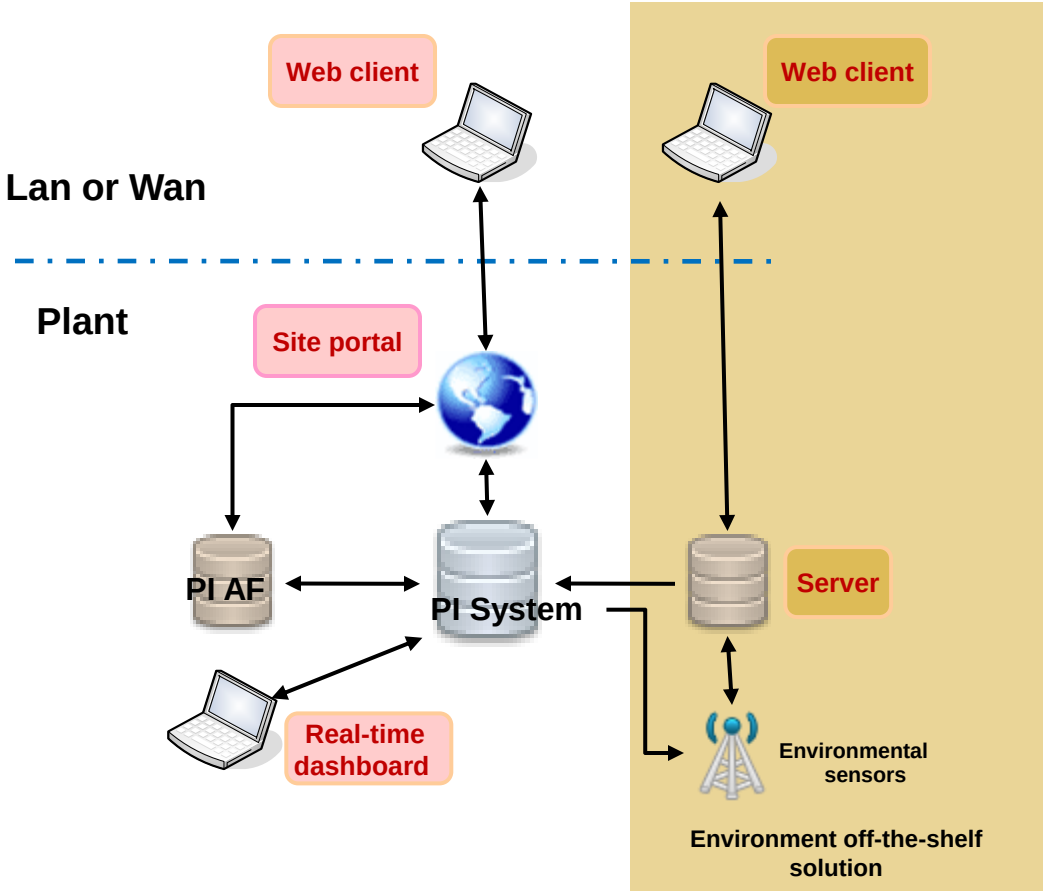
- Authority's tendancy is to require Utilities to have a specific/dedicated system ➔ a specific PI SDK based application was not suitable

- First need: to integrate a specific off-the-shelf application into PITHER
    - Through **PI OPC Server**

- Second need: to consolidate environmental data into the PI System for global reporting and Operator's dashboard
    - Through **PI OPC Interface**

Environment

Environment calculations and data acquisition	• Off-the-shelf software
Dashboards	• Custom .Net app
Reporting	• Custom Webapp • Reporting services
Data Model	• PI AF



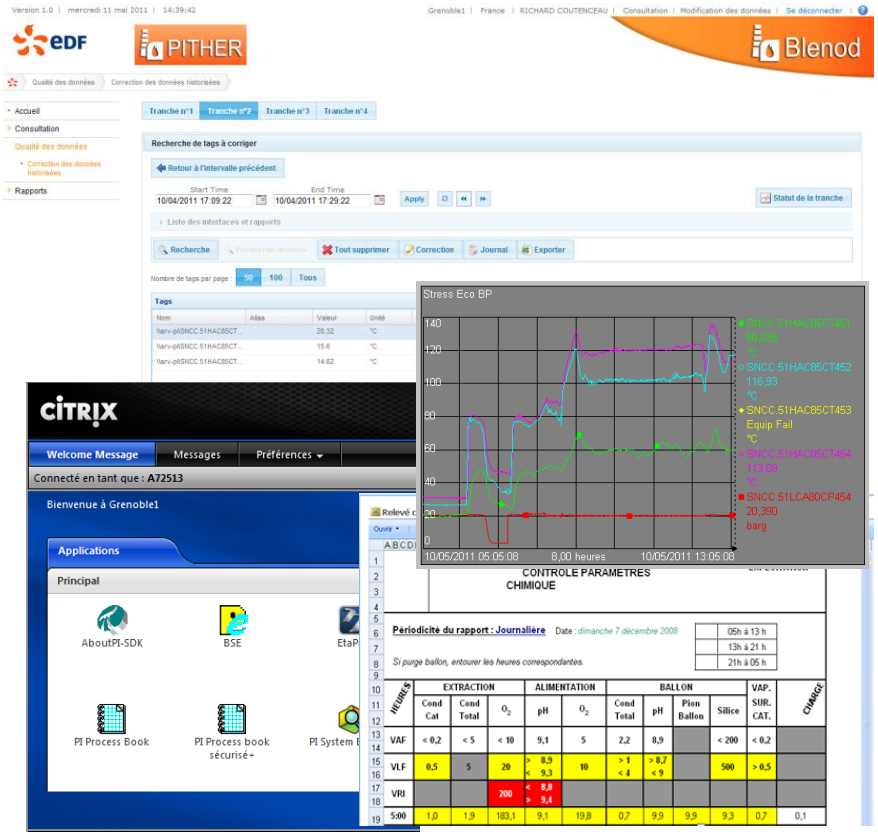
Generic applications

Specific development for generic needs:

- Dashboards
- Reporting
- Data correction

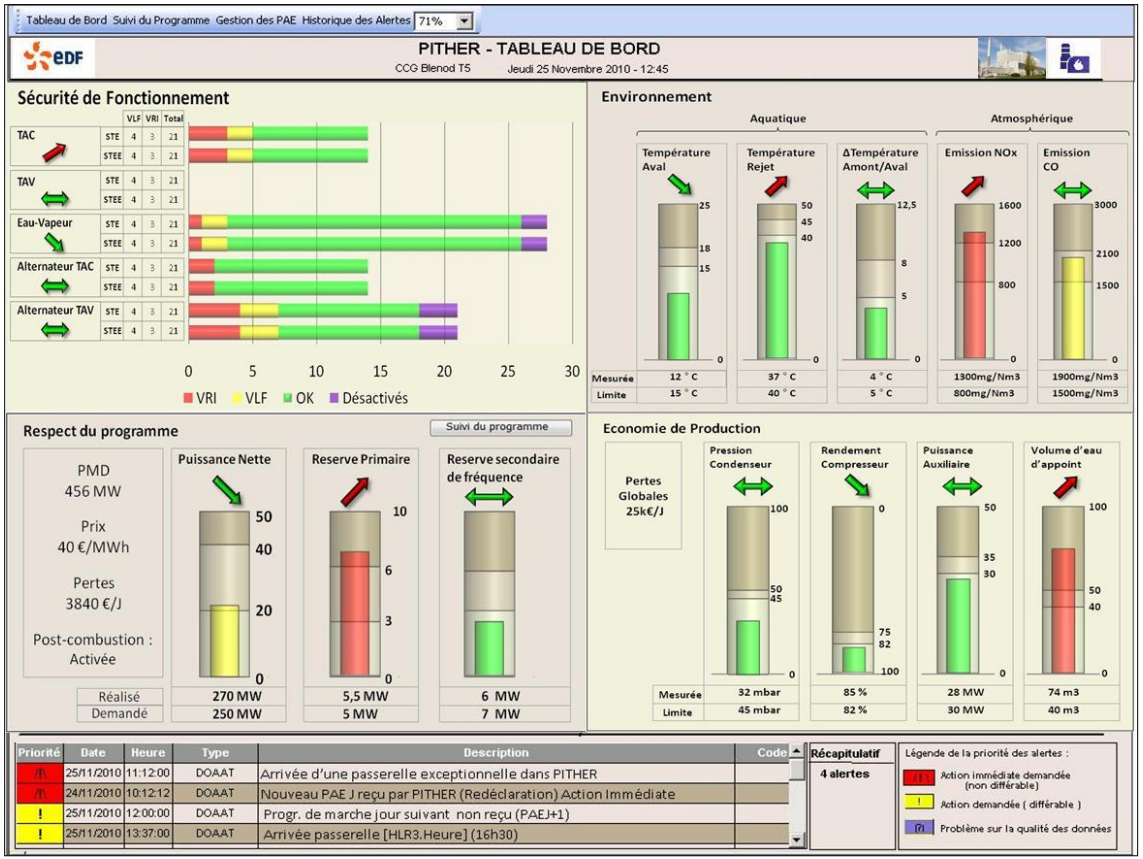
Standard PI System clients accessible through CITRIX:

- PI ProcessBook
- PI DataLink



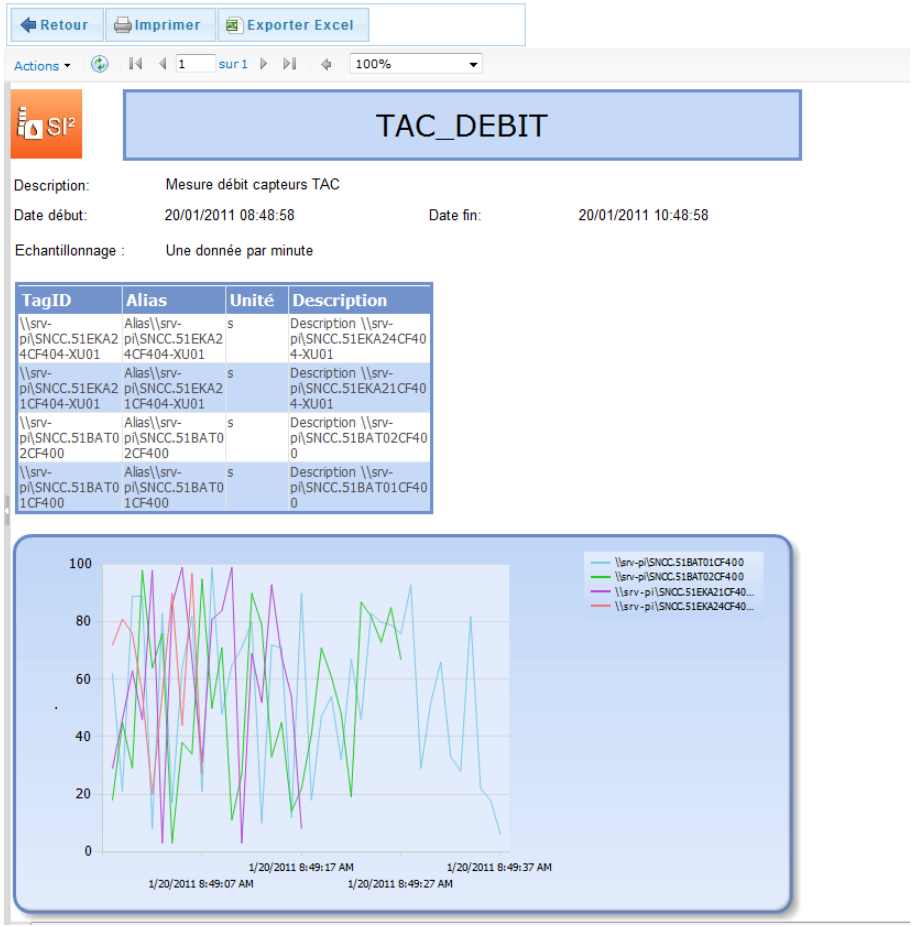
Dashboard

- Available in control room
- A tool for real-time operation
- Home-made PI SDK based client (.NET)
- Configuration in PI AF



Reporting

- Standard reports
- User's custom reports
  - Data, Trends, Svg import
- A custom webapp
- Export to Excel & PDF



Agenda

- About EDF
- Before the PI System: the early stages of Industrial Information System
- The SI² Project
- PITHER: Core Products & Architecture
- Applications samples
- **MDM or how to deal with complexity**
- Lessons learned

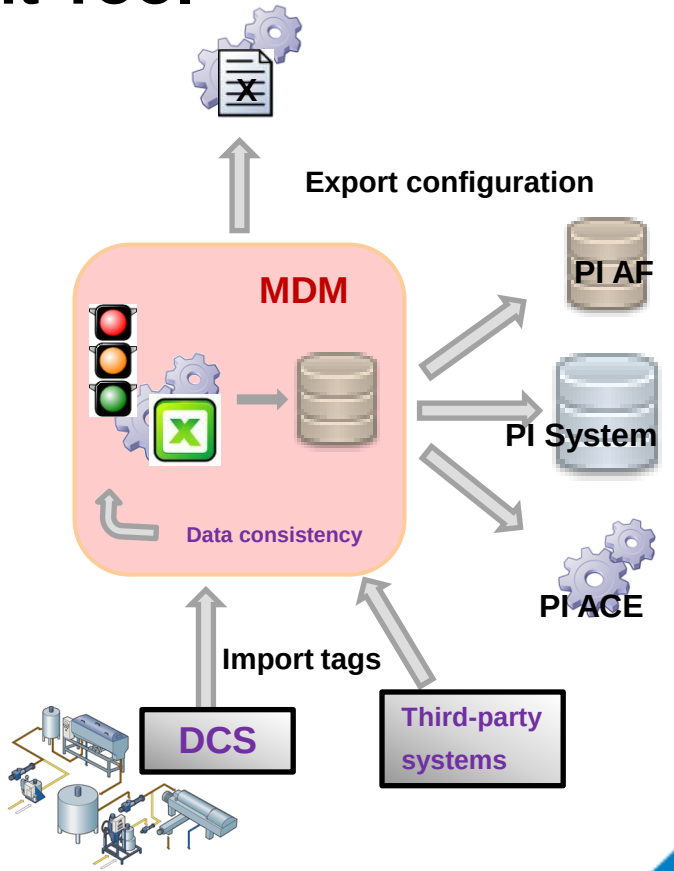
How to deal with complexity?

Complexity?

- A great deal of applications
- Specific development & off-the-shelf software
- Input and Output data between the different applications
- Direct interaction with real-time operation
- Lots of data!
- Different people for maintenance and future developments

Solution: Master Data Management Tool

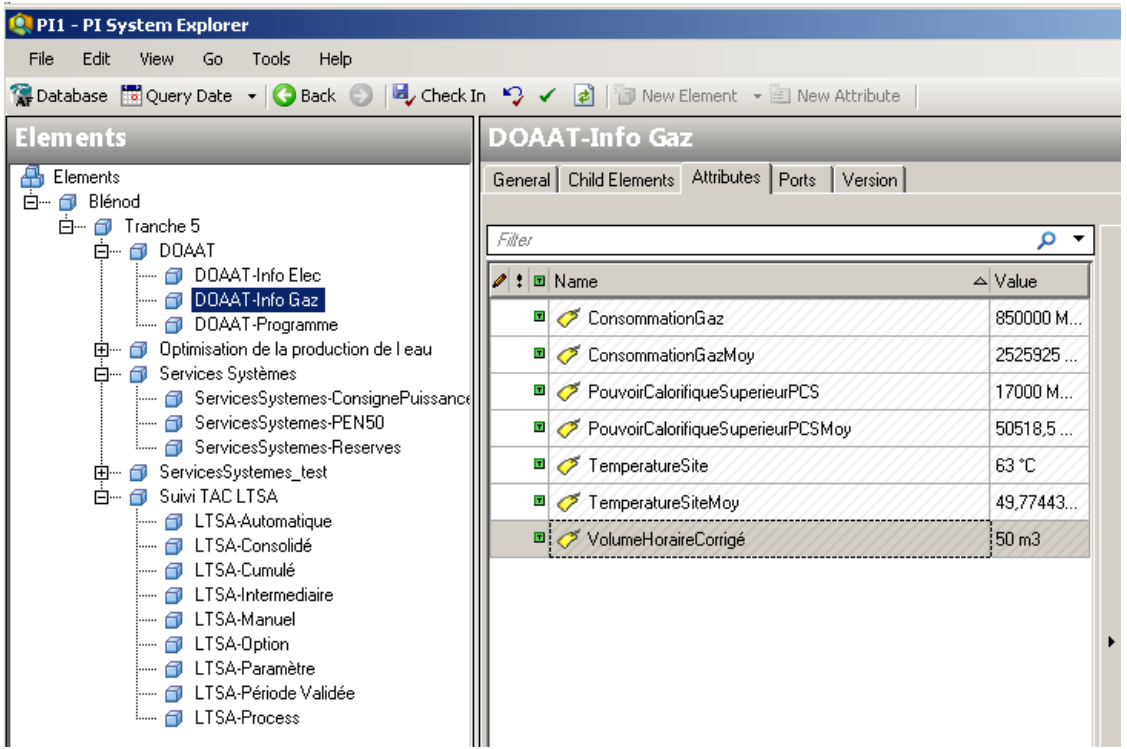
- A custom MDM tool (XML based)
- One reference database for all data
- One centralized configuration tool
- Several custom tools to manage
  - PI Tags & Interfaces configurations
  - PI ACE calculations & dependencies
  - PI AF data model
  - Dependencies with third-party software
- Additional reporting to check data consistency



Master Data Management Tool

Interface Data Model used for:

- Dashboards
- Reporting
- Tag Search



Agenda

- About EDF
- Before the PI System: the early stages of Industrial Information System
- The SI² Project
- PITHER: Core Products & Architecture
- Applications samples
- MDM or how to deal with complexity
- **Lessons learned**

Lessons Learned (1/2)

EDF context:

- Several 10 year-experienced people on Industrial Information System at EDF
- Two different projects have started to use the PI System today (Hydro project aiming at collecting 1 million tags)

Data Infrastructure

- PI System is really fast for retrieving/displaying lots of data
- Reliable PI OPC Interface
- Web Portal
- PI JDBC: a new alternative to SharePoint

Lessons Learned (2/2)

Client

- PI ProcessBook vs. .Net Client?
  - depends on your needs
  - PI SDK and PI AF SDK are here for you

System Integration

- Project size required a specific solution to reduce complexity
- Security issues to be addressed at the beginning

Next steps

- January 2009: start up of the SI² project
- 2010 – 2011 : design & implementation
- September 2011 : COD on first CCG power plant
- 2012 – 2015 : deployment on the rest of the units

Thank you