Infrastructure of Real-time Data Applied to the Monitoring of Renewable Energy

Presented by
Aurélie Nasse
Operations Control Center Manager
EDF EN Services
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Agenda

• Presentation of EDF EN
• Needs of EDF EN Services
• PI System architecture
• Project results
EDF EN: a multi-segment player

1. Growth drivers
   - Wind energy
   - Solar PV energy
   - 85% of the EDF EN group’s total installed capacity
   - Objective: 500 MWp net in service by year-end 2012

2. Potential new growth drivers
   - Distributed solar
   - Biomass
   - Biogas
   - Marine Energies
   - Offshore
   - Selective developments to prepare for the future
An international footprint: 3,423MW installed in 13 countries

Gross figures by country at 12/31/2010
all segments combined

EUROPE
2,279MW

NORTH AMERICA
1,144MW
An integrated operator

Green electricity generation is our core business

**Development**
- Prospecting for land
- Environmental impact studies
- Project management (administrative, economic and technical coordination)
- Electricity production yield assessment

**Construction**
- Engineering (electrical, acoustics, etc.)
- Construction works (project contracting)
- Procurement
- Logistics

**Generation/Sale of assets (DSSA)**
- Asset management
  - Relationships with contractors
  - Production tracking
- DSSA (Development and sale of structured assets)
- Non-recourse project financing
- Tax, treasury and financing and accounting
- Legal affairs, insurance
- Research and development

**Operations & Maintenance**
- Scheduled maintenance
- Corrective maintenance
- Purchasing/management of spare parts
EDF EN Services

EDF EN Services is a EDF Energies Nouvelles company in charge of the operation and maintenance of wind parks and solar parks in Europe.

Today under O&M contracts on 31st of March 2011:

- Wind parks connected to the very high voltage grid 200 MW
- Wind parks connected to the medium voltage grid 300 MW
- Solar parks connected to the medium voltage grid 131 MW
- Industrial roof tops connected to the medium voltage grid 6 MW
- Roof tops connected to the low voltage grid 6 MW
EDF EN Services’ centralized monitoring

- **Goal:** Real-time monitoring of the wind / solar / substation assets
- **Means:** OSIsoft’s PI System / PCVUE
- **Project start date:** January 2009
- **Team:** Pilot: Operating Control Center Manager
  Team Members: 2 PI System experts, 2 technicians
  IT Support

- **Why OSIsoft’s PI System?**
  - Archival performance
  - Multiple interfaces to data sources
  - Associated tools (Microsoft environment)
OSIsoft’s PI System: a single tool for our asset monitoring

- **Central PI Server**
  - PI DataLink: internal reporting
  - PI ProcessBook: Performance Analysis and Fault Diagnostic
  - Sharepoint and PI WebParts: Owner’s reporting
  - PI OPC Interface

- **Local PI Server**
  - PI to PI interface
  - PC Vue: Real-time monitoring

OSIsoft's PI System: a single tool for our asset monitoring.
Interfaces
Real-time monitoring by the OCC: Wind parks

Created a « second level SCADA system » able to communicate with any kind of wind turbines, substations, or solar parks
Real-time monitoring by the OCC: High voltage substation

Grid operator requirements:
- 20 minutes response time to open or close any breaker
- Visual confirmation that the command has been working
- Voltage regulation or manual change of active or reactive power on demand
Real-time monitoring by the OCC: Solar parks

Manosque PV farm

Gabardan Tracker PV farm P/irradiation
Real-time monitoring by the OCC: Medium voltage substation

View created by the O&M IT team. This view gives us access to:
- Alarm logs
- Different data P/U and I
Real-time monitoring by the OCC: Solar barns

Data sent every 2 hours. Entered into PI System with PI UFL interface.
Data retrieval and validation by the owner: Sharepoint and PI WebParts
Performance analysis: PI DataLink

Gearbox oil temperature validation before and after replacement

Wind turbines power curves
Future plans and next steps

Management scorecard
Data models with PI AF
Continue deploying PI System on all of our assets
Questions

Aurélie Nasse
aurelie.nasse@edf-en.com
Thank you