Operational Data Collection – Improvement in Data Quality

Presented by

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Agenda

• Fact & Figures
• Method – Collaboration is Key
• Infrastructure – Replicable by Design
• Trust in Data – Check Everything
• Sample Use Cases
• Conclusion
Facts & Figures
KEY FIGURES
at 31 December 2016

€1,358 M
Consolidated revenues

€306 M
Net income group share

€918 M
EBITDA

9,100 MW
Wind

1,059 Mwp
Solar

219 MW
Other segments

Generation activity
10,378 MW gross
6,664 MW net
installed

2,400 MW gross
under construction\(^9\)

16.5 billion kWh
Green energy generated
in 2016\(^9\)

Complementary activities
3,689 MW
Developed, built and sold

13,359 MW
In operation and maintenance\(^9\)

(1) For own account and for third party.
(2) Annual economic output, including
the proportion of output from
jointly controlled assets.
4,946 MW
Europe
Including France
1,617 MW

4,587 MW
America

845 MW
Africa, Middle East, Asia

Countries in which EDF EN is present
Gross installed capacity at 30 June 2017

www.edf-energies-nouvelles.com
Industrial IT – Scope of Activities

**Wind Turbine**
onshore & offshore

**Solar**
ground, roof, car parks PV

**Few others...**

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**Industrial IT in EMEA:**
- 7 countries
- 11 people

**Managing:**
- 150 parks and substations
- 4 GW raw
- 200 local nodes
- 1 million+ tags, 2 Gb/day
Method: Collaboration is Key
Method: Collaboration is the key – Deployment

Since the very beginning of the construction phase and until the final delivery, Industrial IT department works closely with all different parties.

A similar approach is used for O&M parks (3rd parties owned assets)
Method: Collaboration is the key – Development

- **Data Acquisition**
  - SCADA
  - PLC
  - Meteo towers
  - Files

- **Centralization and Cleansing**
  - Data Quality

- **Standardization/Modeling**
  - Data aggregation/standardization

- **Development**
  - Model development

- **Check/Model Test**
  - In Production

- **Test on Dedicated Environment**

- **Automation via Instantiation Model**

- **Real-Time Alert Generation**

- **Business Expert**
  - Return from Field

- **Business Expert**

- **Automation**

- **Business Expert**
Industrial IT Infrastructure: Reliable by Design
Industrial IT Infrastructure: Links Reliability

Industrialization of the monitoring of the telecom links and industrial IT assets

- Replacement of siloed/legacy IT monitoring tools by PI System
- Status analysis for local equipment, softwares, and databases
- Dynamic Notifications for rapid response
Industrial IT Infrastructure Designed for Reliability and Sustainable Deployment at Scale

- Protocols
  - Variety (Modbus, OPC, DNP3, IEC104...)
  - Robust Interfaces

- Architecture
  - Common Design
  - Easily Deployable / Replicable

- Monitoring
  - Everything is Monitored
  - Analytics and Notifications

Designed for Reliability and Sustainable Deployment at Scale.
Trust in Data: Check Everything
Trust in Data: Collection Real Time Rating

- Inventory / Standardization
- Health Tag / Analyses / Notification
- Modeling / Templates
- Data Confidence

Inventory / Standardization

Health Tag / Analyses / Notification

Modeling / Templates

Data Confidence

100% Guaranteed
Trust in Data : Value Real Time Rating

- Refresh Rate
- Value Checking
- Modeling / Templates

= Data Confidence

PILoad.png

PI_Notification@edf-en.com
Warning : Value Checking - Questionable

Les valeurs envoyées par le parc : [redacted] pour produire des problèmes et nécessite une attention particulière immédiate.

État des transmetteurs de faibles :
Interface Status : Questionable
Value Refresh : Bad
Date de tirage : 05/01/2017 08:34:26

Informations administratives :
Nom du site : [redacted]
Code Pan : [redacted]
Nom du serveur : [redacted]
Priorité : High

Auteur : [redacted]
Acknowledged : With Comment

[Image of data comparison and quality guarantee]
Trust in Data: importance of Dual Data Sourcing

Collecting with PI Infrastructure all available field data sources to mix data and grant data quality

**Low Frequency Data from SCADA database (SQL)**
- Averaged data and events (10 min), hence not very precise and accurate, but could be sufficient for reporting needs.

**High Frequency Real-Time Data from SCADA and/or Controllers (OPC, IEC 104, DNP3….)**
- Accurate (1 second) but can be subject to software issues and can’t be restored afterwards when they failed (no redundancy)

If High Frequency Real-Time Data is missed, it is easier to restore the average data from the SCADA database afterwards.
But SQL database are not available for all Renewable Assets manufacturers

Low Frequency Data from SCADA database (SQL)
- Averaged data and events (10 min), hence not very precise and accurate, but could be sufficient for reporting needs.
1. PLCs, Controllers and local SCADA generates Real Time Data

2. An average of this data is processed every 10 min and stored into local SCADA Database (SQL) as well as alerts and events

3. High Frequency data is published by the SCADA or controllers (OPC, Modbus) and acquired by local PI Interface node

4. Every 10 minutes, averaged/low frequency data from local SCADA Database (SQL) is retrieved and acquired by PI Interface node

5. Local PI Interface node (with buffering) transfers Data to Central PI Server

6. High Frequency (1s) and Lower Resolution (10min) Data are both stored centrally in PI Data Archive

7. Industrial IT infrastructure is monitored in real time and generates alarms and notifications

8. Data is analyzed in real time to detect underperformance, value deviation, data quality… results of these analyses are stored in PI Data Archive
Industrialized Deployment

Acquisition devices, preprocessing and data transfer
Real-Time Analytics and Situational Awareness on all IT assets

Parks Overview
Extensive IT Infrastructure Real-Time Monitoring: example

Windpark overview
Extensive IT Infrastructure Real-Time Monitoring: example

Local Servers Real-Time Monitoring
Extensive IT Infrastructure Real-Time Monitoring: example

Drilldown:
Local Servers
Real-Time Monitoring
Extensive IT Infrastructure Real-Time Monitoring: example

Drilldown: Ethernet Switch Real-Time Monitoring
Extensive IT Infrastructure Real-Time Monitoring: example

Drilldown: UPS & power supplies real-time monitoring
Extensive IT Infrastructure Real-Time Monitoring: example

Local Server Real-Time Dashboard
Extensive IT Infrastructure Real-Time Monitoring : example

PI Interface Node Health
Extensive IT Infrastructure Real-Time Monitoring: example

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<th>Priorité</th>
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Managing Notifications for Rapid Response with Commitment to the Business (SLA)
# Leverage Field Real-Time Data to Maximize Asset Uptime & Performance

## COMPANY and GOAL

**EDF Energies Nouvelles**, a global renewable producer wants to **optimize its renewable generation**, and excel in O&M activities.

## CHALLENGE

Minimize impact of maintenance activities on production, reduce downtime, optimize control settings.

- Good decision starts with good data
- Collecting field data from distant windfarms is challenging
- Connect the field data with the people to take smart decisions

## SOLUTION

Leverage PI System Infrastructure to monitor IT asset in real-time and deliver operational analytics:

- Exhaustive monitoring of IT assets to improve uptime and fix issues in short time
- Empirical analytics to detect weak signal patterns on assets in real time, spot suboptimal settings or future failures before they occur

## RESULTS

**Improved Data Quality**

Tangible business outcomes

- Field data quality has dramatically increased
- Catching suboptimal curtailment enabled the recovery of 50 k€ of production for one single wind farm over a few days. Today, with additional analyses, **700 k€ / year of production recovered for wind farms.**
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EDF Energies Nouvelles
Questions

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