



PV and Wind Integration with PI

Louis Blais, EDF Énergies Nouvelles

April 26th 2010, San Francisco

- EDF-EN Business Overview (until *+5m)
- EDF-EN PI System Architecture (until *+20m)
- List and Description of Monitored Sites (until *+25m)
- Applications Examples (until *+40m)
- Conclusion (until *+45m)



EDF-EN Business Overview

Disclaimer

All figures and information are indicative and non-binding. This document is neither an offer or an invitation to sell, nor a solicitation of an offer to purchase shares of EDF Energies Nouvelles.

For more information about the company : **www.edf-energies-nouvelles.com**

EDF EN : an international pure player in renewable energies

A SPECIALIST IN GREEN ELECTRICITY GENERATION

4 renewable energy sources



Wind



Solar



Biomass



Hydro

INTERNATIONAL FOOTPRINT

A leader present in 13 countries



INTEGRATED OPERATOR

4 activities covering the entire
renewable energy value chain



Development



Construction



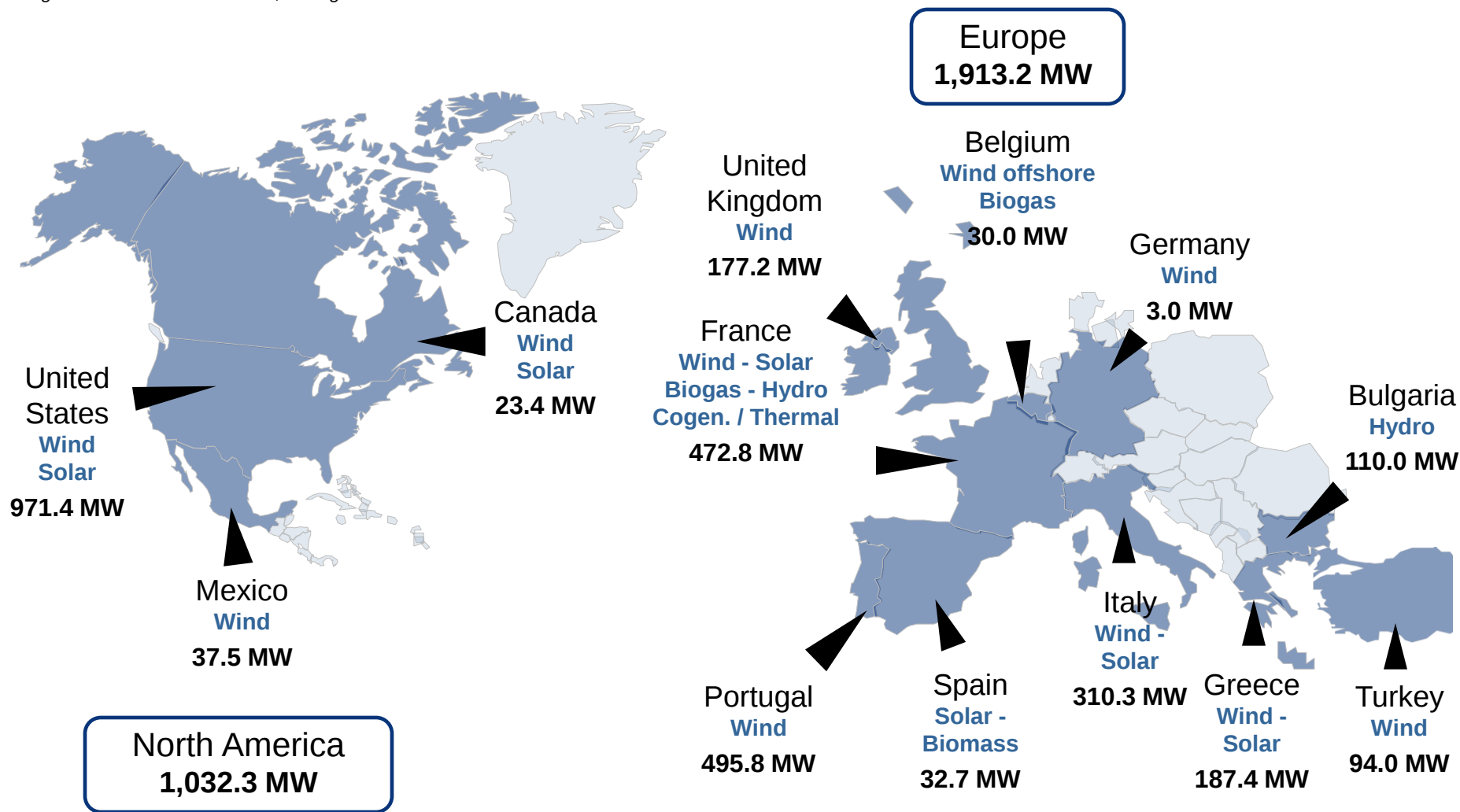
Generation



*Operation &
Maintenance*

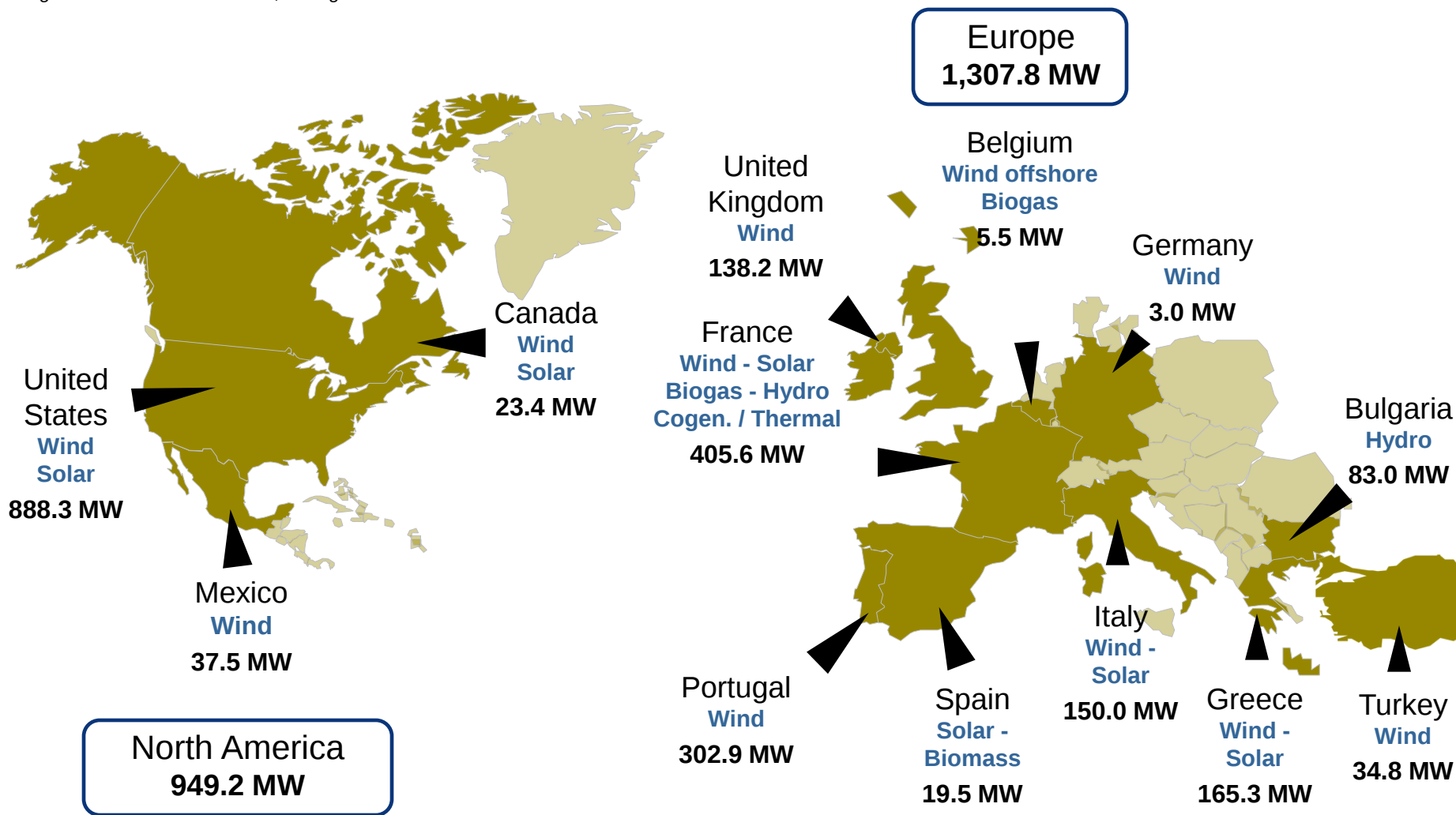
EDF EN gross installed capacity worldwide: 2,945.4 MW

Figures at 31 December 2009, all segments combined



EDF EN net installed capacity worldwide: 2,257,0 MW

Figures at 31 December 2009, all segments combined



EDF EN : a company experiencing strong growth

- Financial results 2009

Consolidated revenues

€ 1,173.1 millions

up 15.5% since 2008

EBITDA

€ 334.2 millions

Up 47.3% since 2008

Net income - Group share

€ 97.9 millions

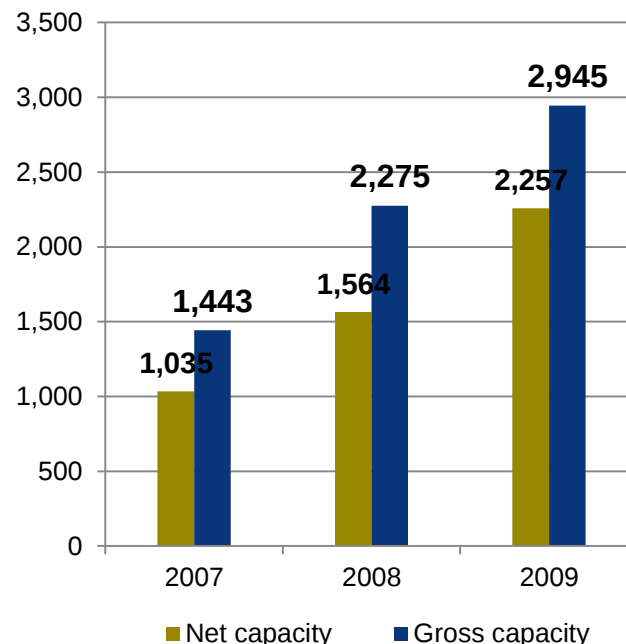
up 38.7% since 2008

Capital expenditure

€ 1,318.6 millions

Figures at 31 December 2009, IFRS

- Installed capacity

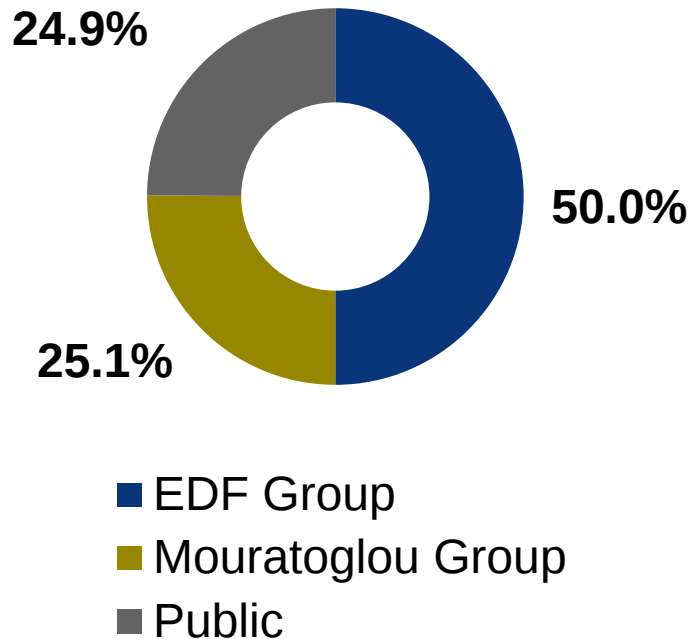


- Pipeline (projects under development)

Wind : > **14 500 MW**

Solar : > **2 900 MWp**

Pipeline at 31 December 2009



- EDF
Main shareholder
- Pâris Mouratoglou
Company's founder
- Public
EDF Energies Nouvelles
is listed on Euronext Paris

Build a sustainable portfolio of green energy production

- **WIND** and **SOLAR** : the two main growth drivers
- **DISTRIBUTED ENERGY** : a promising market
- **EMERGING TECHNOLOGIES** : selective investments

offshore wind energy,
biomass, biofuels, biogas,
marine energies

- **WIND:** pursue targeted organic growth
Pipeline > 14 500 MW
- **SOLAR:** oversee the ramp-up in photovoltaic
PV Solar farms (ground-based and on rooftops) : core market
Pipeline > 2 900 MWp
- **DISTRIBUTED ENERGIES:** seizing positions in a promising market through EDF ENR
 - ▶ a customer all-in-one offering in renewable energies equipments...
 - solar panels
 - solar thermal
 - heat pumps
 - wood-fired heaters
 - ▶ ...and an energy control offering



EDF-EN PI System Architecture

EDF EN Services in Europe : Context

- **Evolution of Construction Organization**
 - **Wind** : O&M for substation and BOP at the commissioning
 - **PV** : O&M for all the plant at the commissioning step
 - **Hydro** : O&M for all the plant
- **Strong Evolution of EDF EN installed capacity in Europe**
- **Evaluation of the performance of the assets**
 - Guaranteed Availability & Power Curve for Wind
 - Performance Ratio for Solar for modules
- **Grid Operators Requirements**
 - Production forecast
 - Ability to operate the substation 24/7 in a very short time (High voltage Grid 20 mn)

EDF EN Services in Europe : Context

- In reaction to the previous elements, EDF EN Services has put in place a central monitoring solution to allow real-time performance tracking of its PV and Wind assets
- Objectives:
 - Allow a uniform and consistent supervision system
 - Use standardized KPIs across the group
 - Allow a more precise feedback on the performance problems with better data to investigate
 - Give real-time visibility to management

- Provides O&M services for projects developed by EDF EN in Europe
- O&M Corporate center
 - Located In Colombiers (Near Béziers, in Southern France)





- OCC Team
 - 24/7 Monitoring
 - Data Management
- Engineering team
 - Technical Support
 - Inspection of Wind and Solar Plant
 - Faults and Performance Analysis
 - Purchasing

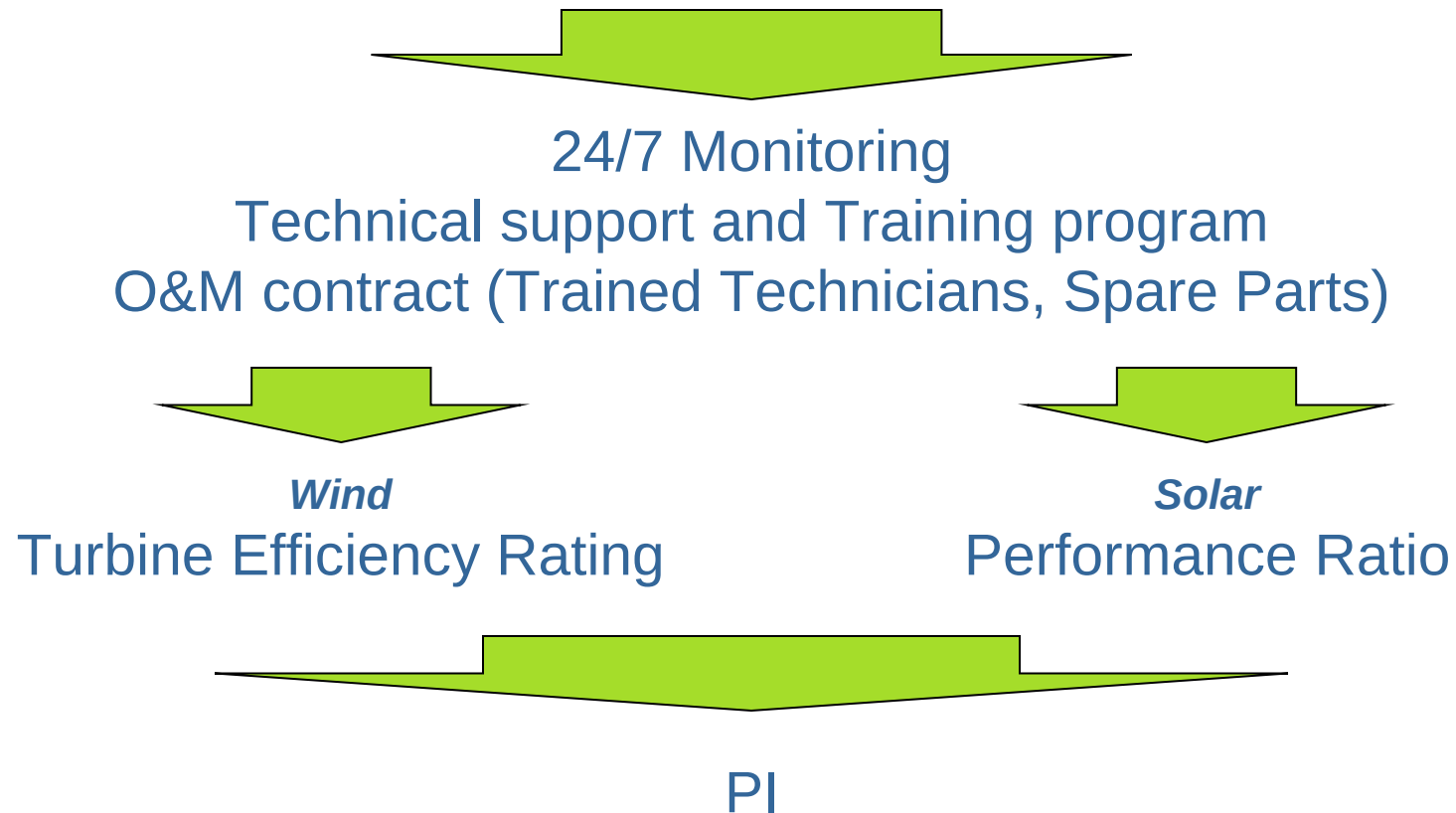


Maintenance team (WTG, PV, Substation)

- On-Site Maintenance
- Substation Maintenance
- Technical Reporting



- Provide Services to the Owner in order to increase revenues of the asset, Wind or Solar



Monitored Assets

- PI infrastructure is used to monitor the following types of generation assets:
 - Wind farms
 - Large PV sites
 - Substations
 - Small PV sites, rooftops & Hyseo
 - Meters
 - Biomass generating station



Data sources

- In terms of different suppliers...

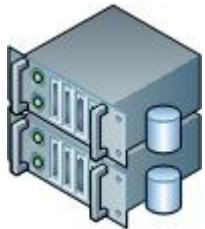


- And many others...

- PI Server Collective
 - Using Active Directory Security
 - SAN dimensioned to provide decades of storage
- PI ACE Server
- Dedicated PI UFL Server for data file treatment from legacy systems
- PI AF Server
- Central PI Agent Node for mPI
- Staging environment for developments

PI System Hardware Architecture

- Central PI Collective in Colombiers
 - Dimensioned to store Data from all Sites
- Satellite PI Servers on Major Sites
 - Standard Hardware for Solar or Wind



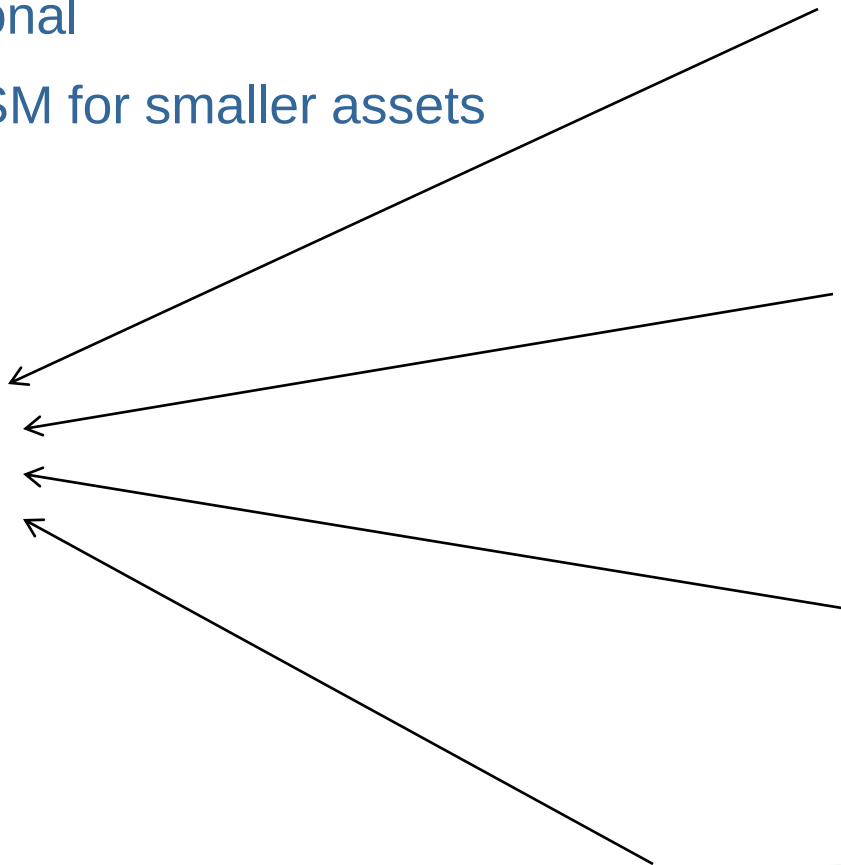
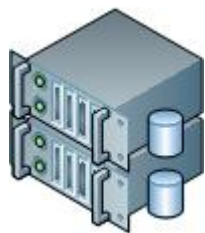
- GPRS Loggers on Smaller Sites
 - Webdyn or SMA Webbox



Telecom Infrastructure

- Each site reports to the Central server

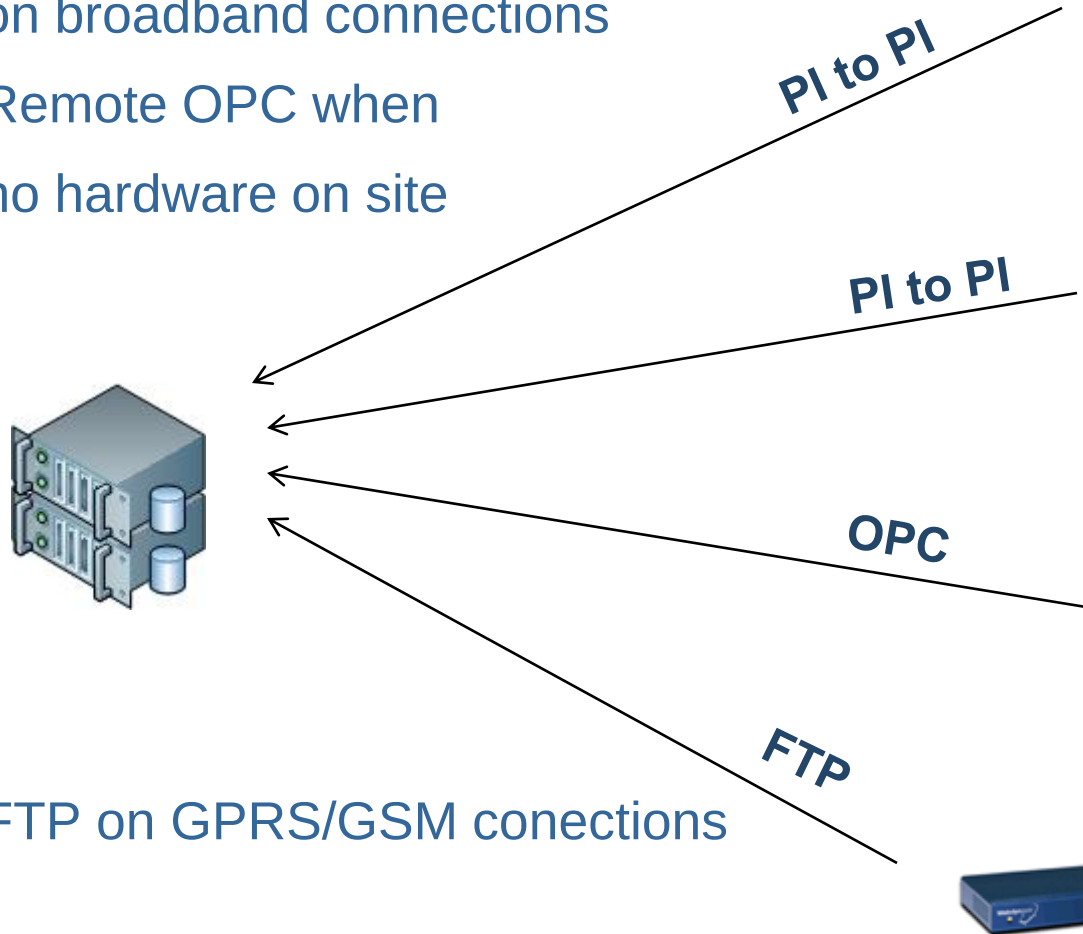
- IP MPLS links for major sites
- SDSL optional
- GPRS / GSM for smaller assets



- Satellite links under evaluation...

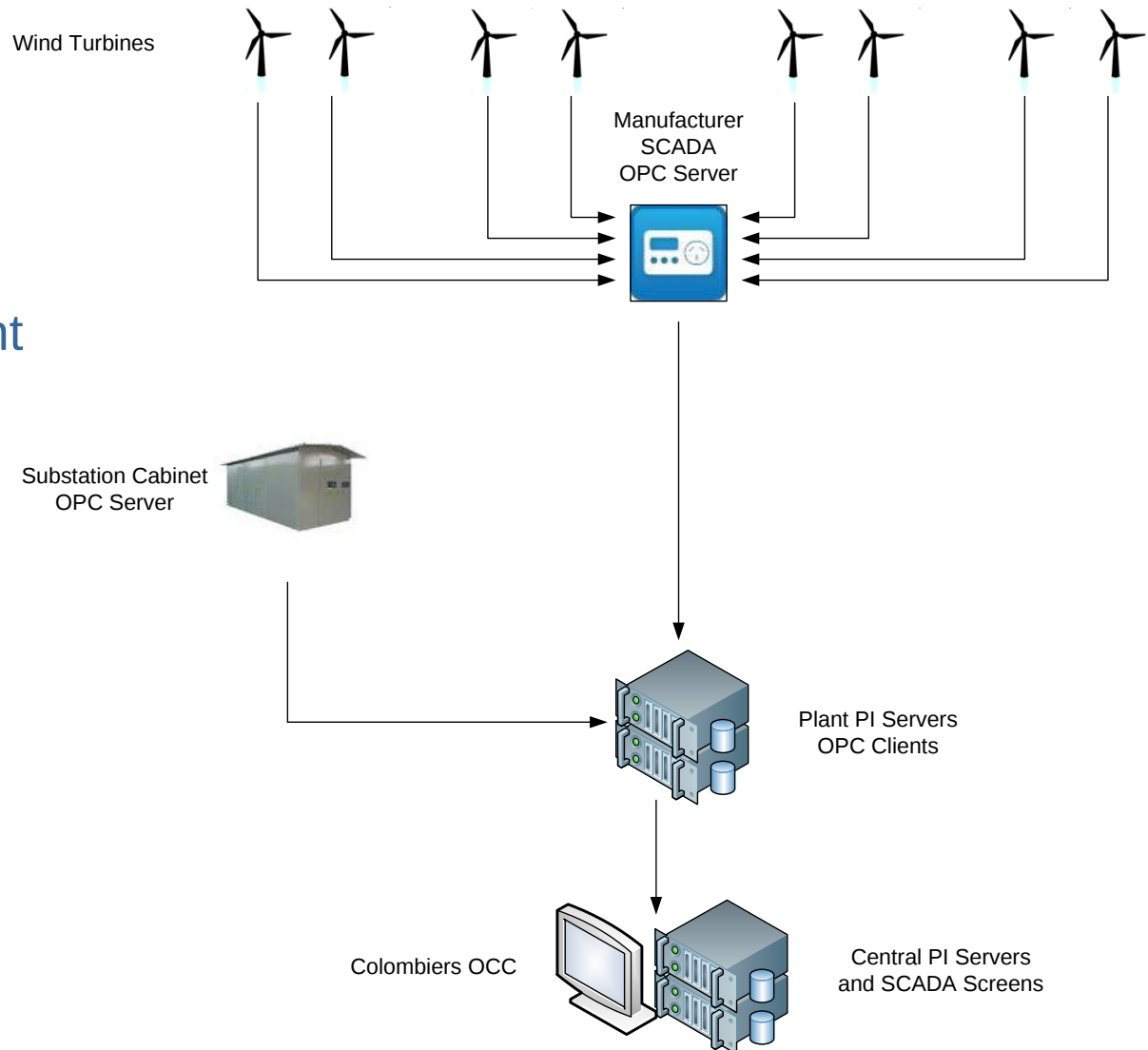
Communication Protocols

- Each site reports to the Central server
 - PI to PI interfaces between PI Servers on broadband connections
 - Remote OPC when no hardware on site
 - FTP on GPRS/GSM connections



Wind Farm Architecture

- **Manufacturer's SCADA**
 - Provides WTG and Met Mast Data
 - Variable Point Count
 - Variable Data Rate
 - Fault reporting unique to each manufacturer
- **Substation Cabinet**
 - Standard in most cases but...



Wind Farm Architecture

- PI System
 - Installed on standard racked servers
 - Greater disk capacity due to high data flow
 - Designed to store 5+ years of site history live
 - Redundant configuration for larger plants
 - Commonly used interfaces
 - OPC DA or XML-DA
 - RDBMS
 - PI to PI
 - UFL



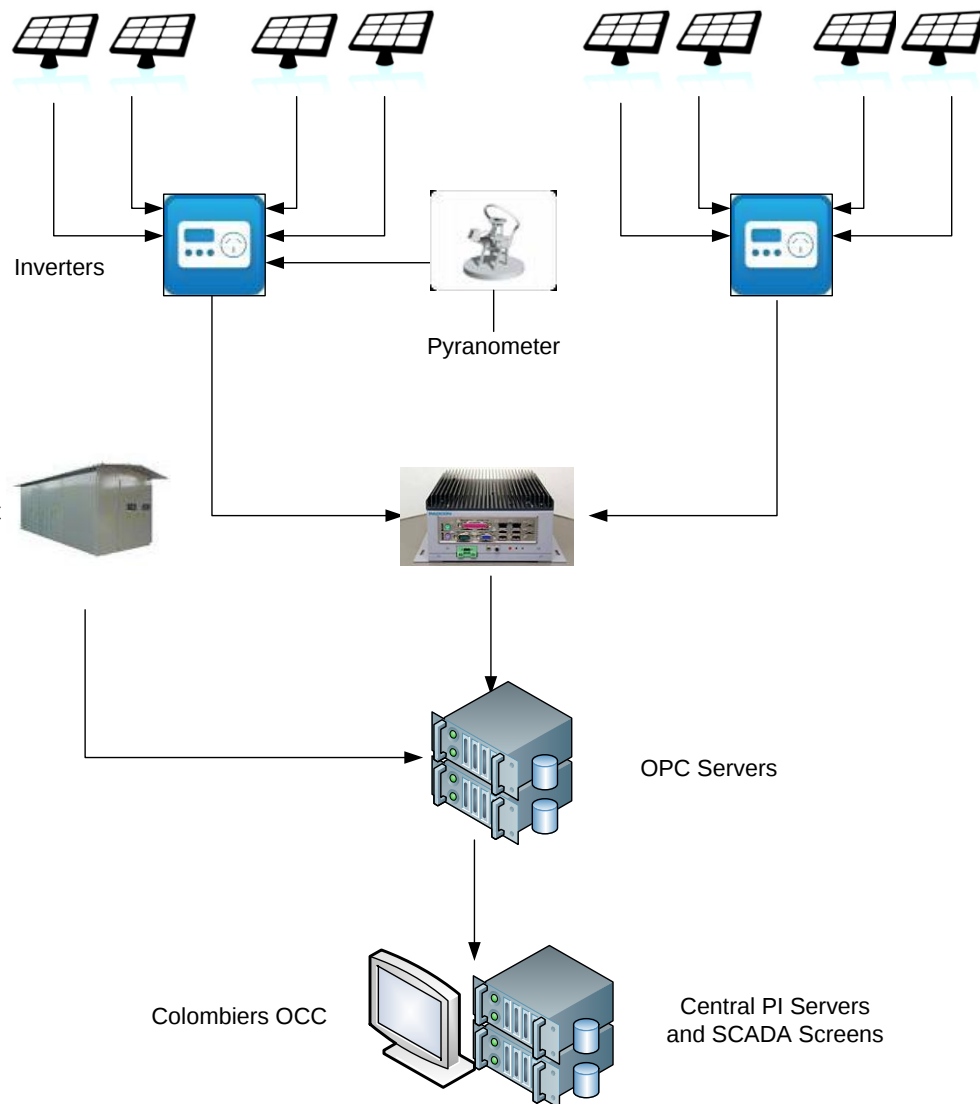
Ground PV Architecture

- Padcon

- Acts as a standard control system for Ground PV plants
- Measures and acquires inverter's Inputs and Outputs at a high frequency
- Integrated SMA protocol and Xantrex on the way



PV Cells



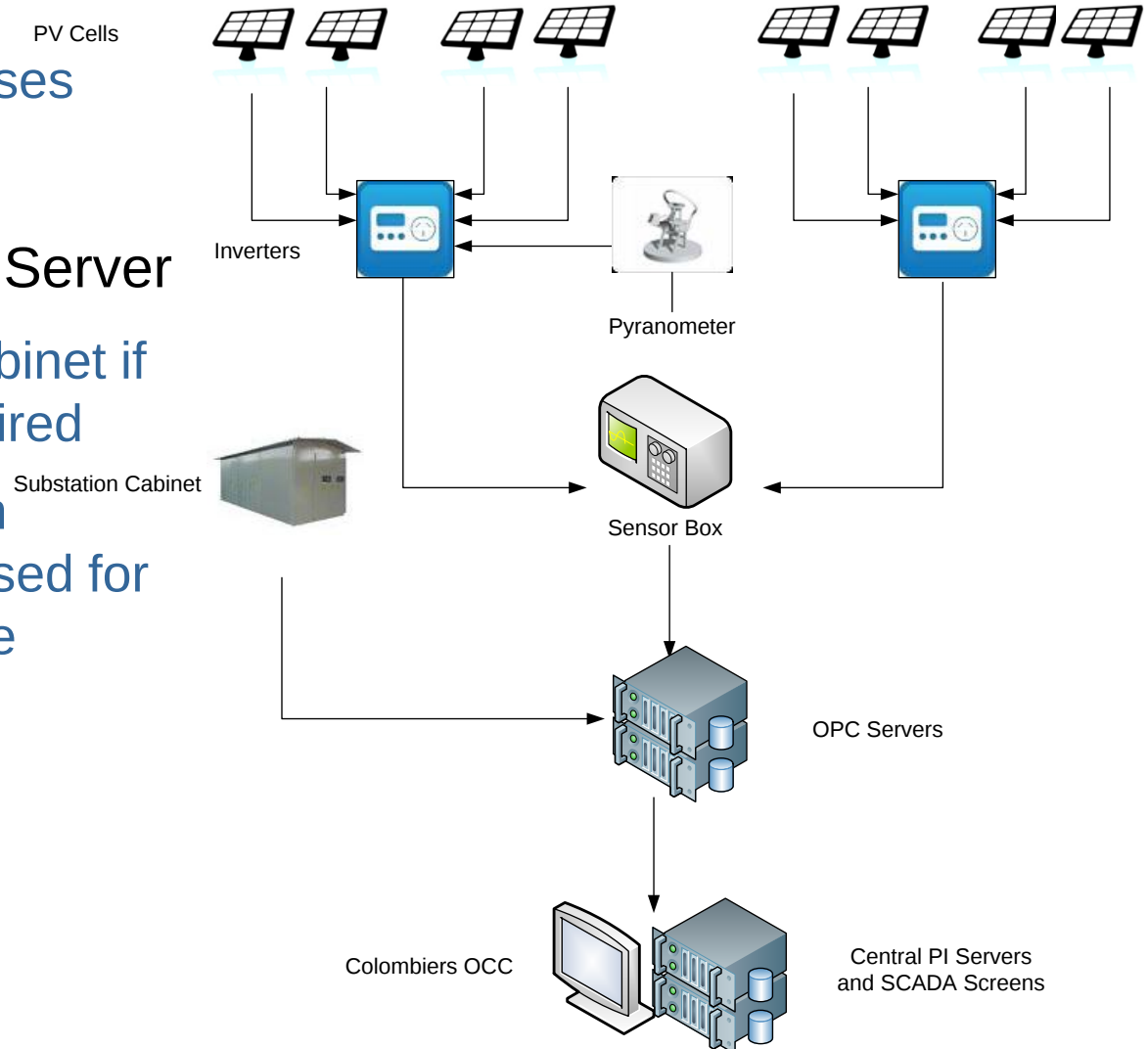
Ground PV Architecture

- Substation Cabinet
 - Standard in most cases but changes by countries.
- PI System
 - Installed on a standard Industrial PC
 - Standardized Wall Mounted Cabinet
 - Commonly used interfaces:
 - Modbus Ethernet
 - RDBMS
 - UFL
 - XML-DA



Large Rooftop Architecture

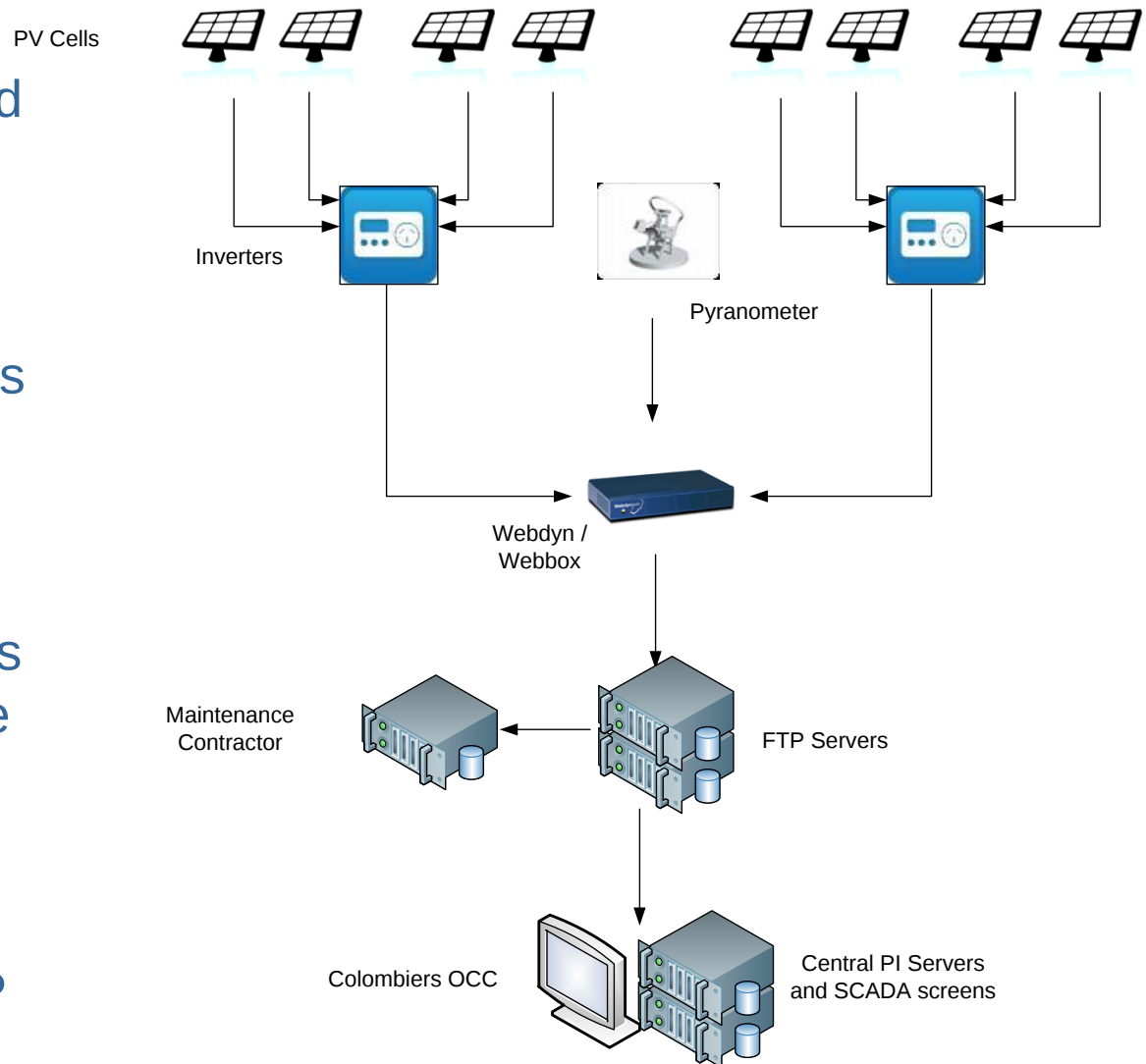
- Substation Cabinet
 - Standard in most cases
- SMA WebBox / OPC Server
 - Local Server and cabinet if local storage is required
 - Centralized server in Colombiers that is used for many sites otherwise



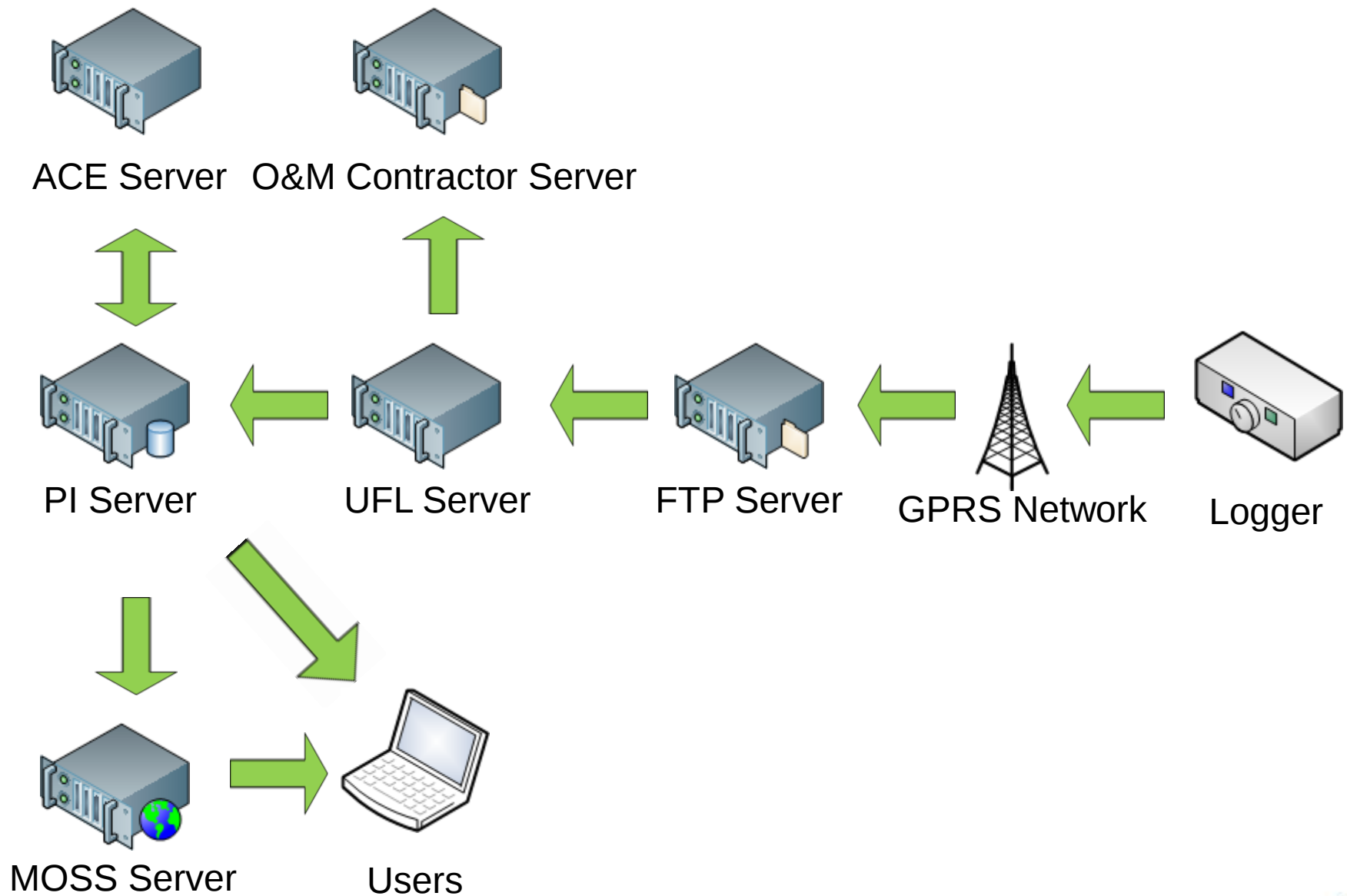
Small Rooftops Architecture

- Webdyn / Webbox

- Allows acquisition and local storage of data locally
- Calls home periodically and sends compressed files via FTP protocol
- Uses GPRS connection and allows flexible location of the assets
- Custom applications process files upon arrival on central FTP in Colombiers



Small Rooftops Data flow



To sum it all...

Colombiers

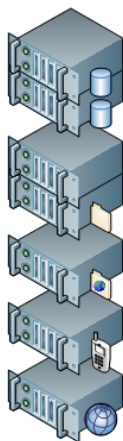
FRC-OSI-01
FRC-OSI-02

FRC-ACE-01
FRC-UFL-01

FRC-DP-01

FRC-VESTAS-01

FRC-MPI-01



Manosque



MANO-SRV-01

Ste-Tulle



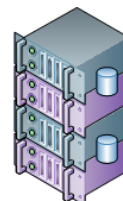
STUL-SRV-01

Chemin d'Ablis



FRA-DC-01
FRA-OSI-01
FRA-OSI-02
FRA-OSI-03

Nord Bassin de Thau



NBTH-SRV-01
NBTH-SRV-02
NBTH-SRV-03
NBTH-SRV-04

Saint Martin



Vestas VOB

Sant'Agata



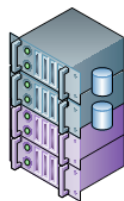
Vestas VOB

Profitis Ilias



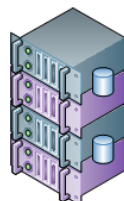
Vestas VOB

Narbonne



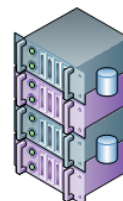
NARB-SRV-01
NARB-SRV-02
NARB-SRV-03
NARB-SRV-04

Gabardan



GABA-SRV-01
GABA-SRV-02
GABA-SRV-03
GABA-SRV-04

Bonneval



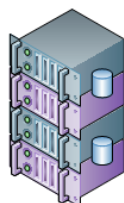
BONN-SRV-01
BONN-SRV-02
BONN-SRV-03
BONN-SRV-04

Rome



ITR-OM-01

Monte Grighine



MOGR-SRV-01
MOGR-SRV-02
MOGR-SRV-03
MOGR-SRV-04

Main Actors

- Many Corporate entities are required to work together to put that structure into place:
 - Engineering
 - Monitoring solutions Testing and Specifications
 - Feedback on Performance of the systems
 - IT Team
 - Hardware and software installation and procurement
 - Networking design
 - System Support (IT side)
 - O&M
 - Interface configuration and OCC views setup
 - Commissioning tests
 - System Support (Operations side)

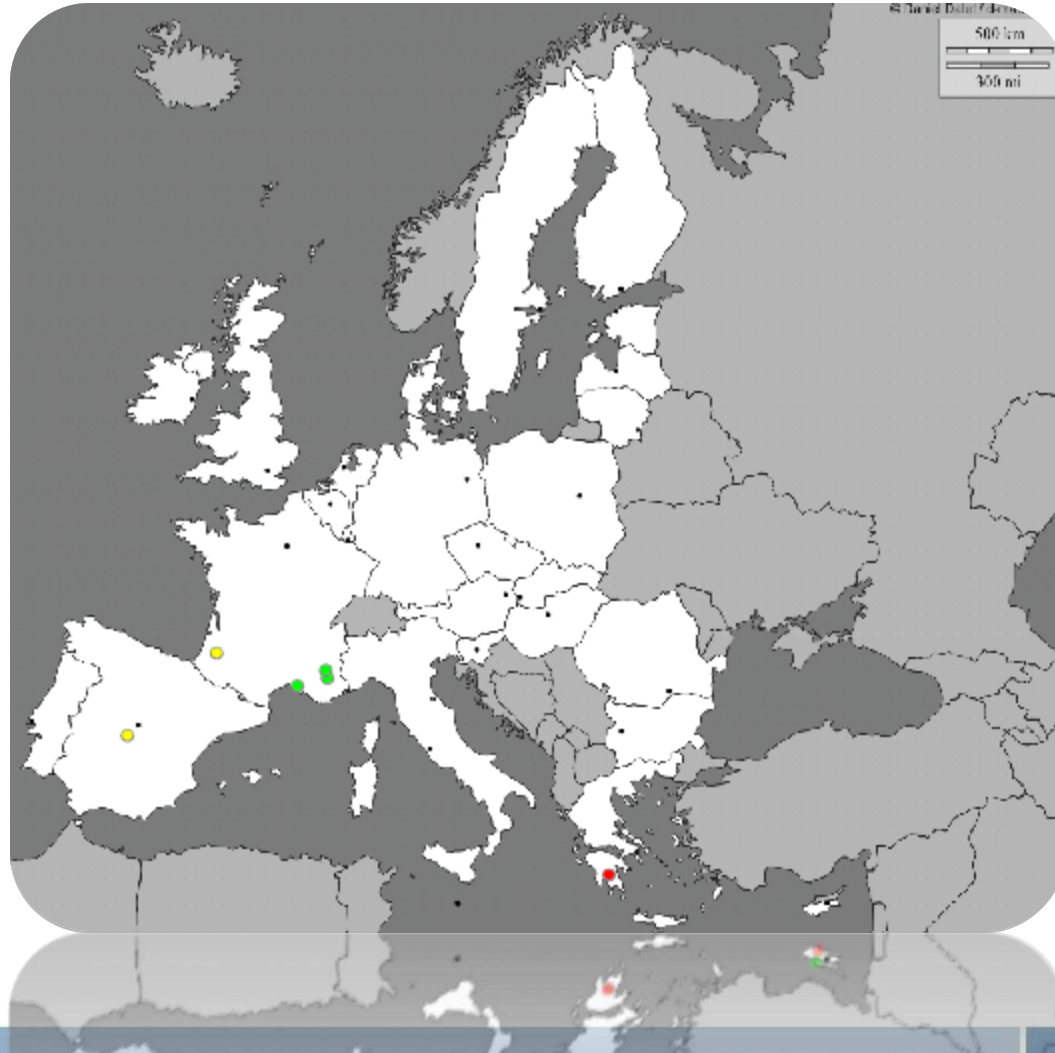


List and Description of Monitored Sites

- PI Monitored Generation assets in:

- France
- Greece
- Italy
- Spain

- For PV
- For Wind
- Overall



Some Interesting Numbers...

- More than 350 MW currently fully monitored by PI
- 5 Central (office) Servers (4 Colombiers, 1 Rome)
- 16 Site Servers
- 15 Generation Sites followed 24/7
- 75000+ PI Tags

- Monitored Assets:
- Vestas:
 - Saint-Martin des Besaces (6 MW , 1 Shared Server)
 - Sant'Agata (72 MW, 1 Shared Server)
 - Profitis Ilias (38 MW, 1 Shared Server)
 - Canton de Bonneval (24 MW, 2 Servers)

- Monitored Assets:
- Repower
 - Chemin d'ablis (52 MW, 2 Servers)
 - Nord Bassin de Thau (26 MW, 2 Servers)
- Nordex
 - Monte Grighine (98,5 MW, 2 Servers)
 - Bouin-Jade (12 MW, 1 Server)*

PV Sites

- SMA / Padcon
 - Narbonne (6,4 MW, 2 Servers)
 - Manosque (5,2 MW, 1 Server)
 - Ste-Tulle (4,1 MW, 1 Server)
- Xantrex / Kerwin
 - Gabardan (22 / 50+ MW, 2 Servers)
- SMA /Webbox
 - Distriport (1 MW, 1 Server)
- Hyseo (Webdyn)
 - 2 sites (245 kW, no Server)

- Over the next few months, installations will mostly focus on:
 - Enercon Sites
 - Xantrex / Schneider integration
 - Hyseo

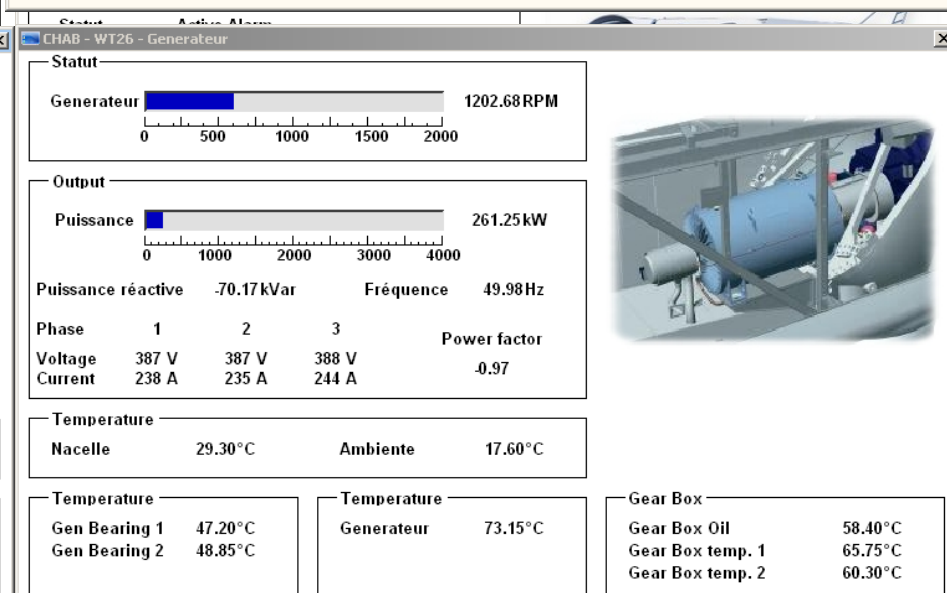
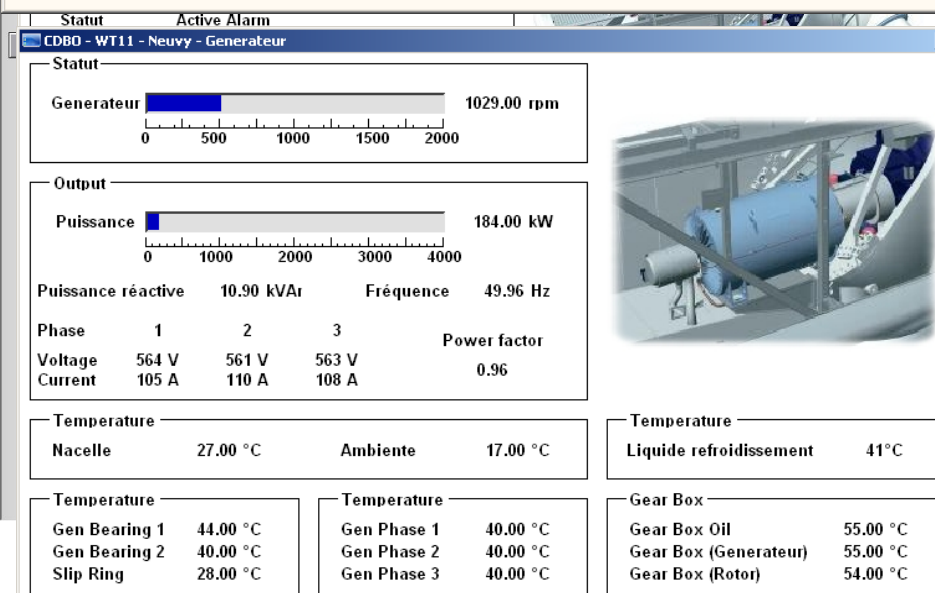
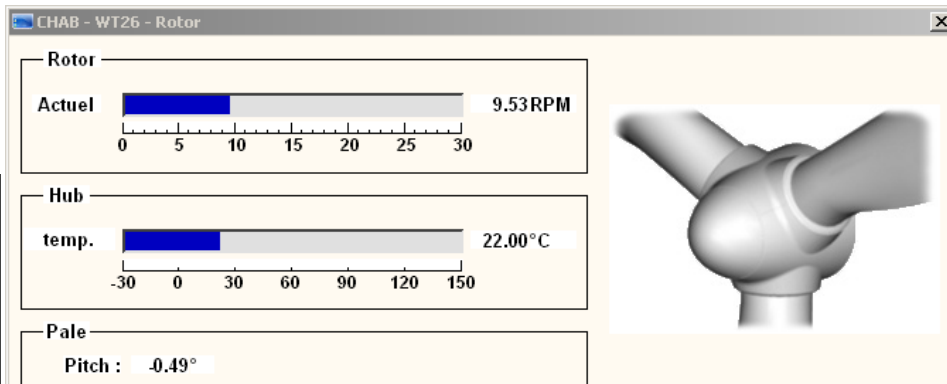
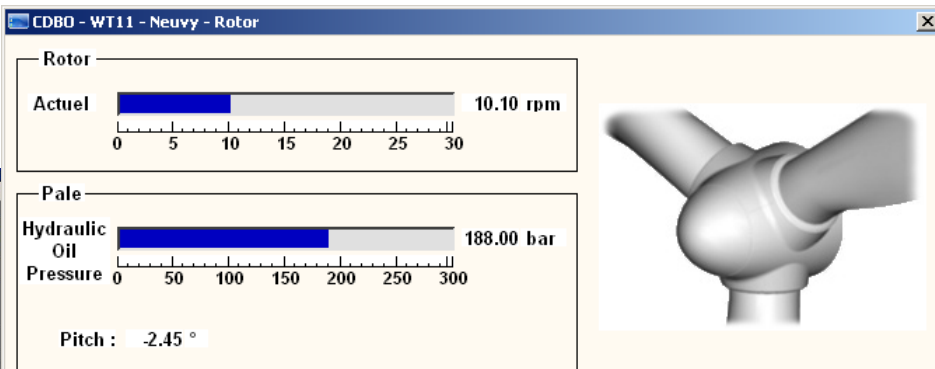


Application Examples

Applications Examples

- OCC Views
- Asset Management Automated Reports
 - Performance Ratio Tracking
 - Wind Asset Management Weekly Reports
 - Hyseo and PV Roofs Official Reports
- Reactive Power Notification Alerts
 - Automated emails to report excess reactive power using PI Notifications
- RTE Real-time information exchange project
 - IEC 61850-based information exchange with Transmission Operator

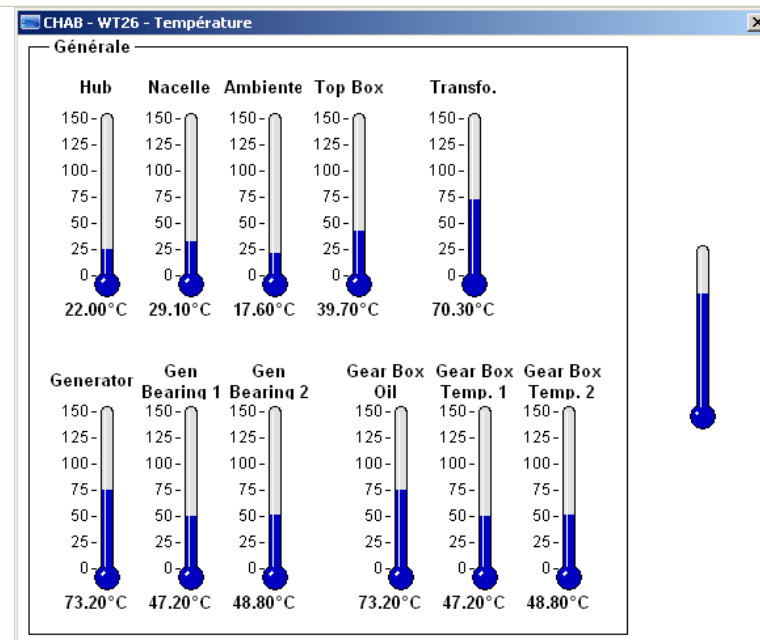
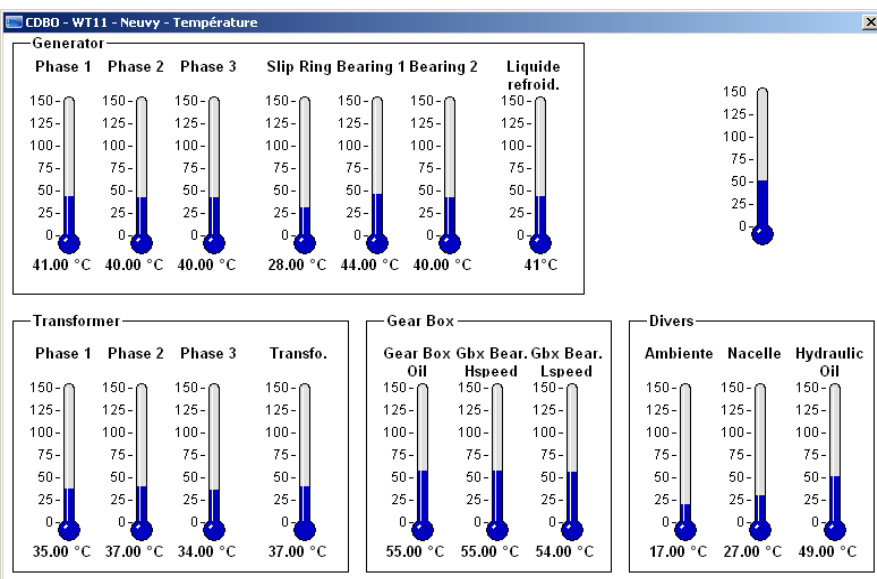
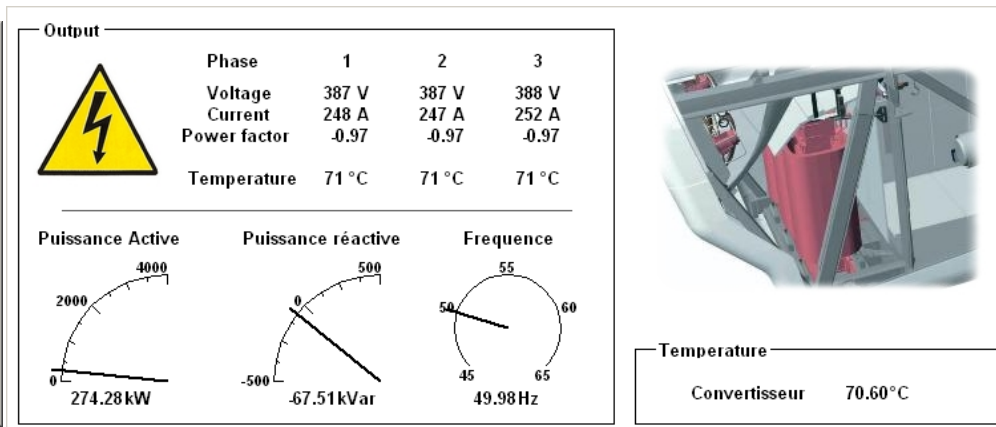
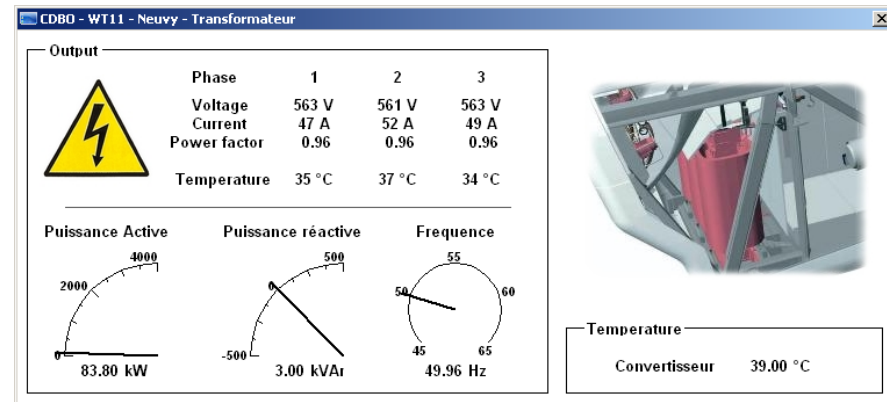
Operation Screens Examples



Operation Screens Examples

Vestas

Repower



PV Plant Overview



Date	Heure	Equ

Date	Heure	
01/12/09	13:41:51:468 (SV)	
06/11/09	13:26:08:437 (PI C)	
07/11/09	13:22:44:486 (PI C)	
08/11/09	13:30:44:486 (PI C)	
09/11/09	09:27:53:468 (SV)	
09/11/09	09:27:53:468 (SV)	
25/11/09	14:13:29:306 (SV)	
25/11/09	14:13:29:306 (SV)	

PV Plant Overview

- Inverters Parameters
- Alarm Logs

Parc Tolén de Villeneuve / GETEX 3000 - Schneider Electric

Conduite **8 Alarmes** SQL Analyseur Opérateur Système Aide Prise de Quart (FT)

01/12/2009 14:25:22 mg

Navigation

EU FR IT GR

Onduleur 1

AC power :	336.06 kW
DC power :	347.15 kW
AC current L1 :	684.56 A
AC current L2 :	684.06 A
AC current L3 :	678.31 A
DC current :	595.87 A
E_Year :	173984.27 kWh
E_Day :	159465.27 kWh
E_Month :	173984.27 kWh
Temps de fonctionnement :	4768.18 Sec
Current 1 :	S11 8.66 A
Current 2 :	S91 43.67 A
Current 3 :	S87 43.66 A
Current 4 :	S83 42.63 A
Current 5 :	S84 46.36 A
Current 6 :	S95 35.07 A
Current 7 :	S86 48.19 A
Current 8 :	S12 42.13 A
Current 9 :	S87 8.66 A
Current 10 :	S88 42.17 A
Current 11 :	S89 35.58 A
Current 12 :	S89 46.67 A

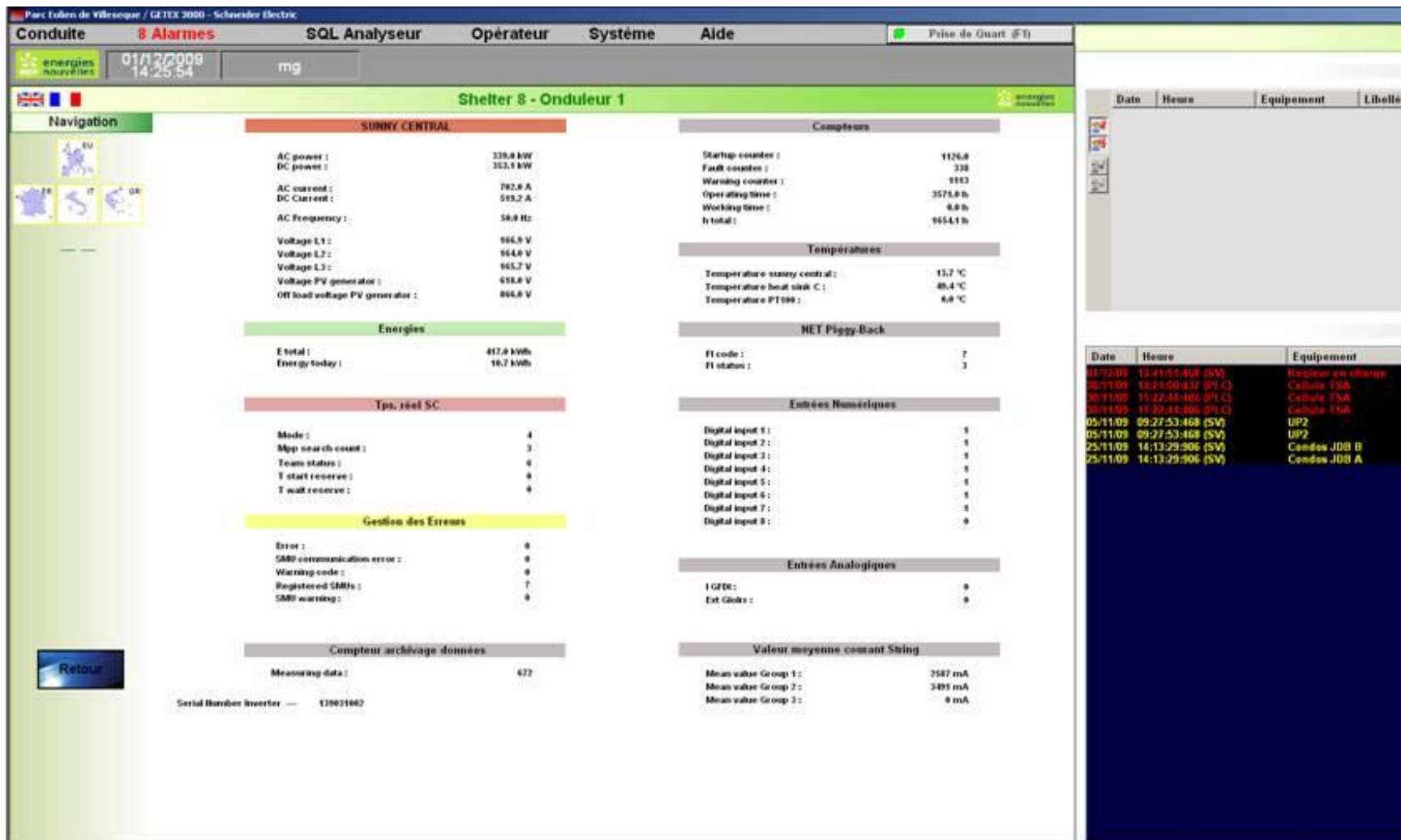
Onduleur 2

AC power :	334.34 kW
DC power :	363.41 kW
AC current L1 :	695.69 A
AC current L2 :	694.76 A
AC current L3 :	689.96 A
DC current :	435.82 A
E_Year :	176468.53 kWh
E_Day :	162933.53 kWh
E_Month :	176468.53 kWh
Temps de fonctionnement :	4668.36 Sec
Current 1 :	S22 8.66 A
Current 2 :	S13 52.66 A
Current 3 :	S14 50.66 A
Current 4 :	S15 38.31 A
Current 5 :	S16 38.57 A
Current 6 :	S17 39.28 A
Current 7 :	S18 39.48 A
Current 8 :	S23 45.95 A
Current 9 :	8.66 A
Current 10 :	S19 8.66 A
Current 11 :	S20 8.66 A
Current 12 :	S24 55.11 A

Retour

Date	Heure	Equipement	Libellé
01/12/09	13:41:51:468 (SV)	Régulateur en charge	Alarme présente
04/11/09	15:21:50:837 (PI-C)	Cellule TSA	Alarme présente
05/11/09	15:22:34:466 (PI-C)	Cellule TSA	Alarme présente
05/11/09	15:22:34:466 (PI-C)	Cellule TSA	Alarme présente
05/11/09	09:27:53:468 (SV)	UP2	Alarme présente
05/11/09	09:27:53:468 (SV)	UP2	Alarme présente
25/11/09	14:13:29:306 (SV)	Condens JD8 B	Alarme présente
25/11/09	14:13:29:306 (SV)	Condens JD8 A	Alarme présente

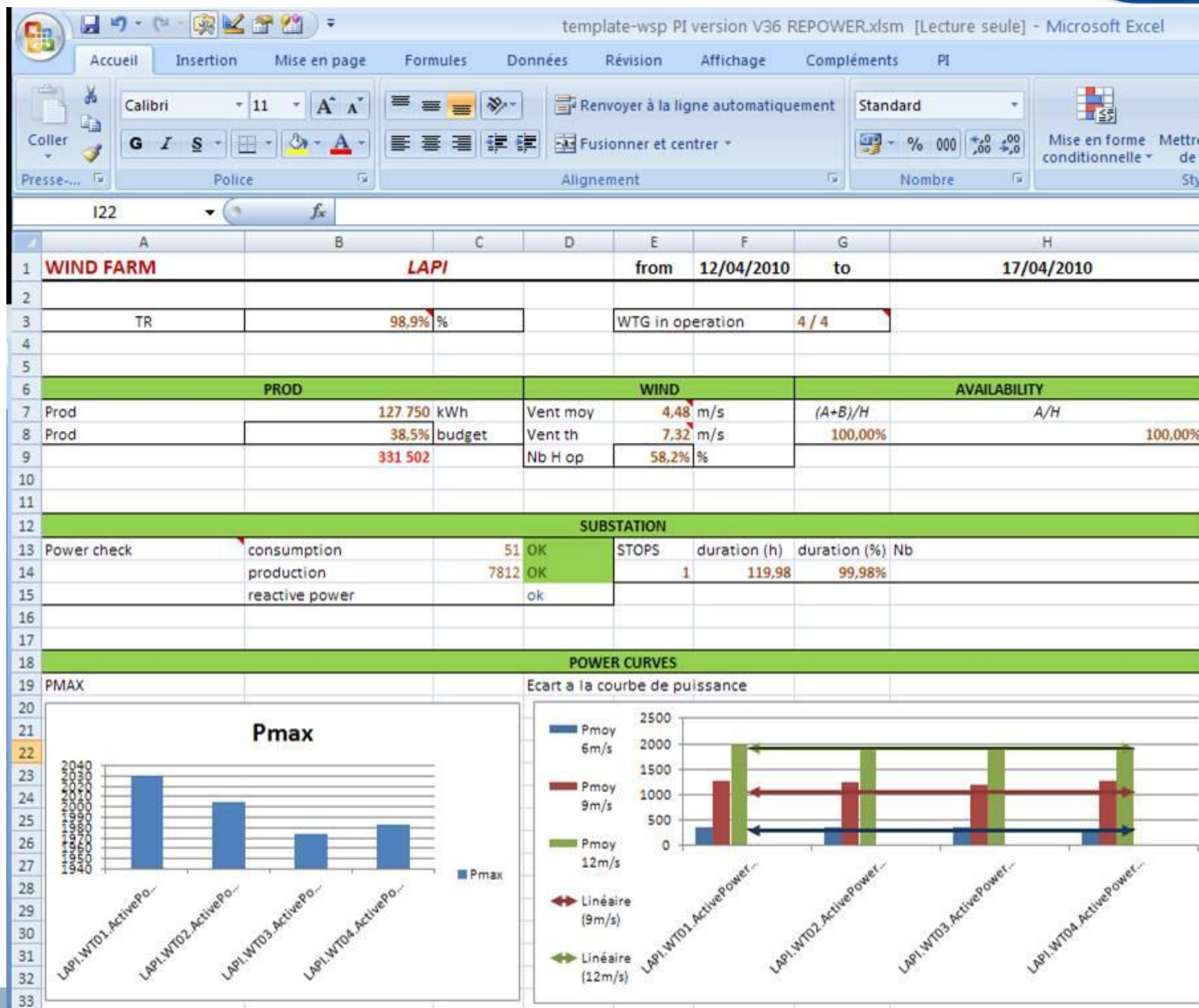
PV Plant Overview



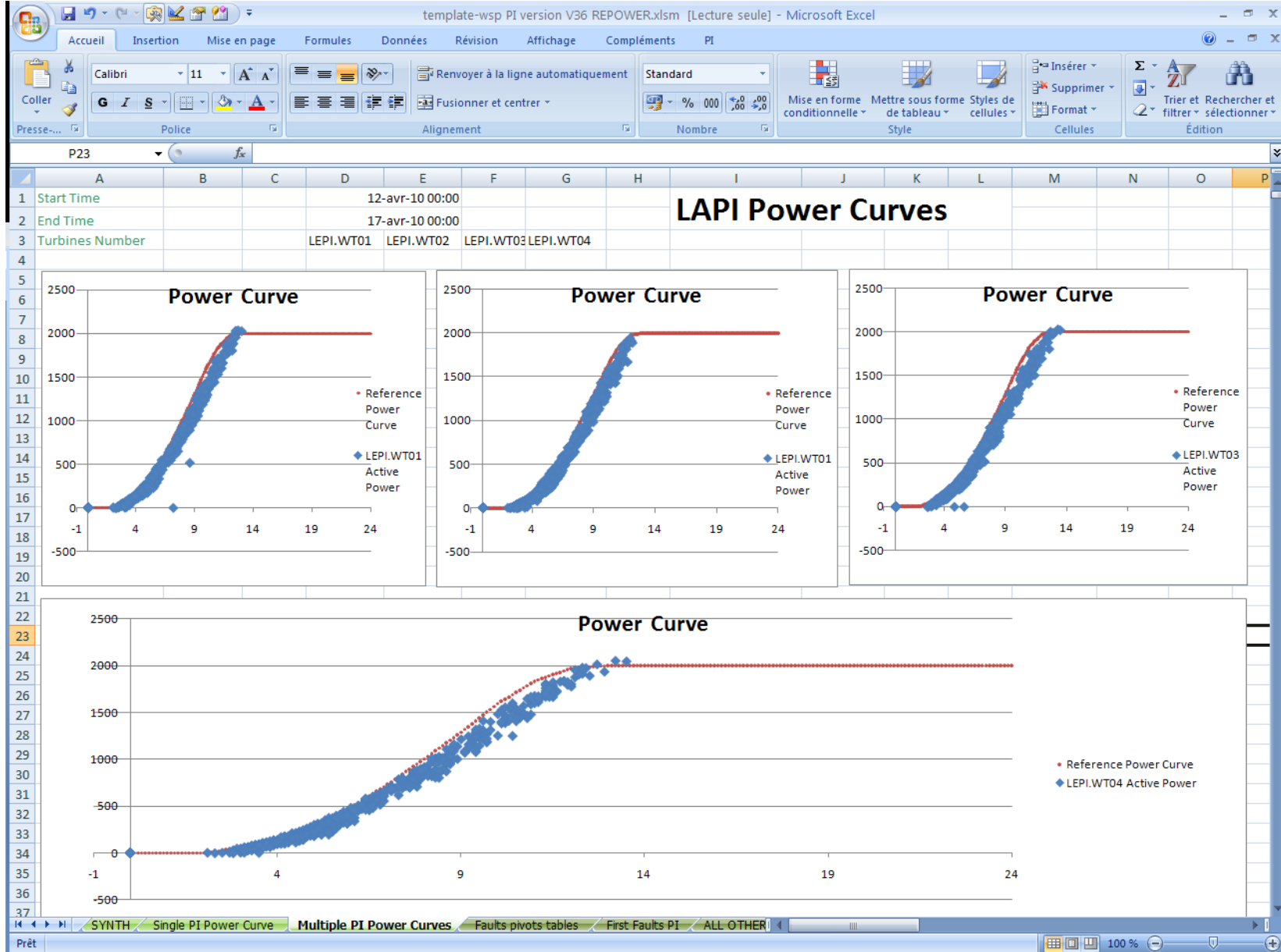
Substation Monitoring



Automated Asset Wind Weekly Report

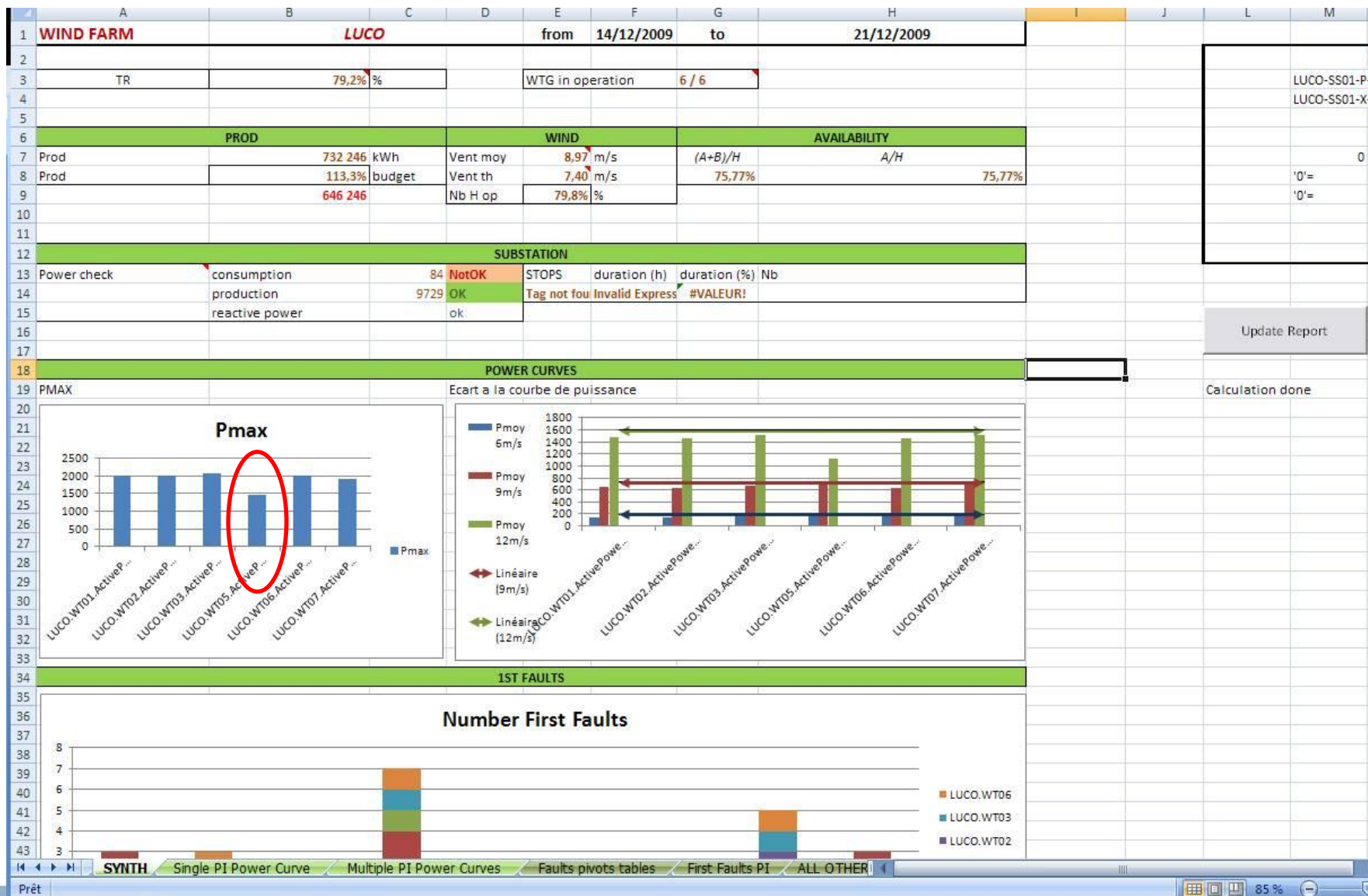


Automated Asset Power Curve Analysis



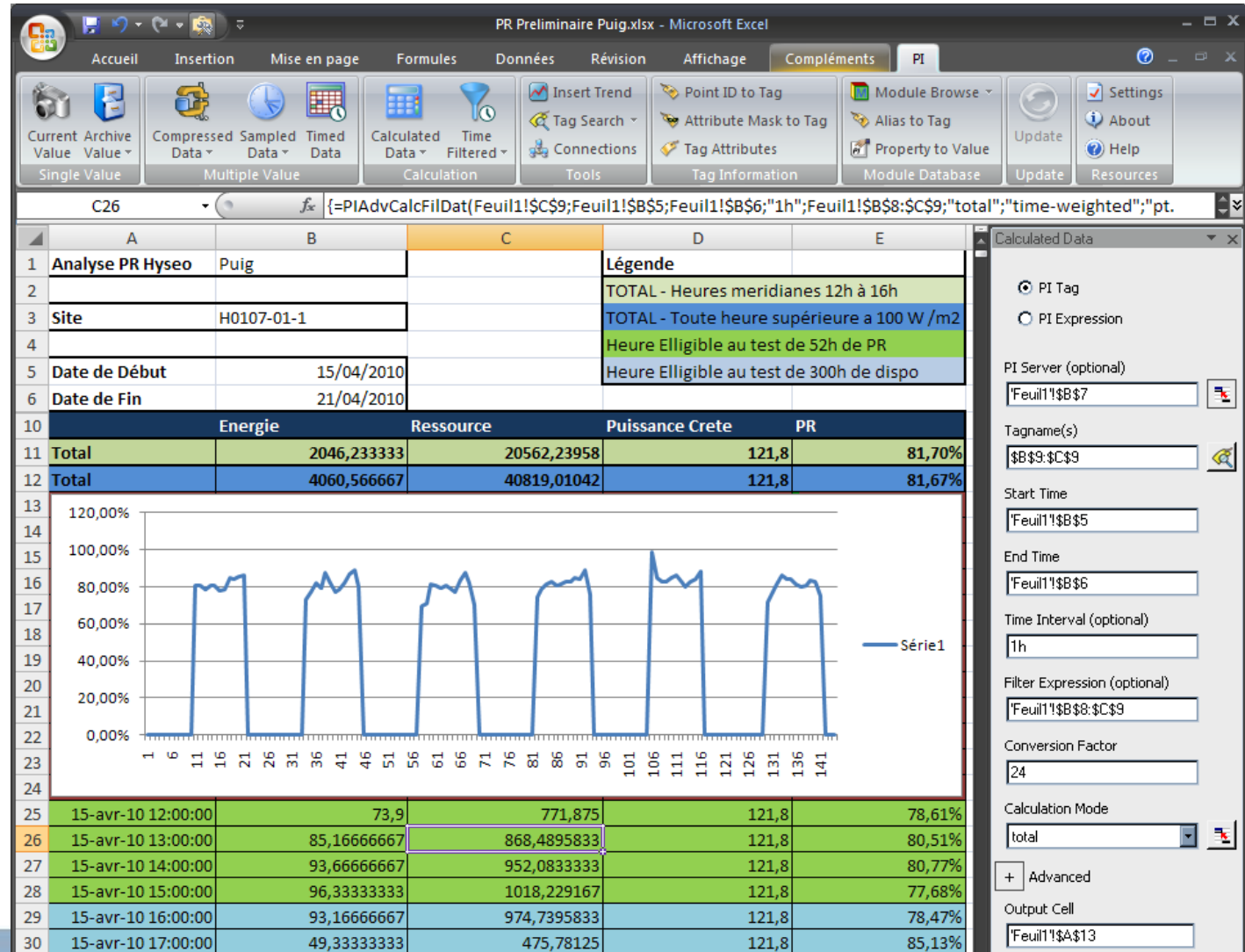
Automated Asset Weekly Report

- Identification of a curtailed turbine



Asset Management

- Daily Capacity Factor
- Daily Performance Ratio



Asset Management

- Automated bill generation
 - One single cell triggers the generation of the final bill that gets sent to the utility

The screenshot displays a Microsoft Excel spreadsheet with two main sections. The left section is a data table with columns A through E, and the right section is a detailed bill calculation.

Data Table (Left):

1	A	B	C	D	E
2	MOIS D				
3					
4					
5					
6	PARCS				
7	JADE				
8	OUPIA				
9	CONQUE				
10	LOU PAOU [Servières]				
11	LUC SUR ORBIEU				
12	FOND DE LA PLAINE				
13	VILLESEQUE 1				
14	VILLESEQUE 2				
15	VILLESEQUE 3				
16	VILLESEQUE 4				
17	SALLES CURAN				
18	FIENNES				
19	SAUVETERRE				
20					
21					
22	a/c du 01/01/2				
23	CHEMIN D'ABLIS				
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52					

Bill Calculation (Right):

Site de production : COTE DE JADE Adresse du site : route des Polders du Dain 85230 BOUIN

Données contractuelles

Puissance active maximale de livraison	11 975 kWé
Indice L	1,10081 a/c du 01/11/2008

Rémunération

Détail du calcul selon justificatif joint

Coût moyen global	11,183 c€/kWh
Prix	9,350 c€/kWh
Energie active fournie	1 388 520 kWh
Montant	129 826,59 €

Rémunération totale

Rémunération du contrat d'achat HT	129 826,59 €
TVA (19.6 %)	25 448,01 €
Total TTC	155 272,60 €

Merci d'établir votre règlement par virement :

RIB	Code Banque	Code Guichet	Numéro de compte	Clé RIB
Crédit du Nord	30076	02918	10099200200	31

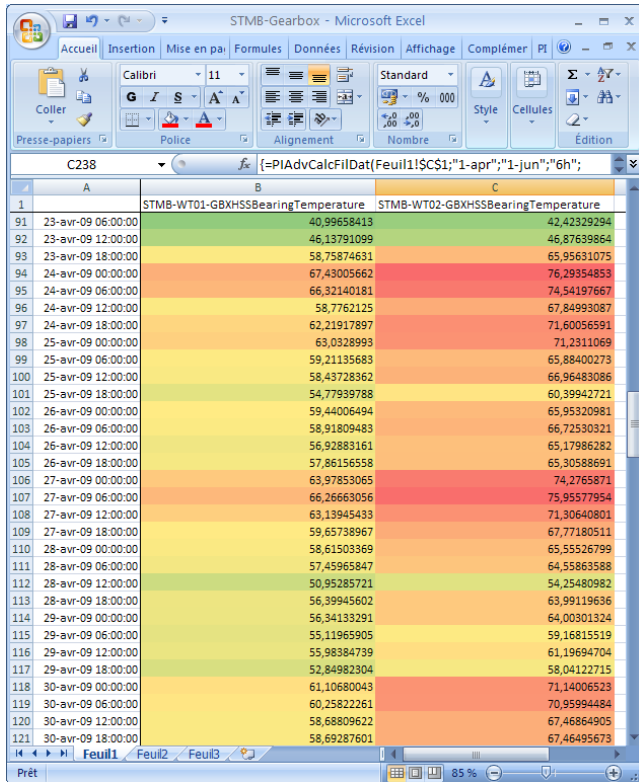
Wind Turbine performance feedback and diagnostics

- On May 27th 2009, we had a gearbox failure on a turbine
- The replacement of the gearbox was already planned by the manufacturer and parts were already provisioned
- The result was 230 hours of downtime.
- On March 25th 2008, an unplanned replacement occurred
- The result was 56 days of downtime.

Wind Turbine performance feedback and diagnostics

- By comparing the average gearbox temperature when the turbine was operating during the previous weeks, with the ones following the replacement, there were indicators that something was wrong.

Before

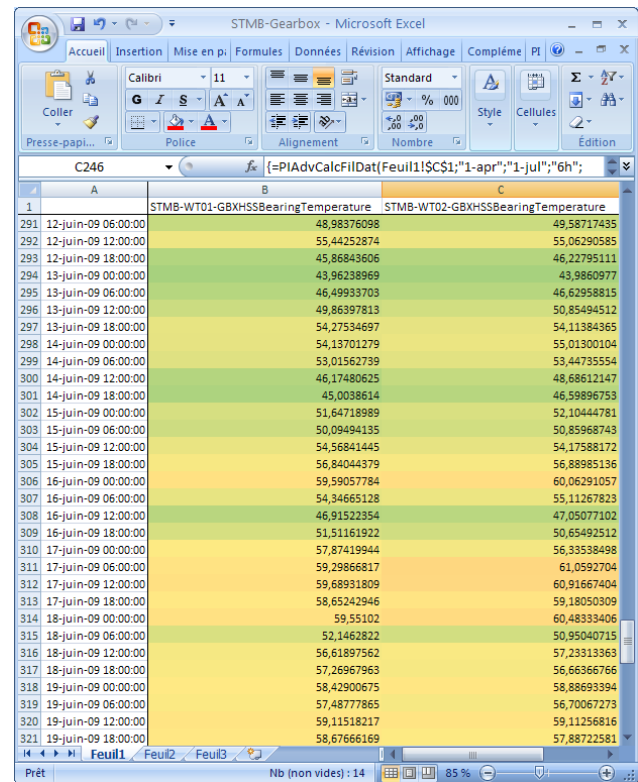


STMB-Gearbox - Microsoft Excel

Formule: $\{=PIAdvCalcFilDat(Feuil1!C1;"1-apr";"1-jun";"6h");$

	A	B	C
		STMB-WT01-GBXHSSBearingTemperature	STMB-WT02-GBXHSSBearingTemperature
91	23-avr-09 06:00:00	40,99658413	42,42329294
92	23-avr-09 12:00:00	46,13791099	46,87639864
93	23-avr-09 18:00:00	58,75874631	65,95631075
94	24-avr-09 00:00:00	67,43005662	76,29354853
95	24-avr-09 06:00:00	66,32140181	74,54197667
96	24-avr-09 12:00:00	58,7762125	67,84993087
97	24-avr-09 18:00:00	62,21917897	71,60056591
98	25-avr-09 00:00:00	63,0328993	71,2311069
99	25-avr-09 06:00:00	59,21135683	65,88400273
100	25-avr-09 12:00:00	58,43728362	66,96483086
101	25-avr-09 18:00:00	54,77939788	60,39942721
102	26-avr-09 00:00:00	59,44006494	65,95320981
103	26-avr-09 06:00:00	58,91809483	66,72530321
104	26-avr-09 12:00:00	56,92883161	65,1786282
105	26-avr-09 18:00:00	57,86156558	65,30588691
106	27-avr-09 00:00:00	63,97853065	74,2765871
107	27-avr-09 06:00:00	66,26663056	75,95577954
108	27-avr-09 12:00:00	63,13945433	71,30640801
109	27-avr-09 18:00:00	59,65738967	67,77180511
110	28-avr-09 00:00:00	58,61503369	65,55526799
111	28-avr-09 06:00:00	57,45965847	64,55863588
112	28-avr-09 12:00:00	50,95285721	54,25480982
113	28-avr-09 18:00:00	56,39945602	63,99119636
114	29-avr-09 00:00:00	56,34133291	64,00301324
115	29-avr-09 06:00:00	55,11965905	59,16815519
116	29-avr-09 12:00:00	55,98384739	61,19694704
117	29-avr-09 18:00:00	52,84982304	58,04122715
118	30-avr-09 00:00:00	61,10680043	71,14006523
119	30-avr-09 06:00:00	60,25822261	70,95994484
120	30-avr-09 12:00:00	58,68809622	67,46864905
121	30-avr-09 18:00:00	58,69287601	67,46495673

After



STMB-Gearbox - Microsoft Excel

Formule: $\{=PIAdvCalcFilDat(Feuil1!C1;"1-apr";"1-jul";"6h");$

	A	B	C
		STMB-WT01-GBXHSSBearingTemperature	STMB-WT02-GBXHSSBearingTemperature
291	12-juin-09 06:00:00	48,98376098	49,38717435
292	12-juin-09 12:00:00	55,44252874	55,06290585
293	12-juin-09 18:00:00	45,86843606	46,22795111
294	13-juin-09 00:00:00	43,96238969	43,9860977
295	13-juin-09 06:00:00	46,49933703	46,62958815
296	13-juin-09 12:00:00	49,86397813	50,85494512
297	13-juin-09 18:00:00	54,27534697	54,11384365
298	14-juin-09 00:00:00	54,13701279	55,03001004
299	14-juin-09 06:00:00	53,01562739	53,44735554
300	14-juin-09 12:00:00	46,17480625	48,68612147
301	14-juin-09 18:00:00	45,0038614	46,59896753
302	15-juin-09 00:00:00	51,64718989	52,10444781
303	15-juin-09 06:00:00	50,09494135	50,85968743
304	15-juin-09 12:00:00	54,56841445	54,17588172
305	15-juin-09 18:00:00	56,84044379	56,88951536
306	16-juin-09 00:00:00	59,59057784	60,06291057
307	16-juin-09 06:00:00	54,34665128	55,11267823
308	16-juin-09 12:00:00	46,91522354	47,05077102
309	16-juin-09 18:00:00	51,51161922	50,65492512
310	17-juin-09 00:00:00	57,87419944	56,33538498
311	17-juin-09 06:00:00	59,29868817	61,05927074
312	17-juin-09 12:00:00	59,68931809	60,91667404
313	17-juin-09 18:00:00	58,65242946	59,18050309
314	18-juin-09 00:00:00	59,55102	60,48333406
315	18-juin-09 06:00:00	52,1462822	50,95040715
316	18-juin-09 12:00:00	56,61897562	57,23313363
317	18-juin-09 18:00:00	57,26967963	56,66366766
318	19-juin-09 00:00:00	58,42900675	58,88693394
319	19-juin-09 06:00:00	57,48777865	56,70067273
320	19-juin-09 12:00:00	59,11518217	59,11256816
321	19-juin-09 18:00:00	58,67666169	57,88722581

Moving this to another plant with the same turbines

- 5 Gearboxes have already been changed over the last year (4 planned and 1 unplanned for a total of 52 turbine-days of downtime).
- Which ones should be next?

- Each column is a turbine
- Each row is a 6 hour average
- Temperature is proportional to the color, red being the hottest

Peril-GBAO - Microsoft Excel															
Accueil Insertion Mise en page Formules Données Révision Affichage Compléments Pi															
Coller		Calibri 11		Standard		Mise en forme conditionnelle		Insérer		Supprimer		Rechercher et sélectionner			
Presse-papiers		Police		Alignement		Nombre		Mettre sous forme de tableau		Format		Filtrer et sélectionner			
C705								Style		Cellules		Edition			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
		'PRIL-WT0-Q	'PRIL-WT0-Op	'PRIL-WT03	'PRIL-WT04	'PRIL-WT05	'PRIL-WT06	'PRIL-WT07	'PRIL-WT08	'PRIL-WT09	'PRIL-WT10	'PRIL-WT11	'PRIL-WT12	'PRIL-WT13	'PRIL-WT14-G
		PRIL-WT01-GE	PRIL-WT02-GB	PRIL-WT03-GE	PRIL-WT04-GE	PRIL-WT05-GE	PRIL-WT06-GE	PRIL-WT07-GE	PRIL-WT08-GE	PRIL-WT09-GE	PRIL-WT10-GE	PRIL-WT11-GE	PRIL-WT12-GE	PRIL-WT13-GE	PRIL-WT14-G
661	12-sept-09 12:00:00	53.33007541	52.69366488	53.1574251	51.0455976	53.8230413	54.1992879	54.1514812	53.946685	52.8009427	56.6743287	53.2503483	53.0569525	52.888952	53.9482536
662	12-sept-09 18:00:00	48.32085818	49.2967441	50.7749152	47.89984	50.4656959	50.623208	50.639744	49.2321564	48.4951035	53.1017575	50.8059524	49.2044159	48.741809	52.8014349
663	13-sept-09 00:00:00	52.88282846	52.84321849	53.5923754	50.8083038	52.603537	52.4554228	52.058487	51.1247782	49.6311395	51.6898998	52.6078528	51.1509046	51.6613871	48.9261448
664	13-sept-09 06:00:00	50.4933058	50.883349	50.3278187	51.849507	50.5632044	47.8678955	45.280145	44.4020076	48.907478	49.7567165	48.880974	49.3485424	42.2658581	52.658581
665	13-sept-09 12:00:00	53.97583565	52.984203	54.0564698	51.6918394	50.9431055	48.847637	52.0078933	52.632118	48.892632	51.6855161	51.7020489	50.0503826	52.0871557	52.658581
666	13-sept-09 18:00:00	55.09409389	53.7898612	51.062877	52.1306014	56.2648754	54.4295825	53.797343	52.031955	50.1028148	52.5616071	53.6586525	52.724083	51.7084028	49.2462064
667	14-sept-09 00:00:00	60.24381287	61.34955098	66.3745119	59.258934	62.2458944	63.5697611	62.8267433	58.1919506	61.616238	61.9629164	59.028723	57.984492	58.066738	56.5686357
668	14-sept-09 06:00:00	60.81090217	60.2618866	67.0630366	62.042882	62.4868263	63.5697611	63.140071	58.4593975	59.0337653	61.4709005	59.1085738	58.145673	58.3346729	55.965431
669	14-sept-09 12:00:00	56.42706131	58.4536943	49.1597142	48.9109734	50.4808684	48.849455	50.458442	50.5408903	49.651087	52.8446263	47.4561472	47.6402365	47.1243528	51.071562
670	14-sept-09 18:00:00	56.81956569	56.7014946	59.3673529	58.4038284	59.4417048	57.204358	55.315146	56.5748032	53.7798062	58.9975356	54.512282	53.012191	53.8242943	54.0096821
671	15-sept-09 00:00:00	52.40084752	53.7052097	55.0608431	52.9368063	53.4723253	47.5015651	54.171836	52.8620593	50.1254474	56.568796	52.0583596	51.0971013	51.0506768	48.2453689
672	15-sept-09 06:00:00	51.7770156	55.08503138	56.127067	52.6785713	58.5879518	56.492802	58	56.492802	58.5879518	56.492802	58.5879518	56.492802	58.5879518	56.492802
673	15-sept-09 12:00:00	52.7505232	53.2750462	54.219427	53.8774474	57.0126295	56.1999688	56.7539432	55.698729	55.6178617	56.2613857	54.1352672	54.312227	53.7397387	54.6932755
674	15-sept-09 18:00:00	49.15935105	49.0867067	50.203126	48.9807724	50.5127451	49.1858523	50.595983	52.6614639	47.3239656	46.7971567	47.8477446	49.4207449		
675	16-sept-09 00:00:00	53.34170534	54.1997238	55.1042925	52.7170576	56.5105533	55.965494	59.928388	54.5042833	52.4562229	56.7463077	52.8630558	50.142265	51.8670754	51.261682
676	16-sept-09 06:00:00	54.84252705	55.88835435	57.557469	55.8008291	56.3164326	58.7955958	57.2955589	55.7833634	52.426167	57.714825	55.144479	54.7983836	54.7957634	54.0632574
677	16-sept-09 12:00:00	51.78974257	52.99021879	53.3300766	55.0568985	52.8802746	50.5510735	53.7121277	52.4219132	52.6953334	54.6958793	51.1298829	51.1498135	51.2799348	52.2510493
678	16-sept-09 18:00:00	47.1566296	50.9958347	51.2684422	51.1166383	52.8189239	51.7327325	51.1687135	49.8948011	50.1390116	51.5467487	48.3099285	48.148409	48.4755313	48.3519995
679	17-sept-09 00:00:00	52.0574502	52.098614	53.8471491	51.7050649	55.9883527	52.1961628	54.1726905	52.2861408	50.5027674	54.3974666	51.5266179	51.1068435	51.0799479	50.5008136
680	17-sept-09 06:00:00	51.93097431	51.87555635	51.4420873	49.5873726	52.2594415	50.6939557	51.8771044	51.5058714	53.9574954	53.5614737	50.3286727	47.7088419	47.6776903	52.8415405
681	17-sept-09 12:00:00	50.51304665	51.4299111	51.6572743	51.54047	53.704722	53.1823463	53.204208	50.0781392	53.9389135	55.6654751	47.8150661	50.066706	49.696042	52.4797881
682	17-sept-09 18:00:00	54.32051204	53.71342977	54.226147	52.0485189	55.7584909	47.5279661	54.5956334	53.0187822	51.3505177	54.415116	51.650381	52.048119	54.7133964	52.5265604
683	18-sept-09 00:00:00	46.6612023	48.0216187	48.4166272	54.5027723	49.2154584	47.5479632	47.20144	46.3563327	47.227689	48.0551862	49.248179	48.9655528	45.008884	
684	18-sept-09 06:00:00	43.9529682	44.73429501	45.0803383	43.8195569	45.3806459	44.5462359	45.253905	43.8744669	42.527739	46.7600346	42.081726	41.8009663	41.7660056	43.7463342
685	18-sept-09 12:00:00	49.21407187	49.02700034	49.0573085	50.9875089	52.16076	50.9830593	49.245504	49.5702689	52.012796	54.8445543	53.1386424	45.8542038	49.9993091	52.700928
686	18-sept-09 18:00:00	46.67278162	49.58095616	49.8736469	49.573992	52.2898502	51.565887	48.6865364	47.9211098	48.5970398	52.4970126	48.3265307	47.3381151	49.3782956	
687	19-sept-09 00:00:00	42.7144973	48.4887595	48.8174745	44.0533138	45.4205086	45.1134343	45.5082374	43.1454187	43.3260375	45.5487086	42.8117113	42.9882343	42.107593	51.9125472
688	19-sept-09 06:00:00	49.24566815	51.67191347	51.871489	50.9837801	53.2746433	53.5956393	48.747887	48.0971131	46.6418815	49.9989713	52.8251507	51.3393923	51.5573184	47.2019031
689	19-sept-09 12:00:00	59.59380025	60.0868669	60.163886	62.927443	63.2364683	66.6425254	64.6784124	60.6873467	60.8924703	63.6093931	62.024487	59.4336342	59.5716747	58.254781
690	19-sept-09 18:00:00	54.99356603	56.0601787	55.4667612	52.4398542	55.7993912	55.2109423	54.5747281	51.9262019	51.3232669	54.5344559	53.491721	54.016512	54.3645754	50.3252765
691	20-sept-09 00:00:00	57.31838002	57.77559151	57.2793152	57.6456495	61.0602912	60.6291627	61.2690317	57.1299898	57.477373	61.1267429	60.4603428	59.0632698	58.5085441	56.964783
692	20-sept-09 06:00:00	61.01937104	65.34493334	73.2417651	67.8321633	66.6338113	71.9537788	69.2331434	62.874267	62.87417	62.068489	63.5122495	62.5090922	62.1694141	60.370753
693	20-sept-09 12:00:00	62.1050333	62.47336729	64.3932619	63.912826	63.912826	63.912826	63.912826	63.912826	63.912826	63.912826	63.912826	63.912826	63.912826	63.912826
694	20-sept-09 18:00:00	56.6993801	72.42931234	76.33604418	73.715831	71.307193	77.1822944	75.490769	68.719596	67.918272	72.794676	67.8729763	65.508381	64.412784	66.505864
695	21-sept-09 00:00:00	64.53187035	74.42640341	76.70805738	75.585881	71.4307134	70.7707809	75.559155	65.983688	68.9941054	72.8190162	67.0874041	65.6946151	66.1024593	67.9127274
696	21-sept-09 06:00:00	63.8149495	71.74581738	74.2589594	73.4544889	67.8885113	70.0861469	68.144777	62.5410274	62.5541155	67.2251824	66.4897781	65.296524	65.03079	60.819617
697	21-sept-09 12:00:00	65.1752618	72.7121679	75.84417309	72.189835	76.436496	74.3666486	70.5015893	67.1704324	73.5410079	68.8070129	67.3953076	67.4654585	64.966323	
698	21-sept-09 18:00:00	62.9764806	70.66624183	74.00771383	69.477027	71.0051687	70.0861469	68.144777	62.5410274	62.5541155	67.2251824	66.4897781	65.296524	65.03079	60.819617
699	22-sept-09 00:00:00	58.6812485	69.79339594	62.0423906	58.350004	61.2748878	61.467565	61.8011207	58.377471	58.313682	62.0872197	58.9090485	58.597373	56.204698	56.2153414
700	22-sept-09 06:00:00	63.2892496	74.61618944	75.3355152	68.417939	67.6680977	73.993719	73.2401134	64.2611887	65.3299181	69.76106	65.386312	64.669648	64.7021781	63.064799
701	22-sept-09 12:00:00	64.1060327	69.9753001	71.4729102	70.9811455	70.027949	76.7980536	74.5662104	68.912466	68.1499407	72.6493131	66.22068	64.668759	64.750566	67.9137345

A Closer View...

PRIL-Gearbox - Microsoft Excel

Accueil Insertion Mise en page Formules Données Révision Affichage Compléments PI

Calibri 11 Standard

Coller Presse-papiers Police Alignement Nombre Style

Mise en forme conditionnelle Mettre sous forme de tableau Styles de cellules Insérer Supprimer Format Trier et Rechercher sélectionner Édition

C705

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		PRIL-WT01-Op	PRIL-WT02-Op	PRIL-WT03-Op	PRIL-WT04-Op	PRIL-WT05-Op	PRIL-WT06-Op	PRIL-WT07-Op	PRIL-WT08-Op	PRIL-WT09-Op	PRIL-WT10-Op	PRIL-WT11-Op	PRIL-WT12-Op	PRIL-WT13-Op	PRIL-WT14-Op
2		PRIL-WT01-GE PRIL-WT02-GB	PRIL-WT03-GE PRIL-WT04-GB	PRIL-WT05-GE PRIL-WT06-GB	PRIL-WT07-GE PRIL-WT08-GB	PRIL-WT09-GE PRIL-WT10-GB	PRIL-WT11-GE PRIL-WT12-GB	PRIL-WT13-GE PRIL-WT14-GB							
661	12-sept-09 12:00:00	53,33007541	52,69366498	53,1574251	51,04559976	53,8230413	54,1992879	54,1514812	53,3496685	52,8009427	56,6743287	53,2503483	53,0565925	52,988952	53,9482536
662	12-sept-09 18:00:00	48,32085381	49,29674411	50,7749152	47,89964	50,465695	50,6223028	50,6379474	49,2321564	48,4595103	53,1017575	50,9875824	49,2044159	48,8741809	52,081449
663	13-sept-09 00:00:00	52,98282846	52,84321849	53,5923754	50,8083308	54,3026337	52,4534228	52,0584987	51,1247782	49,6311393	51,6989998	52,6205928	51,8190946	51,6613871	48,9260334
664	13-sept-09 06:00:00	49,60240887	50,49330268	50,883349	50,3278187	51,849507	50,5632048	47,3679055	45,2580143	44,4020076	42,8030478	49,7567653	48,9809574	49,3945524	42,2655876
665	13-sept-09 12:00:00	52,93758656	52,9942203	54,0564698	52,6918394	55,0649918	53,9431052	53,4476637	52,0780733	52,632118	54,892632	51,6855161	51,7020489	50,5053826	52,0871557
666	13-sept-09 18:00:00	55,09480393	54,31989762	56,0128877	52,1306014	56,2648754	54,4489258	53,797343	52,0919155	50,1028148	52,5616071	53,6586525	52,724083	51,7084028	49,2942604
667	14-sept-09 00:00:00	60,24381287	61,34955099	66,3745179	59,2589344	62,2458944	63,5697611	62,8246743	58,9195806	58,6116238	61,9692614	59,028723	57,9844692	58,0446798	56,5686357
668	14-sept-09 06:00:00	60,81902917	64,26218866	67,6003636	62,0942882	62,4686263	64,5665963	63,1140071	58,4593975	58,0337853	61,4700905	59,1085738	58,1457673	58,3366279	55,5965431
669	14-sept-09 12:00:00	46,22706131	48,45369493	49,1597142	48,9109734	50,4806884	49,894542	50,4584422	50,5408903	49,6501807	52,8446263	47,4561472	47,6402365	47,1524358	51,0175162
670	14-sept-09 18:00:00	56,81956659	55,70149466	59,0637529	55,4083284	59,4417048	57,2430905	58,5315146	55,6735847	53,7798062	59,5987536	54,5122382	53,0121911	53,8242943	54,0089621
671	15-sept-09 00:00:00	52,40084752	53,79205797	55,0608431	52,9360863	53,4725325	47,5015651	54,171836	52,8620593	45,0125474	56,568796	52,0583596	51,0971013	51,5006768	42,4625369
672	15-sept-09 06:00:00	55,17770156	55,08503138	56,127067	52,6738571	56,5879518	56,492802	58,720043	56,6229242	50,8459553	59,6605924	56,0415674	53,9552053	55,0538165	48,8154028
673	15-sept-09 12:00:00	52,27055232	53,92574062	54,2419247	53,8374474	57,0726925	56,1999688	56,7539432	55,698729	55,6178617	59,2613857	54,1352672	47,314227	53,7393787	54,6932755
674	15-sept-09 18:00:00	49,15935105	49,08670677	50,2031216	48,9780724	50,5124741	49,5568062	50,7798121	49,1858523	49,0559383	52,6614639	47,3239656	46,7971567	47,8477446	49,4204749
675	16-sept-09 00:00:00	53,31470534	54,1997238	55,1042925	52,7170576	56,5105513	55,956494	55,9923838	54,5024873	52,4562229	56,7463707	52,8360558	50,142265	51,8670754	54,2167682
676	16-sept-09 06:00:00	54,84252705	55,88835435	57,5576479	55,8008291	62,3164926	58,7296583	57,2955589	55,7833634	55,4226167	57,7164825	55,144479	54,7983836	54,7957634	54,0623574
677	16-sept-09 12:00:00	51,78974257	52,99821879	53,300766	52,9560895	54,6128876	54,0551703	53,7121277	52,4219132	52,6953334	54,6958793	51,1298829	51,1498135	51,2799348	52,2510493
678	16-sept-09 18:00:00	47,71566296	50,99005347	51,2684422	51,1163583	52,8390239	51,7323725	51,1687153	49,8948011	50,1390116	51,5467847	48,3099285	48,1418409	48,4755173	48,3519995
679	17-sept-09 00:00:00	52,0574502	52,2098614	53,8471491	51,7050649	53,6988387	52,1961628	54,1726905	52,2861408	50,5027674	54,3974666	51,5261697	51,0168435	51,0799479	50,5028136
680	17-sept-09 06:00:00	51,90397441	51,37557653	51,4420873	49,587236	52,2594415	50,929557	51,8771104	51,5057814	49,3574954	53,5614737	50,3286272	49,7689419	48,9776903	52,8415405
681	17-sept-09 12:00:00	50,51304645	54,4299311	51,6527343	51,84047	53,704721	53,1822462	53,3042089	53,0781292	53,9389315	55,6654751	47,8150861	50,0466706	49,6966042	52,4379825
682	17-sept-09 18:00:00	54,32052104	53,73142977	54,2261417	52,0485193	55,7568499	53,4574621	54,5593334	53,0187822	51,3505177	54,415116	53,5163081	52,9148199	52,7413964	52,536504
683	18-sept-09 00:00:00	46,69612023	48,0216187	48,4166272	47,5402723	49,2154584	47,5273962	47,62014	46,3563327	45,2272689	48,0651582	46,0954374	45,2485179	44,9856528	45,008884
684	18-sept-09 06:00:00	43,99529682	43,74329501	45,0807393	43,8199569	45,3806459	44,5462359	45,1253905	43,8744668	42,5572793	46,7600346	42,081726	41,8006963	41,7660056	43,7463342
685	18-sept-09 12:00:00	49,21407187	49,02700034	51,0523085	50,9875089	52,160766	50,5980333	49,2452504	49,5702689	50,2712796	52,8445543	45,1336442	45,8542308	43,9599391	51,2709028
686	18-sept-09 18:00:00	46,67227812	49,5609561	49,8736489	49,5773992	52,289850	51,6655887	48,6686364	47,9211098	48,5970398	52,4970126	48,3263507	47,5803392	47,3381151	49,3782956
687	19-sept-09 00:00:00	42,77144973	44,4887589	44,8174745	44,0533138	46,4205016	45,7153463	44,5082374	43,1454187	43,3260375	46,5458706	42,3817113	42,1982343	42,107593	43,9125472
688	19-sept-09 06:00:00	49,24566815	51,6179134	51,8718499	50,9837801	54,671723	53,595393	48,8747887	49,0971131	46,6418815	49,9989713	52,8250157	51,5573184	47,2019031	
689	19-sept-09 12:00:00	59,53830025	62,8108686	66,0138386	62,927443	63,234683	66,6462254	64,6784124	60,6873467	60,8924703	63,6093931	60,2214887	59,4336342	59,5716747	58,2534781
690	19-sept-09 18:00:00	54,99305663	54,0061787	55,4686702	52,4398542	55,7993932	55,2109243	54,5747281	51,9226019	51,3236269	54,5344459	55,4931721	54,0161512	54,3645754	50,3252765
691	20-sept-09 00:00:00	57,31838002	57,7755915	63,2793112	57,6456495	61,060297	62,6482692	61,2690317	57,1299898	57,477373	61,1267429	60,4603428	59,0632698	58,5085441	55,9644783
692	20-sept-09 06:00:00	61,01903174	65,3445933	72,4417651	67,8132613	66,633383	71,9537689	69,2331434	62,8734267	62,87417	67,2068498	63,5122495	62,5090922	62,1694141	60,370753
693	20-sept-09 12:00:00	60,21050333	65,6978358	67,4336729	64,3923916	63,9128216	66,9173142	65,4509536	60,472961	60,3067777	64,807886	61,379616	60,4239303	60,6391525	58,6764069
694	20-sept-09 18:00:00	65,69938011	72,4293123	76,3360418	72,7315831	71,307193	77,1829244	75,4590769	68,719956	67,8912872	72,2794676	67,8729763	66,5508381	66,412784	66,505864
695	21-sept-09 00:00:00	64,53187035	74,4246034	76,7406807	73,5859886	71,4360134	77,707809	75,5359155	68,9563886	67,9941054	72,3190612	67,0874041	65,6946151	66,1024593	65,9712774
696	21-sept-09 06:00:00	63,8149495	71,7458173	74,2585954	68,4344689	67,458613	70,0861469	68,1447777	62,5410274	62,5541155	67,2251824	66,4897781	65,2896524	65,030739	60,819617
697	21-sept-09 12:00:00	65,71752618	71,7211267	75,8417309	72,169815	70,8835447	76,4436496	74,3669448	67,5015863	67,1704324	71,5401079	68,8071029	67,3953076	67,4654585	64,6566323
698	21-sept-09 18:00:00	62,9740711	70,7261222	75,0684077	71,3099646	71,389131	75,8106887	73,8095657	67,4880392	66,9848643	70,9200232	66,0206086	64,4854479	64,8017008	64,6996458
699	22-sept-09 00:00:00	62,30764806	70,6662418	74,0007133	69,4757027	68,2107135	73,001667	70,1385323	63,4412255	63,1974721	67,0535657	64,1465687	62,9407834	62,8259762	59,4582967
700	22-sept-09 06:00:00	58,6812845	60,7933395	64,0223906	58,3350004	61,274883	61,4676585	61,8011207	58,3877471	58,4131682	62,0872197	58,9090845	58,559773	58,3604698	56,2152414
701	22-sept-09 12:00:00	63,28924996	69,4161694	73,4535152	68,6147393	67,668097	73,7398719	71,2340114	64,2611887	65,3299181	69,76106	65,3863212	64,6969486	64,7021781	63,3064799
702	22-sept-09 18:00:00	64,1060327	69,9753700	75,4779102	70,9831245	70,8207677	76,9303356	74,2667104	68,0794262	68,1999402	72,6489131	66,220968	64,6689759	64,7505666	67,3913245
703															
704		Changed	Original	Original	Original	Changed	Original	Original	Changed	Changed	Changed	Original	Original	Original	Original

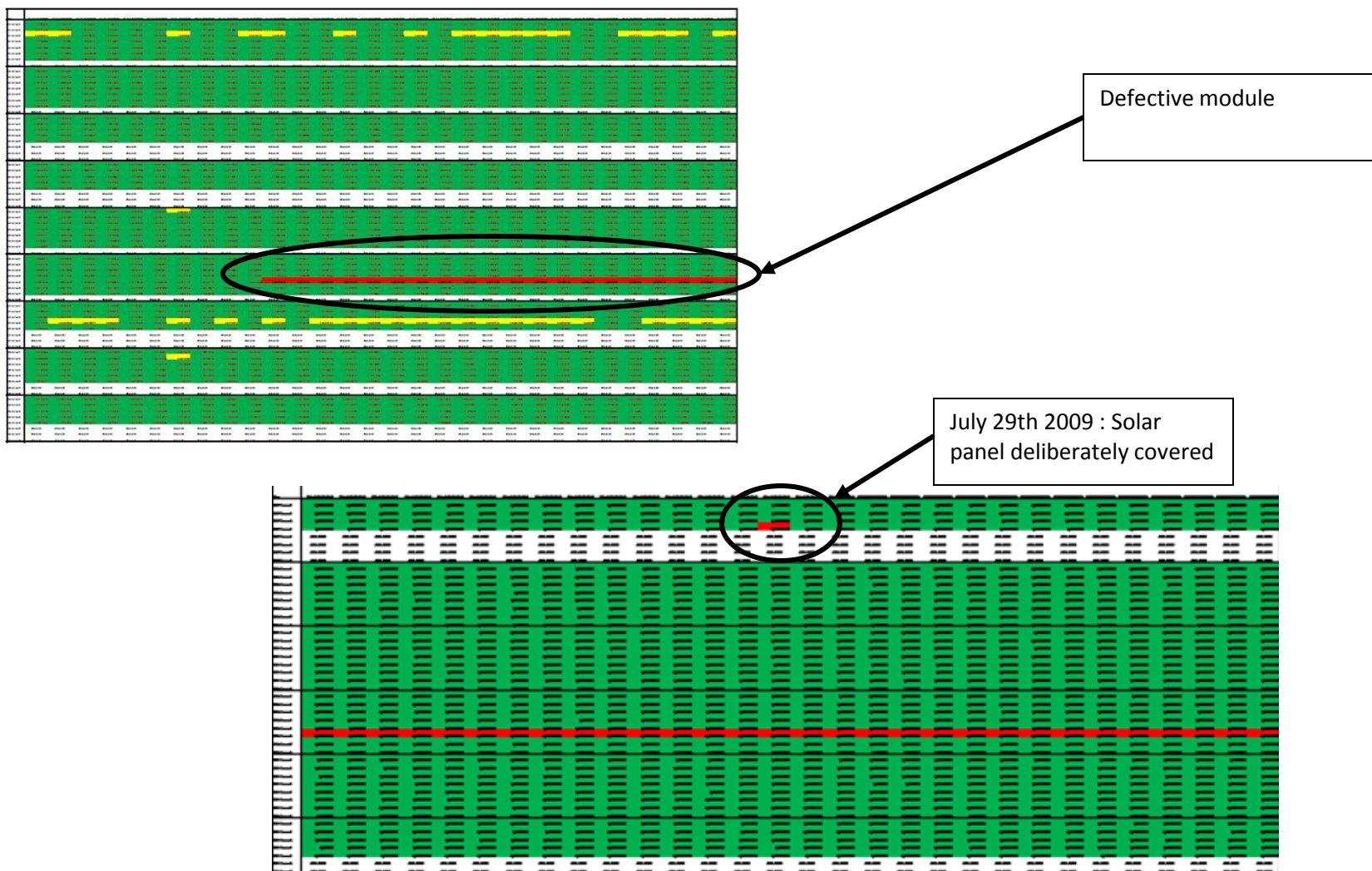
Feuil1 Feuil2 Feuil3

Prêt

85%

PV Diagnostics using PI

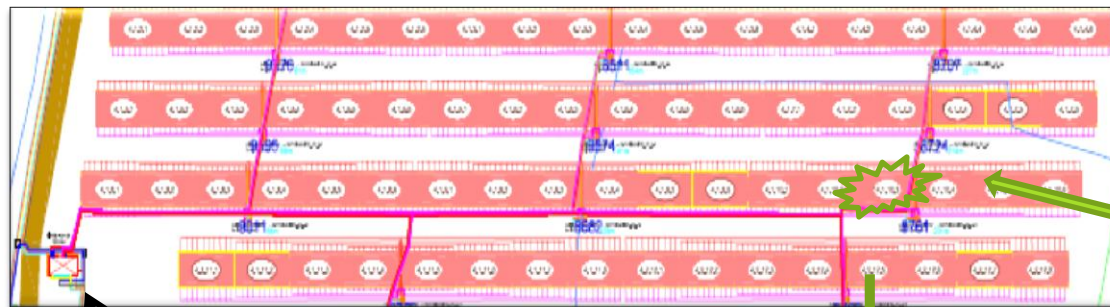
- Remote identifications of defective strings



PV Diagnostics using PI

EXAMPLE : NARBONNE-SHELTER 4 (2)

RESULT :



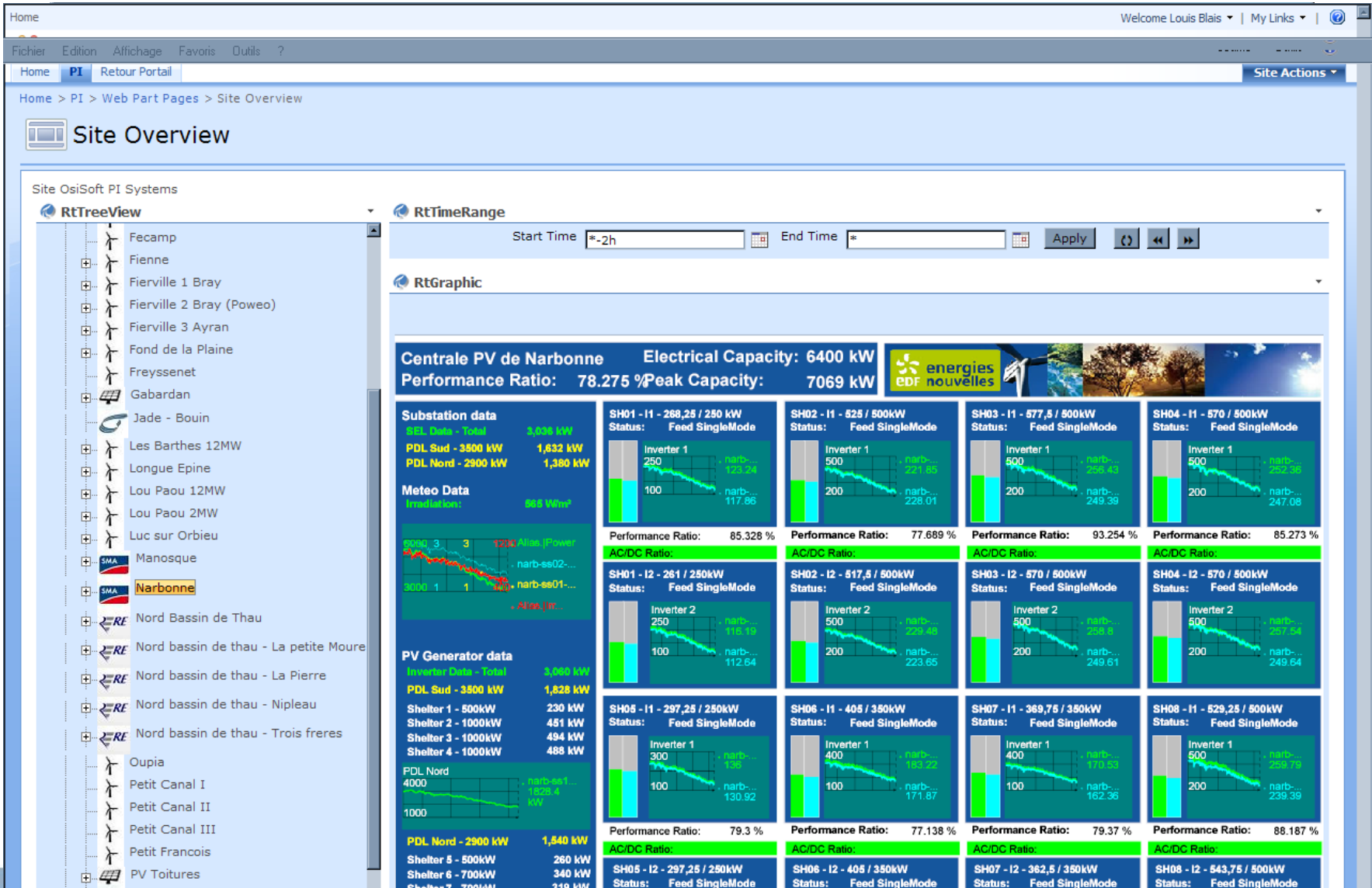
SHELTER 4



Site visit following detection in PI

SharePoint Integration

- Web views currently under construction





Conclusions

Conclusions

- **Standardization**
 - It allows for fast and easy integration of new sites
 - In terms of hardware and architecture
 - In terms of reports and applications
 - But Standardization requires a Template that takes longer to develop...

Questions?

