

EP Produzione PI utilization in Italian Fleet

Franco Rossetti – Giorgio Annunziata



PI OsiSoft User Conference

Barcelona 24 ÷ 27 Sep 2018

Franco Rossetti – Giorgio Annunziata



Agenda

1. Company structure: EPH Group and EP Produzione
2. PI's development in EON and EP Produzione
3. PPs' HW connection scheme and PI Vision architecture
4. PI use in Power Plants
5. PI use in Asset Management and other divisions

EPH Company profile



Largest gas
transmission
route in Europe



Gas distributor
in Slovakia

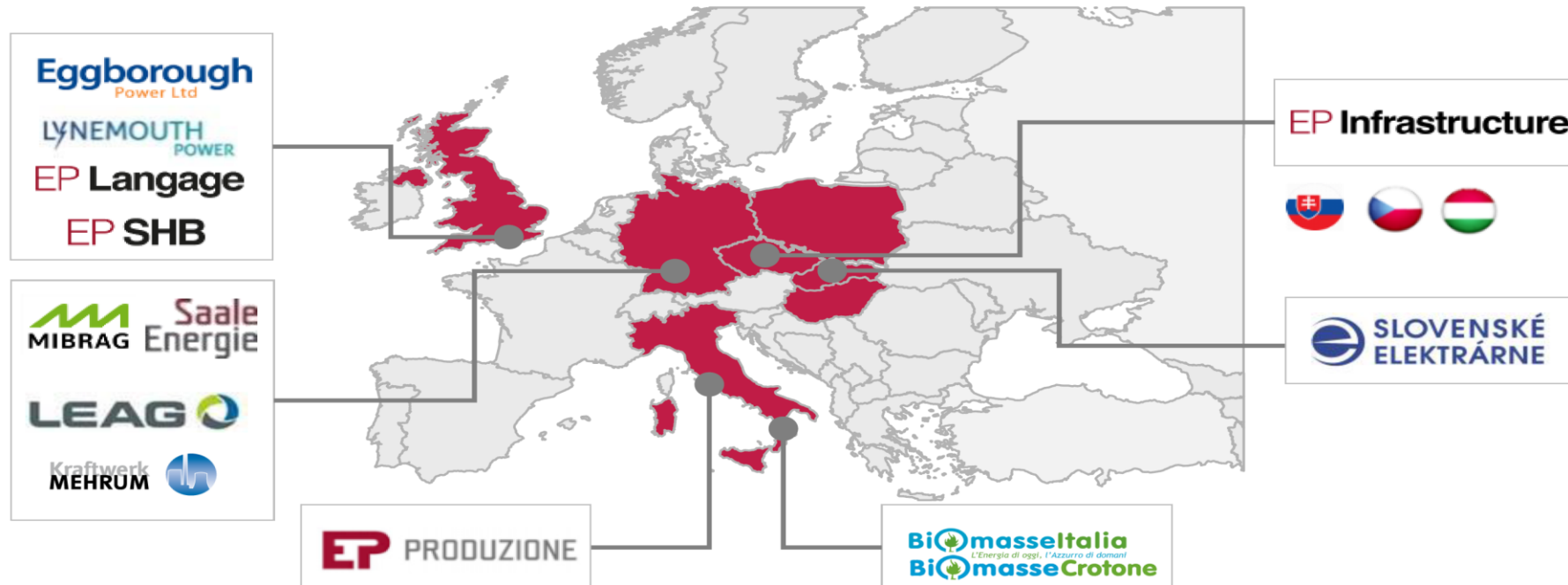


Czech district
heating
infrastructure

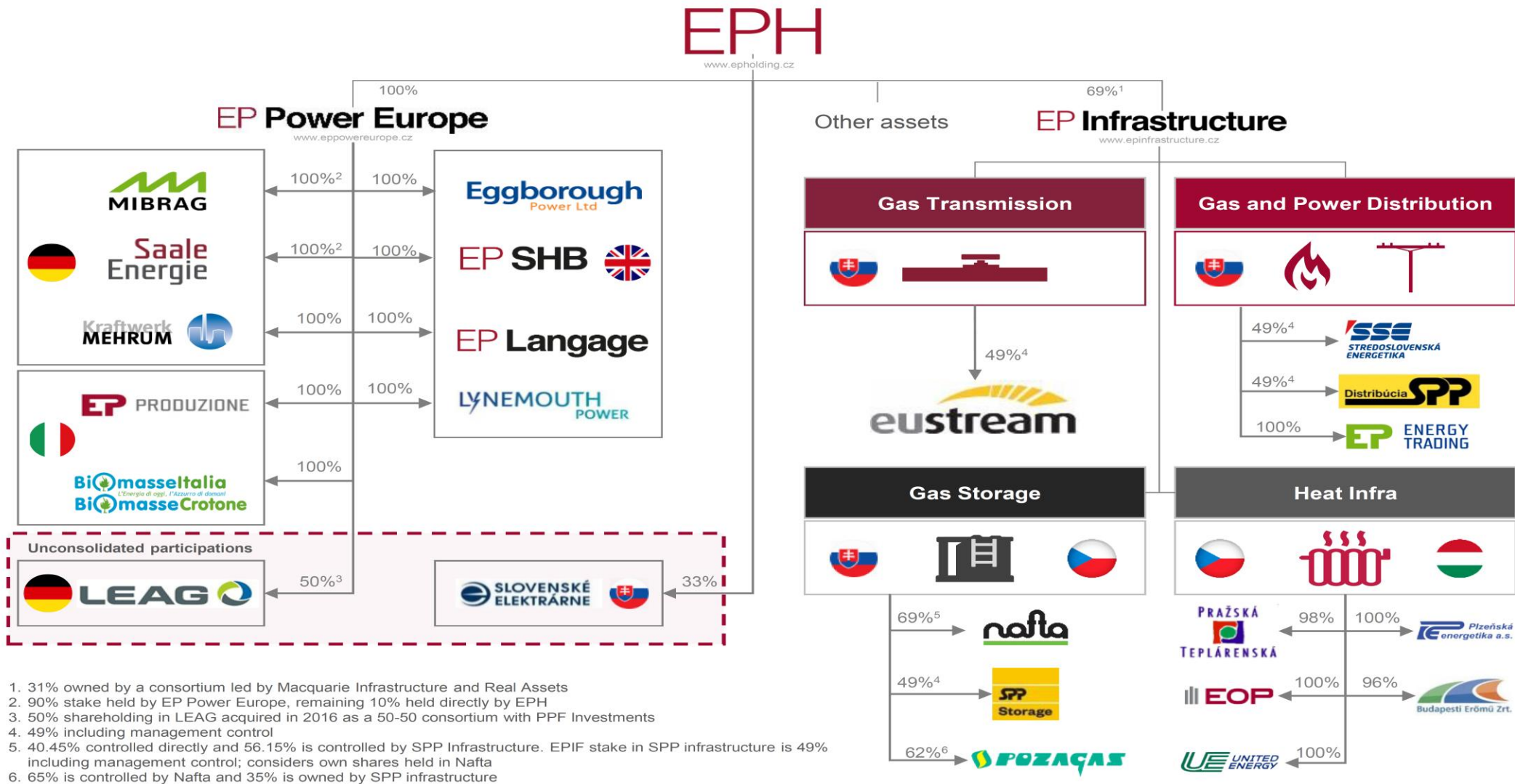


Gas storage
player in region
of Slovakia, the
Czech Republic
and Austria

Geographic presence of EPH



EPH group structure



EPH fleet in Italy



Transaction perimeter

- ❑ E.ON has decided to exit Italy and to sell its Italian operations
- ❑ EPH took over in mid 2015:
 - Coal generation business of 598 MW net capacity in Sardinia
 - Gas generation business comprising of 5 operating power plants located mainly in the North of Italy
- ❑ These assets represent over 10%¹ of total thermal installed capacity in the Northern Zone and 7%¹ of total thermal installed capacity in Italy
- ❑ Coal-fired power plant Fiume Santo with 22% of thermal installed capacity in Sardinia, is a key local generation source
- ❑ The market is split into 6 zones with own prices



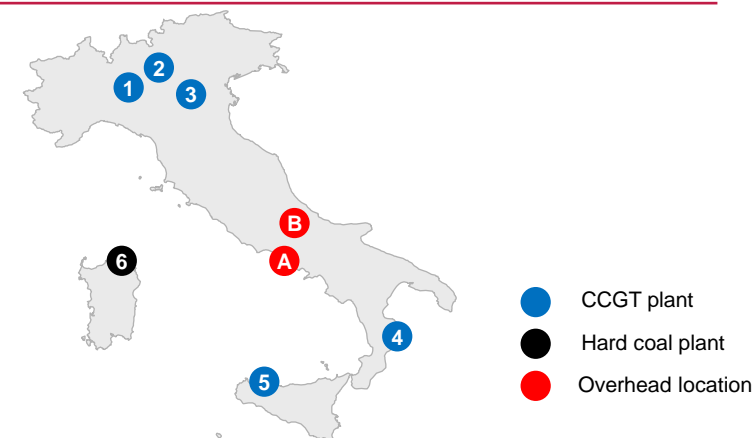
Livorno Ferraris power plant



Fiume Santo power plant

1. Calculated based on 100% ownership of capacity; Terna statistical data 2015
 2. Two non-operating power plants CE Ferrara and CE Teverola (under decommissioning) are included among acquired power plants (both 58% ownership)

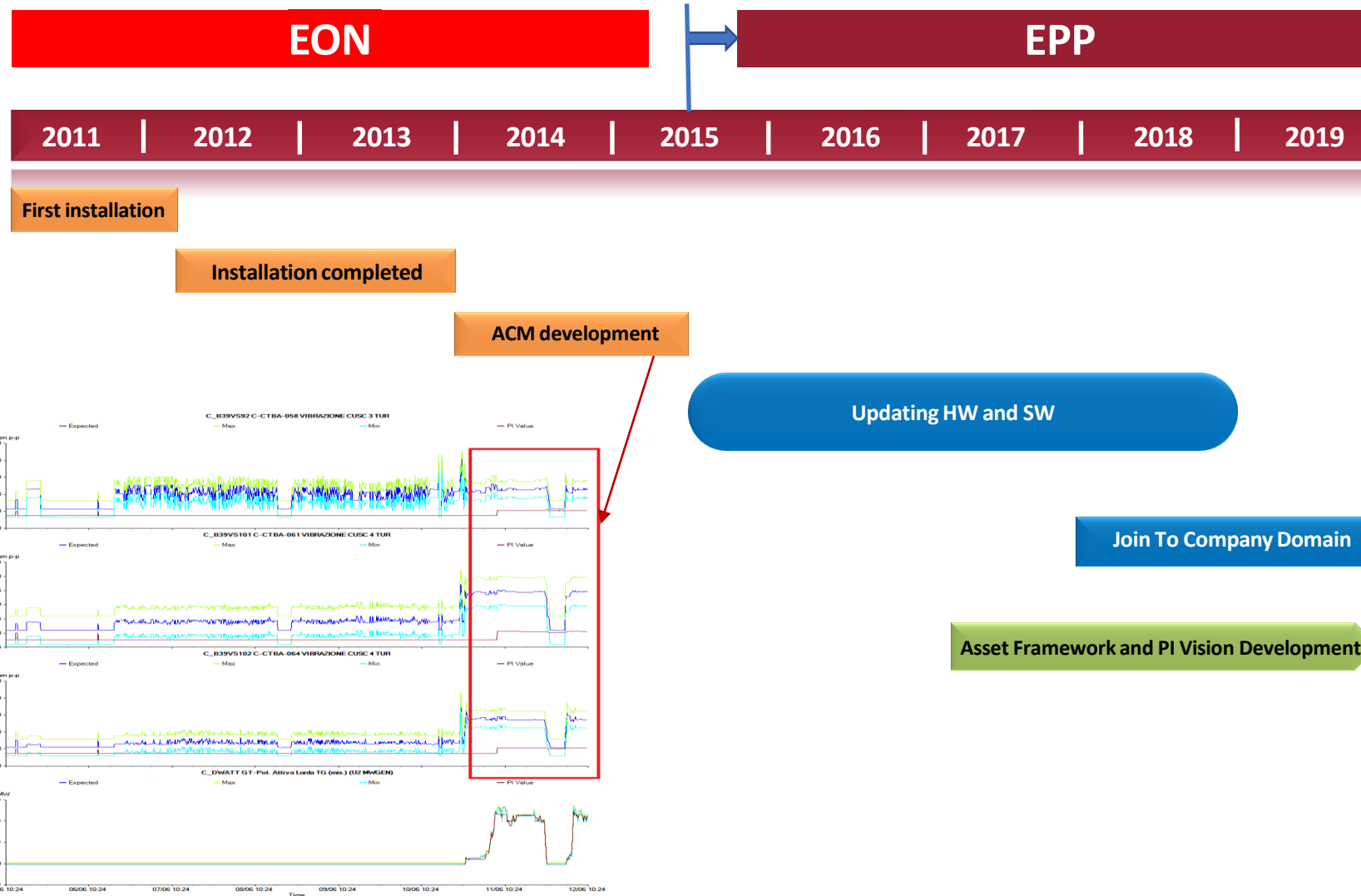
Assets overview



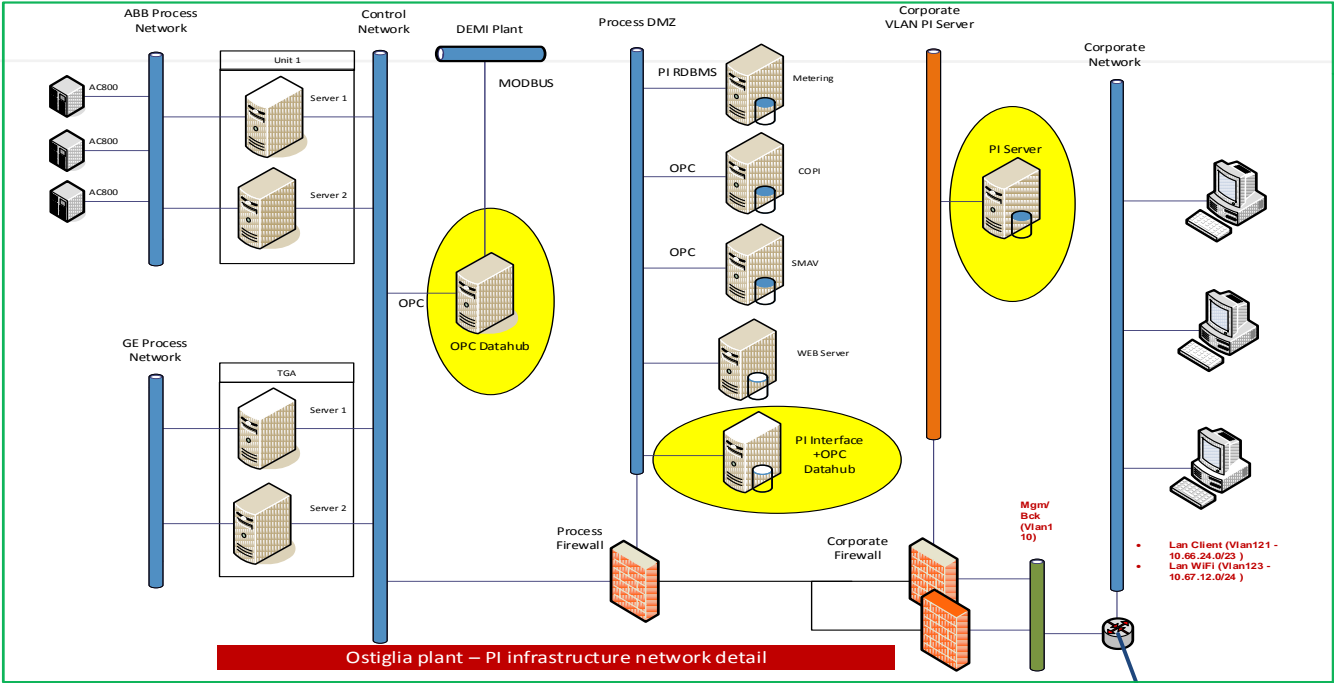
	Plant	Fuel	Net capacity (MW)	Built	Ownership
1	Livorno Ferraris ³	CCGT	805	2008	75%
2	Tavazzano Montanaso	CCGT	1.140	2005	100%
3	Ostiglia	CCGT	1.137	2005	100%
4	Scandale ⁴	CCGT	814	2010	50%
5	Trapani	OCGT	213	2013	100%
6	Fiume Santo	Hard coal	599	2003	100%
Total / Total EPH Share			4.708/ 4.301 ^{3,4}		
A	Rome HQ				
B	Terni overhead location				

3. EP Produzione owns a 75%, BKW Italia S.p.A. owns a 25% (100% controlled by EP Produzione).
 4. EP Produzione owns a 50%, A2A gencogas owns a 50% (50% controlled by EP Produzione).

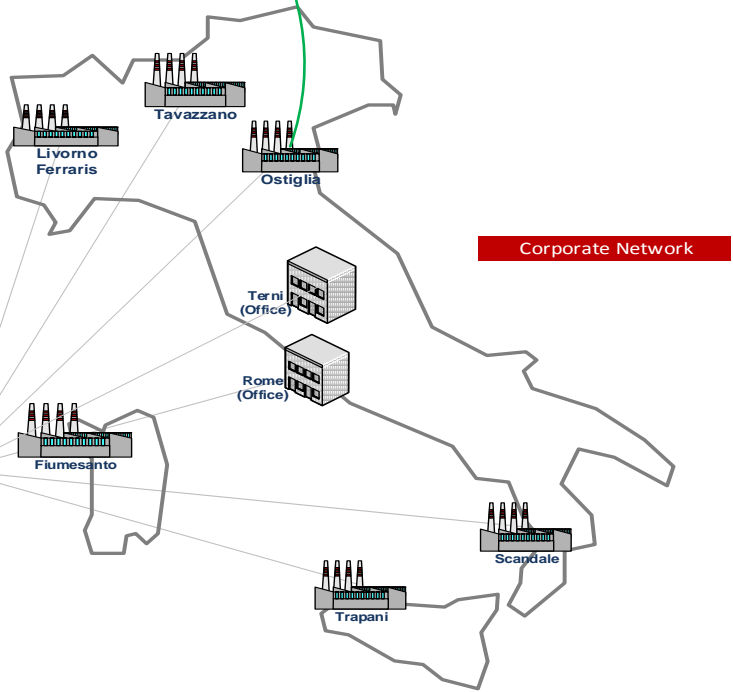
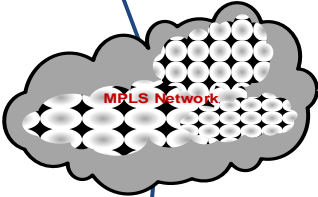
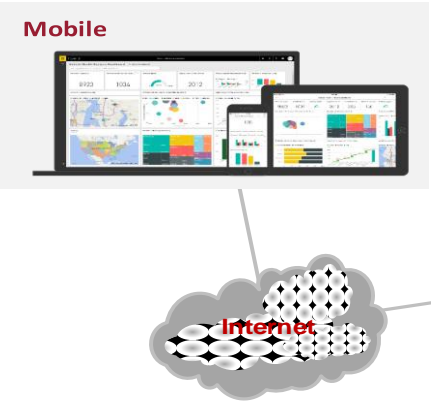
PI development in E.ON and EPP



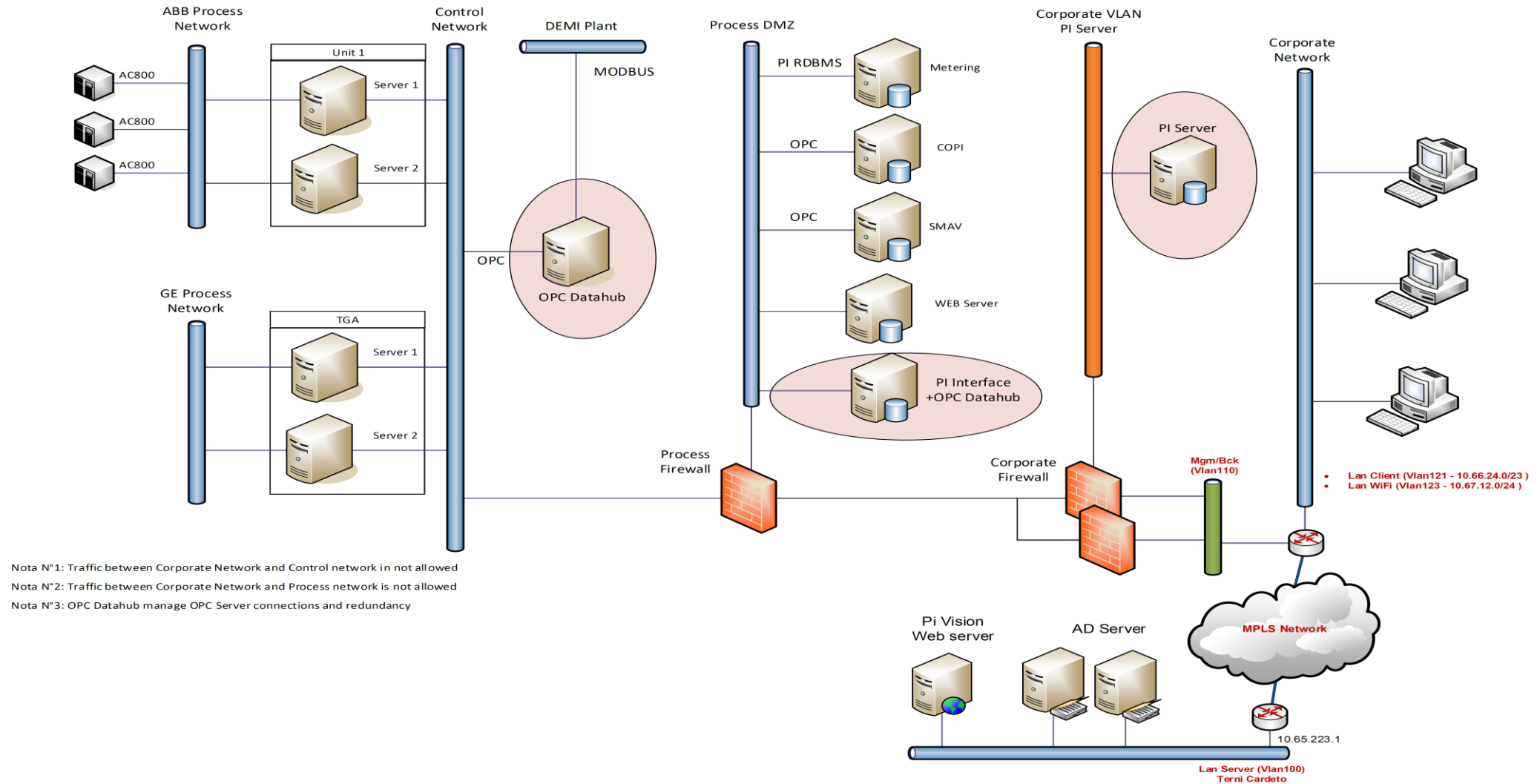
Power Plant HW connection scheme and PI Vision architecture



Nota N°1: Traffic between Corporate Network and Control network is not allowed
Nota N°2: Traffic between Corporate Network and Process network is not allowed



Power plant connection scheme



PI use in power plant via Data link

Operational data for reporting and analysis purposes

- Start up consumption
- Energy production
- KPIs monitoring
- Equipment operating data Hours / Starts

Events analysis
Plant monitoring

Operating time

Energy Production

GT/ST FS-FFH-EOH

Fuel consumption

Startup/shutdown
consumption and
energy production

PI use in power plant via Data Link

Operational data for reporting and analysis purposes

Start up consumption - Energy production - KPIs monitoring - Equipment operating data (op. hours / starts / trips ...)

Daily Summary											29/08/2018		
Daily Net Power Generated		EU	OS1		OS2		OS12		OS3		Plant		
		MWh	0,00		6,69		6,69		0,00		6,69		
Daily Gas Consumed		EU	OS1		OS2		OS12		OS3		Plant		
		0-24 KSmc	0,00		3,59		3,59		0,00		3,59		
		6-6 KSmc									2,41		
Daily Efficiency		EU	OS1		OS2		OS12		OS3		Plant		
		%	0,00		19,21		19,21		0,00		19,21		
Daily Running Time (GT)		EU	OS1		OS2		OS12		OS3		Plant		
		hh:mm	00:00		00:06		00:06		00:00		00:06		
Daily Running Time (CCGT)		EU	OS1		OS2		OS12		OS3		Plant		
		hh:mm	00:00		00:01		00:01		00:00		00:01		
Imbalance			OS1		OS2		OS12		OS3		Plant		
		EU	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	
		Daily	MWh	0,0	0,0	0,0	0,0	6,7	0,0	0,0	0,0	6,7	0,0
			%	0,0%	0,0%	0,0%	0,0%	100,7%	0,0%	0,0%	0,0%	100,7%	0,0%
		Monthly	MWh	0,0	0,0	0,0	0,0	1.948,9	-558,9	37,9	-16,3	1.986,8	-575,2
			%	0,0%	0,0%	0,0%	0,0%	0,7%	-0,2%	0,5%	-0,2%	0,7%	-0,2%
		Yearly	MWh	0,0	0,0	0,0	0,0	10.101,2	-4.690,6	1.697,8	-533,1	11.799,0	-5.223,8
%	0,0%		0,0%	0,0%	0,0%	0,8%	-0,4%	0,9%	-0,3%	0,8%	-0,4%		

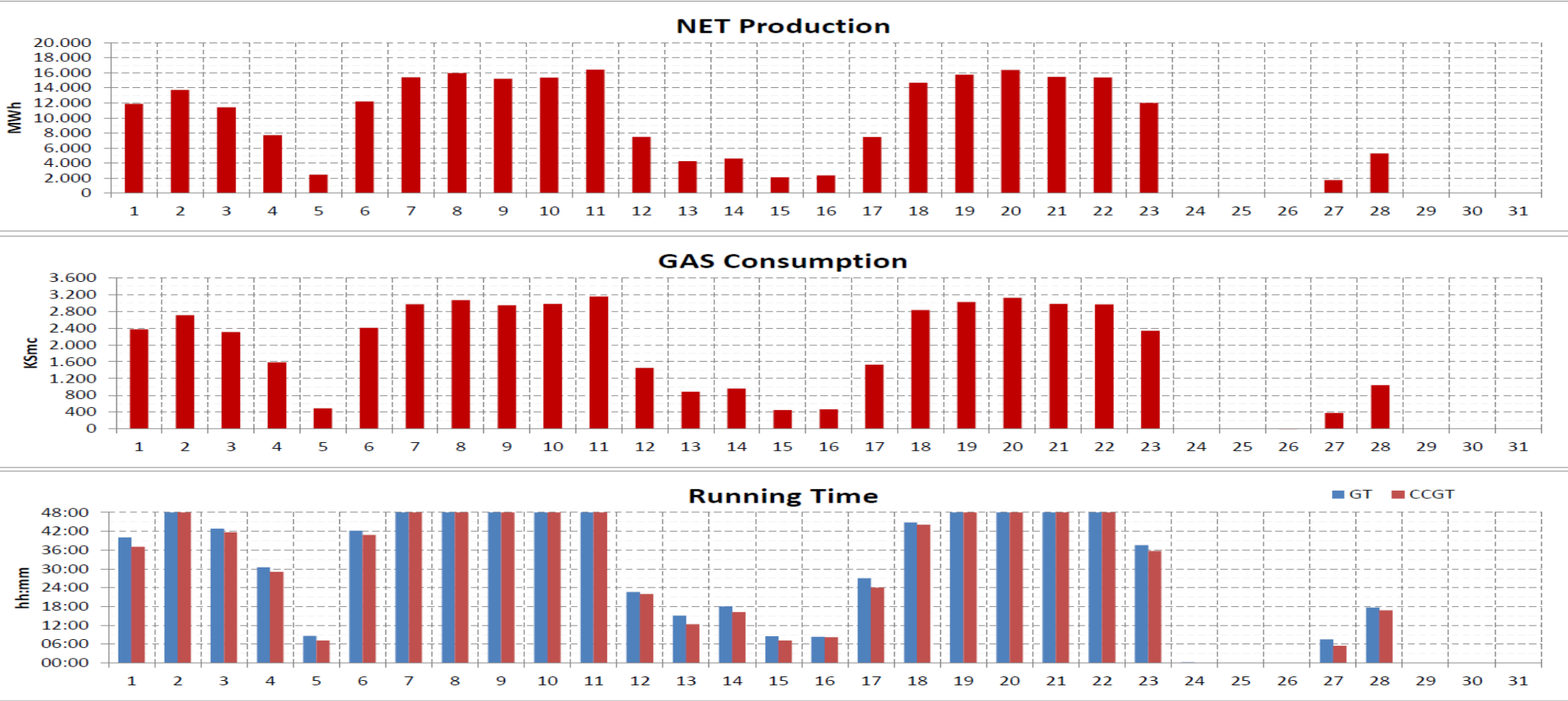
PI use in power plant via Data Link

Operational data for reporting and analysis purposes

Start up consumption - Energy production - KPIs monitoring - Equipment operating data (op. hours / starts / trips ...)

OS12 Daily Data

agosto 2018



PI use in power plants via Data link

Operational live data for status check: production data – NG consumption – Heat Rate

1_PDP_PT_MIN_PCM	13/09/2018 18:18:00	347	MW
A_FQG_ISO5167	13/09/2018 18:18:51	64.700	Sm3/h
GC_PCI_ua_F	13/09/2018 18:14:30	34,957	MJ/Sm3
GC_PCS_ua_F	13/09/2018 18:14:30	38,778	MJ/Sm3
2_PDP_PT_MIN_PCM	13/09/2018 18:18:00	347	MW
C_FQG_ISO5167	13/09/2018 18:18:50	66.593	Sm3/h
A_DWATT	13/09/2018 18:18:43	227	MW
172A0KJE003_M	13/09/2018 18:18:49	121	MW
Net Power		342,2	MW
C_DWATT	13/09/2018 18:18:46	232	MW
272A0KJE003_M	13/09/2018 18:18:51	120	MW
Net Power		346,1	MW
Totale PDP		688	MW
Totale GAS		131.293	Sm3/h

HR (LHV)

6.699

HR (LHV)

6.612

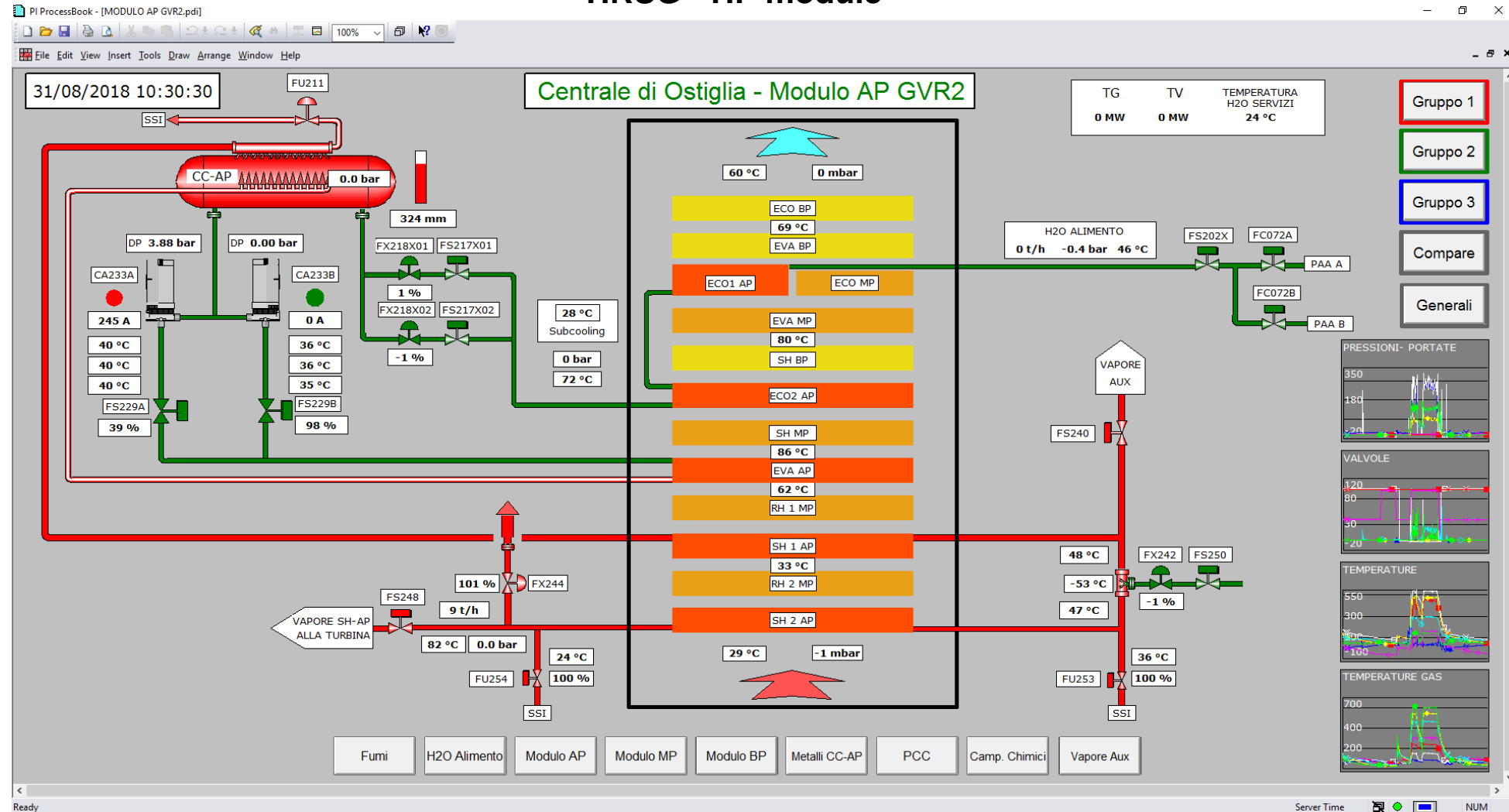
HR (LHV)

6.668

PI use in power plant via Process Book

Equipment analysis via office network, data available for PI clients within the power station and asset management

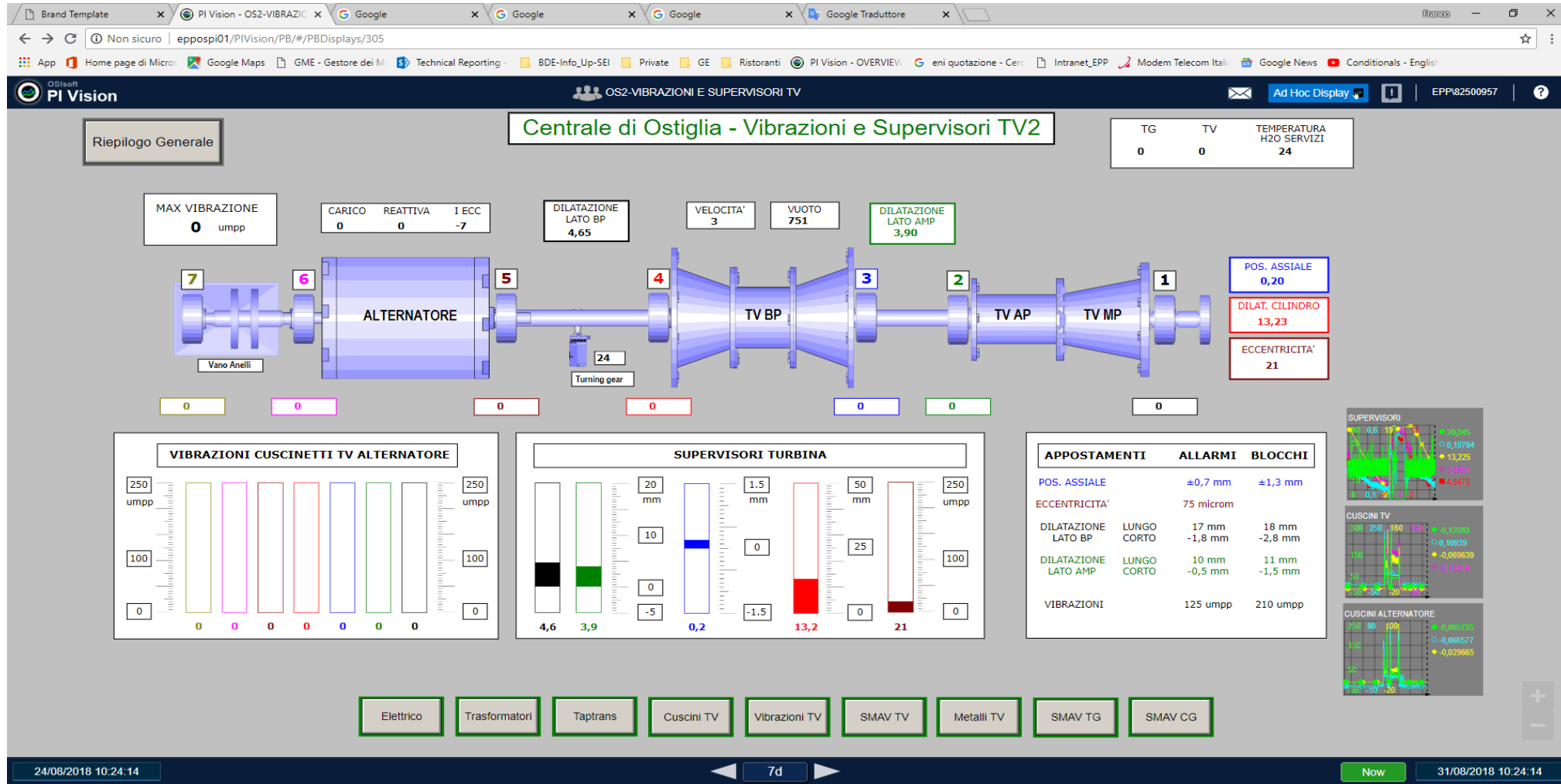
HRSRG - HP module



PI use in power plant via Process Book

Equipment analysis via office network, data available for PI clients within the power station and asset management

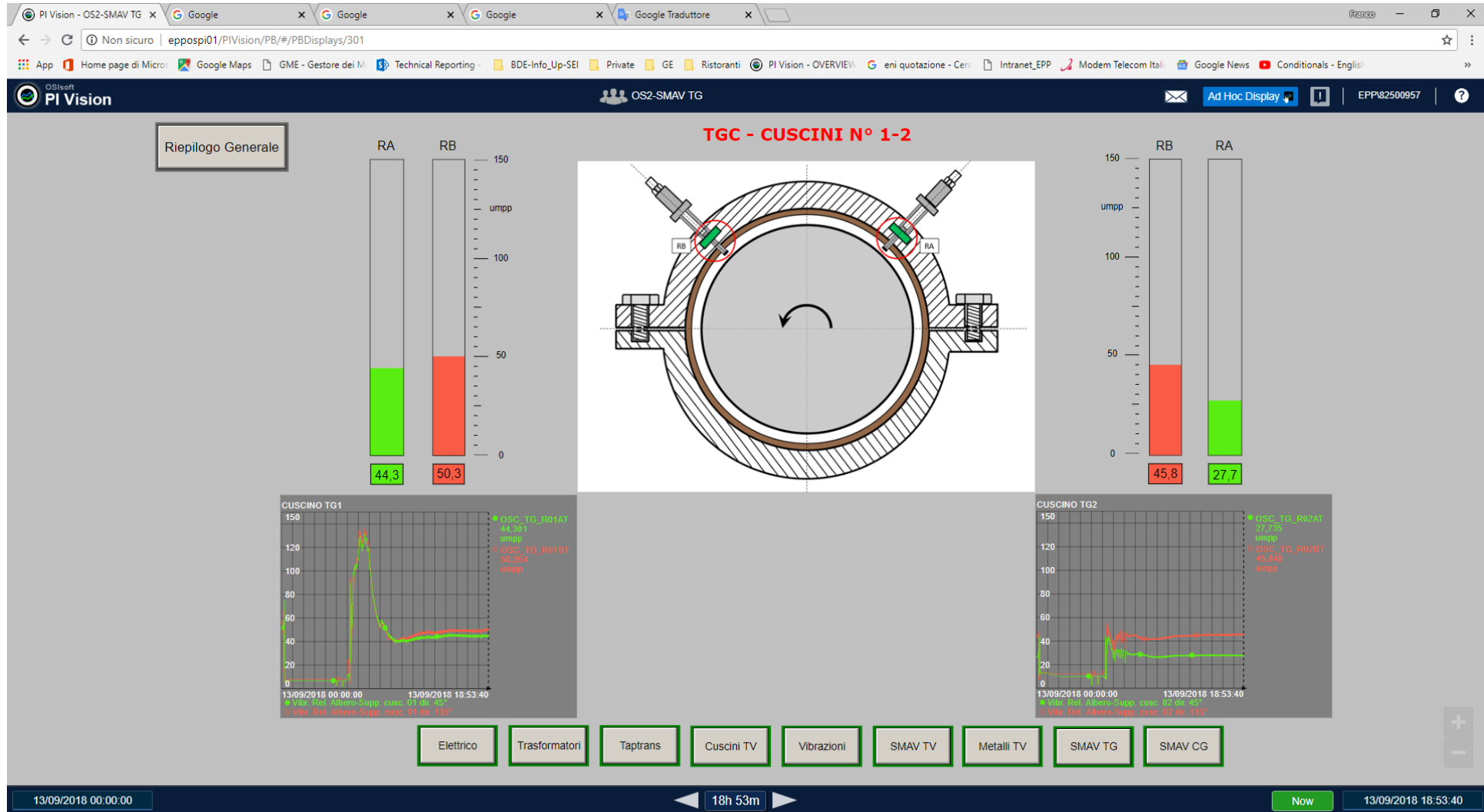
ST Bearings Vibration



PI use in power plant via Process Book

Equipment analysis via office network, data available for PI clients within the power station and asset management

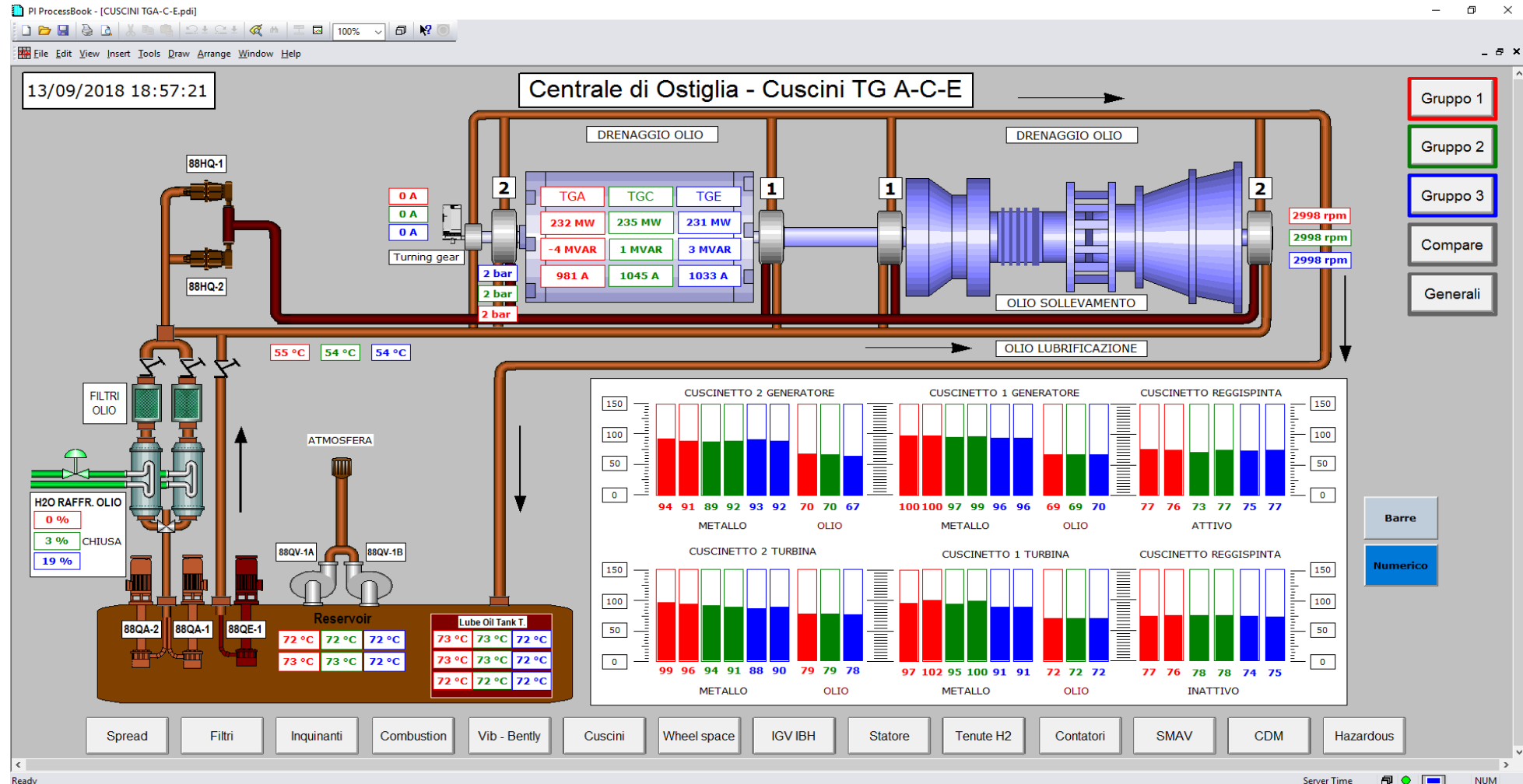
Live Bearing Vibration Details



PI use in power plant via Process Book

Equipment analysis via office network, data available for PI clients within the power station and asset management

Live data comparison – quick detection of deviation between identical units/equipment



PI Vision on web

<http://eppospi01/PIVision/PB/#/PBDisplays/5>

<http://eppospi01/PIVision/PB/#/PBDisplays/2>

<http://eppospi01/PIVision/#/>

[http://eppospi01/PIVision/#/Displays/339/EPP Dashboard](http://eppospi01/PIVision/#/Displays/339/EPP_Dashboard)

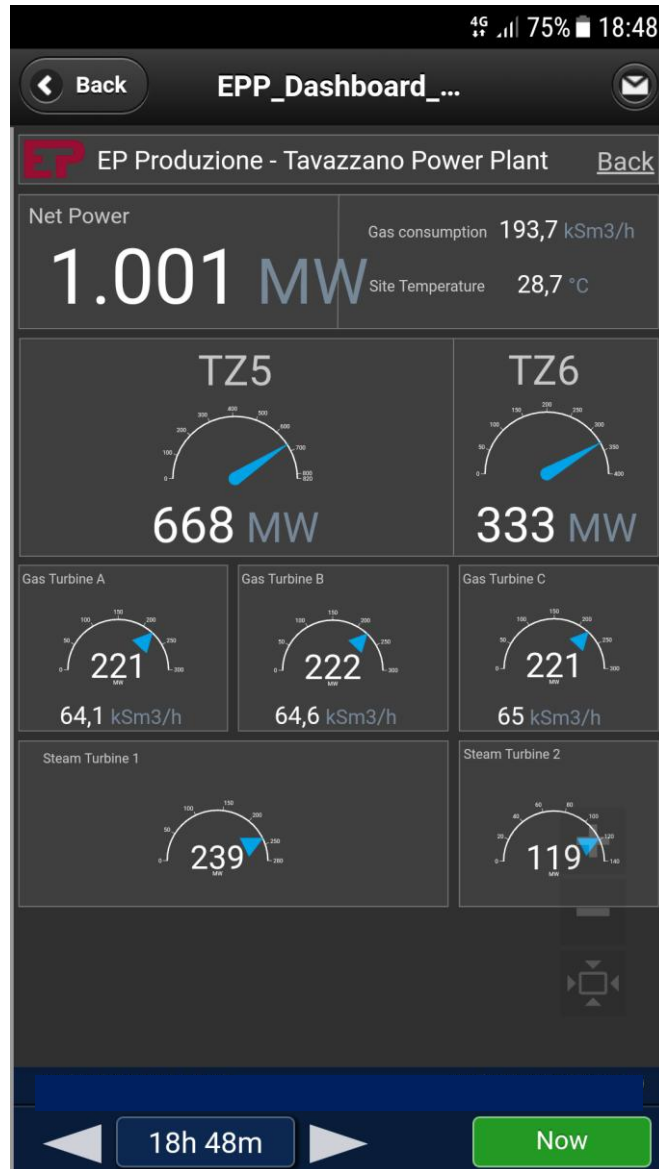
PI Vision on web

Company dashboard, live data available via web on PCs and mobile devices



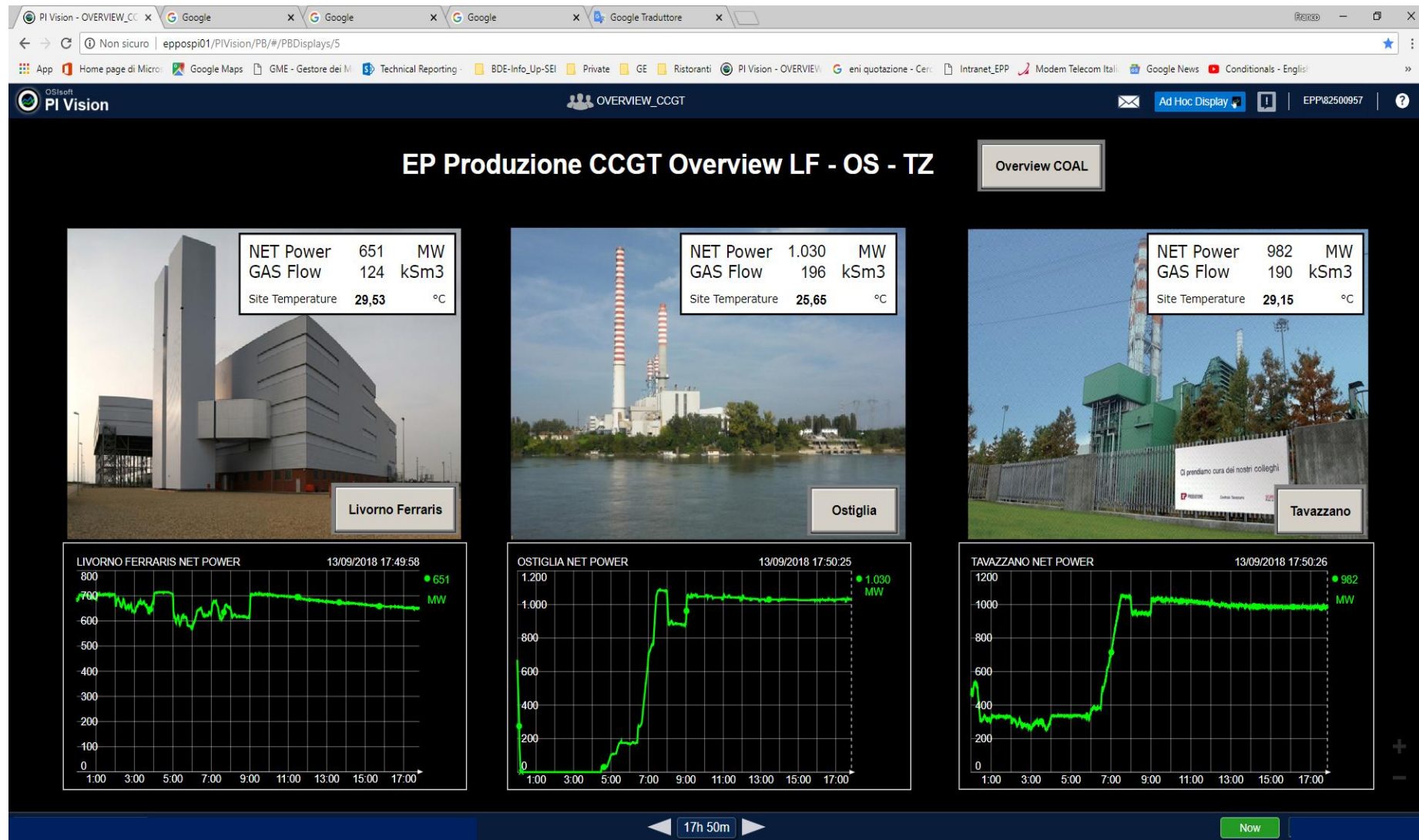
PI Vision on web

Company dashboard, live data available via web on PCs and mobile devices



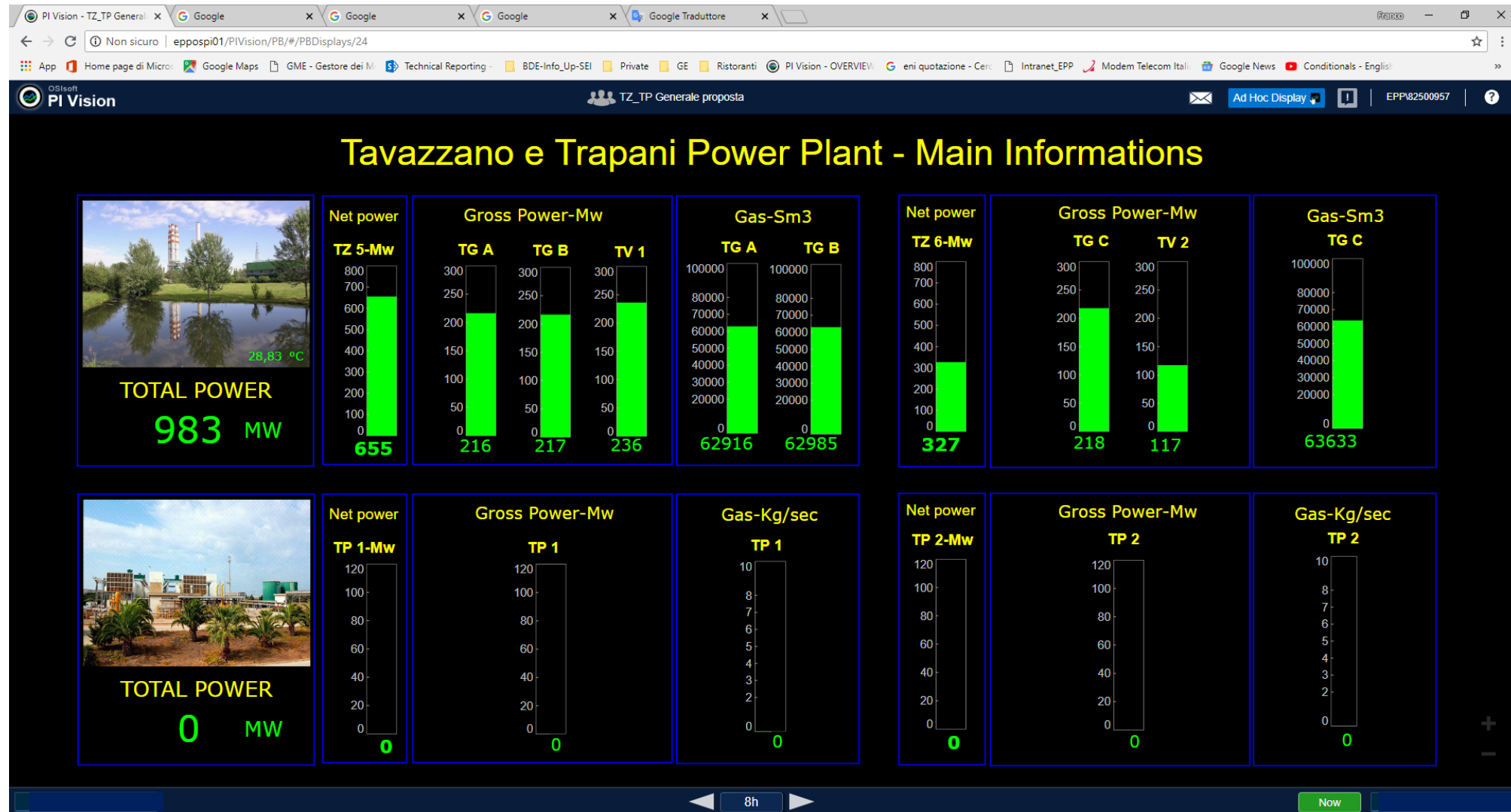
Power Plant data from PI Vision on Web

Company's overview live data



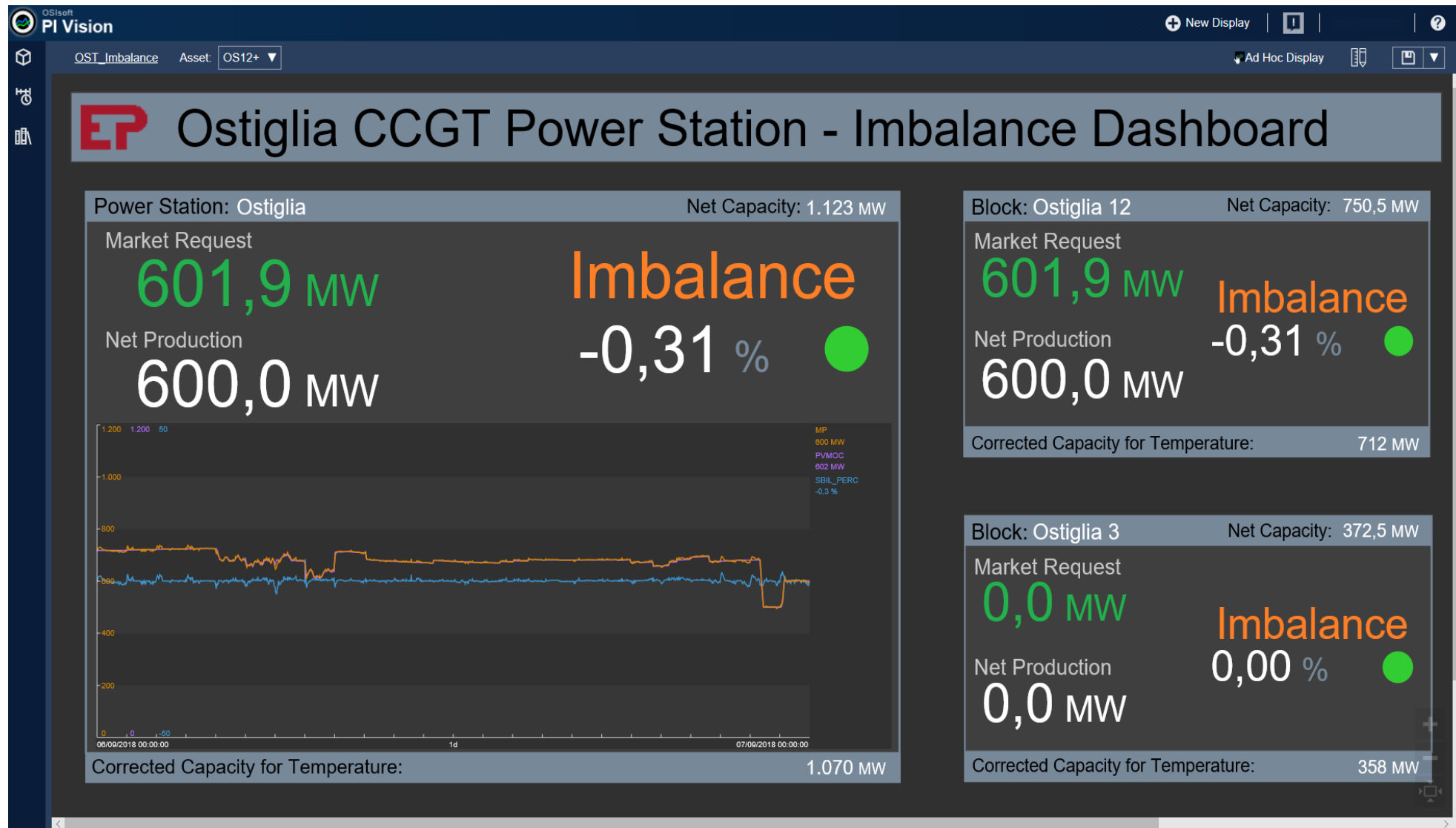
Power Plant data from PI Vision on Web

Plant's overview live data



Power Plant data from PI Vision on Web

Specific detail overview live data (Market imbalance vs Load profile)



Power Plant data from PI Vision on Web

Fleet folders (live data)

The screenshot shows a web browser window displaying the PI Vision interface. The browser's address bar shows the URL `eppospi01/PIVision/#/`. The interface has a dark blue header with the PI Vision logo and a search bar. On the left, there is a sidebar with a search bar and a list of displays under the 'Home' section. The main area displays a grid of 15 displays, each with a thumbnail image and a title. The displays are organized into three rows of five. The first row includes displays for transformers, pumps, turbines, bearings, and a general overview. The second row includes a general plant overview, a specific turbine, another turbine type, a different turbine, and a wheel space. The third row contains three more detailed process diagrams. Each display title includes a code and a reference number (EPP\82500836). The interface also features a 'New Display' button and a user profile icon in the top right corner.

OSIsoft
PI Vision

Non sicuro | eppospi01/PIVision/#/

App Home page di Micro Google Maps GME - Gestore dei M Technical Reporting BDE-Info_Up-SEI Private GE Ristoranti PI Vision - OVERVIEW eni quotazione - Cerc Intranet_EPP Modem Telecom Italia Google News Conditionals - English

+ New Display | I | EPP\82500957 ?

PDI Ostiglia (42)

PDI Ostiglia

Filter by Keywords

All Displays
Favorites
My Displays
Recent

Home

- PDI Fumesanto
- PDI Flotta
- PDI Livorno Ferraris
- PDI Ostiglia**
- PDI Tavazzano

OS3-TRASFORMATORI
EPP\82500836

OS-POMPE AC 1-2-3-4
EPP\82500836

OS1-SMAV TV
EPP\82500836

OS1-CUSCINI TV
EPP\82500836

OS-RIEPILOGO GENERALE
EPP\82500836

OS-GENERALE IMPIANTO
EPP\82500836

OS-CH4 OS1-2-3
EPP\82500836

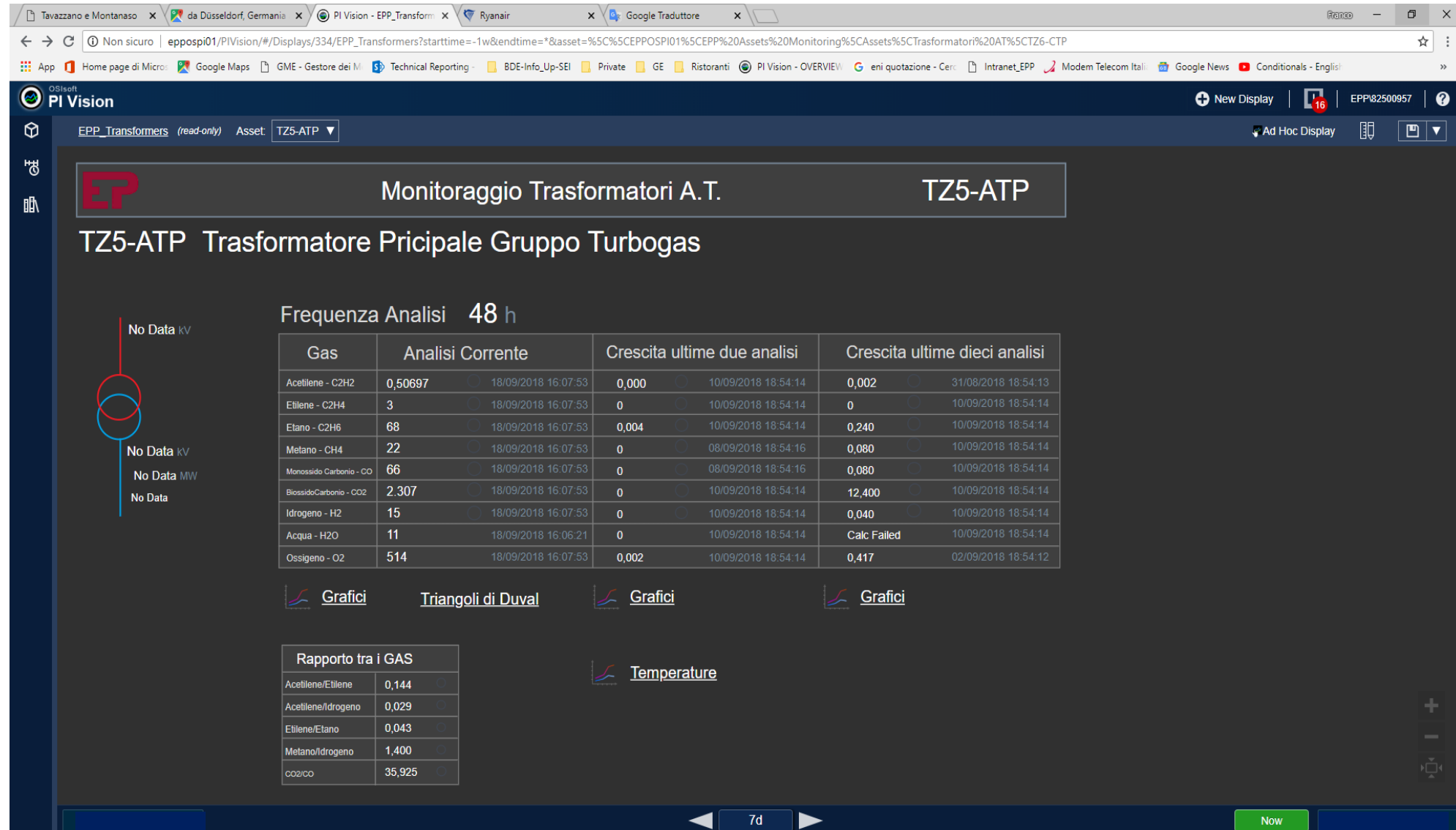
OS-CUSCINI TGA-C-E
EPP\82500836

OS2-SMAV TG
EPP\82500836

OS-WHEEL SPACE TGA-C-E
EPP\82500836

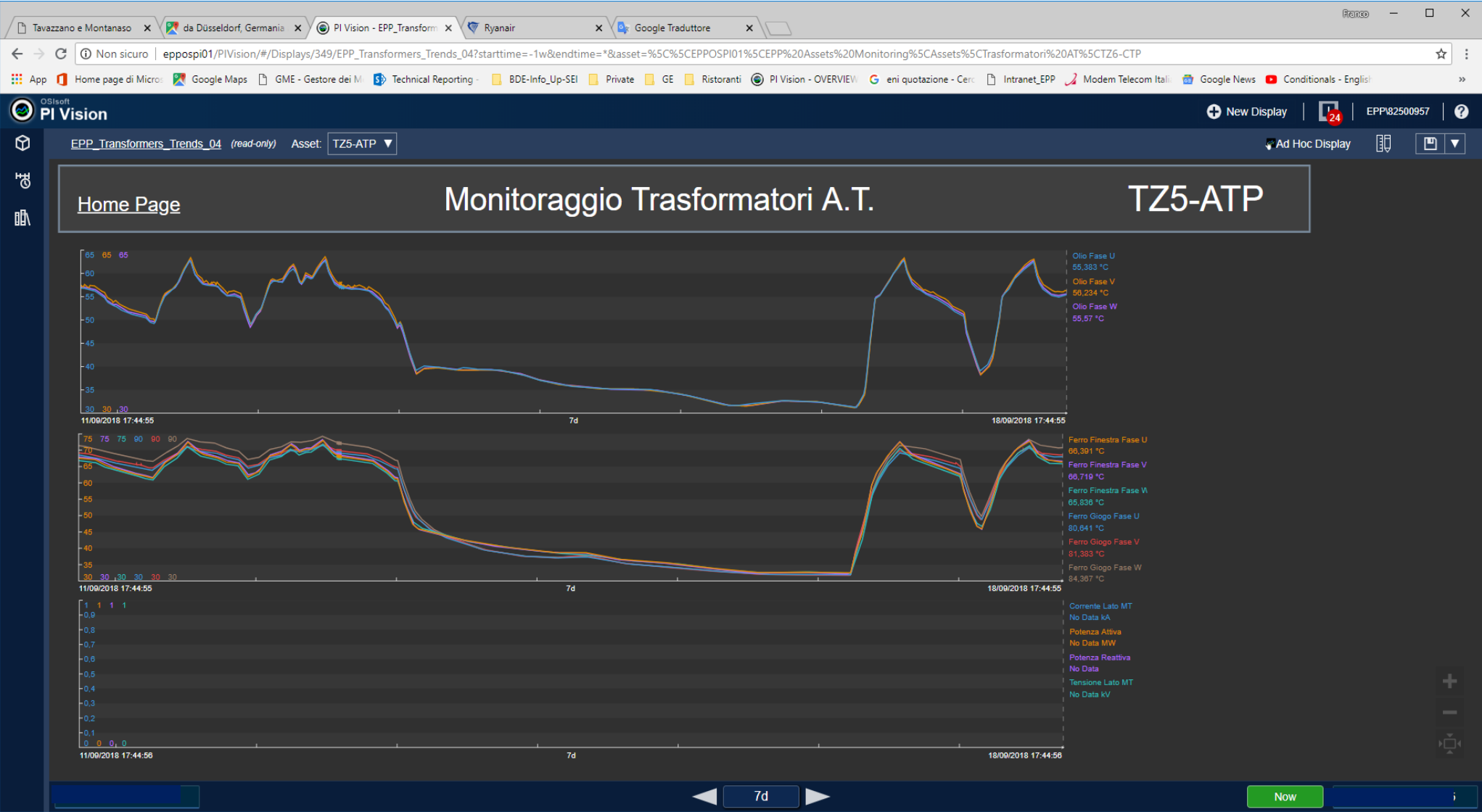
Power Plant data from PI Vision on Web

Fleet details Trafo Gas Analysis



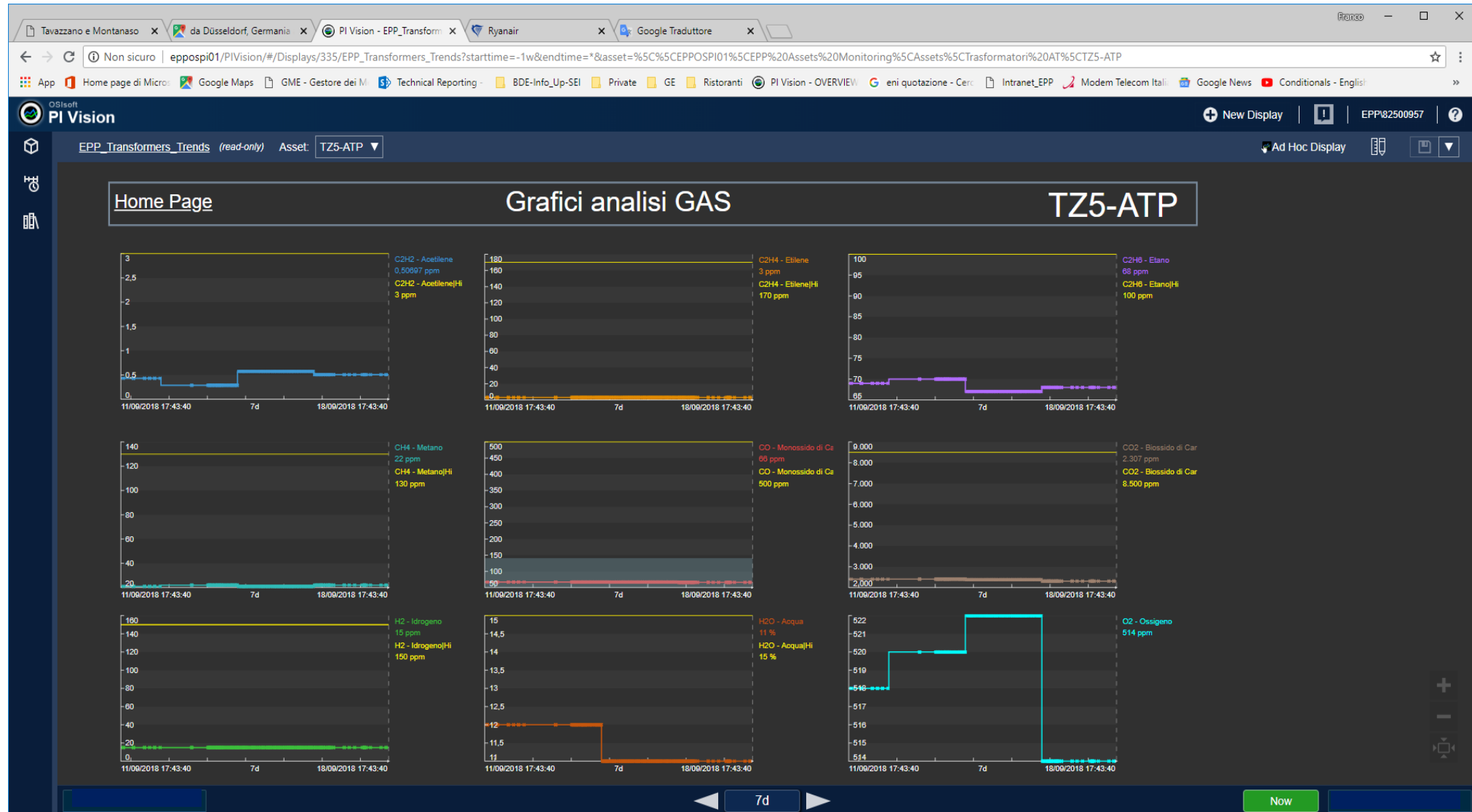
Power Plant data from PI Vision on Web

Fleet details Trafo Gas Analysis



Power Plant data from PI Vision on Web

Fleet details Trafo Gas Analysis



Power Plant data AF management and models

Asset Framework specific equipment models

\\ITA_PIOST\Ostiglia CCGT Power Station - PI System Explorer

File Search View Go Tools Help

Database Query Date Back Check In Refresh New Element New Attribute Search Elements

Elements

- Elements
 - Analog
 - Assets
 - Digital
 - HSE
 - Metering
 - Ostiglia Power Station
 - Shared Assets
 - UP-OS12
 - OS1
 - BOP
 - Griglia 1GR1
 - Pompa 1AA-A
 - Pompa 1AA-B**
 - Pompa 1AC-1
 - Pompa 1CD-A
 - Pompa 1CD-B
 - GTA
 - HRSG1
 - ST1
 - OS2
 - UP-OS3
- Element Searches

Pompa 1AA-B

General Child Elements Attributes Ports Analyses Notification Rules Version

Group by: ☐ Category ☐ Template

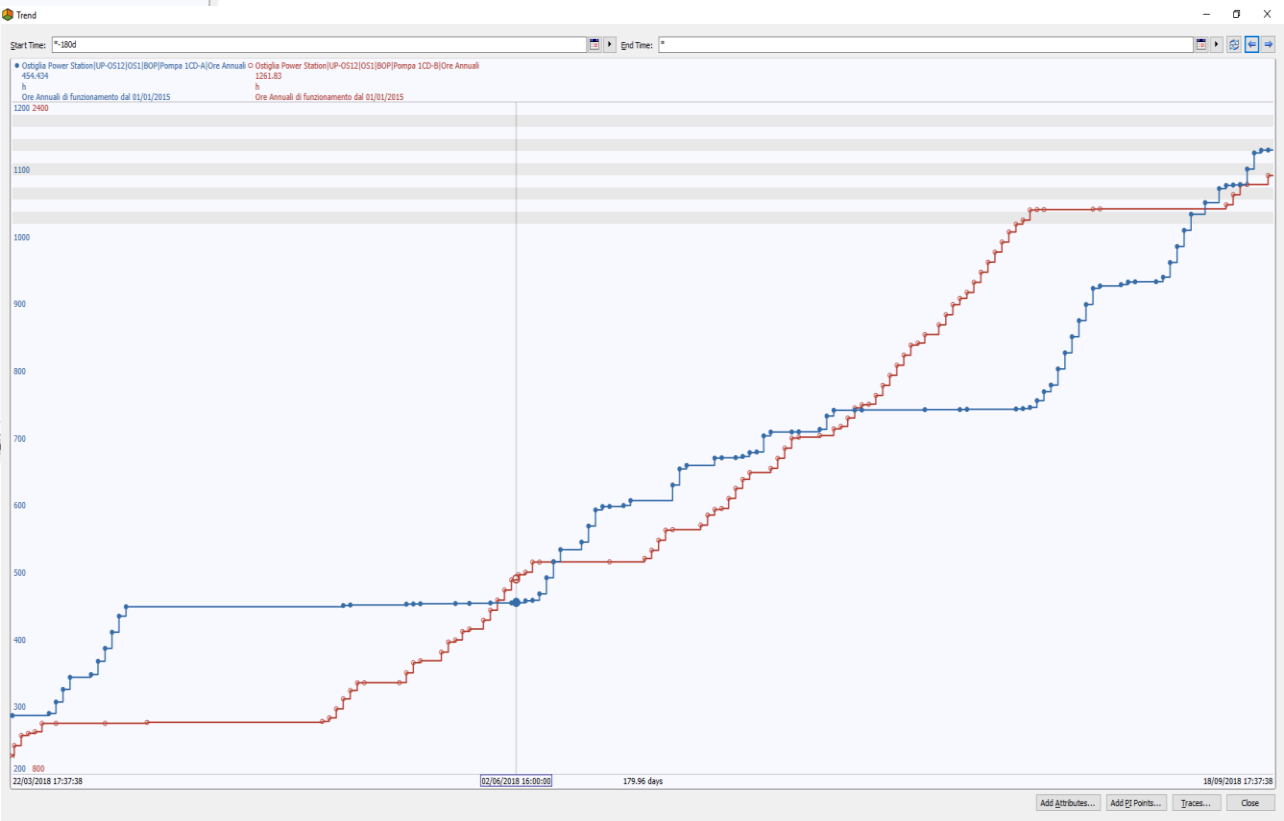
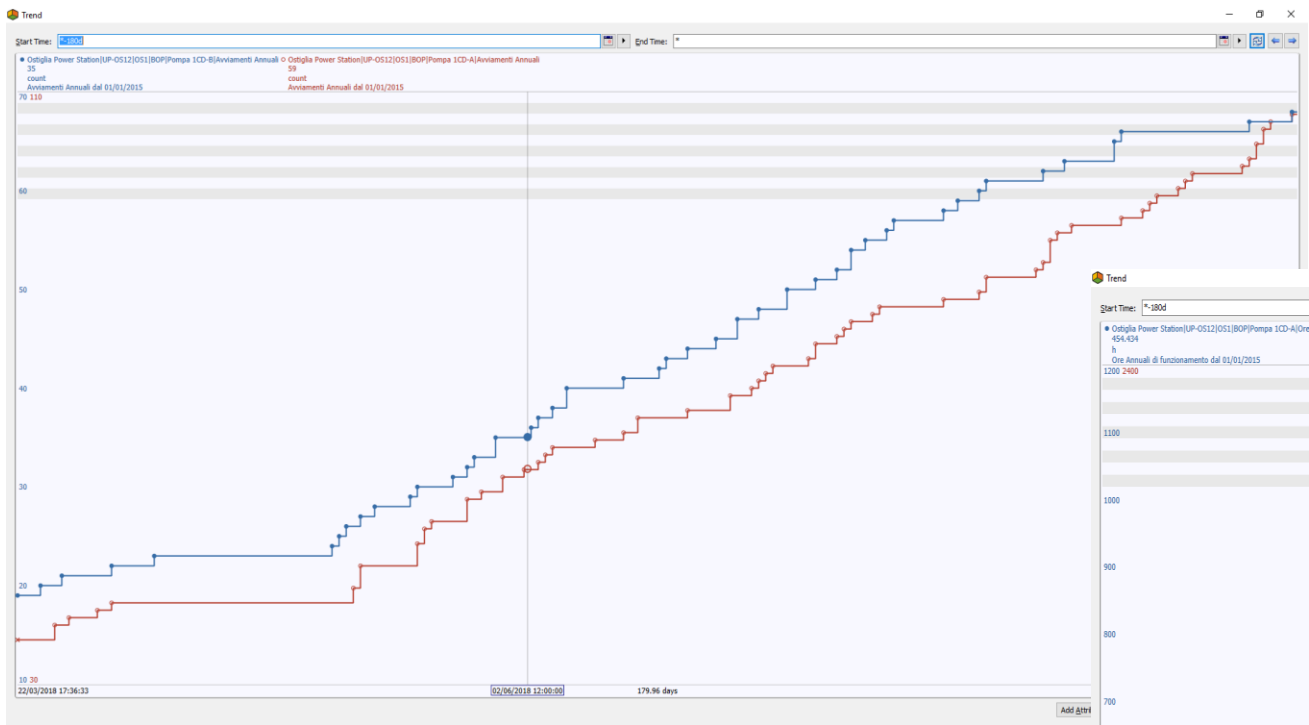
Filter

Name	Value	Time Stamp	Description
Avviamenti Annuali	169 count	18/09/2018 00:00:00	Avviamenti Annuali dal 01/01/2015
Avviamenti Mensili	8 count	18/09/2018 00:00:00	Avviamenti Mensili dal 01/01/2015
Avviamenti Progressi	0	01/01/1970 00:00:00	
Avviamenti Totali	611 count	18/09/2018 00:00:00	Avviamenti Totali dal 01/01/2015
Costruttore		01/01/1970 00:00:00	
Flip	1	18/09/2018 04:48:39.841	
Ore Annuali	2580.5 h	18/09/2018 00:00:00	Ore Annuali di funzionamento dal 01/01/2015
Ore Mensili	260.45 h	18/09/2018 00:00:00	Ore mensili di funzionamento dal 01/01/2016
Ore Progresse	0	01/01/1970 00:00:00	
Ore Totali	10856 h	18/09/2018 00:00:00	Numero totale di ore funzionamento da 01/01/2015
Status	ON	18/09/2018 17:28:39.841	Indica lo stato della pompa ON/OFF

Pompa 1AA-B Modified:17/09/2018 14:07:10 Owner:system Version: 01/01/1970 00:00:00, Revision 6

Power Plant data AF management and models

Asset Framework equipment operation (Starts – Hours)



Power Plant data analysis with Asset Framework

Event Frame for starts-up analysis and comparison

\\ITA_PIOST\Ostiglia CCGT Power Station - PI System Explorer

File Search View Go Tools Help

Database Query Date Back Check In Refresh New Event Frame Search Event Frames

Event Frame Searches

- Event Frame Search 1
- Transfer Searches
- Transfer Search 1

Event Frames

Event Frame Search 1

Filter

Group by: ☐ Category ☐ Template

	Name	2. [26.01:14:04.0799866] ..	Duration	Start Time	End Time	Description	Category	Severity	Template	Primary Element
	OS2 Block Start 2018...		1:09:04.08	23/08/2018 05:12:55.92	23/08/2018 06:22:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		1:21:02.673	23/08/2018 05:12:57.327	23/08/2018 06:34:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS1 Block Start 2018...		0:13:38.821	27/08/2018 00:29:25.002	27/08/2018 00:43:03.823	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		0:16:50.233	27/08/2018 01:15:28.509	27/08/2018 01:32:18.742	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		0:13:36.152	27/08/2018 02:51:06.774	27/08/2018 03:04:42.926	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		2:26:48.748	27/08/2018 16:17:11.252	27/08/2018 18:44:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS2 Block Start 2018...		1:14:25.08	28/08/2018 06:15:34.92	28/08/2018 07:30:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		0:22:09.539	28/08/2018 14:37:00.998	28/08/2018 14:59:10.537	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS1 Block Start 2018...		3:16:08.64	03/09/2018 03:44:51.36	03/09/2018 07:01:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		3:09:07.555	03/09/2018 03:44:52.445	03/09/2018 06:54:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		2:21:30.631	10/09/2018 04:42:29.369	10/09/2018 07:04:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		2:19:25.125	10/09/2018 04:42:34.875	10/09/2018 07:02:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		1:46:28.182	11/09/2018 16:18:31.818	11/09/2018 18:05:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		1:50:14.644	11/09/2018 16:18:45.356	11/09/2018 18:09:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS3 Block Start 2018...		5:31:38.183	12/09/2018 01:49:21.817	12/09/2018 07:21:00	Ostiglia CCGT Block Start ...		None	Block Start	OS3
	OS1 Block Start 2018...		1:12:54.817	12/09/2018 04:17:05.183	12/09/2018 05:30:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		1:11:24.391	12/09/2018 06:09:35.609	12/09/2018 07:21:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS3 Block Start 2018...		1:16:28.801	13/09/2018 04:17:31.199	13/09/2018 05:34:00	Ostiglia CCGT Block Start ...		None	Block Start	OS3
	OS2 Block Start 2018...		1:06:51.526	13/09/2018 06:14:08.474	13/09/2018 07:21:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		1:17:45.659	13/09/2018 06:14:14.341	13/09/2018 07:32:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS3 Block Start 2018...		2:14:59.319	14/09/2018 04:19:00.681	14/09/2018 06:34:00	Ostiglia CCGT Block Start ...		None	Block Start	OS3
	OS1 Block Start 2018...		1:12:30.047	14/09/2018 06:13:29.953	14/09/2018 07:26:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		1:10:16.404	14/09/2018 06:13:43.596	14/09/2018 07:24:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS3 Block Start 2018...		2:19:06.415	17/09/2018 01:19:53.585	17/09/2018 03:39:00	Ostiglia CCGT Block Start ...		None	Block Start	OS3
	OS2 Block Start 2018...		2:10:23.963	17/09/2018 04:46:36.037	17/09/2018 06:57:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2
	OS1 Block Start 2018...		1:54:36.828	17/09/2018 05:51:23.172	17/09/2018 07:46:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS3 Block Start 2018...		1:03:47.562	18/09/2018 03:19:12.438	18/09/2018 04:23:00	Ostiglia CCGT Block Start ...		None	Block Start	OS3
	OS1 Block Start 2018...		1:13:18.246	18/09/2018 05:13:41.754	18/09/2018 06:27:00	Ostiglia CCGT Block Start ...		None	Block Start	OS1
	OS2 Block Start 2018...		1:05:14.181	18/09/2018 05:13:45.819	18/09/2018 06:19:00	Ostiglia CCGT Block Start ...		None	Block Start	OS2

Elements

- Event Frames
- Library
- Unit of Measure
- Contacts
- Management

Event Frame Search

Power Plant data analysis with Asset Framework

Event Frame for starts-up analysis and comparison

Event name	Duration	Primary element	Target Energy	Total Energy	Energy Saving	Target Gas	Total Gas	Gas Saving
OS2 Block Start 2018-01-01 10:30	0 1:06:29	OS2	203,50	213,27	9,77	53.190	62.178	8.988,18
OS2 Block Start 2018-01-02 07:00	0 1:12:53	OS2	203,50	198,11	-5,39	53.190	60.552	7.362,05
OS2 Block Start 2018-01-03 04:00	0 1:09:50	OS2	203,50	110,02	-93,48	53.190	41.934	-11.255,69
OS2 Block Start 2018-01-08 04:00	0 3:20:29	OS2	554,33	259,26	-295,07	220.150	109.251	-10.898,83
OS2 Block Start 2018-01-09 04:00	0 1:12:26	OS2	203,50	120,46	-83,04	53.190	44.587	-8.602,97
OS1 Block Start 2018-01-10 04:00	0 2:19:37	OS1	554,33	250,89	-303,44	220.150	91.385	-28.764,52
OS2 Block Start 2018-01-10 06:00	0 1:13:01	OS2	203,50	168,09	-35,41	53.190	54.231	1.040,61
OS1 Block Start 2018-01-15 04:00	0 2:37:44	OS1	554,33	299,26	-255,07	220.150	104.672	-15.477,89
OS2 Block Start 2018-01-15 04:00	0 2:30:38	OS2	554,33	276,48	-277,85	220.150	99.700	-20.449,93
OS2 Block Start 2018-01-16 06:00	0 1:04:20	OS2	203,50	163,83	-39,67	53.190	50.697	-2.492,57
OS2 Block Start 2018-01-17 08:00	0 1:48:39	OS2	299,00	130,50	-168,50	88.310	57.949	-30.361,38
OS1 Block Start 2018-01-18 03:00	0 2:02:37	OS1	299,00	269,31	-29,69	88.310	88.448	137,82
OS2 Block Start 2018-01-19 04:00	0 2:07:49	OS2	299,00	191,80	-107,20	88.310	75.301	-13.009,45
OS2 Block Start 2018-01-23 05:00	0 3:04:30	OS2	439,75	210,97	-228,78	134.600	95.991	-38.608,88
OS1 Block Start 2018-01-23 22:00	0 2:28:34	OS1	554,33	224,03	-330,30	220.150	87.133	-33.017,28
OS2 Block Start 2018-01-24 05:00	0 1:16:23	OS2	203,50	120,52	-82,98	53.190	44.472	-8.718,09
OS2 Block Start 2018-01-25 04:00	0 1:12:15	OS2	203,50	114,29	-89,21	53.190	40.193	-12.996,55
OS1 Block Start 2018-01-25 21:00	0 3:20:39	OS1	299,00	255,11	-43,89	88.310	111.475	23.165,04
OS2 Block Start 2018-01-26 06:00	0 1:45:10	OS2	299,00	229,88	-69,12	88.310	77.135	-11.174,87
OS1 Block Start 2018-01-29 04:00	0 2:35:44	OS1	314,25	253,39	-60,86	101.250	97.072	-4.178,45
OS2 Block Start 2018-01-29 04:00	0 2:25:20	OS2	314,25	223,85	-90,40	101.250	89.434	-11.815,52
OS1 Block Start 2018-01-31 06:00	0 1:54:07	OS1	299,00	140,19	-158,81	88.310	61.639	-26.671,16
OS1 Block Start 2018-01-31 21:00	0 2:38:56	OS1	203,50	205,24	1,74	53.190	88.071	34.881,33
OS1 Block Start 2018-02-02 03:00	0 1:15:27	OS1	203,50	123,67	-79,83	53.190	45.041	-8.149,39
OS2 Block Start 2018-02-02 21:00	0 2:33:54	OS2	439,75	181,26	-258,49	134.600	82.011	-52.588,82
OS1 Block Start 2018-02-03 05:00	0 1:23:55	OS1	203,50	288,05	84,55	53.190	77.396	24.206,28
OS2 Block Start 2018-02-05 01:00	0 1:57:26	OS2	299,00	127,61	-171,39	88.310	61.861	-26.448,65



PI utilization in Italian Fleet

CHALLENGE

- *Collect and manage, in a unique HW, big data coming from different sources like DCS – SCADA – Data Hub – Web Servers.*
- *Archive in safer way historical data.*
- *Reduce time consumption in data collection.*
- *Web visibility of fleet data for different users.*
- *Advanced data analysis.*
- *Support and advice in maintenance strategy.*
- *Automatic reporting.*

SOLUTIONS

- *PI server installation in all the fleet .*
- *Full visibility in corporate network via common IT architecture.*
- *Operator training on PI system.*
- *Creation of High Level team across the fleet.*
- *Internal development of PI Vison.*
- *Internal development of AF and EF.*
- *Internal development of data reporting.*
- *Cooperation with OSiSoft partners.*

RESULTS

- *Speed up data collection.*
- *Speed up data analysis.*
- *Reduced up to 50% FTE time and costs in data management.*
- *High level of data reliability.*
- *Web visibility on mobile devices for different users.*
- *Early detection of failure.*
- *Cost savings in maintenance strategy.*
- *High possibility of future development.*

Development plan

- Implementation of Condition Based Maintenance using PI data
- Implementation of Asset Condition Monitoring using PI data
- Connection between PI and Power BI Microsoft
- Automatic data collection for company's data base (for authorities)
- Automatic data collection for company's reporting (for board members)
- Manual data input via tablet with WiFi connection on PI server

THANKS FOR THE ATTENTION