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# Ansaldo Energia IPS Integrated Plant Support

Presented by **Sandro Gollini – Ansaldo Energia**  
**Giuseppe di Bartolo - TQService**



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# Agenda

- Ansaldo Energia Company
- Diagnostic Monitoring Support (ADA / APEX)
- Integrated Plant Support center (IPS Center 24/7)
- PI Infrastructure in Cloud
- Obtained Results and Business Impact
- Future plan and next step
- Summary and Conclusion





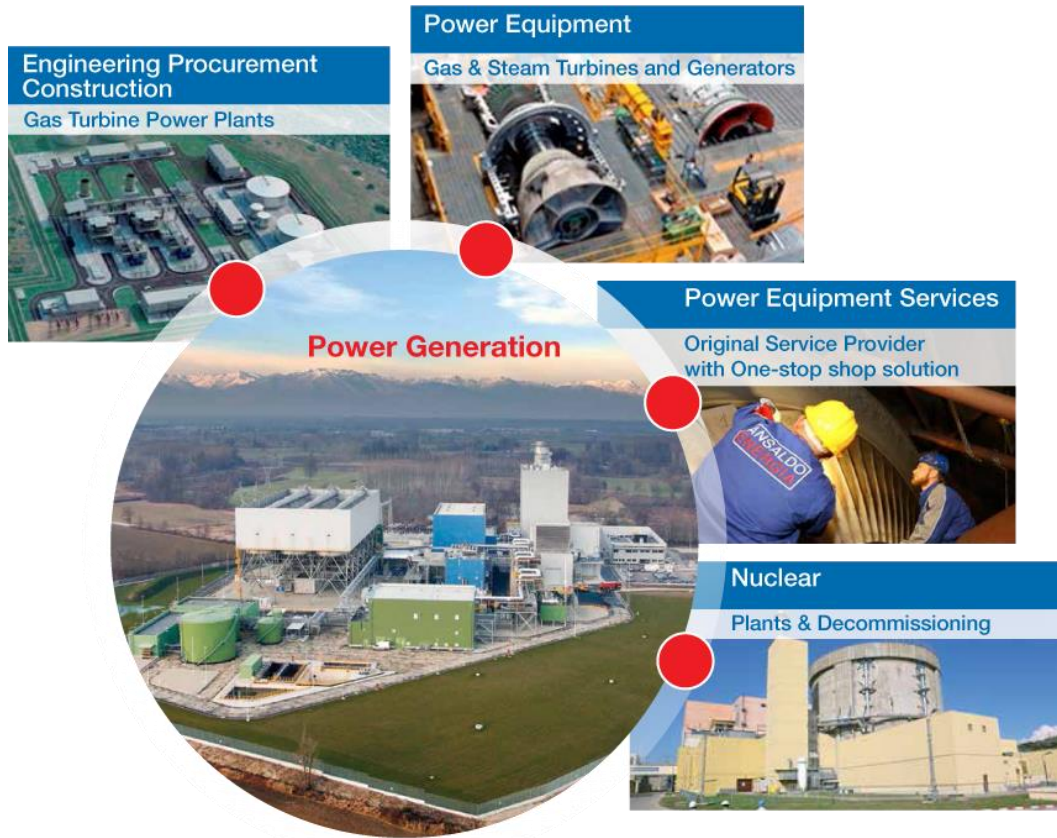
# Background





# Ansaldo Energia Group

Achieve a sustainable growth by providing a **Flexible** and innovative portfolio of **Solutions** to match global energy demand



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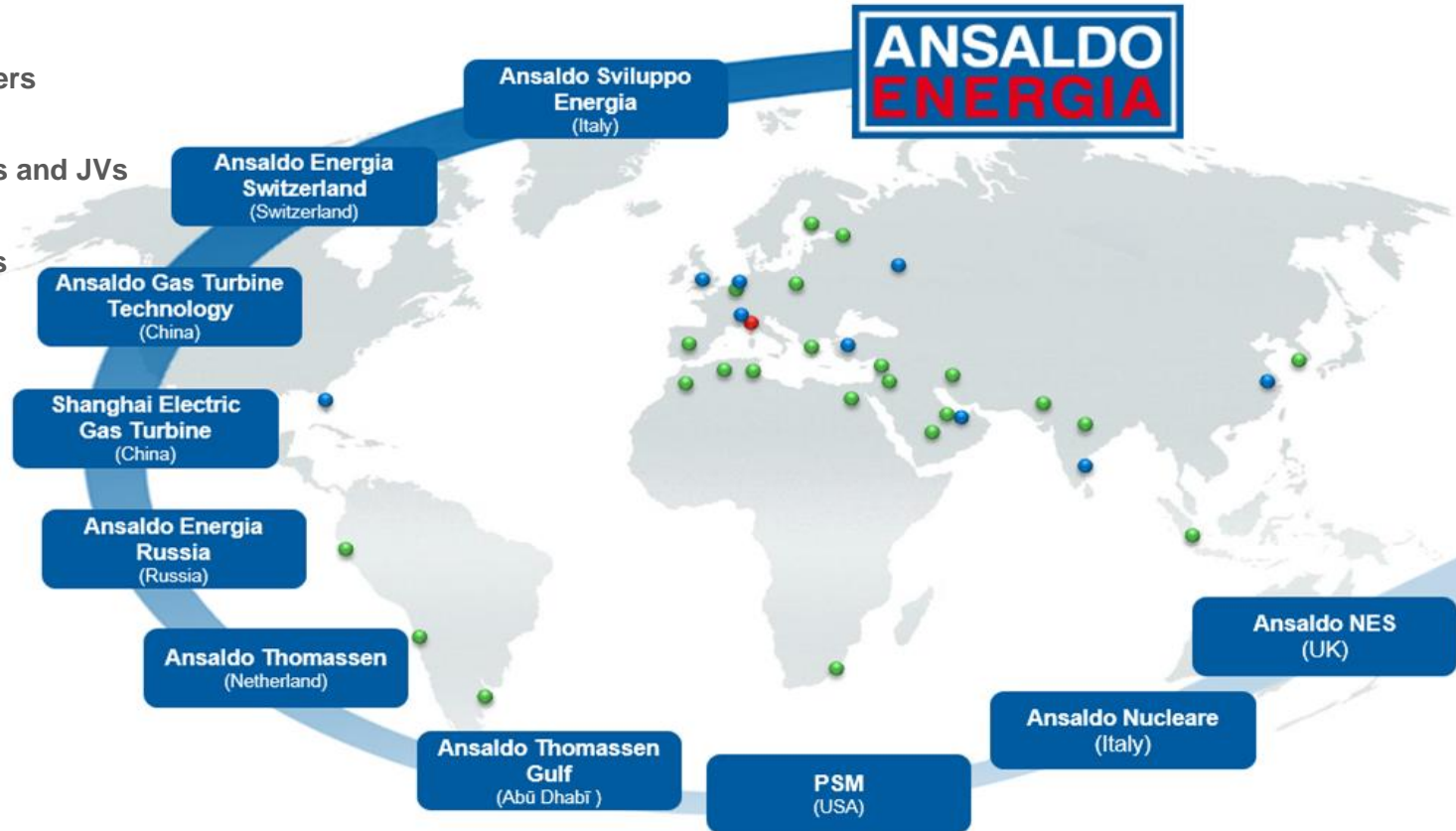
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# Ansaldo Energia in the World

● Company Headquarters

● Controlled Companies and JVs

● Branches and Offices



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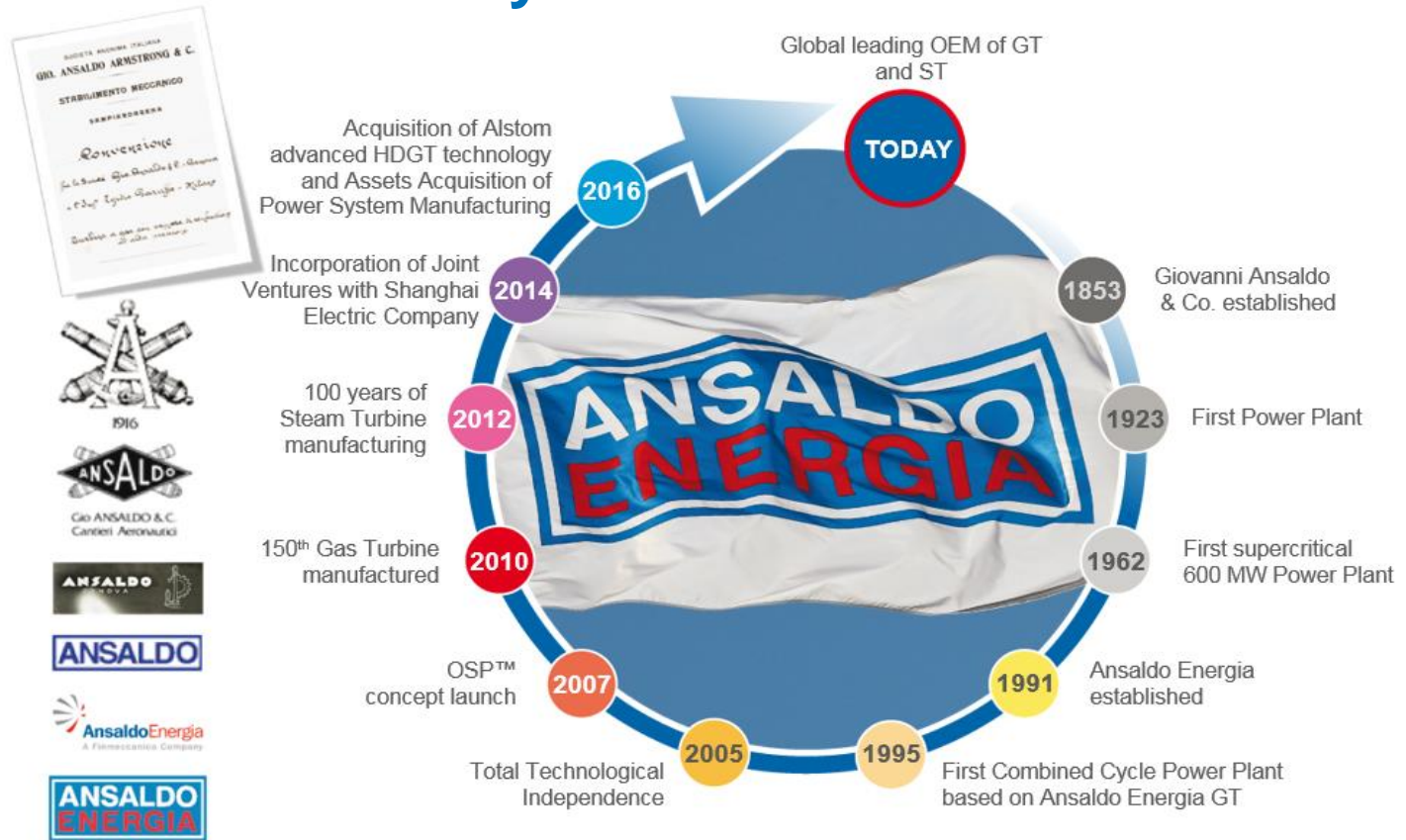
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# More than 160 Years of History

- More than **160** Years of History
- More than **160** Years of Know How
- More than **10** Years of PI Data

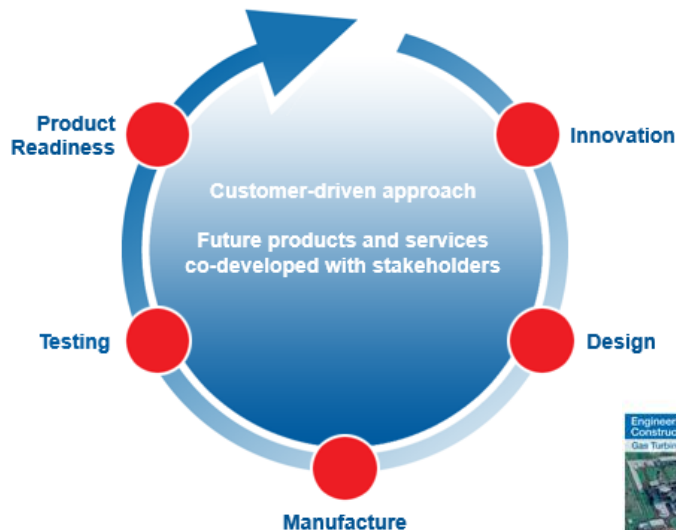


# Integrated Business Model for Power Generation Industry

## FROM CONCEPT TO START-UP & BEYOND

- Plant design
- Environmental impact analysis
- Equipment and BOP purchase
- Project management
- Construction management
- Commissioning
- Long term service agreement

## FROM DESIGN TO TESTING





# Ansaldo Energia - Power Plant in world

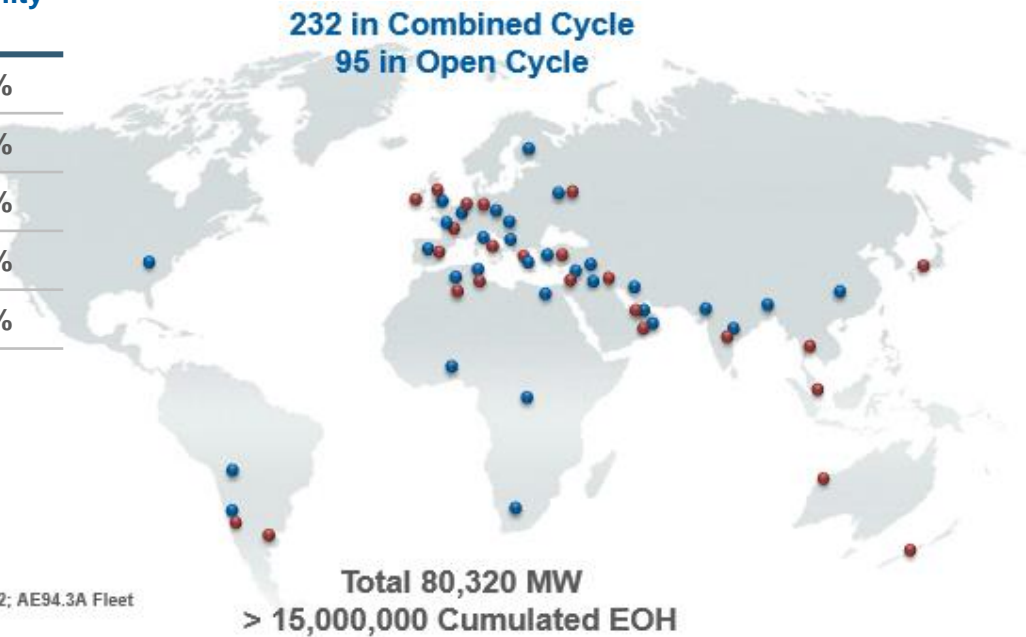
Type	Power Plant Number	Total Power, MW
» Thermal PP	41	13,500
» Open Cycle PP	16	6,600
» Combined Cycle PP	48	22,900
<b>Total</b>	<b>105</b>	<b>43,000</b>



**Africa:** Algeria (8); Egypt (2); Morocco (1); South Africa (2); Tunisia (2); **Asia:** India (1); Malaysia (1); Pakistan (1); **Middle East:** Lebanon (2); Oman (2); United Arab Emirates (2); **Europe:** France (1); Greece (2); Italy (28); Spain (1); Turkey (1); United Kingdom (2); **North America:** USA (3); **South America:** Bolivia (1); Chile (1);

# Ansaldo Energia - Gas Turbines in the world

Model	Unit Power MW	Units	Tot. Power MW	Reliability
» AE64.3A	78	37	2,500	>98%
» AE94.2	185	107	16,800	>98%
» AE94.2K	170	5	800	>98%
» AE94.3A	310	74	20,720	>98%
» GT26	345	104	39,500	>98%
<b>Total</b>		<b>327</b>	<b>80,320</b>	



**Africa:** Algeria (23); Congo Rep (2); Egypt (10); Ghana (2); South Africa (6); Tunisia (3); **Asia:** Bangladesh (3); China (9); India (3); Japan (1); Pakistan (1); Singapore (7); Thailand (9); **Europe:** Albania (1); Belgium (1); Finland (3); France (3); Germany (4); Greece (4); Hungary (1); Ireland (2); Italy (60); Netherlands (5); Poland (2); Russia (17); Spain (16); Turkey (4); United Kingdom (26); **Middle East:** Iran (44); Iraq (4); Israel (2); Jordan (2); Lebanon (4); Oman (13); Syria (4); United Arab Emirates (16); **North America:** USA (1); **South America:** Argentina (2); Bolivia (2); Chile (2); **Oceania:** Australia (2); New Zealand (1).



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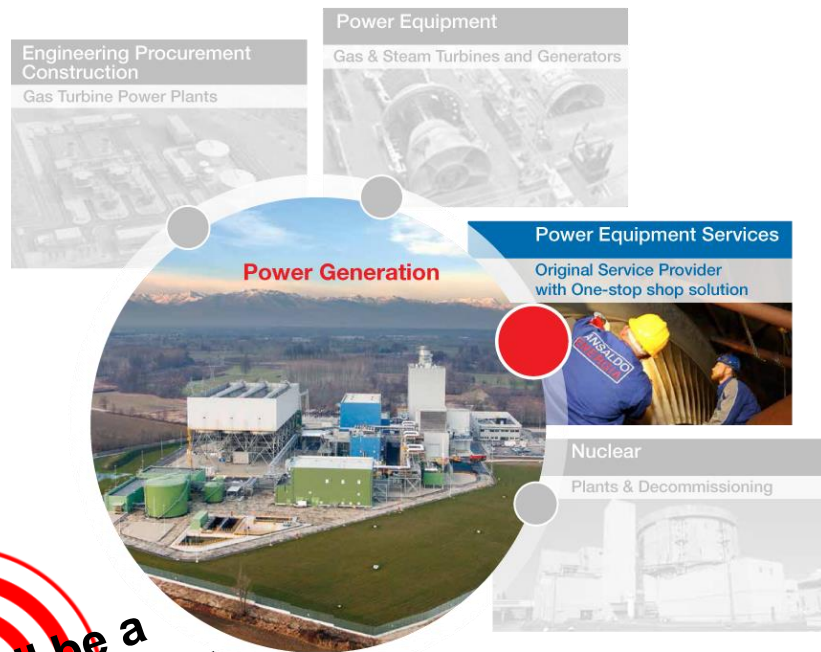
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# Ansaldo Energia Maintenance Service

Mission is to support **Customer Strategy** by providing a **Flexible, Reliable & Multi-Platform Portfolio** of High Technology

Operation Support  
Remote Monitoring & Diagnostics



The goal will be a  
Global 24/7 Monitoring



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# ADA™ - Advanced Diagnostic Analysis

Ansaldo platform for remote monitoring and diagnostic



## Main features

- Independent system
- DCS Communication
- Performance Analysis
- Vibration Analysis
- Combustion Analysis
- Generator Diagnostics
- Early warning/notification
- Predictive Diagnostics

## **ADA™ System build on PI System infrastructure:**

- Implemented about 10 years ago
- Different changes during the years:
  - Technological
  - Architectural
  - Product
  - Features

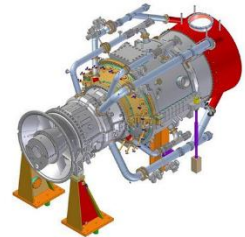
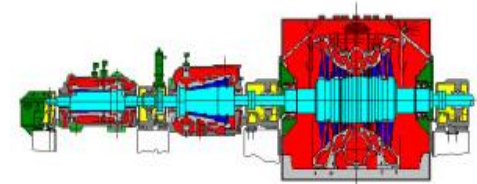




# ADA™ System powered by PI Infrastructure

ADA™ is completely built with OSIsoft products:

- PI Plant server: data collection from plant asset normally by OPC Interfaces
- PI Central server: store all relevant data coming from local plant through PItoPI interface
- PI Asset Framework: used to model and define asset
- PI Totalizer and PI Perf. Equation: used to aggregate data
- PI ACE: used to calculate complex KPI
- PI ProcessBook: used to show display and data
- PI DataLink: used for reporting
- PI Notification: used to send automatic alert according critical or warning condition
- PI rtWebParts: show data in the Ansaldo Microsoft SharePoint portal
- PI Coresight: used to show data in the browser



# ADA™ Services based on PI System infrastructure

## Remote Monitoring & Diagnostics

Customer support (direct phone and mail)

Daily check of machinery parameters

Periodic report

Problem report

Feedback for product development

Maintenance optimization

## Operation Support

Troubleshooting

Remote balancing

GT controller tuning

Combustion tuning

GT restart assistance



# Remote monitoring and diagnostic network

## Services

**Customer support** (direct phone, mail & ticketing)

**Daily check** of machinery parameters

**Periodic report**

**Problem report (PR)**

**Maintenance optimization**



Remote monitoring references  
18,500 MW under R&M contracts  
50,000 tags real time downloaded  
19 Customers, 13 Countries



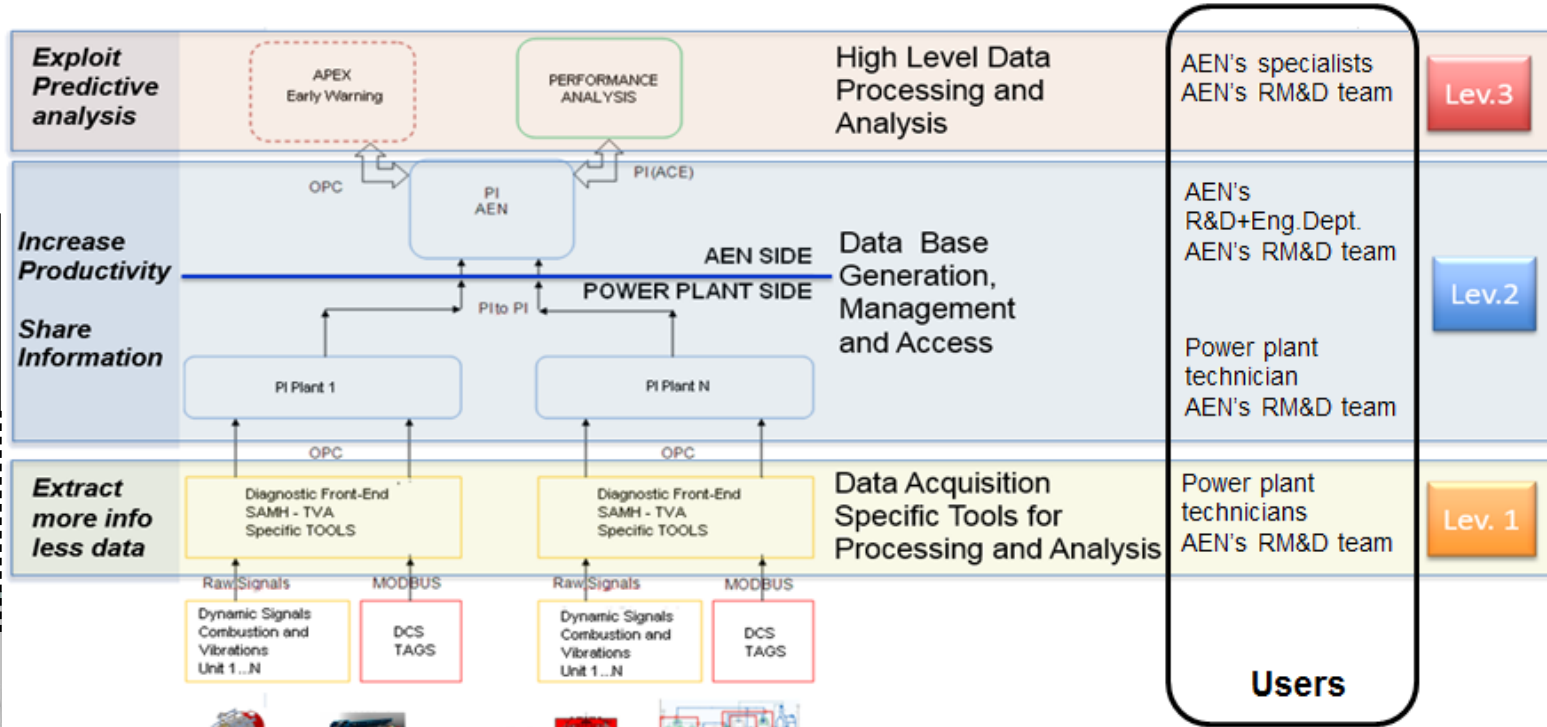
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# Ansaldo ADA™ Architecture





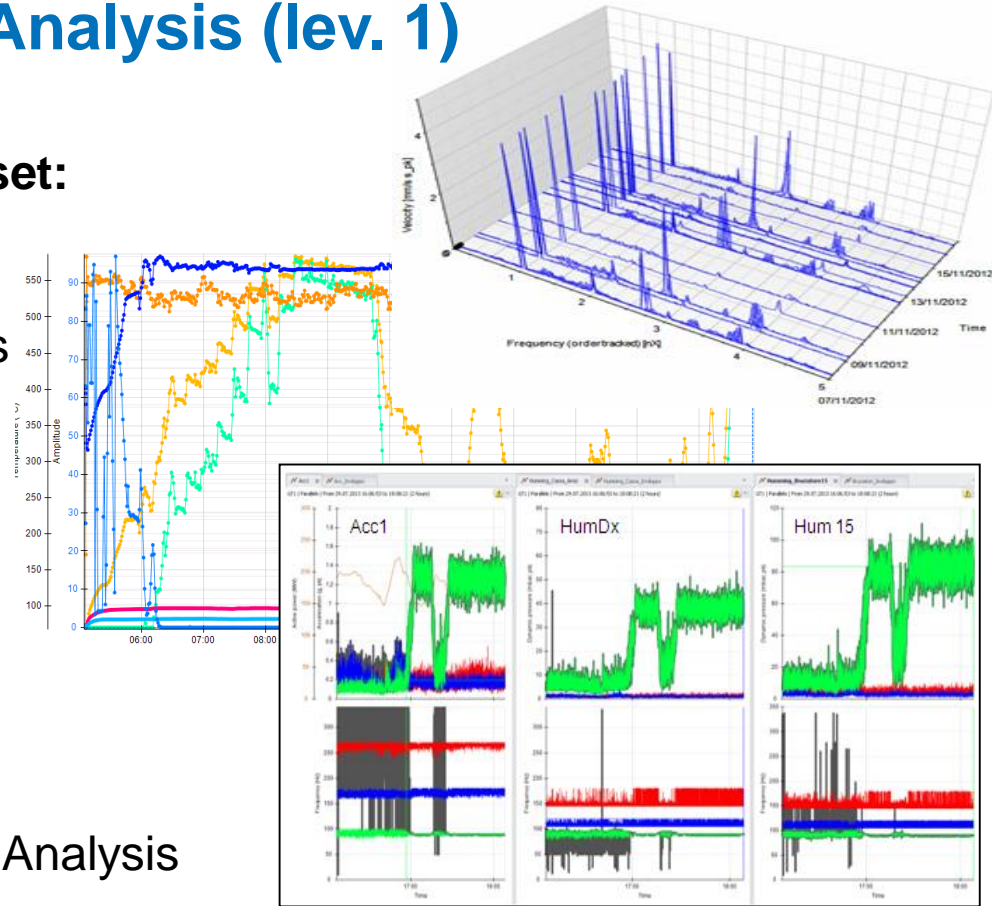
# Ansaldo ADA™ - Data and Analysis (lev. 1)

## Data collected for each turbine asset:

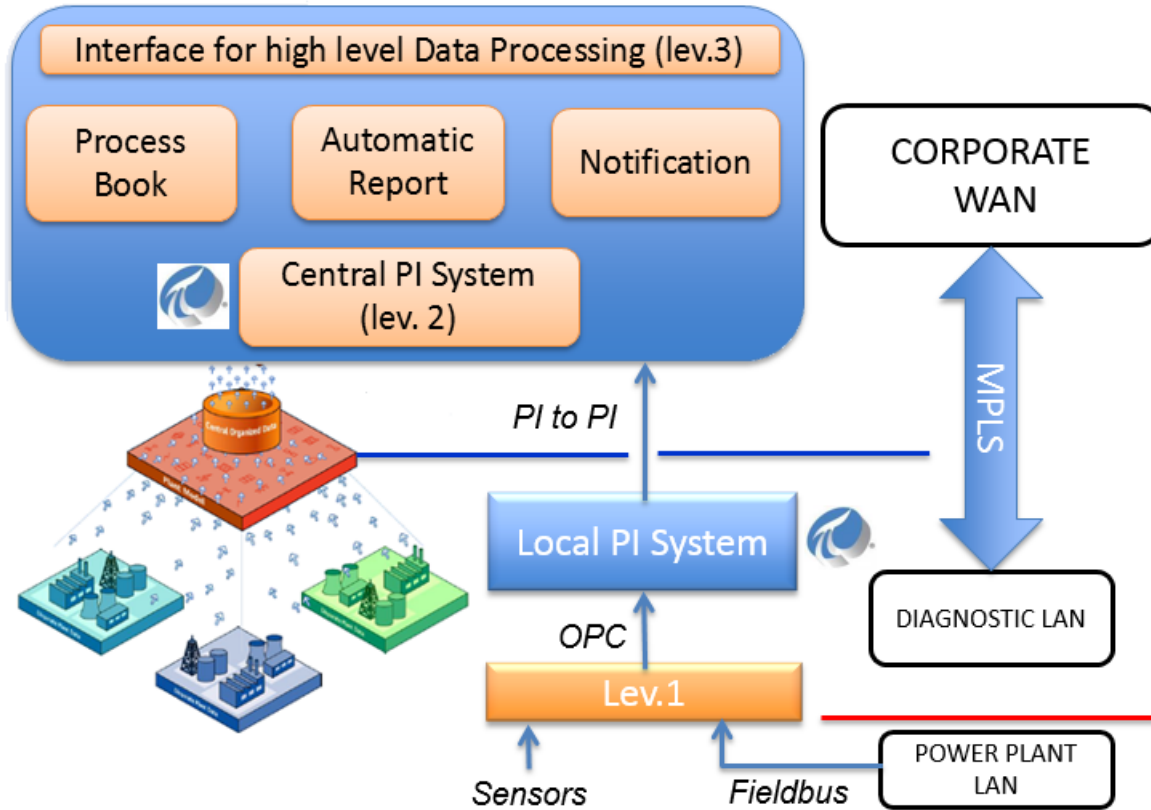
- Vibration Monitoring
- Combustion Monitoring
- Control and Operation Parameters
- Pressures
- Temperatures
- Mass flow
- Chemical Composition

## Analysis for each turbine asset:

- Vibration Analysis
- Combustion Analysis
- Integrated vibration & combustion Analysis



# Ansaldo ADA™ - PI System infrastructure (lev. 2)



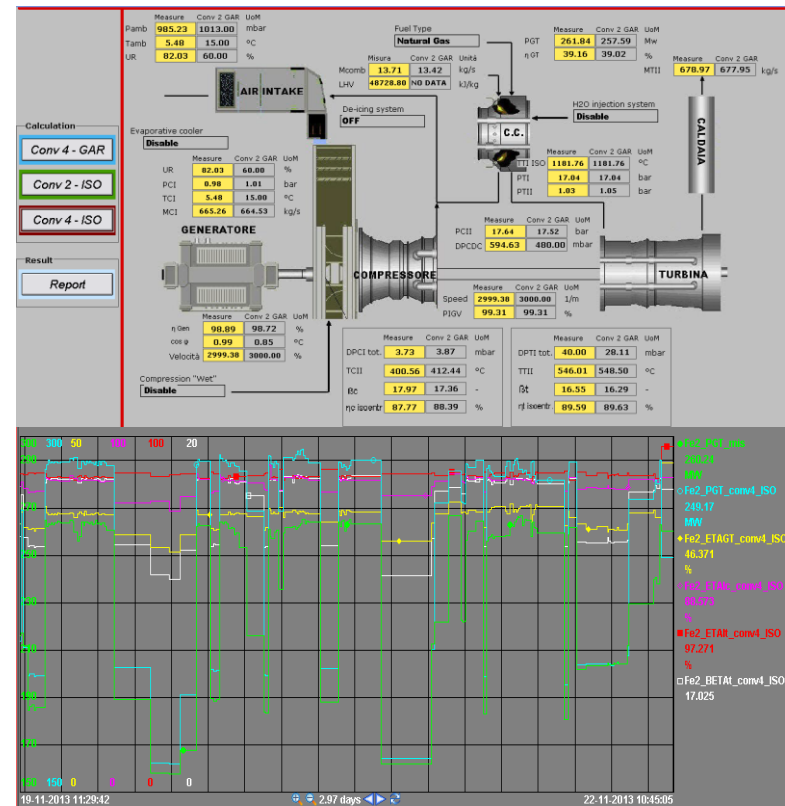
- ✓ OPC DA standard to share information in diagnostic LAN and forward to lev. 2
- ✓ Each power plant has a local PI System that collects data and forward them to Ansaldo Energia main central PI System
- ✓ MPLS to realize VPN connection
- ✓ Manage Large Database (Real Time, Historical)
- ✓ Extract Valuable Information

## Ansaldo ADA™ - Gas Turbine Performance Analysis (lev. 3)

## The GTPA system provides:

- Gas Turbine Performance Indicator
- Steam Turbine Performance Indicator
- Predictive Analysis
- Real Time Performance Indicators (Efficiency, Power)
- Analysis for Diagnostic purpose or for aging evaluation
- Integrated Vibration and Combustion Analysis and Indicators

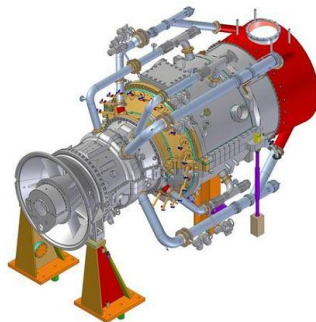
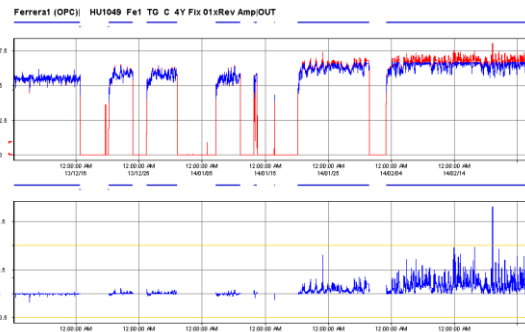
**GTPA System (Gas Turbine Performance Analysis) is built using PI Asset Framework (AF), PI ACE, PI ProcessBook, PI DataLink, PI Notifications**



# Ansaldo APEX™ System (lev. 3)

## Ansaldo Predictive EXpert System (APEX™)

- Approach to predictive analysis
- On-line monitoring of each asset (thermodynamic model)
- PI System provide real-time data to expert System based on Neural Networks
- Estimated vs Measured data
- Real time notification when behavior changes



Neural Network  
Modelling

Combustion  
Analysis

Vibration  
Analysis

Performance  
Analysis



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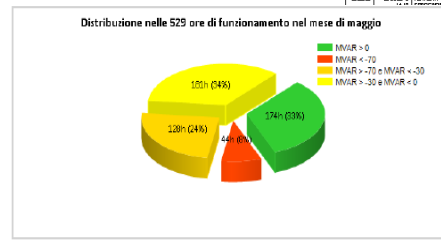
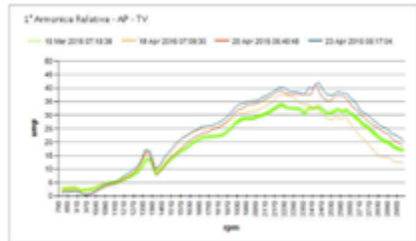
# Ansaldo ADA™ - Automatic reports

## Automatic Word report (about 25) are implemented with:

- Microsoft SharePoint: to distribute and show reports
- Microsoft Reporting Services: to create report
- PI-OLEDB Provider: to get data from PI System

## Benefit with automatic report:

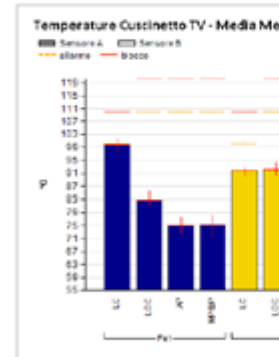
- Reduce time to prepare report
- Standardize the content
- Improve the technical content



### Eventi del Mese - Problem Report

Di seguito si riportano i PR aperti nel mese di Maggio:

ID	Descrizione	Stato	Temperatura	Temperatura
PR1001	ANOMALIA RELATIVA AP - TV	APERTO	120h (44%)	174h (33%)
PR1002	ANOMALIA RELATIVA AP - TV	APERTO	105h (20%)	44h (8%)
PR1003	ANOMALIA RELATIVA AP - TV	APERTO	120h (44%)	174h (33%)
PR1004	ANOMALIA RELATIVA AP - TV	APERTO	105h (20%)	44h (8%)
PR1005	ANOMALIA RELATIVA AP - TV	APERTO	120h (44%)	174h (33%)
PR1006	ANOMALIA RELATIVA AP - TV	APERTO	105h (20%)	44h (8%)
PR1007	ANOMALIA RELATIVA AP - TV	APERTO	120h (44%)	174h (33%)
PR1008	ANOMALIA RELATIVA AP - TV	APERTO	105h (20%)	44h (8%)
PR1009	ANOMALIA RELATIVA AP - TV	APERTO	120h (44%)	174h (33%)
PR1010	ANOMALIA RELATIVA AP - TV	APERTO	105h (20%)	44h (8%)



la temperatura del cuscinetto LC (2176201A) nelle ultime settimane ha raggiunto livelli elevati. A riguardo è stato aperto il PR 3015101. Si suggerisce di pianificare al più presto l'ispezione del cuscinetto. (vedi anche segnalazione fatta nel report di Marzo 2015)

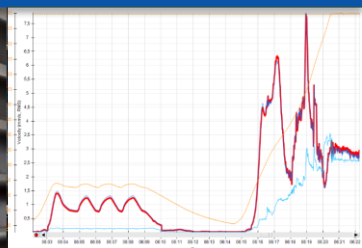
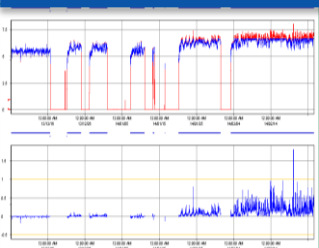
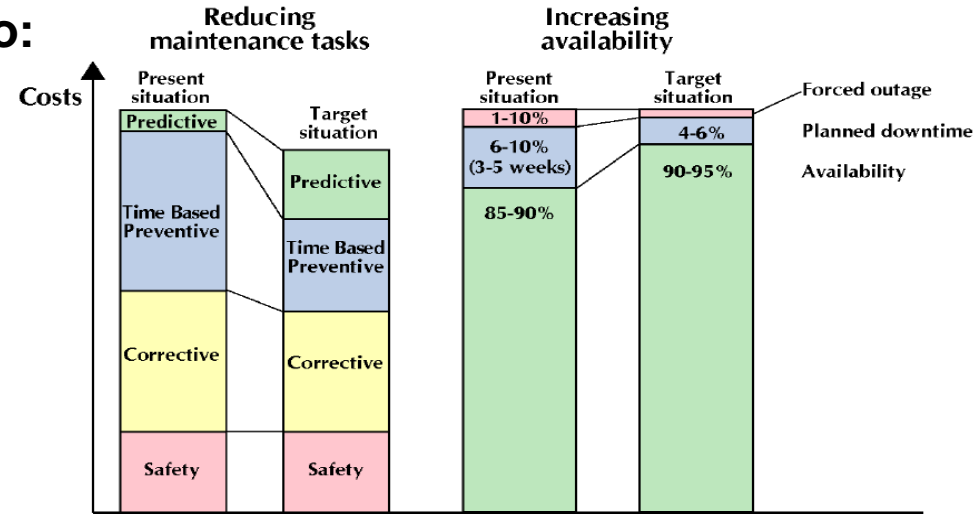


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# PI System ... ADA... APEX... GTPA.... - Why all of this ?

## For Predictive Maintenance in order to:

- Extract information on components health
- Adapt maintenance program
- Reduce maintenance task
- Save cost
- Increase reliability
- Increase availability





# Challenge



# Ansaldo Energia extend its presence in the world

## Ansaldo Energia asset acquisition:

- Power System Manufacturing LLC (Jupiter Florida – US)
- Ansaldo Switzerland (Asset GT26 Gas Turbine)

## Ansaldo Energia strategy:

- World wide IPS Center *Genoa / Jupiter* (support 24/7)
- IPS Team integration:
  - Two-level of support (front-end and engineering support)
  - Team training (Italy / US)
- Share and normalize tool and know-how





# IPS world wide center (Genoa / Jupiter)



Jupiter – Florida - US



Genoa – Italy

**Share team and fill the gap**



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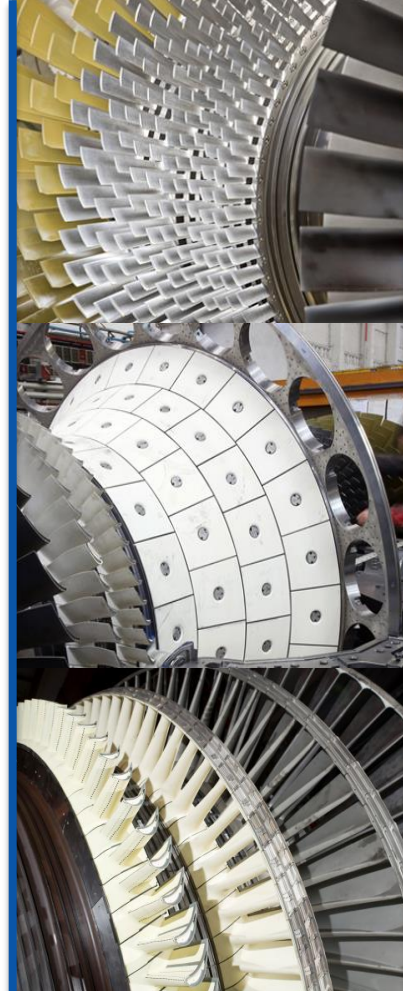
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# Ansaldo Energia assets

- **Ansaldo Energia**
  - Genoa Italy
  - Dedicated on-site PI System installed for each power plant
  - 1 central PI System (80.000 PI Tags)
  - OPC and PI-to-PI Interfaces
- **PSM – Power System Manufacturing LLC**
  - Jupiter – Florida – U.S.
  - Dedicated on-site PI System installed for each power plant
  - 1 central HA PI System (50.000 PI Tags)
  - OPC, PI-to-PI and HTML Interfaces
- **Ansaldo Switzerland (Asset GT26 Gas Turbines)**
  - Under Genoa monitoring
  - Dedicated on-site PI System installed for each power plant
  - OPC and PI-to-PI Interfaces





# Solutions



# Ansaldo Energia & PSM PI systems integration

The common infrastructure has to be ...



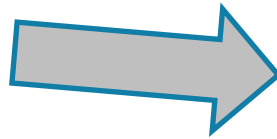
**Redundant**



**Always Available**



**Reliable**



**Move PI Infrastructure  
in the Cloud**



# IPS System Architecture ... before !!!

## PSM Head Quarter – Jupiter Florida US

AF SQL Server    AF Server    PI Server HA



PI to PI protocol

PSM PI Site 1



PSM PI Site 2



PSM PI Site (n)



VPN Concentrator

## Genoa Head Quarter – Italy

AF SQL Server    AF Server    PI Server



PI to PI protocol

Ansaldo PI Site 1



Ansaldo PI Site 1



Ansaldo PI Site (n)



VPN Concentrator



## Shrink the ocean !



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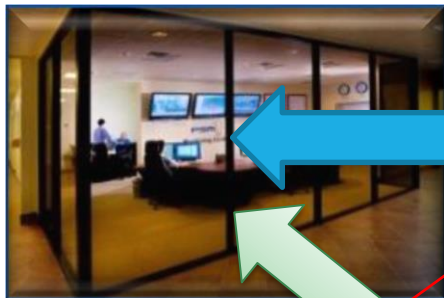
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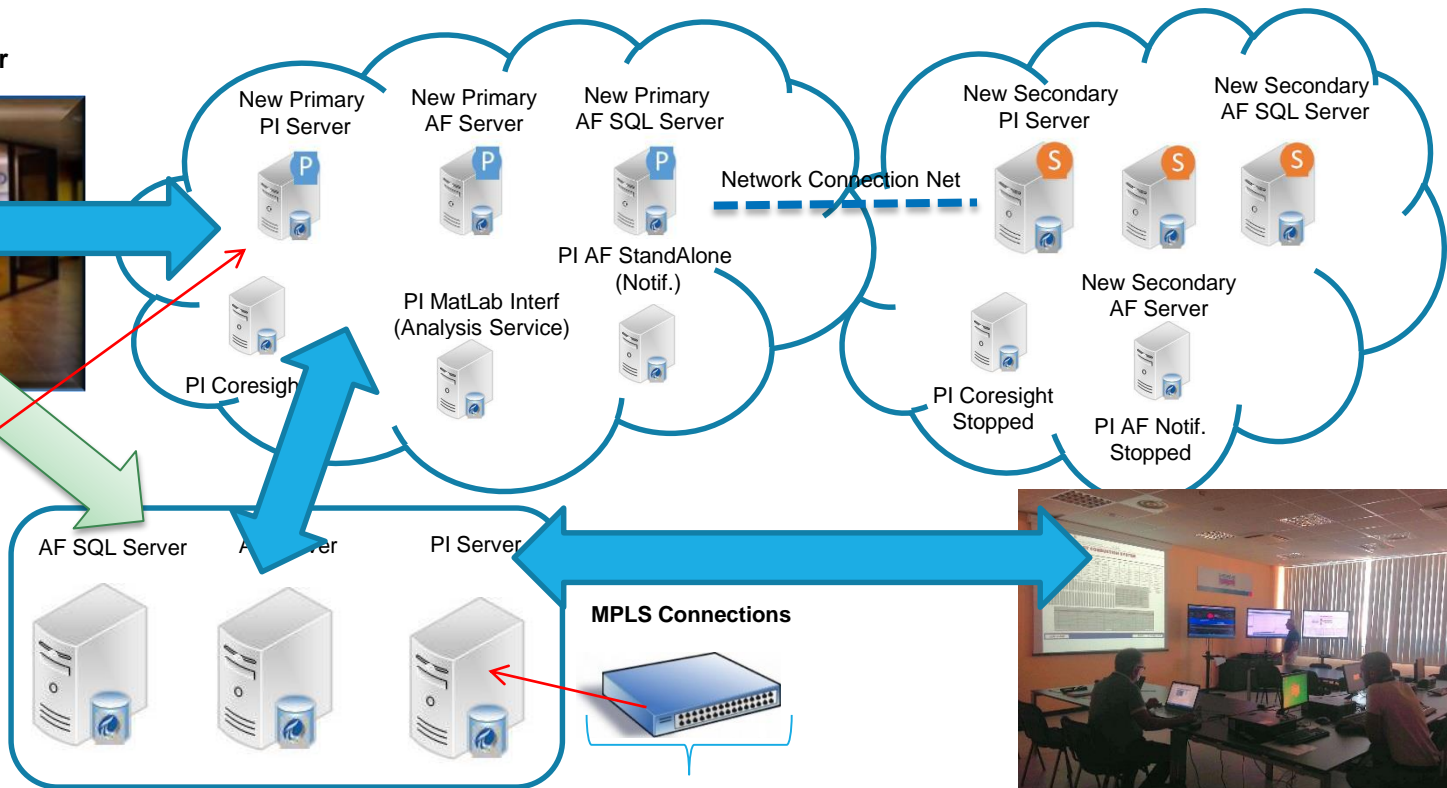
# IPS System Architecture ... after !

PSM Diagnostic Center



VPN Concentrator

PSM Data From PI Sites



Genoa Infrastructure- Italy

MPLS Connections

Ansaldo Energia  
DATA From PI Sites



Genoa Diagnostic Center



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# Results



# Obtained Results and Business Impact

- High scalability and flexibility of PI System permits to redefine world wide architecture in a easy way.
- The cloud infrastructure guarantee a continuous service and availability
- Cloud migration was simple and easy (no loss of data or interruption)
- Different team work on same application and data to manage customer request
- Facilitated know-how sharing and Customer will be supported 24/7
- US and Italy team are experienced users of OSIsoft tools so the integration is more simple
- Reduction of Customer support response time
- Issue resolution improved by real-time data and fast historical data access



# Next step



## Future plan and next step

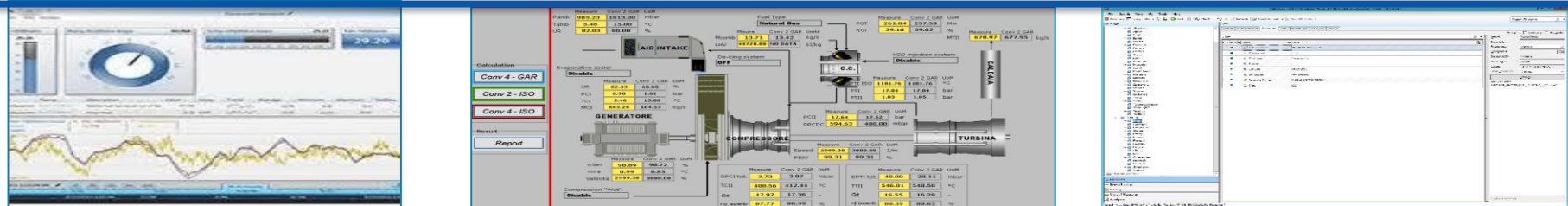
- Move Ansaldo Energia Italy PI Infrastructure in the Cloud
- Complete the integration between Italy and US team
- Complete the standardization and normalization of tool and procedure
- Review AF modeling asset to integrate new sites
- Implement new AF Analysis and PI Notification alert





# Future Plan and Next Step

- Implement new PI Coresight page
- Migrate PI ProcessBook display for Microsoft SharePoint and PI Coresight
- Implement KPI to measure level of service and ROI
- Implement new automatic report for diagnostic



# Summary

## COMPANY and GOAL

Ansaldo Energia, leader in Engineering Procurement construction, Power equipment and services, Nuclear Plant with 160 Years of experience and know how.

The growing of Ansaldo Energia required to integrate different PI System infrastructure, team and knowledge as well.



## CHALLENGE

To get a common diagnostic monitoring center (IPS) operating 24/7

- Genoa and Jupiter diagnostic center
- Two different team
- Availability and reliability of the infrastructure

## SOLUTION

Move PI System infrastructure in the Ansaldo Energia cloud

- PI System installation on cloud
- Training of the teams (Italy / US)
- Normalize tool
- Share knowledge

## RESULTS

Consolidated infrastructure to provide 24/7 integrated support service

- High scalability and flexibility
- High availability and reliability
- Facilitated know-how sharing



# Contact Information

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## Questions

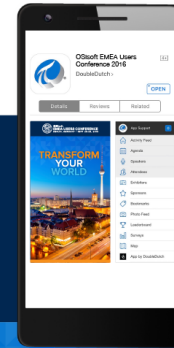
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State your **name & company**

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

Asset Growing ... People & Data Growing .... Opportunities Growing



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