AGL’s Real-Time Data Journey

David Bartolo (Head of Asset Performance)

Australian Gas Light Company (AGL)

- AGL is one of Australia's leading integrated energy companies and largest ASX listed owner, operator and developer of renewable energy generation in the country
- Drawing on more than 180 years of experience, AGL provides gas, electricity, solar PV and related products and services to more than 3.6 million customers across Australia.
- AGL operates the country's largest electricity generation portfolio and we're its largest ASX-listed investor in renewable energy. We are taking action to responsibly reduce greenhouse gas emissions while providing customers with secure and affordable energy
- Our business definition, 'Harness insights to enrich the customer's energy experience' means that our customers are at the heart of everything we do.

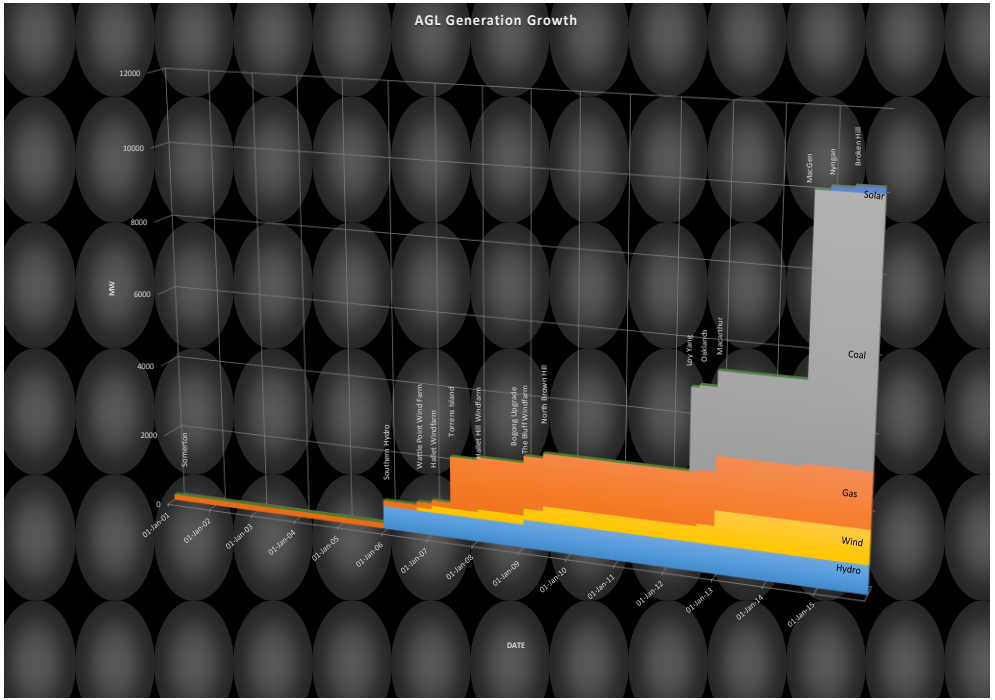
We are committed to prospering in a carbon-constrained future and building customer advocacy as consumer expectations evolve

The AGL Generation Fleet

300-10,000+ MW in 9 Years!

Fast Generation Portfolio Growth via:

- Acquisitions including:
  - Southern Hydro (700MW)
  - Torrens Island Power Station (1280MW)
  - Loy Yang Power Station (2250MW)
  - Macquarie Generation (4560MW)
- Build including:
  - 9 X Wind Farms (1589MW)
  - Bogong Hydro Power Station (150MW)
  - 2 X Solar Power Stations (155MW)



Choosing OSIsoft PI

Data Landscape Early 2012

- Data issues facing AGL
  - Live “Read Only” SCADA screens being used for real time visualisation
  - Data skill set not transferable
  - High reliance on human data champions at each site to provide data
  - Data precision and tractability poor
  - Many data collection processes still manual
  - Data “black spots” reducing capability to investigate asset performance and incidents effectively
  - Centralised human resources hampered by poor access to asset data
  - No capability to efficiently execute any type of Data Analytics across the portfolio
- AGL Generation Fleet was projected to grow to 9000+ MW within 4 years! A data solution that matched our growth strategy was urgently required…….

OSIsoft Real Time Data Infrastructure

The enabling technology that changes our data culture and gets us better results

PI is our real time data infrastructure solution

- It includes the high performance PI Server that acts as a highly adaptable and connectable real time data historian that can connect to almost all power station field devices including, but not limited to:
    - Distributed Control Systems (DCS)
    - Programmable Logic Controllers (PLC)
    - Field Located Digital devices (instruments, controllers etc.)
- Advanced analysis and visualisation tools that greatly increase the value proposition for AGL.
- Mobile data access that is secure for all AGL users.
- Many OSIsoft Partner products that easily connect to PI.

OSIsoft Enterprise Agreement

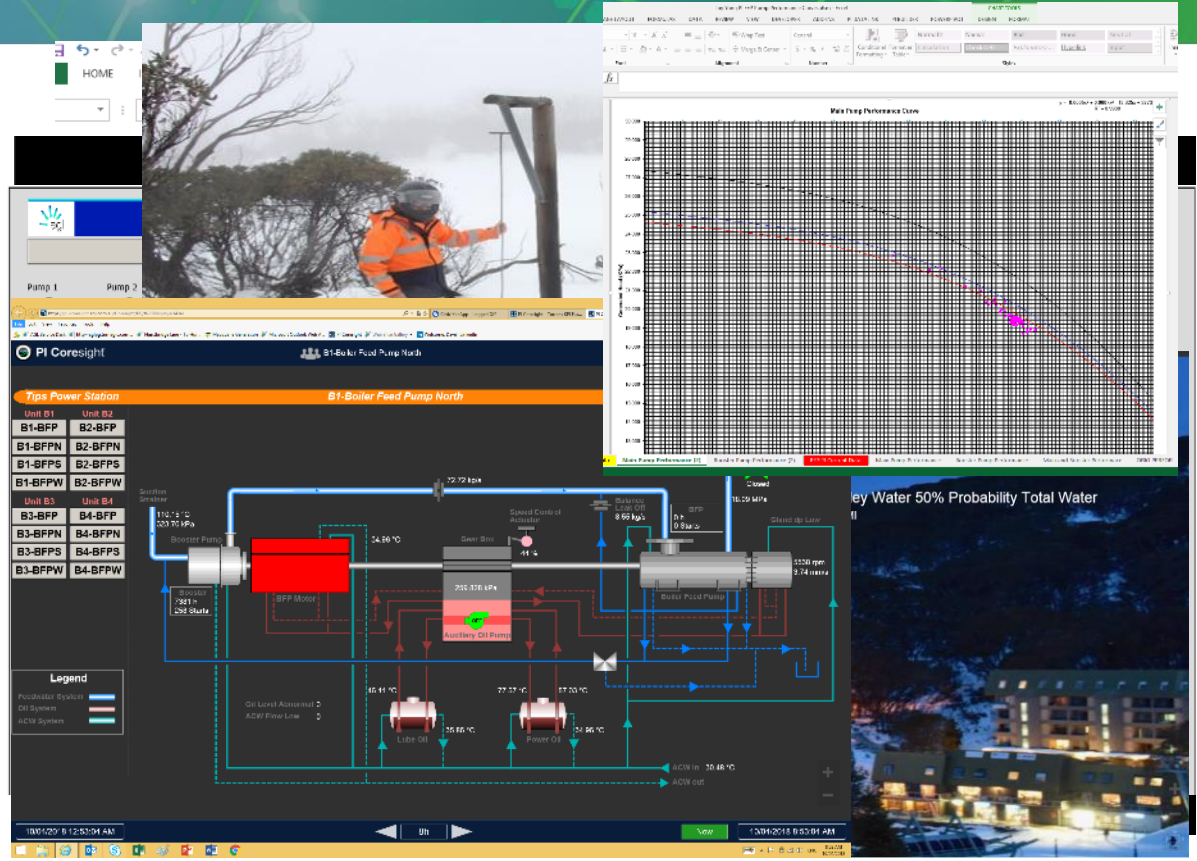
Enabling and supporting a data transformation

Architecture	• EA Technical Support • EA Rollout Plan • System performance monitored
Data Culture	• Face to face and online training services • Unlimited user Licences and tags
Scalability	• Flexible EA and PI system architecture • Easy to include new assets
Value Realisation	• EA assists value realisation program • Support from OSIsoft Centre of excellence

PI empowers AGL people with real time data

AGL People empowered with the PI data system can build value fast

“OSIsoft PI improves our understanding of our assets and processes and allows our team to achieve better results”



PI enables the AGL Operational Diagnostics Centre

Predict It

Advanced Pattern Recognition

"Finding failures before they find us"

Early Warning System

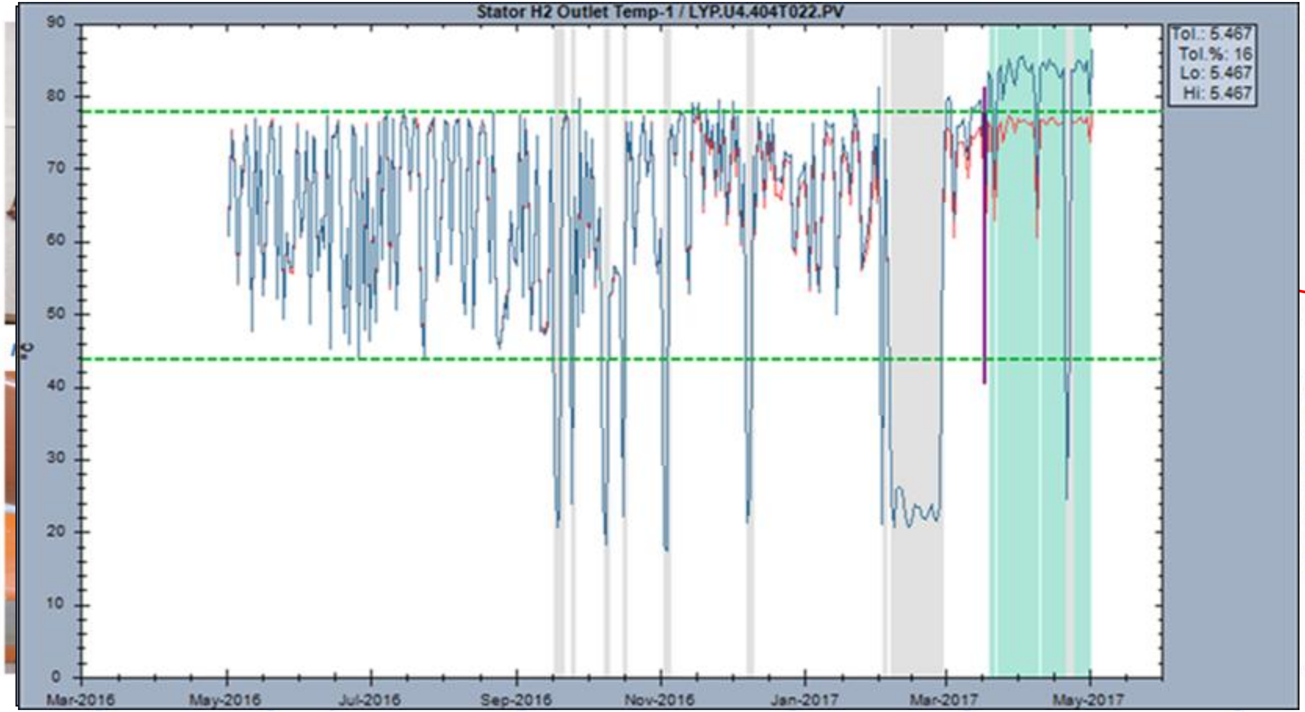
- Providing diagnostic service to Group Operations Business Units
- Foresight through early fault detection (weeks & months vs hours)
- Installed on Central PI System April 2015
- Over 2700 models monitoring over 45k critical points every 5 minutes
- Proven tool to reduce forced outage events and optimise maintenance effort

$18.7M value realised since installation

- Total set up cost $1.2M
- Annual running costs $620k

July 17 ODC: Significant Failure Avoided

- Loy Yang Station U4 Generator, 560MW, Hydrogen Cooled Stator



March 2017 / May 2017 / July 2017

Hydrogen outlet #1 temperature rises 8 to 15 Deg C above Predict It calculated expectation

Generator Stator found to be damaged and close to failing

Unit repaired in situ 4.5 weeks

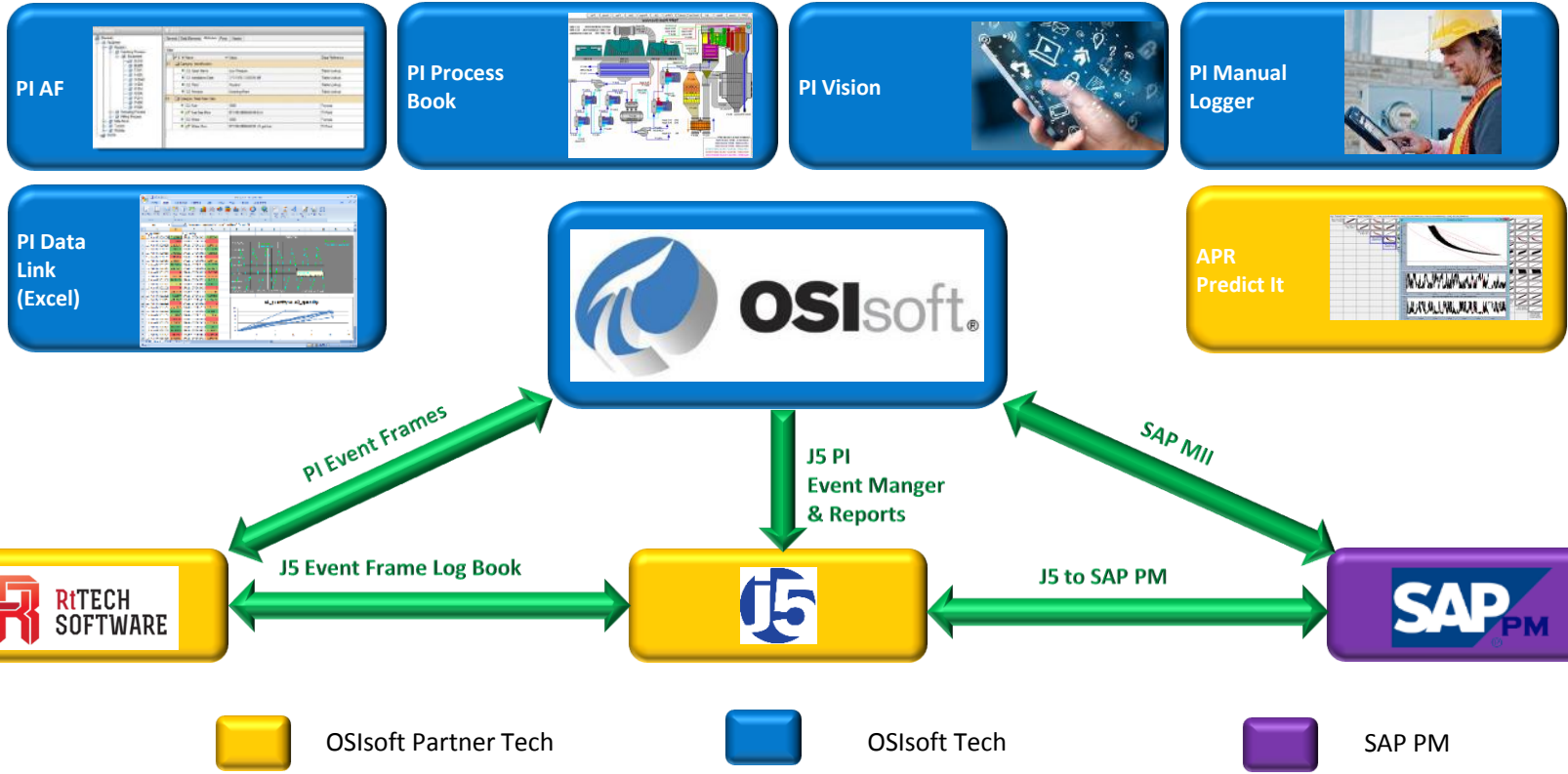
(estimated 12-14weeks)

Unit placed under close monitoring, removed from service and comprehensive inspection actioned

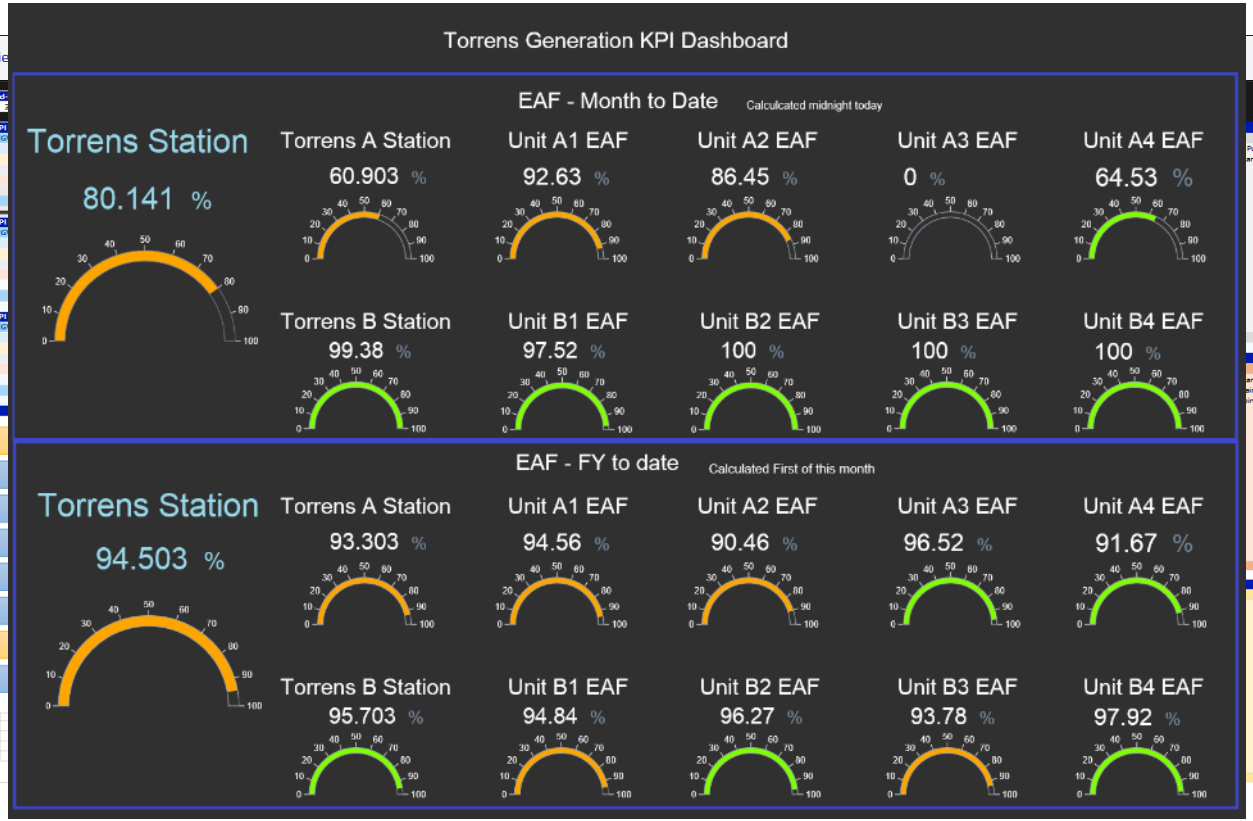
$50-70m

PI enables a new technology platform for operations

OSIsoft PI: The heart of our operational technology platform



Rt Duet: Real performance in real time



OSIsoft technology enables the Thermodynamic Performance Optimisation System (TPOS)

TPOS (under development)

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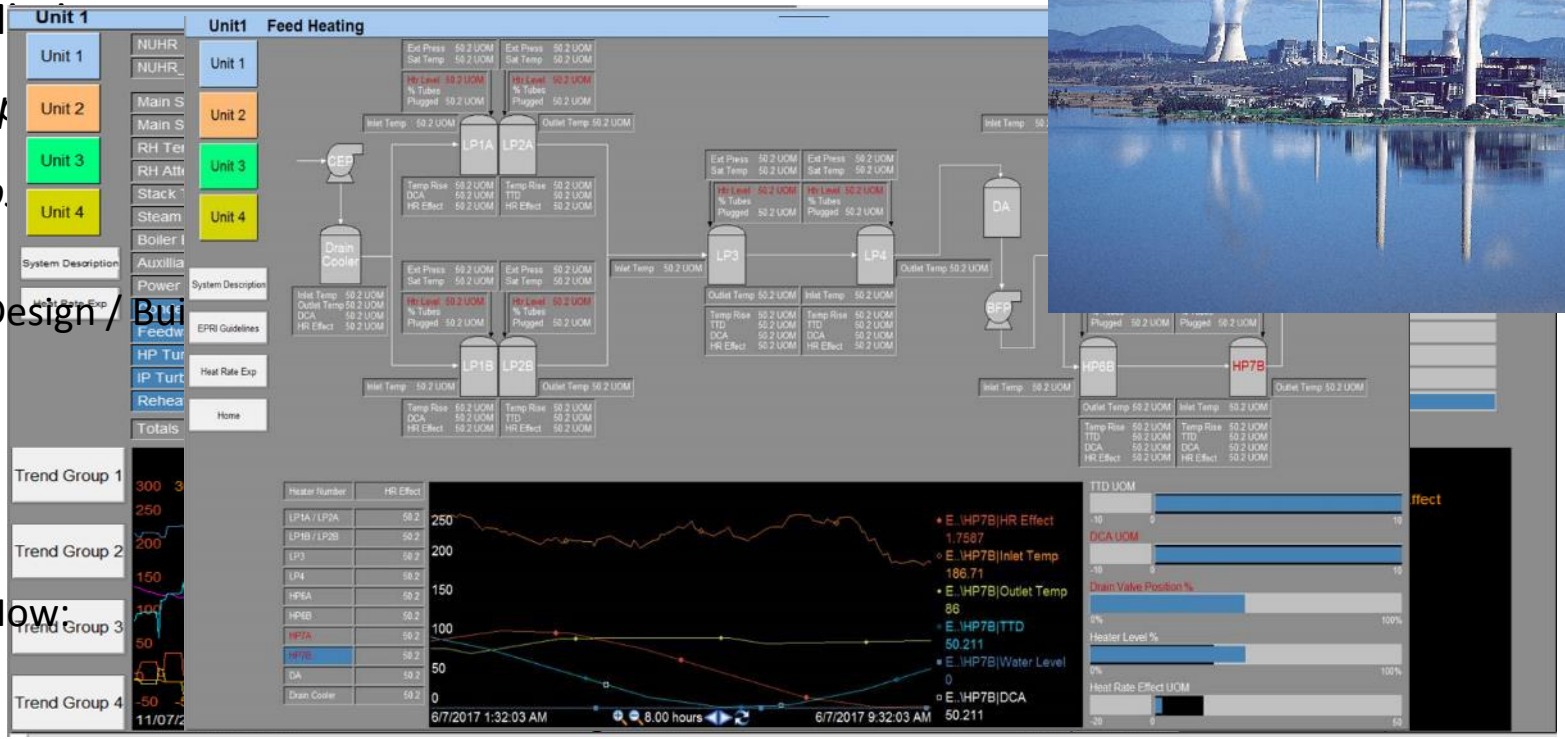
Design / Bui

How:



Operator TPOS Unit overview screen

- Utilise a specialist thermodynamicist to develop and build the system

OSIsoft technology enables the Wind Yield Optimisation System (WYOS)

WYOS (under development)

Mission:

Increase Wind Portfolio Yield (1-2%)

Design / Build:

- Identify underperforming turbines and true performance level
- Turbine alarm trending system
- Turbine uptime/downtime tracking
- Improve Wind resource understanding & forecasting (in PI)
- Improve Capability to sense high stress operating conditions & trends (Eg. Yaw error, feathering etc)

How:

- Use existing software (Primarily PI), combined with cloud computing
- OSIsoft (Centre of Excellence)
- Internal dedicated resource to develop and build the system (+ some support from OSIsoft skilled contractors)

WYOS (under development)

David Bowly | 29 November 2017

Operational Diagnostics Centre

Reduce unplanned generation losses across a mixed technology portfolio of > 10,000 MW

CHALLENGE

Improve capability to sense active failure modes at the earliest possible opportunity and take actions to avoid loss

- Data isolated and scattered
- Multiple SCADA technologies in play
- No access to real time data

SOLUTION

Phase #1: Centralise all real time data via OSIsoft PI

Phase #2: Install and commission Advanced Pattern Recognition Technology

- Predict It (APR) technology was fast to install and did not require a large data base (it uses Pi directly)
- A Centralised Operational Diagnostics Centre (ODC) reduced the number of recourses required and increased the level of skills
- ODC also uses PI system for deep dive investigations

RESULTS

$18.7M of avoided losses in 3 years (from a standing start)

$8.5M of savings last financial year

- ODC delivers significant tangible benefits
- OSISoft PI enables data transformation and the pursuit many other business improvements
- ODC technology now focusing on process safety uplift

AGL's Real-Time Data Journey

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- AGL

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

Merci

谢谢

Danke

Спасибо

Gracias

Thank You

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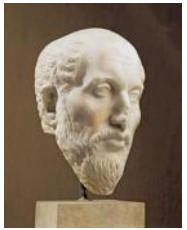

Grazie

Obrigado

“Knowledge, if it does not determine action, is dead to us”

Plotinus, Roman philosopher (205 AD - 270 AD)