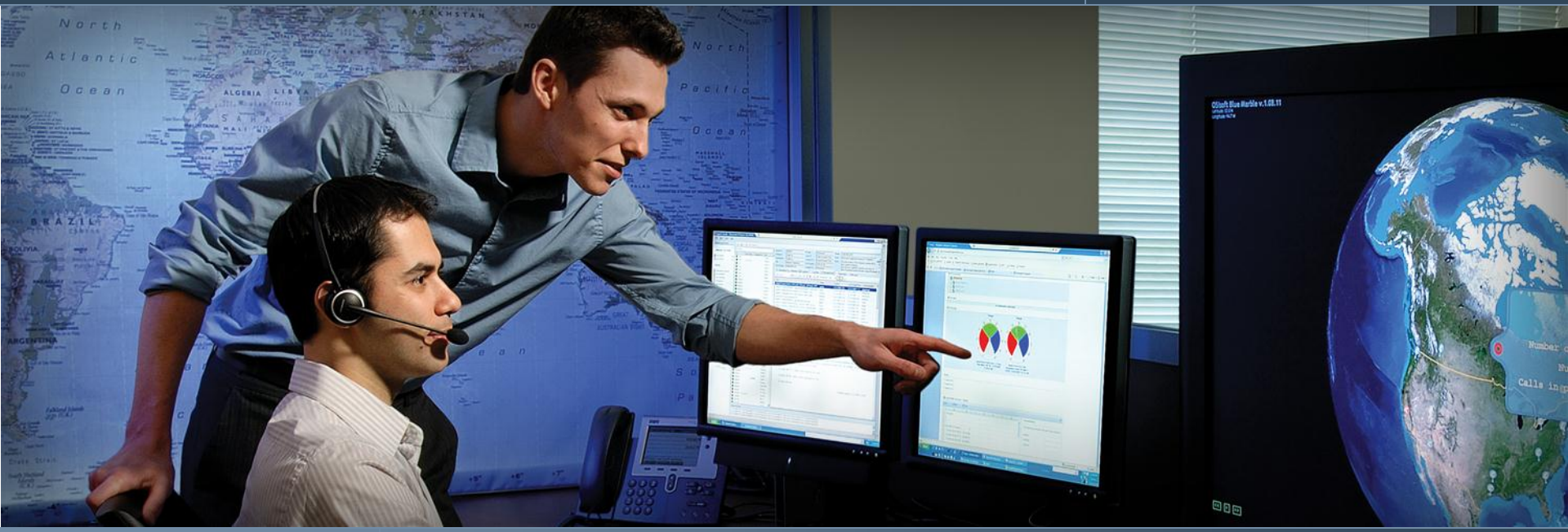
Regional Seminar Series

Johannesburg, Gauteng, South Africa



The Power of a Centralised Historian
Eskom Remote Monitoring & Diagnostics Center

Stafford Sher
Senior Manager: Technology & Utilities
Accenture

24 February 2011

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AGENDA

- Client Overview
- Problem statement
- Requirement
- Architecture & System
- Client Benefits

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About Eskom

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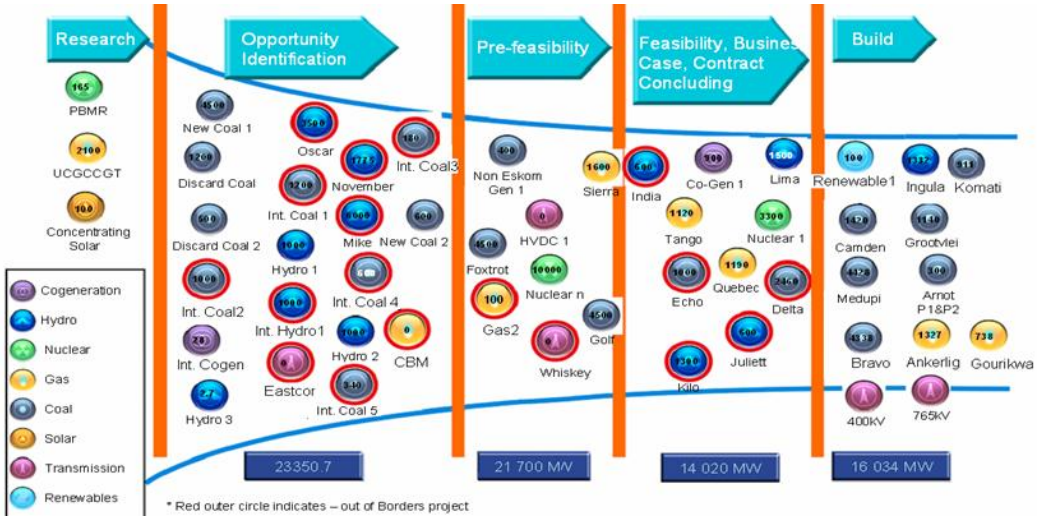
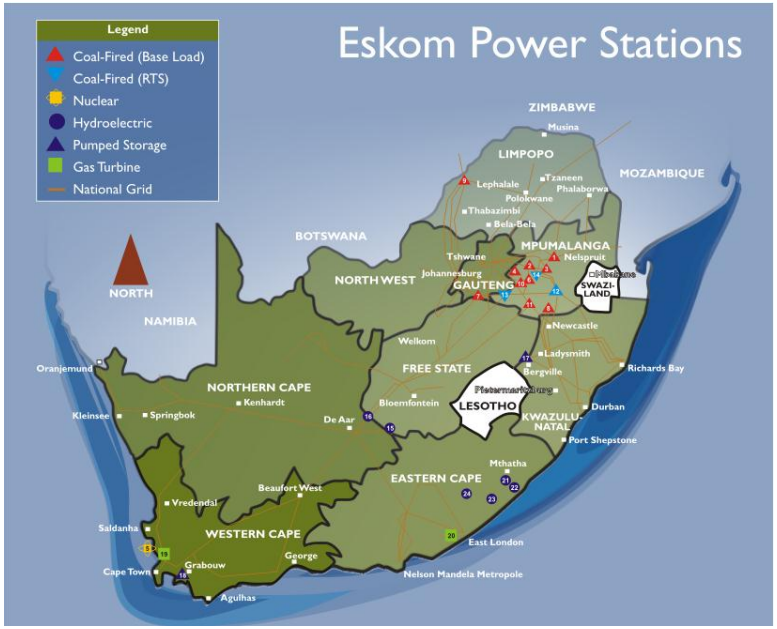
Eskom

- Generates 95% of the electricity used in South Africa
- Vertically integrated electricity utility
- Owned by the South African Government
- Over 3.9 million customers
- 39 222 Employees
- Has a R1.3trillion (€130bn) expansion plan until 2025





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Business Challenge / Problems Addressed

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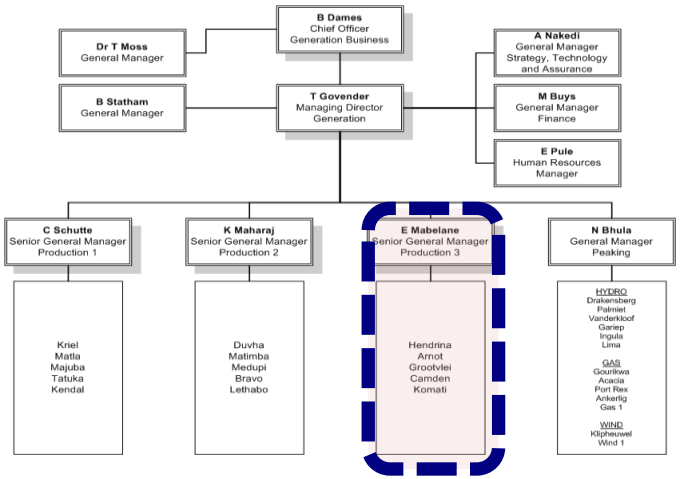
Background

- Increasing demand with near stagnant supply
- Decision taken to return to service three power stations that were mothballed in the late 1980's
- These power stations are called the ***Returned to Service*** power stations
- Organisationally included in Production Unit 3
  - Consists of 5 coal fired power stations



Camden (1 560 MW)
- situated near Ermelo
- commissioning started in 1967
- mothballed in 1990
- No. of Units 8

Grootvlei (1 130 MW)
- situated near Balfour
- commissioning started in 1969
- mothballed in 1990
- No. of units 6

Komati (920 MW):
- situated between Middelburg & Bethal
- commissioning started in 1962
- mothballed in 1990
- No. of units 9

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Challenge / Problem Details

The Return to Service Plants (RTS) are facing significant challenges:

- Limited experience of new plant operators with new plant systems
- Availability and reliability issues of previously mothballed plants
- Lack of sufficient skilled resources to support on-going operations and growth
- No clearly defined Plant IT and knowledge management strategy and capability
- Need to provide remote and real-time support to plant operations to leverage limited subject matter expert base

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Solution

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Solution Overview

The **Remote Monitoring & Diagnostic Centre** (RMDC) is a remote monitoring centre based in Middelburg.

Phase 1 went live in **April 2009** with the aim of providing high visibility of Power Station equipment health and reliability.

Phase 2 went live in August 2010 with the aim of providing extensive alarming capabilities and incorporating 2 additional power stations.

It provides *state of the art* **decision support technology** to Power Stations.

Enabling….

- **Support of plant operators** during periods of plant instability as well as start up and shut down conditions
- **Early detection of potential incidents**.
- Easier and more **accurate incident investigation**, adding to the generation of knowledge capital

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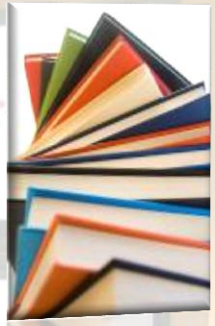
Solution: Key Business Case Drivers

Must Increase

- Availability
- Reliability
- Efficiency

Knowledge Management

Combining knowledge capital from various sources without recreating the sources



Knowledge Sharing

- Pushing context driven data to users;
- Capturing experience for re-use

Training

- Transfer of knowledge at RMDC
- Building of self-confidence

Coaching / Mentoring

- Transfer of knowledge at power stations
- Building of self-confidence

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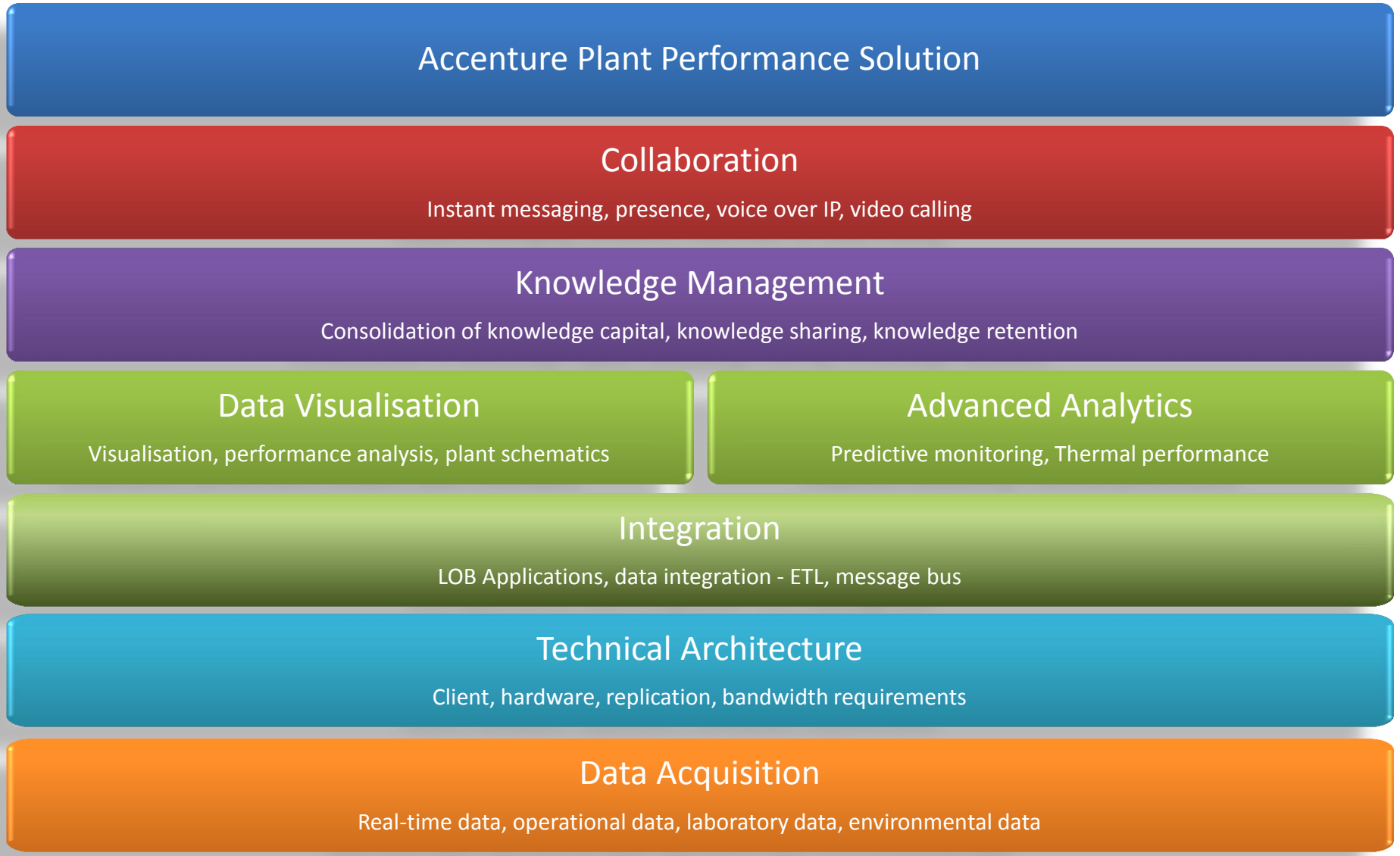
Solution Map



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Technology Stack Overview

User Interface

- OSIsoft PI WebParts
- OSIsoft PI SDK
- OSIsoft PI API
- OSIsoft DataLink for Excel Services
- Office SharePoint Server 2007
- Silverlight
- ASP .Net
- Windows Forms
- Microsoft SQL Server Reporting Services

Business

- OSIsoft PI AF
- OSIsoft PI Notifications
- OSIsoft Batch
- OSIsoft RtReports
- Microsoft SQL Server Analysis Services
- Microsoft Performance Point Server
- Microsoft Excel Services

Data

- OSIsoft PI Server
- OSIsoft PI Batch
- Microsoft SQL Server 2008
- Oracle

Communications

- OSISoft PI Server
- OSIsoft OPC DA /HDA Server
- OSIsoft Pi to PI Interface
- OSIsoft COM Connector
- Microsoft SQL Server Integration Services

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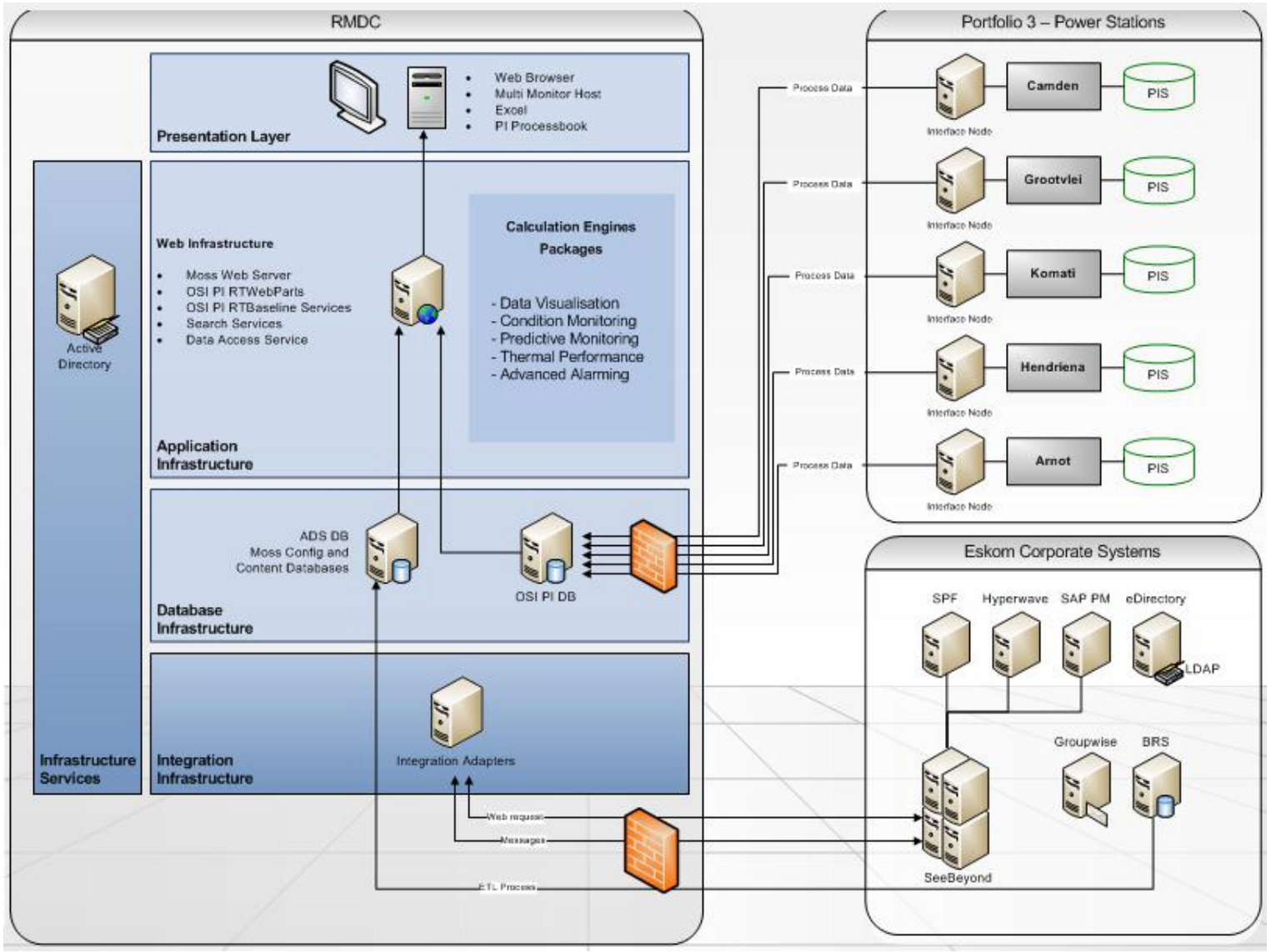
Solution Blueprint



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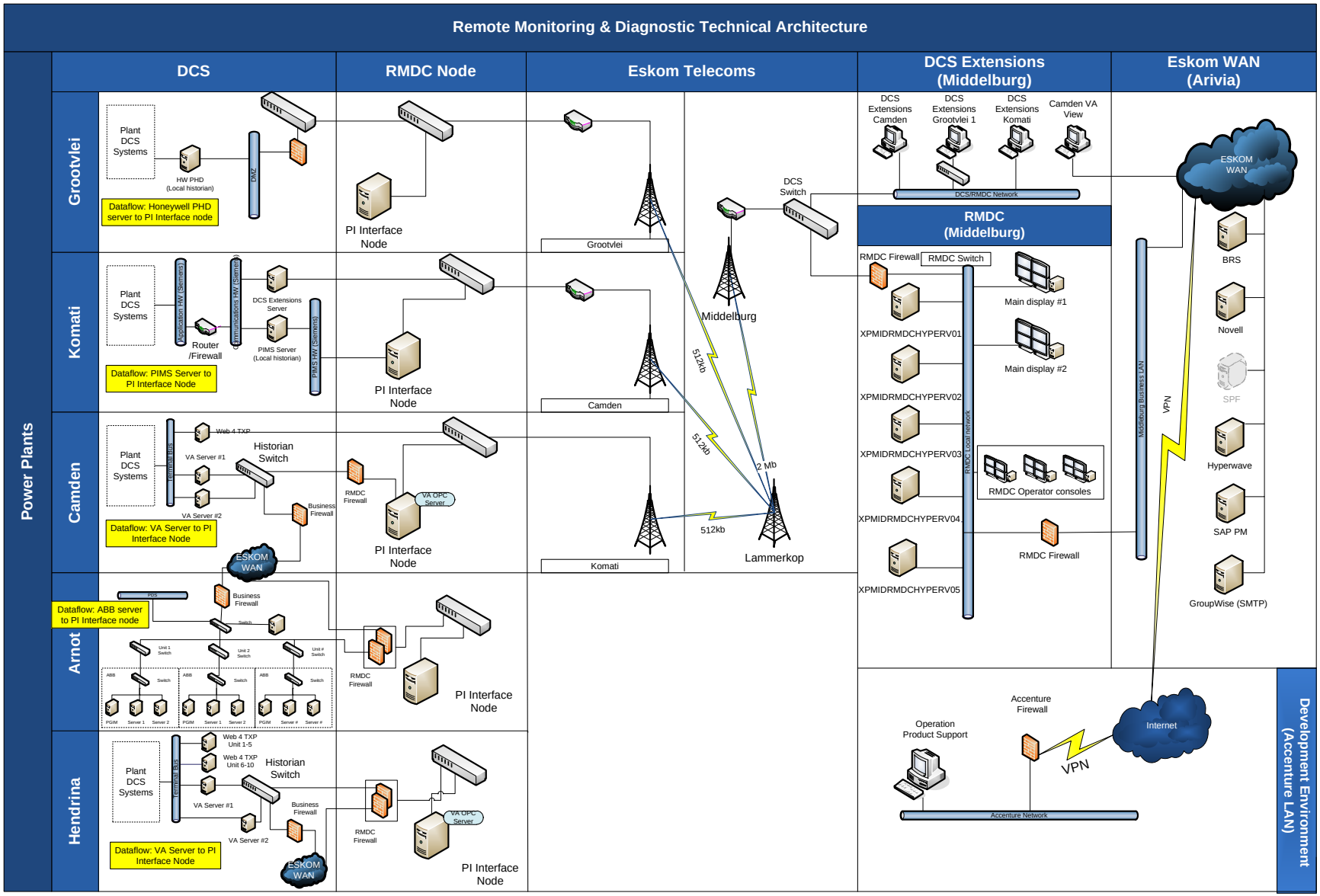
Technical Architecture



Real Time Information – Currency of the New Decade

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Alarming Solution

Alarming Capability

Objective

Alarms aim at **identifying** abnormal/non-optimized operating conditions, **informing** users about deviations and **enabling decisions** to support operational recovery and optimization.

Definition

The alarms enable the monitoring of operations and assets on an almost real time basis. Each alarm is defined by three main criteria: Condition, Priority and Status. Each alarm can be composed of multiple conditions and enables the monitoring of only one parameter (of a given equipment). Alarms will be unique to the RMDC and DCS alarms will not be replicated.

PI Notifications

Notification – A specific alarm configured within PI Notifications.

Trigger – Consists of a collection of conditions that can fire a notification event.

Condition – a specific condition that must be met in order to trigger an alarm. Can have a number of conditions.

Priority – The criticality of the alarm (linked to a condition)

State – The state of the defined condition e.g. High, High-High.

Limits – The values being used to configure the conditions for a specific alarm.

Delivery channel – The conduit through which notification messages are sent to the subscriber

Acknowledgment - A response to a notification. Either manual or automatically.

Notification Instance - An event frame that starts when a trigger is violated and ends when the violation ends.

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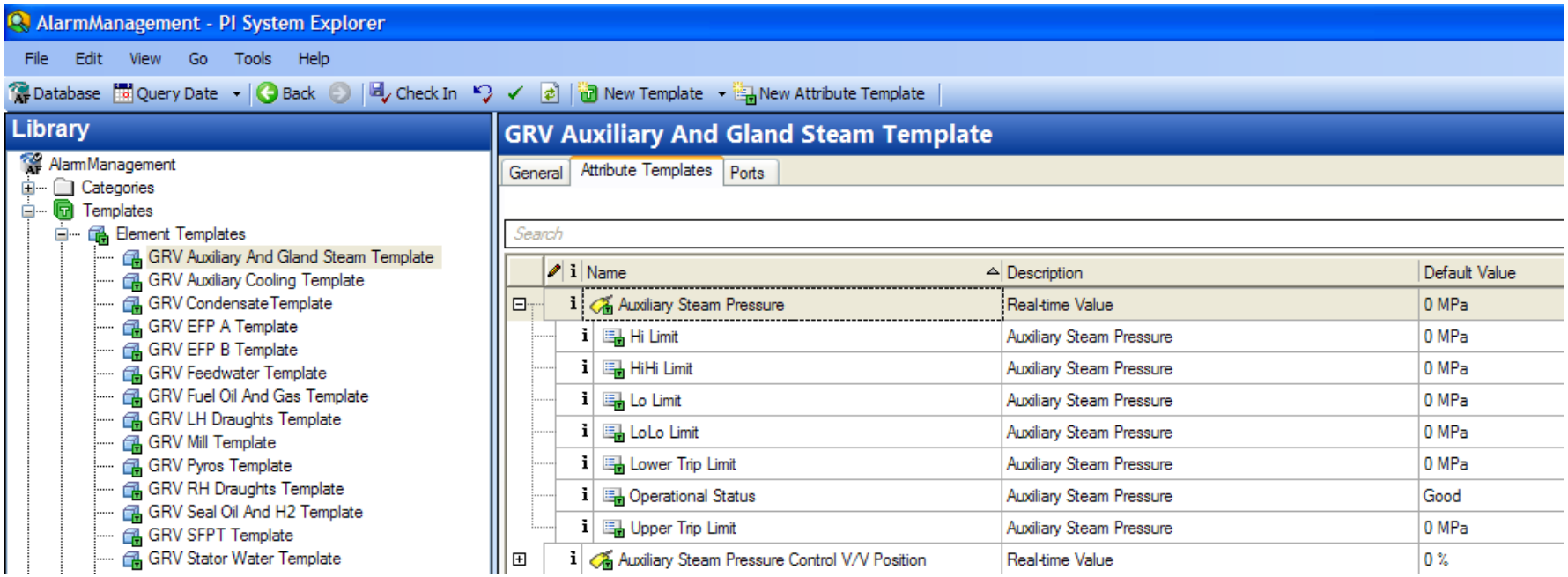
Alarming Solution

Element Definition

- Element templates are created according to the defined solution hierarchy of Power station, Unit, Group, Functional Group, Asset .
- Element templates assist with the creation of unit specific elements required for each unit defined in the solution.
- Elements created with the assistance of the templates contains the source information required by the PI notifications (RMDC Alarms)



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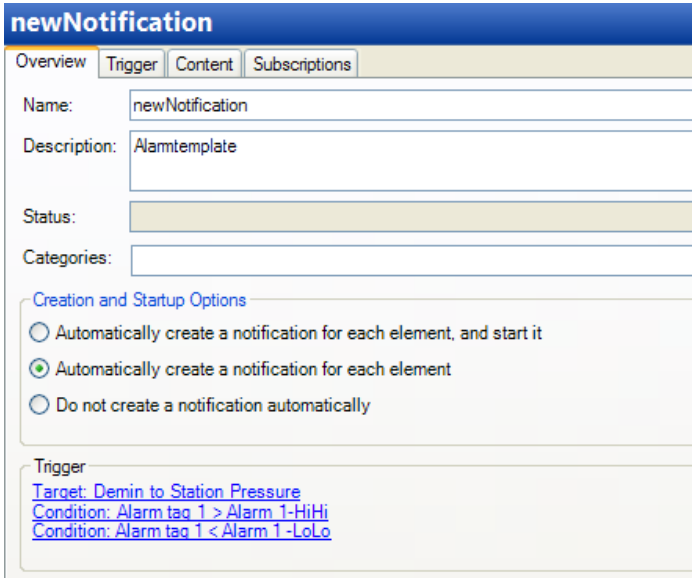
Alarming Solution

Notification Definition

- Notification templates, like element templates also assist with the deployment of the solution to all units.
- The notification template links to an element template that enables the system to create all relevant notifications when a new element is created.
- All alarms currently defined will have a corresponding template defining its default configuration and condition requirements.



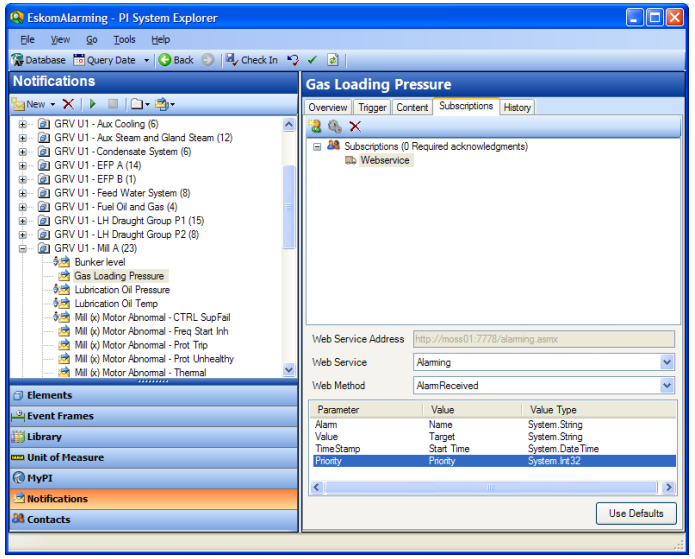
Notification Mechanism

When an alarm triggers the system sends a set of data to the web service.

The web service will provide the information it receives to the **Main Alarm list**, the **Alarm Web Part** and the **Alarm Ticker**.

The following standard information is available:

- Name & Description
- Target & State
- Trigger, Start & End Times
- Priority & Escalation level



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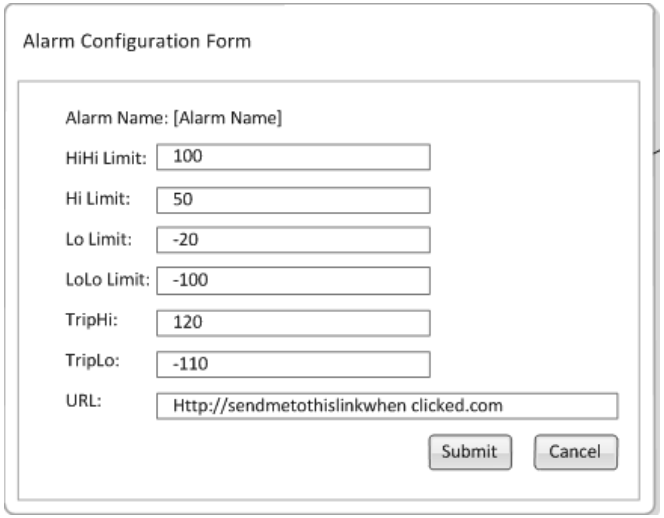
Alarming Solution

Alarm Configuration : Limits & Settings

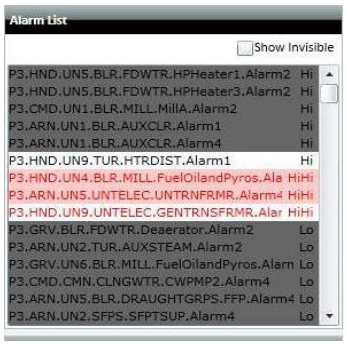
- In order to allow changes to the limits and visual and audible settings, a user front end will be available for the user (with the correct user rights) to make changes to the settings.
- Changes will be captured in an audit log and available via an audit report.
- Alarm configuration e.g. changes on how the alarm functions, will be done via the PI AF Explorer. Only the administrator will have the rights to make such changes.



Alarm User Interfaces

Alarm Ticker

Main Alarm List



Alarm WebPart

Unit Alarm Overview

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Results

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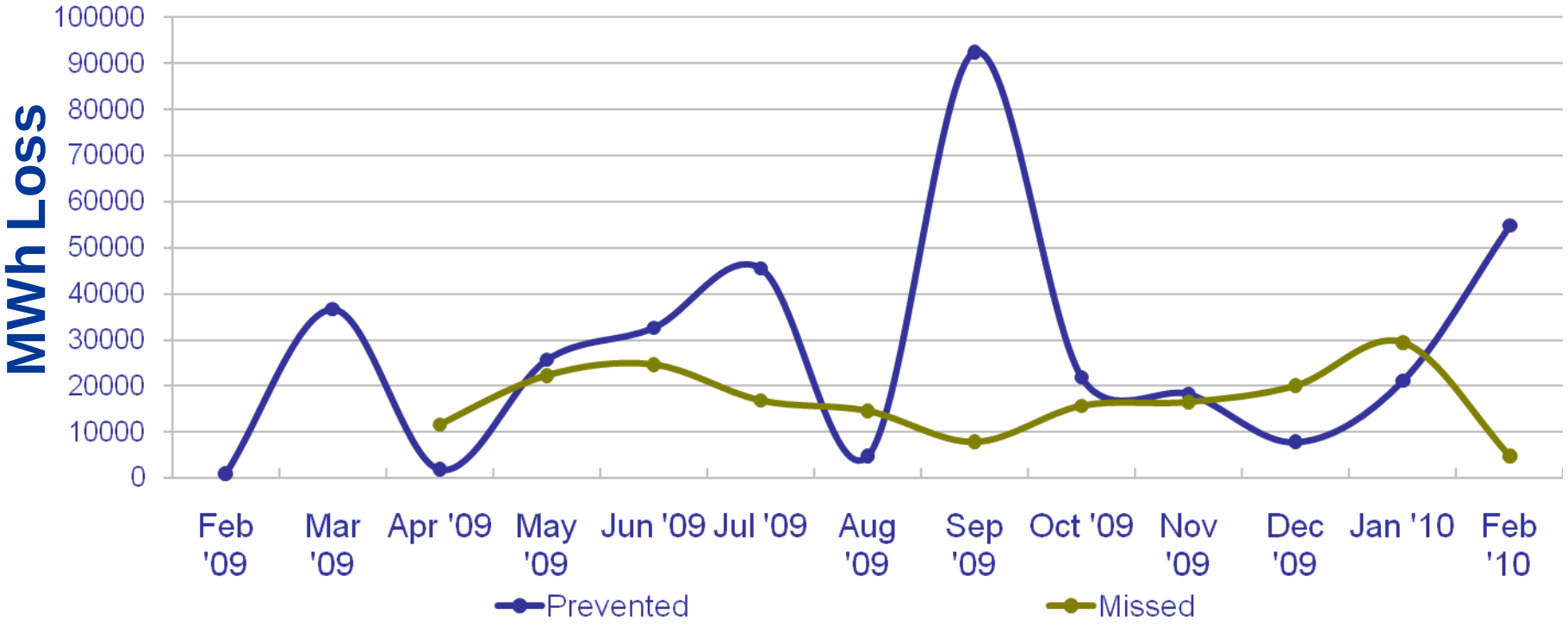
Tangible Benefits



Missed comprises of

- 42% due to incident occurring outside of RMDC operational hours
- 45% due to lack of incident alarming (as planned for Phase 1)
- 13% regarded as 'not preventable'

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Intangible Benefits

Grootvlei, Shift D

Unit Two was busy with a light up, when Louis Coetzer called the SSS to inform the Unit Controller that the spray water valve was still closed.

If Louis hadn't called, the unit would have tripped due to high temperature.

Grootvlei, Shift A

Unit Two was busy with a light up, Frikkie Schoeman assisted the Unit Controller with the superheater inlet header temperature that was too high. If this hadn't been fixed, the long term plant health of the unit would have been negatively impacted.

Komati, Shift A

The unit synchronised on load and delivered 20 MW when the power factor started to fluctuate. This could have lead to a trip and subsequent damage due to pole slipping. Hannes Schoeman advised the Unit Controller to adjust the power factor from 0.55 to about 0.9.

Camden, Shift B

A unit tripped due to high drum levels. Thys Marais assisted the unit by investigating the incident. He then notified the Shift Supervisor that the reason why the drum levels were high was because the feed regulator v/v A tripped in the open position.

E-mail received from Pieter De Jager, Grootvlei

During Unit 2 light-up on Saturday we experienced a lot of problems and had it not been for Alwyn who informed us of the extraction pump trip, we would have had a unit trip.
RMDC support is very much appreciated by Grootvlei Power Station. 28/09/2009

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Future Plans / Next Steps

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Phased Approach

- *Unit Start-up Monitoring*
- *Unit Trip Monitoring and Diagnostics (Manual)*
- *Routine Monitoring*
- *Define communication protocols*
- *Roles and Responsibilities*

- *Alarm / Alert Management*
- *Knowledge Management*
- *Knowledge Sharing*
- *Training*
- *Collaboration*
- *Update communication protocols*
- *Update Roles and Responsibilities*
- *Information Submission*

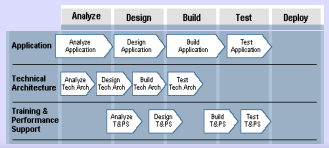
- *Thermal Performance*
- *Perform Special Analysis as requested by Plants*
- *Alarm / Alert Enhancements*
- *Inclusion of Laboratory Information Management Systems (LIMS) data.*
- *System Engineers at power stations*
- *Update communication protocols*
- *Update Roles and Responsibilities*

- *Predictive Monitoring*
- *Alarm / Alert Enhancements*
- *Define communication protocols*
- *Roles and Responsibilities*
- *Information Submission*

Programme Management

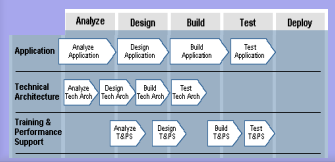
Phase 1

Operator Support (Experience Based)



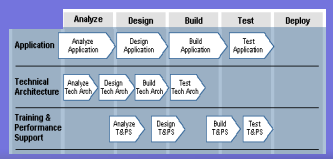
Phase 2

Alarming, Knowledge Management & Collaboration



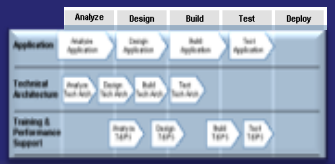
Phase 3

Operator Support (Advanced)



Phase 4

Operator Support (Predictive)



Service Introduction

System Support

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accenture Contacts

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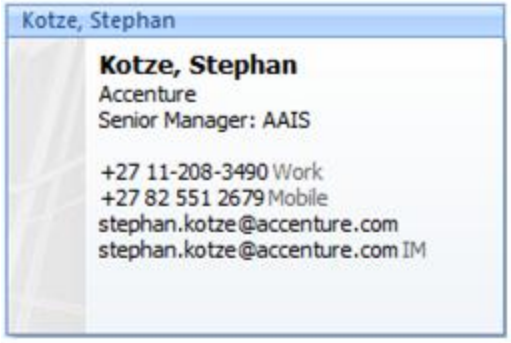
Accenture Contacts



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Not an exhaustive list

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