OSIsoft® VALUE NOW, VALUE OVER TIME

Water and Energy Balances in Mineral Processing Plants

Osvaldo Bascur and Ales Soudek

Introduction

- Water - Scarcity (Chile, Australia)
- Energy - Expensive
  - Energy Price Volatility

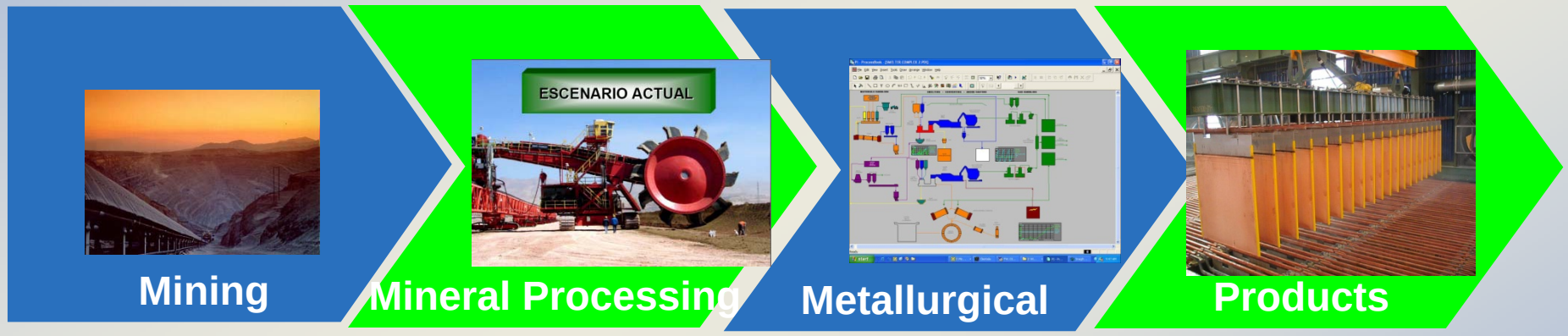
5.8 m3H20/ Ton Cu fino.

1 m3 ton de Conc.

- Enterprise Energy and Water Management
  - Management of corporate energy consumption is essential for carbon management program and initiatives
  - Metal Loss Management
- Role of Mass and Energy Balances

PI Value Drivers in Mining and Metals

How to identify risks and plant availability constraints?
How to validate the data for business decisions?
How to track variable costs by product, by area, by recipe?

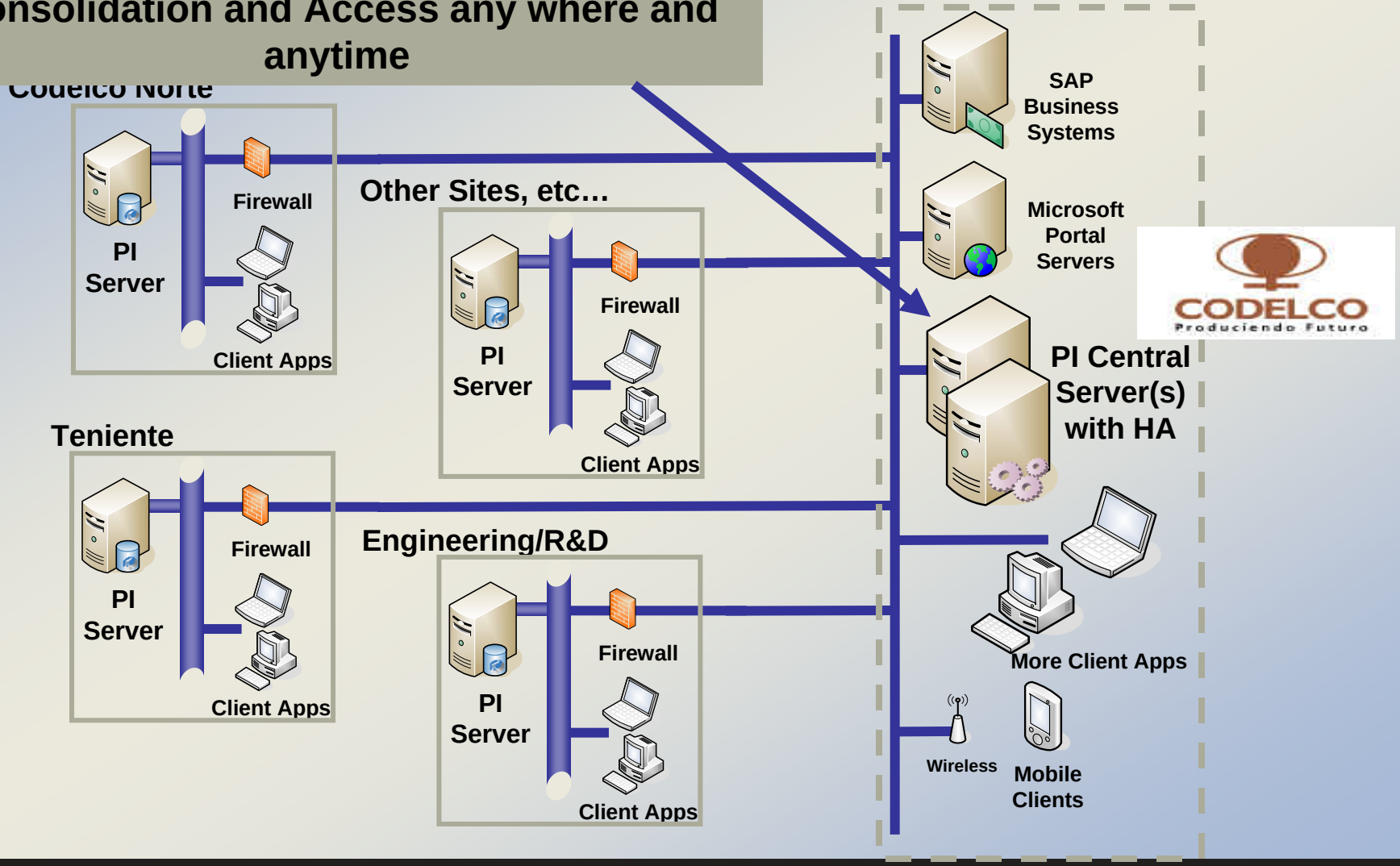


Energy **Assets** **Reagents** **Environmental**

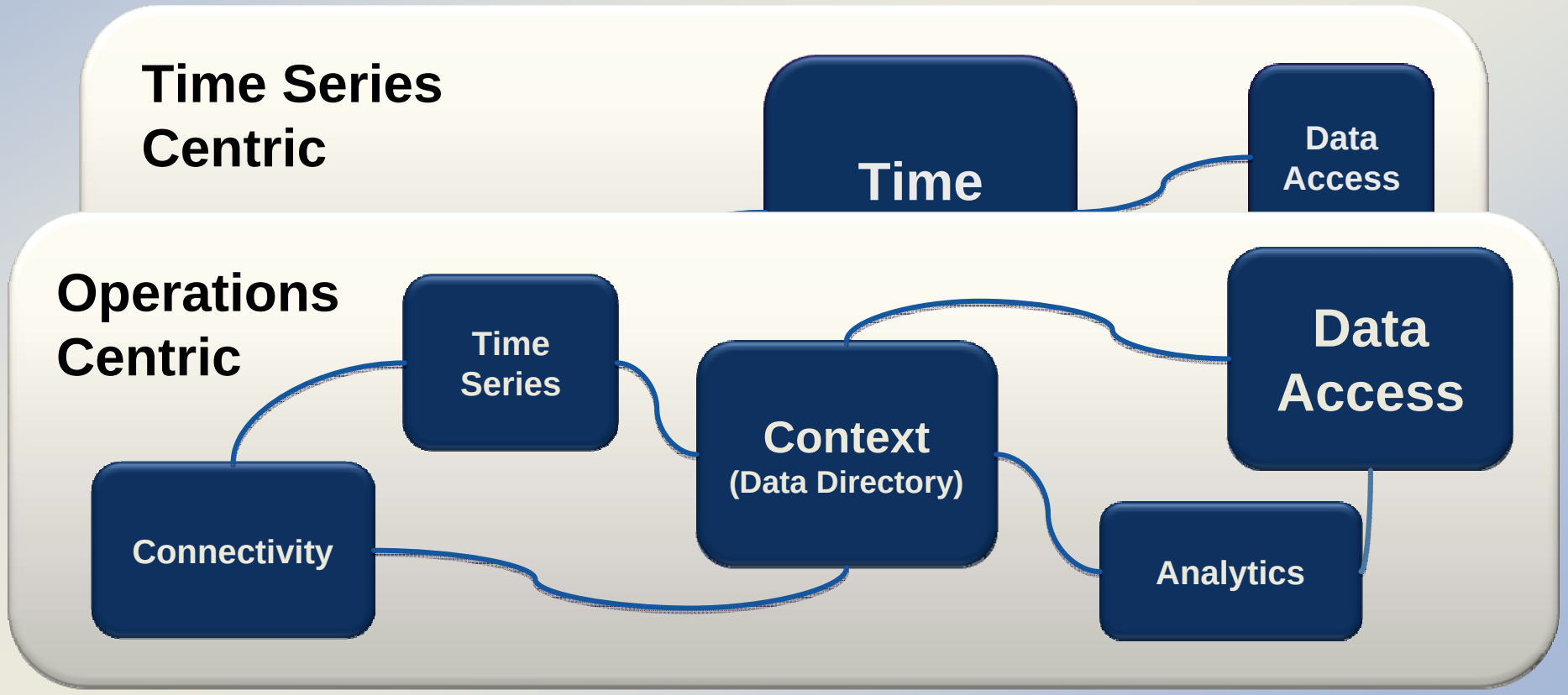
Process Management Workflow

Corporate Architecture with Enterprise Center(s) of Compentency

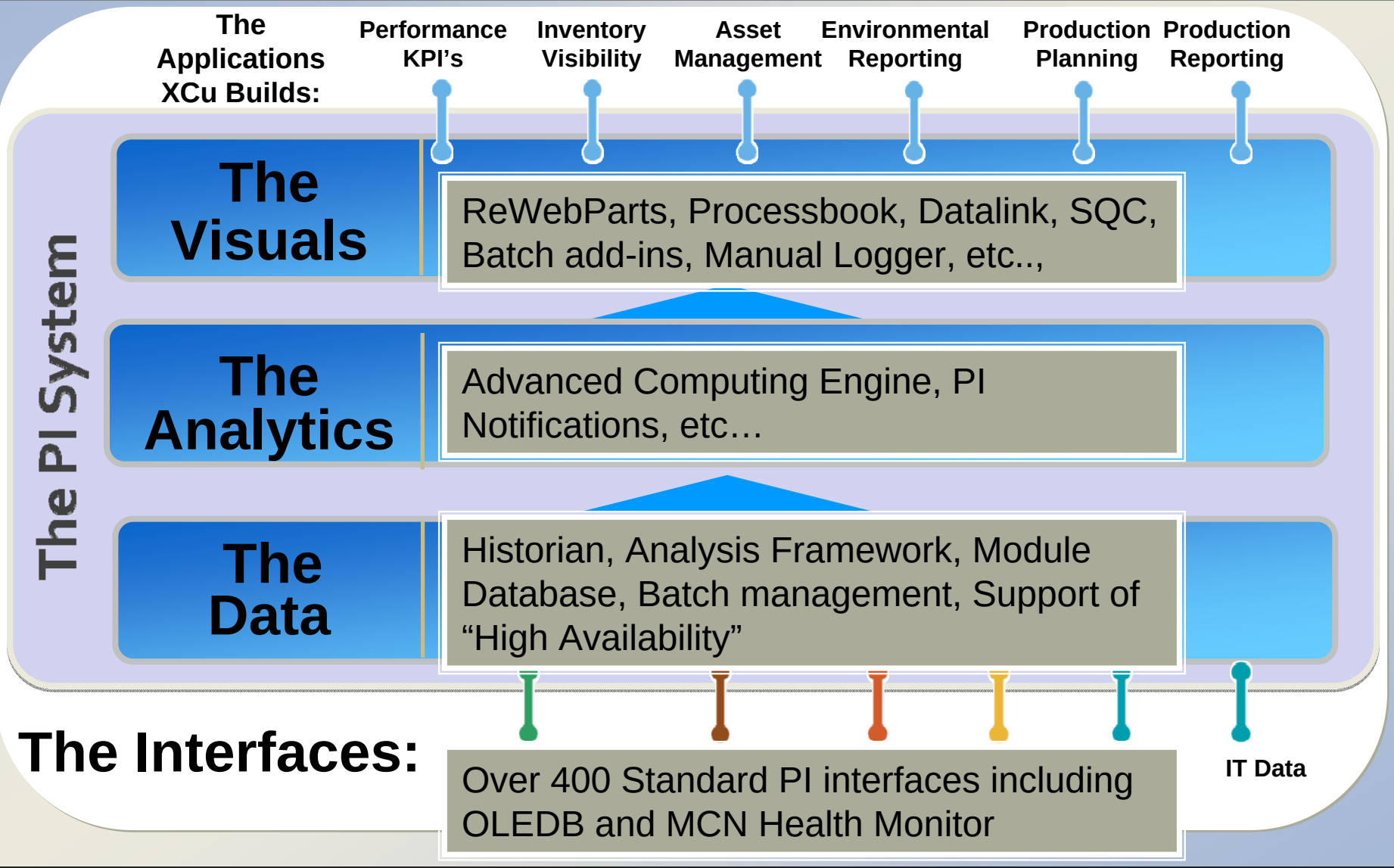
Site Data Replication, Aggregation and/or Consolidation and Access any where and anytime



PI Fundamentals: The Shifting Platform Usage



Enterprise Agreement: Software



Asset Grouping - Operation-Centric

- Start with a collection of assets
- Associate data (tags) with the assets
- New assets are based on templates
- Assets can be connected
- Assets can be grouped
  - By function
  - By location
- Calculations are sourced from assets
- Build once, apply to many
- Visualize results from multiple assets with one graphic

Hierarchical

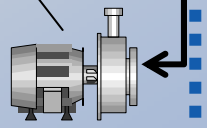
Connectivity

Equipment

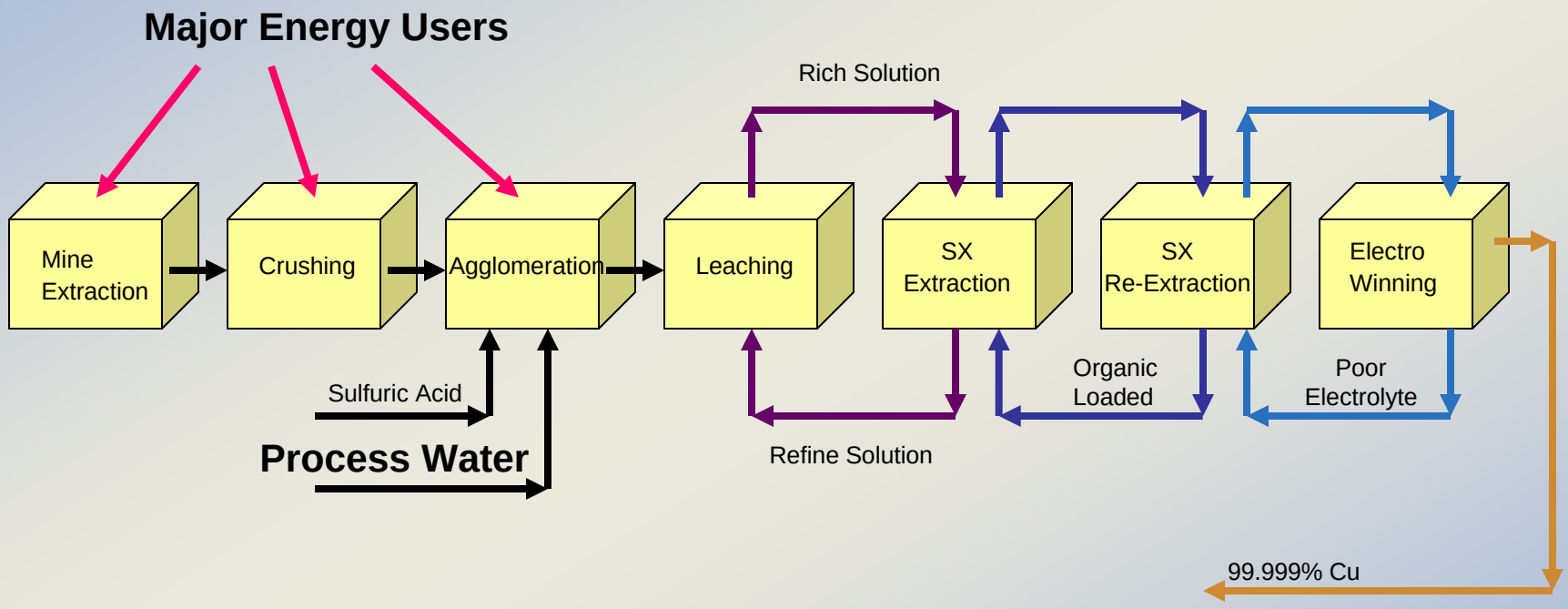
Asset Attributes:
Name plate information
Trays
Related data references
Limits

Mill 1

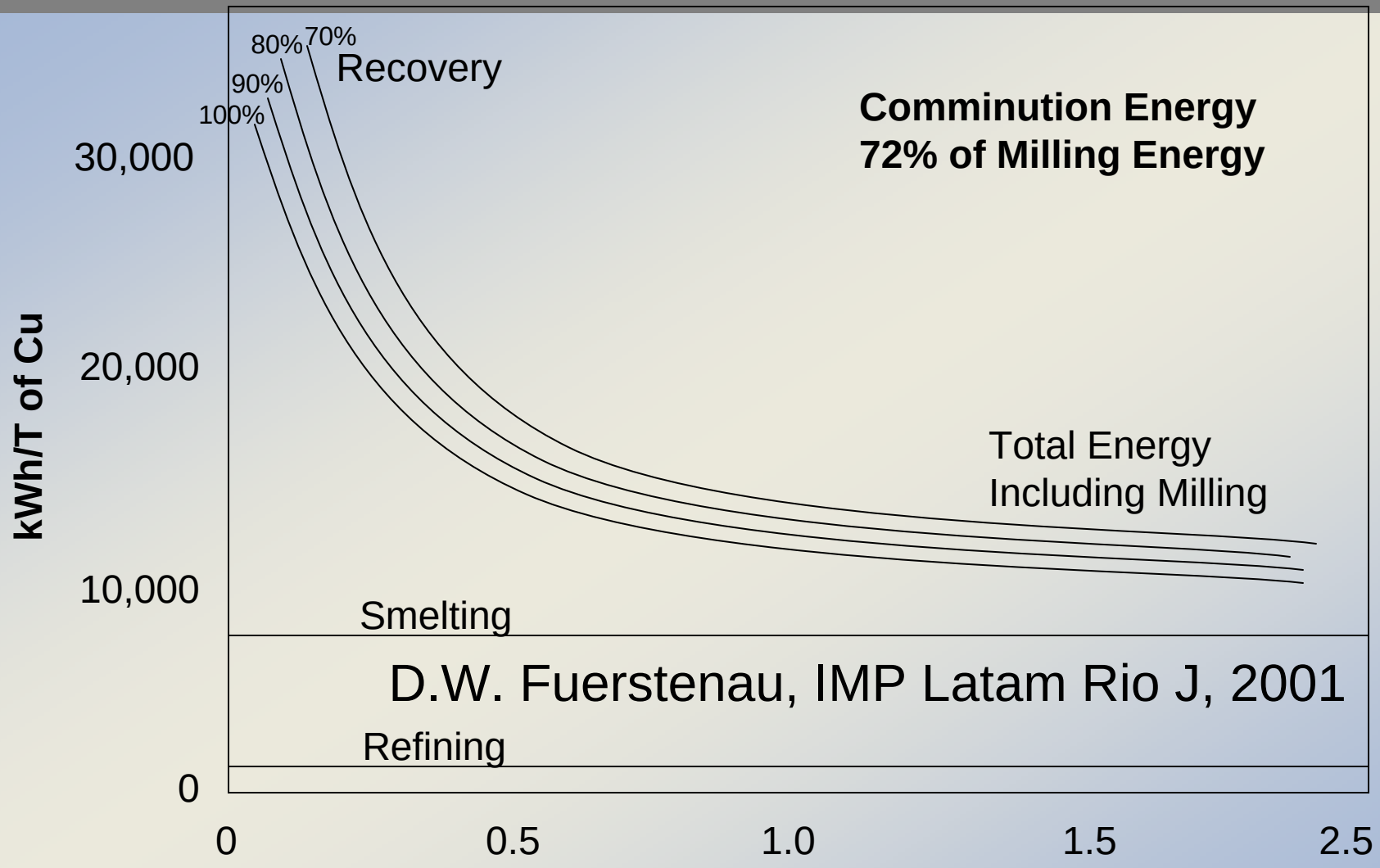
Asset Attributes:
Name plate information
Related data references
Operating limits



Copper Production Process



Effect of Grade and Recovery on Energy



- Mining
- Open Pit, hard rock 3-5 kWh/t ore
- Underground, hard rock 12-40 kWh/t ore

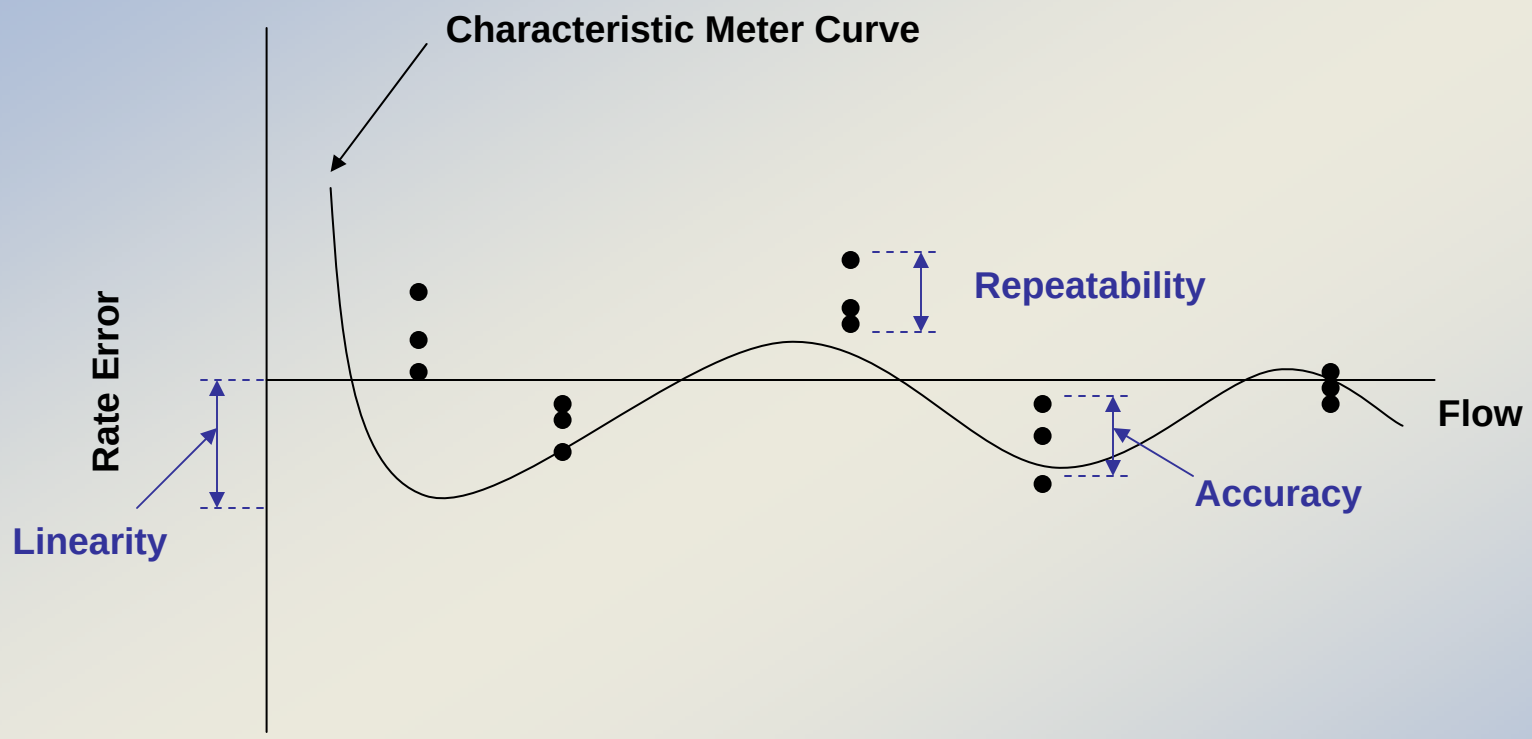
Milling
< 100 mesh grind, flotation 15-24 kWh/t
< 200 mesh grind, flotation 24-34 kWh/t

Measurement Error

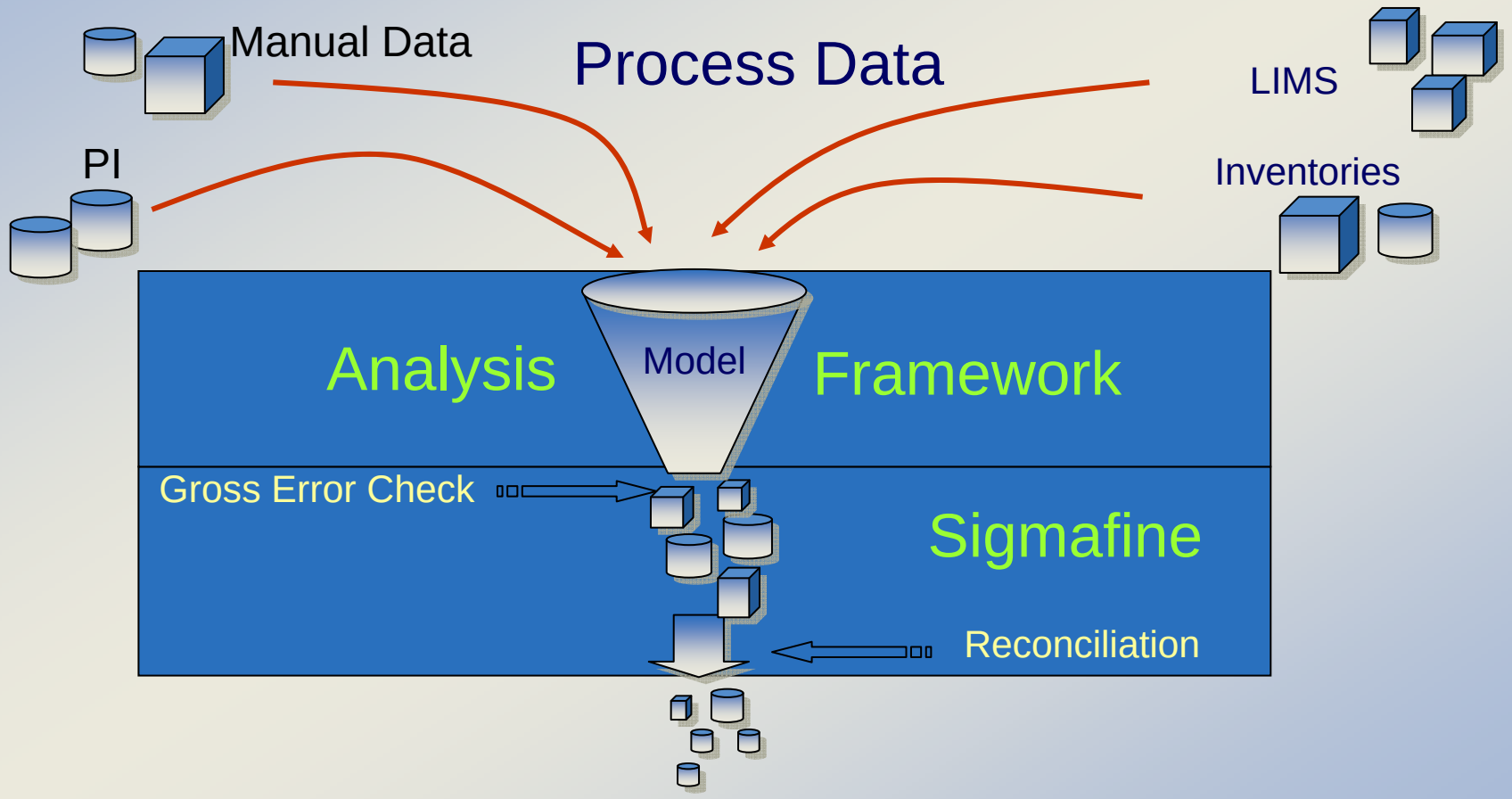
$$\varepsilon_{Total} = \varepsilon_{Gross} + \varepsilon_{Bias} + \varepsilon_{Random}$$

- All measurement has error
- Meter Composite Accuracy
  - Repeatability
  - Accuracy
  - Linearity

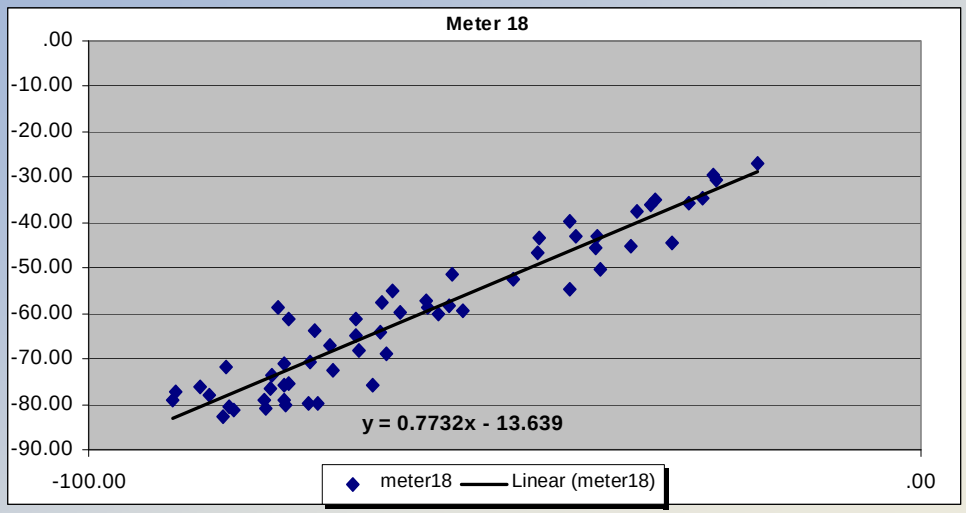
Meter Composite Accuracy



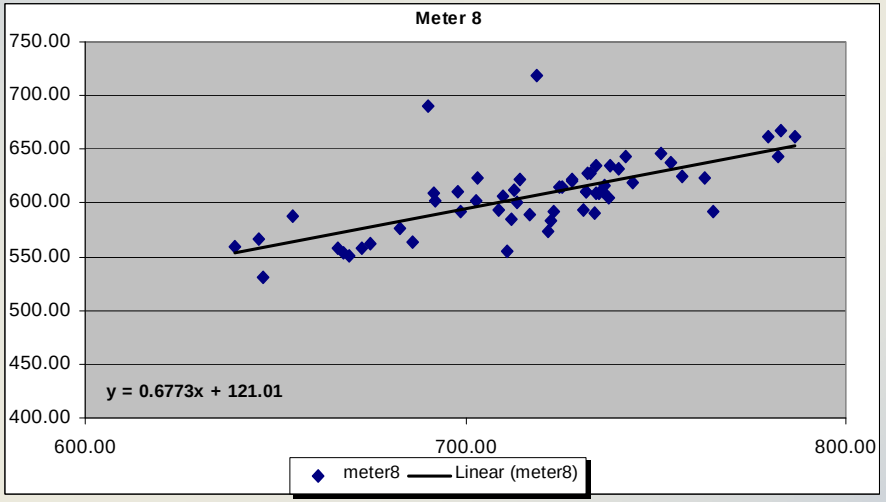
Balancing Process



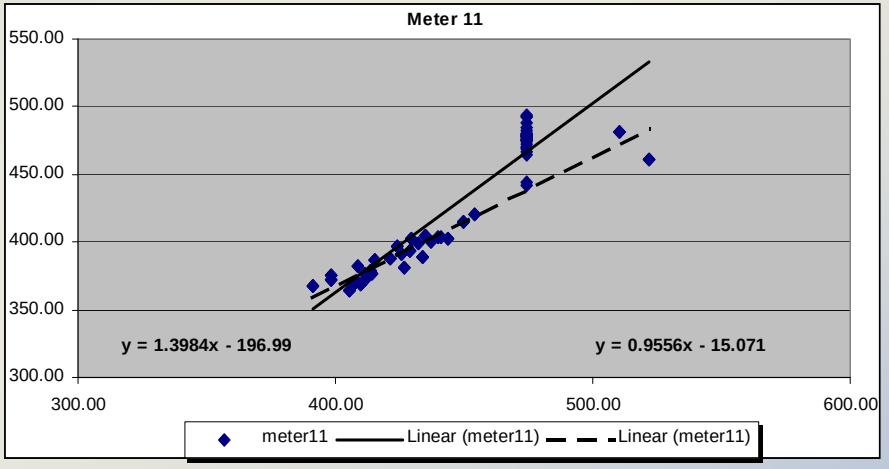
Verify meter performance



Typical Meter

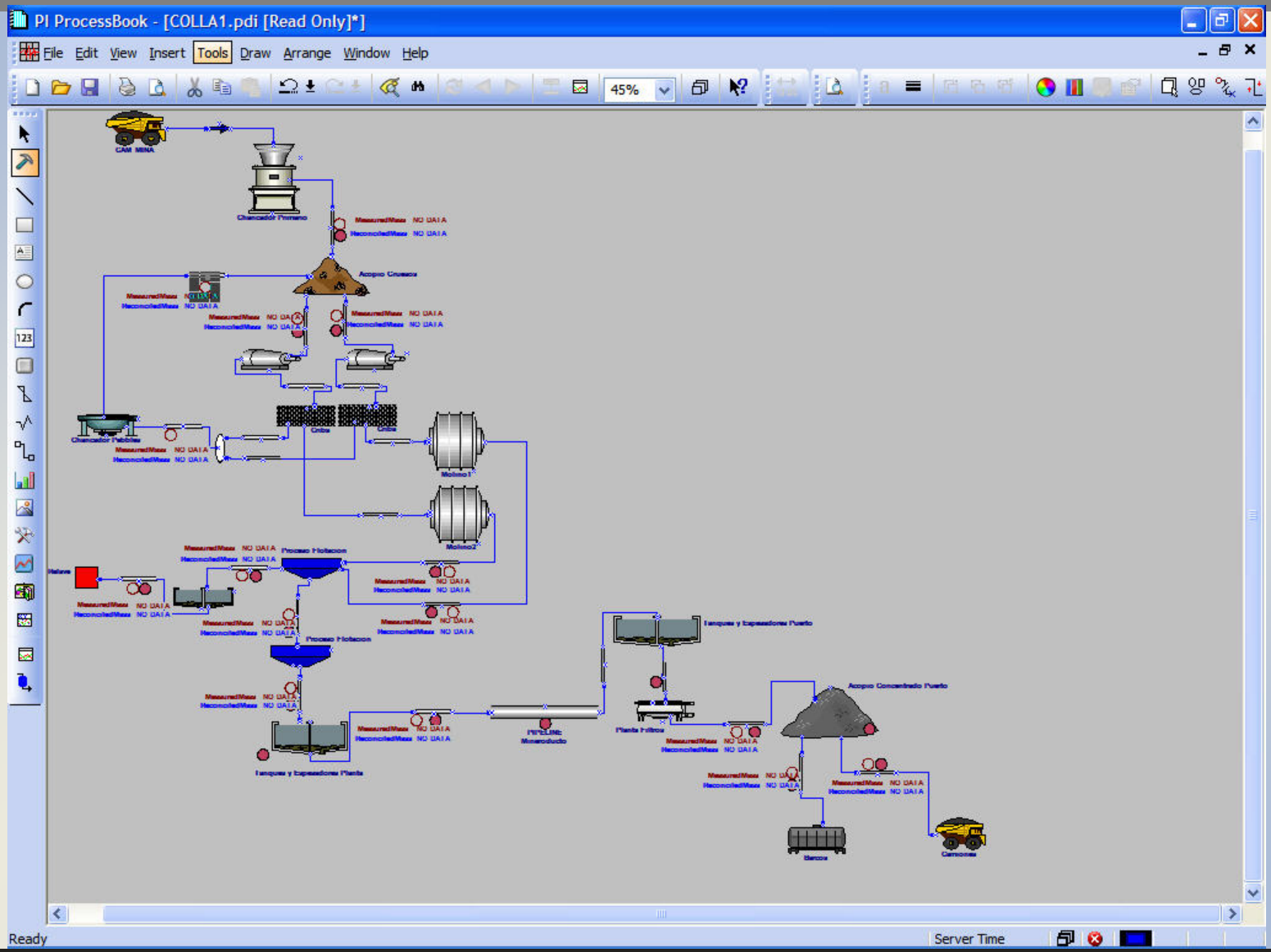


Biased Meter

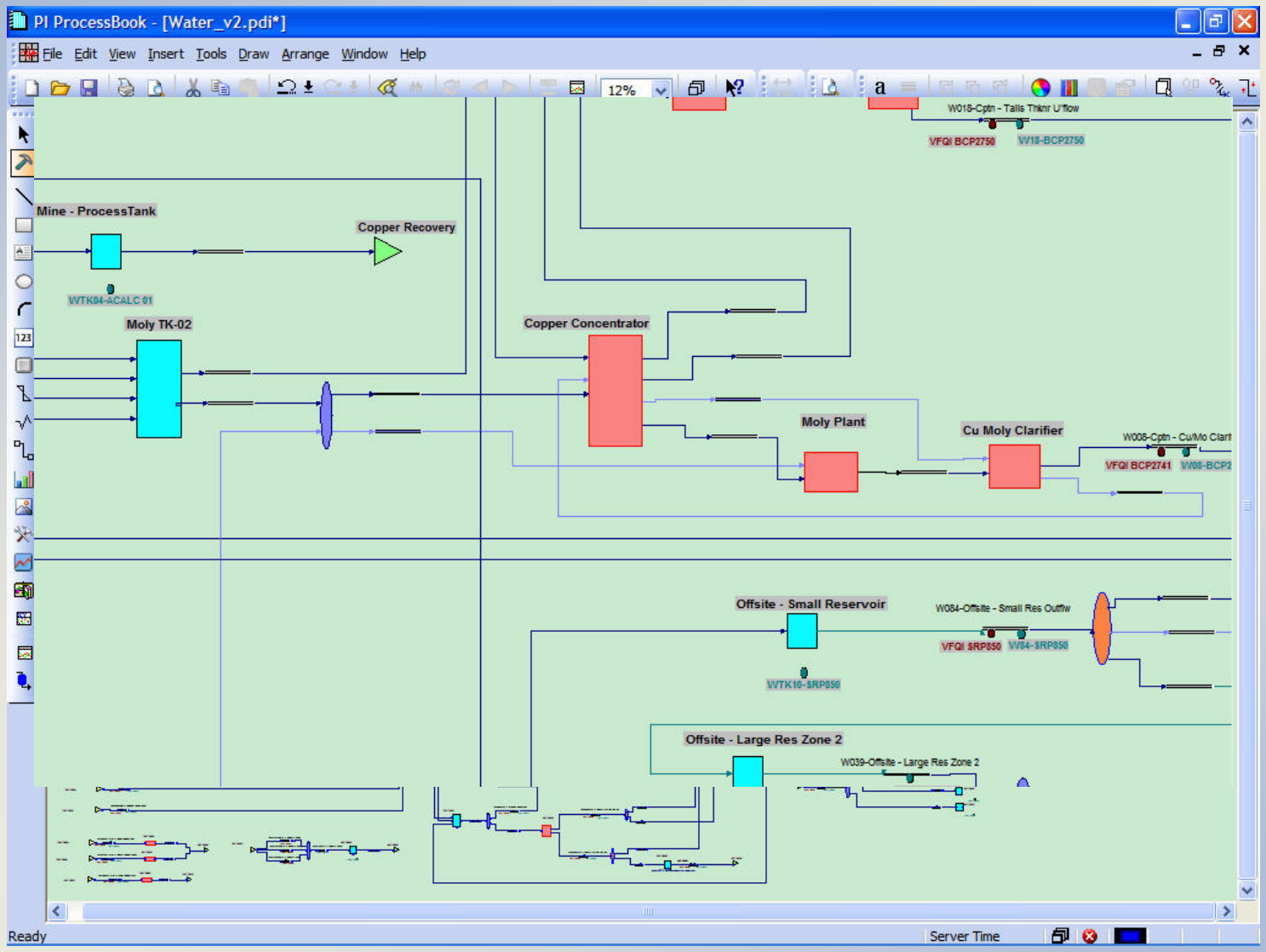


"Sticky" Meter

Mass and Energy Balance

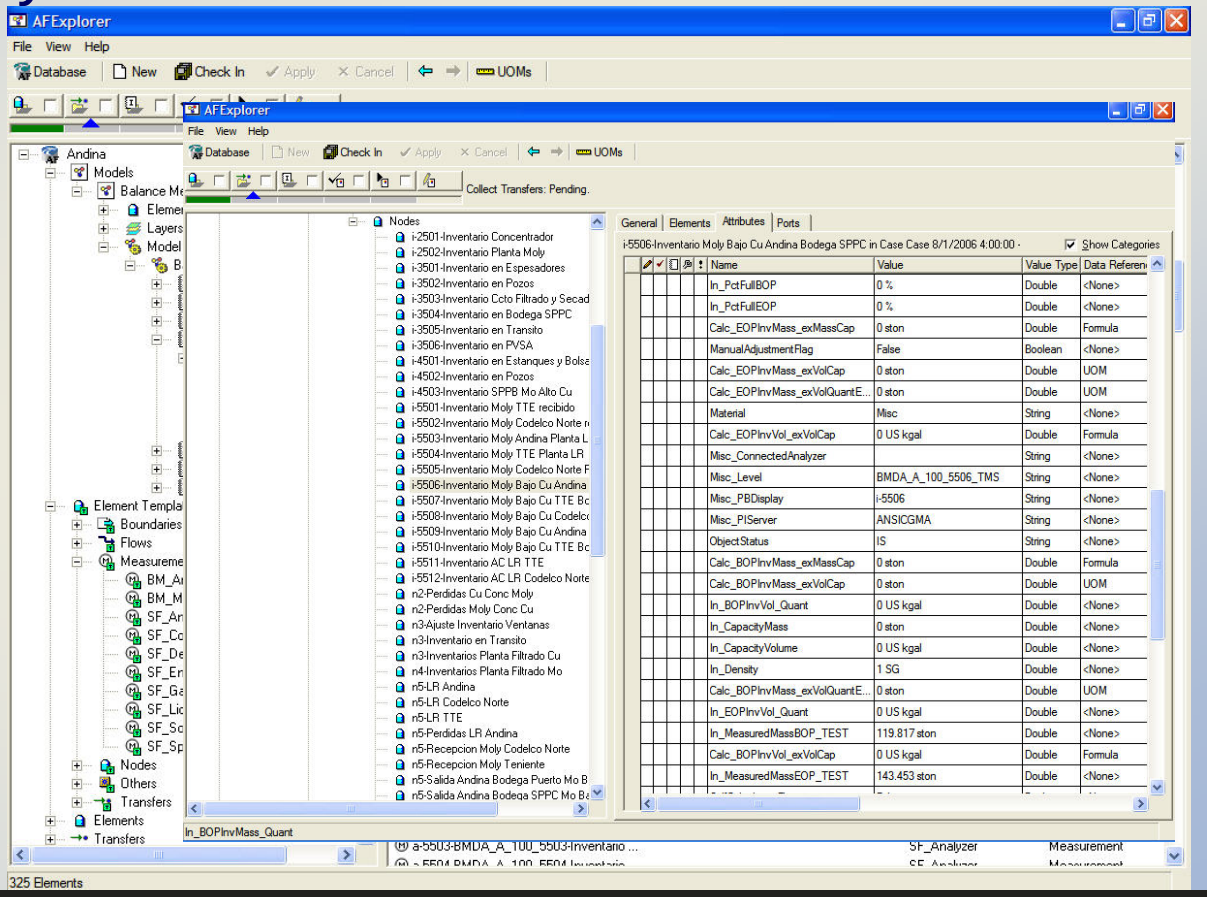


Water Balance

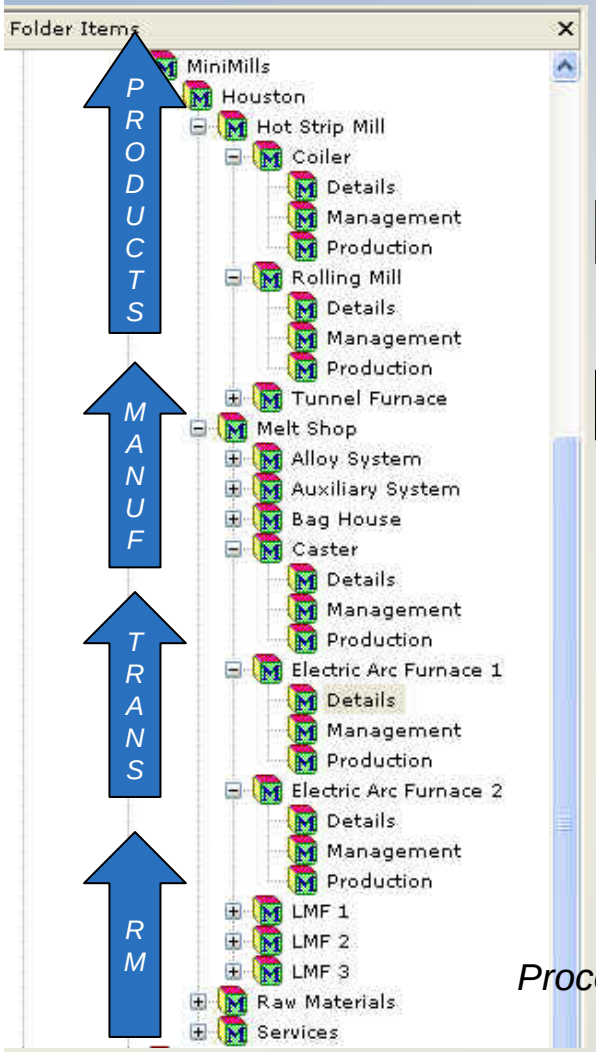


Asset Management

- Common asset model
- Unrestricted access and storage of high fidelity data, including:
  - Historical
  - Real-time
  - Future



Example for Basic Industries



Process and People

What we do

What we manage

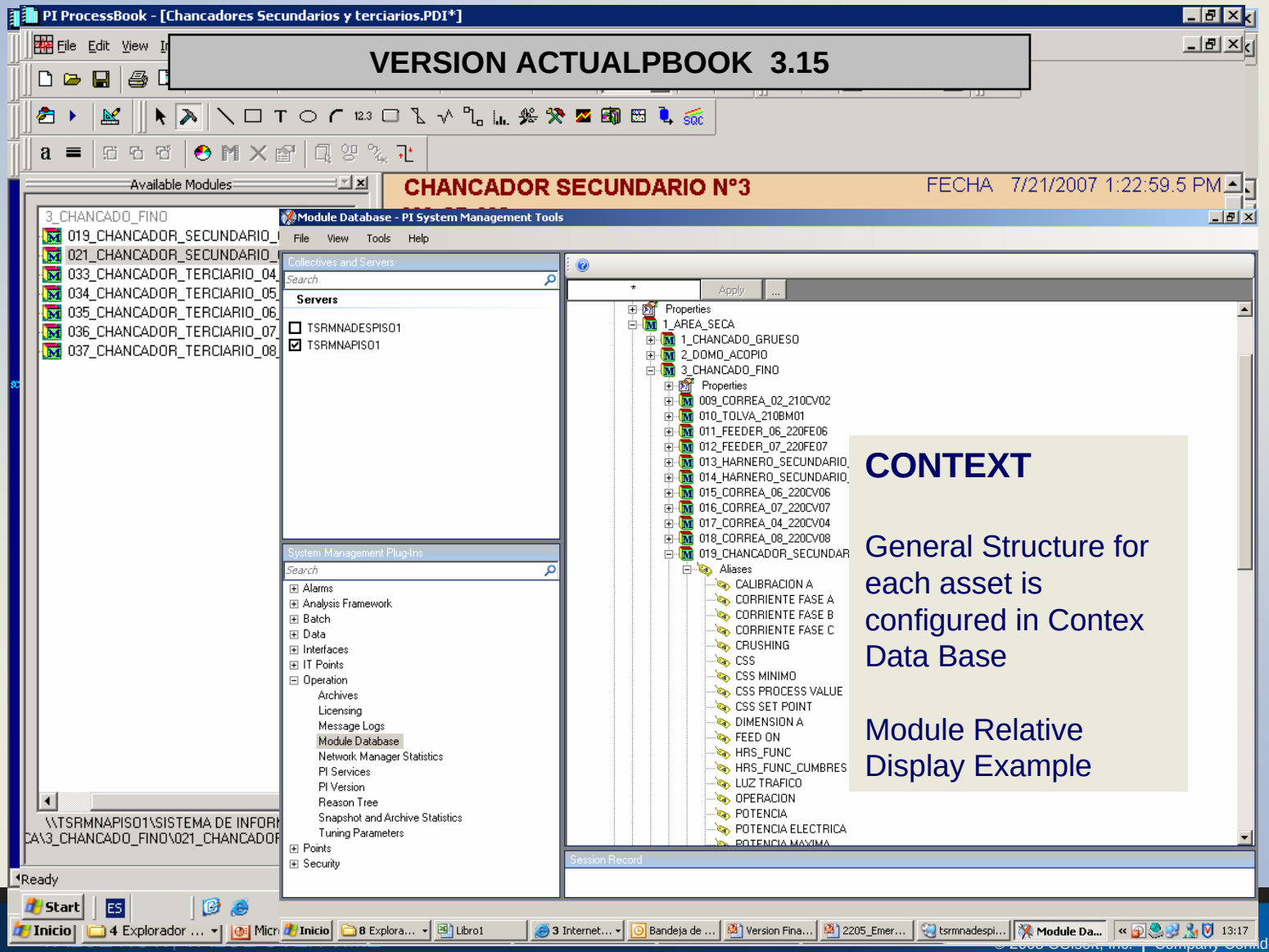
Operations

Business Perspective

1. What we do KPI's (Management)
   1. Variances (Plan – Current)
   - What we manage Metrics
     1. Production
     2. Costs, KWh/ton, $/ton
     3. Availability
     4. Yields
     5. Quality
     6. Environmental
     7. Safety
   - 3. Plant Data
     1. Inventories
     2. Lab
     3. Process
     4. Equipment
     5. Receiving/Shipping

Example PI - Minera El Tesoro

Modernización y Aumento de valor en las aplicaciones existentes

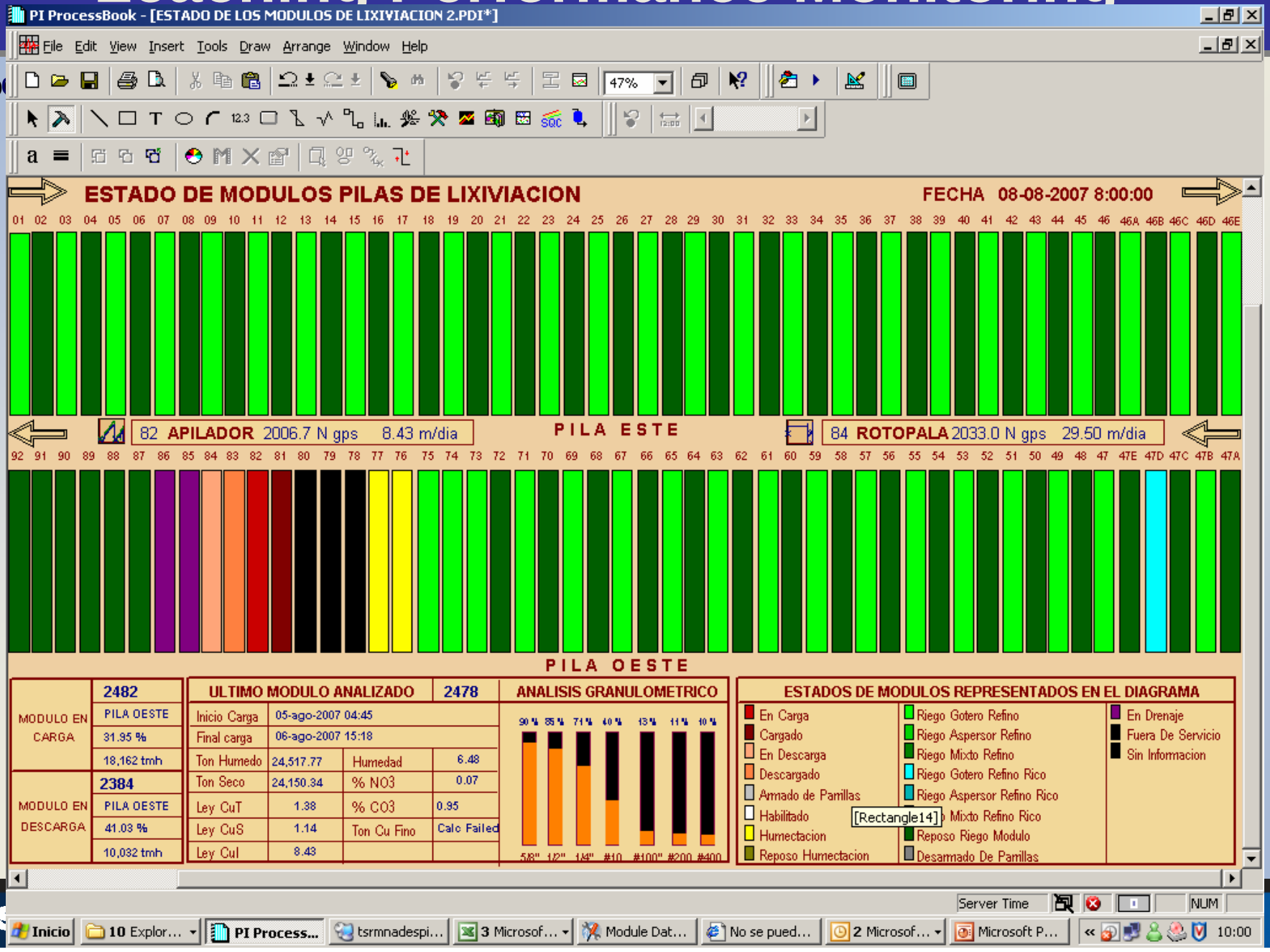


CONTEXT

General Structure for each asset is configured in Contex Data Base

Module Relative Display Example

Leaching Performance Monitoring



Real Time Asset PI Notification and Analysis

MiningCo

Truck Assets

Asset List

- Trucks
  - TR1123
  - TR2003
  - TR3045
  - TR3450
  - TR4085
  - TR4522
  - TR5493
  - TR6676
  - TR9946

Set History Time

Start Time: *-2h

End Time: *

Apply

Current Operation

Mine: Wolverine

Truck ID: TR3450

Speed (Km/Hr)

-90 Min(s) -30

Load 21.2

Motor RPM 18.9

Torque 77.5

RUN

Oil Level 92.8

Bearing Temp 64.6 Deg C

Rear Tire Pressure 19.1 Amps

Oil Temperatures (C)

4/1/2008 3:07:39 PM

120 90 70 50

-90 Min(s) -30

STAGE 1

Repair Status

Assessment Rule
Bushing Degradation

Attention Status

Assessment Rule
Low Nitrogen Pressure

Good Status

Assessment Rule
Elevated Oil Temperature

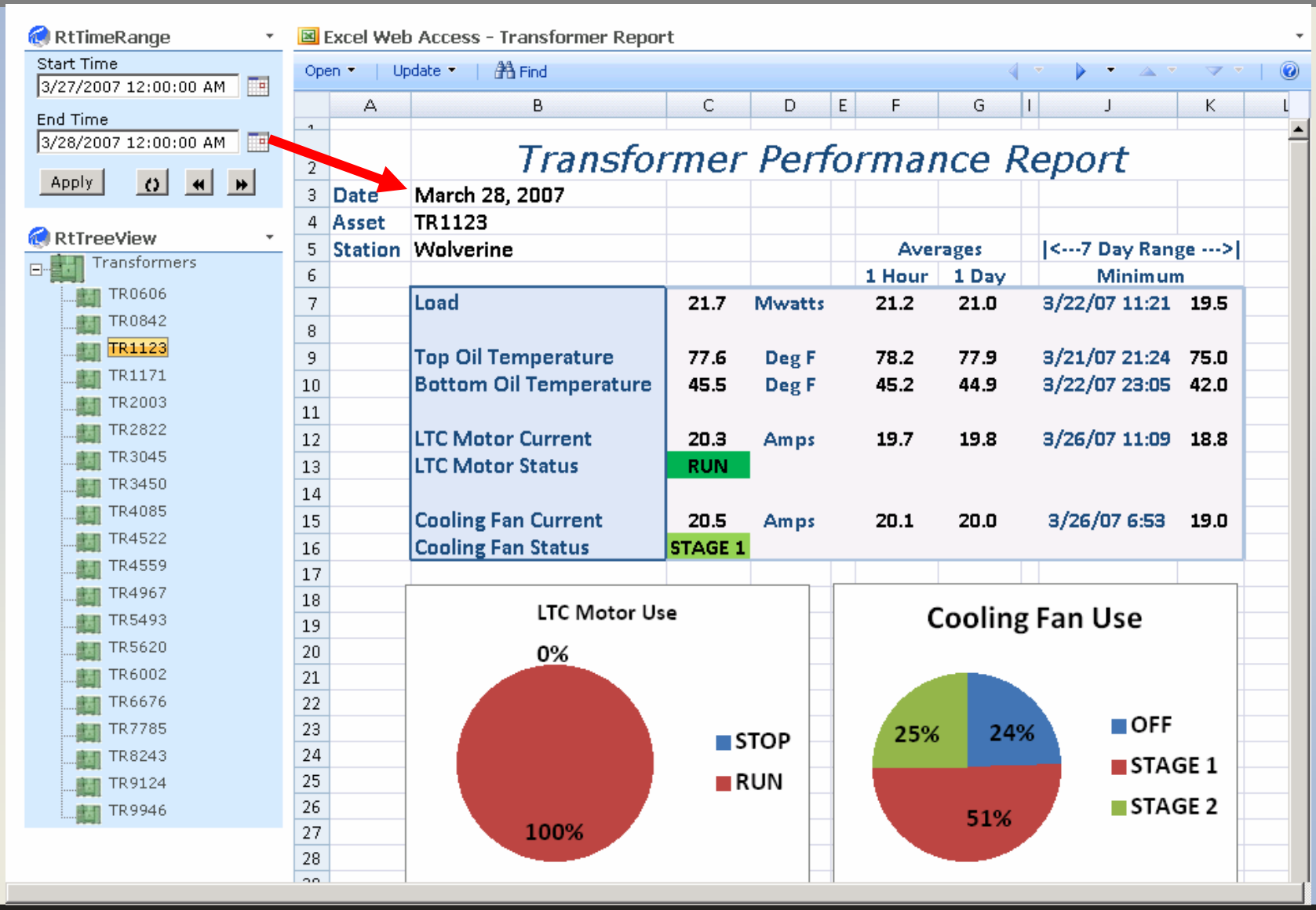
Procedures

Name
Tire Rotation and Balancing
Engine Oil Change
Axle Lubrication

Transmission Oil Analysis

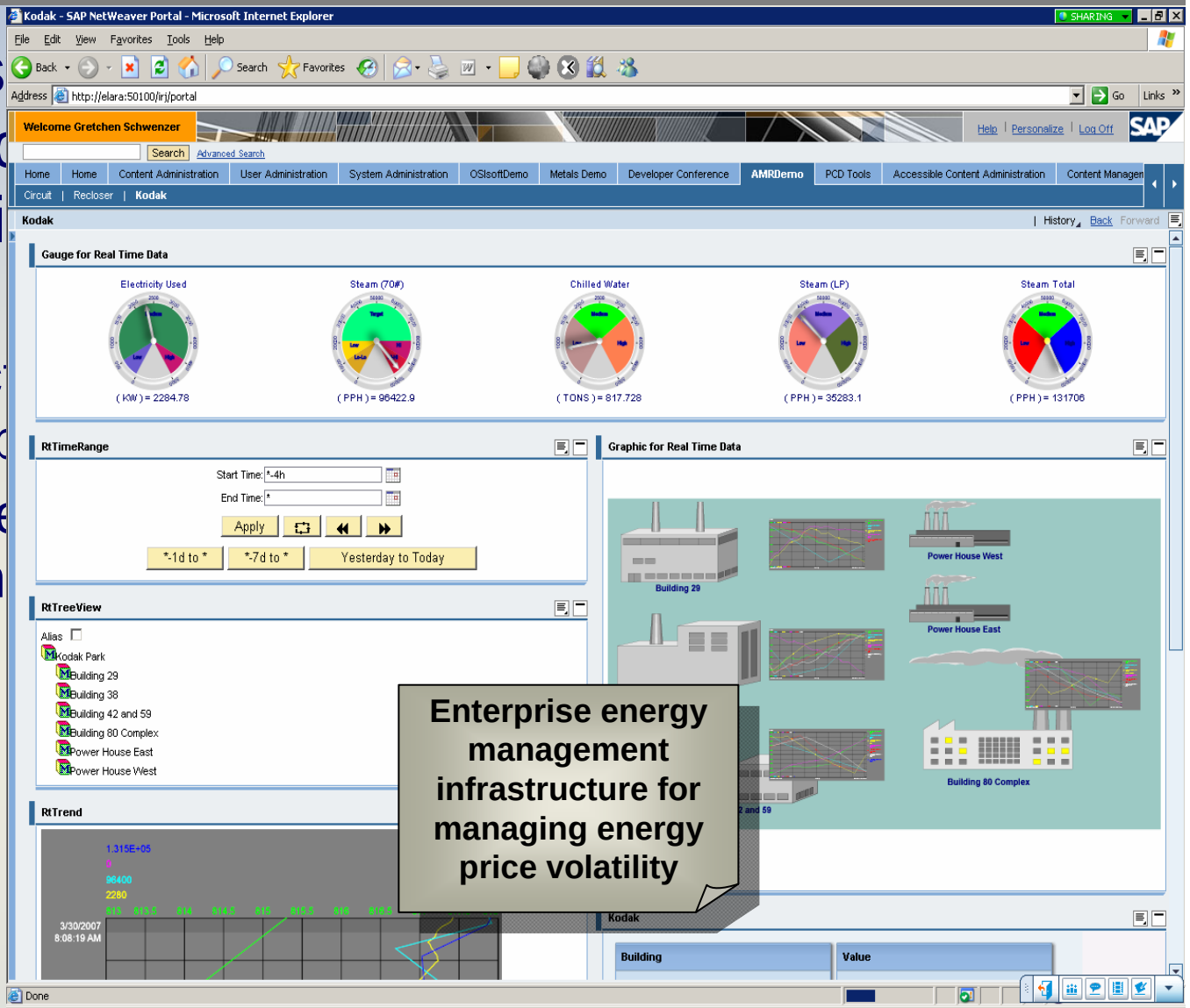
Sample Date	Asset ID	Fluid Temp	H2	CH4	C2H6	C2H4	C2H2	CO2	CO	O2	N2	TDCG (ppm)	Equiv. TCG (%)	Total Gas (%)	CO2/CO	O2/N2
09/26/90	TR3450	50	193	115	137	38	<1	3004	223	2340	22698	813	2	2	13	0
08/01/94	TR3450	50	279	185	164	51	<1	4213	341	2627	25482	1140	3	3	12	0
03/06/95	TR3450	50	489	399	320	109	<1	1652	315	685	24333	1861	5	2	5	0
03/28/96	TR3450	50	1258	1980	590	369	<1	6524	530	732	24800	5227	10	3	12	0
03/21/98	TR3450	50	1390	2568	790	561	<1	5952	554	927	24651	6361	11	3	10	0

Office 2007 Excel Services with PI DataLink



Enterprise Visibility

- Rich and eas
  set of analytic
  and capabiliti
  including:
  - Event detec
    notification b
  - Configurable
    programmin
  - Scalability



INSUMOS MINERA EL TESORO - PLANTA DE OSMOSIS - Microsoft Internet Explorer

Archivo Edición Ver Favoritos Herramientas Ayuda

Atrás Búsqueda Favoritos

Dirección http://tsrmnadesapiso1/PORTAL_PI/INSUMOS%20MINERA%20EL%20TESORO/PLANTA%20DE%20OSMOSIS.aspx Ir Vínculos

Buscar Resaltar Opciones Ventanas emergentes admitidas Hotmail Messenger

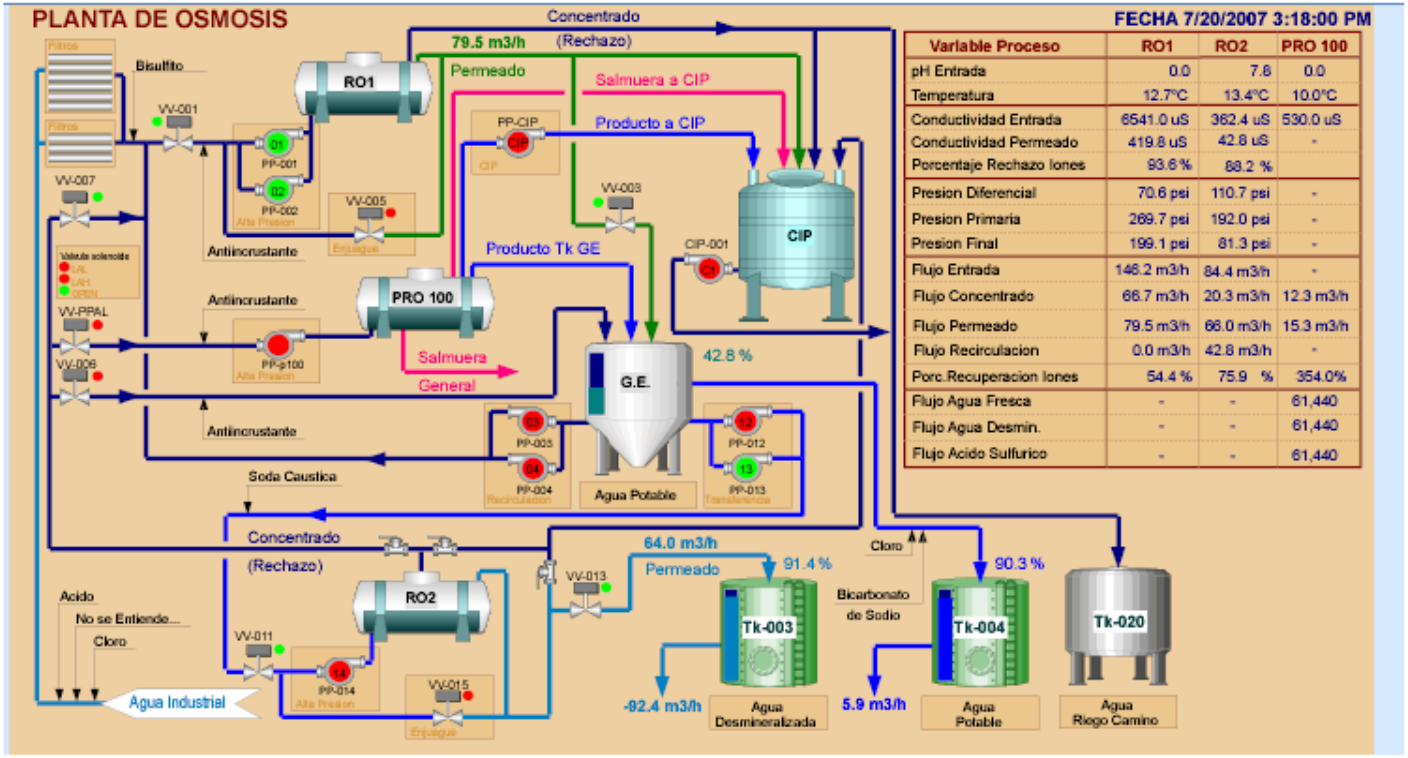
Google Go Bookmarks 36 blocked Check AutoLink AutoFill Send to Settings

PORTAL PI SYSTEM

Content Editor Web Part

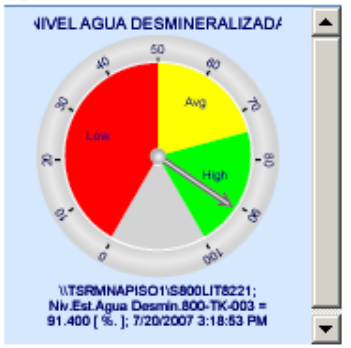
PLANTA DE OSMOSIS MINERA EL TESORO

DIAGRAMA GENERAL PLANTA

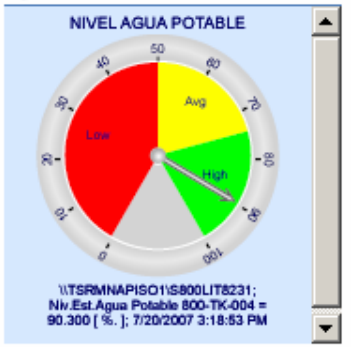


Variable Proceso	RO1	RO2	PRO 100
pH Entrada	0.0	7.8	0.0
Temperatura	12.7°C	13.4°C	10.0°C
Conductividad Entrada	6541.0 uS	362.4 uS	530.0 uS
Conductividad Permeado	419.8 uS	42.8 uS	-
Porcentaje Rechazo Iones	93.6 %	88.2 %	
Presion Diferencial	70.6 psi	110.7 psi	-
Presion Primaria	269.7 psi	192.0 psi	-
Presion Final	199.1 psi	81.3 psi	-
Flujo Entrada	146.2 m3/h	84.4 m3/h	-
Flujo Concentrado	66.7 m3/h	20.3 m3/h	12.3 m3/h
Flujo Permeado	79.5 m3/h	66.0 m3/h	15.3 m3/h
Flujo Recirculacion	0.0 m3/h	42.8 m3/h	-
Porc.Recuperacion Iones	54.4 %	75.9 %	354.0%
Flujo Agua Fresca	-	-	61,440
Flujo Agua Desmin.	-	-	61,440
Flujo Acido Sulfurico	-	-	61,440

NIVEL AGUA DESMIN...



NIVEL AGUA POTABLE



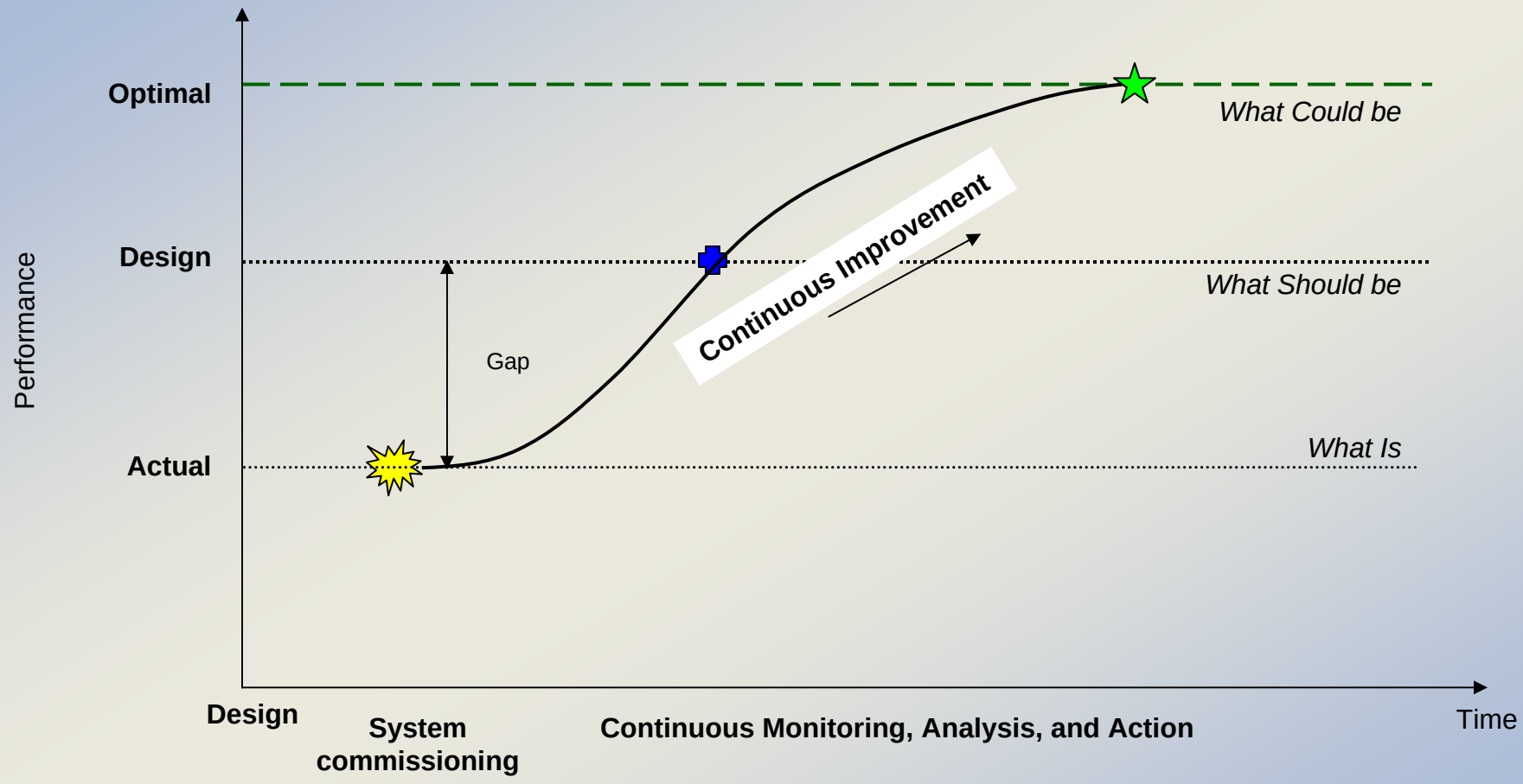
Listo Intranet local

Inicio tsrmnadespiso... Version Final p... 4 Explorador ... 2 Microsoft O... 8 Internet E... Module Databa... 2 Microsoft O... 18:19

KPIs

- Actual yields calculated via PI-ACE based on reconciled values:
  - Per hour
  - Per shift
  - Per running plan
- Overall KPIs calculated via PI-ACE
  - Performance (positive when producing more valuable products than expected)
  - Deviation (gives indication of the distance between target and actual yields)
- Show KPIs - change to notifications/AF

Enterprise Water & Energy Management



Improving Mine and Metallurgical Performance

DATA UNIFICATION

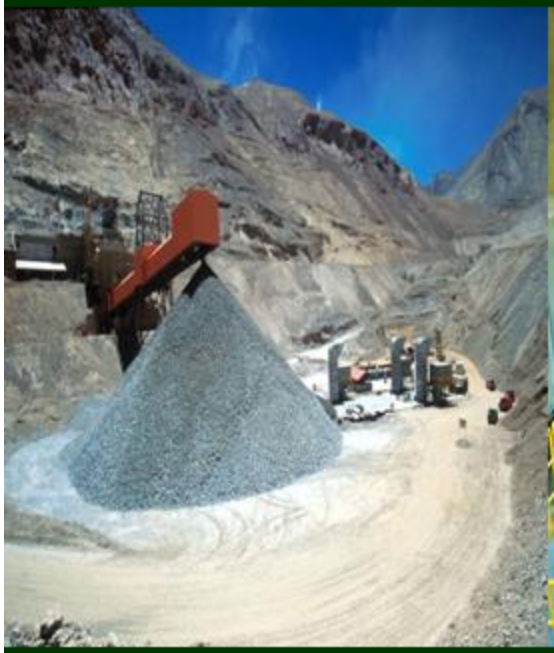
Fernando Romero and Manuel Suarez
Compañía Minera Doña Inés de Collahuasi
SCM, Chile
Osvaldo A. Bascur
OSIsoft, USA

2004 SME Annual Meeting & Exhibit

Denver, Colorado
February 24, 2004

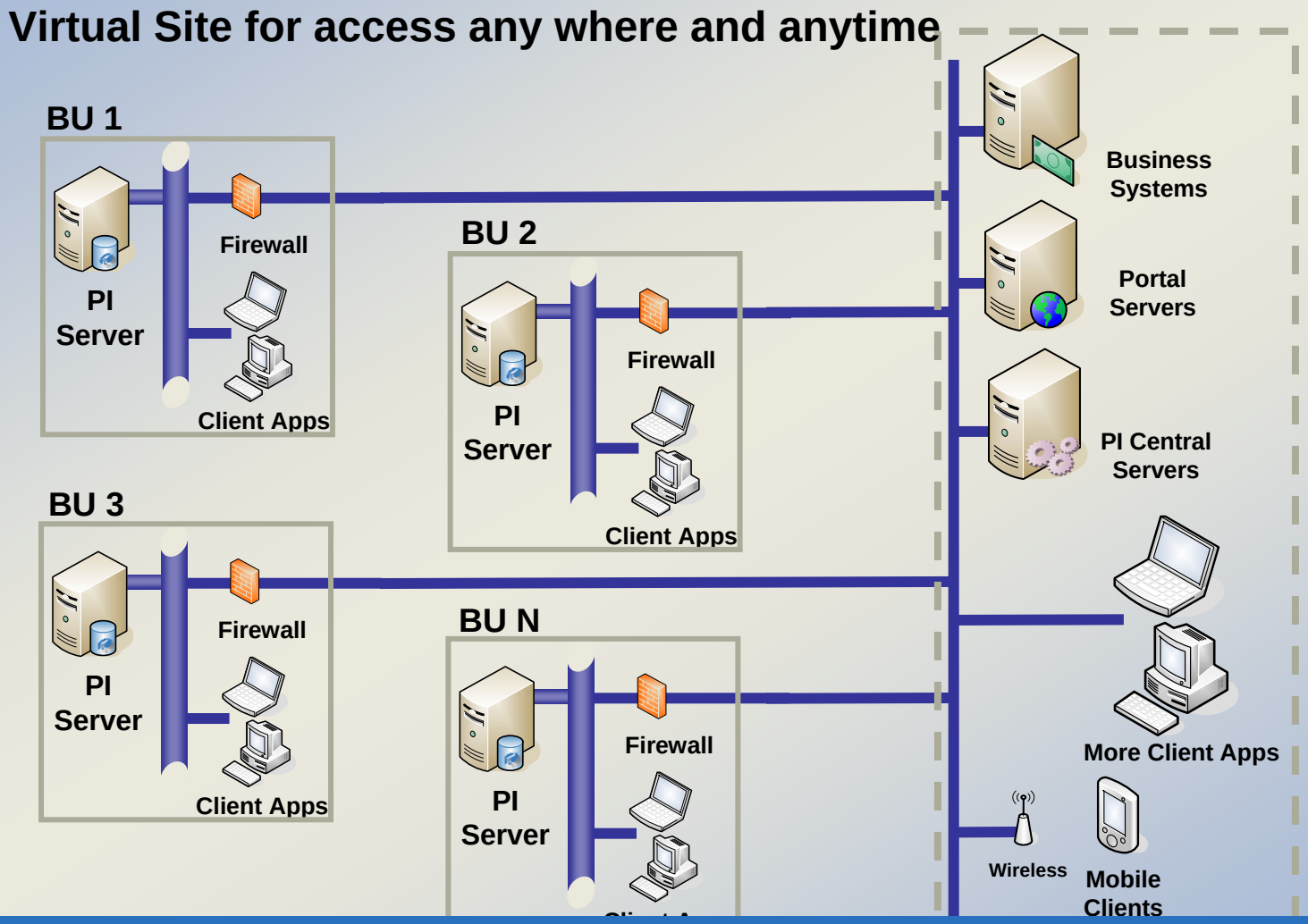
Minera Los Pelambres

Plataforma RtPM

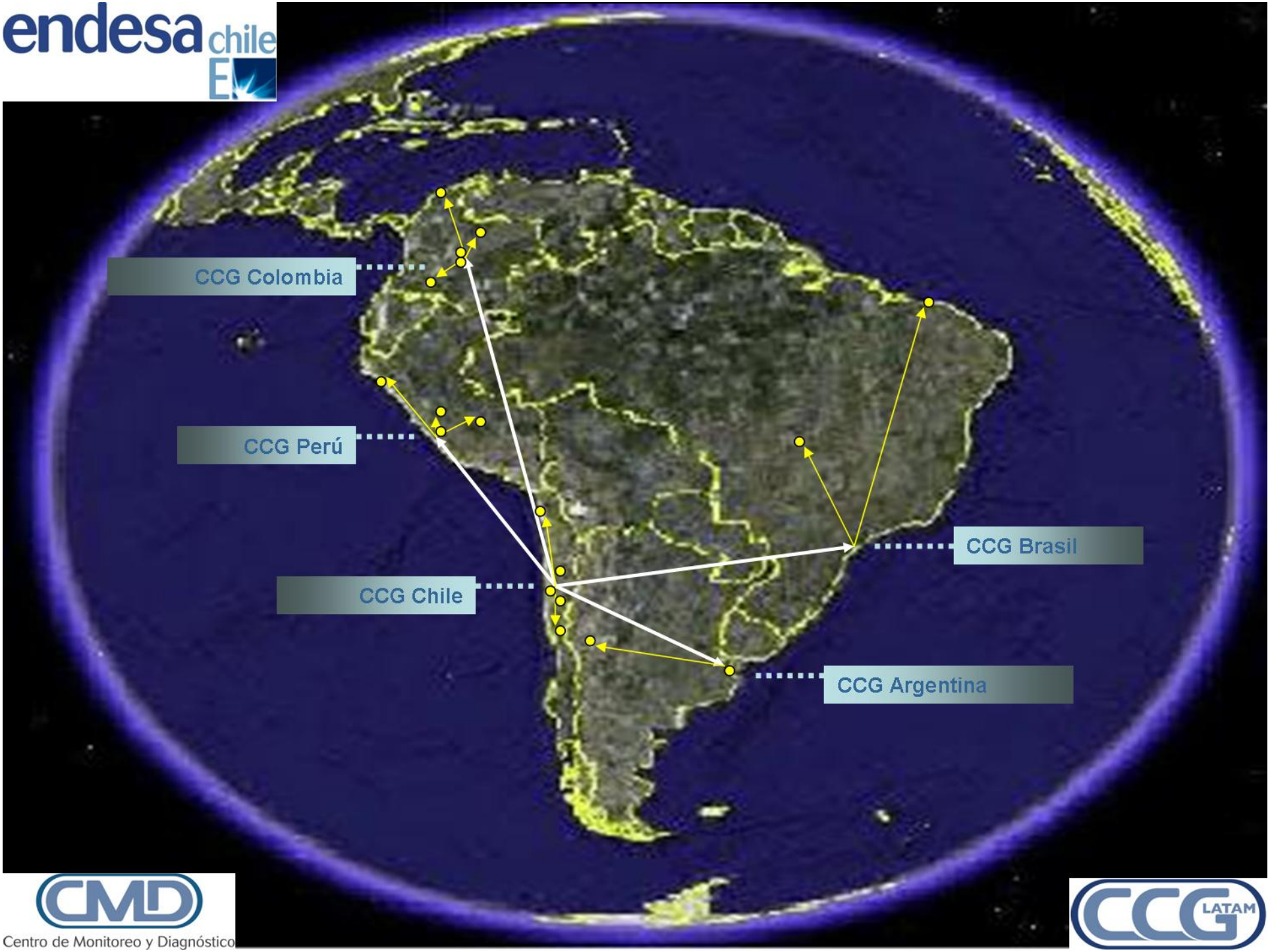


Santiago, Agosto 2005

Enterprise Center of Compentence



Mines, Concentrators, Smelters, Refineries, Power Plants, PI Servers (n)



Centro de Monitoreo y Diagnóstico

fondo - Microsoft Internet Explorer proporcionado por Grupo Endesa

endesa chile

Centro de Control de Generación Grupo Endesa

Centro de Monitoreo y Diagnóstico

24-08-2007 13:01:19

Perú | Colombia | Chile | Argentina | Brasil

Central San Isidro

Datos de Generación

Unidad	Tipo	Potencia Activa [MW]	Potencia Nominal [MW]	Disponibilidad Dia Anterior %	Estado Interruptor
Unidad 1	Gas	194	240	100	
Unidad 2	Vapor	85	139	100	
Total		280	379	100	

INFORMACIÓN TÉCNICA

Nota:
Información provisoriamente no disponible de las Centrales:

- Betania, en Colombia
- Cartagena, en Colombia
- Diego de Almagro, Chile
- Ventanilla unidad 5 (TV), Perú
- Detalle por unidad en Chocón, Argentina
- Detalle por unidad en Arroyito, Argentina

En la información no disponible de estas Centrales, se reflejan con el valor -1.

Central San Isidro

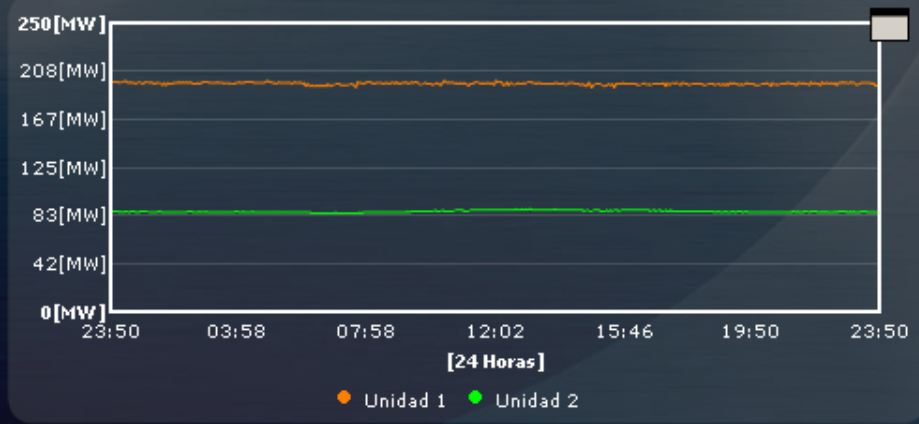
Características Generales

Ubicación: 8 km. de Quillota, V Región.

Tipo: Térmica de ciclo combinado.

Características Generales

Potencia: 379 MW
Generación media anual : 1.787,97 GWh
Frecuencia: 50 Hz
Factor de carga medio : 53,79Combustible: Gas natural



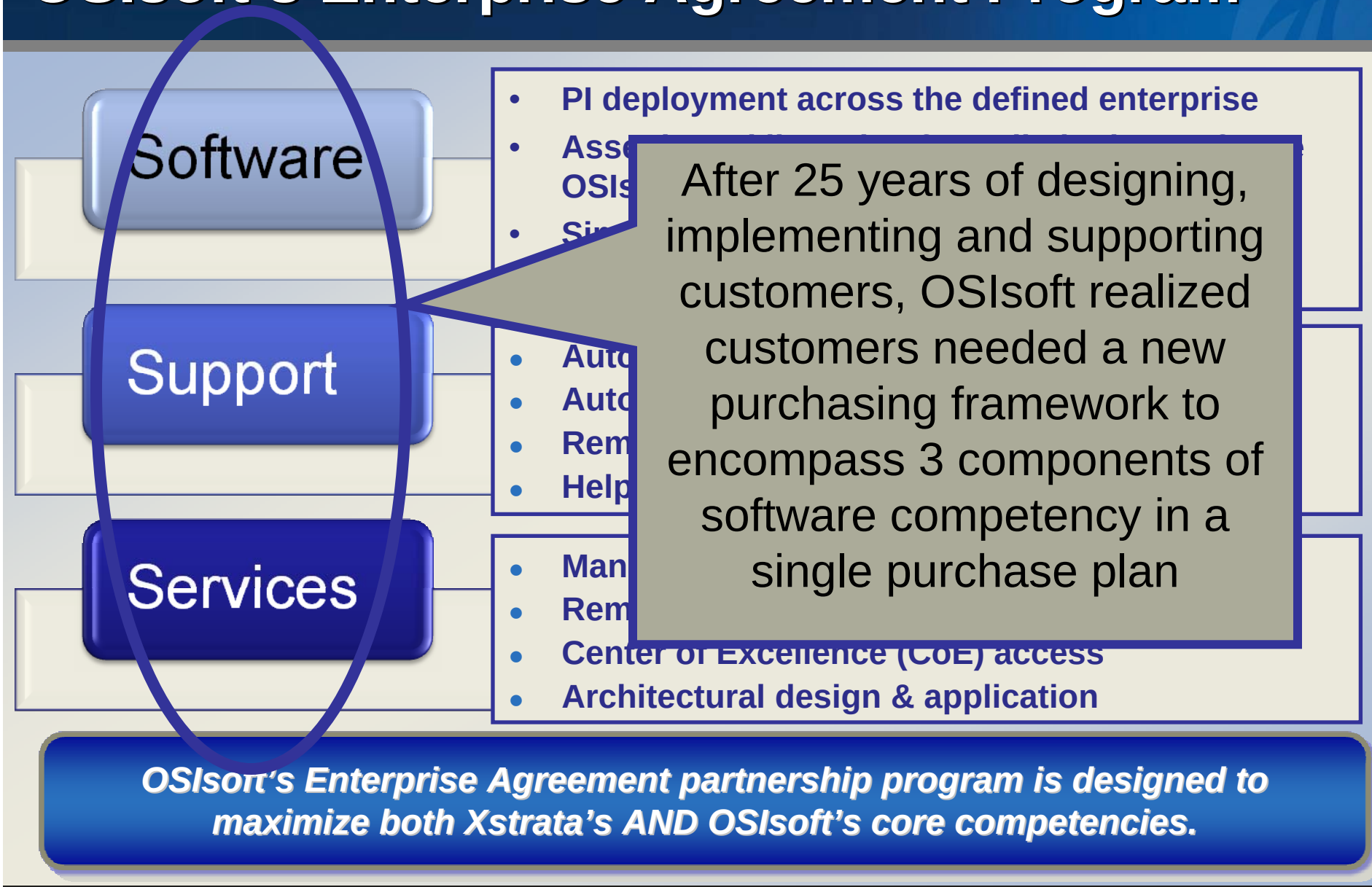
Centrales Térmicas

Centrales Hidráulicas Centro

Centrales Hidráulicas Sur

SALA DEL CMD

OSIsoft's Enterprise Agreement Program



OSIsoft's Enterprise Agreement partnership program is designed to maximize both Xstrata's AND OSIsoft's core competencies.

Enteprise Sales Program

Software

- PI deployment across the defined enterprise
- Asset based licensing
- Simplified contract & procurement processes
- Allowance for material change in business

Support

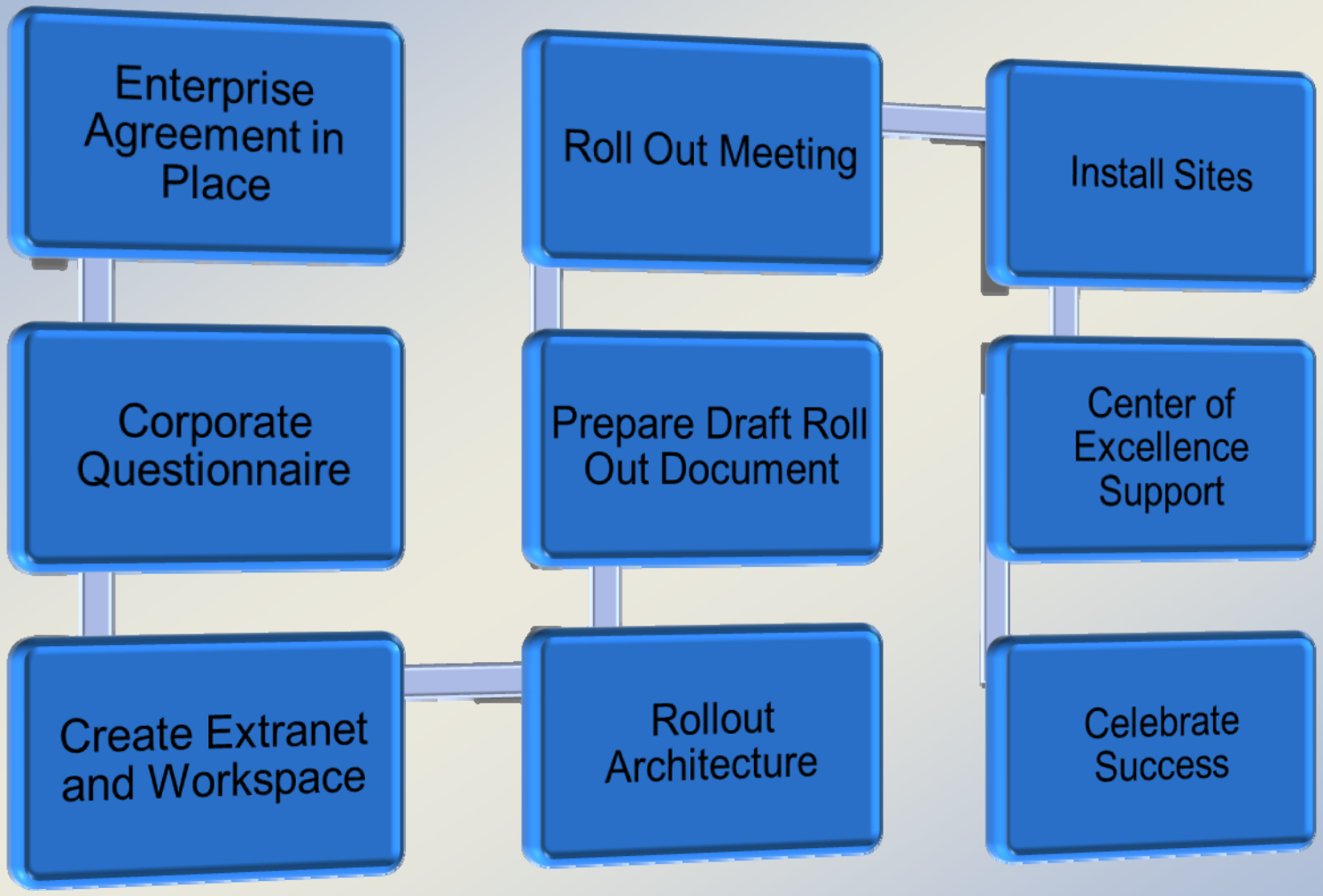
- Automatic Download of New Versions
- Automated Upgrades Available
- Remote monitoring and alerting
- Help Desk, Developers Network and Training

Services

- Managed rollout
- Remotely PI management
- Center of Excellence (CoE) access
- Architectural design & application

OSIsoft's Enterprise Agreement Program is designed to "Get PI done right" and ensure customers "Get value out of PI"

The Enterprise Process



Water and Energy Balances in Mineral Processing Plants

Osvaldo Bascur and Ales Soudek

Kodak Park

Kodak Park Utilities

- Kodak Park Utilities Power Plants
  - 2,000,000 Pound/Hour Steam Load
  - 125 MW Electric Load
  - 80,000 Ton Refrigeration Capacity
  - 30,000,000 Gallons/Day Process Water Load
  - 35,000 SCFM Compressed Air Load

KODAK *Workforce Portal*

Welcome JAMES BREEZE

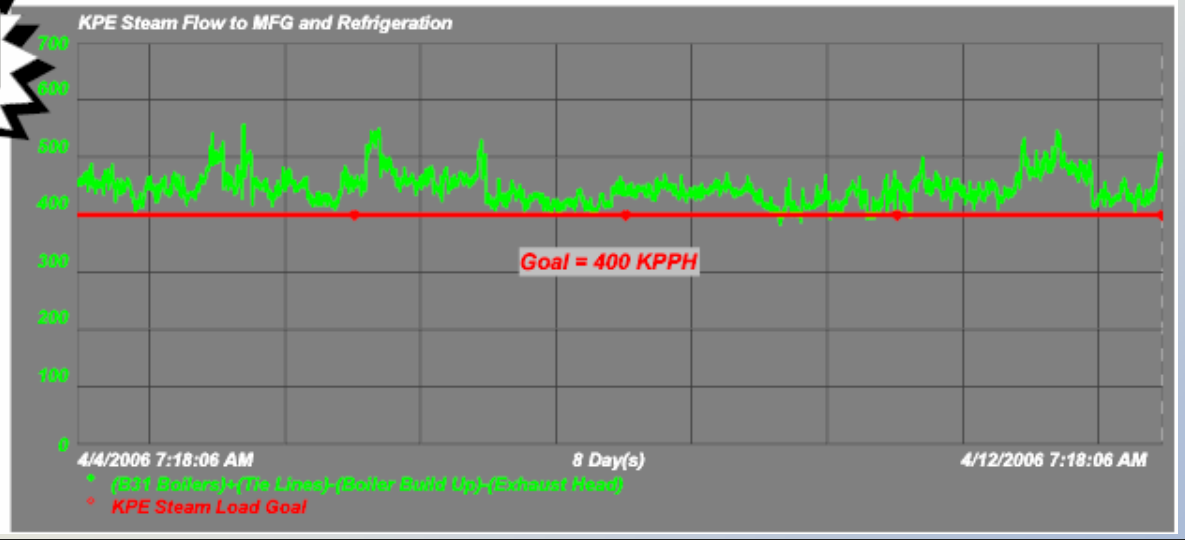
Welcome | myHR | KP Energy

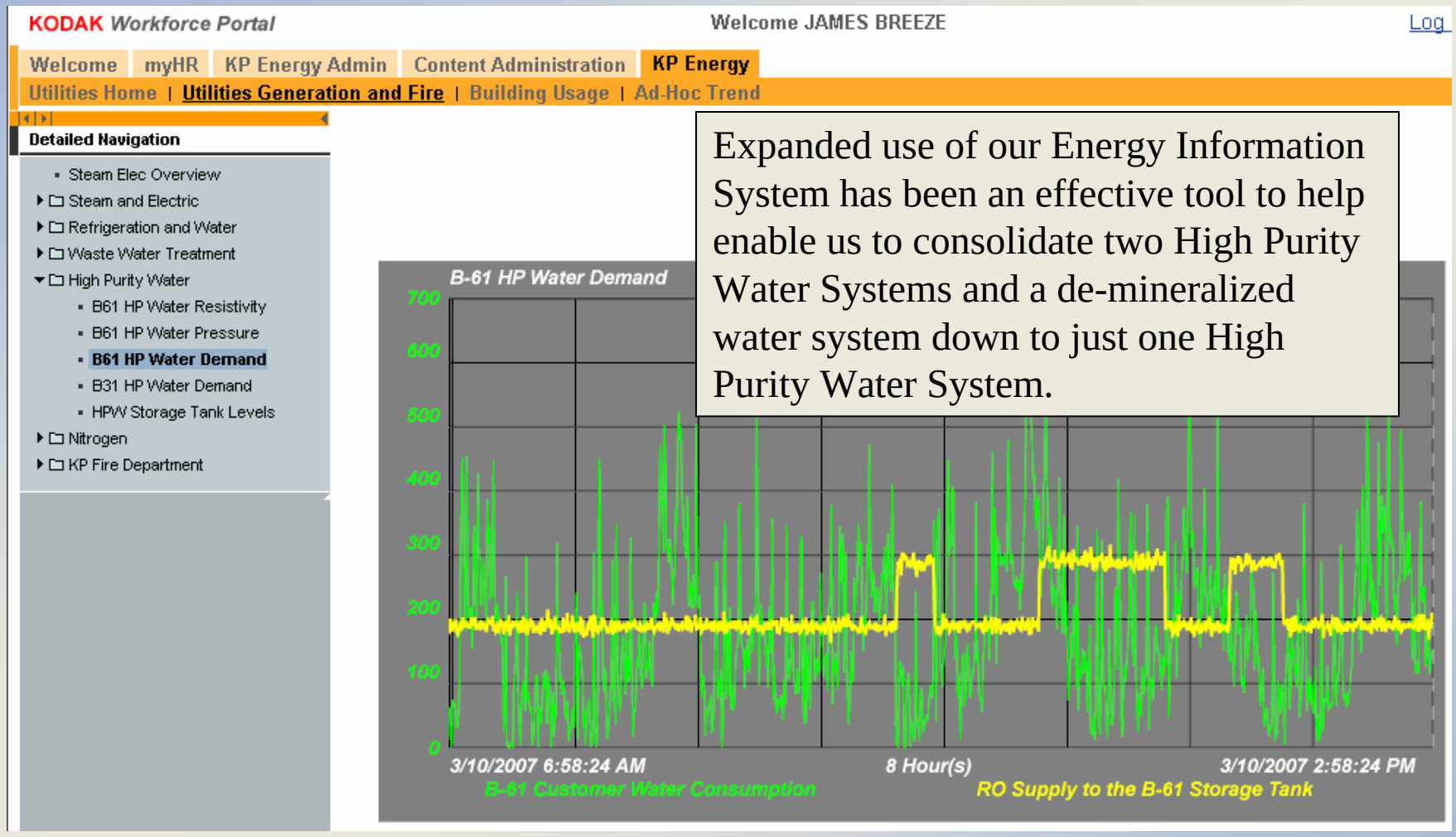
Utilities Home | Utilities Generation | Building Usage | Ad-Hoc Trend

- Steam Scorecard
- Electric Scorecard
- Chilled Water Scorecard
- Kodak Water Scorecard
- Compressed Air Scorecard

Link to "The Energy Times"

Total KP Plant Steam Flow	1426 KPPH (Goal < 1350)
KPE Steam Flow to MFG & Refrigeration	497 KPPH (Goal < 400)
KPW,X&M Steam Flow to MFG & Refrigeration	377 KPPH
KPS Steam Flow	79 KPPH
Exhaust Steam to Atmosphere	127 KPPH
Total Boiler Build-Up	353 KPPH
260# Steam - Tie Line Flow from B-321 to B-31	57 KPPH
Total Megawatts	98 Megawatts (Goal < 95)
Purchased Power	14.0 MWATTS





Harvest Time

- The Energy Information System (EIS) has been an essential tool to help us reach our goal of:

“One Powerhouse for Kodak Park”

Collectively these efforts have yielded savings into the millions of dollars.

Lessons Learned

- No BIG BANG – 1000 little bangs
- Continuous Improvement Process
- Combined Capital and Intelligence Operation
- Infrastructure Approach – Remove Infrastructure from Projects
- Lowers the Cost of Curiosity

Metals Enterprise Business

- Objectives
  - Site Integration for Enterprise Optimization
  - Enterprise Competence Center
    - Leverages expertise across entire enterprise
    - Identify and promote best practices
    - Tracks effectiveness of business processes
    - Collaboration
- Required Tools and Supported Methodology
  - Flexible Collection of Real-Time Data
  - Asset-based Organization for Analysis
  - Web-based, Easy Access to Information
  - Scalable Analysis and Visualization
  - Managed PI and COE Services