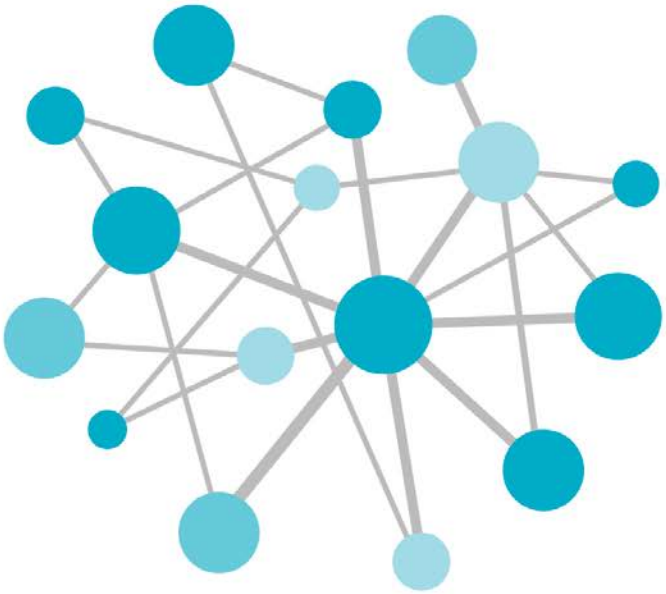

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SEMINÁRIO REGIONAL 2014

The Power of Data

L A T A M

DECISION READY IN REAL-TIME

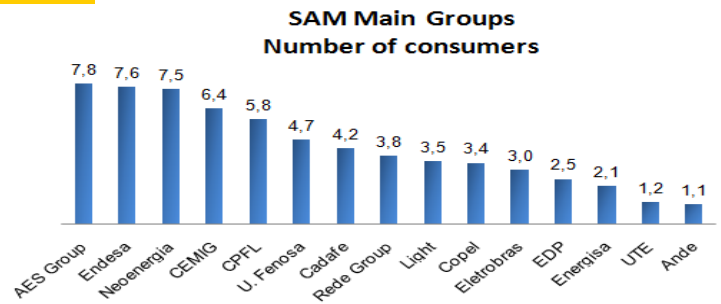
How PI is transforming Energy Efficiency

Table of Content

LATAM Main Utilities - Groups

LAM Main Groups
consumers

37 M
Customers



Main Utility BRAZIL	Consumers dez/2009				
	Res.	Ind.	Com.	Rural	Total
CEMIG	5.601.926	75.018	596.285	490.139	6.832.360
AES ELETROPAULO	5.583.067	29.984	356.403	767	5.987.827
COELBA	4.046.689	20.805	295.322	192.385	4.622.033
LIGHT	3.361.650	10.234	245.666	10.580	3.640.103
COPEL	2.859.749	66.960	300.138	352.992	3.628.183
CPFL PAULISTA	3.092.307	39.631	268.876	68.658	3.502.664
CELPE	2.583.635	13.481	193.674	174.740	2.994.242
COELCE	2.219.849	5.874	154.746	320.736	2.739.086
AMPLA	2.138.595	4.875	146.023	60.345	2.365.536
CELESC	1.745.915	73.466	178.463	219.394	2.237.074
CELG	1.815.954	10.362	208.905	159.977	2.213.183
ELEKTRO	1.814.085	21.828	143.138	122.370	2.123.637
TOTAL	55.515.808	533.484	4.752.023	3.595.508	65.024.136

LAM Hispanic MAIN UTILITIES (#Consumers)

- Owner origin: Private / Spain
- Electricity Users: 4.7 millions
- Countries: CO, PN, NY and GU

- Owner origin: Public / Venezuela
- Electricity Users: 4.2 millions
- Countries: VE

- Owner origin: Private / Spain -Italy
- Electricity Users: 3.2 millions
- Countries: PE and CO

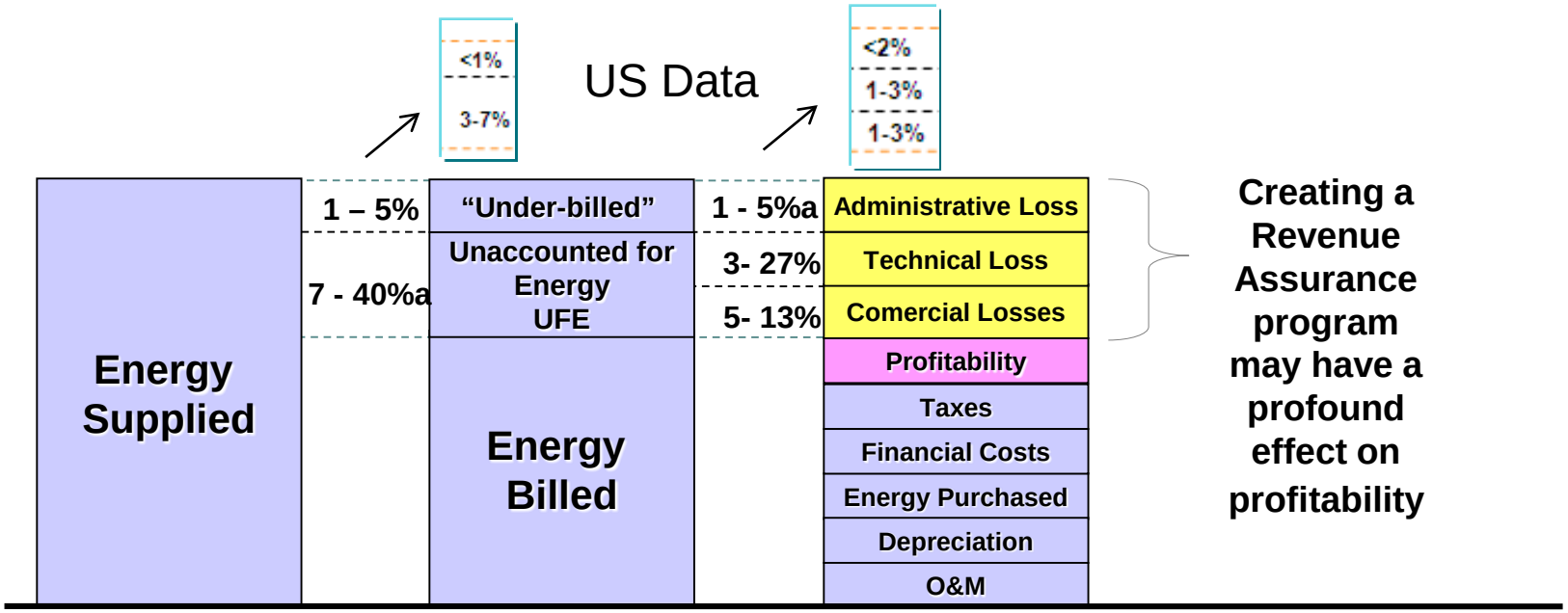
- Owner origin: Public / Uruguay
- Electricity Users: 1.2 millions
- Countries: UY

- Owner origin: Public / Paraguay
- Electricity Users: 1.2 millions
- Countries: PY

Distribution problems

- Utilities focused in revenue protection, non authorized uses and collection.
- Big Utilities driving technology forced by regulation.

Defining Revenue Assurance

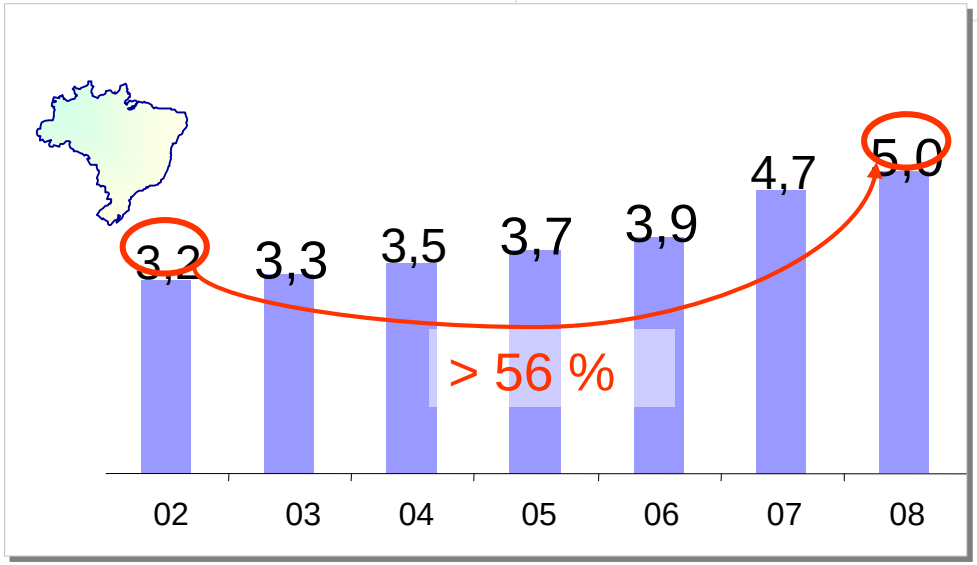


- Administrative losses: uncollected debt, data base problems, meter configuration
- Commercial losses: theft from known accounts, unmetered accounts
- Technical losses: Line losses, unbalance, maintenance problems

Commercial Losses Dimension

Commercial Losses BRASIL %

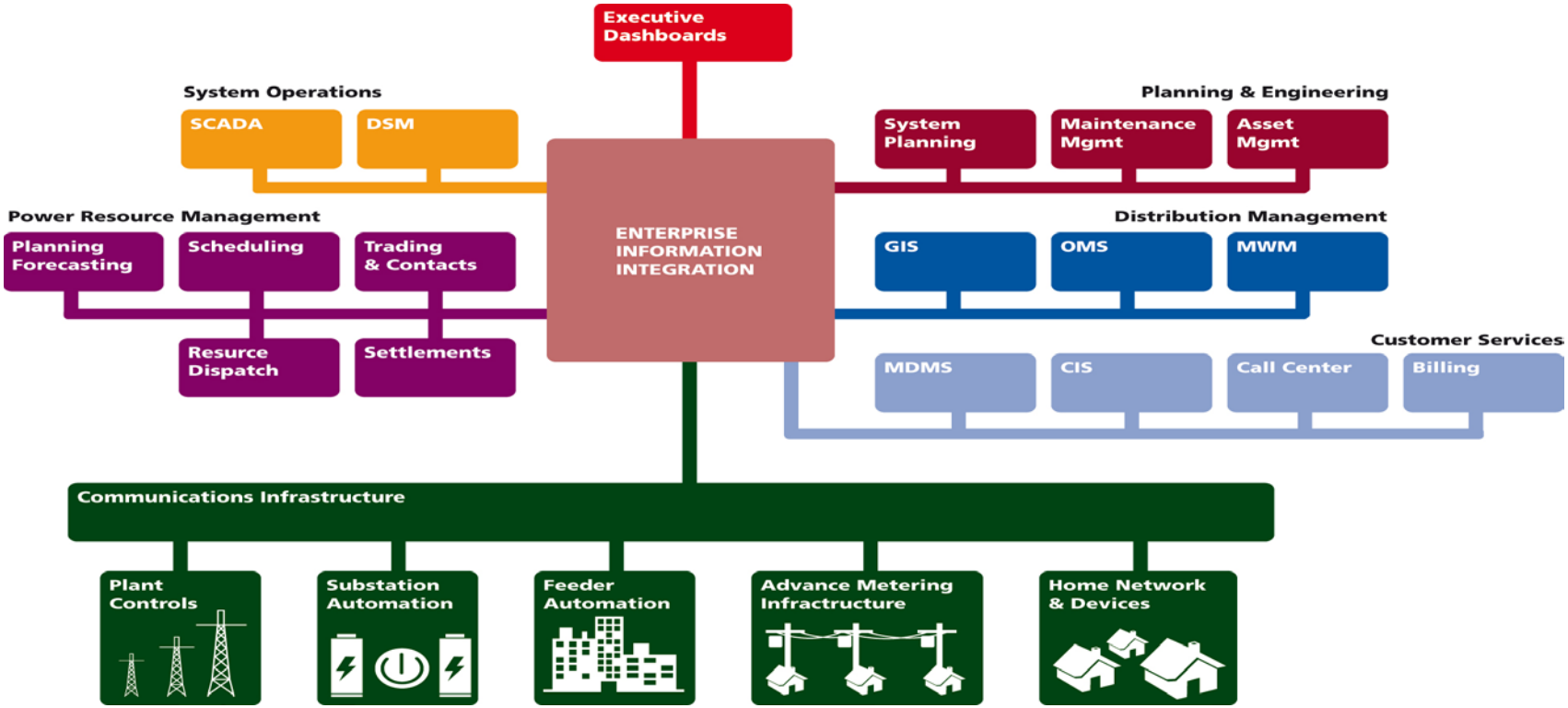
Fonte ABRADEE



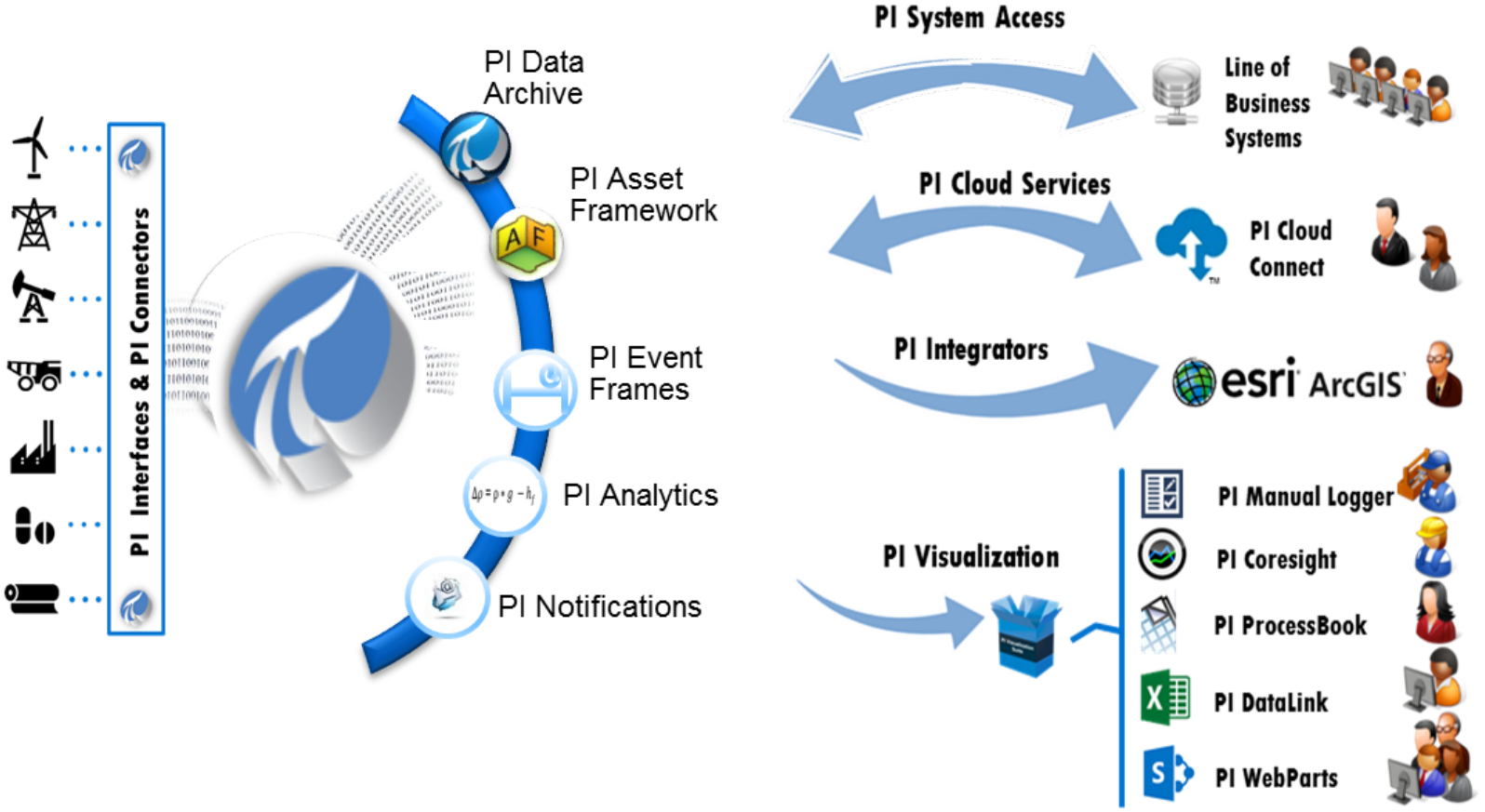
Fonte ABRADEE

Commercial Losses Evolution

Energy & Utilities IT Architecture

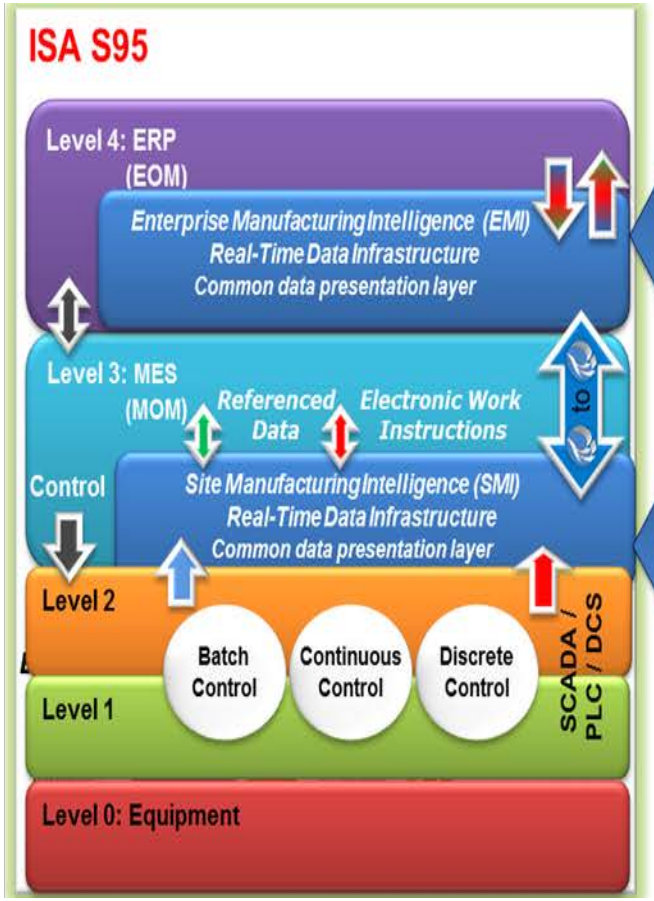


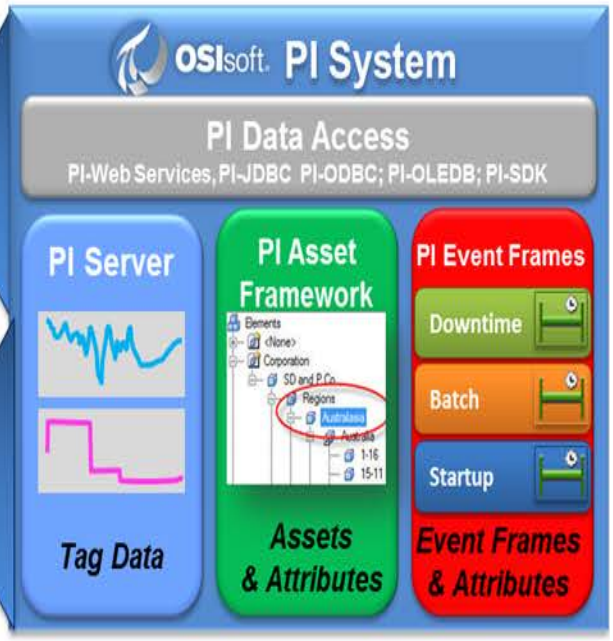
Key Elements of the PI System – A Data Infrastructure



Differentiating the PI System

- Aggregation
- Normalization
- Contextualization
- Analysis
- Visualization
- Propagation





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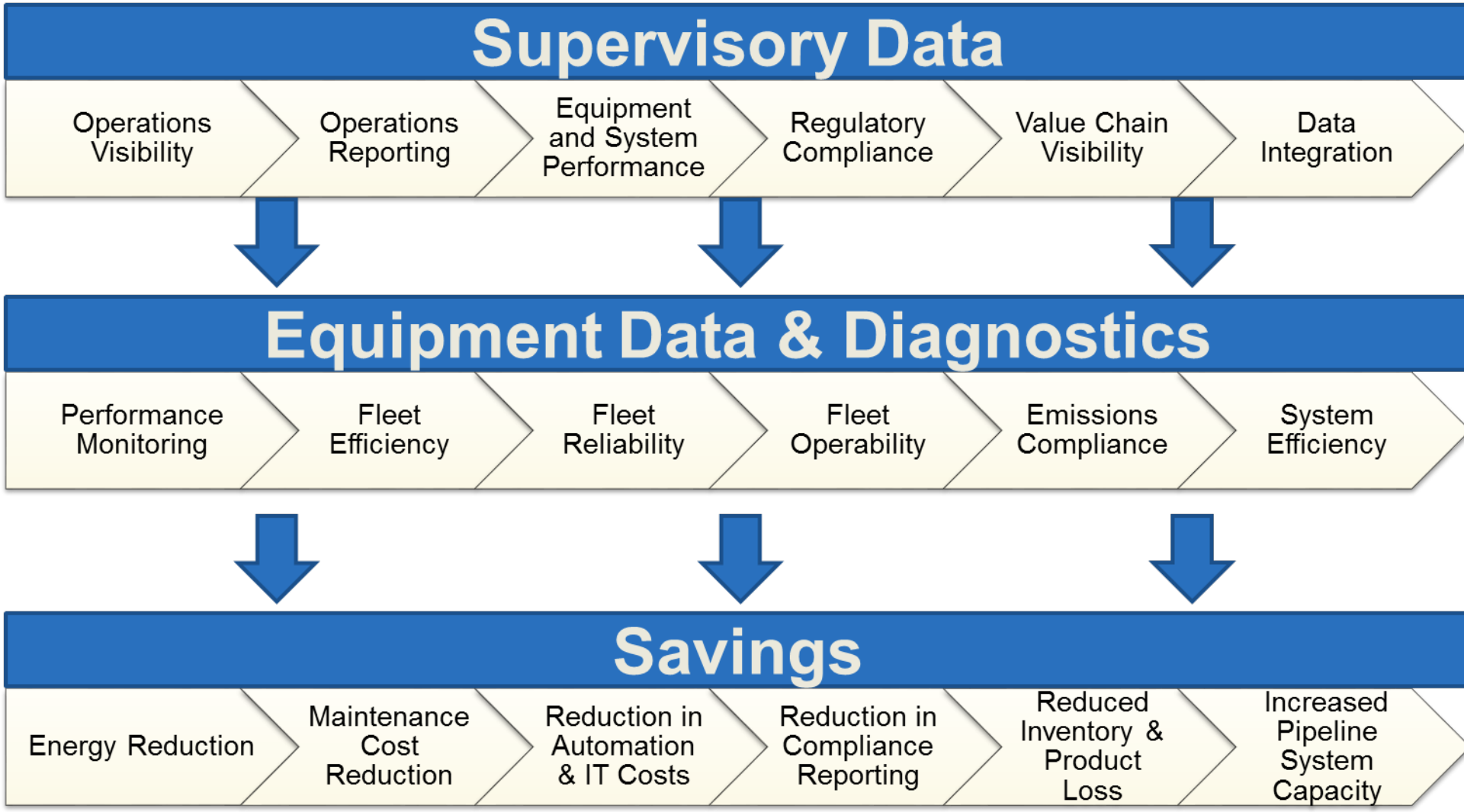
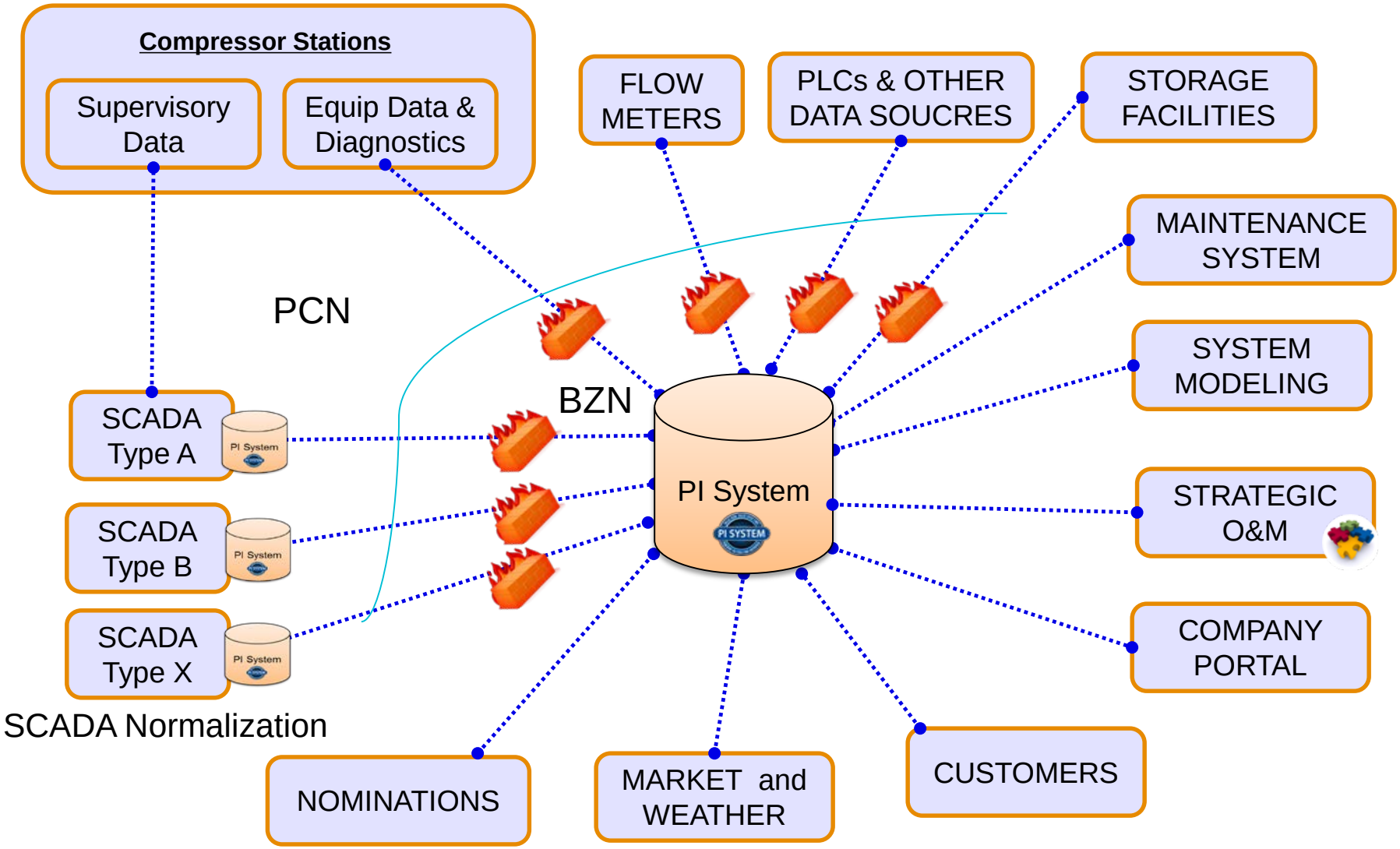
How Pipeline Customers Use PI Data



Getting Data to the Enterprise



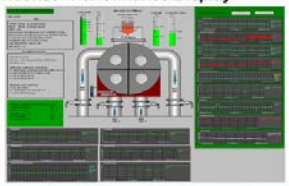
Process Optimization

Wheelabrator Technologies Inc.

A Waste Management Company

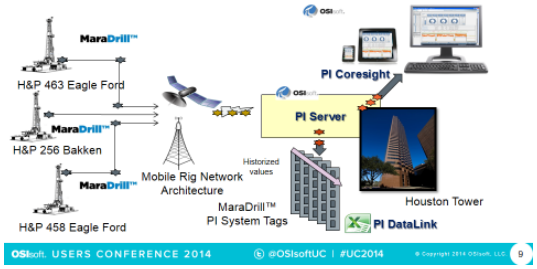
Performance Monitoring Center Hampton NH

Condenser Performance Display



Marathon Oil

Data Workflow

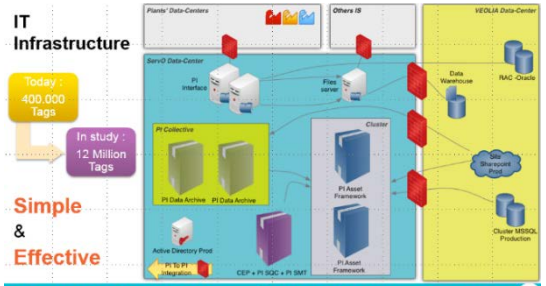


VEOLIA

Eau d'Ile-de-France

Délégataire du SEDIF

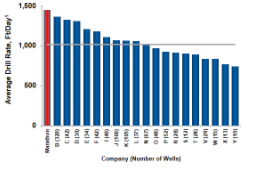
IT Infrastructure



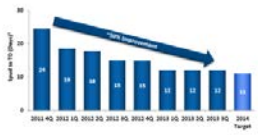
Results and Benefits

- Cooling Tower Performance Improvement - $450K/Year
- River Water Temperature Management - $300K/Summer
- Chemical Consumption Reduction - $70K/Year/Plant

Continuous Improvement in Rate of Penetration (ROP)



Eagle Ford Drilling – Spud to Total Depth



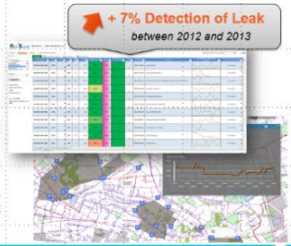
PI System and Real Time Data Analysis

A new generation of tools, agnostic technology, for an automatic and efficient detection

+ 7% Detection of Leak between 2012 and 2013

Leak Detection on demand

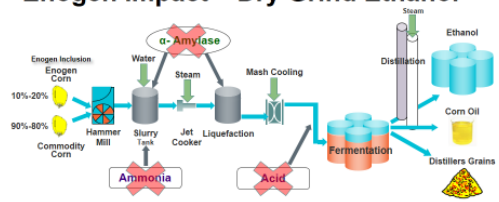
- Analyze every sensor in Real Time
- Put Data for analysis in SQC and Scilab
- compute proximities between the signals to determine the best location of leaks



Process Optimization → Quality Improvement

Enogen® syngenta®

Enogen Impact – Dry Grind Ethanol



PI System provides the ability to monitor, analyze, measure and visualize the Enogen impact.

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PG&E®

PG&E Gas Operation Center

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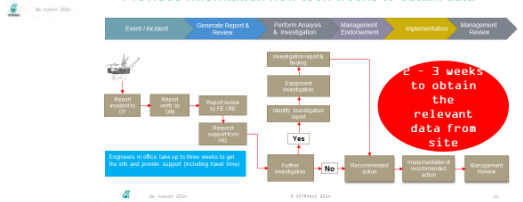
PETRONAS

Why do we need PI System?

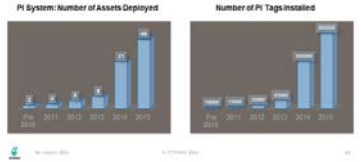
- Diverse operational facilities
- Inhomogeneous sources of operational data
- Real-time process data locked within isolated control systems
- Technical performance & business intelligence reliant on offline data

Previous information flow took weeks to obtain data

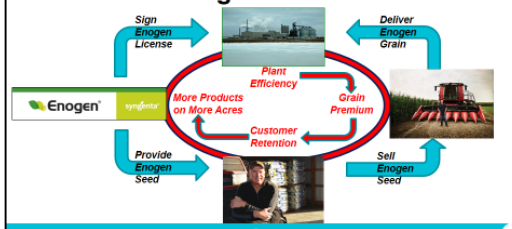


Troubleshooting made easy and accurate!

PI System deployment status



The Enogen Value Chain



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Customer Calls Displayed using Esri

Distribution Calls				
Zero Tags	1	Northern	0	C. Coast
	1	Bay Area	0	C. Valley
Odor	13		6	Northern
			3	Bay Area
			2	C. Coast
			2	C. Valley
No Gas - P	0		0	Northern
	0		0	Bay Area
			0	C. Coast
			0	C. Valley
No Gas - U	4		1	Northern
			2	Bay Area
			0	C. Coast
			1	C. Valley

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Process Optimization → Quality Improvement

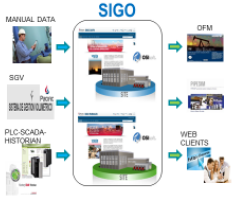
Pacific Rubiales Energy

Business Challenges

- Manual data collection despite the existing automation system.
- Data is being organized using Microsoft Excel.
- Engineers spend long time organizing data and they don't have enough time to analyze it.
- Data is transmitted via email.

Solution

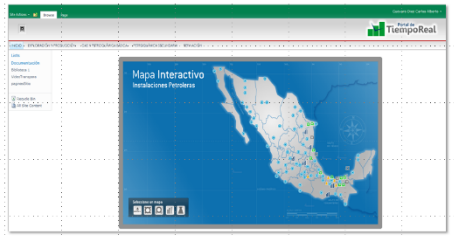
Implement PI System to manage, secure and display operational information through reports and KPIs of wells and CPF (Central Production Facilities)



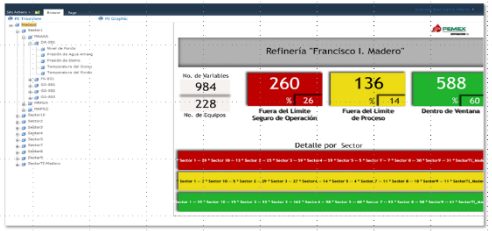
PEMEX

Standardized Real Time Portal at PEMEX

All 4 PEMEX Companies' Metrics are in a single Portal

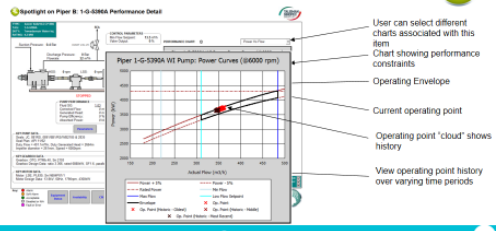


A single detailed view for all equipment



TALISMAN SINOPEC ENERGY UK

Spotlight Display - Performance



Examples of Value Delivered

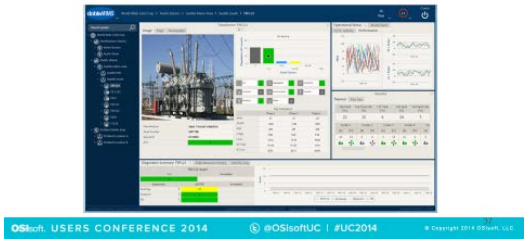
- **High Seal Gas filter DP Catch**
  - DP reached 3.5BarG, limit should be 1BarG
  - *Spotlight* alerted users, who followed up with operators to swap to standby filter and raised work order to replace fouled filter
  - If allowed to continue could have caused 14 days lost production @11,000bbls/day : 154,000bbls
- **High Seal Oil Tank Temperature Catch**
  - Temp should be around 60°C, but had reached 116°C
  - *Spotlight* alerted onshore users, who followed up with offshore team and it was picked up that 2 seal oil pumps were running instead of 1
  - If high temperatures had continued seals could have failed and caused 10 days lost production @7,000bbls/day : 70,000bbls
- **Surging Compressor Proactive Resolution**
  - Operators reported compressor surging
  - *Spotlight*'s history functions allowed engineers to confirm problems had occurred and make control tuning suggestions
  - If allowed to continue would have caused production/mechanical problems

Process Optimization → Quality Improvement → Asset Health and Uptime

Columbia Pipeline Group

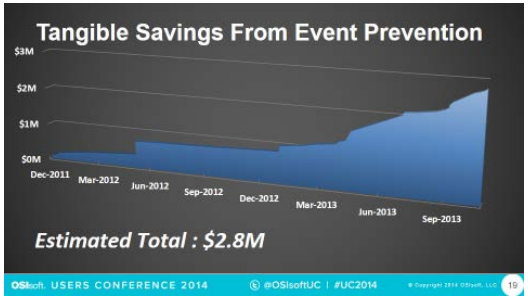
doble

Failure Analysis and Data



pjm

View of control room video walls



Fleet Risk, Financial, Health

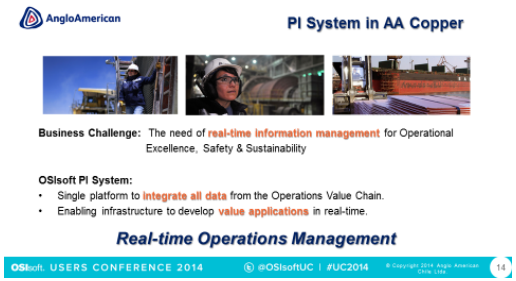
Return on Investment

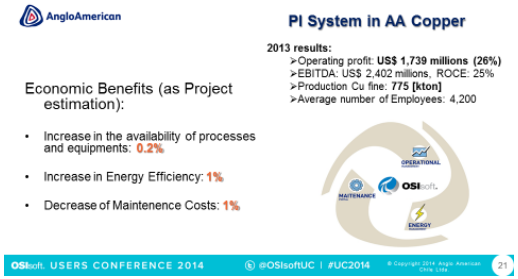
- Based on actuary data, failure reports and FMEA effectivity we expect:
  - 250% ROI for the cost the installed system per year
  - Expect that for every $10 Million spent on maintenance that, at least 25% on a rate base case study.

Situational awareness in control room

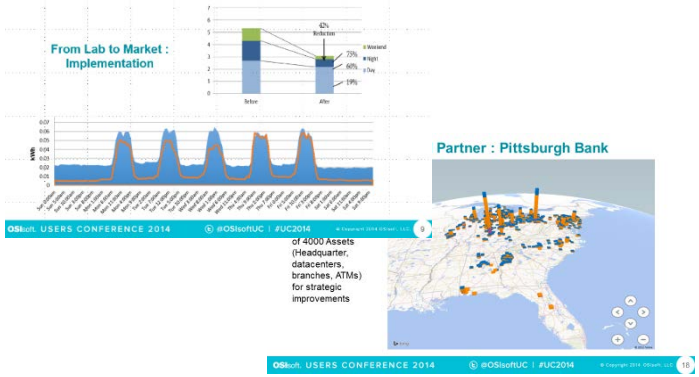
Process Optimization → Quality Improvement → Asset Health and Uptime → Energy Efficiencies

AngloAmerican

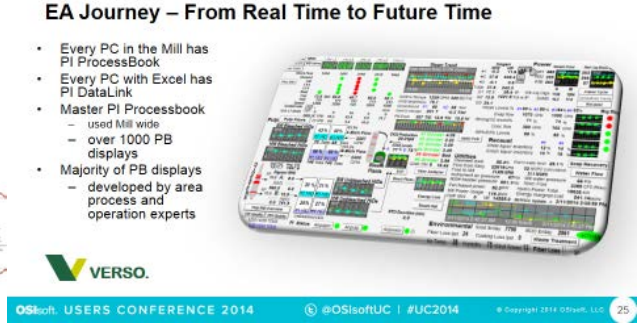


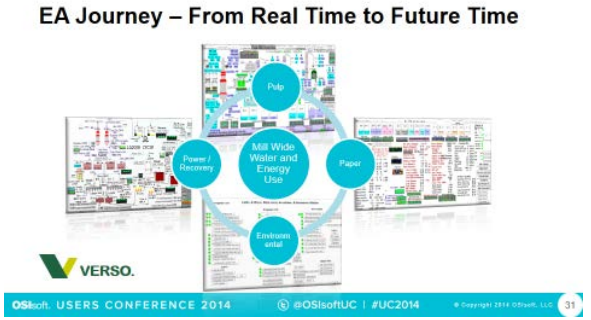


Carnegie Mellon University



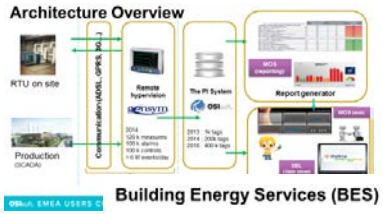
VERSO.



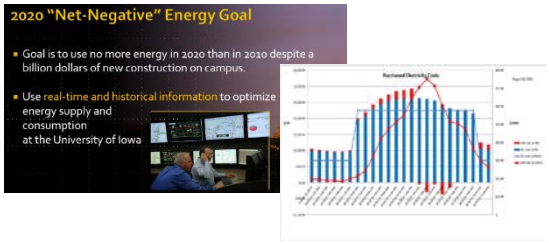


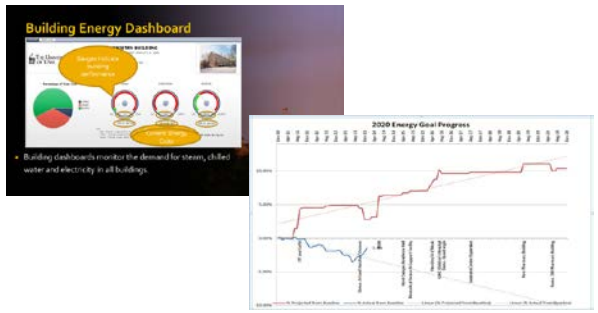
Process Optimization → Quality Improvement → Asset Health and Uptime → Energy Efficiencies

dalkia GROUPE EDF

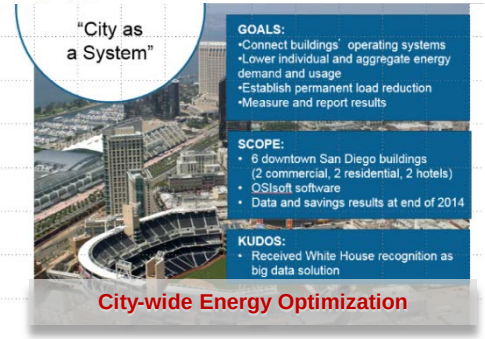


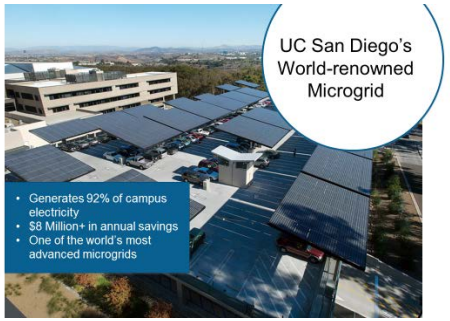
Facilities Management
The University of Iowa





CleanTECH San Diego





Process Optimization | Quality Improvement | Asset Health and Uptime | Energy Efficiencies | Regulatory Requirements

DOLPHIN ENERGY دولفين للطاقة

Air Emissions Calculation System

- Process Units:
  - Boilers/Heaters/ Furnace
  - Turbines
  - Incinerators
  - Sulfur Recovery
- Flares
  - Offshore Flares
  - Onshore Flares
- Compounds/ Pollutants:
  - O_2
  - NO_x
  - CO
  - SO_2/H_2S
  - Greenhouse (
    - CO_2
    - CH_4
    - N_2O

AECS Review –
Process & Environmental Knowledge

- Reviewed/confirmed/revised/added calculation methods
- Identify all PI Tags related to air emissions calculations
- Review/confirm existing tags and tag equations
- Revise and add new tags based on environmental regulatory compliance requirements

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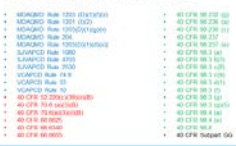
Southern California Gas Company
A Sempra Energy utility

Key Provisions in the Rules

Requirements
- The CPMS must collect data at least once every 15 minutes
- "I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this compliance certification are true, accurate, and complete."

Violations
- Rule violations or violations from the standards are:
  - Deviations from the rules, regulations, or standards occurs
  - Fines up to $10,000 per day per count per facility.

List of Applicable Rules



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Daily Utility Release Report example

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SANOFI

RtReport Review Screen

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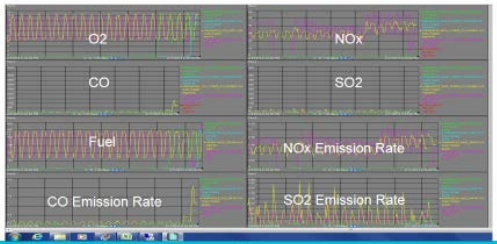
Compliance

PI ProcessBook Display Example
A Dashboard of All Key Parameters for A Process Unit



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Old MACT/NESHAPS Report

Time	Temp	4HrAvg	Time	Temp	4HrAvg	Time	Temp	4HrAvg	Time	Temp	4HrAvg
0:00	840	800	0:15	835	805	0:30	830	803	0:45	820	799
1:00	795	797	1:15	815	800	1:30	820	805	1:45	799	800
2:00	800	801	2:15	780	785	2:30	775	780	2:45	780	775

It would take two employees approximately 1 ½ hours to review 6 months of records. 8 reads for each hour X 24 hours X 183 days yields over 35,000 reads per unit. One location had 2 units another had 3 units.

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Benefits of using PI System

- System Reliability
- Flexible Data Handling
- Tunable Security Parameters
- Scalable

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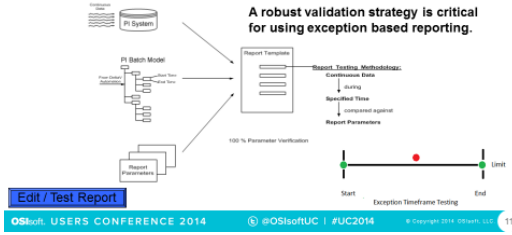
RtReport Validation Methodology



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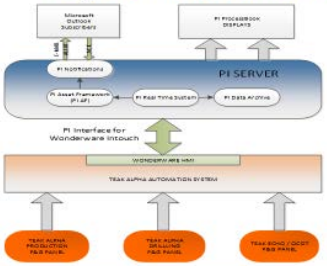
Process Optimization | Quality Improvement | Asset Health and Uptime | Energy Efficiencies | Regulatory Requirements | Safety

REPSOL

PI System Fire & Gas Dashboard Architecture



- Data from the F&G panels are sent to the Wonderware HMI via the automation network
- PI Interface for WonderWare Intouch transfers data to the PI Data Archive.
- PI Notifications (alert conditions from F&G panel) are forwarded to selected e-mail subscribers
- PI ProcessBook display dashboards allow end users to immediately determine the health of the overall system down to sensor level.

Benefits of PI System for Fire & Gas Monitoring

- Real time monitoring of F&G system health: minimizing system downtime and maximizing availability, quality control of preventive maintenance
- Historical archiving of F&G system events: timeline of event reconstruction, identifying faults and root causes
- Better management of control for bypassing
- E-mail notification of system health issues: bypass, sensor trouble, communication failures, panel fault
- Superior process safety: assurance of safety barrier integrity
- High potential for improved safety and production with negligible capital investment

MOL

Controlling Safety via PI System Tools

- On-line analyzers
- Interlock
- Flare

- Notifications
- Reports
- Displays

- Safe operation
- Reduced shut-downs
- Efficiency

Interlock program benefits

Switched off interlocks more than 1 day	2013 (H2)	2014 (H1)
Pcs.	964	881
Days	29.052,4	10.857,97
Total switched off interlocks	**2013 (H2)**	**2014 (H1)**
Pcs.	2294	2224
Days	31.710,3	21.436,9

	2013 (H1-H2)	2014 (H1)
Interlock relevant events (pcs.)	111	22
Unit shutdowns due to interlocks (pcs.)*	11	0

*2013 /11 pcs. shutdowns = 84 lost operation hours

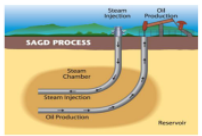
Calculated loss based on EDC is **1.000.000€**

EDC: Equivalent Distillation Capacity – Solomon study

SUNCOR

Steam-Assisted Gravity Drainage (SAGD)

- Approximately 80% of Canada's Oil Sands too deep to mine
- Two key SAGD facilities – Firebag & MacKay River
- Parallel pairs of horizontal wells are drilled:
  - one for steam injection
  - one for oil recovery
- Safety and Operational challenges:
  - Large numbers of assets and instrumentations
  - Complex logic and criteria
  - Process Changes



Low Flow alerts on ESPs (electric submersible pump)

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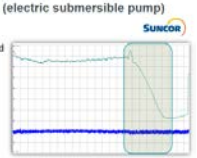
A Low Flow event was detected in one of the pumps based on wellhead temperature fall off

- Lost production
- Potentially fail of an ESP, around $0.5 million at risk
- 130+ wells at Firebag



Data Flow for the Bypass & Equipment Trips Monitoring

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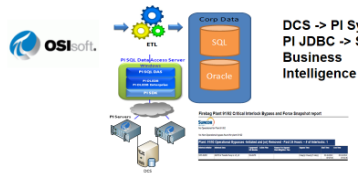
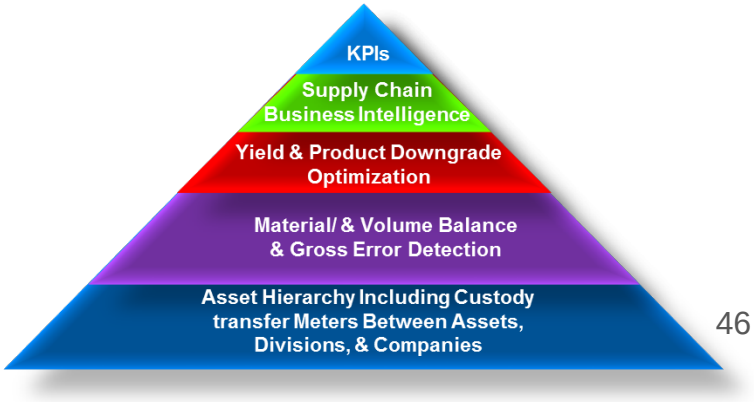


DCS -> PI System -> PI JDBC -> SQL -> Business Intelligence Tools

Our Transformation Journey

Stage 1: Operations monitoring and Remote Collaboration

- PI System Data Infrastructure across Enterprise
- Asset Hierarchy including custody transfer Meter between Assets, Divisions & Companies
- Asset Framework Referential
- Real Time data collection & Dashboard

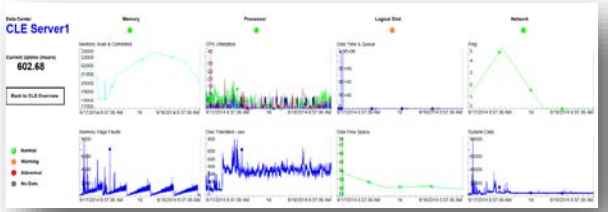


Our Transformation Journey

Stage 1: Operations monitoring and Remote Collaboration

Stage 2: Asset Reliability and Performance Management

- Increased accessibility and ease of use added context
- Material & Volume Balance & Gross Error Detection
- Yield & Product Downgrade Optimization
- Control Room for Operations extend over Enterprise



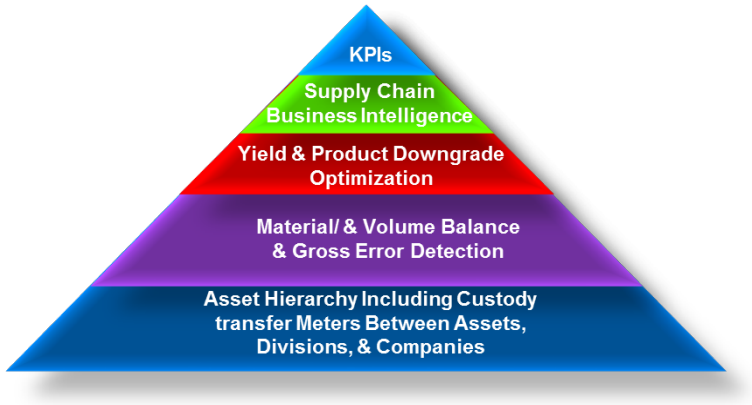
Our Transformation Journey

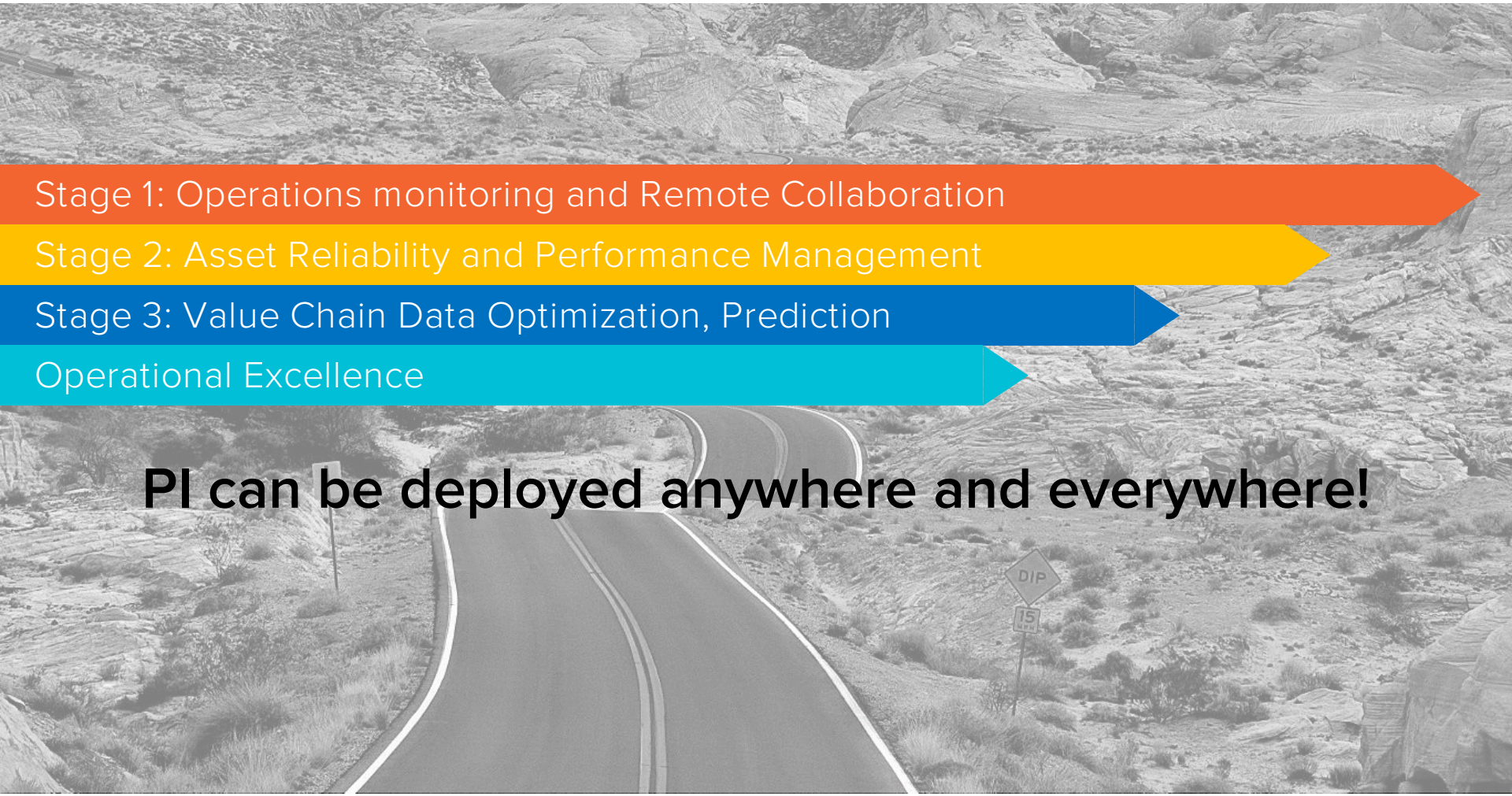
Stage 1: Operations monitoring and Remote Collaboration

Stage 2: Asset Reliability and Performance Management

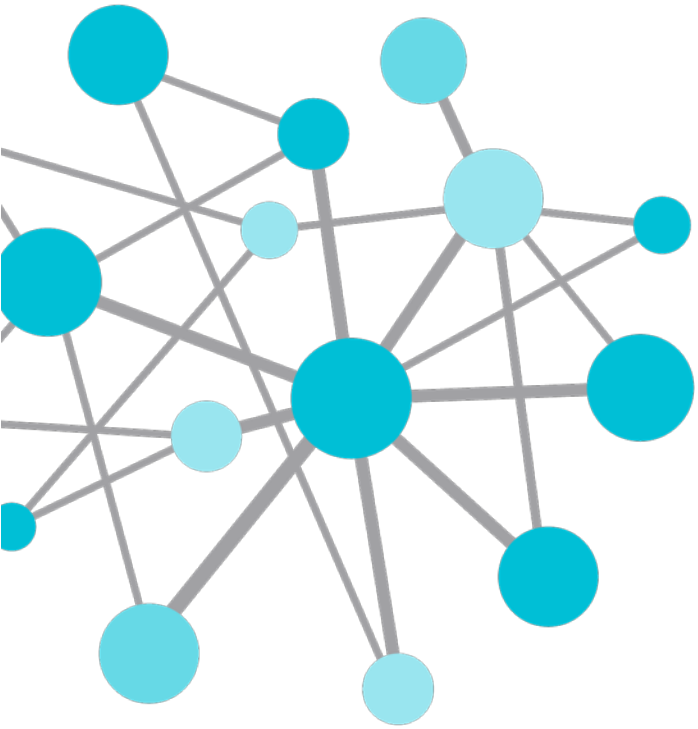
Stage 3: Value Chain Data Optimization, Prediction

- Break down technology siloes
- Predictive Maintenance
- Supply Chain Business Intelligence
- KPI's





PI can be deployed anywhere and everywhere!



THANK YOU

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