



OSIsoft.

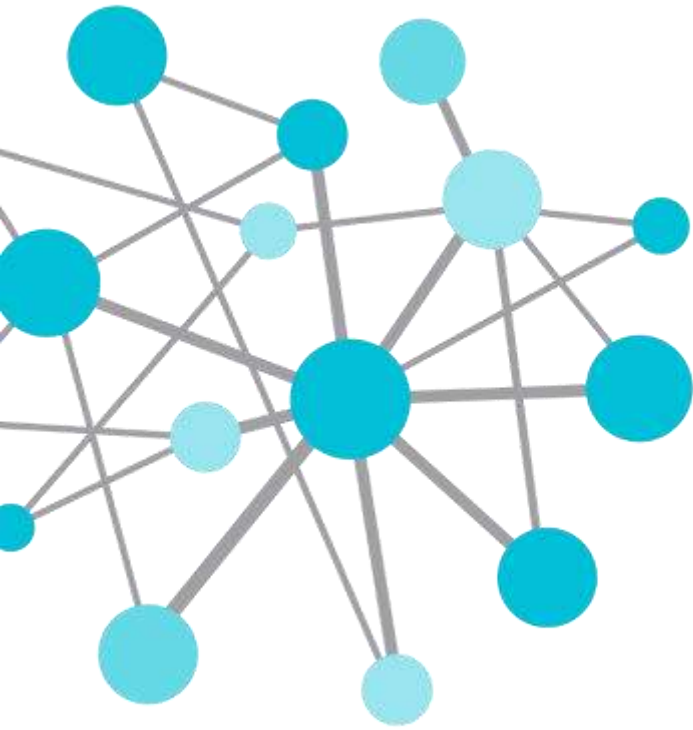
REGIONAL SEMINAR

2014

The **Power** of **Data**

J A P A N

DECISION READY IN REAL-TIME



Power of Data in 電力 & ユーテリテイ



Presented by

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Industry Principal, Power – APAC Yau MingFeng

トピックス

- PI AF、Event Frames、リアルタイムレポート
- 発電・送配電分野の先行保全／状態基準保全
- 再生可能エネルギー分野のPI System
- ケーススタディ
- Q&A



Deregulation

競争の激しい電力市場

- リアルタイム情報のニーズが増大
- さまざまな分野の利益損失
- テクノロジーの活用による継続的な改善
- 可用性・信頼性・柔軟性の向上

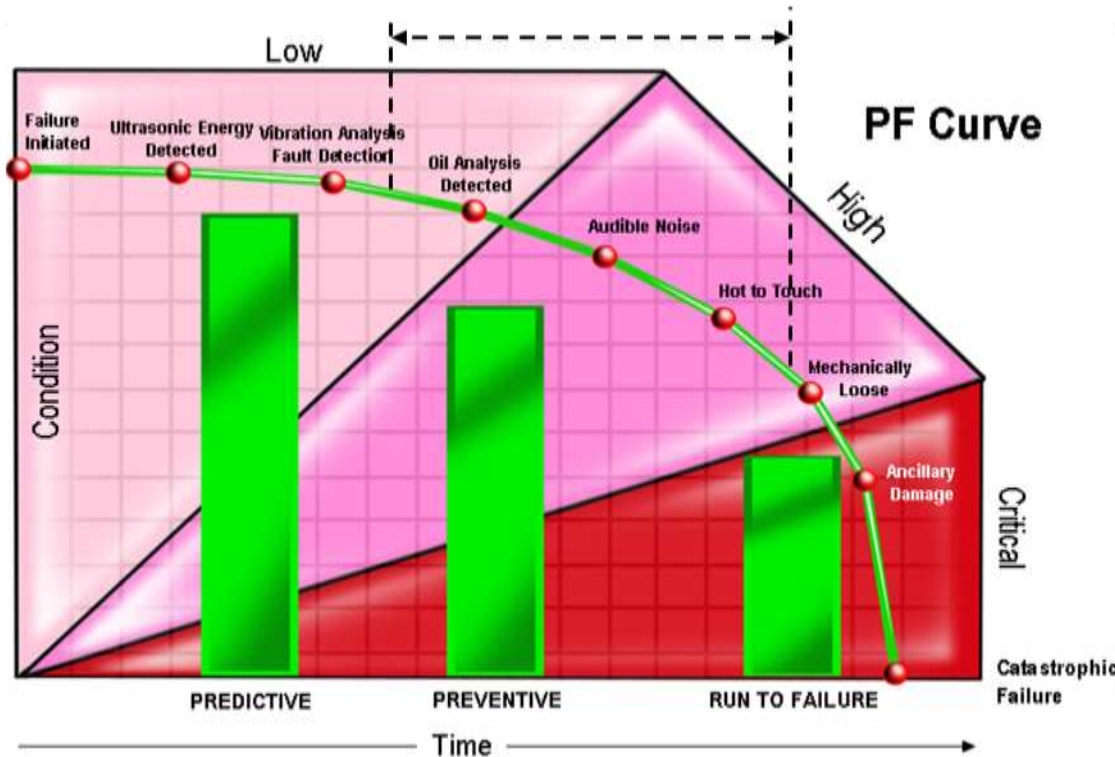
マーケット付帯サービス

- スケジューリング & 経済的ディスパッチ
- 無効電力・電圧制御
- 自動発電制御 / 負荷追従

CBM / 予防保全メンテナンス P-F カーブ

P-F曲線は設備の経年劣化と障害の関係を示すカーブ

- 曲線上のP点は設備の劣化や変化を初めて検出できるポイント
- F点は設備やシステムの障害が発生するポイント
- P点とF点の間が予期せぬイベントを回避する「チャンス」



P-F間隔

迫りくる設備障害を修正できる期間

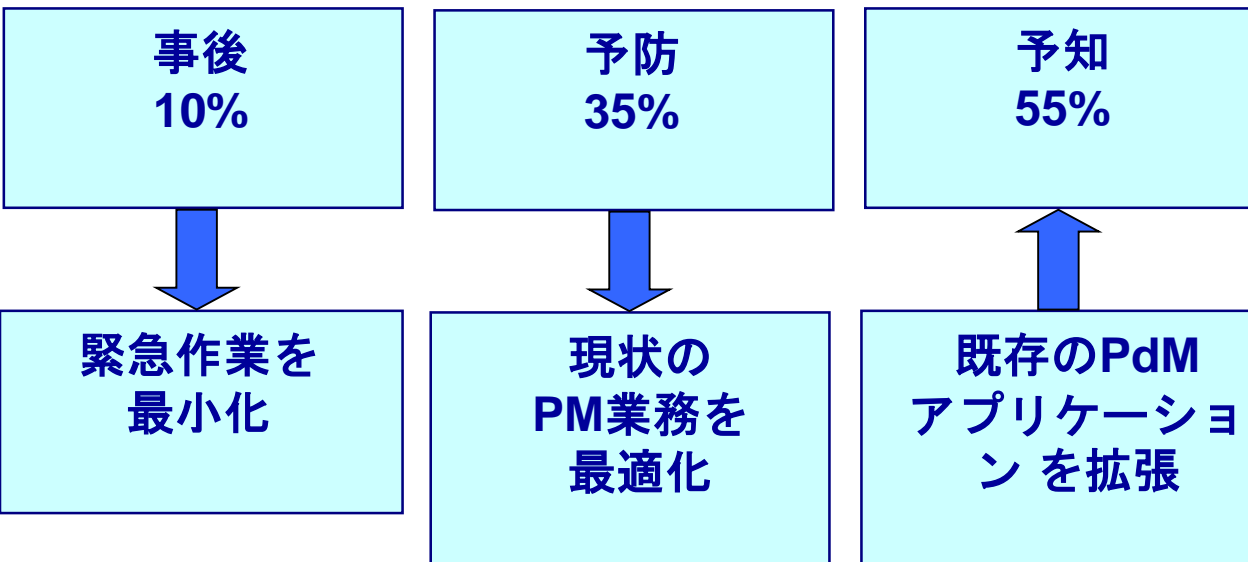
(プランニング/スケジューリング/実行ウィンドウ)

検出するタイミングが早いほど、障害を修正できる期間が長くなる

Source: Allied Reliability

CBM / 予防保全メンテナンス

- 予防保全とは、修正プロセス・予防プロセス・予知プロセスを組み合わせた戦略
- 平均的な工業プラントでは 事後保全作業の割合が55%超
事後対応は、最もコストがかかる！
- トップクラスの工業プラントでは事後保全作業の割合が10%未満
さまざまな保全作業を組み合わせた業界の「ベストプラクティス」



- 戦略：リアルタイムのヒストリカルデータや分析システムをさらに活用

CBM / 予防保全メンテナンス

- 保全を念頭に置いた画面や情報
- クリティカルな設備、状態を示すパラメータを重視
 - 振動（回転装置、モーター、ポンプ、タービン等）
 - 温度（ベアリング、オイル、メタル、モーター等）
 - アンペア
- データを変換し、新たな有益な方法で活用
- すぐに利用できるPI Systemの機能
 - ランタイムカウンター用トータライザー、比較／バランス機能、スケジュールメンテナンス、累積ダメージの測定機能
 - 多彩なグラフィック
 - 通知
- 意思決定のスピードや精度を向上

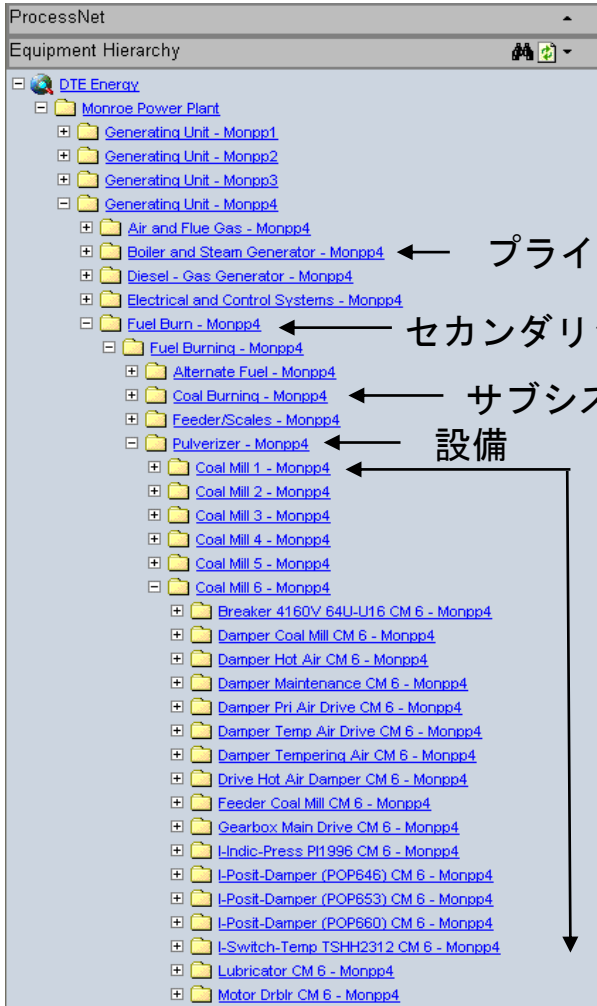
AF ストラクチャー & テンプレート

電力 & ユーティリティ業界のAF事例 :

- **企業** (例 : AGL、DEWA) ← 企業レベル - KPI、生産ロールアップなど
 - **発電所** (例 : GU、発電所) ← ユニットレベル - KPI、総生産など
 - **プラント** ← プラントレベル - KPI、生産、パフォーマンス、情報など
(化石燃料、再生可能エネルギー、原子力、水力などのタイプ別組織)
 - **ユニット# (1、A)** ← ユニットレベル - 生産、パフォーマンス、情報など
 - » **プライマリシステム** ← プライマリシステム - パフォーマンス計算
 - » **サブシステム** ← サブシステム - パフォーマンス計算
 - » **設備** ← 設備毎のテンプレート
 - RT状態監視
 - 計算 (ランタイム、スタートカウントなど)
 - CBMスコアリング
 - MFGネームプレート
 - 稼働管理 (費用実績、費用計画など)
- **T&D**
 - **サブステーション**
 - **フィーダー**
 - » **設備**

計算機能、通知機能、エレメント関連表示機能を備えたレベル別テンプレート

一般的な設備階層構造



← プライマリシステム

← セカンダリシステム

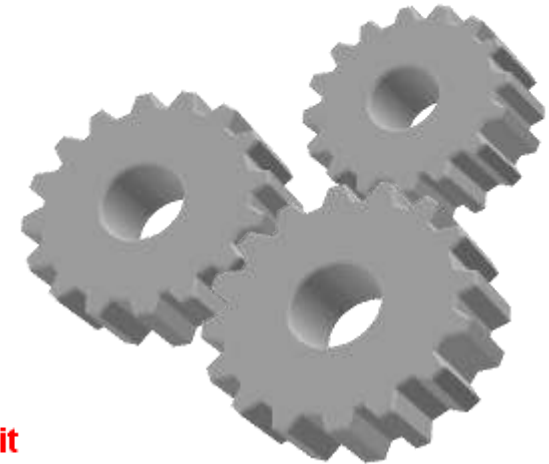
← サブシステム

← 設備

サブ設備

設備の階層構造

- Hierarchical System Index (HSI)
- Work Breakdown Structure (WBS)



DTE Energy – Business Unit

Monroe Power Plant – Plant

Generating Unit - Monpp4 – Unit

Fuel Burn - Monpp4 – Primary System

Fuel Burn - Monpp4 – Secondary System

Pulverizer - Monpp4 – Sub System

Coal Mill 1 - Monpp4 – Equipment / Sub Equip

Breaker 4160V 64U-U16 CM 1 - Monpp4

Damper Coal Mill CM 1 - Monpp4

Damper Hot Air CM 1 - Monpp4

Damper Maintenance CM 1 - Monpp4

Damper Pri Air Drive CM 1 - Monpp4

Equipment Template Details

- 電気モーター
- PI状態データ
- ERPネームプレート
情報
- 計算
 - PI Server
 - AF
- テーブル参照
 - ドキュメント
 - テスト結果
 - WM & MM
- CBMスコア

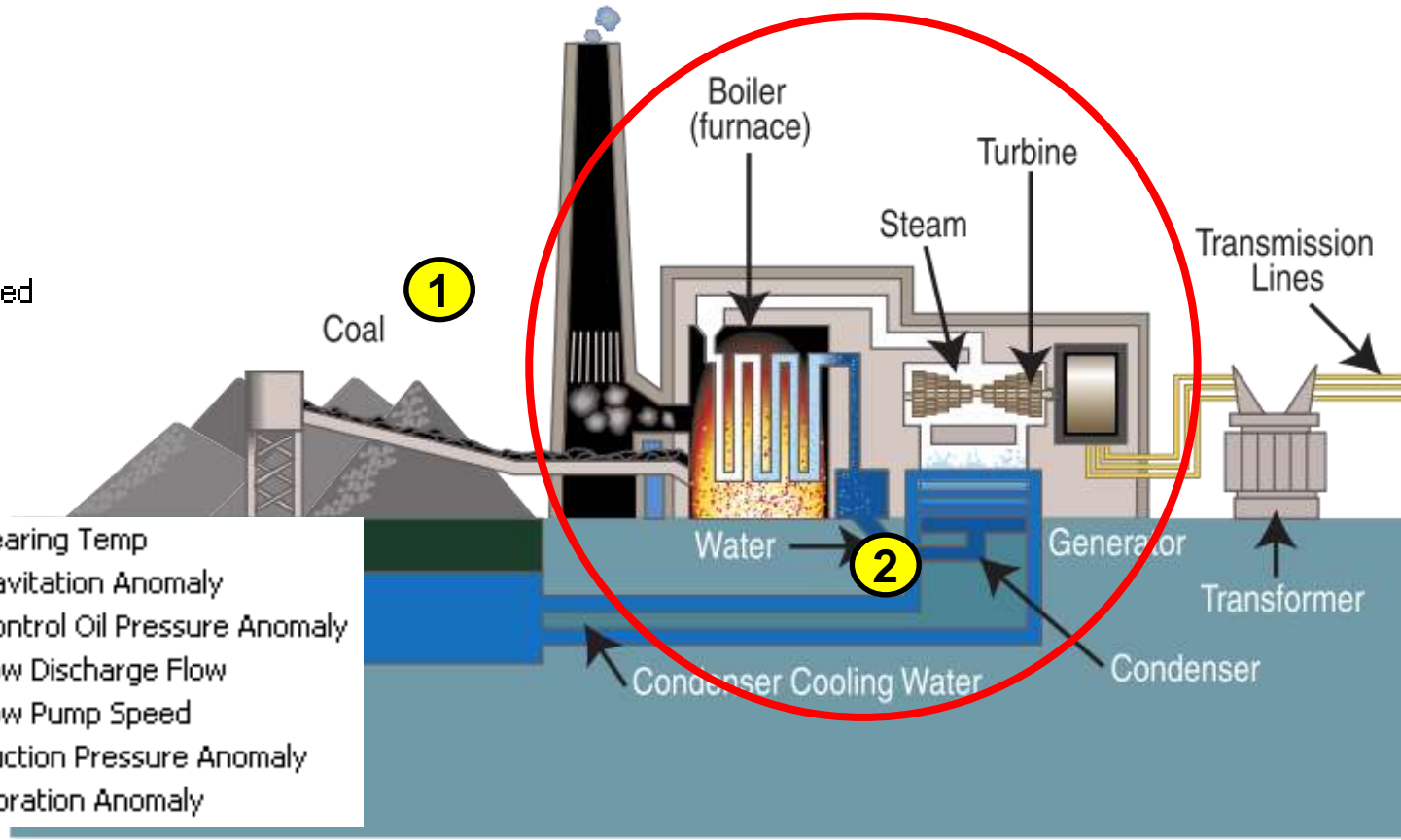
Meas. Point	Parameters	Parameter Units
Operational Data	MOTOR CURRENT	Amps
	VOLTAGE	Volts
	<i>Run-Time Hours (since Overhaul)</i> <i>Starts Count</i>	<i>Hours</i> <i>Count</i>
Stator Temperature Data	MTR WINDING TEMP 1	deg. C
	MTR WINDING TEMP 2	deg. C
	MTR WINDING TEMP 3	deg. C
	MTR WINDING TEMP 4	deg. C
Bearing Temperature Data	FAN MTR IB BRG TEMP	deg. F
	FAN MTR OB BRG TEMP	deg. F
Vibration Data	FAN MTR OB BRG VIB	
	Inboard X	mils
	Inboard Y	mils
	Inboard X	Vdc
	Inboard Y	Vdc
	FAN MTR IB BRG VIB	
	Outboard X	mils
	Outboard Y	mils
	Outboard X	Vdc
	Outboard Y	Vdc
Oil Analysis Data	<i>VISCOSITY</i>	<i>centistokes</i> <i>ssu</i>
	<i>WATER CONTENT</i>	<i>ppm water</i>
	<i>PARTICLE COUNT</i>	<i>iso count</i>
Thermography Data	<i>INFRARED IMAGE</i>	<i>(Document)</i>
	<i>SPOT TEMPERATURE</i>	<i>Deg. F or C</i>

イベントタイプ

- 0**
 - Unit Shutdown
 - Unit TIME.Day
 - Unit TIME.Hour
 - Unit Trip

- 1**
 - Mill Low Feeder Speed

- 2**
 - Boiler Feed Pump Bearing Temp
 - Boiler Feed Pump Cavitation Anomaly
 - Boiler Feed Pump Control Oil Pressure Anomaly
 - Boiler Feed Pump Low Discharge Flow
 - Boiler Feed Pump Low Pump Speed
 - Boiler Feed Pump Suction Pressure Anomaly
 - Boiler Feed Pump Vibration Anomaly



PI AF – Structure and Attributes

The screenshot displays the PI AF software interface. On the left, a tree view shows the 'Elements' hierarchy, including 'Generation' (OSISoft Power, Big Creek Power Plant, Cleveland Power Plant, Houston Power Plant, New Unit, Philadelphia Power Plant, San Leandro Power Plant), 'Unit 1' (Air Heater, Balance of Plant, Feedwater System, Generator, Mills), and 'Unit of Measure'. A callout bubble points to this tree with the text 'AF – Asset Framework'.

The main window shows a list of attributes for a selected element. The attributes are grouped into categories: 'None', 'Bearing Temperatures', 'Flows', and 'Limits'. A callout bubble points to the 'Category' column with the text '属性をグループ化するための カテゴリー'.

On the right, a 'Settings...' dialog box is open, showing fields for 'Categories', 'Default UOM', 'Value Type', 'Value', and 'Data Reference'. A callout bubble points to this dialog with the text '属性エイリアスエレメントで多様なタグやポイント名を標準化'.

At the bottom left, a callout bubble points to the 'Elements' pane with the text 'エレメント テンプレート'.

Category	Name	Value
<None>	In Service Date	1-Jan-13
<None>	Last Service Date	8-Nov-13
<None>	Manufacturer	GE
<None>	Serial Number	1B395
Bearing Temperatures	Inboard Bearing Temperature	135.006500... deg F
Bearing Temperatures	Outboard Bearing Temperature	127.00983581543 deg F
Flows	Auxillary Steam Flow	14.8983793258667 lb
Flows	Discharge Flow	1634.23645019531 k lb/hr
Flows	Discharge Flow Total	757539.875 lb
Flows	EXT Steam Flow Total	260660.078125 lb
Flows	Flow entering economizer	3257.94702148438 k lb/hr
Flows	Main Steam Flow	38.3094062805176 k lb/hr
Limits	Bearing Vibration High Limit	2 mils
Limits	Control Oil Pressure Low Limit	32 psi
Limits	Discharge Flow Low Limit	1700 k lb/hr
Limits	Suction Pressure High Limit	160 psi

PI AF Asset Based Analytics – Event Detection

Element Template

EF Start Trigger

値がTrueな時間

根本原因子イベント

Type = EF 発生

PE機能

Library: Power Generation
Categories: Analysis Categories, Attribute Categories, Element Categories

Boiler Feed Pump Turbine
General | Attribute Templates | Ports | Analysis Templates

Name: Boiler Feed Pump Vibration Anomaly
Description: Boiler Feed Pump Vibration Anomaly
Categories: [Dropdown]
Analysis Type: Expression Rollup Event Frame Generation

Event Frame Template: Boiler Feed Pump Vibration Anomaly

Name	Expression	Value
StartTrigger	if ('Inboard Bearing Vibration X' > 'Bearing Vibration High Limit') Then true else if ('Inboard Bearing Vibration Y' > 'Bearing Vibration High Limit') Then true else if ('Outboard Bearing Vibration X' > 'Bearing Vibration High Limit') Then true else if ('Outboard Bearing Vibration Y' > 'Bearing Vibration High Limit') then true else false	True
EndTrigger	Type an expression (optional)	

Evaluated at 4/1/2014 7:39:22 AM

StartTrigger true for: 30 Seconds

Generate child root cause event frame before parent event frame starts

Duration: 1 Days

Name: Root Cause
Category: [Dropdown]

Scheduling: Event-Triggered Periodic

Trigger on: Any Input

Functions: Insert functions into the expression

- Abs
- Acos
- And
- Ascii
- Asin
- Attr
- Attr2
- Aug
- Bo
- Boo
- Bom
- Bonn
- Ceiling
- Char
- Compare
- Concat
- Convert
- Cos
- Cosh
- Cot
- Coth
- Exp
- Abs(number x): Return the absolute value of an integer or real number. Example: Abs(1).

PI AF Asset Based Analytics – Event Preview



\\UCAFSVR\Power Generation - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element Search Elements

Elements

- Generation
 - OSIsoft Power
 - Big Creek Power Plant
 - Cleveland Power Plant
 - Houston Power Plant
 - Philadelphia Power Plant
 - San Leandro Power Plant
 - Unit 1
 - Air Heater
 - Balance of Plant
 - Feedwater Systems
 - Boiler Feed Pump #1
 - Boiler Feed Pump #2
 - Generator
 - MIs
 - Turbine
 - Wind Power Generation Fleet
 - Transmission and Distribution

Boiler Feed Pump #1

General Child Elements Attributes Ports Analyses Version

Name: Boiler Feed Pump Vibration Anomaly

Description:

Categories:

Analysis Type: Expression Rollup Event Frame Generation

Name	Backfilling
Boiler Feed Pump Low Discharge Flow Anomaly	<input checked="" type="checkbox"/>
Boiler Feed Pump Low Pump Speed	<input checked="" type="checkbox"/>
Boiler Feed Pump Suction Pressure Anomaly	<input checked="" type="checkbox"/>
Boiler Feed Pump Vibration Anomaly	<input checked="" type="checkbox"/>

Event Frame Template

Name: Expr

StartTrigger: IF

EndTrigger:

Start Time: -1w

End Time: *

Preview results for Boiler Feed Pump Vibration Anomaly

Name	Duration	Start time	End time
- Boiler Feed Pump Vibration Anomaly - 2014.03.28.15	01:57:30	3/28/2014 3:57:11 PM	3/28/2014 5:54:41 PM
- Boiler Feed Pump Vibration Anomaly - 2014.03.29.15	01:57:30	3/29/2014 3:57:11 PM	3/29/2014 5:54:41 PM
- Boiler Feed Pump Vibration Anomaly - 2014.04.01.00	06:58:18.0144869	4/1/2014 12:43:11 AM	

StartTrigger true for: 30 Seconds

Generate child root cause event frame before parent event frame starts

Duration: 1 Days

Name: Root Cause

Category:

Scheduling: Event-Triggered Periodic

Trigger on: Any Input

Close

Connected to the PI Analysis Service

Boiler Feed Pump #1 Modified:3/27/2014 12:29:21 AM, Version: 1/1/1970 12:00:00 AM, Revision 13

7:42 AM 4/1/2014

結果
プレビュー

PI AF Asset Based Analytics – Backfilling Events

\\UCAFSVR\Power Generation - PI System Explorer

File View Go Tools Help
Database Query Date Back Check In Refresh

- Analyses
- Choose a filter
- Analysis Template
- All (117)
 - No Template (1)
 - Boiler Feed Pump Turbine/Boiler Feed Pump Cavitation Anomaly (8)
 - Boiler Feed Pump Turbine/Boiler Feed Pump Control Oil Pressure Anom
 - Boiler Feed Pump Turbine/Boiler Feed Pump High Bearing Temperature
 - Boiler Feed Pump Turbine/Boiler Feed Pump Low Discharge Flow Anom
 - Boiler Feed Pump Turbine/Boiler Feed Pump Low Pump Speed (8)
 - Boiler Feed Pump Turbine/Boiler Feed Pump Suction Pressure Anomaly
 - Boiler Feed Pump Turbine/Boiler Feed Pump Vibration Anomaly (8)
 - Gas Turbine Template/GTExhaustGasTempDiff1vP2 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff1vP3 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff1vP4 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff2vP1 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff2vP3 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff2vP4 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff3vP1 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff3vP2 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff3vP4 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff4vP1 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff4vP2 (2)
 - Gas Turbine Template/GTExhaustGasTempDiff4vP3 (2)
 - Gas Turbine Template/GTExhaustGasTemperatureAnomaly (2)
 - Mill/Mill Low Feeder Speed (16)
 - Coal Plant/Plant Generating (4)
 - Coal Plant/Plant Not Generating (4)
 - Combined Cycle Power Plant Template/PowerPlantShutdown (1)
 - Combined Cycle Power Plant Template/PowerPlantStartUp (1)
 - Unit/Unit Shutdown (4)
 - Unit/Unit Trip (4)

Analyses

8 checked analyses

Status	Element	Name	Template	Backfilling
✓	Generation\OSISoft Power\Cleveland Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\Cleveland Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\Philadelphia Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\Philadelphia Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\San Leandro Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\San Leandro Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\Houston Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #2	Boiler Feed Pur	Boiler Feed Pump Vibration	✓
✓	Generation\OSISoft Power\Houston Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #1	Boiler Feed Pur	Boiler Feed Pump Vibration	✓

Operations

Start checked analyses

Stop checked analyses

Backfill checked analyses

イベントを
ヒストリーに
バックフィル

Analysis details

Overview Errors And Warnings

Boiler Feed Pump Vibration Anomaly configuration

Analysis type: Event Frame Generation

Description: Boiler Feed Pump Vibration Anomaly

Element path: Generation\OSISoft Power\Cleveland Power Plant\Unit 1\Balance of Plant\Foodwater System\Boiler Feed Pump #1

Template: Boiler Feed Pump Vibration Anomaly

Schedule: Natural

Status

In AF: Enabled

In PI Analysis Service: Running

- Analyses
- Elements
 - Event Frames
 - Library
 - Unit of Measure

Pending Operations

No pending operations

PI DataLink 2014 – Pump Relative Report

Search Start 1/10/2014 0:00
Search End *
Site Name San Leandro Power Plant
Unit Name Unit 1
Pump Name Boiler Feed Pump #2

現在
見ているのは
BFP2

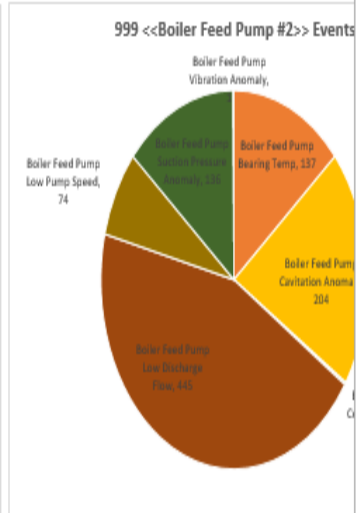
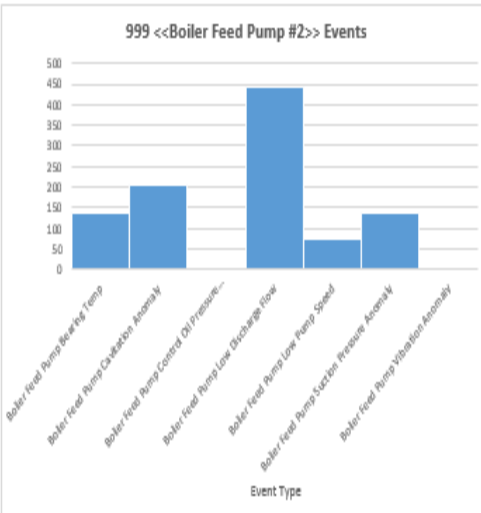
Pump Information [PI AF]

UOM	VIBRATION DATA				Bearing Oil Pressure	Control Oil Pressure	Discharge Pressure	Suction Pressure	TEMPERATURE		UOM
	Inboard Bearing Vibration X	Inboard Bearing Vibration Y	Outboard Bearing Vibration X	Outboard Bearing Vibration Y					Bearing Temperature	Outboard Bearing Temperature	
Value at Start: 10-Jan-14 00:00:00	1.02	0.95	0.74	0.68	14.80	35.76	3689.14	115.66	147.31	125.44	Value at Start: 10-Jan-14 00:00:00
Value at End: 29-Apr-14 06:40:12	0.97	0.87	0.75	0.74	14.78	35.75	3776.16	129.87	147.36	125.25	Value at End: 29-Apr-14 06:40:12
Minimum	0.05	0.04	0.03	0.03	14.71	35.46	-38.58	6.60	71.83	73.63	Minimum
Average	0.95	0.89	0.62	0.61	15.61	37.00	2628.75	111.23	128.93	116.20	Average
Maximum	2.72	1.86	3.68	3.70	19.98	46.90	4099.07	207.40	155.31	135.38	Maximum
StDev	0.53	0.54	0.30	0.31	0.78	1.47	1698.24	50.97	29.67	19.54	StDev

Pump Events [PI EF] (999)

EF NAME	EVENT CATEGORY	EVENT TEMPLATE
*	*	*
Minimum	0 0:01:26	Minimum 1.4
Average	0 16:42:43	Average 1003.3
StdDev	2 12:06:59	StdDev 3607.8
Maximum	31 13:03:01	Maximum 45423.0

Event name	Start time	End time	Duration	Event template	Duration Minutes
Boiler Feed Pump #2 - Boiler Feed Pump L	10-Jan-14 00:00:00	11-Jan-14 06:40:00	16:40:00	Boiler Feed Pump Low Discharge Flow	1840.0
Boiler Feed Pump #2 - Boiler Feed Pump L	10-Jan-14 00:00:00	11-Jan-14 06:40:00	16:40:00	Boiler Feed Pump Low Discharge Flow	1840.0
Boiler Feed Pump #2 - Boiler Feed Pump E	10-Jan-14 00:00:00	12-Jan-14 21:05:00	2 21:05:00	Boiler Feed Pump Bearing Temp	4145.0
Boiler Feed Pump #2 - Boiler Feed Pump E	10-Jan-14 00:00:00	10-Jan-14 05:20:00	0 5:20:00	Boiler Feed Pump Bearing Temp	320.0
Boiler Feed Pump #2 - Boiler Feed Pump E	10-Jan-14 00:00:00	12-Jan-14 21:05:00	2 21:05:00	Boiler Feed Pump Bearing Temp	4145.0
Boiler Feed Pump #2 - Boiler Feed Pump E	10-Jan-14 00:00:00	10-Jan-14 05:20:00	0 5:20:00	Boiler Feed Pump Bearing Temp	320.0
Boiler Feed Pump #2 - Boiler Feed Pump C	10-Jan-14 00:00:00	12-Jan-14 18:40:00	2 18:40:00	Boiler Feed Pump Cavitation Anomaly	4000.0
Boiler Feed Pump #2 - Boiler Feed Pump C	10-Jan-14 00:00:00	12-Jan-14 18:40:00	2 18:40:00	Boiler Feed Pump Cavitation Anomaly	4000.0
Boiler Feed Pump #2 - Boiler Feed Pump E	11-Jan-14 00:30:00	24-Jan-14 21:05:00	13 20:35:00	Boiler Feed Pump Bearing Temp	19955.0
Boiler Feed Pump #2 - Boiler Feed Pump E	11-Jan-14 00:30:00	24-Jan-14 21:05:00	13 20:35:00	Boiler Feed Pump Bearing Temp	19955.0
Boiler Feed Pump #2 - Boiler Feed Pump C	11-Jan-14 07:10:00	11-Jan-14 16:00:00	0 8:50:00	Boiler Feed Pump Cavitation Anomaly	530.0
Boiler Feed Pump #2 - Boiler Feed Pump C	11-Jan-14 07:10:00	11-Jan-14 16:00:00	0 8:50:00	Boiler Feed Pump Cavitation Anomaly	530.0
Boiler Feed Pump #2 - Boiler Feed Pump C	12-Jan-14 16:00:00	13-Jan-14 10:45:00	0 18:45:00	Boiler Feed Pump Cavitation Anomaly	1125.0
Boiler Feed Pump #2 - Boiler Feed Pump C	12-Jan-14 16:00:00	13-Jan-14 10:45:00	0 18:45:00	Boiler Feed Pump Cavitation Anomaly	1125.0
Boiler Feed Pump #2 - Boiler Feed Pump L	12-Jan-14 18:55:00	12-Jan-14 19:55:00	0 1:00:00	Boiler Feed Pump Low Discharge Flow	60.0
Boiler Feed Pump #2 - Boiler Feed Pump L	12-Jan-14 18:55:00	12-Jan-14 19:55:00	0 1:00:00	Boiler Feed Pump Low Discharge Flow	60.0
Boiler Feed Pump #2 - Boiler Feed Pump C	12-Jan-14 19:55:00	12-Jan-14 20:15:00	0 0:20:00	Boiler Feed Pump Cavitation Anomaly	20.0
Boiler Feed Pump #2 - Boiler Feed Pump C	12-Jan-14 19:55:00	12-Jan-14 20:15:00	0 0:20:00	Boiler Feed Pump Cavitation Anomaly	20.0
Boiler Feed Pump #2 - Boiler Feed Pump L	12-Jan-14 20:55:00	14-Jan-14 08:50:00	11:55:00	Boiler Feed Pump Low Discharge Flow	2155.0
Boiler Feed Pump #2 - Boiler Feed Pump L	12-Jan-14 20:55:00	14-Jan-14 08:50:00	11:55:00	Boiler Feed Pump Low Discharge Flow	2155.0



PI DataLink 2014 – Pump Relative Report

AF & Datalink

1/10/2014 0:00	10-Jan-14 00:00:00	Site Name	San Leandro Power Plant
*	24-Mar-14 14:17:41	Unit Name	Unit 1
		Pump Name	Boiler Feed Pump #1

	VIBRATION DATA				PRESSURES				BEARING TEMPERATURES		BOM
	Inboard Bearing Vibration X	Inboard Bearing Vibration Y	Outboard Bearing Vibration X	Outboard Bearing Vibration Y	Bearing Oil Pressure	Control Oil Pressure	Discharge Pressure	Suction Pressure	Inboard Bearing Temperature	Outboard Bearing Temperature	
UOM	mil	mil	mil	mil	psi	psi	psi	psi	deg F	deg F	
Value at Start: 10-Jan-14 00:00:00	1.55	1.39	1.50	1.55	15.04	32.33	3675.56	116.17	135.82	122.56	Value at Start: 1
Value at End: 24-Mar-14 14:17:41	0.09	0.13	0.09	0.05	8.40	34.19	28.38	62.59	80.64	81.67	Value at End: 24
Minimum	0.05	0.05	0.04	0.04	2.33	29.82	-76.94	-4.00	71.84	73.44	Minimum
Average	1.05	1.45	1.21	1.26	14.14	32.87	2796.92	123.04	121.42	110.60	Average
Maximum	2.36	21.00	2.11	1.88	19.12	39.91	4081.25	207.12	142.32	127.20	Maximum
StDev	0.59	2.22	0.68	0.62	3.69	0.96	1687.24	46.10	23.46	16.71	StDev

EF NAME	EVENT CATEGORY	EVENT TEMPLATE
Pump Events [PI EF] (281)	*	*
Minimum	0 0.05:00	Minimum
Average	6 12:35:22	Average
StdDev	1 6:01:40	StdDev
Maximum	23 0:00:00	Maximum

Event name	Start time	End time	Duration	Event template	Duration Minutes
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 00:00:00	11-Jan-14 06:40:00	1 6:40:00	Boiler Feed Pump Low Discharge Flow	1840.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 00:00:00	11-Jan-14 06:40:00	1 6:40:00	Boiler Feed Pump Low Discharge Flow	1840.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 00:00:00	10-Jan-14 00:55:00	0 0:55:00	Boiler Feed Pump Cavitation Anomaly	55.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 00:00:00	10-Jan-14 00:55:00	0 0:55:00	Boiler Feed Pump Cavitation Anomaly	55.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 06:35:00	10-Jan-14 07:00:00	0 0:25:00	Boiler Feed Pump Bearing Temp	25.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 06:35:00	10-Jan-14 07:00:00	0 0:25:00	Boiler Feed Pump Bearing Temp	25.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 09:35:00	11-Jan-14 11:30:00	1 1:55:00	Boiler Feed Pump Cavitation Anomaly	1955.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 09:35:00	11-Jan-14 11:30:00	1 1:55:00	Boiler Feed Pump Cavitation Anomaly	1955.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 11:45:00	10-Jan-14 12:05:00	0 0:20:00	Boiler Feed Pump Bearing Temp	20.0
Boiler Feed Pump #1 - Boiler Feed Pump	10-Jan-14 11:45:00	10-Jan-14 12:05:00	0 0:20:00	Boiler Feed Pump Bearing Temp	20.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 01:30:00	11-Jan-14 01:50:00	0 0:20:00	Boiler Feed Pump Bearing Temp	20.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 01:30:00	11-Jan-14 01:50:00	0 0:20:00	Boiler Feed Pump Bearing Temp	20.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 07:35:00	11-Jan-14 07:50:00	0 0:15:00	Boiler Feed Pump Cavitation Anomaly	15.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 07:35:00	11-Jan-14 07:50:00	0 0:15:00	Boiler Feed Pump Cavitation Anomaly	15.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 08:20:00	11-Jan-14 08:30:00	0 0:10:00	Boiler Feed Pump Cavitation Anomaly	10.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 08:20:00	11-Jan-14 08:30:00	0 0:10:00	Boiler Feed Pump Cavitation Anomaly	10.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 08:25:00	11-Jan-14 08:50:00	0 0:25:00	Boiler Feed Pump Bearing Temp	25.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 08:25:00	11-Jan-14 08:50:00	0 0:25:00	Boiler Feed Pump Bearing Temp	25.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 12:35:00	12-Jan-14 18:35:00	1 6:00:00	Boiler Feed Pump Cavitation Anomaly	1800.0
Boiler Feed Pump #1 - Boiler Feed Pump	11-Jan-14 12:35:00	12-Jan-14 18:35:00	1 6:00:00	Boiler Feed Pump Cavitation Anomaly	1800.0

イベント



Excel チャート

PI DataLink 2014 – Daily Events Production Report

B21 [=PIEFDat(GLOBAL)ISB\$2,"Production Summary Report"!\$C\$3,"Production Summary Report"!\$C\$4,0,"Production Summary Report"!\$F\$4,"Unit TIME.Day","Production Summary Report"!\$F\$5,"",,,,,,"active in range","start time"]

EF Template Unit Time.Day
 Search Start 1/10/2014 0:00
 Search End *

Site Name San Leandro Power Plant
 Unit Name Unit 1
 EF Name *

Day of Week *

Event name	Start time	End time	Duration	Site Name	Primary element	Day of Week	Day Type	AMBIENT TEMPERATURE			GROSS MW				
								Ambient Temperature.Min	Ambient Temperature.Avg	Ambient Temperature.Max	Gross MW.Start	Gross MW.End	Gross MW.Min	Gross MW.Avg	Gross MW.Max
2014_01_10	10-Jan-14 00:00:00	11-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	FRIDAY	WEEKDAY	39.38	53.15	62.12	389.42	383.05	371.63	382.90	409.75
2014_01_11	11-Jan-14 00:00:00	12-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SATURDAY	WEEK-END	42.95	51.00	58.65	383.05	548.17	377.83	513.15	589.75
2014_01_12	12-Jan-14 00:00:00	13-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SUNDAY	WEEK-END	36.49	39.77	42.97	548.17	557.14	532.21	554.91	569.75
2014_01_13	13-Jan-14 00:00:00	14-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	MONDAY	WEEKDAY	31.43	34.38	37.44	557.14	557.33	445.00	557.33	557.33
2014_01_14	14-Jan-14 00:00:00	15-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	TUESDAY	WEEKDAY	29.40	36.46	44.59	557.33	561.43	557.33	557.33	557.33
2014_01_15	15-Jan-14 00:00:00	16-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	WEDNESDAY	WEEKDAY	36.39	39.39	45.72	561.43	483.70	557.33	557.33	557.33
2014_01_16	16-Jan-14 00:00:00	17-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	THURSDAY	WEEKDAY	31.79	33.96	38.39	483.70	559.58	557.33	557.33	557.33
2014_01_17	17-Jan-14 00:00:00	18-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	FRIDAY	WEEKDAY	27.75	31.90	36.31	559.58	584.55	557.33	557.33	557.33
2014_01_18	18-Jan-14 00:00:00	19-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SATURDAY	WEEK-END	32.18	36.37	41.00	584.55	580.75	557.33	557.33	557.33
2014_01_19	19-Jan-14 00:00:00	20-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SUNDAY	WEEK-END	28.63	33.16	40.24	580.75	581.87	557.33	557.33	557.33
2014_01_20	20-Jan-14 00:00:00	21-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	MONDAY	WEEKDAY	25.36	30.89	33.64	581.87	585.75	557.33	557.33	557.33
2014_01_21	21-Jan-14 00:00:00	22-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	TUESDAY	WEEKDAY	21.31	29.28	36.49	585.75	589.75	557.33	557.33	557.33
2014_01_22	22-Jan-14 00:00:00	23-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	WEDNESDAY	WEEKDAY	31.02	36.55	43.74	586.95	582.22	543.00	574.01	589.75
2014_01_23	23-Jan-14 00:00:00	24-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	THURSDAY	WEEKDAY	30.67	35.83	39.71	582.22	584.35	550.66	582.36	589.75
2014_01_24	24-Jan-14 00:00:00	25-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	FRIDAY	WEEKDAY	34.48	36.28	38.73	584.35	584.35	550.66	584.35	589.75
2014_01_25	25-Jan-14 00:00:00	26-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SATURDAY	WEEK-END	33.38	36.73	40.87	584.35	584.35	550.66	584.35	589.75
2014_01_26	26-Jan-14 00:00:00	27-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SUNDAY	WEEK-END	37.34	41.12	46.49	584.35	584.35	550.66	584.35	589.75
2014_01_27	27-Jan-14 00:00:00	28-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	MONDAY	WEEKDAY	35.64	42.73	50.00	584.35	584.35	550.66	584.35	589.75
2014_01_28	28-Jan-14 00:00:00	29-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	TUESDAY	WEEKDAY	35.96	42.99	50.79	584.35	584.35	550.66	584.35	589.75
2014_01_29	29-Jan-14 00:00:00	30-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	WEDNESDAY	WEEKDAY	37.32	45.35	51.52	584.35	584.35	550.66	584.35	589.75
2014_01_30	30-Jan-14 00:00:00	31-Jan-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	THURSDAY	WEEKDAY	38.37	45.66	53.09	584.35	584.35	550.66	584.35	589.75
2014_01_31	31-Jan-14 00:00:00	01-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	FRIDAY	WEEKDAY	45.71	52.39	61.25	584.35	584.35	550.66	584.35	589.75
2014_02_01	01-Feb-14 00:00:00	02-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SATURDAY	WEEK-END	34.55	41.15	52.62	564.46	584.37	489.94	575.82	589.75
2014_02_02	02-Feb-14 00:00:00	03-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SUNDAY	WEEK-END	29.58	37.42	45.33	584.37	502.19	502.19	581.74	589.75
2014_02_03	03-Feb-14 00:00:00	04-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	MONDAY	WEEKDAY	31.52	38.18	47.16	502.19	581.26	502.19	580.03	589.75
2014_02_04	04-Feb-14 00:00:00	05-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	TUESDAY	WEEKDAY	41.13	41.29	41.45	581.26	582.85	581.26	582.05	589.75
2014_02_05	05-Feb-14 00:00:00	06-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	WEDNESDAY	WEEKDAY	40.82	40.97	41.13	582.85	584.49	582.85	583.64	589.75
2014_02_06	06-Feb-14 00:00:00	07-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	THURSDAY	WEEKDAY	40.68	43.56	53.49	584.43	584.13	496.15	575.43	589.75
2014_02_07	07-Feb-14 00:00:00	08-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	FRIDAY	WEEKDAY	48.62	57.47	60.77	584.13	585.30	405.41	473.67	589.75
2014_02_08	08-Feb-14 00:00:00	09-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SATURDAY	WEEK-END	43.24	51.08	67.00	585.30	581.77	557.08	583.15	589.75
2014_02_09	09-Feb-14 00:00:00	10-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	SUNDAY	WEEK-END	43.60	47.53	54.25	581.77	581.77	572.93	583.79	589.75
2014_02_10	10-Feb-14 00:00:00	11-Feb-14 00:00:00	1 0:00:00	San Leandro Power Plant	Unit 1	MONDAY	WEEKDAY	42.88	46.16	50.80	581.77	583.44	472.99	578.89	589.75

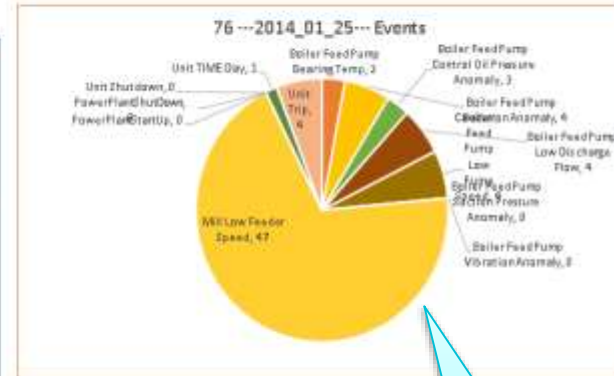
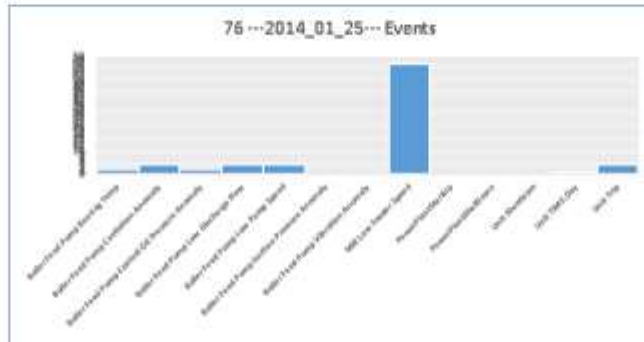
日次イベント

ユニットトリップ!

PI DataLink 2014 – Daily Anomaly Report

目次
データ

(76) Events during DAY --2014_01_25-- on <<Unit 1>>



Excel
チャート

逸脱
イベント

Relative Time	Event name	Start time	End time	Duration	Event template	Site
00-05:05:00	Boiler Feed Pump #1 - Boiler Feed Pump Low Discharge Flow	24-Jan-14 18:55:00	29-Jan-14 21:55:00	5 9:00:00	Boiler Feed Pump Low Discharge Flow	San
00-04:05:00	Boiler Feed Pump #1 - Boiler Feed Pump Low Pump Speed	24-Jan-14 19:55:00	29-Jan-14 21:55:00	5 2:00:00	Boiler Feed Pump Low Pump Speed	San
00-03:05:00	Boiler Feed Pump #2 - Boiler Feed Pump Low Discharge Flow	24-Jan-14 20:55:00	26-Jan-14 00:50:00	1 11:55:00	Boiler Feed Pump Low Discharge Flow	San
00-02:45:00	Boiler Feed Pump #1 - Boiler Feed Pump Control Oil Pressure	24-Jan-14 21:15:00	25-Jan-14 01:55:00	0 4:40:00	Boiler Feed Pump Control Oil Pressure	San
00-02:30:00	Unit Trip	24-Jan-14 21:30:00	31-Jan-14 05:15:00	6 7:45:00	Unit Trip	Unit 1 San
00-01:15:00	Boiler Feed Pump #2 - Boiler Feed Pump Low Pump Speed	24-Jan-14 22:45:00	26-Jan-14 09:15:00	1 10:30:00	Boiler Feed Pump Low Pump Speed	Boiler Feed Pump #2 San
00-00:06:40	Mill 2 - Mill Low Feeder Speed - 2014.01.25.04	24-Jan-14 23:53:20	25-Jan-14 00:01:00	0 0:07:40	Mill Low Feeder Speed	Mill 2 San
00-00:00:00	2014_01_25	25-Jan-14 00:00:00	26-Jan-14 00:00:00	1 0:00:00	Unit TIME Day	Unit 1 San
00-00:32:30	Mill 4 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 00:32:30	25-Jan-14 00:42:00	0 0:09:30	Mill Low Feeder Speed	Mill 4 San
00-00:32:50	Mill 1 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 00:32:50	25-Jan-14 01:36:30	0 1:03:40	Mill Low Feeder Speed	Mill 1 San
00-00:34:00	Mill 2 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 00:34:00	25-Jan-14 01:41:20	0 1:07:20	Mill Low Feeder Speed	Mill 2 San
00-01:40:20	Mill 1 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 01:40:20	25-Jan-14 02:22:00	0 0:41:40	Mill Low Feeder Speed	Mill 1 San
00-04:20:20	Mill 1 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 04:20:20	25-Jan-14 04:32:30	0 0:12:10	Mill Low Feeder Speed	Mill 1 San
00-04:34:00	Mill 1 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 04:34:00	25-Jan-14 04:38:30	0 0:04:30	Mill Low Feeder Speed	Mill 1 San
00-04:40:50	Mill 1 - Mill Low Feeder Speed - 2014.01.25.04	25-Jan-14 04:40:50	25-Jan-14 08:03:30	0 3:22:40	Mill Low Feeder Speed	Mill 1 San
00-05:14:00	Mill 1 - Mill Low Feeder Speed - 2014.01.25.08	25-Jan-14 05:14:00	25-Jan-14 08:40:00	0 3:26:00	Mill Low Feeder Speed	Mill 1 San
00-08:46:40	Mill 1 - Mill Low Feeder Speed - 2014.01.25.08	25-Jan-14 08:46:40	25-Jan-14 08:53:50	0 0:07:10	Mill Low Feeder Speed	Mill 1 San
00-09:09:00	Mill 1 - Mill Low Feeder Speed - 2014.01.25.09	25-Jan-14 09:09:00	25-Jan-14 09:14:20	0 0:05:20	Mill Low Feeder Speed	Mill 1 San

CBM / 予防保全モニタリング

http://cs2014beta/Coresight/#/PBDisplays/26

PI Coresight

PI Coresight - Boiler Feed Pum...

PI Coresight

Boiler Feedpump Overview

Boiler Feed Water Pumps

Analysis

Station OvrVw

Generator

476 MW gross

Pump #1

Service Date: 1-Jan-13

Main Steam Flow: 38.34 k lb/hr

Active Thrust: Inner Temp -249 deg F, Bearing Metal 122 deg F

Bearing Temp: 135 deg F

Oil Temp Leaving Cooler: 110 deg F

HP Bearing Oil Drain: 133.40 deg F

LP Bearing Oil Drain: 118.772 deg F

Bearing Oil Pressure: 15.05 psi

Y: 1.3388 mils, X: 1.3048 mils

Y: 1.5712 mils, X: 1.5256 mils

Speed: 132 rpm

all X-probes

all Y-probes

BFP Steam Turbine Trends

vibe

brg temp

Coupling Trends

vibe

radial brg

thrust brg

lube oil

MHM

Pump Trends

vibe

brg temp

case temp

oper par

MHM

Pump #2

Service Date: 1-Jan-13

Main Steam Flow: 114.79 k lb/hr

Active Thrust: Inner Temp -239 deg F, Bearing Metal 128 deg F

Bearing Temp: 148 deg F

Oil Temp Leaving Cooler: 110 deg F

HP Bearing Oil Drain: 129 deg F

LP Bearing Oil Drain: 129 deg F

Bearing Oil Pressure: 14.78 psi

Y: 0.9297 mils, X: 0.9732 mils

Speed: 133 rpm

all X-probes

all Y-probes

BFP Steam Turbine Trends

vibe

brg temp

Coupling Trends

vibe

radial brg

thrust brg

lube oil

MHM

Pump Trends

vibe

brg temp

case temp

oper par

MHM

4/30/2014 12:02:36 AM

8h

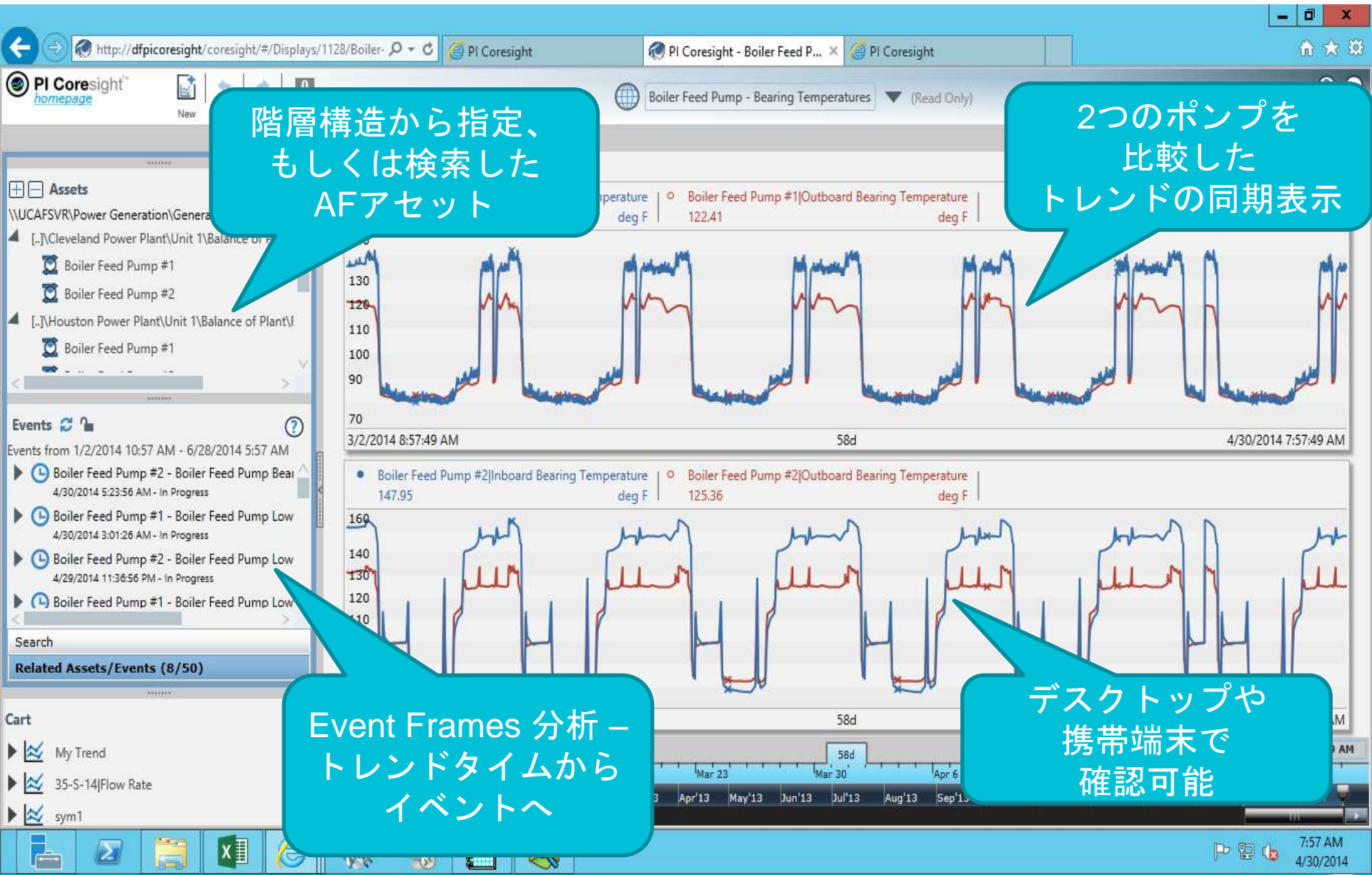
ここを選択すれば
分析画面に移行

状態を評価するための
画面デザイン

PI Coresightの
PI ProcessBook
グラフィック

相関状態データ
(振動、温度など)

CBM / 予防保全モニタリング



階層構造から指定、
もしくは検索した
AFアセット

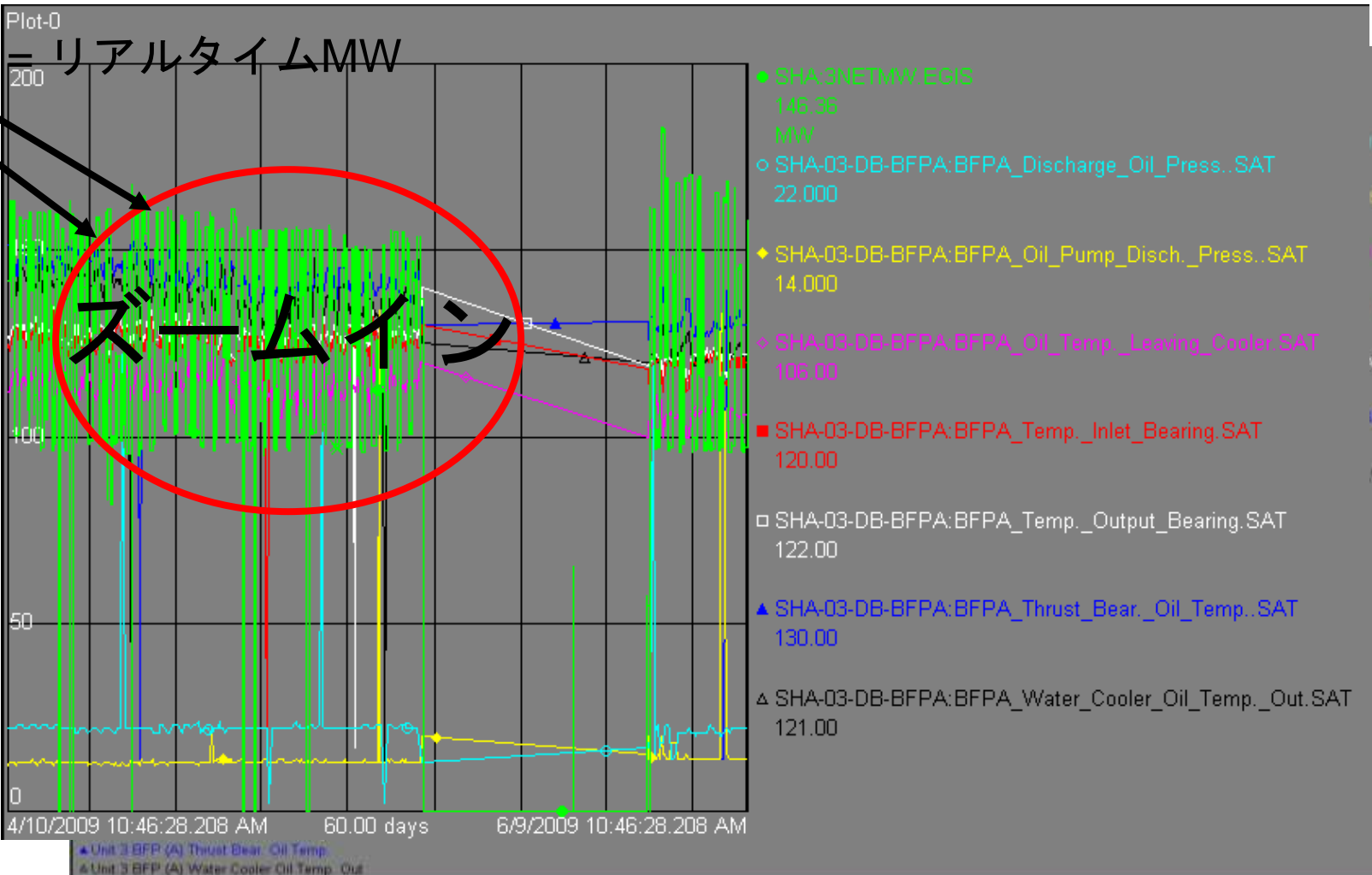
2つのポンプを
比較した
トレンドの同期表示

Event Frames 分析 -
トレンドタイムから
イベントへ

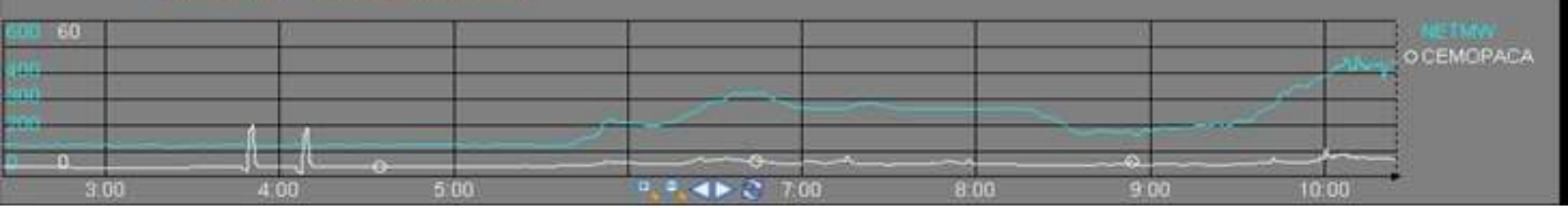
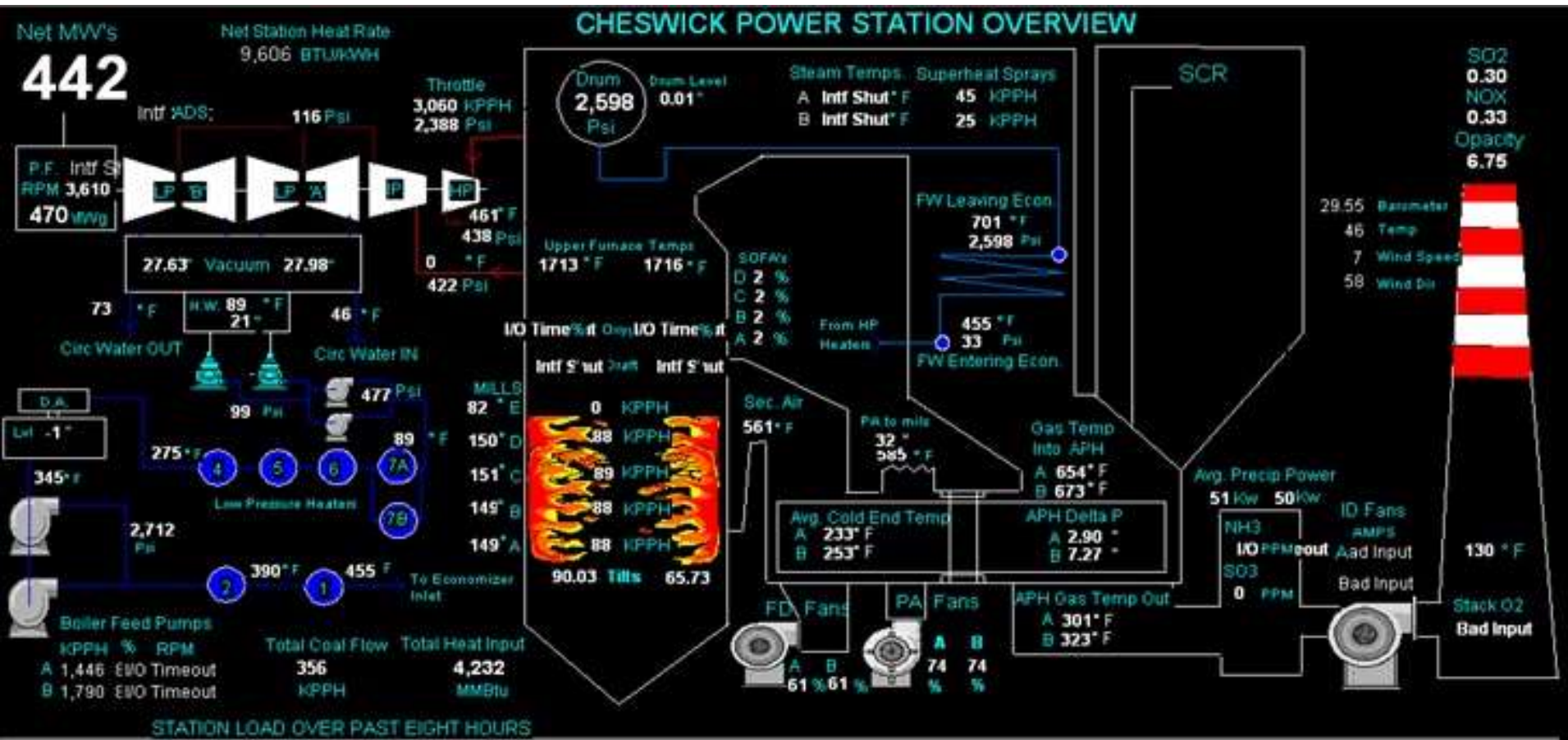
デスクトップや
携帯端末で
確認可能

Manual Round Data Correlation

グリーン
ハンディ
端末から
1時間
おきに
データを
取得



オペレーション



オペレーション – Controllable Loss

ETW 4 OPERATOR CONTROLLABLE LOSS

10/16/2009 17:04:03
Net MW: 249

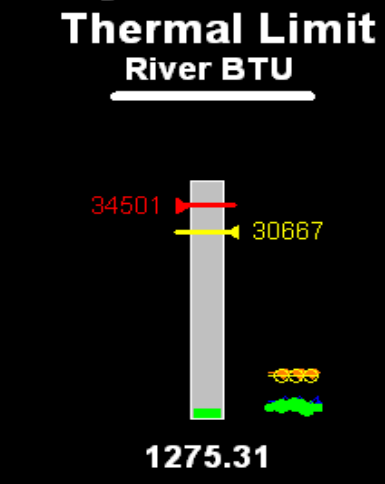
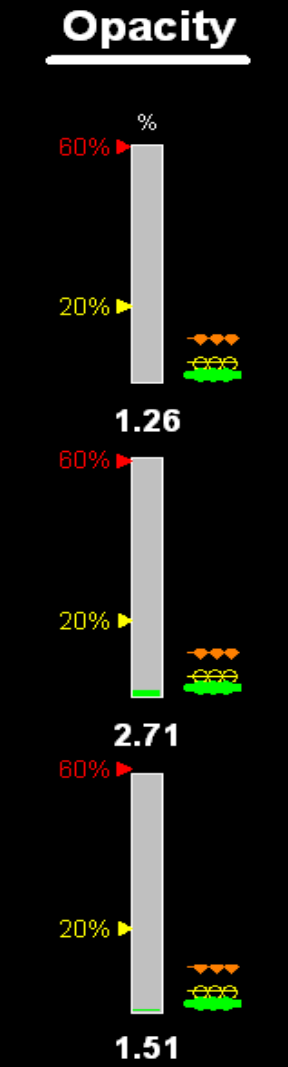
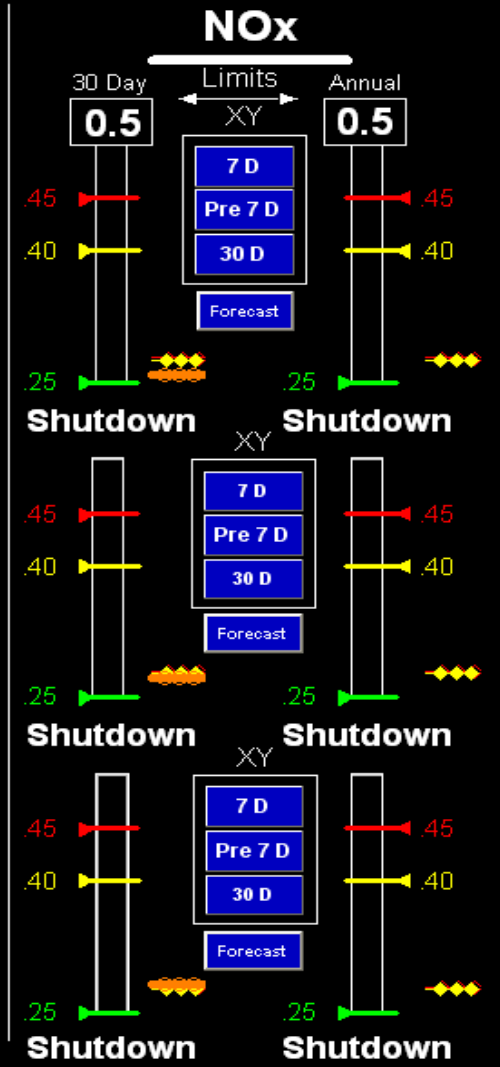
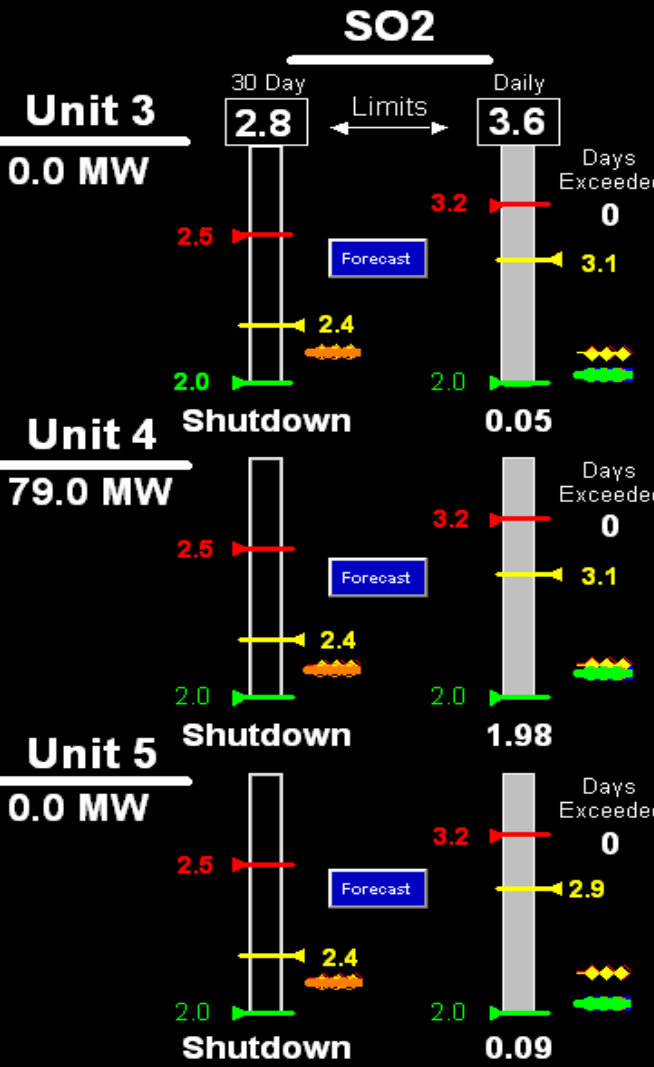
Controllable Variable	UNITS	ACTUAL	DESIGN	+500	DEVIATION (HR)	-500	HR	MW
Main Steam Pressure	PSIG	2401	2415				-14	-0.3
Main Steam Temps	°F	1040	1050				15	0.4
SH Attenuation Flow	klb/hr	Bad Inp	0					
Hot RH Steam Temps	°F	992	1000				13	-0.9
RH Attenuation Flow	klb/hr	40.42	0					
Condensate Subcooling	°F	2.5	4.0 max					
Excess O2 *	%	2.04	1.80					
Stack Temp	°F	256.8	238.2					
Auxiliary Power	MW	7.09	9.50					
Backpressure	in Hga	3.37	2.00				447	-10.3
Vacuum	in Hg	26.55						
Heat Rate	btu/kwh	10644	10306				338	



環境モニタリング

Environmental Monitoring Summary

5/20/2009 8:19:13.01501 AM



CONTROL DE PARQUE

TELECONTROL



UMB



PARQUES EOLICOS

Campisábalos

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%
0	274	237	116	572.9	572.2	1

Pozocañada

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%

Hijos

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%

Somolinos

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%

Morrablancas

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%

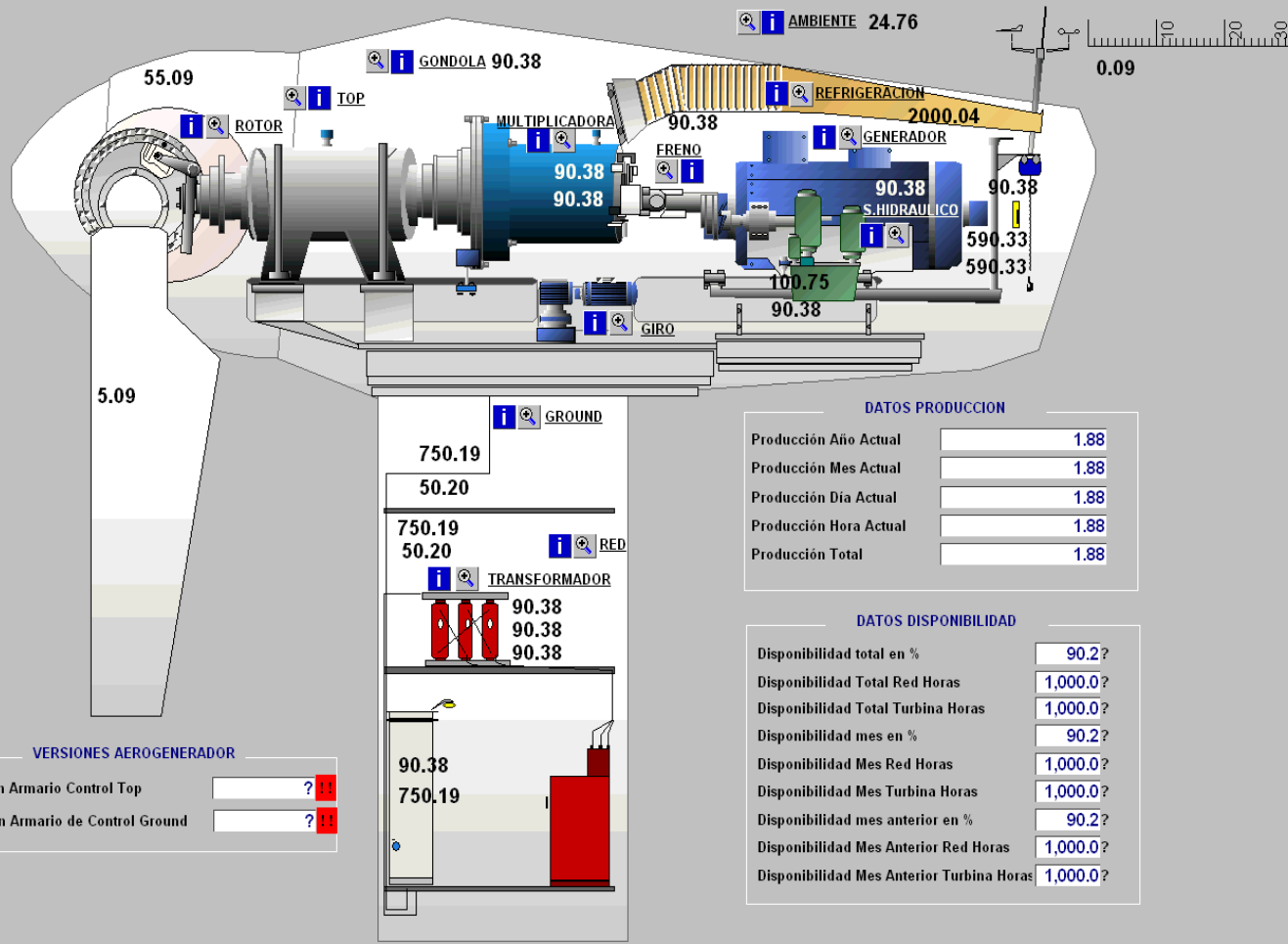
Catalojas

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%

TOTAL

Inc	P.Ord	P.Ord	Etc.%	Emes	Eaño	Cap.%
0	274	237	116	572.9	572.2	1

90.38



VERSIONES AEROGENERADOR

Versión Armario Control Top	?	!!
Versión Armario de Control Ground	?	!!

DATOS PRODUCCION

Producción Año Actual	1.88
Producción Mes Actual	1.88
Producción Día Actual	1.88
Producción Hora Actual	1.88
Producción Total	1.88

DATOS DISPONIBILIDAD

Disponibilidad total en %	90.2?
Disponibilidad Total Red Horas	1,000.0?
Disponibilidad Total Turbina Horas	1,000.0?
Disponibilidad mes en %	90.2?
Disponibilidad Mes Red Horas	1,000.0?
Disponibilidad Mes Turbina Horas	1,000.0?
Disponibilidad mes anterior en %	90.2?
Disponibilidad Mes Anterior Red Horas	1,000.0?
Disponibilidad Mes Anterior Turbina Horas	1,000.0?

PROTECCIONES SUBSTACION

MINIMA TENSION	SOBRETEN. INSTANEA	SOBREINTENSIDAD	MAX. FRECUENCIA	MIN. FRECUENCIA	SOBRETENS. HOMOL.	DISP. CUBA TRAFQ	DIS. NEUTRO. TRAFQ	DISP. TERMOSTATO
ALARMA TEMPERATURA	DISP. TEMPERATURA	ALARMA BUCHHOLZ	DISPARO BUCHHOLZ	BAJO NM. ACEITE	SOBREPRES. TRAFQ	AUTOM. T TENSION	FALTA C.A	FALTA C.C



発電所群監視

- 発電所群監視 & 最適化
- システム詳細
- プラント詳細



ルーティン以外のオペレーション：スター

START UP Ramagundam U#3

PRE START CHECKS

H2 Pr: 1.85Kg/cm2	1.97473
H2 Purity:>98%	98.9995
MOT Level LO	NOT_LOW
Lube oil temp: 45 deg	46.8300
Vacuum	-693.366
Glnd stm temp>280Deg	239.405
M S line charged	151.630
HP/LP charged	OUT_OF_SERVICE
Dea stm charged	8.10537
Drum Lvl	-15.5041
Dea Lvl	2423.75
Hotwell Lvl	447.221
Turning Gear :	DISENGAGED

Rolling Parameter

MS Pr : 75 Kg/cm2	151.630
MS temp: 350 deg	538.275
HRH Pr: 12 Kg/cm2	24.5788
HRH temp: 320 deg	521.469
Boiler PH	7.70544
Cond cation cond.	0.12395

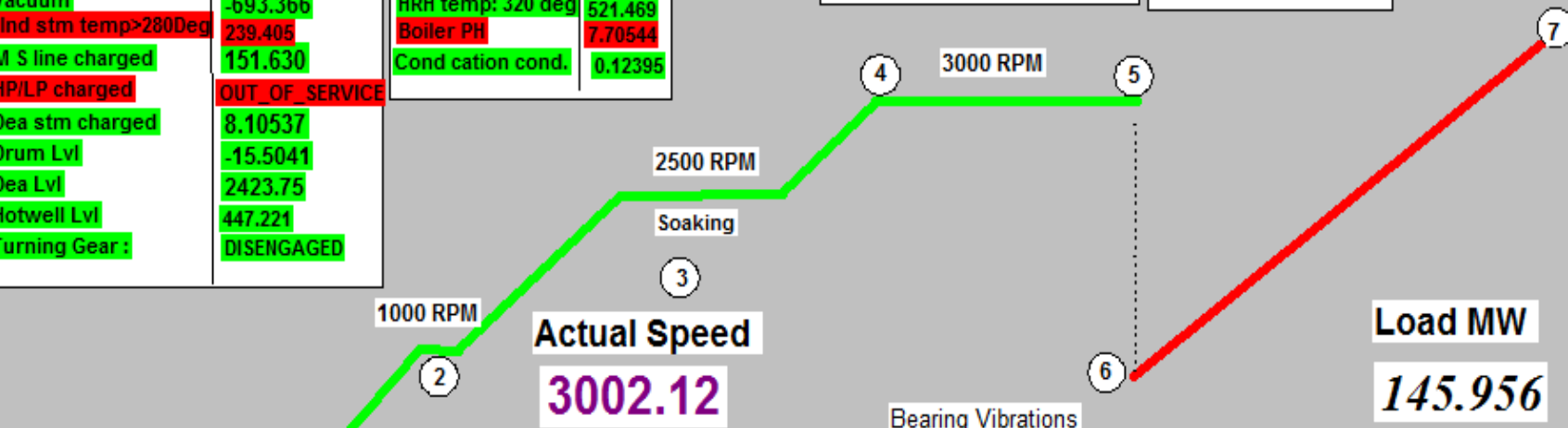
Oil Injection test
Electrical test
Total time at 3000 rpm
Time From step 4 to 5: 6 Hours

Check 5

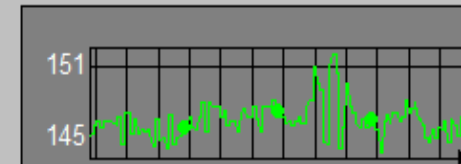
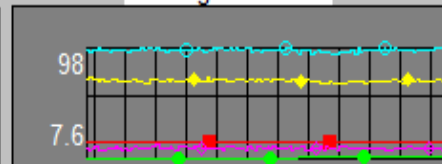
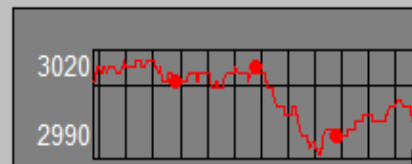
AVR Auto	Auto
H2Cold gastemp	36.1253
Seal oil temp	35.4081

BLK 4,5 FINAL RAMP STABLISH

Raise full load: 200 MW @ 1.5 MW



Prewarming of Turbine 1



Check 1

Barring Speed: 3 to 5 RPM 3002.12
EHC in service NOT_MALFUNCTION
Criteria: ESV opening
Main Stm to CV Chest DT < 50 deg
Criteria:CV opening
HP inner Shell Metal Temp > 165
Speed raising to 1000 rpm

Check 2

Turbine Speed: 1000 RPM 3002.12
All Vibrations With in Limit
Check for all Bearing temp normal
Speed raising from 1000 to 2500 rpm

Check 3

Criteria : Speed raising 3000 rpm
- AccIn rate 100 rpm 0
-HRH pr 12 kg/cm2
Block Load : 10 MW
AOP cut out 2800 rpm OFF

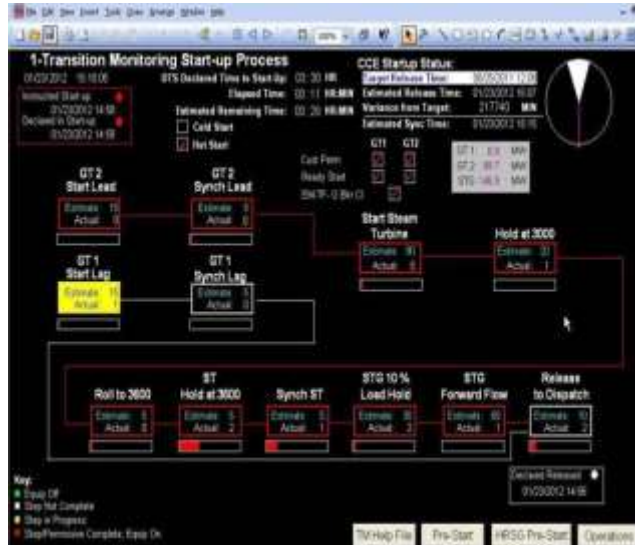
Check 7

Load Raising from Block load to 200 MW
Cross Over Pipe Inner Metal Temp. >= 175 Deg
For 60 Minutes
HP Heaters Charged -1.14373

ROLLING

BLOCKWISE

スタートアップ時の諸問題をどう解決するか？



Transition Monitor Detailed Startup Report

Plant: [] Unit: [] Analysis Date: 10/01/2011 9:14 PM

Startup ID: 1 Startup (29-Apr-11 23:14:48) Duration (HR): 71.68 OTS Estimate (HR): 10.3 Variance from OTS: 64.4 HR (-1.00 HR)

OTS Start Time: 4/29/2011 11:14:28 PM
End Time: 4/30/2011 10:49:26 AM
for Sig Mf Temp

Phase	Start Time	End Time	Duration	TR Estimate	Variance from TR
CDT Prg	4/29/2011 12:08				
FD Fan	4/29/2011 22:58				
Startup	4/29/2011 23:14	4/30/2011 09:49:26 AM	405 HR (11.54 HR)	366 HR (6.1 HR)	126 HR (6.48 HR)
Startup Air Sys	4/30/2011 0:39				
Condenser	4/30/2011 0:45	4/30/2011 2:05	82 HR (1.23 HR)	9 HR (1 HR)	80 HR (1.23 HR)
Build Drum Pressure	4/30/2011 1:13	4/30/2011 1:14	0 HR (0.00 HR)	180 HR (3 HR)	-179 HR (-1.9 HR)
Establish Vacuum	4/30/2011 1:14	4/30/2011 2:05	51 HR (0.81 HR)	60 HR (1 HR)	-9 HR (-1.19 HR)
Safety Steam Conditions	4/30/2011 1:14	4/30/2011 2:05	48 HR (0.81 HR)	38 HR (0.64 HR)	10 HR (1.17 HR)
Boiler	4/30/2011 2:01	4/30/2011 2:02	0 HR (0.00 HR)	0 HR (0 HR)	0 HR (0 HR)
Turbine	4/30/2011 2:05	4/30/2011 2:28	23 HR (0.39 HR)	0 HR (0 HR)	23 HR (0.28 HR)
Condenser	4/30/2011 2:28	4/30/2011 3:43	75 HR (1.25 HR)	0 HR (0 HR)	75 HR (1.25 HR)
Establish Vacuum	4/30/2011 2:28	4/30/2011 3:43	75 HR (1.25 HR)	60 HR (1 HR)	15 HR (1.25 HR)
Boiler	4/30/2011 3:25	4/30/2011 3:18	-30 HR (-0.50 HR)	0 HR (0 HR)	-30 HR (-0.50 HR)
Safety Steam Conditions	4/30/2011 3:18	4/30/2011 3:18	0 HR (0.00 HR)	38 HR (0.64 HR)	-38 HR (-0.64 HR)
Turbine	4/30/2011 3:18	4/30/2011 7:12	175 HR (2.92 HR)	0 HR (0 HR)	175 HR (2.92 HR)
Roll to 2400	4/30/2011 4:10	4/30/2011 4:18	7 HR (0.12 HR)	10 HR (0.17 HR)	-2 HR (-0.24 HR)
Advance Steam Conditions for hold	4/30/2011 4:18	4/30/2011 18:49	141 HR (2.35 HR)	10 HR (0.17 HR)	131 HR (2.18 HR)
Condenser	4/30/2011 7:23	4/30/2011 7:23	0 HR (0.00 HR)	0 HR (0 HR)	0 HR (0 HR)
Establish Vacuum	4/30/2011 7:12	4/30/2011 7:23	17 HR (0.28 HR)	60 HR (1 HR)	-43 HR (-0.82 HR)
Turbine	4/30/2011 7:23	4/30/2011 8:52	99 HR (1.64 HR)	0 HR (0 HR)	99 HR (1.64 HR)
Roll to 3000	4/30/2011 8:58	4/30/2011 8:58	0 HR (0.00 HR)	0 HR (0 HR)	0 HR (0 HR)
Roll to 3000	4/30/2011 8:58	4/30/2011 8:52	-6 HR (-0.10 HR)	3 HR (0.05 HR)	-9 HR (-0.15 HR)
Released	4/30/2011 10:48				

ビジネス上の課題

- 各ユニットのスタートアップは不定期で一貫性がない
- スタッフのプラント間の異動
- スタッフの高齢化／新入社員

ソリューション

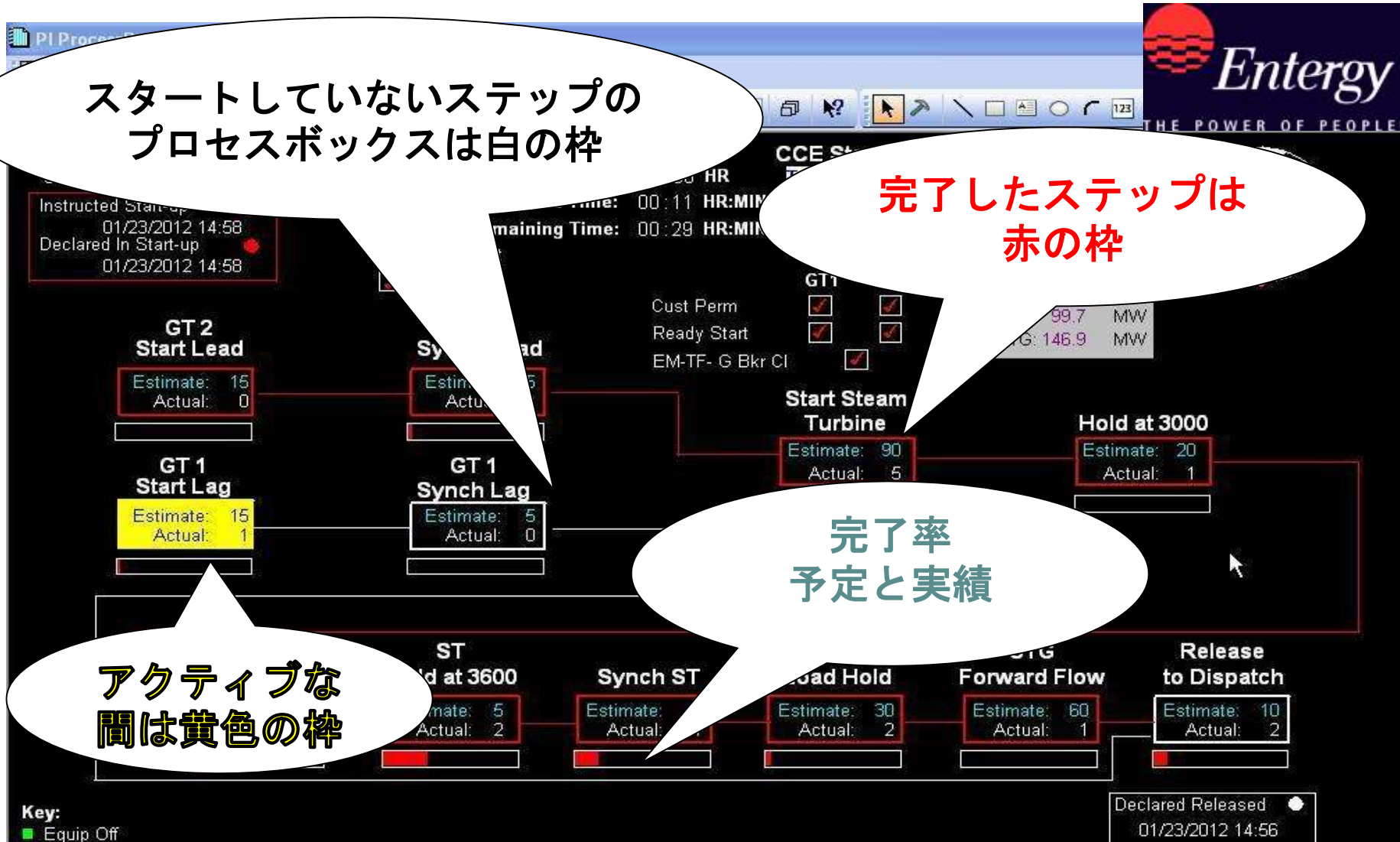
- 一連のPI Processbook画面を実装
- PI Batchを利用し、バッチを生成してスタートアップや時間をトラッキング
- PI-SDKを利用して、レポート表を開発

成果

- プラント外部から、スタートアップがトラッキングしやすくなった
- スタートアップ手続きの一貫性が増した
- スタートアップの精度が約95%向上した



PI Systemのソリューション: モニターの最適化



バッチ、SDKを利用したレポートニング

Transition Monitor Startup Report

Analysis Date 1/24/2012 9:14 AM

Plant: Unit:

Unit:

From: To:

スタートアップを指定して
詳細を確認

Details

To view a detailed report, select **one** startup by typing an "x" in column A next to the desired startup

	Startup ID	Prestart Start Time	OTS Start Time	End Time	Duration (from Declaration) (HR)	OTS Estimate (HR)	TM Estimate (HR)	Variance from OTS	Variance from TM
	1 Startup 12-Feb-11 23:31:45	2/12/2011 11:31:20 PM	2/12/2011 11:31:20 PM	2/13/2011 2:35:20 AM	3.07	2.99	6.1	4.8 MIN (0.08 HR)	-181.8 MIN (-3.03 HR)
x	1 Startup 29-Apr-11 23:14:45	4/29/2011 11:14:20 PM	4/29/2011 11:14:20 PM	4/30/2011 10:49:20 AM	11.58	10.5	6.1	64.8 MIN (1.08 HR)	328.8 MIN (5.48 HR)
	1 Startup 22-Nov-11 09:14:45	11/22/2011 9:14:23 AM	11/22/2011 9:14:23 AM	11/22/2011 12:07:22 PM	2.88	2.01	9.16	52.2 MIN (0.87 HR)	-376.8 MIN (-6.28 HR)
	1 Startup 22-Nov-11 13:13:45	11/22/2011 1:13:22 PM	11/22/2011 1:13:22 PM	11/22/2011 2:44:22 PM	1.52	1.01	6.1	30.6 MIN (0.51 HR)	-274.8 MIN (-4.58 HR)



Improved Startup Reporting via Batch and the SDK

Analysis Date

1/24/2012 9:14 AM

Plant:

Unit

Unit:



Startup ID	Duration (HR)	OTS Estimate (HR)	Variance from OTS
1 Startup 29-Apr-11 23:14:45	11.58	10.5	64.8 MIN (1.08 HR)
OTS Start Time	4/29/2011 11:14:20 PM		
End Time	4/30/2011 10:49:20 AM		
1st Stg Mtl Temp			

Phase	Start Time	End Time	Duration	TM Estimate	Variance from TM
CW Pmp	4/28/2011 12:06	----	----	----	----
FD Fan	4/29/2011 22:08	----	----	----	----
Startup	4/29/2011 23:14	4/30/2011 10:49:20 AM	695 MIN (11.58 HR)	366 MIN (6.1 HR)	329 MIN (5.48 HR)
Station Air Sys	4/30/2011 0:39	----	----	----	----
Condenser	4/30/2011 0:45	4/30/2011 2:05	80 MIN (1.33 HR)	0 MIN (0 HR)	80 MIN (1.33 HR)
Build Drum Pressure	4/30/2011 1:13	4/30/2011 1:14	0.08 MIN (0 HR)	180 MIN (3 HR)	-179.92 MIN (-3 HR)
Establish Vacuum	4/30/2011 1:14	4/30/2011 2:05	51 MIN (0.85 HR)	60 MIN (1 HR)	-9 MIN (-0.15 HR)
Satisfy Steam Conditions	4/30/2011 1:14	4/30/2011 2:02	48 MIN (0.8 HR)	30 MIN (0.5 HR)	18 MIN (0.3 HR)
Boiler	4/30/2011 2:01	4/30/2011 2:02	0.08 MIN (0 HR)	0 MIN (0 HR)	0.08 MIN (0 HR)
Turbine	4/30/2011 2:05	4/30/2011 2:28	23 MIN (0.38 HR)	0 MIN (0 HR)	23 MIN (0.38 HR)
Condenser	4/30/2011 2:28	4/30/2011 3:43	75 MIN (1.25 HR)	0 MIN (0 HR)	75 MIN (1.25 HR)
Establish Vacuum	4/30/2011 2:28	4/30/2011 3:43	75 MIN (1.25 HR)	60 MIN (1 HR)	15 MIN (0.25 HR)
Boiler	4/30/2011 3:25	4/30/2011 3:58	33 MIN (0.55 HR)	0 MIN (0 HR)	33 MIN (0.55 HR)
Satisfy Steam Conditions	4/30/2011 3:25	4/30/2011 3:58	33 MIN (0.55 HR)	30 MIN (0.5 HR)	3 MIN (0.05 HR)
Turbine	4/30/2011 3:58	4/30/2011 7:12	193.25 MIN (3.22 HR)	0 MIN (0 HR)	193.25 MIN (3.22 HR)
Roll to 2400	4/30/2011 4:10	4/30/2011 4:18	7.75 MIN (0.13 HR)	10 MIN (0.17 HR)	-2.25 MIN (-0.04 HR)
Achieve Stm Conditions for Hold	4/30/2011 4:18	4/30/2011 10:49	391.08 MIN (6.52 HR)	10 MIN (0.17 HR)	381.08 MIN (6.35 HR)
Condenser	4/30/2011 7:12	4/30/2011 7:23	11 MIN (0.18 HR)	0 MIN (0 HR)	11 MIN (0.18 HR)
Establish Vacuum	4/30/2011 7:12	4/30/2011 7:23	11 MIN (0.18 HR)	60 MIN (1 HR)	-49 MIN (-0.82 HR)

送配電

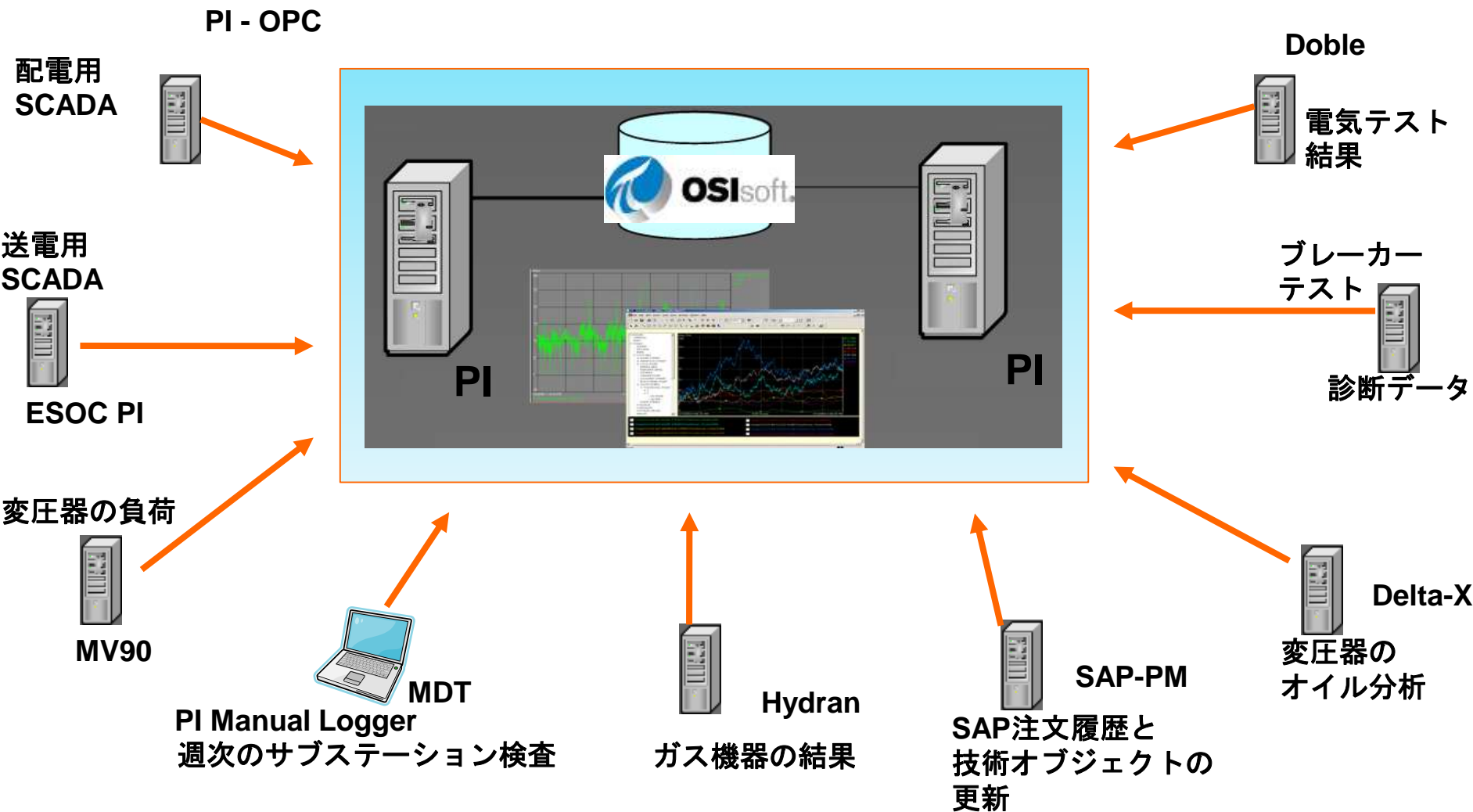
- クラス最高のデータヒストリアン
- サブステーションの自動化
- 可用性のプランニング
- アセット管理の強化
- 状態基準保全
- 優先順位を付けた停電管理
- 需要重視の管理／デマンドレスポンス
- 再生可能な統合 & 最適化



電気 & ガスの公共サービス アセット管理、状態監視、保全に PIを活用



PSE&G CMMS (Computerized Maintenance Management System) Program



アセットモデルと関連データの構築

The screenshot displays the PI System Explorer interface. On the left, a tree view shows a hierarchy of elements: IPE > CE > ADA > T1 > 000000000010503783 Power Transformer. The right pane shows the details for this transformer, including a table of attributes and values.

Name	Value
FLOC NUMBER	IPE-CE-ADA-T1
GAL-X-1000	12.40
INST-COST	0.30
INSTALL DATE	1967/01/01
INSTR-BOOK	114
INSUL-SYSTEM	15.00
LOAD-LOSS-KW	107.70
MANUFACTURER	WESTINGHOUSE
MAX WINDING #1 TEMP...	60
MODEL NUMBER	URT
MV90 KVAR (IN)	0
MV90 KVAR (OUT)	0
MV90 KW	5040
MV90 VOLTS	70.184
MVA	-0.390624
MVAR	-0.52059
MW	22.93186
NITROGEN CYLINDER P...	500
NITROGEN PRESSURE	2
NL-LOSS-KW	33.50
OIL-GALLONS	12000.00
OPER-KV	230-13
P1-NCP	Active
P1-NP	Pt Created
P1-OL	Pt Created

アルゴリズム詳細

Home Documents and Lists Create Site Settings Help Up to PSE&G Delivery

PSE&G LTC CA New Action Algorithm Details Modify Shared Page

Nameplate

Online	Division	Station Code	Station	Station Type	Floc Descr	Equipment	Equipment Descr	Equipment Type	Construction Year	Serial Number	Manufacturer	Model Number
	Southern	MAD	MAPLE SHADE	H	# 2 Transformer	00000000010522665	Load Tap Changer	E-LTC		1973 RBP39133	WESTINGHOUSE	UTTA

Content Editor Web Part

- Equipment Home Page
- SAP Order Details
- View and Trend Equipment PI Points
- CA LTC New Action Algorithm Rules
- CA Comment History

DeltaX Total Combustible Gas

Details	ApprType	Sample Date	CO	H2	Acetylene	Ethane	Ethylene	Methane	Combustible Gas
	LTC	09/14/2011	806	6271	7047	13655	63588	19469	1.1084E+05
	LTC	08/26/2011	909	1979	1927	13739	69662	20494	1.0871E+05
	LTC	08/10/2011	792	3514	2185	11892	66163	23443	1.0799E+05
	LTC	06/28/2011	972	2414	1391	7082	36359	13104	61322
	LTC	06/22/2011	887	2618	1223	6725	34789	12999	59241

Showing 1 to 5 of 25

Algorithm Factors

Factor	Raw Value	Case Value	Weight %	Score
Detectable Acetylene	18	10	25	2.5
Gas Rate of Change	1085.28	10	15	1.5
High Total Gas	107989	10	20	2
High Water	72	7	10	0.7
Low Dielectric	49.1	0	10	0
LTC Operations	1829	0	10	0
LTC THRU NEUTRAL	0	0	10	0

DeltaX Water

Details	Apprtype	Sample Date	Fluid Temp (C)	Water
	LTC	09/14/2011	64	96
	LTC	08/26/2011	47	68
	LTC	08/10/2011		72
	LTC	06/28/2011	48	71
	LTC	06/22/2011	47	75

Showing 1 to 5 of 25

CA Score

Score	maxScore	Ranking(%)	Peer Group
6.7	6.7	100	TS+LTC

DeltaX Fluid

Details	Apprtype	Sample Date	Fluid Temp (C)	D877	D1816
	LTC	09/14/2011	64	31.4	
	LTC	07/09/2007		49.1	
	LTC	07/02/2007		48.1	
	LTC	08/25/1999		49.3	
	LTC	08/25/1999		50	

Showing 1 to 5 of 7

RTrend

Dashboard

Home Documents and Lists Create Site Settings Help

PSEG Equipment Dashboard Modify Shared Page

Equipment Age

Age
39

Order Cost History

Details	Total PM Cost	Total CM Cost	Total CM Count
41502	19020	27	

Equipment Nameplate

Details	Nameplate	Value
CONSTRUCTION YEAR	1967	
MODEL NUMBER	URT	
OPER-KV	230-13	
RATING	24000.00	
SERIAL NUMBER	RAR66902	

DeltaX Information

Details	Location	Desig	Serial Num	Sample Date	Apparatus Type	Equip Cond	Fluid Temp(C)	Acetylene	Ethane	Ethylene	Methane	Water
ADAMS	No. 1 TS	RAR66902	6/30/2006 12:00:00 AM	TS	4	55	8403	402	4322	1702	54	
ADAMS	No. 1	RAR66902	6/30/2006 12:00:00 AM				0	13	2	6	11	
ADAMS	No. 1 SS	RAR66902	6/30/2006 12:00:00 AM				0	196	194	74	40	

Open Order Information

Details	Order	Descr	Status	Planned Cost
000100381836	Cen. Trans		OPEN	1306.7

Asset Load

A circular gauge showing asset load in KW. The scale ranges from 0 to 40,000 KW. The needle is positioned at approximately 9,730 KW. The gauge is divided into three zones: Low (green, 0-13,500 KW), Avg (yellow, 13,500-27,000 KW), and Zone 3 (red, 27,000-40,000 KW). The current load is in the Low zone.

No. 2 Transformer = 9730.00 ;
9/9/2006 5:15:00 AM

Condition Assessment Score

Details	Peer Group	Algorithm Group	Score	maxScore	Ranking(%)
230-344KV	Transformers		4.36	6.38	68
230-344KV	Transformers-Action		3.12	5.48	56

Weekly Inspection Points

Details	Name	Units	Time	Value
GAS LEVEL		ppm	9/6/2006 3:00:00 PM	NOT EXIST
HYDRAN PPM		ppm	9/6/2006 3:00:00 PM	NOT EXIST
MAX WINDING #1 TEMPERATURE		Deg C	9/6/2006 3:00:00 PM	60
NITROGEN CYLINDER PRESSURE		PSI	9/6/2006 3:00:00 PM	1500
NITROGEN PRESSURE		PSI	9/6/2006 3:00:00 PM	3.3
TANK OIL LEVEL			9/6/2006 3:00:00 PM	25C
TOP OIL TEMPERATURE		Deg C	9/6/2006 3:00:00 PM	60

Other PI Data Points

Details	Name	Units	Source	Time	Value
MV90 KVAR (IN)		KVAR	MV90	9/8/2006 11:45:00 PM	1010
MV90 KVAR (OUT)		KVAR	MV90	9/8/2006 11:45:00 PM	0
MV90 KW		KW	MV90	9/8/2006 11:45:00 PM	20580
MV90 VOLTS		VOLTS	MV90	9/8/2006 11:45:00 PM	120
T1 BUS VOLT		VOLTS	DAQ	9/13/2006 8:03:37 AM	122.6214
T1 MVA		MVA	DAQ	9/13/2006 8:03:33 AM	-0.292968
T1 MVAR		MVAR	DAQ	9/13/2006 8:02:33 AM	0.195312
T1 MW		MW	DAQ	9/13/2006 8:01:13 AM	15.23434

重大性スコア

実際の負荷

状態スコア

Done Trusted sites 39

Summary of Worst Performing LTCs

CA Records

Details	Division	Floc	Floc Descr	Equipment	Equip Descr	Score	Person	Status	Manufacturer	Type	ApprType	Serial Number	Tim
	SO	IPE-SO-MAD -T2	# 2 Transformer	000000000010522665	Load Tap Changer	6.7	Mark Stoughton	Awaiting Maint.	WESTINGHOUSE	UTTA	LTC	RBP39133	Se
	ME	IPE-ME-SNW -1TRH	132-1 Transformer	000000000010510407	LTC/Selector and Transfer 13 Kv	5	Paul Morakinyo	No Action	WESTINGHOUSE	URT2	TS	7001829-13	Se
	ME	IPE-ME-SNW -1TRH	132-1 Transformer	000000000010510410	LTC/Selector and Transfer 26 Kv	5	Paul Morakinyo	Awaiting Maint.	WESTINGHOUSE	URT2	TS	7001829-26	Se
	ME	IPE-ME-SNW -3TRH	132-3 Transformer	000000000010510415	LTC/Selector and Transfer 13 Kv	5	Paul Morakinyo	No Action	WESTINGHOUSE	URT2	TS	6537551-13	Se
	ME	IPE-ME-SNW -3TRH	132-3 Transformer	000000000010510418	LTC/Selector and Transfer 26 Kv	5	Paul Morakinyo	Awaiting Maint.	WESTINGHOUSE	URT	TS	6537551-26	Se
	CE	IPE-CE-ADA -T1	# 1 Transformer	000000000010503781	Load Tap Changer (URT)	4.75	Shirish Patel	Awaiting Maint. Results	WESTINGHOUSE	URT	SS	RAR66902	Se
	CE	IPE-CE-SOS -T2	# 2 Transformer	000000000010503189	Load Tap Changer (URT)	4.6	Mark Stoughton	Awaiting Maint.	WESTINGHOUSE	URT	SS	6994649	Se
	CE	IPE-CE-ADA -T1	# 1 Transformer	000000000010503781	Load Tap Changer (URT)	4.3	Shirish Patel	Awaiting Maint. Results	WESTINGHOUSE	URT	TS	RAR66902	Se
	ME	IPE-ME-SNW -2TRH	132-2 Transformer	000000000010510413	LTC/Selector and Transfer 26 Kv	4.25	George	OK	WESTINGHOUSE	URT2	TS	6537553-26	Se
	CE	IPE-CE-SOS -T2	# 2 Transformer	000000000010503189	Load Tap Changer (URT)	4	Mark Stoughton	Awaiting Maint.	WESTINGHOUSE	URT	TS	6994649	Se
	CE	IPE-CE-BEN -T2	# 2 Transformer	000000000010503858	Load Tap Changer (URT)	4	Mark Stoughton	Awaiting Maint.	WESTINGHOUSE	URT	TS	RAR66905	Se
	CE	IPE-CE-GBK -T2	# 2 Transformer	000000000010504122	Load Tap Changer (TC 546)	4	NA		FEDERAL PACIFIC	TC546	LTC	502362	Se
	ME	IPE-ME-LAU -T1	# 1 Transformer	000000000010507675	Load Tap Changer-Main Tank	4	George Arthur	Awaiting Maint.	WESTINGHOUSE	UTT	LTC	UGP50682	Se
	ME	IPE-ME-SNW -2TRH	132-2 Transformer	000000000010510411	LTC/Selector and Transfer 13 Kv	4	Don Fallon	Pending Action	WESTINGHOUSE	URT2	TS	6537553-13	Se
	SO	IPE-SO-BEA -T1	# 1 Transformer	000000000010520910	Load Tap Changer	4	Geoge Arthur	Awaiting Maint.	FEDERAL PACIFIC	TC546	LTC	502222	Se
	SO	IPE-SO-LAW -T1	# 1 Transformer	000000000010522331	Load Tap Changer	4	NA		WESTINGHOUSE	UTTA	LTC	RBP39131	Se
	SO	IPE-SO-MAR -T4	# 4 Transformer	000000000010522900	Load Tap Changer	4	NA		GENERAL ELECTRIC	LRT65	LTC	F961854B	Se
	CE	IPE-CE-SBR -1TRH	220-2 Transformer	000000000010505100	Load Tap Changer 220-2 26Kv	3.5	Mark	Pending Action	MOLONEY	SRTMHD	TS	P670632	Se
	SO	IPE-SO-SLA -T1LTC	220-1 Transformer Tap Changer	000000000010526193	Load Tap Changer SEL 220-1	3.5	Angela Rothweiler	Awaiting Maint.	MOLONEY	SRTMHD	SS	P680443	Se
	CE	IPE-CE-GSE -1TRH	220-1 Transformer	000000000010501563	Load Tap Changer	3.25	Mark	Pending Action	WESTINGHOUSE	UTH	TS	7001753	Se
	SO	IPE-SO-LAW -T2	# 2 Transformer	000000000010522332	Load Tap Changer	3.25		No Action	FEDERAL PACIFIC	TC546	LTC	501092	Se
	SO	IPE-SO-MAR -T1	# 1 Transformer	000000000010522897	Load Tap Changer	3.25	NA	Awaiting Maint. Results	GENERAL ELECTRIC	LRT65	LTC	D596044	Se
	CE	IPE-CE-SPF -T1	# 1 Transformer	000000000010540523	Load Tap Changer (UTT-A)	3.25			WESTINGHOUSE	UTTA	LTC	UGP50673	Se
	CE	IPE-CE-SAL -4TRH	220-4 Transformer	000000000010502666	Load Tap Changer	3			PENNSYLVANIA	394	SS	C0407351	Se
	CE	IPE-CE-SBY -20TR	220-1 Transformer	000000000010502885	Load Tap Changer	3			GENERAL ELECTRIC	LR500	LTC	D572025	Se
	CE	IPE-CE-POH -T2	# 2 Transformer	000000000010504695	Load Tap Changer (UVT)	3	Don Fallon	2010 Replacment	WESTINGHOUSE	UVT	LTC	SLM54021	Se
	DA	IPE-DA-HOF -T1	# 1 Transformer	000000000010515550	Load Tap Changer	3	Paul Morakinyo	Requested Maint.	ABB	UVT	LTC	MLM56600	A

SDG&E

San Diego Gas & Electric

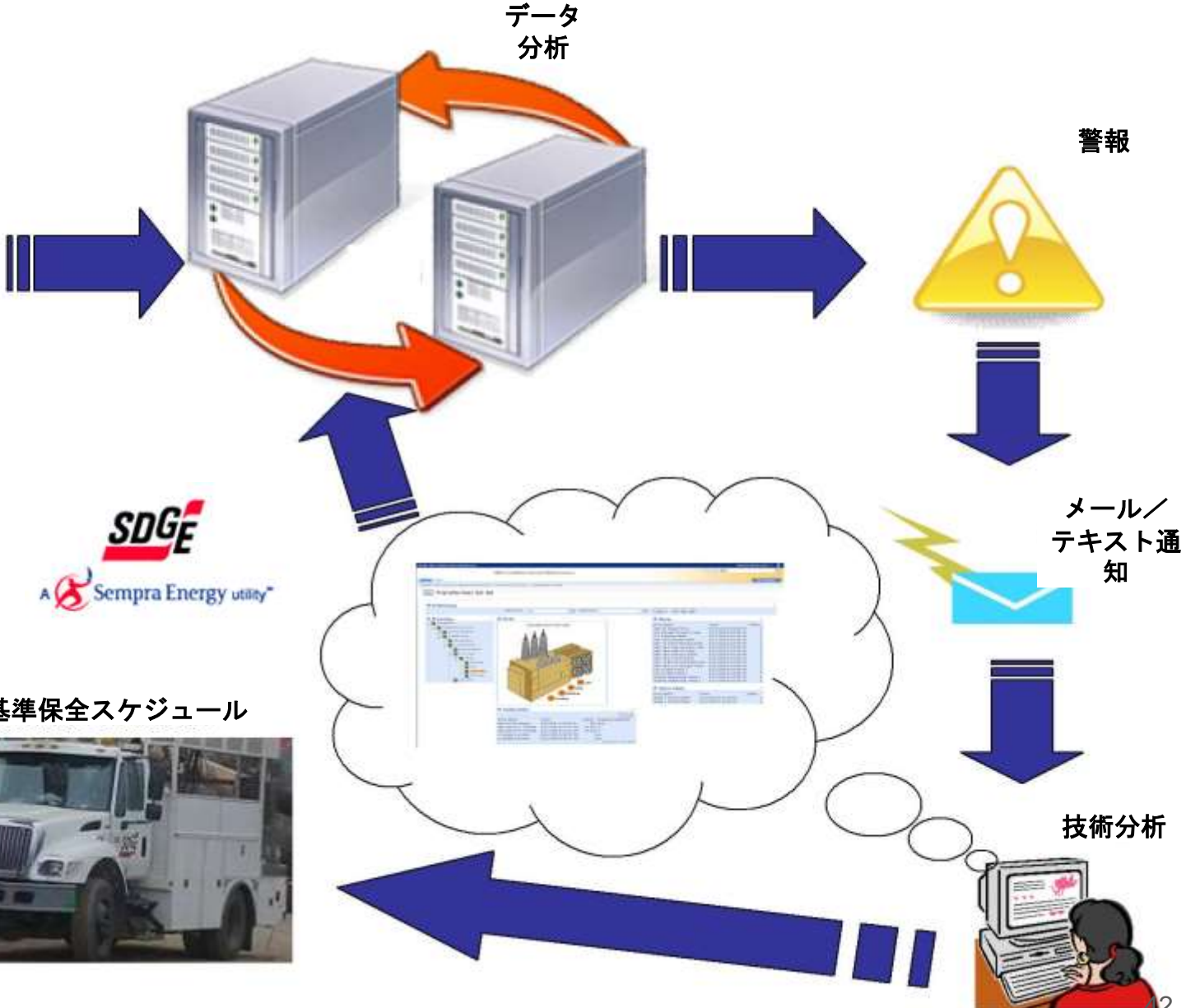
RtCBMプログラム

リアルタイムな状態基準保全



SDG&E CBM-コンディションベースメンテナンス

サブステーション監視



状態基準保全スケジュール



PI AF モデル

CBM - PI System Explorer

File Edit View Go Help

Database Query Date Back Check In New Element Search

Elements

- Elements
 - SISCO Managed Models
 - Layers
 - SDGE_CBM
 - Layers
 - ClassView
 - breakerAssets
 - breakerType
 - bushing
 - CBMSystem
 - DGA
 - distributionTransmission
 - LTC
 - LTCTransformer
 - predictiveAnalysis
 - report
 - SF6GasBreaker
 - Substation
 - systemReports
 - systemStatus
 - thermal
 - transformerAssets
 - transformerType
 - voltageLevel
 - InstanceView

Elements

CBM Group by: Category Template

Search

Name	Description	Category	Type	Template
SISCO Managed Mo...			None	SISCO Model Template
SDGE_CBM	Created from R...		None	SDGE_CBM
ClassView			None	
breakerAssets		SDGE_CBM; S...	None	SDGE_CBM:breakerAssets
breakerType		SDGE_CBM; S...	None	SDGE_CBM:breakerType
bushing		SDGE_CBM; S...	None	SDGE_CBM:bushing
CBMSystem		SDGE_CBM; S...	None	SDGE_CBM:CBMSystem
DGA		SDGE_CBM; S...	None	SDGE_CBM:DGA
distributionTran...		SDGE_CBM; S...	None	SDGE_CBM:distributionTransmission
LTC		SDGE_CBM; S...	None	SDGE_CBM:LTC
LTCTransformer		SDGE_CBM; S...	None	SDGE_CBM:LTCTransformer
predictiveAnalysis		SDGE_CBM; S...	None	SDGE_CBM:predictiveAnalysis
report		SDGE_CBM; S...	None	SDGE_CBM:report
SF6GasBreaker		SDGE_CBM; S...	None	SDGE_CBM:SF6GasBreaker
Substation		SDGE_CBM; S...	None	SDGE_CBM:Substation
systemReports		SDGE_CBM; S...	None	SDGE_CBM:systemReports
systemStatus		SDGE_CBM; S...	None	SDGE_CBM:systemStatus
thermal		SDGE_CBM; S...	None	SDGE_CBM:thermal
transformerAssets		SDGE_CBM; S...	None	SDGE_CBM:transformerAssets
transformerType		SDGE_CBM; S...	None	SDGE_CBM:transformerType
voltageLevel		SDGE_CBM; S...	None	SDGE_CBM:voltageLevel
InstanceView			None	

Elements

Transfers

Library

Unit of Measure

MyPI

Notifications

Contacts

PI ACE 演算と分析

PI-ACE Manager

Server Executable Module Context Tag Help

AP-CBMPI-S01

- AlarmSummaryUpdate
- E1000_AlarmRollUpAndNotification
- PiPostProcessor
- PiPreProcessor
- PiWeeklyProcessor

Name	Status/Value	Since	Schedule	Output Tags
Current Status	On	2/13/2009 10:24:30 AM		
Scheduler Location	AP-CBMINT...			
Scheduler Owner	SYSTEM			
Scheduler Version	2.x			
Context Summary				
AP-CBMPI-S01\AlarmSummar...	On	2/13/2009 10:24:38 AM	Clock (600, 0)	0
AP-CBMPI-S01\E1000_Alarm...	On	2/26/2009 10:28:12 AM	Clock (120, 0)	0
AP-CBMPI-S01\PiPostProces...	On	2/13/2009 10:24:38 AM	Clock (300, 0)	0
AP-CBMPI-S01\PiPreProcess...	On	2/13/2009 10:24:38 AM	Clock (300, 0)	0
AP-CBMPI-S01\PiWeeklyPro...	On	2/13/2009 10:24:39 AM	Clock (600, 0)	0

- バックグラウンドでの計算ジョブ
 - 警報タグの生成
 - 変圧器のオイル分析
 - 警報サマリー
 - 警報増加レポート
 - 警報減少レポート

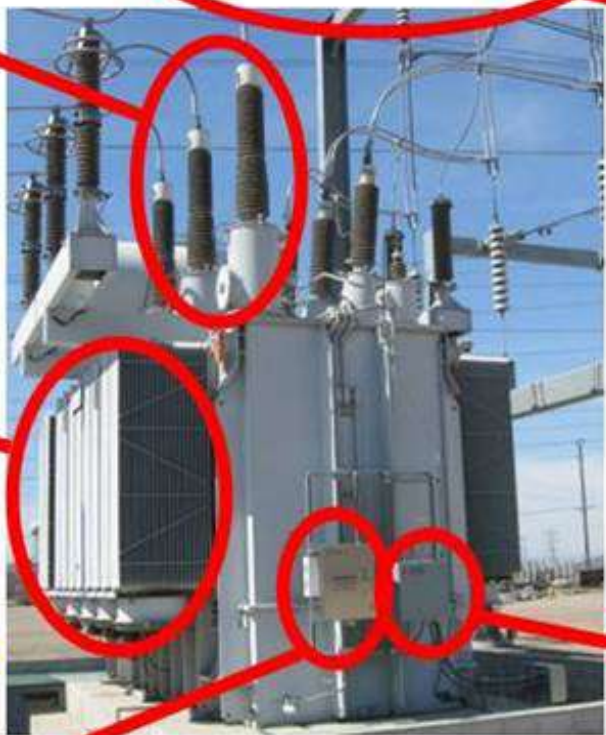
CBM 可視化とレポートニング

**変圧器
ブッシング分析**

LTCエネルギーをバンクの
もう一方にあるコントロール
キャビネットに測定

LTC Overview

変圧器冷却分析



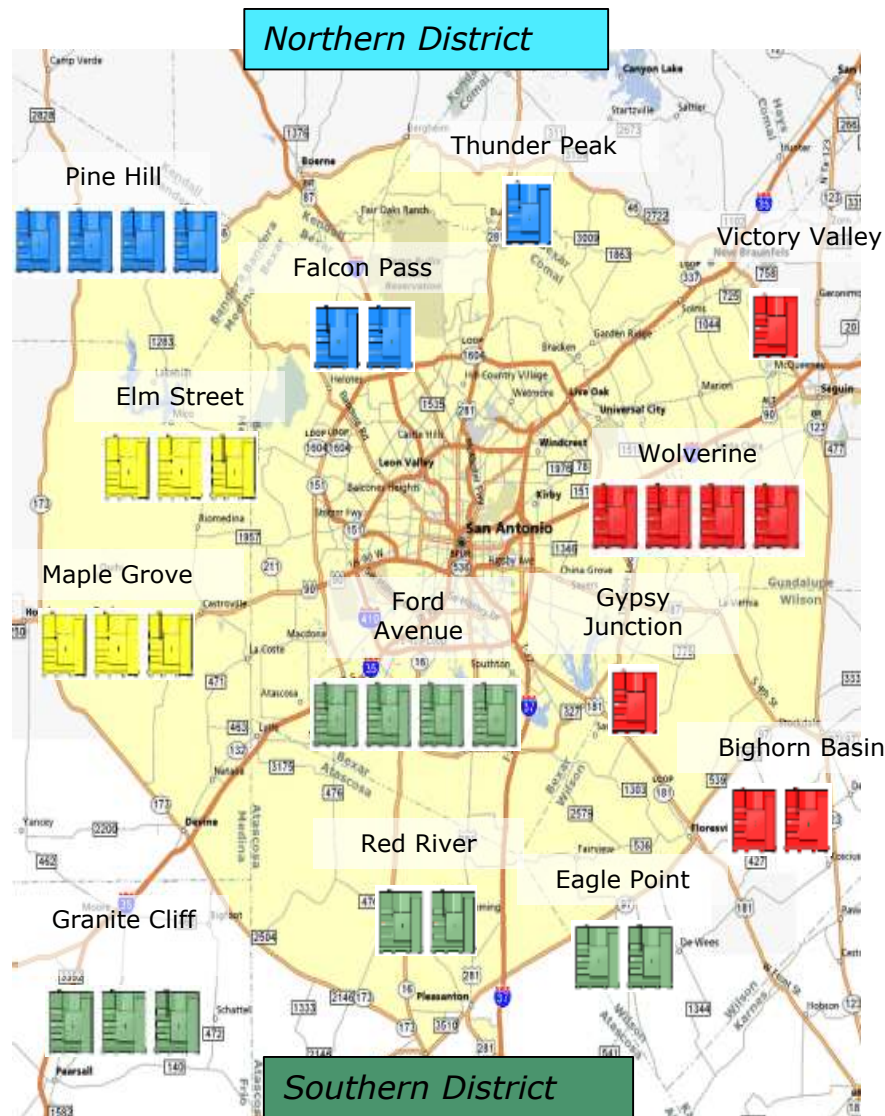
変圧器分析

**溶解ガス
分析**

Substation Power Distribution Profile

目的

- 地域別・時間帯別の配電
- 老朽化したアセットのリスクアセスメント
- 設備状態のベンチマーキング
- *自社で管理したい!*



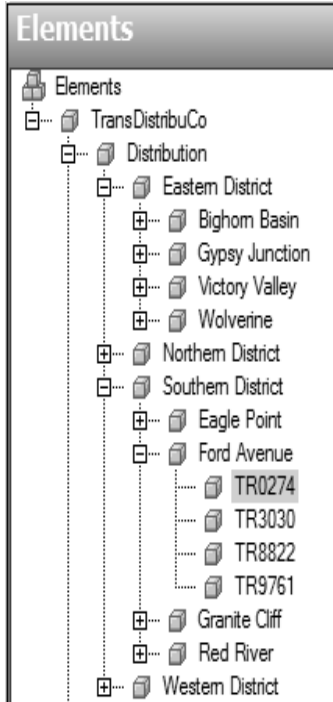
Western District

Eastern District

PI Asset Framework – SQL Server 2012

アセットの階層構造

- 地域
- サブステーション
- 変圧器



変圧器の属性

- PI Systemデータ
- 設備の仕様
- DGA分析

The screenshot shows the PI System data view for transformer TR0274. The view is organized into several categories:

- Category: Current DGA Analysis**

Name	Value
Acetylene	4 ppm
Carbon Dioxide	3004 ppm
Carbon Monoxide	123 ppm
Ethane	190 ppm
Ethylene	38 ppm
Hydrogen	294 ppm
Methane	121 ppm
Nitrogen	22698 ppm
Oxygen	2340 ppm
- Category: Load Tap Changer**

LTC Oil Temperature	65.0885009765625 °F
LTC Oil Temperature - 1H A...	62.7173211853571 °F
- Category: Performance**

Energy	20.6299715201975 MWh
Load	20.1319046020508 MW
- Category: Specifications**

Installation Date	6/10/1992 12:00:00 AM
Manufacturer	PowerMaster
Model	PM-56
- Category: Tank**

Bottom Oil Temperature	48.3781089782715 °F
Top Oil Temperature	79.2328872680664 °F
Top Oil Temperature - 1H A...	83.2808045109946 °F

Microsoft Intelligence – Power View with OSIssoft

対話型分析

Regional Power Distribution - Past 30 Days

Regional Power Distribution - Past 30 Days

Regional Power Distribution - Past 30 Days

Regional Distribution, KWH

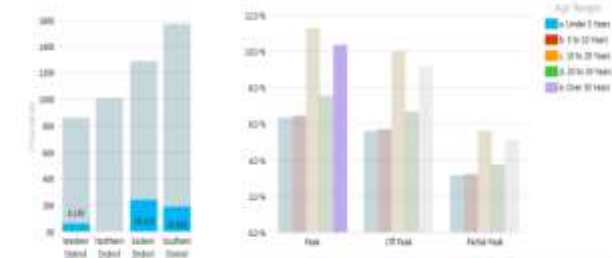
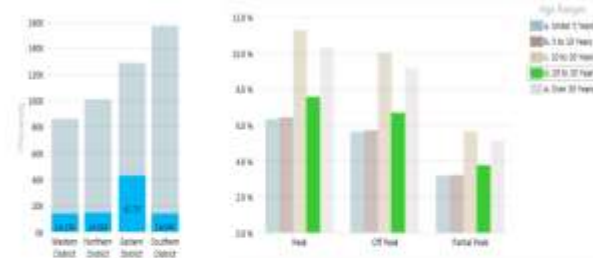
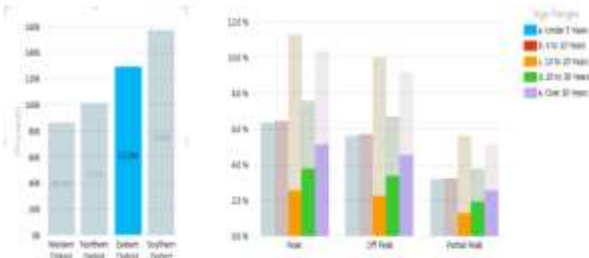
Rate Distribution by Transformer Age,

Regional Distribution, KWH

Rate Distribution by Transformer Age,

Regional Distribution, KWH

Rate Distribution by Transformer Age,



Substation Distribution, %

Substation Distribution, %

Substation Distribution, %



地域別の配電状況

変圧器使用年数別の配電状況

使用年数や時間帯別の配電状況

Demand Profile and Network Analysis



サブステーション
フィーダー

ghorn Basin Substation Service Area

Area Meters
 Agricultural Commercial Industrial Residential

Pole Loads at Peak (9 am - 4 pm), kWh

	Jan KWH	Feb KWH	Mar KWH	Apr KWH
PT0398	4.4	4.5	5.0	5.3
PT1324	3.5	3.6	3.5	4.0
PT2235	3.4	3.9	4.1	4.5
PT4537	2.8	3.2	3.3	3.7
PT7465	3.1	3.2	3.5	3.8
PT7745	3.2	3.2	3.1	3.3
PT8356	10.6	11.0	11.0	11.7
PT8461	3.3	3.3	3.6	3.8

Feeder Distribution, kWh

Service Profile

Substation Feeder Loads

B3

A B C D E F G H I J K L M N O P Q R S T U V W X

Feeder and Pole Transformer Analysis

Feeder Circuit

FD1209

FD2349

FD4602

Pole Transformer

PT0398

PT1324

PT2235

PT4537

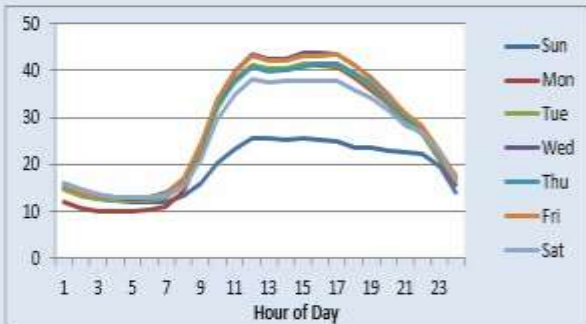
PT7465

PT7745

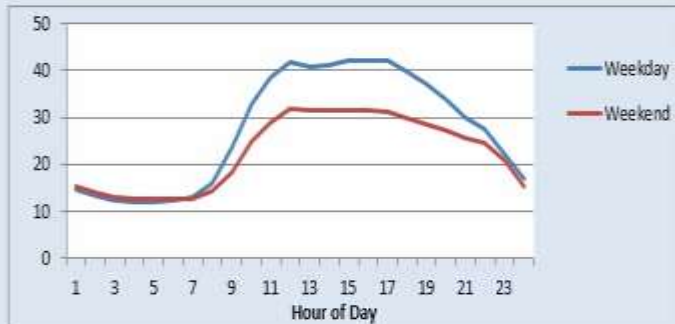
PT8356

PT8461

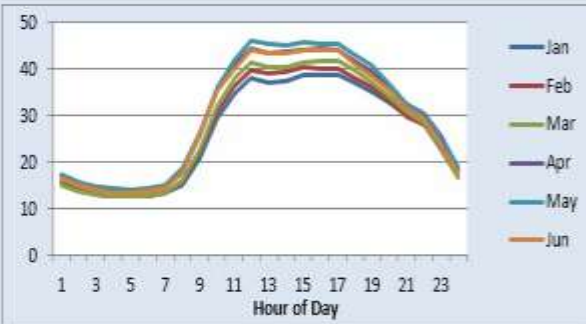
Weekday Profiles, kWh



Weekday \ Weekend Profiles, kWh



Monthly Profiles, kWh



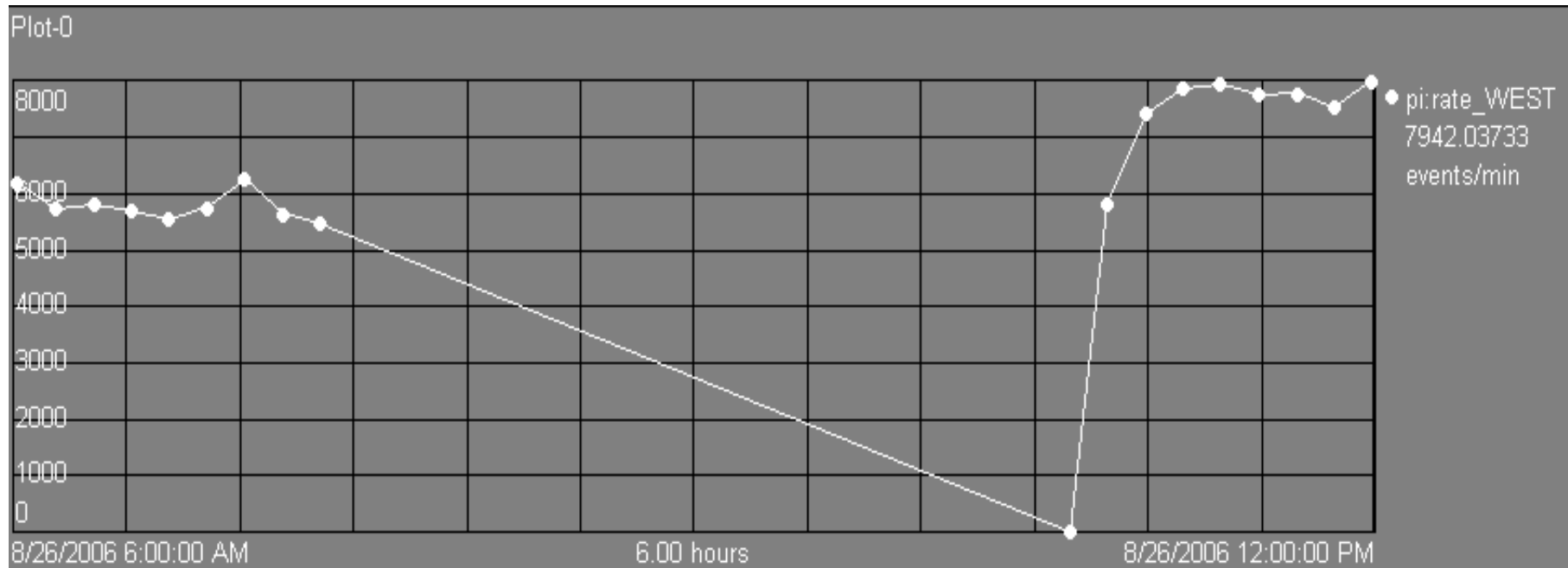
Pole Loads at Peak (9 am - 4 pm), kWh

	Jan KWH	Feb KWH	Mar KWH	Apr KWH	May KWH	Jun KWH
PT0398	4.4	4.5	5.0	5.3	5.5	5.5
PT1324	3.5	3.6	3.5	4.0	4.1	4.2
PT2235	3.4	3.9	4.1	4.5	4.7	3.1
PT4537	2.8	3.2	3.3	3.7	3.8	3.7
PT7465	3.1	3.2	3.5	3.8	3.9	4.0
PT7745	3.2	3.2	3.1	3.3	3.6	4.3
PT8356	10.6	11.0	11.0	11.7	12.1	11.7
PT8461	3.3	3.3	3.6	3.8	3.8	3.5

The Challenge

大量のデータ、少ない時間……

- 大規模化するシステム
- データの過負荷
- どうすればデータマイニングによって情報が把握できる？



Advanced Pattern Recognition Modeling (Partner products using the PI System)

予測分析にPI systemを活用

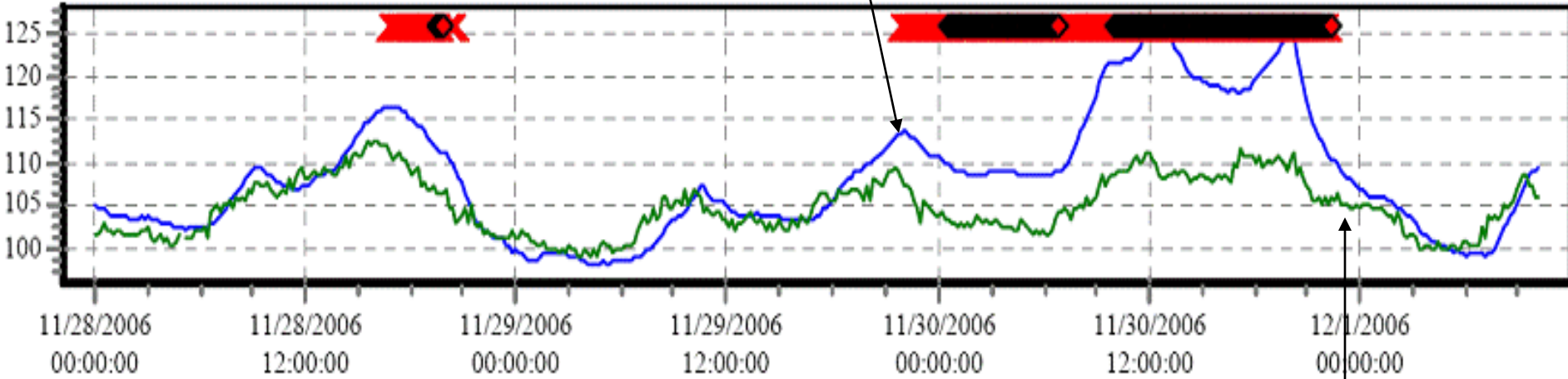
- コンピュータを活用
- 手動モニタリングを削減
- クリティカルな設備やシステムの異常を検出
- 徐々に進む不具合を早期に検出
- 一つの信号に頼らない多様なセンサーモデル
 - 障害を回避
 - サポートイングオペレーション
 - 保全の最適化

各種ルールに基づいてクリティカルなシステムをモニタリング
コンピュータモデルでデータを常時監視

ファンモーターベアリング

FDファンモーターアウトボードベアリングの温度変化
(現在の予想を約17度上回っている)

3D124-3TE273, WEST FD FAN MTR OUTBD BRG (DEGF)



検出後にフィルターが汚れていることが判明し、交換したところ、リアルタイムのオイルレベルと温度が期待値まで減少。

電力業界での成果



- 発熱率の削減、ISOの罰金争議、DMNCテストによる効果は9百万ドル



- 設備全体で毎年20百万ドル以上のコストを削減



- 投資額1ドルあたり年間8ドルの利益を享受



- 保全費用全体の10%を削減

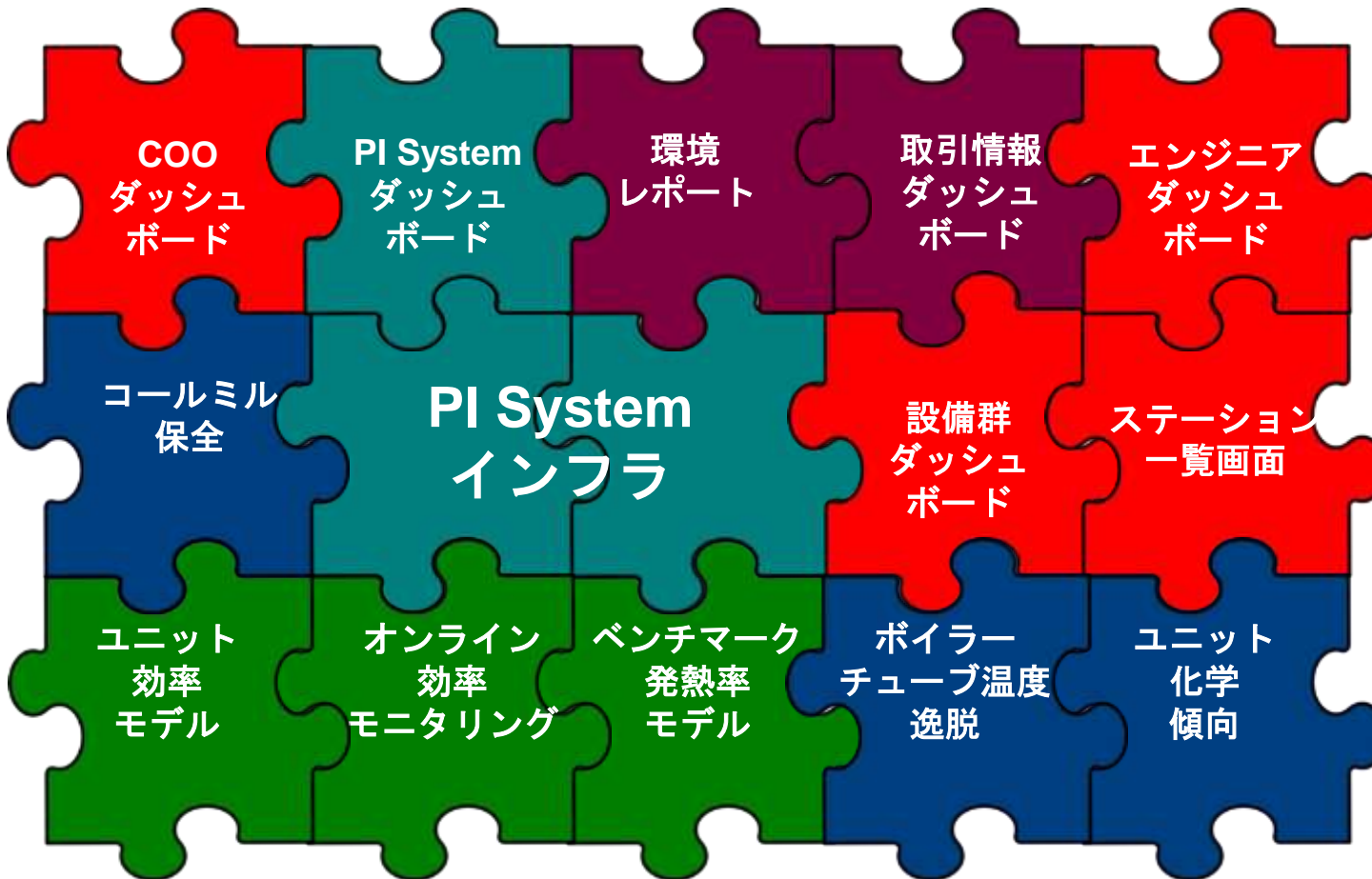


- スタートアップコストを約3分の1削減



- 強制停電を1%削減した結果、利益が年間2百万ドル以上増加
- CBM、オペレーション、RCA、パフォーマンス、効率性、分析、事前対策等により、設備全体で年間20百万ドル超の効果

Business Transformation - Benefits



広がる可能性

PI Systemインフラ
& データフィード

イントラネットとの統合、
認識促進

エキスパートシステムの
探求：

- パフォーマンス最適化
- アセット利用の最適化、
予測監視

他のデータソースとの
連携：

- 高度な分析
& プロセスチューニング



▶ ㄷ

加果



PI System によるコスト削減戦略の有効化

「この1ヵ月で発電量は50 GWh以上増加しましたが、従来の抑制戦略に従っていたら、これほどの増加は見込めなかったでしょう」

「これは当社にとって重要なメリットです。他にもタービンの機械的摩耗や現場の緊急作業が減少するといった成果が見られます。定量化はさらに難しいですが」

COREマネージャー

Gustavo Moreno



ビジネス上の課題

- 非効率な点を改善したい
- リアルタイムの集計データを、TSOによる抑制中のリアルタイム意思決定に役立てたい

ソリューション

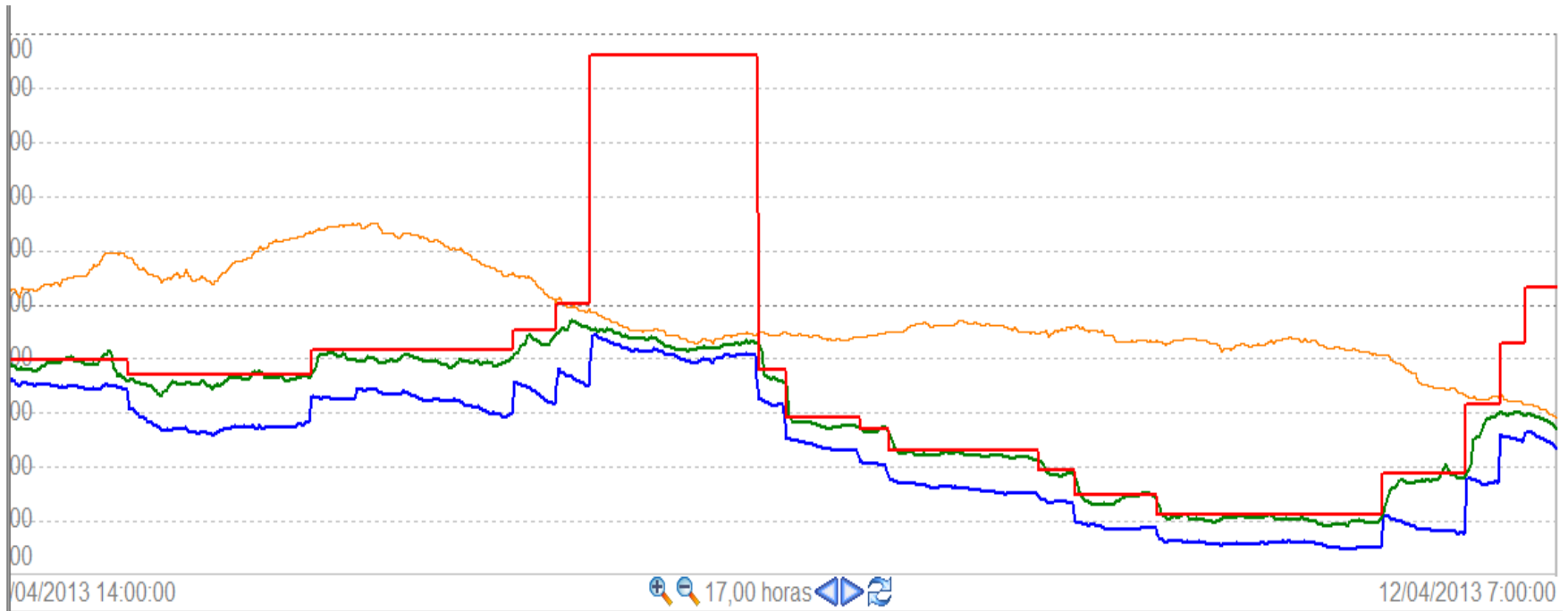
- PIAFのトレーニング・設計・プランニング・展開
- CoEがPI ACEの展開をサポート
- 計算データをPI Serverに投入

成果・メリット

- エネルギー生産量が平均で30%、ピーク時には60%以上増加
- 他のメリットはまだ定量化されていない



CURRENTLY: Global Setpoint Curtailment



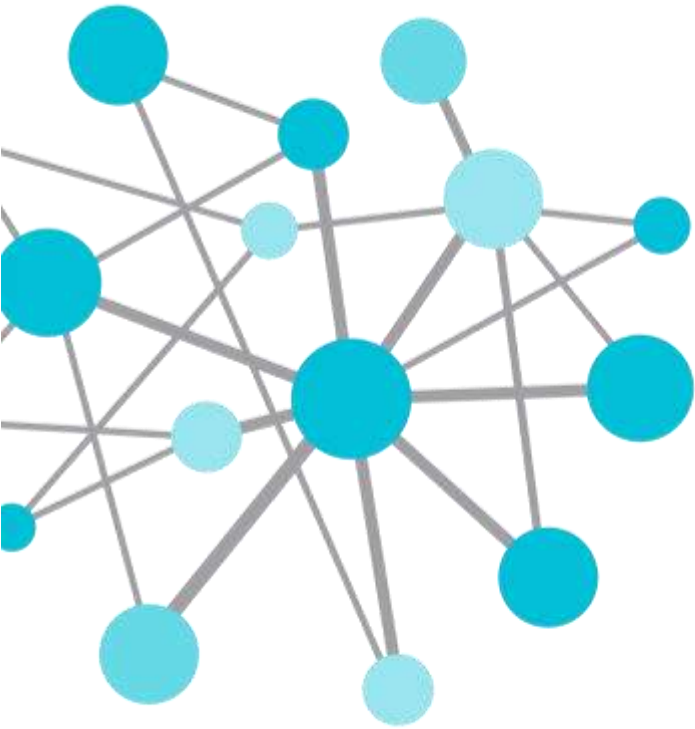
— 総セットポイント — 予想電力 — 個別の抑制を加味した予想電力 — 実際の総電力

エネルギー生産量が平均で30%、ピーク時には60%以上増加

OSIsoft “Power Of Data”

- コンテキストやヒストリーを含む全データをリアルタイムに活用
- 意思決定が
 - よりスピーディーに
 - より正確かつ完全に
 - より効果的に
- ナレッジを蓄積・強化
- 状況を認識し、今後を予測
- 実行スピードがアップ
- 組織の「一体感」を高め、活用





THANK
YOU

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