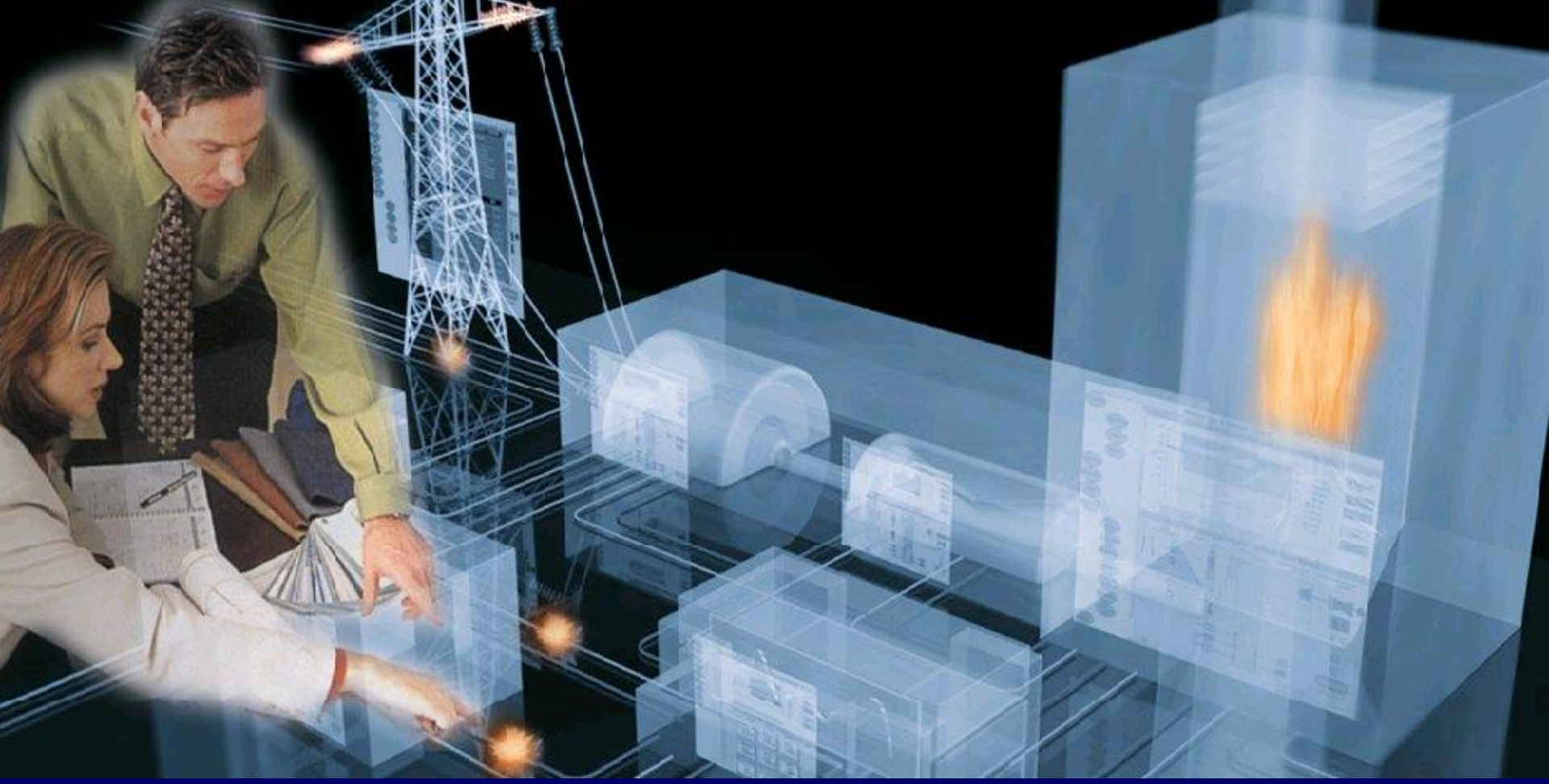

A Real-Time Enterprise Solution for Guohua Electric Power Corporation

SIEMENS

Agenda

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- Introduction: Guohua Electric Power Corporation
- Business Requirements
- The Business Solution:
  - Cockpit by Siemens:
    supporting Fleet Generation Management
- Solution Modules
  - Cost Forecasting
  - Capability Forecasting
  - Extensions based on OSIsoft‘s PI system
- A Closer Look
- Achievements

Guohua Electric Power Corporation

Power Plant Locations

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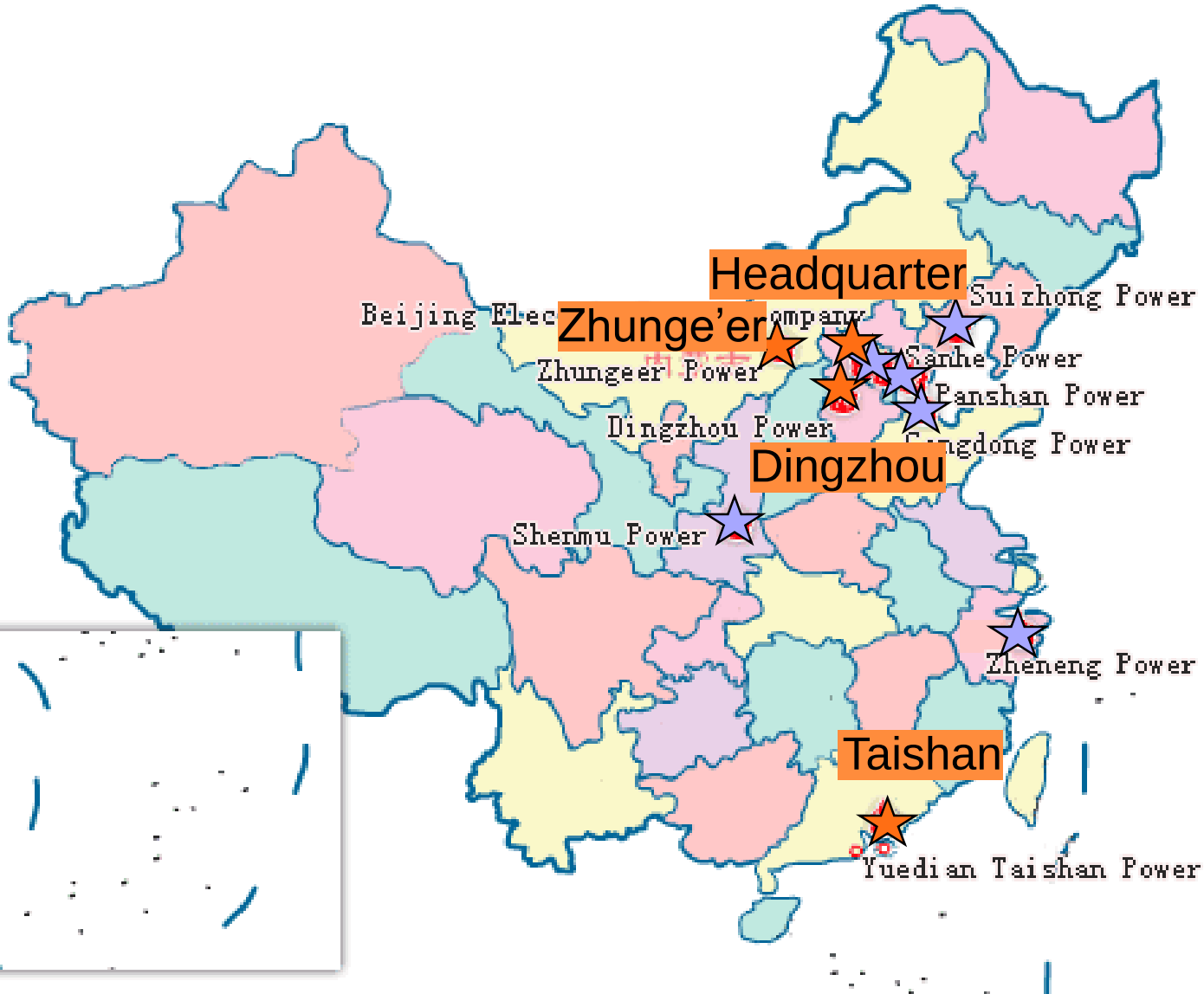

Power Plant Location

Current IT Solution Projects

Guohua Electric Power Corporation

Current Power IT Solution Projects

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Location:	**Xuejiawan Town, Erdos, Inner Mongolia, China**	**Tongluowan, Taishan City Guangdong Province**	**Kaiyuan Town, Dingzhou City Hebei Province**
Plant:	**2 x 330 MW, coal-fired**	**8 x 600MW, coal-fired planned**	**2 x 660MW, coal-fired**
Schedule:	**in operation since April 2002**	**First units in operation since Feb. 2004**	**First units in operation planned for June 2004**

Guohua Electric Power Corporation

Requirements for Enterprise Solutions

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Business Targets:

- Preparation for competitive Chinese power market
- Optimal quality of the product “electricity” for usage in strategic marketing

Requirements

- Optimized technical, operative and strategic functions
- Transparency of technical and business processes

Zhunge'er Thermal Power Plant

Installed systems

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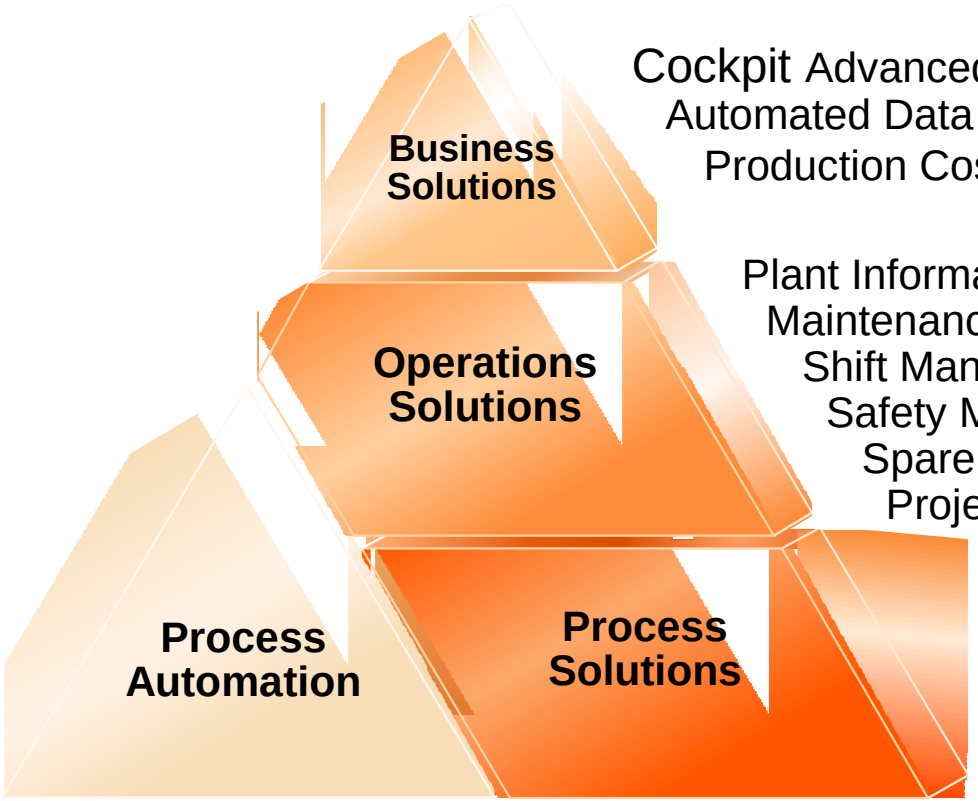
IT Solutions in Zhunge'er



Cockpit Advanced Management Information
Automated Data Exchange
Production Cost Prognosis

Plant Information Management.
Maintenance Management & Strategy
Shift Management
Safety Management
Spare Parts Management
Project & Outage Planning

Performance Monitoring/Optimization
Advanced Unit Control
Condensate Throttling
Temperature Control

A Real-Time Enterprise Solution for Fleet Generation Management

based on the Cockpit system by Siemens

Cockpit is the integrating component of the Siemens Fleet and Plant Management solution for the power generation industry.

Fleet Generation Management

Central Information Desk for Management

SIEMENS

Power Plant Operator(s)	Load Dispatcher	Trader	Exchange Manager	Maintenance Manager	Fleet Management	Risk Mgmt

business and job functions

In Market Availability	Load Capability	Production Costs	Energy Prices	Energy Commit-ments	Reserve Capacity	Plant Utilization

key business information

Historical Information

Real Time

Forecasts & Plans

Calculation engine

Process data	Maintenance Management	Trading Operations	Fuels Management	Plant Diagnostics	Environmental Management	Dispatching Information

data sources

Fleet Generation Management
Cockpit – Information Integration

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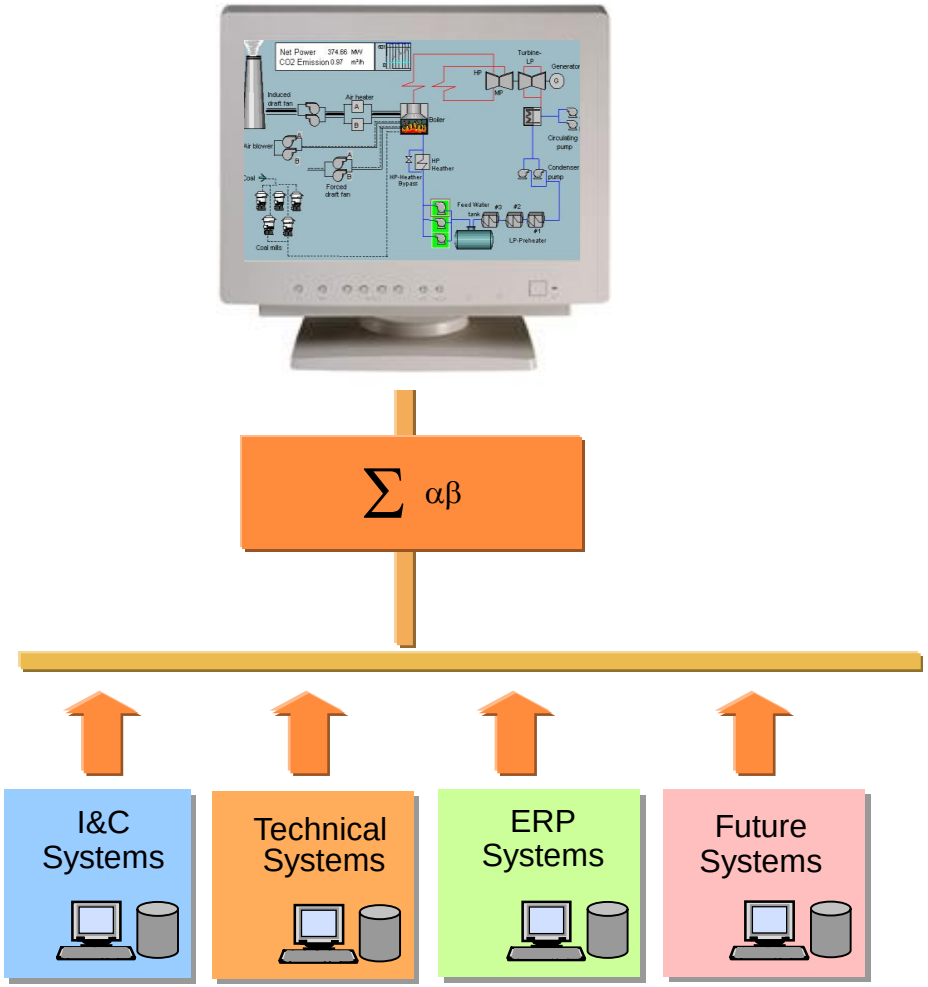
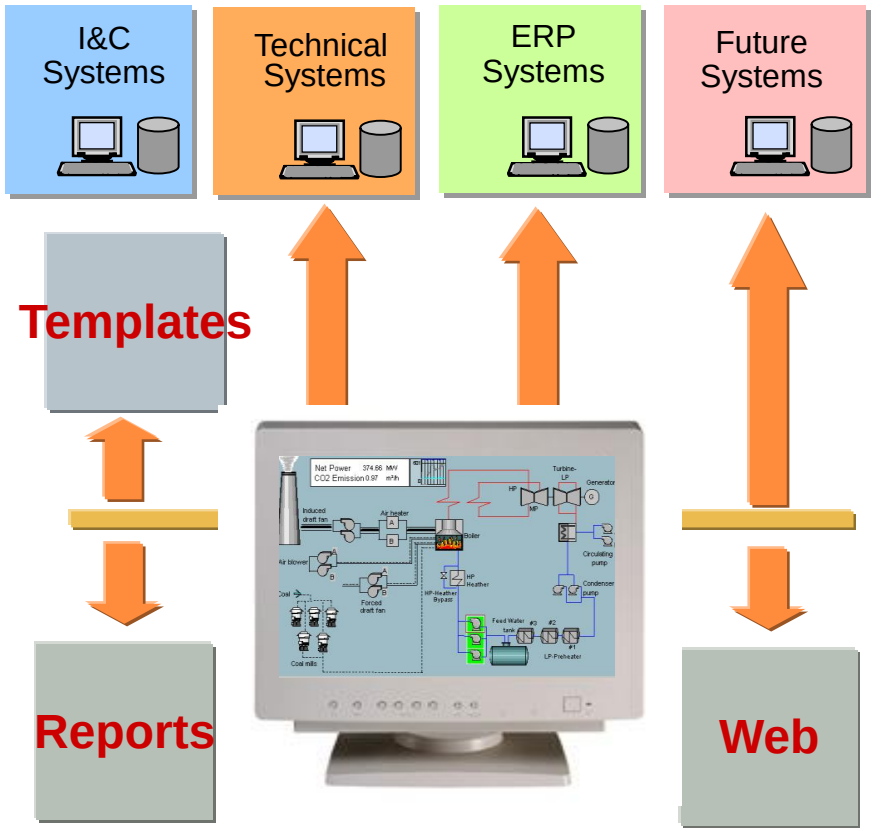


- **Presentation of data**
  user friendly on one screen
- **Aggregation of data**
  to information
- **Collection of data**
  from all connected sources

Fleet Generation Management
Cockpit – Navigation

SIEMENS



- **Navigation center as single entry point for all information**
- **Navigation to all information on your fingertips**

Fleet Generation Management

Cockpit – Time Synchronization

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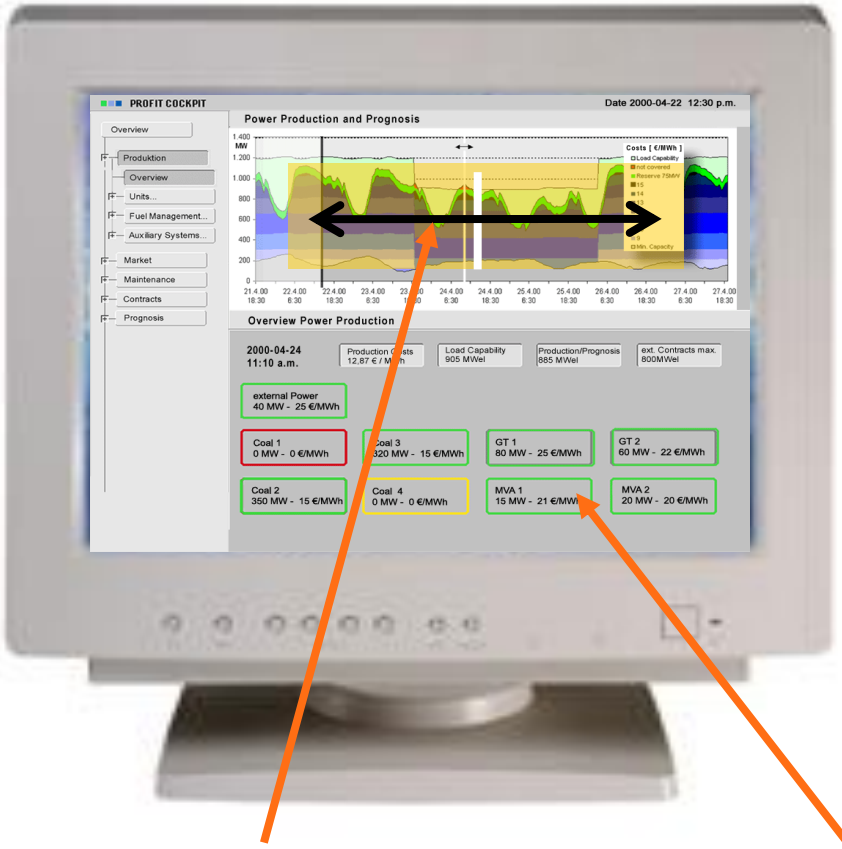

- **Synchronization of all data elements to given point in time**

Pick the time and find your answers

Fleet Generation Management

Cockpit - Architecture Principles

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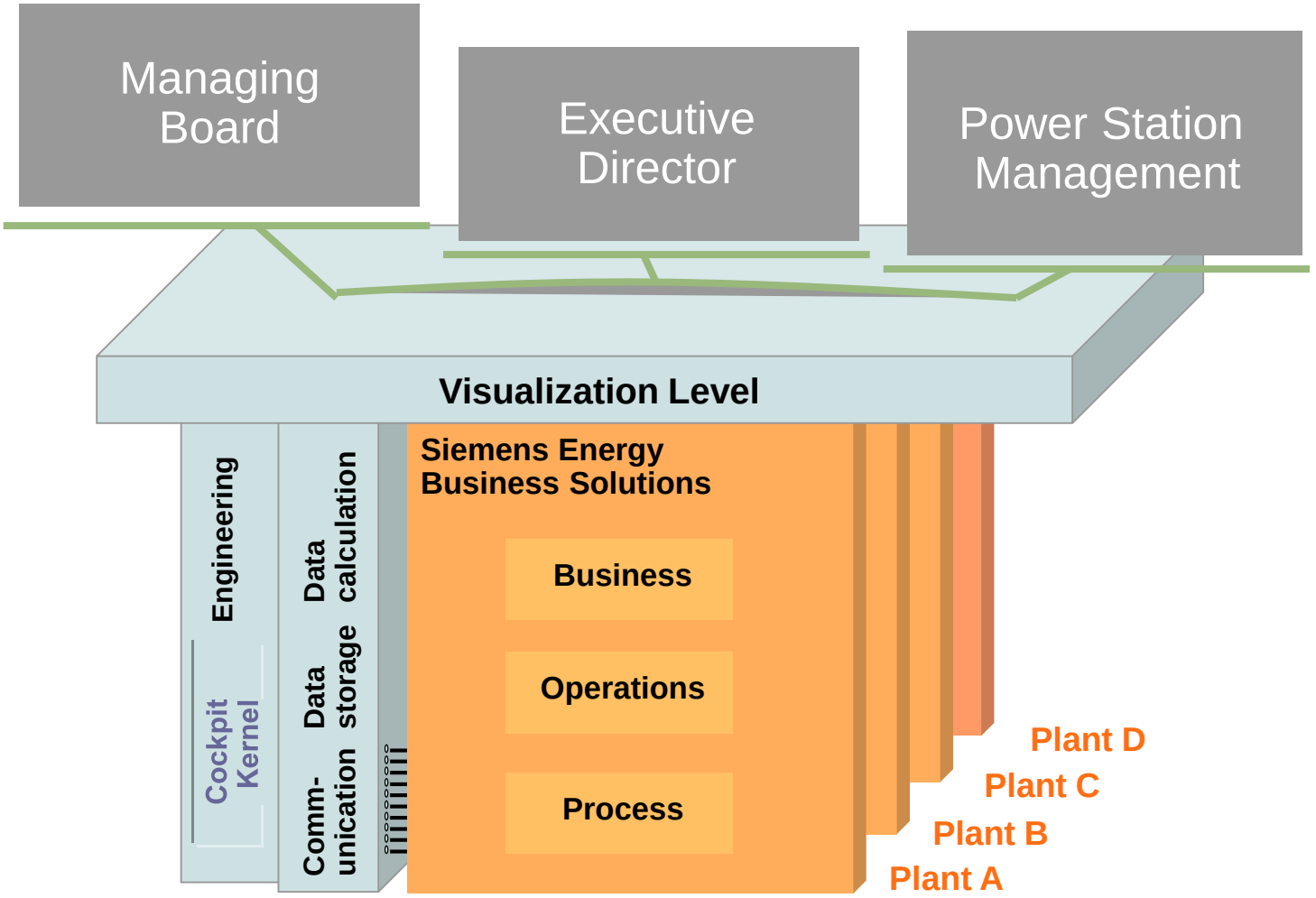
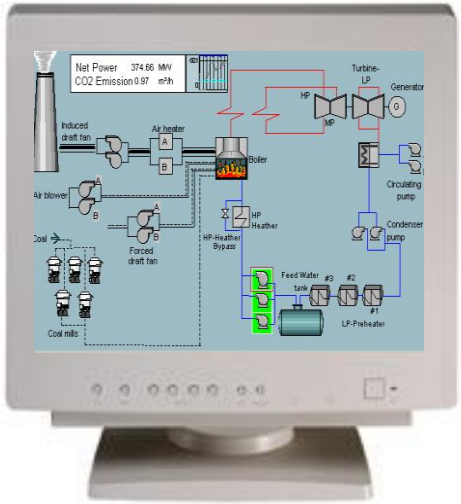


Embedded Calculation Engine



- **Calculation Modules**
  - Basic mathematical functions
  - Accumulation functions
  - Load capability forecast
  - Production cost forecast
  - Load allocation
- **Data Exchange Functions**
  - Mail in / out
  - File read from / save to
  - Copy to databases

Fleet Generation Management

Module: Production Cost Forecasting

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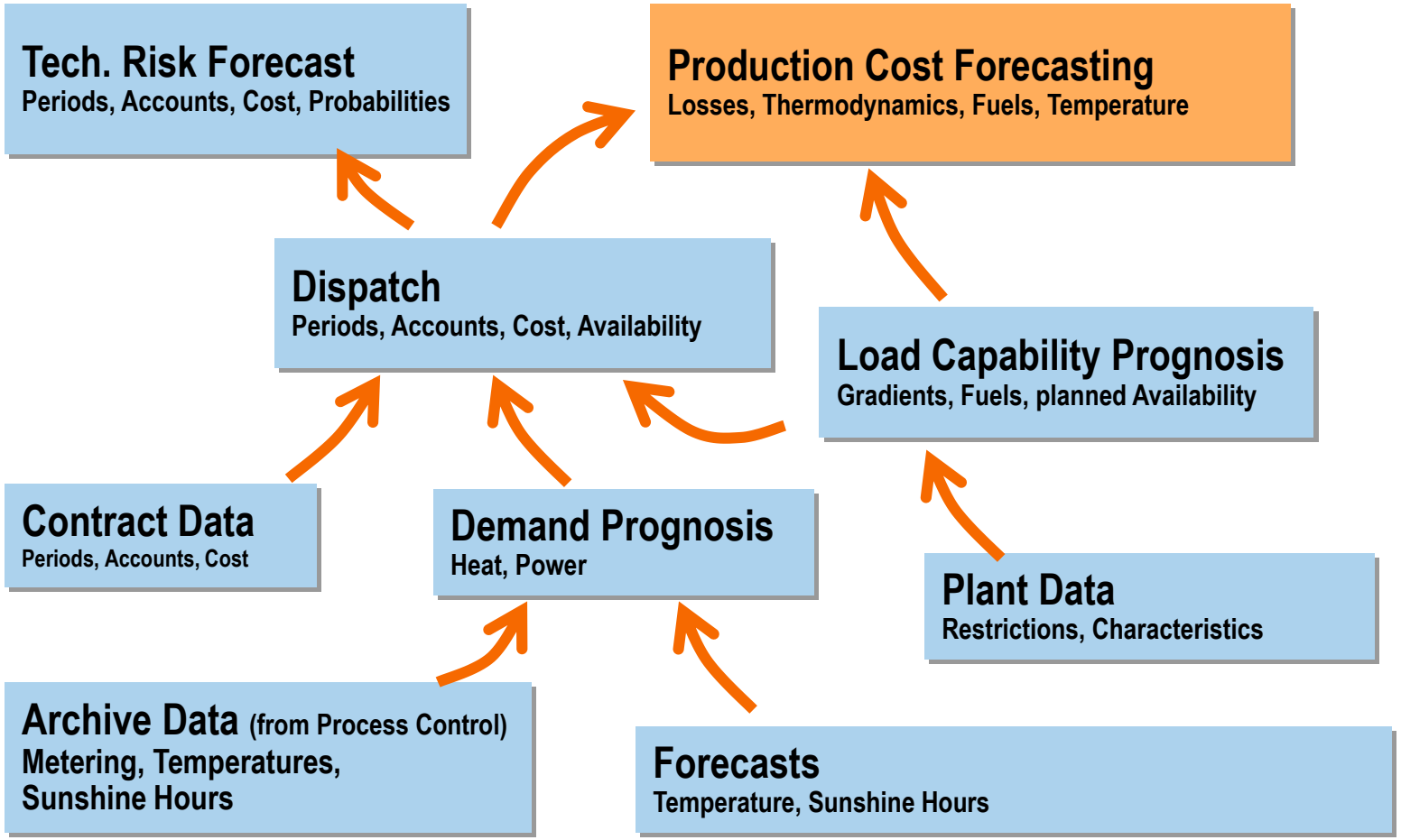

Fleet Generation Management

Module: Production Cost Forecasting with Thermodynamic Models

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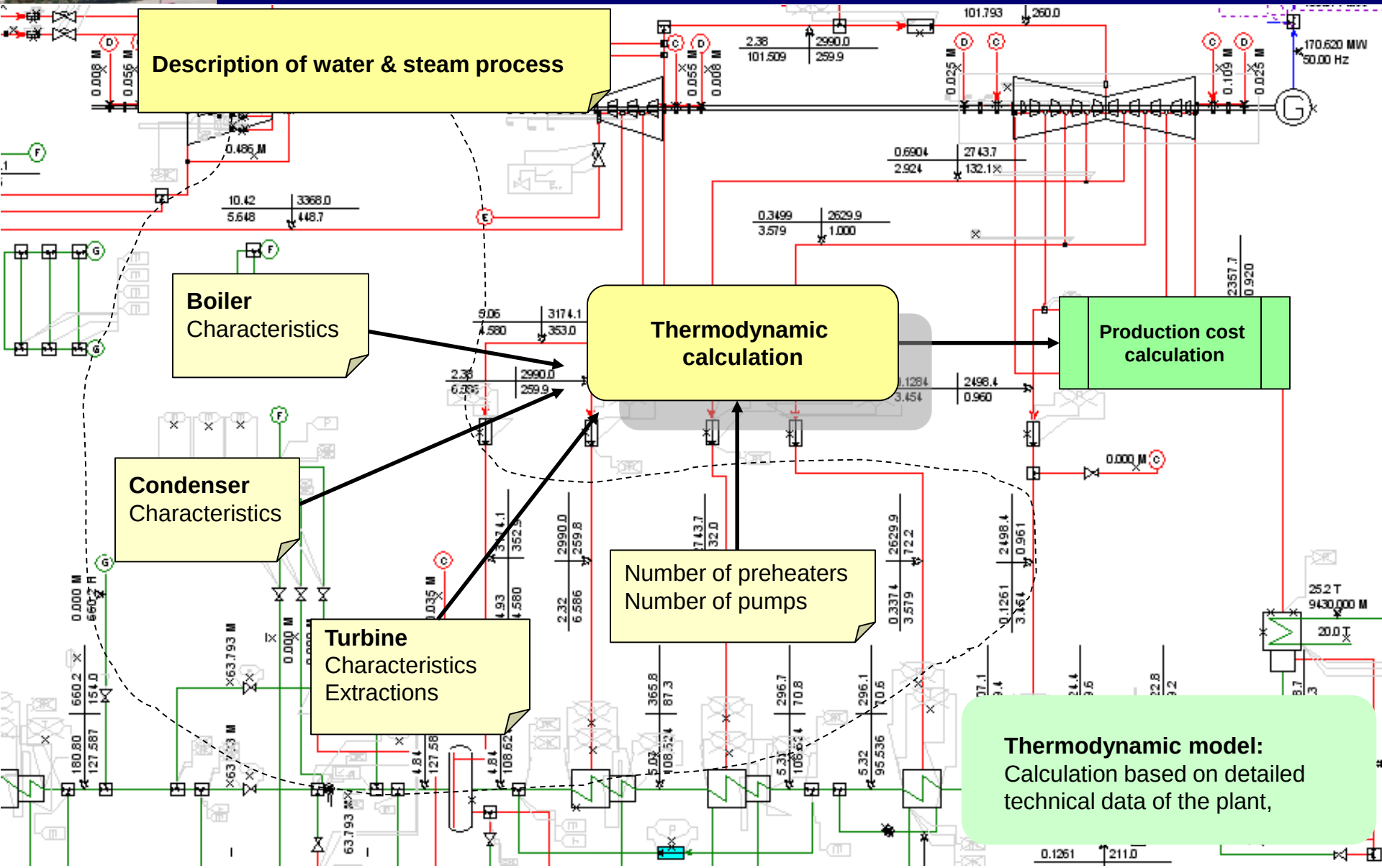

Fleet Generation Management

Module: Load Capability Forecasting

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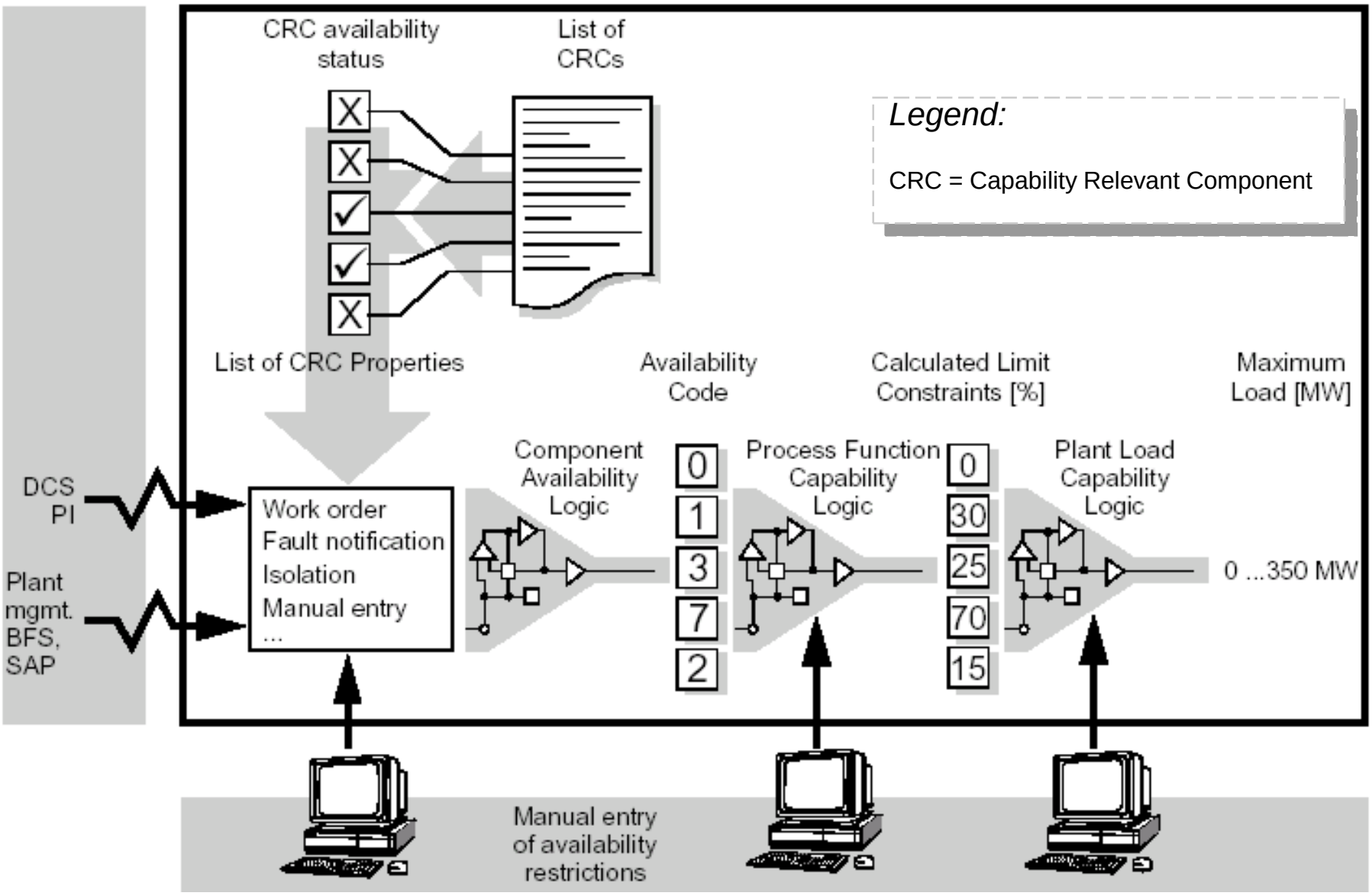

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WHAT DOES THIS HAVE TO DO WITH OSIsoft PI?

Cockpit is based on PI

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Main Extensions by Siemens:

1. **Time-Series Management** incl. Quality Tag
2. **Future data** for planning scenarios
3. **Plant model templates** in MDB
4. **Object structure** for recursive processing of functions
5. **Drill down** information with new display features
6. **Navigation** into correct position in connected application
7. **Integration** with plant maintenance data

OSIsoft PI as basic platform mainly using:

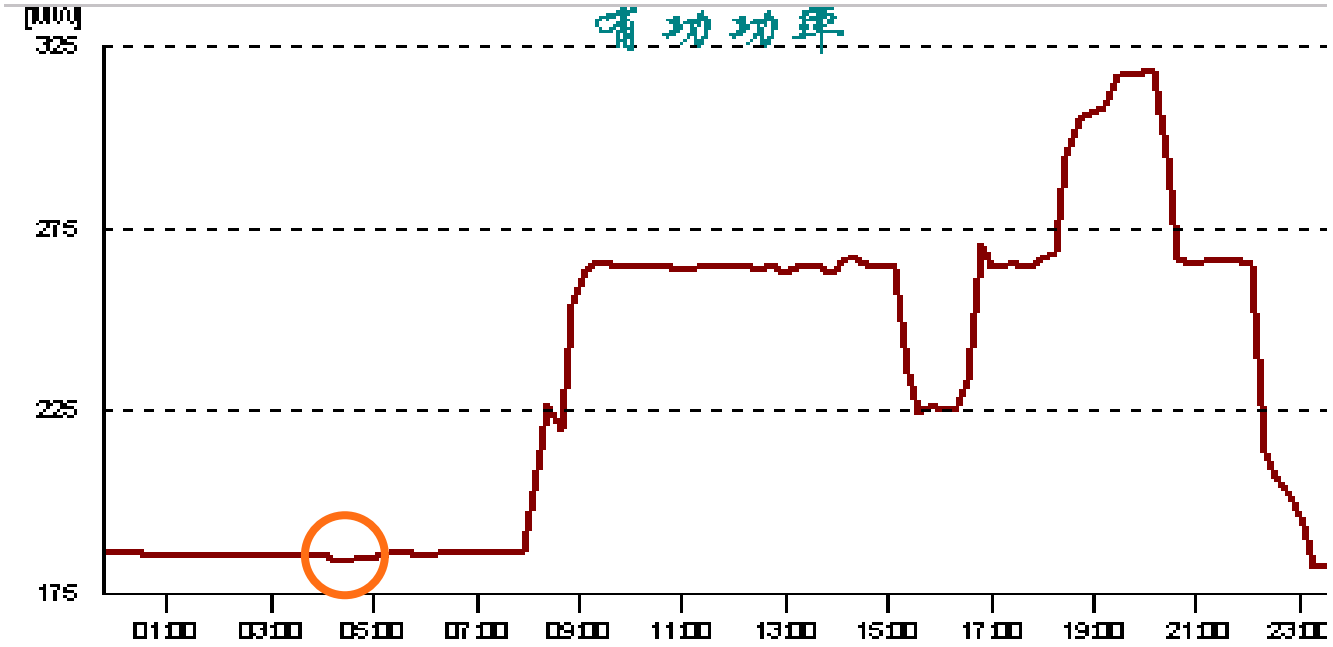
- Interfaces
- Graphical editor
- Object-oriented modeling with Module Database (MDB)
- Scheduled function calls with Advanced Computing Engine (ACE)

Extension for Time Series Management

SIEMENS

Mainly needed for scheduled data

Showing load schedules or forecasted loads / emissions / production costs



Calculation of time series data –

needs **Time series properties**

- **First data point** **(yesterday 2:00 pm)**
- **Time range** **(2 days)**
- **Interval between individual points** **(15 min)**

Log Tag Information for Time Series Calculations

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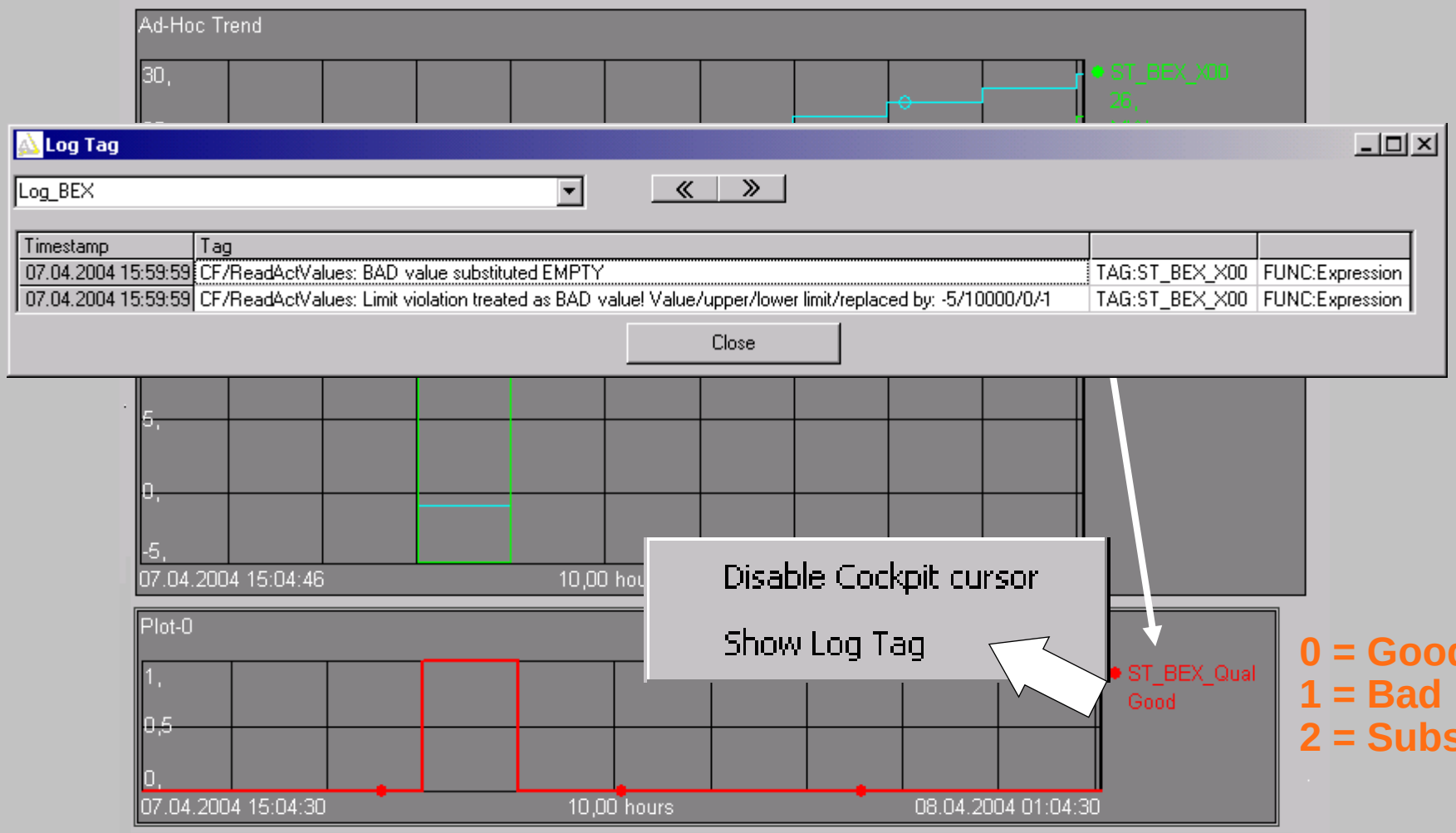

0 = Good
1 = Bad
2 = Subst.

Object structure

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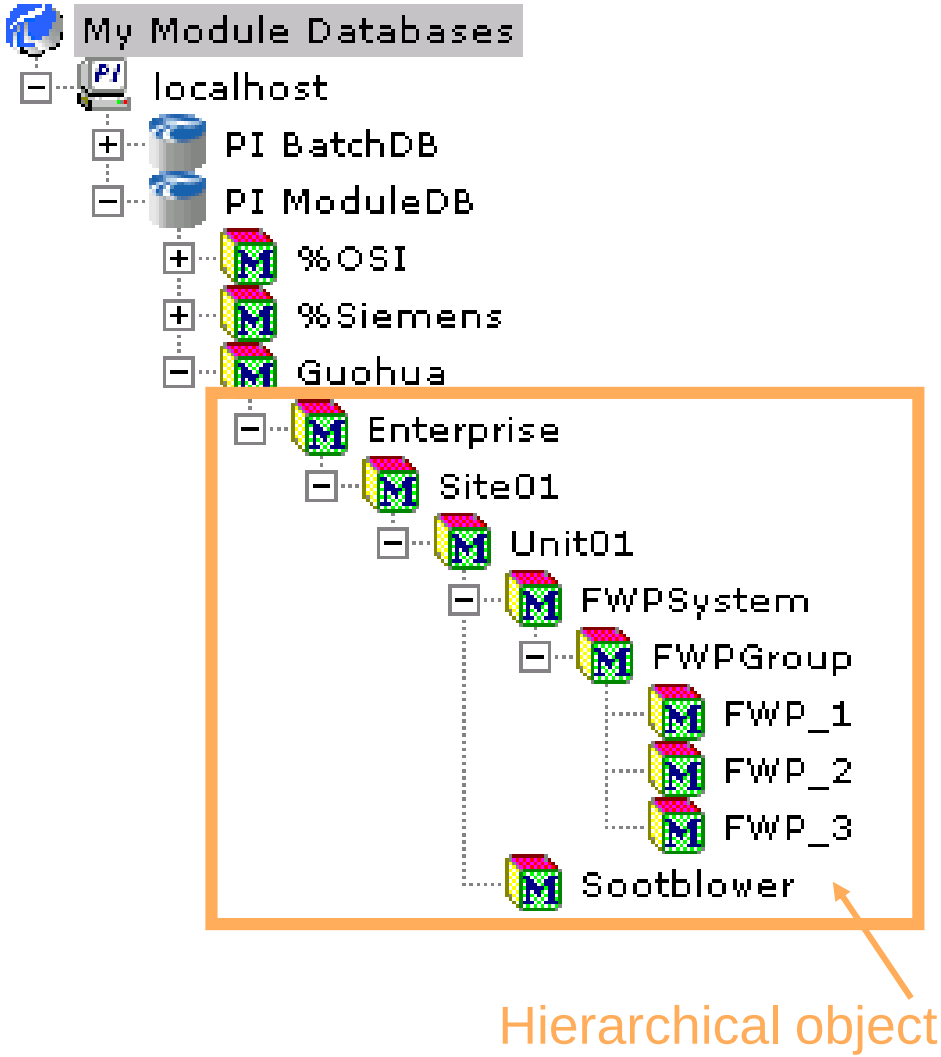


The structure for a plant will be delivered as template

- embedded in the MDB basic structure

- to be copied, completed and parameterized while project engineering

Hierarchical object structure

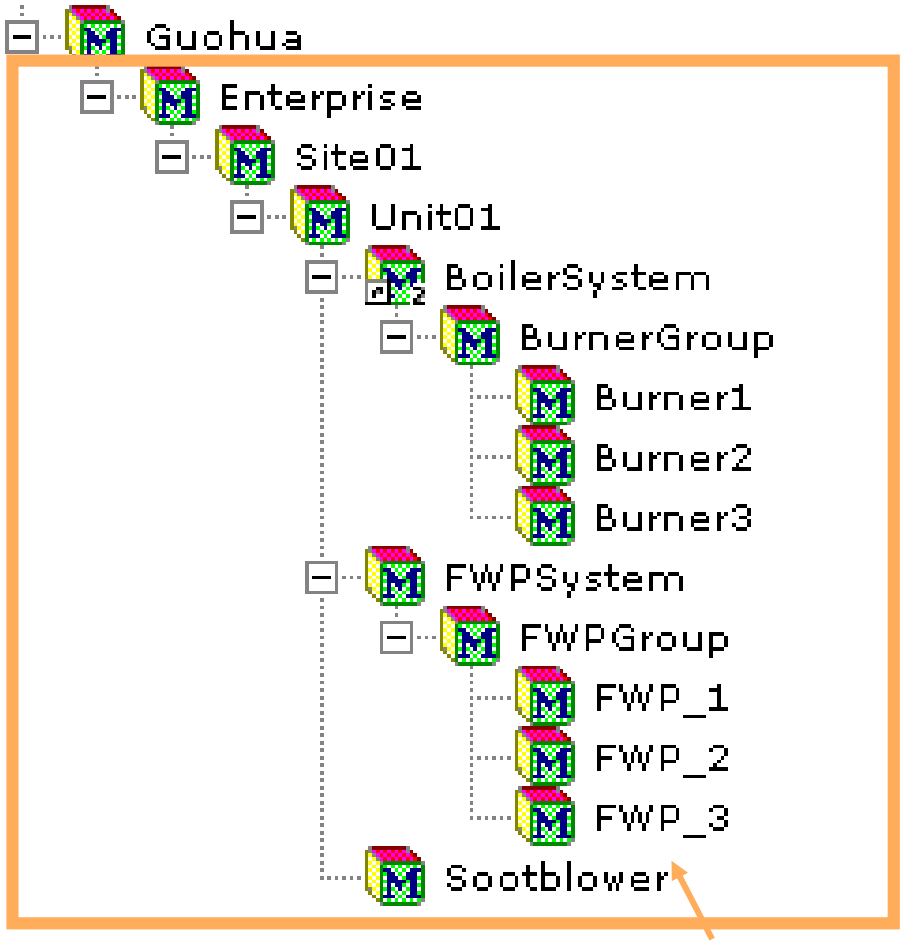
Object structure

SIEMENS

The structure for a plant will be delivered as template

- embedded in the MDB basic structure

- to be copied, completed and parameterized while project engineering



Hierarchical object structure

Visualization Extension

Combing process and maintenance

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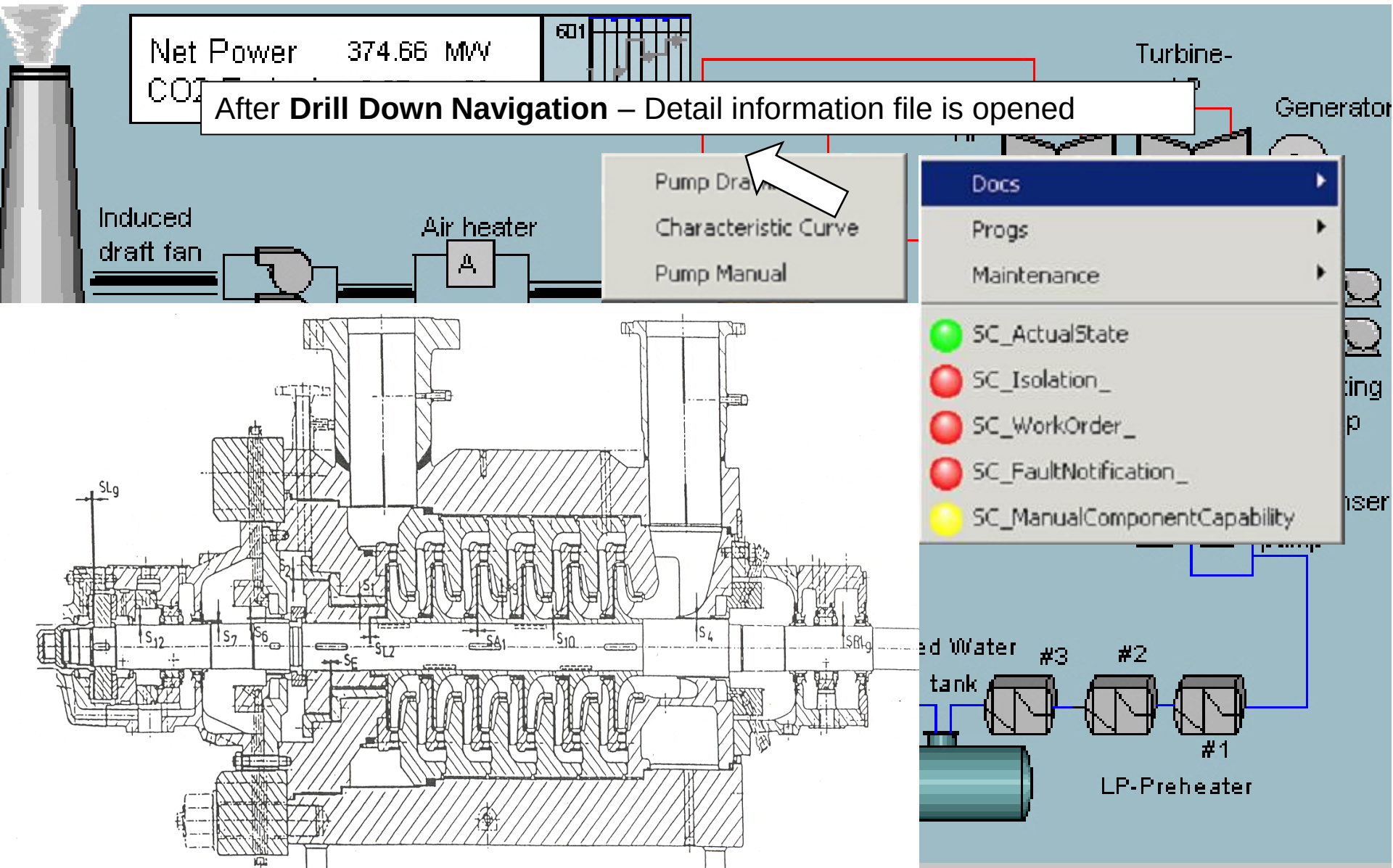

Visualization Extension

Context-related detail information (drill-down)

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BFS++ Test Environment - [Work Order]

File Edit Record Menu View Extra Window ?

Plant WO FN

Find | Table | Work Order | **Work order item** | Costs | Tool | Requisition item | Staff | Permits

WO-No 63 1999 Version WO-Type Individual order Status 9 Site DEMO

Item	Work	Status	Plant item code	Class	Equipm.	Cra
205	Cleaning/Servicing the filter elements	20	10MAV91AT001	Apparatus		TE(
207	Check for any blockage of pipe and service.	20	00PAA10AN001	Machine Set		TE(
208	Calibration of Chopper Pump Gauge. ...	20	10PAA10AT001	Apparatus		TE(
218	Open/service the top cylinder .	20	00SGA11AP001	Machine Set		TE(
221	Open/inspect to find out cause of low outlet pr...	20	00SGA11AP001	Machine Set		TE(
225	1)Cleaning/Servicing of the filter. 2)T...	20	10LAC12AT021	Apparatus	8579	TE(
228	Replacing damaged gasket of Ball valve of Ch...	20	00PAA	Piping System		TE(

Prepared | Permit to work | In progress | Completed | Close out

Dates

Time sector Next outage

Plan dates: Start 01.03.1999 End 01.03.1999

Reference point / Delta

Act. dates: Start 27.02.1999 End 05.03.1999

Outst. Delivery | Isolation... | Reports... | Instructions... | Characterist... | Note...

Effort [hrs]: Plan. effort 4,0

Cost: Calculated 140,00

Material provision

LOP 0 / 0 Not-No

Docs | Progs | Maintenance

SC_ActualState

SC_Isolation_

SC_WorkOrder

SC_FaultNotificat...

SC_ManualComponentCapability

Turbine- LP HP Generator G

Feed Water tank #3 #2 #1 LP-Preheater

Coal mills

After selecting Work order in the **Drill Down Navigation menu** the program navigates into the maintenance program directly to the concerned input/information mask

Cockpit for GHEPC

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POTENTIAL EXTENSIONS:

(Already implemented by Siemens for North American generators)

Key Performance Indicators for In-Market Availability

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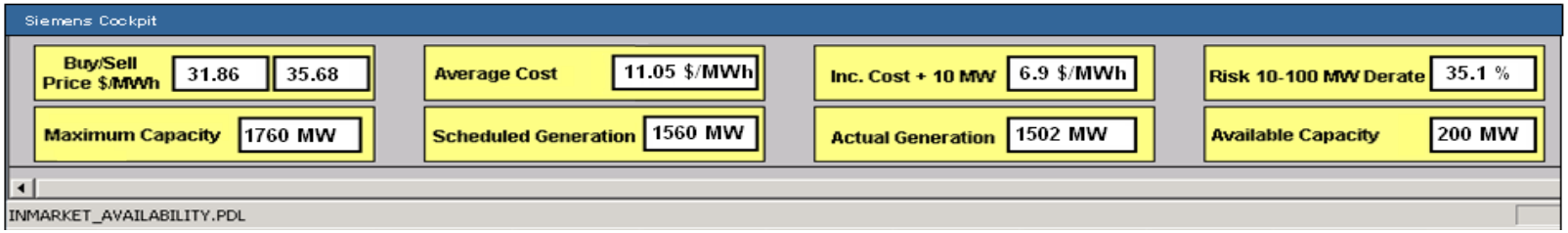

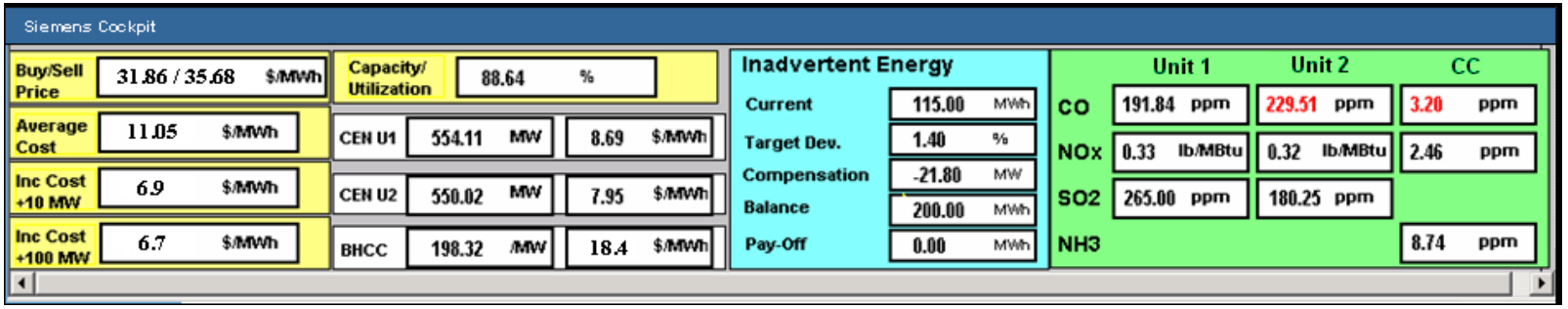

Cockpit for GHEPC

Key Performance Indicators for In-Market Availability

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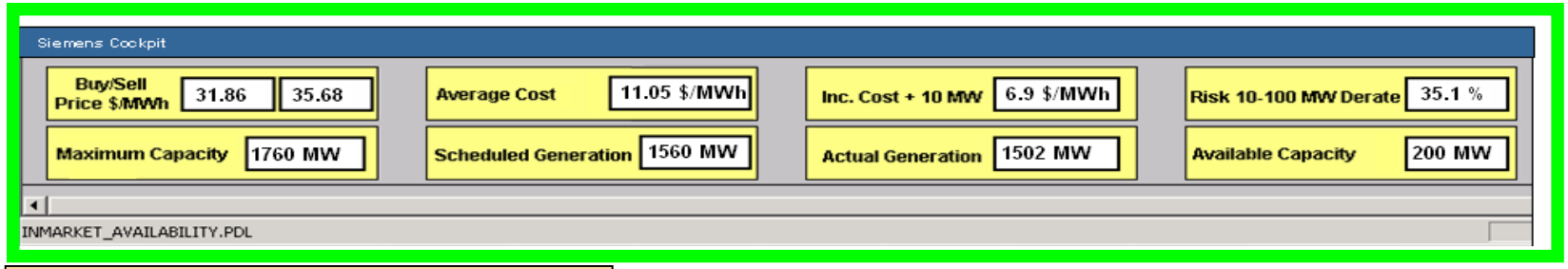
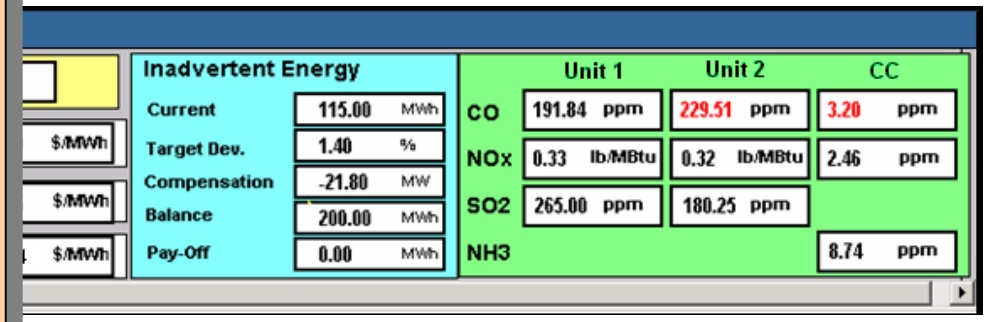


Plant In Market Availability:

**Market prices,
average, incremental costs,
risk of de-rate,
committed and left over
capacity define the in market
availability of the plant.**



Key Performance Indicators for In-Market Availability

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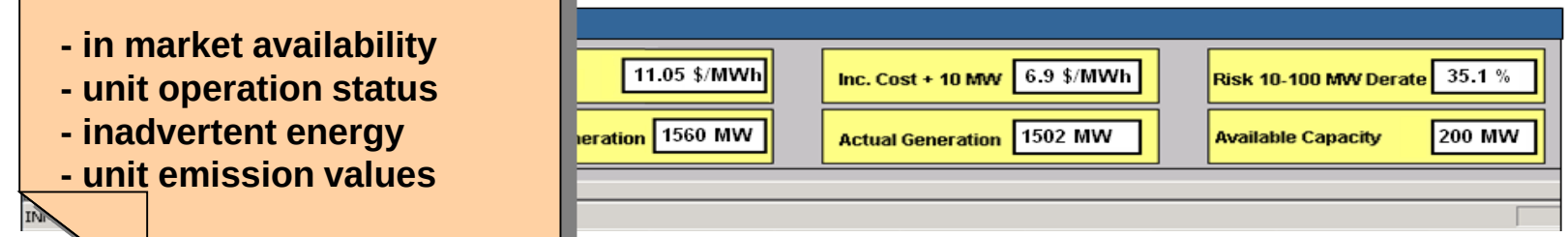
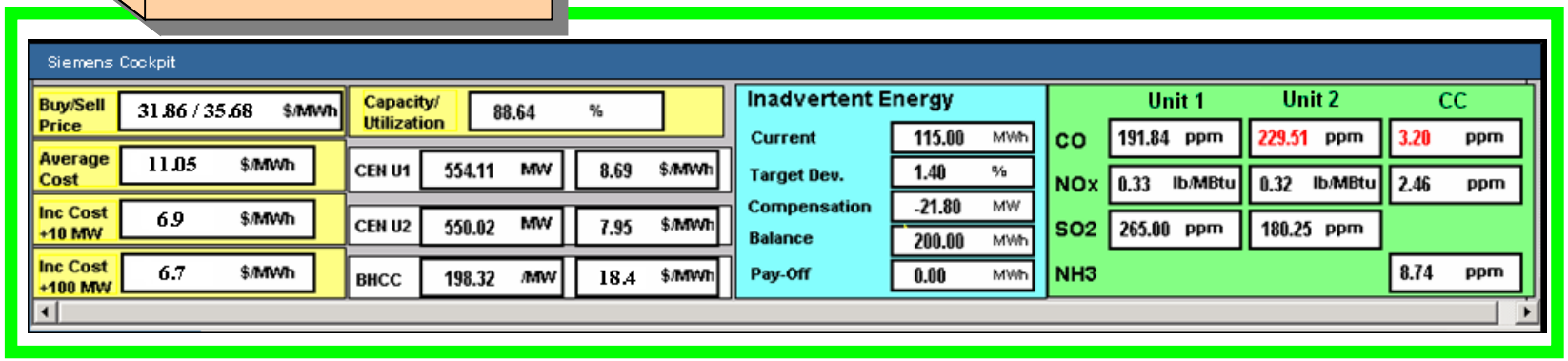
Plant Operation Overview:

Commercial and technical performance

- **in market availability**
- **unit operation status**
- **inadvertent energy**
- **unit emission values**





Cockpit for GHEPC

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CUSTOMER BENEFITS AND OPINIONS

Benefits

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Business	Fit for Future Market Conditions	Flexible reaction to market changes Rapid decision making
Plant	Modern Plant Maintenance Management	Automatic generation of work orders Adequate maintenance strategy Control over stock of spare parts
Process	Improved Plant Operation	High flexibility Dynamic optimization using online models

WHAT HAS THE CUSTOMER ACHIEVED?

"All requirements for competitive markets fulfilled"

"Best starting position for future market liberalization"

"Optimized production and maintenance"

Contacts

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