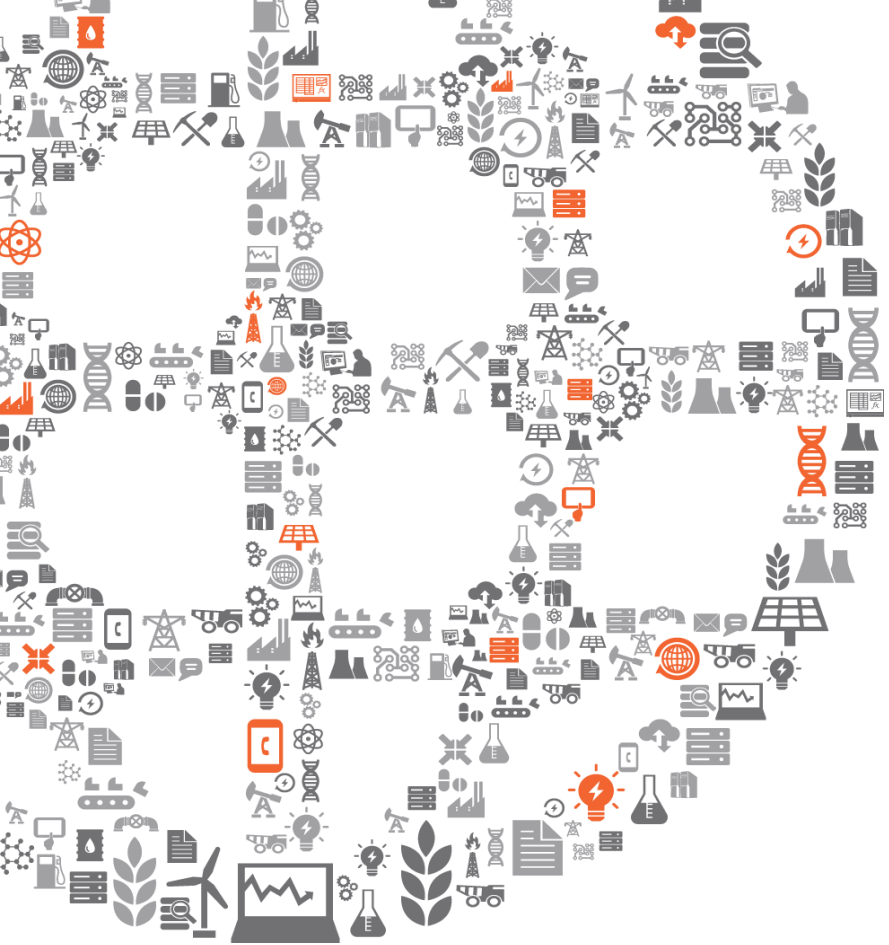
Implementation of PI System in ČEZ

Presented by **Martin ZECHOVSKÝ**

Agenda

- Introducing Czech Power Company CEZ
- Project CUTD



Czech Power Company CEZ

About CEZ Group

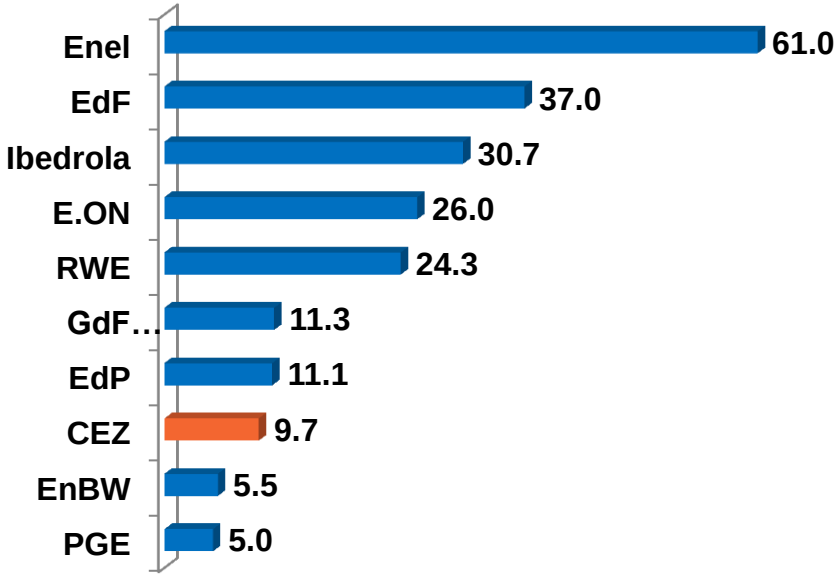
- 1992 ČEZ a.s. founded by the National Property Fund
- 2003 Created CEZ Group
- 2005 Foreign expansion started, three distribution companies in Bulgaria
- 2012 Commissioning of the 600 MW wind farm in Constanta Country

CEZ Group in Europe – 112 companies

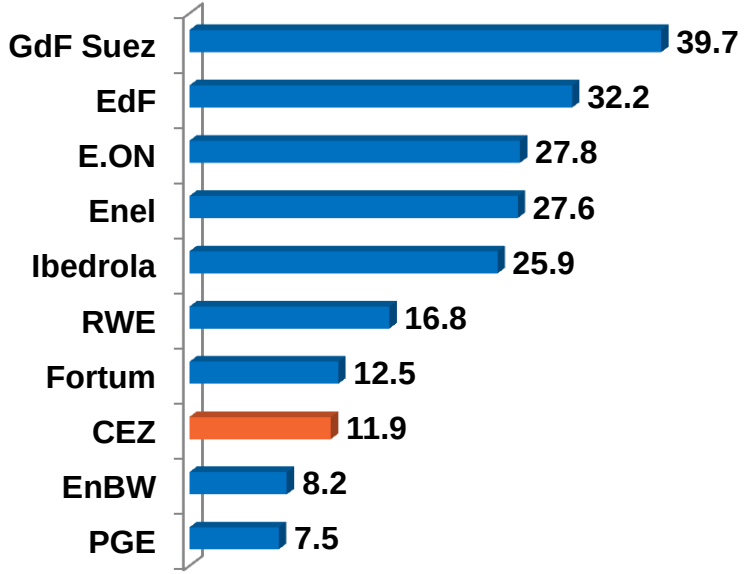
- *Energy activity*
- *Business activity*
- *Country conditional interest*
- *Active subsidiary companies*

10 larges energy companies in Europe

10 Largest energy companies in Europe
Number of customers in 2011, in millions



10 Largest energy companies in Europe
Market capitalization in € bn as of May 2013



CEZ Power plants in Czech Republic

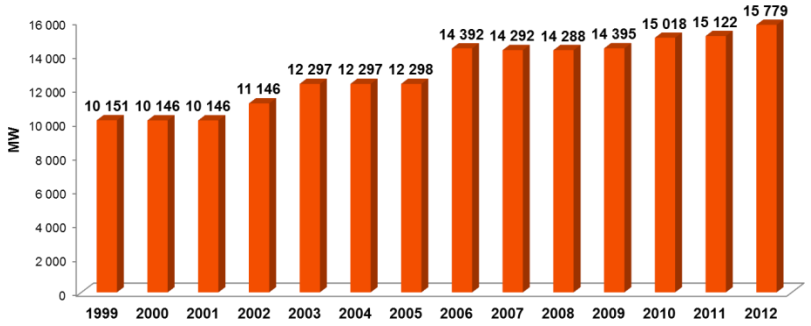
- Nuclear
- Hydro
- Pumpe storage
- Brown Coal-fired
- Biomass
- Heating plant
- Black Coal
- Wind
- Solar
- Black coal and coke oven gas
- CCGT

Ownership ČEZ, a.s.

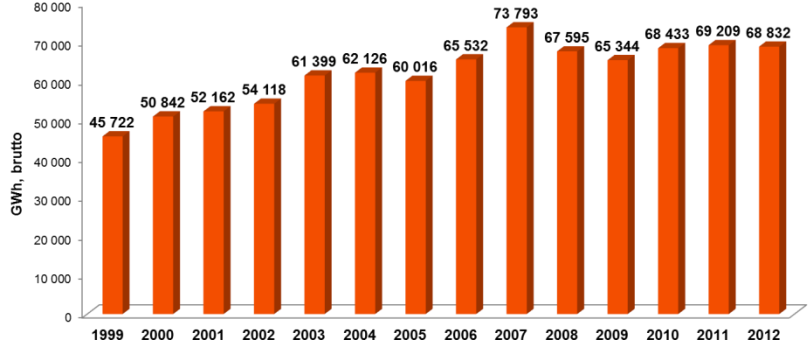
Ownership of another member ČEZ Group

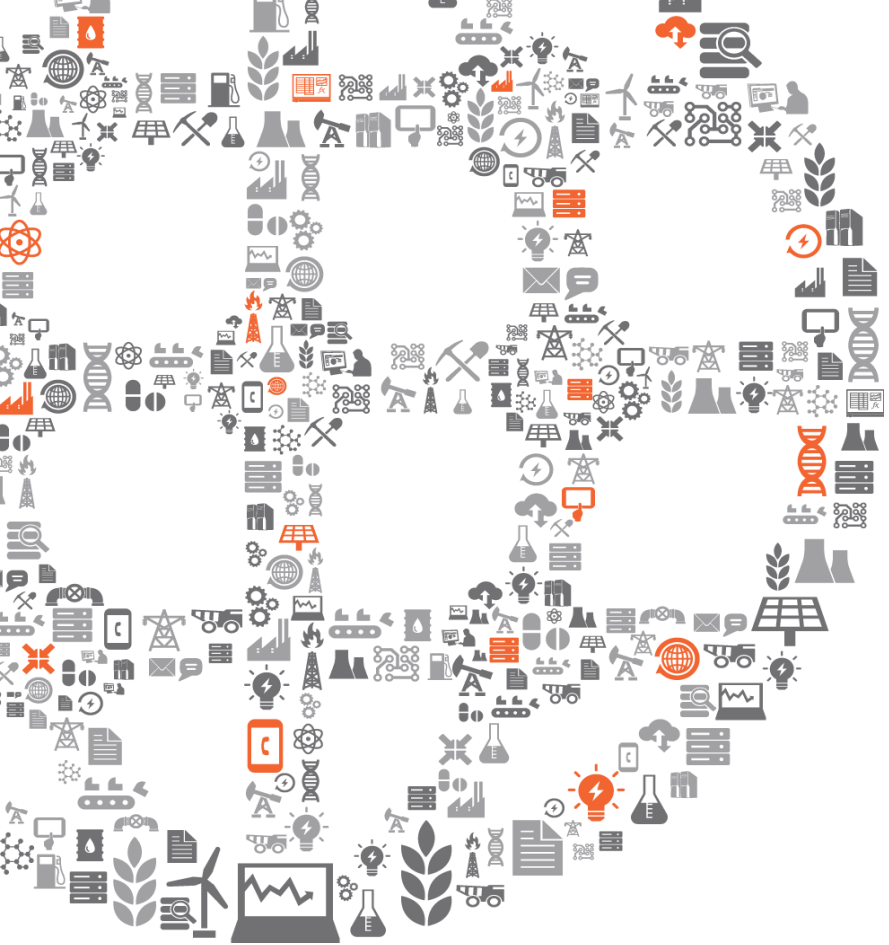
CEZ in Czech Republic

Installed capacity



Production of electricity



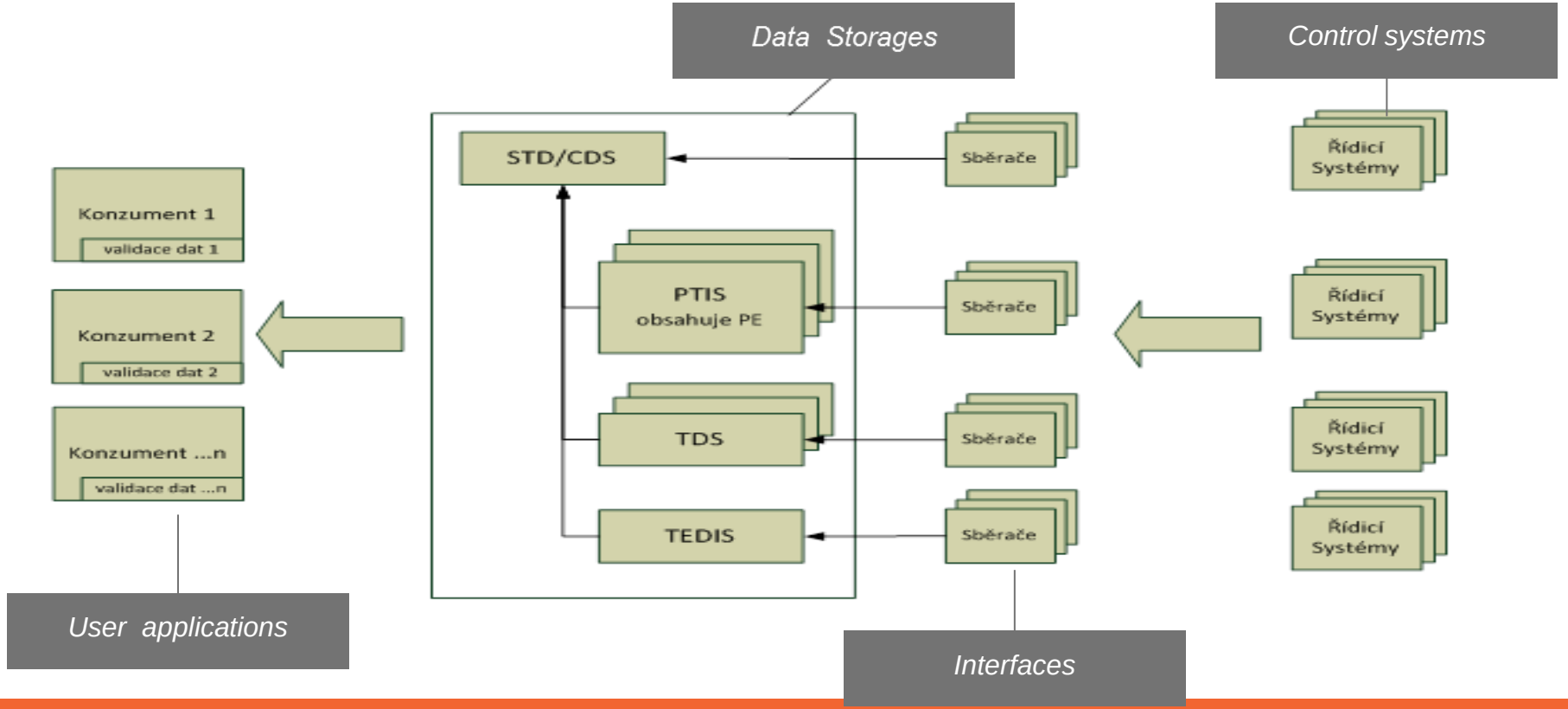


Project CUTD

Project CUTD

- Baseline
- Selecting a solution
- PI System implementation
- Current status and first experience
- Expected benefits and advantages

Baseline



Technical requirements for new solution

- Data collection
- Data processing
- Long term data storage
- Provision of Data
- General requirements for the system
- System Security
- Integration of the surrounding systems
- Connection to centrally manage access roles
- Infrastructure requirements

method of collection, storage, work with data…

calculations, time slices, export data…

identification data structure, data history, creating groups of data…

unified interface, report generation ...

centralized solution respecting standards ČEZ ICT Services, buffering ...

Administration access, logging, auditing, ...

Selecting a solution

- Technical requirements
  - Detailed technical evaluation
  - Ready-to-use product or custom development

- Reference visits

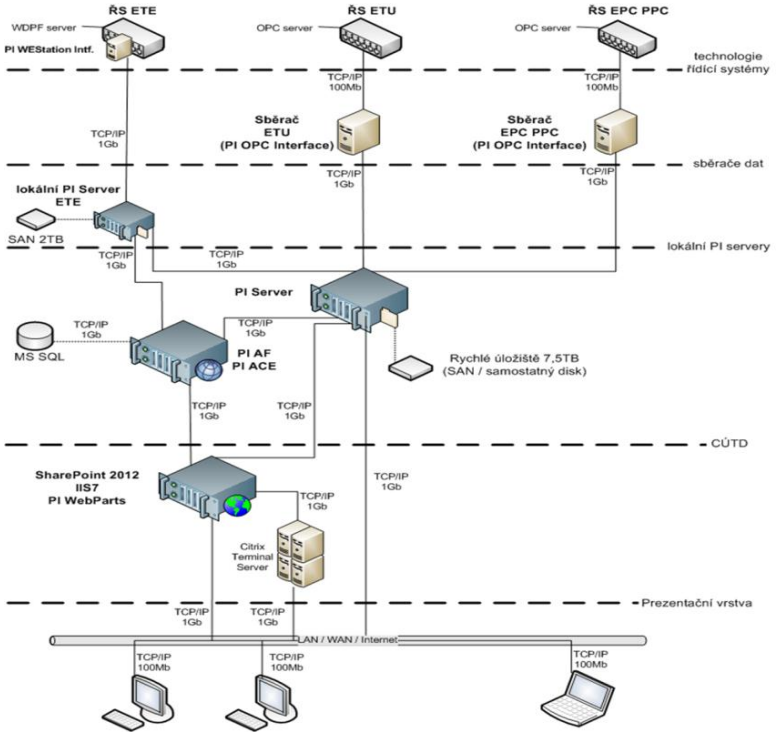
EDP	Portugal
Ibedrola	Spain
Mondi Štětí	Czech Republic
Lovochemie Lovosice	Czech Republic

Implementation of the PI environment

- **Phase I** — Implementation of preparatory work, the creation of the project schedule
- **Phase II** — Implementation of test and production environment for pilot plants
- **Phase III** — Implementation environment for other plants, data migration of all data storages to CÚTD
- **Phase IV** — Support for other projects providing links to applications CUTD
- **Phase V** — Solution acceptance

Solution architecture

- Local PI Servers
  - For the key assets
  - NPP's Temelin and Dukovany
- Central PI Server
  - For the thermal plants and hydro
  - Collects data from NPP's
  - 100.000 tags currently

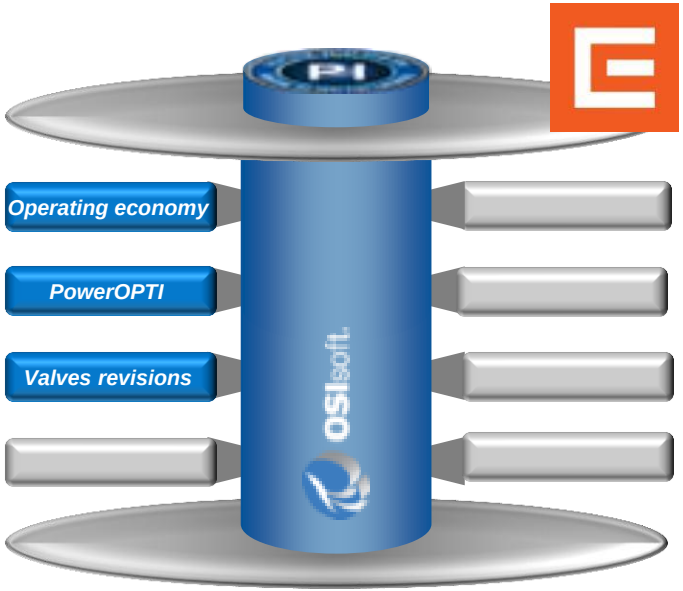


Current status and first experience

- Connecting of power plants
  - ETU, ETE, CC EPC – pilot
  - EPR, EPO, EPC - rollout
- Challenges to address
  - Understand what's where
  - Prepare the IT environment to start collecting data
- Testing, tuning

New applications

- In progress
  - Operating economy
  - PowerOPTI
  - Valves revisions
- Upcoming
  - Chemical laboratories
  - Turbine condition monitoring
  - Vibrations



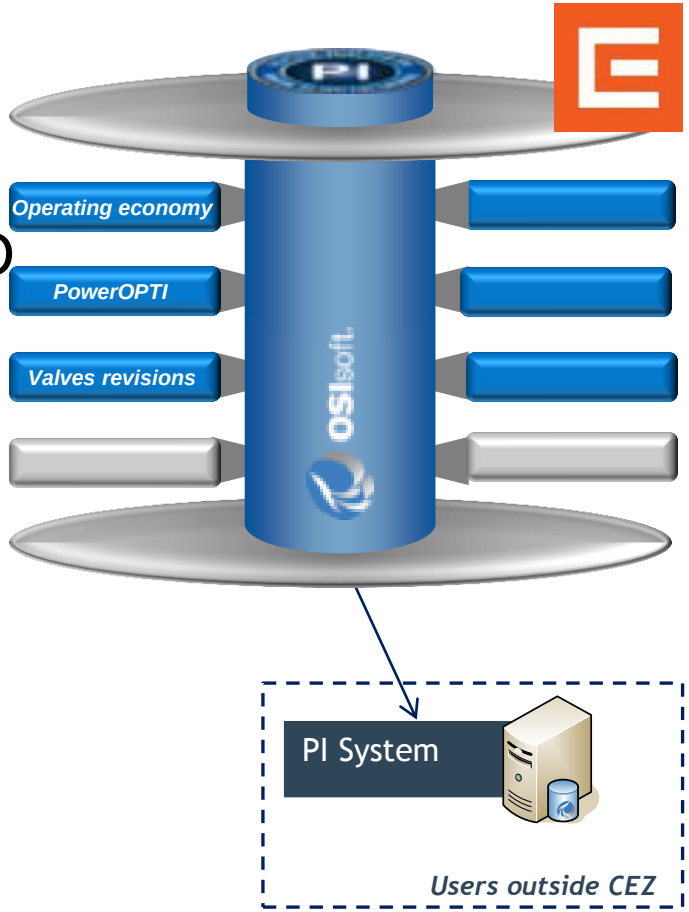
Expected benefits and advantages

- Technical advantages
  - unification methods of collecting
  - unification data sharing
  - reducing access request directly to the control systems

- Economic benefit
  - lower cost for manage applications
  - lower infrastructure costs

Future plans

- More applications on top of the CUTD
- More data
  - PI Servers extensions
- Robustness
  - HA
- More users
  - PVS
- Access for equipment vendors



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THANK YOU

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I & C Energo

PI Implementation
&
SW Solutions

Presented by **Petr HOŘENÍ**

Agenda

- I & C Energo, OSIsoft partner - introduction
- PI implementation in ČEZ
- PI based software solutions
  - Operating Economy - operation efficiency evaluation
  - PowerOPTI - operation efficiency optimization

I & C Energo - Introduction

I & C Energo (since 1993)

- An engineering and supplier organization providing services in the field of I&C systems, electric systems a information systems for power generation, power distribution and other industries
- Main offices in Czech Republic and Slovakia, projects worldwide

Selected indicators

- Approx. 1300 employees
- 2011 revenues > 100 mil. EUR
- 2011 EBIT > 10 mil. EUR

Main products

- Capital projects
- Service (nuclear, industrial)
- **Power Production Optimization**

Power Production Optimization Division

OSIsoft Partner since 2011

OUR CUSTOMERS ARE:

- Power plants:
  - Nuclear
  - Coal-fired
  - Combined cycle
  - Renewable energy sources
- Heating plants and heat supply systems
- Industry

WE DELIVER TO OUR CUSTOMERS:

- Process and technology analyses; Advanced data processing; Process modeling and simulation
- Software solutions; Data warehouses; Diagnostics and optimization systems; Special instrumentation
- Information systems; SCADA systems; Control systems
- Software and hardware integration and consolidation
- Complex deliveries

PI Implementation in ČEZ

Should-Be Analysis

- 2011 - Comprehensive comparison of
  - Oracle based in-house solution
  - WonderWare historian
  - **OSIsoft PI**

Implementation

- 2012 – 2013 (presented by Martin Zechovský)
- Mainly OPC, RDBMS and UFL Interfaces
- New WDPF interface (NPP Temelín)

Integration

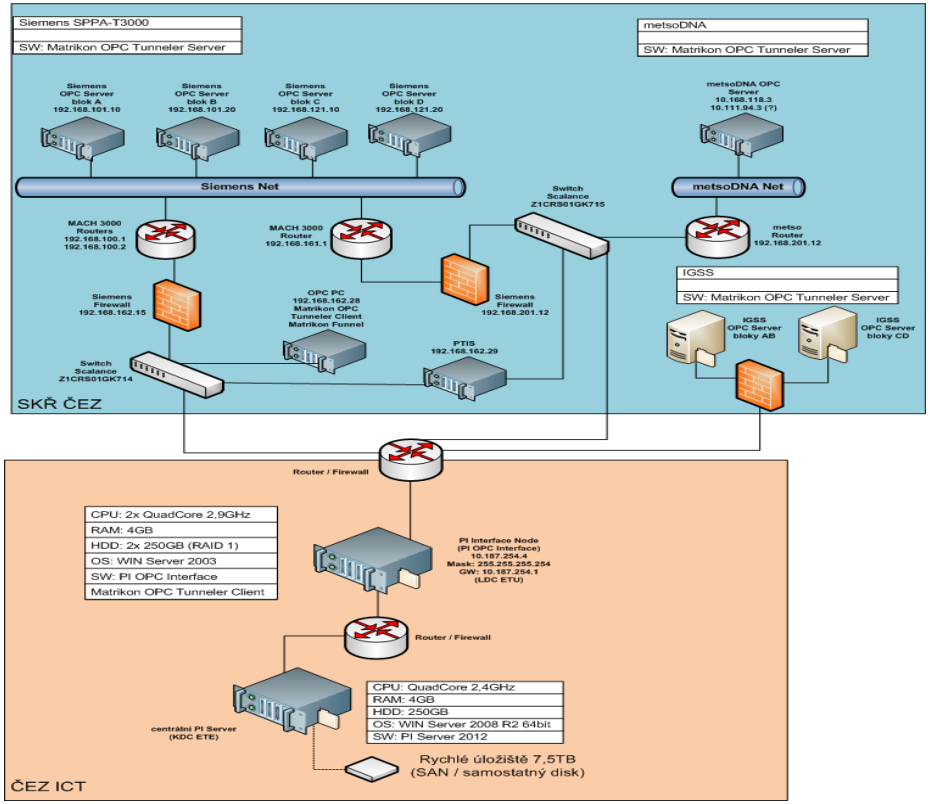
- More than 20 applications to be connected or based on PI System
- SQL and WebServices interfaces to PI and AF
- SharePoint applications using PI WebParts

Operating Economy

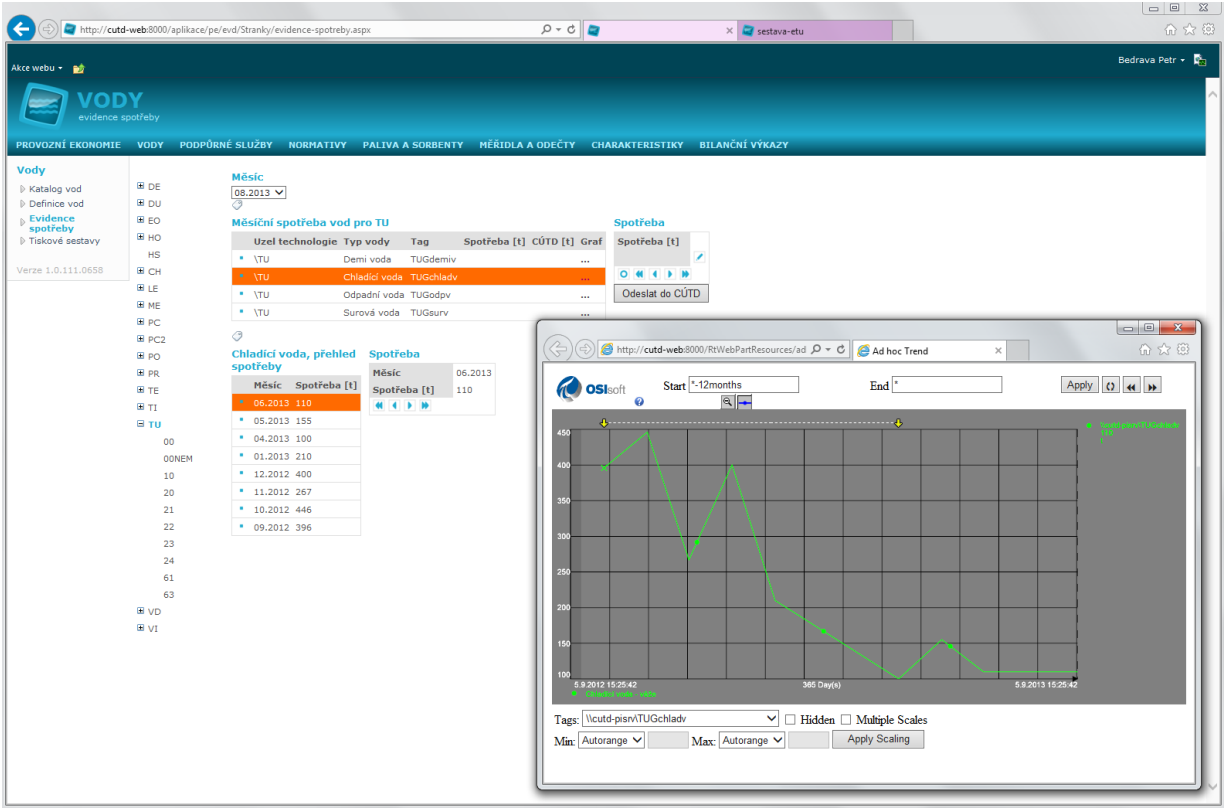
Operation efficiency evaluation

- First PI based application in ČEZ
- Raw operation data from I&C systems
- Supplementary data (coal quality, water consumption, etc.) entered or imported through SharePoint application
- Data aggregated into 10 minutes values using PI Totalizer
- Energy balancing in calculation module using customized equation tree
- 10 minutes (NPP) or 1 day balanced data returned to PI
- Energy balance .xls reports using PI Datalink available in web browser using SharePoint Excel Services

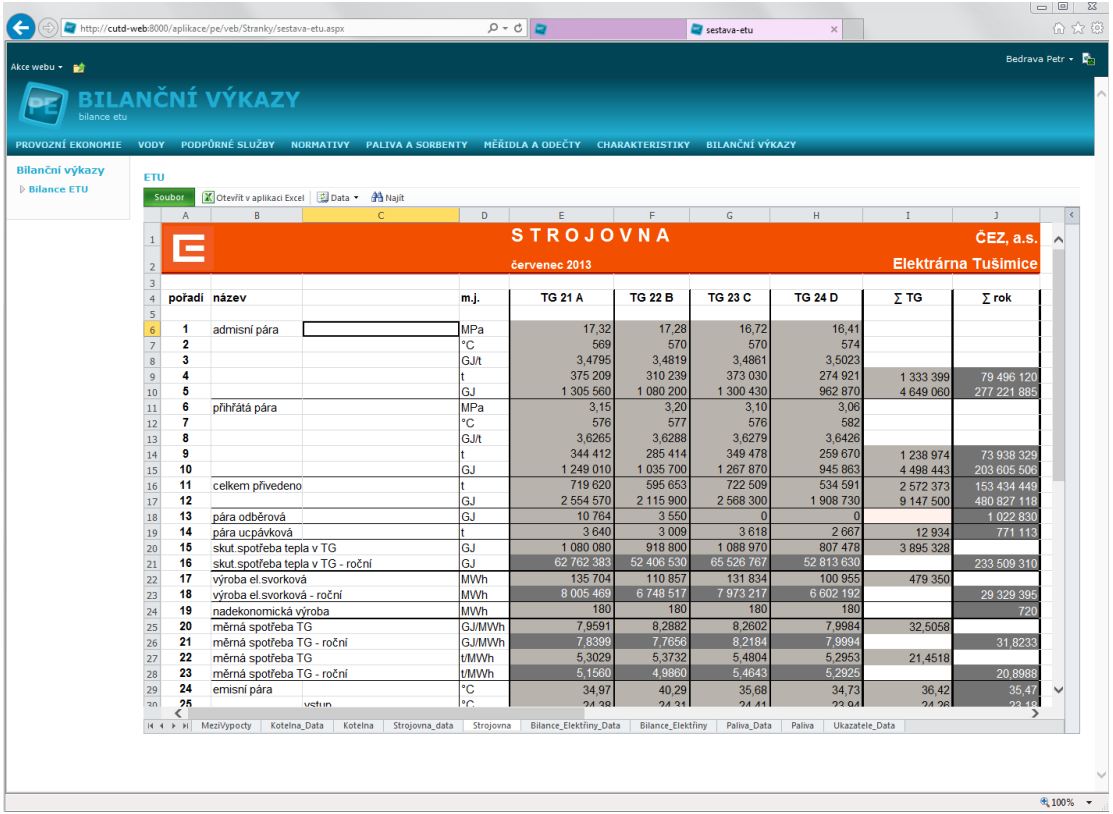
Operating Economy – I&C Data Collection



Operating Economy – Web Client Application



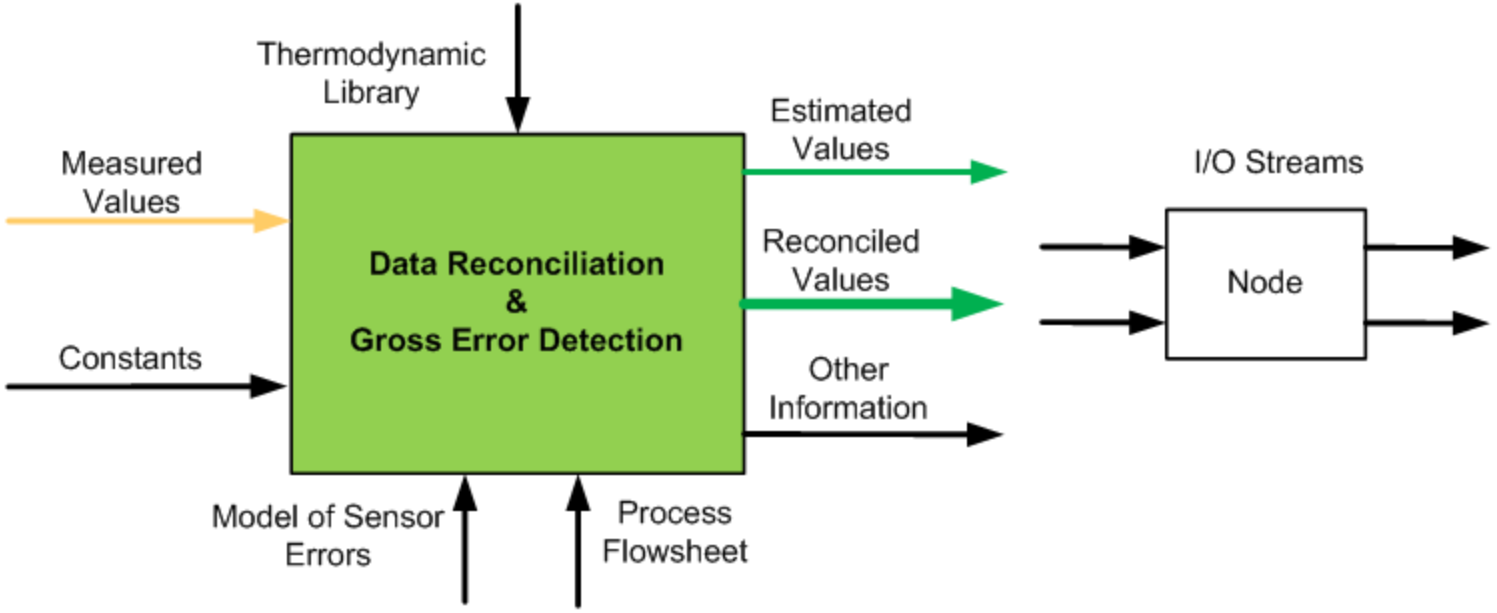
Operating Economy – Energy Balance Report



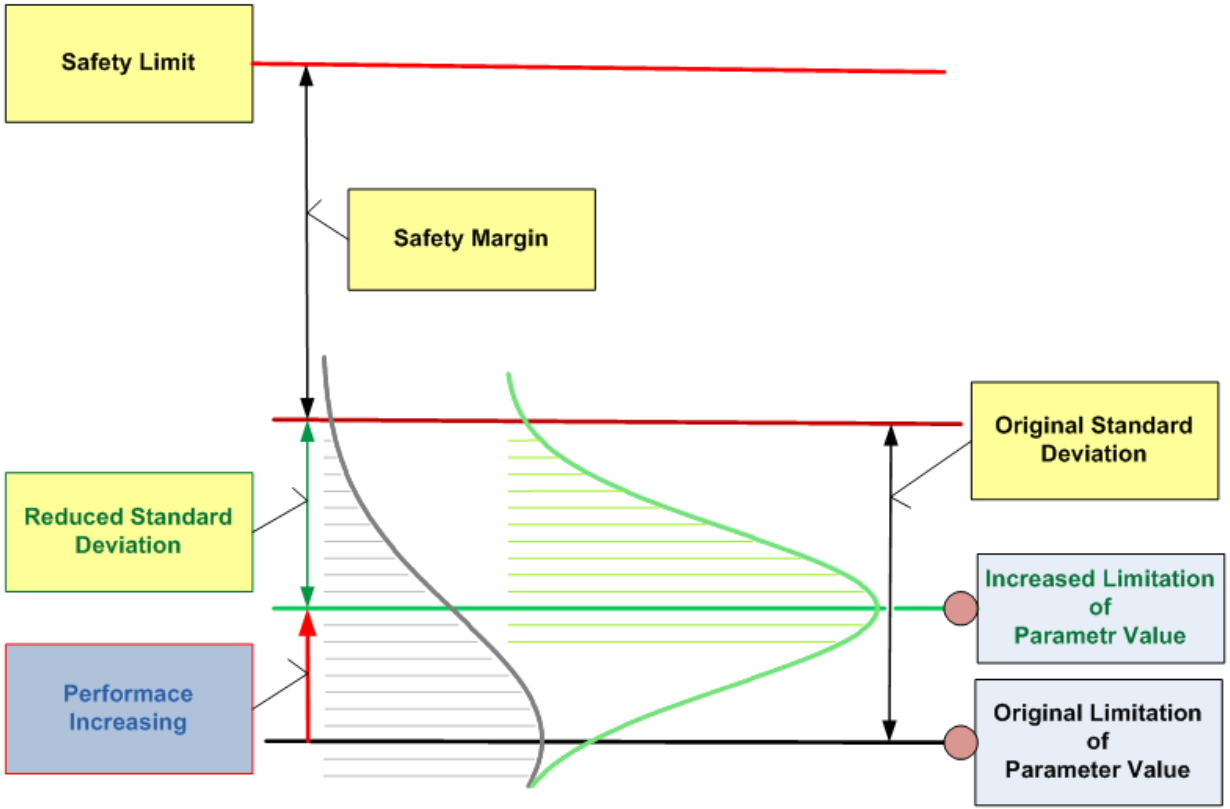
PowerOpti – Main Functions and Benefits

- PowerOpti - monitoring, diagnosis and optimization of the performance of power plants and heating plants
  - Based on power plant thermodynamic model
  - Increase in the precision, accuracy and reliability of measurements (gross error detection and data reconciliation)
  - Obtaining a real picture of the actual condition of the equipment and the technological process
  - Timely detection of equipment faults and malfunctions in the technological process
  - Equipment diagnosis and degradation detection
  - Technological process optimization

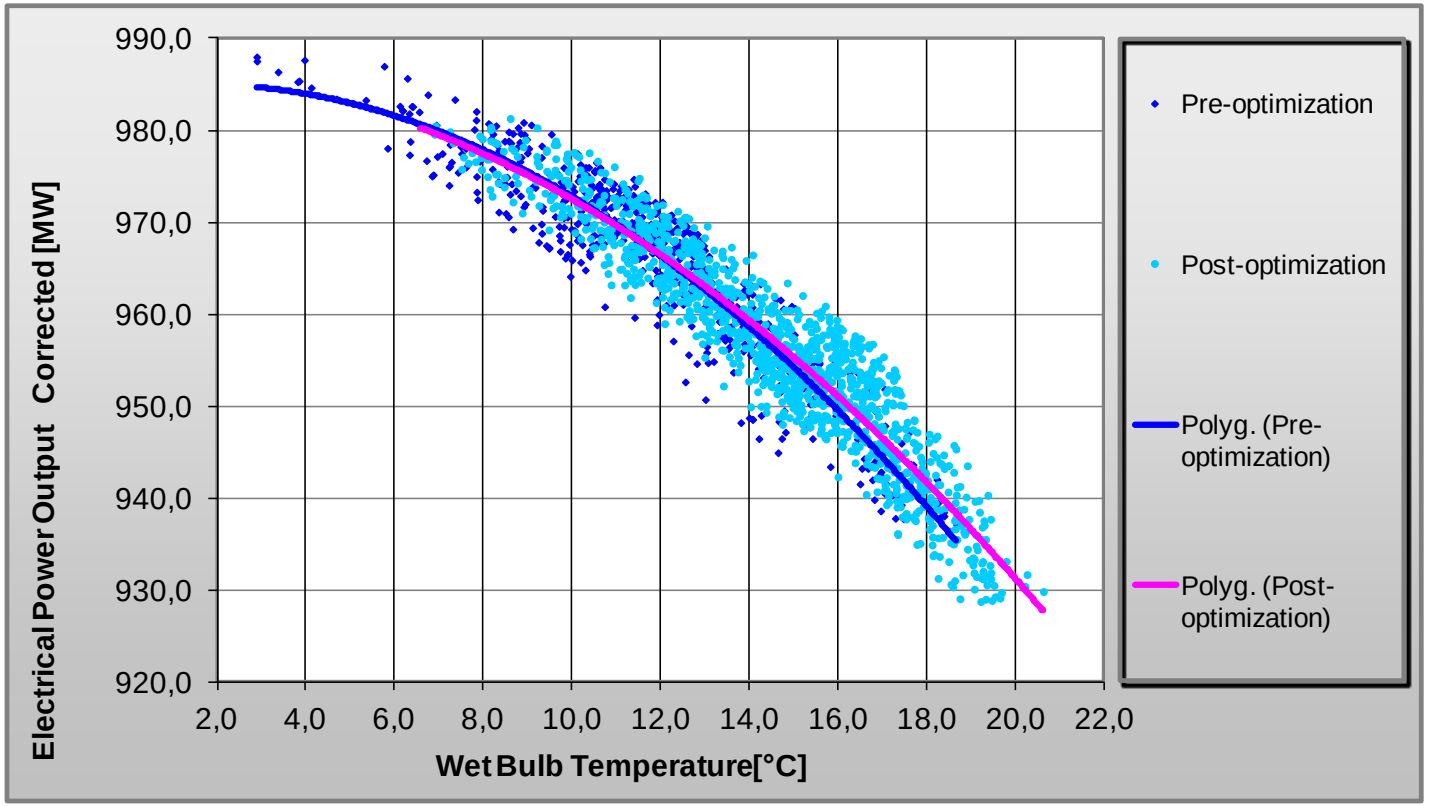
PowerOpti – Data Reconciliation



PowerOpti – Reactor Power Output Refinement



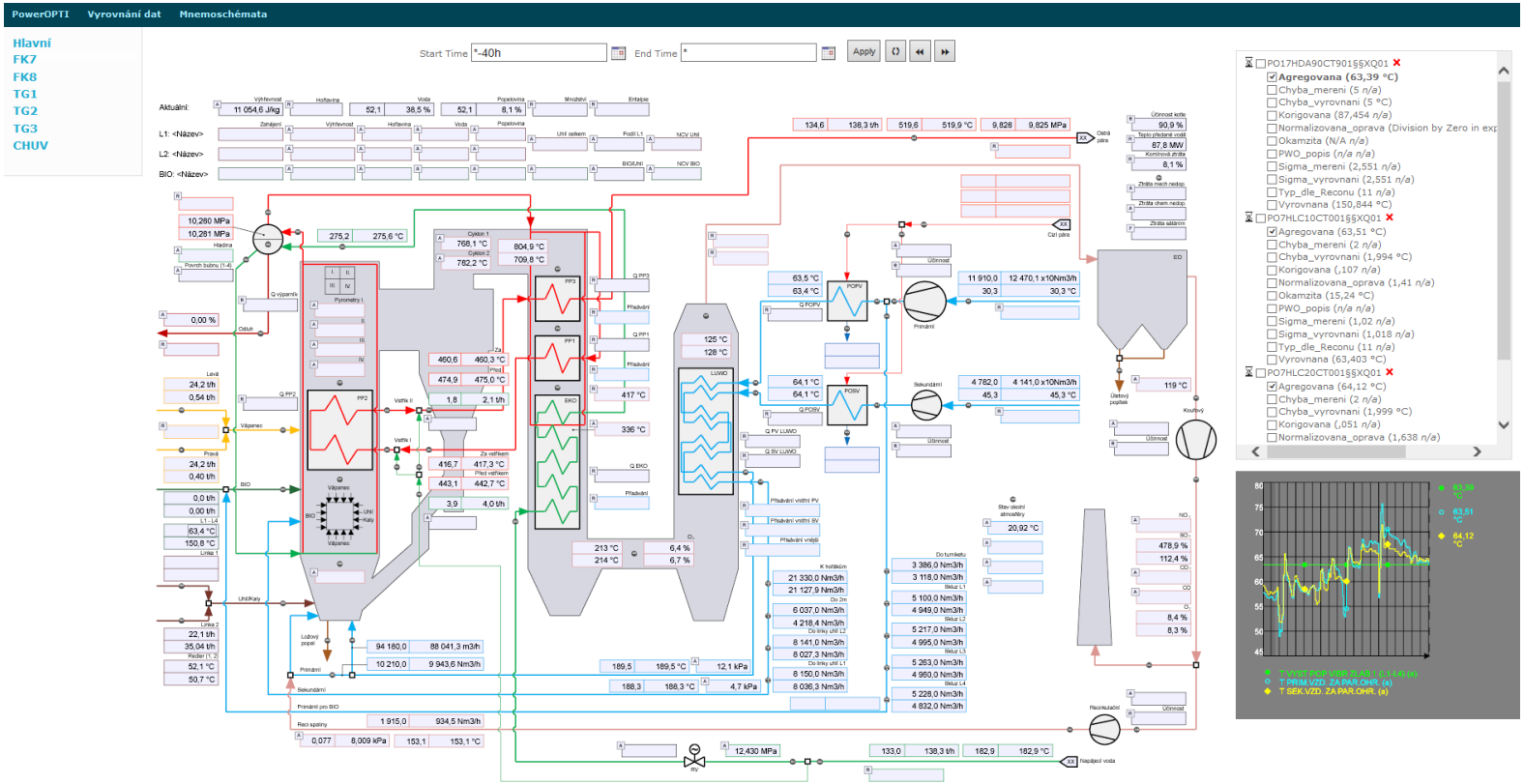
PowerOpti – Cooling Circuit Optimization



PowerOpti – PI Based Application

- PowerOpti RunTime
  - PI Reader, SnapShot Totalizer
  - Reconciliation job executing
  - PI Writer
- PowerOpti TechStudio
  - Plant thermodynamic model configuration
  - Reconciliation job setup
  - Test calculations
  - Recalculation
- RECON
  - Plant thermodynamic model development
  - Reconciliation library
- PowerOpti WebClient
  - Plant schema with raw, reconciled and estimated data using PI Graphic WebPart
  - Easy comparison of selected values using PI Trend WebPart

PowerOpti – WebClient Using PI WebParts



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