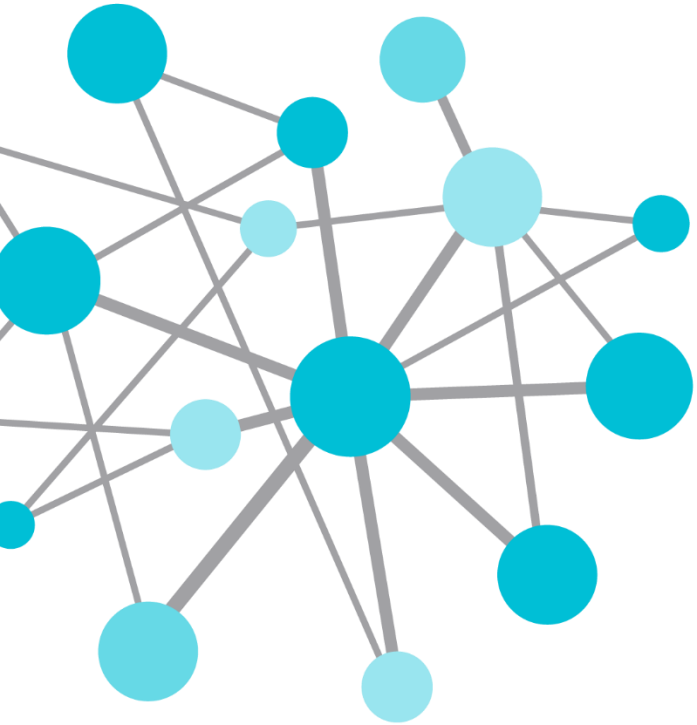


Improving power plant performance in ČEZ by using the power of PI System Infrastructure

Presented by **Marek Mynařík**

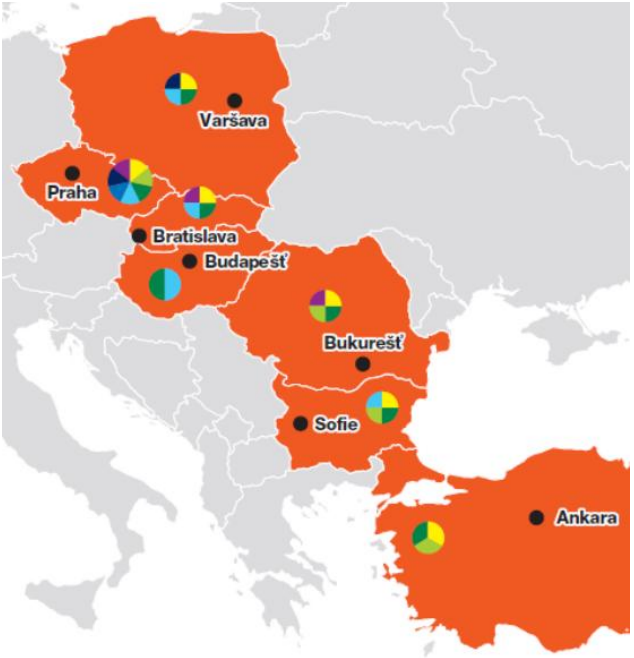
Content

- Introduction of CEZ Group and Porici Power Plant
- CÚTD Project – data from 18 Power Plants
- Project of PowerOPTI

  Thermodynamic Modelling & Data Reconciliation
- Expected benefits of the PowerOPTI implementation

Introduction of CEZ Group

- CEZ Group is an integrated electricity company with operations in a number of countries in Central and Southeastern Europe and Turkey, with its headquarters in the Czech Republic (Installed capacity 15 199 MW).



- CEZ Group currently operates:
- 2 nuclear power plants
- 15 coal-fired power plants
- 35 hydropower plants, including 3 pumped storage plants
- in the Czech Republic.

- 2 locations with wind power plants (Fantanele 600MW)
- 3 coal-fired power plants abroad.

- CEZ is the largest electricity producer in the Czech Republic
  - producing nearly 60 TWh a year (approximately 50% in NPP)

Introduction of Porici Power Plant

Commissioned in 1957

Bus arrangement

Fluidized bed boilers K7, K8 (1997-8) (CNIM)

178 MWt, 250 t/h, eff. 92,5 %

TG 1,2,3 – 55 MWe, 8,8 MPa, 510 °C

2013

Esv – 481 429 MWh,

Qtep – 1 502 608 GJ

Net efficiency 42,9 %

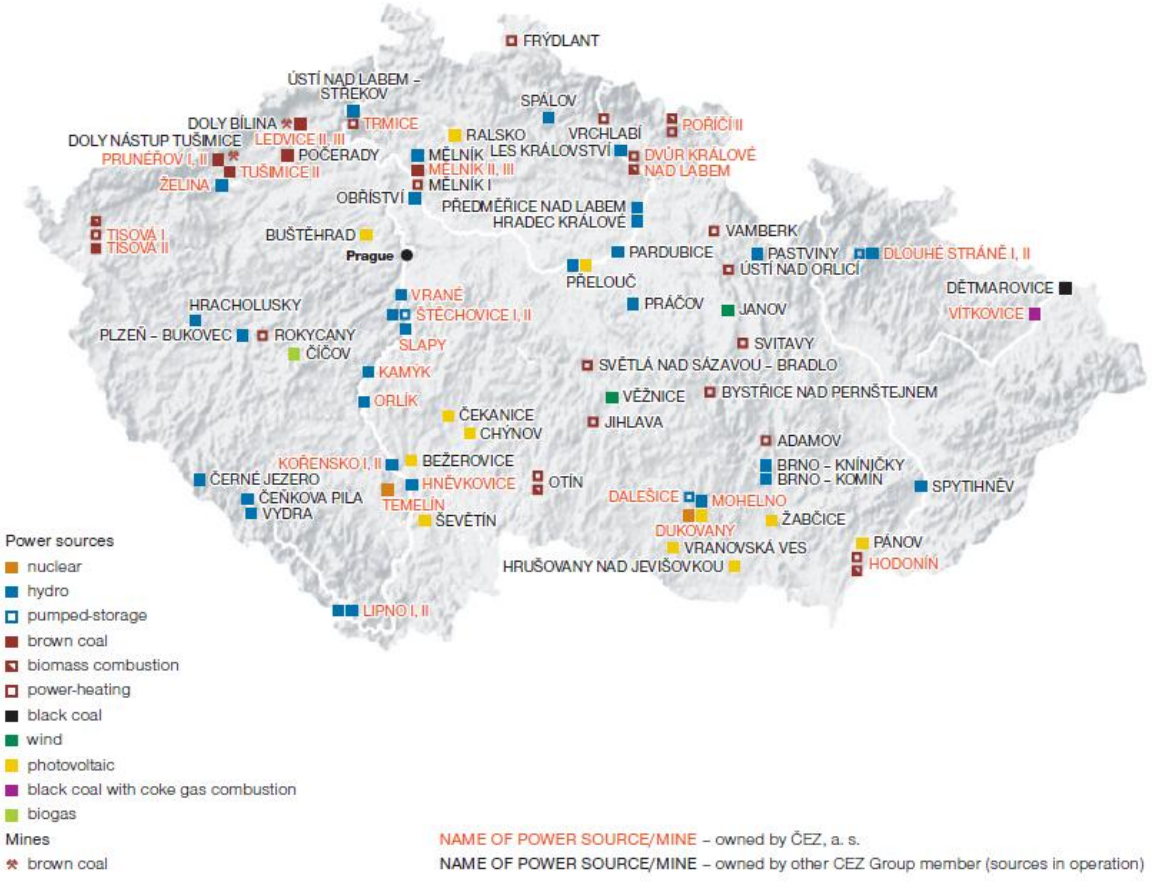
CÚTD Project

(Central storage of process data)

Purpose:

- unification of data base technology data
- savings in other systems and subsequent projects

- The project includes:
  - replacement of existing storage
  - migration of all necessary data from the original storage
  - switching applications to new storage



Project of PowerOPTI

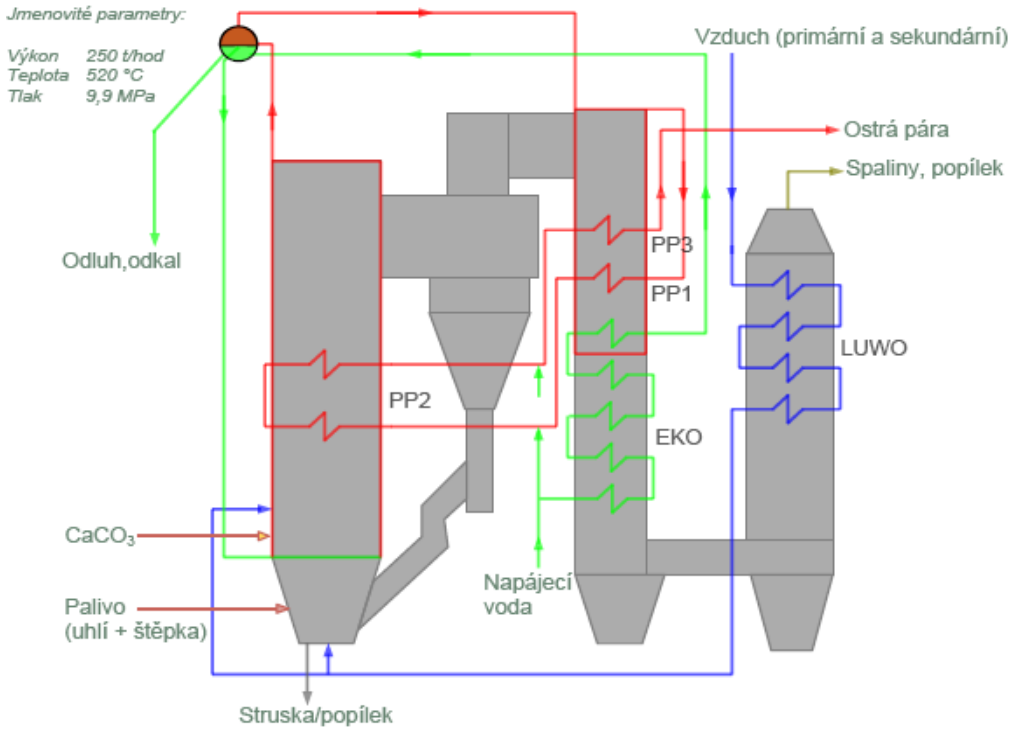
Aim - to get real information about the operation using validation

Implementation process

2012 – model of the boiler FK7

2013 - model of the entire Porici power plant

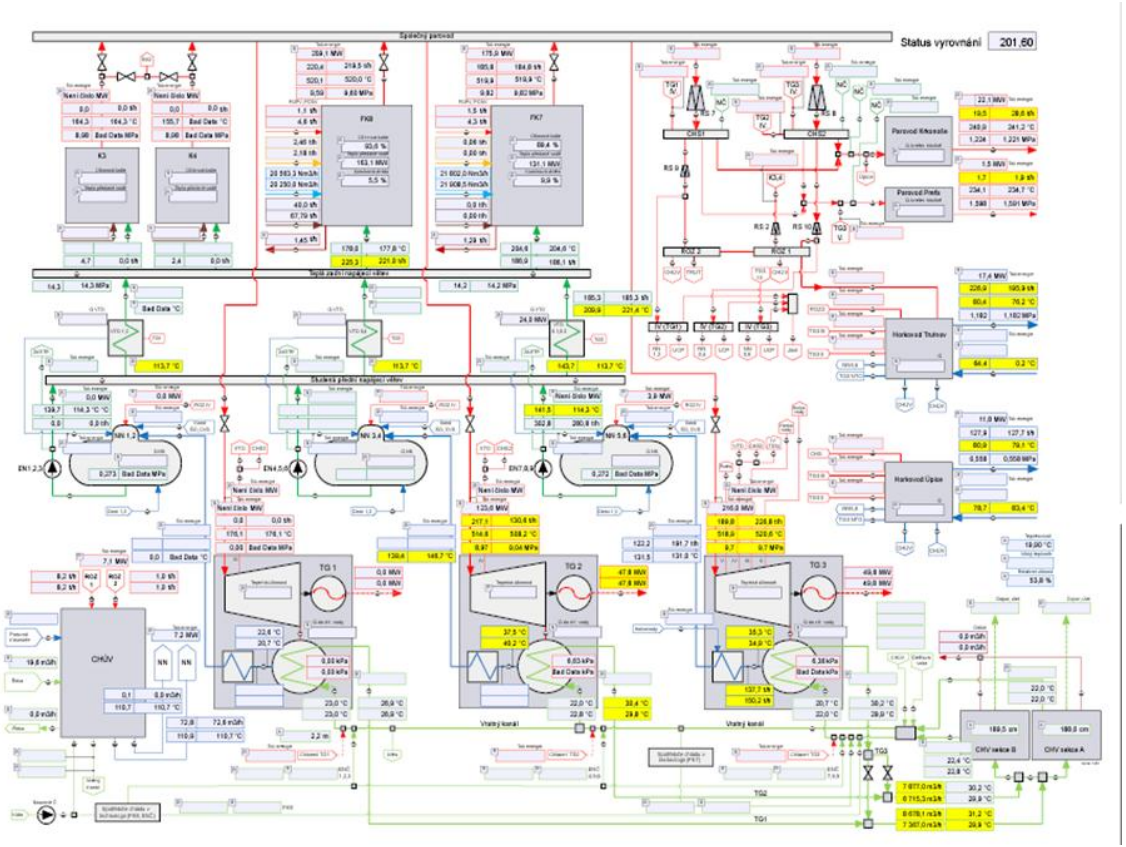
2014 – final tuning of the model validation



Model of the entire Porici power plant

Validation model consists of the following sub-models:

- Boiler FK7
- Boiler FK8
- chemical water treatment
- machine room



Expected benefits may be divided into groups

- Monitoring of faulty functioning measuring points and components
- Real time monitoring of production block condition
- Monitoring of water/steam loss on production blocks
- Operational tests to establish the optimal operating mode
- Increase of the block efficiency - Implementation of the correction factors
- Early warning of bad equipment condition

Direct impact on efficiency

- Implementation of the correction factors + 0,15%
- Real time monitoring of production block condition + 0,1%
- Tests run on system + 0,2%

Impact on efficiency - unachievable

- Lambda value management + 0,06%
- Avoiding condensate subcooling + 0,03%

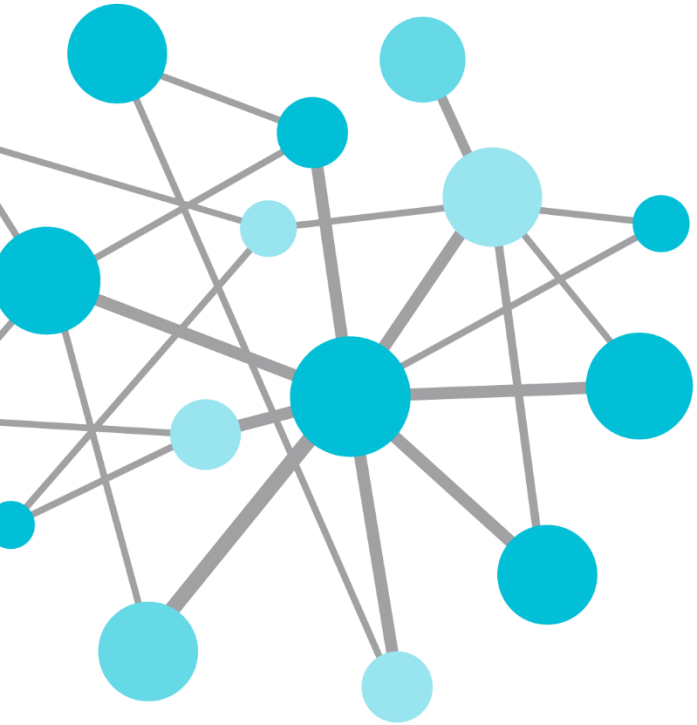
Without influence on efficiency

- Monitoring of faulty functioning measuring points and components
- Evaluation of the start-up costs of the production blocks
- Monthly energy balance reports

Marek Mynařík

- marek.mynarik@cez.cz

- Improving power plant performance in CEZ by using the power of PI System infrastructure
- CEZ, a. s.



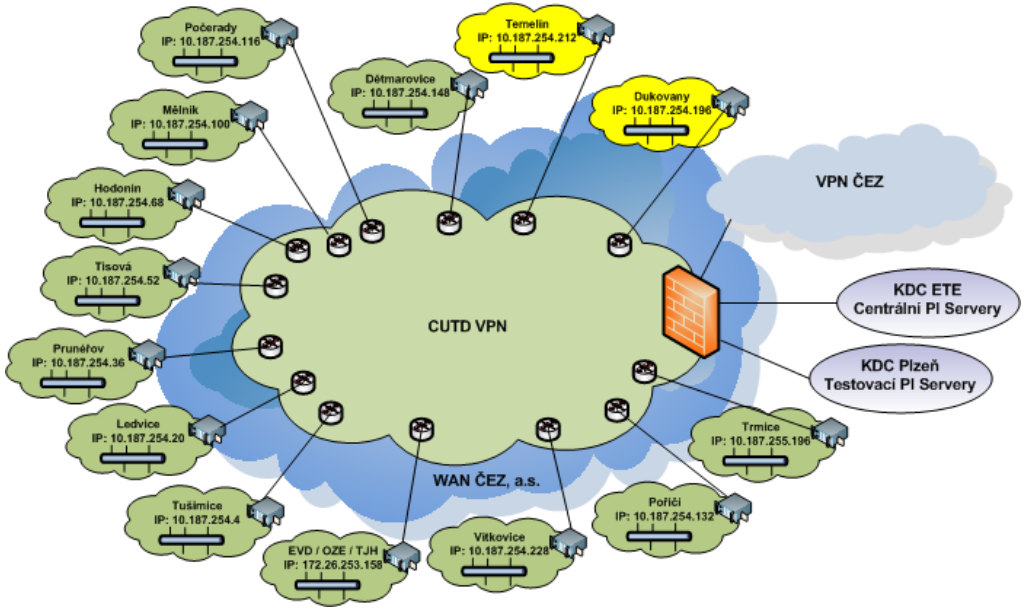
PI System & PowerOPTI Project in ČEZ from Implementer Point of View

Presented by **Petr Hoření**

OT ENERGY SERVICES

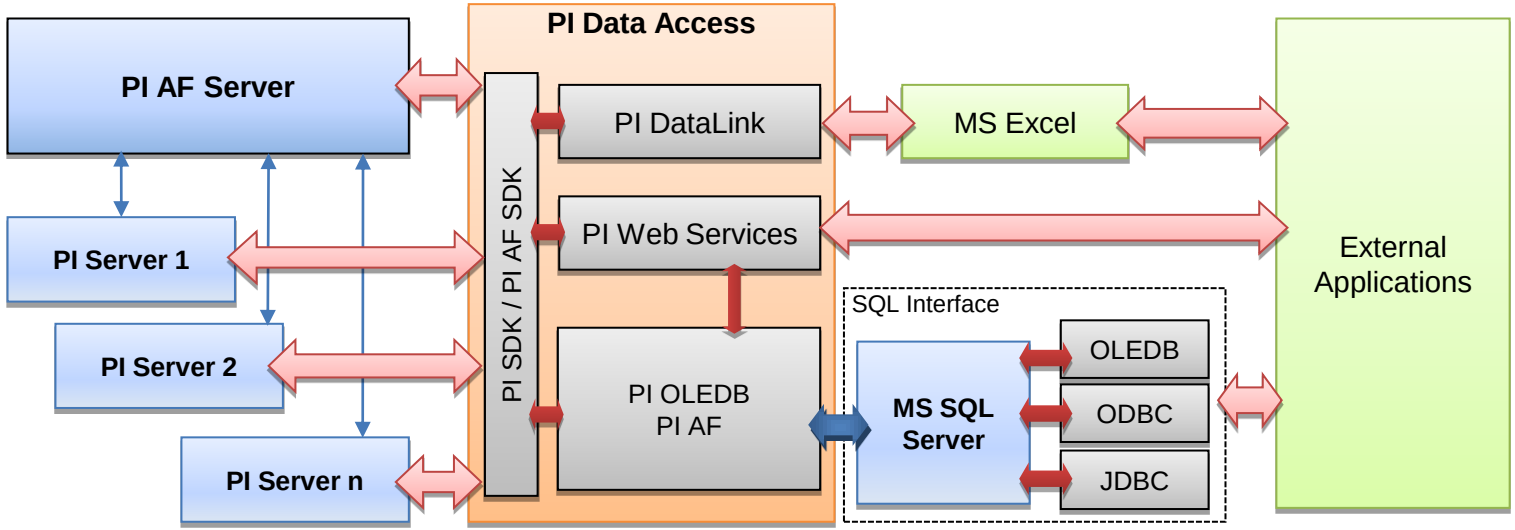
PI System in ČEZ – CÚTD Project

- Implementation 12/2012 – 6/2014, 16 facilities
- 3 PI Servers, 120.000 PI Tags (more than 56.000 used)



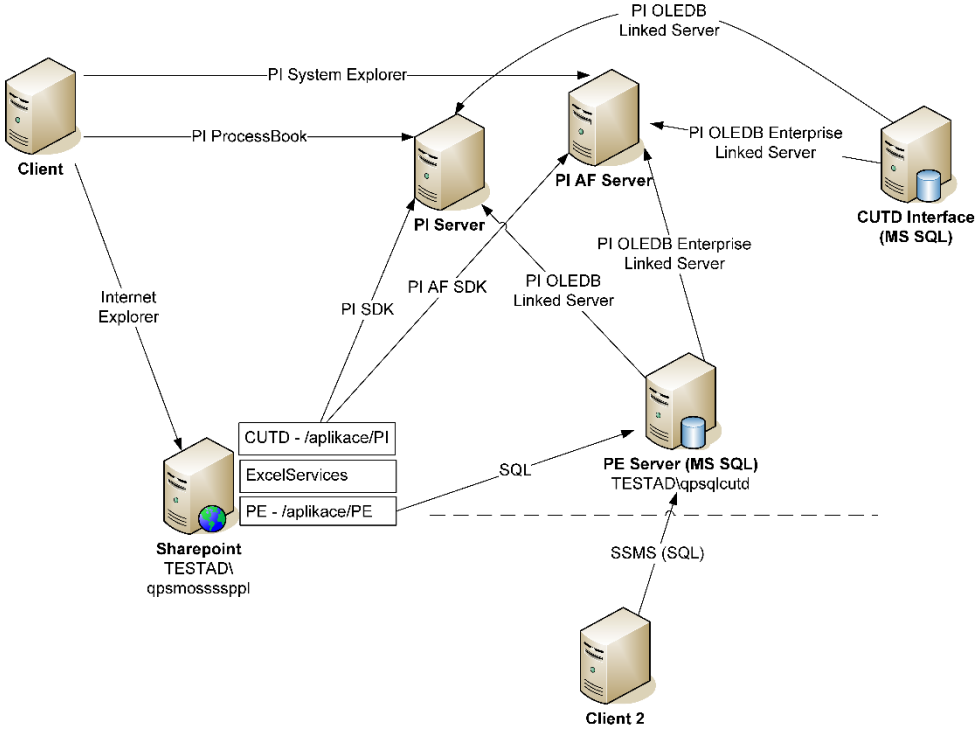
PI System in ČEZ – Integration

Applications are integrated using PI Web Services or using standardized SQL Interface on MS SQL Server 2012.



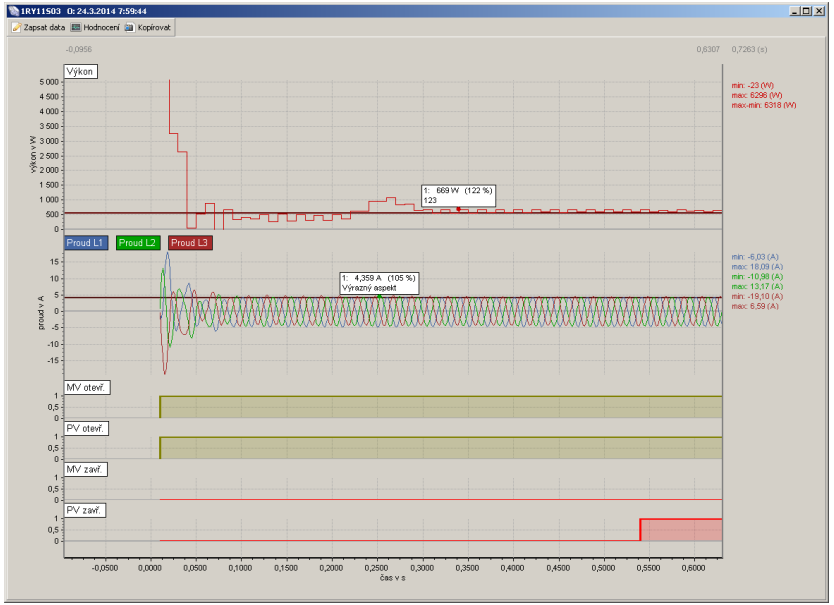
PI System in ČEZ – Identity Delegation

- Security as key issue
- Effort to use tag based authorization in PI System
- Client identity is propagated through SharePoint or MS SQL to PI Server and to PI Asset Framework (PI AF) Server

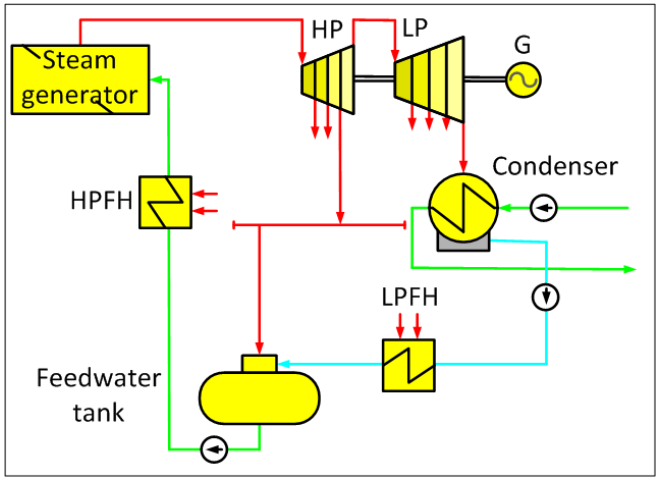


PI System in ČEZ – Platform of Future

- Single store and hub of all operational data for IS
- SharePoint applications using PI WebParts are preferred
- Developed solutions:
  - **PowerOPTI**
  - Operation Economy
  - Valves Diagnostics
- Solutions in progress:
  - ChemPack
  - Vibro Diagnostics



PowerOPTI – Data Reconciliation



Measurement: $\mathbf{X_m}$

Reconciliation: $\mathbf{X_r}$

Calculation: $\mathbf{Y_{cal}}$

Measured values are processed through thermodynamic model

Measurement penalty: $V_{corr} = X_r - X_m$

PowerOPTI – Data Reconciliation

Reconciled values are obtained by solution of optimization task:

$$\min \chi^2 \equiv \sum_i \frac{V_{corr}^2}{\sigma_i^2}$$

Mathematical model is based on analytical redundancy of measurements - more measurements than independent equations

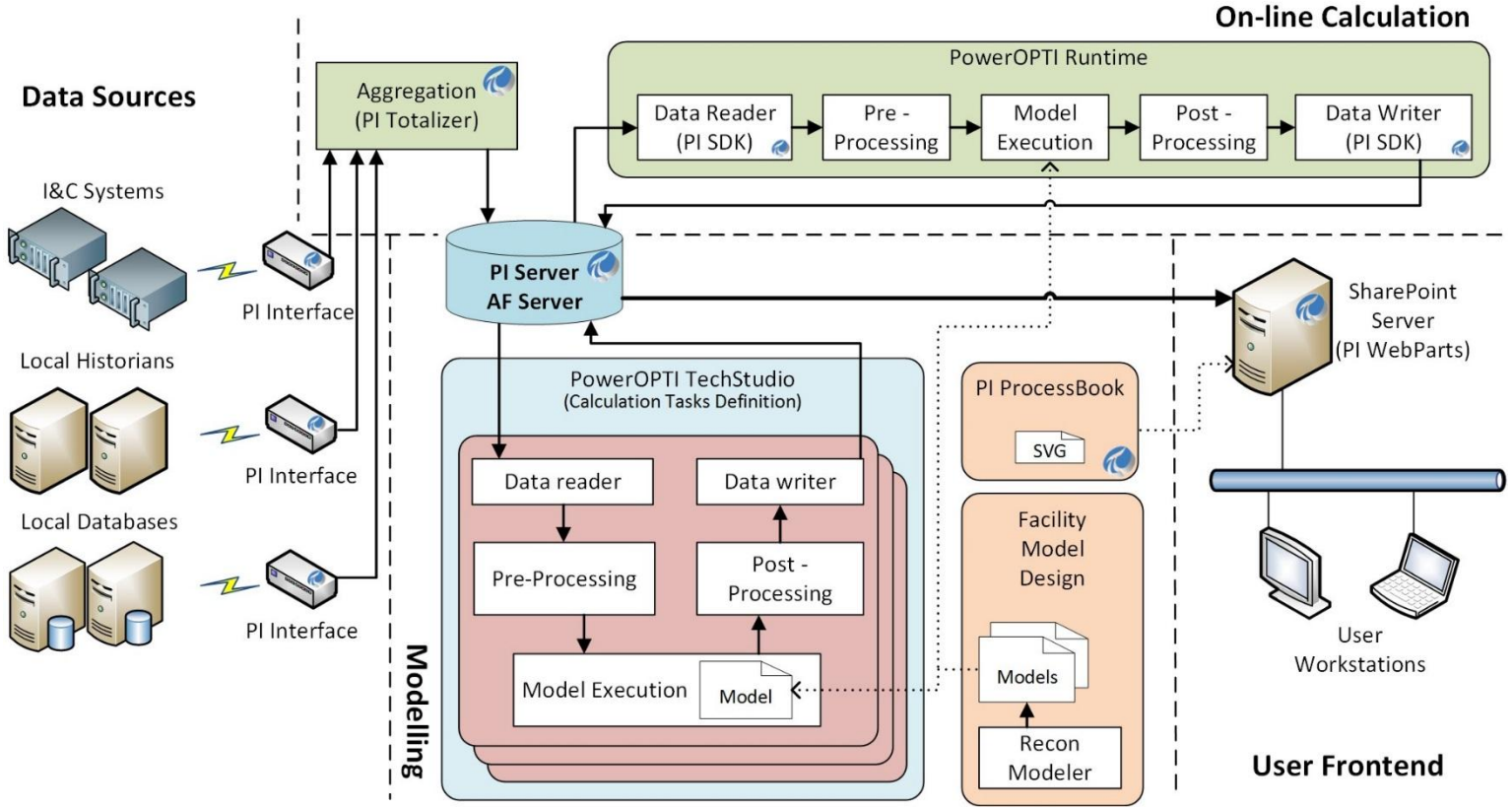
↓

Greater reliability and truthfulness of measured values &

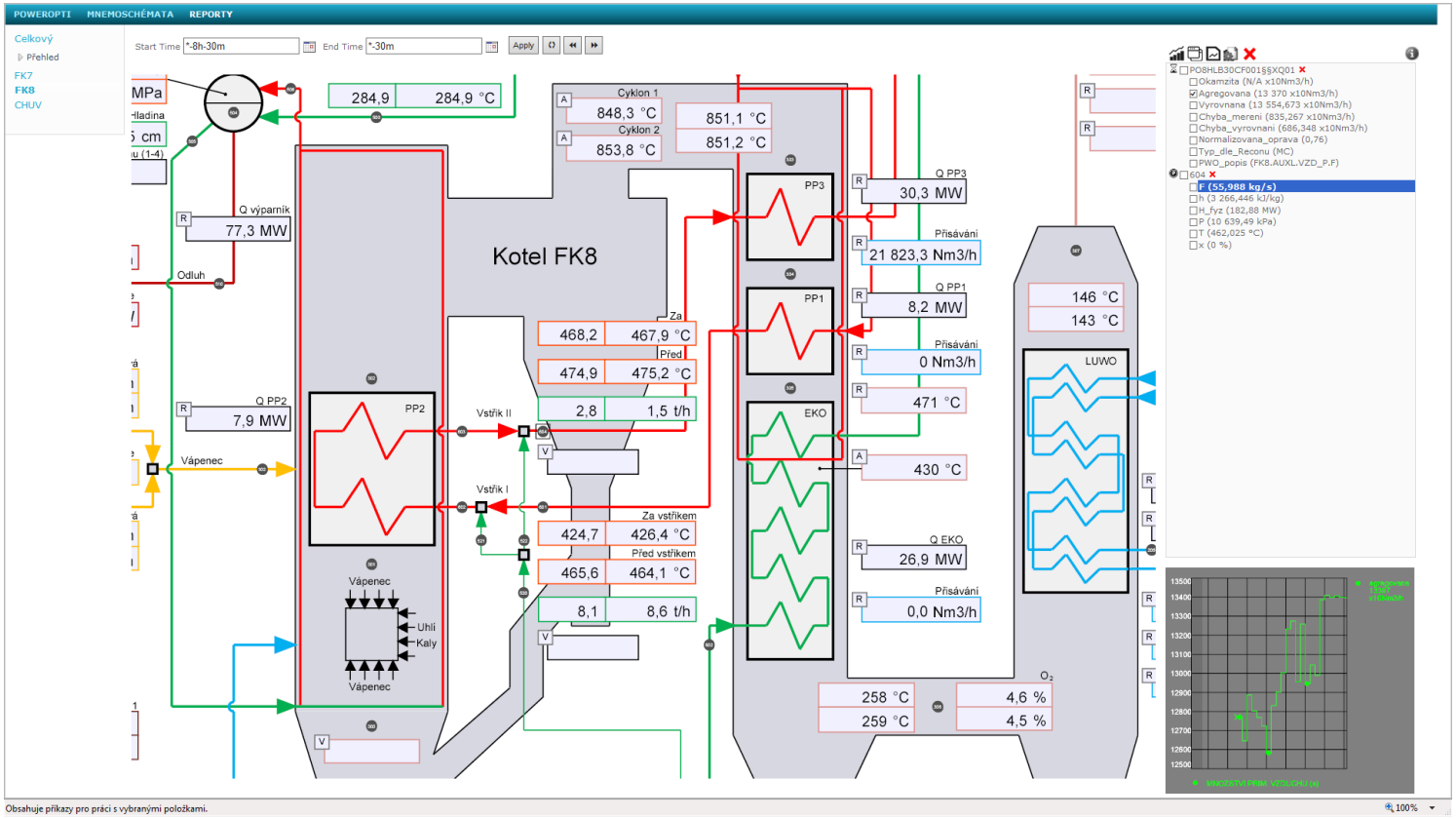
Calculated values of unmeasured quantities &

Detection of faulty meters

PowerOPTI – Architecture



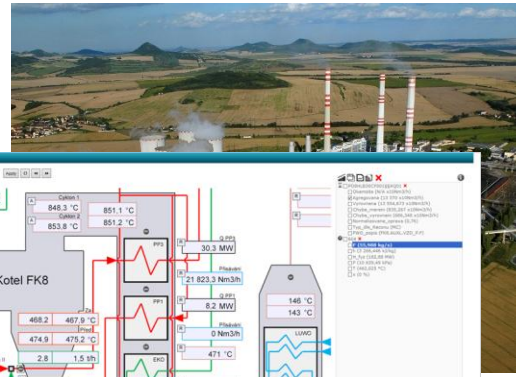
PowerOPTI – PI WebParts



Petr Hoření

- phoreni@otenergy.eu
- Head of Information System Development Department
- OT Energy Services a.s. (Olajterv Group)

Improving plant performance on a power generation fleet



"using the power of PI System infrastructure we have been able to increase our power plant performance through a centralized data collection program combined with the PowerOPTI Project to achieve high valuable business results as reducing our operational costs and monitoring faulty equipment conditions on a fleet basis"

Mr Marek Mynařík, CEZ, Production Manager

Business Challenge

- Wide power generation portfolio (Nuclear, coal, hydro and renewable)
- Current Electrical market conditions require efficient power plants with the lower operational and maintenance costs.

Solution

- CUTD Project: Centralized PI System for data collection across the power generation fleet.
- PowerOPTI Project: using data from PI System on Porici Power Plant as starting point

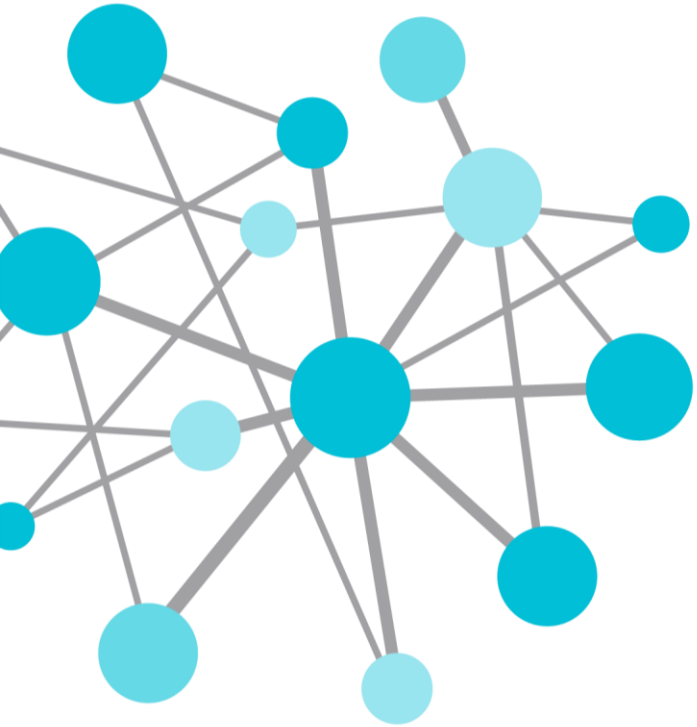
Results and Benefits

- Real time monitoring of production block condition
- Evaluation of the start-up costs of the production blocks for improvement
- Monthly energy balance reports for performance improvement

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**



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