



ČEPS Planned Solutions and Challenges

Presented by Miloslava Chladová



Recommended Flow of Topics in Agenda

- About ČEPS
- PI System position in CEPS IT
- PI System in ČEPS Business Challenge
- Examples
- Conclusions

čeps,a.s. - Transmission System Operator (TSO)



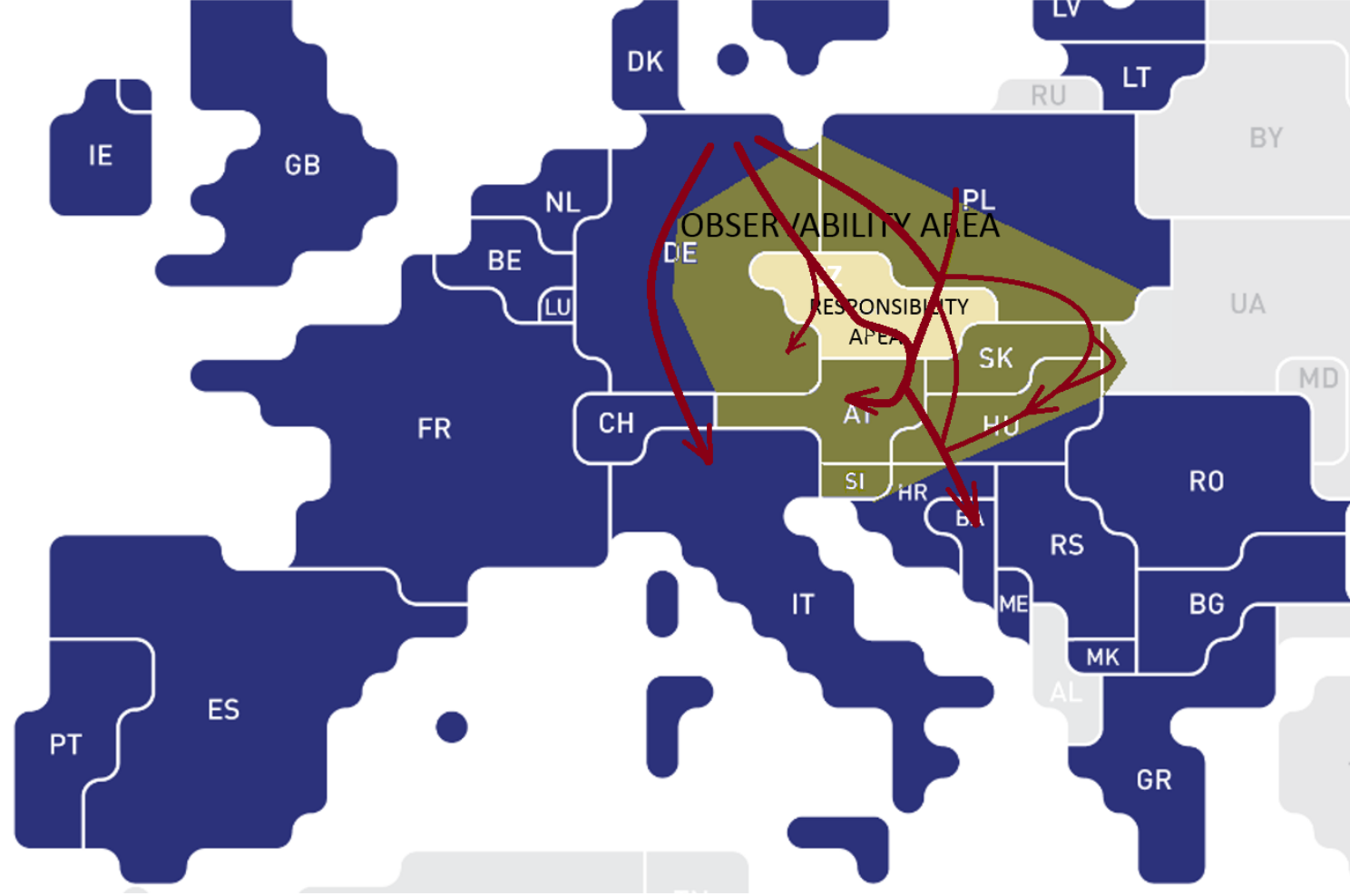
ČEPS basic information

Peak Production is ~14 000 MW (4.2.2015)
(86 152 GWh in 2014)

Peak Demand is ~10,500 MW (10.12.2014)
(68 416 GWh in 2014)

Area: 3510 km of 400 kV
and 1909 km of 220 kV
grid inside Czech Republic
(population: 10 mil people)

Transmission flows



ČEPS control room SW



Dispatch control room

FRONT VIDEO WALL (TRISQ)

4x TRISQ

2x IDS, PI

GRID OPERATOR

4x TRISQ

2x IDS, PI

GRID OPERATOR

1x TRISQ

5x IDS (DaE)

MARKET OPERATOR

GRID MODEL MONITOR

4x TRISQ 1x CTDS 1x IDS

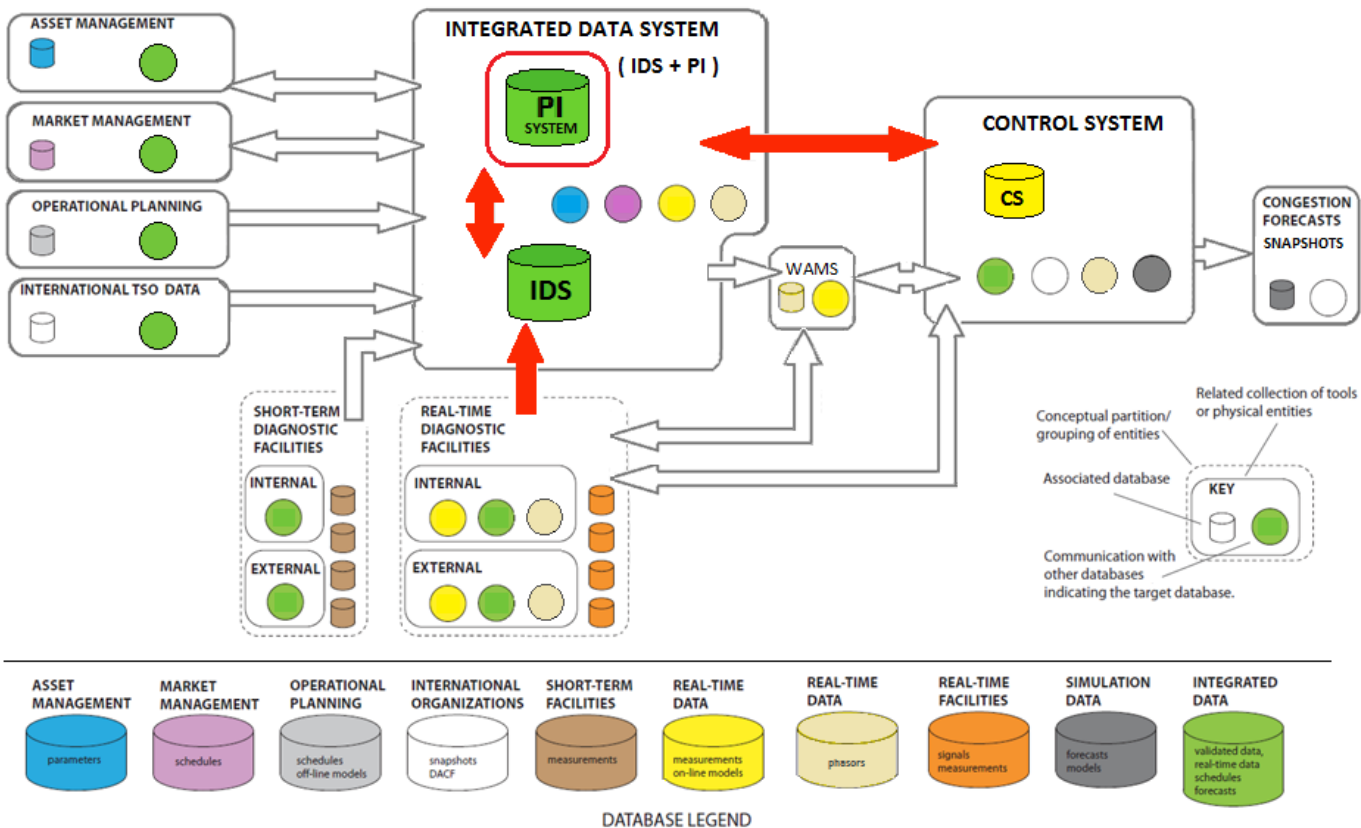
EMERGENCY
OPERATOR (TSC)

4x TRISQ

2x IDS, PI, (DaE)

SHIFT LEADER

The PI System location - easy to connect other systems



The PI System location

- easy to integrate different data

History

Rarely change

Analogs

Real time

„SCADA“ data

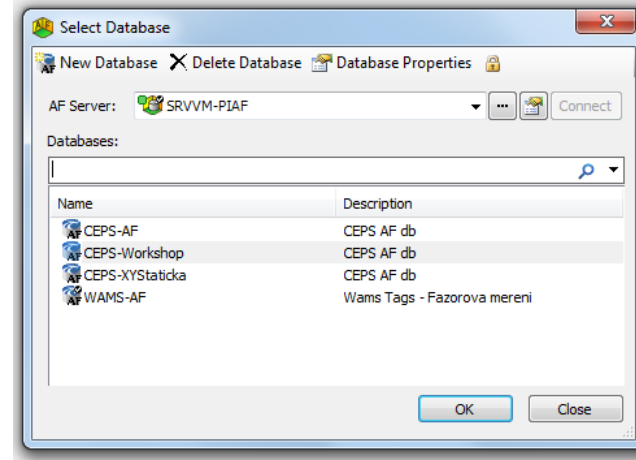
Statuses

Future

Fast data

Phasors

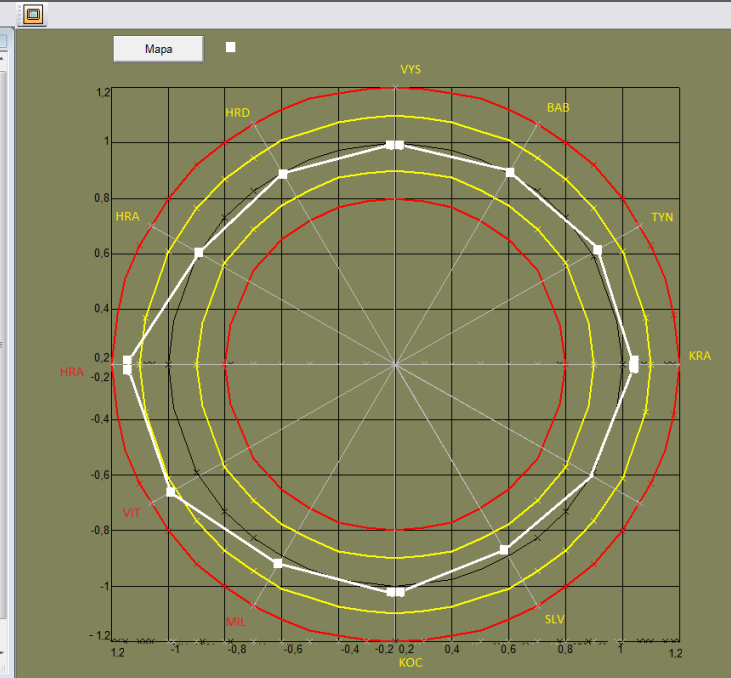
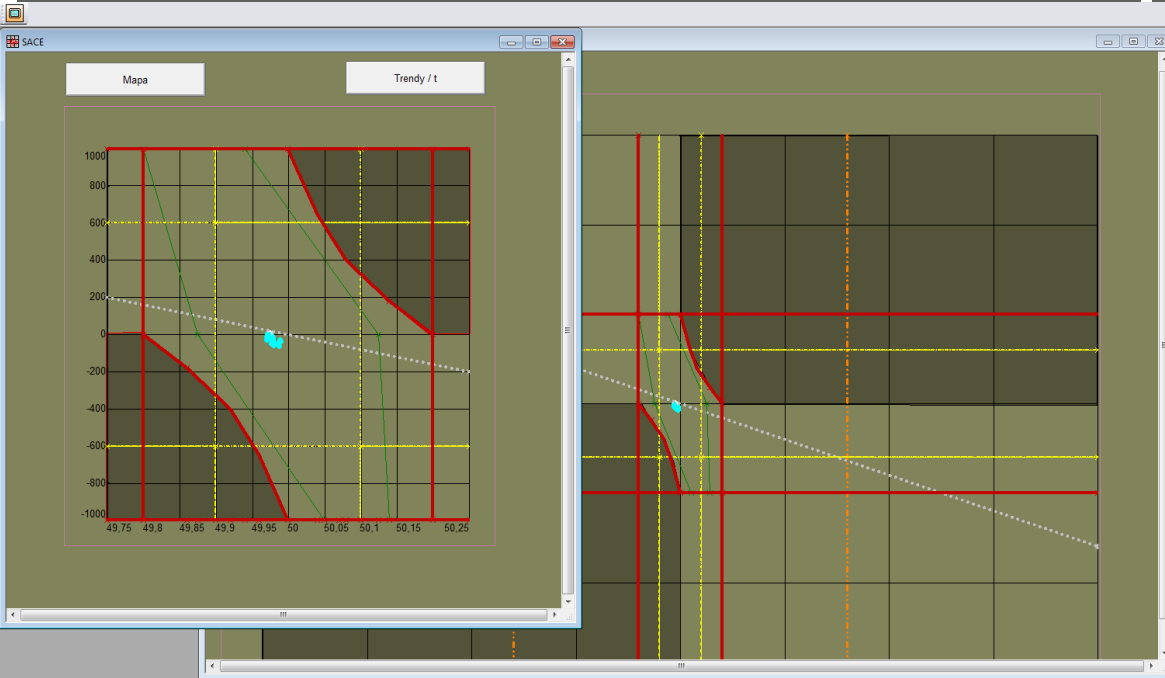
~~Commands~~



CEPS real-time control goals and the PI System role

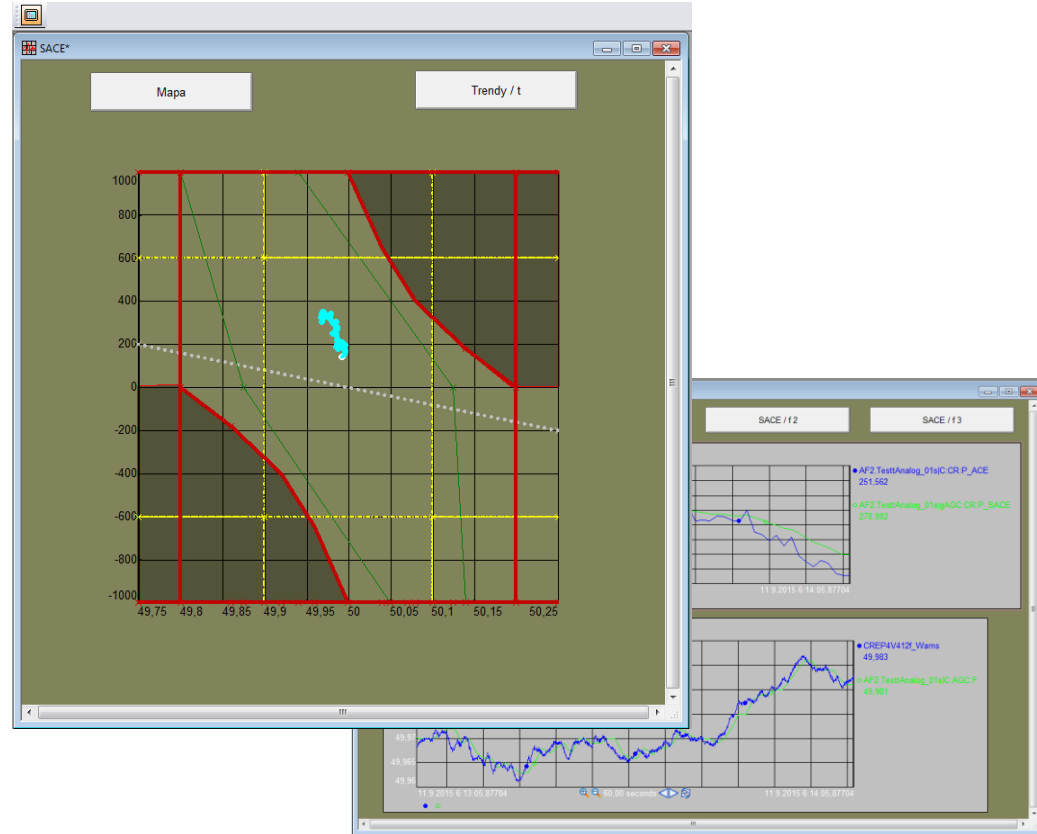
Load Frequency control
LFC

Voltage and
Reactive Power control

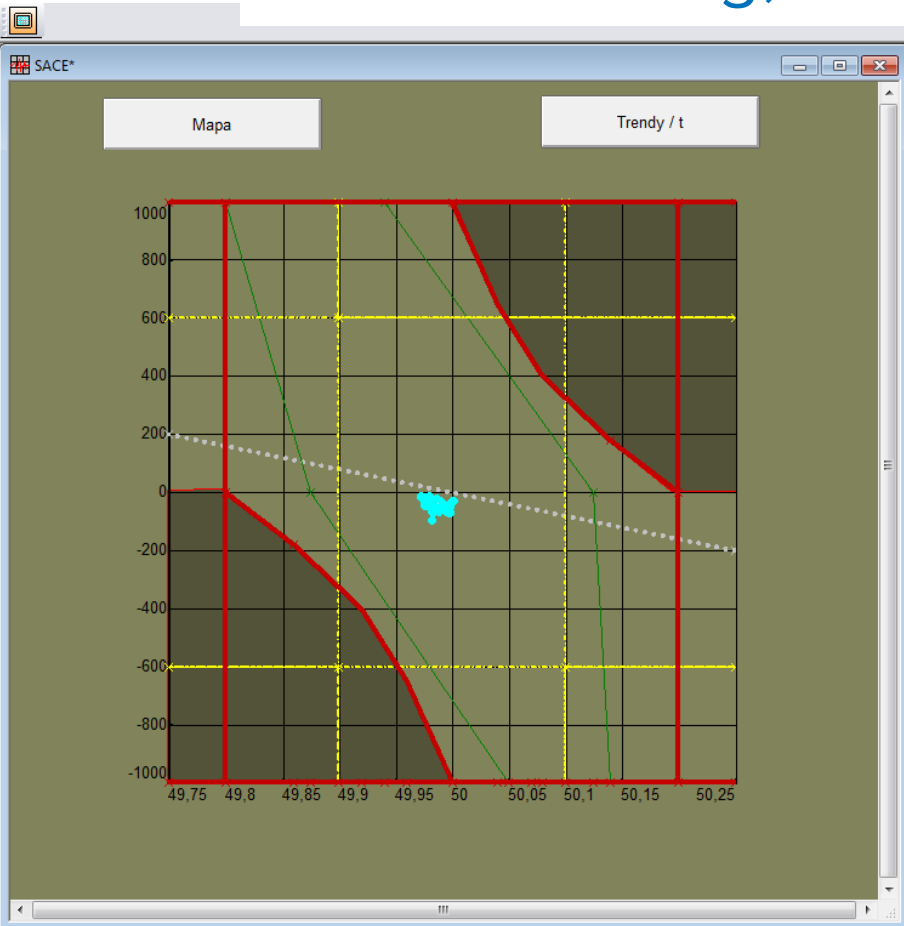


LFC monitoring, easy to present fast data

- Easy to present fast data in XY chart
- Difficult to make zoom, it needs to prepare a lot of fix display formats
- Easy to make the different limit design (static data)
- Possible to make automatic triggering (.net)
- Easy to integrate calculations



LFC monitoring, limits presentation

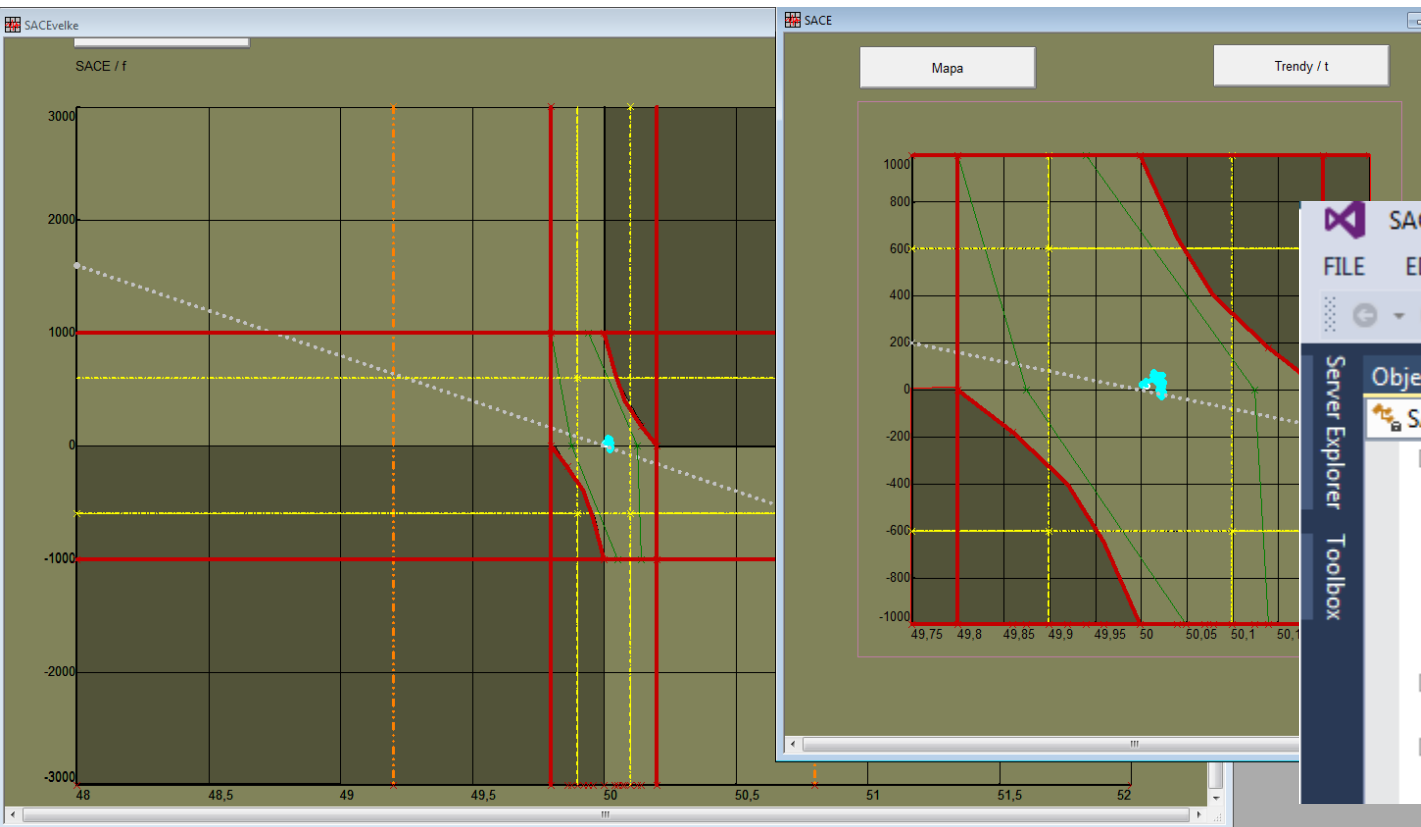


Easy to make the different limit design (static data)

The PI System Explorer software interface displays a table of data. The table has columns for time, X, red1, red2, and yellow1. The data is organized into a table with 15 rows and 5 columns. The first row is highlighted in blue.

time	X	red1	red2	yellow1
2.1.1970 0:00:01	48	1000	Není číslo	600
2.1.1970 0:01:00	52	1000	Není číslo	600
2.1.1970 0:02:00	49,2	Není číslo	Není číslo	Není číslo
2.1.1970 0:03:00	49,8	1000	Není číslo	Není číslo
2.1.1970 0:04:00	49,875	Není číslo	Není číslo	Není číslo
2.1.1970 0:05:00	49,8	3000	Není číslo	Není číslo
2.1.1970 0:06:00	49,8	-3000	Není číslo	Není číslo
2.1.1970 0:07:00	49,8	0	Není číslo	Není číslo
2.1.1970 0:08:00	49,9	Není číslo	Není číslo	600
2.1.1970 0:09:00	49,9	Není číslo	Není číslo	3000
2.1.1970 0:10:00	49,9	Není číslo	Není číslo	-3000
2.1.1970 0:11:00	49,9	Není číslo	Není číslo	-600
2.1.1970 0:12:00	49,86	-180	Není číslo	Není číslo
2.1.1970 0:13:00	49,92	-400	Není číslo	Není číslo
2.1.1970 0:14:00	49,96	-650	Není číslo	Není číslo

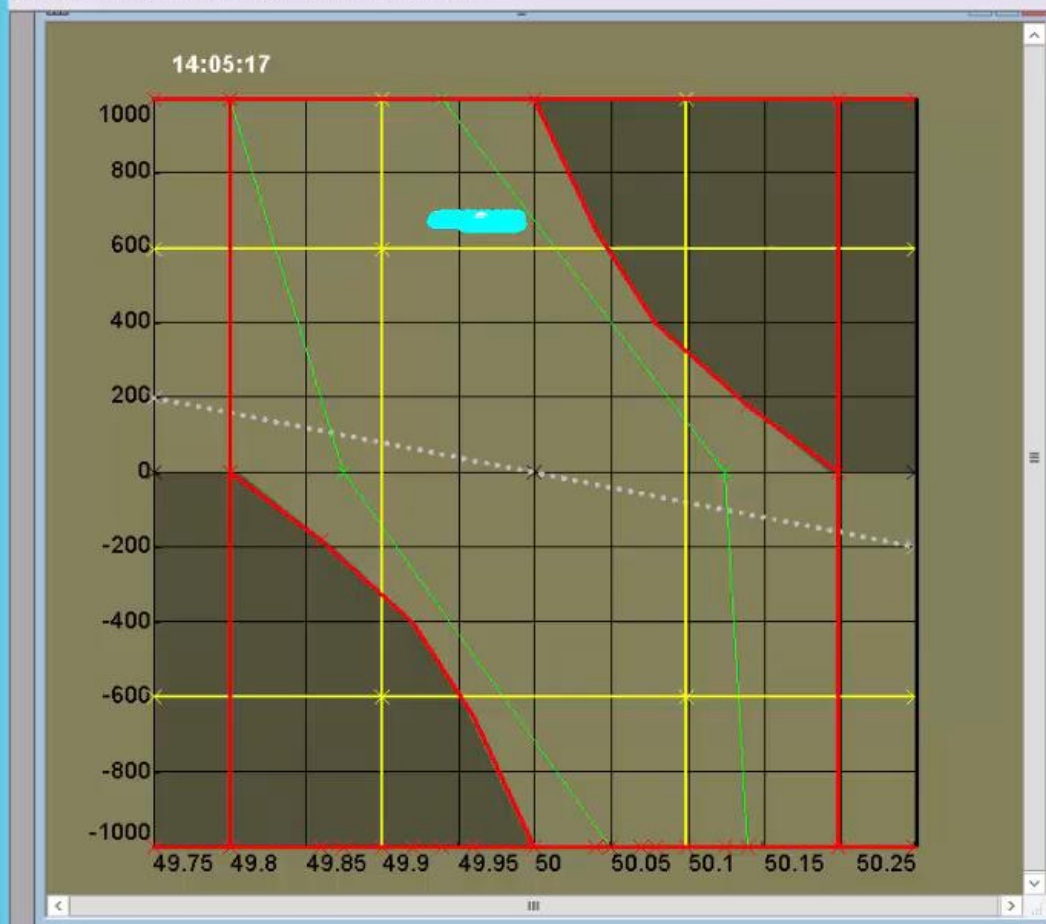
LFC monitoring, automatic triggering



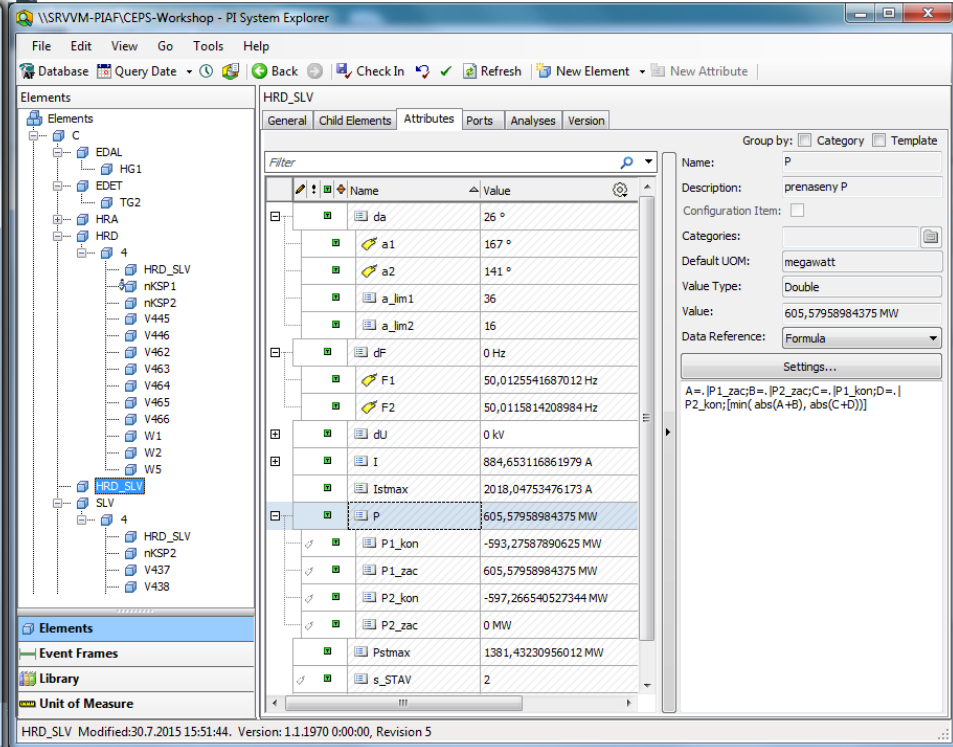
Possible to make automatic triggering (PI SDK)

```
using System;
using System.Threading;
using OSisoft.AF.Asset;
using OSisoft.AF.Data;
using OSisoft.AF.PI;
using OSisoft.AF;

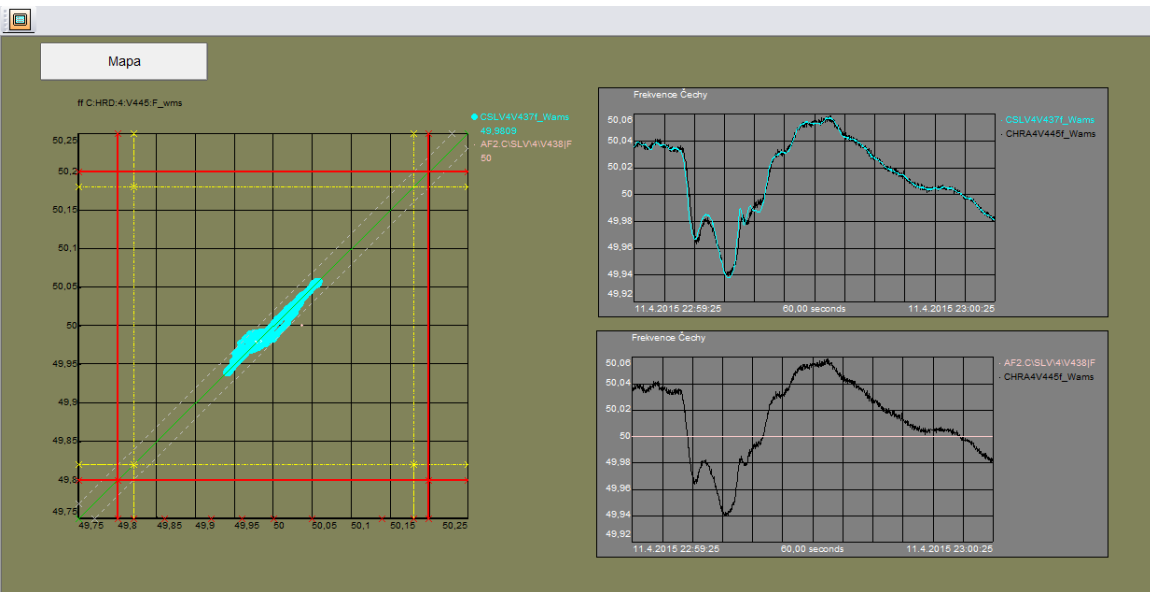
namespace SACEgen
{
    class Observer : IObservable<AFD>
    {
```



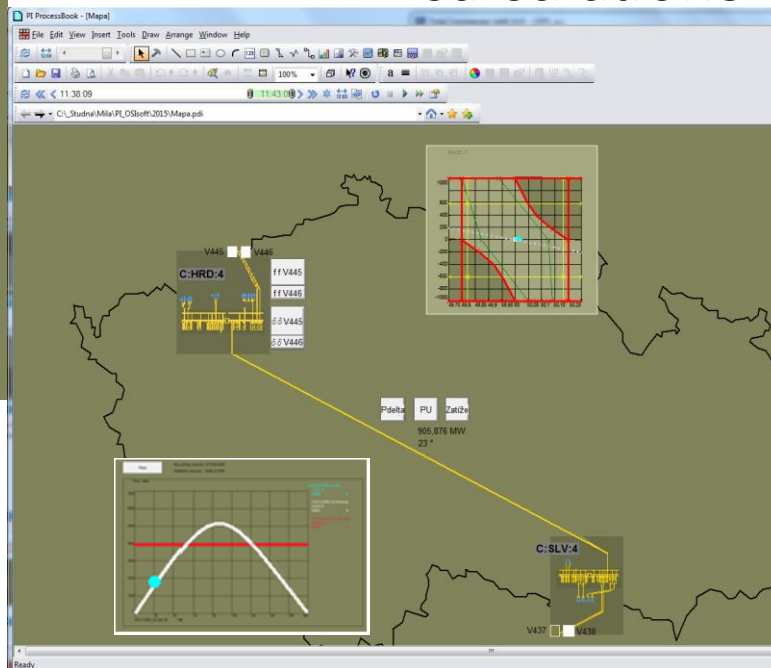
Possible to make
automatic filling of AF structure



50HzT – APG corridor monitoring - frequency

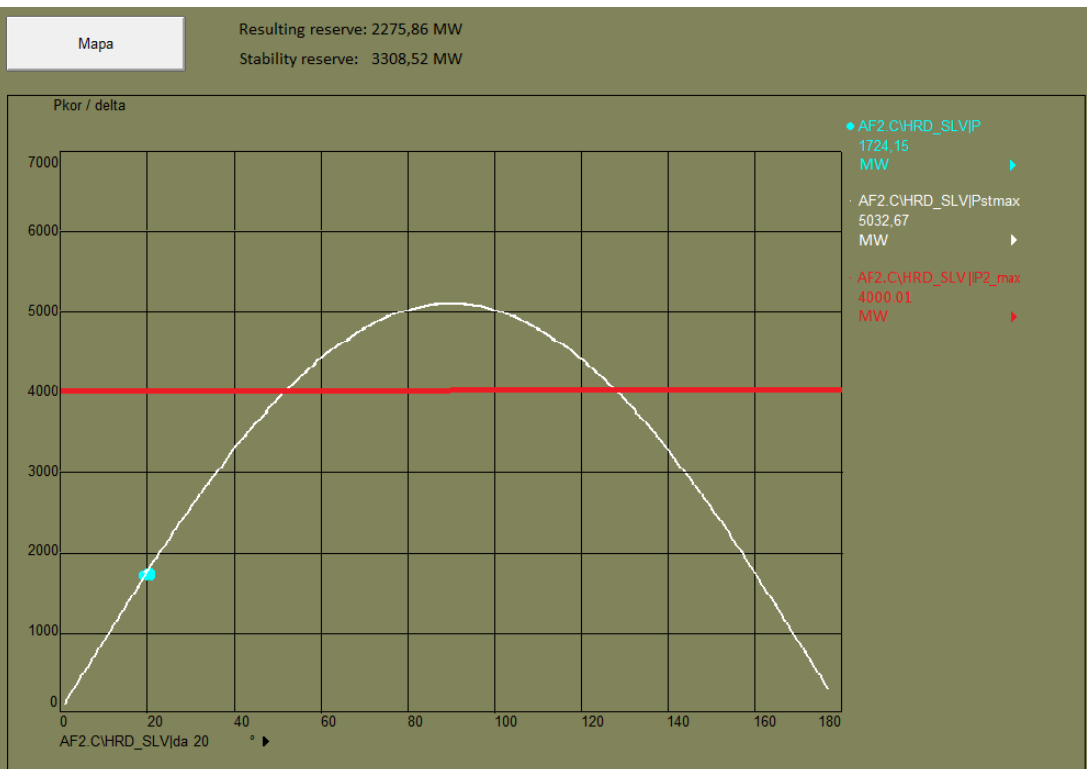


Easy to establish calculations

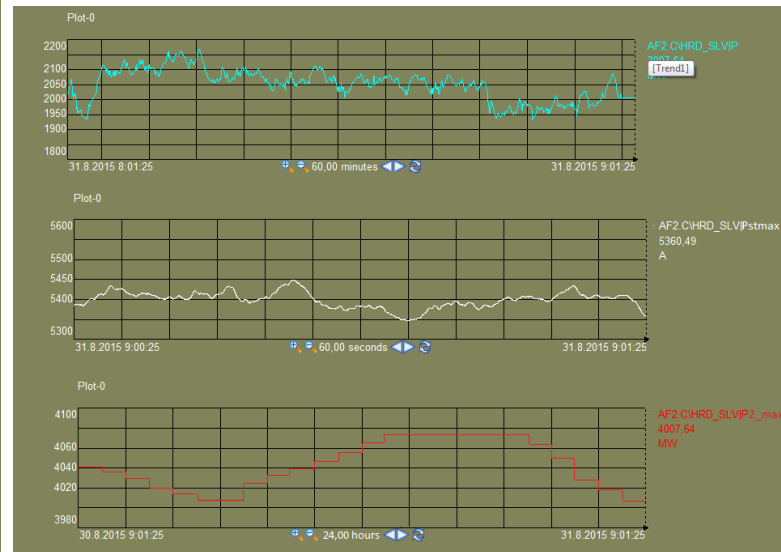


Easy to monitor the PMU data

Integrating data and calculation make possible to monitor 50HzT – APG corridor



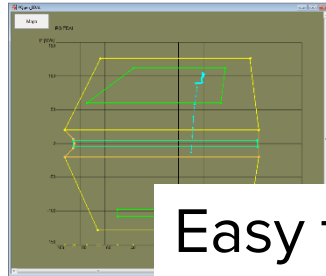
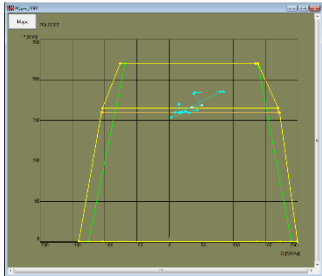
Possible to calculate and to compare different values



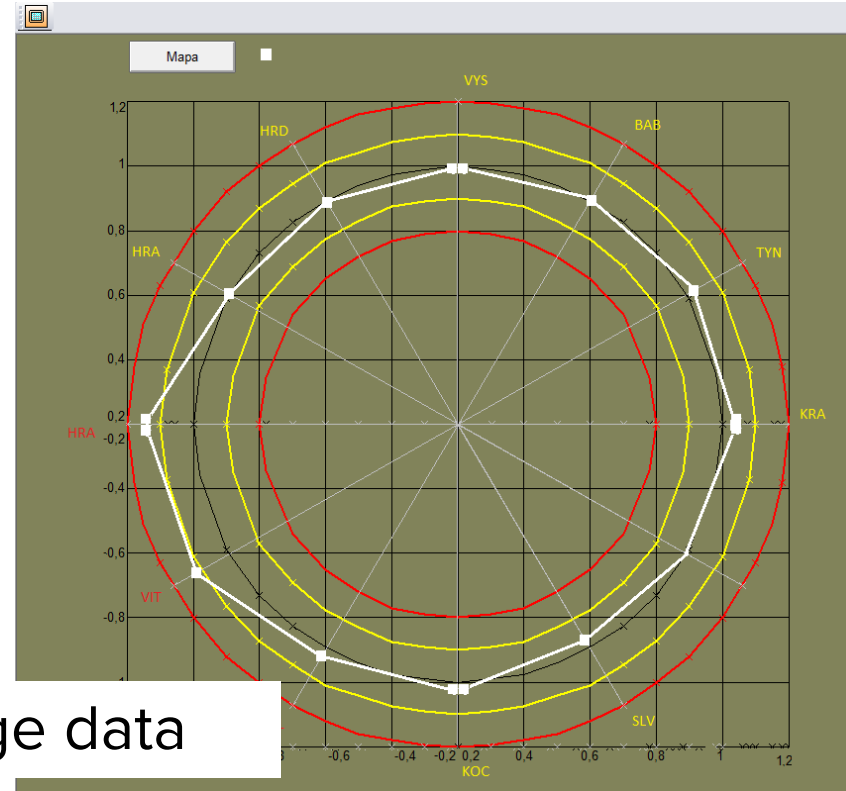
Voltage and Reactive Power Control

the PI System role:

- Monitoring
 - pilot nodes Voltages
 - PQ diagram of generators
- Monitoring V_a



Easy to manage data



Conclusions

- Easy to interpret integrating data
- Easy to manage data
- Easy to make the different limit design
- Easy to integrate calculations
- Easy to establish calculations
- Easy to monitor the PMU data
- Easy to compare different values
- Possible to make automatic triggers
- Easy to use .net

Future:

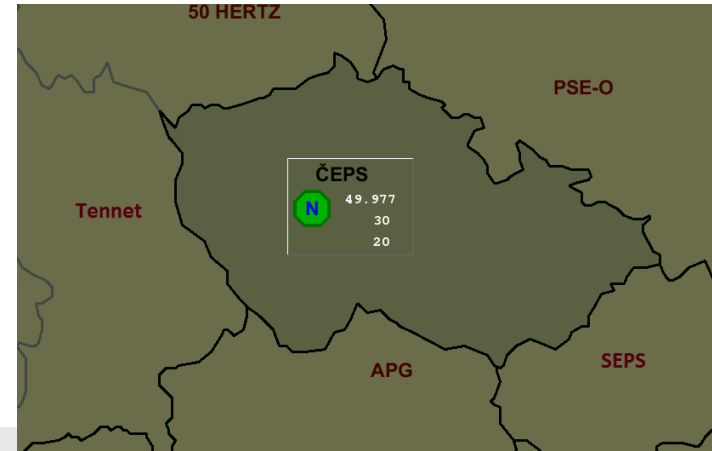
- The PI System as the fully integrated part of IDS
- Operational Control Availability 99,95%

Business impact

- Supplement of the empty functionalities and complement TSO model supervision

Summary

The integration of PI system allows to integrate the calculations, reduced the amount of presented data to compact displays. This will lead to well understanding and to reduction in overall reaction time.



BUSINESS CHALLENGES

- A. transmission flows through CEPS grid territory
- B. Integration PMU technologies to the existing SW solutions

SOLUTION

- A. Robust SW background for Operational control
- B. PMU data integration, synchronizing them with SCADA data

RESULTS AND BENEFITS

- Operational business support improvement
- Extension of understanding about transmission system transient behaviour
- Grid model supplement with relevant data from surroundings of CEPS Observability Area

Contact Information

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Questions

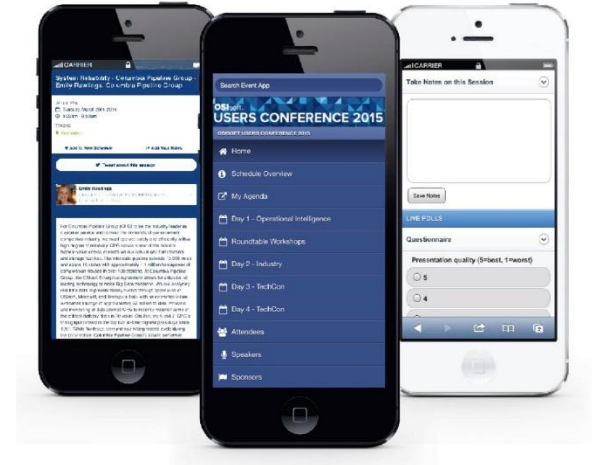
Please wait for the **microphone** before asking your questions



State your
name & company

Please don't forget to...

Complete the Online Survey
for this session



<http://eventmobi.com/emeauc15>



감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

Děkuji