EGÚ Brno, a. s.

Section of electrical network

Automated Icing Monitoring System on the territory of the Czech and Slovak Republic

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Outline

- Project „PMS“ station
- PMS deployment
- PMS utilisation at E.ON Distribuce, ČEPS
- A(I)M System

1st generation - Station „METEO“

- Utility VCE (CEZ at present)
  - 2 Meteo devices
  - First in 1999, second in 2003
- Utility JME (E.ON at present)
  - 12 Meteo, in operation 2001-2012
  - Data collected into SCADA system
  - Data transmitted via radio network

2nd generation – „PMS“ station

- Started in 2006
- PMS – based on METEO
- New functions
  - External sensors
  - Communication via GPRS, Ethernet
  - Power supply (lv/mv lines, solar panels – @hv/uhv lines)

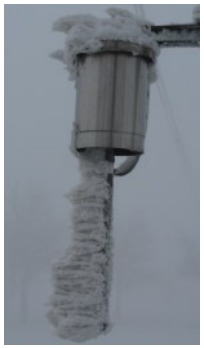
Disposition of PMS device

Supply Transformer 22 kV/57 V

Crossarm with weather sensors and ice load sensor

Case with processing and communication units, power supply

Measured values



- Ice mass (0-40 kg/m)
- Temperature (-40 + 120 °C)
- Humidity (0-100 %)

- Wind velocity (0-40 m/s) – rod
- Wind velocity (0-60 m/s) – external anemometer
- Wind direction – rod/external anemometer

- Irradinence (0-1400W/m^2) – external pyranometer (Kipp & Zonen)

Instalations of PMS

Substation 400/110 kV

MV line (22 kV)

Line 400 kV

Regimes

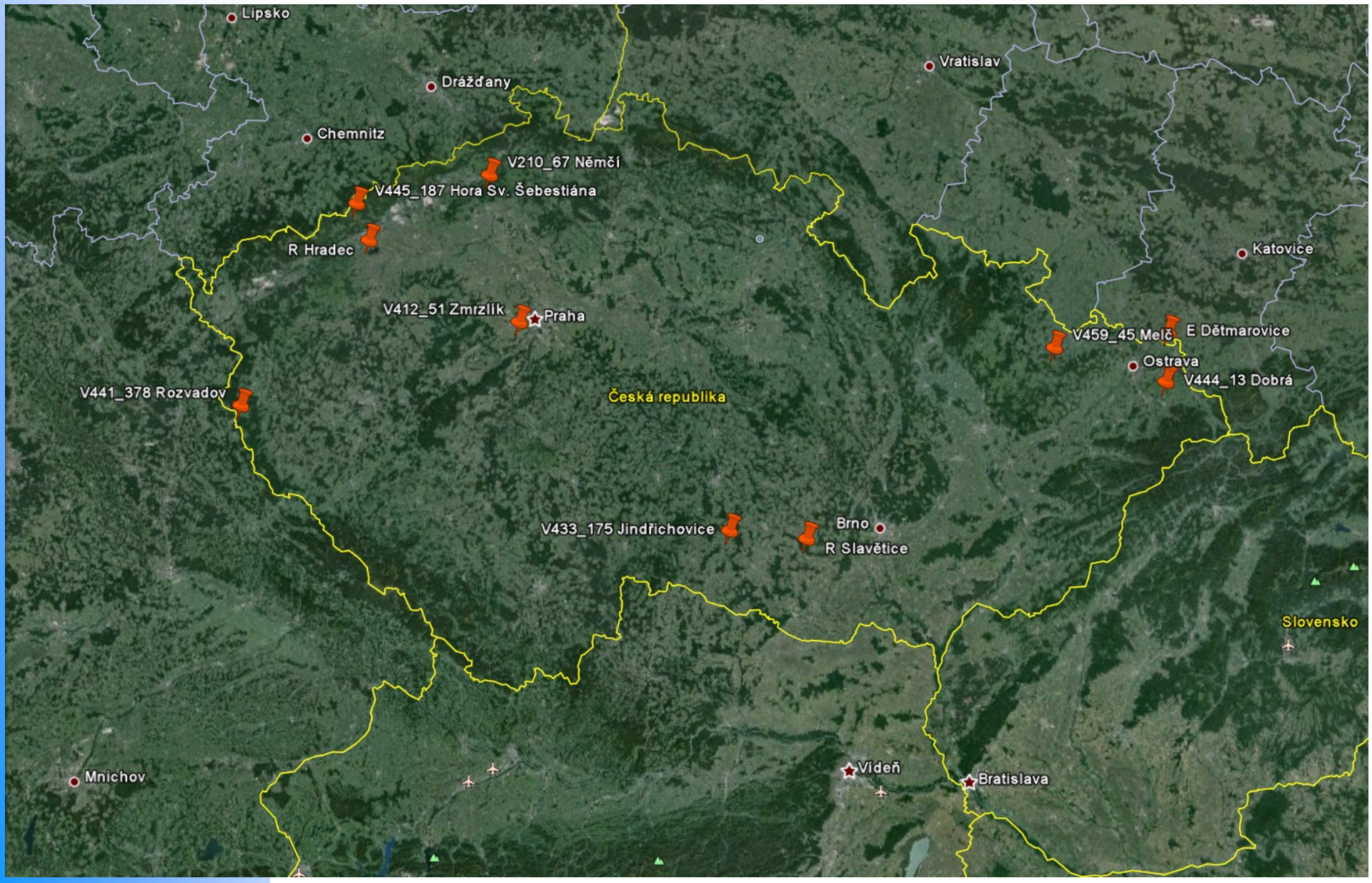
- **Standard**
  - measuring of current quantities, processing measured values and saving into daily files (flash memory)
  - sending local files into the central database
  - transmission current values to the superior system (SCADA)
- **Warning messages**
  - Ice load / Steepness of ice growing / Wind velocity
  - Outage of power supply and its restoration
  - Opening of the box

Deployment of PMS stations

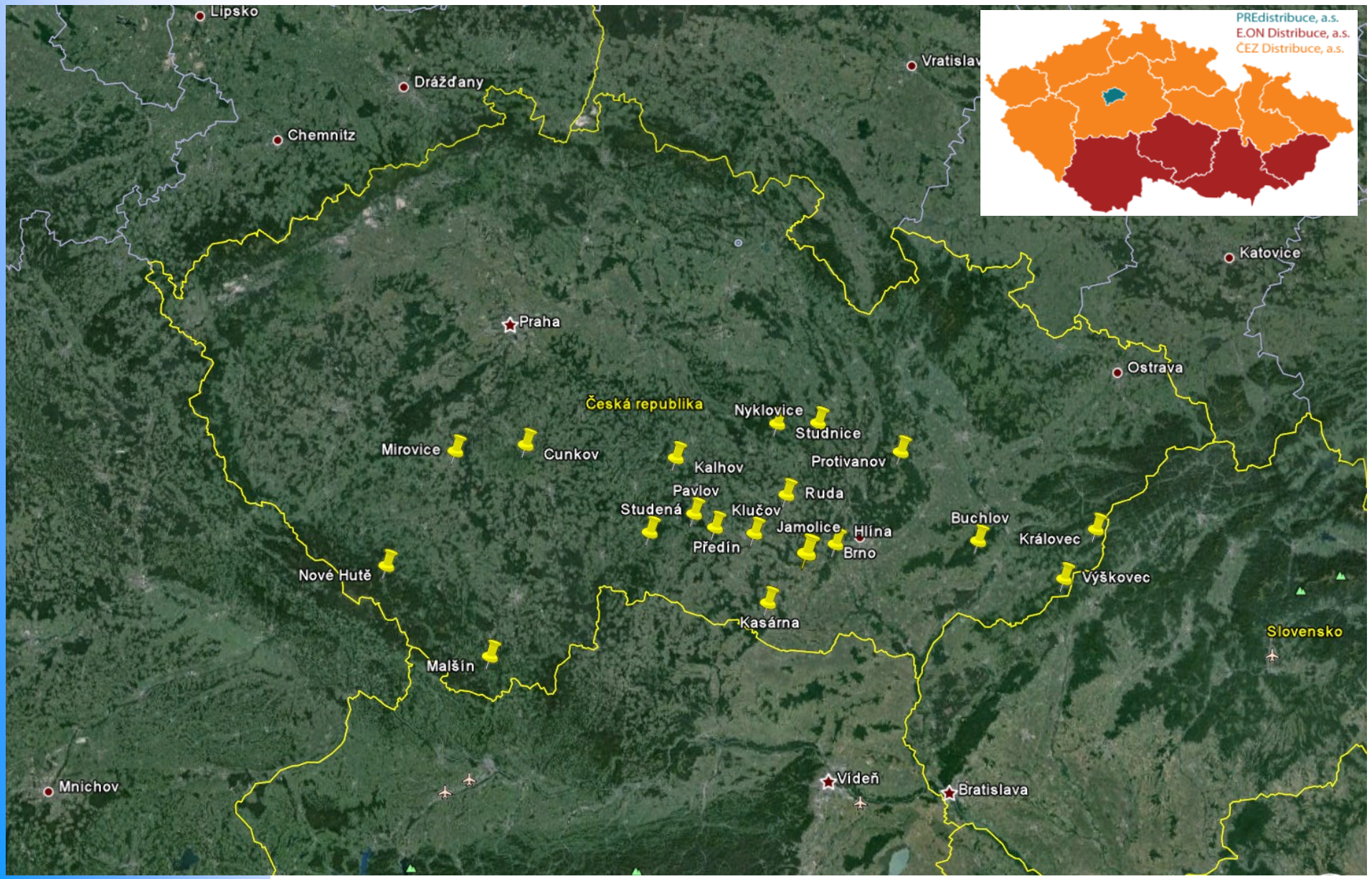
Company	State	Utility	Nr. of PMS installed	Place of installation	Year of installation
ČEPS	Czech Republic	TSO	10	Lines 400 and 220 kV, substations 400/110 kV	2006-2007 (5) 2011 (3) 2012 (2)
ENEL	Slovenia	TSO	1	Line 380 kV	2007
E.ON Distribuce	Czech Republic	DSO	19	MV lines	2012-2013 (18) 2015 (1)
E.ON Thüringen	Germany	DSO	13	MV lines & hv/mv substations	2008-2011
ZSE Distribuce	Slovak Republic	DSO	8	MV lines	2013
NKT	Germany	-	1	testing	2009
SEPS	Slovak Republic	TSO	1	400 kV line	2014
ČEZ	*Czech Republic*	*DSO*	*24*	*MV lines*	*2015 -2016*

Map of the Czech Republic

ČEPS - Deployment of 10 PMS stations

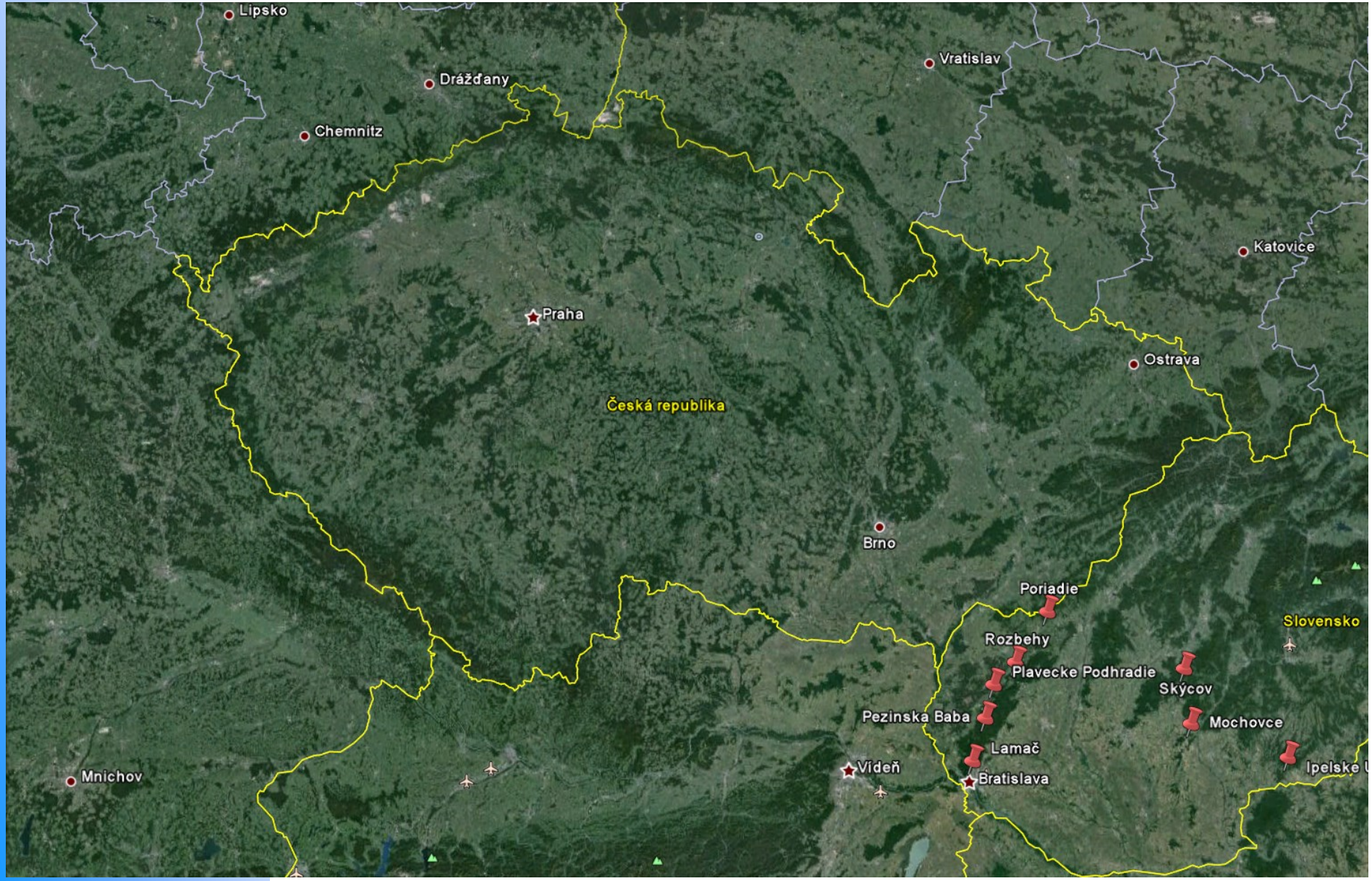


E.ON Distribuce - Deployment of 19 PMS stations

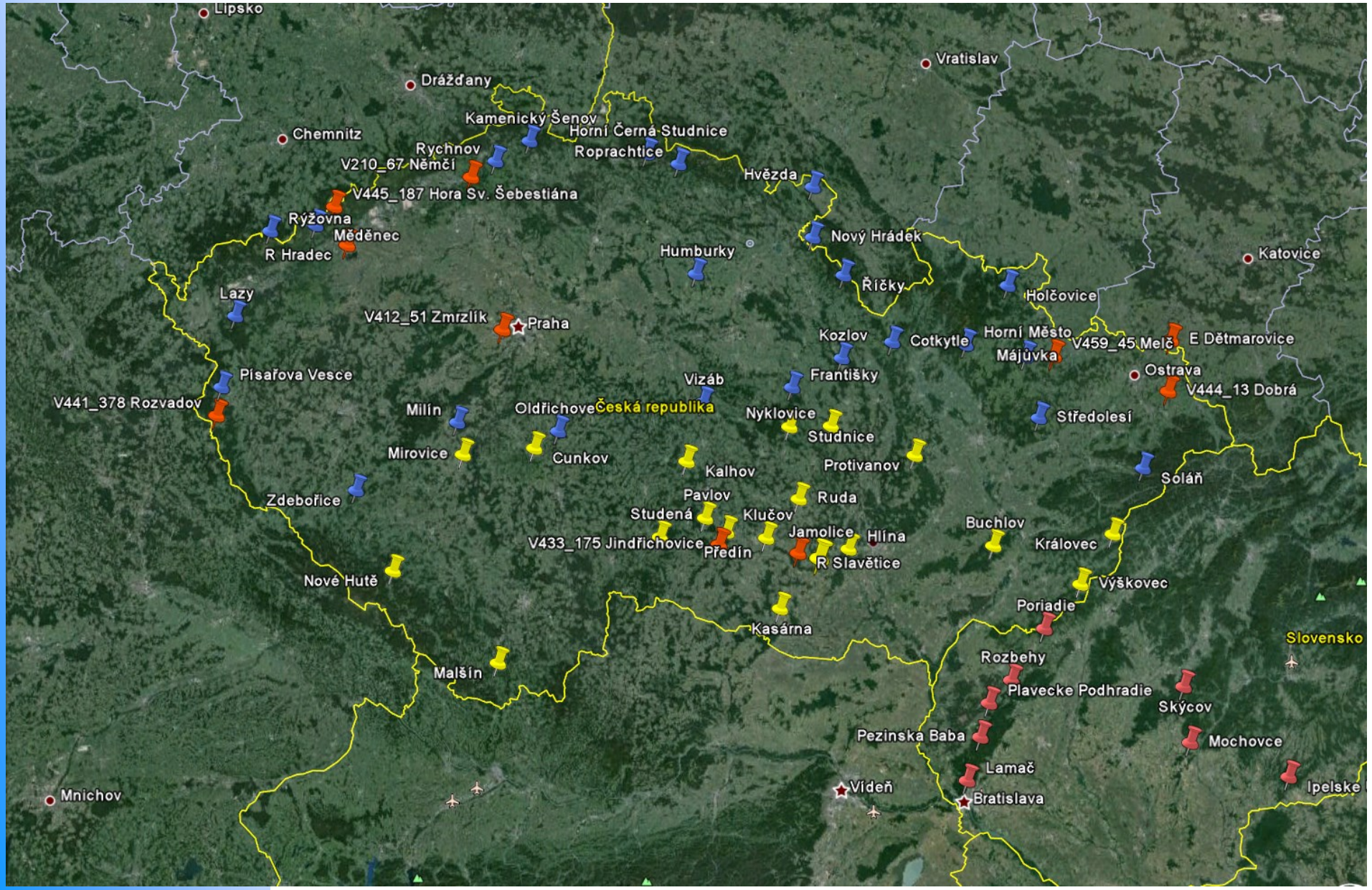


ČEZ – Future deployment of 24 PMS stations

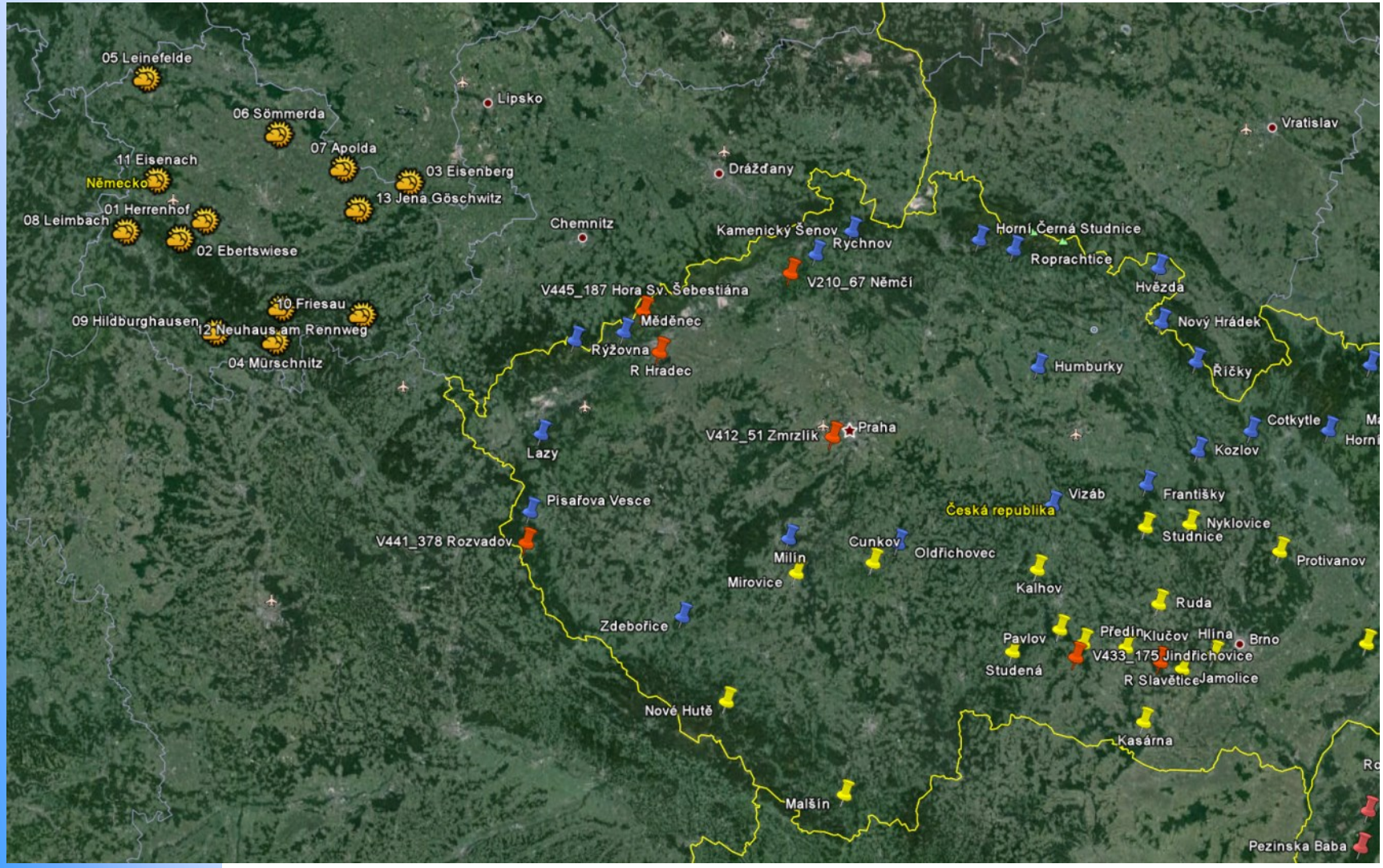
ZSE - Deployment of 8 PMS stations



Deployment of all 53 (+8) PMS stations

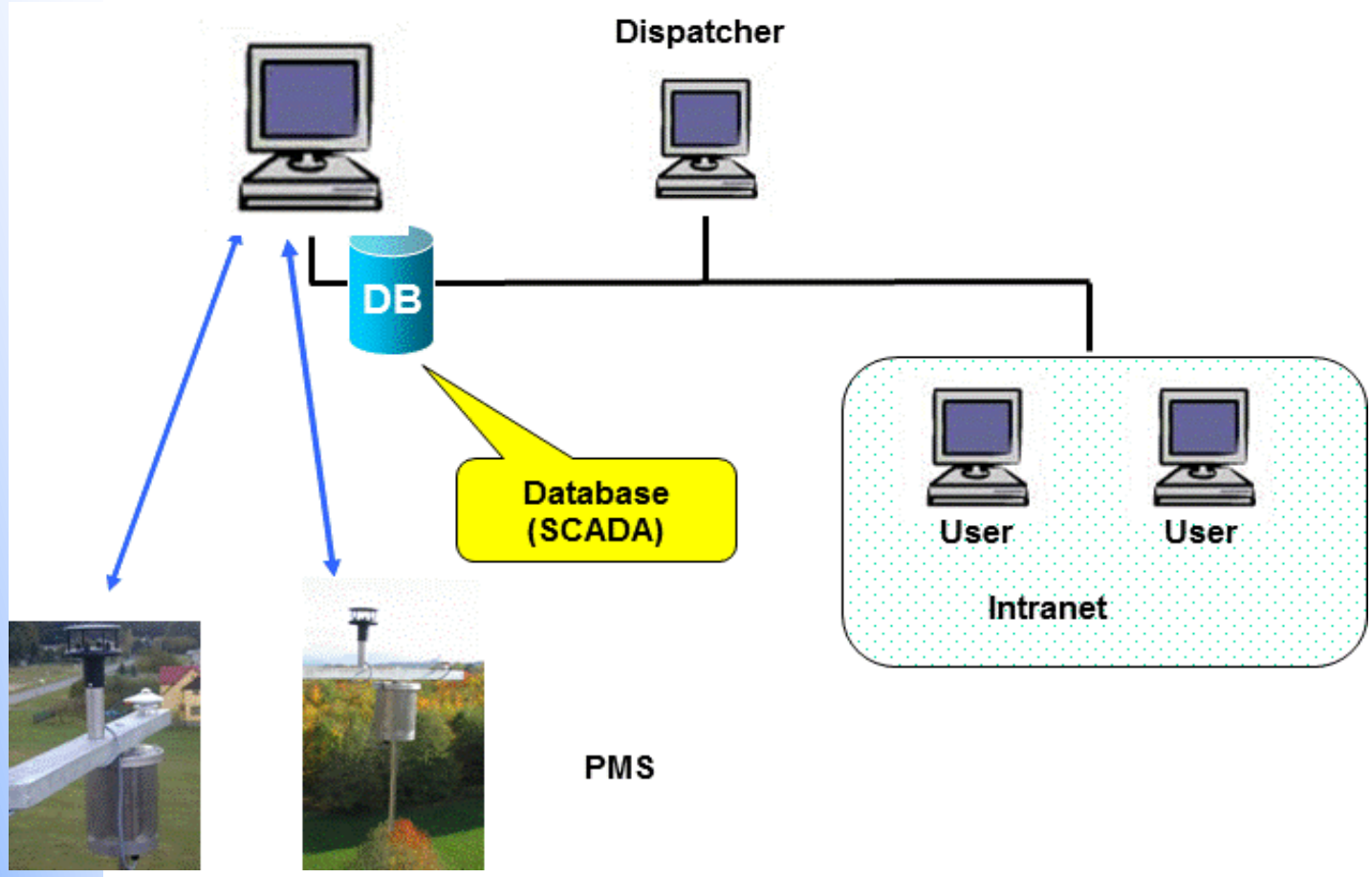


E.ON Thuringen (Germany) - Deployment of 13 PMS stations



E.ON Distribuce

Actual state

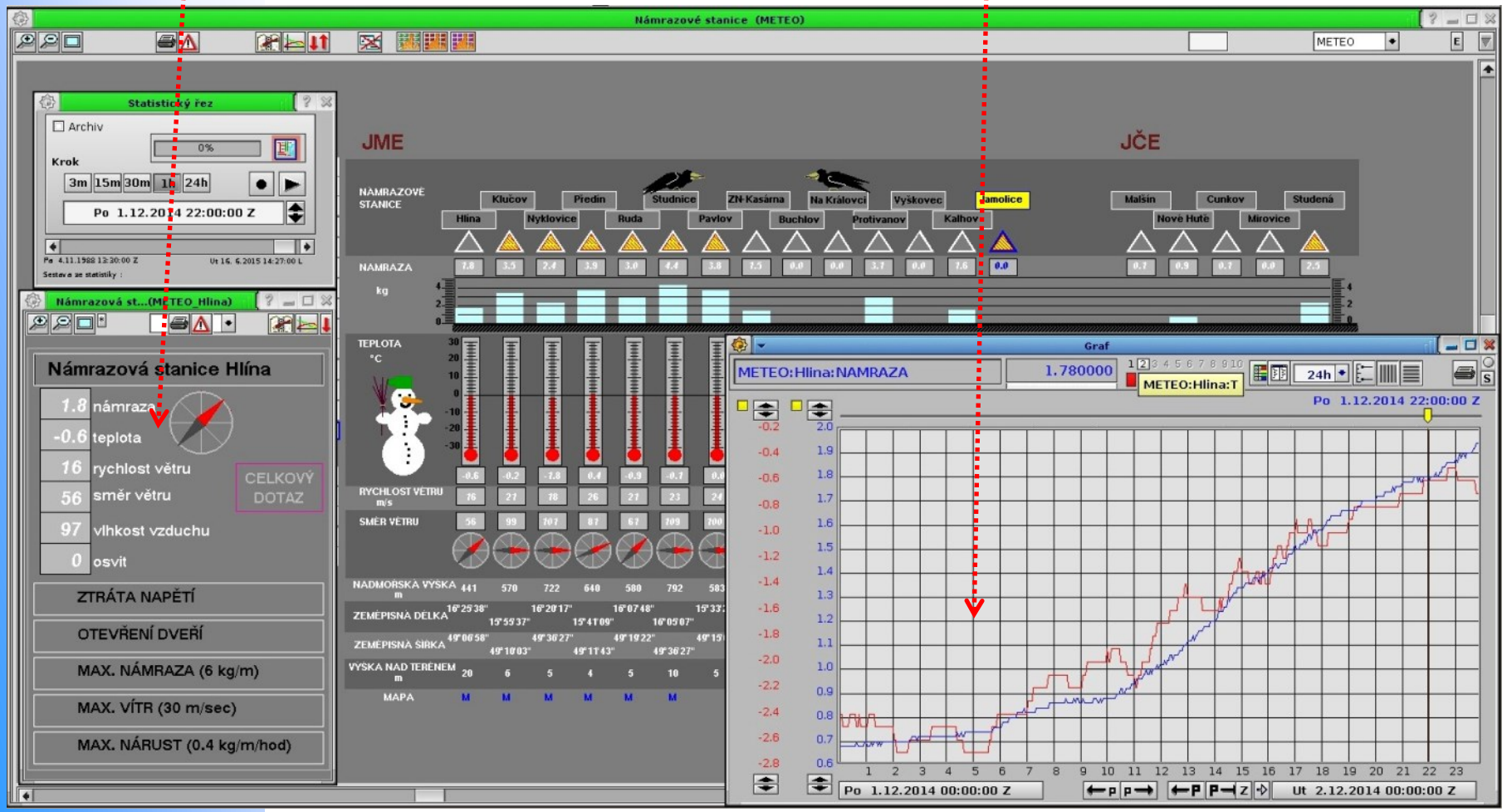


E.ON Distribuce

Dispatcher's screen

Current values

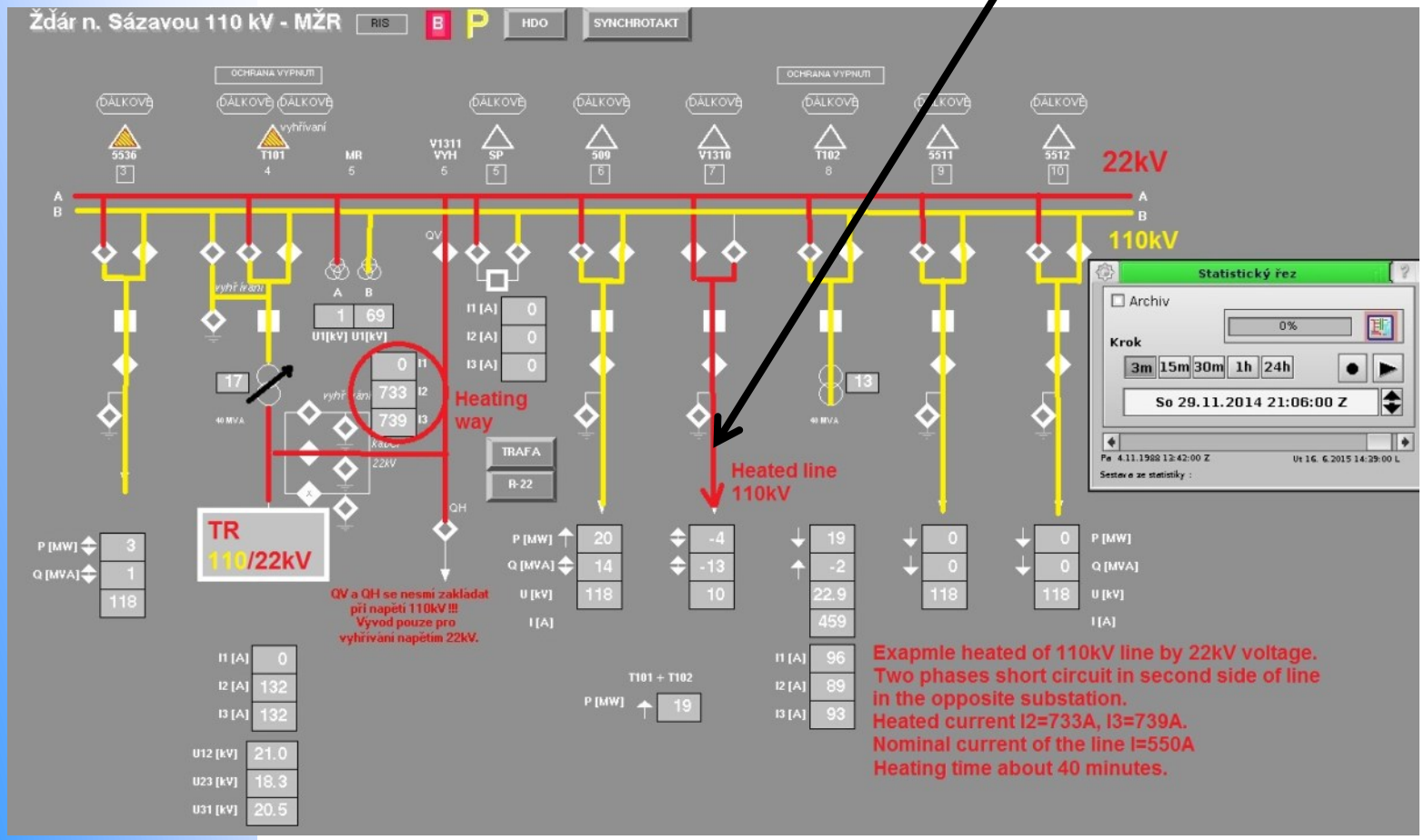
History



E.ON Distribuce

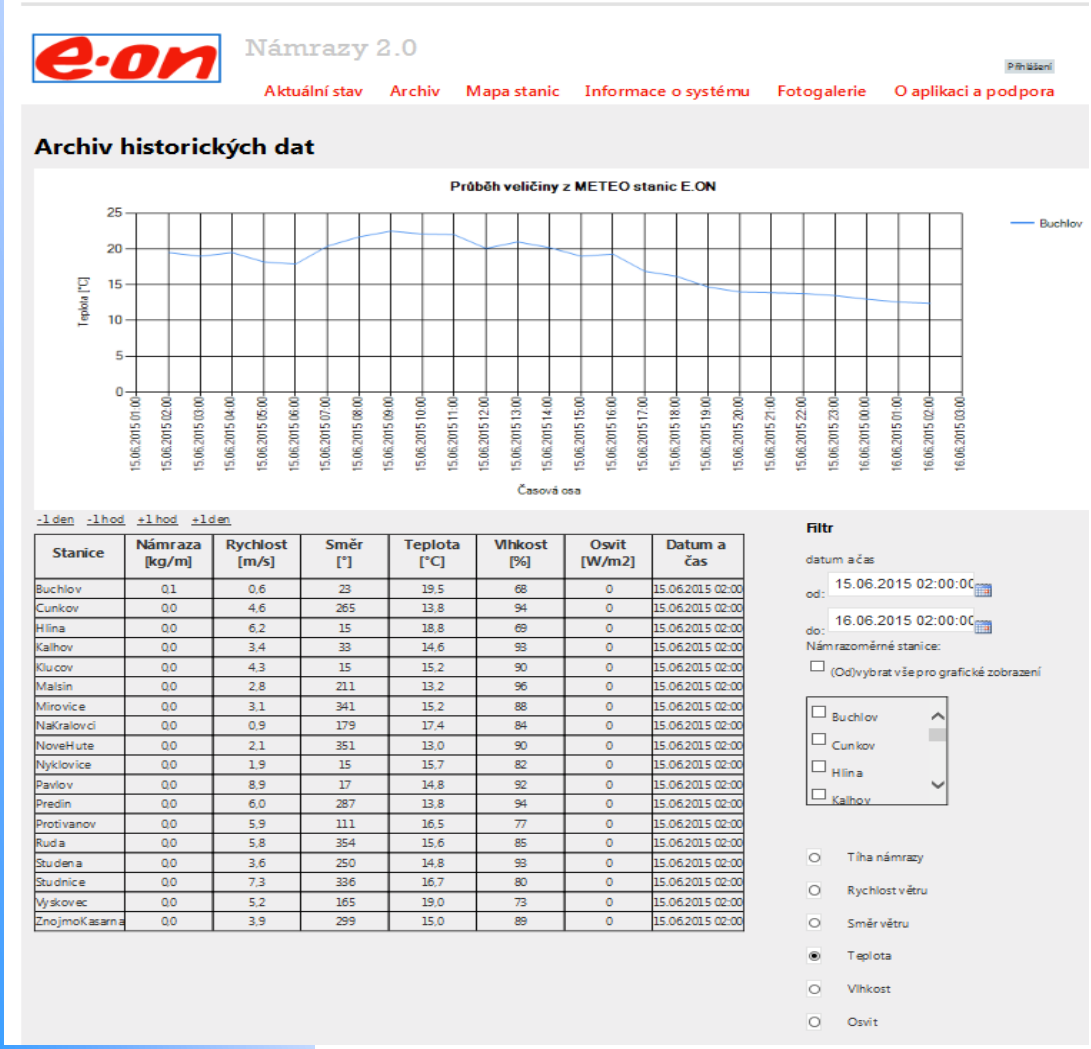
Dispatcher's scheme

Heating of hv line (110 kV) in case of serious icing event



E.ON Distribuce

Intranet



View on actual data

History of measured values

ČEPS - actual state

Calcucation of the line capacity (actual, intraday, D+1, D+2)

ČHMÚ: Actual ambient temperature

PMS:
- Actual data
- Daily data
- Warnings

Server

Db

Capacity [MW]

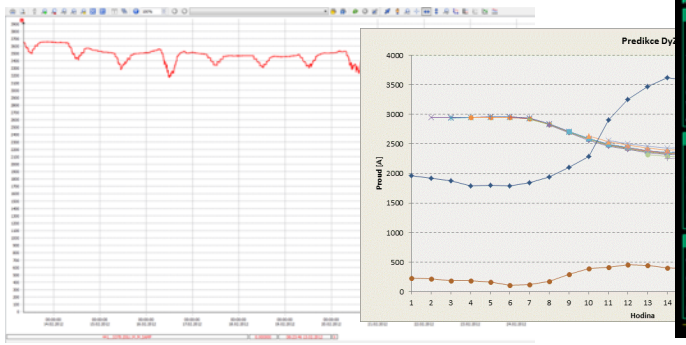
Dispatcher

User

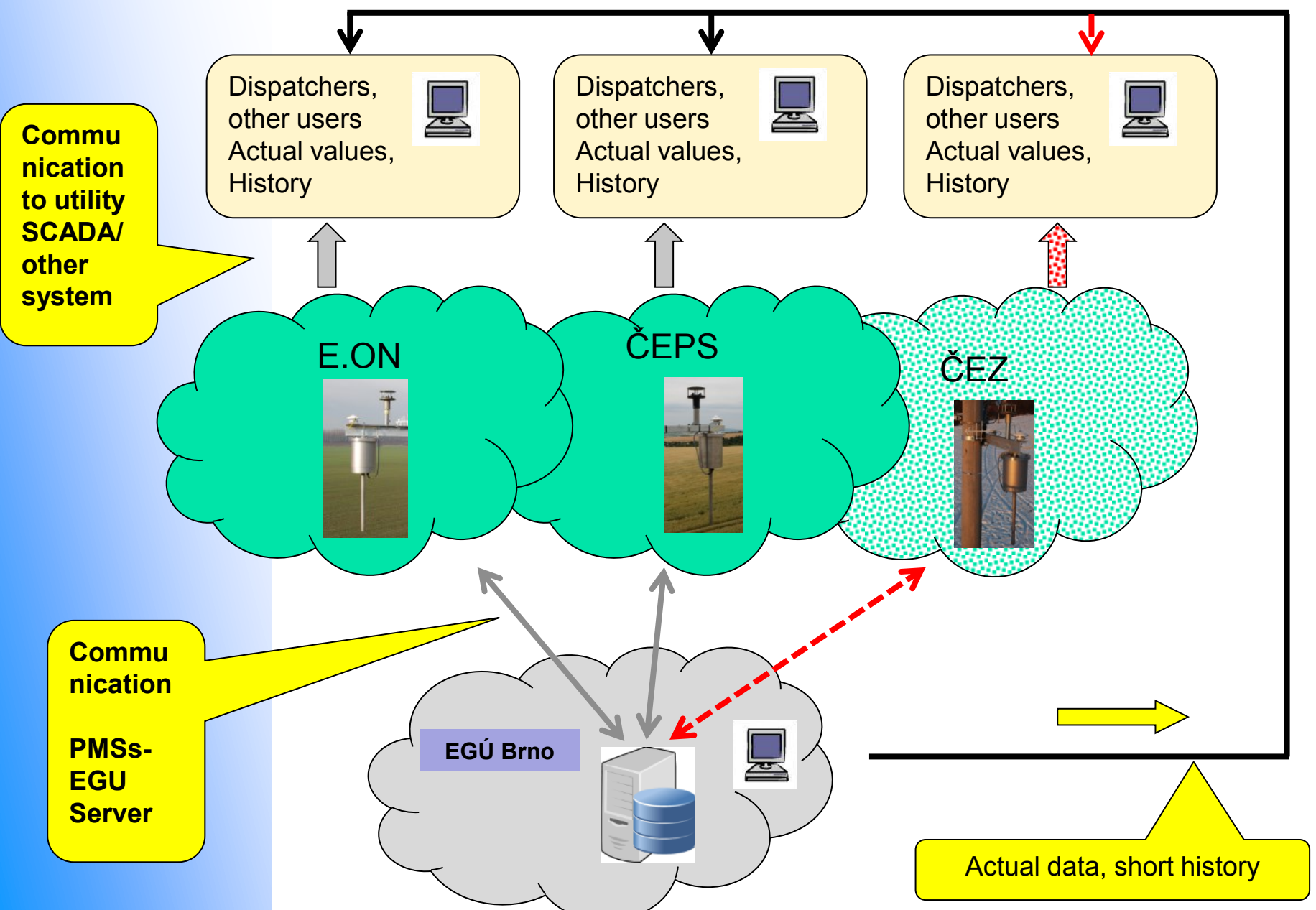
Displaying actual transmission capacity

Displaying measured data

PMS



A(I)M System – concept



A(I)M system at national level

- **Setting up a new database server in EGÚ Brno (MS SQL) & software**
- Providing data of/to other utilities
  - Parralel communication to EGÚ server (partly done)
  - Creating data format
  - Visualisation data from “new” PMS stations for the dispatchers
- Providing data directly from SQL server
  - Access from PC, smart mobile phones via web
  - Users, rights
  - Limited/full access?

A(I)M system

now

- Operation of the networks (continual knowledge of the climatic situation in the area)
- Dynamic Line Rating (TSO)
- Design of OH lines and statistics
- Icing prediction/verification of icing occurrence

future

A(I)M system

Statistics

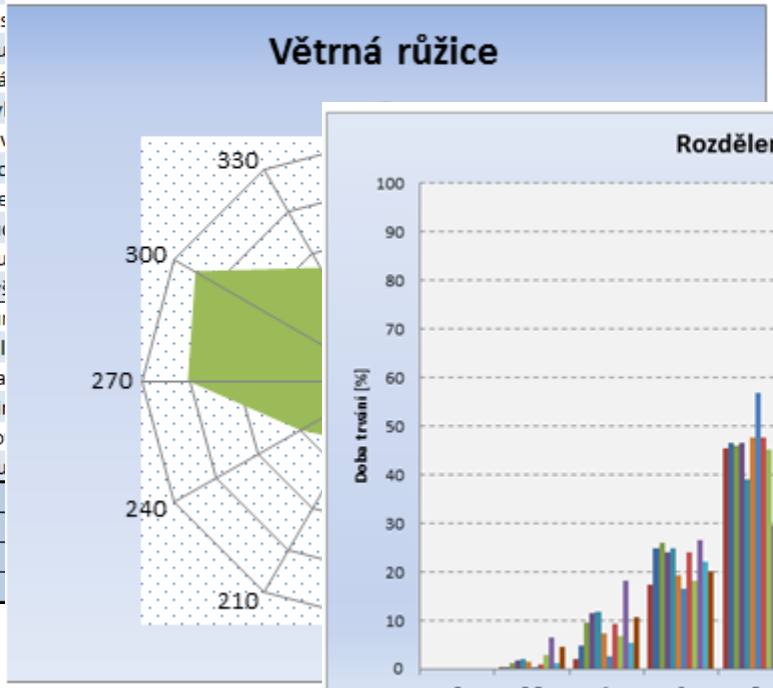
PMS: E.ON Roky: 2012-2013

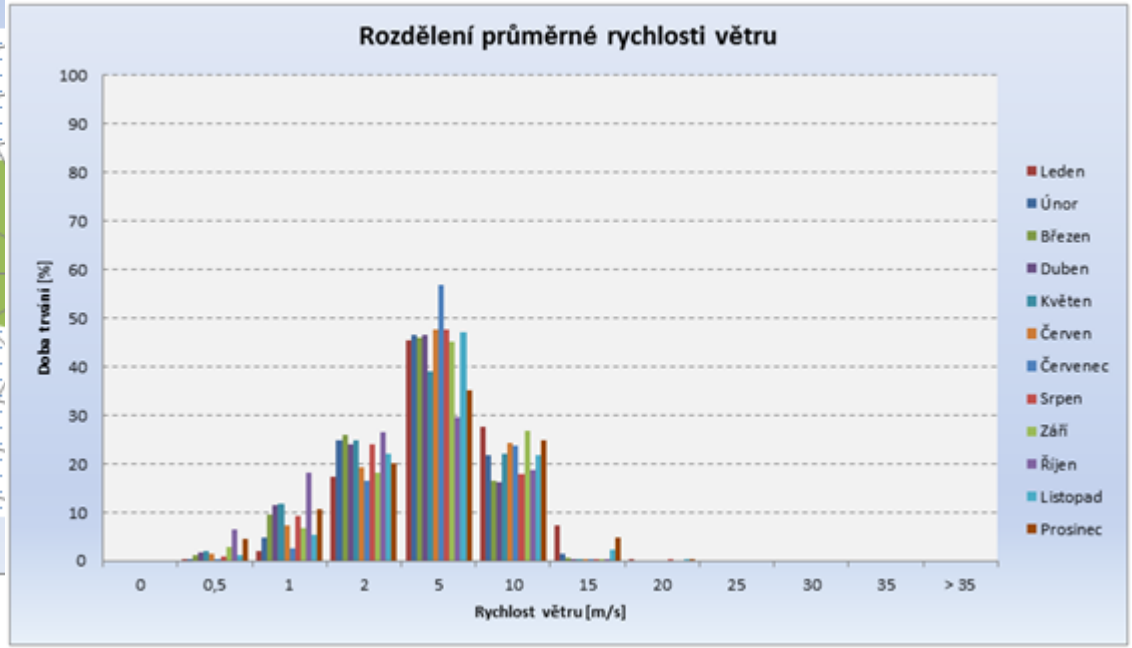
Tabulka s přehledem počtu námrazových cyklů a naměřených maxim námrazy

Oblast	Rok	2012	2013	Období
				Maximum [kg/m]
E.ON Východ	Bu			0,16
	Hlí			0,82
	Kas			0,56
	Klu			4,18
	Krá			0,00
	Ny			0,10
	Pav			
	Prc			
	Pře			
	Ru			
	Stu			
	Výs			
E.ON Západ	Cu			
	Kal			
	Ma			
	Mi			
	No			
	Stu			
Maximum				
Minimum				
Suma				
Průměr				

PMS: Nyklovice Rok: 2013

Tabulka rozdělení doby trvání směru větru [%]





Conclusions & outlook

A(I)M system – a big challenge!

- the situation beyond the utility region
- more info for making operative decisions
- Mutual effect and benefit to utilities
- Extention the area to the west part of the Slovak Republic?

Thank you. ☺
Questions?