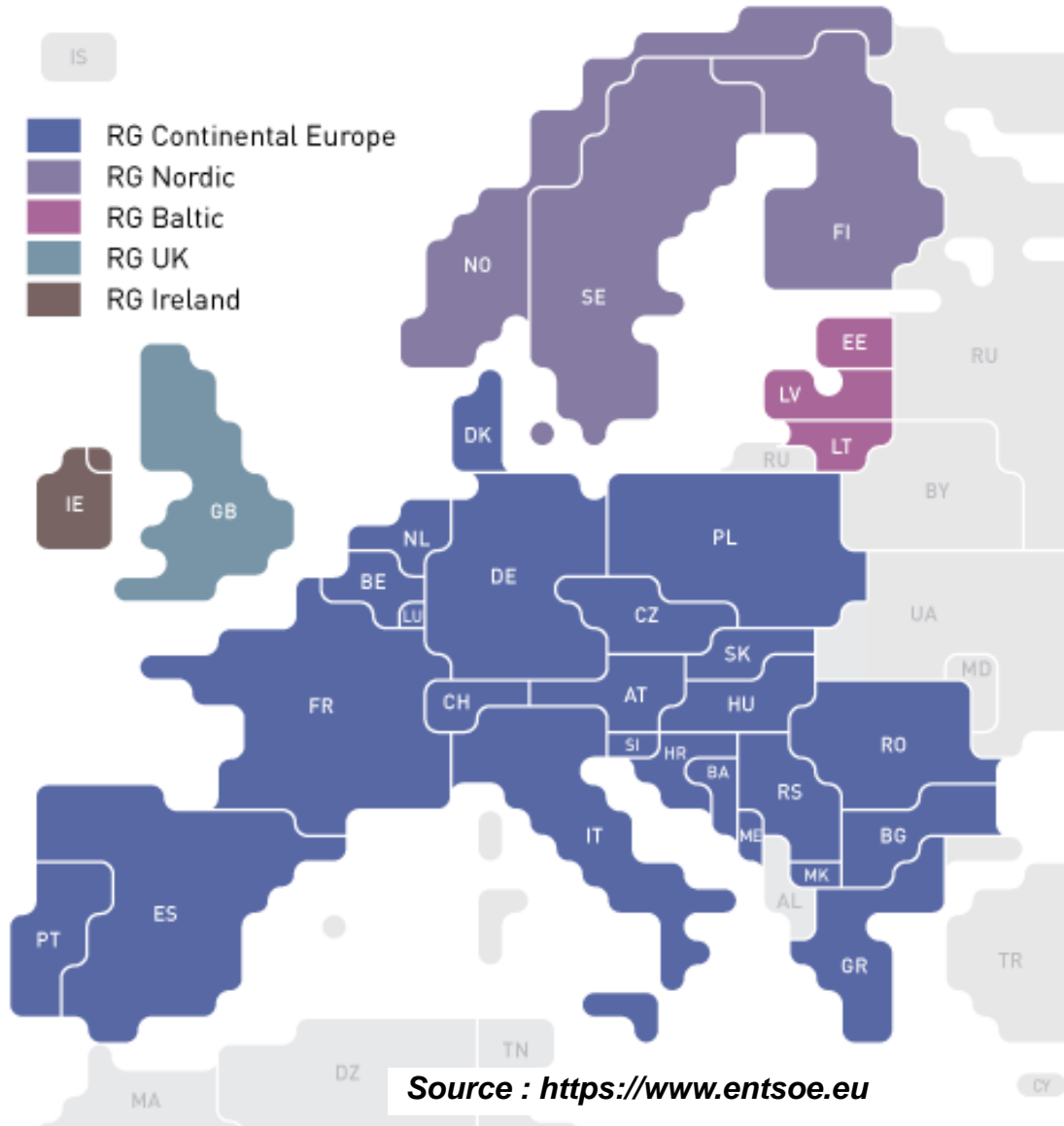




**11th EPCC
Altea, Spain,
May 22-25 2011**

**Operation of
interconnected systems
under emergency
conditions - experiences
made in Inter TSO
training sessions**

udo.spanel@dutrain.de



ENTSO-E Regional Group Continental Europe

Operation Handbook

***P 1 Load Frequency Control
and Performance***

***P 2 Scheduling and
accounting***

P 3 Operational Security

***P 4 Co-ordinated
Operational Planning***

P 5 Emergency Operations

***P 6 Communication
infrastructure***

P 7 Data Exchanges

P 8 Operational Training

Operation Handbook

Operational training requests (Policy 8):

TSO specific initial and ongoing operator training

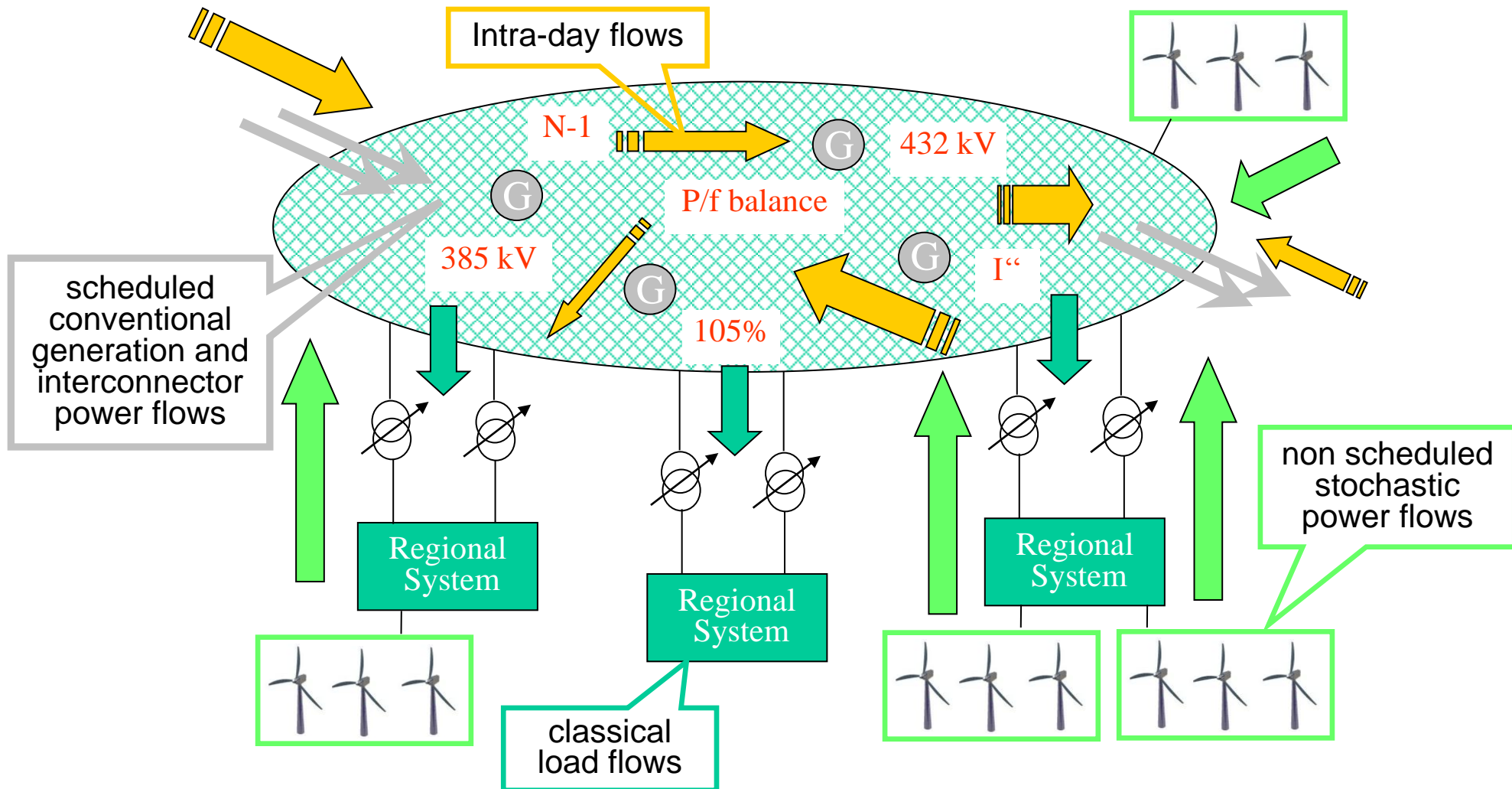
Inter TSO training

- ***Communication, coordination and cooperation***
- ***Use of operator training simulator recommended***
- ***English is used as common language***

Training management

- ***Setting up and monitoring the training***
- ***Appointment of internal trainer(s)***

Operational challenges



Germany

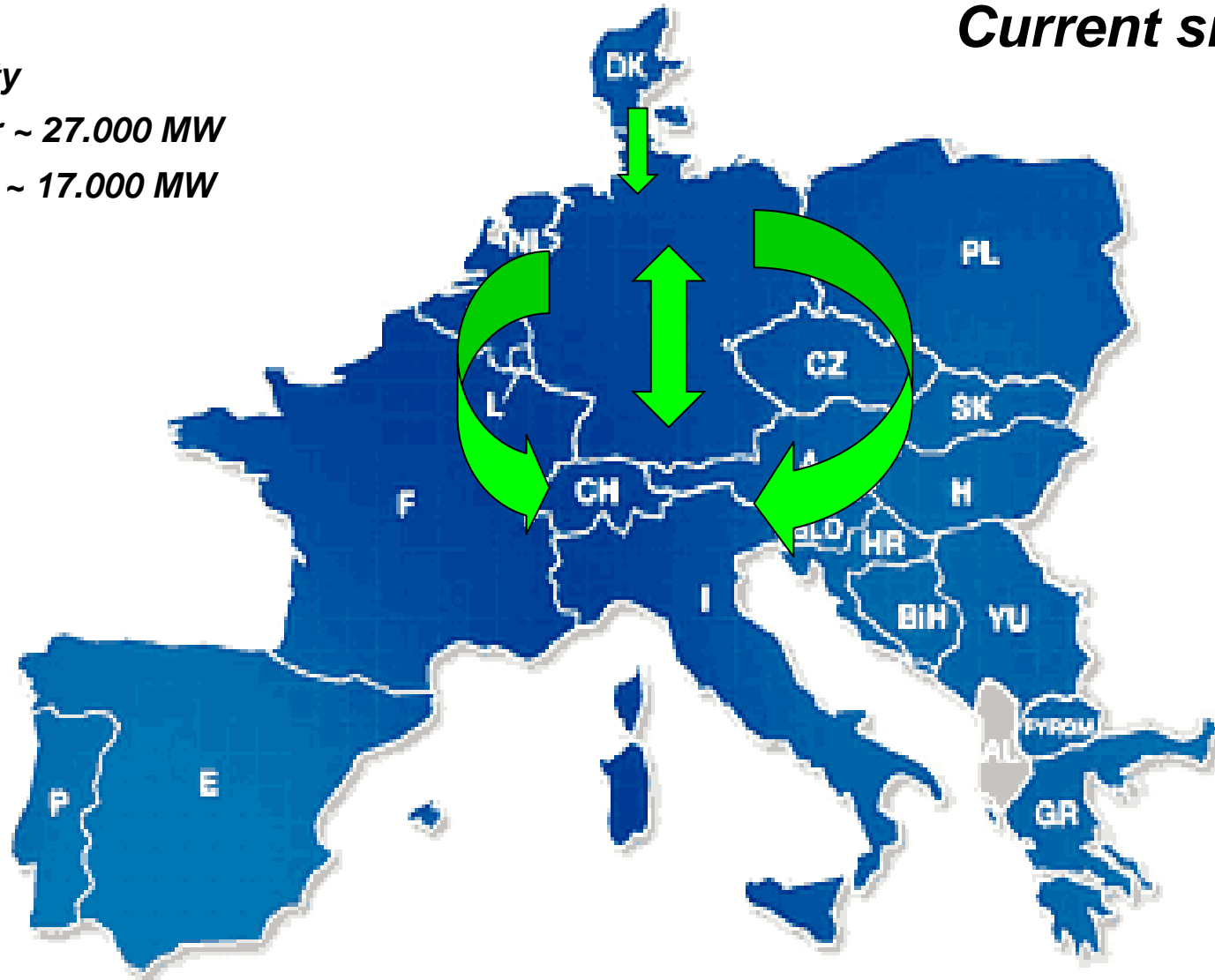
Installed capacity

wind power ~ 27.000 MW

pv-solar ~ 17.000 MW

Current situation

 **Load flow**



Questions

How to represent the overall power system?

Which functionalities have to be represented in the simulator?

How to handle and maintain the data?

How to create scenarios?

How to control a training session?

How to organise a training session?

15 TSO systems

- **400/220kV in full operational detail
incl. generation**
- **Regional systems < 220 kV reduced
incl. generation and load
automatic tap changing**

Specific functionalities

Multiple AGC

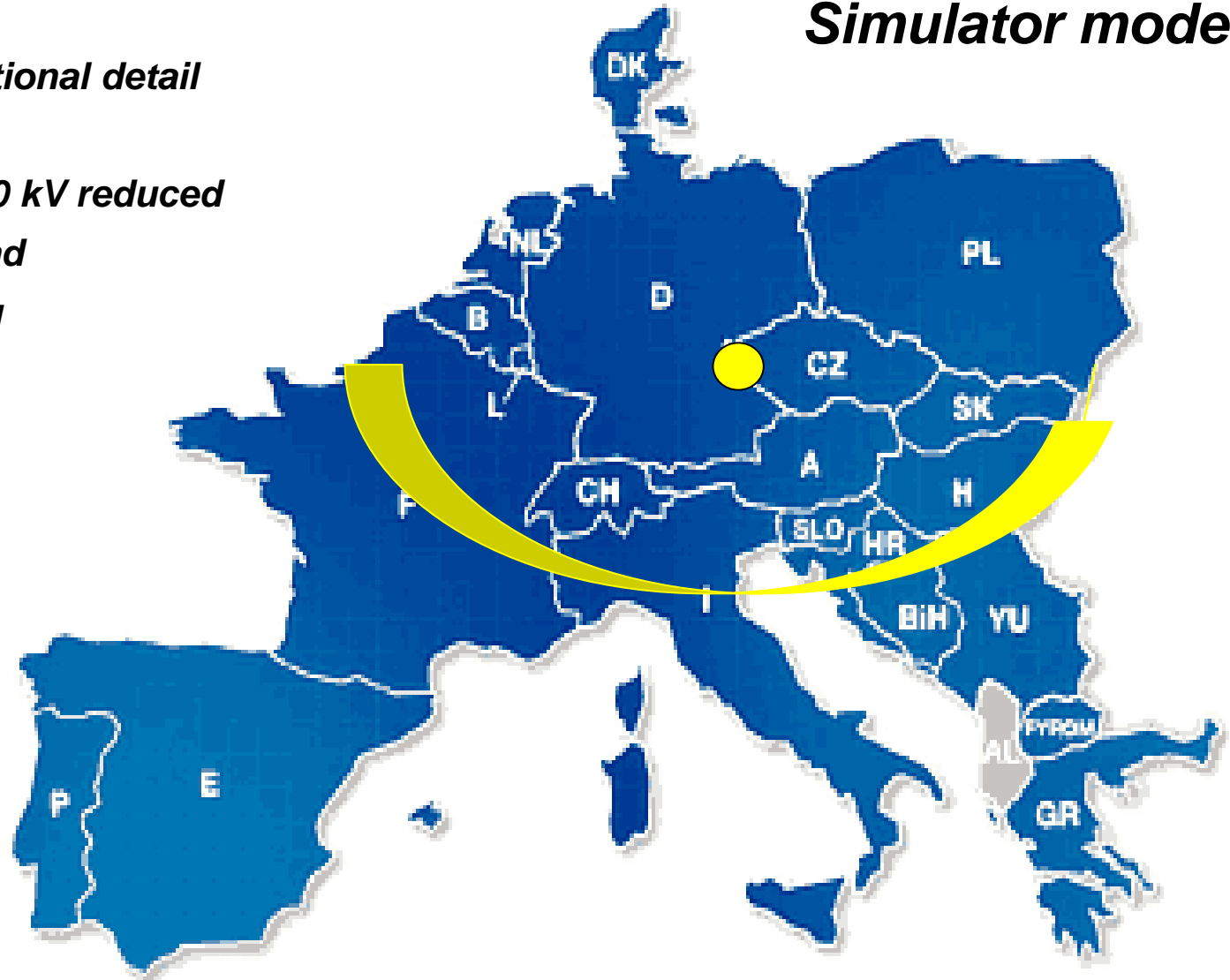
**Combined AGC
Control (GCC – Grid
Control Cooperation)**

**Intra-day Scheduling
system incl. Power
Exchange**

**N-1 (observability
areas)**

**HOBA – German
solidarisation of
windpower**

Simulator model



Simulator issues

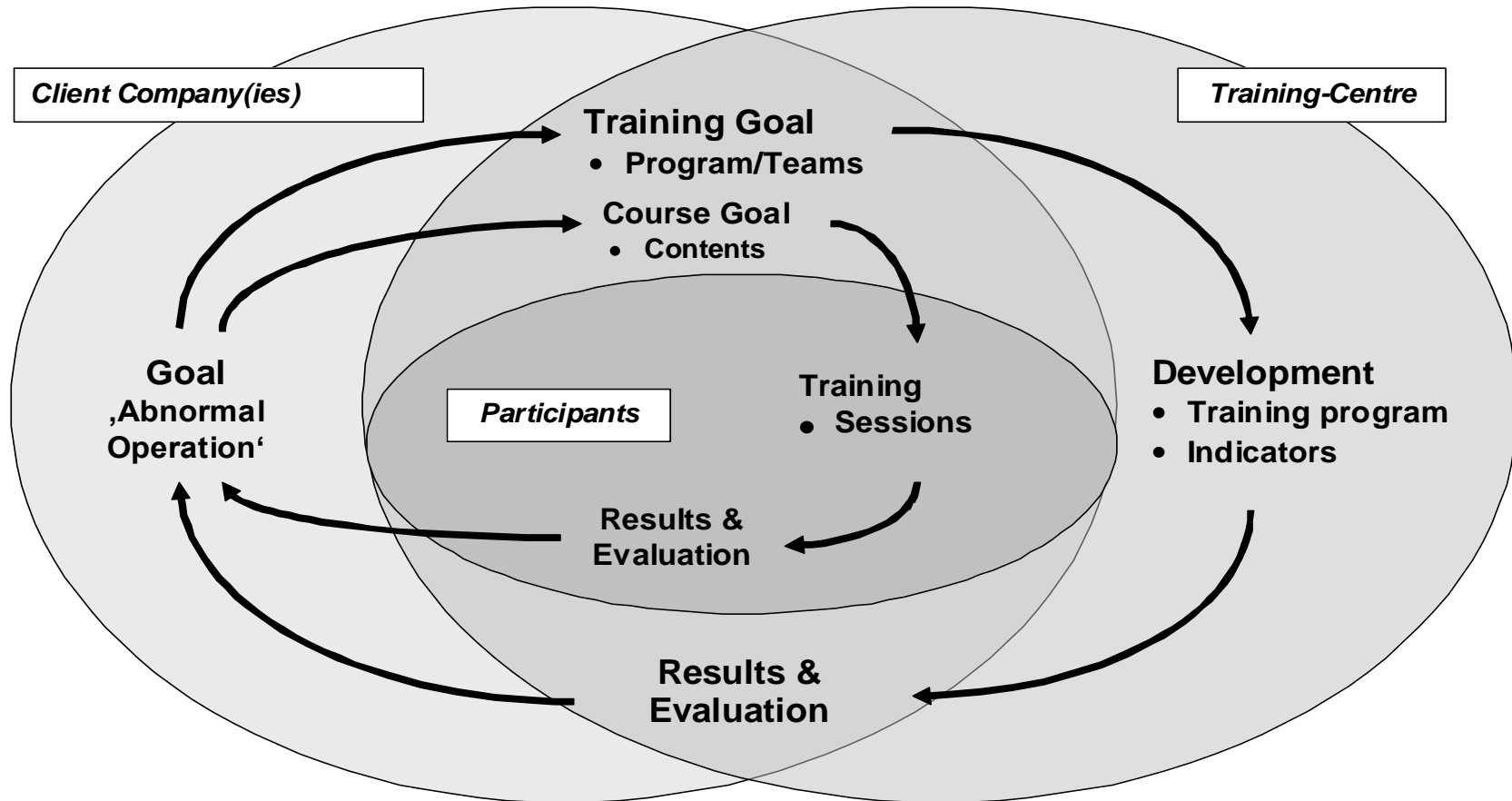
Data handling and maintenance

- ***TSO systems are connected via X-nodes***
- ***TSO system data are stored separately***
- ***each TSO system is represented only once***
- ***for each TSO system one base case scenario***

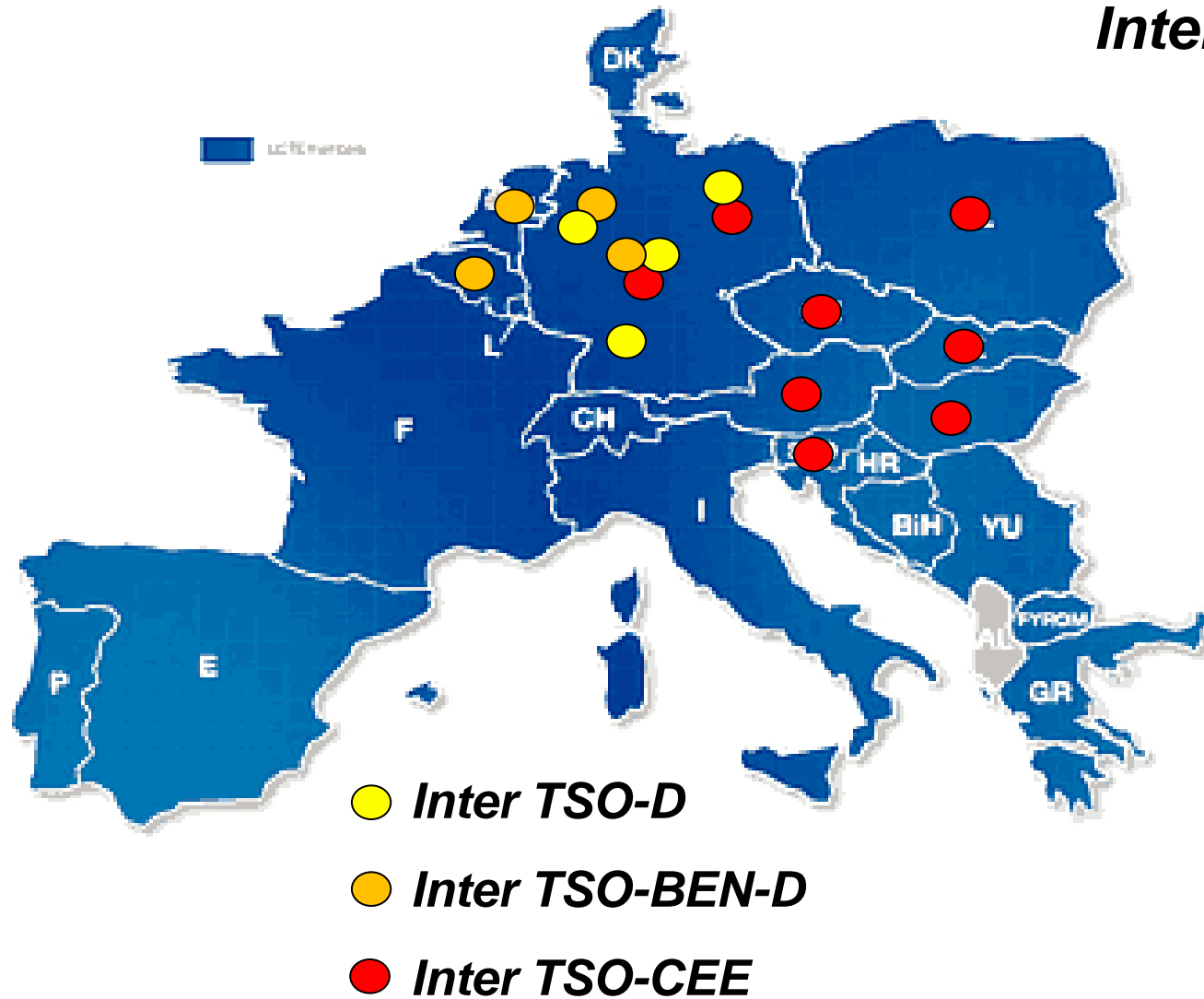
Representation of the power system needs 64 monitors

- ***Trainer Alarm and Awareness System***

Feedback loop



Inter TSO training combinations



Training sessions

3 days

- ***TSO presentations***
 - ***dedicated topics***
 - ***general issues of operation***
- ***Security simulator session***
 - ***preventive and curative actions***
- ***Emergency simulator session***
 - ***islanding / restorative states***