

ENTSO-E – Balancing Pilot Projects

Brussel, December 2014

Outline

- Pilots and non pilots initiatives overview
- Recent achievements and regional collaborations among pilots
- Challenges
- Stakeholders involvement
- NC developing contribution
- Pilot projects road maps

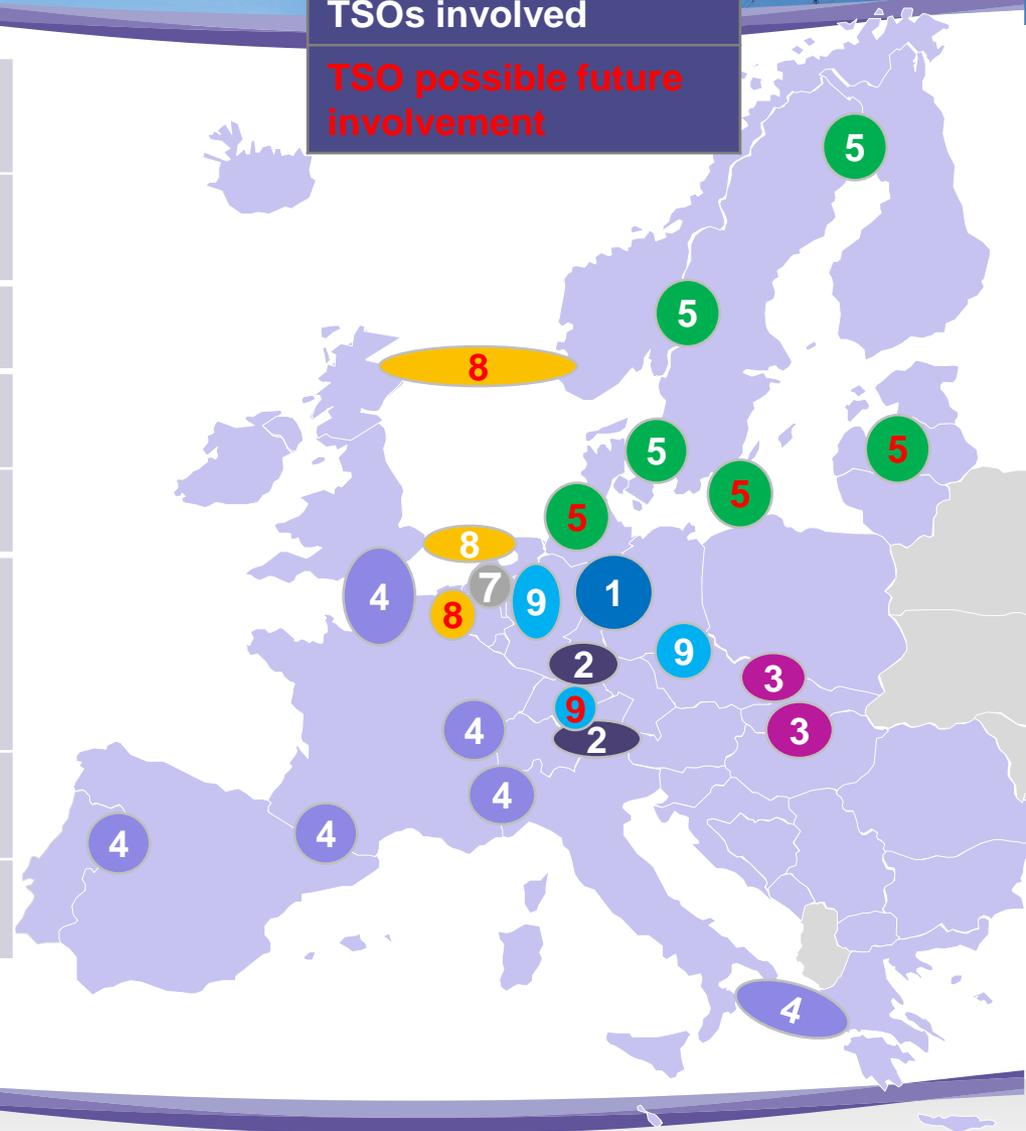
Pilots and non pilots initiatives overview

The current 8 Cross Border Pilot Projects on Electricity Balancing

1	CMOs for mFRR and aFRR with real time flow based congestion management
2	Cross-border market for FCR based on TSO-TSO model
3	E-GCC
4	TERRE: Trans-European Replacement Reserves Exchange
5	Development of the Nordic RPM
7	Design and evaluation of a harmonised reactive balancing market with XB optimisation of Frequency Restoration while keeping control areas, bid zones, and Regulatory oversight
8	BritNed / TenneT / National Grid Balancing Services (project on hold)
9	IGCC Imbalance Netting, aFRR-Assistance and Flow-Based Congestion Management.

TSOs involved

TSO possible future involvement



Current Non pilot initiatives in Europe: examples of several TSO's collaborations previous/in parallel to pilot projects (i)

• FCR

- Cross Border market for FCR – Czech Republic, Slovakia
- Cross Border market for FCR – Belgium, France
- Cross Border market for FCR – France, Switzerland
- Cross Border balancing – Northern Ireland & GB
- Nordic region – Finland, Denmark, Sweden, Norway

• mFRR

- System service agreement – Lithuania, Latvia (exchange of reserve & energy)
- System service agreement – Estonia, Lithuania (exchange of reserve & energy)
- System service agreement – Lithuania, Belarus (exchange of reserve & energy)
- System service agreement – Lithuania, Russia (exchange of reserve & energy)
- Finland, Estonia
- Belgium, Netherlands (reserve sharing)
- Nordic region – Finland, Denmark, Sweden, Norway (**Pilot 5 is an expansion**)

• aFRR

- Nordic region – Finland, Denmark, Sweden, Norway

Current Non pilot initiatives in Europe: examples of several TSO's collaborations previous/in parallel to pilot projects (ii)

•RR

- BALIT – in the SWE region (bilateral solutions NG-RTE, RTE-REE, REN-REE) [RR] (Pilot 4 is a expansion)
- Northern Ireland & GB

• Imbalance netting

- Imbalance netting cooperation (INC) – Austria, Slovenia (extension to Swissgrid expected for Q2 2015)
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• Other important NC issues currently treated by non-pilots initiatives

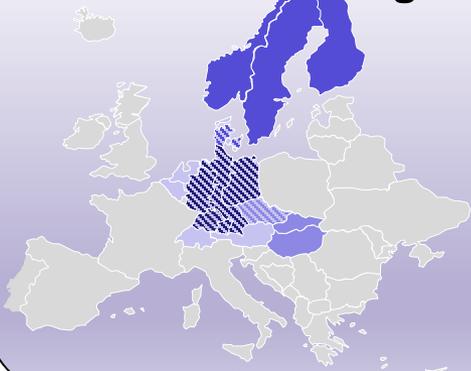
•XB capacity reservation

- Hasle-pilot (exchange of FRR-A balancing capacity) – Norway and Sweden

Pilot Projects according to processes



Imbalance Netting



FCR



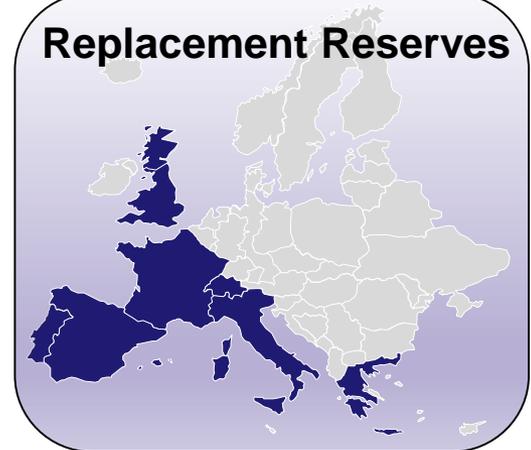
Automatic FRR



Manual FRR



Replacement Reserves



Imbalance Netting

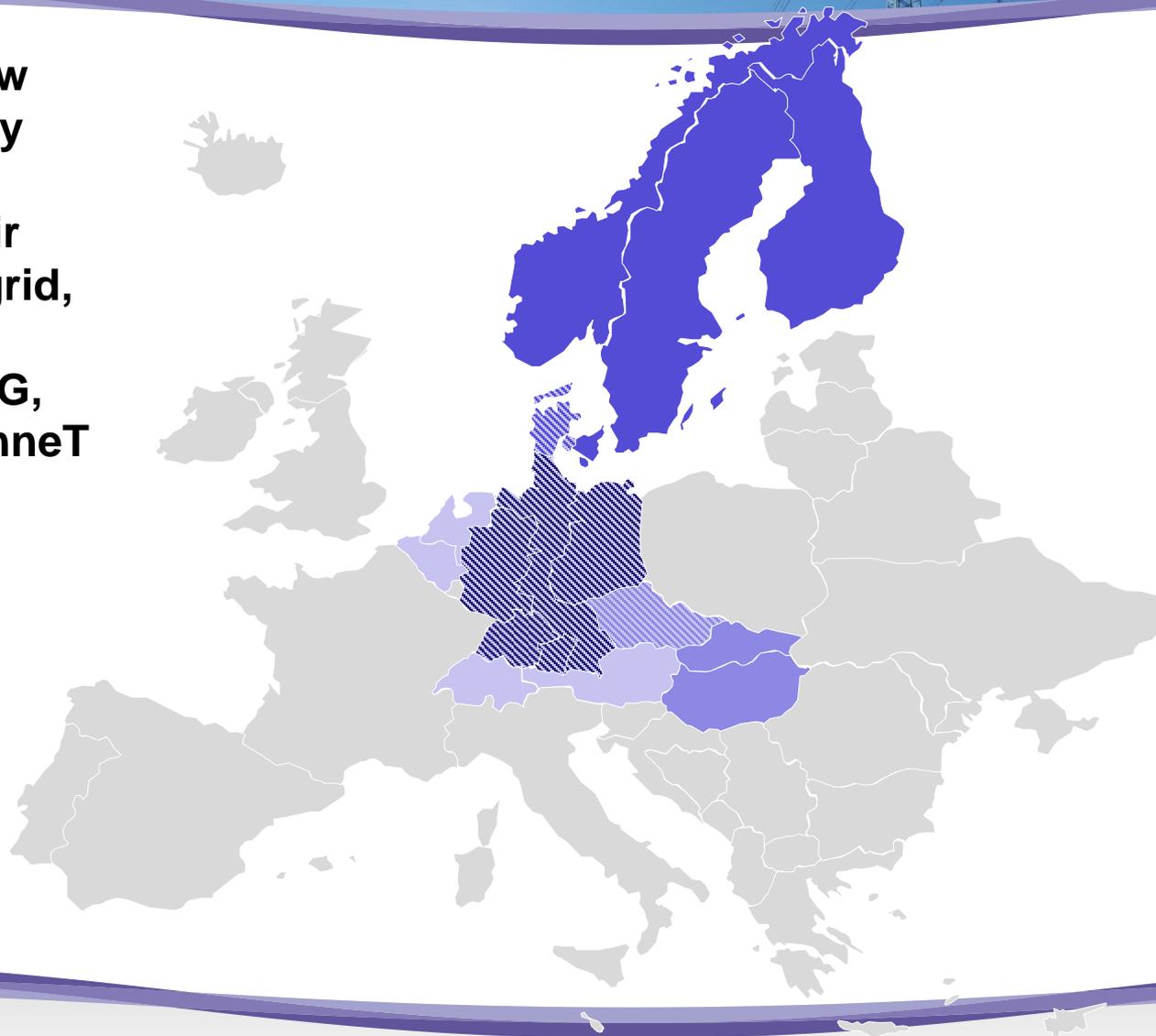
Pilot 1: German TSOs (flow based approach since July 2014)*

Pilot 3: CEPS, SEPS, Mavir

Pilot 5: Statnett, Svk, Fingrid, Energinet

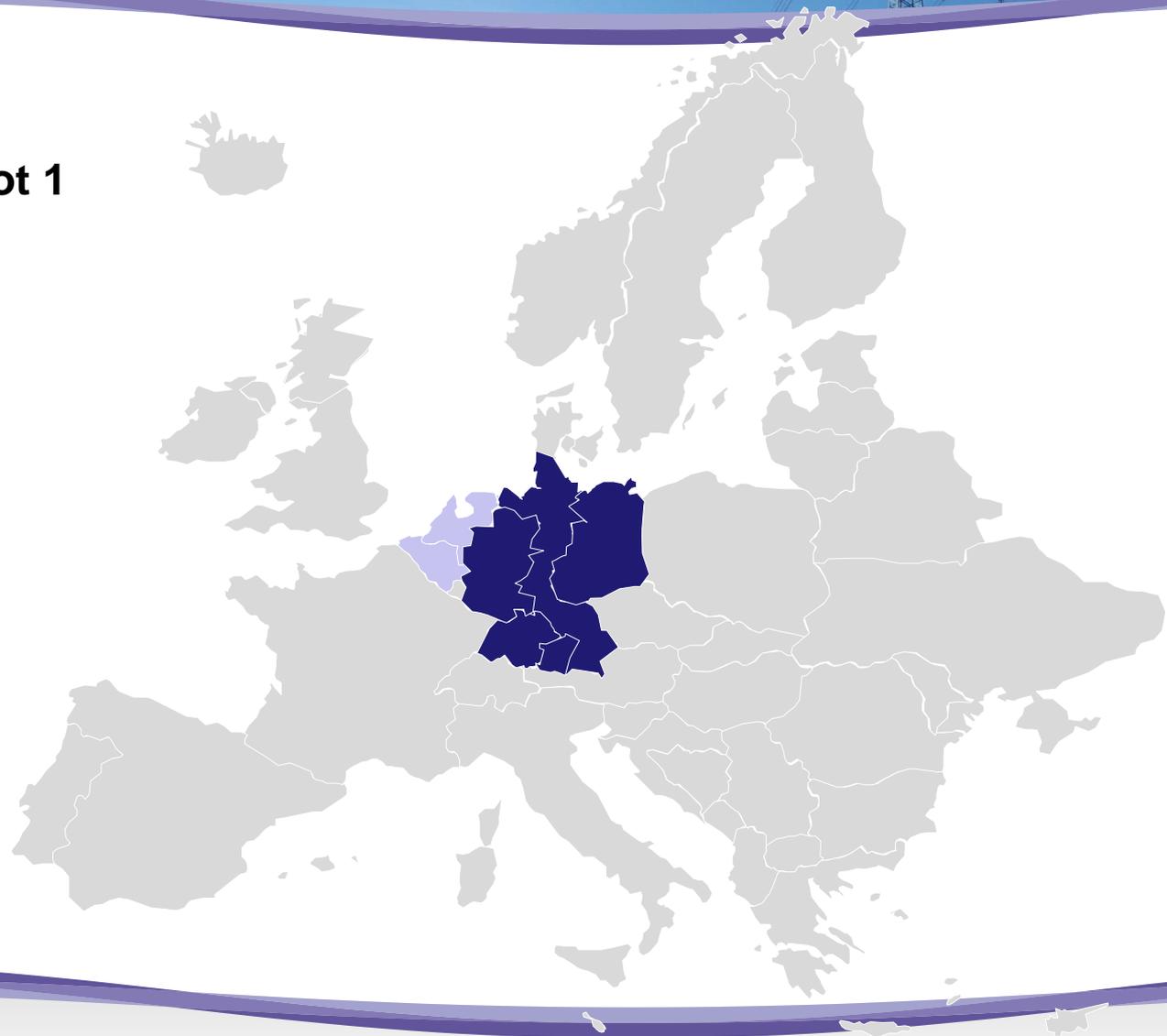
Pilot 9: German TSOs, APG, CEPS, Elia, Energinet, TenneT NL

Switzerland



*striped lines denote a participation to more than one projects

Pilot 1: German TSOs
Pilot 7: Elia, TenneT N
(Feasibility study with Pilot 1
finalized and published)



- Pilot 1: German TSOs**
- Pilot 5: Nordic TSOs**
(Feasibility studies finalized with Baltic, Polish and German TSOs)
- Pilot 7: Elia, TenneT NL**
(Feasibility study with Pilot 1 finalized and published)



ENTSO-E – Balancing Pilot Projects:

Recent achievements and regional collaborations among pilots



Reliable Sustainable Connected

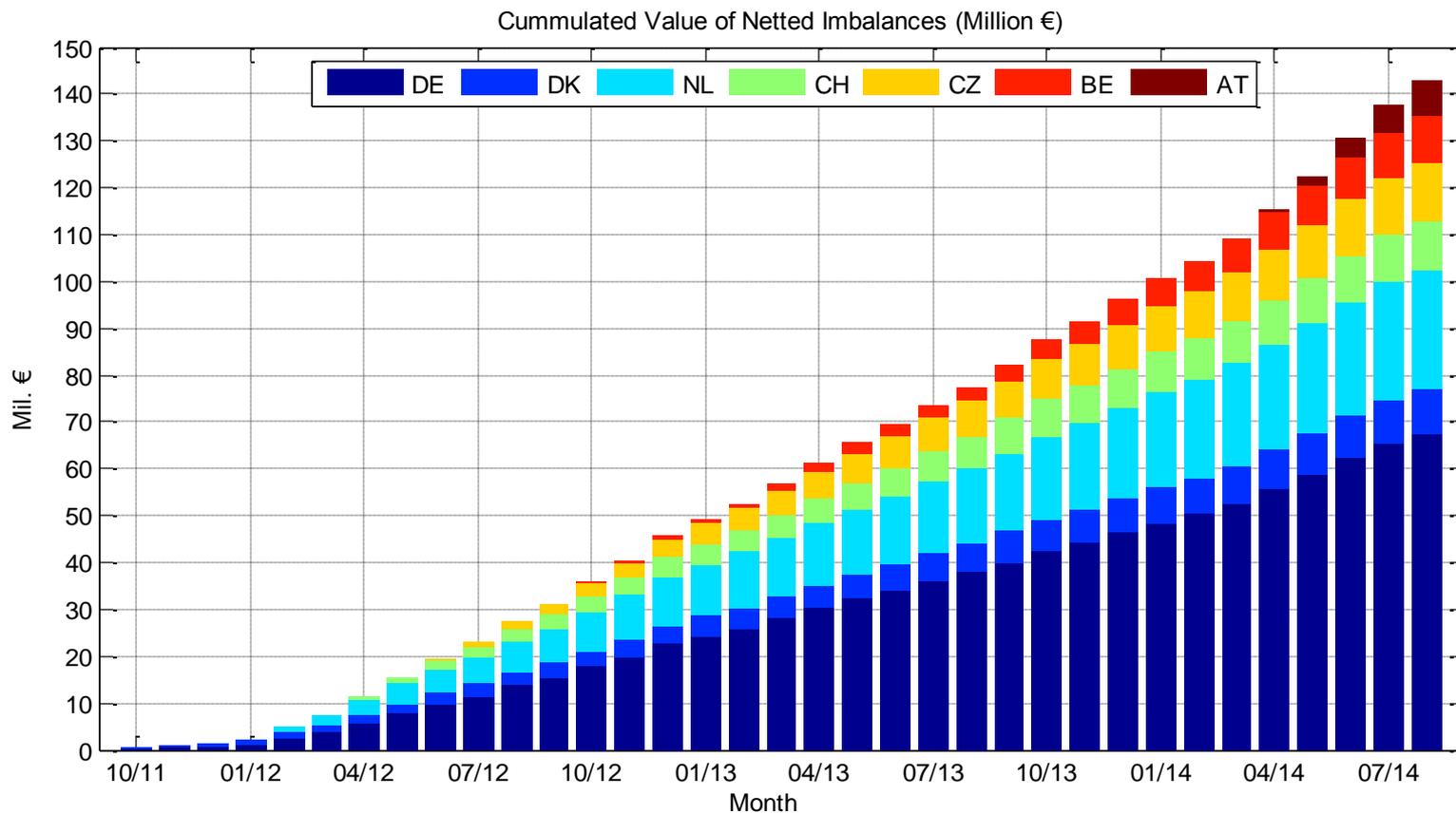
Summary of current achievements and learnings from Pilot Projects

- **Several feasibility studies already finished/on-going** to extend the collaboration among regional initiatives and to increase number of TSO's at current pilot initiatives
 - **Recent main technical achievements:**
 - Go-live of flow-based congestions management for aFRR operation in July 2014 (pilot 1)
 - Design phase completed at pilot 7: products & processes defined for XB mFRR and aFRR (subject to positive CBA result)
 - Progress in pilot 5 towards RES and Demand adequate integration at balancing markets
 - Pilot 4: good advance towards RR harmonized product definition
- TSOs are learning from the pilot projects what the key issues are.
 - These learnings will influence the deliverables from NC EB such as regional implementation models, imbalance settlement, products, pricing, algorithm etc.
 - Key the workshops with stakeholders at European and local levels

Imbalance Netting

- **Pilot 9: IGCC multilateral Agreement in final stage; flow based approach used since July 2014 (at German Scope)**
- **On 9th October 2014 Plenary of Regional Group Continental Europe (RG CE) approved the e-GCC final report, the successful trial phase and that the control blocks ČEPS, SEPS and MAVIR can proceed to regular operation of e-GCC.**
- **Pilot 5 and pilot 1: feasibility study towards imbalance netting actions through HVDC links**

IGCC – Cumulated Monetary Value of Netted Imbalances



mFRR

- **Pilot 5: good advance at RPM internal market to increase demand and RES integration**
- **Pilot 7 report step 2 (analysis of different scenarios relating to changes required in their balancing markets to enable the exchange of balancing energy) finished & published: agreement on working assumptions for mFRR product definition, activation process, bidding process & settlement (subject to CBA analysis)**

Summary of contributions by process (iii)

aFRR

- **Flow based approach applied to pilot 1 since July 2014;**
- **Pilot 7 report step 2 finished & published; agreement on working assumptions for aFRR product definition, activation process, bidding process & settlement (subject to CBA analysis)**

Extension initiatives in pilot projects

- **FCR**

March 2014: decision for extending the collaborations with TSOs from Germany, Netherlands and Denmark (expected for 2015)

- **mFRR**

- Exchange of mFRR energy between possible future CoBAs (Pilot 5 with German pilot 1 and Baltic feasibility studies; pilot 5 initiate as well dialogue with Netherlands)
- Exchange mFRR energy between a self-dispatch system and a central dispatch system (Polish feasibility study)
- Feasibility study (pilot 1 and pilots 7) finished and published on 17/10/2014

- **aFRR**

Pilot 1 feasibility studies finished with pilot 7

- **RR**

Swissgrid, REE and ADMIE have recently joined pilot 4

- **Imbalance netting**

Multilateral agreement in the final stage at pilot 9 (will be useful for future TSO's joining pilot); Expansion of pilot 9 for IN between DE, DK, NL, BE, CH, AT and CZ (10 TSOs, 6 countries)

Perform imbalance netting between synchronous areas and CoBAs (HVDC) (within German pilot feasibility study)

ENTSO-E – Balancing Pilot Projects: Challenges

Challenges to fast cross-border balancing markets (i)

Complexity of electricity balancing

- Four different processes (IN, aFRR, mFRR, RR), variety of products
- RR & mFRR depend on future European Intraday market implementation
- Other issues: XB capacity reservation, settlement time period, adaptation of national regulatory framework, NRA approvals, IT developments & associated cost recognition, governance & legal issues, local LFC&R responsibility (regulation quality & reserves) vs. XB integration of balancing market, etc.
- One example: complexity in integration of Nordic FRR-M market with three different FRR-M setups and different synchronous areas (Germany, Poland, Baltics).

Implementation timeframes:

- TSOs do not have sufficient experience to accurately assess reasonable deadlines for the implementation of the 'European integration models'
- Experience will be gained by the implementation of the regional integration models and by the on-going European balancing pilot projects
- Based on practical experience TSOs will be able to develop a realistic framework, including detailed timing
- Therefore the proposal of the implementation framework of European target models will be developed after the entry into force of the network code considering practical experience gained so far

Challenges to fast cross-border balancing markets (ii)

- Pilot 2 potential regulatory risk: Participation of Denmark not yet supported by German NRA due to concerns about lack of cross-border
- Pilot 4: road map have been delayed; main reasons are difficulties arisen from increasing the number of TSO's with different balancing needs and products that would have to coexist in the same CMO.
- The feasibility study between pilot 7 and 1 demonstrates that the currently applicable Frequency Restoration Reserves market designs diverge considerable between the three countries, which entails complex solutions for the establishment of a cross zonal balancing market as envisaged by the Network Code on Electricity Balancing. Nevertheless the involved TSOs shall further investigate cooperation possibilities for Frequency Restoration Reserves.
- Pilot 8 currently on hold; reason behind is that, due to incompatibility of present market designs in UK and the Netherlands this pilot project on reserve replacement has been put on hold. Nevertheless, a non pilot project cooperation for emergency support between NGET, BritNed and TenneT NL are currently being developed.

ENTSO-E – Balancing Pilot Projects: stakeholders involvement

Stakeholders involvement and transparency issues on pilots in 2014

Stakeholder meetings

- **3 meetings organized by ENTSO-E in 2014: (14 May - Imbalance netting; 11 September – mFRR; 17 December - RR/FCR)**
- **Pilot 7 organized 2 local stakeholder meetings in June 2013 and June 2014. Also a public consultation was organised on the results of step 2 of the project**
- **pilot 9 (IGCC) organized an international stakeholder meeting in November 2014**
- **ENTSO-E pilot projects web page: ENTISOE → Major Projects → NC implementation**

Reporting

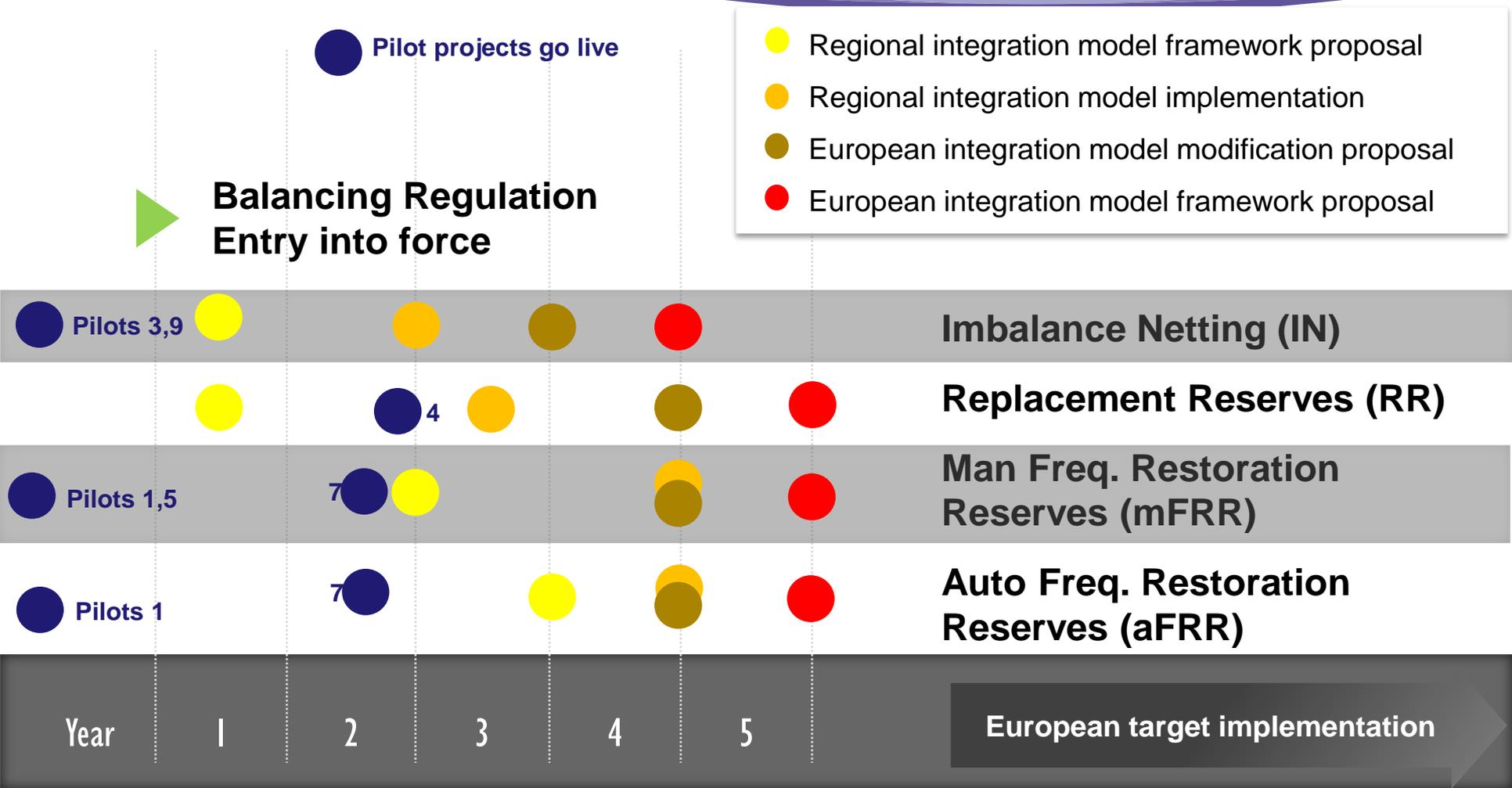
- **A first detailed report of each pilot to be delivered to stakeholders at the beginning of 2015 (currently being elaborated by each pilot project)**
- **EFET questionnaire in the process of being answered by all pilots, and incorporated in the reporting**

Local Stakeholder involvement

- **Agreed in last Stakeholder Advisory Group meeting to establish SPOCs for all pilots from the different stakeholder groups**
- **TSO and NRA SPOCs to coordinate with stakeholder SPOCs on local involvement**

ENTSO-E – Balancing Pilot Projects: NC developing contribution

NC timing versus pilot projects timing



ENTSO-E – Balancing Pilot Projects: road maps

Pilot 2 road map

	2014												2015		
	Q1			Q2			Q3			Q4			Q1		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
EXTENDER COOPERATION AT/CH/D/NL/DK			[Dark Blue Block]												
Concept and process definition															
System architecture and IT communication															
Algorithm development															
Settlement procedure															
Cooperation agreement/ Contracts															
External communication															
Tests and Training															

Pilot 3 road map



	2013				2014				2015				2016				2017				2018				2019			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Design Phase	X																											
IT implementation	X																											
Testing		X																										
Go-Live		X 1																										
Monitoring	X 2	X 2	X 2	X 2	X 2	X 3	X 3	X 4	X 4																			

- (1) ČEPS-SEPS: before 2013, ČEPS-SEPS-MAVIR: 2013 Q2
- (2) Monitoring according to ENTSO-E Testbook*
- (3) Closing the one year trial phase of e-GCC joint by MAVIR and monitoring according to ENTSO-E Testbook.
- (4) Cost-Benefit Analysis of pricing methodology.

* Testbook for the cooperation of control blocks in the framework of GCC (Module 1). Final version 10.10.2011

Pilot 4 road map



	2013	2014				2015				2016				2017			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<i>Design phase</i>	█	█	█	█	█	█	█										
<i>NRA approval</i>								█	█								
<i>Decision go live/ not to go (under a CBA)</i>									█	█							
<i>IT Implementation</i>										█	█	█	█	█			
<i>Testing</i>												█	█	█			
<i>Go Live</i>															█		
<i>Monitoring of economic variables (costs, volumes, social welfare)</i>															█	█	█
<i>NC EB proposal of modification of target model</i>																	

Updated timeline of pilot 5 : Nordic - Polish

Illustration of potential timeline for TSO-TSO cooperation on mFRR (timeline not agreed with participating TSOs)
 ”?”: decision gate

	2013				2014				2015				2016				2017				2018				2019			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Design Phase											?																	
IT implementation											?																	
Testing															?													
Go-Live																												
Monitoring																												

Updated timeline of pilot 5 : Nordic - Baltic



Illustration of potential timeline for CMO for mFRR (timeline not agreed with participating TSOs)

”?”: decision gate

	2013				2014				2015				2016				2017				2018				2019			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Design Phase																												
IT implementation																												
Testing																												
Go-Live																												
Monitoring																												

Updated timeline of pilot 5 : Nordic - German



Illustration of potential timeline for CMO for mFRR (timeline not agreed with participating TSOs)

"?": decision gate

	2013				2014				2015				2016				2017				2018				2019			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Design Phase																												
IT implementation																												
Testing																												
Go-Live																												
Monitoring																												

Updated timeline of pilot 7



	2013				2014				2015				2016				2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<i>Design phase</i>									CBA	CBA	CBA																	
<i>NRA approval</i>																												
<i>Decision go live/ not to go (under a CBA)</i>																												
<i>IT Implementation</i>																												
<i>Testing</i>																												
<i>Go Live</i>																												
<i>Monitoring of economic variables (costs, volumes, social welfare)</i>																												

State of feasibility studies at pilot 5

- German- Nordic: completed and executive summary will be made available (end January 2015)
- Baltic –Nordic: completed and will be made available (end January 2015)
- Polish –Nordic: Completed and will be made available when final conclusions has been agreed on by participating TSO's

Updated timeline of pilot 9



WP	Name	Tasks	2013				2014				2015										
			08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12		
1	Operational Procedures	exchange operational experience, best-practices																			
		harmonise IGCC operation (where applicable / beneficial)																			
		monitoring of technical performance																			
2	aFRR-Assistance	regulatory/balancing market constraints for aFRR-Assistance																			
		settlement model for balancing aFRR assistance																			
		interactions between intra-day and balancing markets																			
		new operational procedures for aFRR-Assistance																			
		implement aFRR-Assistance (step-by-step approach)																			
		collect and to report on the experience of aFRR-Assistance																			
3	Upgrade of IGCC-CM	increase efficiency of the current ATC based algorithm																			
		implement flow-based CM where applicable																			
		evaluate impact of flow-based CM on efficiency																			
		interactions between intra-day flow based and real-time																			
4	Evaluation of Settlement Models and Social Welfare	define social welfare																			
		evaluation of social welfare / monitor the settlement model																			
		increase transparency for TSOs																			
		increase transparency to market participants																			

- Regular tasks
- Studies / evaluations
- Regular reporting to ENTSO-E on technical quality and social welfare
- Implementation of the flow-based IGCC-CM will be first tested inside the German LFC Block
- Implementation on case by case basis (or if necessary) based on studies and evaluations of technical feasibility and social welfare