European Network of
Transmission System Operators
for Electricity

entsoe

ENTSO-E Cross Border Electricity Balancing Pilot Projects

2 Month Report on Pilot Project 7

SPOC Name – SPOC's TSO

25 June 2015

ENTSO-E AISBL • Avenue de Cortenbergh 100 • 1000 Brussels • Belgium • Tel + 32 2 741 09 50 • Fax + 32 2 741 09 51 • info@entsoe.eu • www. entsoe.eu

1. Introduction

This report comprises of the following general issues:

1. The main information of the pilot project;
2. The implementation of relevant targets ahead of the Network code on Electricity Balancing (NC EB);
3. An update on any specific targets of the pilot project not directly linked to NC EB, but key for the pilot project itself;
4. An update on any additional general and particular success/monitoring indicators of each pilot project, taking into account what pilots are or not under a "go live" phase;
5. Balancing products: products implemented/to be implemented at pilot project level, analysing the possibility to harmonise between different pilot projects that deal with the same type of balancing product.

The table below indicates when information has been last updated.

	Last updated
2.a Participating TSOs	
2.b Scope and goals of the pilot project	October 2014
2.c Recent achievements of the pilot project	February 2014
2.d Learning points	October 2014
2.e Specific questions	February 2014
3.a Updated project roadmap	February 2014
3.b Impact on current practice and future market design	
3.c Cross-border exchange relevant data	February 2014
3.d Matching, ATC management and bids update process	October 2014
3.e Pricing-Settlement	February 2014
3.f Experience from the implementation	October 2014
3.g Extensibility and cooperation	
4.a Pilot project roadmap in comparison to NC EB	October 2014
4.b Contribution to standard product definition	February 2014

2. Executive summary

a) Participating TSOs

TenneT TSO B.V. (NL) and Elia (B)

b) Scope and goals of the pilot project

See website Elia & TenneT

http://www.elia.be/en/users-group/ad-hoc-taskforce-balancing/Cross-border-Balancing-Belgium-Netherlands

http://www.tennet.eu/nl/about-tennet/news-press-publications/publications/technical-publications/cross-border-balancing-netherlands-belgium.html

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c) Recent achievements of the pilot project

See website Elia & TenneT

http://www.elia.be/en/users-group/ad-hoc-taskforce-balancing/Cross-border-Balancing-Belgium-Netherlands

http://www.tennet.eu/nl/about-tennet/news-press-publications/publications/technical-publications/cross-border-balancing-netherlands-belgium.html

d) Learning points

Learnings Q1: Identify learnings that can be useful for other pilots or collaboration initiatives in general
Learnings Q2: Identify learnings that can be useful towards the NC EB implementation

TSO LFC responsibilities

Elia and TenneT NL operate an LFC Block coinciding with the LFC Area.

- *TenneT NL and Elia individually responsible for the dimensioning of FRR for their LFC Block;*
- *TenneT NL and Elia individually responsible to achieve satisfactory FRCE (ACE) regulation quality for their LFC Blocks.*

Potential impact product harmonization (aFRR, mFRR ramp rates) on capacity volumes / capacity price

Exchange of balancing energy shouldn't materially affect ACE quality of Connecting TSO (~ link capacity volumes)

➔ **Exchange of balancing energy ⇔ potential impact on capacity costs ⇔ link with access tariffs!!!**

Imbalance Settlement Period and reactive TSO design

In a reactive design it the responsibility for the MARKET responsibility to restore the deployed FRR

Hence TSOs do not make use of Replacement Reserves (market role)

Imbalance price is an important (LOCAL) tool to incentivize market parties in doing so

Reactive design is only possible in case an imbalance settlement period of 15' is applicable

aFRR: identified design assumptions and harmonisation prerequisites

A move from pro-rata to Merit order activation

- Potential impact on aFRR capacity volumes, price and procurement costs

Harmonization of aFRR ramp rate towards 7,5 minutes

- Potential impact on market liquidity and aFRR capacity prices

Exchange of aFRR control request (vs. control target)

- Exchange of control target (~GCC) cannot be replicated for CMOL-based exchanges of aFRR between separate LFC Blocks

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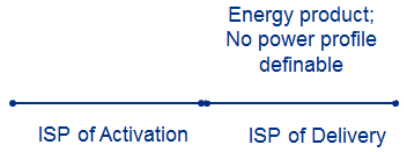
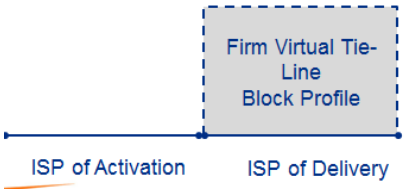
mFRR: identified design assumptions and harmonisation prerequisites

BSP will offer a Schedule activated, mFRR energy product



TSOs shall exchange an activated, firm power profile over the border



Allocation of Cross Zonal capacity: identified assumptions

Use of remaining commercial capacity after ID markets

Decision order in time for XB exchange of balancing energy:

- First decision for mFRR, then for aFRR, then for iGCC

Capacity interdependencies:

1. Imbalance netting, affected by
2. aFRR, affected by
3. mFRR

Capacity allocation on the basis of:

Efficient use of flexibility / Compliance with frequency quality target parameters / Cost-effectivity

Settlement of Balancing Energy

There are 2 options for Cross-Zonal pricing: cross zonal and local pricing and 2 options for pricing between products: cross-product pricing and pricing per product

In total 5 different types of pricing might be applied:

	Local	Cross Zonal
Pay-as-bid pricing	Pay-as-bid	#N/A#
Marginal pricing per product	Local marginal pricing per product	Cross-border marginal pricing per product
Marginal pricing across products	Local marginal pricing across products	Cross-border marginal pricing across products

Cross-border exchange of balancing energy should preserve:

- Correct incentives for BRPs to be balanced per LFC Block (ACE quality, cross-zonal capacity)
- The principle that imbalance settlement covers balancing costs

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- Correct incentives for re-active market design (preserve single imbalance pricing)
- **Working assumption for exchange of aFRR balancing energy between LFC Blocks/BZ is local pricing**

Cross-product pricing of balancing energy requires local pricing to ensure ex-ante firmness of CMOL

- If aFRR balancing energy price affects the mFRR price, it is possible that the mFRR price changes after activation (due to activation of more expensive aFRR
- As such the CMOL isn't firm ex-ante, which might result in sub-optimal activation ex-post
- This can be resolved by **local pricing**

Learnings Q2; Findings of our pilot project are demonstrating close relationships between products (aFRR & mFRR) and different market design elements (product design, pricing balancing energy, imbalance settlement, algorithms)

For more detailed information see website Elia & TenneT

http://www.elia.be/en/users-group/ad-hoc-taskforce-balancing/Cross-border-Balancing-Belgium-Netherlands

http://www.tennet.eu/nl/about-tennet/news-press-publications/publications/technical-publications/cross-border-balancing-netherlands-belgium.html

e) Specific questions

Potential Q1: What are the expected benefits? (quantify) Who will benefit and how are the benefits distributed (e.g. grid tariffs)? To be assessed in the cost benefit analysis: step 3 of the BE-NL pilot; in pay-marginal environment CMO's might be longer and flatter than individual MO's thus reducing actual marginal prices.
Potential Q2: Is the potential benefit of any other balancing cooperation affected by this initiative? To be assessed in the cost benefit analysis: step 3 of the BE-NL pilot
Key regulatory/legal issues overcome or blocking at each pilot project

Expected benefits shall be assesses during step 3 of our pilot project.

3. Detailed of the pilot project

a) Updated project roadmap

The detailed project roadmap is to be added in the Annex 1 of this report. Deliverables of WPs and milestones in the project implementation should be shown in it. Please report and additional information to that here.

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Additional information on the pilot project road map

30/06/2014: Assessment of link to Intraday markets

30/06/2014: Assessment of priority rules of cross-border capacity use

30/06/2014: Assessment of interactions between the aFRR, mFRR and netting process

b) Impact on current practice and future market design

Scope/influence 1: Are there side-effects on existing markets (price, liquidity, gate-closure time)?

The BE-NL pilot project is aiming at the maximisation of the self-balancing (including incentives to restore the system balance) by BRPs. GCT is aimed to be set close to real time

Side effects (the impact on the financial position of TSO's, BRP's and tariff payers) need to be carefully assessed in the cost benefit analysis (step 3) of our pilot project

Scope/influence 2: Does the pilot provide for a better integration of renewable / demand-side flexibility into the market?

The imbalance pricing system, including transparency on the actual system state in both countries already allow renewables and demand side flexibility to participate in restoring system balance, e.g. by allowing ex post notification of trades on the hub. The CMO is foreseen to be dynamic, and to be updated after GCT balancing, to allow intermittent generation and demand side to participate as in balancing energy provision. Schedule activated mFRR offers an easy access product to all sources to provide balancing energy by its similarity to IntraDay markets products.

Incentives 1: Are there any changes to BRP incentives? (e.g. via imbalance settlement, to be balanced in day-ahead/real-time, to help restoring the system balance, to become active in day-ahead/intraday trading)

One of the objectives the BE-NL pilot project is to develop a market design where balancing services can be exchanged while on the same time the present features (strong local balancing incentives to be balanced and to help to restore the system imbalance) are kept

Incentives 2: Does the pilot provide special incentives to certain BSP units (generators/load)? (Incentives for investment in new/existing technology enforced/void)

No special incentives foreseen as current methodology is non-discriminatory.

Incentives 3: What are the TSO's incentives for economic efficiency?

National regulation.

Integration of balancing markets should not result in perverse incentives to TSO's, BRP's or BSP's, nor impair a level playing field

System security: Q1: Does the pilot project provide an enhancement/impairment to system security in the involved control zones?

To be assessed in the cost benefit analysis: step 3 of the BE-NL pilot project; no security impairment foreseen

Transparency Q1: What is the (additional) operational information that is provided to BSPs and BRPs in the participating systems?

See Q2

Transparency Q2: Is there a continuous evaluation and communication of quality?

As the Dutch and Belgian balancing market rely on BRP reactions and try to promote self-balancing and/or incentivising to restore system balance, currently both TSOs are currently providing real time

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balancing information.

Hence when developing a cross-border balancing these levels of transparency should be kept - at least - at the same level.

In the BE-NL pilot project transparency issues shall be a topic to be dealt once –based on the results of the cost benefit analysis – a decision for implementation is taken.

c) Cross-border exchange relevant data

Not relevant for Pilot 7 as it is still in the implementation phase.

d) Matching, ATC management and bids update process

Matching algorithm (First Come First Served or CMO through an optimisation tool or others)

Merit order activation for aFRR; matching process via CMO

Merit order activation for mFRR; matching process via CMO

See also website both TSOs

Cross border capacity management (ATC/flow based) and its interaction with intraday market and previously activated slower balancing products.

Only remaining capacity after ID will be used

The use of Cross Zonal Capacity has been described into detail in chapter 9 of report of step 2 and has been presented to stakeholders in a public workshop

http://www.elia.be/~/media/files/Elia/About-Elia/Users%20Group/Task-force-balancing/06-Use-of-cross-zonal-transmission-capacity.pdf

Balancing bids update process and how this update process is coordinated with previous intraday energy market and previously activated slower balancing products

Balancing Gate closure time shall be after Cross Zonal Intraday Gate Closure Time for bids aFRR and mFRR; Products with longer activation times than aFRR or mFRR not used for balancing in either Bidding Zone

e) Pricing – Settlement

Information on TSO-TSO settlement scheme

Local pricing arrangements

Information on TSO-BSP settlement scheme

Local pricing arrangements

BRP´s imbalance settlement scheme

Straight single marginal pricing, (1 imbalance perimeter per BRP)

How cross border balancing actions will be taken into account at the imbalance settlement mechanism?

Local pricing; balancing actions in one LFC Block shouldn't set the imbalance price in another LFC Block to ensure local balancing incentives towards BRPs to be balanced per LFC Block.

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Details about imbalance settlement period at pilot project level ISP= 15 min in both bidding zones

f) Experience from the implementation

CBA finished for a certain process. Results of CBA to be expected in 2015. Scoping of CBA (step 3) currently ongoing
Internal regulatory change approval, cost recognition from NRAs. Regulatory approval only required once implementation starts. Both TSOs have signed a cost sharing agreement and did foresee a dedicated budget for the project
Update about on-going internal regulatory changes associated with pilot project objective. Regulatory exchange occurred on frequent basis up till now and shall continue like this
Reporting about contracts signed (at TSO-TSO level, for instance MoU signature between participating TSOs, at TSO – platform owner level, etc.) Cost sharing agreement + NDA
What were the implementation costs and risks?
Governance issues: platforms management and ownership. Only applicable once implementation starts
Flow based approach (and associated feasibility study accomplished, if proceed). Not in scope
Reporting about stakeholder involvement at pilot project level (Workshops held, relevant feedback obtained from stakeholders) Overview on website of both TSOs - 2 public workshops were organised up so fare - 1 public consultation was organised - Both TSOs frequently communicated to their stakeholder via their Users'group - All information has been published in a transparent way on the website of both TSOs
Cross Border capacity reservation experience
Other comments. None

g) Extensibility and cooperation

Extensibility Q1: Identify any potential extensions of this project towards other pilots or other areas in general **<u>Scheduled activated energy mFRR product</u>** Firm product exchanged over Virtual Tie-Line This is the easiest solution for implementation and the most transparent for market parties => no barriers identified Study has been finished between our pilot project and pilot project 1 **http://www.elia.be/en/users-group/ad-hoc-taskforce-balancing/Cross-border-Balancing-Belgium-**

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Netherlands-Germany

This present study is demonstrating that the less complex cooperation options like Imbalance Netting are already partially established. The study also 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

The involved TSOs shall further investigate cooperation possibilities for the more complex products (Frequency Restoration Reserves).

Currently no initiative ongoing between pilot 7 and pilot 5

aFRR product (Pilots 1, 9, 6 and 7)

Working assumption is ≤ 7,5 min aFRR product; however the local impact on market liquidity and ACE quality to be looked at in CBA.

No other pilot projects (a part from pilot 1) are having the exchange of standard aFRR products via merit order list in scope.

Study has been finished between our pilot project and pilot project 1

http://www.elia.be/en/users-group/ad-hoc-taskforce-balancing/Cross-border-Balancing-Belgium-Netherlands-Germany

The involved TSOs shall further investigate cooperation possibilities for the more complex products (Frequency Restoration Reserves).

Extensibility Q2: Please provide details about potential harmonisation of balancing products of the same process or justify any possible barriers

Extensibility Q3: Under which conditions can the cooperation be extended? (Reciprocity for BRPs and BSPs is guaranteed, specific regulatory/legal framework required?)

Extensibility Q4: What is the regional extensibility of the method, due to technical restrictions? (Uniformly applicable within regions of limited extension or no restrictions on extensibility)

The cost benefit analysis: step 3 of the BE-NL pilot project will assess the added value of the cooperation between BE & NL before assessing the extensibility. Indeed if the outcome of the cost benefit analysis would be negative it is possible that no implementation shall be done.

4. Contribution of Pilot Project to NC Implementation

a) Pilot project roadmap in comparison to NC EB

Where relevant explain briefly the expected or the already achieved contribution of each pilot to any of the NC milestones (A-J) listed below and also complete the timing in the corresponding table.

A. Proposal of regional implementation framework:

Project delivered a market design describing all aspects of a cross-border balancing market for FRR (automatic, and manual schedule activated) between 2 different control blocks and bidding zones. Working assumptions have been formulated on the harmonisation requirements regarding:

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	- the definition of products - the bidding-, activation and cross-border processes - pricing mechanism for balancing energy and imbalance settlement These working assumptions will be subjected to Cost-Benefit Analysis.
B.	**Implementation of the regional integration model:** Implementation is subject to a positive CBA-analysis, agreement with market parties and cost recognition by NRAs
C.	**Proposal of modification of the European integration model** Implementation is subject to a positive CBA analysis
D.	**Proposal of the European implementation framework** Our pilot project is dealing with a common merit order list of aFRR without unshared bids which is one of the long term targets of the NC on balancing.
E.	**Proposal of common settlement rules** Only the TSO-TSO Settlement of the exchange of balancing energy (FRR) shall be described.
F.	**Proposal of settlement harmonisation** Different options for the settlement of balancing energy (and their impact on the imbalance settlement) have been assessed during the 2nd step of our pilot project. A preferred market design working assumption was taken (local pricing) which shall be subject to further analyses during step 3 of our pilot project. It is foreseen to perform a CBA on different pricing scenarios. Both TSOs strongly agree that for imbalance settlement should be based on a universal single pricing scheme. And is taken as working assumption to be subject to further CBA.
G.	**Proposal of standard products definition** Our pilot project proposed a set of standard products for FRR (automatic, and manual schedule activated) and explained how they should be offered by BSPs, requested by the reserve requesting TSO, activated & settled between the BSP and TSO, exchanged and settled between the involved TSOs. Validation of this proposal is foreseen during the CBA
H.	**Proposal of standard products pricing** See Answer on "proposal of settlement harmonisation". Pricing of standard products is closely related to imbalance settlement. Hence these topics cannot be handled separately
I.	**Proposal of standard products algorithms** See Answer on "proposal for standard products definition". Proposal for standard products algorithms is closely related to the definition of the standard products and even the pricing used for the settlement. Hence these topics cannot be handled separately
J.	**Proposal for common settlement rules of intended exchanges of energy associated to the Frequency Containment Process** Not in scope
Other expected contributions? (if yes, explain contribution and indicate both NC road map and	

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pilot project road map)

The BE-NL pilot project is assessing the exchange of aFRR and mFRR between 2 different Bidding Zones & LFC blocks.

Hence our pilot project assessed :

- the impact on local TSO responsibilities (link between FRR & ACE quality)
- the target model of the NC on balancing; XB exchange of aFRR and mFRR:
- the impact of the settlement pricing mechanism of different products
- Impact on the imbalance pricing per LFC block
- The complexity of having a different ways of using of aFRR and mFRR
- Required level of harmonization
- Definition of standard products
- The optimal use of remaining XB capacity (after ID markets) between 2 different Bidding Zones by different products
- Cost benefit analysis of the target model, including the financial position of the TSO's

Our pilot project is also explaining that the length of the imbalance settlement period is fundamental as this is having a direct impact on the balancing market design. Different ISP's between TSOs is affecting the potential for harmonisation (products, algorithms, pricing, imbalance settlement, etc…)

The timing of the pilot project in relation to the NC EB implementation schedule (A-J), should be completed where applicable.

Process										
aFRR	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Deadline from NC EB (EiF+)	**3 y**	**4 y**	**4 y**	**5 y**	**2 y**	**3 y**	**1 y**	**1 y**	**1 y**	
Pilot Project 7	To be assessed in CBA	To be assessed in CBA	17/10/2014	To be assessed in CBA	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014	N/A

Process										
mFRR	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Deadline from NC EB (EiF+)	**2 y**	**4 y**	**4 y**	**5 y**	**2 y**	**3 y**	**1 y**	**1 y**	**1 y**	
Pilot Project 7	To be assessed in CBA	To be assessed in CBA	17/10/2014	To be assessed in CBA	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014	N/A

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Describe current or expected mismatches of pilot project with respect to the NC EB. None encountered so far
Describe the reasons behind these mismatches. N/A
Describe (if feasible) forecasted date to overcome mismatches. N/A

b) Contribution to standard product definition

The table below provides details about the technical characteristics of the standard product that is to be exchanged in the scope of the pilot project. The explanation of the terms used is given in the Annex of this report.

Process	mFRR	aFRR
Request time	-	-
Preparation period	1-2 Min	0 min.
Ramping period	0 Min	7,5 Min
Minimum and Maximum bid size	1 MW	1 MW
Minimum and Maximum delivery period	15 Min	15 Min
Deactivation period	0 Min	Equal to ramping period
Scheduled activated or direct activated (when applicable)	Scheduled	Direct activated
Divisibility: only divisible bids or divisible/indivisible conditions allowed?	Divisibility is optional	Yes
Upward/downward (specify if there is symmetry at product characteristics for upward/downward); if not, fulfil 2 tables: one for upward product, the other one for downward product	Upwards & Downward, separate	Upwards & Downward, separate
Validity period of the bid (next hour, ...)	Per 15 Min	Per 15 Min

5. Additional relevant information of the pilot project

Description of re-active and pro-active balancing markets has been described in chapter 2 of our report of the 2nd step of our pilot project. This was also presented to the stakeholders in a workshop: http://www.elia.be/~/media/files/Elia/About-Elia/Users%20Group/Task-force-balancing/02-Reactive-balancing-market-design.pdf

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Appendix 1. Project road map Summary

	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
Design phase									CBA	CBA	CBA																	
NRA approval																												
Decision go live/ not to go (under a CBA)																												
IT Implementation														?	?	?	?	?	?	?								
Testing																		?	?	?								
Go Live																												
Monitoring of economic variables (costs, volumes, social welfare)																												
NC EB proposal of modification of target model	Question not clear				?	?	?	?	?																			

Appendix 2. Standard product characteristics