

Flexible balancing power services within four control zones, using e-trading platform – Future Flow project

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Motivation

- Four European TSOs of Central-Eastern Europe (Austria, Hungary, Romania, Slovenia), associated with power system experts, electricity retailers and IT providers, designed a unique regional cooperation scheme, aimed at opening Balancing and Redispatching markets to new sources of flexibility using a prototype aggregation solution with renewable distributed generators (DG) and commercial and industrial consumers (C&I) to provide automatic Frequency Restoration Reserves (aFRR). Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691777.

Method/Approach

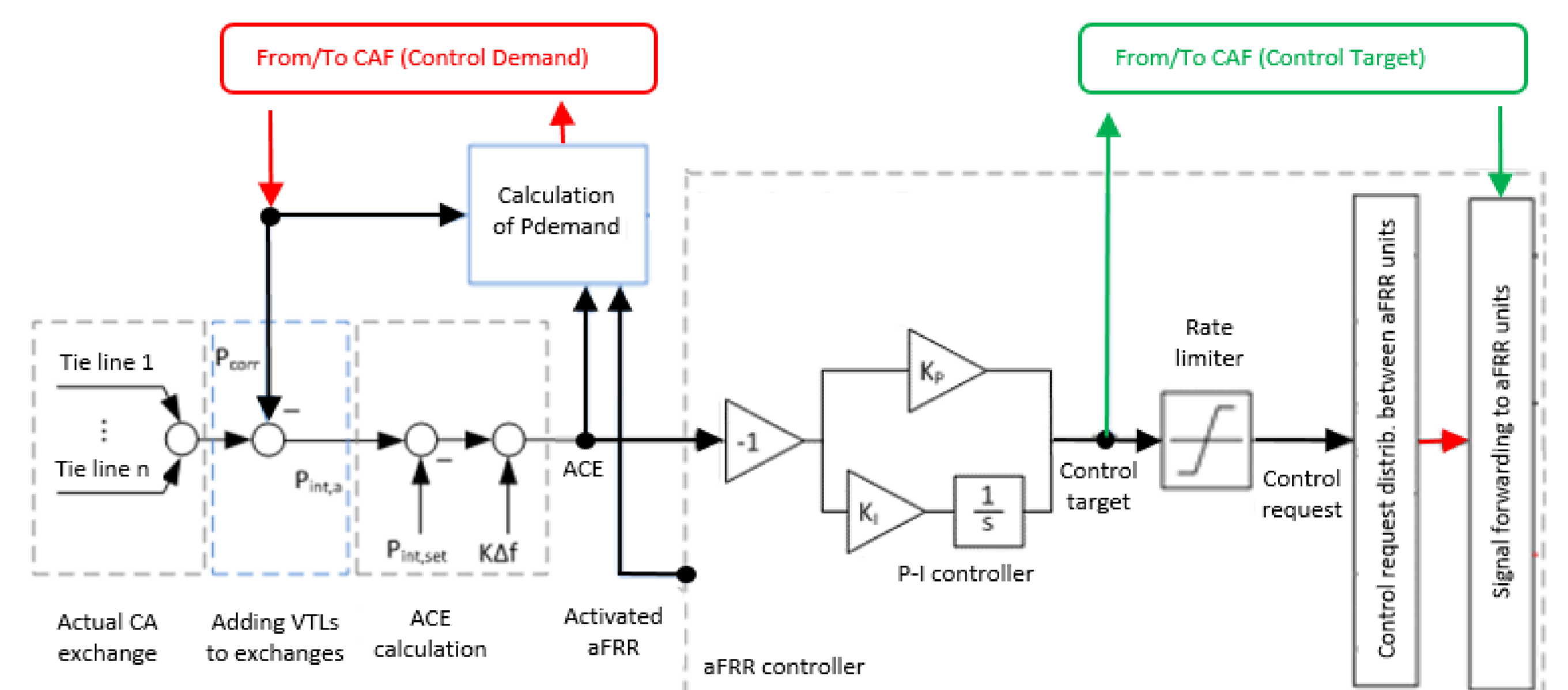
- FutureFlow aFRR exchange Target Model is in line with the EU Target Model (mainly defined by Electricity Balancing Guideline – EB GL) and System Operation Guideline – SO GL), assuring at the same time requirements regarding security, sustainability, replicability and applicability in the situations of congested borders.
- Alternatives investigated in simulations were:
 - EB GL standard and target model for the exchange of balancing services;
 - procurement procedure with separate procurement of aFRR balancing capacity and balancing energy;
- A combination of standard FAT bids (5 min) and specific ones (10 min) was analyzed in the simulation phase
- Common Merit Order considers portfolio-based activation inside bidder entities Imbalance Settlement Period (ISP) of 15 minutes. Pay-as-bid pricing and/or marginal pricing.
- ATC-based and Flow-based (PTDF/RAM) definitions of CZC applied in parallel in the CAF algorithm.

Objects of investigation

- Influence for the Frequency restoration process for the four TSOs in case of two different algorithms: Control Target and Control Demand
- Common Activation Function algorithm functionality in real time
- Type of aggregation, comportment of DG&DR inside the CAF and usability as aFRR

Experimental setup & test results

- Control demand vs. Control Target integration option – simplified scheme:

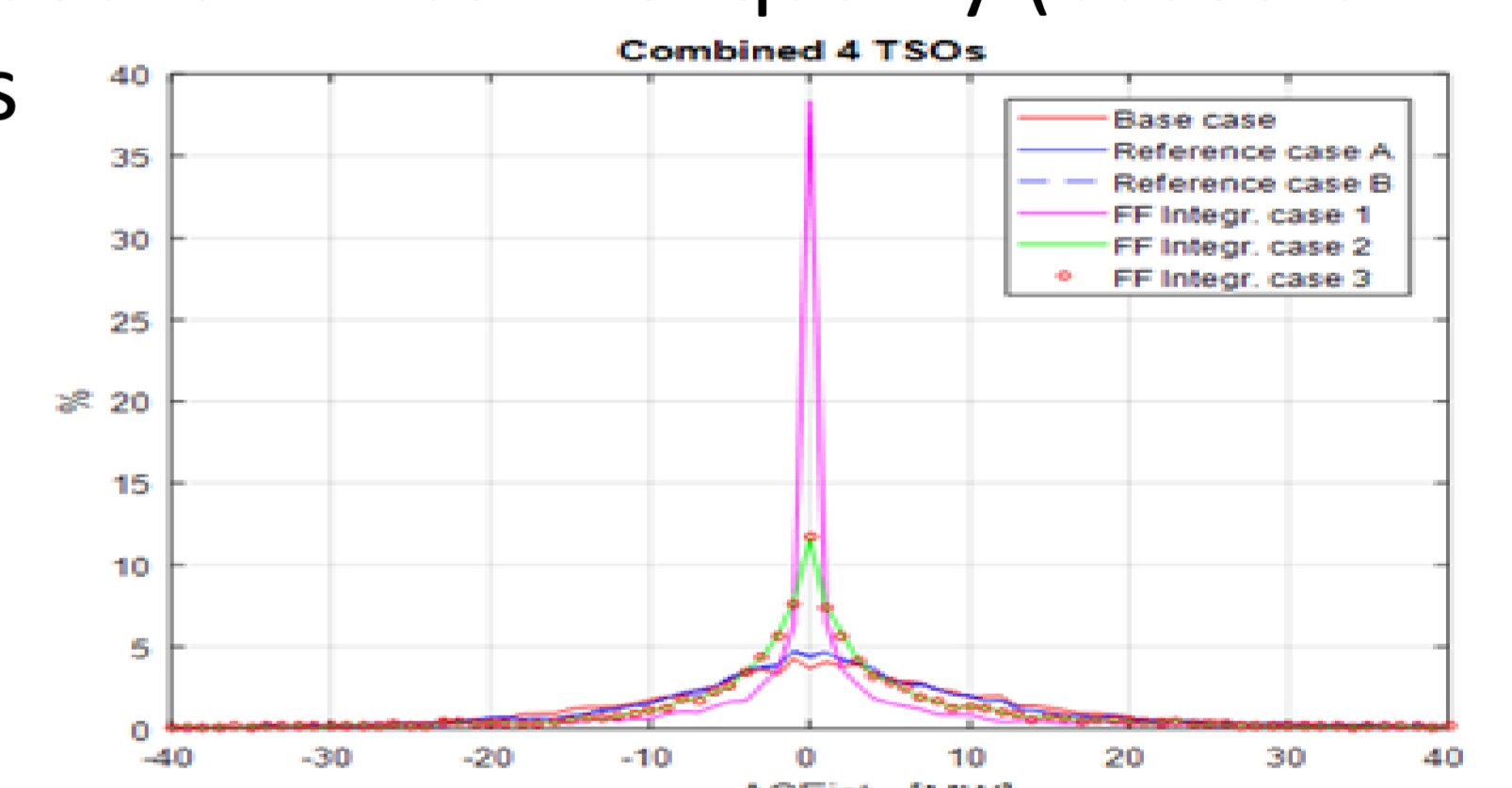


- FutureFlow Integration Cases

SI, RO: pro-rata activation	All: merit-order activation	CASES	Integration approach	Pre-netting	Products
BASE CASE STATUS QUO (SI, HU, RO: 15 min FAT)	REFERENCE CASE A (5 min FAT)	FF INTEGRATION CASE 1	Control Demand	No	STANDARD (FAT 5 min)
	REFERENCE CASE B (5 & 10 min FAT)	FF INTEGRATION CASE 2	Control Target	Yes	STANDARD (FAT 5 min)
		FF INTEGRATION CASE 3			STANDARD + SPECIFIC (FAT 5 min) + (FAT 10 min)
CZC = 0 No regional cooperation	CZC = 0 No regional cooperation	CZC ≠ 0 ATC-based, and Flow-based			

Discussion

- Global Key Performance Indicator (KPI) used in the selection of target model was the ACE quality for each analyzed case and for all four control areas. It shows that Integration Case 1 (Control Demand-based) provides the best results with respect aFRR control quality (based on 15-min average ACE). As



- the comparison of results of simulation cases is based on evaluation of the selected KPIs (ACE quality, aFRR market liquidity, volatility, and complexity).

CASES	Integration approach	Products	ACE quality	aFRR market liquidity	Volatility	Complexity of implementation	Fallback to national mechanism
FF INTEGRATION CASE 1	Control Demand	STANDARD (FAT 5 min)	++	0	0	+	+
FF INTEGRATION CASE 2	Control Target	STANDARD (FAT 5 min)	+	0	+	-	-
FF INTEGRATION CASE 3	Control Target	STANDARD + SPECIFIC (FAT 5 min) + (FAT 10 min)	+	+	+	--	-

Conclusion

- The Case based on Control Demand activation with Standard Product (5 min) shows the best ACE control quality indices
- The forthcoming pilot tests within the FutureFlow project, the inclusion of DR/DG units in aFRR exchange will be exercised accordingly