IGCC Regular Report on Social Welfare

Q4 2023

IGCC-Settlement – Basic Principle
(Methodology applied from 01/02/2016)

Value of avoided aFRR activation (VoAAA)

without IGCC	with IGCC	VoAAA= Opportunity Value/IGCC Volume
$BE_{before\ IGCC}$ [MWh] x $BE\ price_{before\ IGCC}$ [€/MWh]	IGCC exchange: $BE_{after\ IGCC}$ [MWh] x $BE\ price_{after\ IGCC}$ [€/MWh]	[($BE_{before\ IGCC}$ * $BE\ price_{before\ IGCC}$) – ($BE_{after\ IGCC}$ * $BE\ price_{after\ IGCC}$)] / IGCC exchange

BE: Balancing Energy from automated frequency restoration reserves (aFRR)

BE price: marginal or average price for balancing energy from aFRR

IGCC Initial Settlement Price

- IGCC Initial Settlement Price (P_{IGCC}): **Energy weighted** ($E_{\mathrm{Imp},i}$ and $E_{\mathrm{Exp},i}$) **average** of the **VoAAA** ($C_{\mathrm{Imp},i}$ and $C_{\mathrm{Exp},i}$)
- Symmetric price for IGCC imports and exports

$$P_{\mathrm{IGCC}} = \sum_{i=1}^{n}\left(C_{\mathrm{Imp},i}E_{\mathrm{Imp},i} + C_{\mathrm{Exp},i}\,E_{\mathrm{Exp},i}\right) \Big/ \sum_{i=1}^{n}\left(E_{\mathrm{Imp},i} + E_{\mathrm{Exp},i}\right)$$

IGCC Settlement Ex-post Adjustment

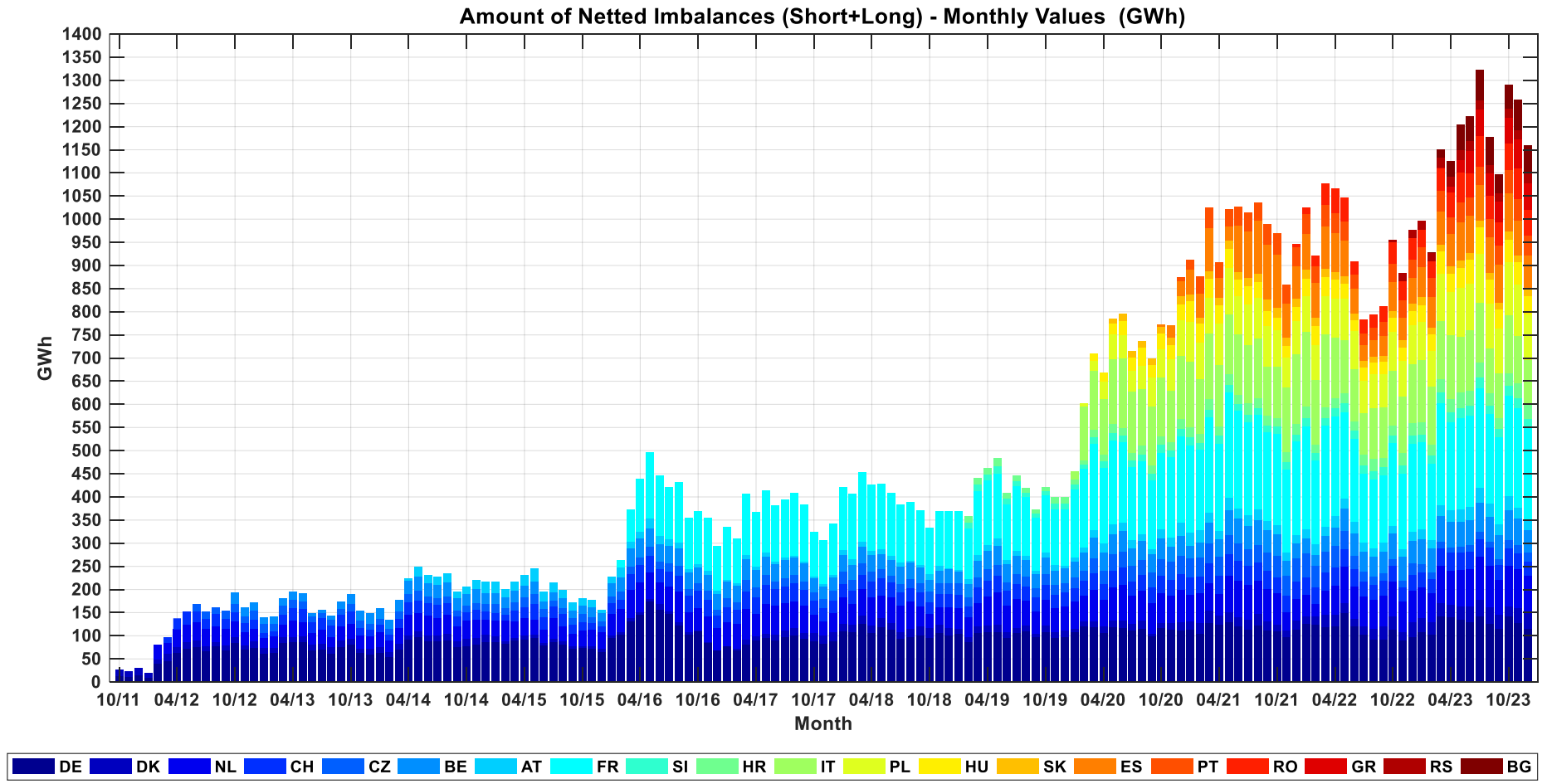
- In case of negative individual benefits for one or more IGCC Members but positive overall benefit of the IGCC, an ex-post adjustment of settlement is performed in order to guarantee TSO neutrality.
- IGCC adjusted settlement prices (P'_{IGCC}) which may vary from member to member depending on their benefit before the adjustment

Calculation of Cost Reduction

- Cost reduction for a participant is driven by the spread between the opportunity price and the IGCC adjusted settlement price

$$B'_i = \sum_{t=1}^{T}\left(C_{\mathrm{Imp},i,t} - P'_{\mathrm{IGCC,i,t}}\right)\cdot E_{\mathrm{Imp},i,t} + \sum_{t=1}^{T}\left(P'_{\mathrm{IGCC,i,t}} - C_{\mathrm{Exp},i,t}\right)\cdot E_{\mathrm{Exp},i,t}$$

Monthly Volumes of Netted Imbalances



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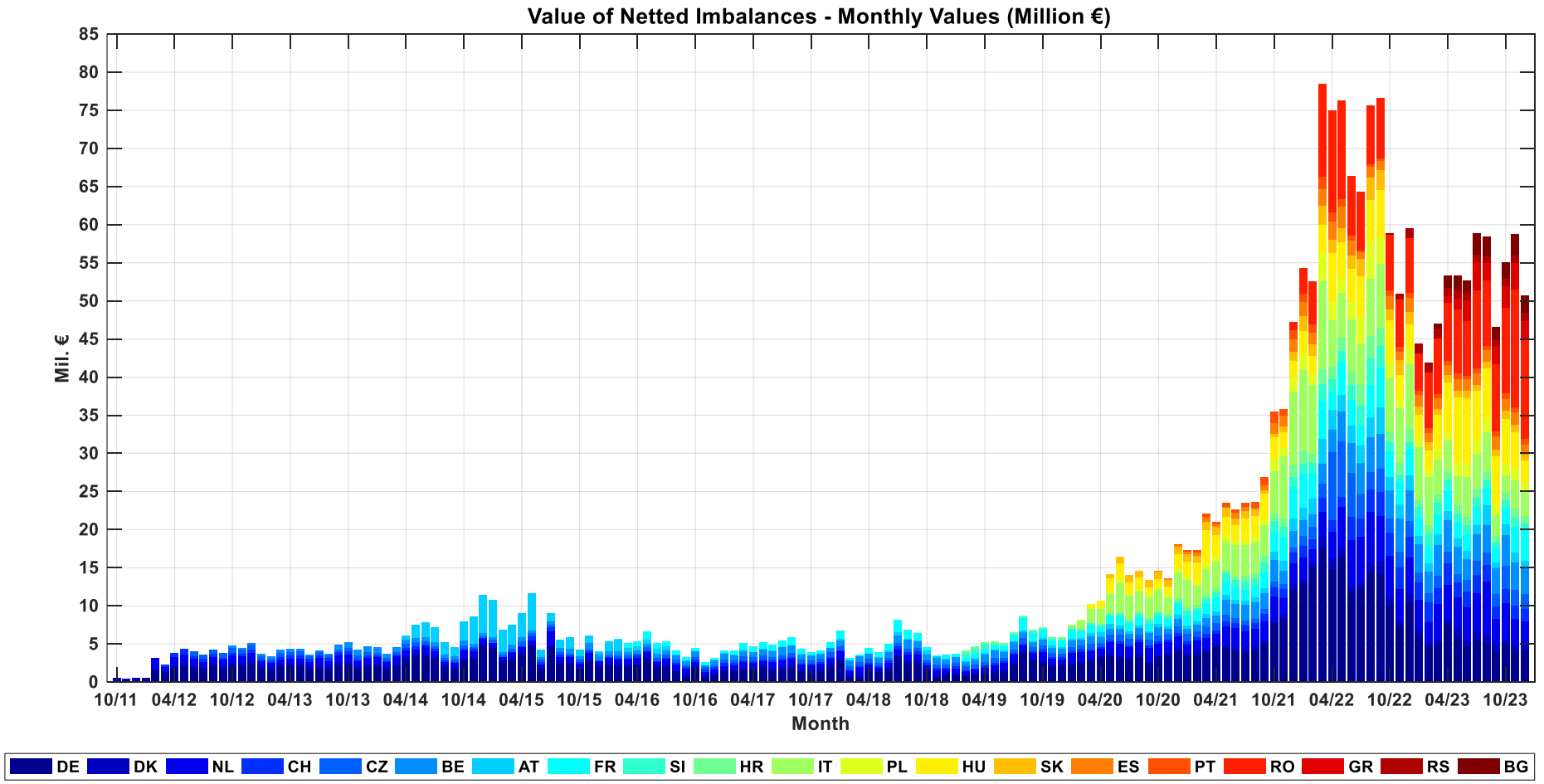
Monthly Volumes of Netted Imbalances (last Year, in GWh)

Month	de	dk	nl	ch	cz	be	at	fr	si	hr	it	pl	hu	sk	es	pt	ro	gr	rs	bg	total
2023/1	108.14	29.59	67.75	32.57	16.51	55.21	20.05	189.13	17.10	25.30	134.19	81.93	37.55	17.64	63.42	43.99	37.60	0.00	19.12	0.00	996.78
2023/2	102.83	27.67	61.33	31.42	14.80	50.96	19.12	163.71	18.31	23.52	124.43	76.82	37.29	13.64	66.76	40.51	36.77	0.00	17.47	0.12	927.49
2023/3	142.07	28.71	81.58	36.84	13.63	56.37	23.30	219.84	23.12	28.65	127.25	101.01	47.37	16.11	71.93	43.59	49.07	1.30	22.16	17.10	1150.99
2023/4	141.10	26.99	72.52	39.03	11.96	55.33	25.06	190.09	21.58	28.53	137.88	93.19	39.00	15.91	69.52	37.37	52.95	12.64	21.91	33.00	1125.56
2023/5	135.92	27.76	80.06	35.88	12.53	55.32	25.97	197.37	21.64	33.06	121.61	104.80	43.69	15.08	82.82	43.52	64.55	26.92	21.62	53.85	1203.97
2023/6	129.68	34.24	81.45	35.89	15.60	53.40	28.43	197.50	22.51	30.65	130.54	101.80	50.83	14.92	80.31	39.78	52.79	47.35	21.93	52.30	1221.93
2023/7	142.73	35.26	93.27	37.88	16.62	61.55	32.74	215.28	24.10	30.82	128.89	107.25	56.33	14.66	77.06	39.21	65.11	59.11	19.37	64.99	1322.23
2023/8	125.56	35.42	91.09	38.78	12.26	53.67	29.25	193.15	18.36	27.79	95.58	96.68	52.34	13.75	78.00	38.79	50.23	49.69	16.68	59.72	1176.78
2023/9	115.46	29.76	75.91	32.36	12.17	52.73	21.96	189.95	16.35	24.20	96.48	97.28	41.30	14.34	81.48	42.11	49.01	45.72	17.47	39.68	1095.71
2023/10	142.07	21.54	88.60	36.51	18.45	65.32	29.19	217.44	21.67	27.14	126.20	112.93	49.47	16.99	82.42	50.92	57.36	54.75	19.69	51.49	1290.16
2023/11	129.08	30.81	84.71	34.90	16.82	57.91	22.91	215.31	22.08	31.48	102.96	109.64	49.22	15.06	73.69	47.33	66.26	63.10	19.79	65.51	1258.55
2023/12	114.65	35.50	79.38	31.28	19.21	49.41	20.86	199.54	19.27	31.58	96.06	97.67	39.27	14.98	72.78	44.46	54.12	57.88	22.98	57.81	1158.69

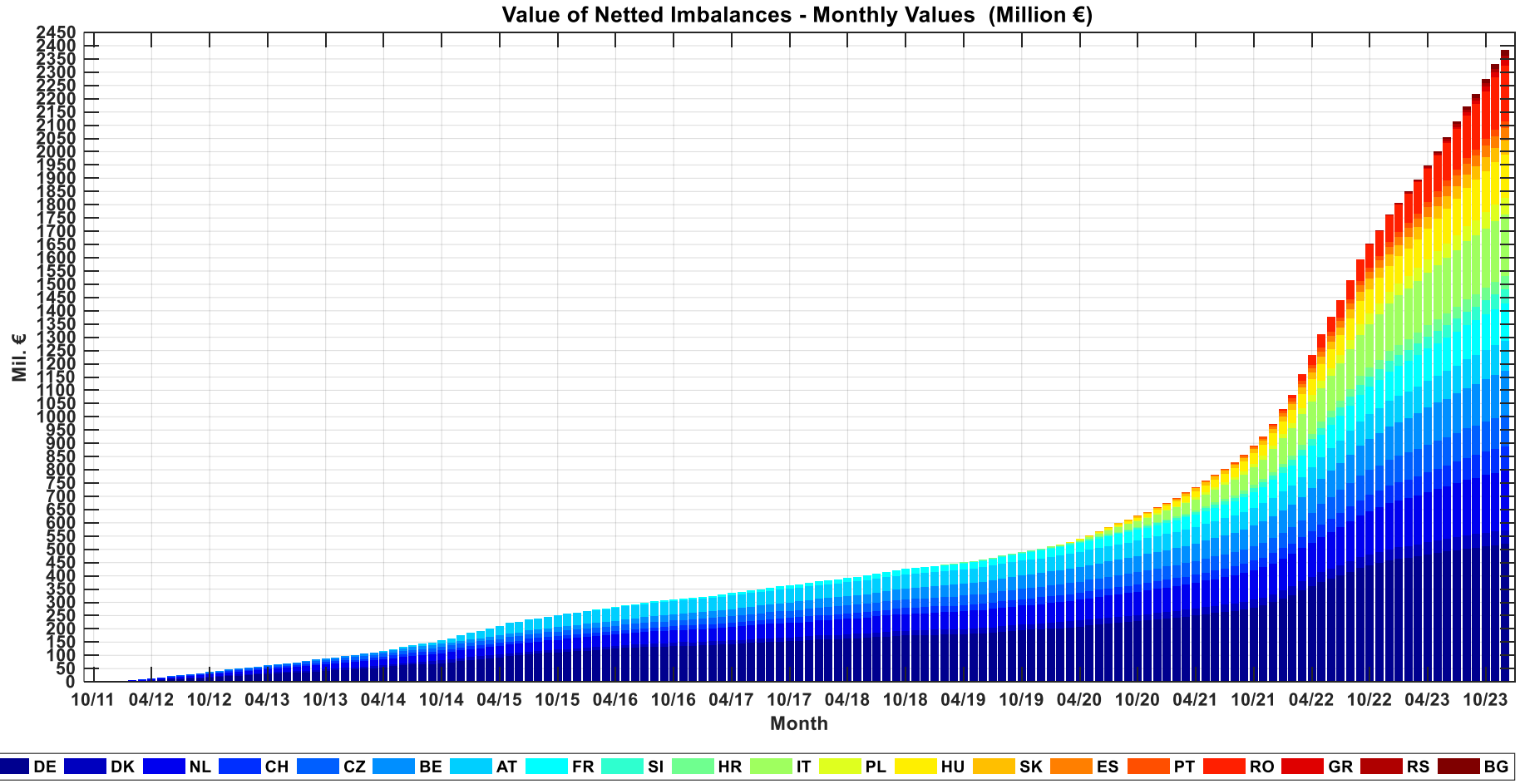
Monthly Value of Netted Imbalances



Monthly Value of Netted Imbalances (last Year, in Million €)

Month	de	dk	nl	ch	cz	be	at	fr	si	hr	it	pl	hu	sk	es	pt	ro	gr	rs	bg	total
2023/1	6.12	0.86	3.84	2.25	1.37	3.64	1.10	2.39	1.37	1.05	6.84	1.11	3.08	1.19	1.46	0.62	4.82	0.00	1.20	0.00	44.31
2023/2	4.54	0.65	2.72	2.52	1.19	2.93	1.06	2.18	1.79	1.10	6.20	0.90	2.60	1.09	1.23	0.69	7.21	0.00	1.29	0.01	41.91
2023/3	5.06	0.52	4.75	2.00	1.63	4.10	1.31	2.57	1.64	1.11	4.50	1.48	4.36	0.86	1.38	0.55	7.24	0.06	1.12	0.75	46.98
2023/4	7.52	0.71	4.52	2.89	1.44	4.20	1.23	2.62	1.43	1.09	4.01	1.28	6.44	0.88	1.34	0.55	7.62	0.82	1.15	1.57	53.32
2023/5	5.87	1.24	4.06	1.94	1.09	3.63	1.01	2.14	1.17	1.05	3.87	1.87	8.43	0.87	1.56	0.69	8.38	1.50	1.00	1.95	53.31
2023/6	4.69	0.85	4.28	2.11	1.55	2.66	1.04	2.24	1.26	1.09	5.12	1.90	8.50	0.91	1.51	0.54	7.08	2.74	0.99	1.61	52.68
2023/7	5.63	0.92	5.10	2.44	1.88	3.49	1.22	2.31	1.27	1.12	4.45	1.81	6.59	0.84	1.44	0.66	10.28	3.67	0.92	2.82	58.85
2023/8	5.07	1.07	7.03	2.21	1.68	3.49	2.61	2.25	1.03	1.11	5.24	1.76	6.65	0.81	1.51	0.56	8.64	2.25	0.90	2.52	58.39
2023/9	4.01	0.88	3.45	1.61	1.58	3.43	0.74	1.72	0.94	0.87	2.67	1.60	6.12	0.88	1.70	0.72	8.79	2.34	0.93	1.63	46.62
2023/10	5.10	0.49	4.80	1.87	3.00	4.09	1.35	2.07	1.14	0.97	2.30	1.65	5.77	1.01	1.52	0.78	11.24	2.79	0.96	2.11	55.02
2023/11	4.11	0.70	3.51	1.71	2.06	3.56	1.41	3.31	1.22	1.13	3.78	1.62	4.70	0.94	1.66	0.66	15.42	3.45	1.04	2.75	58.74
2023/12	4.13	0.93	2.93	1.62	1.96	3.36	0.99	3.98	0.94	0.94	3.13	1.41	2.75	0.81	1.34	0.77	12.85	2.56	1.03	2.24	50.68

Value of Netted Imbalances - Development



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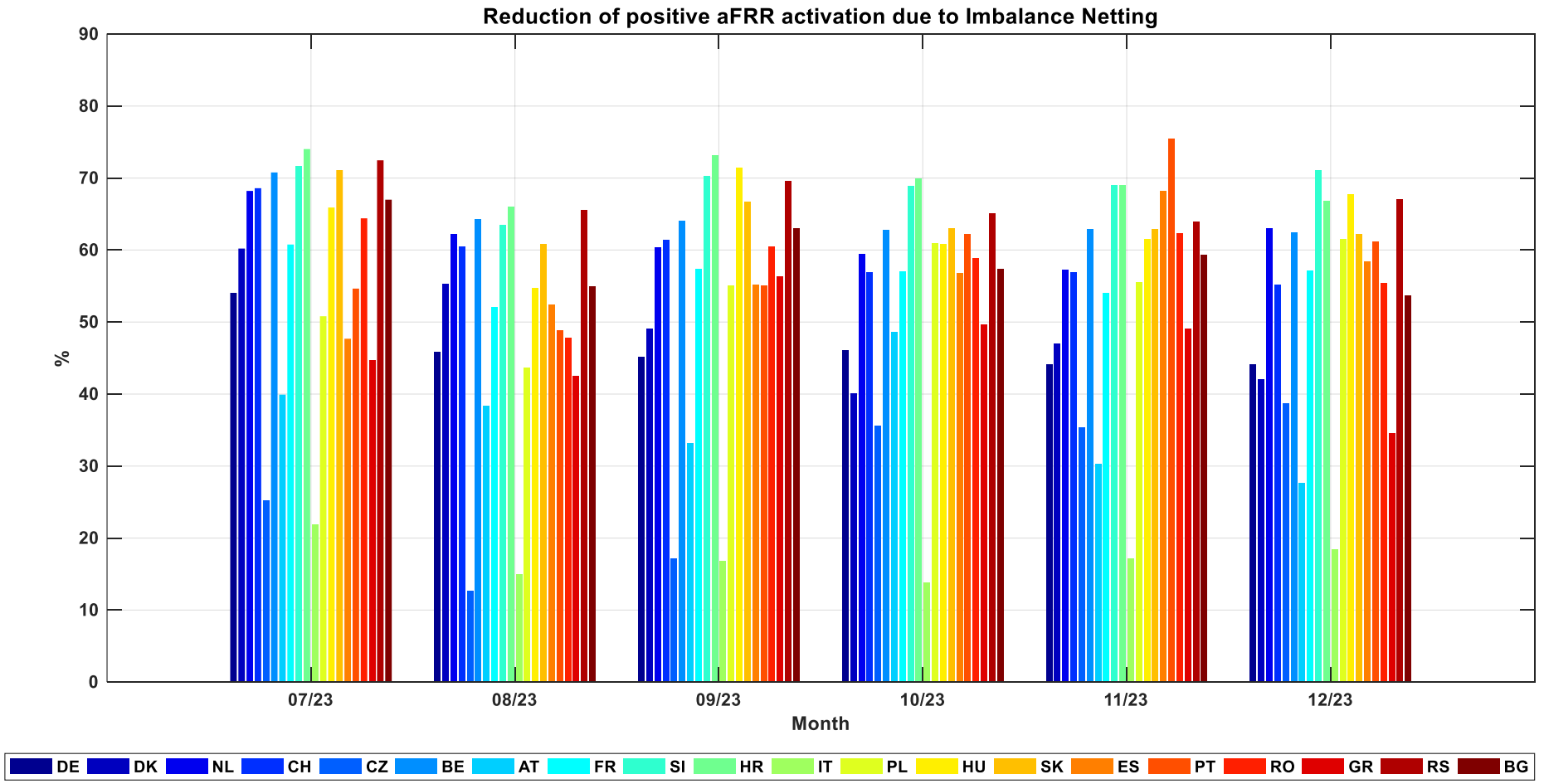
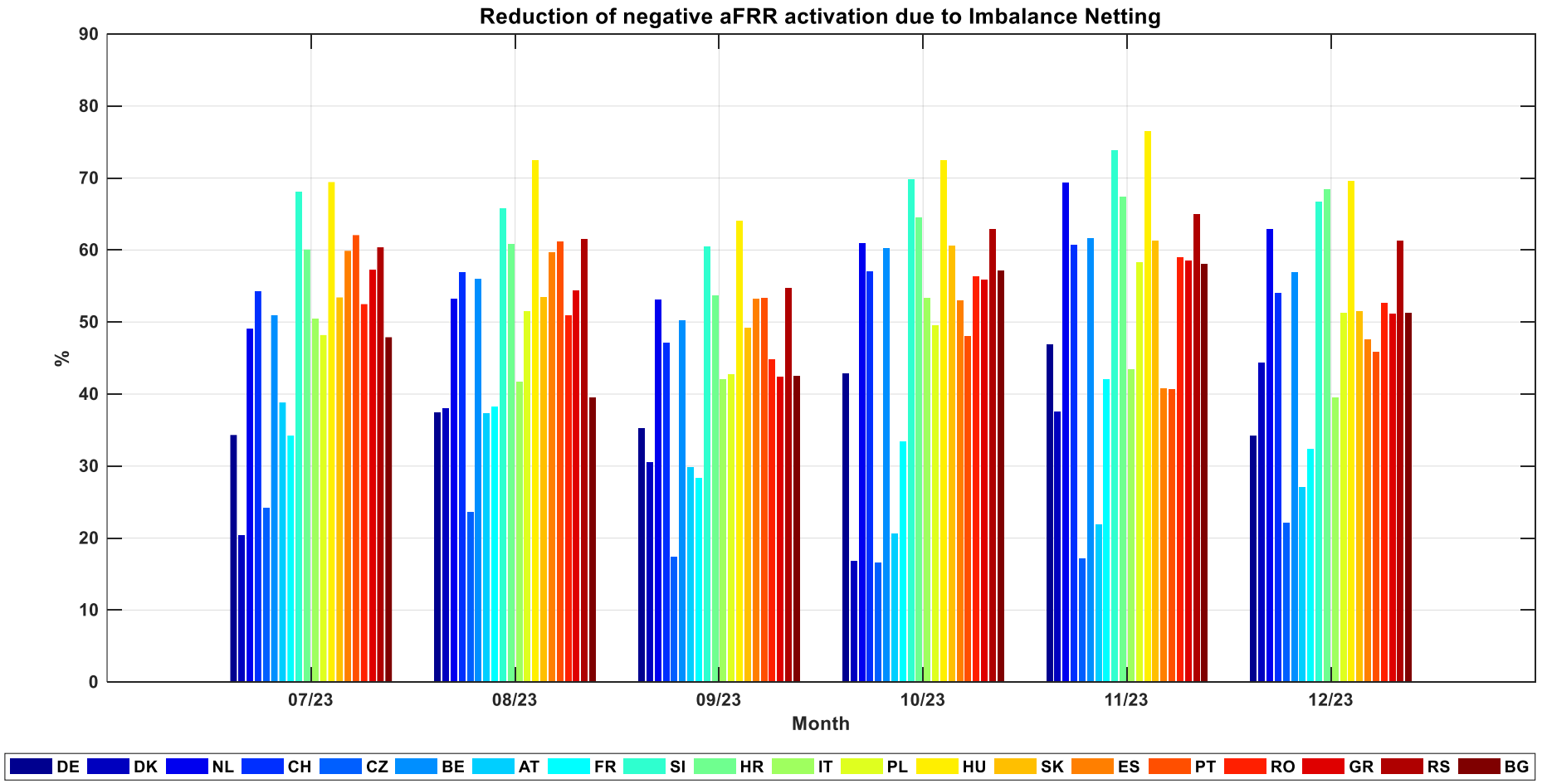
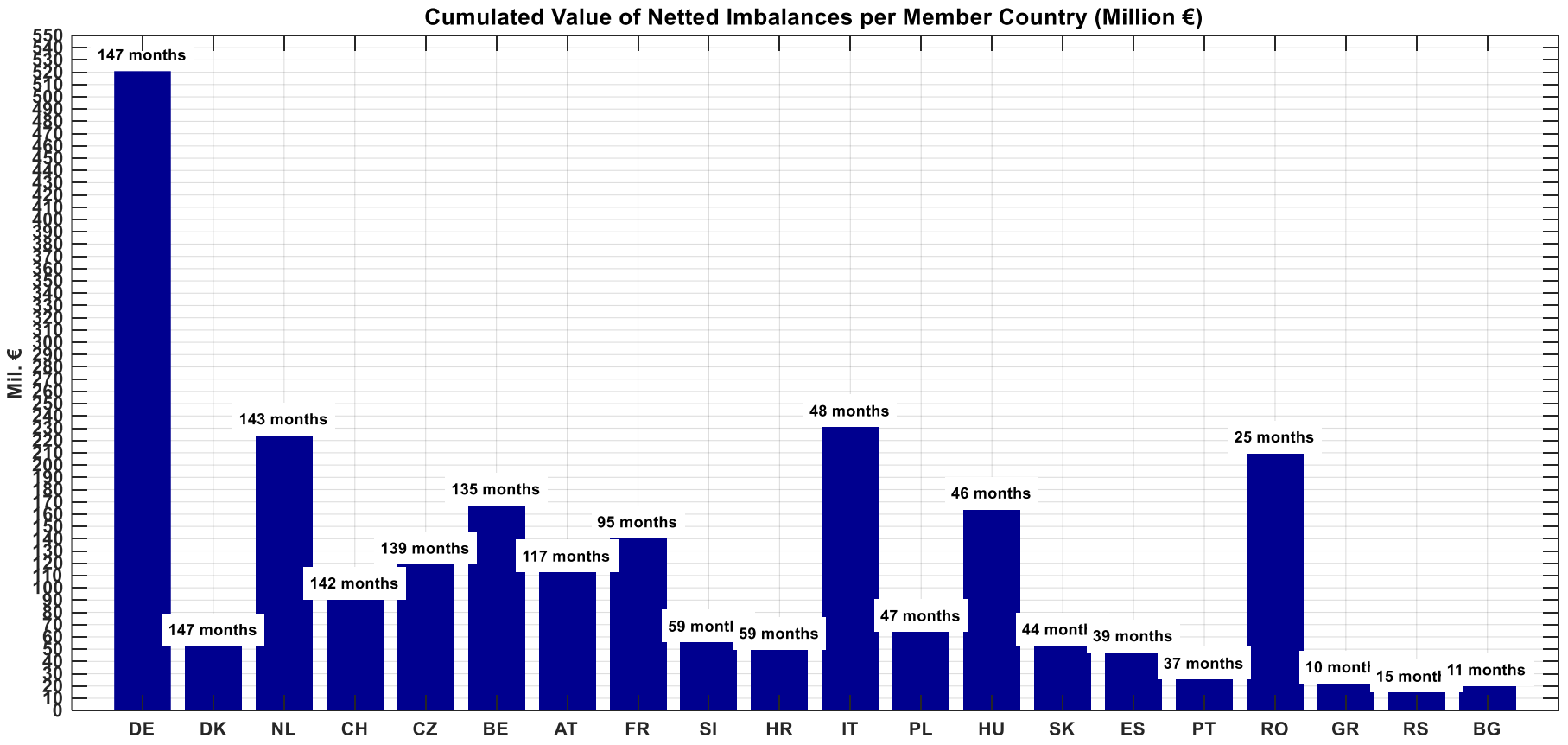
Monthly percentage of avoided pos. aFRR-activations (last 6 Months)



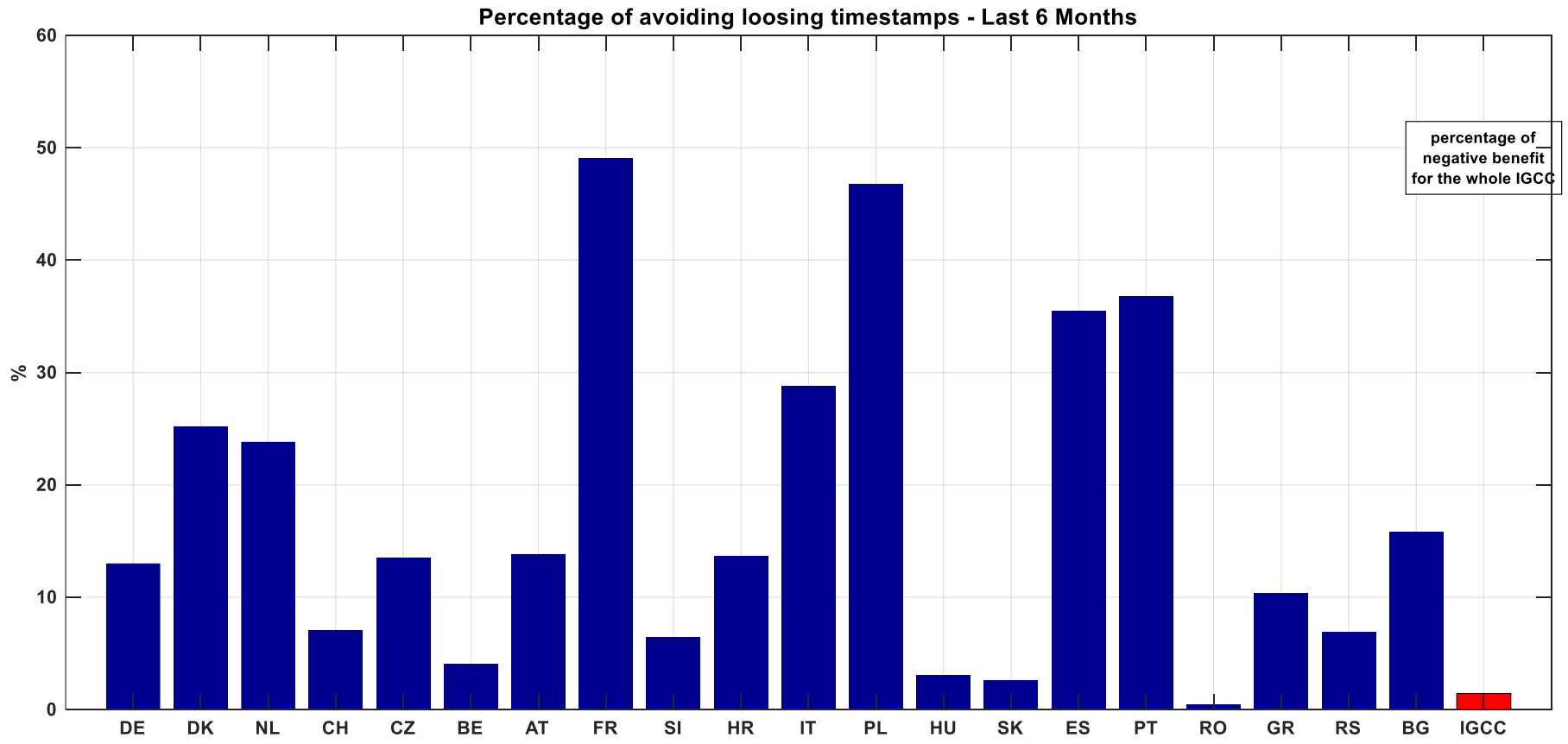
Monthly percentage of avoided neg. aFRR-activations (last 6 Months)



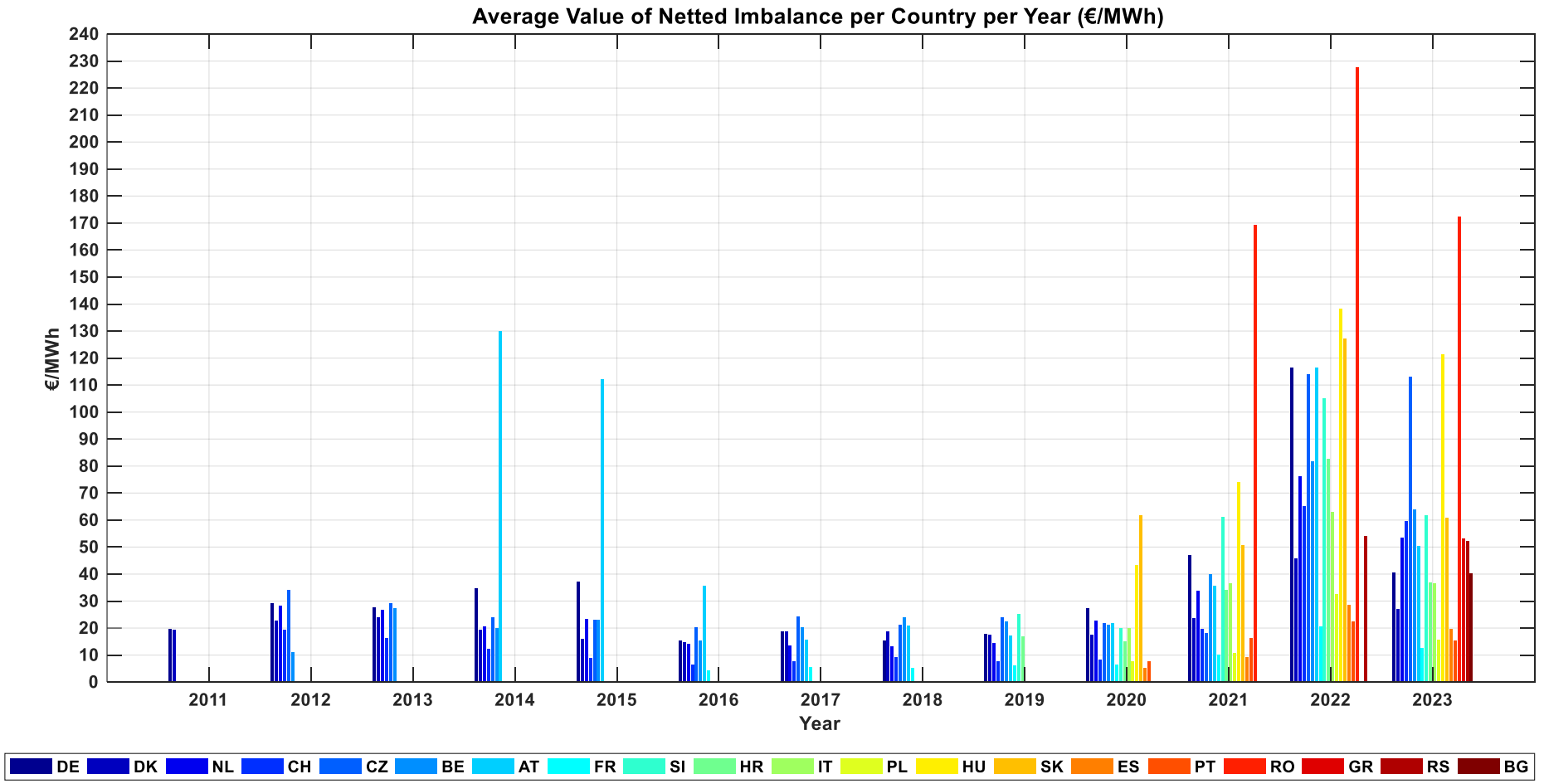
Cumulated Value of Avoided Activations



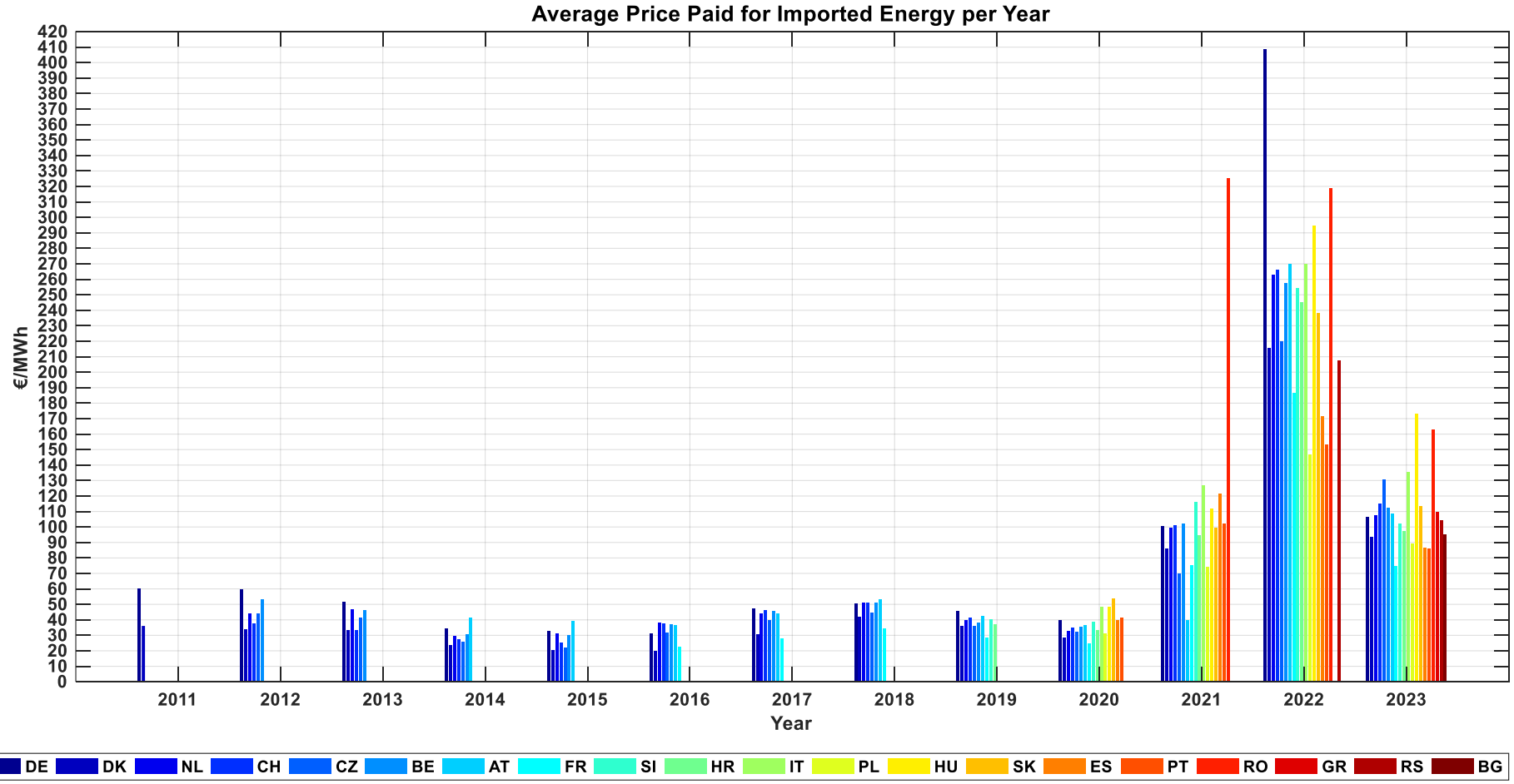
Percentage of avoiding loosing timestamps due to the second step of settlement method



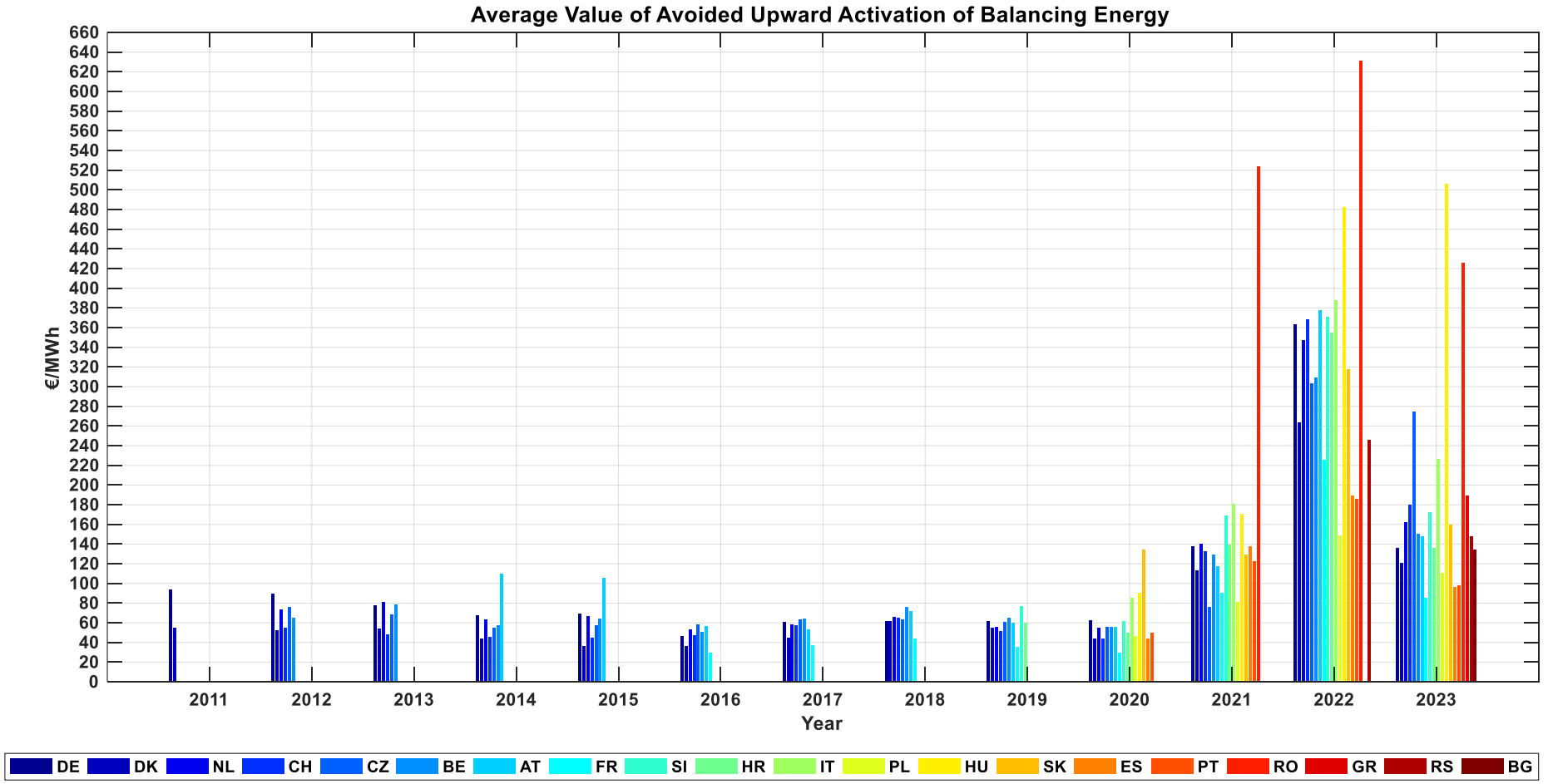
Average Value of Netted Imbalance per Country per Year in €/MWh



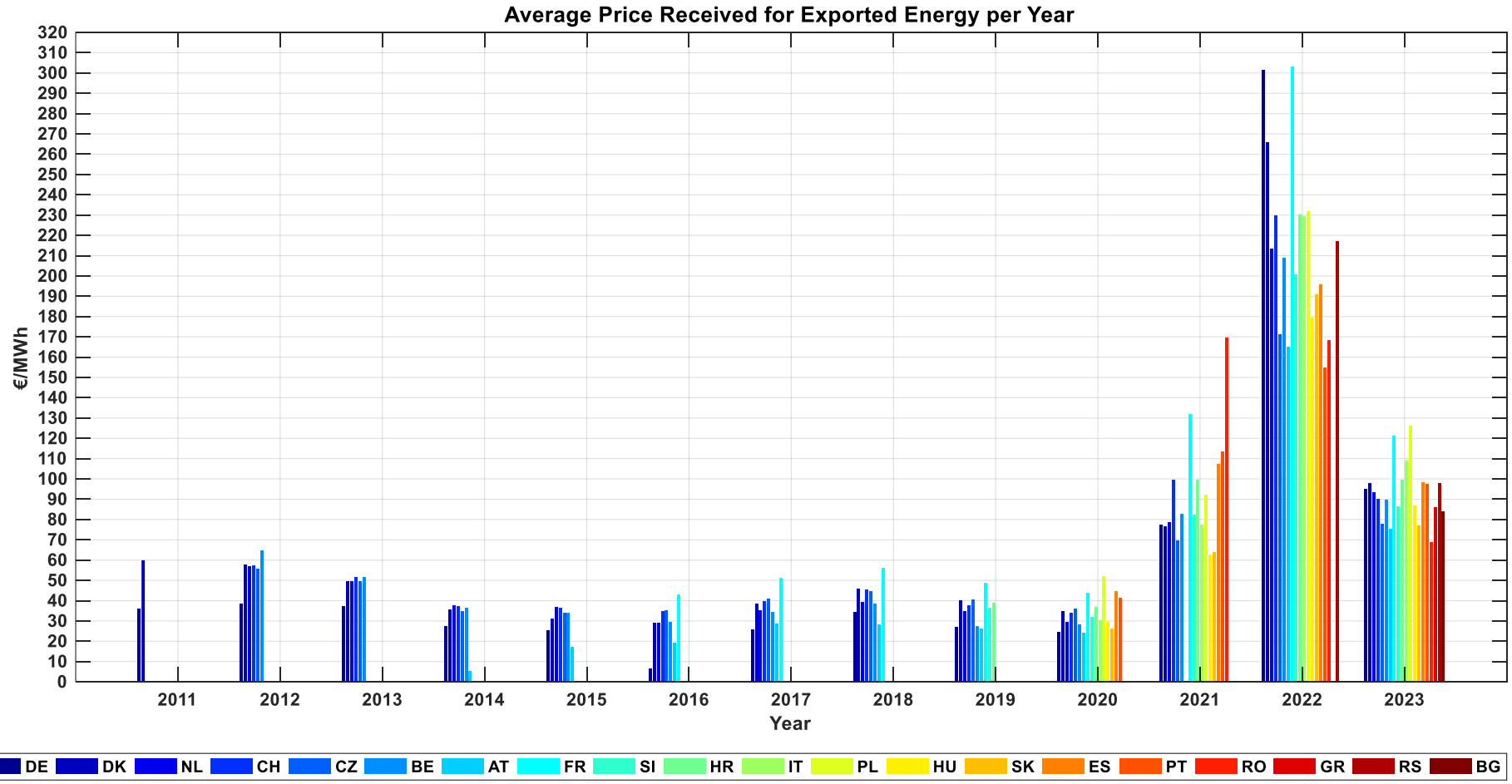
Average Price Paid for Imported Energy per Year



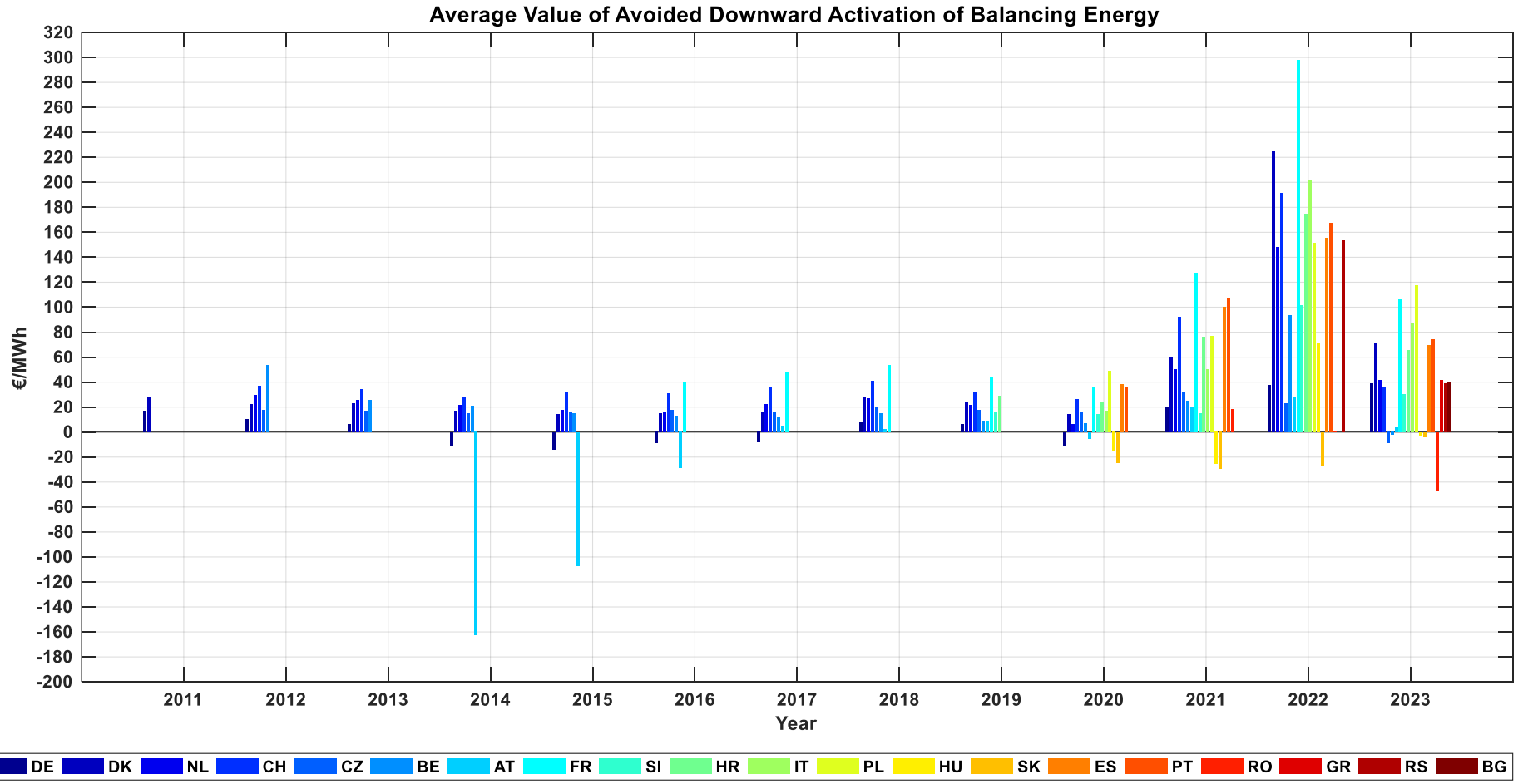
Average Value of avoided Upward Activation of Balancing Energy



Average Price Received for Exported Energy per Year



Average Value of avoided Downward Activation of Balancing Energy



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Appendix - Mathematical formulas of figures

- **Amount of netted imbalances (volume):**

$$E_{short+long,i} = E_{exp,i} + E_{\mathrm{Imp},i}$$

- **Amount of netted imbalances (value):**

$$R_{\mathrm{IGCC}} = \sum_{i=1}^{n} \left(C_{\mathrm{Imp},i} - C'_{\mathrm{IGCC}}\right) \cdot E_{\mathrm{Imp},i} + \sum_{i=1}^{n} \left(C'_{\mathrm{IGCC}} - C_{\mathrm{Exp},i}\right) \cdot E_{\mathrm{Exp},i}$$

Appendix - Mathematical formulas of figures

- **Local value of the avoided activated positive balancing energy (imported by IGCC):**

$$LV_{paid,i} = \sum_{i=1}^{n} C_{\mathrm{Imp},i} \cdot E_{\mathrm{Imp},i}$$

- **Local value (received) of the avoided activated negative balancing energy (exported to IGCC):**

$$LV_{received,i} = \sum_{i=1}^{n} C_{\mathrm{Exp},i} \cdot E_{\mathrm{Exp},i}$$

Appendix - Mathematical formulas of figures

- **Average price payed for imported energy:**

$$C_{paid,i} = \frac{\sum_{i=1}^{n} C_{\mathrm{IGCC},i} \cdot E_{\mathrm{Imp},i}}{\sum_{i=1}^{n} E_{\mathrm{Imp},i}}$$

- **Average price received for exported energy:**

$$C_{received,i} = \frac{\sum_{i=1}^{n} C_{\mathrm{IGCC},i} \cdot E_{\mathrm{Exp},i}}{\sum_{i=1}^{n} E_{\mathrm{Exp},i}}$$

Appendix - Mathematical formulas of figures

- **Average Value of avoided Upward Activation of Balancing Energy (Upward Opportunity Price)**

$$OP_{upward,i} = \frac{\sum_{i=1}^{n} C_{\mathrm{Imp},i} \cdot E_{\mathrm{Imp},i}}{\sum_{i=1}^{n} E_{\mathrm{Imp},i}}$$

- **Average Value of avoided Downward Activation of Balancing Energy (Downward Opportunity Price)**

$$OP_{downward,i} = \frac{\sum_{i=1}^{n} C_{\mathrm{Exp},i} \cdot E_{\mathrm{Exp},i}}{\sum_{i=1}^{n} E_{\mathrm{Exp},i}}$$