



IGCC REGULAR REPORT ON SOCIAL WELFARE

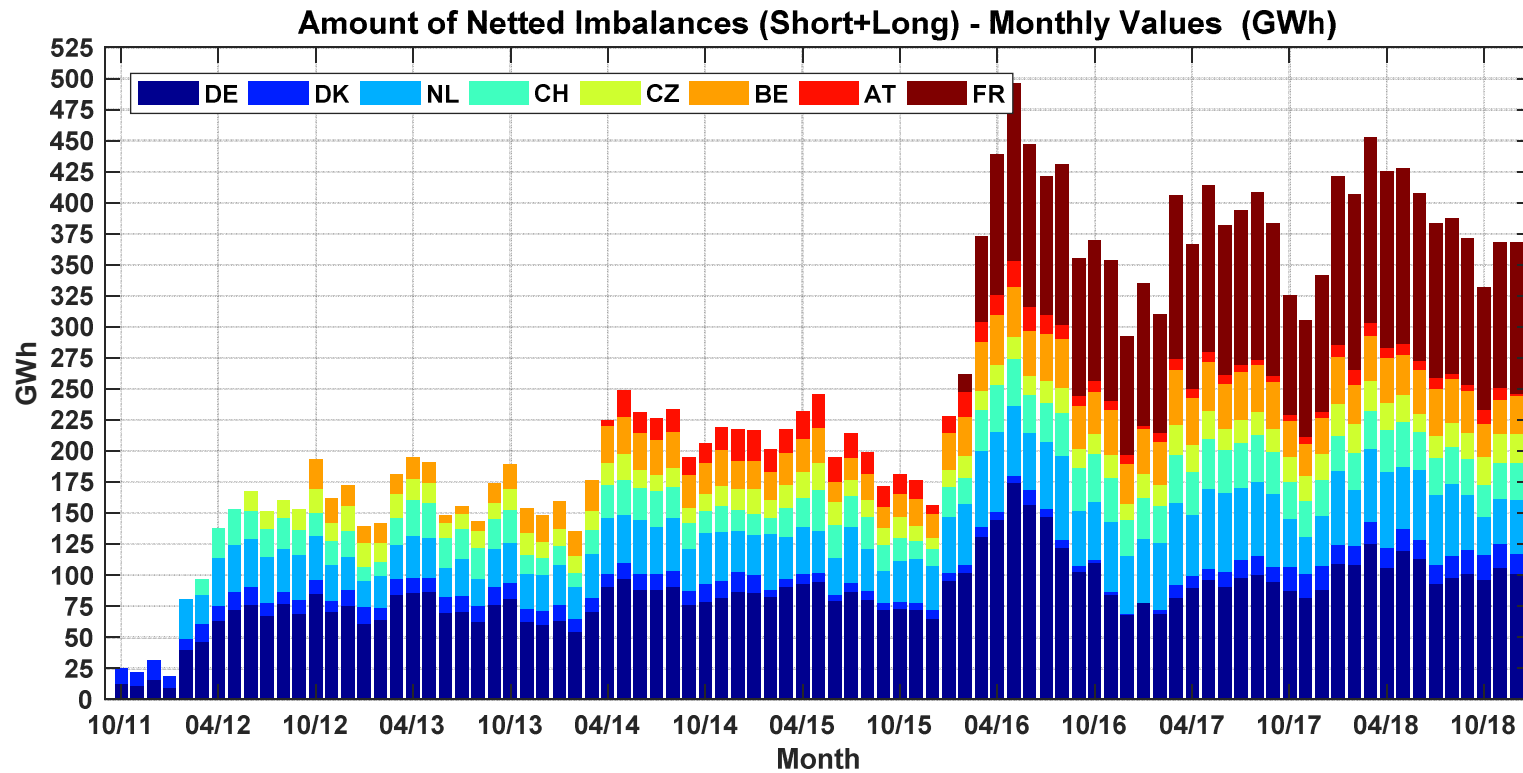
Q4 / 2018

IGCC-Settlement – Basic Principle

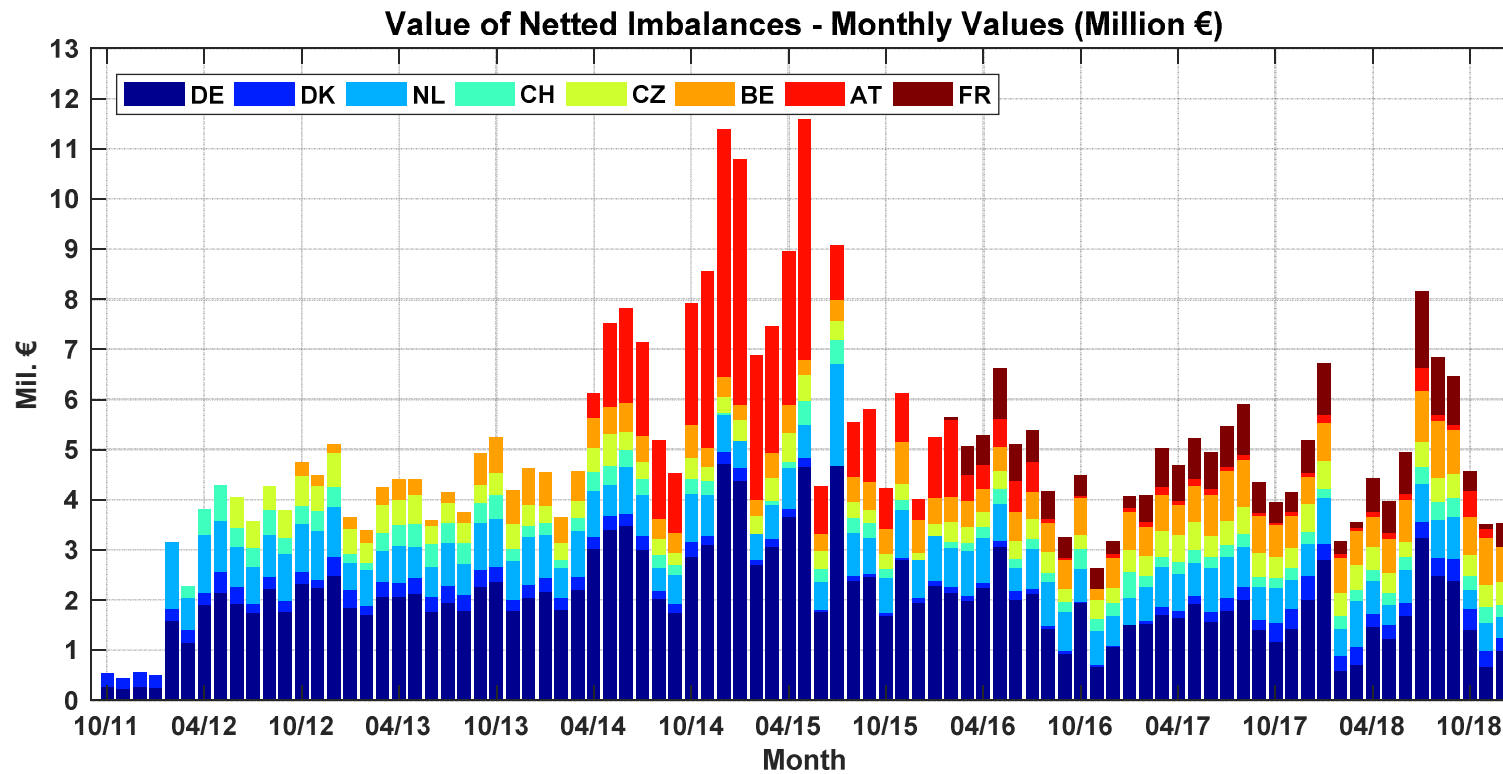
(Methodology applied from 01/02/2016)

<p>Opportunity Prices for Imbalance Netting</p>	<table border="0" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">without IGCC</td> <td style="width: 33%;">with IGCC</td> <td style="width: 33%;">Opportunity Price = Opportunity Value/IGCC Volume</td> </tr> <tr> <td style="background-color: #800000; color: white; padding: 10px;"> $\frac{SCE_{\text{before IGCC}} [\text{MWh}] \times SCE_{\text{price}_{\text{before IGCC}}} [€/\text{MWh}]}$ </td> <td style="background-color: #800000; color: white; padding: 10px;"> <div style="background-color: #92d050; padding: 2px 5px; margin-bottom: 5px;">IGCC exchange</div> $\frac{SCE_{\text{after IGCC}} [\text{MWh}] \times SCE_{\text{price}_{\text{after IGCC}}} [€/\text{MWh}]}$ </td> <td style="background-color: #ffcc99; padding: 10px;"> $\frac{[(SCE_{\text{before IGCC}} \times SCE_{\text{price}_{\text{before IGCC}}}) - (SCE_{\text{after IGCC}} \times SCE_{\text{price}_{\text{after IGCC}}})]}{\text{IGCC exchange}}$ </td> </tr> </table>	without IGCC	with IGCC	Opportunity Price = Opportunity Value/IGCC Volume	$\frac{SCE_{\text{before IGCC}} [\text{MWh}] \times SCE_{\text{price}_{\text{before IGCC}}} [€/\text{MWh}]}$	<div style="background-color: #92d050; padding: 2px 5px; margin-bottom: 5px;">IGCC exchange</div> $\frac{SCE_{\text{after IGCC}} [\text{MWh}] \times SCE_{\text{price}_{\text{after IGCC}}} [€/\text{MWh}]}$	$\frac{[(SCE_{\text{before IGCC}} \times SCE_{\text{price}_{\text{before IGCC}}}) - (SCE_{\text{after IGCC}} \times SCE_{\text{price}_{\text{after IGCC}}})]}{\text{IGCC exchange}}$
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<p>IGCC Initial Settlement Price</p>	<ul style="list-style-type: none"> — IGCC Initial Settlement Price (P_{IGCC}): Energy weighted average of the opportunity prices ($C_{Imp,i}$ and $C_{Exp,i}$) — Symmetric price for IGCC imports and exports $P_{IGCC} = \frac{\sum_{i=1}^n (C_{Imp,i} E_{Imp,i} + C_{Exp,i} E_{Exp,i})}{\sum_{i=1}^n (E_{Imp,i} + E_{Exp,i})}$						
<p>IGCC Settlement Ex-post Adjustment</p>	<ul style="list-style-type: none"> — 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 						
<p>Calculation of Cost Reduction</p>	<ul style="list-style-type: none"> — Cost reduction for a participant is driven by the spread between the opportunity price and the IGCC adjusted settlement price $B'_i = \sum_{t=1}^T (C_{Imp,t} - P'_{IGCC,t}) \cdot E_{Imp,t} + \sum_{t=1}^T (P'_{IGCC,t} - C_{Exp,t}) \cdot E_{Exp,t}$						

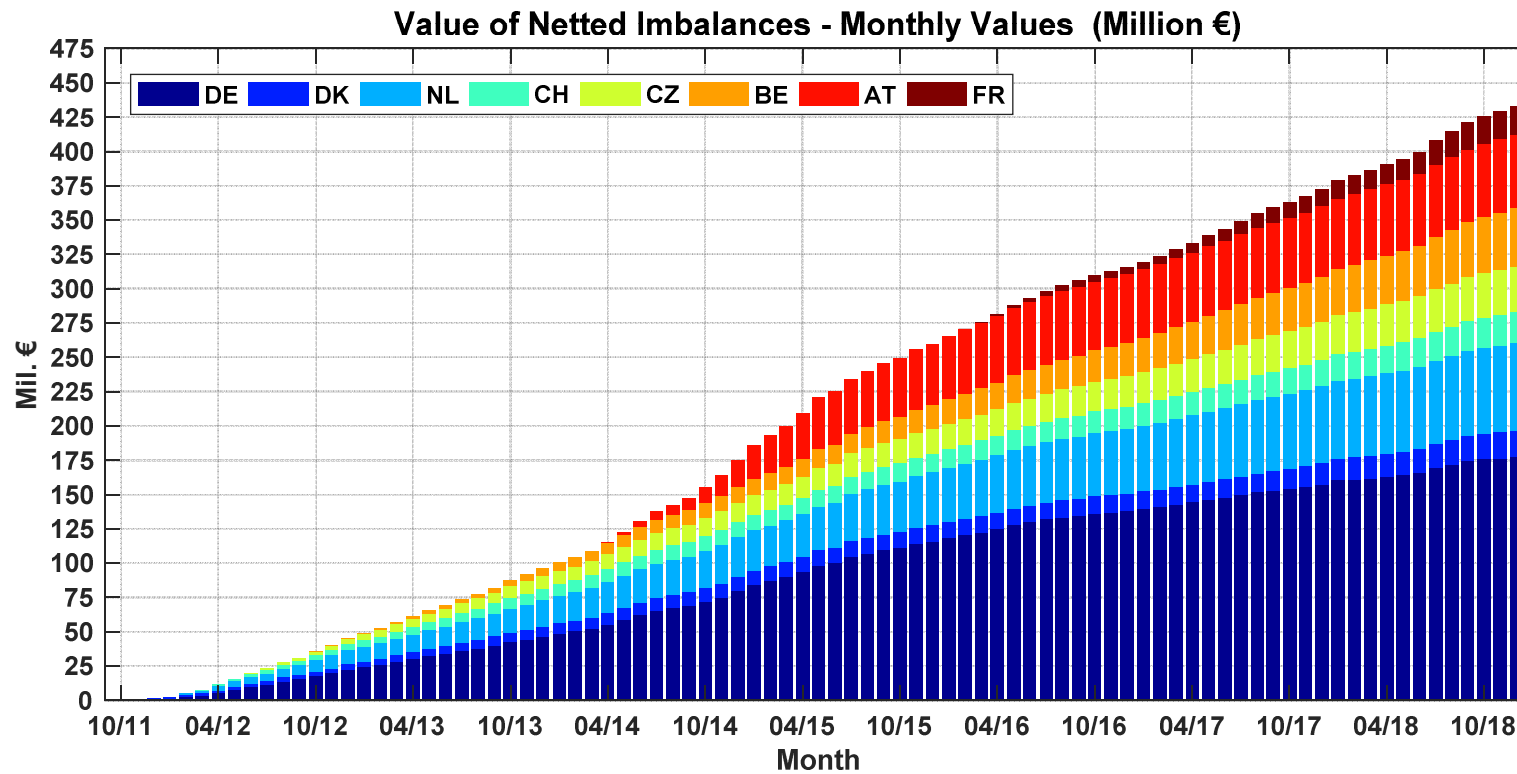
Monthly Volumes of Netted Imbalances



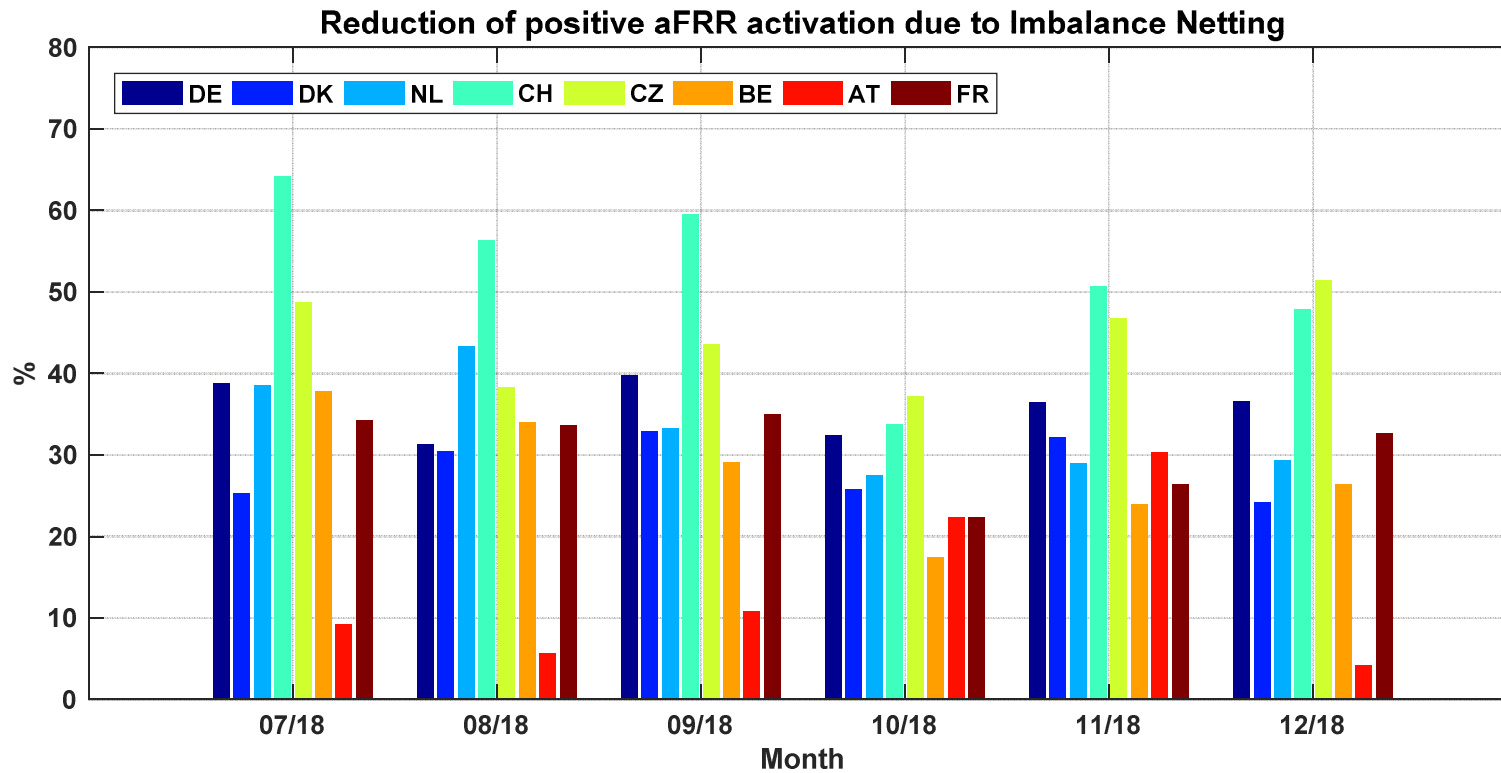
Monthly Value of Netted Imbalances



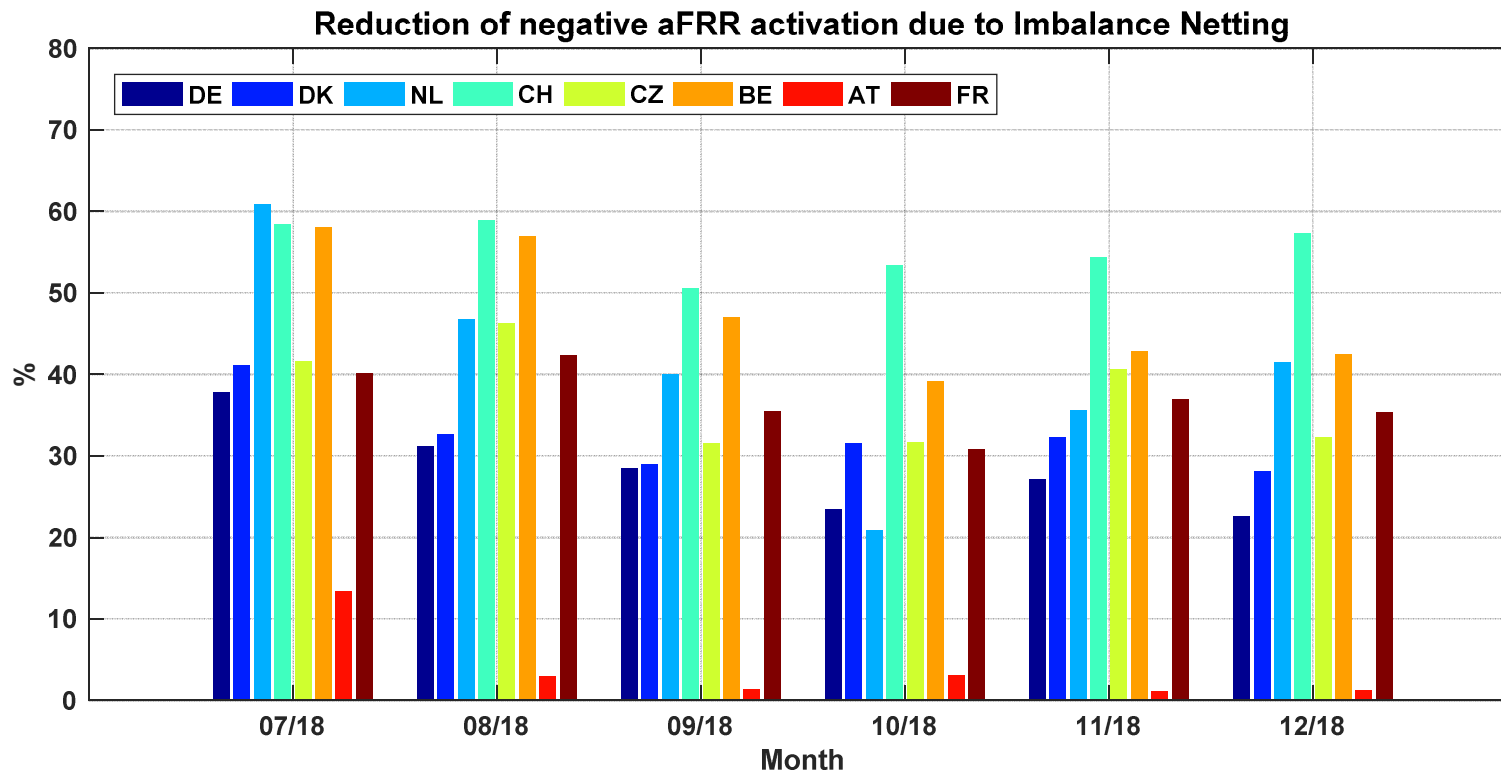
Value of Netted Imbalances - Development



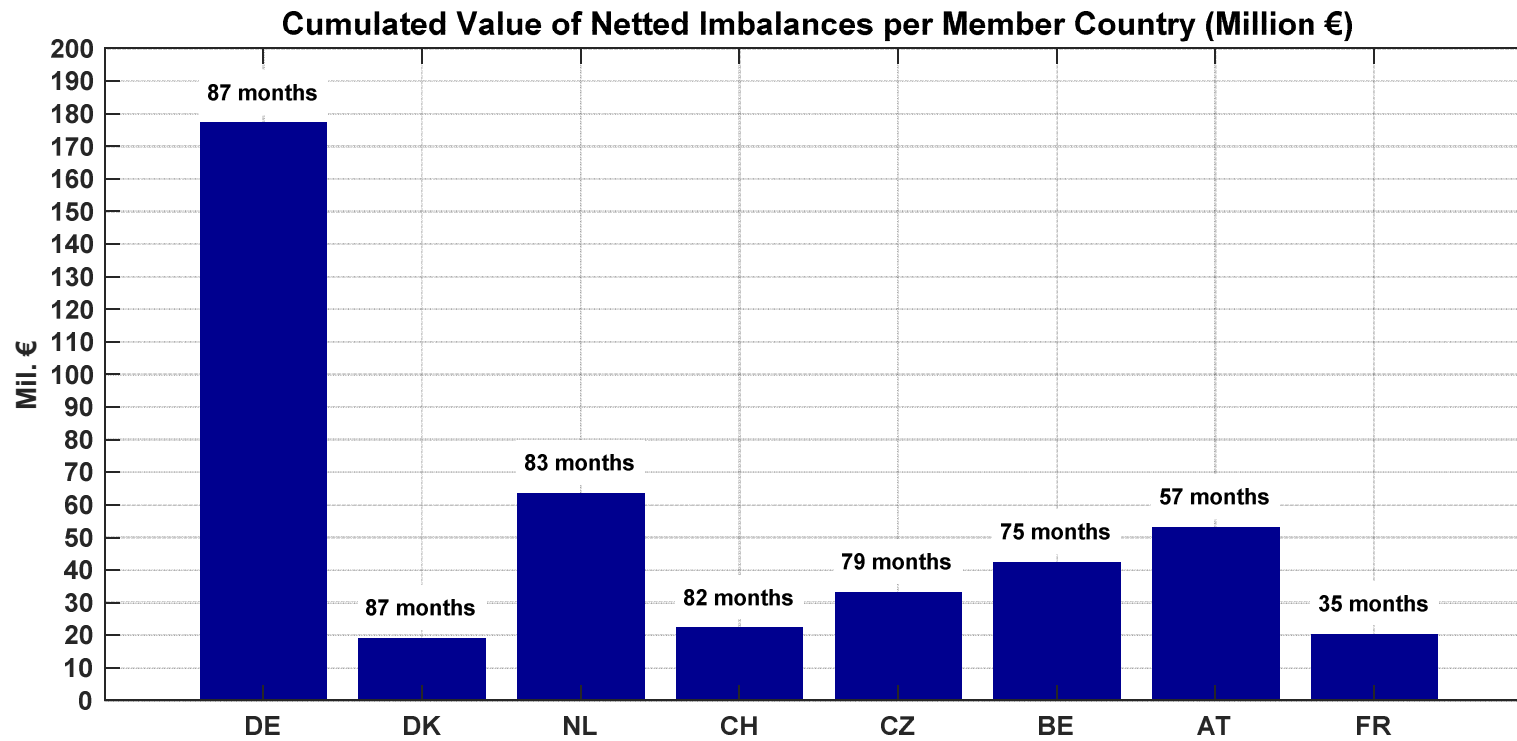
Monthly Percentage of Avoided pos. aFRR-Activations (last 6 Months)



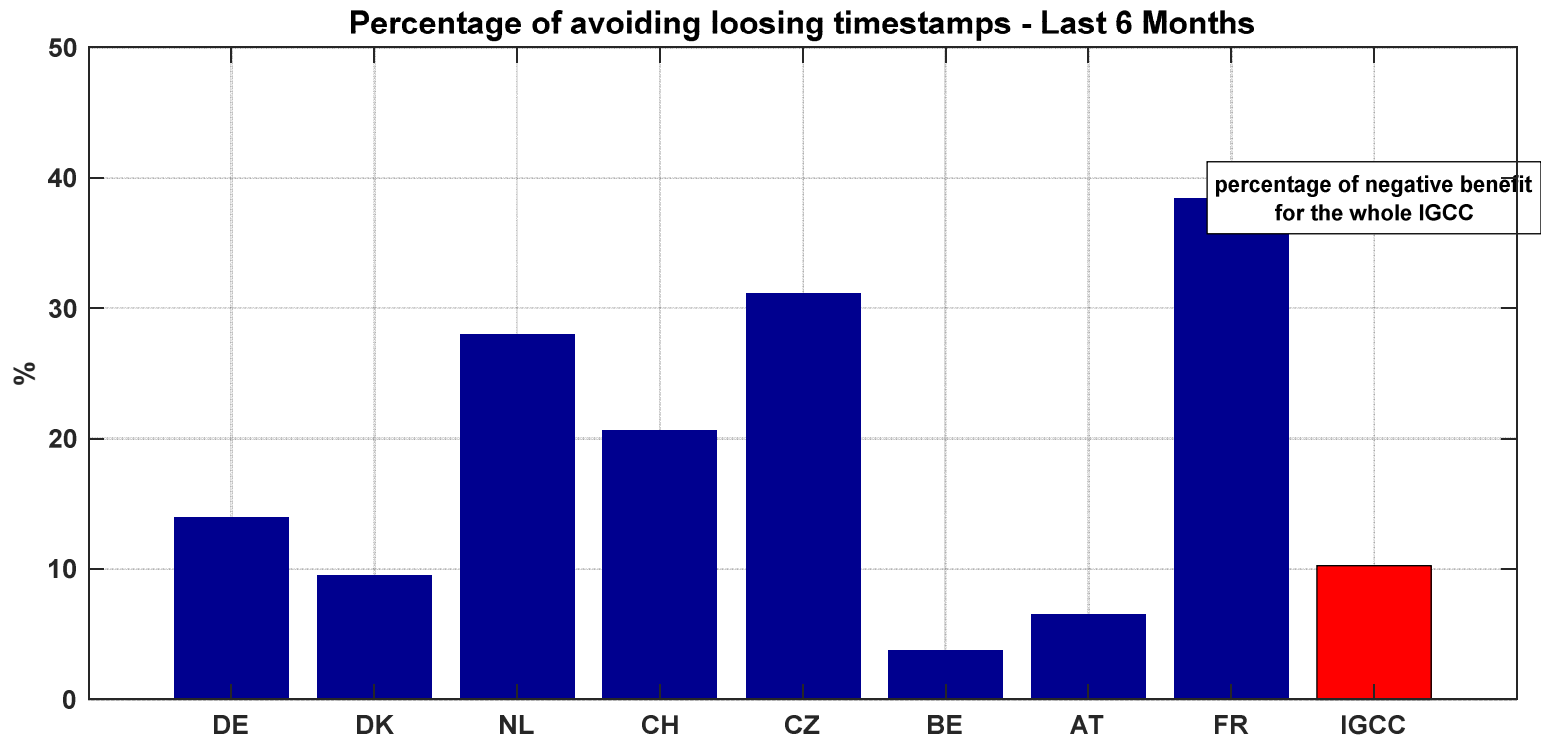
Monthly Percentage of Avoided neg. aFRR-Activations (last 6 Months)



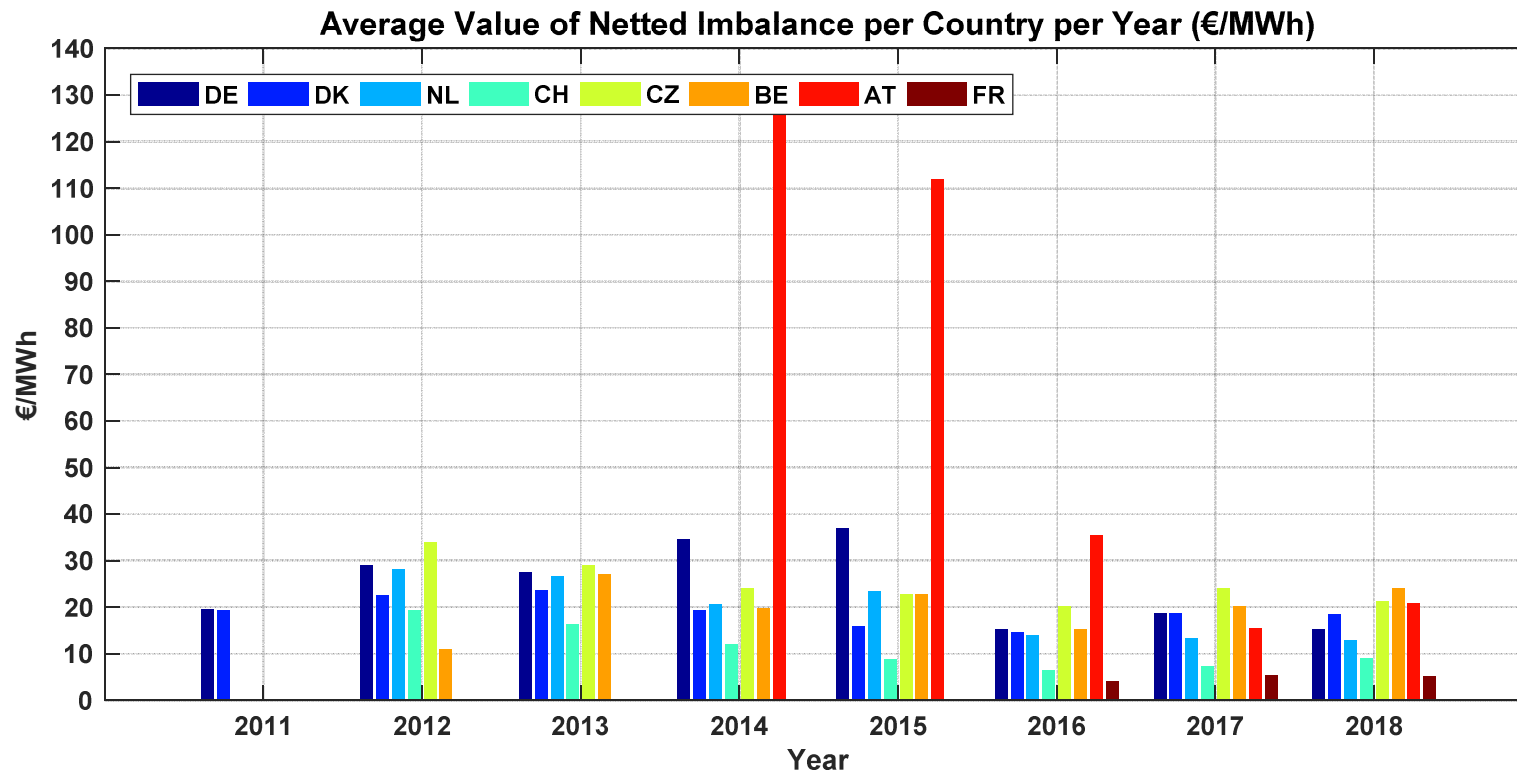
Cumulated Value of Avoided Activations



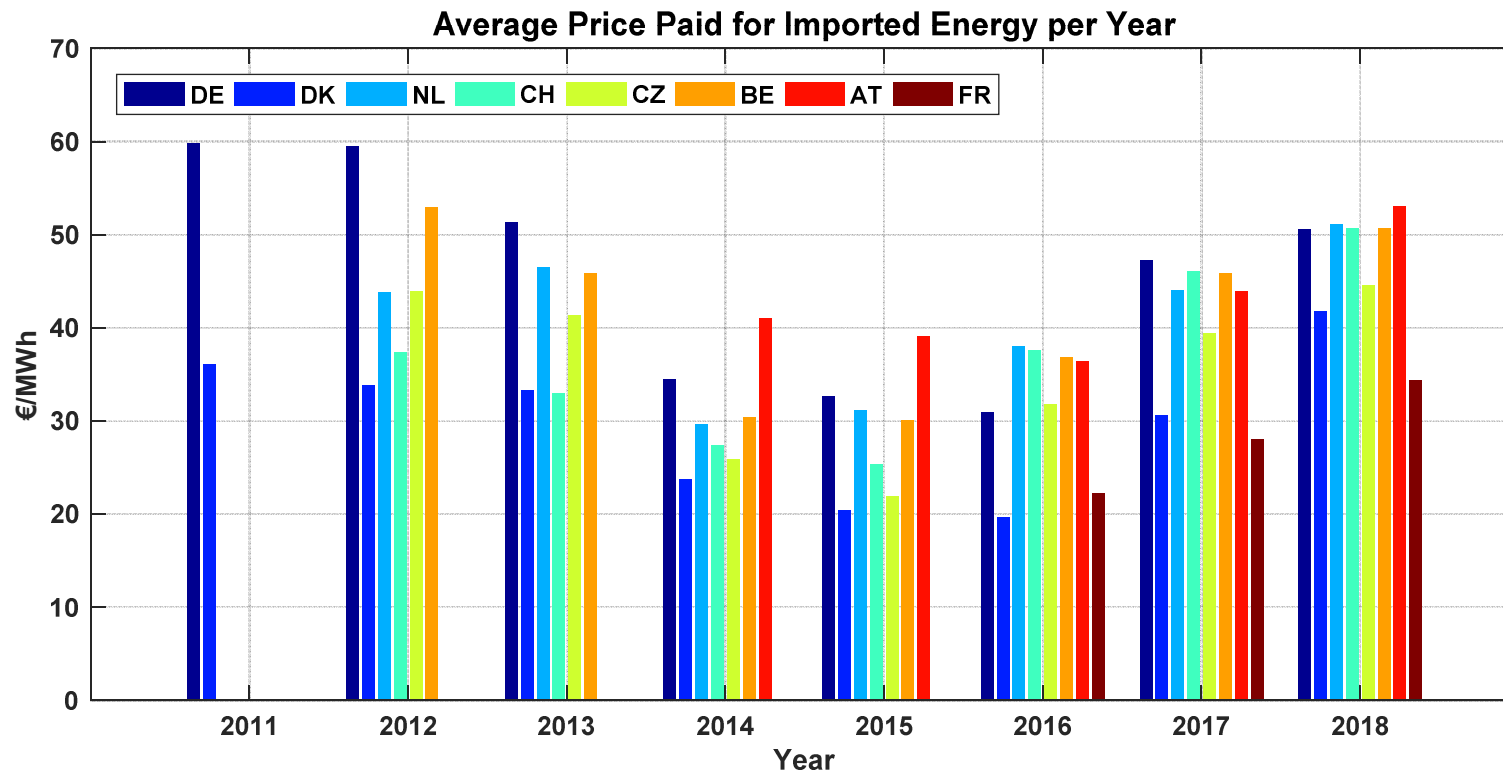
Percentage of avoiding loosing timestamps due to the second step of settlement method



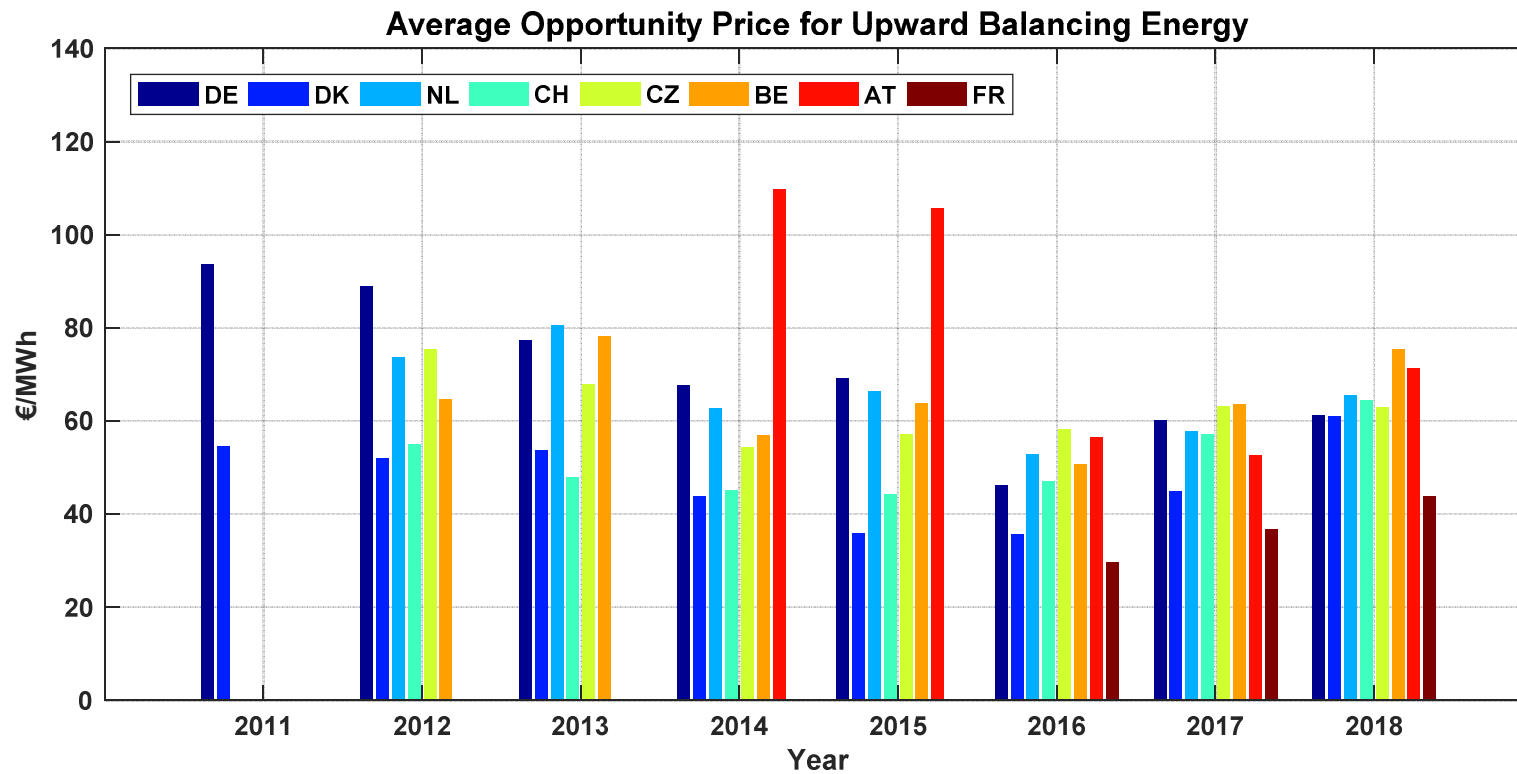
Average Value of Netted Imbalance per Country per Year in €/MWh



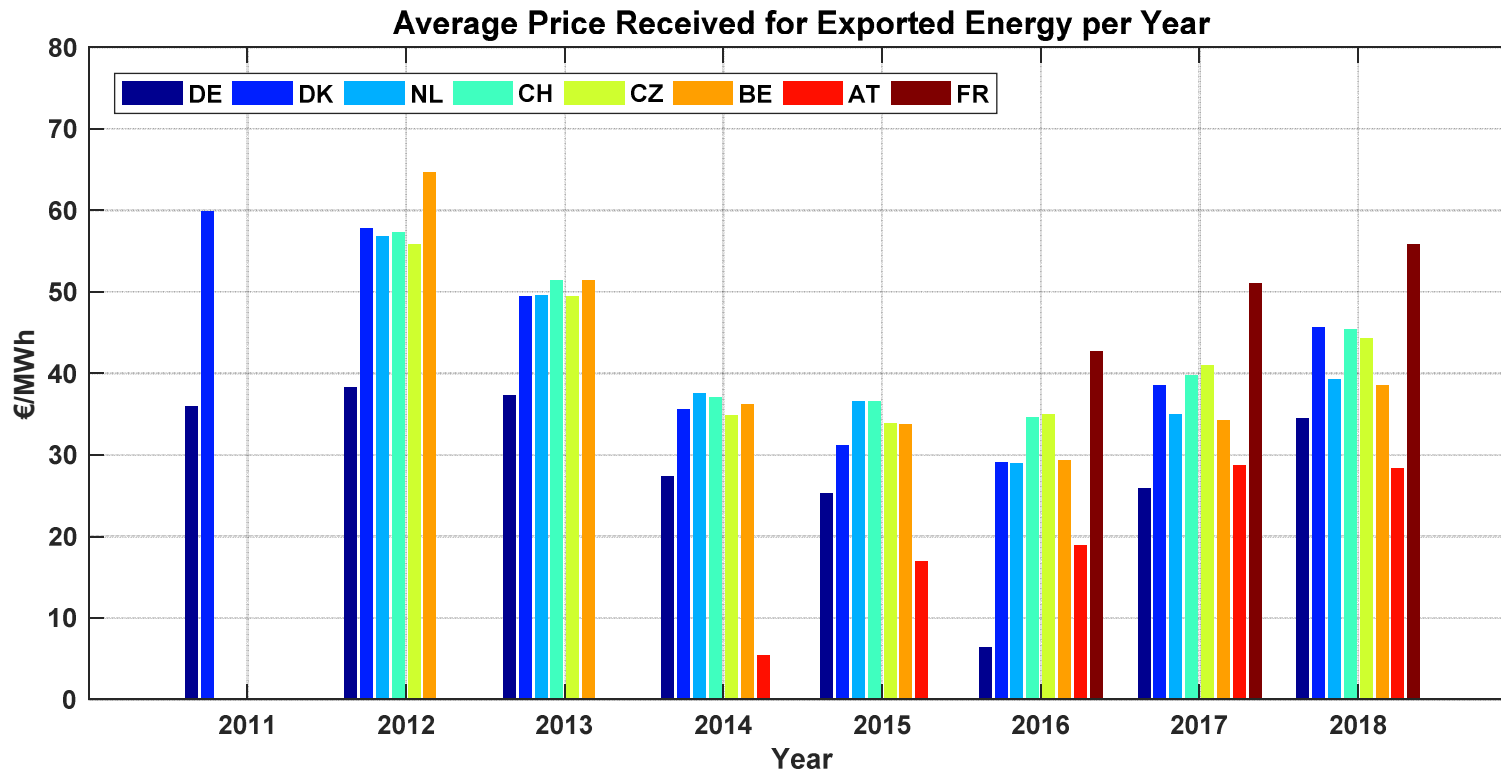
Average Price Paid for Imported Energy per Year



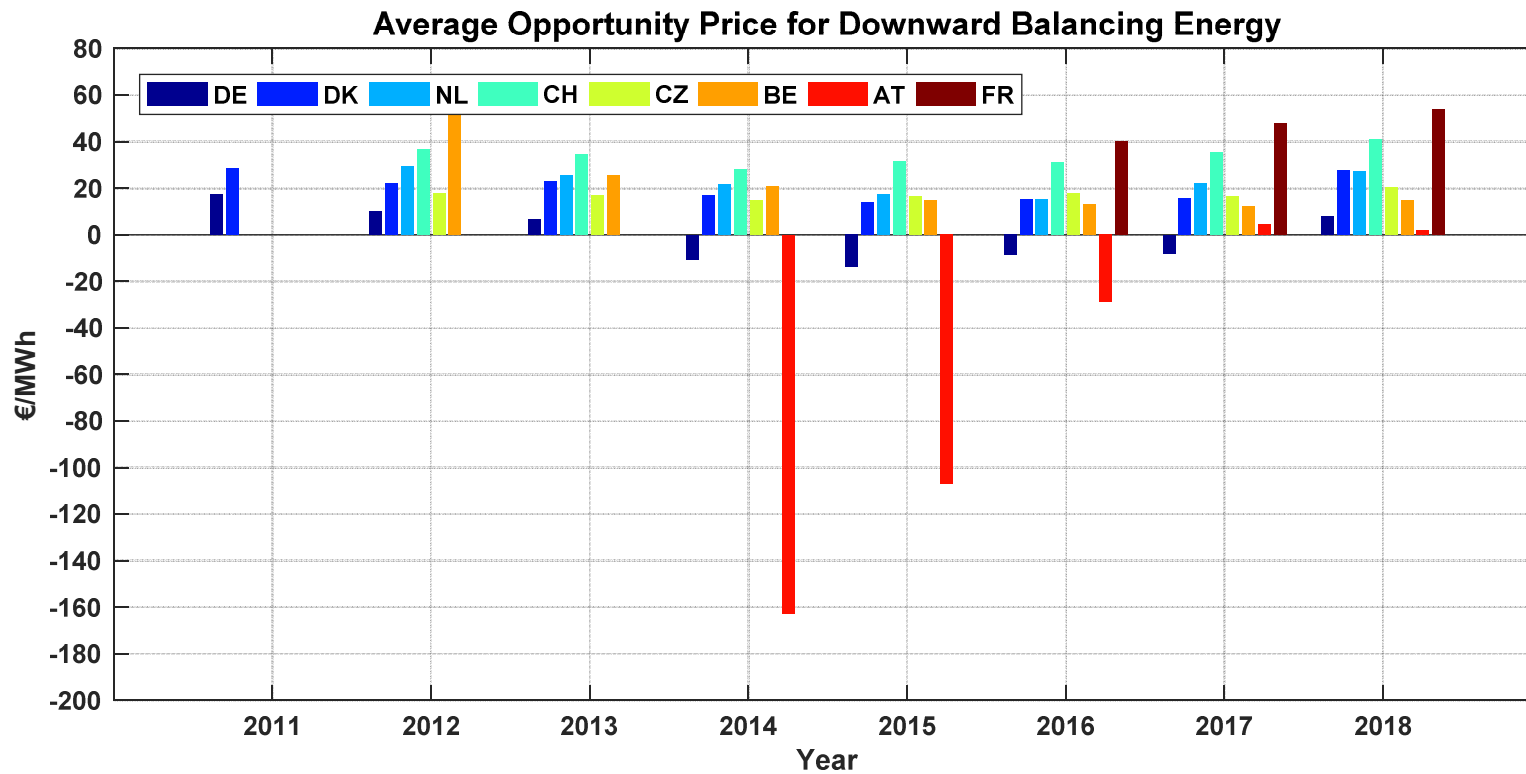
Average Opportunity Price for Upward Balancing Energy



Average Price Received for Exported Energy per Year



Average Opportunity Price for Downward Balancing Energy



Appendix - Mathematical formulas of figures

— Amount of netted imbalances (volume):

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

— Amount of netted imbalances (value):

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

Appendix - Mathematical formulas of figures

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

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

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

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

Appendix - Mathematical formulas of figures

— Average price payed for imported energy:

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

— Average price received for exported energy:

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

Appendix - Mathematical formulas of figures

— Average opportunity prices upward:

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

— Average opportunity prices downward:

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