WP5 – Assessment of the impacts of RES policy design options on future electricity markets

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Impacts Analysed

- Merit-order, prices (EU)
- Market value of RES (EU)
- Price volatility (EU)
- Balancing needs and costs (Spain)
- System adequacy (Central Western Europe)
- Network effects: grid operation and investment (South Western Europe)

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Starting Assumptions

- Policy scenarios
  - No policy
  - HARMFIT
  - HARMQUO
  - NATFIP
- Green-X results for RES capacity and CO2 prices
- PRIMES High-RES for non-RES capacity, demand, and fuel prices

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Different methodologies

- PowerACE
- ROM
- Ecofys
- TEPES: Network expansion planning model

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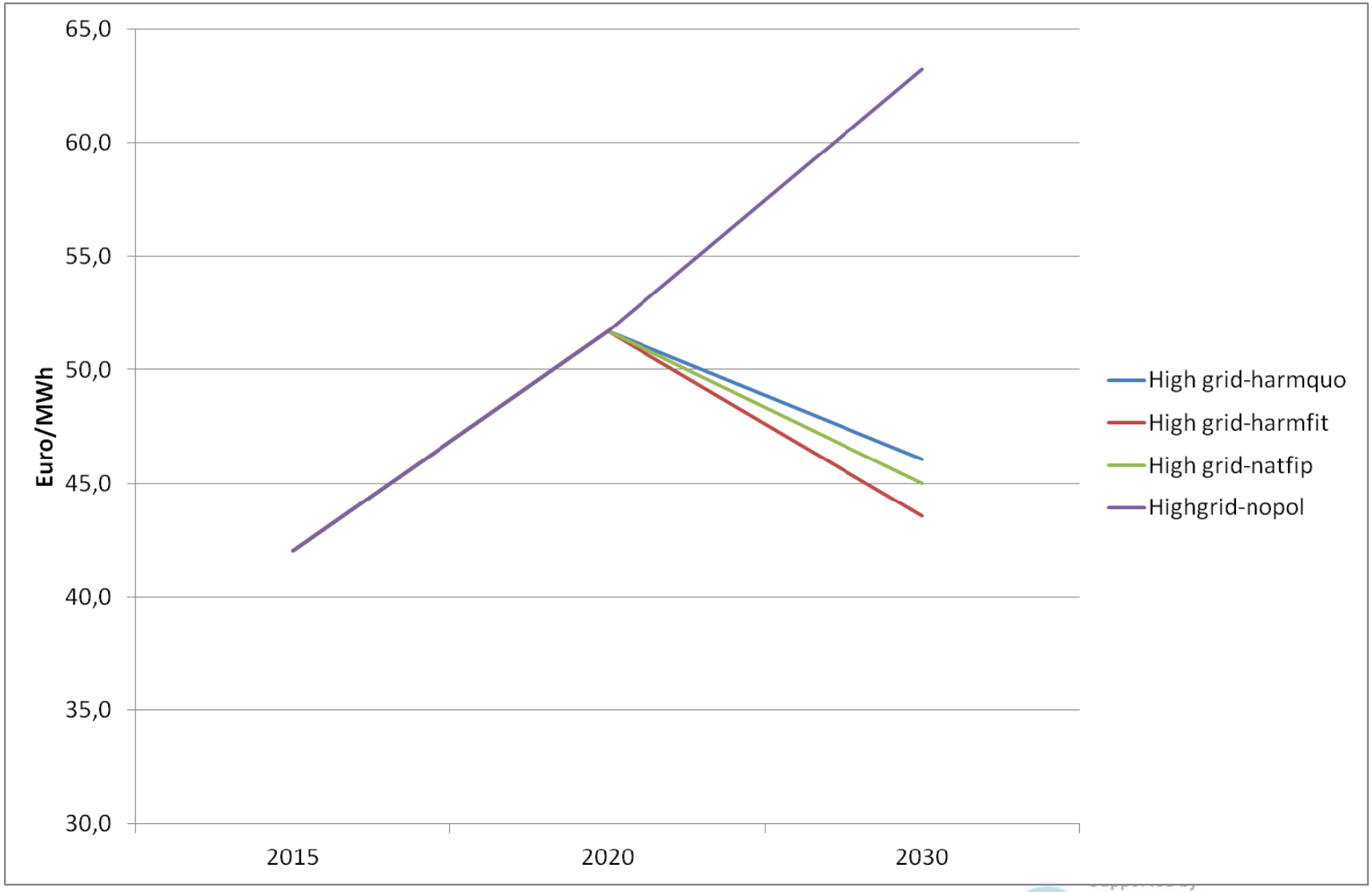
Price Effects (I)



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Price Effects (II)

- Depend much on grid expansion
  - Particularly for HARMQUO
- Increases in fuel and CO2 prices counteract the merit-order effect
  - We are not assuming a reaction of investment
- After 2030 there is a price reduction
  - Which can be due to overcapacity

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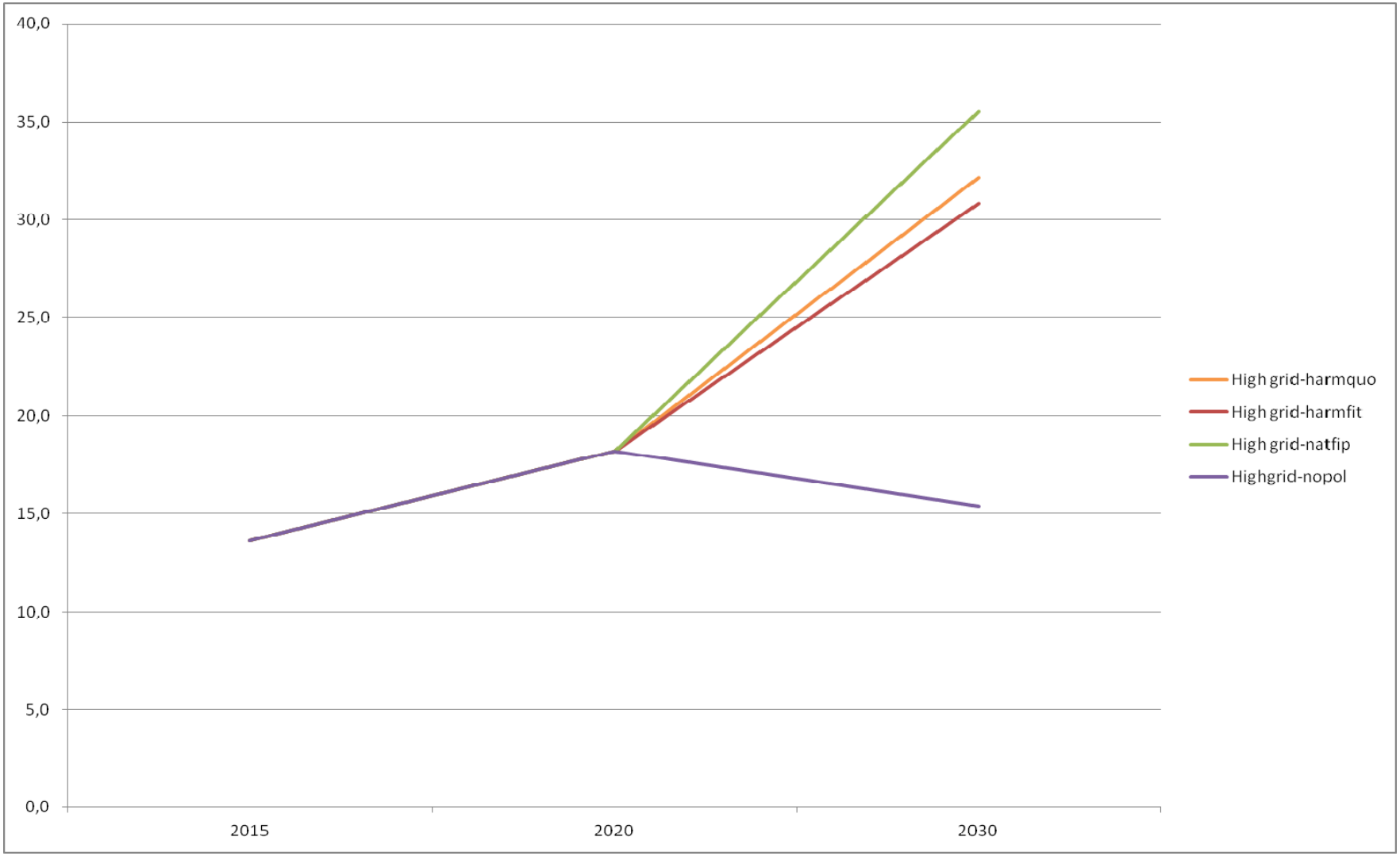
Price Volatility



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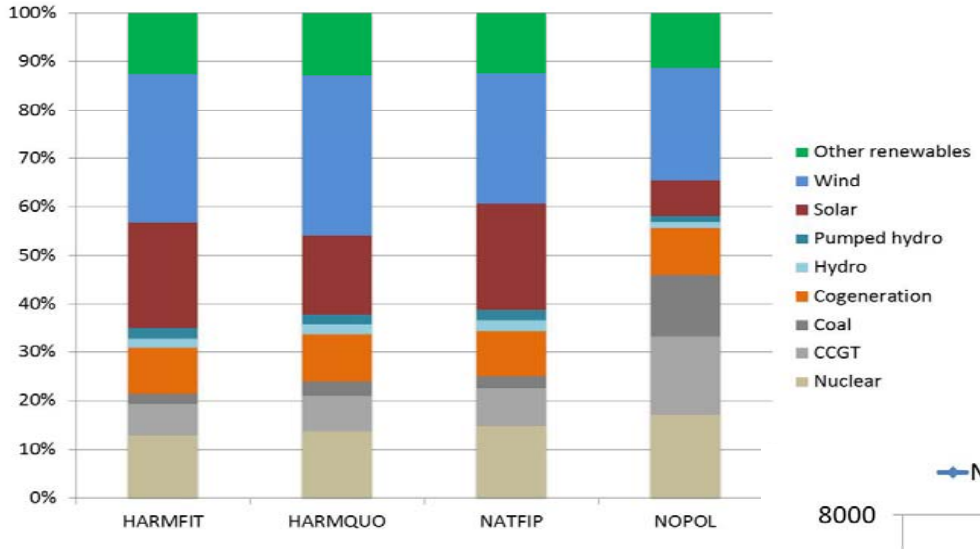
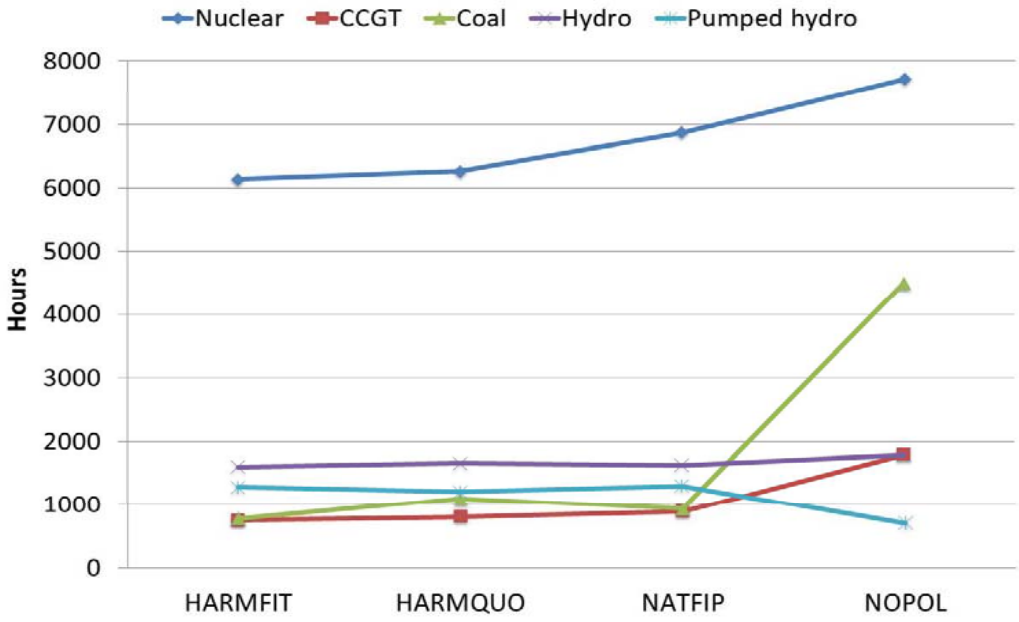
Balancing needs: Changes in the electricity mix





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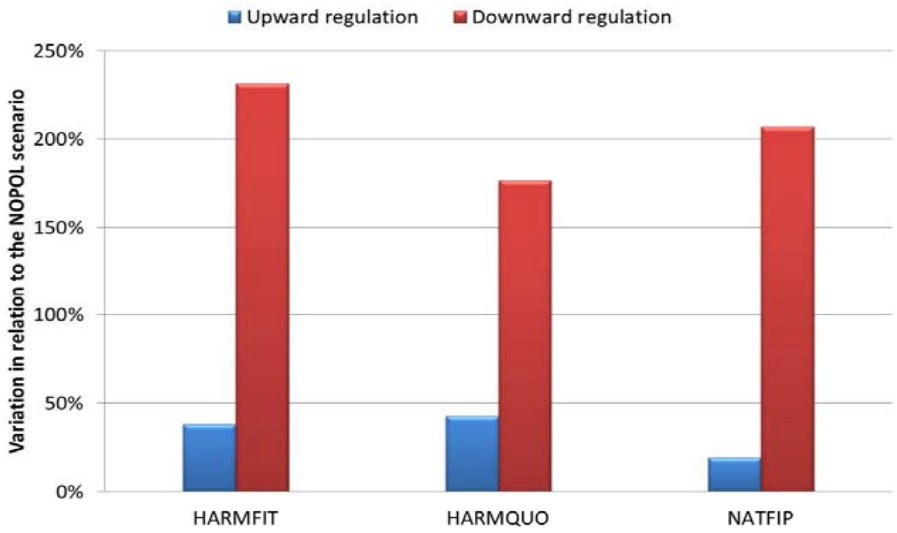
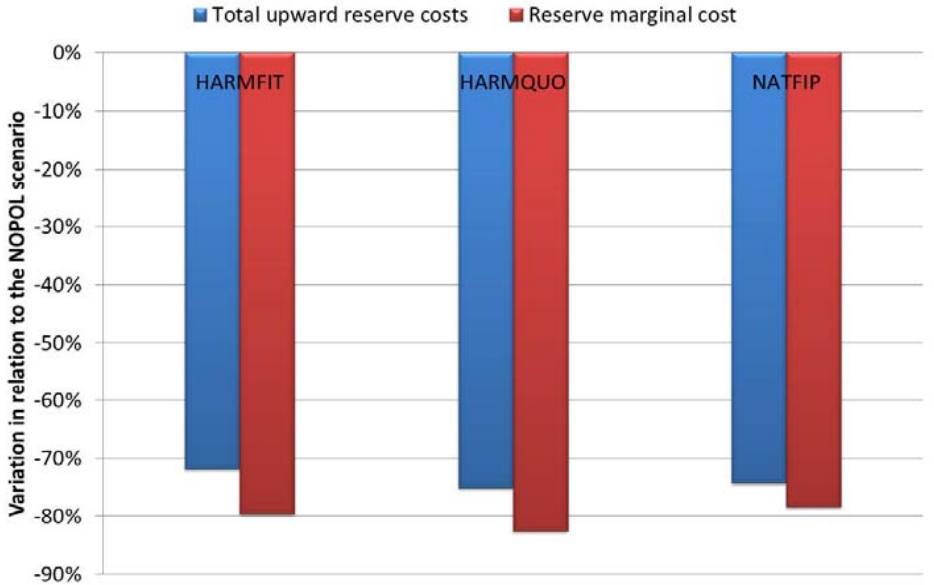
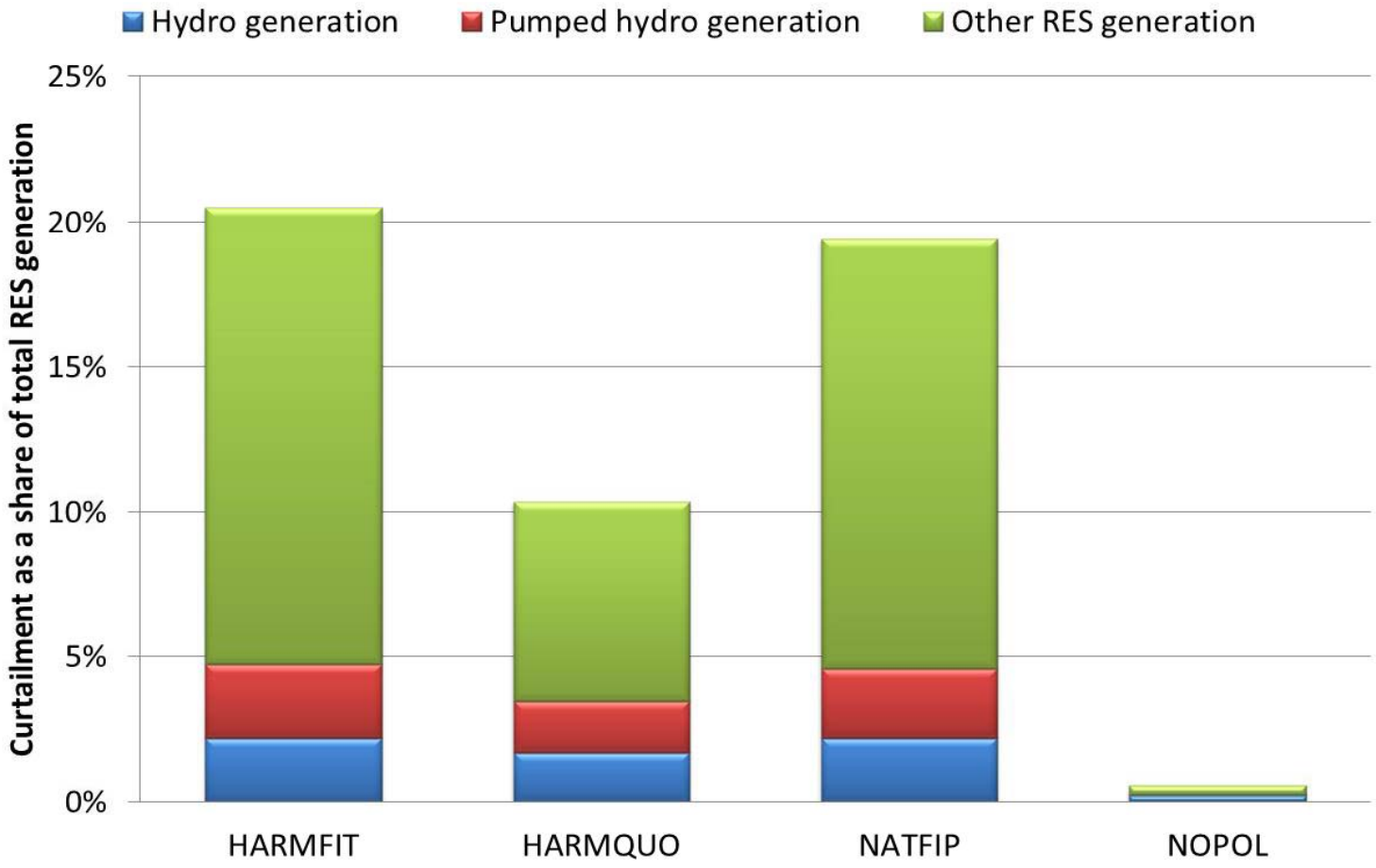
Balancing needs: Changes in reserves





Balancing needs: Curtailment



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Network Effects (I)

[M€ annual]	Harmfit	Harmquo	Natfip	Nopol
ES_C	110	49	72	72
ES_NE	167	122	151	105
ES_NW	79	50	42	46
ES_SE	147	132	146	73
ES_SW	175	120	171	86
FR_C	157	160	138	155
FR_N	130	91	119	160
FR_SE	141	81	105	95
FR_SW	112	110	84	187
PT	61	42	40	32
TOTAL	1279	957	1067	1011

	€/MWh]
Harmfit	2.13
Harmquo	1.68
Natfip	1.76
Nopol	2.43

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Network Effects (II)

- Network costs depend on the signals sent:
  - Renewable resource
  - Market/Network prices
  - Market value of RES
- When RES follow market prices: Lower network costs
- When RES capacity is low: Lower network costs
- When market value of RES is higher: Higher network costs

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System Adequacy

- Different methodology and scenarios

	• AT	• BE	• DE/LU	• FR	• NL
Margin (GW)	+ 1.9	- 4.1	- 7	- 10.1	+ 2.2
Margin (% Peak Load)	+ 20%	- 30%	- 9%	- 12%	+ 12%
$LOLE_{No\ INT}$	0	8760	62.6	1049	1.8
$LOLE_{INT}$	0	11	7	209	0
$LOLE_{INT+20}$	0	2.7	3.4	138	0

- Additional capacity is much needed
  - But the energy market will not provide for it

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Overall Conclusions

- Impacts depend mostly on the amount of RES, not as much on their distribution/support system
- Market impacts are mitigated by a stronger grid expansion and market integration
- The higher the market value of RES, the stronger the grid reinforcement
    - But market value decreases with RES

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Some Caveats and Limitations

- We do not assume a joint optimization of the system:
  - Only the impact of RES expansion
  - And assuming that the system does not react to this (grid, conventional)
- The network study does simulate grid expansion, but at a lower detail
- Some results are regional and difficult to extrapolate

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Thanks for your attention

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