Modelling the supply scenarios

Prices & Volumes

Carmen Rodríguez

Adviser

Brussels – 30 April 2013

Introduction

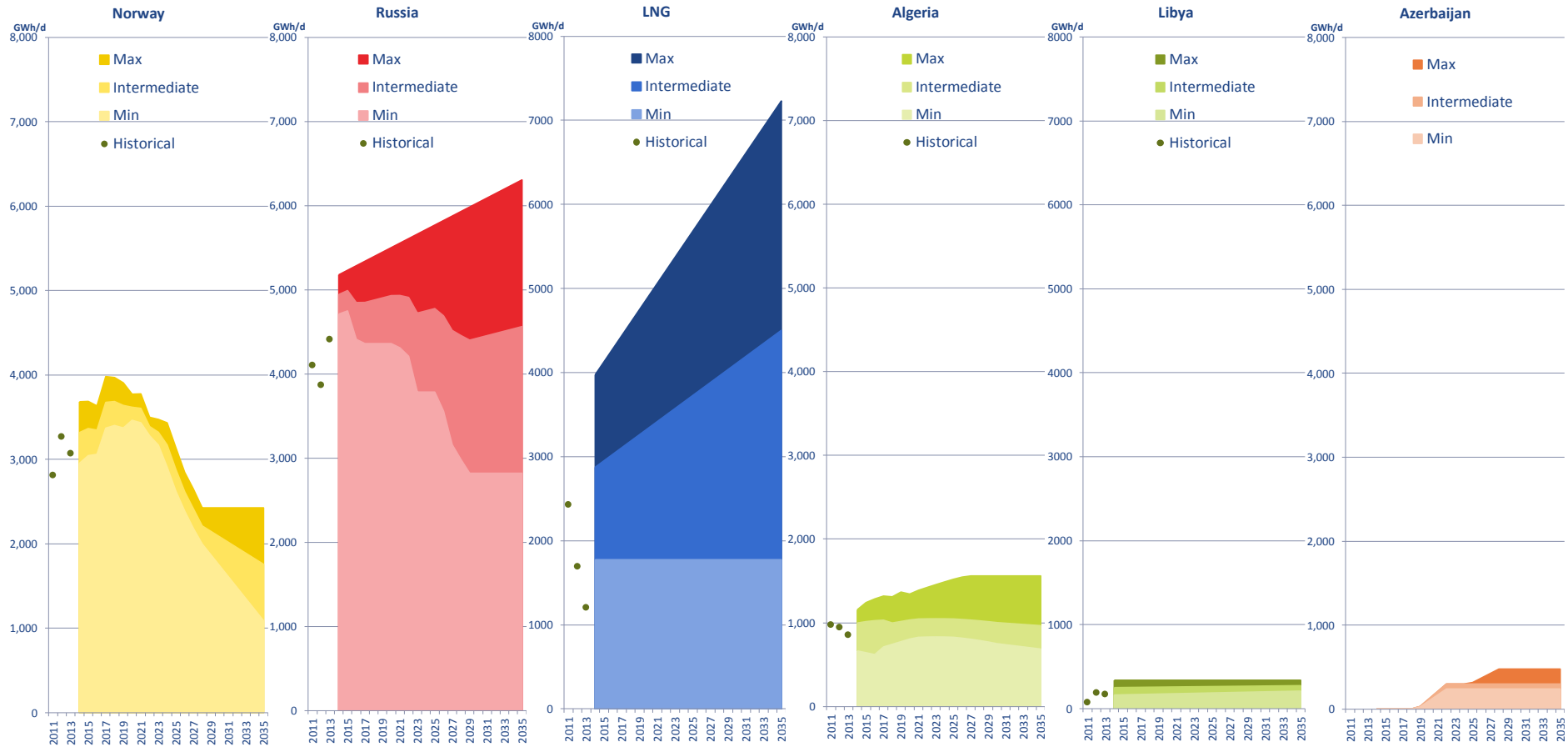
Use of the potential supply scenarios

- The multiple (minimum, maximum and intermediate) potential supply scenarios have a direct use as part of the Supply Adequacy Outlook.
- The use of these scenarios in the modelling is indirect: the supply cases come out of different calculations.
- In TYNDP 2013 the calculation of the supply cases was done based on the historical supply shares for the reference case.
- Now, for TYNDP 2015 the introduction of the market layer derives in the calculation of the supply case to the price conditions of the different sources, as resulting from the network modelling.
- Constraints on the levels of supply of the different sources should be defined to avoid unrealistic supply situations
- The supply constraints depend on the demand case.

Modelling results come out of the combination of Supply constraints and network constraints.

Potential supply scenarios

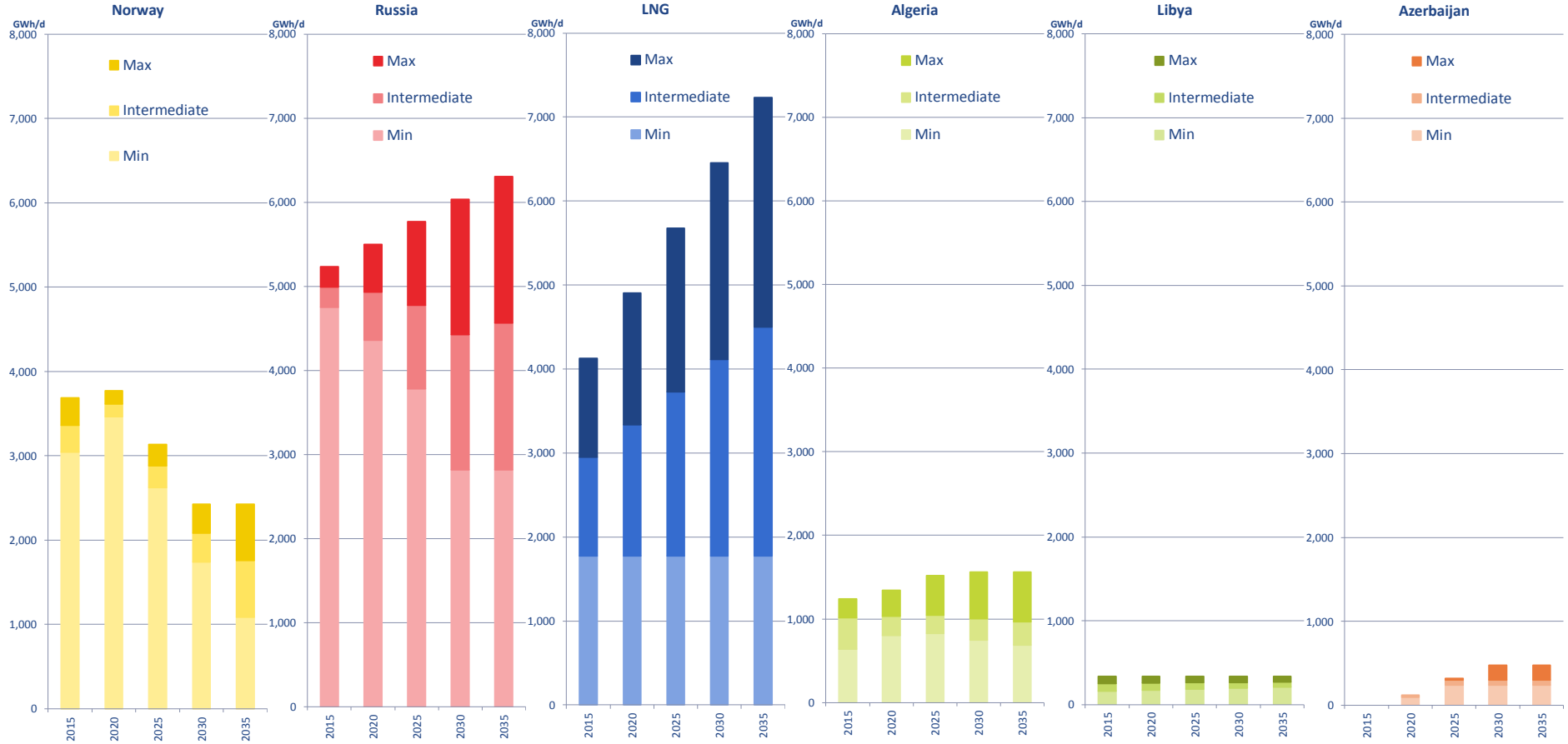
The potential supply scenarios as raw material



Snapshots of the continuity of the years to be modelled are taken from the continuity of the potential supply scenarios: 2015, 2020, 2025, 2030 and 2035. The treatment of these values is applied independently to each of the years.

Potential supply scenarios

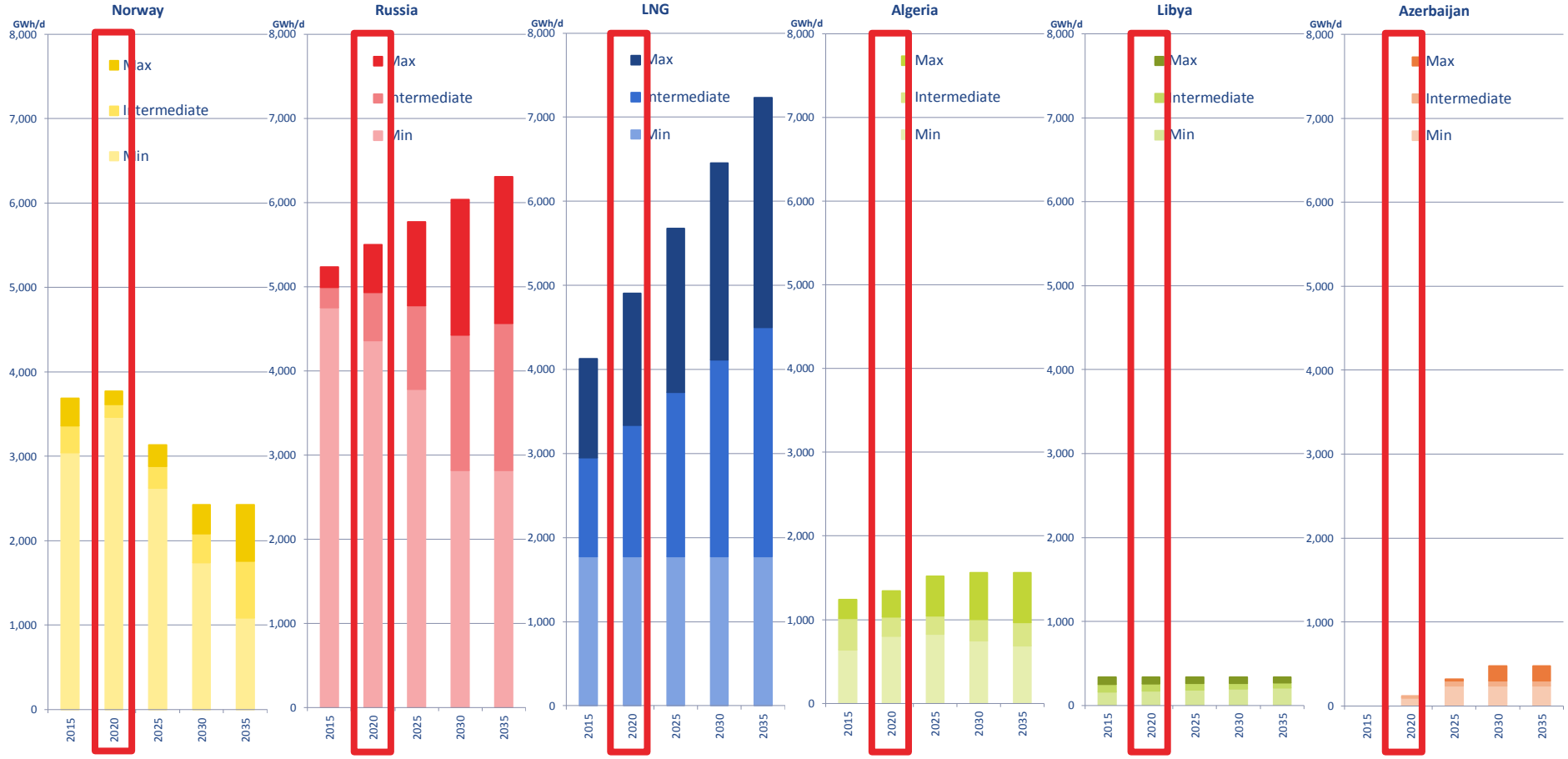
The potential supply scenarios as raw material



Snapshots of the continuity of the years to be modelled are taken from the continuity of the potential supply scenarios: 2015, 2020, 2025, 2030 and 2035. The treatment of these values is applied independently to each of the years.

Potential supply scenarios

The potential supply scenarios as raw material



Example: Price/volume treatment for the potential supply scenarios in 2020

Potential supply scenarios

Summer and Winter figures derived from the yearly scenarios

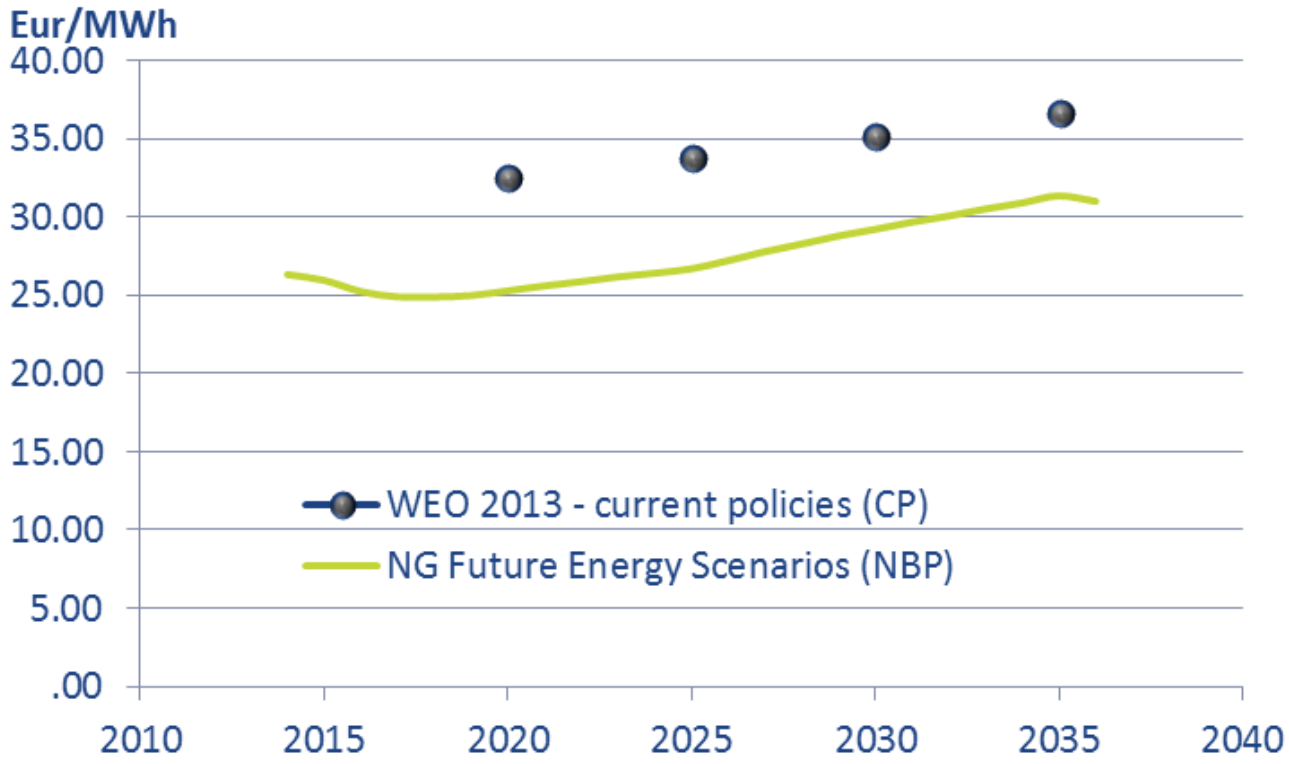
	GWh/d	NO	RU	DZ	LY	LNG	AZ
Potential supply scenarios	minimum potential scenario	2,745	4,000	279	187	2,314	150
	intermediate	2,904	5,000	1,248	290	4,095	297
	maximum potential scenario	3,062	6,000	1,610	336	5,605	504
Daily maximum (historical) (**)	maximum 2 weks	4,160	8,200	1,702	343	7,600	240
	maximum peak	4,472	9,500	1,790	363	9,500	250

	GWh/d	NO	RU	DZ	LY	LNG	AZ
Based on the Potential supply scenarios (*)	minimum	1,742	3,000	279	174	2,314	150
	yearly maximum	3,062	6,000	1,610	336	5,605	240
	max summer	3,062	6,000	1,610	336	5,605	240
	max winter	3,368	6,600	1,702	343	6,166	240
Daily maximum (historical) (**)	maximum 2 weks	4,160	8,200	1,702	343	7,600	240
	maximum peak	4,472	9,500	1,790	363	9,500	250

(*) The minimum potential scenario applies both to the yearly and the summer seasons. Winter maximum exceeds in 10% the yearly maximum to consider seasonal modulation.
(**) Daily maximums (peak day and over a 2 week peak) is derived from the historical maximum at source level: conservative approach.

Cost/Price of supply

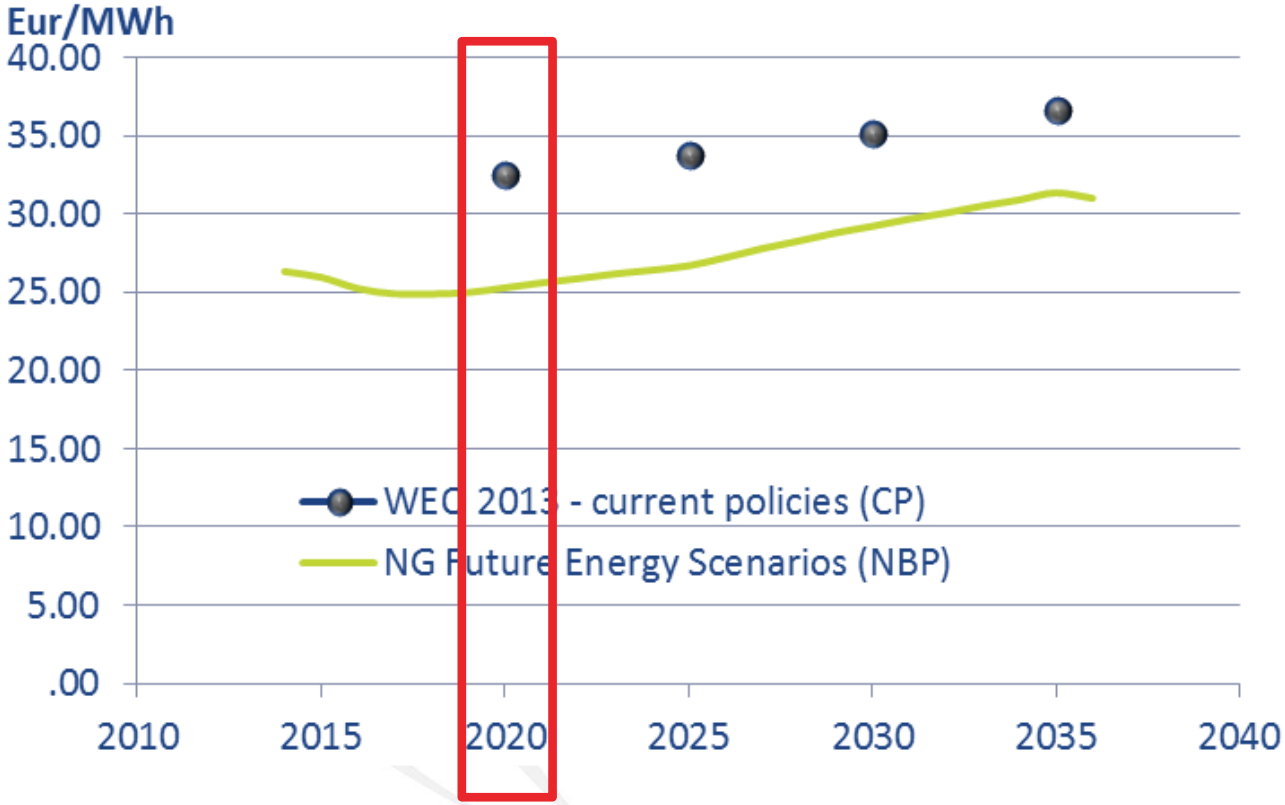
Average supply price for Europe



The definition of the price/volume curves is done in parallel for the two "GLOBAL" scenarios: GREEN and GREY

Cost/Price of supply

Average supply price for Europe



Example: Price/volume treatment for the potential supply scenarios in 2020 – GREEN scenario

Volume/price curves

Reference case

- Under the reference case the average price/cost of all the sources corresponds to the average supply price/cost for Europe.
- The price/volume curves are defined as follows:
- Minimum point:
  - Minimum volume: Min (Minimum potential supply scenario; 60% Intermediate)
  - Minimum price/cost: 90% of the average price for Europe
- 2nd point of the slope:
  - Volume: Maximum winter volume (110% maximum potential scenario)
  - Price: 110% of the average price for Europe
- The maximum price per source will depend on the spread between the maximum peak supply and the maximum winter volume. (different spread, same slope)

The slope of the curves is the same for the two global scenarios.

Volume/price curves

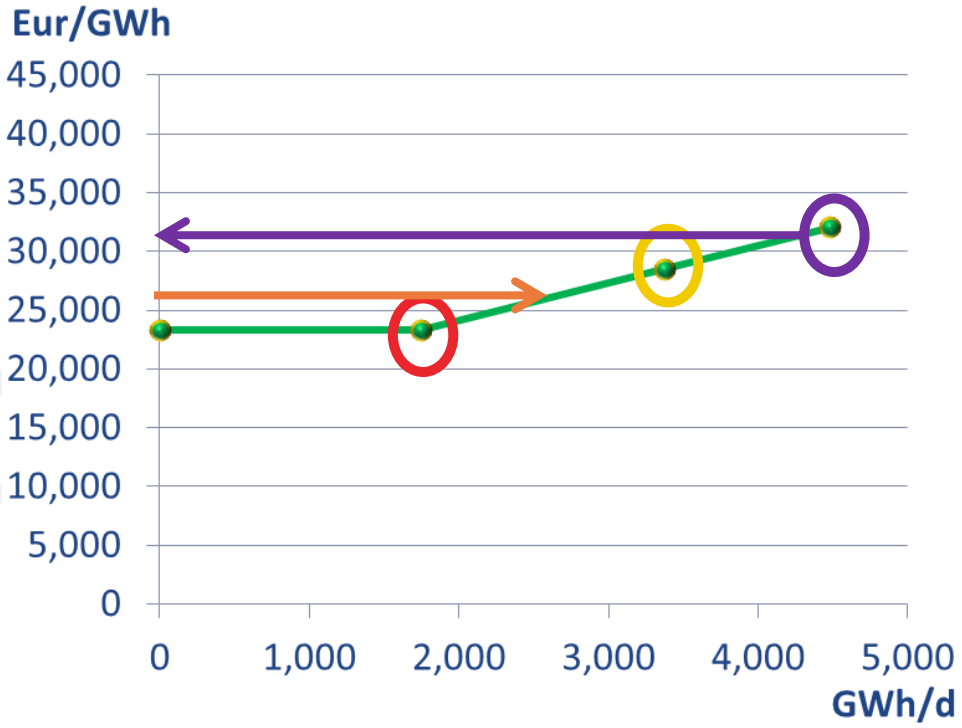
Reference case

	GWh/d
minimum potential scenario	2,745
intermediate	2,904
maximum potential scenario	3,062

	Eur/MWh
Average price	25,900

Reference	GWh/d
minimum	1,742
yearly maximum	3,062
max summer	3,062
max winter	3,368
maximum 2 weks	4,160
maximum peak	4,472

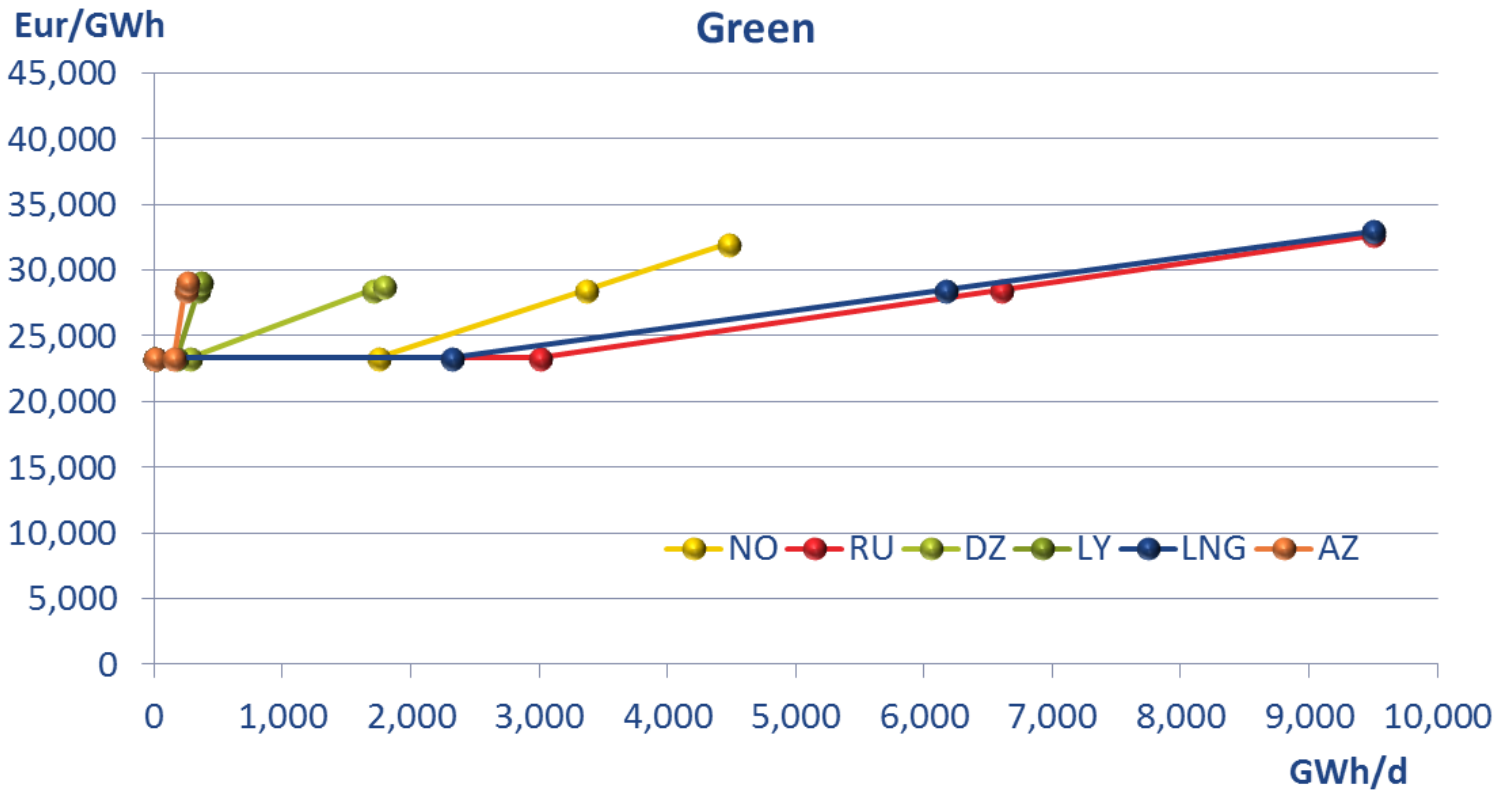
	Eur/MWh
90%* Average price	23,310
110%* Average price	28,490



The maximum price that one source will be allowed to reach will depend on the maximum flow defined for each specific modelling case.

Volume/price curves

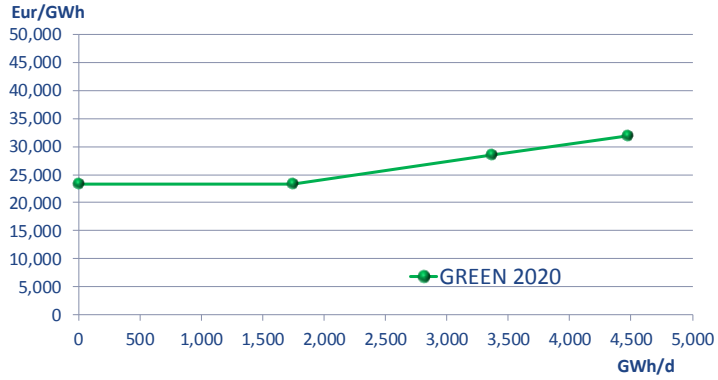
Reference case

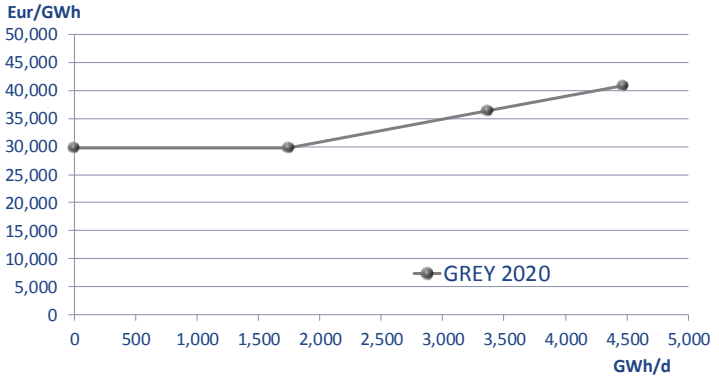


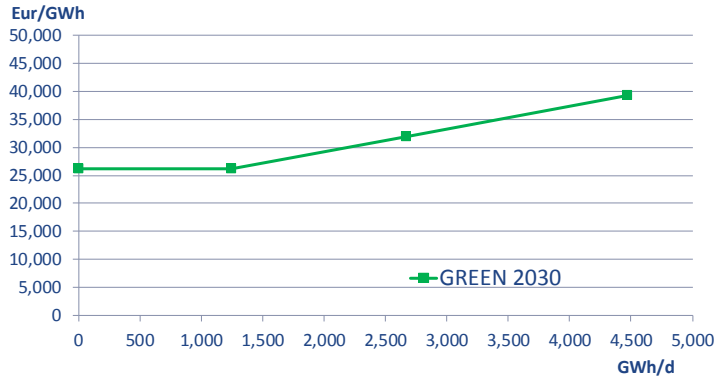
Each source has its own specific slope depending on its minimum, intermediate and maximum scenario. The common point for all of them in the maximum winter price (110% of the maximum supply scenario). The maximum price for each of them will depend on the spread between the maximum winter volume and the peak day supply.

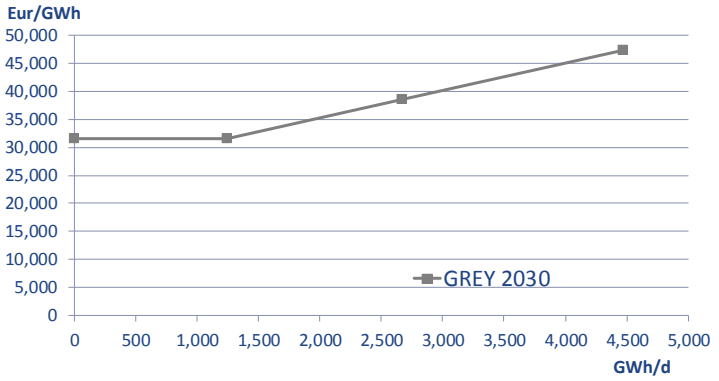
Volume/price curves

Comparison of the reference case for the same source under different year and scenario







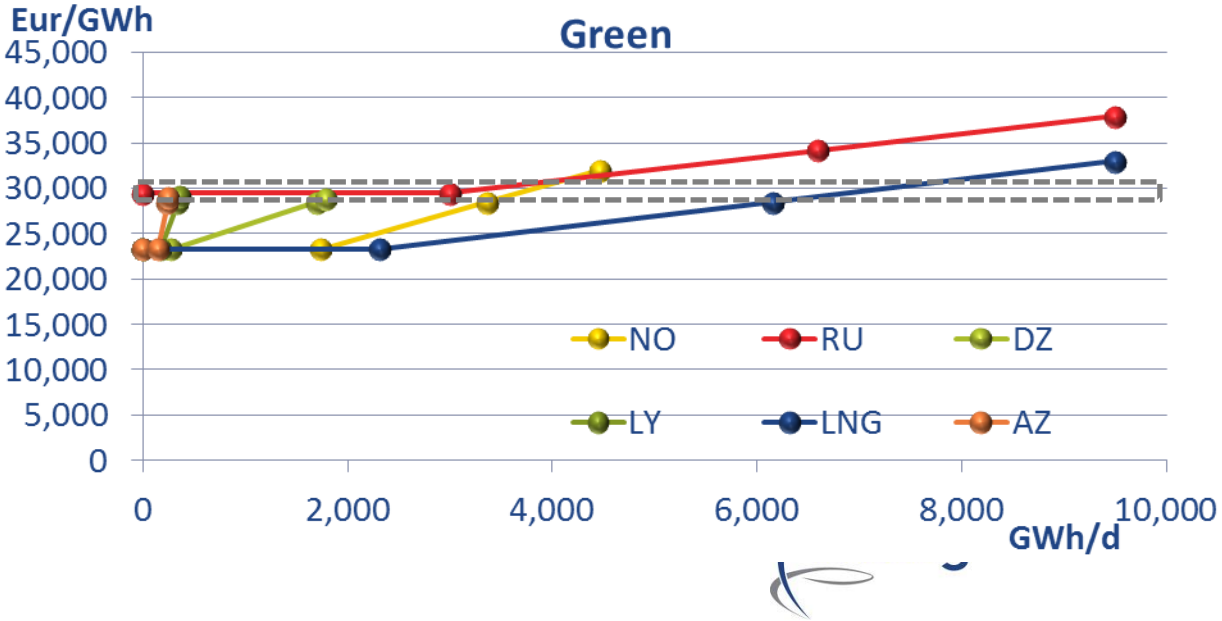


The slope of the curve will be the same for the two GLOBAL scenarios in one year, this slope will change along the time horizon according to the lines defined by the maximum, intermediate and minimum potential supply scenarios.

Volume/price curves

Source being more expensive than the average

- The minimum price of the expensive source should be higher than the highest price of the other sources. That applies to the winter maximum, as the minimization/maximization of sources is done for the yearly assessment – seasonal averages.
- The difference between the minimum price of the most expensive and the maximum price of the other should be at least equal to the cost assigned by the model to UGS (injection+ withdraw) preventing the use of UGS is replaced by the extra use of the expensive source in winter.

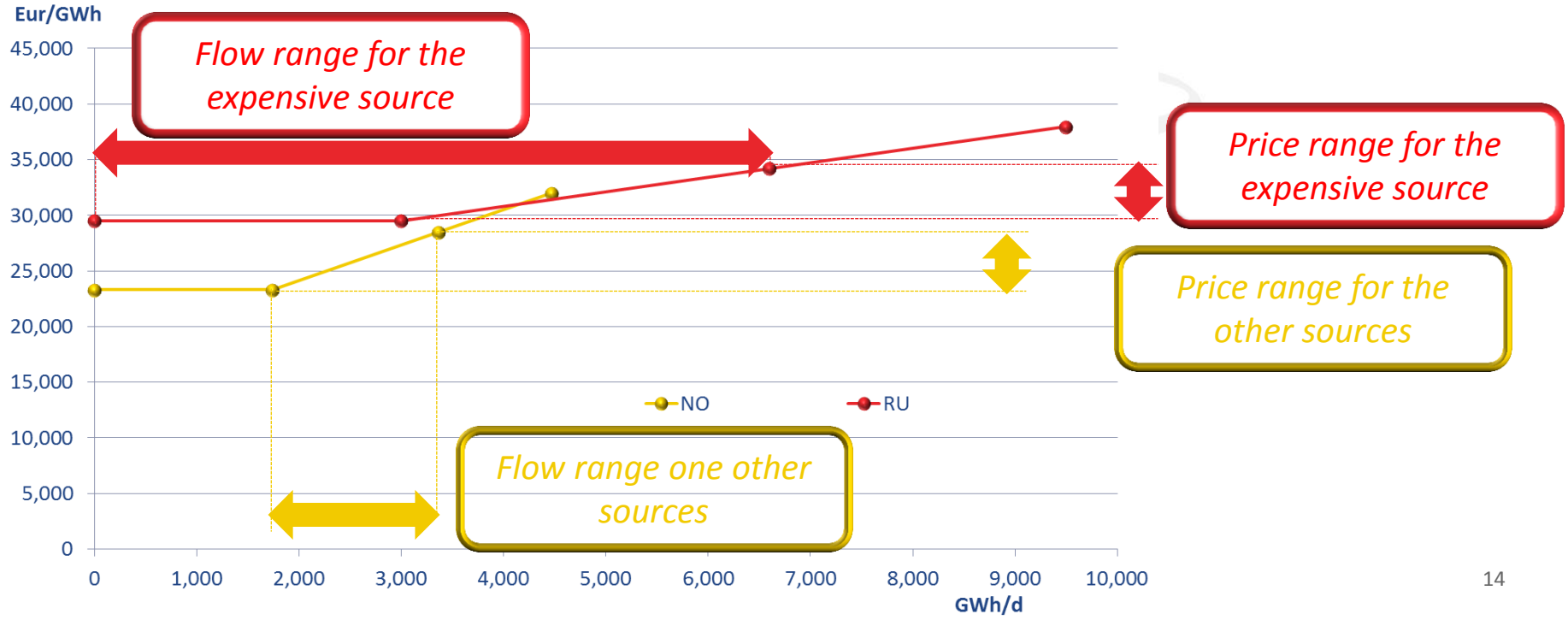


The minimum price of the expensive source will be higher than the price at winter maximum for the other sources.

Volume/price curves

Source being more expensive than the average

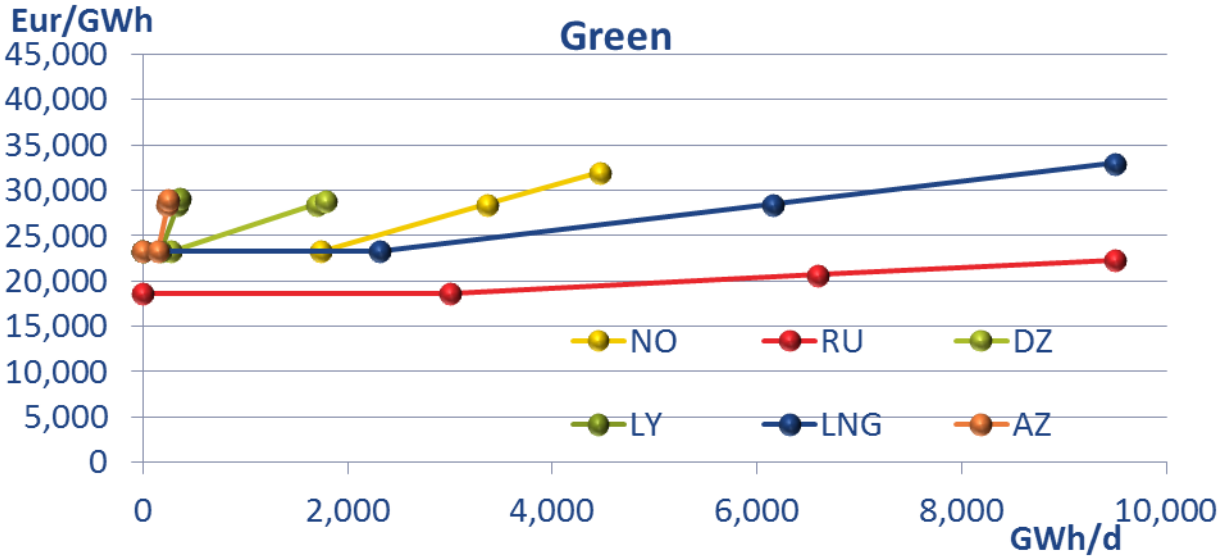
- The price difference between the minimum for the expensive source and the maximum for the other sources is equal to the cost of use of UGS + 1
- Depending on the spread between the daily maximum and the winter maximum, the prices for the other sources may reach higher prices than the minimum of the expensive. Nevertheless, in the maximization/minimization cases such levels will not be reached due to flow constraints.



Volume/price curves

Source being cheaper than the average

- For the source being cheaper than the others, the highest price of the cheap source should be lower than the minimum price of the other sources. That applies to the winter maximum, as the minimization/maximization of sources is done for the yearly assessment – seasonal averages.
- In order to keep consistency between the maximization and minimization results, a difference of UGS cost +1 is set as the difference between them.



The maximum price of the cheap source will be lower than the minimum price for the other sources.

The slope of the curve of the cheaper source is softer than the slope of the other sources. That is due to the subtraction of the UGS cost, reducing the range of prices for the cheapest source.

Volume/price curves

Curve comparison