

ELECTRICITY, NATURAL GAS AND CO₂ MARKETS OBSERVATORY

3rd Quarter of 2017

Wholesale electricity, natural gas and CO₂ markets

INTRODUCTION

The wholesale markets observatory aims to provide general monitoring indicators of electricity, natural gas and CO₂ markets in France.

This observatory is updated on a quarterly basis and published on CRE's website (www.cre.fr). A French version is also available.

The first part of the report summarises the highlights of the quarter. The indicators (main dates, key Graphs and graphs) are detailed in the second part.

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QUARTERLY HIGHLIGHTS

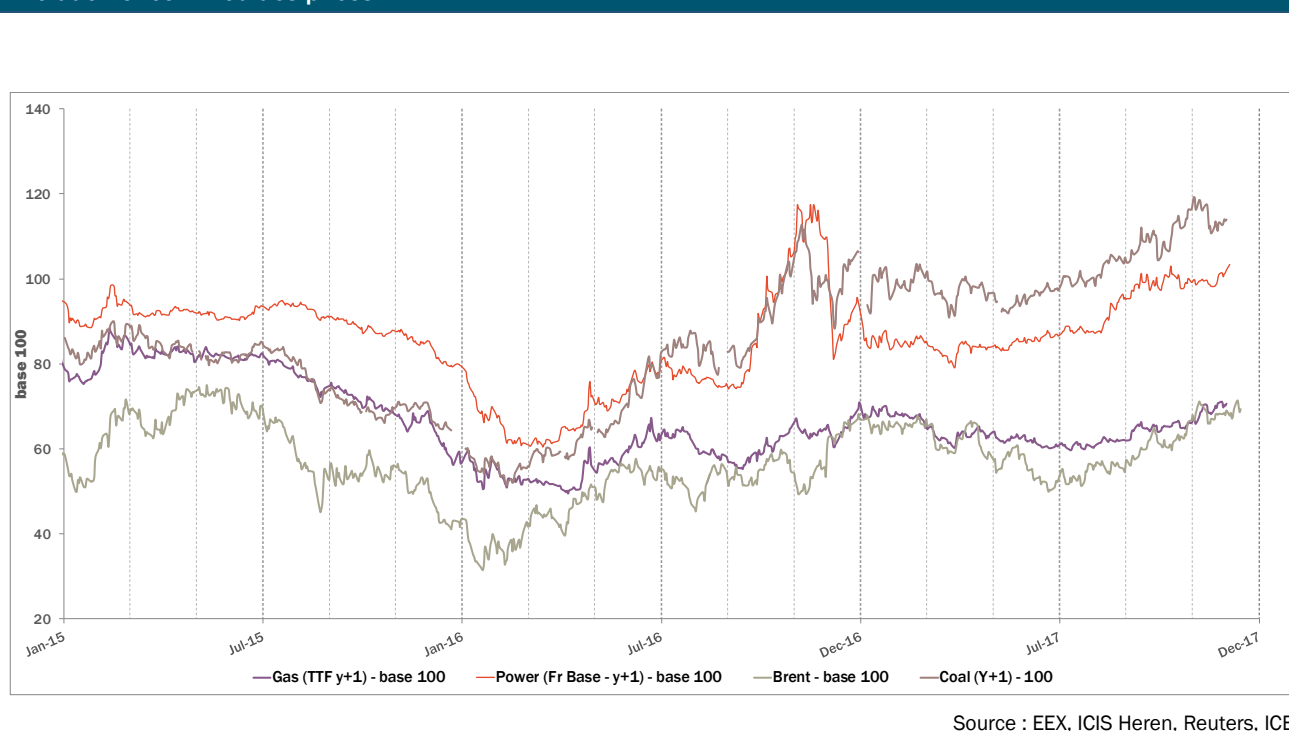
An upward trend of commodity prices

Oil prices reached 44€/bbl on average during the third quarter of 2017 but remained steady compared to the previous quarter. Contrary to the previous quarter with a downward price trend, prices followed an upward trend during the third quarter of 2017. Prices rose from 43.2€/bbl at the beginning of July to 48.3 €/bbl at the end of September. This could be driven by the expectations of renewed supply cuts from OPEP countries, the decrease of US crude oil stocks and forecasts of higher global demand for 2017 and 2018.

Coal prices settled on average at 65.5 €/t during the third quarter of 2017 up by +7.7% compared to the previous quarter and by 15.2% compared to the third quarter of 2016. This rise is notably due to a decline in China coal production and expectations of a growing demand from the power sector.

Following the downward trend observed during the second quarter of 2017, the CO₂ price surged from € 4.8/tCO₂ during the previous quarter to € 5.9/tCO₂, increasing by 23% (and by 30% compared to the third quarter of 2016). This was mainly due to statements on a possible reform of the ETS. Traded volumes reached 1 388 Mt during the quarter, increasing by 18% compared to the second quarter of 2017 and by 17% compared to the same quarter of 2016.

Evolution of commodities prices



A general increase of electricity prices

French power consumption remained steady during the third quarter of 2017 and stood at around 98.9 TWh (Graph 14) while it was at 98.4 TWh during the same quarter of 2016 (+0,5%). Recorded temperatures were close to the seasonal norm, with a difference of -0.6 °C, about the same as the year before. Nuclear availability, which was at its lowest level from historical range of 2011 – 2015, improved during the quarter with the average rate of availability being at 65.1%, up by 1.9 points (Graph 15). In this context, electricity produced by nuclear plants surged by 5% to reach 86.1 TWh. However, because of low rainfall during the quarter, hydro stocks fell by 8.5% compared to the same quarter in 2016. The decrease even exceeded 10% in August. As a consequence, hydraulic generation went down by 16.5% to reach 10.5 TWh. In contrast, wind generation soared by 44.5% to reach 4.6 TWh. Fossil fuel electricity output rose by 1.9% but this rebound was essentially due to higher coal generation (Graph 16) which reached 1.7 TWh, an increase of 50.9%, whilst electricity from gas-fired power plants fell by 8.2% and was around 5.6 TWh (Graph 17).

Cross-border imports and exports were higher during the quarter and rose by 4% (+ 20.9% compared to the third quarter of 2016). As a result, the French export balance settled at 13 TWh, up by 33% compared to the same period in 2016. This increase was in particular fueled by a better nuclear availability during the quarter.

Spot prices rose to 34.51 €/MWh during the third quarter of 2017, an increase of 2% compared to the previous quarter and of 6.9% compared to the third quarter in 2016. Generally speaking, spot prices were higher in all countries of the Central West Europe (CWE) zone. German spot prices went up to 32.72 €/MWh in the third quarter of 2017 from 28.27 €/MWh in the same period of 2016, an increase of 15.7% (Graph 10). The main driver of this increase of spot prices in France and Germany was higher coal and gas prices against the background of higher fossil-fuel electricity generation.

On future markets, the French Calendar Baseload 2018 was traded at around 39.1€/MWh on average, ie a 9% rise compared to the previous quarter of 2017. Its German equivalent reached 33.1 €/MWh, up by 9.9% compared to the second quarter of 2017. French monthly products (M+1) prices climbed by 13.2% to 37.8 €/MWh compared to the third quarter of 2016. This general increase of prices on future markets was also observed for the quarterly products (Q+1) where prices reached 47.5 €/MWh, versus an average of 39.2 €/MWh during the same period the year before (up by 21.2%) (Table 2).

Besides the influence of coal and natural gas prices, French forward electricity products were influenced by several press releases from ASN relating to EDF's nuclear power plants. In July, ASN launched a public consultation on the proposed decision related to anomalies in the steel alloy of the reactor vessel of Flamanville. In August, EDF was asked to provide a complete assessment of all manufacturing requirements of components installed on nuclear power plants and manufactured at the Creusot Forge plant. During September, French Belleville nuclear power plant was placed under strong supervision for safety reasons. ASN also stated that more than 600 discrepancies were spotted on documents already provided by EDF in the framework of analysis performed on components manufactured at the Creusot Forge plant. Finally, at the end of September, ASN ordered the temporary closure of Tricastin nuclear power plants because of safety reasons in case of earthquake.

Under these circumstances, CRE is particularly attentive to the conditions of this price evolution and especially to compliance with the transparency obligations imposed by REMIT. As pointed out in its surveillance report published in October 2017, the unusual market episodes are specifically analyzed as part of wholesale market monitoring.

Regarding traded volumes of futures market in the third quarter of 2017, traded quarterly product volumes plunged by 22% compared to the same period the year before and by 29% compared to the previous quarter. Traded volumes of monthly products (M+1) increased by 23% compared to the previous year and declined by 3% compared to previous quarter. Finally for yearly contracts (Y+1), there is a rise of 7% of traded volumes compared to the third quarter of 2016 and a surge of 54% compared to the second quarter of 2017 (Table 3). This increase may be explained by the calendar product prices volatility since July.

Low gas injections into storages and substantial LNG supply

During third quarter of 2017, gas consumption was similar to the previous year at the same period (62 TWh i.e. up by 3%). The slight increase was due to the 3 TWh rise of consumers connected to the distribution network. In line with the second quarter of 2017, exports were high – reaching 34 TWh (up by 19 TWh i.e. up by 125% as compared to third quarter of 2016) – especially towards Spain, related to an increase of gas power plants production compensating low levels of hydro storages. Higher exports were allowed on the one hand by increasing imports (+ 9TWh i.e. +7%) mainly due to LNG imports (+44%), and on the other hand by decreasing injections into storages (- 10 TWh i.e. -18 %).

Against this background, PEG Nord day-ahead prices settled at 15.99 €/MWh. This slight increase as compared to Q2 2017 (+3%) is similar to the European trend. This is to be linked with higher storage injections as compared to the second quarter of 2017, and to a rise in gas power plant production especially in Spain. This was however limited by high LNG imports.

TRS day-ahead prices settled at 16.24 €/MWh, close to PEG Nord prices. This reveals both an optimal use of the North-South link and high LNG imports at Fos. The average PEG Nord / TRS spread was 0.25 €/MWh. However during Fos LNG terminal maintenance in July and North-South link maintenance in September, the spread went up to 1.30 €/MWh.

Higher calendar prices in September (+0.70 €/MWh within several days) should be seen in a broader context of commodities increase during this month.

INDICATORS

PART 1: **WHOLESALE ELECTRICITY MARKET**

1. MAIN DATES

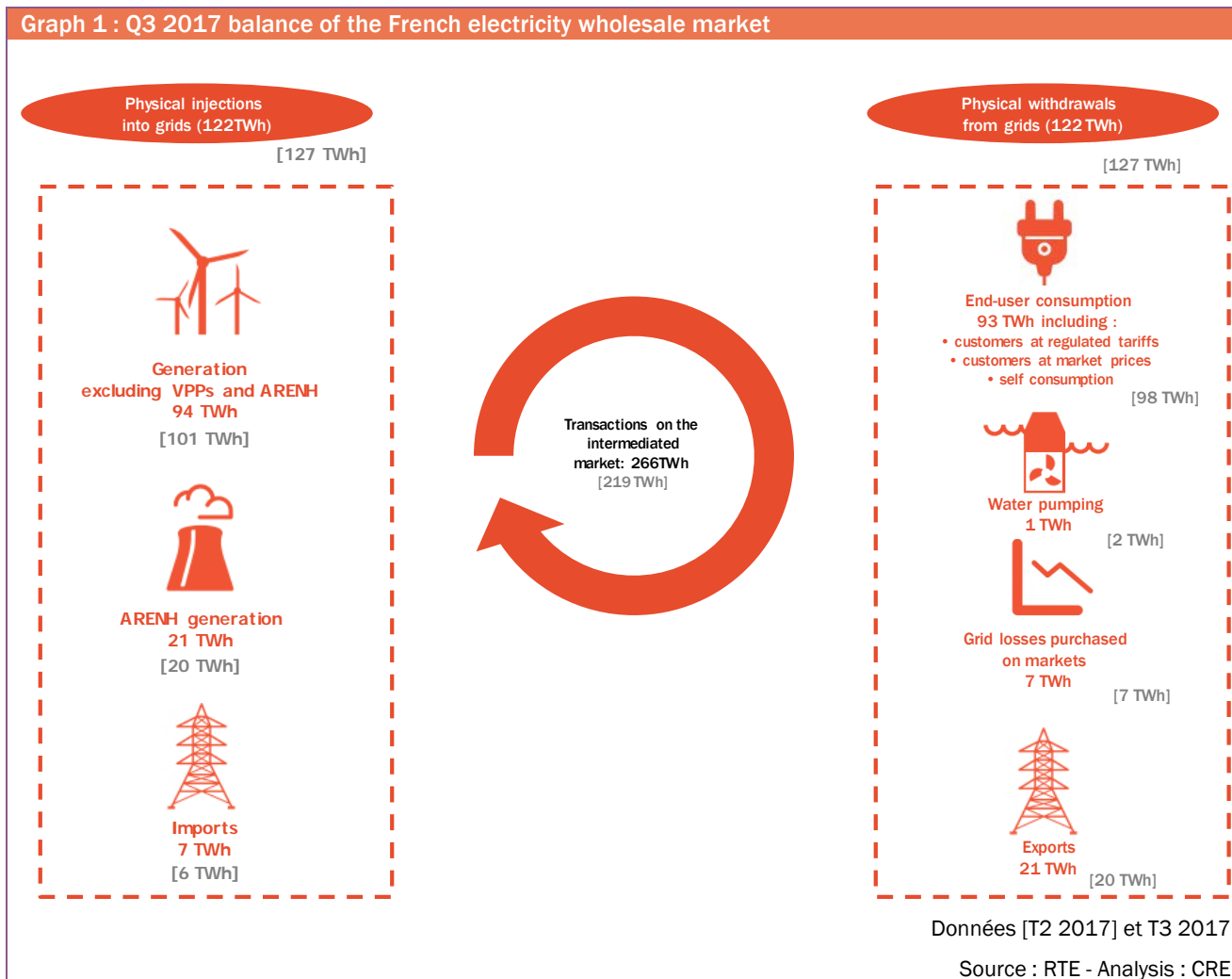
November 2000	CRE validated the initial version of the Balancing Responsible Entity (BR) contract
Early 2001	First purchases of losses on the market by RTE
May 2001	First OTC quotations published regarding the French electricity market
September 2001	First virtual power plant auctions set up by EDF (VPP)
November 2001	Launch of the Powernext Day-ahead market
June 2004	Launch of the Powernext Futures market
July 2004	First purchases of losses on the market by the distribution system operator (ERDF)
January 2006	Implementation of explicit capacity auctions on interconnections (except for Switzerland)
November 2006	Launch of the market coupling between France, Belgium and the Netherlands
July 2007	Launch of Powernext Intraday and Continuous markets
April 2009	Merger of Powernext and EEX markets - launch of EPEX SPOT and EPD for futures contracts
November 2010	Day-ahead market coupling with France, Belgium, Netherlands, Luxembourg and Germany
December 2010	Start of the intraday market coupling between Germany and France
July 2011	First ARENH subscription
November 2011	Futures products traded on EPD France become cash-settled
November 2011	End of VPP auctions ¹
January 2012	Beginning of explicit auctions for long-term cross-border transmission capacity allocations between France and Switzerland
January 2012	Beginning of explicit intraday cross-border transmission capacity allocations between France and Switzerland.
June 2012	Beginning of explicit intraday cross-border transmission capacity allocations between France and Italy
June 2013	Launch of the Swiss intraday market, and intraday market coupling with Germany and France
February 2014	Coupling of the NWE zone
April 2014	Coupling of the SWE zone
May 2014	Coupling of NWE and SWE zones
September 2014	New EEX transparency platform (www.eex-transparency.com)
December 2014	New RTE transparency platform in order to comply with the transparency rules CE

¹ http://encherescapacites.edf.com/fichiers/fckeditor/File/Encheres/DecisionCE_Fin_VPP_301111.pdf

	543/2013
February 2015	Extension of market coupling to France-Spain border and Austria-Slovenia border
May 2015	Flow-based methodology for CWE market coupling successfully launched
December 2015	Transition to half-hourly products in the intraday market for the France-Switzerland and France-Germany interconnections
March 2016	Transition to explicit continuous capacity allocations for France-Belgium in the intraday market
October 2016	Intraday market coupling of Belgium and the Netherlands. The France-Belgium interconnection capacity is only implicitly available.
December 2016	Launch of the first auction of capacity guarantee
March 2017	Launch of 30 minutes products on Intraday market in France, Germany and Switzerland

2. BALANCE OF THE WHOLESALE ELECTRICITY MARKET

Graph 1 : Q3 2017 balance of the French electricity wholesale market



3. KEY DATA

Table 1 : Physical flows on the wholesale electricity market

	Quarterly values					Quarterly variation		Yearly variation		
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q3 2017 / Q2 2017	In percentage	In values	In percentage	In values
Injections, in TWh										
Production (excluding ARENH and VPP), in TWh	111	137	135	101	94	-7%	-6,79	-15%	-16,85	
ARENH, in TWh	0	0	20	20	21	1%	0,22	-	20,68	
Imports, in TWh	7,2	12,1	9,6	6,9	7,4	8%	0,58	3%	0,24	
Withdrawals, in TWh										
Consumption, in TWh	93	124	133	98	93	-5%	-4,88	0%	0,43	
Water pumping, in TWh	1,5	1,7	1,9	1,8	1,5	-18%	-0,31	-1%	-0,02	
Exports, in TWh	18	14	19	22	21	-2%	-0,47	20%	3,54	
Grid losses, in TWh	6,5	9,7	10,9	7,0	6,7	-5%	-0,32	2%	0,13	

Source : RTE – Analysis : CRE

Table 2 : Wholesale electricity market prices during the quarter

	Quarterly values					Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	In percentage	In values	In percentage	In values
Spot Market prices									
Intraday Price France, in €/MWh	32,8	59,1	54,0	33,9	34,6	2%	0,72	6%	1,81
Day-Ahead Base Price France, in €/MWh	32,3	59,7	55,0	33,9	34,5	2%	0,61	7%	2,24
Day-Ahead Peak Price France, in €/MWh	38,8	76,7	65,6	38,7	40,3	4%	1,59	4%	1,46
Spread Base Day-Ahead France-Germany, in €/MWh	4,0	22,1	13,7	4,1	1,8	-56%	-2,33	-55%	-2,21
Spread Peak Day-Ahead France-Germany, in €/MWh	6,5	29,3	12,5	5,1	2,6	-49%	-2,48	-60%	-3,90
France-Germany Day-Ahead prices convergence rate	43%	8%	25%	46%	62%	35%	0,16	44%	0,19
Futures Market Prices									
M+1 Price France, in €/MWh	33,4	77,6	46,0	33,8	37,8	12%	3,96	13%	4,42
Spread M+1 France-Germany, in €/MWh	4,7	37,9	9,9	2,0	3,3	64%	1,31	-30%	-1,40
Q+1 Price France, in €/MWh	39,2	69,0	33,0	34,2	47,5	39%	13,28	21%	8,30
Spread Q+1 France-Germany, in €/MWh	9,0	31,7	1,9	1,9	10,5	450%	8,55	16%	1,46
Y+1 Price France, in €/MWh	32,9	42,7	35,6	35,9	39,1	9%	3,21	19%	6,20
Spread Y+1 France-Germany, in €/MWh	6,0	11,0	5,8	5,8	6,1	4%	0,25	0%	0,01
Ratios Y+1 Peakload/Baseload ratios									
France	130%	142%	134%	130%	129%	-1%	-0,01	0%	-0,01
Germany	126%	126%	127%	126%	124%	-2%	-0,02	-1%	-0,02

Source : EPEX SPOT, EEX Power Derivatives, Courtiers – Analysis : CRE

Table 3 : Traded volumes during the quarter

	Quarterly values					Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	In percentage	In values	In percentage	In values
NEB									
NEB volumes, in TWh	126,95	133,23	106,57	94,95	98,94	4%	3,99	-22%	-28,01
Ratio NEB/Consumption in France	137%	108%	80%	97%	106%	-	0,09	-	-0,31
Spot Market, in TWh									
Volumes on EPEX SPOT Intraday market, in TWh	1,4	1,6	1,5	1,5	1,6	8%	0,12	15%	0,21
Fr-De Cross-Border Intraday volumes market shares	58%	63%	66%	75%	80%	7%	0,05	38%	0,22
Volumes on EPEX SPOT Day-Ahead market, in TWh	26,4	26,3	25,2	27,9	28,0	0%	0,09	6%	1,55
Volumes on Brokers Day-Ahead market, in TWh	6,1	6,0	6,4	6,0	4,9	-17%	-1,03	-20%	-1,22
Futures Market									
Volumes, in TWh	225,8	426,3	148,8	184,1	232,0	26%	47,9	3%	6,20
Brokers market share	84,0%	85,8%	84,2%	87,7%	98,1%	-	10,4%	-	14,1%
EEX Power Derivatives market share	16,0%	14,2%	15,8%	12,3%	1,9%	-	-10,4%	-	-14,1%
Number of Transactions	18 184	34 452	17 664	17 287	17 780	3%	493	-2%	- 404
Brokers market share	85,6%	83,6%	79,7%	86,0%	98,0%	-	12,0%	-	12,3%
EEX Power Derivatives market share	14,4%	16,4%	20,3%	14,0%	2,0%	-	-12,0%	-	-12,3%
Y+1 product									
Volumes, in TWh	79,6	162,6	32,9	55,2	85,0	54%	29,75	7%	5,37
Number of Transactions	1970	3704	991	1483	2041	38%	558	4%	71
Q+1 product									
Volumes, in TWh	29,9	49,6	24,1	33,1	23,3	-29%	-9,73	-22%	-6,52
Number of Transactions	2190	4190	1942	2461	1838	-25%	-623	-16%	-352
M+1 product									
Volumes, in TWh	23,0	39,4	26,0	29,0	28,2	-3%	-0,79	23%	5,27
Number of Transactions	3643	7493	4857	5161	4226	-18%	-935	16%	583

Source : RTE – Analysis : CRE

Table 4 : Availability of electricity generating plants

	Quarterly values					Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	In percentage	Variation	In percentage	Variation
Nuclear power plants									
Average nuclear generation rate (%)	58,9	65,3	80,2	65,9	60,3	-5,6		1,4	
Availability rate of nuclear power plants (%)	63,2	70,1	82,1	69,2	65,1	-4,1		1,9	
Hydraulic storage capacity rate									
Hydro storage level (end of quarter) (%)	27,4	21,3	28,9	29,6	23,0	-6,6		-4,4	

Source : RTE- Analysis : CRE

Table 5 : Cross-border flows

	Quarterly values					Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	In percentage	Variation	In percentage	Variation
Imports (TWh)									
Peakload imports (TWh)	2,6	4,4	3,6	2,7	2,9	7,4%	0,2	11,5%	0,3
Offpeak imports (TWh)	4,6	7,7	6,0	4,2	4,6	9,5%	0,4	-0,2%	0,0
Exports (TWh)	17,0	12,9	18,3	21,0	20,5	-2,4%	-0,5	20,9%	3,5
Peak exports (TWh)	5,5	3,6	6,7	7,5	6,9	-8,0%	-0,6	25,0%	1,4
Offpeak exports (TWh)	11,4	9,3	11,6	13,5	13,6	0,7%	0,1	18,9%	2,2
Net balance (TWh)	9,8	0,8	8,7	14,1	13,0	-7,8%	-1,1	33,3%	3,3

Source : RTE- Analysis : CRE

Table 6 : French balancing responsible entities

	Quarterly values					Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	In percentage	Variation	In percentage	Variation
Balancing responsible									
Active in electricity generation	19	18	19	20	18	-10,0%	-2	-5,3%	-1
Holder of rights of regulated access to ARENH	0	0	18	18	16	0,0%	-2	0,0%	16
Final customers provider	29	30	31	30	28	-6,7%	-2	-3,4%	-1
Active on imports/exports	65	61	50	48	47	-2,1%	-1	-27,7%	-18
Active on block exchange	91	95	94	86	85	-1,2%	-1	-6,6%	-6

Source : RTE- Analysis : CRE

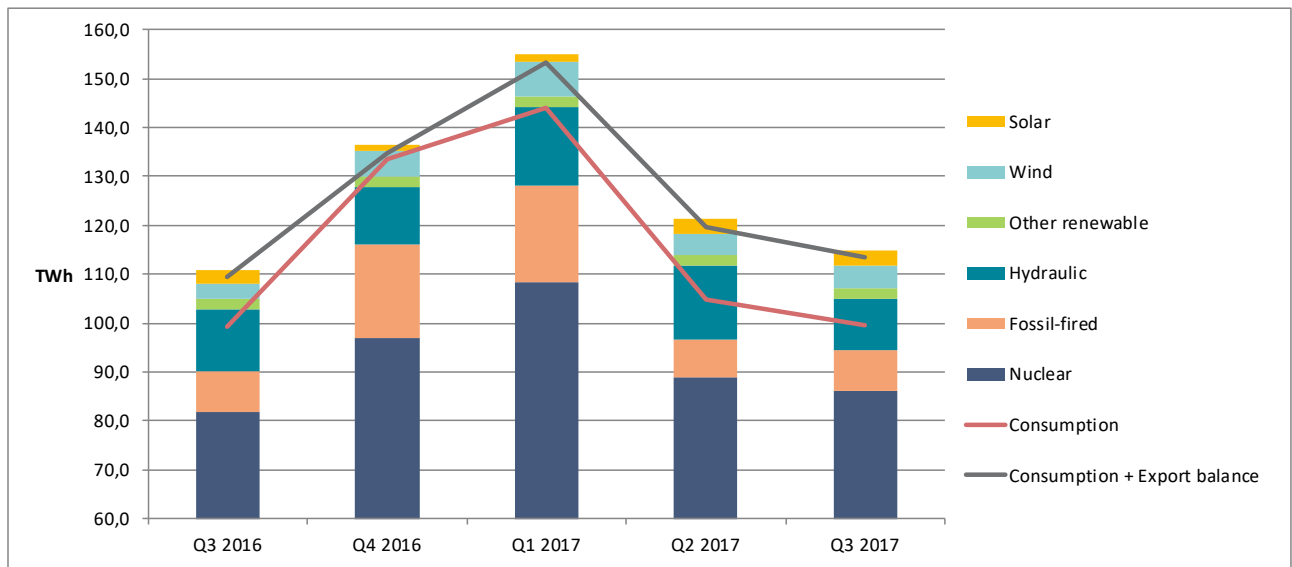
Table 7 : Index of market concentration

	HHI - Concentration indices					
	Q3 2016		Q2 2017		Q3 2017	
		EDF included		EDF included		EDF included
Wholesale energy market						
OTC - block purchases	511	1206	353	964	330	809
OTC - block sales	648	1120	576	754	537	756
EPEX - purchases	734	737	511	1138	712	1297
EPEX - sales	406	3867	408	2455	428	1668
Injections						
Generation	3331	7341	3859	7300	3990	7449
Imports	722	734	1747	1399	2200	1635
Deliveries						
End-consumer consumption	1704	4888	1755	4813	1738	4639
Grid losses	1626	1514	1476	1633	1562	1671
Exports	606	745	2135	1734	1756	1444

Source : RTE, EPEX SPOT, EEX Power Derivatives, Courtiers - Analysis : CRE

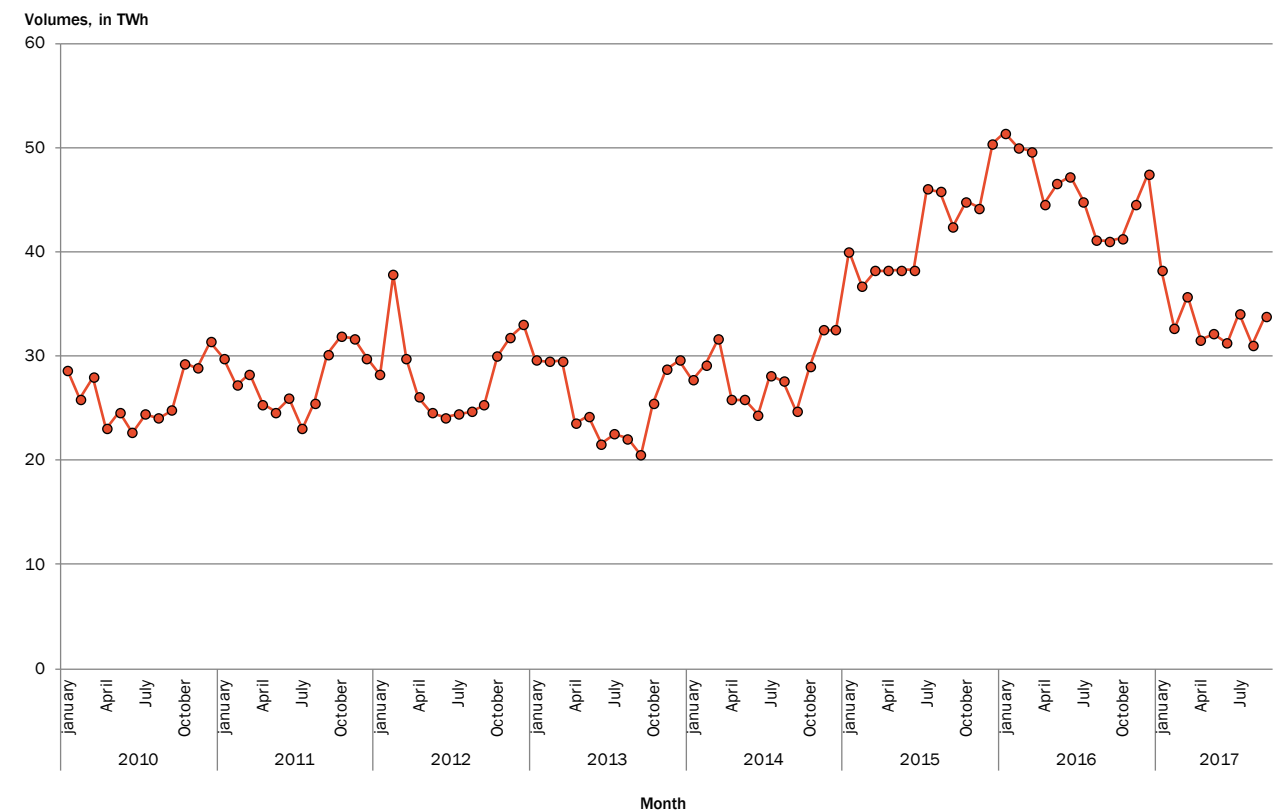
4. GRAPHS

Graph 2 : Generation per technology and quarterly consumption



Source : RTE – Analysis : CRE

Graph 3 : Volume of net deliveries resulting from OTC transactions (excluding ARENH)



Source : RTE – Analysis : CRE

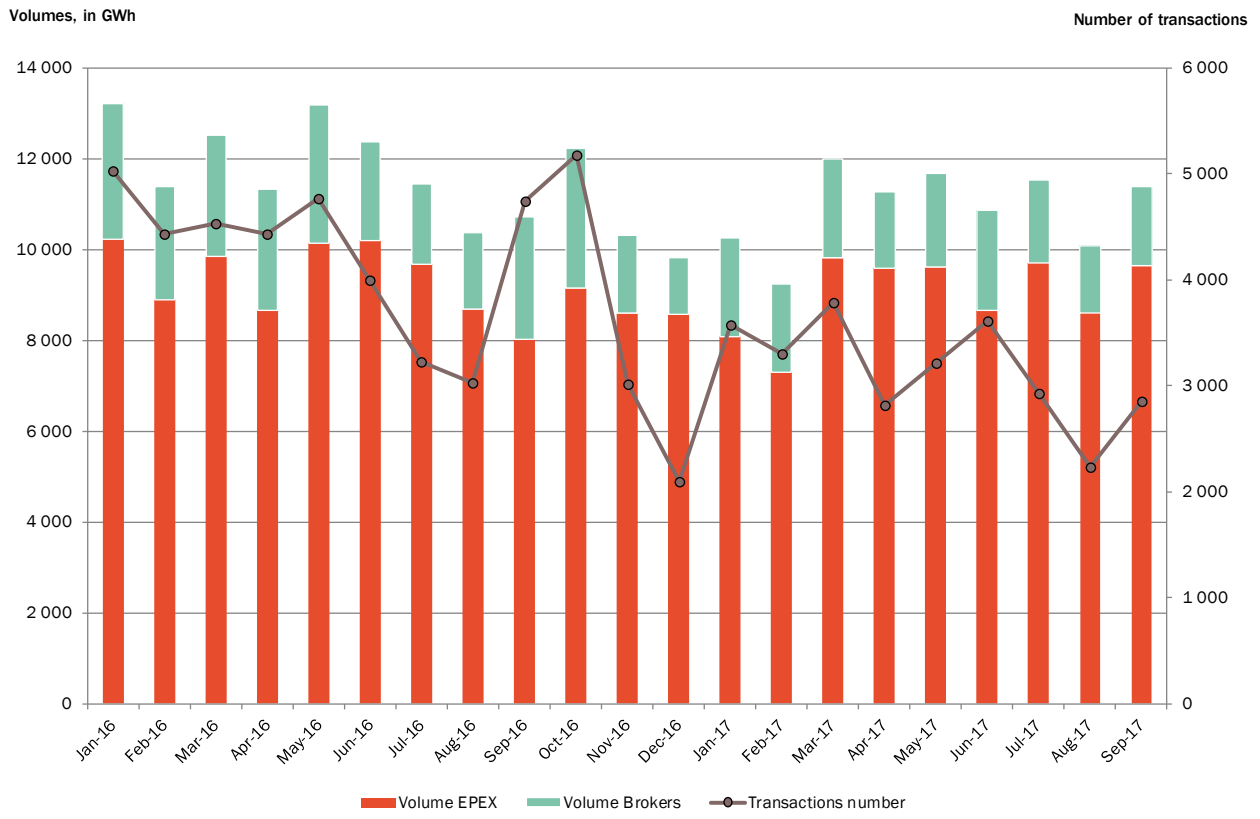
Graph 4 : Volumes and amount of intraday transactions on the EPEX SPOT exchange

// SUMS ON A MONTHLY BASIS //



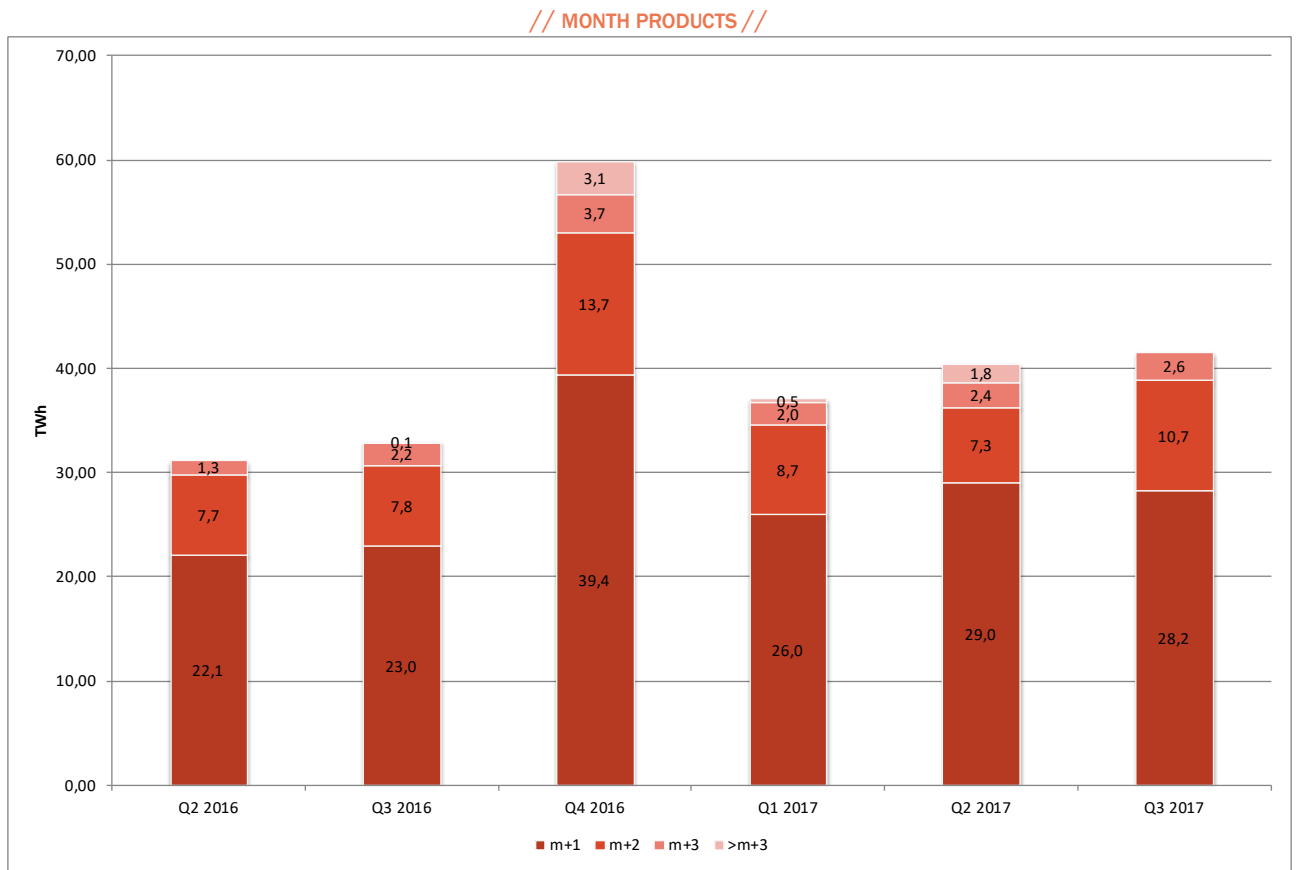
Source : EPEX SPOT, Courtiers - Analysis : CRE

Graph 5 : Volumes and amount of day-ahead transactions on the OTC intermediated market and the EPEX SPOT exchange



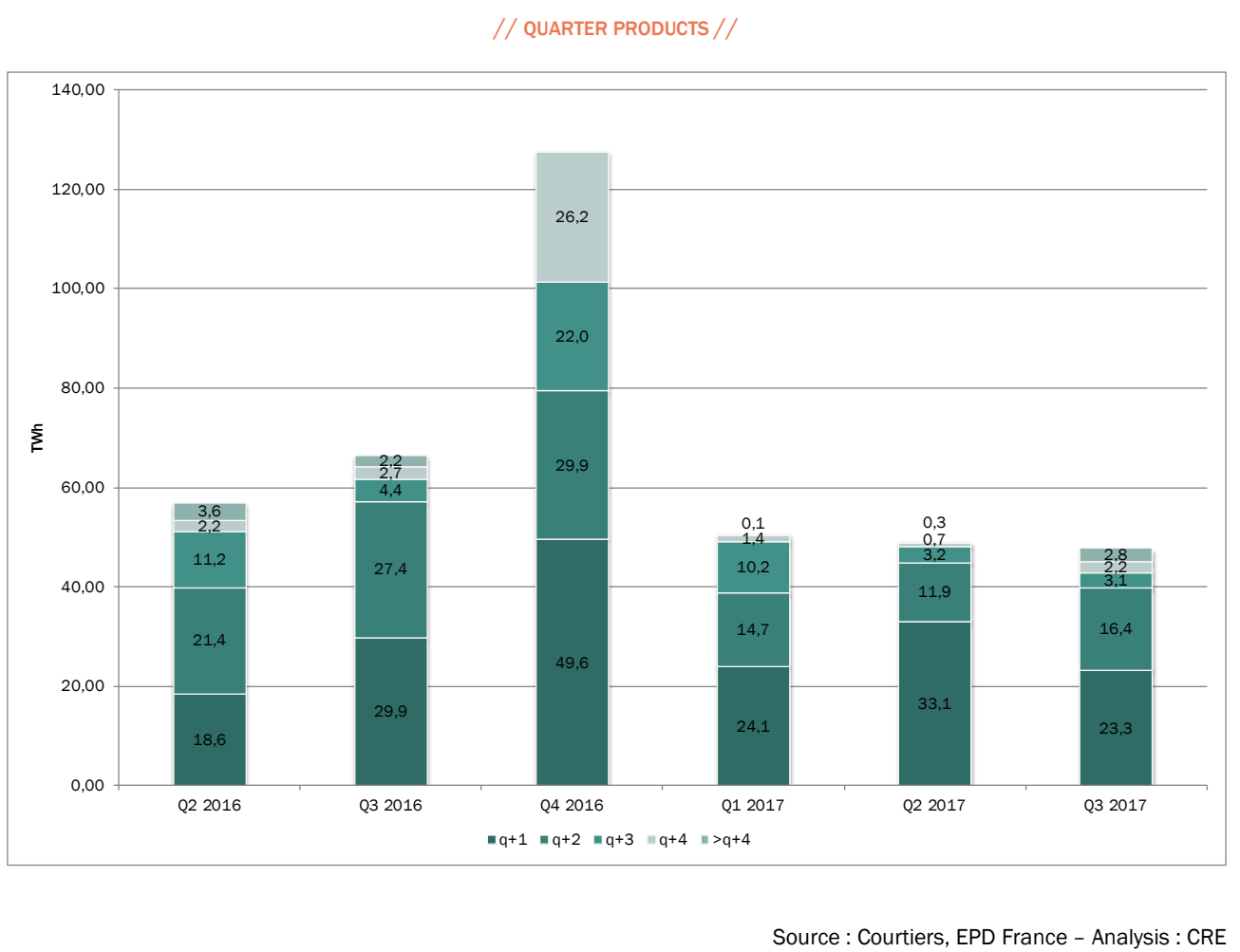
Source : EPEX SPOT, Courtiers – Analysis : CRE

Graph 6 : Quarterly traded volumes on the intermediated wholesale market



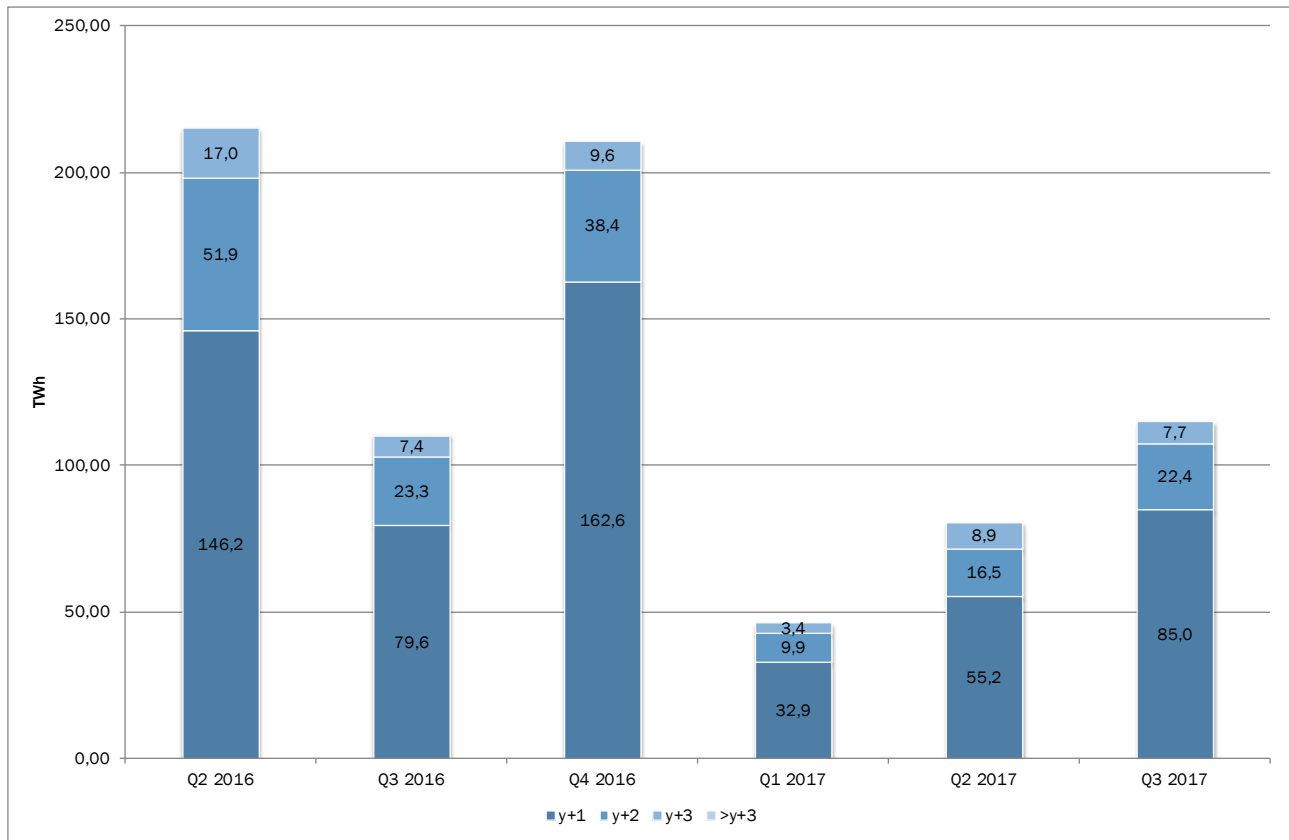
Source : Courtiers, EPD France – Analysis : CRE

Graph 7 : Quarterly traded volumes on the intermediated wholesale market



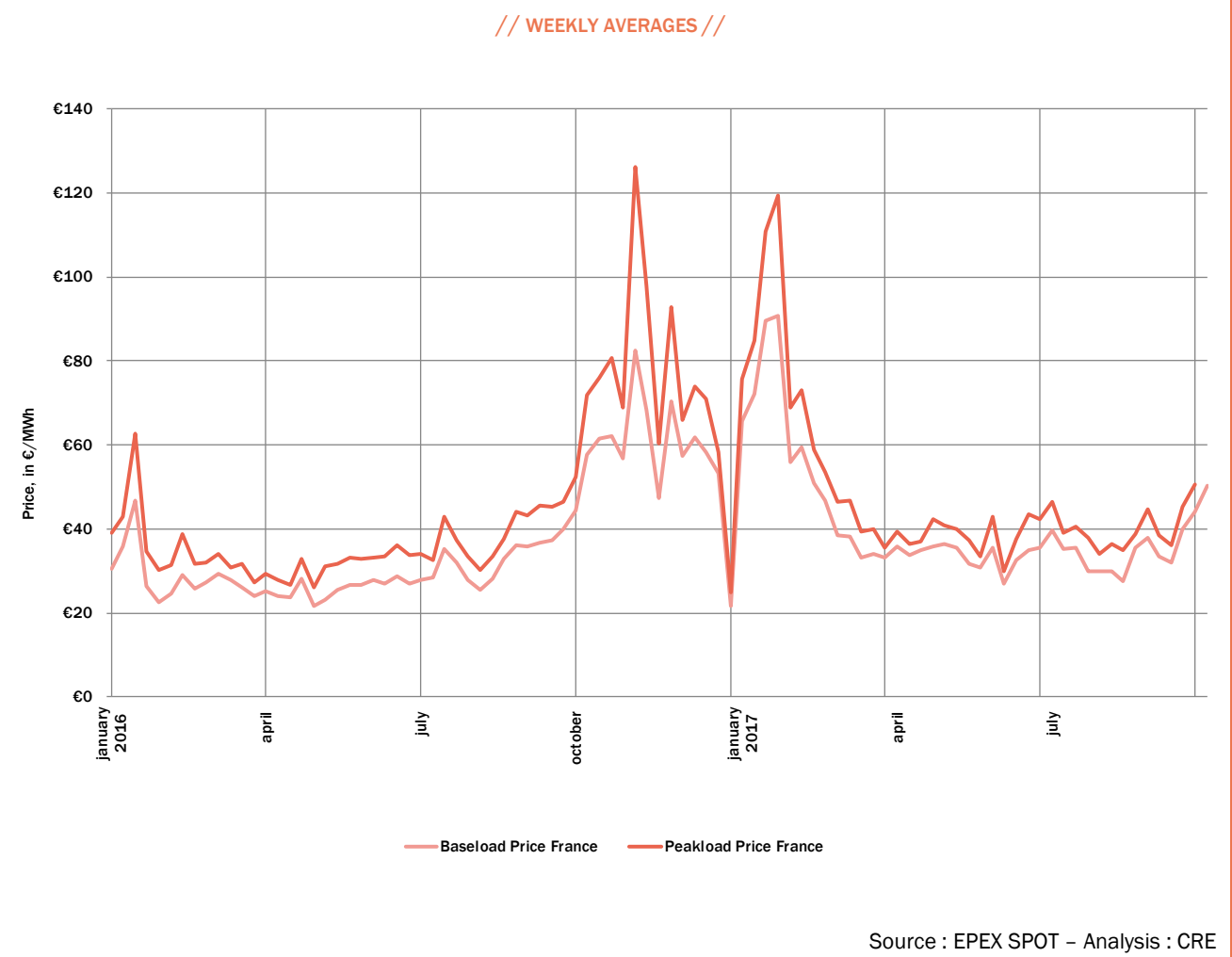
Graph 8 : Quarterly traded volumes on the intermediated wholesale market

// CALENDAR PRODUCTS //



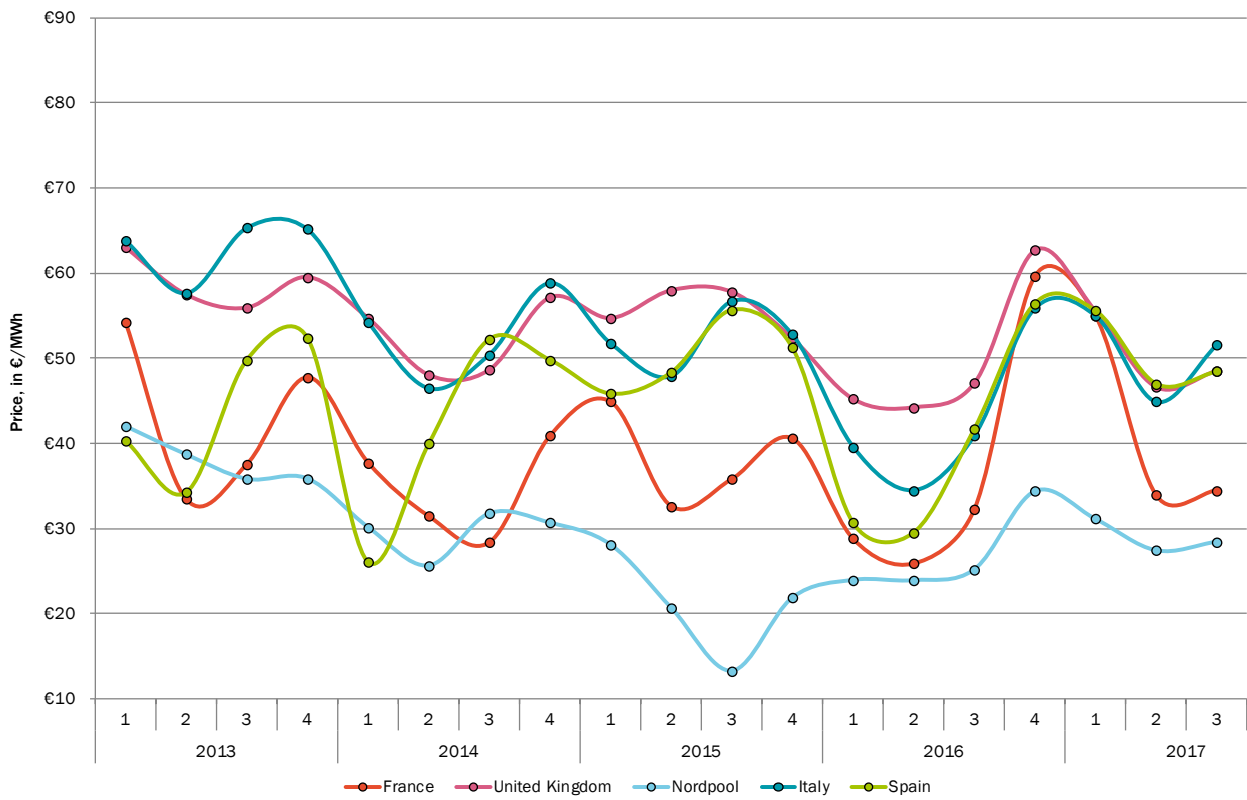
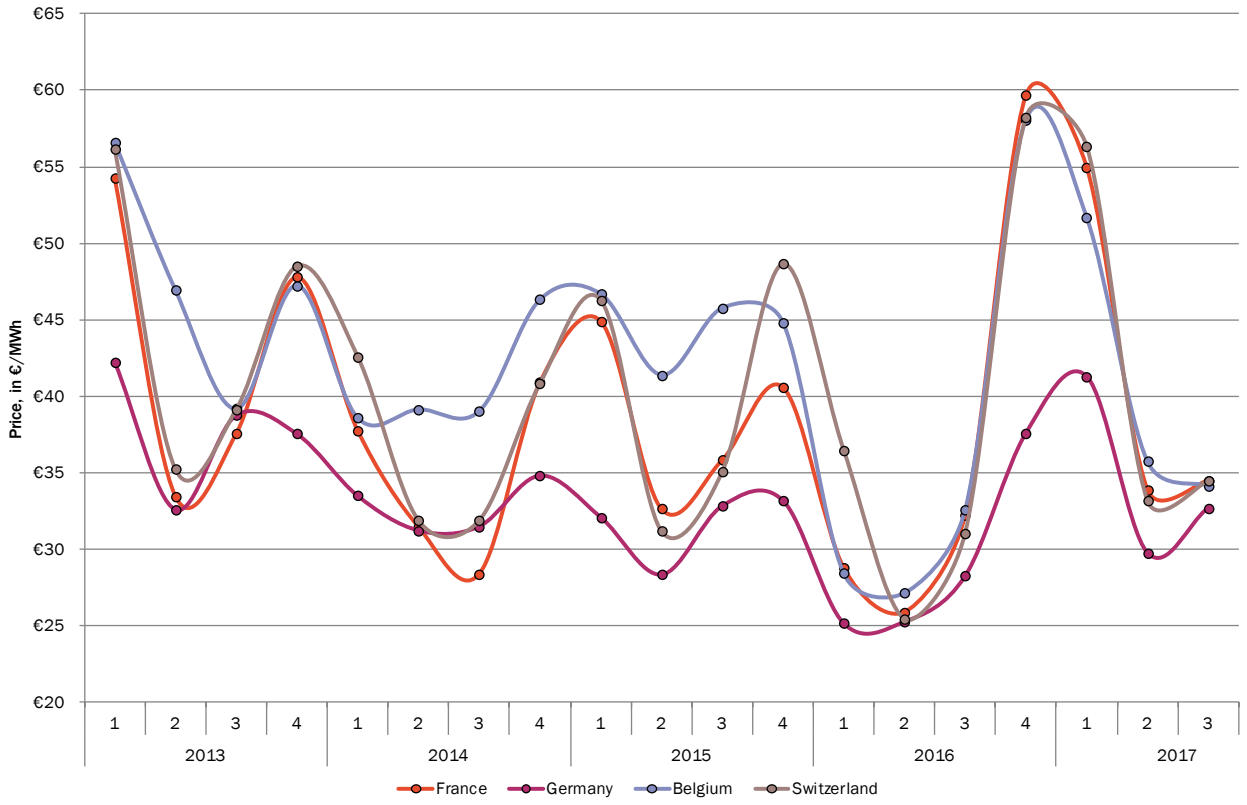
Source : Courtiers, EPD France – Analysis : CRE

Graph 9 : French Day-ahead prices on EPEX SPOT (baseload and peakload) SPOT



Graph 10 : Day-Ahead Baseload prices on the main European electricity markets

// QUARTERLY AVERAGES //

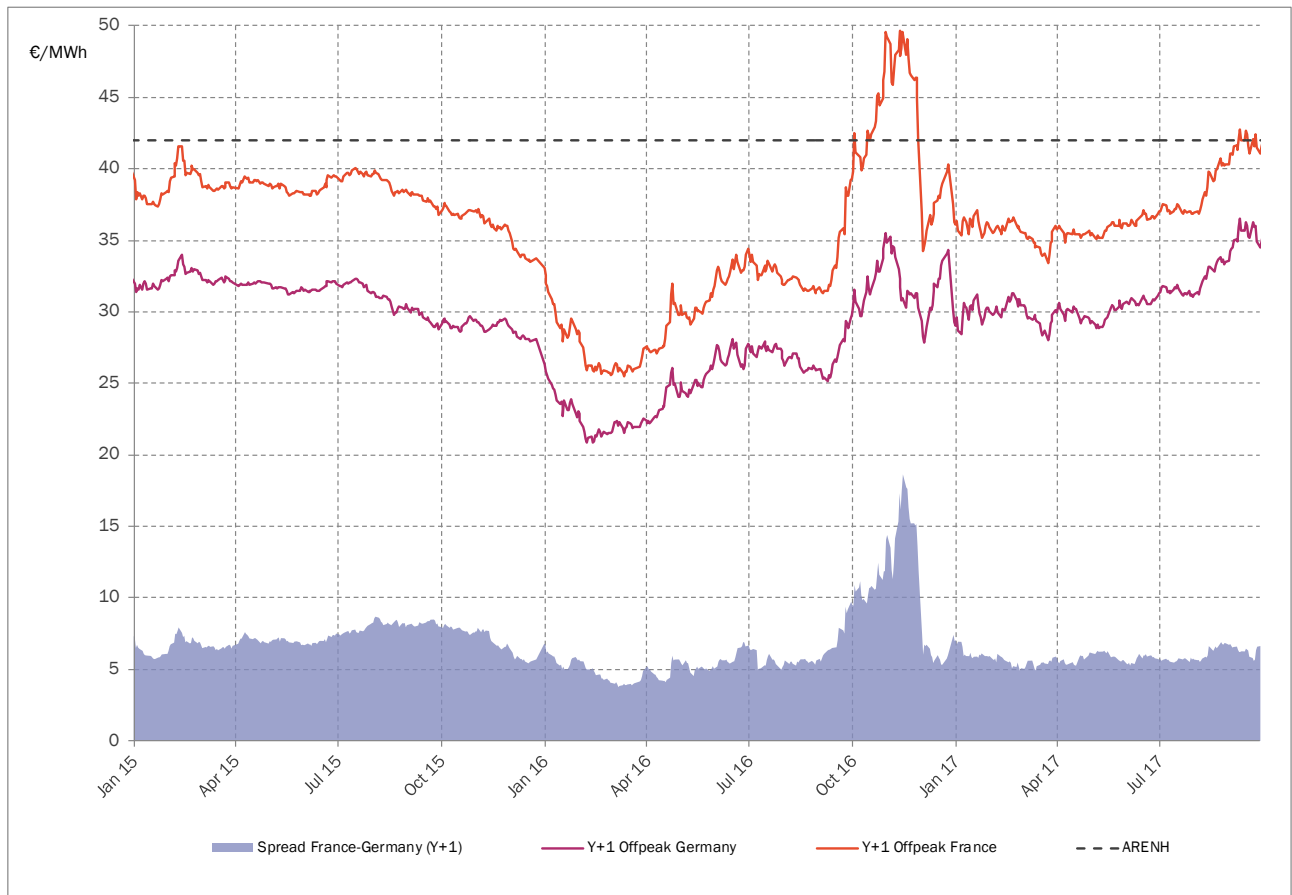


Source : EPEX SPOT, Nordpool, N2EX, GME, OMEL, BELPEX – Analysis : CRE



Graph 11 : Baseload Y+1 calendar prices in France and Germany

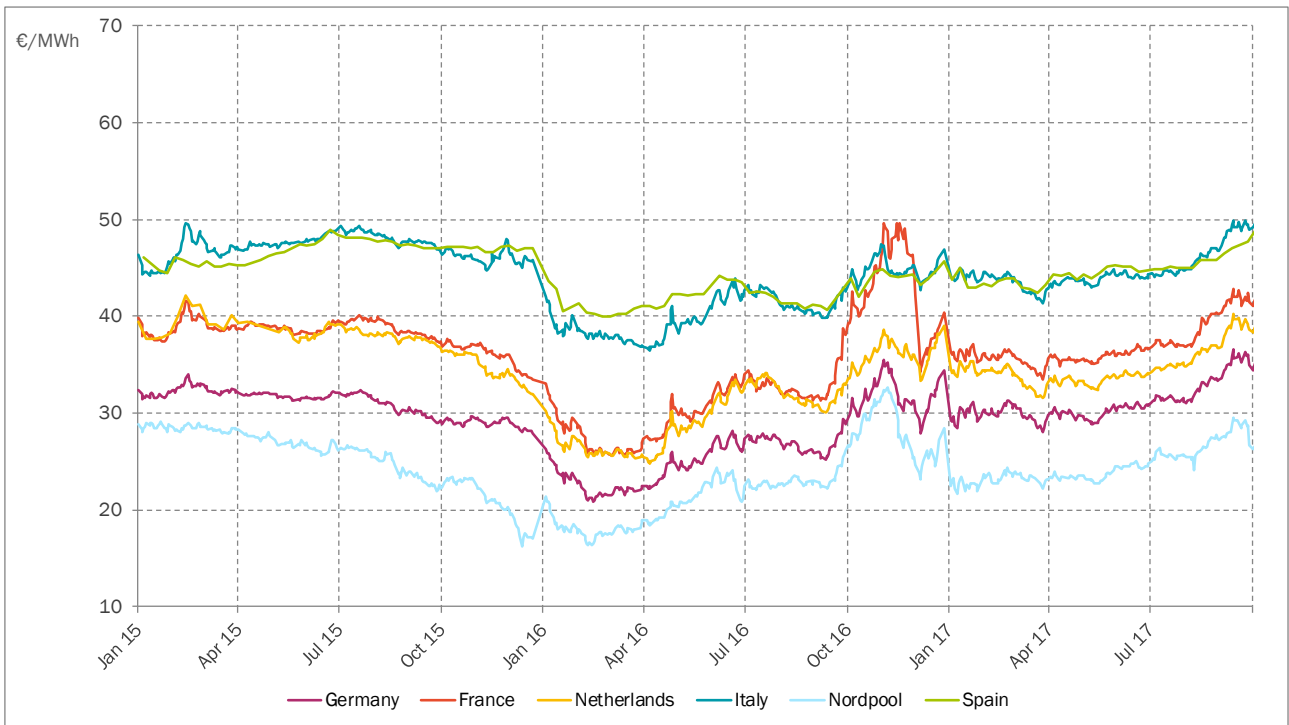
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Source : EEX Power Derivatives - Analysis : CRE

Graph 12 : Baseload Y+1 calendar prices in Europe

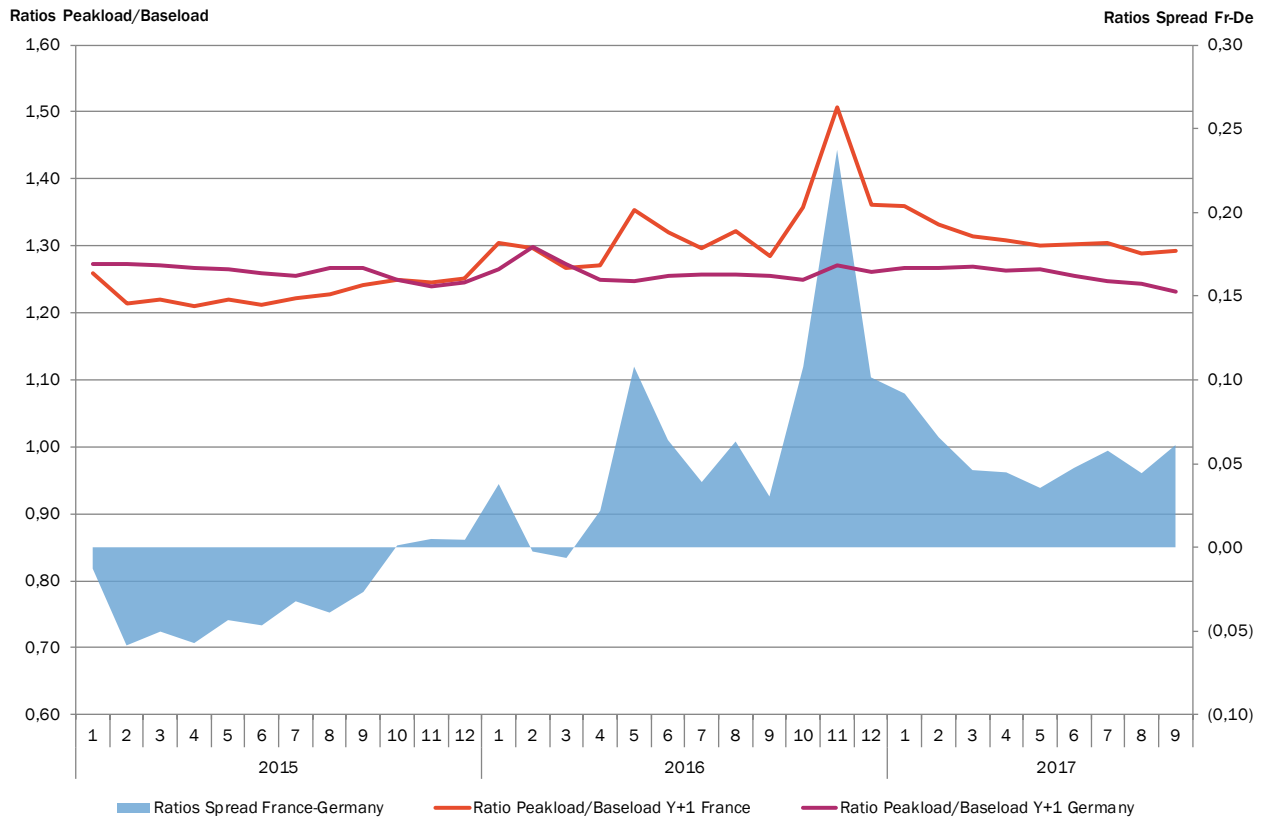
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Source : EEX Power Derivatives, Courtiers – Analysis : CRE

Graph 13 : Ratio Peakload/Baseload of Y+1 calendar prices in France and Germany

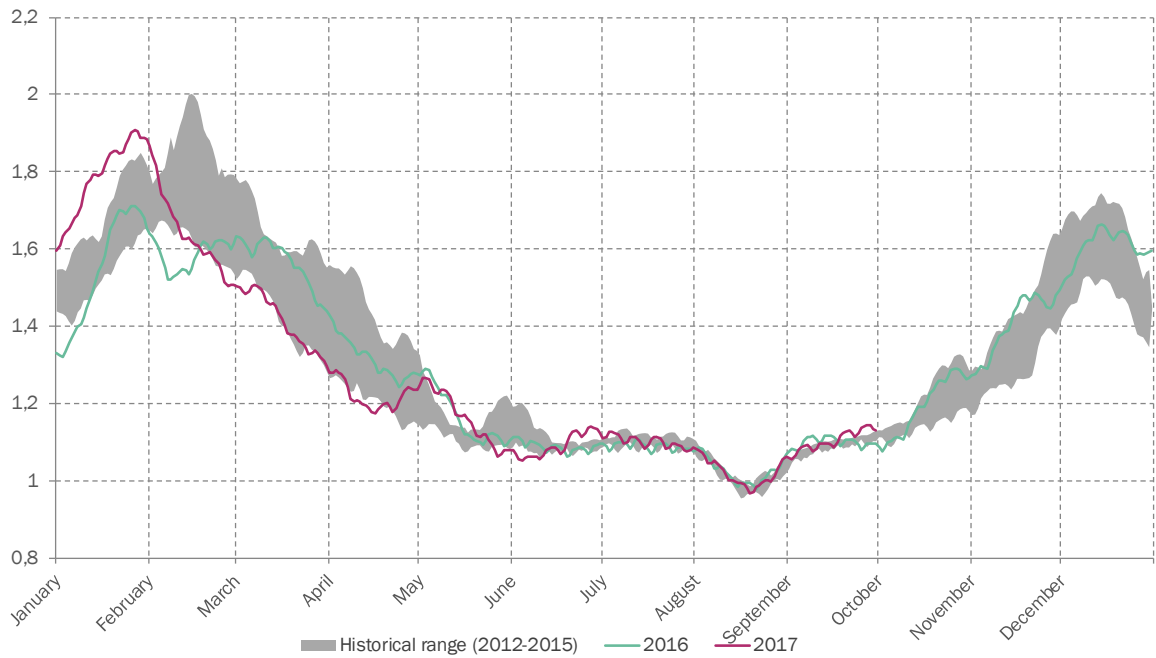
// MONTHLY AVERAGES //



Source : EEX Power Derivatives – Analysis : CRE

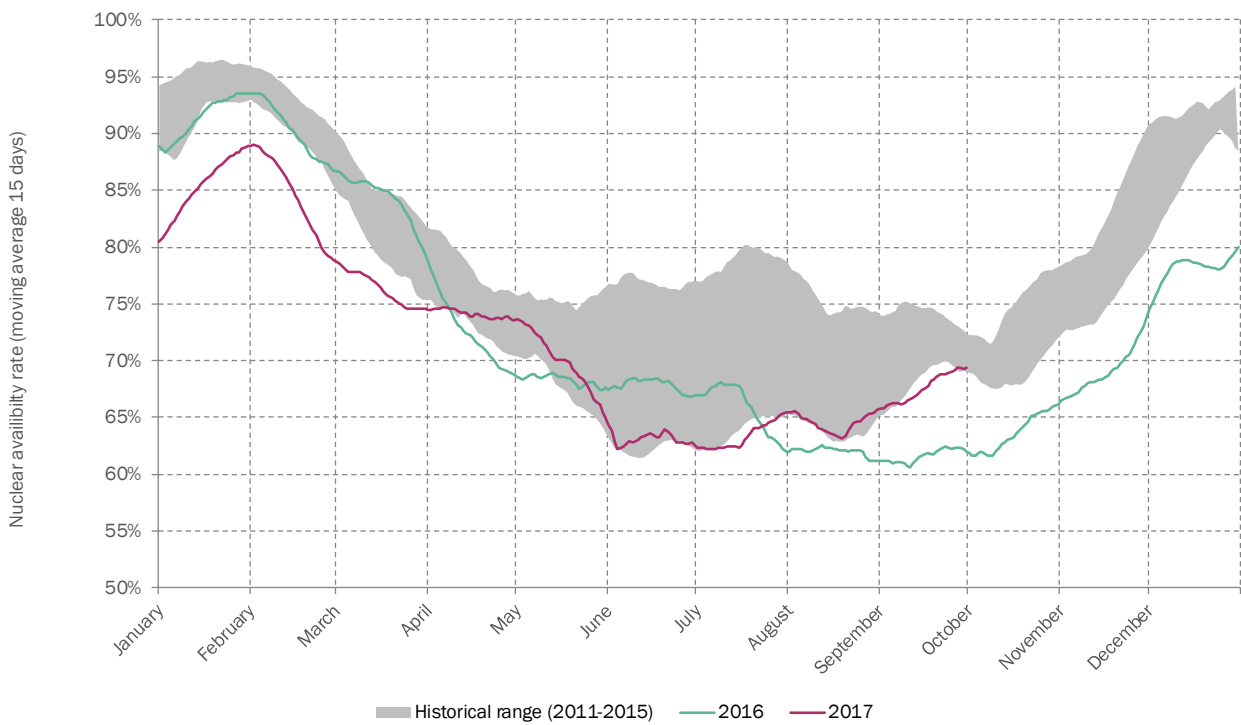
Graph 14 : French electricity consumption

Daily consumption (TWh) - moving average 15 days



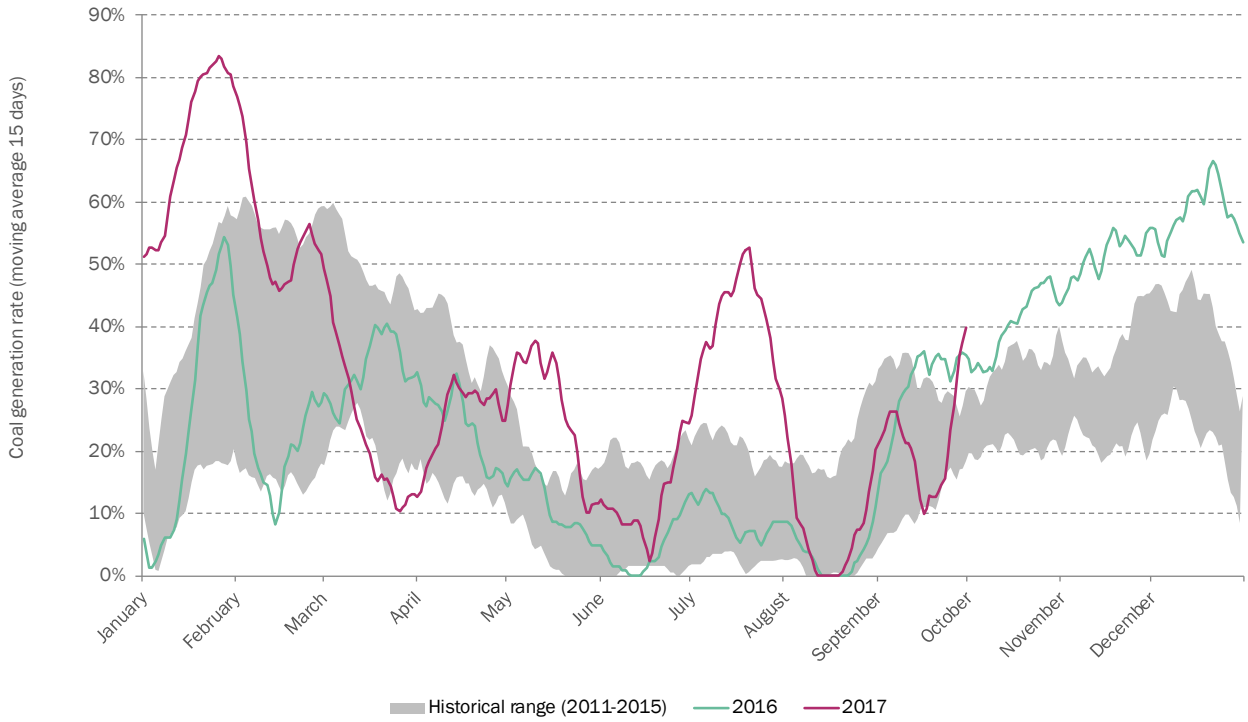
Source : RTE - Analysis : CRE

Graph 15 : Availability of nuclear generating capacity



Source : RTE - Analysis : CRE

Graph 16 : Average coal generation rate



Source : RTE – Analysis : CRE

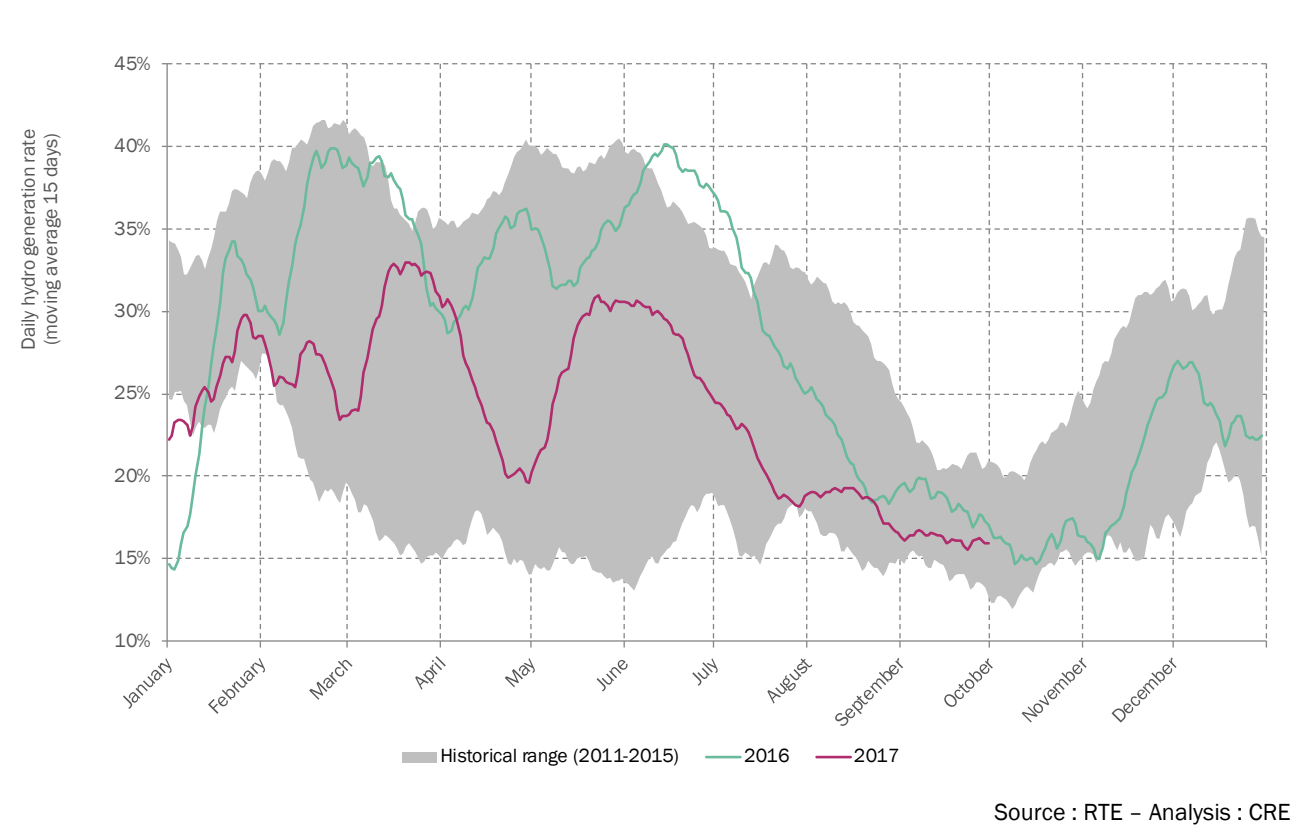
Graph 17 : Average gas generation rate



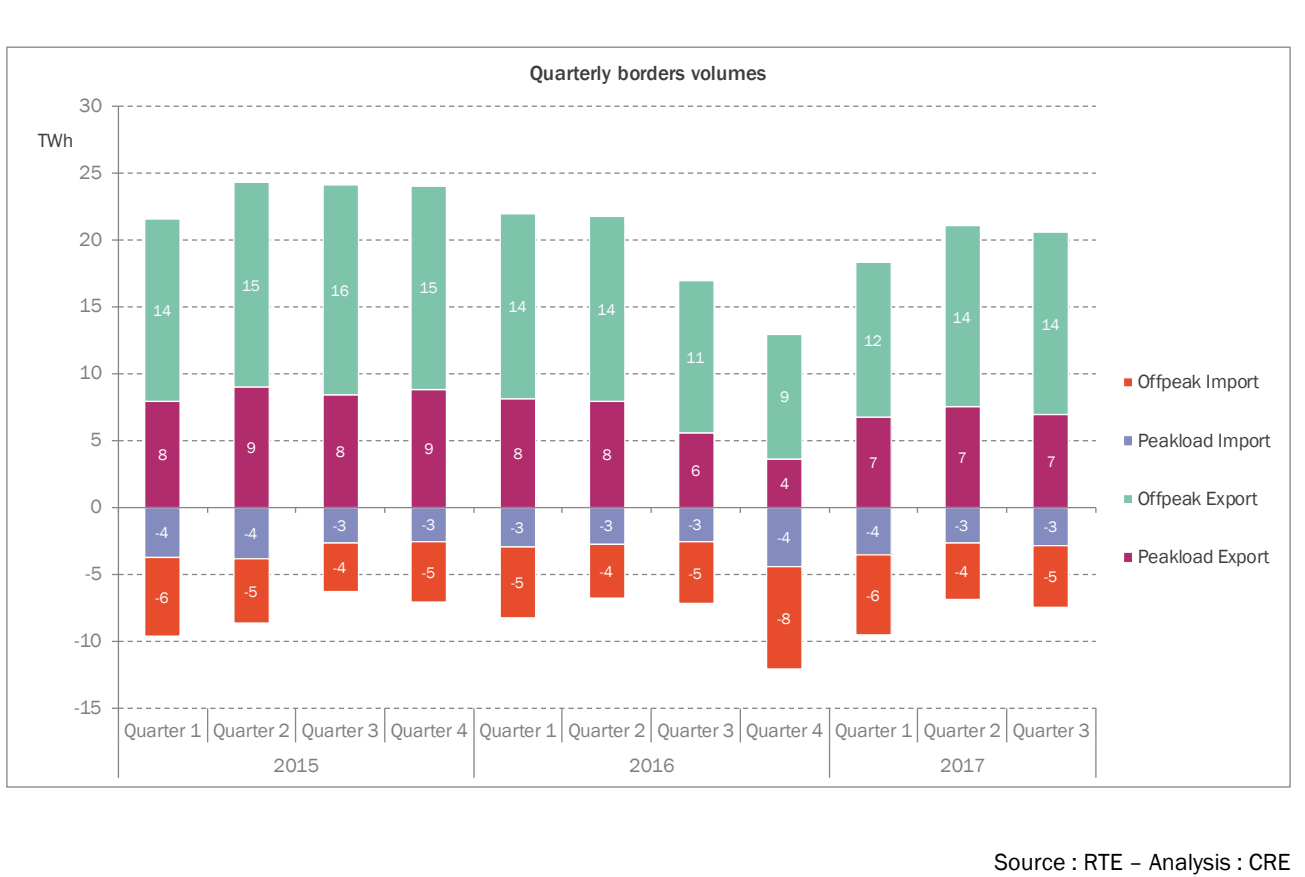
Source : RTE – Analysis : CRE



Graph 18 : Hydraulic generation rate

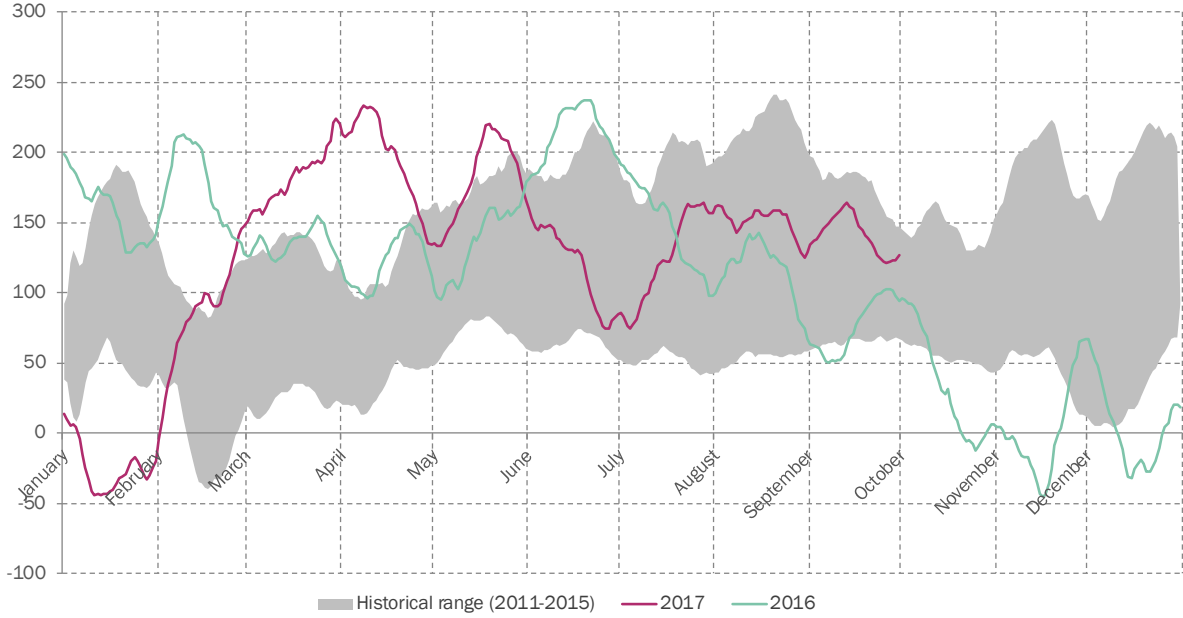


Graph 19 : Imports and exports (peak/Off-peak)



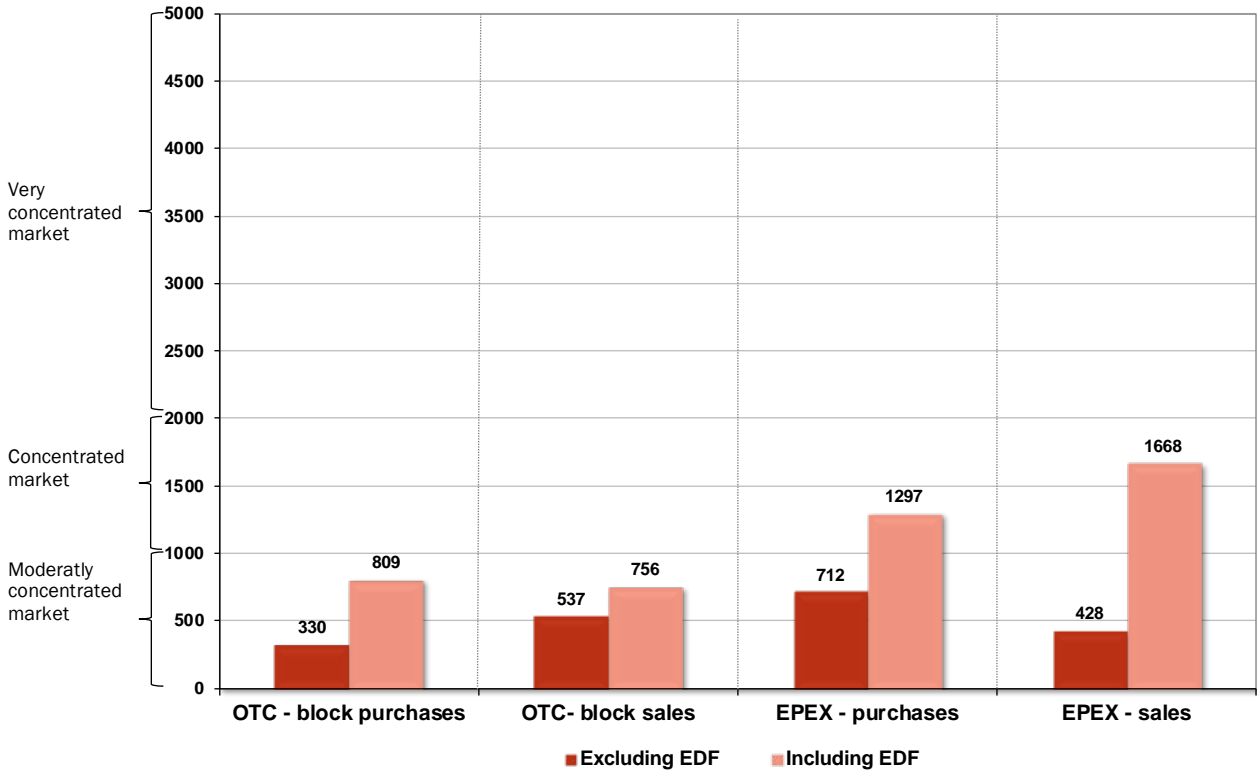
Graph 20 : Export balance

Daily net exports (GWh)
moving average 15 days



Source : RTE – Analysis : CRE

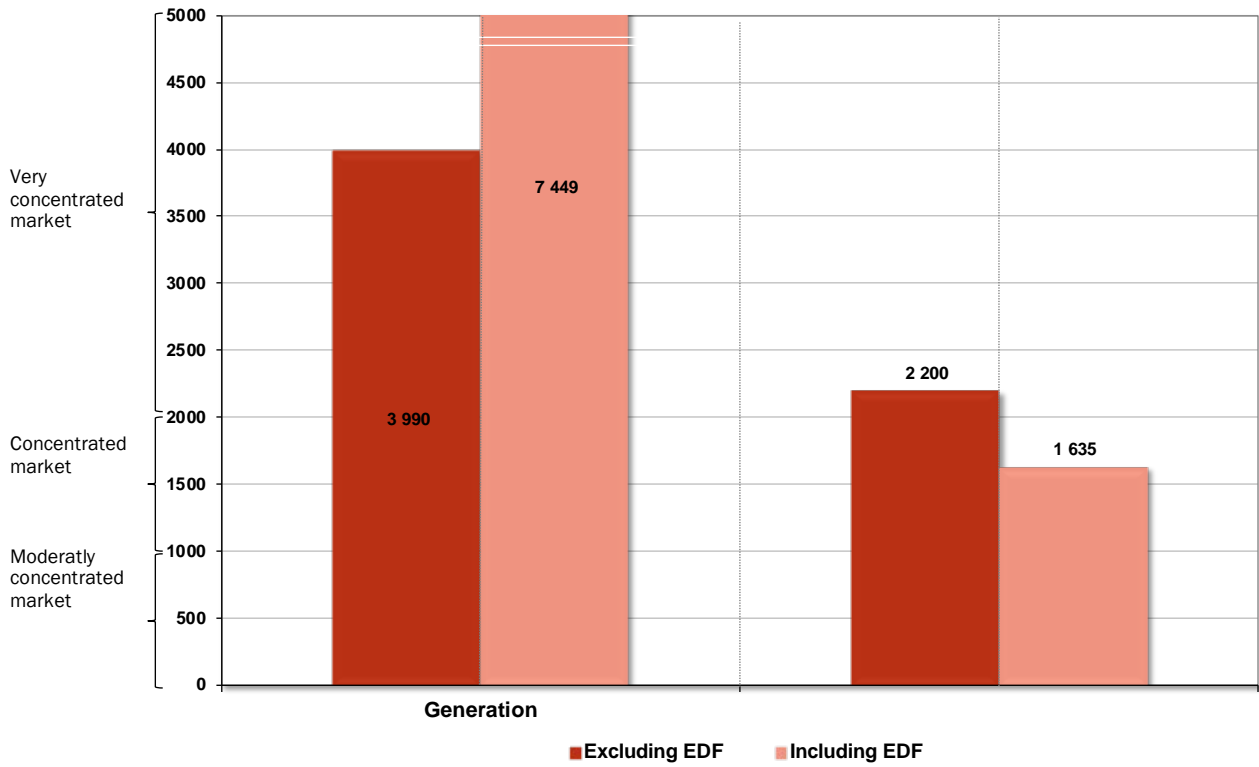
Graph 21 : HHI concentration index – Energy wholesale market in Q3 2017



Source : EPEX SPOT, EEX Power Derivatives, Courtiers – Analysis : CRE

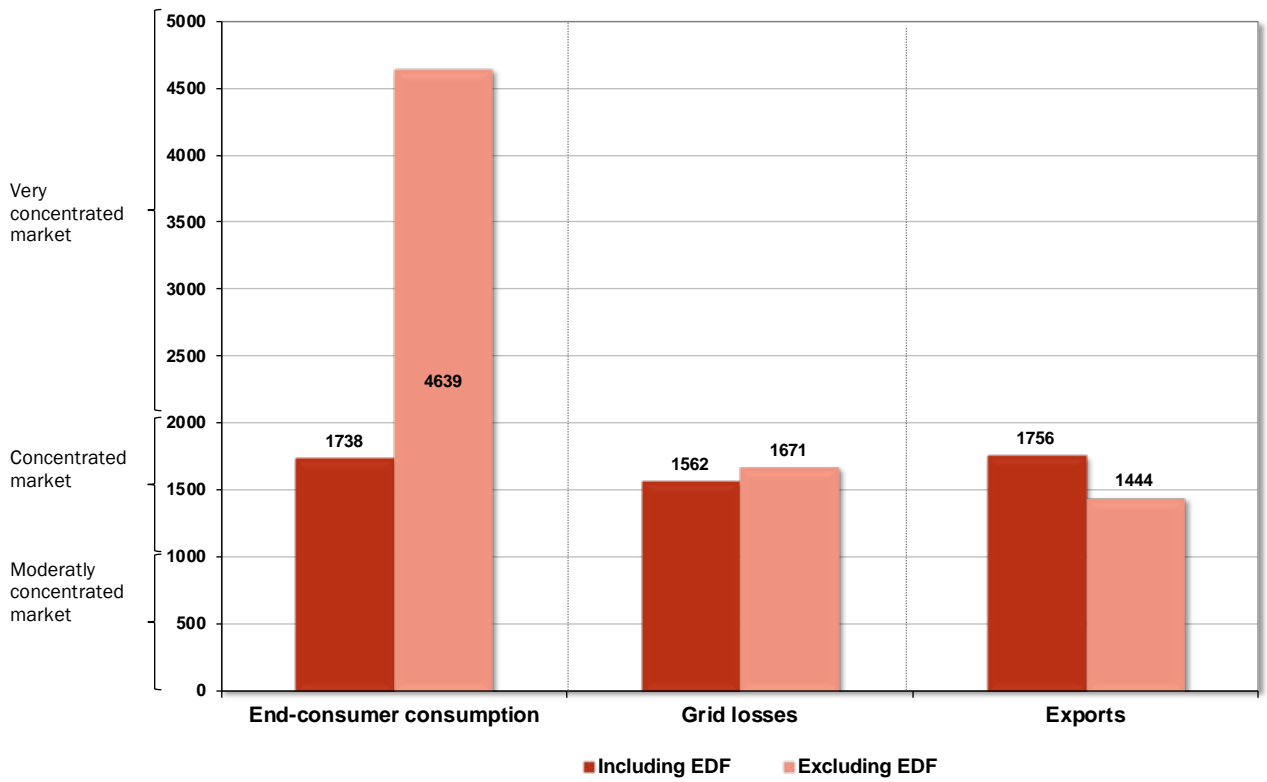


Graph 22 : HHI concentration index – Injections in Q3 2017



Source : RTE – Analysis : CRE

Graph 23 : HHI concentration index – Withdrawals in Q3 2017



Source : RTE – Analysis : CRE

PART 2: WHOLESALE NATURAL GAS MARKET

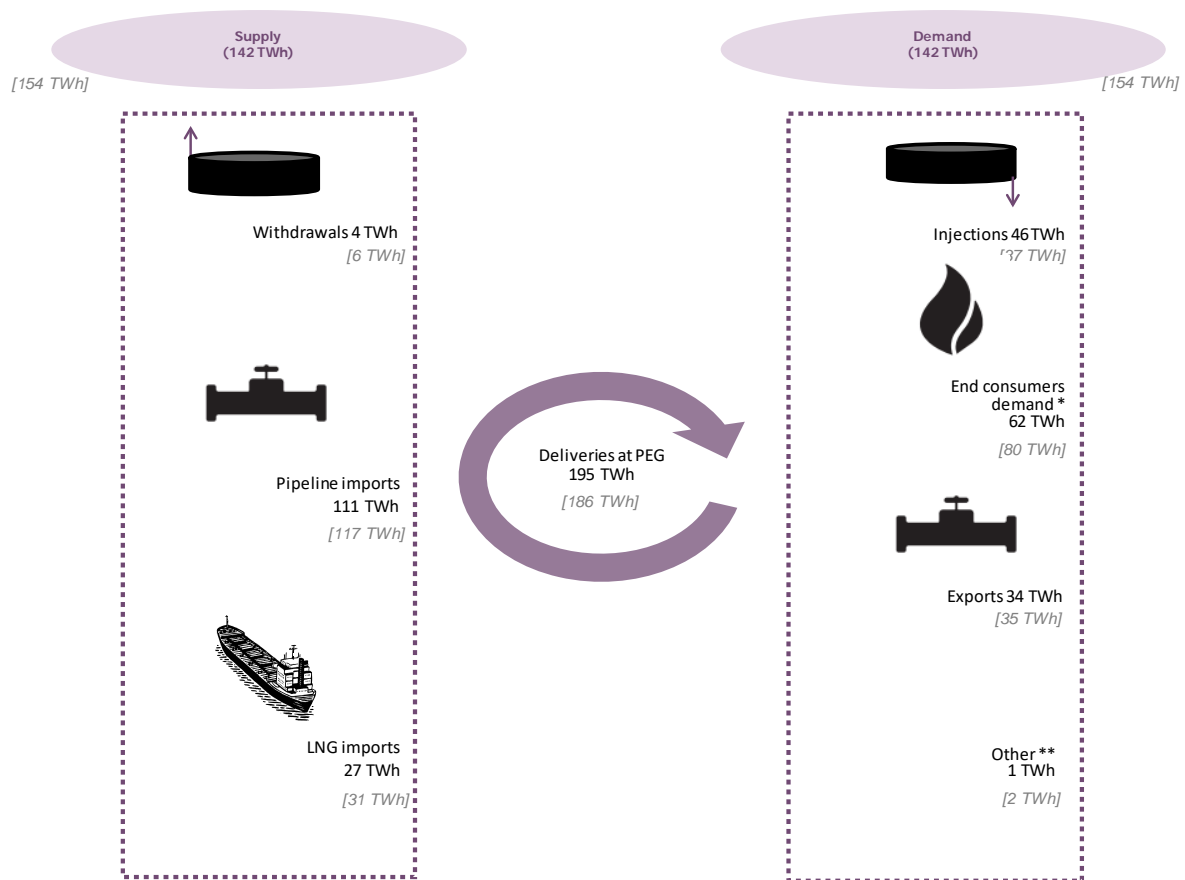
1. MAIN DATES

2004	First publication of price references for the French gas markets
January 2005	Launch of the French Gas Release program on a volume of 16.3 TWh/yr during 3 years
April 2007	Launch of the platform Powernext Balancing GRTgaz designed as a market access for the TSO in order to cover its daily balancing needs
2008	Accessibility to the wholesale market for consumers directly connected to GRTgaz transmission system
November 2008	Launch of Powernext Gas Spot and Powernext Gas Futures
January 2009	Merger of the 3 balancing zones of GRTgaz in the North of France (Nord-H, East and West)
December 2009	GRTgaz starts covering part of its balancing needs on the Powernext Gas Spot platform (Powernext Balancing GRTgaz platform is abandoned)
November 2010	Commissioning of the Fos Cavaou LNG terminal at 100% of its capacity
December 2010	Commercialization of daily and monthly interconnection capacity between Zeebrugge and PEG Nord
January 2011	GRTgaz and Luxembourgish CREOS launch a market consultation for the development of firm interconnection capacity from France to Luxembourg
May 2011	Powernext launches a spread PEG Nord / PEG Sud contract on its platform Powernext Gas Spot
July 2011	GRTgaz and Powernext Gas Spot launch the first market coupling initiative in the European gas markets
December 2011	TIGF becomes a member of Powernext Gas Spot and starts covering a part of its daily balancing needs at PEG TIGF
February 2012	Elengy launches a reloading service at Montoir-de-Bretagne LNG terminal
February 2013	Powernext Gas Futures launches the TTF and spread PEG Nord/TTF contracts
April 2013	Launch of PRISMA, a joint capacity booking platform of major European Transmission System Operators Merger of the Nord-H and Nord-B balancing zones New capacities at the border between France and Spain. Total available capacities at Larrau interconnection passed from 70 to 165 GWh/d for entry and from 100 to 165 GWh/d for exit
May 2013	Powernext and EEX launch PEGAS, a natural gas trading cooperation allowing market participants to trade both exchanges' contracts on a common trading platform
June 2013	Launch of the auction Joint Transport Storage (JTS) mechanism for commercializing additional daily capacities at GRTgaz north-to-south link
October 2013	Powernext launches both a new Front Month contract at PEG Sud and its spread

	contract with PEG Nord's Front Month
March 2014	Decree N° 2014-328 modifying the rules for accessing French storages in order to improve the security of supply
July 2014	Powernext launches a 24/7 service on its spot platform
October 2014	Launch of an auction mechanism through the PRISMA platform for the capacity allocations at GRTgaz north/south link
April 2015	Creation of TRS (Trading Region South) resulting from the merging of PEG South and PEG TIGF
January 2017	Commissioning of the Dunkirk LNG terminal
July 2017	Decree of 31 July 2017 on the modalities for taking into account other modulation instruments for the application of the reporting and holding obligation and storage capacity of natural gas suppliers

2. BALANCE OF THE WHOLESALE GAS MARKET

Figure 24: Quarterly supply and demand of natural gas in France



* Consumption includes clients at both regulated and market based prices

** 'Others' includes TSOs and DSOs consumptions, metering errors and losses

Data [Q2 2017] and Q3 2017

Source: GRTgaz, TIGF

3. KEY DATA
Table 1: Fundamentals

Market fundamentals	Quarterly values					Quarterly variation		Yearly variation	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q3 2017 / Q2 2017		Q3 2017 / Q3 2016	
						In percentage	In value	In percentage	In value
Entry and exit flows									
Supply (TWh)	132	202	216	154	142	-7%	-11	0	10
Storages withdrawals	3	44	64	6	4	-26%	-2	38%	1
Imports	129	157	152	148	138	-7%	-10	7%	9
<i>Pipeline</i>	110	134	129	117	111	-5%	-6	1%	1
LNG	19	23	23	31	27	-13%	-4	44%	8
Demand (TWh)	132	202	216	154	142	-7%	-11	8%	10
Storages injections	55	9	8	37	46		8	-18%	-10
End consumer demand	60	168	185	80	62	-22%	-18	3%	2
<i>Distribution consumers</i>	21	105	128	43	24	-44%	-19	12%	3
<i>Consumers connected to the transmission system</i>	38	63	57	37	38	2%	1	-2%	-1
Exports	15	21	22	35	34	-1%	0	125%	19
Other	2	3	1	2	1	-71%	-1	-67%	-1
Deliveries at PEG (TWh)	194	220	222	186	195	5%	9	1%	1
PEG Nord	160	171	179	152	160	5%	8	0%	-1
TRS	33	50	44	34	35	4%	1	5%	2
Infrastructure figures									
North-to-South link	100%	98%	87%	89%	92%		3%		-8%
Availability of the North-to-South link	76%	84%	84%	79%	86%		7%		10%
Utilization of Talsnieres H interconnection (Entry)	71%	56%	61%	60%	54%		-7%		-17%
Utilization of Obergaibach interconnection (Entry)	51%	54%	46%	41%	37%		-4%		-14%
Stock levels (TWh as at the end of the Quarter)	119	84	27	59	98	68%	40	-17%	-20
Avg. Net variation of French stocks (GWh/j)	568	-382	-626	348	447	29%	100	-21%	-121
Avg. LNG terminals emissions (GWh/j)	200	240	249	338	348	3%	10	74%	148
Avg. Exports from France to Spain (GWh/j)	88	118	106	123	135	10%	12	52%	46

Source: GRTgaz, TIGF – Analysis: CRE

Table 2: Prices

Prices	Quarterly values					Quarterly variation		Yearly variation	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q3 2017 / Q2 2017		Q3 2017 / Q3 2016	
						In percentage	In value	In percentage	In value
Spot prices (€/MWh)									
PEG Nord day-ahead (avg.)	13.1	17.6	18.9	15.6	16.0	3%	0,4	22%	2,9
TRS day-ahead (avg.)	15,8	19,5	23,5	15,9	16,2	2%	0,4	3%	0,5
Day-ahead PEG Nord/Sud spread (avg.)	2,6	1,9	4,6	0,3	0,3	-18%	-0,1	-90%	-2,4
Day-ahead PEG Nord/TTF Spread (avg.)	0,3	0,4	0,5	0,0	-0,1	591%	-0,1	-145%	-0,5
Forward prices (€/MWh)									
PEG Nord M+1 (avg.)	13,3	17,5	18,6	15,3	15,9	3%	0,5	19%	2,5
PEG Nord Y+1 (avg.)	16,0	17,0	17,7	16,6	16,6	0%	0,0	4%	0,6
M+1 PEG Nord/Sud spread (avg.)	2,3	1,6	3,0	0,8	0,8	-5%	0,0	-65%	-1,5
M+1 PEG Nord/TTF spread (avg.)	0,2	0,3	0,3	0,2	0,2	-14%	0,0	-10%	0,0
Summer-ahead/Winter-ahead spread* (avg.)	2,6	1,4	1,2	1,8	1,4	-24%	-0,4	-48%	-1,3

* During the winter season, this indicator corresponds to the spread between winter-ahead and summer-ahead prices. During the summer season, it corresponds to the spread between winter-ahead and Balance of summer prices (calculated from contracts delivering during the rest of the summer)

Source: Powernext, Heren – Analysis: CRE

Table 3: Trading Activity

Trading activity	Quarterly values					Quarterly variation		Yearly variation	
	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q3 2017 / Q2 2017		Q3 2017 / Q3 2016	
						In percentage	In value	In percentage	In value
Activity in the French wholesale gas markets									
Natural gas exchanged at PEG* (TWh)	148	184	186	135	144	7%	9	-3%	-4
% of national consumption	248%	109%	100%	170%	233%				
Trading volumes in the French intermediated markets									
Spot market (TWh)	46	50	52	47	38	-19%	-9	-16%	-7
Intraday	5	8	8	6	6	1%	0,1	5%	0,3
Day Ahead	25	29	30	26	23	-12%	-3,1	-10%	-2,5
Exchange (DA, WD, WE, other spot)	32	43	44	41	33	-19%	-7,8	3%	0,9
Brokers (DA, WD, WE, other spot)	14	8	8	6	6	-15%	-1,0	-60%	-8,3
Forwards market (TWh)	91	88	113	126	100	-21%	-26	9%	9
M+1	32	37	32	32	31	-4%	-1,1	-3%	-0,9
Q+1	6	19	4	24	4	-83%	-20,2	-33%	-2,0
S+1	12	11	33	20	12	-39%	-7,7	-1%	-0,1
Y+1	1	1	3	10	9	-13%	-1,3	668%	7,9
Exchange (all maturities)	10	10	8	7	8	15%	1,0	-22%	-2,2
Brokers (all maturities)	82	78	105	120	92	-23%	-27,5	13%	10,7
Number of transactions in the French intermediated markets									
Spot market	35627	40557	41082	36960	29194	-21%	-7766	-18%	-6433
Intraday	6 537	8 528	8 207	6 620	6 801	3%	181	4%	264
Day Ahead	23 202	26 391	26 689	24 066	18 346	-24%	-5720	-21%	-4856
Exchange (DA, WD, WE, other spot)	30 083	38 088	38 634	34 920	27 140	-22%	-7780	-10%	-2943
Brokers (DA, WD, WE, other spot)	5 544	2 469	2 448	2 040	2 054	1%	14	-63%	-3490
Forwards market	1579	1693	1937	1652	1463	-11%	-189	-7%	-116
M+1	928	1 135	1 084	928	953	3%	25	3%	25
Q+1	104	210	79	240	62	-74%	-178	-40%	-42
S+1	98	63	202	91	72	-21%	-19	-27%	-26
Y+1	6	8	19	50	43	-14%	-7	617%	37
Exchange (all forwards)	390	459	336	324	302	-7%	-22	-23%	-88
Brokers (all forwards)	1 189	1 234	1 601	1 328	1 161	-13%	-167	-2%	-28
Concentration of the natural gas market in France									
Number of shippers active in the market	94	100	101	95	98	3%	3	4%	4
Active in Powernext Gas Spot	54	56	59	59	61	3%	2	13%	7
Active in Powernext Gas Futures	35	35	38	37	31	-16%	-6	-11%	-4

* Deliveries resulting from exchanges in the intermediated markets in France

Source: GRTgaz, TIGF, Powernext, brokers – Analysis: CRE

4. GRAPHS

4.1 Evolution of natural gas prices in France and Europe

Figure 25: Day-ahead prices in the main wholesale markets in Europe

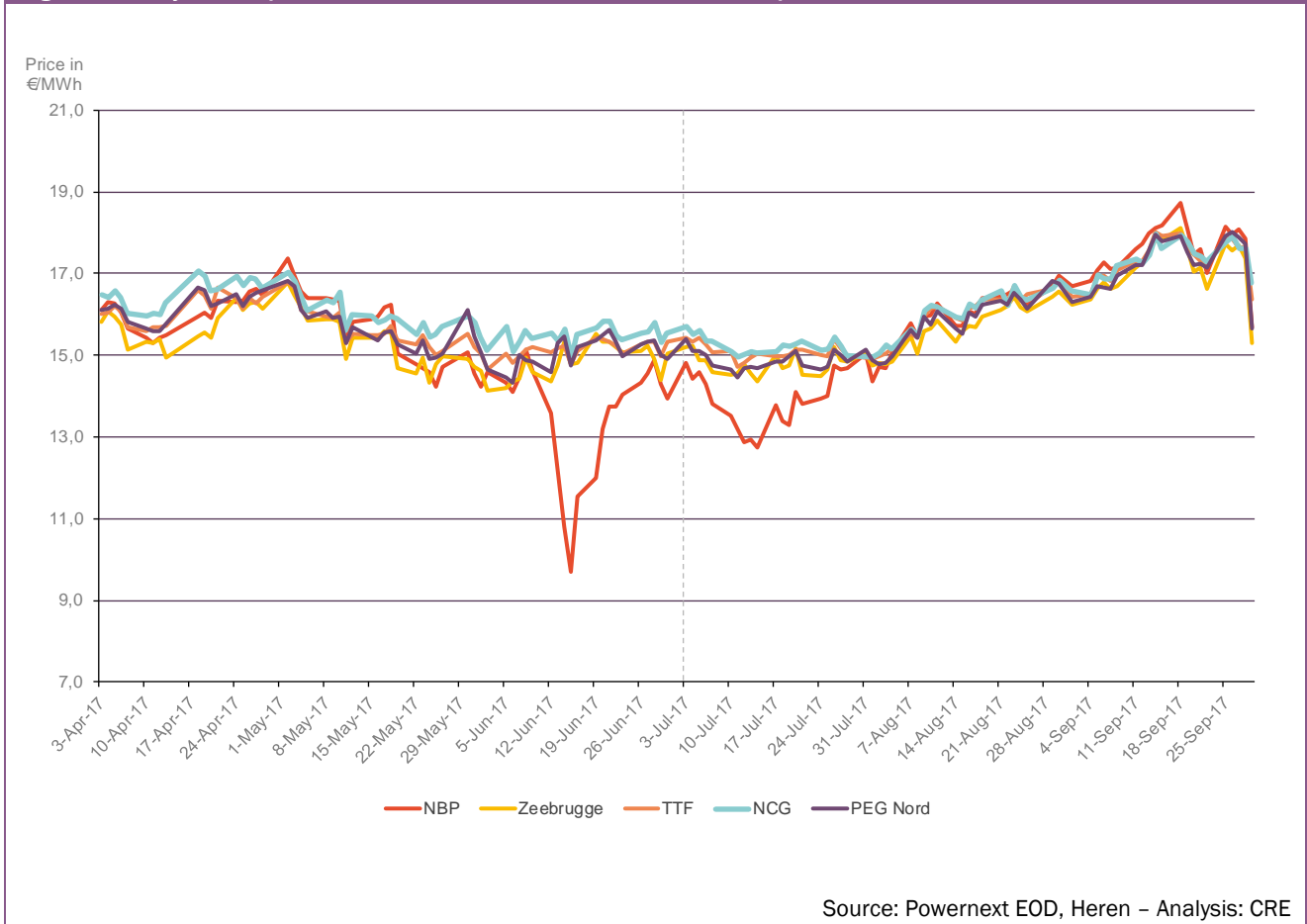
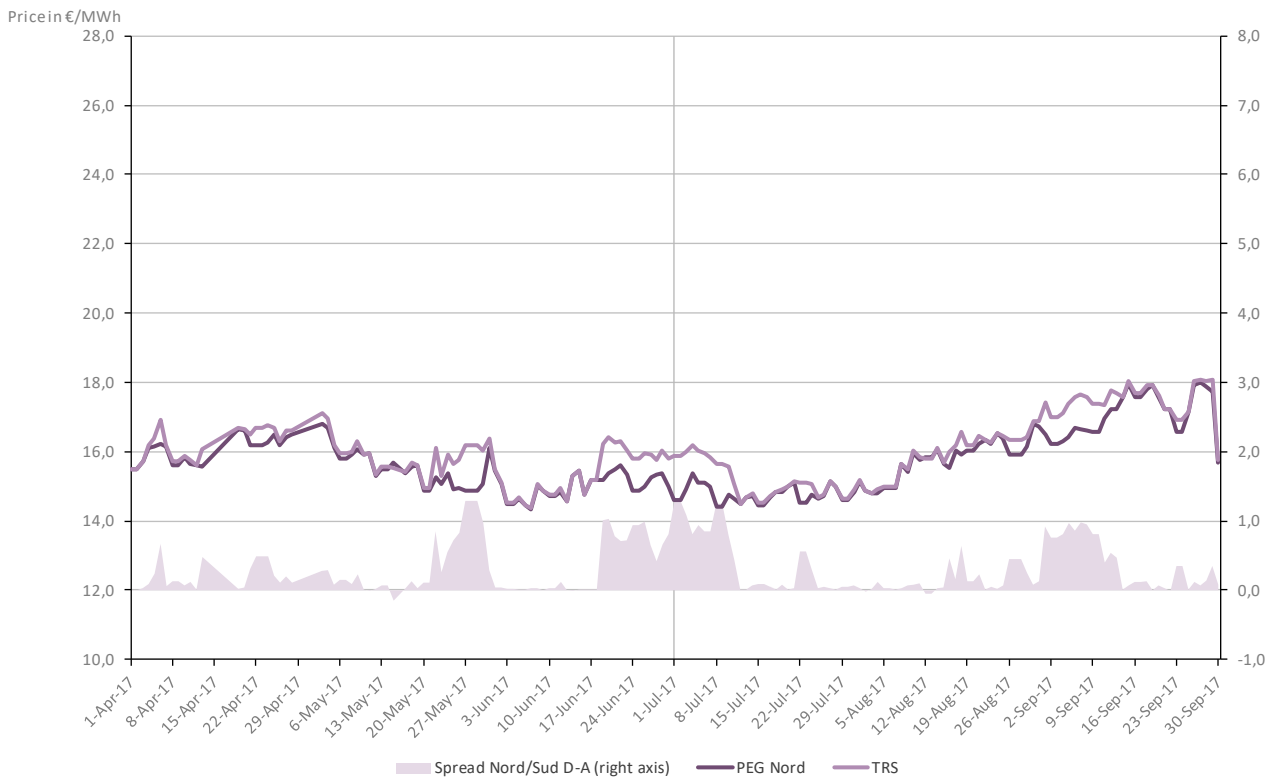


Figure 26: Day-ahead prices in the wholesale market in France



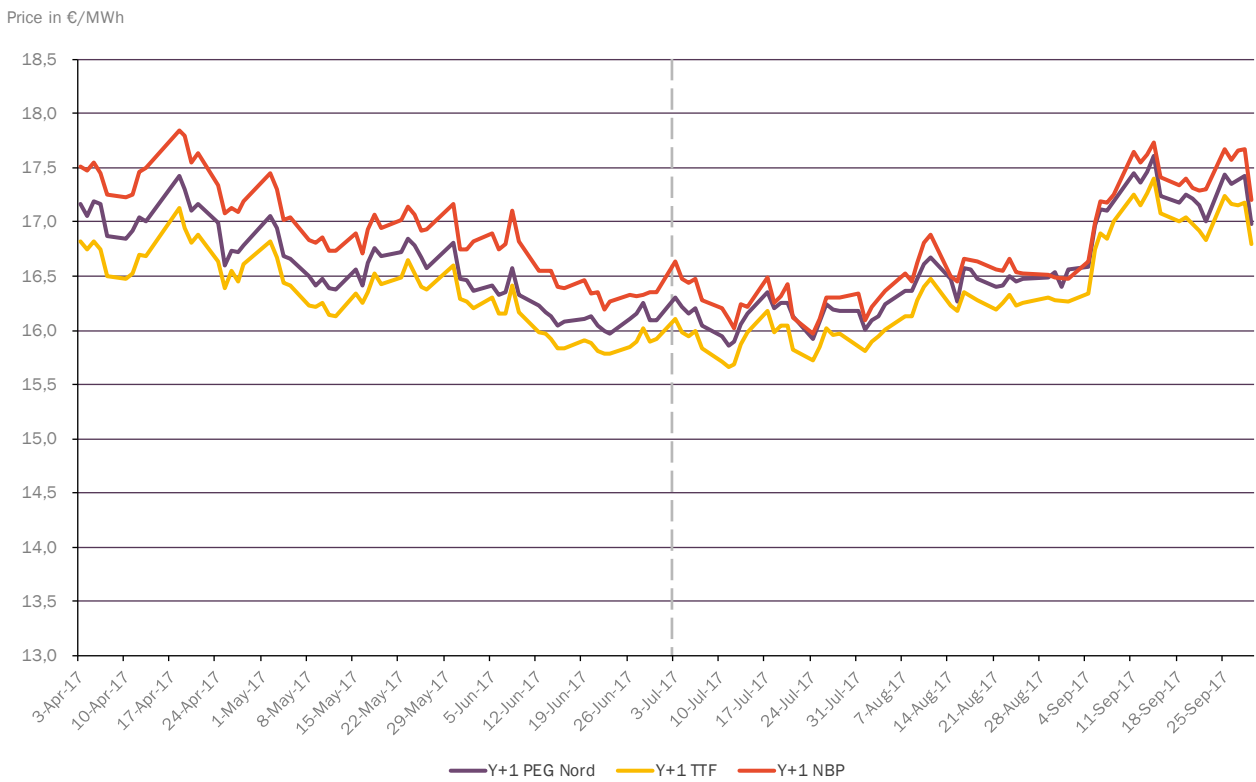
Source: Powernext EOD, Heren for PEG TIGF – Analysis: CRE

Figure 27: Month-ahead prices in the main wholesale markets in Europe



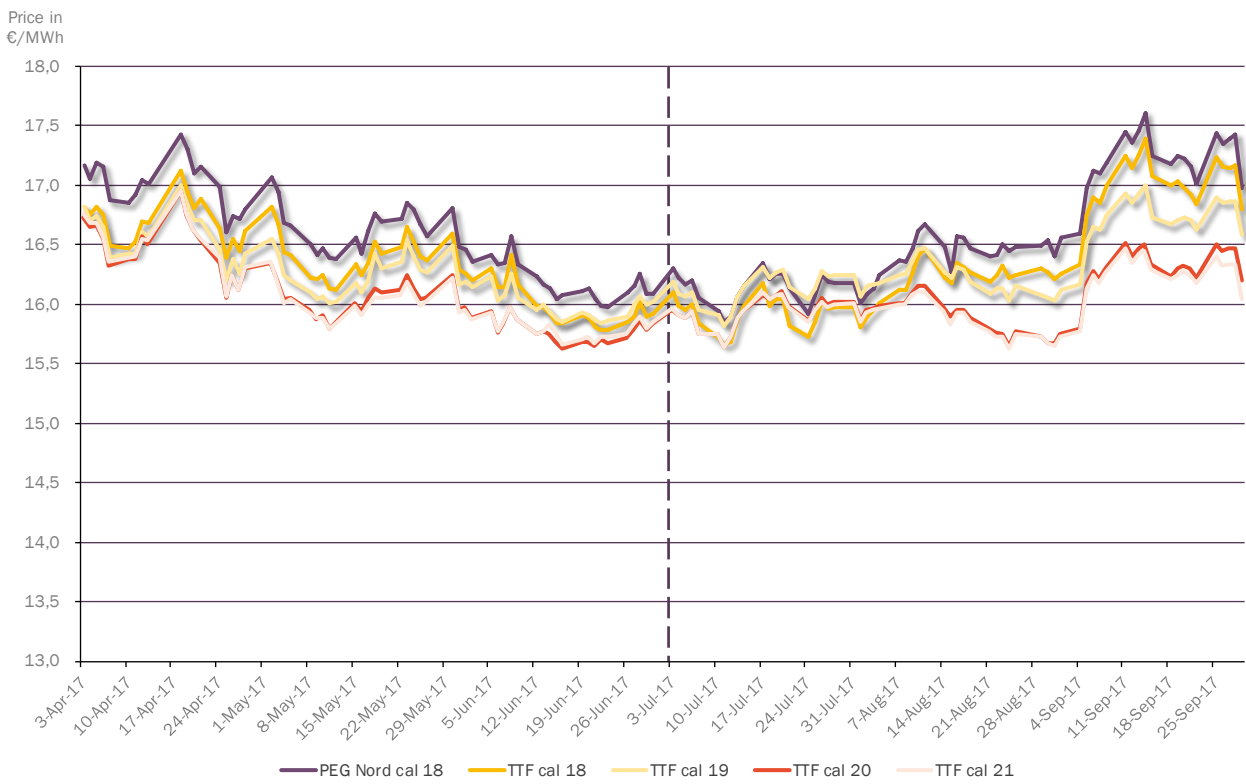
Source: Powernext, Heren – Analysis: CRE

Figure 28: Year-ahead prices in the main wholesale markets in Europe



Source: Powernext, Heren – Analysis: CRE

Figure 29: Price of calendar-year contracts for PEG Nord and TTF



Source: Powernext, Heren – Analysis: CRE

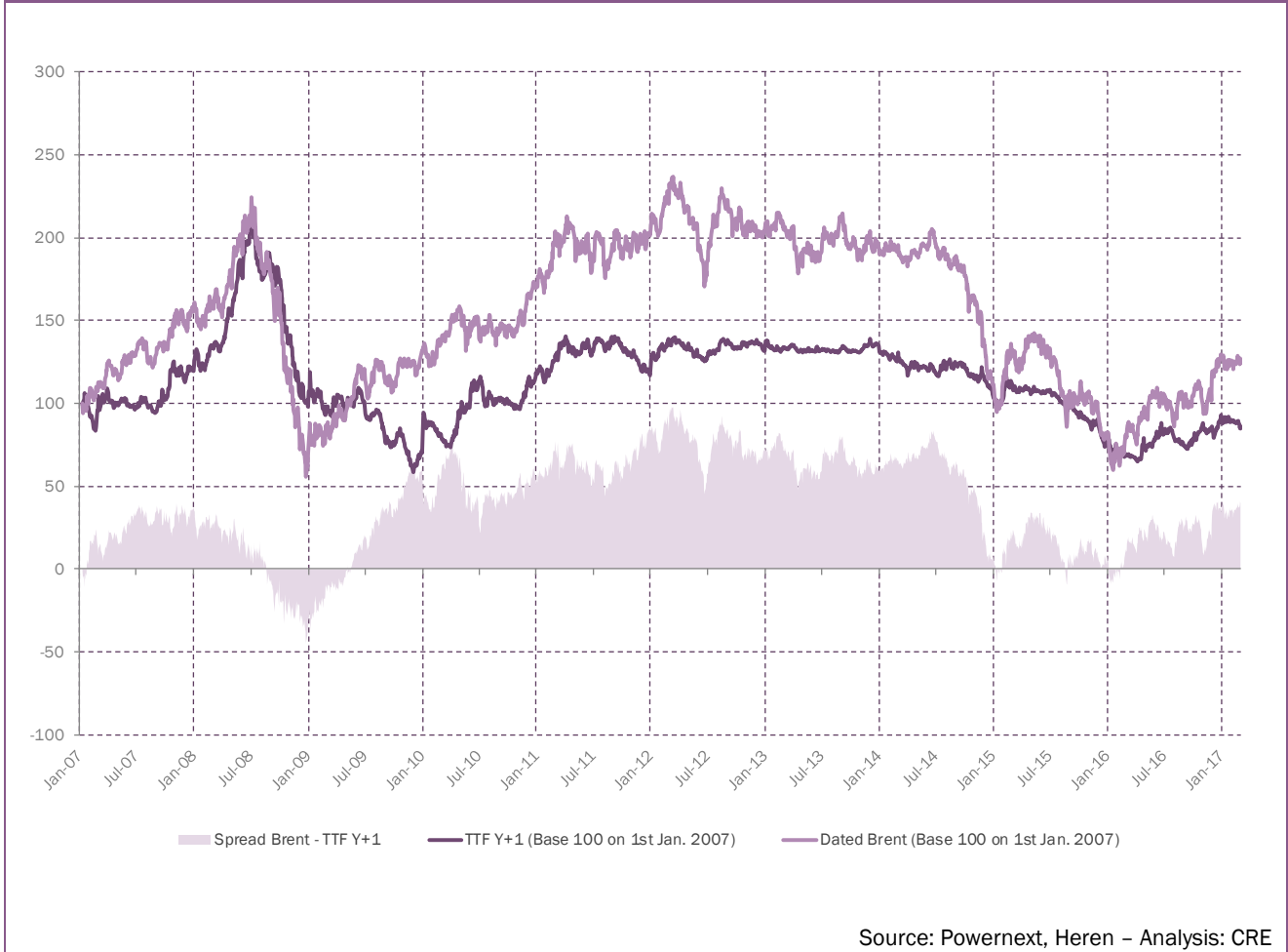
4.2 Global markets

Figure 30: International natural gas prices



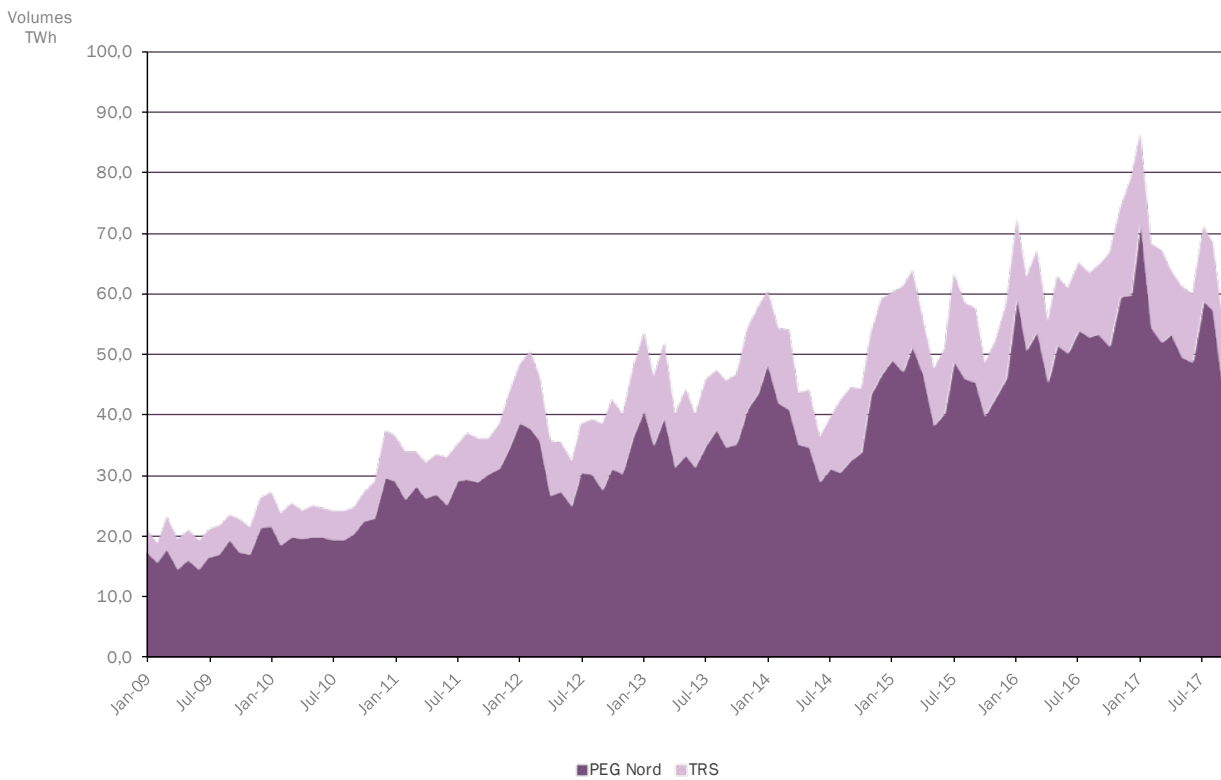
Source: Powernext, Heren – Analysis: CRE

Figure 31: Comparison between natural gas and oil prices



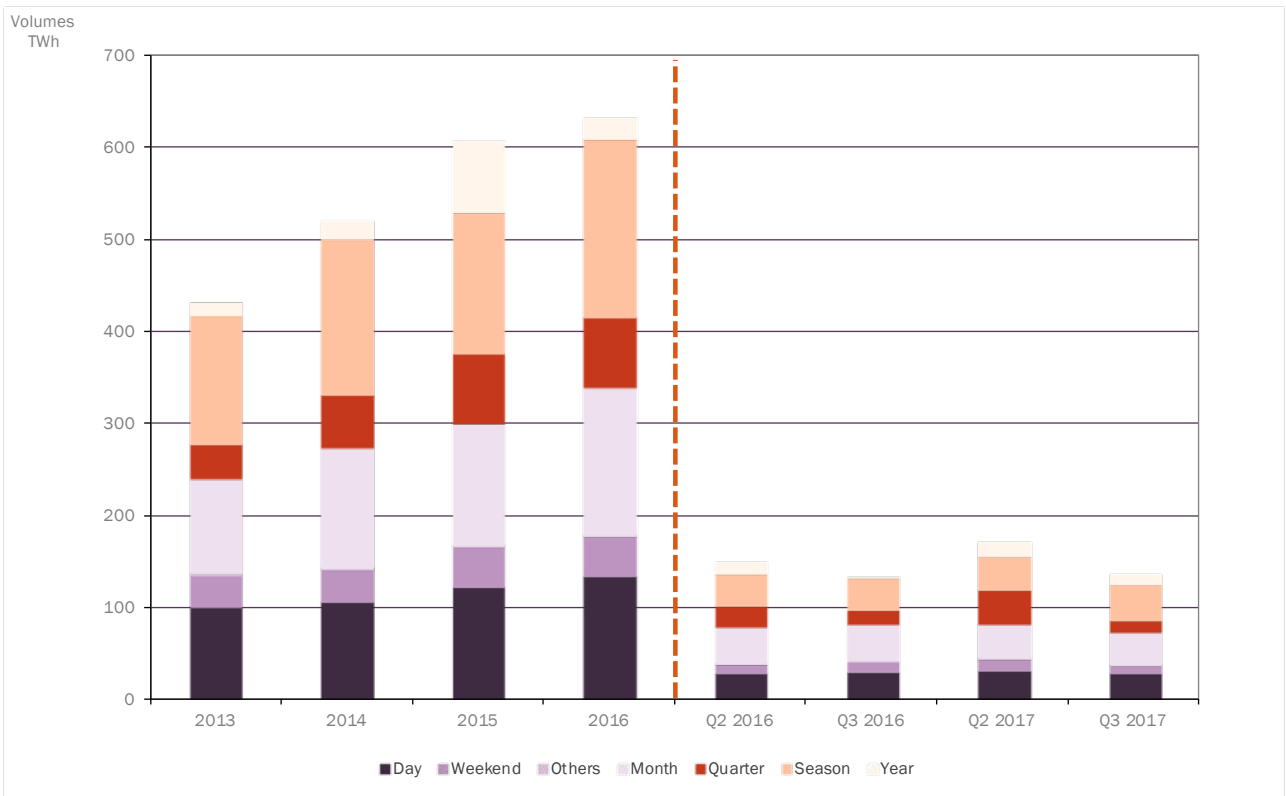
4.3 Development of the French natural gas markets

Figure 32: Deliveries at PEGs



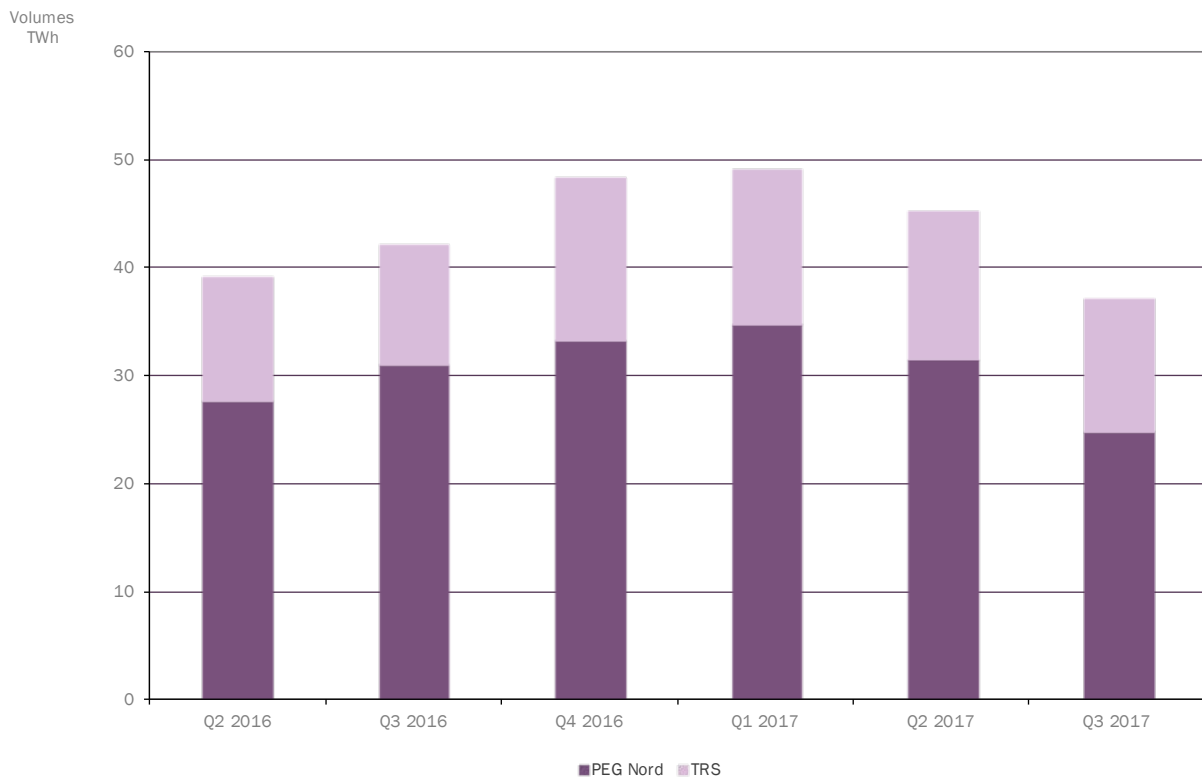
Source: GRTgaz, TIGF – Analysis: CRE

Figure 33: Trading volumes in the intermediated markets by contract



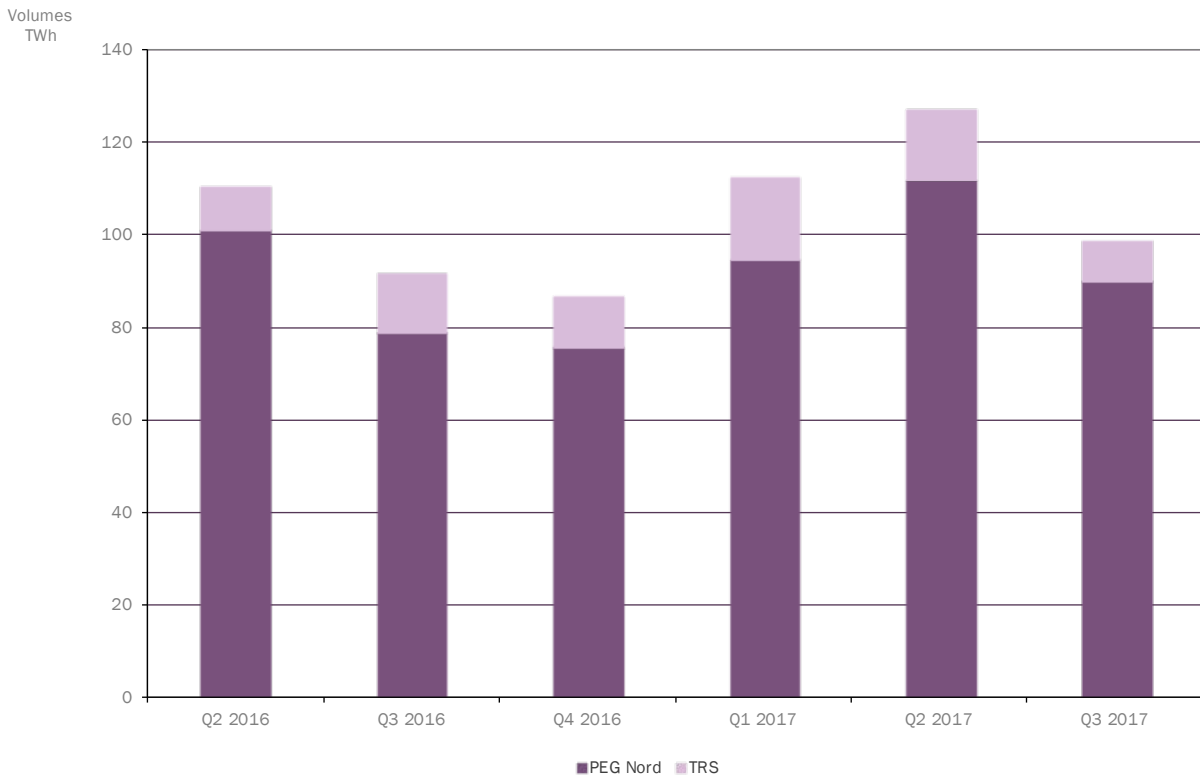
Source: Powernext, Brokers – Analysis: CRE

Figure 34: Trading volumes in the spot markets by PEG



Source: Powernext, Brokers – Analysis: CRE

Figure 35: Trading volumes in the forward markets by PEG



Source: Powernext, Brokers – Analysis: CRE

Figure 36: Trading volumes in the spot markets by type of intermediation

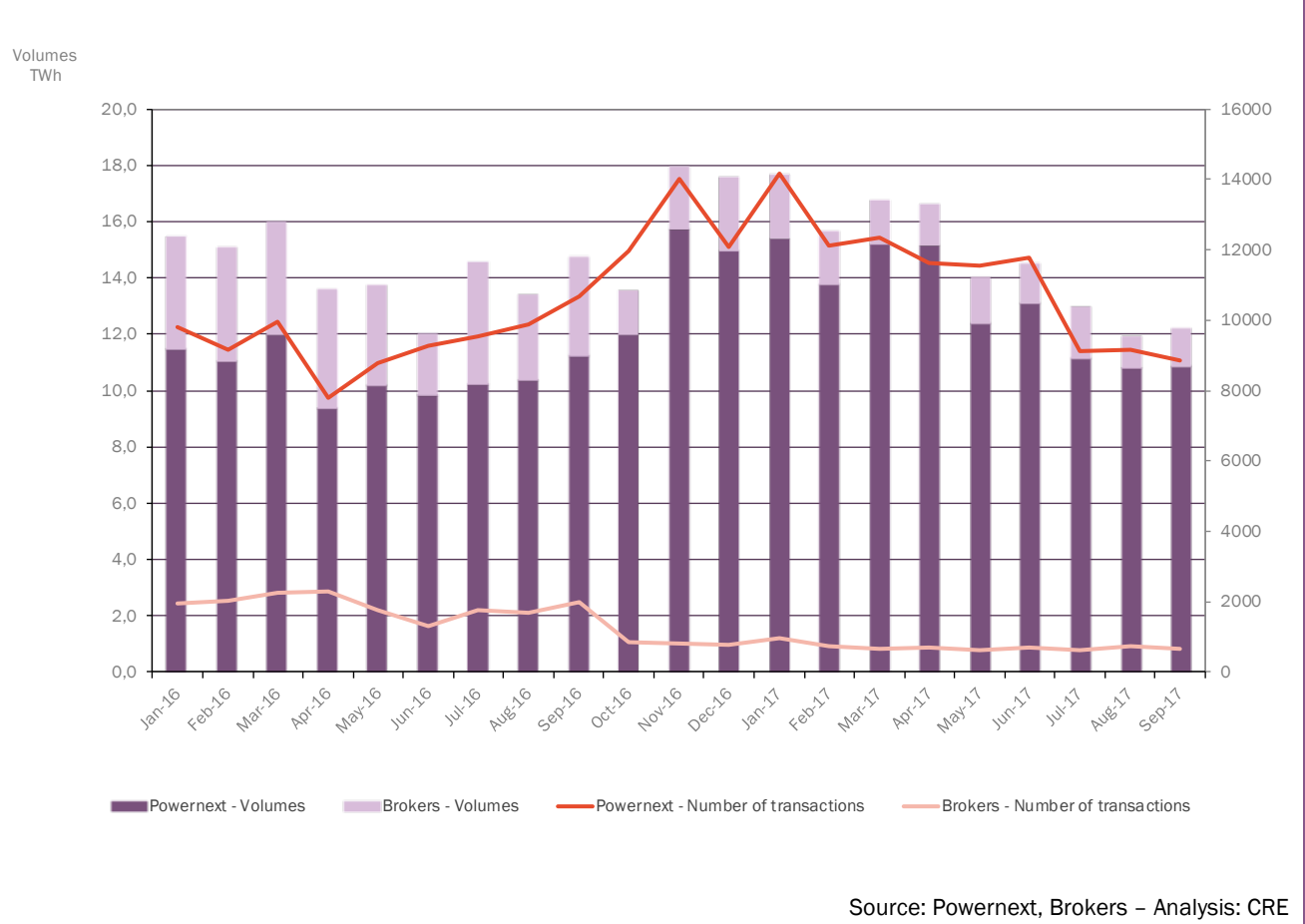


Figure 37: Trading volumes in the forward markets by type of intermediation

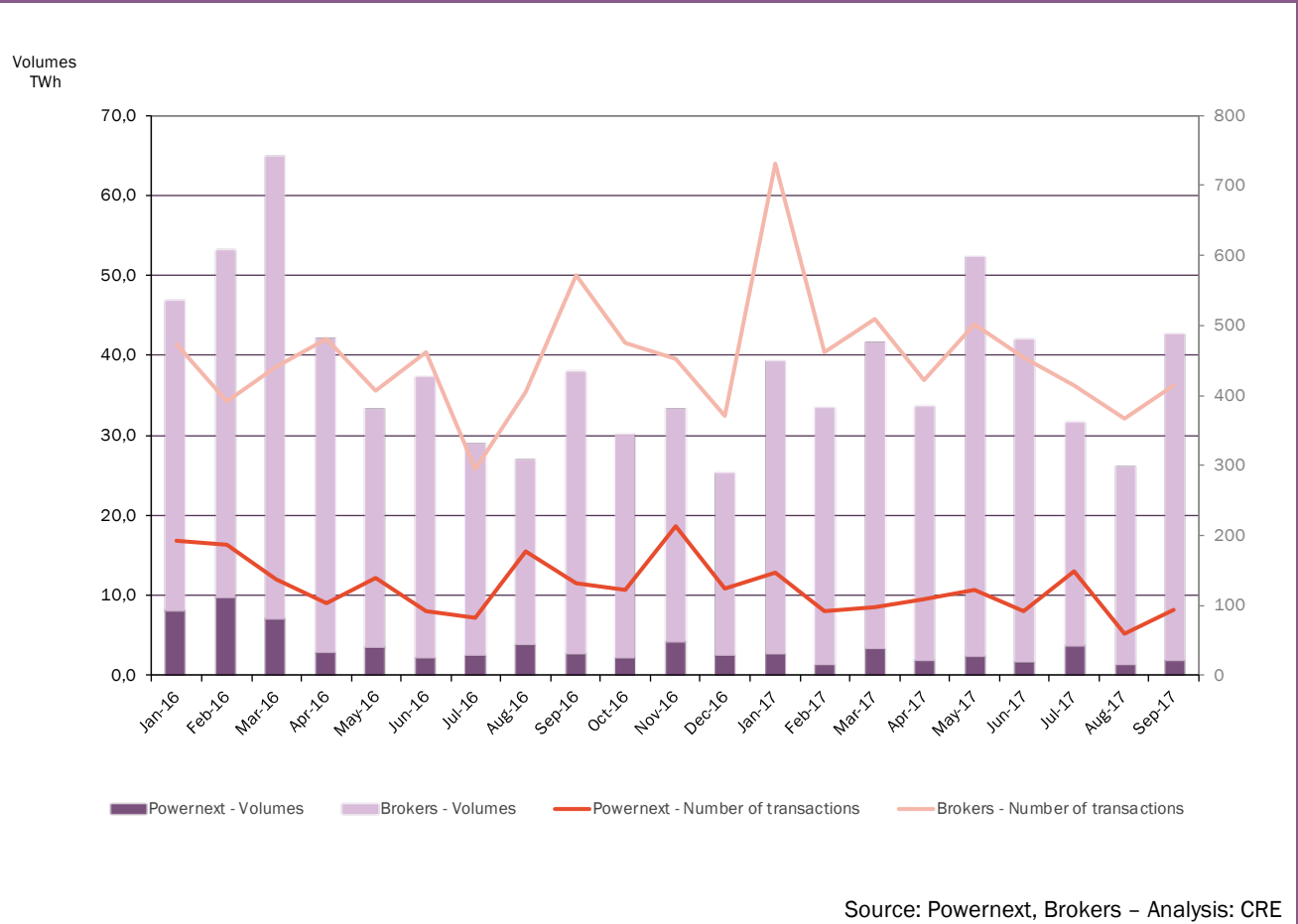
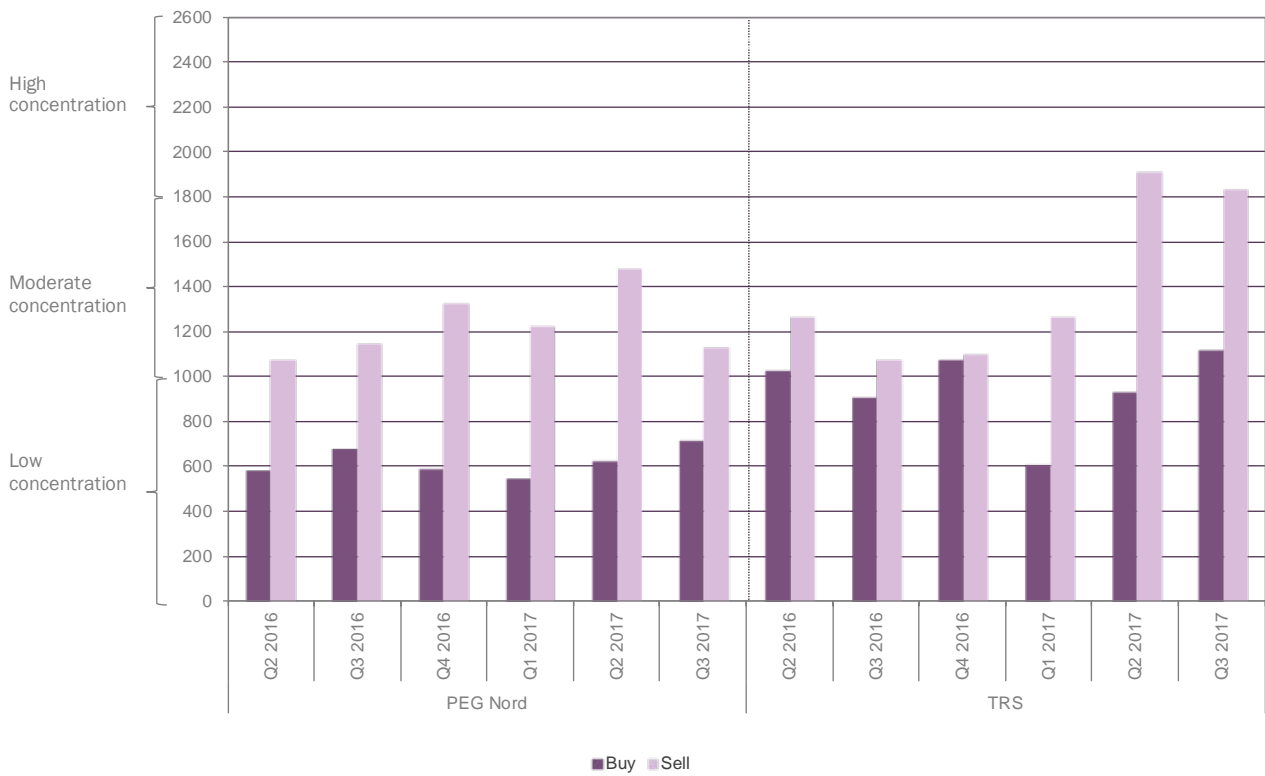
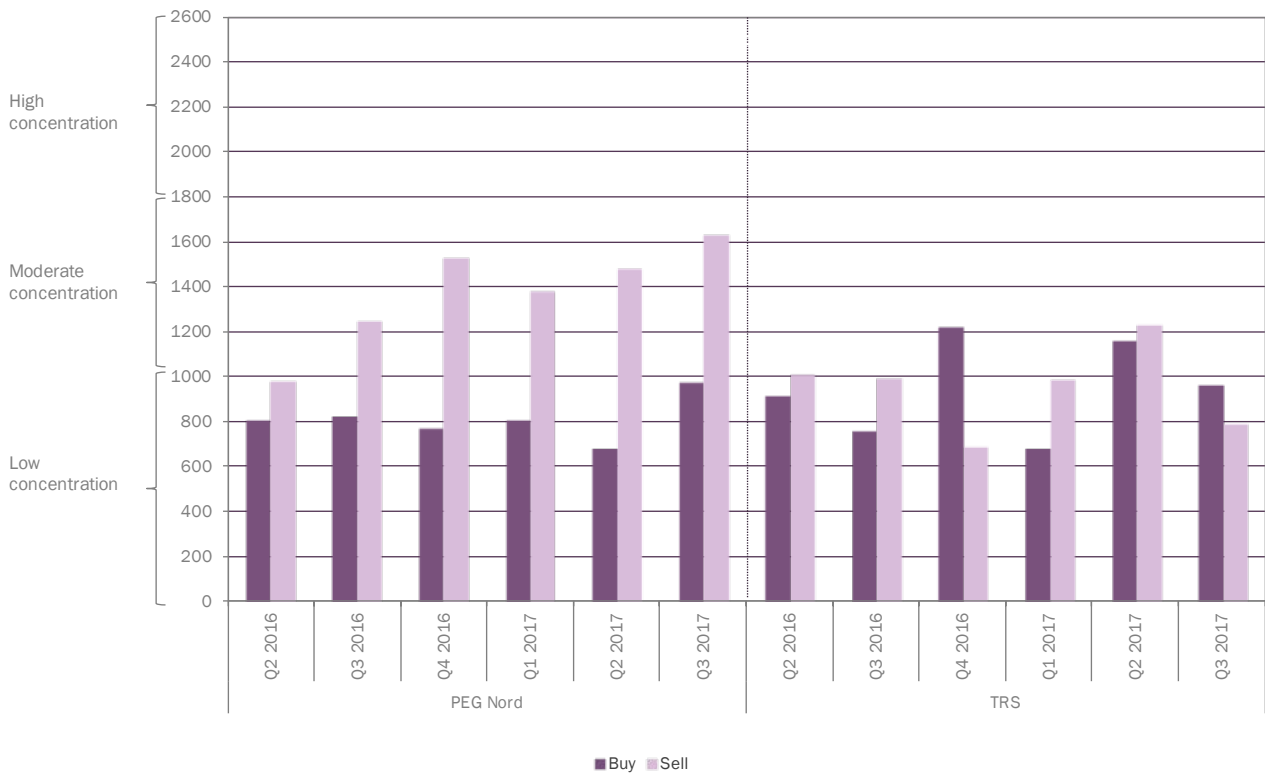


Figure 38: Concentration indexes in France on the spot market, by PEG



Source: Pownext, Brokers – Analysis: CRE

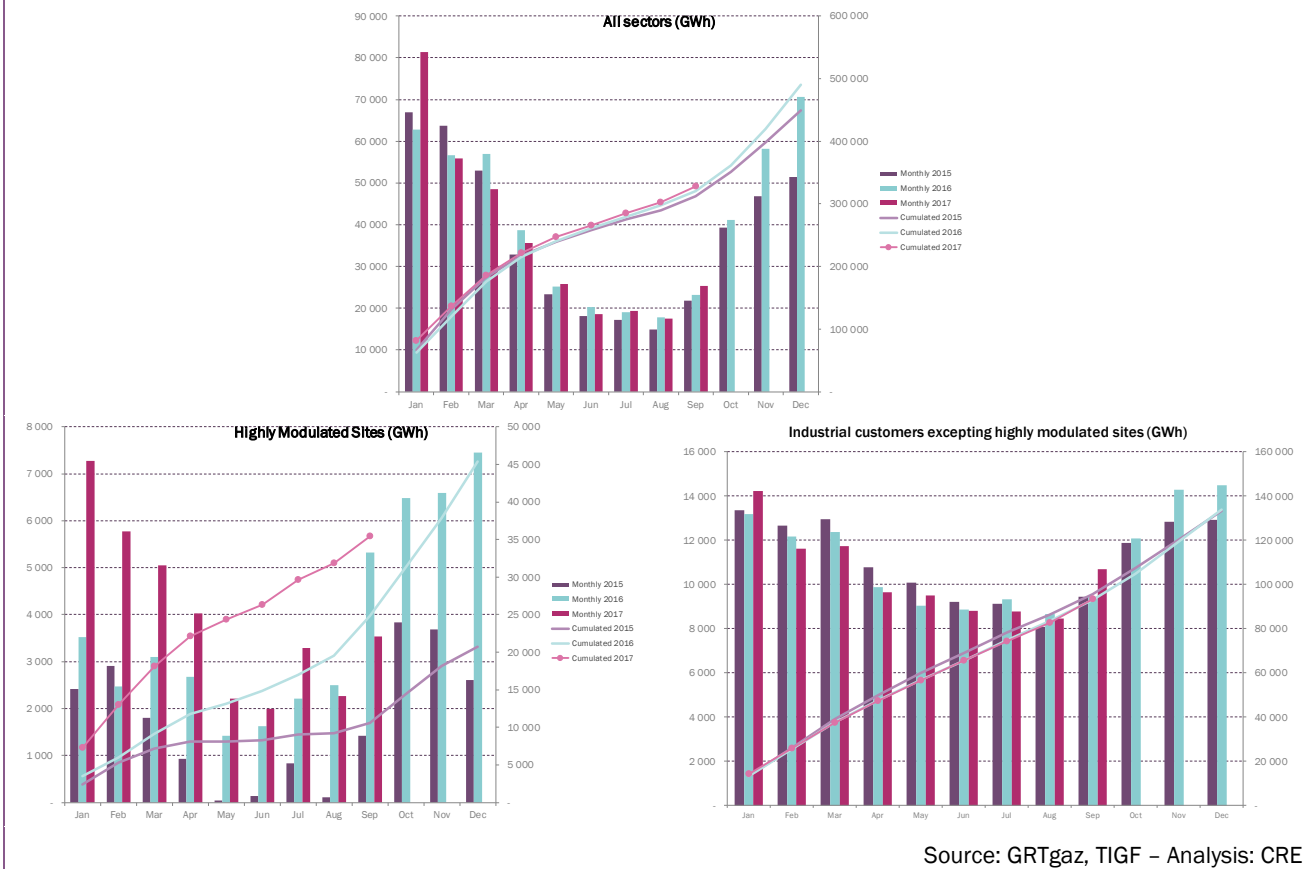
Figure 39: Concentration indexes in France, by PEG



Source: Powernext, Brokers – Analysis: CRE

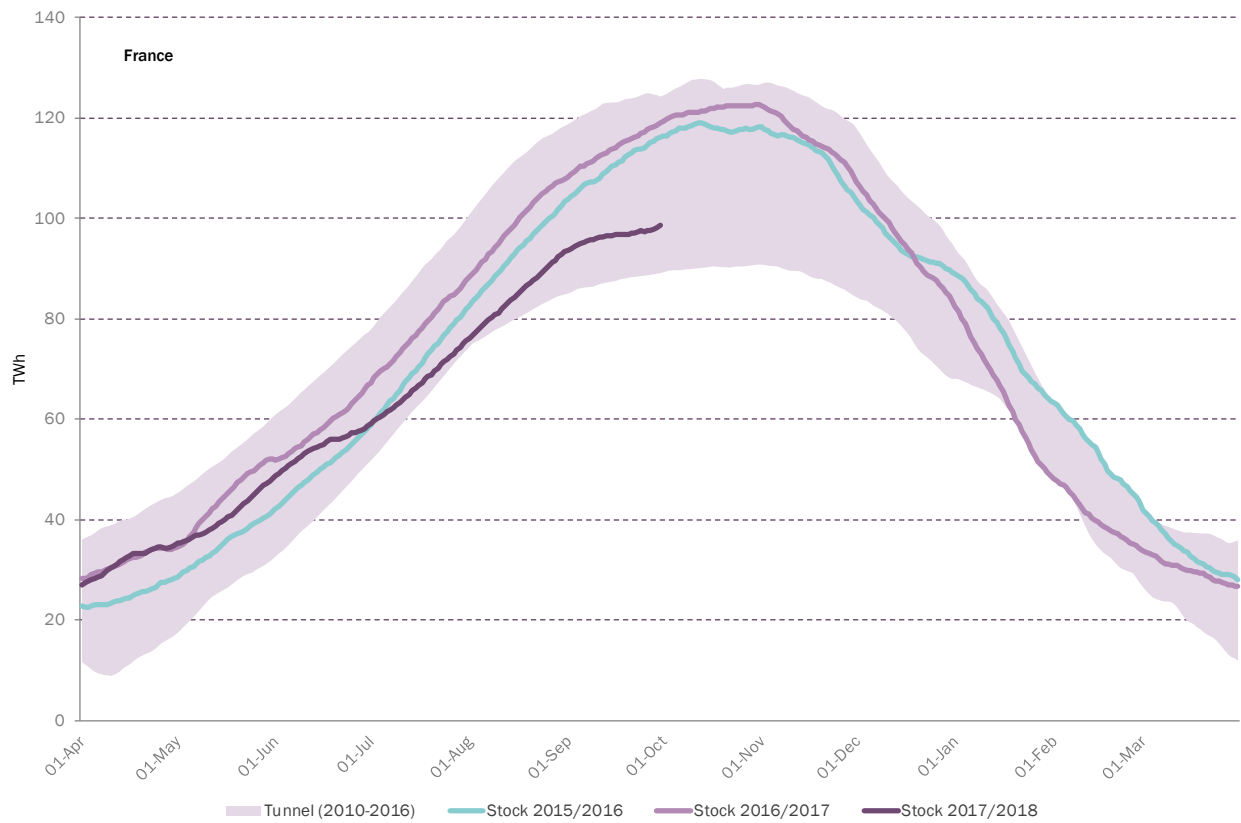
4.4 Market fundamentals

Figure 40: Natural gas consumption in France



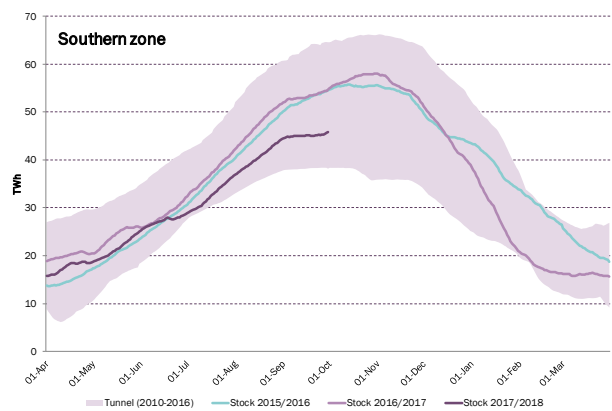
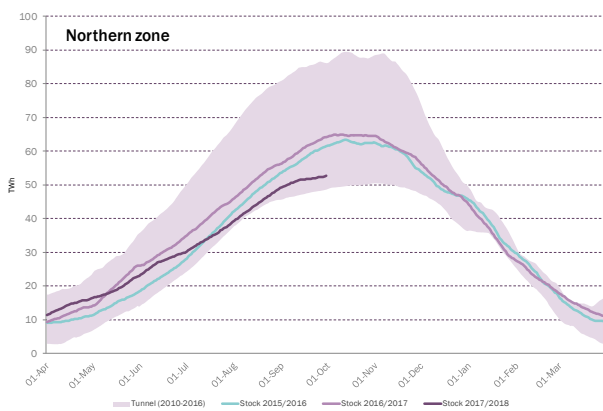
Source: GRTgaz, TIGF – Analysis: CRE

Figure 41: French stocks



Source: Storengy, TIGF – Analysis: CRE

Figure 42: French stocks by zone



Source: GRTgaz, TIGF – Analysis: CRE

Figure 43: Send-out of the French LNG terminals

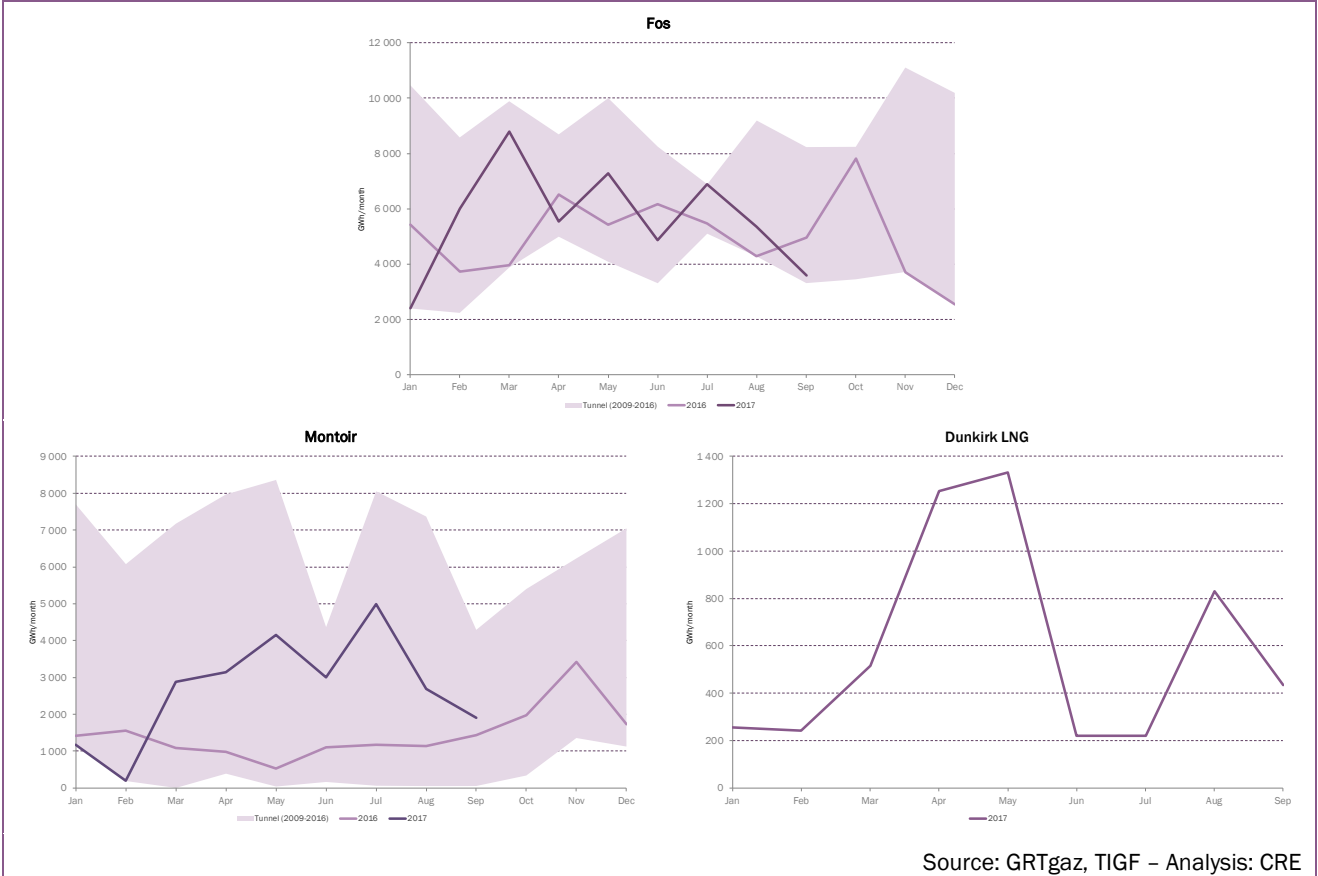
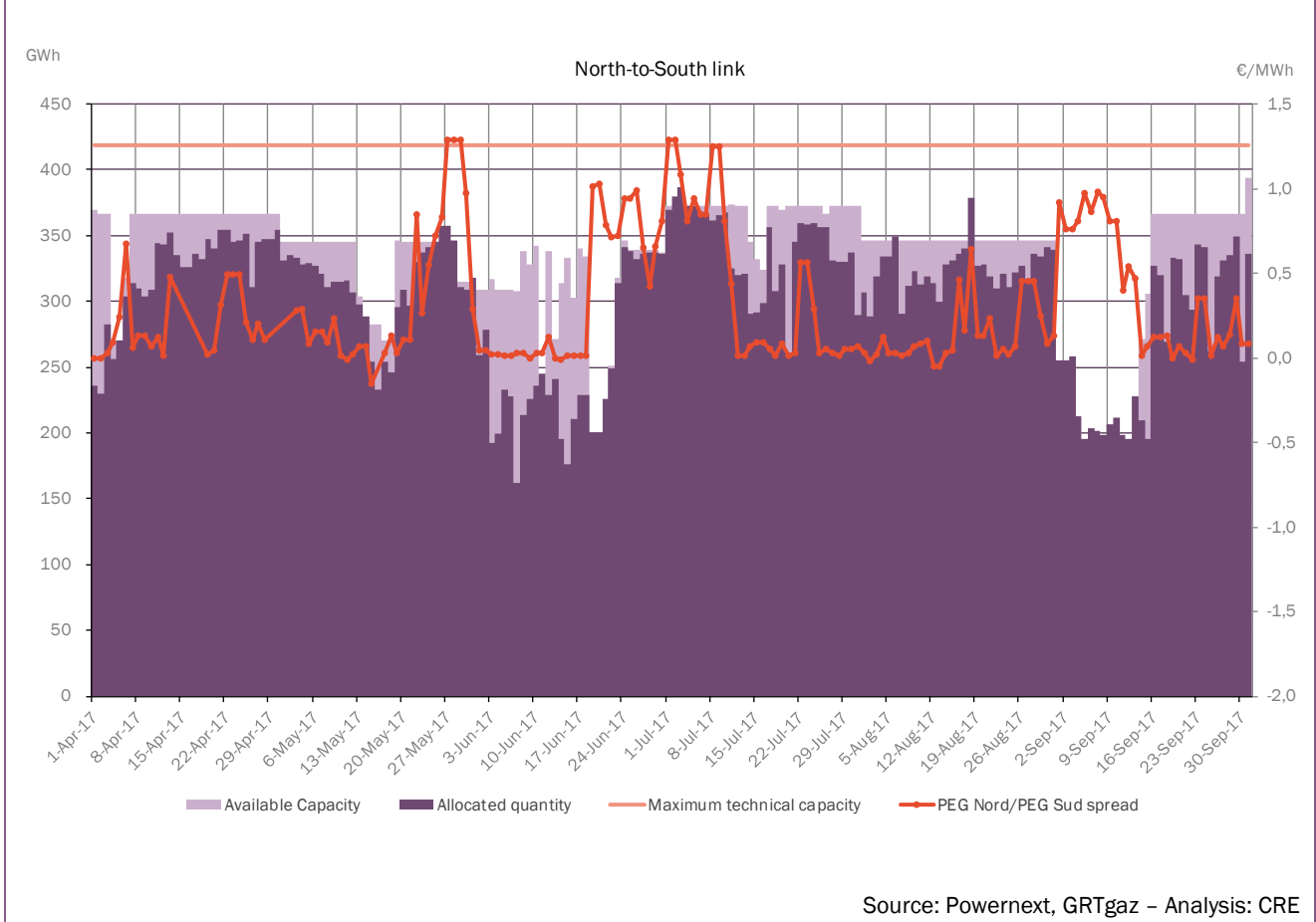


Figure 44: North-South link utilization (North to south)



Source: Powernext, GRTgaz - Analysis: CRE

Figure 45: Dunkirk interconnection utilization (Entry)

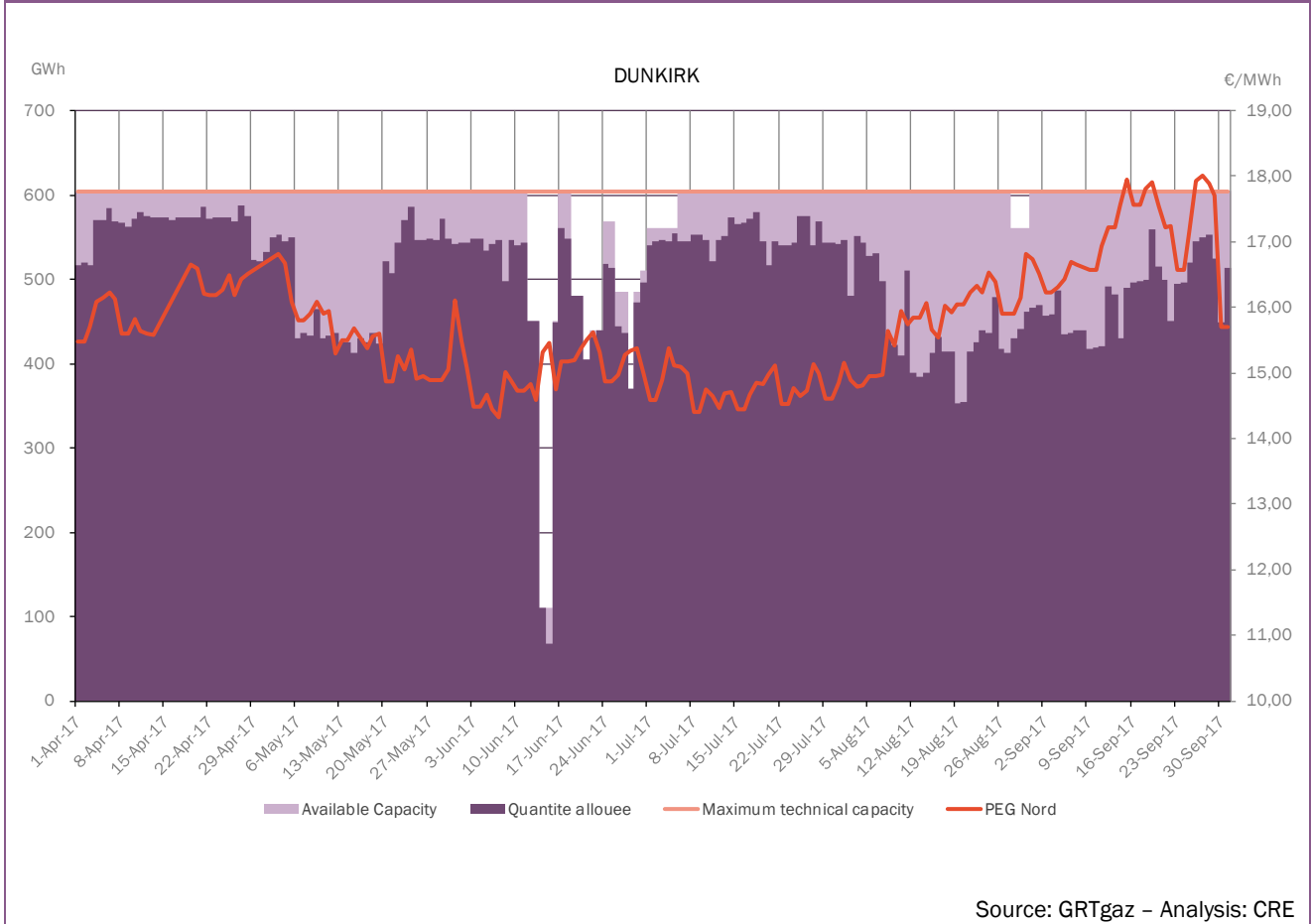


Figure 46: Taisnieres-H interconnection utilization (Belgium to France)

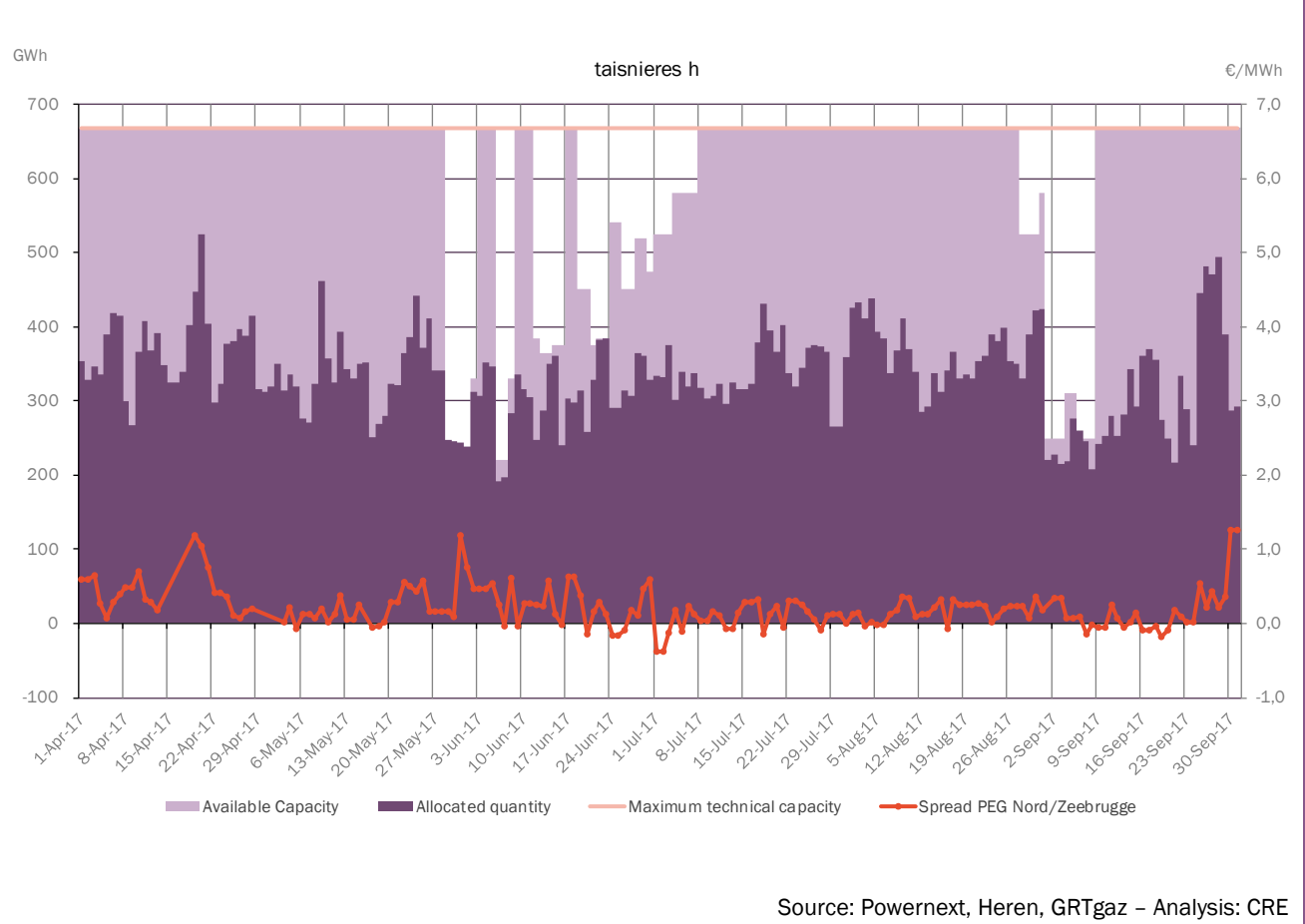


Figure 47: Obergailbach interconnection utilization (Germany to France)

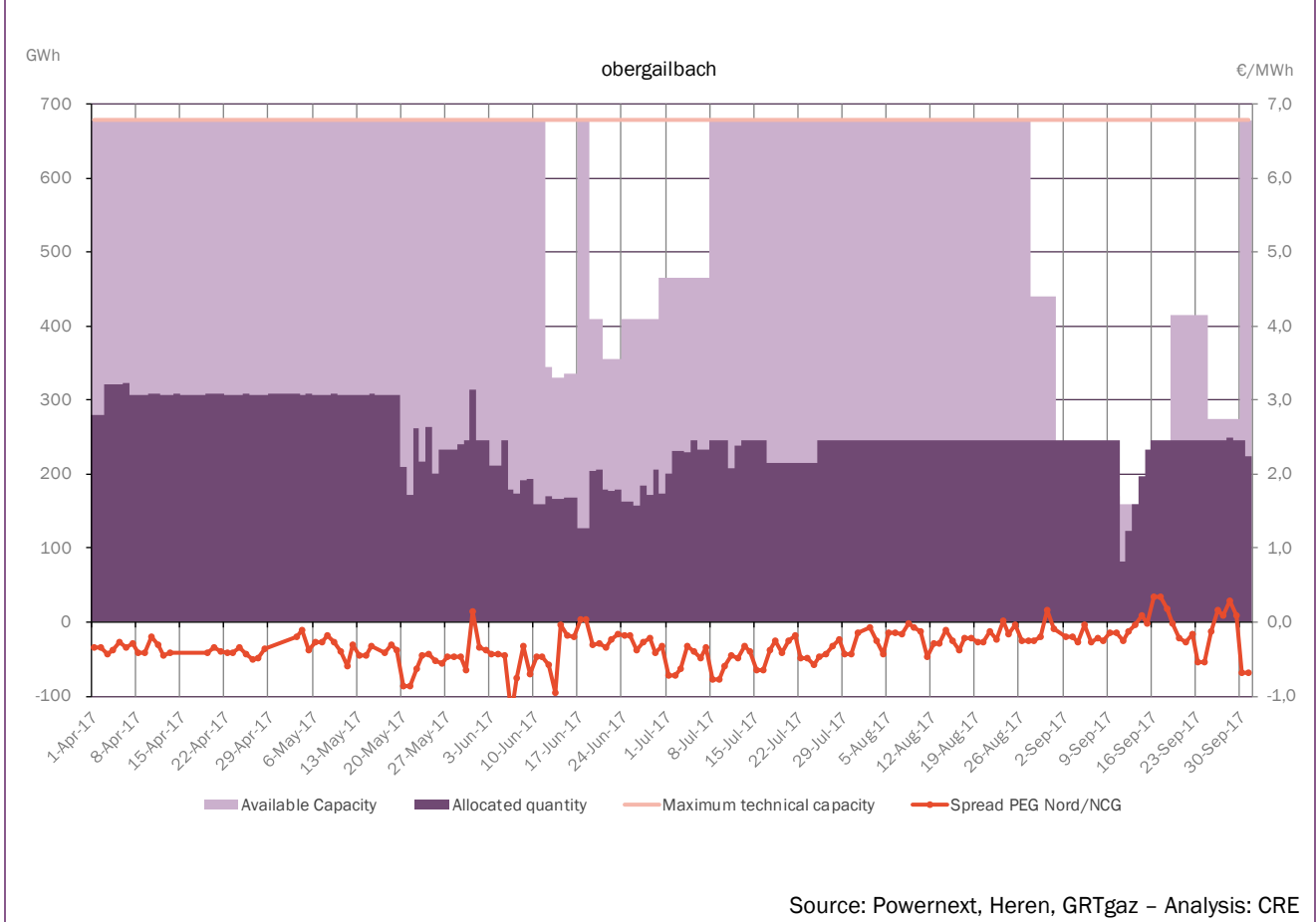
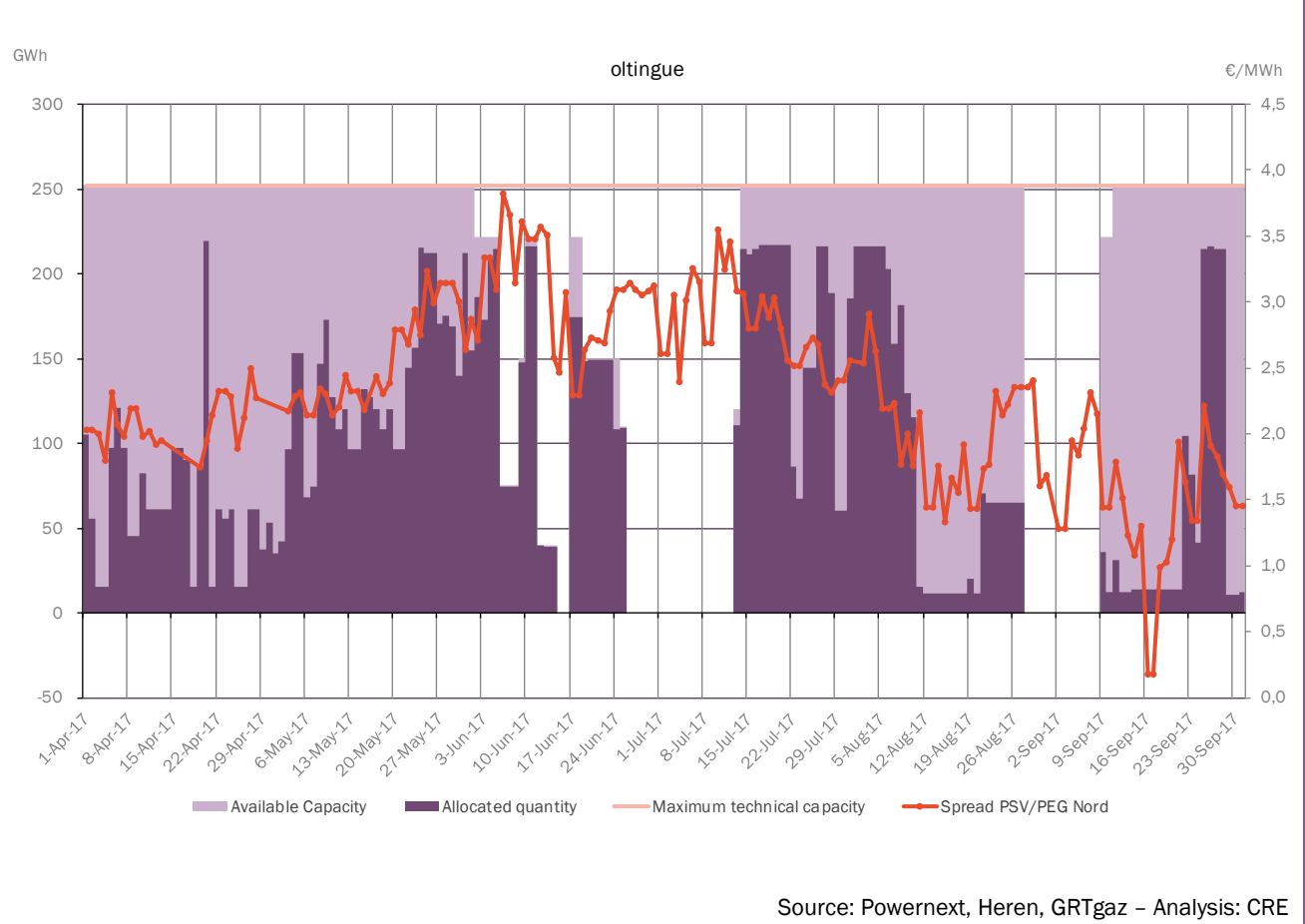
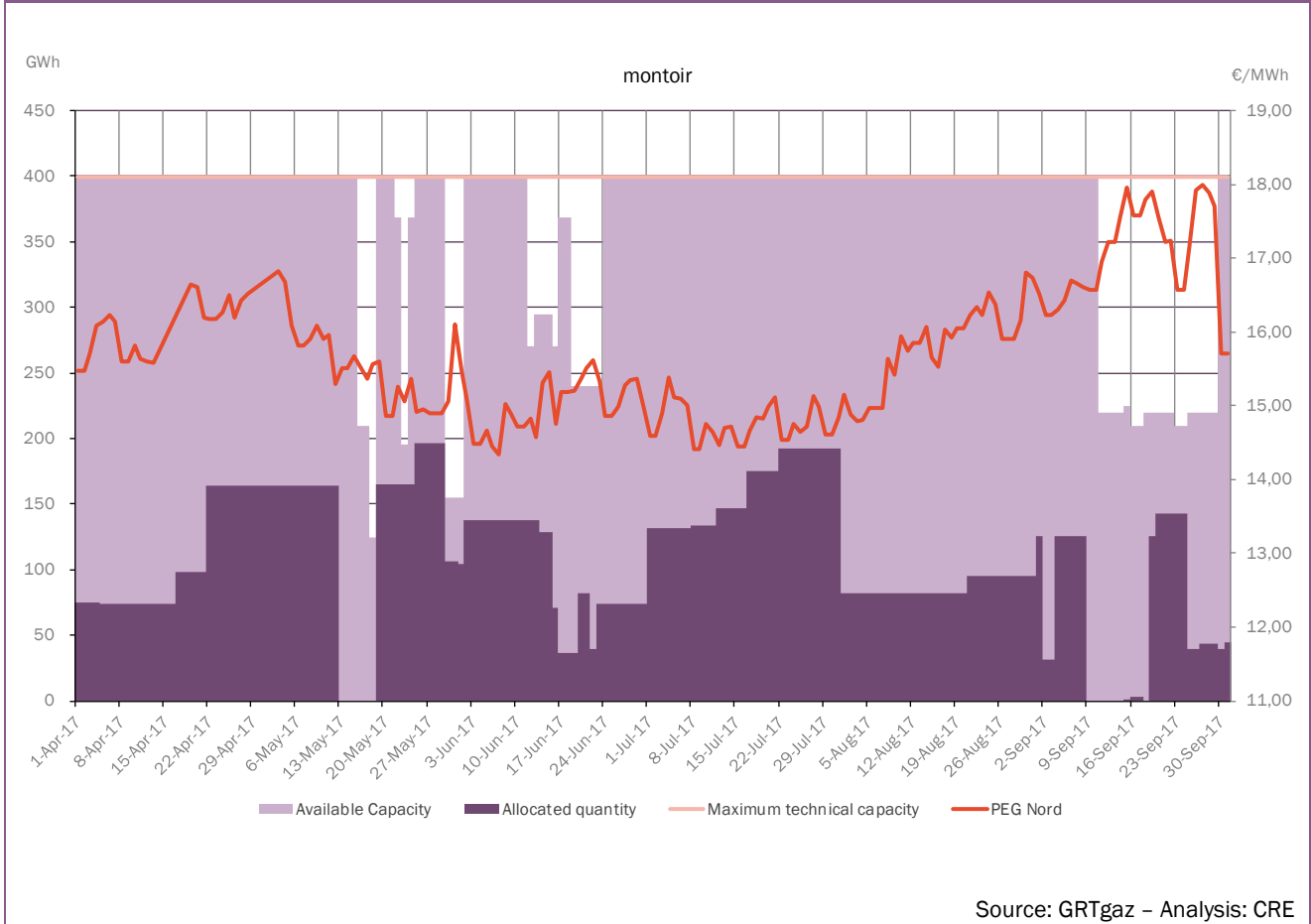


Figure 48: Oltingue interconnection utilization (France to Switzerland)



Source: Powernext, Heren, GRTgaz – Analysis: CRE

Figure 49: Montoir entry point utilization (entry)



Source: GRTgaz - Analysis: CRE

Figure 50: Fos entry point utilization (entry)

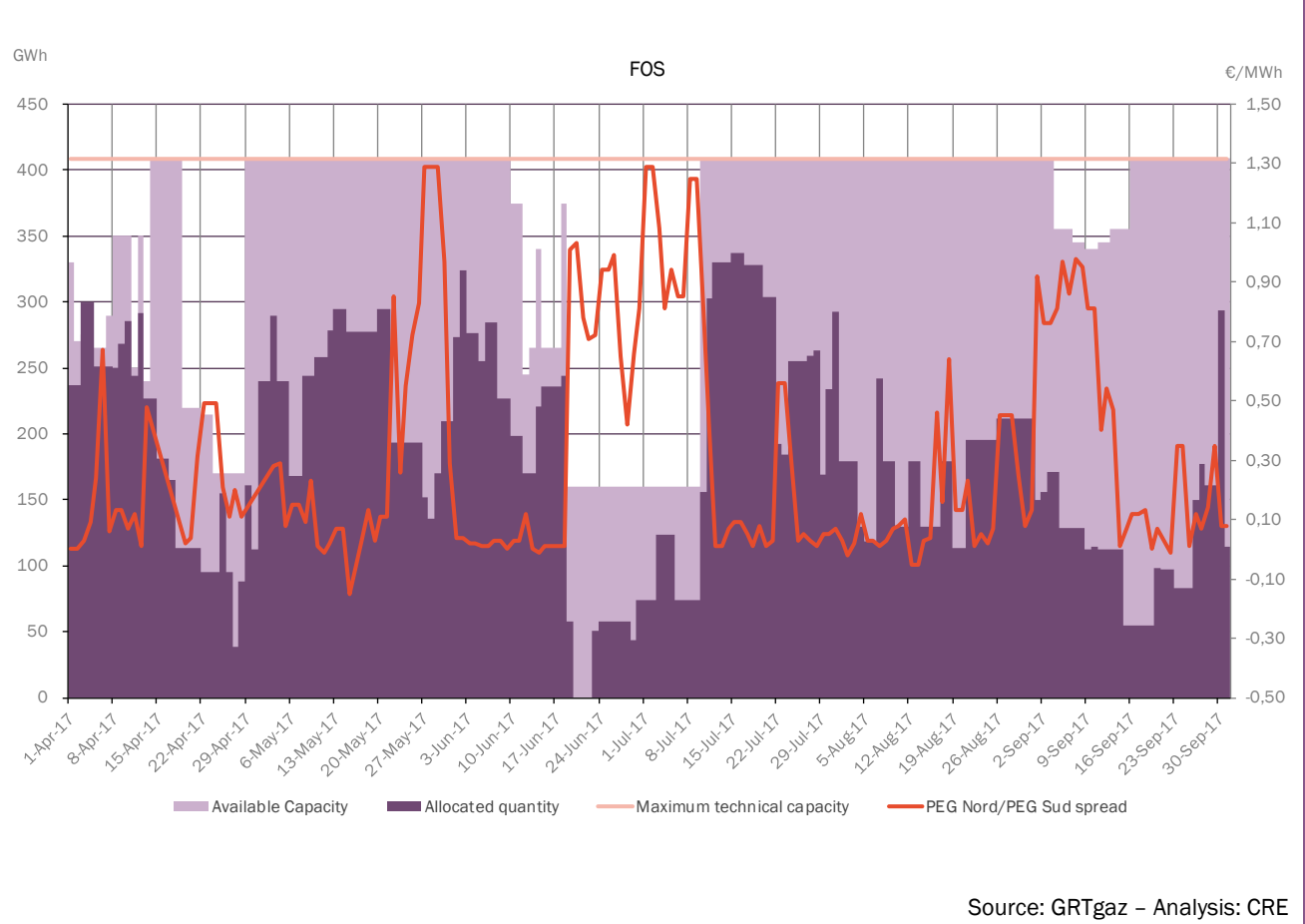
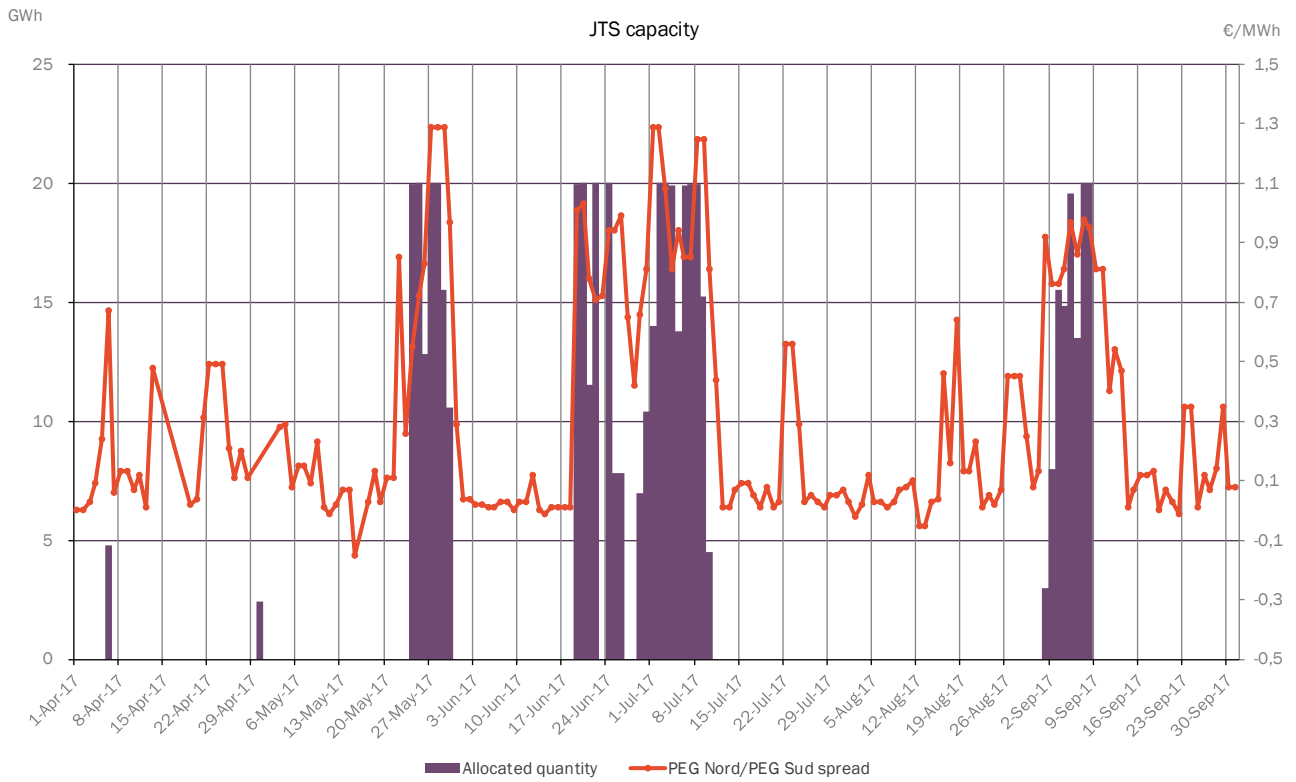


Figure 51: JTS capacity utilization (North to South)



Source: Pownext, GRTgaz – Analysis: CRE

Figure 52: Exports from France to Spain vs PEG Nord/Sud spread

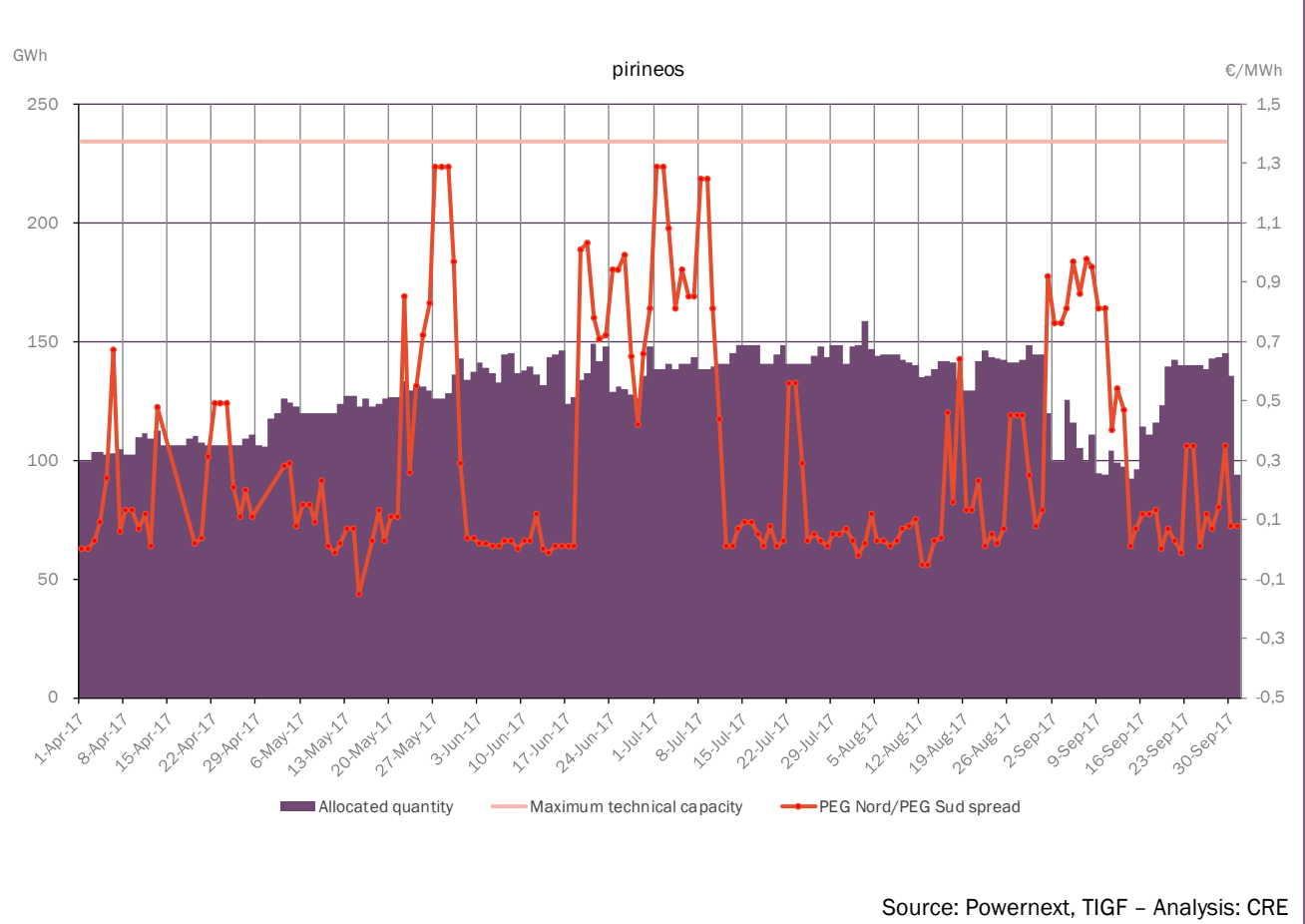
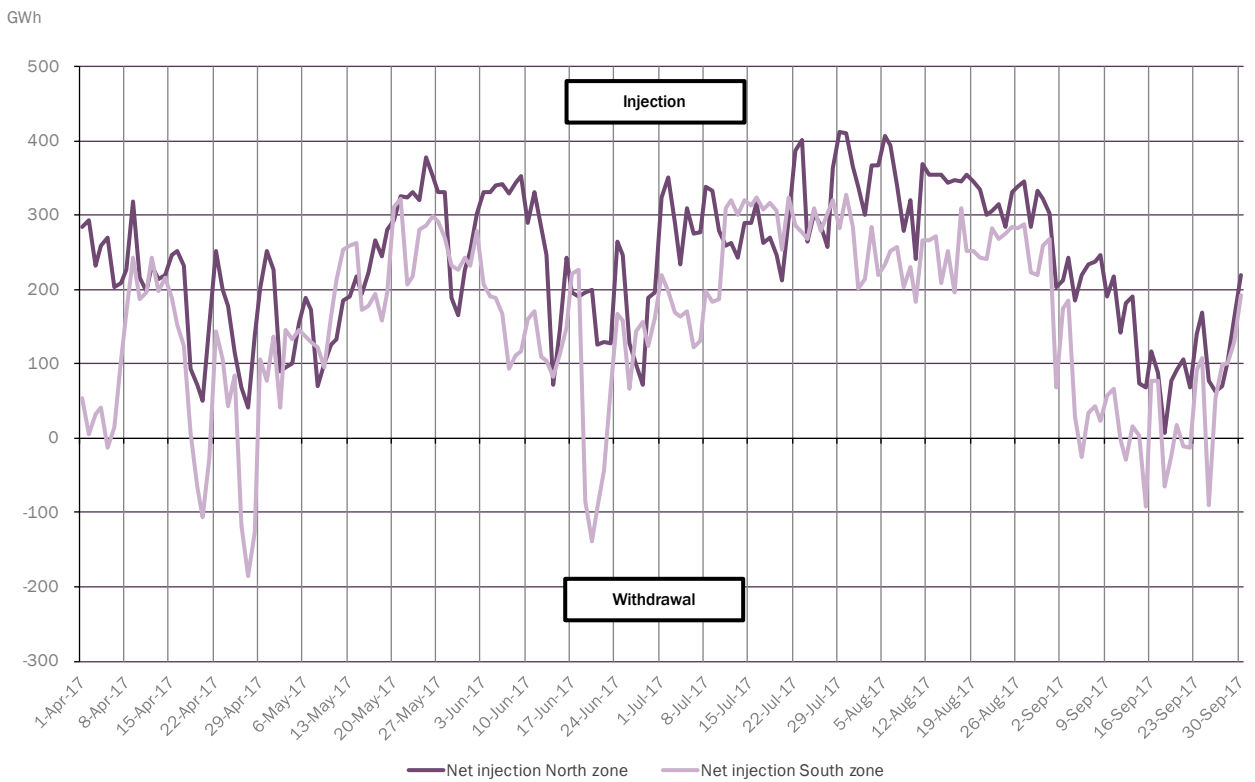
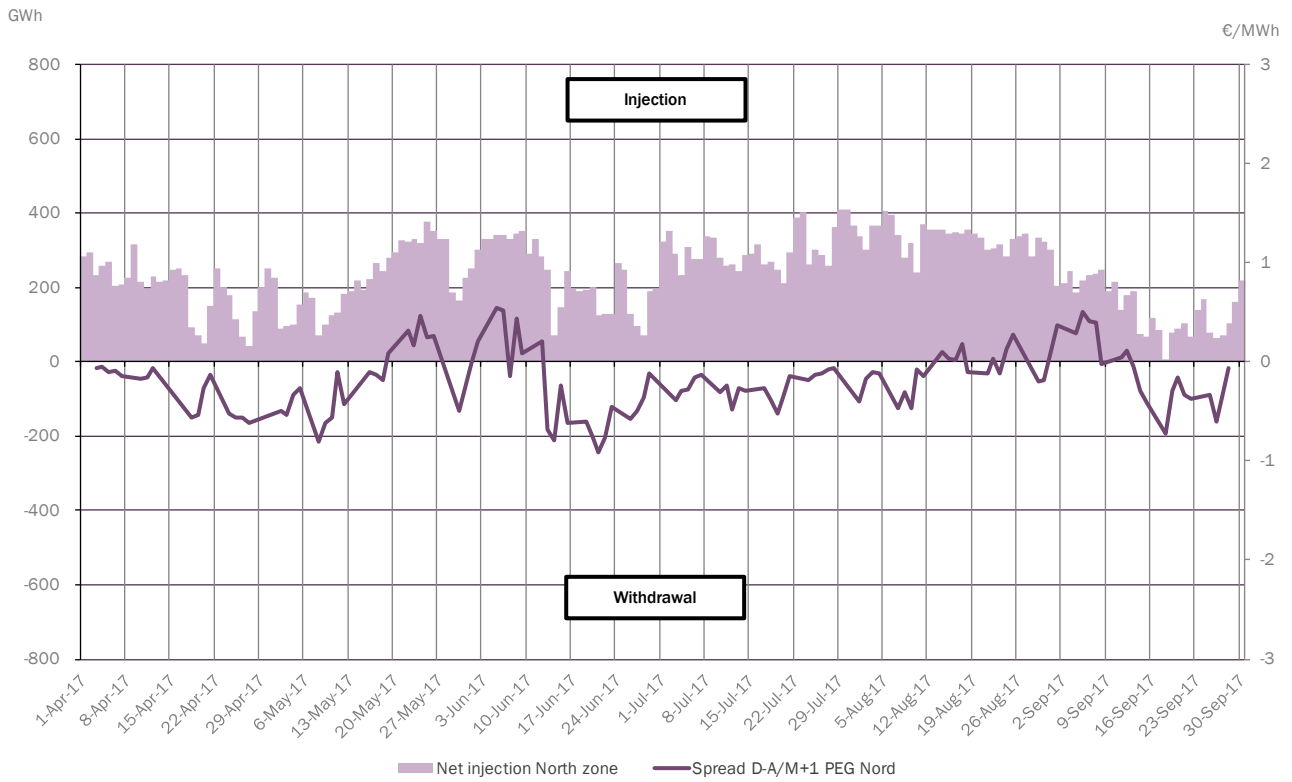


Figure 53: Storages utilization



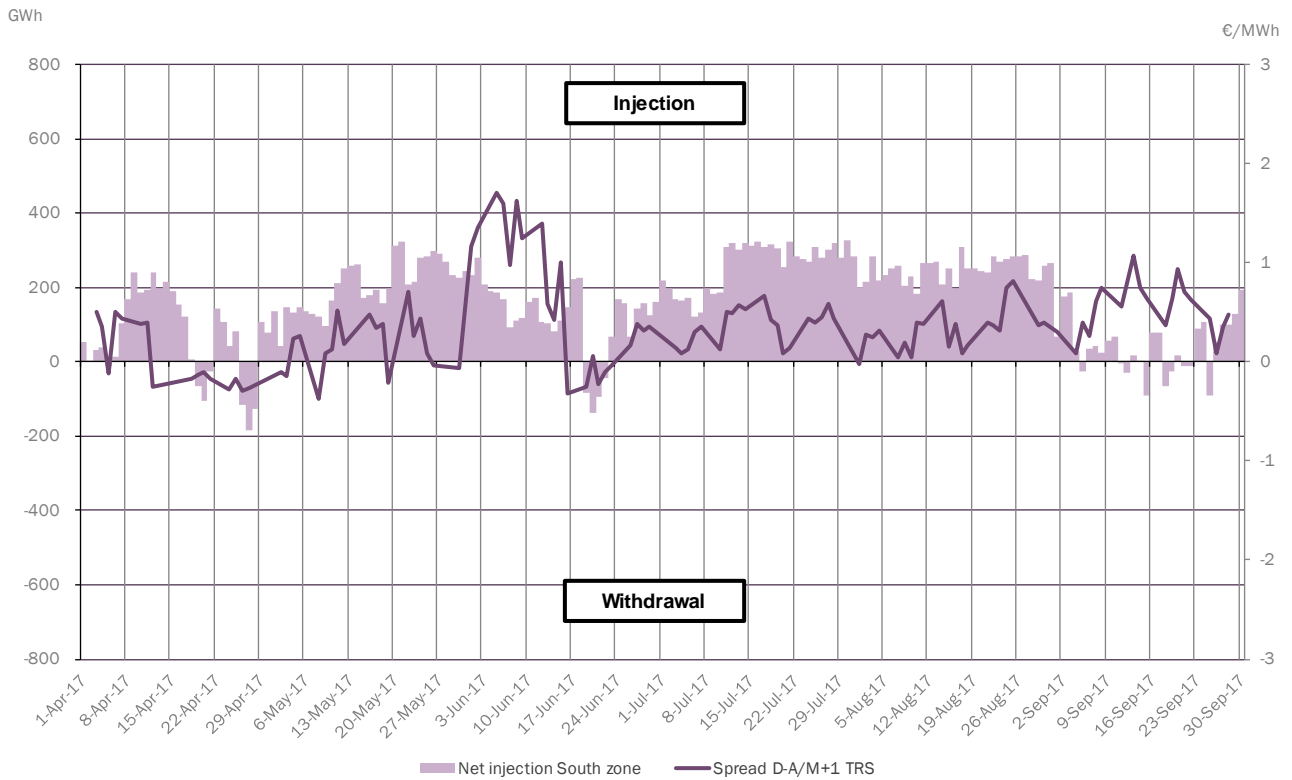
Source: GRTgaz, TIGF - Analysis: CRE

Figure 54: Net stock variation in the North zone vs temporal spreads (same trading date)



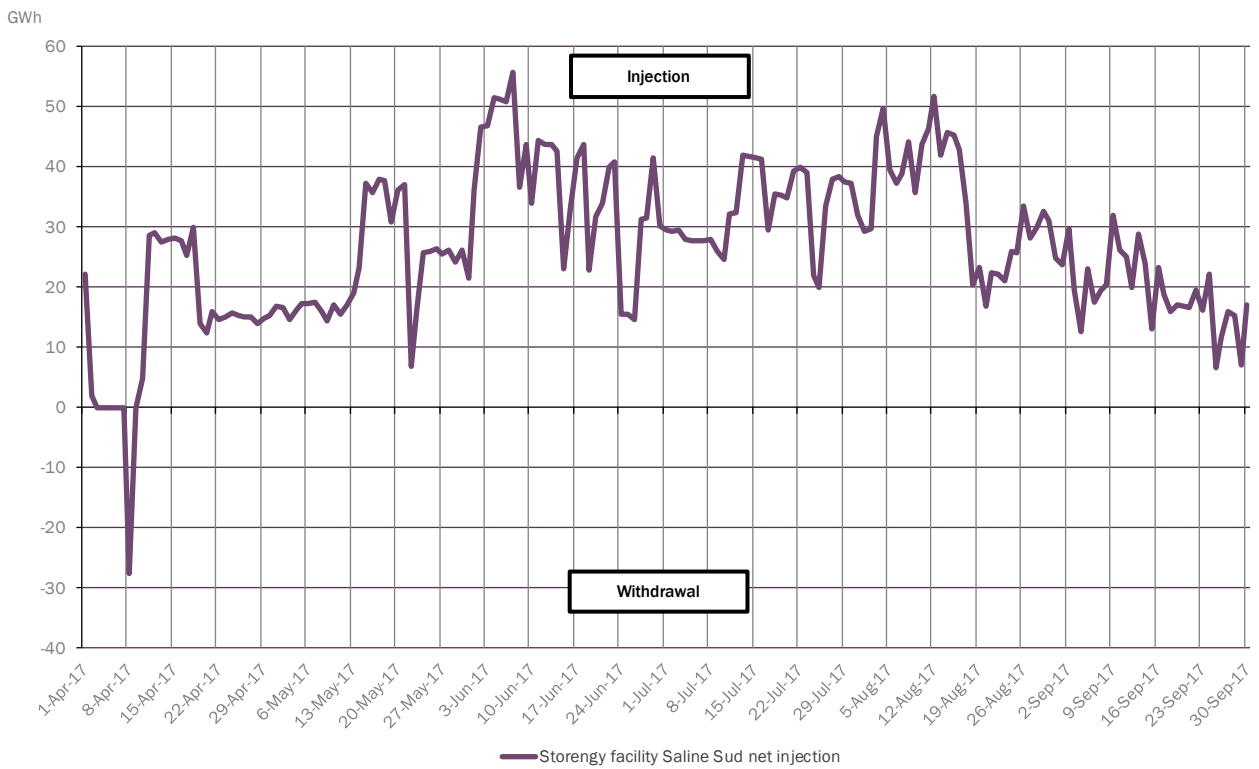
Source: Pownext, GRTgaz - Analysis: CRE

Figure 55: Net stock variation in the South zone vs temporal spreads (same trading date)



Source: Pownertex, GRTgaz - Analysis: CRE

Figure 56: Net stock variation of Salins storage in the South zone



Source: GRTgaz, TIGF – Analysis: CRE

PART 3: **WHOLESALE CO₂ MARKET**

1. MAIN DATES

26 May 2015	The Parliament and the European Council agreed on the anticipated implementation of the MSR in 2018 to resorb the allowance surplus starting from January 2015. A formal vote is expected for end July
1st July 2015	Decision of the German government to shut down 2.7 GW lignite-fired power plants in Germany in order to reach its emission reduction objectives.
8 July 2015	The Parliament and the European Council agreed on the anticipated implementation of the MSR in 2018 to resorb the allowance surplus starting from January 2015. A formal vote is expected for end July
6 October 2015	The Council formally approved the EU Commission proposal concerning the establishment and the operation of a MSR for the EU ETS. The MSR will be implemented in 2018 and the allowances will be put into the reserve from 1 January 2019
12 December 2015	Global climate agreement after the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21/CMP11) which was held in Paris
25 April 2016	French President's announcement at the environmental conference the 25 April 2016 to unilaterally set a carbon price floor starting from as soon as 2016.
24 June 2016	The United Kingdom decides by referendum that it will exit the European union.
11 July 2016	The French Minister of Environment and Energy indicated on 11 July 2016 that the proposal would only concern coal power plants.
21 October 2016	French government deferred the introduction of a floor price for CO ₂ .
9 November 2017	European Parliament and Council agreement on the EU ETS reform for the period after 2020

2. KEY DATA

Table 8: Volumes of EUA/CER products exchanged on the wholesale carbon market

	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
						In percentage	Variation	In percentage	Variation
Volumes exchanged (Mt)	1451	2288	1622	1549	2023	31%	-74	39%	572
Volumes EUA	1440	2274	1618	1545	2021	31%	475	40%	580
<i>exchange</i>	1189	1797	1373	1179	1388	18%	209	17%	199
<i>brokers</i>	251	477	245	366	633	73%	266	152%	381
Volumes CER	10	13	4	3	2	-41%	-1	-81%	-8
<i>exchange</i>	8	9	3	3	1	-67%	-2	-88%	-7
<i>brokers</i>	2,2	4,3	1,1	0,3	1,0	217%	0,7	-58%	-1,3
Volumes EUA Exchange (Mt)									
EUA spot	229	219	271	192	192	0%	0	-16%	-37
EUA future	200	563	1047	967	1135	17%	168	468%	935
<i>Dec'17</i>	121	414	838	740	867	17%	127	617%	746
<i>Dec'18</i>	64	99	130	136	162	19%	26	153%	98
<i>Dec'19</i>	12	38	52	65	70	8%	5	483%	58
<i>Dec'20</i>	3	12	27	26	36	38%	10	1100%	33

Source: ECX, EEX, LEBA – Analysis: CRE

Table 9: Evolution of EUA/CER prices on the carbon market

	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
						In percentage	Variation	In percentage	Variation
Spot price (€/tCO ₂)									
EUA/CER average spot price spread	4,2	5,2	4,9	4,6	5,7	25%	1,12	37%	1,54
EUA average spot price	4,5	5,5	5,2	4,8	5,9	23%	1,09	30%	1,35
CER average spot price	0,4	0,3	0,3	0,2	0,2	-12%	-0,03	-48%	-0,19
Future price (€/tCO ₂)									
EUA									
<i>Dec'17</i> EUA average price	4,59	5,54	5,17	4,81	5,91	23%	1,10	29%	1,32
<i>Dec'18</i> EUA average price	4,63	5,57	5,20	4,85	5,94	22%	1,09	28%	1,31
<i>Dec'19</i> EUA average price	4,70	5,63	5,26	4,93	6,02	22%	1,10	28%	1,33
<i>Dec'20</i> EUA average price	4,77	5,71	5,34	5,01	6,10	22%	1,10	28%	1,33
CER									
<i>Dec'17</i> EUA average price	0,38	0,32	0,28	0,23	0,21	-12%	-0,03	-46%	-0,17
<i>Dec'18</i> EUA average price	0,40	0,33	0,28	0,23	0,21	-12%	-0,03	-49%	-0,19
<i>Dec'19</i> EUA average price	0,40	0,33	0,28	0,23	0,21	-10%	-0,02	-49%	-0,19
<i>Dec'20</i> EUA average price	0,40	0,33	0,28	0,23	0,21	-10%	-0,02	-49%	-0,19

Source: ECX, EEX, LEBA – Analysis: CRE

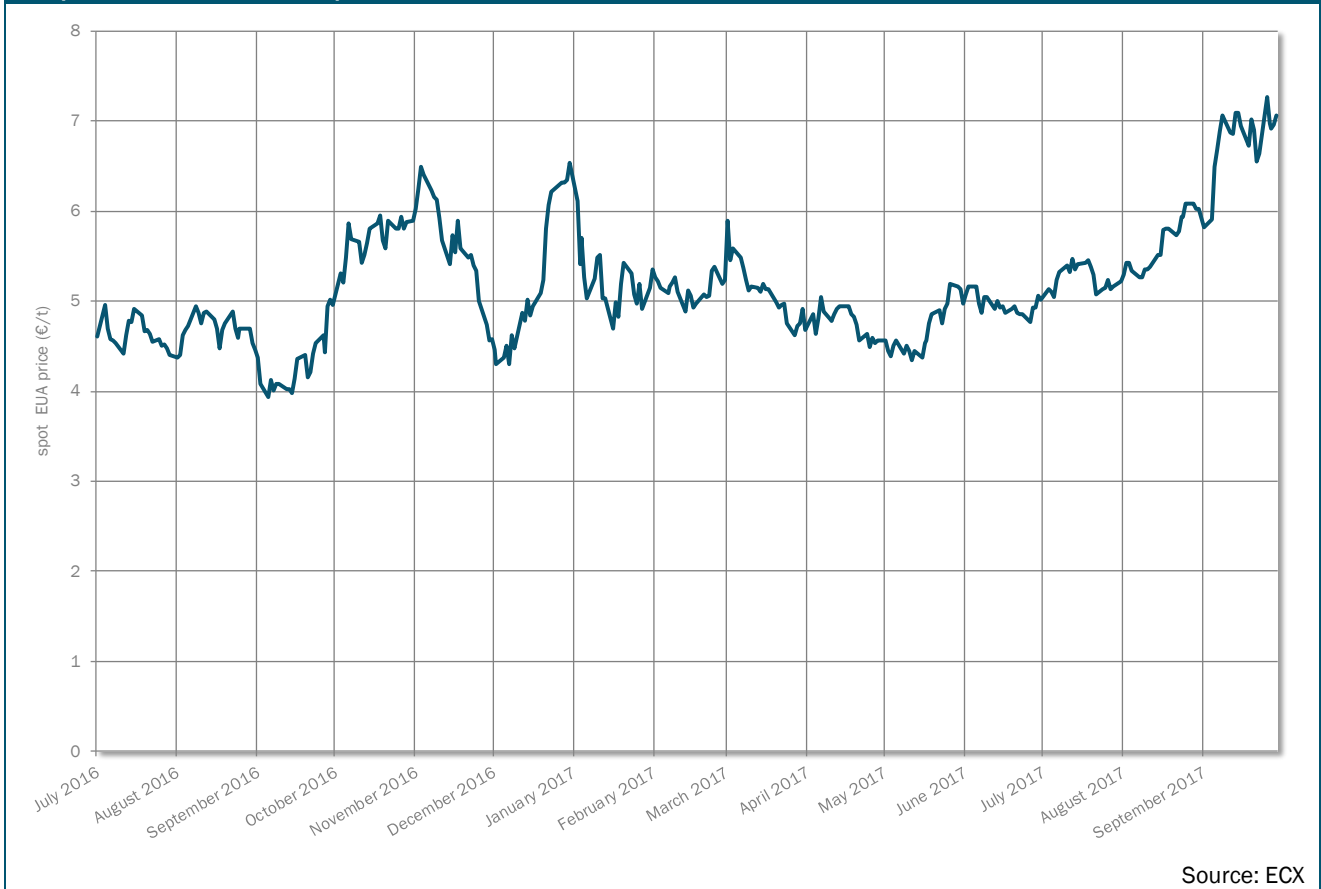
Table 10: Energy products and evolution of market fundamentals

	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Quarterly variation Q3 2017 / Q2 2017		Yearly variation Q3 2017 / Q3 2016	
						In percentage	Variation	In percentage	Variation
Coal (€/t)	52,1	59,1	63,1	61,1	64,3	5%	3,2	23%	12,2
Clean Dark spread (future) (€/MWh)	20,2	35,5	20,4	20,7	22,4	8%	1,7	11%	2,2
Clean Spark spread (future) (€/MWh)	8,2	24,6	9,0	10,7	14,1	31%	3,4	72%	5,9

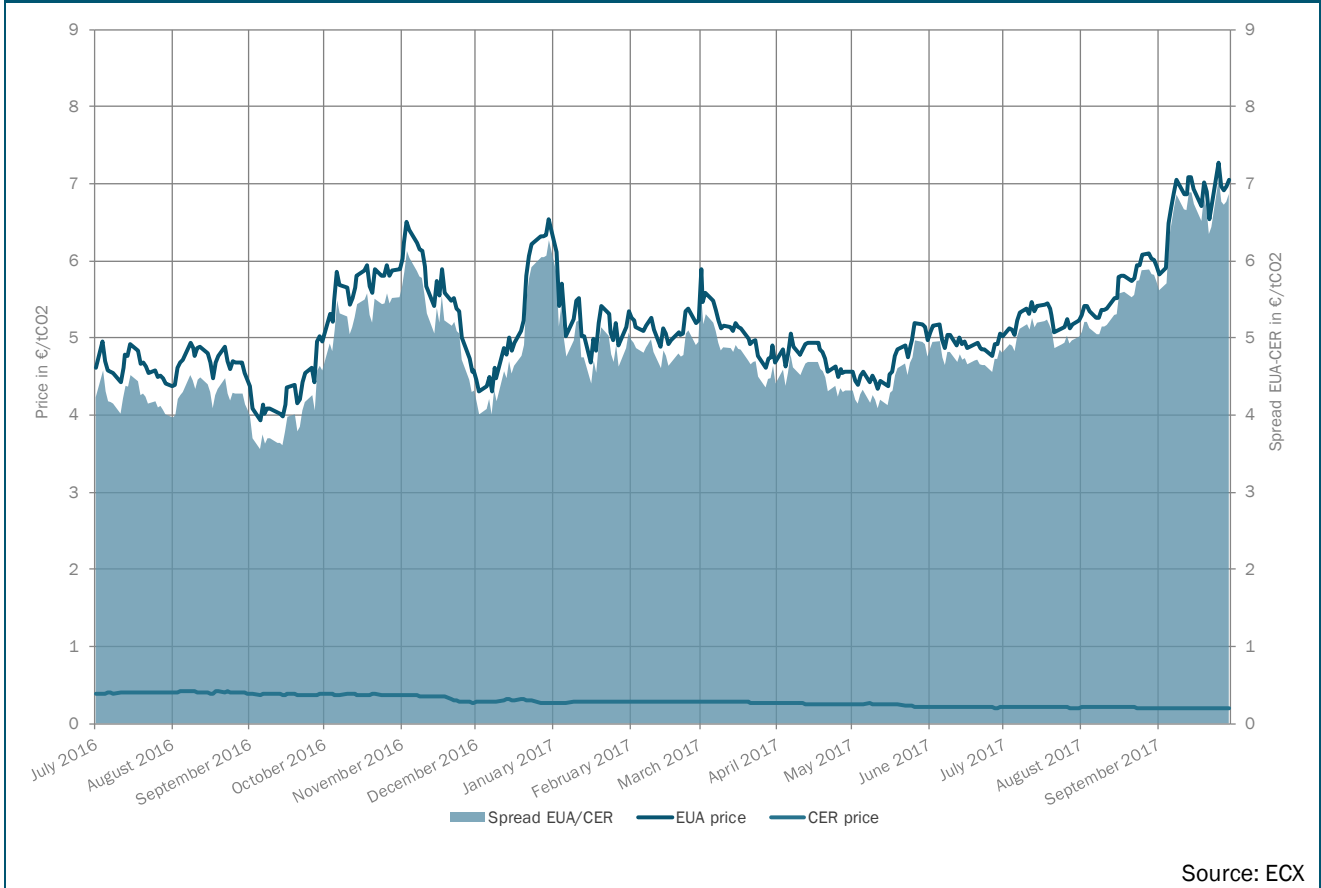
Source: NBP, EEX, ECX – Analysis: CRE

3. GRAPHS

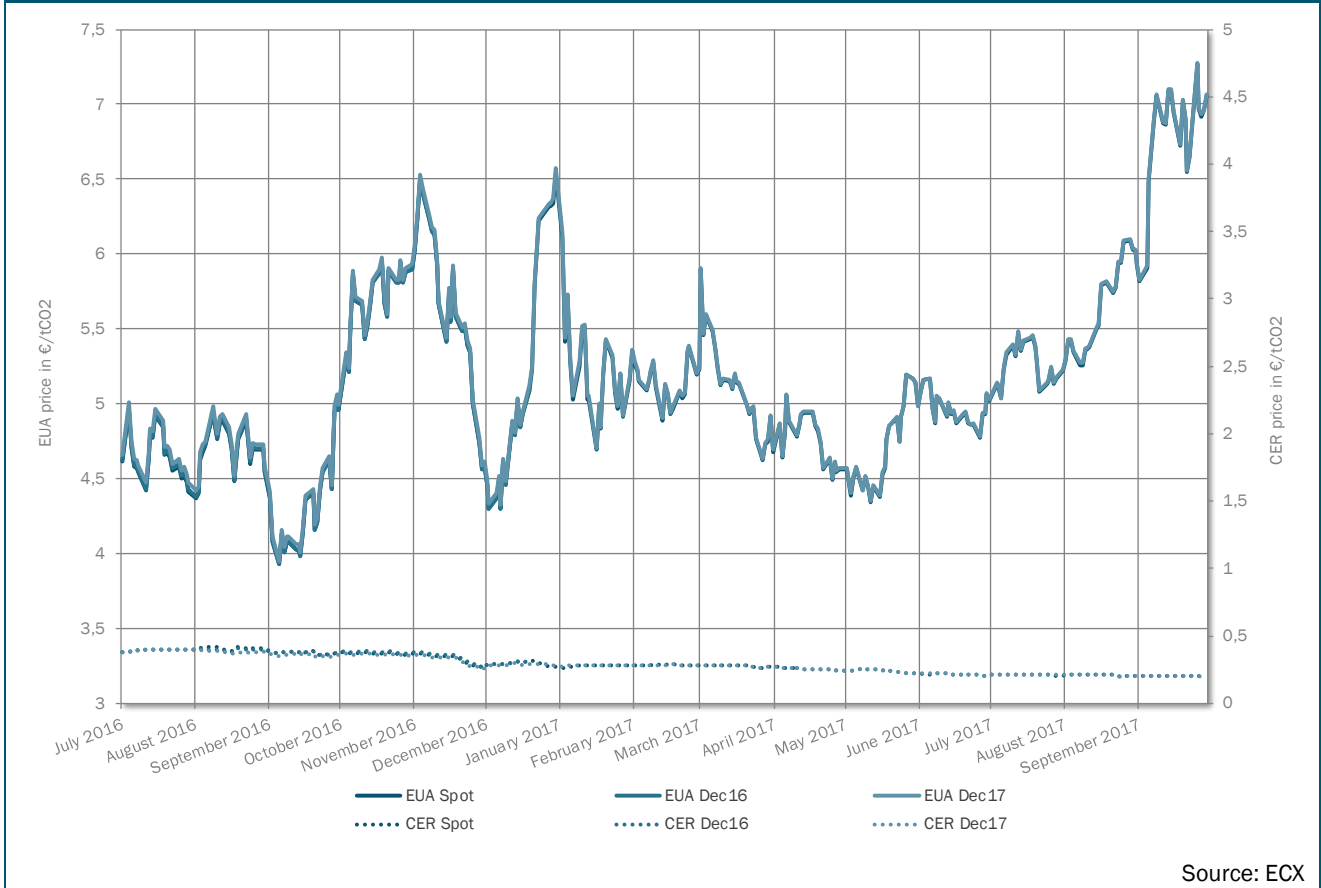
Graph 57: Evolution of EUA prices



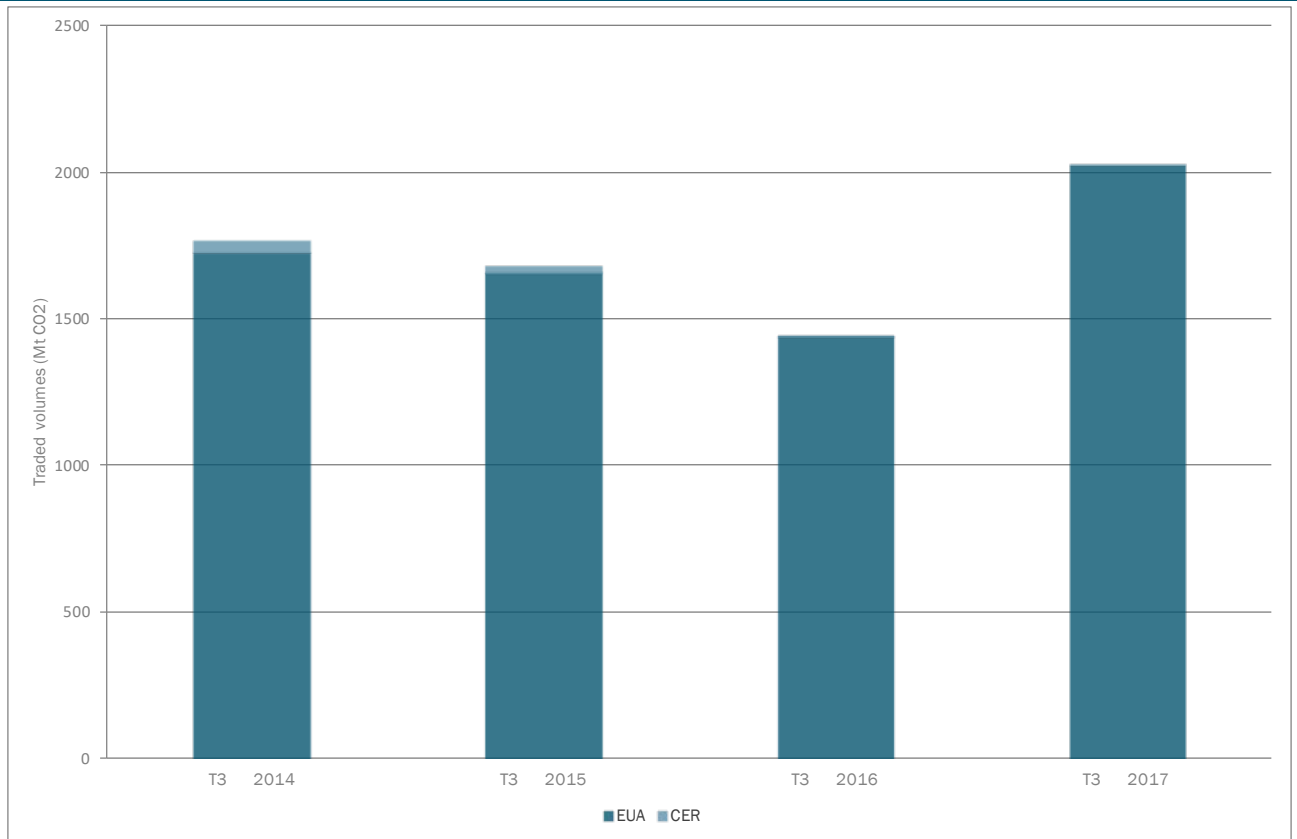
Graph 58: Evolution of the EUA/CER price spread



Graph 59: Evolution of EUA and CER spot and future prices

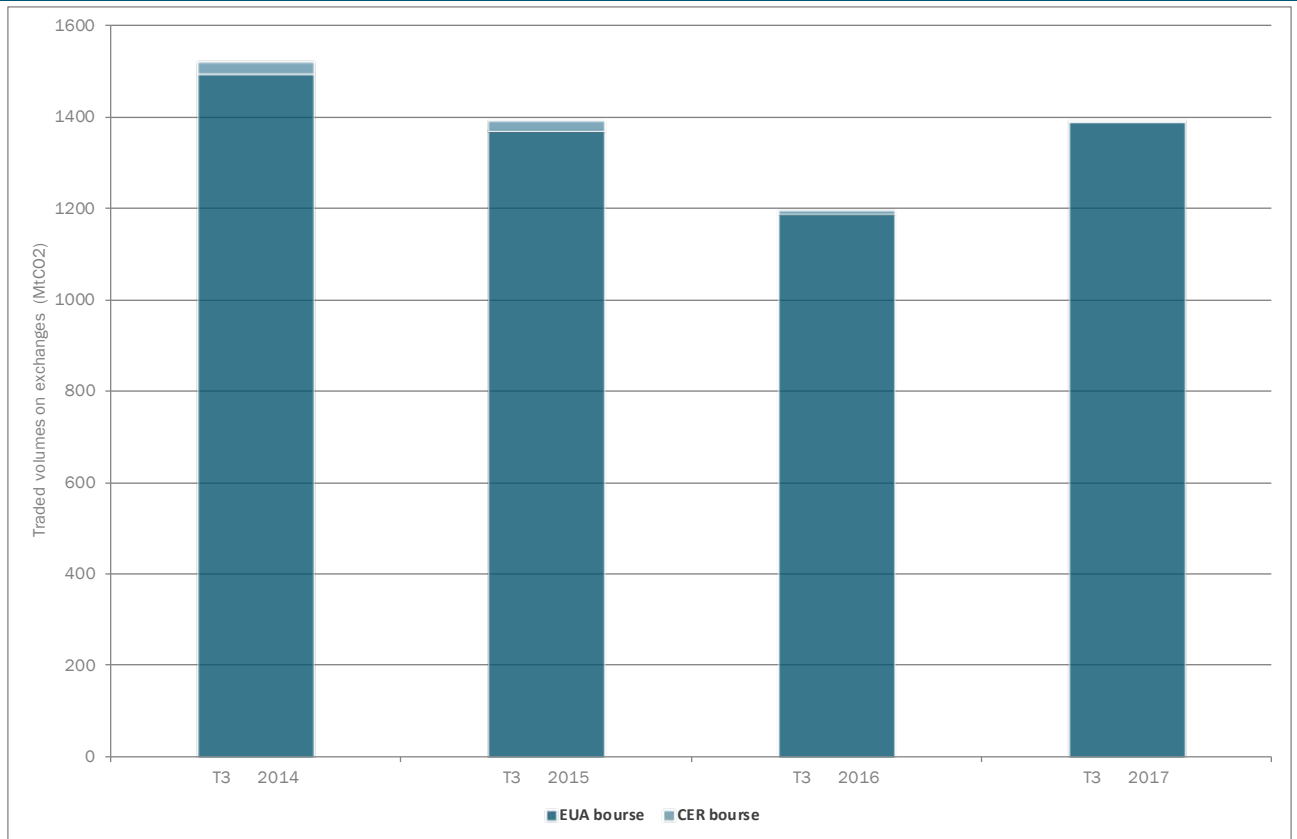


Graph 60: Total EUA and CER quarterly volumes



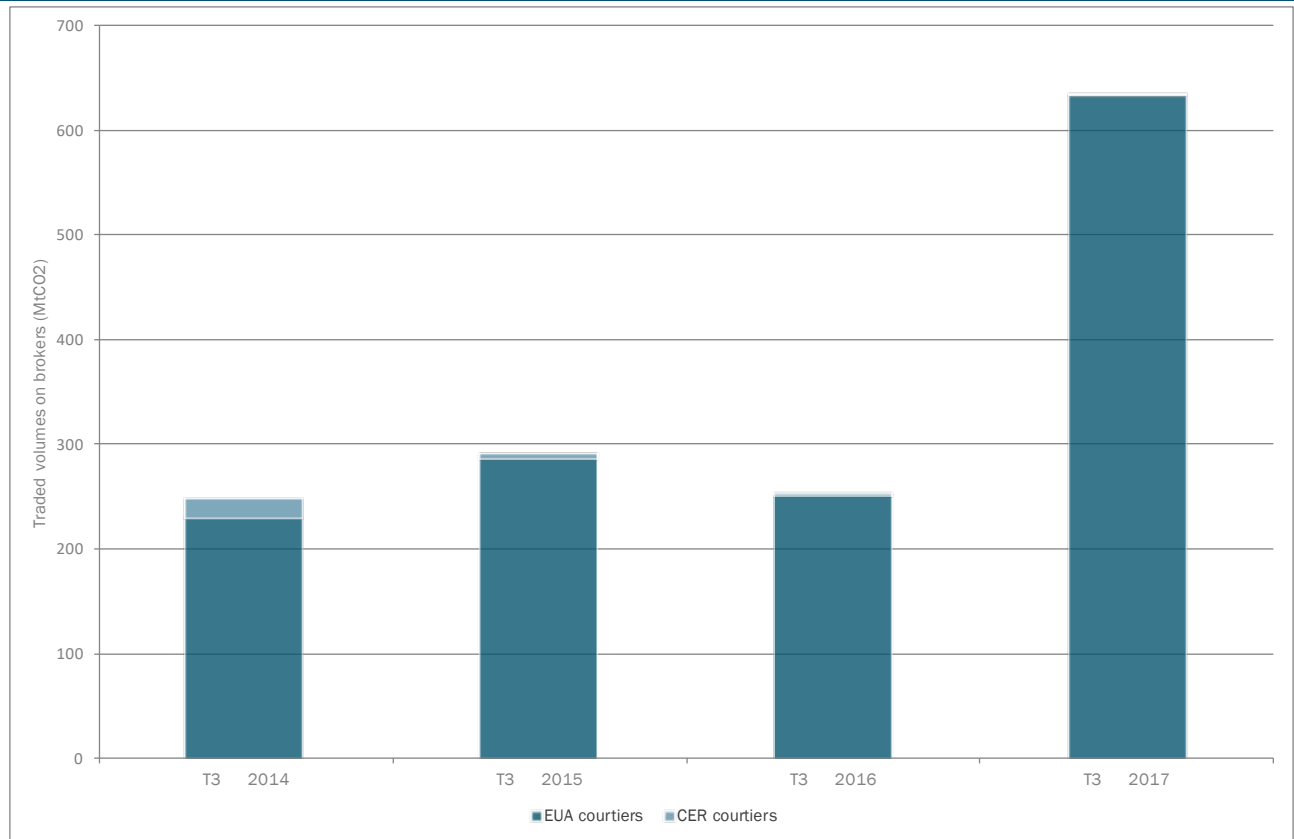
Source: ECX, EEX, LEBA

Graph 61: EUA and CER quarterly volumes traded on exchanges



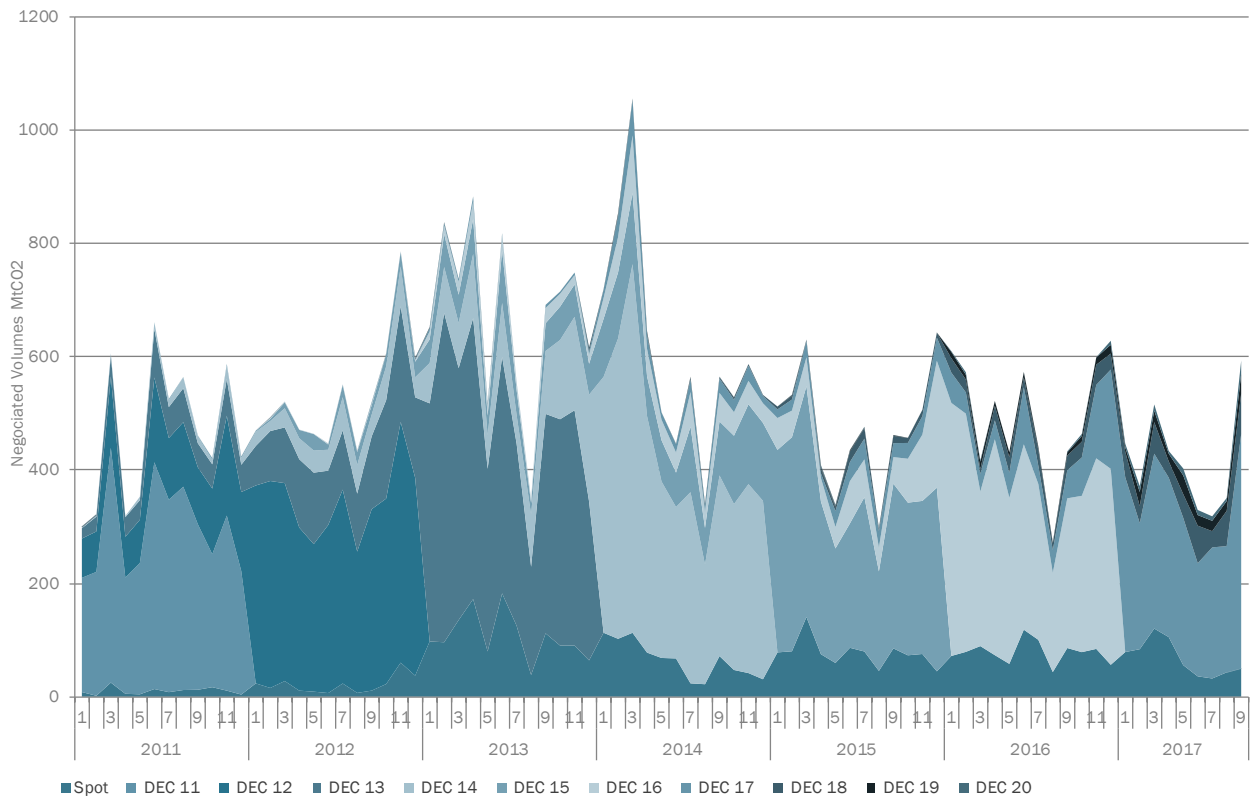
Source: ECX, EEX

Graph 62: EUA and CER quarterly volumes traded on brokers



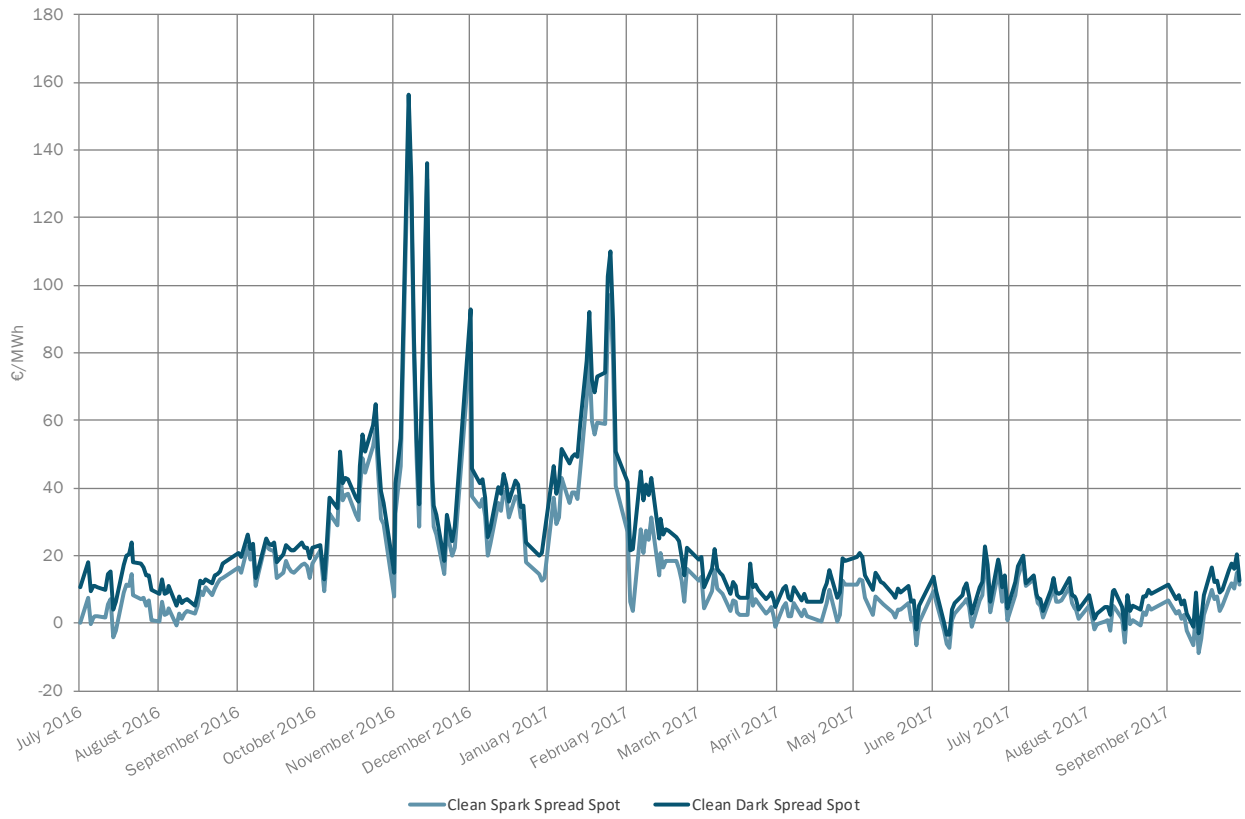
Source: LEBA

Graph 63: Evolution of EUA trades per maturity



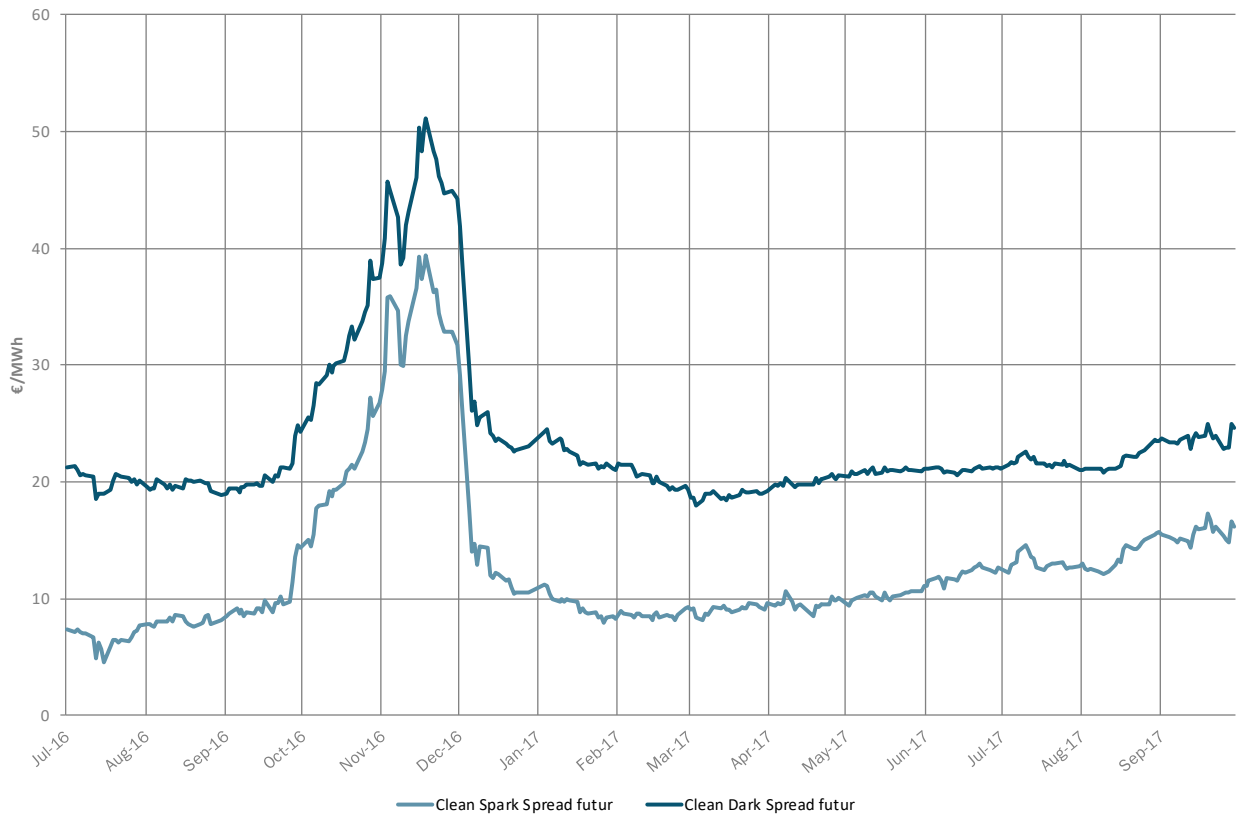
Source: ECX, EEX.

Graph 64: Evolution of the Clean Dark Spread and Clean Spark Spread on peakload (spot)



Source: Powernext, HEREN, EPEX Spot, EPD Futures, RTE

Graph 65: Evolution of the Clean Dark Spread and Clean Spark Spread on peakload (future)



Source: Powernext, HEREN, EPEX Spot, EPD Futures, RTE

Clean Dark Spread (€/MWh) = $pE - (\alpha pC + \beta pCO_2)$	Clean Spark Spread (€/MWh) = $pE - (\gamma pG + \delta pCO_2)$
<ul style="list-style-type: none"> • pE spot or Y+1 peakload price Germany (€/MWh) • pC M+1 or Y+1 coal price (€/MWh) • pCO_2 spot or Y+1 CO₂ price (€/MWh) • α includes the calorific power value and the coal yield² • β coal emission factor³ 	<ul style="list-style-type: none"> • pE spot or Y+1 peakload price Germany (€/MWh) • pG M+1 or Y+1 gas price (€/MWh) • pCO_2 spot or Y+1 CO₂ price (€/MWh) • γ gas yield⁴ • δ gas emission factor⁵

² Based on the assumption of a calorific power of 8.14 MWh/t for coal and a yield of 35% for coal-fired plants. It should be noted that these yields correspond to new reference installations and therefore may be quite different from the yields of existing installations and that other costs, including transportation, are not taken into account

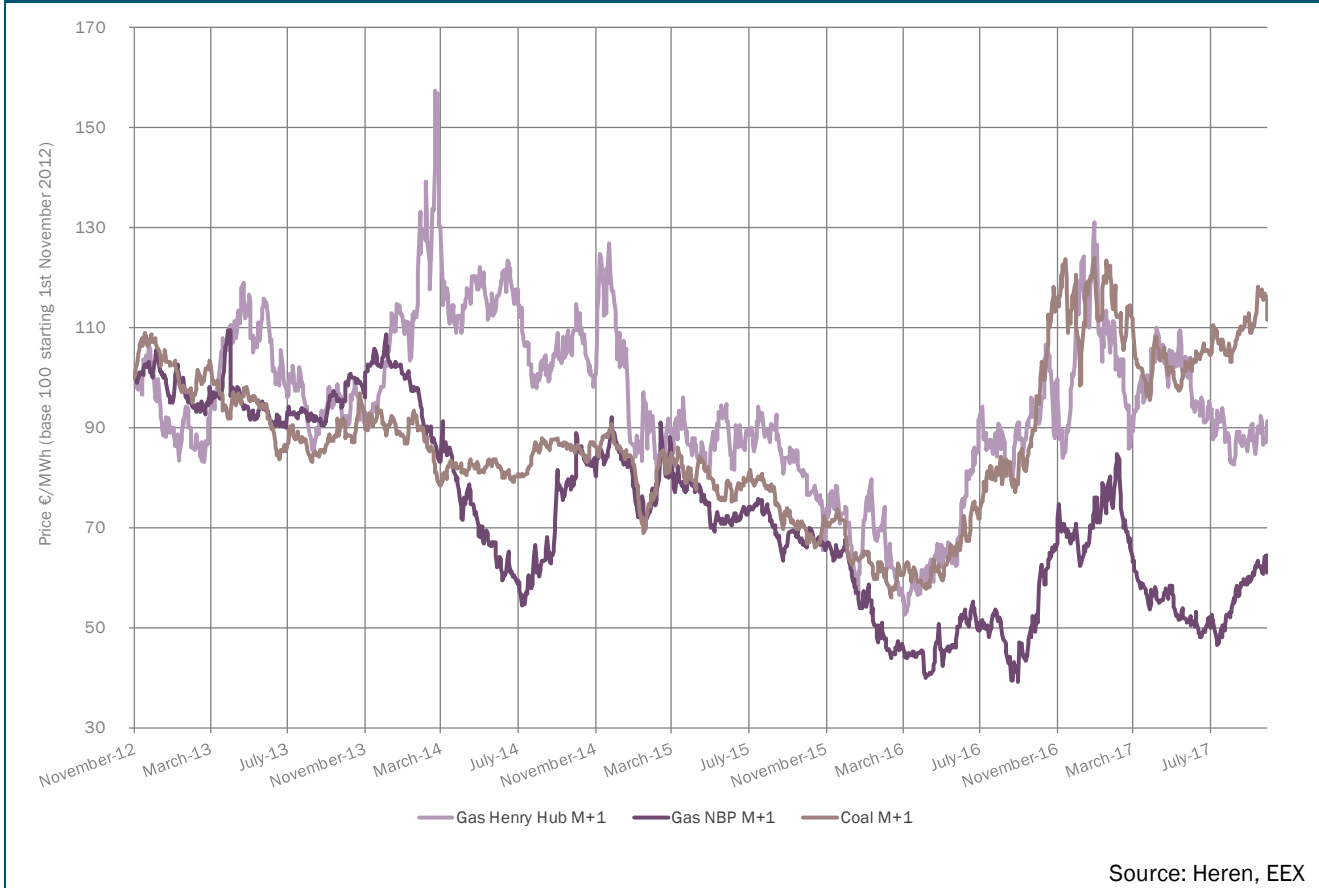
³ Based on an assumed emission factor of 0.96 t CO₂/MWh for coal-fired plants

⁴ Based on an assumed yield of 49% for gas plants

⁵ Based on an assumed emission factor of 0.46 t CO₂/MWh for gas plants



Graph 66: Gas price in Europe (NBP) and in America (Henry Hub) versus coal price (base 100 in November 2012)



GLOSSARY

GENERAL GLOSSARY

Delivery on the wholesale market: Daily declaration of a market player to a system operator, of the gas or electricity exchanges taking place the following day with each of its counterparties. Each delivery can result from one or several transactions concluded beforehand on the wholesale market.

Forward contract: a standard contract agreement for delivery of a given quantity at a given price, for a given maturity (OTC markets).

Future contract: a standard contract agreement for delivery of a given quantity at a given price, for a given maturity (organized exchanges).

Different maturities can be proposed depending on the exchange platform (week, half-year, quarter, month, year, etc.). The Y+1 contract correspond to the calendar year after the current year.

Day-ahead: a contract agreement signed for delivery the day after.

Transaction on the wholesale market: Conclusion of a contract between two wholesale market players, relative to the delivery of gas or electricity for a determined period of time, at a given price, The number of transactions in a market represents its level of activity, or its liquidity

SPECIFIC GLOSSARY FOR ELECTRICITY MARKETS

- Main electricity power exchanges in Europe (electricity):

- **EPEX Spot:** French power exchanges, non-mandatory (www.epexspot.com/fr).
- **EEX Power Derivatives:** German European Energy Exchange power exchanges, non mandatory (www.eex.de)
- **APX:** Dutch Amsterdam Power Exchange power exchanges, mandatory for imports and exports to the Netherlands (www.apx.nl)
- **Omel:** Spanish pool, almost mandatory (www.omel.es)
- **NordPool:** Scandinavian power exchanges, non mandatory (one of the power exchanges in Europe, www.nordpool.no)

- Wholesale products:

- **Intraday:** Hourly contracts and intraday blocks for an undergoing day delivery
- **Day-ahead:** Contract negotiated the day before the delivery date
- **Future:** Standard contract for a given quantity, at a given price, at a given delivery date. The maturity of the contracts depends on the organized market place (week, month, quarter, season, year). The maturity Y+1 refers to the next calendar year following the on-going year.
- **Baseload:** 24 hours a day, 7 days a week
- **Peak** (continental Europe): from 8 a.m. to 8 p.m. Monday to Friday

Wholesale market segments:

- Generation

- **ARENH:** which stands for 'Regulated Access to Incumbent Nuclear Electricity', is a right that entitles suppliers to purchase electricity from EDF at a regulated price, in volumes determined by the French energy regulator,

- **VPP:** "Virtual Power Plant" or capacity auction sales set up by EDF as a result of a decision made by the European Commission (<http://capacityauctions.edf.com/the-edf-group/capacity-auctions/overview-114023.html>)

- **Wholesale purchases and sales (OTC):** block trading notifications, i.e, quantities selected by RTE the previous day for the day after, excluding trading via EPEX Spot,

- **Imports and exports:**

http://www.rte-france.com/htm/fr/offre/offre_inter_1.htm

- **Purchases and sales via EPEX Spot,** the French electricity power exchange: www.epexspot.com

- **Final consumption:** sales to sites as a balancing responsible entity or under block trading

- **Sales to network operators to compensate for their losses:** http://www.rte-france.com/htm/fr/offre/offre_perte.htm

- **VPP – Products auctioned off by EDF:**

- **VPPs baseload:** these are products which reflect a generator running in base mode, It runs on the principle that bidders pay a fixed premium (in Euros/MW) each month in order to reserve available capacity, and that they regularly send EDF a schedule for using these capacities, Then they pay an operating fee per MWh taken off, which is similar to the marginal cost of EDF's nuclear generators, The price structure is therefore "fixed cost + variable cost",

- **VPPs peak:** these are products which reflect a generator running in peak mode, The principle is the same as for the VPPs baseload, but the price paid for each MWh taken off is an estimate of the marginal cost of EDF's peak generators, Given this high variable cost, the fixed premium paid by bidders is lower than for VPPs baseload.

SPECIFIC GLOSSARY FOR NATURAL GAS MARKETS

Bcm: billion cubic meters.

Balancing zone: geographical zone of the natural gas transmission system within which entry and exit flows must be balanced by shippers

Day-ahead: contract negotiated the day before the delivery date.

ENTSOG: European Network of Transmission System Operators for Gas, association created by the European Commission to facilitate the cooperation between the network operators from European Member States and the creation of a European gas network.

Forward: contract with delivery at a given quantity, price and deadline.

Future: forward contract traded on an exchange (organized market).

Gas release program: in order to encourage competition in the South of France, a gas release program was set up in 2005 for a three-year period. During this program:

- Gaz de France released 15 TWh per year (i.e. 45 TWh for the entire program) at PEG Sud through calls for tenders and bilateral negotiations.
- Total released 1,1 TWh per year (i.e. 3,3 TWh during the program) at PEG TIGF.

Herfindahl–Hirschman Index (HHI): it is equal to the sum of the squares of the market shares of the companies and measures the market's concentration. It is higher for a concentrated market. It is normally assumed that a market is not concentrated when the HHI is lower than 1000 and very concentrated if it is above 1800.

Market coupling: mechanism that enables to bring together supply and demand of the coupled markets and to simultaneously and implicitly allocate the interconnection capacities between the balancing zones (North and South). Market coupling between North and South GRTgaz zones respects the specificities of the gas market: day-ahead prices are set continuously (each transaction is dealt at a particular price) and not by a fixing as it is for the electricity market (a unique auction operated by the exchange to set the price for each hour of the day).

Liquefied Natural Gas (LNG): LNG is natural gas condensed into liquid (by reducing its temperature to about -160°C at atmospheric pressure), which has a volume decreased to about 1/600. It is mainly transported by sea in LNG tankers and unloaded in regasification terminals before being reinjected into the transport network.

National Balancing Point (NBP): gas hub of the United-Kingdom. Because of the large volumes exchanged on this hub, prices on that exchange are an important reference for gas wholesale exchanges in Europe.

Nomination: quantity of energy, expressed in kWh (PCS 25 °C) notified by the shipper to the TSO any day that the shipper asks the TSO to take off, transmit or deliver gas in the transport network. By extension, “to nominate” refers to the notification to the TSO of a nomination.

Nord H / Nord B balancing zones: the Nord B balancing zone is supplied by B-gas, which comes essentially from the Netherlands and is characterized by a higher level of nitrogen (B and H meaning low and high calorific value, respectively). Since 1st April 2013, the Nord-H and Nord-B balancing zones merged creating a unique balancing zone.

Point d'échange de gaz – PEG: Virtual point attached to each balancing zone in France in which players in the wholesale market can exchange physical quantities of gas.

Spot market: the spot market include Intraday, Day-ahead, Week-end, Week products and those with a maturity below one month.

Take-or-Pay: clause of a long term gas contract under which the seller (generally the producer) guarantees to supply a defined volume of gas to its client (generally an end consumer supplier) in exchange of its engagement to pay a minimal volume, whether or not the client decided to take this volume.

Unconventional gas: shale gases include three types of natural gas: shale gas, coal bed methane and tight gas. Unlike conventional gases, unconventional gases are found in low permeability rocks difficult to access. Their extraction is done thanks to two techniques: horizontal drilling and hydraulic fracturing.

SPECIFIC CO₂ MARKET OBSERVATORY GLOSSARY

Backloading: measure to delay sales of some allowances as of 2013, proposed by the European Commission in order to face the surplus of allowances in the European carbon market.

Banking: possibility for registrants to use an allowance issued at the beginning of a previous compliance period for compliance purposes.

Borrowing: the borrowing of an allowance for compliance purposes, giving registrants the option to use an allowance granted at the beginning of the following compliance period (allowances for Year N are entered on the registers before 28 February, while on 30 April in Year N, allowances must be returned in respect of emissions for Year N-1).

Carbon dioxide (CO₂): main greenhouse gas, produced primarily from the combustion of fossil energies.

CITL: Community Independent Transaction Log, a central transaction log run by the European Commission which records the information provided by national registers.

CDM: Clean Development Mechanism. This is one of the flexibility mechanisms under the Kyoto Protocol, which enables developed countries to finance emissions reduction or greenhouse gas sequestration projects in developing countries and to claim Certified Emissions Reduction units (CERs), which they can accrue to fulfil their own emissions reduction obligations. CDM projects aim to encourage the transfer of environmentally-friendly technologies and to promote sustainable development in developing countries.

CER: Certified Emissions Reduction units from projects deployed under the Clean Development Mechanism (CDM). Some countries and companies make use of credits from CDM projects and joint application projects to comply with their Kyoto objectives.

ECX: European Climate Exchange, carbon exchange based in London (www.theice.com)

Emission allowance (or emissions permit): unit of account under the EU Emission Trading Scheme. The allowance is a quantity of GHG emissions (expressed in tonnes of CO₂ equivalent) that cannot be exceeded over a given period, which is granted to a country or an economic agent by an administrative authority (intergovernmental organisation or government agency).

Energy - climate package: a set of EU laws adopted late 2008, relating to energy and climate change.

ERU: Emission Reduction Unit, carbon credits generated by Joint Implementation (JI) projects, in accordance with the rules defined by the Kyoto Protocol. Companies falling within the scope of the European Union Emission Trading Scheme (EUETS) can use these credits to meet their greenhouse gas emission reduction obligations.

EUA: European Union Allowance, European emission allowance which authorises the holder to emit the equivalent of one tonne of carbon dioxide in greenhouse gases.

EU ETS: the European Union Emission Trading Scheme is an EU mechanism that aims to reduce the global emission of CO₂ and achieve the European Union's objectives under the Kyoto Protocol. It is the largest greenhouse gas emission trading scheme in the world.

GHG: greenhouse gas. Gas contributing to the greenhouse effect (see Greenhouse effect). Not all GHGs make the same contribution to the greenhouse effect. In order to compare the different greenhouse gas emissions, their effects are expressed in terms of tonnes of carbon dioxide.

Greenhouse effect: effect causing a natural process, which maintains the lower atmosphere at an average temperature of 15°C. It is linked to the presence of certain gases in the atmosphere, such as carbon dioxide and methane, which trap the radiation emitted by the Earth and reflect some of it in the direction of the sun. As the quantity of greenhouse gases produced by humans is too high, temperatures are increasing significantly.

Kyoto Protocol: international treaty aiming to reduce greenhouse gas emissions. The Protocol sets out detailed commitments for the industrialised countries concerned, for reducing or limiting greenhouse gas (GHG) emissions during the first, so-called commitment period, i.e. 2008-2012 (-5.2% in relation to 1990). To achieve this, these countries are obliged to define policies and national measures to fight climate change.

Phase III: the third phase of the EU ETS for the period 2013-2020, during which significant changes in terms of auctioning will take place.

Set aside: option of setting aside a share of the allowances for Phase III proposed by the European institutions, in order to curb the surplus of allowances of EU ETS.

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