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Functioning of the wholesale electricity and natural gas markets

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SUMMARY

Integration of wholesale market monitoring in the European mechanism

Since 28 December 2011, CRE's wholesale energy market monitoring mission has been governed by the European regulation on the integrity and transparency of wholesale energy markets ((EU) Regulation No. 1227/2011 of 25 October 2011) known as REMIT. French law No 2013-312 of 15 April 2013 amended the Energy code so as to entrust CRE with guaranteeing compliance with the obligations and prohibitions specified by the REMIT regulation and to provide CRE's standing committee for disputes and sanctions (CoRDIS) with the possibility of sanctioning breaches of these obligations and prohibitions. The national legal framework was then specified by order No 2016-461 of 14 April 2016 which, in particular, amended Articles L. 131-2 and L. 134-25 of the Energy code so as to specify CRE's competence as regards the collection of information, registration and obligations of persons professionally arranging transactions and the possibility for CoRDIS to sanction breaches to these provisions.

In operational terms centralised collection of standard data by the Agency for the Cooperation of European Regulators (ACER) started in October 2015 and that of non-standard data in April 2016. All transactions and fundamental data collected by ACER are then shared with national regulatory authorities (NRAs). In parallel, CRE temporarily extended the national data collection directly from operators and persons professionally arranging transactions in order to actively participate in the data quality checks performed by ACER. Market participants that report their data to ACER must first register with an NRA. At the end of 2016, over 1,100 market participants were registered in the French register.

Wholesale energy market monitoring interacts with financial legislation. On 10 February 2016, the European Commission postponed to 3 January 2018 the entry into effect of the MiFID II Directive to give stakeholders and competent authorities more time to set up the appropriate systems. This directive expands in particular the list of financial instruments. The delegated regulation of 25 April 2016 of the European Commission clarified the definition of certain products for which doubts persisted concerning the legal regime applicable (REMIT or financial law). The interaction between REMIT and financial regulation is the subject of regular discussions between CRE's and AMF's (French financial authority) departments within the framework of the cooperation agreement between the two institutions provided for by the Energy code and the monetary and financial code.

Within the framework of its wholesale market monitoring mission, CRE carries out in-depth analyses following the detection of unusual or suspicious market events by its departments, by ACER, by another NRA, by persons professionally arranging transactions or any other market participant. Within this context, in 2016 and the first half of 2017, CRE sent 26 requests for information to market participants. For the year 2016, CRE's monitoring scope represented 730,000 transactions, i.e. the equivalent of 1,900 TWh traded or more than €60 billion.

As at the date of publication of this report, six investigations have been opened by CRE, three for electricity and three for gas.

Rebound in commodity prices after very low levels in 2016

Pressure on price were observed at the end of 2016 in wholesale electricity and gas markets in France, in a context of highly unavailable nuclear power generation, increase in the price of fossil energy, particularly coal, and LNG supply tightness. The Brent oil price settled at €39.5/barrel on average in 2016, down by 16% compared to 2015. The oil market started the year at very low levels (€24.7 at its lowest on 21 January 2016) before following an upward trend during 2016 with a 54% increase in the Brent price between 1 January and 31 December. This jump started in April 2016 and the price reached €40/barrel on 29 April 2016. It reflected in particular the negotiations on lowering the production and the subsequent agreement between some OPEC member countries and Russia of 30 November 2016. The upward trend, however, ceased in the first half of 2017, particularly due to higher stocks and American crude oil production. On 30 June 2017, the Brent price had returned to €41.3/barrel.

Coal had a similar evolution as that of oil. In 2016, the average coal price was €48.5/tonne, down by almost 2% compared to 2015. In 2016 it followed an upward trend, with a price progression of almost 75% between the start and the end of the year. The jump in coal prices is mainly related to measures taken in China to shut down the least productive coal mines. These measures caused a drop in production of close to 8% and higher coal imports by China, related to electricity production. China is once more the world's leading importer of coal.

Lastly, the price of CO₂ allowances remained stable throughout 2016 with developments marked by announcements of measures, particularly in Europe. It stood at an average €5.4/tonne in 2016, down sharply compared to 2015 (-30%) in a context of surplus allowances. In terms of surveillance, the CO₂ allowance will fall within the scope of the MiFID II Directive as of its entry into effect on 3 January 2018 as a financial instrument.

Wholesale electricity markets: Historically low prices in the first semester of 2016 followed by a surge in the second half in the context of major nuclear unavailability

The year 2016 was characterized on the one hand, by a loose supply/demand balance during the first semester of 2016 against low commodity prices at the start of the year, and on the other hand by tight supply in the fourth quarter mainly due to the historically low availability of nuclear generation from mid-July 2016 to March 2017, because of the shutdown of reactors to test carbon concentration levels on the steam generators channel heads.

Installed renewable generation capacity (excluding hydraulic power) continued to grow and was on the verge of exceeding installed thermal fossil generation capacity in 2017. The hydraulic production rate edged up in 2016 (+8.2%) compared to 2015 in relation to heavy rainfall in the first half of 2016 and a rainfall deficit as from July. The relative level of energy prices also enabled gas and coal plants to be profitable throughout the year. Heavily used particularly during the winter 2016/2017 against tight supply, gas plants registered production rates at 35%. They were in fact marginal 23% of the time in 2016 compared to 16% in 2015.

The low availability of nuclear generation also resulted in a significant drop in exports (-22%) and a major increase in imports (+8%) equivalent to a 36.6% drop in the export balance. With regard to demand, gross French consumption rose slightly in 2016 (+1.5%) compared to 2015, totalling 483 TWh and reflecting temperature variations observed during the year.

In these circumstances, spot prices settled on average at €34.6/MWh in 2016, down by -4.9% compared to 2015. Nevertheless, during the last quarter of 2016, tightness in the French electricity system and higher commodity prices mechanically pushed spot prices up, to an average of €60/MWh (+47% compared to the same quarter in 2015). The month of November was marked by three episodes of peak hourly prices during the evening at over €800/MWh on 7, 8 and 14 November 2016. In the first quarter of 2017, spot prices reached high levels during the cold spell in January. As of March, they stabilised at about €35/MWh, above the levels recorded the previous year.

Futures prices stood at an average €33.4/MWh in 2016, down by -12.5% compared to 2015, reaching €25/MWh at the lowest for calendar products in the first quarter of 2016. However, the rise in coal prices as from the second quarter of 2016 began to push futures prices upwards. In particular, uncertainty on the availability of nuclear generation contributed, as from September, to the increase in wholesale prices for delivery in the last quarter of 2016 and in 2017. The 2017 calendar product went from €32/MWh in September 2016 to €50/MWh in November 2016. These price levels exceeding €42/MWh sparked a renewed interest of alternative suppliers who subscribed ARENH volumes in the 16 November 2016 gate opening. Against announcements by the nuclear safety authority (ASN) concerning the restart of nuclear power plants under conditions, futures prices plummeted early December, down to €34/MWh before edging up and closing off at €40/MWh. During the first quarter of 2017, futures prices remained stable, at around €35/MWh for calendar products.

CRE remains particularly attentive to price evolutions and in particular to compliance with the transparency obligations of the REMIT regulation. Episodes of tightness, as each unusual market episode, are specifically analysed as part of wholesale market monitoring.

Low wholesale electricity prices enabling hedging at a low cost at the start of 2016 and the high volatility in futures prices exceeding the ARENH price at the end of 2016, thus creating arbitrage possibilities, largely contributed to the increase in volumes traded in the intermediated markets (+35% in 2016 compared to 2015). Transactions totalled €55 billion in 2016 for 1,274.2 TWh compared to 931.9 TWh in 2015.

Wholesale gas markets: natural gas prices following the commodity trends in 2016 but remaining at low levels

The fundamentals of the French wholesale gas market were marked in 2016 and in H1 2017 by the reappearance of a spread between the South zone and the North zone and heavy use of gas-fired power plants as from Q4 2016 against major unavailability of nuclear generation. At the PEG Nord spot prices were closely linked to the prices of adjacent markets against the background of good supply conditions and lack of tightness in

infrastructure use. However, in the South zone, maintenances at the North-South link in Q3 2016 but also the lack of LNG supplies combined with a cold spell in January 2017, created tensions in the system in the trading region south (TRS) and in particular bottlenecks in the south-east. In that regard, the spread between the South zone and the North zone exceeded €20/MWh on certain days.

As mentioned above, this type of events are analysed specifically as part of wholesale markets surveillance.

The spot price at the PEG Nord dropped sharply until Q4 2016, reaching its lowest at €10.6/MWh in September 2016. It then recovered up to almost €22/MWh late December 2016, synchronously with adjacent markets, reflecting seasonal movements, and against a global rise in commodity prices. The average spot price at the PEG Nord was €14.2/MWh, down by 29% compared to 2015. In the south, against supply tightness and the increase in the LNG price, the maximum price was €43.6/MWh on 21 January 2017. The average spread compared to the PEG Nord over the period of tightness (December 2016 to January 2017) was €8.2/MWh. This tightness was resolved on 11 February 2017, bringing back the spread to zero. This spread remained below €1.30 until the end of the first semester 2017.

In the futures market, the prices of calendar products followed the same trend reaching their lowest below €13/MWh (TTF Y+1 – the Netherlands market) in April 2016. Prices then rose until winter 2016/2017 against the general increase in commodity prices.

Gas prices in Europe, Asia and South America converged only in the first half of 2016. In the second half of 2016, prices at the PEG Nord and the NBP remained lower than Asian, South American, TRS and Spanish prices, particularly because of these regions' dependence on LNG supply. In addition, prices in the Henry Hub (USA) followed an upward trend but remained disconnected, at levels lower than the other global prices (an average €7.8/MWh in 2016).

Lastly, volumes traded in the wholesale gas markets increased compared to 2015. In total, these volumes increased by 4% in 2016 compared to 2015. They represented 633 TWh for a transaction volume of over €9 billion.

KEY FIGURES

1. ELECTRICITY MARKET

Table 1: Installed production capacity in France

	Annual variation 2015/2016				
	End 2014	End 2015	End 2016	As a pourcentage	
				As a value	
Generating facilities (GW)	128,9	129,3	130,8	1,2%	154,1%
Nuclear	63,1	63,1	63,1	0,0%	0,0%
Hydraulic	25,4	25,4	25,5	0,4%	10,0%
Fossil-fired	24,4	22,6	21,8	-3,3%	-75,3%
Coal	5,1	3,0	3,0	-0,2%	-0,7%
Fuel oil	8,9	8,6	7,1	-17,9%	-154,5%
Gas	10,4	10,9	11,7	7,3%	79,9%
Renewable (excluding hydraulic)	16,0	18,2	20,4	12,1%	219,4%
Wind	9,1	10,3	11,7	13,5%	138,8%
Solar	5,3	6,2	6,8	9,8%	60,9%
Renewable thermal	1,6	1,7	1,9	11,6%	19,7%

Source: RTE

Table 2: Production of different technology sectors in France

	Annual variation 2015/2016					Half-year variation HY1 2016 / HY1 2017			
	2014	2015	2016	As a pourcentage		HY1 2016	HY1 2017	As a pourcentage	
				As a value				As a value	
Production (TWh)	540,6	545,1	531,3	-2,5%	-13,8	282,6	275,8	-2,4%	-6,8
Nuclear	415,9	416,8	384,0	-7,9%	-32,8	205,1	197,2	-3,9%	-7,9
Hydraulic	68,2	58,7	63,9	8,9%	5,2	38,9	30,7	-21,1%	-8,2
Fossil-fired	27,0	33,2	45,9	38,3%	12,7	18,1	27,1	49,7%	9,0
Coal	8,3	8,5	7,3	-14,1%	-1,2	2,8	4,6	64,3%	1,8
Gas	14,3	21,9	35,3	61,2%	13,4	14,0	20,8	48,6%	6,8
Fuel oil	4,4	2,8	3,3	17,9%	0,5	1,3	1,7	30,8%	0,4
Renewable (excluding hydraulic)	29,5	36,4	37,5	3,0%	1,1	20,5	20,8	1,5%	0,3
Wind	17,0	21,1	20,7	-1,9%	-0,4	12,3	11,6	-5,7%	-0,7
Solar	5,9	7,4	8,3	12,2%	0,9	3,9	4,8	23,1%	0,9
Renewable thermal	6,6	7,9	8,5	7,6%	0,6	4,3	4,4	2,3%	0,1
Consumption (TWh)	435,0	443,0	483,0	9,0%	40,0	248,9	247,7	-0,5%	-1,2

Source: RTE

Table 3: France imports and exports

	Annual variation 2015/2016					Half-year variation HY1 2016 / HY1 2017			
	2014	2015	2016	As a pourcentage	As a value	HY1 2016	HY1 2017	As a pourcentage	As a value
Imports	27,2	31,8	34,4	8,2%	2,6	15,0	16,4	9,1%	1,4
Peak imports (TWh)	11,9	12,9	12,7	-1,6%	-0,2	5,7	6,2	8,8%	0,5
Off-peak imports (TWh)	15,3	18,9	21,7	14,9%	2,8	9,3	10,2	9,3%	0,9
Exports	92,3	93,8	73,5	-21,7%	-20,3	43,6	39,3	-9,9%	-4,3
Peak exports (TWh)	33,3	34,1	25,1	-26,4%	-9,0	16,0	14,2	-11,3%	-1,8
Off-peak exports (TWh)	59,0	59,7	48,4	-19,0%	-11,3	27,7	25,1	-9,3%	-2,6
Net export balance	65,1	62,0	39,1	-37,0%	-22,9	28,6	22,9	-19,9%	-5,7

Source: RTE

Table 4: Balance at borders

	Annual variation 2016 / 2015					Half-year variation HY1 2016 / HY1 2017			
	2014	2015	2016	As a pourcentage	As a value	HY1 2016	HY1 2017	As a pourcentage	As a value
Balance at borders, in TWh									
CWE zone	10,6	6,7	-5,4	-180,6%	-12,1	0,5	-2,1	-520,0%	-2,6
Spain	3,6	7,4	7,8	5,4%	0,4	2,5	6,5	160,0%	4
United Kingdom	15,2	14,1	10,0	-29,1%	-4,1	7,7	4,7	-39,0%	-3
Italy	19,3	19,7	16,5	-16,2%	-3,2	10,5	9,0	-14,3%	-1,5
Switzerland	16,9	14	10,1	-27,9%	-3,9	7,4	4,8	-35,1%	-2,6
Total	65,6	61,9	39,1	-58,3%	-22,8	28,6	22,9	-19,9%	-5,7

Source: RTE

Table 5: Clean dark and spark spread and coal

	Annual variation 2016 / 2015					Half-year variation HY1 2016 / HY1 2017			
	2014	2015	2016	As a pourcentage	As a value	HY1 2016	HY1 2017	As a pourcentage	As a value
Y+1 maturity									
Coal (€/t)	58,5	49,5	48,3	-2,4%	-1,2	39,4	61,3	55,6%	21,9
Peak clean dark spread (€/MWh)	27,4	22,3	22,3	0	0	18,5	20,9	13,0%	2,4
Peak clean spark spread (€/MWh)	1,3	2,5	10,7	328,0%	8,2	5,5	10,5	90,9%	5

Source: ICE, EPD

Table 6: Injections and withdrawals in the French electricity system

	Annual variation 2016 / 2015					Half-year variation HY1 2016 / HY1 2017			
	2014	2015	2016	As a pourcentage	As a value	HY1 2016	HY1 2017	As a pourcentage	As a value
	Injections, in TWh								
Production, excluding ARENH and VPP, in TWh	466	529	531	14,0%	63,2	284	274	5,0%	13,7
ARENH, in TWh	71	16	0	-77,0%	-55,1	0	40	-100,0%	-12,4
VPP, in TWh	3	0	0	-89,0%	-2,7	0	0	-100,0%	-0,3
Imports, in TWh	27	32	33	16,0%	4,4	15	17	-18,0%	-3,3
Withdrawals, in TWh									
End customer consumption, en TWh	435	442	447	2,0%	7,4	233	270	0,0%	-0,2
Pumping, in TWh	7,9	6,8	7	-14,0%	-1,1	3,5	4	-4,0%	-0,1
Exports, in TWh	95	96	74	1,0%	0,9	45	41	-4,0%	-2
Losses in TWh	31	33	36	9,0%	2,7	18	18	-1,0%	-0,2

Source: RTE

	Annual variation 2015/2016					Half-year variation HY1 2016 / HY1 2017			
	2013	2014	2016	As a pourcentage	As a value	HY1 2016	HY1 2017	As a pourcentage	As a value
	Balancing responsible	193	193	197	2%	4			
Active in electricity generation	25	23	26	13,0%	3	20		-100,0%	-20
Holder of volumes purchased at VPP	24	10	0	-100,0%	-10	5		-100,0%	-5
Holder of rights of regulated access to ARENH	18	20	0	-100,0%	-20	14		-100,0%	-14
Final customers provider	28	26	32	23,1%	6	23		-100,0%	-23
Active on imports/exports	94	103	77	-25,2%	-26	87		-100,0%	-87
Active on bloc exchange	107	113	103	-8,8%	-10	108		-100,0%	-108
Active on Exchange	96	105	96	-8,6%	-9	94		-100,0%	-94

Source: RTE, EPEX SPOT, Brokers

Table 7: Spot and futures prices in the French electricity market

	Annual variation 2016 / 2015					Half-year variation HY1 2016 / HY1 2017			
	2014	2015	2016	As a pourcentage	En valeur	S1 2016	S1 2017	As a pourcentage	As a value
	Spot market prices								
Intraday price France, in €/MWh	35	38,8	36,9	-4,8%	-1,9	27,8	44,7	60,8%	16,9
Day-Ahead price France Baseload, in €/MWh	34,6	38,6	36,7	-4,9%	-1,9	27,3	44,4	62,6%	17,1
Day-Ahead price France Peakload, in €/MWh	43,8	46,6	47,1	1,0%	0,5	33,8	52,6	55,6%	18,8
France-Germany Day-ahead Baseload spread, in €/MWh	1,9	6,8	7,7	13,2%	0,9	2,4	8,9	270,8%	6,5
France-Germany Day-ahead peakload spread, in €/MWh	2,8	8,2	11,5	40,2%	3,3	3,2	8,7	171,9%	5,5
Day-Ahead France-Germany convergence rate	50,8%	26,5%	35,8%	-	9,3 pts	46,0%	35,5%	-	-10,5 pts
Forward market prices									
M+1 price France, in €/MWh	40	36,9	41,2	11,6%	4,3	27	39,9	47,8%	12,9
M+1 France-Germany Spread, in €/MWh	6,5	6	11,9	100,0%	6	2,4	5,9	142,8%	3,5
Q+1 price France, in €/MWh	42	37,1	39,5	6,4%	2,4	25	33,6	34,3%	8,6
Spread Q+1 France-Germany, en €/MWh	7,6	6,2	10,5	70,7%	4,4	0,7	1,9	192,3%	1,3
Y+1 price France, in €/MWh	42,5	38,1	31,9	-16,4%	-6,2	29	35,8	23,6%	6,8
Spread Y+1 France-Germany, en €/MWh	7,4	7,2	6,2	-13,6%	-1	5,1	5,8	13,9%	0,7
Y+1 Peakload/Baseload ratio									
France	1,25	1,23	1,33	8,1%	0,1	1,3	1,3	0,0%	0
Germany	1,26	1,26	1,26	0,0%	0	1,26	1,26	0,0%	0

Source: EPEX SPOT, EEX

Table 8: Spot and futures volumes in the French electricity market

				Variation annuelle				Variation semestrielle S1 2017 / S1 2016	
	2014	2015	2016	En pourcentage	En valeur	S1 2016	S1 2017	En pourcentage	En valeur
NEB									
Volumes NEB, en TWh	338,9	503,0	201,5	-60%	-301,5	201,5	0,0	-100%	-201,5
Ratio NEB/Consommation française	73%	116%	46%	-	-70,76%	87%	0%	-	-86,50%
Marché Spot, en TWh	106,7	159,4	144,9	-19%	-14,5	77,0	173,4	125%	96,4
Volumes sur le marché Intraday EPEX SPOT, en TWh	5,2	5,4	6,1	11%	0,6	3,0	108,1	3482%	105,0
Part des Volumes Intraday cross-border Fr-All	72%	62%	65%	5%	3,34%	69%	74%	7%	0,0
Volumes sur le marché Day-Ahead EPEX SPOT, en TWh	67,8	106,4	110,7	4%	4,3	58,0	53,1	-8%	-4,9
Volumes sur le marché Day-Ahead Brokers, en TWh	33,7	47,6	28,2	-41%	-19,4	16,0	12,2	-24%	-3,8
Marché à terme									
Volumes, en TWh	825,9	1109,0	1309,4	18%	200,4	657,2	332,9	-49%	-324,3
Part de marché Brokers	96%	91%	86%	-	-4,98%	86,42%	86,14%	-	-0,28%
Part de marché EEX	4,37%	9,20%	14,18%	-	4,98%	13,58%	13,86%	-	0,28%
Nombre de Transactions	87914	115319	102218	-11%	-13101	49 582	34 951	-30%	-14631
Part de marché Brokers	1,0	0,9	0,9	-	-5,19%	89,18%	82,83%	-	-6,35%
Part de marché EEX	4,23%	8,12%	13,31%	-	5,19%	10,82%	17,17%	-	6,35%
Produit Y+1									
Volumes, en TWh	206,1	294,9	495,7	68%	200,8	253,4	88,2	-65%	-165,3
Nombre de Transactions	4020	6493	11672	80%	5179	5998	2474	-59%	-3524
Produit Q+1									
Volumes, en TWh	92,1	122,3	125,8	3%	3,4	46,3	57,2	24%	10,9
Nombre de Transactions	6703	8312	9648	16%	1336	3268	4403	35%	1135
Produit M+1									
Volumes, en TWh	119,2	162,6	119,3	-27%	-43,3	56,9	55,0	-3%	-1,9
Nombre de Transactions	16314	24526	20231	-18%	-4295	9096	10018	10%	922

Source: EPEX SPOT, EEX, Brokers

Table 9: Concentration indices (HHI) for the different segments of the wholesale electricity market in France

	HHI - Market Concentration			
	2015		2016	
		EDF inclus		EDF inclus
Deliveries				
OTC - block purchases	377	859	496	1107
OTC - bloc sales	417	923	657	1079
EPEX - purchases	430	414	592	599
EPEX - sales	455	2312	320	3346
Injections				
Generation	3055	8076	3587	7085
ARENH	1544		0	
Imports	629	573	731	740
Withdrawals				
End-consumer consumption	1877	6476	1795	5334
Grid losses	1862	1581	1643	1535
Exports	469	1615	566	1603

Sources: RTE, EPEX SPOT, Brokers

2. GAS MARKET

Table 10: Fundamentals of the gas market in France

Market fundamentals	Yearly values			Yearly variation 2016 / 2015				Yearly variation S1 2017 / S1 2016	
	2014	2015	2016	In percentage	In value	S1 2016	S1 2017	In percentage	In value
Entry and exit flows									
Supply (TWh)	624	648	683	5%	35	349	368	6%	19
Storages withdrawals	100	120	118	-2%	-2	70	69	-2%	-1
Imports	524	528	565	7%	37	279	300	7%	21
<i>Pipeline</i>	454	463	485	5%	22	241	246	2%	5
<i>LNG</i>	70	65	80	23%	15	38	53	41%	15
Production	0	0	0	5%	0	0	0	-5%	0
Demand (TWh)	624	648	683	5%	35	349	368	6%	19
Storages injections	116	115	113	-1%	-1	49	42	-14%	-7
End consumers demand	416	448	488	9%	39	260	257	-1%	-2
<i>Distribution consumers</i>	271	289	304	5%	15	177	164	-7%	-13
<i>Consumers connected to the transmission system</i>	145	160	184	15%	24	83	94	13%	11
Exports	87	80	75	-6%	-5	38	53	37%	14
Other	5	5	7	40%	2	2	17	754%	15
Deliveries at PEGs (TWh)	580	681	797	17%	116	383	408	7%	25
PEG Nord	450	543	643	18%	100	312	330	6%	19
TRS*	130	138	154	12%	16	71	77	9%	6
Infrastructure figures									
North-to-south link	94%	90%	95%		5%	92%	88%		-3%
Availability of North-to-south link	86%	83%	81%		-1%	83%	81%		-2%
Utilization of Dunkirk (Entry)	85%	88%	80%		-7%	83%	91%		8%
Utilization of Taisnières H interconnection (Entry)	74%	69%	63%		-6%	63%	60%		-2%
Utilization of Pirineos interconnection (Exit)	79%	57%	45%		-13%	45%	50%		5%
Stock levels (TWh as at the end of the Quarter)	74	96	83		-13%	83	78		-7%
Avg. Net variation of French stocks (GWh/j)	22	-11	-8		-28%	3	16		-147%
Avg. LNG terminals sent-out (GWh/j)	190	179	214		19%	208	294		42%
Avg. Exports from France to Spain (GWh/j)	134	101	102		2%	102	110		8%

Table 11: Price of gas in France

Prices	Yearly values			Yearly variation 2016 / 2015				Yearly variation S1 2017 / S1 2016	
	2014	2015	2016	In percentage	In value	S1 2016	S1 2017	In percentage	In value
Spot prices (€/MWh)									
PEG Nord day-ahead (avg.)	21,4	20,1	14,3	-29%	-5,8	13,2	17,3	31%	4,1
TRS day-ahead (avg.)	25,0	21,6	15,6	-28%	-6,0	13,5	19,9	47%	6,3
Day-ahead PEG Nord/Sud spread (avg.)	3,5	0,5	1,3	149%	0,8	0,3	2,6	713%	2,2
Day-ahead PEG Nord/TTF Spread (avg.)	0,5	0,3	0,3	7%	0,0	0,2	0,3	31%	0,1
Forward prices (€/MWh)									
PEG Nord M+1 (avg.)	21,9	19,9	14,2	-29%	-5,7	13,0	17,0	31%	4,0
TRS M+1 (avg.)	25,7	20,5	15,5	-25%	-5,1	13,5	19,0	40%	5,5
PEG Nord Y+1 (avg.)	24,8	20,4	15,6	-23%	-4,8	14,8	17,2	16%	2,4
M+1 PEG Nord/Sud spread (avg.)	3,8	0,6	1,2	104%	0,6	0,5	2,0	299%	1,5
M+1 PEG Nord/TTF spread (avg.)	0,4	0,3	0,2	-23%	-0,1	0,2	0,3	43%	0,1
Summer-ahead/Winter-ahead spread (avg.)	3,4	1,5	1,9	25%	0,4	1,8	1,4	-19%	-0,3

Table 12: Gas trading in France

Trading activity	Yearly values			Yearly variation 2016 / 2015		Yearly variation S1 2016 / S1 2017			
	2 014	2 015	2 016	In percentage	In value	In percentage	In value		
Wholesale markets activity in France									
Natural gas exchanged at PEG (TWh)	487	567	632	11%	65	299	321	7%	21
% of national consumption	117%	127%	130%		3%	115%	125%		9%
Trading volumes in the French intermediated markets									
Spot market (TWh)	152	178	188	6%	10	92	97	6%	6
Intraday	16	18	27	44%	8,2	13,3	13,3	0%	0,0
Day Ahead	89	102	105	3%	3,1	51,1	54,8	7%	3,7
Exchange (DA, WD, WE, other spot)	92	119	139	17%	20,1	64,2	85,1	33%	20,9
Brokers (DA, WD, WE, other spot)	61	59	49	-17%	-10,3	27,3	12,1	-56%	-15,2
Forwards market (TWh)	379	440	455	3%	15	274	220	-20%	-53
M+1	112	108	129	20%	21,2	59,0	60,3	2%	1,3
Q+1	45	51	43	-15%	-7,6	18,0	26,9	49%	8,9
S+1	104	78	75	-4%	-3,4	51,0	51,4	1%	0,3
Y+1	15	46	7	-85%	-39,2	4,6	11,1	139%	6,5
Exchange (all maturities)	47	45	54	21%	9,2	34,8	14,6	-58%	-20,1
Brokers (all maturities)	332	395	401	2%	6,0	238,9	205,6	-14%	-33,4
Number of transactions in the French intermediated markets									
Spot market	119 342	138 607	142 800	3%	4193	66596	77376	16%	10780
Intraday	21 739	24 615	29 496	20%	4881	14431	14825	3%	394
Day Ahead	80 561	92 575	92 680	0%	105	43084	50278	17%	7194
Exchange (DA, WD, WE, other spot)	89 613	112 872	122 942	9%	10070	54771	73554	34%	18783
Brokers (DA, WD, WE, other spot)	29 729	25 735	19 858	-23%	-5877	11825	3822	-68%	-8003
Forwards market	5 563	6 074	6 586	8%	512	3291	3394	3%	103
M+1	3 415	3 329	3 790	14%	461	1702	1940	14%	238
Q+1	421	572	528	-8%	-44	214	301	41%	87
S+1	618	530	468	-12%	-62	306	281	-8%	-25
Y+1	91	244	54	-78%	-190	41	56	37%	15
Exchange (all forward maturities)	1 772	1 550	1 700	10%	150	851	660	-22%	-191
Brokers (all forward maturities)	3 791	4 524	4 886	8%	362	2440	2734	12%	294
Concentration of the natural gas market in France									
Numbers of shippers active in the market	106	110	103	-6%	-7	98	101	3%	3
Active in Powernext Gas Spot	54	55	59	7%	4	54	66	22%	12
Active in Powernext Gas Futures	40	40	47	18%	7	43	46	7%	3

Table 13: Transactions in the intermediated gas market in France

	2014	2015	2016	H1 2016	H1 2017
Most commonly trades volumes (MWh/j)					
Spot	1000 (44%)	1000 (48%)	1000 (51%)	1000 (51%)	1000 (52%)
day-ahead	1000 (48%)	1000 (53%)	1000 (54%)	1000 (55%)	1000 (55%)
Forwards	720 (38%)	720 (39%)	720 (43%)	720 (42%)	720 (38%)
month	720 (41%)	720 (41%)	720 (46%)	720 (45%)	720 (40%)
season	720 (41%)	720 (50%)	720 (44%)	720 (46%)	720 (39%)
Total intermediated market	1000 (42%)	1000 (46%)	1000 (48%)	1000 (49%)	1000 (50%)

SECTION 1

INTEGRATION OF WHOLESALE MARKET MONITORING WITHIN THE EUROPEAN FRAMEWORK

1. A LEGAL FRAMEWORK IMPLEMENTED OPERATIONALLY AT EUROPEAN AND NATIONAL LEVELS

Since 28 December 2011, the CRE's wholesale energy market monitoring mission has been governed by the European regulation on the integrity and transparency of wholesale energy markets ((EU) Regulation No. 1227/2011 of 25 October 2011) known as REMIT. Adopted in October 2011, it prohibits market abuses - insider trading and market manipulation - and requires participants to disclose any inside information they may have.

Pursuant to provisions of the regulation, ACER must monitor all European markets, in cooperation with national regulators. National regulatory authorities (NRAs) carry out investigations on suspected market abuses. In cross border cases, ACER has a power of coordination and can set up, if needs be, an investigatory group comprising representatives of NRAs.

1.1 A precise European and national legal framework

Work to incorporate REMIT provisions into national law was completed in 2016. In particular, order No 2016-461 of 14 April 2016¹ amended Articles L. 131-2 and L. 134-25 of the Energy code to specify CRE's powers regarding the collection of data, registration and obligations of persons professionally arranging transactions. This order also empowered CRE's standing committee for disputes and sanctions (CoRDiS) to sanction any breaches related to these obligations. Article L.131-2 of the Energy code henceforth states that CRE shall "guarantee compliance with Articles 3, 4, 5, 8, 9 and 15" of REMIT. Investigations may be launched when CRE detects or is informed of potential breaches of these provisions. CRE also guarantees compliance with Articles 3, 4 and 5 of REMIT for the capacity market. These articles refer to:

- insider trading (Article 3) and market manipulation (Article 5) prohibitions;
- transparency obligations and the obligation to publish inside information (Article 4);
- the obligation for market participants to report records of wholesale energy market transactions, including orders to trade (Article 8);
- the obligation for market participants to register (Article 9);
- obligations of persons professionally arranging transactions (Article 15).

The legal framework stemming from REMIT is therefore complete and fully operational.

In addition, surveillance of wholesale energy markets must take into account financial legislation regarding market abuse, with which REMIT interacts. Articles 3 and 5 do not apply to wholesale energy products which are also financial instruments in accordance with financial regulations². In that regard, on 10 February 2016, the European Commission postponed to 3 January 2018 the entry into effect of Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments, known as "MiFID II"³, to give the stakeholders and competent authorities more time to set up the appropriate systems. This Directive also expanded the list of financial instruments to include CO₂ emission allowances as well as derivative products with an underlying electricity or gas asset, traded in a platform such as an organised trading facility (OTF) in the meaning of MiFID II. In this last category, wholesale futures energy products which must necessarily be settled physically are however not considered as financial instruments. This exception is known under the term "REMIT carve-out"⁴. Important clarifications about the definition of these products were afterwards made by the European Commission's delegated regulation of 25 April 2016⁵, which lifted doubts about the legal framework applicable to them.

¹ Consult Order No. 2016-461 of 14 April 2016

² See Article 1(2) of REMIT (Regulation (EU) No. 1227/2011)

³ Consult Directive 2014/65/EU of 15 May 2014 on markets in financial instruments

⁴ See Annex I, section C of Directive 2014/65/EU

⁵ Consult the delegated regulation supplementing directive 2014/65/EU of 25 April 2016 of the European Commission, in particular Articles 5 and 8

Financial instruments are subject to the provisions related to market abuse in the MAR regulation (Market abuse regulation⁶), entered into effect on 3 July 2016. Nevertheless, REMIT remains applicable to products which are wholesale energy products and financial instruments as regards obligations to publish insider information (Article 4), to report data to ACER (Article 8) and registration (Article 9). These issues are regularly discussed by CRE and AMF (French financial authority) within the framework of cooperation between the two institutions provided for by the Energy code and the Monetary and financial code.

1.2 Surveillance procedures and tools implementing these provisions

REMIT provides that before reporting their data, market participants must register with the national regulatory authority (NRA) in the Member State in which they are established or, if they are not established in a European Union country, with the NRA of a Member State in which they are active⁷. CRE chose to use the Centralised European Register for Market Participants (CEREMP) developed by ACER and accessible in France since 7 October 2014. Market participants are required to communicate as early as possible to NRAs any changes in data concerning them⁸. At the end of 2016, over 1,100 market participants were registered in the French register. ACER subsequently consolidates the national registers so as to establish a European register of market participants. This is updated regularly and part of the data it contains is made public.

In compliance with the REMIT implementing acts, continuous collection of standard data⁹ and non-standard data by ACER started in October 2015 and April 2016 respectively. For all European markets, data collection is done via data reporting entities, which can be the market participants themselves when they have been accredited as a "Registered Reporting Mechanism" (RRM) or third-party RRM. Data are then shared with NRAs whose information security policy meets the criteria imposed by ACER.

The year 2016 was a transitional year, since CRE, in parallel, temporarily extended the national data collection directly from operators and persons professionally arranging transactions (PPAT) in order to actively participate in the data quality checks performed by ACER. Ultimately, surveillance work will be based mainly on data collected at European level, supplemented, if needs be, by data collection at national level. In this regard, REMIT enables NRAs to collect additional data necessary for their market surveillance mission, at national level.

Lastly, coordination of the implementation of REMIT in Member States is ensured at operational level by a constant communication between the different NRAs and ACER, but also by the use of shared tools. Communication is mainly bilateral and within working groups dedicated to different topics relating to REMIT (IT aspects, tools, methods and means of surveillance, harmonisation of the implementation of REMIT provisions, etc.). For example, the guidelines published by ACER, in compliance with Article 16 of REMIT, or the "Q&A" document, which contains the questions most frequently asked to regulators as well as the Agency's answers, are the result of common thinking and understanding.

⁶ Consult Regulation (EU) 596/2014 of 16 April 2014 on market abuse

⁷ Consult the fourth edition of ACER's guidance on this subject

⁸ See Article 9(5) of REMIT

⁹ The list of standard contracts is available on ACER's website: <https://www.acer-remit.eu/portal/standardised-contract>

2. THE MONITORING ACTIVITY IN 2016 WITHIN THE FRAMEWORK OF REMIT

Within the framework of its wholesale market monitoring mission, in 2016 CRE oversaw 730,000 market transactions, i.e. the equivalent of 1,900 TWh traded or more than €60 billion. CRE can carry out in-depth analyses following the detection of unusual or suspicious market events or a notification by ACER, by another NRA, by persons professionally arranging transactions or any other market participant. In 2016 and the first semester of 2017, CRE issued 26 requests for information to market participants within the framework of in-depth analyses.

In case of a suspected breach of REMIT provisions, the opening of an investigation may be decided by CRE's chairman who appoints an officer in charge of carrying out that investigation. This investigation may result, if needs be, in referral to CoRDIS. As at the date of publication of this report, six investigations have been opened by CRE, three for electricity and three for gas.

Throughout 2016, CRE held several information meetings to present to market participants the REMIT regulation and its operational implementation¹⁰. It also supported market participants and assisted them with the understanding of the regulation in order to answer their practical questions relating to registration and data reporting obligations.

CRE also contributed to the drafting of the fourth edition of ACER's non-binding guidance, which was published in June 2016. It highlights monitoring of the obligations of persons professionally arranging transactions (PPATs) as specified by Article 15 of REMIT. Indeed PPATs must inform relevant NRAs when they suspect breaches of REMIT (See box: monitoring of obligations imposed on persons professionally arranging transactions detailed in the fourth edition of ACER's Guidance).

European work was also concentrated on the development of common positions on the analysis and qualification of the different practices that are likely to be qualified as market manipulation within the meaning of Article 5 of REMIT. The first guidance note, available on ACER's website, covers "wash trades", defined as "the act of a market participant entering into arrangements for the sale or purchase of a wholesale energy product, where there is no change in beneficial interests or market risk or where the beneficial interest or market risk is transferred between parties who are acting in concert or collusion".

¹⁰ All of these documents are available on CRE's website, see the page dedicated to REMIT

Box: monitoring of obligations imposed on persons professionally arranging transactions detailed in the fourth edition of ACER's Guidance.

The fourth edition of ACER's Guidance highlights Article 15 of REMIT, which requires PPATs to report transactions which they reasonably suspect might breach the prohibition of insider information and market manipulation.

Chapter 9 of the Guidance describes the concept of PPATs and gives examples of entities that correspond to this definition. Exchanges, brokers and transmission system operators are considered PPATs, their main characteristic being their intermediary role. TSOs play in particular a major role in market mechanisms relating to electricity system balancing (imbalance mechanism, frequency control reserve, etc.).

In this new chapter, ACER describes its current understanding of the definition of PPAT (chapter 9.2), the obligation to notify any potential breaches of Article 3 or 5 of REMIT (chapter 9.3), what is expected from PPATs regarding the implementation of effective provisions and procedures to detect breaches of Articles 3 and 5 of REMIT (chapter 9.4), as well as examples of surveillance methods that may be used by NRAs to promote compliance with Article 15 of the regulation.

With regard to the obligation to notify any potential breaches of Articles 3 and 5 of REMIT, the Guidance goes over the information that a suspicious transaction report (STR) should contain when that information is available, and the criteria to determine to which NRA it should be sent. In addition, it specifies that the notion of "without delay" is understood by regulators, as a best practice, as being less than four weeks as from the occurrence of the event. Notifications may be done via the "notification platform" made available by ACER and which can be found at the following link: <https://www.acer-remit.eu/np/home>. This platform enables PPATs to send a STR to several NRAs simultaneously.

Lastly, Article 15 of REMIT requires PPATs to establish and to keep effective measures in order to detect breaches of Articles 3 and 5, which means that they must actively monitor the wholesale energy markets in which they are involved. This fourth edition of the Guidance proposes solutions to avoid potential conflicts of interest and examples of governance models that might reduce this risk. Indications regarding the appropriate level of resources to be devoted to surveillance, both from a quantitative and qualitative point of view, as well as examples of potentially virtuous procedures (in terms of communication and traceability for example) are also given.

SECTION 2

CONTEXT OF THE ENERGY MARKETS

The year 2016, breaking with the downward trend of 2015, was characterised by an increase in wholesale energy market prices driven by the recovery in commodity prices after the very low levels in Q1. The global coal market and the gas market experienced a period of major price fluctuations. During the first semester 2017, commodity prices stabilised, in particular for coal, and dropped slightly for oil and gas.

The 2016 climate was warmer in general compared to the average temperatures but not as warm as those recorded in 2015. Climatic vagaries had very important consequences on electricity demand in France and Europe, with perceptible effects in the wholesale markets. Temperature variations recorded during the year were reflected in electricity consumption, particularly during the first winter cold spell in Q4 2016. Rainfall levels in 2016 were on average close to normal according to the French meteorological centre. However, the second semester was characterized by a deficit of over 35% compared to normal, which weighed on the production of hydraulic plants.

The price of the CO₂ allowance continued to plunge. This trend began at the end of 2015. At an average €5.3/tonne during the year, fluctuations in the price of the CO₂ allowance were correlated to announcements of national, European and international measures. In addition, the CO₂ allowance will fall within the scope of the MiFID II Directive as of its entry into effect on 3 January 2018 as a financial instrument.

1. PICKUP IN COMMODITY PRICES DURING 2016 AND BREAK IN THE UPWARD TREND IN THE FIRST HALF OF 2017

The downward trend in the prices of the main energy commodities (oil, coal, gas and electricity) stopped as from Q2 2016 (Graph 1), after reaching their lowest levels since 2008.

Graph 1: Evolution in commodity prices



Sources: EEX, ICIS Heren, Reuters, ICE

1.1 Upward trend in oil prices in 2016, which reversed in 2017 against supply glut

The year 2016 was marked by soaring oil prices following a sharp drop started in H2 2014 (Graph 2). The Brent price settled at €39.5/barrel on average in 2016, down by 16% compared to 2015. Nevertheless, prices followed an upward trend as from Q2 2016, from €32.1/barrel on 1 April 2016 to €52.5/barrel on 30 December 2016, i.e. a 63.5% jump.

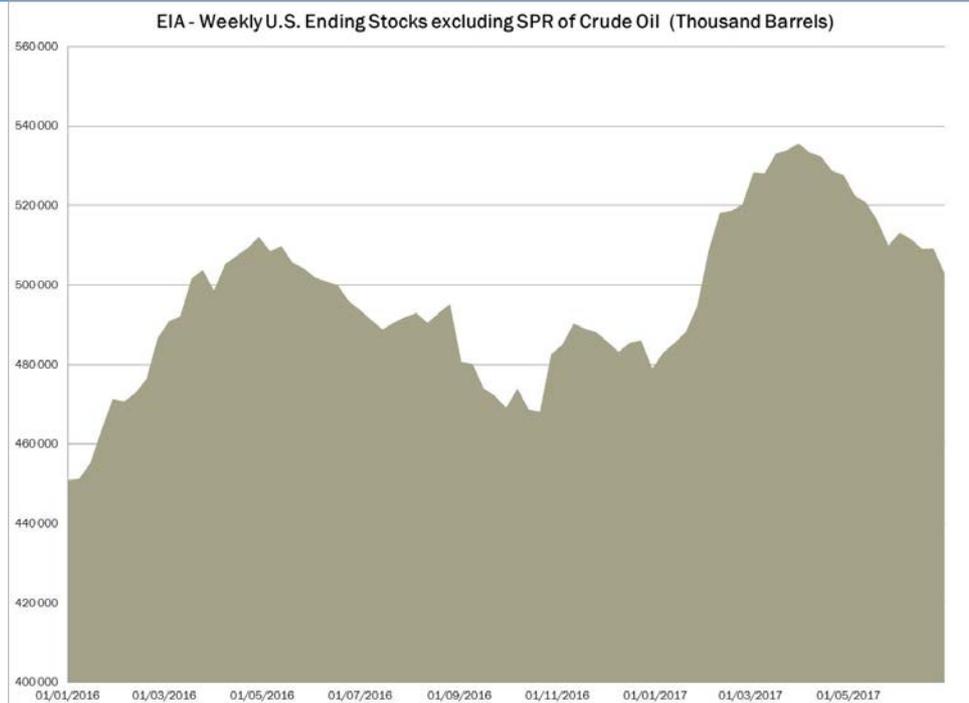
Graph 2: Oil prices



Source: Reuters

This rise in prices during the year was due to discussions between OPEC member countries and Russia which started in May 2016. These discussions resulted in the signing on 30 November 2016 by most stakeholders with the exception of Iran, Libya and Nigeria, of an agreement to cap production in the first semester of 2017. However, there was still a supply surplus in 2016, sustained partly by additional volumes from Iran, Iraq, Libya and Saudi Arabia, and by high levels of commercial stocks in the USA (Graph 3).

Graph 3: Evolution in American EIA - Weekly U.S. Ending Stocks excluding SPR of Crude Oil (Thousand Barrels)



Source: U.S. Energy Information Administration (EIA)

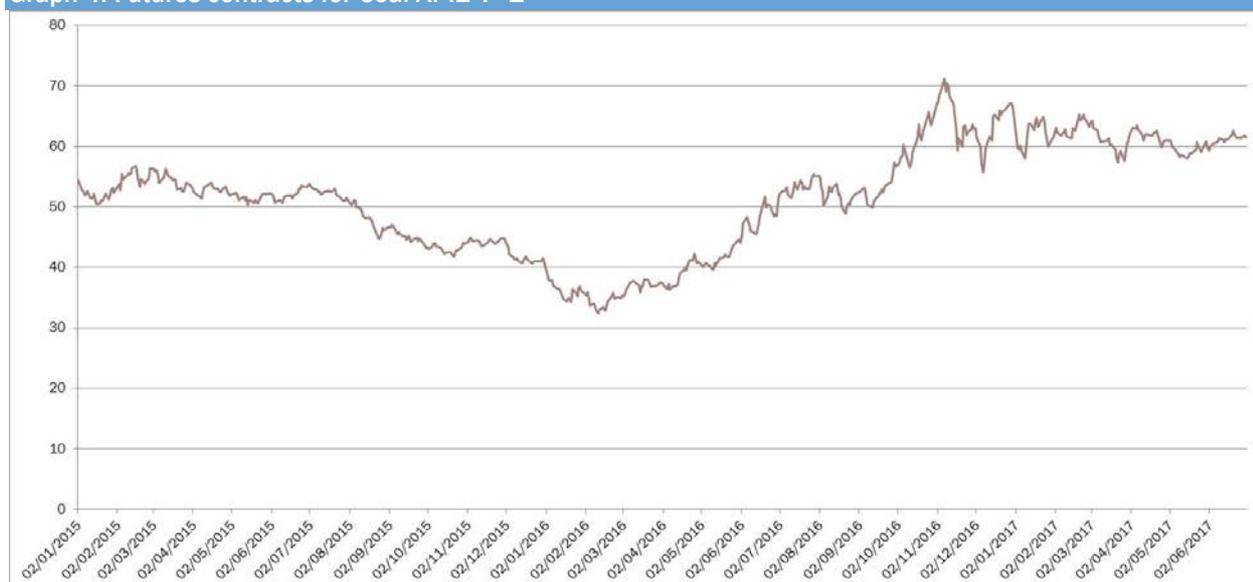


During Q1 2017, the Brent reached an average of €50.3/barrel, representing a 10% increase compared to the previous quarter. The rise in prices on average in Q1 2017 continued against the implementation and compliance with measures aimed at reducing production by countries that signed the abovementioned agreement. However, the increase in American, Nigerian and Libyan production as well as the rise in American crude oil stocks to record levels according to EIA data, halted this evolution. In Q2 2017, the Brent reached on average €45/barrel, representing a 10.6% drop compared to the previous quarter. Very high levels of American stocks and the jump in American production contributed to falling oil prices. In addition, OPEC did not manage to stop the downward trend despite the willingness of some countries to extend the agreement to reduce production to March 2018.

1.2 Soaring coal prices throughout the year 2016

Coal API2 Y+1 futures prices (**Erreur ! Source du renvoi introuvable.**) fell to an average €48.5/tonne in 2016 compared to an average €49.4/tonne in 2015. Nevertheless, they also followed an upward trend in 2016, contrary to the downward trend in 2015, after reaching their lowest level since 2005 in Q1 2016. The average price went from €35.8/tonne in the Q1 2016, to €63/tonne on average in the last quarter of that same year.

Graph 4: Futures contracts for Coal API2 Y+1



Source: Argus API2

Higher coal prices resulted mainly from the major drop in global production, particularly Chinese and American productions, compared to 2015. The drop in Chinese production was due in particular to measures to reduce production capacity of mines in China within the framework of its policy to fight against pollution.

In the first semester 2017, coal prices stabilised and stood at an average €61.3/tonne. Despite the slight increase in Chinese production, prices were sustained by disturbances to Australian and Indonesian exports and by high demand in the electricity sector in Europe, due to the low level of hydraulic reserves particularly in the south of Europe.

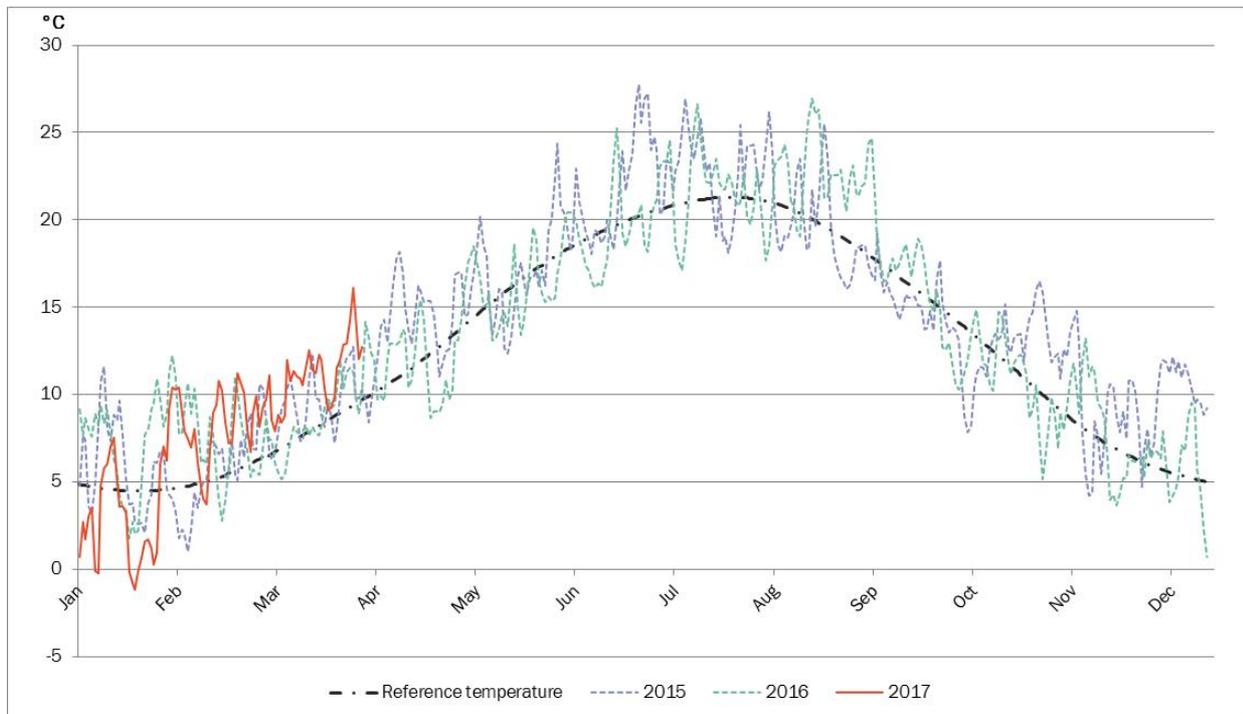
2. TEMPERATURES IN 2016 ABOVE NORMAL AND A RAINFALL DEFICIT IN THE SECOND HALF

Temperatures in 2016 were close to normal season temperatures (-0.04°C) (Erreur! Source du renvoi introuvable.). In the first half of 2017, the temperatures were warmer than in the first half of 2016, with, in particular, a difference of 0.9°C above reference temperatures on average.

January and February 2016 were mild, with about +1°C compared to reference temperatures. Cooler temperatures were registered during the rest of the year with average differences compared to normal temperatures between -0.2°C and -1.15°C. The end of summer was marked by an exceptionally hot September, with a over +1.5°C compared to normal season temperatures. In contrast, the end of the year was cooler and remained so at the start of 2017, with temperatures 2°C lower than normal temperatures. However, as from February 2017, temperatures recovered, with, in particular, a month of March considered the hottest since 1900, at 2°C above normal.

Despite an average overall rainfall close to normal throughout France in 2016, the pattern was very uneven across the territory and over the months. The first half of 2016 had above-average rainfalls, whereas the second half, which had an overall rainfall deficit except in November, was marked by the driest August and December ever recorded over the 1959-2016 period according to the French meteorological centre.

Graph 5: Temperature curve for France



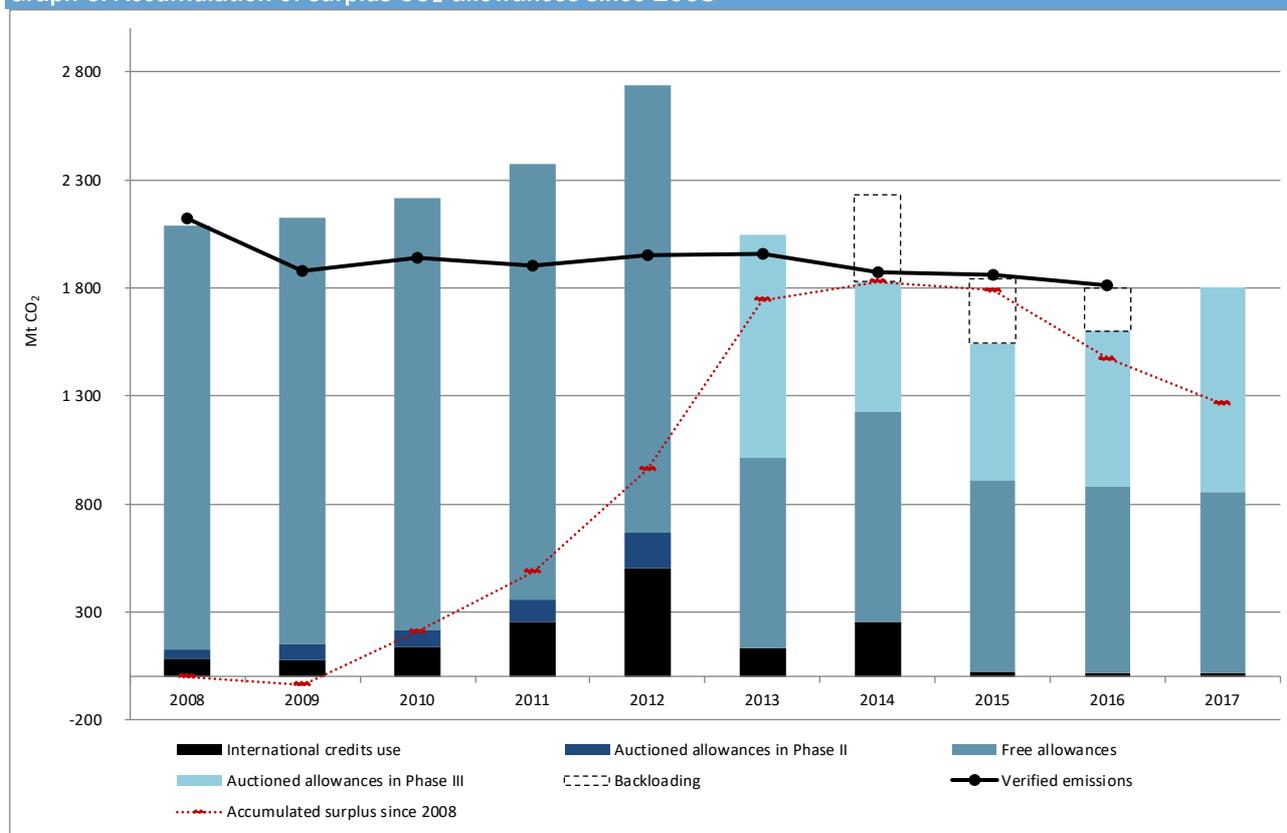
Source: Thomson Reuters

3. PRICE OF CO₂ ALLOWANCE LOW AND VOLATILE

3.1 Decrease in the emission allowance surplus in 2016 even if the surplus was still considerable

In 2016, the number of allowances auctioned increased by 14%, reaching 724 MtCO₂, compared to 633 in 2015, while 200 MtCO₂ were taken out within the framework of the backloading mechanism (Graph 6). The year 2016 was the last of this mechanism which enabled 900 MtCO₂ in total to be progressively back-loaded between 2014 and 2016. The number of allowances allocated free of charge was down 3.5% in 2016 compared to 2015, totalling 857 MtCO₂. Overall, the number of allowances in the market in 2016 was slightly up compared to 2015. In addition, there was a 3% drop in verified emissions in 2016 compared to 2015, reaching 1,811 MtCO₂. A deficit of about 230 MtCO₂ was observed between the allowances distributed and verified emissions in 2016 and therefore contributed to the reduction in the existing surplus. However, this did not enable the accumulated allowance surplus created since 2008 to be eliminated, and therefore had no effect on the price.

Graph 6: Accumulation of surplus CO₂ allowances since 2008



Source: Reuters, European Commission

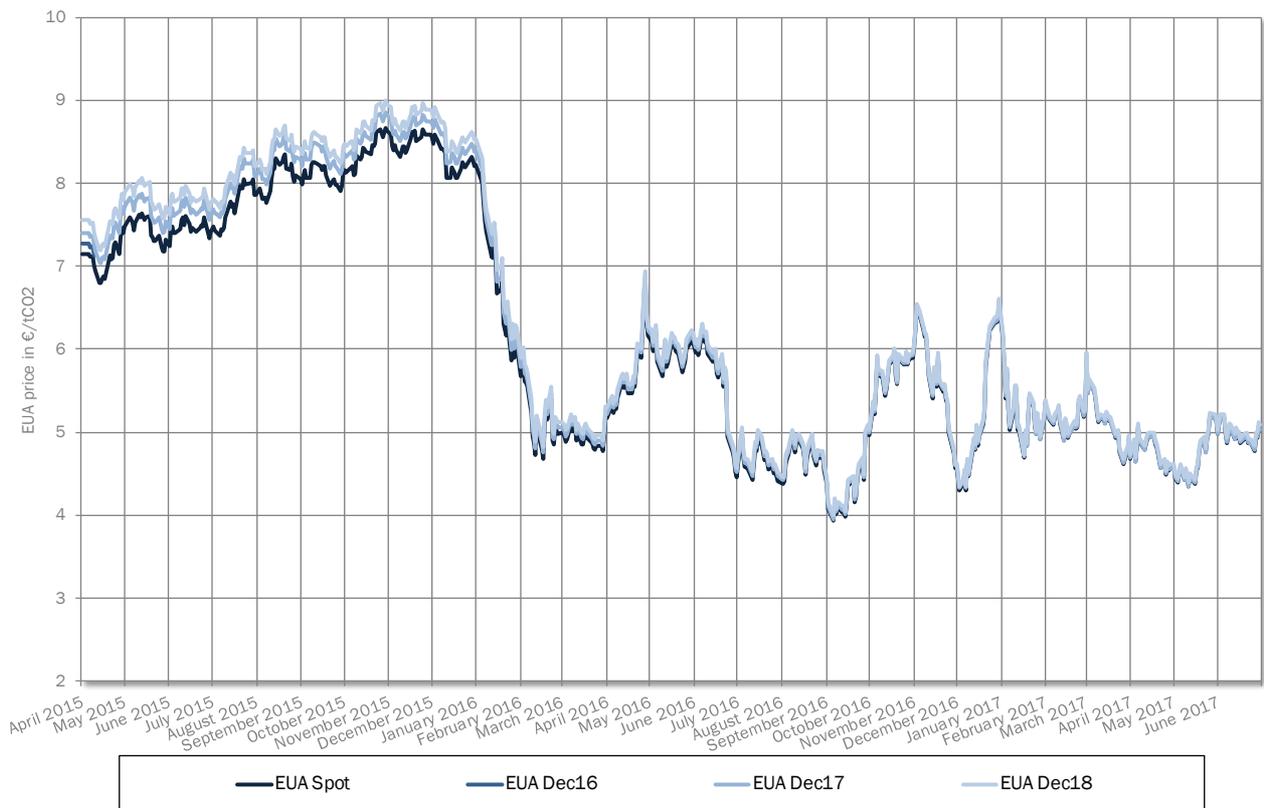
3.2 A drop followed by volatility in the price of the CO₂ allowance

In 2016, the average spot price of the emission allowance (EUA) in the EU trading emissions system was down by 30% compared to 2015, settling at €5.3/tCO₂ (Graph 7). This drop is mainly related to the 50% fall in prices during the first months of 2016, against a mild winter (surplus allowances in market participants' portfolios), an increase in volumes auctioned (+100 Mt) and a drop in demand during those auctions (drop in coverage rate). The price of the CO₂ emission allowance oscillated around its average value at €5.3/tCO₂. These fluctuations went from +€2/tCO₂ to -€1/tCO₂ in tune with national and European measures and announcements. The announcement by the President of France about the intent to introduce a CO₂ floor price at €30/tCO₂ on 25 April 2016, the different trialogue stages in EU ETS reform and results of the Brexit referendum on 24 June are notable examples (Graph 7). The first half of 2017 was marked by an increase by €2.11/tCO₂ in January 2017 due to the

particularly cold winter 2016/2017, combined with low hydraulic reserve levels in France and Spain and low wind production. These factors resulted in heavy use of thermal generation using fossil sources and therefore an increase in demand for CO₂ allowances. The price of the CO₂ allowance regained relative stability around €5/tCO₂ during the first two quarters of 2017.

As regard surveillance, emission allowances will be included in the list of financial instruments as of the entry into effect of the MiFID II Directive on 3 January 2018, and will thus be subjected to the regulation on market abuse (MAR). As reiterated in its 2014-2015 surveillance report, follow-up by CRE of the carbon market may be part of the monitoring of energy market fundamentals. This follow-up could give rise to specific requests for information to market participants active in the French energy markets. These requests could fall within the framework of cases of unusual events involving the carbon market and electricity markets at the same time. The detection of these cases could result from the follow-up conducted directly by CRE, ACER or the financial regulators.

Graph 7: Evolution in the price of the CO₂ allowance



Source: ECX – Analysis: CRE

SECTION 3

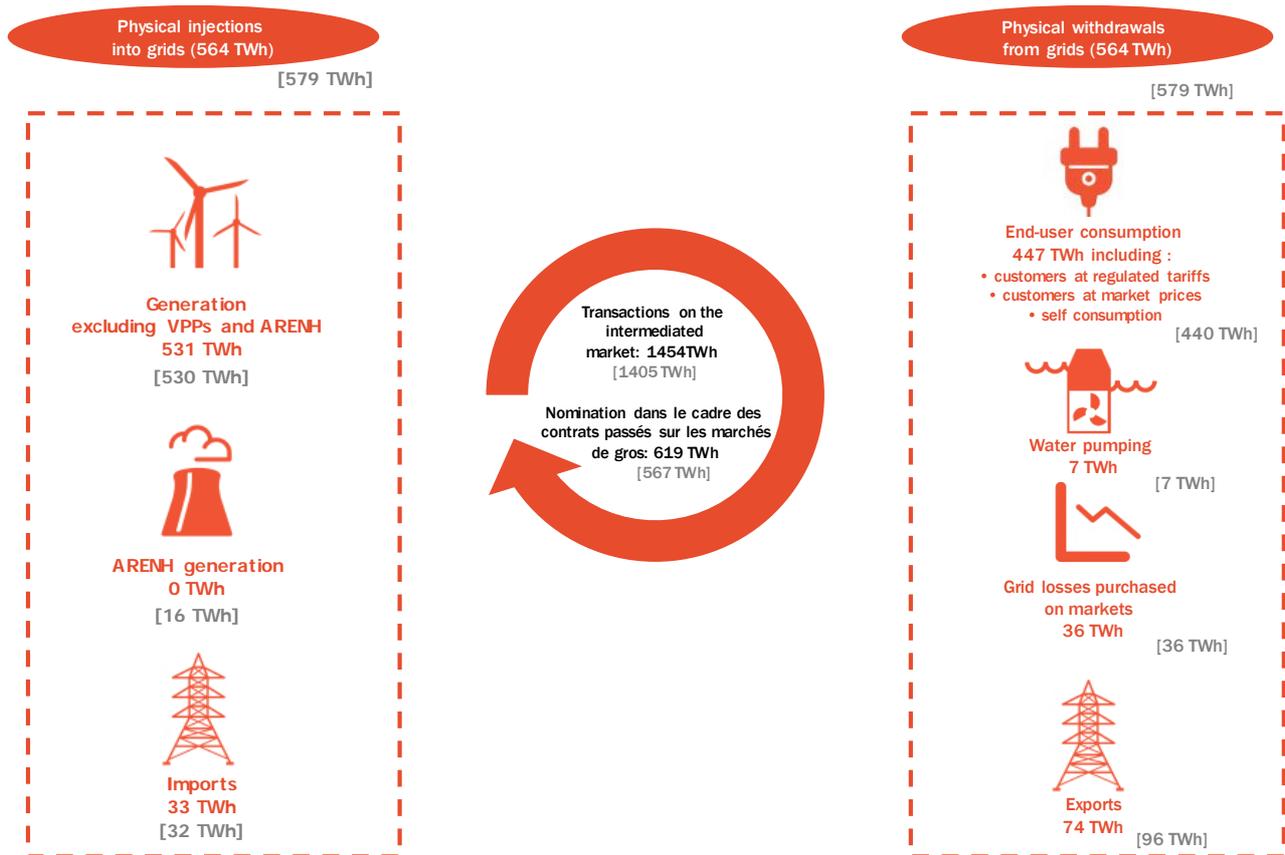
WHOLESALE ELECTRICITY MARKETS

1. ELECTRICITY MARKET FUNDAMENTALS MARKED BY MAJOR UNAVAILABILITY OF NUCLEAR FACILITIES AT THE END OF 2016

The year 2016 was characterized by a loose supply/demand balance in the first semester 2016 against low commodity prices early in the year. However, supply tightness in Q4 emerged due in particular to the historically low availability of French nuclear generation, from mid-July 2016 to March 2017, in connection with the shutdown of reactors for testing the carbon concentration levels in the steam generators channel heads.

Graph 8 presents a simplified version of the main flows for 2016 in the French electricity system and compares them to the figures for 2015 (between brackets).

Graph 8: Injections and withdrawals for 2016 [2015]



Sources: RTE – Analysis: CRE

1.1 Slight rise in consumption and a fall in production offset partly by a drop in exports

Total consumption in France slightly rose in 2016 compared to 2015, from 440 TWh to 447 TWh, i.e. +1.6% (Graph 9). This increase was homogenous for households, business and major industry. In 2016, consumption of households and businesses settled at 198 TWh and that of large industries and SMEs/SMIs at 227 TWh¹¹.

The evolution in consumption between 2015 and 2016 reflects mainly temperature variations. The increase in gross consumption in 2016 was concentrated in the months of November and December 2016 (+9.1 TWh) during which average monthly temperatures were lower by 2.3°C and 3.0°C compared to 2015 (Erreur ! Source du renvoi introuvable.). Over the first half of 2017, January stands out because of very high consumption due to the

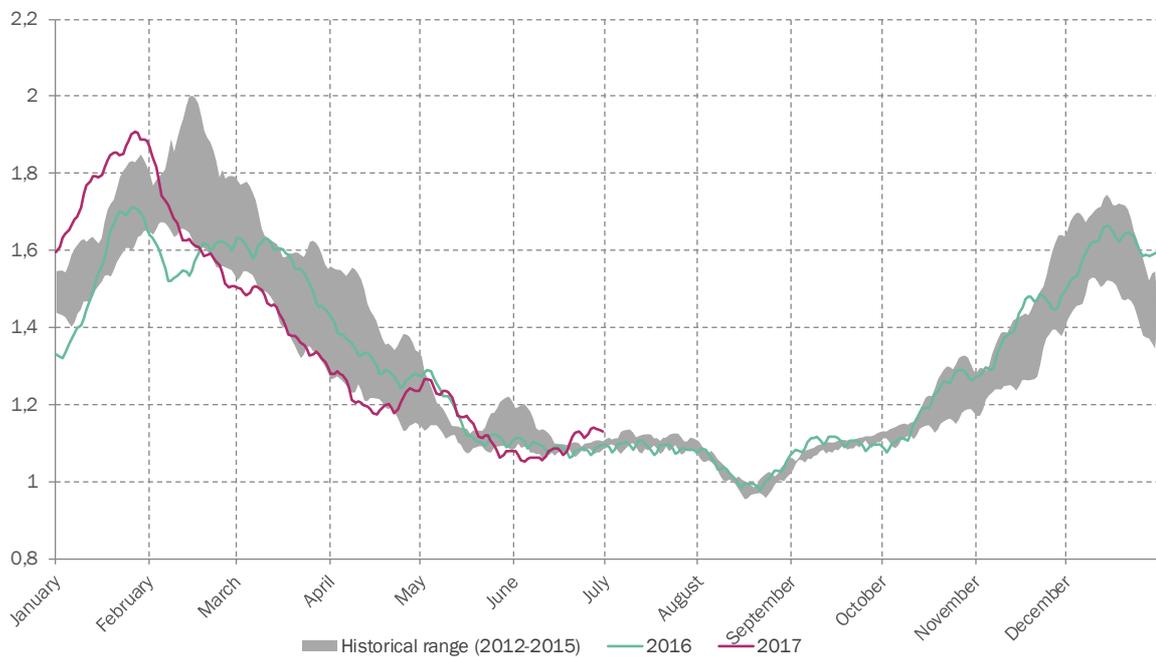
¹¹ Source: RTE (<http://bilan-electrique-2016.rte-france.com>)

cold spell of winter 2016/2017, with temperatures 2°C lower than normal. This consumption growth in winter contributed to increasing electricity system tightness against major nuclear unavailability. From early February 2017, average temperatures were about 2°C higher than normal season temperatures causing, as a result, a drop in consumption. Consumption picked up late April/early May because of a cold spell in the north of France during that period.

With regard to physical injections in the network, electricity deliveries dropped by -2.6%, going from 579 TWh to 564 TWh. There were no ARENH subscriptions¹² in 2015 for delivery in 2016 because alternative suppliers arbitrated between market products and the ARENH product, which was less competitive since calendar prices went below €42/MWh. Nevertheless, the rise in calendar product prices at the end of 2016, due to uncertainties surrounding the availability of French nuclear generation in 2017, caused a recovery in ARENH subscriptions in the November gate opening for delivery in 2017. In total, approximately 30 alternative suppliers requested subscriptions within the framework of the ARENH mechanism for delivery in 2017 (see below).

Graph 9: Consumption in France

Daily consumption (TWh) - moving average 15 days



Source: RTE – Analysis: CRE

Total electricity generation in France dropped by 2.7% compared to 2015, going from 546.2 TWh to 531.3 TWh in 2016, despite the increase in the overall installed generation capacity in France (+1.3% compared to the previous year to reach 130.8 GW). This drop in electricity generation, caused by nuclear, coal and fuel oil sectors, was only partially offset by a greater use of gas, solar and hydraulic generation. Therefore, withdrawals/injections were balanced in particular by the major drop in France's net exports compared to 2015 (-36%) in particular as from the third quarter of 2016 and during Q4 2016 with a 45.8% drop in these net exports (Graph 10). During that last quarter, imports increased by 50% and exports dropped by 33% compared to the same period in 2015. The use of interconnections compensated electricity system tightness due to nuclear unavailability and a higher consumption during this winter period. Nevertheless, France maintained a positive balance in 2016 even if it was a net importer in December 2016 for the first time since February 2012.

Electricity generation in the first half of 2017 was down by -2.4% compared to the same period in 2016. This drop is due to lower nuclear production, particularly during winter, a falling hydraulic production, less favourable hydrological conditions than in the first half of 2016 and stable renewable energy production. However, these

¹² The ARENH product corresponds to baseload energy delivered over the year, but also to guaranteed capacity. Arbitrage is between, on the one hand, the sum of calendar product prices and capacity prices, and on the other hand the ARENH price.



movements were offset by increased use of thermal generation, up by 50% compared to 2016, reaching 27.1 TWh (4.6 TWh for coal, 20.8 TWh for gas and 1.7 TWh for fuel oil).

The downward trend in net exports which started in Q4 2016 continued in the first half of 2017, offsetting the drop in production. This drop in net exports was even more marked in January and February with periods during which France became a net importer from its neighbouring countries, with net exports going up from March. On average in the first semester 2017, exporting balance of France dropped by 20% in total compared to the first semester 2016 (+9.9% for imports and -9.9% for exports).

Graph 10: Quarterly volumes traded at borders

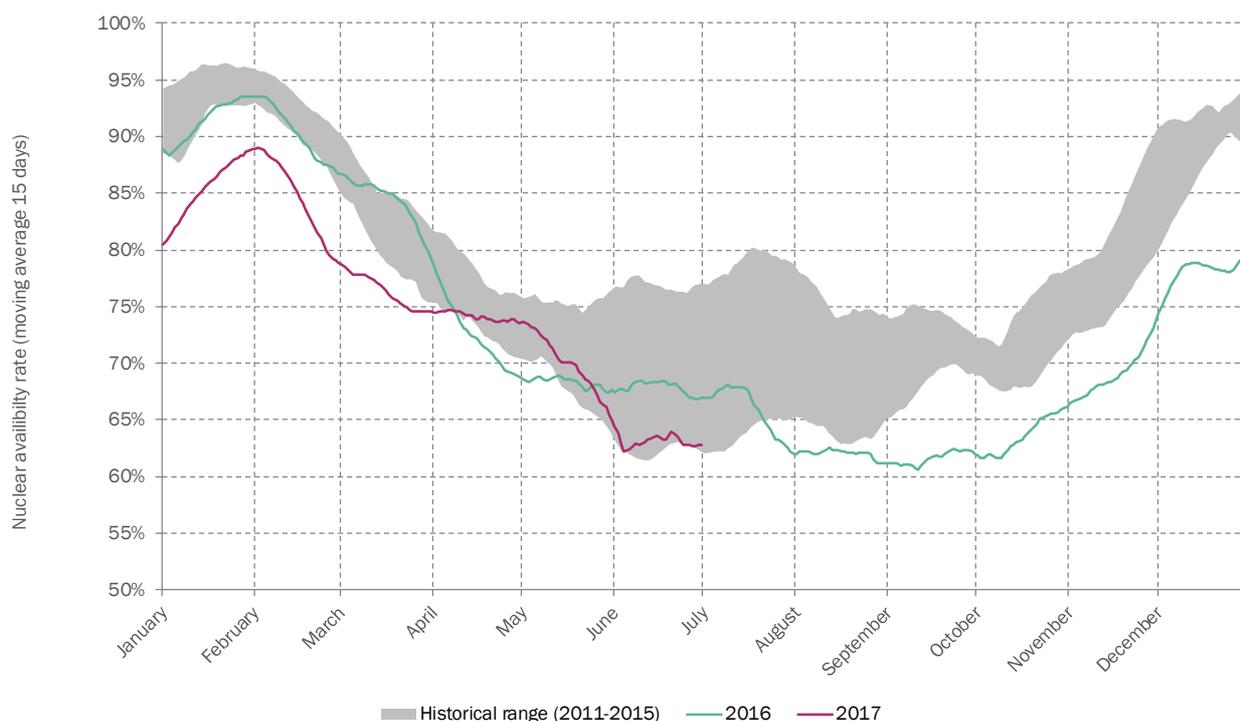


Source: RTE – Analysis: CRE

1.2 Nuclear generation rate at its all-time lowest from August 2016 to April 2017

The year 2016 was characterized by the fall in the rate of nuclear availability, going from 79.1% in 2015 to 72.9% in 2016. Availability of nuclear fleet was, from mid-July 2016 to early April 2017 (Graph 11), at historically low level due to the shutdown of reactors (up to 21 of 58 reactors down in November 2016), to allow for analyses of carbon concentration levels of steam generators channel heads. This episode had a significant impact on physical tightness in the system with, in particular, a 7.9% drop in production by this sector, and mechanically drove wholesale electricity prices upward. As from early April 2017, the rate of unavailability of French nuclear generation improved, but nevertheless remained low.

Graph 11: Availability rate of French nuclear generation



Source: RTE – Analysis: CRE

1.3 Installed renewable energy capacity (excluding hydraulic) on the verge of exceeding installed capacity of fossil thermal sectors and hydraulic production slightly up in 2016

Installed renewable generation capacity (excluding hydraulic) continued to grow and was on the verge of exceeding thermal fossil generation installed capacity in 2017 (Erreur ! Source du renvoi introuvable.), totalling 20.4 GW. This movement was even more marked given that the overall capacity of thermal fossil sectors (excluding nuclear) declined in 2016 and early 2017. However, for the first time since 2014, production of renewable sectors (excluding hydraulic) was lower than production of thermal fossil sectors (excluding nuclear) in Q4 2016 and Q1 2017 (Graph 13), against heavy use of fossil generation because of the unavailability of nuclear generation. In general, wind and solar sectors have followed a rapid growth rate for several years now (Table 14: Evolution of installed capacity of renewable sectors), though this rate slowed for wind generation in 2016.

Table 14: Evolution of installed capacity of renewable sectors

	2012	2013	2014	2015	2016	AAGR 2012/2016
Wind	+12%	+8%	+12%	+13%	+14%	+12%
Solar	+36%	+27%	+22%	+17%	+9%	+17%

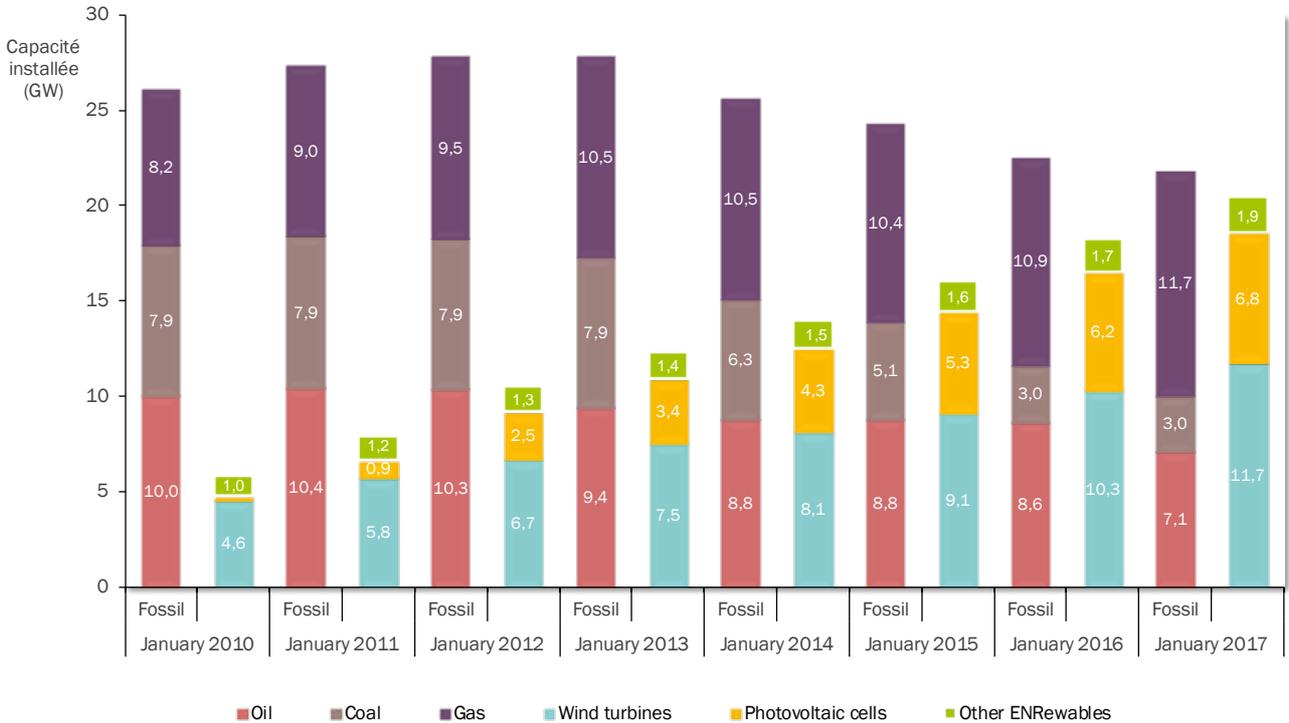
Source: RTE – Analysis: CRE

Fuel oil-based power plants' capacity dropped in 2016 with the closing of the two Aramon plants (685 MW each) as well as the four units in the Porcheville plant. However, gas generation capacity increased with the opening in



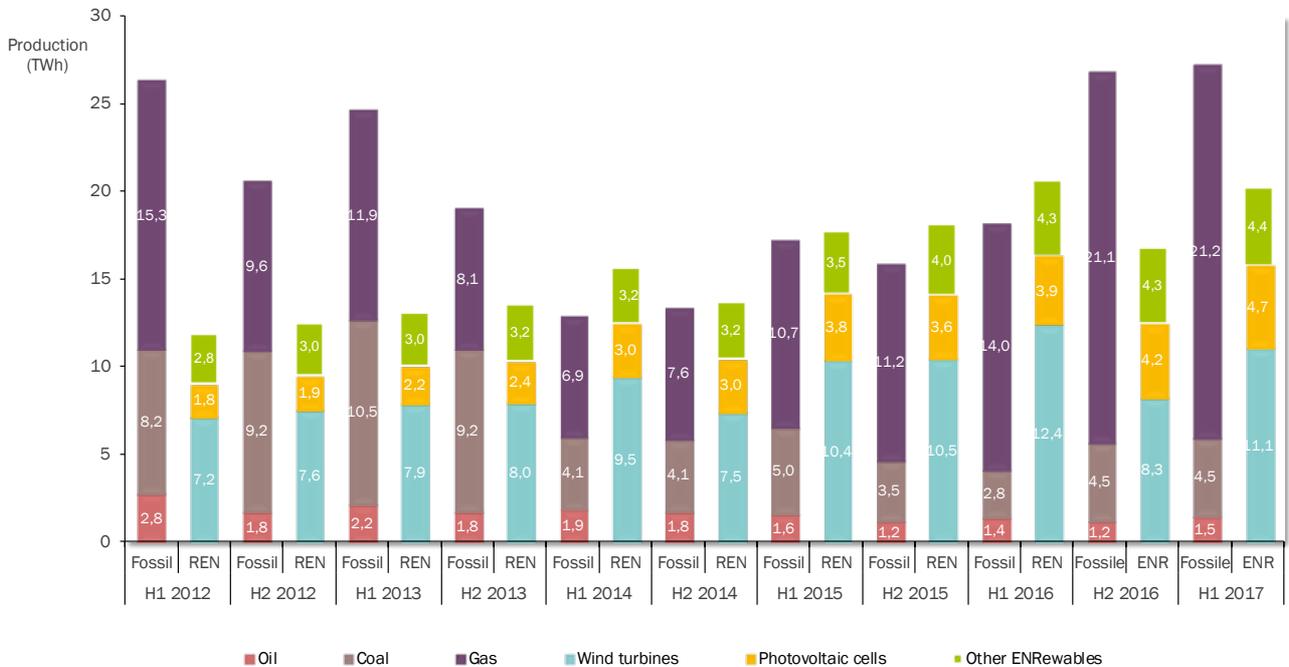
2016 of EDF's CCGT at Bouchain of a capacity of 563 MW (Graph 12). Thermal fossil capacity dropped in 2016 by 7.2% and early 2017 by 3.3%.

Graph 12: Comparison of installed capacity of thermal fossil generation (excluding nuclear) and renewable energy sectors (excluding hydraulic)



Source: RTE – Analysis: CRE

Graph 13: Comparison of six-month production of thermal fossil generation (excluding nuclear) and renewable energy sectors (excluding hydraulic)



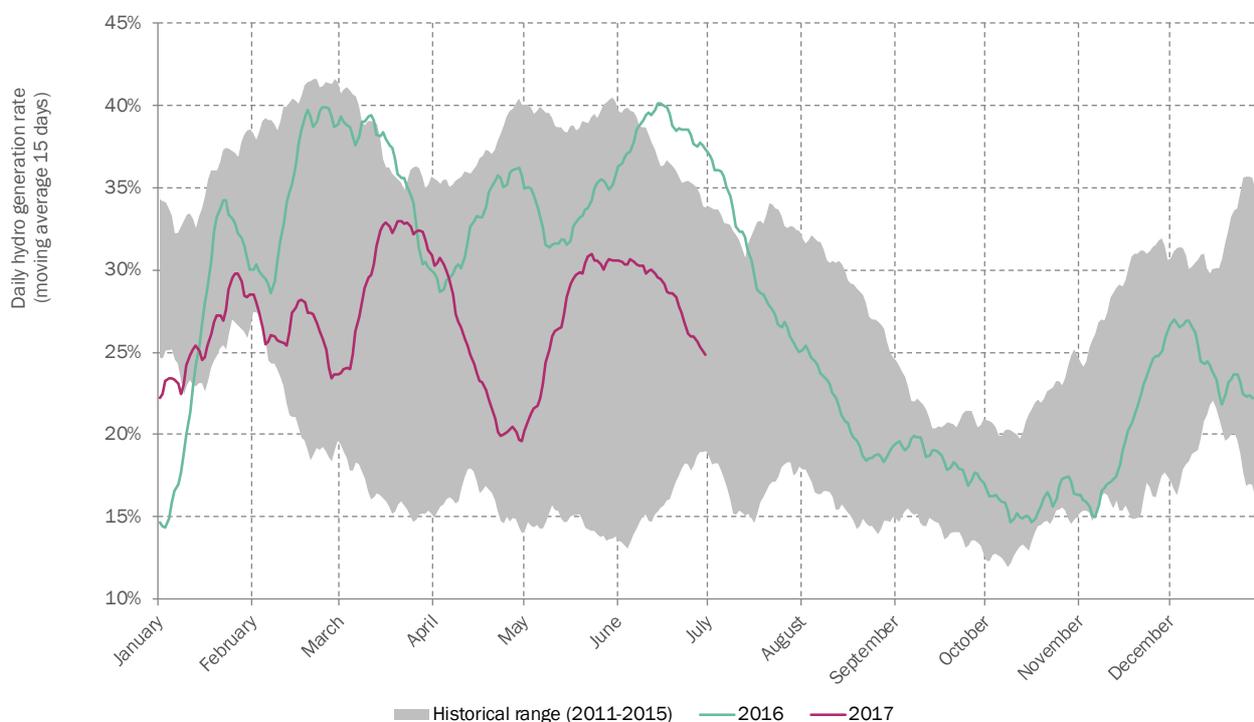
Source: RTE – Analysis: CRE

With regard to hydraulic production, the average production rate was up in 2016 (+8.2%) compared to 2015 thanks to heavy rainfall in H1 2016 (Graph 14). Levels of hydraulic production, in particular run-of-the river



production, increased significantly at the start of 2016 due to heavy rainfall. In addition, heavy rainfall in spring 2016 brought hydraulic stock levels back up. During the second half of 2016, the hydraulic production dropped because of a rainfall deficit, but reached similar levels to those observed over the last few years. Early 2017 built on the end of 2016 with levels consistent with 2011-2015 data.

Graph 14: Rate of hydraulic generation



Source: RTE – Analysis: CRE

1.4 Gas power plant generation rate at its highest in over 10 years

In 2016, despite the drop in installed capacity of the thermal fossil fuels, their production soared considerably compared to 2015, from 33.2 TWh to 45.9 TWh (+38.3%)¹³. This increase was concentrated in the second half of 2016 and for gas power plants mainly. On average over the year, gas sector production surged (+61%) (Graph 16), whereas coal and fuel production respectively fell by 15% and 18%. Gas sector production rate was an average 35% in 2016 with a use rate largely above historical levels because of relatively low gas prices in the first three quarters of 2016 enabling positive returns (measured by the clean spark spread¹⁴). At the end of 2016, against major unavailability of nuclear generation, a rise in electricity prices and low gas prices, gas power stations had an excellent theoretical profitability and were largely used. In the first half of 2017, low nuclear availability in January and February, along with low hydraulic production led to greater use of thermal generation, and more particularly gas plants. Gas plant production increased by roughly 50%, reaching 20.8 TWh compared to 14 TWh in the first semester 2016.

Similarly, the clean dark spread was positive throughout the year (Graph 15) and coal-fired power plants had a largely positive theoretical profitability between mid-August 2016 and February 2017. Coal-fired production rate was an average 26% in 2016 (Graph 17), but exceeded historical levels as from October and remained at high levels until February 2017, when the clean dark spread returned to levels similar to those of H1 2016.

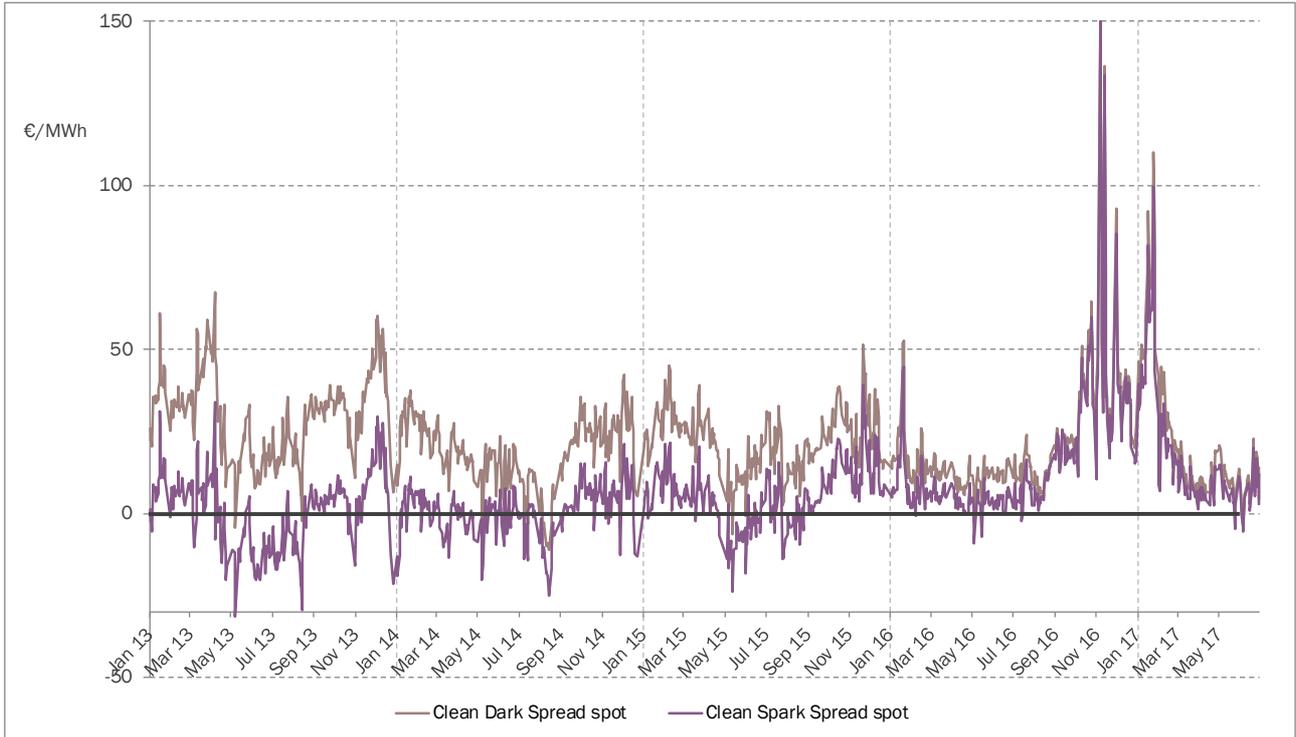
¹³ Source: RTE (<http://bilan-electrique-2016.rte-france.com>)

¹⁴ The clean spark and dark spread measures the theoretical profitability of a gas- or coal-fired power plant. The calculations presented are indicative and do not take into account all costs, in particular fixed costs and start-up costs, and are therefore not the only indicators for the decision to start a unit.

CSS (€/MWh) = $p_E - (\alpha p_C + \beta p_{CO_2})$, where p_E is the day-ahead peak electricity price in France, p_C is the price of coal, p_{CO_2} the spot price of CO₂, α the average yield of a coal plant (35%) and β the emission factor of coal plants (0.96 tCO₂/MWh). Calculations were done assuming a coal calorific value of 8.14 MWh/t.

CSS (€/MWh) = $p_E - (\gamma p_G + \delta p_{CO_2})$, where p_E is the day-ahead peak electricity price in France, p_G is the price of gas, p_{CO_2} the spot price of CO₂, γ the average yield of a gas plant (52%) and δ the emission factor of gas plants (0.43 tCO₂/MWh)

Graph 15: Peak spot clean dark spread and peak spot spark spread



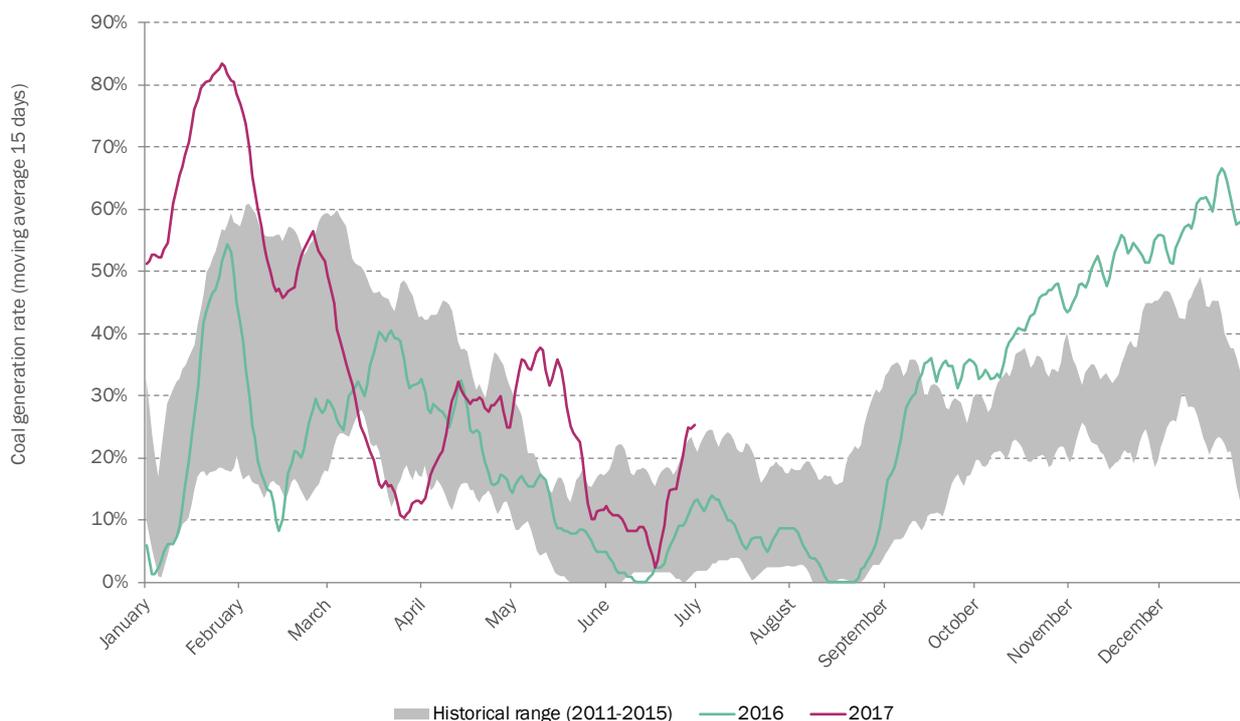
Source: ECX, Heren, Powernext, EPEX Spot - Analysis: CRE

Graph 16: Production rate of gas-fired power generation



Source: RTE - Analysis: CRE

Graph 17: Production rate of coal-fired power generation



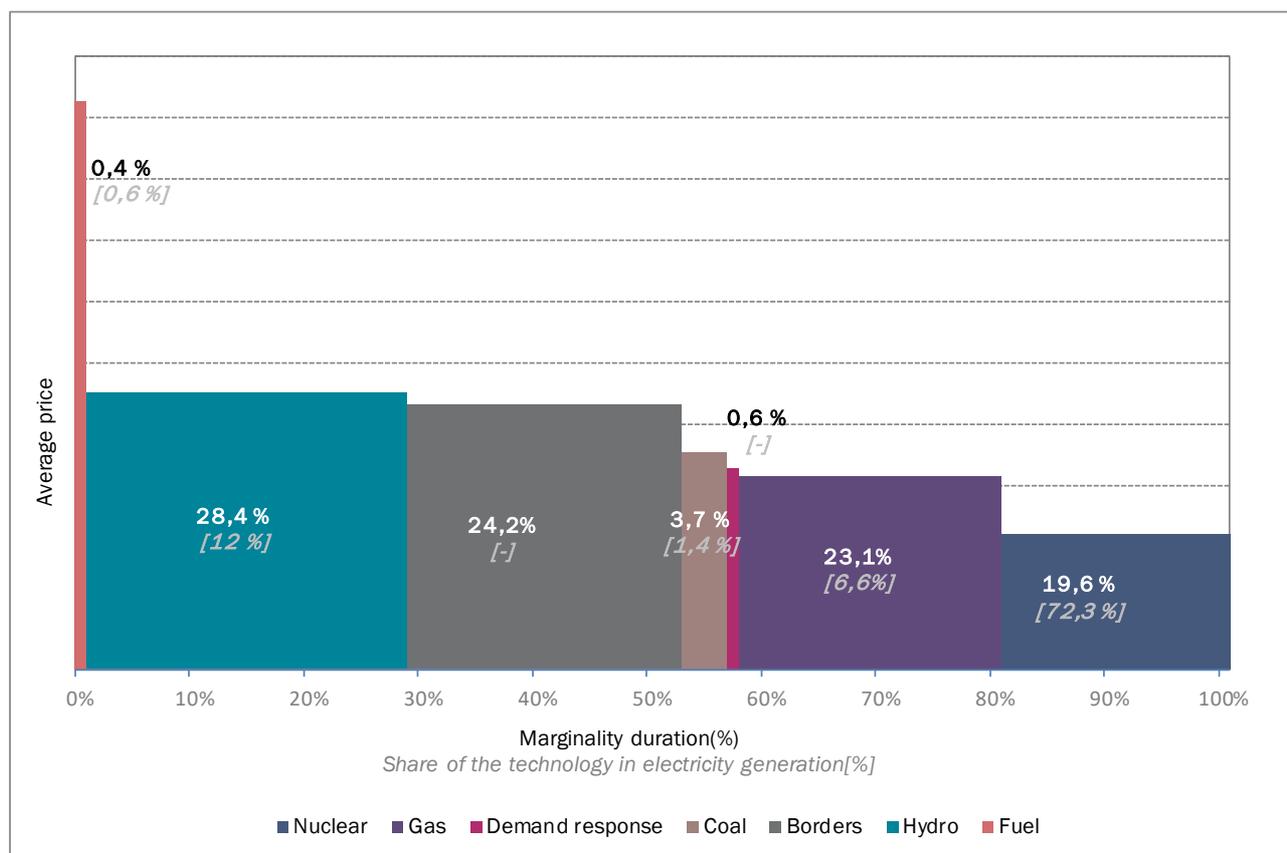
Source: RTE – Analysis: CRE

1.5 Gas sector more used in 2016, with a marginal cost setting the market price more frequently

A generation sector is said to be "marginal" when its marginal cost sets the market price, i.e. when its cost is close to EPEX SPOT's day-ahead auction market price. It can then be considered that it is the last unit used to meet demand and that its cost is decisive in the formation of the market price.

The study of marginal sectors in 2016 corroborates fundamental analyses concluding that the gas sector was more used and its marginal cost set the market price more frequently (23% of the time in 2016 compared to 16% in 2015). The coal sector, less used, was marginal only 4% of the time. Nuclear marginality dropped from 25% in 2015 to 20% in 2016, particularly because of a lower generation. Imports partly compensated the drop in nuclear production and brought border marginality to 24% for the year compared to 17% in 2015 (Graph 18).

Graph 18: Marginality of the different generation sectors in 2016



Sources: EPEX SPOT, RTE, Producers

2. HISTORICALLY LOW WHOLESALE PRICES IN H1 2016 FOLLOWED BY A SHARP INCREASE IN H2

2.1 Spot prices high in Q4 2016 with price peaks due to the major unavailability of nuclear generation

The average spot price for the year 2016 fell by 4.9% compared to 2015 and reached €36.7/MWh. Intraday prices settled at €36.9/MWh on average in 2016, i.e. a drop equivalent to that of spot prices, approximately -5% compared to 2015.

Early 2016, spot prices were very low compared with previous years, at an average of €27.3/MWh in particular in the first half, i.e. a 29.8% drop compared to the same period in 2015 (Graph 19). These low prices were due, on the one hand, to the start of the year marked by mild temperatures causing a drop in consumption, and on the other hand, by low commodity prices and very high renewable energy production. In the second half of the year and especially in the last quarter of 2016, spot prices rocketed because of supply/demand tightness related to the unavailability of certain nuclear power plants shut down for ASN checks so that extensive tests could be carried out to determine the carbon concentration level in steam generators channel heads. Against this background, spot prices settled on average at €46/MWh in S2 2016 (+20.4% compared to the second semester 2015) and at €59.5/MWh in Q4 2016 (+47% compared to Q4 2015).

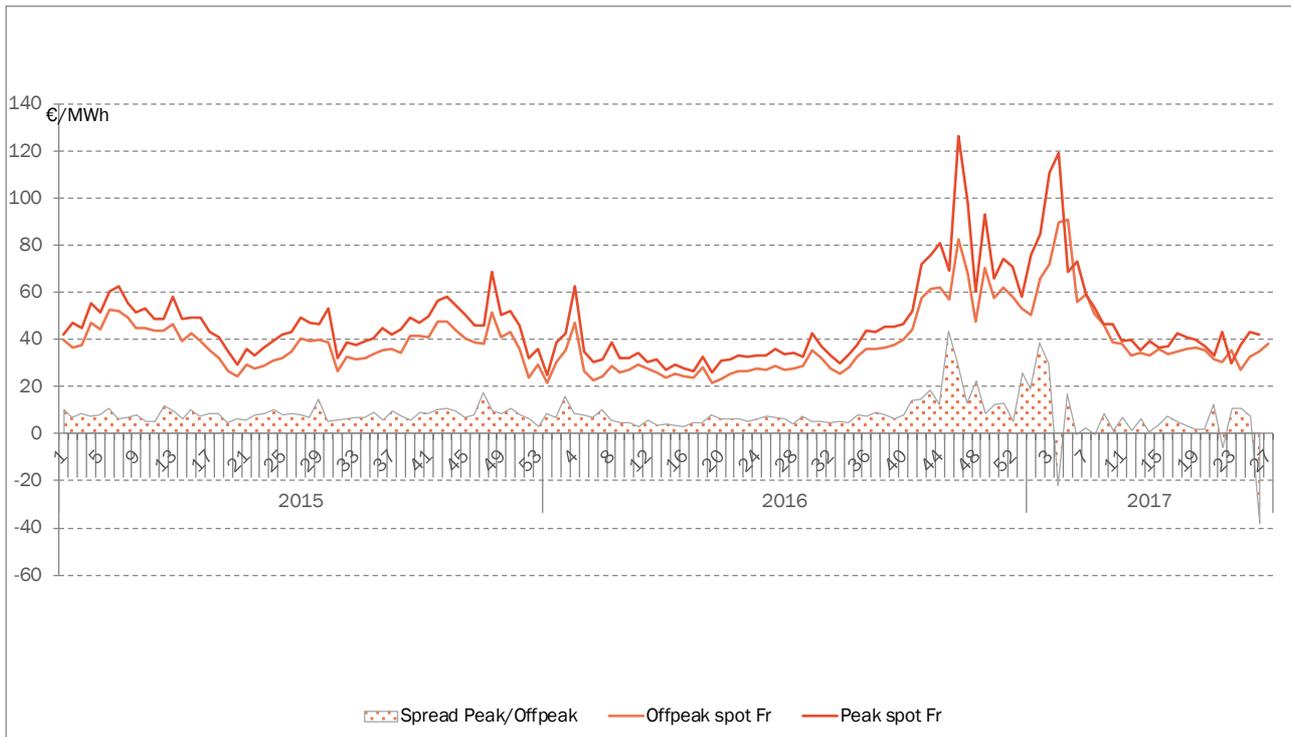
Supply/demand tightness in France observed at the end of 2016 continued into Q1 2017, mainly due to a cold spell in January, low hydraulic production and historically low nuclear availability levels. Therefore, spot prices stood at €44.4/MWh in the first half of 2017, up by 62.4% increase compared to H1 2016 (Table 15: Average day-ahead and intraday prices). In H1 2017, intraday prices settled at €44.7/MWh, i.e. +60.9% compared to S1 2016 (+16.9/MWh).

Table 15: Average day-ahead and intraday prices

Period	Average day-ahead price	Average intraday price
2015	€38.6/MWh	€38.8/MWh
2016	€36.7/MWh	€36.9/MWh
H1 2016	€27.3/MWh	€27.8/MWh
H1 2017	€44.4/MWh	€44.7/MWh

Source: EPEX Spot

Graph 19: Evolution of day-ahead prices in France (average weekly price)



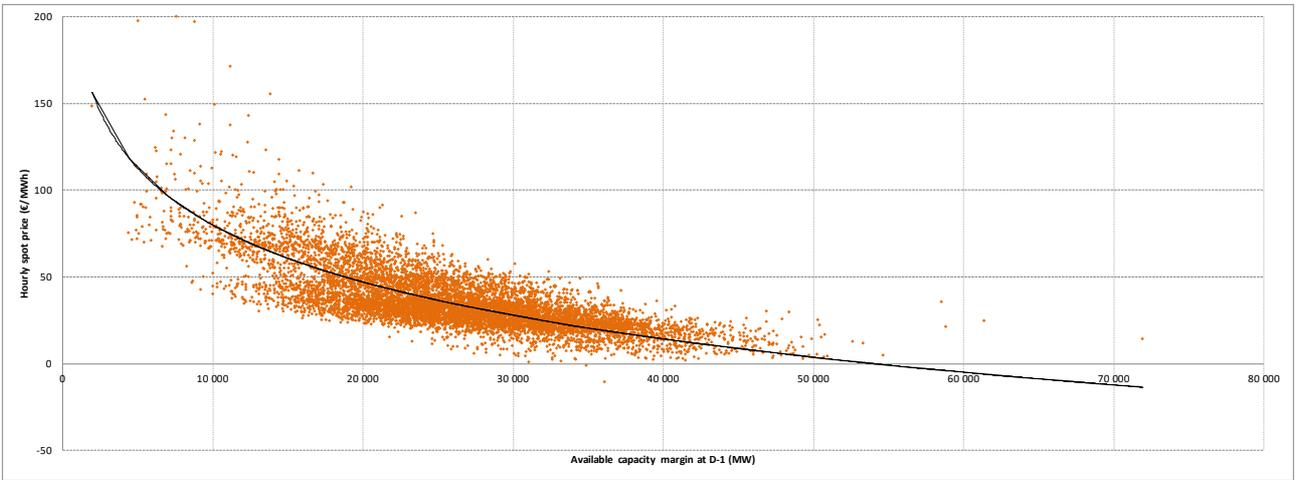
Source: EPEX Spot

French electricity system margins were lower than in 2015, from 30.8 GW on average to 26.2 GW in 2016, mainly because of the low nuclear availability at the end of the year. Against this background, spot prices exceeded €100/MWh for 71 hourly periods in Q4 2016, 51 of which were in November. In total over the year, prices exceeded €100/MWh for 75 hourly periods.

Analysing spot prices with regard to the margins observed hour by hour can help verify the overall consistency of prices with fundamentals (Graph 20). During episodes where prices exceeded €100/MWh, the average forecast day-ahead margin of the French electricity system was on average 9.5 GW. In addition, EPEX SPOT auctions experienced, in November, during a situation of particular tightness due to low nuclear availability and low temperatures, three hourly evening price peaks (between 6.00 p.m. and 7.00 p.m.) at over €800/MWh on 7, 8 and 14 November 2016 (€874.01/MWh on 7/11/2016, €850.07/MWh on 8/11/2016 and €829.79/MWh on 14/11/2016). This type of market event is systematically analysed by CRE.

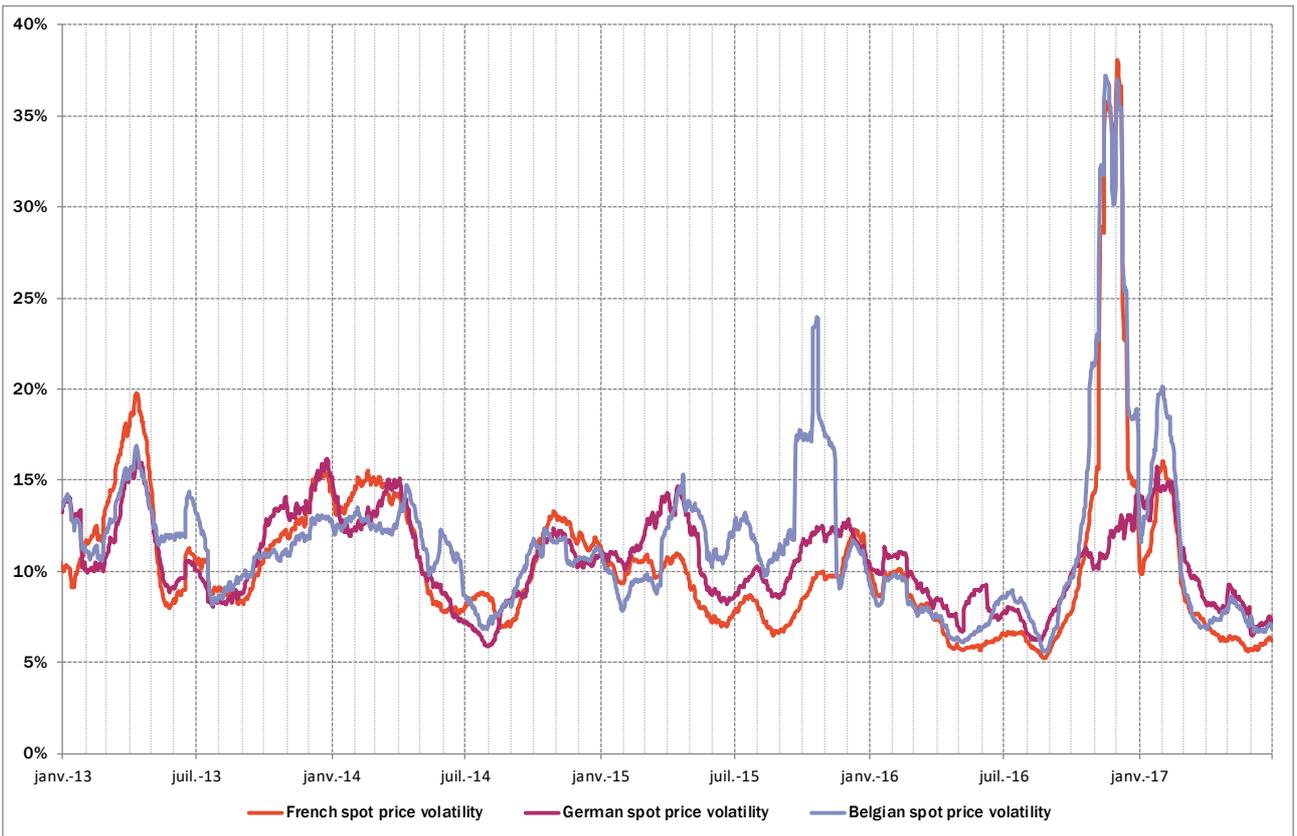
Lastly, these episodes of high prices occurred against a very volatile French market in Q4 2016 and early 2017. French market tightness mechanically drove neighbouring markets, in particular the Belgian market. The German market was also affected, but to a lesser extent (Graph 21).

Graph 20: Spot prices and day-ahead forecast margin of the French electricity system in 2016



Source: RTE, EPEX SPOT

Graph 21: Volatility of day-ahead prices



Source: EPEX SPOT, Belpex - Analysis: CRE

2.2 Difference between spot prices and EDF's marginal costs down in 2016

With regard to the spot price formation, CRE specifically monitors spreads between spot market prices and the marginal costs of EDF's generation plants resulting from the calculation of its daily optimisation models.



On average, the spread ¹⁵ during these periods in 2016 was 2.9%, lower than the level recorded in 2015 which was 5.3% (5.5% in 2014) (see 2016-2015 and 2015-2014 Monitoring Reports). Ever since CRE has measured this indicator (2008), it has never exceeded 6.5%.

Without pre-empting additional checks, CRE considers that this average level does not reflect the exercise of market power.

2.3 Increase in spot prices in H2 2016 widened the difference with the German price and narrowed it compared to countries that are usually more expensive

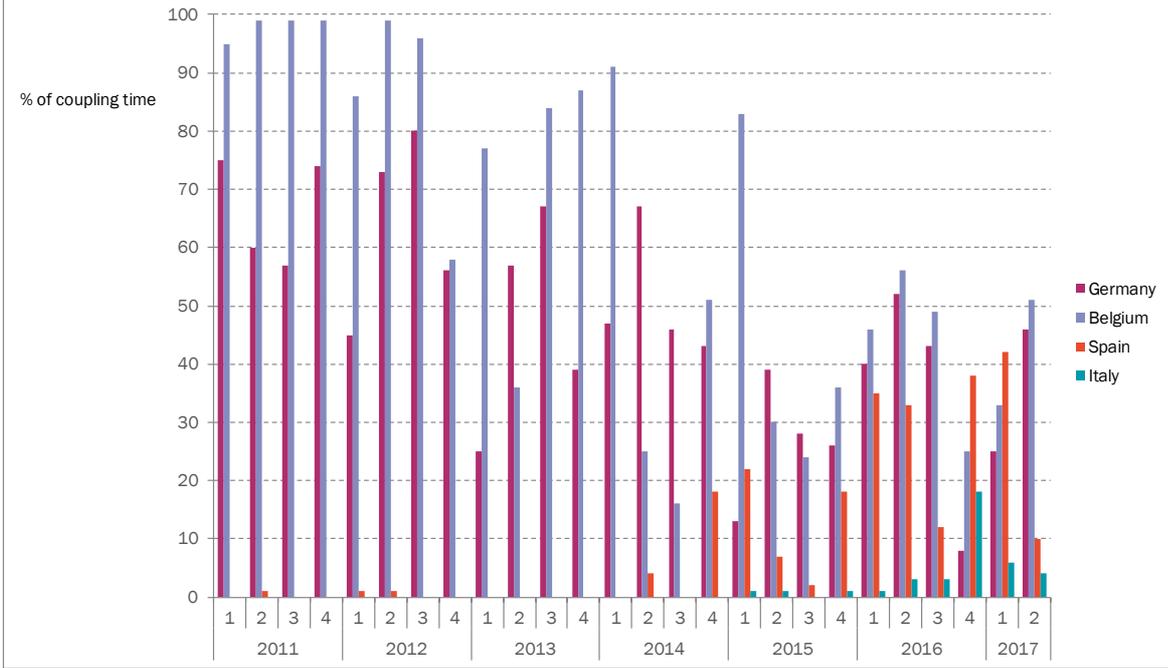
Spot price spreads dropped in 2016 compared to the previous year at all borders, with the exception of the France-Germany border (Graph 23), whose price spread increased by €0.9/MWh. These conclusions mostly reflect the rise in French spot prices during the second half of 2016, and in particular in the last months of 2016. This increased the spread with German prices, but lowered with countries' that are usually more expensive and with which the French export balance is positive, and in particular, Italy and Spain. The average spot price spread dropped by €8.9/MWh in 2016 with Spain (Graph 25) and by €7.8/MWh with Italy (Graph 26). The average price spread with Great Britain dropped by €5/MWh (Graph 27). These developments were particularly marked in Q4 2016, period during which the spot price difference was even reversed compared to Spain and Italy (France more expensive). Generally in H1 2017, spot prices were up at all borders, due to the start of the year marked by cold temperatures and greater consumption, low availability of French nuclear generation and the increase in commodity prices compared to H1 2016. The spread between the French spot price and the English price was an average - €6.8/MWh (France cheaper) compared to -€17/MWh in H1 2016. Compared to Germany, the spread went from €2.4/MWh in H1 2016 to €8.9/MWh in H1 2017. These evolutions reflect the significant increase in French spot prices at the start of the year when France was the most expensive country in the region for about 80 hourly periods.

With regard to market coupling, France's coupling rate with Spain soared compared to 2014 and 2015, going successively from 5.5%, 12.2% to 29.5% (Graph 22). Against the implementation of flow-based market coupling, which tends to bring market prices of interconnected countries closer, France's coupling rate with Germany was up by 9 points between 2015 and 2016. However, the major drop in this coupling rate with Germany in Q4 2016 must be highlighted.

The normalisation of spot prices in the first months of 2017 improved the coupling rate with Germany, but it did not return to its 2015 levels.

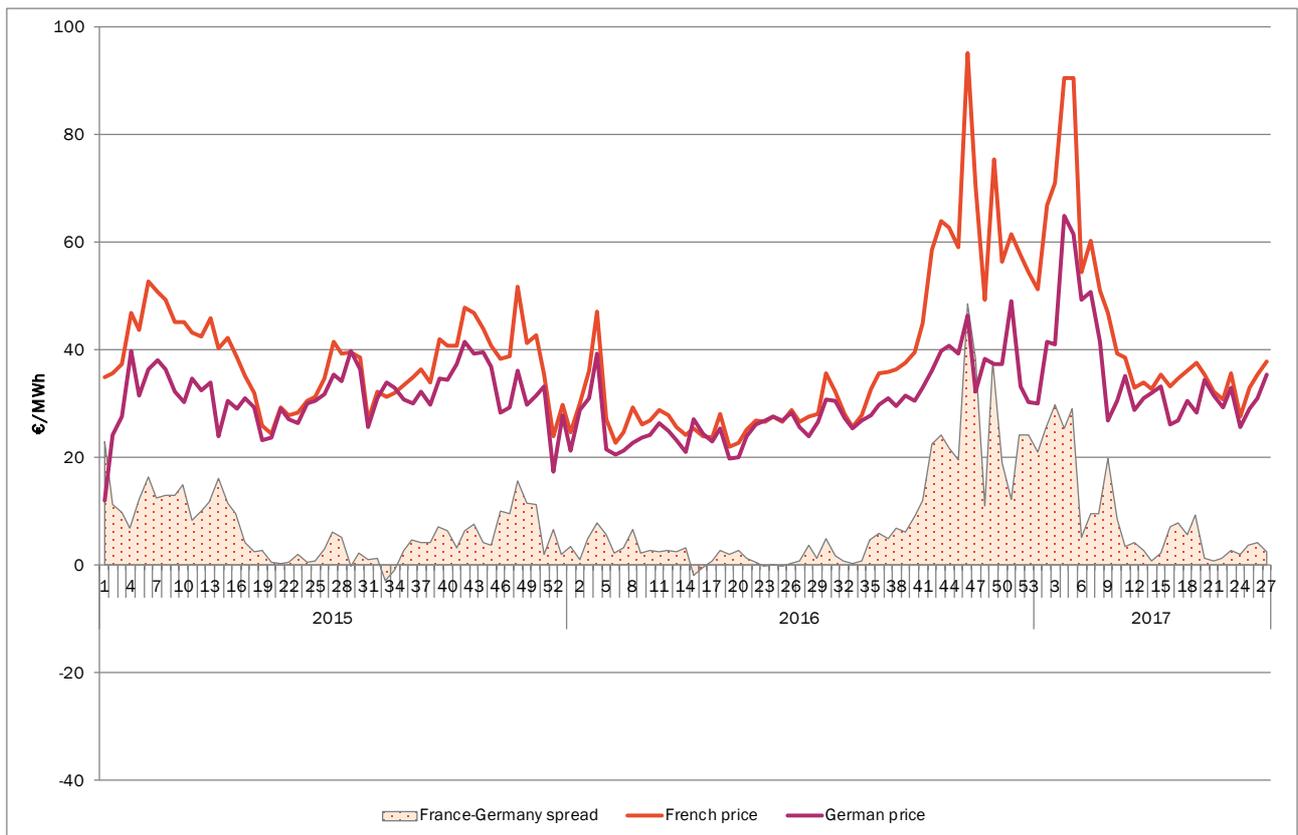
¹⁵ This indicator assists in detecting the exercise of market power. This analysis is carried out on a daily basis, based on data received monthly, and covers the times for which EDF's offers are supposed to determine the auction price.

Graph 22: Quarterly coupling rate of hourly prices with coupled countries



Source: EPEX SPOT, Belpex, OMEL, IPEX

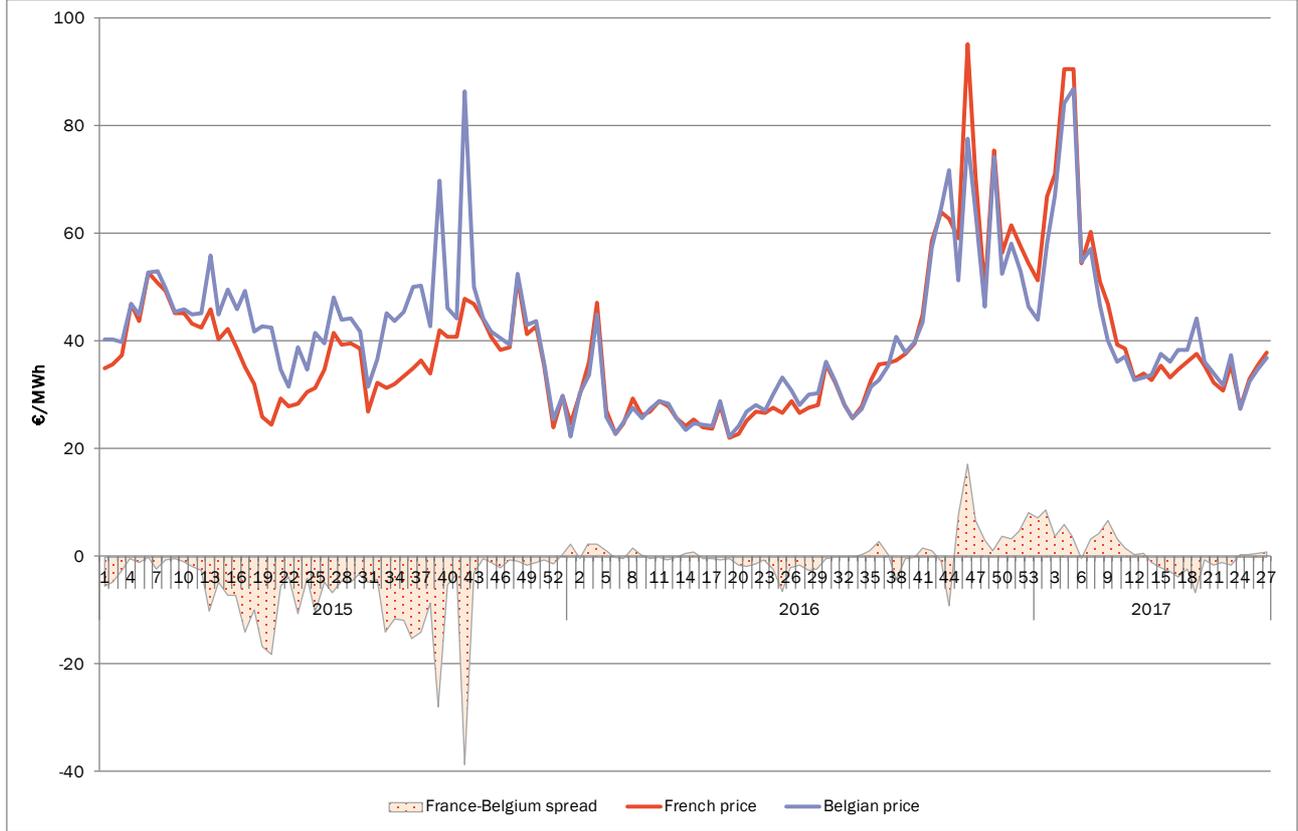
Graph 23: France and Germany spot price (weekly average)



Source: EPEX Spot

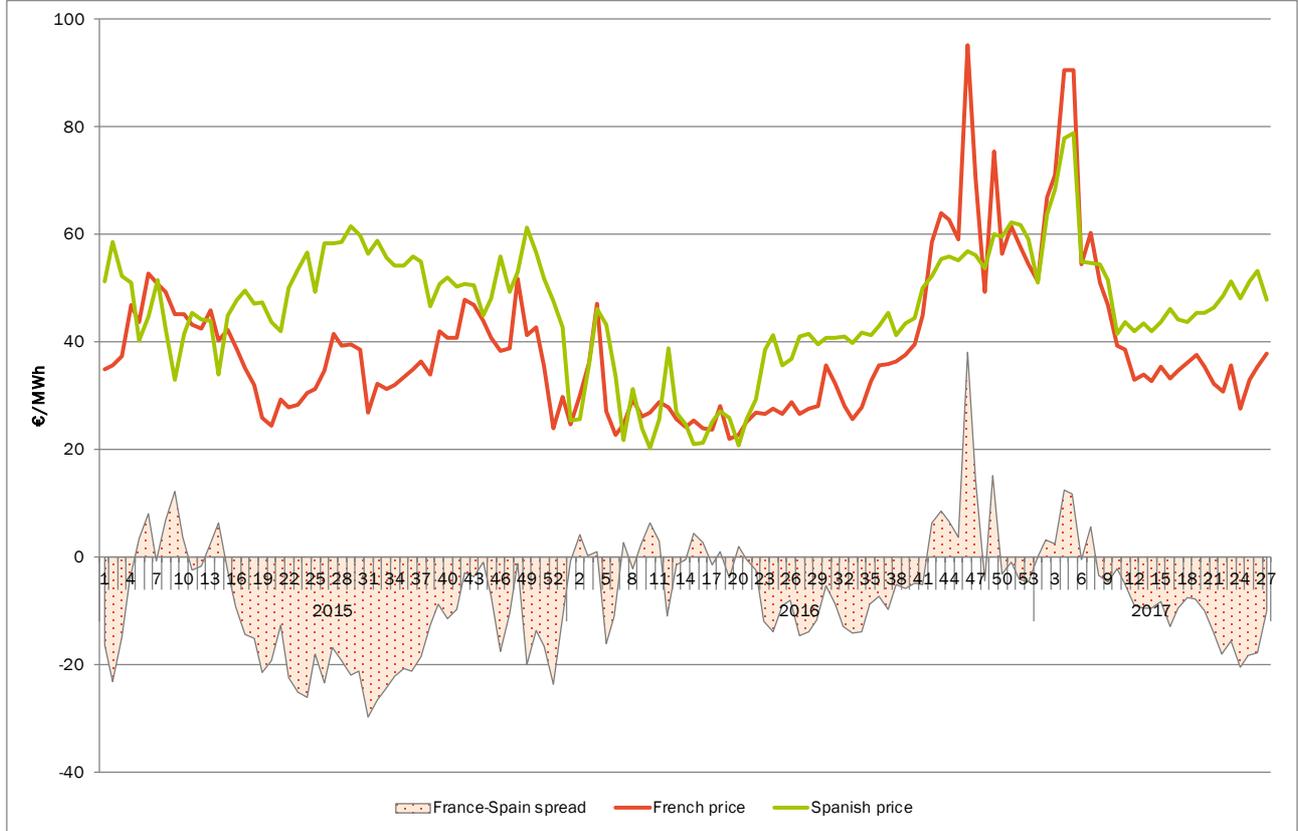


Graph 24: France and Belgium spot price (weekly average)



Source: EPEX SPOT, Belpex

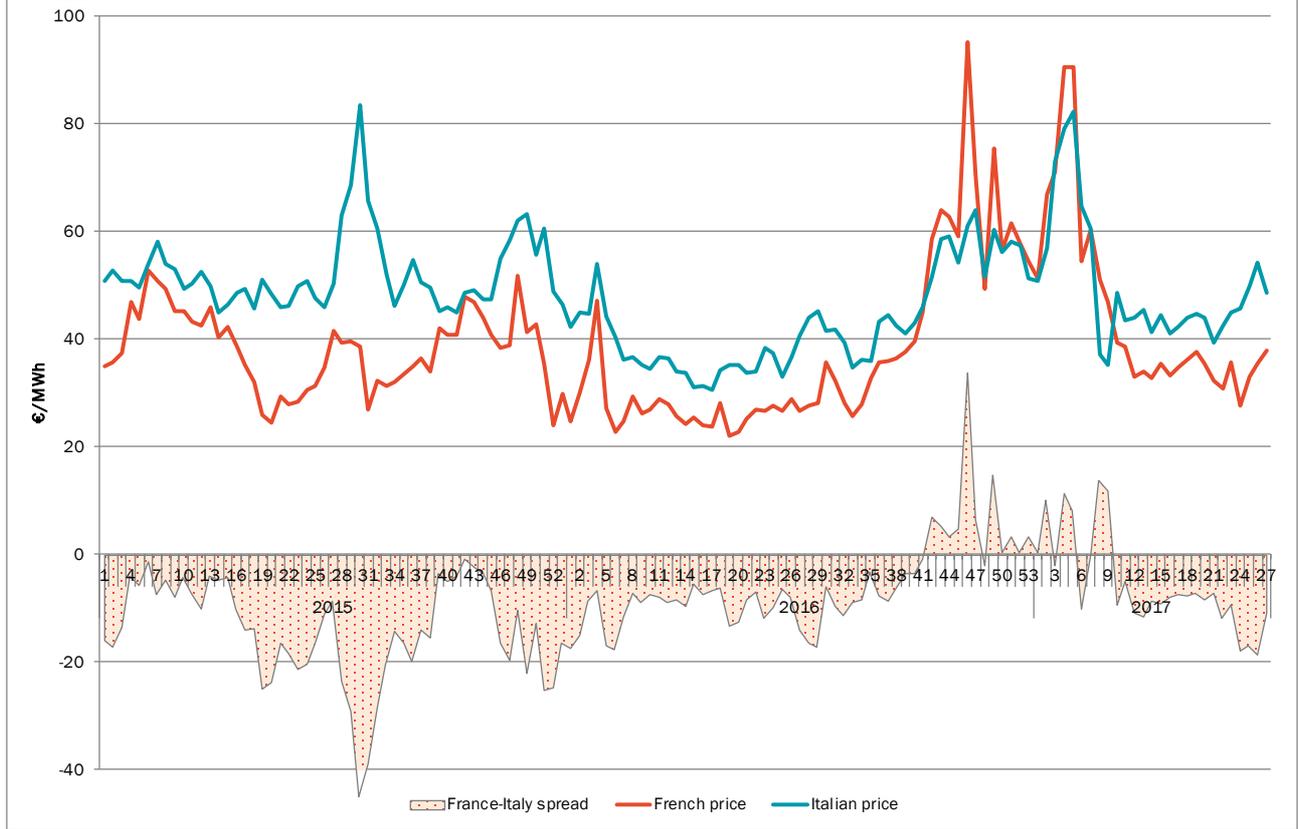
Graph 25: France and Spain spot price (weekly average)



Source: EPEX SPOT, OMEL
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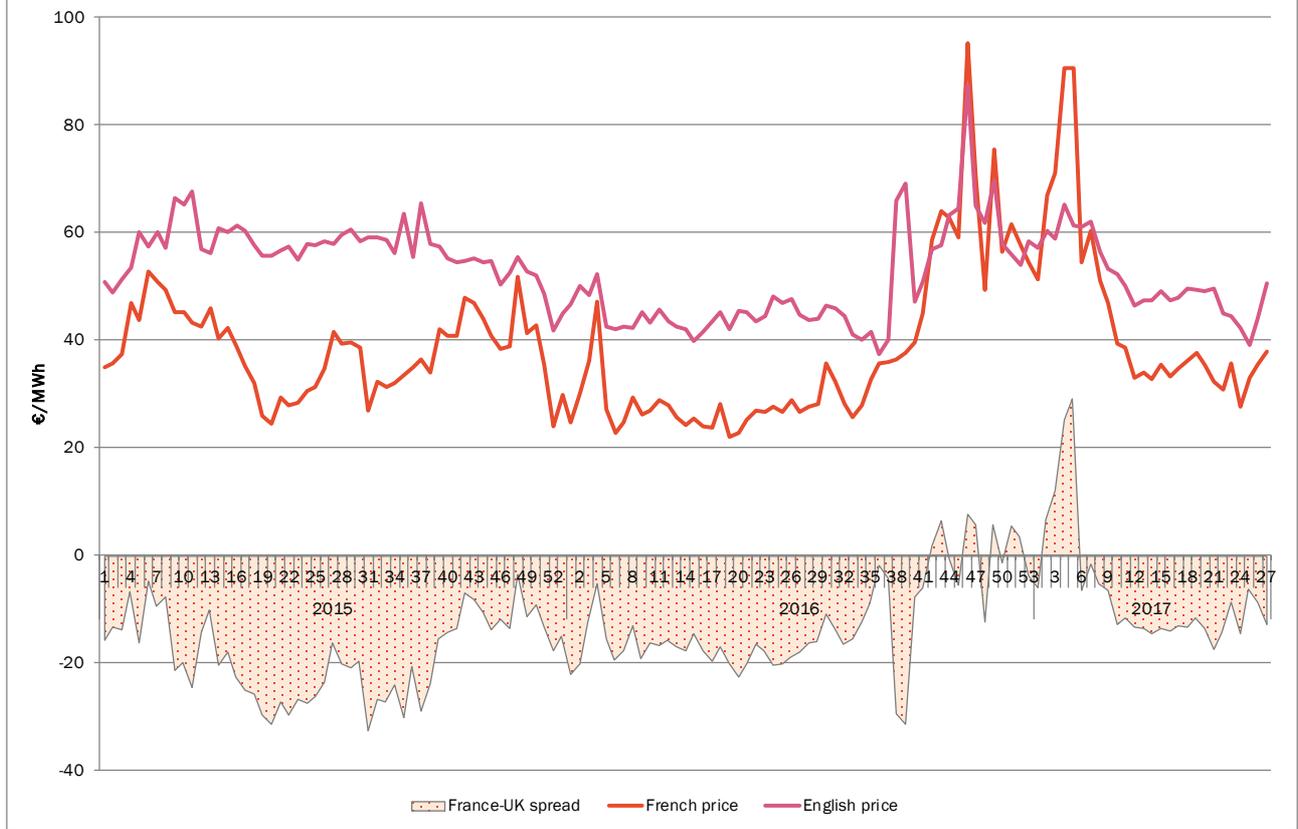


Graph 26: France and Italy spot price (weekly average)



Source: EPEX SPOT, IPEX

Graph 27: France and England spot price (weekly average)

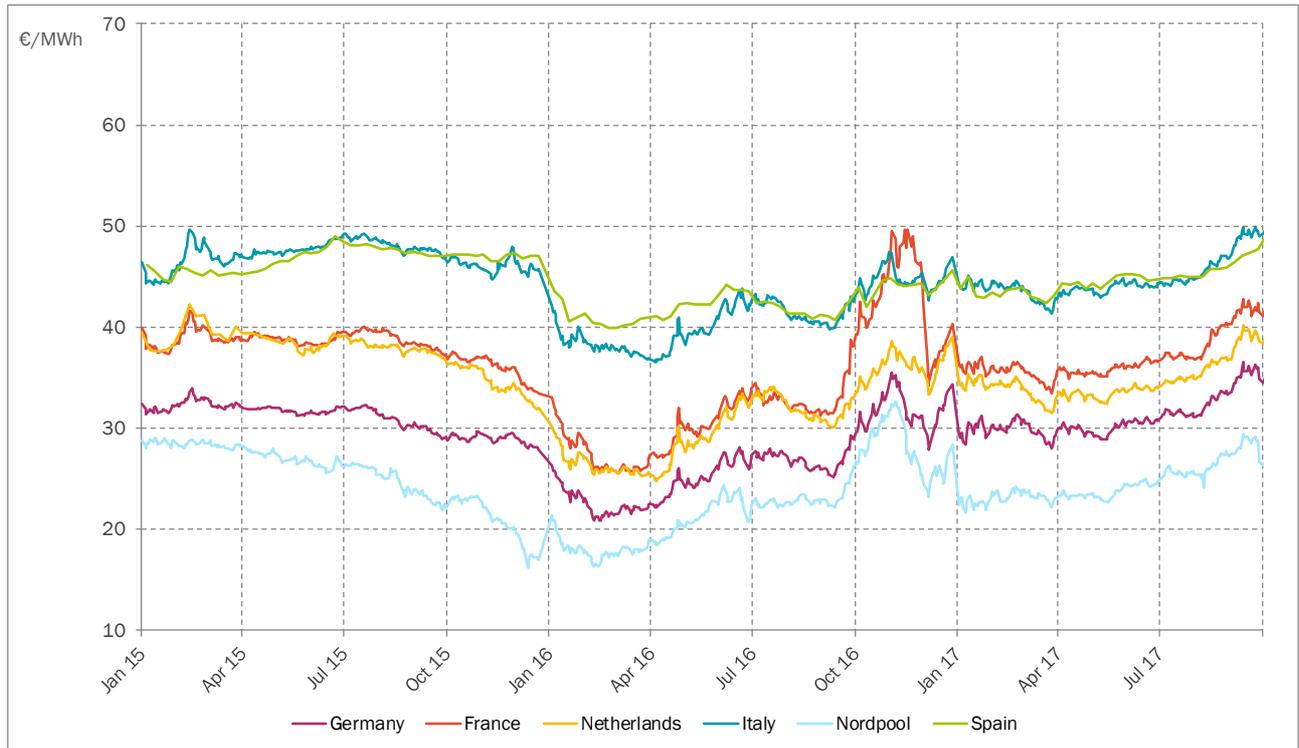


Source: EPEX SPOT, APX

2.4 Futures wholesale prices up in Q4 driving neighbouring prices

Prices of futures products in the different European countries (Graph 28) followed similar trends in 2016 and in the first half of 2017. In Q1 2016, futures prices reached their lowest due to the low gas and coal prices, before edging up in spring, driven by fuel oil prices. As from September 2016, announcements concerning unavailability of nuclear generation in France caused prices of French futures products to rise considerably. This rise drove futures prices in neighbouring countries up.

Graph 28: Y+1 product prices in Europe

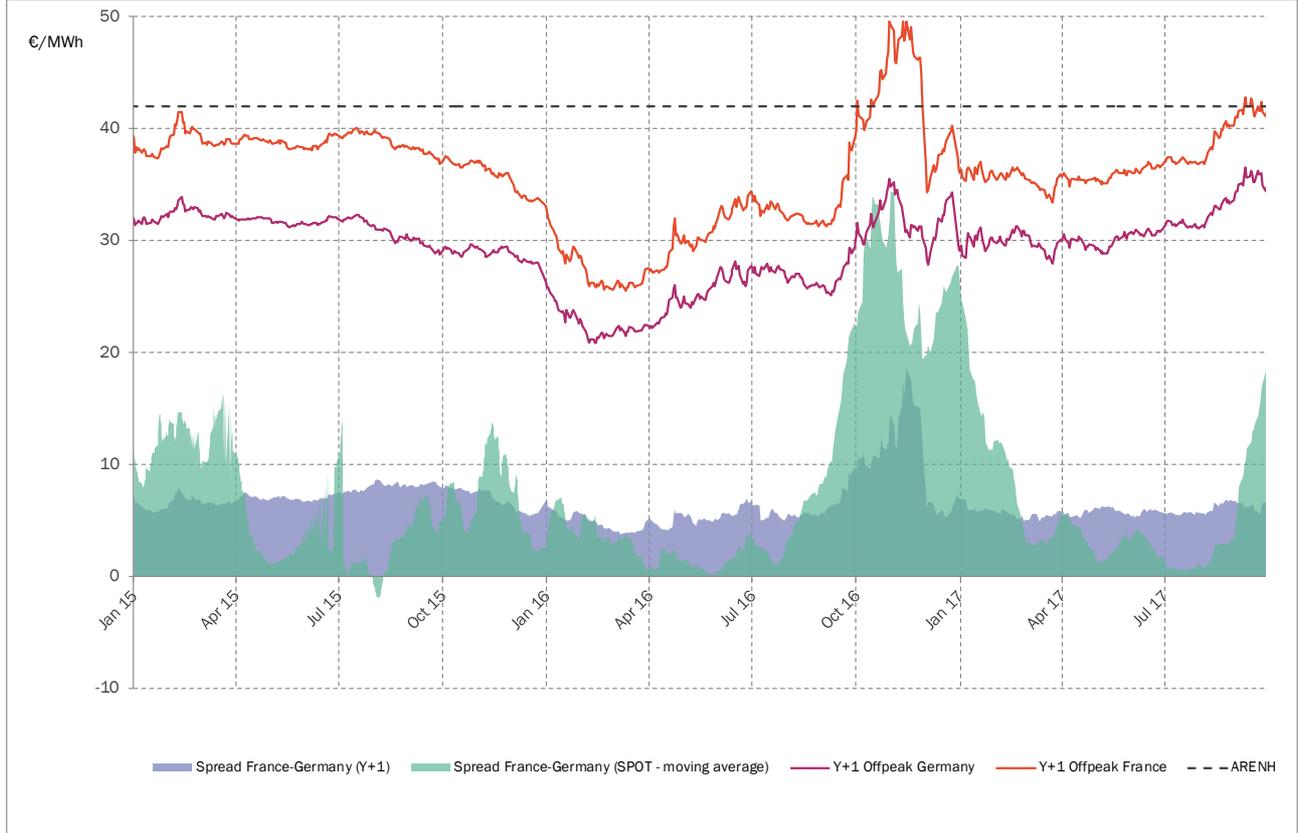


Source: EPD, ICE ENDEX, Heren

The spread between German and French futures prices reached a high level in Q4 2016, upon the release of announcements concerning nuclear unavailability (Graph 29). This spread was €7.2/MWh in 2015. It reached an average of €6.2/MWh in 2016, following a mixed trend: it narrowed in the first months of 2016 and widened in Q4 to reach €9.8/MWh. In H1 2017, German and French prices converged and the spread was comparable to the level of H1 2016.

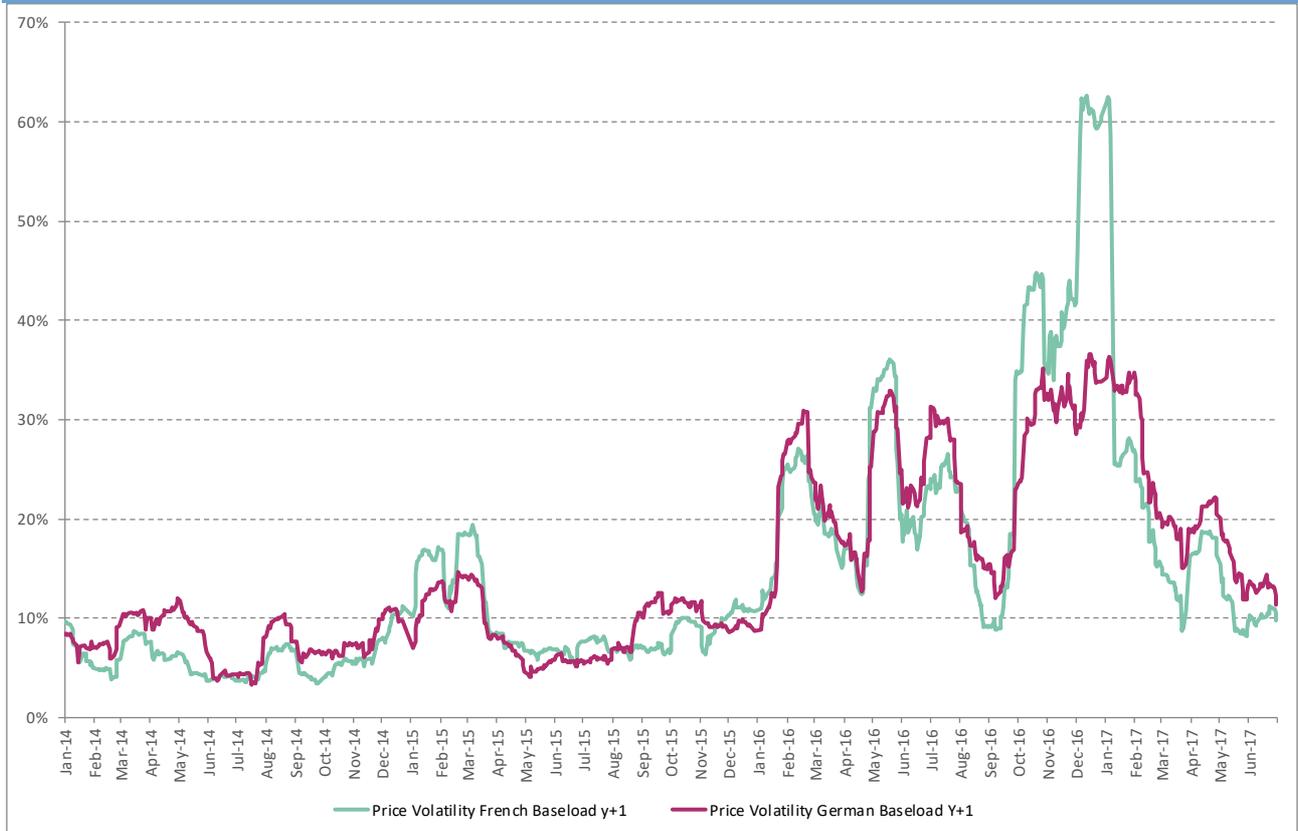
In connection with the abovementioned evolutions, prices of the Y+1 calendar product for delivery in France and those of the same product for delivery in Germany were very volatile in 2016 (Graph 30). There were three volatility peaks, the first two of a low magnitude and the third of a very considerable magnitude. The first corresponds to the period during which prices were low in Q1 2016; the second to the rise in these prices in spring 2016 when the trend reversed. The last peak, which reached about 60% in France and 35% in Germany, showed nervousness in the market in autumn 2016, when prices were influenced by announcements about unavailability of French nuclear plants.

Graph 29: Prices and difference between the French and German calendar products



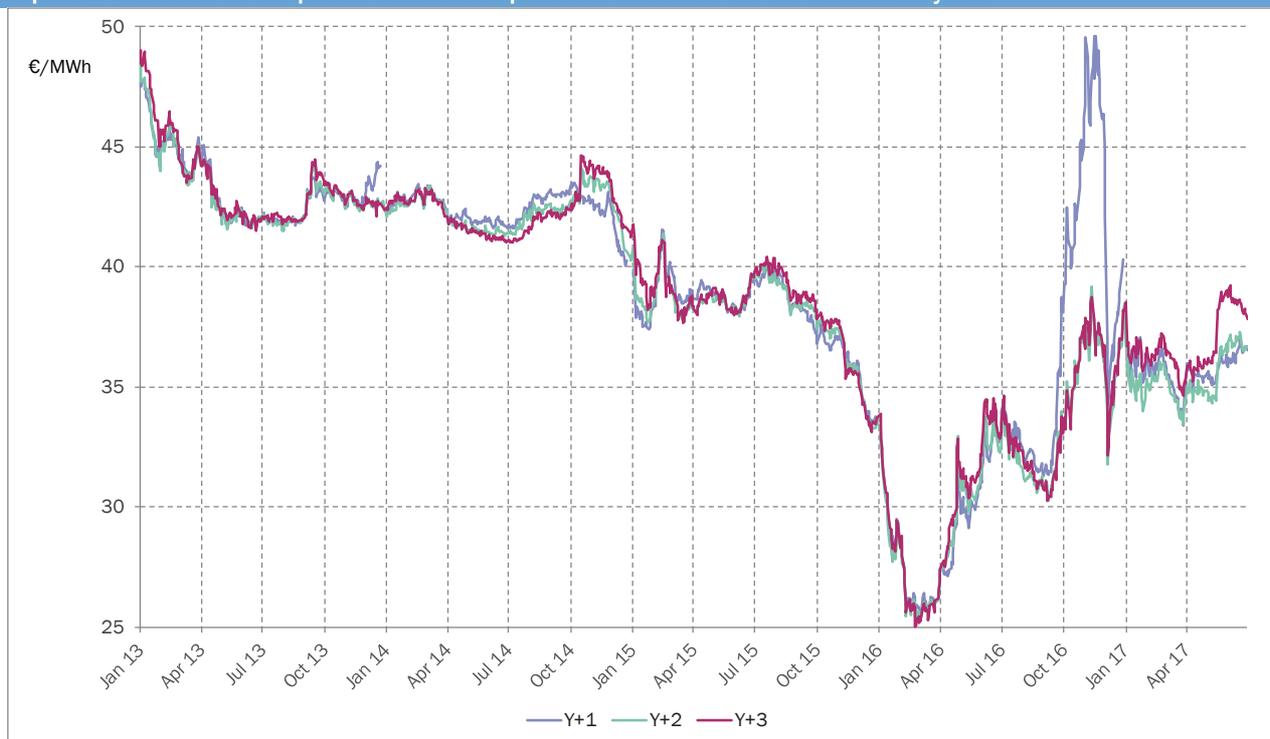
Source: EPEX SPOT, EEX

Graph 30: Volatility of calendar product prices



Source: EPEX Spot

Announcements about nuclear generation had different effects on French futures prices depending on the timeframes. The prices of one-, two- and three-year calendar products in France remained steady until September 2016, when the price of the product for delivery in 2017 heightened unlike products for delivery in 2018 and 2019 (Graph 31).

Graph 31: Evolution of the prices of calendar products in France for the next three years


Source: EEX

The price evolution in Q4 2016, given its magnitude and rapidity, had a major impact on energy markets. As reiterated in its most recent quarterly observatories, CRE is, under these circumstances, particularly attentive to the conditions of this price evolution and especially to compliance with the transparency obligations of the REMIT regulation.

2.5 First capacity guarantee trades in 2016

In its decision of 8 November 2016, following a thorough one-year investigation, the European Commission authorised, in accordance with EU rules on State aids, the French capacity mechanism. The first year in which this mechanism will be operational is delivery year 2017.

The principle of this mechanism is based on electricity suppliers' obligation to demonstrate each year that they can cover their portfolio needs during peak periods: they are required to have capacity guarantees. These guarantees are issued by RTE to producers and demand management operators certifying the availability of their assets during peak periods.

The capacity mechanism aims to ensure long-term security of supply of France in electricity. It covers all capacity - including in particular demand-response- making accountable suppliers of end clients on the one hand, and producers and demand management operators on the other hand, through the control of the effective availability of assets. Suppliers that do not have guarantees covering the needs required to satisfy their portfolios must obtain additional capacity guarantees. On the contrary, suppliers that have guarantees exceeding their needs can sell them.

In accordance with the provisions of Article L.131-2 of the Energy code, CRE monitors that market, and ensures compliance with the prohibitions and obligations specified in Articles 3, 4 and 5 of REMIT.

Exchanges between participants are done over the counter or via EPEX auctions. Capacity certification processes are conducted from four years prior to the delivery year and certificate exchanges are possible between four years before and three years after the delivery year (deadline for notification of the obligation set at 1 March of the delivery year + 3). In order to enhance the transparency, RTE publishes on the one hand the register of certified capacity with the distribution per sector, and on the other hand, all of the anonymised transactions conducted over the counter (price, volume, date), including in particular intra-group trades. EPEX publishes aggregated bid/offer curves of these auctions.

The first EPEX auctions were held on 15 December 2016 and 27 April 2017 for the delivery year 2017. During these auctions, there were respectively 226,358 capacity guarantees exchanged at the price of €999.98/guarantee, and 5,167 guarantees at €1,041.94/guarantee, i.e. a 4.2% price increase. This represents 25% of certified capacity for the delivery year 2017. Excluding the EPEX auction, as at 30 June 2017, the equivalent of 52.1 GW of guarantees has been exchanged at prices comparable to those of the two auctions.

It can also be noted that some transfers were made for the delivery years 2018 - 2019 - 2020, but for lower volumes.

Market concentration for the auction was high (**Erreur ! Source du renvoi introuvable.**), both from the purchase and selling point of view.

Table 16: Capacity market: HHI index

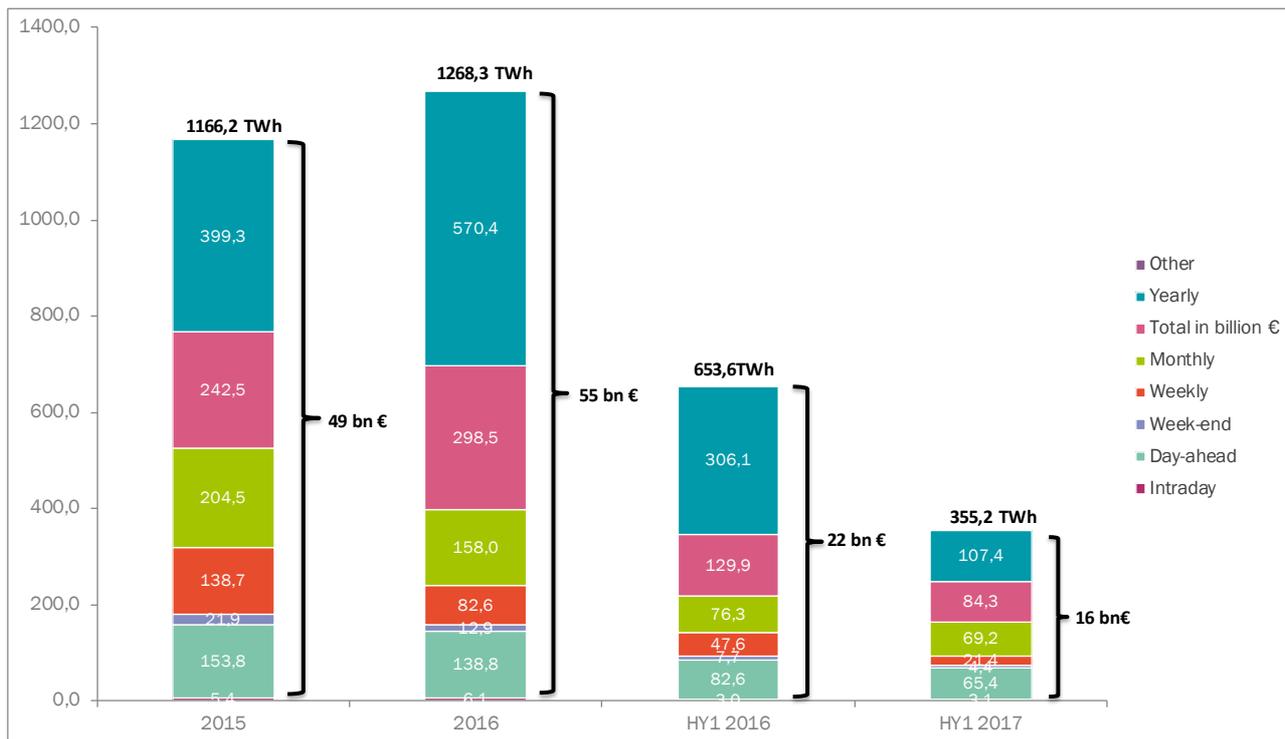
	Purchase	Sale
Auction of 15/12/2016	3074	2860
Auction of 27/04/2017	3901	3206

Source: RTE, EPEX SPOT

3. VOLUME INCREASE IN 2016 AGAINST MAJOR PRICE VOLATILITY

Volumes exchanged in the wholesale electricity market continued to grow in 2016 despite a drop in exchanges of daily, weekly and monthly products (Graph 32). This is due to the sharp increase in quarterly and annual product exchanges, against major price volatility of these products in 2016. However, in H1 2017, volumes exchanged in the wholesale market fell compared to the same period in 2016. All products were affected by this decrease except intraday products whose trading volume remained stable.

Graph 32: Volumes traded in the wholesale markets



With regard to volumes traded in the futures organised market, there were two periods when exchanges were particularly important: in Q2 2016 where prices were at a historically low level, giving room for suppliers to hedge their portfolios at a low prices, and the second period in Q4 2016 against major price volatility and arbitrage with the ARENH product in the futures market. In 2017, volumes exchanged in the organised futures market returned to levels observed in 2015 (Graph 33). Overall, in the intermediated futures market, taking into account exchanges through broker platforms, the trend was similar (Graph 34).

The surge in futures prices as from the month of October above the level of €42/MWh led to renewed interest in the ARENH mechanism, while there had been no demand in 2015 for delivery in 2016. In the 16 November 2016 gate opening, 32 alternative suppliers made a request to CRE within the framework of the mechanism, and a total of 82 TWh was allocated. As part of wholesale market monitoring, CRE questioned the main participants that booked ARENH volumes and are active in the wholesale markets in order to analyse their coverage strategy for the year 2017.

These analyses showed that – even if intra-annual arbitrage opportunities had been reduced by regulatory developments adopted¹⁶ or announced¹⁷ mid-November 2016 – participants, within the context at the time, arbitrated between hedging positions taken in 2016, particularly when prices were low, and sales, within the limit of their ARENH right, distributed across the period during which the futures price had exceeded €42/MWh.

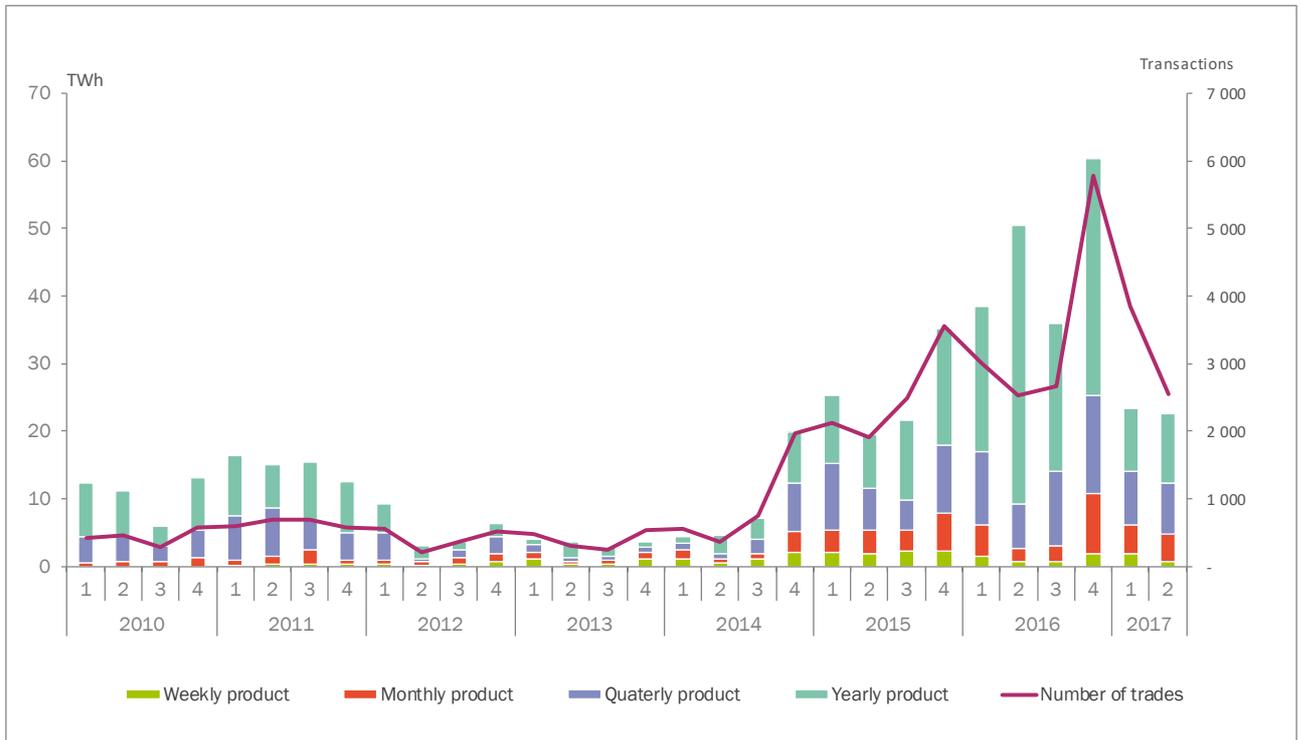
Without pre-empting any additional checks, these analyses did not reveal any behaviour likely to be qualified as a breach of the provisions of the REMIT regulation by alternative suppliers that booked ARENH volumes.

¹⁶ <https://www.legifrance.gouv.fr/eli/arrete/2016/11/14/DEV1628319A/jo/texte>

¹⁷ <http://www.cre.fr/documents/deliberations/avis/projet-de-decret12/consulter-la-deliberation>

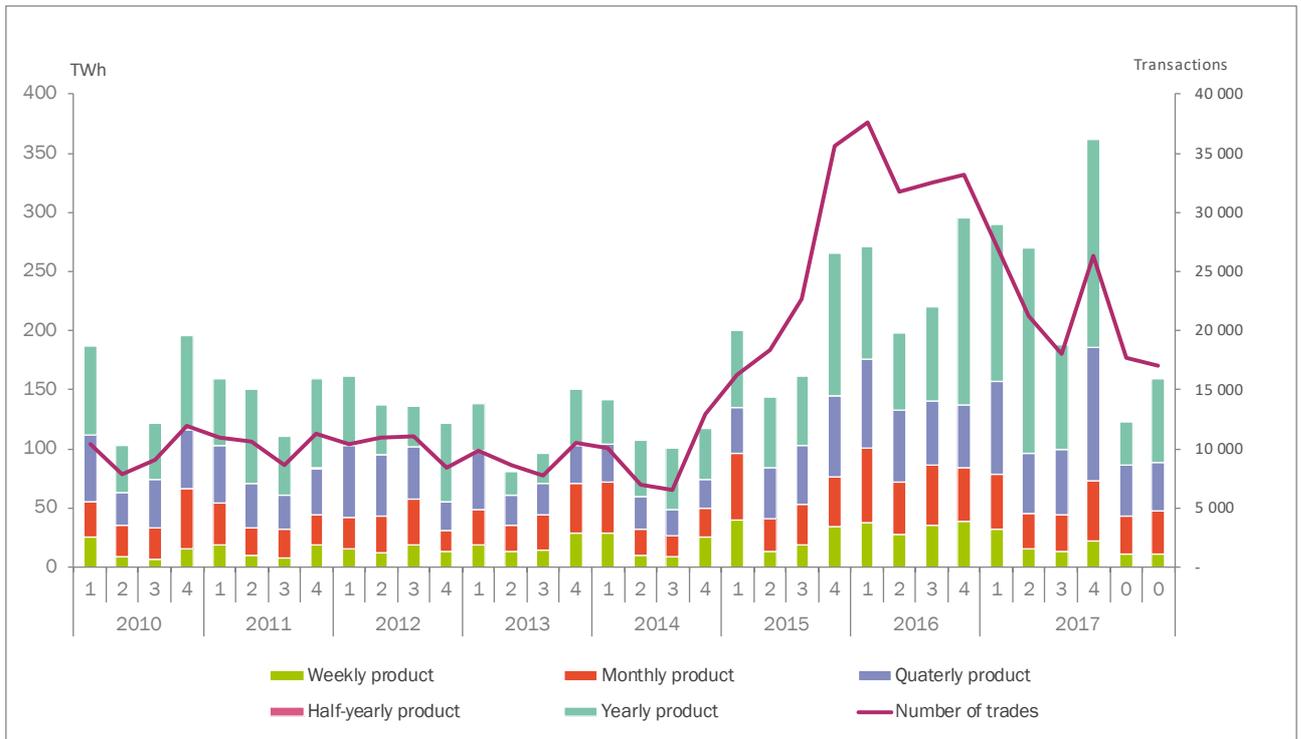


Graph 33: Volumes traded in the futures exchange



Source: EEX

Graph 34: Volumes traded in the intermediated futures market



Source: EEX, Brokers

SECTION 4

NATURAL GAS WHOLESALE MARKETS

1. SHARP CONSUMPTION INCREASE IN 2016

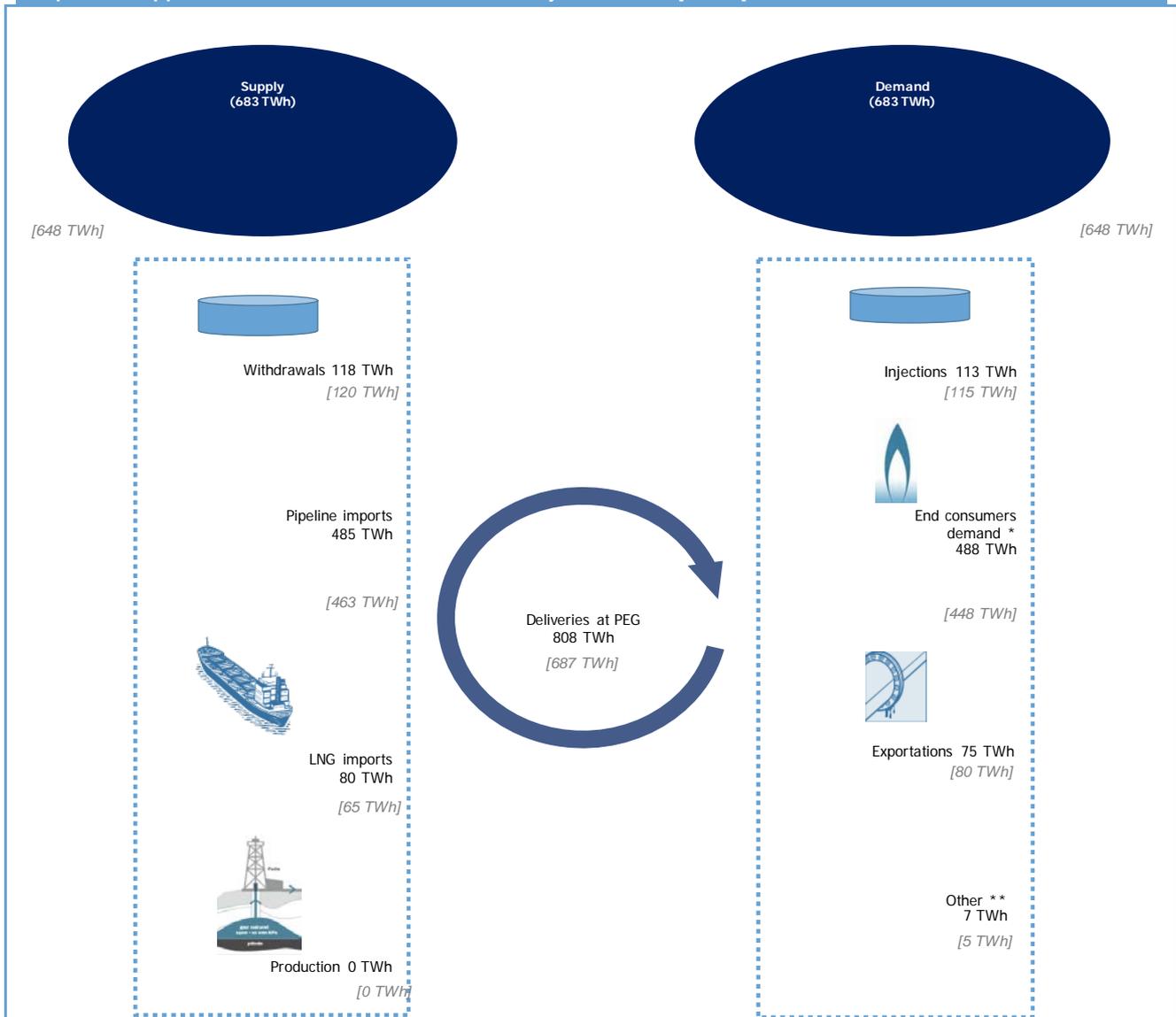
1.1 Increase in demand because of the use of gas-fired power plants and the colder temperatures than in 2015

In 2016, as in 2015, gas consumption extended with supply volumes and end markets up to 5.4% compared to 2015. With a slight decline in exports (-5 TWh, i.e. -6%), the overall increase in end markets is related to final customers' consumption. 40% of this increase is due to customers connected to the distribution network – because of colder temperatures than in 2015 -, and 60% to clients connected to the transmission network. Industry consumption remained stable at 134 TWh; highly modulated sites were responsible for the consumption increase of clients connected to the transmission network (Graph 35).

In 2016, LNG imports surged (+23% compared to 2015) and storage were substantially used (118 TWh, stable compared to 2015).

The South zone experienced an episode of major tightness early 2017, in relation to the low LNG supply at Fos which caused bottlenecks in the south-east.

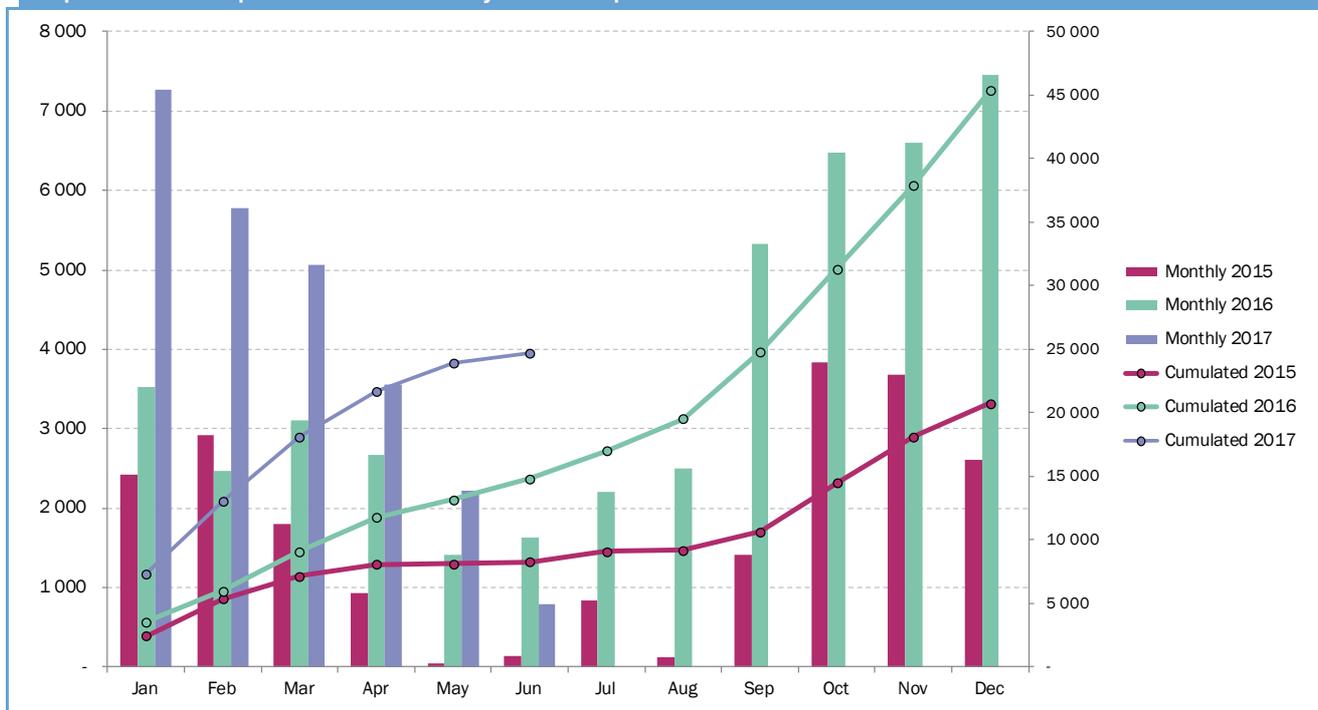
Graph 35: Supplies and end markets in the French system 2016 [2015]



Source: GRTgaz, TIGF – Analysis: CRE

In the first three quarters of 2016, low gas prices enabled gas-fired power plant margins to increase (Chapter **Erreur ! Source du renvoi introuvable.** of section 2). In Q4 2016 and Q1 2017, low nuclear availability combined with relatively high electricity consumption led to an increased use of gas-fired power plants. Consumption of highly modulated sites reached 45 TWh in 2016 (+118% compared to 2015), and this trend continued during the first semester 2017 (25 TWh, i.e. +67% compared to H1 2016) (Graph 36).

Graph 36: Consumption of sites with major consumption variations



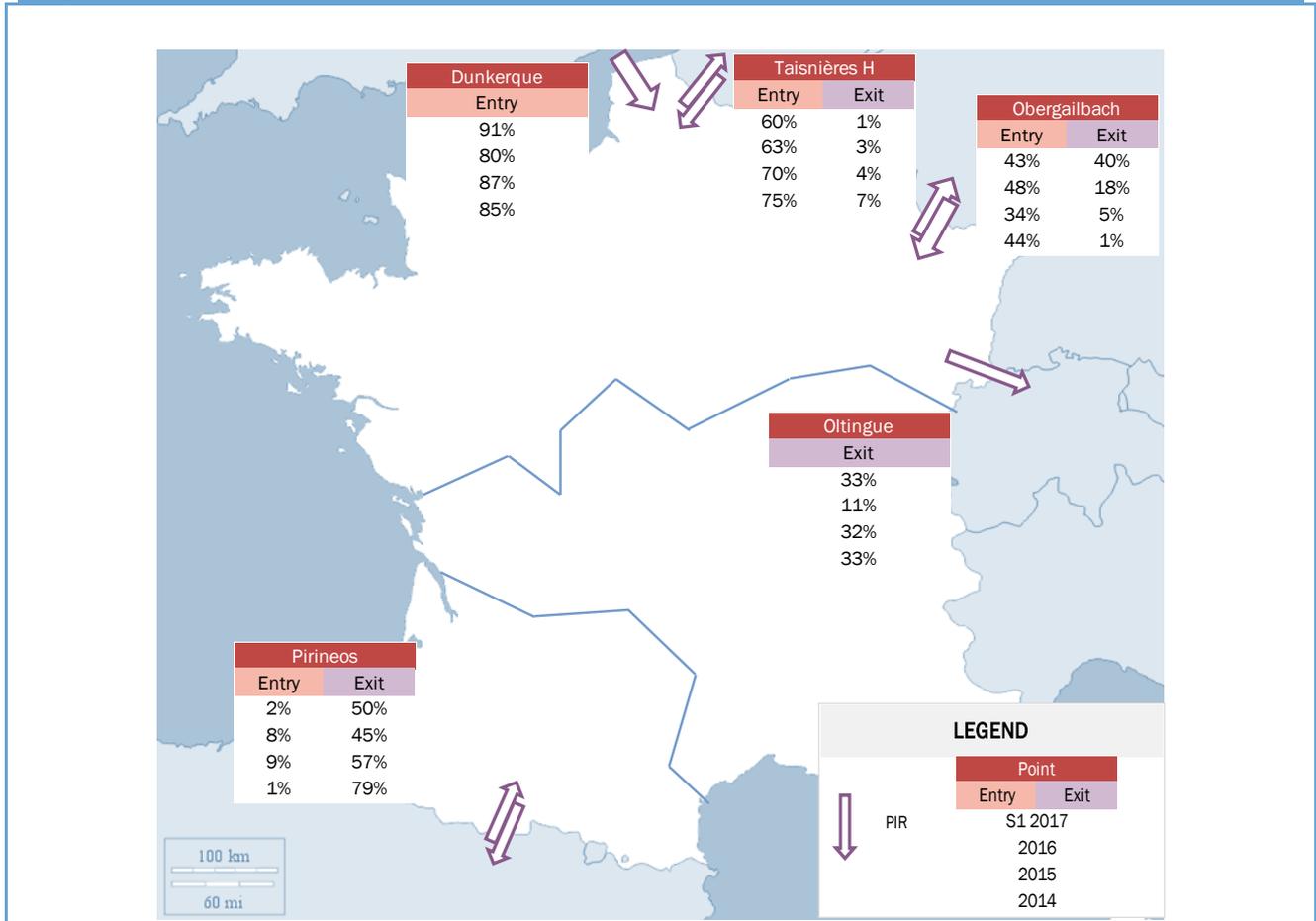
Source: GRTgaz, TIGF – Analysis: CRE

1.2 Increased LNG supply, but tightness in the south in January 2017

In 2016, 40% of the overall rise in imports (Graph 37) (+37 TWh, i.e. +7%) was due to higher LNG supply (+15 TWh) and 60% to the increase in overland imports (+22 TWh). The jump in overland imports was seen at Obergailbach (+31 TWh gross, i.e. +46%). This was mostly gas imported from Russia, whose market share in French supplies is now 25% (Graph 40).

The increase in LNG supply occurred both in the North zone (at 19 TWh, i.e. about twice as much as in 2015) and in the South zone (at 60 TWh, i.e. +9%). The first commercial delivery at the Dunkirk terminal took place on 22 January 2017, following the industrial start-up which started in summer 2016 for testing.

Graph 37: Rate of use of French interconnections (trade flows)

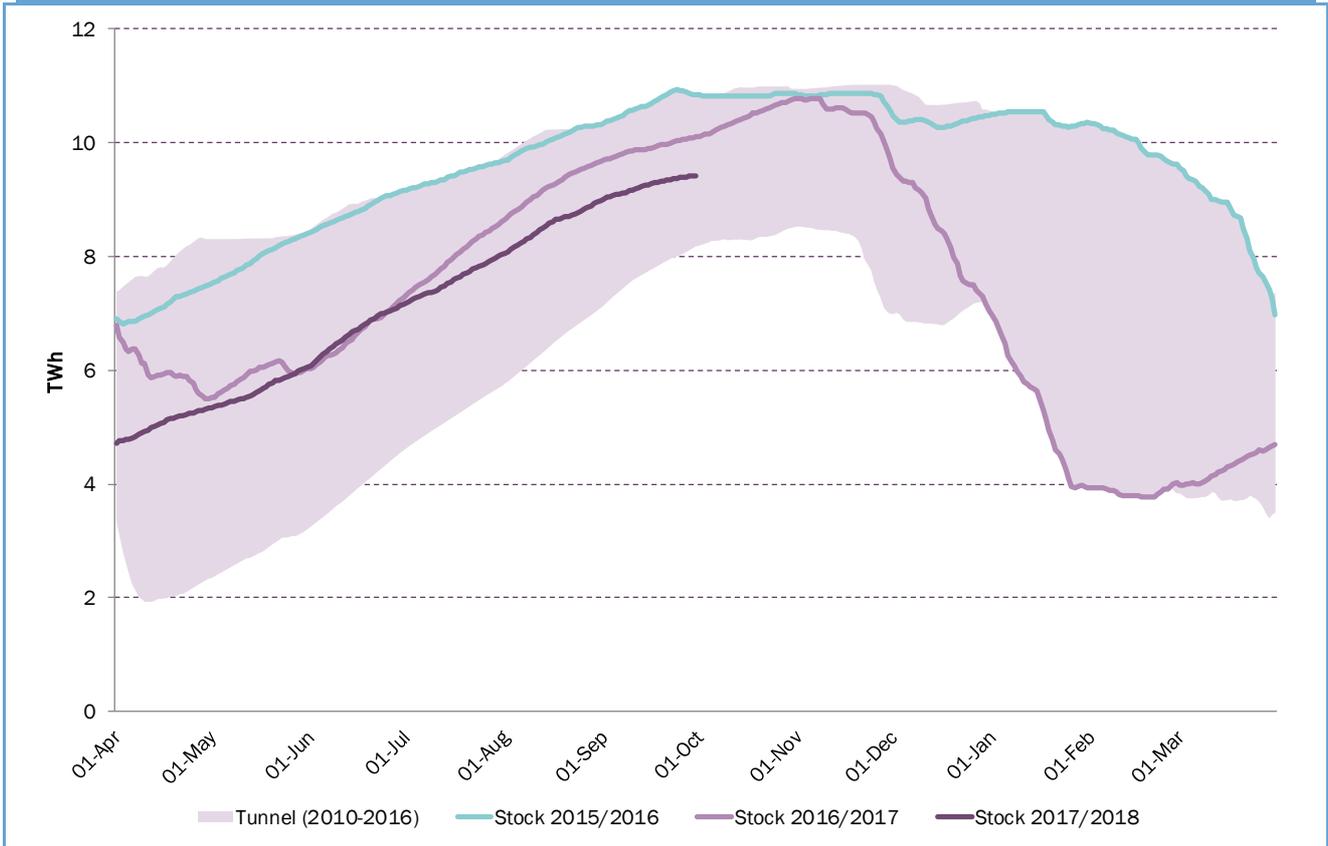


Source: GRTgaz, TIGF – Analysis: CRE

The episode of major tightness in the South zone between December 2016 and January 2017 was due to the considerable drop in LNG send-out at Fos. As from November 2016, this send-out was an average 81 GWh/d in December and 77 GWh/d in January, which represents about half of the average send-out for the 12 preceding months and the lowest monthly averages for the last four years. This fall was due to the reduction in LNG cargo arrivals because of problems with Algerian LNG trains during that period.

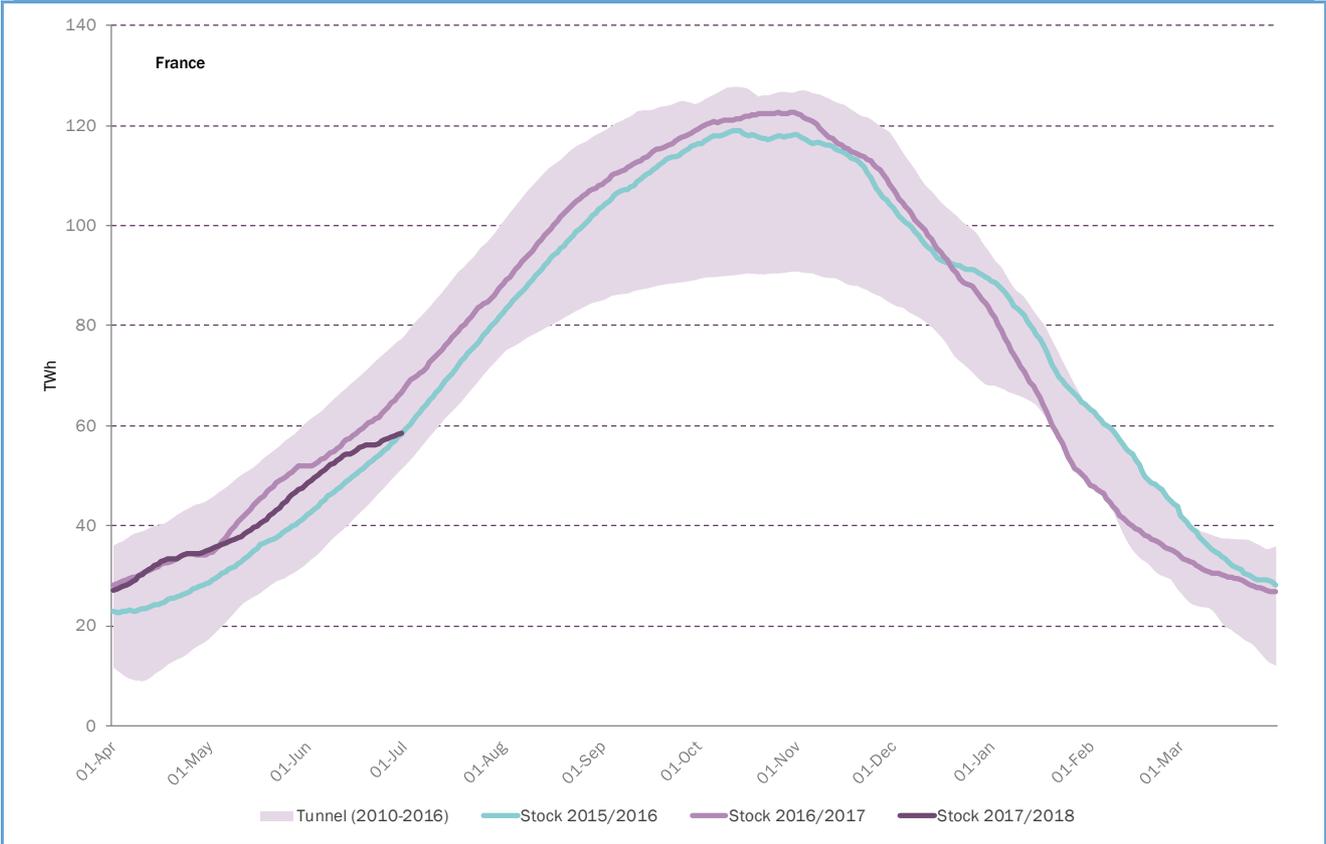
In addition, gas demand was affected by temperatures lower than normal and high use of gas-fired power plants (see part on wholesale electricity markets). Within this context, south-east bottlenecks emerged which GRTgaz addressed, in particular, by using on several occasions operational instruction notices for the gas storage Salins storages and the Fos terminal. Mid-February, the level of stocks in the south-east reached its lowest since 2013 (Graph 38). Within the perimeter of France, winter 2015/2016 withdrawals were relatively low, enabling the 2016/2017 gas year to start with satisfactory stock levels (Graph 39).

Graph 38: Stock levels in the south-east zone



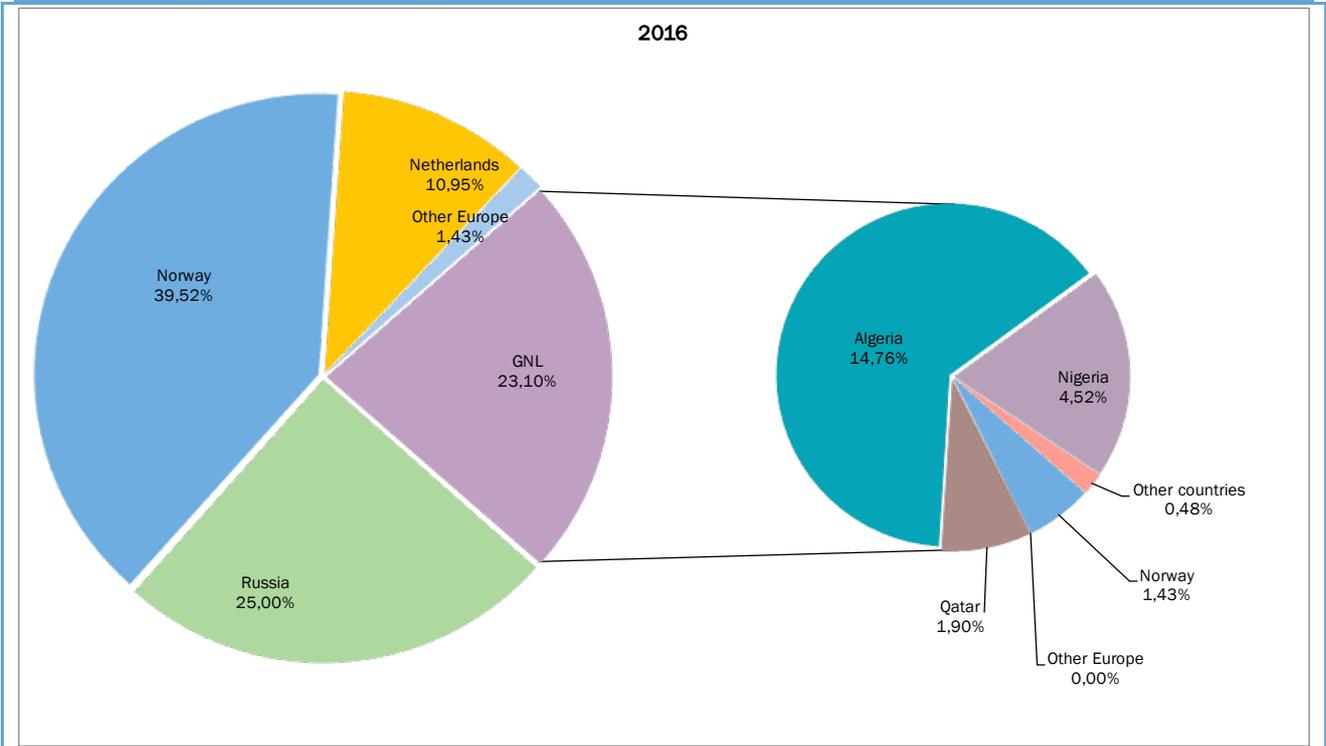
Source: Storengy, TIGF - Analysis: CRE

Graph 39: Stock levels in France



Source: Storengy, TIGF – Analysis: CRE

Graph 40: Origin of French natural gas supply



Source: BP Statistical Review of World Energy – Analysis: CRE



2. WHOLESALE GAS PRICES FOLLOWING THE COMMODITY TREND IN 2016 BUT REMAINING AT LOW LEVELS

2.1 Spot prices in Europe lower on average in 2016, but breaking with the downward trend of 2015

In 2016, spot prices at the main gas hubs in Europe dropped on average compared to 2015 (Graph 41). Prices at the TTF and the PEG Nord stood at an average of €13.9/MWh and €14.0/MWh respectively compared to €19.6/MWh and €20/MWh in 2015. The downward trend observed in 2015 continued until the end of August 2016. TTF reached its lowest point at €10.4/MWh on 20 August 2016.

Nevertheless, this downward trend in gas spot prices stopped as from early September, when prices picked up significantly and quickly, driven by commodity prices. This evolution also reflected the seasonality in price movements as winter approached. This movement was also marked by episodes of volatility, fuelled in particular by risks of strikes in the Norwegian gas fields early October 2016. Prices reached their highest in January 2017 during the cold spell (-1.6°C below average in France). TTF and PEG Nord respectively settled at €19.9/MWh on average and €21.2/MWh in January 2017. Spot prices fell off again progressively afterwards, to levels similar to those at the end of 2015, at around €15/MWh, in connection with low tightness on transmission infrastructure in Europe, major LNG imports and a drop in global gas prices (**Erreur ! Source du renvoi introuvable.**)

The prices at the main European gas hubs converged, testifying to the lack of physical bottlenecks between the hubs concerned and the fluidity of the European markets. The price at the NBP (gas exchange point of the United Kingdom) however was sometimes lower than European hubs, particularly in September 2016 and June 2017, mainly due to a drop in available flexibility because of operational degradation of the Rough storage site since summer 2016.

Graph 41: Gas spot price in Europe



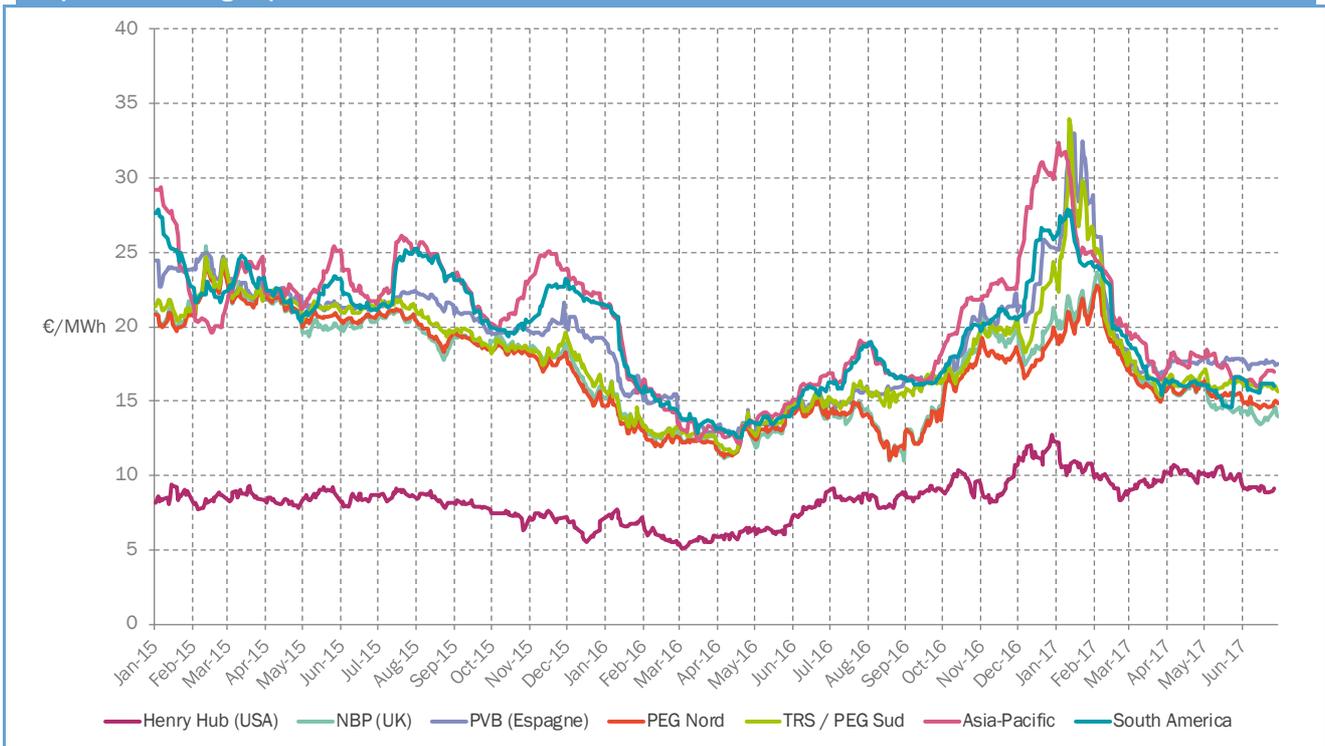
Source: ICIS Heren; Analysis: CRE

2.2 Global prices peaked at the end of 2016 before declining afterwards

Global prices were characterized in the first months of 2016 by the downward trend which had started the previous year, against abundant supply (Graph 42). After reaching its lowest in spring 2016, an upward movement began, following that of commodity. The climb in international gas prices reflects in particular the increase in international demand, particularly in China (7.7% jump in gas consumption in 2016) and in southern Europe. In addition, prices in the Asian markets remained heavily influenced by oil because of the still strong indexing of long-term contracts to this commodity for LNG supplies shipped to Asia.

Following this upward trend, gas prices dropped in H1 2017, in connection with those of commodities and demand associated with good global gas supply.

Graph 42: Global gas prices



Source: ICIS Heren; Analysis: CRE

The spread between Asian and European prices, reflecting LNG arbitrage between demand from these two regions, dropped sharply in the first semester 2016, then climbed as from Q3 2016. The Asia Pacific/NBP (price of English gas) spread reached an average of €9.8/MWh in December 2016, its highest since 2015.

The TRS and PVB (Spanish gas exchange point), hubs for which a significant portion of supplies depends on LNG, were particularly affected by the increase in global prices at the end of 2016, because of a very cold winter and a major drop in LNG flows in the south of Europe. The prices of these two hubs fell off below Asian prices for almost 20 days as from mid-January 2017. In January 2017, TRS prices were on average lower than Asian prices by €0.2/MWh, while those of PVB were higher by €1.5/MWh.

2.3 Reappearance of a North/South spread in 2016 and a price spike at the TRS in January 2017

In S1 2016, the spread between spot markets in France (TRS and PEG Nord) remained low, in continuity with 2015, standing at an average €0.35/MWh.

This lack of bottlenecks during this period is a result of low exports to Spain, but also good LNG supplies at Fos and in Spain, with arbitrage possibilities with Asian markets being limited by low spreads with Asian LNG prices (Graph 42).



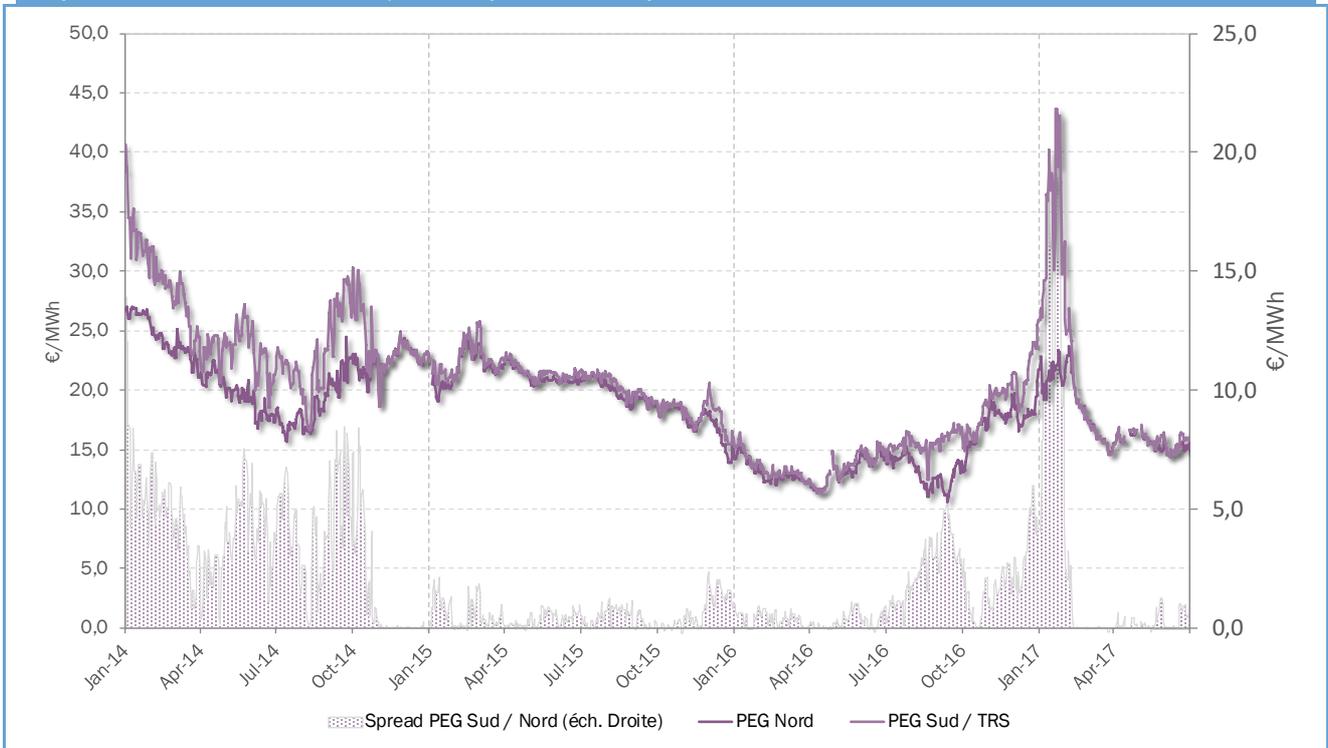
The spread between the TRS and the PEG Nord however widened as from H2 from August to October 2016 and at the end of 2016 and in January 2017 (Graph 43).

From August to October 2016, the increase in prices in the South zone was mainly related to low LNG supplies at the Fos terminal, the rise of exports to Spain, together with bottlenecks at the North-South link, almost fully used over the period (Graph 44).

Early 2017, particularly low temperatures associated with low LNG supplies at Fos (the terminal sent out an average 77 GWh/d in January, i.e. half the average for 2016) and in Spain (tight LNG supply in the South in January 2017) exacerbated the jump in prices of the TRS which exceeded Asian and South American price levels (Graph 42). This price signal resulted in an international arbitrage in favour of LNG deliveries in the south of France which returned, as from end of January 2017, to price levels similar to those of the PEG Nord. In that context, the TRS/PEG Nord spread was almost €13/MWh on average for the whole January 2017 and reached its highest at over €21/MWh on 21 January. As for all unusual market episodes, the tightness seen at the start of the year in the South zone was examined attentively as part of CRE's wholesale markets monitoring activities.

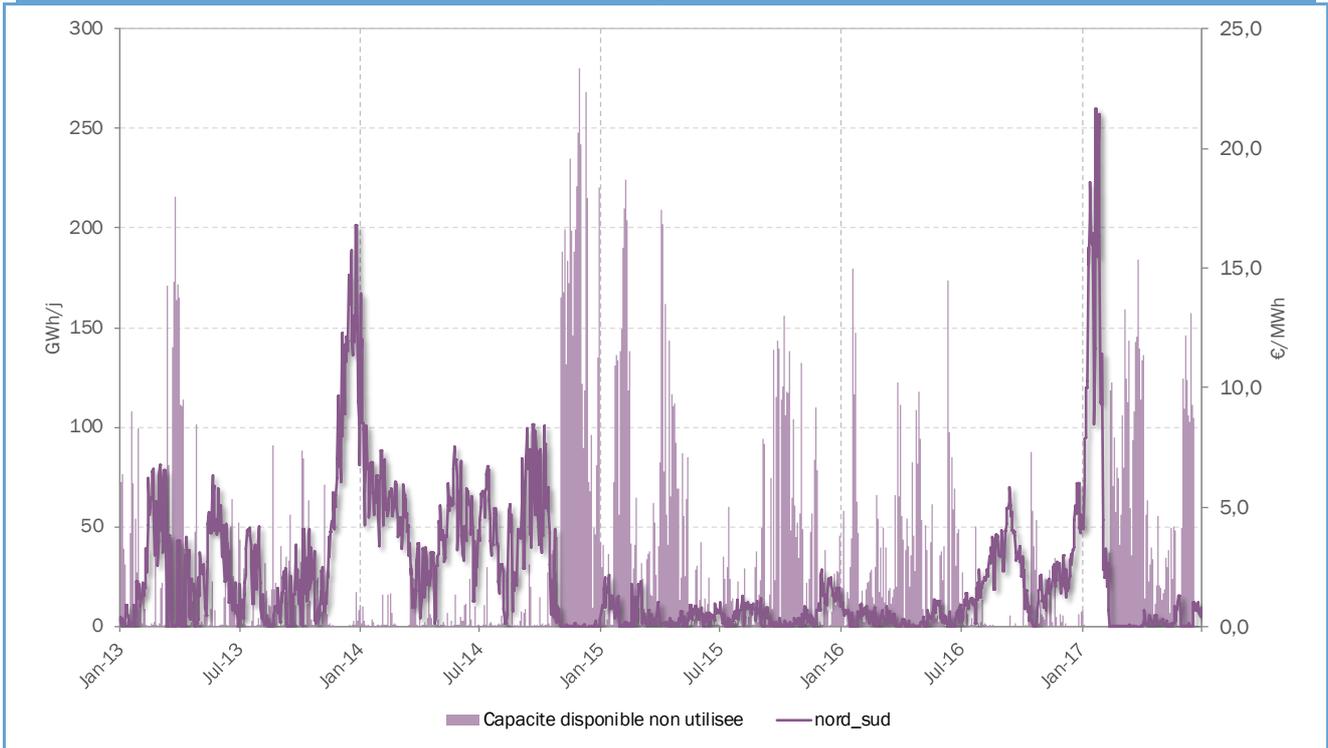
Following the January price spike, the North/South spread nosedived at levels close to zero, against high LNG supplies at Fos (send-out at the Fos terminal increased 17% in H1 2017 compared to the average send-out of 2016).

Graph 43: Evolution of the North/South spread in the spot market



Source: ICIS Heren; Analysis: CRE

Graph 44: Use of the North/South link vs North/South spread



Source: ICIS Heren; Analysis: CRE

2.4 Futures prices following commodities trends

European futures prices soared in 2016 (over 20% jump during the year), against a general increase in commodities prices (Graph 45).

In H1 2017, the 2018 calendar product was higher than 2019 and 2020 maturities, with spreads between products sometimes reaching €0.5/MWh. Futures prices followed a downward trend (-10%) throughout this half-year period due to the general drop in commodity prices. The spreads between the different maturities narrowed.

Graph 45: Futures prices in Europe



Source: ICIS Heren; Analysis: CRE

2.5 Low summer/winter spread unfavourable to storage capacity booking

Summer/winter spread remained low and comparable to those recorded in 2015/2016, i.e. lower than €2/MWh on average. This spread reached its highest at the end of August 2016, at almost €4/MWh, for a short period, before plunging (Graph 46).

Apart from any considerations relating to regulatory obligations on storage, the profitability for market participants of using underground storage to inject during summer and withdraw during winter was limited in this context.

Graph 46: France summer/winter spread



Source: ICIS Heren; Analysis: CRE

3. GENERAL INCREASE IN VOLUMES TRADED AT THE PEG, STILL SHARPER IN THE NORTH THAN IN THE SOUTH IN 2016

Wholesale gas in France is traded over the counter (OTC), i. e. directly between participants or through brokers, or via the organised market Powernext.

Trading in the French wholesale market is materialised at marketplaces called *Points d'échange gaz* (PEGs), virtual points where participants deliver gas to their counterparties according to their obligations. Following the merging of the PEG Sud and TIGF, entered into effect on 1 April 2015¹⁸, the French market is currently organised into two marketplaces: the PEG Nord, attached to the North balancing zone, and the TRS, attached to GRTgaz Sud and TIGF balancing zones.

The present report distinguishes between volumes traded in the intermediated markets and physical deliveries at PEGs:

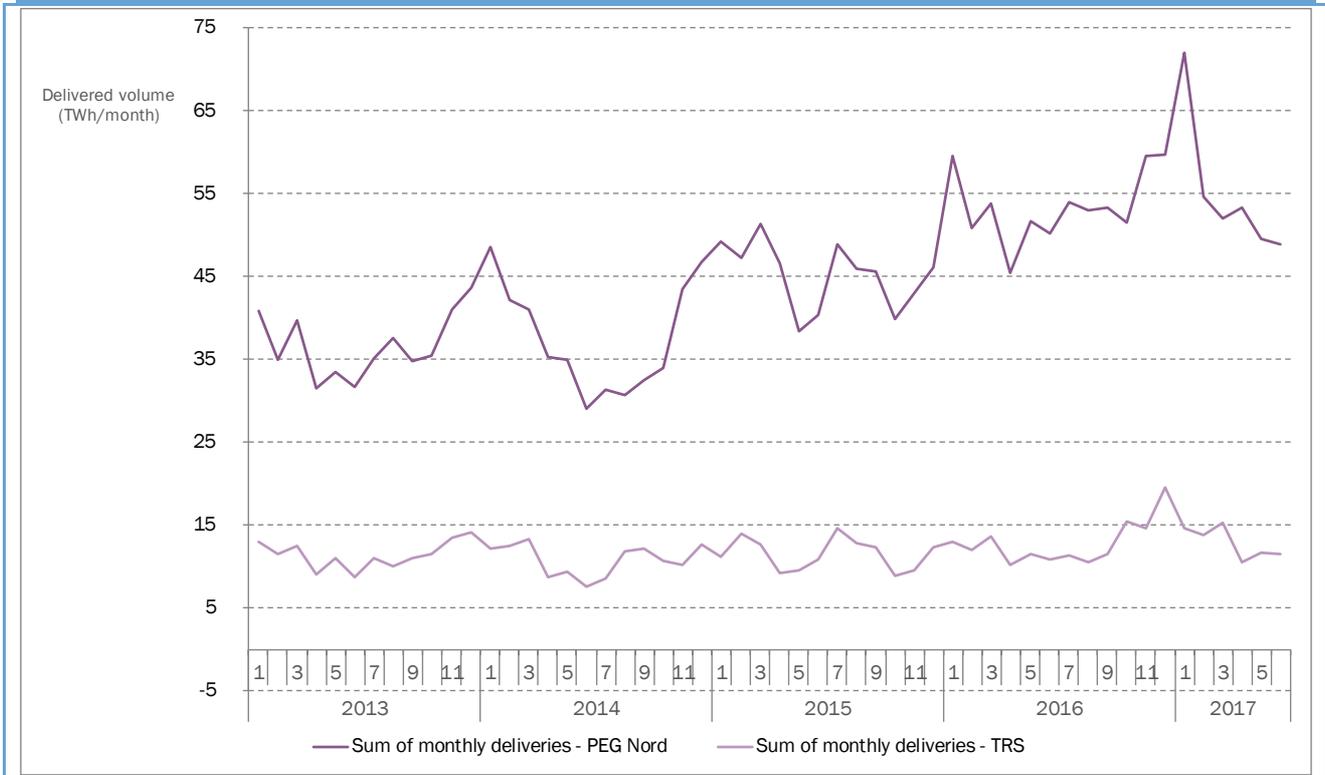
- brokered markets include all of the contracts signed between the different market participants through the exchange or brokers;
- deliveries at the PEGs cover net daily deliveries made between pairs of participants at the PEGs.

¹⁸ In compliance with CRE's deliberations of 19 July 2012 and of 13 December 2012



In 2016, deliveries at the PEG Nord and at the TRS continued the growth observed since 2005. However, these deliveries have not increased at the same pace at the two French hubs. Deliveries at the PEG Nord considerably crept up in 2016, by 18.5% compared to 2015, while at the TRS, deliveries edged up by only 11.6% compared to 2015 (Graph 47). This increase at the TRS was however much higher than that in 2015, which stood at 6%.

Graph 47: Deliveries at the PEG Nord and the TRS



Source: ICIS Heren; Analysis: CRE

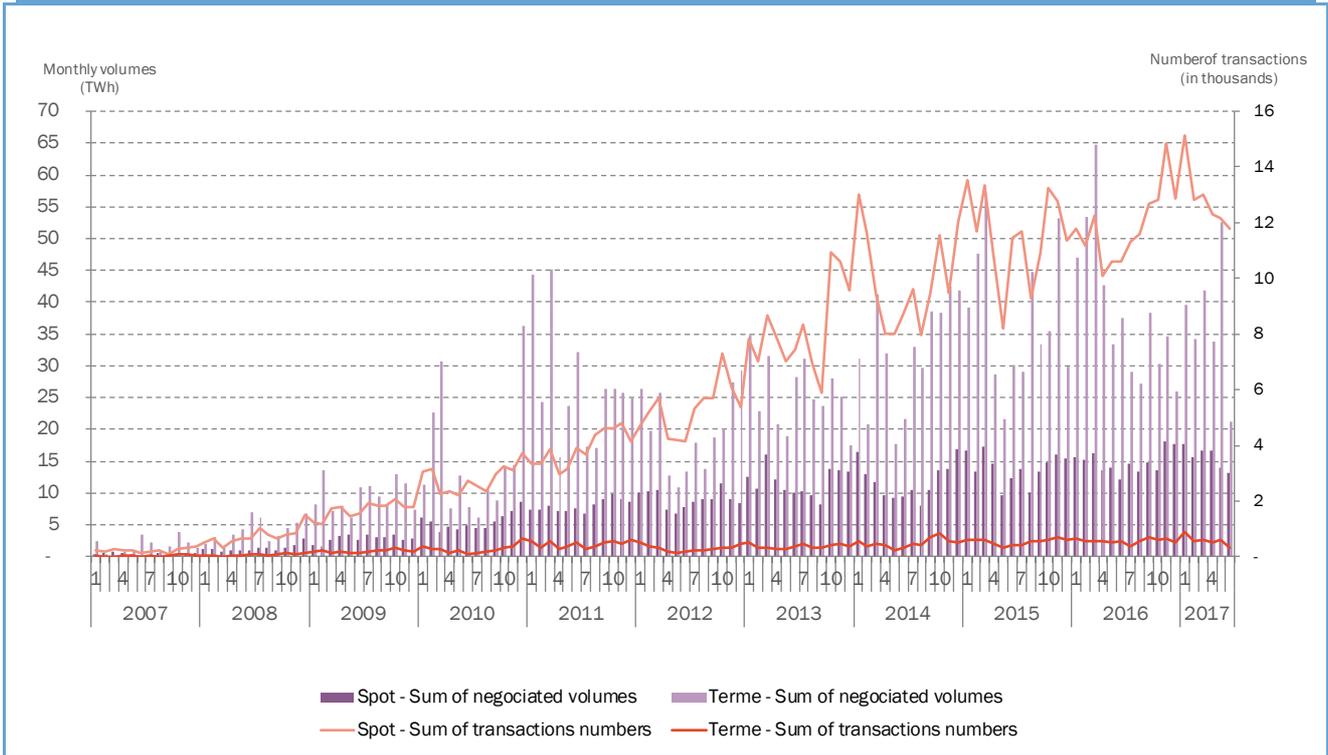
The growth in volumes delivered at the PEG Nord and at the TRS continued in the first semester 2017 with a 7% rise compared to H1 2016. Growth in trades was higher between the first two half-year periods at the TRS (+9%) than at the PEG Nord (+6%), with, in particular, trades up an average 14% in the first three months of 2017 at the TRS.

3.1 Growth in spot and futures trading in 2016

Activity in the brokered markets slightly grew in 2016, with global volumes up by 4% compared to 2015 and the number of transactions up by 3% (Graph 48). In H1 2017, the activity of brokered markets dropped in volume, with -13% compared to H1 2016, mainly related to lower futures volumes (-20%). However, the spot market grew by 8%. The drop in futures trading in H1 2017 was mainly due to a lesser use by market participants of calendar products (-6.2 TWh, i.e. -32%) and seasonal products (-50.6 TWh, i.e. -37%), against low storage capacity booking for the 2017/2018 storage year.



Graph 48: Evolution of volumes traded and of the number of transactions in the French intermediated market

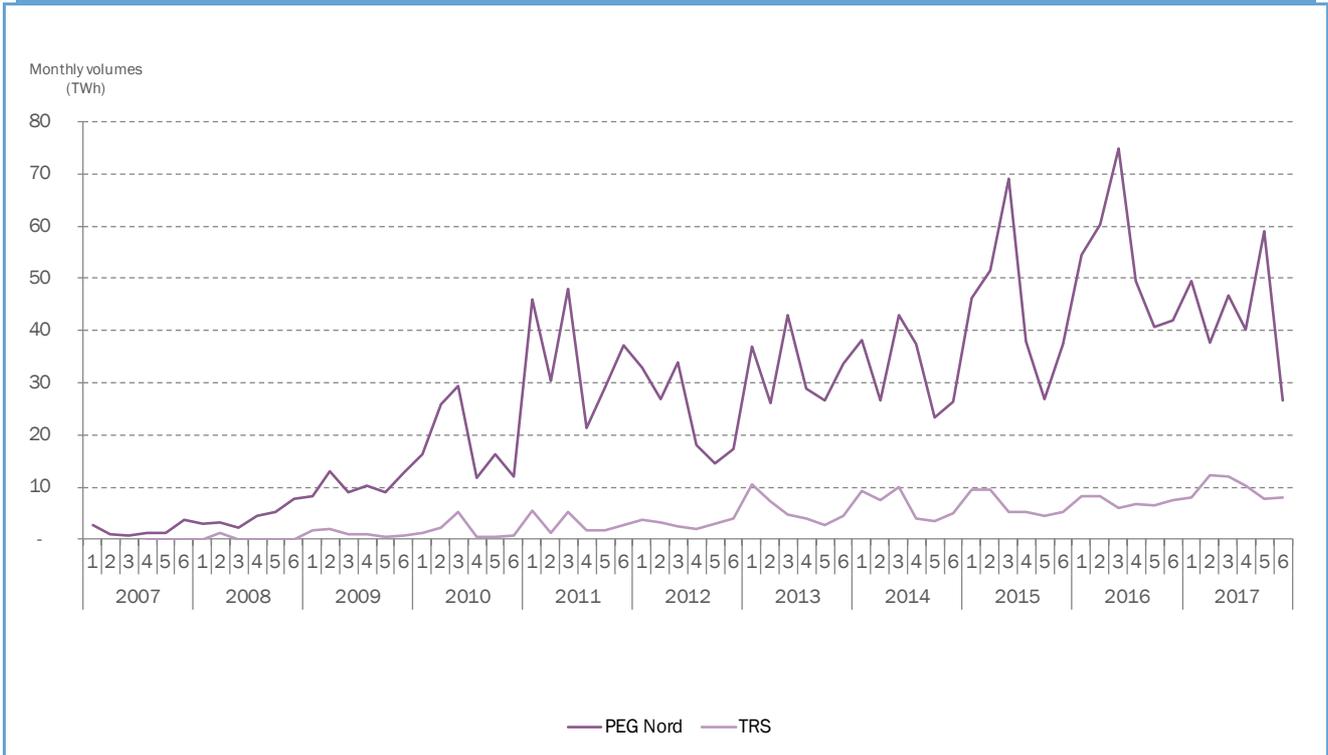


Source: ICIS Heren; Analysis: CRE

The growth in volumes in 2016 was mostly at the PEG Nord, with a 3% increase (+17 TWh) compared to 2015. However, traded volumes increased by 9% at the TRS (+7 TWh), which is a major rise compared to 2015. This reflects a better liquidity at the TRS following the merger of the hubs of the south zones (PEG TIGF and PEG Sud) in April 2015 (Graph 49).

The decline in volumes observed in H1 2017 was mainly due to a drop in trades at the PEG Nord (-19% compared to H1 2016). Volumes traded at the TRS surged by 34% compared to H1 2016.

Graph 49: Volumes traded at each PEG in the intermediated market

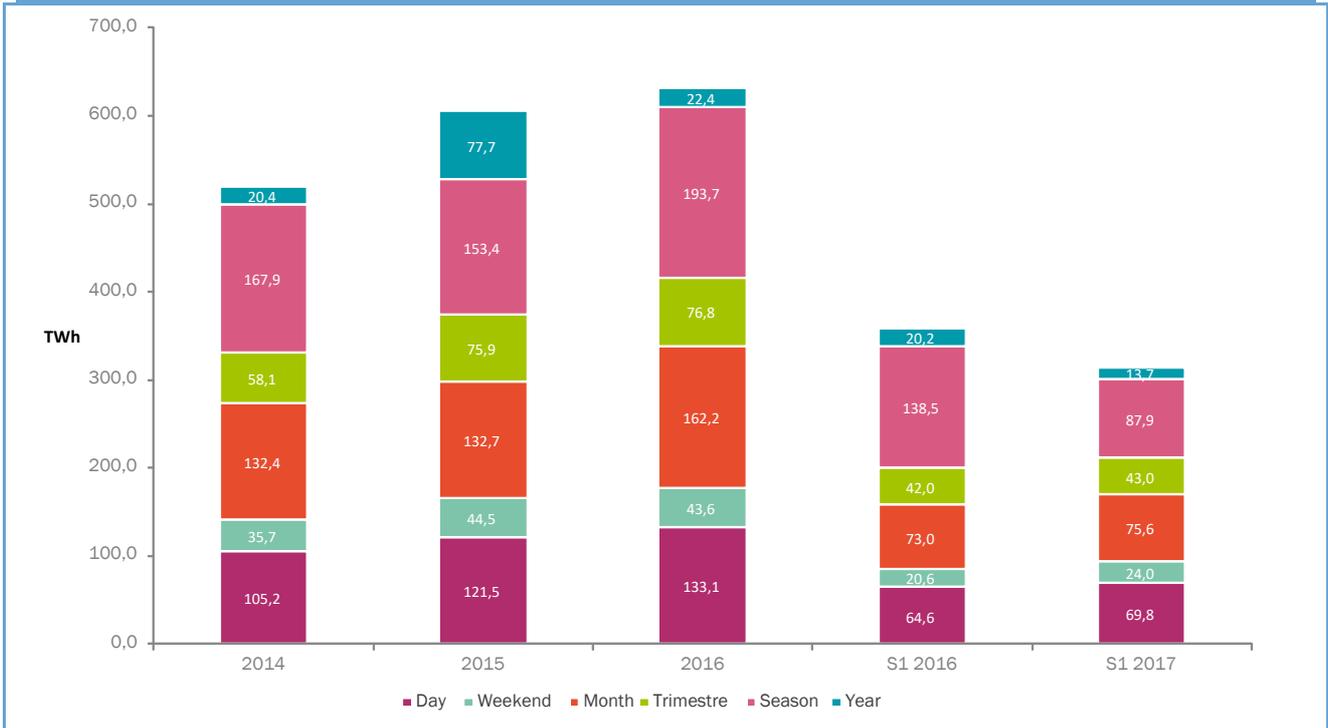


Source: ICIS Heren; Analysis: CRE

Despite the jump in volumes traded in the French brokered markets in 2016, the sharp drop in wholesale gas market prices led to a lower value (-23%) for these trades compared to 2015 (Graph 50).

In contrast, during the first semester 2017, the value of trades increased despite a drop in volumes traded, as a result of higher wholesale prices. This was particularly marked in January 2017 (+38% in value compared to January 2016) and represents 22% of trades in H1.

Graph 50: Volumes traded for each product in the intermediated market

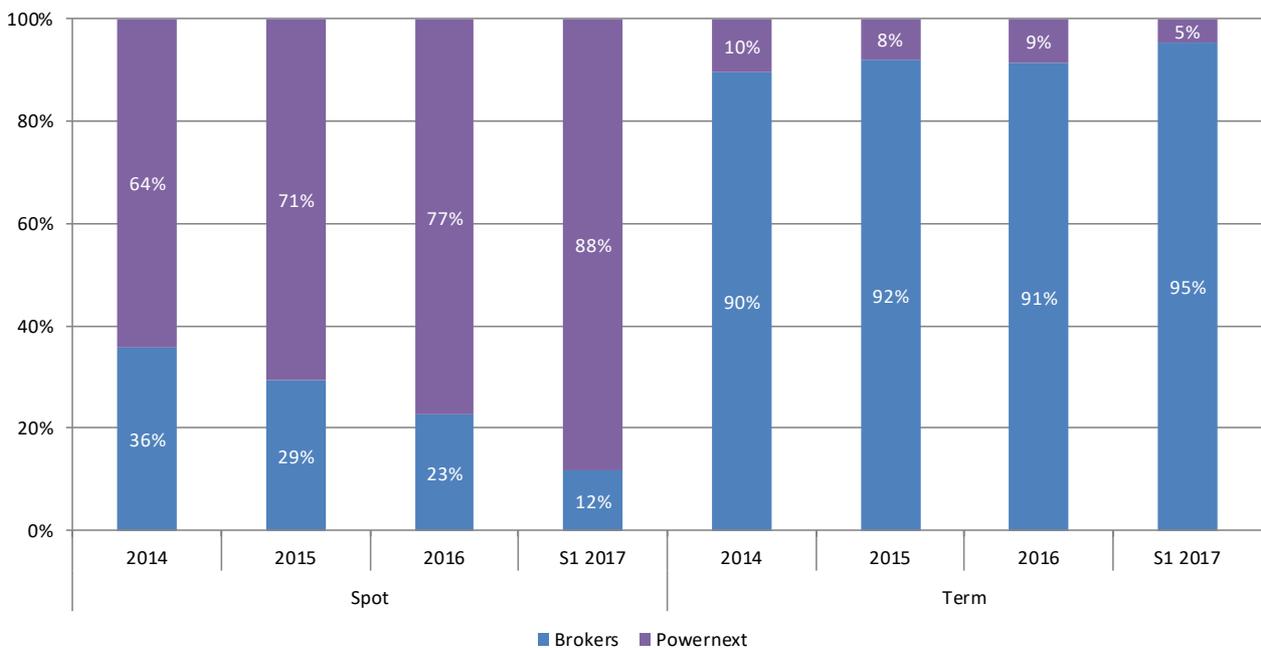


Source: ICIS Heren; Analysis: CRE

Powernext exchanges continued to grow in volume in the spot market in 2016 with a 6-point increase compared to 2015. This trend continued in H1 2017, during which 88% of volumes of the spot segment in France were traded through Powernext(Graph 51).

In the futures segment, Powernext's market share slightly increased in 2016 (+1 point compared to 2015), and represented 9% of volumes traded. However, in H1 2017, the portion of volumes traded in Powernext fell off, down by 4 points compared to 2016, mainly due to a drop in seasonal product traded via the exchange (86% drop in volumes compared to H1 2016).

Graph 51: Distribution of spot and futures volumes traded by type of intermediary in France



Source: Powernext, brokers; Analysis: CRE

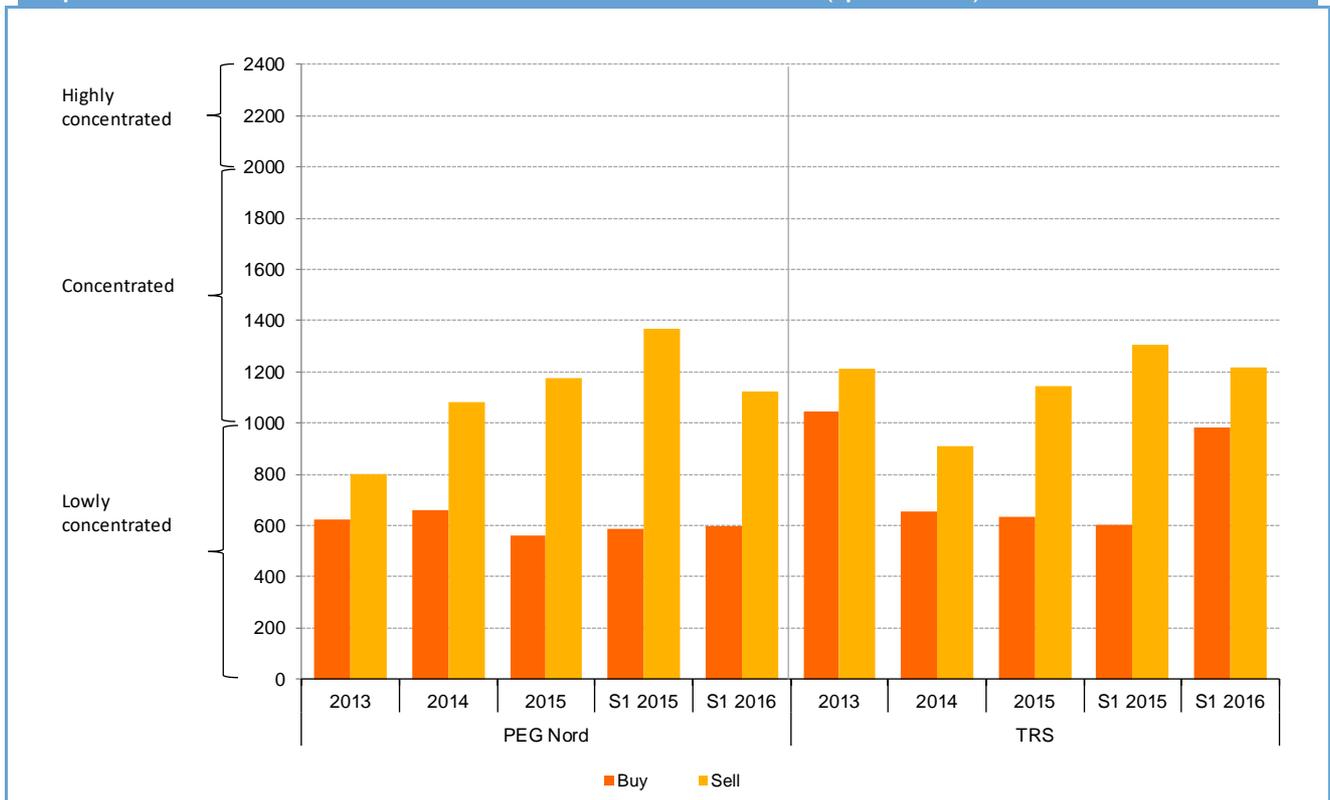


3.1 Stability of competition indices in 2016

The Herfindahl-Hirschman (HHI) index measures the market concentration and is an indicator of its liquidity and development.

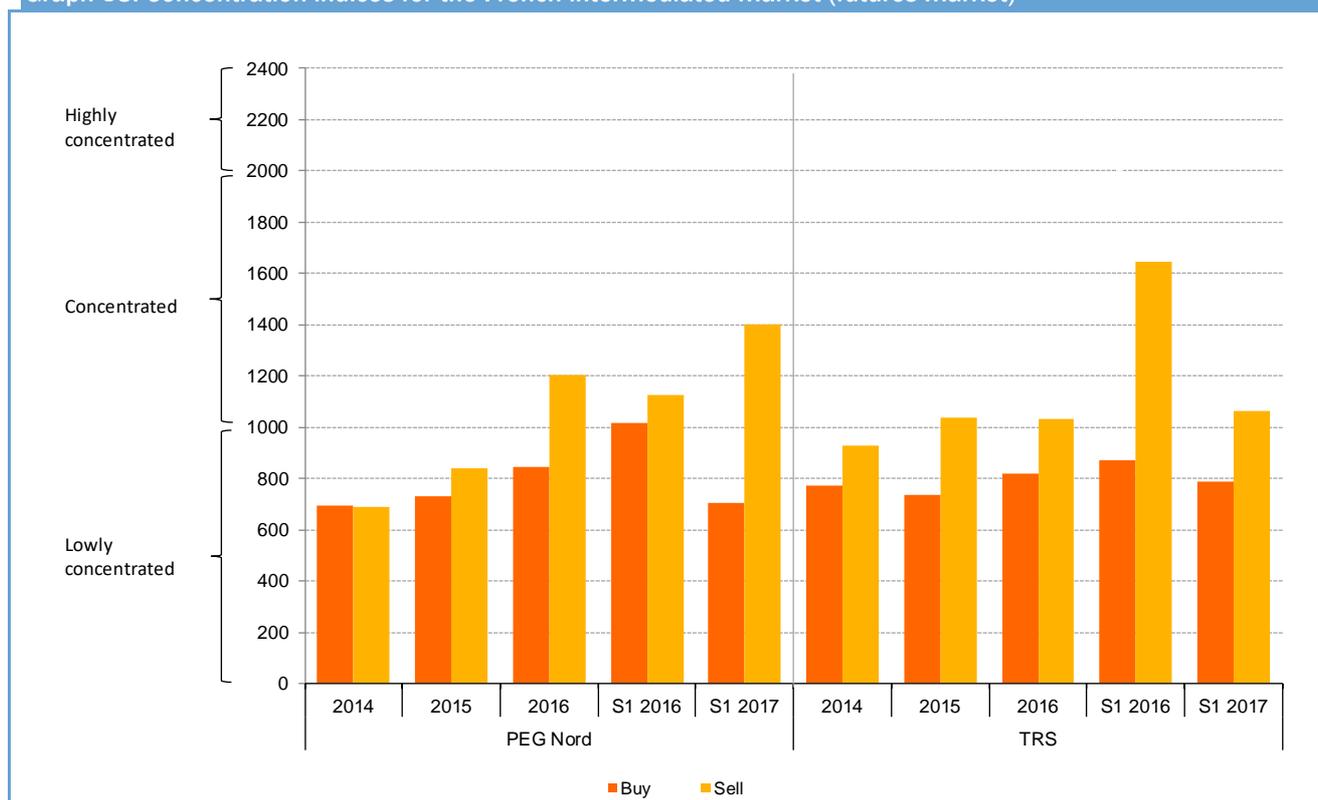
The HHI indices of wholesale gas markets in France (Graph 52 and Graph 53) are characteristic of a moderately concentrated market as regards sales and of little concentration as regards purchases. Concentration levels were similar in the spot and futures segments for the Nord and South marketplaces from 2014 to H1 2017.

Graph 52: Concentration indices for the French intermediated market (spot market)



Source: Powernext, brokers; Analysis: CRE

Graph 53: Concentration indices for the French intermediated market (futures market)



Source: Powernext, brokers; Analysis: CRE

The number of participants active in the French market decreased in 2016 and in H1 2017 (Table 17). The number of them active at the network interconnection points (PIRs) followed the same trend. The number of shippers active at the transport/storage interface points (PITS) and the transport/distribution interface points (PITDs) remained stable between 2015 and H1 2017.

With regard to LNG terminals, the number of participants rose in H1 2017 at Fos Cavaou, particularly in response to the considerable LNG needs in January 2017 (**Erreur ! Source du renvoi introuvable.**). Commercial operation of the Dunkirk terminal started in H1 2017. Two shippers sent out volumes from this terminal (Table 18).

Table 17: Number of participants active in the French market

	2012	2013	2014	2015	2016	S1 2017
PEG	68	75	87	92	88	86
PIR	46	46	52	56	51	50
PITD	28	26	33	33	35	35
PITS	38	27	39	38	41	40

Table 18: Number of active participants that imported volumes via the LNG terminals

	2012	2013	2014	2015	2016	S1 2017
Montoir	2	1	1	2	2	2
Fos Tonkin	2	1	1	1	1	1
Fos Cavaou	3	2	2	2	2	4
Dunkerque	na	na	na	na	na	2

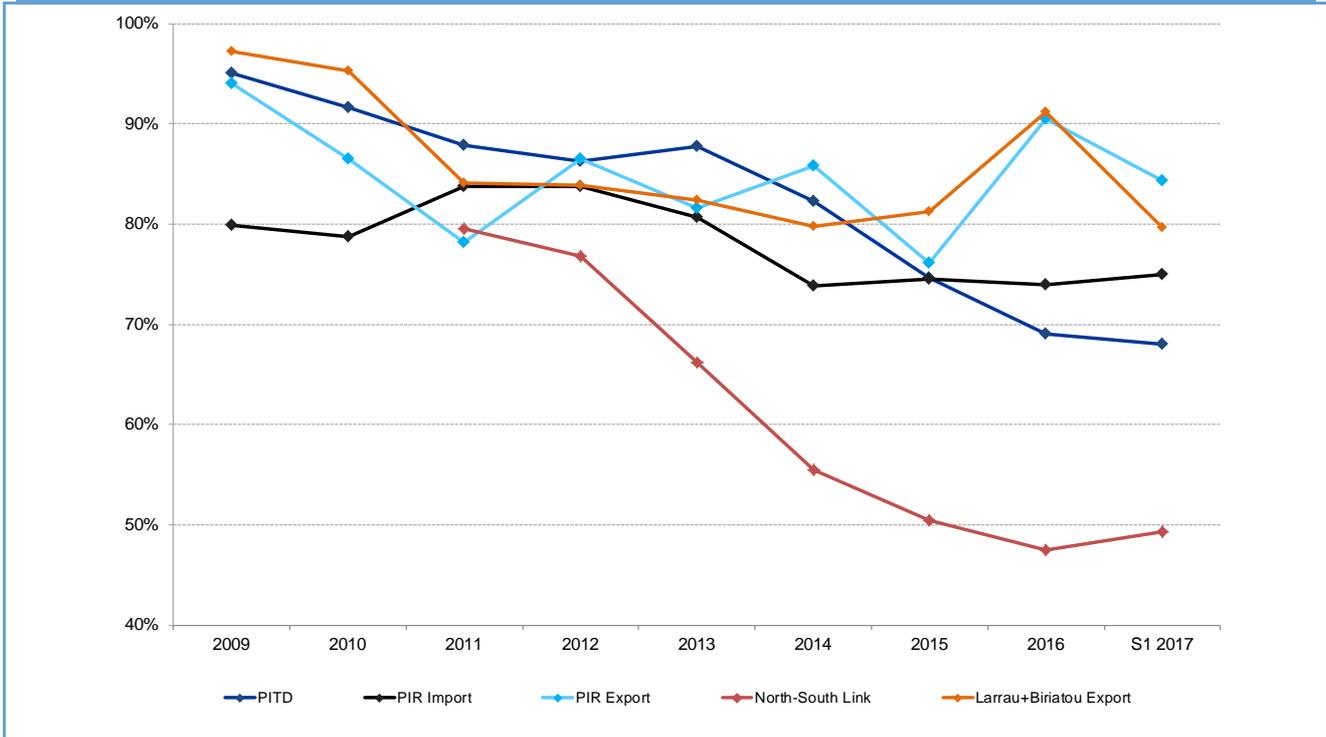
The market share of the three main participants as regards the use of infrastructure remained high, apart from at the North-South link. After following a downward trend since 2009 (Graph 54), the market share of the main

participants picked up in 2016 for exports (GRTgaz and Pirineos PIR), reaching levels close to 90% before dropping back, in H1 2017, to levels close to those seen in 2015.

At the North-South link, after a continuous decline for the three main participants since 2011, the major capacity demand in H1 2017 (particularly in January 2017, as a result of low LNG supplies and a long cold period), caused this share to creep up compared to 2016.

Lastly, the aggregated market share of the three main participants continued to decline at the PITD, reflecting a fiercer competition.

Graph 54: Aggregated market share of the three main participants calculated based on nominations at the different infrastructure



Source: GRTgaz, TIGF; Analysis: CRE

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