



NOTES ON ENERGY AND ENVIRONMENTAL MARKETS AT 30 09 2017

◆ ————— ◆
OVERVIEW OF ITALY AND BORDERING COUNTRIES

November 2017

WITH GLOSSARY

SUMMARY – Q3 2017

POWER AND ENVIRONMENTAL MARKETS



- In Q317 there was a **2.6% increase in electricity demand** compared to the same quarter of 2016. In the first 9 months, the demand increased by 1.7% y/y.
- **Hydroelectric production in Q3 decreased by -5.2% y/y** (-11.7 in the first nine months), due to lacking rainfalls and consequent low level of hydro reservoirs.
- **Thermoelectric production in Q3 increased slightly on previous year's level (+1.3%)**, mainly due to the strong increase in August (+15%) thanks to high temperatures and low precipitations.
- **Net import levels were higher y/y** (+9.5%), mainly in August (+22%, due to very high prices in Italy) and September (+21.8%, due to very low levels last year).
- **The first 9 months of the year saw a 13 €/MWh increase in PUN prices y/y**, due to low hydro production and higher gas costs. In Q3, the rise (+10.7 €/MWh) was particularly sharp in August (+18.7 €/MWh) due to the high temperatures.
- **In the first 9 months the Clean Spark Spread increased by 3.8 €/MWh**. The increase in Q1 (+5.2 €/MWh) was mainly due to the French nuclear situation, while in Q2 (+3.4 €/MWh) it was largely caused by the reduction in hydro production. High temperatures contributed to the increase in Q3 (+3 €/MWh).
- **In Q3**, EUA prices registered an upward trend, from 4.8 €/ton at the end of June to touch 7.8 €/ton at the beginning of October. **Regulation** was the main bullish factor: in Q3 several trilogue meetings among the EU Council, Parliament, Commission representatives brought to the **approval of the reform for phase 4** (2021-2030) on the 9^o of October.

- **Q3 2017 showing a significant rise in gas consumption**, on a year-on-year basis (+4.4%). **The industrial gas demand segment is showing the largest improvement**, with nearly +0.4 bcm of growth on a year-on-year basis (+13.4% in Q317 vs. Q316).
- **Algerian flows marked another contraction in flows in Q3 2017 on a year-on-year basis** (-34.8%). The Algerian drop was compensated by **rising flows through Tarvisio** (+25.2% on a year-on-year basis). Griespass remained lower as well, due to technical issues on the Fluxys TENP pipeline.
- **Significant increase in LNG imports** (about +0.85 bcm in Q3 2017 on a year-on-year basis, +45%).
- **Strong gas price increase in Q317 vs. Q316 on the PSV** (about +24.1% year-on-year), with a general price increase all over Europe due to strong gas stock injections and higher coal prices. **Spreads with the Austrian VTP, TTF and Peg Nord (Q317 vs. Q316) marked an important uptick as well**, mainly due to an extensive maintenance on the TENP pipeline and the Wallbach exit point, from Germany to Switzerland.

CONTENTS



01

Power Market
Supply & Demand
Spot Markets

02

Gas Market
Supply & Demand
Spot Markets

03

Environmental
Markets: EUA

ITALIAN ELECTRICITY SUPPLY – BREAKDOWN BY SOURCE

STILL LOW HYDRO PRODUCTION AND INCREASE IN POWER DEMAND BRING AN INCREASE IN THERMO PRODUCTION



GWh	Q3 2017	Q3 2016	Var. % 2017/2016	9 M 2017	9 M 2016	Var. % 2017/2016
Net Production						
Hydroelectric	11.775	12.427	-5,2%	30.849	34.937	-11,7%
Thermal	48.402	47.796	1,3%	144.667	134.538	7,5%
Geothermal	1.432	1.458	-1,8%	4.331	4.412	-1,8%
Wind	3.642	3.047	19,5%	12.366	13.291	-7,0%
Solar	8.146	7.498	8,6%	20.895	18.504	12,9%
Total net production	73.397	72.226	1,6%	213.108	205.682	3,6%
Import	11.059	10.536	5,0%	32.458	36.241	-10,4%
Export	1.227	1.557	-21,2%	4.312	4.706	-8,4%
Foreign balance	9.832	8.979	9,5%	28.146	31.535	-10,7%
Pump storage	416	493	-15,6%	1.706	1.759	-3,0%
Demand	82.813	80.712	2,6%	239.548	235.458	1,7%

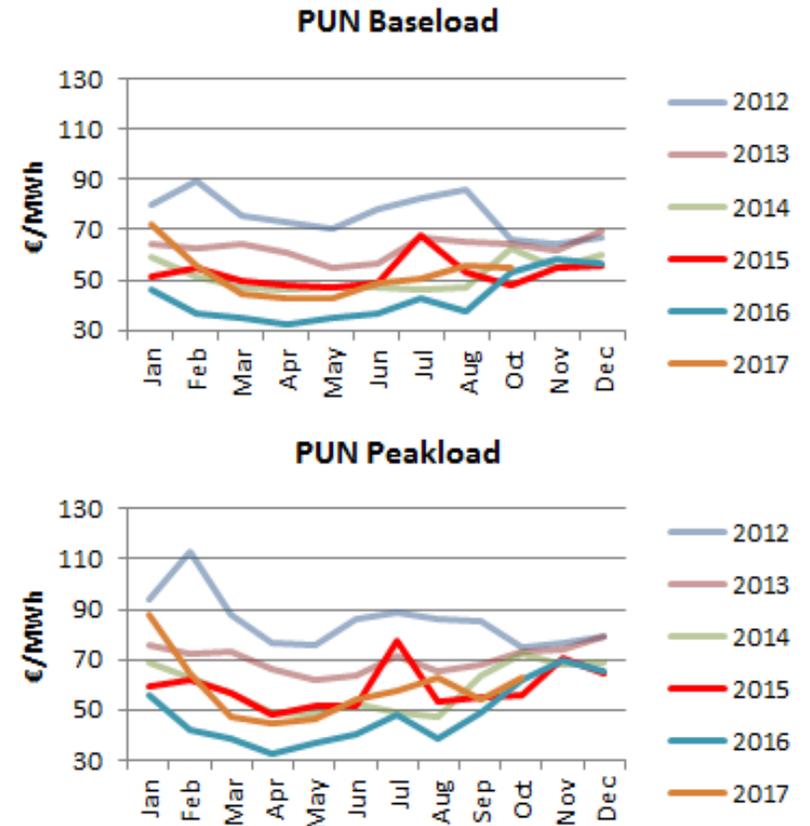
- In Q317 there was a **2.6% increase in electricity demand** compared to the same quarter of 2016. In particular, in August the demand increased by 9.5%, due to the high temperatures. In the first 9 months, the demand increased by 1.7% y/y.
- **Hydroelectric production decreased by -5.2% y/y in Q3** (-11.7 in the first six months), due to persistent lacking rainfalls and consequent low levels of hydro reservoirs. **2017 is going to register one of the lowest hydro productions in the last 15 years.**
- **In Q317 solar production** was higher (+8.6%) y/y, as well as **wind production** (+19.5%), which, on the contrary, is lower y/y if we consider the first 9 months.
- **Thermoelectric production in Q3 increased slightly on previous year's level (+1.3%),** mainly due to the strong increase in August (+15%) thanks to high temperatures and low precipitations.
- **Net import levels were higher (+9.5%),** mainly in August (+22%, due to very high prices in Italy) and September (+21.8%, due to very low levels last year).

ITALIAN ELECTRICITY SPOT PRICES

PUN INCREASE Y/Y CONTINUES IN Q3, PARTICULARLY IN AUGUST



€/MWh		PUN BL	PUN PL	PL - BL
2016	Q1	39,6	45,2	5,6
	Q2	34,5	36,4	1,8
	Q3	40,9	45,1	4,2
	Q4	55,9	65,8	9,9
9 months		38,4	42,2	3,9
2017	Q1	57,5	66,2	8,7
	Q2	44,9	48,4	3,5
	Q3	51,6	58,0	6,5
9 months		51,3	57,5	6,2
9 months 2017 vs 2016		13,0	15,3	2,4



- **The first 9 months of the year saw a 13 €/MWh increase in PUN prices y/y**, due to low hydro production and higher gas costs. In Q3, the rise (+10.7 €/MWh) was particularly sharp in August (+18.7 €/MWh) due to the high temperatures.
- Peakload prices increased more than baseload prices, bringing up the BL-PL spread (+2.4 €/MWh y/y), which was unusually high in Q3.

ITALIAN ELECTRICITY SPOT PRICES: MARGINAL TECHNOLOGY ON MGP



HIGHER MARGINAL PRICES FOR ALL THE TECHNOLOGIES; COAL PLANTS AND CCGTs AT ROUGHLY THE SAME MARGINAL PRICE.

MARGINAL TECHNOLOGY										2017-2016								
	Coal, Dual Fuel Coal	CCGT	Renewables	Run-of-river hydro	Storage hydro	Pumped storage hydro	Market Coupling	Oil + gas turbines + Others	Import	Coal, Dual Fuel Coal	CCGT	Renewables	Run-of-river hydro	Storage hydro	Pumped storage hydro	Market Coupling	Oil + gas turbines + Others	Import
Q1	17%	42%	2%	5%	4%	2%	21%	2%	6%	4%	-4%	-3%	-4%	-2%	-3%	15%	-4%	1%
Q2	27%	47%	1%	5%	5%	2%	11%	1%	1%	11%	6%	-1%	-3%	0%	-3%	-7%	-3%	-1%
Q3	32%	39%	1%	8%	7%	3%	7%	2%	2%	15%	-8%	0%	-1%	2%	-3%	-6%	0%	0%

MARGINAL PRICE €/MWh										2017-2016								
	Coal, Dual Fuel Coal	CCGT	Renewables	Run-of-river hydro	Storage hydro	Pumped storage hydro	Market Coupling	Oil + gas turbines + Others	Import	Coal, Dual Fuel Coal	CCGT	Renewables	Run-of-river hydro	Storage hydro	Pumped storage hydro	Market Coupling	Oil + gas turbines + Others	Import
Q1	50,5	54,4	53,7	63,6	62,2	70,1	58,3	65,5	58,6	17,7	13,6	23,2	25,3	19,3	26,2	20,0	25,2	19,5
Q2	45,5	43,5	38,8	44,2	49,3	48,5	42,6	44,5	43,9	12,9	8,1	3,7	13,0	10,6	7,3	12,2	12,4	10,0
Q3	49,4	50,0	51,9	53,9	52,1	55,4	54,9	62,6	50,3	10,8	10,7	10,5	13,1	7,9	8,3	15,6	8,6	7,5

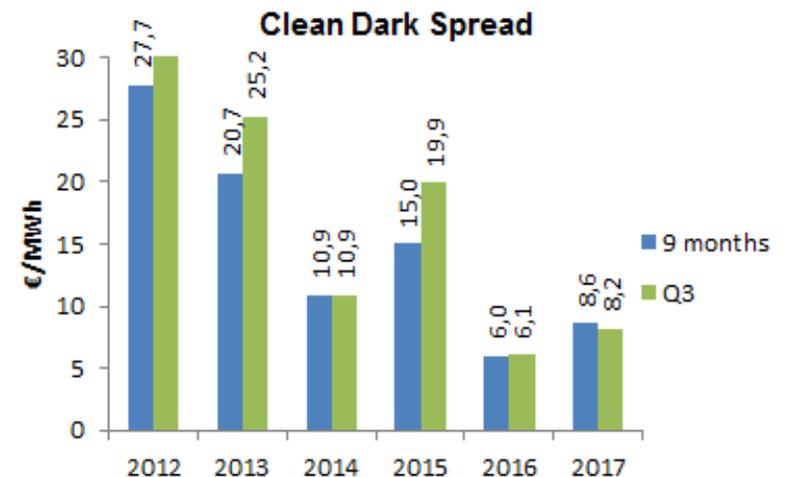
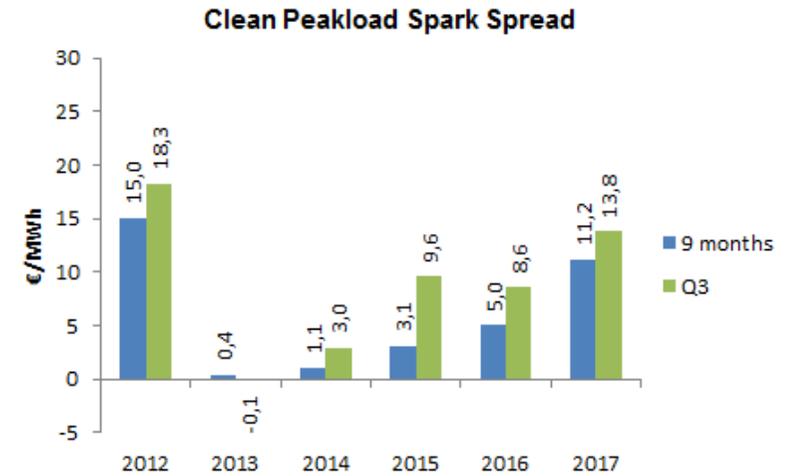
- **Number of hours in which the technologies are marginal: in Q3, increase for coal plants** (probably due to higher coal costs), and decrease for CCGT plants and market coupling.
- Marginal prices are higher than last year for all the technologies. **The difference between CCGTs and coal plants "marginal prices" reduced further**, due to the increase in the coal "marginal price" (in September, coal plants "marginal prices" were higher than the ones of CCGTs). In August marginal prices in the hours in which market coupling was marginal were strongly higher (+31,8 €/MWh), due to higher prices in Slovenia.

ITALIAN ELECTRICITY CLEAN SPARK AND DARK SPREADS (CSS AND CDS)



IMPROVEMENT IN CSS and CDS ALSO IN Q3, DUE TO HIGH TEMPERATURES

GWh		clean baseload spark spread - 51% efficiency	clean peakload spark spread - 51% efficiency	clean dark spread - 35% efficiency
2016	Q1	1,5	7,2	8,9
	Q2	-2,6	-0,8	3,1
	Q3	4,4	8,6	6,1
	Q4	8,6	18,4	9,5
	9 months	1,1	5,0	6,0
2017	Q1	6,6	15,4	13,5
	Q2	0,8	4,3	4,3
	Q3	7,3	13,8	8,2
	9 months	4,9	11,2	8,6
9 months 2016 vs 2015		3,8	6,2	2,6



- **In the first 9 months the Clean Spark Spread increased by 3.8 €/MWh.** The increase in Q1 (+5.2 €/MWh) was mainly due to the French nuclear situation, while in Q2 (+3.4 €/MWh) it was largely caused by the reduction in hydro production. High temperatures contributed to the increase in Q3 (+3 €/MWh).
- **Also CDS increased** (+2.1 €/MWh in Q3), **due to higher PUN prices** and despite the rising coal cost.

Clean Spark Spread: PUN (BL/PL) – gas PSV cost (eff. 51%) – EUA cost – CV cost (up to 2014)- variable transport costs
 Clean Dark Spread PUN BL –coal cost (API2 + spread MED + variable transport costs - eff. 35%) – EUA cost – CV cost (up to 2014)

CONTENTS



01

Power Market
Supply & Demand
Spot Markets

02

Gas Market
Supply & Demand
Spot Markets

03

Environmental
Markets: EUA

ITALIAN GAS SUPPLY – BREAKDOWN BY SOURCES

REDUCTION IN ALGERIAN FLOWS AND THROUGH GRIESPASS



mcm	Q3 2017	Q3 2016	Δ% Q317/Q316	9M-2017	9M-2016	Δ% 9M-17/9M-16
Import						
Mazara del Vallo (Algeria)	2.942	4.511	-34,8%	13.019	13.212	-1,5%
Gela (Lybia)	1.066	1.139	-6,4%	3.391	3.540	-4,2%
Tarvisio (Austria)	7.276	5.810	25,2%	22.399	20.172	11,0%
Gorizia (Slovenia)	-	-	-	2	-	-
Passo Gries (Switzerland)	2.043	2.631	-22,3%	5.920	5.251	12,7%
Total Pipeline	13.328	14.092	-5,4%	44.731	42.175	6,1%
Cavarzere	1.926	1.444	33,3%	5.263	4.479	17,5%
Panigaglia	454	83	-	624	175	-
Livorno (OLT)	362	363	-	900	470	-
Total LNG	2.741	1.890	45,0%	6.787	5.124	32,5%
Total Import	16.069	15.982	0,5%	51.518	47.299	8,9%
Domestic Production	1.301	1.333	-2,4%	3.871	4.107	-5,8%
Delta Stock	4.610	5.071	-9,1%	3.479	3.425	1,6%
Demand	12.673	12.134	4,4%	51.500	46.571	10,6%

- Algerian flows marked another contraction in flows in Q3 2017 on a year-on-year basis (-34.8%).
- The Algerian drop was compensated by rising flows through Tarvisio (+25.2% on a year-on-year basis). Griespass remained lower as well, due to technical issues on the Fluxys TENP pipeline.
- Significant increase in LNG imports (about +0.85 bcm in Q3 2017 on a year-on-year basis).

Source: Bloomberg, Snam Rete Gas, PCS correction by Snam Rete Gas during 2016, data corrections by Snam Rete Gas

ITALIAN GAS CONSUMPTION

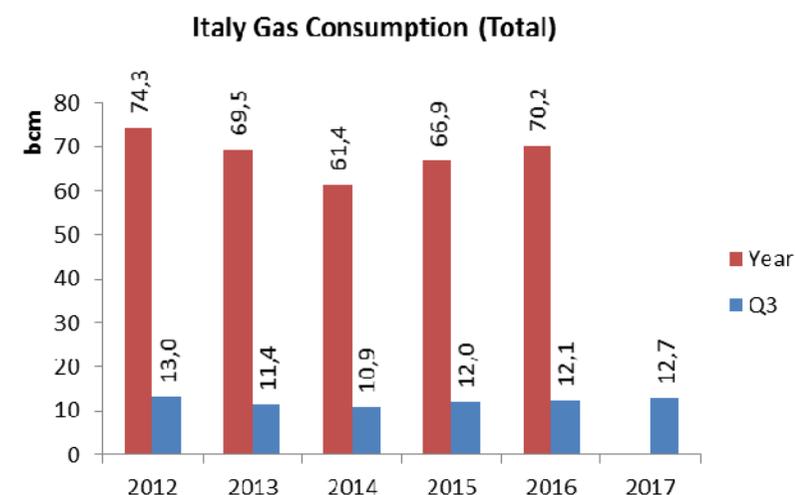
GROWING DEMAND IN Q3 2017, STRONG INDUSTRIAL SEGMENT



Italy: Gas consumption

mcm		Industry	Thermal	Distribution Network	Other networks	Total
2016	Q1	3.501	5.632	13.680	773	23.585
	Q2	3.283	4.475	4.187	206	12.152
	Q3	2.983	6.054	2.843	254	12.134
	Q4	3.613	7.178	10.964	531	22.286
Tot.		13.380	23.339	31.674	1.764	70.157
2017	Q1	3.737	6.699	14.379	635	25.448
	Q2	3.440	5.389	4.255	295	13.379
	Q3	3.385	6.059	2.979	249	12.673

Q3-17 vs. Q3-16	403	5	136	- 5	539
9M-17 vs. 9M-16	795	1.985	903	- 54	3.629



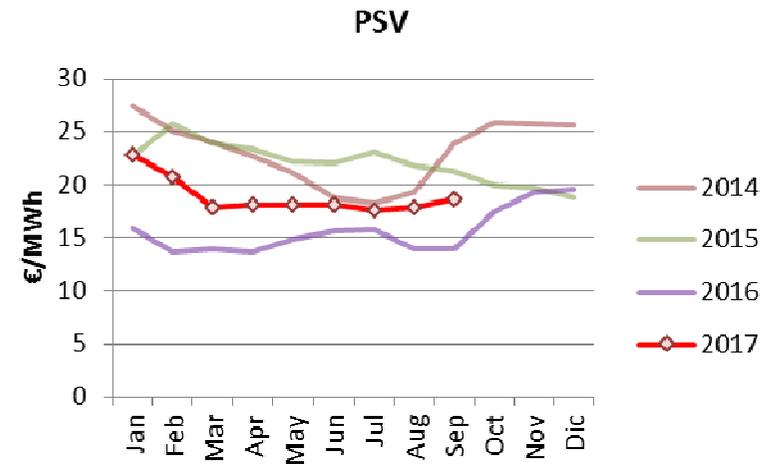
- Q3 2017 showing a significant rise in gas consumption, on a year-on-year basis (+4.4%).
- Industrial gas demand segment showing the largest improvement, with nearly +0.4 bcm of growth on a year-on-year basis (+13.4% in Q317 vs. Q316).

SPOT GAS PRICES – PSV AND MAIN HUBS SPREAD

PSV PRICES INCREASED IN Q3-17 (+24.1% Y-O-Y)



€/MWh	PSV	PSV-TTF	PSV-VTP	PSV-PEG NORD	
2016	Q1	14,5	1,6	1,1	1,3
	Q2	14,7	1,6	0,8	1,5
	Q3	14,5	1,8	0,5	1,5
	Q4	18,8	1,7	1,1	1,4
	Year	15,6	1,7	0,9	1,4
2017	Q1	20,4	2,0	1,3	1,4
	Q2	18,1	2,5	1,2	2,6
	Q3	18,0	1,9	1,1	2,1
	Q4	-	-	-	-
	Year	-	-	-	-
Q3-17 vs. Q3-16		3,4	0,1	0,6	0,6



- Strong gas price increase in Q3 2017 vs. Q3 2016 on the PSV (about +24.1% year-on-year), with a general price increase all over Europe due to strong gas stock injections and higher coal prices.
- Spreads with the Austrian VTP, TTF and Peg Nord (Q3 2017 vs. Q3 2016) marked an important uptick as well, mainly due to an extensive maintenance on the TENP pipeline and the Wallbach exit point, from Germany to Switzerland.

CONTENTS



01

Power Market
Supply & Demand
Spot Markets

02

Gas Market
Supply & Demand
Spot Markets

03

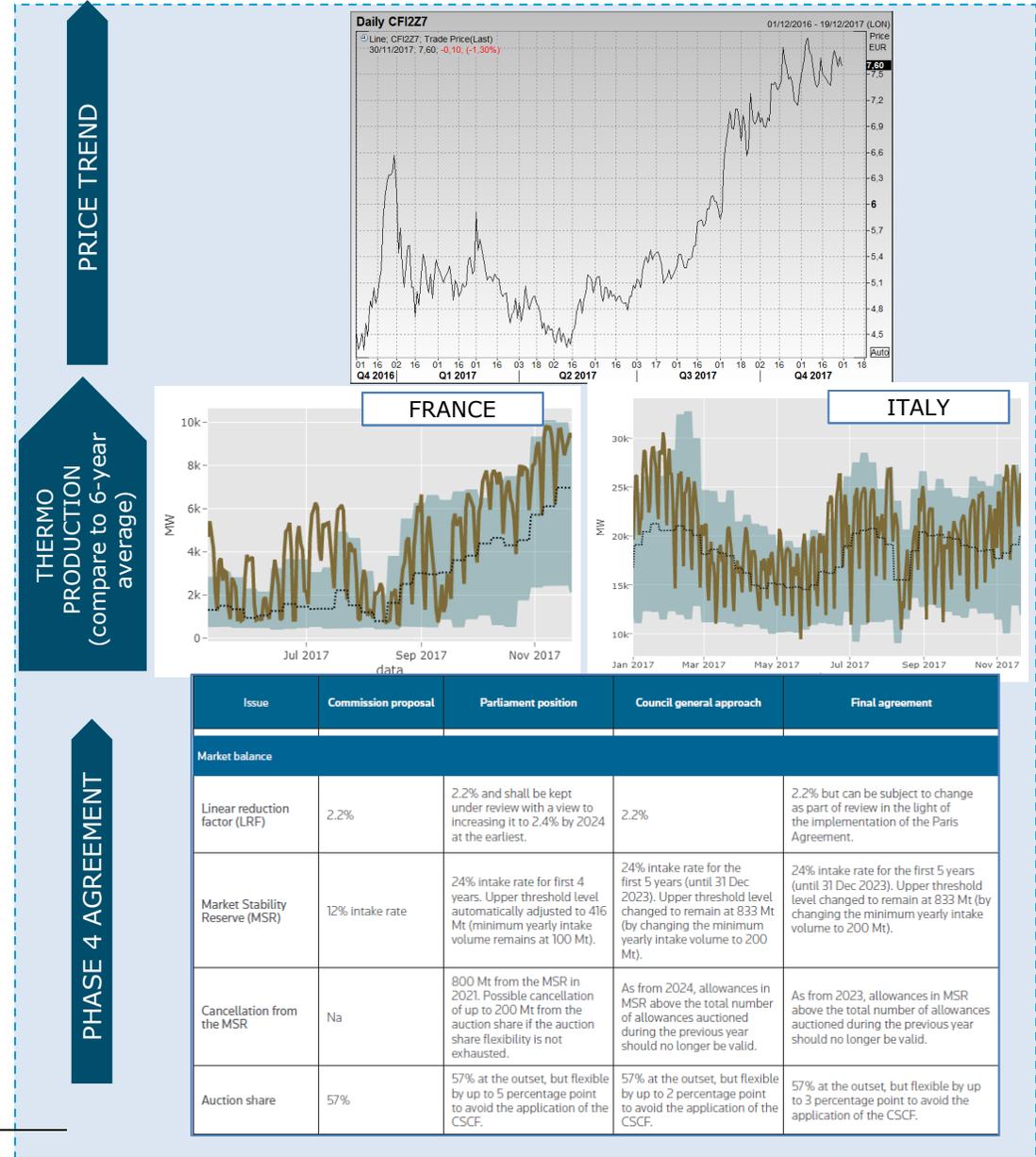
Environmental
Markets: EUA

EUA MARKET



INCREASE IN PRICES MAINLY DUE TO REGULATORY ISSUES (FIRST APPROVAL FOR PHASE 4 REFORM)

- **In Q3**, EUA prices registered an upward trend, from 4.8 €/ton at the end of June to touch 7.8 €/ton at the beginning of October. The reasons are connected to increasing commodity prices, to forecasted higher EUA demand and, most of all, to regulatory issues.
- **Forecasted higher demand:** the better macroeconomic picture should bring an increase in EU industrial production and therefore emissions; moreover, extended outages at French nuclear plants and low hydro production in Europe (mainly in South and Eastern Europe) should bring further increases in demand for EUAs.
- **Regulation** was the main bullish factor: in Q3 several trilogue meetings among the EU Council, Parliament, Commission representatives brought to the **approval of the reform for phase 4** (2021-2030) on the 9^o of October (it still needs further approvals). The reform has a **bullish effect** mainly due to the following drivers:
 - 2.2 linear reduction factor (from the current 1.74%),
 - doubled Market Stability Reserve intake at 24% from 2019 for 5 years,
 - invalidation of allowances in the MSR above previous year's auctioning amount from 2023,
 - possible voluntary cancellation of allowances by Member States to account for domestic policy measures.



GLOSSARY (1)



Baseload (BL-PL): A Baseload Day consists of all hours from 00:00 to 23:59 Central European Time of each calendar day

CDS (Clean Dark Spread): It represents the margin an hypothetical coal plant with 35% efficiency can obtain on energy markets by selling one unit of electricity, given fuel and environmental costs. Throughout our analysis CDS are computed as follows

$$CDS = \text{PUN BL} - \text{coal cost (API2 + spread MED + variable transport costs - eff. 35\%)} - \text{EUA cost} - \text{CV cost (up to 2014)}$$

CSS (Clean Spark Spread): It represents the margin that an hypothetical CCGT power plant with 51% efficiency can obtain on energy markets by selling one unit of electricity, given fuel and environmental costs. Throughout our analysis CSS are computed as follows:

$$CSS = \text{PUN (BL/PL)} - \text{gas PSV cost (eff. 51\%)} - \text{EUA cost} - \text{CV cost (up to 2014)} - \text{variable transport costs}$$

EUA (European Union Allowances): A tradable and bankable unit under the EU ETS. Each allowance equals 1 tonne of CO₂.

GLOSSARY (2)



Henry Hub: It is the main US gas hub, located in Erath, Louisiana. It serves as the official delivery location for futures contracts on the NYMEX

Marginal Technology: electricity generating technology that sets the selling price on the Italian day-ahead market in each hour. Data on marginal technologies are an average of zonal data taken from the marginal technology index (ITM) published by the GME.

Peakload (PL): A Peakload Day consists of all hours from 08:00 to 19:59 Central European Time of each weekday (i.e. Monday to Friday inclusive)

PSV (Punto di Scambio Virtuale): virtual trading point for natural gas in Italy, as established by the relevant Network Operator and located between the entry points and the exit points of the national transportation network where shippers may exchange and sell natural gas

PUN (Prezzo Unico Nazionale): average of Zonal Prices in the Day-Ahead electricity Italian Market, weighted for total purchases and net of purchases for Pumped-Storage Units and of purchases by Neighboring Countries' Zones.

VTP (Virtual Trading Point): a notional point in Austria at which gas can be traded within the market area after injection and before offtake. The VTP is not a physical entry/exit point but enables grid users to transfer capacity titles from one balancing group to another within the market area (for trading) without the need to book capacity.

TTF (Title Transfer Facility): it is a virtual trading point for natural gas in the Netherlands.

Peg Nord (Point d'Echange du Gaz): it is one of the virtual trading locations for the sale, purchase and exchange of natural gas and LNG in France. It is one of the pricing and delivery points for Powernext natural gas futures contracts.