

European Electricity Market Summary

Q4-2022

October to December

Generation and Contribution by Fuel Type

Renewables: 298TWh (12%)

Fossil Fuels: 259.7TWh (-2%)

Nuclear: 158.8TWh (9%)

Percentage changes are from the previous quarter

Contents

1	Quarterly Review of European Electricity Market Q4 2022.....	1
	Gas Prices	2
	Nuclear availability in the French system	Error! Bookmark not defined.
	Interconnector switch between Norway and other countries	5
2	Day-ahead Price Trends	6
3	Generation Activity Overview	6
4	Notes on the Report	9

1 Quarterly Review of European Electricity Market Q4 2022

Gas prices increased across the previous quarter as a result of the halting of supply through Nord Stream 1, as well as the ongoing impacts of the invasion of Ukraine. In October, as large volumes of gas were stored in preparation for the coming winter, prices began to fall. Mild weather contributed further, resulting in storages being completely filled, and then an oversupply of gas for a brief period. During this period, LNG tankers were forced to wait offshore to be unloaded. High consumer prices and a warm autumn reduced demand throughout much of Q4, bringing down day-ahead prices.

This quarter's average wholesale gas prices were 35% lower than last quarter's and 20% lower than those seen in Q4 2021. Due to a combination of factors, including unseasonably warm weather, high levels of European gas storage and large volumes of LNG imports, the wholesale electricity prices in the EU and in the GB market were low.

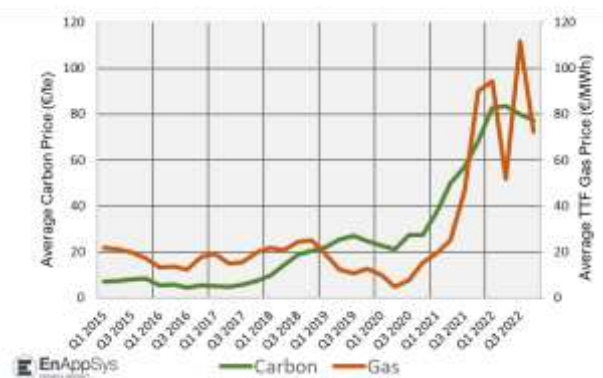


Figure 1: Gas (TTF) and carbon prices from Q1 2015 to Q4 2022

The below chart shows the more moderate price evolution of GB versus other European countries.

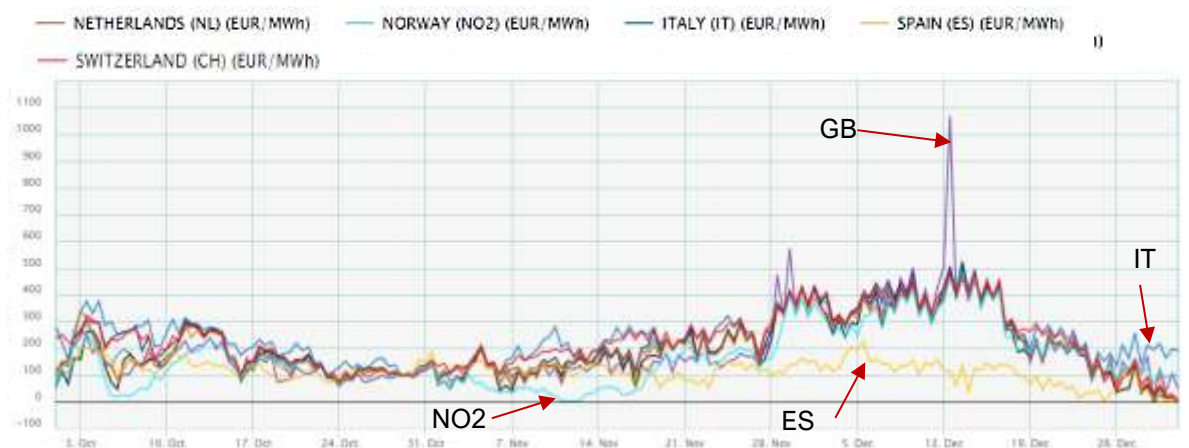


Figure 2: EPEX Day-ahead prices by country for Q4 2022

The key takeaways from the quarter are:

- **Demand reduction:** Due to demand reduction in both industrial and consumer sectors as well as extended periods in which temperatures were warmer than usual, Q4 2022 saw average demand significantly lower than any recent year.
- **Gas storage and prices:** Levels of gas storage increased across Europe. This, along with the reduced demand, resulted in gas prices dropping to their lowest levels since spring 2022 throughout October and November. Following this, a period in which temperatures were lower than average was seen in December.
- **French nuclear outages and interconnector activity:** The continuous decline of French nuclear power has put added pressure on the European wholesale market this year and this quarter since France has consistently been a primary exporter in Europe with units being out of service whilst stress-corrosion cracking problems were addressed. Nuclear availability increased this quarter, however the observed levels were lower than Q4 2021.

Demand reduction

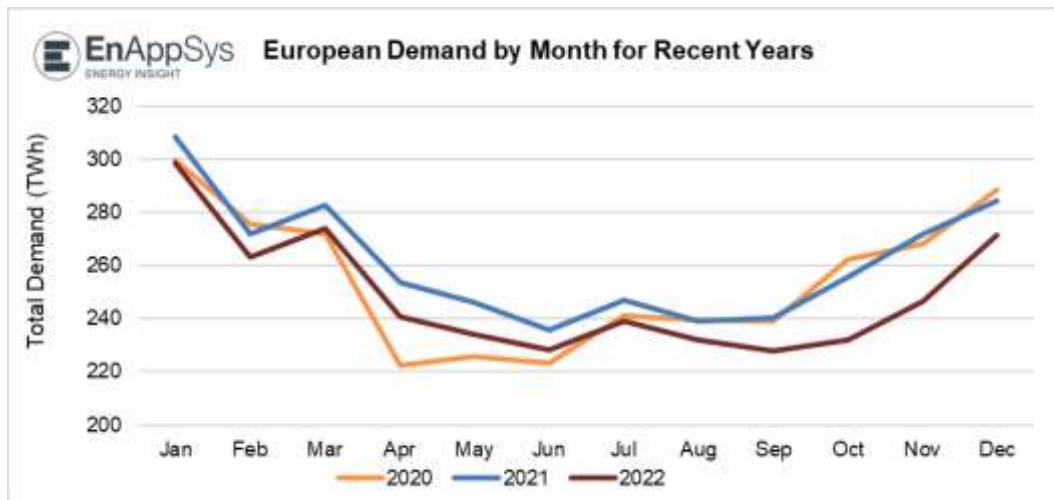


Figure x: European demand by month for 2020-2022

As a result of higher prices, Europe saw lower demand this year in general when compared to previous years, though demand did not dip beneath 2020 levels during Q2, as the beginning of the COVID-19 pandemic in 2020 brought demand to unprecedentedly low levels. The total European demand this quarter was ~750TWh which is a ~8% drop from Q4 2021. There are two main reasons behind the drop: milder weather conditions and the impact of high wholesale prices on demand. Demand destruction was widespread in Europe and impacted both industry and consumers. This

became most prominent during Q4 in which demand was substantially below that of previous years. In October, European demand was ~25GW (~7% lower) below that seen in October 2021.

Gas storage and prices

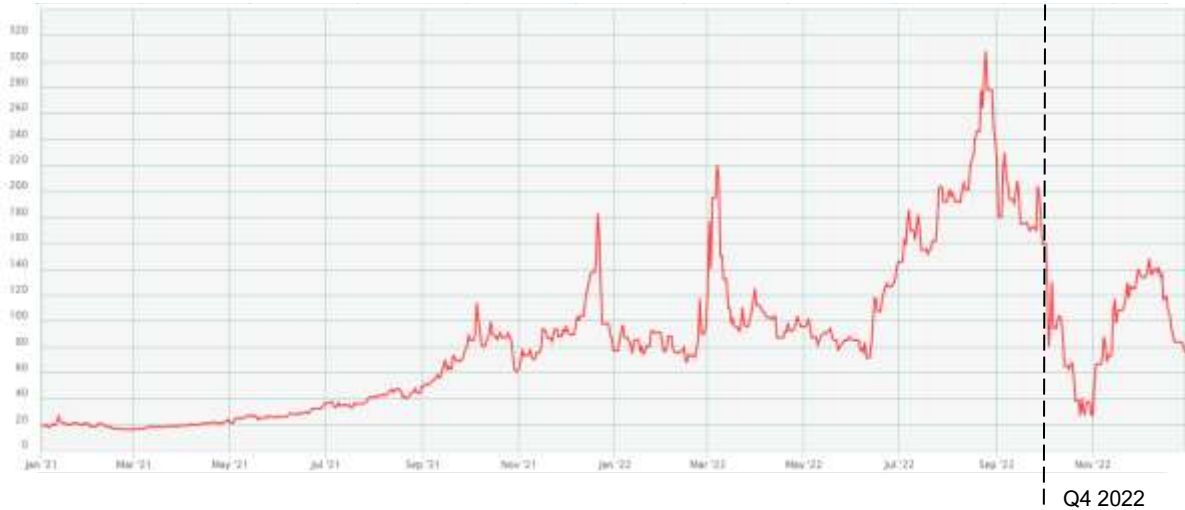


Figure 2: TTF gas prices 2021 to 2022 (EUR/MWh)

The fourth quarter of 2022 saw two patterns of price. From October through to mid-November, prices were low due to unseasonably high temperatures, large quantities of gas imports and high storage levels. The arithmetic average of the TTF gas prices was ~€73/MWh from October to mid-November. However, in December, when demand increased due to lower temperatures, the average TTF gas price was ~€116/MWh, a 59% increase from what it had been previously in the quarter. Prices go back down during the end of the quarter due to higher wind levels and temperatures throughout Europe.

French nuclear outages and interconnector activity



Figure 3: French nuclear generation from 2017 to 2022. Local maximum generation (by quarter range) highlighted.

In Q4 2022, the average French nuclear generation was 32GW, which is 26% higher than Q3 2022. Most of the French units were laid over this year based on scheduled outages, but a few were shut-down due to safety protocols, following high river temperatures and further discoveries of stress corrosion cracking problems earlier this year. Nuclear outturn was better this quarter. Despite the increase in generation from the previous quarter, Q4 2022 generation was still 25% lower than Q4 2021.

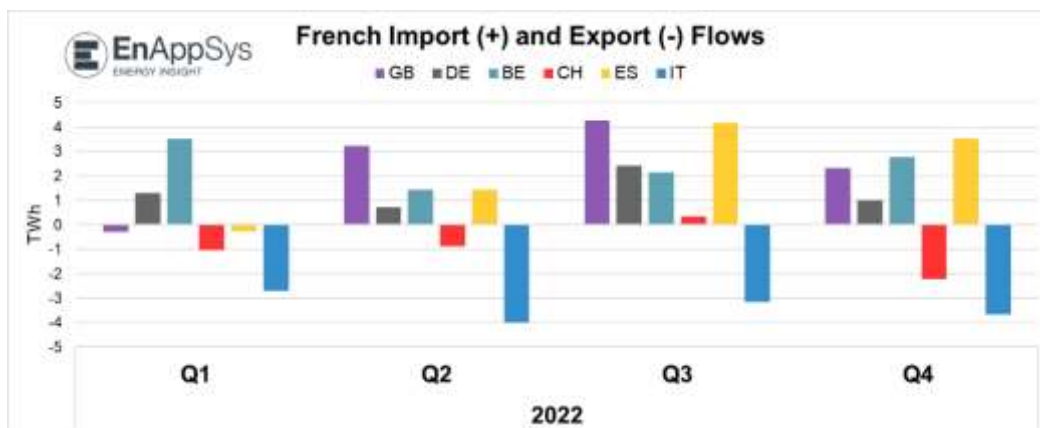


Figure 4: Interconnector flows between neighboring countries and France in 2022. High levels of imports to France can be seen in Q3 (positive value indicates import to France).

France’s nuclear issues caused the nation’s day-ahead prices to be record high this quarter, which resulted in a materially stronger net-import position for the French market when compared to

previous years. The average EPEX day-ahead price in France this quarter was €214.10/MWh which was higher than all European countries except for Italy (see Table 1: EPEX Day-ahead quarterly average prices). In Q3 2022, we saw France importing power from all countries except Italy, including Switzerland which had typically imported power from France (see Figure 4). In Q4, with improved nuclear availability, France saw lower net imports of 3.7TWh compared to the net imports of 10.2TWh, which were seen in Q3 2022. This is still high when compared to 1.9TWh in Q2 2022 and -1.2TWh Q4 2021.

2 Day-ahead Price Trends

Table 1 below shows key statistics on pricing in the quarter and all previous quarters over the last seven years. The EPEX Day-ahead prices shown are averages across the quarter.

Table 1: EPEX Day-ahead quarterly average prices (EUR/MWh)

	BE	DE	DK (Ave)	ES	FR	GB	IT (Ave)	NL	NO 1-2-5	NO 3-4	SE 3-4	SE 1-2
Q1 2016	28.4	25.2	22.9	30.7	28.8	34.7	39.3	27.7	22.7	22.9	24.3	23.1
Q2 2016	27.1	24.8	25.7	29.5	25.9	35.1	36.3	28.4	22.8	24.1	26.5	26.4
Q3 2016	32.6	28.3	28.9	41.7	32.3	39.6	42.1	31.4	22.4	27.3	29.6	29.5
Q4 2016	58.1	37.6	34.6	56.5	59.8	52.4	53.1	41.4	33.7	33.1	37.0	36.7
Q1 2017	51.7	41.3	31.0	55.6	55.0	48.0	55.3	42.8	31.0	28.7	32.3	31.7
Q2 2017	35.7	29.8	28.7	47.0	33.9	40.0	46.4	34.6	27.1	26.2	28.8	28.5
Q3 2017	34.2	32.7	33.8	48.4	34.5	43.0	52.1	35.4	27.6	25.6	33.7	33.0
Q4 2017	56.8	33.0	30.6	58.0	56.5	50.2	61.0	44.5	29.9	30.0	32.0	30.2
Q1 2018	44.9	35.5	36.8	48.1	43.8	52.7	54.2	45.1	37.8	38.3	39.2	38.9
Q2 2018	44.1	36.0	39.7	52.0	36.8	52.7	55.0	46.1	38.7	39.7	39.5	38.5
Q3 2018	60.7	53.5	53.2	65.8	57.2	61.3	70.3	58.1	49.7	50.2	52.6	51.8
Q4 2018	71.1	52.7	50.4	63.0	62.7	63.0	68.3	60.6	46.8	47.1	50.2	47.4
Q1 2019	48.6	41.4	43.0	55.0	47.2	51.8	59.3	48.6	48.0	46.1	46.7	46.0
Q2 2019	34.5	36.6	36.9	48.7	34.9	41.3	52.3	39.1	37.0	35.3	33.8	33.0
Q3 2019	35.0	36.9	38.0	46.2	35.5	38.5	52.9	37.9	33.2	34.7	36.6	35.3
Q4 2019	39.4	36.7	38.9	41.0	40.3	40.1	48.5	39.3	39.0	37.7	39.4	37.5
Q1 2020	30.1	26.1	21.2	34.9	29.4	32.7	40.4	30.5	15.1	15.4	19.5	15.6
Q2 2020	18.5	20.5	20.5	23.2	18.0	24.3	25.2	20.9	4.5	5.6	16.2	8.2
Q3 2020	36.5	36.0	33.9	37.5	39.0	36.4	43.9	35.3	4.8	5.7	29.1	18.6
Q4 2020	42.3	38.6	31.0	40.1	42.2	47.5	49.5	42.1	12.6	10.0	29.2	15.1
Q1 2021	51.0	49.8	49.1	45.2	53.0	63.6	58.8	50.6	46.8	35.5	47.6	37.5
Q2 2021	62.3	60.9	58.7	71.8	63.9	72.2	77.2	62.1	47.2	30.0	46.5	33.1
Q3 2021	97.3	97.3	96.0	117.8	96.6	128.6	126.2	101.5	77.8	45.1	80.8	54.8
Q4 2021	204.3	183.5	147.1	211.0	221.4	205.3	237.4	196.0	126.4	41.5	117.3	44.5
Q1 2022	208.0	185.4	152.6	229.4	232.2	200.8	246.0	207.5	151.4	20.1	105.6	24.8
Q2 2022	193.9	188.5	179.6	182.8	226.0	155.3	247.0	195.5	167.1	18.6	119.4	51.7
Q3 2022	372.3	380.8	347.9	146.3	429.7	294.8	461.6	365.4	309.7	22.4	188.8	49.0
Q4 2022	202.6	194.6	176.5	113.2	214.1	171.1	236.3	198.0	164.8	71.3	147.8	115.6

3 Generation Activity Overview

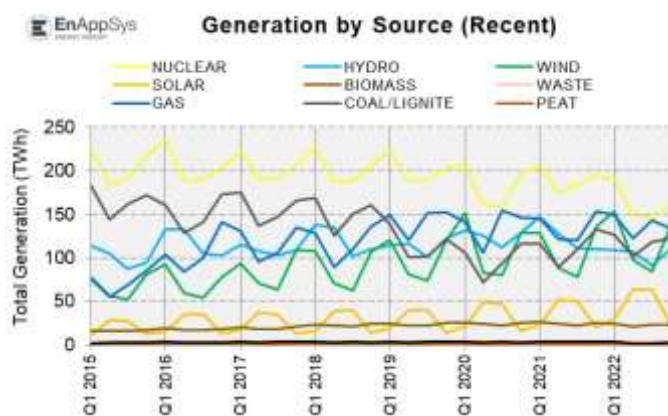


Figure 6: Generation by source in Europe from 2015 to 2022

In Q4 2022, renewable generation was 0.8% higher, nuclear generation was 18% lower and fossil fuel generation was 10% lower than in Q4 2021. As a result of lower demand this quarter, total generation was ~717TWh, which is 8.2% lower than what was seen in Q4 2021.

Table 2: Quarterly generation summary Q2 2020 – Q3 2022

	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
TOTAL GENERATION BY FUEL (TWh)									
Biomass	25.4	25.9	24.5	22.0	25.5	23.9	21.3	22.9	23.5
Coal/Lignite	115.8	116.5	89.8	110.5	132.6	126.2	101.5	118.5	122.4
Gas	146.5	145.4	121.4	120.0	153.0	148.8	122.6	142.8	133.6
Hydro	128.6	146.8	127.8	110.9	110.5	109.3	107.3	91.4	110.2
Nuclear	195.5	205.5	174.8	184.0	194.5	190.7	149.5	146.0	158.8
Oil	3.1	3.6	3.4	3.3	3.6	3.2	1.9	2.2	2.7
Peat	1.3	1.4	0.8	0.6	1.4	1.5	1.1	0.5	0.9
Solar	16.4	23.0	52.7	50.3	19.9	29.5	63.9	63.3	23.3
Waste	3.9	4.1	4.1	4.2	4.2	4.2	3.8	3.8	3.8
Wind	128.3	128.3	88.7	77.5	135.4	153.6	97.9	84.0	137.2
FOSSIL FUELS	266.7	266.9	215.4	234.4	290.6	279.8	227.1	264.0	259.7
NUCLEAR	195.5	205.5	174.8	184.0	194.5	190.7	149.5	146.0	158.8
RENEWABLE (INCLUDES WASTE)	302.6	328.1	297.7	264.9	295.5	320.5	294.2	265.3	298.0
TOTAL	764.9	800.6	687.9	683.3	780.6	790.9	670.8	675.4	716.5
Fossil Fuel Percentage									
Fossil Fuel Percentage	35%	33%	31%	34%	37%	35%	34%	39%	36%
Clean Percentage									
Clean Percentage	65%	67%	69%	66%	63%	65%	66%	61%	64%
Renewable Share of Clean Power									
Renewable Share of Clean Power	61%	61%	63%	59%	60%	63%	66%	65%	65%
SHARE OF GENERATION (%)									
Biomass	3.3%	3.2%	3.6%	3.2%	3.3%	3.0%	3.2%	3.4%	3.3%
Coal/Lignite	15.1%	14.5%	13.1%	16.2%	17.0%	16.0%	15.1%	17.6%	17.1%
Gas	19.2%	18.2%	17.7%	17.6%	19.6%	18.8%	18.3%	21.1%	18.7%
Hydro	16.8%	18.3%	18.6%	16.2%	14.2%	13.8%	16.0%	13.5%	15.4%
Nuclear	25.6%	25.7%	25.4%	26.9%	24.9%	24.1%	22.3%	21.6%	22.2%
Oil	0.4%	0.5%	0.5%	0.5%	0.5%	0.4%	0.3%	0.3%	0.4%
Peat	0.2%	0.2%	0.1%	0.1%	0.2%	0.2%	0.2%	0.1%	0.1%
Solar	2.1%	2.9%	7.7%	7.4%	2.5%	3.7%	9.5%	9.4%	3.2%
Waste	0.5%	0.5%	0.6%	0.6%	0.5%	0.5%	0.6%	0.6%	0.5%
Wind	16.8%	16.0%	12.9%	11.3%	17.3%	19.4%	14.6%	12.4%	19.1%
FOSSIL FUELS	34.7%	33.2%	31.2%	34.2%	37.0%	35.2%	33.7%	39.0%	36.1%
NUCLEAR	25.6%	25.7%	25.4%	26.9%	24.9%	24.1%	22.3%	21.6%	22.2%
RENEWABLE (INCLUDES WASTE)	39.6%	41.0%	43.3%	38.8%	37.9%	40.5%	43.9%	39.3%	41.6%

Table 3: Year-on-year comparison of Q2 generation (TWh and %)

	Q4 2017	Q4 2018	Q4 2019	Q4 2020	Q4 2021	Q4 2022
TOTAL GENERATION BY FUEL (TWh)						
Biomass	21.7	24.5	25.4	25.4	25.5	23.5
Coal/Lignite	165.8	160.7	121.6	115.8	132.6	122.4
Gas	134.3	135.6	152.7	146.5	153.0	133.6
Hydro	109.0	109.8	122.7	128.6	110.5	110.2
Nuclear	206.0	205.3	203.6	195.5	194.5	158.8
Oil	3.5	3.0	3.4	3.1	3.6	2.7
Peat	1.7	1.9	1.8	1.3	1.4	0.9
Solar	13.5	13.9	14.3	16.4	19.9	23.3
Waste	3.8	4.1	4.1	3.9	4.2	3.8
Wind	108.5	107.3	120.5	128.3	135.4	137.2
FOSSIL FUELS	305.3	301.1	279.5	266.7	290.6	259.7
NUCLEAR	206.0	205.3	203.6	195.5	194.5	158.8
RENEWABLE (INCLUDES WASTE)	256.6	259.8	287.0	302.6	295.5	298.0
TOTAL	767.9	766.2	770.1	764.9	780.6	716.5
Fossil Fuel Percentage	40%	39%	36%	35%	37%	36%
Clean Percentage	60%	61%	64%	65%	63%	64%
Renewable Share of Clean Power	55%	56%	59%	61%	60%	65%
CHANGE SINCE Q1 2017 (%)						
Biomass		13%	17%	17%	17%	8%
Coal/Lignite		-3%	-27%	-30%	-20%	-26%
Gas		1%	14%	9%	14%	-1%
Hydro		1%	13%	18%	1%	1%
Nuclear		0%	-1%	-5%	-6%	-23%
Oil		-15%	-3%	-11%	3%	-23%
Peat		13%	6%	-25%	-18%	-44%
Solar		3%	6%	21%	47%	72%
Waste		8%	7%	2%	10%	0%
Wind		-1%	11%	18%	25%	26%
FOSSIL FUELS		-1%	-8%	-13%	-5%	-15%
NUCLEAR		0%	-1%	-5%	-6%	-23%
RENEWABLE (INCLUDES WASTE)		1%	12%	18%	15%	16%

4 Notes on the Report

The figures used in the report refer to data provided through ENTSO-E for the period from 2015 which have been aggregated by EnAppSys into a European total. This data does sometimes suffer from outages or gaps in reporting, but it is considered generally complete. This report is based on the most recently available data as at quarter and year ends. National Grid data is used for GB demand.

Included Countries

Albania	Germany	Norway
Austria	Great Britain	Poland
Belgium	Greece	Portugal
Bosnia & Herzegovina	Hungary	Romania
Bulgaria	I-SEM	Serbia
Croatia	Italy	Slovakia
Czech Republic	Latvia	Slovenia
Denmark	Lithuania	Spain
Estonia	Montenegro	Sweden
Finland	Netherlands	Switzerland
France	North Macedonia	

EnAppSys offers incredibly detailed market insights and consultancy services for companies in the energy industry.

*This report has been created using our pan-European **market data platform**, which has flexible configurable screens and automated data feeds. If you would like to gain more detailed information and insight, please contact us to arrange trial access to the platform via: sales@enappsys.com*

To find out more about EnAppSys contact us via: info@enappsys.com or visit our website at: www.enappsys.com



EnAppSys Ltd.

Blenheim House, 1 Falcon Court, Stockton On-Tees, TS18 3TS, U.K.
Company Registration No.: 04685938

EnAppSys B.V.

Oostelijk Bolwerk 9, 1st Floor, 4531 GP, Terneuzen, The Netherlands
Company Registration No.: 67992358

