

July 12, 2023 04:00 PM GMT

## The European Gas Manual | Europe

## Hold onto Your Hats

Risk remains that storage will be full well before winter demand kicks in, skewing near-term risks downwards for TTF prices. After October, however, a particularly wide range of scenarios opens up. Brace for a volatile period ahead.

**Weak demand continues:** Gas consumption in our European perimeter remained weak in June, tracking ~15% below the 5-year seasonal average, or ~13% below on a weather-adjusted basis. This percentage decline has been stable for some time now: over the last 12 months, weather-adjusted demand has settled within a relatively narrow range of 12-15% below seasonal averages. In June, the drivers were once again broad-based: industrial, power generation and residential demand were all tracking below historical levels. Relative to our forecast, June demand was 18 mcm/d (or 4%) lower than expected.

**Lower pipeline imports due to Norwegian outages...** Pipeline exports from Norway declined 16 mcm/d month-on-month due to outages at the Nyhamna processing plants, which also impacted production at the Ormen Lange and Aasta Hanstein fields. This also reduced exports from Norway to the UK. In turn this resulted in reduced flow from the UK into our European perimeter, which in total fell by another 46 mcm/d month-on-month.

**...but LNG came in strong once again:** LNG flows stayed elevated at 233 mcm/d, only marginally down from the near-record 245 mcm/d in May. Maintenance at France's Montoir and Fos Tonkin LNG terminals lowered French sendout, but was largely offset by record high sendout from the Netherlands.

**Risk of 'tank tops' this summer still there:** Inventories in our European perimeter ended June at 64.6 bcm, marginally below our forecast of 65.1 bcm. At current levels, inventories are ~81% full, well above last year's 62% and the five-year average of 65%. Although LNG imports have slowed down somewhat so far in July, the total amount of LNG on-the-water steaming for Europe still suggests that LNG imports will continue above 200 mcm/d in coming weeks. Although TTF now trades at a small discount to JKM, this only creates a marginal incentive to send LNG to Asia once freight costs are taken into account.

If demand remains roughly as weak as it has been recently, pipeline flows from Norway normalise and LNG imports continue at ~200 mcm/d, our modelling still suggests that inventories in our perimeter could reach 100% full sometime in early Sept. To prevent this scenario from playing out, LNG imports would need to fall to ~140 mcm/d in the next few months, i.e. a decline of ~30%. Recent TTF prices have not been sufficiently low to slow down the pace of LNG imports. Hence, they will likely need to fall somewhat further, in our view.

*Continues inside...*

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**Exhibit 1:** Our near-term TTF price forecasts are unchanged, but our scenario analysis suggests a slightly bigger risk premium is justified this winter

Period	\$/mmbtu		€/MWh	
	Previous	New	Fwd curve	New
3Q23	8.0	8.0	9.4	25
4Q23	10.0	13.5	13.8	42
1Q24	12.0	14.5	16.0	45
2Q24	11.0	13.5	15.1	42
3Q24	11.0	13.5	15.6	42
4Q24	12.0	15.0	16.5	46

Source: Morgan Stanley Research estimates

Previous research:

- [The European Gas Manual: Sprint Start to Storage Season](#)
- [The European Gas Manual: Sky-high non-Russian supply](#)
- [The European Gas Manual: Out of the Winter, Into the Summer](#)

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# Hold on to Your Hats

*Continued from front page...*

## After October, however, a particularly wide range of possible outcomes opens up

In the coming months, inventory capacity could become a constraint for the European gas market. However, this changes from mid-October onwards when winter demand kicks in.

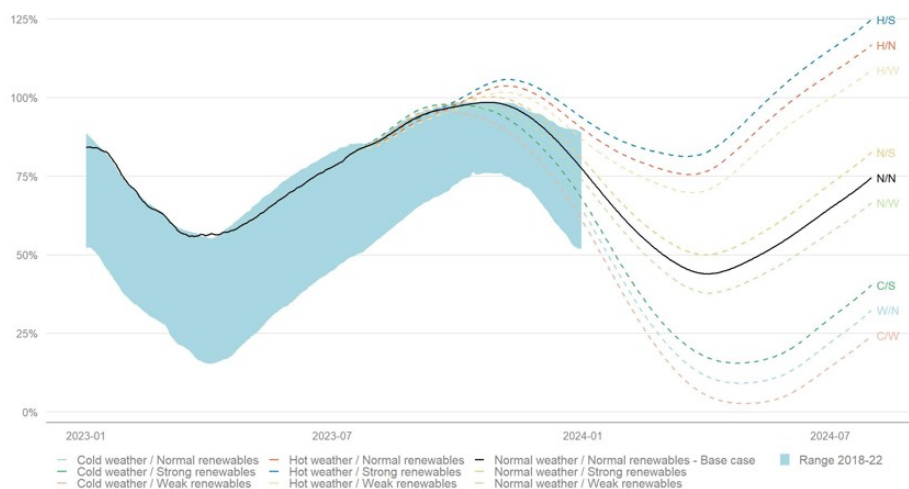
At that point, two factors have a particularly strong impact on demand: weather and the performance of renewables. [Exhibit 2](#) shows several trajectories for inventories, assuming different demand levels depending on: 1) whether European weather is either cold, normal or warm, and 2) whether the performance of wind, solar and hydro power is either weak, normal or strong. Altogether, this spans up  $3 \times 3 = 9$  possible scenarios. The trajectories in [Exhibit 2](#) are based on  $\pm 1$  standard deviation changes in either of these two parameters.

As shown, the range of possible outcomes is particularly wide. If weather is persistently cold and renewables perform poorly at the same time, inventories could draw (very) fast. Even though storage levels are currently well-above normal, they could reach historical lows if this scenario were to play out. However, the flip side is also true: if weather remains warm and renewables perform well, storage levels could stay far above normal ranges.

**Exhibit 2:** Uncertainty over weather and the performance of renewables creates a particularly wide range of trajectories for inventories this winter

### Natural gas inventory utilisation scenarios

Within perimeter, including forecast (% of available storage capacity)



Both weather and renewables performance are inherently hard to forecast, which makes forecasting prices also very uncertain. At this point in the year, scenario analysis is arguable the only suitable approach to say something meaningful about this winter's prices. We have attempted this in [Exhibit 3](#).

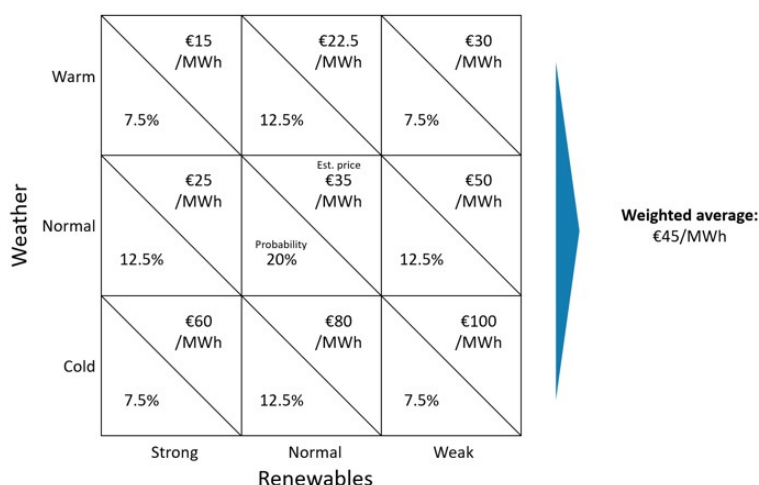
This exhibit outlines our best-estimate of both the likelihood and price impact of each of

the scenarios in the previous chart. Three scenarios stand out and anchor this analysis:

- **Normal weather /normal renewables - €35/MWh:** if weather is in-line with historical averages and the performance of renewables is as-expected, we suspect that prices can stay at ~€35/MWh, close to recent levels and towards the bottom of the coal-gas switching range that we estimate at €33-55/MWh at the moment.
- **Cold/poor - €100/MWh:** If the number of heating degree days is 1 standard deviation above-normal each month, and at the same time, the performance of wind, solar and hydro power is similarly 1 standard deviation below-normal, then inventories will likely draw quickly. In that case, Europe would need to attract even more LNG, which would probably require pricing-out buyers in other countries. Similarly to 2022, this will likely require much higher TTF prices, close to €100/MWh, broadly the median price of last year (outside the very large spike at the end of the summer).
- **Warm/strong - €15/MWh:** If weather is persistently warm and renewables perform strongly, the opposite will likely happen, i.e. inventories could stay far above normal. In that scenario, LNG needs to be diverted away from Europe and new demand must be created. That probably requires prices to revert back to levels that prevailed before the invasion of Ukraine, say ~€15/MWh.

**Exhibit 3** summarises our price estimates and associated probabilities for all the other scenarios as well. Needless to say, with such a wide range in possible outcomes, this is hardly an exercise in precision. However, this analysis highlights that these scenarios are not symmetric: there is far more upside than downside around the 'normal/normal' scenario. That skews the weighted-average price higher. Using the probabilities shown below, the weighted average price across these scenarios is ~€45/MWh.

**Exhibit 3:** The matrix below shows our best-estimate of prices and probabilities of each weather/renewables scenario. The weighted average prices comes out at ~€45/MWh, slightly below but close to Dec-Mar TTF futures which are currently at €50-51/MWh



Source: Morgan Stanley Research

At the moment, the December-to-March futures for TTF are trading around €50/MWh. The weighted-average of €45/MWh estimated above is, of course, below that level.

However, given the volatility of TTF prices, the difference is not big.

Combining this with storage economics shines another light on where the floor price might be for near-dated TTF futures. If LNG imports into Europe were to persist at the current level of ~200 mcm/d, we estimate that inventories in the European perimeter would overshoot capacity by around 3.5 - 4bcm. If inventories within our European perimeter end up full, that volume would need to be stored elsewhere. That might be possible, but might require floating LNG storage as well.

At the moment, LNG tanker rates in the Atlantic basin are such that the cost of floating storage from mid-Sept to mid-Jan amounts to ~€26/MWh. If €45-50/MWh is indeed the appropriate price for winter TTF, then the September future should not trade below ~€20-25/MWh. If prices were to fall into that range, LNG demand for inventory purposes would increase as floating storage economics start to become attractive.

In the end, we set our near-term TTF forecast at the top of that range (i.e. €25/MWh) and our winter TTF forecast in-line with the scenario analysis above (i.e. €45/MWh). With those estimates, we would characterise our base-case view as slightly bearish, but only marginally so - the majority of the price decline is probably behind us.

Still, that is only the current base-case view. The wide range of possible outcomes for inventory fill partly reflects the uncertainty over supply and demand, but it also suggests that Europe's storage capacity is arguably quite small (an argument we have made before; see [here](#)). It was probably suitable for the old market structure in which Europe could call on a large swing supplier with substantial spare capacity, i.e. Russia. However, that swing capacity is no longer available. LNG value chains can supply substantial volumes but don't have the same short-term flexibility.

With little short-term swing capacity, inventory capacity that is arguably quite small for the current market structure, and still an outlook for demand that depends heavily on weather and the performance of renewables, one thing seems clear: the prospect of ongoing volatility is high.

# Balance

**Exhibit 4:** Supply/demand balance for countries within European perimeter

By calendar year																		By gas year		
(mcm/d)	2019	2020	1Q21	2Q21	3Q21	4Q21	2021	1Q22	2Q22	3Q22	4Q22	2022	1Q23	2Q23	3Q23	4Q23	2023	2020/21	2021/22	2022/23
Demand	781	754	1,146	645	458	938	797	1,035	539	417	742	683	900	492	406	775	643	795	732	635
LDC	327	312	596	244	114	450	351	537	185	101	346	292	475	178	99	369	280	347	318	275
Power	142	140	156	122	113	150	135	149	111	125	124	127	126	100	120	127	119	135	134	118
Industry	240	234	282	221	193	245	235	248	194	157	198	200	213	169	153	200	184	238	211	183
Other*	71	68	111	58	39	94	76	101	48	33	73	64	85	45	34	79	61	75	69	59
Est. weather impact	-9	-24	17	65	-23	23	20	-36	-8	17	-50	-19	-	-	-	-	-	12	-1	-13
Adjusted demand	789	778	1,129	579	481	916	776	1,071	546	400	792	702	900	492	406	775	643	783	733	647
Production	111	80	86	76	67	67	74	73	66	62	63	66	62	47	46	46	50	78	67	55
Netherlands	75	56	61	55	44	42	51	49	43	39	40	43	40	27	25	25	29	54	43	33
Other	36	25	25	22	23	25	23	24	23	23	23	23	22	20	21	21	21	23	24	22
Pipeline imports	597	554	537	593	576	581	572	542	596	446	414	500	382	425	395	408	403	575	541	404
from Russia	346	290	293	308	268	247	279	193	174	49	25	110	20	31	27	27	26	304	166	26
from Norway	213	218	207	203	232	234	219	241	243	238	239	240	242	227	223	250	236	211	239	233
from North Africa	42	43	71	64	51	69	64	65	69	66	73	68	60	74	72	72	70	62	67	70
from UK	7	11	-40	-1	7	16	-4	18	69	68	49	51	33	52	41	27	38	-12	43	44
from Azerbaijan	0	0	10	18	23	24	19	24	28	28	26	27	25	26	25	25	25	13	26	25
via Spain	-11	-7	-3	0	-4	-9	-4	1	13	-3	2	3	3	15	7	7	8	-3	1	7
Other net exports	-21	-26	-10	-8	-9	-9	-9	-21	-18	-12	-20	-17	-25	-30	-27	-27	-27	-11	-15	-26
Call on LNG	93	145	533	-16	-176	299	160	441	-105	-80	284	135	481	50	-8	348	218	153	139	202
LNG import	132	112	92	140	73	101	101	184	194	199	228	201	215	242	167	160	196	96	170	213
France	57	48	41	60	32	46	45	93	84	87	100	91	72	82	58	54	67	43	78	78
Italy	36	33	24	35	24	18	25	32	39	35	42	37	43	42	33	32	38	28	31	40
Netherlands	21	19	17	28	10	26	20	35	40	47	51	43	52	64	34	33	46	16	37	50
Belgium	18	12	9	17	7	10	11	24	31	30	35	30	35	33	22	21	27	9	24	31
Germany	0	0	0	0	0	0	0	0	0	0	1	0	13	21	20	20	18	0	0	14
Balance	39	-33	-441	156	248	-198	-59	-257	299	279	-56	66	-266	192	175	-188	-22	-57	31	11

\* 'Other' refers to countries for which segmental demand data is not available, which are Austria, Switzerland, the Czech Republic and Slovakia

Source: Morgan Stanley Research estimates

**Exhibit 5:** Countries included in perimeter of supply/demand balance above



Source: Morgan Stanley Research

# Prices

Exhibit 6:

## Natural gas prices

TTF and JKM - month ahead (\$/mmbtu)



Exhibit 7:

## TTF Forward curve evolution

(€/MWh)

Current Week ago Month ago

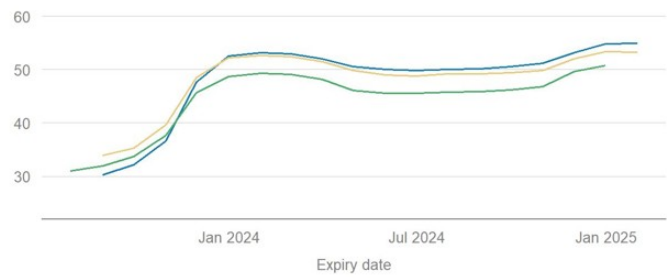


Exhibit 8:

## Coal-gas switching price

NW Europe (€/MWh)

Coal-gas switching band Avg switching price TTF price

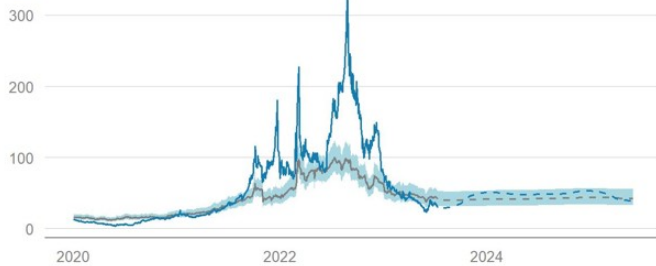


Exhibit 9:

## TTF vs Henry Hub delivered in NW Europe

Forward curve (\$/mmbtu)

Henry Hub - LRMC Henry Hub - SRMC Dutch TTF

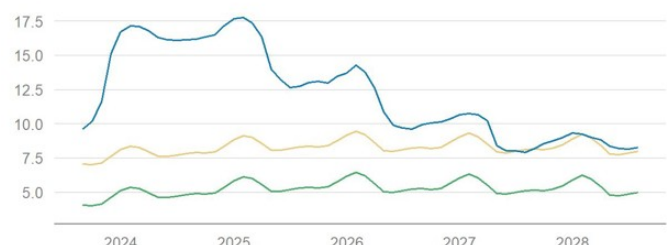


Exhibit 10:

## LNG Japan/Korea vs Gasoil FOB Singapore

(\$/mmbtu)

Gasoil 10ppm Spore LNG Japan/Korea

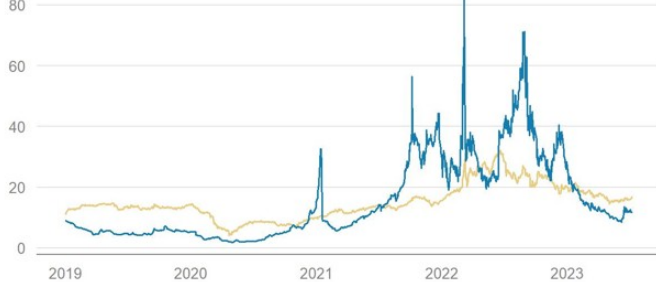
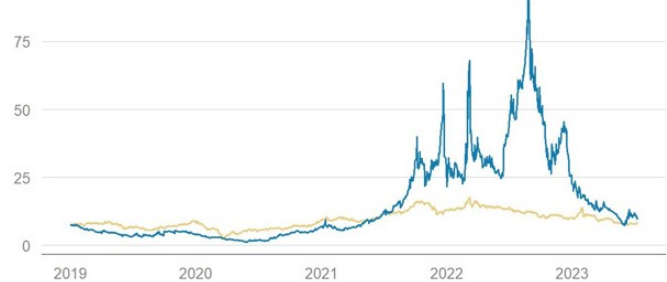


Exhibit 11:

## Dutch TTF vs Propane NW Europe

(\$/mmbtu)

Propane CIF NWE TTF



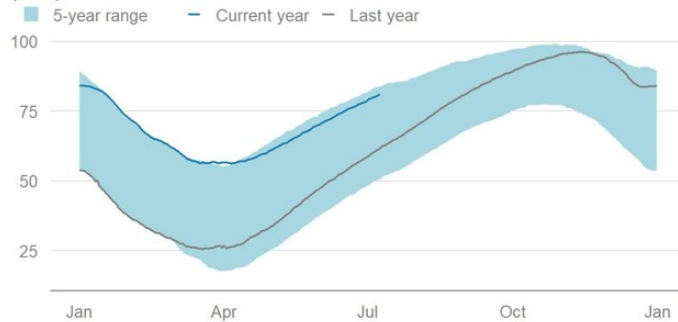


# Inventories

Exhibit 12:

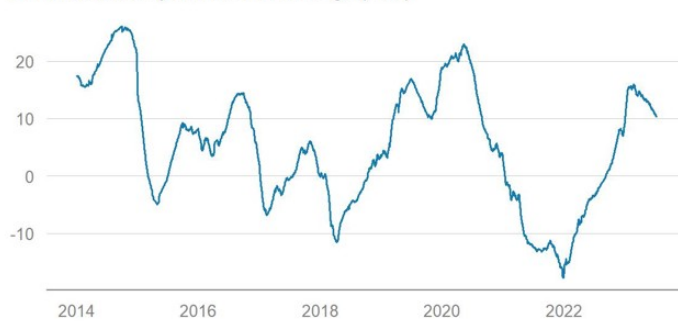
## European natural gas inventories

(bcm)



## Seasonally adjusted

Deviation from 5-year seasonal average (bcm)



## Percentage full

Compared to 5-year seasonal range for 09 July (%)

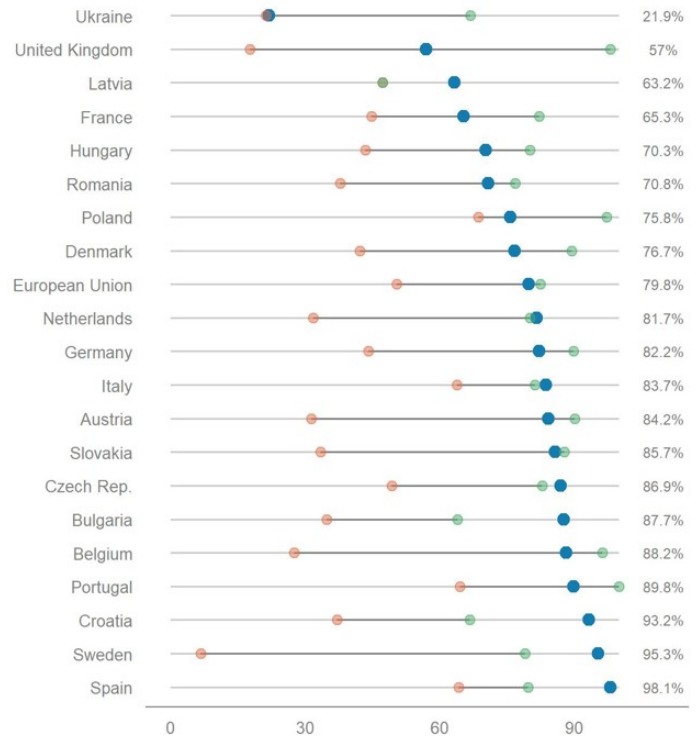


Exhibit 13:

## European Union: natural gas inventory injection/withdrawal

7-Day moving average (mcm/d)

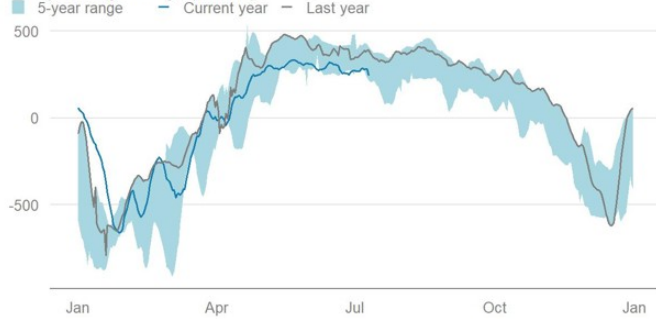
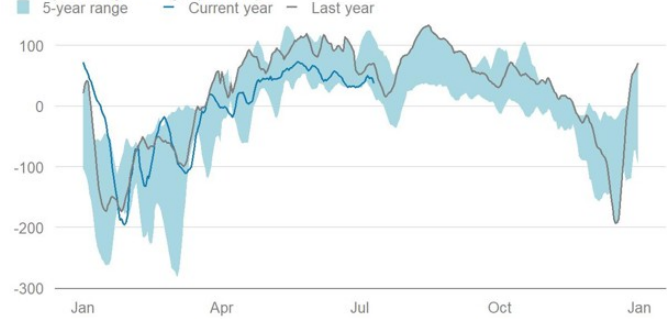


Exhibit 14:

## Germany: natural gas inventory injection/withdrawal

7-Day moving average (mcm/d)

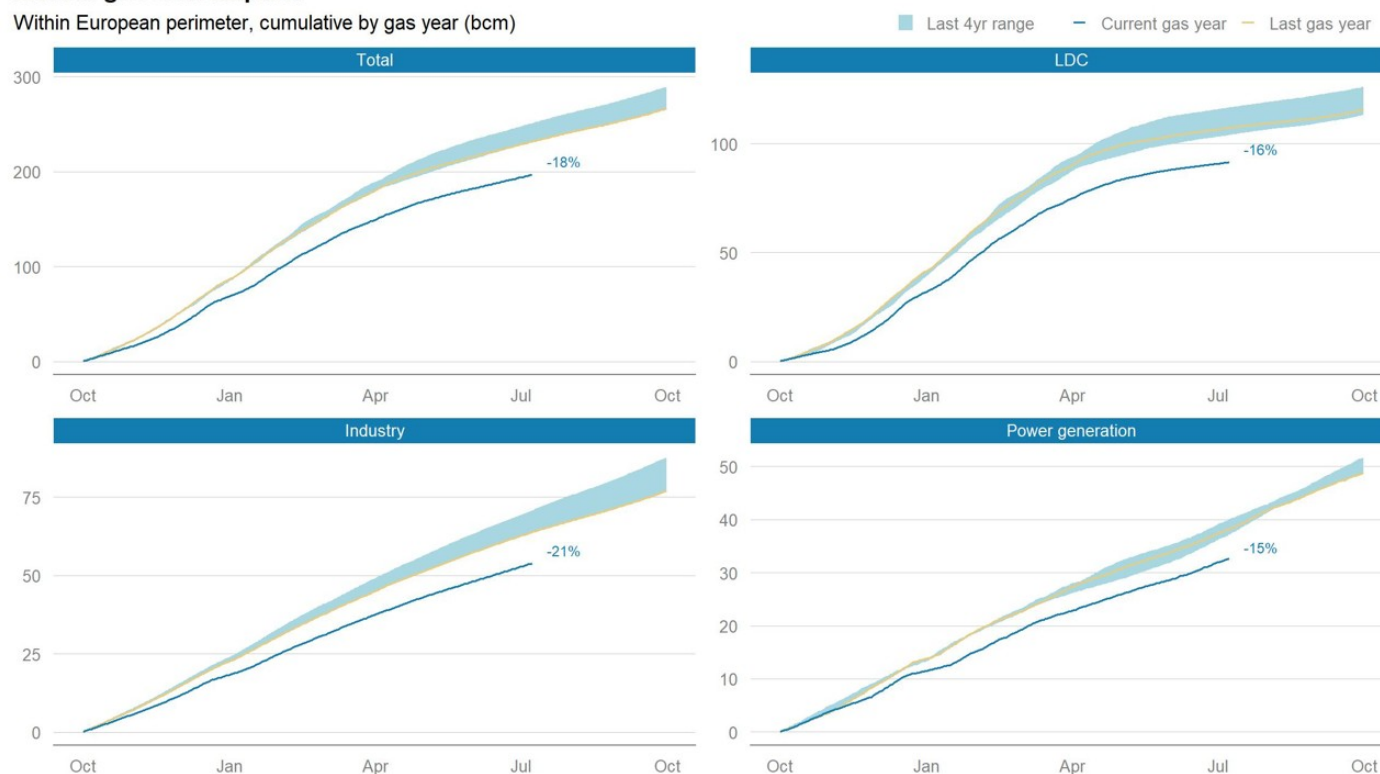


# Demand

Exhibit 15:

## Natural gas consumption

Within European perimeter, cumulative by gas year (bcm)



Note: figure in chart shows difference between latest value and average of gas years 2017-2020; the gas year runs from October to October  
Source: System operators, Morgan Stanley Research

Exhibit 16:

## Natural gas demand

Within European perimeter (mcm/d)

	Jun 2016	Jun 2017	Jun 2018	Jun 2019	Jun 2020	Jun 2021	Jun 2022	Jun 2023	Diff (%) <sup>1</sup>
<b>By type</b>									
LDC	123.3	106.5	111.5	109.2	118.3	111.5	105.6	95.2	-14%
Industry	206.8	208.2	206.5	200.6	199.0	194.1	179.8	157.6	-20%
Power generation	81.8	106.2	96.0	126.9	140.1	127.7	117.1	110.9	-9%
Not split out	31.8	33.0	31.9	36.9	33.3	38.5	34.7	31.6	-10%
<b>Total</b>	<b>443.7</b>	<b>453.9</b>	<b>445.9</b>	<b>473.6</b>	<b>490.7</b>	<b>471.8</b>	<b>437.2</b>	<b>395.3</b>	<b>-15%</b>

<sup>1</sup> Shows difference to 2017-21 average

Source: System operators, Morgan Stanley Research



# Demand - Weather adjusted

Exhibit 17:

## Natural gas demand

Within European perimeter (mcm/d)

	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023
<b>LDC</b>													
Demand	90	77	68	118	141	304	468	460	453	347	252	131	82
Weather-adjusted	90	76	68	97	212	342	467	513	446	381	218	141	90
Prev. 5yr avg.	94	84	75	115	204	379	499	557	512	417	254	157	94
Difference (%)	-4%	-9%	-10%	-16%	4%	-10%	-6%	-8%	-13%	-9%	-14%	-10%	-4%
<b>Industry</b>													
Demand	180	154	148	170	176	204	214	215	218	206	185	163	158
Weather-adjusted	181	155	151	165	189	210	208	225	220	210	179	163	160
Prev. 5yr avg.	196	189	180	204	222	252	255	284	282	259	224	212	196
Difference (%)	-8%	-18%	-16%	-19%	-15%	-17%	-18%	-20%	-22%	-19%	-20%	-23%	-18%
<b>Power generation</b>													
Demand	117	139	122	114	120	115	138	117	146	116	100	89	110
Weather-adjusted	113	134	113	110	127	119	138	123	145	120	97	93	107
Prev. 5yr avg.	122	142	128	133	131	152	145	160	146	133	109	98	122
Difference (%)	-7%	-6%	-12%	-17%	-3%	-22%	-5%	-23%	0%	-10%	-11%	-6%	-12%
<b>Total<sup>1</sup></b>													
Demand	437	414	378	460	507	740	978	941	965	794	637	443	395
Weather-adjusted	434	409	371	421	613	798	963	1033	964	842	582	460	403
Prev. 5yr avg.	464	464	431	517	656	932	1075	1197	1126	965	692	540	464
Difference (%)	-6%	-12%	-14%	-19%	-6%	-14%	-10%	-14%	-14%	-13%	-16%	-15%	-13%

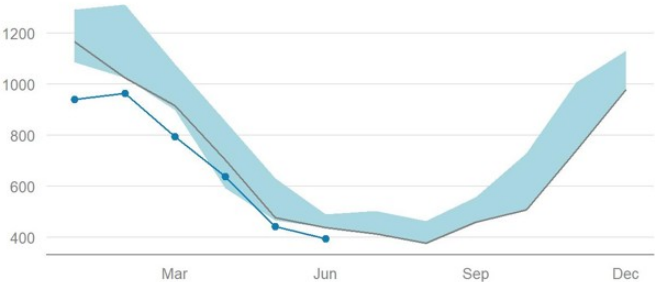
<sup>1</sup> Note: Breakdown into LDC, industry and power generation is not available for all countries, hence the total exceeds the sum of the sectoral breakdown

Source: System operators, Morgan Stanley Research

# Demand by segment

Exhibit 18:

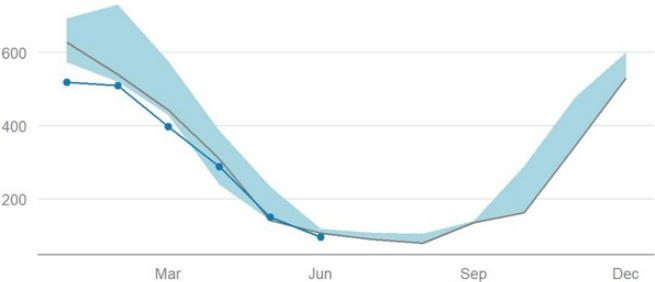
**Total consumption**  
Within perimeter (mcm/d)



Note: dark blue = current year, grey = last year, light blue = previous five year range  
Source: Network operators, Morgan Stanley Research

Exhibit 19:

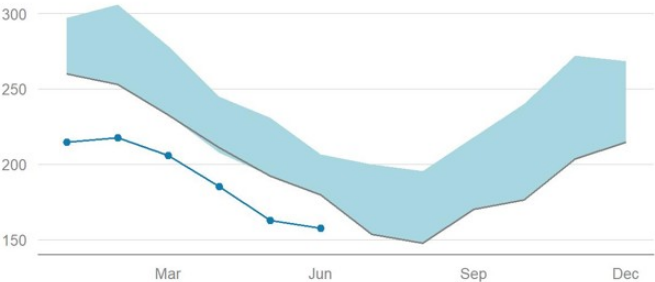
**LDC consumption**  
Within perimeter (mcm/d)



Note: dark blue = current year, grey = last year, light blue = previous five year range  
Source: Network operators, Morgan Stanley Research

Exhibit 20:

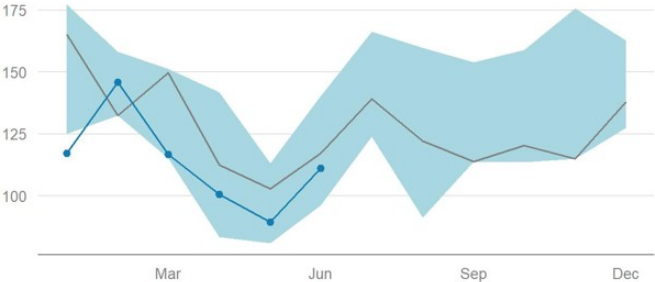
**Industry consumption**  
Within perimeter (mcm/d)



Note: dark blue = current year, grey = last year, light blue = previous five year range  
Source: Network operators, Morgan Stanley Research

Exhibit 21:

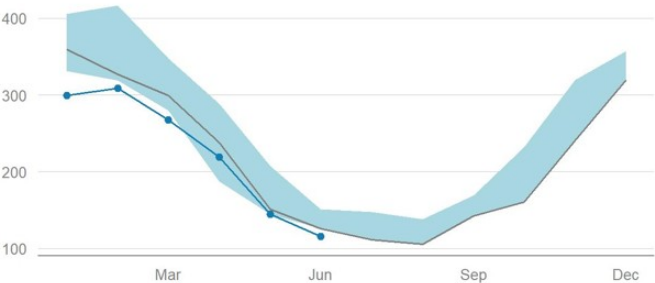
**Power generation consumption**  
Within perimeter (mcm/d)



Note: dark blue = current year, grey = last year, light blue = previous five year range  
Source: Network operators, Morgan Stanley Research

Exhibit 22:

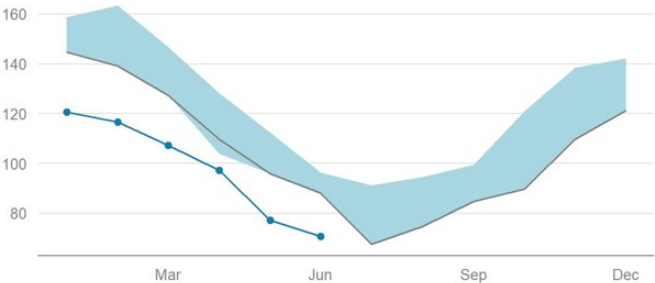
**Germany**  
Total consumption (mcm/d)



Note: dark blue = current year, grey = last year, light blue = previous five year range  
Source: Network operators, Morgan Stanley Research

Exhibit 23:

**Germany**  
Industry consumption (mcm/d)



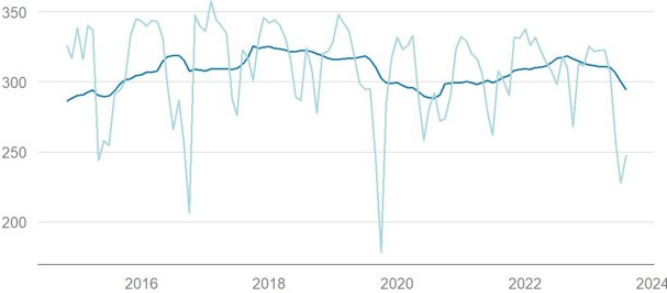
Note: dark blue = current year, grey = last year, light blue = previous five year range  
Source: Network operators, Morgan Stanley Research

# Production

Exhibit 24:

**Norway**

Production (mcm/d)

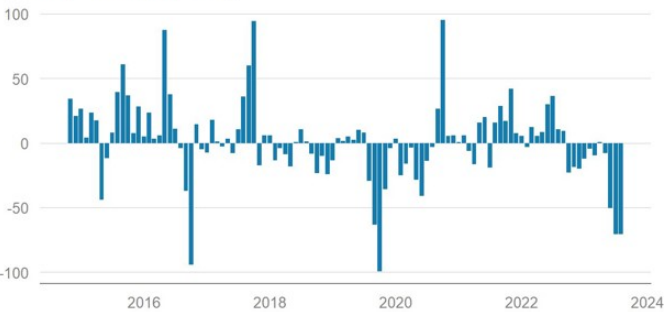


Source: Gassco, Morgan Stanley Research

Exhibit 25:

**Norway**

Year-on-year change (mcm/d)

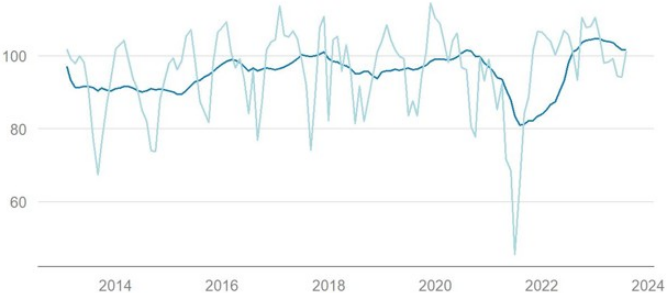


Source: Morgan Stanley Research

Exhibit 26:

**United Kingdom**

Production (mcm/d)

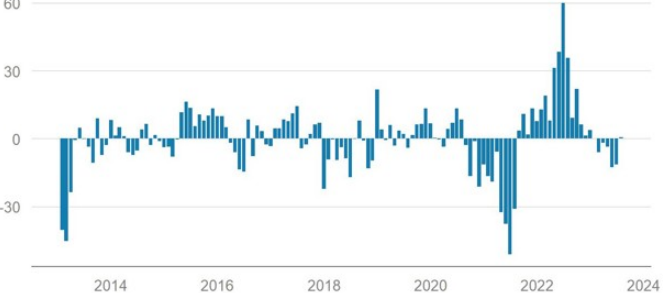


Source: National Grid, ENTSOG, Morgan Stanley Research

Exhibit 27:

**United Kingdom**

Year-on-year change (mcm/d)

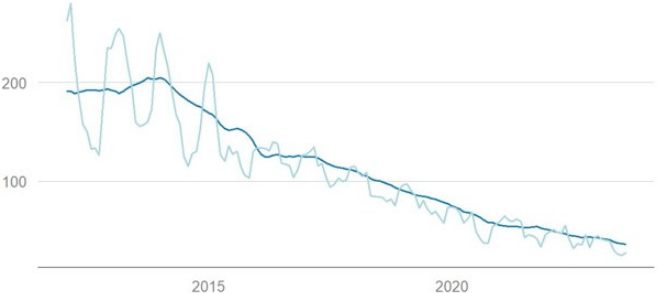


Source: Morgan Stanley Research

Exhibit 28:

**Netherlands**

Production (mcm/d)

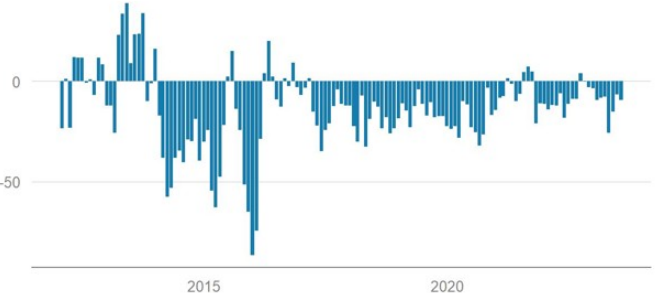


Source: ENTSOG, Morgan Stanley Research

Exhibit 29:

**Netherlands**

Year-on-year change (mcm/d)



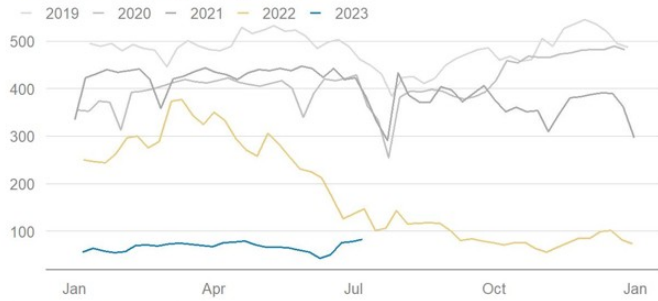
Source: Morgan Stanley Research

# Physical Flow

Exhibit 30:

## Pipeline flows from Russia into Europe

Weekly data to 07 July 2023 (mcm/d)

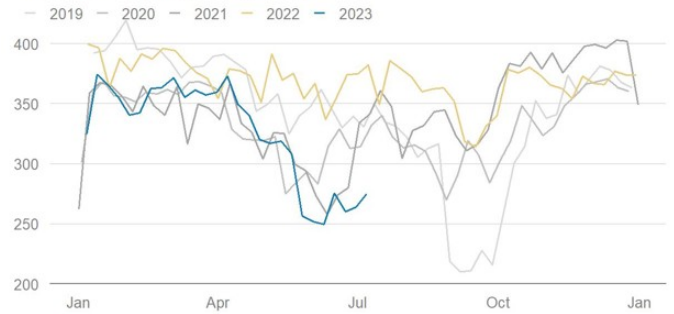


Note: flows into Turkey not included  
Source: ENTSOG, Morgan Stanley Research

Exhibit 31:

## Pipeline flows from Norway into Europe

Weekly data to 07 July 2023 (mcm/d)

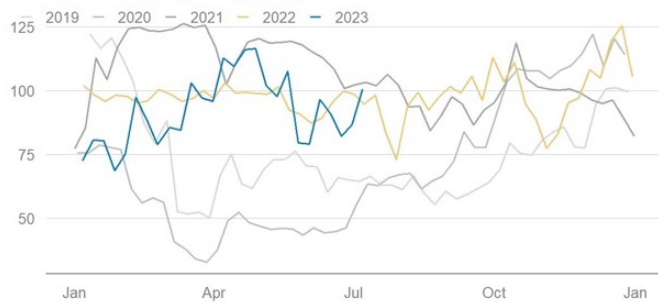


Source: ENTSOG, Morgan Stanley Research

Exhibit 32:

## Pipeline flows from North Africa into Europe

Weekly data to 07 July 2023 (mcm/d)

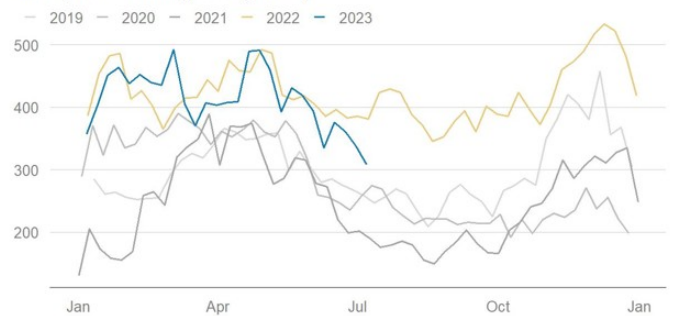


Note: aggregates imports that flow in from/via Algeria, Libya, Tunisia and Morocco  
Source: ENTSOG, Morgan Stanley Research

Exhibit 33:

## LNG imports into Europe

Weekly data to 07 July 2023 (mcm/d)

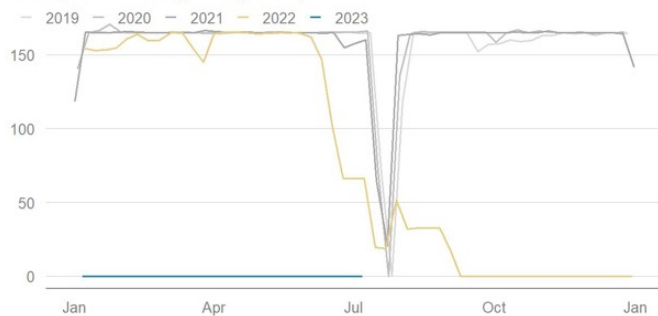


Source: ENTSOG, Morgan Stanley Research

Exhibit 34:

## Pipeline flows via Nord Stream 1 into Europe

Weekly data to 07 July 2023 (mcm/d)



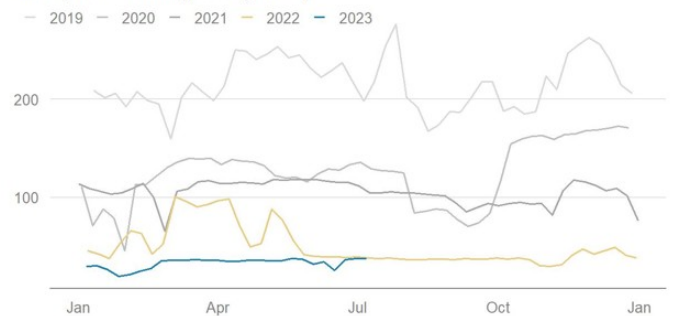
Source: ENTSOG, Morgan Stanley Research

Note: definition of 'Europe' for charts on this page is EU27 + UK

Exhibit 35:

## Pipeline flows via Ukraine into Europe

Weekly data to 07 July 2023 (mcm/d)



Source: ENTSOG, Morgan Stanley Research

# LNG

Exhibit 36:

## LNG imports into Europe

By receiving country (mt per month)

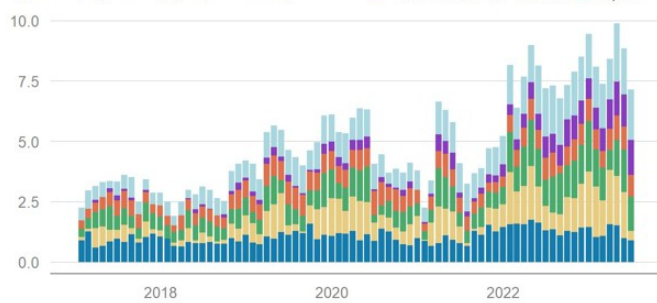


Exhibit 37:

## LNG imports into Europe

Seasonal (mt per week)

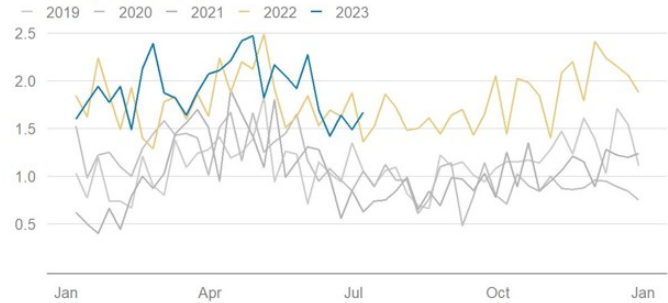


Exhibit 38:

## LNG imports into Europe from US

(mt per week)

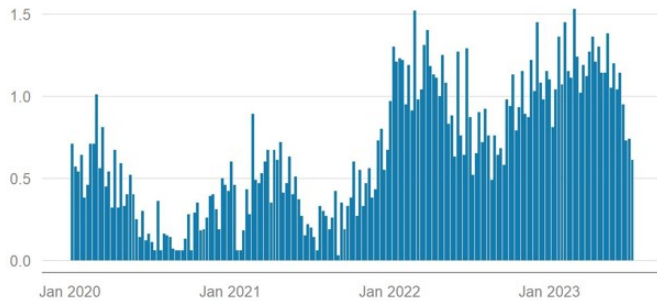


Exhibit 39:

## LNG inventories in Europe

(TWh)

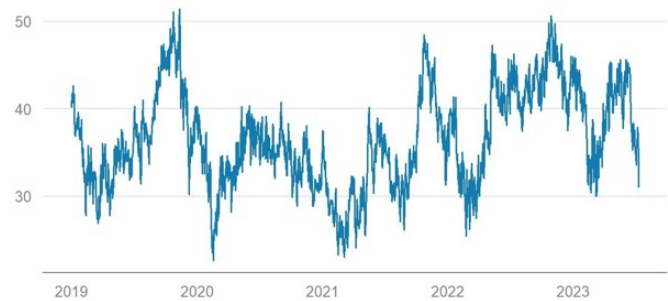


Exhibit 40:

## LNG imports into China

Seasonal (mt per week)

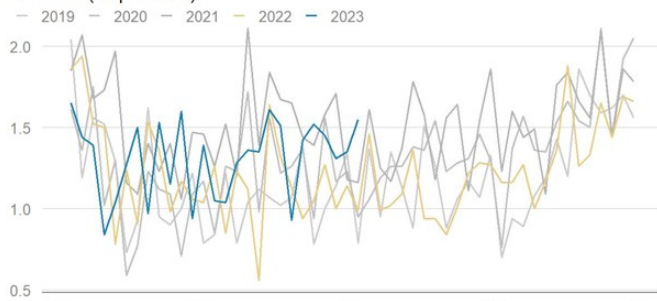
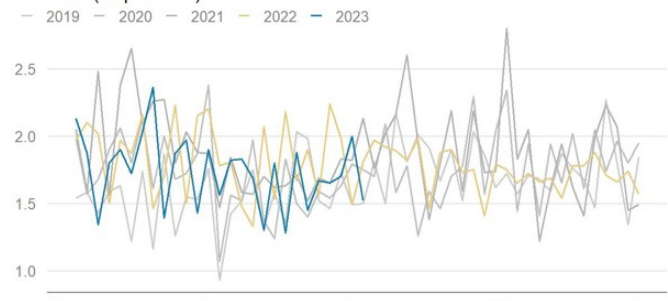


Exhibit 41:

## LNG imports into Asia ex-China

Seasonal (mt per week)



Note: definition of 'Europe' for charts on this page is EU27 + UK



# LNG (cont'd)

Exhibit 42:

## LNG flow to European perimeter

(30-day moving average, in mcm/d)

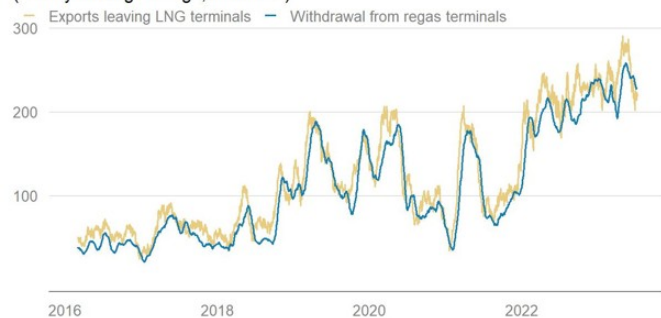


Exhibit 43:

## LNG flow to European perimeter

(million tonnes and mcm/d)

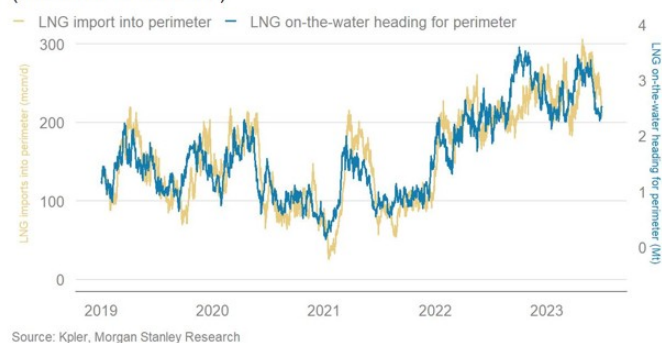


Exhibit 44:

## LNG arbitrage: price minus freight

Difference between USGC → Japan/Korea vs USGC → NW Europe (\$/mmbtu)

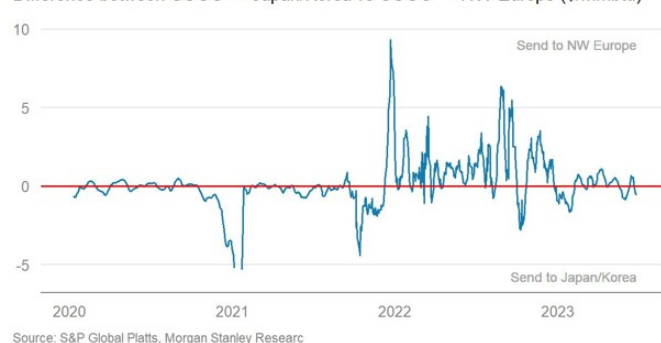


Exhibit 45:

## LNG on-the-water

Share of total that is heading for European perimeter (%)

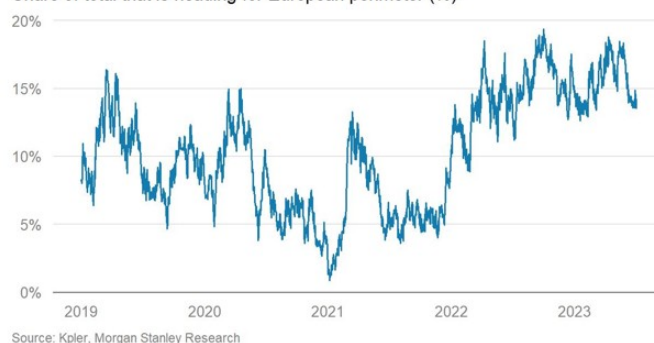


Exhibit 46:

## Utilisation of LNG regas terminals

Within European perimeter for month of June (%)

Country	Asset	Jun 2016	Jun 2017	Jun 2018	Jun 2019	Jun 2020	Jun 2021	Jun 2022	Jun 2023
Belgium	Zeebrugge Lng	8%	7%	16%	37%	25%	26%	82%	70%
Germany	Brunsbuettel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	48%
Germany	Lubmin, Deutsche ReGas	n/a	n/a	n/a	n/a	n/a	n/a	n/a	34%
Germany	Wilhelmshaven	n/a	n/a	n/a	n/a	n/a	n/a	n/a	61%
France	Dunkerque LNG	0%	3%	2%	54%	24%	27%	75%	81%
France	Fos	51%	47%	29%	32%	16%	49%	50%	87%
France	Montoir	10%	28%	16%	74%	31%	33%	73%	78%
Italy	Adriatic	71%	78%	58%	78%	78%	94%	96%	79%
Italy	Toscana	16%	44%	1%	66%	69%	64%	80%	76%
Netherlands	Eemshaven	n/a	n/a	n/a	n/a	n/a	n/a	n/a	104%
Netherlands	Gate LNG	8%	13%	6%	74%	16%	57%	95%	94%

Source: ENTSOG, system operators, Morgan Stanley Research

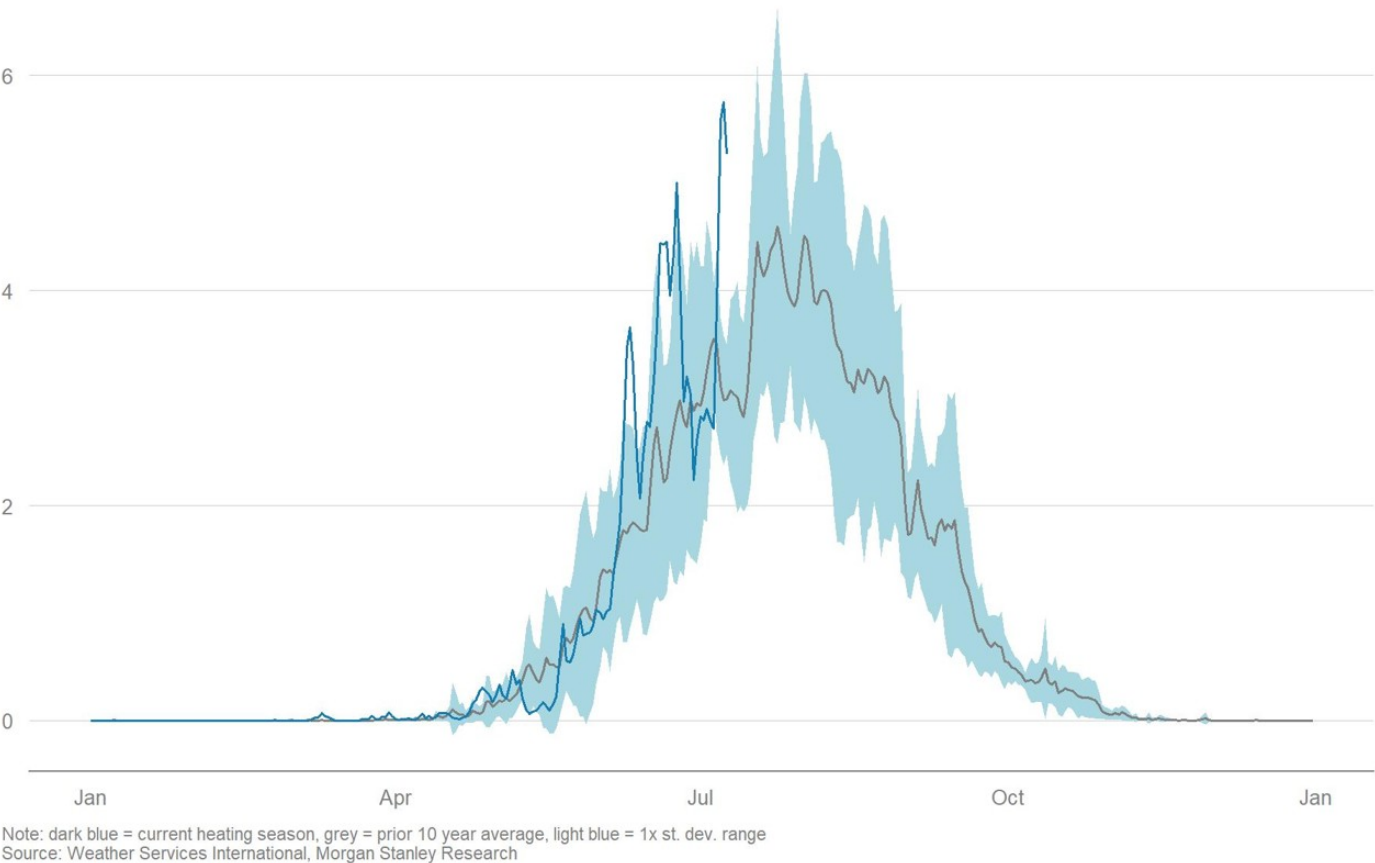


# Weather - CDDs

Exhibit 47:

## Cooling degree days

Europe, based on country data weighted by natural gas consumption

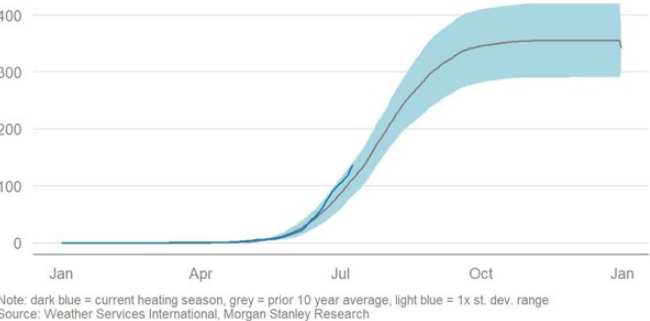


Source:

Exhibit 48:

## Cumulative cooling degree days

Europe, based on country data weighted by natural gas consumption

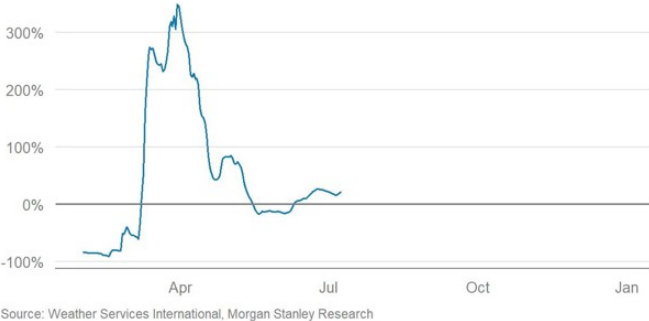


Source:

Exhibit 49:

## Deviation from normal

Cumulative CDDs in current heating season vs prior 10 year average (%)



Source:

# Weather – HDDs

Exhibit 50:

**Heating degree days**  
Europe, based on country data weighted by natural gas consumption

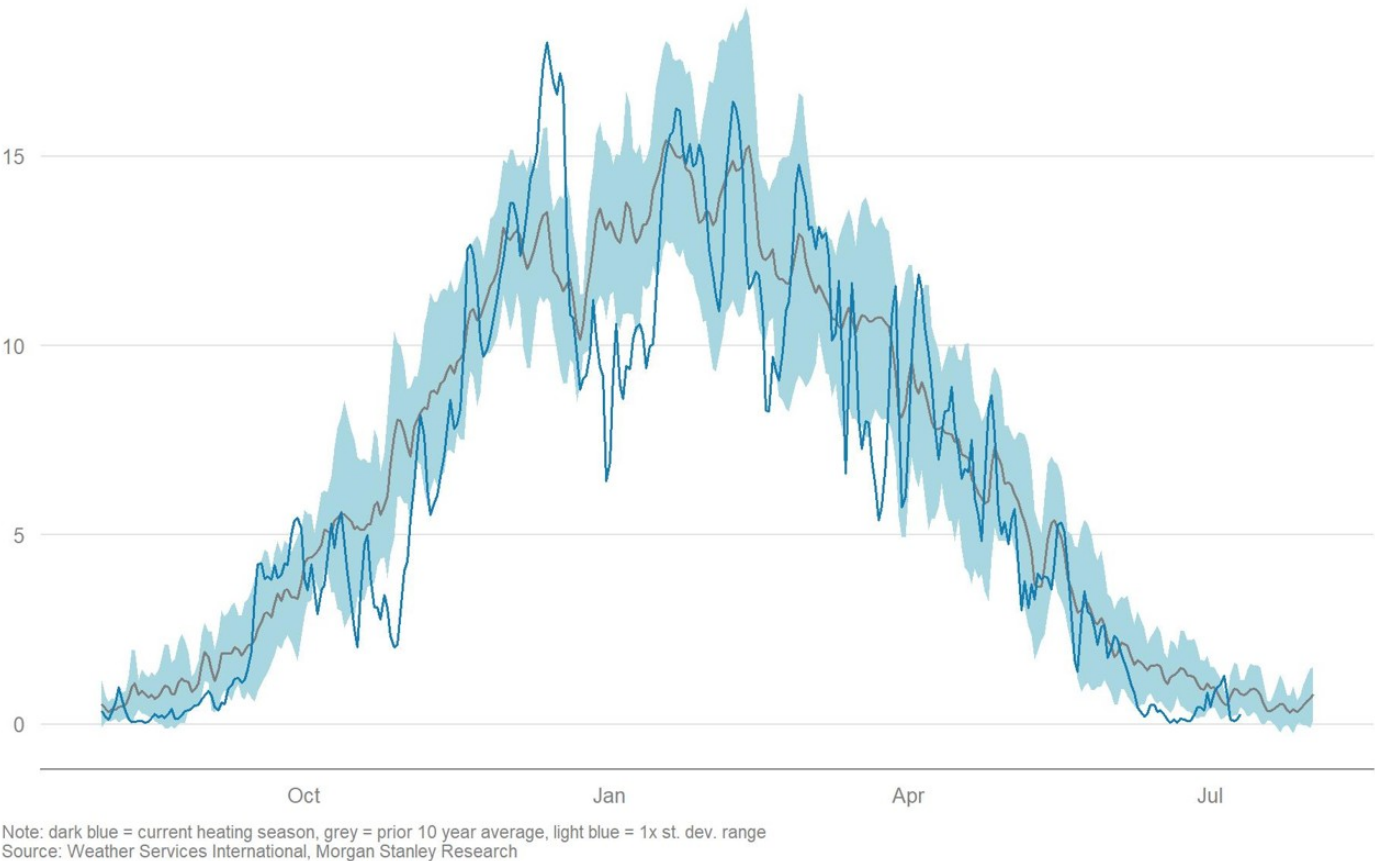


Exhibit 51:

**Cumulative heating degree days**  
Europe, based on country data weighted by natural gas consumption

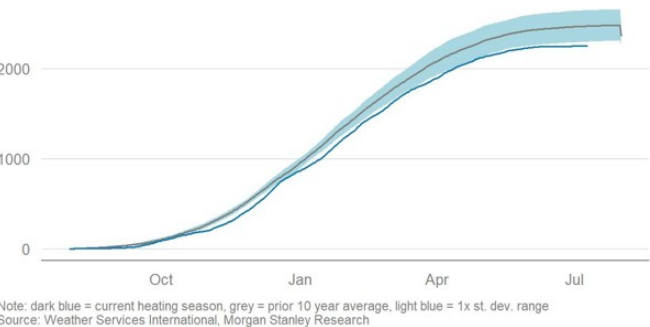
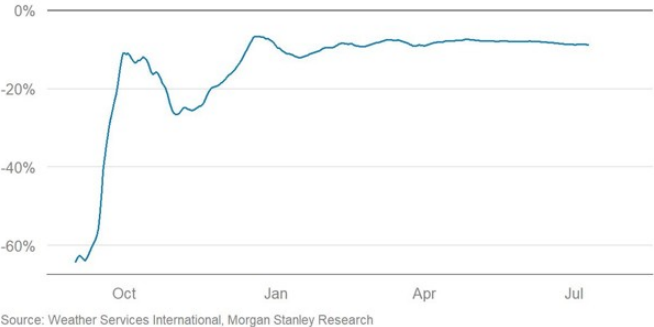


Exhibit 52:

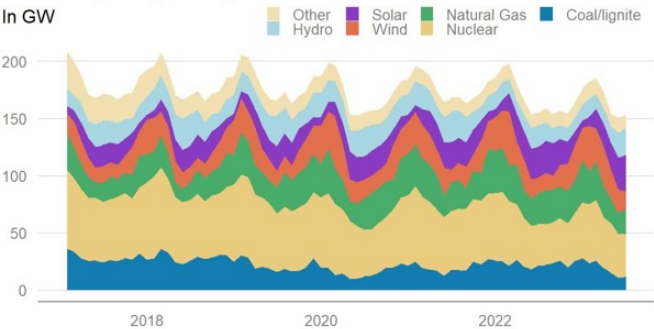
**Deviation from normal**  
Cumulative HDDs in current heating season vs prior 10 year average (%)



# Power

Exhibit 53:

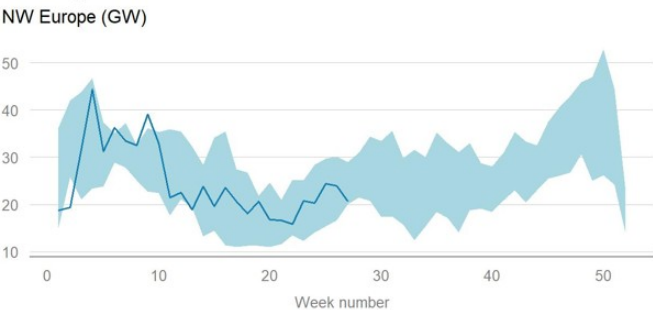
## NW European power generation



Note: Based on Austria, Belgium, France, Germany, Italy, Netherlands and Switzerland  
Source: ENTSO-E, Morgan Stanley Research

Exhibit 54:

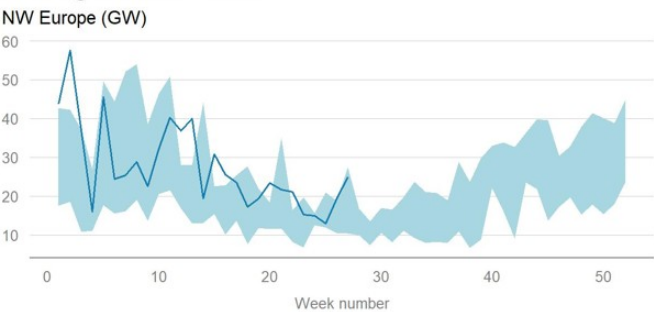
## Power generation - Natural Gas



Note: dark blue = current year; light blue = previous five-year range; based on Austria, Belgium, France, Germany, Italy, Netherlands and Switzerland  
Source: ENTSO-E, Morgan Stanley Research

Exhibit 55:

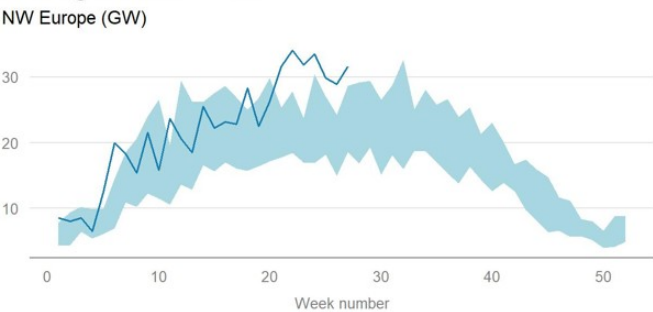
## Power generation - Wind



Note: dark blue = current year; light blue = previous five-year range; based on Austria, Belgium, France, Germany, Italy, Netherlands and Switzerland  
Source: ENTSO-E, Morgan Stanley Research

Exhibit 56:

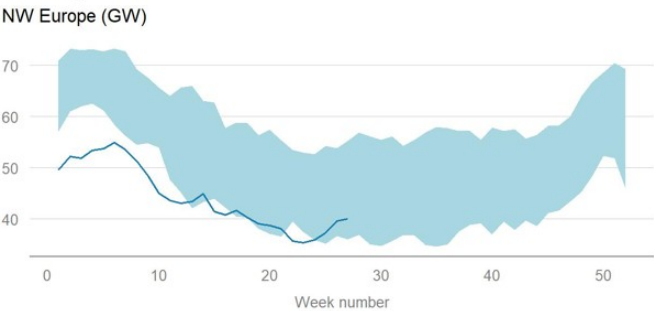
## Power generation - Solar



Note: dark blue = current year; light blue = previous five-year range; based on Austria, Belgium, France, Germany, Italy, Netherlands and Switzerland  
Source: ENTSO-E, Morgan Stanley Research

Exhibit 57:

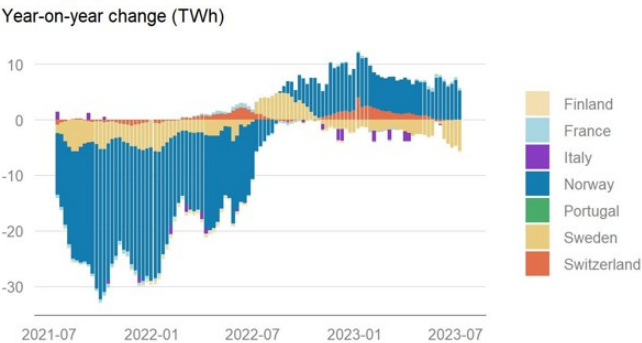
## Power generation - Nuclear



Note: dark blue = current year; light blue = previous five-year range; based on Austria, Belgium, France, Germany, Italy, Netherlands and Switzerland  
Source: ENTSO-E, Morgan Stanley Research

Exhibit 58:

## Weekly hydro reservoir levels



Source: RTE, Nordpool, Terna, REDES, Swiss Federal Office of Energy, Morgan Stanley Research

## Exhibit 59:

**Power generation within European perimeter**

In natural gas equivalent (mcm/d)

Month	Coal/lignite	Gas	Nuclear	Biomass	Hydro	Wind	Solar	Waste	Other	Total
Jun 2016	105.1	60.5	190.6	22.9	77.9	31.8	47.8	3.7	20.1	561.4
Jun 2017	98.6	77.1	182.4	24.7	57.9	63.4	55.7	4.0	22.2	586.9
Jun 2018	106.8	75.9	184.7	23.9	78.6	61.0	55.6	3.2	35.1	625.7
Jun 2019	65.1	117.2	188.4	25.5	73.5	66.9	65.0	3.1	20.6	627.9
Jun 2020	51.2	131.6	141.4	25.2	75.5	68.9	61.5	2.9	16.9	577.7
Jun 2021	75.9	120.0	190.0	25.2	75.6	49.3	72.8	5.8	17.4	633.9
Jun 2022	88.6	111.2	140.6	24.8	47.4	62.5	83.3	5.3	19.5	586.5
Jun 2023	51.6	104.4	151.5	23.8	66.5	66.5	96.7	5.3	17.0	583.8

Note: data shown for countries within European perimeter where available, i.e. Belgium, Denmark, France, Germany, Italy, Luxembourg and the Netherlands

Source: System operators, Morgan Stanley Research

# Long Term

Exhibit 60:

## European natural gas consumption

By use (EJ)

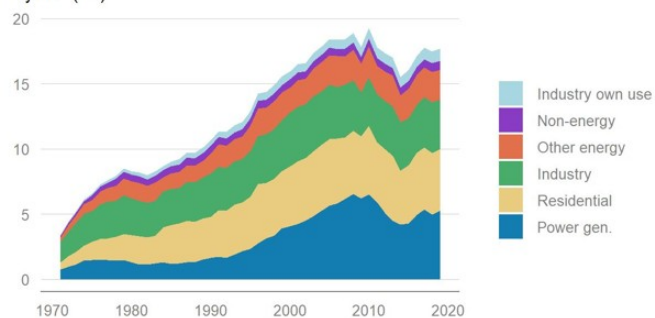


Exhibit 61: The use of natural gas in Europe

(EJ)	2018	2019	2020	Share
Indigenous production	8.0	7.5	6.9	41%
Net imports	10.1	11.4	10.2	63%
Other	- 0.3	0.7	0.5	-4%
<b>Total supply</b>	<b>17.9</b>	<b>18.2</b>	<b>17.7</b>	<b>100%</b>
<i>Transformation</i>				
Electricity generation	5.0	5.3	NA	29%
<i>Final user consumption</i>				
Industry	3.9	3.8	NA	21%
Residential	4.7	4.7	NA	26%
Other consumption	2.4	2.3	NA	13%
Non-energy use	0.7	0.7	NA	4%
Industry own use	0.9	1.0	NA	5%
o/w oil & gas extraction	0.4	0.4	NA	2%
Losses/statistical differences	0.4	0.4	NA	2%

Source: IEA

Exhibit 62:

## Europe's electricity mix

In EJ

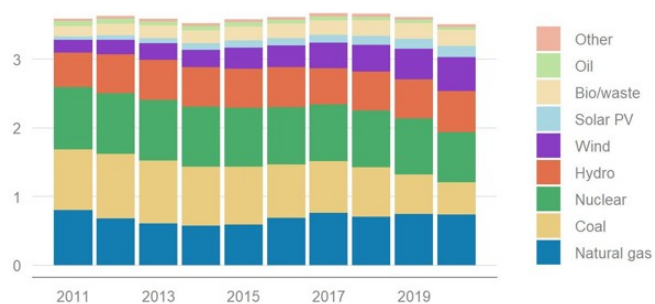
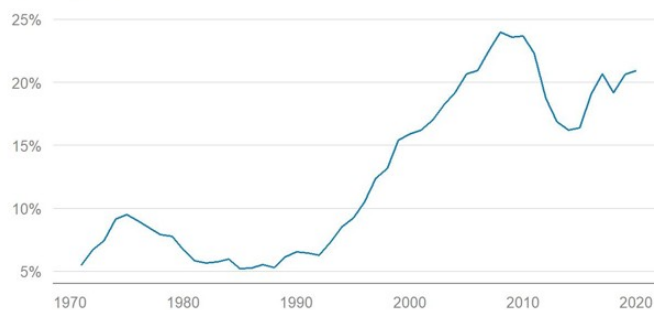


Exhibit 63:

## Share of electricity generated from natural gas

In Europe (%)



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Stock Rating Category	Coverage Universe		Investment Banking Clients (IBC)			Other Material Investment Services Clients (MISC)	
	Count	% of Total	Count	% of Total IBC	% of Rating Category	Count	% of Total Other MISC
Overweight/Buy	1353	37%	280	44%	21%	607	39%
Equal-weight/Hold	1658	46%	293	46%	18%	716	46%
Not-Rated/Hold	2	0%	0	0%	0%	0	0%
Underweight/Sell	610	17%	68	11%	11%	224	14%
Total	3,623		641			1547	

Data include common stock and ADRs currently assigned ratings. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months. Due to rounding off of decimals, the percentages provided in the "% of total" column may not add up to exactly 100 percent.

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