



**Thank you Jens, and good afternoon everyone!**

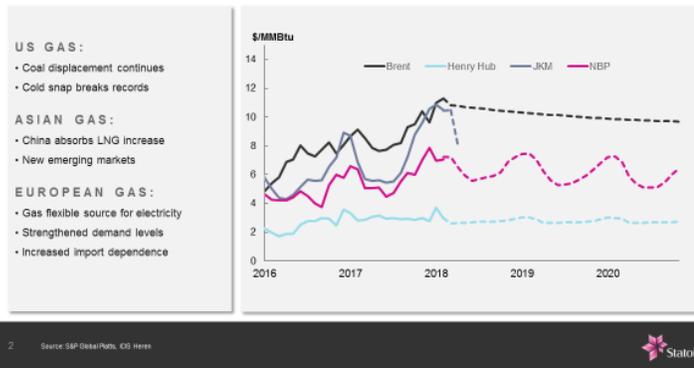
**I am Elisabeth Aarrestad and I head up the Statoil Market Analysis group. We are responsible for**

- 1) short- and long-term commodity markets for oil, gas and electricity,**
- 2) we support Jens with related advice to corporate management,**
- 3) as well as supporting Tor Martin and his organization on the trading activity.**

**I will focus on the latest developments in the global gas markets, take a closer look at some of the key drivers in these markets as well as some expectations for the near future.**

**But first I would like to take a look back to refresh what has happened since our last gas seminar in 2017.**

## What happened since our 2017 gas seminar?



### US:

- 1) In US, gas has continued to outcompete coal based on price, forcing existing capacity to switch to gas.
- 2) Further, a weather bomb in the US around year end saw extremely low temperatures across much of the US and this led to the highest ever gas usage in a single day, and considerable price fluctuations.

### Asia:

- 1) In Asia, a revised government policy on emissions in China has led to a significant increase in the LNG requirements in China, and China alone absorbed nearly all the LNG supply increase in 2017.
- 2) Secondly, increasing oil prices and a strengthening demand from emerging markets led to an increase in the Japan Korean Marker price.

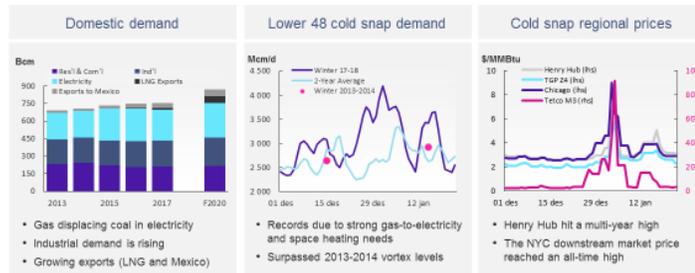
### Europe:

- 1) In Europe, gas has also in 2017 proven to be a flexible source for electricity. Record low rainfalls led to low hydro stocks, and this has been in combination with low nuclear availability especially in France. Due to its relatively low cost and greater flexibility, gas has benefitted from increased demand from CCGT plants.
- 2) Also in 2017 we saw limited LNG availability in Europe, and reduced indigenous supply have led to increased pipeline imports from North Africa, Russia and Norway.

If we take a look back to our first gas seminar in 2016 and up to today, we have seen an upward price development trend. This is of course positive and in line with indications in our previous gas seminars.

## US gas demand

Short-term spikes, long-term growth



### Domestic demand:

- In the US, we have seen growth in demand over the last years driven by the electricity sector, with gas displacing coal and new gas generation capacity growing.
- Gas growth going forward will primarily be within the industrial sector and is expected to grow by 10% from 2017 to 2020. By 2020, we expect to see 750 Bcm of demand in the US.

### Export outlook:

- The US has become a net exporter of gas due to increased flows to Mexico and the beginning of an LNG export wave (5 Bcm 2016, 20 Bcm in 2017, 70 Bcm 2020).
- Mexico's economy is growing, and this implies also a steady growth in gas demand. With Mexican natural gas production declining, the US has stepped up to supply volume and is expected to export 60 Bcm by 2020.
- Cheniere's Sabine Pass LNG export terminal shipped its first cargo in February 2016, around the time we had our first gas seminar, and has now 4 trains running. With several other LNG exports facilities to be commissioned in the next 2-3 years, LNG exports are expected to jump to >70 Bcm by 2020.

### Lower 48 Cold Snap Demand:

- Extreme weather rolled into the US in the final week of December and early January. This resulted in record demand (peaked at 4,2 Bcm/d on January 1 and averaged a record 3,2 Bcm/d for the month of January), and heating demand in the residential and commercial sector was responsible for the demand spike. This compares with the Polar Vortex of winter 2013-2014 which is shown in the magenta markers on the graph.

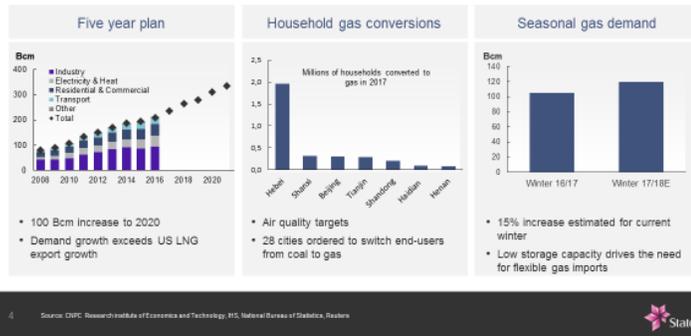
## **Cold Snap Prices:**

- **Record breaking demand, in combination with reduced supply, helped propel the Henry Hub spot price to 6.9 USD/MMBtu on January 4th — which is the highest levels since the Polar Vortex in 2014. However, HH did not see the severe spikes as the infrastructure constrained benchmarks. The record was seen on the NYC downstream price which surpassed levels achieved historically and reached far beyond >100 USD/MMBtu.**
- **The extreme cold also affected the production negatively. The extreme low temperatures led to freeze-offs at the wellheads in many production basins, reducing the available supply in a period with record demand which added to the tightness. These freeze-offs and production constraints also restricted feedgas to the Sabine Pass and thus the LNG exports, and it lowered the gas storage levels.**

**To sum up for the US, we see a continued strong demand and increasing exports to Mexico and as LNG. Further, volatility and periods with price fluctuations will also be relevant in the future, providing opportunities.**

## Chinese gas demand growth exceeds expectations

Emission reduction targets drive gas demand



**A key gas driver in Asia, is that China is switching from coal to gas due to air quality targets. The government (the ministry of environmental protection) has ordered end-users in 28 cities to switch from coal to gas (most of the cities are larger than Norway in terms of population!). The government's 5-yr clean heating plan for the 2017-21 period calls for cleaner fuels to cover 70% of heating consumption in the north by 2021. Auctions on piped gas indicate markets tightness as gas was sold 20% above city-gas prices (regulated).**

**China's demand growth is thus very strong, and the push for stricter air quality targets could lift gas demand above 300 Bcm by 2020 (up nearly 100 Bcm in 5 years compared with 2016 demand). This growth in China alone is twice the growth expected in US LNG export in the same period (20->70 Bcm).**

**Gas demand in North East China is "very" seasonal (heating and boilers). With only around 14 Bcm storage capacity, the demand for flexible LNG and other gas sources like domestic production and pipeline imports is high. Storage of 14 Bcm is very low compared to annual demand of around 235 Bcm in 2017. During the last 2 winters, particularly in 2017/18, the demand potential has been higher than the available supply, leading to an estimated deficit of at least 5 Bcm for this winter (CNPC Statement). This means that the seasonal demand could have been even higher than shown here if it were not for the supply bottlenecks.**

**The gas friendly governmental priorities in China cover 3 key priorities for gas:**

- 1) Increase domestic gas supply via E&P: Chinese state companies are actively ramping up gas output, but shale output is rising slower than hoped, producing less than 10 Bcm in 2017.**
- 2) Pipeline infrastructure: At the end of 2017, China had a total of 74,000 km of long-distance natural gas pipelines, according to CNPC. China aims to extend the country's**

**network of gas trunk lines by 40% (to 104,000 km) by 2020 and by 120% (163,000 km) by 2025.**

**3) Gas storage: As mentioned, China's gas storage capacity is today around 14 Bcm, representing only 6% of the annual demand. In Germany, storage capacity represent 25% of annual demand. Currently, additional 5 bcm of storage capacity is under construction in China.**

(German gas demand is around 90 bcm and has a storage capacity of around 23 bcm.)

**China's LNG imports are expected to continue to rise in 2018. In January 2018, CNPC estimated that imports will increase 14% in 2018 to reach nearly 60 Bcm, up from about 52 Bcm last year. According to CNPC, China's LNG import handling capacity is expected to increase to 85 Bcm this year, up from 76 Bcm in 2017.**

**This development and planned investments demonstrate the importance of gas for China in the future. It also means that there will be competition for LNG which will impact Europe. So let us take a closer look at the situation in Europe.**

FACTS:

Department of Oil & Gas, NEA, China

In 2016 Chinas natural gas demand = 207 bcm (2017 = 235 Bcm)

End of 2016:

- 6.4 million km nat gas trunk PIPE network – all provinces (except Tibet)
- 43 million km TOTAL urban nat gas pipelines
- 12 LNG terminals were constructed = import capacity of 43.8 mtpa
- 6500 GNG/LNG filling stations were constructed
- 13 Marine LNG filling stations

**“We will press ahead with the institutional reform of oil and gas by easing market access, improving pipeline construction, increasing equal access to infrastructure, developing market-based pricing mechanism, enhancing industry supervision and regulations, and gradually develop a modern market system that is open, orderly and enables fair competition.”**



**Europe remains dependent on gas imports; and the consensus is that this reliance will increase in the future. Focus remains on global LNG availability for Europe, which we have seen has been limited over the last few years due to the strong demand growth in Asia and particularly China. However, to sole focus on the LNG would miss a number of different of other and important drivers that are illustrated here.**

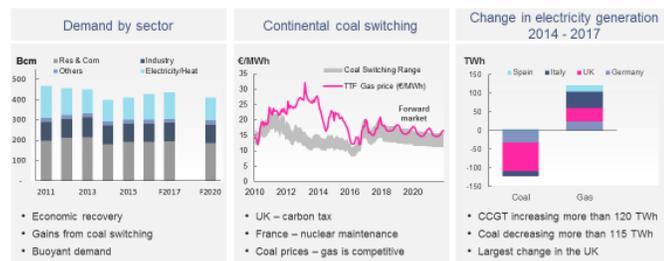
**In 2017, the weather conditions have been particularly relevant. Weather has an impact on gas demand directly, but is also increasingly important with the growing share of renewable in the European energy mix:**

- **Rainfall in the Alpine region was the lowest levels for a decade, this let to constrained output in hydro electric production levels.**
- **Temperature: Cold temperatures in January and December supported heating demand, however, exceptionally mild temperatures in January 2018 saw a considerable reduction.**
- **Wind and sun is impacting new renewables availability, and also impacting the need for additional electricity sources. Due to windy weather in January, wind output records were broken in Germany, France and the UK for peak generation with 43 GW, 10 GW and 13 GW respectively.**

**I will now go into more details on some of these drivers, and how they have been influenced lately.**

## European demand factors

Gas flexible source for electricity and replacing coal



Source: TS&DM, Argus, ESI, Heron, CE, Eurostat, TD's  
Forward market 13 Feb 2016



## Demand:

- Demand in Europe has continued to gain from coal switching within electricity sector over the last 5 year period. The strong economic recovery in the Euro Zone has also pushed up gas demand in the manufacturing sector. Further, “normal winter temperatures” has also lead to increased consumption from the heating sector.
- In the coming years, we expect stable demand given normal weather, although normal hydro and nuclear availability could se a bit lower gas to electricity consumption.

## Coal:

- Gas prices in Europe has become more competitive with coal during 2016 and 2017 and there has been incentives to run gas-fired plants ahead of coal-fired units, taking into account emissions prices. This is especially the case in UK following the increase in the Carbon Price Support from April 2015, and where gas overtook coal to become the dominant fuel in the UK generation mix already in 2016.
- However, coal to gas switching has also been relevant at the Continent which can be seen from the coal switching range on the middle graph. Further in France, extended nuclear maintenance and very low hydro level has had a positive impact on gas demand for electricity generation.

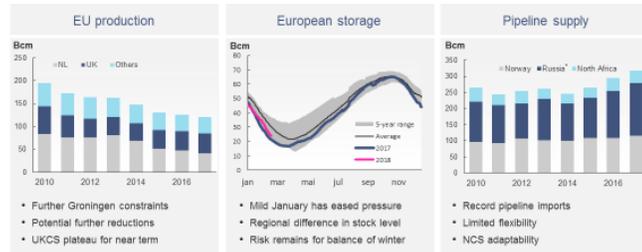
## Capacity replacement:

- Since 2014, coal generation in 4 of the largest countries has decreased with more 115 TWh. This is a drop of more than -25%. In the same period, gas generation is up more than 120 TWh or 40%.
- The reduced production from coal plants is especially visible in the UK where total share of production has decreased from 33% in 2015 to below 7% in 2017 and gas has increased it's share from 32% to 45% in the same period. (Renewables is up from 18% to 22%).

- **In Italy, gas has gained share due to lower coal generation and lower hydro levels (coal generation down from 43 TWh to 29 TWh, gas up from 94 TWh to 138 TWh).**
- **In Spain, gas generation capacity is nearly doubled (21 TWh in 2014 to 37 TWh in 2017) due to lower hydro production, lower imports from France (nuclear outages) and high demand (coal generation was also up from 41 TWh to 45 TWh).**
- **Going forward, the decreasing profitability outlook for coal will increase the pressure on Europe's oldest coal plants to close.**
- **From an environmental perspective, electricity generated from gas emits less than half the CO<sub>2</sub> as from a coal plant. And with the CO<sub>2</sub> price it is relatively more costly to generate electricity from coal. (Around 350 kg CO<sub>2</sub> per MWh produced for a CCGT and 840-850 kg CO<sub>2</sub> per MWh for a coal plant).**

## European supply factors

Imports compensating for reduced indigenous production



7 Statoil's position in Europe and the Middle East  
Source: NAM, OSE, TSO's in Europe, Oaseco, Statoil

### EU Production:

- Overall EU production levels have dropped significantly over the last 5 years. Whilst UKCS output has increased slightly over the same period, it has been Groningen's ongoing issues that have reduced the overall numbers.
- Earthquakes continue and therefore Dutch governments proposals for reductions continue.
- The current cap is 21.6 Bcm, but the state supervision of mines (SODM) has advised the government to reduce production from the field to 12 Bcm "as soon as possible" to minimise seismic activity in the region.
- On the UKCS, the production is expected to peak in the near term and enter into decline.
- Overall, the total supply situation in Europe remains positive for Statoil and Statoils position.

### European Storage:

- In 2017, we saw historically low storage levels which added strength to the market.
- The storage situation in Europe changed dramatically at the beginning of 2018 as mild temperatures in January 2018 alleviated pressure on stock levels.
- Since then, colder temperatures, including predictions of further cold (and a potential polar vortex) to come, have renewed focus on current stock levels, and the levels for the end of the withdrawal season.
- Currently, the stocks stand at 6 Bcm above 2017 level. However, further cold weather could see stocks fall below last year's level, which will generate additional demand for the coming summer.

## **Pipeline Supply:**

- **Both Russian and Norwegian supply have been at record levels in 2017, which was needed to cover the supply gap in Europe.**
- **Russian volume has increased by almost 10% year on year to hit 163 Bcm (from 150) in 2017.(exluding Turkey and Baltikum - Finland, Lativia, Lithuainia Estonia)**
- **NCS stepped up by 7% from previous record levels to 116 Bcm (from 108). Going forward this might increase marginally.**
- **North Africa has also been flowing at an increased level, supplying the southern region. Going forward this pipeline supply will most likely decrease somewhat due to increased domestic demand in Algeria and less export. Anyway, there is not sufficient piped gas to Southern Europe, which means that also LNG import is required.**

**Overall, the supply gap in Europe is still growing as indigenous production is declining with a flattish demand development. Over the coming years it is expected that Russian gas will constitute ~35%, NCS gas 25% and LNG imports 14% of the total gas mix.**

Total demand ~450

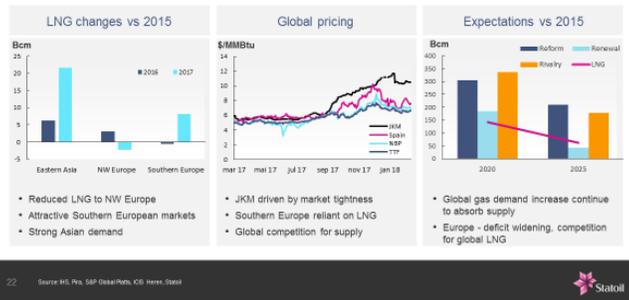
Russia: 150-160

NCS: 110-112

LNG: 60-63

## Global fundamentals

LNG production is increasing, but competition remains



## LNG deliveries:

- Despite sizable production increases in global LNG, NW Europe has seen less LNG volume in 2017 than 2016, actually 13% fewer cargoes than the previous year.
- Demand for gas in China has seen significant increases as environmental policy has led to coal switching out in favor of gas. Increase in China alone (~30 Bcm) represented similar amount as the new global LNG capacity (36 Bcm) coming on stream in 2017.
- Subsequent tightness in the Asian markets has led to a premium market price, with a significant proportion of available LNG supply heading to those markets.
- Due to increased electricity demand in Southern Europe, and relatively limited connectivity to NW Europe, Spain/Portugal/Greece and to some extent Italy have been increasingly dependent on LNG. 75% of the LNG import to Europe in 2017 landed in these countries. Southern Europe LNG deliveries increased by 9 Bcm year on year.

## Global Pricing:

- As mentioned, market tightness in Asia, and increasing oil prices have led to increases in the JKM proxy price.
- Whilst NW Europe has been tighter than expected in 2017, diversity of supply options, and interaction with coal markets have kept price volatility lower than that seen in Southern Europe, but higher than previous years.
- Due to its reliance on LNG, Southern European markets have had to price against JKM for periods of 2017 to secure cargoes.
- This competition for LNG between Southern Europe and Asia is an increasing evidence that gas markets are globalizing.

## **Global LNG production:**

- **Global LNG production levels have increased by 10% in 2017 against 2016. This equates to an additional 36 Bcm, where of 40% from the US. (From 350 to 386 Bcm, of total 3500 to 3650 – representing increase from 10% to 10.5% of total market)**
- **The production increases have been regionalized with increases coming from Australia (15 Bcm), Angola (5 Bcm) and America (14 Bcm).**
- **Additional volume expected to come online in the first half of 2018 is Yamal (20 Bcm), Cove Point (20 Bcm) and Cameroon (first FLNG 5 Bcm).**

**I have here also included an illustration comparing the increase in global gas demand in our 3 EP scenarios with the additional LNG coming on stream in the same time period. As you can see from the illustration, the additional demand is expected to continue to depend on the LNG, indicating a continued competition for LNG also for Europe in the future.**

## Globalizing gas – flows according to price signals

US LNG in the money; prices driven by other factors as well



With the increasing globalization of gas, I also would like to show you this price illustration which we have used in our previous gas seminars.

The bars represent the short-run marginal cost for US LNG supply to Asia and Europe.

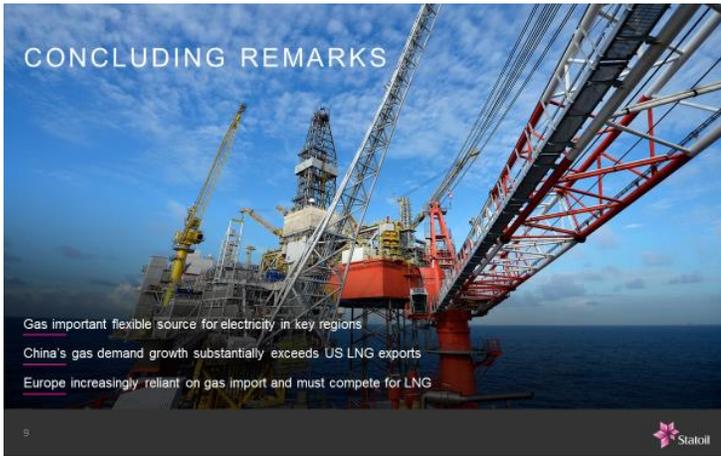
Starting in the middle with the US, there is a sourcing cost for gas at HH + a 15% cost to liquify the gas. Based on forward prices for , this sums up to 3.1 USD/MMBtu.

To bring this US LNG to Asia, a shipping cost is added, resulting in a SRMC for US LNG delivered in Asia between 4.6 and 5.3 USD/MMBtu.

To bring the US LNG to Europe, we need to add both a shipping and a regas cost as we are comparing with a piped gas price and not an LNG price. The SRMC in Europe is then between 3.9 and 4.3 USD/MMBtu.

When comparing these SRMC with forward market prices here indicated as magenta lines, it is clear that the US LNG is in the money, but also that Asia is a premium market.

There is price variation over time, and we have indicated the minimum levels and maximum levels observed over the last 2 years in the white and black lines.



**The key messages that I hope I have been able to convey to you, and that is our expectations are**

**Firstly, that gas will be important flexible source for electricity in both the US as well as in Europe.**

**Secondly, that Asia will be the engine for global gas demand growth, China's gas demand growth substantially exceeds the US LNG exports.**

**And finally, Europe is increasingly reliant on gas imports and will face competition to attract the required LNG.**

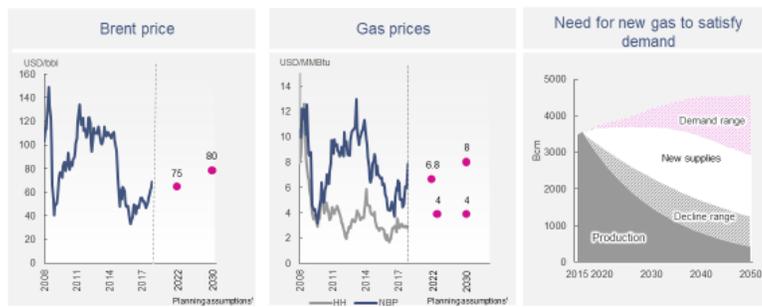
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**Before leaving the stage, I will share with you some of the long-term perspectives for gas, from Eirik Wærness' presentation.**



## Prices are up from the bottom – uncertainty prevails

Important: Substantial need for new investments to satisfy demand

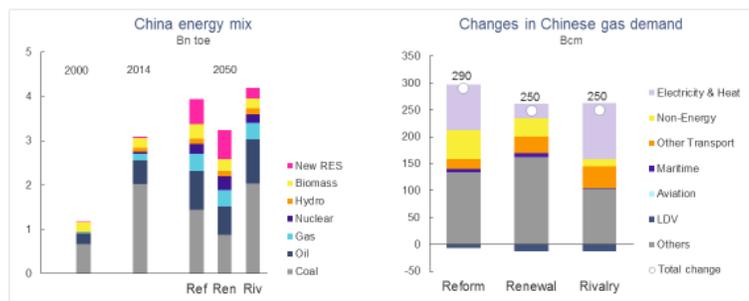


18 Sources: Platts, ICE, ICIS, NYMEX  
1 Planning assumptions are 2010 real



- In our Energy Perspectives from 2017, we extended the time horizon with 10 years, going all the way to 2050. Here I would like to draw your attention to the illustration on the right hand side.
- This illustration show in the grey area how gas production will decline based on decline rates of 3-6%.
- Further, the pink shaded area shows the gas demand range for our 3 EP scenarios up to 2050.
- And the white area shows the gap that needs to be filled with new supply.
- Over the long term, there is a significant need for new production capacity, irrespective of scenario
- The production declines far outweigh any demand reduction
- In a 2-degree scenario (the lowest demand level), we might need to deliver 50% more new gas supplies over the next 35 years than the accumulated deliveries from the US, Russia and Middle East combined over the last 35 years.
- This is a huge challenge

Asia, and China, play an important role in our energy future  
 Growing gas demand in all scenarios – part of the energy transition



**Our long-term energy future will be determined in Asia.**

**A bit of background:**

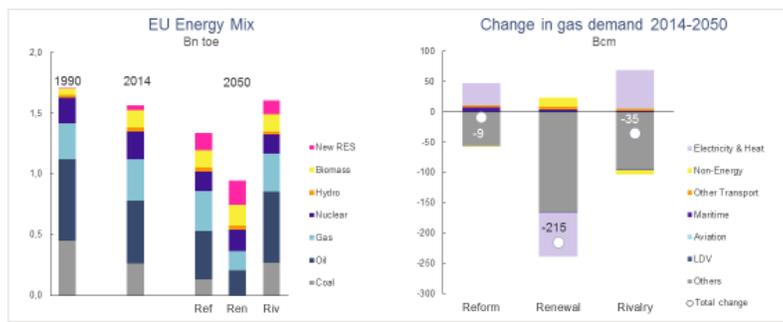
- **Half the global population lives less than 4000 kms from Hong Kong**
- **Strong economic growth and growth in energy demand**
- **Currently high use of coal as you can see on the left hand side – and there is consequently a need to reduce pollution and climate emissions**
- **So here there is a strong case for gas (and renewables)**
- **Asia has low indigenous supply – which means that there is a need for imports**

**In our scenarios for China:**

- **We see significant changes in the energy mix, with growth in new renewables and nuclear**
- **Sustainability will require a large reduction in coal use**
- **There is a large growth in gas demand towards 2050 in all scenarios. The growth is 250 – 290 Bcm growth which is ~the same as total EU imports of gas today**

## EU: Improving energy efficiency, and fuel mix changes

Electricity sector demand change key for gas development



20 Source: IEA (History), StatOil (projections)

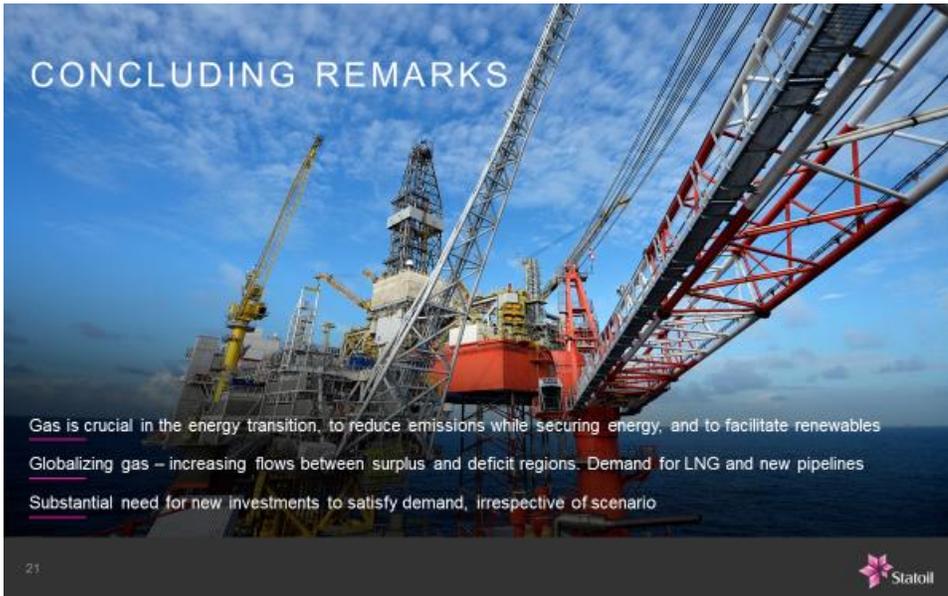


**EU's total energy demand has probably peaked, and the future is about energy efficiency and fuel mix changes.**

**What the future will be, is uncertain**

- **For gas demand, the key is how the electricity sector and the use of gas in industrial processes, direct use in housing/office buildings etc. will develop towards 2050.**
- **In a 2-degree scenario, which is the Renewal scenario in the middle, EU is rapidly decarbonizing. 60% of the electricity generated is from intermittent renewables in this scenario. Consequently, gas demand is rapidly going down.**
- **On the other hand and as I showed you in the short-term picture, indigenous supply falls even faster, so import needs do not fall as quickly.**
- **In the other scenarios, demand is more stable, with increasing imports as a result.**

**To sum up: For Europe, we have 1 scenario, the 2-deg scenario where the gas demand is rapidly going down, and we have 2 scenarios indicating similar demand levels for gas in 2050 as today.**



**And finally, to conclude on the long-term perspectives for gas:**

**Gas is crucial in the energy transition. Gas is required to reduce emissions and at the same time securing energy as well as facilitating for increased renewables.**

**We will see increasing globalization of gas, with increasing gas flows between surplus and deficit regions.**

**Finally, there is a substantial need for new investments to satisfy the growing global demand, irrespective of scenario.**

**Thank you very much for your attention, and I will now leave the stage for Tor Martin.**