WELCOME TO FLUXYS’ ZEEBRUGGE LNG TERMINAL

Energy Charter
Zeebrugge, 15th May 2014
FLUXYS: GAS INFRASTRUCTURE COMPANY FOR EUROPE

- Cross-border TSO in 8 countries
- Major gas transit operator
- Fully independent player
A BELGIAN COMPANY

Publigas
- 77.7%

Caisse de dépôt et placement du Québec
- 20%

Federal Holding and Investment Company
- 2.1%

Employees and management
- 0.2%

FLUXYS BELGIUM
- Regulated activities in Belgium
  - 89.97%
  - 10.03%

FLUXYS FINANCE
- Centralised management of cash funds and financing
  - 100%

FLUXYS EUROPE
- Non regulated activities in Belgium
  - 100%
  - Listed shares (NYSE Euronext Brussels)
  - 10.03%

Golden Share
- Belgian State

Employees
- Federal Holding and Investment Company
- Employees and management

Belgian State
- Listed shares (NYSE Euronext Brussels)
- Golden Share

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OUR STRATEGY

• Activities based on three feet
  – Transmission
  – Storage
  – LNG Terminalling

• Competitive Position
  – Security of Supply
  – Well functioning markets
  – Competitive tariffs

• Increase our size
  – Acquire a wide portfolio of assets in Europe
  – Cautious and selective growth

• Asset Prosperity
  – Provide management and staff with required resources
  – Develop activities with these resources
Priority of markets depend on:

- Geographical link with the Belgian market and
- Importance of the infrastructure in terms of main gas flows between producing countries and end-user markets
CROSSROADS FUNCTION AND CROSS-BORDER FLOWS OF KEY IMPORTANCE FOR BELGIUM

Security of Supply, competition and end-user price
- Increase Security of Supply and diversification of sources
- Bring a flurry of gas players to the Belgian market and make large volumes of gas circulate through the country
  - Increase of competition
  - Positive impact on gas price
- Economy of scale: combination of cross-border flows and domestic flows lowers the weight of the transmission cost in the end-user price for gas

Trade Balance in Belgium
- From an economic point of view: border-to-border business = 60% of regulated activity in Belgium
  - Revenues from companies abroad which reflects in Belgium’s trade balance
  - Belgia end-users pay maximum 40% of the costs for Fluxys infrastructure in Belgium

Supply in Belgium: 17 BCM/y
To other markets: 80 BCM/y exit capacities
OUR VISION: EUROPE NEEDS GAS NATUREL AND FLUXYS BRIDGES THE MARKETS

Market Size

Challenges:
- Diminishing production in EU
- Increasing competition between corridors for cross-border transmission

Gas most appropriate fuel for back-up of renewables
- Environmentally
- Technically: interoperability of gas/power grids and gas-to-power/power-to-gas

Future gas flows to Europe
- LNG from NW to East
- Pipeline gas from East to West and from South to North

Consolidation wave ➔ opportunity to efficiently bridge markets

Pipeline ➔ LNG
ACHIEVEMENTS

• Development of tentacular asset and capacity portfolio

• Belgium: unabated investments to intensify crossroads role 1,2 billion € investments 2009-2013

• Elsewhere in Europe
  - Close collaboration with partners and other TSOs
  - Investments in Greenfield and Brownfield infrastructures: 1,9 billion € investments 2009-2013

• Successful integration of teams in Germany, Switzerland and France

• Revenue driven business model with optimisation of commercial offer and utilisation of assets at group level
TRANS ADRIATIC PIPELINE (TAP)

- Greenfield project developed by major internationally renowned oil and gas companies (Statoil, E.ON, BP, Total, Socar)
- Fluxys : participation of 16 %
- Bridging the markets: TAP will be the key infrastructure to unlock additional gas sources from the Caspian region for Europe
- Thanks to the reverse-flow project, the Azeri gas can be transmitted to NW Europe including UK
- TAP also contributes to the attractiveness of the reverse-flow project.
ITALY/SWITZERLAND/GERMANY/BELGIUM: REVERSE FLOW PROJECT

- Additional supply corridor from the South:
  - Pipeline gas from Russia, Algeria and Libya
  - LNG (worldwide)
- Strengthen competition by linking the Italian gas trading point (PSV) with those in Germany and NW Europe.
DUNKIRK LNG TERMINAL

• New entry point for gas into NW Europe: 13 BCM/y – Commissioning scheduled 2015
• Fluxys holds 25% stake in asset owner and 49% in the joint venture operating the terminal
• Project Fluxys Belgium / GRTgaz to build a pipeline linking the Dunkirk facility to the Zeebrugge area: optimum destination flexibility for Dunkirk terminal users.
YAMAL LNG

- Project partners: Novatek (60%), Total (20 %) and CNPC (20 %)

- Construction of 3 LNG trains of 5.5 Mt LNG each on the Yamal peninsula, shipment of South Tambey field gas by means of ice-class LNG carriers

- Request for transshipment service in NW Europe, as ice-class ships are optimized for arctic conditions (Start-up early 2017)

- Cooperation Agreement signed in Brussels on 4th April 2014 between Yamal LNG and Fluxys, according to which Fluxys will now carry out all technical, permitting and regulatory processes with a view to provide LNG transshipment services at Zeebrugge LNG Terminal
FLUXYS BELGIUM: OVERVIEW OF ACTIVITIES

Regulated Activities
- 100% open access for shippers
- Tariffs approved by the regulator
- Terms and Conditions approved by the regulator
PROVED NATURAL GAS RESERVES (BCM)

North America 11,160
Europe 4,809
Africa 14,479
Latin America 7,649
CIS 15,829
Iran 33,780
Saudi Arabia + UAE 25,069
Qatar 25,069
Asia - Oceania 16,991
Russia 48,810

Together 64,639

Source: Cedigaz  Natural Gas In The World 2013 Edition
Eu: imports (Norway incl.) cover 68% of the consumption (2012)

Russia 37%
Norway 31%
Algeria 13%
Qatar 9%
Nigeria 4%
Others 6%

Natural Gas by pipelines 84%
LNG 16%

FLUXYS BELGIUM: OVERVIEW OF ACTIVITIES

Transmission

Storage

LNG Terminalling
BELGIQUE : 100% GAS IMPORTER

- North Sea Gas fields (mainly Norway) 65.2%
- LNG (mainly from Qatar) 3.8%
- The Netherlands 23.9%
- Sources from the East (e.g. Russia) 7.1%

Source: Fluxys Belgium EDP Feb 2014
FLUXYS’ ROLE ON THE BELGIAN MARKET

- Fluxys Grid
  - 4,100 km
  - High pressure
  - 58 shippers

- Transmission for supply in Belgium
  - 17 BCM/y

- Interconnection points
  - 18
  - 113 BCM/y entry capacity

- Transmission to neighbouring grids
  - 80 BCM/y exit capacity

- 198 large industrial end-users
  - 17 CHP units

- 19 Power stations

- Grids of 17 DNOs
  - 60,000 km
  - Low pressure

- 2.6 million households

- 100,000 SMEs

Natural gas consumption EU27:
~ 470 BCM/y
UPSTREAM: NETWORK CONNECTED TO ALL MAJOR NATURAL GAS SOURCES FOR EUROPE

- **H**: High calorific gas
- **L**: Low calorific gas
- Natural gas consumption EU27: ~470 BCM/y

- Norwegian natural gas (H) through Zeepipe and the Netherlands: 39 BCM/y
- British natural gas (H) through Interconnector: 20 BCM/y
- LNG sources worldwide (H), mainly from Qatar: 9 BCM/y
- Natural gas from the Netherlands (L): 24 BCM/y
- Natural gas through Germany (H), a.o. from Russia: 21 BCM/y
Natural gas (H) to the United Kingdom: 25.5 BCM/y

Consumption in Belgium (H+L): 17 BCM/y

Natural gas (H) to France, Italy and Spain: 20 BCM/y

Natural gas (H) to the Netherlands: 11 BCM/y

Natural gas (H) to Germany and farther East: 13 BCM/y

Natural gas (H) to Luxemburg: 1.6 BCM/y

Natural gas (L) to France: 9 BCM/y

- H: High calorific gas
- L: Low calorific gas
- Natural gas consumption EU27: ~470 BCM/y
4,100 KM PIPELINES IN 417 MUNICIPALITIES
194 PRESSURE REDUCING STATIONS
FLUXYS BELGIUM: OVERVIEW OF ACTIVITIES

- Transmission
- LNG Terminalling
- Storage
WHY STORAGE?

- **Send-Out**
- **Injection**
- **Supply**
- **Offtake**

Legend:
- Orange: Supply
- Teal: Offtake
1. Surface installations
1. Surface installations
2. Safety: monitor stockage
• Workable storage capacity: 700 millions m³(n)
• Send-Out capacity: 625,000 m³(n)/h
• Injection capacity: 325,000 m³(n)/h
FLUXYS BELGIUM : APERCU DES ACTIVITES

Transmission

LNG Terminalling

Storage
1975
LNG SUPPLY
CONTRACT
SONATRACH/DISTRIGAS
1978: CONSTRUCTION of PENINSULA for the LNG terminal
Commissioning
1987
First capacity enhancement

+4.5 bcm/year

2004-2008
KEY STRENGTH ZEEBRUGGE LNG TERMINAL: OPTIMUM DESTINATION FLEXIBILITY

To United Kingdom
To the Netherlands
To Germany and further to the East
To GD of Luxembourg
To France and Italy
To Belgian Market
To storage
To Belgian trading point
Loading LNG carriers: redirect LNG
LNG truck loading for road transport of LNG

Loading LNG carriers: redirect LNG
LNG truck loading for road transport of LNG
KEY ROLE OF ZEEBRUGGE AREA

INTERCONNECTOR 1998
To Zeebrugge: 20 BCM/y
To UK: 25.5 BCM/y
ZEEBRUGGE BEACH 1998
73 BCM/y
net traded 2013

LNG TERMINAL 1987
9 BCM/y

ZEEPIPE TERMINAL 1993
16 BCM/y

Zeebrugge area: throughput capacity of ~ 50 BCM/y
= approximately 10% of border capacity needed to supply Europe

Interconnector pipeline ⇆ United Kingdom
Zeepipe from Norwegian gas fields
FROM SOURCE TO END USER MARKET: PIPELINES AND LNG CHAIN (LIQUEFIED NATURAL GAS)

Why LNG?
• LNG offers competitive advantage over pipe gas for transmission over longer distances
• Easy diversification of sources
• Easy flexibility in destination markets

- Cool down to -162°C  
  - Volume 1/600

- Warm up to +3°C  
  - Volume x 600

- Liquefaction
- Transmission
- Gas fields
- Storage
- Regasification
- Transmission
- Storage
LNG TERMINAL 27 YEARS IN OPERATION

- Very high safety level (no incidents where LNG or gas caused a fire since its commissioning in 1987)
- ~1,350 LNG carriers received
- 78 million tonnes LNG unloaded = 104 BCM of natural gas
LNG TERMINALLING PROCESS: VESSEL RECEPTION

- LNG carriers: small - standard - Q-flex - Q-max (7,500 m³ to 266,000 m³ LNG)
- About 100 different ships docked at the terminal to this day
# Definition of a LNG Carrier

<table>
<thead>
<tr>
<th></th>
<th>LOA</th>
<th>WOA</th>
<th>D. MAX</th>
<th>LNG cap.</th>
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<tbody>
<tr>
<td>Conventional</td>
<td>&lt; 300 m</td>
<td>&lt; 50 m</td>
<td>13.5 m</td>
<td>&lt;175,000 m³</td>
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<tr>
<td>Q-flex</td>
<td>315 m</td>
<td>50 m</td>
<td>13.6 m</td>
<td>217,000 m³</td>
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<tr>
<td>Q-max</td>
<td>345 m</td>
<td>53.8 m</td>
<td>13.6 m</td>
<td>266,000 m³</td>
</tr>
</tbody>
</table>
SERVICES

• Unloading of **Q-Flex** ships
• Unloading of **Q-Max** ships
• Loading of ships
MAY 2010:
LOADING A SMALL LNG VESSEL, A FIRST IN EUROPE

Coral Methane: loading capacity of 7,500 m³ LNG
LNG SHIP UNLOADING: A FLURRY OF SOURCES
LNG SHIP LOADING: A FLURRY OF DESTINATIONS

Ship loadings

- 2008: 6
- 2009: 4
- 2010: 6
- 2011: 10
- 2012: 25
- 2013: 21
4 storage tanks - 380,000 m³ LNG = about 3 standard LNG ships
LNG TERMINALLING PROCESS: SEND-OUT

Send-out flow rate: 1,700,000 m³(n)/h = 1 standard LNG ship in about 2 days
LNG TERMINALLING PROCESS: SEND-OUT
LNG TERMINALLING PROCESS: SEND-OUT
LNG TERMINALLING PROCESS: COMBINED HEAT & POWER UNIT
SEND-OUT: COMBINED HEAT & POWER UNIT
COMBINED HEAT & POWER: PROCESS

- LNG -162°C
- Natural gas in gaseous form 3°C

Heat: 72 MW

CHP

GAS TURBINE

Flue gases 483°C

Power: 40 MW

Water

50°C

15°C

REGASIFICATION
LNG TERMINALLING PROCESS: OPEN RACK VAPORISER
SEND-OUT: OPEN RACK VAPORISER
SEND-OUT: OPEN RACK VAPORISER

• Additional regasification capacity during periods of peak demand:
  200,000 – 400,000 m³(n)/h

• Use of heat from seawater to regasify LNG: less energy needed (-35%), less CO₂ emissions (-31%) and less NOₓ emissions (-25%)

• LNG: 160 tons/h

• Seawater:
  - Flow rate: 7000 m³/h
  - Temperature
    » minimum inlet temperature: 6°C
    ΔT : 4°C
    » minimum outlet temperature: 2°C
LNG TERMINALLING PROCESS: LNG TRUCK LOADING
LNG TRANSPORT BY ROAD: TRUCK LOADING SERVICE

• Capacity of 4,000 loadings/year
• Destinations: The Netherlands, UK, Germany, Poland
  - Industrial sites without pipe gas supply
  - LNG refuelling stations
  - LNG as fuel for shipping

![Image of truck loading LNG]

![Graph showing LNG transport by road over years]

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DEVELOPING THE ZEEBRUGGE LNG TERMINAL INTO A HUB FOR SMALL-SCALE LNG AS WELL

LNG as bunker fuel: 40 Mt/y potential

LNG as fuel for long-haul trucks: 5 Mt/y potential
LNG for trucks: similar advantages over traditional fuels as in shipping

<table>
<thead>
<tr>
<th>Diesel Euro VI</th>
<th>CO(_2)</th>
<th>NO(_x)</th>
<th>PM</th>
<th>SO(_2)</th>
<th>dB</th>
<th>€</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
<td>-12%</td>
<td>-70%</td>
<td>-99%</td>
<td>-99%</td>
<td>-50%</td>
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<tr>
<td>Greenhouse effect</td>
<td></td>
<td>Air quality</td>
<td>Noise</td>
<td>Price</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chicken-and-egg situation to be overcome!
LNG AS A FUEL: ENVIRONMENTAL BENEFITS

- Immediate impact on carbon footprint: on average 20% less CO$_2$
- Immediate impact on health footprint:
  - particulate matter and SO$_x$: negligible
  - at least 50-60% less NOx
- Fuel price
SHIPPING:
SEVERE SULPHUR EMISSION STANDARDS IMPORTANT
DRIVER FOR CHANGING OVER TO LNG

0.1% as from 2015 in SECA zone

Sulphur Emission Control Area

- Fuel oil: 1-3% S
- Marine Diesel Oil: 0.001 – 0.5% S
- LNG: S negligible

IMO standards included in amendments to Sulphur directive by the European Commission
Ports of Zeebrugge and Antwerp: first truck-to-ship bunkering operations from Fluxys terminal successfully executed

Bunkering of first LNG-fuelled tugboat M/T Borgøy in the port of Zeebrugge
LNG SHIPS ALREADY SUPPLIED WITH LNG FROM ZEEBRUGGE

Argonon: LNG powered barge for Deen Shipping

Greenstream LNG powered barge dedicated for Shell
SECOND JETTY UNDER CONSTRUCTION: COMMISSIONING 2015

- Reception of LNG carriers with capacity from 2,000 to 217,000 m³ LNG (including LNG bunker carriers)
  - Unloading and loading
  - Ship-to-ship transfers

- Long-term market for bunker vessel loading developing: 200 berthing slots already sold under long-term contracts
LNG as fuel for ships and long-haulage trucks
Safety Induction for visitors
Fluxys LNG terminal

YOU NEED
A SAFETY
INDUCTION
TO ENTER
THIS SITE
GENERAL SAFETY RULES

• LNG is very inflammable

- No smoking

→ Leave smoking devices outside the LNG terminal or in the locker at the security post

- No radio’s, camera’s, cell phones inside the LNG terminal
ON SITE: PERSONAL PROTECTIVE EQUIPMENT

• Safety helmet
• Safety shoes
• Safety glasses
• Safety vest

Please follow the guide, don’t “explore” on your own
EVACUATION AT THE LNG TERMINAL

• Evacuation signal = electronic siren
• Immediately stop all activities
• Leave the LNG terminal on foot, guided by the Fluxys attendant
• Take the wind direction into account, never move into the danger zone (white cloud). If necessary make a detour

Testing: siren is tested every Monday morning. Evacuation is not necessary in this case.
ON SITE: MEETING POINT
THANK YOU FOR
YOUR ATTENTION!