Gas Transmission Europe

GTE+ Reverse Flow Study TF
Technical Solutions

21 July 2009

Introduction

- This report has been produced in close cooperation with the TSOs across Europe to identify possible "small" investments that can improve the European Security of Supply on the short term
- Most of the projects are eligible for the European Energy Programme for Recovery
- The report is divided in two parts :
  - Part I – View per region (slides 3-13) : maps of Europe showing the location and type of projects
  - Parti II – View per country (slides 14-92) : detailed description of each individual project, as provided by the TSOs

- This document is preliminary and subject to change

PART I – View per region

- This part of the document provides an overview of the reverse flow projects per region

- Legend :
  -  – Reverse flow capacity needed (new)
  -  – Reverse flow capacity (new) at other places
  -  – Pipelines needed (new)
  -  – Pipelines (new) at other places

Comments :

- Most of the reverse flow projects are described hereafter; however not all projects are included
- Not all countries are eligible for funding under EEPR
- Some projects include pipelines that are out of scope for pure "reverse flow projects"; however they contribute the improvement of European Security of Supply

South-South-East

Balkans


AUSTRIA
BUDAPEST
HUNGARY
SLOVENIA
LJUBLJANA
ZAGREB
CROATIA
BOSNIA
HERZEGOVINA
SARAJEVO
SERBIA
BELGRADE
MONTENEGRO
PODGORICA
UNMI
KOSOVO
SKOPJE
FYRO
MACEDONIA
TIRANA
ALBANIA
SOFIA
Kiskundorozsma
Novi Sad
Zaule
Omisalj
Fier
Brindisi
Taranto
Otranto
Nabucco
WBR
IAP
TAP

Greece


BULGARIA
SOFIA
Obilic
Pristina
UNMIK
KOSOVO
Bujanovac
Dupnitsa
94
Zidilovo
Tetovo
SKOPJE
FYRO
MACEDONIA
TIRANA
Elbasan
WBR
(Western Balkan Ring)
Fier
ALBANIA
TAP (Trans Adriatic Pipeline)
TAP
Gjirokastel
IGI (Interconnection Greece-Italy)
Kilkis
Thessaloniki
Katerini
Larissa
Volos
GREECE
Lamia
Halkida
Thiva
ATHENS
64
Rendhoussa
65
Drama
Xanthi
Komotini
Kipoi
Alexandroupoli
93
Malkoclar
Nabucco
ITG
Tekirdag
Marmara Ereglisi
Karacabey
Canakkale
Çan
Ezine
Balikesir
Aliaga
Manisa
Turgutlu
Izmir
Aydin

Central (1)


Leipzig
Lasów
27
Radom
Wrocław
Lublin
Deutsch Neudorf
28
Kielce
Opole
PRAGUE
Kouřim
Katowice
Krakow
Waidhaus
29
Rzeszow
Drozdwicze
72
Drozdovichi
CZECH REP.
Veselí nad Lužnicí
Hostim
Kralice
Oberkappel
30
62
SLOVAKIA
Velké Kapušany
Überackern
31
Linz
Baumgarten
61
63
Uzhgorod
München
VIENNA
Salzburg
Beregdaróc
76
Beregovo
Tekovo
Kiefersfelden
32
BRATISLAVA
60
88
Innsbruck
AUSTRIA
BUDAPEST
Satu Mare
Graz
Arnoldstein
Murfeld
57
59
Tarvisio
Klagenfurt
Trento
SLOVENIA
HUNGARY

Central (2)


Überackern
München
Linz
Baumgarten
VIENNA
Burghausen
Salzburg
Oltingue
Wallbach
Kiefersfelden
Rodersdorf
Innsbrück
AUSTRIA
Geneva
BERN
SWITZERLAND
Arnoldstein
Griespass
Passo Gries
Tarvisio
Klagenfurt
Murfeld
Ceršak
Trento
SLOVENIA
Rogatec
Aosta
Sempeter
LJUBLJANA
Milano
Gorizia
ZAGREB
Venezia
Zaule
Trieste
Grenoble
Lučko
Torino
Porto Viro
Umag
Rijeka
Karlovac
CROATIA
Omisalj
Cavarzere
Vodnjan
Krk
Pula
Genova
Bologna
Gospič
Nice
Panigaglia
Zadar
Knin
Benkovac
Firenze
Toscana Offshore
Rosignano Marittimo
Ancona

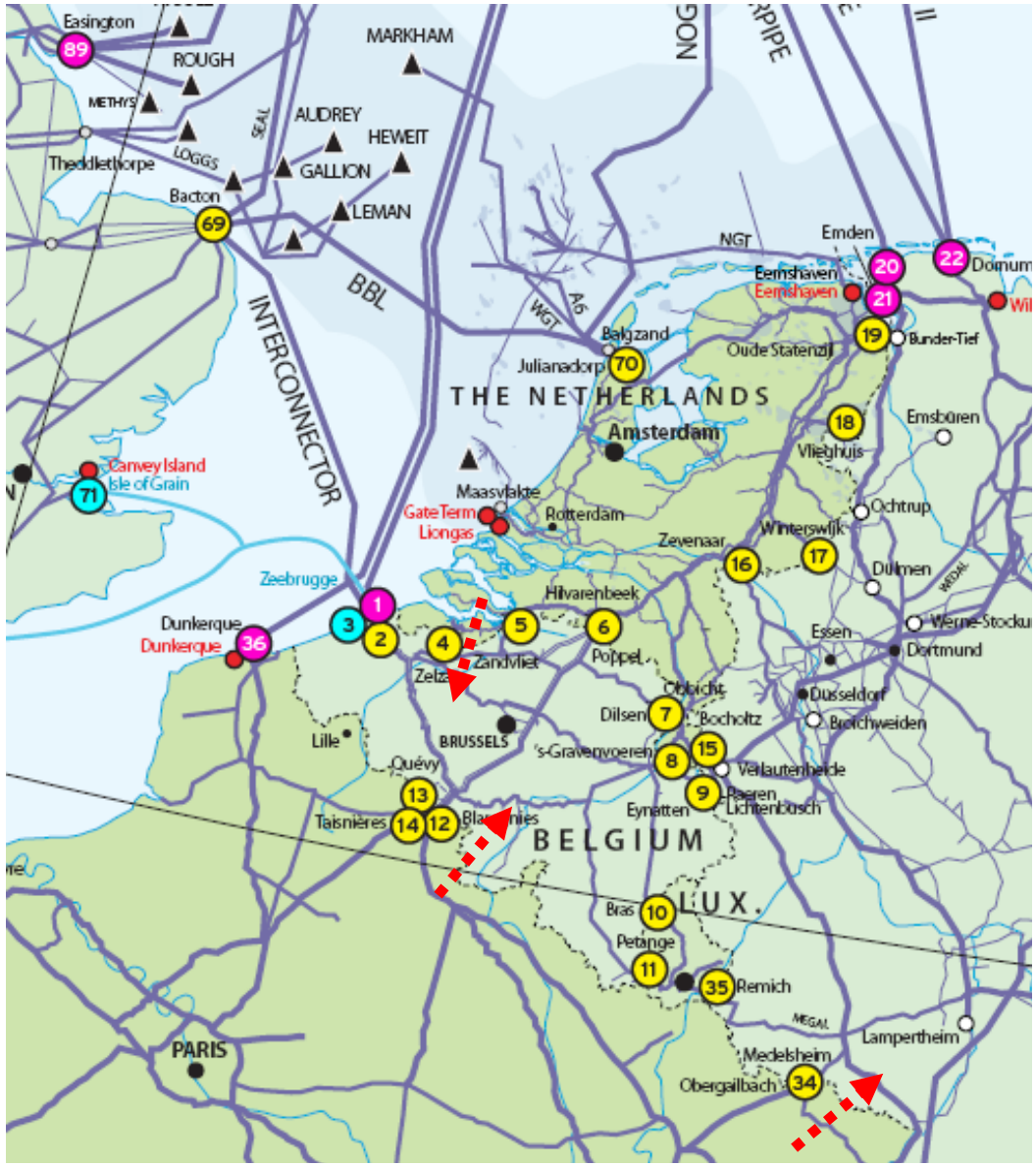
Poland


BALTIC PIPE
OPAL
RUSSIA
Kaliningrad
Gdansk
VILNIUS
Vilnius S.
Šakiai
81
Olsztyn
POLAND
Szczecin
Bydgoszcz
Torun
Tietierowka
Białystok
74
75
Kondratki
EuRoPoL
Włocławek
Mallnow
Gorzów Wielkopolski
Szamotuły
26
Kienbaum
Lwówek
Poznan
Wysokoje
73
Kobryn
Zielona Góra
WARSAW
Lodz
Lasów
27
Radom
Lublin
Wroclaw
Olbernhau
28
Hora Svaté Kateřiny
Kielce
Opole
Katowice
Krakow
PRAGUE
Kouřim
CZECH REP.
Rzeszow
Drozdwicze
72
Drozdovichi
Lviv
Kralice
Hostim
Veselí nad Lužnicí
Břeclav
Lanžhot
Oberkappel
30
Ivano-Frankivsk

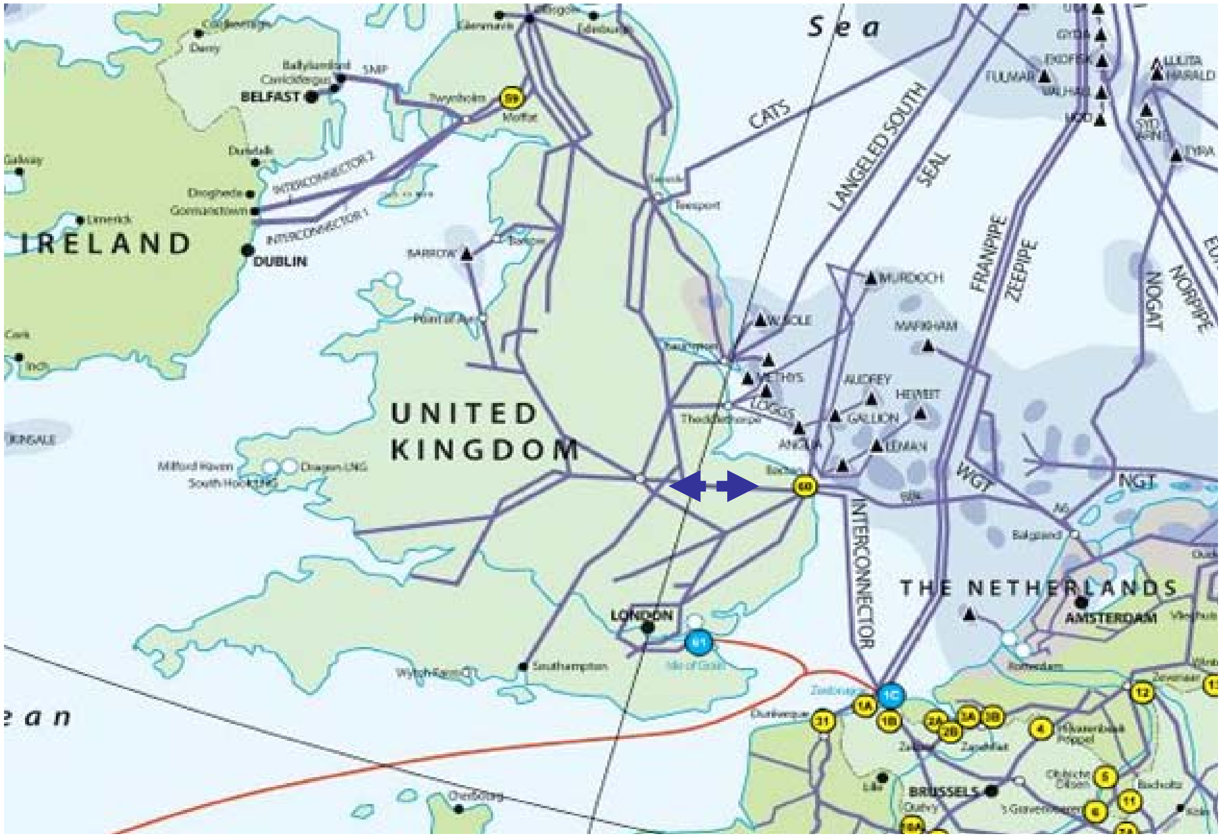
Germany


open season on-going
open season on-going
OPAL
EGT
GERMANY
NETHERLANDS
BELGIUM
LUX.
CZECH
PRAGUE
Amsterdam
Rotterdam
Dortmund
Essen
Düsseldorf
Hannover
Kassel
Leipzig
Reckrod
Steinitz
Lampertheim
München
Salzburg
Linz
Rostock
Greifswald
Kiel
Malmö
Ellund
Emshaven
Wilhelmshafen
Emsbüren
Ochtrup
Winterswijk
Zevenaar
Vlieghuis
Oude Statenzijl
Balgzand
Hilvarenbeek
Poppel
Dilsen
Bocholtz
Eynatten
Petange
Remich
Medelsheim
Obergailbach
Oberkappel
Überackern
Kiefersfelden
Oltingue
Wallbach
Rodersdorf
Innsbruck
Swinoujscie
Szczecin
Mallnow
Kienbaum
Deutsch Neudorf
Olbernhau
Hora Svaté Kateřiny
Zielona Góra
Lasów
Veselí nad Lužnicí
Kourim
Waidhaus
Komminke
Swinoujście
Szczecin
NOGAT
NORPIPE
BALTIC PIPE
EUROPOL
MEGAL
NEL
RING

North-West


Easington
89
ROUGH
METHYS
AUDREY
HEWETT
GALLION
LEMAN
Theddlethorpe
LOGGS
SEAL
Bacton
69
MARKHAM
BBL
INTERCONNECTOR
NGT
WGT
A6
Emden
Eemshaven
Eemshaven
20
21
22
Dornum
19
Bunder-Tief
Oude Statenzijl
Balgzand
Julianadorp
70
THE NETHERLANDS
Amsterdam
18
Emsbüren
Vlieghuis
Canvey Island
Isle of Grain
71
Maasvlakte
Gate Term
Liongas
Rotterdam
Ochtrup
Winterswijk
Zevenaar
16
17
Zeebrugge
Hilvarenbeek
Dülmen
1
3
2
5
6
Dunkerque
Dunkerque
36
4
Zandvliet
Poppel
Essen
Dortmund
Obbicht
Dilsen
7
Bocholtz
Düsseldorf
Borchweiden
Lille
BRUSSELS
's-Gravenvoeren
8
15
Verlautenheide
Quévy
13
9
Eynatten
Lichtenbusch
Taisnières
14
12
BELGIUM
LUX.
Bras
10
Petange
11
35
Remich
PARIS
Lampertheim
Medelsheim
Obergailbach
34

Ireland - GB


Sea
CATS
LANGELED SOUTH
SEAL
FULMAR
TYRA
MURDOCH
MARKHAM
AUDREY
HEWETT
GALLEON
LEMAN
FRANPIPE
ZEEPIPE
NOGAT
NORPIPE
WGT
NGT
BELFAST
INTERCONNECTOR 2
INTERCONNECTOR 1
IRELAND
DUBLIN
BARROW
UNITED
KINGDOM
INTERCONNECTOR
THE NETHERLANDS
AMSTERDAM
LONDON
Southampton
BRUSSELS

South-West


Mugardos
Ferrol
A Coruña
50
Musel
Oviedo
Lugo
Santander
Bilbao
51
GAVIOTA
Pontevedra
Ourense
Tui
49
Valença do Minho
Leon
Bilbao
S.Sebastián
52
Irun
Vitoria
Pamplona
40
Larrau
Lacq
Bordeaux
Castillon (Dordogne)
PIR-MIDI
Toulouse
Cruzy (Hérault)
Burgos
Logroño
Palencia
Zamora
Valladolid
Soria
Serrablo
Huesca
Zaragoza
Lleida
Girona
Salamanca
Carrizo
Segovia
Ávila
PORTUGAL
MADRID
Guadalajara
42
Barcelona
Tarragona
LISBON
Cáceres
Toledo
Cuenca
Teruel
SPAIN
Campo Maior
48
Badajoz
Castellón de la Plana
Sagunto
43
Valencia
Sines
47
Ciudad Real
Albacete
Palma de Mallorca
from Egypt
Cordoba
Palos
Huelva
46
POSEIDON
Sevilla
Jaén
Alicante
Murcia
Granada
44
Cartagena
Cádiz
Málaga
Motril
Almeria
45
Tarifa
Ceuta

PART II – View per country

Countries :

- Austria
- Bulgaria
- Czech Republic
- France
- Germany
- Hungary
- Italy
- Poland
- Romania
- Slovakia
- Spain
- United Kingdom

Comments :

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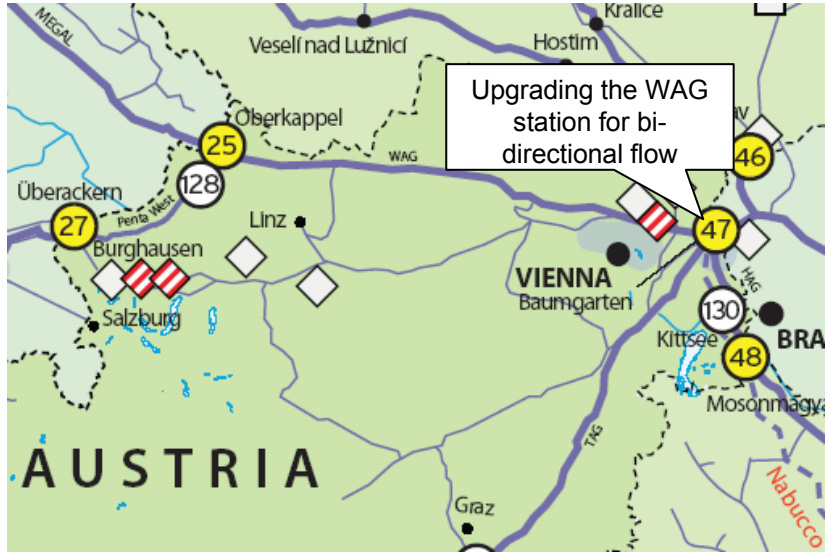
AUSTRIA

1 – Upgrading the WAG metering and compressor station in Baumgarten for bi-directional use on behalf of BOG GmbH

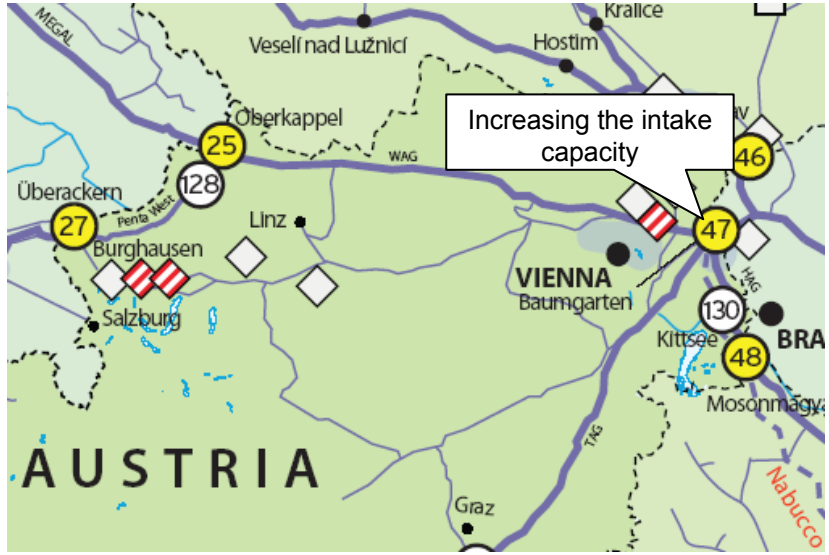
Project Goal
Availability of gas transport from Austrian storages and from Western European sources to the CEE countries.
Project Description
The West Austria Gas pipeline (WAG), which belongs to the TSO BOG, can be bidirectionally operated except Baumgarten station. This project aims at enhancing the WAG-Baumgarten CS in order to enable the metering and compressing functionalities in reverse direction, towards the Slovakian network as well as towards the other connected gas networks. It requires two new connection and couple of valves.



Capacity created in reverse flow	1.800.000 Nm^3/h at 71 bara	**Project maturity**	Basic designed
Capital expenditures	3.767 M€	**Construction time**	16 months
Countries involved	CEE countries	**Commencement of operations earliest**	12/2010

2 – Increasing the interconnection capacity from OMV Gas system into the TAG system for gas not coming from Slovakia

Project Goal
1. Availability of more intake from Austrian storages and from Western European sources into the Baumgarten gas turntable, TAG and SOL system and toward CEE countries. 2. Availability of gas from Southern European sources into the WAG and Austrian domestic system and toward CEE countries.
Project Description
This is to connect the upstream side of the metering station of the TAG to an existing collector which gathers the quantities from Austrian storages and from Western European sources and to increase the capacity of the existing interconnection between the TAG and the domestic transmission system. It requires couple of new connection and valves.

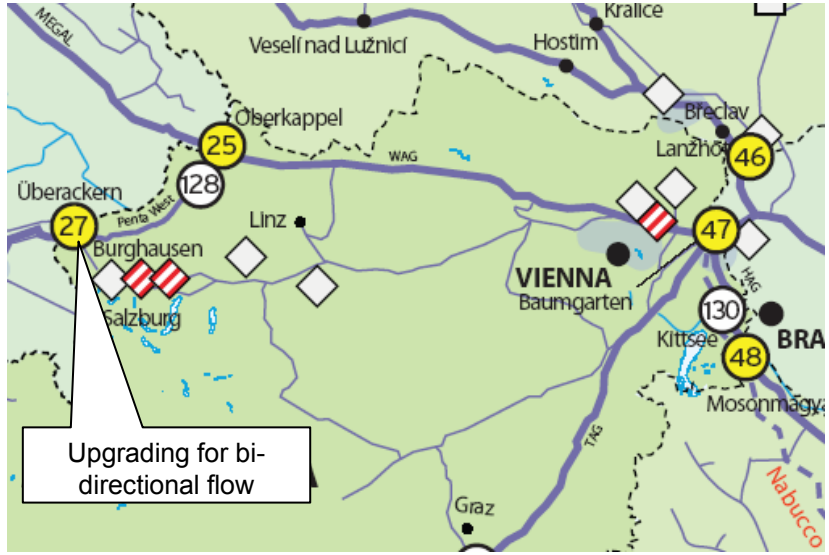


Capacity created in reverse flow	1.0 mcm/h at 50 bar	**Project maturity**	Basic designed
Capital expenditures	0.9 M€	**Construction time**	15 months
Countries involved	Austria, CEE countries	**Commencement of operations earliest**	2010

Gas Transmission Europe

3 – Upgrading the Überackern Export facility for bi-directional use

Project Goal
Availability of reverse flow of Penta West system.
Project Description
The existing Penta West pipeline supplies southern Germany cross border connection. This project is to transport gas from the large and increasing storage facilities in Austria through the WAG to the Baumgarten gas turntable as well as to the MEGAL System. It requires two new connection and couple of valves, as well as major upgrade of the station control system.



Capacity created in reverse flow	0.3 mcm/h at 65 bar	**Project maturity**	Planned
Capital expenditures	1.7 M€	**Funds breakdown**	2009
Countries involved	Austria, CEE countries	**Commencement of operations**	2011

TAG : Proposals

- A pre-feasibility study is ongoing regarding implementation of Reverse Flow on the TAG system
- Three options are currently envisaged (see next slides) :
  - Reverse flow from Italy to the Slovakian border without internal off-takes
  - Reverse flow from Italy to the Slovakian border with internal off-takes
  - Reverse flow from Italy to the Slovakian border with internal off-takes (higher capacity)

TAG : Option 1

Project Goal
Reverse flow to the Slovakian border without internal off-takes
Project Description
In-take I/A border pressure 52.5 barg Modification of the metering stations of Arnoldstein and Baumgarten No operation of the existing station is required No flow rate is delivered on the Austrian domestic market Off-take pressure at A/SK border 50 barg

Capacity created in reverse flow	From 9 Mio Sm³/d to 27 Mio Sm³/d	**Project maturity**	Pre-feasibility study currently ongoing
Capital expenditures	From 9.7M€ to 20.6M€	**Funds breakdown**	FID (final investment decision) + 19 months
Countries involved	Austria – Italy – Slovakia	**Commencement of operations**	FID (final investment decision) + 20 months

TAG : Option 2

Project Goal
Reverse flow to the Slovakian border with internal off-takes
Project Description
In-take I/A border pressure 52.5 barg
Modification of the metering stations of Arnoldstein and Baumgarten
No operation of the existing station is required
Off-take pressure at A/SK border 50 barg
All off-take points to be considered
Austrian off-take pressure of 44 barg from Arnoldstein to Sulmeckgreith and 49 barg from Weitendorf to Baumgarten area

Capacity created in reverse flow	From 32 Mio Sm³/d in Arnoldstein to 18 Mio Sm³/d in Baumgarten	**Project maturity**	Pre-feasibility study currently ongoing
Capital expenditures	20.6 M€	**Funds breakdown**	FID (final investment decision) + 19 months
Countries involved	Austria – Italy – Slovakia – Slovenia	**Commencement of operations**	FID (final investment decision) + 20 months

TAG : Option 3

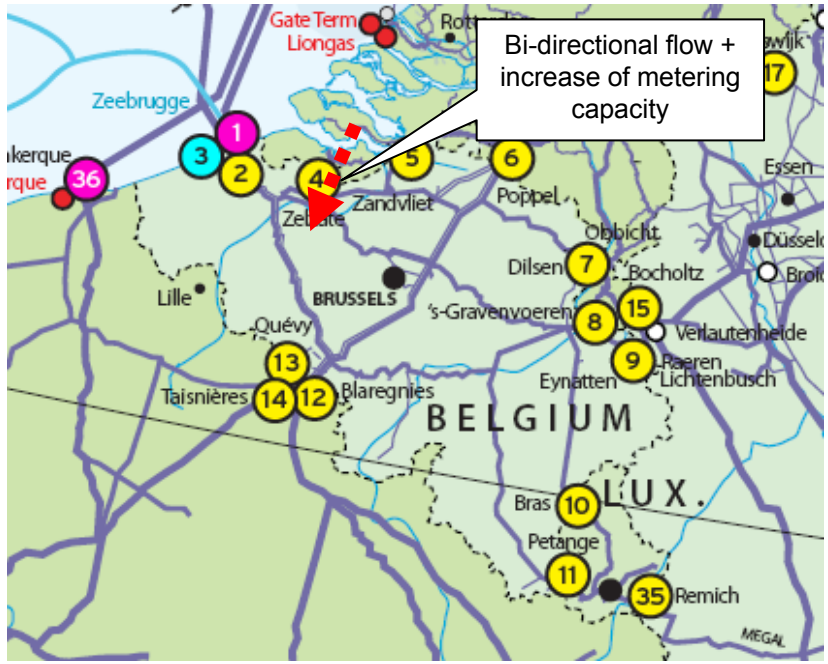
Project Goal
Reverse flow to the Slovakian border with internal off-takes
Project Description
In-take I/A border pressure 52.5 barg Modification of the metering stations of Arnoldstein and Baumgarten and modification of the piping connection of Weitendorf compressor station Off-take pressure at A/SK border 50 barg All off-take points to be considered Austrian off-take pressure of 44 barg from Arnoldstein to Sulmeckgreith and 49 barg from Weitendorf to Baumgarten area

Capacity created in reverse flow	From 40 Mio Sm³/d in Arnoldstein to 25.5 Mio Sm³/d in Baumgarten	**Project maturity**	Pre-feasibility study currently ongoing
Capital expenditures	29.5 M€	**Funds breakdown**	FID (final investment decision) + 19 months
Countries involved	Austria – Italy – Slovakia – Slovenia	**Commencement of operations**	FID (final investment decision) + 20 months

BELGIUM

1 – Zelzate metering

Project Goal
Reverse metering station at Zelzate to allow flows from NL to BE
Project Description
Phase 1 : Add new piping and valves (DN 900) inside Zelzate metering station to allow reverse flow (0.9 mcm/h at 59 bar) Phase 2 : Increase metering capacity (additional metering lines) from GTS to Fluxys to 1.2 mcm/h according to the results of the VTNbis open season



Capacity created in reverse flow	1.2 mcm/h (59 bar)	**Project maturity**	Phase 1 under construction
Capital expenditures	3.9 M€	**Funds breakdown**	Phase 1 : 2009-2010 Phase 2 : 2011
Countries involved	BE, NL	**Commencement of operations**	Phase 1 : end 2010 Phase 2 : 2011

BULGARIA

1 – Reverse flow from Turkey at Malkochlar

Project Goal
Allow reverse flow from Turkey to Bulgaria at Malkochlar interconnection point
Project Description
GMS Malcochlar is not designed for reverse flow. The reverse flow is possible if the check valve is disassembled at the GMS. The measuring should be performed using the volume method Needed investments : build a DN 200 bypass line of the check valve, equipped with 1 turbine gasmeter DN200, 1 filter, 2 valves and 1 control valve (Agreement signed with Botas)

Capacity created in reverse flow		**Project maturity**	
Capital expenditures	0.25 M€	**Funds breakdown**	
Countries involved	Turkey, Bulgaria	**Commencement of operations**	

2 – Increase reverse flow from Turkey to Bulgaria

Project Goal
Increase capacity of transit system and enhance reverse flow from Turkey to Bulgaria
Project Description
Current situation : existing DN 1000 Transit pipeline Bulgaria-Turkey between CS Lozenetz and CS Strandja (20 km single pipeline and 45 km two parallel DN 1000 pipelines) Project : build a 20 km DN 1000 pipeline (loop) In the pipe yard of CS Lozenetz an interconnector exists between the transit pipeline system and the national pipeline system

Capacity created in reverse flow	2.4 mcm/day	**Project maturity**	
Capital expenditures	25 M€	**Funds breakdown**	
Countries involved	Bulgaria	**Commencement of operations**	

3 – Reverse flow from Greece at Kula / Sidirokastron

Project Goal
Improving SoS of Bulgaria by allowing reverse flow from Greece
Project Description
The GMS Strimonohori is not designed for reverse flow. The reverse flow was performed in January 2009 using a newly built bypass measuring line of the GMS reversing the ultrasonic meter at 180° (An agreement signed between DESFA and Bulgartransgaz in January 2009 during the gas crisis)

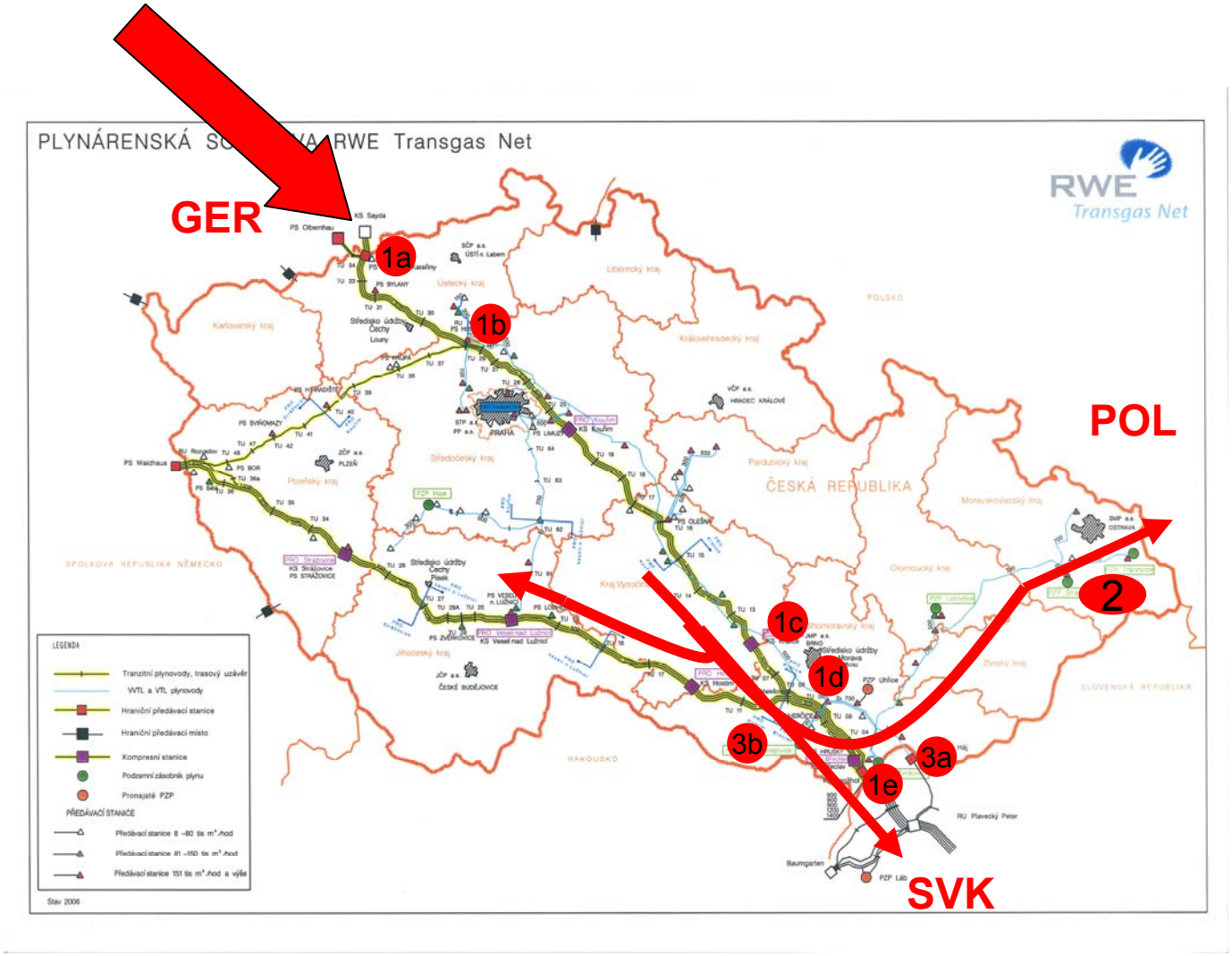
Capacity created in reverse flow	2.4 mcm/day	**Project maturity**	
Capital expenditures		**Funds breakdown**	
Countries involved		**Commencement of operations**	

CZECH REPUBLIC

List of projects

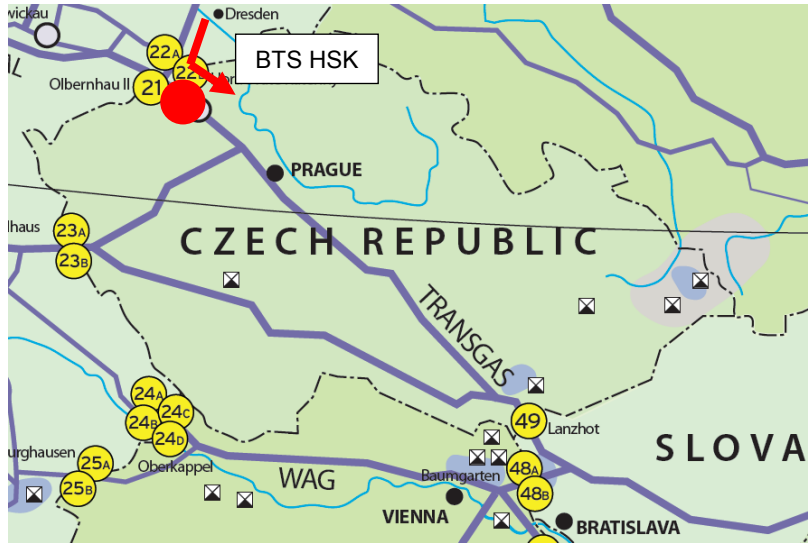
1. Reverse flow capacity increase west – east
   a) Adaptations at BTS Hora Sv. Kateriny
   b) Adaptation of piping at JP Hospozin
   c) Adaptation of piping at CS Kralice nad Oslavou
   d) Adaptation of piping at JP Malesovice
   e) Adaptation of the piping systém of hall I. of CS Breclav enabling gas transmission from the Czech Republic to the Slovak Republic
   f) Adaptation of BTS Lanzhot for west-to-east transmission
2. Czech-Polish interconnector (Project “Stork”)
3. Flexibility increase of gas storage to transit system
   a) UGS Tvrdonice – CS Breclav
   b) UGS D. Dunajovice – CS Břeclav

Summary


PLYNÁRENSKÁ
RWE Transgas Net
RWE
Transgas Net
GER
POL
SVK
1a
1b
1c
1d
1e
2
3a
3b
ČESKÁ REPUBLIKA
LEGENDA

1 a) Adaptations at BTS Hora Sv. Kateriny

Project Goal
Crossborder SoS, increase of reverse flow capacity from existing 16 mcm/d up to 24 mcm/d from Germany (Sayda) to Czech Rep.
Project Description
Modifications of the pipeline system at BTS Hora Sv. Kateriny. Increase of capacity of connecting pipes and capacity of gas flow metering The well defined transportation routes in case of uninterrupted deliveries from Russia do not allow an economic rationale of the project



Capacity created in reverse flow	8 mcm/d	**Project maturity**	Planned
Capital expenditures	0.6 M€	**Funds breakdown**	2010-2011
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2011

1 b) Adaptation of piping at JP Hospozin

Project Goal
Increased capacities from BTS HSK to Waidhaus, using full capacity of DN1000 PN75 from HSK to Hospozín and DN 900 PN 63 from Hospozín – to Rozvadov The project will increase reverse flow capacity and higher flexibility of the transmission system. Without the project the gas flow HSK-Hospozín-Rozvadov using DN900 is not possible due to low pressure at Hospozín
Project Description
Modification of piping system at junction point Hospozin, with gas regulation from 7.35 MPa level at DN1000 to 6.3 MPa level at DN900

Capacity created in reverse flow	up to 15 mcm/d *)	**Project maturity**	Ready for implementation
Capital expenditures	0.7 M€	**Funds breakdown**	2009-2010
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2010

*) Depends on the available pressure at BTS HSK, maximal values are for 7.35 MPa

1 b) Adaptation of piping at JP Hospozin

Time Schedule:

Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Investment decision																
SFPD	done															
Design for Realization																
Material Specification																
Material purchase																
Tender and contract with realizer																
Realization																
Testing, commisioning																

Investment

Engineering	50.000 €
Pipeline	650.000 €
TOTAL	**700.000 €**

1 c) Adaptation of piping at CS Kralice nad Oslavou

Project Goal
Crossborder SoS, increase of existing reverse flow gas compression at CS Břeclav from 25 mcm/d up to 39,5 mcm/d in the direction from H. Sv. Kateřiny (north) to Czech (Moravian UGSs) and further to Waidhaus (Germany) or Lanžhot (Slovakia)
Project Description
Modifications of the pipeline system at CS Kralice. Connection of suction and discharge of compressors to all three pipelines (DN900/I, DN900/II, DN1000). The well defined transportation routes in case of uninterrupted deliveries from Russia do not allow an economic rationale of the project

Capacity created in reverse flow	up to 14,5 mcm/d *)	**Project maturity**	Ready for implementation
Capital expenditures	2.9 M€	**Funds breakdown**	2009-2010
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2010

*) Depends on the available pressure at BTS HSK, maximal values are for 7.35 MPa

1 c) Adaptation of piping at CS Kralice nad Oslavou

Time Schedule:

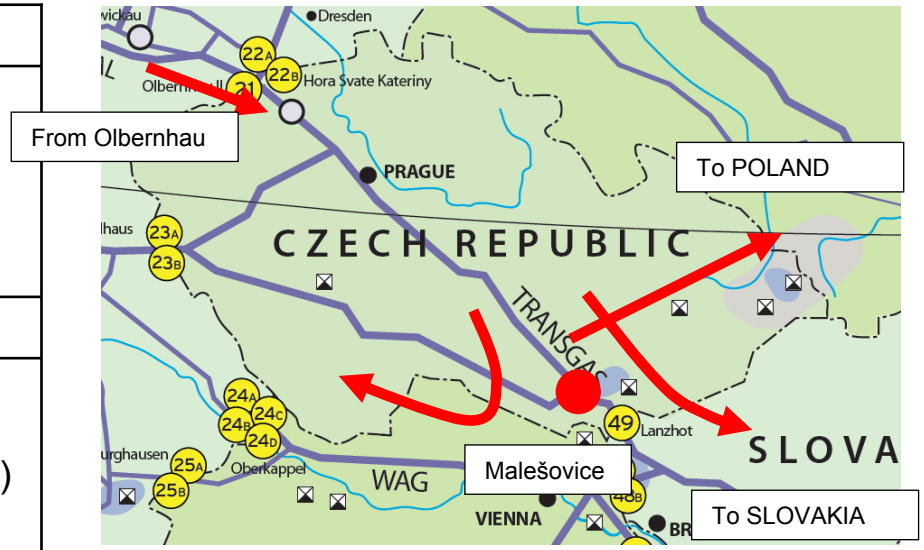
Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Investment decision																
SFPD	done															
Design for Realization																
Material Specification																
Material purchase																
Tender and contract with realizer																
Realization																
Testing, commisioning																

Investment

Engineering	0.3 mio €
Pipeline	1.0 mio €
TOTAL	**2.9 mio €**

1 d) Adaptation of piping at JP Malesovice

Project Goal
Crossborder SoS, increase of existing reverse flow capacity from 25 mcm/d up to 35 mcm/d in the direction from H. Sv. Kateřiny (north) via Malešovice to Waidhaus (Germany) or Lanžhot (Slovakia).
Project Description
Interconnection between DN 1000 and DN 1400 at Malešovice, enabling re-pumping of gas from the DN 1000 (north) line into the DN 1400 (south) line of the transmission system. The well defined transportation routes in case of uninterrupted deliveries from Russia do not allow an economic rationale of the project.



Capacity created in reverse flow	10 mcm/d *)	**Project maturity**	Ready for implementation
Capital expenditures	1.3 M€	**Funds breakdown**	2009-2010
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2010

*) Depends on the available pressure at BTS HSK, maximal values are for 7.35 MPa

1 d) Adaptation of piping at JP Malesovice

Time Schedule:

Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Investment decision																
SFPD	done															
Design for Realization																
Material Specification																
Material purchase																
Tender and contract with realizer																
Realization																
Testing, commisioning																

Investment

Engineering	0.3 mio €
Pipeline	1.0 mio €
TOTAL	**1.3 mio €**

1 e) Adaptation of the piping systém of hall I. of CS Breclav enabling gas transmission from the Czech Republic to the Slovak Republic

Project Goal
Crossborder SoS, reverse flow gas compression at CS Břeclav (from Czech to Slovakia).
Project Description
The modifications of the pipe yard at Břeclav CS enable RWE TGN. In case of cut of supplies through Ukraine this would allow the transport of significant amounts direction Slovakia. The well defined transportation routes in case of uninterrupted deliveries from Russia do not allow an economic rationale of the project.

Capacity created in reverse flow	15 mcm/d	**Project maturity**	Ready for implementation
Capital expenditures	0,5 M€	**Funds breakdown**	2009-2010
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2010

1 e) Adaptation of the piping systém of hall I. of CS Breclav enabling gas transmission from the Czech Republic to the Slovak Republic

Time Schedule:

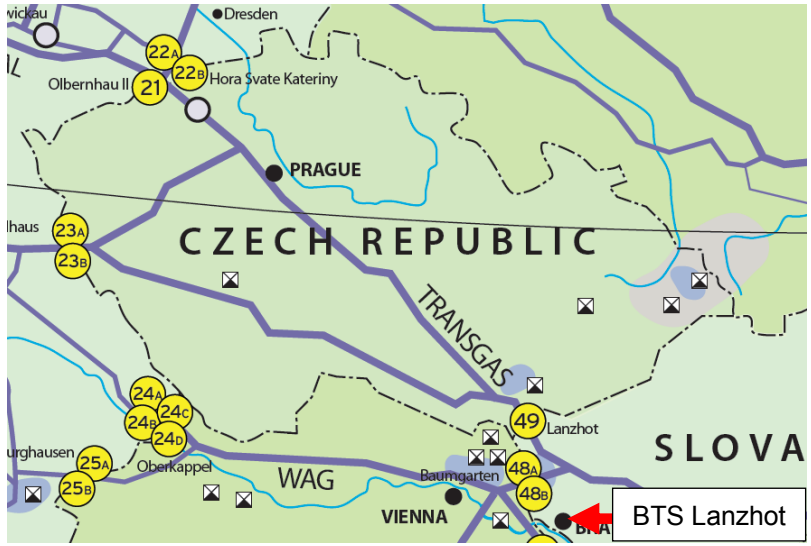
Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Investment decision																
Design for Realization																
Material Specification																
Material purchase																
Tender and contract with realizer																
Realization																
Testing, commisioning																

Investment

CS Breclav 0.50 mio €

1 f) Adaptation of BTS Lanzhot for west-to-east transmission

Project Goal
Crossborder SoS, reverse flow gas compression at BTS Lanžhot (from Czech to Slovakia).
Project Description
The modifications of metering facilities at BDS Lanžhot enable RWE TGN. In case of cut of supplies through Ukraine this would allow the transport of significant amounts direction Slovakia. The well defined transportation routes in case of uninterrupted deliveries from Russia do not allow an economic rationale of the project.



Capacity created in reverse flow	28 mcm/d	**Project maturity**	Ready for implementation
Capital expenditures	1.35 M€	**Funds breakdown**	2009-2010
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2010

1 f) Adaptation of BTS Lanzhot for west-to-east transmission

Time Schedule:

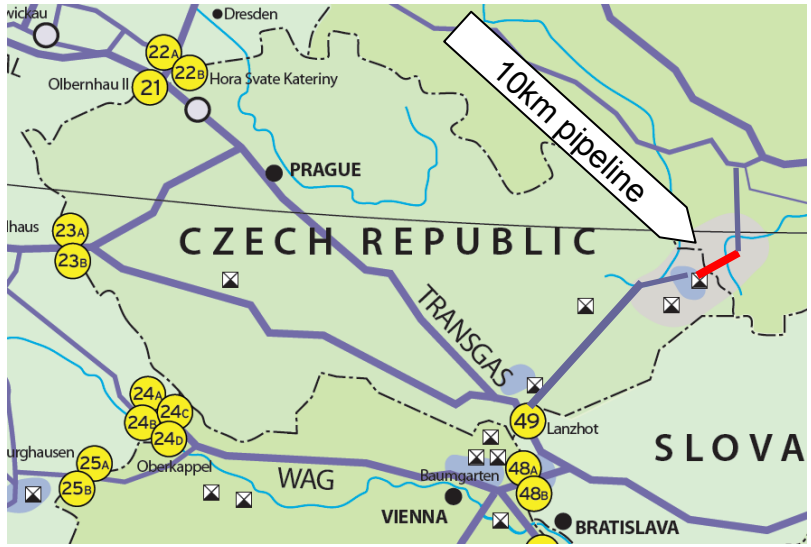
Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Investment decision																
Design for Realization																
Material Specification																
Material purchase																
Tender and contract with realizer																
Realization																
Testing, commisioning																

Investment

BTS Lanzhot 1.35 mio €

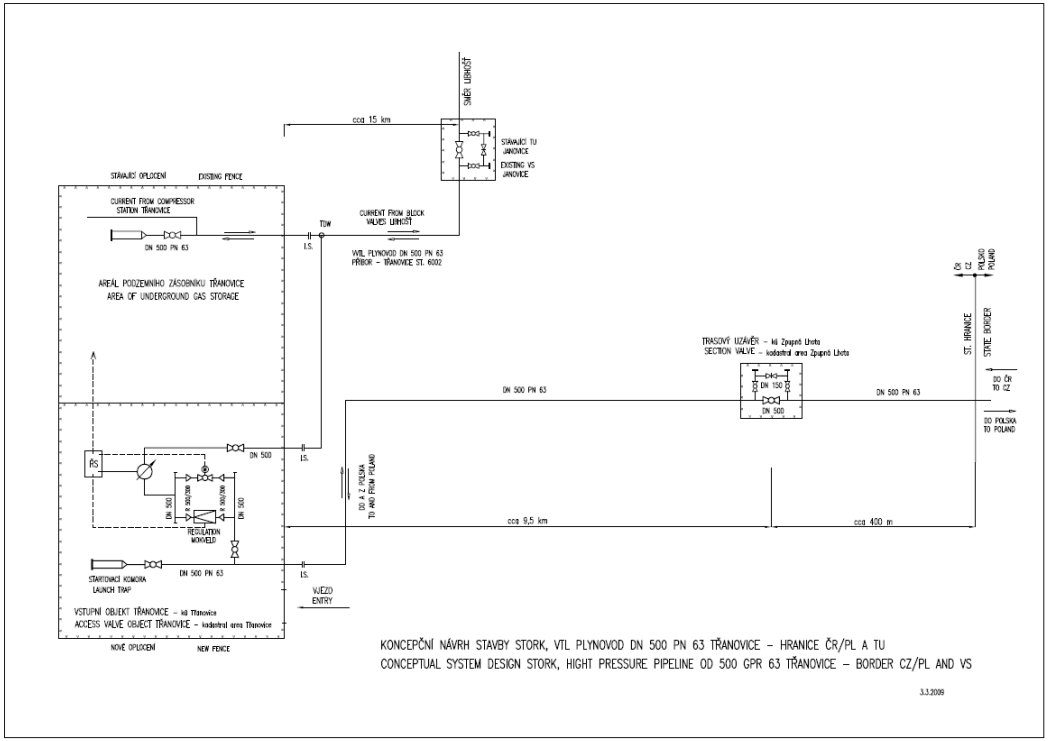
2. Interconnector Czech Republic – Poland

Project Goal
Create interconnection between Poland and Czech Republic on high pressure level. Increased safety of supply in Poland, region North Silesia. Development of North-South connection.
Project Description
Phase I: 10 km of new pipeline DN500 PN63 at CZ, joint project with Poland (ca. 22km of pipeline and a transfer station at PL side). 500 mcm/a in direction CZ --> PL; In emergency situations also 1,6 mcm/d in direction CZ --> PL. Phase II. requires massive investment at both sides, capacity 2-3 bcm/a, ready after 2020



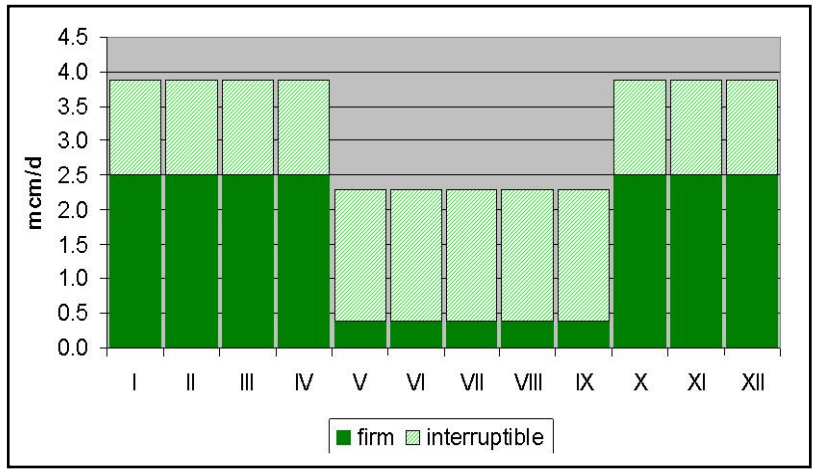
Capacity created in reverse flow	500 mcm/a CZ <-> PL	**Project maturity**	Construction in 2010
Capital expenditures	7 mio €	**Funds breakdown**	Pipeline 6 mio € Engineering 1 mio €
Countries involved	Czech, Poland	**Commencement of operations**	2010

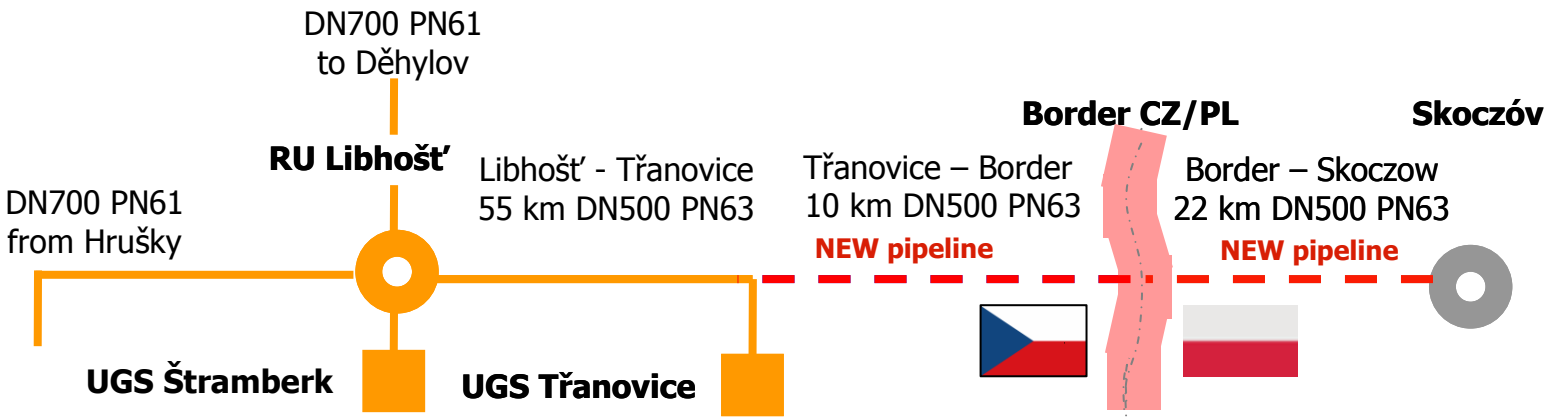
2. Interconnector Czech Republic – Poland



Available capacities:

- Limited capacity 0,5 mcm/d in summer during injection to UGS Třanovice;
- 2,5 mcm/d firm capacity in winter;
- direction CZ <-> PL; 500 mcm/a;

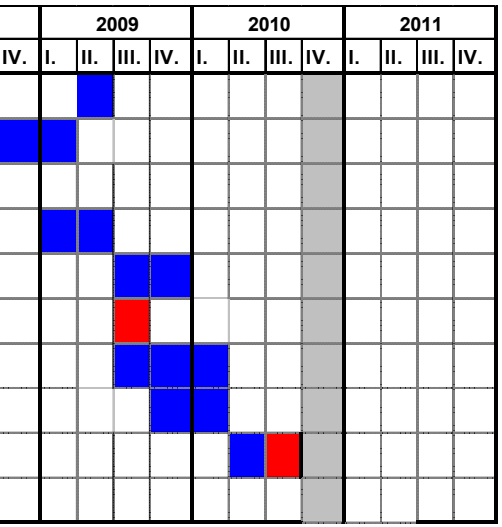




2. Interconnector Czech Republic – Poland

Time Schedule for Phase I:

Milestones / Time Period	Start	End
Open Season process	Mar 07	Oct 07
Easements acquisition	-	Aug 09
Land Permission Design		Sep 07
Technical specifications valves, pipes		
Construction Permit	Feb 09	Aug 09
Investment Decision		March 09
Purchase Process for valves & pipes	March 09	Oct 09
Tender Process for General Contractor	March 09	Oct 09
Construction & Commissioning	July 07	June 10
Commissioning		Oct 2010

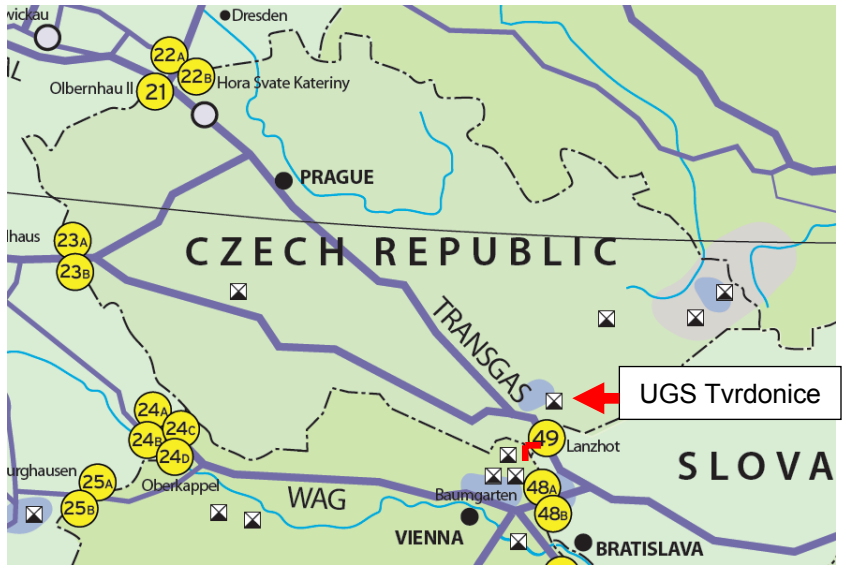


Investment Schedule

Engineering	1 Mio Euro
Pipeline	6 Mio Euro
TOTAL	**7 Mio Euro**

3 a) Flexibility increase of gas storage to transit system (UGS Tvrdonice – CS Breclav)

Project Goal
Crossborder SoS, UGS connection to transit system.
Project Description
3,2 km of new pipeline DN1000 PN75 to connect UGS Tvrdonice (extended, 200 mcm of new storage capacity) directly to transit system and increase daily injection and withdrawal capacities. Increase of the security of supplies in the direction east-west (H. Sv. Kateřiny – Waidhaus / Lanžhot. The well defined transportation routes in case of uninterrupted deliveries from Russia do not allow an economic rationale of the project.



Capacity created in reverse flow	10 mcm/d	**Project maturity**	Ready for implementation
Capital expenditures	4.6 M€	**Funds breakdown**	2009-2010
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2010

3 a) Flexibility increase of gas storage to transit system (UGS Tvrdonice – CS Breclav)

Time Schedule for Phase I:

Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Routing study																
SFPD																
EIA																
Design for Land Permission																
Land Permission																
Easements																
Design for Building Permit																
Building permit																
Design for Realization																
Material Specification																
Material purchase																
Investment decision																
Tender and contract with realizer																
Mobilization																
Erection																
Testing, commisioning																

Investment Schedule

Engineering	0.6 Mio Euro
Pipeline	4.0 Mio Euro
TOTAL	**4.6 Mio Euro**

3 b) Flexibility increase of gas storage to transit system (UGS Dolni Dunajovice – CS Breclav)

Project Goal
Crossborder SoS, connection of UGS Dolni Dunajovice directly to the transmission system of RWE Transgas Net.
Project Description
New pipeline from Dolní Dunajovice to to CS Břeclav. Parameters of pipeline: DN 700 Dolní Dunajovice→ CS Břeclav - 41km

Capacity created in reverse flow	16 mcm/d	**Project maturity**	Running
Capital expenditures	36 M€	**Funds breakdown**	2009-2011
Countries involved	Czech Republic, Germany, Slovakia	**Commencement of operations**	Q4/2011

Gas Transmission Europe

3 b) Flexibility increase of gas storage to transit system (UGS Dolni Dunajovice – CS Breclav)

Time Schedule for Phase I:

Milestones / Time Period	2009				2010				2011				2012			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Routing study	done															
EIA																
Design for Land Permission																
Easements																
Land Permission																
Design for Building Permit																
Building permit																
Design for Realization																
Material Specification																
Material purchase																
Investment decision																
Tender and contract with realizer																
Mobilization																
Erection																
Testing, commisioning																

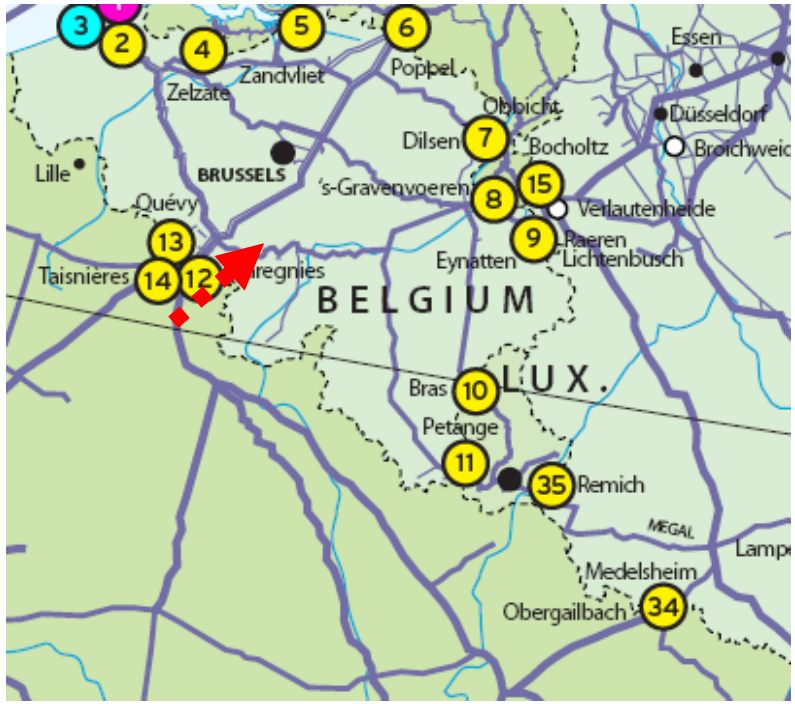
Investment Schedule

Engineering	1 Mio Euro
Pipeline UGS DD – BTS ÖT/CZ	18 Mio Euro
Pipeline BTS ÖT/CZ – CS Břeclav	10 Mio Euro
Border Transfer Station	7 Mio Euro
TOTAL	**36 Mio Euro**

FRANCE

1 – Taisnières H - Existing facilities

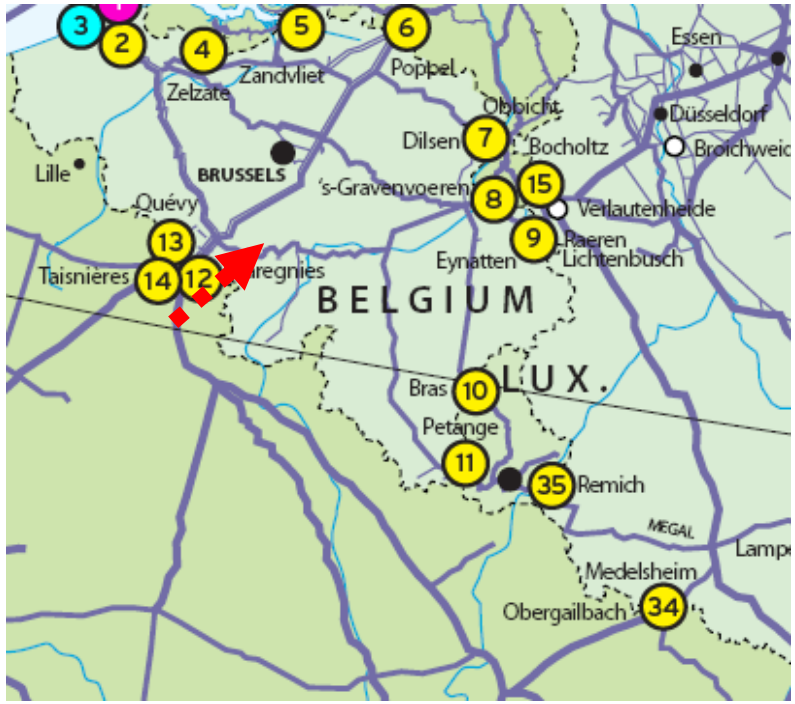
Project Goal
Existing reverse flows capacities
Project Description
GRTgaz has already adapted the interconnexion of Taisnières in order to allow reverse flows of up to a maximum of 1 000 000 (n) m^3/h NB1 : natural gas is odorised NB2 : quantities available at the border for physical reverse flow may be lower, depending on the gas balance in Zone Nord of France



Capacity created in reverse flow	Up to 1.10^6 (n) m^3/h of odorised gas (about 55 bar)	**Project maturity**	implemented
Capital expenditures	–	**Funds breakdown**	–
Countries involved	France, Belgium	**Commencement of operations**	In operation

2 – Taisnières H - Gas treatment

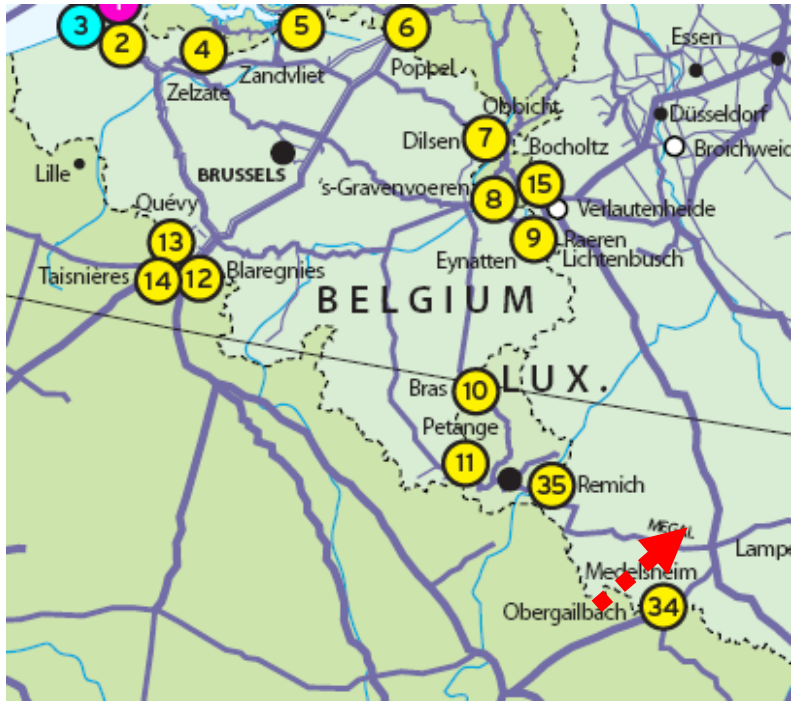
Project Goal
Treatment of natural gas in order to remove THT (odorant used in France)
Project Description
GRTgaz has started a project to confirm the technical feasibility of treatment equipment to remove THT A small scale pilot plant has been tested : • a process is available but very expensive • it is not sure that gas quality will meet standards for Belgium • capacity is limited



Capacity created in reverse flow	300 000 (n) m^3/h (60 bar)	**Project maturity**	Pre-feasibility studies
Capital expenditures	167 €/m^3/h of capacity	**Funds breakdown**	2010-11-12
Countries involved	France, Belgium	**Commencement of operations**	Not decided (Q4 2012 at the best)

3 – Obergailbach - Existing facilities

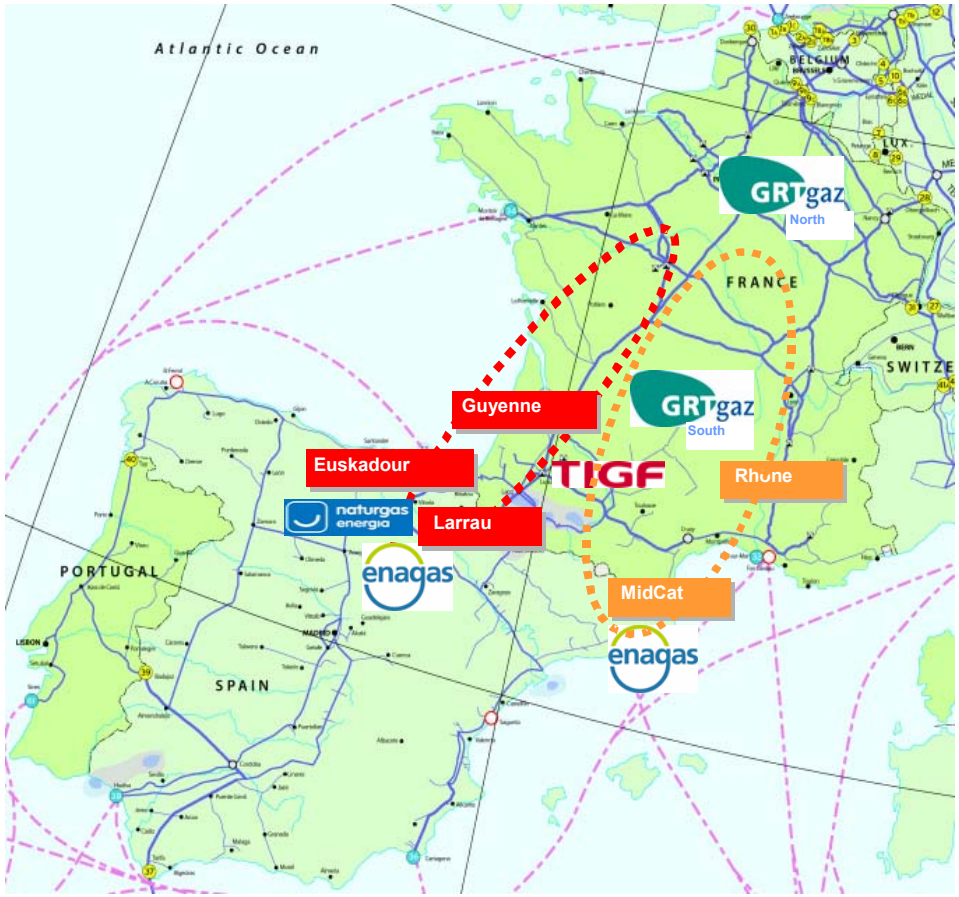
Project Goal
Existing reverse flows capacities
Project Description
GRTgaz has adapted the interconnexion of Obergailbach in order to allow reverse flows of up to 300 000 (n) m^3/h This capacity is not available in winter conditions (ie average temperature < 3°C) NB : natural gas is odorised



Capacity created in reverse flow	300 000 (n) m^3/h of odorised gas (65 bar)	**Project maturity**	implemented
Capital expenditures	–	**Funds breakdown**	–
Countries involved	France, Germany	**Commencement of operations**	In operation

4. France ↔ Spain interconnections

- Coordinated investments by GRTgaz, TIGF (France) and Enagás (Spain) → look at Spain section



GERMANY

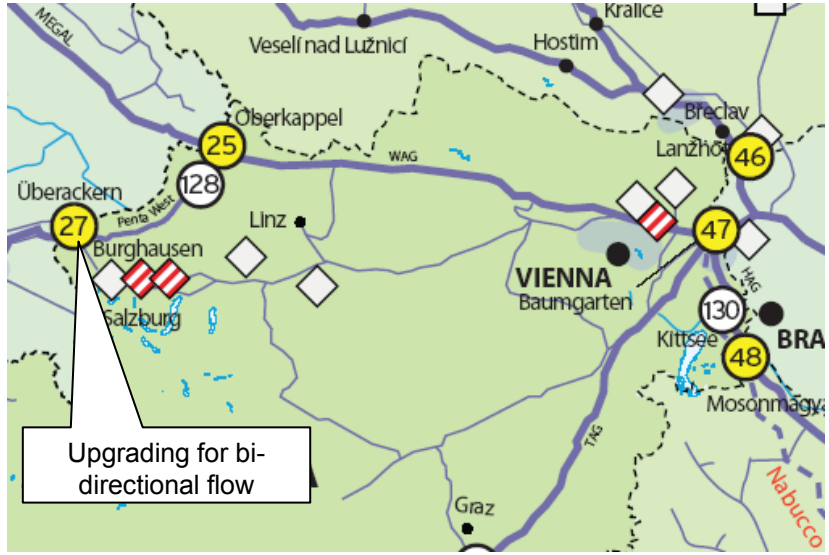
E.ON Gastransport : North-South de-bottlenecking

Project Goal
Numerous capacity expansion projects, including major north-south de-bottlenecking. This improves transport capacity via Austria to South-East Europe.
Project Description
Two loop pipelines: From Sannerz in Hesse to Rimpar in Lower Franconia and at the MEGAL pipeline system to Austria; as well as numerous modifications of stations and installations The project is the result of open season procedure (details: www.eon-gastransport.com). The measures serve European security of supply; investment decision was taken despite regulatory uncertainty about treatment of investments

New capacity (overall new capacities of projects)	Austria : 4742 MW (Exit: approx. 18000 MW Entry: approx. 11000 MW)	**Project maturity**	Investment decision taken
Capital expenditures	approx. 400 M€	**Funds breakdown**	2009-2012
Countries involved	Germany, Austria	**Commencement of operations**	part 2011, part 2012

Wingas Transport : Upgrading the import grid point "Überackern"for bi-directional use

Project Goal
See project description
Project Description
Support the reverse flow ability of grid connection point "Überackern"



New capacity	0.3 mcm/h at 70 bar	**Project maturity**	Planned
Capital expenditures		**Funds breakdown**	
Countries involved	Germany, Austria	**Commencement of operations**	Q1/2011

HUNGARY

List of projects

1. Reverse flow connections and flow control systems at Városföld node
2. New flow control system at Pilisvörösvár node
3. New flow control system at Adony node
4. New flow control system at Algyő
5. New flow control system at Vecsés node

List of projects

1 – Városföld node modification

Project Goal
Help to cover the demand for capacity in the domestic transmission and transport of gas towards Serbia, Bosnia Herzegovina, Romania and later towards Croatia
Project Description
Modifications of the pipeline system at compressor station and node Városföld (reverse flow connections and flow control systems), which enables the delivery of gas in the direction West-East and West-South The project involves some flow, pressure regulations and new pipeline connections, which enables the reverse compressed gas flow

Capacity created in reverse flow	1.0 mcm/h at 63 bar	**Project maturity**	Under decision
Capital expenditures	5,5 M€	**Funds breakdown**	2010
Countries involved	Hungary	**Commencement of operations**	2011

2 – Pilisvörösvár node modification

Project Goal
New flow control system at Pilisvörösvár node
Project Description
Flow control and pressure control equipments have been constructed at Pilisvörösvár node This project will allow the gas flow regulated way to Alag and/or Százhalombatta

Capacity created in reverse flow	8-9 mcm/d at 50 bar	**Project maturity**	Under decision
Capital expenditures	3.5 M€	**Funds breakdown**	2010
Countries involved	Hungary	**Commencement of operations**	2011

3 – Adony node modification

Project Goal
Reverse flow connections and flow control systems at Adony node
Project Description
Modifications the pipeline system at node Városföld, which enables the transmission system to deliver gas in the direction West-East and West-South (Városföld, Papkeszi and Dunaújváros). The project contains some flow, pressure regulations and new pipeline connections, which enables to reverse gas flow The project will help to cover the demand for domestic transmission capacity

Capacity created in reverse flow	14 mcm/d at 50 barg	**Project maturity**	Under decision
Capital expenditures	2,5 M€	**Funds breakdown**	2010
Countries involved	Hungary	**Commencement of operations**	2011

4 – Algyő node flow control system

Project Goal
New flow control system at Algyő node
Project Description
New flow control system has to be built at Algyő node. The project will help to mix the Algyő production into the Romanian transit gas flow. The gas quality parameters has to maintain according to the Romanian standards

Capacity created in reverse flow	3 mcm/d at 50 bar	**Project maturity**	Under decision
Capital expenditures	2,1 M€	**Funds breakdown**	2010
Countries involved	Hungary	**Commencement of operations**	2011

5 – Vecsés node flow control system

Project Goal
New flow control system at Vecsés node
Project Description
Flow and pressure control equipments have to be constructed at Vecsés node This project will allow the gas flow regulated way from Vecsés to Hajdúszoboszló and vice versa

Capacity created in reverse flow	3,6 mcm/d at 50 bar	**Project maturity**	Under decision
Capital expenditures	1.5 M€	**Funds breakdown**	2010
Countries involved	Hungary	**Commencement of operations**	2010

Time schedule

Milstone / Time period	2009				2010				2011			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Feasibility study												
Capacity and hydraulic study		■										
Cost estimation		■										
Project approval												
EERP decision about the subsidy				■								
Investment decision					■							
Company approval					■							
Hungarian Energy Office licence						■						
Public procurement												
Design and construction							■					
Project realization												
Design for construction permit								■	■			
Consrtuction permit									■	■		
Material specification								■				
Material purchase								■	■			
Mobilization									■			
Construction									■	■	■	■
Testing and comission												■

Slovak-Hungary Interconnection pipeline

Project Goal
New interconnection pipeline between Hungary and Slovakia allowing a diversification of gas supplies for Hungary and neighbouring countries and more stable gas supplies to end-customers
Project Description
New DN800 interconnection between Hungary and Slovakia between FGSZ and EUSTREAM pipeline system and a compressor station Gas will flow from Slovakia in reverse flow, from Hungaria from Nabucco pipeline and later from Adria/Krk LNG terminal Planned capacity : 14,4 million Ncm/day

Capacity created in reverse flow	14.4 mcm/d at 40 bar	**Project maturity**	Under decision
Capital expenditures	120-130.0 M€ (preliminary)	**Funds breakdown**	?
Countries involved	Slovakia, Hungary	**Commencement of operations**	2012-2013

ITALY

1 – Additional capacity at Tarvisio exit point

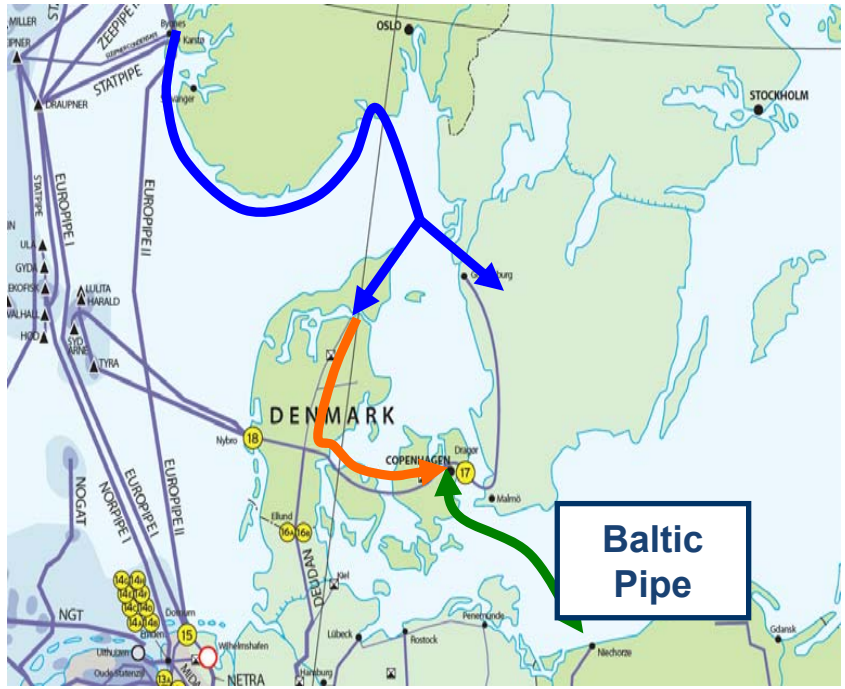
Project Goal
Increase existing export capacity from Italy to Austria at Tarvisio exit point
Project Description
Adjustments of piping in the ISTRANA compressor station to allow the compression of gas in both directions This intervention would make available at Tarvisio exit point approximately 30 million Sm³/d in addition to the 9 million Sm³/d offered today

Capacity created in reverse flow	~ 40 mil Sm³/d	**Project maturity**	Planned
Capital expenditures	15 M€	**Construction time**	18 months
Countries involved	Italy	**Commencement of operations earliest**	Q1/2011

POLAND

1 – Poland-Denmark Connection

Project Goal
Integration of gas systems in order to diversify and ensure stable gas supplies to end customers Increasing safety of systems and markets
Project Description
Offshore pipeline: 260-290 km Onshore pipeline: ca. 45 km DK Entry/Exit Point: Avedore PL Entry/Exit Point: Płoty (base) – Alternative PL Entry/Exit Point possible depending on final route Forward and reverse flow enabled Commercial flow PL → DK should be possible earlier (2015) depending on the source of gas in Poland DK investment: 2 km pipeline and compressor station



Capacity created in reverse flow	DK → PL : 9 mcm/d PL → DK : 3-7,5 mcm/d	**Project maturity**	EIA ongoing
Capital expenditures	450 M€	**Funds breakdown**	
Countries involved	Poland, Denmark	**Commencement of operations**	Dependent on market demand – not earlier than 2013

2 – Poland-Czech Rep. Connection – Phase I

Project Goal
Integration of gas systems in order to diversify and ensure stable gas supplies to end customers Increasing safety of systems operations
Project Description
Phase I : 500 mm, 6,3 MPa pipeline Length: PL: ca. 22 km Transfer station near Cieszyn: ca. 500 mcm/a Capacity CZ → PL: up to 2,5 mcm/d Capacity PL → CZ: up to 1-1,6 mcm/d

Capacity created in reverse flow	PL → CZ : up to 1,6 mcm/d	**Project maturity**	Construction in 2010
Capital expenditures	21 M€	**Funds breakdown**	Pipeline: 18 M€ Transfer station: 3M€
Countries involved	Poland, Czech Republic	**Commencement of operations**	2010

2 – Poland-Czech Republic Connection – Phase II

Project Goal
Integration of gas systems in order to diversify and ensure stable gas supplies to end customers Increasing safety of systems markets
Project Description
Phase II : 500 mm, 6,3 MPa pipeline Length: PL: ca. 130 km Transfer station: ca. 2-3 bcm/a

Capacity created in reverse flow	2-3 bcm/a	**Project maturity**	Study phase
Capital expenditures	106 M€	**Funds breakdown**	Pipeline: 71 M€ Compressor St: 33 M€ Transfer station: 2 M€
Countries involved	Poland, Czech Republic	**Commencement of operations**	Dependent on market demand

3 – Poland-Germany Connection

Project Goal
Integration of gas systems in order to ensure stable gas supplies to end customers Increasing safety of systems operations
Project Description
Phase I : 500 mm, 6,3 MPa, ca. 105 km new pipeline 400 mm, 5,5 MPa, ca 53 km upgrading Transfer station : ca. 500 mcm/a Capacity D → PL: up to 1,5 mcm/d Phase II : Compressor station Transfer station : ca. 0,5 bcm/a Capacity D → PL: up to 1,5 mcm/d

Capacity created in reverse flow	ca 0,5+0,5 bcm/a	**Project maturity**	Engineering ongoing
Capital expenditures	60+16 M€	**Funds breakdown**	
Countries involved	Poland, Germany	**Commencement of operations**	Phase I: 2011 Phase II: 2015

ROMANIA

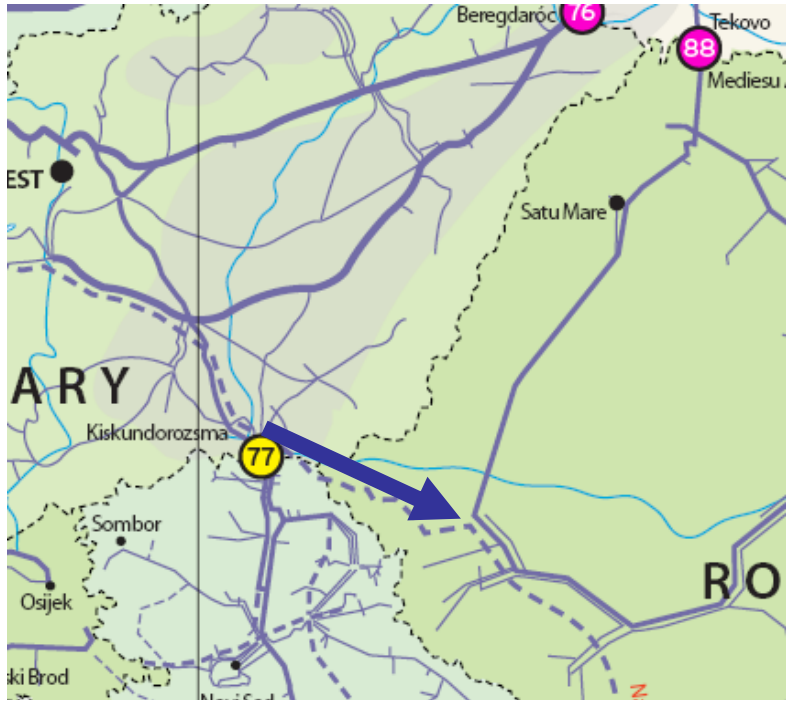
1 – Interconnection between the Romanian and Bulgarian Gas Transmission Systems

Project Goal
Construction of a new interconnection pipeline between the Bulgarian and Romanian Gas Transmission Systems
Project Description
New interconnection pipeline planned between Russe (Bulgaria) and Giurgiu (Romania), undercrossing the Danube river – approx. 15 km in DN 500 (pre-feasability study under progress by Transgaz & Burgartransgaz) Metering stations will allow for reverse flow measurement

Capacity created in reverse flow	1.5 bcm/a	**Project maturity**	Feasability study
Capital expenditures	Depending on results of study	**Funds breakdown**	2010-2011
Countries involved	Romania, Bulgaria	**Commencement of operations**	Depending on results of study

2 – Interconnection pipeline between the Romanian and Hungarian transmission systems

Project Goal
Construction of a new interconnection pipeline between the Hungarian and Romanian gas transmission systems
Project Description
The new pipeline will have a diameter of DN 700 and a total length of 109 km (62 kim in Romania – out of which 36 km are achieved – and 47 km in Hungary) A meter run will also be constructed at Csanadpalota (at the Hungarian-Romanian border) Design pressure is 63 bar



Capacity created in reverse flow	max. 4.4 bcm/a	**Project maturity**	Under development
Capital expenditures	12 M€	**Funds breakdown**	2009
Countries involved	Romania, Hungary	**Commencement of operations**	2010

3 – Technical solution for supplying Bulgaria from the Romanian transmission system

Project Goal
Create a technical possibility to supply Bulgaria with natural gas from the Romanian transmission system in crisis situations
Project Description
Short interconnection between the Romanian national transmission system and the transit pipeline towards Bulgaria (downstream Isaccea) In crisis situations, gas could be directed from Silistea compressor station via the Romanian system (in reverse flow), through this interconnection into the transit pipeline towards Bulgaria Works include an extension of the Silistea compressor station, adapting the technical installation to allow compression in reverse flow, and building the interconnection and a metering station with two meter runs

Capacity created in reverse flow	2.6 mcm/d	**Project maturity**	Planned
Capital expenditures	approx. 2 M€	**Funds breakdown**	2010-2011
Countries involved	Romania, Bulgaria	**Commencement of operations**	Yet unknown

3 – Technical solution for supplying Bulgaria from the Romanian transmission system

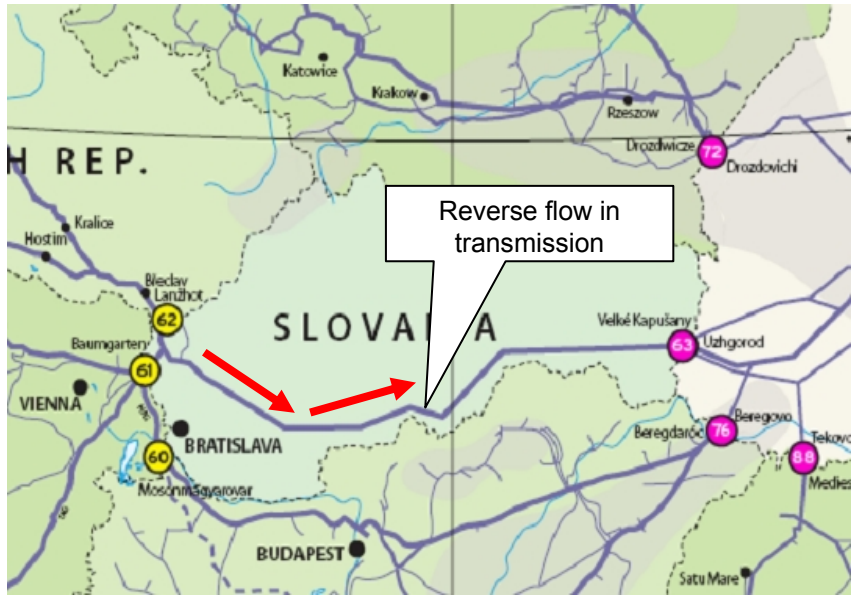
Romania – Bulgaria reverse flow project on Romanian territory at GMS Isaccea

- Reverse flow should be performed from the Romanian National Transmission System to Transit 1 (Ukraine-Bulgaria) pipelines supplying natural gas from Romania to Bulgaria in case of flow disruption from Ukraine
- Technical aspect : reverse flow is possible by constructing an interconnection between the Romanian National Transmission System and Transit 1 at GMS Isaccea
- Needed investments : one additional compressing unit and adjustments of the technical installation in the Silistea compression station, DN 200 interconnection, equipped with 2 parallel meter runs (2 ultrasonic gasmeter DN200, 2 filters, 9 valves and 1 control valve)
- Expected capital investment : approx. 2 M€

SLOVAKIA

1 – Bi-directional flow in transmission system

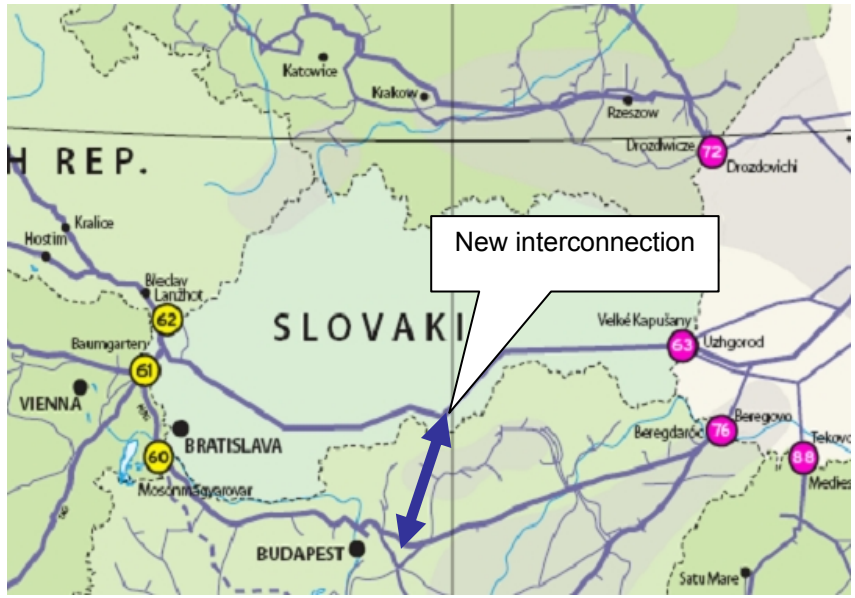
Project Goal
Enabling reverse flow in Slovak gas transmission system
Project Description
The modifications of the pipe yards, adding appropriate technologies at the 3 compressor stations and solution of backhaul volume measurement in order to enable eustream to transport gas in reverse direction, i.e. from Czech republic and from Austria. In case of cut of supplies in Ukraine this would allow the transport of significant volumes from other sources to Slovakia and, after finalization of connection to Hungary, also to other countries



Capacity created in reverse flow	60.0 mcm/day at 56 barg	**Project maturity**	In preparation
Capital expenditures	3.5 M€	**Funds breakdown**	2009
Countries involved	Slovak republic	**Commencement of operations**	2010

2 – Connection Slovakia – Hungary (Slovak part)

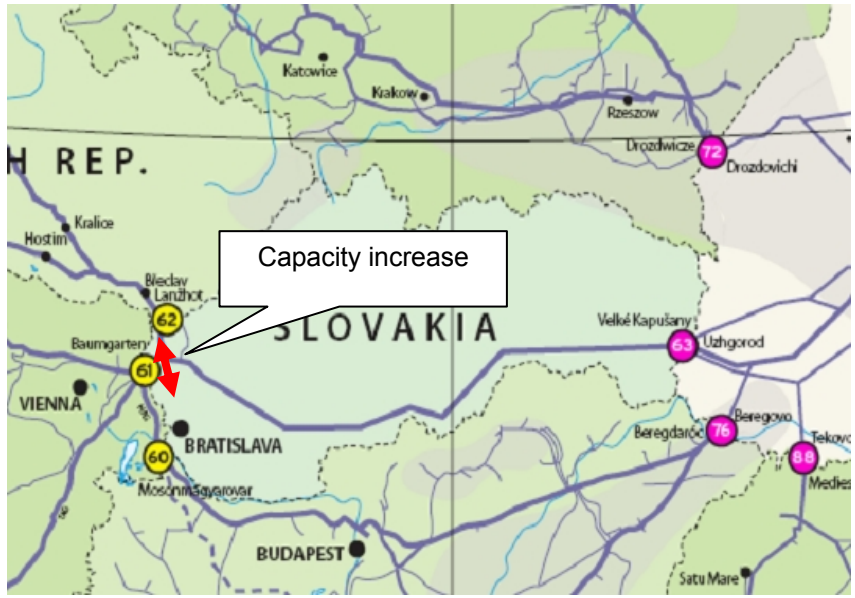
Project Goal
Construction of a pipeline connecting Slovak gas transmission system with Hungarian gas transmission system
Project Description
Connecting the transmission systems will enhance security of supply and enable transport of gas from west to Hungary or from south (storages, Nabucco or LNG Krk) through Hungary to Slovakia The connection is to have a compressor station, border metering station and be of a bi-directional capacity. The Slovak part is of a length up to 20 km



Capacity created in reverse flow	30 mcm/day	**Project maturity**	Planning
Capital expenditures	Slovakia 20 M€	**Funds breakdown**	2009
Countries involved	Slovak republic, Hungary	**Commencement of operations**	2012

3 – Capacity increase of Lab storage connection

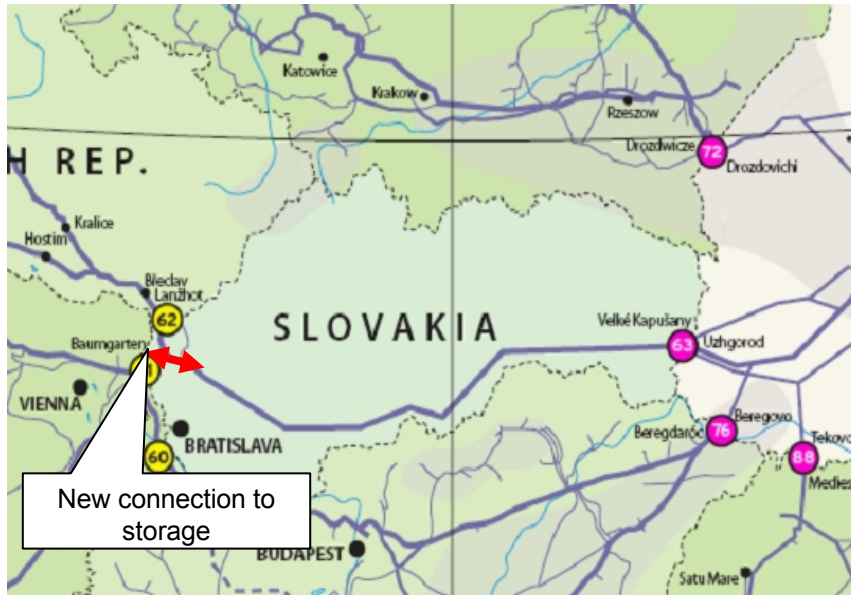
Project Goal
Increase of the daily capacity in a connection between underground storage Lab and eustream transmission system
Project Description
The daily withdrawal capacity in a pipe connecting the underground storage Lab and the eustream transmission system is not sufficient to supply Slovak gas market and storage customers from neighboring countries during the gas crisis despite the fact that there were sufficient volumes of gas in a storage The goal of the project is de-bottleneck the storage/transmission connecting pipeline



Capacity created in reverse flow	4 mcm/day	**Project maturity**	In implementation
Capital expenditures	0.4 M€	**Funds breakdown**	2009
Countries involved	Slovak republic	**Commencement of operations**	2010

4 – New connection to storage Gajary-Baden

Project Goal
Construction of a connection between the new underground storage Gajary-Baden and eustream transmission system
Project Description
The current pipe connecting the complex of underground storages is limited The project will connect the new storage Gajary-Baden with eustream transmission system and allow to supply Slovak gas market and neighboring countries from the new Gajary-Baden underground storage with significant daily volumes up to 22 mcm/day

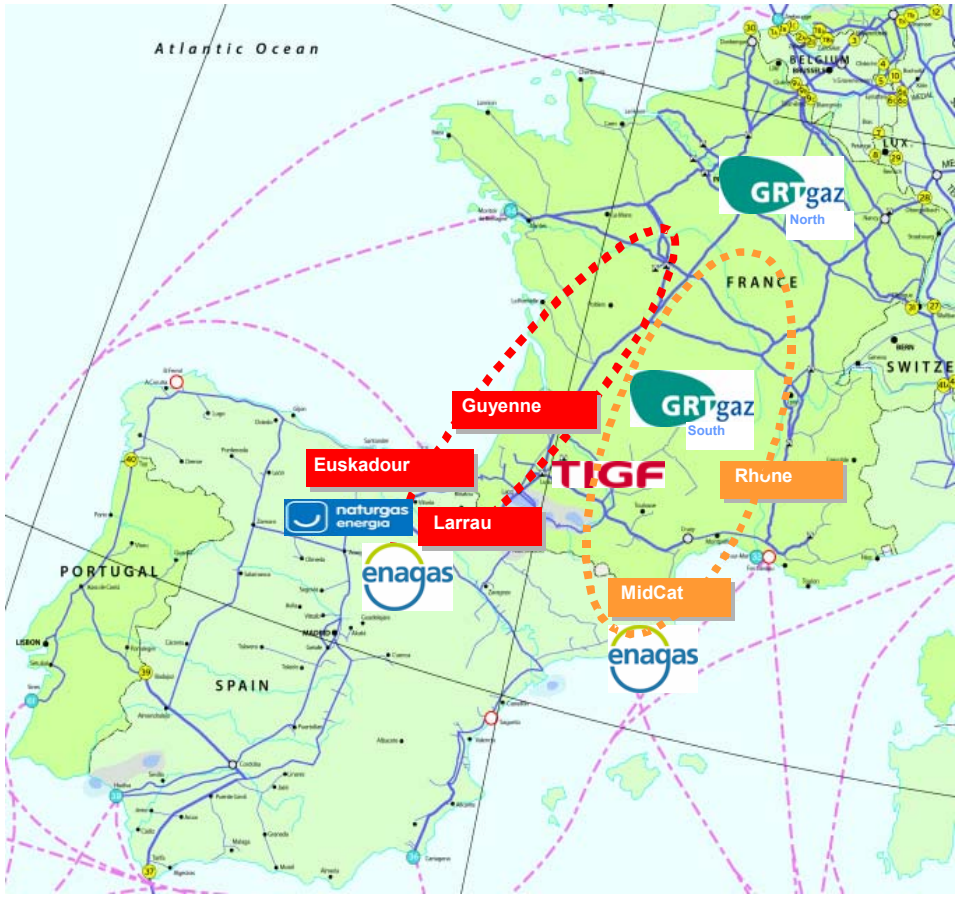


Capacity created in reverse flow	22 mcm/day	**Project maturity**	In preparation
Capital expenditures	9 M€	**Funds breakdown**	2009
Countries involved	Slovak republic	**Commencement of operations**	2011

SPAIN

Spain ↔ France interconnections

- Coordinated investments by GRTgaz, TIGF (France) and Enagás (Spain)



Spain ↔ France interconnections

Project goal

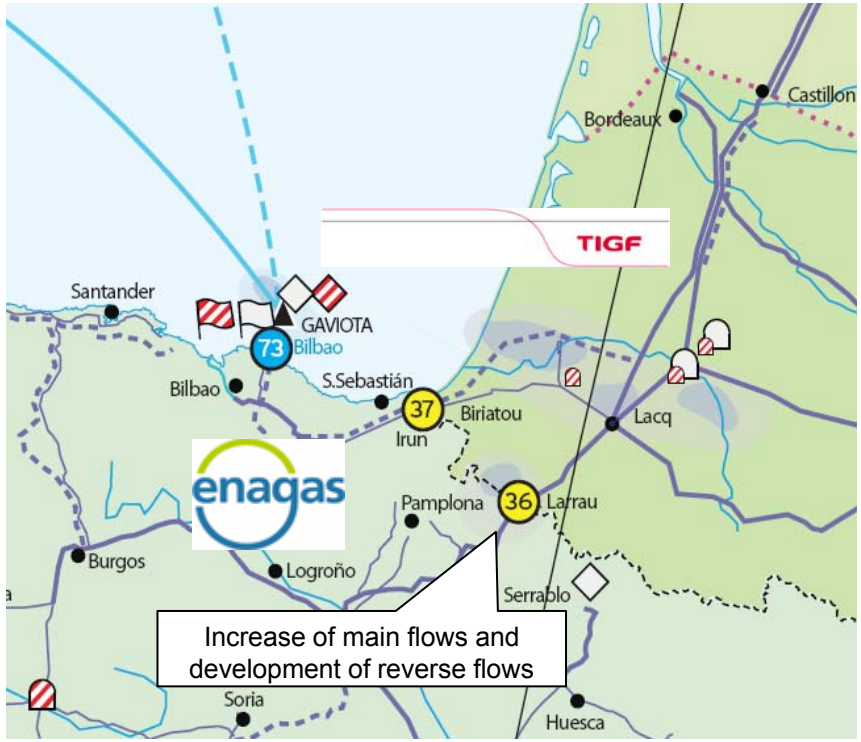
- Increase of main existing and new flows and development of the reverse flows between France and Spain through Larrau / Biriatou and Perthus interconnection points

Project description

- Nowadays there is only one existing flow direction developped : from North to South
- The aim is to develop the existing capacity in both directions at the existing interconnection points (Larrau and Biriatou) and create new capacity in both directions in the new interconnection points (Perthus)
- In this frame different developments are envisaged between Spain and France :
  - Western corridor : increasing existing interconnections (2013)
  - Eastern corridor : building a new interconnection (2015)
- Through two differents capacity comercial methodologies (Open Subscription Period and Open Season) for this two developments, LNG and Algerian gas will be able to arrive into Europe and consequently will contribute to reduce Northern Europe dependance on Russian gas, increasing Europe‘s DoS and SoS. On the other side, Spain will benefit from gas coming from Northern Europe and increase its DoS
- For more detail information please see : http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_INITIATIVES/GRI/South

1 – Larrau reverse flow

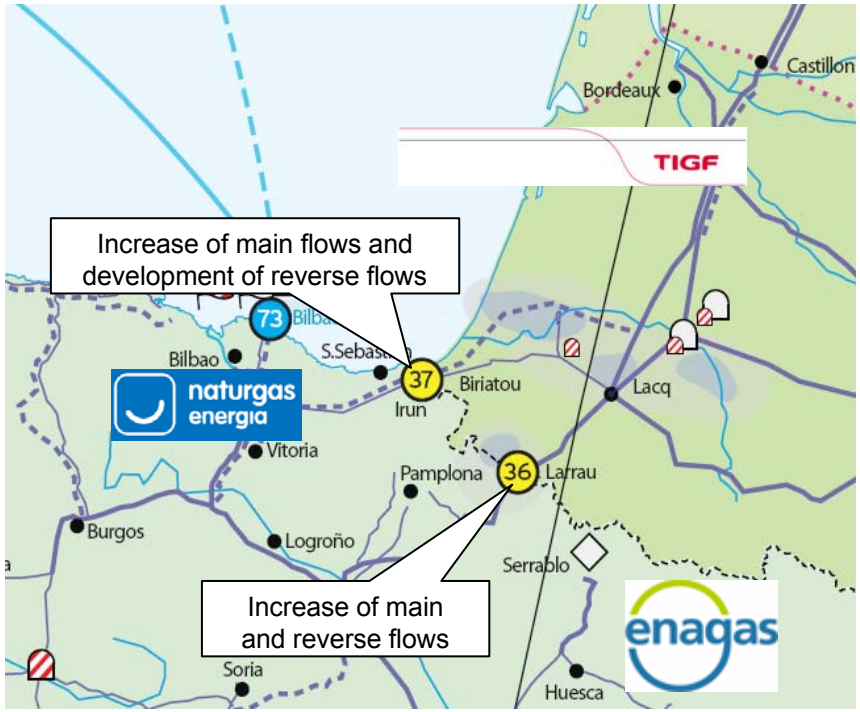
Project Goal
Increase of main flows and development of reverse flow between France and Spain through the Larrau interconnection point
Project Description
The existing Larrau interconnection point allows flows from France to Spain. This project will increase flows from France to Spain at a first phase (1st April 2009), at a second stage (1st November 2010) reverse flow will be available, and at a third stage (4th Q2012) the reserve flow will be increased. The reverse flow project requires: duplication of Tivissa-Paterna pipeline, duplication of Tivissa-Castelnou pipeline, reversibility of flow in TIGF network, pipeline Zarza de Tajo-Villar de Arnedo and Villar de Arnedo CS



Capacity created	ES → FR : 110 GWh/day (summer), 100 (winter) FR → ES : 100 GWh/day	**Project maturity**	Coordinated Open Suscription Period done (Enagás ↔ TIGF)
Capital expenditures	–	**Funds breakdown**	2009
Countries involved	France, Spain	**Commencement of operations**	• Increase of main flow capacity: 1st April 2009 • Reverse flow capacity (ES → FR): 1st November 2010 • Increase of reverse flow capacity (4Q 2012)

2 – Biriatou, Larrau : 2013 Capacities *

Project Goal
Increase of reverse and main flows between Spain and TIGF and vice versa
Project Description
The project involves the development of 2 existing interconnection points : Larrau and Biriatou with the same capacities in main and in reverse flow This project is included in an Open Season, currently under development, that will increase Spanish – French interconnection capacity NRAs and TSOs are currently working in the design of the OS that will be launched during 2009 New infrastructures are needed both in France and in Spain. In the Spanish side, a new compression station is needed at the cross-border interconnection

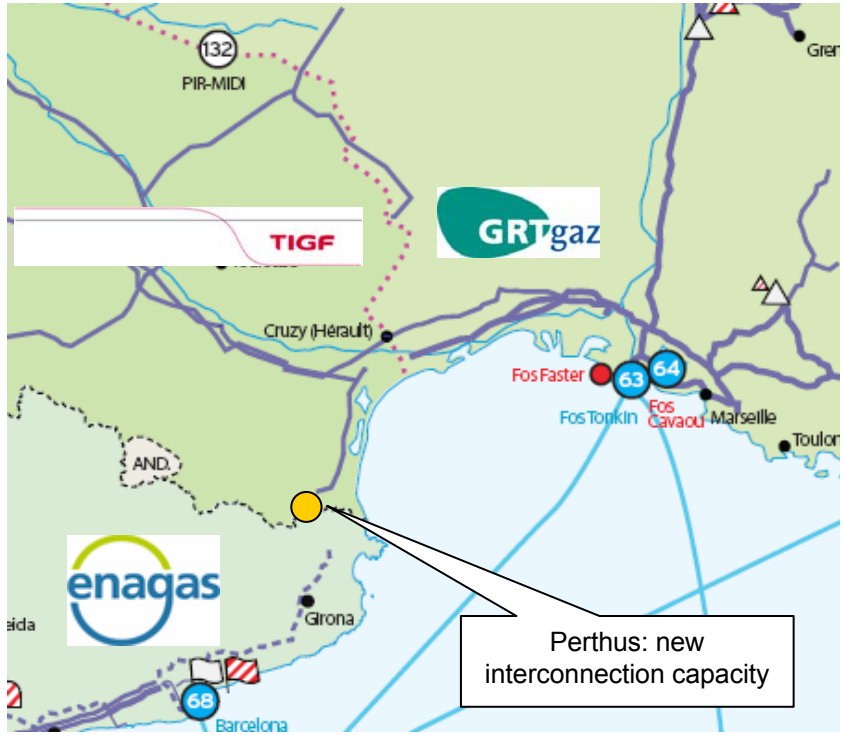


Capacity created in reverse flow	Larrau : 55 GWh/day (total : 165) Biriatou : 55 GWh/day (total : 60)	**Project maturity**	OS under development
Capital expenditures	–	**Funds breakdown**	2009-2010
Countries involved	France, Spain	**Commencement of operations**	2013

* Note that this project is not to be in the European Economic Recovery Plan for reverse flows.

3 – MidCat : 2015 Capacities *

Project Goal
New interconnection point between Spain and France and vice versa
Project Description
This project will create a new interconnection point between Spain and France, Perthus This project is included in an Open Season that will increase Spanish – French interconnection capacity through a new interconnection point NRAs and TSOs are currently working in the design of the OS that will be launched during 2009



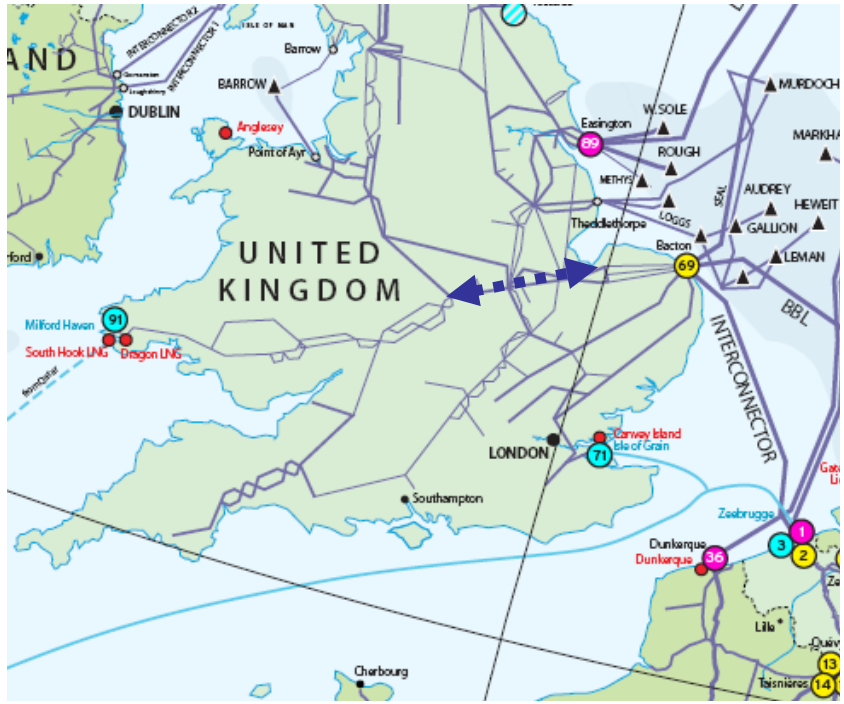
Capacity created	ES → FR : 230 GWh/day FR → ES : 180 GWh/day	**Project maturity**	OS under development
Capital expenditures	–	**Funds breakdown**	2010
Countries involved	France, Spain	**Commencement of operations**	2015

* Note that this project is not to be in the European Economic Recovery Plan for reverse flows.

UNITED KINGDOM

1 – Kings Lynn to Wisbech

Project Goal
Increase West-East transport capacity from sources such as the new LNG terminals in Wales towards Bacton Interconnectors
Project Description
This 30km x 1200mm pipeline will enable transmission of large volumes of gas from UK supply sources such as Milford Haven to Bacton for onward transmission through the interconnectors to mainland Europe. Thus significantly improving the ability of the UK market to provide support to mainland Europe during times of gas supply shortages The Milford Haven LNG terminals are designed to be able to bring up to 950 GWh/d into the UK Gas flows through I(UK) were been utilised to support Continental Europe during the recent crisis. The projects would allow this ability to increase significantly BBL is currently UK import only but commercial reverse flow is close to reality and physical reverse flow has been discussed



Capacity created in reverse flow	81 GWh/d	**Project maturity**	Feasibility study and conceptual design stages completed
Capital expenditures	€79.2m (assuming £1 = €1.1)	**Funds breakdown**	09/10 – €27.72m 10/11 - €43.56m 11/12 - €7.92m
Countries involved	UK, Netherlands, Belgium	**Commencement of operations**	2011

2 – Wisbech to Peterborough

Project Goal
Increase West-East transport capacity from sources such as the new LNG terminals in Wales towards Bacton Interconnectors
Project Description
This 41km x 1200mm pipeline will, in conjunction with project 1, enable transmission of large volumes of gas from UK supply sources such as Milford Haven to Bacton for onward transmission through the interconnectors to mainland Europe Thus significantly improving the ability of the UK market to provide support to mainland Europe during times of gas supply shortages

Capacity created in reverse flow	76 GWh/d	**Project maturity**	Feasibility study completed
Capital expenditures	€108.2m (assuming £1 = €1.1)	**Funds breakdown**	09/10 – €5.41m 10/11 - €32.46m 11/12 - €59.51m 12/13 - €10.82m
Countries involved	UK, Netherlands, Belgium	**Commencement of operations**	2012