



## GTE+ Reverse Flow Study TF Report on Technical Solutions

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## 1. EXECUTIVE SUMMARY

**Scope and context of project** – During the gas supply crisis between Russia and Ukraine in January 2009, it was clear that the gas transport infrastructure could be used in an unusual way in the case of supply disruption. There is a potential to improve significantly the European security of supply in a short time span by the implementation of reverse flow at some key interconnection points of the existing gas transport infrastructure.

GTE+ offered to the European Commission to carry out a study on reverse flows in order to improve security of supply of Europe. The focus is to identify “small” projects, using often the existing infrastructure, implementable in the short term (typically 1 or 2 years). A dedicated Task Force has been set up in February 2009 to carry out the study and to achieve concrete results within a 6-months period.

**Types of projects identified** – In this report, about 45 projects are identified and described from 15 TSOs representing 12 countries. Different types of projects have been identified:

- reverse of compression stations;
- reverse of metering stations at cross-border points;
- connection of storage to high-pressure transportation pipelines;
- modifications to control stations;
- new pipelines and increase of capacity.

**Gas quality** – Harmonization of gas quality parameters would improve the interoperability of gas. It is possible that some identified projects in this study could not be used effectively because of incompatible gas specifications.

**Cost recovery and the EEPR** – If the market does not show commercial interests for the capacity created in reverse flow, cost recovery becomes an issue for the investing TSO. The problem is emphasized if a TSO invests for the security of supply of a neighbouring country.

The European Energy Programme for Recovery will be key to trigger the final decision of some investments, but a mechanism to recover the uncovered 50% (or more) of the investment has still to be designed.

**Cooperation between TSOs** – This study has been carried out in the context of an evolution of GTE+ towards ENTSOG: this report is an illustration of the increased cooperation between TSOs regarding investments.

## 2. INTRODUCTION

During the gas supply crisis between Russia and Ukraine in January 2009 – which affected most of Europe – it was clear that the gas transport infrastructure could be used in an unusual way in the case of supply disruption. In some countries, technical solutions were found during the emergency to enable reverse flows that helped supply affected countries with gas coming from alternative sources.

Further analyses carried out after the crisis showed that there is a potential to improve significantly the European security of supply in a short time span by the implementation of reverse flow at some key interconnection points of the existing gas transport infrastructure. However, using existing pipelines in the opposite direction is not straightforward: important modifications have to be carried out at cross-border points and compression stations to enable reverse flow. Moreover, the choice of the technical solution depends on the capacity needed in reverse flow, which depends on the availability of alternative gas supplies – production or storage in other countries, or alternative import pipelines or LNG – that cannot be forecasted by TSOs.

In this context, GTE+ proposed to the European Commission to carry out a study on reverse flows in order to improve security of supply of Europe. The focus is to identify “small” projects, using often the existing infrastructure, implementable in the short term (typically 1 or 2 years). A dedicated Task Force has been set up in February 2009 to carry out the study and to achieve concrete results within a 6-months period. The strong commitments of the concerned TSOs enabled GTE+ to progress fast: the present report shows clearly that concrete results have been achieved.

This study has been carried out in the context of the transition of GTE+ towards ENTSOG: the Third Package foresees that ENTSOG will have to produce a “Community-wide 10-year network development plan, including a European supply adequacy outlook”. In addition to the Capacity Development Report already produced by GTE+, this report is an illustration of the increased cooperation between TSOs regarding investments.

This study responds also to the increased awareness for European security of gas supply. The activities of the Gas Coordination Group and the proposal of the European Commission for a new regulation repealing the current directive 2004/67/EC on gas security of supply, will lead to a better preparation for supply disruption. In this context, the TSOs have to provide the means to transport gas from alternative sources to the consumption markets in order for each Member State to achieve the appropriate standard of security of supply.

## 3. TECHNICAL SOLUTIONS

In this report, about 45 projects are identified and described from 15 TSOs representing 12 countries. The annex to this document contains two parts:

- a set of maps showing regions of Europe with the locations of the different projects in the region; this shows the consistency of the technical solutions proposed;
- for each project, a detailed description and other information like: the amount of capacity created in reverse flow, an estimation of the capital expenditures, the funds breakdown and the expected date for the commencement of operations.

The projects described in this document are still preliminary in the sense that the final investment decision has often not yet been taken by the respective TSOs. In most cases, the issue of cost recovery and/or funding under the European Energy Programme for Recovery will be key in the final investment decision (see section 4).

### 3.1. Types of projects identified

Different types of projects have been identified:

- reverse of compression stations: additional piping and adaptation of system control is needed to enable the operation of a compression station in reverse flow;
- reverse of metering stations at cross-border points: most metering systems are uni-directional, thus requiring additional piping to enable reverse flow;
- connection of storage to high-pressure transportation pipelines: some storages are dedicated for local markets and not connected to the main cross-border transport pipelines; additional pipelines and/or compression is required to bring gas from these storages to the main pipelines;
- modifications to control stations: operation of pipelines in reverse flow may require additional piping at control stations (e.g. pressure reduction stations) as well as adaptation of system control;
- new pipelines and increase of capacity: some pipelines do not have enough capacity in reverse flow to provide enough alternative supply; in such case additional pipelines and/or compression may be required to increase the reverse flow capabilities.

It is important to determine the requirement for capacity in reverse flow. For example, an existing 40 bcm/y system in forward flow could be useful in reverse flow, but only 10 bcm/y is required because of the market to supply in reverse flow is smaller. In such case, not all compression stations of the system need to be equipped with the reverse flow capability.

### 3.2. Cooperation between TSOs

This study has requested significant coordination between neighbouring TSOs in order to design and propose technical solutions that are consistent across countries, despite the limited time allowed for the study. The principal difficulty is to plan changes in existing infrastructure for hypothetical reverse flows that the market has not requested yet and that have not been experienced before. Therefore it is difficult to calculate the capacity that would be needed in case of supply disruption.

The proposal of the European Commission to set up a Task Force dedicated to the issue of supply disruption scenarios under the Gas Coordination Group will enable all involved parties to provide input and allow TSOs to better assess the need in reverse flow capacity.

Notwithstanding, TSOs have already been able to propose very concrete technical solutions in a very short time span, as the annex to this document clearly shows.

### 3.3. Overview of projects by region

Although the study started after the January 2009 crisis, its scope has been extended to all Europe in order to identify useful reverse flow projects.

Eastern and South-East Europe were the most affected regions in January 2009: national production and storage were the main alternative sources of gas during the supply disruption, as well as alternative gas sources, but they were insufficient to cover the demand – which was reduced in several countries. The ability to use storage for other countries and to better use alternative gas sources (mainly from Norway and UK, through Germany, and from Italy) is the driver of most projects identified under this study. The capability of the Czech and Austrian systems to operate in reverse flow could allow important alternative gas from Germany and Italy to be transported to the Baumgarten area. From there it can supply Slovakia and Hungary with the Slovakian system in reverse flow. Also the implementation of the Czech Republic – Poland interconnection as the development of the route Baumgarten – (Slovakia) – Czech Republic – Poland and reverse flow route Poland - Czech Republic - Slovakia on the trans-European connection within the North – South axis will enable more effective access to the European gas market at Baumgarten hub (in future also Nabucco pipeline), as well as to the Polish LNG Terminal in Świnoujście. Better interconnections of Hungary with Romania and Serbia and projects improving the interconnections between Romania, Bulgaria and Greece would improve significantly the security of supply of the Balkan region. South East Europe plays an important role for the security of supply of the European continent. The existing infrastructure in the Region can be developed with limited efforts, providing the Region with a wide diversification of gas sources and improving the reliability of the overall European gas system. In particular, in the near future, at the Italy-Austria interconnection point it is planned to make available a substantial amount of new reverse flow capacity.

North-West Europe is already well equipped with the capability to switch between different gas sources (including reverse flow capabilities) because of the diversity of gas supply that characterises that region. Still a few projects have been identified, resulting mainly from new market needs – e.g. new LNG terminals in UK and the Netherlands, increased supply diversity to France, new supply to Germany.

In South-West Europe, the Spanish-France interconnection capacity will be increased significantly in the future as a result of the ongoing open season. Bi-directional capacity will be implemented at once, improving the security of supply of the two countries.

### 3.4. Gas quality

Reverse flow capacities are useful if gas coming from unusual sources is compatible with the gas quality specifications of the country. Harmonization of gas quality parameters would improve the interoperability of gas. However gas quality is out of the control of most TSOs. It is possible that some identified projects in this study could not be used effectively because of incompatible gas specifications.

Due to the short time span allowed for the study, it has not been possible to analyse fully the implications of different gas quality specifications between countries in the context of new flows created by reverse flow capacity.

#### 4. COST RECOVERY

In the context of the Internal Gas Market, reverse flow projects can be initiated for two reasons:

- If the market has shown commercial interests for using alternative gas supplies, it will likely be ready to subscribe capacity created in reverse flow. In this case, cost recovery can possibly be organised within the legal and regulatory framework applicable in the country where the investment takes place.
- If the market does not show commercial interests for the capacity created in reverse flow, this capacity will not likely be subscribed. In such a case, cost recovery becomes an issue for the investing TSO: such investment would likely result in an increase of transportation tariffs to the domestic market and that may not be acceptable. The problem is emphasized if a TSO invests for the security of supply of a neighbouring country. An appropriate mechanism could be designed by which the benefiting parties contribute to the cost of the investment.

The European Energy Programme for Recovery will allow the recovery of up to 50% of the implementation costs of the accepted projects. Of course this measure will help the final decision of some investments, but a mechanism to recover the remaining 50% (or more) has still to be designed.

#### 5. CONCLUSION

This study of GTE+ contributes to the improvement of the European security of supply in a very pragmatic and effective way: potential reverse flow projects have been identified in a number of countries. They could be implemented in the short term. They would improve security of supply significantly.

This study has been carried out in the context of an evolution of GTE+ towards ENTSOG: this report is an illustration of the increased cooperation between TSOs regarding investments.