



# **Status Review on the Design of Security of Gas Supply Schemes and Solidarity Mechanisms between Member States**

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## 1 Introduction

The proposals in the European Commission's "3rd Package" request that Member States implement security of gas supply measures and cooperate in order to promote regional and bilateral solidarity. In order to advise the Commission on guidelines for this issue, ERGEG has analysed the need for security of supply-policy measures for gas storage facilities. The questions to be answered are the following:

1. To what extent and in what manner have Member States implemented security of supply measures or participated in (bi/multi)lateral solidarity mechanisms?
2. How should we assess these measures and mechanisms?
3. What would be the most cost-effective approach to address security of supply?

The structure of this paper is as follows; Chapter 2 sets out some background information on the security of gas supply; what is meant by a secure gas supply and what policies have been implemented or proposed within the EU. Chapter 3 provides an overview of current practices regarding securing the supply of gas, predominantly based on the results of the questionnaire completed by ERGEG members. This section also describes the view of the regulators on the usefulness and design of security of supply mechanisms. Chapter 4 provides a more substantial discussion on these mechanisms, using insights gained from economic literature and seeks to determine if these measures can efficiently achieve the policy goals and assess their effects on the storage market. Chapter 5 provides ERGEG's recommendations for the European Commission.

## 2 Background

### 2.1 Driving factors

The issue of security of supply has been high on the international political agenda for about a decade. A number of factors have contributed to this. Chief among them is Europe's increasing dependence on imports for the supply of gas. Additionally, the liberalisation of energy markets in Europe since the 1990s demands new approaches to security of supply, which have been extensively covered in the literature (see chapter 4).<sup>1</sup>

The main driving factor behind the issue of security of gas supply is the growing import dependence of the European Union. Energy consumption is foreseen to continue increasing in Europe as well as in all developed countries and emerging economies. Gas will remain an important component of the European energy mix in the coming decades, although production of natural gas will decline. Annual gas production in the United Kingdom is already declining, resulting in almost full depletion of the British fields in the coming decade. In the Netherlands, the other major EU gas producer, offshore gas producers are facing difficulties in maintaining production levels, while the outlook for the largest (Groningen) field is that the remaining production time span is less than 20 years. As European demand for gas is likely to grow by a few percentage points annually, EU imports from non-EU countries, such as

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<sup>1</sup> See e.g. G. Luciani, Security of Supply for Natural Gas Markets. What is it and What is it not?, International Energy Markets, September 2004 and C. Tonjes and J.J. de Jong, Perspectives on security of supply in European natural gas markets, CIEP, Working Paper, August 2007.

Norway, Algeria and Russia, will continue to grow.<sup>2</sup> This increasing import dependence will make the gas supply more vulnerable to geopolitical factors. In addition to varying levels of political stability within the gas exporting countries, production in these countries is predominantly controlled large state-owned firms. As a result, supply decisions may be less determined by market-based considerations and more by (geo)political ones. In addition, the strategic position of the gas exporting countries within the global gas market is becoming stronger due to the growing demand from other regions, in particular China and India.

## 2.2 European policy

Because of the perceived growing risks in the gas market, the European Union has been developing security of supply policies for a number of years, culminating in the Directive on Security of gas supply of the Council of the European Union, published in 2004.<sup>3</sup> The issue of security of supply is one of the three pillars of the European energy policy; the other two being competitiveness and sustainability.<sup>4</sup>

European Union energy market reform, through the Third Energy Package<sup>5</sup> (3<sup>rd</sup> Package), is based upon the premise that without competitive and efficient European energy markets, European citizens will pay excessive prices for energy, one of the most fundamental human needs. Furthermore, competitive EU-wide electricity and gas markets are seen as crucial to ensure the security of Europe's energy supply, as a single, competitive, European market is viewed to be able to attract global gas, to generate the right investment signals, to provide fair network access to all potential investors and to provide real and effective incentives for network operators and generators to invest the billions of Euros that will be required in the EU over the next two decades.

Yet, competitive markets may not completely overrule security of supply risks such as supply failures or risks stemming from geopolitical uncertainties. In the above Directive, the Council underlined the importance of ensuring the security of gas supply. Member States may implement security of supply measures as well as mechanisms for mutual cooperation in case of emergency.

The Council stated that a minimum common approach should exist. Member States are obliged to define and publish national emergency measures. These measures should be transparent and non-discriminatory and include clear definitions of the roles and responsibilities of market players. In addition, the Council stated that Member States should ensure that gas supplies for households (and other captive consumers that cannot switch to other energy sources) are protected from disruptions.

In order to meet these security of supply standards, Member States have (at least theoretically) a large number of instruments to assist them, such as production flexibility, system flexibility, import flexibility and working gas in storage facilities. Bilateral agreements

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<sup>2</sup> The import dependence of the EU 27 will increase from the current 60% to about 85% in 2030 (source: EC).

<sup>3</sup> Council Directive 2004/67/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0067:EN:HTML>

<sup>4</sup> See e.g. European Commission, Prospects for the internal gas and electricity market, COM(2006)841.

<sup>5</sup> European Third Energy Package: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007PC0529:EN:NOT>

between Member States can possibly contribute to mutual flexibility. Nationally, Member States may impose minimum targets for gas storage in order to guarantee the presence of sufficient working volumes in the case of an emergency.

A precondition for imposing security of supply measures is that they should not “impose unreasonable and disproportionate burden on gas market players, including new market entrants and small market players”. Moreover, the Council stresses that security of supply obligations should not hinder the efficient functioning of the gas market.

The Directive established a Gas Coordination Group<sup>6</sup> in order to improve the coordination of measures directed at security of supply within the European Union. One of the activities of this group is to foster regular distribution of information on security of gas supply within the European Union. Other activities of the Gas Coordination Group are evaluating the effects of the Directive, defining a compensation mechanism and conducting a study on natural gas storage.<sup>7</sup>

The Directive also prescribed that Member States should adopt and publish national emergency provisions. Finally, the Council stated that in the case of a major interruption, the Community should only intervene if market parties are not able to respond adequately and Member States fail to solve the supply disruption.<sup>8</sup>

In the 3<sup>rd</sup> Package, in particular in the proposal for the Directive regarding the gas market, the European Commission maintains the measures prescribed in the above Directive<sup>9</sup>, with two issues explicitly addressed. Regarding security of gas supply, the EC proposes that gas operators should be obliged to publish data on the actual volume of working gas on a daily basis. This information is expected to enhance confidence in the ability of the gas system to meet unexpected disruptions. In addition, measures for regional solidarity should include:

- coordination (or streamlining) of national emergency regulations;
- modernising electricity and gas interconnections, if necessary;
- conditions and practical rules for mutual assistance in case of emergency.

The topical question now is whether the European Commission should extend the obligations for Member States regarding the security of gas supply. In order to answer that question, the next section presents the results of a questionnaire completed by national regulatory authorities, along with various options for security of supply policies regarding storage facilities, which includes insights gained from economic literature.

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<sup>6</sup> The Gas Coordination Group is composed of representatives of Member States, the industry (Eurogas, GIE and OGP) and relevant consumers (Eurelectric, BEUC and IFIEC) under the chairmanship of the European Commission.

<sup>7</sup> Presentation J.-A. Vinois, Head of Unit Energy Policy and Security of Supply, DG Energy and Transport, European Energy Forum, Brussels 27 February 2008.

<sup>8</sup> The effects of the implementation of the Directive are not yet known. The results of the evaluation should have been available as of 19 May 2008, according to the Directive, but the publication of the results seems to have been postponed until November 2008.

<sup>9</sup> COM(2007)529, 19 September 2007.

### 3 Results of questionnaire<sup>10</sup>

#### 3.1 Current situation

Although the Council Directive 2004/67/EC prescribed that all Member States should implement security of supply schemes as well as mechanisms for mutual cooperation, these schemes and mechanisms have not been widely implemented (see Figure 1). Approximately two-thirds of the responding Member States seem to have implemented a security of supply scheme, while no country is currently participating in an international-solidarity mechanism.

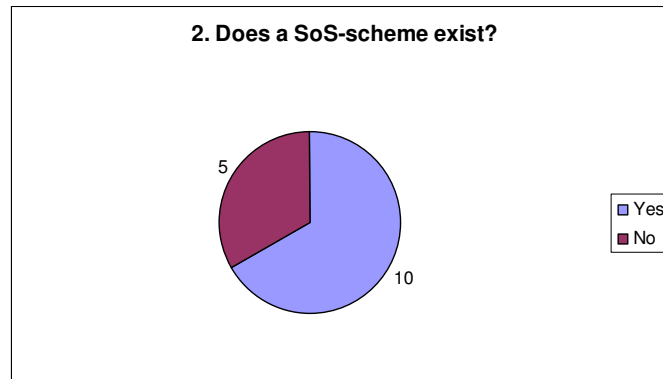


Figure 1 – Implementation of SoS schemes (number of countries)<sup>11</sup>

The security of supply schemes which have been implemented are mainly meant to minimise the risk of physical disturbance within production (Figure 2). In addition, the prevention of failures in LNG supply is a frequently mentioned target of these schemes. Some countries also include provisions to ensure the System Operators are able to balance the system. One respondent says that “the purpose of the security of supply scheme is to face all kinds of emergency situations, including occurrences of *force majeure*.” Another respondent states that the national gas act “contains management tasks for the short, medium and long-term, in case gas supply cannot be guaranteed under market conditions”.

<sup>10</sup> The questionnaire was distributed among all National Regulatory Authorities (NRAs) of the European Union. The response rate was 15 out of 27; more than 50%.

<sup>11</sup> The numbers in title in the graphs refer to the number of the question in the questionnaire.

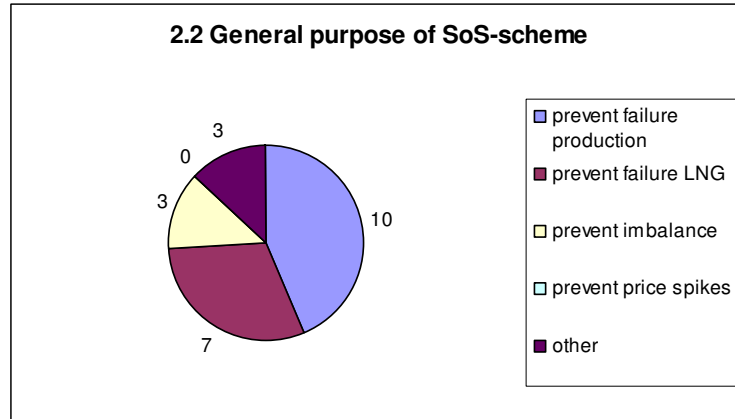


Figure 2 – Purposes of Security of Supply (SoS) schemes (number of countries per purpose)<sup>12</sup>

The development of security of gas supply schemes appears to be a process in which several stakeholders participate (Figure 3). The government is, of course, the most-often mentioned party. Other stakeholders frequently participating in the process are Storage System Operators (SSOs), suppliers and other market participants, i.e., Transmission System Operators (TSOs). One respondent states that in its country “the TSO is responsible for working out and handling the security of supply scheme. The scheme and hence the security of supply requirements are rooted in legislation passed by the national authorities (within the overall legal framework passed by the parliament). SSOs have to make the necessary capacity available to the TSO for its security of supply commitments.” Another respondent says that the security of supply scheme is approved by Royal Decree and is submitted for consultation to an advisory group, comprised of representatives of all market parties, including consumers and other stakeholders. Some respondents state that the security of supply schemes are developed through an open consultation process, in which all market parties are invited to participate.

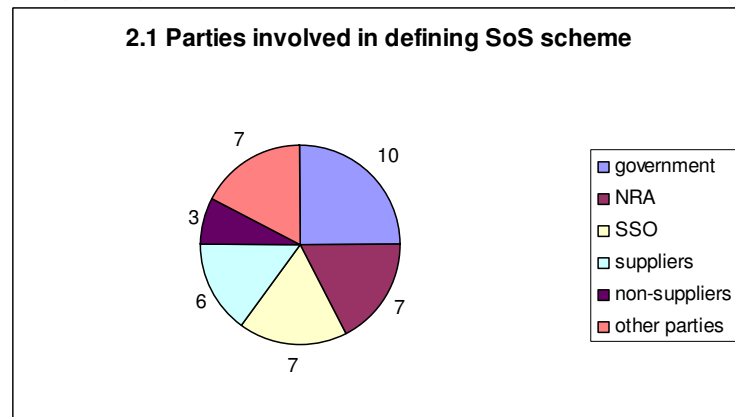


Figure 3 – Parties involved in defining SoS schemes (number of countries per party)<sup>13</sup>

<sup>12</sup> Some countries pursue more than one purpose. The figure only includes countries having implemented an SoS scheme.



The security of supply schemes differ with respect to the obligations they impose on customers, SSOs, as well as other players. In some schemes, customers are obliged to maintain a certain level of gas in storage, while other schemes prescribe that customers must diversify their portfolio (Figure 4).

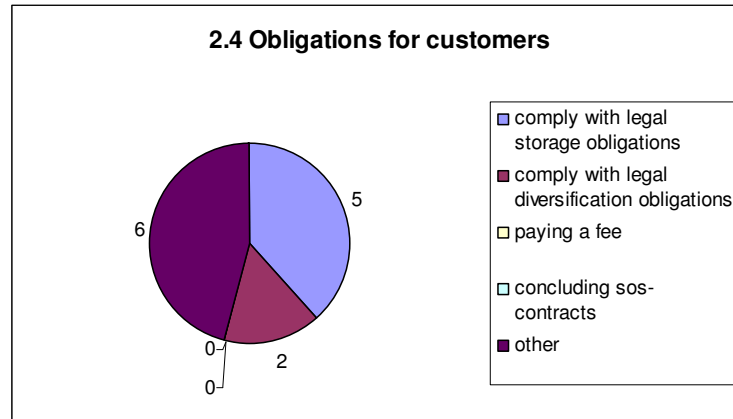


Figure 4 – Obligations for customers in SoS schemes (number of countries per type of obligation)<sup>14</sup>

Regarding SSOs, in some cases the operators are obliged to hold spare capacity while in others, operators are responsible for storing gas themselves (Figure 5). In several countries, SSOs are obliged to follow the instructions of the TSO in case of emergency.

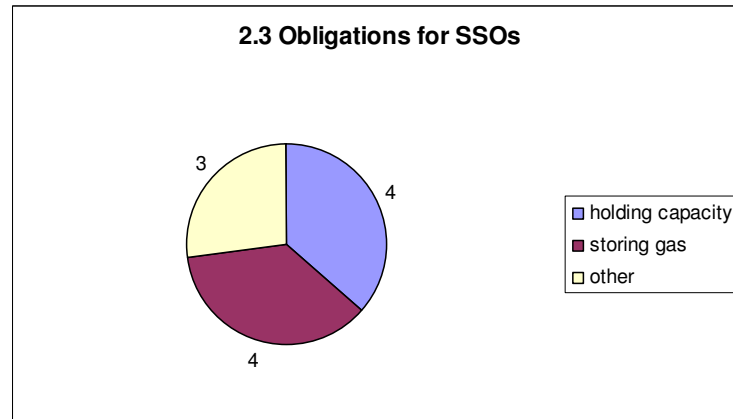


Figure 5 –Obligations for SSOs in SOS schemes (number of countries)<sup>15</sup>

<sup>13</sup> In several countries more than one party is involved.

<sup>14</sup> In some countries customers are subject to more than one obligation.

<sup>15</sup> In some countries SSOs are subject to more than one obligation.

One respondent says that ‘during Climatic Emergency Procedure, SSOs have the obligation to assure the maximum performance’. In another country, suppliers are obliged to continue to supply gas in specific circumstances, such as very low temperatures during 3 days in the coldest of 1 out of 50 winters. Another respondent states that “customers have to live up to certain filling restrictions, i.e., a certain level of gas must be maintained in storage during the critical winter months”.

In Italy, the Ministry sets out annual requirements for the amount of storage to be held for strategic storage. Since 2001 the strategic storage volume is 5,1 Bcm, i.e., around 37% of the total storage capacity. SSOs coordinate in the offer of the strategic storage volume defined by the Ministry.

In Spain, SoS obligations are imposed on storage users (suppliers) and not on operators. These obligations are based on the firm sales of the previous calendar year (20 days of their firm sales).

In Hungary, the Act 26 of 2006 on the Security Storage of Natural Gas prescribes the storage of 1.2 billion m<sup>3</sup> gas, and the construction of underground storage required for this by 2010. The gas security storage must be placed in an underground storage (UGS) facility that has a daily withdrawal capacity of 20 million m<sup>3</sup> for at least 45 days. The security storage of gas prescribed by the Act primarily serves the secure supply of gas to household and communal customers, as well as the supply of those consumers who cannot replace their gas consumption with other energy sources.

Until 31 December 2009, the spare capacity of the present gas storage facilities will determine the degree of the security storage, which – if an adequate quantity of spare capacity is available – cannot be less than a) 150 million m<sup>3</sup> from 1 October 2006 to 30 September 2007 or b) 300 million m<sup>3</sup> from 1 October 2007 to 31 December 2009.<sup>16</sup>

In Denmark, the level of strategic storage is set at macro level: the total amount of strategic gas storage must always be sufficient to meet the next 60 days of gas consumption. This rule implies that the size of these reserves changes over time; before the winter period starts, the amount is significantly higher than at the end of the winter period.

In the Netherlands, security of gas supply is addressed by regulating the annual production from the Groningen field in order to conserve its swing potential.<sup>17</sup> In addition, one storage field is only used for emergency purposes, to support the Groningen field in cases of high gas demand. This storage field and the Groningen field are operated by the same operator (NAM). Other market players do not have access to this field.

In the United Kingdom, the security of supply scheme consists of three types of measures<sup>18</sup>:

1. Publication of storage monitors, providing information to the market to ensure that supply is guaranteed and to allow the TSO to direct SSOs to retain gas in storage in

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<sup>16</sup> The Hungarian Hydrocarbon Stockpiling Association has announced a call for tender for the construction of a security storage facility, which was awarded to MOL Plc. The construction had started in 2007 in the Algyő gas-field, at the Szőreg-I layer in Southern Hungary.

<sup>17</sup> Swing potential is the ability of a field to adapt its production level to the size of the actual demand.

<sup>18</sup> Information provided by the NRA in the questionnaire.

- case of insufficient levels of storage;
2. Defining operating margins dealing with the immediate consequences of failure of supply before the market has been able to respond;
  3. Establishment of Emergency Arrangements setting out a 4 stage process of practical action to mitigate the risk of wider loss of supply.

In France, a decree compels active suppliers to have in stock on 1<sup>st</sup> November of each year, the quantity of gas corresponding to at least 85% of the capacity rights dedicated to domestic customers and customers providing services of general interest.

As security of supply schemes can be seen as a kind of insurance, the question to be answered is “what criteria determine whether the insurance will or will not be used to reduce the negative impacts of a disturbance?” The most significant criterion appears to be (perceived/expected) lack of supply, which is frequently coupled with the reduction in the capacity of production or transportation (Figure 6). One respondent states that a mix of criteria is used, including the capacity of transport infrastructure, the level of stocks in storage and (expected) demand.

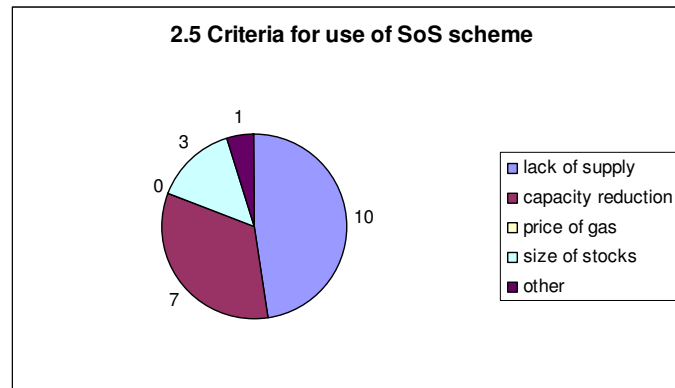


Figure 6 – Criteria for using the SoS schemes (number of countries)<sup>19</sup>

The security of supply schemes which have been implemented, but have rarely been called upon (Figure 7). The majority of the respondents having a security of supply scheme answer that their schemes have never been called upon. Only one respondent states that the scheme has been utilised more than once year.

<sup>19</sup> Several countries use more than one criterion.

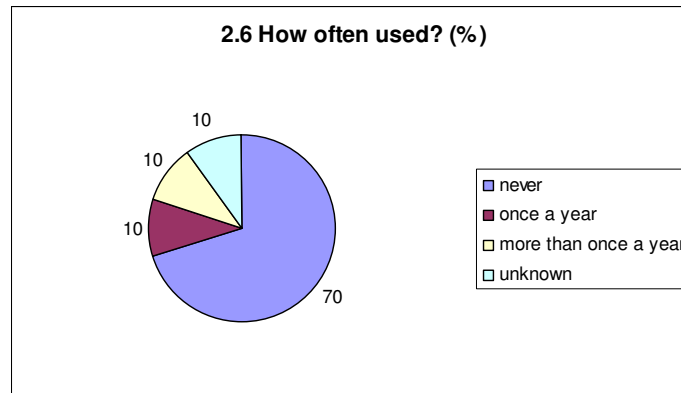


Figure 7 – Frequency of use of SoS schemes (percentage of countries)

Approximately 1/3 of the respondents believe that the schemes are effective in preventing physical disturbance of the gas supply. Economic effects of the schemes are rarely seen. One respondent states that obligations on storage owners or their customers may result in additional investments in storage, as their use is assured.

### 3.2 Assessment of current situation

The respondents have mixed views on the usefulness of security of supply schemes: 6 believe the schemes are very valuable, 6 others cannot assess whether they are beneficial or not, while one respondent clearly stated that the schemes are too expensive (Figure 8). One respondent (from a country without domestic supply) states that “the costs of implementing a security of supply scheme are high, but the costs of a severe failure of supply are much higher”. Another, however, believes that “generally, market signals should provide gas to meet demand, but that there may be circumstances where it may be beneficial to use a security of supply scheme to prevent physical disturbances”.

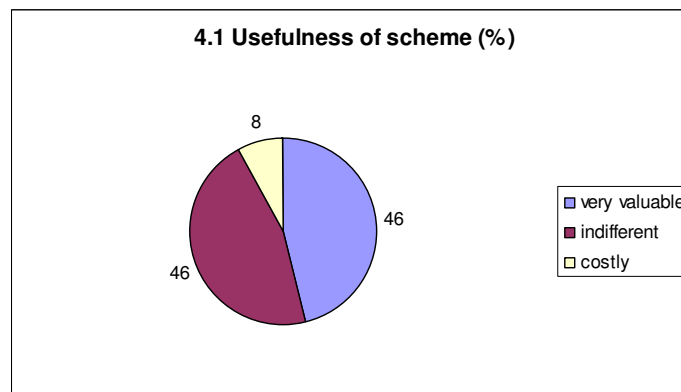


Figure 8 – Views of respondents on the usefulness of schemes (percentage of countries)

A key issue in assessing any government intervention in markets is the crowding-out effect: - to what extent does the scheme negatively affect activities of market participants, such as investments. The views on this issue are also mixed (Figure 9). Approximately 50% consider that the schemes will not have any effect on commercial activities, while the others say that the schemes do have some distorting effect on the market.

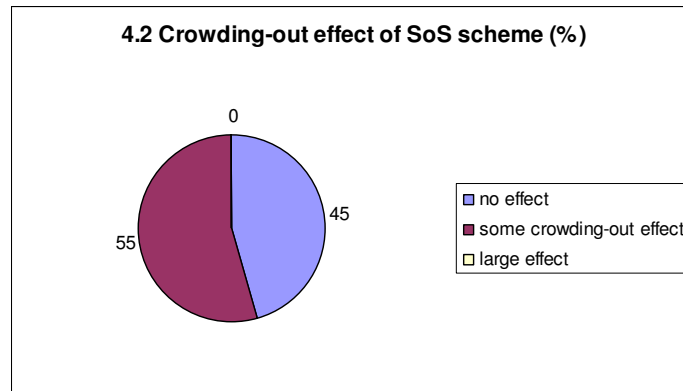


Figure 9 –View of respondents on the crowding-out effect of SoS schemes (percentage of countries)

Most respondents answered that obligations on market parties guarantee the best design of security of supply schemes (Figure 10). As one respondent states “only through obligations it is possible to be sure that the company has the appropriate stocks when needed”. Another respondent, however, states that the TSO should have the obligation to ensure that sufficient gas is held in storage, in addition to market obligations.

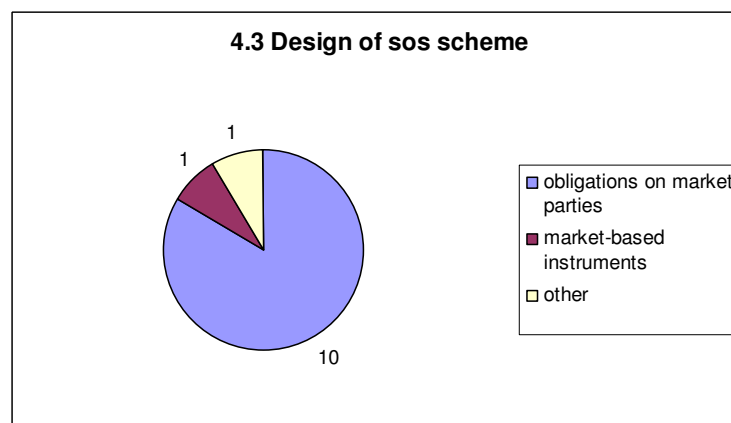


Figure 10 –Views of respondents on measures to be used in SoS schemes (number of countries)<sup>20</sup>

Assuring a secure supply of gas is seen as the responsibility of several parties, although there are differing views regarding which parties should be involved (Figure 11). TSOs are the most-often mentioned party, but also SSOs, customers and even other players are viewed to be important players in this respect. The group of ‘other players’ include shippers, gas producers, importing companies, NRAs and governments.

<sup>20</sup> Several countries prefer more than one measure

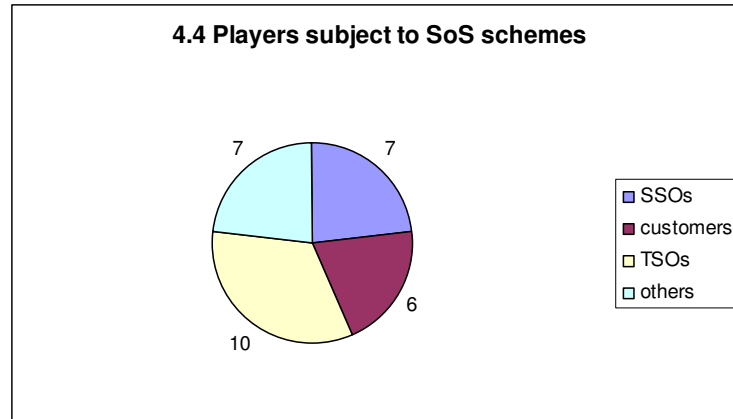


Figure 11 –Views of respondents on players subject to SoS schemes (number of countries)<sup>21</sup>

Another major aspect in designing security of supply schemes is the degree of harmonisation among Member States. Most respondents agree that there should be some degree of harmonisation, but there is no need to pursue full harmonisation (Figure 12). As Member States differ strongly regarding the degree of import dependence and the availability of commercial storage, they should be free to design their national scheme, provided that the various national schemes do not produce additional barriers for the integration of the European gas market. It is more important to have a coherent approach in Europe than a fully harmonised security of supply scheme for gas storage facilities. One respondent says that “if national security of supply schemes are designed in a similar way, it could be possible and useful. It could also be useful to exchange information and warnings between the countries concerning the availability of gas volumes and demand”. Another respondent suggests starting with harmonisation on a regional basis. Another adds to this saying that “there may be merit in setting out common principles between countries with interconnection”.

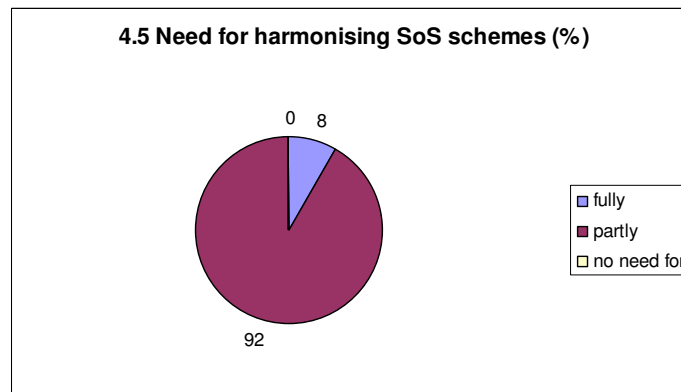


Figure 12 – Views of respondents on the need for harmonising SoS schemes (percentage of countries)

<sup>21</sup> Several countries prefer more than one measure

On the need for implementing international solidarity mechanisms, the views diverge again, although the general attitude can be summarised as quite positive (Figure 13).

Some respondents strongly support solidarity mechanisms, believing that these would efficiently contribute to a secure gas supply. One respondent says that “solidarity mechanisms are needed to tackle international crises, even if domestic security of supply schemes are implemented. In fact, the costs involving security of supply schemes are high and their economic impact could be lower with proper solidarity mechanisms in force, granting a similar level of security of supply”. Another respondent states that “international crises can require a certain degree of coordination and cooperation which is not guaranteed by national schemes. Solidarity mechanisms increase the effectiveness of security of supply schemes and are an available tool when national measures are not enough”. One respondent also supports the importance of international solidarity mechanisms, albeit that these mechanisms should only be used on a commercial basis and if national measures are exhausted.

Others, however, doubt or even reject the usefulness of such mechanisms. These respondents believe that international solidarity mechanisms do not have an additional positive effect on top of national security of supply schemes.

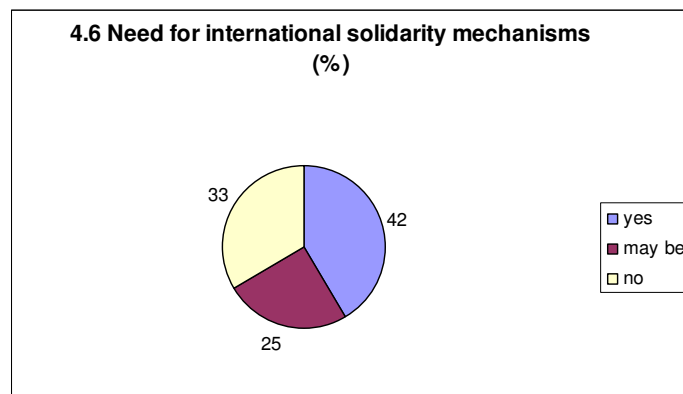


Figure 13 – Views of respondents on the need for international solidarity mechanisms (percentage of countries)

## 4 Discussion

### 4.1 Introduction

In order to formulate recommendations on security of supply in relation to storage facilities, it is necessary to discuss several issues more fundamentally. These issues are the seriousness of the threats to security of supply, the ability of markets to cope with these risks, and the efficiency of several types of policy measures for gas storage facilities to assure the security of supply.

### 4.2 Threats to security of supply

In section 2.1, the factors that are often mentioned as the possible threats to the security of supply were mentioned, including Europe’s growing import dependence and increasing competition for gas worldwide. These factors are said to raise the vulnerability of European economies to adverse geopolitical developments, and they are sometimes used as

arguments for an active role of governments to secure the supply of energy. The best ways to tackle security of supply risks in competitive markets is subject to some debate in the (economic) literature.

Whether competitive markets are able to fully deal with the issue of security of supply is debated by some authors. Halstrup et al. (2007)<sup>22</sup>, for instance, claim that open trading places are unable to secure a stable supply of gas, hence, long-term bilateral (import) contracts are needed to realise security of supply. Given the highly capital-intensive nature of the gas industry (in particular, gas infrastructure), long-term contracts are believed to be necessary to achieve a sufficient level of investment and to prevent price spikes. Others, however, conclude that competitive markets foster a sufficient level of investment and adequately ensure security of supply. In a literature review of studies on two decades of liberalisation in the North-American gas market, Von Hirschhausen (2007)<sup>23</sup> concludes that “there is little reason for concern about infrastructure investments, resource adequacy, and supply security”. Regarding storage, the author finds that “the US storage market is well developed and there are no evident shortages that would endanger supply security. Restructuring has changed the perception of storage by the market players, and has fostered independent, merchant-oriented storage operators”. In other words, if the storage market is well developed, with low barriers to entry and there is appropriate regulatory treatment of investments, the market appears to be able to attract sufficient investments and to take care of security of supply.

The issue of import dependence is also not as straightforward as one might expect. The growing importance of imports from non-EU countries is generally accepted, but the question is whether that will result in increased risks for the gas supply. Luciani (2004) states that “it is a mistake to equate import dependence to vulnerability”.<sup>24</sup> What matter are the composition of the customer base and the share of interruptible customers over total demand relative to the diversification of import sources”. The point this author rightly makes is that not only should the composition of the imports be taken into account, but also the composition of demand. If the customers have the flexibility to adapt to disturbances, no risk to the security of supply exists. Suppliers should therefore balance the risks on their supply side with the relative importance of firm and interruptible customers on the demand side. The more customers are able to react to price uncertainty, the less vulnerable the system is to supply shocks.

The statement that increasing import dependence does not automatically result in a higher threat to security of supply is also made by Tonjes et al. (2007), albeit from another perspective.<sup>25</sup>

These authors argue that the main gas exporter to Europe, i.e., Russia, has the potential to use its market power by reducing its exports, but that it does not have an incentive to do so

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<sup>22</sup> D. Halstrup, G. Krude, S. Groblinghoff, Ensuring security of supply for the European gas market – Alliance of long-term gas import contracts and open trading points (“Cohabitation des régimes”), Utilities Policy 15(2007), pp. 223-224.

<sup>23</sup> C. von Hirschhausen, Infrastructure, regulation, investment and security of supply: A case study of the restructured US national gas market, Utilities Policy 16(2008), pp. 1-10.

<sup>24</sup> G. Luciani (2004), Security of Supply for Natural Gas Markets. What is it and What is it not?, International Energy Markets, September 2004.

<sup>25</sup> C. Tonjes et al., (2007).



for a long period of time. Quoting the authors, “the negative consequences for the exporter in question in terms of demand destruction would potentially be significant”. These authors, however, acknowledge that some (neighbouring) countries appear to be more vulnerable to gas curtailments by Russia than others. Although they believe that “there is little reason that producers will use energy deliveries against the European Union and its Member States as a means to achieve political objectives on a large scale”, they also state that “the risk of political and economic pressure exerted by producers is unevenly distributed across European Member States and the perceptions about that threat vary accordingly”.

The statement that increasing import dependence reduces the security of gas supply is not true in all cases. If the gas market is well developed, i.e., low barriers to entry in storage and highly flexible demand, it is well equipped to deal with disturbances in supply. Particular countries might, however, need specific measures to cope with the (political) risk of distorted gas supplies from the major external gas supplier.

### 4.3 Measures

Measures dealing with the (political) risks are, among others, strategic storage and solidarity mechanisms. Both measures could be effective to assure the supply of gas for a certain period of time. However, in the long run, these measures are ineffective as the storage facilities will be exhausted by then.

Obligations to store gas appear to be expensive. Ejarque (2008)<sup>26</sup> concludes that security of supply regulation in Denmark yields a cost of approximately 16% to 20% of discounted net present value of the profits of storage operators. These costs consist of the loss of seasonal arbitrage profit due to the (strategic) stock which cannot be used. Ultimately, obligations to store gas may result in increased costs for consumers because they reduce availability of gas and market liquidity. Depending on their specific design, these obligations may also distort competition by placing some players in a competitive disadvantage.

In particular, the Danish scheme appears to be expensive, as the size of the strategic stock is linearly related to total gas consumption. After all, when consumption is large (during winter periods), gas prices are also high, and, hence, the cost of keeping gas (unused) in strategic storage is both relatively and absolutely high. In the Italian scheme, where the magnitude of strategic storage does not depend on the actual consumption, the costs are lower, although still significant.

For the Netherlands, De Joode et al. (2003) concluded that conserving the Groningen field in order to secure the gas supply is also a highly expensive measure.<sup>27</sup> The costs of this measure likely exceed the (expected value of the) costs of physical disruption.

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<sup>26</sup> J. M. Ejarque, Evaluating the Economic Cost of Strategic Storage of Natural Gas, University of Essex, Department of Economics, Discussion Paper Series no. 658, July 2008.

<sup>27</sup> J. de Joode, D. Kingma, M. Lijesen, M. Mulder and V. Shestalova, Energy policies and risks on energy markets; a cost-benefit analysis, CPB, The Hague, 2004.

## 5 Conclusions and recommendations

Both the results of the questionnaire and the economic literature indicate that the need for and the type of security of supply scheme depends on the characteristics of a country, such as the degree of dependency on less secure exporters, the presence of a commercial storage market, the liquidity of the gas market, the amount of dual fuel and interruptible consumption, and the percentage of natural gas within total primary energy consumption.

In addition, policy makers in different countries appear to have different views on the ability of markets to ensure security of supply. Some believe the government has an important role to play to ensure that supply will always meet demand; others believe that government interference might distort private action, making governmental intervention easily inefficient and therefore, unnecessarily costly for consumers.

The importance of storage as means of securing supply depends strongly on the national situation. Therefore, it is not efficient to prescribe whether and how Member States should implement strategic stocks or measures. Countries should have autonomy in the measures taken to ensure security of supply. As harmonisation of national measures is very important, the EC should develop ways to achieve sufficient harmonisation of the national schemes.

Harmonisation should be aimed at ensuring that security of supply measures are transparent, non-discriminatory and compatible with the requirements of a competitive internal market. Any such measures should clearly define the roles and responsibilities of gas market players (including small players and new entrants) and not impose an unreasonable or disproportionate burden on any of them.

The best policy to assure the security of supply is to proceed on the way towards fully liberalised gas markets, in which market parties can easily enter the market and both producers and consumers can flexibly respond to changing market circumstances<sup>28</sup>

Given the fact that some Member States are more vulnerable to geopolitical risks in the supply of gas, (regional) solidarity mechanisms could be developed, taking into consideration the possible 'moral hazard'<sup>29</sup> effect of such an insurance-like scheme. As a step in that direction, the regulators could issue a proposal for the regulation of cross-border use of storage for security of supply considerations.

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<sup>28</sup> This statement is also made by GSE, concluding that "availability of commercial storage is a crucial contributor to security of supply" (GSE, Position Paper on Capacity Allocation Mechanisms and Congestion Management Procedures, nr. 08GSE209).

<sup>29</sup> Moral hazard refers to the fact that an agent takes more risk when he/she is not fully responsible for the negative consequences of certain behaviour. Moral hazard is the prospect that a party insulated from risk may behave differently from the way it would behave if it were fully exposed to the risk. Moral hazard arises because an individual or institution does not bear the full consequences of its actions, and therefore has a tendency to act less carefully than it otherwise would, leaving another party to bear some responsibility for the consequences of those actions.