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SECURITY OF SUPPLY IN LIBERALISED EUROPEAN GAS MARKETS

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1. Introduction

Not only in Europe demand for natural gas is growing faster than for any other fuel. In less than 40 years natural gas has become the fuel of choice in many European countries. Development of the European gas market was driven by the discovery of major gas fields in and around Europe, starting with Groningen (Netherlands) in 1959, and was supported by the establishment of an effective supply and distribution industry. With the transition from de facto monopolies to competitive markets by introducing third party access to the grid and unbundling of supply and transportation many uncertainties for all players acting along the gas chain arise. In liberalized markets, each supplier will be responsible for ensuring that supply needs of its customers are met. Fulfilling contractual obligations by entering into supply agreements with a variety of producers and/or building storage facilities will hopefully spare the gas sector experiences such as the electricity blackout in Italy.

The process of liberalisation is adding a new, internal, dimension of concerns regarding security of gas supplies to Europe to the already existing external dimension in terms of import dependency. Import dependency of Europe is expected to grow from 36% in 2000 as high as 69% by 2030. Not only have additional supplies to come from remote areas, but they will also be following more complex and potentially risky transportation routes as some 70% of global gas reserves are located in the CIS and the Middle East (IEA, 2002a, pp.110).

Aim of this work is to understand and apply the concept of security of supply in liberalised European gas markets and as consequence identify roles and responsibilities of players when defining a legal framework for security of gas supplies in the new context of market liberalisation. In a first step a brief glance on amended and existing legislation will be provided in chapter two. The third chapter introduces the concept of security of supply and provision of it in the occurring institutional framework. Chapter four is tempting to quantify the term “security of supply” for Europe, before looking at a new proposal for a European Council Directive in chapter five. The same chapter will identify roles and responsibilities of different players with regard to security of supply before chapter six concludes.

2. Institutional Framework

To fully understand all consequences for each player along the gas chain during the process of restructuring the infrastructure sector for natural gas from de facto (national) monopolies into competitive markets a brief insight into amended and existing legislation is given. Main focus will be on instruments and key elements serving as prerequisites for competition.

2.1 First Gas Directive 98/30/EC

Liberalisation process in the European Union started in the early 1990-ies with the adaptation of the Directives of Price Transparency[1] and Transit[2]. In 1992, the European Commission issued a proposal for the completion of an internal market for electricity and natural gas. Common rules on production of natural gas were adopted in 1994 (Hydrocarbon Licensing Directive). Member States of the EU on 22nd June 1998 agreed on the creation of an internal market for gas by adopting the First EU Gas Directive 98/30/EC[3]. The Directive entered in to force in August 1998 and all Member States (MS) had two years[4] to transpose it into national law. All countries of the European Economic Area and all Accession Candidate Countries are concerned by the Directive, although some of them have negotiated special transitional agreements.

The main objective of the Gas Directive is to promote competition and efficiency in the EU gas market. This is to be achieved by four main instruments: accounting transparency of natural gas undertakings (Articles 12 and 13); right of access to gas networks on the part of third party operators (Articles 14, 15, 16 and 17); the legal right to third party access (TPA) for eligible customers entering into contractual agreements with gas undertakings of their choice (Articles 18 and 19); objective, transparent and non-discriminatory criteria for the issue of authorisations for the activities of gas undertakings, including the construction of new pipelines (Articles 3 and 4).

Furthermore, the Directive provides for control mechanisms supervised by the competent national authorities and the European Commission (EC) to guarantee that provisions of the Directive are respected in accordance with European law.

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[1] Council Directive 90/377/EC of 29 June 1990 (OJ L 185, 17.7.1990)
[2] Council Directive 91/296/EEC of 31 May 1991 (OJ L 147, 12.6.1991)
[3] OJ L 204, 21.7.1998
[4] Until 10th August 2000

Main elements are the right of access to the network for direct purchases by producers of electricity, eligible customers and distributors, a minimum level of 20% opening in 2000, 28% in 2003 and 33% in 2008[5], an accounting and functional separation of transport activities within gas operators under the control of regulators or competition authorities (unbundling) as well as the definition of appropriate and effective mechanisms of regulation, control and transparency.
Finally, conditions of access to the network play a crucial role. Gas undertakings have the choice between negotiated or regulated TPA[6] for both transport and access to LNG terminals and for distribution, have to choose a pricing system of one of the main models (stamp post, distance-related and entry-exit tariffs) and will have to offer transport ancillary services, balancing conditions, storage etc.

General rules of the Gas Directive establish the general principle of non-discrimination between companies (i.e. general abolition of exclusive rights)[7]. Main provisions are the construction of facilities, Public Service Obligations (PSO), network access and market opening, unbundling and transparency of accounts, take-or-pay and special conditions of emergent markets. The following section gives a brief insight into each provision.

Rules regarding the objective and non-discriminatory granting of *rights to construct and operate (new) gas facilities* are a crucial principle laid down in Article 4 of the Directive. Member States may grant authorisations according to objective, transparent and non-discriminatory criteria that should be made public. Refusals should be accompanied by reasons provided to the applicant and the Commission. Dispute settlement procedures are to be made available.
Public Service Obligations[8] are required for customer protection or protection of the integrity and safety of the system[9]. Such obligations may be imposed by

[5] By reducing threshold consumer eligibility from 25 mcm/a in 2000 to 5 mcm/a in 2008.
[6] Tariffs for regulated TPA have to be published.
[7] Gas Unit, DG XVII, Interpreting notes on the Gas Directive 98/30/EC, Brussels 1998/1999
[8] Under Community law, Article 2 of Council Regulation No 1191/69 of 26 June 1969 (OJ L 156 of 28 June 1969) concerning PSOs in inland transport stipulates that PSOs are "obligations which the undertaking..., if it were considering its own commercial interests, would not assume or would not assume to the same extent or under the same conditions". The Commission applies this definition to the energy sector, subject to the following conditions: I) the obligations imposed must be related to the supply of the service of general economic interest in question; ii) they must contribute directly to satisfying this general economic interest; iii) they must be imposed in such a way that they do not affect the development of trade to an extent contrary to the interests of the

public authorities on service operators such as gas companies and can be applied at national or regional level. PSO must be objective, transparent and non-discriminatory as well as verifiable and published (Articles 3 and 9). They have to be notified to the Commission and are subject to the rules of the Treaty.

Access to gas pipelines and other gas facilities by others than the owner, the so-called TPA, is a fundamental for competition and principles are put down in Articles 14, 15 and 16. Generally, two types of network access can be distinguished. First, under *negotiated access*, MS must take necessary measures to enable natural gas undertakings and eligible customers either inside or outside the territory covered by the interconnected system to negotiate access to the system so as to conclude supply contracts with each other on the basis of voluntary commercial agreements. MS will require parties to publish their terms for use of the system within the first year following implementation of the Directive and on an annual basis every year thereafter.

MS opting for a procedure of *regulated access* will take the necessary measures to give parties involvement either inside or outside the territory covered by the interconnected system a right of access to the system on the basis of published tariffs and/or other terms and obligations for use of that system. This right of access may be given by enabling them to enter into supply contracts with competing natural gas undertakings other than the owner and/or operator of the system or a regulated undertaking.

Regarding *market opening*, a gradual approach to market opening over a ten-year period is adopted (Article 18) with quantitative and qualitative criteria being applied. MS are to designate “eligible customers” that are domestic customers having the legal right to enter into gas supply contracts. In addition there will be a minimum of market opening requirement.

Another provision requires that the *accounts* of all integrated undertakings in the sector must be as *transparent* as possible in particular to detect any abuse of a dominant position such as very high or low tariffs or discriminatory practices for equivalent services (Article 13). To this end *unbundled accounts* must be kept for natural gas transmission, distribution and storage activities and where

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Community. (Note of DG Energy & Transport on Directives 2003/54/EC and 2003/55/EC on the internal market in electricity and natural gas, Public Service Obligation, Brussels, 16/01/2004)

[9] Which a non-regulated market cannot guarantee appropriately.

appropriate, consolidated accounts for non-gas activities as they would be required to be kept if these activities in question were carried out by separate undertakings. Transmission and distribution undertakings are forbidden from using commercially sensitive information gained in the role of system operator in the context of sales or purchase of natural gas (Articles 8 and 11).

The Gas Directive contains certain *derogations* (Article 25) including the possibility of refusal on access on the grounds of lack of capacity, PSO or serious problems with take-or-pay contracts[10]. The Commission can arbitrate/adjudicate exemptions granted by MS.

Beyond derogations it also allows for some safeguard of new investments in *emergent markets* and regions but not for longer than ten years (Article 26). The EC intends to apply objective criteria to such exemptions in a very restrictive manner in order to avoid a proliferation of temporary derogation.

Member States were obliged to implement the Directive through national legislation by 10 August 2000. At that date, most of them had transposed the Directive (Belgium, Finland, Germany, Ireland, Italy, Spain and the UK), whilst others were discussing draft laws (Austria, Denmark, France, Netherlands and Sweden) and two were seeking derogation from the provisions of the Directive (Greece and Portugal). As of August 2003, all 15 countries have transposed the Directive.

Despite its ambition to establish a European market for natural gas, the First Directive adheres to the "principle of subsidiary and sets down rules that are no more than general principles providing for a framework, the detailed implementation of which should be left to Member States" (Clause 9 of the Preamble and Article 3 (1)). This has resulted in a mix of situations, both in the terms of access and speed of implementation in national gas markets.

Table 1 summarizes the position of each MS as of April 2003 including details on unbundling of DSOs, capacity booking procedures as well as balancing conditions and wholesale gas markets. In addition, there is detailed assessment of overall network tariffs.

[10] An operator could be allowed to refuse access to the network to an eligible customer in circumstances where ToP contracts pose serious economic difficulties to the parties.

Table 1: Implementation of the Gas Directive as of April 2003

	Declared Market Opening (%)	Unbundling Transmission System Operator	Unbundling Distribution System Operator	Regulator	Transmission Tariff Structure	Overall Network Tariffs	Capacity Booking Procedure	Balancing Conditions Favourable to Entry	Concentration in Wholesale Markets
Austria	100	Legal	Legal	ex-ante	under review	n.a.	moderate	favourable	yes
Belgium	59	Legal	Legal	ex-ante	distance	normal	flexible	moderate	unknown
Denmark	35	Legal	Legal	ex-post	postalised	normal	moderate	moderate	yes
France	20	Accounts	Accounts	ex-ante	distance	high	inflexible	moderate	yes
Germany	100	Accounts	Accounts	NTPA*	distance	high	inflexible	unfavourable	moderate
Ireland	82	Management	Management	ex-ante	entry-exit	normal	flexible	moderate	unknown
Italy	100	Legal	Legal	ex-ante	entry-exit	normal	flexible	favourable	yes
Luxbg	72	Accounts	Accounts	ex-ante	postalised	normal	flexible	unfavourable	yes
Neth	60	Management	Accounts	hybrid	entry-exit	normal	flexible	moderate	yes
Spain	100	Ownership	Legal	ex-ante	postalised	normal	flexible	favourable	yes
Sweden	47	Accounts	Accounts	ex-post	postalised	high	flexible	n.a.	yes
UK	100	Ownership	Ownership	ex-ante	entry-exit	normal	flexible	favourable	moderate

*NTPA = Negotiated Third Party Access

Coloured fields indicate conditions that impede competition

Source: Second benchmarking report on the implementation of the internal electricity and gas market, SEC (2003) 448

According to the EC, a number of obstacles to the creation of a truly integrated gas market became apparent after adoption of the Directive. The most significant barriers besides unequal level of market opening were in particular inappropriate tariff structures as well as unexplained disparities in network access tariffs between MS and regions for transportation and distribution transactions, thus forming a barrier for competition and providing revenue for cross-subsidies.

Not only lack of transparency regarding infrastructure capacity and capacity reservation procedures not giving third parties flexibility to change customer base without incurring increased cost, but also concentration of gas production and import on a few companies, slow development of gas trading hubs and an unnecessary stringent, non-market based and not cost-reflective balancing regimes hindered the evolution of a truly internal market for natural gas in Europe (SEC (2003) 448, pp. 5)

A comparative scientific study confirms the assessment of the European Commission (Finon, 2002): Germany together with France is ranked lowest amongst the big European countries when it comes to market openness; the

United Kingdom is leading far ahead. A new legislative package adopted in June 2003 seeks to address the diversities of these issues still remaining among MS.

2.2 Second Gas Directive 2003/55/EC

At its meeting in Lisbon in March 2000, the European Council called for rapid work to be undertaken to complete the internal market in both electricity and gas sectors and to speed up liberalisation in these sectors with a view to achieve a fully operational internal market. Following this request, the EC proposed amendments to the Gas and Electricity Directives, which were approved in June 2003. In August 2003, the New Directive, amending the until then existing 98/30/EC, entered into force and Member States have a year to transpose it into national law.

The New Directive will impose accelerated opening of the end market and an enhancement in non-discriminatory guarantees for access to every gas system.

The main objective of the New Directive is to create a truly operational internal gas market and to accelerate market opening. It includes quantitative proposals regarding progressively freeing all gas consumers to choose their supplier to ensure that they benefit from advantages of an open market and to guarantee competition and a level playing field between MS. A significant acceleration and extension of the obligations under the First Directive is the deadline for the opening of the gas market (Article 23). MS are now required to ensure that all non-household customers are entitled to choose their supplier by 1 July 2004 and all customers by 1 July 2007 at the latest. Article 31 requires the Commission to compile a detailed report on the state of the market by 1 January 2006, with substantial reporting beforehand.

Furthermore, there are qualitative issues designed to improve structural aspects of the Community market and ensure equivalent access to the market throughout the EU. Where a gas transmission system operator (TSO) or distribution system operator (DSO) is part of a vertically integrated undertaking the New Directive requires Member States to ensure, as a minimum, that transmission will be carried out via a subsidiary company that is *legally and functionally separate* vis-à-vis its day to day operation from generation and sales activities of its parent company (Articles 9, 10,11, 12, 13, 14 and 15). The requirements to implement a “Code of Conduct” and confidentially limiting the

ability of vertically integrated firms to exploit the remaining links between businesses are just as important. The Directive specifies a number of measures that must be respected in order to ensure that the transmission subsidiary company is able to operate in functional terms independently of the other commercial interests of the group to which it belongs and requires TSO to be legally unbundled in terms of its legal form, organisation and decision making from other activities from 1 July 2004. Similar conditions are applied to DSOs whilst Article 13 gives MS the possibility to exempt small DSOs[11] from legal unbundling and this might be postponed until 1 July 2007 (Article 31(3)). Article 15 of the Directive allows the possibility of a combined distribution and transmission system operator.

Provisions on *unbundling and transparency of accounts* have been clarified and extended requiring integrated companies now to specify rules used to allocate assets and liabilities, expenditures and incomes and to indicate any transactions above a certain size conducted with related undertakings (Article 17).

With regards to *TPA*, the reference to the model of "negotiated" TPA has been abolished therefore obliging all Member States to implement a system of "regulated" TPA to gas transmission and distribution systems as well as to LNG facilities based on published tariffs. As for gas storage and upstream facilities and line pack, the possibility to choose between regulated and negotiated TPA remains according to Articles 19 and 20. Exemptions from certain provisions of the TPA regime are allowed for in Article 22.

The designation of one or more competent bodies with functions of *regulatory authorities* for electricity and gas markets ensuring "non-discrimination, effective competition and efficient functioning of the market" is required by all Member States. Regulatory authorities, besides their dispute settlement function, have to fix or approve terms, conditions and tariffs for connection, access and balancing services. In addition, they are required in dealing with further matters related to the markets and behaviour of market participants (Article 25).

In order to ensure customer protection, integrity and safety of the system as well as supplies at reasonable prices, Articles 3 and 7 deal with *PSO*. Member States will require TSO to meet minimum levels on investment for maintenance and

[11] Serving less than 100.000 connected customers or serving small isolated systems.

development of the transmission system (including interconnection capacity) to guarantees network maintenance and development. Measures chosen by MS are not to distort competition or slow down opening of markets, thus need to be clearly defined, transparent, non-discriminatory and verifiable, as they have to be notified.

Cross-border arrangements are not explicitly discussed in the New Gas Directive, but Article 25 grants jurisdiction over disputes to the regulatory authority of the MS with jurisdiction over the network that is denying access. Article 20 awards responsibility for dispute resolution to Member States in cases of inter-state collaboration and consultations, whereas Article 22 exempts new gas interconnections from requirements to offer TPA and other obligations.

Summing up, the main elements of the New Directive are increasing PSO, strengthening of regulation, imposing legal unbundling, enforcing regulated TPA, recognizing exemptions for new infrastructure, taking account of SoS and maintenance of former transits.

Concluding, the New Directive marks a significant further step towards the integration of European gas markets. It does not stop at creating formally open markets throughout Europe but some of the measures described above have been included to remove practical and structural barriers that have to date prevented effective competition. In particular, the focus on unbundling of TSO and DSO as well as TPA to the network and interconnections should effectively reduce problems faced by market entrants when delivering gas to the customer. Not only the Commission is putting high hopes into that the new legislative package will provide the final development of (real) competition in European Energy Markets. Difficulties and challenges during the implementation of the New Directive and the roles of different institutions in the process are worth an analysis, but would go beyond the scope of this work.

3. The Concept of Security of Supply

Security of gas supply in the energy system has always been an important concern given society's dependence on energy and lack of alternative sources. Symptoms of insecurity can be physical (supply interruption) or financial (fluctuating prices). The best way to think about energy security is a process of managing risk. After the first oil shock, energy was strategic and governments owned large parts of the network energy industry or regulated them as monopolies. Political and economic harm from interruption of supply seemed much greater than from surplus investments and profit maximising behaviour was discouraged. This quite often resulted in high levels of investment and security but at substantial cost.

Today, energy security applies to all energy sources, is firmly established as a global issue and enhanced by environmental concerns. With gas and electricity markets being liberalised efficient markets, secure frameworks for investment, trade and transit, and undistorted pricing are today understood to be essential elements of energy security. The concern about security of supply in liberalised markets can be ascribed to viewing security as a public good or externality. In liberalised markets new competitors have the opportunity to "free ride" on the security provided by incumbents and competition itself may lead operators to prioritise cost cutting at the expense of security. Security of natural gas supply has to be maintained in a market that links producers and customers in different countries via transmission, transportation and distribution networks (UNECE, 2003).

3.1 Definition of Security of Supply

A vast variety of definitions has evolved over time and been adjusted to prevailing issues. Box 1 merely provides a glance of existing definitions as seen by various stakeholders and institutes.

As the whole concept of security of supply (SoS) should be understood as a concept of risk management (IEA, 1995, p.31), different types of risk need to be identified. Basically, five types of risk are distinguished: technical, political, regulatory, environmental and economic. Economic risks mainly include the price risk. Customers require a cost-reflective price level as price spikes are a

threat just like physical interruption of deliveries. Price volatility itself is a risk effecting both producers and consumers.

Box 1: Definition "Security of (gas) supply"

- "…possible risks or consequences of a disruption in gas supply or non-availability of supply…risks fall into three broad categories: technical, long-term and political."

  IEA, 1995, p.31

- "…the threats of supply and price disruptions arising from risks associated with the sources of gas supplies, the transit of gas supplies and the facilities through which gas is delivered."

  Stern, 2002, p.6

- "Security of supply of gas, a concept which includes physical system security, economic security and continuity of supply, has in principle two main aspects.
  - Long-term security, which concerns the…ability to ensure a reliable and economic supply of efficient energy in the long run.
  - Short-term security, which concerns the avoidance of interruptions to contracted gas supply, and the guarantee for customers to receive their gas supply in fulfilment of their contracts

  Both…require attention to two aspects: the availability of physical gas to meet firm demands, and the physical transportation capacity to move these volumes of gas to the end consumer."

  Eurogas, 2002

- "In all geographic markets security of gas supply can be viewed as the need to have sufficient access to gas production, sufficient delivery capacity, and the right balance of diversity in supply routes, or back-up measures in the event of a disruption to supply."

  Centrica, 2002

- "From a gas transporters' perspective security of supply touches on three key aspects:
  - Gas availability
  - Adequacy of the gas network
  - System integrity"

  GTE, 2003

A different angle to look at the same concept is over different time horizons. To balance demand and supply, thus maintaining continuity of supply, on a short-term basis (availability of infrastructure), e.g. under extreme weather conditions, traditionally is considered a "national" problem. The ability to meet future

demand for gas and ensuring deliverability rather bears a long-term aspect (adequacy of infrastructure). Each of the five risks mentioned above can be allocated to at least one of the two time horizons.

Finally, the expansion from an external to an internal dimension for Europe has developed over time. The widely accepted external dimension with growing import dependence has been supplemented by an internal dimension with ongoing market reforms of the gas and electricity industries and security of supply reaching all the way to the final customer and not stopping at national borders.

For the remainder of this work security of gas supply is best to be understood as "no disruption or delay of delivery due to endogenous or exogenous influences" (Hirschhausen/Neumann, 2003a).

3.2 The Green Paper

The Green Paper "Towards a European Strategy for the Security of Energy" (COM (2000) 769) adopted in November 2000 by the EC focuses on the growing dependence on external supplies of energy. It draws attention to structural weaknesses as well as geopolitical, social and environmental shortcoming of the EU's energy supply, notably with regards to European commitments in the Kyoto Protocol. The Paper correctly indicates that SoS does not seek to maximize energy self-sufficiency or to minimize dependence, but to reduce the risks linked to such dependence. Furthermore, it identifies two main priorities: i) controlling the growth of demand and ii) managing supply dependence in Europe. There is a consensus that import dependency of oil and natural gas supplies from outside the EU will increase and accession countries (even gas rich nations like Norway) are not going to change the situation with Norway, Russia and Algeria remaining the main suppliers for Europe but new gas exporting countries (Egypt, Qatar, Trinidad & Tobago) entering the picture.

The Green Paper defines a clear strategy based on demand management[12] making it appropriate for the Union to concentrate on guiding and steering demand for energy in a way that respects Kyoto's commitments and is mindful about SoS.

[12] As the margins for manoeuvre for any increase in Community supply are weak in view of its requirements, the scope for action to address demand appears more promising.

One of the main possible "traps" in respect of natural gas as seen by the Green Paper is the danger for the EU to grow increasingly dependent on relatively unpredictable long-term supplies as currently gas imports are mainly coming from Algeria and Russia. The growing demand for natural gas across the EU (mainly driven by use of natural gas for power generation in combined cycle gas turbines due to decarbonisation and increase in reserves of natural gas) poses the Union a problem with the search of an option providing stability of gas imports at an overall reasonable price.[13] Listed among the main targets is "ensuring external supplies", which is hoped to be achieved by "making our voice heard in negotiations with producer countries". This implies an on-going dialogue or strategic partnership with gas producing countries, esp. Russia, the development of oil and gas resources and strengthening supply networks. Furthermore, the Union is to promote new import routes[14] and expand strategic reserves.

3.3 Security of Supply in the First Gas Directive

In advance of reforms of gas markets across Europe, security of gas supply was a matter of national policy and governments delegated responsibility to a single actor, either a de facto monopoly state-owned gas company or a private company with exclusive concession rights.

First contribution towards the creation of an internal market for natural gas was made by the Directive 98/30/EC of the European Parliament and of the Council of 22 June 1998. In it, importance of SoS for the internal market is acknowledged. It gave Member States the possibility to impose PSO on natural gas undertakings in relation to SoS as Article 24 allows MS to take necessary safeguard measures "in the event of a sudden crisis in the energy market". *It therefore in Article 3(2) acknowledged the right of MS to consider SoS as a*

[13] „In the long run, the supply of gas in Europe risks creating a new situation of dependence, all the more so given the less intensive consumption of carbon. Greater consumption of gas could be followed by an upward trend in prices and undermine the EU's security of supply. As long as the EU's external supply of gas depends on 41% of imports from Russia and almost 30% from Algeria, geographical diversification of our supplies would appear desirable, particular in LNG. By comparison, Europe's oil and coal supply is more diversified. The development of a long-term energy partnership with key suppliers such as Russia is therefore essential." COM(2000) 769 Final

[14] The European Union is promoting the development of Trans -European Networks (TEN) as a key element for the creation of the internal market and the reinforcement of economic and social cohesion. This development includes the interconnection and interoperability of national networks as well as access to such networks.

PSO. Measures taken shall cause least possible disturbance to the functioning of the internal market and shall be least restrictive to competition.

The importance of existing long-term take-or-pay contracts, which have developed the European gas market over the last 40 years and secured gas supply, had been realised by the EC and has been integrated by including Article 25 in the First Directive: "...if a natural gas undertaking encounters…serious economic and financial difficulties because of its take-or-pay commitments accepted in one or more gas-purchase contracts" it may apply "for a temporary derogation" from the requirement to grant TPA to the system. This might be granted by the MS but will have to be submitted to the Commission for final approval. However, a number of conditions must be fulfilled to evaluate necessity to grant derogation and it has to be proven that no other, less competition restrictive, measures could be taken. In any case, derogation can be granted only when overall gas sales of the gas undertaking "fall below the minimum offtake guarantees included in the take-or-pay contract". The Commission makes a distinction between existing and future contracts. With this, the Directive attempts to reconcile market opening with long term security of supply and the handling in practice determined the future evolution of the contractual arrangements between buyer and sellers of natural gas.

Commenting, one has to notice that Article 24 deals with emergency situations, which are short-term events. Crisis management is not sufficient for securing supply in the long run. Article 24 and 25 leave the impression that the Commission was certain that SoS would be ensured through an open market functioning under competitive conditions at all stages along the gas chain. However, SoS is not merely a question of dealing with emergencies and crisis (balancing demand and supply at the very short term) in a competitive market, but also involves long-term strategic aspects.

3.4 Security of Supply in the Second Gas Directive

The Gas Directive 2003/55/EC adopted in August 2003 contains major obligations for MS: definition of a security of supply policy and required measures to be taken ensuring SoS.

Article 2 (32) clearly defines SoS including "both security of supply of natural gas and technical safety". According to the Directive, MS shall implement

appropriate measures to achieve SoS, in particular provision of adequate economic incentives.

Article 5 requires "the *monitoring* of security of supply issues" which covers "the supply/demand balance on the national market, the level of expected future demand and available supplies, envisaged additional capacity being *planned* or under construction". MS shall publish an annual report by 31 July each year *including planned measures* to guarantee SoS. This will be done by an independent regulatory authority that is to be created in each MS and has monitoring as one of their tasks as defined by Article 25.

Giving MS the possibility to "introduce the implementation of long term planning…" as stated in Article 3 (2) regarding PSO reflects the EC's recognition of long term aspects of SoS. Furthermore, Article 3 (4) regarding PSO and customer protection requires all MS to "implement appropriate measures to achieve...security of supply. Such measures may include, in particular, the provision of adequate economic incentives, using, where appropriate, all existing national and Community tools, for the maintenance and construction of necessary network infrastructure, including interconnection capacity."

The importance of security of supply with respect to TPA and it's exemptions for new gas infrastructure is clearly defined in Articles 20 and 22 respectively, emphasising the very important strategic role of storage facilities in terms of SoS.

4. Indicators for Security of Supply and an Application to Europe

As far as known so far only little research work has been undertaken to construct an accepted indicator for energy supply security for a nation or region. The currently intense conduced debate on SoS by not only policy makers seems to require some quantification of the problem. Up to now SoS was "measured" as level of import dependency, but further definition for a useful indicator seems to be indispensable.[15] The following proposed indicators only deliver an assessment of dependence and vulnerability measure of a single country.

[15] The following part of this work is based on joint research with Christian von Hirschhausen (DIW Berlin), has been presented at workshops and picked up in the forthcoming publication "Designing indicators of long-term energy supply security", ECN, 2004 (J.C. Jansen, W.G. van Arkel, M.G. Boots).

Further research is necessary to describe risks and effects of disruptions in an index accounting for world trade and intra-area movements.

4.1 The Herfindahl-Hirschman-Index

The Herfindahl-Hirschman-Index is a commonly accepted measure of market concentration that takes into account the total number of companies in the market and their relative size (market share). It is defined as the sum of the squares of the market share of each individual firm. As such it can range from 0 to 10.000 moving from a very large amount of very small firms to a single monopolistic producer.

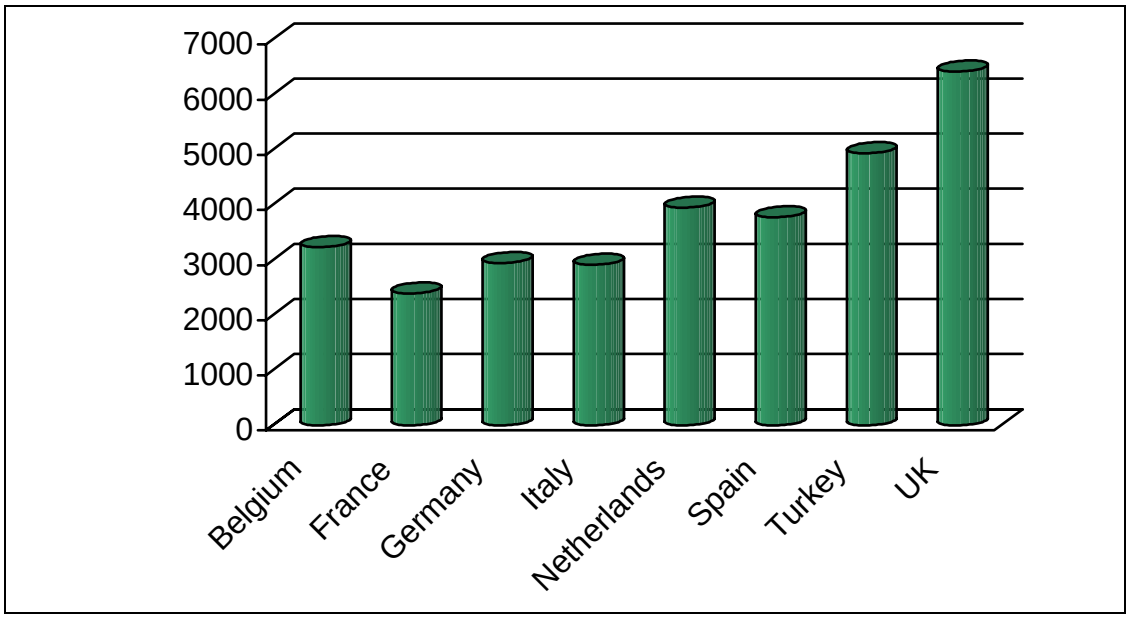
$$HHI = \sum_i x_i^2 \tag{1}$$

It approaches zero when a market consists of a large number of firms of relatively equal size. The index increases both as the number of firms in the market decreases and as the disparity in size between those firms increases.

Markets in which the HHI is between 1000 and 1800 points are considered to be moderately concentrated, and those in which the HHI is in excess of 1800 points are considered to be concentrated. Transactions that increase the HHI by more than 100 points in concentrated markets presumptively raise antitrust concerns under the Horizontal Merger Guidelines §1.51 issued by the U.S. Department of Justice and the Federal Trade Commission.

Figure 1 shows the HHI for gas imports by the main consuming countries across Europe, with Turkey as accession country playing an important role as strategic transition country for imports via the Balkans. To make the index applicable to European gas markets, x_i does not represent the market share of a single firm but the share of imports from a particular country into the country considered. All indices indicate a high level of market concentration on a national level across Europe. The derived index does not distinguish between pipeline and LNG imports, nor does it take into account indigenous production and thus just gives a very coarse impression of the true picture.

Figure 1: Herfindahl-Hirschman-Index for Europe (2002)



Source: Own calculations based on BP Statistical Review of World Energy, June 2003

4.2 The Shannon-Wiener-Index[16]

As a well-designed diversity strategy appears to hold out a good promise of energy supply security, the Shannon-Wiener diversity index, placing weight on smaller participants, will shed more light on the issue when aiming to first quantify diversity and SoS. Stirling (1999) has shown that the Shannon diversity index is the most attractive dual concept diversity index, reflecting both variety and balance in an even way. The basic indicator for the portfolio of sources for natural gas is given by:

$$SWI = -\sum_{i}^{n} (x_i \ln x_i) \qquad (2)$$

Where x_i, as with the HHI, is the share of imports from a particular country n into the country considered. Because the natural logarithm of a fraction is always negative, the minus sign at the beginning of the equation ensures that the index is always positive. Assuming 16 potential (foreign) regions of origin, the corresponding maximum value would be approximately 2.77 [-ln (1/n); N=16]. The minimum value (for being completely dependent on a single importing region) is zero. The index increases as the number of different supply sources

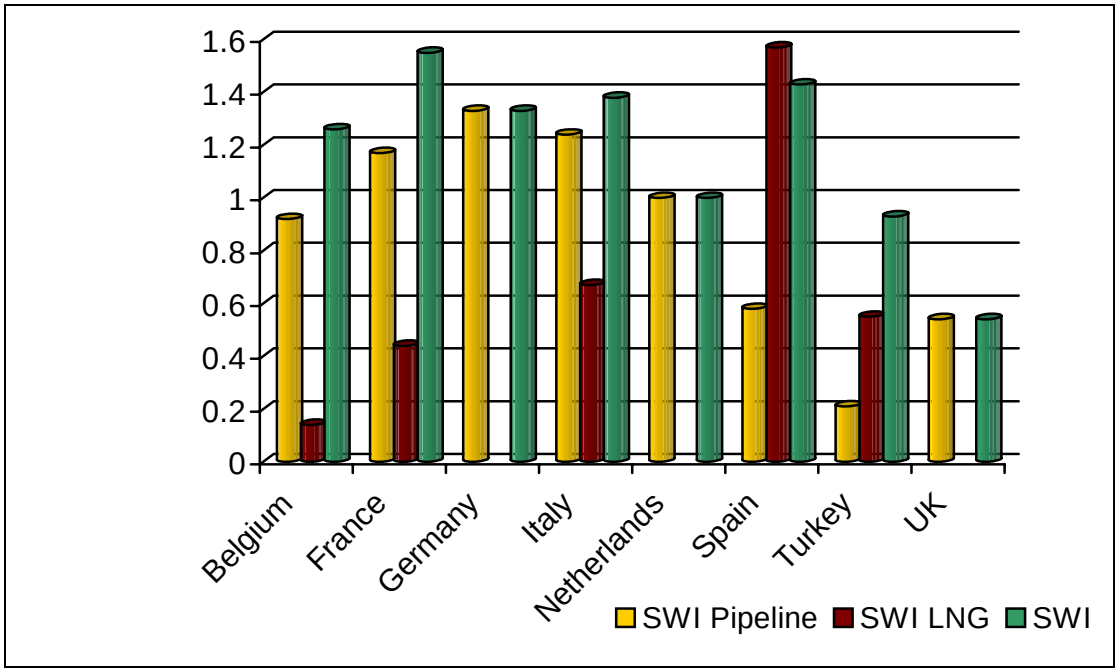
[16] Based on DTI "UK Energy Sector Indicators 2003", BP "Statistical Review of World Energy, June 2003" and Hirschhausen/Neumann (2003b).

increases. Thus, a lower value of the SWI suggests a worse situation than a higher value.

Different types of transporting natural gas from producing to consuming regions of the world was taken into account, thus calculating the index for pipeline and LNG imports before determining it for the total trade. A country like Germany or the UK was not affected as until today only pipeline gas is imported.

Overall, Europe seems to be well diversified in terms of pipeline imports, but lacks sufficient diversification when it comes to LNG. This might change with an ever-increasing number of proposed LNG receiving terminals to be build, particularly in Southern Europe and the United Kingdom.

Figure 2: Shannon-Wiener-Index for Europe (2002)



Source: Own calculations based on BP Statistical Review of World Energy, June 2003

4.3 The Adjusted "Shannon-Wiener-Neumann-Index"

Having determined the Shannon Wiener diversity index several drawbacks of the same emerge. Like the HHI it does not account for indigenous production. For a member state like the United Kingdom or the Netherlands providing 98% and 81% respectively (IEA, 2002) of natural gas consumption by home production the level of diversity is significantly lower than for Spain or France where only 1% and 4% of overall consumption is provided for by indigenous production. On the other hand, as imports from political unstable regions weaken

the level of SoS this also will have to be allowed for. For these reasons the original SWI is now being adjusted. In the first step, political risk rating b_i is taken care of. The index is now derived by:

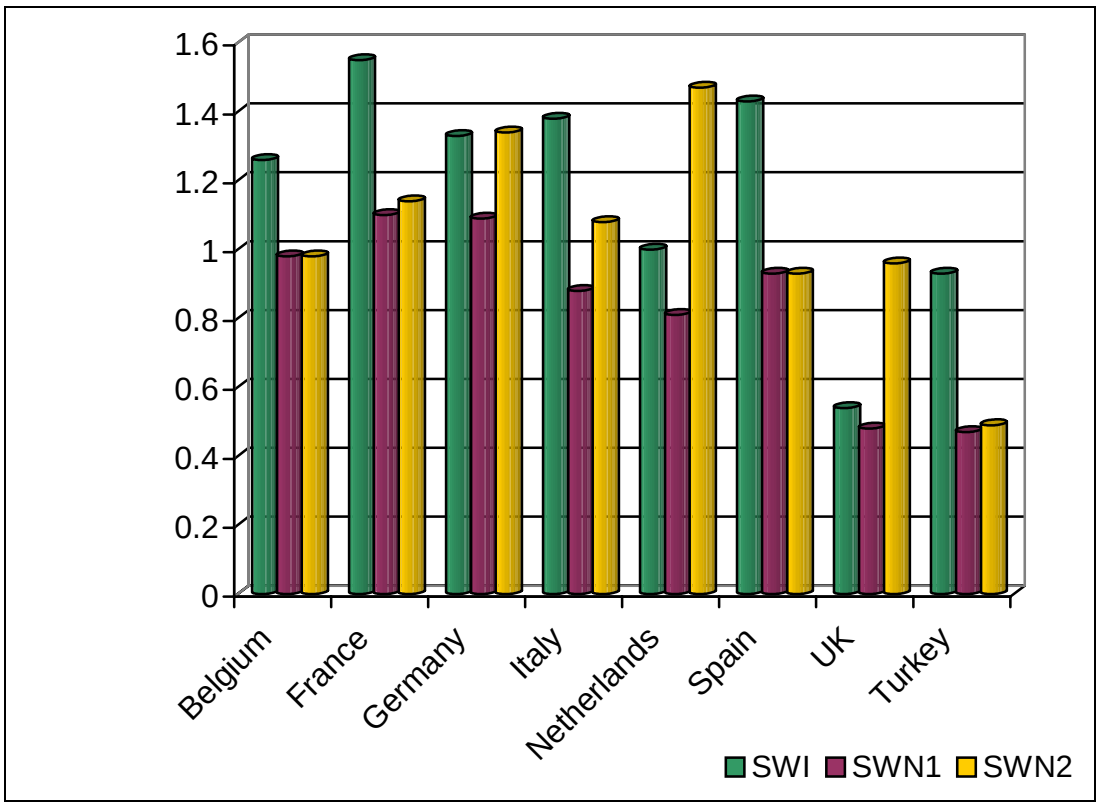
$$SWN_1 = -\sum_i (b_i x_i \ln x_i) \qquad (3)$$

The PERC Ltd. index of political stability of producing regions b_i ranging from 0 to 100% will in particular severely reduce the original SWI for imports from very unstable regions[17]. In a next step a further adaptation will incorporate the level of self-sufficiency. The share of indigenous production g_i is taken from IEA 2002.

$$SWN_2 = -\sum_i (b_i x_i \ln x_i)(1 + g_i) \qquad (4)$$

Figure 3 presents a comparison of the original SWI (regardless the type of trade) and the two adjustments made.

Figure 3: Adjusted "Shannon-Wiener-Neumann-Index" for Europe (2002)



Source: Own calculations based on BP Statistical Review of World Energy, June 2003

[17] Political and Economic Risk Consultancy Ltd.

Having allowed for specific adjustments, the Netherlands and UK importing only a minor share from stable regions (Norway, Netherlands and UK) seem to be more secure in terms of diversity than with the original index as opposed to Belgium, Spain or Turkey obtaining most of their consumed gas from relatively instable regions such as UAE, Algeria, Libya, Nigeria or Iran.

The overall picture for Europe does not seem to be too bad but certainly leaves room for improvement in diversifying import portfolios. This will play an even more important role as the UK is expected to join the league of net importers of natural gas in the very near future.

5. Proposal for a New Directive Concerning Security of Supply

Commission proposal for a Directive concerning measures to safeguard security of natural gas supply referenced COM (2002) 488[18] receives explicit attention in a number of ways. The main arguments given by the European Commission in justifying the proposal for this new Directive to cover national gas supply security are the increasing importance of gas in Europe and rising import dependence, the growing importance of gas in power generation, the lack of security of supply guarantee from any single player in liberalised markets[19], and the need for European Community mechanisms to ensure "unity and solidarity" in the event of supply problems.

5.1 Objectives and Elements

Main proposals and obligations of the proposed Directive are laid out in the following. Article 3 of the draft Gas Security Directive states that "Member States shall take the necessary measures to define the general policies for security of supply…". Provided the requirements of this directive are met, the exact content of supply security policy and the way in which this policy is determined shall be treated in accordance with the subsidiarity principle. When determining measures and standards MS are obliged to take utmost account of ensuring continuity of gas supplies (notably to vulnerable customers), ensuring adequate levels of gas storage or alternative back-up fuels, diversifying supplies whilst ensuring a reasonable balance between different supply sources, providing

[18] OJ C 331, 31/12/2002

[19] Security of gas supply has to be seen as shared responsibility because in a competitive market, a single entity can no longer be assigned the responsibility for all SoS aspects (Eurogas, 2002).

incentives for new gas supplies, the risk of system failure or disruption of the largest natural gas supply source and related costs of such a disruption, considering possibilities for cross-border co-operation as well as the importance of long-term contracts and their flexibility.

The proposed Directive makes storage a particular feature requiring MS to publish a report every two years setting national targets for the future contribution of storage to SoS.

According to Article 4, all MS need to ensure deliveries to vulnerable customers without fuel switching capabilities can be maintained “in case of extremely cold temperatures during a period of three days statistically occurring every twenty years”, “in case of a cold winter statistically occurring every fifty years”, and “in case of disruption of the single largest source of gas supply during sixty days given average weather conditions”. In order to achieve these standards, MS may use a combination of, at least, interruptible customers, gas storage, supply flexibility, spot markets and diversification of gas supply sources, including the use of biogas. Long-term gas supply contracts implying gas imports from non-EU countries, will be closely monitored by the Commission as on the one hand those contracts certainly ensure long-term security of gas supplies, but on the other hand may hinder development of a more liquid market for gas. Furthermore, Article 6 allows the Commission to oblige MS to ensure that a minimum fixed proportion of new gas supplies from non-EU countries is based on long-term contracts.

In the event of an extraordinary gas supply situation, the Commission in Article 8 specifies its powers in the event of a major supply crisis. In such a case it may issue recommendations so as to get MS to assist MS particularly affected by the disruption. Emphasis again is put on unity and solidarity thus MS not simply considering the security implications of their national portfolio.

The creation of a European Observation System for supply of hydrocarbons as proposed in Article 10 has been opposed by the European Parliament, Commission on Industry, External Trade, Research and Energy in their final Report on the proposal for a directive (A5-0295/2003).

According to the Proposal, the purpose of storage seems to play an important role in case of a crisis or disruption. Storage capacity across EU Member States

is highly variable. It seems doubtful whether MS by a directive should be forced to build storage if it is not economic to do so. Obligations will take into account geological and economic storage possibilities. Allocation of costs between those, which will be required to build new facilities and those benefiting from facilities in case of an emergency, will be complicated. Gas held in storage in a MS might be released in the event of a crisis in another MS. The effect would only be little or none as gas grids are still national. The certainly seems to be the need to consider further instruments for securing gas supplies across Europe.

5.2 The Role of Governments

Member State's governments will need to define national energy policies, but primarily will have to set standards for security of gas supply. Furthermore, they will have to allocate responsibilities among all players along the gas chain and take on some themselves. This will have to result in putting in place a stable and predictable fiscal, legal and regulatory framework and fostering a good investment climate. Governments will have to ensure that companies provide adequate level of SoS in competitive markets should monitor investment performance. By doing so, they should rely on market instruments as far as possible to overcome eventual bottlenecks, i.e. investment incentives, instead of intervention. Financing of new projects in competitive markets needs a stable framework in order for investors being able to judge economic feasibility of projects. Here governments can provide incentives by putting into place stable rules such as higher profits and avoiding over-taxation.

National governments should play a role in encouraging cross border trade by creating a favourable political climate, e.g. engaging in producer/consumer dialogues. In addition, governments should encourage gas-producing countries to meet future European supply requirements by opening their reserves to export (and foreign investment) and help them in restructuring their upstream gas sectors (open the investment regime).

Governments themselves will have to take on the responsibility of protecting small customers against volatile prices and providing a clearly defined level of SoS for that specific group of customers.

Concluding, there certainly is a role for governments in enhancing both short and long term security of gas supply by encouraging investments in pipeline

interconnections, facilitating international and cross border trade, determining acceptable security levels for small customers, setting safety requirements and providing a legal basis for dealing with emergencies.

5.3 Definition and Role of Regulators

The internal market demands for regulators ensuring open access to the network, protecting customers´ ability to choose their supplier and enforcing antitrust laws. Competitive markets require regulators to carry out their tasks impartially, without discrimination between market players. They need to be independent from stakeholders and activities carried out as transparently as possible. In most OECD Europe several institutions share authority over the industry. There are three broad institutional approaches to gas supply industry regulation in OECD Europe. First, *independent regulatory agencies* separate from the ministry have been established in Denmark, France, Italy, Ireland, Portugal, Sweden and the UK. These agencies often cover both gas and electricity sector. In most cases they are responsible, among other matters, for network regulation. They mainly are governed by a collegial board and operate on the basis of public consultation and other procedures meant to enhance transparency. A second approach is *ministries directly handling most regulatory responsibilities*. A third group of countries has established *ministerial regulatory agencies*. These are subordinated to the ministry but designed to operate autonomously in the day-to-day management of regulatory affairs. The scope of their activity is similar to that of independent agencies.

With the new Directive 2003/55/EC all European Member States are required to create an independent regulatory authority with a large set of regulatory and related functions assigned to them including regulation of monopolies (unbundling, network pricing and access conditions, rules for system operators), end-user tariffs, quality and performance standards, monitoring market behaviour and performance, enforcement of rules, regulation of entry (licensing and authorisations), advising the government and dispute resolutions.

With only few European countries producing natural gas, the role for regulators for upstream gas industry is very limited. However, regulators play a role by facilitating access to the markets and to capacity at entry points and to facilitate

investments to avoid congestions. Another important role is facilitating the building of cross border pipelines/interconnections and LNG terminals.

At the European level a regulator does not play a role for access to supply. The upstream business is matter of Member States with EC Gas Directives directed to the downstream sector.

The role given to regulators with regard to security of gas supply can be very complex but does not involve defining responsibilities. The main task will be ensuring that efficient incentives are put into place. Main instrument for fostering SoS is ensuring TPA to existing infrastructure and setting tariffs which encourage extra investments into transport and other infrastructure. For regulators, the challenge is to ensure security of gas supply without distorting competition and guaranteeing the well functioning of the domestic gas market.

5.4 The Role of Operators[20]

Transmission system operators (TSO) are responsible for determining infrastructure investments to provide technical transmission capacity and technical integrity and safety of network operation. This can only be provided if long-term investment signals from suppliers are received. But with all transmission tariffs being regulated, hence driven down, no such incentives for investments in transport capacity are provided. All TSO's should cooperate with other TSO's and operators of other connected systems in order to facilitate trade and allowing network users to transport gas through the transmission network.

6. Conclusion

With an expected rapid increasing demand for natural gas in Europe over the next 30 years mainly driven by increased use in power generation, its low carbon content and inherent environmental advantages the necessity of diversification of sources and economic usage as pointed out in the Green Paper can no longer be neglected. Indigenous production in Europe, concentrated in the UK, Netherlands and Norway, cannot compensate the anticipated increase in demand, therefore making imports from external suppliers indispensable. Global demand of natural gas and trade with mainly liquefied gas growing swiftly further contribute to rising concerns regarding

[20] Suppliers and transportation

security of gas supply no longer making it only a matter of national law but effecting interdependencies of all EU Member States thus requiring some form of legal framework for the provision of security of supply.

The First Gas Directive 98/30/EC created new challenges for gas security, which before was an implicit matter of national policies since integrated gas companies were largely controlled by governments. Security itself by then only was mentioned, but certainly not focused on, thus missing the point of investment performance along the gas chain down to the end user. This was caught up with in the Second Gas Directive 2003/55/EC repealing Directive 98/33/EC containing two major obligations for Member States: definition of a security of supply policy and measures which need to be taken to ensure security of supply.

A quantitative analysis of the current situation of several Member States using concentration and diversity indices provides a surprisingly positive impression, certainly leaving room for further improvements, of the European position with regard to security of supply.

The legal framework of liberalized gas markets inhibiting multiple players[21], unbundling of responsibility and each company being responsible for security of supply of its own customers, is scheduling a new, separate environment for security of supply. Here, governments have the executive power in defining security of supply policy and objectives with national regulators, when delegated by governments, being responsible for implementing security of supply or otherwise being responsible for ensuring appropriate market arrangements and rules. Gas operators will be responsible for effective security of supply and for developing an optimised portfolio of instruments and even consumers such as power generators or large industrial customers with fuel-switching capabilities will have to bear their share contributing to the provision of security of supply.

The new Commission Proposal for a Directive concerning measures to safeguard security of natural gas supply marks a right step towards a separate legislation concerning just these issues.

[21] Owners and operators of network storage, shippers and traders providing services, suppliers/marketers to different classes of customers and customers themselves.

7. Abstract (German)

Die langfristige Energieversorgung Europas steht spätestens seit den Elektrizitätskrisen in Kalifornien und Italien im Mittelpunkt der Debatte um die Schaffung eines europäischen Binnenmarktes für Elektrizität und Erdgas und dem damit einhergehenden Liberalisierungsprozess. Wurde die Versorgungssicherheit mit Erdgas durch bis dato de facto staatliche Monopole und deren Langfristbeziehungen mit Produzenten ohne Probleme gewährleistet, unterliegt der Markt für Erdgas derzeit drastischen institutionellen Veränderungen. Diese Arbeit gibt zunächst einen Abriss der veränderten legislativen Grundlagen, um sich dann der Frage der Versorgungssicherheit en detail zu widmen. Nach einer Begriffsklärung wird versucht anhand von Maßzahlen die momentane Situation der Mitgliedstaaten der EU in Bezug auf Versorgungssicherheit mit Erdgas zu quantifizieren. Abschließend wird näher auf einen Gesetzesvorschlag der Europäischen Kommission betreffend Maßnahmen zur Sicherstellung der Erdgasversorgung eingegangen.

8. Glossary of Terms and Abbreviations

BP – British Petroleum

Centrica – British Service Company created in 1997 following the demerger of British Gas plc.

DG TREN – EC Directorate General Energy and Transport

DSO – Distribution System Operator

Eligibility/eligible customers – Gas users that meet criteria specified in the EU Gas Directive or in national legislation, such as minimum volume of gas consumed per year, have the right to choose their supplier and request third-party access to the grid.

EC – European Commission

EEC –European Economic Community

e.g. – for example

EU – European Union

Eurogas – International non-profit association representing European natural gas industry towards the EU.

GTE – Gas Transmission Europe

HHI – Herfindahl-Hirschman Index

Hub – A transfer site or system where several pipelines interconnect and where shippers may obtain services to manage and facilitate their routing of supplies from production areas to market.

i.e. – that is

IEA – International Energy Agency

LNG (liquefied natural gas) – Natural gas that has been liquefied by reducing its temperature to –161 degrees Celsius at atmospheric pressure.

MS – Member States

OECD – Organisation for Economic Cooperation and Development

PSO - Public Service Obligation

Shipper – A company, which transports gas along a pipeline system. Shippers need to be registered with the local regulatory body.

SoS – Security of Supply

SWI – Shannon-Wiener Index

SWN – Adjusted “Shannon-Wiener-Neumann Index”

TPA (Third Party Access) – The right or possibility for a third party to make use of the transportation or distribution services of a pipeline company to move his own gas, while paying a set or negotiated price.

TSO – Transmission System Operator

UAE – United Arab Emirates

UK – United Kingdom

Unbundling – The separation of the various components of gas business in order to introduce greater competition to these segments of the industry.

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„Security of Supply in Liberalised European Gas Markets“

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