



QATAR AS AN ALTERNATIVE GAS SUPPLIER TO THE EU: A FEASIBILITY STUDY

Draft Paper

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INTRODUCTION

In recent years, there has been a substantial debate over **energy security**¹ at the national, regional and the EU levels respectively. The issue of energy security, as well as the development of a new energy transmission infrastructure, has taken on a strong political dimension, which shows that the market logic is not the only element to take into account²: Energy security has increasingly become of major concern for all developed and developing countries³. Accordingly, many authors suggest that the EU may have made energy an integral part of its external trade, foreign relations and security policies.⁴ Indeed, **taken as a public good, energy security should not be left solely to the responsibility of private enterprises.**

Europe depends largely on hydrocarbon imports, as the current dependence rate of 53.8% for the EU-27 indicates⁵. More than that, projections show that Europe's dependence on outside sources of energy (most notably oil and gas) will continue to grow in the decades to come (by 2030 reaching 90 and 80 %, respectively)⁶. At the same time, the use of alternative and renewable sources will hardly reach a level that those forms of energy may fully substitute the conventional ones in the foreseeable future.⁷ Fossil fuels will, thus, remain the primary energy sources in the EU during the next several decades. At the same time, the environmental obligations of the Kyoto-Protocol make natural gas the preferred option when compared with other fossil fuels, such as oil or coal, due to its lower CO₂ emissions. Also, as the IEA reckons, "greater deployment of renewables (...) may enhance the role of gas to balance intermittent sources such as wind"^{8,9}. **Given the clear need for fossil fuels in the future and the relative environmental friendliness of natural gas, we focus on the security of gas supply in this paper.**

As already suggested above, the dependence on (gas) supply is often understood as undermining the energy security of Europe. Some authors show, however, that import

¹ In this paper we understand **energy security** (or, more specifically, the security of supply as this is particularly relevant for the EU) "as the availability of energy at all times in various forms, in sufficient quantities, and at reasonable and/or affordable prices" (Clingendael Institute (2004): 37).

² Percebois (2008): 33-53.

³ See e.g. Marquina (2008).

⁴ Correlje/van der Linde (2006): 532-543.

⁵ This is the respective figure for 2008 (see <http://www.energy.eu/#dependency>, last access: 1.4.2010).

⁶ EurActiv (2010).

⁷ Umbach (2007).

⁸ IEA (2009): 15.

⁹ Gas-fired powerplants can be quite easily switched on and off, compared to other plants.

dependence as such does not *necessarily* entail greater insecurity¹⁰. There is, of course, the danger that political considerations could interfere with the flow of gas and gas would be thus used as a “strategic weapon”. Yet, there is another fear frequently mentioned as well: political instability in the producer and transit countries or regional tensions which in turn might lead to gas supply disruptions. In such a case, the disruptions lie outside of control of the gas exporting state. Both of the aforementioned threats can be, nevertheless, reduced by the careful diversification of supply structures. **Hence, it is the aim of this paper to focus on one particular strategy through which a better diversification of gas suppliers (and thus greater energy security) could be achieved.**

It is necessary to note, however, that the situation of the EU member states is quite uneven as different states face different situations in the global gas market. Accordingly, the EU countries can be subdivided into three groups¹¹: The first group with a relatively *high risk index* includes Central and Eastern European member states of the EU. These countries do not produce any gas and usually import most of their gas from non-EU (Russia and to a lesser extent: Norway) suppliers. The share of gas in their total energy consumption is relatively high, their external gas supply not being well diversified.¹² The second group of countries includes Finland, Germany, Ireland and most Southern European states. This group is characterized by a medium risk due to a more diversified gas import structure and/or less reliance on gas in their aggregate energy portfolio. Nevertheless, Germany and Italy remain the most important contributors to the overall EU risk exposure with their energy security being of crucial importance at the EU level.¹³ The third group consists of the remaining countries which exhibit a relatively low risk index either due to their domestic production (like the Netherlands or the United Kingdom) or to their mostly European import origin. On the other hand, though, e.g. the UK gas production is projected to decline steeply, its dependency on imports rising to some 80 % by 2020¹⁴. It is thus a foreseeable decline of European gas production, which tends to de-emphasize the differences between the three groups of states mentioned. Moreover, the Russian gas exports¹⁵ to Europe will plateau (at around 200 billion cubic meters [cm]/year) over the next decade and are not expected to rise

¹⁰ Luciani (2004).

¹¹ Le Coq/Paltseva (2008): 36-38.

¹² Ibid.

¹³ Ibid.

¹⁴ Stern (2007): 87.

¹⁵ Russia is the dominant importer of gas to the EU.

thereafter¹⁶. This, again, might force the member states to diversify their gas supplies. given these trends, then, the **diversification of supply seems to be beneficial for all member states in the long run.**

Qatar as a proposed solution

In this paper, **we consider Qatar as an additional gas supplier.** There are several reasons for choosing this country in particular. Firstly, Qatar is now the world's largest producer of liquefied natural gas (LNG) and its gas resources (natural-gas reserves) are the third largest in the world - after Russia and Iran¹⁷. In a relatively short time, Qatar will become the world's second largest gas exporter (after Russia), maintaining its leading position for LNG.¹⁸

Secondly, Middle East and North Africa (MENA) countries have always been seen as a promising import resource for European gas markets. However, with the exception of Qatar, the prospects for Middle East gas exports to Europe are relatively poor for at least the next decade and probably even longer. What is more, a number of MENA countries (particularly Iran and, to lesser extent, Algeria and Libya) may even reduce the quantity of gas available for export.¹⁹ Thus, thinking of these countries, Qatar stands out as the most secure partner when long-term availability of export gas is considered.

Thirdly, when compared with other regions and projects, Qatar quite often seems to represent a more viable alternative. In contrast to that, the pipeline gas projects from the Caspian region seem to be less promising both in terms of gas availability²⁰ and/or in their zero effect on the diversification of suppliers. In West Africa, on the other hand, the political situation seems to be rather problematic for reasons of political stability: Nigeria (the most important LNG exporting country in the region) experienced "petroleum-related political unrest (...) in 2006"²¹. Similarly, the ruling regime in Equatorial Guinea gives rise to severe transparency and human rights concerns.²²

¹⁶ Stern (2007): 121.

¹⁷ Qatar's proven natural gas reserves stood at approximately 890 trillion cubic feet as of January 1, 2009 (this number is given by the EIA, see: <http://www.eia.doe.gov/emeu/cabs/Qatar/NaturalGas.html>, last access: 25.3.2010).

¹⁸ Stern (2007): 85-127.

¹⁹ Ibid.

²⁰ The most striking current example (directly related to the plans of the EU) is the Chinese deal with Turkmenistan: Whilst the future of Nabucco still remains uncertain, a new gas pipeline from Turkmenistan to China is already under construction.

²¹ Stern (2007): 107.

²² Ibid.

Evaluation Criteria

Having chosen Qatar as an alternative gas supplier, we use three evaluation criteria to assess the feasibility and appropriateness of this option. These derive from relevant EU documents in the field of energy, most notably from the second Green Paper from 2006²³. On the basis of these documents, three pillars²⁴ of a common EU energy policy in the making can be identified. These are:

- **Security of supply,**
- **Environmental sustainability,**
- **Economic efficiency.**

As already indicated above, the whole approach of this paper is directly informed by the notion of “supply security”. In our analysis, we further use the criterion of supply security to assess potential threats stemming both from political considerations and political instability.

The second criterion to be focused on is “environmental sustainability”. Thus, the environmental impacts of both natural gas and, more specifically, of its liquified form (LNG) are assessed. In doing so, we concentrate predominantly at Qatar-specific indicators and at potential environmental hazards which could be associated with the import of LNG from Qatar to the EU.

The third evaluation criterion used here is “economic efficiency”. This explains the focus on LNG: With the gas markets being increasingly described in terms of a looming market failure²⁵, LNG with its relative flexibility could help to overcome this particular obstacle. Although it represents only a small percentage of the current global gas market, the LNG share is expected to rise significantly in the near future.²⁶ In our further analysis, we use the criterion of economic efficiency specifically to assess gas supplies from Qatar by looking at their economic sustainability, their possible profitability as well as Qatar’s reliability as a partner.

²³ European Commission (2006): 17-18.

²⁴ For more detailed analysis see e.g. Fischer (2009).

²⁵ Mueller (2007): 5 - 10.

²⁶ IEA (2009): 13.

POLITICAL THREATS TO INCREASED GAS SUPPLIES FROM QATAR

The security risks of gas supply cover political threats, such as using gas as a political weapon, regional instabilities, violent conflicts, terrorist attacks, separatist sentiments and territorial disputes in the gas supplier country and the transit area. Political threats could lead to unsustainable gas supplies and should therefore be considered an important factor while analyzing the reliability of a particular gas supplier. Apparently, political tensions formed the background of the recent and much debated Russian-Ukrainian gas conflict. Experts have emphasized in this regard that not only the economic, but also political issues may have led to that very conflict, mostly a “Russian revenge” for the Ukrainian “Orange revolution” and its subsequent pro-Western politics²⁷. This section thus refers to the analysis of the Qatari internal and external political dimensions, as well as relevant regional instabilities, which all could threaten the eventually increased LNG supply from Qatar to the EU.

Internal political dimensions

Qatar, with its huge offshore gas resources, is arguably the most stable country in the Gulf region. A high level of internal regime stability has been achieved through liberalization and democratization reforms after 1995, when in a bloodless coup Sheikh Hamad bin Khalifa deposed his father and proclaimed a new modernization course in the country. The modernization reform of the new Emir was directed to encourage the economic private sector, freedom of expression and democratization, resulting in economic growth and an enhanced foreign investments flow. Thanks to the then loosened governmental regulations on foreign activities, the FDI inflow in Qatar increased from 1,1 billion USD (US-Dollar) in 2004 to 6,7 billion in 2008²⁸ (primarily directed into the LNG sector); in the same year the economic growth reached 14,2 %²⁹. The Qatari economy is much more open and more flexible than ever before, almost all sectors have been privatized and new laws allow full foreign ownership of certain companies in the small-and medium-scale industries sector, including those related to the field of education, health, leisure and tourism. Qatar Petroleum is the only state-owned company in the gas sector, while the other companies are predominantly joint

²⁷ Proedrou (2007): 339.

²⁸ Global Investment House (n.d.).

²⁹ World Almanac & Book of Facts (2009): 939.

venture-enterprises. Besides, in 2003 a new and visibly more democratic constitution was adopted, which highlights the freedom of expression, freedom of religion and equality of citizens in rights and public duties.

Although one could believe Qatar being an oasis of flourishing democracy in the Middle East, one certainly has to take into consideration the Emir's supreme power and the overall rentier character of the state³⁰. As a typical rentier state, Qatar derives more than 50 percent of the state income from the export of its natural resources, which enables it to extend the welfare expenditures and to reduce the taxation burdens on citizens. As a result, demands for accountability and representation are comparatively low, spending on patronage is high and the political groups within society are adverse to the formation of a fully fledged democratic orientation.

Despite the reforms recently undertaken, Qatar remains thus autocratic and any meaningful political liberalization is elusive. Emir Shaykh Hamad is blamed for fostering factionalism, specifically regarding the initiation of the liberalization campaign with the purpose to secure the ruler's position in the Al Thani intra-family competition and to gain much-needed support from the larger international community. The launched democratization process of the 1990s can thus also be considered as a manoeuvre to gain legitimacy and external support. Currently, the political power and decision-making remains centralized firmly in the hands of Al Thani family.

Although the Emir of Qatar may have used democratization tools to maintain internal security and stability in Qatar, these measures might be beneficial from a perspective of energy supply. Due to the country's small size and its geopolitical surroundings, its autocratic political elite is rather unlikely to use a politically motivated interruption of gas supply or impose higher gas prices in order to put political pressure to the gas importing partner countries, as other suppliers, namely Russia did (the latter regarding Ukraine, Belarus, Georgia, Moldavia, Poland or Lithuania, for instance)³¹.

The only threat to the internal stability of Qatar is the seeming dependence of Qatar on the influx of foreign labour (mostly notable in the hydrocarbon sector), which constitutes more than 80 percent of the working population at this moment. On the one hand, the majority of

³⁰ Rathmell/Schulze (2000): 48.

³¹ Proedrou/Filipos (2007): 339.

these expatriates stems from Muslim countries, which in general oppose the United States' (US) policy in the Middle East, an issue to be considered given the fact that the US is being a major ally to Qatar. On the other hand, looming social conflicts can destabilize the internal security of Qatar regarding the composition of its society and the fragility of any national identity. Currently, the government has recognized the problem and has launched a program called "Qatarization" to enhance the number of the Qatar nationals to the proportion of the foreign working force.

External political dimensions

Qatar pursues an independent foreign policy that differentiates it from more larger and powerful neighbours. As for Qatar "small" means "strategic" (and usually small countries are inclined to ensure their security through a policy of effective alliances), it aims at avoiding envy and hostile actions because of its substantial wealth stemming from gas and oil exports (as it happened in the case of Kuwait), Qatar follows a strategy of ensuring its security by balancing other powers in the region, looking for a common ground with its neighbours and not least for protection from leading world powers, such as the US.

Qatar was involved in several territorial disputes with Bahrain and Saudi Arabia, but both were peacefully resolved. The territorial sovereignty and maritime boundary dispute between Bahrain and Qatar, which concerned the Hawar Islands, as well as the Dibal and Jarada shoals, is the longest standing case in the history of the existence of the International Court of Justice. However, today the relationships with Bahrain are fairly stabilized and the risk of future disputes is low. Moreover, both countries are working actively to strengthen their bilateral economic cooperation; for example, the construction of the Qatar-Bahrain-Friendship Bridge (40 kilometres long) connecting both countries is scheduled to start this year³².

Throughout the 1990s, several skirmishes between Qatar and Saudi Arabia had taken place regarding the common sea and land border (60 kilometres long). Finally, in 2001, a border agreement was signed between two parties. Nevertheless, due to the sometimes controversial political, social and religious content of Al-Jazeera news footage and reporting on the Middle East (the news channel is based in Qatar), Qatari democratization efforts and the presence of US military personnel at the Qatar Air Base (which was used for US attacks on Iraq) and the

³² Singh (2009).

large logistic base in al-Sahiliya, new tensions between Saudi Arabia and Qatar are not unlikely to resurface once in a while.

In 1989, Iran claimed that the strategically and economically important Qatari North Field lies under Iranian waters. Later on, both parties agreed to exploit this field jointly. The relationships were strained again in 2006, when a dispute concerning a geographical name used for the body of water that separates Iran from the Arabian Peninsula erupted. Traditionally, this area had been called the Persian Gulf, after Persia (now Iran), while Arabs generally refer to it as the Arabian Gulf. Despite this dispute, Qatar has arguably established relatively friendly relations with Iran compared to other Arab countries; this seems paradoxical, as the Iranian regime remains at the same time one of the United States' most outspoken foes in the region (and beyond that is highly criticized by the international community because of its nuclear program), not least given Qatar's close relationship with the US. Nevertheless, as reported by Iran's Islamic Republic News Agency in January this year, the Iranian president Mahmoud Ahmadinejad has repeatedly said that "relations between Iran and Qatar serve as an exemplary model for excellent regional ties"³³. It is, however, fair to assume that Qatar's cooperation with Iran has a deeply strategic side, as it is aware of the potential threat Iran poses to Qatar and the region. Qatar's extensive dialogue with Iran does not equal trust and friendship, as the efforts to keep a strong military relationship with the US may indicate the idea to counterbalance any looming "Iranian threat". Diplomats thus underline that the Qatar relationship with Iran and its president Ahmadinejad may resemble more sort of promotional policies: "you only have to look at the map of the north fields to understand it: the Iranians could knock the economy out for 10 years easily"³⁴.

Qatar, as has been said, maintains very close relations to the US³⁵. The US is not only a credible guarantor of Qatar's regional security, but its presence has also helped to improve Qatar's position regionally. Qatar signed the Defence Cooperation Agreement with the US in 1992, which allows the US military access to Qatari air and naval facilities. The Qatari newspaper commentator and professor of Islamic Law, Abdel-Hameed al-Ansari, explains the rationale behind this as follows: "we can't protect the wealth here without America, since

³³ BENAMA (2010).

³⁴ Hammond (2009).

³⁵ E.g. after the devastations of the Hurricane Katrina in the US in 2005, the Qatar of Emir denoted "on behalf of the people of Qatar" 100 Mio Dollar to assist the victims, see: <http://www.qatarkatrinfund.org/>, last access: 31.3.2010.

there are many regional and Arab designs (on Qatar)”³⁶. Today, a large US air base named Al-Udeid, as well as the US military’s Central Command in Qatar both create a rather credible deterrent for any outside intervention. For Qatar, its strong relations with the US bring both benefits and risks. On the one hand, the people of Qatar may enjoy the protection on behalf of the US from any jeopardy posed by its neighbours, especially by Iran. On the other hand, the US presence (as well as the close ties) make Qatar an attractive target for al-Qaida (-alike) terrorist attacks, potentially putting also the gas pipelines, ports and other facilities in danger. There has already been an al-Qaida terrorist attack associated with the US presence in 2005³⁷. Later on it was discovered that the same suicide bomber had also been planning to explode the Qatar Petroleum facilities, but for some reasons did not succeed. Several months after that incident, the British newspaper Sunday Times reported that Qatar may have started buying off Al-Qaida attacks with oil millions³⁸. The first deal between Qatar and al-Qaida had allegedly been struck before the US invasion of Iraq and was renewed after the March 2005 attack. Various Qatari officials have referred to such deals and stated their support by explaining: “we are a soft target and prefer to pay to secure our national and economical interests”³⁹. Of course, buying off terrorist threats may postpone terrorist attacks, but the deal with al-Qaida - an organization, which obviously does not exhibit a strong top-down hierarchy in order to enforce such an agreement within all its cells – is hardly an overall insurance against terrorist acts.

Gas-OPEC threat

An existing EU-LNG Study explicitly highlights the future threat from a “gas cartel” or a so-called “gas-OPEC” in terms of dictating the gas prices⁴⁰. The idea of a gas cartel was introduced in 2002 by former Russian president Vladimir Putin. Such a gas cartel would not only dictate and probably raise the overall prices, it also contains a geopolitical imperative, according to which, above all, Russia will be able to increase its power on the worldwide gas markets. Iran, Qatar and Russia, the so-called “big gas troika” may have already agreed on forming an OPEC-style gas cartel, which will control roughly 60 percent of the world’s gas supplies. In April 2010, the next meeting of Gas Exporting Countries Forum (GECF – whose members already represent 72 percent of the world’s gas reserves) in Algeria will be a forum

³⁶ Hammond (2009).

³⁷ Isikoff (2007): 42.

³⁸ Mahnaimi (2005).

³⁹ Ibid.

⁴⁰ LNG Study (2008): 30 - 31.

for further discussing the details of a common pricing mechanism and other cartel-related issues. However, a gas-OPEC could not be as effective as the original “oil-prototype” OPEC. First of all, in general gas is sold on long-term contracts and not on open markets as oil. Second, gas markets are more fragmented and regional compared to the oil markets. Regarding these features, any “gas-OPEC” would not be able to influence the process through restricting quotas, but would rather have to focus on refining and distribution contracts. Beyond that, regarding the case of Qatar, any gas-OPEC is unlikely to work to the detriment of the gas buyers in the medium term, as Qatar’s gas capacity is already sold or contracted for the years to come. Still, in a long term-perspective, the establishment of a gas cartel may be an option that should worry European consumers as well.

Threats to the LNG supply routes

The last dimension of threats to increased gas supply from Qatar relates to the potential disruption of the LNG supply to the EU through (Somali) piracy. Securing a dangerous shipping route of LNG tankers that have to cross the Strait of Hormuz and the Suez Canal seems to be crucial in this regard to ensure *any* stable LNG supply to Europe. In 2008, there were 111 attacks of the Somali pirates; in the first nine months of 2009, already 168 attacks were registered. The International Maritime Bureau counted around 40 successful hijackings in 2008 and 31 in the first half of 2009⁴¹.

As a reaction towards the pirates’ attacks, the EU, the US and other states have increased their military patrols in Somali waters, adopting such measures as security guards and a convoy to the ships. The increased warships presence pushed Somali pirates to shift their attacks farther offshore, up to 1.100 miles from Somalia’s coast. Despite all the attempts of the international community to secure the situation in the waters close to Somalia, the piracy problem is far from solved. Of course, the current sea-based methods are essential to counteract Somalian piracy, but they address only the symptoms and arguably not the core of the problem, which lies in the failed state of Somalia, where 40 percent of the population needs food aid to survive. **Until the land-based catalysts of Somali pirates activities are not eliminated, there is a heightened possibility of a continuous hijacking of the LNG tankers on their way from Qatar to the EU.**

⁴¹ Abruzzese (2009): 71.

Conclusion: political threats

Despite Qatar's autocratic regime, it is much more liberalized and democratic than any other country in the region. It enjoys a degree of stability that makes it an attractive partner for the development of closer energy relations. On the other hand, especially the external environment of Qatar remains dangerous, a situation similarly to be observed in the other gas-rich countries of the Middle East region. Although the Qatar's foreign policy practices of building sound relationships with all its neighbours and generally relying on the overall protection of the US are considered as indicators of stability, al-Qaida terrorist attacks and (Somali) piracy remain a source of imminent concern. In the near future, a much-debated "gas-OPEC" will not be able to influence matters substantially, but the possibility of the future establishment of such an institution should be taken into account while negotiating any LNG contracts with Qatar. **Based on this analysis, politically, Qatar is a promising alternative for any EU diversification plans of the gas supply structure.**

LNG AND THE ENVIRONMENTAL DIMENSION OF GAS SUPPLIES FROM QATAR

Environmental aspects of gas imports from Qatar are relevant, not least since the only way to import natural gas from Qatar is by sea, i.e. gas has to be imported in the liquefied form (LNG). In what follows we assess the environmental impact of such gas imports with a focus on the peculiarities of LNG regarding the processes of its (de-)liquefaction and its transport.

LNG: what is it exactly?

In order to answer this question, the basics about natural gas itself should be summed up. Briefly speaking, natural gas is a fossil fuel found deep under earth's surface. It's composed mainly (usually 90% or more) of methane (CH₄), but it also contains small amounts of ethane (C₂H₆), propane (C₃H₈), and butane (C₄H₁₀). All these compounds are hydrocarbons, i.e. compounds containing only carbon and hydrogen. Other compounds present in raw natural gas include water, nitrogen, carbon dioxide and helium. Natural gas is lighter than air, usually colourless and odourless and highly flammable. It is used around the world as a fuel for

heating, cooking and the production of electricity and, like all fossil fuels, contributes to rapid climate changes.⁴²

Natural gas in general can be transported by two means:

1. Via pipeline (certainly the more economical method when there are short distances between producer and client-countries, usually up to 3000 km).
2. Via ships, as LNG (more economical on long distances).

Because of Qatar's location and the resulting long distances towards European countries, the only economical possibility to transport this gas is by ships, as LNG.

LNG is a natural gas cooled down to -162°C, at which point it becomes a liquid. This process reduces its volume by a factor of more than 600 – similar to reducing the volume of a beach ball to the volume of a ping-pong ball. This allows natural gas to be transported efficiently by sea. Once it reaches destination ports, LNG is unloaded from ships at import terminals where it is stored as a liquid until it is warmed back to natural gas. The natural gas is then sent through pipelines for distribution to businesses and households.⁴³

The process of changing gas into its liquid form is called liquefaction. As LNG contains mostly methane, it must be cleaned before production (liquefaction), especially from water, which simply would freeze in such conditions. The reversal process, changing it back to gaseous form, is called re-gasification.

⁴² See the data of the Ecology Action Centre (<http://www.ecologyaction.ca/content/liquefied-natural-gas>, last access: 1.4.2010).

⁴³ See the remarks of the Centre for Liquefied Natural Gas (<http://www.lngfacts.org/About-LNG/Overview.asp>, last access: 28.3.2010).

Properties of LNG and its potential hazards

Properties	LNG	Liquefied Petroleum Gas (LPG)	Gasoline	Fuel Oil
Toxic	No	No	Yes	Yes
Carcinogenic	No	No	Yes	Yes
Flammable Vapor	Yes	Yes	Yes	Yes
Forms Vapor Clouds	Yes	Yes	Yes	No
Asphyxiate	Yes, but in a vapour cloud	Same as LNG	Yes	Yes
Extreme Cold Temperature	Yes	Yes, if refrigerated	No	No
Other Health Hazards	None	None	Eye irritant, narcosis, nausea	Same as gasoline
Boiling point (°C)	-160	-42	32	204

Table 1 Properties of LNG compared to other fuels. Source: Centre for Energy Economics (2003b)

Table 1 displays some common information about LNG as compared to other fuels' properties. Focusing on LNG, we can see that it has no toxic or carcinogenic abilities. Neither does it pose any other health hazards. However, under higher temperatures than -160°C, it vapours, forming vapour clouds. These vapour clouds can cause asphyxiation, but are not toxic and normally disappear very fast, inflicting no damage to the environment. This is visible when compared with other fossil fuels. Under special conditions, however, LNG can be flammable (between 5 and 15% of condensation in the air, given a high ignition temperature of about 540°C). Importantly, LNG is stored under extreme low temperatures and does not need to be pressurized. That is why there is no risk of explosion because of eventual pressure differences, for example after losing tank-tightness.

In sum thus, the main LNG hazards are⁴⁴:

1. Explosion (very rare; flammable only under very special conditions);
2. Vapour clouds (can cause asphyxiation);
3. Rollover (changing its state during transportation or unloading process can cause losing of tank-tightness);
4. Freezing liquid (when spilled, can cause freeze damage);
5. Earthquakes and terrorism (external danger, valid for other fuels as well).

LNG “Producer-to-Client” Chain

As it was stated before, LNG is especially economical when the distances between producer and consumer are long. But to sell natural gas in this form, a special infrastructure is needed. This, in turn, leads to a specific LNG producer-to-client chain (value chain). It consists of the following stages:

1. Exploration, extraction and production of natural gas (in its original, gaseous form). Usually, the gas deposits are being discovered near the oil deposits.
2. Liquefaction – converting natural gas into liquid so that it can be transported by ships.
3. Shipping LNG in specifically designed ships.
4. Storage in special tanks.
5. Re-gasification – converting LNG back into natural gas (reversal process to liquefaction).⁴⁵

Although, the chain is arguably longer (hence also more risky from an abstract perspective, given the fact that more steps are needed) than transferring natural gas through pipelines, there were only few accidents in the 40 years of history of LNG technology. This is explained by high security standards and relatively strict rules on the one hand and a highly sophisticated technology on the other hand.

⁴⁴ Centre for Energy Economics (2003a).

⁴⁵ Ibid.

Because of LNG's chemical properties, the main problem is the storage phase. It begins just after liquefaction, goes through shipping and ends during re-gasification. Storage tanks must be specifically built and endowed with modern sensors and emergency systems to avoid leaks and/or uncontrolled vaporizing. Usually, containers are constructed like an "onion" having many protection layers. The tanks are double-walled (like a tank in a tank) with the inner container usually built from nickel steel, aluminium and a pre-stressed concrete wall. This layer is in direct contact with the LNG. On the outer side, there is a second container made of carbon steel or a pre-stressed concrete wall again. Between the containers, there is a layer of insulation.⁴⁶ Those systems form the first and second line of protection with several detection and security systems stopping possible leaks in addition to them. Another important and crucial aspect of providing a secure storage is keeping a meaningful distance from densely populated cities, other industries or any other objects that might be harmed due to possible leaks.

Identical problems occur during shipping. To transport LNG, ships with special tanks are needed. There are commonly 3 different types of LNG transporting ships according to the containers used:

1. The membrane design;
2. The structural prismatic design;
3. The spherical (Moss) design (which is the most popular; these are the ships with spherical containers visible on board).

The containers are made of stainless steel with an insulation layer of polyurethane, polyvinyl chloral foam, polystyrene, etc. There is also a layer of nitrogen between the tanks helping to detect potential leaks⁴⁷.

Conclusions: Environmental sustainability

The main conclusions regarding gas imports from Qatar – and particularly LNG imports – are the following: First, it certainly is a comparatively environmental friendly liquid in itself (being mostly pure methane), with no toxic and carcinogenic abilities, (while of course its

⁴⁶ Ibid.

⁴⁷ Ibid.

impact on climate change is similar to other fossil fuels). Hazardous aspects include the low temperatures of the liquid needed for the transport and the risk of asphyxiation (in gaseous form the possible asphyxiation is caused by lack of oxygen). The risk of explosion is rather negligible, because of the special conditions needed for autoignition. Second, the whole process of producing, shipping and re-gasifying of LNG is relatively safe due to strict security norms and sophisticated technology. It is worth to say that in the whole “LNG history” were only few incidents. To put it simply, **LNG is very safe**. Finally, it is both economical and environmental-friendly – as compared to other forms of energy transport – to send it by ships because of the high condensation of gas (the same amount of gas in liquid state takes 600 times less space than in its gaseous form). For example, from 125,000 cm of LNG (the capacity of smaller tankers), after re-gasification 70,757,210 cm of gas can be extracted.

That is why LNG can be regarded as environmental friendly and, at the same time, one of the safest sources of energy.

ECONOMIC FACTORS INCORPORATED WHEN CONSIDERING QATAR AS A VIABLE GAS SUPPLIER TO THE EU

The analysis to follow shall assess the economic factors that are relevant, when considering Qatar as a future LNG supplier to the EU. The evidence presented shall reflect notions of sustainability, profitability and risk when considering this option with regard to Qatar. This section shall not, however, delve into start up costs and running costs as imperative factors, due predominantly because risk management and overall profit shall show these incurred costs. As a final protruding point, it shall seem useful to briefly examine what macroeconomic and microeconomic trends shall be taken into account while considering this line of supply.

Readiness and Innovation

The Qatar Gas company now possesses five LNG train terminals in which to change natural gas into LNG, of which train four, owned and operated jointly by Qatar Gas and ExxonMobil, is world’s largest LNG train. This accompanied by the four other trains has so far seen a maximum monthly output of 45,500 trillion British thermal units (Tbtu) – or roughly 2,758

million cubic meters of natural gas to be converted – in January 2006⁴⁸ or near the same at 45,300 Tbtu monthly output during March 2008⁴⁹. The willingness and readiness to supply is thus really coming to fruition for Qatar gas. With an annual output of 25 million tonnes of LNG⁵⁰, the company has set very ambitious plans to behold a maximum output of 77 million tonnes of LNG per annum by the end of the decade (2010).⁵¹

Qatar Gas record of innovation and safety only increases its output and profitability, as the December 2009 statistics from Qatar Gas reflect an impeccable LTA (lost time accidents) of 2,740 days free⁵²; therefore since July 2002, the LNG trains have run constantly without any interruption except during maintenance. **Increased technology has without question put Qatar at the forefront of innovation and resource accessibility, seemingly playing into the hand of an eventually expanded partnership with the EU, as judged from the perspective of the EU.**

Transportation is another cost incurred in this case by the producer, with two types of transport ships, the Q-Flux and Q-Max. This, again, only amalgamates risk onto the producer rather than the customer, as this cost is incurred when buying, rather than through a third party actor. Carrying up to 215,000 tonnes (Q-flex, total 31 available) of LNG, they are the largest transporters available on the market and would assist with constant supply for the EU while having decreased transportation cost compared to other fuels/transportation systems.

But what does this convey for the EU as a customer? Essentially, limited investment, maximum output, sustainability and decreased shareholder/investor risk. The readiness and potential output from Qatar alongside its price accounts for an exciting venture for profit and stable supply. Owing to the infrastructure and steps taken by Qatar gas, there is little if any economic trade off that the EU should consider, namely that the EU shouldn't be required to invest financially into this project with the exception of futures contracts. However, there are still other economic considerations to take into account as the following headings shall now portray.

⁴⁸ The Pioneer (2006).

⁴⁹ The Pioneer (2008).

⁵⁰ Qatar Gas Press Release (n.d.).

⁵¹ Ibid.

⁵² The Pioneer (2009).

Sustainability and Profitability

From an economic perspective, on the surface Qatar appears a viable partner for businesses both economically and sustainably. 2009 CIA predictions detailed that Qatar possesses 25,260,000,000,000 cubic meters of natural gas reserves⁵³, whilst its sustainability must exist of a lengthened duration of time to incur profits for the long run, in this instance 25-30 years depending on the source. Thus by dividing the abundance of resource by aimed output per year of 77 million tonnes by the amount of gas it takes to make a one ton of LNG, the equivalent according to equations below is:

$$1 \text{ million ton (LNG)} = 1,380,000,000 \text{ cm or } 1.38 \text{ billion cm (bcm) per ton}^{54}$$

Therefore, to produce 77 million tonnes of LNG (predicted gross output yearly)

$$1,38 \text{ bcm} \times 77 = 106,26 \text{ bcm are needed.}$$

The figure below reflects the years available of supply at 77 million tonnes a year output:

$$25,260 \text{ bcm (reserves available)} / 106,26 \text{ bcm (yearly produced resource prediction)} = \\ 237.7188029 \text{ (time factor = years).}$$

Even allowing for gas escaping into the atmosphere and losses during production known as utilization standing at 6.7% of production as industry standard only evokes a decrease of 1,768 bcm capacity usage if rounded up to a 7.0% utilization loss. This coincidentally does not allow for further technological advancement or increase in standards, so there is ample supply and sustainability, shown in the working below:

$$25,260 \text{ (reserves available in bcm)} - 1,768 \text{ (7\% of total resources = to amount un-utilized or} \\ \text{lost)} = 234.918 \text{ (time = years)}$$

(meaning total operating output, taking into account utilization loss, is almost 235 years according to current extraction and production capacities).

Profitability

Profitability is something that is always unpredictable and Qatar beholds no conclusive difference. However, as Fesharaki (examining the cost ratio's globalisation of the LNG market East versus West) testifies, "Qatar is imposing high long term prices in Asia"⁵⁵ or,

⁵³ CIA World Fact book (2009).

⁵⁴ Hofstrand (2008).

⁵⁵ Fesharaki (2008): 17.

moreover, how prices of LNG are increasing as “Qatar holds most of the cards in the near term ... and they know it!”⁵⁶ One may reasonably assume that investments for profitability seem an almost certainty with Qatar in the long term.

Yet can Qatar realistically match the demand for natural gas? The simplistic answer is yes but EU demand is set to increase over prolonged periods of time, and thus microeconomic demand and supply are far more indeterminate. However, with this said, Qatar remains a strong candidate for a more diversified EU energy portfolio, with its vast reserves matching with predicted demand⁵⁷.

Macroeconomic & Microeconomic Considerations

When considering purchasing power parity (PPP) for LNG, the EU as the euro zone, must be wary of fluctuating rates of exchange, inflation rates, demand and finally supply for gas resources, because of privatization and the need for annually dividends. To explain, through using private enterprises answerable to investors, the EU must be ready to contend with fluctuations in price and demand from other actors in contention for EU LNG supplies.

Answering firstly macroeconomic considerations, the Euro currency is thwarted with increased inflationary pressures, due primarily to rising national debts of some Euro involved countries⁵⁸. The problems associated with these debts are that, even for the Euro as the world's second reserve currency, the general economic abilities of countries like for instance Germany, Greece and Italy as three prominent examples, are in doubt given varying levels of GDP debt of 73.1% (Germany) 112.6% (Greece) or even 114.6%⁵⁹ (Italy). This arguably increases the price of imports whilst decreasing the price of exports in Dollars or Yen for European competitors, a daunting position when considering long term imported energy security from Qatar, a country renowned for one of the world's largest GDP per capita⁶⁰.

Yet, Europe enjoys relative security in that gas is based on dollar pricings; therefore falls in the dollar's exchange rate enable far greater leniency or PPP. From a PPP viewpoint, this

⁵⁶ Ibid.: 4.

⁵⁷ Oxford University Institute of Energy (2006): 40.

⁵⁸ Such as Greece, Spain, Ireland, Italy, and Portugal. See also Der Spiegel (2010).

⁵⁹ BBC News (2010).

⁶⁰ Sambidge (2009).

means alternative actors (say for example the UK, USA or Japan with their respective currencies) could be undercut by the EU or taken over by depending upon inflation in Europe or European countries. However, the problems these non-EU/non-Euro countries are facing are only exacerbated by the fact that the respective economies face a situation essentially worse than within Europe. The UK has high levels of quantitative easing (QE) alongside largely unpaid for personal debt, the USA has still to struggle with the remnants of the “subprime mortgages-time bomb”, and last but not least, one should not forget the massive dollar reserves being held by the Chinese as an undervalued currency. Lastly, Japan displays a mixture of high interest rates, unsustainable mortgage repayments and very high costs of living. Furthering on from this, the nation still struggles to recover from the 46%-loss of exports in 2009⁶¹. Thus overall Europe’s position seems fairly self-assured, although any future IMF-involvement in the Euro zone could have disastrous consequences on trade, taxation or financial volatility.

Financial aspects and Futures markets

Any major gas supplier, say for example Qatar Gas, beholds a highly lucrative futures market, which is important with reference to EU-LNG trading because of several reasons. Firstly, the cost of production, liquidation and transportation are unimportant to investor risk, whereas profitability and supply are the most important factors when considering investment from companies or interest from shareholders. It is this requirement for profit that allows Qatar such a unique position from a risk management perspective. Currently, the cost of supply is equal to EUR 20-22 per X (fictive unit) depending on demand and time of year. Yet, current Russian supplies cost EU customers EUR 40 – 45, again variable on time of year and demand, but obviously an increase at 100% - 110%. **In price differentiation, Qatar is far more financially viable alternative.**

A concise argument, however, considering the implications or strengths of futures markets is not easily obtainable. The most conclusive and decisive statement on the futures markets is detailing how “by buying and selling futures contracts, an impersonal agency is created which permits producers, consumers, inventory holders and other traders in physical products to reduce (i.e. hedge) undesired risk”⁶². On the one hand, “futures markets help reduce erratic

⁶¹ McCurry (2009).

⁶² Banks (1986): 181.

price movements”; on the other hand, “inventory demand is strongly influenced by changes in expectations above futures prices, and any institution which encourages frequent revisions of expectations can be identified as a potential source of increased price volatility”⁶³. It would be naive of the EU to not consider the futures market implications of trading with Qatar; however such risks seem limited when considering Russia or Iran as energy importer alternatives. In whichever domain the EU would work within for gas futures markets will always be open to short selling price volatility from demand, supply, interest rates or currency exchange rates. Fortunately, Qatar looks strong judged from our previous macroeconomic findings.

Conclusion: Economic factors

Economically, **Qatar has been unearthed as a reliable, sustainable and economically viable LNG partner for either direct trade with the EU or private companies supplying to EU consumers.** The infrastructure under development in Qatar itself allows for limited start-up investment from the source, yet one should not readily forget the trains to re-gas the liquefied product is required in Europe as well, an area that may seek investment.

RECOMMENDATIONS

As the previous three parts have shown, **Qatar should be viewed as a viable solution for the diversification of EU gas supplies.**

So far, the EU has primarily focused on steps to create a more efficient internal energy market. This surely is a necessary, but not a sufficient step to achieve greater energy security. With the Lisbon treaty coming now to force, the EU has gained more (albeit not much) room to manoeuvre in its foreign energy policy⁶⁴. Consequently, the already active role of the European Commission in pushing the EU’s common external energy security policy should be adequately exploited. On grounds of the analysis above, we maintain that **the EU should:**

⁶³ Ibid.

⁶⁴ See e.g. Fischer (2009).

- **Foster energy cooperation with Qatar**

Quite importantly, there already exist some established EU-Qatar energy relations⁶⁵. The EU established bilateral relations with the Gulf Cooperation Council (GCC) countries through a Cooperation Agreement, aiming at broadening economic and technical cooperation and cooperation in energy, industry, trade and environmental issues⁶⁶. At the Doha Natural Gas Conference in 2009, the EU energy commissioner Piebalgs delivered an optimistic view of future EU-Qatar relations, stating that “Qatar can be an important player in European energy security and find a reliable partner in the EU, the world's largest open gas market”⁶⁷.

The optimism, however, deserves only to be a careful one. The position of the EU as a customer of the Gulf countries has decreased in the long-term as a result of successful diversification policies, which followed as a reaction to oil dependency.⁶⁸ Consequently, a slight mistrust towards the EU as a stable and promising consumer might be expected, especially when added to the current economic downturn within Europe. The results of the 12th International Energy Forum of March 2010 also point in this direction. In the Forum, the Petroleum and Mineral Resources Minister of Qatar said his country would be significantly strengthening cooperation with India and China.⁶⁹ Hence, more attention should be paid to the relations with Qatar, aiming at developing real cooperation projects and thus fostering mutual trust. Moreover, it should act swiftly, as growing LNG demand will possibly not be met from 2013 and onwards⁷⁰.

- **Facilitate the establishment of regasification terminals in Europe**

When we take a closer look at the current map of the LNG terminals in Europe⁷¹, it becomes apparent that (thus far) only western EU member states seem to benefit from this form of diversification. Hence, the new member states in Eastern and Southern Europe remain largely dependent on Russian supplies only. This could be overcome, however, through supporting the build-up of further LNG terminals in Greece (and possibly in Croatia, should this country

⁶⁵ Apart from this, there is also bilateral cooperation between Qatar and EU member states (namely Spain, France, Italy and the UK already importing LNG from Qatar).

⁶⁶ European Commission/External Relations (n.d.).

⁶⁷ Piebalgs (2009).

⁶⁸ Hoogeveen/Perlot (2007): 505.

⁶⁹ Qatar committed to meet India's LNG needs. See The Hindu (2010).

⁷⁰ Hancher (2009).

⁷¹ See, e.g. King & Spalding Report (2008): 7.

join the EU). Further transfers of gas in its re-gasified form from LNG terminals in Italy might also be a possibility.

The Commission should, therefore, consider promoting common rules to facilitate and encourage the establishment of regasification terminals. This, again, is not quite a new thing: Already the Second Gas Directive⁷² mentions LNG import and storage facilities. The geographical proximity of Qatar through the Suez Canal would be, especially in this case, of advantage.

⁷² See European Council (2003).

LIST OF SOURCES

- Abruzzese, L. (2009): The worst country on Earth. In: The Economist, 21.11.2009, p. 71 (supplement "World in 2010").
- Banks, F. (1986): The Political Economy of Natural Gas. London: Croom Helm.
- BBC News (2010): Deal reached over Greece debts at Brussels summit, online available: <http://news.bbc.co.uk/1/hi/world/europe/8587847.stm>; last access: 26.3.2010.
- BERNAMA (n.d.): Iran-Qatar. An Exemplary Model In Region, online available: <http://www.bernama.com/bernama/v5/newsworld.php?id=467814>, last access: 30.03.2010.
- Centre for Energy Economics (2003a): Introduction to LNG, October 2003, online available: <http://www.beg.utexas.edu/energyecon/lng/>, last access: 1.4.2010.
- Centre for Energy Economics (2003b): LNG Safety and Security, October 2003, Report.
- CIA World Factbook (2009): Country Comparison: Natural Gas Proved Reserves, online available: <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2179rank.html>, last access: 19.3.2010.
- Clingendael Institute (2004): Study on Energy Supply Security and Geopolitics, online available: http://www.clingendael.nl/ciep/events/20040130/EU_study_presentation.pdf, last access: 25.2.2010.
- Correlje, A./van der Linde, C. (2006): Energy supply security and geopolitics: A European perspective, in: Energy Policy 24, 5 (March), pp. 532-543.
- Der Spiegel (2009): Schwerer Schlag, issue 52, p. 101.
- Der Spiegel (2010): PIIGS To the Slaughter: Can The Euro Zone Cope With a National Bankruptcy? 22.2.2010, online available: <http://www.spiegel.de/international/europe/0,1518,679502,00.html>, last access: 26.3.2010.
- EurActive (2010): Geopolitics of EU energy supply, 29.1.2010, online available: <http://www.euractiv.com/en/energy/geopolitics-eu-energy-supply/article-142665>, last access: 28.3.2010.
- European Commission/External Relations (n.d.): The EU and the Gulf Cooperation Council, online available: http://ec.europa.eu/external_relations/gulf_cooperation/index_en.htm, last access: 1.4.2010.
- European Commission (2006): A European strategy for sustainable, competitive and secure energy, Green Paper, 8.3.2006 [COM (2006) 105].
- European Council (2003): Second Gas Directive, DIRECTIVE 2003/55/EC (2003), online available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:176:0057:0057:EN:PDF>, last access: 1.3.2010.

Fesharaki, F. (2008): Globalization of LNG Markets: East versus West, IAEE Conference Presentation, available online at: <http://www.docstoc.com/docs/21496540/Globalization-of-LNG-Markets-East-versus-West-Prices-and>, last access: 26.3.2010.

Fischer, S. (2009): Energie- und Klimapolitik im Vertrag von Lissabon: Legitimationserweiterung für wachsende Herausforderungen, in: *Integration* 32, 1, 50-62, online available: http://www.iep-berlin.de/fileadmin/website/09_Publikationen/integration_2009/volltext/integration1-09_Fischer.pdf, last access: 5.3.2010.

Global Investment House (n.d.): FDI in GCC – Saudi and UEA attracting the lion's share, online available: http://www.menafn.com/updates/research_center/Regional/Equity_val/gih151009.pdf, last access: 30.3.2010.

Hadfield, A. (2007): Superpower Ambitions vs. Hyper-dependence: US, EU and Russian Energy Policy, Paper presented at the annual meeting of the International Studies Association 48th Annual Convention, 28.2.2007, online available: http://www.allacademic.com/meta/p179858_index.html, last access: 27.2.2010.

Haghighi, S. S. (2008): Energy Security and the Division of Competences between the European Community and its Member States, in: *European Law Journal*, 14, 4, , pp. 461-482.

Hammond, A. (2009): FEATURE: Gas-rich Qatar annoys Arabs with pro-Iran policy, Reuters, 1.4.2009, online available: <http://www.alertnet.org/thenews/newsdesk/L1335208.htm>, last access: 30.3.2010.

Hancher, L. (2009): LNG – After the Action Plan? Online available: http://www.energy-regulators.eu/portal/page/portal/FSR_HOME/ENERGY/Policy_Events/Workshops/2009/EU_Energy_Law_and_Policy/L.Hancher.pdf, last access: 1.4.2010.

Hofstrand, D. (2008): Natural Gas and Coal Measurements and Conversions, Iowa State University, online available: <http://www.extension.iastate.edu/agdm/wholefarm/html/c6-89.html>, last access: 26.3.2010.

Hoogeveen, F./Perlot, W. (2007): The EU's Policies of Security of Energy Supply Towards the Middle East and Caspian Region: Major Power Politics?, in: *Perspectives on Global Development and Technology* 6, 1-3, , pp. 485-507.

IEA (2009): Natural Gas Market Review 2009. Executive summary, online available: <http://www.iea.org/Textbase/npsum/gasmarket2009SUM.pdf>, last access: 28.3.2010.

Isikoff, M. (2007): The Qatari Connection, in: *Newsweek*, 10.12.2007 (issue 24), p. 42.

King & Spalding Report (2008): LNG in Europe: An Overview of European Import Terminals, online available: <http://files.meetup.com/207586/Rigassificatori%20-%20RAA%20Sintesi%20Terminali%20LNG%20in%20Europe.pdf>, last access: 1.4.2010.

Le Coq, C./Paltseva, E. (2008): Common Energy Policy in the EU: The Moral Hazard of the Security of External Supply, Stockholm: Swedish Institute for European Policy Studies, online available: <http://www.sieps.se/en/dokument/download-document/66-20081.html>, last access: 25.3.2010.

- LNG Study (2008): Part II, Task A: The Geopolitics of EU Gas Supply, p. 30-31, online available: http://ec.europa.eu/energy/gas_electricity/studies/doc/gas/2008_05_lng_facilities_part2_task_a.pdf, last access: 31.3.2010.
- Luciani, G. (2004): Security of Supply for Natural Gas Markets: What is it and what is it not, INDES Working paper No2, March 2004, online available: <http://www.ceps.be/book/security-supply-natural-gas-markets-what-it-and-what-it-not>, last access: 22.3.2010.
- Mahnaimi, U. (2005): Qatar buys off Al-Qaeda attacks with oil millions, in: The Sunday Times, 1.5.2005, online available: <http://www.timesonline.co.uk/tol/news/world/article387163.ece>, last access: 23.3.2010.
- Marquina, A., ed. (2008): Energy Security, Visions from Asia and Europe. New York etc.: Palgrave MacMillan.
- Marquina, A. (2008): The Southeast-Southwest European Energy Corridor, in: Marquina, A. (ed.): Energy Security, Visions from Asia and Europe. New York etc.: Palgrave MacMillan, pp. 54-68.
- McCurry, J. (2009): Export slump deepens Japanese economic crisis, in: The Guardian, online available: <http://www.guardian.co.uk/business/2009/feb/25/japan-economic-crisis-recession>, last access: 26.3.2010.
- Mueller, F. (2007): Energy Security: Demands Imposed on German and European Foreign Policy by a Changed Configuration in the World Energy Market. SWP (Stiftung Wissenschaft & Politik – German Institute for International and Security Affairs), January 2007.
- Oxford University Institute of Energy (2006): Future Natural Gas Demand in Europe: The Importance of the Power Sector, online available: <http://www.oxfordenergy.org/pdfs/NG10.pdf>, last access: 26.03.2010.
- Percebois, J. (2008): The supply of natural gas in the European Union – strategic issues, in: OPEC Energy Review 32, 1, , pp. 33-53.
- Piebalgs, A. (2009): Speech at the 7th Doha Natural Gas Conference, 11.3.2009, online available: <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/09/102&format=HTML&aged=0&language=EN&guiLanguage=en>, last access: 23.3.2010.
- Pratrap, J. (2008): Gulf Times RasGas set to receive largest LNG carrier to boost its fleet, online available: http://www.gulf-times.com/site/topics/article.asp?cu_no=2&item_no=207684&version=1&template_id=48&parent_id=28, last access: 26.3.2010.
- Proedrou, F. (2007): The EU-Russia Energy Approach under the Prism of Interdependence, in: European Security 16, 3-4, September-December2007, pp. 329-355.
- Qatar Gas/Press Release (n.d.): Qatar Gas Train 5 Start LNG Production, online available at: <http://www.qatargas.com/PressReleases.aspx?id=159548&tmp=88&folderID=154>, last access: 26.3.2010.
- Rathmell, A./Schulze, K. (2000): Political Reform in the Gulf: The Case of Qatar, in: Middle East Studies 36, 4, pp. 47-62.

Sambidge, A. (2009): Report: Qatar's economy to see 9.6% growth in 2009, in: Arabian Business Report, online available: <http://www.arabianbusiness.com/557317-qatars-economy-to-see-96-growth-in-2009---report>, last access: 26.3.2010.

Singh, T. (2009): World's marine causeway to start construction by 2010? In: MENA Infrastructure, 24.9.2009, online available: <http://www.menainfra.com/news/marine-causeway/>, last access: 30.3.2010.

Stern, J. (2007): The New Security Environment for European Gas: Worsening Geopolitics and Increasing Global Competition for LNG, in: Energy Politics, issue 12 (Spring), pp. 85-127.

The Hindu (2010): Qatar committed to meet India's LNG needs, 31.3.2010, online available: <http://beta.thehindu.com/news/national/article329574.ece>, last access: 1.4.2010.

The Pioneer (2006): Q-Max The Future of LN, issue 109, p. 2, online available: <http://www.docstoc.com/docs/2456419/The-future-of-LNG-shipping>, last access: 26.3.2010.

The Pioneer (2008): Qatar gas' fourth LNG Prepares to Start Up, issue 121, p. 2, online available: http://www.qatargas.com/uploadedFiles/QatarGas/Media_Center/Publications/The_Pioneer_121_E.pdf, last access: 26.2.2010.

The Pioneer (2009): Scorecard 2009, issue 129, p. 2, online available: http://www.qatargas.com/uploadedFiles/QatarGas/Media_Center/Publications/Pioneer%20Nov-Dec%202009-English.pdf, last access: 26.3.2010.

Umbach, F. (2007): Europe's Energy Dependence in Mid-term Perspective, online available: www.aicgs.org/documents/advisor/umbach.gmf.pdf, last access: 24.3.2010.

World Almanac & Book of Facts (2009), New York: Infobase Publishing.