

Security of Europe's Gas Supply: EU Vulnerability

Andrew Macintosh

Introduction: The changing gas market

Clearly the natural gas market is experiencing considerable change: a second Ukraine-Russia gas crisis, a collapse in the price of natural gas, a new European natural gas security of supply regulation and the mass production of natural gas from unconventional sources in the US as a result of technological advancements, which could yet have an impact on the EU. This Policy Brief is a summation of the European Union's vulnerability to natural gas supply security risks.¹

1. Threat identification, impact assessment and EU vulnerability

1.1 Increasing imports, declining production

A present and obvious threat to the EU's natural gas security of supply is the dramatic increase in the use of natural gas as a source of energy coupled with a decrease in the production of natural gas from traditional sources of supply such as the North Sea. The Figure below details the increase in import dependency in the EU over the past decade in light of the falling levels of production.

Import dependency has clearly increased rapidly in recent years and appears likely to continue with the depletion of traditional sources of supply, such as Norwegian gas.

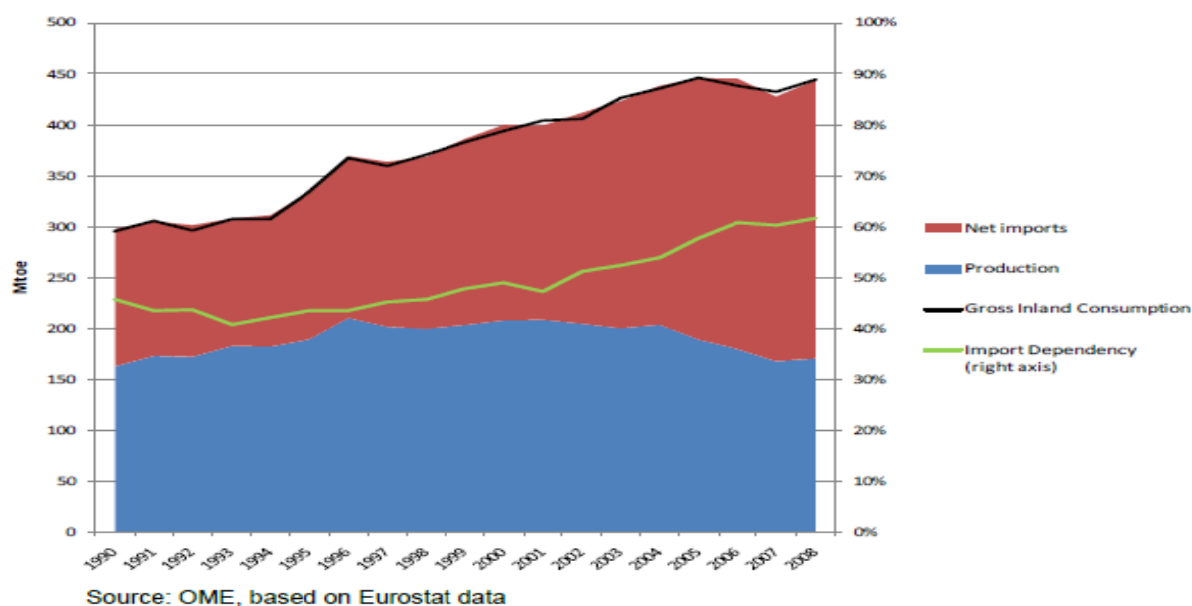
¹ For a more detailed discussion on source country risks in particular, see *Europe's Gas Supply Security: Rating Source Country Risk*, François-Loïc Henry, CEPS Policy Brief No. 220, CEPS, Brussels, November.



Research for this paper was carried out in the context of the SECURE project (Security of Energy Considering its Uncertainties, Risks and Economic Implications), funded by the European Commission under the Seventh Framework Programme. The project develops appropriate tools for evaluating the vulnerability of the EU to the different energy supply risks, and for promoting the optimisation of EU energy insecurity mitigation strategies, including investment, demand side management and dialogue with producing countries.

Andrew Macintosh is a researcher at Ramboll Oil & Gas. CEPS Policy Briefs present concise, policy-oriented analyses of topical issues in European affairs, with the aim of interjecting the views of CEPS researchers and associates into the policy-making process in a timely fashion. Unless otherwise indicated, the views expressed are attributable only to the authors in a personal capacity and not to any institution with which he is associated.

Figure 1. Import dependency of the EU on natural gas, 1990-2008



1.2 Aggregate and disaggregate levels of security of supply

Figure 2 shows 2010 aggregate levels of security of supply in EU countries. The considerable heterogeneity should be considered in light of differing rates of use of natural gas as a source of energy in each country. However, it is clear that a considerable imbalance in security of supply exists across the EU, with countries in Western Europe generally maintaining higher levels of security of supply than those in Eastern Europe.

Figure 2. Ramboll RAMSOS model aggregated results 2010

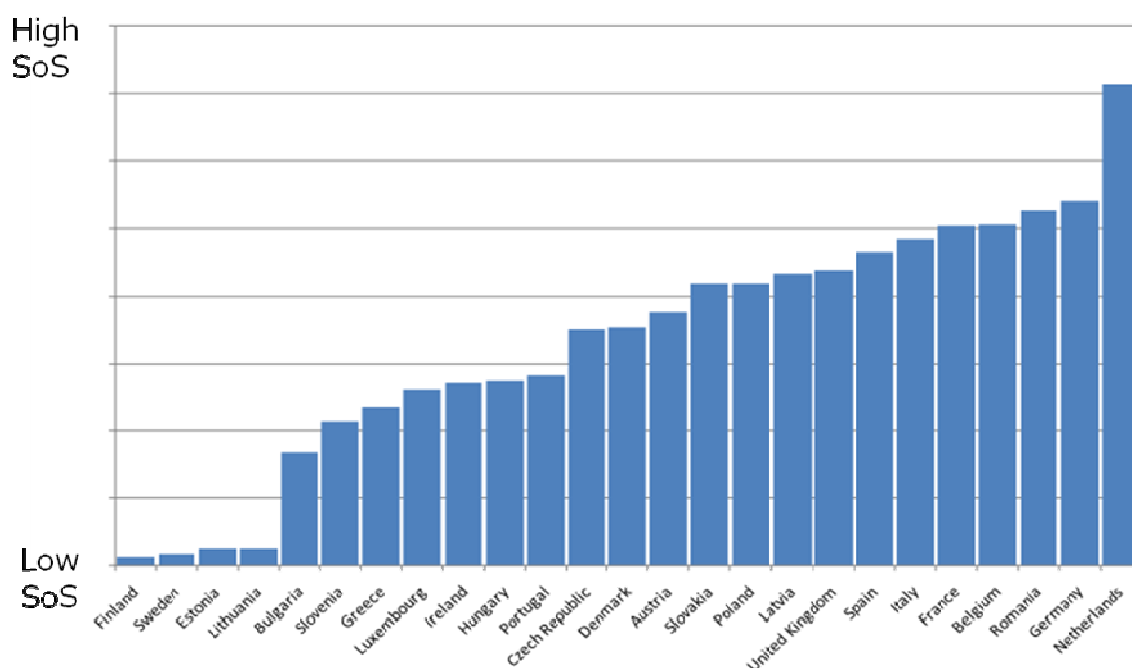
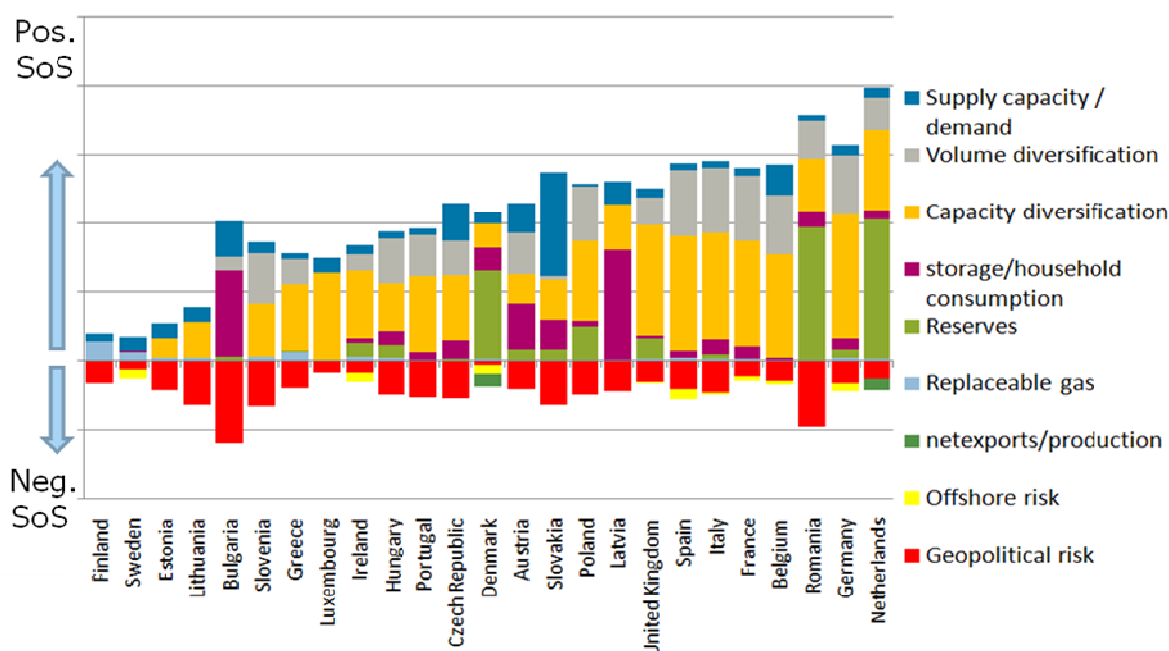


Figure 3. specifies why individual countries experience differing levels of security of supply.

Figure 3. Ramboll RAMSOS disaggregated results 2010



The disaggregated results show that countries enjoying the highest levels of security of supply are highly diversified and have access to storage and their own indigenous supply.

The Netherlands, for example, has a considerable level of capacity diversification and access to its own production, giving it the highest level of security of supply. Countries that have the lowest levels of security of supply have poor to nonexistent levels of diversification, are reliant on one source and have no access to storage. Such countries are usually also subject to higher geopolitical risks in the supply of their gas because they might be dependent on a principal supplier or transit country in order to be supplied. But the level of security of supply is not the only consideration; balance is also important to consider. In the UK, for instance, capacity diversification is high but volume diversification is low owing to a lack of access to gas storage.

1.3 Risk and impact analysis

Evaluating the relationship between risk and impact, by accounting for the country's actual gas use and the impact of a disruption, can provide a more systematic comparison of the level of security of supply among EU countries.

Figure 4. SoS index vs gas share in primary energy consumption, 2010

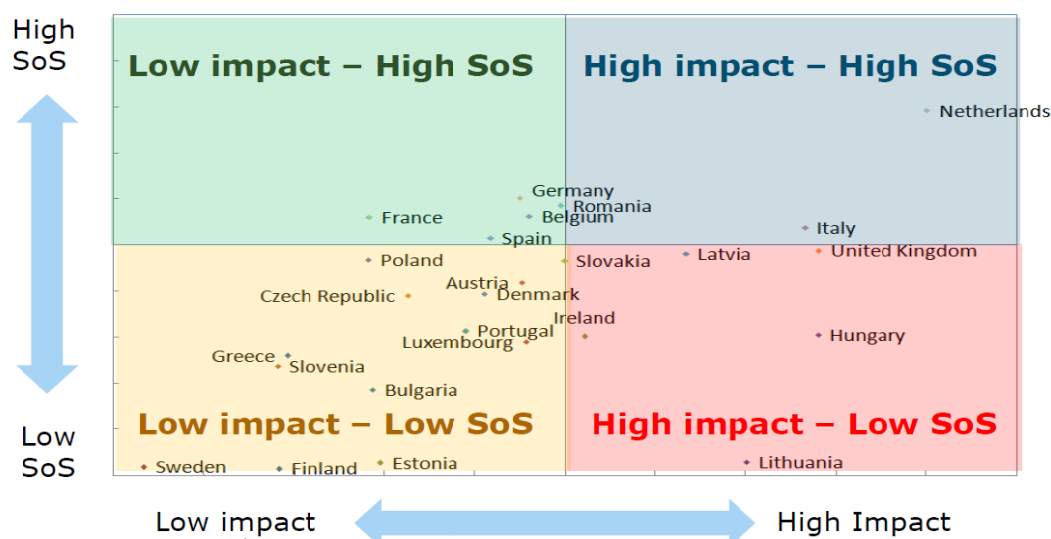
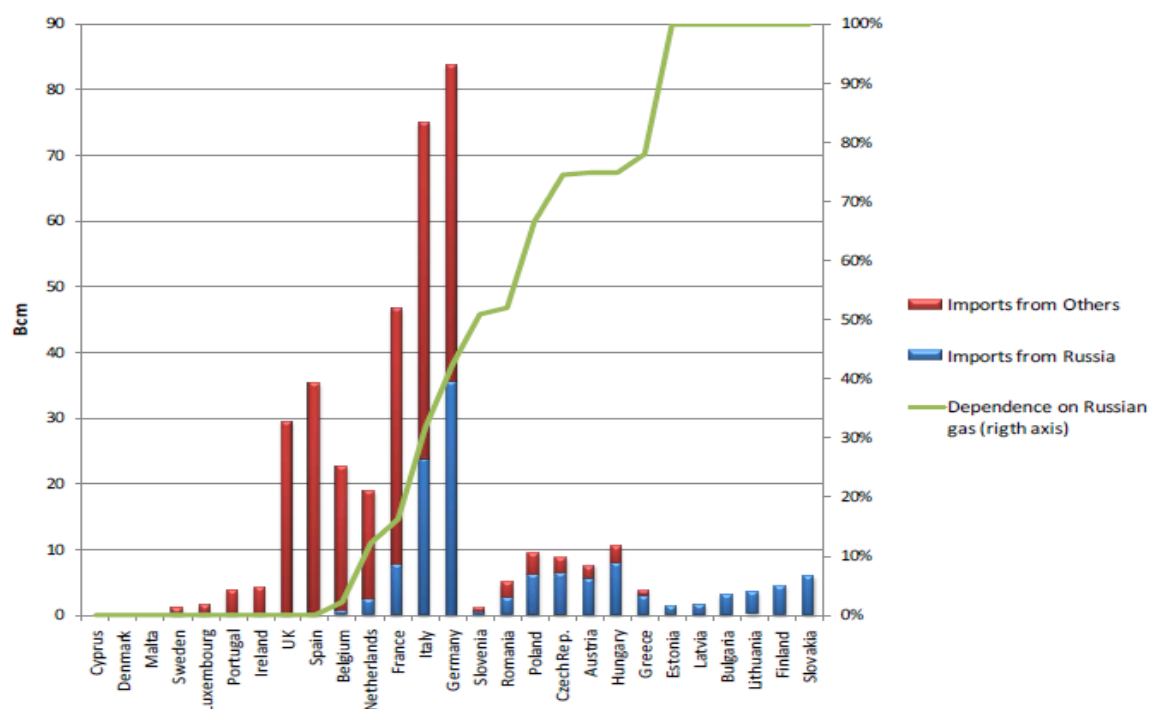


Figure 4 shows that several countries – Lithuania, Ireland, Luxembourg, Slovakia, Latvia, the United Kingdom and Hungary – are subject to a relatively high level of risk and vulnerability, i.e. they have a high share of gas in primary

energy consumption combined with a low level of security of supply. Based on the above matrix, these countries should review their security of supply situation and evaluate what can be done to improve their levels. Analysis of the situation anticipated by 2030 and by 2050 indicates that several countries could join the high-impact and high-risk quadrant of the matrix, particularly those that are presently reliant upon domestic production to meet part of their consumption, if nothing is done to address the issues of supply diversification and decreasing indigenous production. Turning to supply diversification, Figure 5 shows how much imports from Russia contribute to the overall gas supply of individual European countries. Specifically, it shows several countries are highly dependent on Russian supply and remain insufficiently diversified. Countries with more developed gas markets appear to have greater diversification.

Figure 5. European dependence on Russian gas



1.4 Investment delay

The recession and recent decrease in investment projects throughout the EU threatens its future security of supply. Investments in major gas infrastructure needed to increase the overall level of security of supply on a regional level are capital intensive and take years of planning to complete. Putting off decisions now will guarantee negative future impacts.

1.5 Uncertainty in projections

Another threat to natural gas security of supply is the considerable uncertainty regarding future projections of natural gas demand in the EU. Differing sets of EU demand and domestic production estimates in the long term create unnecessary yet wide-ranging uncertainty among both producers and consumers regarding their energy consumption and thus future import requirements. Such discrepancies and differences in estimates of EU import requirements could prove problematic for exporting countries, which require accurate information in order to maintain the appropriate investments and energy strategies. The range of the EU's gas import requirement estimates for 2030, drawn from the forecasts of several institutions, is very broad. Attention should be drawn to the profound implications of these differing estimates and their eventual consequences in the execution of EU energy policies. A more than expected decline in EU domestic gas production will translate into a higher gas deficit and hence greater import dependency, which would require a greater-than-planned launch of new EU gas transport infrastructure.

1.6 Technical risks

Research in the context of the SECURE project found that technical risks of gas disruption were not a considerable threat to the EU's gas supply security, but that technical restrictions such as a lack of reverse flow in some parts of

the gas system were. Lack of reverse flow disables the single gas market and stops gas from flowing to areas where it is needed. In particular, gas flow is lacking from Western Europe to Eastern Europe.

1.7 Evolution of demand/climate targets

It should be kept in mind that much of the uncertainty about the EU's future natural gas import requirements will depend on the evolution of electricity generation from gas-fired power plants. Market liberalisation, the global increase in energy prices, and the recent disagreements between Europe's main gas supplier and transit countries have exacerbated, for all actors, the feeling that gas businesses are increasingly risky. If the EU's commitment to its 20/20/20 targets by 2020 is really achieved, then the outlook for exporters to the EU may look rather grim. This is worrying not only for the suppliers but also for importers, because a gas bubble has already been building over the EU and has been exacerbated by the impact of the recession. At the same time, new import infrastructures (both by pipeline and via LNG) are mushrooming across the Union. As if these uncertainties were not enough, the worldwide financial and economic turmoil has already started to cause energy demand erosion. Producers and consumers are now facing extra challenges. On the one hand, the expected development of gas demand and import requirements in consuming countries are becoming more uncertain. On the other hand, the situation in gas exporting countries is getting critical. They are now struggling to sustain their export projects, and postponing or down-scaling their investment programmes.

1.8 Russia

Additional threats exist with regard to the EU's export partner's infrastructure, investment and existing relationships with certain importing countries. In particular, gas imports from Russia are subject to a variety of potential disruptions. According to available estimates, in order to meet its obligations by 2020, Gazprom will have to seriously revamp and expand its gas transportation system, including the trunk pipelines and compressor systems, in order to maintain gas supply, potentially costing billions. In addition to infrastructure threats, broader threats exist between the EU and Russia. A mutual lack of trust and an attempt to guarantee one's own security at the expense of the other have prevented the optimally functioning relationship that is in both regions' overwhelming interest to pursue.

1.9 Transit states and commercial disputes

Gas exported from Russia has to cross states that can sometimes be unreliable. Belarus remains an important partner for Russia in its role as a transit state, although the relationship has ranged from exceptionally close to open hostility. Belarus has the capacity to transport 45 billion cubic meters of gas per year (BCM/Y) compared to 120 BCM/Y through the Ukraine. Obviously, the risks that are inherent in the transportation of gas through the Ukraine have been somewhat mitigated by the recent election results. In 2008, more than 120 BCM of Russian gas was transited through the Ukraine. The threats to such transit are threefold; first, the potential risk of a physical rupture via Ukraine; second, the threat of a monopolistic behaviour (transit fees and in general); and third, a country can fail to deliver across its border with the EU the whole volume of gas that entered across its border with Russia.

Commercial disputes, such as the one between Russia and the Ukraine in 2009, remain a threat to the EU. The lack of a firm enforceable legal contract between the countries and the inability to reroute the gas transferred through the Ukraine means that such a threat cannot be ruled out in the future and is thus a principal area of concern for the EU.

Additional geopolitical risks include the improper domestic management of gas consumption in export countries, which results in less gas available for export. This risk will likely increase unless some exporting countries take the necessary steps to increase their energy efficiency and remove existing subsidies for gas. Posing additional risk is the lack of investment in new upstream infrastructure. Algeria and Russia have been accused in recent years of insufficient investment in their upstream and export facilities.

1.10 Political risk

Political risk refers primarily to delaying or curtailing investments by creating an uncertain investment climate. As natural gas is dependent on complex and capital-intensive infrastructure with significant lead times, uncertainty created by political inertia in the energy sector can become a serious problem for security of supply. Investments are often interlinked with political decisions and may be subject to wider influence from seemingly diverse policy areas, including foreign policy and environmental considerations. Therefore, such decisions are necessarily complex and at times impeded by policy objectives in other areas. A lack of certainty as to what the outcome of a certain policy will be often afflicts investment in gas infrastructure; if the political decision-making process is protracted, it will have a significant effect on decisions to invest in gas infrastructure, which require significant lead times and capital costs.

Security of demand is also subject to risk. Table 1 breaks down EU vulnerability to the evaluated risks and their respective impacts on security of supply.

Table 1. EU vulnerability to evaluated risks and their impact

High risk		<ul style="list-style-type: none"> • Inadequate investments • Producer country policy • Transit, disputes and other risks 	
Medium risk	<ul style="list-style-type: none"> • Technical disruptions • Terrorism 	<ul style="list-style-type: none"> • Lack of reverse flow, commercial and technical • Market failures 	<ul style="list-style-type: none"> • Geopolitical • Insufficient upstream investments • Import diversification
Low risk	<ul style="list-style-type: none"> • Inefficient SoS policy • Gas OPEC 	<ul style="list-style-type: none"> • Construction/ components failure • Self-induced gas disruption 	
	Small impact	Medium impact	Large impact

2. Conclusions

Security of supply and security of demand are complementary issues in ensuring balance in the EU's natural gas supply. Security of supply requires improvements such as strengthening interconnections and increasing supply flexibility and diversification.

Security of demand requires the EU to provide clearer signals regarding future gas demand in Europe to facilitate investment both internally and externally. Contradictory estimates in gas demand present a pertinent threat, as they cause exporters to underinvest in new supplies or fail to develop necessary new infrastructure. The result of the present lack of clarity within the EU and consequent underinvestment would lead to serious security of supply issues in natural gas that could not be solved in the short or medium terms.

The possibility of an independent transmissions operator in Ukraine composed of Ukraine, the EU, and Russia should be seriously evaluated. Such cooperation would significantly enhance security of supply, reducing the chances of bilateral disputes affecting gas supply and ensuring much needed investment in Ukraine transmission infrastructure. While the technical constitution of such a tripartite operator may be complicated, the realisation of such a consortium could contribute greatly to EU gas security.

National and regional differences imply that security of supply levels and mitigation tools will necessarily differ between countries and regions. The Baltic countries and parts of the south-east EU have significantly lower levels of security of supply and are subject to regional and country specific circumstances, which call for an overall EU security of supply policy that will allow for adjustment of measures and policies to specific regional circumstances.

EU gas market development and liberalisation are not yet fully realised and there is a pressing concern to go ahead with these measures in order to ensure long-term gas supply security. National market structures in the EU remain highly concentrated, interconnection projects must be realised, and regulation should be clear and facilitate

investments. Furthermore, gas prices in the EU should reflect long-term gas supply and demand. Legislation should be reviewed continually and the goal of creating a fully functioning gas market should be a focal point of legislators both nationally and across the EU.

Traditional oil majors have realised that gas maintains a number of advantages over oil and have started shifting focus from oil to gas production. Natural gas offers greater long-term reserve growth, abundance and accessibility, lower production costs, stable economic returns, and lower technical and capital risk. In addition, environmental regulation favours a shift to gas production. The EU should seize this opportunity and provide clear policy signals and a stable regulatory environment to allow the EU to benefit from this commercial shift and ensure investments and other initiatives to increase the provision of security of supply.

EU gas markets have been shown to invest in markets and not necessarily in security of supply. But markets alone will not solve the current issues of low security of supply in some countries, because in many member states markets are poorly or not at all developed, as is the case in the Baltic countries. The procrastination and prolonging of investment decisions in such regions further exacerbates security of supply. Thus increasing security of gas supply in these regions is likely to be dependent on government intervention and/or EU regulation.

The potential of unconventional gas in Europe to significantly influence security of supply is presently unclear, and such resources should only be considered to have a potential impact in the medium to long term. Mass unconventional gas production in the United States has already had the indirect effect of increasing redirected LNG supply to Europe, but the potential production of unconventional gas in Europe, compared to that in the US, might be significantly more challenging owing to environmental impacts, population density, and the fact that the industry and knowledge of what resources are available in Europe are in their infancy.

3. Policy Recommendations

Legislators and the oil and gas industry must cooperate more fully to ascertain how EU legislators can accommodate the increased focus on natural gas by large oil companies and how this focus can accommodate the quest for increased security of supply.

Legislative coherency is crucial: the three main issues in energy markets – sustainability, market development and security of supply – should be addressed in a common form, whether through legislation, strategic review or some other means.

Regional differences in security of supply call for policy measures and instruments that allow for regional security of supply initiatives. The model applied in the Baltic Energy Market Interconnection Plan (BEMIP) could be applied for this regional focus, allowing for resolute regional action. BEMIP was designed to ensure commitment from stakeholders, progress via incentive schemes, and political and legislative focus.

Areas with a current low level of suppliers and routes require further diversification. This can be ensured by reverse flow and interconnection and new supply routes.

A tripartite commission should be established for the Ukraine transit operator.

Demand flexibility should be studied further as a means of mitigating EU security of supply risk. For instance, little is known about the EU's potential to lessen the impact of a disruption by fuel switching in major power producers or large consumers. A study should be commissioned to ascertain the EU's ability to do so in the event of a crisis.

The EU needs to be more proactive and decisive in developing a policy toward regions that are expected to play a more important role in gas supply after 2030. With traditional suppliers such as Norway and Algeria expected to deplete their supplies in the medium term, Europe must have a robust policy in the Caspian, Middle East and North African regions that shows pragmatism, partnership and commitment to their development as gas export partners.

The EU should develop a gas demand forecast based on the amalgamation of energy policies and individual national plans. This work could be foreseen by ENTSOG, as the capacity forecasts made in the ten-year network development plan should be compared to and based on the national and overall development of natural gas consumption.

Legislation regarding unconventional gas production should be streamlined and reviewed in order to speed up unconventional gas production in Europe and make sure any gaps regarding the law of its production are addressed. Additionally, an accurate survey of its potential production in Europe should be generated in order to evaluate its potential impact and elucidate recoverable resources. Any procrastination regarding the generation of an accurate survey of unconventional gas's potential impact may have a detrimental effect on investment in medium- and long-term infrastructure projects.

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