Revisiting energy security in turbulent times

Discussion Paper

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by Clémentine d'Oultremont (Egmont), Aurélie Faure (IFRI), Marco Giuli (Madariaga)

Despite years of normative advancements in EU energy policy, energy security is a relatively new concern in EU policymaking. It was mentioned for the first time in the Commission's 2006 Green Paper as a result of a pricing dispute between Russia and Ukraine which caused disruptions in the gas supply to some of the eastern Member States. This "wake-up call", reinforced by further disruptions in 2009, showed just how necessary a common European energy policy was. Since then, energy security has been presented as a by-product of internal market integration, and of the expansion of the internal energy market rules to third countries, notably suppliers and transit countries. However, this approach has proved insufficient: not only because a number of third countries do not accept to play by the same rules, but also because a number of countries in the EU are still lagging behind in terms of implementation of the internal energy market *acquis*.

A comprehensive European energy security policy has remained limited by the reluctance of Member States to alienate sovereignty on a policy area deemed critical for national interests. According to the Treaty, the EU energy policy's objectives must be achieved in "a spirit of solidarity between member states", but governments retain the right to determine the general structure of their energy supply, the choice of their energy mix and the conditions for exploiting their energy resources (Art. 194 TFEU). There is thus a strong tension between the declared need for closer cooperation and solidarity, and the respect of national prerogatives.

However, the combination of recent political turmoil across the EU neighbourhood, along with the new institutions' insistence on the need to create an Energy Union, has revived ambition for a more integrated approach to energy security, as demonstrated by the Communication of the European Commission on the European Energy Security Strategy released in May 2014. In the medium and long term, the strategy calls for comprehensive efforts to moderate demand, fully integrate the internal energy market, increase the production of domestic sources, further develop energy technologies, diversify the energy imports and improve coordination of national energy policies, while speaking with one voice in external energy policy.

By approaching the notion of energy security from different theoretical angles, the three following contributions intend to provide recommendations on how to reach these objectives, considering political constraints and the global and regional market conditions. In particular, the following points will be highlighted.

On the domestic side, the first priority of the EU energy security should be to complete the internal energy market. However, not only is it far from being completed but also at serious risk of fragmentation. In order to avoid this, the European market design should encompass the following measures: 1) All national energy policies must be compliant with EU rules and guidelines; 2) Mature renewables should be integrated into the market and balancing prices should reflect full system costs; 3) Transmission infrastructure should be developed in a common manner; 4) Network codes should be adopted and implemented as soon as possible; 5) The demand-side should be empowered to participate as much as possible in all markets; 6) The key European energy actors should be further empowered. The implementation of all these measures will require strong cooperation between the Member States, the EU and all energy stakeholders.

Moreover, the transition to a low-carbon energy system is adding a new internal security dimension, linked to the electricity system transformation (renewable integration, decentralised generation) to the traditional notion of energy security. This raises new policy challenges as the role of the energy system's main actors (mostly infrastructure operators) is evolving. In this context, energy efficiency policies need to be considered as an integral part of the EU's energy system security.

On the external side, energy security is currently being revisited with special focus on natural gas and imports from Russia. It remains to be seen how the new challenges for the security of gas supply will be addressed by an (Energy) Union and to what extent this will be coordinated through governance mechanisms at regional and Member State level to increase resilience and flexibility in the system. The EU has to adapt to the new situation in its neighbourhood. It has to do so by also reviewing its external energy governance and its particular tools.

With respect to gas pricing, a transition towards contractual arrangements incorporating spot pricing is to be expected. Joint purchase schemes make thus sense in order to counterbalance the suppliers' market power. However, this should be accompanied by a significant alienation of sovereignty especially if the choice is made for an energy mix, in order to avoid free riding.

The first priority of the EU energy security: completing the internal energy market

A body with 28 heads in need of a common direction

Clémentine d'Oultremont, *Senior Research Fellow, Egmont Institute*

In order to enhance the European energy security, the first priority in the short and medium term is to complete the internal energy market. The three EU legal packages on market liberalisation have clearly given form to a body. However, this body is still governed by 28 heads. Fearing for their energy security, the member states prefer to decide for themselves. Yet, if they all accepted this common body, to which they are definitively linked now, they would be much stronger and consequently safer. The key to make it function is greater cooperation and interconnections between these heads in order to take the right common direction. This paper will thus highlight the barriers preventing the full integration of this body with 28 heads and the measures that should be taken to overcome them.

Why is the internal energy market beneficial?

According to the European Commission, the net economic benefits of a fully integrated internal energy market could range from 16 to 40 billion euros per year.[1] However, this is only an estimate, as it is very difficult if not impossible to quantify all the benefits that a fully integrated internal energy market would bring.

As usually said, two (or more) heads are better than one, at least when they are cooperating. Likewise, the cooperation between different energy systems improves the cost-effectiveness in the production, distribution and use of electricity and gas, thus security of supply. With the development of variable and unpredictable renewable energy sources, it is very difficult to maintain a match between electricity supply and demand. The construction of interconnections between the EU transmission grids and the cooperation between different operators are thus essential to keep the system balanced. For instance, when there is no more wind, a gas/coal power plant must be able to quickly respond to maintain the balance in the system. Also, when there is a surplus of zero marginal cost renewables in a country, it can replace the functioning of an expensive gas power plant in another country. With respect to gas, it is even more obvious that an integrated and competitive internal market is essential for security of supply. Although the security of gas supply has greatly improved over the past years, the crisis in Ukraine has put it back high on the EU agenda. Some Member States in Eastern Europe are still isolated from the rest of Europe and entirely dependent on a single external supplier.

Well-functioning gas and electricity markets are supposed to secure affordable energy prices for consumers, improving industrial competitiveness. Consumers themselves should be enabled to reduce the cost of securing energy supplies by adjusting their energy demand to price signals.

An integrated, competitive and transparent internal energy market would also strengthen the EU's external energy policy by reinforcing its bargaining power with external supplier and transit countries. The European Commission is already in a position to question commercial deals with foreign suppliers negotiated at national level when they do not align with Europe's security of supplies and diversification options. The long term objective is to integrate all the neighbouring countries of the EU into the internal energy market by expanding the EU's energy acquis.

What is currently wrong?

So far, the integration of the internal energy market has delivered positive outcomes. The development of cross-border energy exchanges and the increased competition between energy companies have resulted in a progressive convergence of national wholesale energy prices. Consequently, wholesale electricity prices declined by one-third and wholesale gas prices remained stable between 2008 and 2012. However, although the harmonisation of national short-term wholesale markets has been quite successful, the integration of gas and electricity markets is still far from being completed and even at serious risk of fragmentation. In addition to the slow national implementation of EU legislation, three main barriers remain: the different national energy policies; the lack of market integration through

[1] European Commission Communication, *Progress towards completing the Internal Energy Market*, October 2014, p. 4

increased investment in transmission infrastructure (hardware) and harmonised rules and regulations (software)[2]; and the lack of consumers' empowerment.

Firstly, the internal energy market is still subject to largely different regulatory policies. The development of variable renewable energy sources, the Fukushima accident and the Ukrainian crisis have increased anxiety about long-term security of supply. It is evident that Member States tend to think nationally when security of supply is at stake.

Most investment decisions are currently based on national policies rather than on market conditions. National support schemes for renewables (and now also for nuclear); national capacity mechanisms for keeping conventional power plants running as back-up to re-balance the system; and national ancillary services for maintaining the system balanced prevent the emergence of an integrated approach between member states, which would be much more cost-effective.

These national public schemes are also very costly for final consumers who have to incur a high share of national taxes and levies in their energy bills. The lack of harmonisation in the EU retail energy prices is mainly due to the fact that each Member State can decide the share of national taxes and levies, as well as the share of network costs, in its retail energy prices. Moreover, with the expected increasing use of these national support schemes for renewables and back-up capacity in the coming years, the retail energy prices can only continue to rise. Security of supply can thus involve non-market national measures, which are not easily reconcilable with the challenge of integrating and opening-up the internal energy market.

Secondly, there is a lack of transmission infrastructure (hardware) and harmonized rules and regulations (software) to transport and trade gas and electricity efficiently across borders. So far, both hardware and software have mainly developed nationally. These various national transmission systems now have to be interconnected and their rules harmonized in order to turn into regional systems in a first time and an EU-wide system ultimately.

The hardware, consisting in cables and pipelines, needs to be upgraded and expanded in order to secure gas and electricity supplies. This is essential not only to integrate an increasing share of variable renewables generated far from consumption centres, but also to ensure cost-efficient energy supplies, save energy and replace foreign supplies by endogenous supplies when possible. The EU has come up with a continuously evolving list of 248 Projects of Common Interests (PCIs) that shows the importance of these transmission networks. The Ten Year Network Development Plan[3], the Juncker's Investment Plan, the Connecting Europe Facility and the Structural Funds are key tools to finance these infrastructure projects and meet the EU's objectives. The EU committed to meet a target of minimum 10% interconnections by 2020, to integrate the so-called "energy islands" (in priority the Baltic States and the Iberian Peninsula) and to reach a target of 15% interconnections by 2023. However, the achievement of these EU objectives will be complicated due to three main barriers that hamper investments in transmission infrastructure: the lack of public acceptance; access to finance; and slow and complex permit-granting procedures, in particular for cross-border projects. According to the European Network of Transmission System Operators for Electricity (ENTSO-E), about one third of investments are delayed due to public resistance and lengthy permitting procedures.[4] If the development

[2] *Ibidem*, p. 7

[3] This main instrument should bring up to € 150bn for projects of pan-EU significance by 2030.

[4] ENTSO-E recommendations to help achieve Europe's Energy and Climate Policy Objectives, October 2014, p. 4.

of transmission infrastructure is not accelerated in order to catch up with the rapid growth of renewables, volatility of electricity prices could increase further.

As a well-designed software is essential to make the hardware work, network codes are essential to deliver a well-integrated internal energy market. The increasing transport and trade of energy across borders coupled with the development of intermittent renewables have made energy systems much more complicated to operate. To address this complexity, various network codes have been developed. They are harmonised and legally-binding technical rules that aim to ensure a level playing field for all market participants in three main areas of energy systems, namely: grid connection, system operations and market arrangements. However, harmonising the technicalities of these areas have important redistributive effects that are not easy to deal with. The complexity and breadth of these network codes have thus delayed the adoption of most of them so far.

Thirdly, the demand-side, i.e. consumers, should be further empowered to offer their flexibility to the market. They should be rewarded for both reducing their consumptions (energy efficiency) and adapting their consumption patterns to price signals (demand response). The grid could thus be stabilised in an easiest and cheapest way than expensive peak generation and network capacity. This necessitates to roll out smart grids that would make the whole energy system interactive and responsive. The installation of such smart grids will be the responsibility of distribution system operators (DSOs) but the functioning of the whole system would involve all players, including consumers, producers, DSOs, Transmission System Operators (TSOs), regulators and member states.

What measures should be taken to overcome these barriers?

The European energy policy is today at a crossroads. It can go back to its originally form, i.e. a body with 28 heads individually managed with some inefficient exchanges of flows, or it can develop into a body with 28 fully integrated and coordinated heads moving cost-effectively in the direction of a secured low-carbon energy system. This entails the rapid implementation of existing EU legislation and the improvement of the current design with a fit-for purpose market encompassing the following key measures:

- In order to reconcile the objectives of integrating the internal energy market and energy security, all **national energy policies** (i.e. support schemes, capacity remuneration mechanisms, regulated prices and other ancillary services) must be **fully compliant with EU rules and guidelines** and not used for national industrial or social policies.

- In order to **improve price signals for investments**, mature renewables should be fully integrated into the market and financial incentives for balancing features such as capacity and flexibility should reflect all system costs.

- The hardware, i.e. **transmission infrastructure** for gas and electricity, **should be identified and developed in a common manner** (PCIs) to ensure that no country is left alone in case of disruption and to reach the targets of 10% interconnections by 2020 and 15% by 2030. This requires accelerating the process of public acceptance and permit granting via the rapid establishment of the cross border allocation of costs in order to secure political support.

- The software, i.e. **network codes**, should be **adopted rapidly.** Regarding their complexity, their implementation should be monitored by ENTSO-E.

- The **demand-side**, i.e. consumers, **should be empowered** to participate as much as possible in all markets (energy, capacity mechanisms or ancillary services) in order to help maintain a balanced system, particularly during expensive peak periods. This entails the roll-out of smart meters by DSOs and the involvement of all energy actors in order to make the system interactive and responsive.

- **In terms of governance**, the key European energy actors, i.e. the **European Commission**, the Agency for the Cooperation of European Regulators (**ACER), ENTSO-E,** the European Network of Transmission System Operators for gas (**ENTSO-G), and DSOs, should** also **be further empowered** in order to better coordinate the whole energy system, while adapting it to changing circumstances.

The implementation of all these measures would result in a paradigm shift for the energy sector that requires coordinated action by Member States, the EU and all energy stakeholders. Each head of our body with 28 heads will have to accept politically to drop some of its individual decision-making powers in favour of a common approach, which is not only more cost-efficient but also more secure.

A Low-Carbon Policy Emphasizing Energy Security and Energy Efficiency

Aurélie Faure, *Research Fellow, Ifri*

If the transition to low-carbon energy sources is deemed to improve Europe's domestic energy supplies, the penetration of renewables in the energy mix also brings new operational challenges in terms of energy security. This raises questions about the role of energy efficiency in meeting final demand, how the EU's energy policy can emphasise both supply security and energy efficiency.

The security of Europe's energy supply largely depends on its position in the global geopolitical energy landscape as a consumer region. Since the oil prices shocks of the 1970s, the security of Europe's energy supply has traditionally been analysed through the triptych of energy import dependency, the diversification of energy imports and the diversification of energy sources.

Back in 2008/2009, Europe's renewable energy policy, based on EU National Renewable Energy Plans, supported the development of wind and solar energy resources. It claimed this would reduce Europe's energy imports and improve diversification. However, the idea that the promotion of indigenous renewable supplies, which is the cornerstone of the energy transition, improves energy independence needs to be reassessed in light of the experiences so far, in a number of European countries like Denmark and Germany.

In connecting renewable energy sources and decentralised production to the system, the energy transition raises new internal challenges and opportunities in terms of system security. In the context of the energy transition, primary energy sources have a lesser "input" role, in feeding the system to match specific consumption patterns, but they are increasingly required to play more flexible roles in the overall energy system.

The objective of this paper is to re-focus policy dialogue on the security challenges and benefits that Europe might find in the transition to a low-carbon system. The paper will review major underlying transformations taking place in the operation and planning of the energy system, mostly electricity systems, and to what extent they are leading to a new energy security paradigm. It will explore the flexibility needed by the system to absorb renewable energy and will examine the role of energy efficiency policies in contributing to a more secure and decarbonised energy system.

The impact on energy security of the transition to low-carbon energy production

Our current energy system is based on a combination of different physical components, including: cables, transformers, pipelines, power plants, LNG import terminals, oil pipelines, etc. These are integrated using specific scientific knowledge, and technological developments. This is a complex architecture which is constantly adapting to provide a certain level of security and to cope with the needs of transportation infrastructures, industrial logistics supply-chain requirements and public service obligations, etc.[5]

Electricity networks and systems have been designed *ex-ante* for high security levels, with investments adjusted to cover peak capacity. The security aspect was supposed to be covered by the system in itself, acting as a guarantee of supply continuity to final customers.[6] The latter are situated at the end of a vertical chain, and are also protected through specific stringent limits (SAIDI),[7] from unforeseen events like winter freezes, storms or summer cooling peaks.

From this perspective, integrating a large range of renewable sources constitutes a **breakthrough in the operation of the electricity system.** Electricity market scenarios for 2050 reflecting a high share of renewables (70-100%) lead to a **constrained system** as opposed to a **secure system**. 2050 scenarios also forecast needs for **a global electricity surplus** that the system cannot integrate.[8] This surplus will have to be matched by long term energy storage options (using combined natural gas, hydrogen, pumped hydro storage) and long term demand responses.

All around Europe, electricity transmission operators are preparing "flexibility responses" for the long term management of networks.[9] These result both from new system constraints and strong fluctuations in electricity generation at specific times, like peak winter periods. These challenges are mainly related to the operation of the grid as illustrated below. Earlier in October this year, the Danish transmission operator (Energinet.dk) bought a second underground gas storage facility from Dong Energy, in order to ensure that Denmark can manage a secured and efficient green energy transition. In Germany, Baden Wurtenberg's system operator (TransnetBW) is auctioning power capacity reserves for power and storage plants, in order to cover shortages during next winter season (2015/2016).[10]

Europe has entered a period in which its energy infrastructures need new operating models driven by technological change and the feed-in of renewables. In energy infrastructure, the role of primary energy is being reoriented from an energy feed-in into being a provider of flexibility, in order to ensure long term adequacy and reliability. This adaptation will differ between Member States, according to the priorities given to long term storage technologies, the pace of demand responses and the level of interconnections. Infrastructure operators are natural monopolies and have mandatory missions to ensure system security, stability and long term reliability in the face of external shocks. Their role,

[5] "Before the Lights Go Out: Conquering the Energy Crisis Before It Conquers Us", Maggie Koerth Baker, 2012.
[6] IEEE (**Institute of Electrical and Electronics Engineers)** / CIGRE (International Council on Large Electric Systems) Joint Task Force on Stability Terms and Definitions, See the definition of Security, Reliability, Stability, 2004.
[7] SAIDI: System Average Interruption and Duration Index.
[8] "Analyse du coût du transport du gaz naturel dans l'économie de l'hydrogène en France", E-cube pour GrT Gaz, March 2013.
[9] "In general terms, flexibility is the ability to reconcile volatile consumption and volatile generation. This implies a capability (e. g. ramping), coupled with a high level of controllability and reliability / availability."
[10] 545 MW capacity reserve.

however, needs to be adapted. Infrastructure operators will have to be able to procure flexible services from alternative market players (generators, Distribution System Operators, Demand Response) in order to guarantee system security.

The next chapter of this paper will examine the role of energy efficiency policies in meeting flexibility and contributing to a more secure and decarbonised energy system.

Energy efficiency: a key challenge in achieving energy security

Energy efficiency policies were launched back in 2012 in a fragmented manner.[11] They were complementing the two pillars of the 2020 agenda, which focused on the reduction of greenhouse gas emissions and the increasing share of renewables shares.[12] Limited progress on the 2020 targets, however, is leading the EU to implement a new policy framework for energy efficiency.

Energy efficiency's role in mitigating demand

Energy consumption results directly from socio-economic activities and progresses in economic development.[13] Confronted with patterns of low demand growth, mature economies are generally more inclined to tackle energy system inefficiencies, in order to control costs better or cut them. In the US, the State of California is an example where electricity consumption per capita only rose by 9% between 1973 and 2005. Extensive measures to reduce energy consumption were implemented, while the US consumption grew by more than 50% over the period.[14] This example shows that energy efficiency policies can play a major role in mitigating demand.

Energy efficiency measures, affecting both primary and secondary energy (electricity) all the way through to final consumption, have wide-ranging effects on the economy in general. A lot of efficiency efforts can be undertaken outside the energy sector (in buildings and industry), leading to more energy efficient consumption. Direct energy efficiency effects should also be differentiated from the indirect efficiency outcome of economic activity related to: the slowdown of GDP, the reduction in GDP intensity, and fluctuating energy and CO2 prices.

Striping out these economic factors allows the structural aspects of energy efficiency, as well as the behavioural/technological aspects to be identified. [15] Structural aspects are related to investments or operational changes to the system aimed at lowering final energy consumption or primary energy imports. They include shifts in the energy mix, efficiency of energy conversion (including efficiency of power generation plants), and obligations of reduced consumption in gas and electricity distribution.[16] They also cover final consumption uses, for which efficiency standards used in specific energy consuming equipment can be applied.[17] Complementary to structural energy efficiency, the behavioural facet of energy efficiency relates to consumers' habits, the ability to innovate, and to some extent to price elasticity. This facet is partly linked to smart grid innovations, and interactions within energy communities.

[11] Energy Performance of Buildings Directive (Directive2010/31/EU) and Energy Efficiency Directive (Directive 2012/27/EU).
[12] Directive 2009/28/EC – Renewable Energy Sources / Directive 2009/29/EC – Emission Trading Scheme.
[13] Primary energy demand per capita 4.2 toe in OECD countries vs 1.3 toe in non OECD countries (IEA).
[14] "A comparison of per capita electricity consumption in the United States and California", California Energy Commission, August 2008.
[15] McKinsey Global Sustainability and Resource Productivity, "Energy Efficiency: A Compelling Global Energy Resources",2010, p.13.
[16] In Europe, they are covered by the EED Directive in nearly half of the Member States.
[17] EcoDesign Directive, Directive 2009/125/EC.

If targeted properly within the energy system, energy efficiency policies can lead to the long term reduction in energy consumption. When targeted at consumers' behaviour, energy efficiency interacts with innovation in energy transition and leads to changes in load patterns. Overall, energy efficiency has an important role to play in supply security, while also bringing about significant cost reductions in the system.[18]

Energy efficiency in EU policy

In Europe, energy efficiency policies have, so far, been focused more on lowering primary energy demand, than lowering primary energy intensity. In June 2011, the EC translated the 2011 Energy Efficiency Plan into a proposal of a new directive: the Energy Efficiency Directive (EED). After extensive discussions with the Member States it was adopted on 25 October 2012 as Directive 2012/27 on Energy Efficiency. The Directive repeals both the Energy Services Directive (2006/32/EC) and the Combined Heat Power Directive (2004/8/EC). It introduces measures for energy efficiency in the manufacturing industry, for energy transformation including Combined Heat Power systems, and for energy transmission and distribution. It also mandates suppliers to promote energy savings.

The EC impact assessment study was published in July 2014.[19] It shed light on the progress of the energy efficiency mix.[20] It confirms that the European Union will not achieve its 20% target in 2020 (only reaching 18-19% according to the EC), as slow progress has been made in the implementation of existing legislation, especially in the building sector and in the energy savings of the main utility companies. In the report, the Commission assesses security benefits deriving from energy efficiency policies. Based on the ambitious 2030 targets – equivalent to energy savings of between 25% and 40% - the report expects a reduction in gas imports by 2.6% for every additional 1% in energy savings. The effectiveness of this benefit can however be questioned, as can the numerous assumptions underpinning it, given the difficult practical implementation of energy efficiency policies. The factors included among the measures highlighted by the study for the 2030 framework are: reinforcing the Energy Efficiency Directive to achieve the 2020 targets, promoting Combined Heat Power (heating and cooling sectors), and limiting energy grid losses.[21]

With energy security back on the agenda, the reliance of Europe on its energy system and the potential energy efficiency from the system need to be evaluated. While the EU Council reiterated that the EU carbon trading scheme (ETS) is the cornerstone of the energy policy, the energy efficiency pillar still needs to be consolidated further.[22] The recommendations arising from the EC's impact assessment study of July 2014 could be complemented with a stronger focus on system and infrastructure-related investments. This would reinforce the pathways to long term reductions in energy consumption, together with an improvement in system security, complementing a reduction in energy dependency.

[18] "Estimating energy system costs of sectoral RES and EE targets in the context of energy and climate targets for 2030", Fraunhofer Institute for System Research and Innovation ISI, 2014.
[19] "Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy", Commission Impact Assessment, COM2014/520, July 2014.
[20] SWD(2014) 255 final, page 8: "if current trends continue by 2020 roughly 1/3 of reduction in energy consumption compared to the 2007 Reference will stem from lower growth than anticipated, and about 2/3 from increasing energy efficiency improvements".
[21] 6% of demand in electricity.
[22] EU Council Conclusions; 23rd / 24th October 2014.

Conclusion

The transition to a low carbon economy requires several steps in the adaptation of the energy system. Infrastructure operators engaged in this transition process are securing more flexibility to the system. But their traditional mission of ensuring security also needs to be reconsidered.

The energy security policy may be complemented and enlarged compared to its traditional definition. Having a broad view of the energy system helps moving from the concept of **security of energy supplies** (largely an external concept), to the **energy system security**. In this, both external (interconnections) and internal energy security factors (e.g., adequacy and quality of networks) play a strong role. To this extent, **energy efficiency** should also be considered as a **specific pillar of energy security,** as it is mentioned in the European Energy Security Strategy (EESS): *"one of the most effective tools to reduce the EU's external energy dependency and exposure to price hikes"*.[23]

To this extent, efficiency measures and low-carbon investments need to be refocused on what directly constitutes the optimisation of the system. The recommendations arising from the EC’s impact assessment study in July 2014 could be complemented with a stronger focus on system and infrastructure related investments.

While this approach may be formalised in the pathway to energy security for 2030 and beyond, its implementation may affect the system costs incurred by infrastructure operators and utility companies, and will inevitably have an impact on their revenues. Therefore, the EU energy policy and the Energy Union need to reflect concrete actions in view of aligning system players with the agenda of a transition towards a decarbonised energy system. In particular, EU energy policy needs to clarify the role of system operators, especially DSOs.[24] Regulation also needs to be adapted, in view of the wider development of energy efficiency. This will further be an important step for the EU in convincing infrastructure investors of the potential of its energy system as a “safe and secure” system.

Shifting gas pricing mechanism in Europe: what implication for energy security?

Marco Giuli, *Research Fellow, Madariaga – College of Europe Foundation*

The transition towards hub pricing in continental Europe gives rise to a number of uncertainties, some of which are related to energy security, such as the potential negative effects of price volatility on investments and coordinated behaviour among exporters. These risks are accentuated for an externally dependent, fragmented and concentrated market such as the European one. Common purchasing schemes and enhanced interconnectivity could be appropriate responses, as long as some additional political and regulatory conditions develop.

Introduction

Gas pricing in continental Europe is under pressure for change. A growing number of European utilities are decoupling their contracts from oil, moving towards a pricing mechanism which reflects gas-to-gas competition rather than gas-to-oil competition. As a lot of long-term supply contracts in Europe will

[23] COM(2014) 330.
[24] “The EU electricity policy outlook for the smart grid roll out”, Aurélie Faure-Schuyer, Ifri, October 2014.

expire during this decade, the shift towards spot pricing is expected to accelerate. On the political side, a resolution of the September 2013 EU Parliament called into question oil indexation on the basis of the high prices imposed on the consumers, advocating short term trading as a more flexible alternative.[25] Further, the Commission believes that a transition to spot prices is in line with the completion of the internal market for energy, and it adopted the Gas Target Model (GTM)[26] to encourage the development of regional trading hubs all across the EU in order to create regional wholesale markets – a potential step towards a single European pricing.

However, this evolution raises more questions than answers due to the peculiarities of the institutional and infrastructural frameworks of the EU market. This paper intends to investigate under which conditions a transition towards spot pricing could be expected to enhance or to compromise energy security.

An American revolution

The traditional oil indexation of long-term contracts in Europe has been facing growing criticism since the 80s, when the UK decoupled gas contracts from oil on the basis that oil was no longer a competitor to gas in gas' final use. Ever since, the EU's preference for the development of spot pricing has been consistent with a liberal approach to energy markets aimed at breaking national monopolies through the discipline of competition. As such, it is no surprise that large national wholesalers have opposed this transition.

The current evolution of the North American gas market is modifying this structure of preferences. The economic crisis and the demand contraction coincided with additional LNG availability in the Atlantic basin due to the US' shale revolution that took the country's demand out of the market. This oversupply put the continental incumbents in an uncomfortable position. As the exceeding amounts – contracted at oil-linked prices under take-or-pay schemes - are in competition with spot-indexed volumes in Western Europe, the differentials count as a net loss, pushing European actors to change their traditional reservations on spot pricing.

However, is Europe well placed to embrace the change and turn the expansion of the supply-side of the LNG market into a truly beneficial pricing revolution? When compared to the US market, characterised by self-sufficiency; an integrated infrastructural panorama; and strong competition, the European panorama looks quite different.

First, Europe imports mainly by pipeline. Even if a wave of renegotiations has led to a majority of imports being traded at spot prices since 2013,[27] pipeline trade remains bilateral. The dominant role of importing via pipelines implies that there is a limited interconnection of supply lines from different suppliers at the EU borders, creating problems for the emergence of competitive hubs in large portions of the continental market.

Second, Europe is suffering from fragmentation. This exacerbates the first problem. Whilst energy supply in Eastern Europe remains exposed to the capricious evolution of Russia-Ukraine relations, in Western Europe the country with the largest spare import capacity – Spain – is the least interconnected with the rest of the continent.[28] Against a backdrop of abundant spare import capacity, the internal

[25] EU Parliament (2013), Motion for a Resolution on "making the internal energy market work" 2013/2005 (INI), http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A7-2013-0262+0+DOC+XML+V0//EN#title1.
[26] http://www.acer.europa.eu/Gas/Gas-Target-Model/Pages/default.aspx.
[27] Gazprom included a hub index accounting for 15% of its oil formula, whilst Statoil reduced the take obligation for some contracts by 25%, letting buyers take the rest at spot prices.
[28] Half of the Spanish LNG import capacity is currently unused, with interconnectivity of the Iberian Peninsula being abnormally low, for both gas pipelines and electricity. France's nuclear industry's opposition and the

transmission system is highly dysfunctional. The aim of adopting entry/exit transmission capacity, introduced with the Third Energy Package, is to develop regional hubs and wholesale markets. However, there is a potential risk of maintaining centralised-investment decision-making, incorporating the concerns of national transmission system operators (TSOs), recreating *de facto* the same situation which preceded the introduction of ownership unbundling in terms of price distortions.[29]

Third, the European gas market suffers from an extremely concentrated supply structure. Whilst within the US the largest gas extraction operator holds no more than 6% of the market, Europe relies on few external state-controlled suppliers. When it comes to the evolution of pricing, the fundamental difference with the American and British experience is that incumbent suppliers did not support the status quo.[30] On the contrary, relations between the EU and its incumbent suppliers are affected by a significant level of mutual mistrust. This means that a substantial part of the change will have to go through international arbitration, in the worst case scenario, and renegotiation, in the best.[31]

For all these reasons, shifting pricing mechanisms towards a hub-based system might cause significant uncertainties, some of which relate to energy security. These uncertainties will be explored in the next section.

Implications of shifting prices for the quest for energy security

Over the last two decades, pricing has rarely been considered by literature on energy security. The International Energy Agency (IEA) defines energy security as the "physical capacity of suppliers to satisfy demand at a given price".[32] In other words, the focus of the definition is related to volumes. Only recently, the IEA changed the definition into "uninterrupted availability of energy sources at an affordable price",[33] incorporating the notion of affordability as elaborated by classic studies on energy security.[34] There are several ways in which shifting pricing mechanisms towards a hub system might affect energy security: the "greenfield argument" relates to price volatility, potentially preventing investments in future capacity and therefore putting security at risk; the "cartelisation argument" relates to the potential for coordinated behaviour among the suppliers to withhold production in order to raise prices, hardly possible when the price is linked to another commodity.

The greenfield argument. According to this argument, old pipelines – which have already paid off – can adapt more easily than greenfield infrastructure in the case of hub pricing being based on short-term contracts. As such, the prospects for diversification – a key concept in all the EU communications on energy security - might be damaged. This is a pipeline-specific problem, to the extent that their fixed routing does not allow the supplier to hedge between different clients.[35] As a result, the Southern

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Spanish opposition to the France-sponsored "Mediterranean solar plan" constitute the major political obstacles (Escribano Francès, G. "Une union de l'énergie au-délà des Pyrénées", *Le Monde*, 25 October 2014; "Europe needs the will to build an energy union", *Financial Times*, 21 October 2014).

[29] Hunt, P. (2008), "Entry/Exit Transmission Pricing with Notional Hubs: Can It Deliver a Pan-European Wholesale Market in Gas?", Oxford Institute for Energy Studies, February 2008; DNV KEMA (2013), "Study on Entry/Exit Regimes in Gas", by order of the EU Commission – DG ENERGY, http://ec.europa.eu/energy/gas_electricity/studies/doc/gas/201307-entry-exit-regimes-in-gas-parta.pdf.

[30] Melling, A.J. (2010), *Natural Gas Pricing and Its Future: Europe as the Battleground*, Carnegie Endowment for International Peace, Washington DC.

[31] Stern, J. and Rogers, H. (2011), *The Transition to Hub-Based Gas Pricing in Continental Europe, Oxford Institute for Energy Studies*, Oxford.

[32] IEA (2001), *Towards a Sustainable Energy Future*, International Energy Agency, Paris.

[33] IEA (2014), *Energy Security*, IEA Energy Technology Systems Analysis Programme, International Energy Agency, Paris.

[34] Deese, D.A. (1979), "Energy: Economics, Politics, and Security", *International Security*, Vol.4, N. 3.

[35] Jensen, J. (2012), "International Natural Gas Pricing – A Challenge to Economic Modeling", a Presentation to the Energy Information Administration, Washington, 23 August 2012.

corridor, whose aim has been for a long time to give a European outlet to the ladlocked Caspian resources, is facing additional difficulties, to the benefit of Russian interests in maintaining control over the post-Soviet infrastructural panorama and preventing newcomers from competing in the Southern European market.[36] Experience shows that underinvestment is a concrete risk when prices collapse. However, it also shows that the largest Southern corridor project, the Nabucco pipeline, was undermined by overly optimistic considerations regarding volumes, promoted for political purposes and with very weak economic rationale regardless of price levels.

Cartelisation. Another source of concern is the cartelisation argument. Essentially, the analytical concept of energy security started being elaborated on the occasion of the oil shock of the 70s, which was the result of cartelisation. Similarly, it lost centrality in the late 80s when oligopolistic behaviour got broken and prices stabilised at low levels, suggesting that affordability matters for security. An oil-indexed long-term framework makes the prospects for cartelisation implausible in the gas markets. However, an evolution towards hub pricing would make coordinated behaviour possible among the exporters. Several new suppliers appeared on the European markets between 2008 and 2013; however they eroded the fringe suppliers' shares rather than the shares of the incumbents. As a result, concentration is on the rise, the Herfindhal-Hirschmann index (HHI) of concentration went from 0.30 in 2008 to 0.32 in 2013, suggesting interesting potential for cartelisation. The creation of the Gas Exporting Countries Forum (GECF), along with a series of suspicious technical failures in 2010 in Qatar, Algeria and Norway induced buyers to suspect that volumes were being withheld deliberately. Idle capacity is a fundamental requirement to enforce coordination in a cartel. After years of overinvestment and with the current attempts to invest in overcapacity in the EU and China, Russia seems increasingly well placed to play such a role.

Recommendation for the energy union

The previous concerns seem to point out that hub pricing might lead to a situation where volatility – both downwards and upwards – puts energy security at risk. This risk could be limited through adequate policies.

The mercantilist option. This option refers to the creation of a European monopsony, by way of a single purchasing instrument. Under this scenario – envisaged by Donald Tusk and more recently by the new Commission's Vice-President for the Energy Union Maroš Ševčovič – the national monopsonies would be replaced by a centralised European purchasing agency.[37] Although not mentioned specifically for this purpose in the Communication on Energy Security, a scheme of coordinated purchase would render Europe more resilient to the risk of coordinated behaviour among the suppliers. It would also have parallel advantages in terms of ensuring security of demand, and providing a framework to organise a more diversified and flexible supply. However, such a policy should be carefully engineered to overcome the contradictions that exist with the last three decades of EU energy policy, whose liberal approach was aimed at enhancing energy security as a by-product of internal competition rules by way

[36] There is ample evidence of how Russia is able to affect policy options of individual EU member states by using energy. The most recent cases were recorded in Bulgaria and Hungary (Giuli, M. (2014), "The South Stream in the Wake of the Ukrainian Crisis: a Test Case for the Third Energy Package", *Madariaga Papers*, Vol. 7, N. 8, September 2014).

[37] Donald Tusk proposed a three-step process with the establishment of a mechanism for jointly negotiating energy contracts, the elimination of secrecy and market-distorting clauses from bilateral agreements, and finally the EU Commission intervening in all the new negotiations. Other proposals are more in line with the Japanese scheme of joint purchase, where a private company aggregates the demand of importers (Egenhofer, C., F. Genoese and A. Dimitrova (2014), "Energy Union: Can Europe learn from Japan's joint gas purchase?" *CEPS Commentary*, 11 December 2014.

of their extension to external partners.[38] In other words, an EU monopsony would bring the EU back to the public utility models of the 70s and 80s. Other risks are related to bureaucratisation and free ride: member states could gain from collective action without paying the price in terms of alienation of sovereignty as regards the choice for their energy mix and the structure of supply, clearly stated in Art. 194 TFEU.

Investing in interconnectivity. If the problem is oligopolistic manipulation, then the obvious answer should be to increase the competitive fringe. However, when it comes to the gas market this is not straightforward. Despite more and more countries supplying gas to the EU, the market shares of the incumbents have been growing. In other words, the fringe countries erode each other's shares, or simply replace the declining European domestic production. This happens for a number of reasons, among which the persistent fragmentation of continental Europe plays an important role. Due to a lack of interconnectivity – exacerbated by a complex method for the allocation of transport capacity, which distorts price signals and keeps a national approach to investment – LNG suppliers compete among themselves mainly for the North-Western European market, without significantly challenging the incumbents and contributing to the persistence of a hybrid pricing system. It is quite clear that, if solidarity cannot be displayed for physical and regulatory reasons, several member states will prefer to ensure their energy security by maintaining privileged long-term relations with the incumbents. The resentment showed by Bulgaria and Hungary towards the EU Commission after Russia's decision to withdraw the South Stream project is an alarming signal. Other countries in Eastern Europe are building up their own regasification capacity, at the risk of multiplying small and illiquid national hubs and attracting imports that, will be systematically more expensive than Western hub prices by incorporating additional transport costs, and, that with all probability, will be higher than Gazprom's prices. Moving towards spot pricing could be a factor for security, but only if coupled with a more integrated regulatory approach and a more interconnected physical infrastructure. This means having a framework flexible enough to react to potential coordinated behaviour by the suppliers.

Conclusion

Under the pressure of the expansion of the LNG supply in the Atlantic basin, a transition from oil-indexed prices to spot-indexed gas prices is accelerating in continental Europe. However, several characteristics of the EU gas market – notably dependence, fragmentation and concentration - risk not allowing this transition to work to the benefit of security. Energy security might be affected by a price volatility that risks hindering strategic diversification projects, and creating opportunities for the coordinated behaviour of suppliers – notably Russia - as long as they don't fear the competition of LNG in their geographical portion of the European market. Policy responses might include joint purchasing and enhanced interconnectivity schemes. Joint purchasing can increase the bargaining power of Europe vis-à-vis external suppliers, also providing them with security of demand, at the price of bureaucratisation and opportunities for free riding as long as additional aspects of energy policies are not shifted to the supranational level. A more coherent approach would be to deter potential oligopolistic manipulation of spot prices by enhancing interconnection through the removal of political and regulatory obstacles, in order to let spare LNG import capacity in the West be beneficial for security in the East. Failure to do so will incentivise some Eastern Member States to devise autonomous diversification strategies. It will also be an incentive for others to keep some sort of preferential relationship with Russia, to the detriment of any plan for an energy union.

[38] Goldthau, A. and T. Boersma (2014), « The 2014 Ukraine-Russia Crisis: Implications for Energy Markets and Scholarship », *Energy Research & Social Science*, 3/2014.