ENTSOG's Ten-Year Network Development Plan for the gas market: the importance of remaining committed to a long-term vision in difficult times

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European transmission system operators are building the network for the gas flows of the future – but will there be any gas flowing in Europe ten years from now? At a workshop in Riga in March 2013 organised by ENTSOG (the European Network of Transmission System Operators for Gas), representatives from the gas industry discussed the implications of ENTSOG's crucial Ten-Year Network Development Plan (TYNDP), which was adopted in February. The participants concluded that under the current grim market conditions, it is crucial for policymakers and the industry to remain committed to building a healthy European gas market. Gas, they emphasized, has unique qualities to make the European energy market more competitive, secure and sustainable – indeed, in many ways even to transform the energy landscape. What is needed above all to bring out "the economic superiority" of gas is to complete the integration of the European gas market – with the help of the TYNDP.

Getting away from Brussels sometimes brings a sharper focus on what is really happening in Europe. This was certainly the case at the ENTSOG workshop which took place in March in the beautiful city of Riga, in Latvia, where stakeholders from across Europe discussed the prospects of the European gas market in the light of ENTSOG's new Ten-Year Network Development Plan (TYNDP). The workshop made it clear to all concerned that the development of the European gas market is still very much a work in progress, with no success guaranteed.

Europe's gas transmission system operators (TSO's) are responsible for ensuring that the infrastructure (pipelines, LNG terminals, storage facilities) is in place that underpins an integrated – competitive, secure and sustainable – European gas market. Not an easy task, especially not the integration bit, but Harald Stindl, Managing Director of Gas Connect Austria and Member of the Board of ENTSOG, underlined in Riga that ENTSOG is making steady progress. Although the organisation started just 3.5 years ago, it has already delivered most of the technical building blocks needed for a single EU gas market, Stindl said. Thus, for example, the first capacity allocation code developed by ENTSOG is nearing adoption in the comitology process.[1] In addition, ACER, the body of European regulators, has approved ENTSOG's balancing code. And with the start of pilot capacity platform projects such as PRISMA, gas TSO's are now able to offer gas transport capacity on joint platforms. Stindl even noted that with the PRISMA project "we have surpassed our electricity colleagues".

ENTSOG's Magnum Opus: the TYNDP

ENTSOG's efforts and expertise come together in its biennial Ten-Year Network Development Plan. This is an in-depth overview and analysis of the state of the European gas

[1] *Note by author: The CAM Network Code was adopted by the Gas Committee on 15 April 2013.*

infrastructure and its potential development over the next ten years. Thanks to the TYNDP, European infrastructure projects and needs are made fully transparent for all participants in the gas market.

In February 2013, the 3rd edition of the TYNDP was officially adopted by the ENTSOG's members, the EU's Transmission System Operators for gas, although, as Stindl pointed out, this new edition is really the first one that can be considered truly complete. "For the first time it's the real thing", he said.

So what does the new TNYDP have to say? Well, the good news is that it shows Europe has a well-developed gas infrastructure: well-connected to a diversity of supply sources and capable of dealing with high daily demand situations. In other words, technically speaking, nothing has to stand in the way of the integration of European gas markets. In addition, in view of the hundreds of infrastructure projects that are in the pipeline, the TYNDP also concludes that most of the potential "investment gaps" looming on the horizon may be overcome.

Supply and demand scenarios

In Riga, Carmen Rodriguez and Oliver Lebois of ENTSOG explained some of the findings and assumptions that underlie these conclusions from the TYNDP. First of all, the TYNDP relies on demand and supply projections for the next ten years. Rodriguez showed that the TYNDP's demand scenario, when compared with other scenarios (e.g. of the European Commission in its Roadmap 2050, the International Energy Agency in its World Energy Outlook and of Eurogas, the association of gas suppliers), comes out in the middle of the range. The TYNDP projects slow but steady growth in gas demand, adding up to 9% in 2013-2020, thanks mainly to continued demand growth from the power sector. It foresees the highest growth in East and South East Europe, Sweden, Spain and Portugal.

The supply picture in the TYNDP shows that there is sufficient potential to allow for flexibility in meeting gas demand. The actual supply mix, however, will result from the current market situation, noted Rodriguez. The TYNDP forecasts that indigenous production will continue to decline, with perhaps a slight uptick towards 2020 thanks to increased biogas and shale gas production – but this last is far from certain. As to external supplies, no significant growth in absolute terms is expected from Norway, Algeria, and Libya. A completely new supply source will appear on the scene in 2018: the long-awaited Azeri gas. The only significant growth is likely to come from Russia – and from LNG. But again, this last is uncertain, because LNG supplies can easily be diverted if the market sees more attractive opportunities elsewhere. Nevertheless, on the whole, TYNDP's supply and demand picture is one of steady slow growth on both sides of the fence.

Market integration and network resilience

Lebois went a bit deeper into the TYNDP's findings with regard to the current state of infrastructure-related "market integration" which is analysed through four different assessments. . He also noted that the TYNDP includes the most comprehensive database of gas infrastructure projects available anywhere: some 300 in all. For about 25% of those

(including 10 LNG terminals and 14 storage facilities) a positive final investment decision (FID) has been made. All simulations are first carried out with FID projects only (including existing capacity). Afterwards, Non-FID projects are included as well and all simulations are run again.

Lebois discussed in some detail the methodology used to assess the ability of the network to face different demand and supply situations. First, a detailed overview is created of the network, a "European gas spider web", with the help of a network modelling tool which includes such elements as the topology of the network (e.g. cross-border capacity, LNG and storage capacity), definition of demand and allocation of supply. Then, the different assessments are run which analyse network resilience, supply source dependence, network adaptability to changing supply patterns, and accessibility of different supply sources.

Network resilience of the gas spider web is tested by looking at the ability of the infrastructures to transport large quantities of gas under High Daily conditions and Supply Stress cases (e.g. a complete disruption of Norwegian supplies to France or a complete disruption of Russian supplies through Ukraine). The overall conclusion is that resilience in most of the European network is adequate, with some exceptions (in particular Sweden and Finland and areas that are at risk from disruptions in Belarus and Ukraine).

As for the supply source dependence, Lebois noted that a strong dependence has been identified only on Russian gas and LNG for some parts of Europe. In particular Romania and Hungary are strongly dependent on Russia and the Iberian peninsula and the south of France are strongly dependent on LNG. The evolution of dependence on Russian gas is strongly linked to the implementation of non-FID projects, Lebois noted. In other words, if many of these projects are implemented, dependence on Russia will decrease.

The assessments of the network adaptability to changing supply patterns and of the accessibility of different supply sources for different parts of Europe further complement the infrastructure testing.

The TYNDP also contains an "import route diversification index" and an "import dependency index", both of which show fairly stable (though not always altogether positive) results. Again, the extent to which diversification will be improved depends to a large extent on the commissioning of projects for which no FID has yet been made, said Lebois, especially in South East Europe.

Current gas market situation

The big picture emerging from the TYNDP, then, as sketched by Lebois and Rodriguez, seems fairly reassuring. The question is, though, how realistic is it? Certainly many participants at the workshop thought it is far too optimistic, given the current slump the European gas market is in. Thus, for example, as Rodriguez acknowledged, scenarios from ENTSOG's electricity colleagues, ENTSO-E, show a much lower future demand for gas for power generation – between 30% and 60% annually for the rest of the decade – even though they assume the same installed capacity for gas-fired power plants. The reason for this, as one participant of the workshop pointed out, is that much of the time it is not economic at this

moment for operators to use their gas-fired power plants. They are better off using coal-fired power plants or renewables. And it is by no means certain whether this will change in the future.

The problems faced by the European gas market are by now well-known of course. They were highlighted by various speakers in Riga:
-competition of cheap coal from the US (European gas prices are too high compared to coal prices, noted one speaker, but too low to attract LNG supplies, which tend to go to Asia)
-the competition of heavily subsidised renewables (in particular, said David Viduna of Czech power incumbent ČEZ, solar power is "killing" for gas-fired power production, as it tends to shave off daytime peak demand and thereby peak prices)
-the economic crisis (add to this: energy efficiency measures that further reduce demand growth)
Viduna of ČEZ also pointed out that lignite power plants and nuclear power plants are much more flexible than many people assumed in the past, and so can cope quite well with the intermittency caused by renewable energies.

Georg Dorfleutner of the Austrian company RAG Storage expressed the situation most clearly: "The hope for a golden age of gas in Europe has stopped in 2010."

Clearly this cannot be good news for European energy policy, which is aimed, among other things, at reducing emissions from coal-fired power, reducing dependency on imported and relatively dirty oil and improving diversity of supply sources.

Longer-term prospects

So what can be done? Fortunately, participants of the workshop in Riga saw plenty of reasons to be positive about the longer-term prospects of the gas market. Dorfleutner of RAG Storage noted that gas still has lots of things going for it. There is still plenty of demand for gas. The need for backup capacity will only become more urgent in the electricity sector, as "wind and solar power often produce in tandem and will not balance each other out". There is a lot of potential for new and innovative applications. And a lot can still be done to improve the market structure and make gas more competitive.

This last may be the most important thing to be done, certainly for policymakers. The experts in Riga noted that there is an urgent need for the remaining "bottlenecks" in the European gas market to be removed. "There are many cost-efficient measures that can help utilise gas for power production", Viduna said. He gave a number of examples: to increase the flexibility of the pipeline network, to allow efficient access to short-term capacity of pipelines and storages, to further improve congestion management, especially for short-term products, to support the interplay of gas and power markets, etcetera. Viduna also advised TSO's not to build new pipelines just for the purpose of serving power plants, as this would make gas only more costly. A better option, he said, is to build cost-effective, short cross-border interconnectors, to improve the flexibility of gas supply.

The role of gas storage

The participants at the workshop also discussed the role gas storage can play in helping to improve market functioning. Dorfleutner asked for "good connections between storage and supply" and showed himself worried that traders increasingly seem to ignore considerations of security of supply. They see flexibility and balancing more and more as "virtual products", he said, warning that "gas supplies are in the end always based on real infrastructure. The market reality is based on physical flows."

According to Dorfleutner, gas storage should not just be viewed as a market product, but also in terms of the security of supply it can deliver. "The TYNDP can play an important role here. It can highlight bottlenecks regarding storage deliverability. But you need to make the right assumptions in your network plan: demand is not the same as the need for capacity. We need better analysis of capacity needs."

Zbyněk Pokorný of RWE Gas Storage made a similar point. He noted that shippers more and more use spot gas rather than storage as a form of physical flexibility. "They see storage as an avoidable cost." This is all very well as long as supplies are ample. But if they become tight, he said, the situation can become very dangerous: "Even though I like the free market a lot, it might be necessary to implement measures to guarantee security of supply."

Pokorný noted that the Russians, who are continuing to invest in gas storages in EU countries, tend to look at storage much more from a strategic viewpoint. Simon Blakey of Eurogas concurred, explaining that the Russians are looking ahead a number of years, to a world dominated by hub pricing. "They will be in a position to influence the price then." This is why it is important, Blakey said, for policymakers, including TSO's and storage operators, to take an "integrated view" of the market. "The role of the TYNDP is incredibly important here."

New applications for gas

But most workshop participants agreed that perhaps the most promising way for the gas market to find its way back to growth (apart from an end to the economic crisis and – who knows – the advent of a new ice age) is to develop new applications for natural gas. It became abundantly clear during the workshop that there are a surprising number of opportunities for innovation in the gas market, which are mostly still in an early phase.

One potential new growth area for gas is to have excess power from renewables converted through electrolysis into hydrogen, which is then stored and used in the gas infrastructure. (This is called "power-to-gas" or "power2gas"). Dorfleutner noted that it is much more efficient to transport energy through gas pipelines than through the electricity network. Hence, power-to-gas has the potential of making the building of many power transmission lines and "supergrids" unnnecessary – an important consideration given the strong public resistance to the construction of new high-voltage transmission lines.

Gas in marine transport

Gas also has plenty of growth opportunities in transport applications. Tomas Aminoff of the Finnish "power solutions company" Wärtsilä demonstrated that there are great possibilities to expand the use of gas in marine engines. Wärtsilä has developed a complete portfolio of dual-use engines (that can use both gas and diesel) for naval vessels, offshore vessels, merchant vessels, cruise ships and ferries. It now has some 210 of these engines installed.

The use of gas instead of diesel leads to 25% lower CO2 emissions, 85% lower NOx emissions and 99% lower SOx emissions, said Aminoff. This is important because the areas covered by the so-called SECA protocol ("Sulphur Emission-Controlled Areas") continues to expand. At this moment, the Baltic Sea, the North Sea and the Californian coastal area are already covered by SECA controls, affecting some 14,000 individual ships.

Bunker consumption in the European SECA amounts to some 20 to 30 million m3 LNG (12.3 to 18.45 bcm of natural gas) a year, said Aminoff. Not a huge chunk of the gas market perhaps, but good for 130 to 200 LNG shipments. Aminoff noted that Wärtsilä's flagship project, the 2800 passenger Baltic cruise ferry Viking Grace, accounts for more than 1% of the total energy consumption used for traffic to and from Finland. And there is plenty of room for growth, as worldwide emission rules for ships are tightening.

Gas in road transport

Road transport presents an even bigger potential growth area for natural gas. Matthias Maedge of the NGVA (Natural and Biogas Vehicle Association) pointed out that the use of natural gas in cars leads to a significant reduction of CO2 emissions, an almost total reduction of NOx, a 50% reduction in noise levels and avoidance of particle emissions. It also leads to a reduction of dependence on oil of course – and it is cheaper and more abundantly available than oil.

Indeed, the advantages of using natural gas in cars and trucks are so great that analysts of Citigroup have predicted recently in a new report that oil demand may reach a plateau worldwide by the end of the decade as cars, trucks, railroad engines and power plants will increasingly rely on natural gas. In the US this shift is already under way and China too has ambitious targets in this area. Maedge noted that China now has 40,000 vehicles running on gas and plans to expand this number to 300,000 in 2015. The number of LNG filling stations will grow from 500 to 3,500 in the same period.

In Europe there are already 1.5 million natural gas vehicles on the road – three times as many as in 2003. Most of the growth has taken place in heavy transport rather than passenger cars. The main brake on the expansion of CNG and LNG powered passenger cars is the lack of available car models and filling stations, said Maedge, although on both fronts progress is being made. Car manufacturers are increasingly producing CNG models, which are superbly energy efficient ("it doesn't get any cleaner than that", noted Maedge). In addition, the European Commission published a proposal in January (the Clean Power for Transport Package) that, if adopted, will lead to a widespread European-wide rollout of CNG

and LNG filling stations by 2020 as well as LNG refuelling stations in all 139 maritime and inland ports in Europe.

LNG in small quantities

To make LNG available for road transport and (inland) marine transport, it has to be made available in small quantities. As Jacques Rottenberg of French LNG company Elengy, a subsidiary of GdF-Suez, noted, there is no lack of LNG import facilities in Europe at the moment. In the SECA region, only 5% of reception capacity is currently being used. The main challenge is to convert this LNG for use in ships and trucks.

This is precisely what the Rotterdam LNG Hub, a joint-venture of Gasunie and Vopak, is working on. It is expanding the existing LNG terminal in Rotterdam into an "extended LNG chain", explained Wim Groenendijk of Gasunie. This means LNG is put into tanks that are transported by road trailer to small satellite plants, where it is converted into gas, or it is reloaded onto smaller LNG carriers and used for bunkering. Groenendijk noted that LNG is not only favoured by stricter environmental regulations, but it is also a lot cheaper than gasoil: on average 60% over the last three years.

Rottenberg also pointed to the potential of LNG "reloading", in which ships rather than pipelines are used to transport LNG between European countries. This, he said, is "a genuine alternative to pipeline transportation, which helps to reduce investment risks by avoiding the need to build expensive pipelines that may be underutilised." The main reloading flows at the moment are taking place from Belgium to Spain and Portugal and from Spain to Italy and Greece.

Holistic approach

Some people may think that talking about new applications for gas may not be at the heart of what ENTSOG's work with the TYNDP is all about, but nothing could be further from the truth.

Andrea Ćirlićová, ENTSOG, Business Area Manager, System Development, noted that the TYNDP is an "evolving" and "dynamic" document. Infrastructure requirements have to be constantly reviewed in the light of market developments, including innovations. She said that what the market needs above all is a "holistic" or integrated approach to European energy policies. "Physical integration of markets will lead to market integration. And if you have the right market integration, you will hopefully have competition, innovation, security of supply and sustainability."

ENTSOG Board Member Harald Stindl likewise emphasized that the tasks of ENTSOG are not confined to "technical" issues. "We need to show the economic superiority of our product", he said. "Gas can transport much more energy than electricity. It is affordable, abundant and environmentally friendly. We have to convince consumers and policymakers of this. We have to show the way to new products and processes. We have to lead the way to a standardisation of the transportation of our product. That will improve its overall

attractiveness. This is the basic job of ENTSOG. To set the standard, to make the product better, to create the conditions for a truly integrated internal market."

ENTSOG's CBA methodology to assess Projects of Common Interest (PCI)

An important new element in gas infrastructure investment (and therefore the TYNDP) is the Regulation that establishes rules for designating certain projects as "Projects of Common Interest", which will enter into force in May 2013. Such projects are eligible for fast-track permitting procedures and may be able to obtain EU funding. As "Projects of Common Interest" (PCI) it will also be easier for them to attract external investors.

The question is by what criteria should projects be evaluated to get qualified as a PCI. To help policymakers in this decision-making process, ENTSOG will develop a Cost-benefit analysis (CBA) methodology to assess gas infrastructure projects. Adela Comanita of ENTSOG explained in Riga that enough mature projects will be subject to a project-specific CBA if they want to get designated as PCI. In addition, a project-specific CBA is required for requests for financial assistance and to make possible cross-border cost allocations.

The main elements of ENTSOG's CBA methodology are twofold: a methodology for an energy system wide analysis to be carried out by ENTSOG allowing for a holistic approach to the assessment of PCIs projects, and a complementary methodology for project-specific analysis applicable by the project promoters for their individual project. Such economic analysis reflects not just benefits and costs for the investors but also for society as a whole. This last is crucial of course. As Comanita noted, the CBA will not merely give a monetary view, it will also apply quantitative and qualitative assessment where monetisation of benefits is not possible. ENTSOG proposes to combine these assessments which seem to offer the most feasible and balanced approach. She acknowledged that such assessment and concepts like the "social discount rate" will nevertheless be challenging.

Catharina Sikow-Magny of the European Commission's Energy Department concurred, noting that assessments might go wrong if you approach them purely quantitatively. She added that the discussions the Commission was having in various regional groups are an essential part of the CPI process.

Sikow-Magny was optimistic about the effects the ENTSOG approach would have. "The TYNDP and the CBA methodology will change gas infrastructure planning in Europe dramatically", she said. "National operators will take the best elements of European planning into account. We will see a transition from regional and national to European planning."

She noted that the next TYNDP, which will come out in 2015, will be key to the next PCI identification process. For this reason she urged all stakeholders in the gas sector to make their views heard now, so that they could be taken into account in the writing of the next TYNDP. The ENTSOG people in Riga, however, were happy for now that the 2013 TYNDP is finished!

Baltic gas island

So what about Latvia itself, the host of the TYNDP workshop in Riga? How does it view its part in the evolving European gas market? Andra Ješinska, Head of the International Department at Latvijas Gāze, said the Baltic States are still in many ways a “gas island”. However, with the Inčukalns Underground Gas Storage (where Gazprom holds long-term capacity rights), Latvia has significant gas storage capacity that serves the entire Baltic region. In addition, under the EU’s BEMIP (Baltic Electricity Market Interconnection Plan), an upgrade of the Eastern Baltic natural gas network is being carried out.

Still, Ješinska said “further action and cooperation is needed to end the isolation of the Baltic States and secure gas supply diversification." The TYNDP, she said, can help with this by improving transparency and providing an integrated vision on the regional gas infrastructure development.