Designing a new world, better for consumers and simpler for producers

This is a short discussion paper, written in conjunction with (and as part of) a proposal for the work of reviewing the gas market design for Europe. It is the property of Sund Energy with Thierry Bros, and might be published on our websites as such.

The purpose of the article is to describe a possible vision of the future gas market in Europe and how a more integrated design could improve overall efficiency and welfare for the European Union. This and other submitted discussion papers will form a basis for the winning bidder to review as an early task in the study requested by the European Commission:

Quo vadis EU gas market regulatory framework – Study on a Gas Market Design for Europe

We attempt to describe a future vision for the European gas market, and how regulation could be adapted to achieve it. While current regulations have had a high focus on security of supply and competition, these issues are less problematic today. There are many routes of supply to Europe and competition has given lower prices to all countries. This could be a result of regulations alone, but probably also benefit from a general oversupply of natural gas globally, renegotiating old long term contracts, and an overcapacity in import facilities. Most gas is now priced at or near hub prices (with sellers covering transportation), and the price differences between countries have fallen due to sufficient transportation being available, and the lack of congestion. The next challenge will be cost coverage of internal infrastructure (interconnectors, reversible pipelines and storage) that, if used less efficiently, could lead to less welfare to European users. Lower demand has been a deliberate policy of the Commission, to reduce climate emissions and import dependency, and may now contribute to higher infrastructure costs.

A single EU zone with a single wholesale price…

Starting point of our 2020 hypothesis

- UK out but impacting (on the supply/demand, on the transport to Ireland, on shale...) UK regas could be in competition with French and Belgium terminals
- EU is 27 Member Countries
- TTF has established itself as the most liquid hub in Europe in 2015. Even with Dutch domestic production declining we assume TTF to be the central hub in EU. ICIS tradability index provides 20/20 for TTF in 2016 and we assume this stays the same until 2020.
- Flat demand at 375 bcm vs 2015 (402,1-68,3 = 373,8 bcm)
- Gas supplier sourcing price: 21€/MWh max @ TTF as oversupply and reduction in demand (efficiency) have pushed prices down
- Ukraine as a transit country with around 30 bcm/y
- Most gas sold spot in Europe[1] (c. 75%)
- Declining domestic production
- No gross welfare losses in 2020 (vs €4.5bn estimated in 2015 by ACER[2]) as all interconnections/reverse flows have been built to achieve this (in line with past decrease of gross welfare losses
- The US is a net exporter (LNG capacity is around 70mtpa) with some of its LNG berthing in Europe

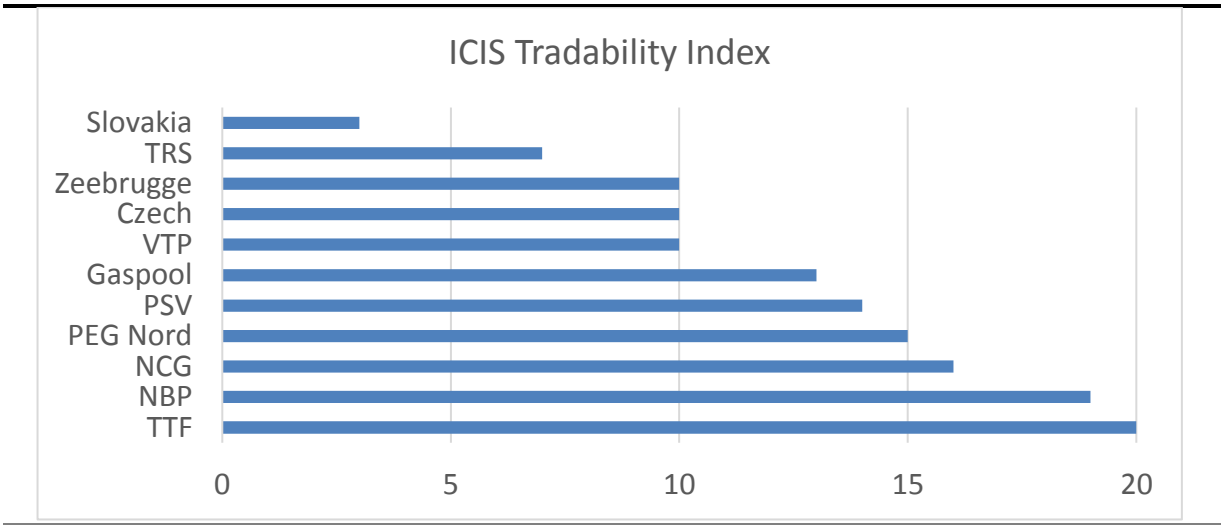
[1] According to IGU wholesale gas price survey 2016 edition, there has been a broadly continuous move from oil indexation (OPE) to gas-on-gas competition (GOG) since 2005, with GOG's share increasing from 15% in 2005 – when OPE was 78% – to 64% in 2015 – when OPE had declined to 30%.

[2] ACER annual report on the results of monitoring the internal gas markets in 2015. The welfare losses have decreased by 60% between 2012 and 2015.

- Russia stays the biggest gas exporter and the only one with spare capacity
- Reduced take-or-pay contracts that were making it more difficult in the past for the importers to use the interconnector capacity to get more competition, allowing extra competition in our 2020-2030 period. Reduced long term contracted capacity means that price for booking capacity could go up if regulation is not changed.
- China has contracted enough gas via LNG and pipe (Myanmar, Turkmenistan, Russia). This diversification strategy starts to pay with China renegotiating its long-term contract to get better (cheaper) deals.
- Following China, all other Asian countries are starting to ask for better terms (reduced oil-indexation, no destination clause)
- Turkey may evolve to provide for some liquidity for the SEE markets
- LNG becomes a fungible market, hence should be viewed like oil by policy makers (in fact LNG has proven more flexible/resilient than oil already in 2011 after the Fukushima disaster with 7% of the global supply rerouted to Japan).
- Renewable energy continues to increase its share in the EU mix to meet the 2030 Energy Roadmap.

As one of the goals at the EU is "reduction (or elimination) of price differences across the continent that are due simply to competitors being able to exercise market power in certain geographic regions", 2020 could be the best timing to implement a single EU zone and to charge producers for entering the single zone and consumers for burning gas (exit). If this is not implemented the price differences could re-emerge once long term capacity contracts are expiring, as the booking fee could go up (at least on a flow basis). TTF becomes the de facto the trading reference. It increases its liquidity as all trades are done there.

ICIS Tradability index (out of a max of 20) for major European hubs (H1 16)



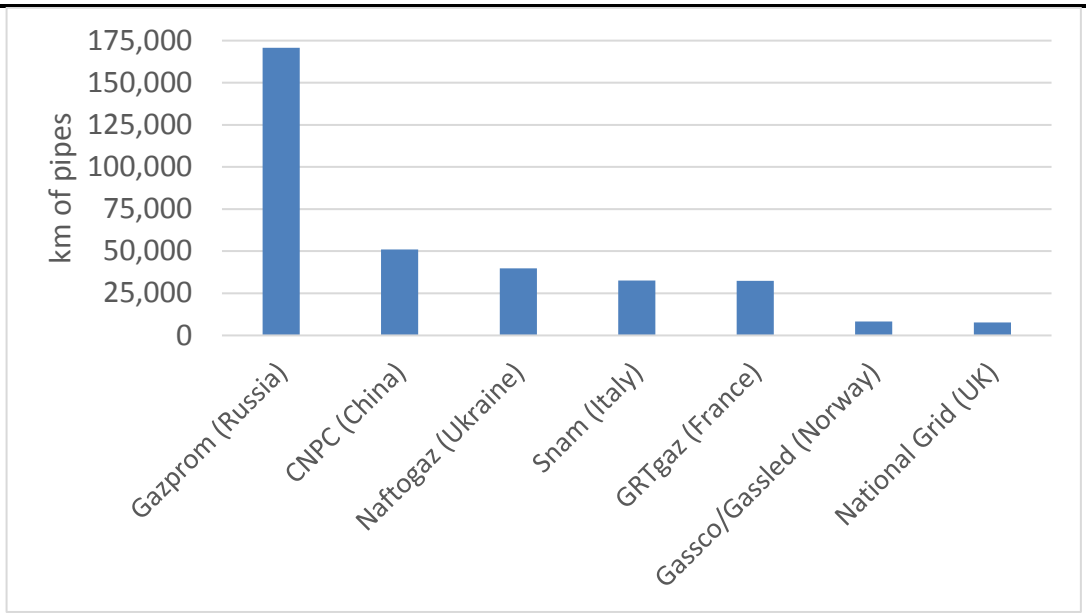
Source: ICIS, thierrybros.com

And as transport inside the single zone is "free" there is no place having a discount or a premium. This drastic change in vision will also allow resetting the Regulated Asset Base (RAB) of each player and the total remuneration of all transport companies in Europe[3]. This will, as usual, be

[3] The charge network users' tariffs at system entry and exit points forms the basis of transmission system operator revenue since 2016 and this continues in our model but with a single EU zone (excluding non-connected islands/countries) the entry points are at the EU border.

resisted by transport companies[4] unless one is smart enough to become the EU pipe company (by buying all the others)[5] or by applying a Norwegian Gassco/Gassled solution[6].

Major transportation companies



Source: Companies, thierrybros.com

Europe to keep wholesale gas prices in check needs to have the best regulatory regime as it competes for the commodity vs China that has implemented its diversification bargaining strategy. Cost of international transport / transit also means that the spread between Europe and the US or the spread between Europe and Russia is likely to stay positive.

The demand will be depending on market and regulatory factors, of which the competitiveness of gas relative to other fuels will be a key driver. The "wrong" regulation could end up in less gas demand, increasing de facto the gas price (at least due to the unused infrastructure if allowed by regulation as it is now) and or higher price of gas on the wholesale market.

So we need to look on how to remunerate the pipe companies[7] keeping Europe attractive for producers and gas for consumers? We therefore look at the next 10 years (2020-2030) and see what need to be done theoretically to maximise the EU welfare for this period taking 2 opposite assumptions:

- EU sees itself *vulnerable* to Security of Supply: **"SoS Vulnerability"**
  - Demand decreases at around 1%pa to reach 340bcm
  - Dependency on Gazprom increases with the perceived risk of SoS
  - Tighter LNG markets (no FID taken in 2015-2020 or continued growth in Asia)

[4] The EU obligation has created effectively unbundled transmission system operators.
[5] This should not be a problem as transport is de facto a monopoly but this should be taken into account in the regulation as this EU wide transport company could be powerful.
[6] With effect from 1 January 2003, virtually all of Norway's offshore gas transport systems were integrated in a major new joint venture called Gassled while as operator, Gassco is responsible for safe and efficient gas transport from the Norwegian continental shelf to Europe.
[7] Regas terminal could be viewed as entry door to the single EU market but as regas can also act as storage we start the entry fee after the regas terminal in our case. For underground storage there will also be an entry/exit fee.

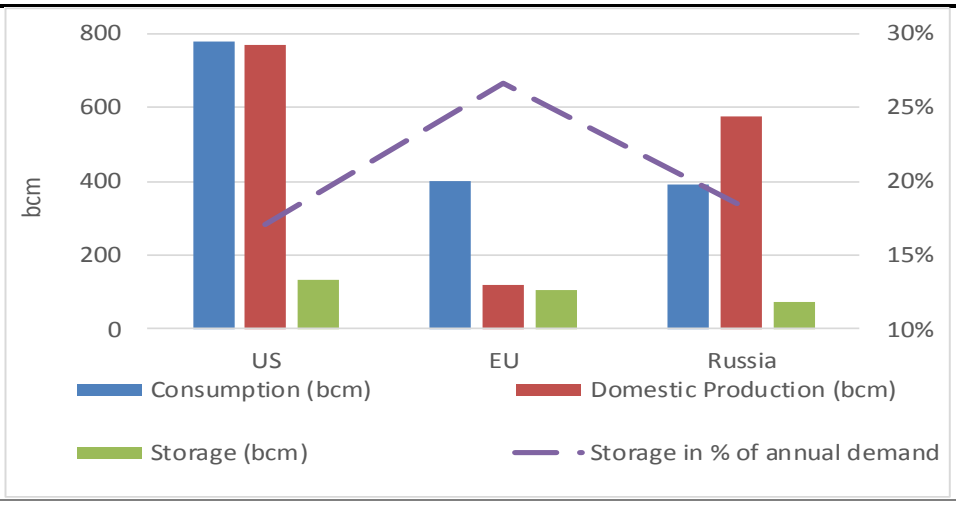
- Reduction in Norwegian and Russian capacity as both countries avoid investing in a declining industry
- No domestic and UK shale gas
- To manage this perceived vulnerability, further extra infrastructure is built in Europe with prices to stay at the same level as in 2020
- The Southern Gas Corridor is facing technical/political/security issues and doesn't operate as expected. The 10bcm/y from Shah Deniz 2 do not materialize in Europe.
- What happened in Ukraine (reverse flow), Lithuania (new regas) could be viewed as the route ahead increasing both SoS and competition

- EU *doesn't* see itself vulnerable to Security of Supply: **"Commoditisation"**
  - Competition inside Russia; Novatek and Rosneft allowed to use spare Gazprom transport capacity
  - Dependency on Russia increases but dependency on Gazprom is reduced
  - Russian gas becomes like Russian oil; perceived SoS risk is reduced
  - LNG markets to stay balanced (either thanks to FID taken in 2015-2020 or due to less demand growth in Asia)
  - Gas becomes a real commodity market as the oil. Fungibility allows market players to access gas when needed
  - Shale gas production starts in the UK and EU follows later
  - The Southern Gas Corridor operates as expected with 10bcm/y from Shah Deniz 2 delivered to Europe. It is scaled up to accommodate potential additional gas supplies.
  - In a peak demand world, all producers prefer to monetize their gas reserves as fast as possible, rather than risking leaving it in the ground (stranded). If gas can be extracted in a competitive way, East Med gas can appear as an EU supplier
  - More diversified and less concentrated markets (on a company basis) allow market participants to strike a more cost-effective balance among supply options. Prices go down by 3€/MWh to 18€/MWh
  - Lower prices (and higher CO2 prices) displace coal in the power generation and allow demand to grow by 65bcm to 400 bcm (from 2020 or 100 bcm from the scenario "SoS Vulnerability" and still lower than the maximum registered in 2005 and 2010 (405 bcm))
  - No new pipelines are built

We assume, in both cases, that the 2030 Framework for climate and energy, including EU-wide targets and policy objectives for 2030[8] are achieved. We have also assumed that with 107 bcm storage capacity in 2015 (and 32 bcm in Ukraine), EU is already long in storage and doesn't need to build any more.

[8] 40% cut in greenhouse gas emissions compared to 1990 levels, at least a 27% share of renewable energy consumption and at least 27% energy savings compared with the business-as-usual scenario.

Consumption, domestic production and storage in 3 major gas markets



Source: BP Statistical Review, Gazprom, Cedigaz, thierrybros.com

We have left regas terminals outside our design as there is already enough regas capacity[9] in Europe and we concentrate on the remuneration of pipeline operator(s). In a single zone, it does not matter where LNG enters the system. The LNG supplier will therefor select the least costly regas terminal taking into account his shipping cost. This means that less new regas needs to be built as we can operate the actual ones with a higher load factor[10]. Our design will allow regas terminals to compete by providing the cheapest prices to their user. And with a potential load factor increase, the unit fee could go down.

… with an entry fee that needs to compete vs the UK one…

For both cases, we assume that EU single zone, maintains a no gross welfare loss. To then see what "wrong" regulation can cost, we assume that each scenario leads to the opposite consequences. The risk of mistake is then calculated as either too much infrastructure stranded that needs to be remunerated or too little infrastructure allowing all suppliers to achieve a higher price. To maximize its welfare, EU should change the regulation to only build infrastructure going ahead when this can guarantee putting additional pressure on all suppliers. The total remuneration of pipes should be fine-tuned by the EU to incentivize only new relevant infrastructure and to force decommissioning of old/useless infrastructure. One way could be for infrastructure players that want to build something new to demonstrate the benefit via a Cost Benefit Analysis as this is done today. But this is likely to end with a powerful transport company pushing for increased (stranded) assets as they have a vested interest in increasing their RAB to improve their revenues/profit and to delay any decommissioning. To avoid this a simple way is to set the remuneration of transport players linked to volume effectively sold and put into storage in 2020 (weather corrected) and a fine system in case of congestion (as this will impede the EU gas market). As the total remuneration is going to be set by the regulator and lower than actual remuneration, pipe companies will have to decommission useless infrastructure (to reduce their RAB) while maintaining spare capacity in the system (to avoid fines). Furthermore, some depreciation will need to be done as the system is getting older and less used.

We then split the cost of the pipe infrastructure into an entry and an exit fee. The entry fee will have to be cheap enough to incentivize all suppliers to provide gas. This also put all suppliers on the same level playing field as they will receive for their gas the hub price – entry fee[11]. The

[9] The average load factor of EU regas was 24% in 2015 vs a worldwide net load factor of 32% (GIIGNL).

[10] The actual regas capacity in EU 27 (excl. UK) is 152 bcm, ie 38% of the total demand of our bullish scenario for gas demand in 2030 if operating at 100% load factor.

[11] For pipe gas. For LNG, there is the added cost of using the regas terminal.

competition will be more global. As the UK will be out of the EU, the EU entry fee will be higher (bigger market more liquid less volatility) but the entry fee needs to be in the same range as the UK one. Also the remuneration will have to be competitive vs Gassco/Gassled tariffs. The idea behind is to have a competitive entry fee to allow suppliers to enter the EU market… to compete and keep prices as low as possible.

… and two exit fees to differentiate customers needing SoS (premium) and others

Taking into account the full picture (supply/demand/renewable, SoS), our study will then look at the 2030-2040 period with 2 further options:

- Energy storage is not achieved at an acceptable cost and gas stays the only flexible solution.
- Energy storage becomes a reality and gas consumption starts its final decline, leaving more and more stranded (and hence costly) infrastructure.

To achieve the best regulation taking into account SoS, we believe the exit tariff should be set in a way where clients needing SoS pay a premium vs one not bothered. Again the exit fee must be competitive to allow consumers to select gas vs other fuels.

Early findings

Our preliminary work indicates (to be further developed in the complete study) that:

- Once EU gross welfare loss is reduced to close to zero in 2020, EU should take the option to move to a single EU zone with (entry and exit tariffs). The case of Ireland and Greece will have to be looked differently. Hence by construction the gross welfare loss is 0 for the next period and solidarity is simple and straight forward: all wholesale buyers pay the same price.
- Competition is enhanced with all producers able to access a liquid market with a single entry fee[12] that will have to be competitive.
- SoS will be paid by a premium on the exit tariff for customers needing SoS.
- The remuneration of pipes players will be revised and done on a collective level at the entry and exit levels. Pipe companies will collect global revenues at the entry and exit points and redistribute their respective share to their counterparts in different locations (unless a single transportation company emerges).
- For the period 2020-2040, the EU needs to implement a remuneration system for pipe operators with the aim to reduce to the minimum the risk of mistake. The total remuneration of pipe should be fine tuned by the EU to incentivize only new relevant infrastructure that can guarantee putting additional pressure on all suppliers and to force decommissioning of old/useless infrastructure. The entry and exit fees should in no way go up above inflation during the 2020-2040 period.
- The pipe industry will have an incentive to allow gas companies to sell more gas to Europe (the higher the demand, the higher the revenues) and to avoid congestions / fines.
- Amortized useless infrastructure will have to be decommissioned to avoid customers being overcharged and gas to be taken too fast out of the EU energy mix.
- Depreciation of infrastructure will have to take into account market value in a world where gas demand could be reduced.
- The fees will have to be competitive vs storage fees as swing in production/imports competes directly vs storage. This competition between storage and entry should lead to the decommissioning of the less used assets.

Our design is simple and easy to grasp for both suppliers and consumers. It could be resisted by transportation companies that will need to adapt but it makes much more sense to have a EU wide transportation company (that could also be highly viewed by the financial markets) than numerous regulated companies that try to maximize their respective profits and have a history of discriminatory access and poor interoperability of their respective networks. The general EU gas welfare interest is far above the sum of the respective transportation companies. With no welfare

[12] If there is a political will/request, biogas could get a discounted entry fee but for simplicity we recommend having the same entry fee.

losses and reduced long term contracted capacity materializing in 2020, it is now the perfect timing to reset the remuneration of European pipe operators.

The study will look, as requested, on the maximisation of the EU welfare at the wholesale level but the EU should also take care of the maximisation at the final customer level (on top of our exit fees are taxes).

The Sund Energy team has experts from both the EU and the Norwegian sides is well positioned to deliver this analysis to maximize overall EU welfare and to provide key recommended changes looking at the past EU and Norwegian examples.

The work will be conducted in cooperation with Correggio Consulting, with long experience in both developing of hubs/trading and assisting in unbundling of companies for better compliance with EU regulations. Having a diverse team with long experience should be advantage to the Commission in its strategic choice of next steps, at this “tipping point” for gas.