Natural gas market integration in the Danube Region

Background paper

Contribution of the Danube Region to the debate on the Energy Union

Draft Final

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Key messages

- The Danube Region is a significant beneficiary of a more integrated European gas market and is fully supporting further integration efforts.
- The PCI process is key for the Danube Region. The Region is ready to support the revision of the PCI list as in 2012-13 to arrive at the necessary level of regional interconnectivity at least cost (the PCI list can be slightly reduced).
- Infrastructure upgrade and source diversification has already been effective to demolish the market power of the dominant supplier in several cases (CZ, SK, HU and UA are outstanding examples from the Region).
- The regulatory scrutiny suggested by the Energy Union on transparency and access to pipeline capacities is key.
- Transmission tariff harmonisation would lessen regulatory barriers to trade across the Region and is key for market integration.
- Better regional interconnectivity provides for an effective spill-over of global LNG price changes towards landlocked countries in the Region. Therefore the development of an EU-level LNG policy, proposed by the Energy Union, is supported by the Danube Region.

1. Introduction and background

The Energy Union strategy[1] has five mutually-reinforcing and closely interrelated dimensions designed to bring greater energy security, sustainability and competitiveness. REKK has been commissioned by the Danube Region Strategy to address 3 dimensions:

- Energy security, solidarity and trust;

- A fully integrated European energy market;

- Decarbonising the economy

for the Second Stakeholder Seminar of the Priority Area 2 "To encourage more sustainable energy" of the EU Strategy for the Danube Region “Towards the European Energy Union” to be held in Brussels, 19-20 May 2015.

This paper addresses the “Fully integrated European energy market” dimension. The analysis and related recommendations are based on the economic modelling of the market integration effects of the following measures in the DR:

- Enabling reverse flow on existing pipelines
- Better interconnectivity through implementing PCIs
- More LNG flow to Europe.

[1] COM (2015) 80 final 25.2.2015 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions and the European Investment Bank: A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy

Modelling simulations has been carried out by the European Gas Market Model of REKK. Our underlying assumption is that the more efficient use of existing infrastructure, improved interconnectivity and increased supply source diversity are the key drivers for market integration and to support trading natural gas towards markets with a higher gas wholesale price. As we will see, however, regulatory obstacles might hinder the efficient utilization of the "hardware" for market integration.

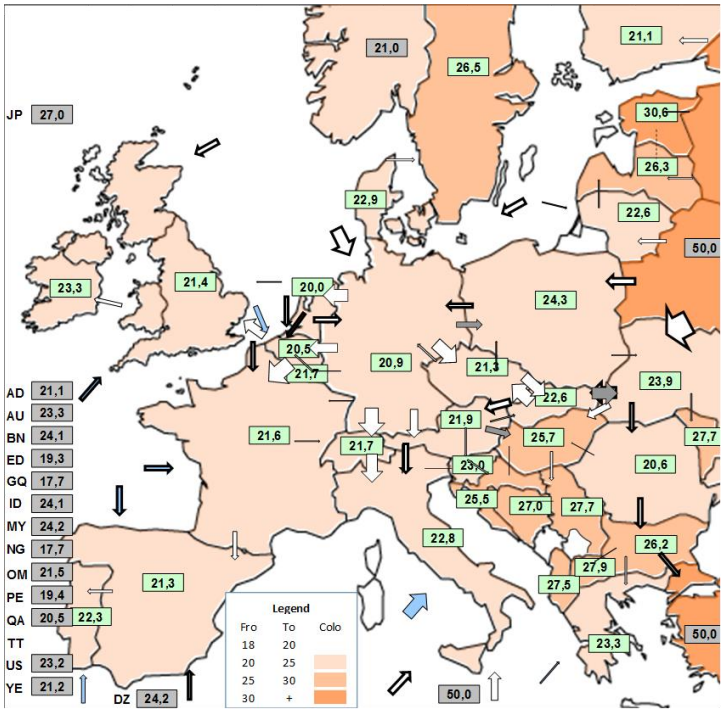
2. Modelling today's natural gas wholesale market in Europe

We start by setting a reference case (market equilibrium) for the analysis that is based on 2015 demand, supply, infrastructure and contractual conditions. Equilibrium annual average gas wholesale prices and trade flows are depicted on Figure 1. The most important characteristics of the reference case are as follows.

- The average price of the Danube Region (24.2 €/MWh) is slightly more expensive than the rest of Europe (23.8 €/MWh).
- However, there are still significant price differences within the region. The countries more interconnected with Western Europe and hence to more liquid wholesale markets perform better (Germany, Czech Republic Slovakia)[2]. Seven countries are above EU average while six below under average. The price difference between the cheapest (RO) and the most expensive (SB) markets is 7.1 €/MWh.
- The physical congestion on HAG (between Austria and Hungary) still prevents Hungary and the Balkan region to trade on Western European hubs, and also the dominance of one single supplier is reflected in higher prices.
- The gap between Western and Eastern prices is however closing, mainly due to the fact that today Eastern Europe is better interconnected with Western Europe than a few years ago and increased competition on wholesale markets strengthens the bargaining position of countries towards outside suppliers. Hence many Russian contracts in the region have been renegotiated in the last few years.
- Ukraine benefits from the new reverse flow deliveries through Slovakia (in the modelling it is also fully utilized), while Romania is less dependent on external sources, thanks to the domestic production that can supply almost fully the decreasing Romanian demand.

[2] For the modelled reference country prices see Table 1 below.

Figure 1 2015 Reference scenario: wholesale natural gas prices (€/MWh) in normal scenario (without HU-SK and PL-LNG)



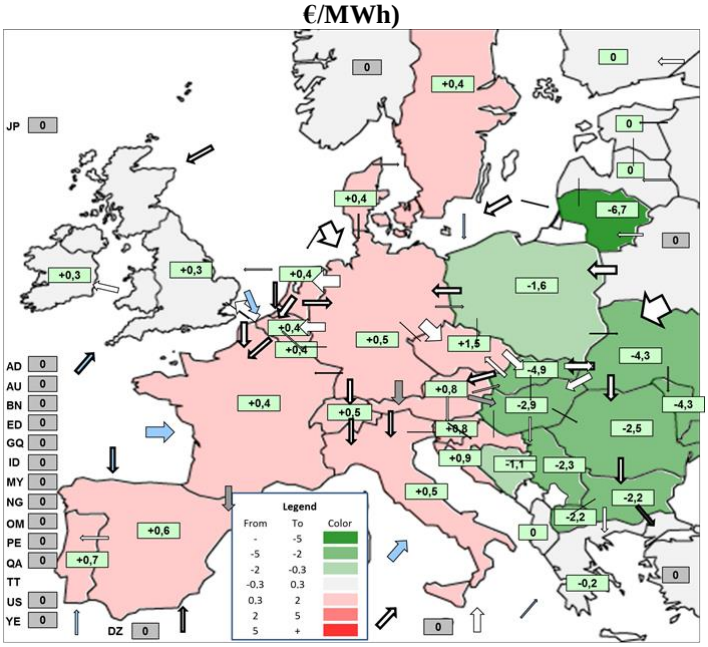
The green boxes depict the modelled yearly average wholesale gas prices as of 2014-15. The colouring of the countries indicates the price level.

3. Physical reverse flow and new interconnector projects are key

Work on infrastructure projects has accelerated in recent years. New infrastructures and new reverse flow possibilities on the existing pipelines implemented since 2009 have contributed to the resilience of the European gas system to supply shocks and at the same time have improved regional market integration. Figure 2 illustrates the price integration effect of the new infrastructure built since 2009. The green boxes indicate the modelled yearly wholesale price change compared to the prices that would have been experienced without infrastructure upgrade since 2009[3]. The green countries – including the majority of the Danube Region countries - experienced a natural gas wholesale price decrease and the gap between prices in Western and Eastern Europe decreased.

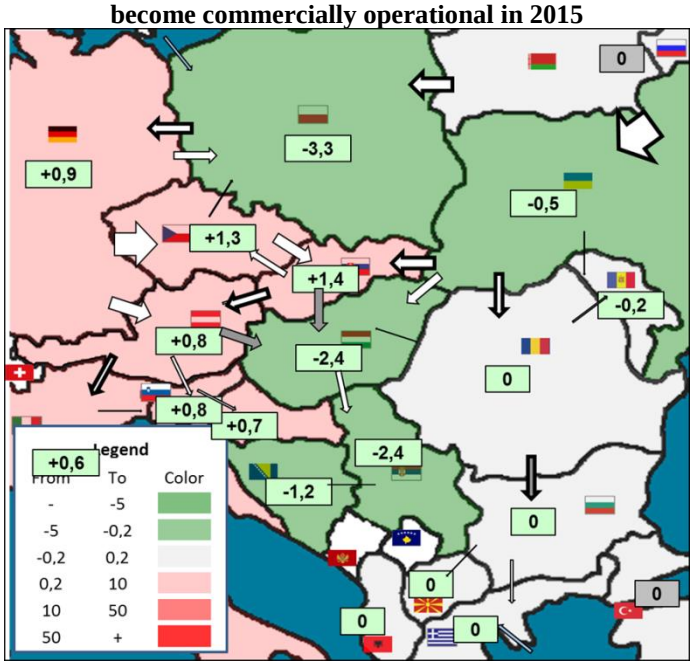
[3] On this map all input data (consumption, domestic production, LTCs volume and price) except for infrastructure reflect the 2014 conditions.

Figure 2: Price effect of infrastructure built since 2009 (difference to 2015 without new infrastructure €/MWh)



When infrastructure projects under construction (HU-SK interconnector and LNG in Poland) become operational, this gap will further close. Poland is expected to benefit from increased spot LNG flows, while all other countries, coloured green on Figure 3will benefit from the better interconnectivity to the more liquid Western European market. Important to note that improved interconnectivity will imply a slight price increase in Western Europe, the Czech Republic, Slovakia and to a lesser extent also to Germany, Austria and Slovenia. This is clearly a reflection of European solidarity.

Figure 3 Price integration effect of new infrastructure under construction (HU-SK and PL-LNG) to become commercially operational in 2015

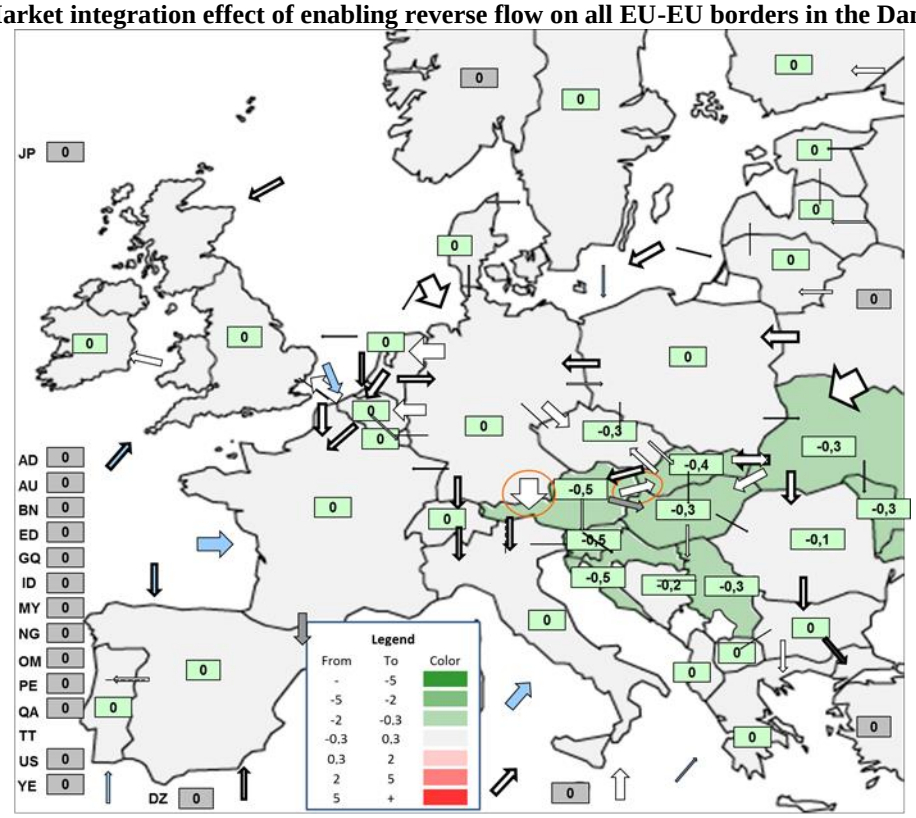


4. Market integration effect of enabling further reverse flows

Reverse flow on existing pipelines is the cheapest way to interconnect markets. The gas supply security regulation has obliged physical reverse flow on all EU – EU borders. Physical reverse flow capacities are intended to serve security of supply purposes in crisis situation but flows into new directions also change the gas trading landscape under normal market conditions. In some cases changing market circumstances can fully turn a pipeline's main flow direction (see the example of Czech pipelines).

The next simulation looked at the potential market integration effect of allowing full (100% of the main direction) physical reverse flow on all EU-EU pipelines in the Danube Region. As Figure 4 illustrates, the effect is not breath-taking. The simulation suggests that the implementation of the DE-AT and AT-SK full reverse flows are the most important from a market integration point of view. The rest of additional reverse flow capacity would not be utilized under short term and business as usual conditions according to the modelling results.

Figure 4: Market integration effect of enabling reverse flow on all EU-EU borders in the Danube Region



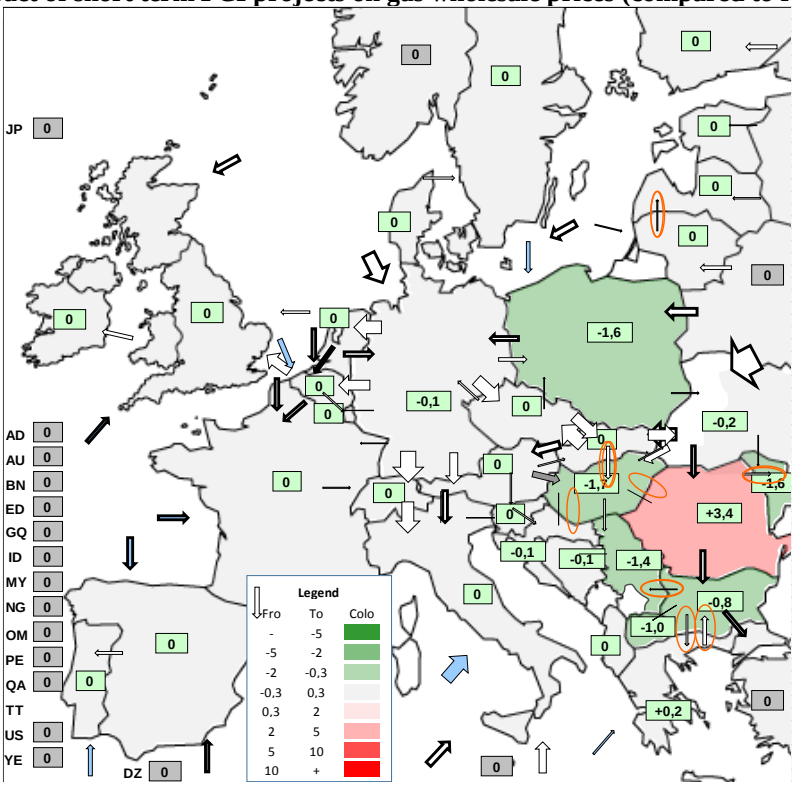
Short term PCI projects[4] as defined by the European Energy Security Strategy would provide the Danube Region moderate price benefits under normal conditions (-0.2 €/MWh or -0.5%; see Figure 5) The reason for that is that by the short term projects no new additional source

[4] See annex

would be connected to the Region. The RO-MV interconnector ends the isolation of Moldova and at the same time increases the Romanian wholesale gas prices. There is however no further flow from Romania: the reverse flow to Hungary is not used because of exceptionally high regulated tariffs on the Romanian exit. The Trans Balkan pipeline cannot be used for spot trade, so flow from Romania to Bulgaria is prohibited. The reverse flow from HU to HR has no use without the Croatian LNG.

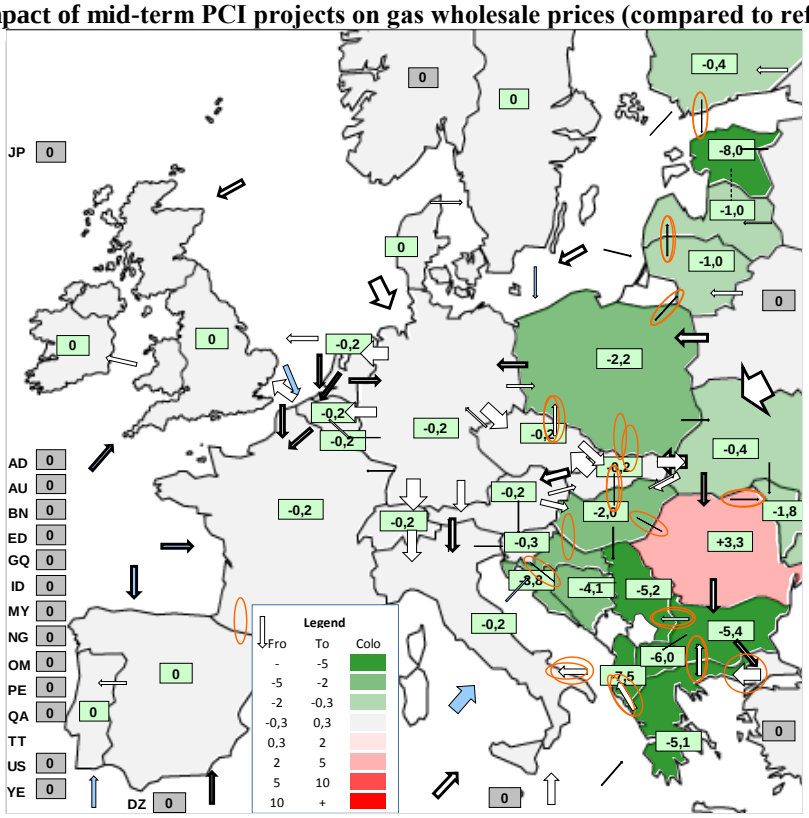
Implementing all the mid-term projects[5] would decrease the Danube Region's yearly average wholesale gas price by 1.2% (-0.5 €/MWh). Bulgaria and Serbia are the main beneficiaries in DR (above 5 €/MWh price decrease). The infrastructures not utilized at all are the SK-PL and HU-SI interconnectors. The HR-HU is still not in use because of high regulated tariffs. New sources, namely Croatian LNG combined with Azeri gas through TAP bring significant benefit to the whole region. The regulatory condition established for the TAP third party access exemption was to provide backhaul transactions. Without backhaul trade the benefits of the new Azeri gas would not target the Balkan, but rather Western Europe.

Figure 5: The impact of short term PCI projects on gas wholesale prices (compared to reference, €/MWh)



[5] See annex

Figure 6: The impact of mid-term PCI projects on gas wholesale prices (compared to reference, €/MWh)



The implementation of the key 33 infrastructure projects defined by the European Energy Security Strategy would bring a 6.8% price decrease to Europe and about the same magnitude to the Danube region. The only country in the Danube Region experiencing a price increase would be Romania. However it must be noted that at the same time producer benefit in Romania would increase accordingly (see Table 1).

Table 1: Summary of modelling results on price change due to the implementation of the short term and mid-term PCI projects

Market	Reference	Short-term	Mid-term	Price change due to short-term PCI projects (€/MWh)	Price change due to mid-term PCI projects (€/MWh)	Price change due to short-term PCI projects (%)	Price change due to mid-term PCI projects (%)
AT	21.9	21.9	21.7	-0.03	-0.22	-0.1%	-1.0%
BA	27.0	26.9	23.0	-0.13	-4.07	-0.5%	-15.1%
BG	26.2	25.4	20.8	-0.76	-5.35	-2.9%	-20.5%
CZ	21.3	21.2	21.1	-0.04	-0.22	-0.2%	-1.0%
DE	20.9	20.9	20.7	-0.07	-0.24	-0.3%	-1.1%
HR	25.5	25.3	21.6	-0.15	-3.81	-0.6%	-15.0%
HU	25.7	24.0	23.7	-1.71	-2.03	-6.6%	-7.9%
MV	27.7	26.1	25.9	-1.62	-1.79	-5.8%	-6.5%
RO	20.6	24.0	23.9	3.43	3.25	16.6%	15.8%
SB	27.7	26.3	22.5	-1.44	-5.20	-5.2%	-18.7%
SI	23.0	23.0	22.8	-0.04	-0.26	-0.2%	-1.1%
SK	22.6	22.6	22.4	-0.04	-0.22	-0.2%	-1.0%
UA	23.9	23.7	23.5	-0.22	-0.40	-0.9%	-1.7%
DR average	**24.2**	**24.0**	**22.6**	**-0.22**	**-1.58**	**-0.9%**	**-6.5%**
Whole Europe	**23.7**	**23.6**	**22.1**	**-0.10**	**-1.60**	**-0.4%**	**-6.8%**

5. The effect of LNG flows to Europe

Increased LNG supply to Europe is the single most important source diversification option for the internal gas market. However, the rest of DR countries are either land-locked or missing LNG regasification assets. In the followings we analyse how LNG flows to Europe change assuming different Asian LNG prices and in particular, how better interconnectivity might help importing LNG price impacts into this more remote region. Figure 7 illustrates the price effect of a 5 € decrease in Japanese LNG prices. It can be seen that a 5 €/MWh decrease in Asian LNG prices might result in a 2-3 €/MWh drop in wholesale gas prices in the Danube Region.

Figure 7 The impact of decreasing Japanese LNG price on EU gas wholesale prices (left hand side: 35€/MWh, right hand side: 30€/MWh LNG price in Asia)

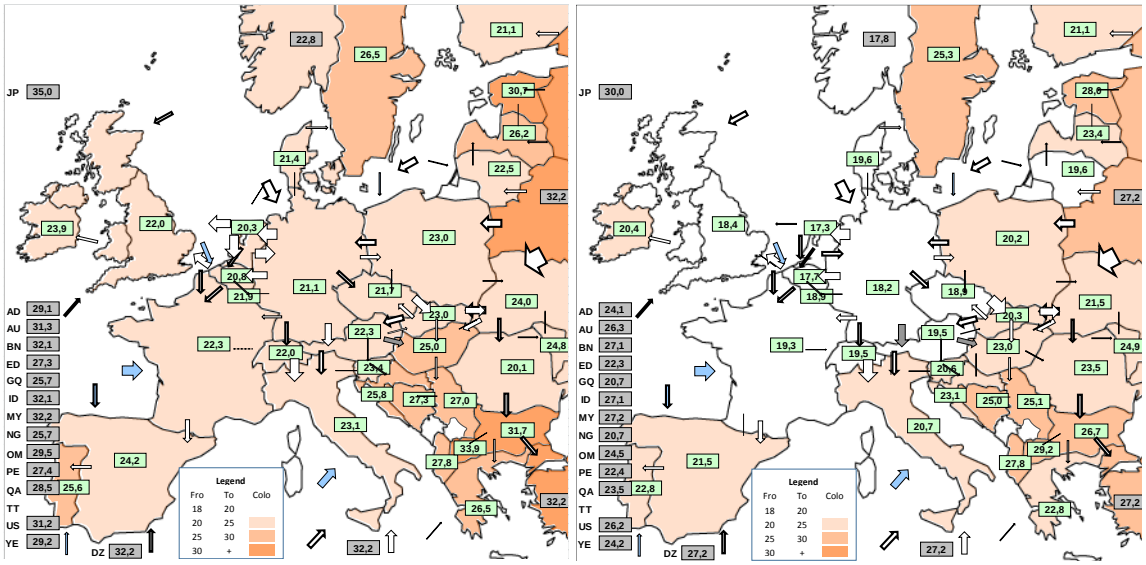
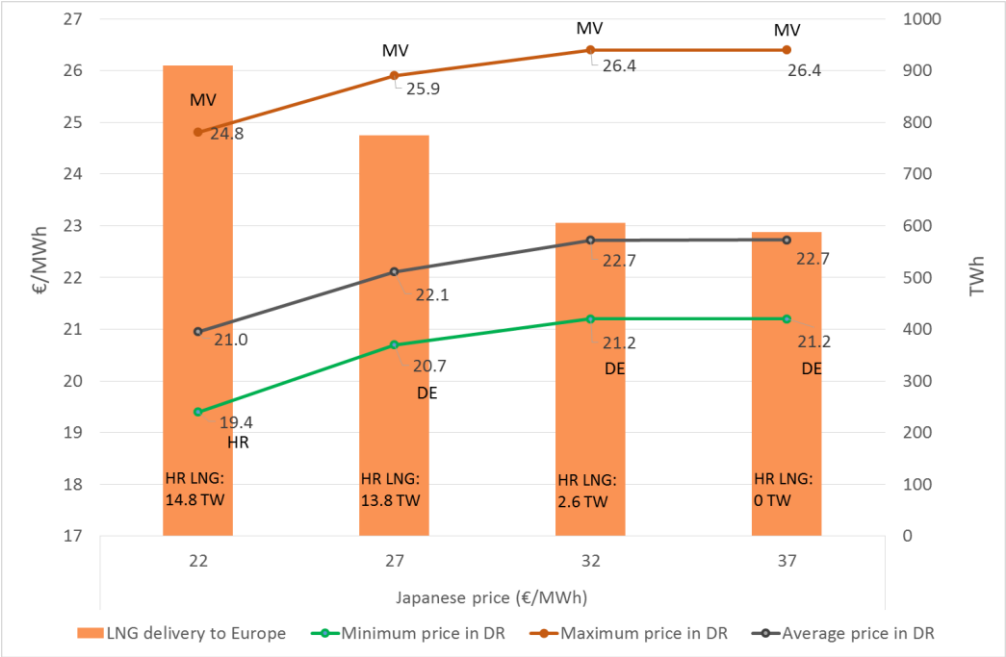


Figure 8 illustrates the effect of decreasing Japanese LNG price on the LNG delivery to Europe and the according wholesale prices in the Danube Region. For this analysis we assume short- and mid-term PCI projects are implemented.

Figure 8 Effect of decreasing Japanese LNG price on the LNG delivery to Europe and the wholesale prices in DR



The most important lesson from Figure 8 is that LNG delivery to Europe increases as the Japanese price decreases. However the increase becomes significant when the Asian LNG price falls below 30 €/MWh. LNG starts to flow to the HR terminal on spot basis when the Japanese price gets below 33 €/MWh. A further 5 €/MWh decrease of Japanese LNG price (from 32 €/MWh to 27 €/MWh) results in 11.2 TWh increase in spot LNG flow to Croatia.

Wholesale prices in the Danube Region start to decrease significantly when the Japanese LNG price falls below 32 €/MWh. Moldova is the most expensive DR country in all scenarios. While at higher Japanese prices Germany is the cheapest, the price in Croatia falls below Germany's price at lower Asian price levels due to the increased LNG flow.

ANNEX I. Short-term selected gas PCI projects

A	Short-term projects (2014 – 2016)			
#	Name of project	Details	Capacity	Finished by
Baltic gas market				
1	LT: LNG vessel	Vessel (not a PCI). Status: operational since Oct 2014	50 GWh/day	End 2014
2	Klaipėda-Kiemėna pipeline upgrade together with LT-TV upgrade	Capacity enhancement of the connection from Klaipėda to the LT-LV interconnector. Status: EIA and engineering design	57,4 GWh/day	2020
Gas optionality in Central and South-East Europe				
1	PL: LNG terminal	Terminal in Swinoujscie and connecting pipeline (not a PCI due to maturity). Status: under construction	150 GWh/day	End 2014
2	EL-BG interconnector	New interconnector to support diversification and deliver Shah Deniz gas in Bulgaria. Status: permitting, EIA (2 years delay)	134 GWh/day	2016
4	BG: storage upgrade	Increase storage capacity in Chiren; Status: pre-feasibility	up to 5,78 TWh/year mobil gas capacity	2017
5	HU-HR reverse flow	Reverse flow enabling gas flows from Croatia to Hungary. Status: feasibility studies.	76 GWh/day	2015
6	HU-RO reverse flow	Project to enable gas flows from Romania to Hungary. Status: feasibility studies	127 GWh/day	2016
7	BG-RS interconnector	New interconnector supporting SoS in Bulgaria and Serbia. Status: EIA, routing, financing (issued with Srbijagas unbundling to access finance)	80 GWh/day	2016
8	SK–HU interconnecter	New bi-directional pipeline. Status: construction	SK-HU: 126,8 HU-SK: 50,75 GWh/day	2015
9	RO-MV interconnector	Under construction (in delay)	30 GWh/day	2016

ANNEX II. Mid-term selected gas PCI projects

B	Medium-term projects	(2017 – 2020)		
#	Name of project	Details		Finished by
Baltic gas market				
1	PL-LT interconnector	New bi-directional pipeline (GIPL) ending isolation of the Baltic States. Status: feasibility/FEED	PL-LT: 73,4 GWh/day LT-PL:30,6 GWh/day	2019
2	FI-EE interconnector	New bi-directional offshore pipeline ("Balticconnector"). Status: pre-feasibility/permitting	80 GWh/day	2019
3	Baltic LNG terminal	New LNG terminal with location to be decided (EE/FI). Status: pre-feasibility, permitting	FI: 133 GWh/day	2017
Enabling gas from Spain to flow north				
1	ES-FR "Midcat" interconnector	New interconnection (including compressor) to enable bi-directional flows[1] between France and Spain. Status: feasibility study	ES-FR: 230 GWh/day	tbd
Cluster Gas optionality in Central and South-East Europe				
1	PL-CZ interconnector	New bi-directional pipeline between Czech Republic and Poland. Status: Feasibility/FEED, permitting (CZ)	153,2 GWh/day	2019
2	PL-SK interconnector[2]	New bi-directional pipeline between Slovakia and Poland. Status: final investment decision in 2014	PL-SK: 143,9 GWh/day, SK-PL: 174,5 GWh/day	2019
4	TANAP (TR-EL)	Trans-Anatolian Natural Gas Pipe bringing Caspian gas to the EU via Turkey and opening the Southern Gas Corridor. Status: feasibility/final investment decision	TR-GR: 348 GWh/day	2019
5	TAP (EL-AL-IT)	Intra-EU section of the Southern Gas Corridor. Direct connection to TANAP. Status:	526,01 GWh/day (20 bcm/year)	2019

		permitting		
6	IAP (AL-ME-HR)	New interconnector part of the Balkan Gas Ring and connected to TAP. Status: feasibility/FEED	HR-AL:30, HR-BiH: 30, HR-ME:15 GWh/day	2020
7	HR – LNG terminal	New LNG terminal in Krk supporting SoS and diversification in the Region. Status: feasibility/FEED (financing issues)	170 GWh/day (6,5 bcm/year)	2019
11	EL: Alexandroupolis LNG terminal	New LNG terminal in Northern Greece. Status: permitting	455 GWh/day	2016[3]
12	EL: Aegean LNG terminal	New LNG floating terminal at Bay of Kavala. Status: feasibility/FEED, permitting	155 GWh/day	2016[4]