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TRENDS IN NATURAL GAS PRICING MODELS SEGMENTATION IN EUROPE AND REPUBLIC OF CROATIA

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- Changes in the structure of the share of individual gas price models at the wholesale level in Europe
- Natural gas price models in relation to the development of a liberalized natural gas market in the Republic of Croatia
- Conclusion

Natural gas pricing models

Fixed price

The fixed price is unchanged for the entire duration of the contract

$$P_n = P_{fix}$$

P_n – natural gas price in the month „n”

The price of gas is related to the price of crude oil or a basket of petroleum products

Oil Price Escalation formula

The price of gas is related to the price of petroleum products > *example of possible price formula*

Typical gas-to-oil formulas:

9.0.3 = the price is determined on the first day of each quarter for the next quarter based on the 9-month average of the oil / petroleum products prices from the previous period

3.0.1 = the price is determined on the first day of each month for the current month based on a 3-month average of the prices of oil / petroleum products from the previous period

$$P_n = P_0 \times \left(A \times \frac{G}{G_0} + B \times \frac{F}{F_0} \right)$$

G – average of gasoil prices

F – average of fuel oil prices

$A + B = 1,0$

G_0, F_0 – the initial gasoil and fuel oil price values

P_0 – basic (reference) natural gas price

The price of gas is related to the price of gas on the natural gas exchange

Gas-On-Gas Competition

Gas price related to the price of gas on the natural gas exchange (gas hub)

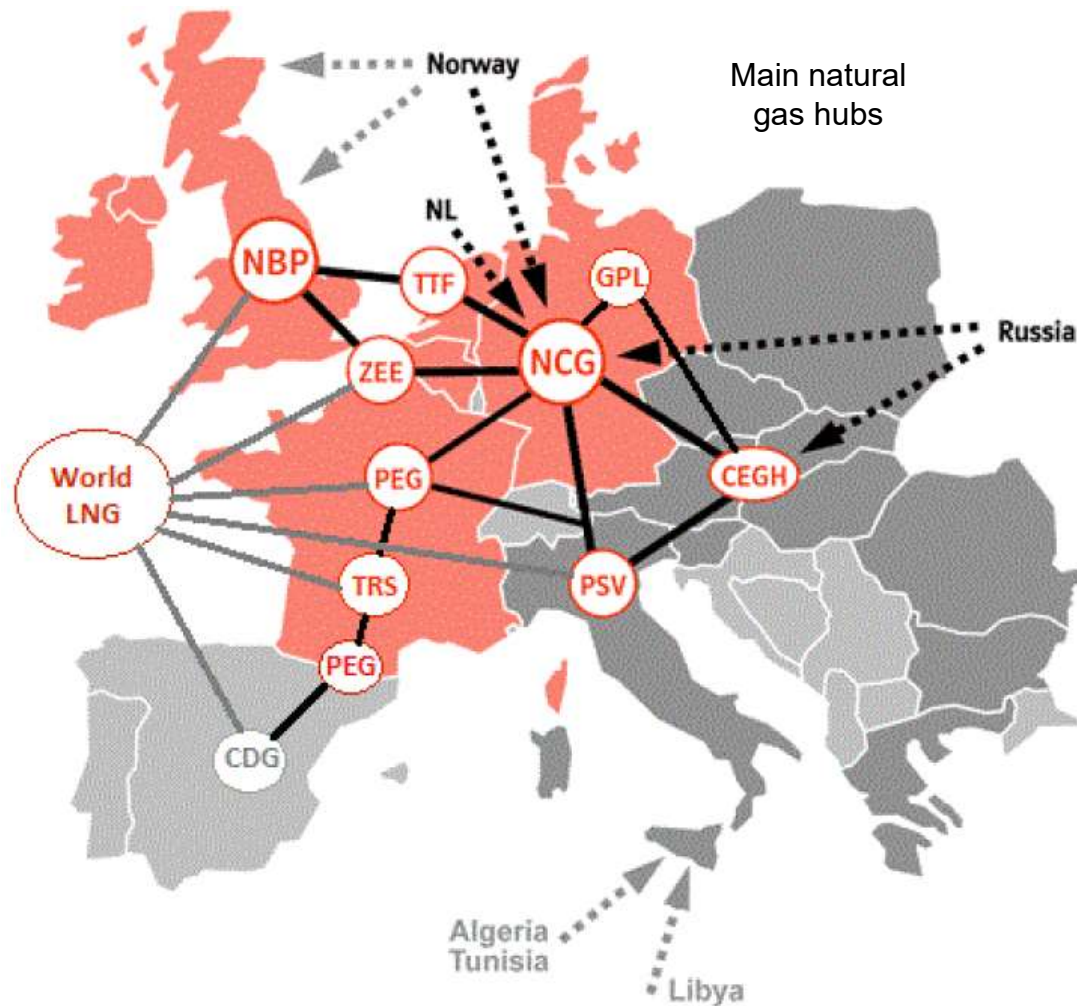
$$P_n = P_{CEGH} + Spread$$

$$P_n = P_{TTF} + Spread \quad \dots$$

CEGH, TTF... - gas prices from the associated gas hub

Spread = other costs + margin

Natural gas hubs in Europe



Source: Buslig, Z.S. (2018)
 Study on future EU plans for gas supply to the Central and Eastern Europe Region, with focus on Gas price formation

P – Physical gas hub
 V – Virtual gas hub

NBP – National Balancing Point (V)
 PEG - Point d'Echange de Gaz (V)

GPL – Gaspool (V)
 ZEE - Zeebrugge (F)

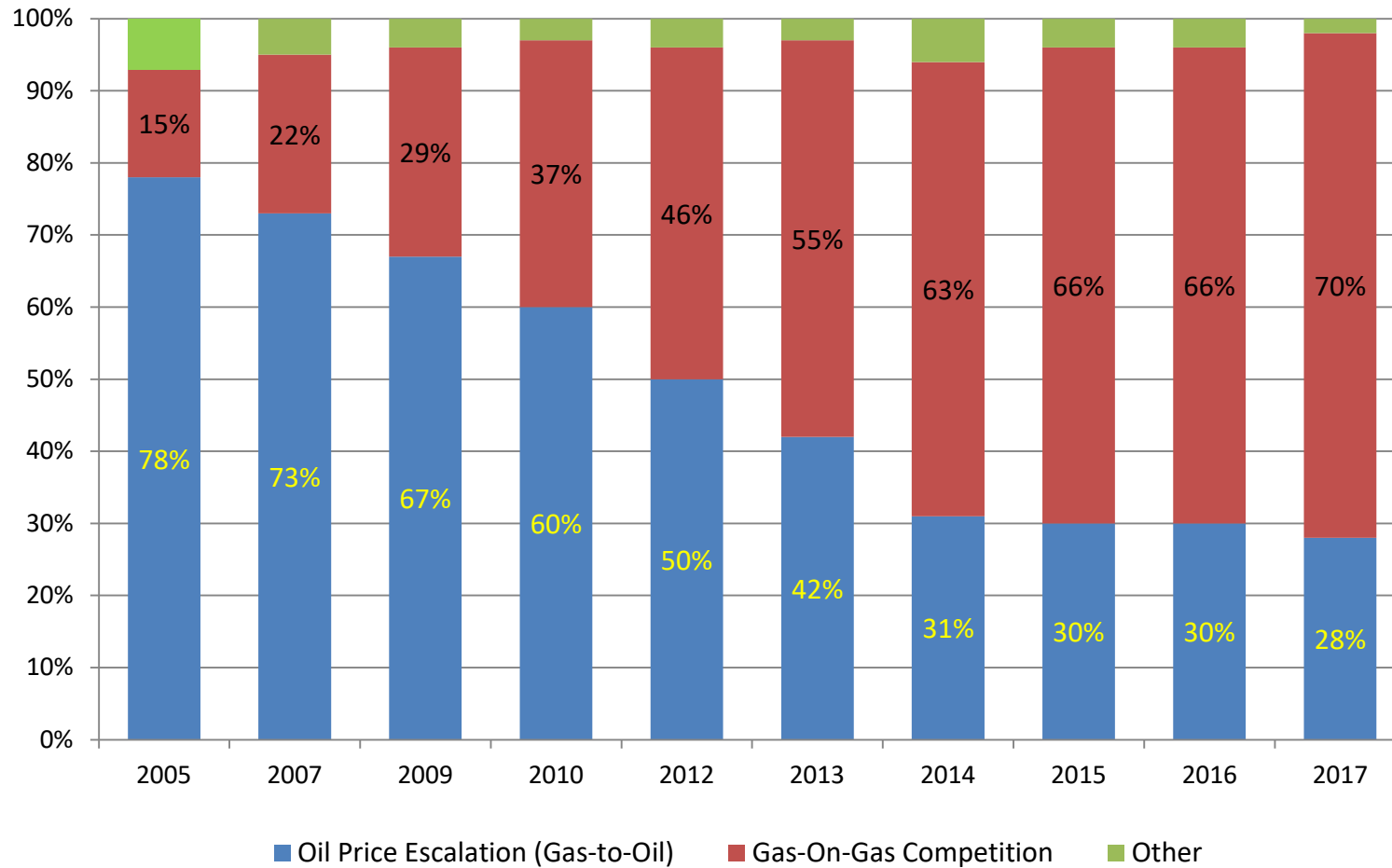
TRS – Trading Region South (V)
 CDG - Centro de Gravedad (V)

TTF - Title Transfer Facility (V)
 NCG - Net Connect Germany (V)

PSV - Punto di Scambio Virtuale (V)
 CEGH – Central European Gas Hub (V)

Structure of the share of individual gas price models at the wholesale level in Europe

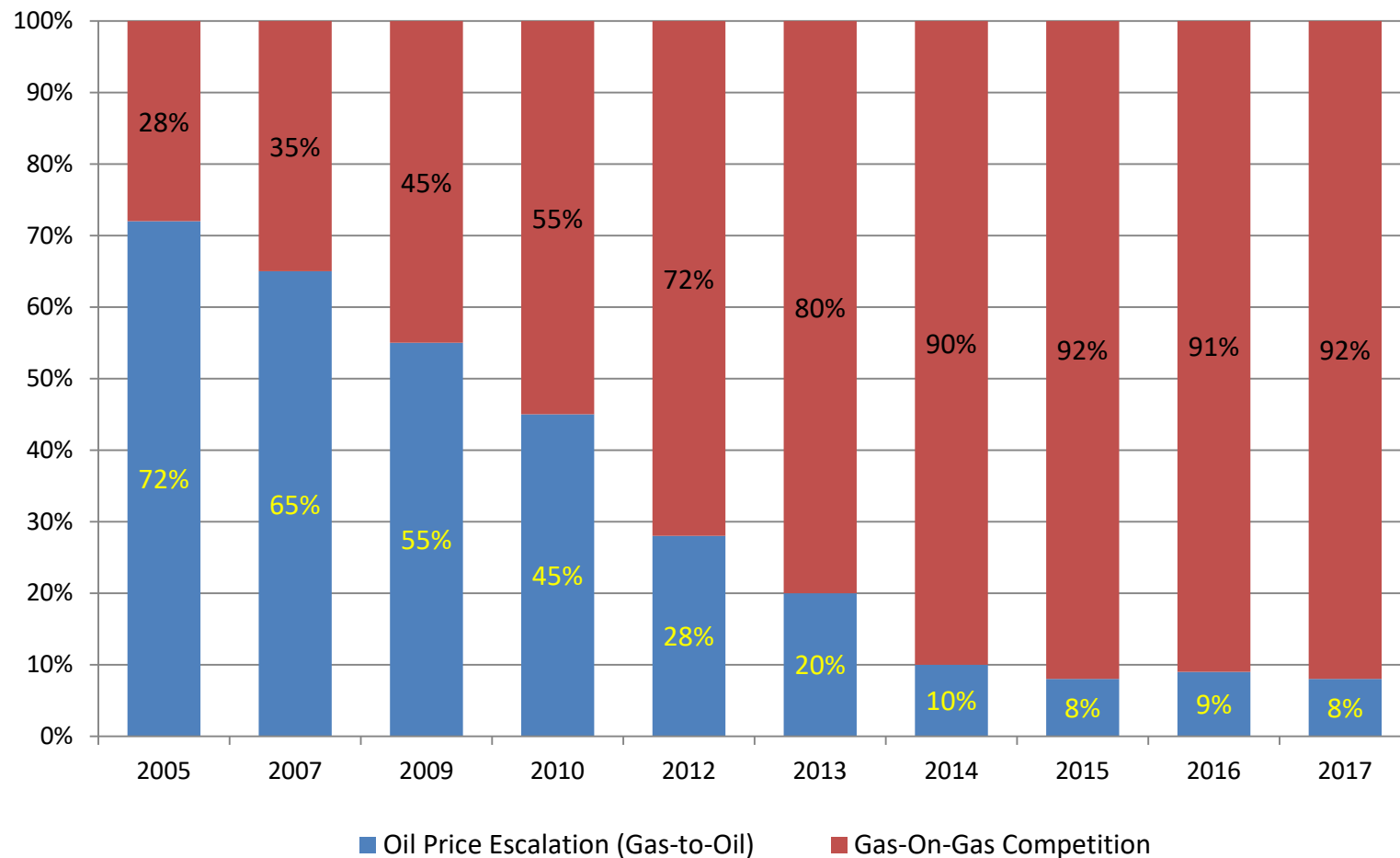
Price models in Europe in the period 2005 - 2017



Source: International Gas Union (2018). WHOLESAL GAS PRICE SURVEY 2018 EDITION - A GLOBAL REVIEW OF PRICE FORMATION MECHANISMS 2005 TO 2017: WORLD GAS CONFERENCE 2018 EDITION

Structure of the share of individual gas price models at the wholesale level in Europe

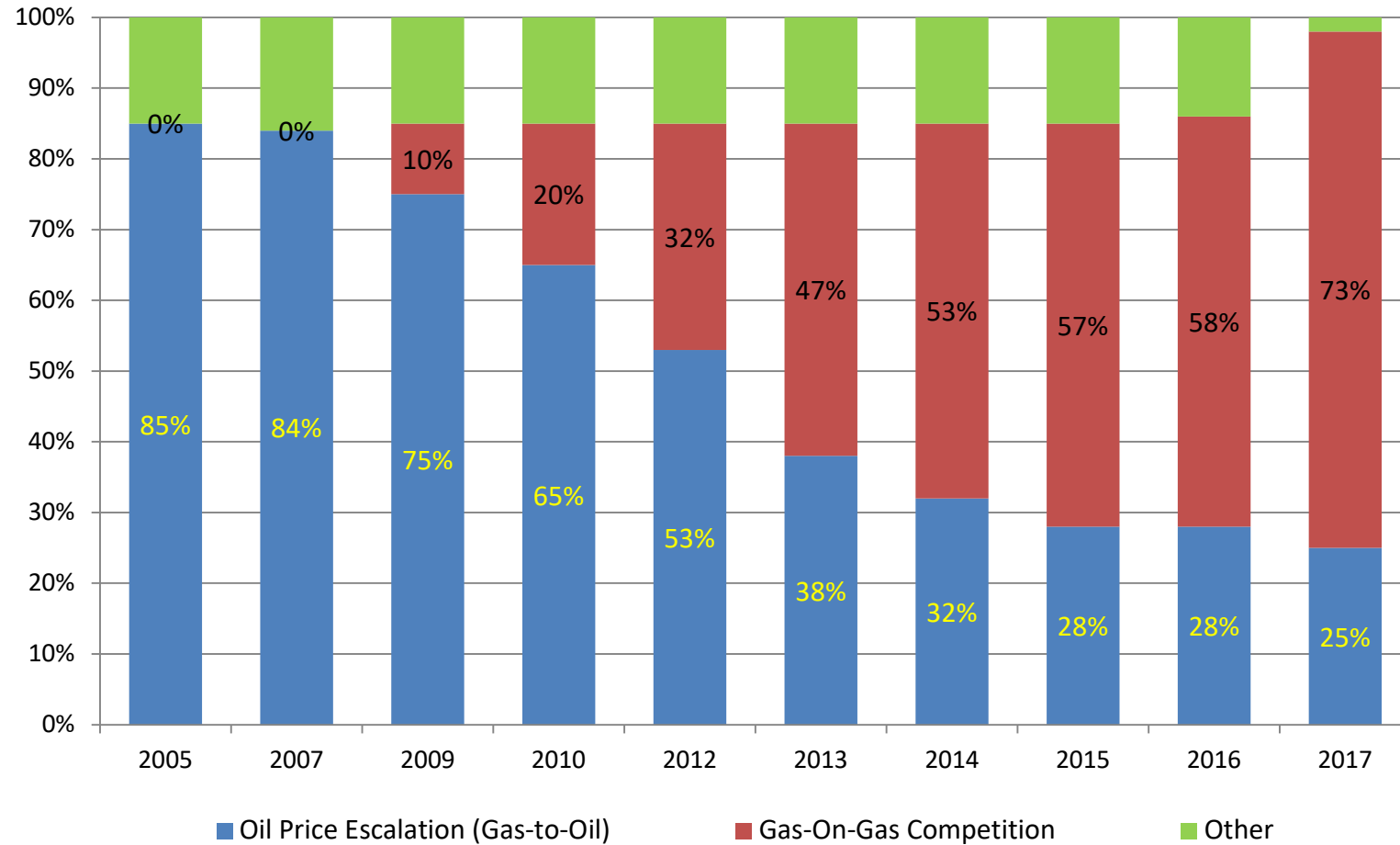
Price models in North-West Europe in the period 2005 - 2017



Source: International Gas Union (2018). WHOLESAL GAS PRICE SURVEY 2018 EDITION - A GLOBAL REVIEW OF PRICE FORMATION MECHANISMS 2005 TO 2017: WORLD GAS CONFERENCE 2018 EDITION

Structure of the share of individual gas price models at the wholesale level in Europe

Price models in Central Europe in the period 2005 - 2017



Source: International Gas Union (2018). WHOLESAL GAS PRICE SURVEY 2018 EDITION - A GLOBAL REVIEW OF PRICE FORMATION MECHANISMS 2005 TO 2017: WORLD GAS CONFERENCE 2018 EDITION

Natural gas system in Republic of Croatia

Existing supply routes to the Republic of Croatia



- Gas hubs – Austria and Hungary
- Underground gas storages – Austria and Hungary
- Underground gas storage - Croatia

Map source: PPD



Source: HSUP

bcm	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Proven reserves	29,2	31,1	35,9	28,2	26,6	30,4	30,1	40,9	36,4	34,5	31,6	24,0	24,2	21,4	17,9	14,9	13,2	10,3
Domestic production*	1,7	2,0	2,1	2,2	2,2	2,3	2,7	2,9	2,7	2,7	2,7	2,5	2,0	1,9	1,7	1,8	1,6	1,5
Import	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,2	1,0	1,0	0,9	1,4	1,3	1,1	1,1	1,3	1,8
Total consumption	2,7	2,8	2,9	2,9	3,0	2,9	2,9	3,3	3,2	2,9	3,2	3,1	3,0	2,8	2,4	2,5	2,6	3,0
Share of import (%)	41%	38%	37%	39%	35%	39%	39%	32%	38%	35%	31%	31%	46%	46%	46%	42%	48%	60%

Source: EIHP, HSUP

* Part of domestic production exported to Italy based on Production Sharing Agreement

Croatian natural gas transport system development (incl. Interconnections)



2006

Source: HERA, Annual report 2006



2016

Source: HERA, Annual report 2016

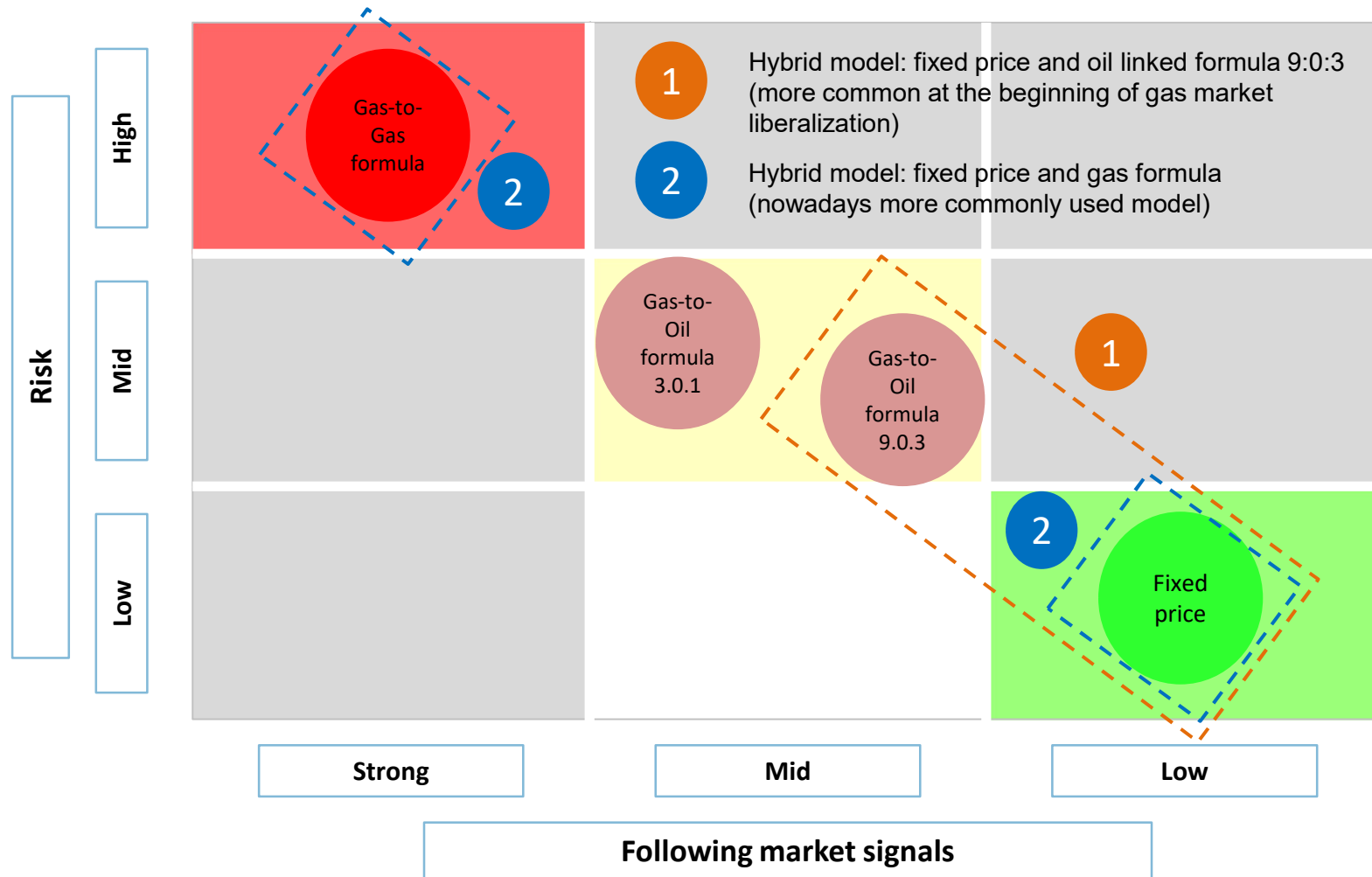
Natural gas price models in relation to the development of a liberalized natural gas market in the Republic of Croatia

- Real market opening started in 2012 (suppliers switching in non-households sector)
- Conservative price models preferred and requested (low response to market signals)
- Fixed price with volume flexibility as preferred model (simpler tendering, contracting and budget planning)
- Increasing liquidity of (surrounding) European gas hubs and increasing number of suppliers on the liberalized gas market in Croatia:
 - Strengthening influence of global market price signals
 - Reaction of customers on the price drop (on surrounding gas hubs) during winter season in gas year 2015 - 2016
 - Fixed price losing image of „low risk product”
- Customer's dilemma: When and how to contract the natural gas?

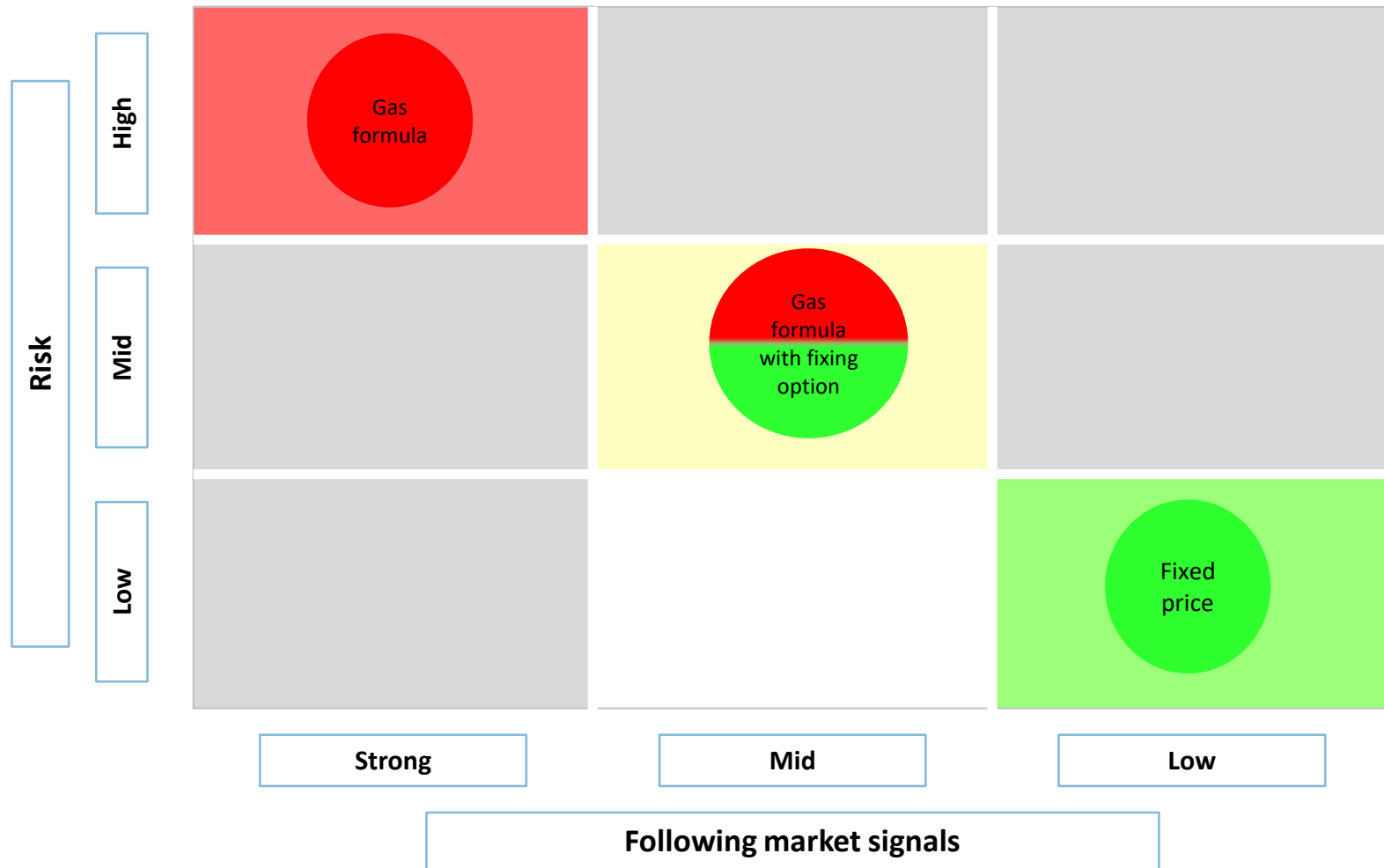
Day-ahead price (CEGHIX) at Central European Gas Hub



Natural gas price models in relation to the development of a liberalized natural gas market in the Republic of Croatia



Natural gas price models in relation to the development of a liberalized natural gas market in the Republic of Croatia



CONCLUSIONS

- With increasing liquidity of gas hubs in Europe, the share of price models based on gas-to-gas competition in Europe is growing significantly becoming the prevailing model
- The initial period of liberalization of the gas market in the Republic of Croatia is marked by the demand for conservative pricing models not strongly reflecting global market trends and movements
- Further development of liberalized gas market in Croatia brought increasing number of suppliers and growing influence of market prices and price signals from the relevant gas hubs (CEGH, TTF ...)
- When and how to contract the natural gas becomes increasing dilemma for suppliers and large end-customers
- Despite the fact that fixed price is still most popular model, models common in Europe are now also spreading in Croatia (gas formula solely or in combination with fixed price)
- Model brought to Croatia several years ago mainly by foreign multinational companies (gas formula with fixing option) is now further penetrating to the market as it provides to gas customers possibility to actively manage their natural gas costs portfolios.

**THANK YOU VERY MUCH
FOR YOUR ATTENTION!**



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