Energiewirtschaftliches Institut an der Universität zu Köln

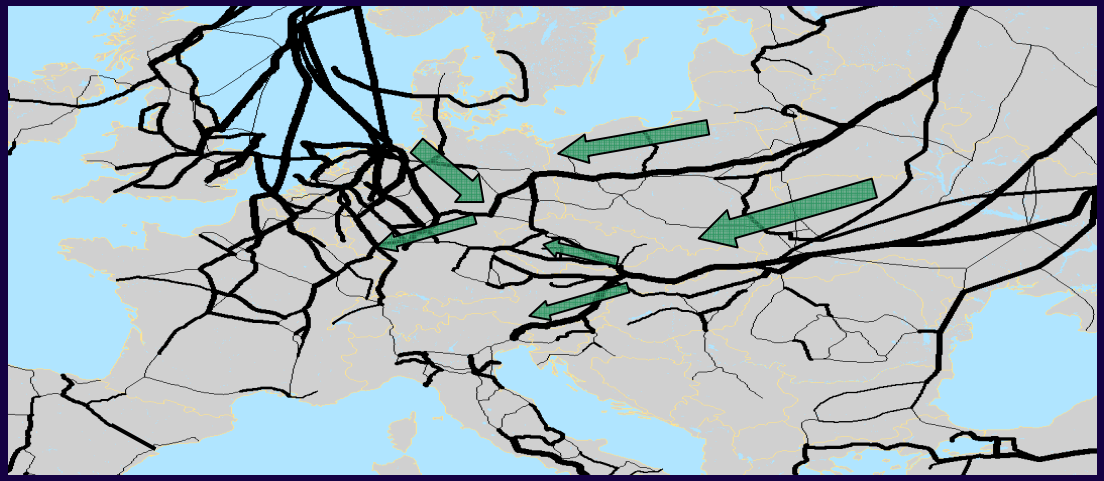
Analysis of the January Gas Crisis & Implications for Security of Gas Supply Regulations

Prof. Dr. Marc Oliver Bettzüge

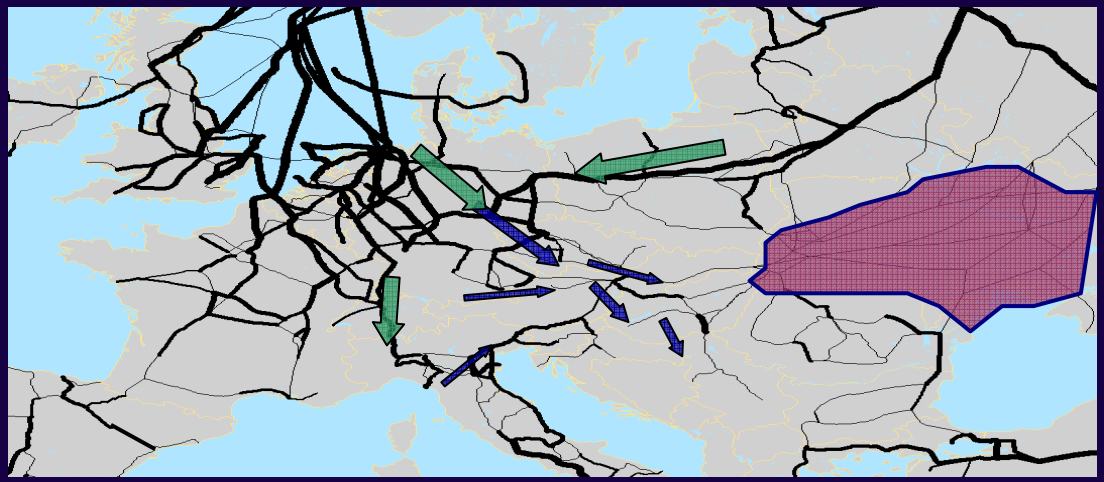
Mini-Public Hearing on Security of Gas Supply
European Parliament - Brussels, 9th November

The Russian-Ukrainian gas conflict

Benchmark Scenario – A normal winter day



Crisis Scenario – January 2009

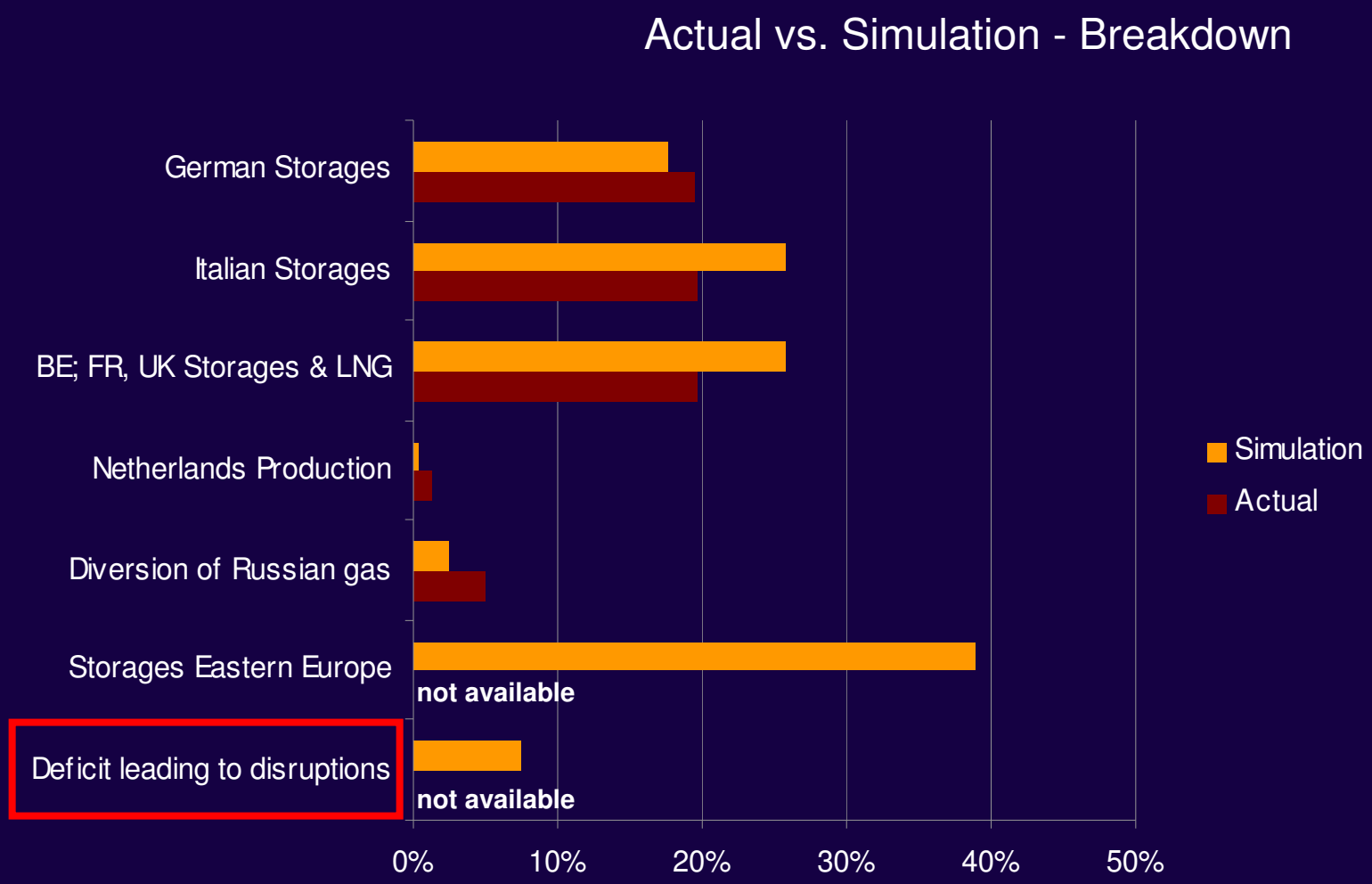


Physical gas flows
million cubic meters / day

- > 60
- 35 to 60
- 21 to 35
- 12 to 21
- 4 to 12
- 2 to 4
- 1 to 2
- 0 to 1
- 0

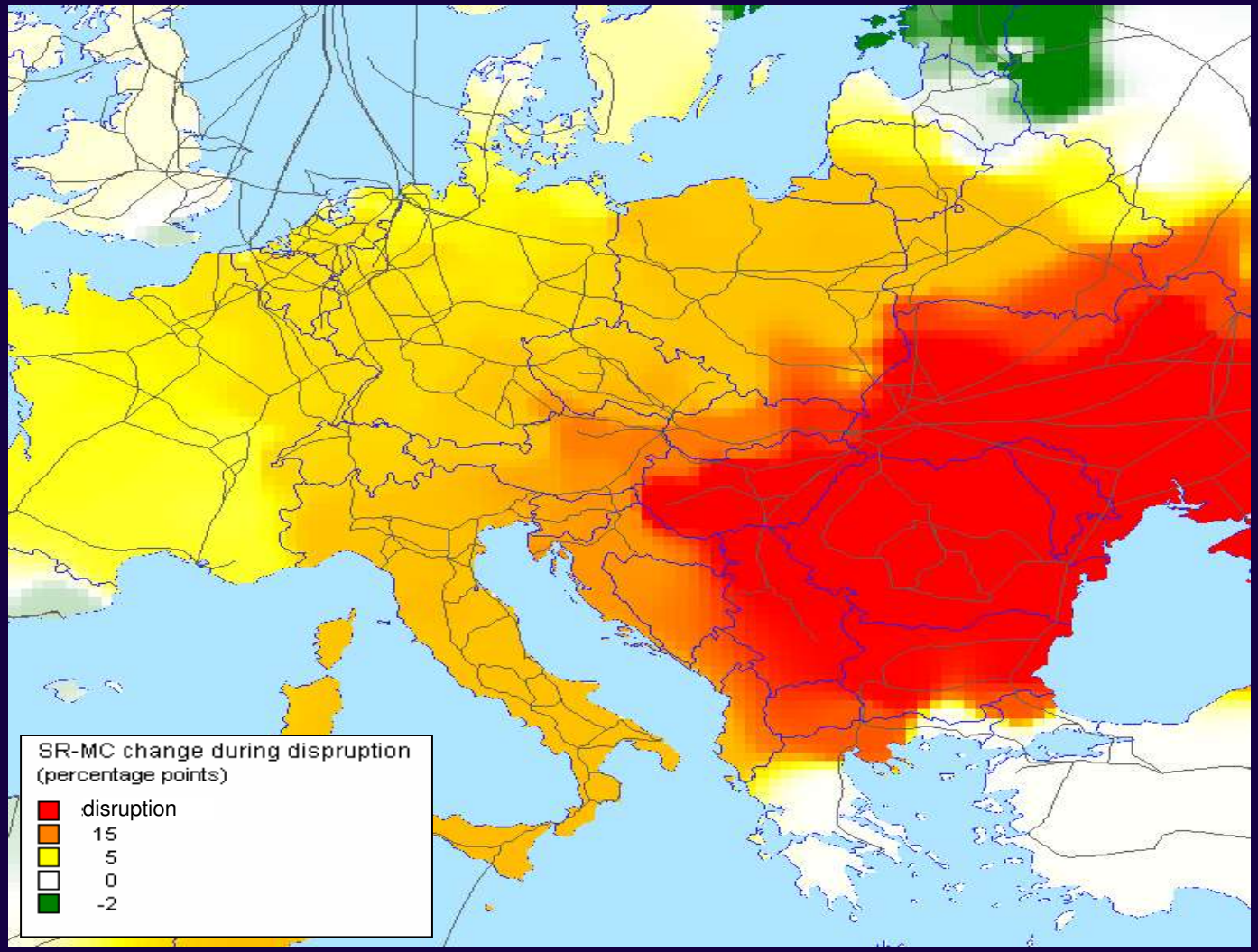
Source: Bettzüge & Lochner (2009)

Matching the Disruptions



Source: *Simulation*: Bettzüge & Lochner (2009), relative values compared to simulation of January 2009 without crisis.
Actual: Own estimates based on published data from Bundesnetzagentur, DG TREN, GSE and Pirani/Stern/Yafimava (2009), relative to 14 day period before the crisis.

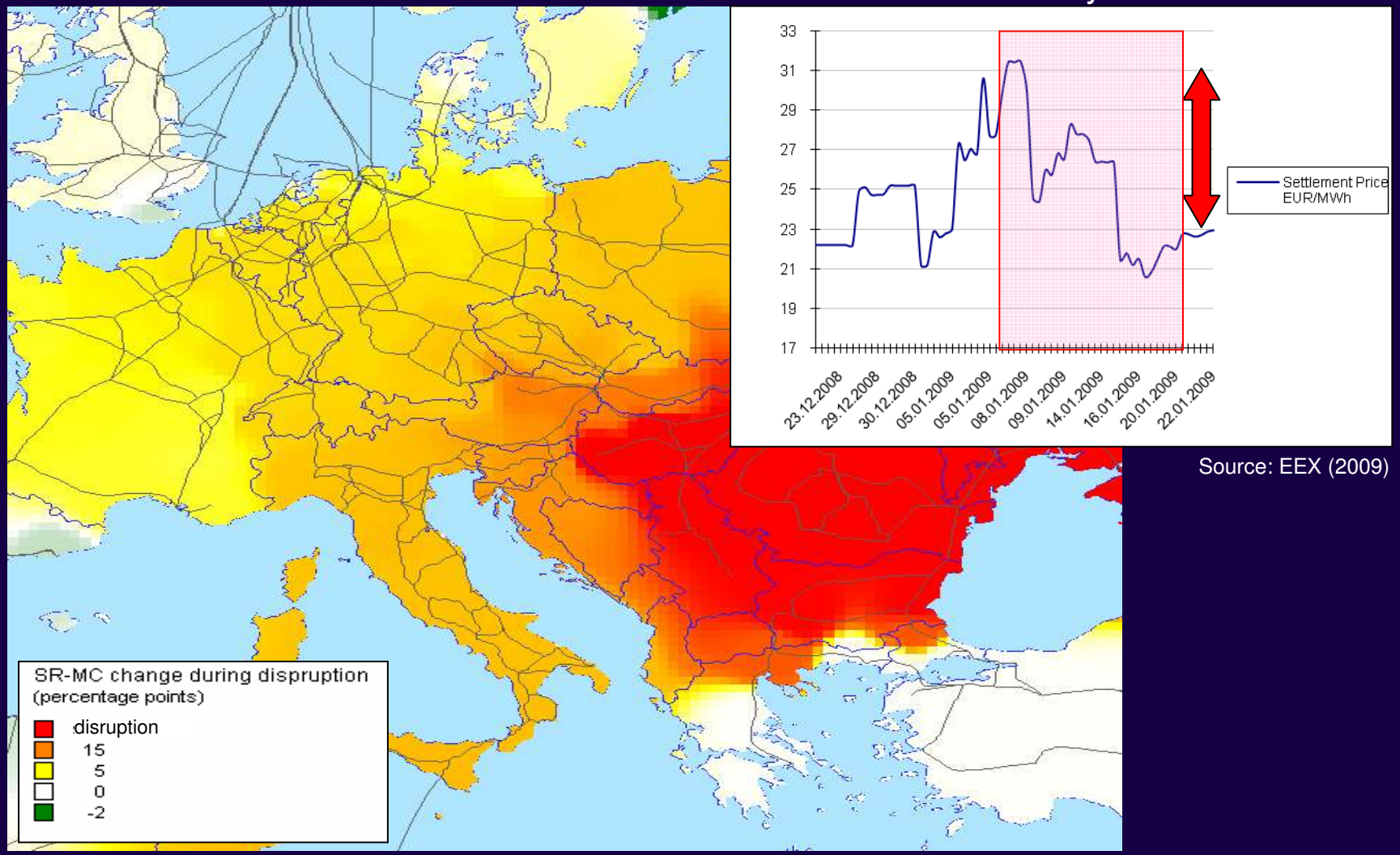
Supply Cost Increases and Disruptions



Source: Bettzüge & Lochner (2009)

Locational short-run marginal costs indicate the costs for the whole system of supplying one additional cubic meter of gas at the respective time and location (the marginal unit's commodity cost at the import point plus variable transport and storage costs). This map illustrates the relative increase in the short-run marginal cost during the crisis compared to a "normal" January day.

Supply Cost Increases and Disruptions



Source: EEX (2009)

Source: Bettzüge & Lochner (2009)

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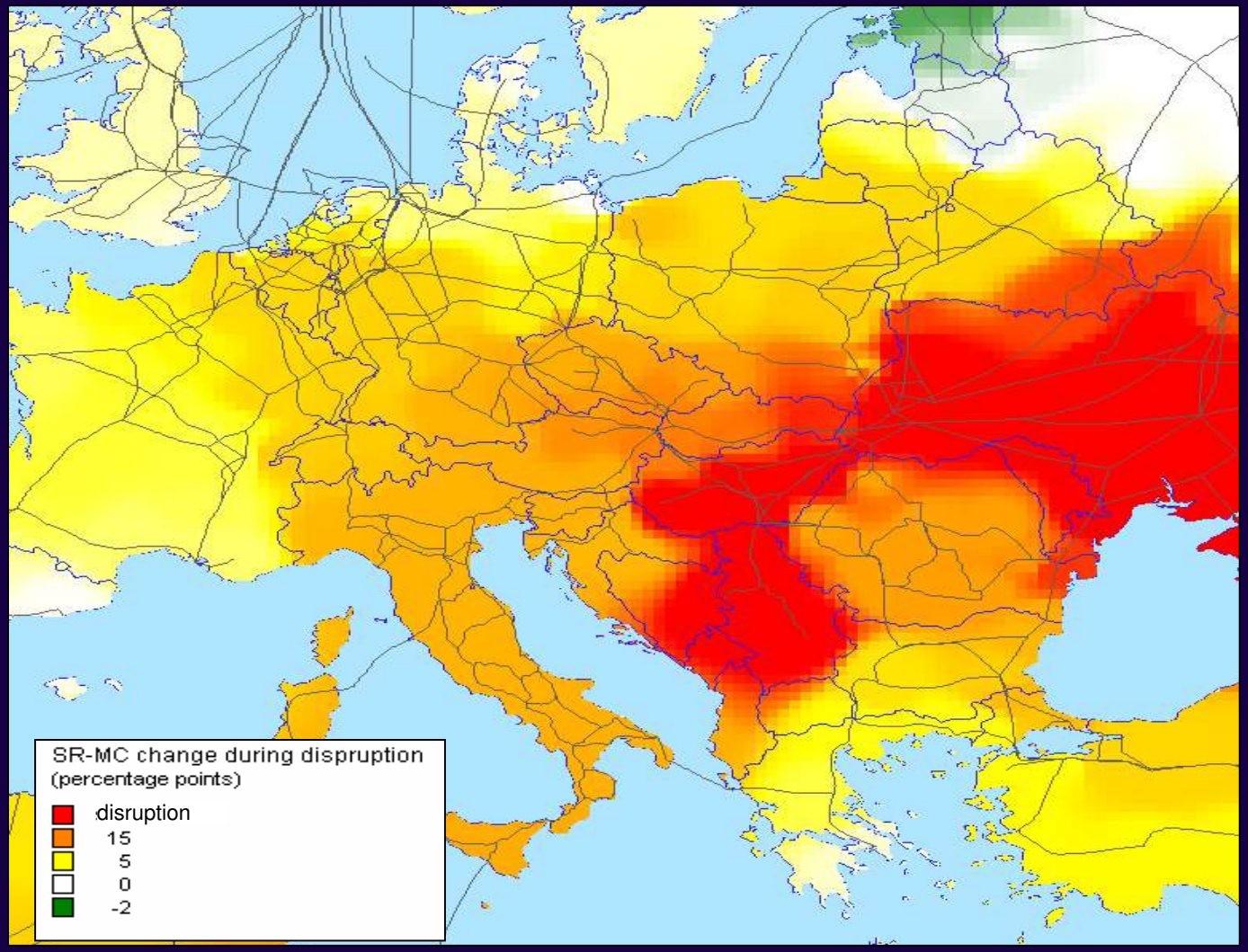
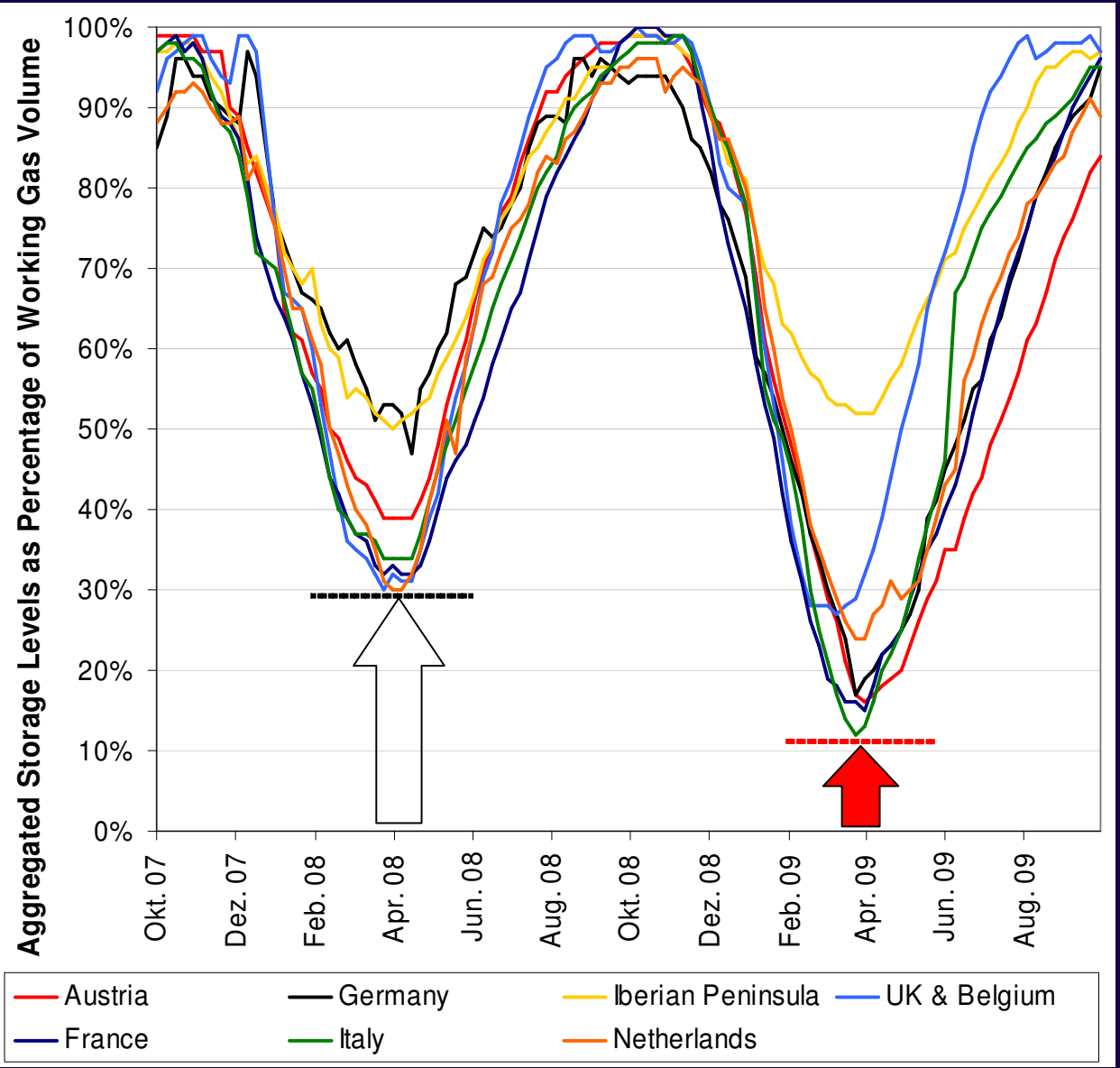
Implementing additional reverse flows



Source: own illustration based on simulations by the Institute of Energy Economics at the University of Cologne (EWI).

This map illustrates the relative increase in the short-run marginal cost during an identical crisis compared to a “normal“ January day, assuming that all pipelines can be operated bi-directionally.

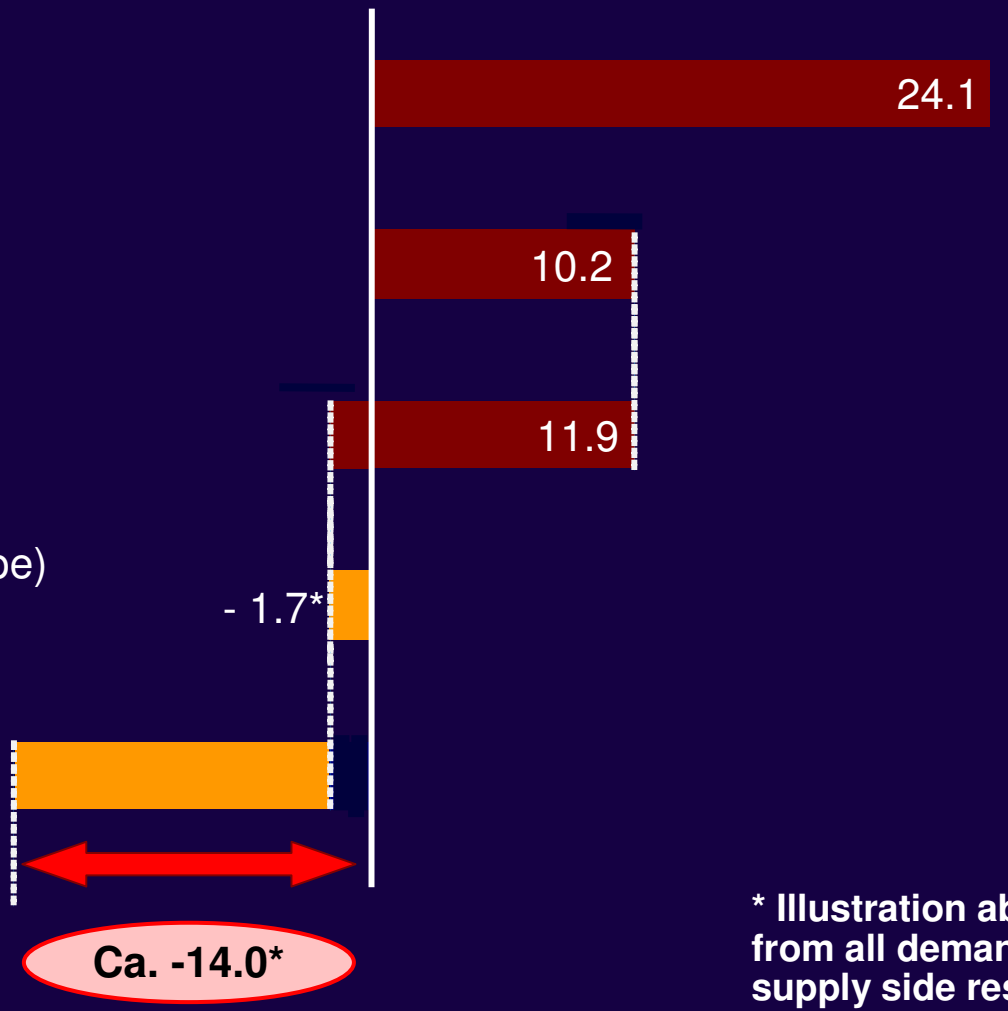
The Role of Storage



- Utilities store sufficient gas volumes for very cold winter (implicit obligation to secure supply at all times)
- Consequently, in normal winter 2007/08, more gas in storages when actually required
- 2008/09: normal winter, but “reserves” needed to compensate crisis, more severe consequences likely if less gas in storages
- Unclear if fully liberalized gas market would have delivered the same storage volumes

Source: GSE

Consumption vs. Storage*



Storage level (NW+C-Europe)
as of 1 Apr 08

Storage level (NW+C-Europe)
as of 1 Apr 09

Demand shortfall winter
08/09 vs winter 07/08

Est. Storage level* (NW+C-Europe)
with demand 07/08

Est. range of temperature
risk with cold winter
(+ 5 % higher demand)

*** Illustration abstracting from all demand and supply side responses lower storage levels would have implied.**

In Billion Cubic Meters (BCM), aggregation for DE, FR, NL, AT, IT, UK, BE.
Source: Own calculations based on GSE and Eurostat .

Lessons from the 2009 crisis

Overall, successful management of crisis

- Gas industry's reaction to the crisis close to a simulated least-cost solution (with given infrastructure restrictions)
- Cooperation in the industry ad-hoc but apparently rather effective

However, need for action arising especially from

- Physical bottlenecks in the European transport grid in the case of crisis
- Insufficient storage levels in the case of a colder winter and/or higher demand and/or a prolonged duration of the crisis
- Limits to cross-border solidarity partially visible
- Unnecessarily high complexity for crisis management due to insufficient harmonization and transparency

Comments on current COM Proposal

Overall, EU level approach highly desirable

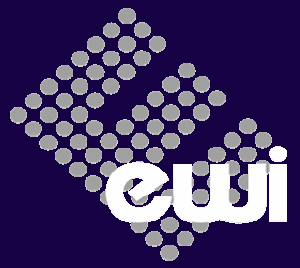
- Appropriate formalisation of subsidiarity principle for case of crisis
- Standardization, harmonization, and coordination across Europe potentially beneficial for future crisis management

However, scope for improvement especially in the following aspects:

- Inflexible emergency plans might hamper efficient market reaction
- State / commission intervention during a crisis will not necessarily result in efficient market behaviour / efficient allocation of volumes
- General call for bi-directional capacity not economically efficient
- N-1 as proposed not a sufficient, and potentially ill-guided, measure for security of supply

Some suggestions to improve current proposal

- **Competitive market segment** can efficiently and flexibly react to crisis without state intervention
  - exception: potential interference of nation states
  - Potential approach: Ex-post sanctioning to create incentive for efficient behaviour by companies and states (common EU practise), rather than direct interference through COM
- **Regulated market segment**: Standardization & harmonization to allow better functioning of markets, i.e. enhance prerequisites for efficient market response & simplified procedures for case of crisis
- Replace N-1 with system-based stress-testing approach, consistently on European, regional, and national levels
- Focus on infrastructure and volumes rather than procedures:
  - Identify and incentivize effective AND efficient investments in redundant capacities (European system perspective)
  - Define, monitor, and if needed, contribute to sufficient storage levels



CONTACT:

Prof. Dr. Marc Oliver Bettzüge
Research Institute for Energy Economics
at the University of Cologne (EWI)
Alte Wagenfabrik
Vogelsanger Str. 321
50827 Cologne, Germany
http://www.ewi.uni-koeln.de

Tel: +49-221-27729-0
Mail: Bettzuege.Marc@uni-koeln.de
Fax: +49-221-27729-400

Appendix: Selected EWI publications

- Bettzüge, M.O.; S. Lochner (2009). Der russisch-ukrainische Gaskonflikt im Januar 2009 – Eine modell-gestützte Analyse. In: *Energiewirtschaftliche Tagesfragen* 59 (2009), No. 7, pp. 26-30.
- Lochner, S.; D. Bothe (2009). The development of natural gas supply costs to Europe, the US and Japan in a globalizing gas market - Model-based analysis until 2030. In: *Energy Policy*, 37 (2009) No. 4 pp. 1518-1528.
- Lochner, S.; C. Dieckhöner (2008). Analyse von Grenzkostenpreisen im Europäischen Gasmarkt. EWI Working Paper 08/5.
- Bothe, D.; S. Lochner (2008). Erdgas für Europa: Die ewiGAS$_{2008}$ Prognose. In: *Zeitschrift für Energiewirtschaft* 32 (2008) No. 1, pp. 22-29.
- Lochner, S.; D. Bothe (2007). Nord Stream-Gas, quo vadis? Analyse der Ostseepipeline mit dem TIGER-Modell. In: *Energiewirtschaftliche Tagesfragen* 57 (2007) No. 11, pp. 18-23.
- Lochner, S.; D. Bothe (2007). From Russia With Gas - An analysis of the Nord Stream pipeline's impact on the European Gas Transmission System with the TIGER-Model. EWI Working Paper 07/2.
- Bothe, D.; M. Lienert; S. Lochner (2007). Analysing the Sufficiency of European Gas Infrastructure - the TIGER Model. Conference Paper presented at ENERDAY 2007, Dresden.
- Seeliger, A. (2006). Entwicklung des weltweiten Erdgasangebots bis 2030 - Eine modellgestützte Prognose. Schriften des Energiewirtschaftlichen Instituts, Band 61, München.
- Bothe, D.; A. Seeliger (2005). Forecasting European gas supply - selected results from EUGAS model and historical verification. EWI Working Paper 05/1.
- Bartels, M; A. Seeliger (2005). Interdependenzen zwischen Elektrizitätserzeugung und Erdgasversorgung unter Berücksichtigung eines europäischen CO2-Zertifikatehandels. In: TU Wien (Hrsg.), *Energiesysteme der Zukunft: Herausforderungen und Lösungspfade*, Tagungsband der IEWT 2005, Wien.
- Perner, J.; A. Seeliger (2004). Prospects of gas supplies to the European market until 2030 – results from the simulation model EUGAS. In: *Utilities Policy* 12 (2004) No. 4, pp. 291-302.