Perspectives for Natural Gas in a Low-Carbon Context- Proposal for a Concurrent Session for IAEE European conference

Convened by Christian von Hirschhausen (TU Berlin, and DIW Berlin)

Motivation for the Concurrent Session

1 Trends in the Natural Gas Industry: Prices, Contracts, and Geopolitics (by Anne Neumann and Christian von Hirschhausen)

1.1 Abstract

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2 Regulation for a „Low-Carbon“ Fuel: Natural Gas (by Jeff Makholm, NERA)

2.1 Abstract

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3.1 Abstract

3.2 The Authors: Ruud Egging, PhD, Dr. Franziska Holz, and Philipp Richter

Motivation for the Concurrent Session

The objective of this special concurrent session of the IAEE Europe is to shed light on the perspectives for natural gas in a low-carbon context, and to explore pathways for the economic and environmental role of natural gas. Natural gas plays a particular role in the transformation of energy systems towards a low-carbon world: burning natural gas produces less CO_2 than burning any other fossil fuel (oil or coal), natural gas-fired power plants are suited to provide system flexibility to back up intermittent wird and solar electricity, and natural gas is also a flexible fuel that can be used in almost every application: electricity, heating, and the transportation sector.

Over the last years and decades, the natural gas industry has gone through a period of structural change and price changes, as almost no other commodity (with the probable exception of oil): from a „by product" of oil, the natural gas sector has become mature as a regulated sector, with more or less competitive pricing in most countries around the world. Furthermore, since about a decade the „globalization" of natural gas markets has set in, driven by a thriving market for liquified natural gas (LNG), for which all major natural gas consumers are competing on equal terms. After the „LNG-rush" in the middle of the last decade, however, the „unconventional gas" revolution has set in, and has overthrown traditional forecast of natural gas reserves, particularly in the U.S., but also in other regions of the world.

1 Trends in the Natural Gas Industry: Prices, Contracts, and Geopolitics (by Anne Neumann and Christian von Hirschhausen)

1.1 Abstract

This paper sets the scene for the IAEE Session on natural gas: it relates lessons from the past and previous decades to current trends, and also attempts an outlook on issues determining the future of natural gas. In doing so, the paper identifies some constants in what appears to be an ever-moving target. We provide an econometric analysis of global natural gas price trends, and identify periods with converging and diverging prices; we also test whether bi- or trilateral relations are (co-)integrated. In a second step, we analyze the institutional structure of natural gas supplies around the world, with a focus on the evolution of long-term-supply contracts, stuck between upstream natural gas producers with down-stream trading houses and/or large consumers. We expect to find a different role for natural gas, depending on the environmental and energy economic context of each region under scrutiny, e.g. the U.S., Asia/China/Japan, Europe, etc. Last but not least, we shed light on the ever-relevant issue of geopolitics, where we sense a more away from the traditional care of the supply industry (Middle East and Russia) towards "younger" big international players, e.g. the United States and China.

1.2 The Authors: Prof. Dr. Anne Neumann and Prof. Christian von Hirschhausen.

Anne Neumann is Professor of Economic Policy at Potsdam University, and Research Professor at DIW (German Institute for Economic Research). One of her specializations is the econometric analysis of resource prices, amongst them natural gas, upon which she has published extensively. She has also advised the International Energy Agency (IEA), the German government, and industry on natural gas policy issues. Christian von Hirschhausen Professor of Infrastructure Economics at TU Berlin, and is Research Director at DIW (German Institute for Economic Research); he has publishedon international natural gas issues.

2 Regulation for a „Low-Carbon“ Fuel: Natural Gas (by Jeff Makholm, NERA)

2.1 Abstract

The objective of this paper is to discuss the regulatory framework that allows (or prohibits) the development of natural gas as a „low-carbon“ fuel, in different jurisdictions around the world, and to derive policy conclusions for regulatory reforms in areas of the world that have not yet (or insufficiently) addressed natural gas market reform. The paper will also highlight the nexus between the technical aspects of natural gas transportation and use, and the importance of the regulatory framework; this nexus is largely ignored both by engineers and public policymakers trying to promote the use of clean natural gas. The paper first sketches out the fundamentals of natural gas sector regulation, focusing on the importance of a competitive global market and competitive domestic markets; it then highlights a particularly successful model, the U.S. pipeline competition, before addressing reforms, or the lack thereof, in other important regions, such as Canada, Europe, China, and India. The paper ends with an outlook on regulatory action that can boost natural gas use, by strengthening the competitive regulatory framework.

2.2 The Author: Jeff Makholm, PhD

Dr. Jeff Makholm is Senior Economist and partner with National Economic Research Associates (NERA) in Boston, MA, providing economic analysis to government, regulatory agencies, and corporations in the natural gas and other energy industries. Makholm has over two decades of experience in the natural gas sector, and regularly publishes in applied energy matters. He is the author of „The Political Economy of Pipelines“ (The University of Chicago Press, 2012), the first scholarly book on the topic in the last 40 years.

3 Natural Gas in a global perspective: resource, trade, and uncertainties (by Ruud Egging, Franziska Holz, and Philipp Richter)[1]

3.1 Abstract

Since the "emergence" of natural gas as a fuel in its own, as an input to the power sector, heating, and transportation, back in the 1960s/70s, the natural gas sector has increased its importance in the energy system world-wide. Whereas this development took place in regionally segmented markets in the last century (e.g. North America, Europe, Asia, etc.), the "globalization" of natural gas markets has set in around the turn of the century, which further strengthened the role of natural gas in the fuel mix. However, the past decade has also brought about several, and often contradictory, trends that have made natural gas a particularly uncertain fuel: this includes price developments, the role of liquefied natural gas, unconventional natural gas resources, the role of climate policy, and, last but not least, the traditional competition of natural gas with its "sibling" conventional fuels, mainly coal.

The objective of this paper is to identify the key drivers for natural gas markets in the coming (two to three) decades, including resource availability, and to forecast major trends in natural gas production, consumption, and trade in this period. The paper is based on recent empirical evidence, including an up-to-date survey of resource availability, as well as on extensive modeling of the world gas markets using the "Global Gas Model" (GGM). The paper also highlights and quantifies major uncertainties in the future use of natural gas, e.g. future climate policies and CO_2 prices, the future of nuclear power and natural gas as a potential substitute, as well as the role of the major producing and/or consuming regions, such as the U.S., Europe, and China.

3.2 The Authors: Ruud Egging, PhD, Dr. Franziska Holz, and Philipp Richter

Ruud Egging, PhD, is currently Senior Researcher at SINTEF, a Norwegian energy research group, and Associate Professor of NTNU, the Trondheim University of Technology. Since his doctoral dissertation on world natural gas markets (University of Maryland, 2009, supervised by Prof. Steven A. Gabriel), he has specialized in the economics of natural gas markets. Dr. Egging is the main programmer of the "Global Gas Model" which will be used to in Sections 3 and 4 of the paper. He has published extensively on numerical programming and natural gas markets.

Dr. Franziska Holz is Senior Researcher at the German Institute of Economic Research (DIW Berlin), and co-director of the research group on "Resource Markets and Policies". She has specialized on natural gas market modeling since 2005, and has since then extended her research to other fossil fuel markets (oil, coal). Dr. Holz is the author of numerous scholarly refereed papers as well as co-editor of

[1] This paper has been submitted separately by Philipp Richter

the book on “European Energy Supply Security - Natural Gas, Nuclear, and Hydrogen. CESSA-Book” (Edward Elgar, 2010).

Philipp Richter is Researcher at the German Institute of Economic Research (DIW Berlin), and participates in the research group on “Resource Markets and Policies”.