Energy Market Modeling

Stream: Emerging Applications of OR

Invited session

Chair: Steven Gabriel, Civil & Env. Engin./ Applied Math and
Scientific Computation Program, University of Maryland, 1143
Martin Hall, 20742, College Park, MD, United States,
sgabriel@umd.edu

1 - Analysis of a Possible Natural Gas Cartel

Steven Gabriel, Civil & Env. Engin./ Applied Math and
Scientific Computation Program, University of Maryland, 1143
Martin Hall, 20742, College Park, MD, United States,
sgabriel@umd.edu, Knut Rosendahl

In this presentation we present an analysis of the global gas market under sev-
eral possible cartels involving the Gas Exporting Countries Forum (GECF).
We make use of the World Gas Model, a large-scale complementarity model
determined Nash-Cournot based market equilibria.

2 - Using Real Options to Evaluate Optimal Funding Strategies for Carbon Capture and Storage (CCS) Projects in the European Union

Jeremy Eckhause, Civil and Environmental Engineering,
University of Maryland/LMI, 2000 Corporate Ridge, 22102,
McLean, Virginia, United States, jeckhause@lmi.org, Johannes Herold

A barrier to large scale implementation of CCS is the lack of demonstration projects that validate the technology. A few projects in the EU are under de-
velopment to use CCS on a large scale. Taking a funding agency’s perspective,
we employ a real options framework to select an optimal project portfolio. We
solve stochastic dynamic programs to obtain funding strategies in order to max-
imize success by a target year. The model demonstrates the reduction of risk
in the multi-stage competition, while considering knowledge spillover. State
space, computational complexity and runtimes are analyzed.

3 - A Model for Oligopolistic Natural Gas Markets

Ibrahim Abada, Electricite de France/Univ. Paris, Université
Paris Ouest, Nanterre - La Défense, 200, Avenue de la
République, 92001, Nanterre, France, ibrahim.abada@edf.fr,
Steven Gabriel, Olivier Massol, Vincent Briat

In our model, the interaction between certain market players is posed as a gen-
eralized Nash-Cournot competition. We take into consideration the long-term
contracts aspects. The producers sell their gas to a set of independent traders
who sell it then to end-users. Storage and transportation aspects are taken care
of by global operators. We use a system dynamics approach to model possible
fuels substitution between the consumption of coal, oil and natural gas. We de-
scribe some of the theoretical aspects as well as preliminary numerical results
for the European natural gas market.

4 - Cartelisation in the Natural Gas Market: the Stability Issue

Olivier Massol, Center for Economics and Management, IFP -
IFP School, 228-232 Avenue Napoléon Bonaparte, 92852 ,
Rueil-Malmaison, France, olivier.massol@ifp.fr, Stephane
Tchung-Ming

The creation of the Gas Exporting Countries Forum (GECF) has motivated
numerous discussions. In that context, Egging et al. (2009) have recently pro-
posed a numerical model to measure the market power that could potentially be
exerted by a coalition of gas exporters. As the GECF is often described as “an
informal association” with an unstable membership, an investigation focussed
on the cartel stability might be needed. This is precisely the goal of our contribu-
tion that illustrates how a numerical model (a simple mixed complementarity
problem) can provide some policy-relevant conclusions.