Geopolitics of Natural Gas

A joint study from PESD Stanford University and the Baker Institute Rice University

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Program on Energy & Sustainable Development

- Established with EPRI gift to Stanford, 2001
- Focus: Politics, Law, Institutions
- Four Research Platforms
  - Futures for gas
  - Electricity Markets in developing countries
  - Low-income, rural energy markets
  - Futures for climate policy
- Network operation; half Stanford, half overseas
Major Points

- Introduction to the Problem:
  - Expected Gas Demand
  - The Need for Infrastructure

- Our approach

- Initial Findings
  - Methodological & Substantive
Increasing Role of Gas in all Regions:
Gas as Fraction of Total Primary Energy

*Note: A3 is a high growth scenario that emphasizes renewables, nuclear, as well as gas*
Global Gas Consumption:
IPCC “Illustrative” Scenarios & IIASA-WEC A3

IPCC SRES (2000)
Supply and Demand

Green: stock: EIA Current Reserves (rough)
World Gas Trade

Total World Gas Movement

by Pipeline

Billion Cubic Meters (Bcm)

Year

Geopolitics of Natural Gas Study

Two Research Tracks:

1. Historical Case studies
   - Look to the past for insights into why some projects are built, and their consequences.

2. Gas Market Modeling
   - World Gas Trade Model
   - Political Economy Applications
### Six Historical Case Studies

<table>
<thead>
<tr>
<th>Built Projects</th>
<th>Author</th>
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<tbody>
<tr>
<td>1. Indonesia LNG to Japan</td>
<td>Lewis &amp; von der Mehden</td>
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<td>2. Algeria to Italy</td>
<td>Hayes</td>
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<tr>
<td>3. Russia to Poland and Germany</td>
<td>Victor &amp; Victor</td>
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<tr>
<td>4. Turkmenistan (to Iran, to Russia, to Pakistan &amp; India)</td>
<td>Olcott</td>
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<td>5. Qatar to Japan</td>
<td>Hashimoto</td>
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<tr>
<td>6. Southern Cone (Bolivia to Argentina; Argentina to Chile; Bolivia to Brazil)</td>
<td>Mares</td>
</tr>
</tbody>
</table>
Research Protocol:
Why are Some Projects Built, others not?

1. Context: Project Economics and Technology

2. Other Key Explanatory Factors:
   1. Political and Policy Drivers
   2. Investment climate in host countries
   3. Transit countries
   4. Offtake quantity and price risk
   5. International institutions

Seven Initial Observations

1) Methods
2) The “gas weapon”
3) Transit countries
4) State control vs. markets
5) The roles of long-term contracts and short term markets
6) Regional Institutions and the “peace dividend”
7) Spillovers benefits to under-served
Observation #1: Methods

• Research Question: Why are some key projects built but others not?
• Danger: Focus on built projects only
  – Built projects are visible; failures usually not
  – Case “selection bias”
• Our solution: studies of “alternative projects” (APs)
Observation #2: The Gas Weapon

- To date, very few political interruptions
  - Non-commercial markets → many interruptions (e.g. Ukraine 1990s)
  - The only severe example: early 1980s Algeria
- Why?
  - Gas pipelines are fixed infrastructures, costly to leave empty
  - Unlike oil using the weapon is usually costly
  - Severe effects on reputation
    - Long-term damage to Algeria’s export potential
Transmed Gas Pipeline

“Magrheb” (not built)

“direct” (not built)

Transmed

Dispenza (2002)
Algeria Gas Exports to Italy

*Price in $/mmbtu
Observation #3: Transit Country Risks

- Project design vs. project operation.
- Example: Soviet/Russian gas exports
- Project design:
  - Soviet era: zero concern for transit “countries”
  - Today: transit country concerns dominate new project design
- Project operation:
  - Transit country risks remarkably low
  - Mainly about rent allocation (Are there credible alt.’s?)
Observation #4: States and Markets

• Today: Great Transition from “states” to “markets”
  – Poses difficulty for case selection
• One (of many) issues:
  – Will shift to markets speed or slow the diffusion of gas technology?
    • UK example: markets accelerate dash to gas
    • Most other countries: state itself created gas niches
      – Contrast Russia and Poland
  – Not obvious what the impact of liberalization is on gas use
Observation #5: Contracts and Spot Markets

• First Projects: Always Anchored in Long-term contracts
  – What is a “contract?”
    • Renegotiation clauses, price & quantity
  – Enforcement of contracts
    • Self-enforcing contracts (esp. pipelines)
    • Outside enforcers (World Bank, western firms)
  – A shift to merchant markets?
    • Example of U.S. gas market and LNG
Gas and Crude Prices
Observation #6: A Peace Dividend from Pipelines?

- Analogy: European Coal and Steel Community and the Treaty of Rome (1957)
- Same true for pipelines?
  - Southern Cone example
  - No evidence supports this hypothesis
  - Causal arrows run opposite direction—peace and institutions allow gas, not vice-versa
Southern Cone: Gas Interconnections

Before 1990

Gas pipeline Bolivia-Argentina 1972
Bermejo-Ramos 1988

Current and Future

Gas pipeline Santa Cruz-Sao Paulo 1999
GasAndes 1997
Gas pipeline del Pacífico 1999
Gas pipeline Paisandú 1998
Gas pipeline Methanex 1996
Gas pipeline Mercosur
Gas pipeline Uruguayiana 2000
Gas pipeline Bolivia-Chile
Atacama 1999
Norandino 1999

de la Vega, 2000
Observation #7: Benefits to Under-served

- Do large-scale infrastructure projects generate spillover benefits and public goods?
- Results: as theory would predict
  - State-driven projects assembled through political negotiations: spillovers are key
    - Southern Italy example
  - Market-driven projects: private benefits and scalability dominate decision-making
    - GasAndes example
What Next?

• Refining the results
  – And, new questions
    • E.g., does the “resource curse” apply to Gas?

• Three Trials in the World Gas Trade Model
  • Real vs. estimated projects in ’90s
  • Making a market: China
  • State-owned enterprises: Russia
The Value of Soviet & Russian Gas Exports: The Difficulty of SOE reform

Note: Prior to 1992 FSU export, excludes movements between FSU countries.
Backup slides follow
Poland Primary Energy Consumption

Share of Final Consumption

Coal

Oil

Gas

Hydro

Bcm Gas Equiv

Italian Gas Supply by Source

Source: IEA
map of proved gas reserves at end 2001

Trillion cubic metres

Europe 4.86
S. & Cent. America 7.16
North America 7.55
Africa 11.18
Asia Pacific 12.27
Middle East 55.91
Former Soviet Union 56.14

bp statistical review of world energy 2002
Indonesia Primary Energy Supply

Share of Total

- Oil
- Gas
- Coal
- Hydro