World Energy Markets and Regulation:
Opportunities in the Gaps

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Director
Question 1

What percent of the world’s energy supply was from renewable energy in 2011?

a. 9%

b. 13%

c. 18%

d. 25%

World total primary energy supply, 1973 and 2011

Question 2

What percent of the OECD’s energy supply was from renewable energy in 2011?

a. 9%
b. 13%
c. 18%
d. 25%

OECD total primary energy supply, 1973 and 2011

Question 3

Where are the biggest opportunities in energy?

a. Increased efficiency
b. Effective regulation
c. Transport of energy
d. Technology development

The future?

• Patterns in opportunities
• Role of regulation
Caveat

Energy forecasts often wrong

Source: Denys Sakva, “Evaluation of errors in national energy forecasts” Rochester Institute of Technology, 2005
Forecasts are flat for OECD and growth for non-OECD.

Non-OECD consumption exceeds OECD.

Most of the non-OECD growth is for Asia…
Figure 13. Energy consumption in the United States, China, and India, 1990-2040

History

2010

Projections

quadrillion Btu

250

200

150

100

50

0

1990

2000

2010

2020

2030

2040

China

United States

India


…primarily China
Natural gas growth primarily industrial, but all areas grow
Fossil fuels will dominate electricity Generation

Implications for carbon pricing?

Question 4

Which is the most subsidized fuel for generating electricity in the U.S.?

a. Nuclear
b. Fossil fuels
c. Solar
d. Wind
Fuel Subsidies ($ millions)

Traditional Fuels

- Oil and Gas
- Hydropower
- Coal
- Nuclear

Renewables

- Solar
- Wind

Subsidies per MwH

### Traditional Fuels

- Oil and Gas: $0
- Hydropower: $2
- Coal: $4
- Nuclear: $6

### Renewables

- Solar: $800
- Wind: $200

World carbon emissions from energy, 1973 and 2011

Consumption outstrips emissions OECD, but not non-OECD

CO₂ Emissions vs GDP, 2011

China

India

Russia

Japan

USA

Turkey
What if China, India, and Russia moved onto the trajectory?
Roles of Regulation

• Limit exploitation of market power
• Limit exploitation of political power
  – Opportunism
• Provide commercial framework
• Provide standards, such as for safety
Features of Regulation

• Tariff authority (prices, safety, terms and conditions)
• Commitment
• Expertise
• Transparency
• Independence
Question 5

Which best describes regulation?

a. Controlling bad guys
b. Controlling all of us
c. Response to problems
d. Political favors
U.S. Path for Public Utilities

• Common Law Foundation

• Features
  – Enduring natural monopoly
  – Affected with public interest
  – Franchise

• Jurisdiction local as possible
Electricity Industry Structure

• Prior to 1990s, vertically integrated structure
  – Utilities traded at wholesale

• Since 1990s
  – Some states have unbundled
  – Development of ISOs and RTOs
U.S. Electricity Co-Evolution

Challenges

• Industry enlargement
• Unserved areas and jobs
• Northeast blackout 1968
• Declining air quality
• Rising fuel imports and costs
• High jurisdictional prices

Policy Responses

• PUCs, FPA (1935), PUHCA (1935)
• TVA (1933), REA
• NERC (1968)
• PURPA (1978), ESA (1979, 1980), state EE
U.S. Electricity Co-Evolution

**Challenges**

- California Crisis (2000-2001)
- Climate change concerns

**Policy Responses**

- Reforms ended
- State: RPSs, CO2 targets, renewable subsidies, EE
Gas Industry Structure

• Prior to 1980s, linear market structure
  – Producers explored, extracted
  – Pipelines bought, transported, sold
  – LDCs sold to end-users

• Regulation focused on prices
  – FERC: Producer and pipeline prices
  – States: LDC prices
### U.S. Gas Development

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Policy Responses</th>
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</thead>
<tbody>
<tr>
<td>• Infant industry</td>
<td>• Local and state regulation</td>
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<tr>
<td>• Industry expansion</td>
<td>• NGA (1938)</td>
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<tr>
<td>• Gas shortages (1970s) and take or pay contracts</td>
<td>• NGPA (1978), Gas spot market</td>
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<td>• New gas bias</td>
<td>• FERC Order 436</td>
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<tr>
<td>• Arbitrage gas pricing (Enron)</td>
<td>• FERC Order 636</td>
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</tbody>
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Changing Structure

- Producers free to sell to anyone at market prices
- Pipelines just transport
- Marketers can sell to anyone
Gas Marketers

• National or regional (mostly in the case of LDC marketers)

• First marketers were spin-offs from pipeline companies who had signed ‘take or pay’ contracts before regulation
U.S. Gas Jurisdiction

**Agencies**
- Federal Energy Regulatory Agency (FERC)
- US Dept. of Transportation (DoT)
- State PUCs

**Authority**
- Interstate pipeline, certain construction, transport rates
- Pipeline safety
- LDCs, local safety, inspector for DoT
Summary for Gas

- Increased flexibility
- Role of regulation changed, not eliminated
- New business challenges and opportunities
But often we get it wrong…

• Political influence
• Cognitive bias
• Resistance to loss
Special Interests: Fuel Subsidies (millions)

Traditional Fuels

Renewables

Subsidies per MwH

Traditional Fuels

- Oil and Gas
- Hydropower
- Coal
- Nuclear

- $0
- $2
- $4

Renewables

- Solar
- Wind

- $0
- $200
- $400
- $600
- $800

Cognitive Biases

• Over reactions to
  – Three Mile Island
  – California energy crisis

• Poor estimates of
  – Carbon costs
  – Benefits of electricity markets
The Secret to Co-Evolution…

• Dealing with losses
• Steering and stirring
• Acting with conviction
  – While maintaining with equal validity that you might be wrong
Losses

• Every change involves a loss
• People resist loss, not change
• Identify
  – Losses
  – Mitigation strategies
Three Juxtapositions

• Not BEST Practice, but NEXT Practice
• Not WHAT, but WHY
• Not LEADING, but LEADERSHIP
The Regulatory Practice

What is possible?
- Engineering
- Economics
- Finance
- Law

What is important?
- Politics
- Negotiation
- Dialogue

How can we do it?
- Counsel
- Management
- Relationships

The work of leadership is helping stakeholders, policymakers, and ourselves find the place where reality, our values, and our abilities join together.
Contact

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Appendix
Co-Evolution

Energy Infrastructure Development

Maturity Curve

Alignment of Regulation with Sector, Political, Economic, Financial, Institutional Development
Co-Evolution

Maturity Curve

Sector
- Penetration
- Efficiency
- Commercial Practices
- Private investment
Co-Evolution

Maturity Curve

Political

- Rule of law
- Transitions
- Independent judiciary
- Freedom of speech
- Expert
Co-Evolution

Maturity Curve

Economic
• Other infrastructure
• Education
• Economic freedom
• Dynamic
Co-Evolution

Maturity Curve

Financial Markets
• Liquidity
• Security
• Transparency
Co-Evolution

Maturity Curve

Institutions

• Well-defined
• Transparent
• Adaptable
Southeast Natural Gas Market: Average Basis to Henry Hub

Southeastern Monthly Average Basis Value to Henry Hub

Source: Derived from Platts data

Updated: October 03, 2013

"Leadership in Infrastructure Policy"
Weekly Henry Hub Gas Prices