

NATURAL GAS

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Lessons on funding practices from
developing gas networks



Why study gas infrastructure?

- Gas reserves are frequently the booby prize
- Locations such as Shtokman, Yamal, Gorgon, Qatar North Field, etc.
- Remoteness of production from markets implies the need for infrastructure investments:
 - Pipelines (including compressor stations)
 - LNG supply chains: liquefaction, ships, regasification
- Many of the best renewable resources are similarly remote, e.g. North-Sea, North-Dakota, North Africa

Applying this to renewables

- How to get essential transmission in place for new renewable capacity?
 - At the right time, the right place, the right size?

- For renewables such regional integration is a key factor in
 - coping with intermittency
 - and improving economics:
 - ◆ negative pricing indicates a growing problem of sub-regional congestion in Europe

Characteristics of Gas Pipelines (1)

- **Large Economies of Scale**
- **Long operating life, but lack of flexibility**
- **Strong government involvement**

Characteristics of Gas Pipelines (2)

- Pipeline as a (vulnerable) part of a longer value chain
 - Strong interdependence with upstream and downstream
- Externalities and high threshold costs can lead in market failure
 - Potential implications for competition, environment

Many of these characteristics have analogies for long distance power transmission, especially cross-border

Some consequences

- Natural monopoly dimension: creates need for regulation to protect consumers
- Large upfront investment / low operating cost
- Agreements governing the pipeline have to operate over a long period
- Interruptions to operation can have far-reaching implications

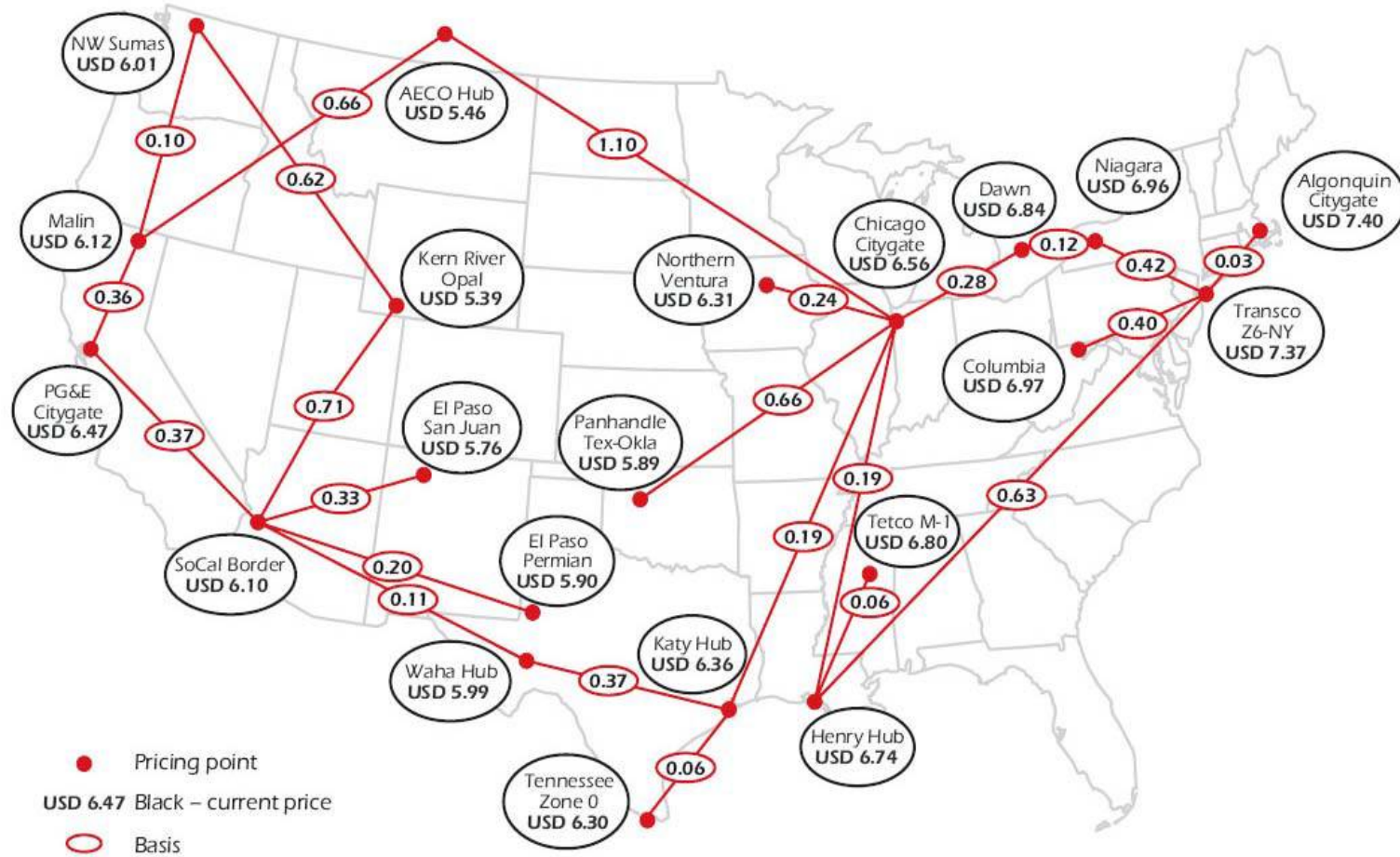
Cross-border interactions

- Challenge of aligning jurisdiction interests along the gas value chain. Increasing complexity as number of transit countries increases.
- Challenge of operating in (multiple) legal and regulatory regimes
- Pipeline negotiations facilitated by increased choices
- Similar issues prevail between governments and private sector or between companies

A tale of three pipelines

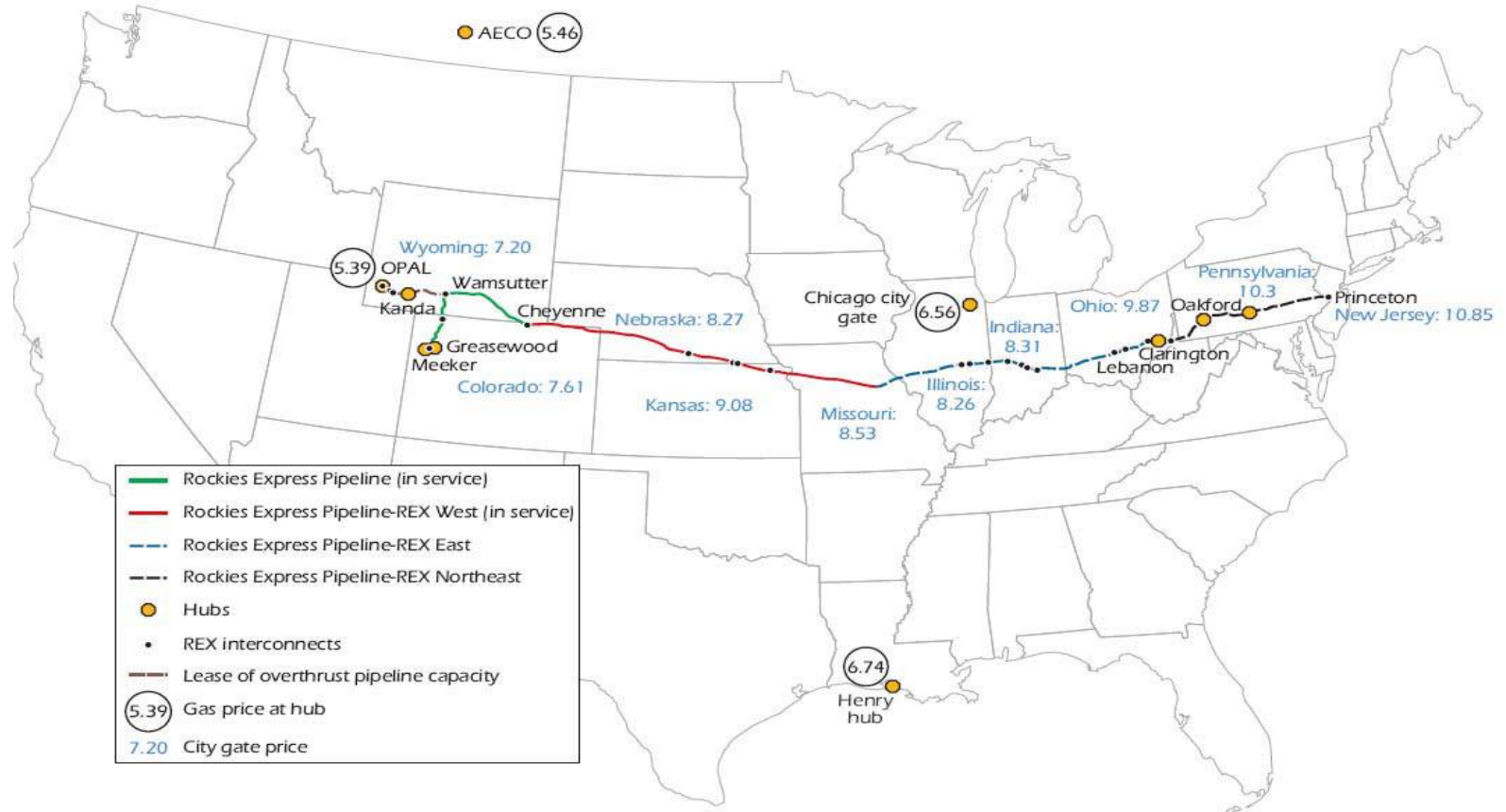
- **The Rockies Express Pipeline (USA)**
 - Response to market signals within a single jurisdiction
- **The Turkmenistan-China Pipeline**
 - States and state-owned companies take the lead
- **The Nabucco Pipeline**
 - Aligning multiple state and private interest along the gas chain

Existing Hub – System (as of 2006)



Rockies Express

A 2,700 km pipeline, at total cost of USD 4.4 billion, went from concept to operation in 3 years,

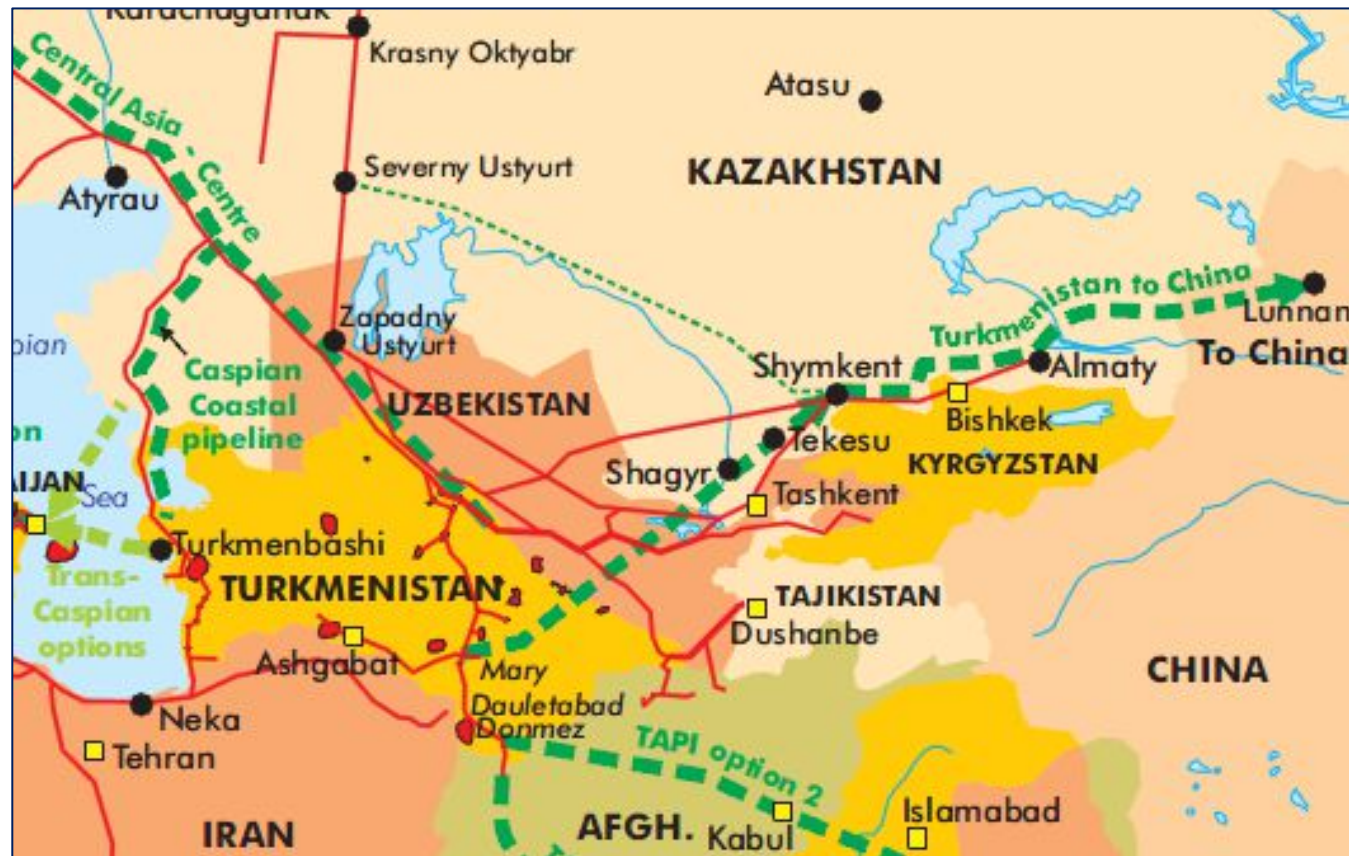




Rockies Express – Key factors

- Transparent market signals (prices) that gave investors confidence in project fundamentals
- Strong links between producers and the pipeline owner operator
- Open season process which encapsulated these factors,
- Transparent, timely regulatory processes for a pipeline crossing several state boundaries,
- Implemented by a single Federal agency,
- Pipeline routes utilising existing utility corridors for 90% of the length

Turkmenistan – China pipeline



- Turkmenistan-China Agreement on Gas Cooperation 2006, followed by PSA and Gas Sale and Purchase Agreement
- Uzbekistan, Kazakhstan transit countries: Inter-Governmental Agreements in place

Turkmenistan – China: key-factors

- State-state negotiations and implementation by state-owned companies eases challenge of coordination
- Gas supply underpinned by 30-year gas sales and purchase agreement, linked in part to production from CNPC's own PSA / production in Southeast Turkmenistan
- Transit risk mitigated by inter-governmental agreements and backed up by China's bilateral political relationships
- Joint ventures by CNPC in Kazakhstan and Uzbekistan to build and own sections of the pipeline in the respective transit countries

Nabucco Pipeline





Nabucco – Key factors

- Offers more diversified and secure European gas supply, plus access to European markets for gas exporters
- Multiple jurisdictions and regulatory regimes increase transaction costs.
- Need for more transparent European gas market operation
- Need to meet concerns about security of gas supply for transit countries
- Link to gas-rich region, but questions about specific supplier and short-term gas availability

What needs to be done to make markets work better? (1)

- Improving the interconnection between markets:
 - Better use of existing capacity
 - Cross-border investment
 - Balancing and quality issues

- Improving transparency (infrastructure data):
 - Publishing border flows
 - Publishing stock levels
 - Future capacity availability



What needs to be done to make markets work better? (2)

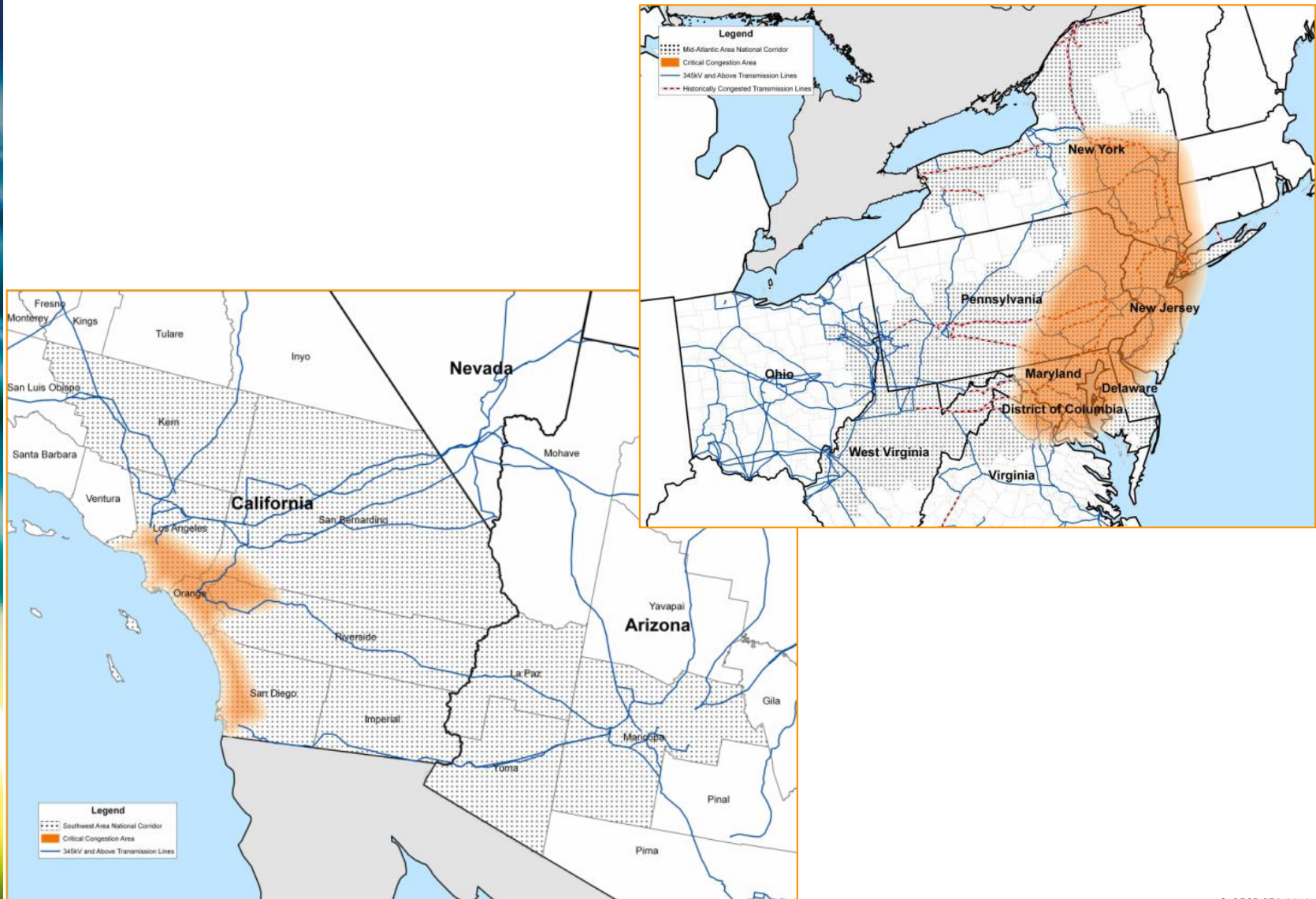
- Improved regulation:
 - Predictable, stable
 - Uniform across borders or at least harmonise
 - A Federal European Energy Regulator??

- Coordinated Investment planning:
 - TSOs produce medium to long term plans
 - Coordinated at European level



Thank you for your attention

United States: National Interest Electric Transmission Corridors (NIETC)

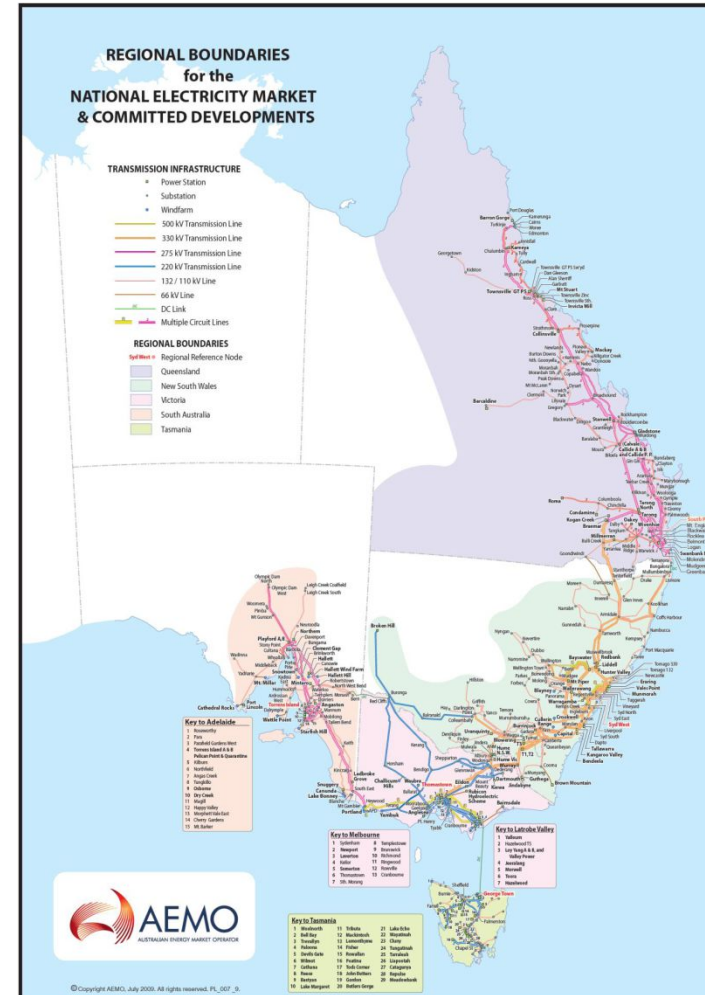




Australia: statement of opportunities



Gas pipelines



Electricity network

Public-private interactions

- Pipelines can involve multiple public and private parties with different interests
 - The more parties involved, the greater the challenge of coordination..
 - Importance of a transparent, stable and harmonised regulatory framework,
 - Commercial drivers for projects work well
 - But energy is political.....
- Different companies involved may have different objectives
 - Vertically integrated companies vs. unbundled private entities
- In a well-conceived project, the interests of all stakeholders are balanced and aligned for the lifetime of the project.