Better Energy, Better World

The Perspectives of International Pipeline Projects in NEA

March 2004

Heung Bog Lee

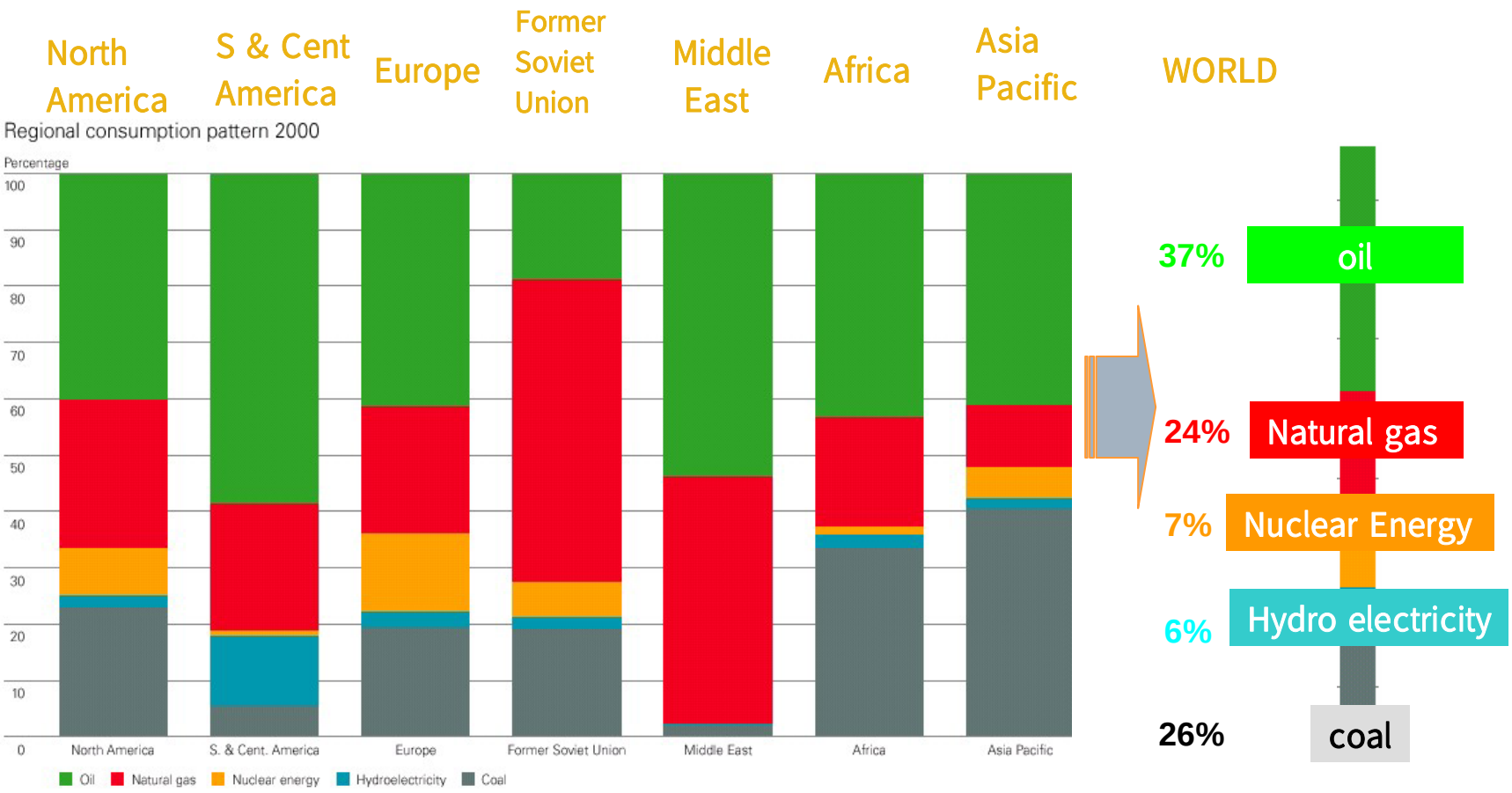
Contents

1) PNG (Pipelined Natural Gas) means natural gas transported by pipeline without liquefaction process of natural gas

I. Outlook of Natural Gas in the World

1. Regional Gas Consumption Pattern
2. Gas Consumption in the world
3. LNG Demand in Asia Pacific (Yr 2010)
4. Trends of LNG Markets in the world
5. Review of NEA Natural Gas Markets in Global Context

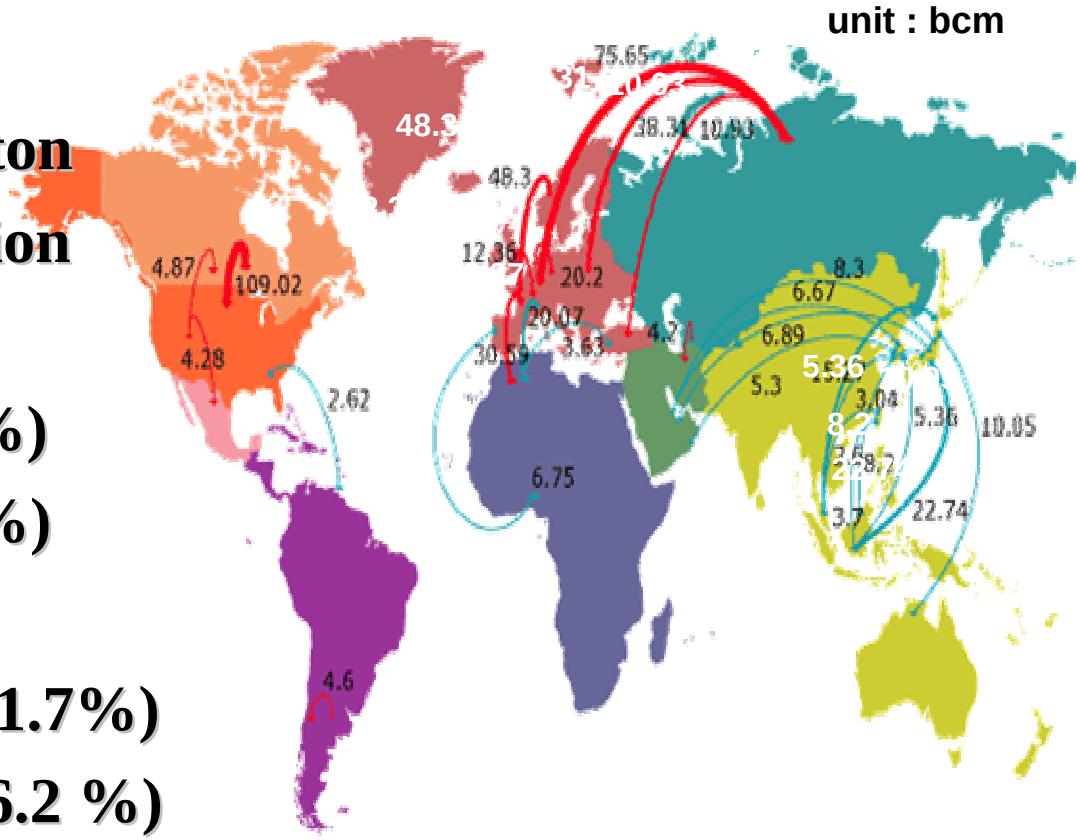
1. Regional Gas Consumption Pattern



Source : BP, bp statistical review of world energy June 2003

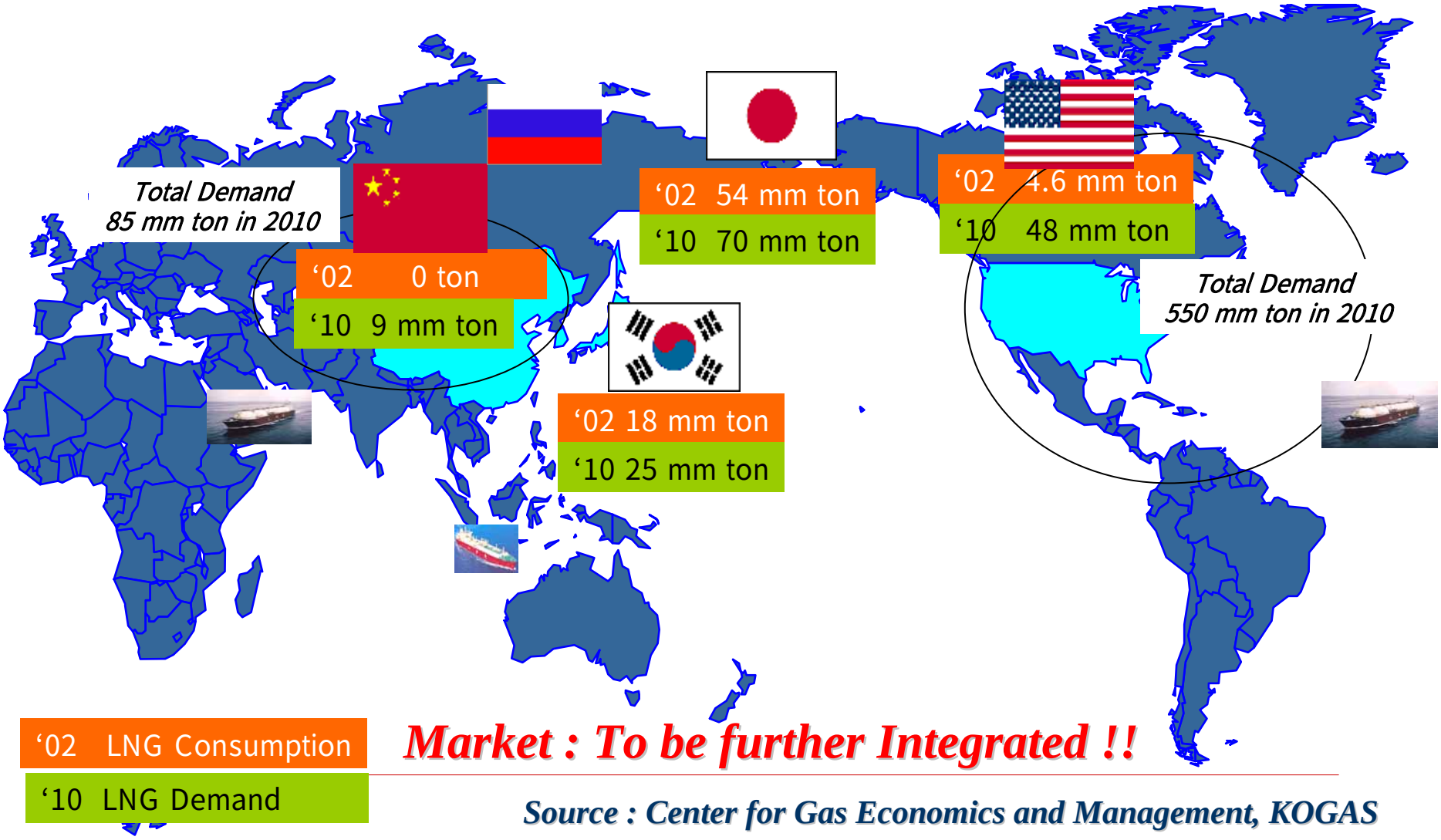
2. Consumption in the World (2002)

- **Total : 1,930 mm ton**
- **Trade Volume: 440 mm ton**
  - **23% of total consumption**
- **Traded by**
  - **PNG: 330 mm ton (75%)**
  - **LNG: 110 mm ton (25%)**
- **Major LNG Importers**
  - **Japan : 53.9 mm ton (51.7%)**
  - **Korea : 17.8 mm ton(16.2 %)**



Source : BP, bp statistical review of world energy June 2003

3. LNG Demand in Asia Pacific (Yr 2010)



Market : To be further Integrated !!

Source : Center for Gas Economics and Management, KOGAS

4. Trends of LNG Market in the World (1/2)

❒ More Competitive Price : Driving Forces to reduce the Price

A. Buyers' Market: Shifting Negotiation Power to Buyers

- **Sufficient Number of Gas Projects compared with the current demand**

B. Cost Reduction by Technological Developments

- **LNG Chains : Liquefaction, Ship Building & Shipping, Storages**
  (Economy of Scale reduced the cost)

C. Penetration to the emerging markets such as China and Idia

D. Spot Markets to spur the integration of markets

- **Spot Market Share: 8%(2002) to 15%(2010)**

E. The Roles of Majors and Success of Currently Operated LNG Projects

- ***How much the price level will go down?***
- ***How long Buyers' market will continue?***

4. Trends of LNG Markets in the World (2/2)

❒ More Flexible Terms and Conditions

A. Price : A reduced oil price linkage, S-curve or Price Cap
Various Pricing Mechanisms

B. Flexible Contract Volumes : Base Volume + Optional
Volume, The Secured Seasonal Volumes,

C. Lower Level of Take or Pay

D. Shorter Contract Period

E. More flexible Destination Clause: Chances of Trade

5. Review of NEA Gas Markets in the Global Context

❒ Gas demand is projected to show robust growth

A. Stable Economic Growth

B. Government Policy on Security and Diversification of Energy Source, Environmental Concerns

C. Declining Cost and Favorable Price to Importers

❒ Current Status

A. Reliance on LNG Importation (Japan, Korea, Taiwan)

B. No Experience of Trading by cross-border Pipeline gas

C. Gas Demand from such big Economies as USA, China & India sharply increases

II. Proposed International PNG Project in NEA

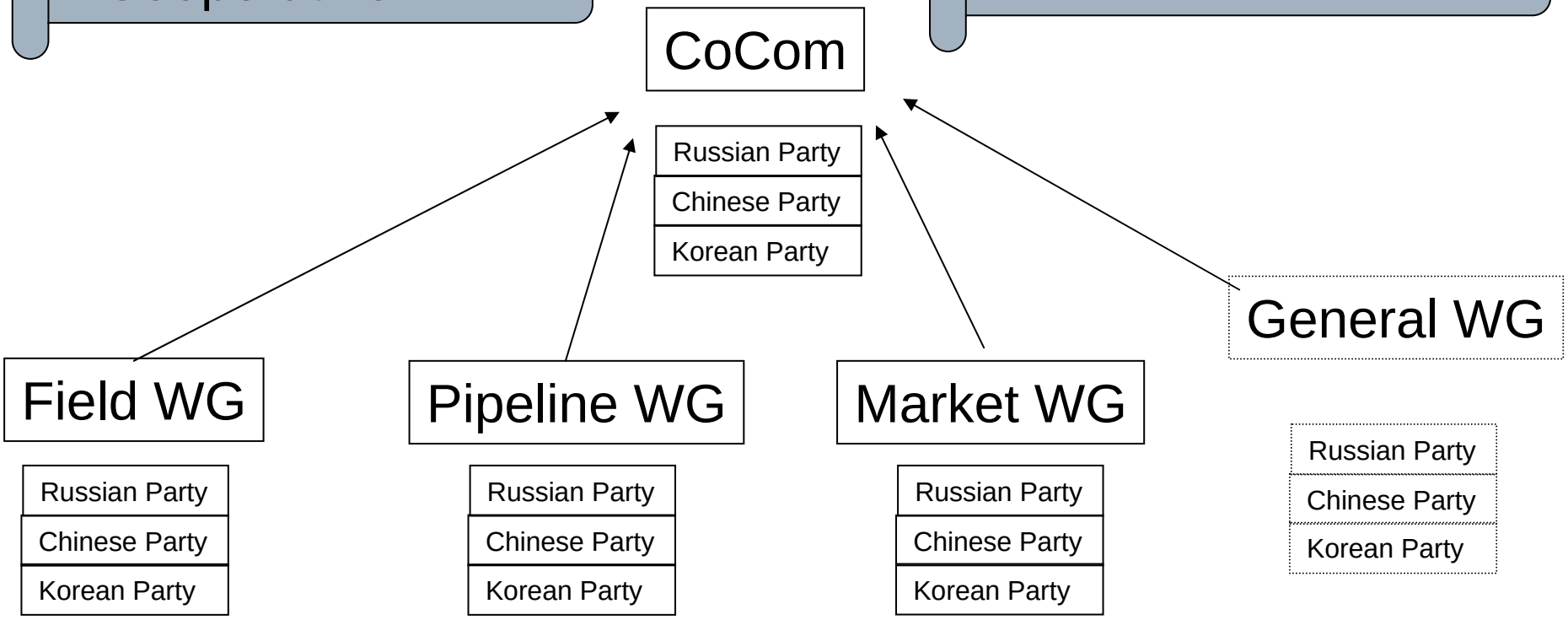
- Focusing on Irkutsk PNG Project -

Signing Ceremony for IFS (Beijing, Nov. 2000)

1. IFS[1)] - Framework

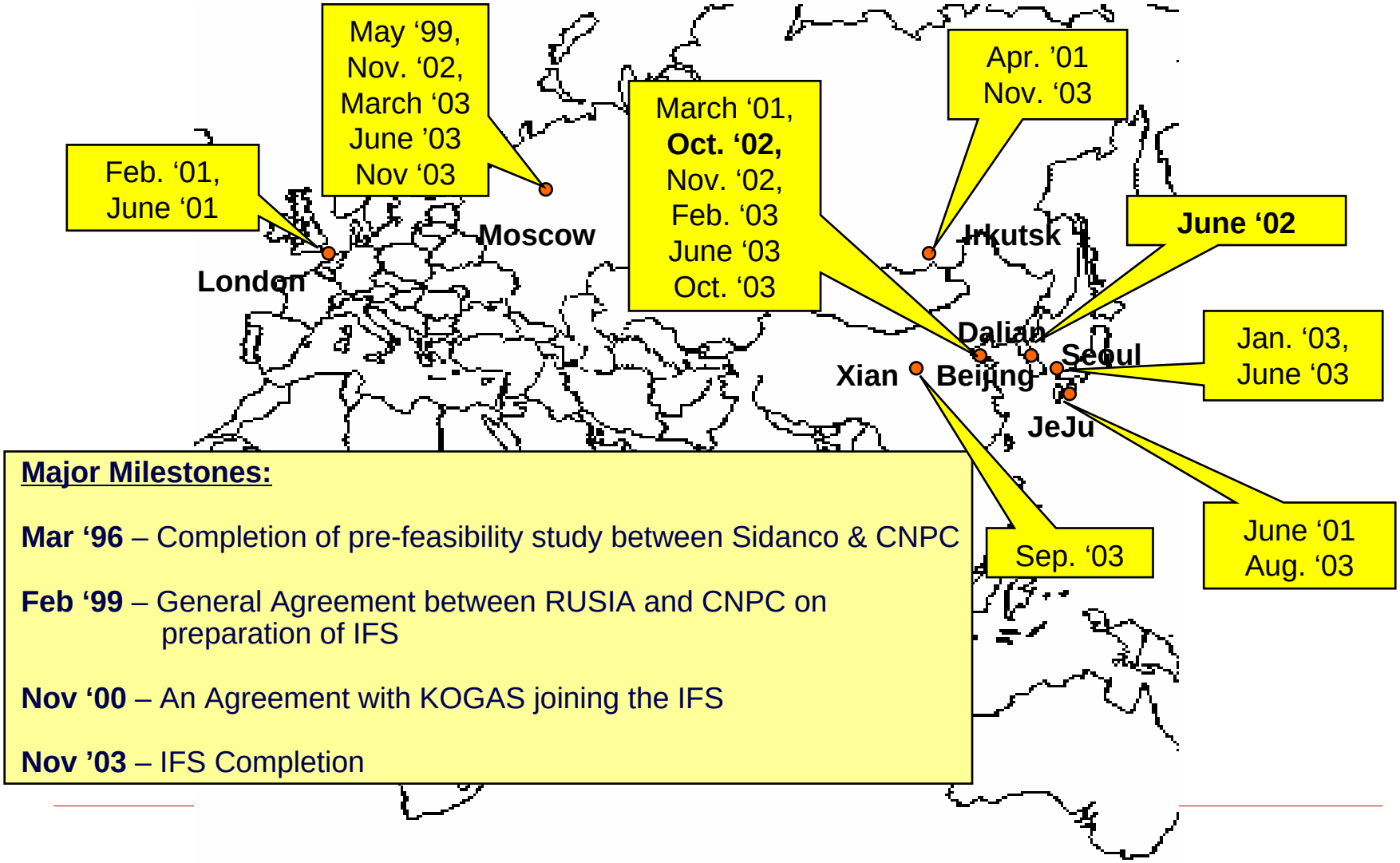
Process
- Trilateral
- Cooperative

Report
- Technical & Economic
- 2003



1) IFS means International Feasibility by KOGAS, CNPC and RUSIA Petroleum Jointly

2. IFS - History



Major Milestones:

Mar '96 – Completion of pre-feasibility study between Sidanco & CNPC

Feb '99 – General Agreement between RUSIA and CNPC on preparation of IFS

Nov '00 – An Agreement with KOGAS joining the IFS

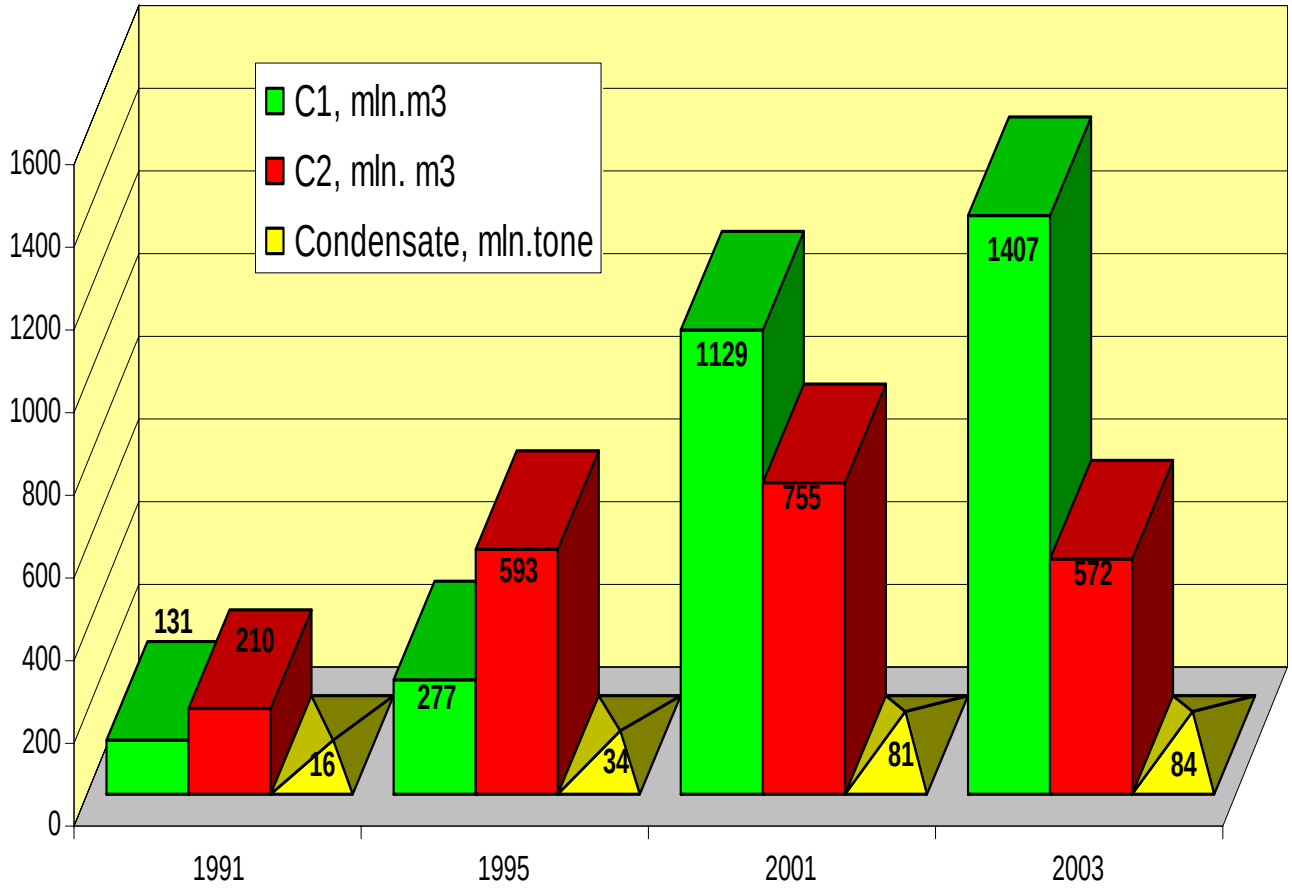
Nov '03 – IFS Completion

3. Kovykta Gas Field (1/2)

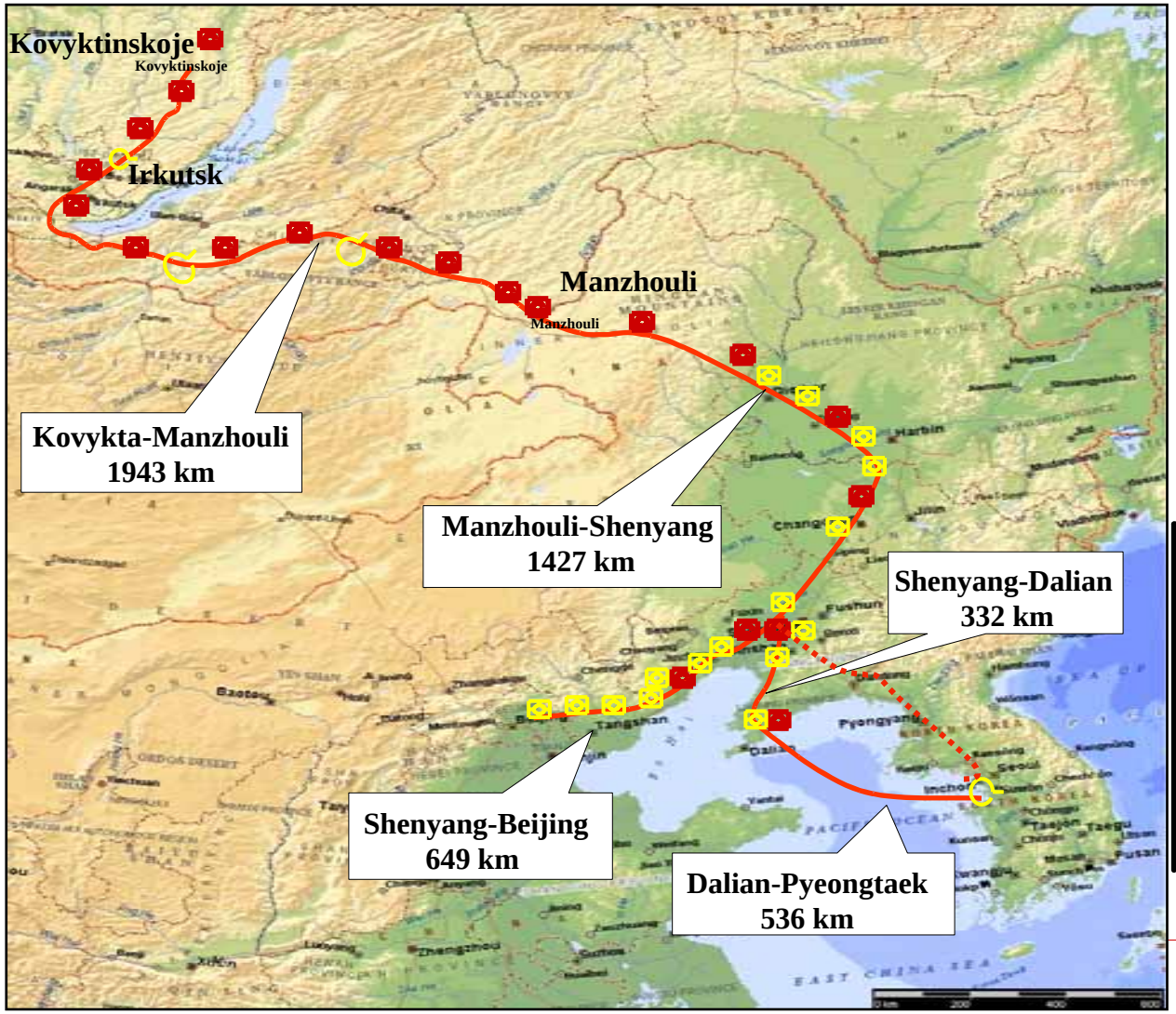
- Discovered: 1987
- Total License Area: 9000 km^2
- Located: 400 km northeast of Irkutsk City, and 110 km to the east of Lake Baikal.
- Elevation: Ranging from 380 to 1503m above mean of sea level
- Climate: Extreme continental
- Gas-in-Place up to 2 TCM

3. Kovykta Gas Field (2/2)

- Certified reserves for Kovykta Field



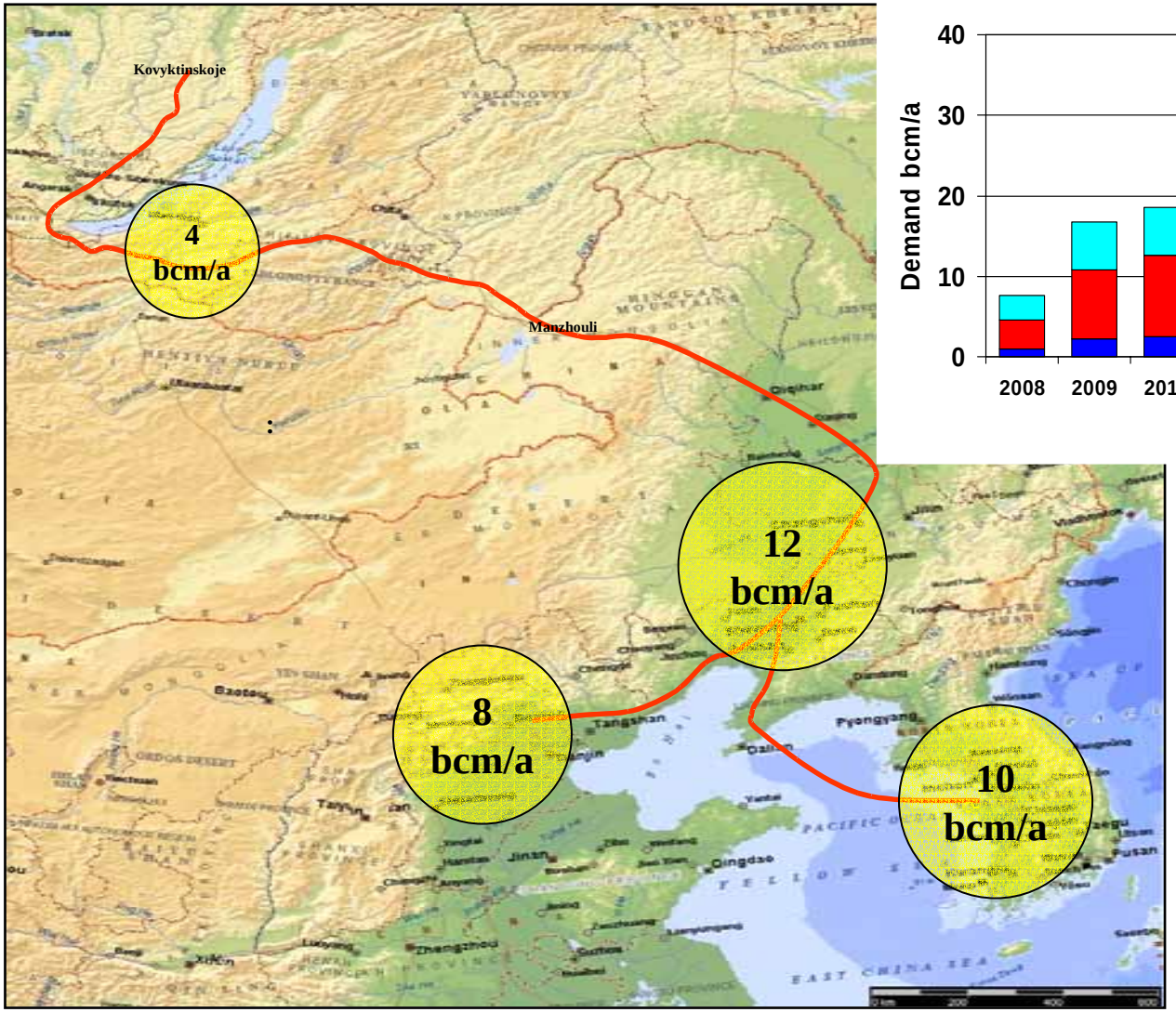
4. Pipeline Route

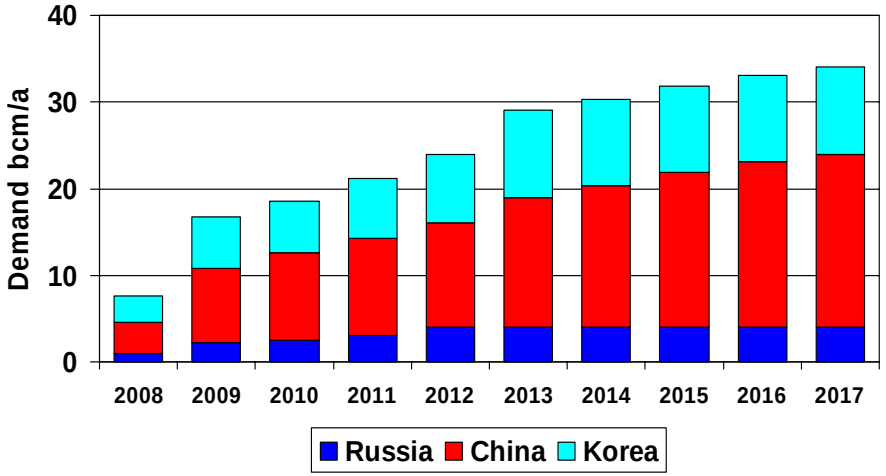


- Total length of pipeline 4,887km
  - **The longest as a Single Project**
- 20 compressor Stations
- 20 off-take stations
- Total estimated cost up to US $11 billion

	Russia	China	Korea
Flow Rate (bcm)	35.3	30	10
Pressure (Mpa)	9.8	10	12
Diameter (mm)	1420	1422/ 1016	939/ 813

5. Market : Demand for Kovykta Gas (1/4)

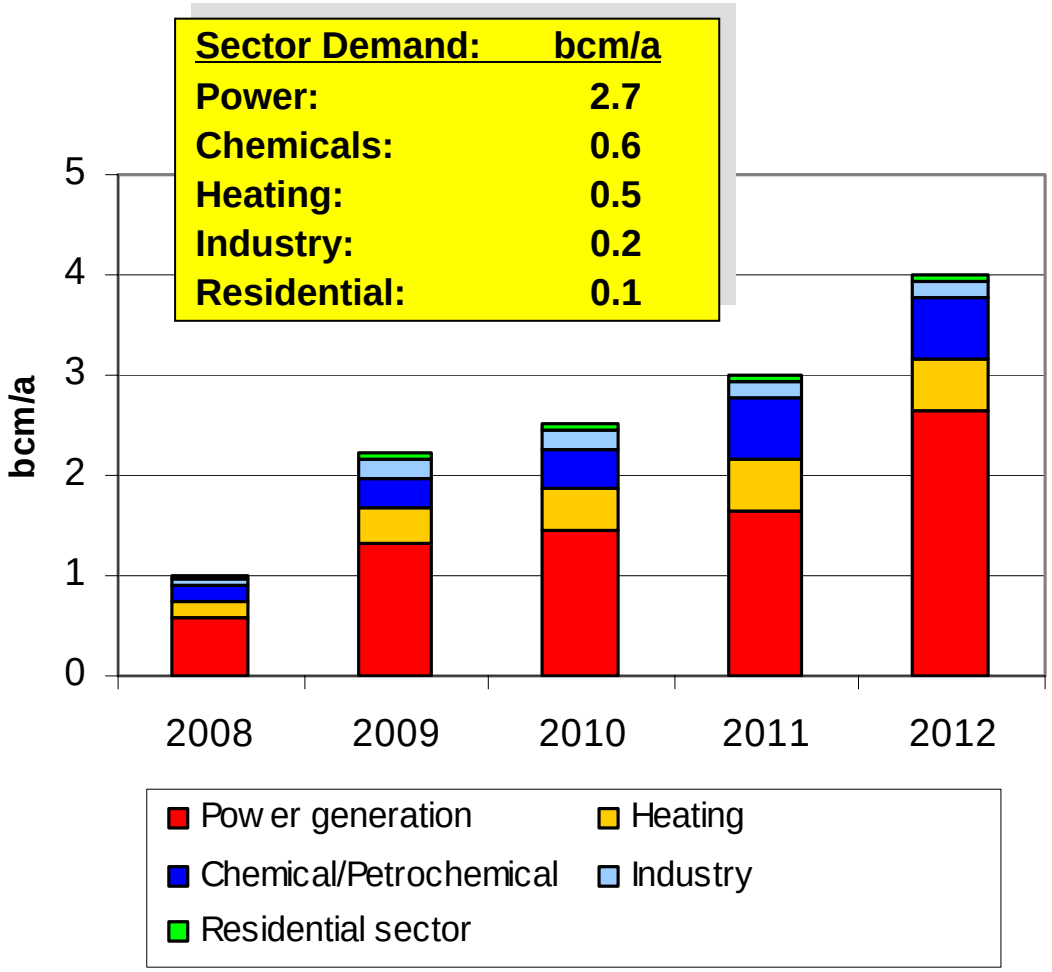




Market (First Gas)	Plat. Sales
Russia (2006-08)	4 bcm/a
NE China (2008)	12 bcm/a
Bohai China (2013)	8 bcm/a
Korea (2008)	10 bcm/a

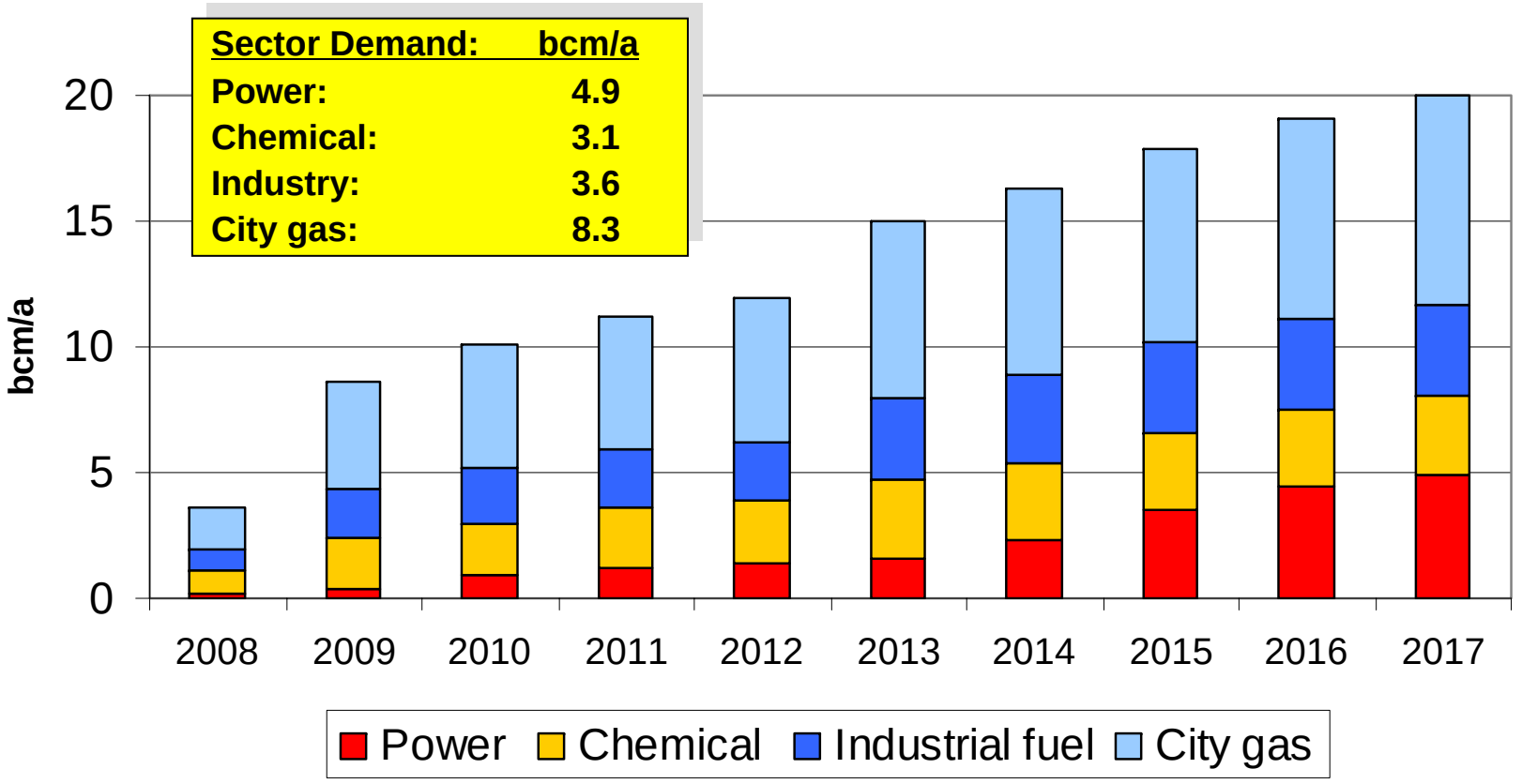
9 year build-up to plateau for export.

5. Market - Russia (2/4)



- Strong potential for growth
  - energy markets increasing by 2.5% - 3.5% p.a.
- Early regional supply could start as early as 2006/7
- Total gas demand of 4bcm/a by 2012
- Major consumption in heat generation and power sectors

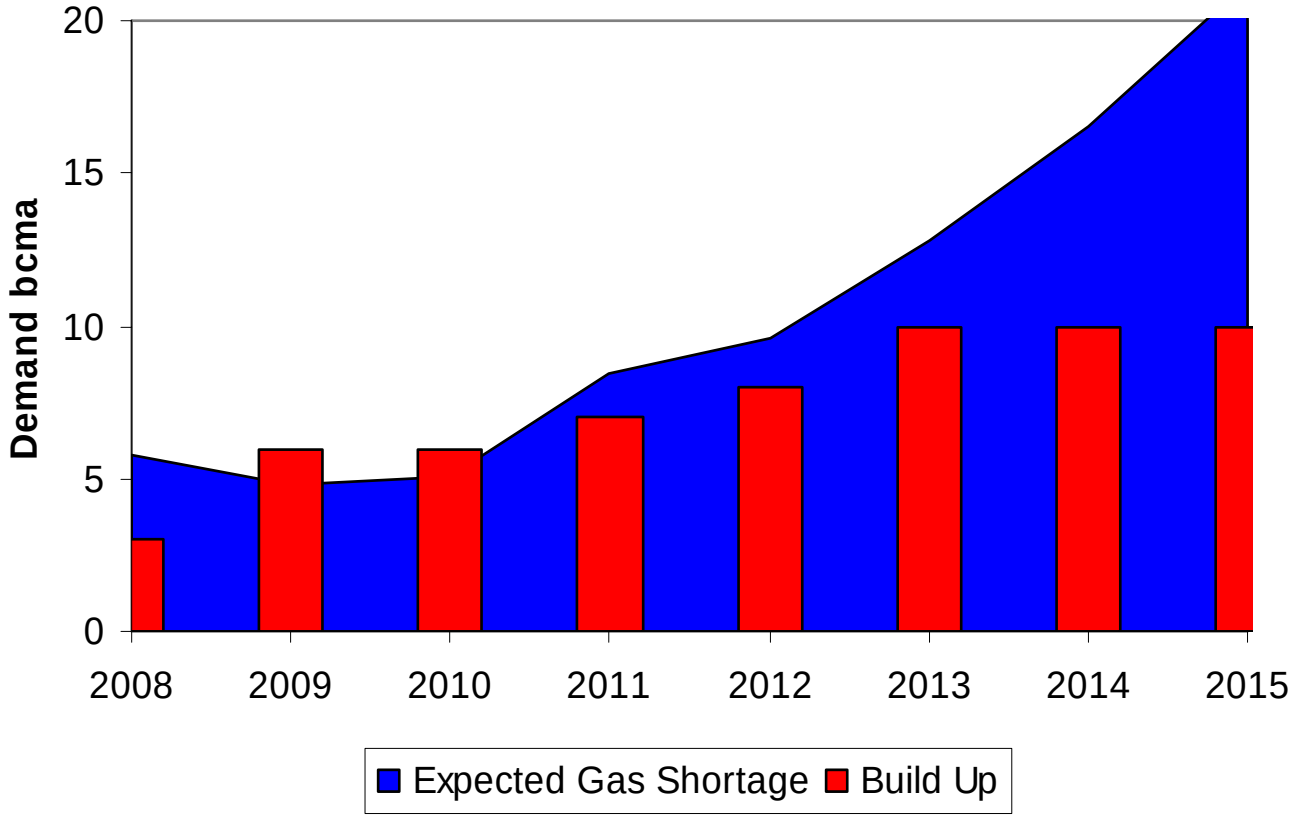
5. Market - China (3/4)



- China market is ready for Russian gas imports
- Economic growth and population will result in significant future demand growth

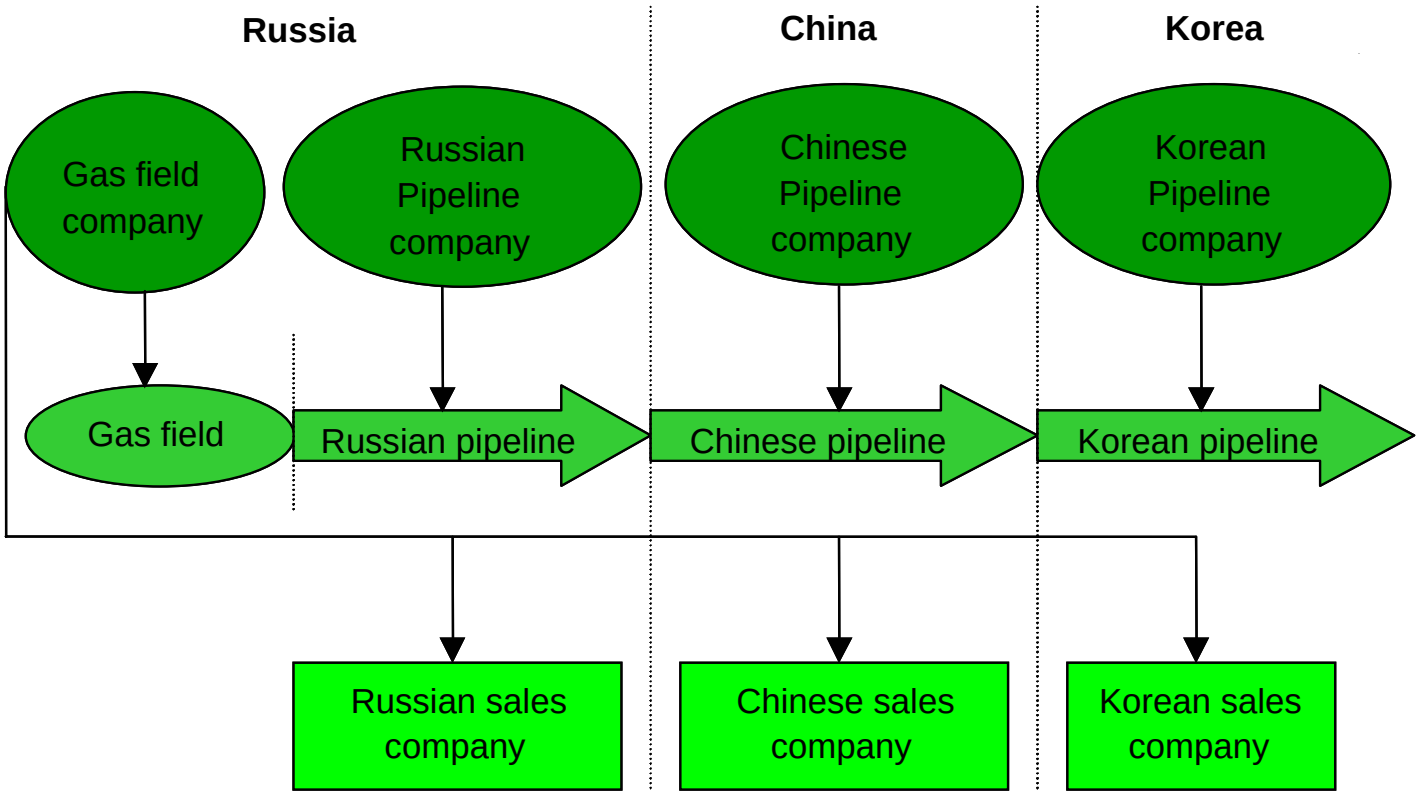
5. Market – Korea (4/4)

Expected Gas Shortage & Build-up for Kovykta Gas



- **Target Market: Power Plants & Industries**
- **Competing Fuels: Heavy Fuel Oil, Coal, and LNG**

6. General : Business Organizational Model (1/2)



A number of different business models have been evaluated

The IFS recommends a segregated model by both country and function

6. General: Legal, Financing, Taxation (2/2)

Legal & Contractual Issues

- PSA status / GSPA
- Intergovernmental Agreements

Financing

- Project Finance will be required given scale of investment
- Involvement of international agencies and commercial banks

Taxation System: Needs to be stable and favourable to encourage investment

Economic Analysis & Gas Pricing

Results indicate that the project is economically viable under conditions

7. Conclusions in IFS

A. Project is technically and commercially viable – IFS objectives have been met by the parties

- **Sound Markets and Proper Reserves**

B. Project will be beneficial to both governments, customers, suppliers & investors.

C. Development of the project will require significant investment and create a large number of jobs

D. Development of NEA and Provision of clean energy for the 21st century

E. Government support for the project will be critical

8. Meanings of IFS and Way Forward

A. Joint-working Experience and Outcome of IFS is a cornerstone to understand each other for expediting Implementation of the Project

– Very Serious Study Supported by Three Governments

B. Governments have recognized that Government supports are critical

C. Way Forward

- The Authorized Exporter and Pipeline Owner to be selected by Russian Government

- Negotiation to set beneficial price both to seller and buyers

- Optimization through Further Engineering to reduce the Cost Estimation.

- Launching the official Inter-government discussions among three countries

- Further Efforts to develop Win-Win Program by Trilateral Governments and Business Sectors

III. Brief Overviews on Future Studies of Gas Projects in NEA

- -

1. By Gazprom (Russia)
2. By Chinese Gas Association (China)
3. By Northeast Asian Gas & Pipeline Forum
4. Japan
5. Korea

1. Russia (1/2)

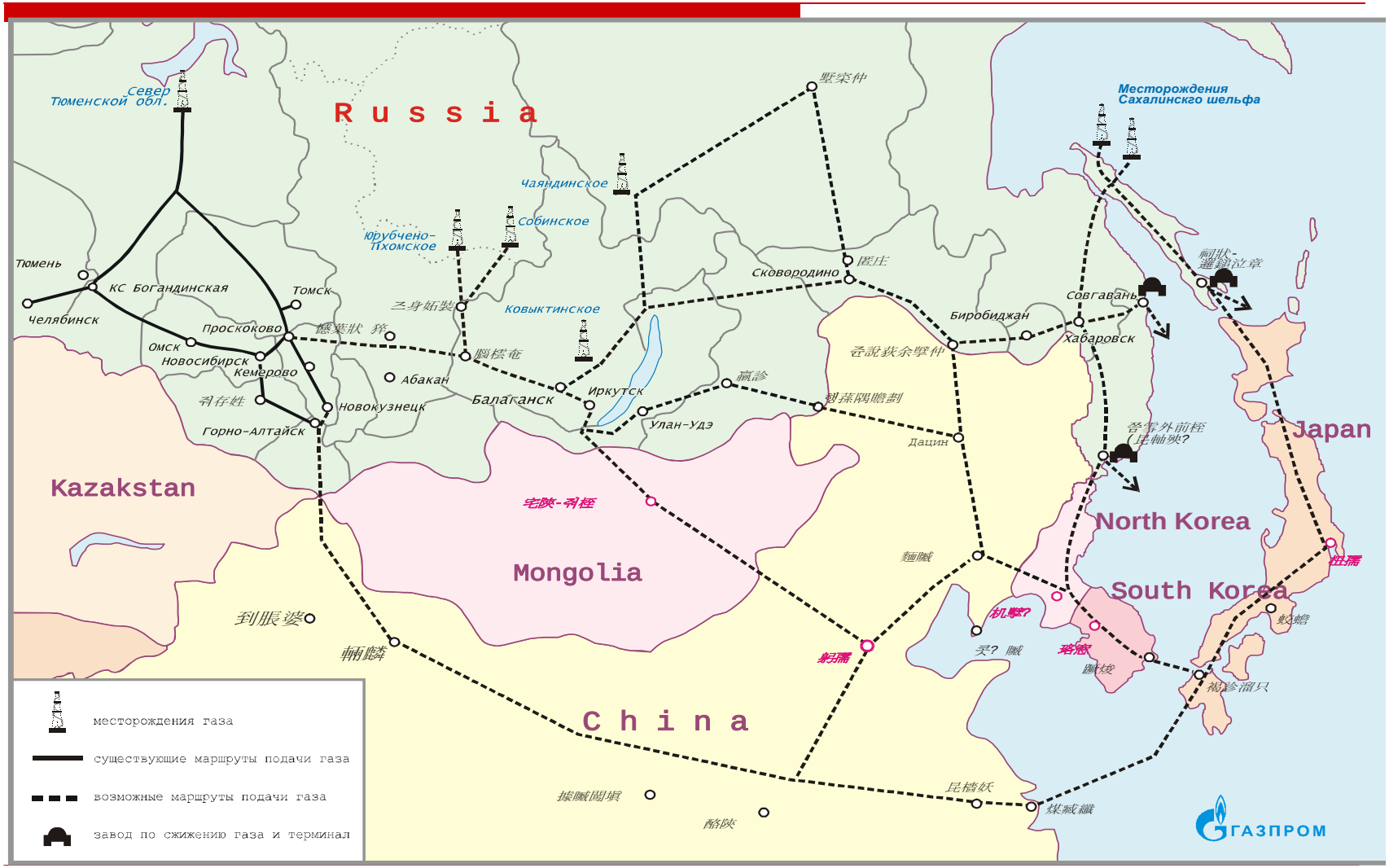
A. Proven Natural Gas Reserves have been increased to find out the Markets

- Kovyta, Sakhalin, Sakha, etc.

B. Strong Government Policy to develop the Unified Gas Supply System

Source : Gazprom

1. Russia (2/2)： Gas Pipeline System in 2050 (Gazprom)



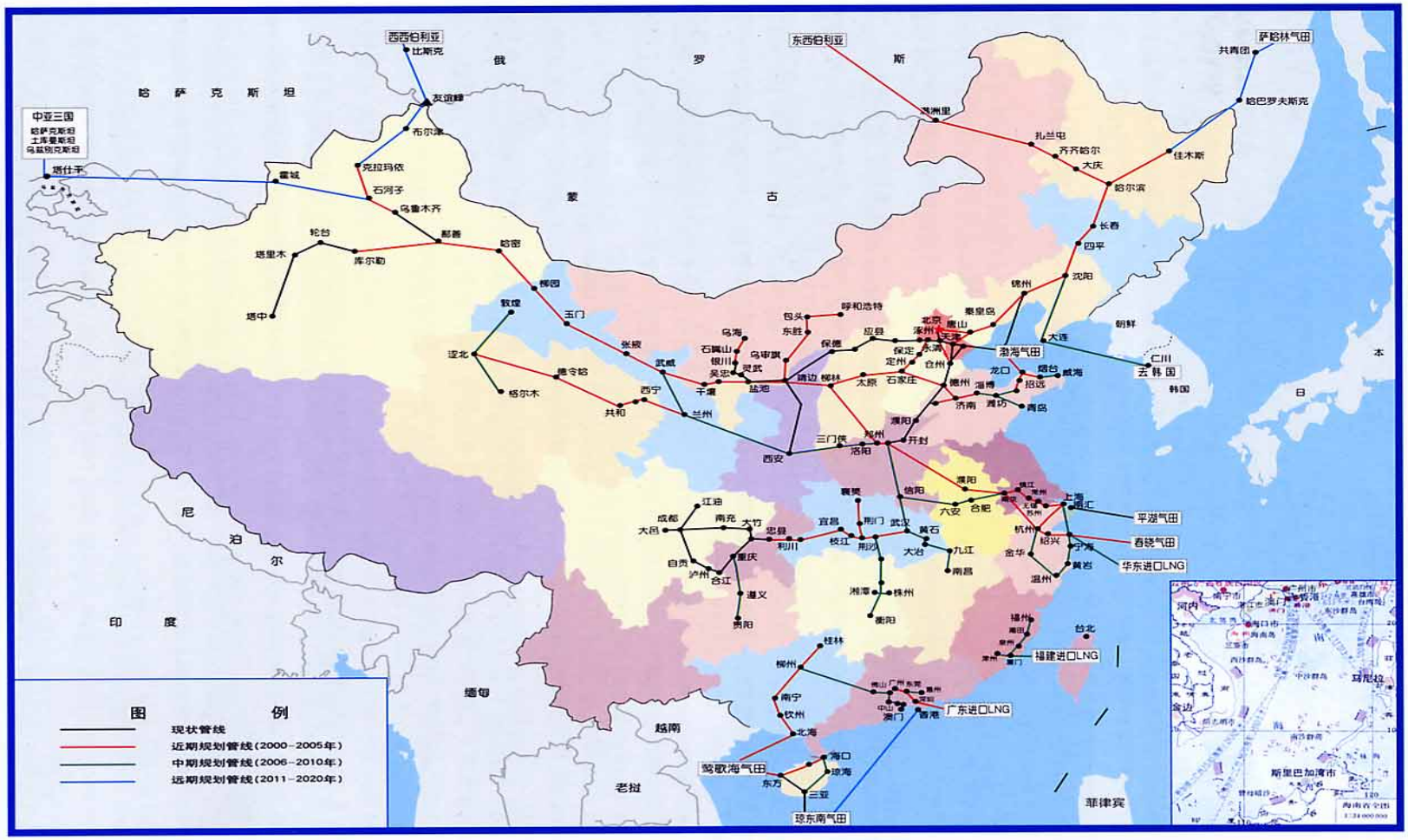
Source : Gazprom

2. China (1/2)

A. Successful Projects (West Gas to East Project, LNG Projects)
B. Economic Developments as One of the Big Economies and Robust Gas Demand

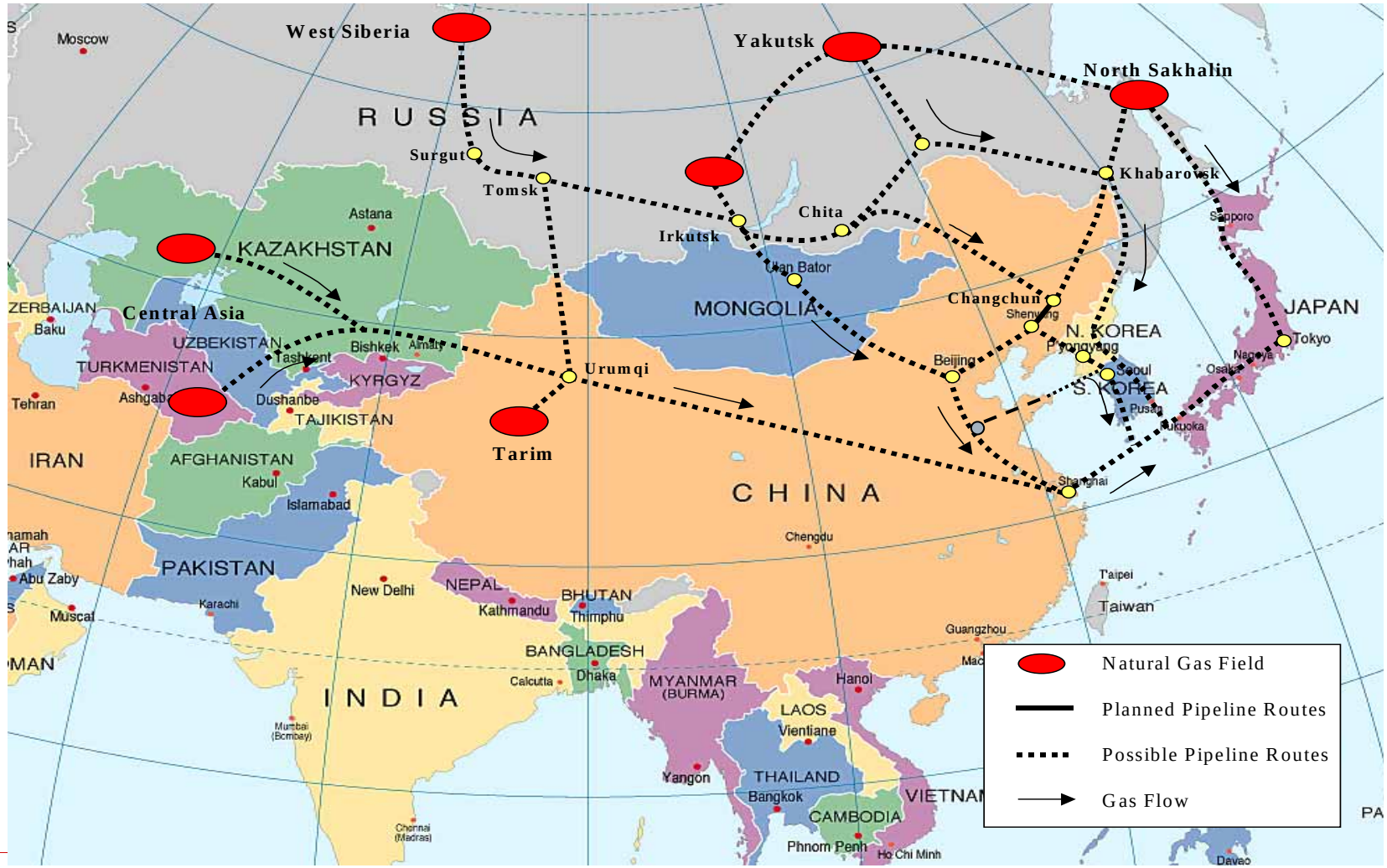
West Gas to East Project

2. China (2/2) : Chinese Gas Pipeline System in 2020



Source : Chinese Gas Association in 2002

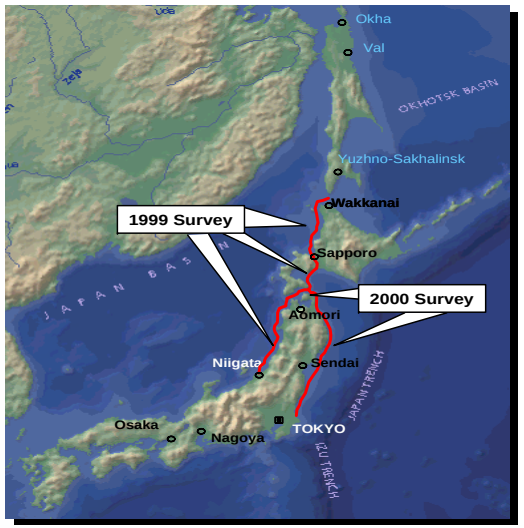
3. NAGPF's Pipeline Route Map in NEA



Source : Northeast Asian Gas & Pipeline Forum (NAGPF) in 2002

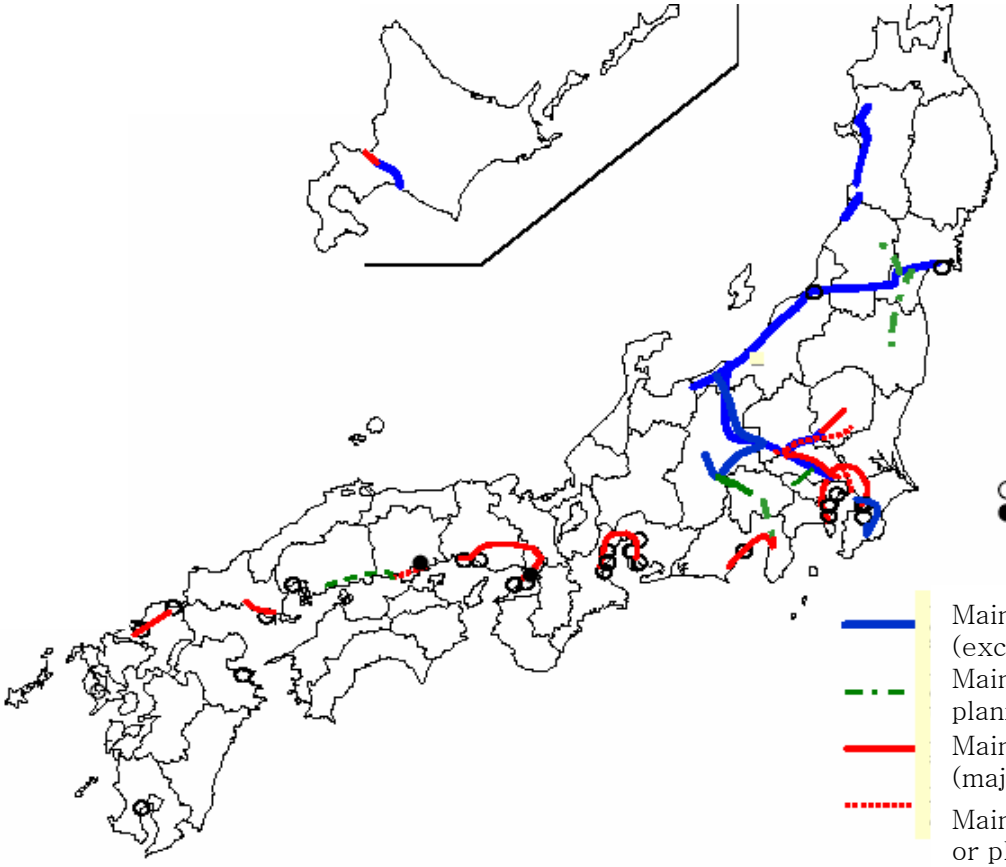
4. Japan

Study on PNG Project from SA-1



LNG Receiving Terminal and Pipeline Network

- LNG Based Supply System



○:L LNG Terminal (existing)
●:J LNG Terminal (under construction)

Main Gas Pipeline [existing] (except major gas company)

Main Gas Pipeline [under construction or planning] (except major gas company)

Main Gas Pipeline [existing] (major gas company)

Main Gas Pipeline [under construction or planning] (major gas company)

4. Korea

LNG Receiving Terminal and Pipeline Network

- **LNG Based Supply System**
  - 3 terminals and 2,460 km national grid
- **Two Options to import natural gas**
  - LNG or PNG
- **Intention to implement international PNG Project**
  - **diversification and security of energy sources for the long terms**

IV. Conclusions (1/3) : Value of PNG Projects in NEA

- **Contribution to Economy, Public Welfare and Environments in NEA over 50 to 100 years (during the Project Life Time)**

  - Beneficial to both Exporters and Importers

  - To build "21 Century Energy Express Way" through Int'l Cooperation

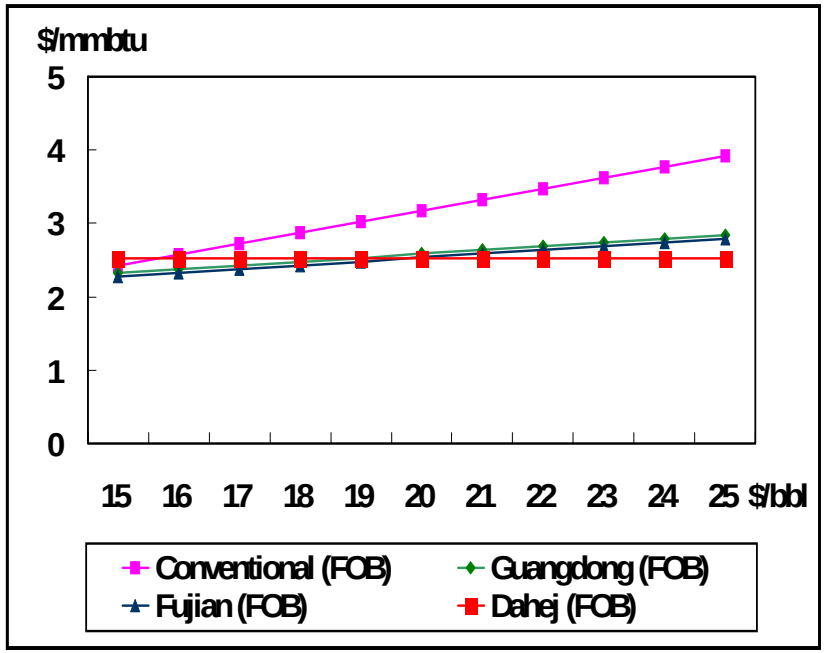
- **Emergence of Integrated NEA gas market through construction of International Pipeline Infrastructure**

- **Diversification of Energy Sources and Enhanced Security of Gas Supply**

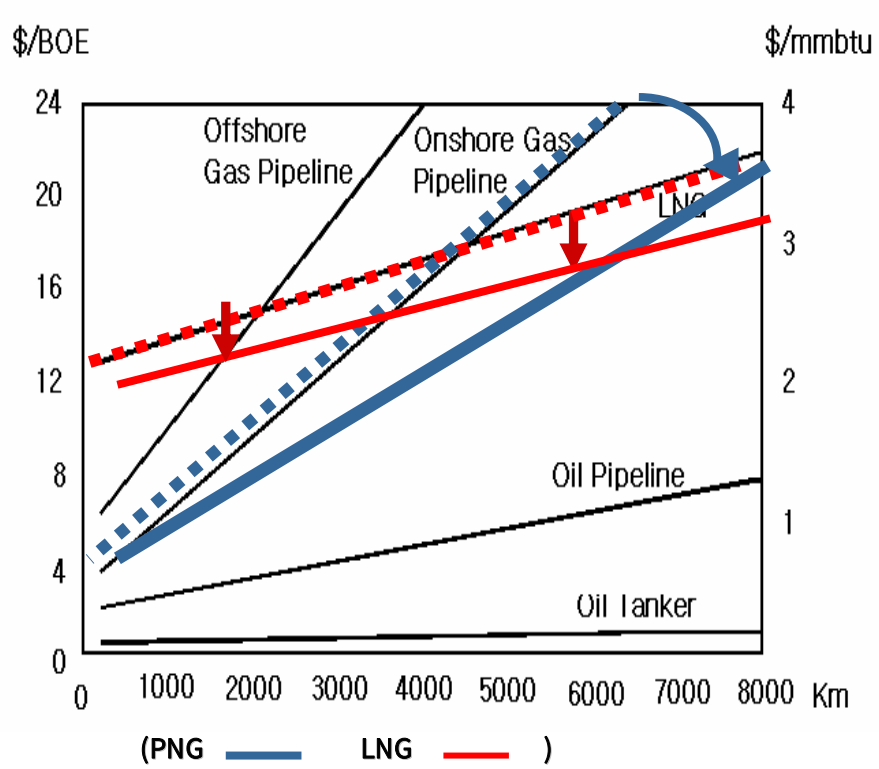
IV. Conclusions (2/3) : Perspectives

- **In the short term, Current LNG Markets including Sa-2 LNG Project will stimulate PNG to be more flexible and competitive**
  - **Otherwise, Potential Markets in China, Korea & Japan will take LNG**
- **China will continue to promote Domestic Projects, as well as LNG Projects and International PNG Projects**
- **In the mid and long term, PNG will also play an important role in NEA Gas Markets**
  - **Realization of PNG Projects will be heavily dependent upon strong Government support and Close International Cooperation**

For Reference :



Estimated LNG Import Prices in Asia



It is the time for PNG to be evolved through international cooperation

IV. Conclusions (3/3) : Suggestions

- **Intergovernmental Cooperation and Agreement are crucial**
  - **Need of Win-Win Program and harmonization of different Legal and Tax Systems, Level of Economy, Political System, tariff system, etc between countries**
  - **Strong Supports to construct International Gas Infrastructure**
  - **Government Approval on large volumes of gas import for better economics**
  - **Selection of Sound Project Players and favorable investment Conditions**
- **Close Cooperation and Compromise between Project participants**
  - **Adoption of Optimal Project Management to reduce CAPEX/OPEX**
  - **Lower profitability may be compensated by gaining of long-term project security from the government**
  - **Continuous efforts to realize the Project with the long-term point of view**

Thanks You !!!