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Diversifying Energy Sources of Northeast Asia

**Role of Government Initiative
toward
Sustainable Development**

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1. China and Northeast Asia

1) China's Impact on Northeast Asia

1980s: Industry Enhollowment

1990s: Export of Deflation

2000s: Resource Inflation

China's Demand: 2003		International Market
Oil	+10%	WTI hitting \$35/Bbl
Coal	+14%	Spot price hitting \$40/t
Power	+15%	(Serious power shortage in industrialized region)
Steel	+20%	Term price for 2004 soaring 20%

2) Interdependence develops in Northeast Asia

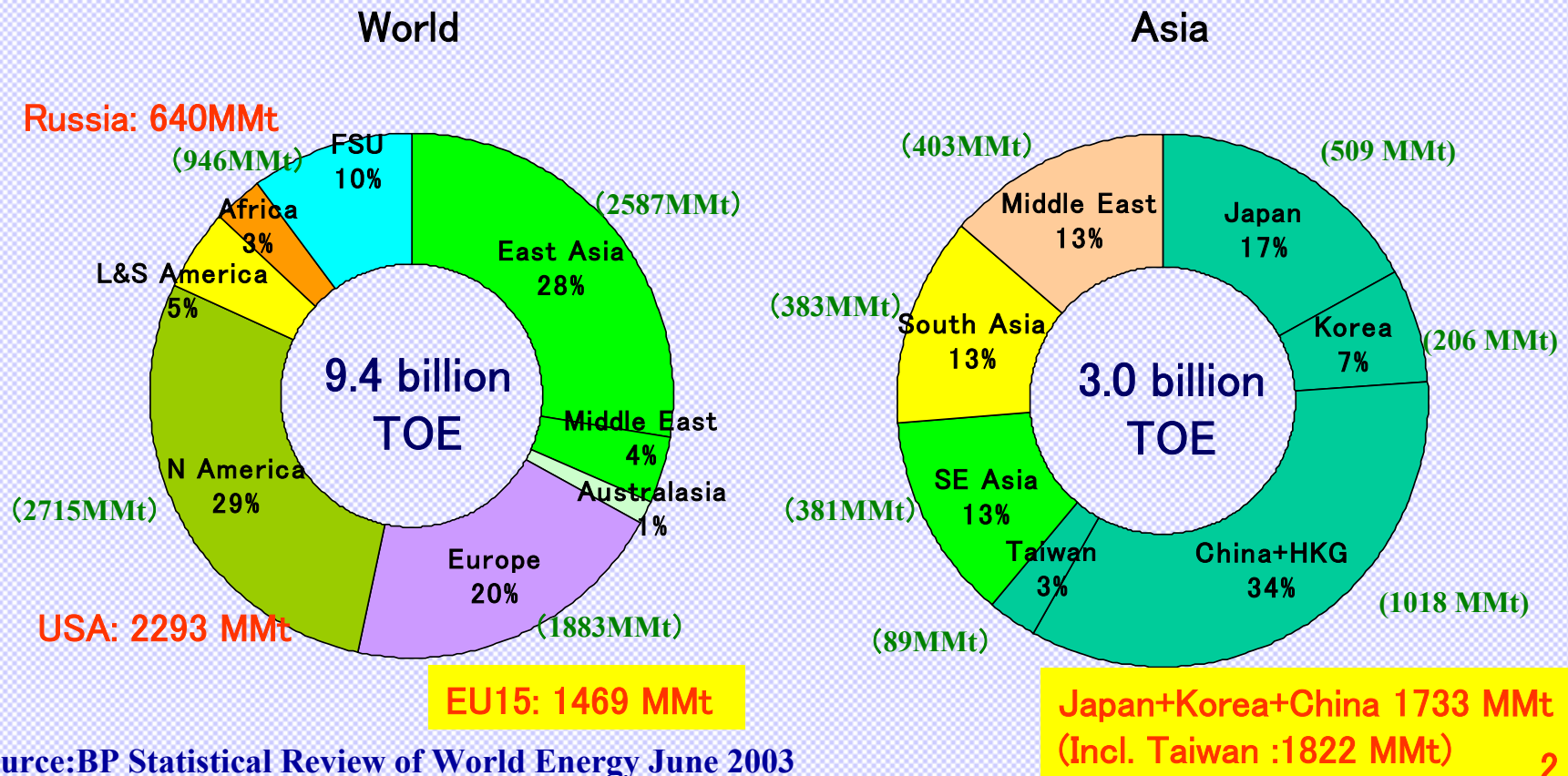
- * Increasing regional trade: China is No.1 trade partner of Japan
 - * Economy and Industry will be further consolidated with China's accession to WTO: 2880 Japanese firms invested in China
- China's problem is the region's problem to be mutually solved.

3) Among others, Energy Supply is one of the most serious challenges for sustainable development of Northeast Asia.

- * Harmony with Environment should also be considered.

1.1 World and Asian Energy (TPE):2002

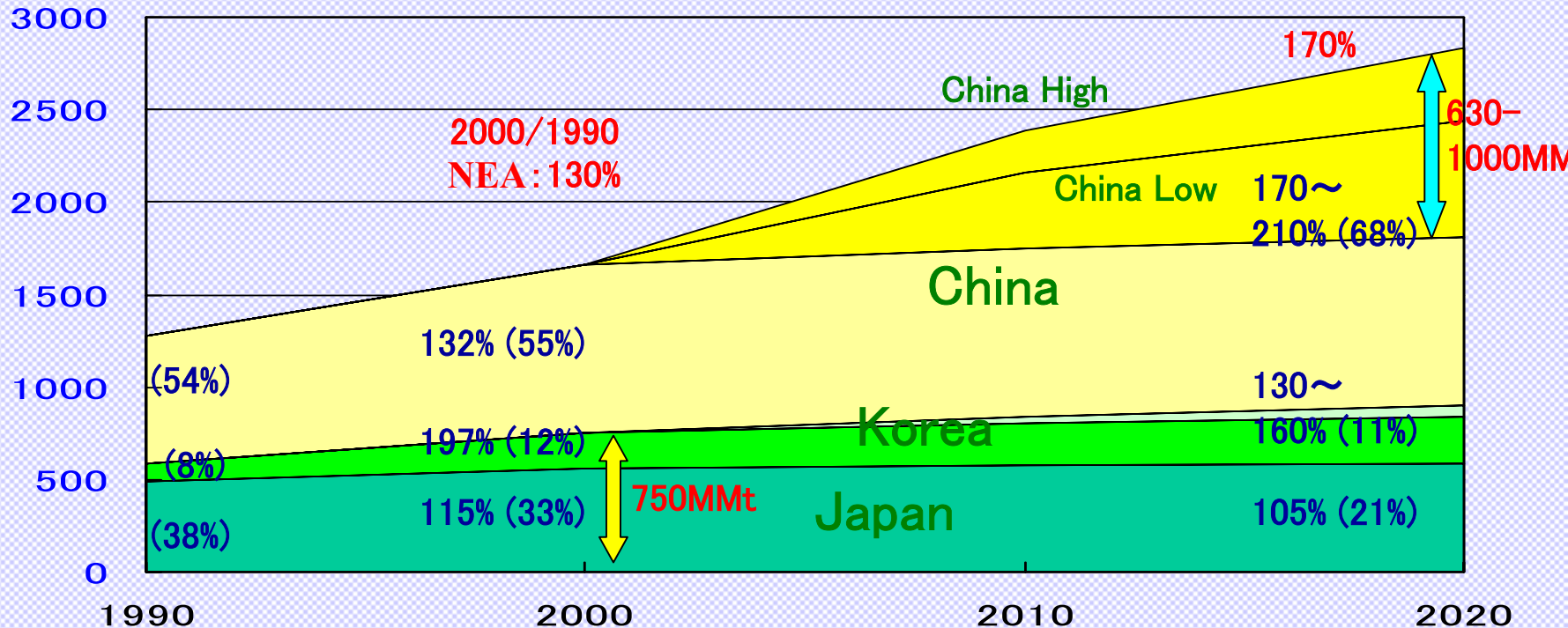
- 1.Asia shares 30% of the world primary energy (TPE) consumption.
 - 2.Energy consumption of Northeast Asia exceeds that of EU 15 countries.
- Securing stable energy supply is an important policy objective



1.2 Energy Outlook of Northeast Asia

1. **Japan:** Moderately leveling off.
2. **Korea:** While recorded rapid increase of energy consumption in 1990s, growth will become moderate.
3. **China:** Continues rapid increase driven by high economic growth, and, with vast land and big population, **absolute increase is huge.**

MMt Oil Equivalent



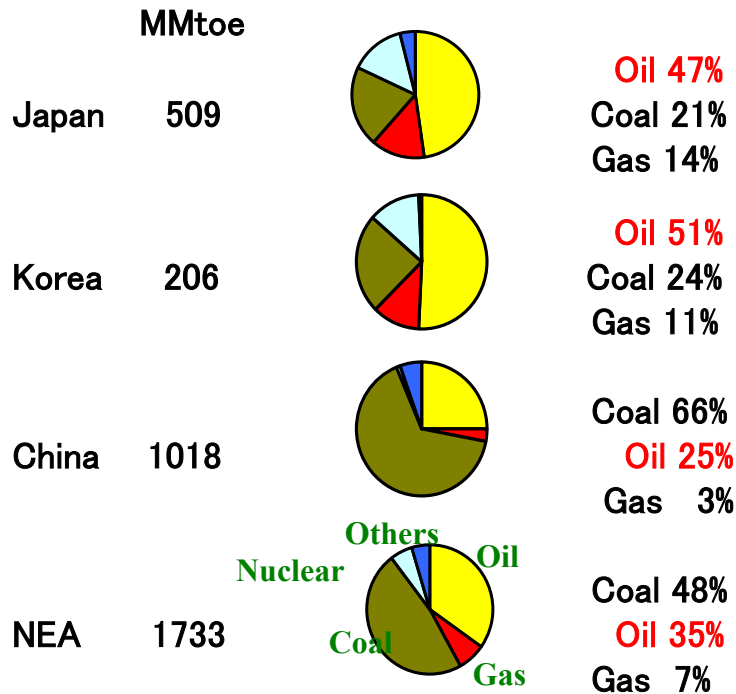
1.3 Energy Structure and Oil Import

1. Oil and Gas play major role in Japan and Korea.
2. Coal dominates in China.
3. Northeast Asia depends on Middle East over 3/4 of the crude oil import

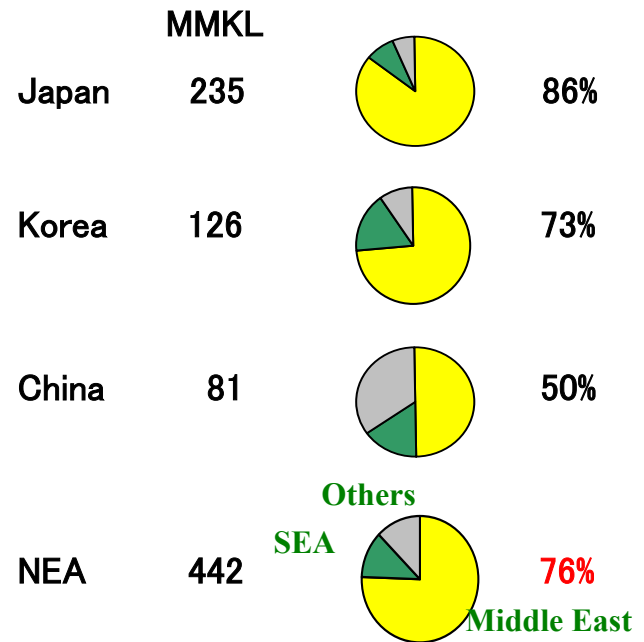
Challenges... Oil and Gas: Sufficient supply and stable price

Coal : Sufficient supply and environment protection

Energy Consumption: 2002

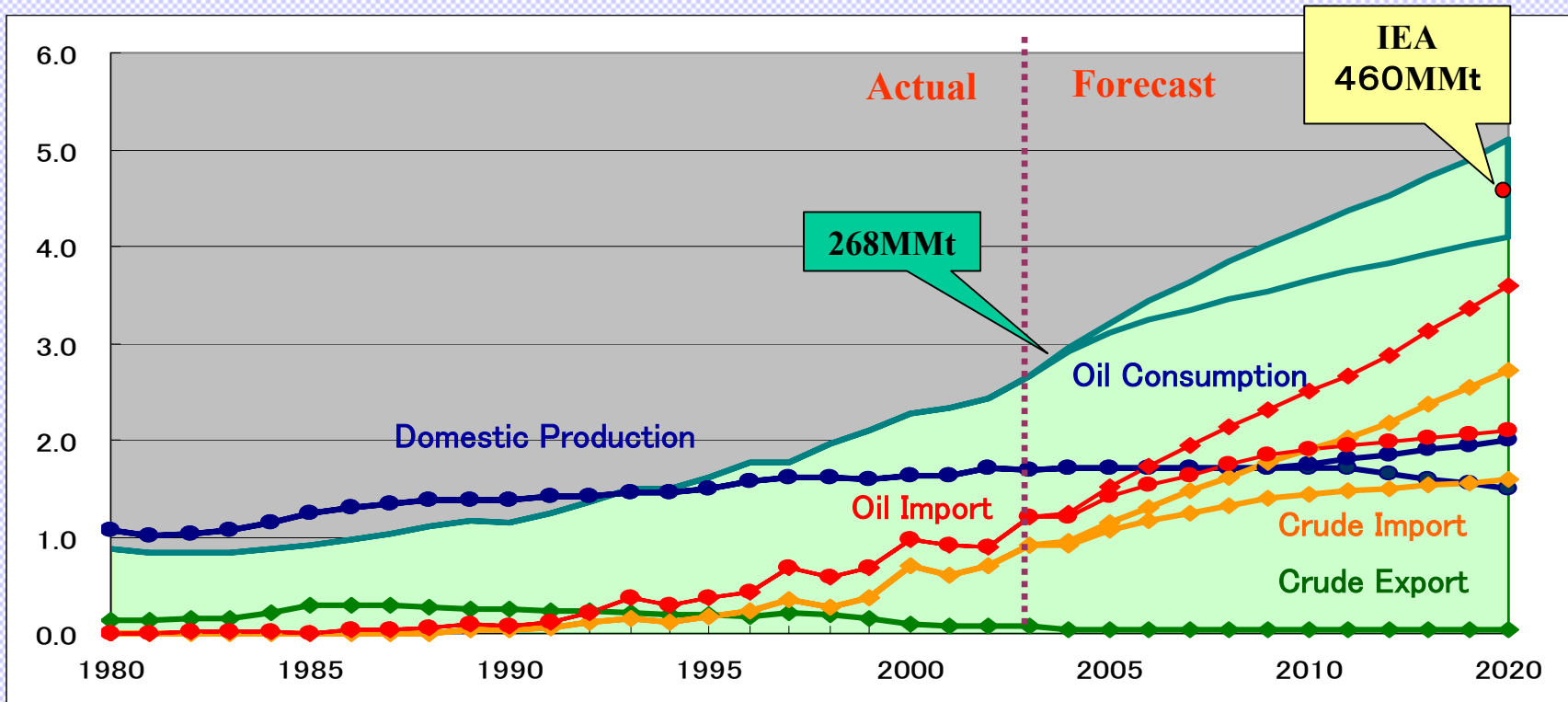


Crude Import by Source: 2002
ME Ratio



1.4 China's Petroleum Outlook

- Oil consumption will continue to grow rapidly, while domestic production will be leveling off despite intensive exploration efforts, as traditional large fields such as Daqing are maturing.
- Current trend indicates huge increase of oil import, exceeding 300 MMt in 2020. → Increasing dependence on the Middle East is inevitable.
- A dream plan?? Manage demand at 400 MMt and increase domestic production to 200 MMt to control oil import at 200 MMt in 2020.



2. Energy Challenges facing Northeast Asia

Facts

1. Mismatch of demand and supply in Northeast Asia
 - a. Northeast Asia is facing energy shortage, short term and long term.
 - b. Huge energy resources undeveloped in eastern Russia; oil, natural gas and hydro-power.
2. Serious environment pollution in China by heavy use of coal
 - a. Thermal power, mostly coal fired, shares over 80%.
 - b. Without flue gas treatment, 20 million tons of SO_x is released annually.

- Concerns**
1. Sufficient and stable supply : Middle East dependence
 2. Stable price : Asian premium of the Middle East oil
 3. Environment : Clean Coal Technology + Cleaner fuels

Policy Objectives

- a. Energy conservation with proper environmental protection
- b. Rationalizing/diversifying energy structure : introduction of natural gas
- c. Increasing regional/domestic supply
- d. Diversifying supply sources

Natural gas will be the right answer to the above.

2.1 Improving Energy Security

Energy security for short term and long term

1. Short term turbulence?

Caused by extreme weather or unexpected disruption?

Then, cures are to eliminate anxieties and speculations + quick response

a. Recognizing position : Quick and accurate information and statistics

b. Reinforcing supply flexibility and preparedness :

Stock Piling + Emergency Response Program

2. Long term mismatch ?

Caused by

a. Demand movement difficult to control or predict

* Abrupt market enthusiasm : car, air conditioner, etc.

* Untransparent policy ; laws, guidance and enforcement especially on pricing and environment protection

b. Long lead time required for supply facility increase

* Mismatch in market accumulates for years while symptoms are not noticed or properly taken care of

Cures are to increase supply developing new energy projects, which are huge and time-consuming, by proper navigation and initiative.

2.2 Potential Energy Projects in NEA

Measures to increase energy supply in Northeast Asia

a. Upstream resources : located in frontier area of eastern Russia

Coal, Crude Oil, Natural Gas and Hydro Power

b. Transportation Infrastructure :

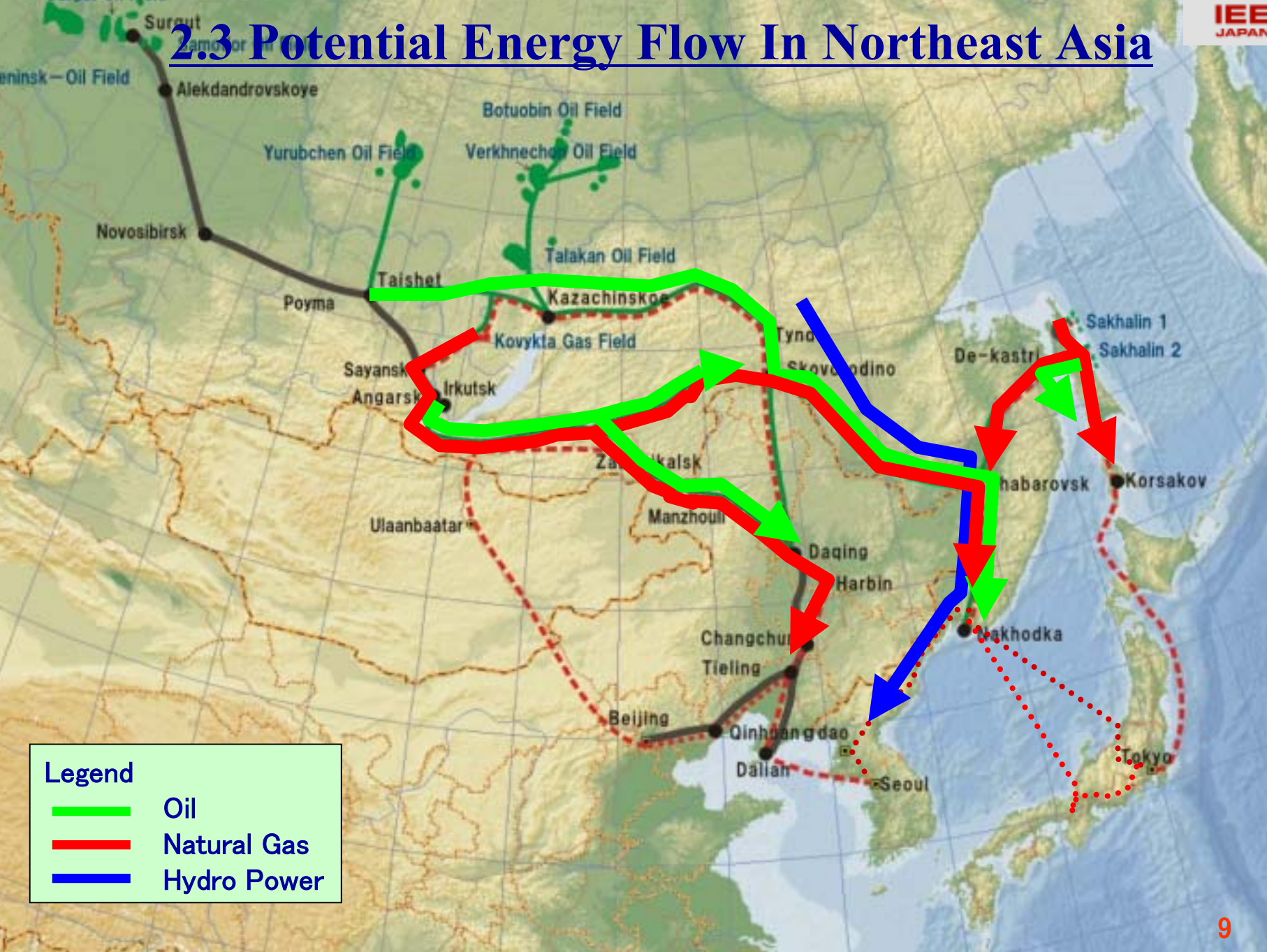
Railway, Long Distance Pipelines and HV Transmission Lines

c. Market : growing Chinese market is untransparent

Can the market forces work and autonomously link them?

	Upstream	Transportation	Market
Coal	Rich resource Abundant low quality coal	Railway and shipping port congestion	Japan & Korea : Available China : Heavy use causing serious pollution
Oil	Potentially rich, but yet to be confirmed	Pipeline is huge but relatively cheap	Readily available
Natural Gas	Rich potential	Pipeline is a huge project and costly	Japan & Korea : Maturing China : Yet to develop
Hydro Power	Rich potential	Transmission is very costly	Japan & Korea : Matured China : Main market is remote

2.3 Potential Energy Flow In Northeast Asia



Legend

- █ Oil
- █ Natural Gas
- █ Hydro Power

3. Developing Natural Gas Pipelines in NEA

1. Expected Benefits

- a. Reinforcing region's energy security by increased energy supply and diversification of sources
- b. Improving environment by wide use of cleaner fuel
- c. Reducing transport congestion, fuel and pollution
- d. Developing eastern Russia and enlarging regional trade
- e. Most rational measure to cope with increasing GOR

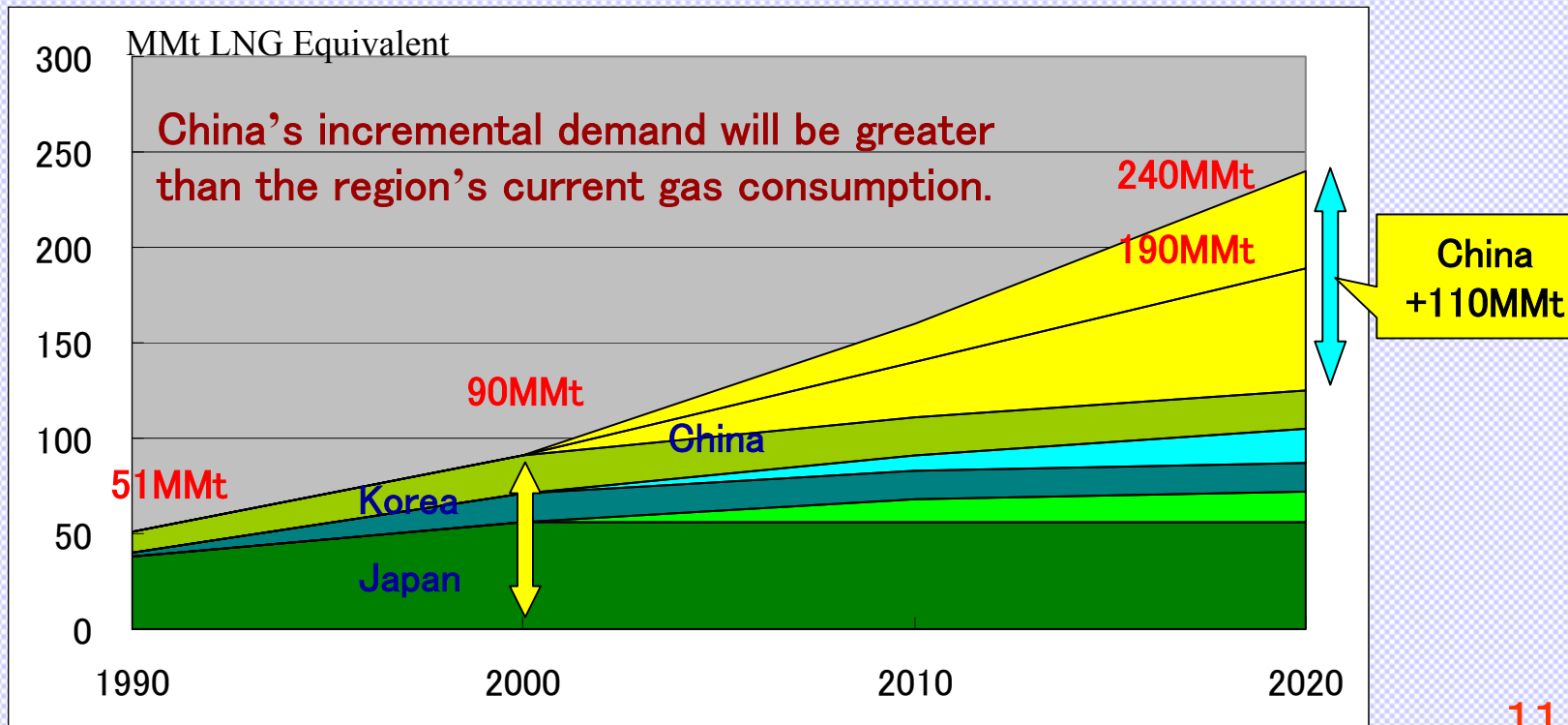
2. Challenges

- a. Resources and markets are very far apart
- b. Demand is not sufficient or transparent
- c. Institutional structures and roles of players are yet to be discussed
 - * Rules for investment, operation, transit and delivery
- d. Project is gigantic for private business

Great social benefit is expected, but cannot be incorporated into commercial project evaluation under business accounting rules !

3.1 Natural Gas Outlook of Northeast Asia

1. Japan and Korea : Market is matured and future growth will be moderate.
 - * Is replacing existing LNG contracts realistic and worthwhile?
2. China : Nationwide gas market is just to emerge
 - ... and is expected to grow rapidly.
 - * Future growth substantially subject to environmental policy
 - * Import via LNG and PNG is planned



3.2 Project Evaluation

1. Characteristics of sectors as Business Model

Upstream	Adventurous with high risk high return	Commercial business type
Pipeline	Stable if resource and market are assured	Utility type
Market	Unpredictable and long lead time	Commercial/utility mixture

2. Project value for implementation

- a. Commercially viable ... qualifying commercial criteria and in a pretty size
- b. Economically feasible ... cost recovery is OK but not commercial,
or too large in size for private sector
- c. Socially required ... social benefit is large but not measurable

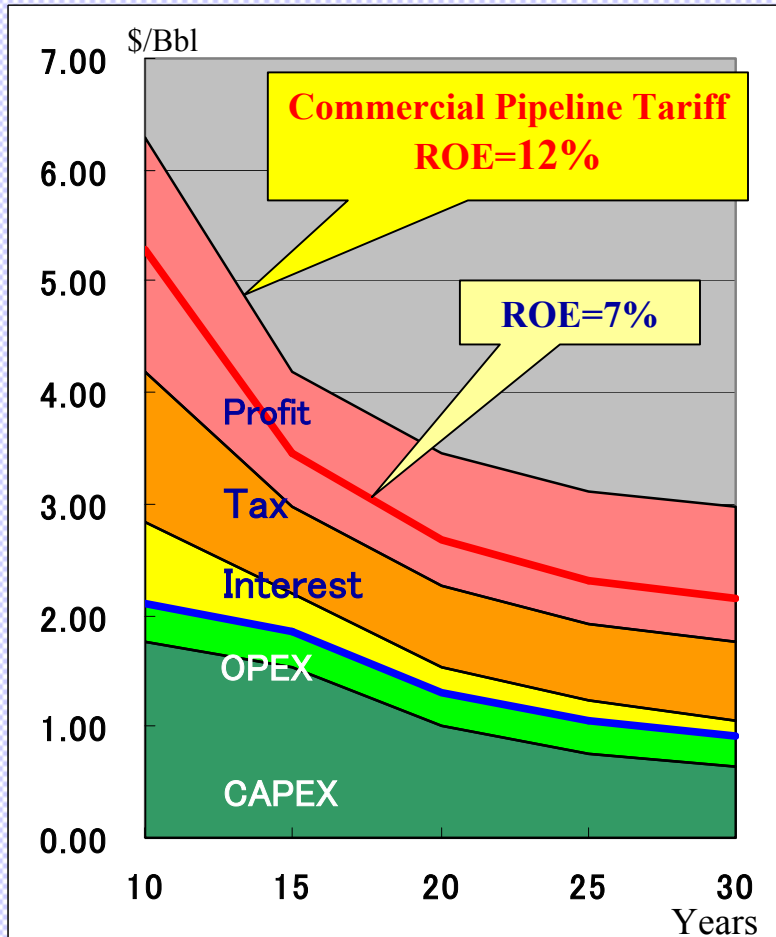
3. Social Benefit at the market is the key, if not commercially viable

- a. Resource potential is huge but remote, thus
economics may be justified if transportation cost is reasonably low.
- b. Pipeline economics is a key, and
can be politically adjusted if substantial social benefit exists.
- c. Social benefit should be defined as political consensus, and
should be more than replacing the existing gas demand.

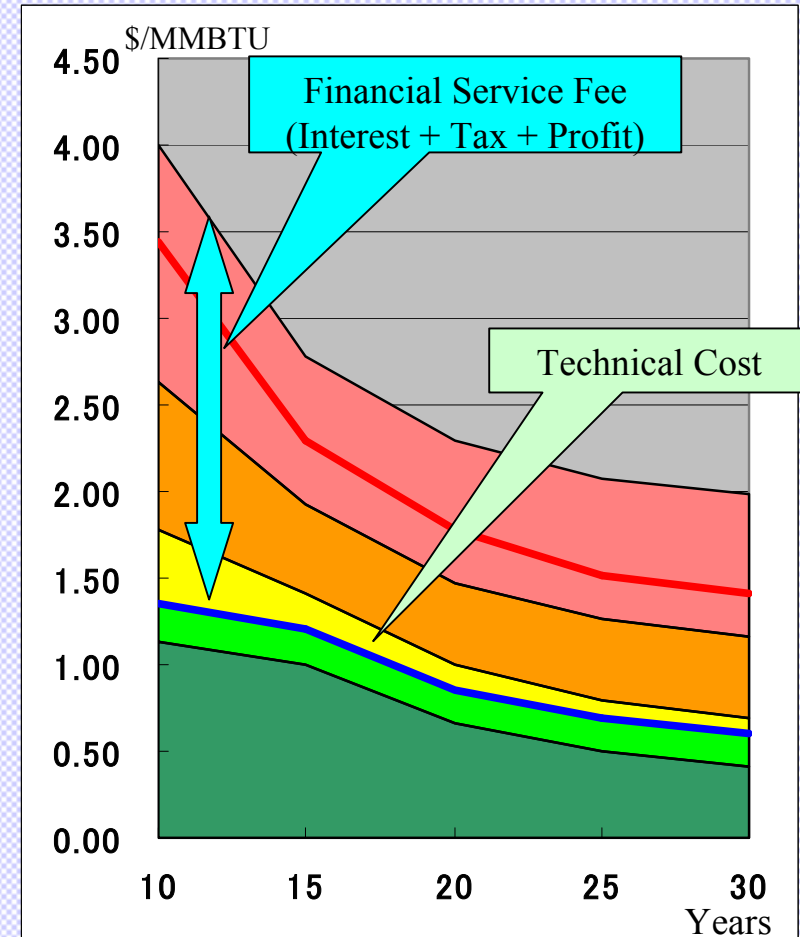
3.3 Economics of Pipelines

Assuming roughly on initial investments for 4000km pipelines

Oil Pipeline \$10 Billion for 2 MMbD



Gas Pipeline \$10 Billion for 30 Bcm/Y



3.4 Economics of Pipelines: Observations

Project term	Commercial Tariff at ROE=12% (A)	Technical Cost (B)	Expected Price (C)	B/A	A/C	B/C
25 years						
	\$/Bbl	\$/Bbl	\$/Bbl	%	%	%
Oil	3.10	1.05	CIF 30.0	34	10	4
	\$/MMBTU	\$/MMBTU	\$/MMBTU	%	%	%
Natural Gas	2.08	0.69	At City Gate 4.00	33	52	18

Oil Pipeline

- * Commercial Pipeline Tariff is about 10% of oil price (\$3/Bbl) OK
- * Substantial improvement over railway transport (\$10/Bbl) OK
- * Market is readily available, as contract term is short and flexible OK
- * Project size is gigantic as private business ?

Natural Gas Pipeline

- * Commercial Pipeline Tariff is more than 50% of gas price ?
- * Market is yet to develop, or tightly guarded by long term contract ?
- * Competition with other gas sources is harsh ?
- * Project size is gigantic as private business ?

3.5 Economics of Pipeline : Conclusion

Pipeline tariff is crucial in realizing the NEA Gas Network

1. **Ratio of Transportation Cost is extremely high for natural gas.**
 - a. In assuring commercial viability, Financial Service Fee (FSF) is enormous.
FSF (Interest+Tax+Profit) is more than double of Technical Cost
 - b. Social benefit of the pipeline (energy security, cleaner environment, etc.) is difficult to include in commercial evaluation by private firms.
 - c. Pipeline tariff can be lowered substantially, because of social benefit,
 - * by lowering commerciality criteria (ROE) and/or tax rate,
 - * by institutional finance only to consider payout of Technical Cost, or
 - * further by subsidizing.

2. **Government role is important in setting forth the financial structure.**
 - a. The aggregate government take is determined by market price, as
Social Benefit + Tax on [Market Price – Overall Project Cost]
 - b. Favors given to the pipeline can be recovered from other sectors.
 - c. The benefit can be realized only when the project is implemented.

4. Role of Government Initiative

Government initiative is essential in implementing the Northeast Asia Gas Pipeline Network

Upstream Sector : Appropriate and clear mining right structure to invite investment by private business firms.

Trunk Pipeline : Financial and Tax structures to enable the trunk line.
Provision of Institutional Finance and Subsidy

Principles of Transit Fee : To be agreed internationally assuring reasonably low and stable rate. Consider it same as inviting foreign investment

- * A transform of corporate tax upon deemed fair return.
- * No other tax on pipeline operation : no influence on pipeline economics.
- * Reasonable fee passing Mongolia : less than 10 cents per MMBTU.

Market : To be identified by clear policies of member countries

- * National energy policy to diversify energy structure
- * National environment policy to introduce cleaner fuel
- * Long term energy plan as navigator
- * Legislation and arbitration system on international pipeline trade

5. Designing NEA Gas Network

Upstream : Mining right may be sovereign. Each government should show clear and coherent policy and rulings.

Form an international forum to discuss the following issues:
the resultant agreement should be legally binding

Trunk Pipeline to Major Hubs :

- * Build under government initiative as social infrastructure, provided that market and social benefits are confirmed.
- * Establish transit rules
- * Branch lines and distribution systems are responsibility of each market

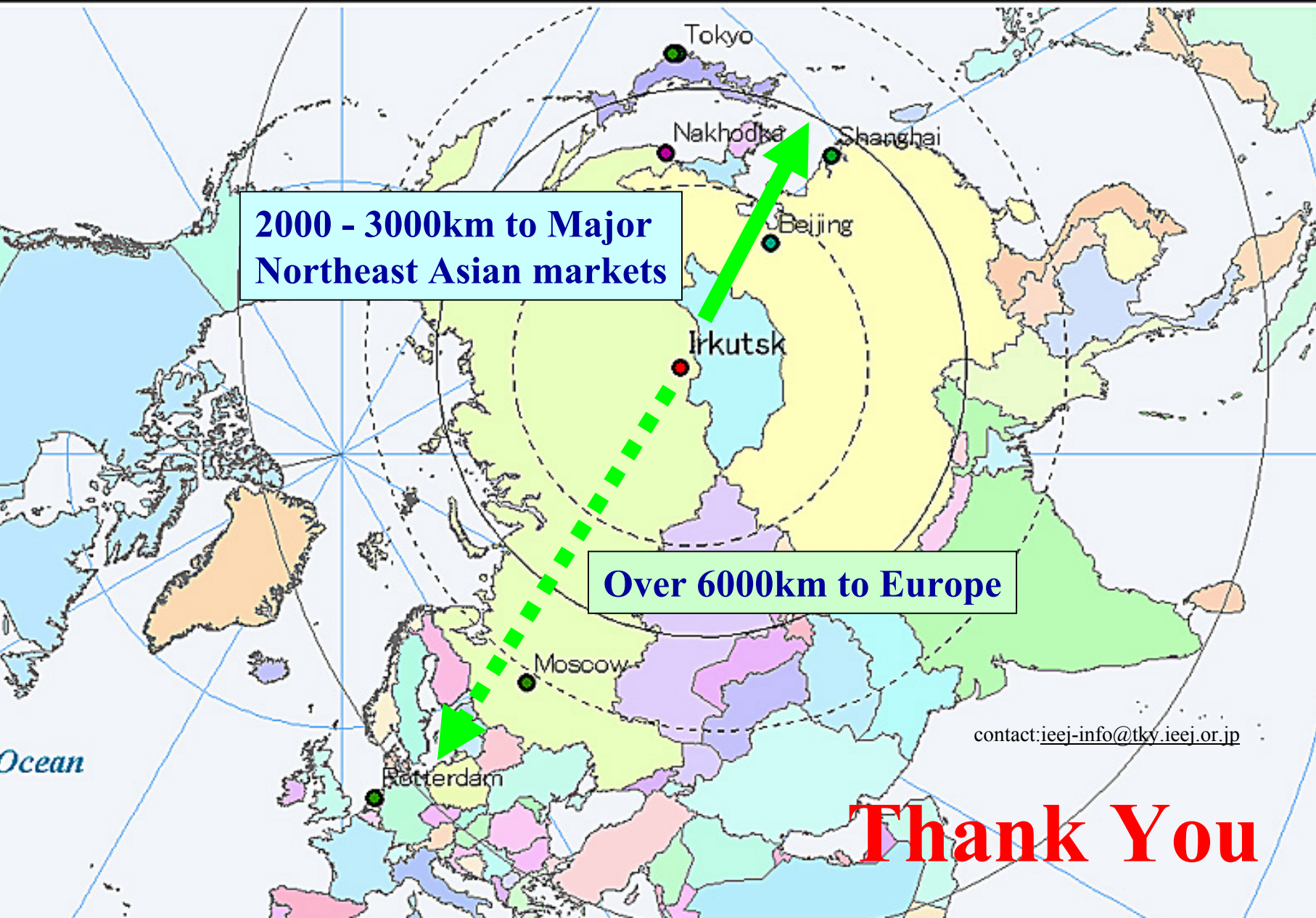
Market :To be identified first by clear policies of member countries:

- * Energy and environment policy
- * Long term energy plans
- * Laws and rulings : coherent and transparent
- * Identify social benefit of introducing natural gas

Replacing the existing market and/or creating new market

Proper market design is essential to encourage private transactions !

World View from Eastern Russia



**2000 - 3000km to Major
Northeast Asian markets**

Over 6000km to Europe

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Thank You