



# ***Post Fukushima Energy Strategy : Energy Security and Sustainability in Asia***

*2012/10/31 Tokyo*

*Sasagawa Peace Foundation and W. Wilson Center*

*Nobuo TANAKA*

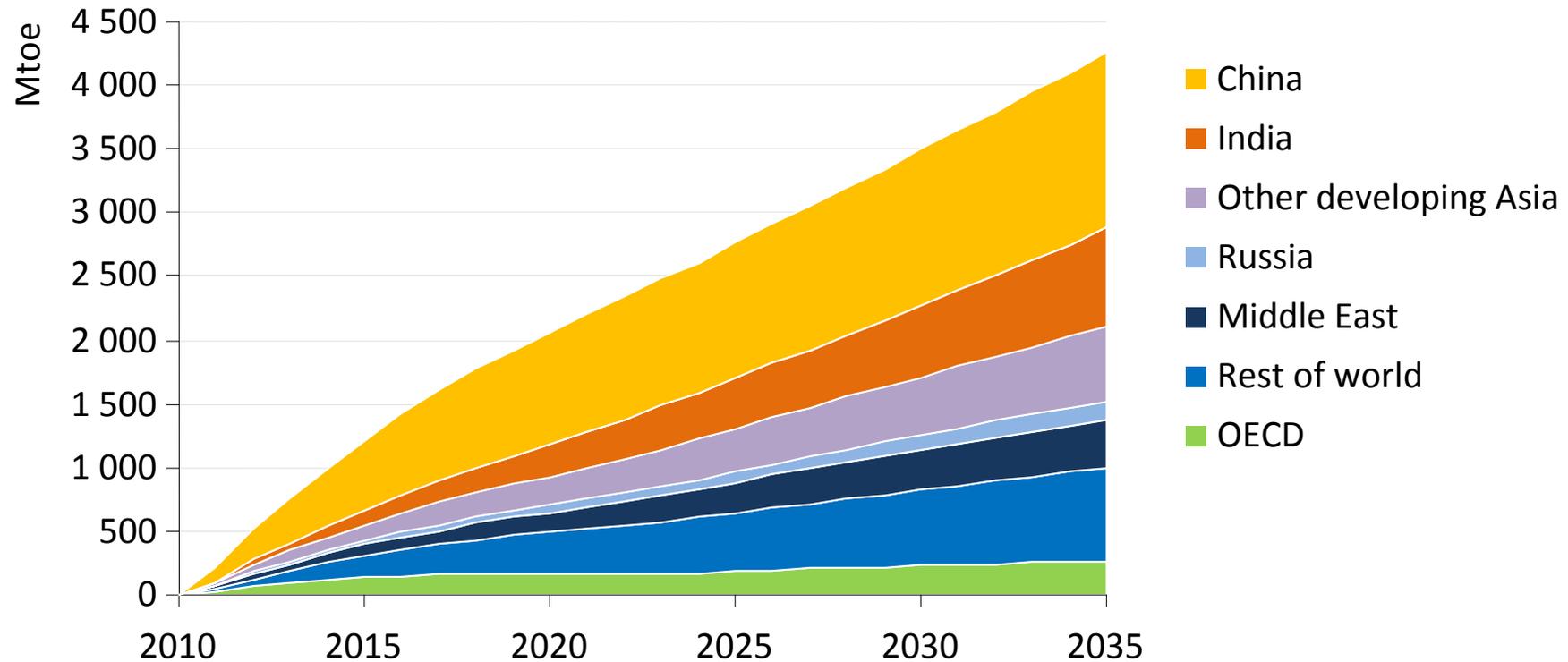
*Former Executive Director of the IEA*

*Global Associate of Energy Security and Sustainability, IEEJ*

# Energy Demand grows in Asia. Energy Security is the issue for Asian countries.

IEA WEO 2011

Growth in primary energy demand

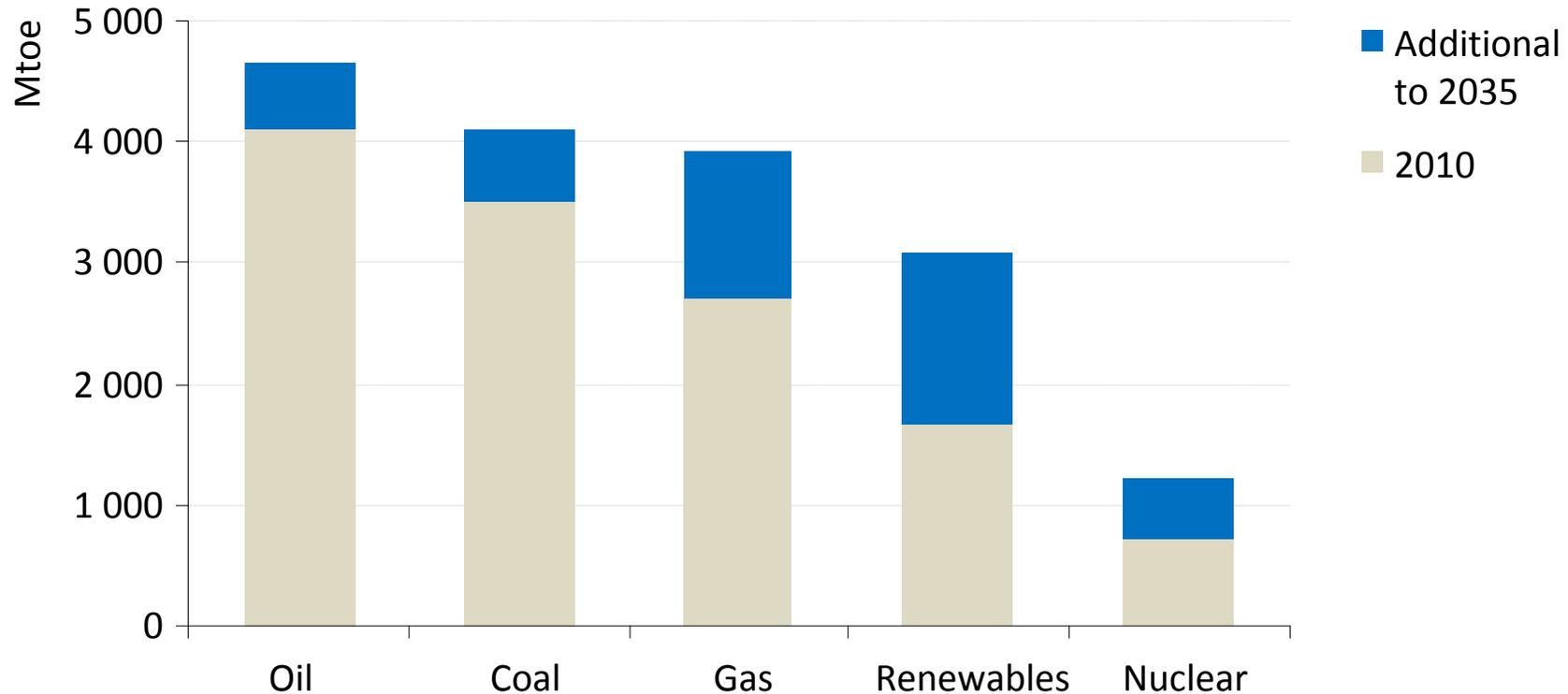


*Global energy demand increases by one-third from 2010 to 2035, with China, India and other Asia accounting for two thirds of the growth*

# New Policies Scenario assumes Natural gas & renewables become increasingly important.

IEA WEO 2011

World primary energy demand

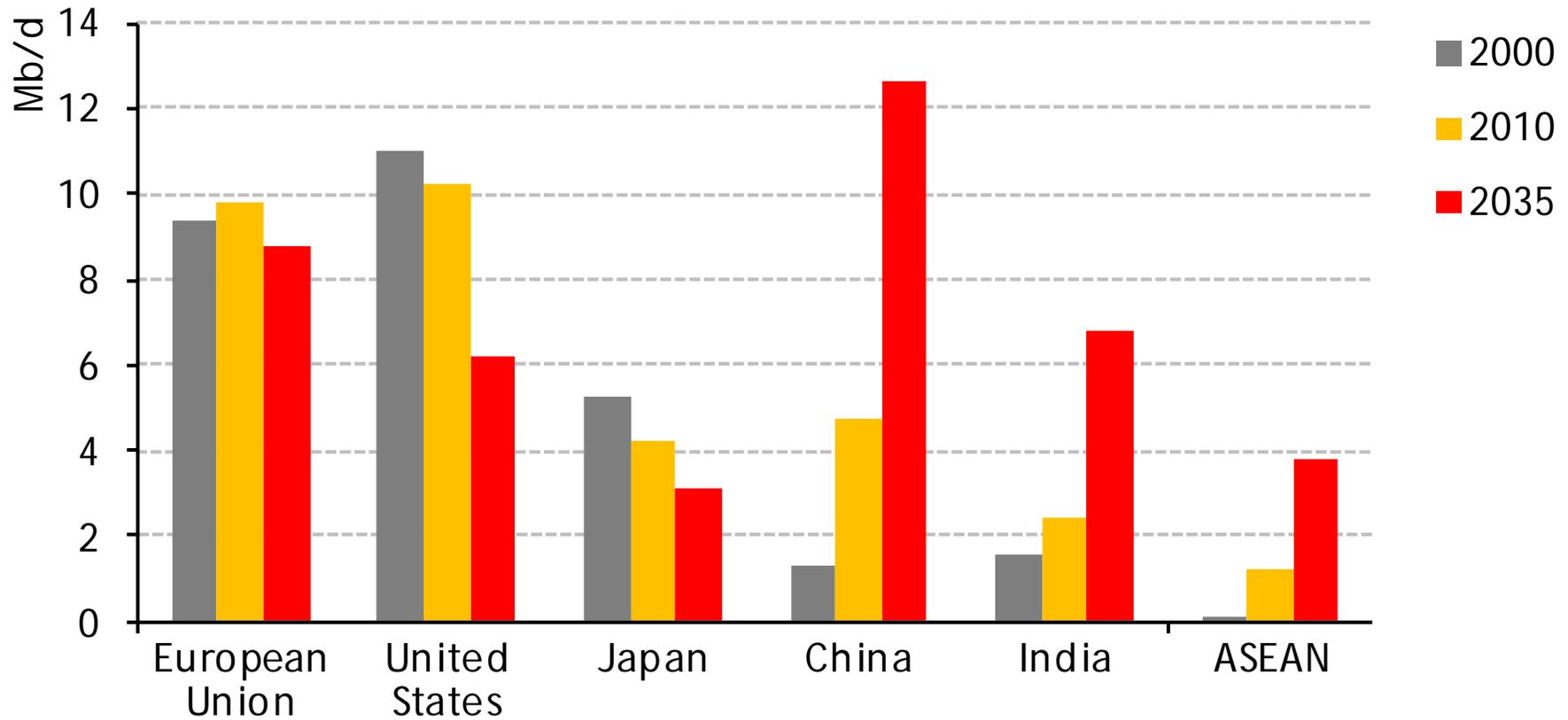


*Renewables & natural gas collectively meet almost two-thirds of incremental energy demand in 2010-2035*

# Oil supply security is particularly the issue for Asia in the 21<sup>st</sup> Century.

Net imports of oil

IEA WEO 2011



***US oil imports drop due to rising domestic output & improved transport efficiency:  
North American Energy Independence is coming! ( WEO 2012 )***

# Iran Crisis and the Hormuz Strait



85% of Japanese oil import  
 20% of Japanese LNG import  
**But if no nuclear reactors are running,,,,,?**

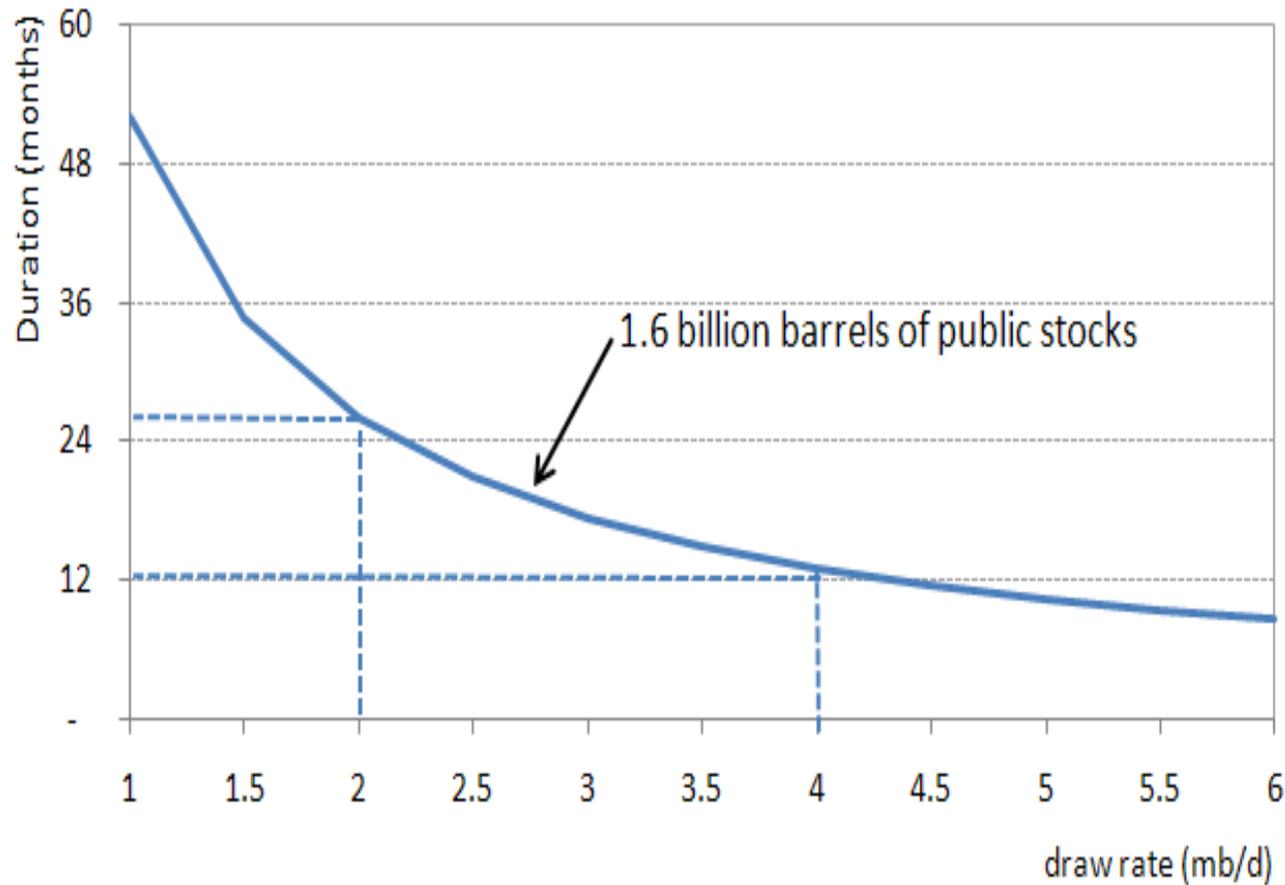
と仮定

17 mbd of petroleum  
 (20% of global demand )

82 million tons of LNG pa  
 (30% of global demand)

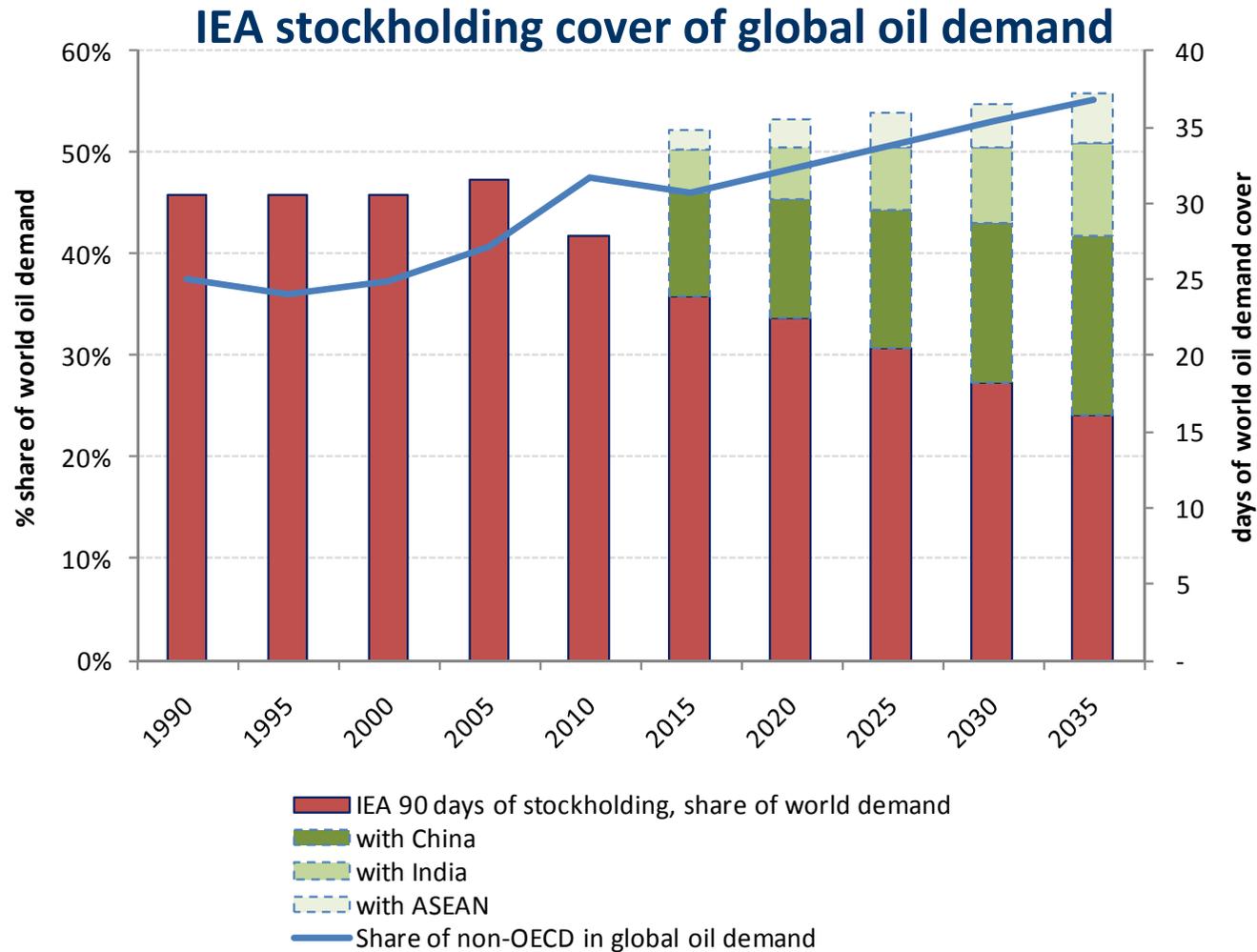


# IEA Petroleum Strategic Stock can relieve 2mbd disruption for 24 months.



1974 disruption was 4.3mbd. 1979 was 5.6mbd. Hormuz blockage is 13 mbd.

# Strategic Petroleum Reserve: Does the current IEA system continue to work?



***Growing share of non-OECD oil demand results in declining global demand cover from IEA oil stocks***

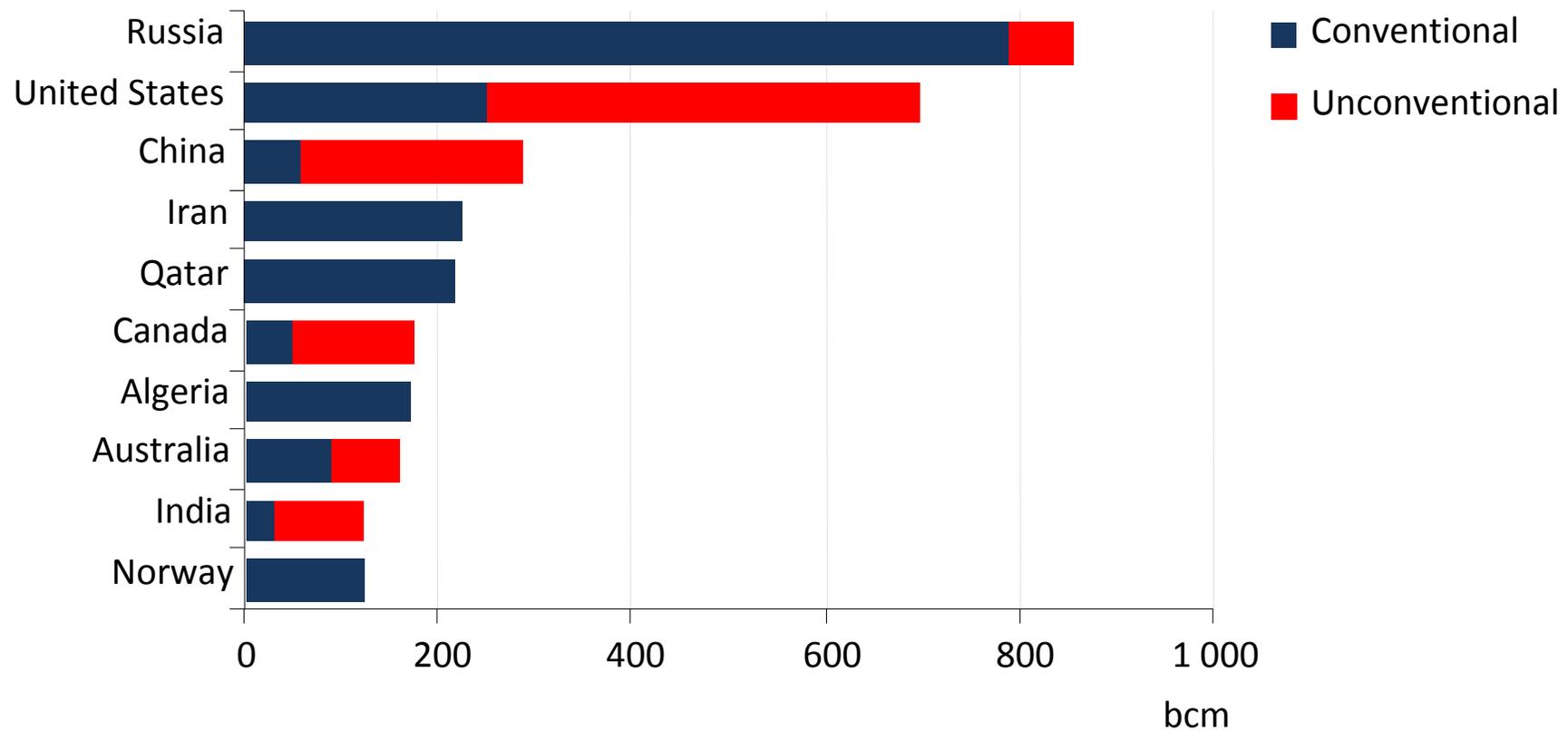
# Compounding Crisis may hit Japan

- Blockage of the Strait of Hormuz
  - Oil Price may double to \$160 / barrel
  - Japan's current account surplus ( 9 trillion yen in 2011 ) may turn to deficit of 6 trillion yen.
  - Without further restarting of nuclear power plants, deficits may reach 12 trillion yen.
- Confidence on Japan's public finance may be lost.
  - Current Account surplus is the basis for confidence
  - Persisting Deficit may lead to capital flight from Japan
  - Power crisis enhances flight of manufacturing industries
- Loss of Confidence in JGB and Yen.

# The Golden Age for Natural Gas ? Shale Gas Revolution.

IEA WEO 2011

Largest natural gas producers in 2035



*Unconventional natural gas supplies 40% of the 1.7 tcm increase in global supply, but best practices are essential to successfully address environmental challenges*

# The Golden Age for Natural Gas?

## Asian Demand Increase is the game changer.

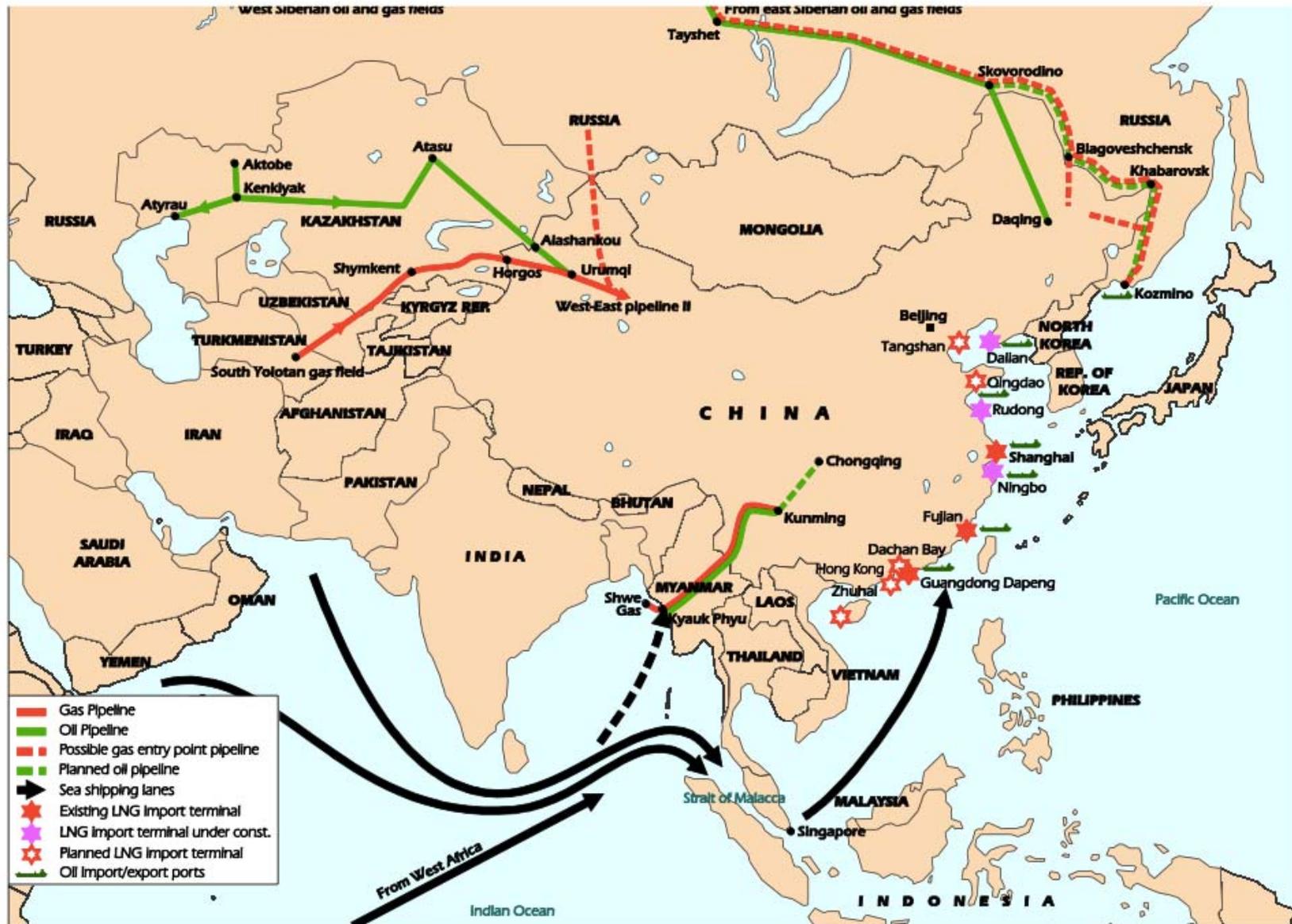
**Figure 2.18** • Natural gas demand and the share of imports by region in the New Policies Scenario, 2009 and 2035



Note: Other Asia had net natural gas exports of 56 bcm in 2009.

China's demand is 97 BCM in 2009, same as Germany,  
In 2035 it grows to 502 BCM same as Europe as a whole in 2009

# Current and Future routes of China's Importation of Oil and Gas

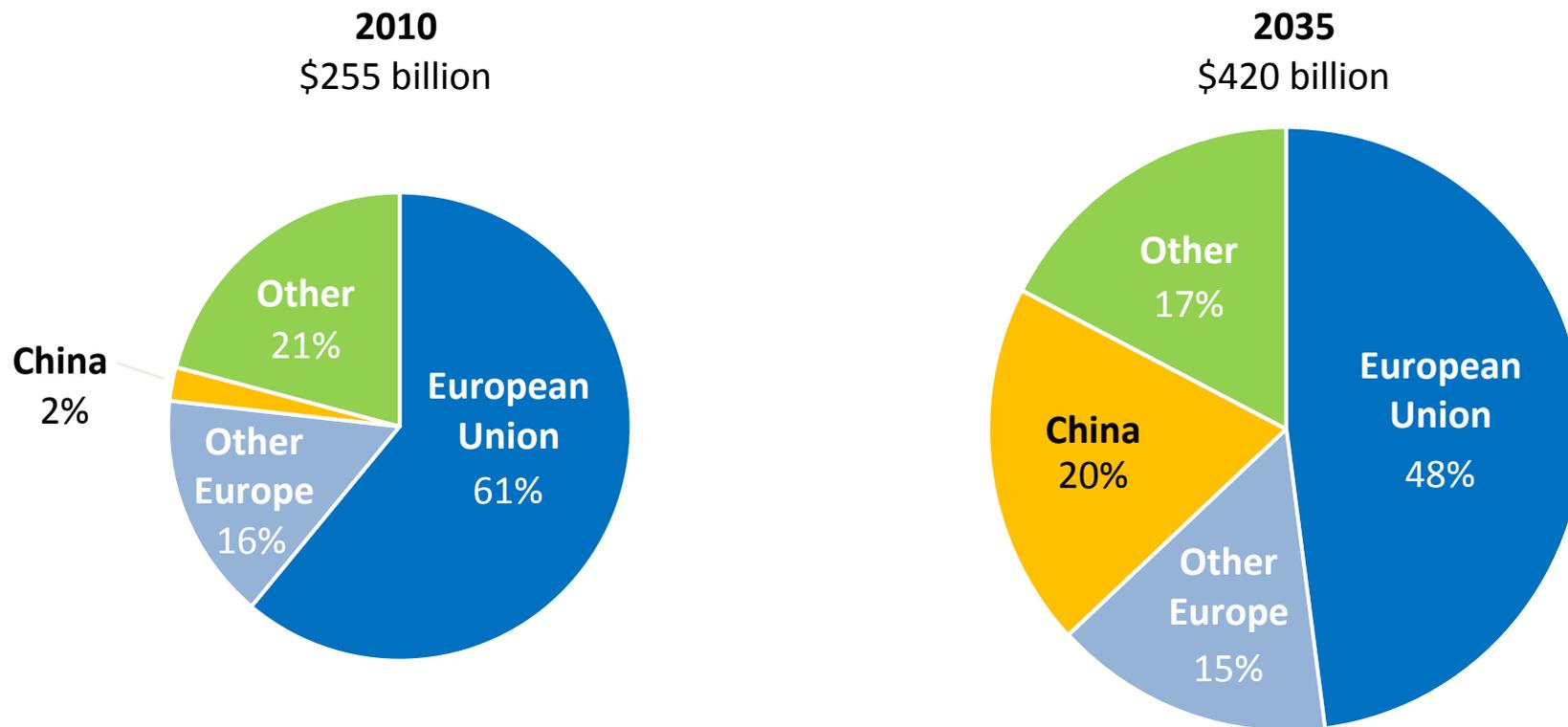


Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts

# Russia's focus will move to the East

IEA WEO 2011

Russian revenue from fossil fuel exports

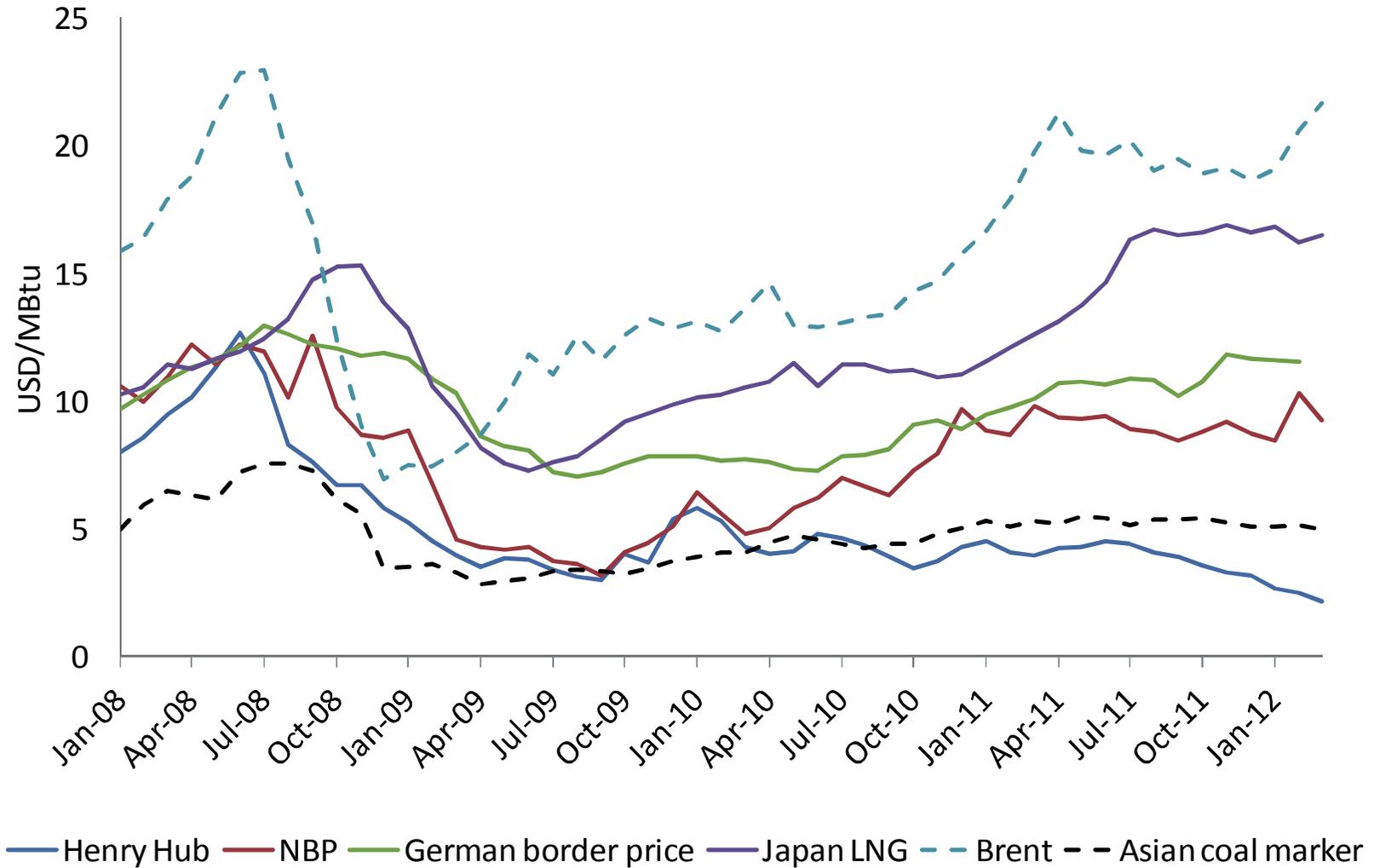


*An increasing share of Russian exports go eastwards to Asia, providing Russia with diversity of markets and revenues*



# International Gas Prices

## How can we reduce Asian Premium?

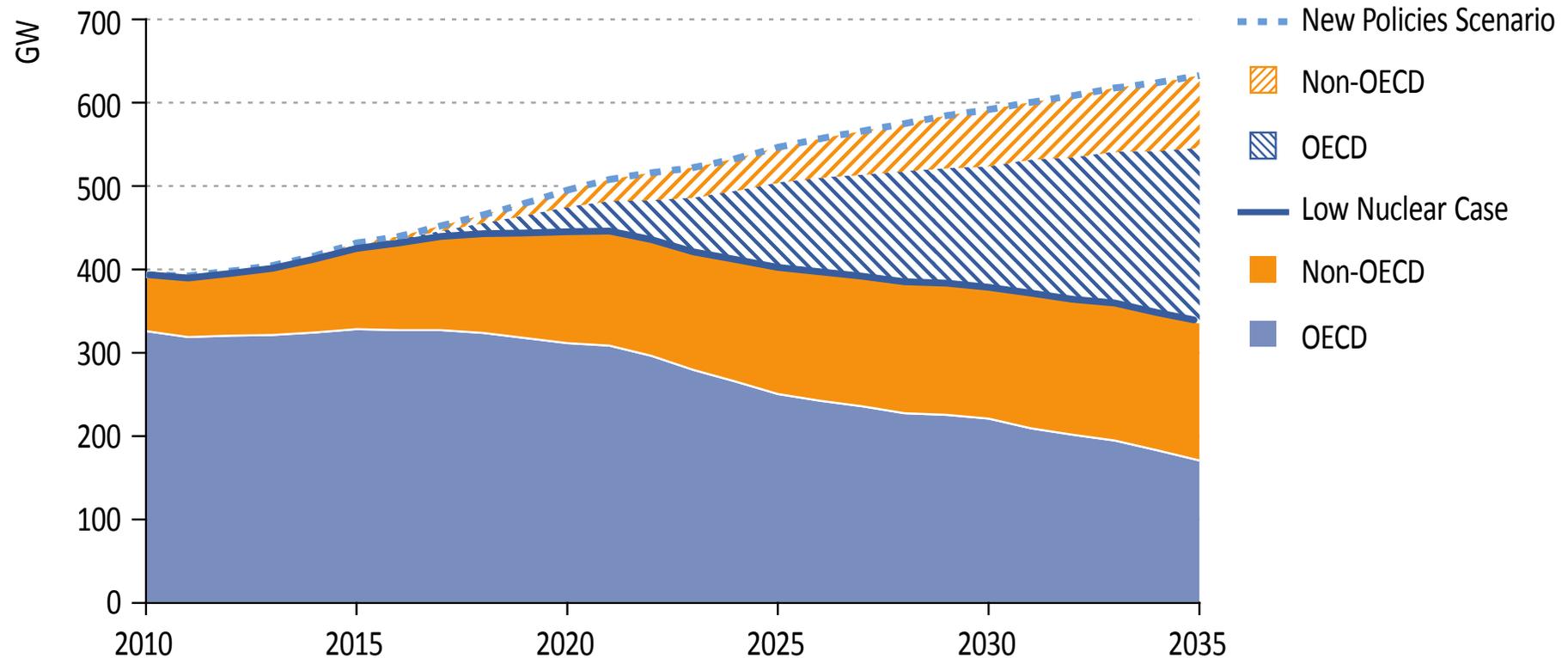


IEA Mid Term Gas Market Review 2012

# Post Fukushima Low Nuclear Case

IEA WEO 2011

**Figure 12.3** ● Nuclear power capacity in the Low Nuclear Case

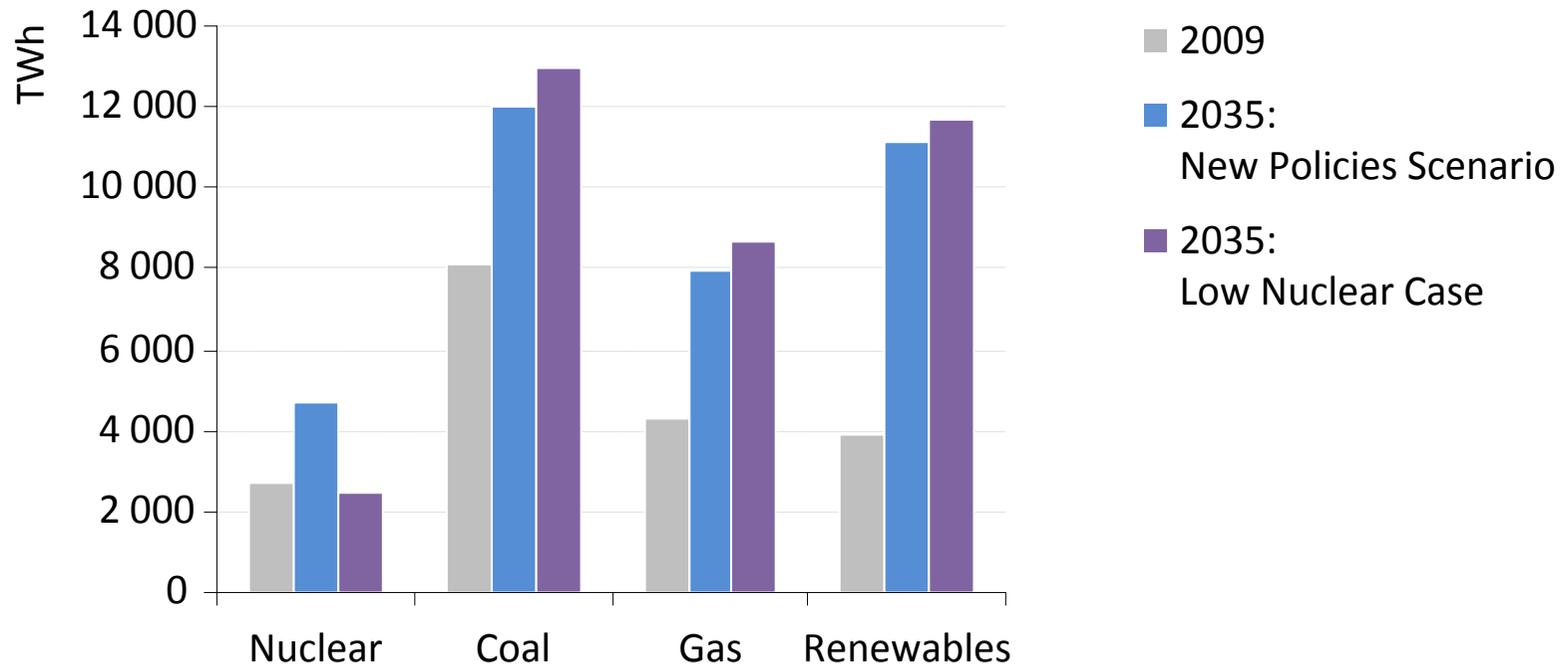


If no new nuclear plants be built in OECD countries,  
Nuclear power will decline to 7% of total power generation in 2035.

# Less nuclear means more of everything else + CO<sub>2</sub>

IEA WEO 2011

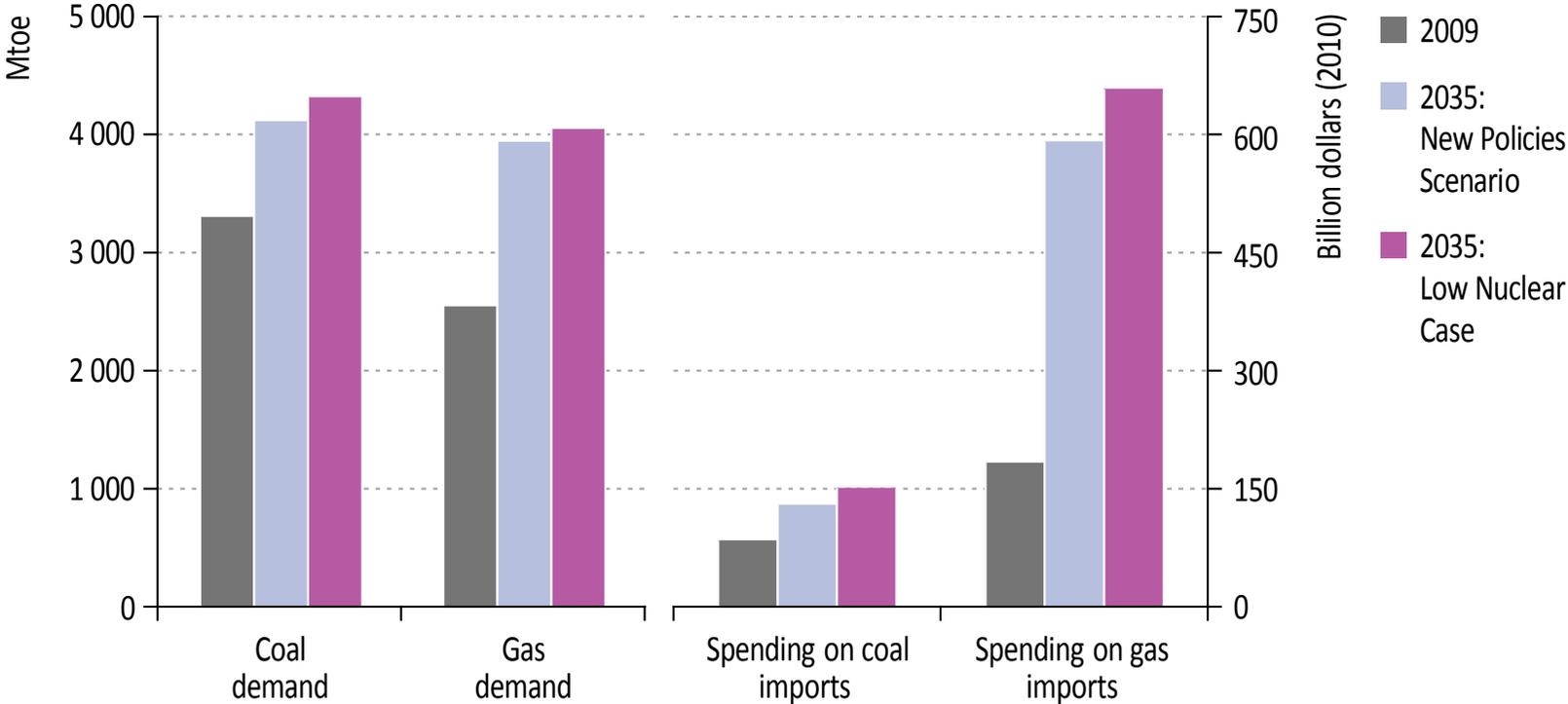
- Power generation by fuel in the New Policies Scenario and Low Nuclear Case



- The biggest chunk of the lost nuclear generation is replaced by power generation from gas and coal, leading to a 6% or 0.9 GT increase in CO<sub>2</sub> emissions in the power sector

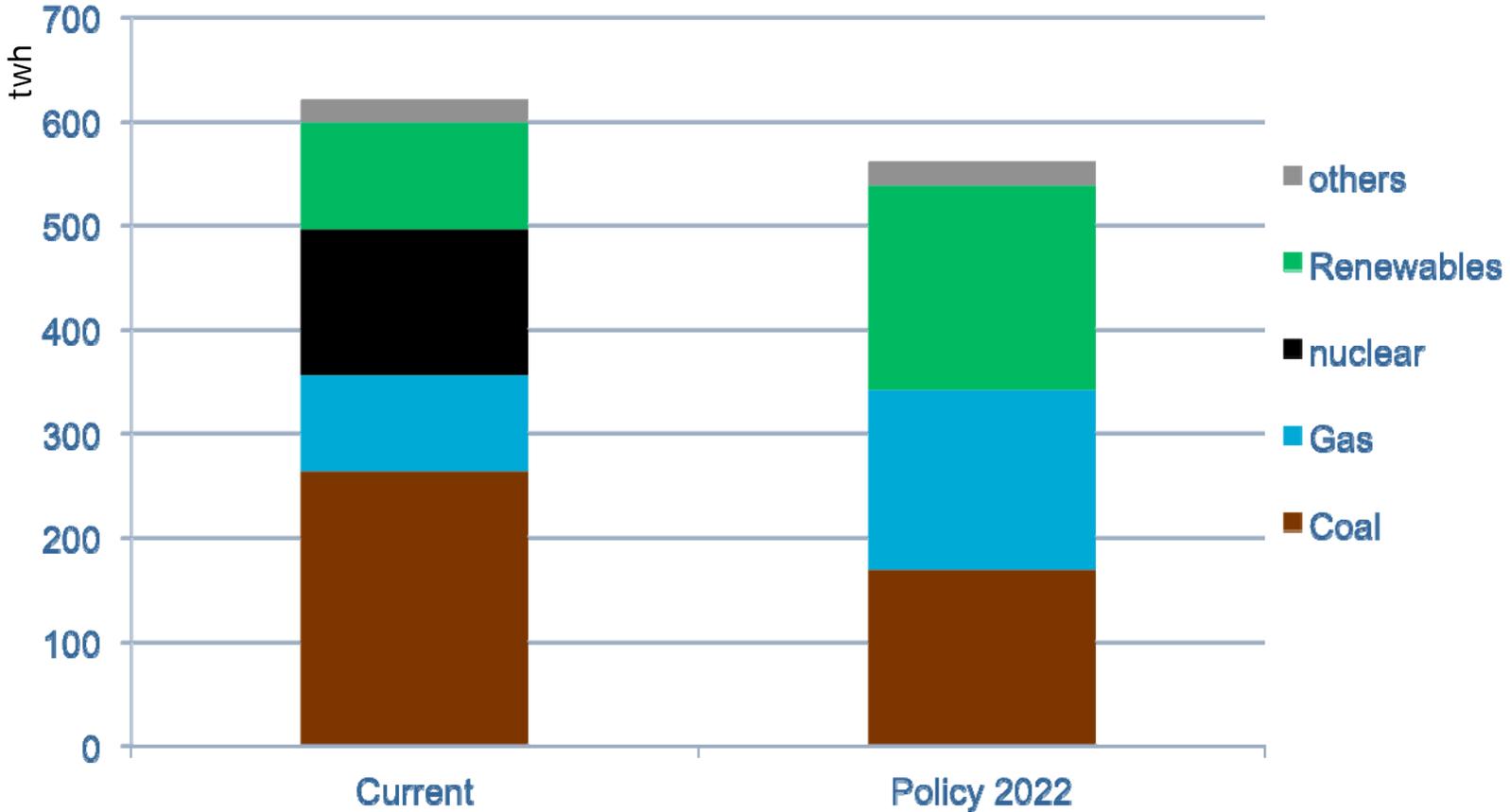
# Additional \$90 billion is needed to import gas and coal.

**Figure 12.5** • *Global primary coal and gas demand and annual spending on imports in the Low Nuclear Case*



Note: Calculated as the value of net imports at prevailing average international prices.

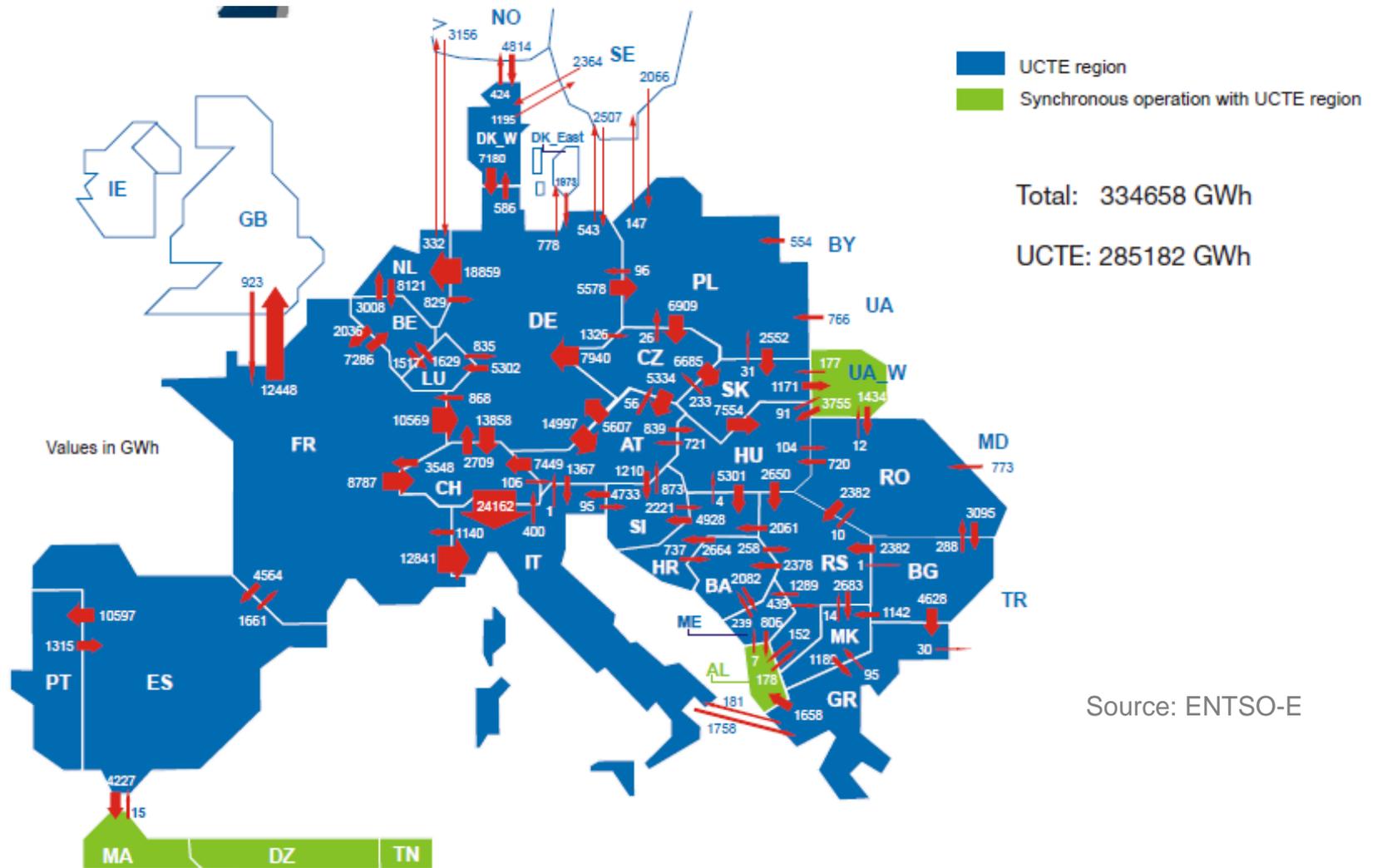
# Germany may need much more Gas to phase out Nuclear by 2022



**Germany needs to import 16 BCM of gas to achieve electricity mix with 10% demand reduction, no nuclear, 35% renewables and CO2 at the target level**

# Power Grid Connection in Europe

Physical energy flows between European countries, 2008 (GWh)



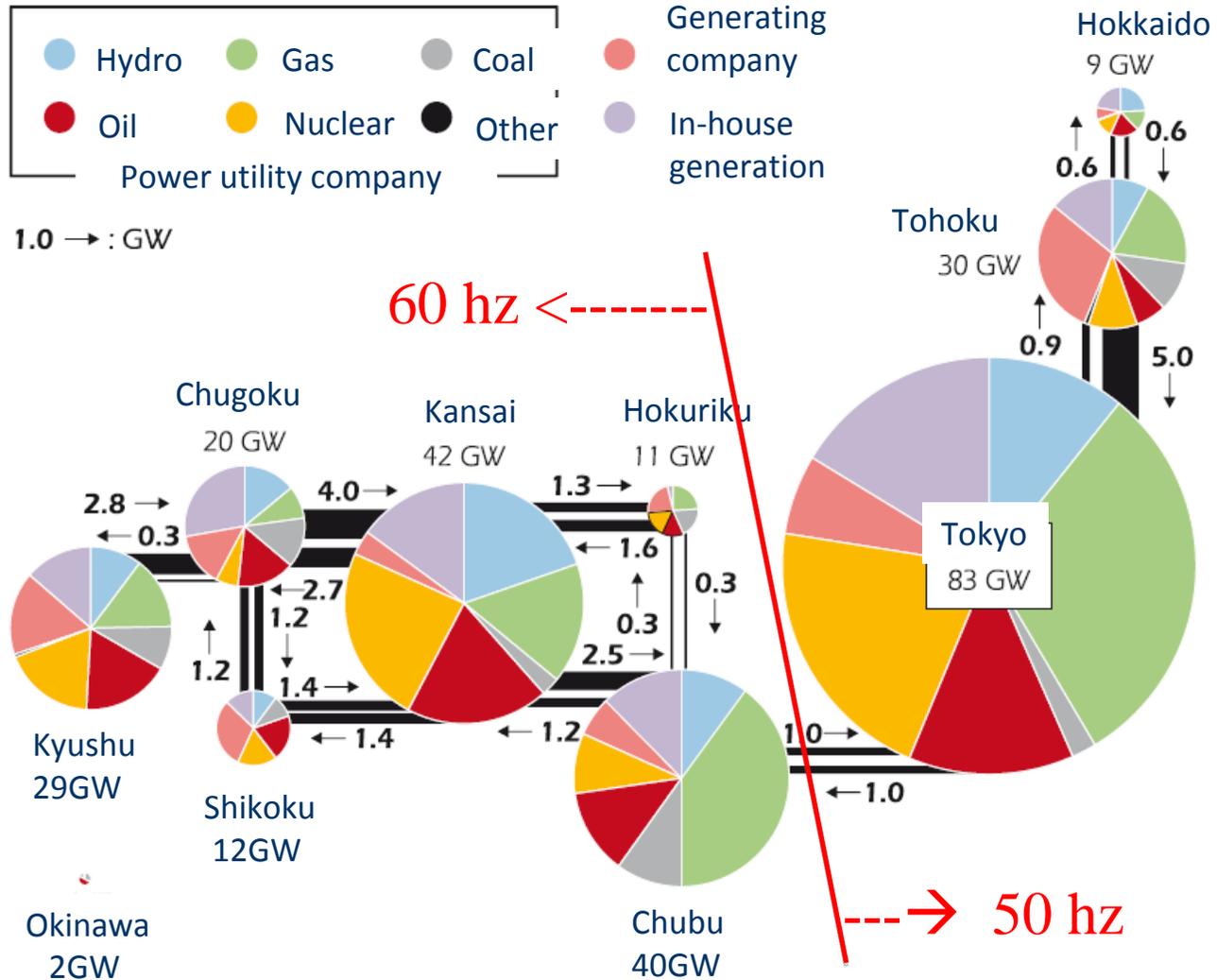
# Innovative Energy & Environment Strategy

Decision by the Energy & Environment Council , GOJ

September 14<sup>th</sup>, 2012

- Mobilize all possible resources to phase out Nuclear Power Generation during 2030s.
  - Strict 40 years life of reactors. Restart reactors with approval by the new NRC. No new construction.
- Green Energy Revolution
  - 10% Power saving and 19% energy efficiency by 2030.
  - Triple Renewables by 2030. ( x8 excluding hydro)
  - R&D for new generation vehicles, Hydrogen system, CCS.
- Expand LNG gas power, Combined Heat & Power.
- Reform of power market.
- Flexible review of the decision.

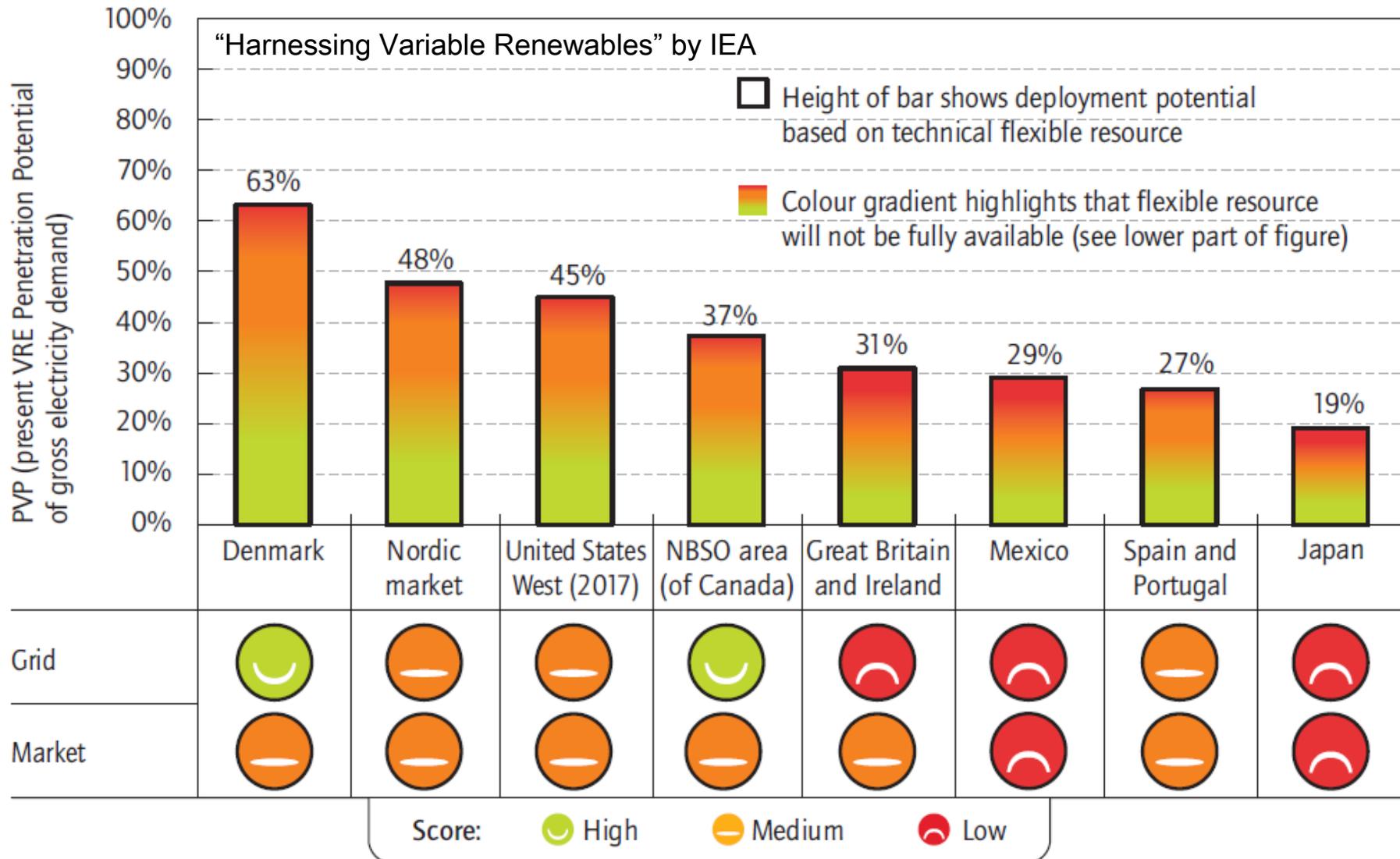
# Power grid in Japan



Source: Agency for Natural Resources and Energy, The Federation of Electric Power Companies of Japan, Electric Power System Council of Japan, The International Energy Agency

# Not only Feed-in-tariffs but Grid integration !

## Snapshot of present penetration potentials

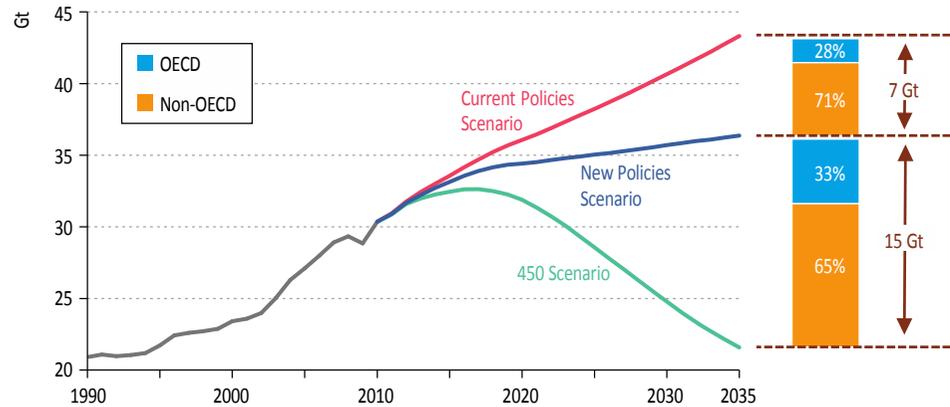


# Lessons of the Fukushima

- Lessons to be Shared
  - **Think about the unthinkable**; Tsunami and Station Black Out. Large scale Blackout. Change total mind set for “Safety”.
  - Prepare for the severe accidents by defense in depth, common cause failure & compound disasters.
  - Clarify why it happened only to Fukushima Daiichi and NOT to Fukushima Daini, Onagawa nor Tokai daini.
- Safety Principles
  - Fukushima accident was caused by **human error and should have been avoided**. (Mr. Hatamura, Parliament Investigation Commission report )
  - International Cooperation : A nuclear accident anywhere is an accident everywhere.
  - Independent Regulatory authority ; Transparency and Trust, “Back Fitting” of regulation
- Secured supply of Electricity
  - Power station location
  - Strengthened interconnection of grid lines
- Once disaster has happened, Recovery from disaster is at least as important as preparing for it.
  - FEMA like organization and training of the nuclear emergency staff including the self defense force ; integration of safety and security.
- New Technology. New type of Reactors.

# 450 ppm Scenmario : what we need and where .

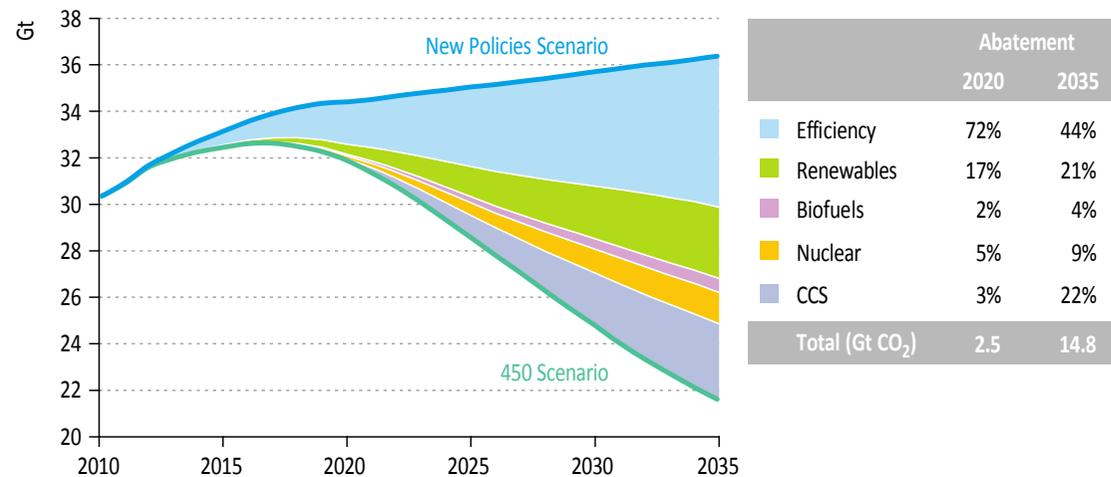
Figure 6.2 • World energy-related CO<sub>2</sub> emissions by scenario<sup>2</sup>



IEA WEO 2011

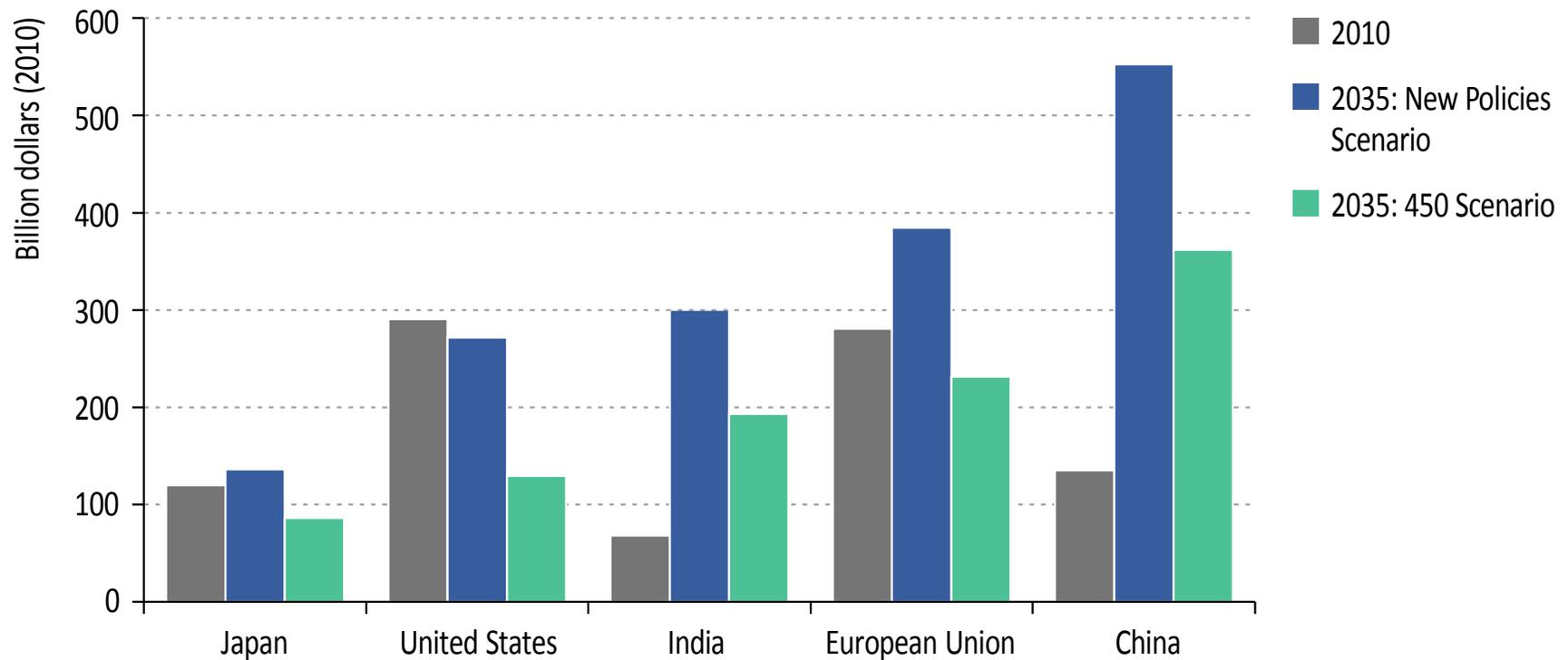
Note: There is also some abatement of inter-regional (bunker) emissions which, at less than 2% of the difference between scenarios, is not visible in the 2035 shares.

Figure 6.4 • World energy-related CO<sub>2</sub> emissions abatement in the 450 Scenario relative to the New Policies Scenario



# Sustainability helps Energy Security

**Figure 6.11** • Oil-import bills in selected regions by scenario



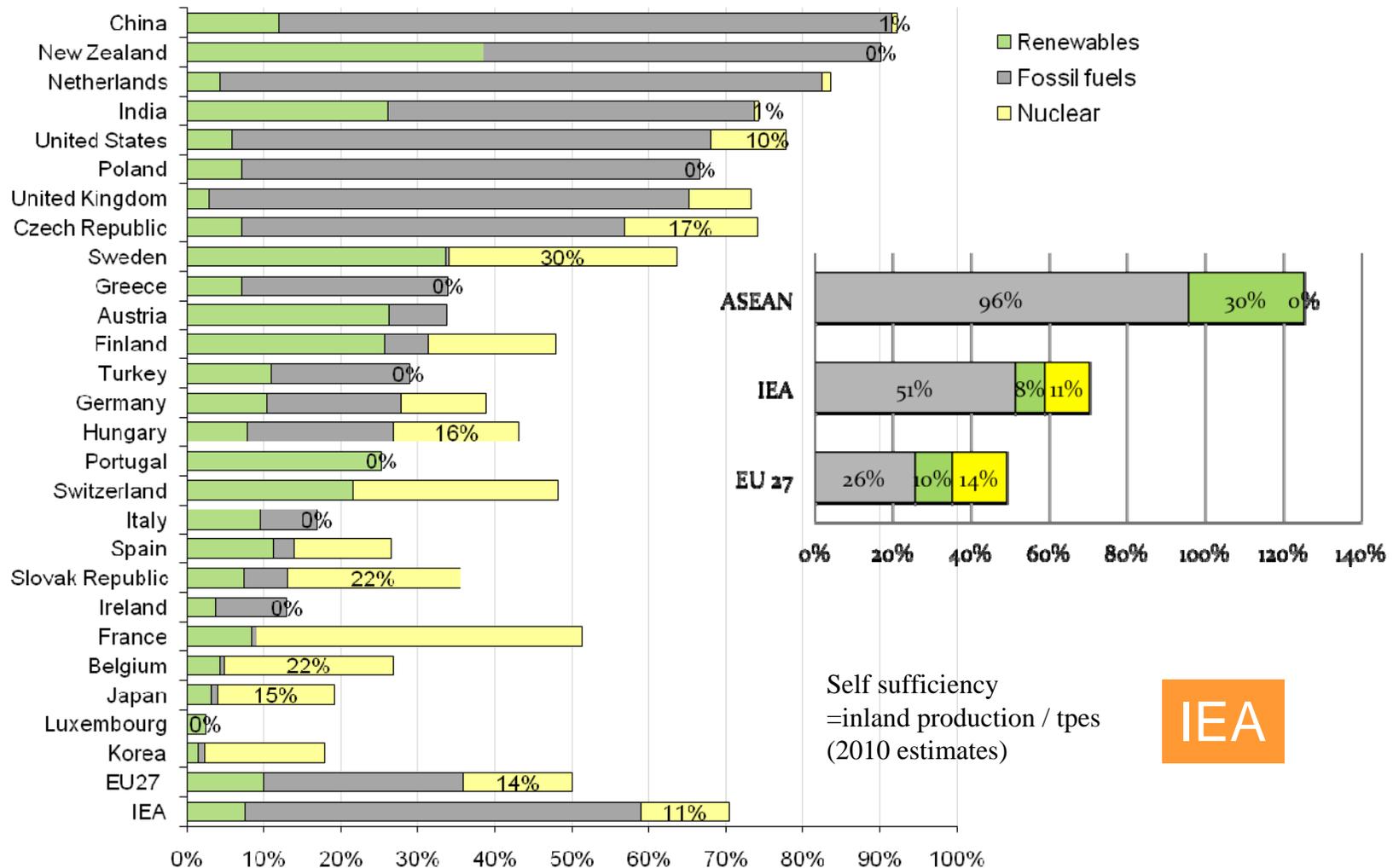
IEA WEO 2011

# What is Energy Security in the 21<sup>st</sup> Century?

# Diversity means Energy Security .

**"Safety and certainty in oil lie in variety and variety alone." ( Churchill )**

Energy Self -Sufficiency rates by fuels in 2010



**Nuclear is an important option for countries with limited indigenous energy resources .**

# North American Gas Infrastructure

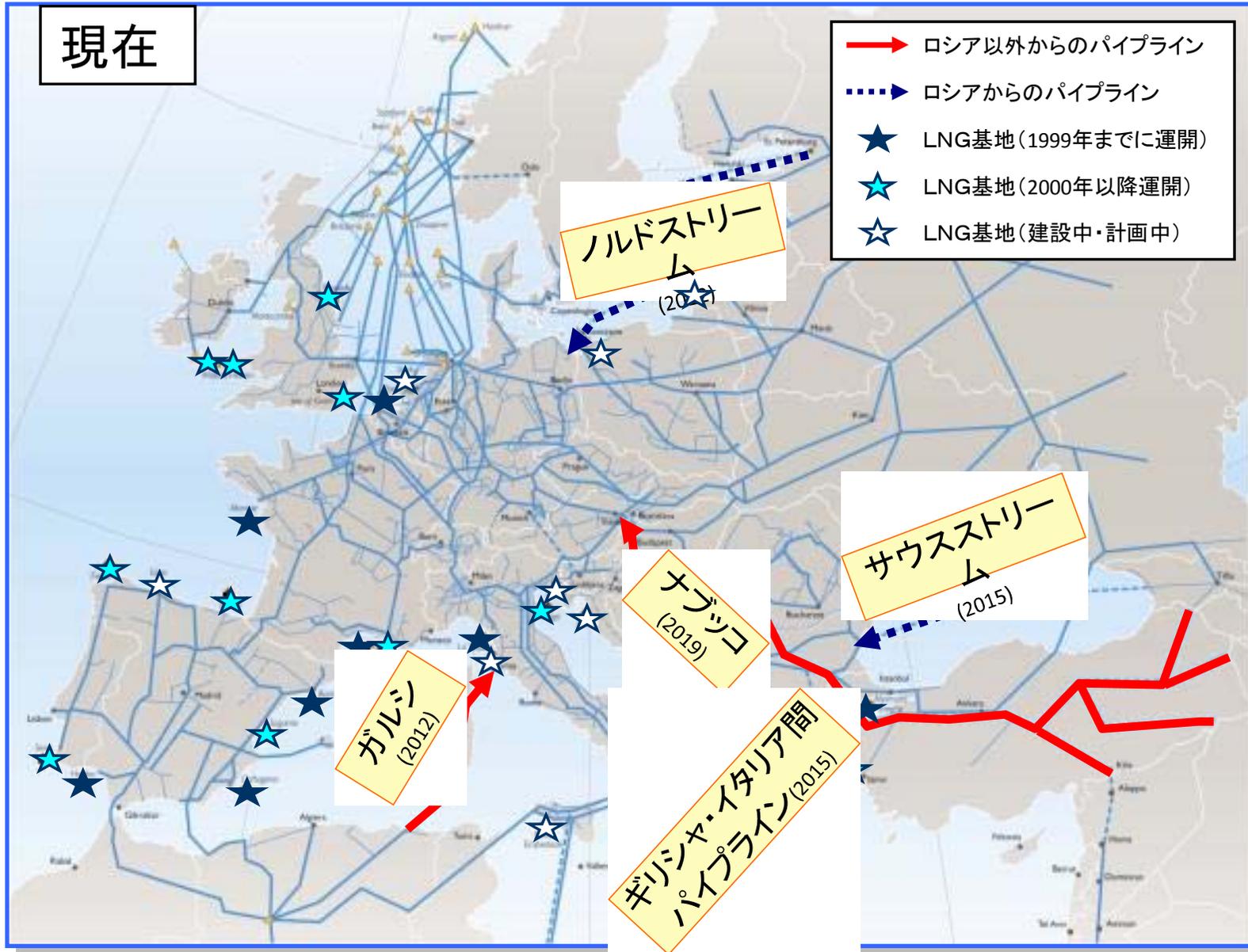
## North America Gas Infrastructure



Mid-Term Oil & Gas Market 2010, IEA

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

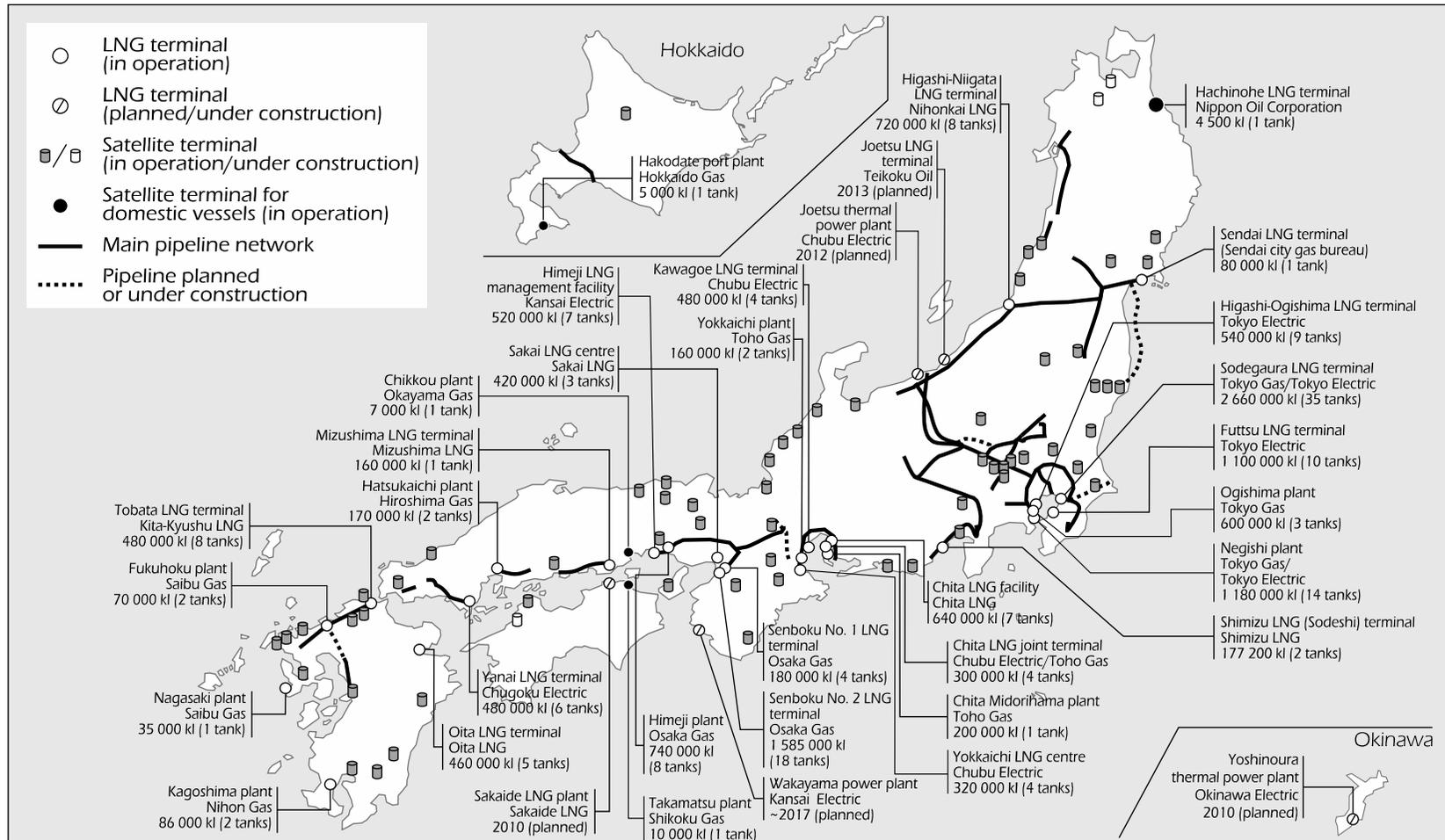
# Gas Infra in Europe: New Pipelines and LNG ports.



# Gas Pipeline system in Japan is very weak.

IEA Japan review 2008

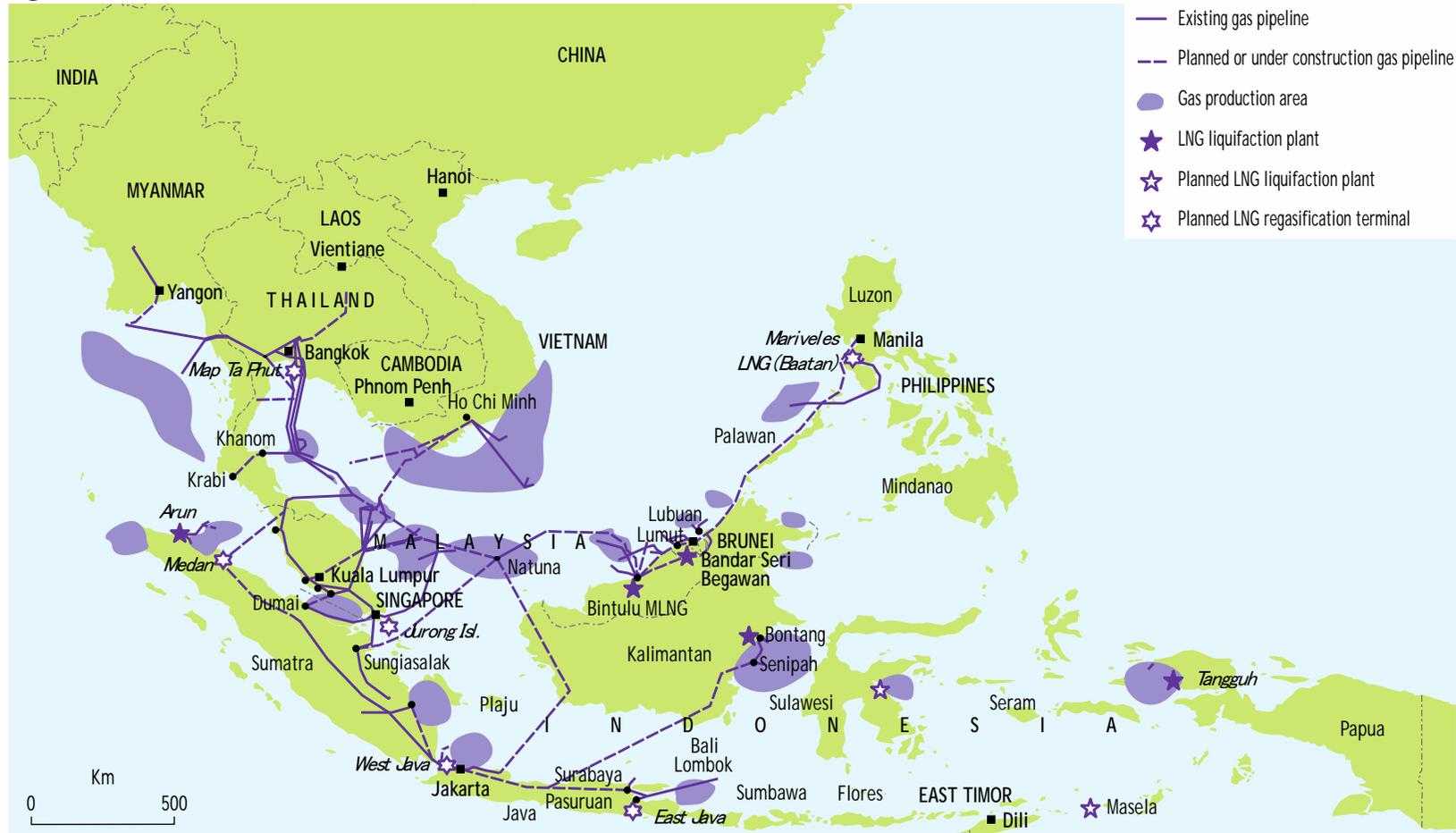
Map of the Japanese Gas Grid



Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the IEA.  
 Source: Country submission (compiled by ANRE from data provided by relevant companies).

# ASEAN is working on Gas Pipeline System.

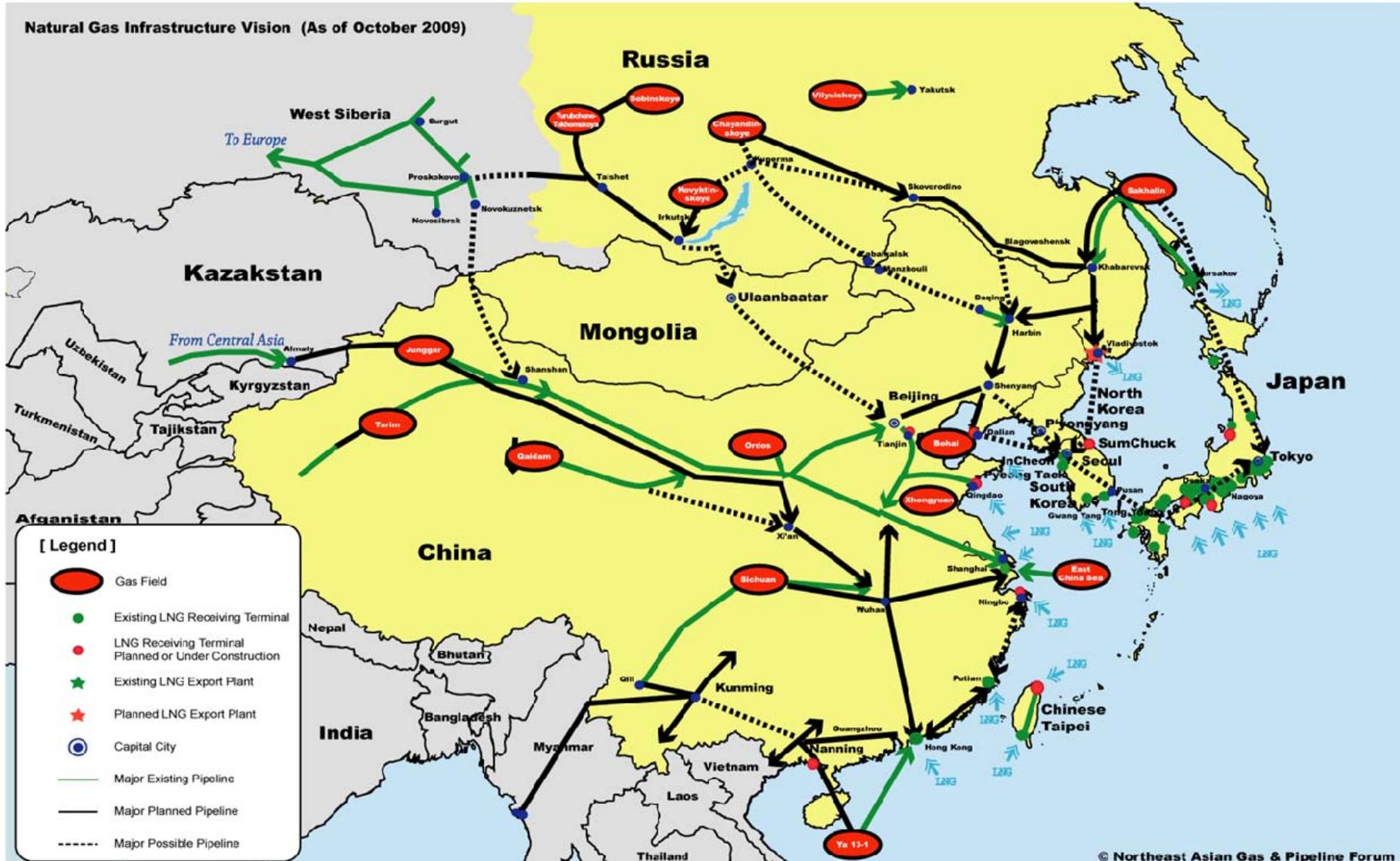
Figure 15.16 • The Trans-ASEAN Gas Pipeline (TAGP)



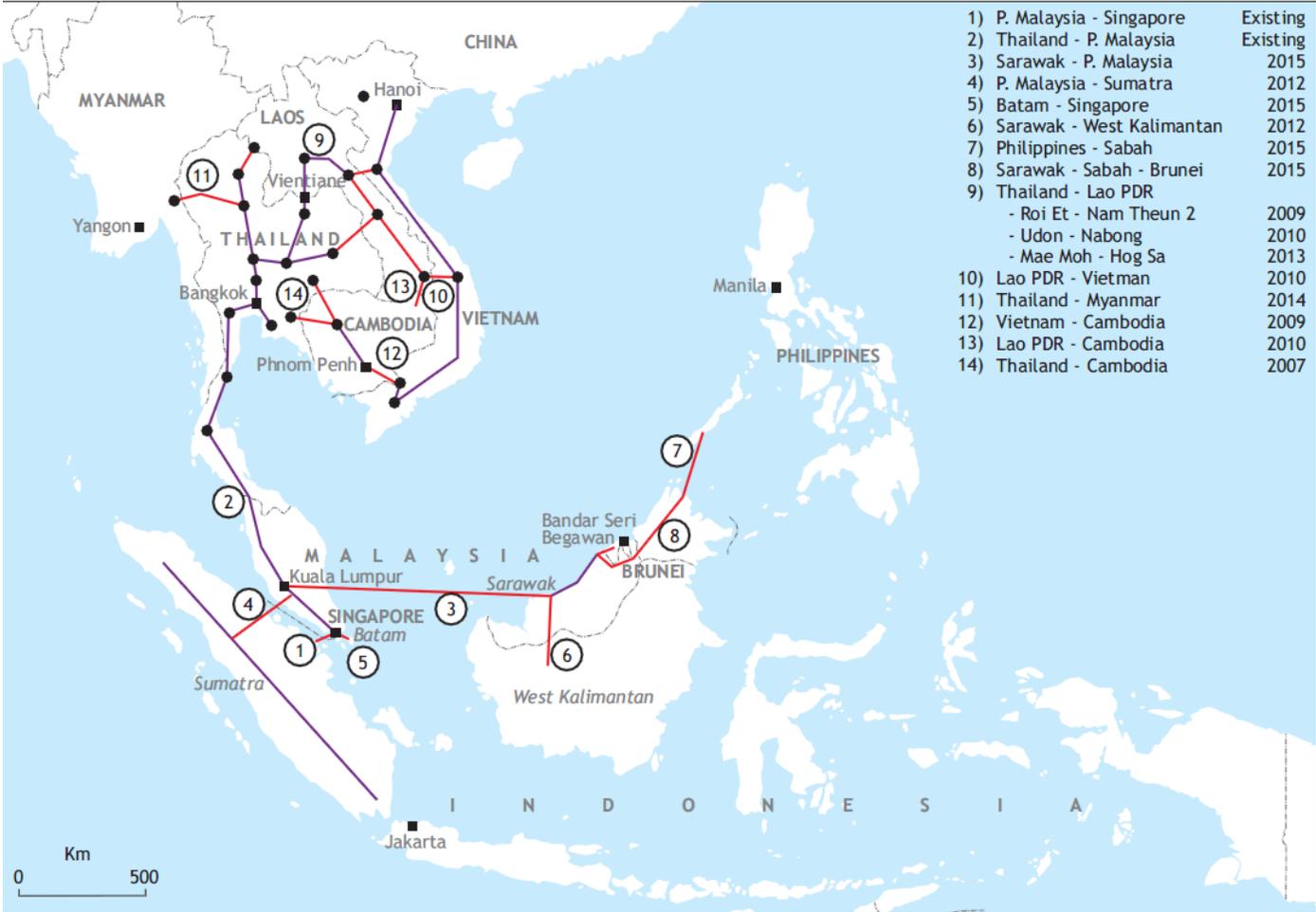
The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Source: ASCOPE Secretariat

# New concepts for North East Asia Gas & Pipeline Infrastructure



# ASEAN is working on Power Grid Interconnections.



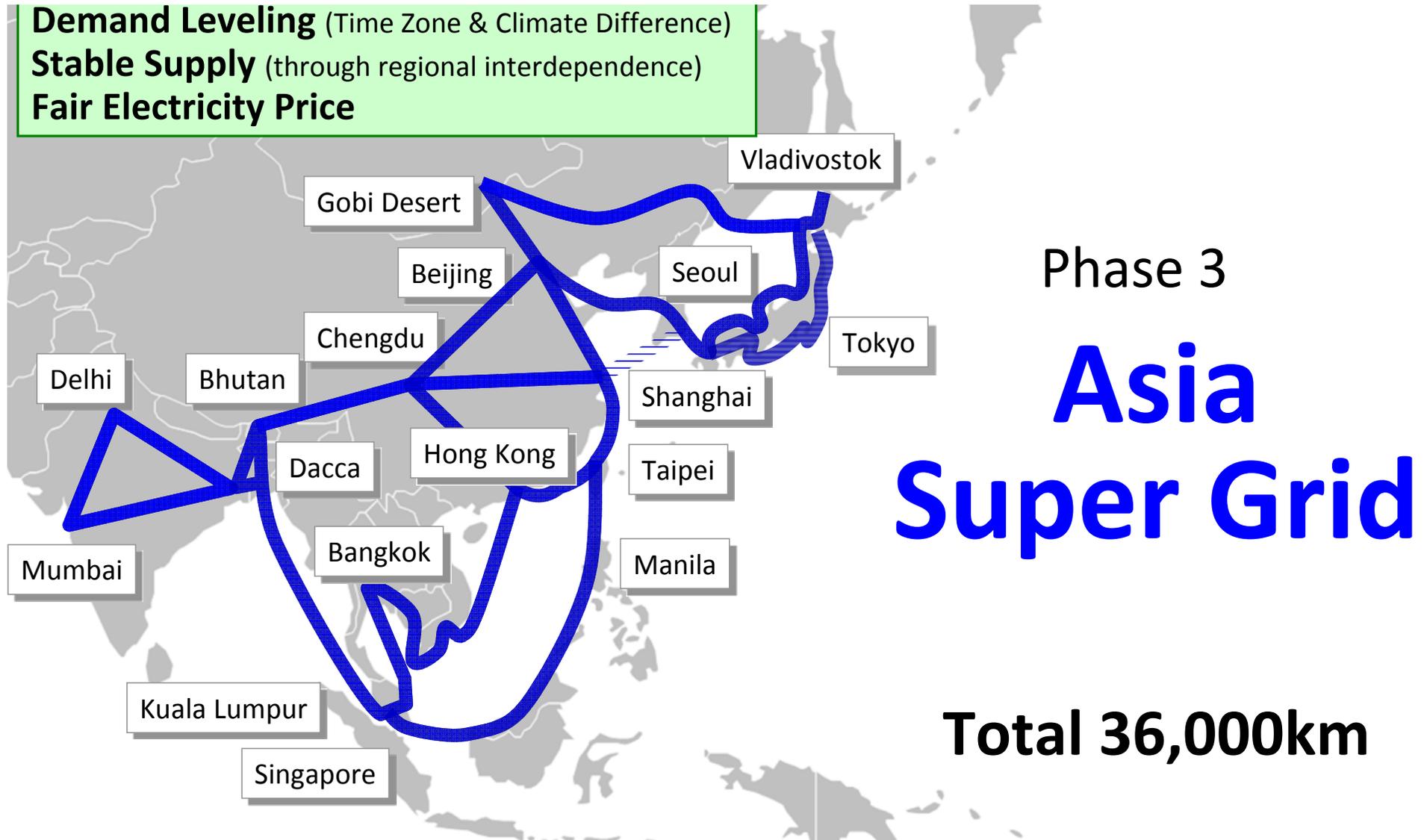
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# Connecting MENA and Europe: "Desertec" as visionary "Energy for Peace"



Source: DESRETEC Foundation

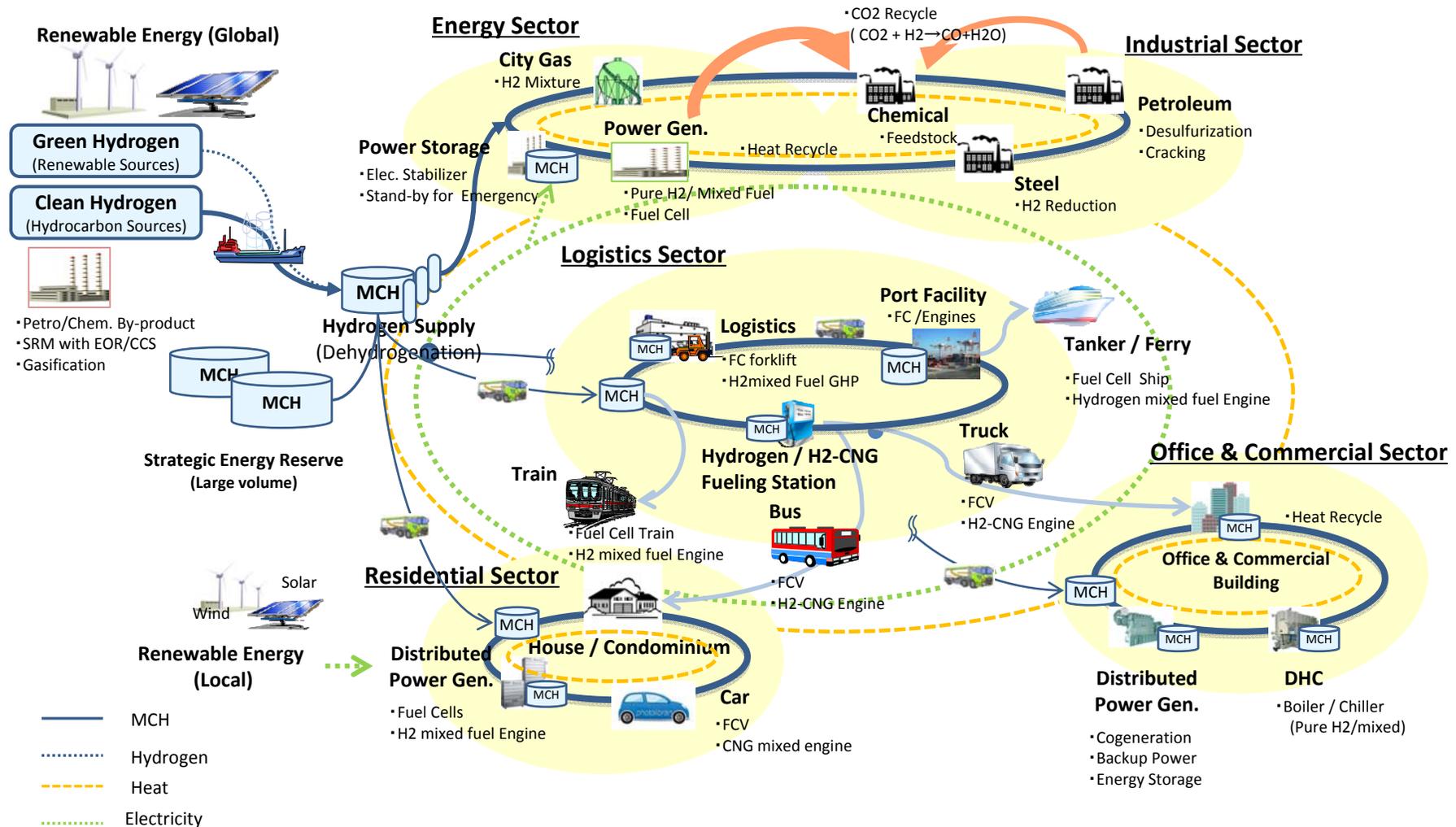
# Energy for Peace in Asia. A New Asian Vision?



Presentation by Mr. Masayoshi SON

# Technology helps! Hydrogen Community with MCH

- Large volume Hydrogen transportation & storage technology will be essential to build 'Hydrogen Community'.
- 'Hydrogen Community' realizes Low Emission Carbon Recycling Society, with empowered resistance against disasters.
- New path toward the Hydrogen Society will enhance innovation and create New Industries.



(Note) MCH : Methylcyclohexane FC : Fuel Cell FCV : Fuel Cell Vehicle GHP : Gas Heat Pump DHC : District Heating and Cooling

# Technology helps. Case of Smart Grid

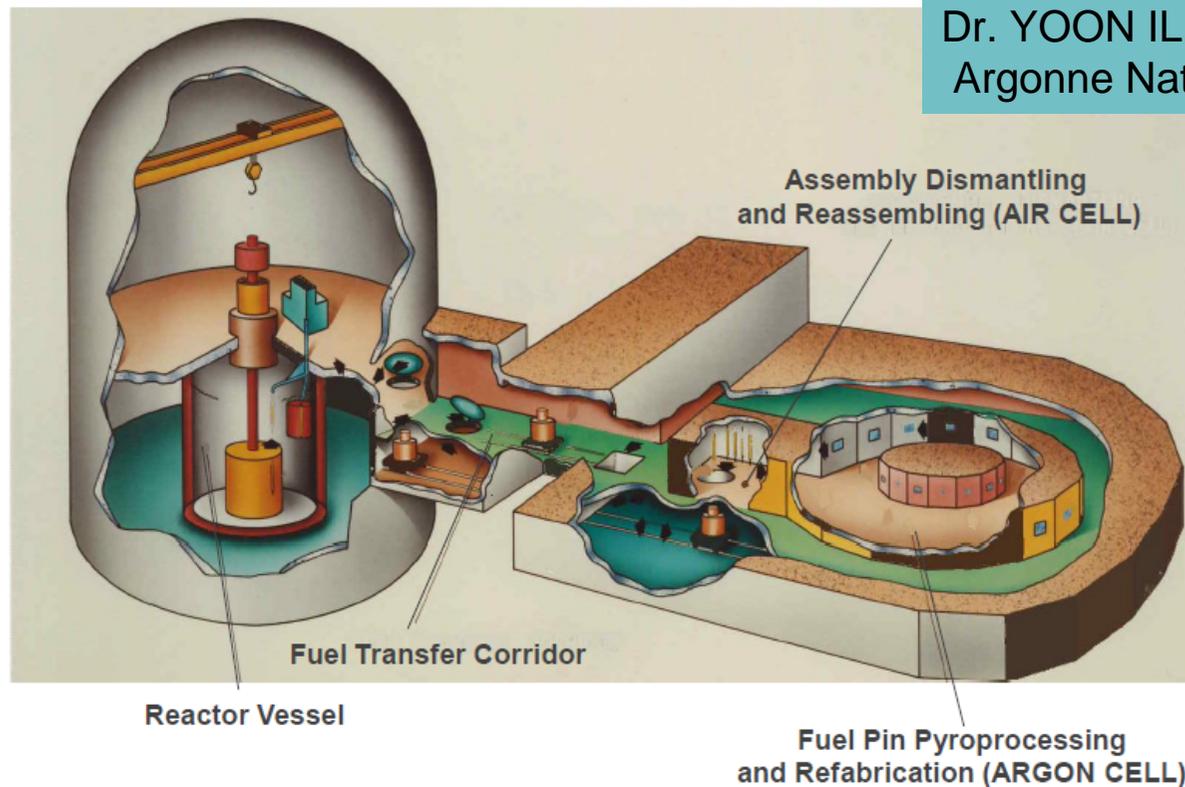
Figure 3 • Producing significant shares of heat, power and biofuels from locally available resources including solar, wind, ocean, geothermal, energy crops and biomass from wastes, could be a future option for a municipality



# Integral Fast Reactor and Pyroprocessing

Pyroprocessing was used to demonstrate the EBR-II fuel cycle closure during 1964-69

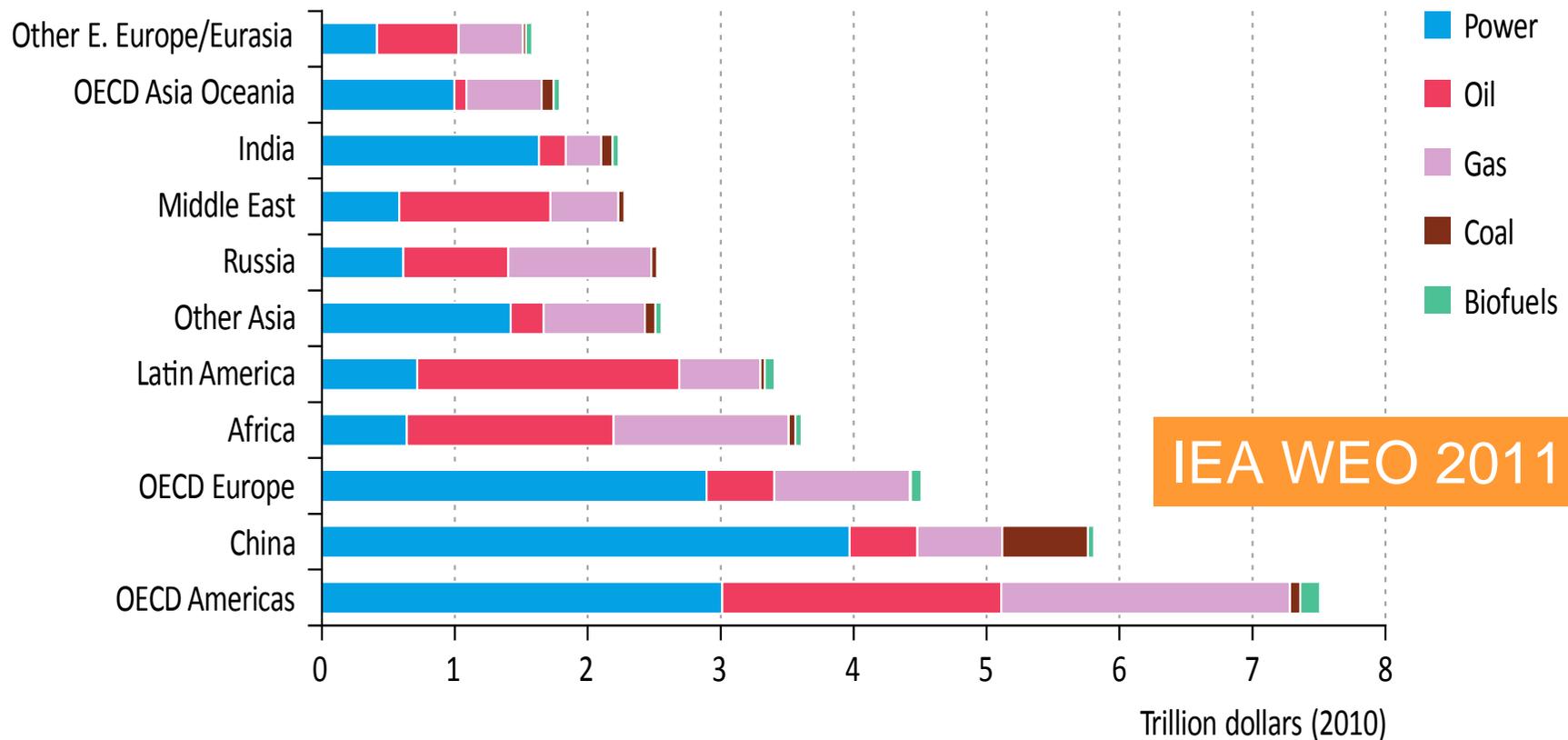
Dr. YOON IL CHANG  
Argonne National Laboratory



IFR has features as Inexhaustible Energy Supply ,Inherent Passive Safety ,Long-term Waste Management Solution , Proliferation-Resistance , Economic Fuel Cycle Closure.

# \$39 Trillion and more Investment is needed for energy Infrastructure.

**Figure 2.21** • Cumulative investment in energy-supply infrastructure by region in the New Policies Scenario, 2011-2035



# One cannot enhance energy by risking someone else's.

- Lesson of the Quake and Tsunami : Think about the unthinkable.
- Energy Security for the 21st Century must be **Comprehensive Electricity Supply Security** under sustainability constraints.
- EU Model of Collective Energy Security** be applied to the growing Asia. Develop **Regional Power Grid interconnection & Gas Pipelines** including Russia.
- Innovation in Power supply: **Efficiency**, Decentralized Renewables, EVs, Smart Grids, Storage, etc.
- Develop **gas** resources and infrastructure. Diversify supply and demand. Russia remains as a key player.
- For coal to remain the backbone of power supply, **CCS** readiness & highly efficient power plants are needed.
- Nuclear Power** will continue to play a major role in the world. Japan's role after Fukushima is to share the lessons learned for **safer Nuclear** Power deployment in Asia and elsewhere. Develop **safer and more proliferation-free reactor models**, e.g. Integral Fast Reactor as the 4G or Modular.
- New **technologies** help; hydrogen economy, Methane-hydrate , Super-conductivity grid.