



# ***Energy Security & Sustainability for Asia in the 21<sup>st</sup> Century***

2012/2/22 IAEE conference in Kyoto

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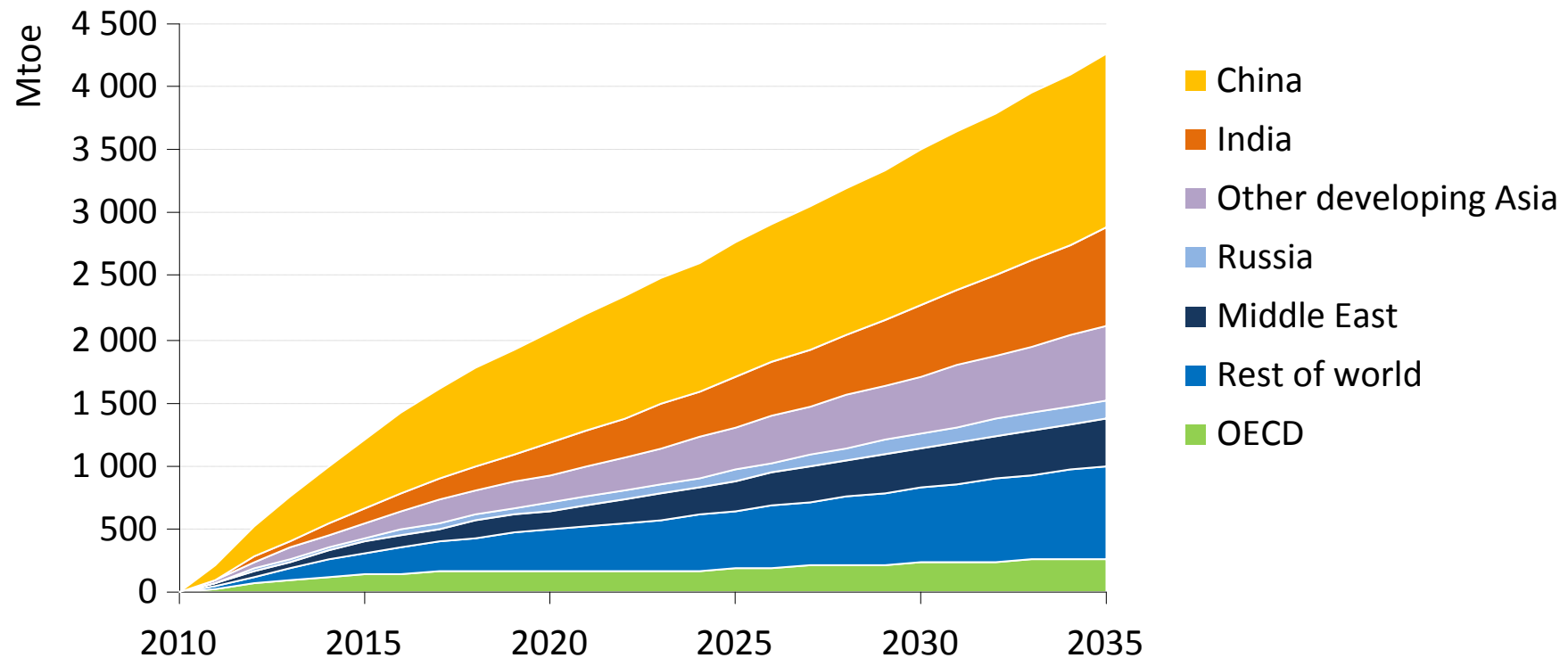
# A Time of Unprecedented Uncertainties.

- Does the global economic crisis continue?
- Does political unrest in producing regions make oil market tighter? What will be the longer term market structure?
- Is Golden age of Gas a solution for security?
- How about mainstreaming of Renewable Energy?
- Climate Change Mitigation: what does this mean for energy security?
- Growing Asian economies will shape the global energy future – where will their policy decisions lead us ?
- What is the implication of Fukushima Nuclear accident to the global energy security?

# Asian emerging economies continue to drive global energy demand

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Growth in primary energy demand

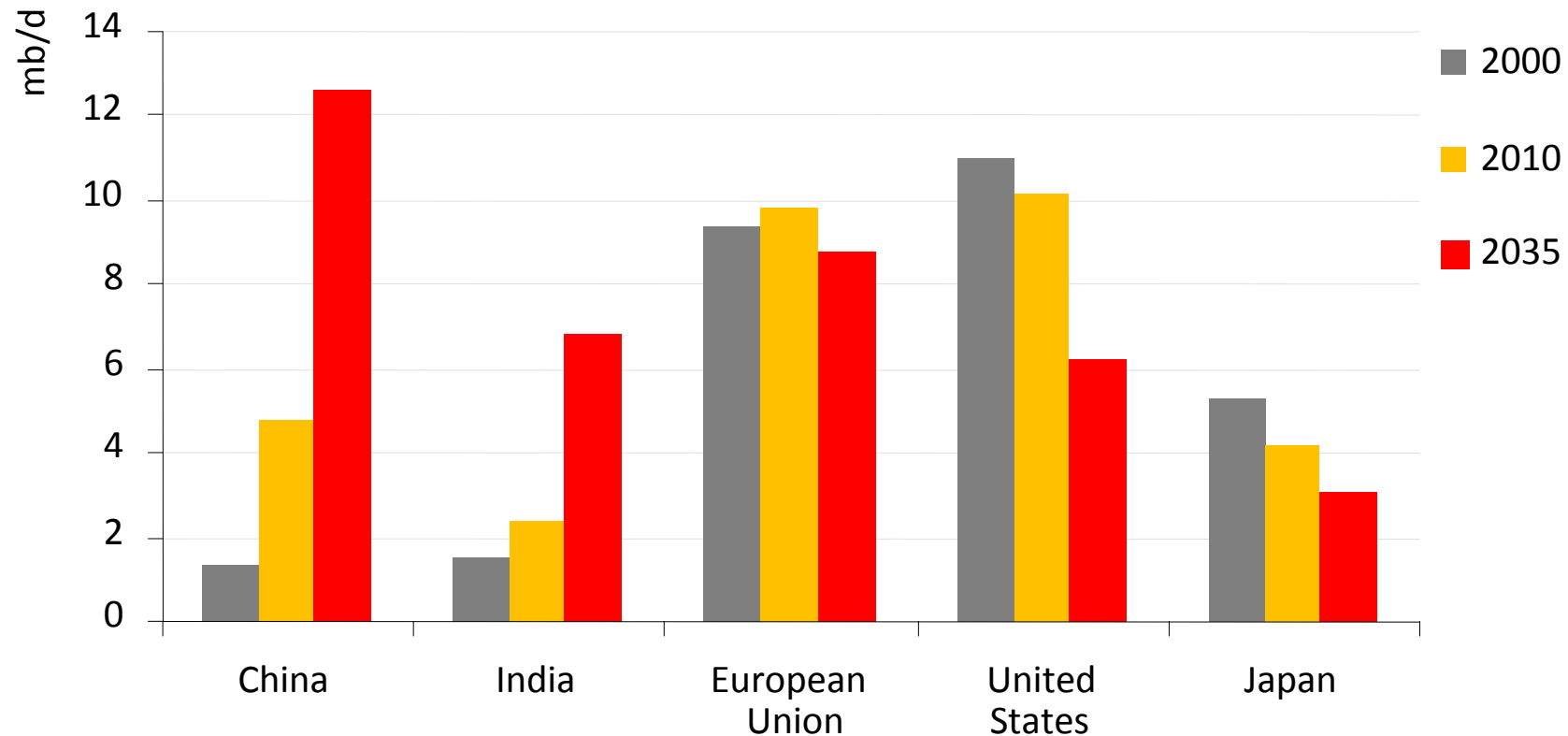


*Global energy demand increases by one-third from 2010 to 2035, with China, India and other Asia accounting for two thirds of the growth*

# Changing oil import needs are set to shift concerns about oil security

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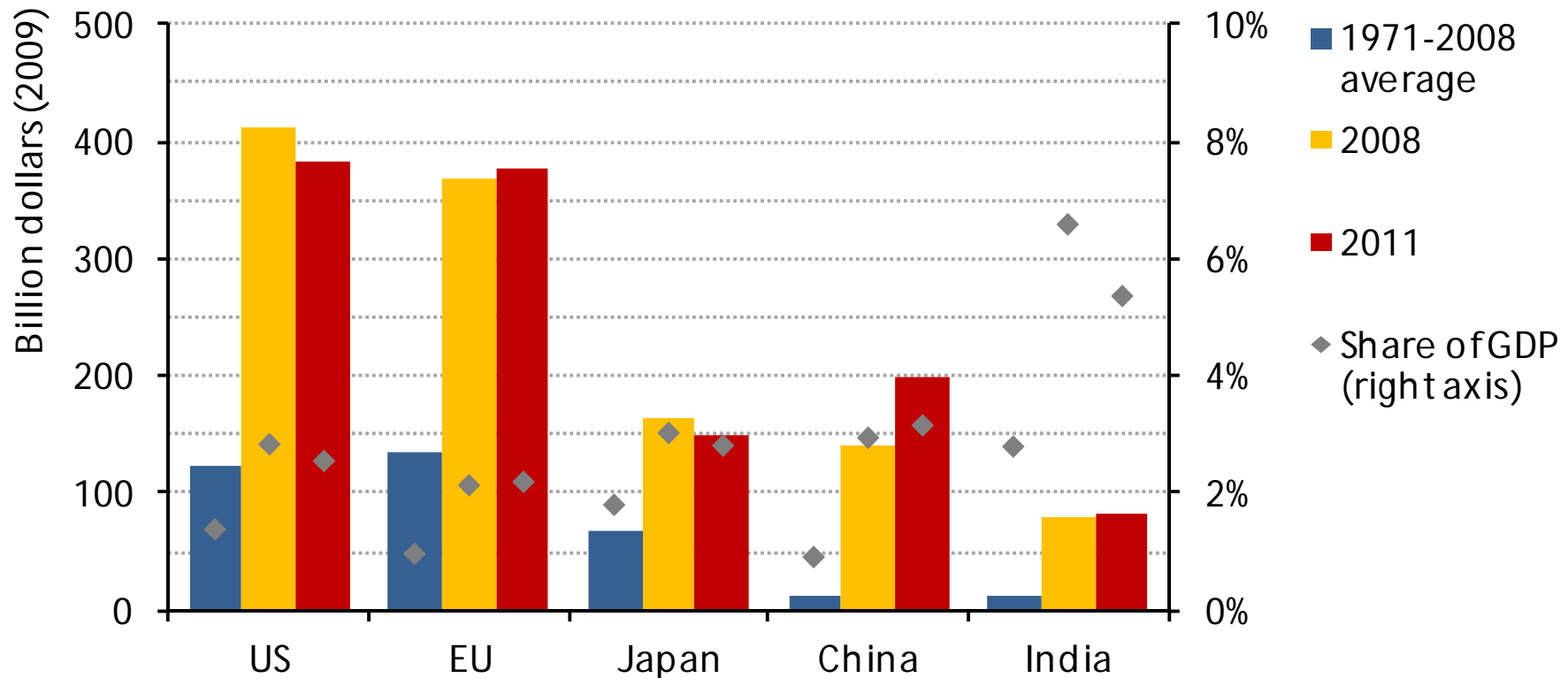
Net imports of oil



**US oil imports drop due to rising domestic output & improved transport efficiency: EU imports overtake those of the US around 2015; China becomes the largest importer around 2020**

# Oil Burden is heavier for Emerging Economies.

## Annual expenditure on net imports of oil



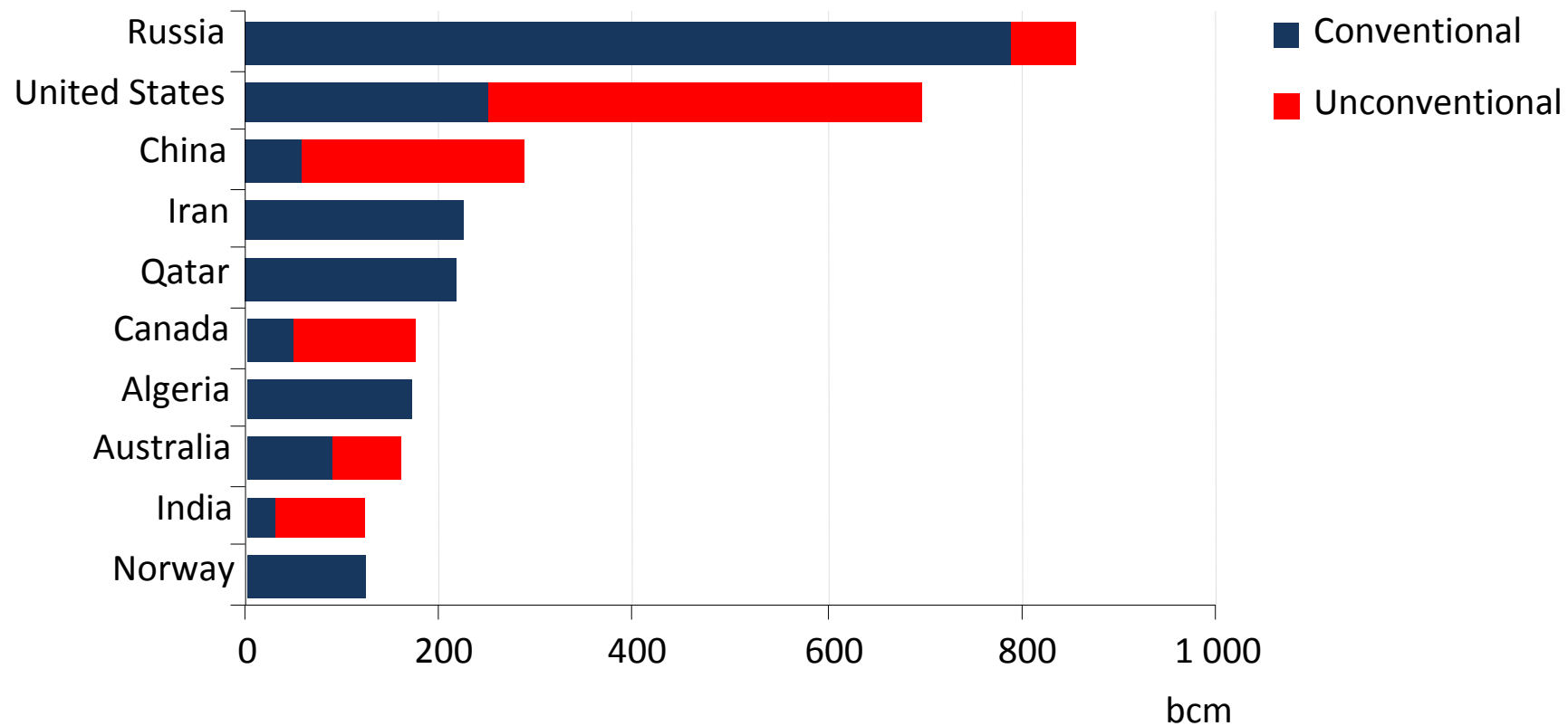
***If oil prices average US\$100 a barrel in 2011, spending on oil imports in many countries will reach or surpass the record levels of 2008***

***\* Projections made prior to events of 11 March***

# The Golden Age for Natural Gas ?

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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*

# Asian demand for gas grows much faster.

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

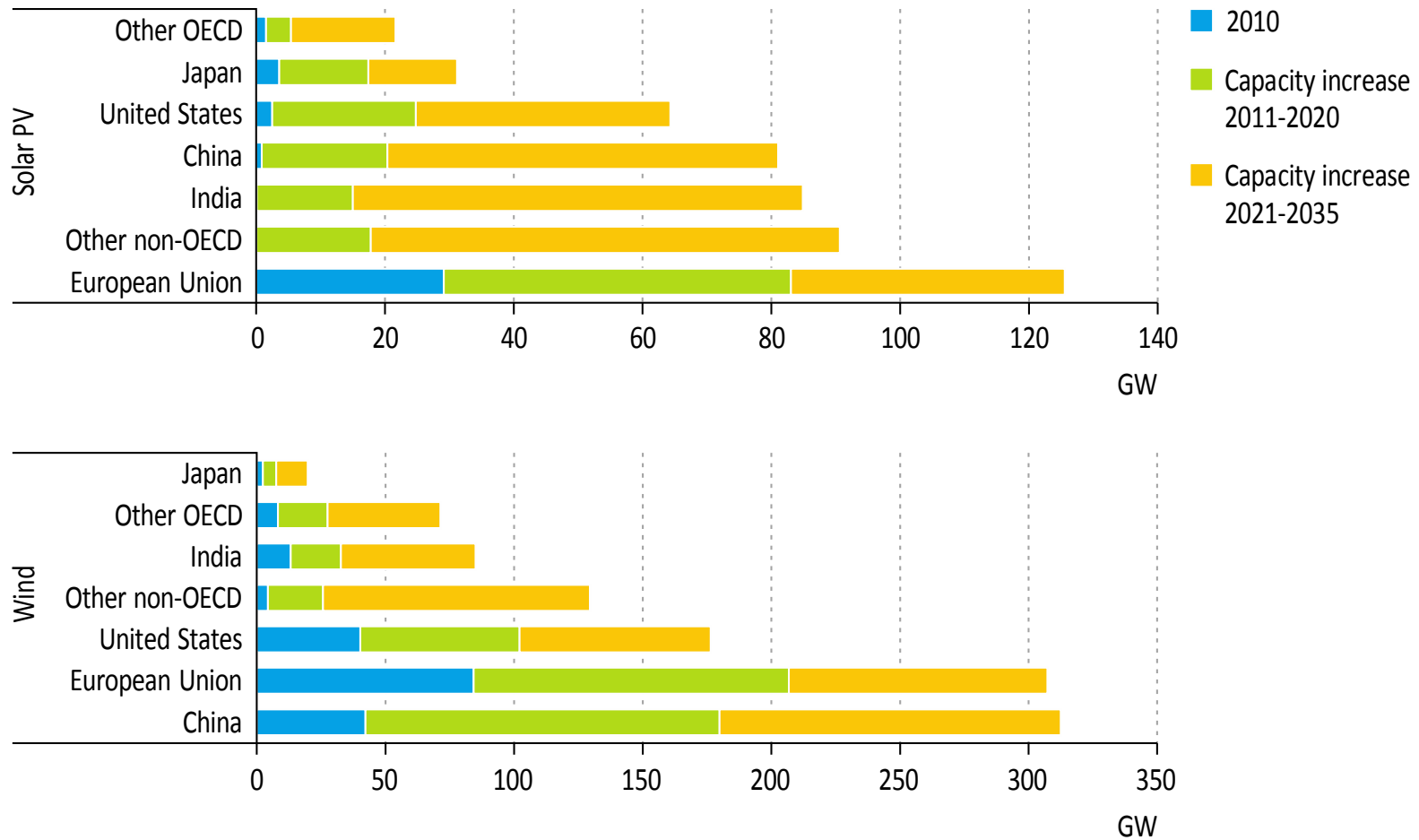


Note: Other Asia had net natural gas exports of 56 bcm in 2009.

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

# Renewable Energy also grows in Asia.

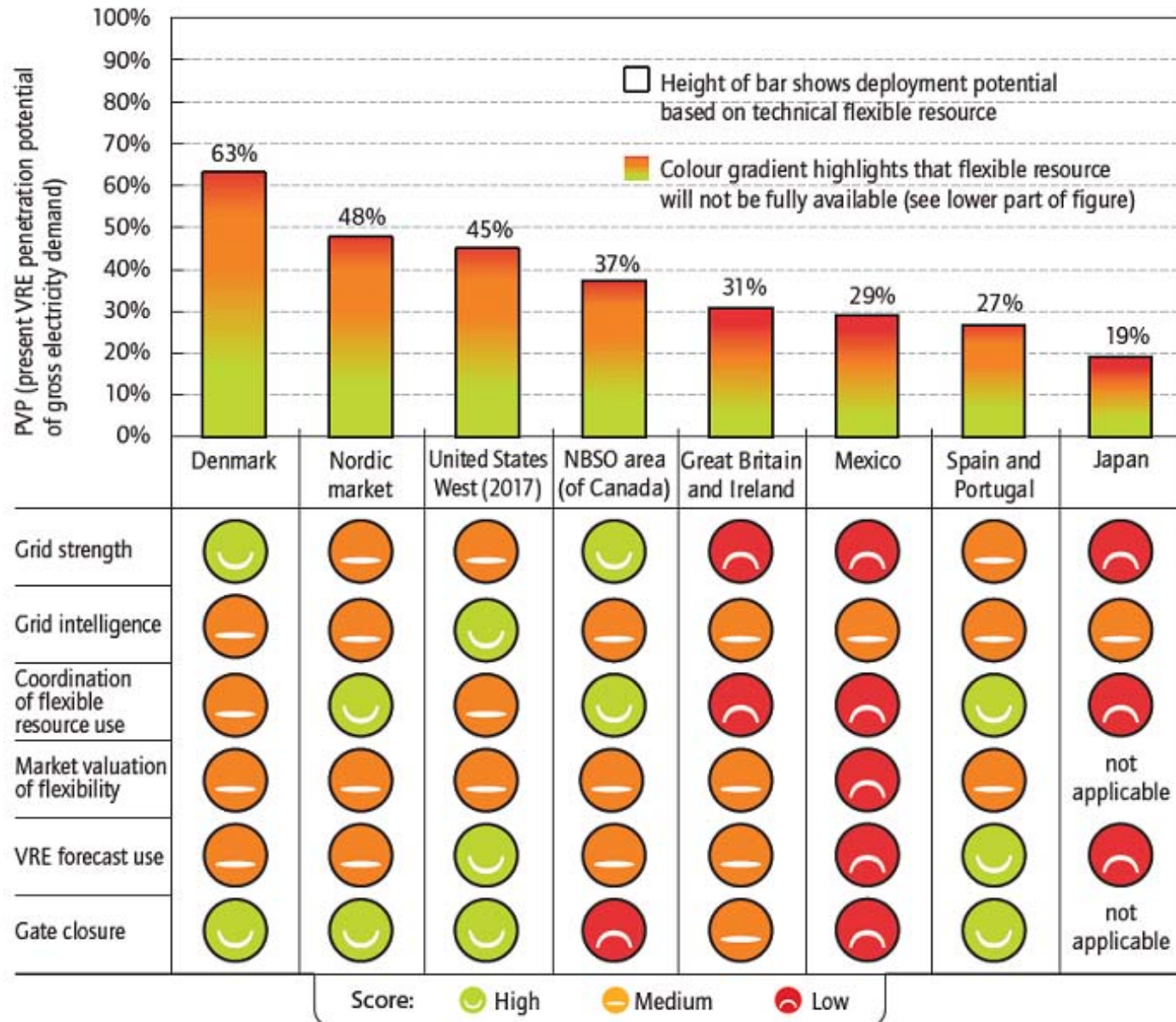
**Figure 5.9** • *Solar PV and wind power capacity by region in the New Policies Scenario*





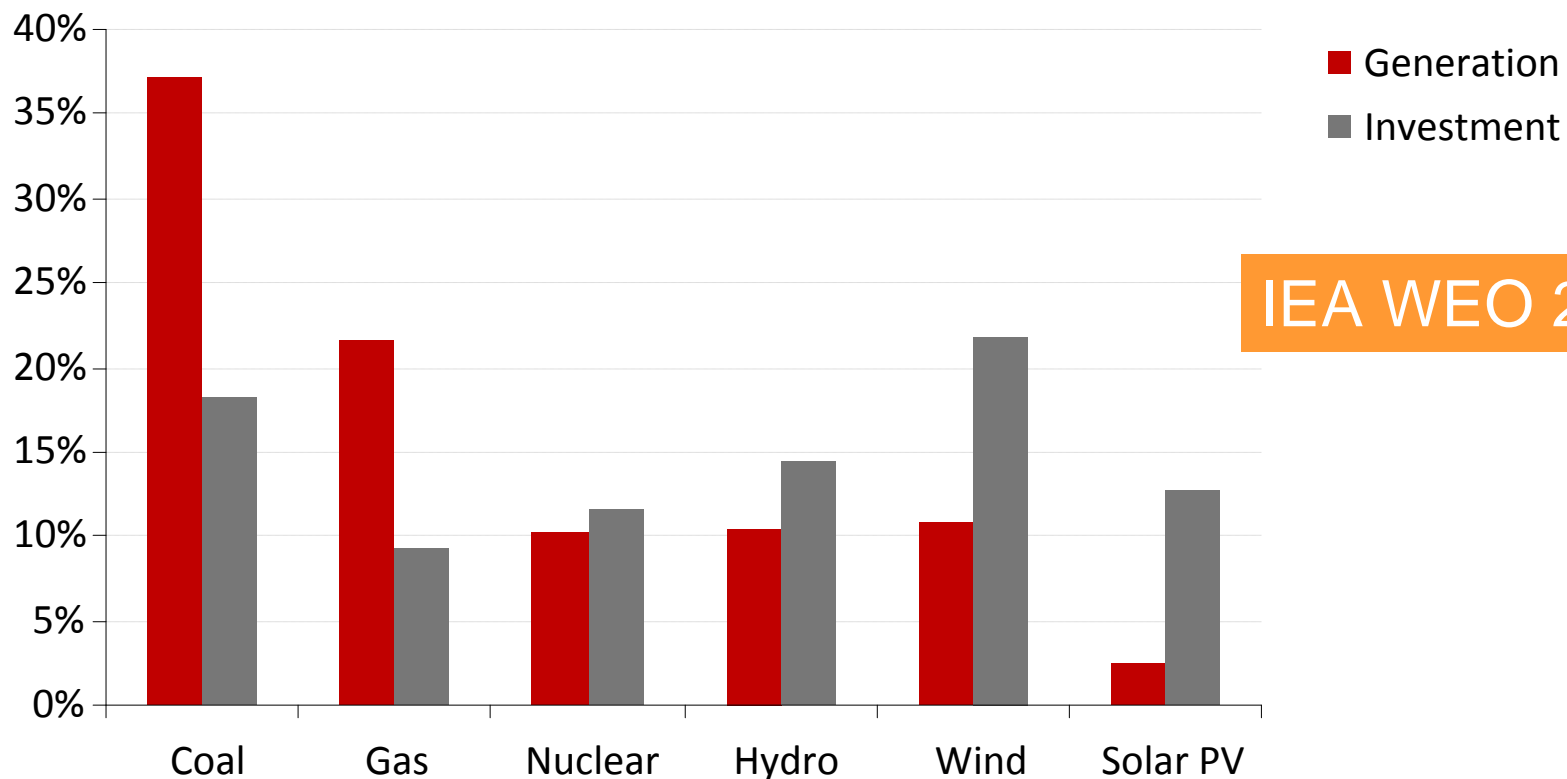
# Harnessing Variable Renewables

Figure 31 • VRE potentials today, from the balancing perspective



# Power investment focuses on low-carbon technologies but **it is costly.**

Share of new power generation and investment, 2011-2035

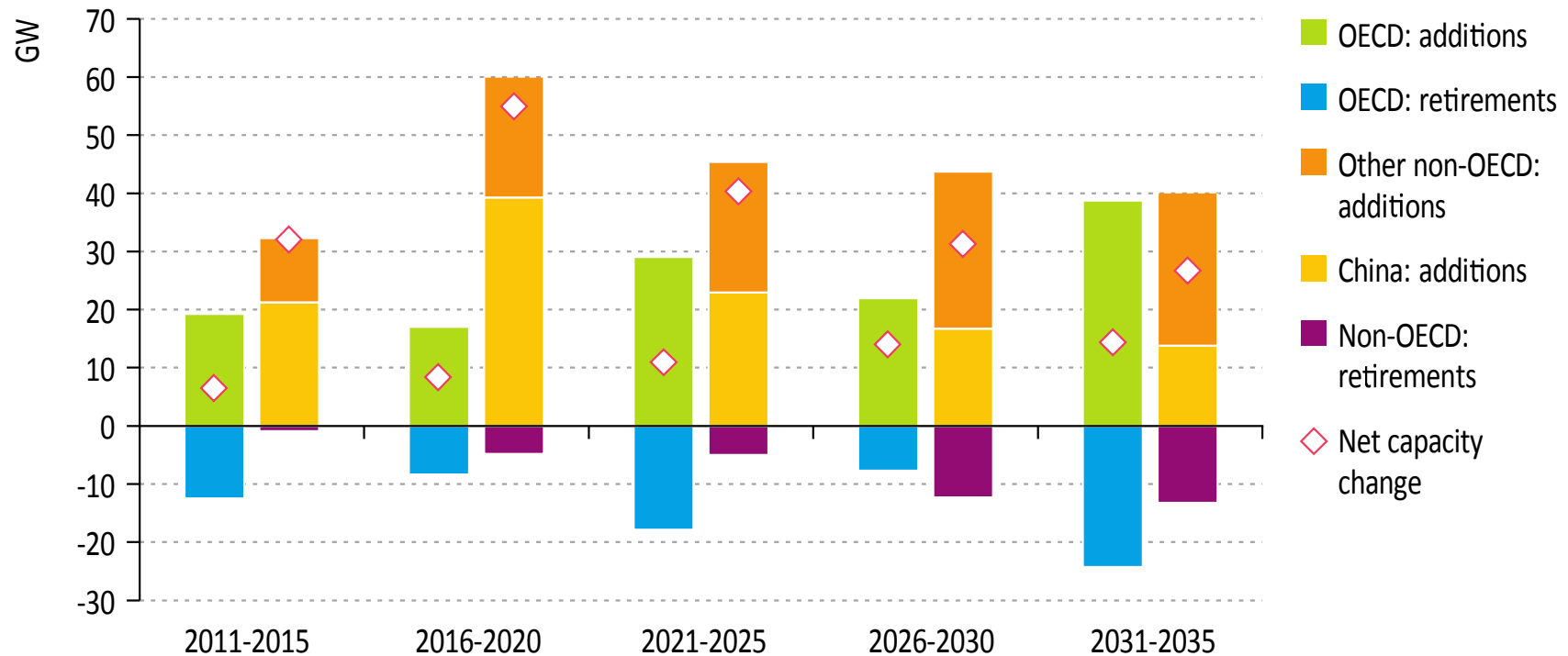


*Renewables are often capital-intensive, representing 60% of investment for 30% of additional generation, but bring environmental benefits & have minimal fuel costs*

# Nuclear Power continues to be an important option.

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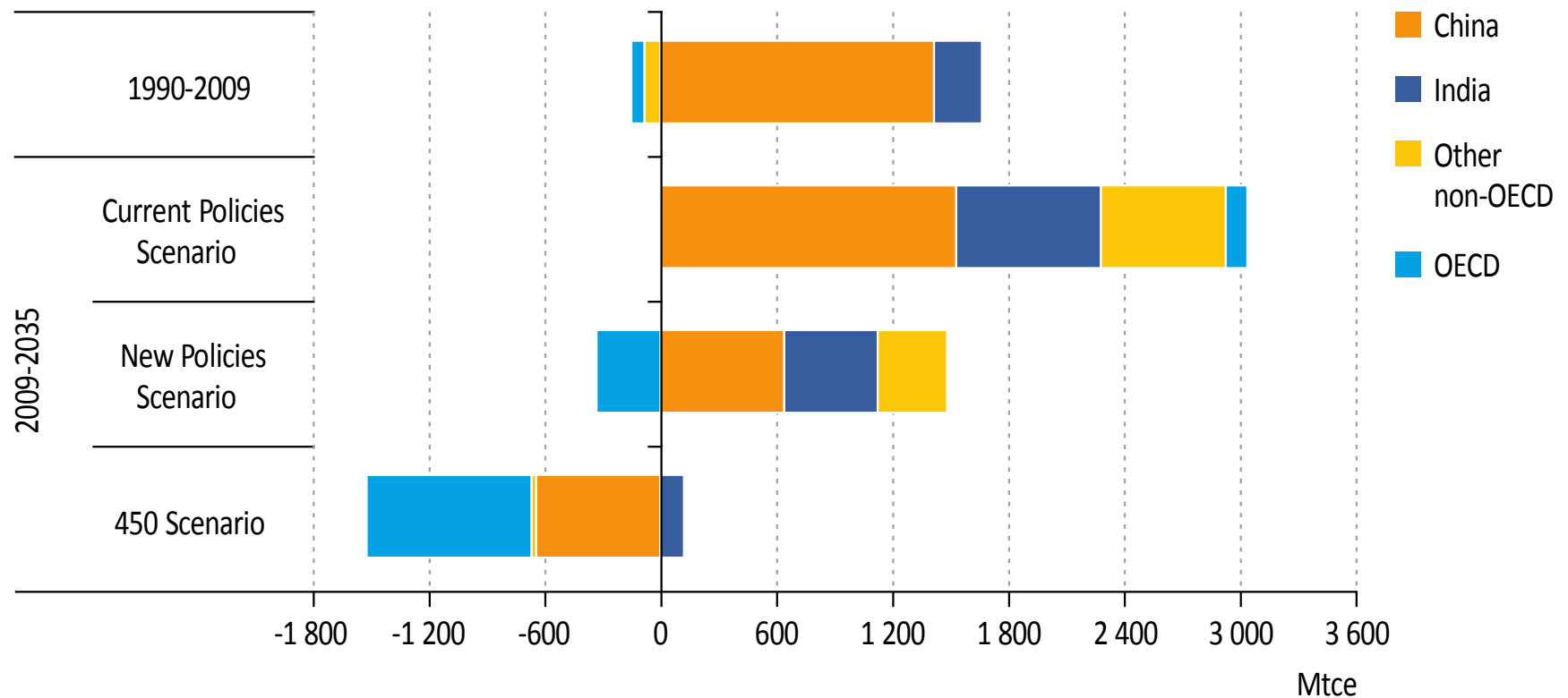
**Figure 5.7** • Additions and retirements of nuclear power capacity by region in the New Policies Scenario



# Who needs coal most?

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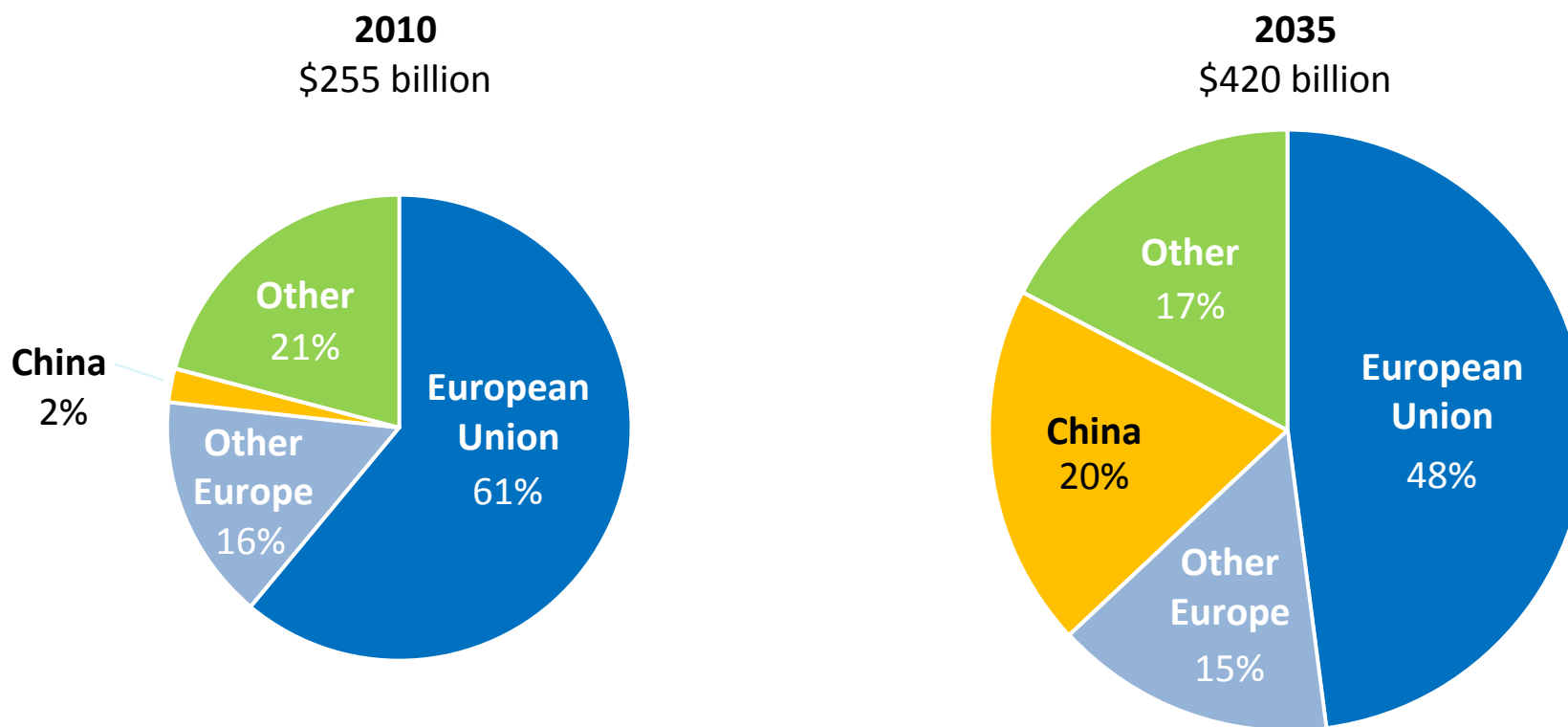
**Figure 10.3** • Incremental world primary coal demand by region and scenario



# Russia's focus will move to the East

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Russian revenue from fossil fuel exports

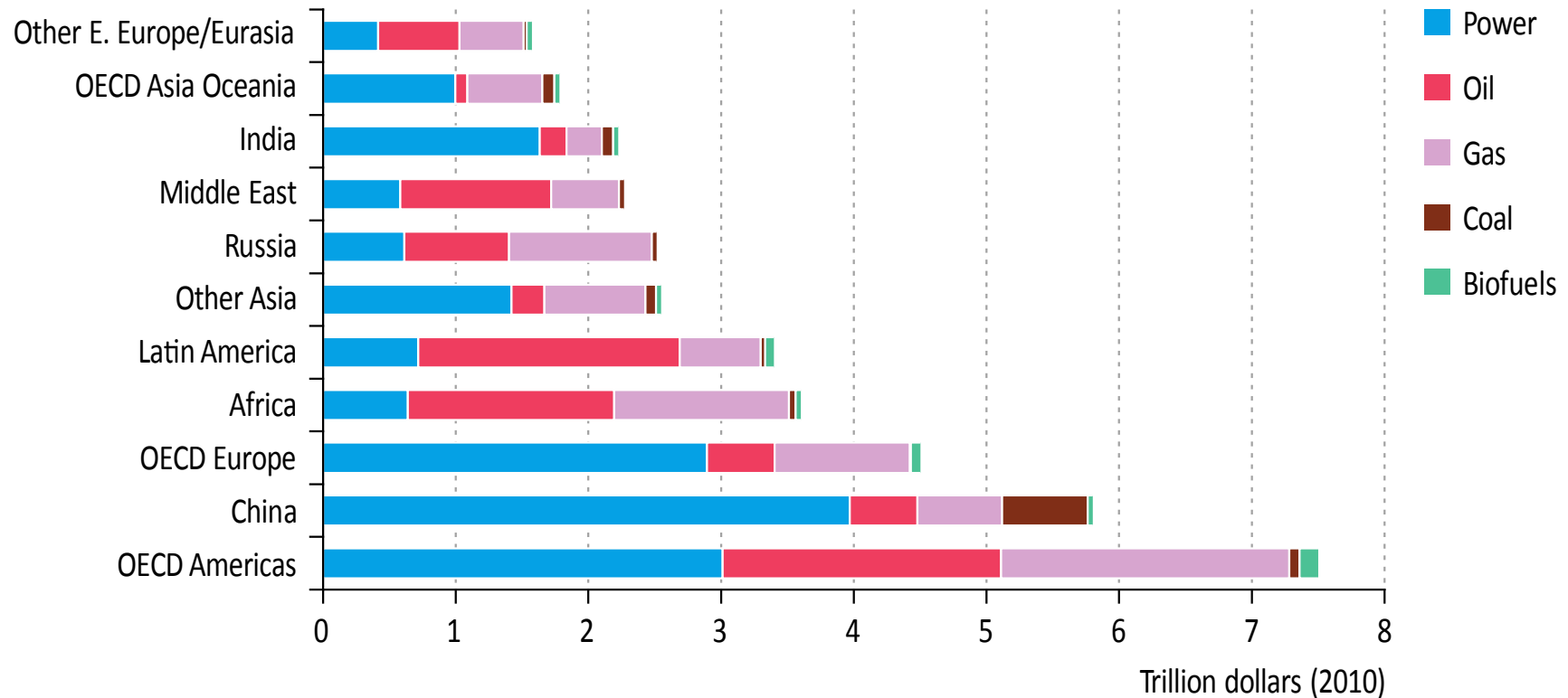


*An increasing share of Russian exports go eastwards to Asia, providing Russia with diversity of markets and revenues*

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

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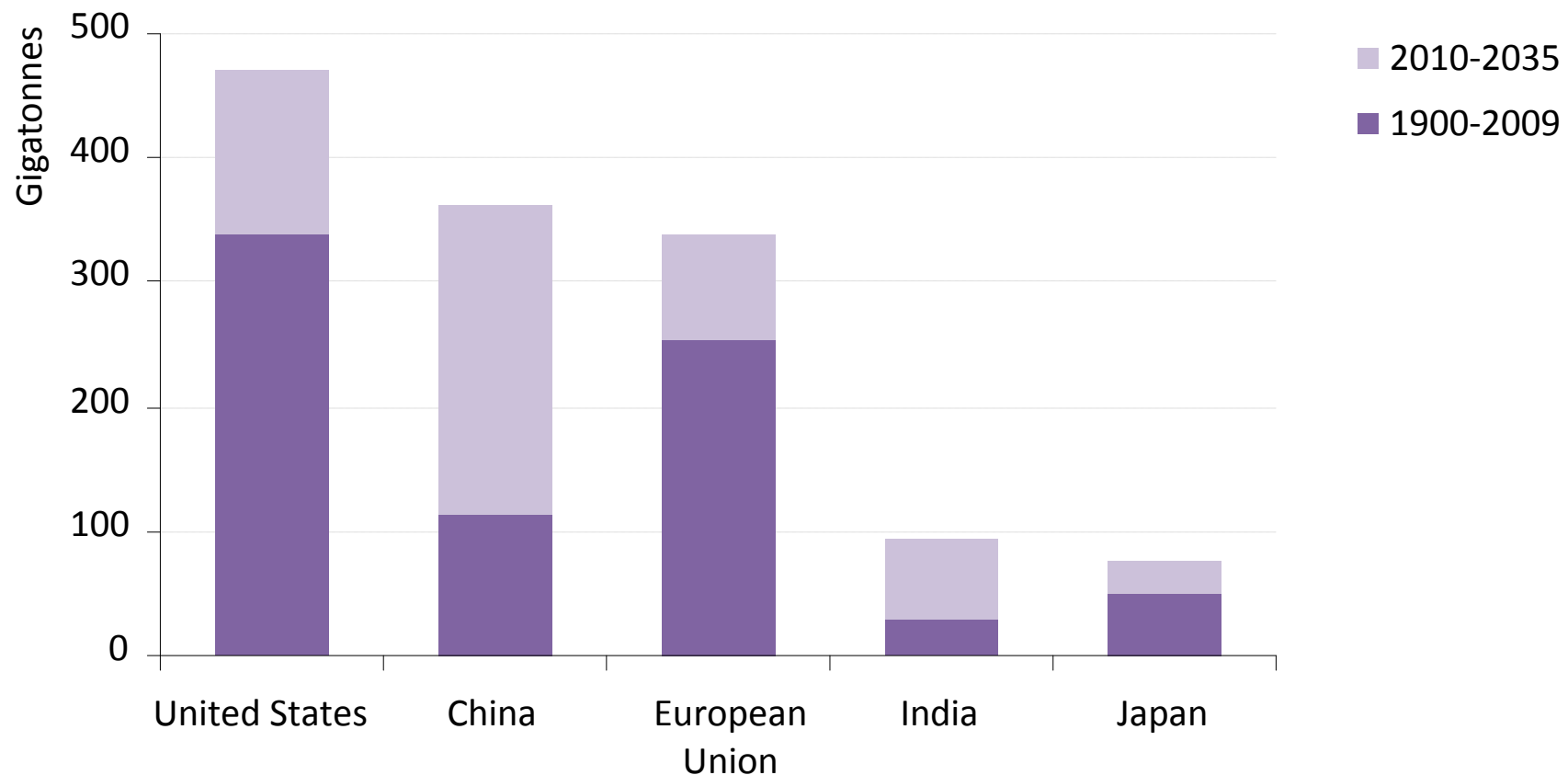
**Figure 2.21** • Cumulative investment in energy-supply infrastructure by region in the New Policies Scenario, 2011-2035



# Energy is at the heart of the climate challenge

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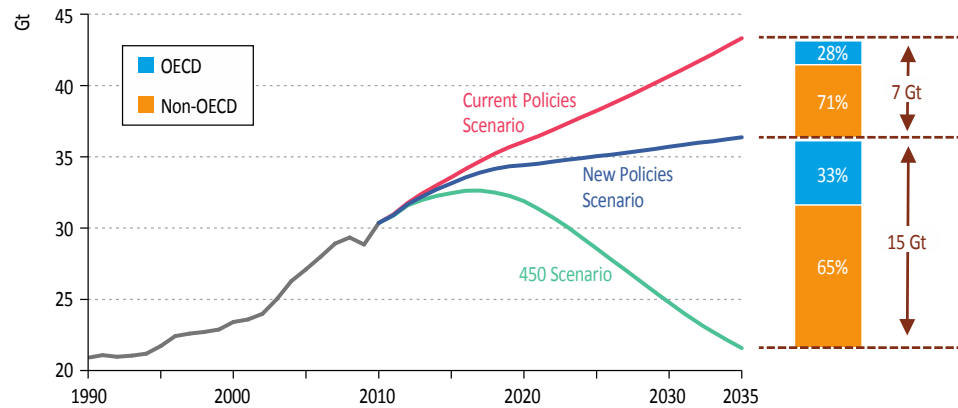
Cumulative energy-related CO<sub>2</sub> emissions in selected regions



*By 2035, cumulative CO<sub>2</sub> emissions from today exceed three-quarters of the total since 1900, and China's per-capita emissions match the OECD average*

# 450 ppm Scenario : what we need and where .

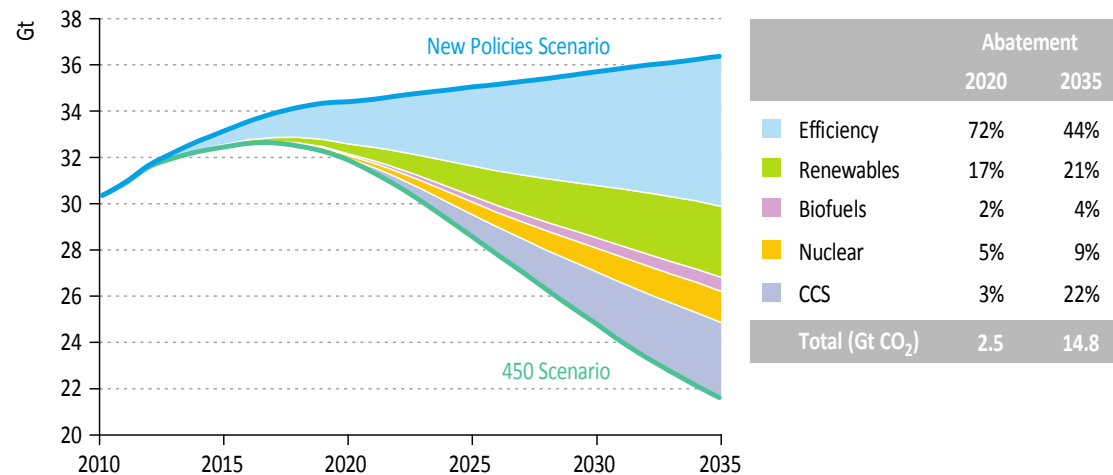
Figure 6.2 • World energy-related CO<sub>2</sub> emissions by scenario<sup>2</sup>



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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.

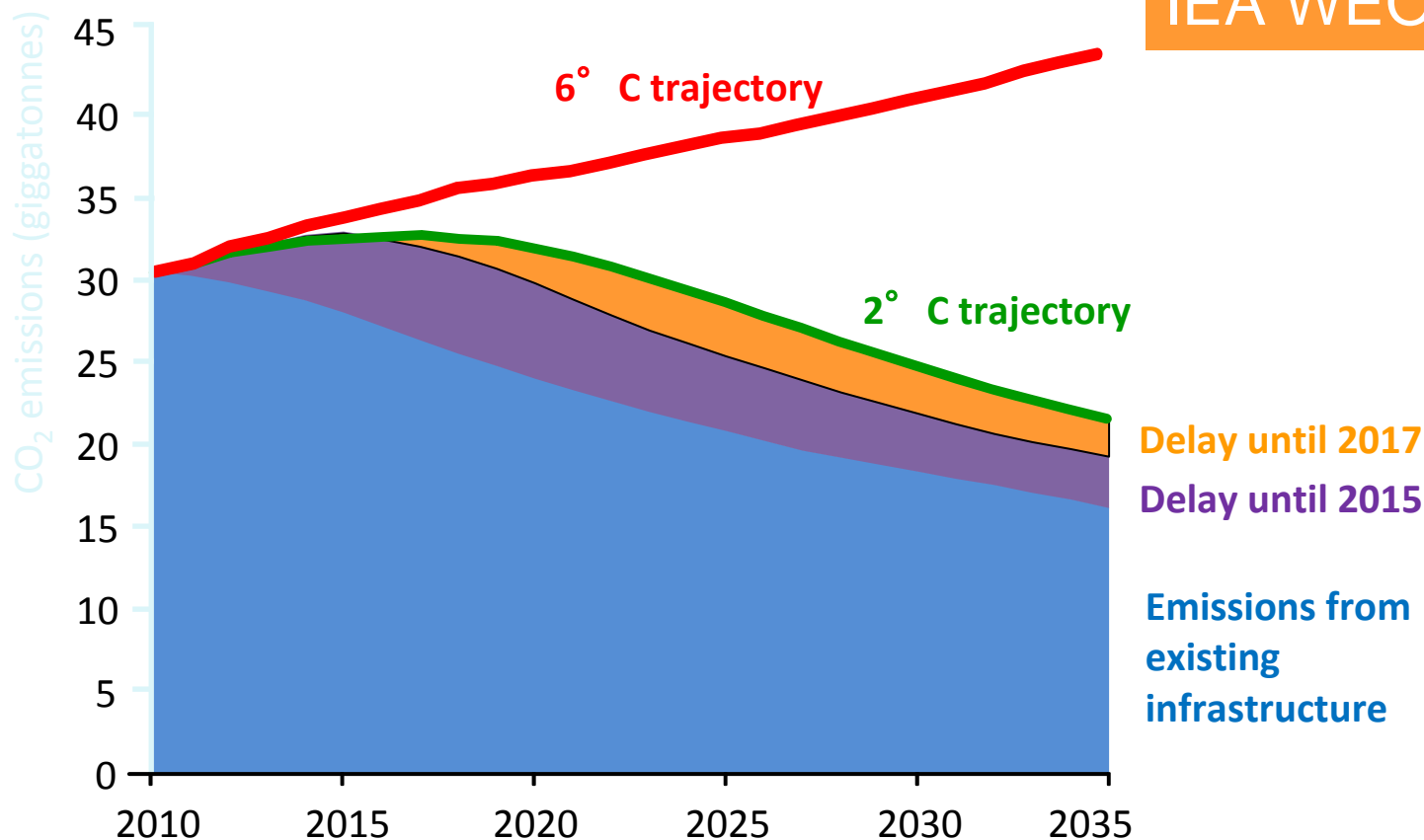
Figure 6.4 • World energy-related CO<sub>2</sub> emissions abatement in the 450 Scenario relative to the New Policies Scenario





*The door to 2° C is closing,  
but will we be “locked-in” ?*

IEA WEO 2011



***Without further action, by 2017 all CO<sub>2</sub> emissions permitted in the 450 Scenario will be “locked-in” by existing power plants, factories, buildings, etc***

# Low Nuclear Case

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**Table 12.3** • *Key projections for nuclear power in the New Policies Scenario and the Low Nuclear Case*

	Low Nuclear Case			New Policies Scenario		
	OECD	Non-OECD	World	OECD	Non-OECD	World
Gross installed capacity (GW)						
in 2010	326	68	393	326	68	393
in 2035	171	164	335	380	252	633
Share in electricity generation						
in 2010	21%	4%	13%	21%	4%	13%
in 2035	9%	5%	7%	21%	8%	13%
Gross capacity under construction (GW)*	14	54	69	14	54	69
New additions in 2011-2035 (GW)**	6	84	91	111	167	277
Retirements in 2011-2035 (GW)	176	42	218	71	36	107

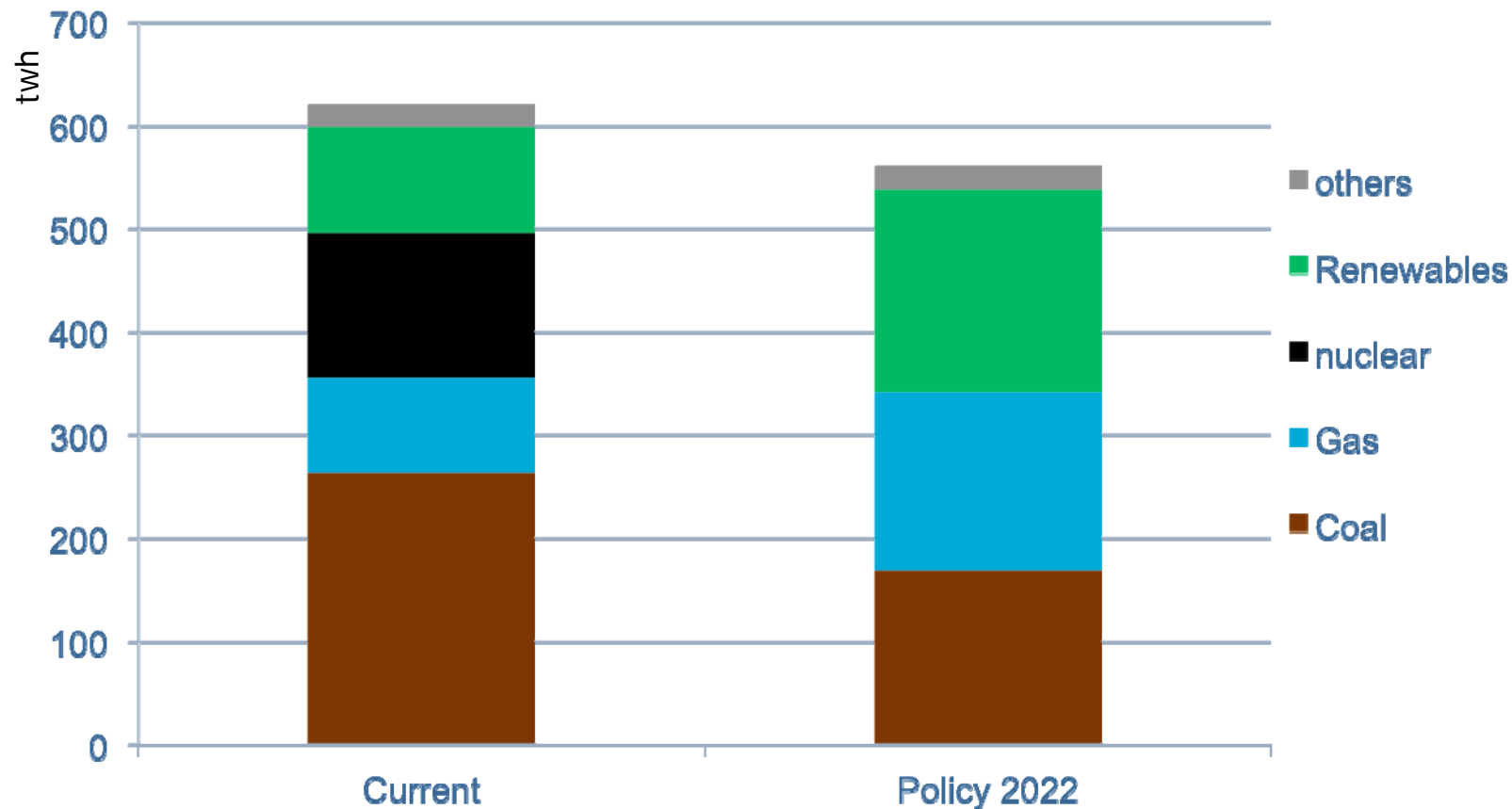
\*At the start of 2011. \*\*Includes new plants and uprates, but excludes capacity currently under construction.

# ***Second thoughts on nuclear would have far-reaching consequences in Security***

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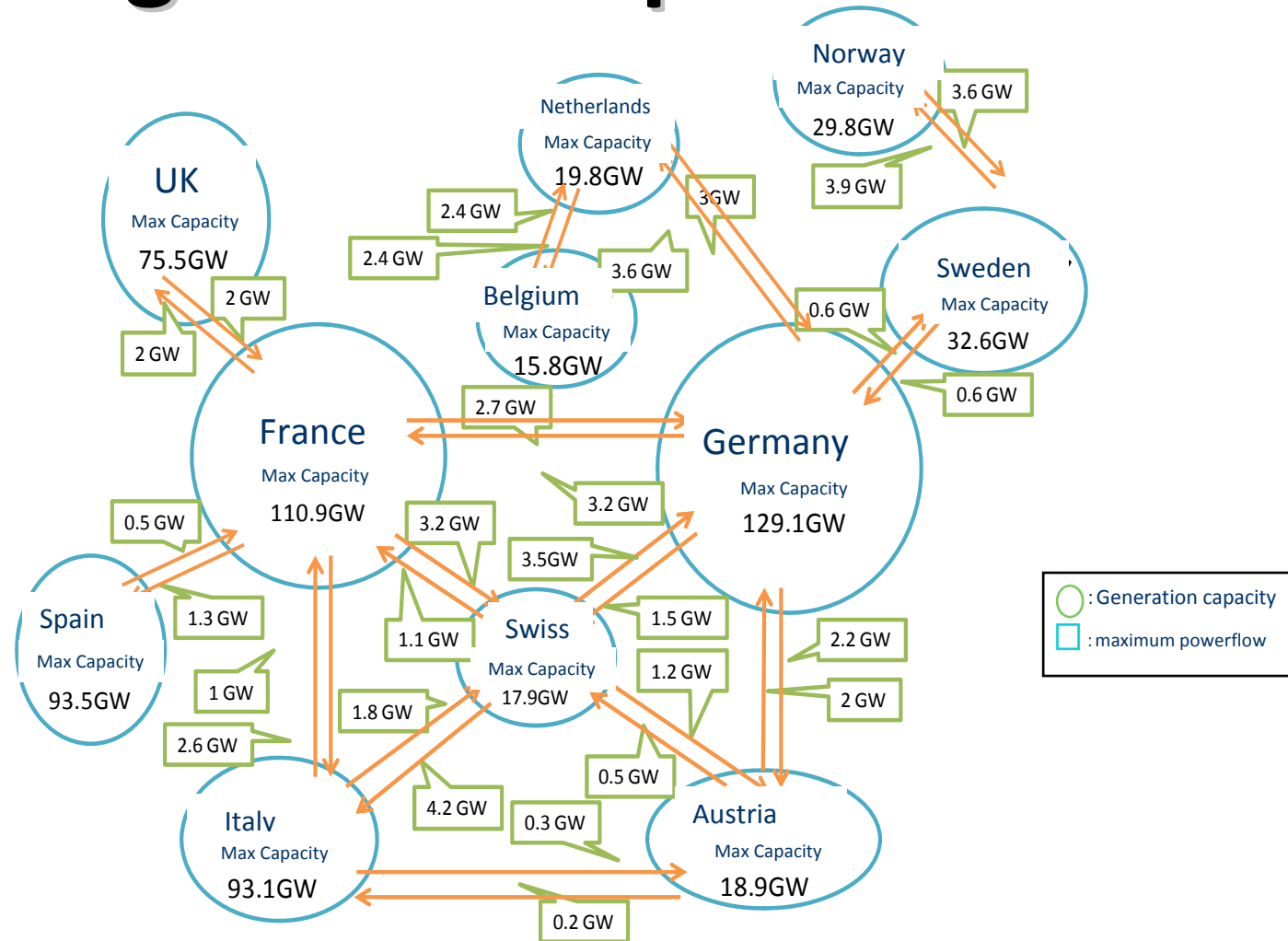
- **“Low Nuclear Case”** examines impact of nuclear component of future energy supply being cut in half
- Gives a boost to renewables, but increases import bills, reduces diversity & makes it harder to combat climate change
- **By 2035, compared with the New Policies Scenario:**
  - *coal demand increases by twice Australia’s steam coal exports*
  - *natural gas demand increases by two-thirds Russia’s natural gas net exports*
  - *Renewables power increases by 550TWh = 5 times of RE in Germany*
  - *power- sector CO<sub>2</sub> emissions increase by 6.2%*
- **Biggest implications for countries with limited energy resources that planned to rely on nuclear power**

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



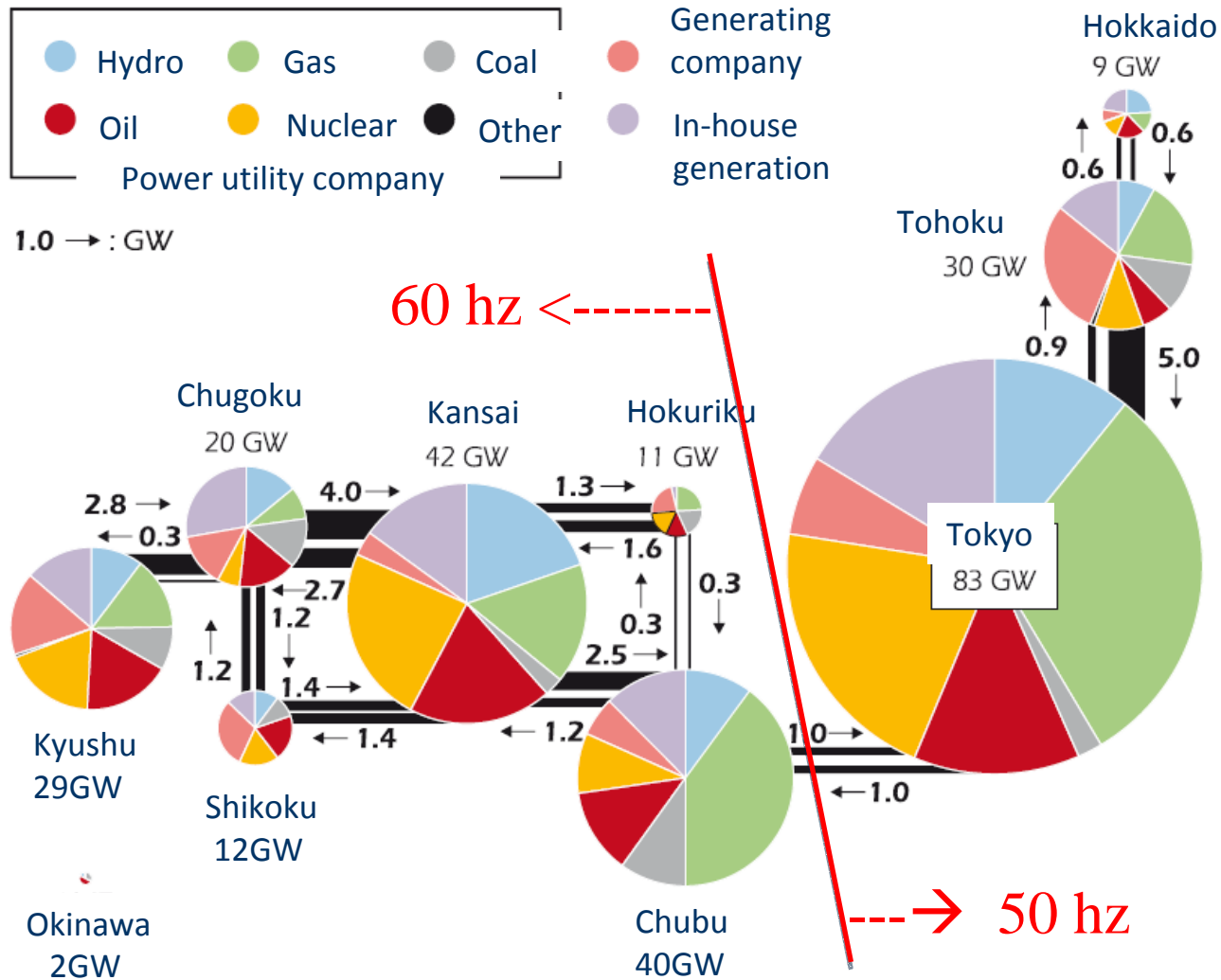
**Germany needs to import 16 BCM of gas to achieve electricity mix with 10% demand reduction, no nuclear, 35% renewables and CO2 at the target level**

# Power grid in Europe



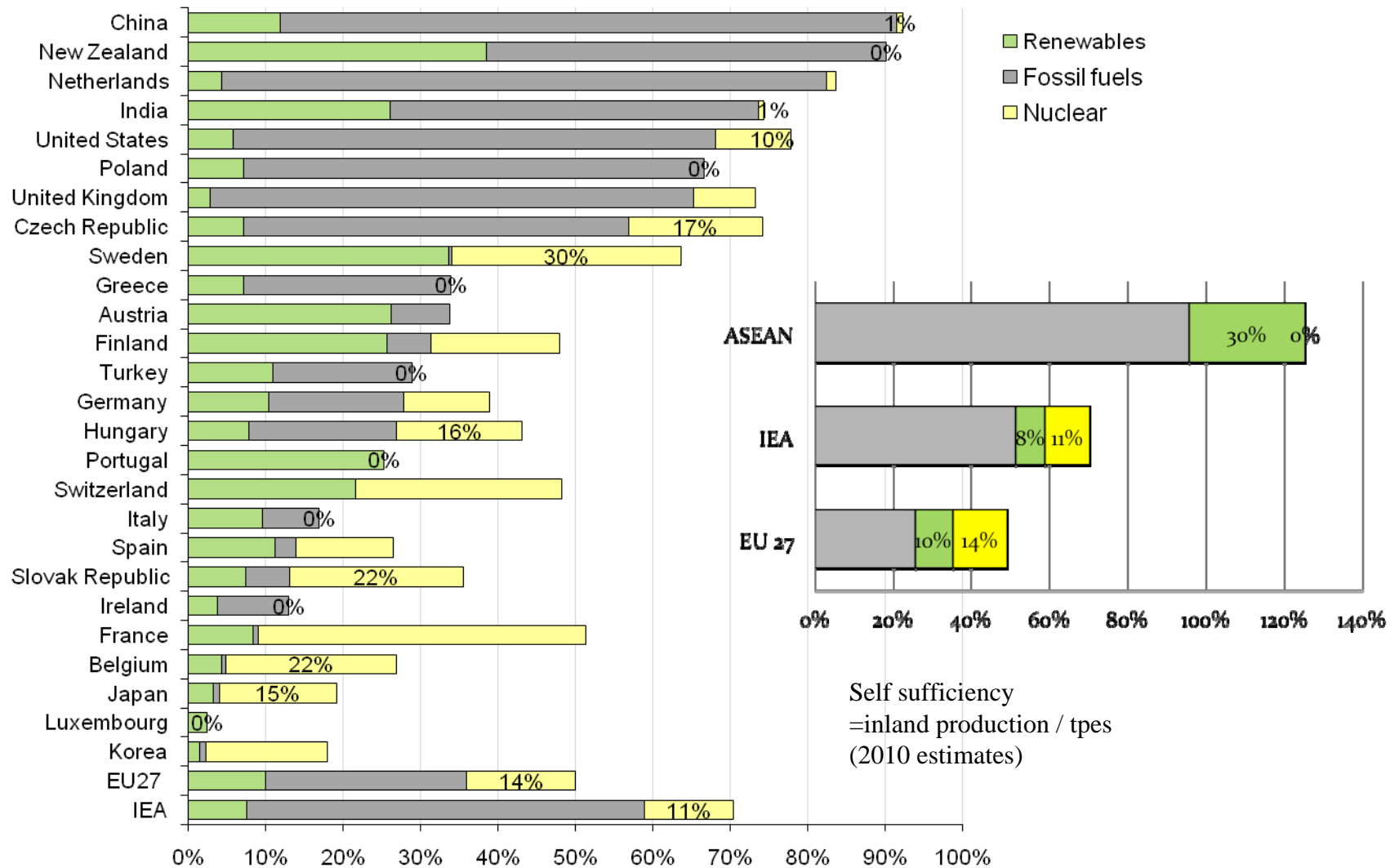
Source: IEA 「Electricity Information 2010」  
Indicative value for Net Transfer Capacities (NTC) in Continental Europe

# 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

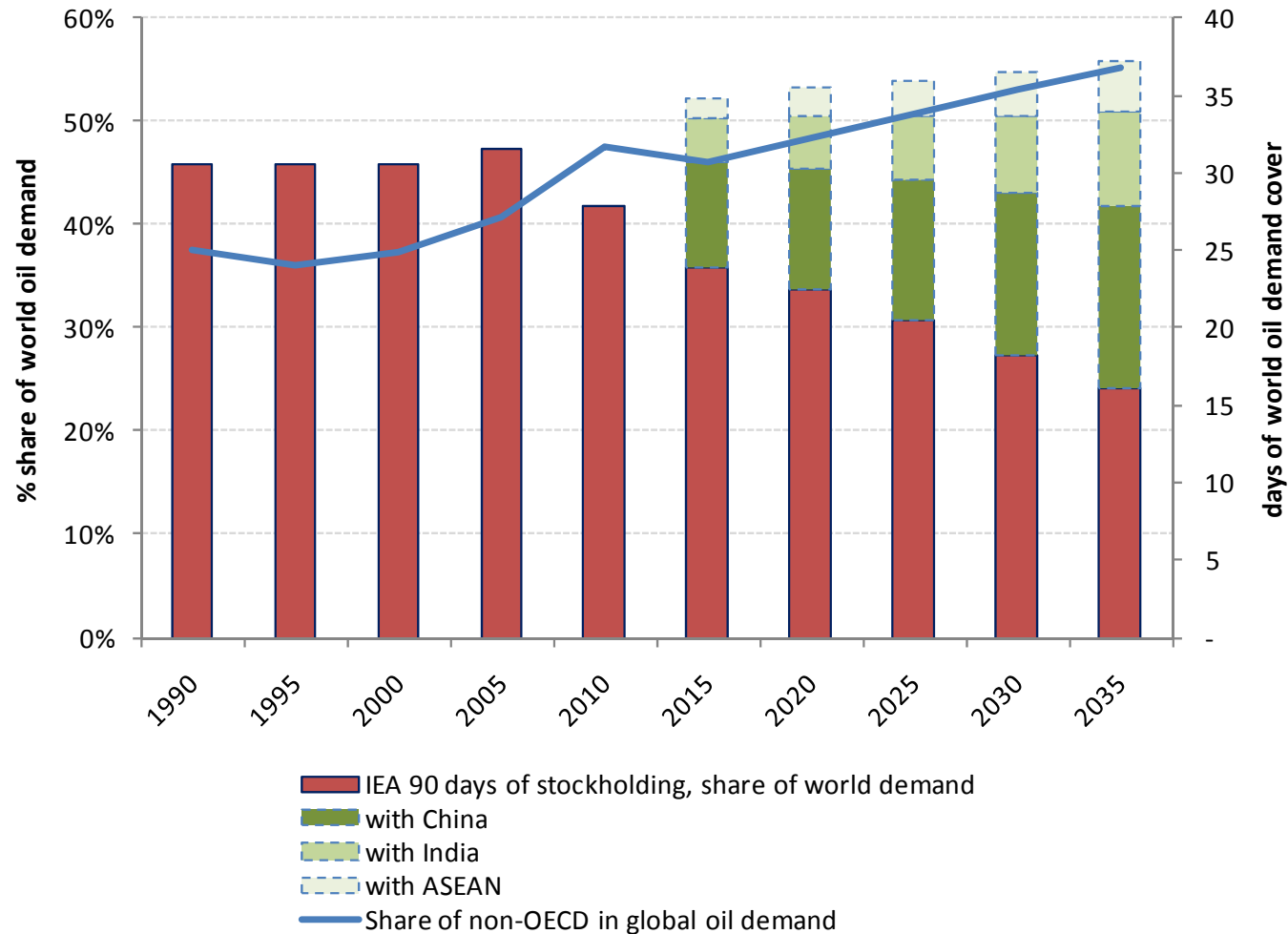
# Energy mix as Energy Security Mix



***Nuclear is an important option for countries with limited indigenous energy resources (low energy sustainability).***

# Does current IEA system continue to work?

## IEA stockholding cover of global oil demand



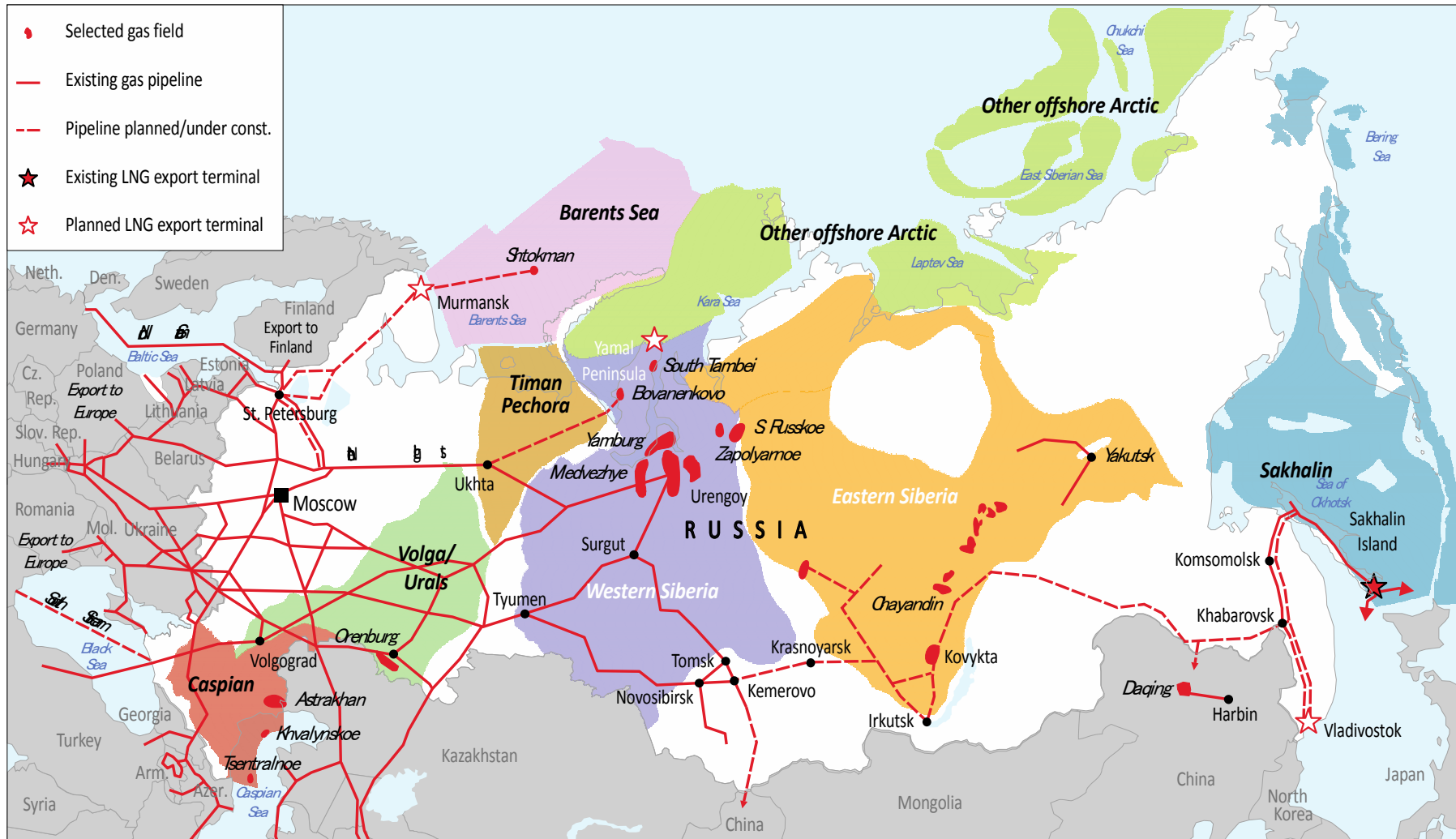
***Growing share of non-OECD oil demand results in declining global demand cover from IEA oil stocks***



# Russian Gas Pipelines

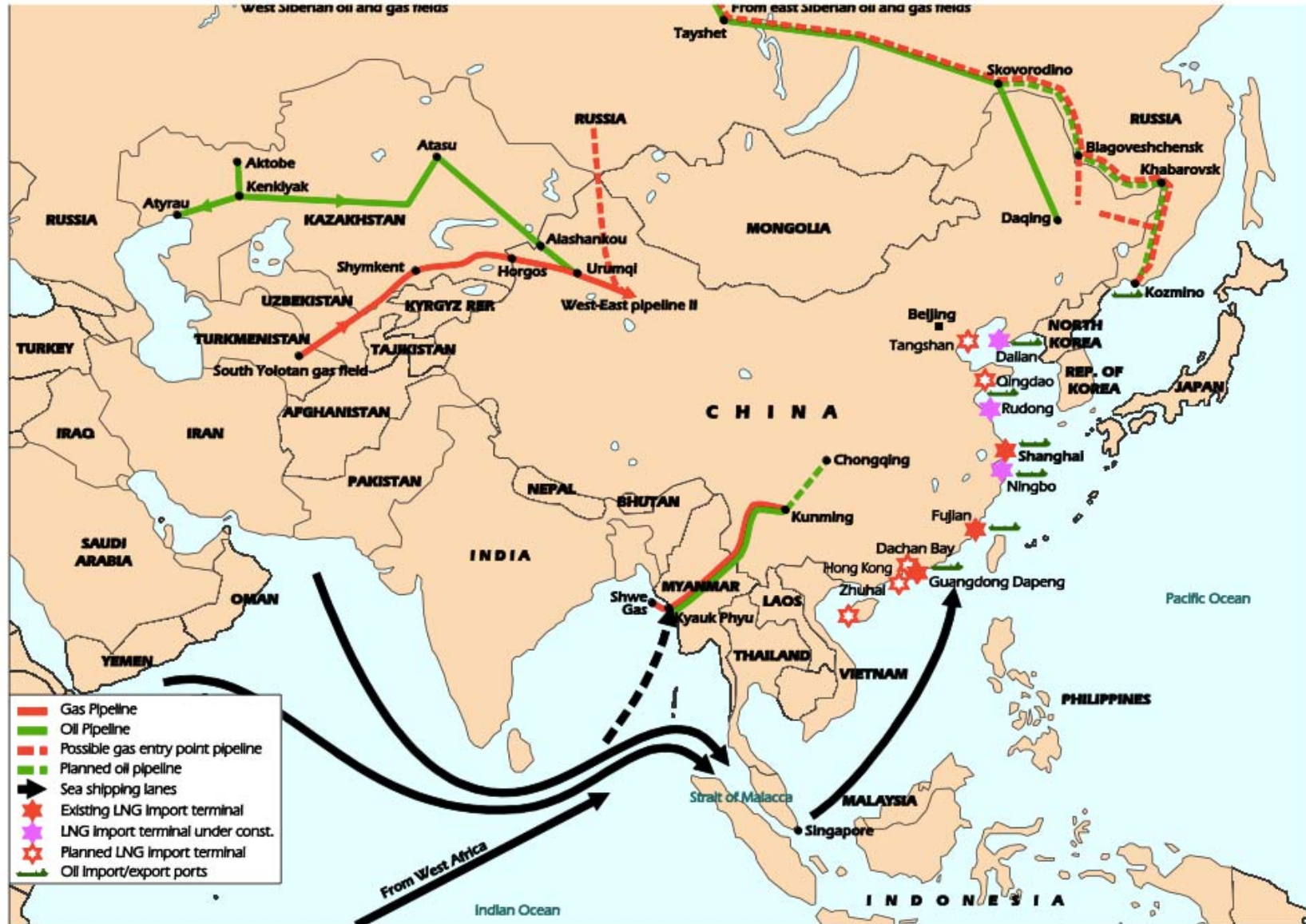
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Figure 8.15 • Major gas fields and supply infrastructure in Russia



This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

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



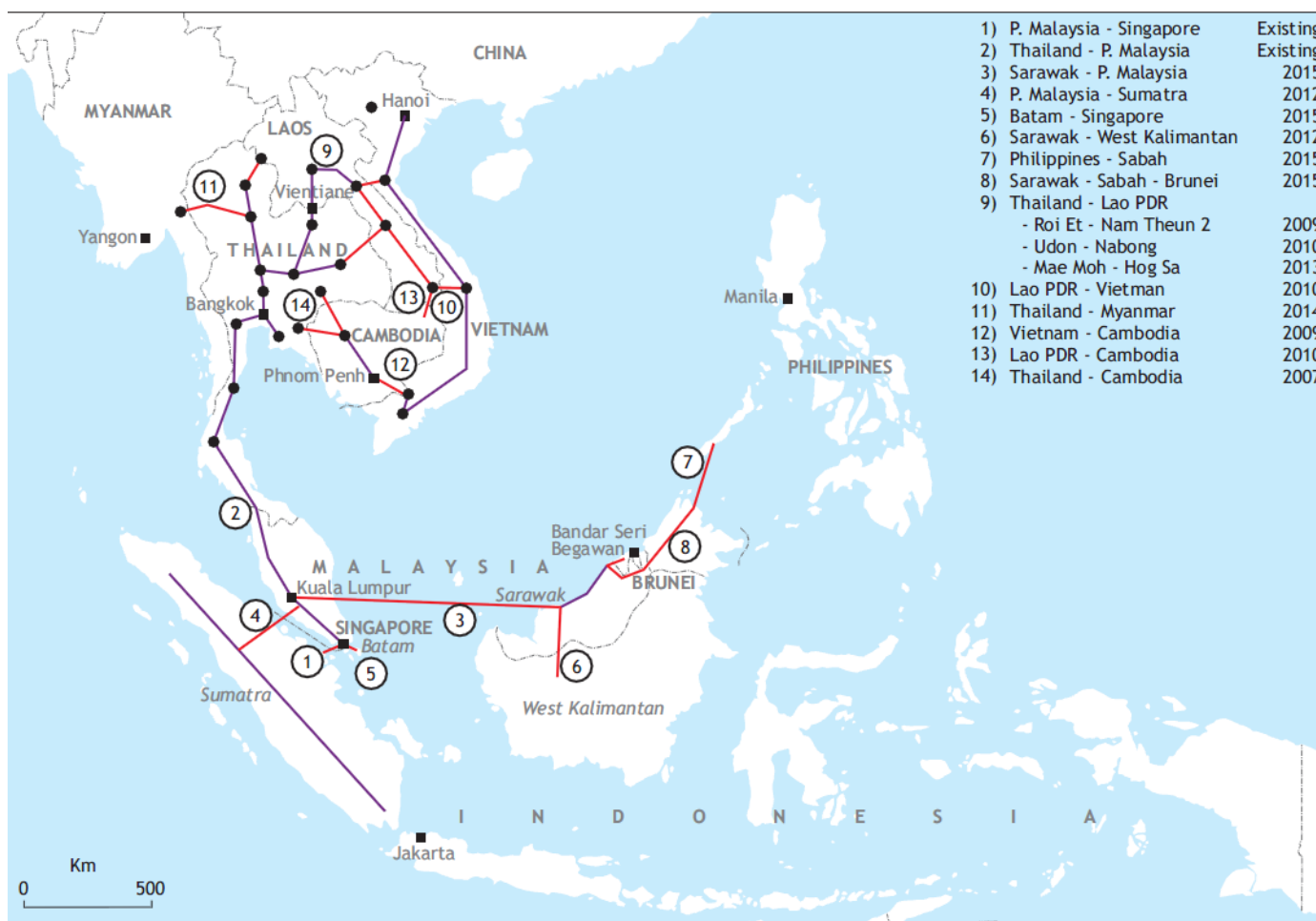
Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts

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



Source: DESRETEC Foundation

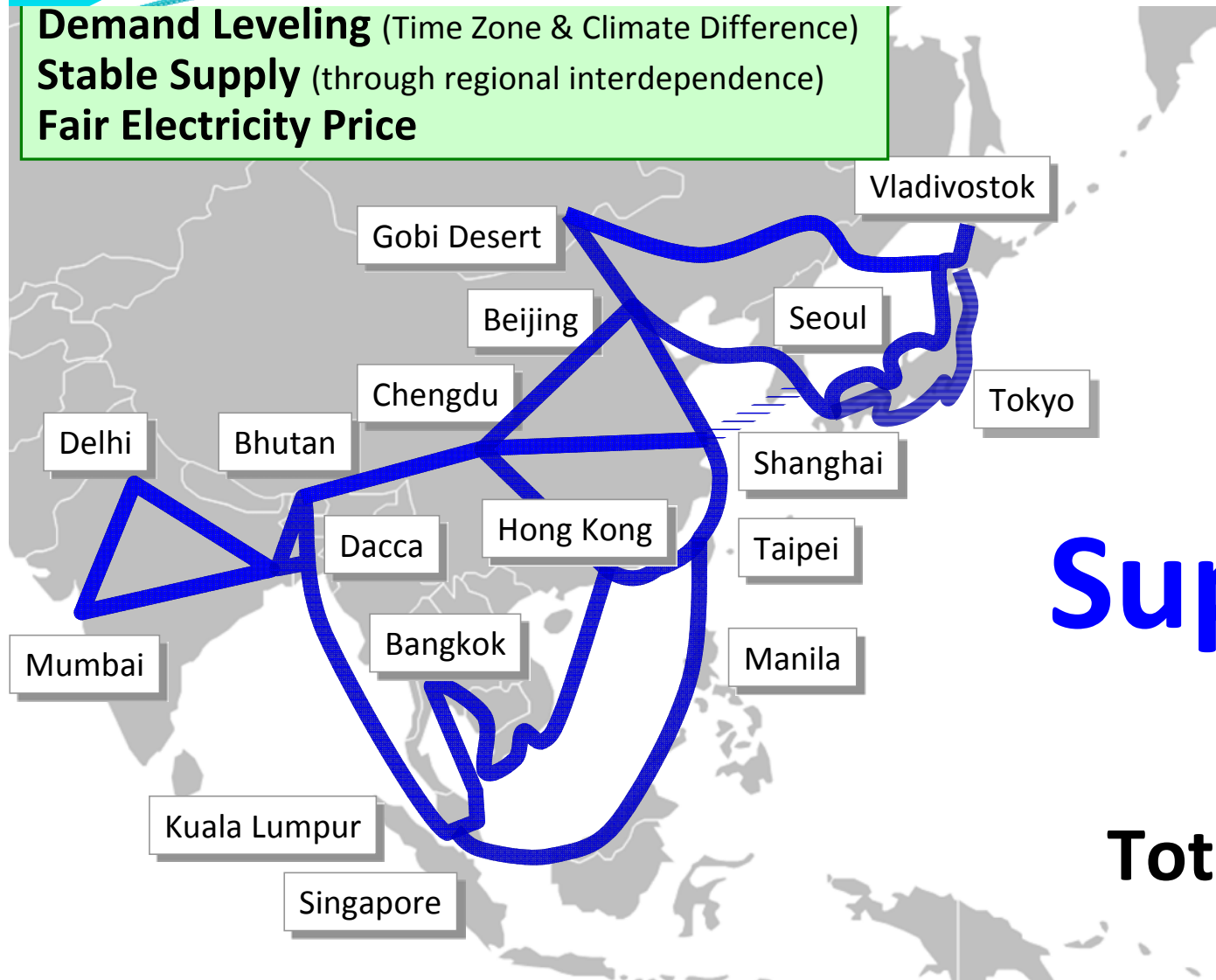
# Existing and proposed ASEAN Power Grid Interconnections



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.

# Energy for Peace in Asia ? A New Vision

**Demand Leveling** (Time Zone & Climate Difference)  
**Stable Supply** (through regional interdependence)  
**Fair Electricity Price**



Phase 3

## Asia Super Grid

**Total 36,000km**

Presentation by Mr. Masayoshi SON

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

- Energy Security for the 21st Century must be **Comprehensive Electricity Supply Security** with diversified sources, such as oil, gas, renewables, cleaner coal and safer nuclear, under sustainability constraints.
- EU Model of Collective Energy Security** be applied to the growing Asia.
  - ⑩ Enlarge IEA's oil emergency preparedness to Asia and other fuels.
  - ⑩ Develop Regional Power Grid interconnection & Gas Pipelines including **Russia**.
- Deploy a green growth paradigm by **Efficiency**, decentralized Renewables, EVs, Smart Grids, Storage, etc.
- New technologies** help; hydrogen economy, Methane-hydrate , 4G Nuclear power, Super-conductivity grid, CCUS, etc .
- Develop **unconventional gas** resources and infrastructure.
- For coal to remain the backbone of power supply, **CCS** readiness & highly efficient power plants are needed.
- Japan's role after **Fukushima: Share the lessons** learned for **safer Nuclear** Power deployment in Asia.