

Energy Security & Sustainability for Asia in the 21st Century

2012/3/22 CSIS

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A Time of Unprecedented Uncertainties.

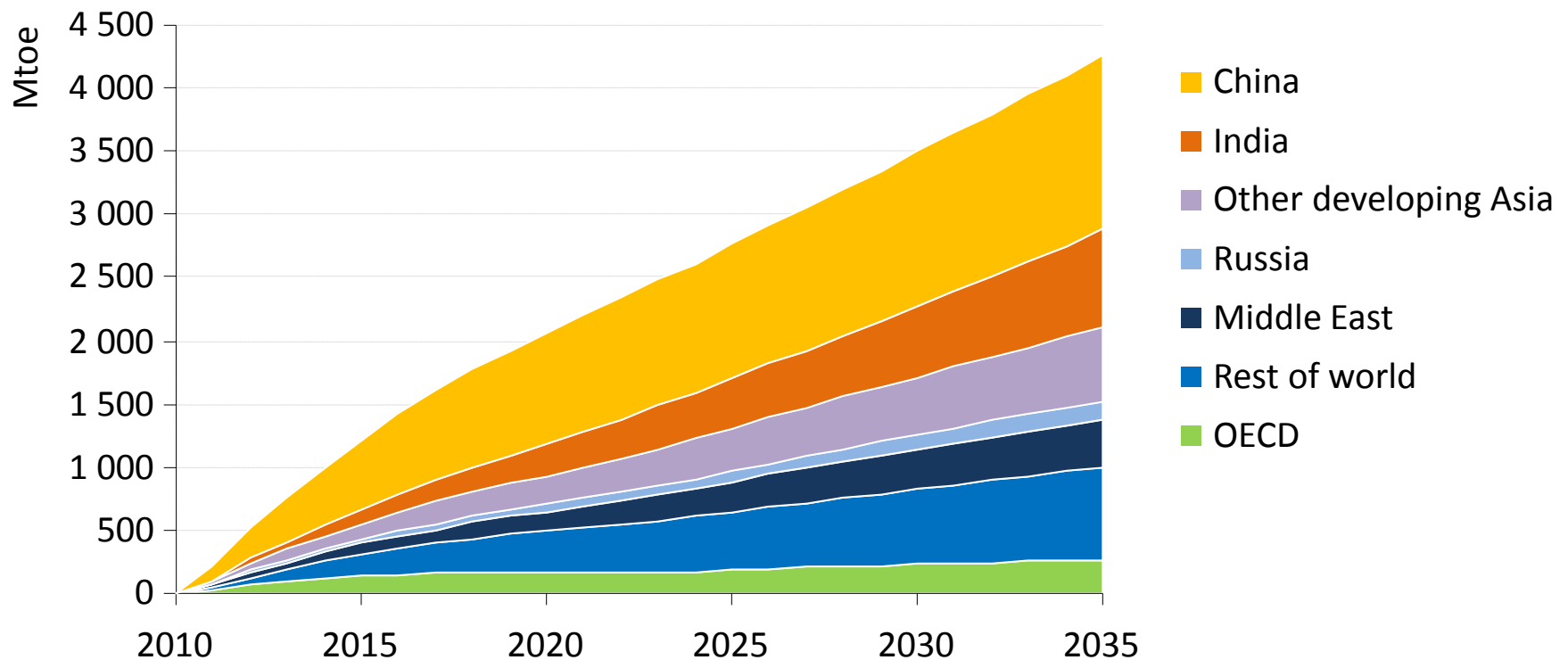
Uncertainty No.1

- Growing Asian economies will shape the global energy future – where will their policy decisions lead us ?

China is already the largest consumer of energy and will be the largest oil consumer in 2035.

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Growth in primary energy demand

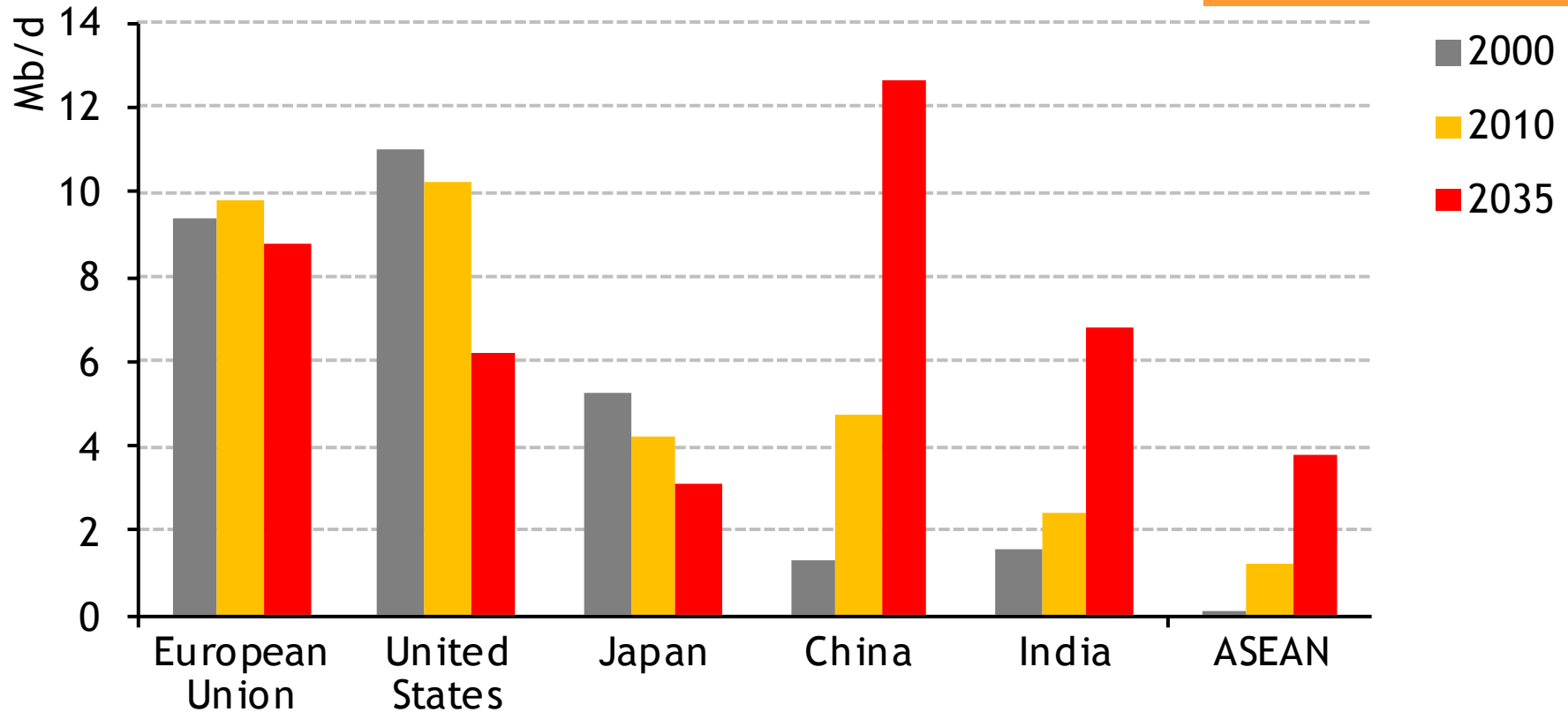


Global energy demand increases by one-third from 2010 to 2035, with China, India and other Asia accounting for two thirds of the growth

Petroleum security is particularly the issue for Asia in the 21st Century.

Net imports of oil

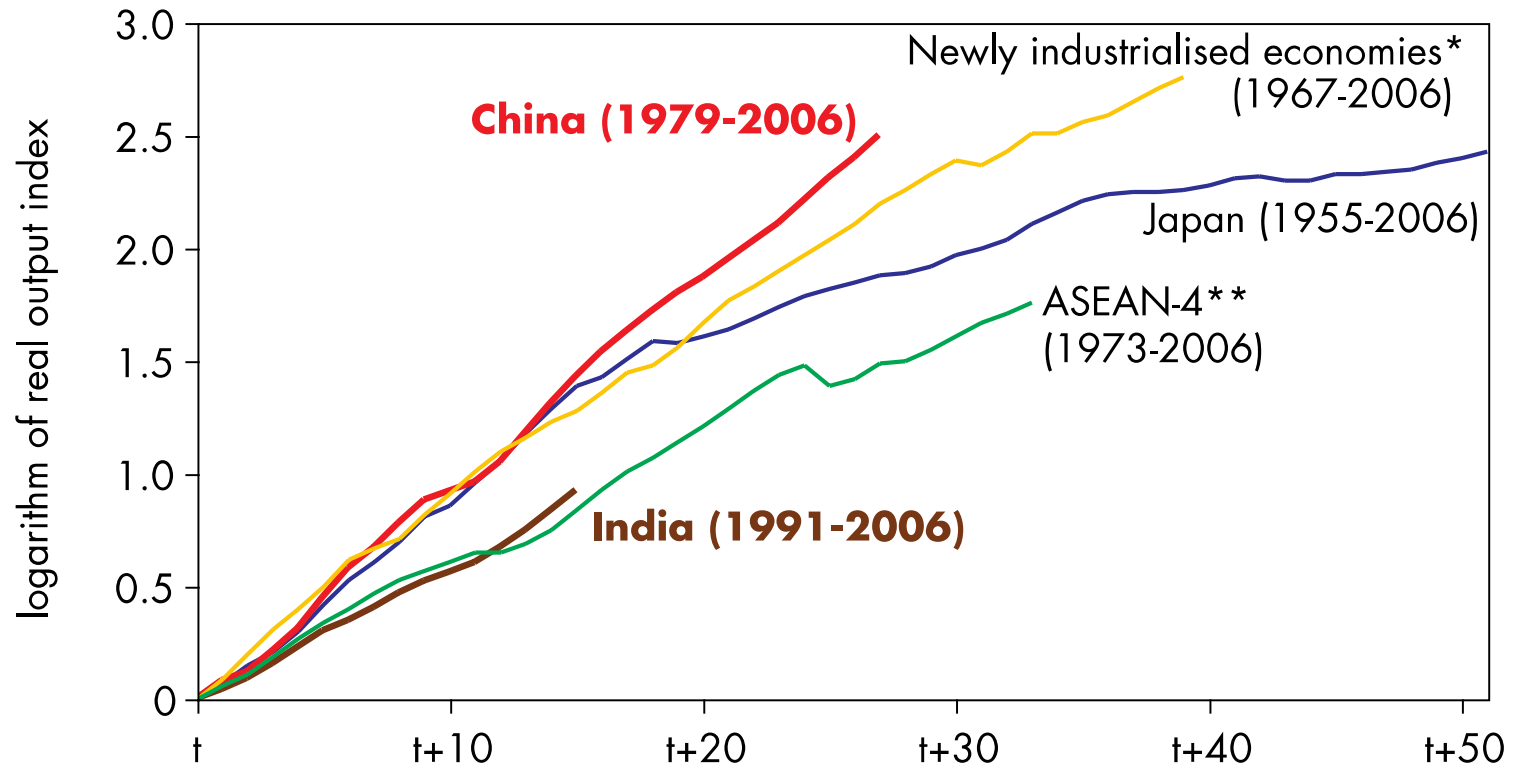
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US oil imports drop due to rising domestic output & improved transport efficiency: EU imports overtake those of the US around 2015; China becomes the largest importer around 2020

How soon may Chinese growth slow down?

Figure 3.1: Real Output in China, India, Other Asian and Newly Industrialised Economies



* Chinese Taipei, Hong Kong, Korea and Singapore. ** Indonesia, Malaysia, Philippines and Thailand.

Note: The starting point, t , is defined by when the three-year moving average of constant-price export growth first exceeded 10%. For China, it is 1979, and for India, 1991, when major economic reforms began. Real output is GDP expressed in constant prices, indexed at the beginning of the period of rapid growth and expressed in logarithmic form.

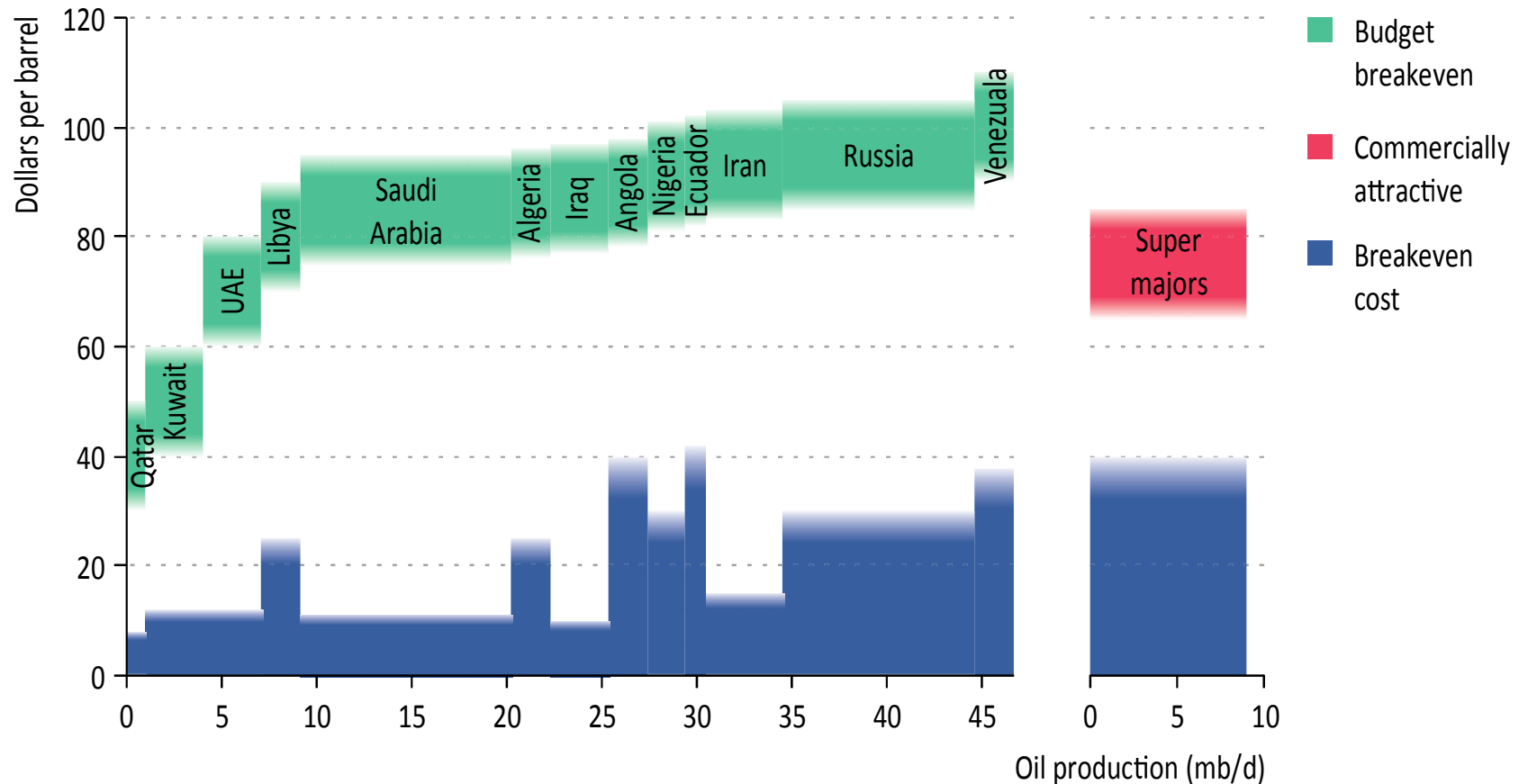
Source: IMF *World Economic Outlook* database.

Uncertainty No.2

- Does political unrest in producing regions make oil market tighter? What will be the longer term market structure? What will be the impact of Iran Sanction?

Figure 3.21 • Breakeven costs, budget breakeven and commercially attractive prices for current oil production for selected producers, mid-2011

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‘Deferred Investment Case’ looks at near-term investment falling short by one-third. MENA output falls 3.4 mb/d by 2015 and Consumers face a near-term rise in oil prices to \$150/barrel.

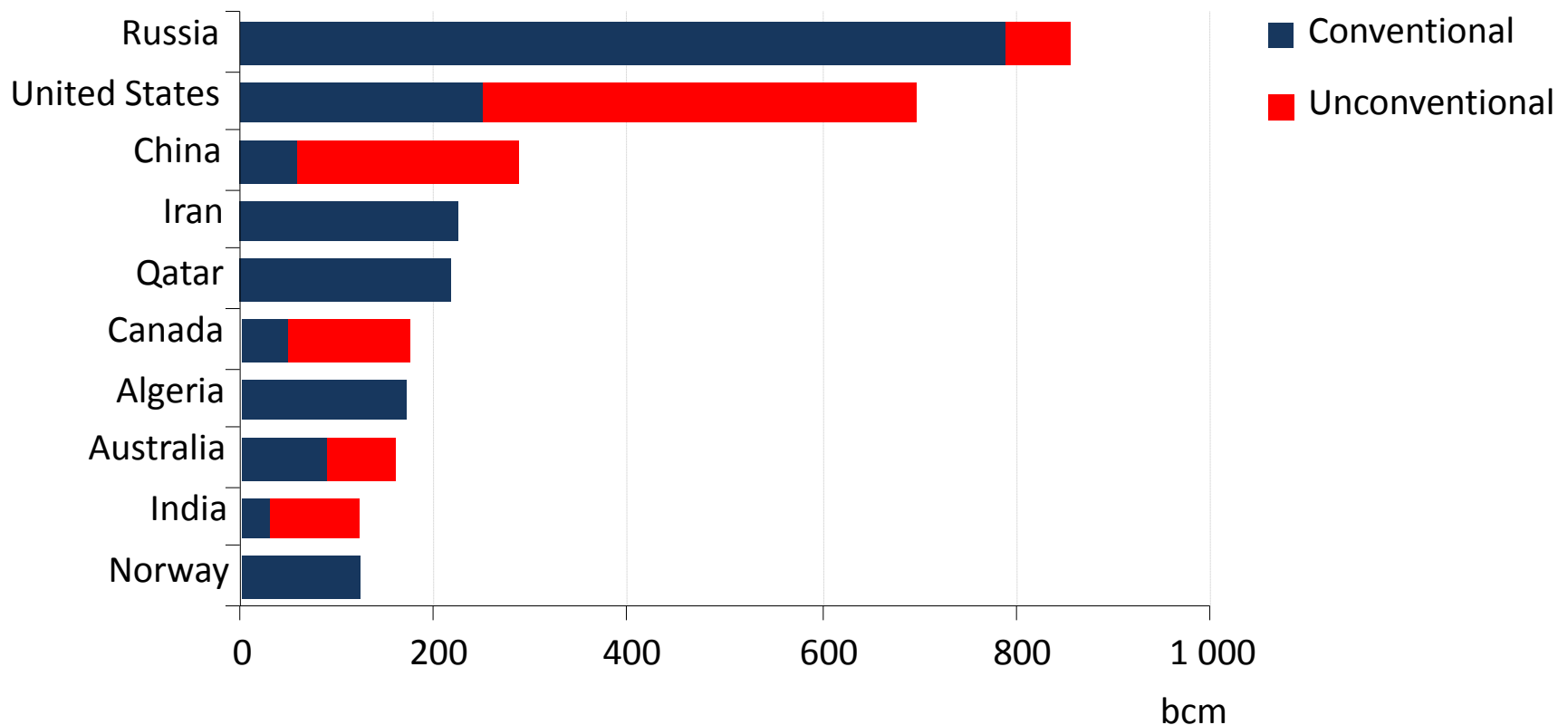
Uncertainty No. 3

Is the Golden age of Natural Gas a solution for security?

The Golden Age for Natural Gas ?

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Largest natural gas producers in 2035



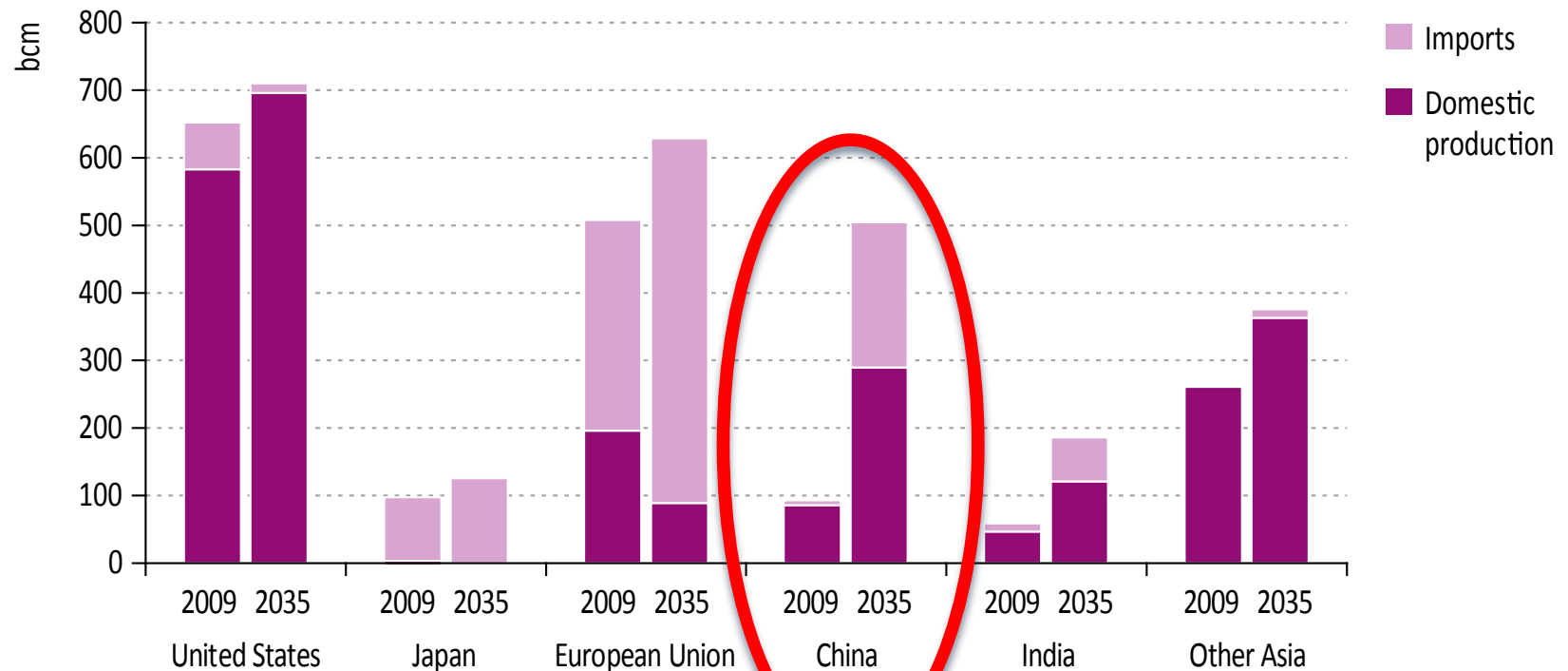
Unconventional natural gas supplies 40% of the 1.7 tcm increase in global supply, but best practices are essential to successfully address environmental challenges

The Golden Age for Natural Gas?

China's Gas demand grows fast by 5 times and its Import by 20 times by 2035

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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

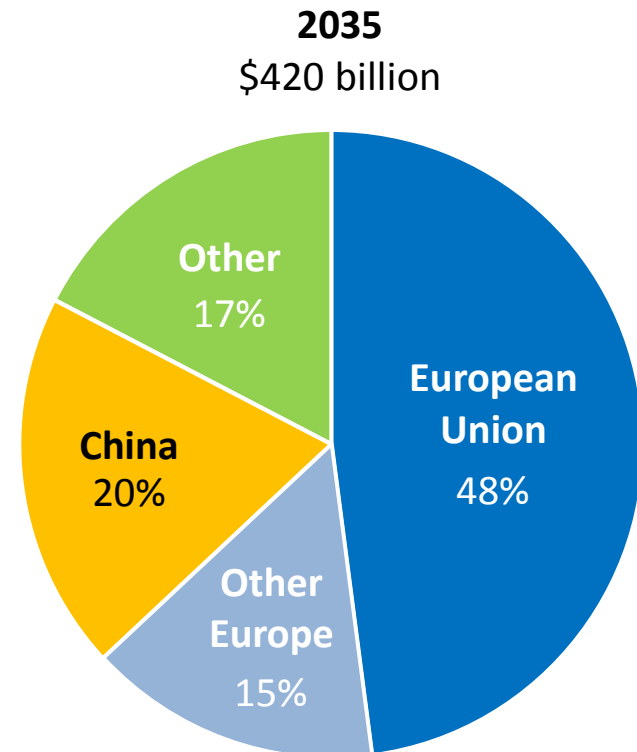
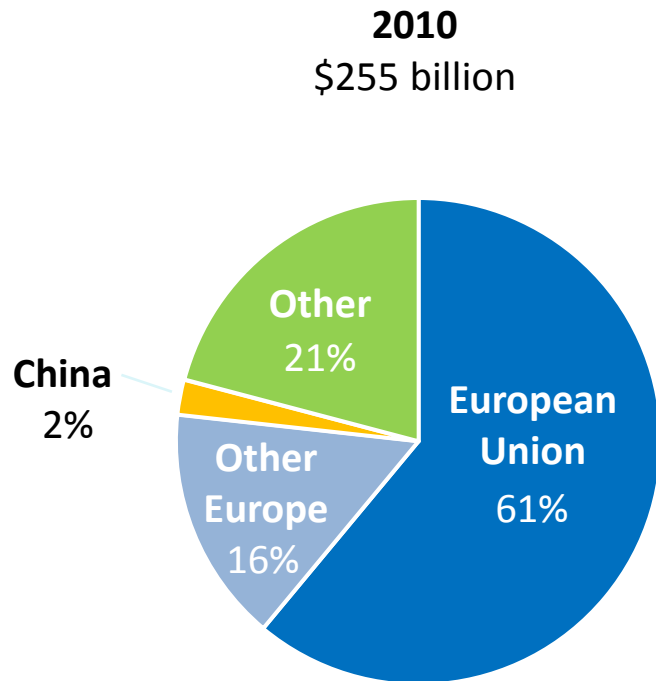
Uncertainty No. 4

- Strategic Role of Russia as the key exporter of fossil fuels especially Natural Gas

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

Uncertainty No. 5

- What is the implication of the Fukushima Nuclear accident to the global energy market and security?

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

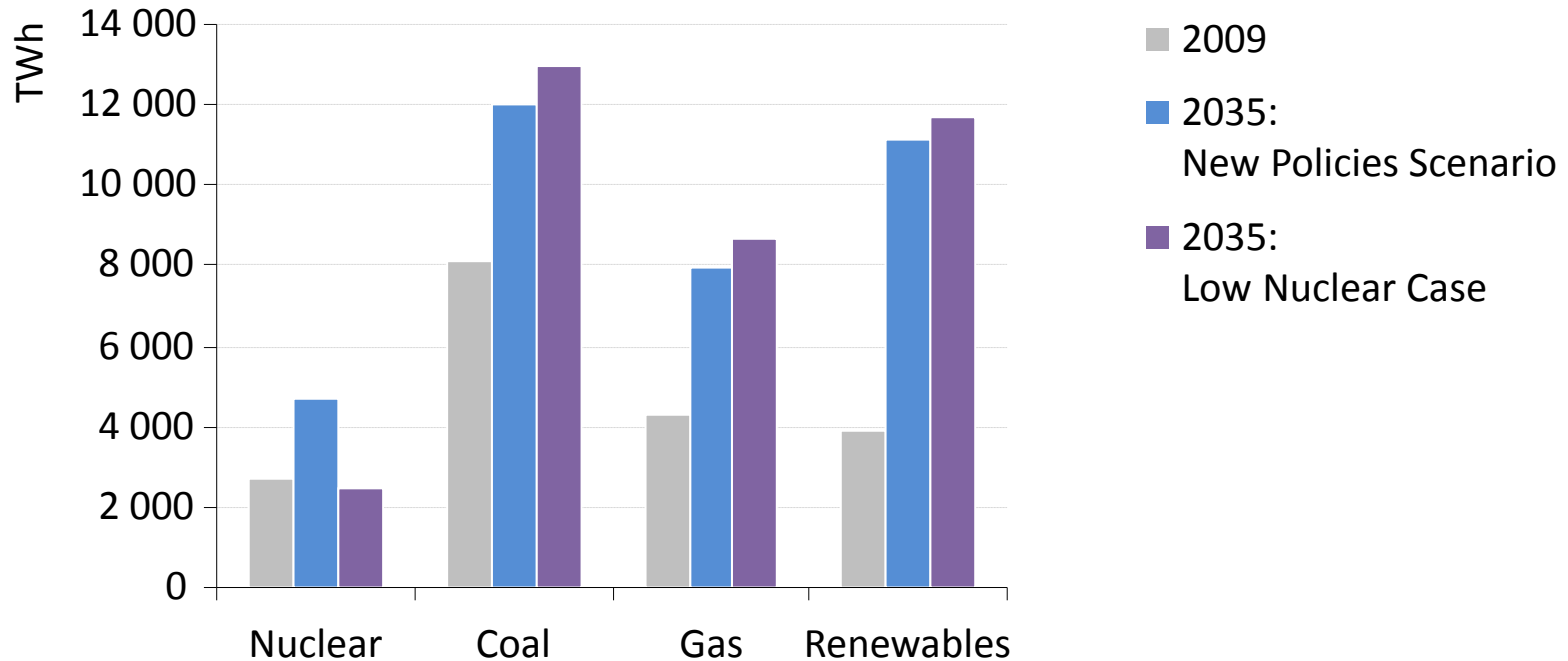
| | Low Nuclear Case | | | New Policies Scenario | | |
|---|------------------|----------|-------|-----------------------|----------|-------|
| | OECD | Non-OECD | World | OECD | Non-OECD | World |
| Gross installed capacity (GW) | | | | | | |
| in 2010 | 326 | 68 | 393 | 326 | 68 | 393 |
| in 2035 | 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.

Less nuclear means more of everything else

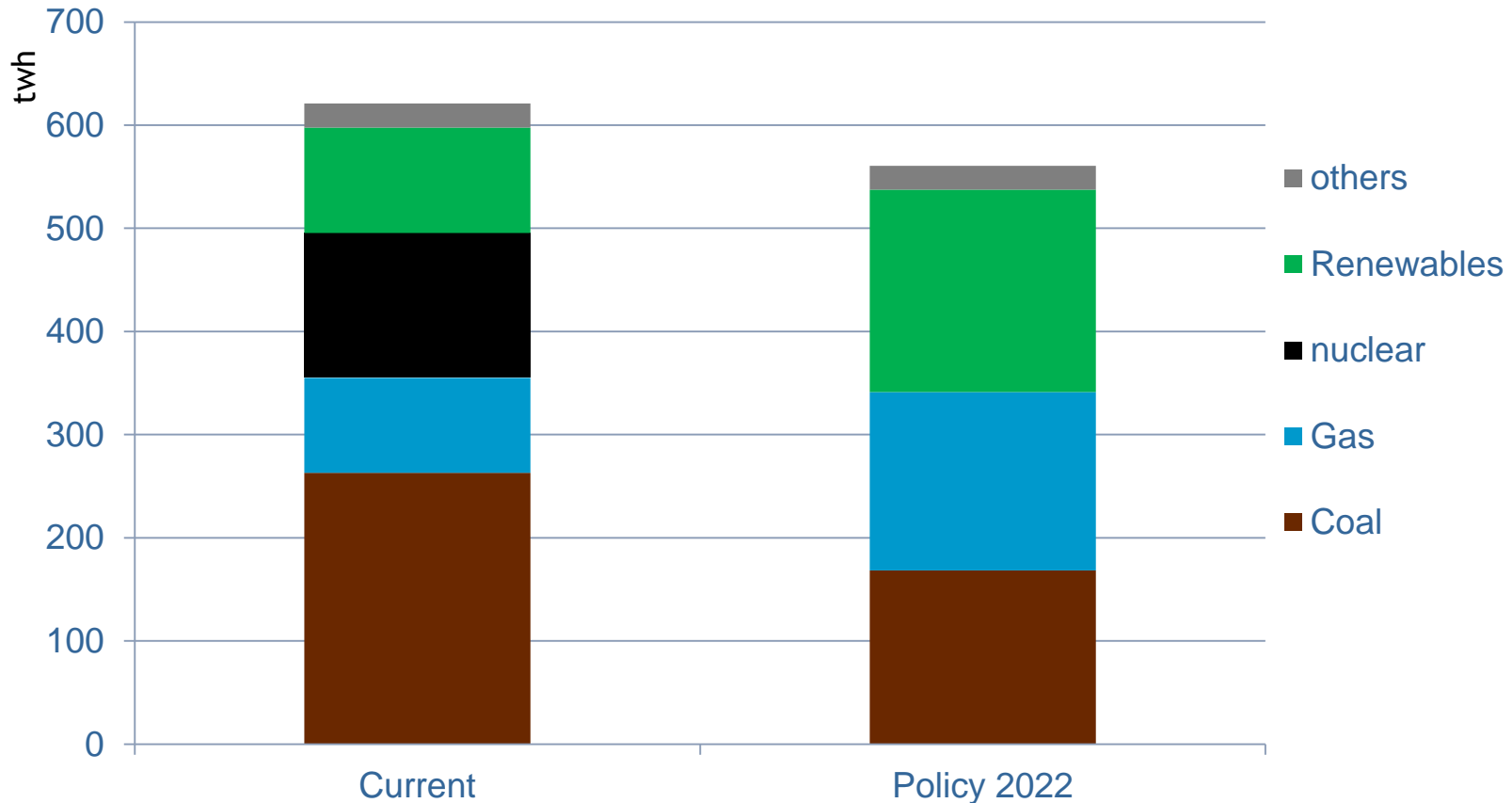
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Power generation by fuel in the New Policies Scenario
and Low Nuclear Case



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 CO₂ emissions in the power sector

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

Lessons from the Fukushima

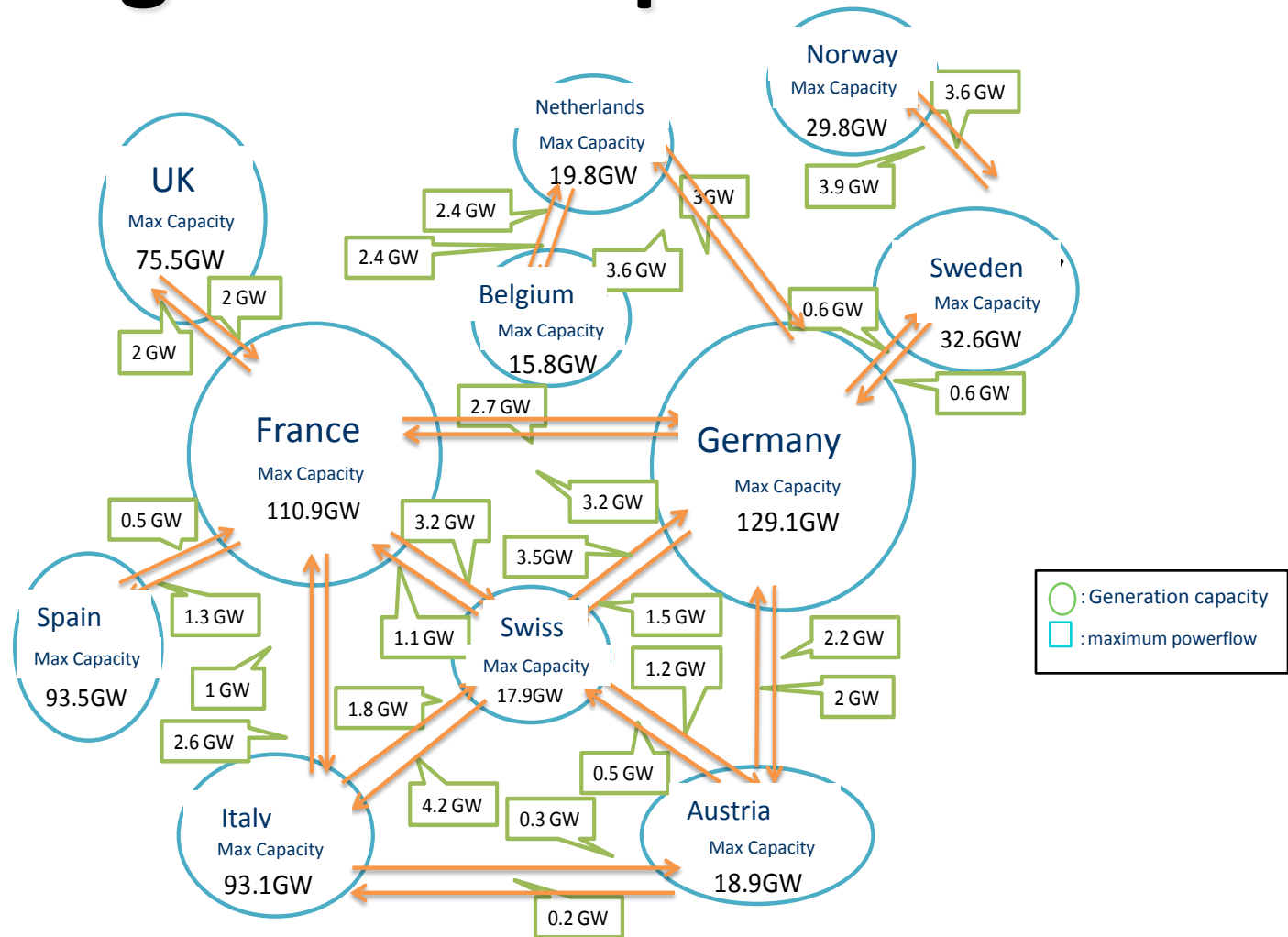
- Fukushima accident was caused by human error and should have been avoided.
- Think about the unthinkable; Tsunami and Plant Black Out. Change total mind set for “Safety”.
- Prepare for the severe accidents & compound disasters .
- Independent Regulatory authority ; Reduce risk of too much political involvement; Transparency and Trust.
- Organization and training of the nuclear emergency staff including the self defense force
- International Cooperation : A nuclear accident anywhere is an accident everywhere.
- Further clarification needed why it happened only to Fukushima Daiichi and NOT to Fukushima Daini, Onagawa nor Tokai daini.

Uncertainty No. 6

Electric Power Grid and Renewable Energy.

Will Renewables be a solution ? Challenge to the Grid for stable supply of the electricity.

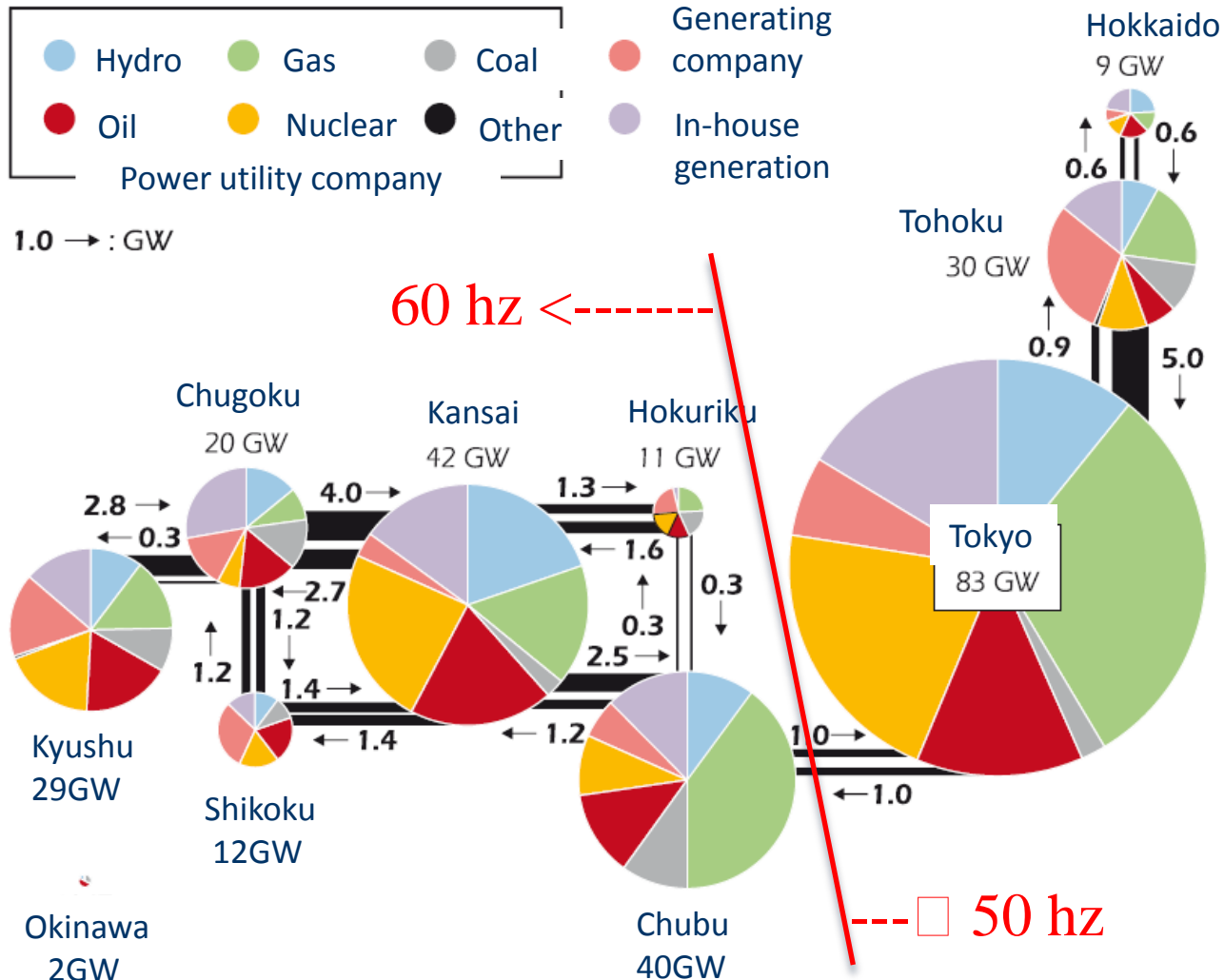
Power grid in Europe



Source: IEA 「Electricity Information 2010」

Indicative value for Net Transfer Capacities (NTC) in Continental Europe

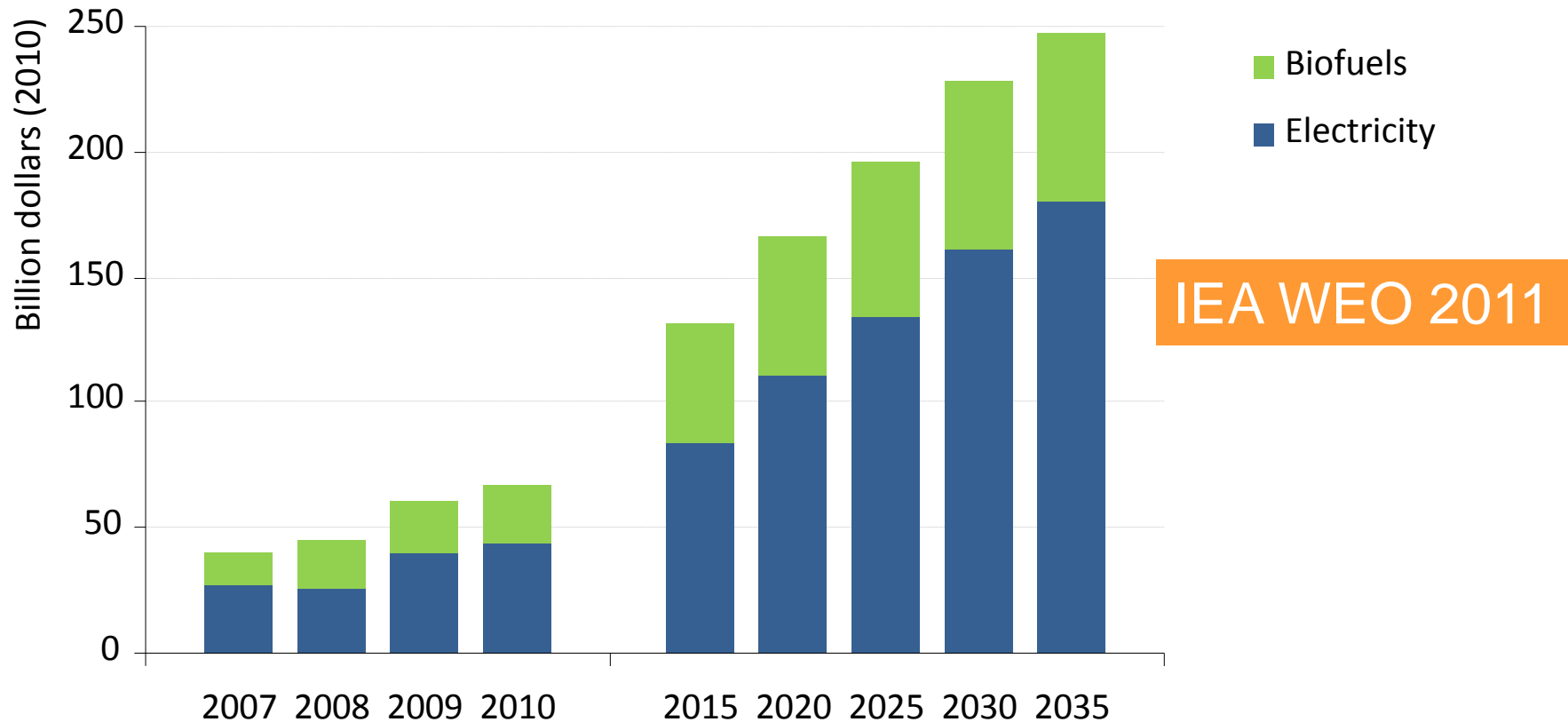
Power grid in Japan



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

The cost of the Renewables is higher due to subsidies.

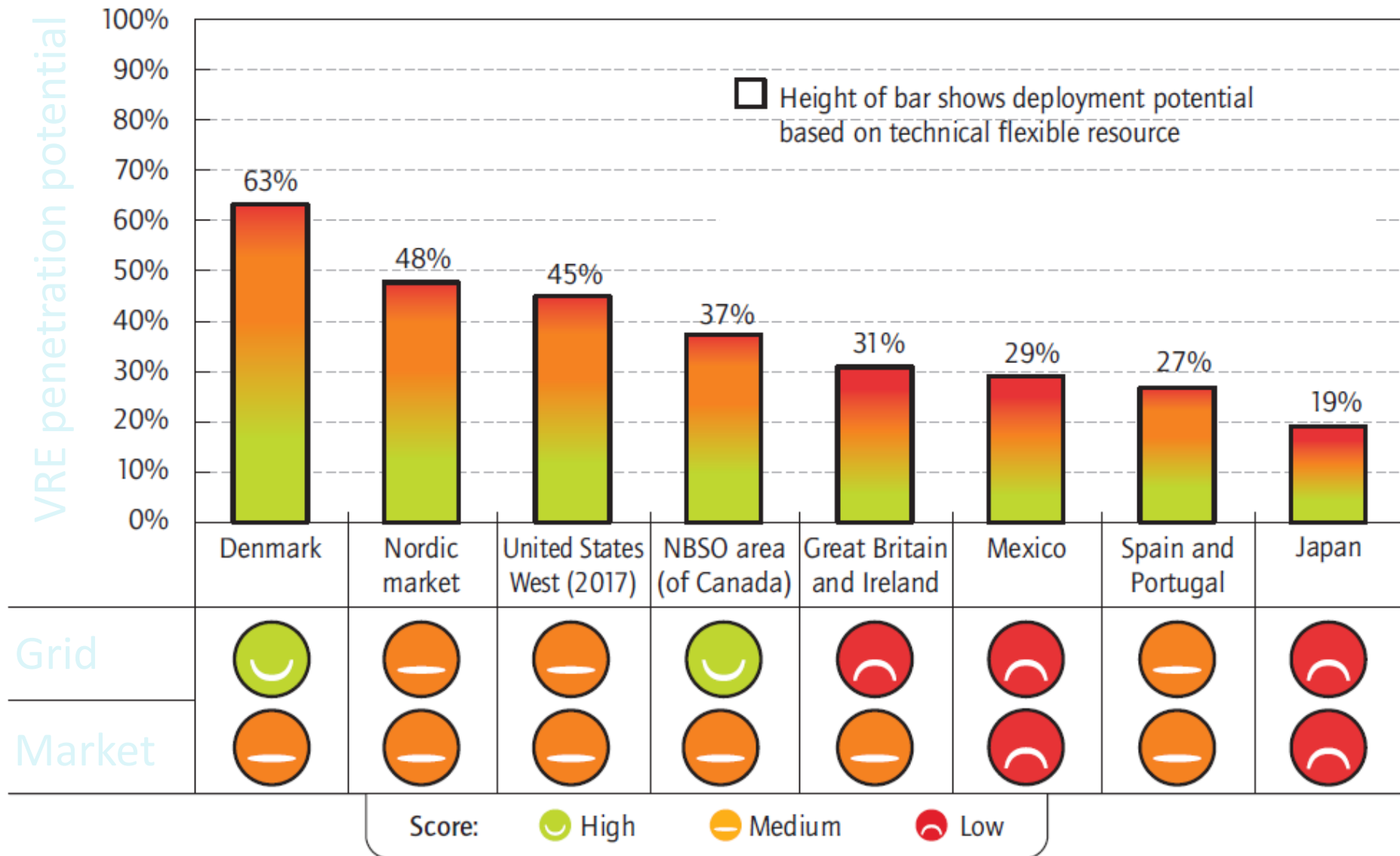
The overall value of subsidies to renewables



Renewable subsidies of \$66 billion in 2010 (compared with \$409 billion for fossil fuels), need to climb to \$250 billion in 2035 as rising deployment outweighs improved competitiveness

Not only Feed-in-tariffs but Grid integration !

Snapshot of present penetration potentials



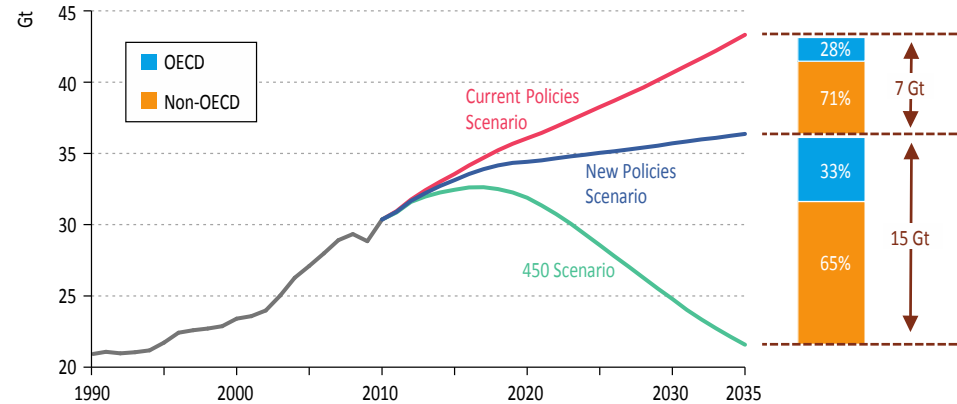


Uncertainty No. 7

Climate Change Mitigation: Where are we going and what does this mean to energy security?

450 ppm Scenario : what we need and where .

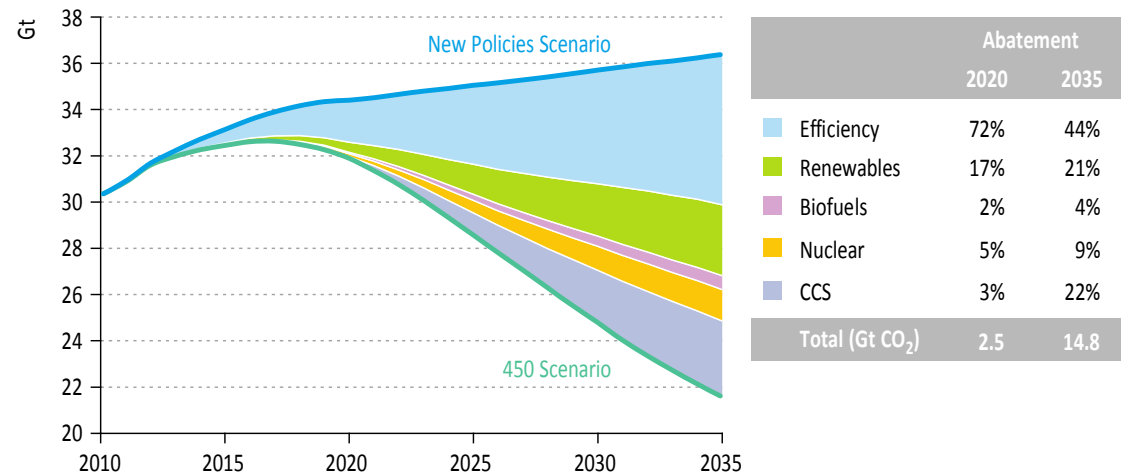
Figure 6.2 • World energy-related CO₂ emissions by scenario²



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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.

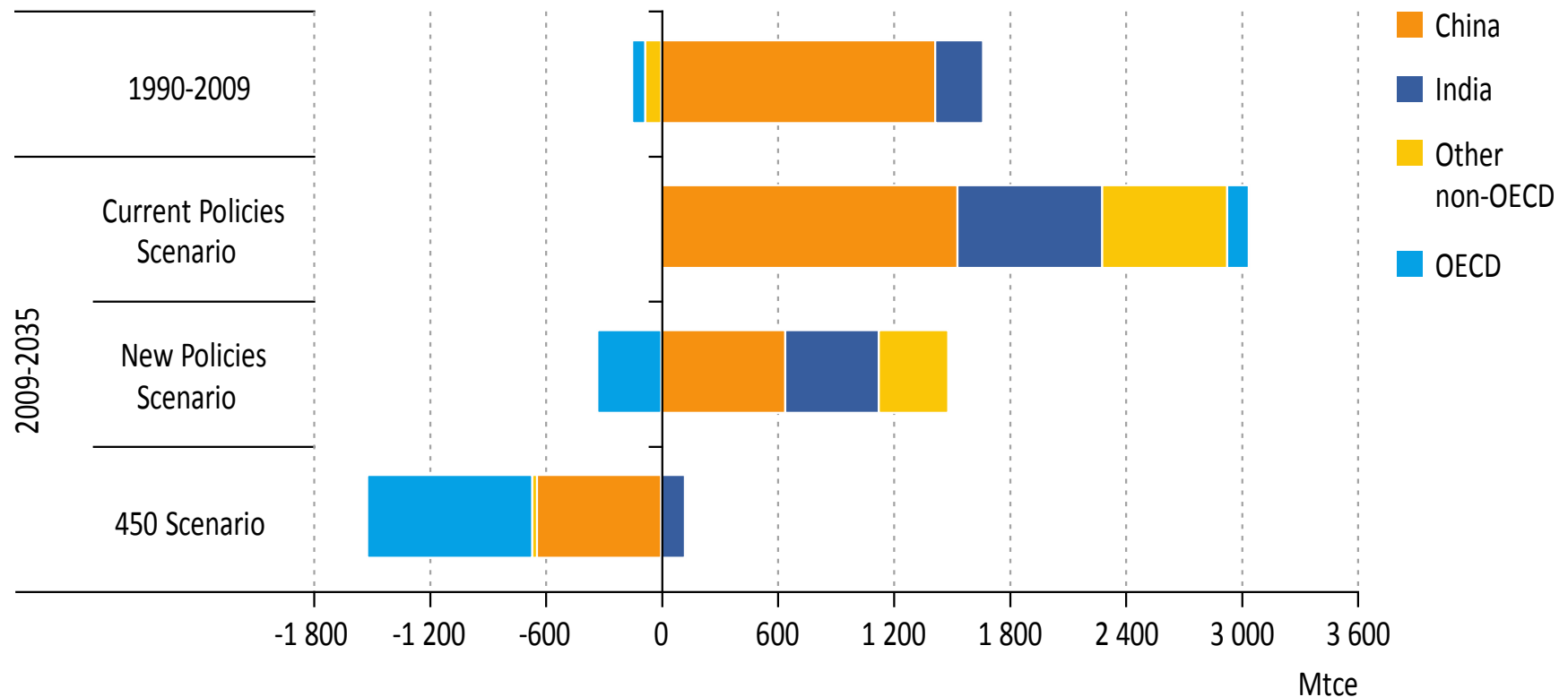
Figure 6.4 • World energy-related CO₂ emissions abatement in the 450 Scenario relative to the New Policies Scenario



Coal is abundant but CO2 intensive.

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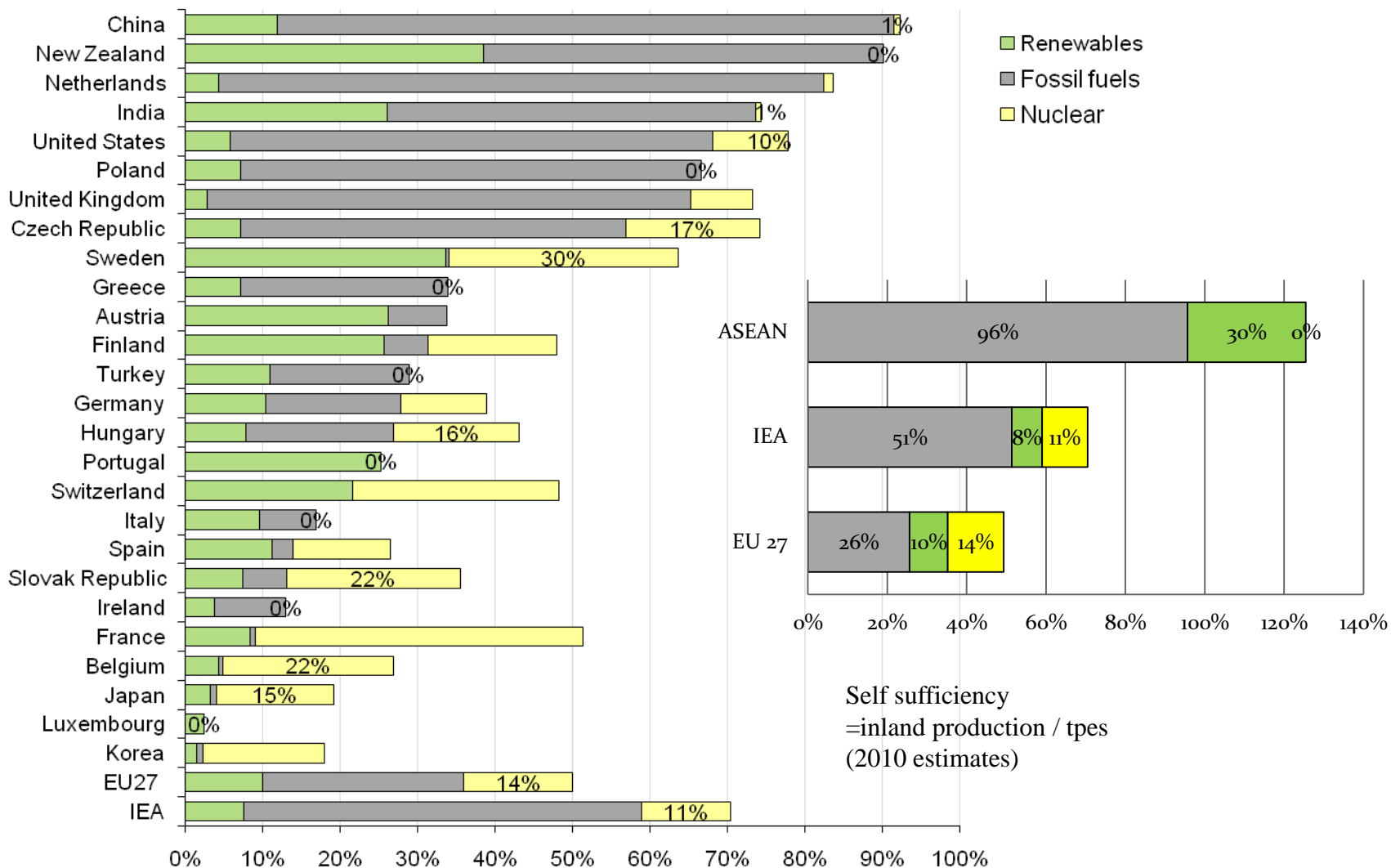
Figure 10.3 • *Incremental world primary coal demand by region and scenario*





What is Energy Security in the 21st Century?

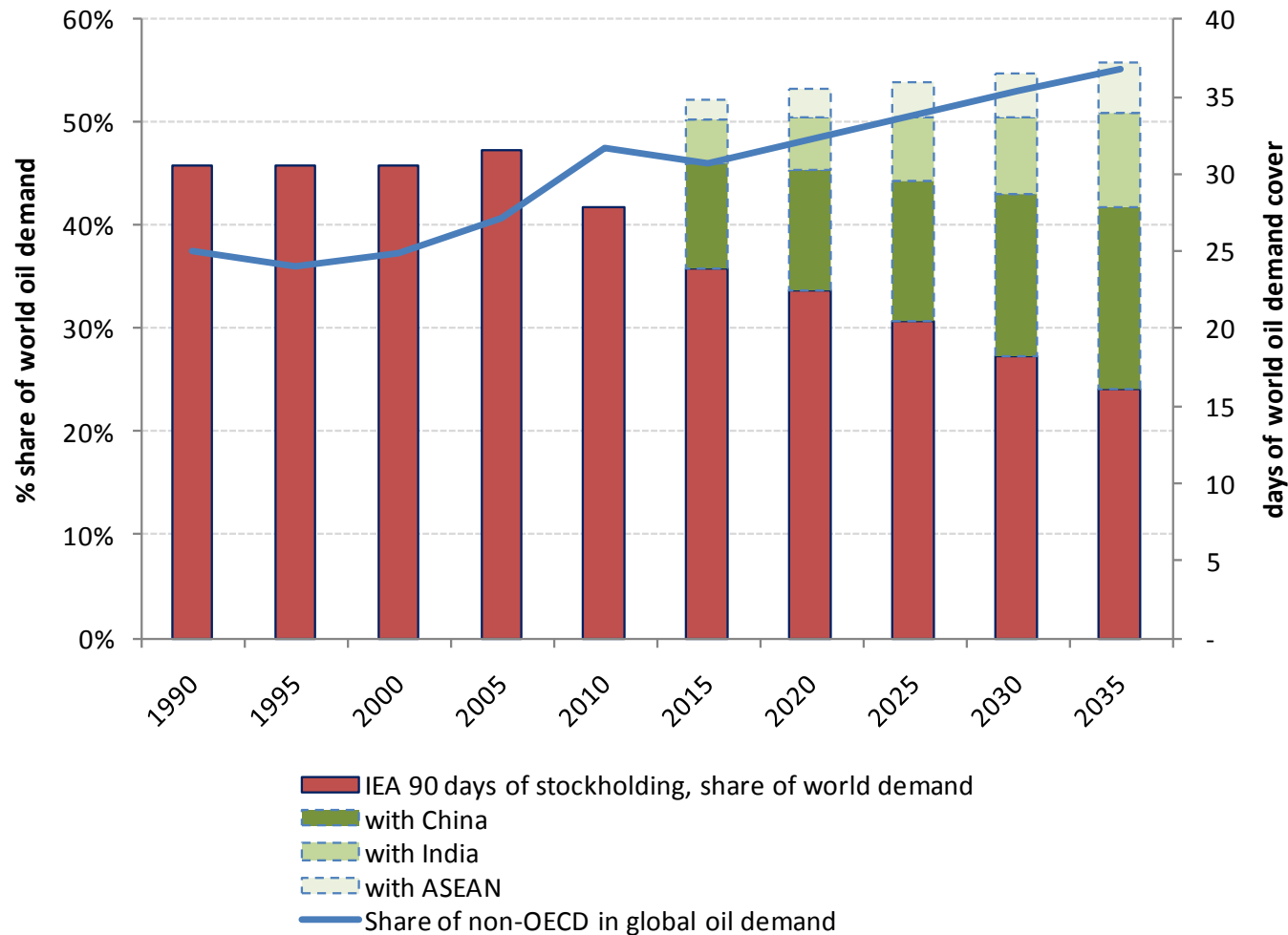
Diversity : Energy mix as Energy Security Mix



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

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

IEA stockholding cover of global oil demand

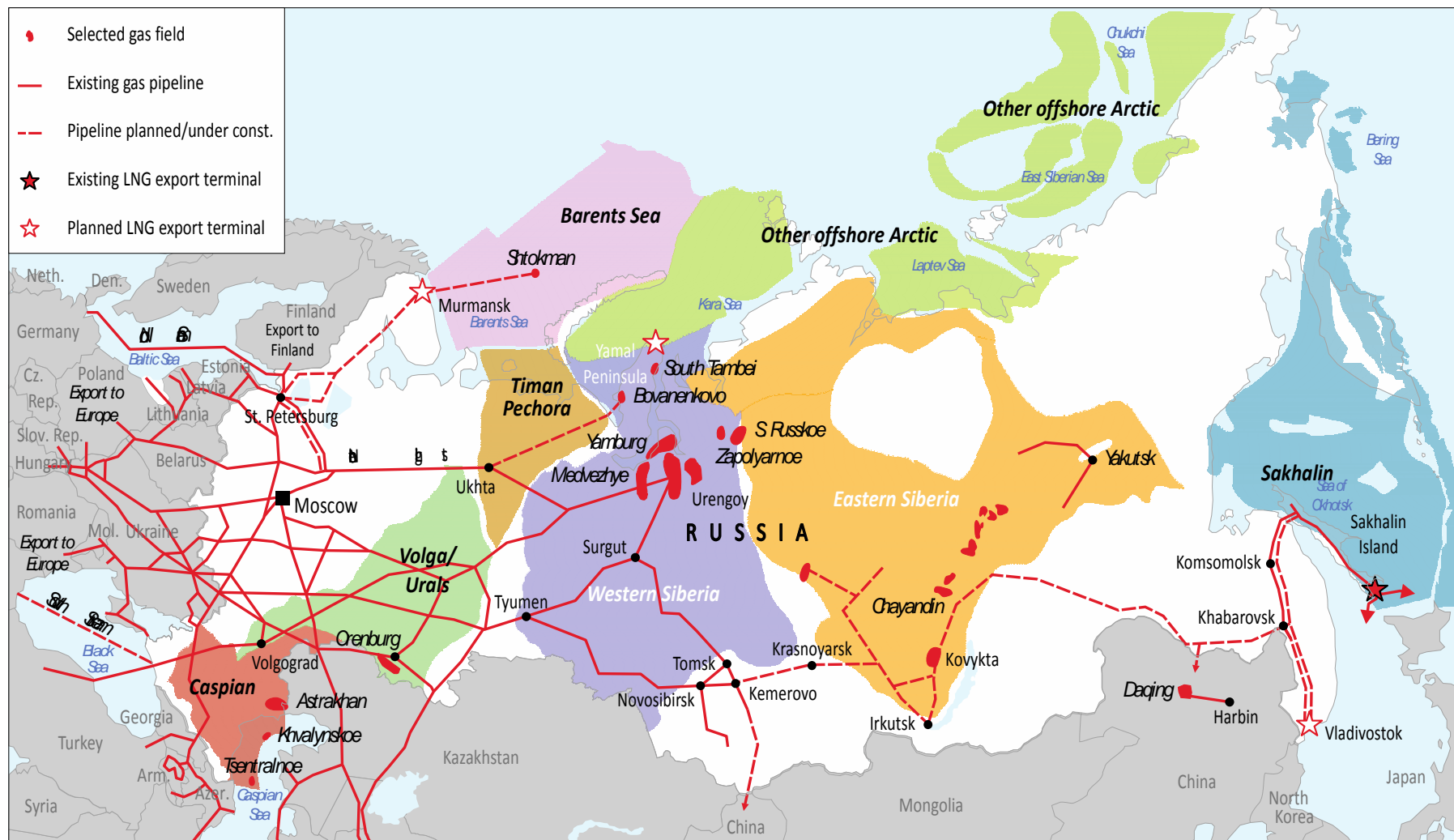


Growing share of non-OECD oil demand results in declining global demand cover from IEA oil stocks

Gas Supply Security and Russian Gas Pipelines

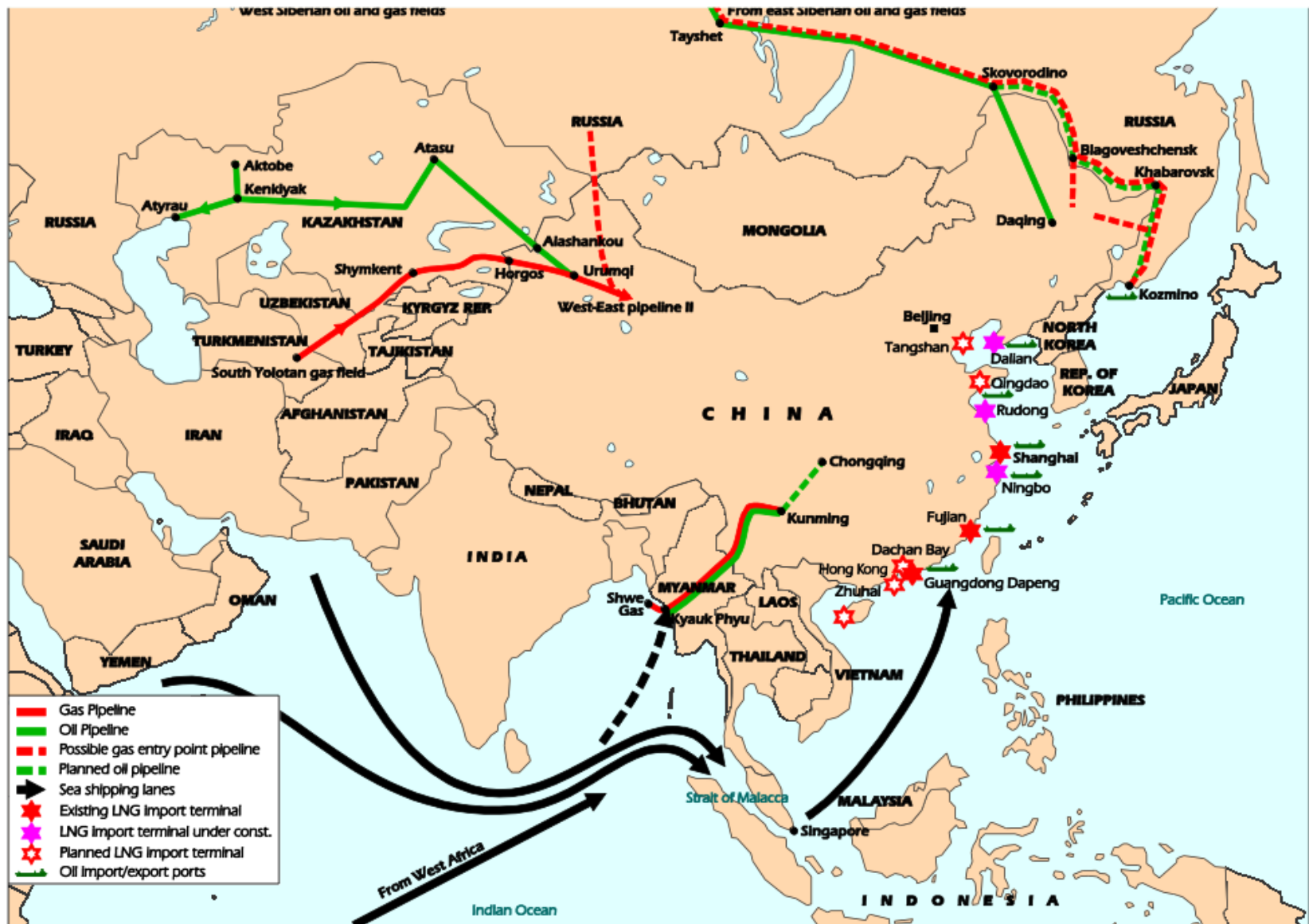
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Figure 8.15 • Major gas fields and supply infrastructure in Russia



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

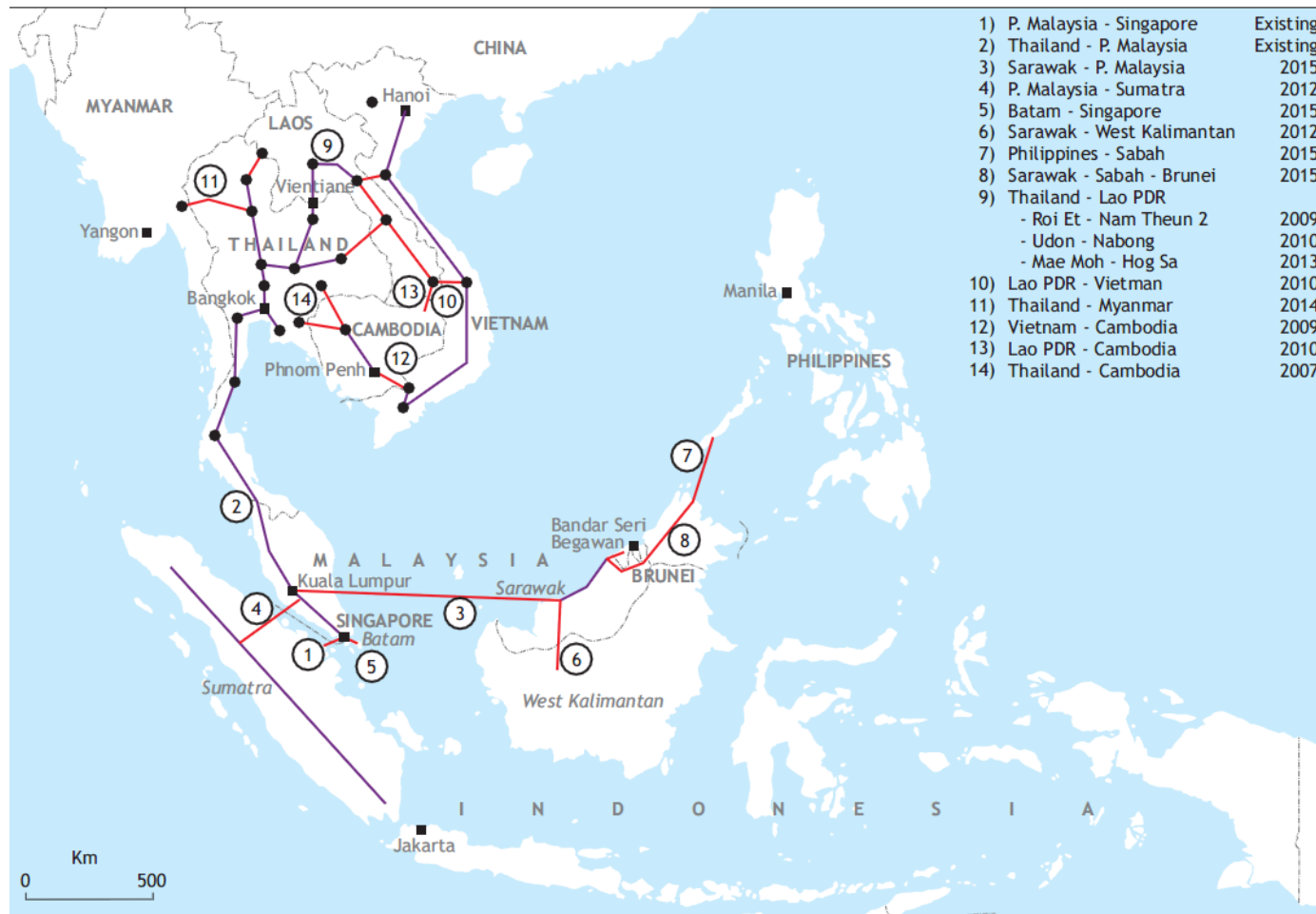


Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts

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

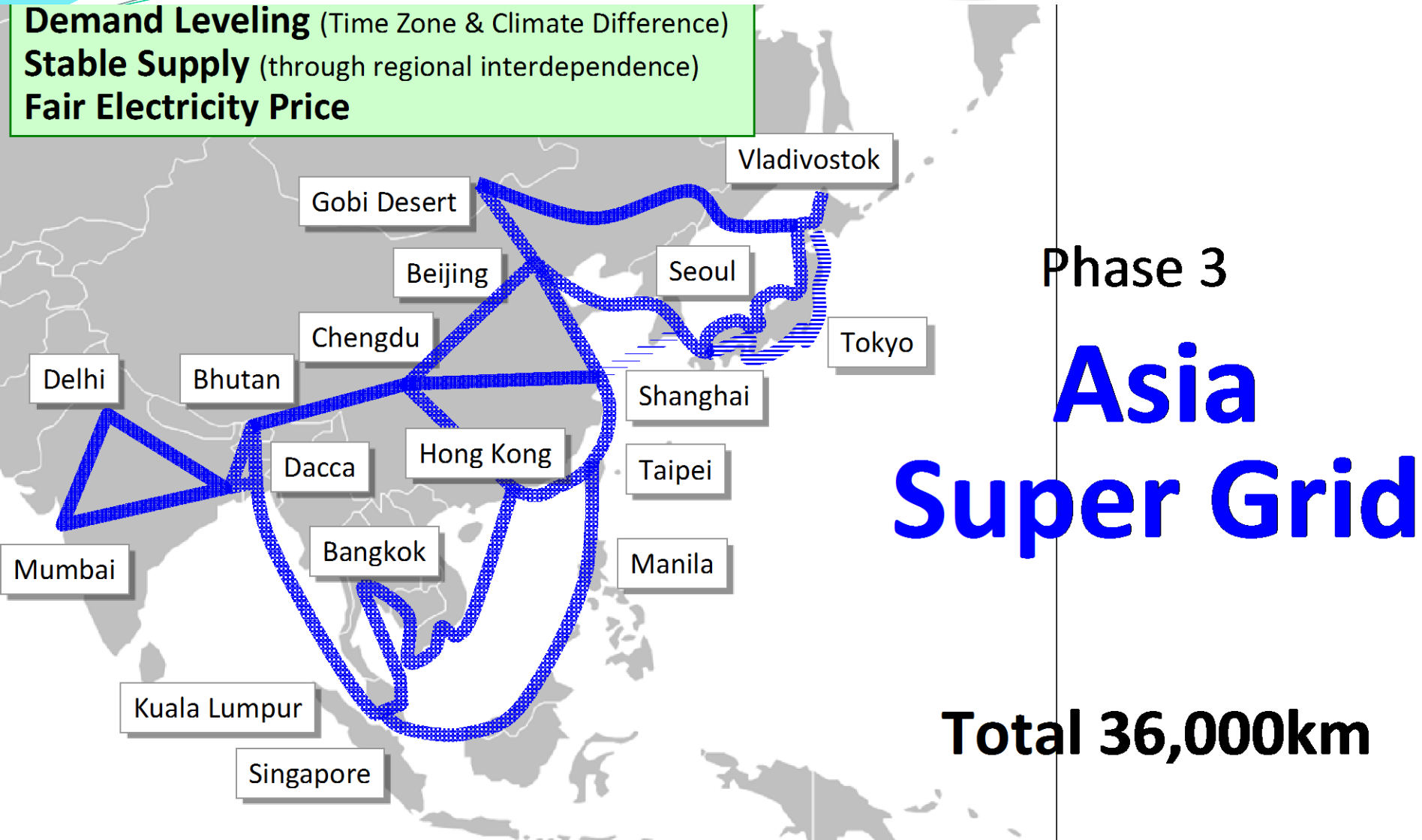


Existing and proposed ASEAN Power Grid Interconnections



Energy for Peace in Asia ? A New Vision

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



Presentation by Mr. Masayoshi SON

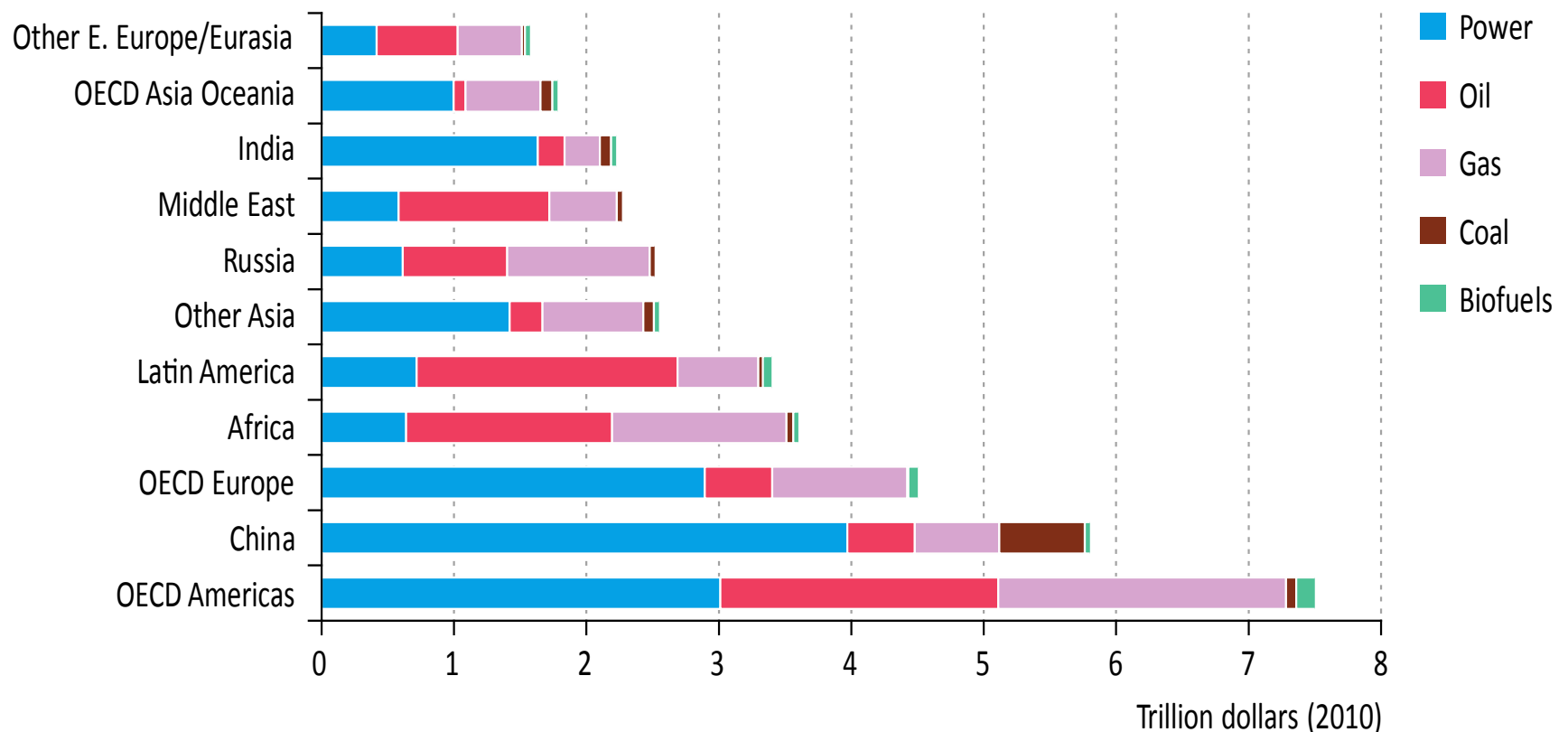
Last Uncertainty

- Politico-Economic Crisis. Governments' ON-OFF-ON-OFF frequent Policy changes will discourage private investments.

\$39 Trillion and more Investment is needed for energy Infrastructure. Who should Invest for the long term Energy Security?

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



One cannot enhance energy security by risking someone else 's. Fukushima told us to plan together.

- 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.
 - Enlarge IEA' s oil emergency preparedness to Asia and other fuels.
 - 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, CCS, etc .
- Develop unconventional gas resources and infrastructure. US, Canada, and Australia become important exporters.
- 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 and elsewhere.
- What are the new roles of the US as a Pacific nation?