Energy Security & Sustainability for Asia in the 21st Century

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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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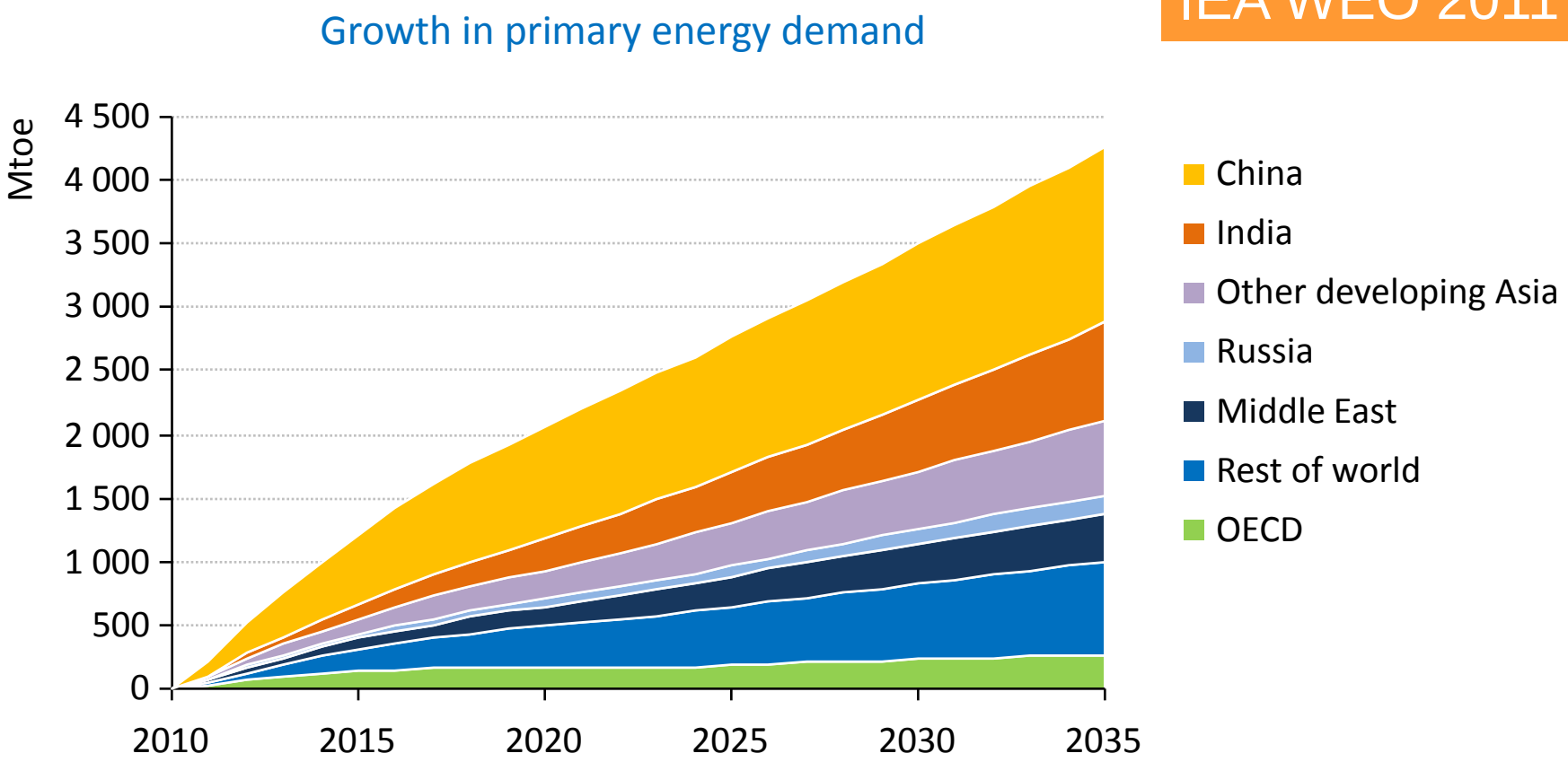

Global energy demand increases by one-third from 2010 to 2035, with China, India and other Asia accounting for two thirds of the growth

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

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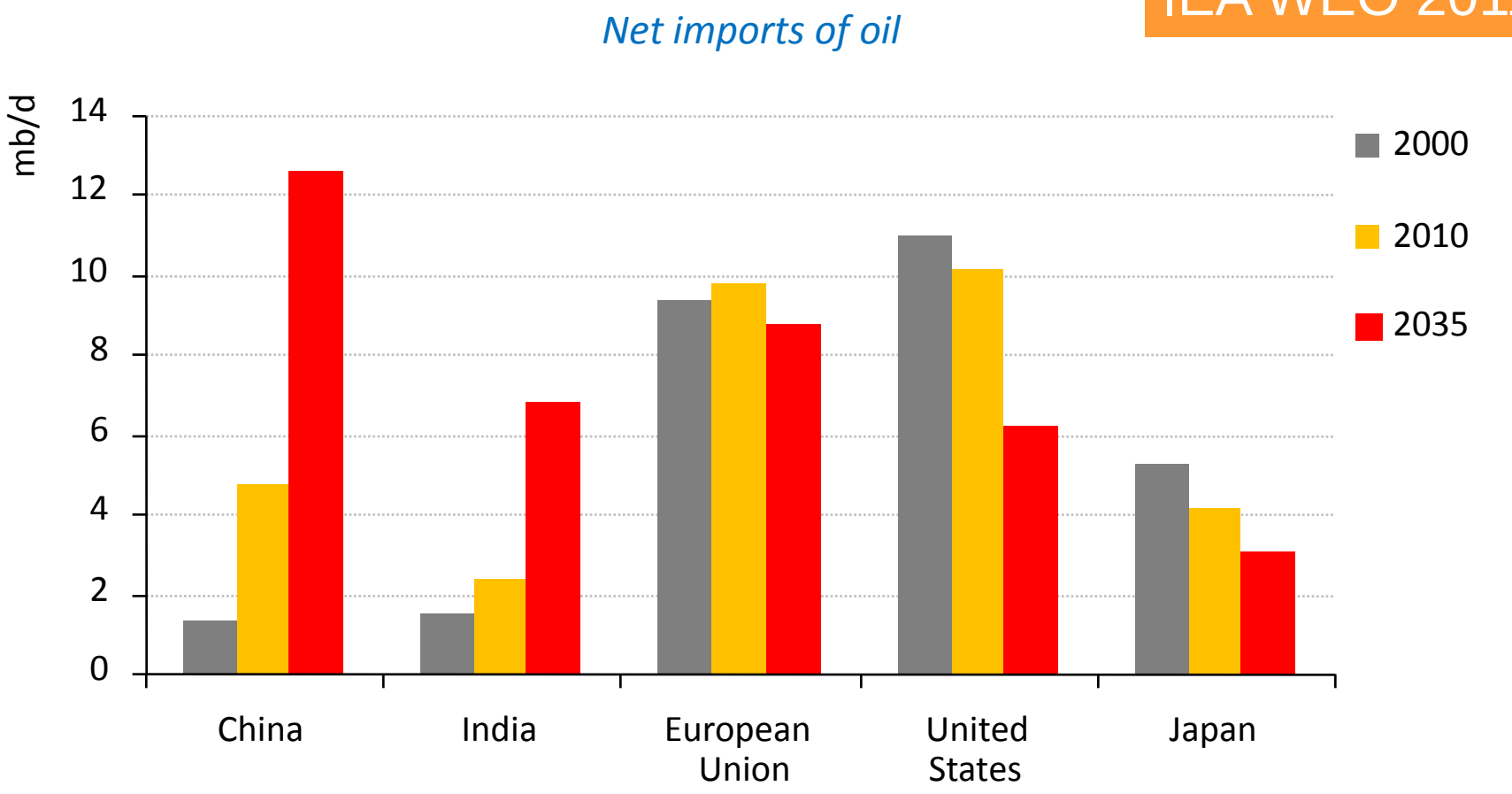
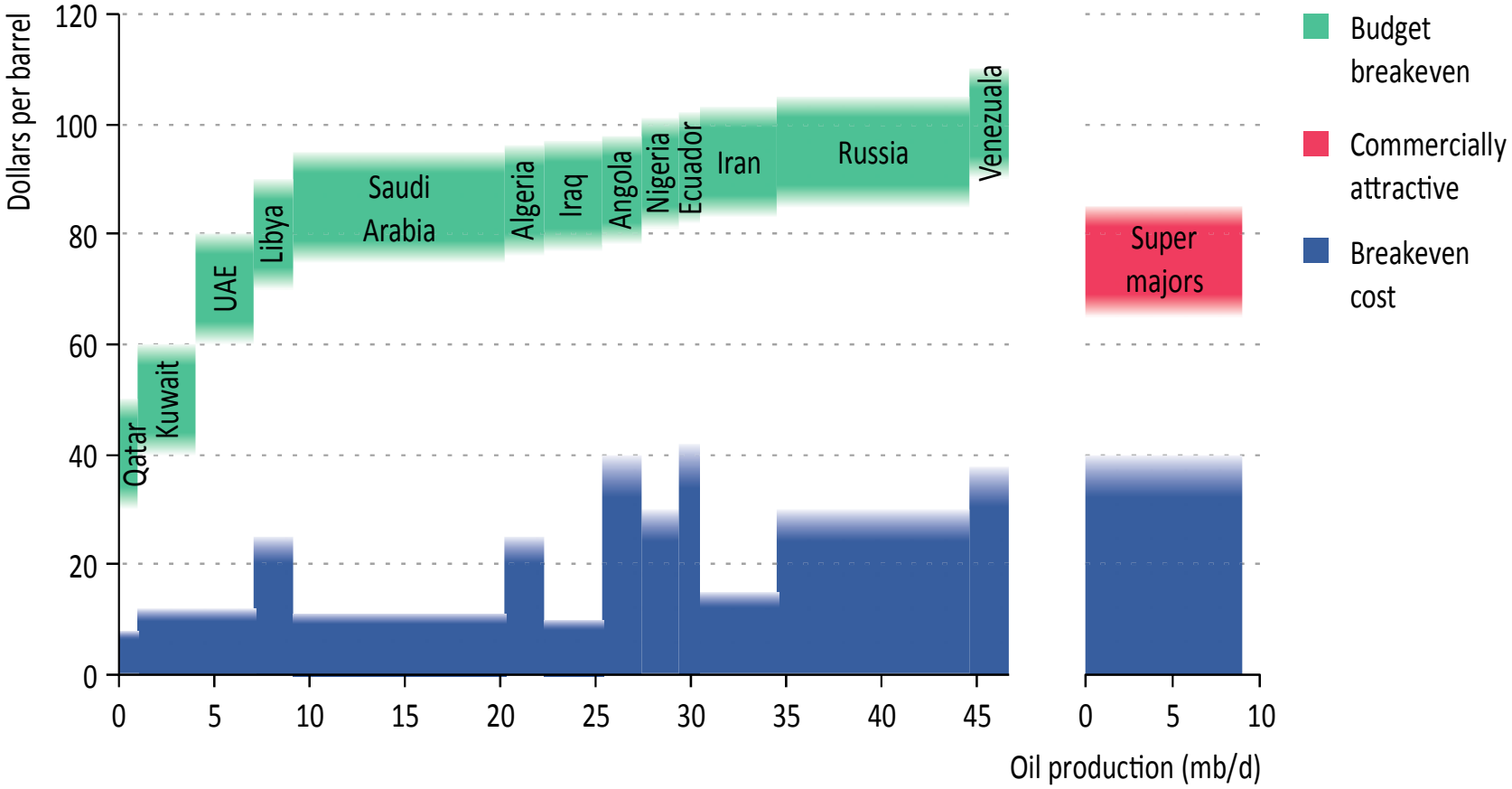


US oil imports drop due to rising domestic output & improved transport efficiency: EU imports overtake those of the US around 2015; China becomes the largest importer around 2020

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

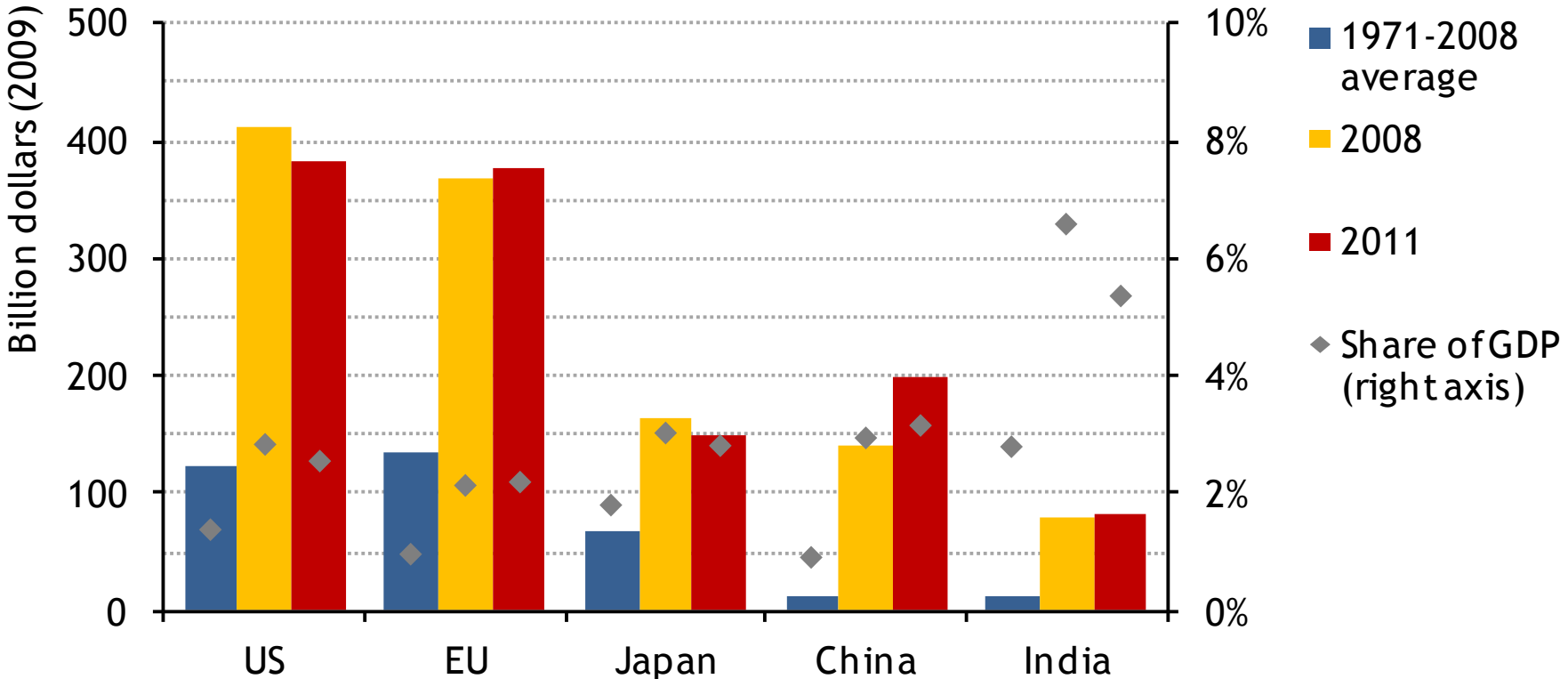


Notes: Only OPEC countries, Russia and the aggregation of the five super-majors (BP, Chevron, ExxonMobil, Shell and Total) are included. The breakeven cost is the realised oil price at which all operating expenses (excluding taxes) and capital costs (including a 10% capital discount rate), are fully recovered.

Sources: IEA databases and analysis based on industry sources: APICORP (2011), Deutsche Bank (2011), Credit Suisse (2011), IMF (2011), PFC (2011) and CGES (2011).

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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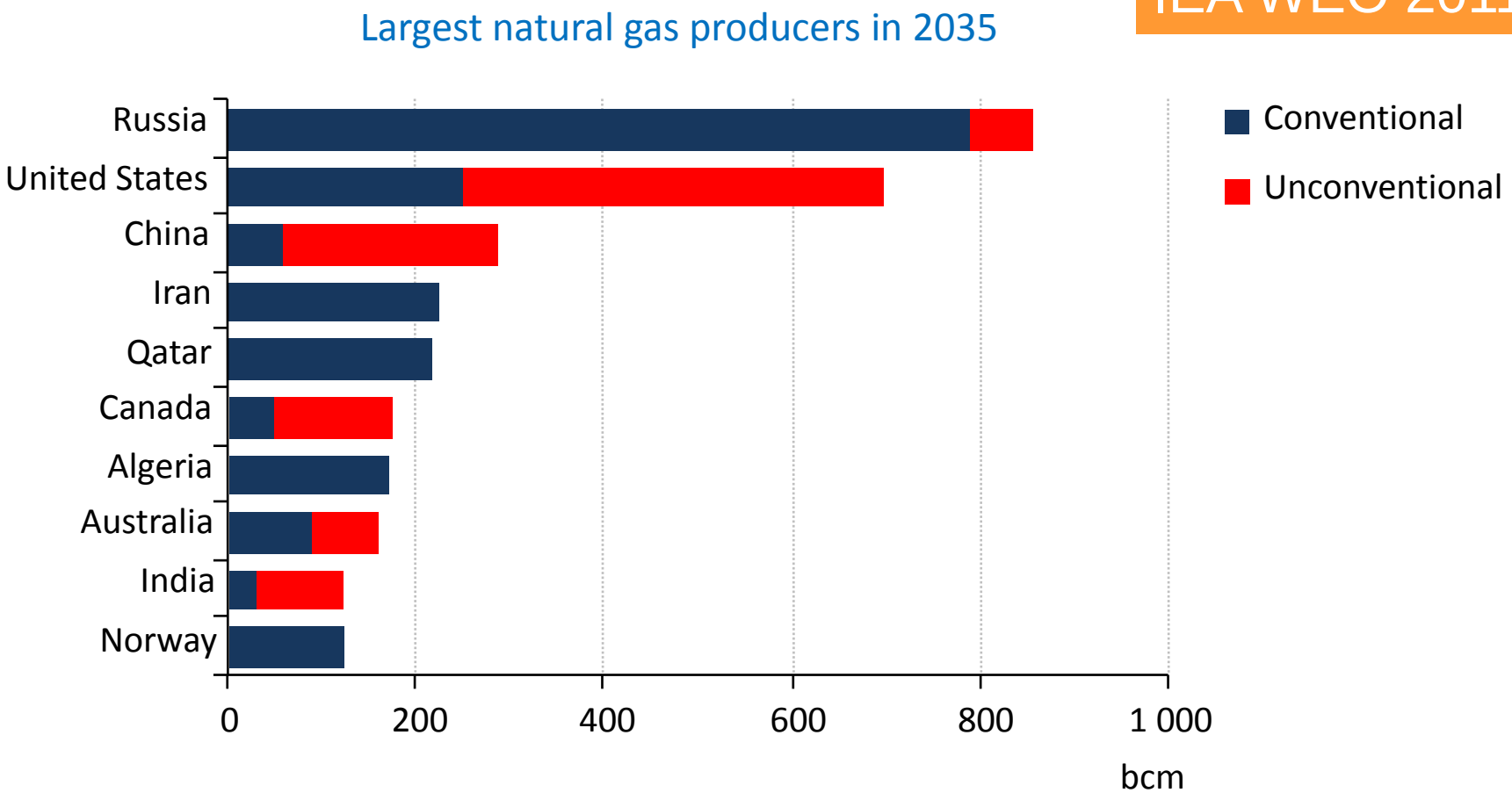

Unconventional natural gas supplies 40% of the 1.7 tcm increase in global supply, but best practices are essential to successfully address environmental challenges

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*

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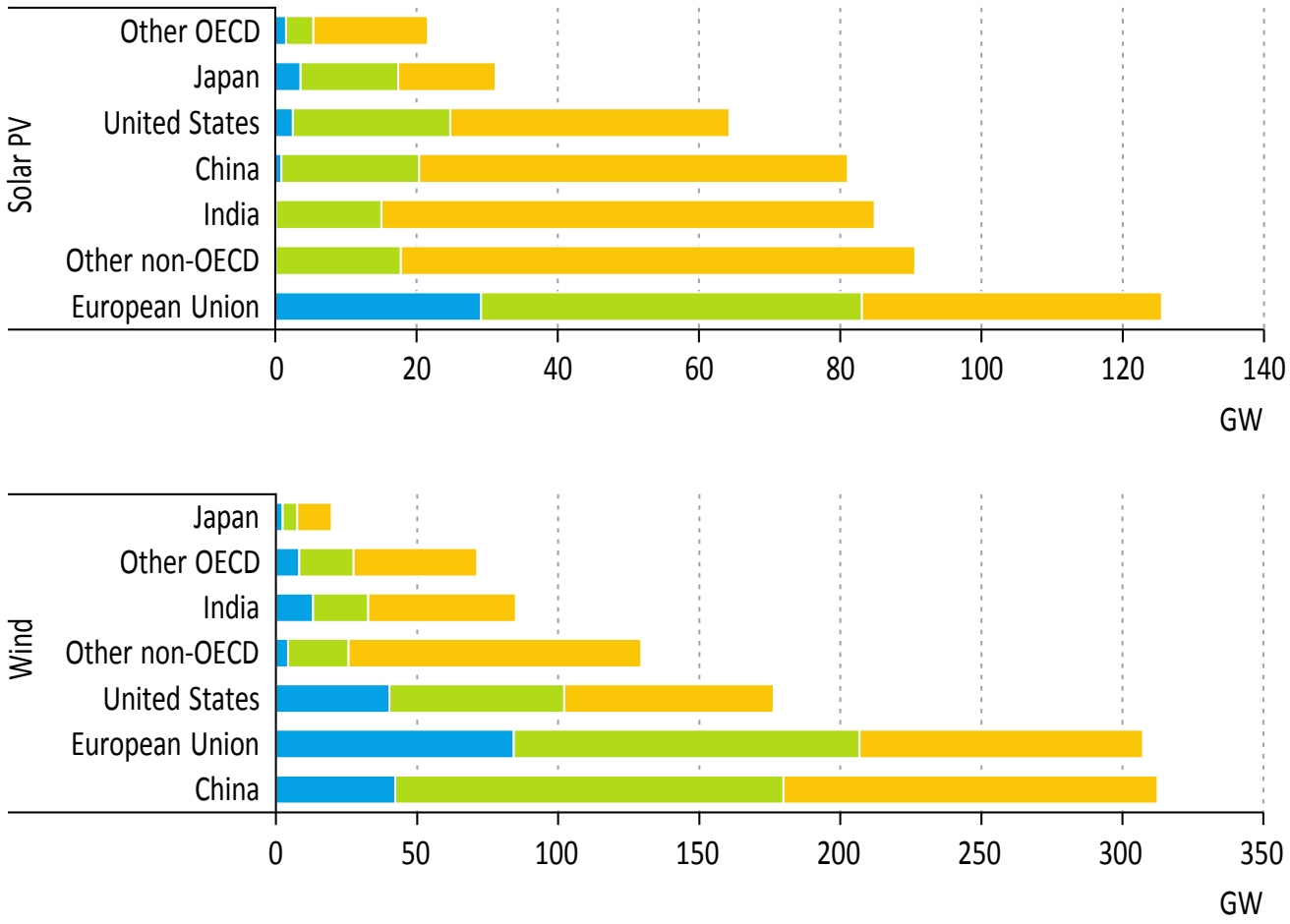
Note: Other Asia had net natural gas exports of 56 bcm in 2009.

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*



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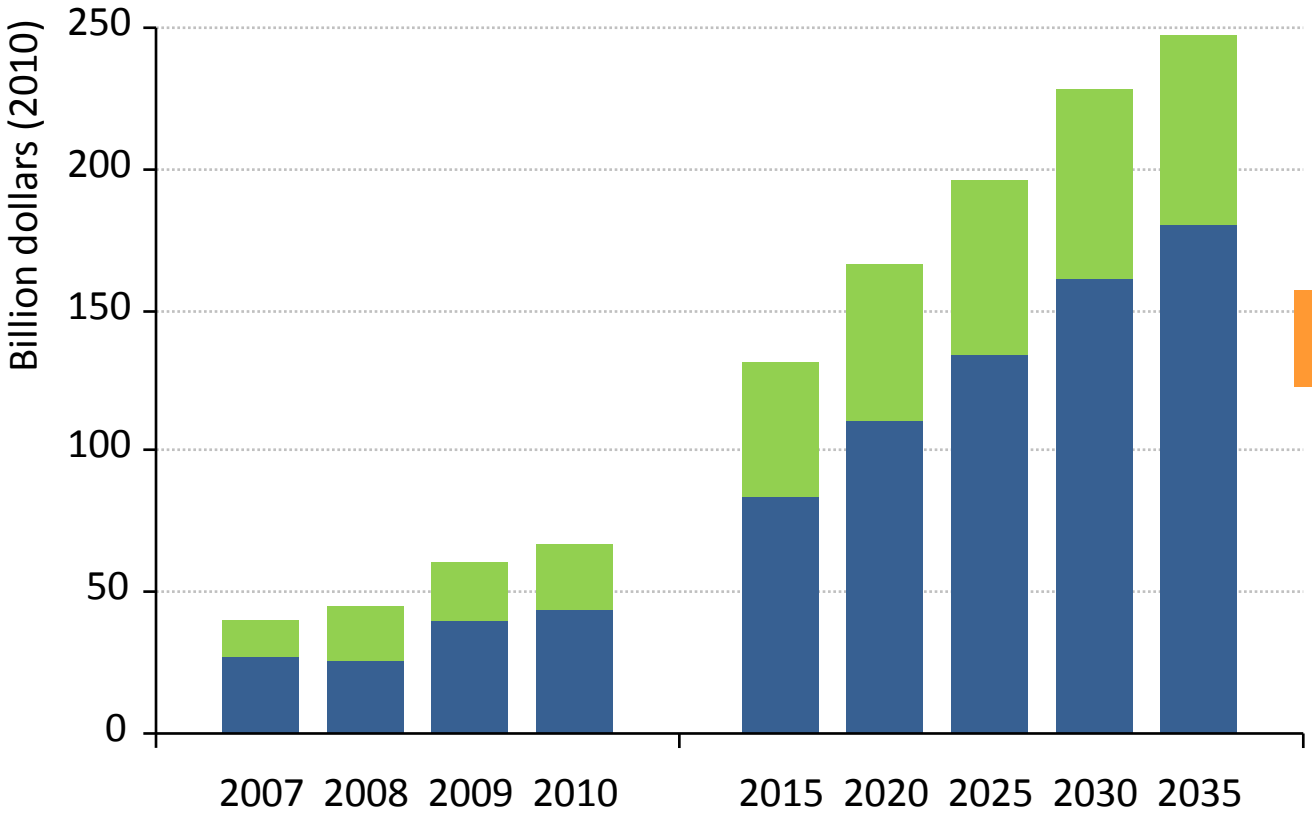
The cost is higher due to subsidies.

The overall value of subsidies to renewables



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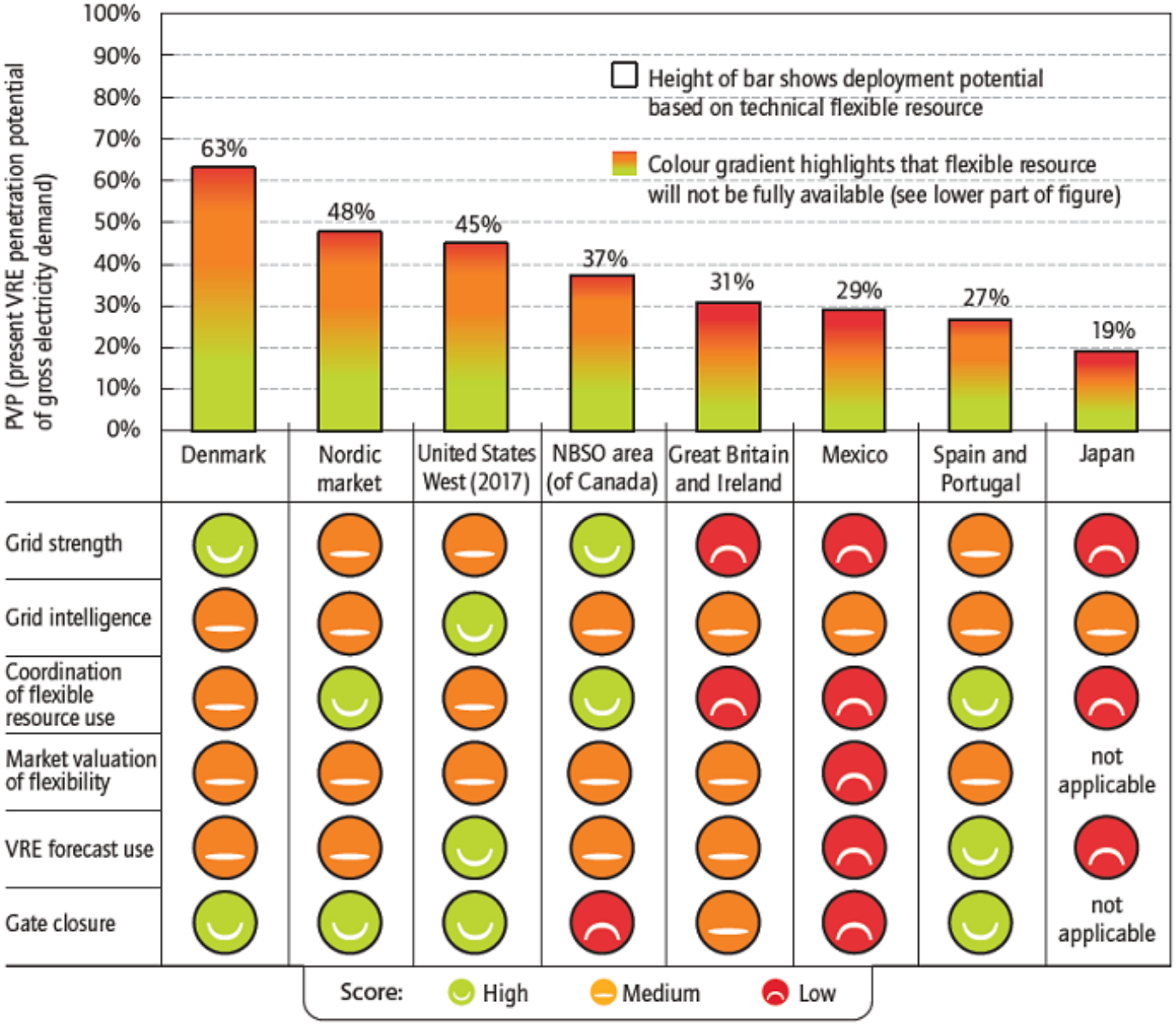
Renewable subsidies of $66 billion in 2010 (compared with $409 billion for fossil fuels), need to climb to $250 billion in 2035 as rising deployment outweighs improved competitiveness

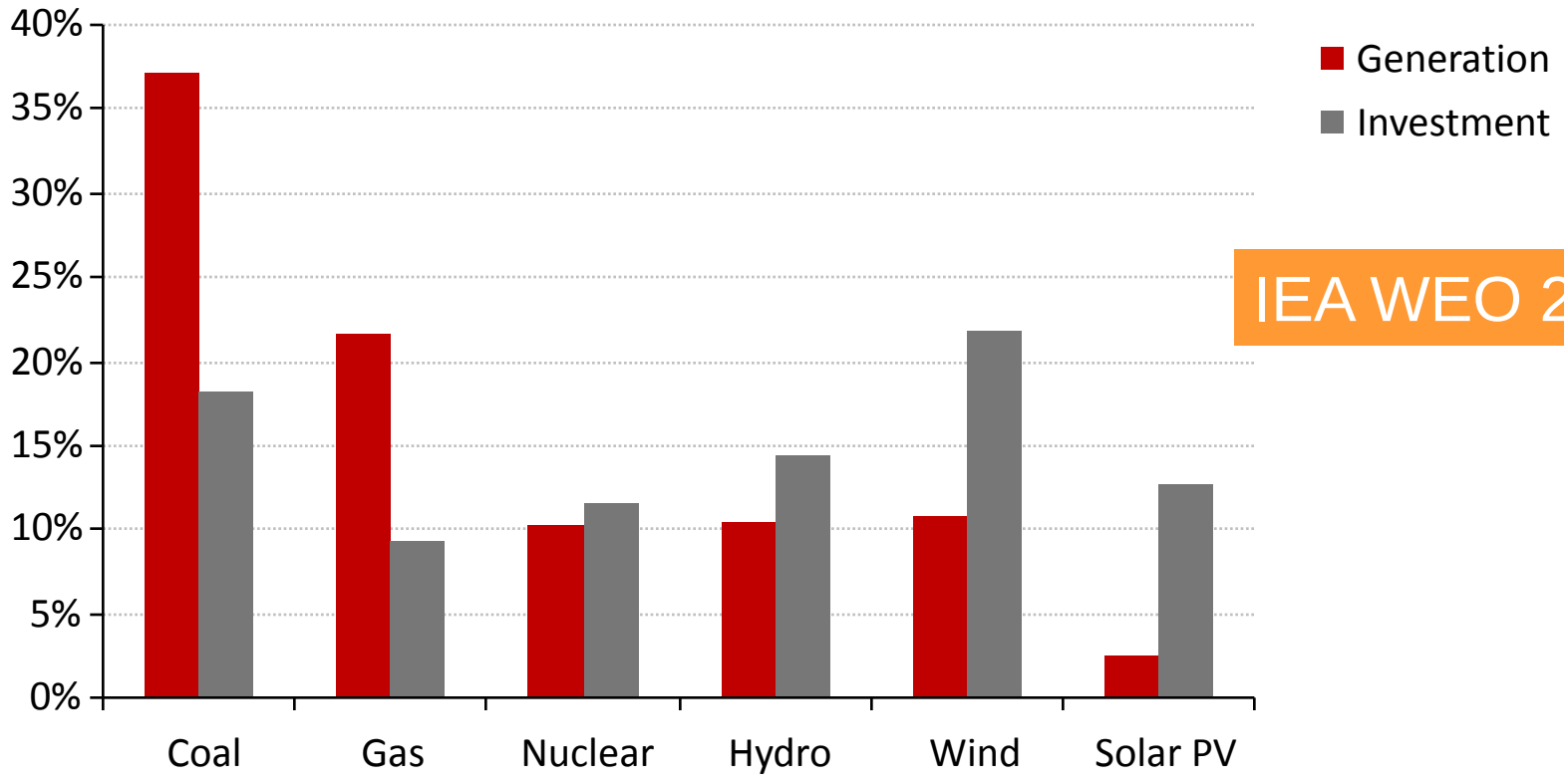
Harnessing Variable Renewables

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



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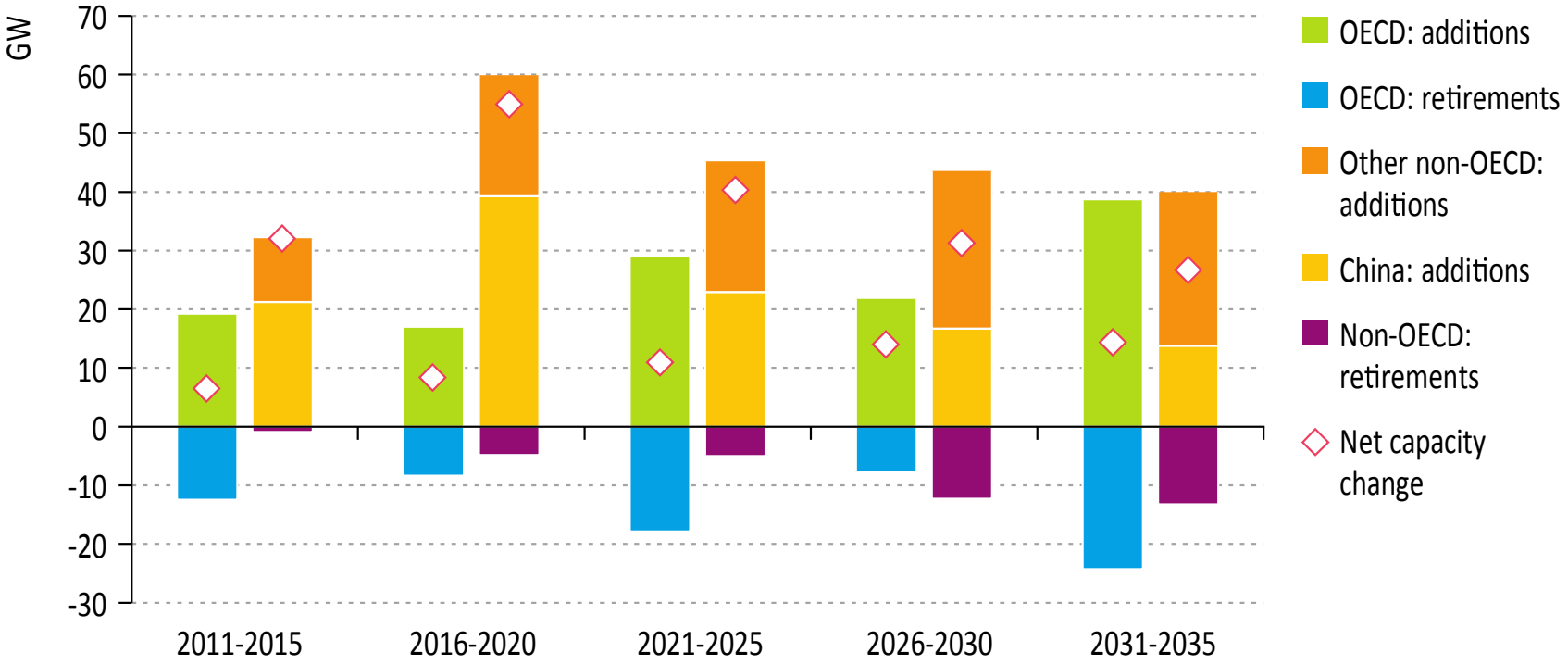
Figure 5.7 ● *Additions and retirements of nuclear power capacity by region in the New Policies Scenario*



Who needs coal most?

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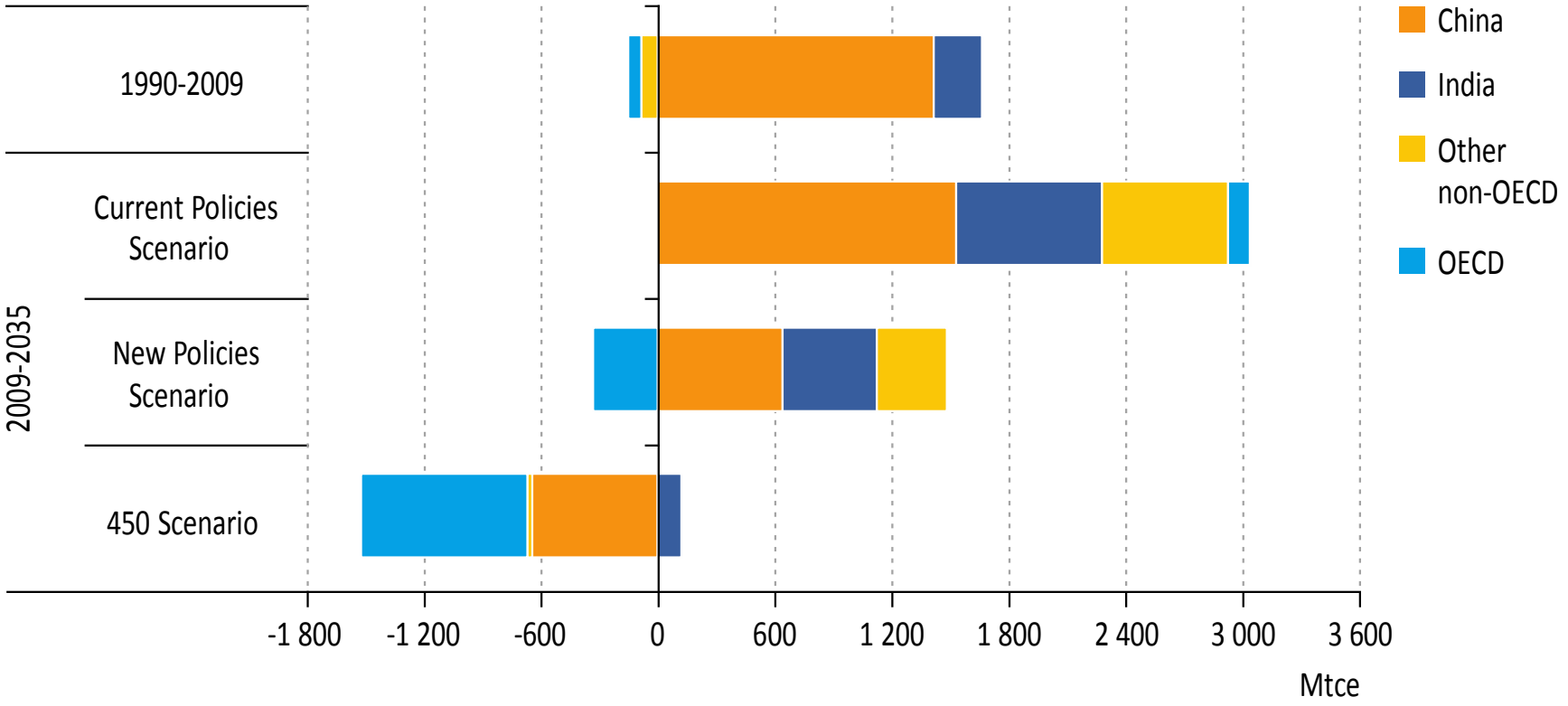
Figure 10.3 ● *Incremental world primary coal demand by region and scenario*



Russia's focus will move to the East

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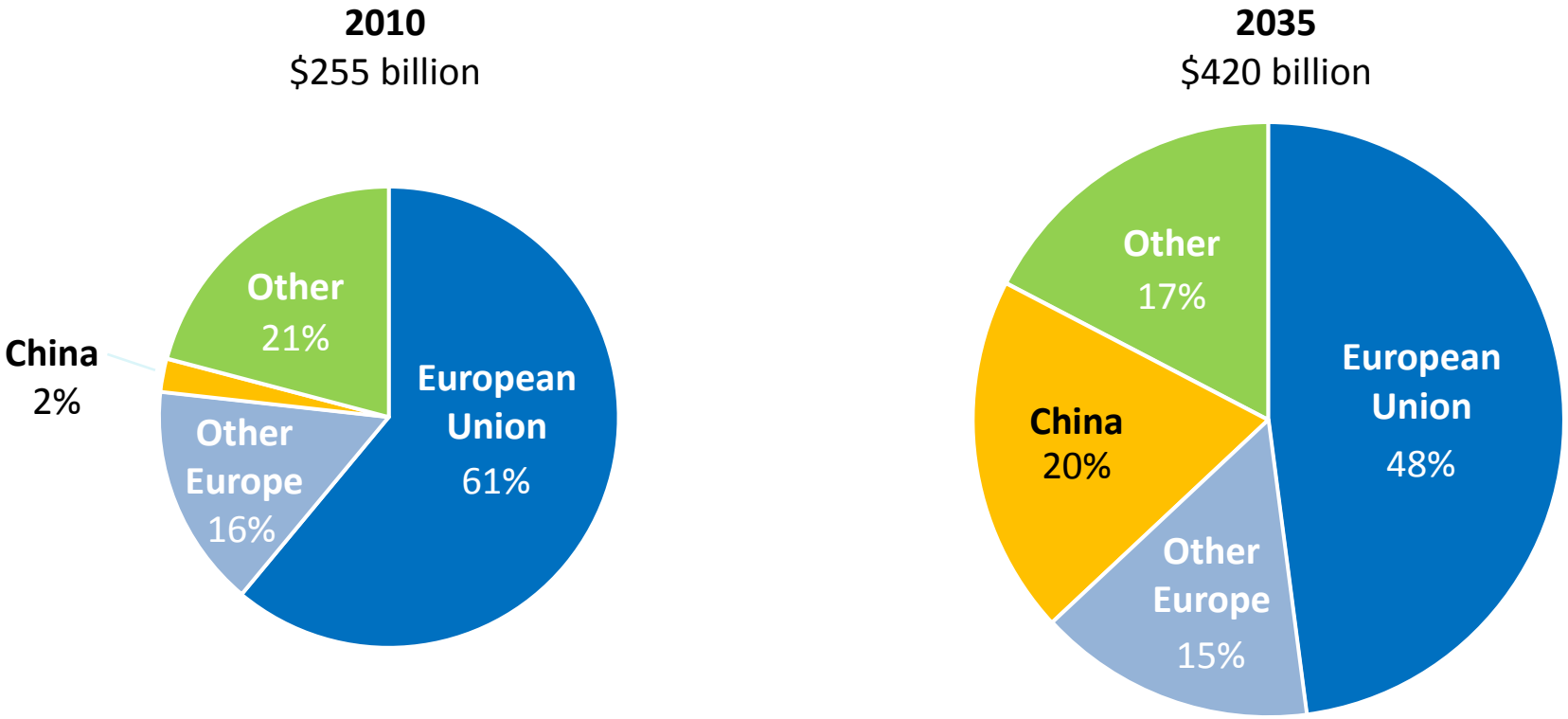
Russian revenue from fossil fuel exports



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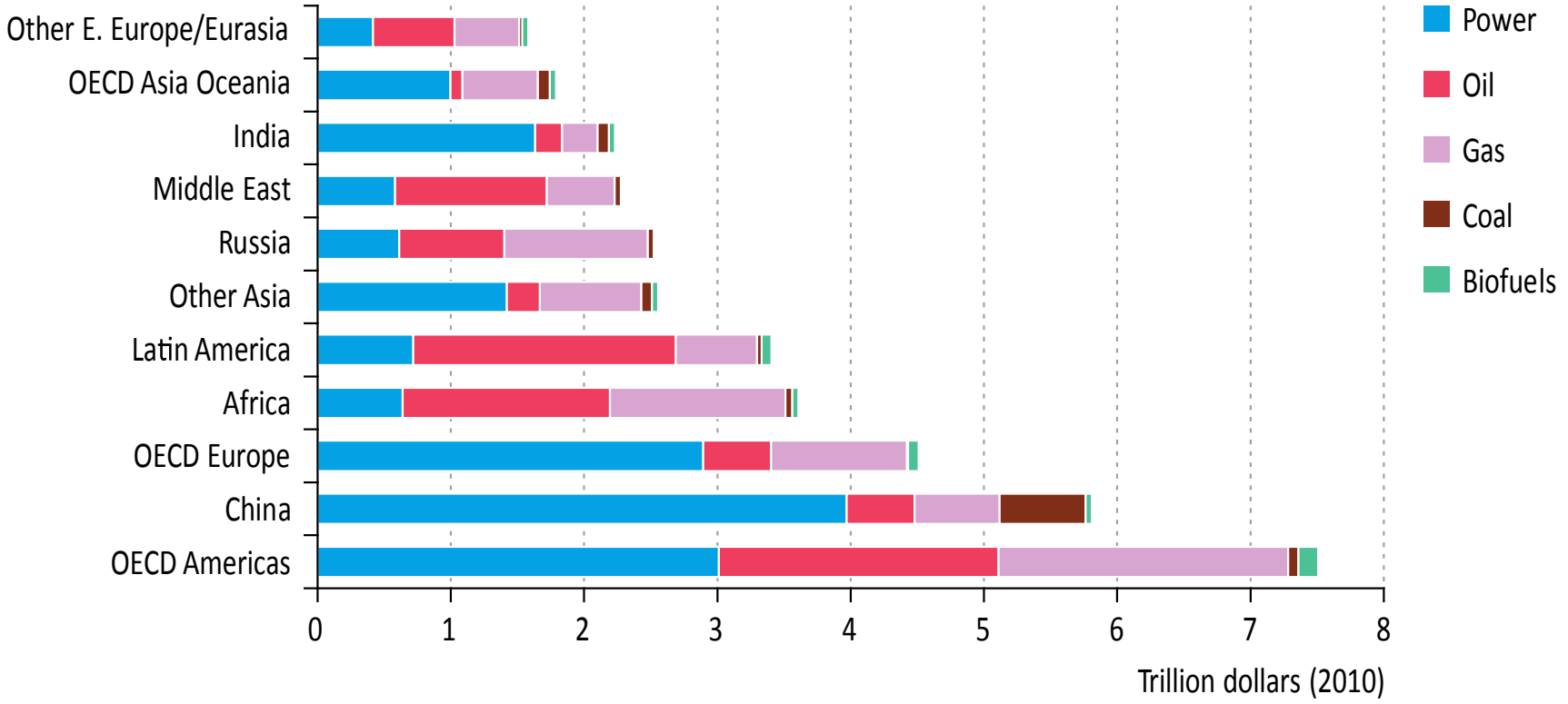
Figure 2.21 • *Cumulative investment in energy-supply infrastructure by region in the New Policies Scenario, 2011-2035*



Energy is at the heart of the climate challenge

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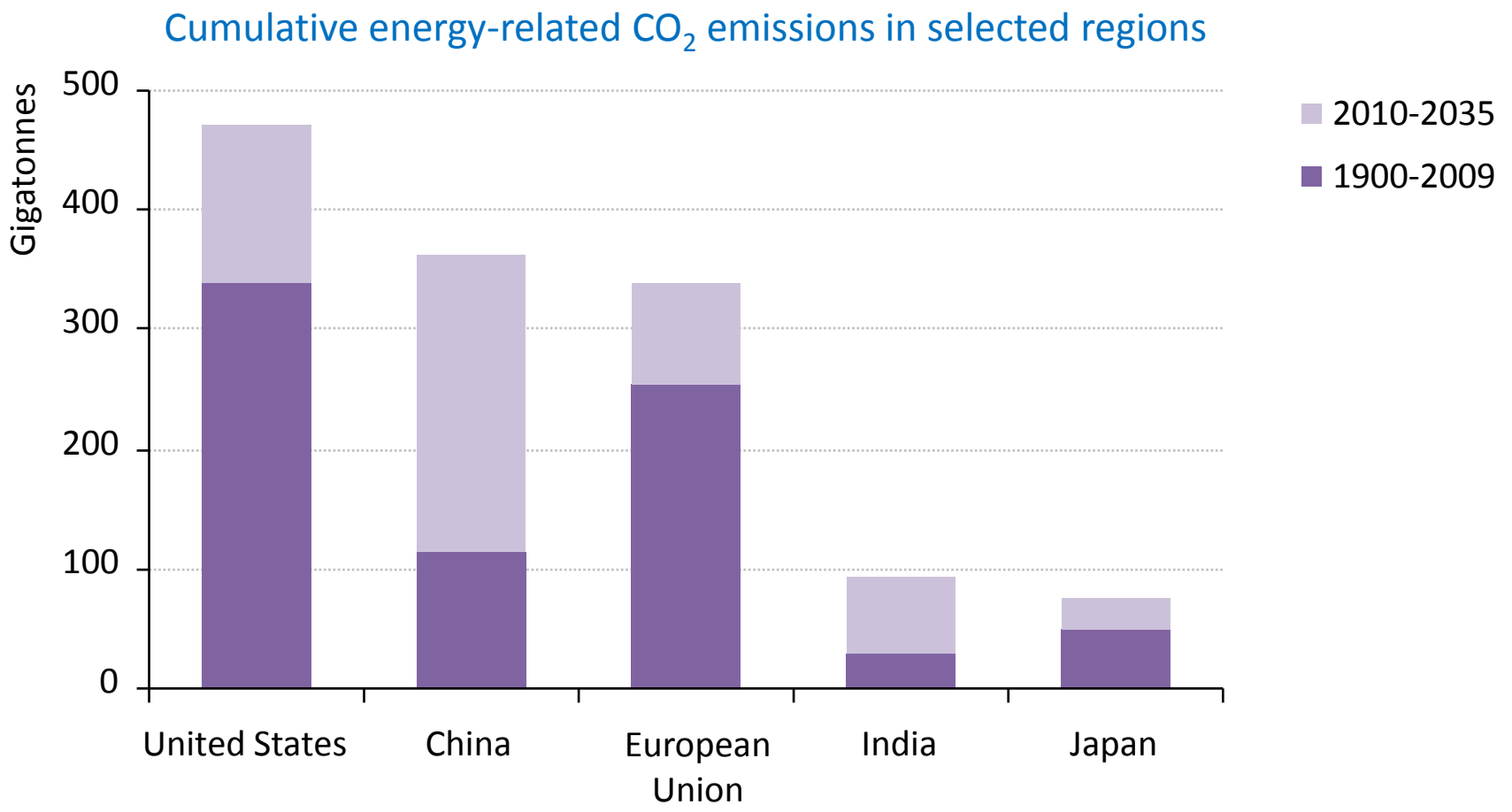
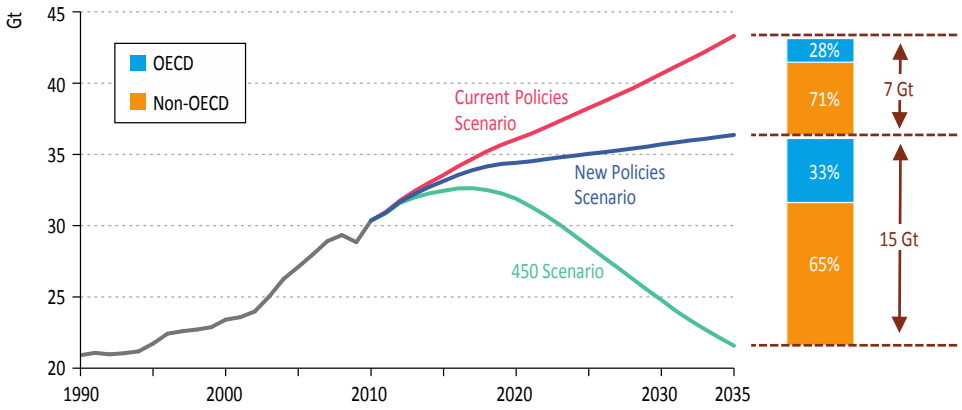


By 2035, cumulative CO_2 emissions from today exceed three-quarters of the total since 1900, and China's per-capita emissions match the OECD average

450 ppm Scenmario : what we need and where .

Figure 6.2 ● *World energy-related CO_2 emissions by scenario*[2]



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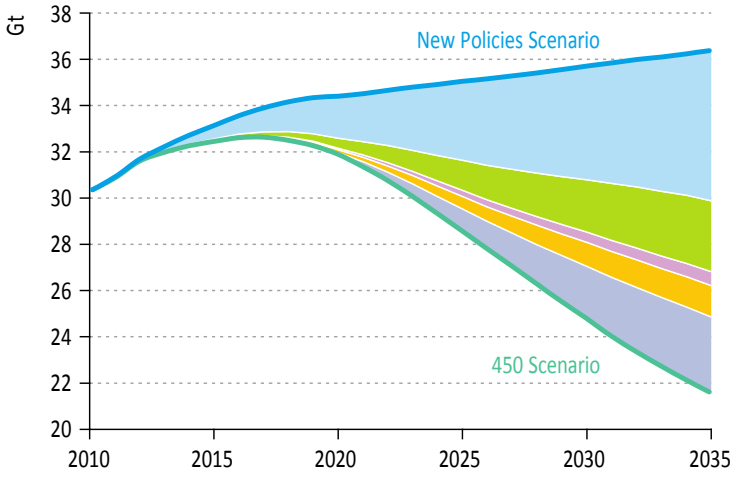
Note: There is also some abatement of inter-regional (bunker) emissions which, at less than 2% of the difference between scenarios, is not visible in the 2035 shares.

Figure 6.4 ● *World energy-related CO_2 emissions abatement in the 450 Scenario relative to the New Policies Scenario*



	Abatement	
	2020	2035
Efficiency	72%	44%
Renewables	17%	21%
Biofuels	2%	4%
Nuclear	5%	9%
CCS	3%	22%
Total (Gt CO_2)	2.5	14.8

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

WORLD ENERGY OUTLOOK 2011

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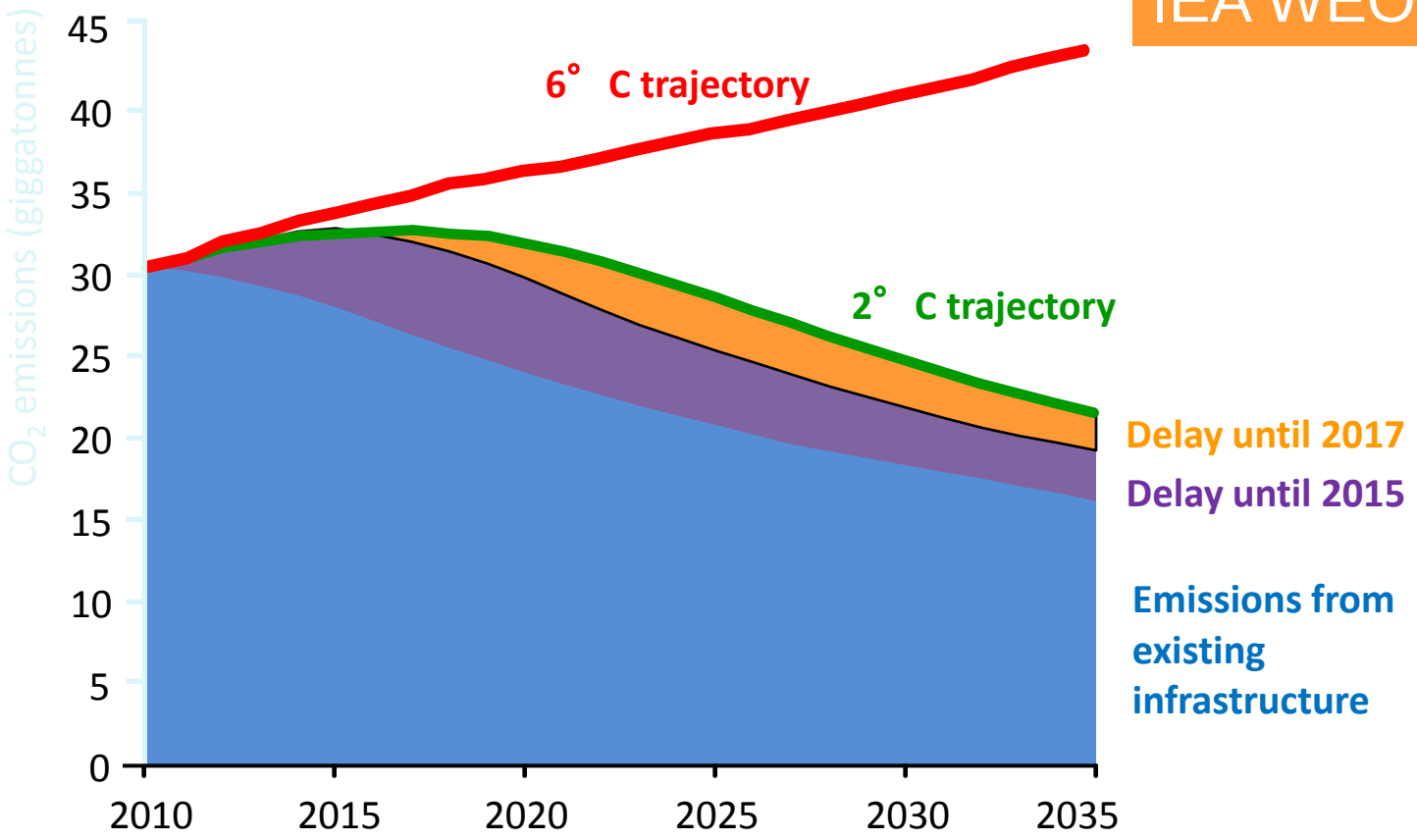
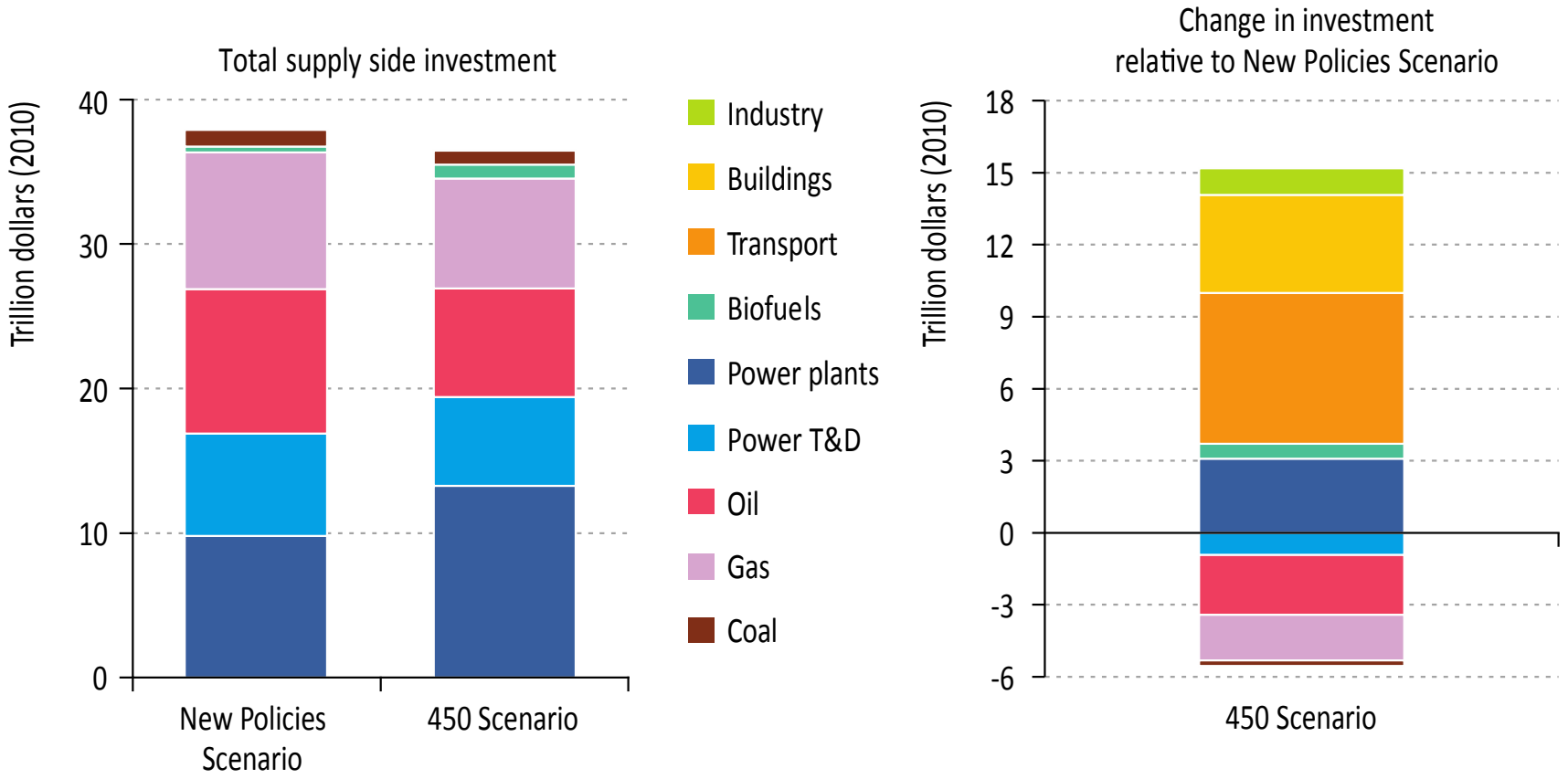


Without further action, by 2017 all CO_2 emissions permitted in the 450 Scenario will be "locked-in" by existing power plants, factories, buildings, etc

450 Scenario needs additional $10 trillion Investment

Figure 6.10 • *Cumulative energy sector investment by scenario, 2011-2035*



Notes: Investment in solar PV in buildings is a ributed to power plants in supply-side investment. Elsewhere, it is a ributed to the buildings sector. T&D = transmission and distribu on.

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_2 emissions increase by 6.2%***
- **Biggest implications for countries with limited energy resources that planned to rely on nuclear power**

Low Nuclear Case: implications for spending on energy imports

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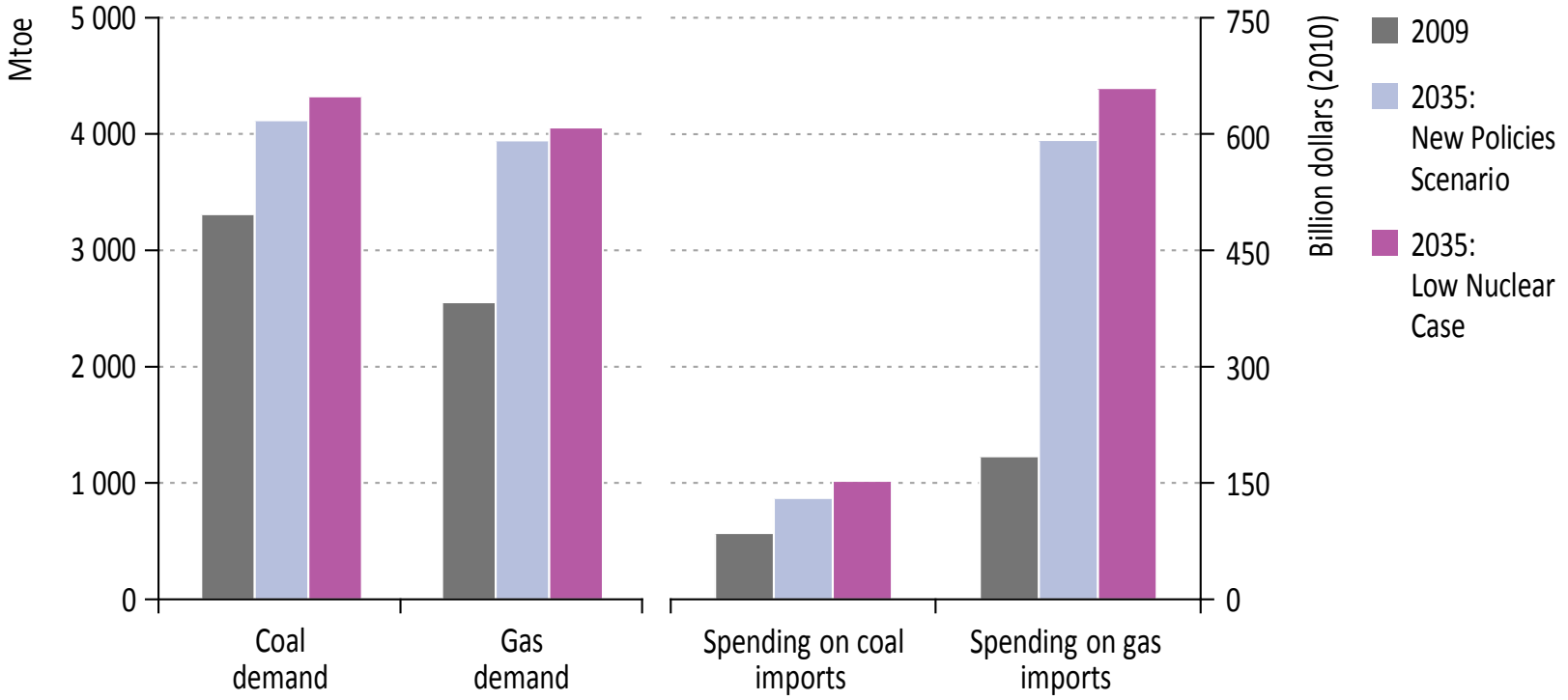
Figure 12.5 ● *Global primary coal and gas demand and annual spending on imports in the Low Nuclear Case*



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

In the Low Nuclear Case , global gas import bill rises by $67 billion than New Policies Scenario in 2035 .

And 0.9 Gigatons of more CO2 emissions

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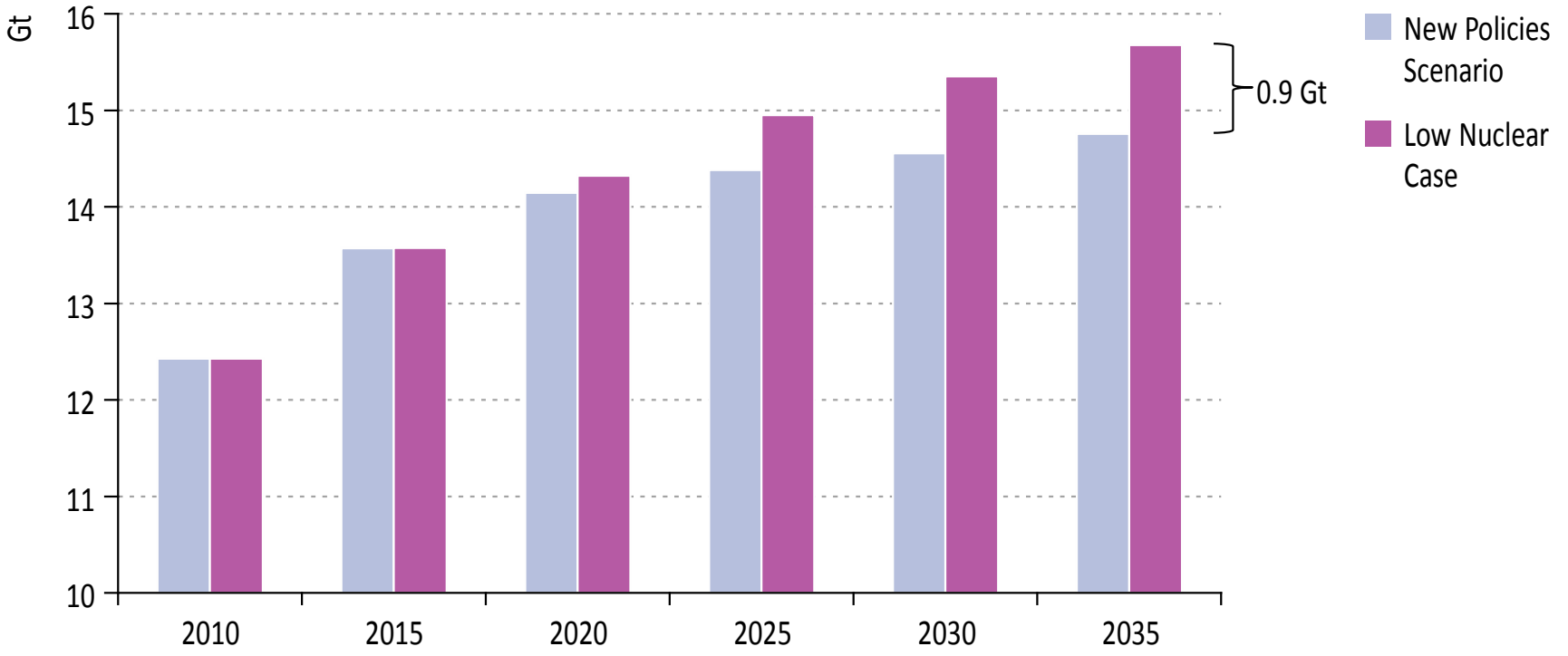
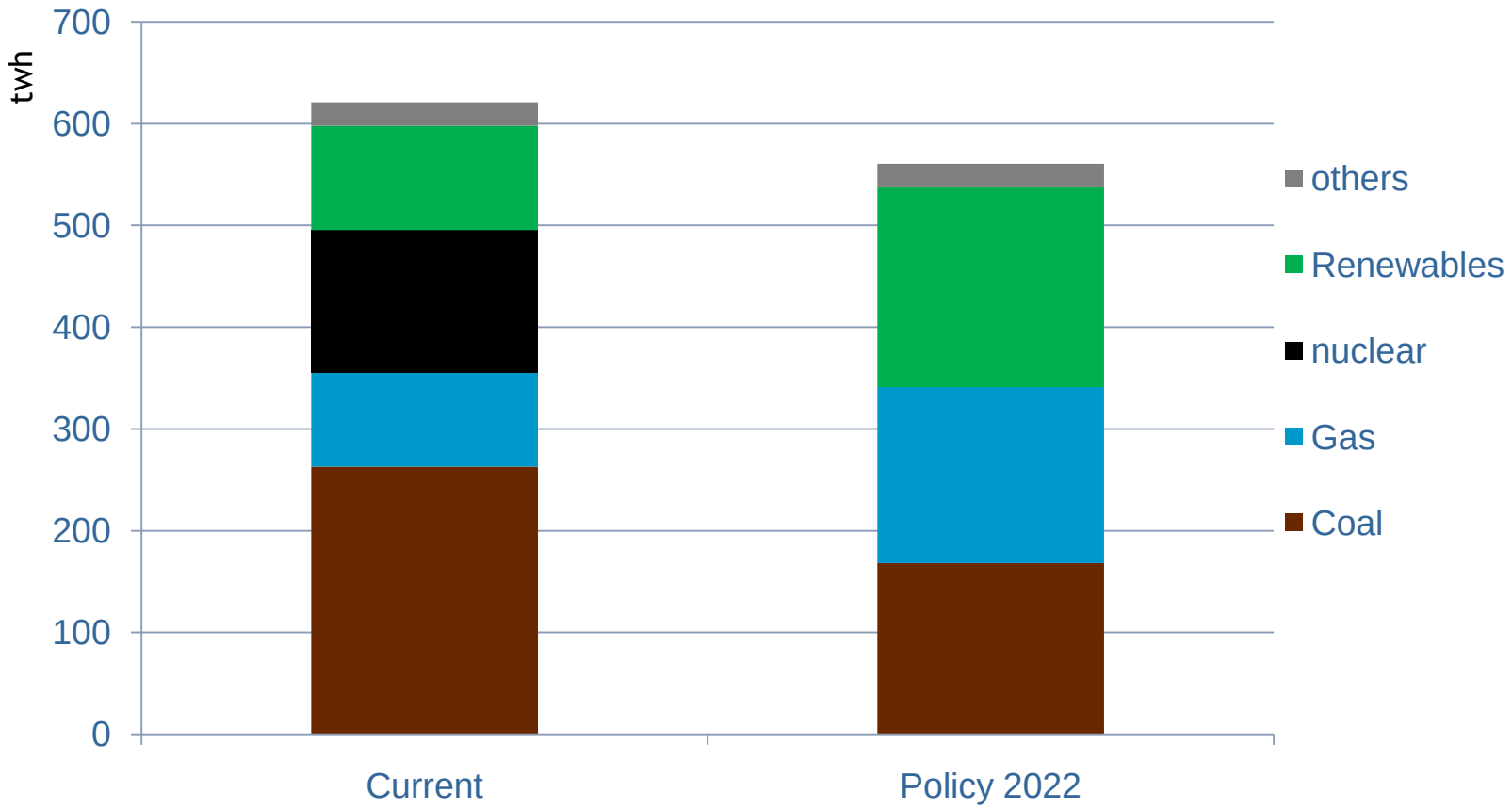
Figure 12.6 ● *Energy-related CO_2 emissions from the power sector in the New Policies Scenario and the Low Nuclear Case*

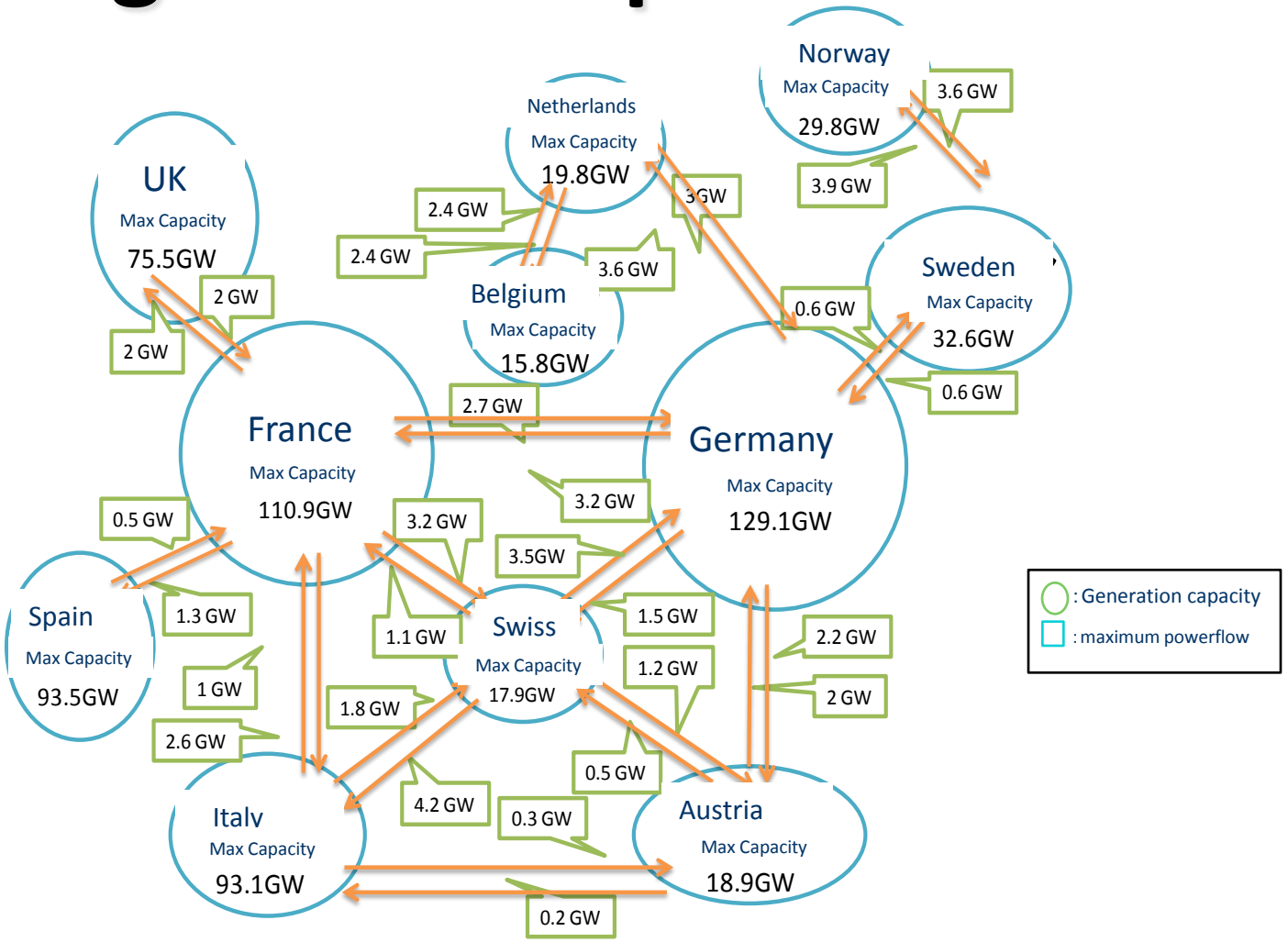


Germany may needs much more Gas to phase out Nuclear by 2022



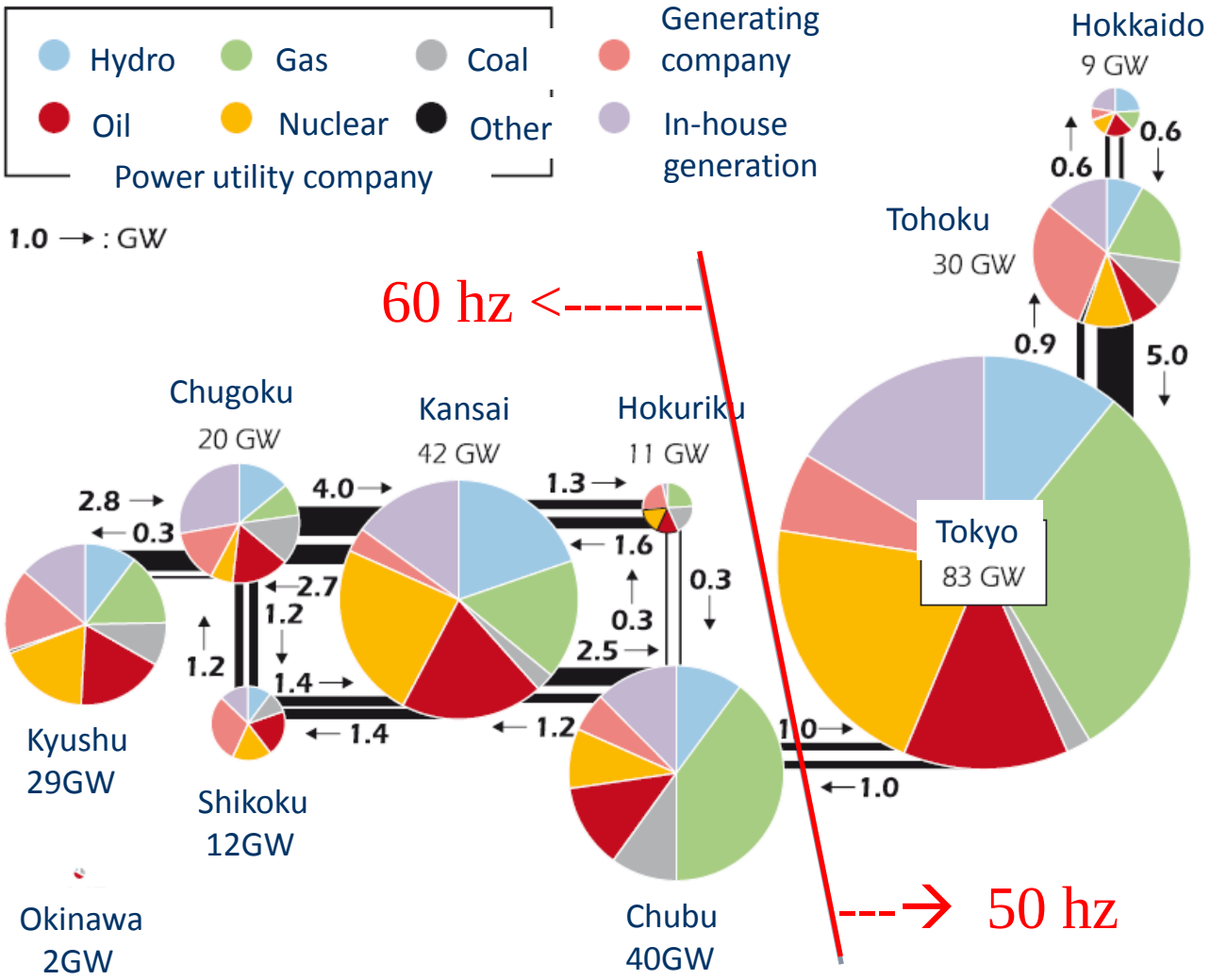
Germany needs to import 16 BCM of gas to achieve electricity mix with 10% demand reduction, no nuclear, 35% renewables and CO2 at the target level

Power grid in Europe



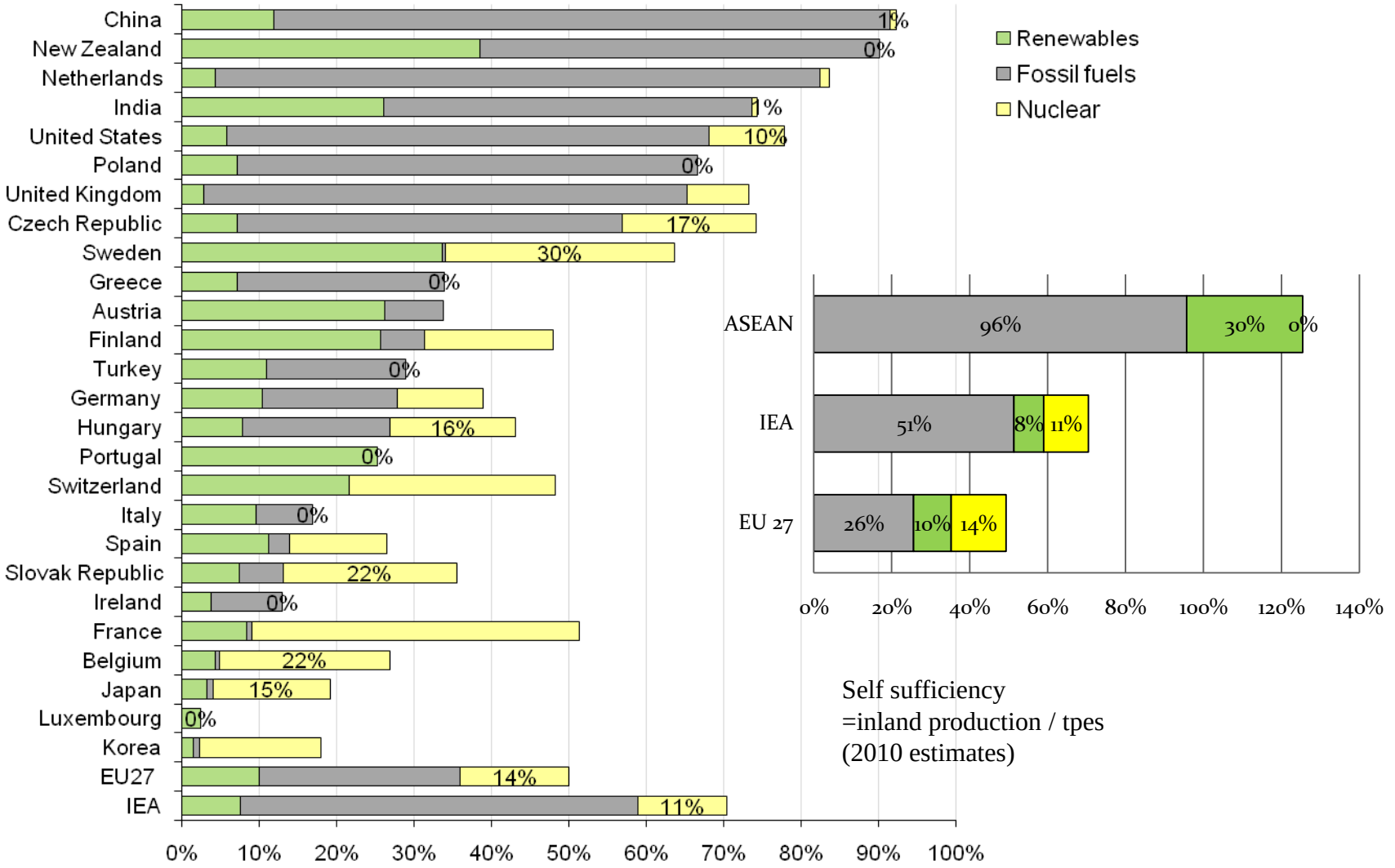
Source: IEA 「Electricity Information 2010」
Indicative value for Net Transfer Capacities (NTC) in Continental Europe

Power grid in Japan



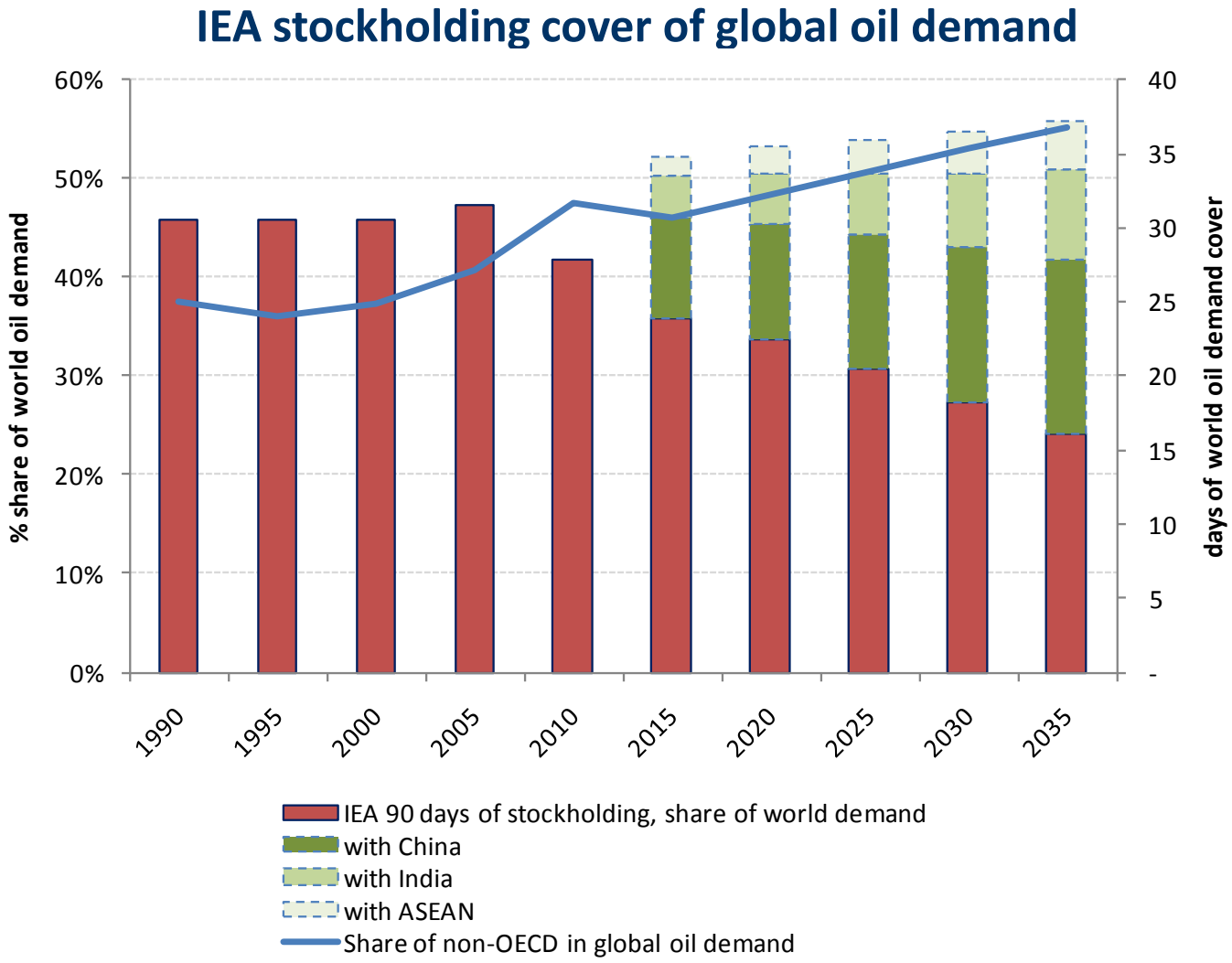
Source: Agency for Natural Resources and Energy, The Federation of Electric Power Companies of Japan, Electric Power System Council of Japan, The International Energy Agency

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?



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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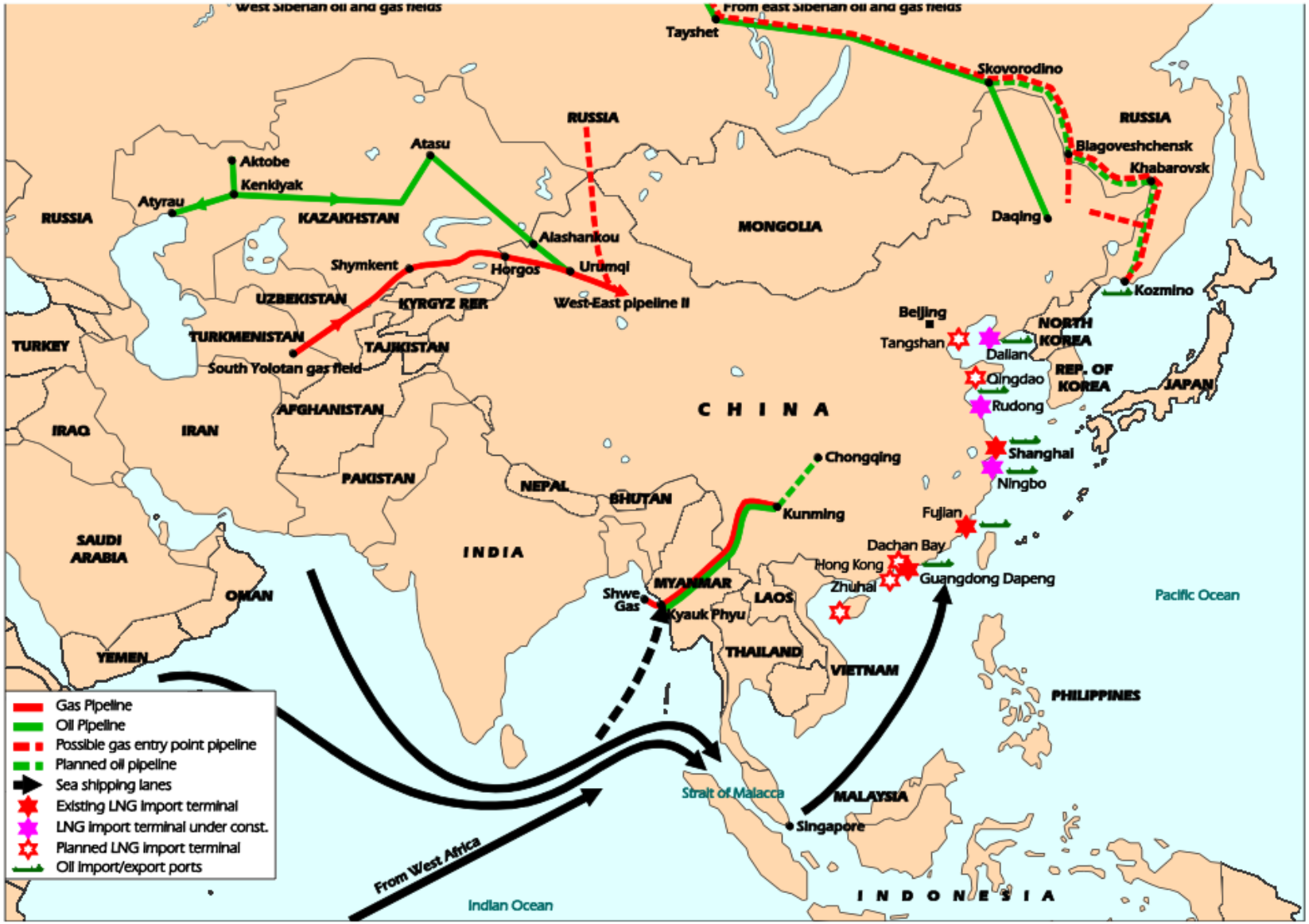
Figure 8.15 ● *Major gas fields and supply infrastructure in Russia*

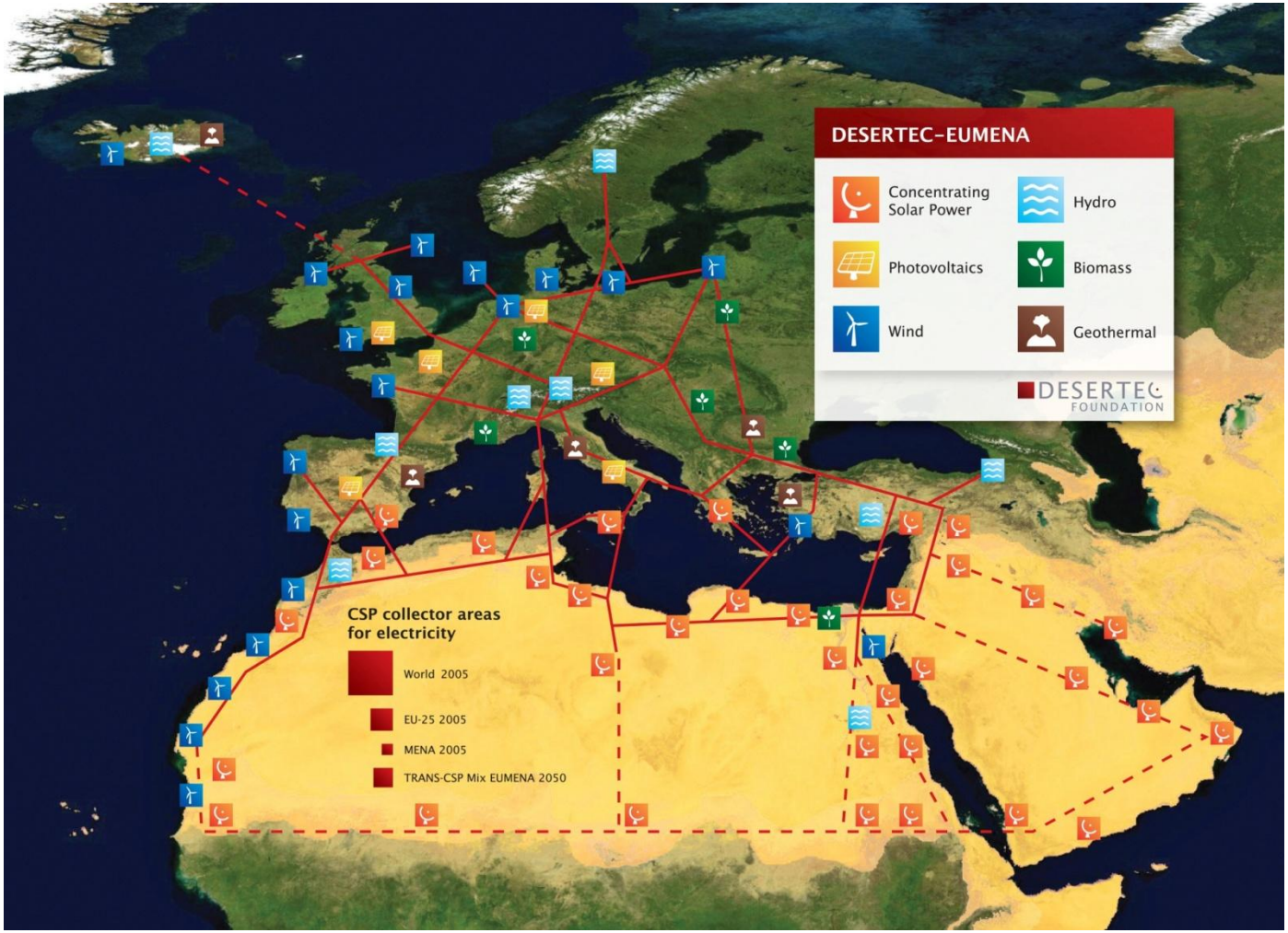
This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

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



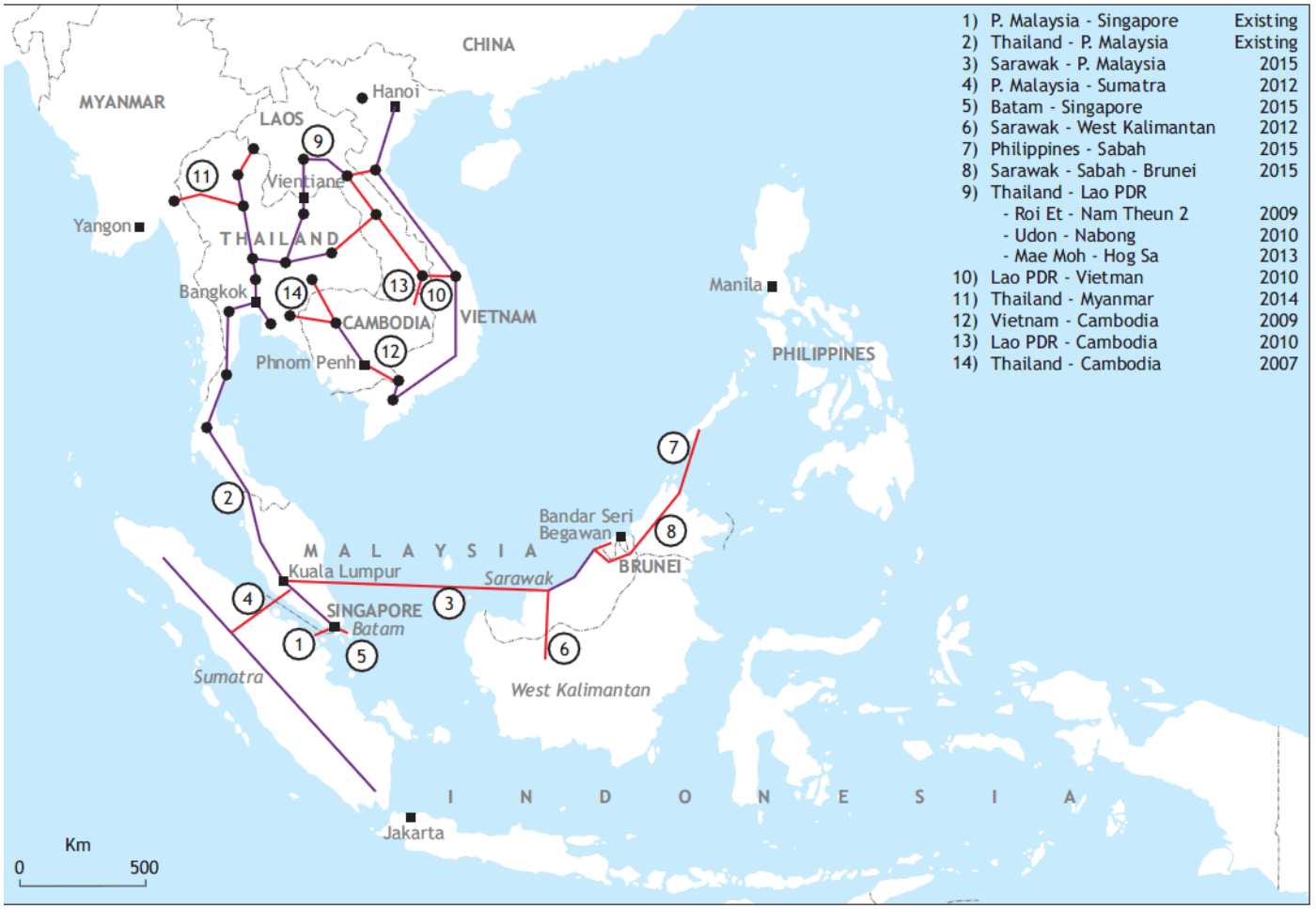
Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts

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



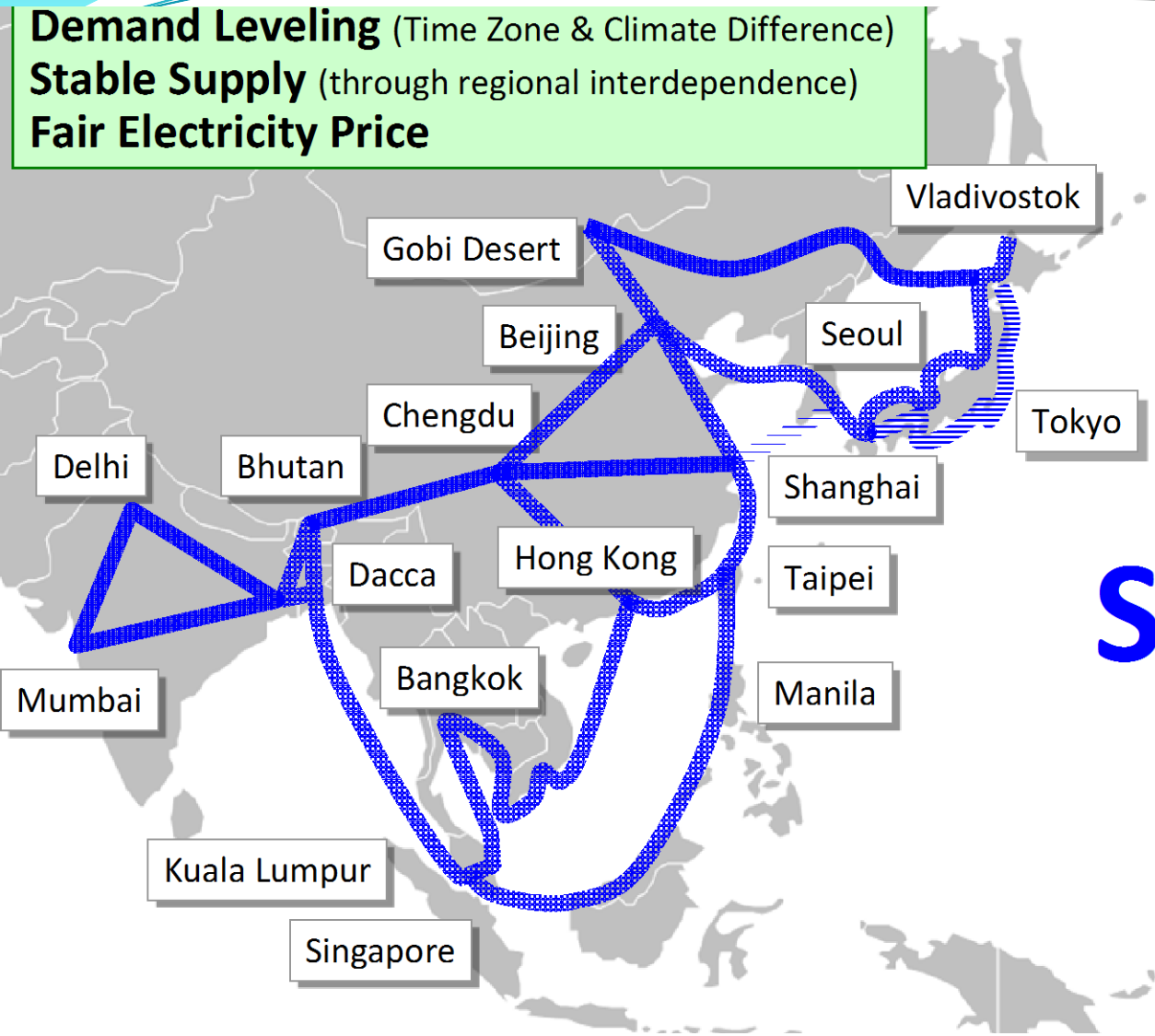
Source: DESRETEC Foundation

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



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.

- 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, 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.