

Stormy Energy Future and Security Strategy

2016-5-26 IEEJ / APERC Symposium

Former Executive Director, IEA
President, the Sasakawa Peace Foundation
Nobuo TANAKA

Oil as strategic commodity

“Safety and certainty in oil lie in variety and variety alone.”



International
Energy Agency
Secure
Sustainable
Together

World Outlook Energy 2015

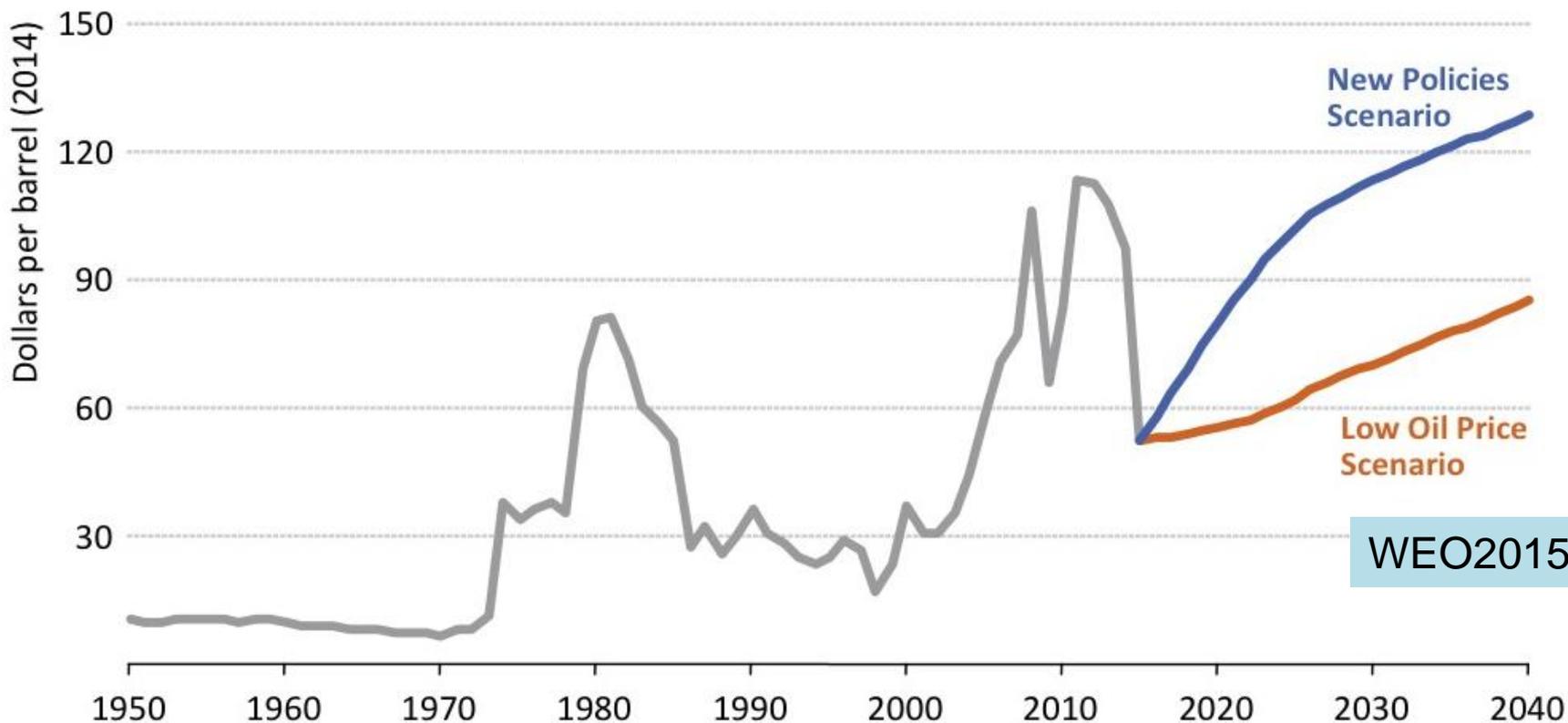
London, 10 November 2015

The start of a new energy era?

- 2015 has seen lower prices for all fossil fuels
 - Oil & gas could face second year of falling upstream investment in 2016
 - Coal prices remain at rock-bottom as demand slows in China
- Signals turn green ahead of key Paris climate summit
 - Pledges of 150+ countries account for 90% of energy-related emissions
 - Renewables capacity additions at a record-high of 130 GW in 2014
 - Fossil-fuel subsidy reform, led by India & Indonesia, reduces the global subsidy bill below \$500 billion in 2014
- Multiple signs of change, but are they moving the energy system in the right direction?

Low Oil Price Scenario

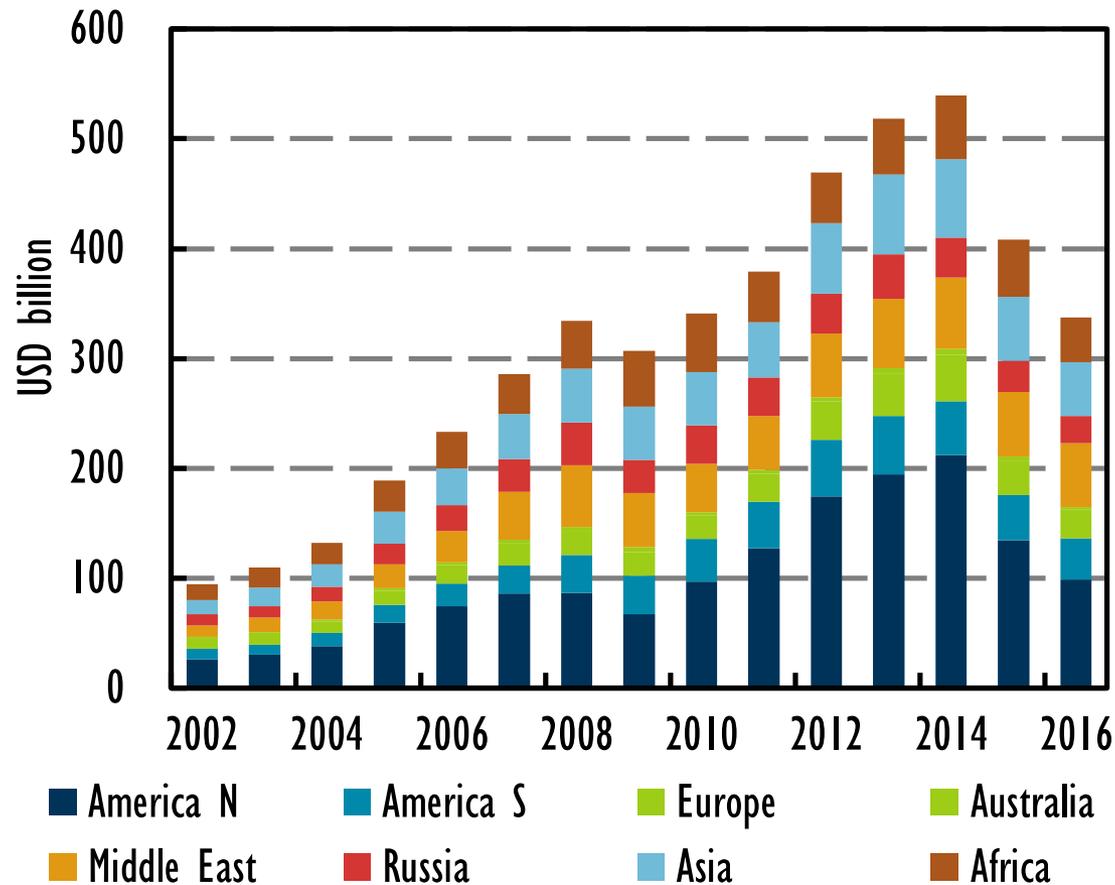
Figure 4.1 ▶ Average IEA crude oil import price by scenario



What will happen if Oil Price of \$50 per barrel continues well into 2020s?

Upstream oil capex cut for 2nd year

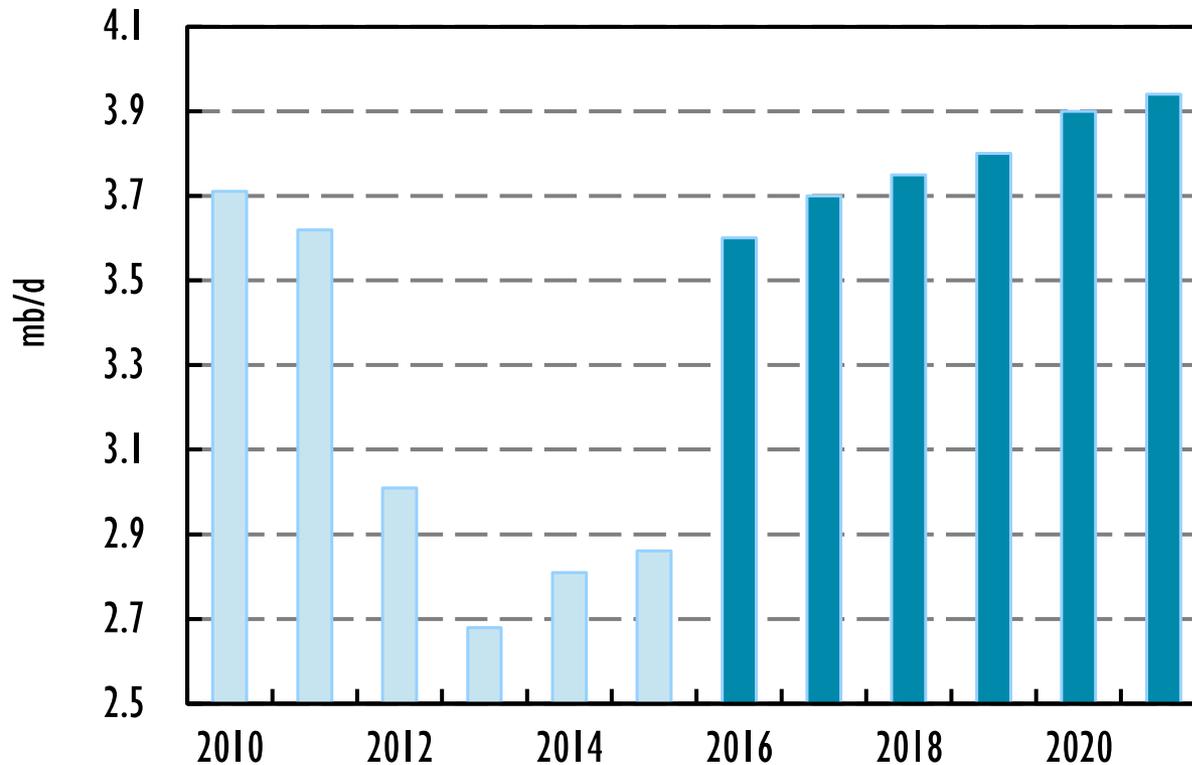
Medium-Term
Market Report
2016



■ **Drop of 17% in 2016 follows 24% reduction in 2015**

Post-sanctions Iran leads OPEC gains

Medium-Term
Market Report
2016

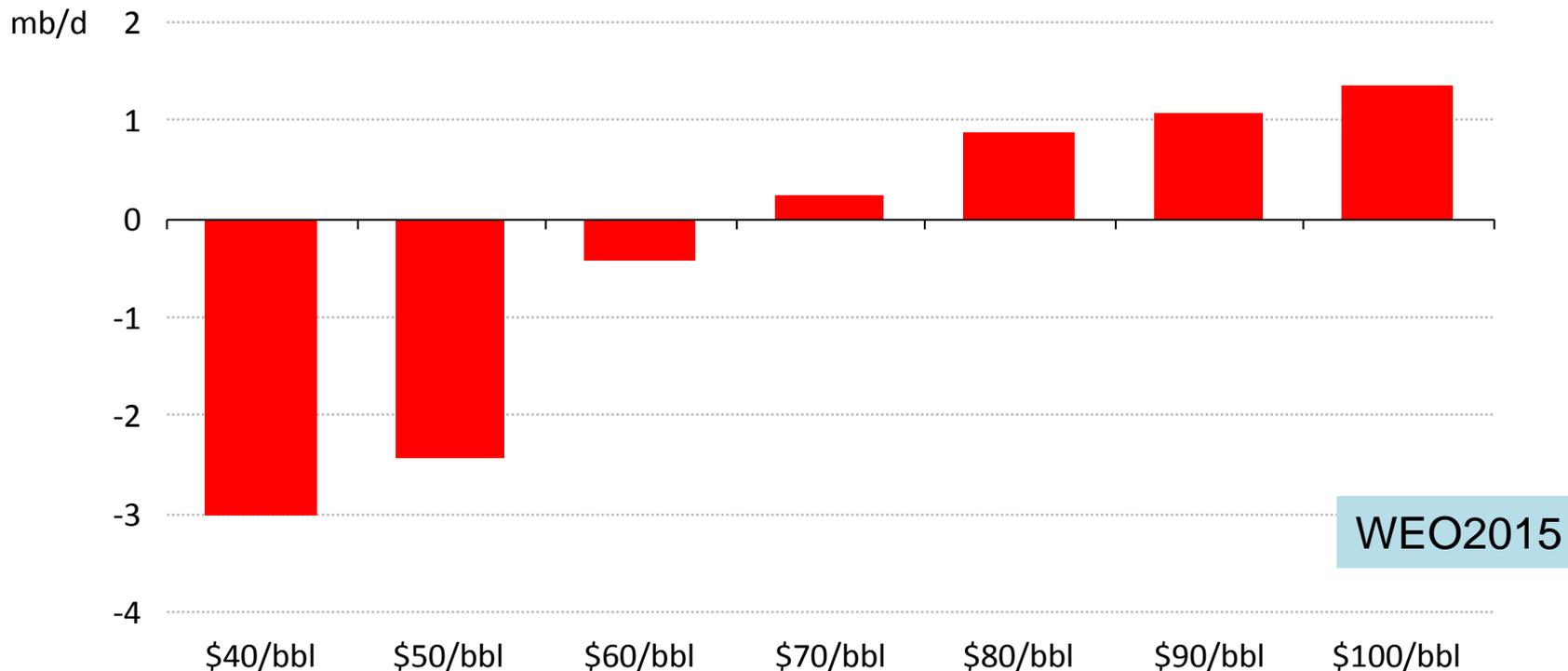


Actual production 2010-15, capacity thereafter

■ **Output to rise 1 mb/d to 3.9 mb/d by 2021**

A new balancing item in the oil market?

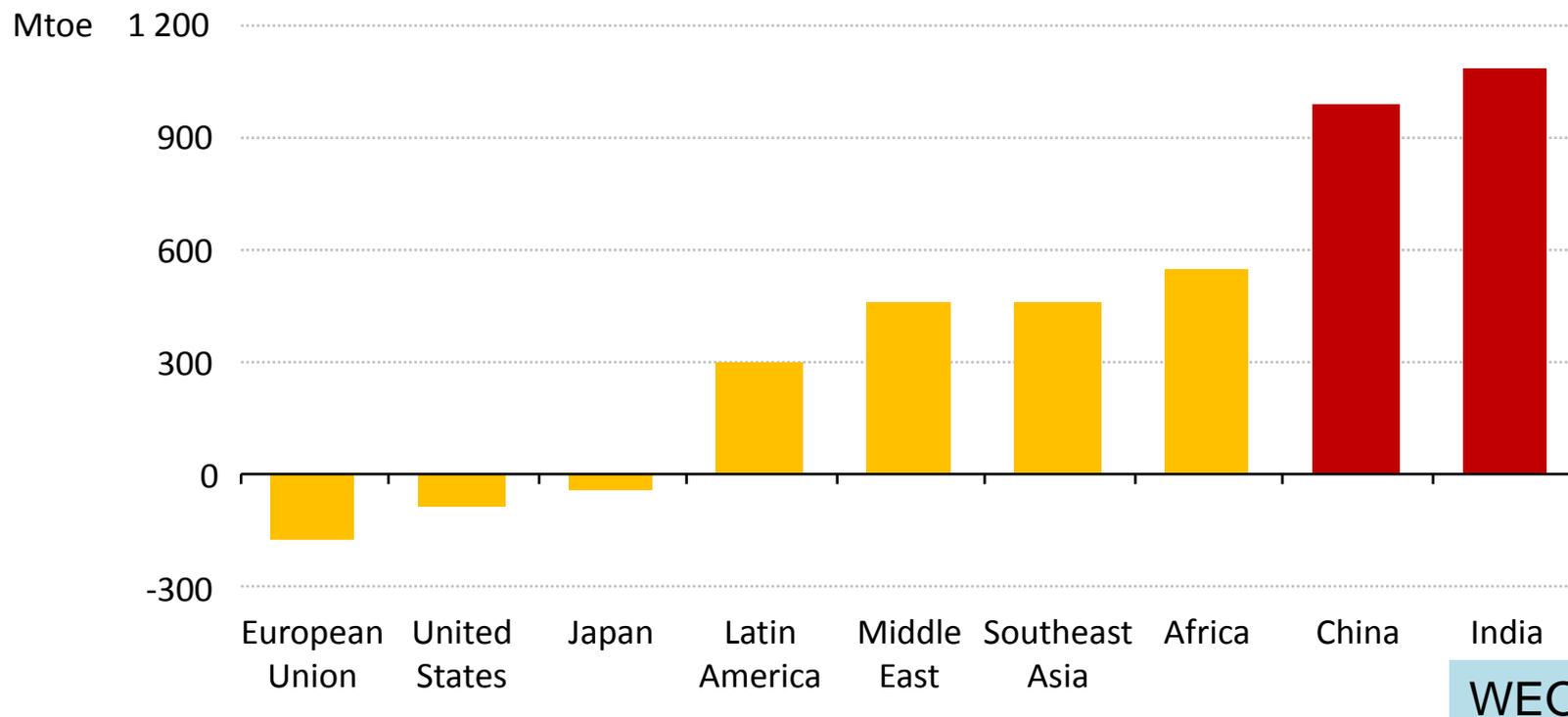
Change in production (2015-2020) of US tight oil for a range of 2020 oil prices



Tight oil has created more short-term supply flexibility, but there is no guarantee that the adjustment mechanism in oil markets will be smooth

Demand growth in Asia – the sequel

Change in energy demand in selected regions, 2014-2040



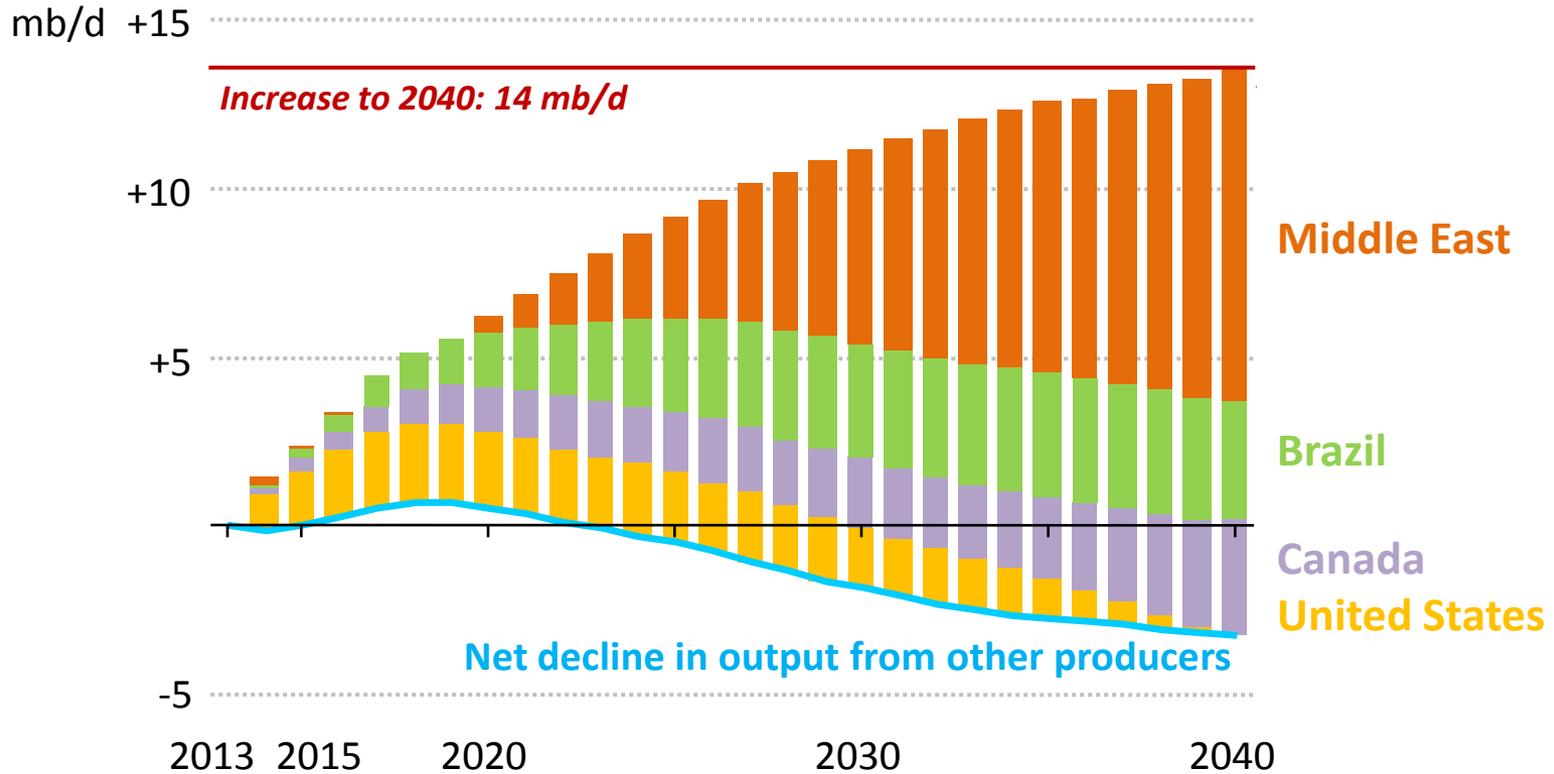
By 2040, India's energy demand closes in on that of the United States, even though demand per capita remains 40% below the world average

Instability in the Middle East a major risk to oil markets

WEO2014

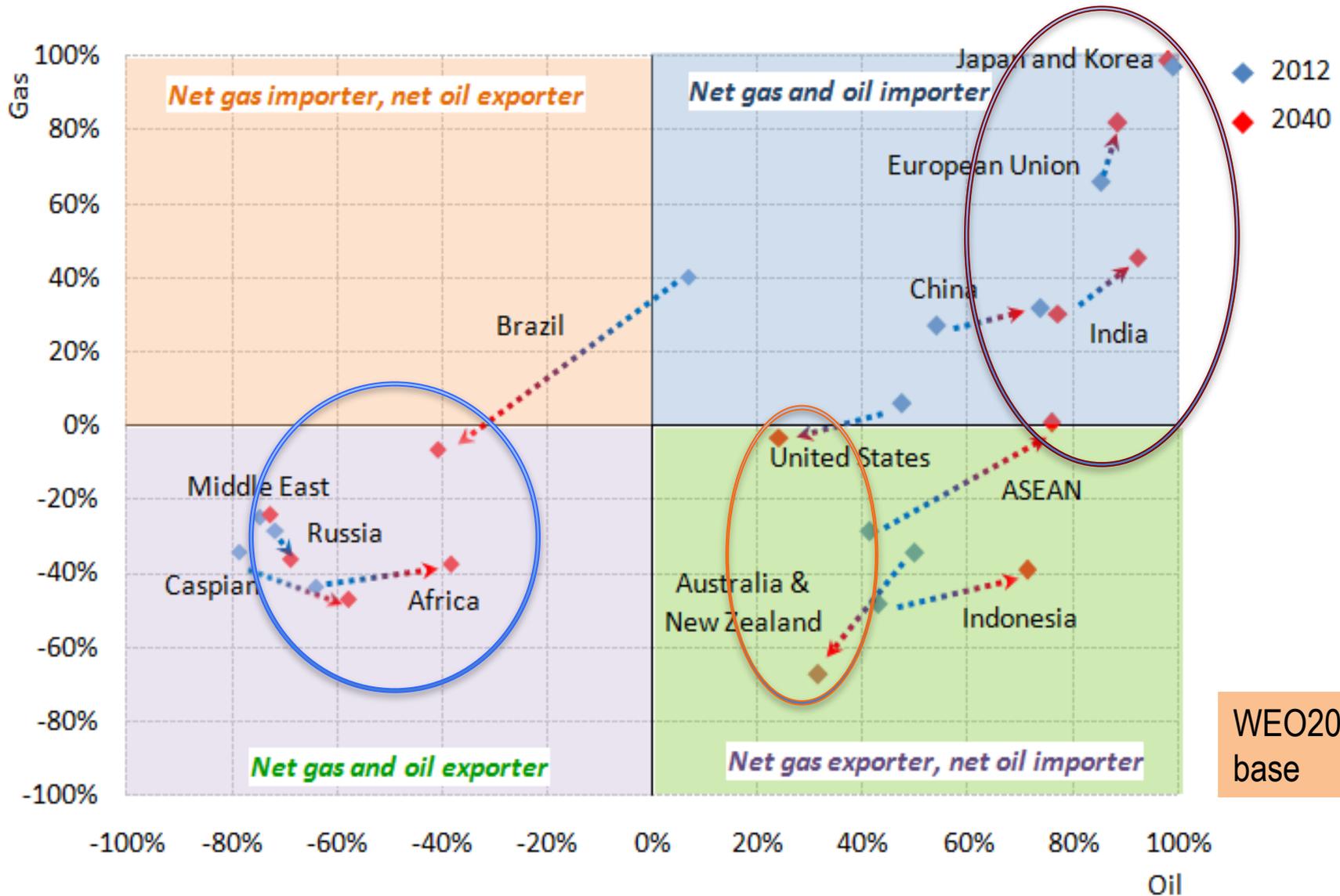
Oil production growth

in United States, Canada, Brazil & the Middle East

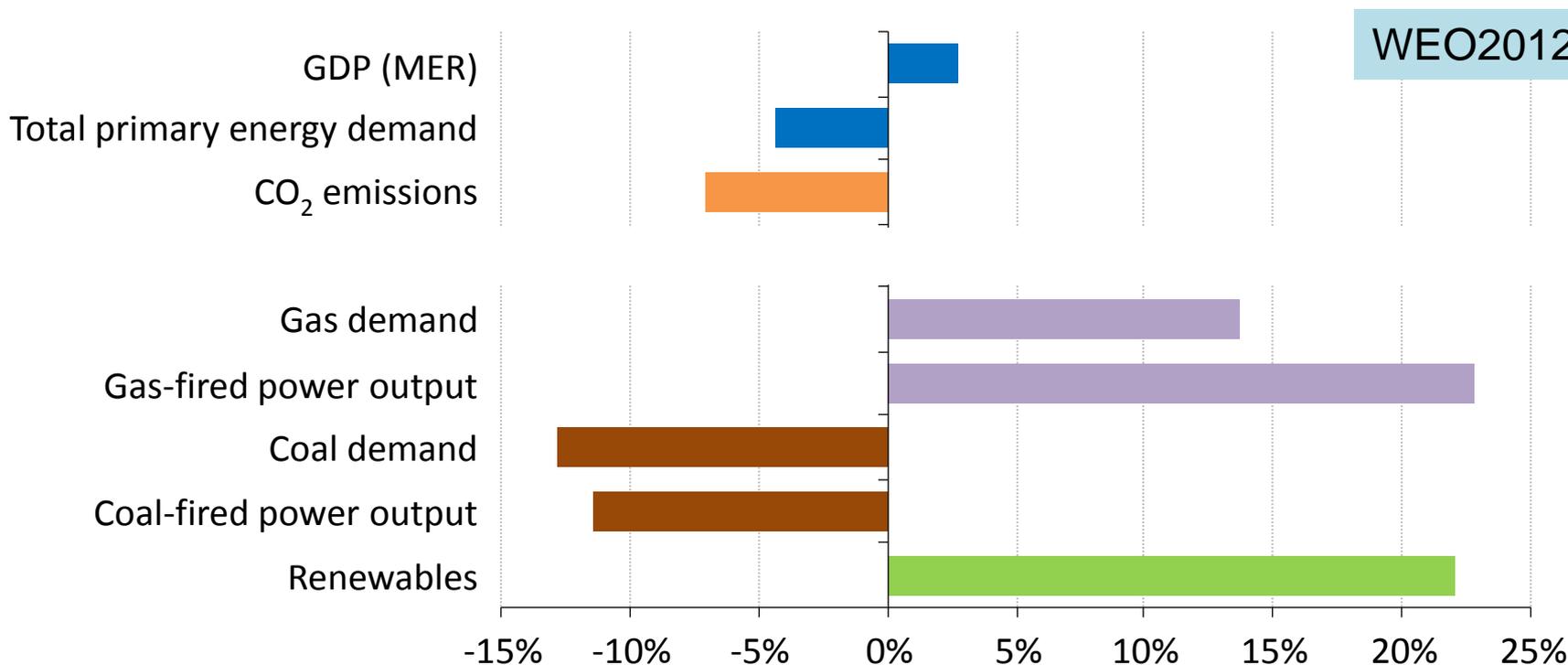


The short-term picture of a well-supplied market should not obscure future risks as demand rises to 104 mb/d & reliance grows on Iraq & the rest of the Middle East

Geopolitics of the Shale Revolution: Strategic Positioning of Oil / Gas exporters and importers.



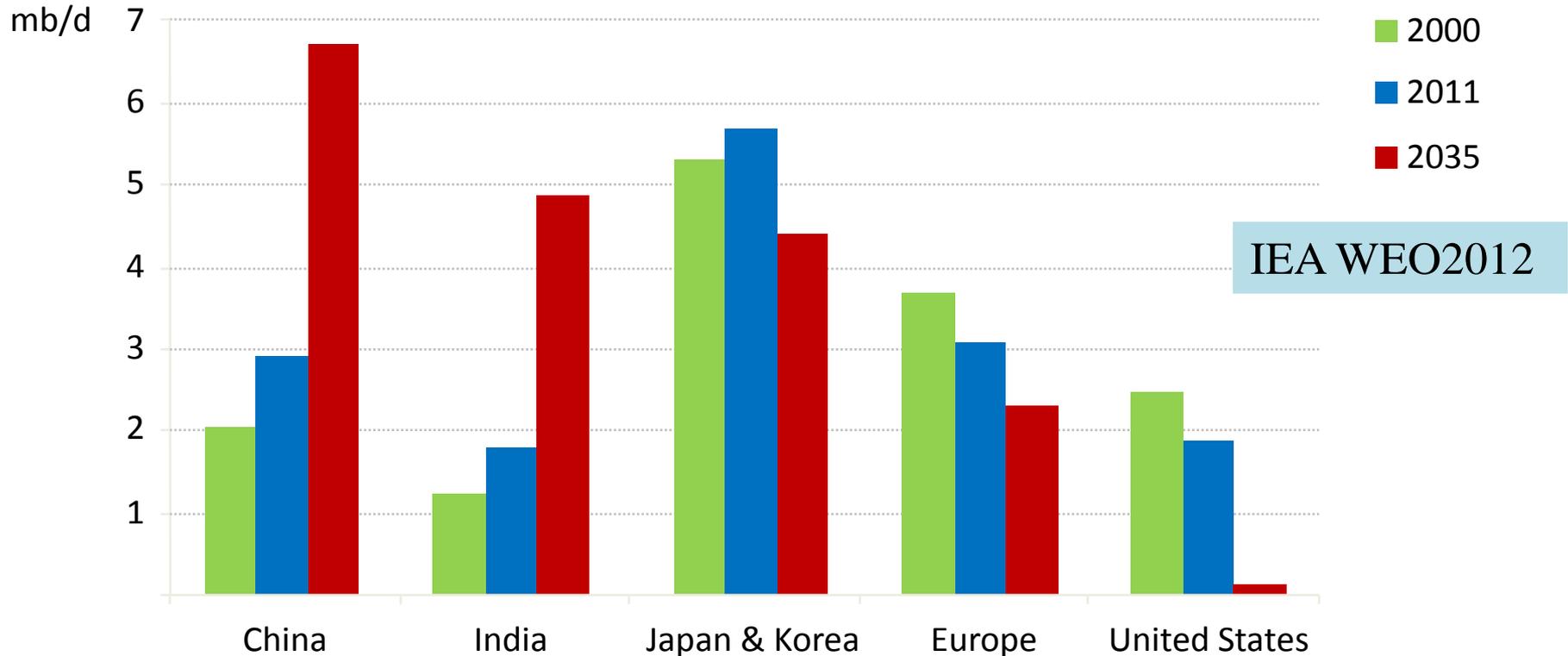
The Shale revolution in the US achieved Win-Win-Win. Economy, Environment and Energy Security.



From 2006-2011, United States CO₂ emissions went down by 7% due to coal-to-gas fuel switching, power generation efficiency gains & increased renewables output

North American Energy Independence and Middle East Oil to Asia: a new Energy Geopolitics

Middle East oil export by destination



By 2035, almost 90% of Middle Eastern oil exports go to Asia; North America's emergence as a net exporter accelerates the eastward shift in trade

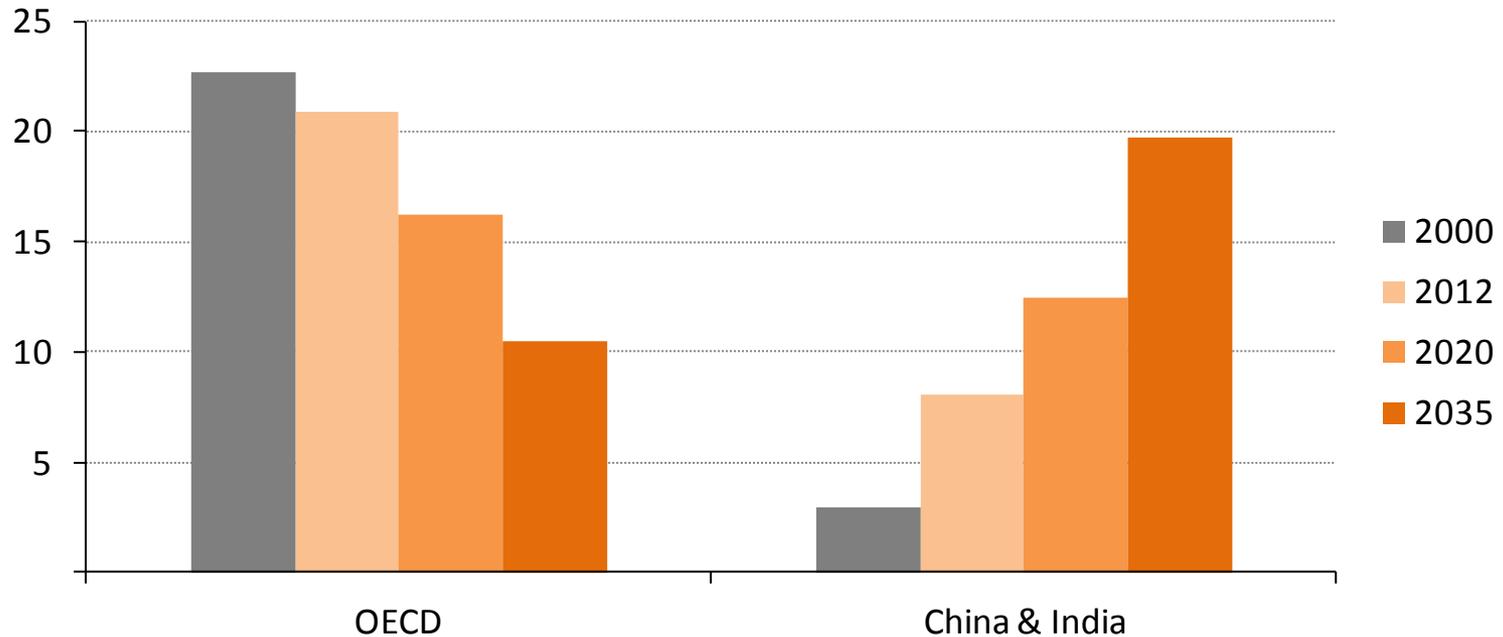
China's Oil and Gas Import Transit Routes: One Belt and One Road (一帶一路)

(U) China's Import Transit Routes/Critical Chokepoints and Proposed/Under Construction SLOC Bypass Routes



Should China and India join the IEA ?

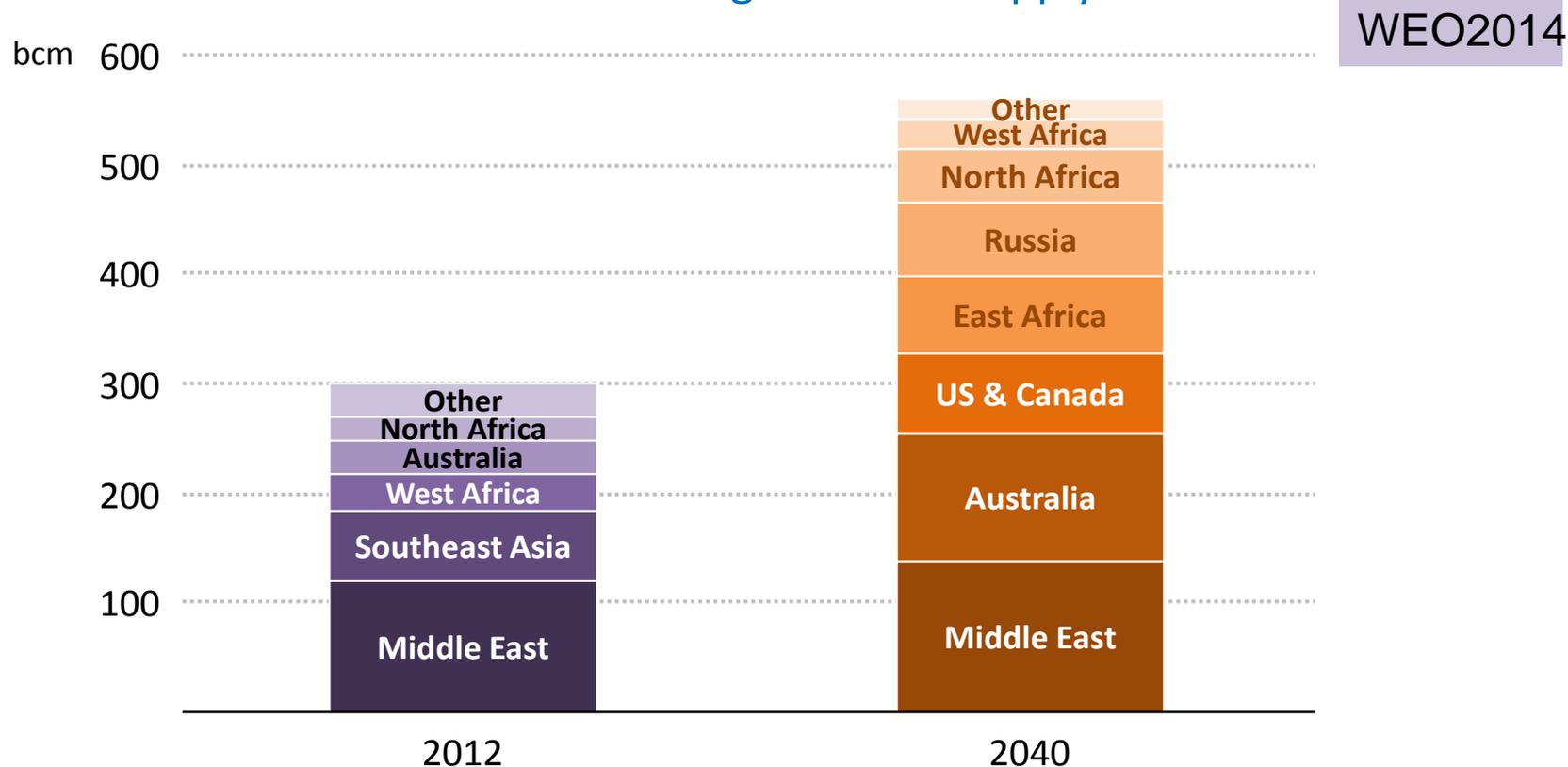
Net oil imports of selected countries in the New Policies Scenario (mb/d)



Asia becomes the unrivalled centre of the global oil trade as the region draws in a rising share of the available crude

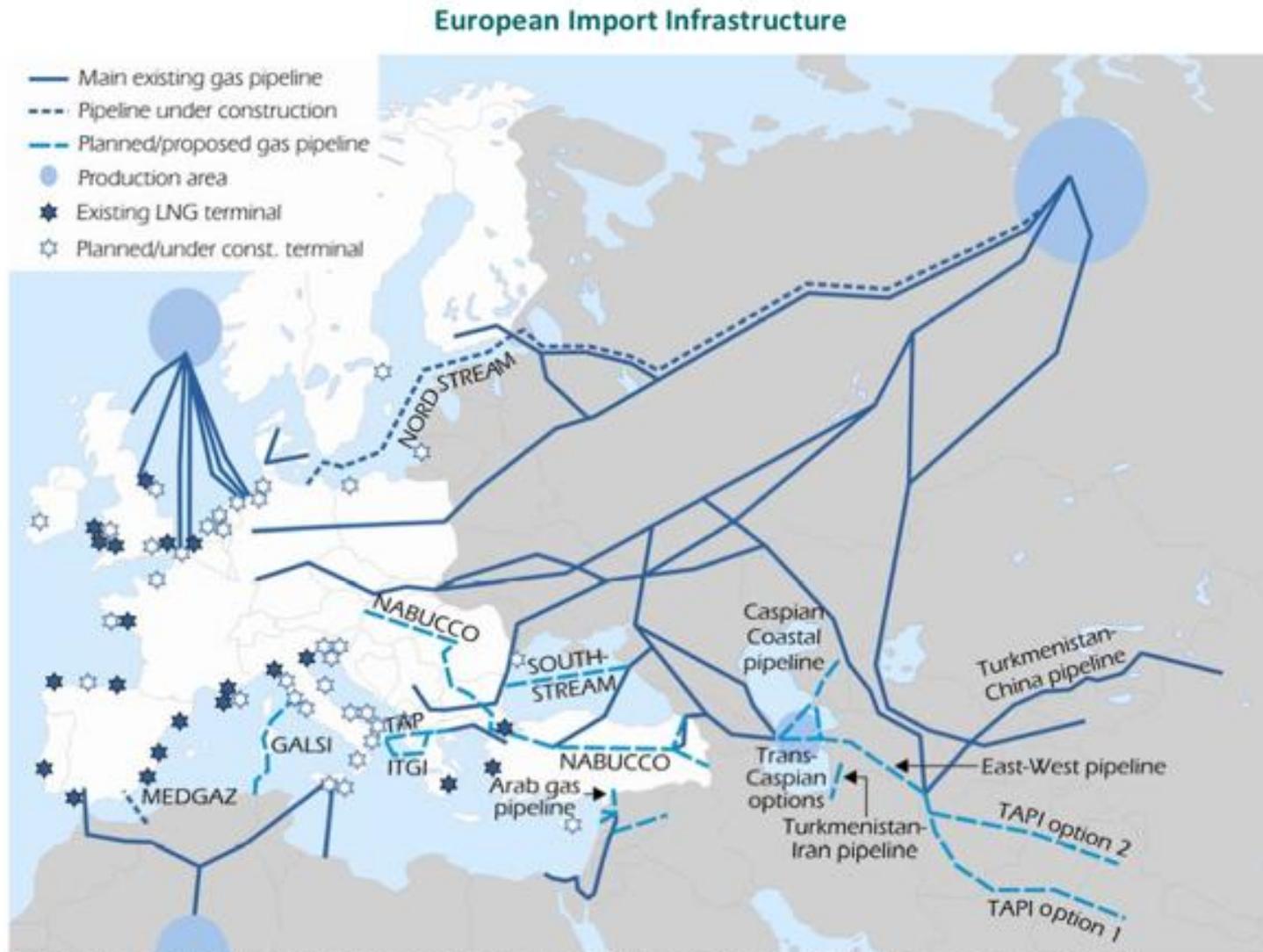
Gas on the way to become first fuel, with role of LNG on the rise

Main sources of regional LNG supply



***Share of LNG rises in global gas trade, pushed by a near-tripling in liquefaction sites:
LNG brings more integrated & secure gas markets, but only limited relief on prices***

Natural Gas Import Infrastructure in Europe



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: IEA.

IEA Medium Term Oil and Gas Markets 2010

Russian Gas Pipelines Will Extend to the East: Recent China Deal

Russian Gas Infrastructure



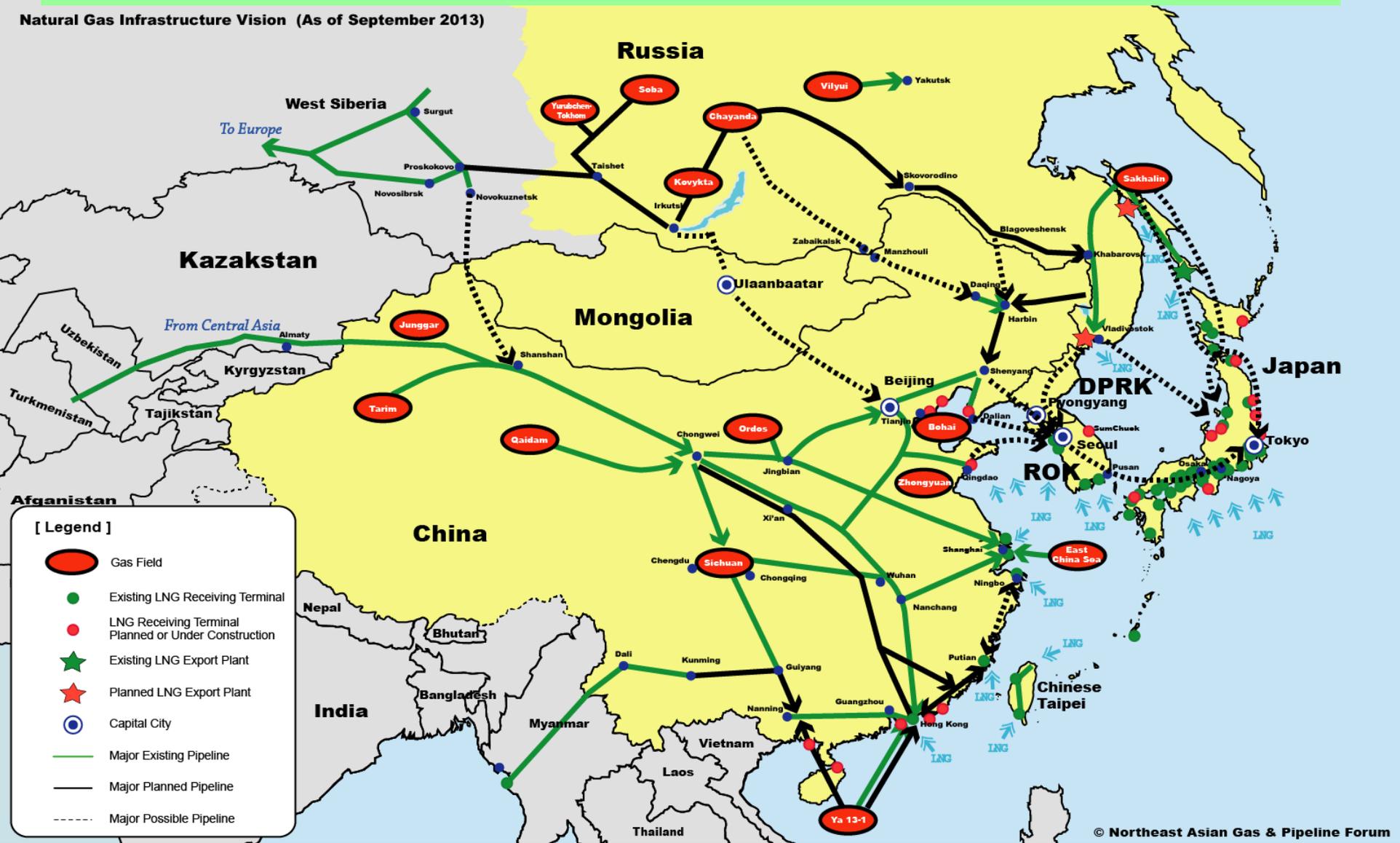
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Mid-Term Oil & Gas Market 2010, IEA

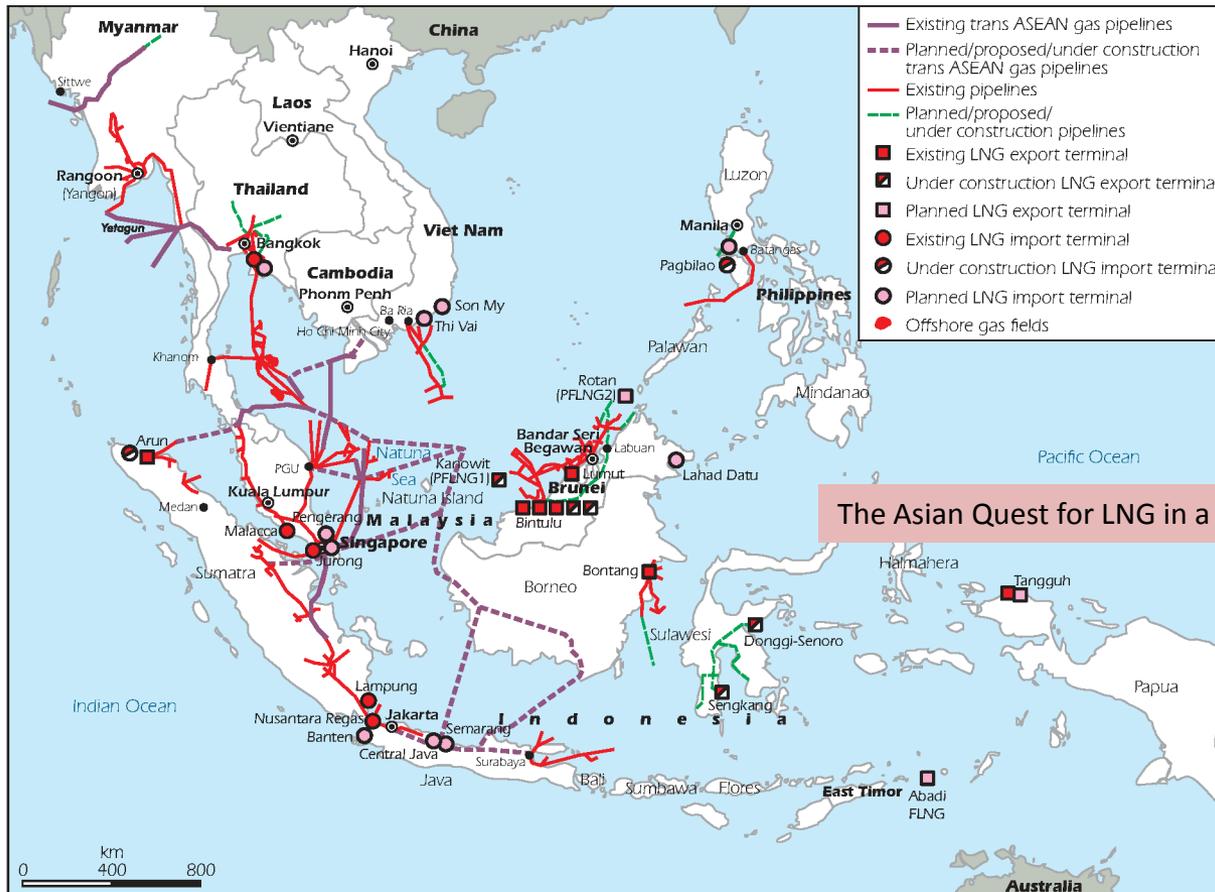
Blue Print for North East Asia Gas & Pipeline Infrastructure: Dr. Hirata's Concept

Natural Gas Infrastructure Vision (As of September 2013)



Trading hub – Asian-tailored solution?

TAGP and LNG terminals in Southeast Asia



The Asian Quest for LNG in a Globalising Market

- Southeast Asian countries are already interlinked by pipeline and plan to increase these linkages through Trans ASEAN Gas Pipeline (TAGP) and LNG.

Possible Pipeline Project from Russia to Japan

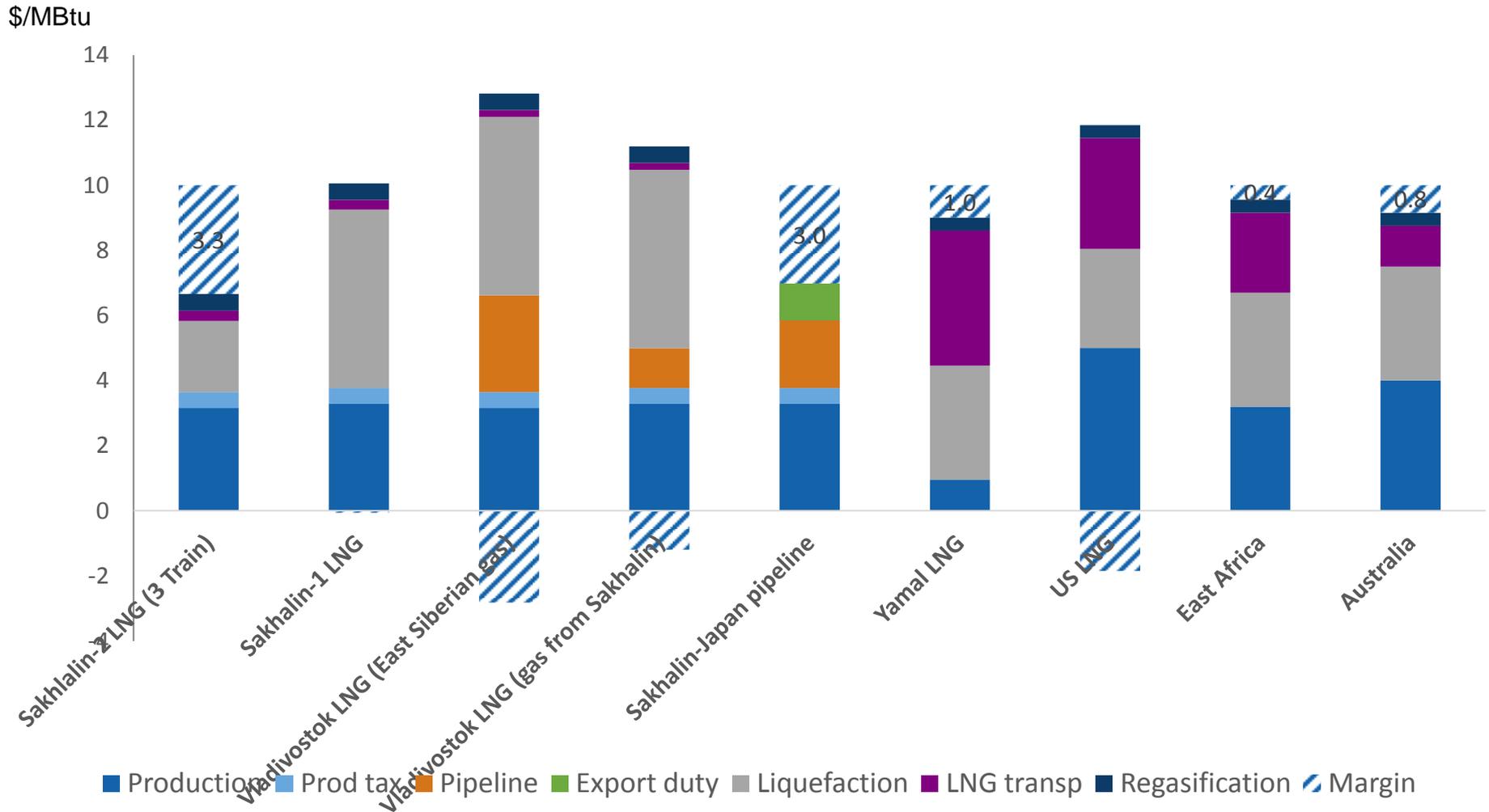
Figure 1. Proposed Subsea Pipeline Route*



* Only the Ishikari-Tomakomai section has onshore PL.

Estimated volume of 8bcm pa

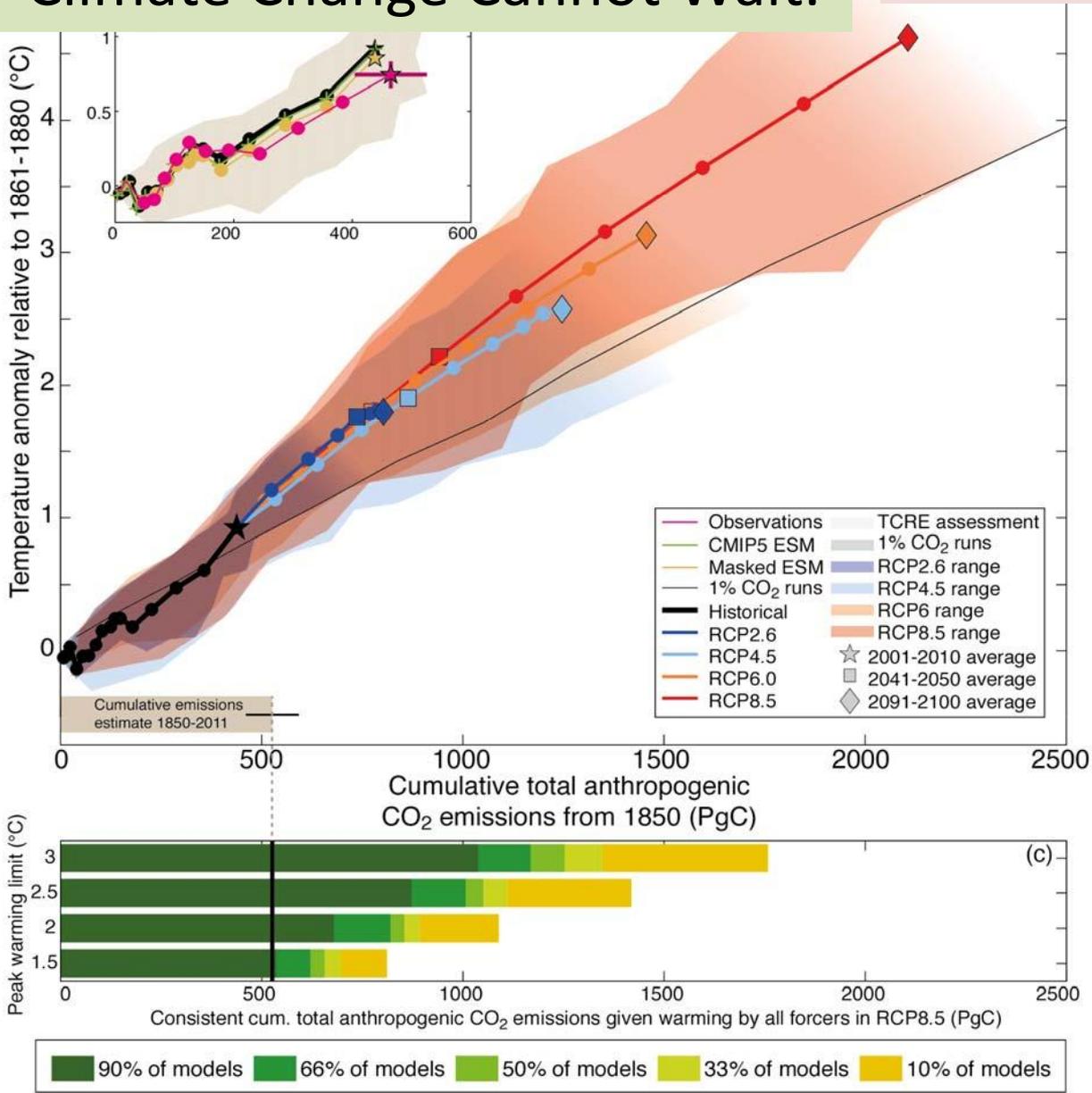
Russian LNG and especially pipeline gas is more competitive at 10\$/Mbtu, some projects – even at 8\$/Mbtu



Source: ERI RAS

タチアナ・ミトロバ ロシア科学アカデミーエネルギー研究所

Climate Change Cannot Wait.



Carbon Budget

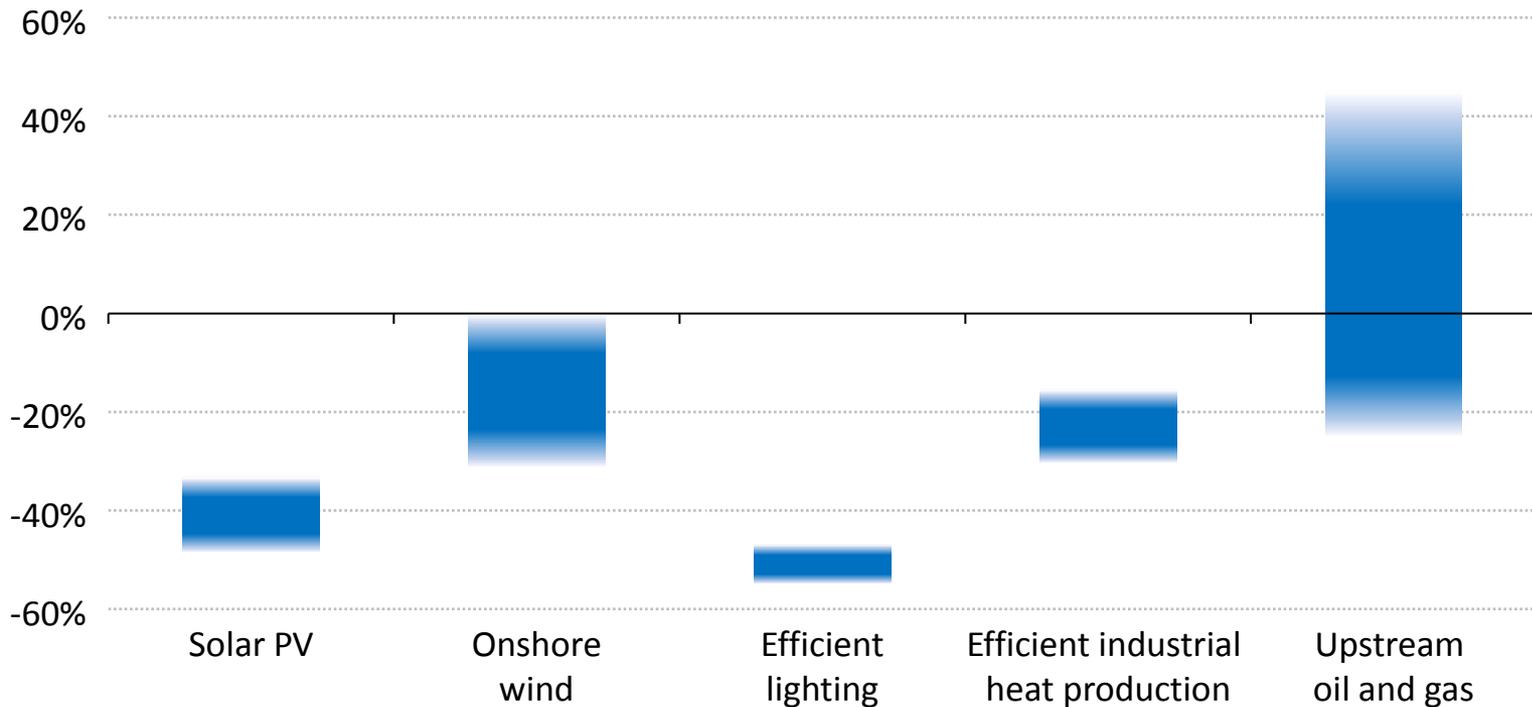
515Gt had been emitted by 2011.
 2C scenario needs to stop at 790Gt.(66%).
 790-515=275Gt budget left.

Annual 2012 =9.7Gt

275/9.7=Only 28 years to go!

Policies spur innovation and tip the balance towards low-carbon

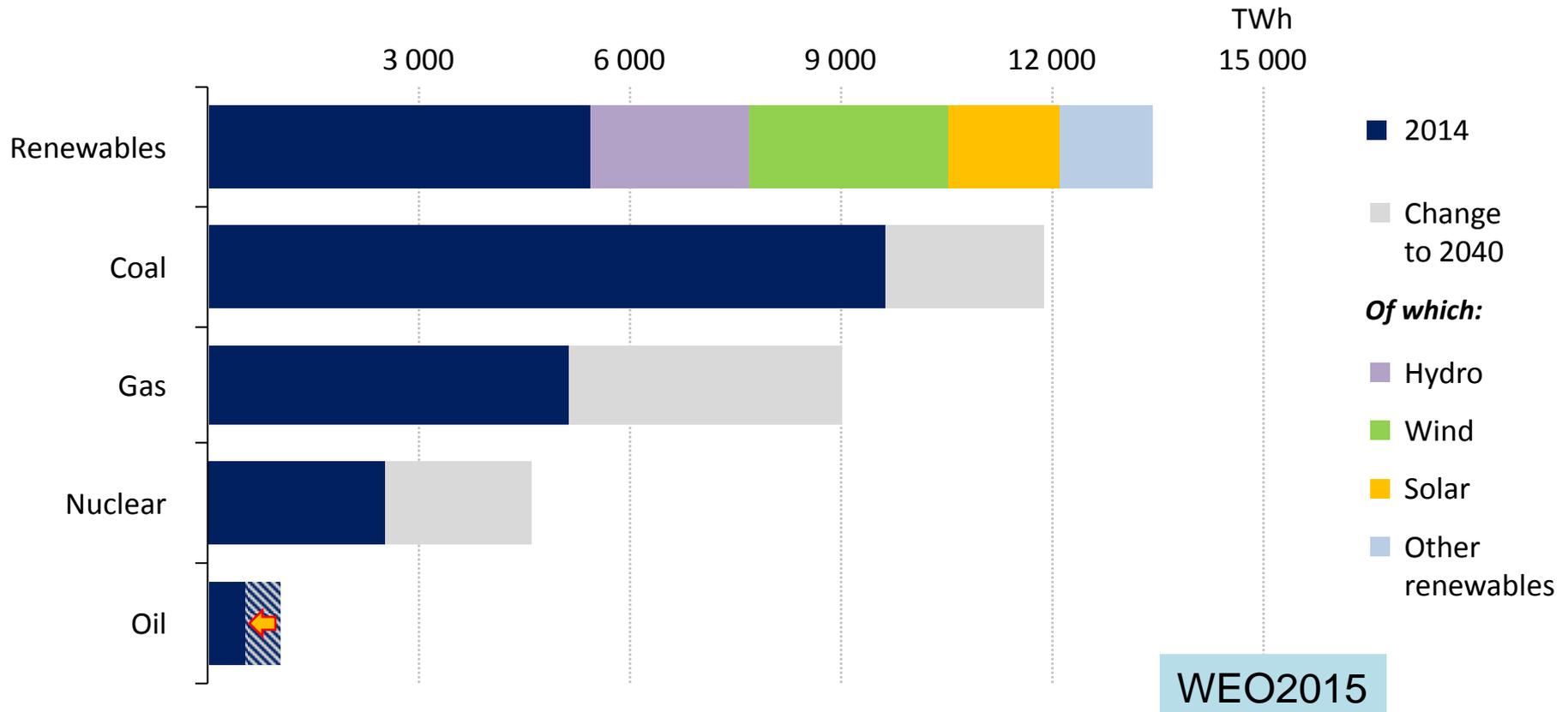
Costs in 2040 for different energy sources/technologies, relative to 2014



Innovation reduces the costs of low-carbon technologies & energy efficiency, but – for oil & gas – the gains are offset by the move to more complex fields

Power is leading the transformation of the energy system

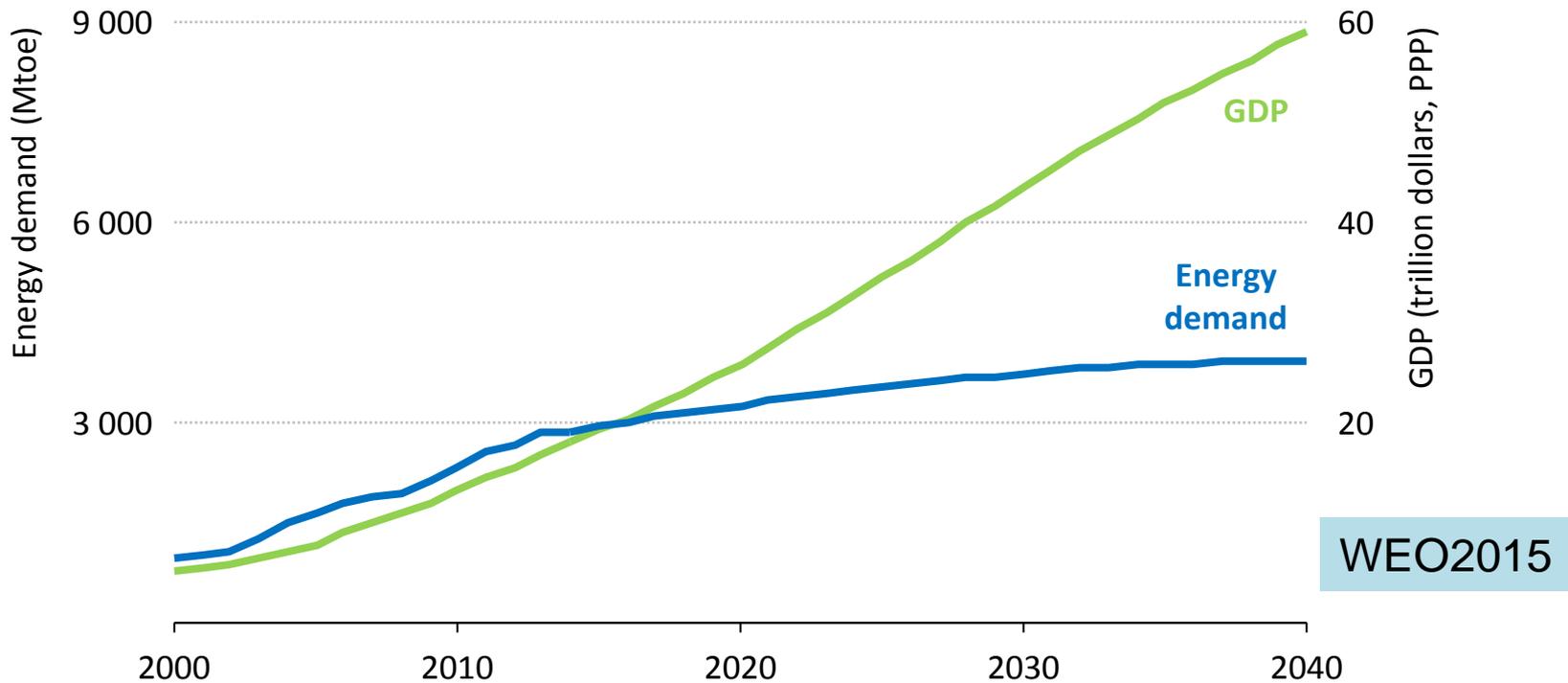
Global electricity generation by source



Driven by continued policy support, renewables account for half of additional global generation, overtaking coal around 2030 to become the largest power source

A new chapter in China's growth story

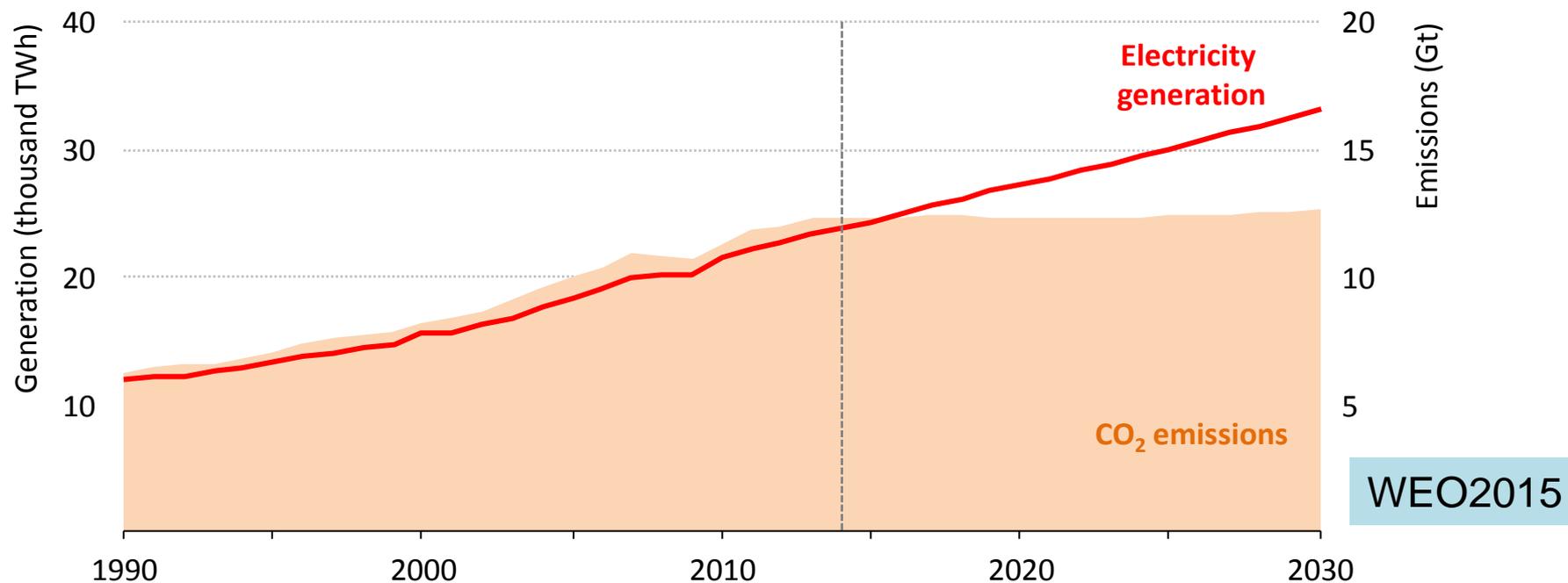
Energy demand in China



Along with energy efficiency, structural shifts in China's economy favouring expansion of services, mean less energy is required to generate economic growth

Climate pledges decouple power sector emissions from electricity demand

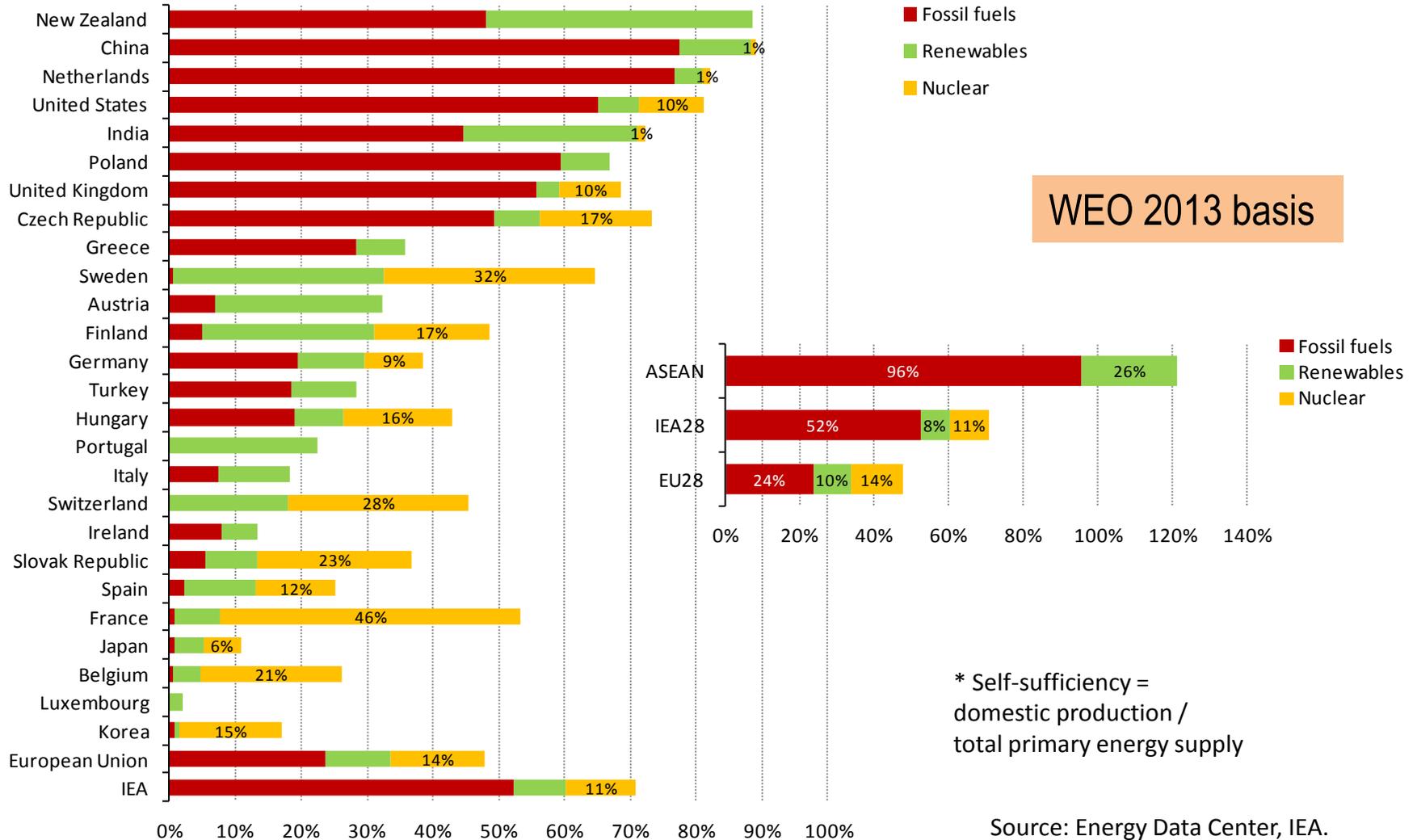
World electricity generation and related CO₂ emissions



The share of low-carbon power generation grows to almost 45% in 2030 so that power emissions remain flat, while electricity demand grows by more than 40%

Collective Energy Security and Sustainability by Diversity, Connectivity and Nuclear

Energy self-sufficiency* by fuel in 2011

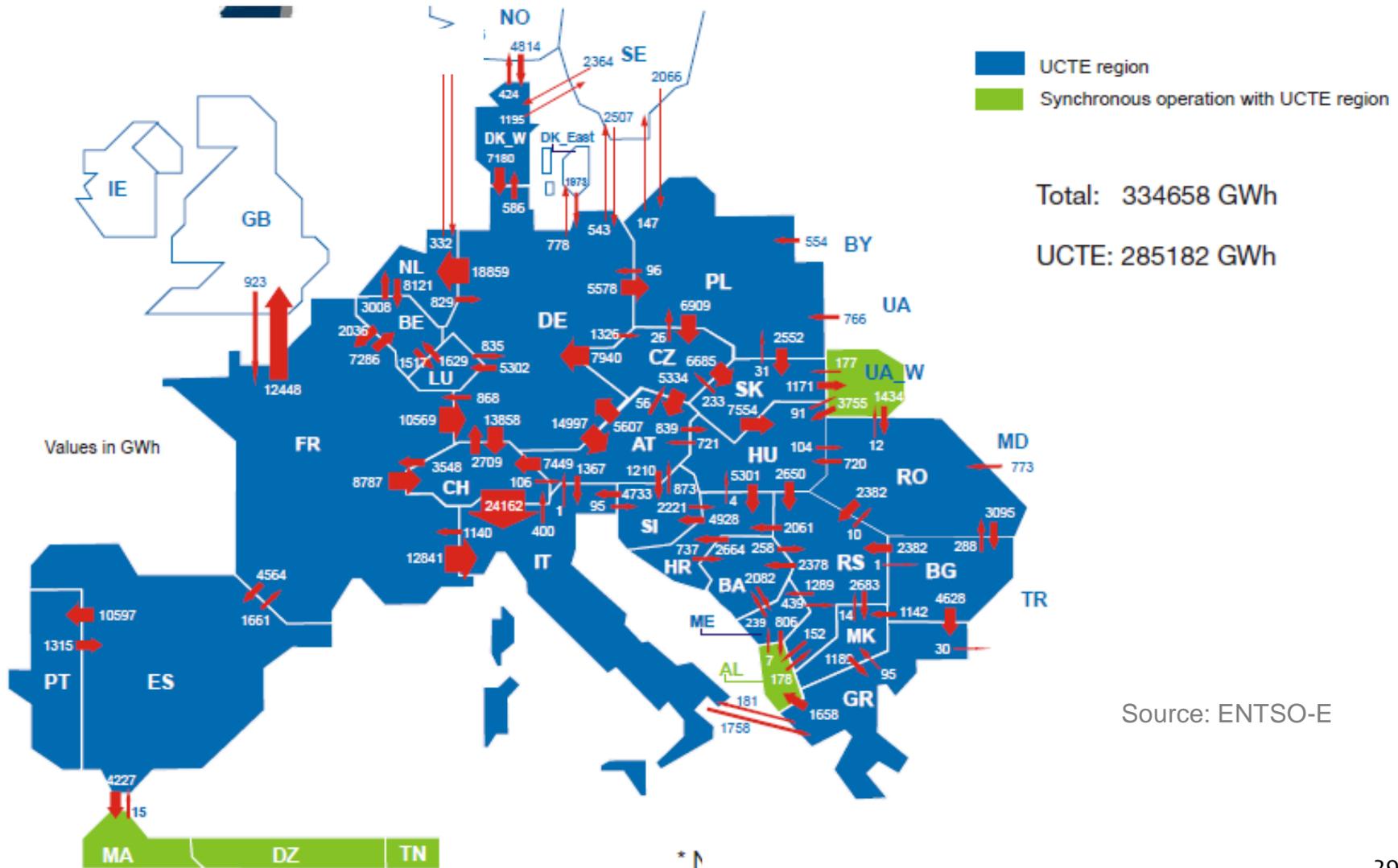


Source: Energy Data Center, IEA.

Note: Does not include fuels not in the fossil fuels, renewables and nuclear categories.

Power Grid Connection in Europe: Collective Energy Security and Sustainability

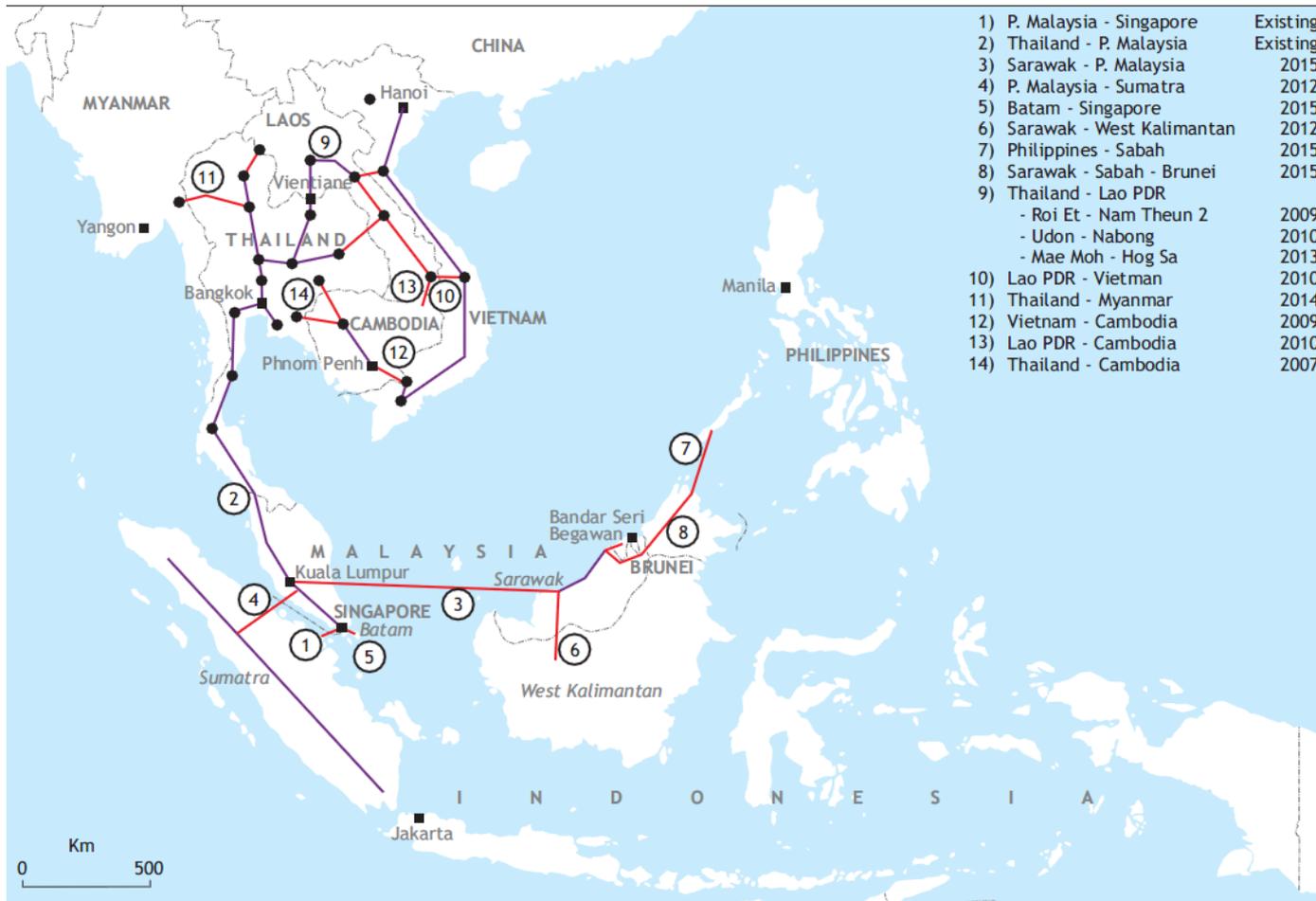
Physical energy flows between European countries, 2008 (GWh)



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



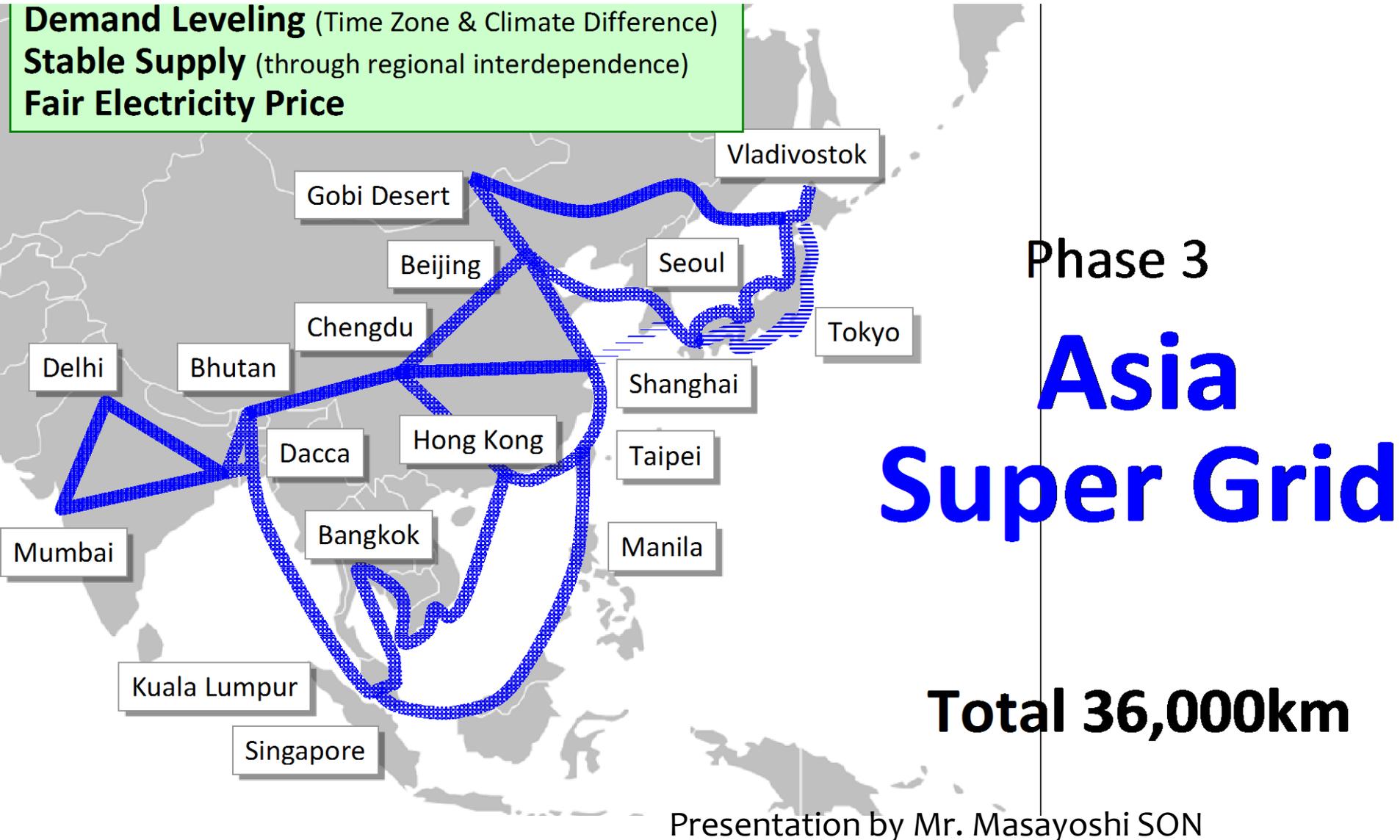
ASEAN power grid connection



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“Energy for Peace in Asia” New Vision?

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



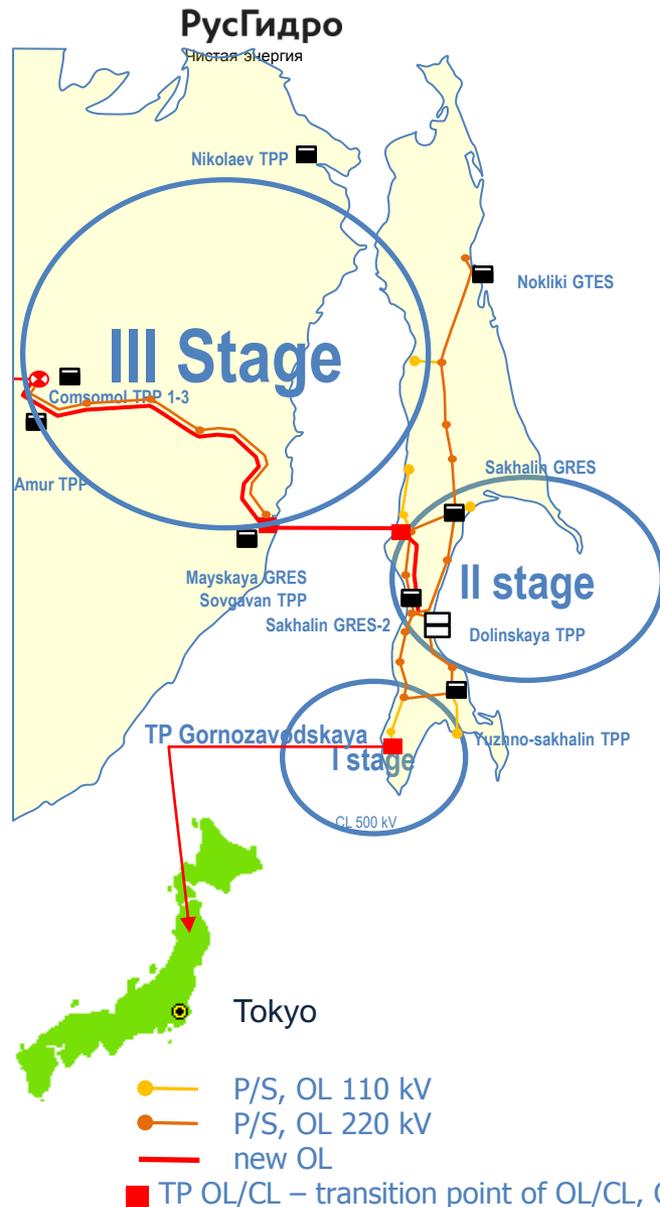
GOBITECH Initiative

Renewable Energy in Asia through Sun and Wind





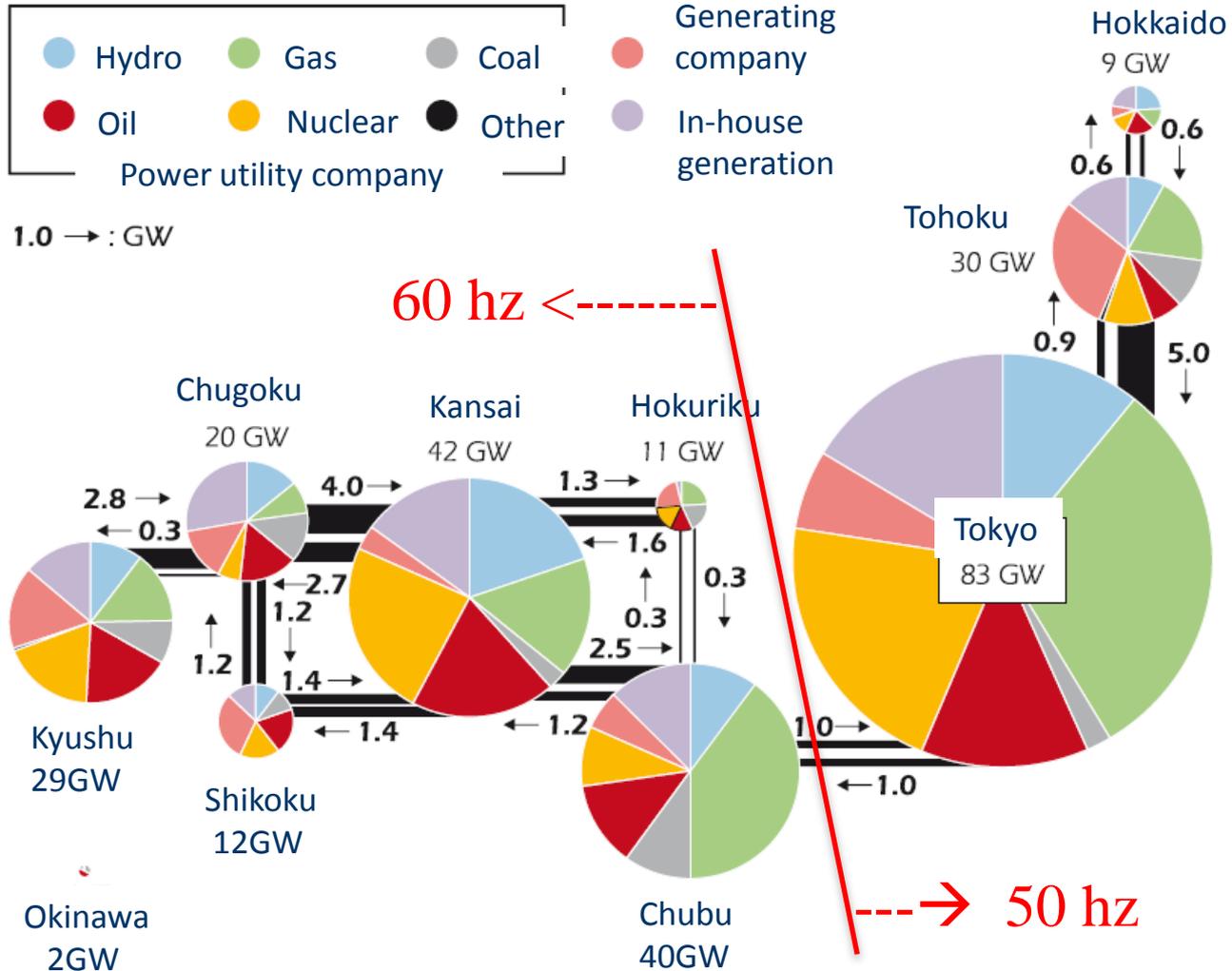
Power Bridge Project by Roshydro



Stage	Ключевые мероприятия в российской части	Export volume	Actions for the laying of underwater cable
Stage I (2020)	<ul style="list-style-type: none"> The construction of the 2-3 stages of the Sakhalin GRES-2 with the increase of installed capacity up to 360 MW The construction of grid infrastructure (additional OL, OL/CL converter station Gornozavodskaya) 	Up to 400 MW	Installation of underwater cable from Sakhalin island to Northern Hokkaido (Ishikari/Wakkanai) with a distance of 50-200 km*
Stage II (2022)	<ul style="list-style-type: none"> The construction of a large export-oriented generation "Dolinskaya TPP" (up to 660 MW) Further expansion of the network infrastructure 	Up to 1000 MW	Installation of underwater cable from Hokkaido (Ishikari/Wakkanai) to Aomori (Honshu) with a distance of 650-800 km*
Stage III (2025)	<ul style="list-style-type: none"> The connection of the Sakhalin energy system with the United Energy System of the East by underwater DC cable 	2-4 GW	Installation of a submarine from Aomori (Honshu) cable to Kashiwazaki (Honshu) with a distance of 400 km

Total cost for 3 stages in the Russian part of the Project is estimated at USD 5.7 billion. excluding costs for the construction of additional generation in the UES of the East to increase exports volumes

Lack of Grid connectivity 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

Impact of 450 ppm Scenario on Oil Market

WEO 2013

Figure 2.5 ▶ World primary energy demand by fuel in the New Policies Scenario

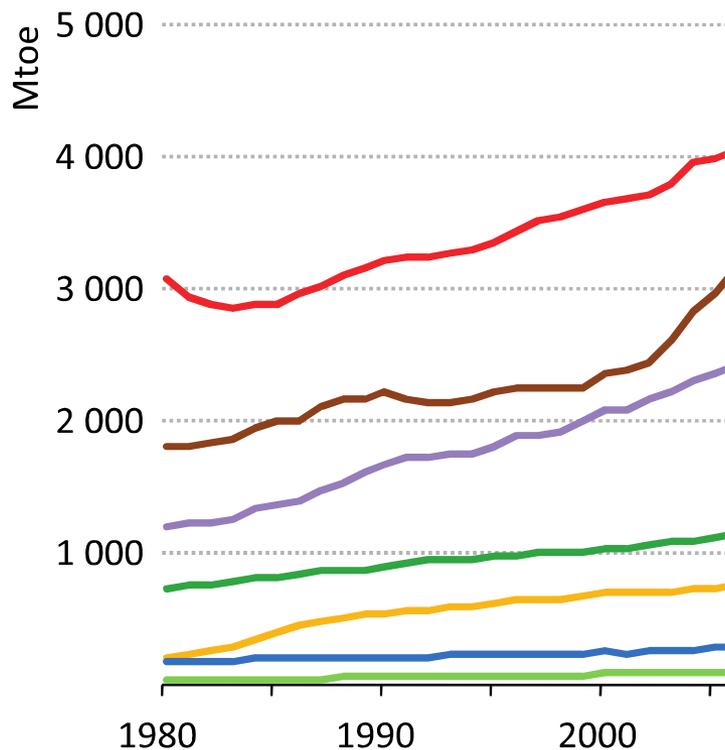
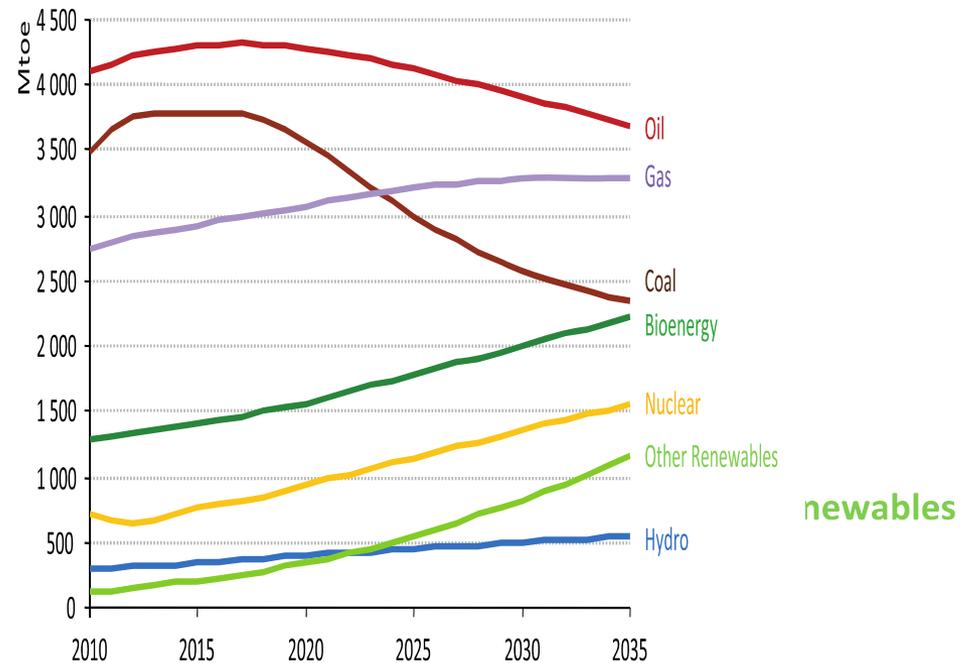


Figure 8.5 ▶ Primary energy demand in the 450 Scenario by fuel



The Stone Age didn't end because we ran out of stones.

