

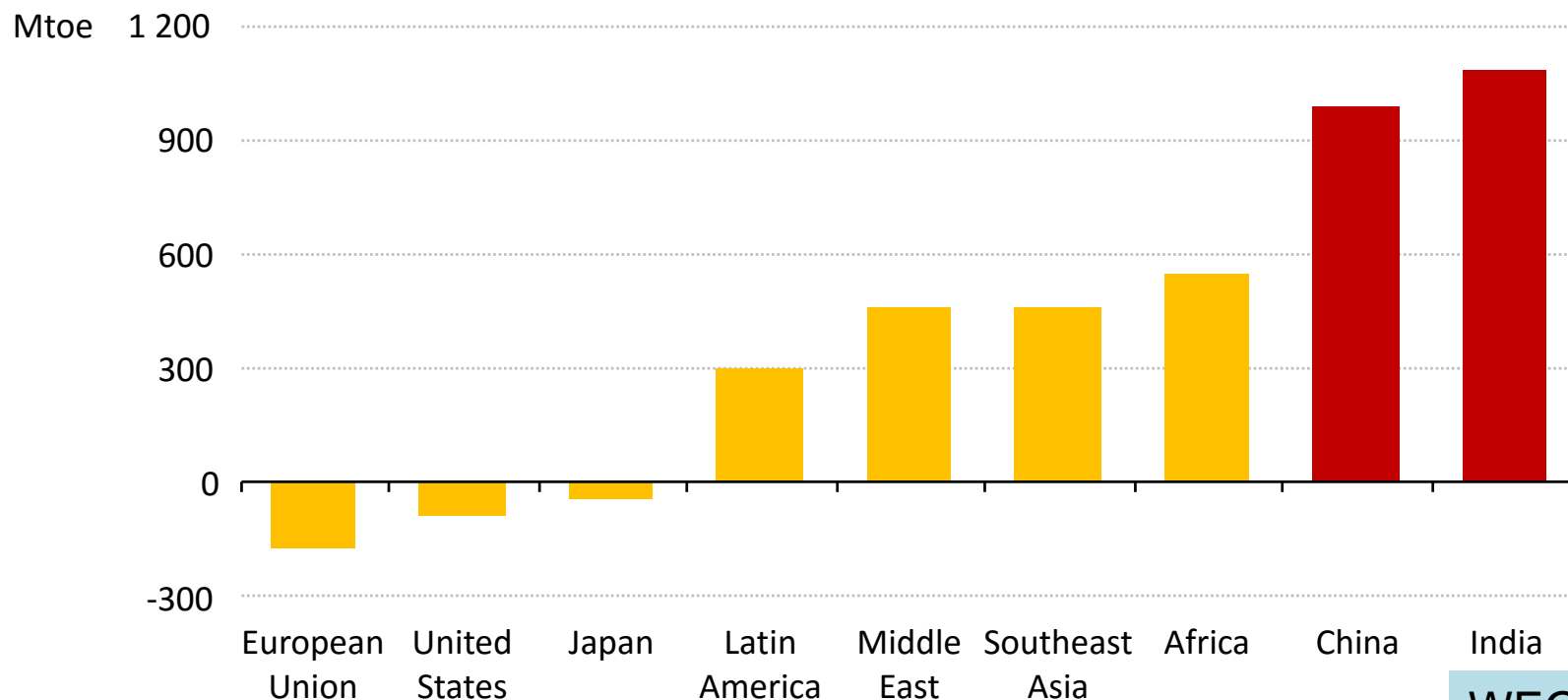
Stormy Energy Future and Security Strategy for Asia

2016-9-9 Renewable Energy Institute

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

Demand growth in Asia – the sequel

Change in energy demand in selected regions, 2014-2040



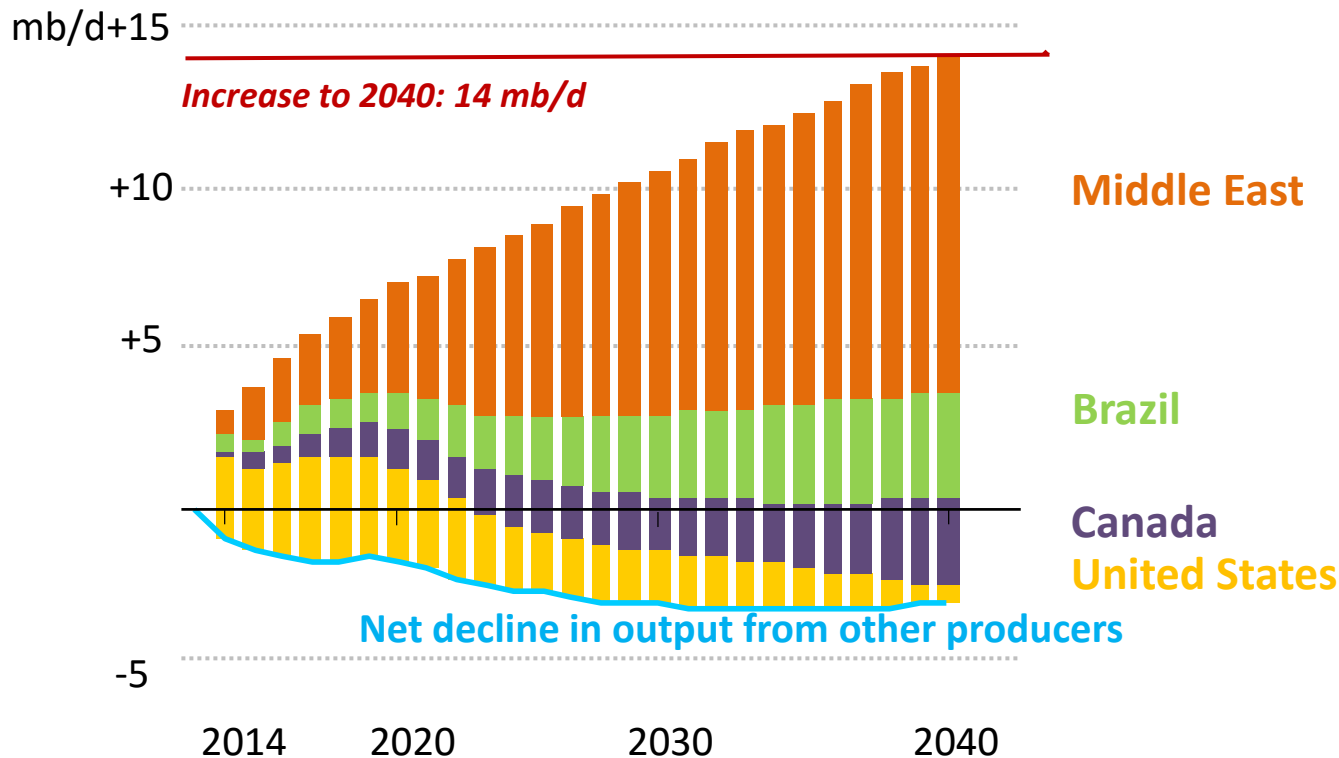
WEO2015

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

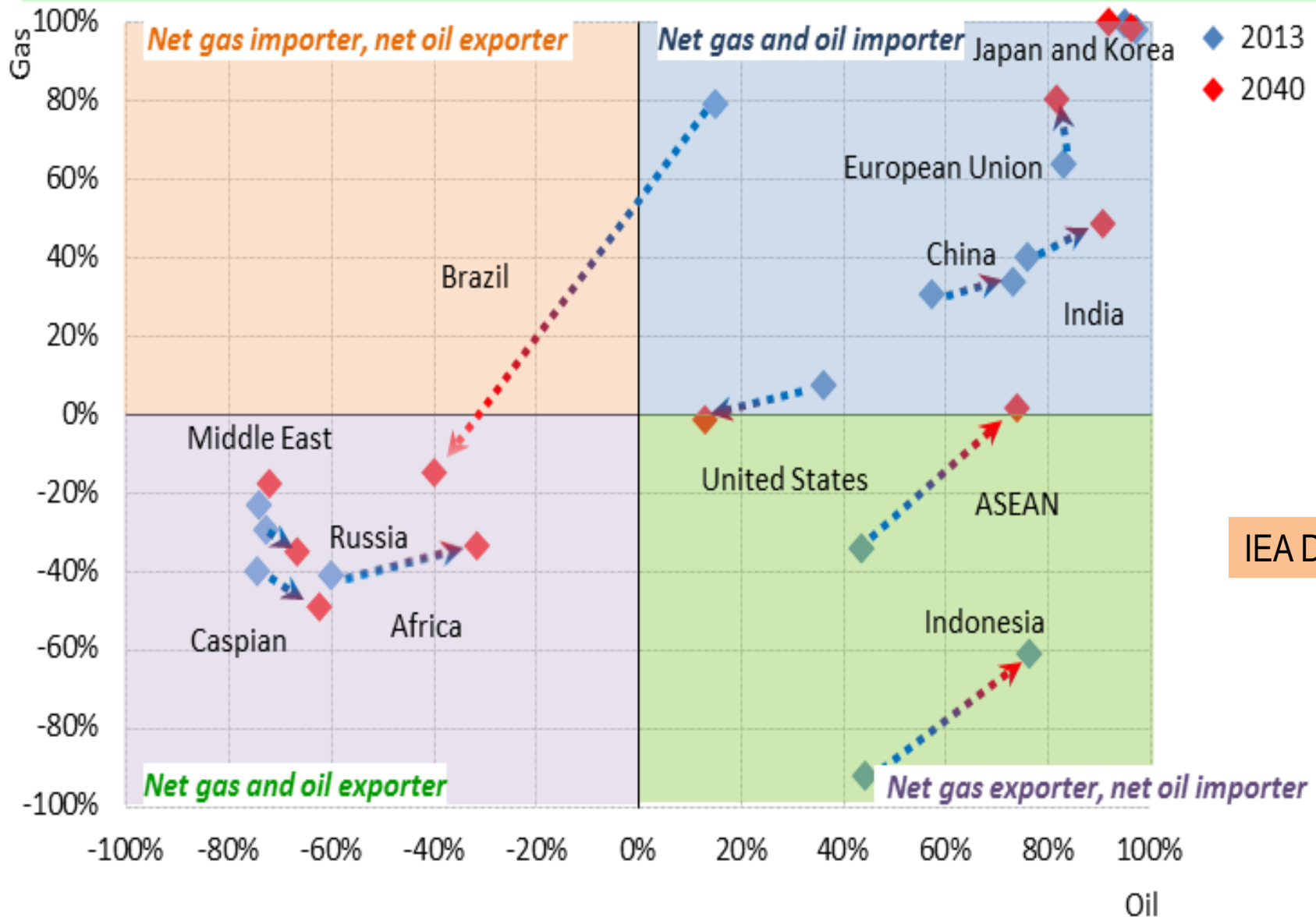
Oil production growth
in United States, Canada, Brazil & the Middle East

IEA data



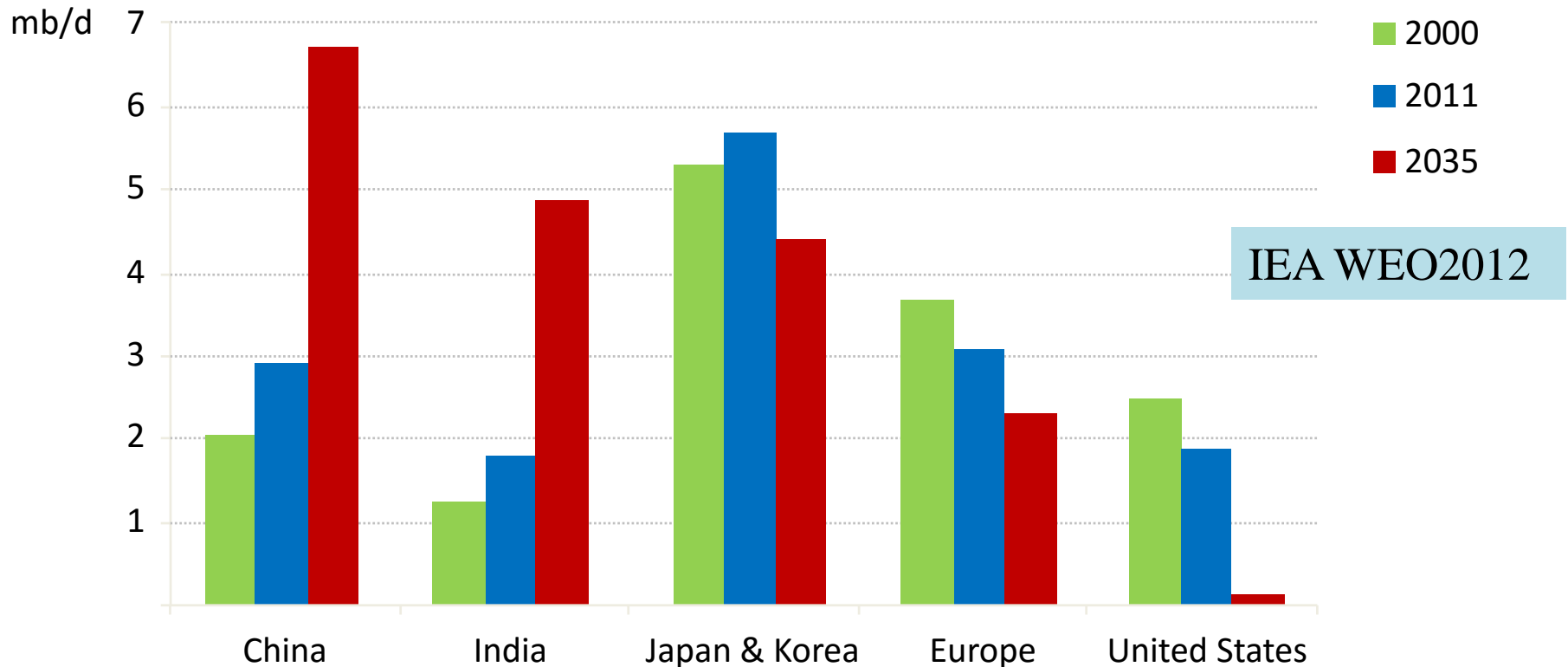
The short-term picture of a well-supplied market should not obscure future risks as demand rises to 104 mb/d & reliance grows on Iraq & the rest of the Middle East that will become less stable with lower oil revenue.

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



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

Middle East oil export by destination



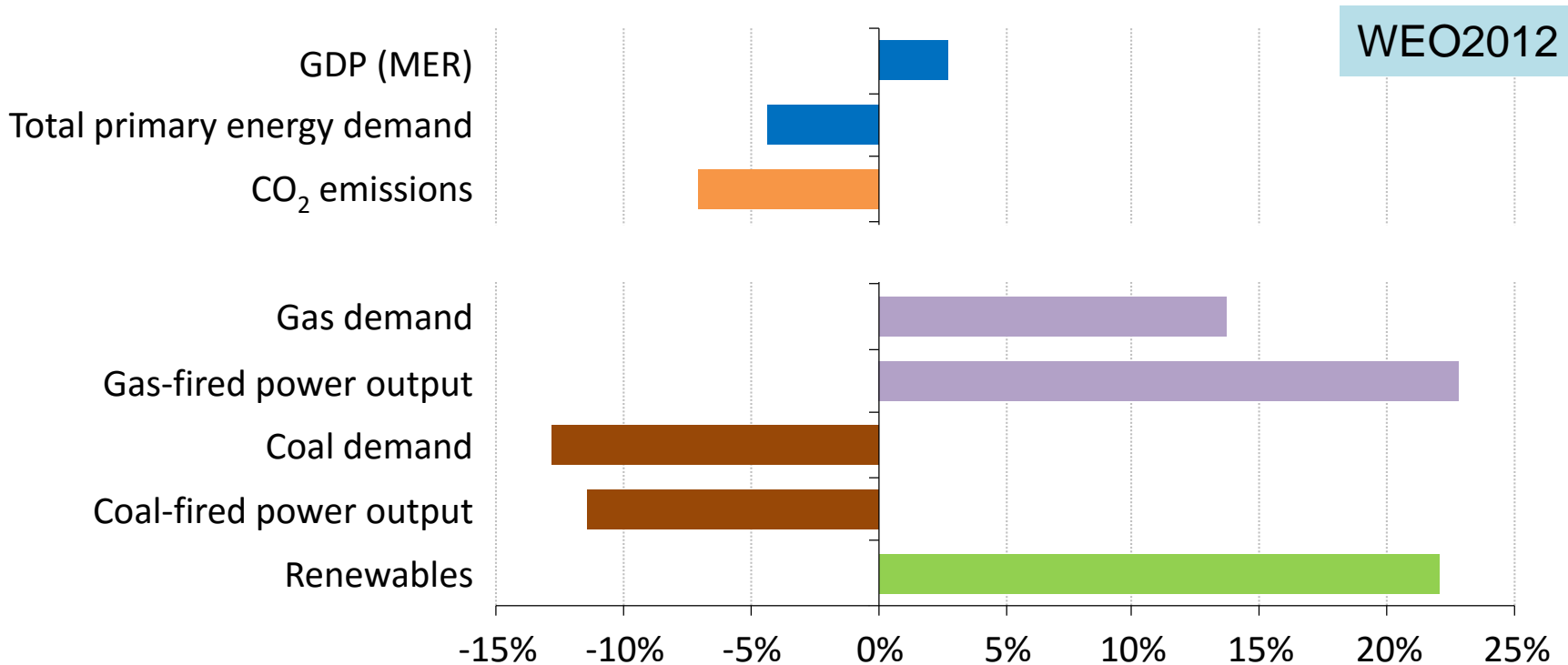
By 2035, almost 90% of Middle Eastern oil exports go to Asia; North America's emergence as a net exporter accelerates the eastward shift in trade

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

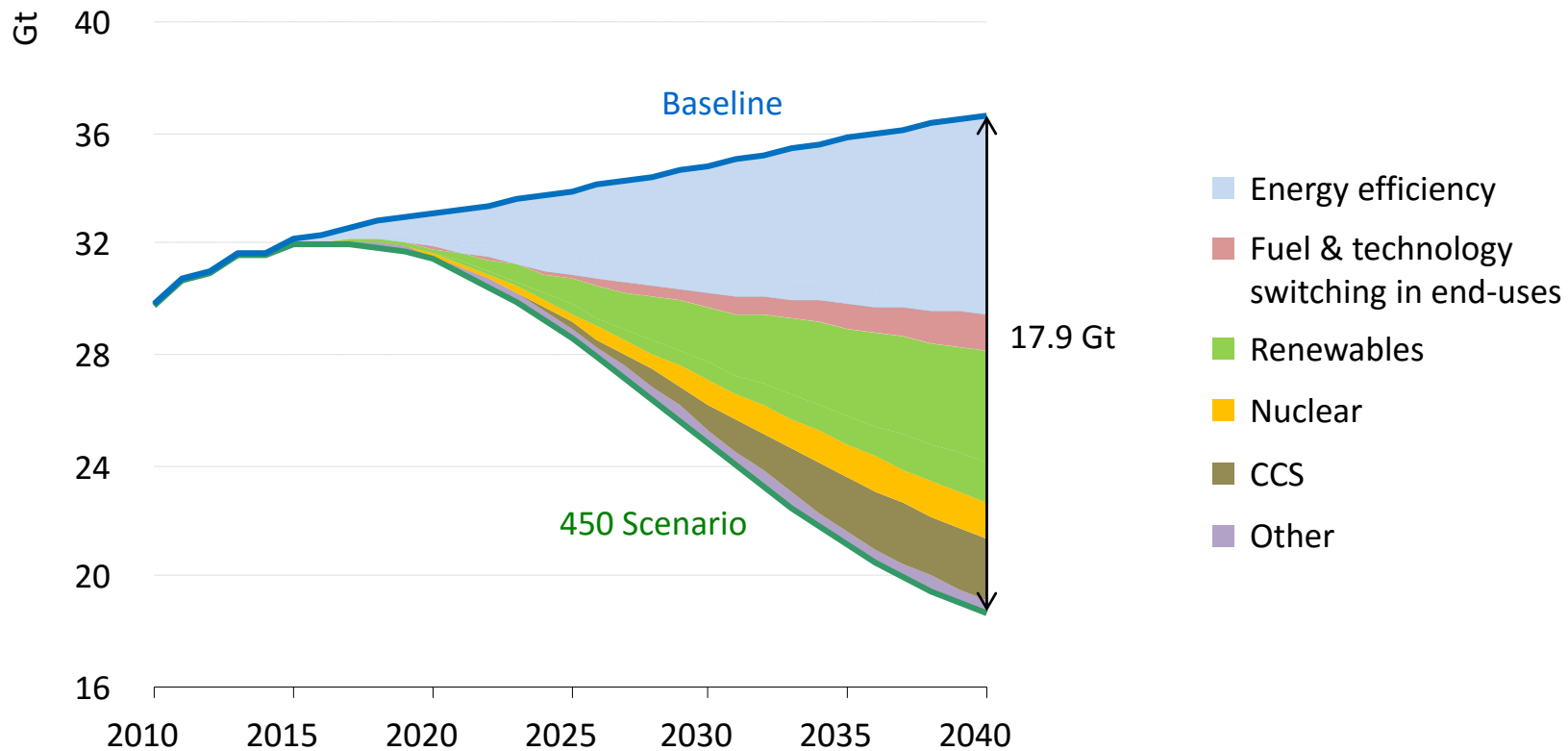


The Shale revolution in the US achieved Win-Win-Win. Economy, Environment and Energy Security.



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

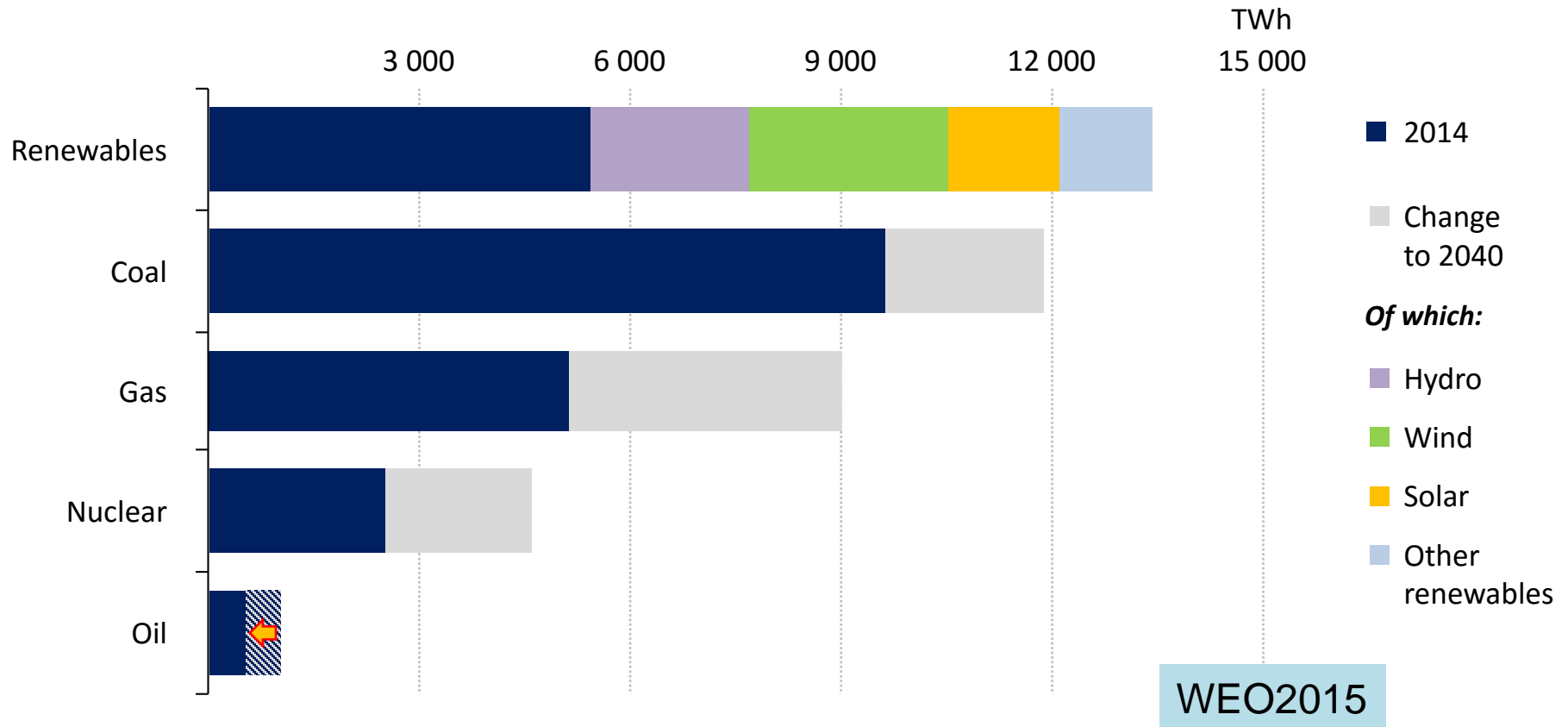
A 2°C pathway is still some further efforts away



A peak in emissions by around 2020 is possible using existing policies & technologies; technology innovation and RD&D will be key to achieving the longer-term goal.

Power is leading the transformation of the energy system

Global electricity generation by source

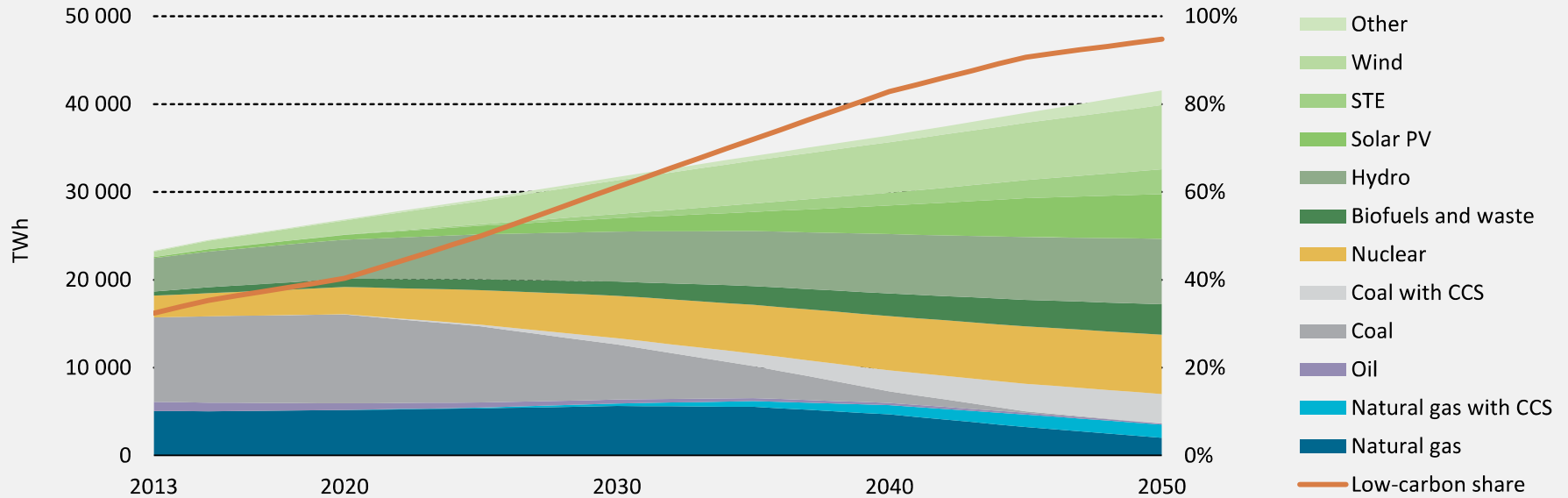


Driven by continued policy support, renewables account for half of additional global generation, overtaking coal around 2030 to become the largest power source

Figure 1.7

Global electricity generation mix in the 2DS, 2013-50

ETP2016



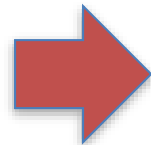
Notes: STE = solar thermal electricity. Low-carbon share refers to the combined share of the generation of electricity from renewables, nuclear and CCS. Source: IEA analysis and IEA (2015f), *World Energy Statistics and Balances*, www.iea.org/statistics.

Key point

Today fossil fuels dominate electricity generation with 68% of the generation mix; by 2050 in the 2DS, renewables reach a similar share of 67%.

• 2013 Generation share

- Fossil fuels: 68%
- Renewables: 22%
- Nuclear: 11%

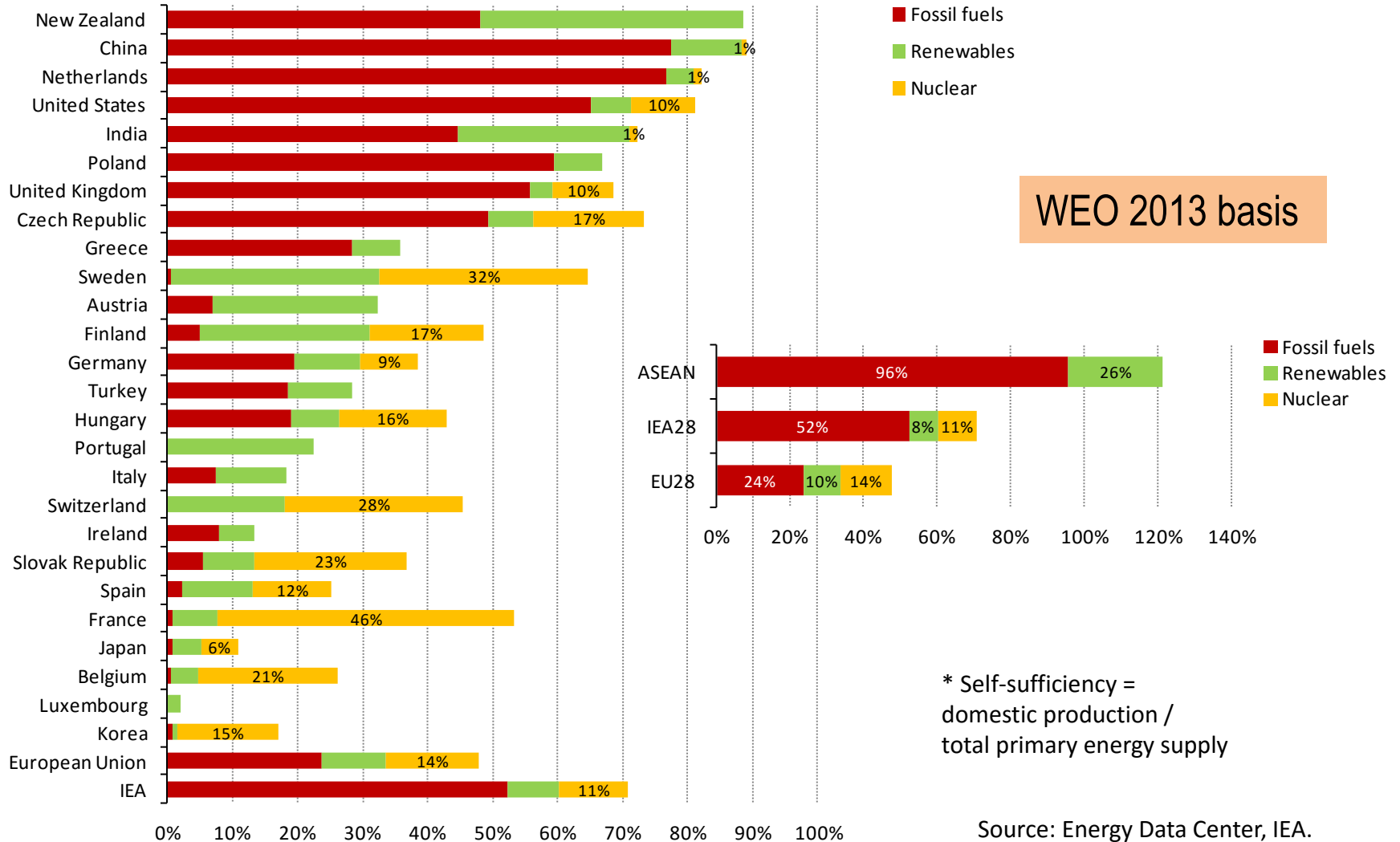


■ 2DS 2050

- Renewables: 67%
- Fossil fuels: 17% (CCS 12%)
- Nuclear: 16%

Collective Energy Security and Sustainability by Diversity, Connectivity and Nuclear

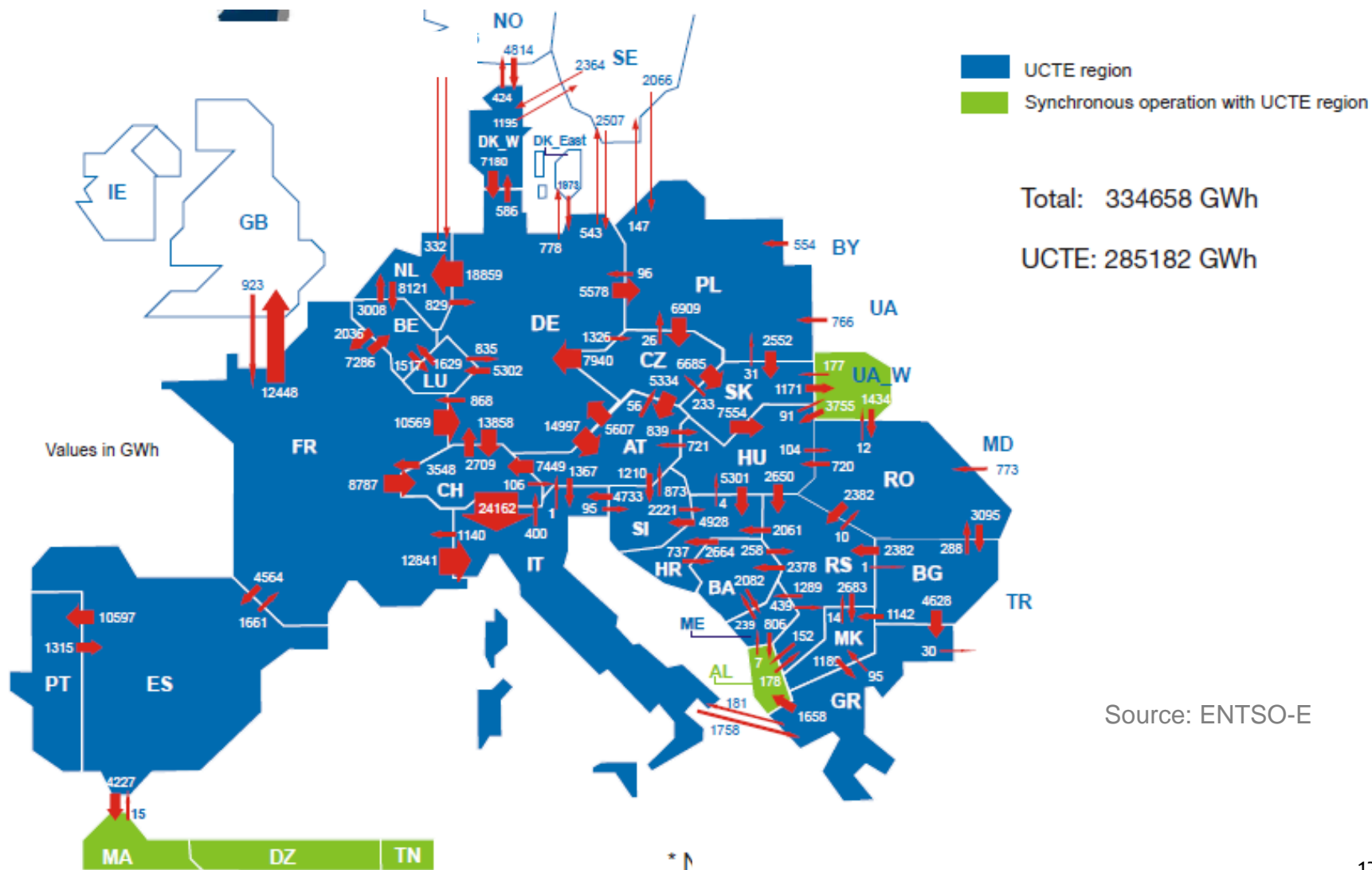
Energy self-sufficiency* by fuel in 2011



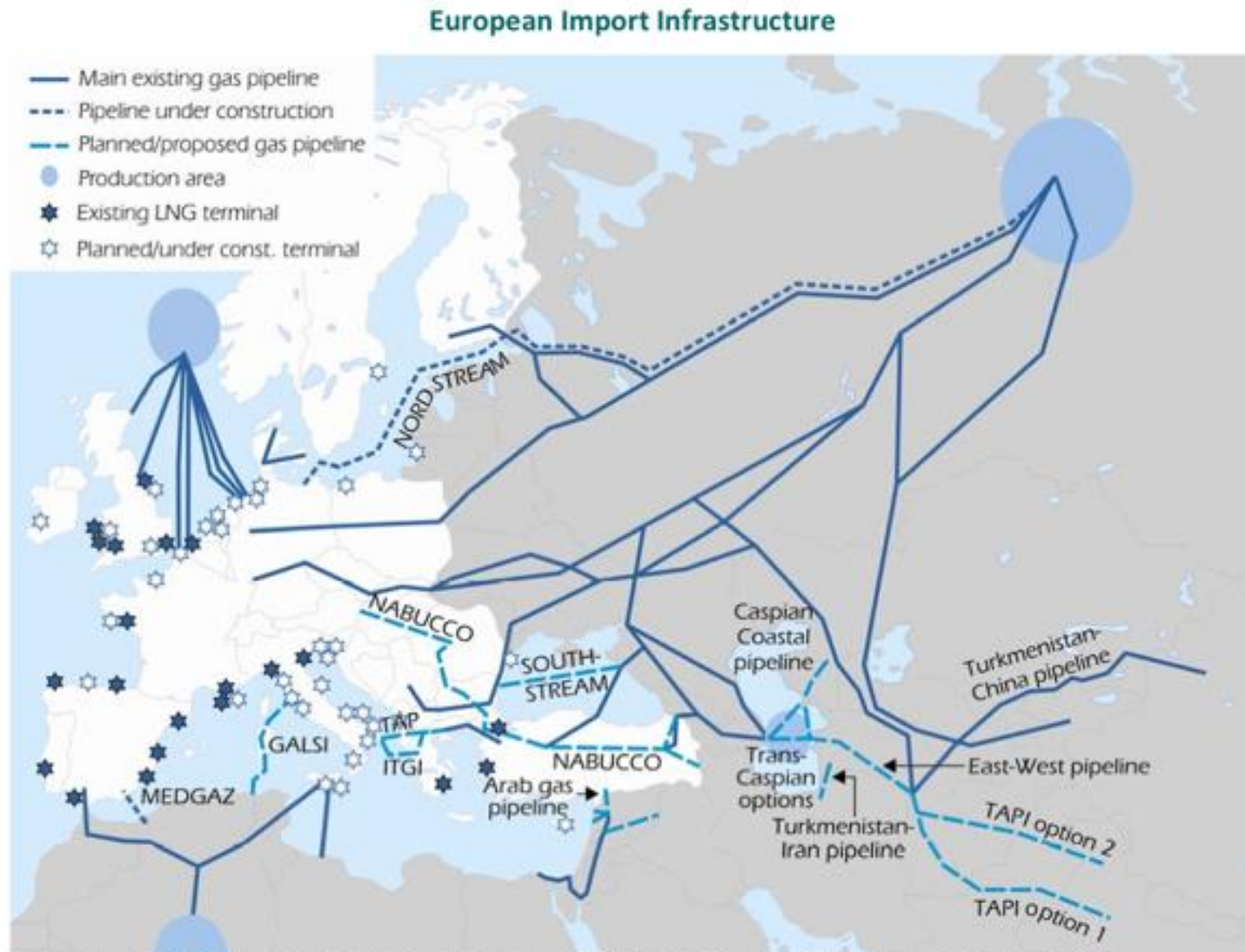
Note: Does not include fuels not in the fossil fuels, renewables and nuclear categories.

Power Grid Connection in Europe: Collective Energy Security and Sustainability

Physical energy flows between European countries, 2008 (GWh)



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



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

Mid-Term Oil & Gas Market 2010, IEA

Possible Pipeline Project from Russia to Japan

Figure 1. Proposed Subsea Pipeline Route*

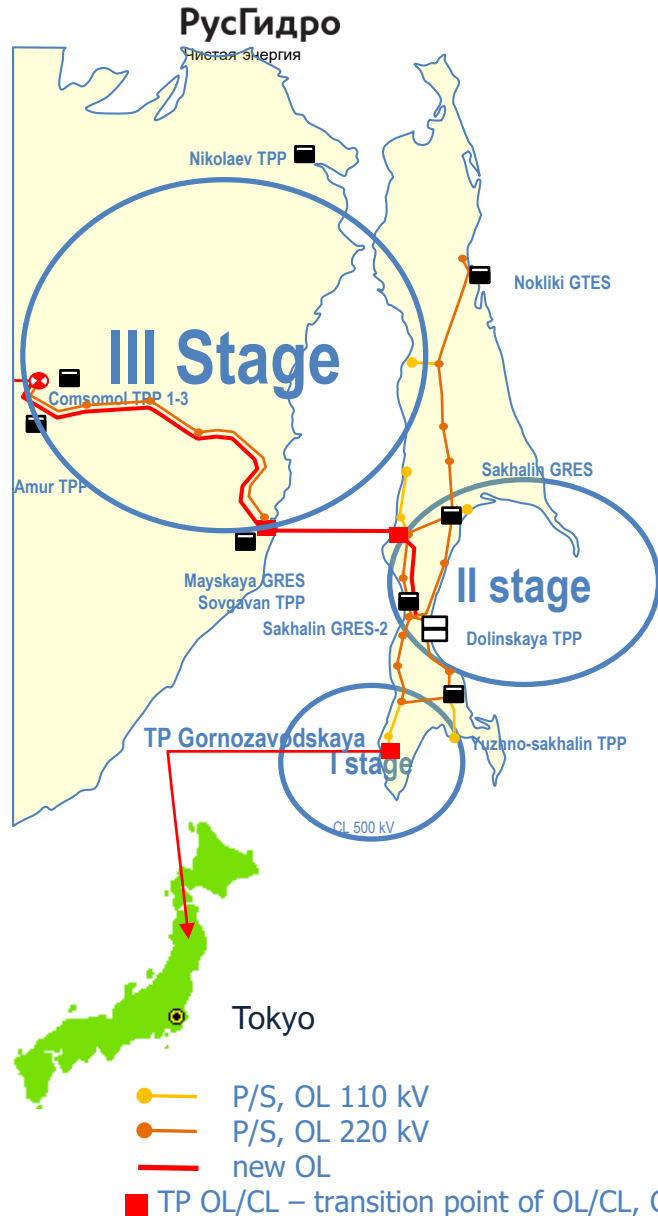


* Only the Ishikari-Tomakomai section has onshore PL.

Estimated volume of 8bcm pa



Power Bridge Project by Roshydro



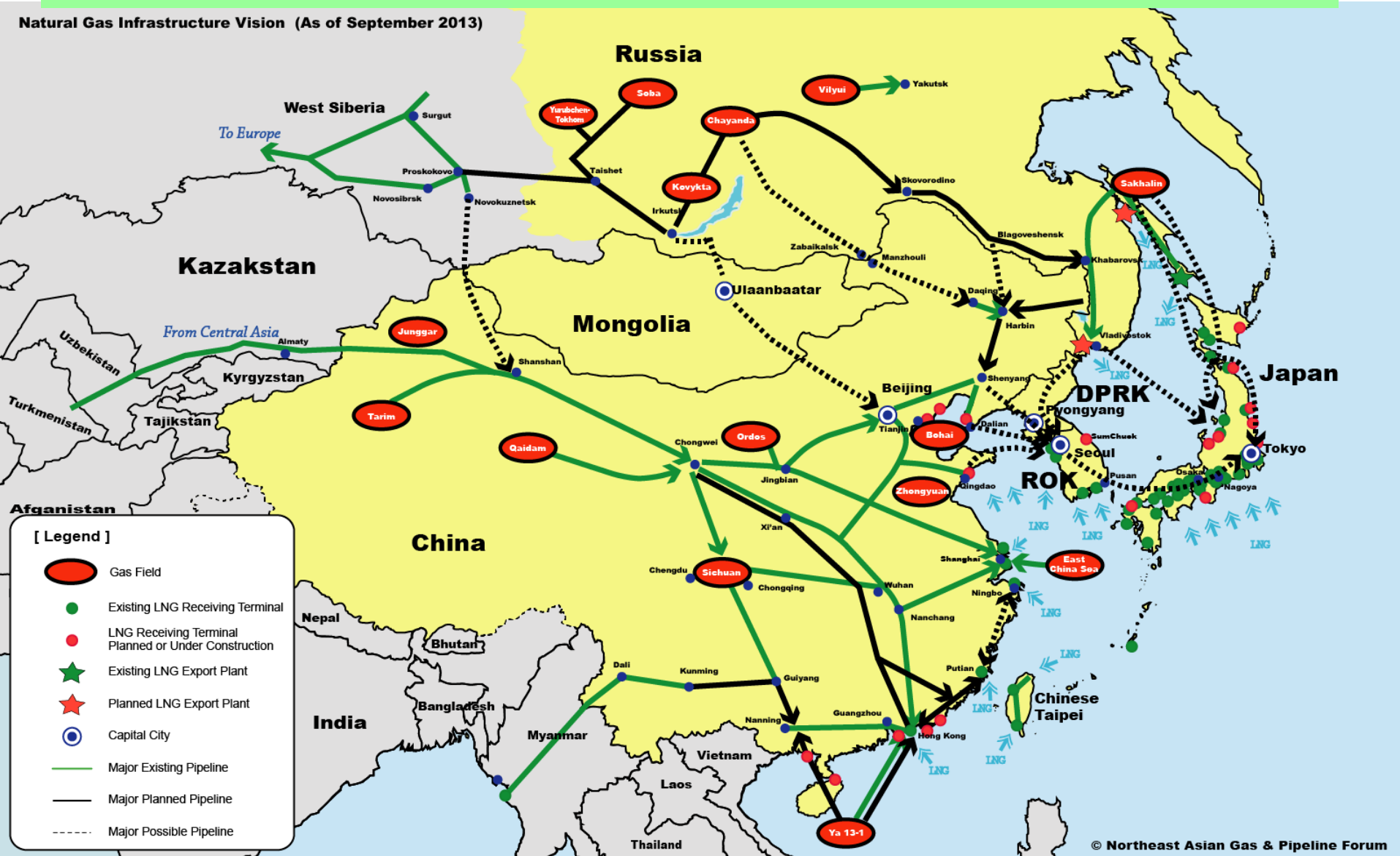
| Stage | Ключевые мероприятия в российской части | Export volume | Actions for the laying of underwater cable |
|------------------|--|---------------|--|
| Stage I (2020) | <ul style="list-style-type: none"> The construction of the 2-3 stages of the Sakhalin GRES-2 with the increase of installed capacity 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

* - depends on the choice of connection point in Japan

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

Natural Gas Infrastructure Vision (As of September 2013)



© Northeast Asian Gas & Pipeline Forum

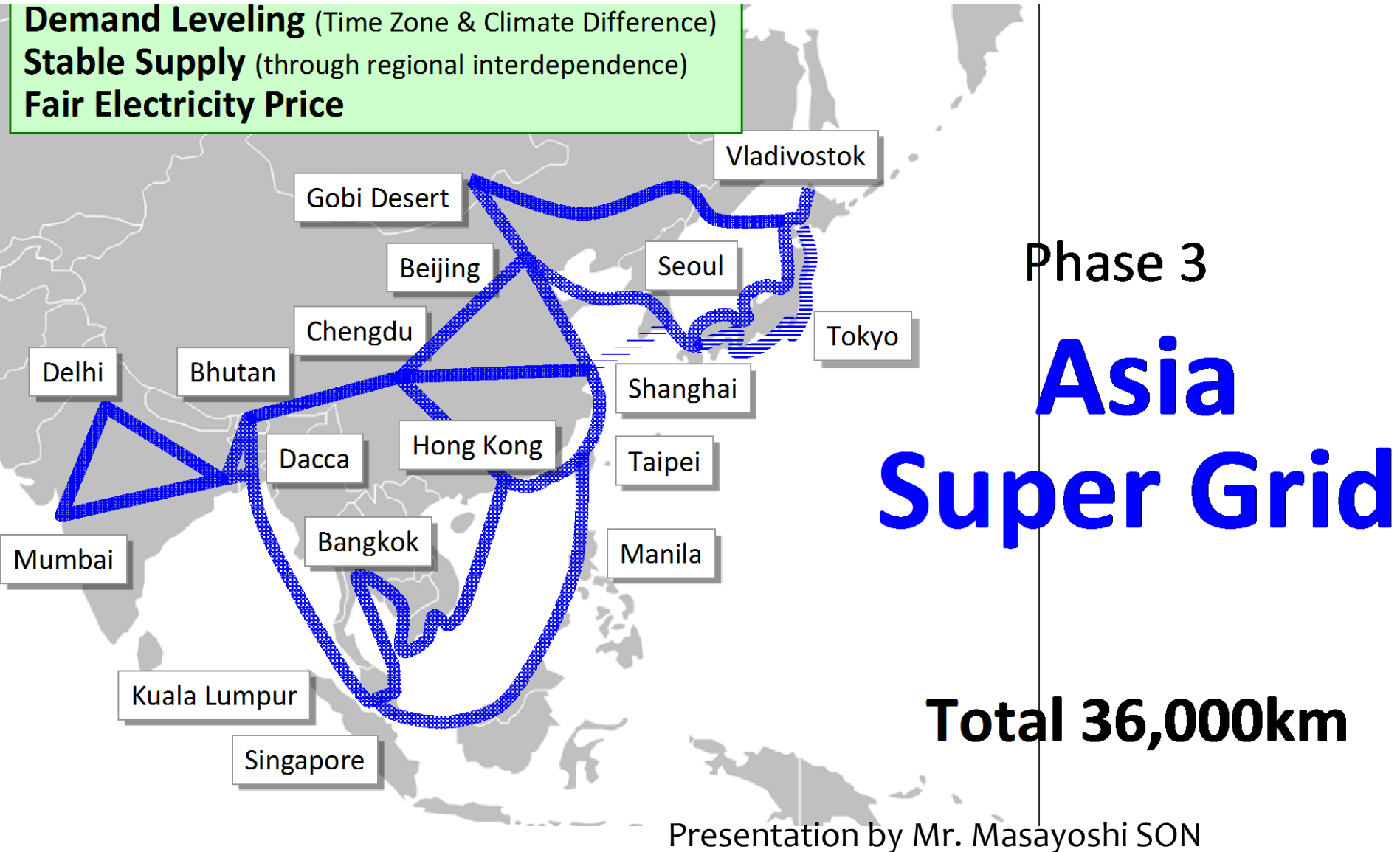
GOBITECH Initiative

Renewable Energy in Asia through Sun and Wind



“Energy for Peace in Asia” New Vision?

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



Total 36,000km

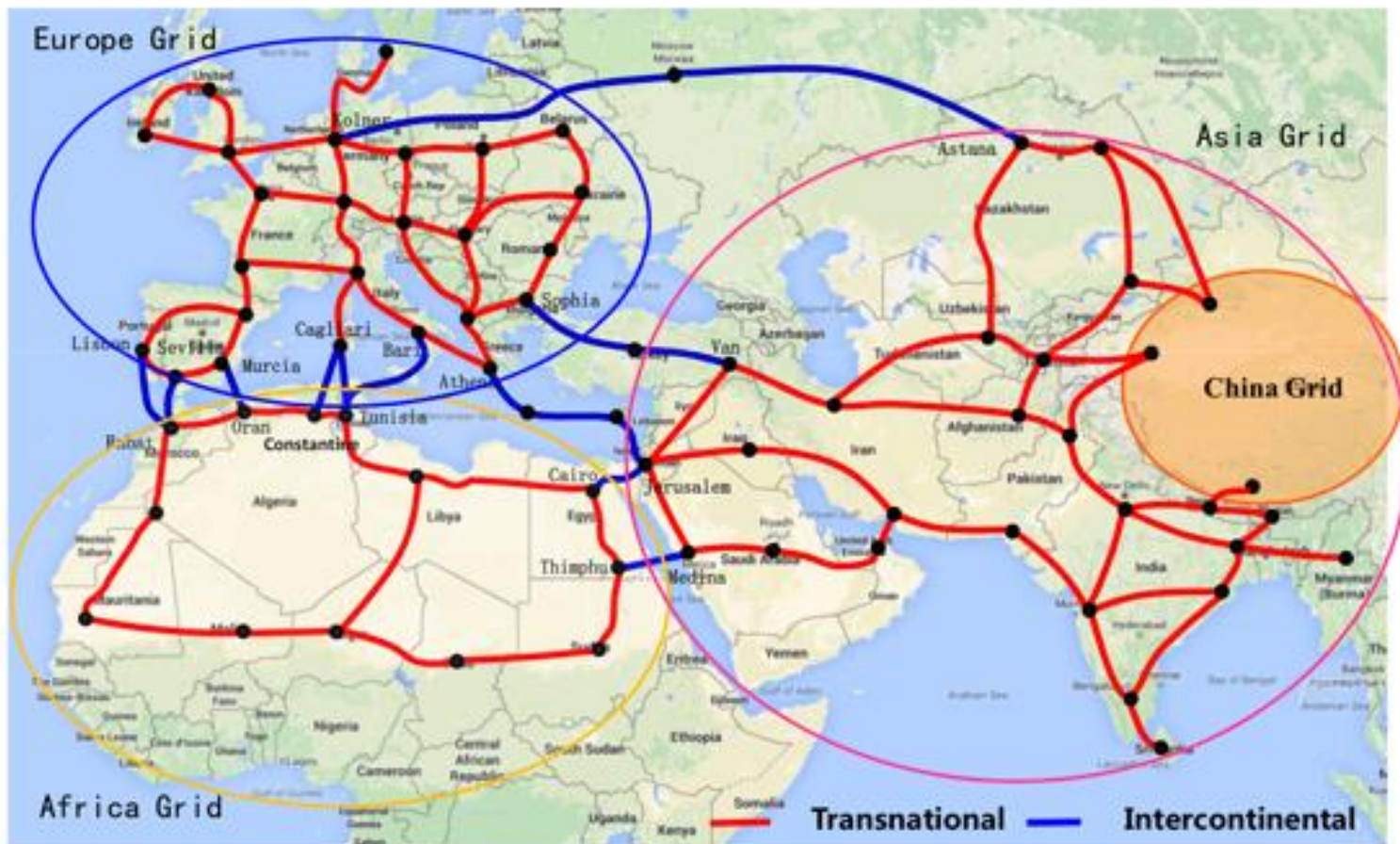
Presentation by Mr. Masayoshi SON

Global Energy Interconnection

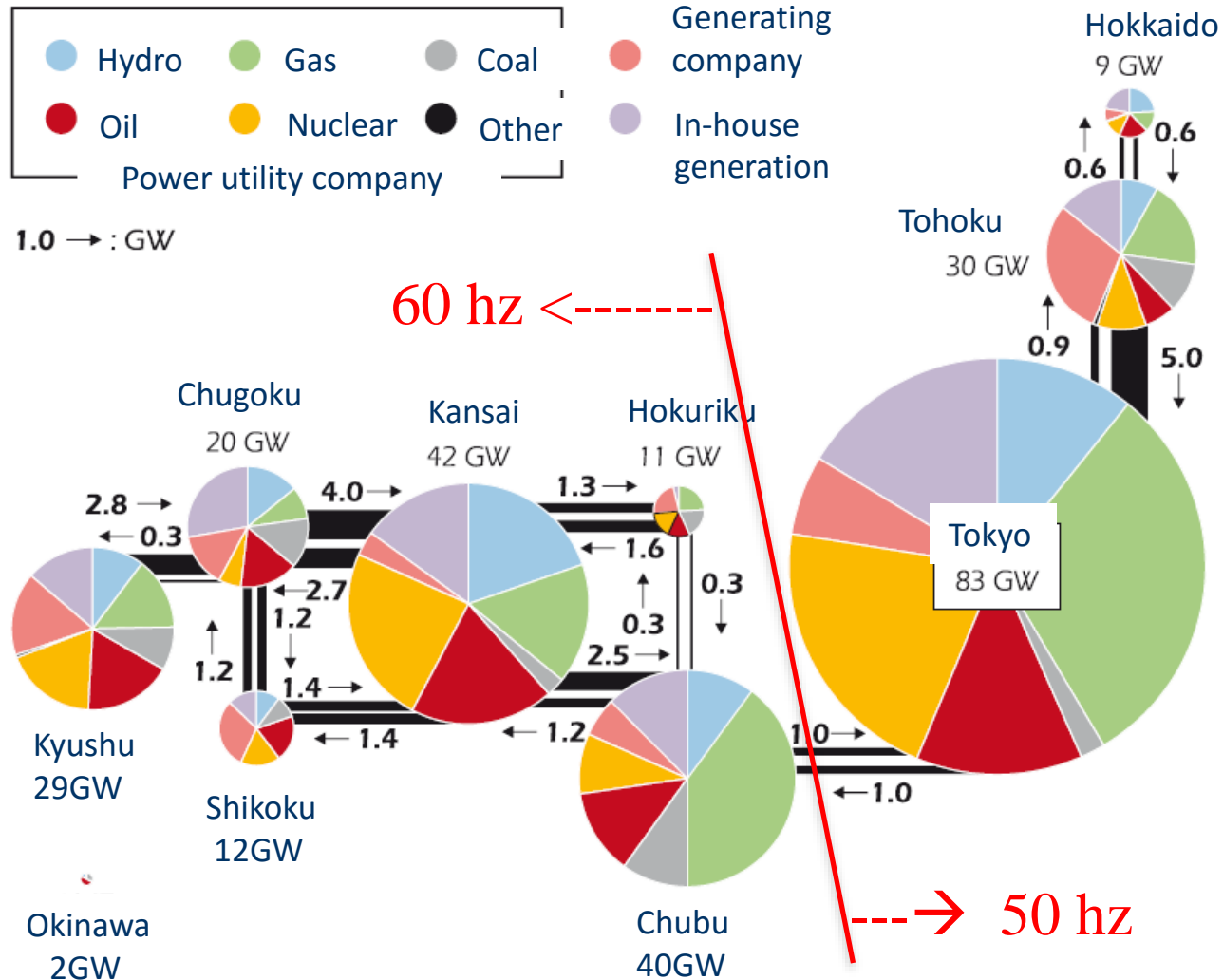
Transcontinental Grid Interconnection of Asia, Europe and Africa



国家电网公司
STATE GRID
CORPORATION OF CHINA



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

Asian Super Grid in SPIEF

