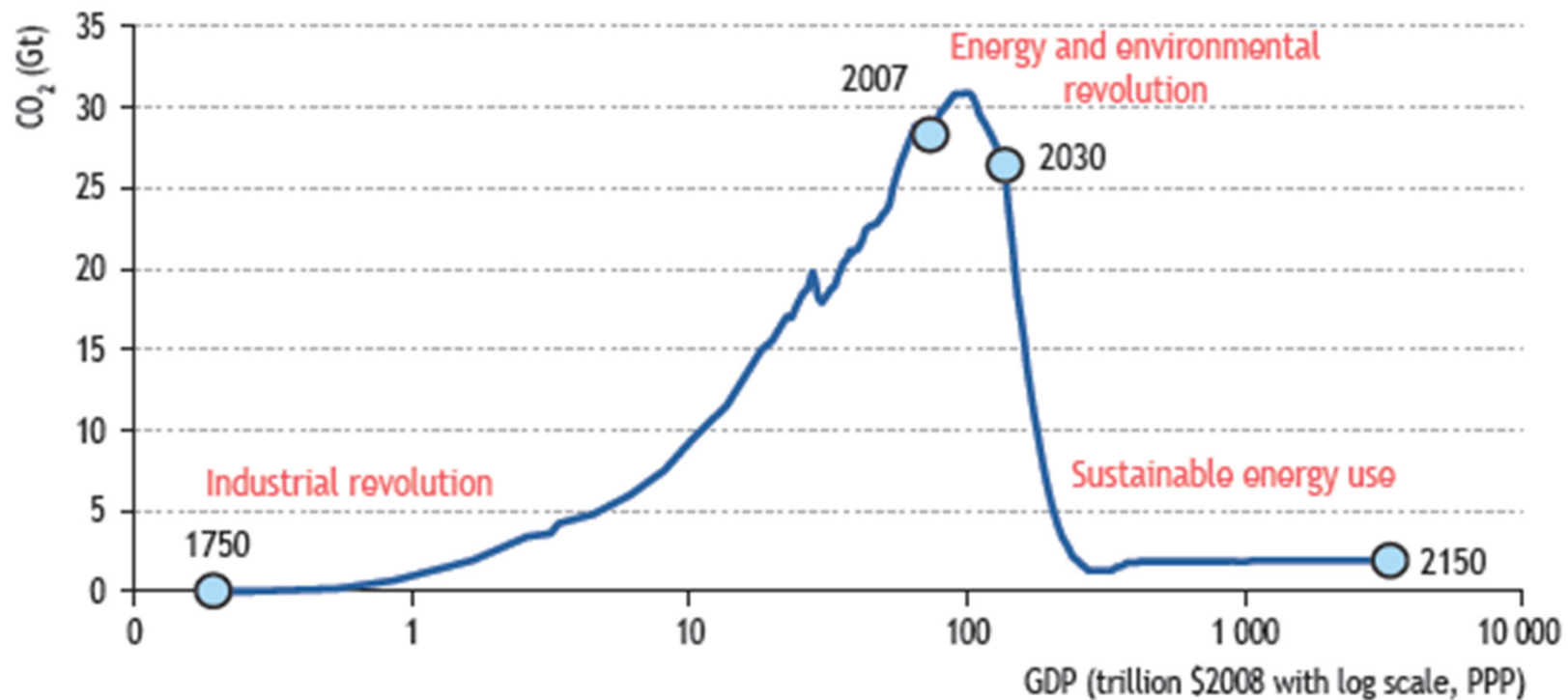


ภาพอนาคตพลังงานโลก

วีรินทร์ หวังจิรนิรันดร์

สถาบันวิจัยพลังงาน จุฬาลงกรณ์มหาวิทยาลัย

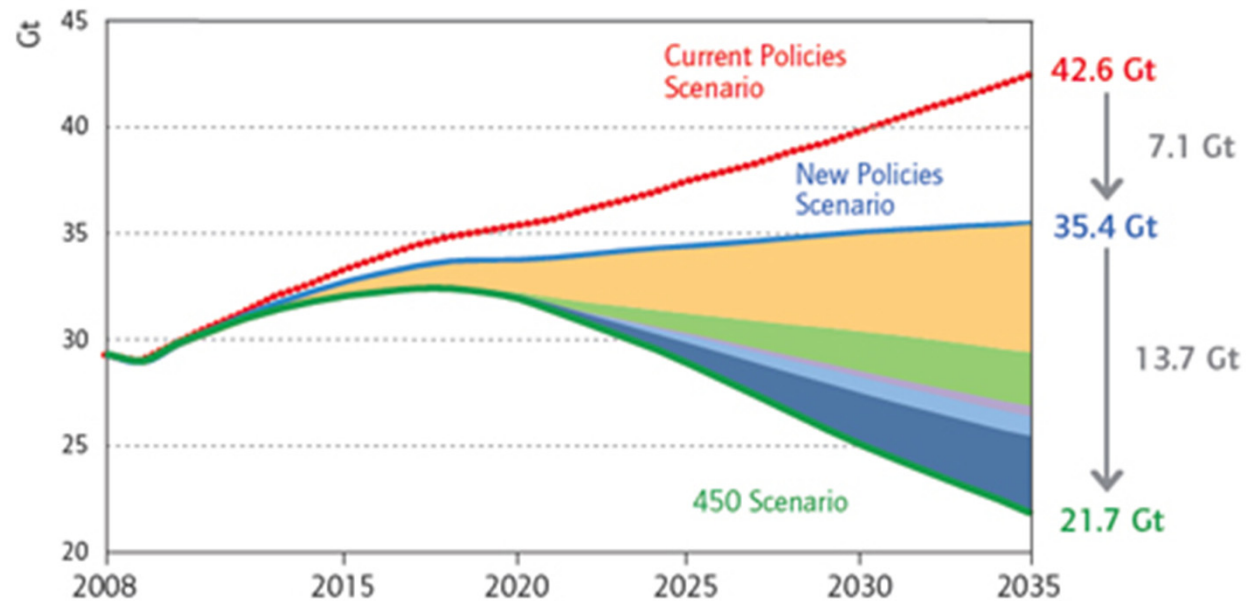
Sustainability goal



Note: The projected trend approximates that required to achieve long-term stabilisation of the total greenhouse-gas concentration in the atmosphere at 450 ppm CO₂-eq, corresponding to a global average temperature increase of around 2°C. World GDP is assumed to grow at a rate of 2.7% per year after 2030.

Source: IEA databases and analysis.

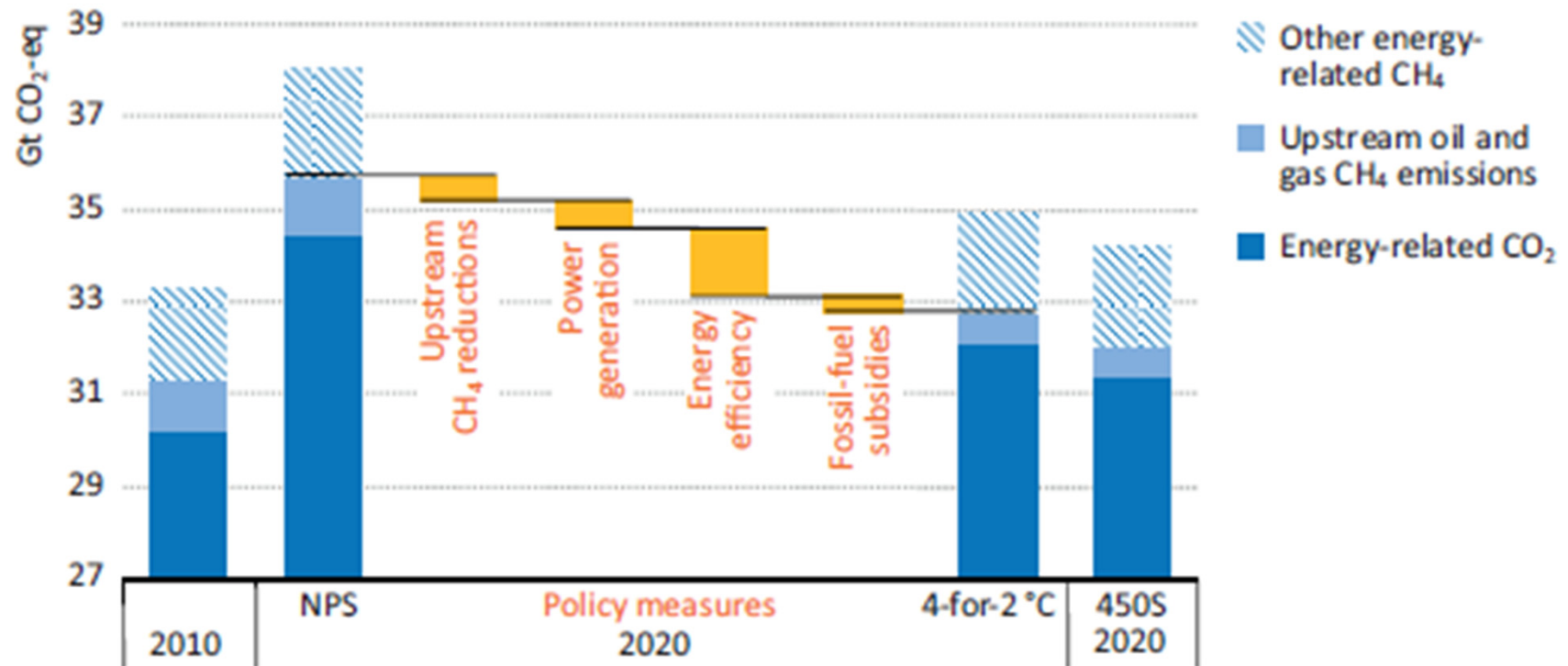
New Policies Scenario becomes the baseline in stead of Current Policies Scenario in 2011



Share of cumulative abatement
between 2010-2035

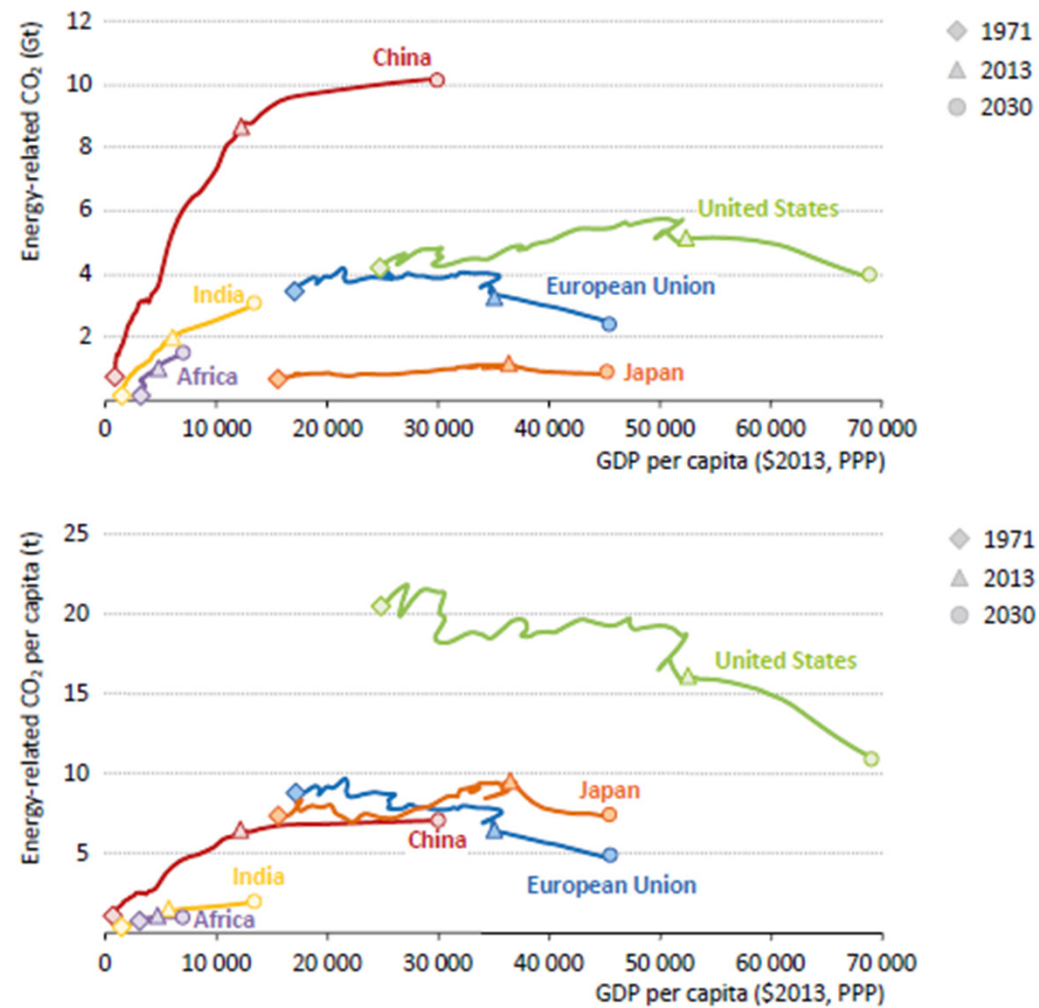
Efficiency	50%
Renewables	18%
Biofuels	4%
Nuclear	9%
CCS	20%

4-for-2 Scenario is proposed in 2013 to achieve short-term target



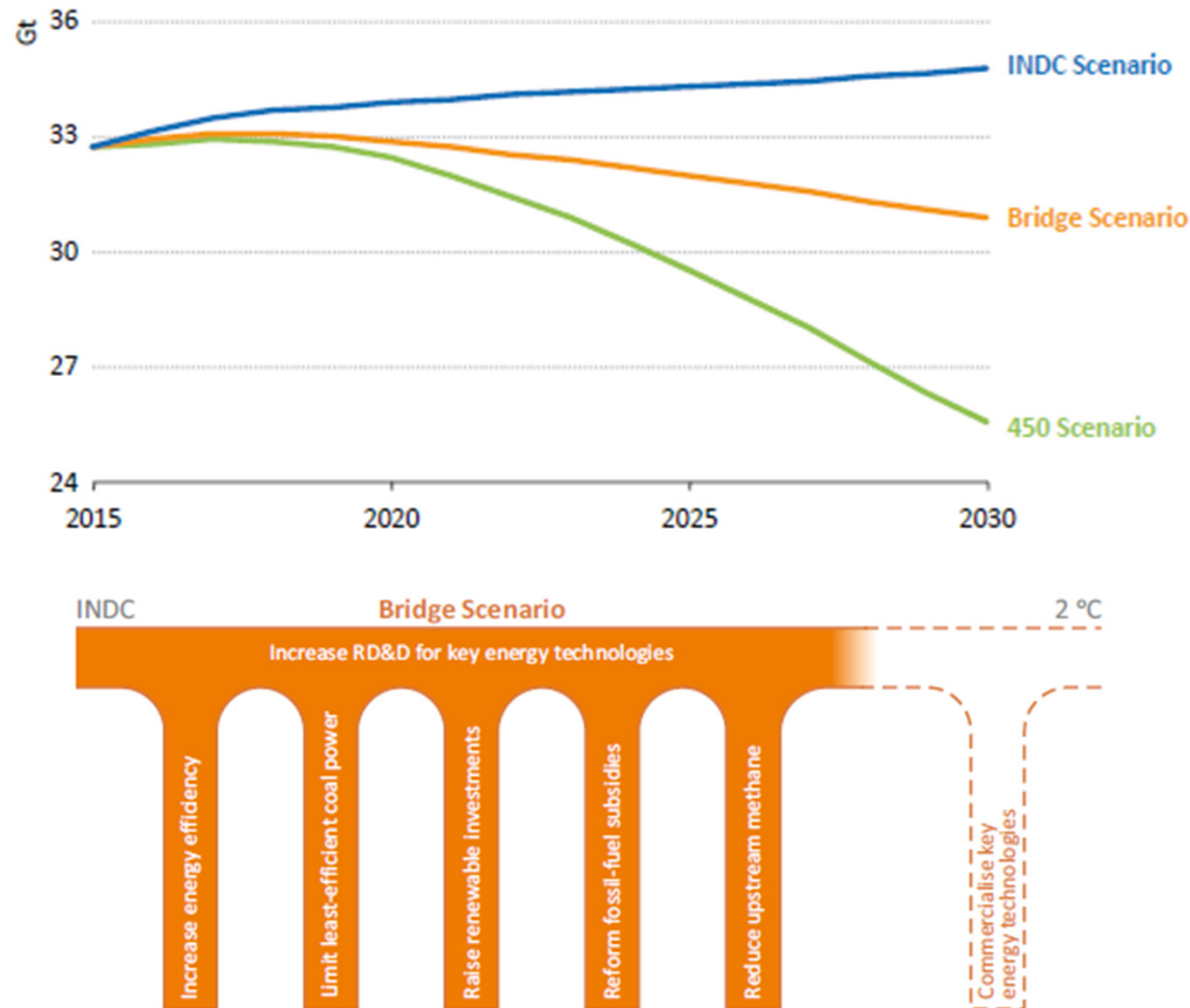
Note: NPS = New Policies Scenario; 450S = 450 Scenario. Source: IEA (2013a).

Early Sign of Decouple Between Economic and Emission Growth in China

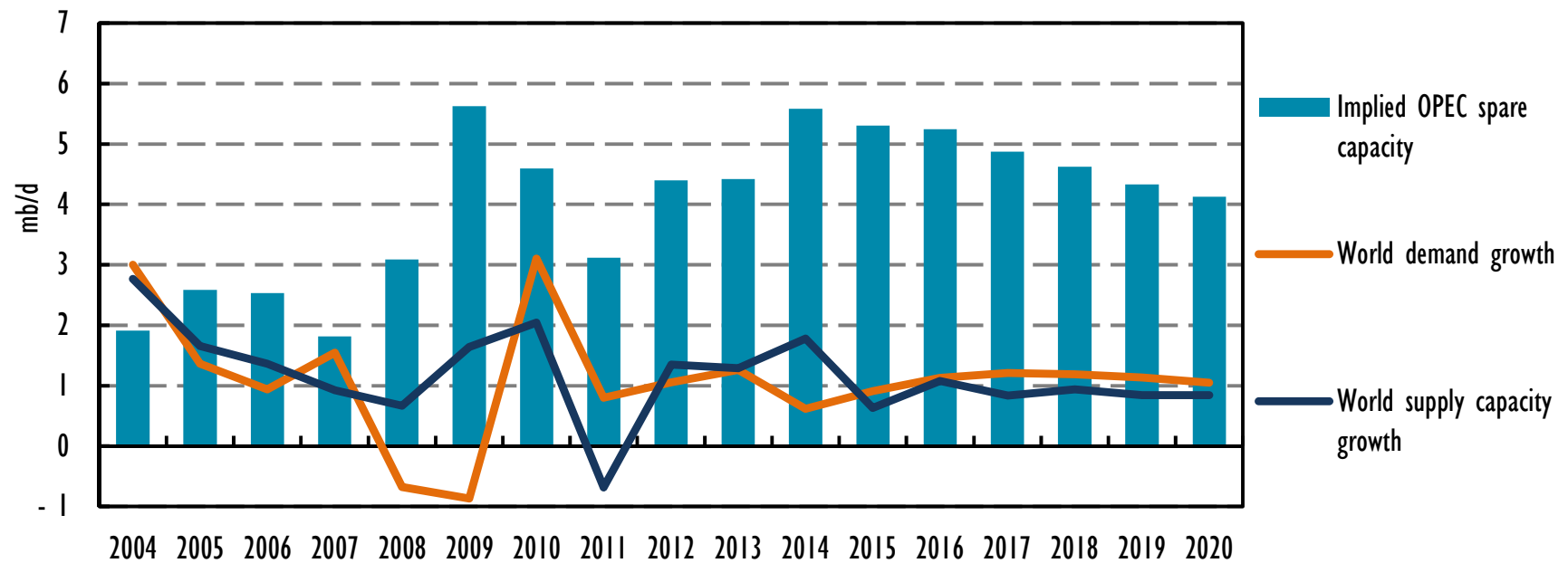


Source: WEO2015 Special report on Energy and Climate Change, IEA

Global Energy-related GHG stayed flat in 2014 – Options for COP21 in December 2015



Oil: Business as Unusual in Short-term Oil Market

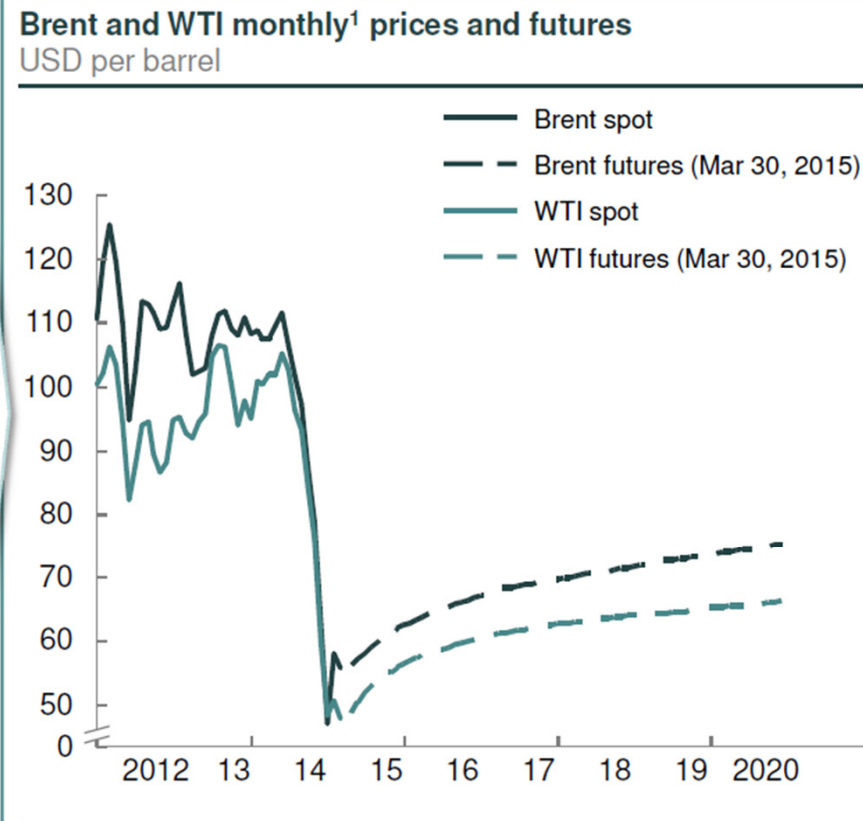


- The market response to lower prices is asymmetrical:
- Supply has become more price-elastic, demand less so

Oil: Price shock in 2015

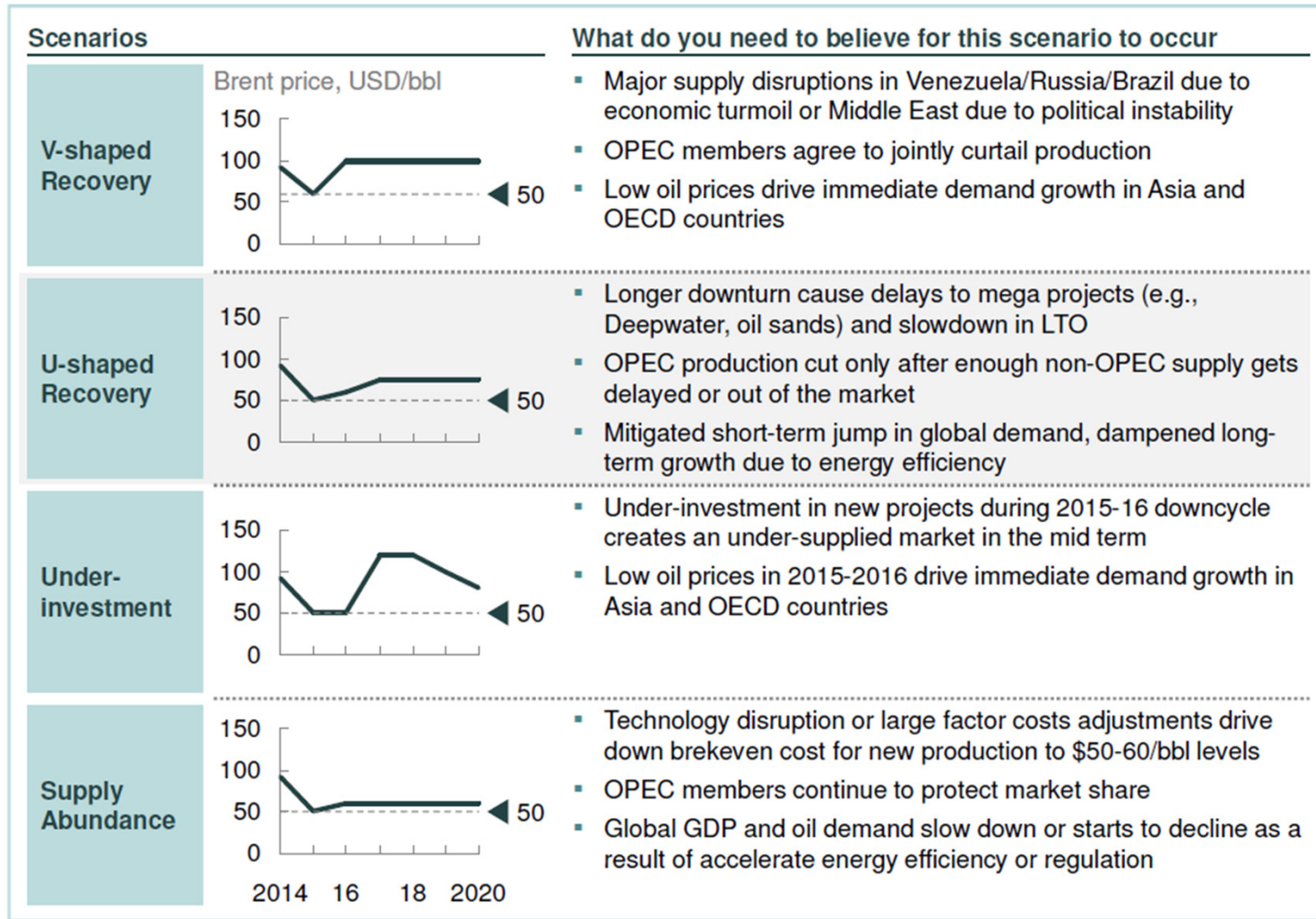
The recent oil price drop is a result of weak demand and high supply, intensified by OPEC's decision not to cut its output

- A Weakening global oil demand growth** as a result of lower than expected GDP growth in developing countries, especially China, and slow economic recovery in Europe
- B Supply glut**, especially in the Atlantic Basin, due to strong growth in US output and recovery in political wildcard producers (e.g. Libya)
- C OPEC inaction** as Middle Eastern exporters continue to produce and protect market share in Asia against rising competition from W. Africa and S. America that are pushed out of the Atlantic Basin due to US LTO boom



¹ Mar 2015 spot prices are YTD average to Mar 30

Oil: Long-term perspective in 2015



Oil: Price equilibrium

In the long-term, we can see a crude price equilibrium around \$70-85/bbl assuming OPEC maintains a ~40% market share

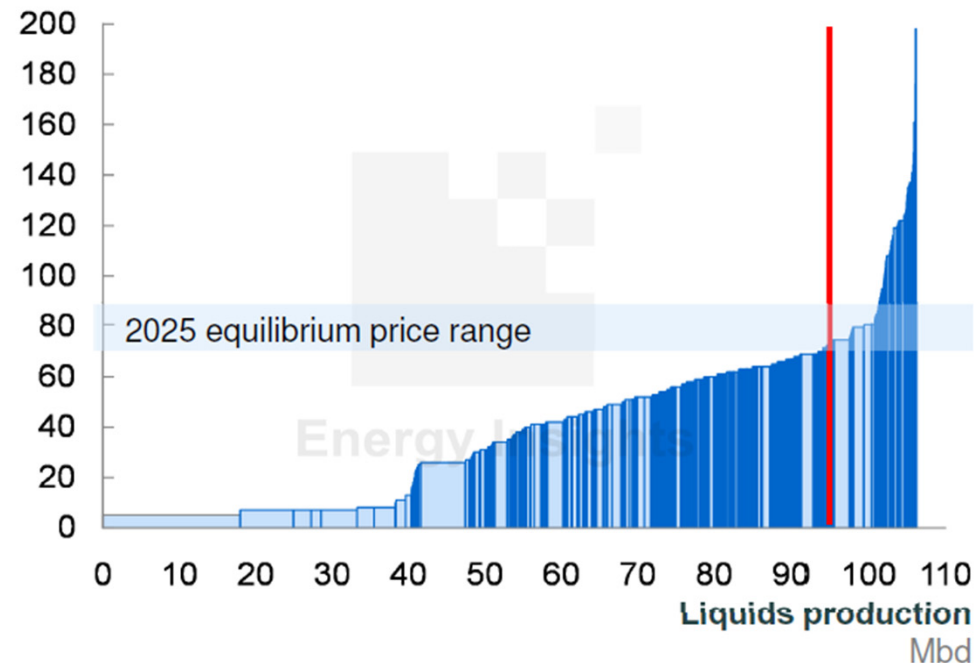
Key drivers

- The market clears at USD 70-85/bbl in the long-term as supply-demand balances through
 - 1 Dampened long-term demand growth
 - 2 Continued LTO growth
 - 3 Delays and cancellations in oil sands and deepwater projects
 - 4 OPEC maintains market share above 40% and modulates production to keep the prices in check
 - 5 In long-term, the tail of the cost curve is very steep therefore small changes in demand can cause big price shifts

Global liquids cost curve¹ in U-shaped Recovery, 2025

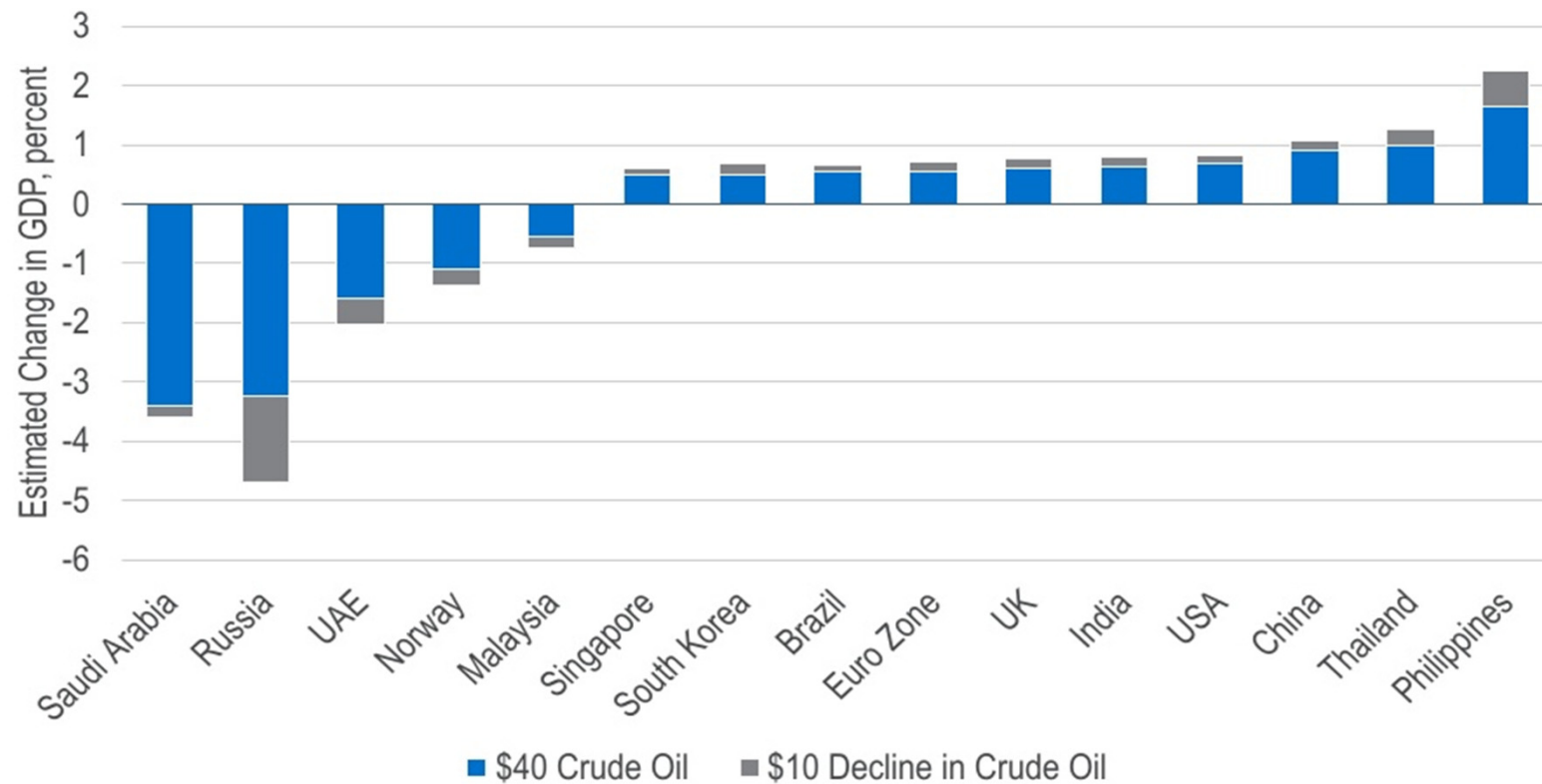
Production cost¹
USD/bbl

2025 Demand:
101 Mbd



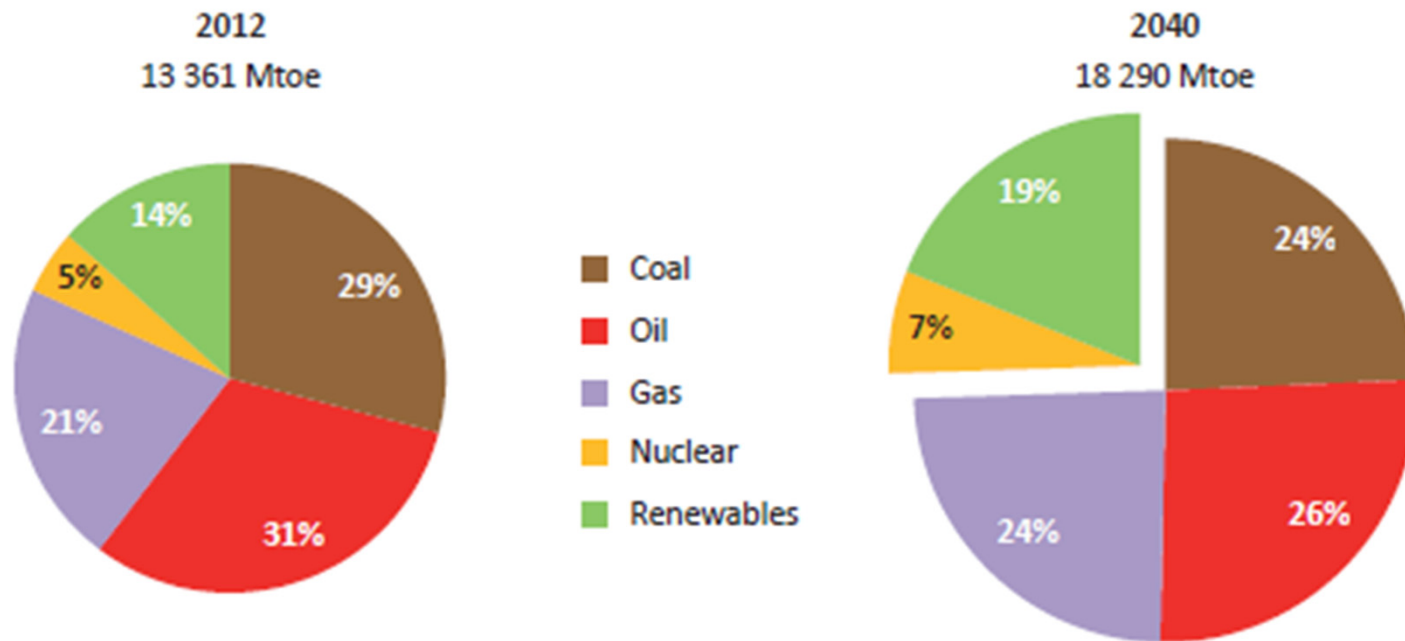
¹ Includes technical cost (capex, opex, exploration cost) and government take (taxes and royalties); cash cost for existing fields and full life cycle cost for new fields developments

Oil: Impact of oil price decline on economic



Natural gas: Strong demand in long run

Share of Primary Energy Demand in the New Policies Scenario



LNG: Solid growth and increase global trade routes

New suppliers have come onto the market ...

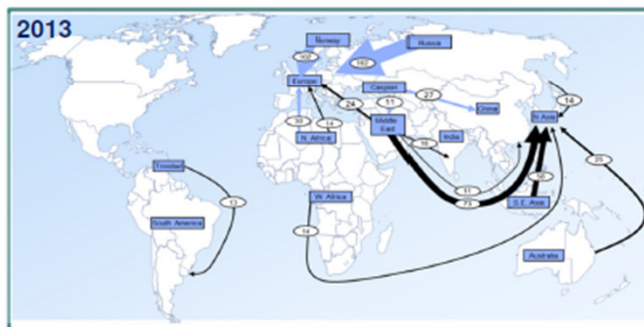
From 2001

- 8 main export routes
- 3 main markets (Europe, USA, North Asia (Japan/Korea/Taiwan))
- Each supplier serves only one main market

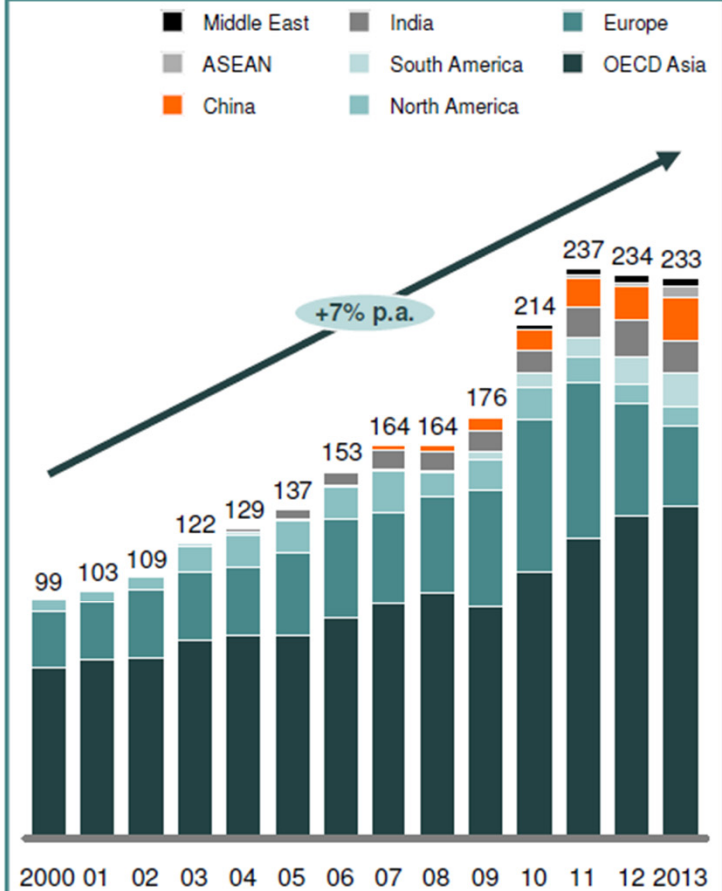


To 2013

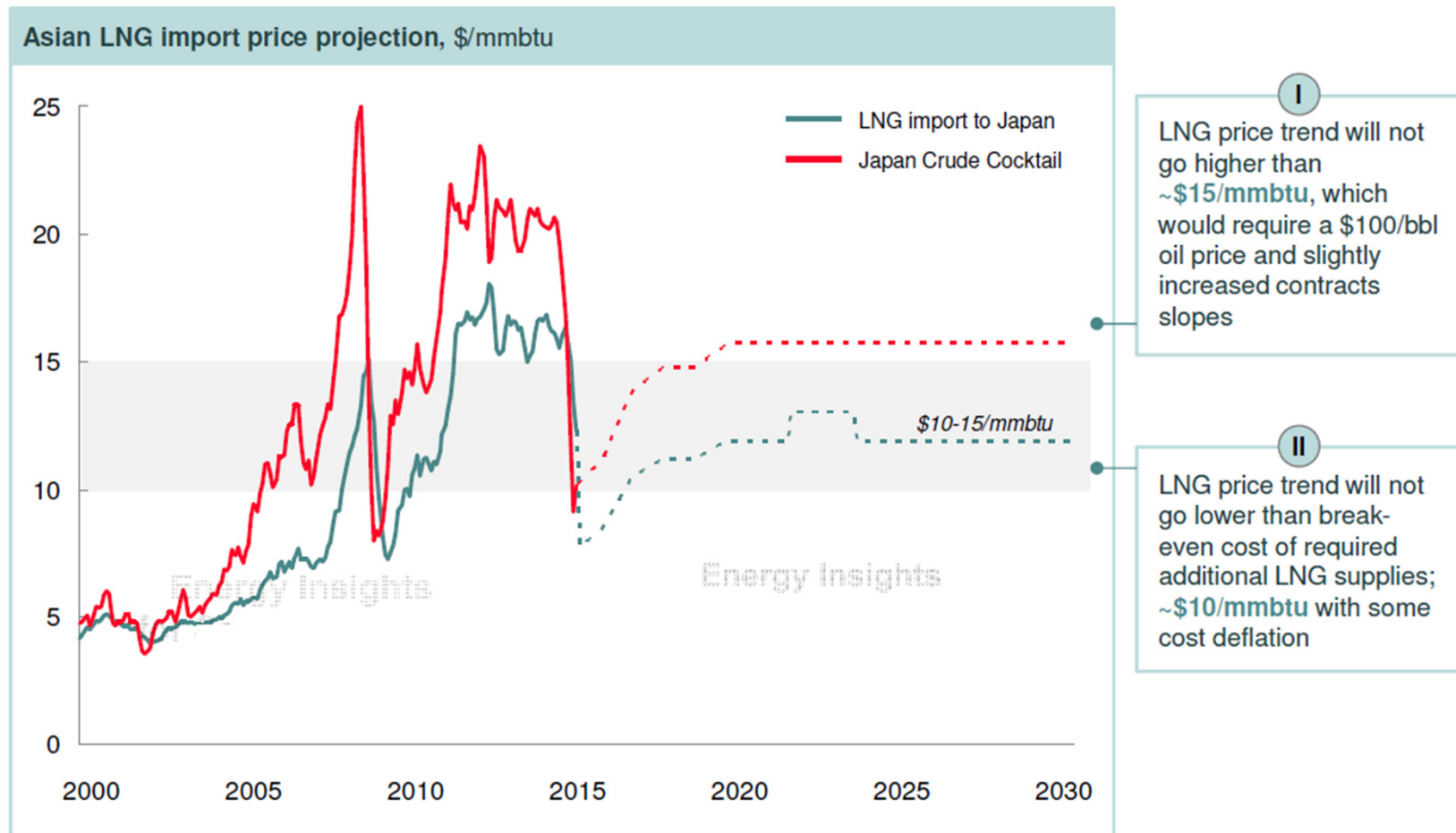
- 14 main export routes
- 3 new import markets (India, China and Latin America)
- Middle East and Russia each serve multiple markets



... helping to support strong growth in demand



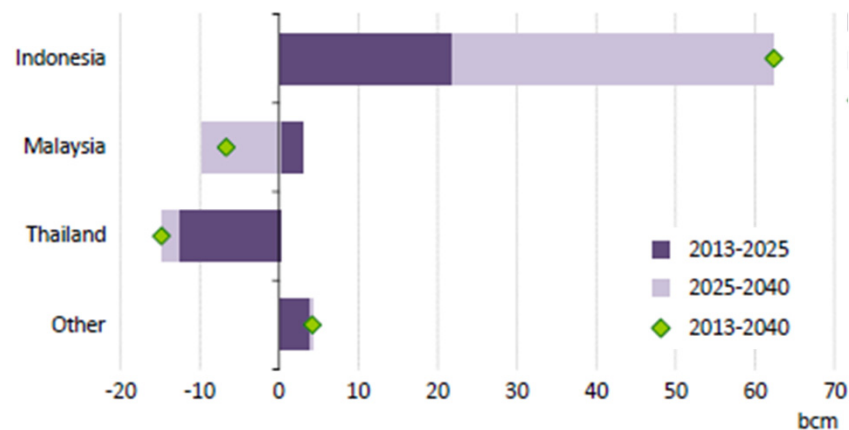
LNG: Upper and lower boundaries for long-term



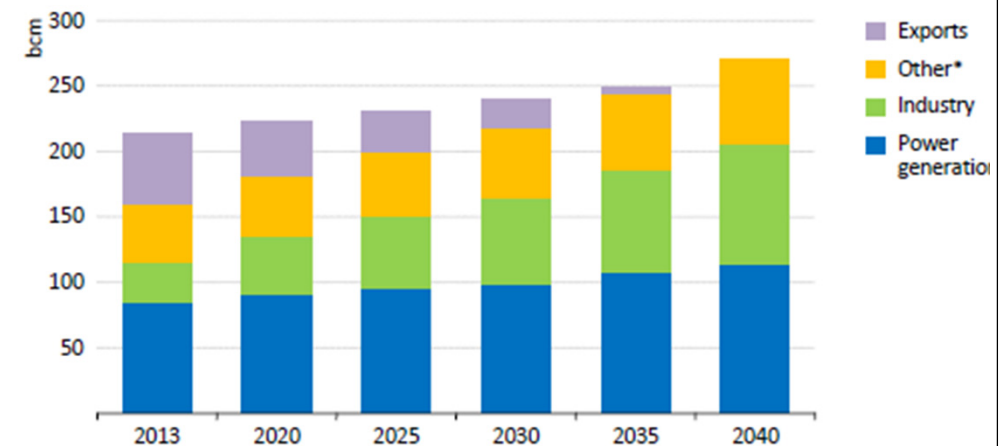
Natural gas:

Indonesia grows but SEA may not be exporter anymore

Change in NG production in SEA 2013-2040



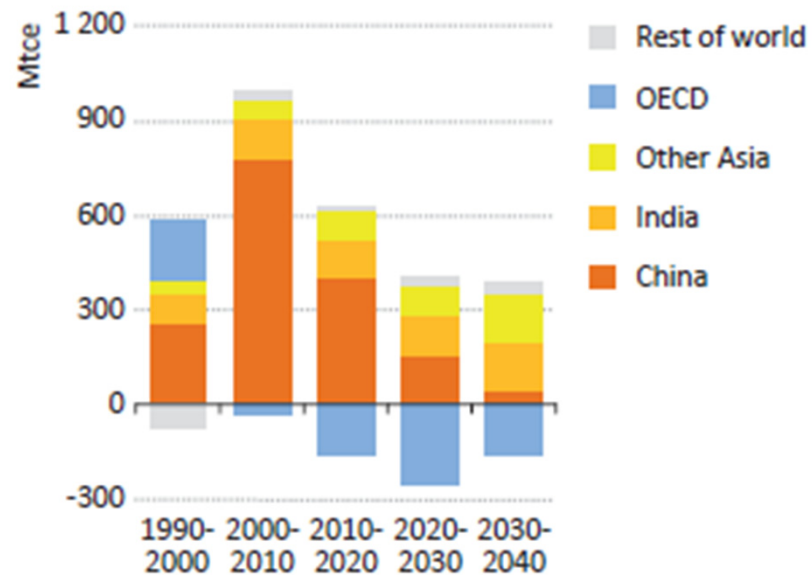
Destination of SEA NG production



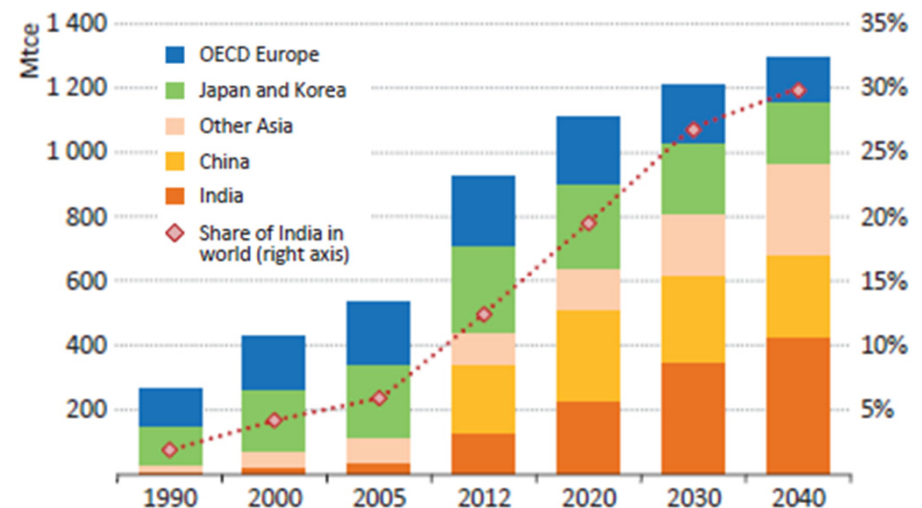
*Includes buildings, agriculture, non-energy use, other energy sector and bunkers.

Coal: India (+SEA) the leaping tiger, China a pausing dragon?

Incremental coal demand in power sector

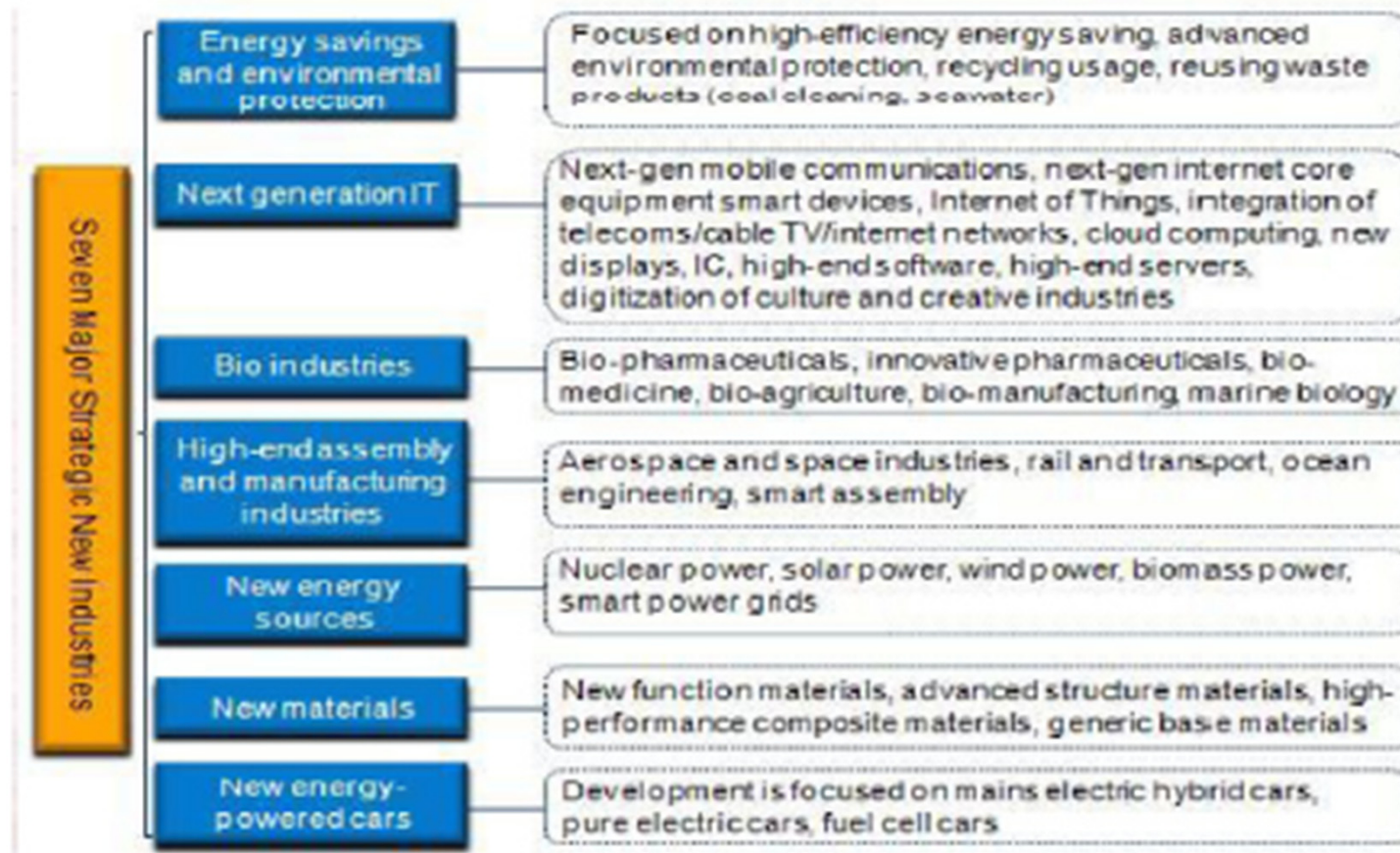


Global coal trade by major importer



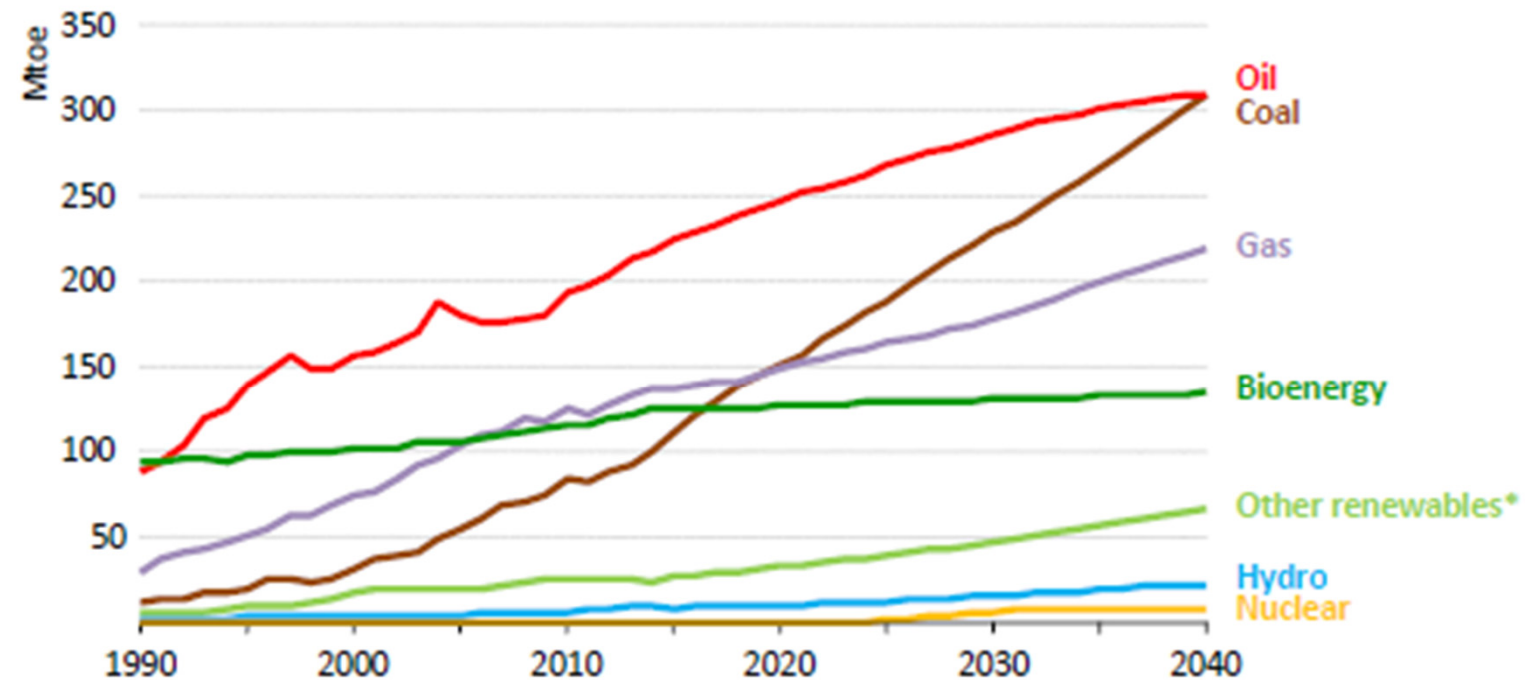
Coal: Economic restructuring in China

Seven strategies for China new direction



Coal: Overtake oil in SEA energy mix within 2040

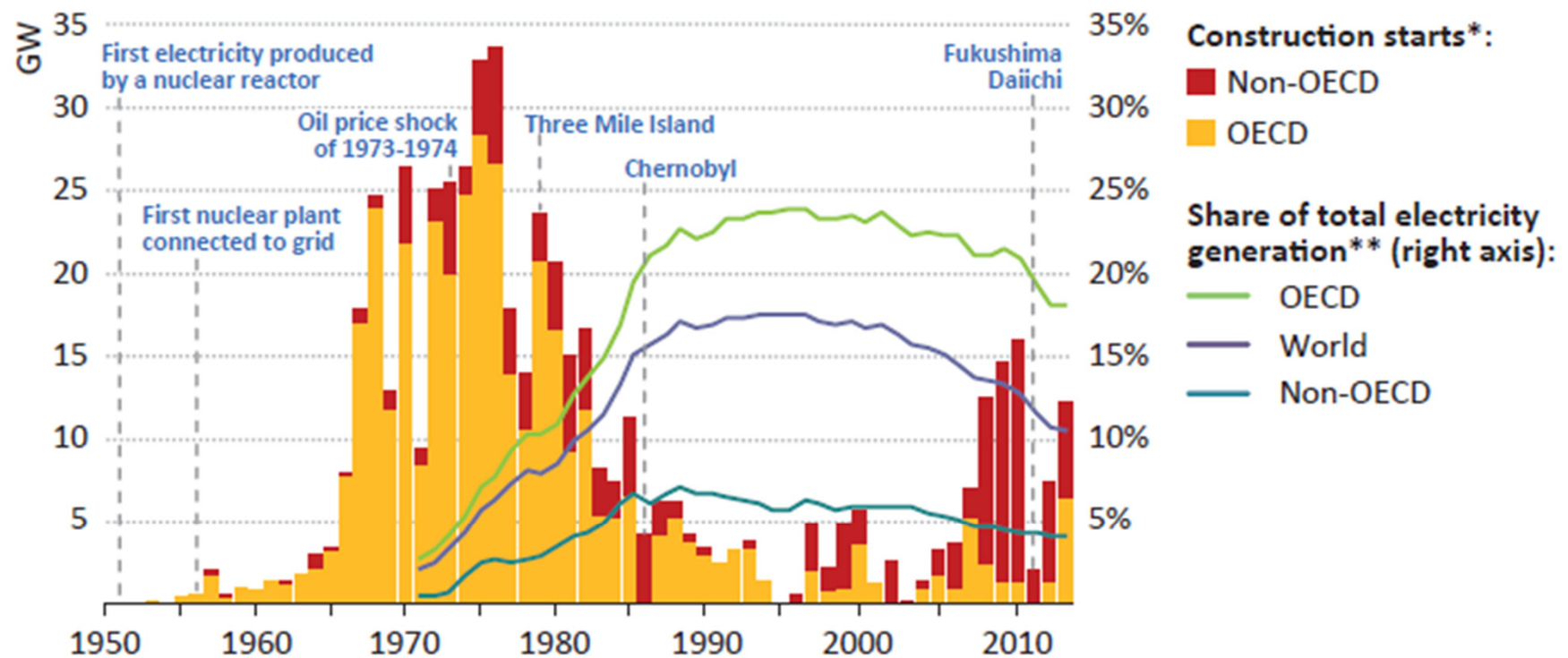
Primary energy demand in SEA 1990-2040



*Includes solar PV, wind, and geothermal.

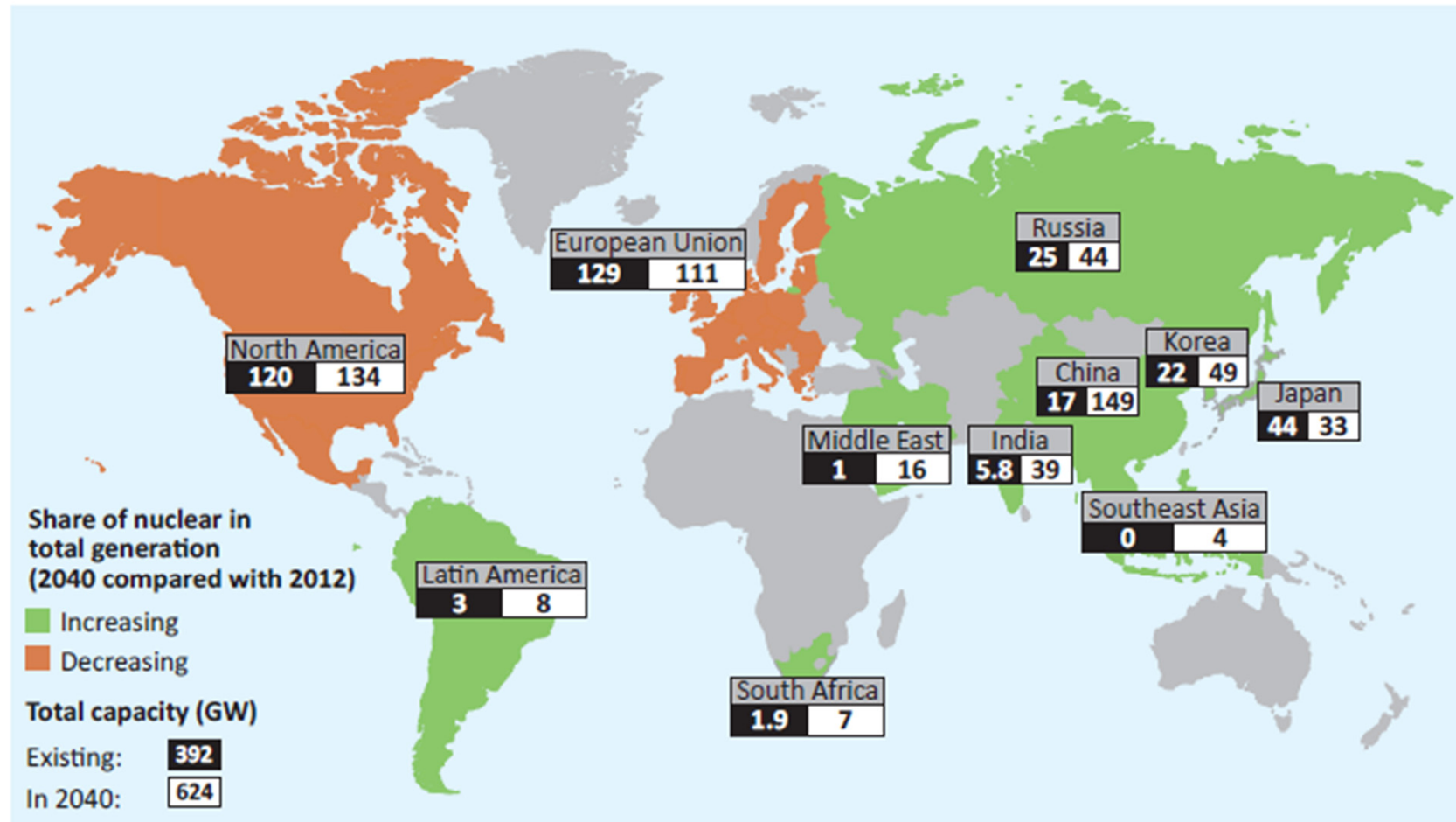
Nuclear: An option for Non-OECD

Reactor construction starts and timeline



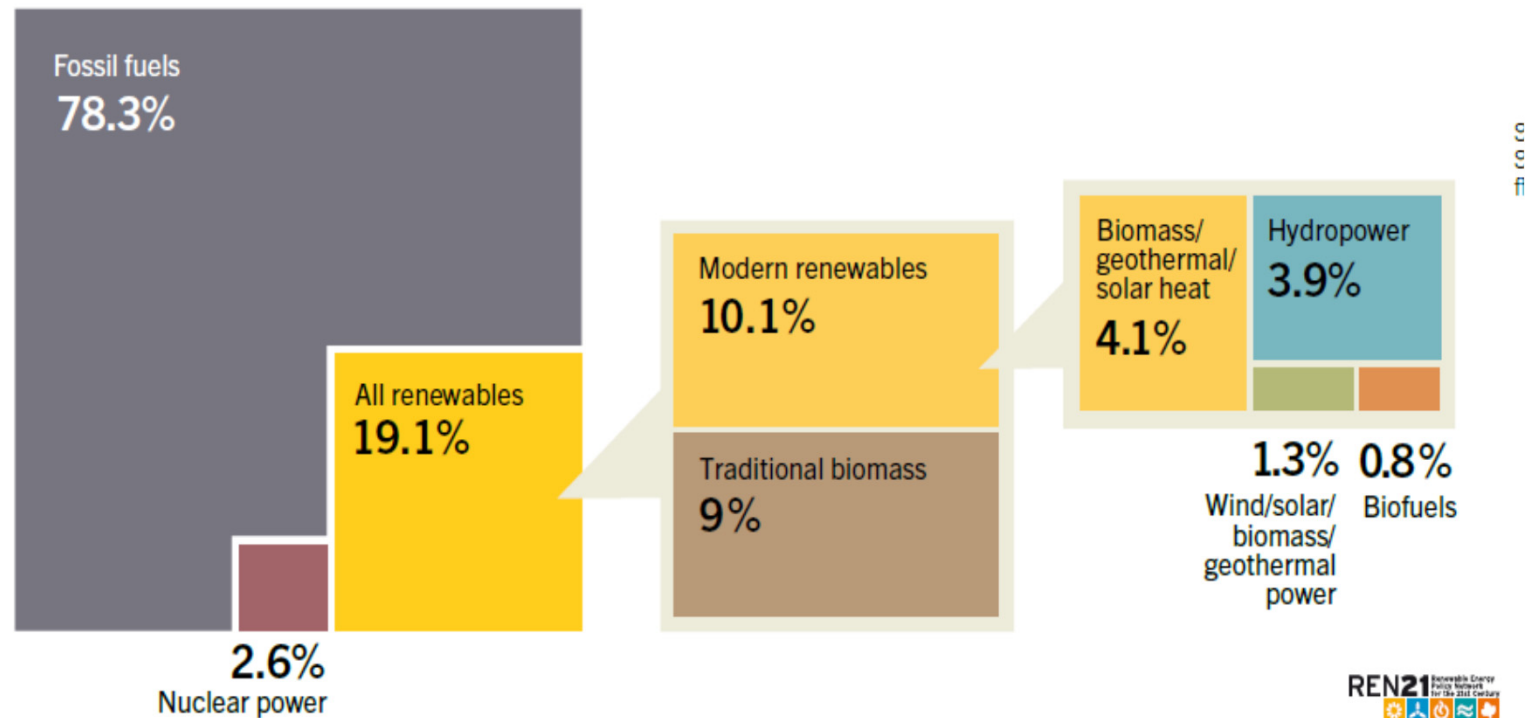
* The data do not include construction starts for units that were later cancelled. Some reactors that are currently under construction, however, may yet be cancelled. ** Data are available from 1971.

Nuclear: Change in share of NPPs for power generation



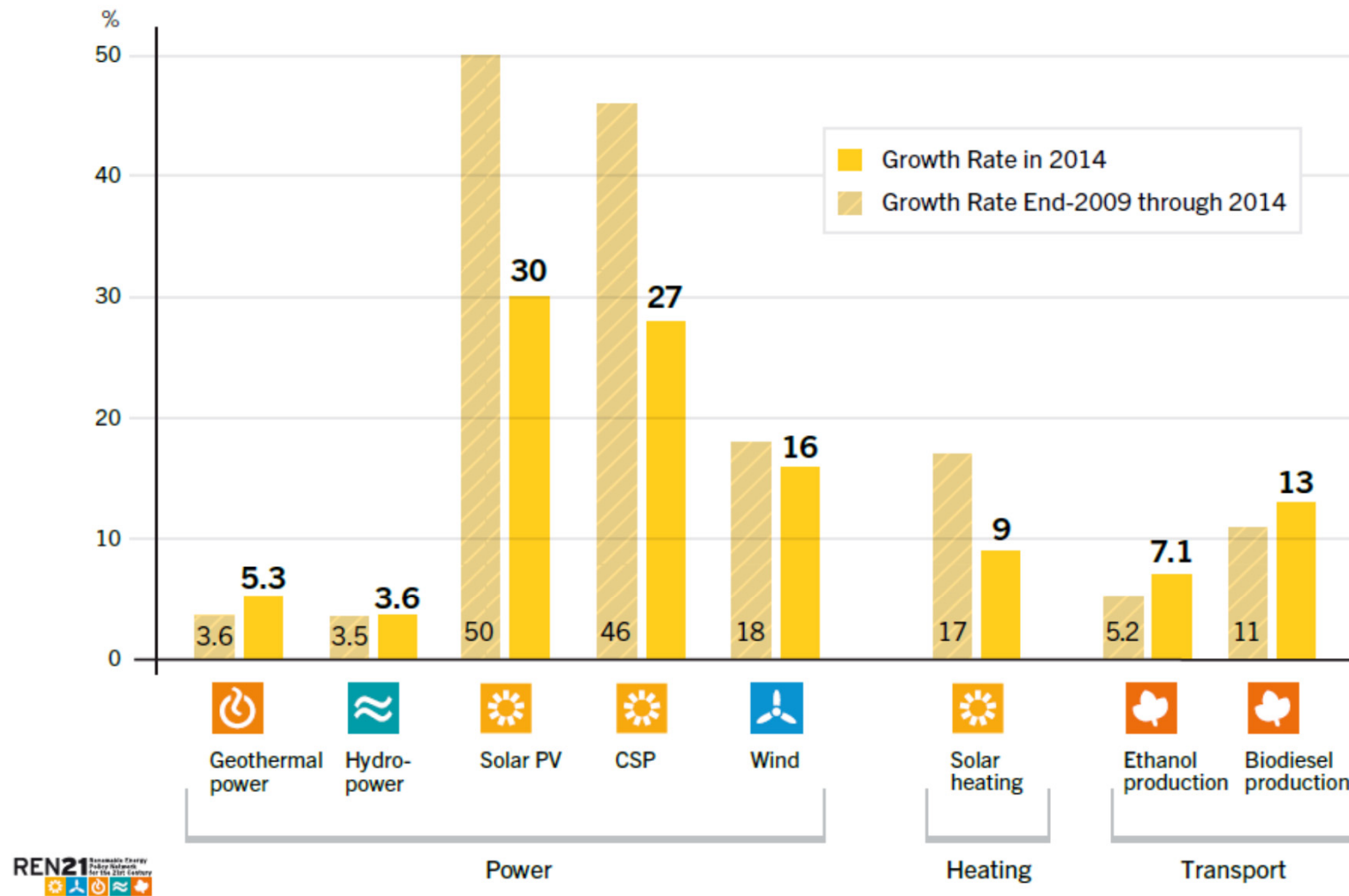
This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

RE: Global Status 2014

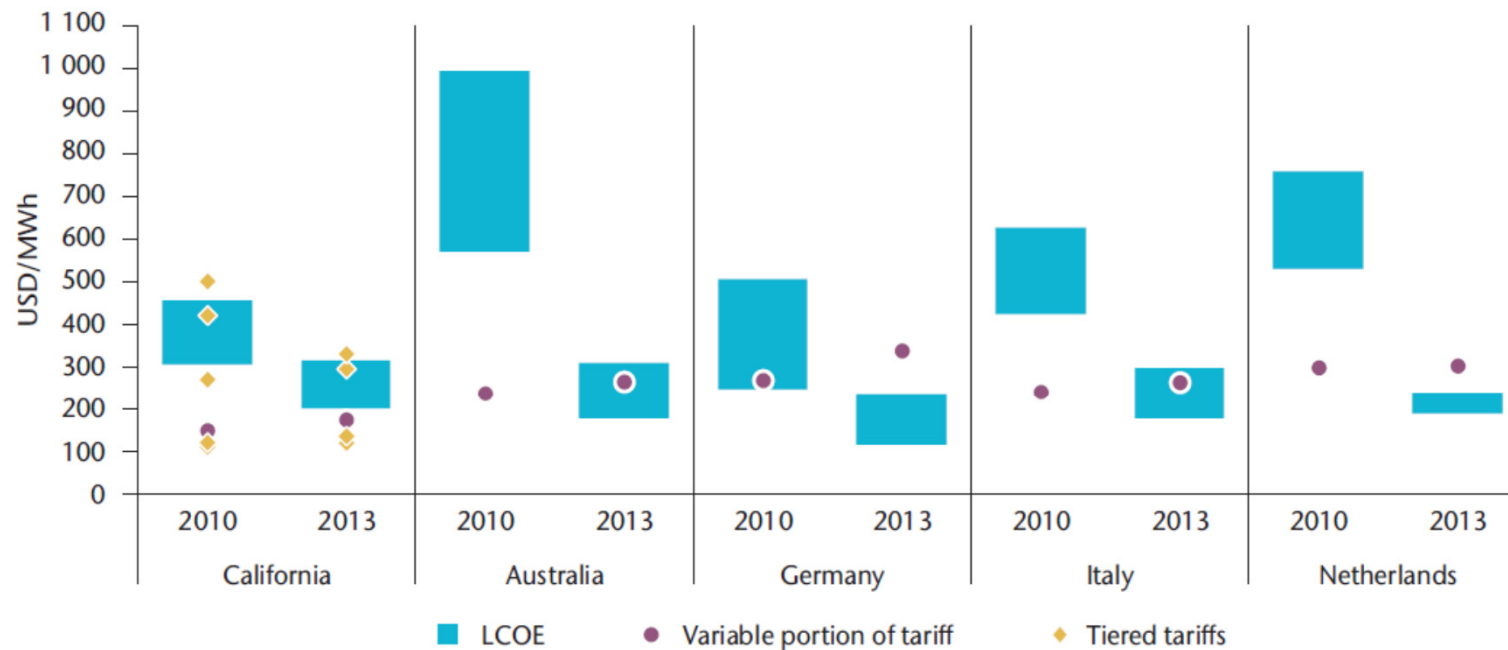


- i - An estimated 1.2 billion people worldwide lack access to electricity, and 2.8 billion people rely on traditional biomass for cooking and heating. See United Nations Sustainable Energy for All (SE4ALL), "United Nations Decade of Sustainable Energy for All 2014-2024," <http://www.se4all.org/decade/>, viewed 10 April 2015.
- ii - SE4ALL has three interlinked objectives: ensuring universal access to modern energy services, doubling the global rate of improvement in energy efficiency, and doubling the share of renewable energy in the global energy mix. See SE4ALL, "Our Objectives," <http://www.se4all.org/our-vision/our-objectives/>, viewed 10 April 2015.

RE: Keep growing in 2014

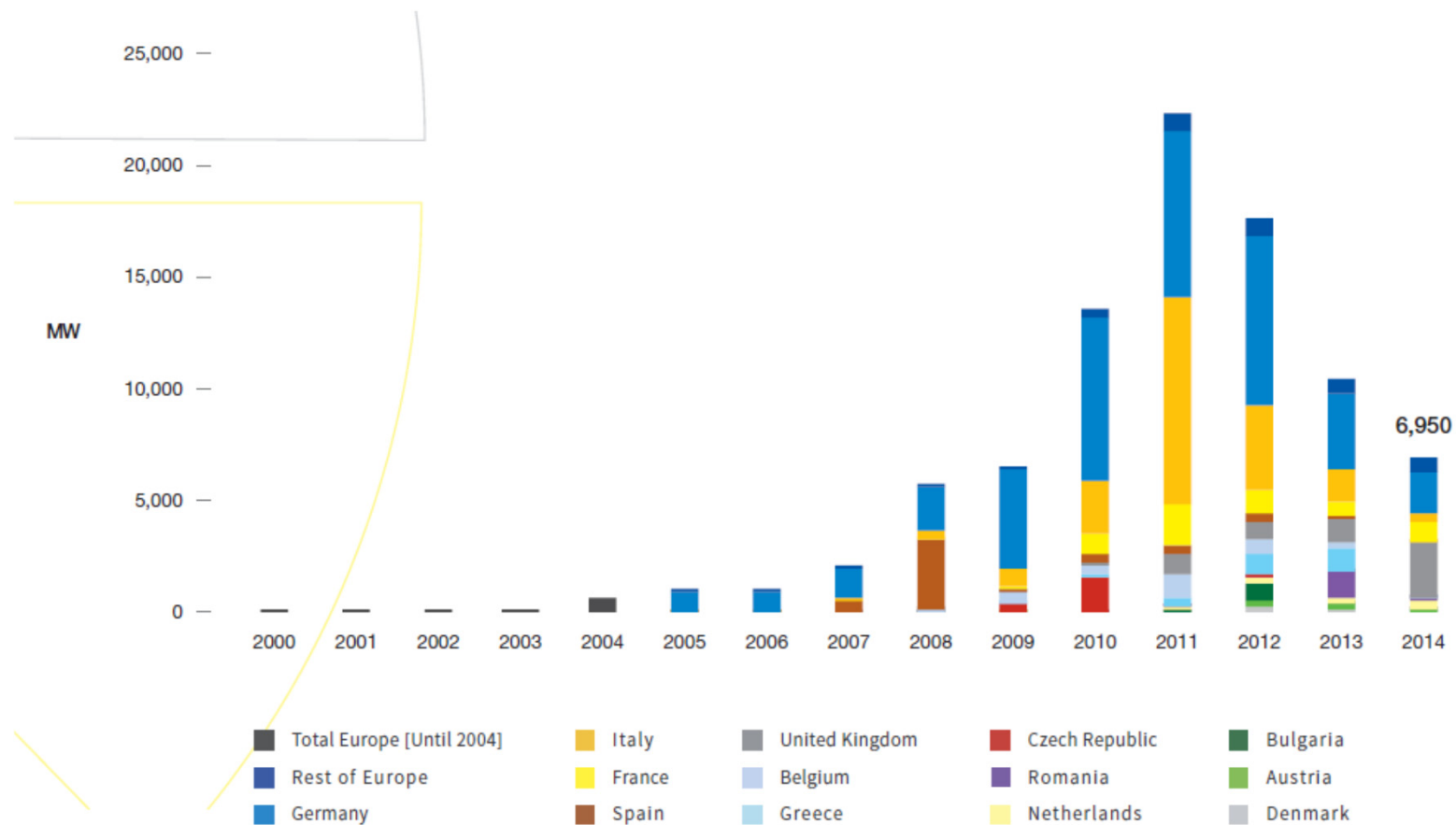


RE: Approaching grid parity for Solar



Note: Household electricity tariffs exclude fixed charges. LCOEs are calculated using average residential system costs (including value-added tax and sales tax in where applicable, and investment tax credit in California); ranges mostly reflect differences in financing costs. The tiered tariffs in California are those of Pacific Gas and Electric. Tiers 3 to 4 or 5 are tariffs paid on monthly consumption when it exceeds given percentages of a set baseline. All costs and prices are in 2012 USD.

RE: Phase out subsidy for solar PV in Europe



Key issues in ASEAN:

Power grid interconnection, energy access, energy investment, and fossil-fuel subsidy



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

ประเด็นเชื่อมโยงกับประเทศไทย:

- ผลกระทบเชิงบวกต่อดุลการค้าและเศรษฐกิจภาพใหญ่จากราคาน้ำมันที่ปรับตัวลดลง
- โอกาสสำหรับการยกเลิกการอุดหนุนราคาพลังงานที่ไม่ส่งผลกระทบต่อต้นทุนและค่าครองชีพ
- โอกาสสำหรับการปรับ Portfolio เพื่อกระจายแหล่งจัดหาน้ำมันและก๊าซฯ (โดยเฉพาะ LNG)
- โอกาสสำหรับการเป็นศูนย์กลางซื้อขายระบบไฟฟ้าในภูมิภาค
- การลงทุนด้านพลังงานจะเป็นอีกทางหนึ่งที่จะกระตุ้นเศรษฐกิจที่ซบเซาของประเทศ
- การอนุรักษ์พลังงานและการส่งเสริมพลังงานหมุนเวียนยังคงเป็นกุญแจสำคัญสำหรับการพัฒนาด้านพลังงานอย่างยั่งยืนในระยะยาว

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8. PTIT mid-year oil an gas update 2013, by Khunying Thongtip Ratanarat, 31 July 2013.