

RENEWABLE ENERGY



Challenges for the Growth of Renewable Energy Markets

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Today's Contents

- **Overview of global energy markets**
- **Projection of renewables market in Asia**
- **Japan's challenges for deploying renewables**
- **Grid integration of variable renewables**
- **Conclusions**



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- **Overview of global energy markets**
 - **WEO 2012**
 - **1st Medium-term RE Market Report 2012**
- Projection of renewables market in Asia
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- Grid integration of variable renewables
- Conclusions

The context

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■ Foundations of global energy system shifting

- *Resurgence in oil & gas production in some countries*
- *Retreat from nuclear in some others*
- *Signs of increasing policy focus on energy efficiency*

■ All-time high oil prices acting as brake on global economy

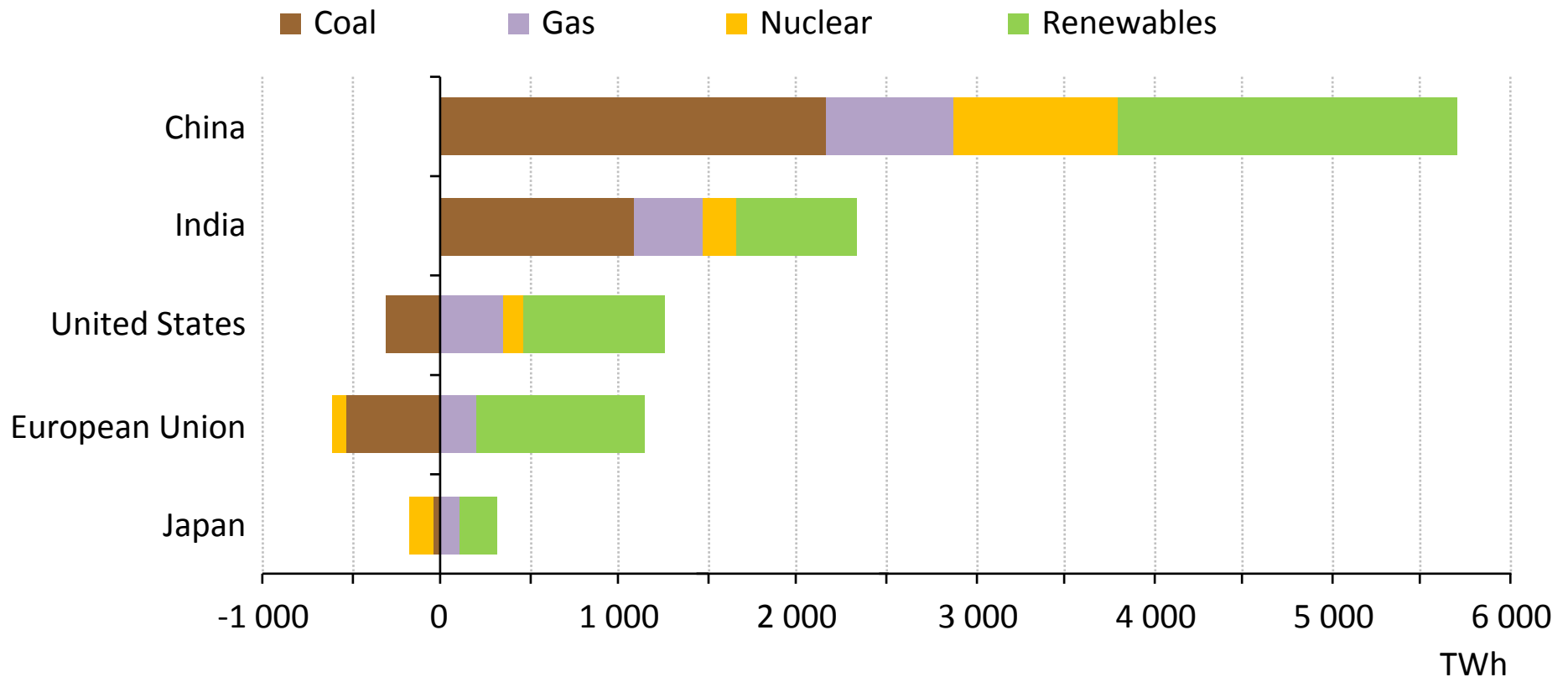
- *Divergence in natural gas prices affecting Europe (with prices 5-times US levels) and Asia (8-times)*

■ Symptoms of an unsustainable energy system persist

- *Fossil fuel subsidies up almost 30% to \$523 billion in 2011, led by MENA*
- *CO₂ emissions at record high, while renewables industry under strain*
- *Despite new international efforts, 1.3 billion people still lack electricity*



Change in power generation, 2010-2035

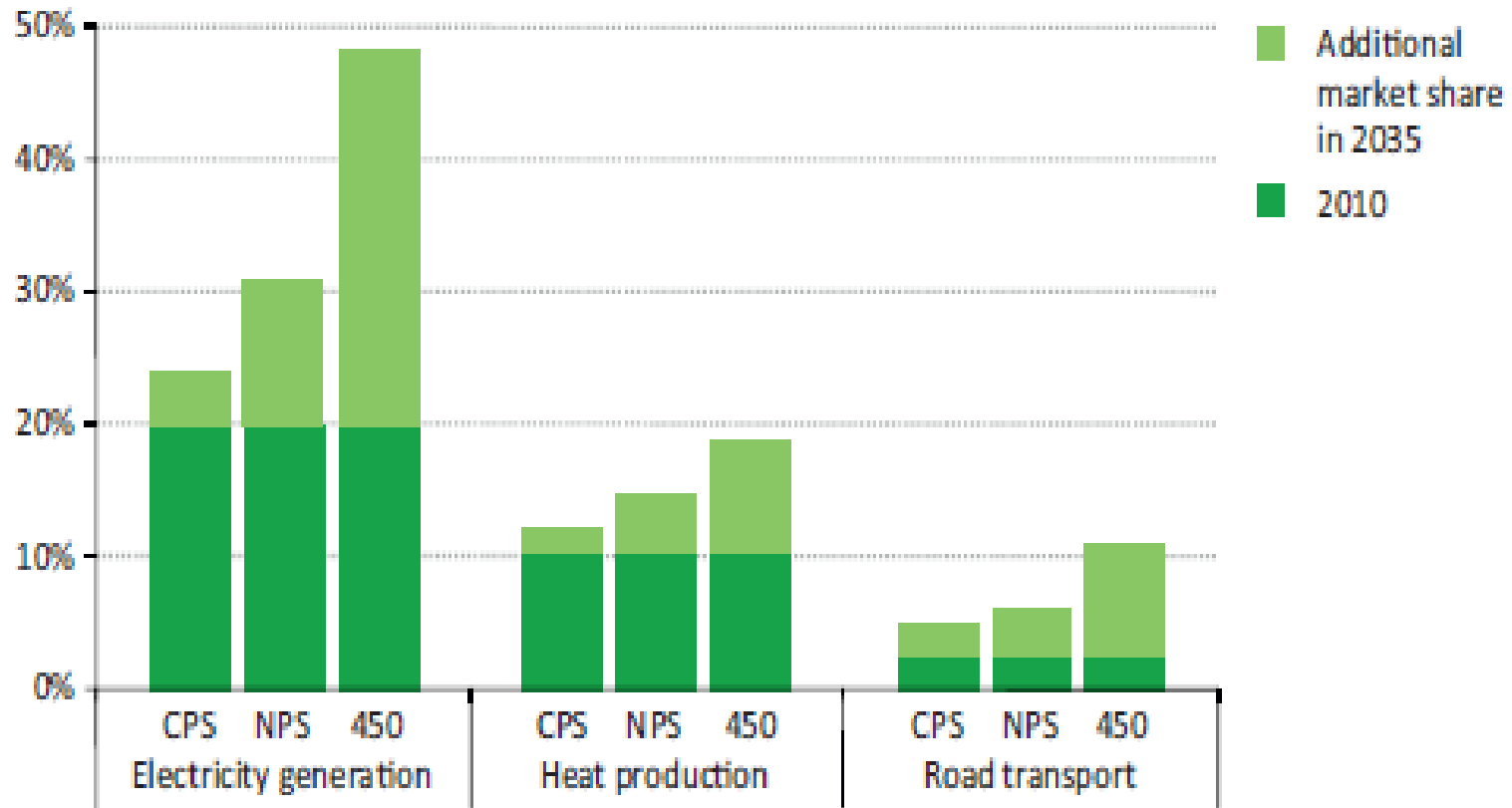


The need for electricity in emerging economies drives a 70% increase in worldwide demand, with renewables accounting for half of new global capacity

Outlook for renewables

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Shares of renewables in different scenarios



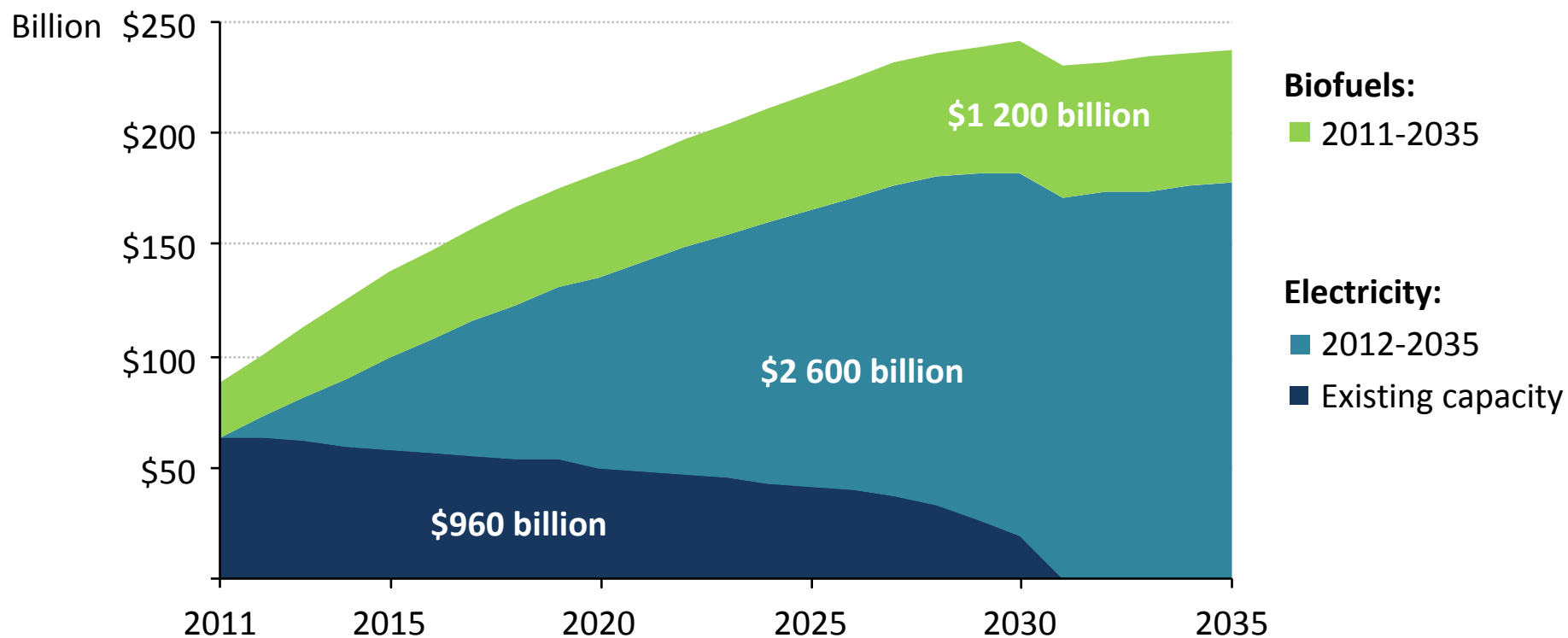
Note: CPS = Current Policies Scenario; NPS = New Policies Scenario; 450 = 450 Scenario.

IEA, WEO 2012

The multiple benefits of renewables come at a cost

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Global renewable energy subsidies



Renewable subsidies were \$88 billion in 2011; over half the \$4.8 trillion required to 2035 has been committed to existing projects or is needed to meet 2020 targets



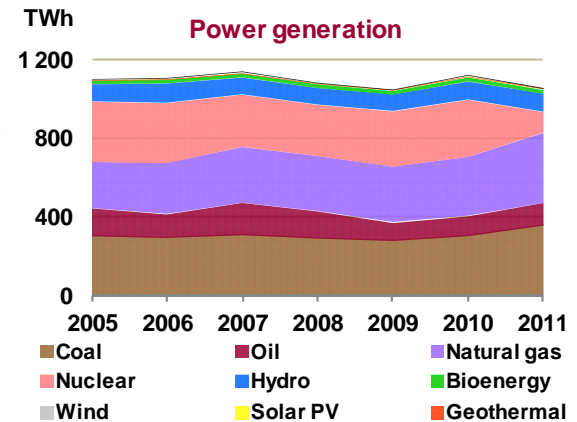
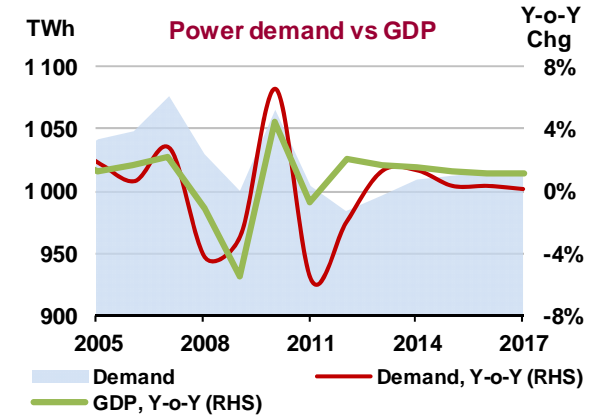
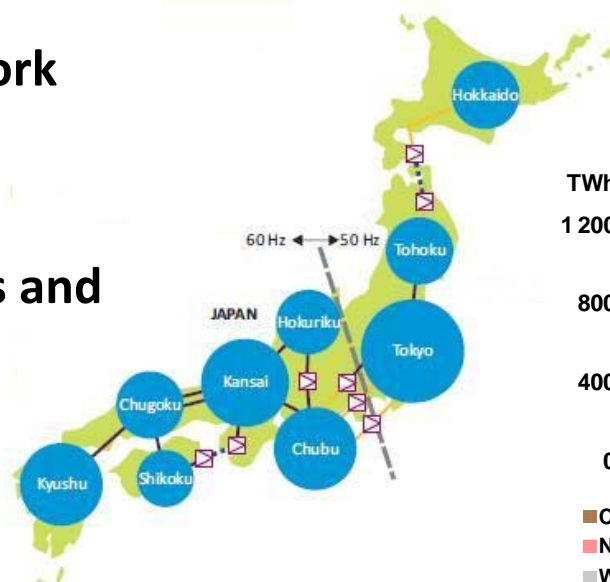
RE Market Report Analytical Framework

Japan example

■ Generation and capacity forecast based on -

- Power demand
- Power sector structure
- Grid and system integration
- Economic attractiveness
- Financing
- Policy framework robustness

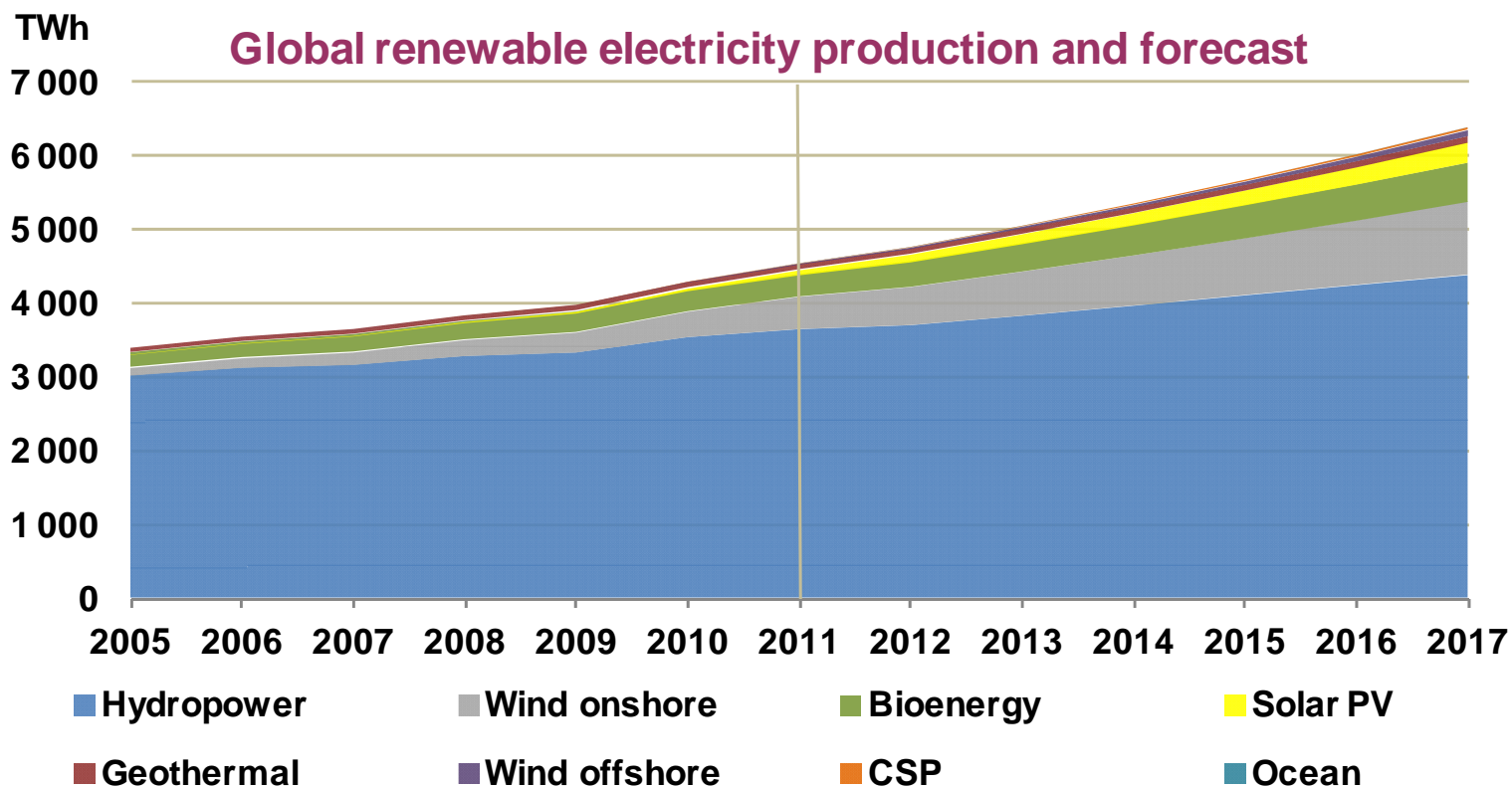
- Identify drivers and challenges for renewable deployment





Growth in renewable power is forecast to accelerate

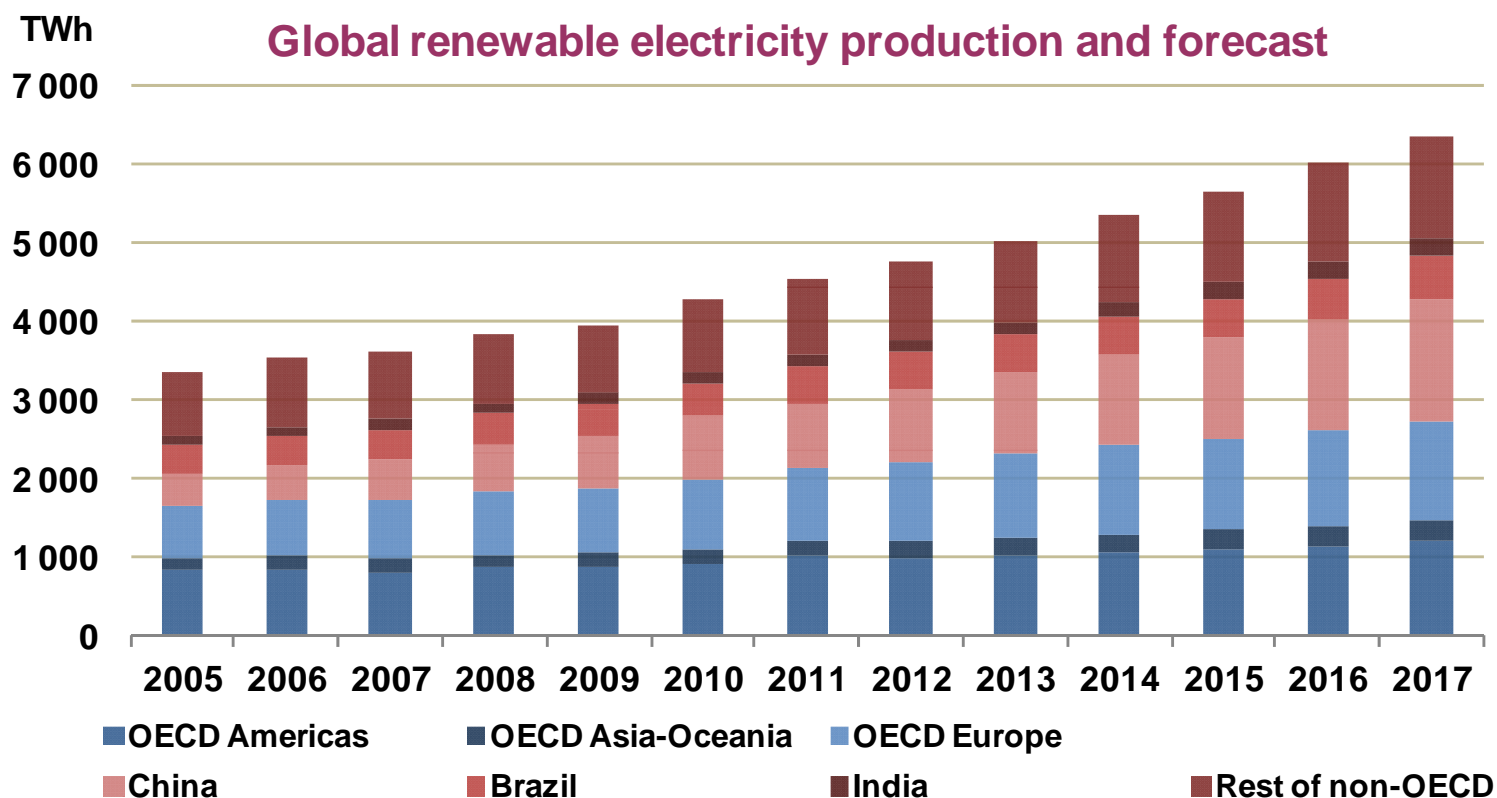
- Hydropower remains the main renewable power source (+3.1% p.a.)
- Non-hydro renewable sources grow at double-digit annual percentage rates (+14.3% p.a.)





Growth is led by non-OECD countries

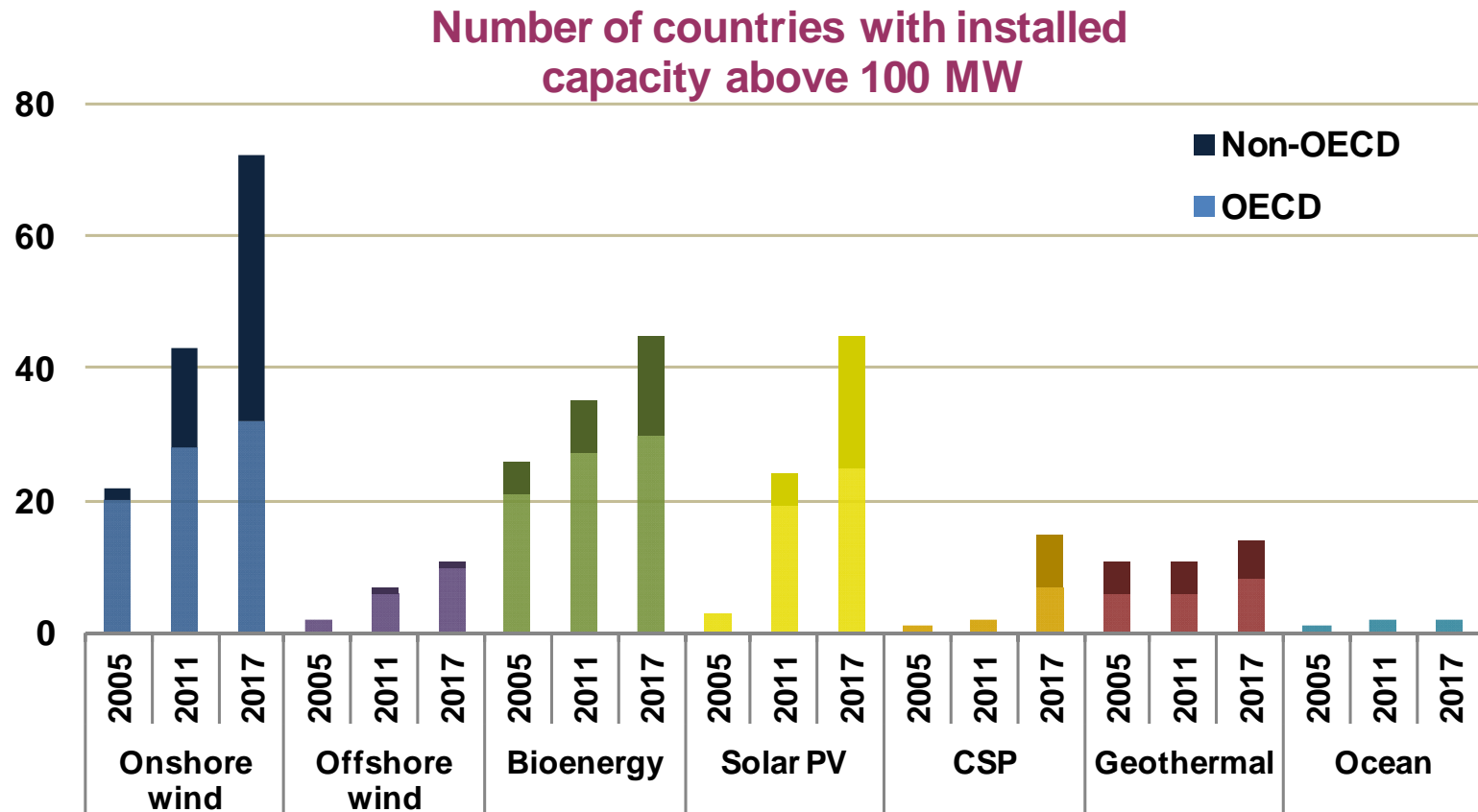
- Non-OECD accounts for two-thirds of the overall growth
 - China, Brazil, India lead; others grow significantly as well
- OECD growth still largely driven by Europe but Americas and Asia-Oceania make significant contributions





Non-hydro technology deployment spreads out

- Number of countries with cumulative capacity larger than 100MW (can cover consumption of 100k households) increases significantly
- Growth areas include Asia, Africa, Latin America and the Middle East





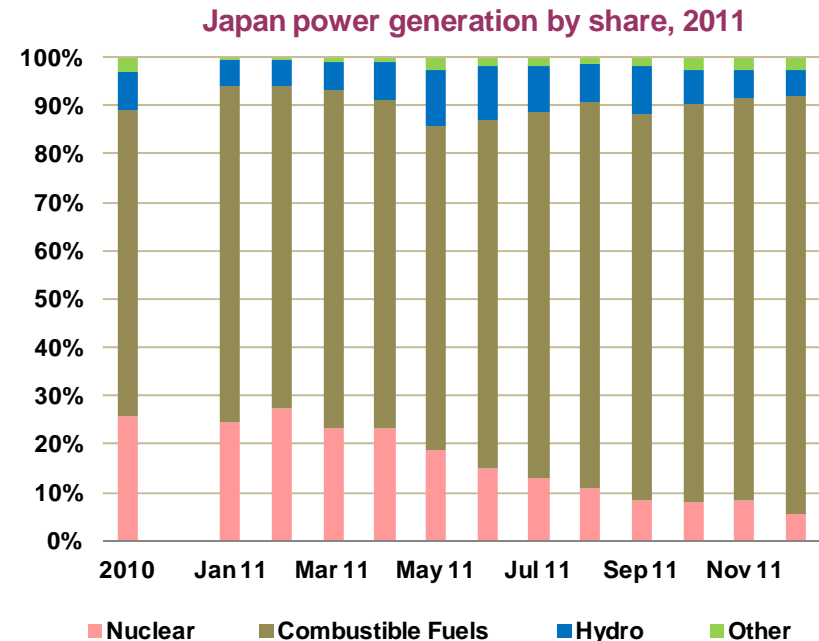
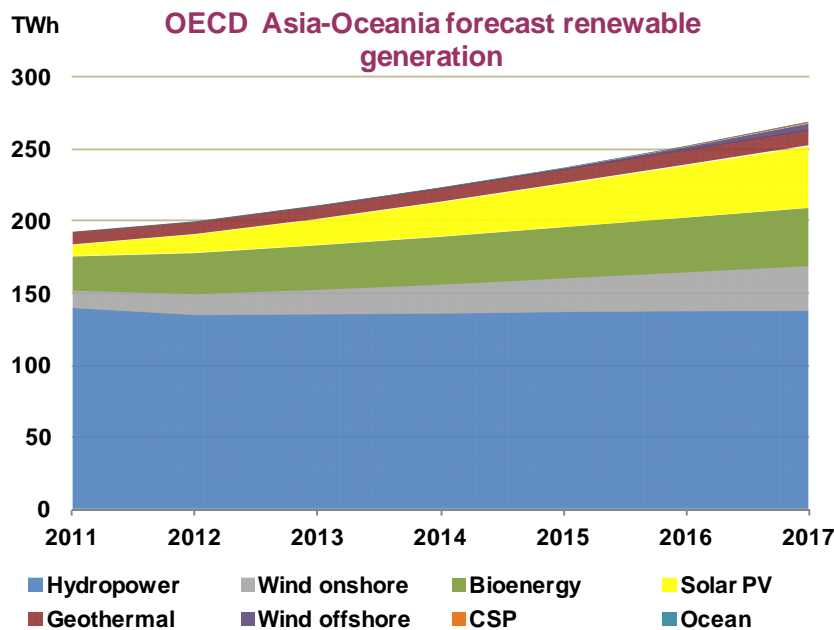
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OECD Asia-Oceania growth mostly in solar PV

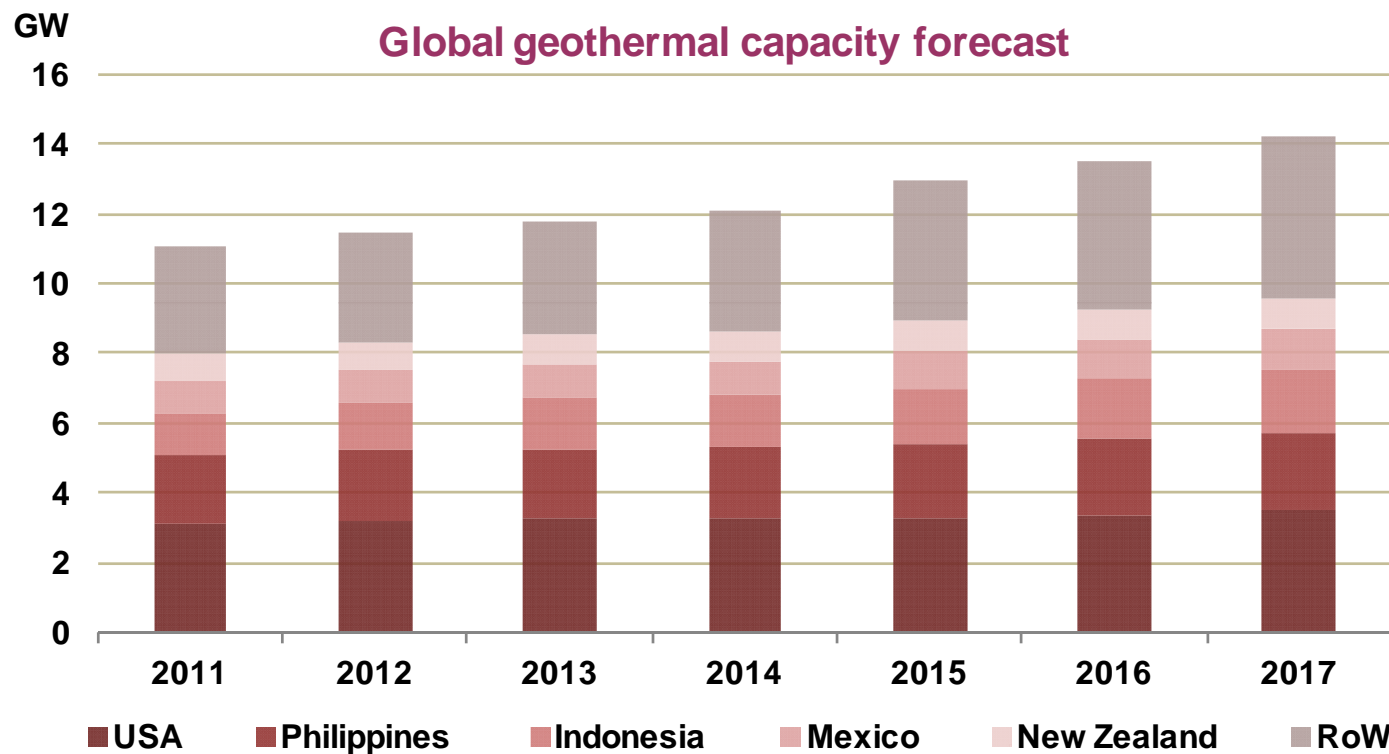
- Japan grows (mostly solar PV) under generous FiTs and uncertain nuclear situation
- Australia's growth is centered around wind and solar PV
- New Zealand continues its steady growth
- Korea and Israel grow from a low base





ASEAN a significant source of other Asia growth

- Geothermal expands in Indonesia and the Philippines
- Significant hydropower additions expected in Vietnam
- Thailand continues to grow a portfolio of renewable power sources – biomass, biogas, waste-to-power, solar PV, wind





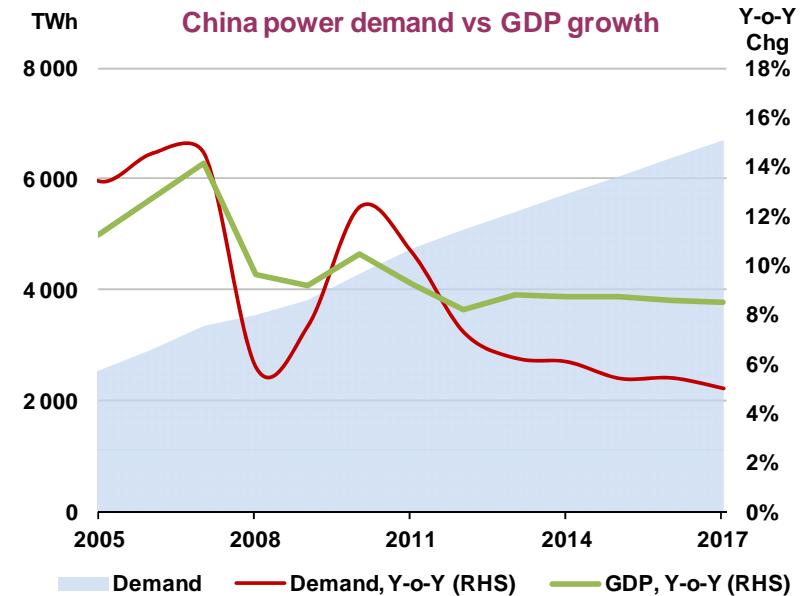
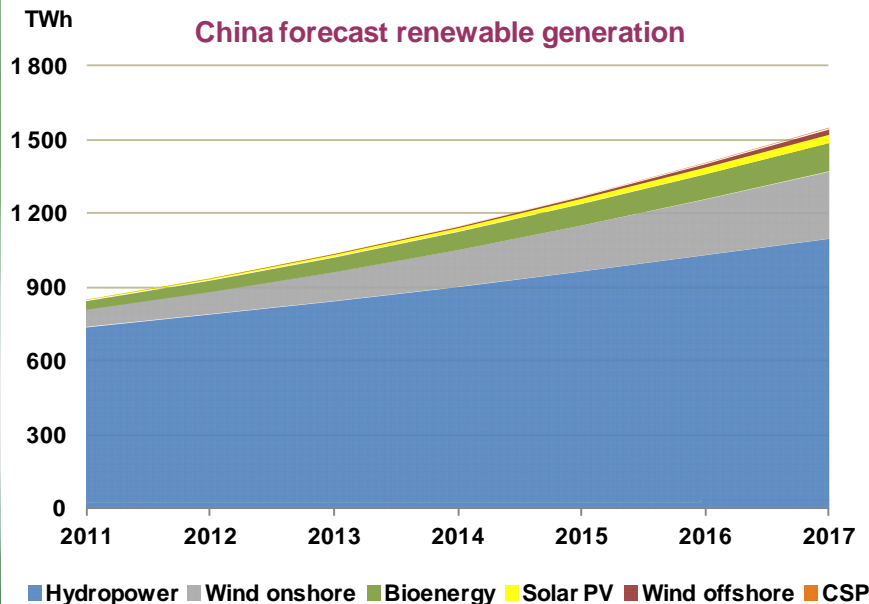
China accounts for 40% of global growth

■ Drivers:

- Growing energy needs
- Diversification
- Government targets
- Ample low-cost finance
- Robust manufacturing

■ Challenges:

- Pricing framework
- Priority dispatch
- Grid upgrades
- Prohibitive licensing for small-scale systems





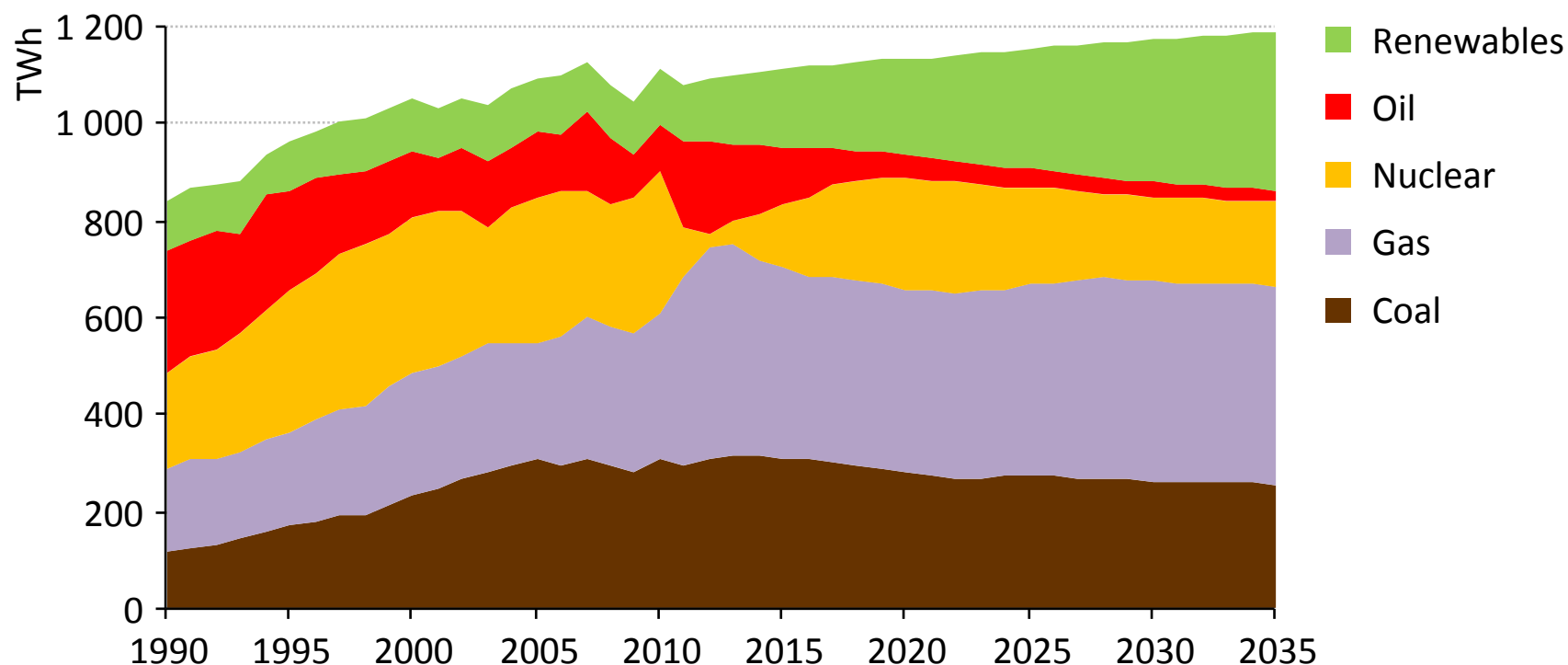
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Japan's Power Sector: Renewables & energy efficiency leading the charge

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Japan electricity generation by source



A decline in nuclear is compensated by a 3-fold increase in electricity from renewables, a continued high reliance on LNG imports & improvements in efficiency



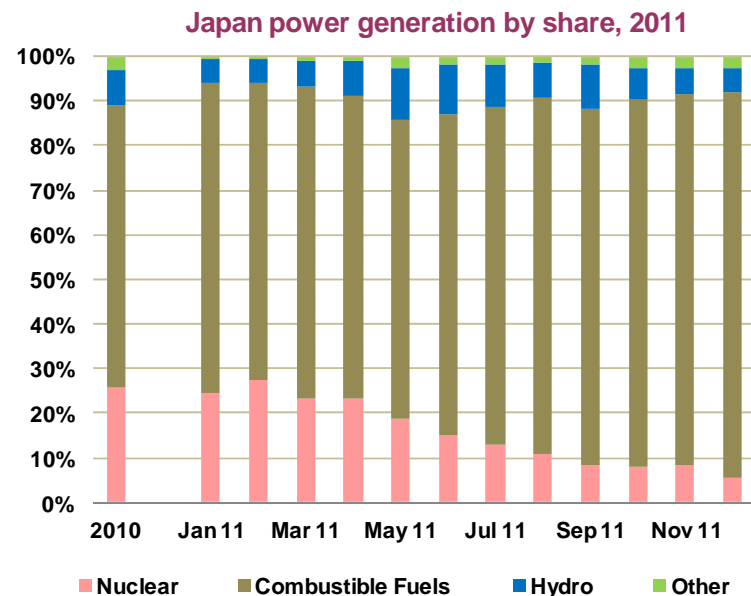
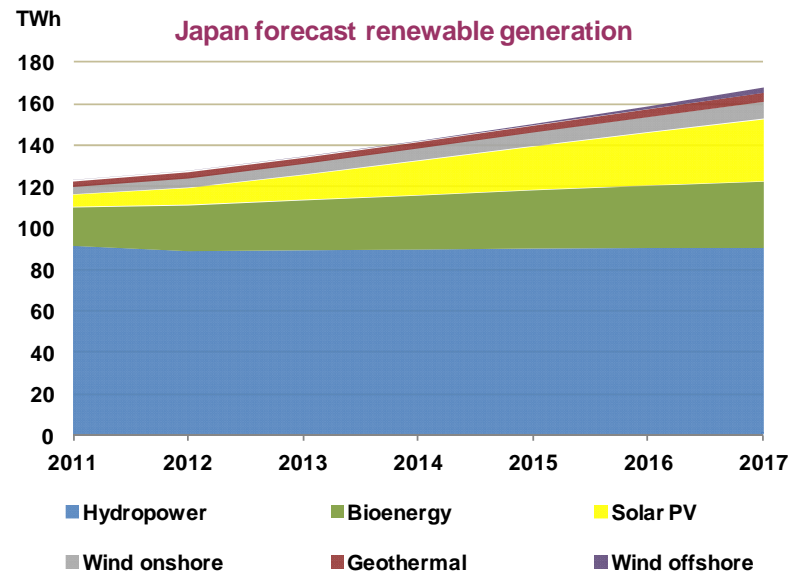
Japan grows strongly under uncertain nuclear situation and new feed-in tariff policy

Drivers:

- Uncertainties about nuclear restart
- New feed-in tariffs
- Good match of solar PV for shaving peak load

Challenges:

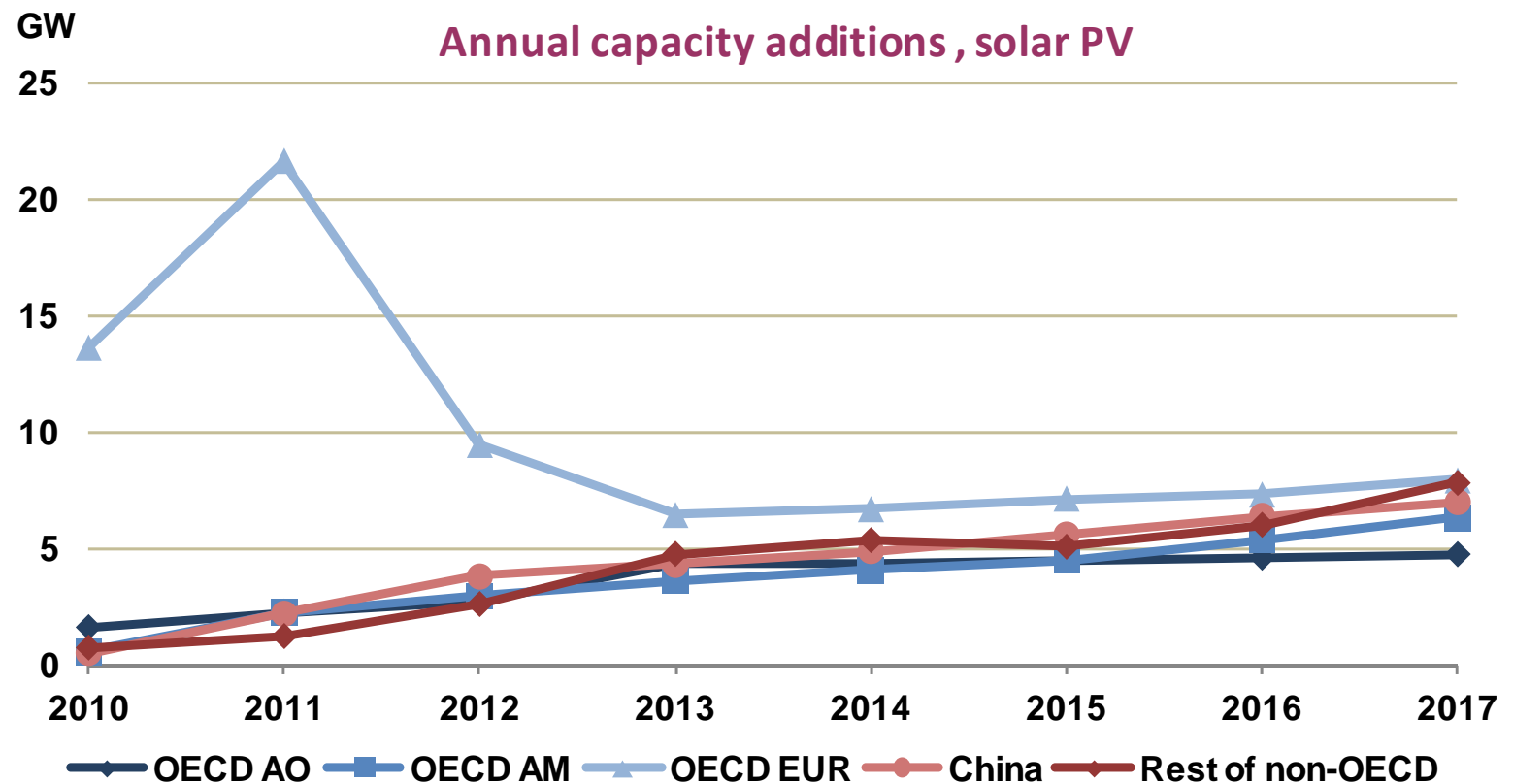
- Power system fragmentation
- Relatively high capital costs of renewable energy
- Location of wind and geothermal resources far from demand centres





Solar PV - from volatility to smoother growth

- Short term volatility and slowing growth in Europe
 - In some markets, cost reductions outpaced incentive reductions
- Japan's high incentives could cause deployment to surge to unsustainable levels if incentives are not adjusted over time

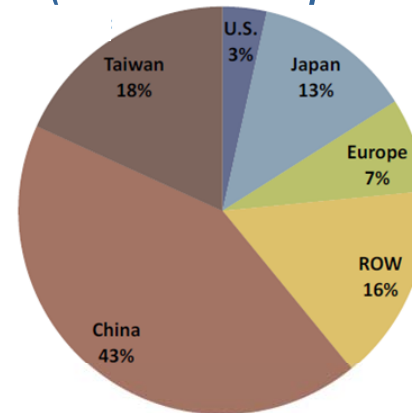




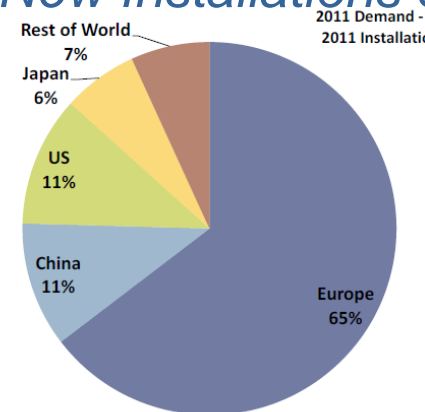
Ongoing Issues for PV

- **Impact on electricity bills in some countries**
 - German EEG-surcharge will increase 45% in 2013
 - But likely to stabilise from 2014 on
- **Emerging trade disputes**
 - Imbalance is smaller if whole value chain is taken into account

*Supply in 2011
(Manuf. Capacity 55 GW)*

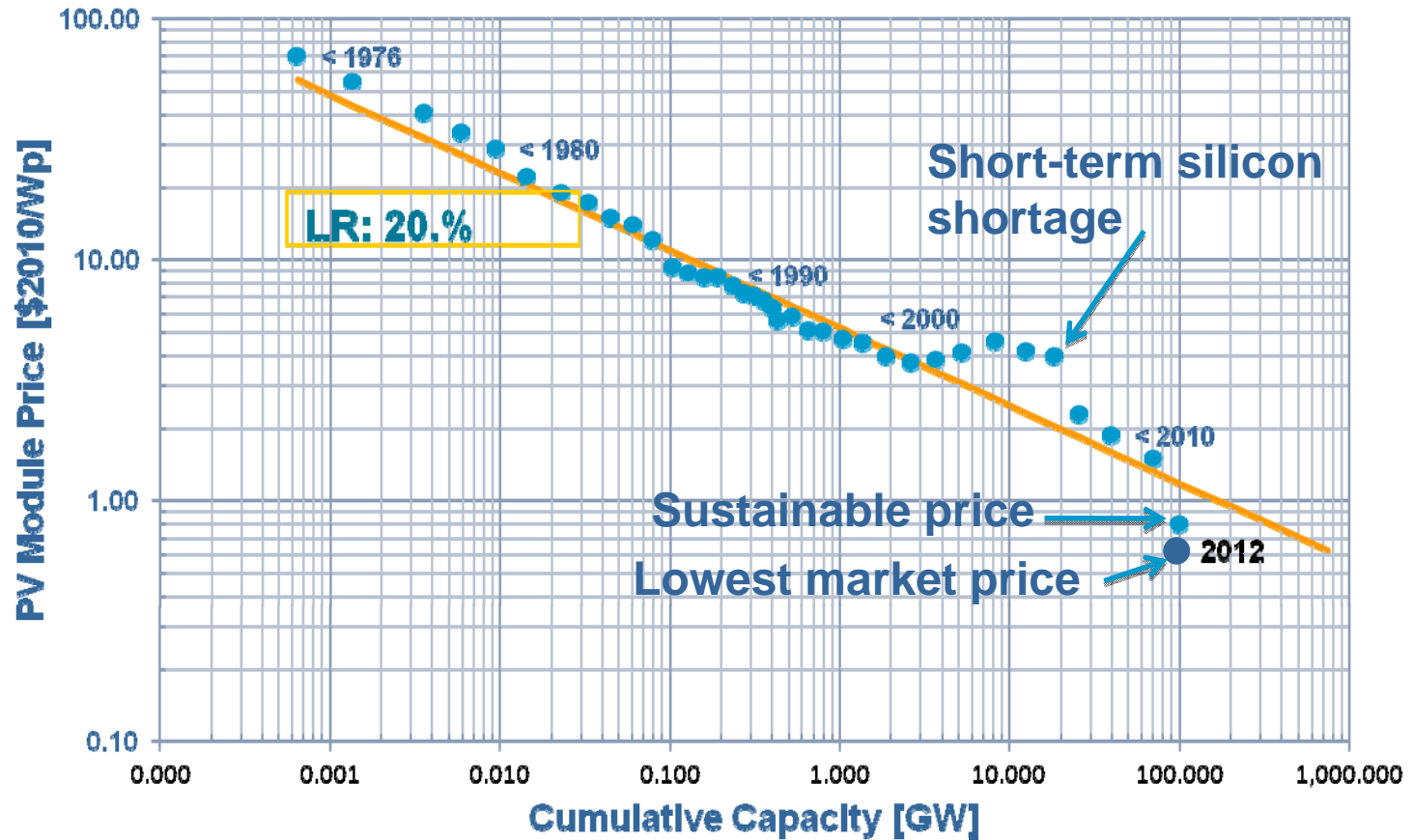


*Demand in 2011
(New Installations 30GW)*





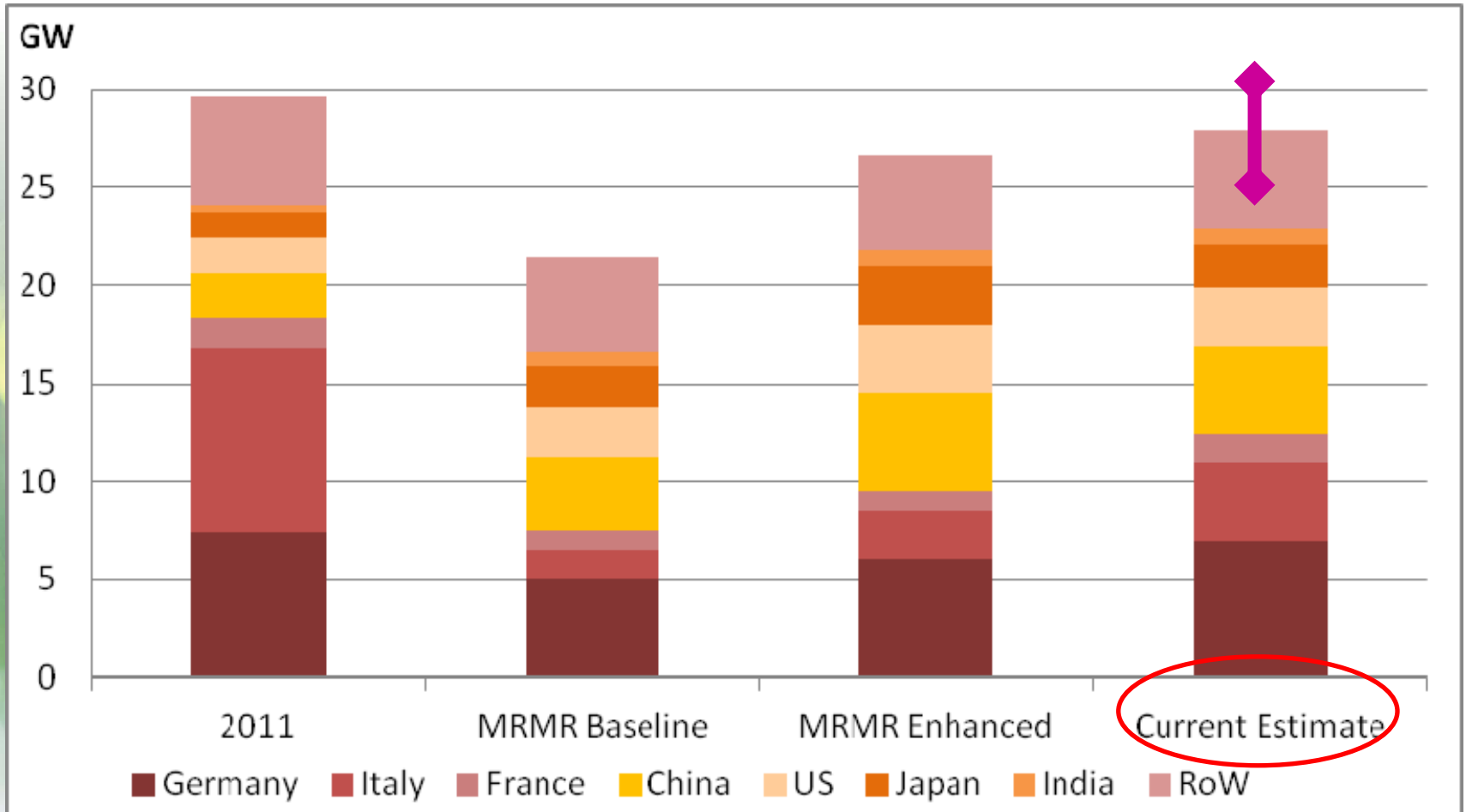
PV Module Prices



- Technology improvements and economies of scale drive sharp cost reduction
- Overcapacity leads to price setting below costs



2012 PV Market stronger than expected



- **Another >7 GW year in Germany**
- **Italy slows down but less than expected, other markets accelerate**
- **Cumulative world capacity around 100 GW**

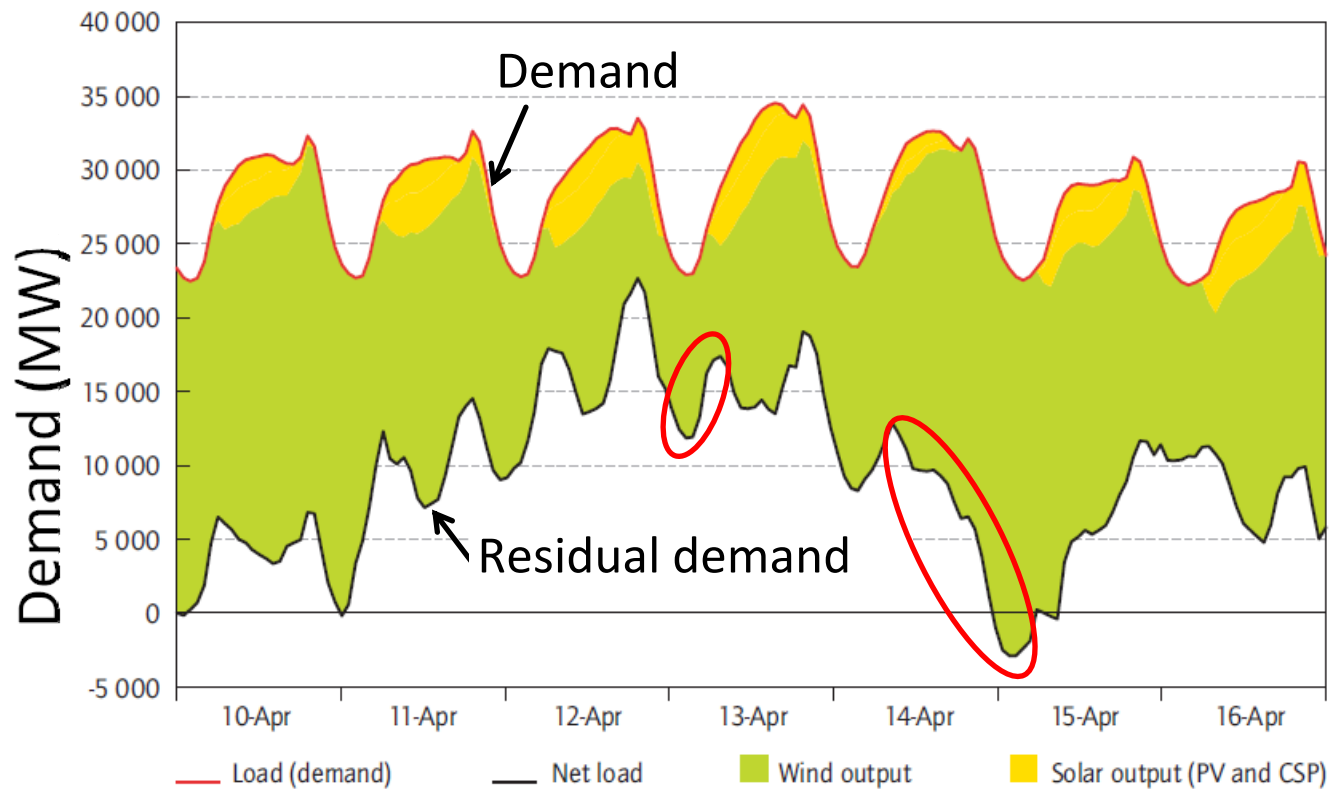


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A power system perspective is important

- Variability and uncertainty are **not** new
 - ◆ But at **high shares** (of VRE) the challenge will be considerable

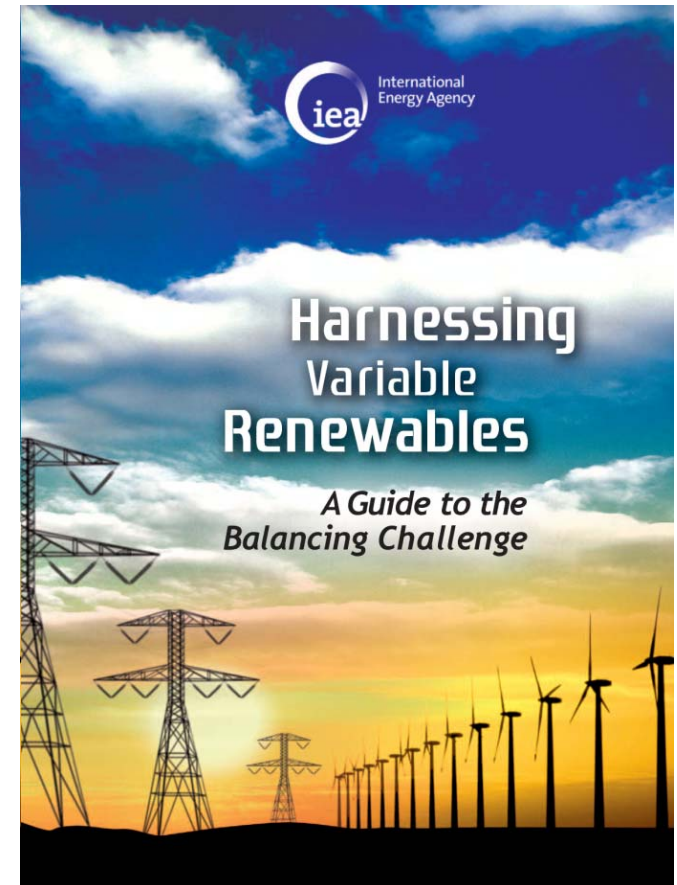


- Residual demand shape is **irregular** (particularly wind, wave)



Grid Integration of Variable Renewables (GIVAR)

- 2011: IEA published technical assessment of integration
- Key points:
 - Feasible share of variable RE depends on system flexibility; no principle ceiling
 - Technical assessment of power system flexibility based on case studies
- New phase:
 - Refined definition of flexibility
 - Assess Economics of Flexibility



Flexibility is key

There are 4 flexible resources

Dispatchable power plants

Demand side Response (via smart grid)

Energy storage facilities

Interconnection with adjacent markets

Source: IEA Harnessing Variable Renewables 2011



A biomass-fired power plant

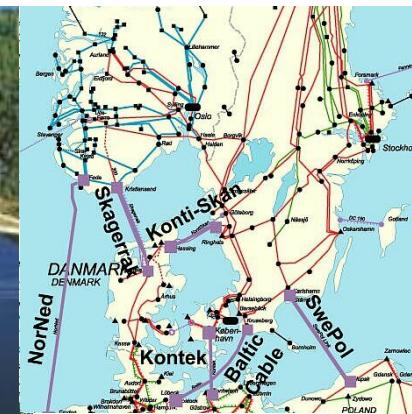


Industrial

residential

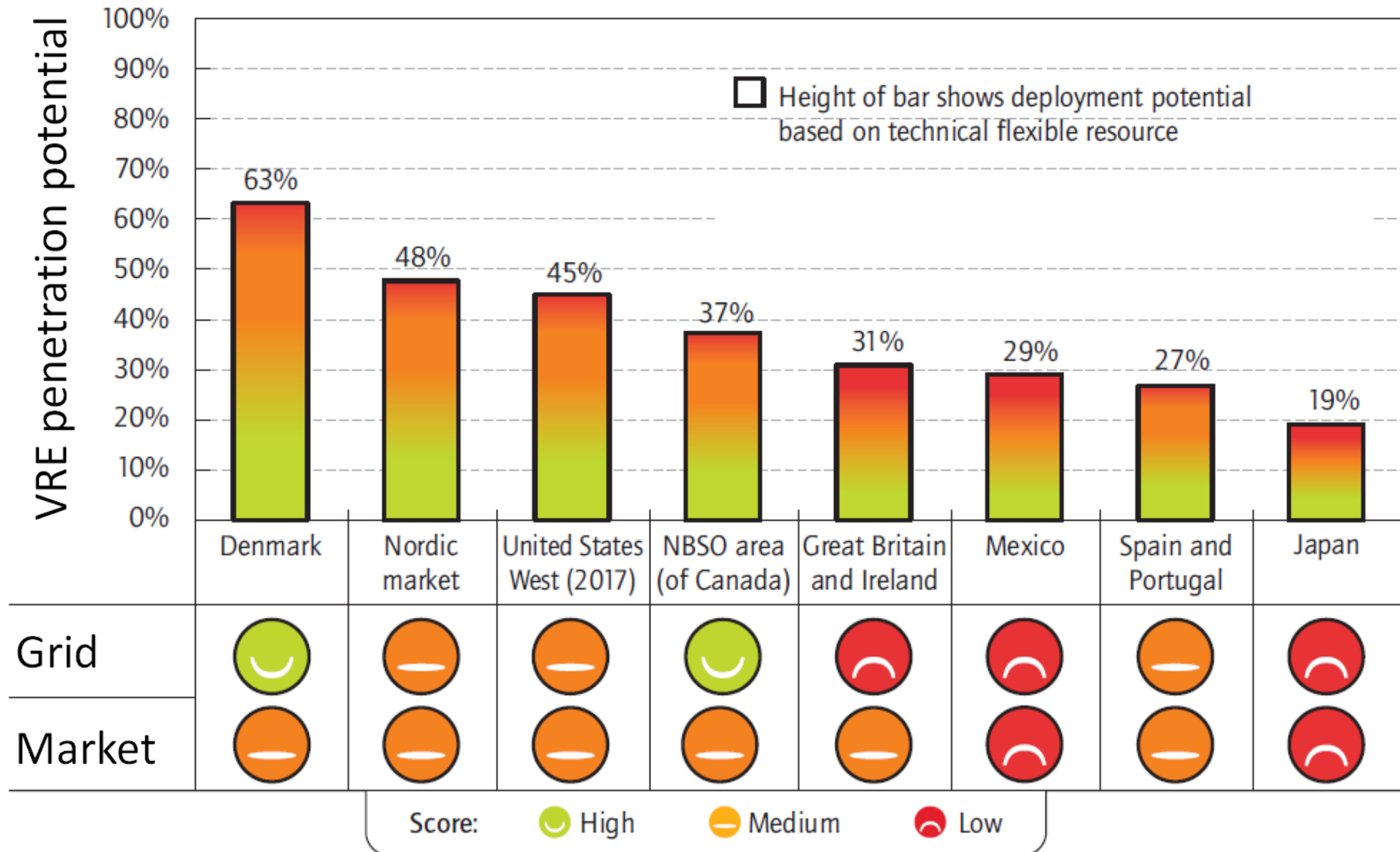


A pumped hydro facility

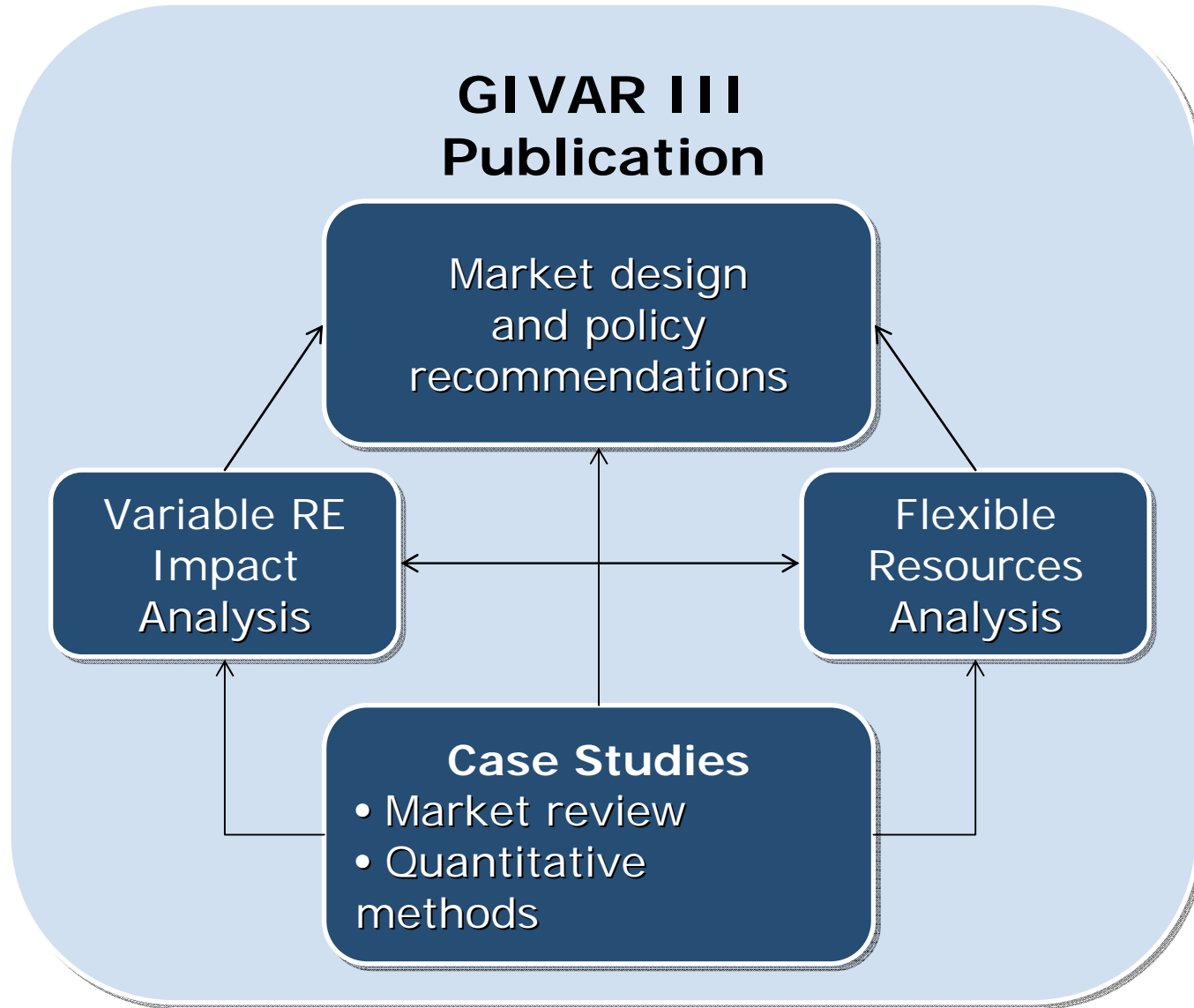


Scandinavian interconnections

Snapshot of present penetration potentials

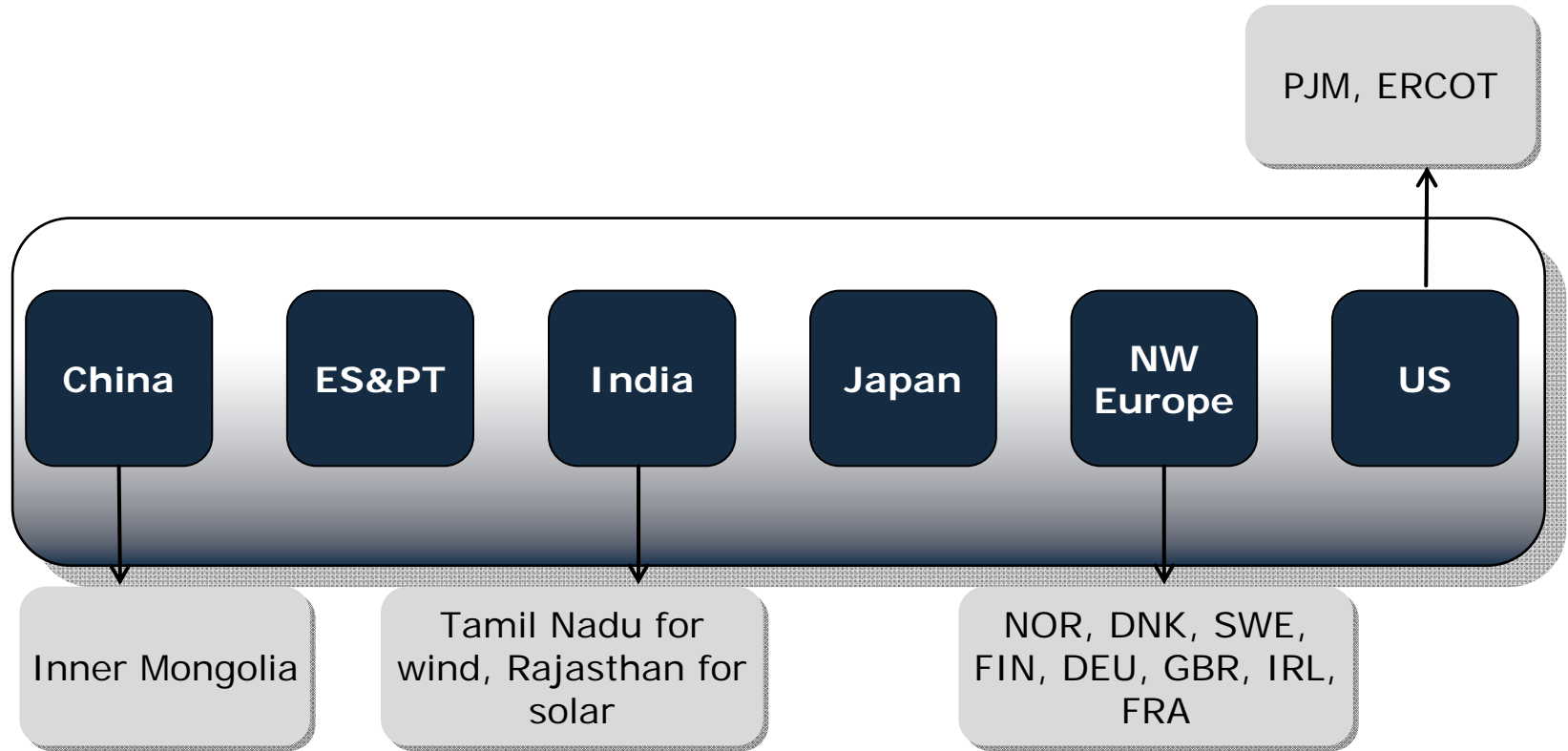


GIVAR III Scope & Objectives



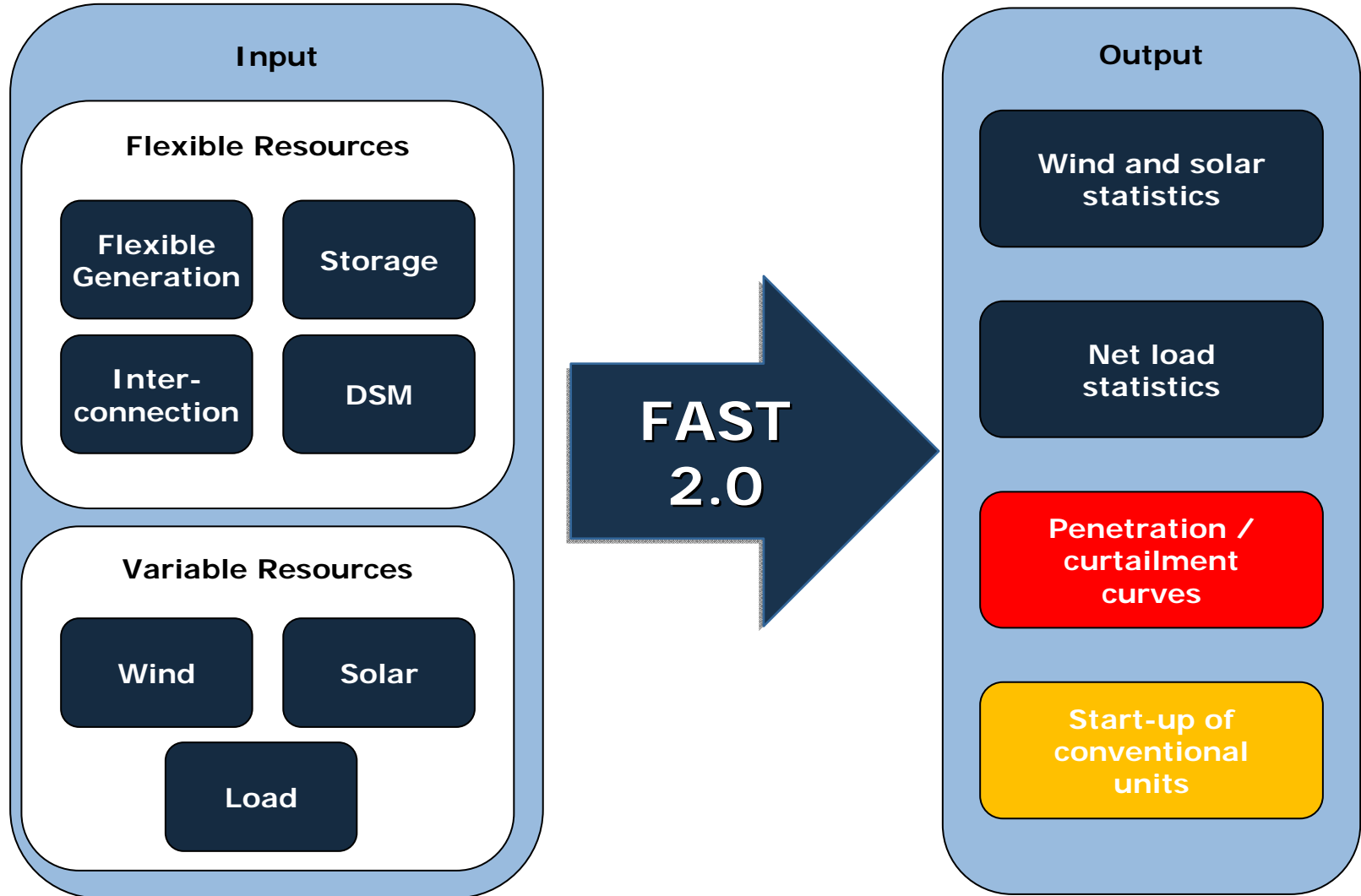


Case Study Regions





Revised FAST Tool





Relevance for Japan

- **Grid integration of renewables will be key issue with growing shares of v-RE**
- **IEA analysis brings together expertise from leading institutions world wide**
- **Co-operation could be very fruitful:**
 - **Benefit from international best practice**
 - **Help the IEA to better understand the situation in the Japanese system, which is an important and special case**



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Is renewable energy under pressure?

- In the short term, there are pressure indicators, particularly in the most dynamic segments: solar PV and wind
 - Challenging macroeconomic and financing conditions
 - Policy uncertainty, (e.g. stop-and-go decision making) in some key markets
 - Economic incentives cut in some markets
 - Market competition from other energy sources, particularly gas in the US
 - Industry upheaval and integration challenges

- In the long term, larger integration issues to emerge
 - Renewables becoming more competitive over time
 - Market design reforms needed for high penetrations of low marginal cost, variable renewables into power systems

- Yet, the overall renewable outlook is quite positive
 - Robust fundamentals and drivers remain; huge long-term potential of RE
 - Outlook will depend on policy robustness



Policy messages

- **Clarity, predictability and a long-term orientation of RE policy frameworks are keys to maintaining investment**
 - Policymakers should avoid stop-and-go decision making, which can cause investment to stall
- **These frameworks should focus on the whole portfolio of renewables (incl. hydropower, bioenergy, RE heat, etc.)**
- **Meanwhile, there needs to be increased focus on market designs that integrate higher levels of renewables in power systems (both variable and dispatchable)**
- **A radical turn away from renewables now would be more costly in the long run in terms of climate costs and energy import bills**



For further insights and analysis...



- **The Medium-Term Renewable Energy Market Report 2012 online at:**

www.iea.org

- **Thank you for your attention!**

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