

RENEWABLE ENERGY

Medium-Term Market Report 2014

Renewables: where do we stand

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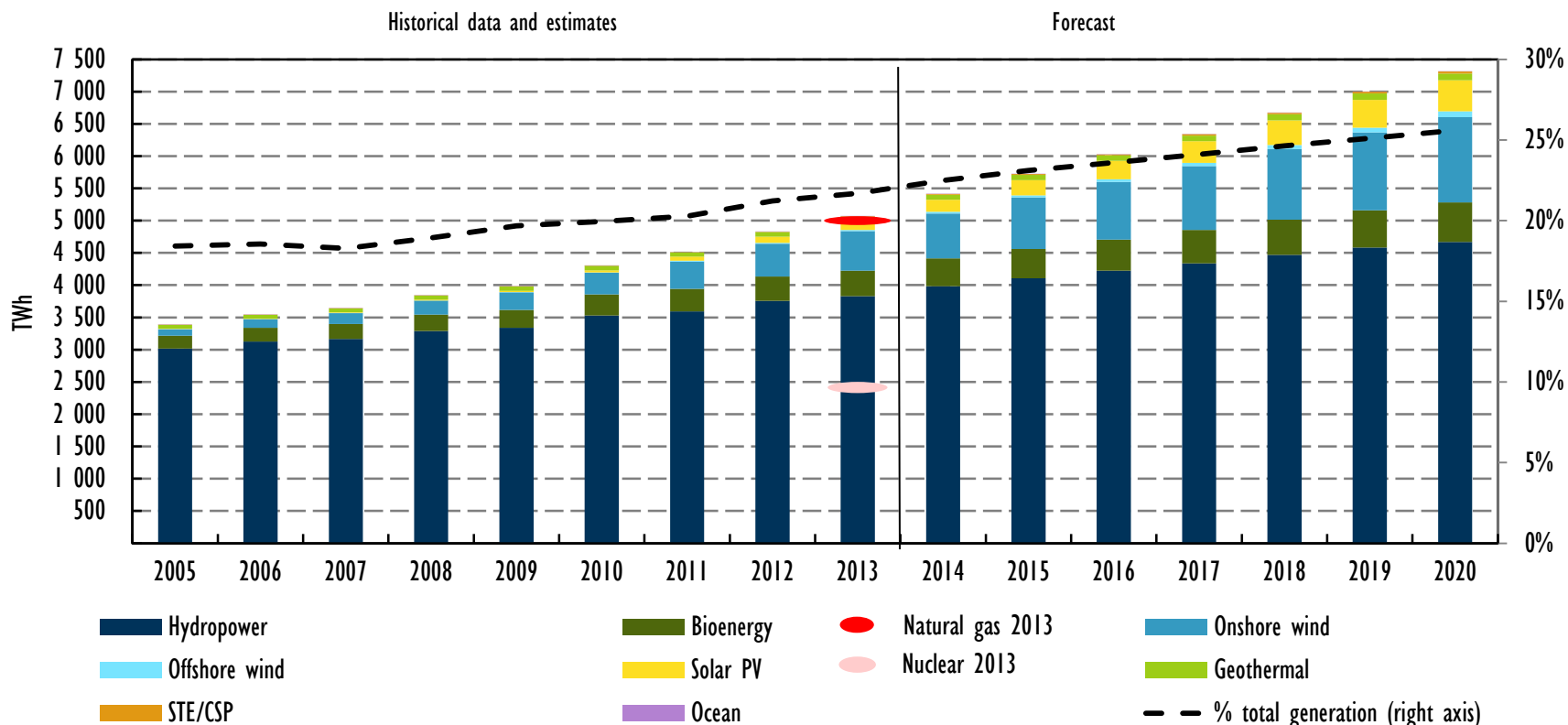
Renewable Energy Division

International Energy Agency

Strong momentum for renewable electricity



Global renewable electricity production, historical and projected

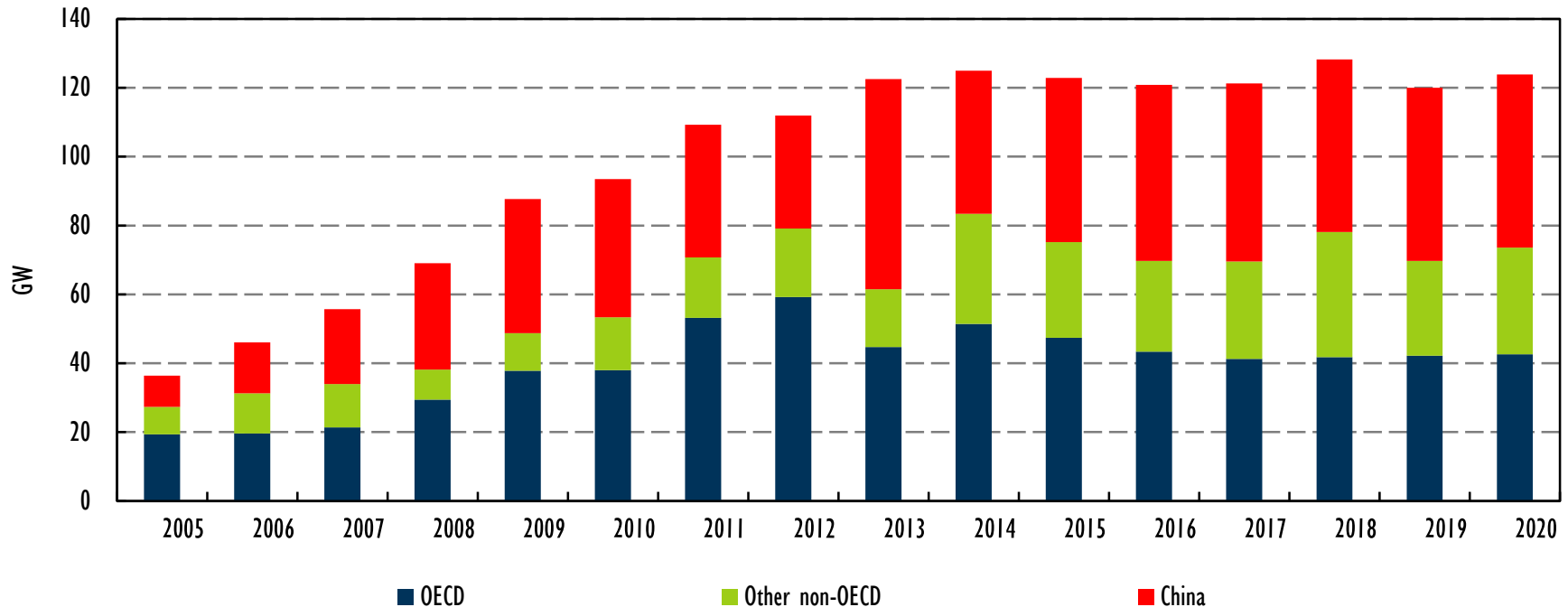


Renewable electricity projected to scale up by 45% from 2013 to 2020

Increasing risks are expected to slow renewable growth



Renewable power annual net capacity additions, historical and projected



- Policy and market risks threaten to slow deployment momentum for renewables

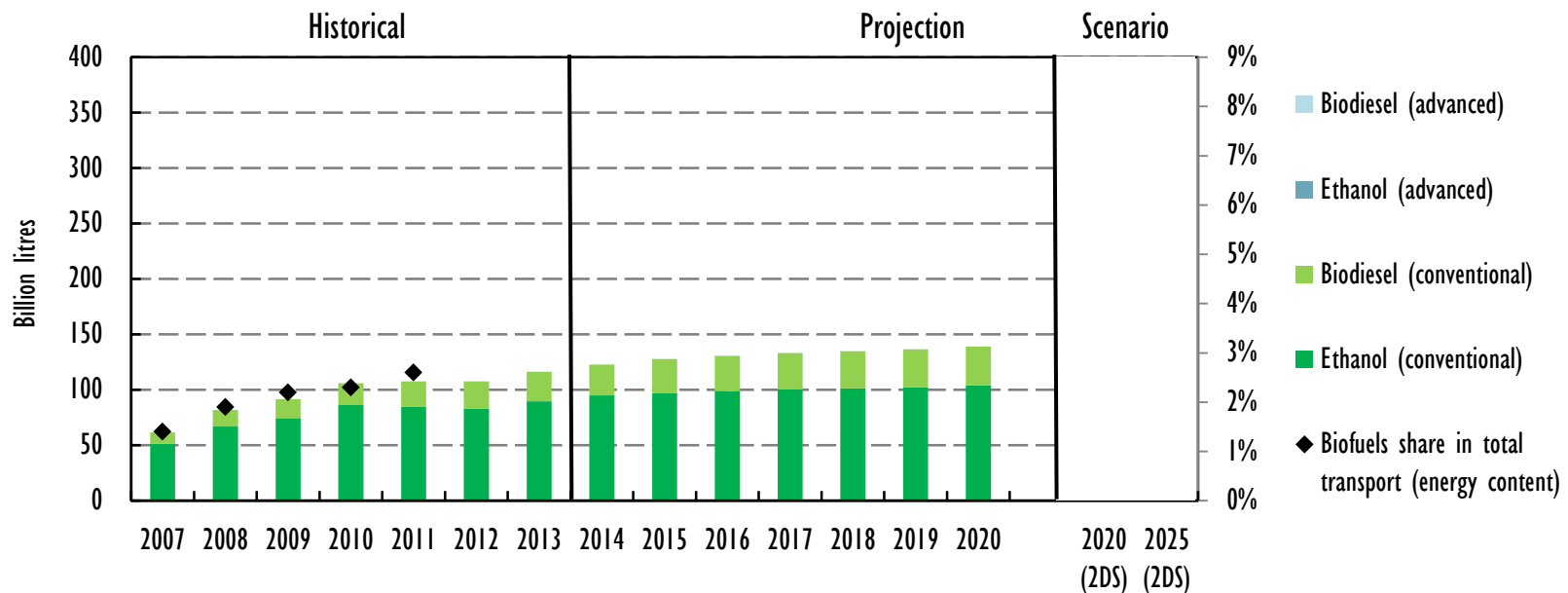


- **Modern renewable heat continues to grow, providing 9% of world final energy use for heat in 2020**
 - **Broader adoption of support policies for renewable heat could reduce energy consumption and enhance energy security**

Transition to advanced biofuels for transport threatened by policy uncertainty



Projected biofuel production versus targets in IEA 2°C Scenario (2DS)

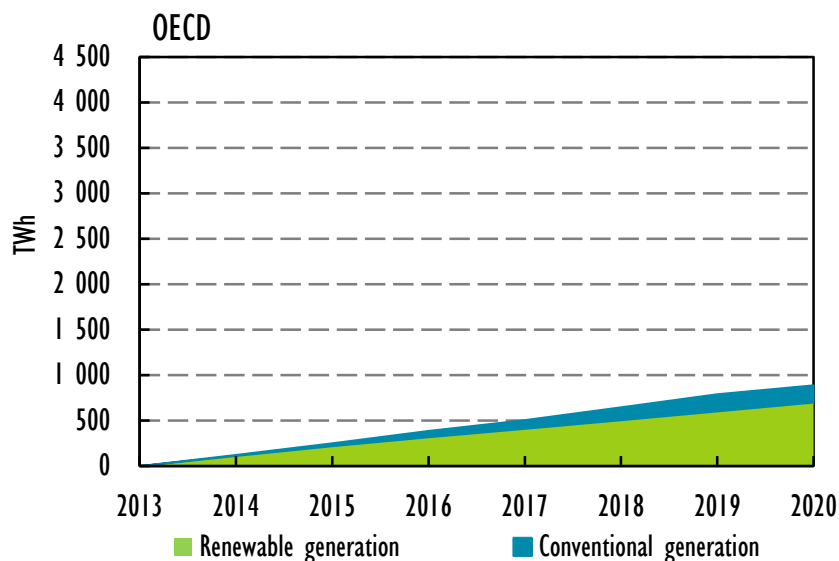


- Conventional biofuel production continues to grow, and will provide 4% of road transport fuel demand in 2020
- First commercial-scale advanced biofuel plants coming on line
 - Without adoption of long-term policy framework, advanced biofuels sector faces grim future

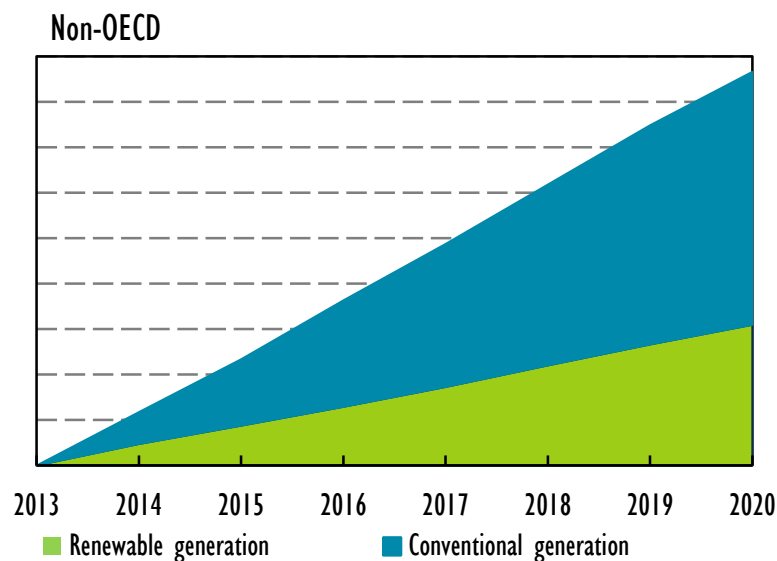
Renewables are major source of new generation



Cumulative change in gross power generation by source and region, 2013-20



- Renewables account for 80% of new generation in OECD
 - Limited upside in stable markets with slow demand and growing policy risks

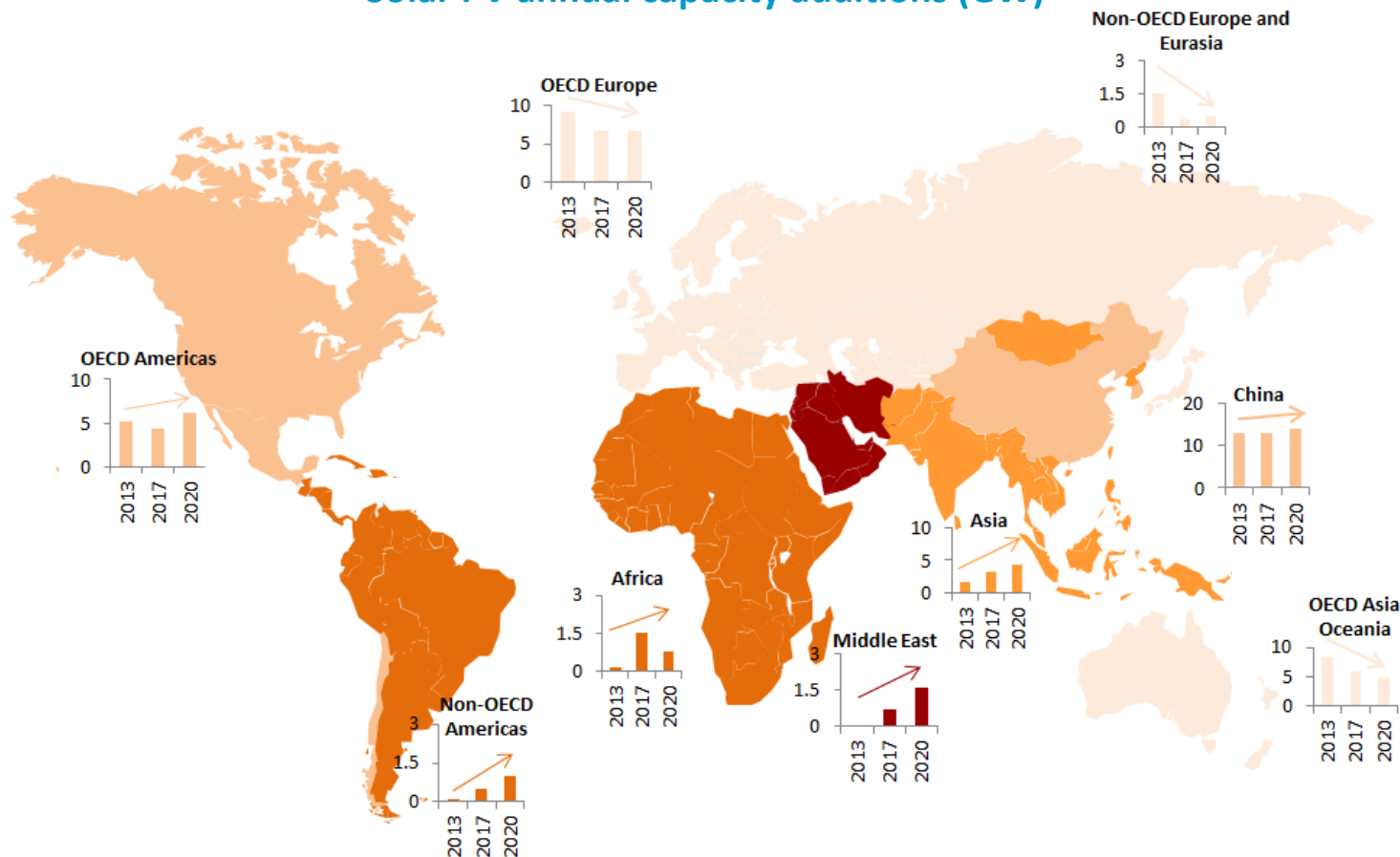


- Renewables are largest new generation source in non-OECD, but meet only 35% of growth
 - Large upside for dynamic markets with fast-growing demand

Stronger outlook for solar PV



Solar PV annual capacity additions (GW)



- Strong growth in emerging markets and some OECD areas
- Policy debates over distributed PV a source of forecast uncertainty

Renewables becoming a cost-competitive generation option in more cases



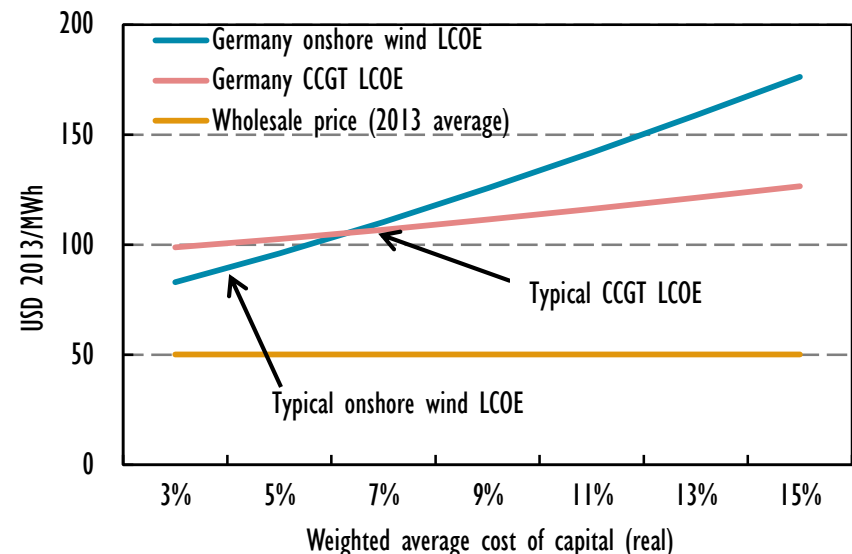
- In some dynamic markets with country-specific conditions and market frameworks, new onshore wind is the economically preferred option versus new fossil fuel plants (e.g. Brazil, Chile and South Africa)

- But fossil fuel subsidies can distort this picture

- In some stable markets, onshore wind with good financing cheaper than new CCGT plants

- But market design based on wholesale pricing may not provide adequate remuneration

Germany LCOEs versus wholesale prices

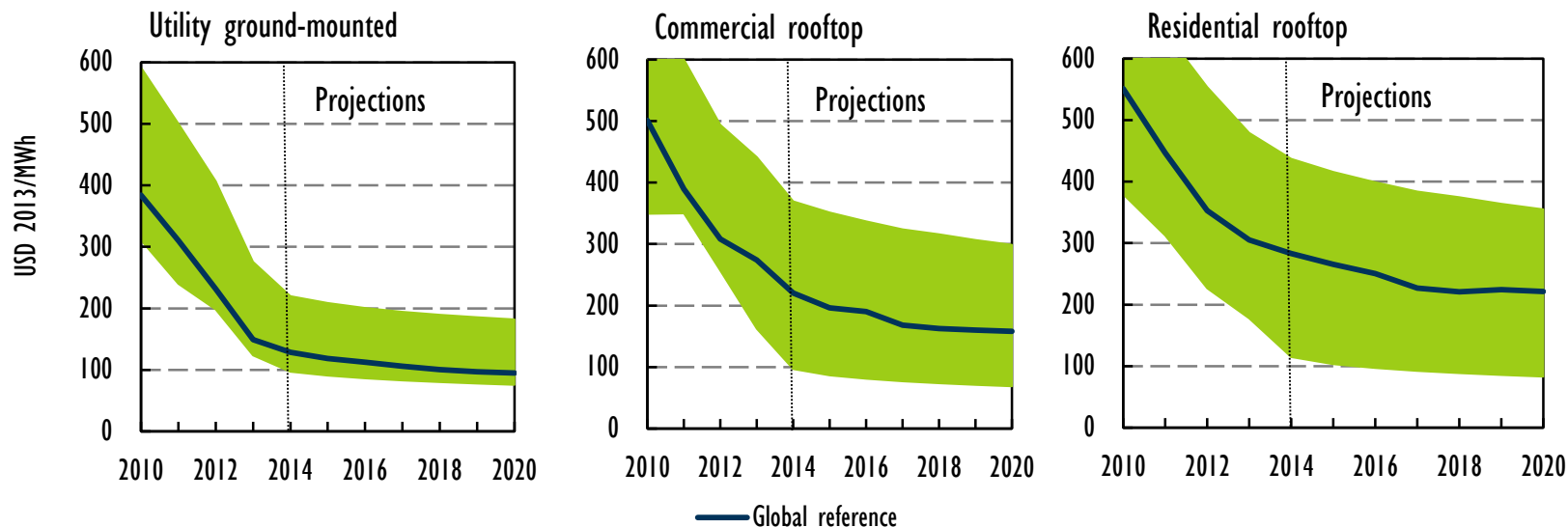


Notes: Onshore wind full load hours are assumed at 2000 and that for CCGT is 3500.
Source: IEA analysis with day-ahead average base-load wholesale prices for 2013 from Bloomberg LP.

Generation costs for solar PV falling rapidly



Historical and projected LCOEs for typical solar PV systems, beginning year

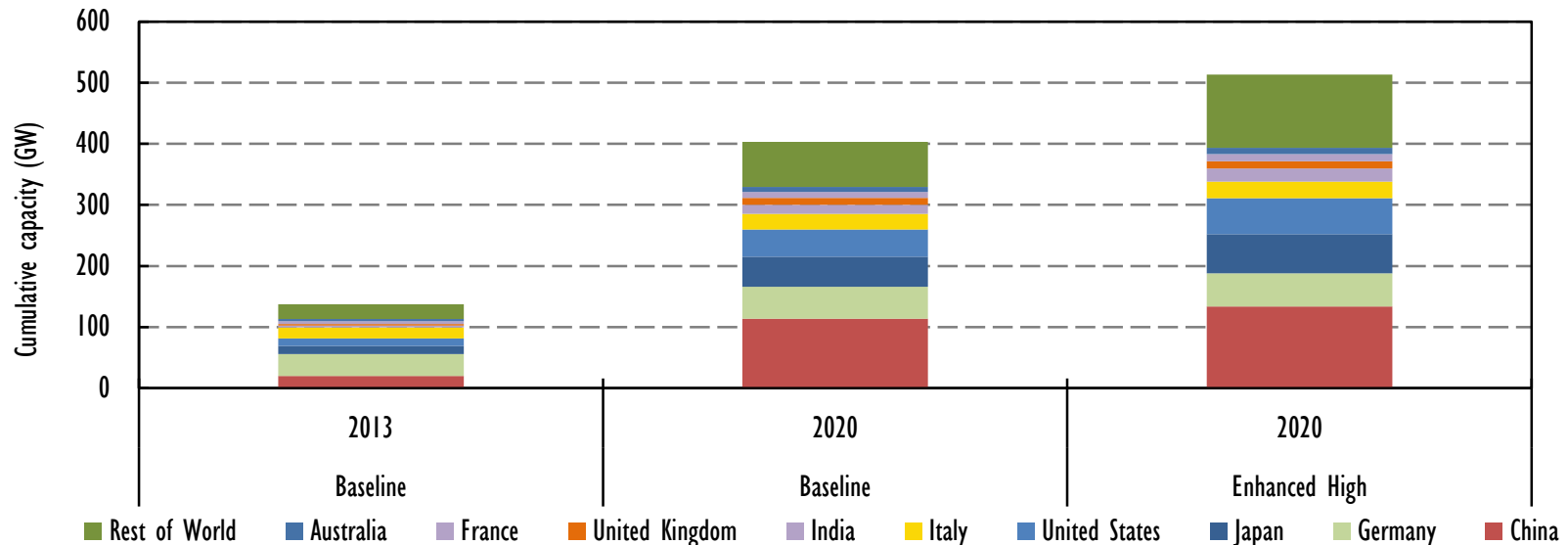


- Growing economic competitiveness of utility-scale solar PV, with fewer incentives, versus other bulk power sources
- At present, the combination of low financing costs, low system prices and excellent resources remains exceptional
- Large ranges still exist between markets, i.e. China at low end, Japan at high end

Higher solar PV under enhanced case



Solar PV cumulative capacity, baseline versus enhanced case



■ With certain market and policy enhancements -

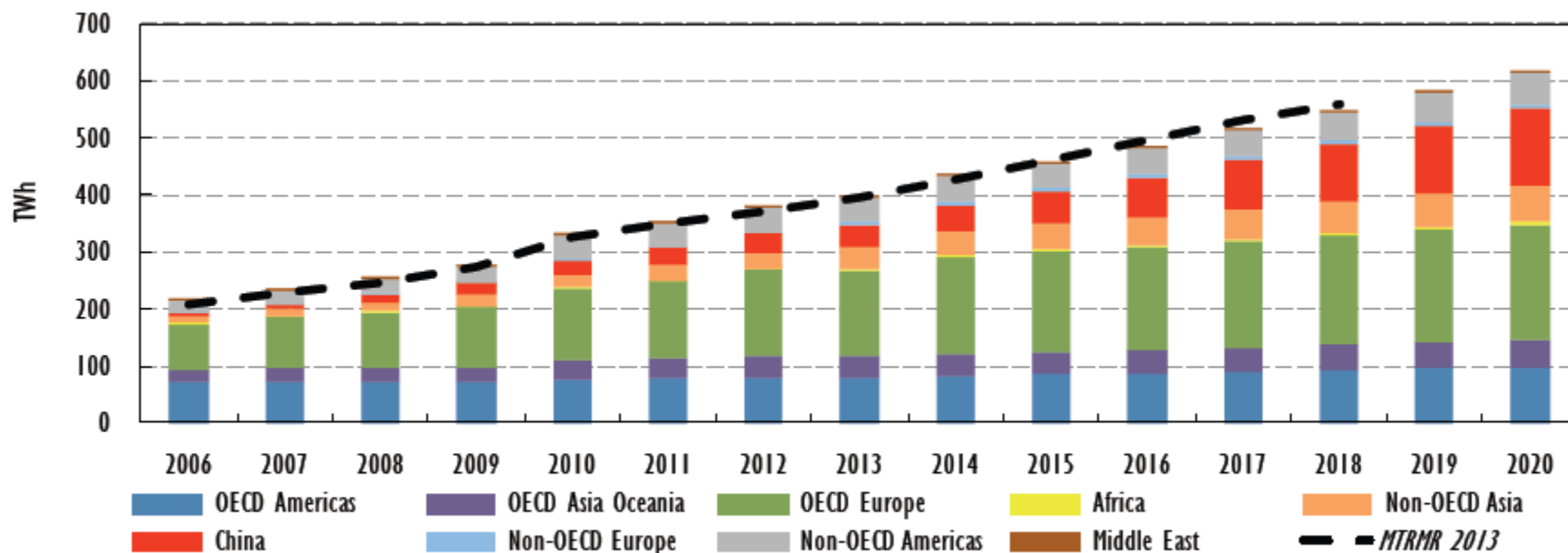
- Fair rules and appropriate electricity rate design for allocating the costs and benefits from fast-growing distributed solar PV
- Greater implementation of ambitious policy aims (e.g. Middle East)
- Faster-than-expected decreases in solar PV costs

■ Solar PV capacity could top 500 GW globally in 2020

Biomass power generation to increase 50%



Bioenergy electricity generation



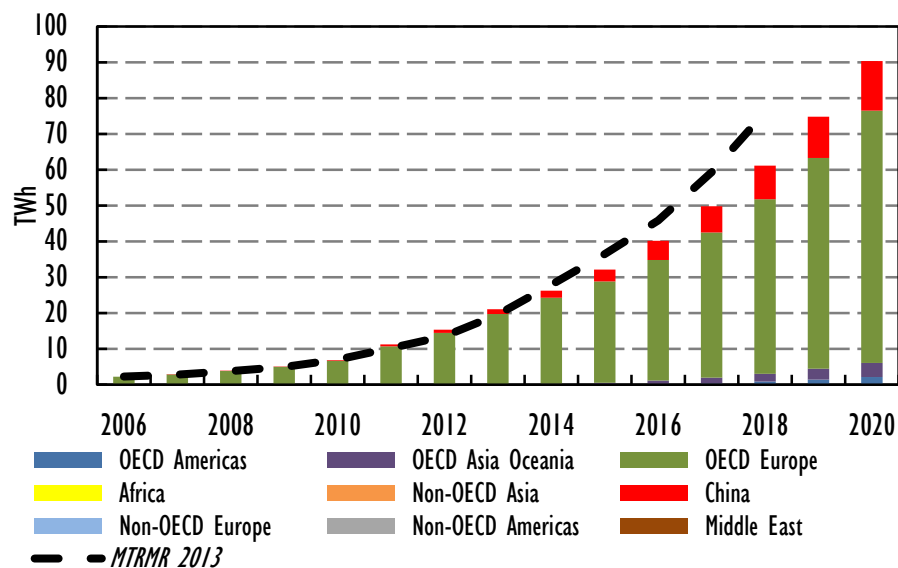
Note: includes generation from renewable municipal solid waste.

- Ambitious plans for agricultural residue use, and waste-to-energy projects, lead to tripling of capacity in China
- Targets for biomass power in the European Union remain an important driver, despite growth in some markets slowing down

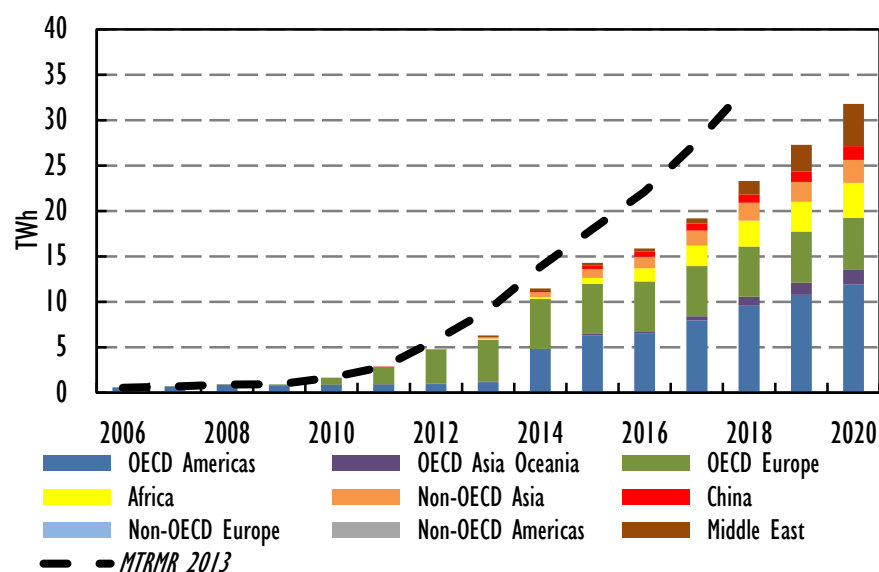
Other technologies growing slowly



Offshore wind generation



Solar thermal electricity generation



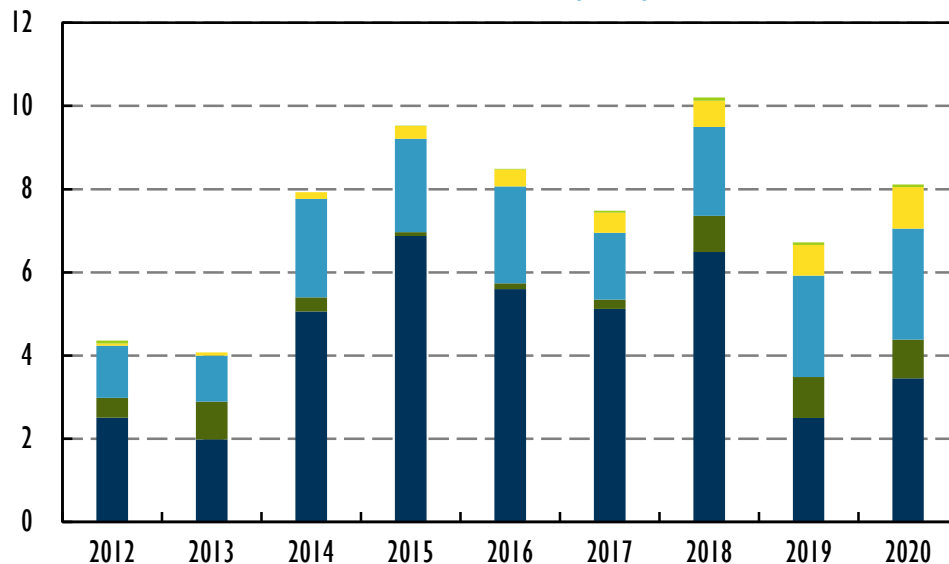
- Potential of offshore power remains high, but technical, financial and grid connection issues pose challenges
- Storage adds value to CSP, but deployment hampered by relatively high costs

Non-OECD Americas growth driven by hydropower and wind

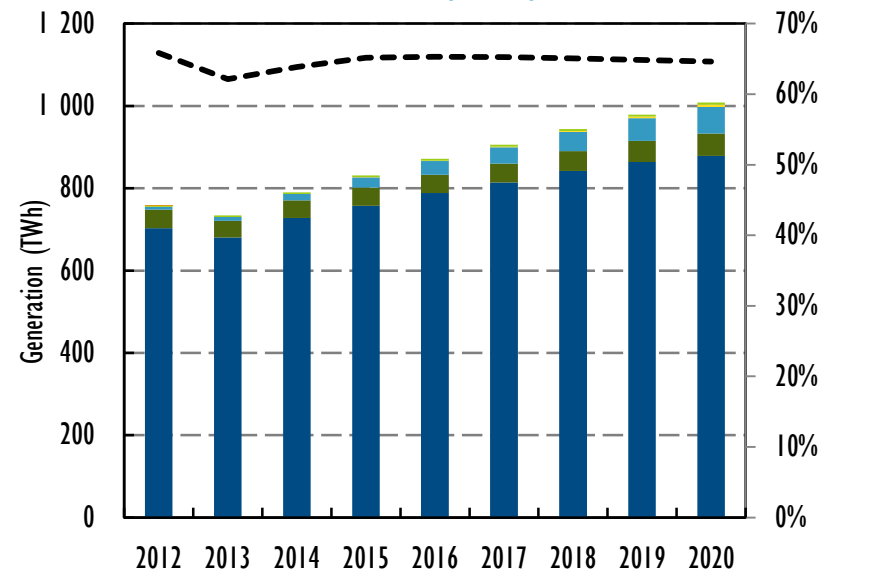


- Total RE capacity seen rising by almost 40%, from 163 GW in 2013 to 221 GW in 2020
- Hydropower leads additions (Brazil, Ecuador, Colombia), followed by wind (Brazil, Peru, Uruguay)
- Large potential for solar PV; bioenergy developments led by new bagasse-fired generation in Brazil

Annual additions (GW)



Generation (TWh)



■ Ocean
 ■ STE
 ■ Geothermal
 ■ Solar PV
 ■ Offshore wind
 ■ Onshore wind
 ■ Bioenergy
 ■ Hydro
 --- % renewables

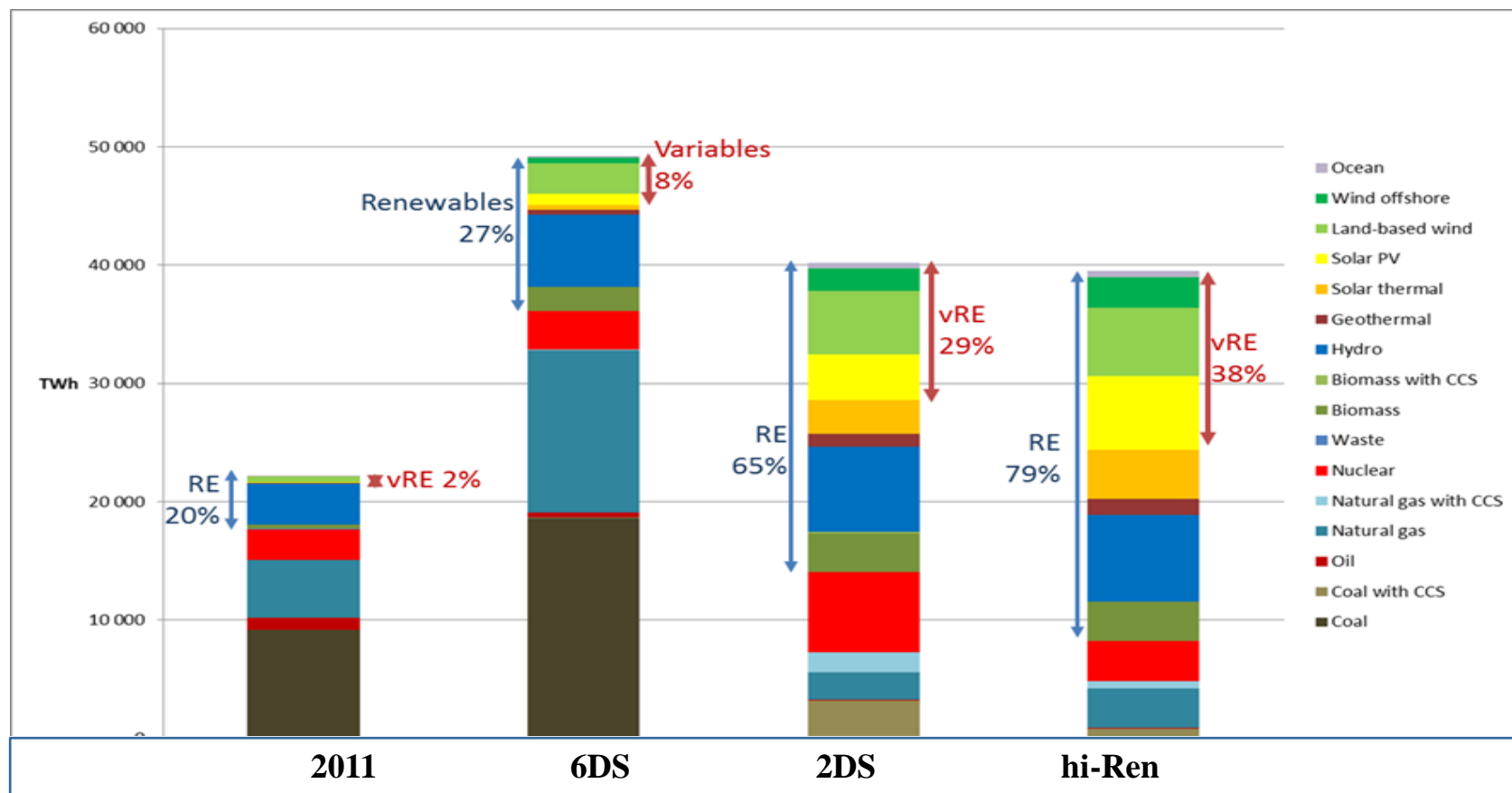
Two dynamic markets for renewables in Latin America



	Chile	Mexico
Power Market	Dynamic with high prices, need new generation	Dynamic with high prices, need new generation
RE target	Share of non-hydro 20% by 2025	Clean energy target 30% (nuclear inclu.) by 2024
RE policy/support	Portfolio standard	Green certificates
Grid Integration	Connection problems and congested grid	Connection problems and lack of interconnection between regions
Competitiveness	Wind and solar competitive with fossil fuel plants in some locations	Wind and solar competitive with fossil fuel plants in some regions
Financing	Findings PPAs with large consumers/distributors is challenging	New electricity reform and uncertainty of implementation RE policy

Power: a share reversal is needed

ETP
2014



■ Today:

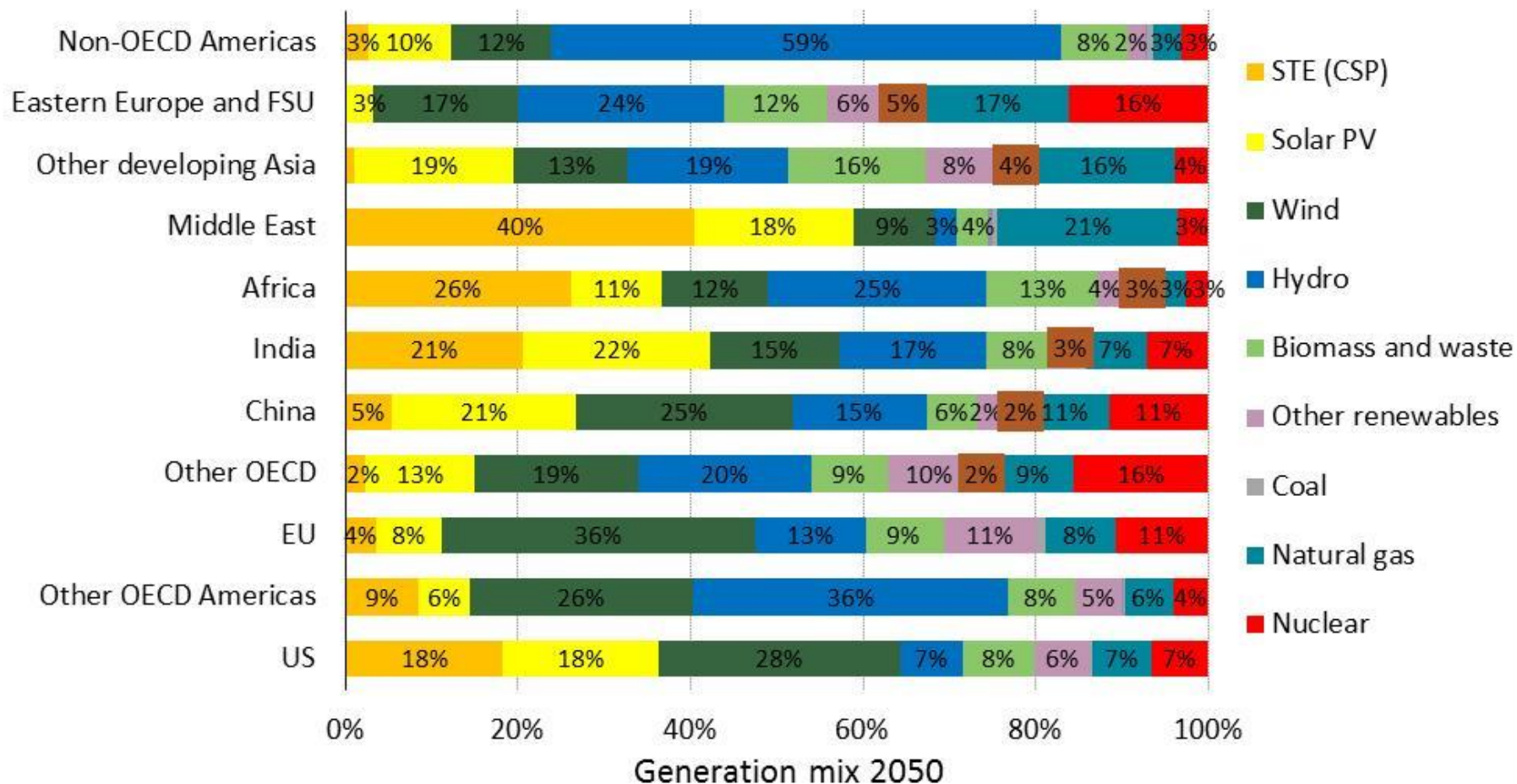
- Fossils: 68%
- Renewables: 20%

■ By 2050

- Renewables: 65 to 80%
- Fossils: 20%

Different optimal power mixes in different regions by 2050

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Three pillars of system transformation

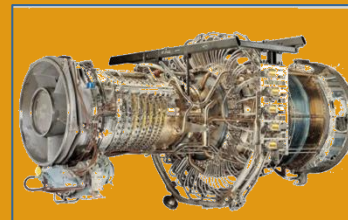


Technology
spread

Geographic
spread

Design
of power
plants

*System
friendly
VRE*



Investments



Operations

Main messages to policy makers



- **Solutions to future development rest in policy makers' hands**
 - Policy risk main barrier to investment
- **Policies to focus on cost-efficiency**
 - But policy changes must be predictable, and retroactive changes must be avoided
- **Given capital-intensive nature, renewables require market context that assures reasonable and predictable returns**
- **Muddled signals may send the wrong messages about renewables at a time when newer markets have opportunity to leapfrog to more flexible and cleaner energy systems**