



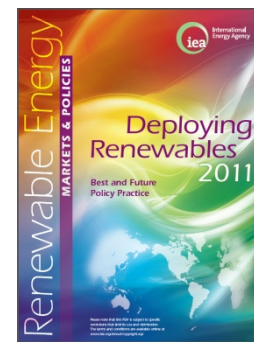
Renewables Outlook and Policy Challenges

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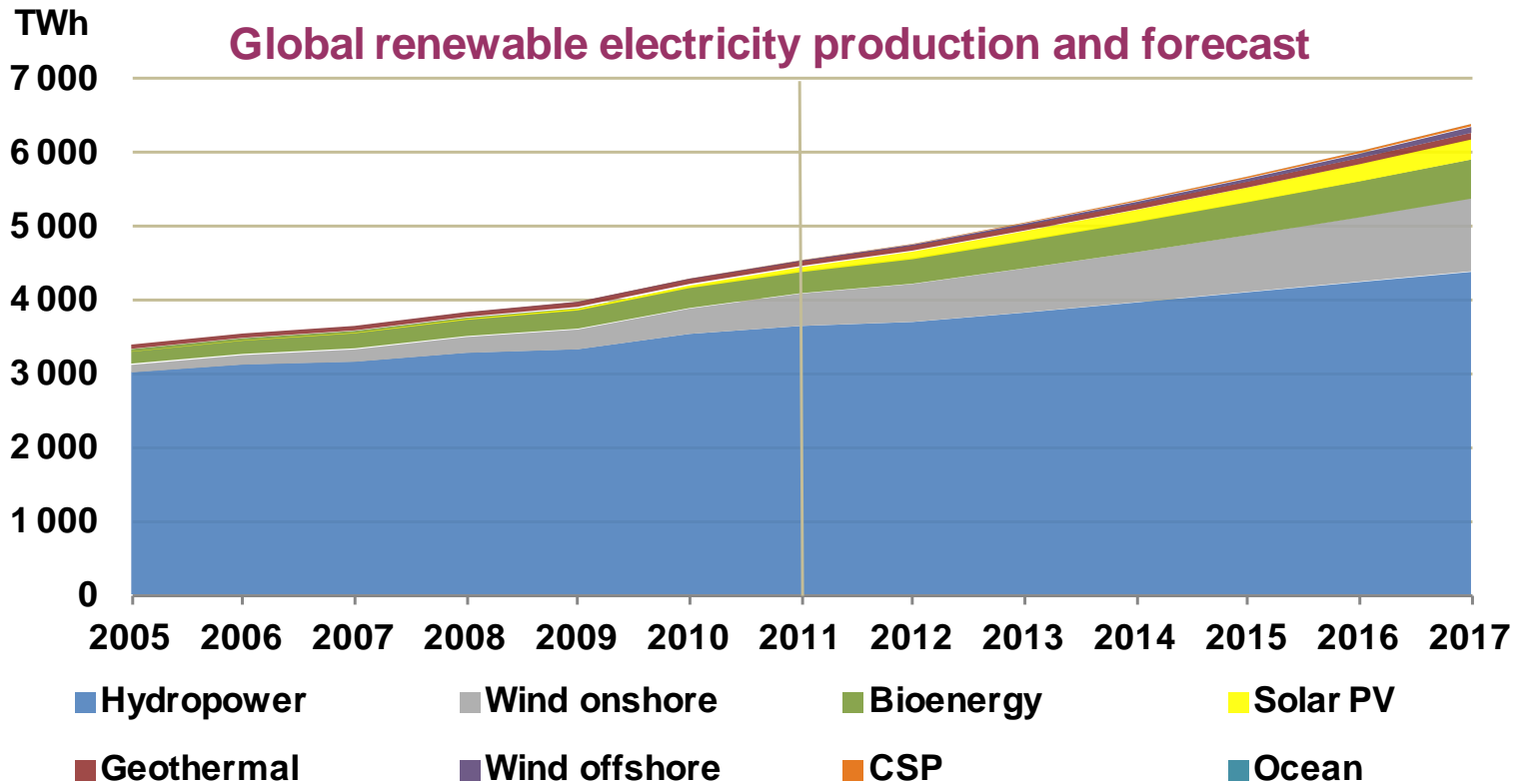
International Energy Agency

- **Market outlook for renewable electricity to 2017**
- **The role of bioenergy in long-term scenarios to 2050**
- **Policy challenges for renewable energy deployment**



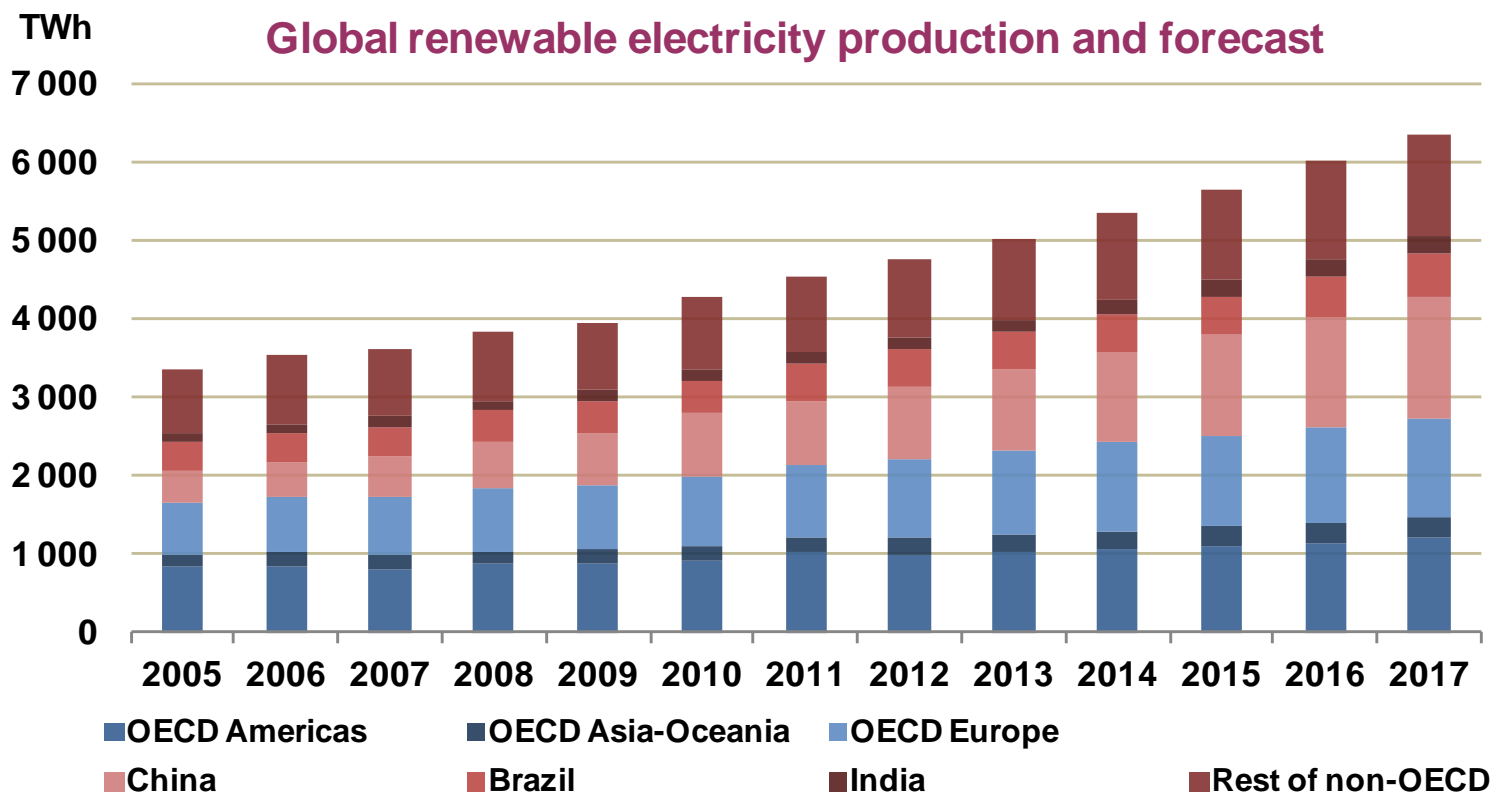
Growth in renewable power is forecasted to accelerate in next five years

- 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.)



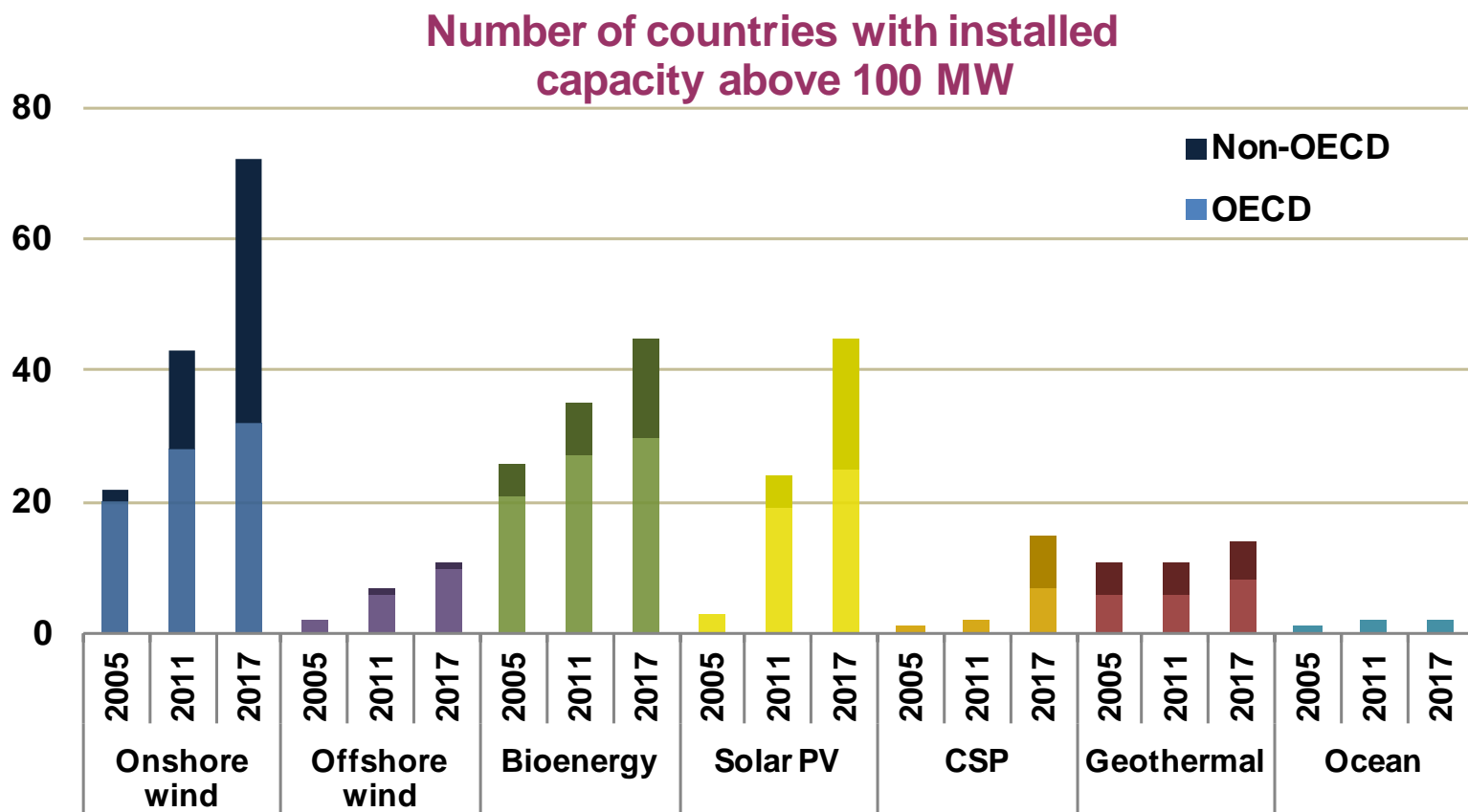
Growth is led by non-OECD countries

- 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

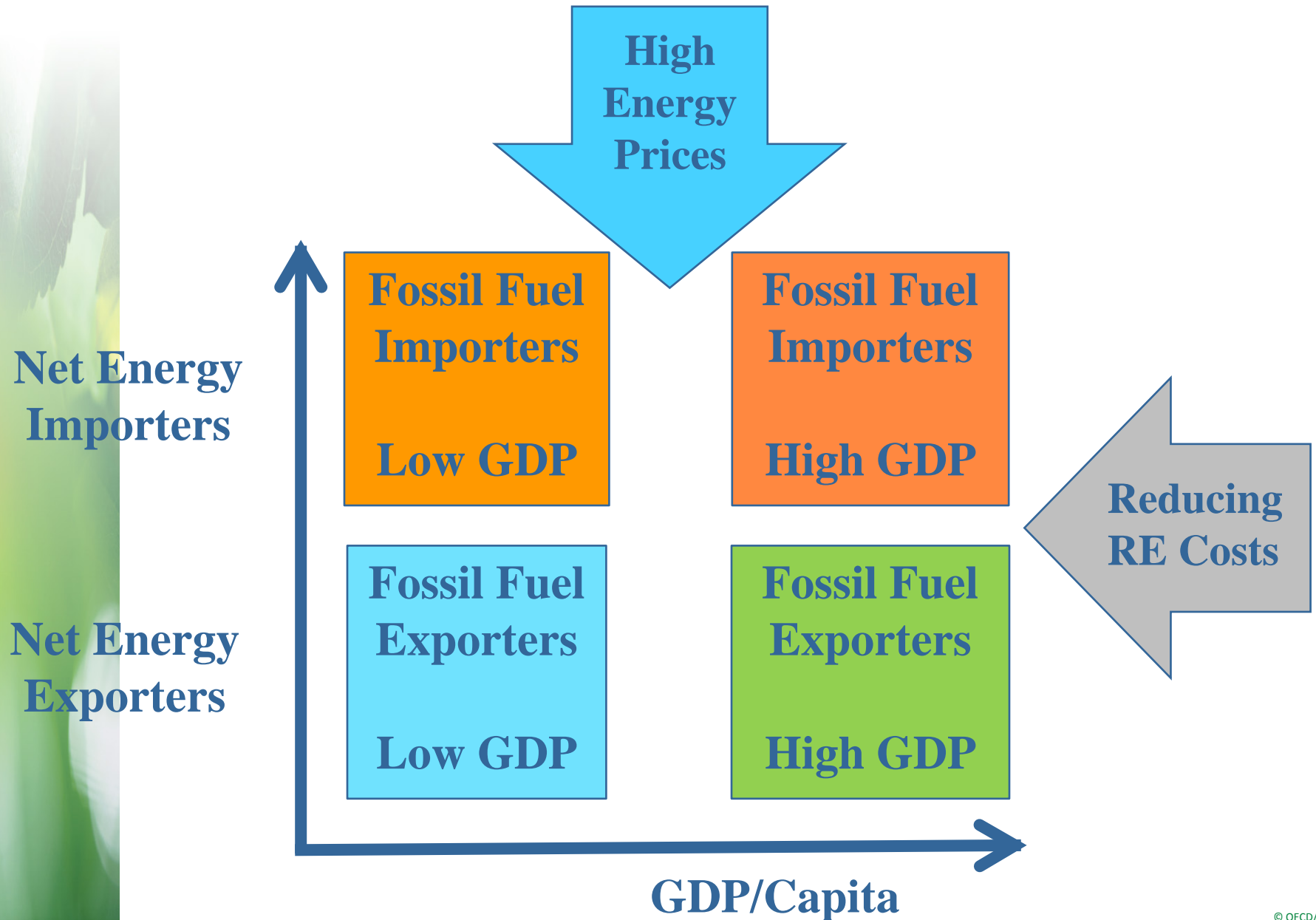


Non-hydro technology deployment spreads out

- Number of countries with cumulative capacity larger than 100 MW increases significantly
- Growth areas include Asia, Africa, Latin America and the Middle East

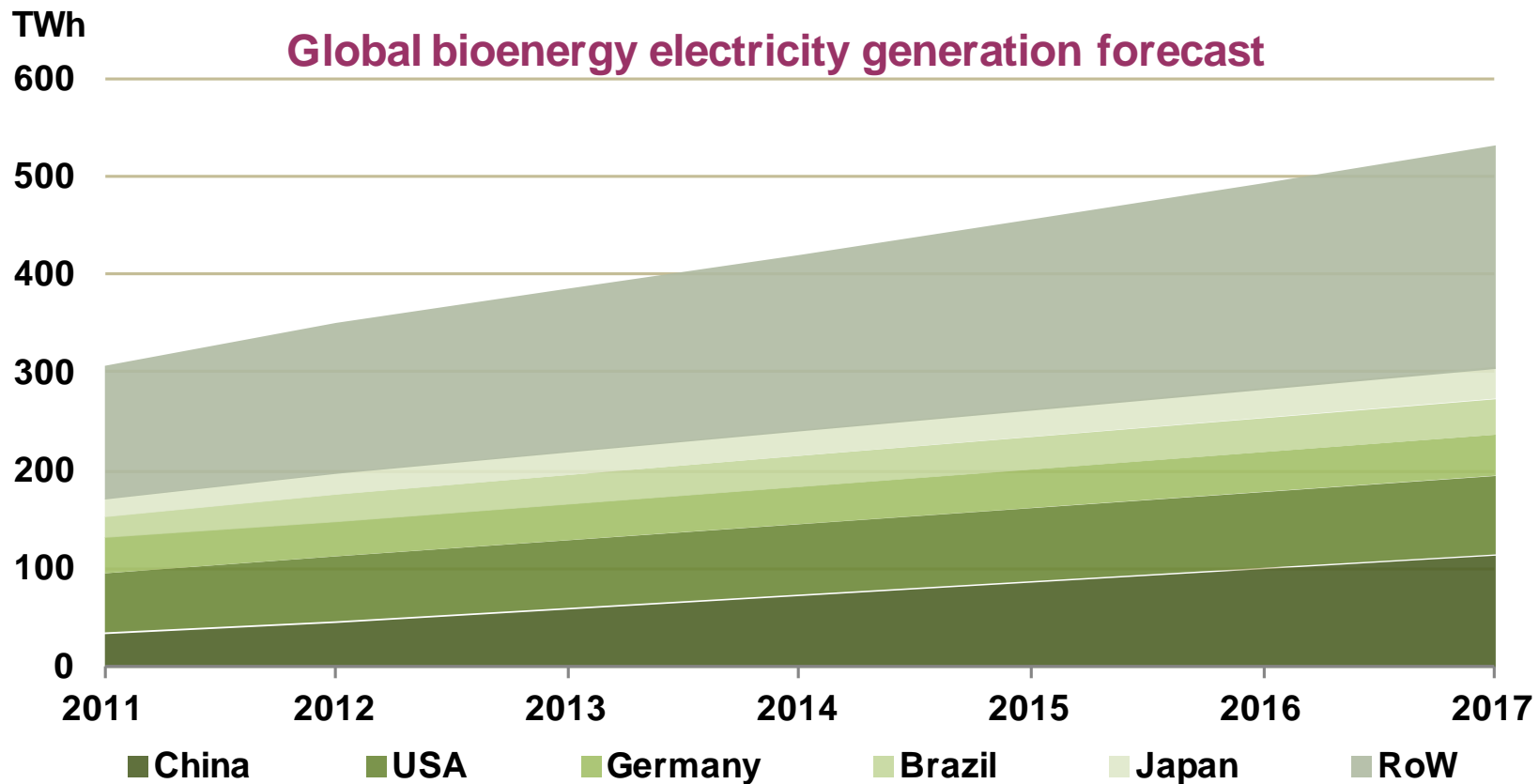


RE Market Expanding



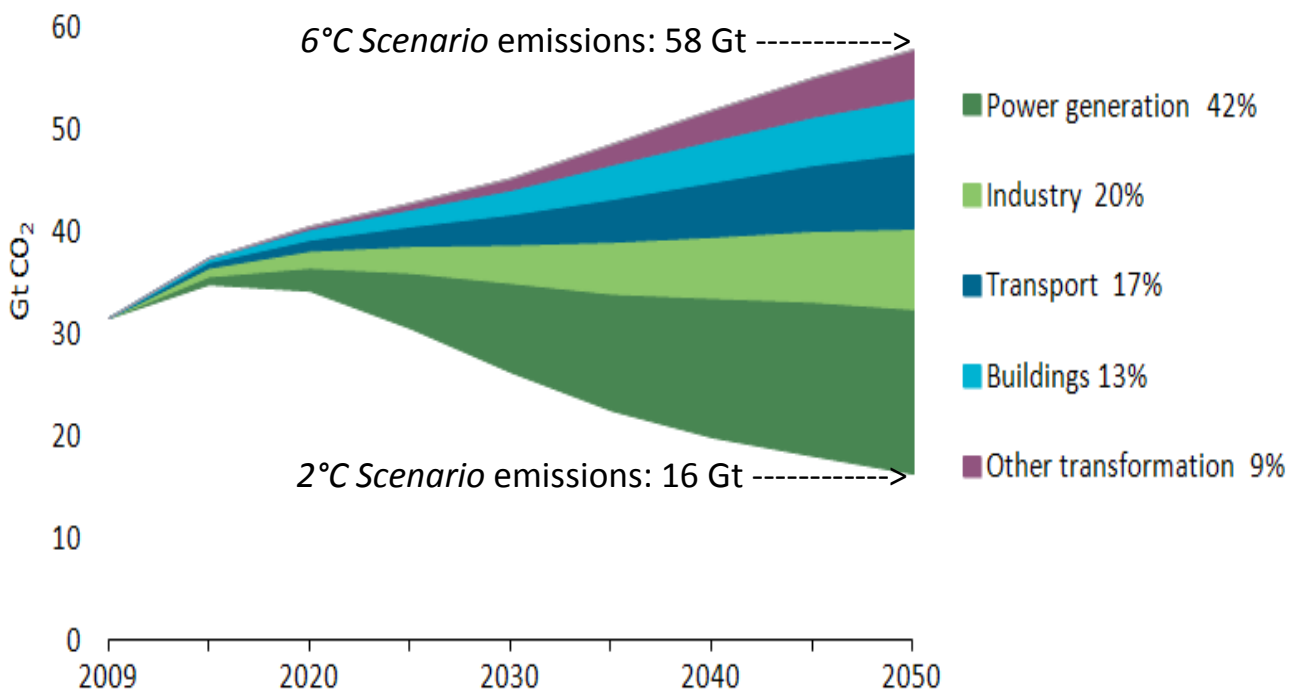
Medium-term bioenergy outlook

- Global generation to top 530 TWh in 2017
- Bioenergy electricity grows at 10% p.a.





Key role of bioenergy in a low-carbon future



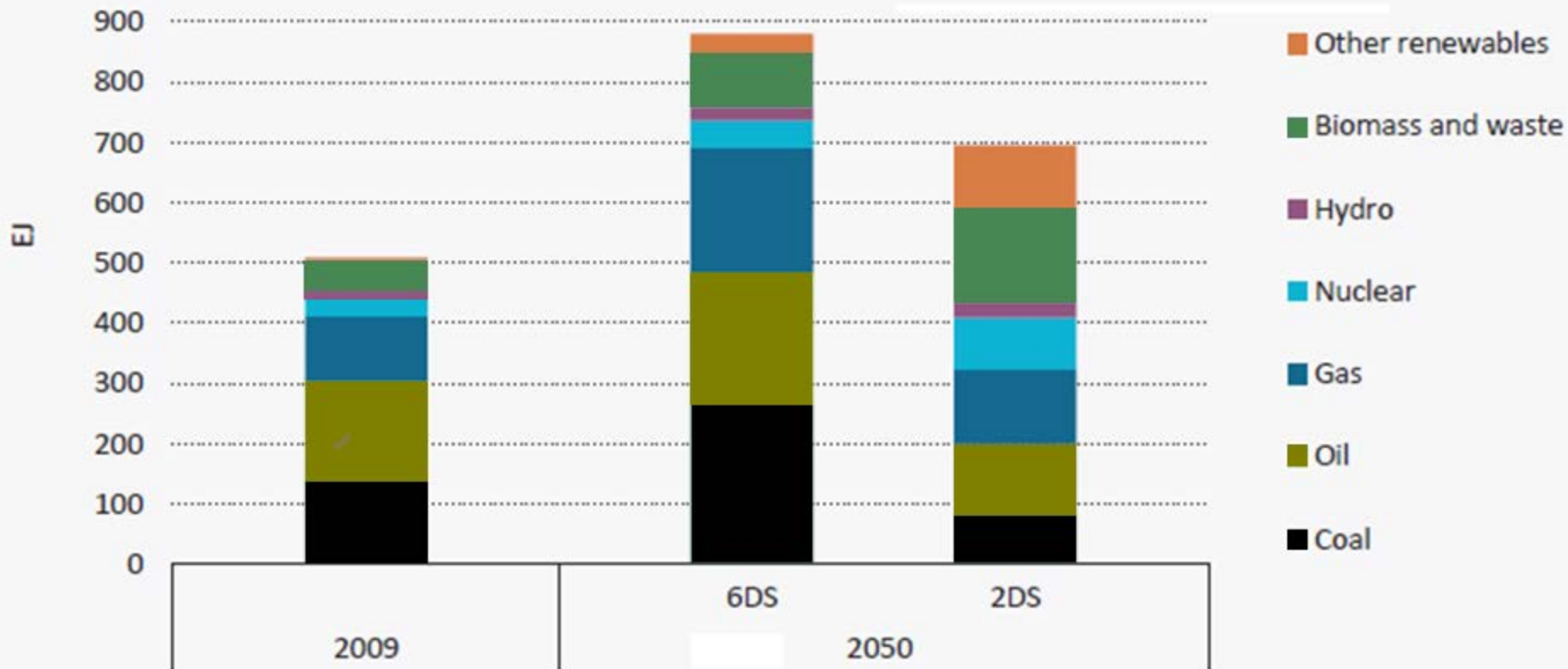
Bioenergy technologies	Emissions reduction in 2050
Bioenergy power	1.0 Gt CO _{2-eq}
Bio-power + CCS	0.3 Gt CO _{2-eq}
Bioenergy heat (industry)	0.5 Gt CO _{2-eq}
Bioenergy heat (buildings)	0.1 Gt CO _{2-eq}
Biofuels	2.1 Gt CO _{2-eq}
Total	4.1 Gt CO_{2-eq}

Source: Energy Technology Perspectives 2012

- Reaching the 2DS will require **42 Gt CO₂ annual emissions reduction** by 2050
- Biomass is the only renewable energy source that can make a contribution in all sectors, providing **around 10% of total CO₂ emissions reduction**



Total Primary Energy Supply by Fuel Source

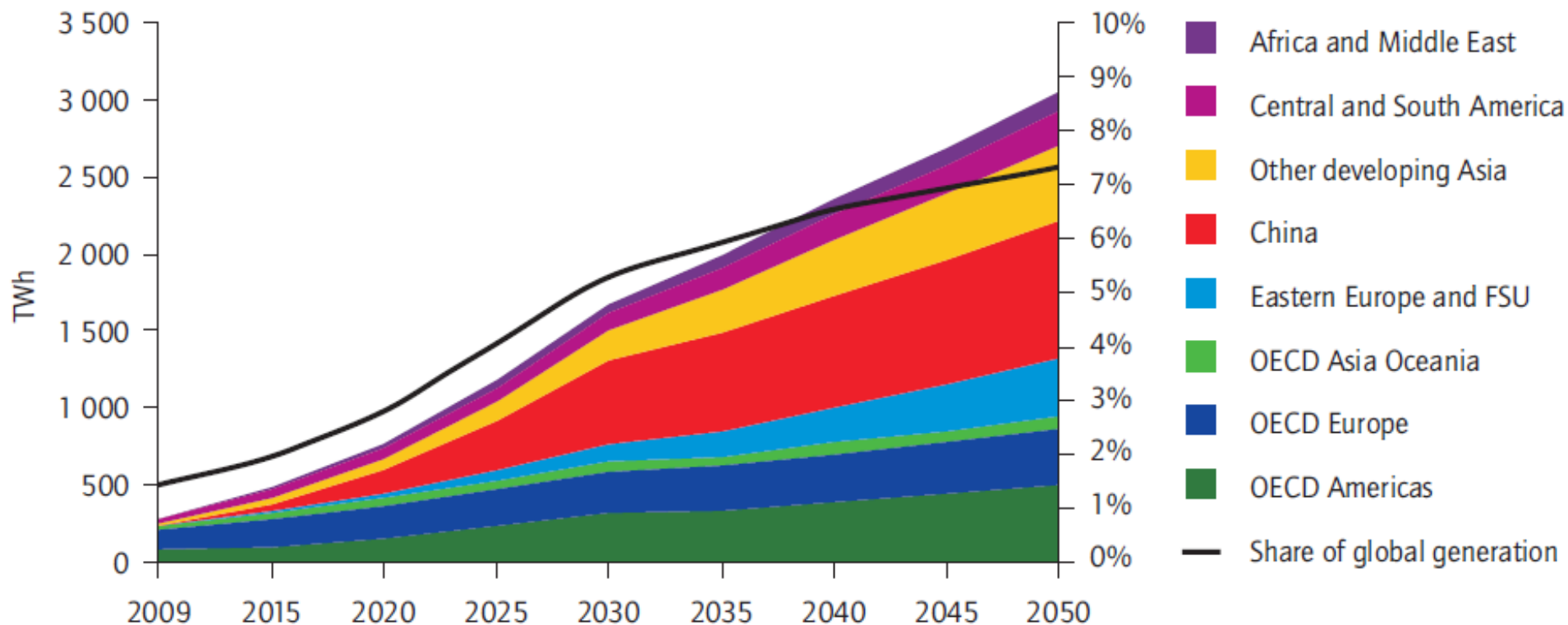


Source: Energy Technology Perspectives 2012

- Bioenergy accounts for 24% of primary energy supply by 2050 in the 2°C Scenario
- In the 2DS 250-400 Mha of land, *i.e.* 5-8% of total agricultural land today, will be needed in 2050



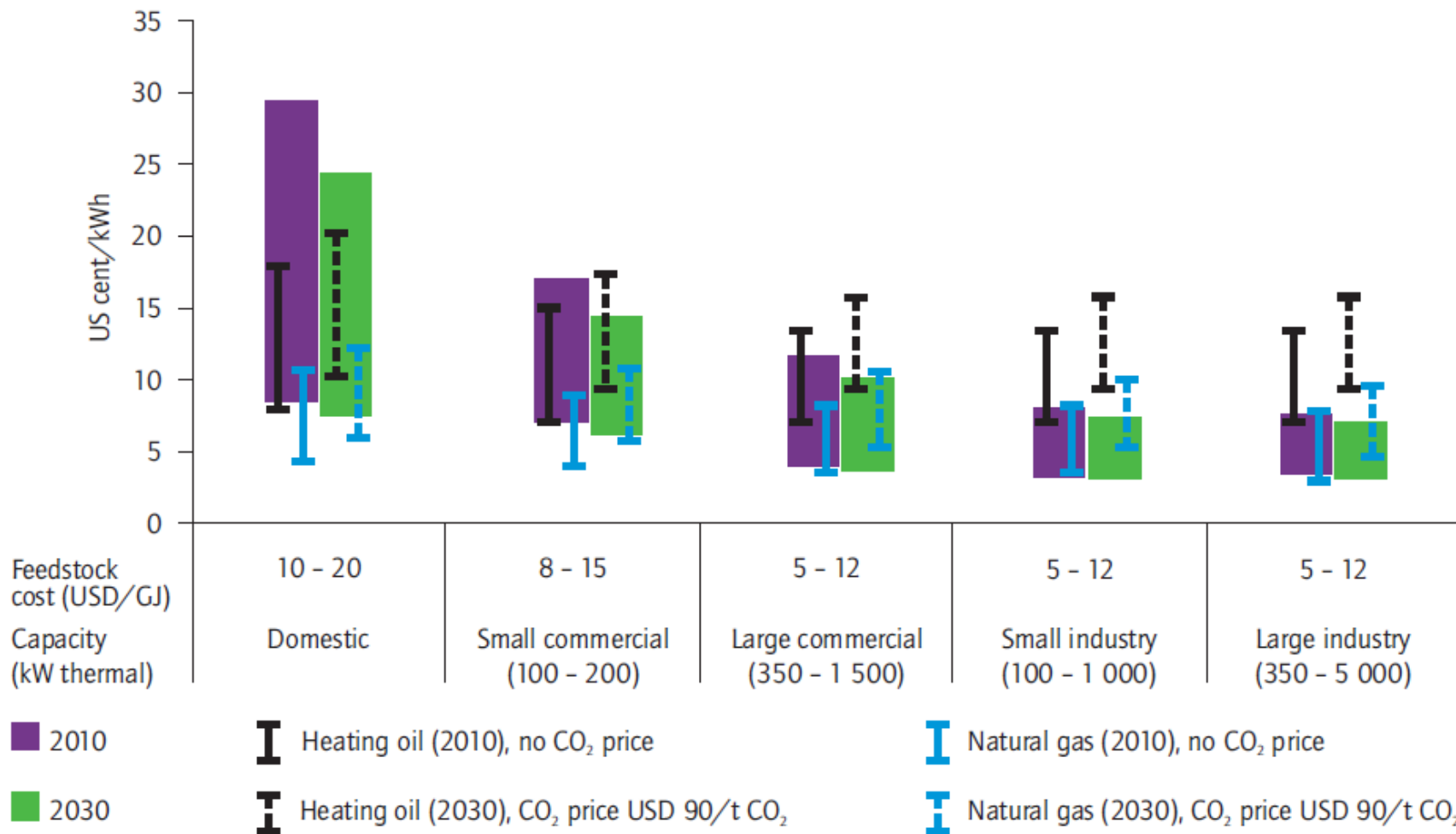
World bioenergy electricity supply to grow more than ten-fold



- Share in total electricity generation increases from 1.5% today, to 7.5% in 2050
- Bioenergy provides firm capacity and dispatchable electricity
- At large scale, with low feedstock costs, biomass-electricity can already be competitive with fossil fuels today



Bioenergy – a competitive heat source in many circumstances

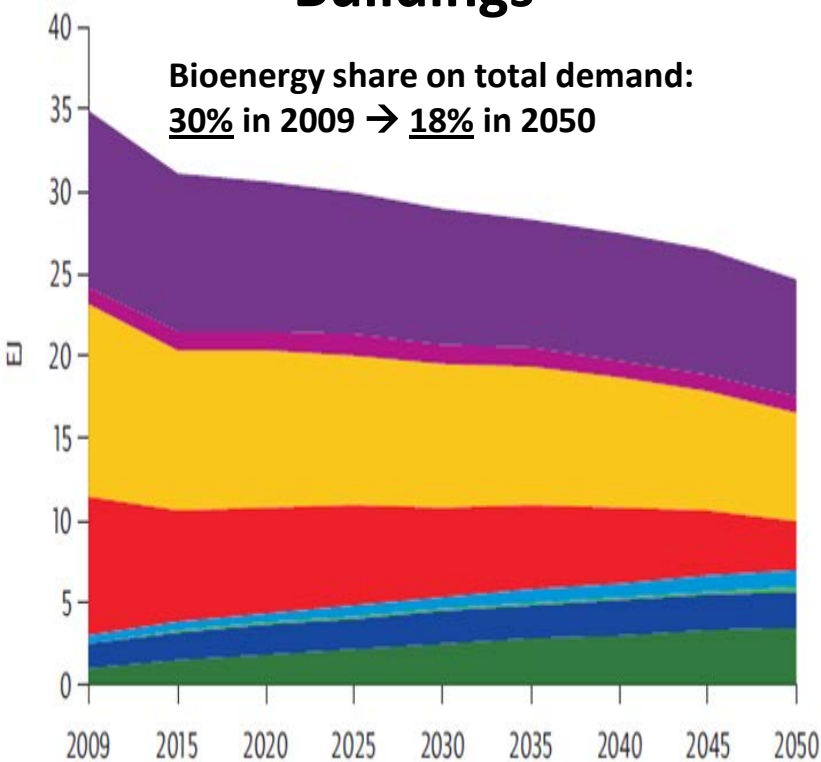


Source: IEA analysis based on AEA (2011), DECC (2011), IPCC (2011), Mott MacDonald (2011), Uslu *et al.* (2012).

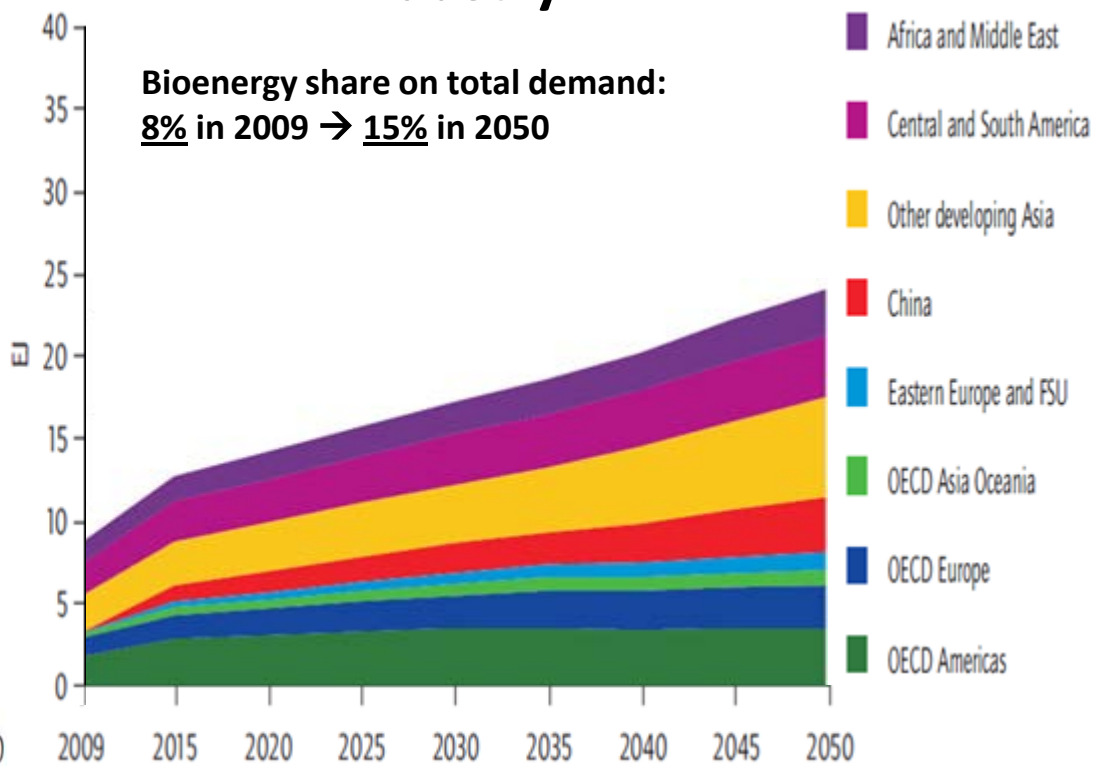


Bioenergy – an important source of heat

Buildings



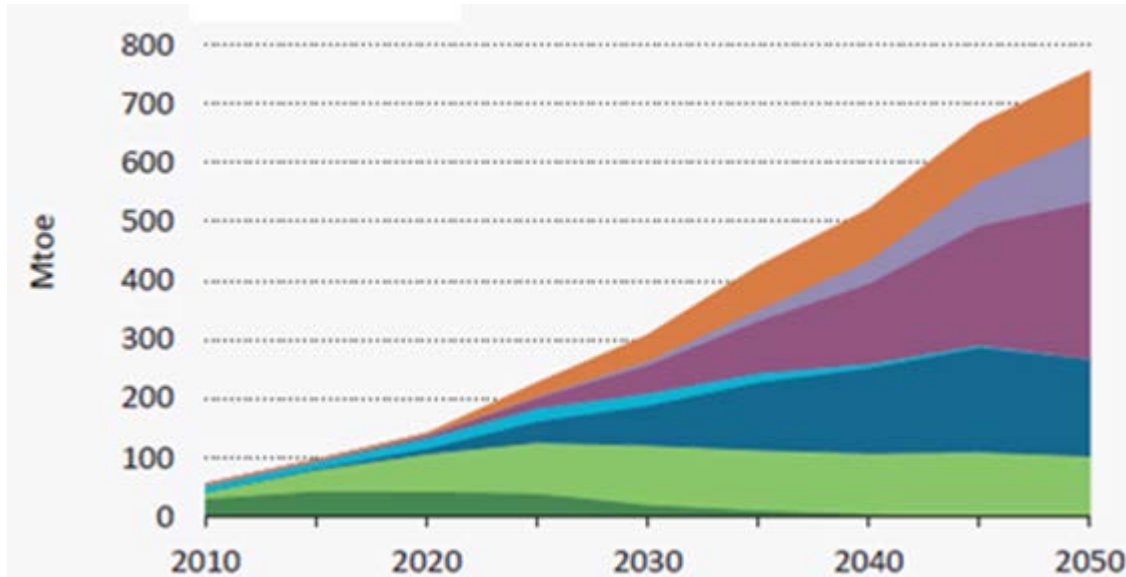
Industry



- Bioenergy use in non-OECD buildings sector declines
→ Improved energy efficiency; traditional biomass replaced by more efficient technologies
- Industry use is becoming increasingly important for production of high temperature heat at relatively competitive costs



Advanced biofuels to play a key role in the long-run



■ Ethanol - conventional ■ Ethanol - cane ■ Ethanol - advanced ■ Biodiesel - conventional ■ Biodiesel - advanced ■ Biomethane ■ Biojet

- Biofuels share in total transport fuel increases to 27% in 2050
- Advanced biofuels are the only low-carbon fuel alternative for heavy transport

Best-Practice Policy Principles

Renewable Energy

- **Predictable** RE policy framework, integrated into overall energy strategy
- **Portfolio** of incentives based on technology and market maturity
- **Dynamic** policy approach based on monitoring of national and global market trends
- Tackle **non-economic** barriers
- Address **system integration** issues

Bioenergy

- Medium-term targets for bioenergy need to consider resource availability
- Different incentives for electricity, heat and transport fuels
- Challenging due to smaller cost reduction potential compared to other RE technologies
- Sustainability is key requirement (incl. for public acceptance)
- Dispatchable power can balance variable renewables
- Infrastructure compatibility of biofuels

Conclusions – Renewables

- **Renewables deploying rapidly but several barriers looming**
 - Policy uncertainty and economic slowdown in several countries
 - System and market integration issues emerging → market reform needed
 - Industry under pressure in restructuring and consolidation processes

- **Moving to new countries and competitive market segments will be key**

- **Robust fundamentals and drivers; huge long-term potential of RE**

Conclusions - Bioenergy

Opportunities:

- **Bioenergy has an increasingly important role to play**
 - can provide renewable energy in all sectors
 - can already be competitive with fossil fuels today
 - can provide dispatchable renewable power
 - has the potential to provide substantial emission-reductions

Challenges:

- **Supply chains for large-scale feedstock supply need to be established**
- **Solid sustainability framework is needed to ensure overall positive impact of bioenergy development**