

RENEWABLE ENERGY

Medium-Term Market Report 2013

Medium-Term Outlook for Renewable Energy – What's next for bioenergy?

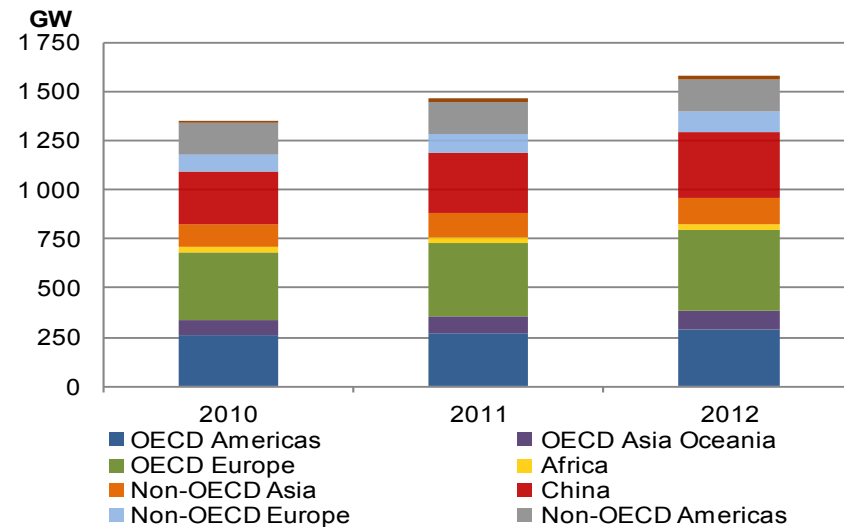
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International Energy Agency

Market Trends and Projections to 2018

Despite challenges, strong renewable energy drivers in 2012

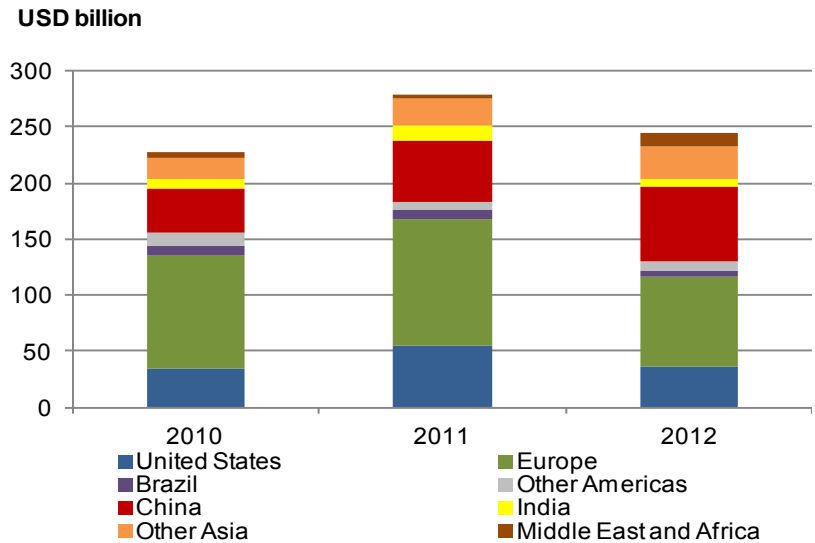


Global renewable electricity capacity, by region



Source: IEA MTRMR 2013

Global renewable new investment, by region



Source: Bloomberg New Energy Finance

■ Total renewable capacity and generation grew strongly in 2012 (+8%)

- Strength partly due to China hydropower
- Global non-hydro capacity grew by 21%
- Onshore wind and solar PV capacity grew faster than expected

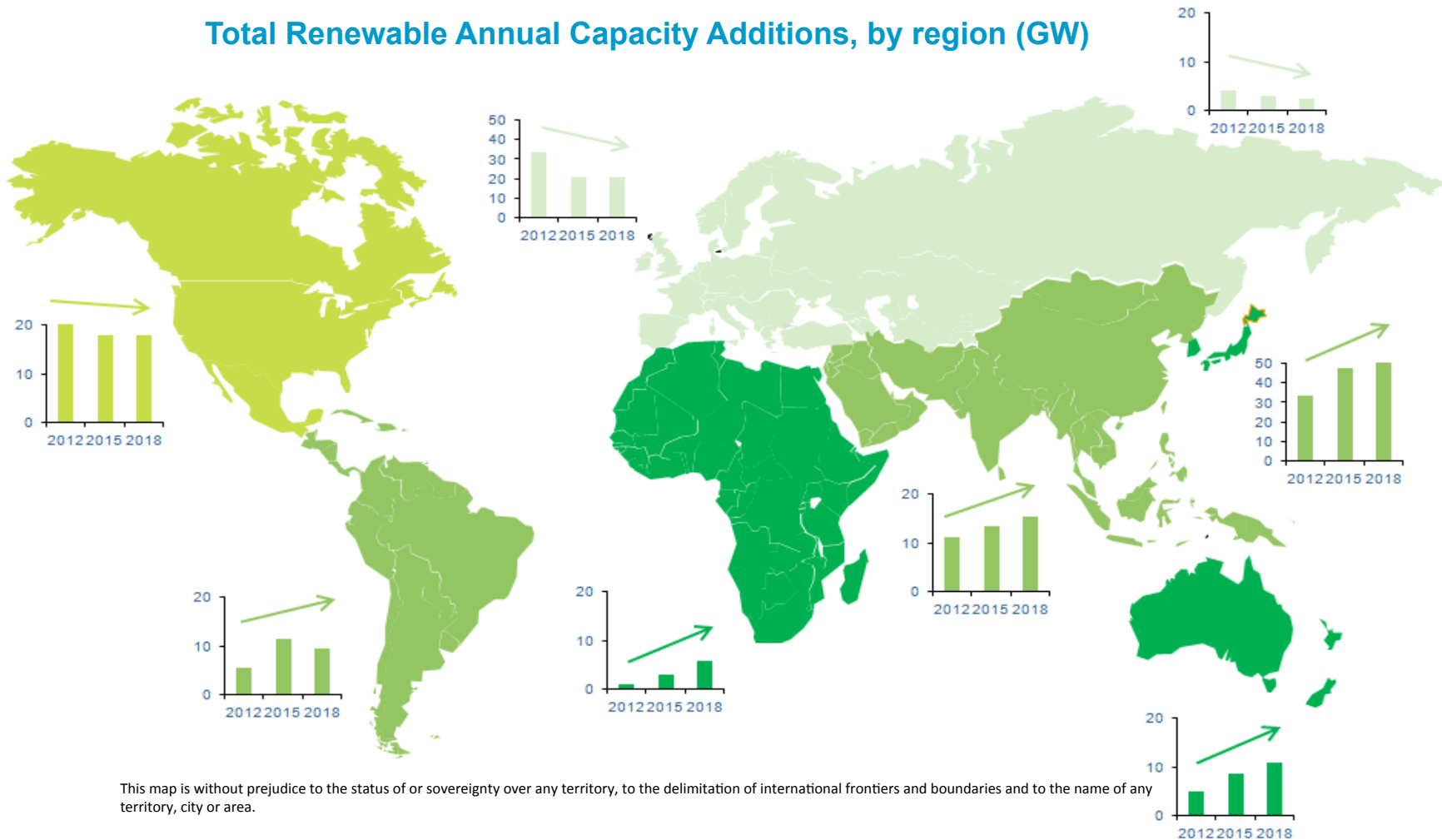
■ Still, some emerging challenges

- Global investment fell (-12%)
- Policy uncertainty in some key countries
- Grid integration issues emerging
- Biofuels production growth stalled

Renewable power spreading out everywhere



Total Renewable Annual Capacity Additions, by region (GW)



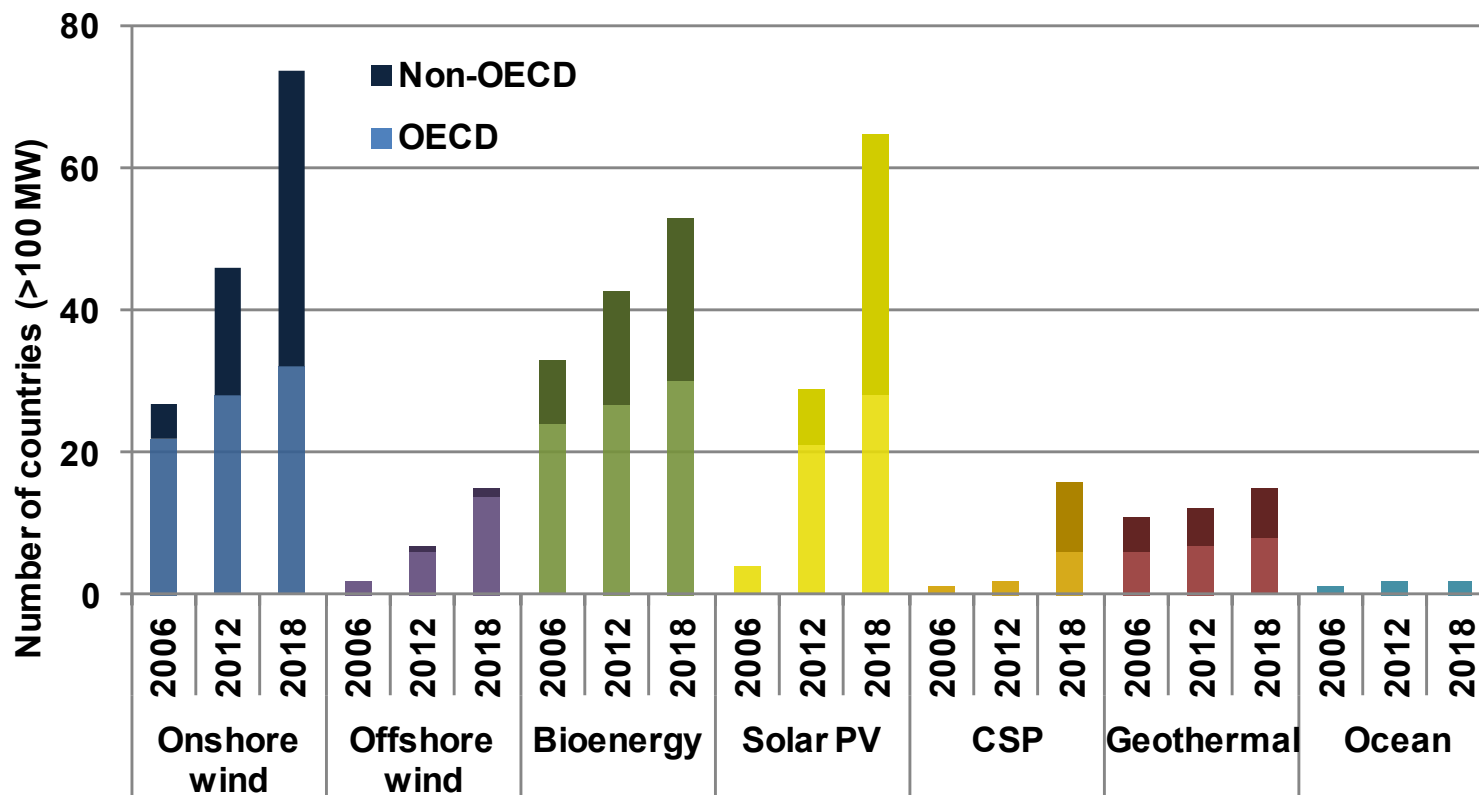
This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

- Emerging markets more than compensate for slowing growth and volatility in markets such as Europe and the US

Deployment transitioning to more markets



Number of countries with non-hydro renewable capacity above 100 MW

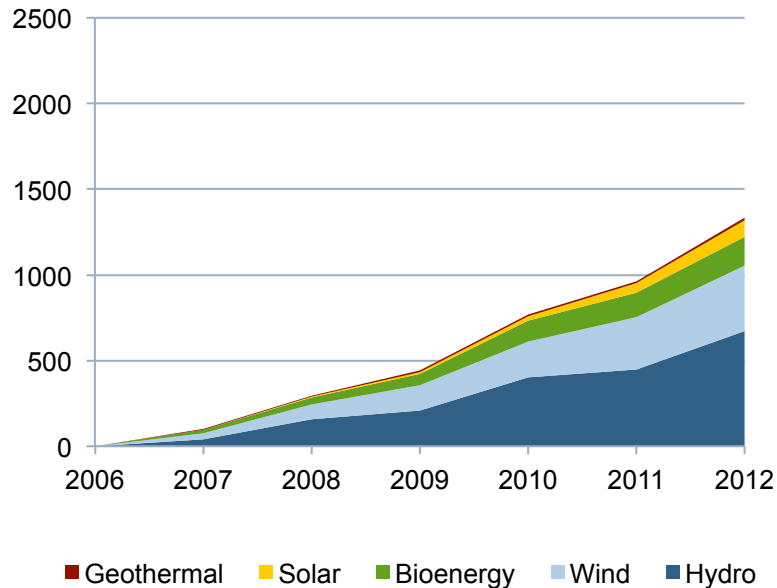


- Non-hydro renewable electricity development becoming increasingly widespread – *more optimistic than MTRMR 2012*

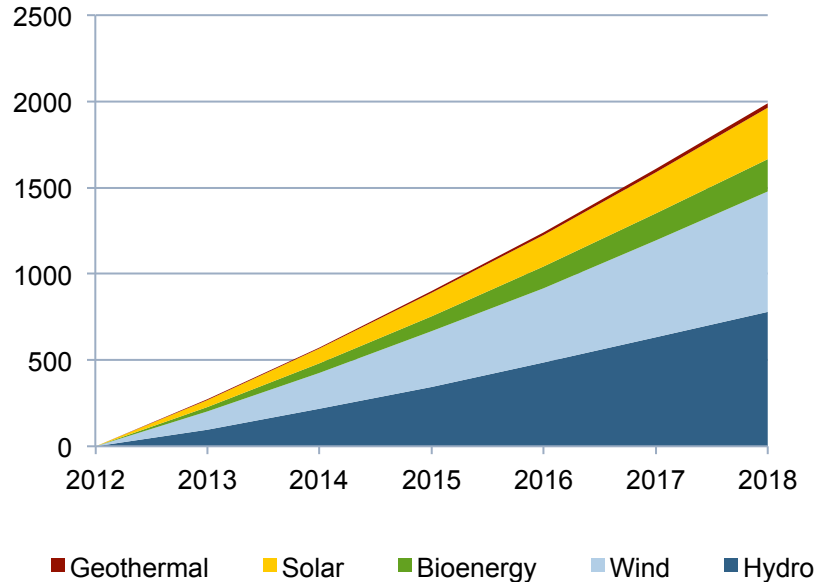
Growth of renewable power accelerating



Historical cumulative additions (TWh)



Forecast cumulative additions (TWh)

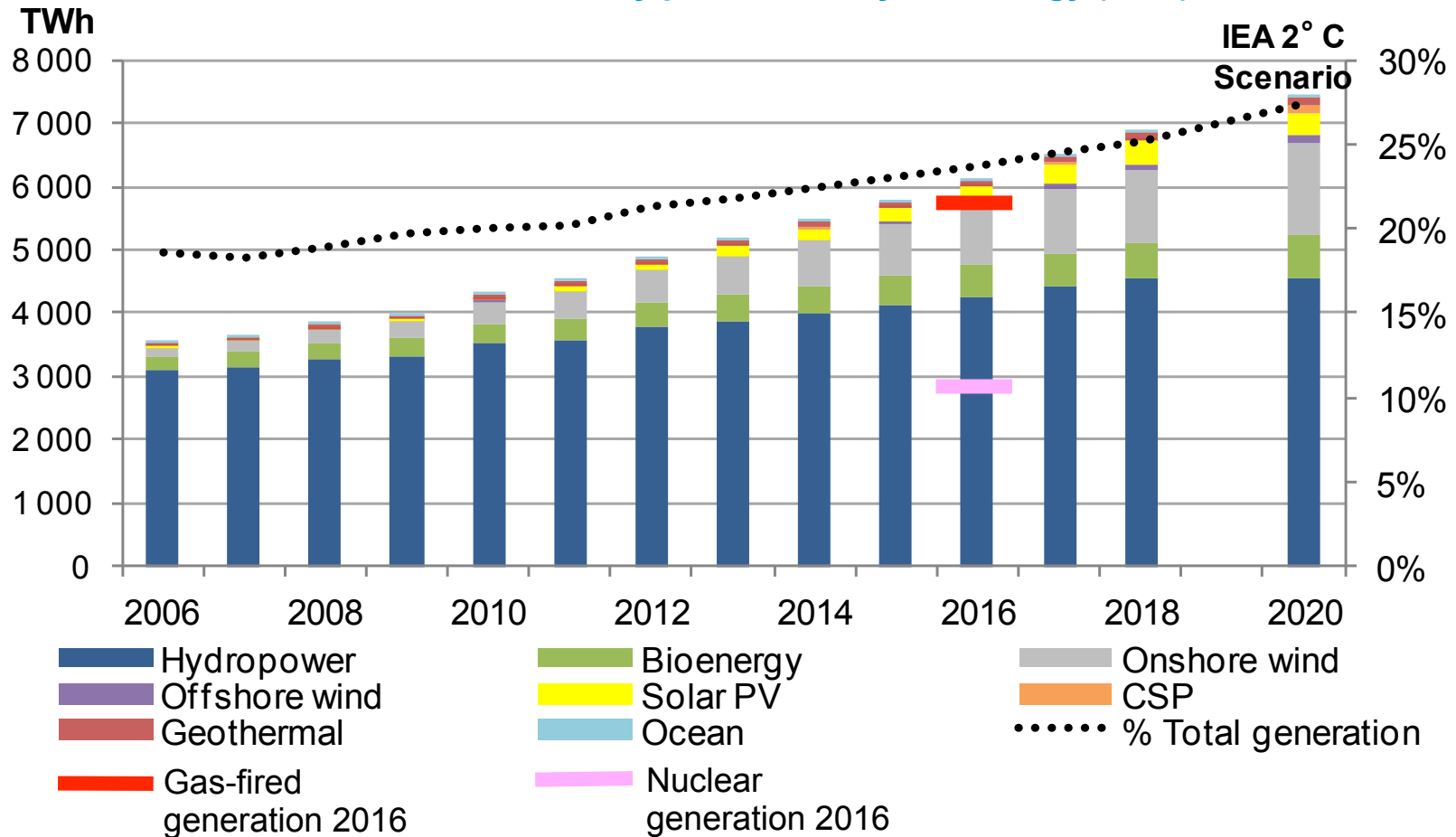


- **Hydropower remains the largest increasing single renewable technology in electricity generation**
- **But for the first time additional generation expected from all non-hydro sources exceeds that from hydropower; and additional capacity led by wind**

Positive outlook for renewable electricity



Global renewable electricity production, by technology (TWh)

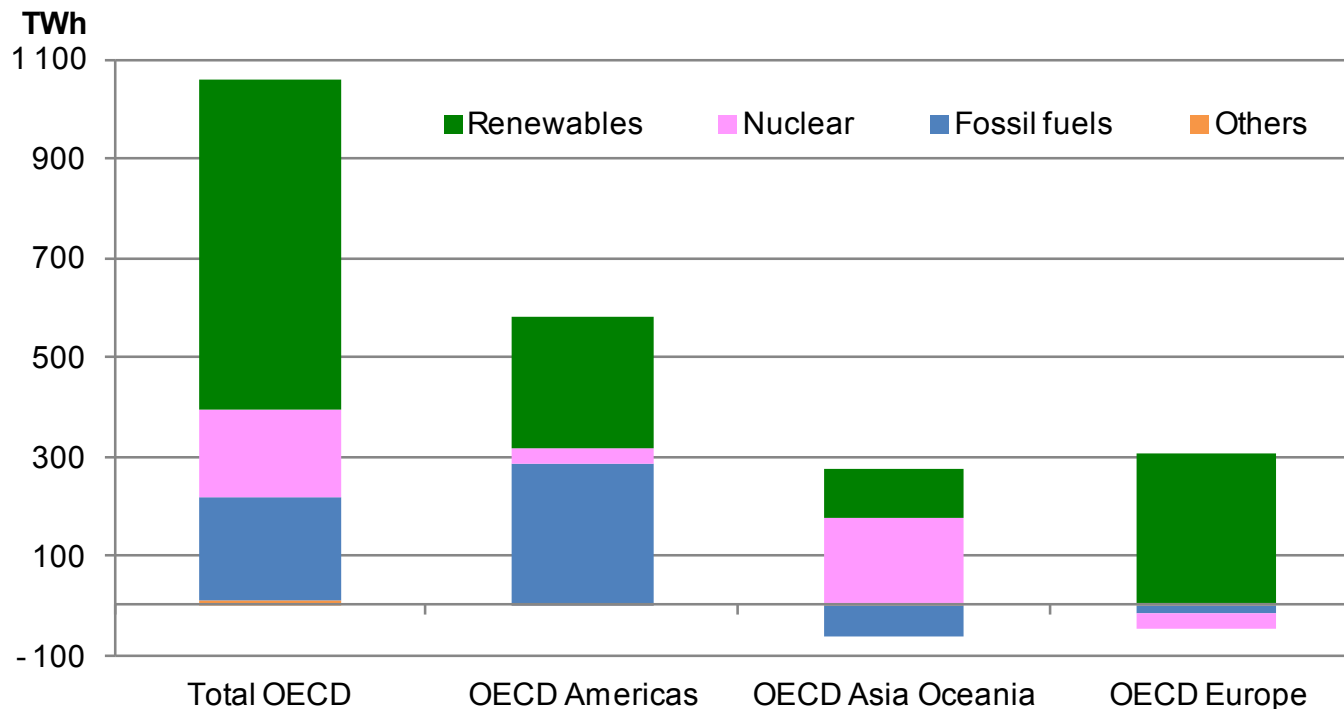


■ Renewable electricity projected to scale up by 40% from 2012 to 2018

RE largest contributor to total electricity increase in OECD



Changes in power generation by source and region, OECD, 2012-18

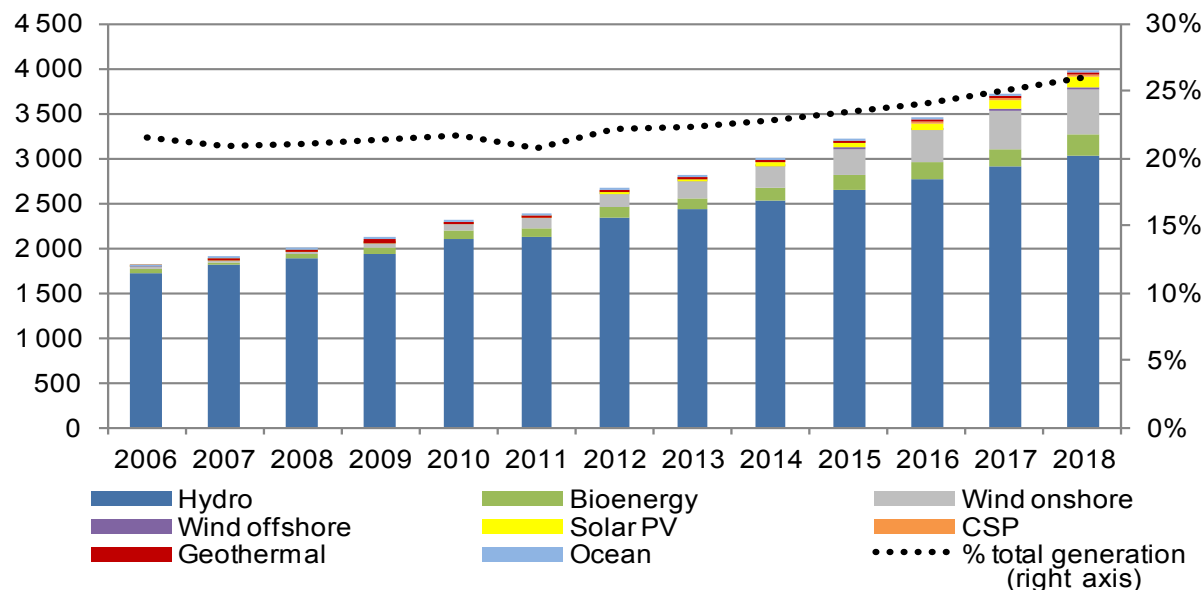


- Renewables expected to grow almost like fossil fuels in OECD Americas, and more than total demand in Europe

Non-OECD accounts for two-thirds of renewable power growth



Non-OECD renewable generation by source (TWh)



- In 2018, non-OECD comprises 58% of total renewable generation, up from 54% in 2012 and 51% in 2006
- China alone accounts for 40% of growth
- Other key markets:
 - Brazil (wind, bioenergy), India (wind, solar, bioenergy), South Africa and Morocco (wind, solar), Thailand (bioenergy), Middle East (solar, wind)

Renewable power and natural gas

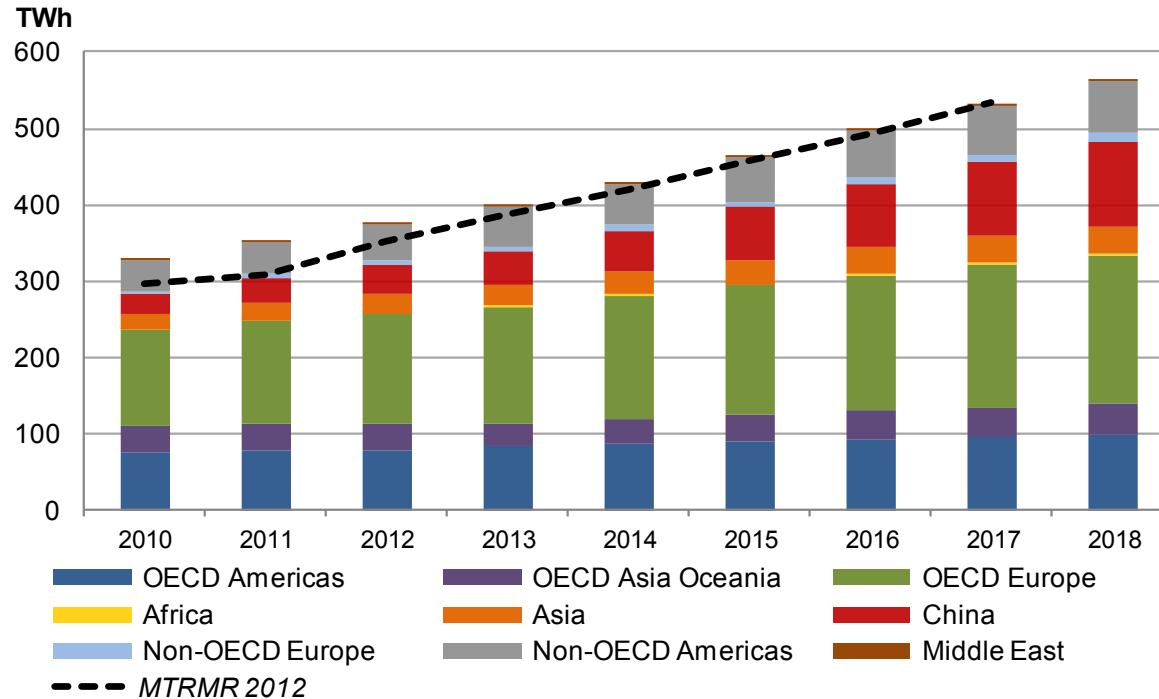


- Gas generation to crowd out renewables? Or vice-versa?
 - Renewables and gas can both grow strongly...
- **Globally:** coal-to-gas switching can lead to large reductions in CO₂ emissions, but gas is not enough to meet 2DS
- **USA:** some competition, but strong RE drivers even with low power prices; RE enhances diversification, gas helps balance variable RE; large scope for coal replacement
- **Europe:** slow demand growth, high gas prices, overcapacity in some markets; RE crowding out gas; still, gas provides important balancing for rising variable RE
- **Asia:** portfolio of low-carbon solutions needed to meet rapid demand growth; high LNG prices make RE attractive

Bioenergy scales up with increased use of agricultural residues, renewable waste and co-firing



Bioenergy generation and projection by region

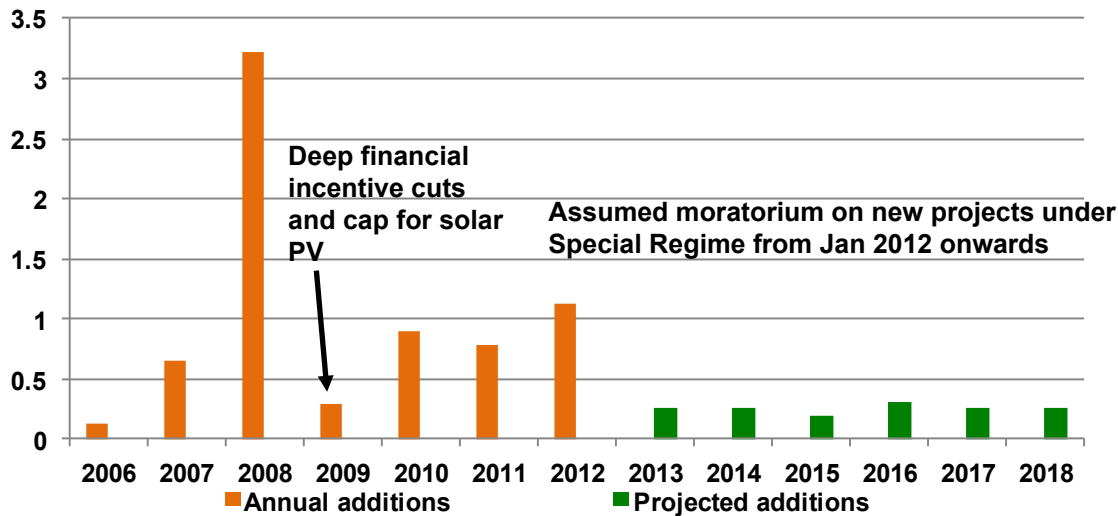


- China grows fast, with ambitious targets and increasing renewable waste-to-energy plants
- Other non-OECD countries – Brazil, India and Thailand – also expected to add significant new generation
- OECD growth dominated by Europe, driven by 2020 targets

Policy uncertainty is the number one risk

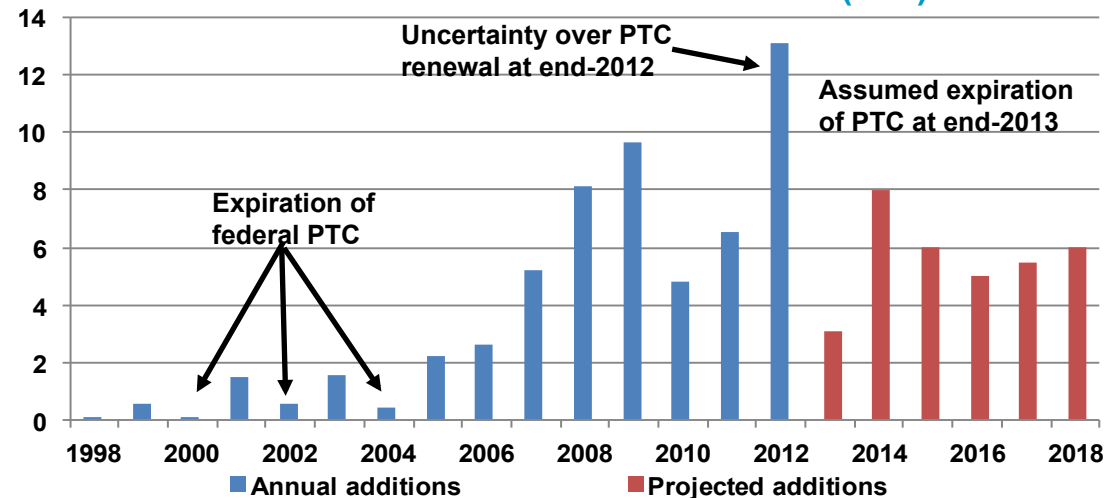


Spain solar PV + CSP annual additions (GW)



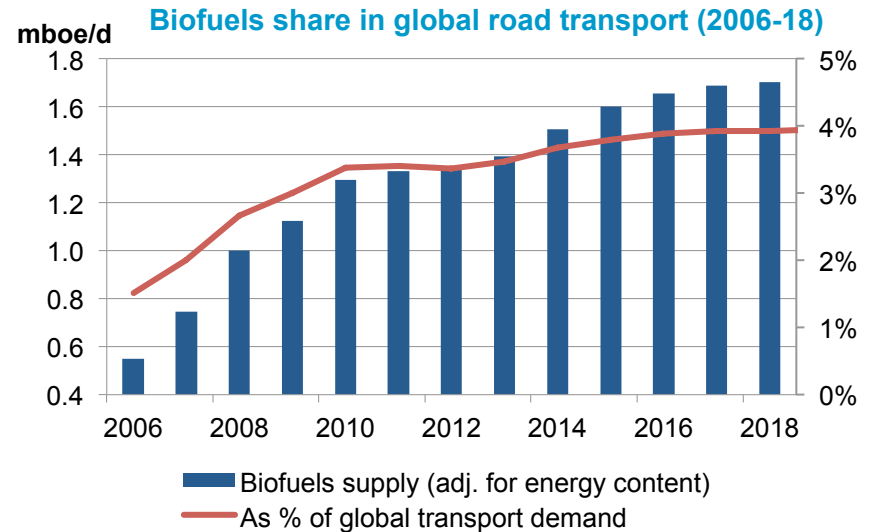
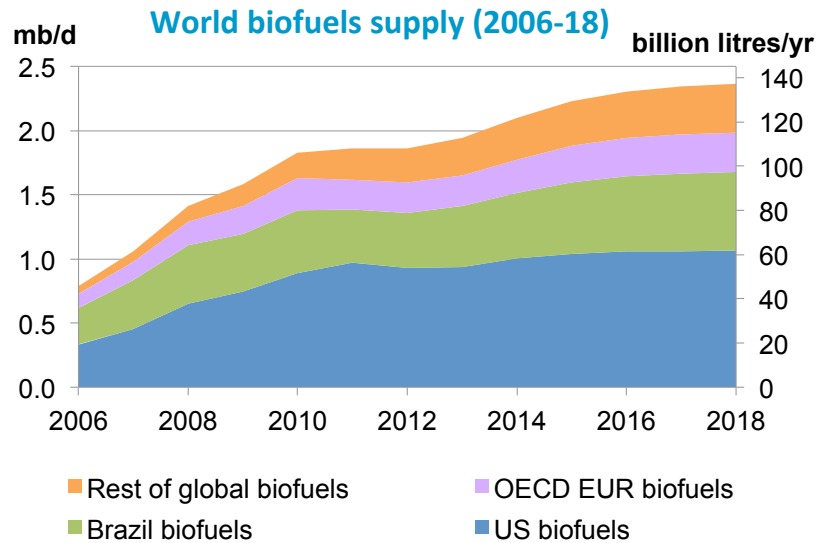
Abrupt, retroactive policy changes

US onshore wind annual additions (GW)



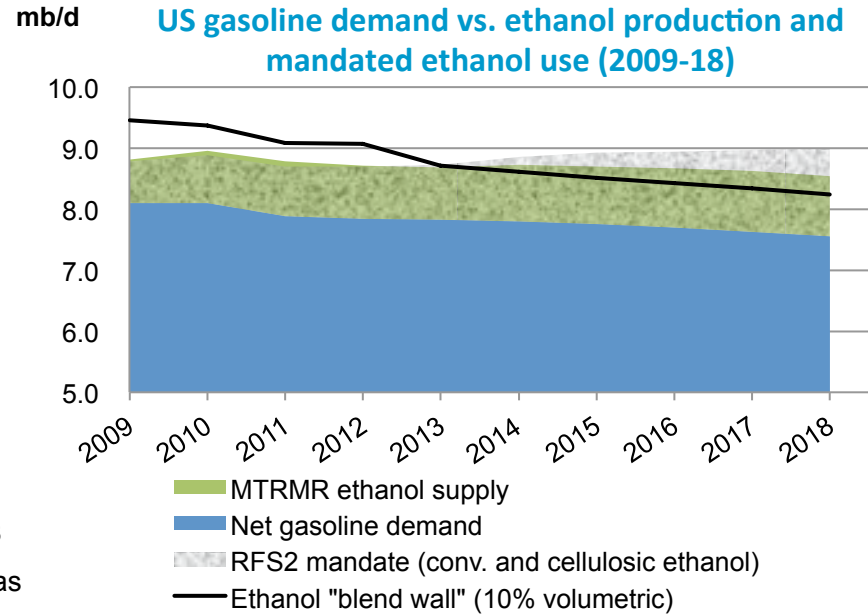
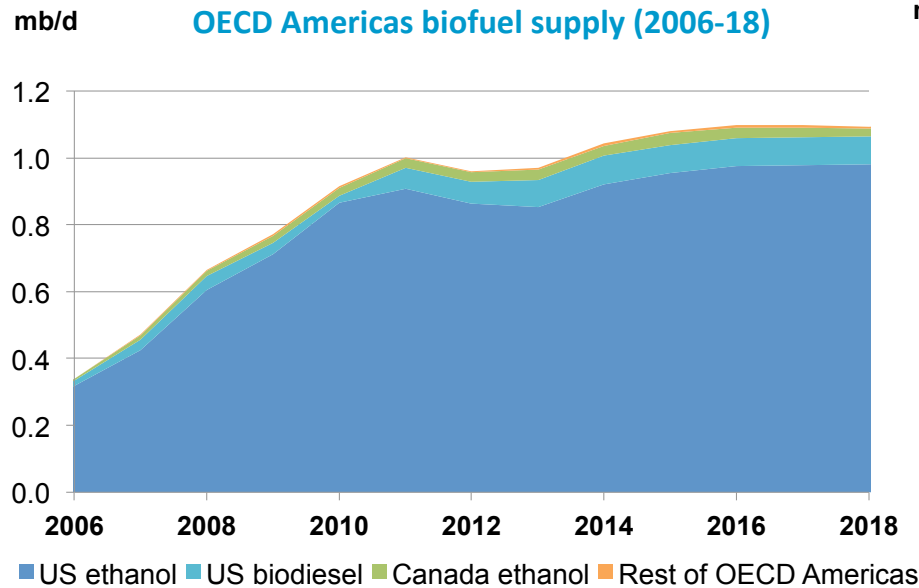
Stop & go policies

Biofuels production to grow 25% to 2018



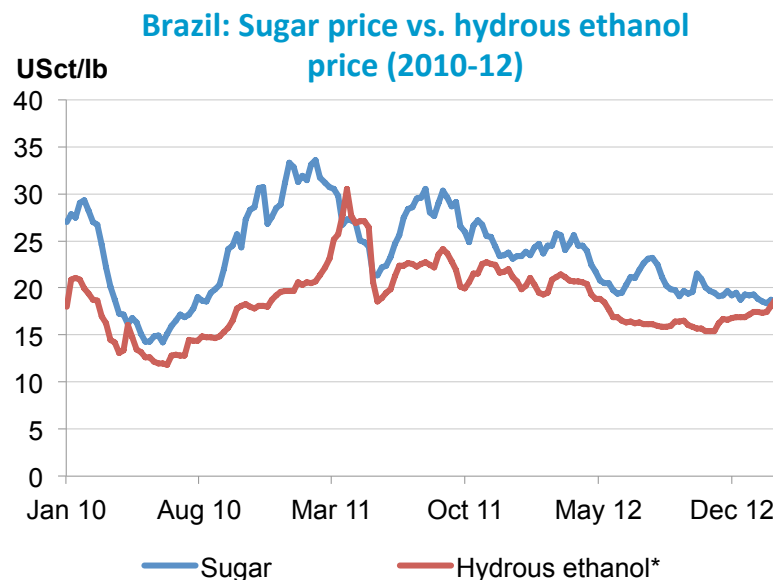
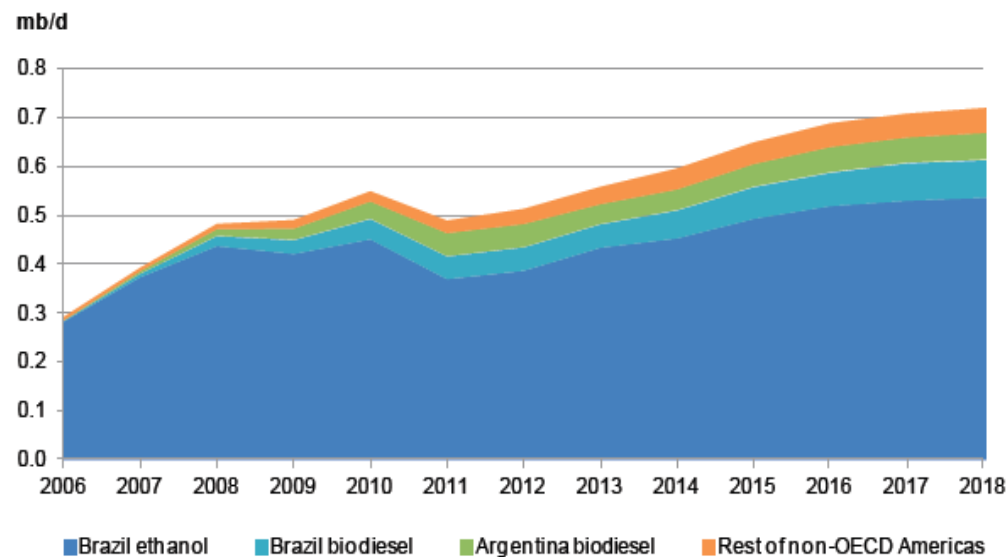
- **Global biofuels output to grow 3.5% per year on average from 110 billion litres in 2012 to 135 billion litres in 2018**
- **On an energy adjusted basis versus oil, biofuels provide 4% of global road transport fuel demand in 2018**
- **Growing political uncertainty in the EU and US provides an important downside risk, and might undermine the long-term growth prospects**

OECD Americas production faces challenges



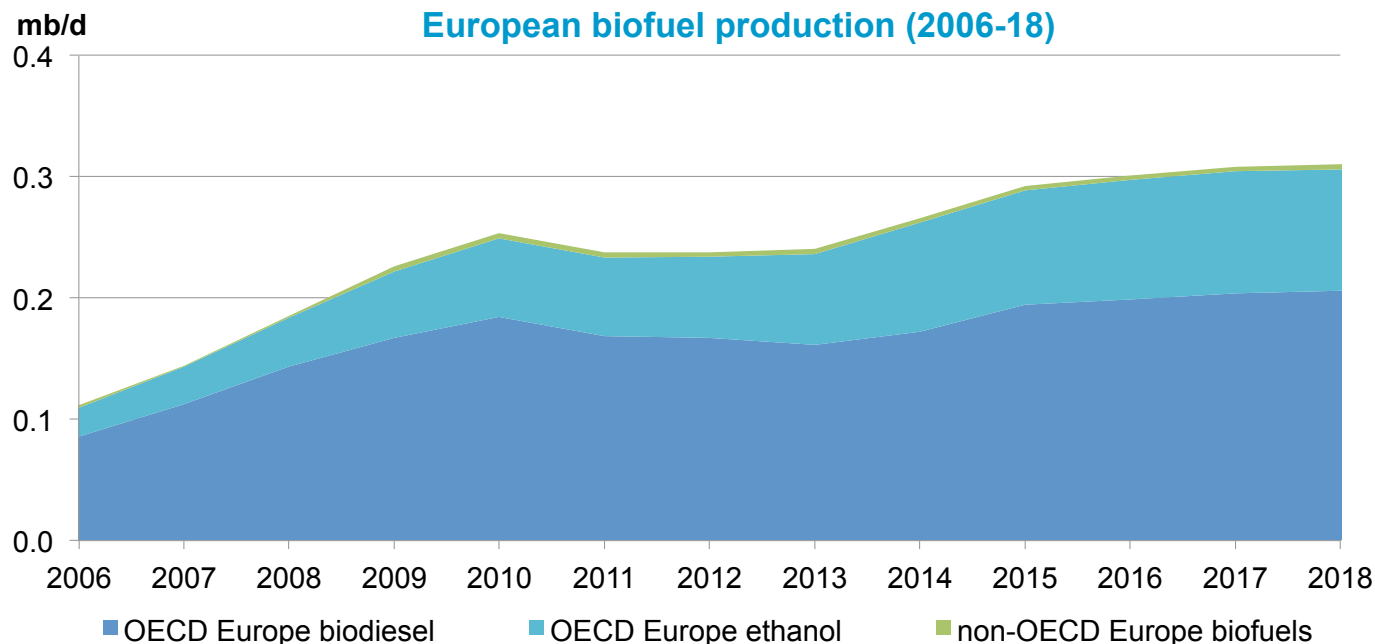
- **OECD Americas production to reach 974 kb/d in 2013, as drought-affected US ethanol production recovers, and US biodiesel output increases**
- **Total OECD Americas biofuel output could reach 1.1 mb/d in 2018, driven by US output**
- **“Blend wall” in the US proves challenging to overcome, and might limit domestic ethanol demand and potential production**

Non-OECD Americas production driven by Brazilian ethanol



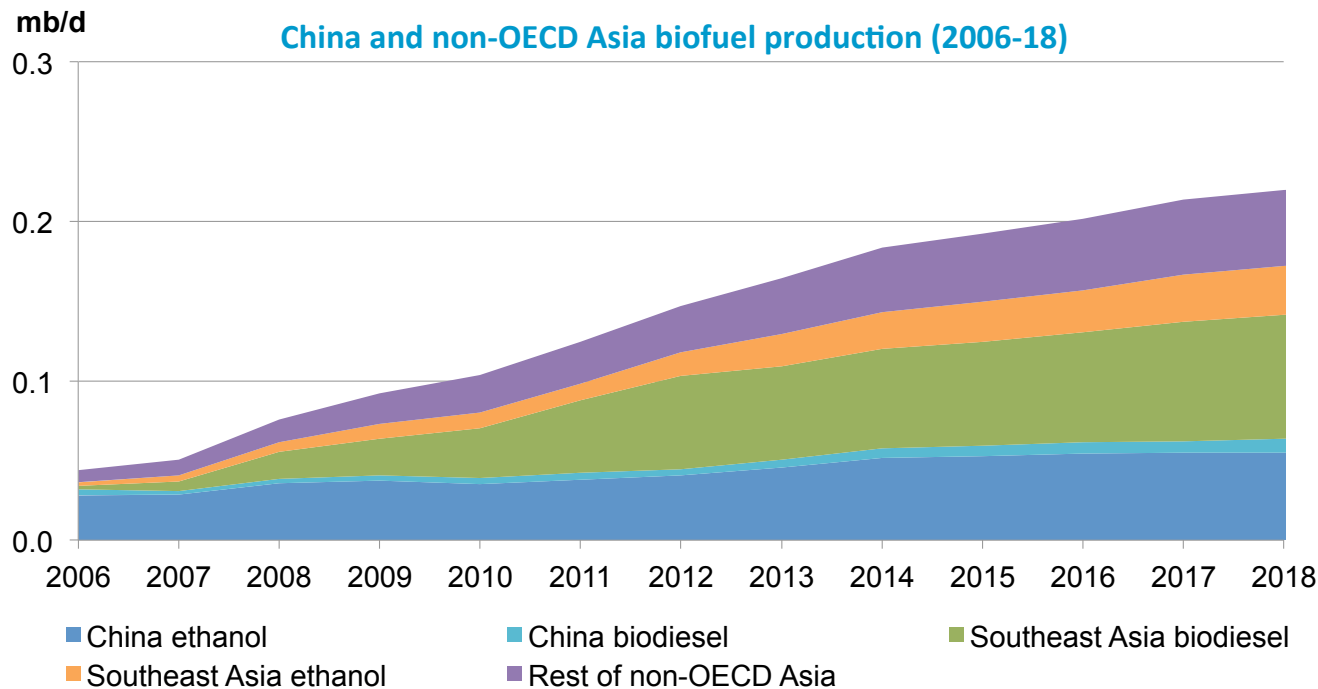
- Non-OECD Americas production to reach 560 kb/d in 2013, amid Brazil preparing for banner sugarcane harvest
- Production could grow to 720 kb/d in 2018, driven mainly by Brazilian ethanol output
- Argentine biodiesel output depressed, as introduction of anti-subsidy duties in the EU reduce export opportunities for biodiesel

EU policies to determine the future of the European biofuel sector



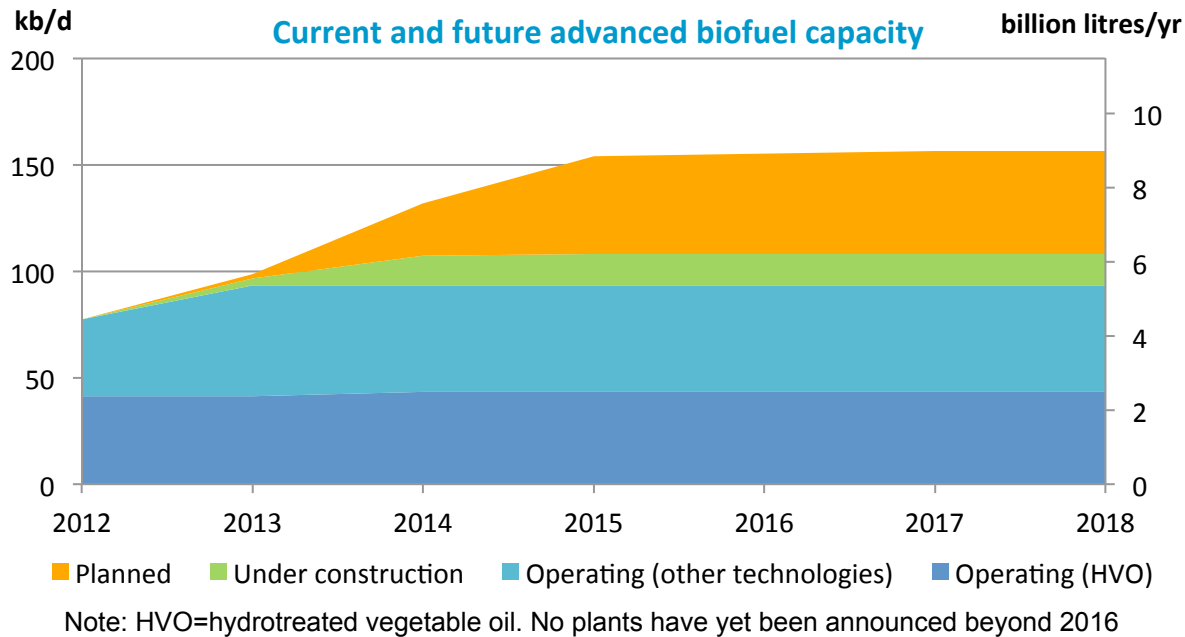
- **Growth in biofuel output to stall in 2013 due to a slight drop in Germany and UK biodiesel output**
- **Medium-term growth of 70 kb/d driven by EU mandate for renewable energy in transport**
 - supported by introduction of import duties for US ethanol, Argentine and Indonesian biodiesel
- **EU draft legislation to limit share of conventional biofuels to 5% in 2020, provides considerable downside risk to medium-term outlook**

Asian biofuel production to grow 50% 2012-18



- Asian production to grow from 130 kb/d in 2012 to 200 kb/d in 2018, driven by South-East Asian production
- China remains important producer, but growth prospects limited amid lack of policy drivers and limitations to feedstock use
- South-East Asian biofuel output driven by domestic blending mandates, as export to the US and EU market more restricted

Advanced biofuels industry expands

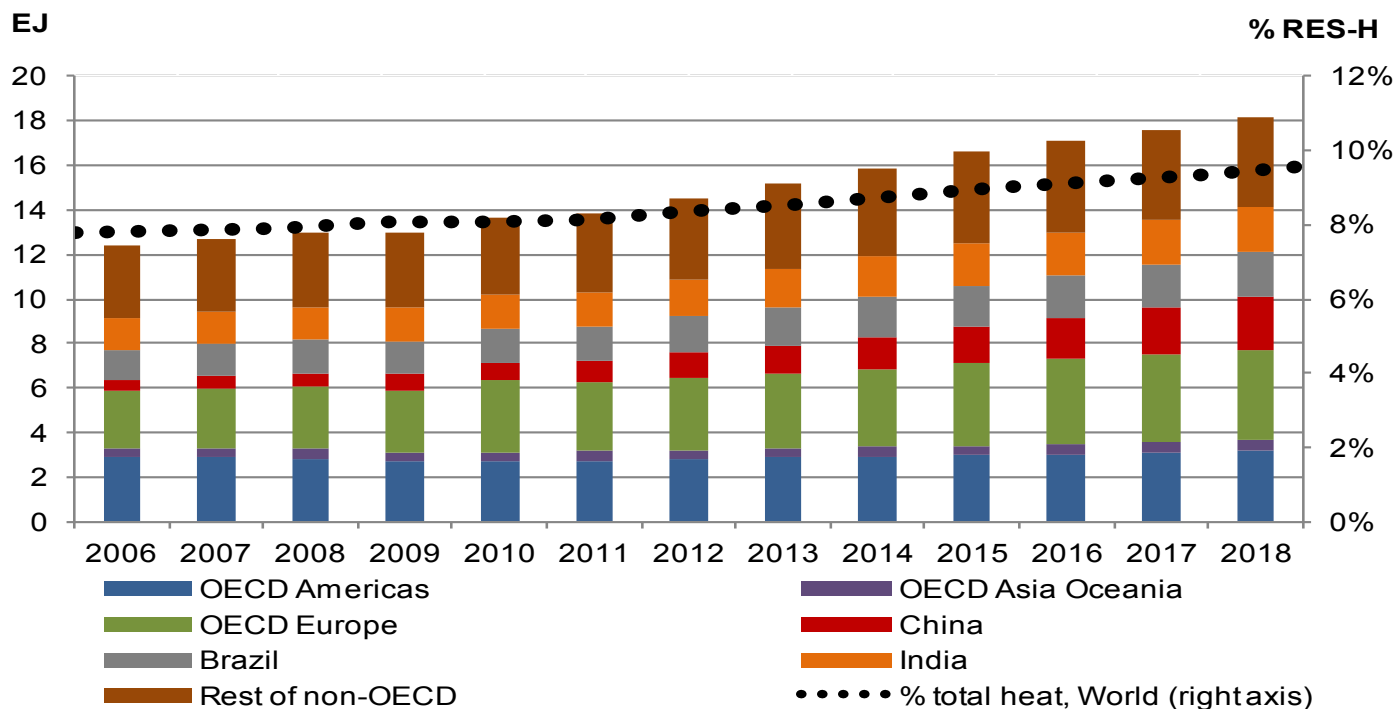


- Industry currently enters large-scale production with first commercial plants coming online
- Operating capacity at 4.5 billion litres in 2012 could grow to 9 billion litres in 2018
- Perceived investment risk is most important barrier to more rapid deployment

Renewable energy use for heat rises by 24%



Final energy use of renewable sources for heat (including commercial heat) by region



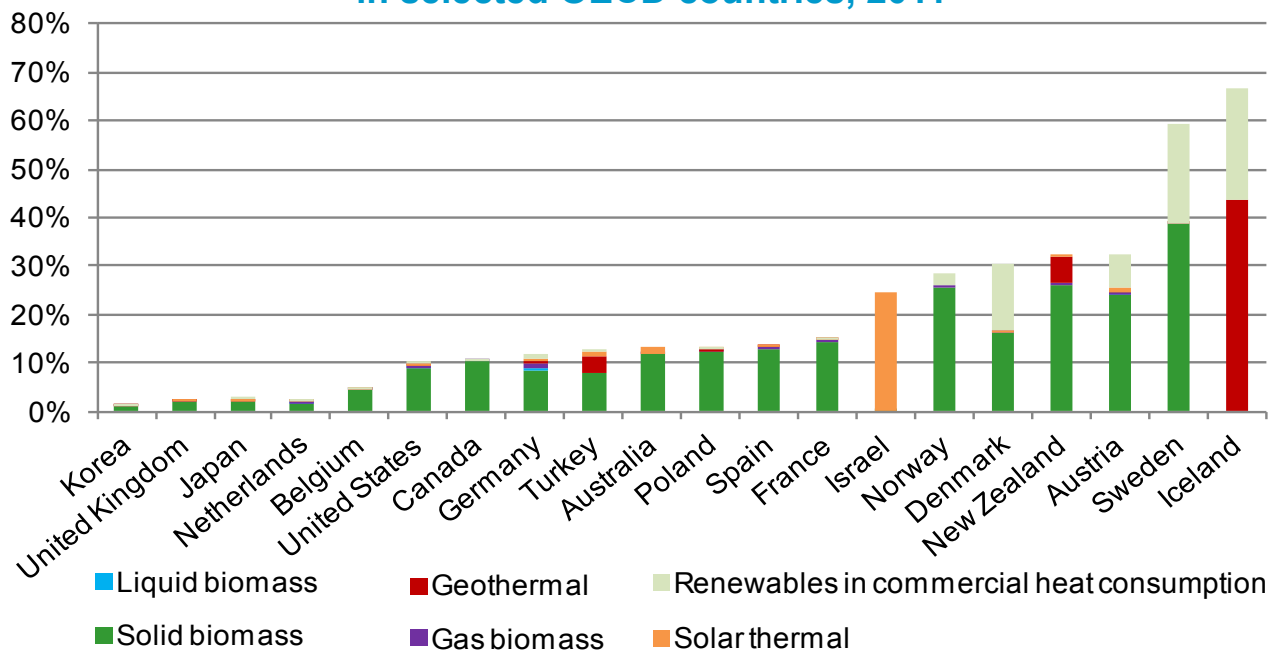
Note: excludes traditional biomass

- As % of final energy consumption for heat, renewables rise to almost 10% in 2018, up from just over 8% in 2012 and 8% in 2006
- China accounts for 39% of global growth
- OECD Europe drives 22% of growth, with EU 2020 targets and rising bioenergy (direct use and commercial heat) and solar thermal use

Renewables play significant role in OECD heating use...though shares vary by country



Share of renewable sources in final consumption of energy for heat in selected OECD countries, 2011



- So far most extensive policy drivers for renewable heat have emerged in OECD Europe, though comprehensive frameworks are generally still lacking
- Bioenergy provides largest portion of renewable heat across the OECD and accounts for most district heat (*e.g.* in Scandinavian countries and Austria)
- Geothermal and solar thermal play significant roles in a range of markets.

Modern biomass to lead growth of RE sources used for heat

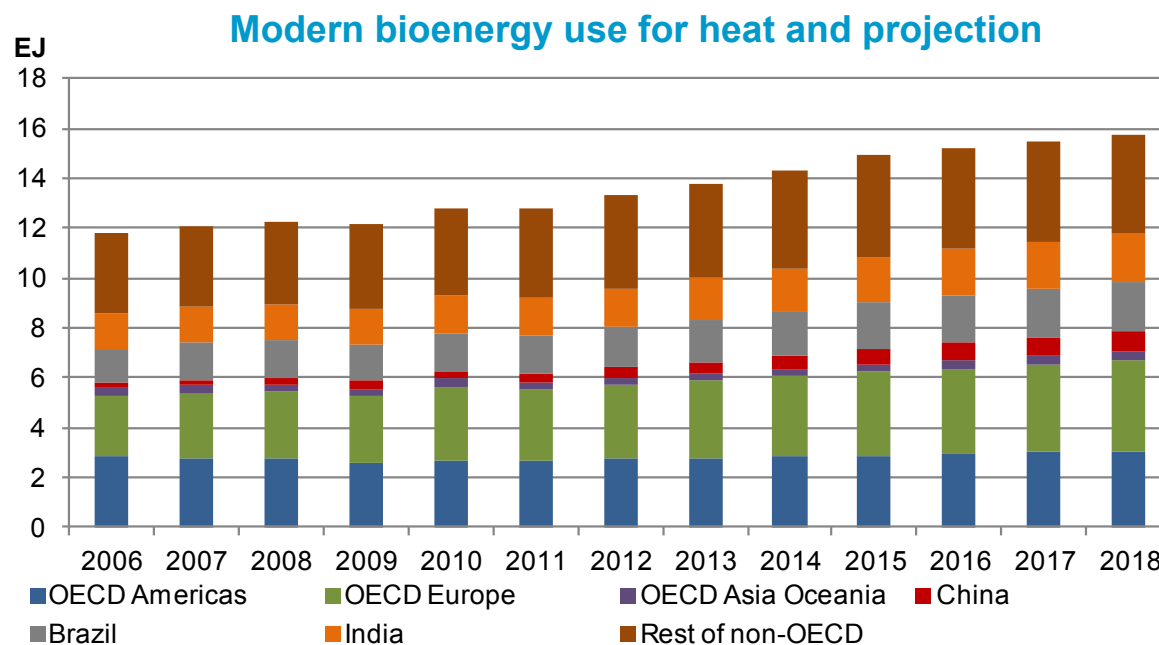


Drivers

- mature technology with good competitiveness versus alternatives;
- increasing comm. heat use from cogeneration plants and co-firing w/coal
- generally good suitability for providing low-emissions process heat in industry

Challenges

- good resource availability and targets for a portfolio of renewable technologies
- strong demand growth and diversification needs
- attractive financial incentives and market framework



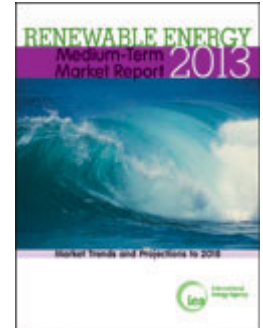
- Many renewables no longer require high economic incentives
- But they do need long-term policies that continue to provide a predictable and reliable market and regulatory framework compatible with societal goals
- Consistent policy framework more important than specific RE incentive type
- Competitiveness of renewables depends on market design
 - Fair rules for up-front capital intensive technologies and distributed generation will be key

Thank you for your attention!



- **Medium-Term Renewable Energy Market Report 2013**

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