



Renewable Energies for Manufacturing Industries

Bioenergy

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Nothing new under the sun....or in the woods!



“In the days of [charcoal](#) iron production in England, most woods in iron making regions were managed as coppices, usually being cut on a cycle of about 16 years. In this way, fuel could be provided for that industry, in principle indefinitely, as long as the nutrient mineral content of the soil was appropriately maintained. This was regulated by a statute of [Henry VIII](#), which required woods to be enclosed after cutting (to prevent browsing by animals) and 12 standels (*standards* or mature uncut trees) to be left in each acre, to be grown into timber”



Biomass in Industry

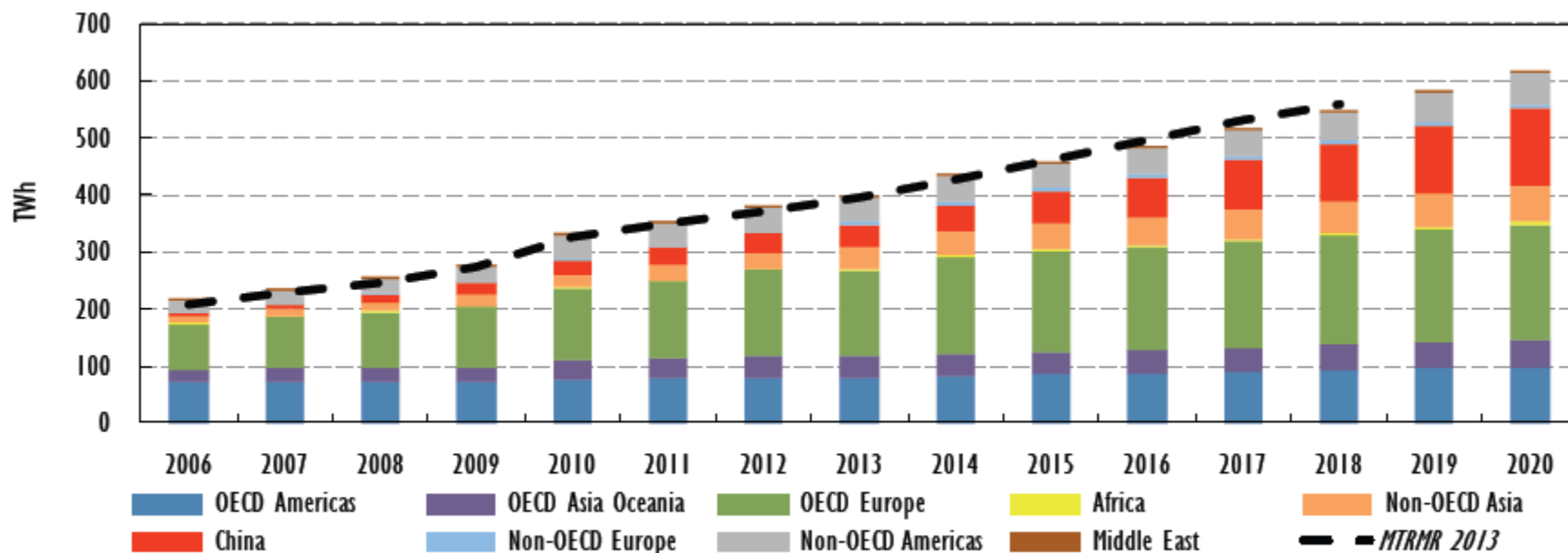


- Electricity
- Heat – steam/hot water
- Heat – coal replacement in C heavy industries
- Source of biochemicals

Biomass power generation to increase 50%



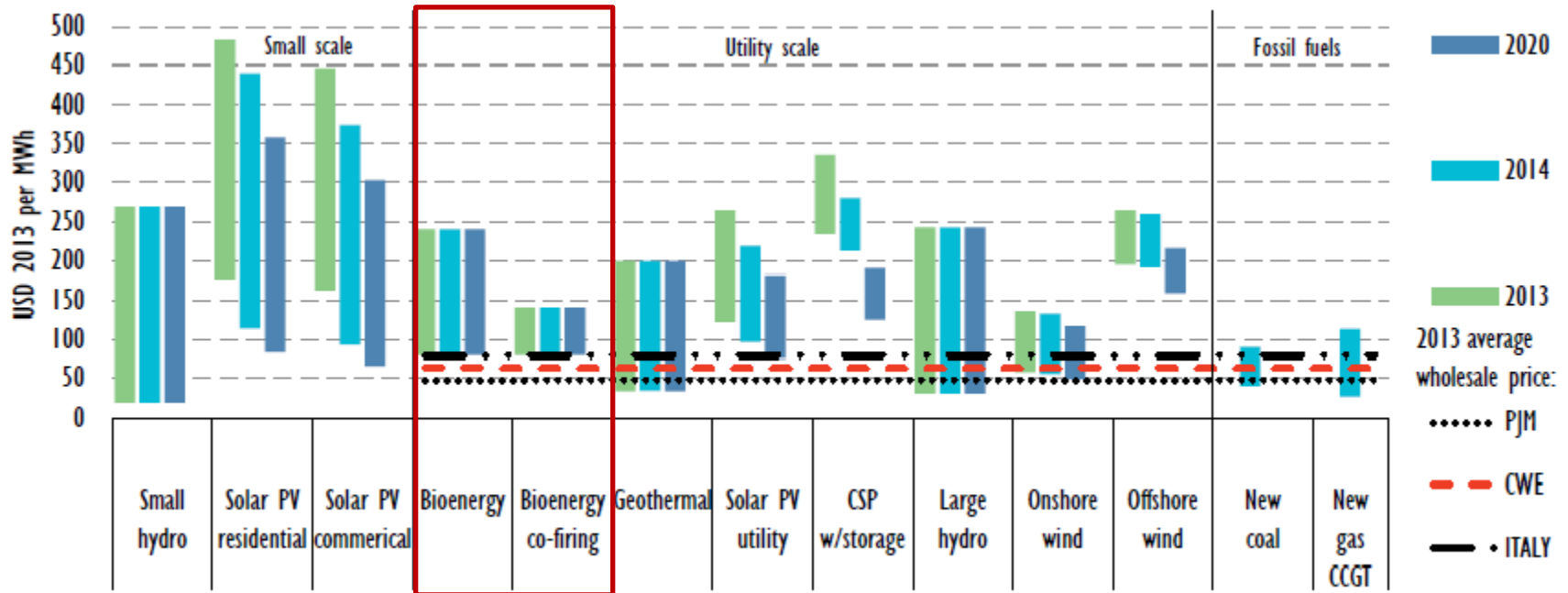
Bioenergy electricity generation



Note: includes generation from renewable municipal solid waste.

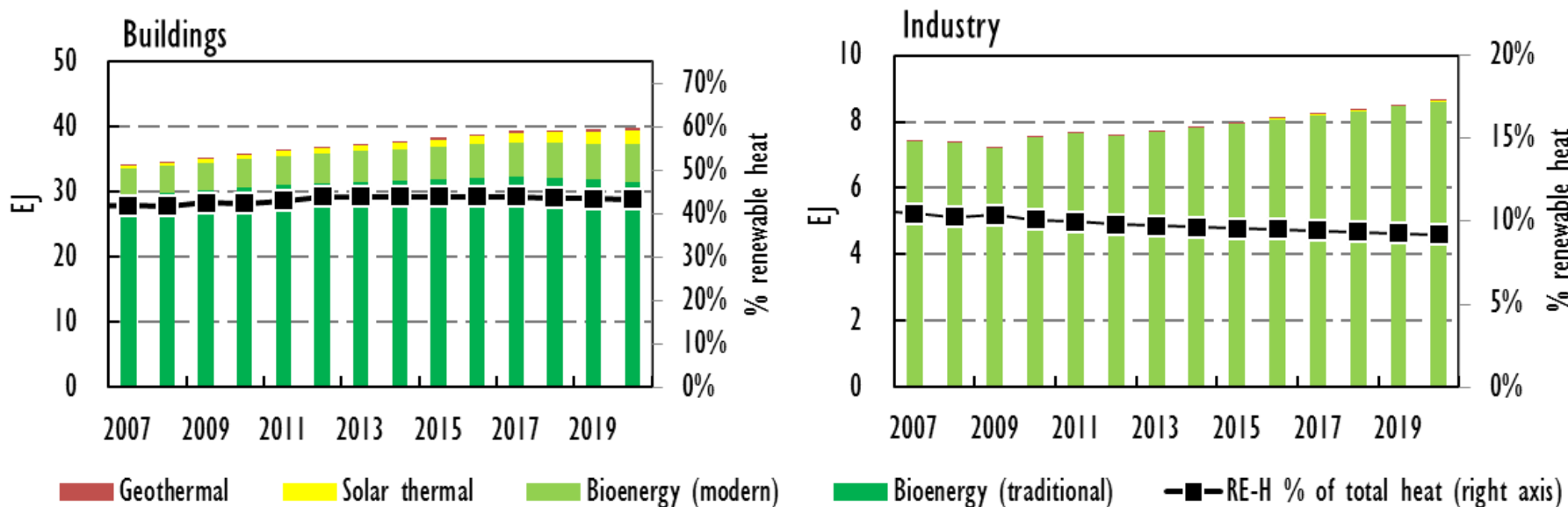
- Ambitious plans for agricultural residue use, and waste-to-energy projects, lead to tripling of capacity in China
- Targets for biomass power in the European Union remain an important driver, despite growth in some markets slowing down

Electricity generation costs pose challenge for bioenergy



- Levelised cost of electricity generation continue to decrease for most renewable technologies
- Bioenergy falling behind as most technologies already mature and feedstock costs prevent steep cost reductions

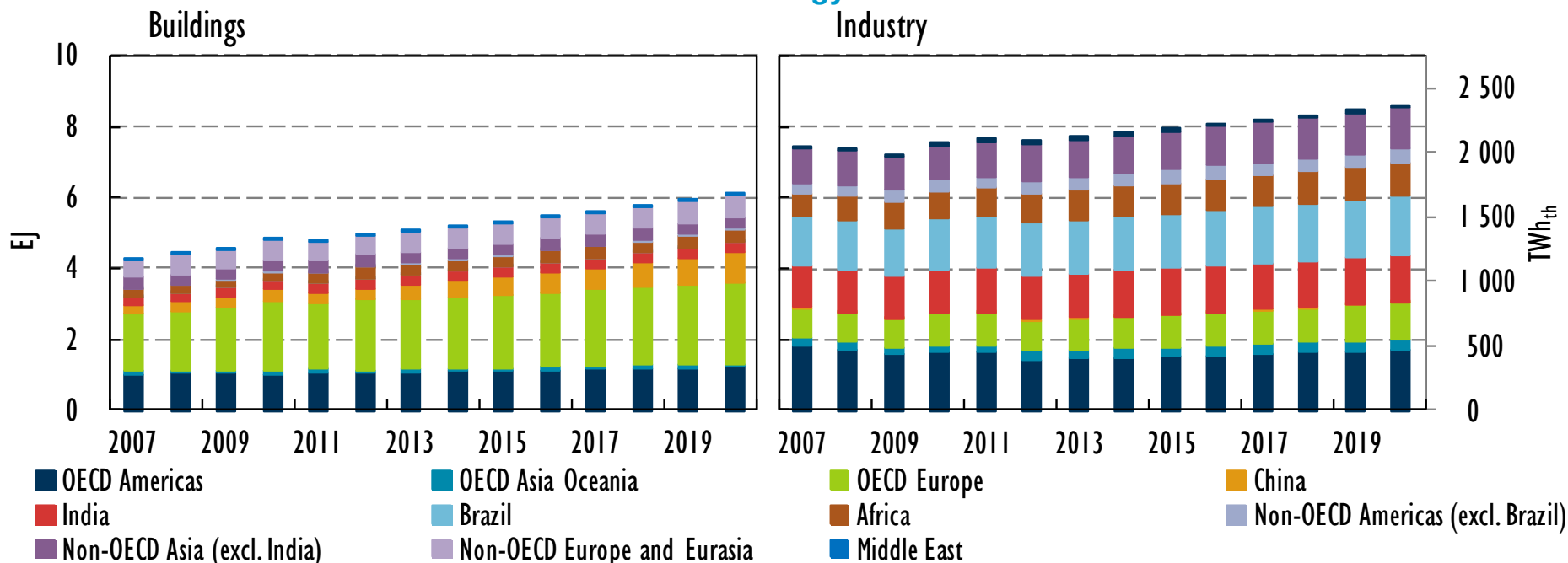
Renewable energy use for heat to grow in buildings and industry



- **Buildings sector's renewable heat use only growing slowly due to opposing trends in bioenergy use:**
 - Traditional biomass use set to decline (China, Brazil) or growth slowing down
 - Modern biomass continues to grow driven by support policies and attractive economics
- **Renewable heat in industry growing slowly in absence of strong (policy) drivers**

Bioenergy remains most important source of modern renewable heat

Modern bioenergy use for heat



Note: excludes traditional biomass use

Buildings

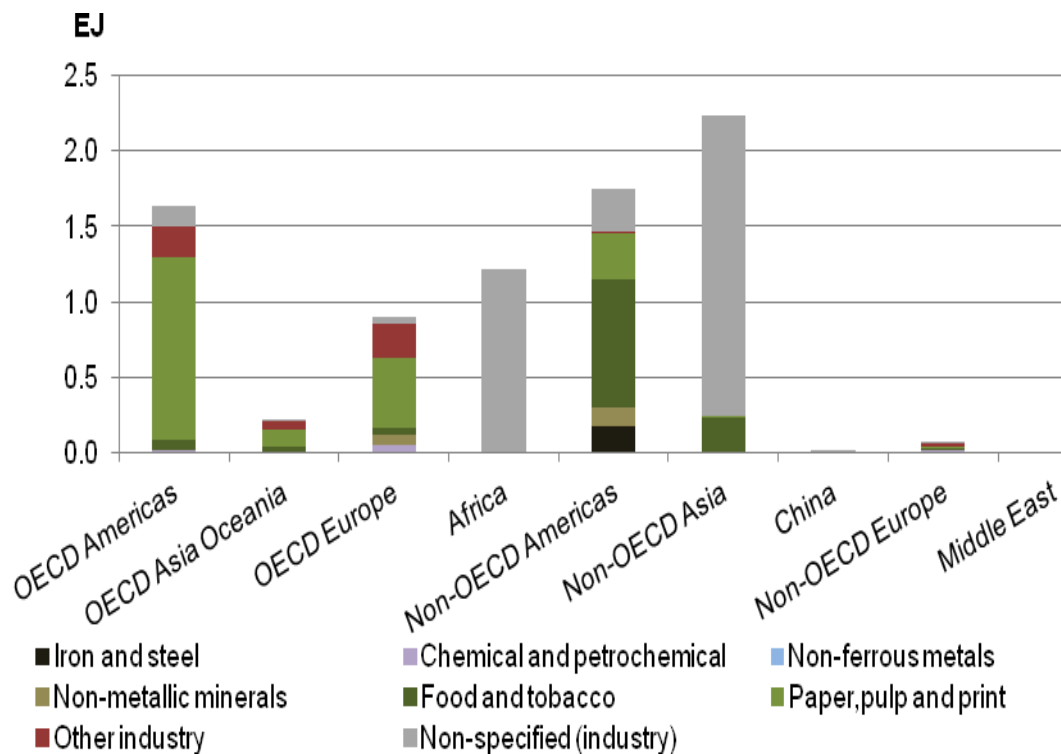
- OECD Europe remains key market, due to EU 2020 targets for renewable energy
- China fastest growing market a.o. due to ambitious biogas program

Industry

- Steady growth continues, as economic recovery and high fossil fuel costs drive bioenergy use for heat

Where and what is it used for now?

Global final bioenergy use for heat in industry by sub-sector in different regions, 2011



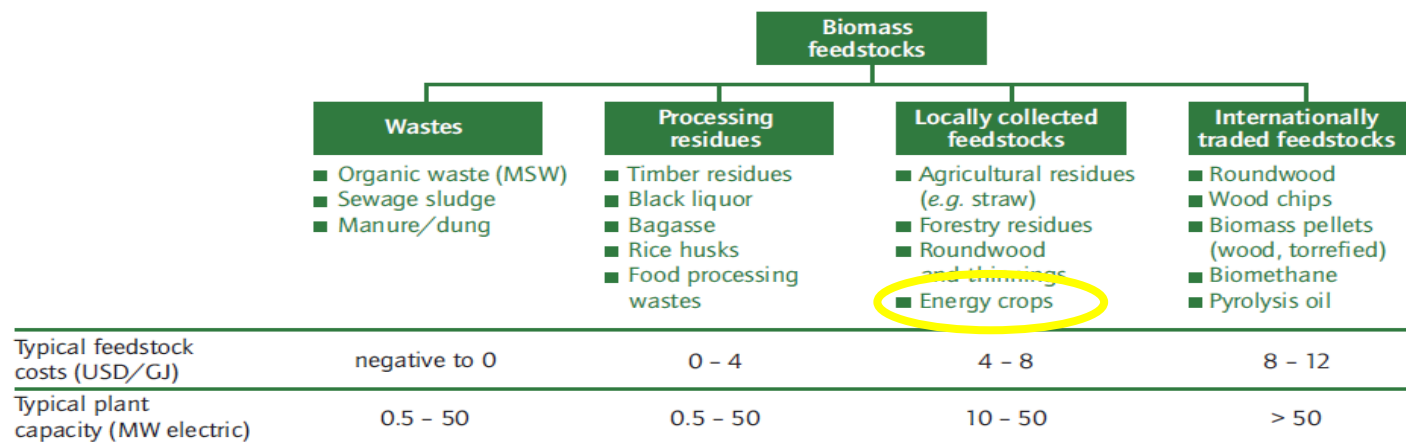
Ref: HEATING WITHOUT GLOBAL WARMING, IEA 2014

Biomass in Iron and Steel - Brazil

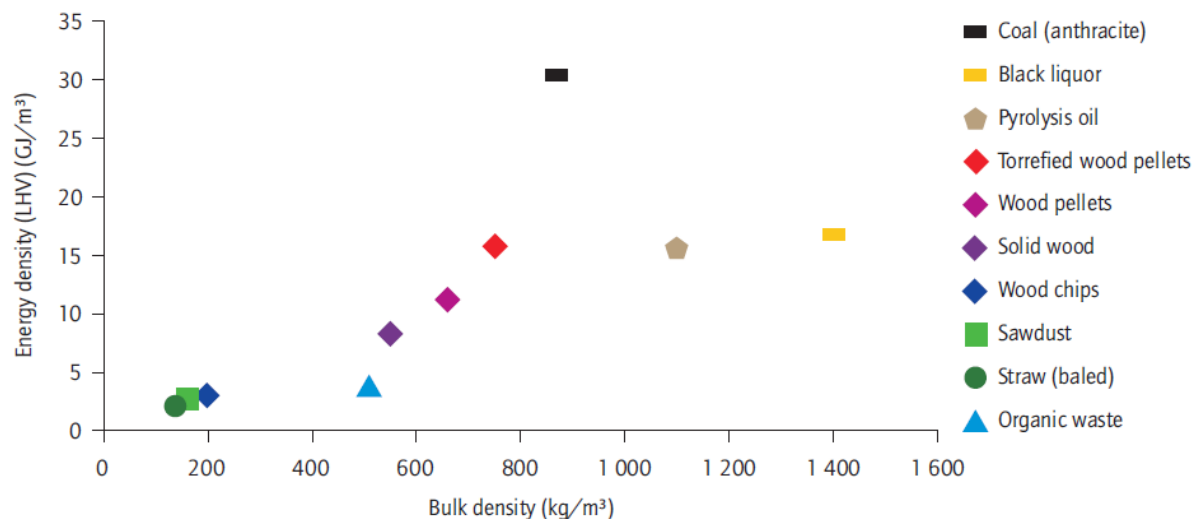


- **Brazil: 37% of iron and steel sector's energy used for heat provided by charcoal in 2011 for pig iron manufacture.**
- **Quality constraints**
- **Structural properties unsuitable for large scale operation?**
- **Potential for torrefied pellets**

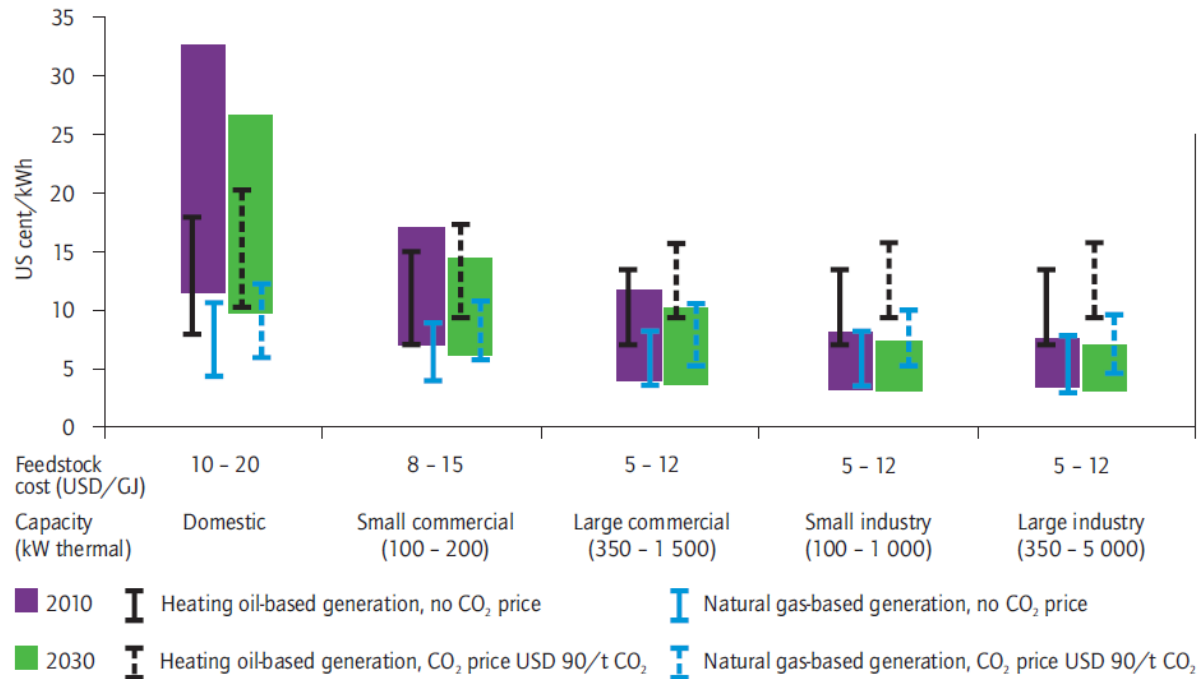
Costs and Value of Biomass



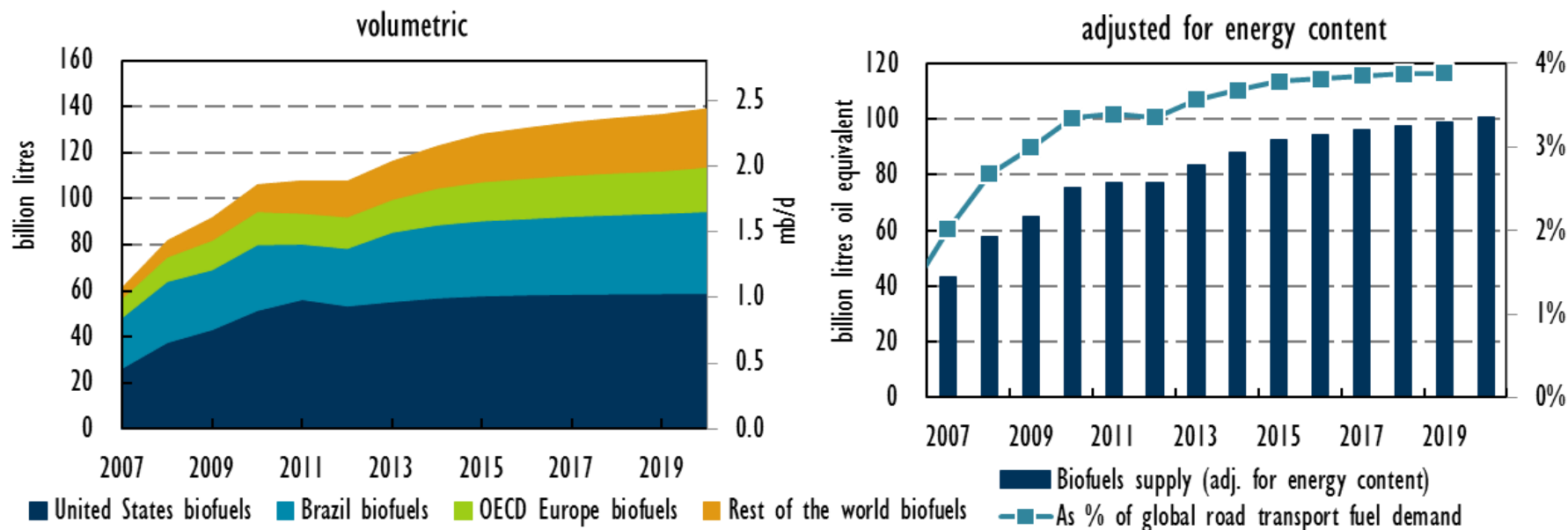
Comparison of bulk density and energy density of different biomass feedstocks.



Bioenergy for Industrial Heat

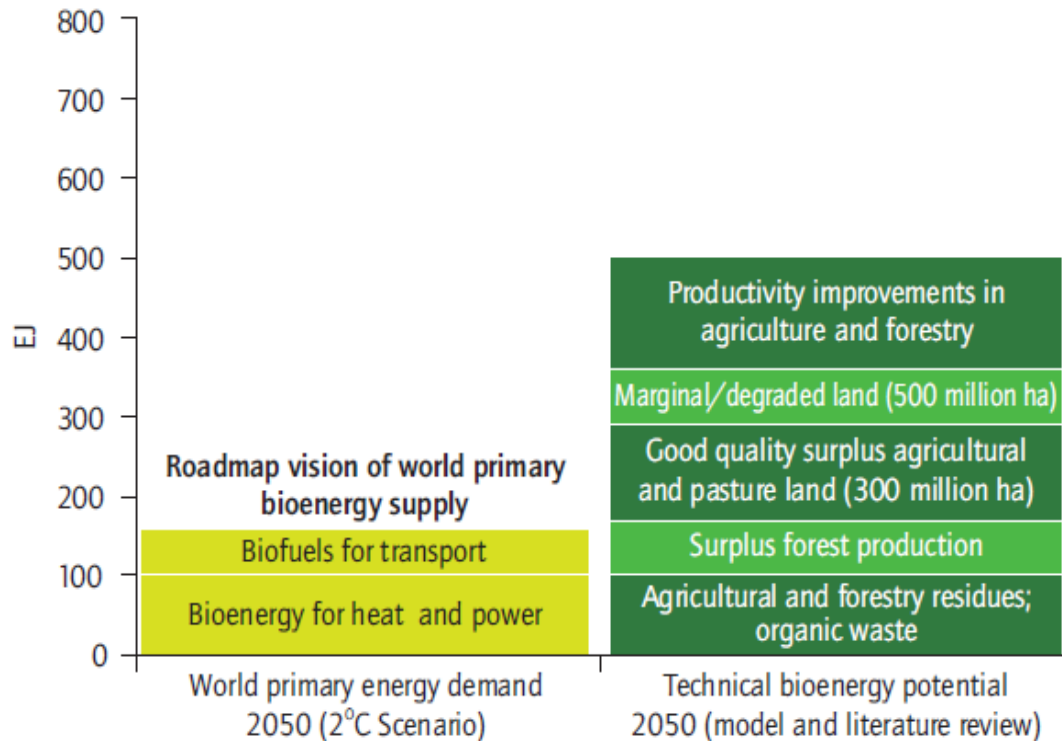


Shifting policy grounds slow down growth



- Biofuels account for 3.6% of world road transport fuel demand in 2013
- Global production set to grow by 2.6% /year to 139 bn L (2.3 mb/d) in 2020
- Growing political uncertainty in the EU and US might undermine the medium-term growth prospects, while emerging markets ramp up support policies

Biomass supply prospects - uncertainties remain



IEA Bioenergy Heat and Power Roadmap, based on IPCC supplemented with IEA data

- Biomass demand for heat and power reaches 5-7 billion tons in 2050
- Intermediate targets should be adopted to enhance international biomass trade, and assess costs and impact on sustainability

Bioenergy in industry

Questions



- **Large scale sustainable supply chains**
 - (100MW thermal = c.150,000 tonnes dry biomass)
 - Role for torrefaction?
 - Sustainability?
 - Competition for resources?
- **Costs including handling and conversion plant?**
- **Security of supply for industrial users?**
- **RD and D for industrial uses?**
- **Role of bio as chemical feedstock vs fuel**
 - Move to integrated approach?
 - Specialist or bulk chemicals?
 - Policy drivers skewed towards fuels?