



**IEA Bioenergy**  
Technology Collaboration Programme



# Sustainable bioenergy to displace fossil fuels in industries

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*WBA webinar: Lessons so far - the role of sustainable bioenergy in displacing fossil fuels*

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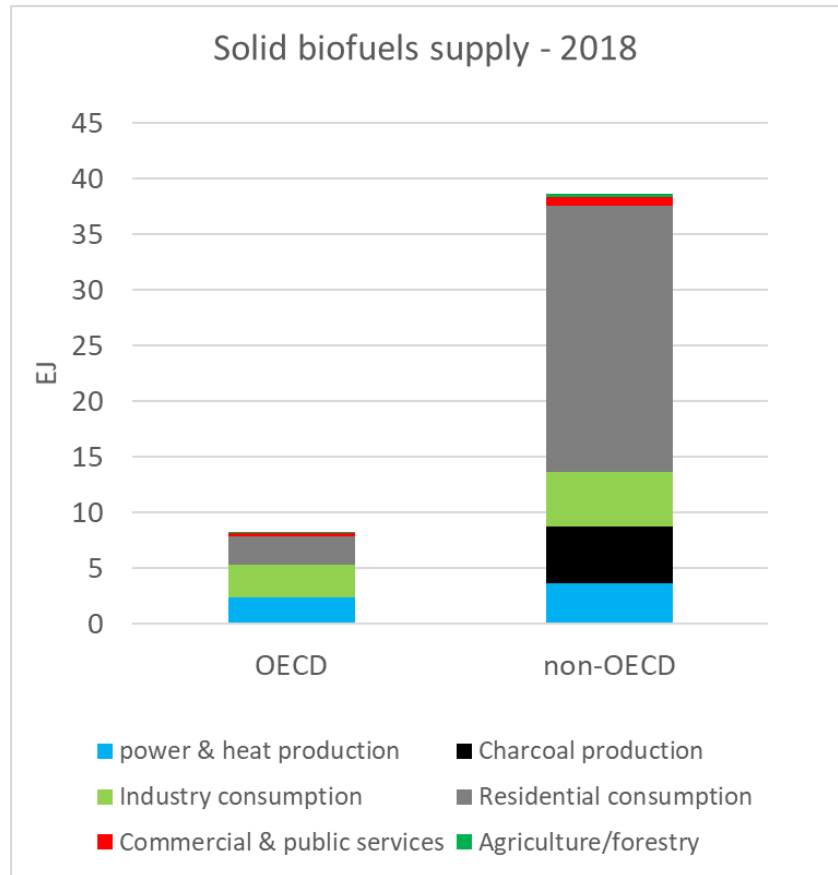
# Unique role for sustainable bioenergy

- **Available** now
- **Versatile:** role in different sectors - heat, power, transport fuels
- Readily integrated with **existing infrastructure**
- **Storable** - can support expansion of intermittent renewables
- Can lead to **net extraction of atmospheric CO<sub>2</sub>** (“negative emissions”) when linked to Carbon Capture & Storage (CCS): BECCS / Bio-CCS

Bioenergy contributes to climate change mitigation when:

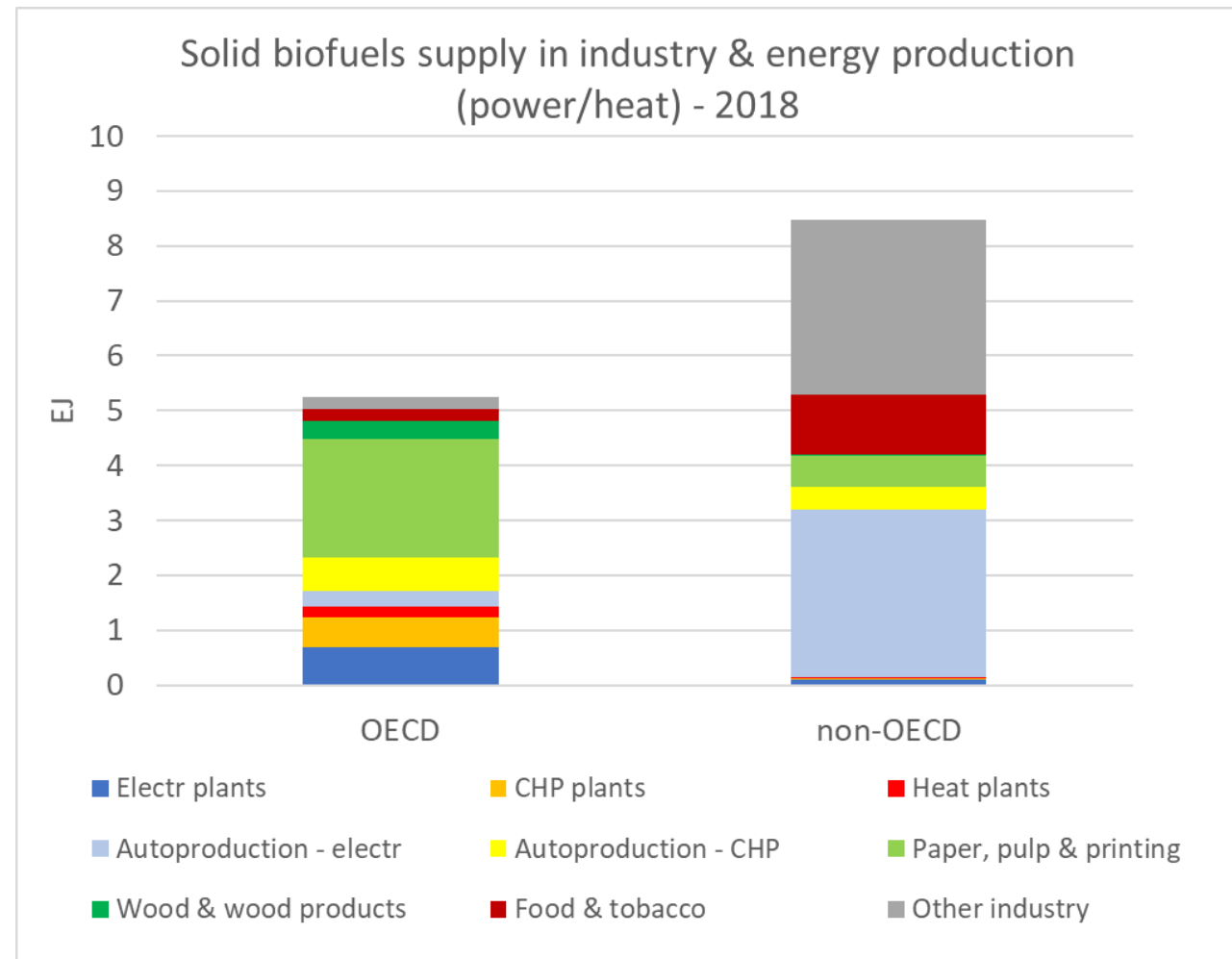
- Biomass harvests fit within sustainable land/forest management or based on **waste/residues**
- **Converted** to energy products **efficiently** (often as co-product of biomaterials)
- Used to **displace GHG-intensive fuels**

# Current use of solid biofuels in industries



## OECD:

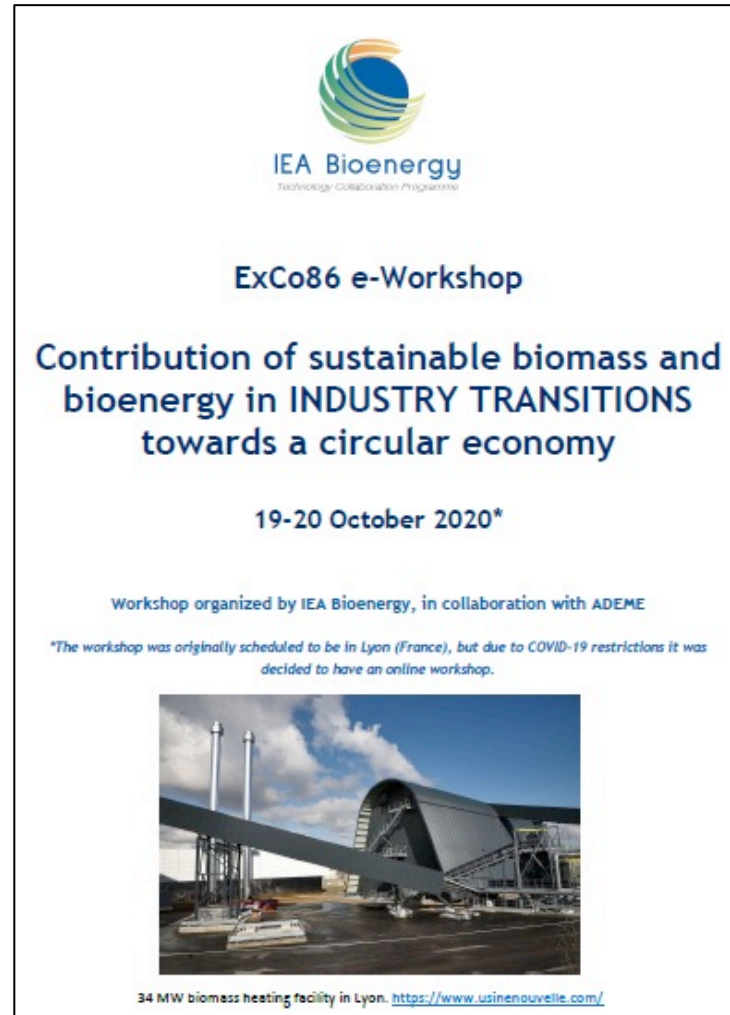
- Very important role of pulp & paper industries
- Energy production: mix electricity only - CHP; autoproduction (for own use) – activity producer



## Non-OECD:

- much more auto-production electr (own use) & use in 'other industries'
- High demand for residential use ('traditional' bioenergy) & charcoal prod.

# IEA Bioenergy workshops on industry applications in 2019-2020



Summary & presentations available at:  
<https://www.ieabioenergy.com/iea-publications/workshops/>

# Some workshop conclusions - biomass in industry

- Several fuel-technology combinations are commercially available for producing power & heat in industry, and there are many successful examples of biobased industrial heat.
- Use of own process residues in pulp & paper, wood processing, food industries, ... is most common and cost-competitive. For further deployment in industries we need to go beyond that => low cost of fossil fuels is main challenge.
- Heat demand in small and medium sized industries can often be better matched with the biomass resources that may be locally/regionally available
- The optimal technology-feedstock combination is very site specific and needs to be carefully assessed.
- Size of consumption in large energy intensive industries can be a bottleneck and access to biomass is one of the biggest issues. Combinations with other solutions (e.g. electrification, hydrogen, CCUS) needed to further reduce the carbon footprint in these sectors.

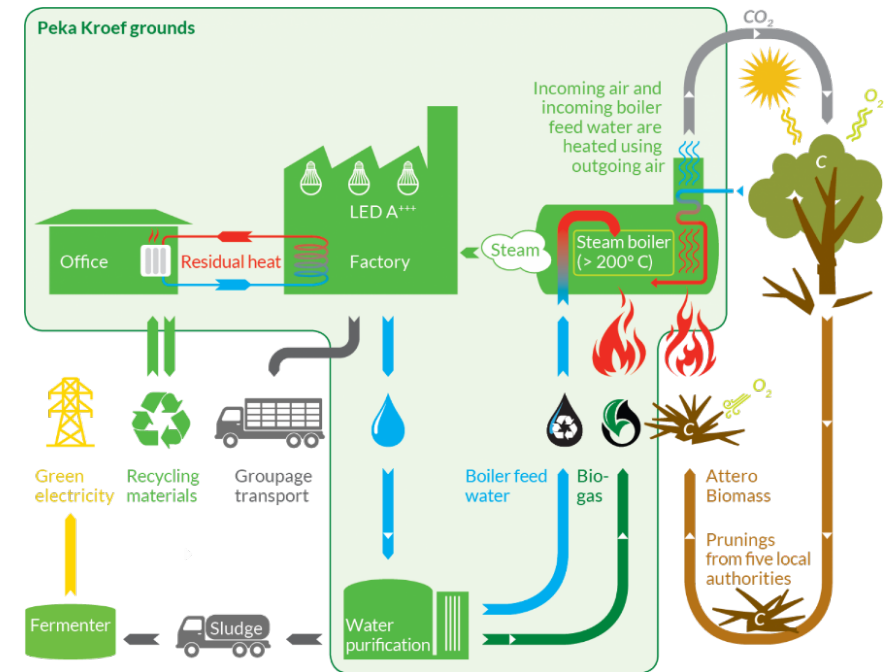


Figure: Schematic diagram of anticipated water and energy streams at PEKA Kroef, a potato processing company in the Netherlands. Process team is generated by a biomass fired boiler, operated by the waste processing company Attero. (source: PEKA Kroef)



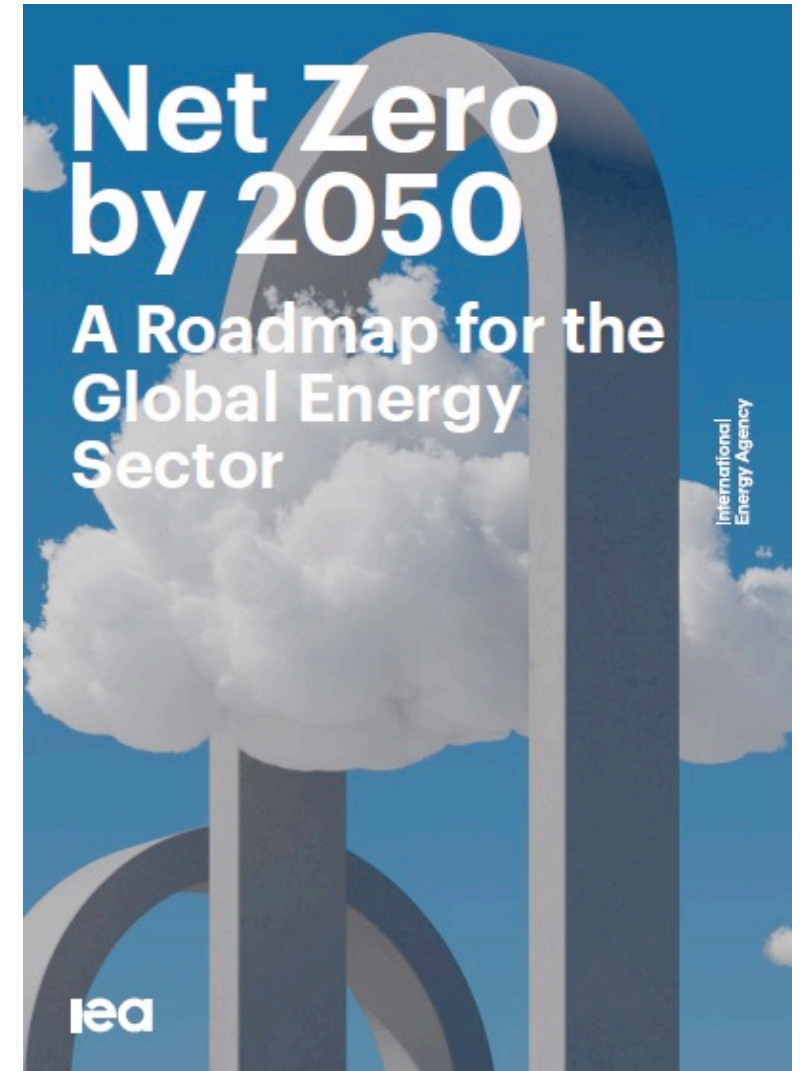
# Some workshop conclusions - business models

- For further deployment of bioenergy at the global level => need to develop **economically viable and bankable business models**
- **Mobilisation of biomass resources** is important prerequisite in biobased business models. Feedstock cost, feedstock diversity, supply security, as well as sustainability governance are all key considerations in setting up successful business models.
- **Bio-hubs** - providing feedstock collection, intermediate pre-treatment and storage - can be a promising tool to deal with the interface between supply chains and markets they serve. Can link to **trading platforms**.
- Biomass availability has its limits. Towards the future, **value creation** from the biomass to be maximized through a mix of technologies and end products (*as is common practice in petroleum refineries*)
- **Sustainability advantages should be reflected through market value or market access**. Credits for CO<sub>2</sub> savings & negative CO<sub>2</sub> emissions will be needed.
- **Stable policy framework!** Risk abatement and risk sharing for early market introduction.
- Communication and engagement of the **local community!** Shared benefits/ownership can be a powerful way to deal with local resistance to new facilities. + deal with local concerns (e.g. air quality)

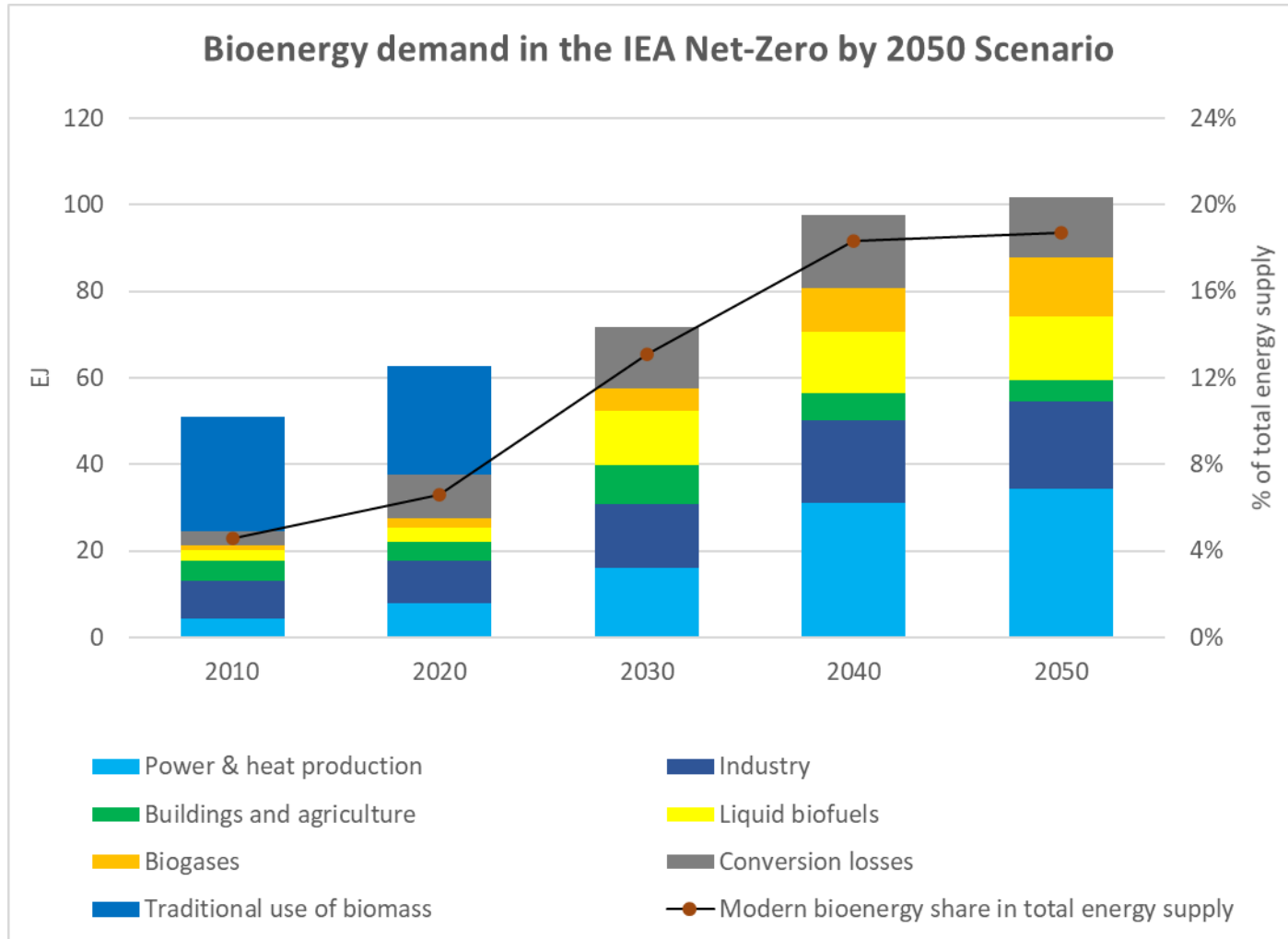
# Bioenergy's role in future energy transition

## IEA 'Net Zero by 2050' roadmap (18 May 2021)

<https://www.iea.org/reports/net-zero-by-2050>



# Bioenergy demand in IEA 'Net Zero by 2050' roadmap



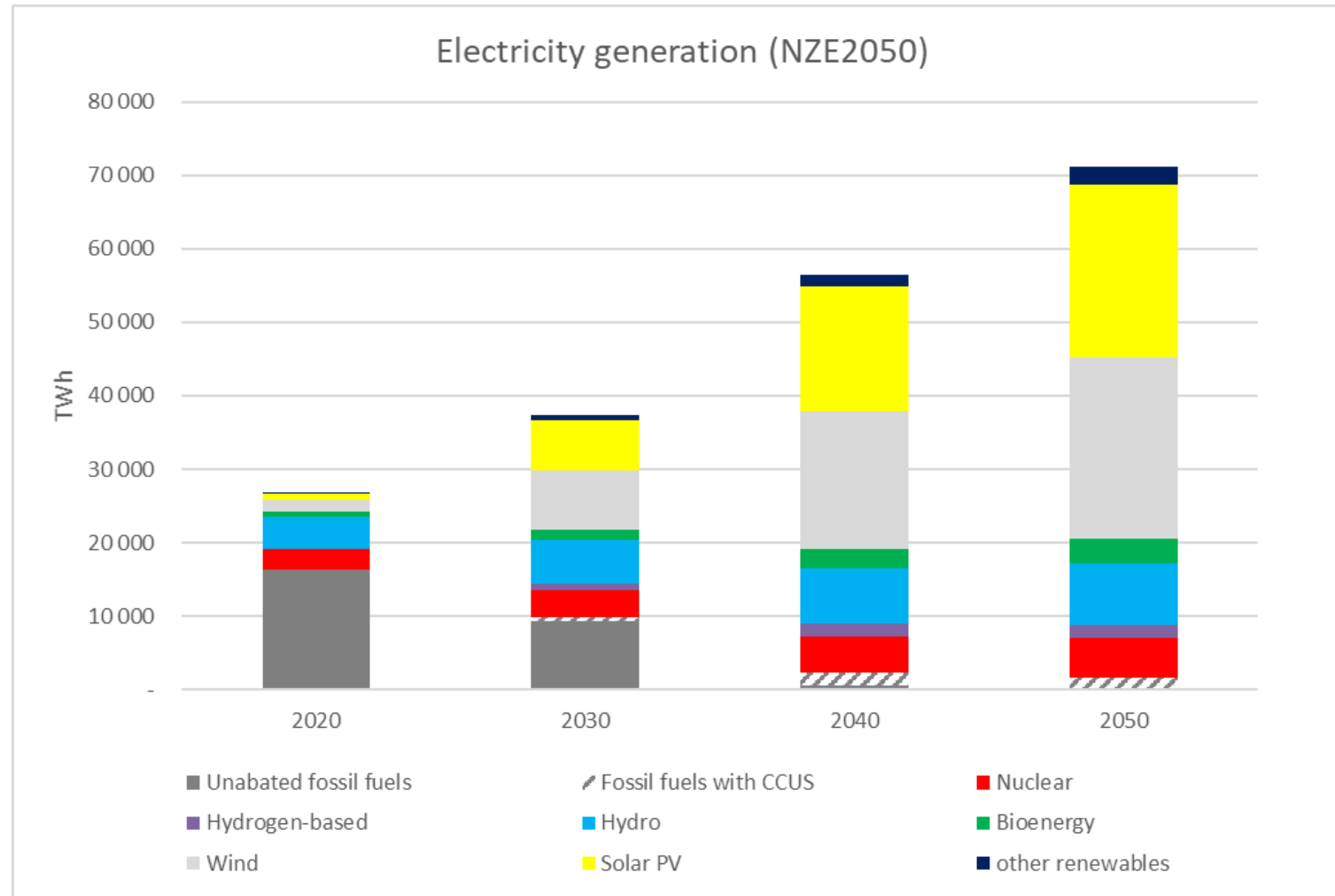
- IEA NZE roadmap puts overall limit of ~100 EJ on biomass availability (*to be on the safe side*)
  - 60 EJ from agri, forestry & industry residues & wastes
  - 40 EJ requiring land use (crops, forestry plantations, agroforestry)
- Bioenergy to represent 18% of total energy supply in 2050
- asap phase out of traditional bioenergy

International Energy Agency (2021), Net Zero by 2050, IEA, Paris



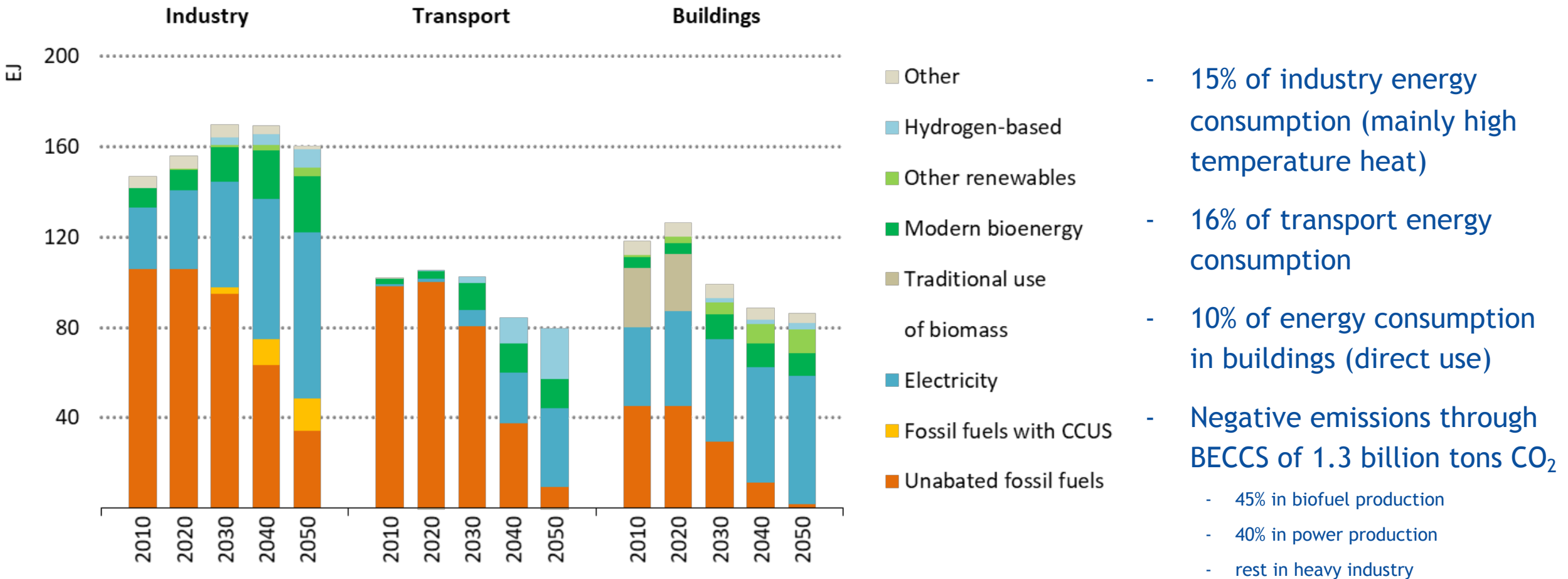


# Global electricity generation in IEA NZE2050 roadmap



- Electricity x 2.5 by 2050 due to increased electrification
- Dominated (70%) by **variable & seasonal renewables** (solar, wind) => other components to provide flexibility, dispatchability, grid inertia
- Biomass represents 5% of total electricity generation in 2050 (also producing heat in CHP), of which one quarter is equipped with CCS

# Global final energy consumption by sector and fuel in the IEA NZE2050



*There is a wholesale shift away from unabated fossil fuel use to electricity, renewables, hydrogen and hydrogen-based fuels, modern bioenergy and CCUS in end-use sectors*

# Key lessons

- Biomass is a **key component** to reduce the climate impact of industries, next to electrification, hydrogen & CCUS.
- It is important to increase awareness on the role of biomass and bioenergy, both to industry and authorities.
- Industries need to take a long term perspective and make real engagements towards net carbon neutrality. Market pull can help (*customers requiring lower carbon footprint*).
- The main challenge is the low cost of fossil alternatives (*if carbon cost is not accounted*). Sustainability advantages need to be reflected in economics.
- Biomass resources are limited (*although there is room for further mobilisation*). Focus on efficient and value added use.
- Availability and access to sustainable biomass (*with due account of competing uses*) are crucial to increase the role of biomass in industry transitions. Importance of mobilizing biomass supply chains, with sustainability safeguards!

Thanks for your attention

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