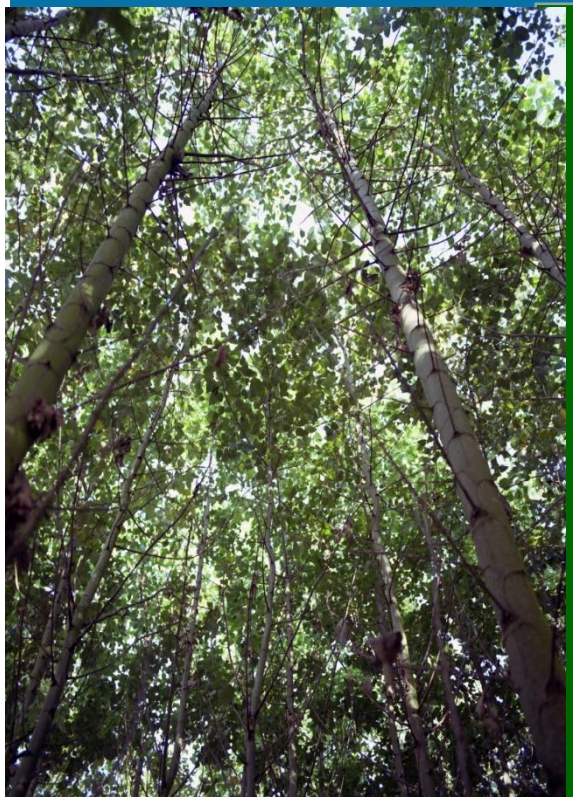
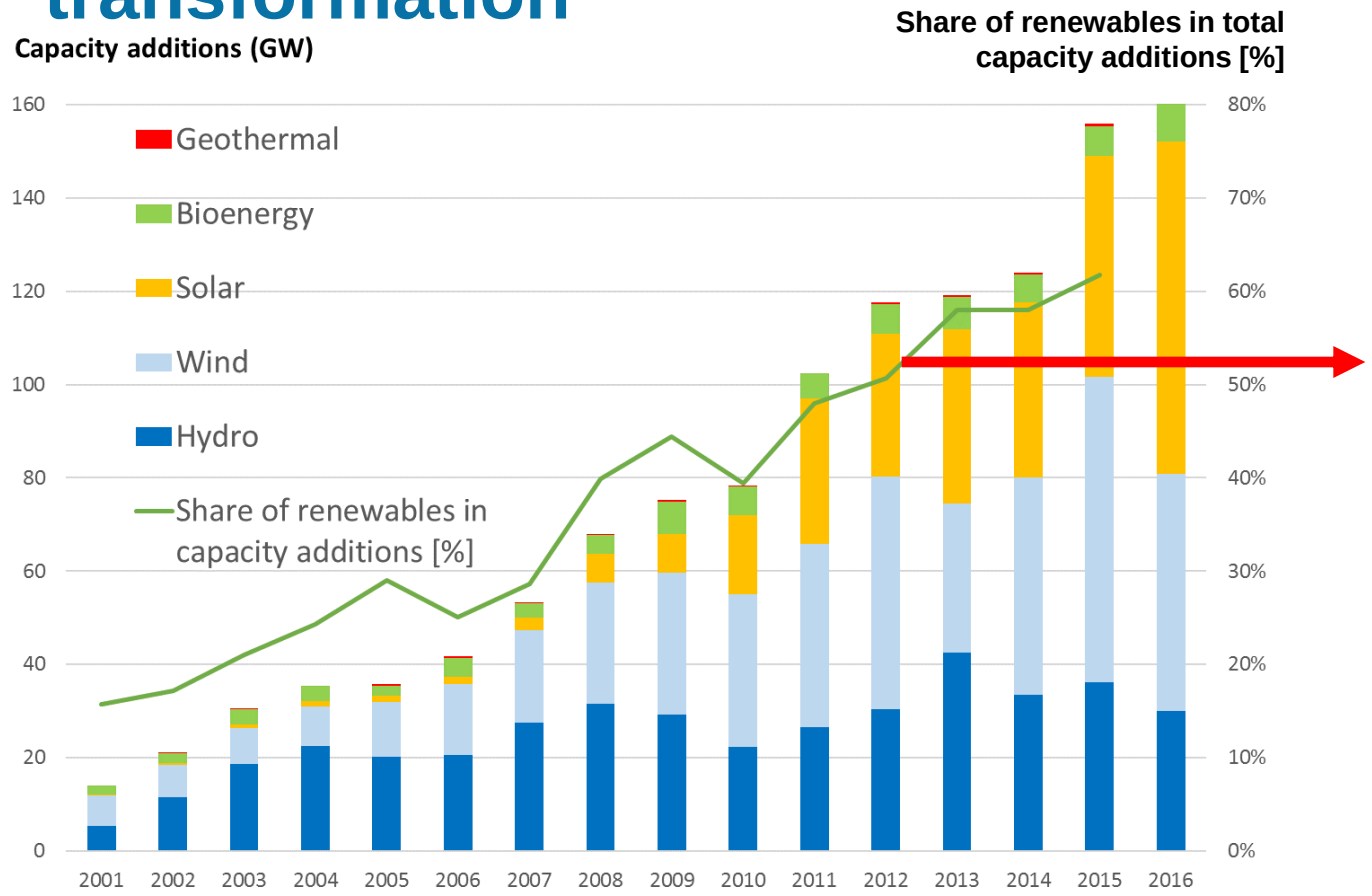
Bioenergy Prospects for EU and the World



Dolf Gielen
International Renewable Energy Agency
IRENA

Circular Conference
Geertruidenberg
Netherlands
14 March 2018

On-going power sector transformation



Since 2012 >50% of total capacity additions

2017 (est.)

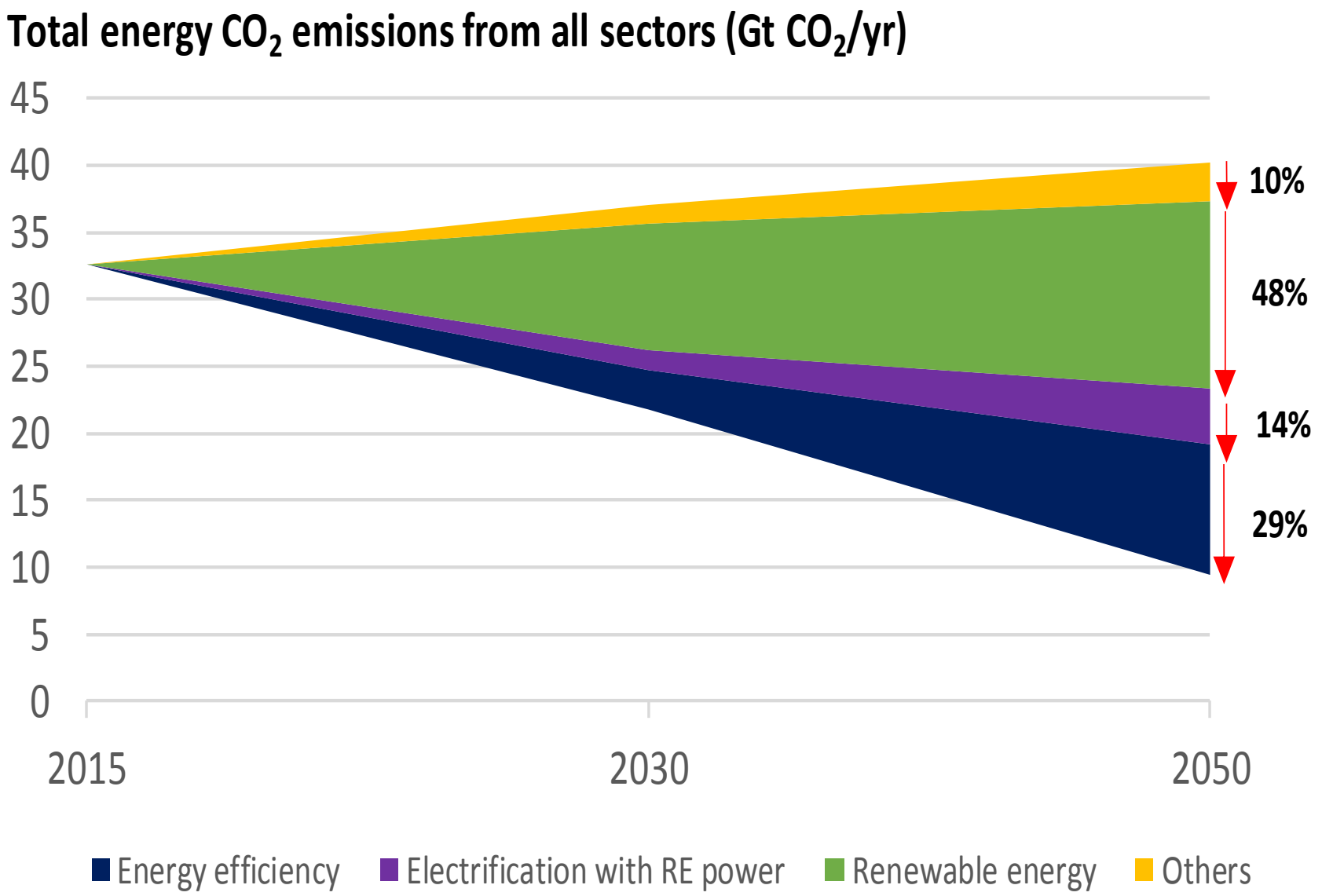
- 95 GW solar PV
- 53 GW wind
- 3 GW biomass
- 20-30 GW hydro

Source: IRENA statistics

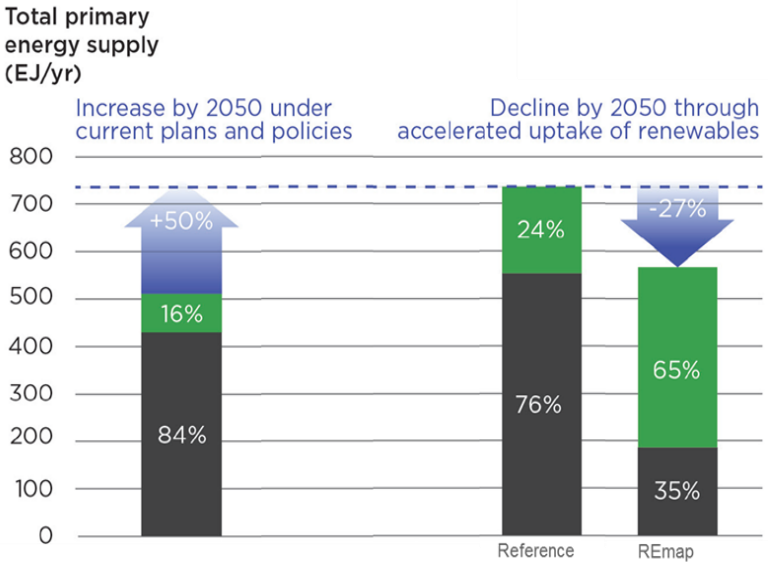
- Around **25%** renewable power generation share worldwide
- Growing by **0.7 percentage points** per year
- 477 TWh biomass power in 2015, 9% of all renewable power

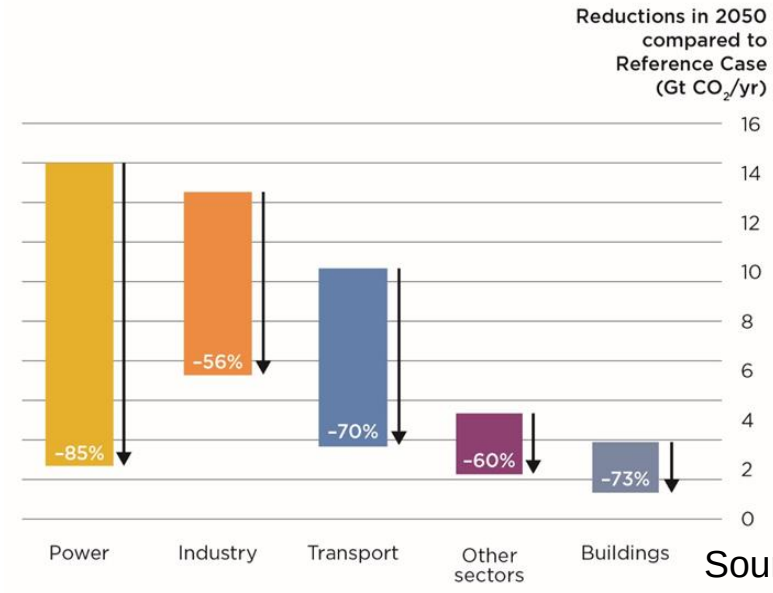
An urgent need for emissions reduction

48-62% of CO_2 emission reductions based renewables



Global view of Energy Transition by 2050





- Renewable energy would make up two-thirds of the energy mix by 2050 in REmap case, up from just one-quarter in Reference Case
- This requires an increase in the renewables' share of 1.4% per year,
- A six-fold acceleration of recent years growth
- Power sector and end use sector efforts will be required

Source: IRENA, 2017

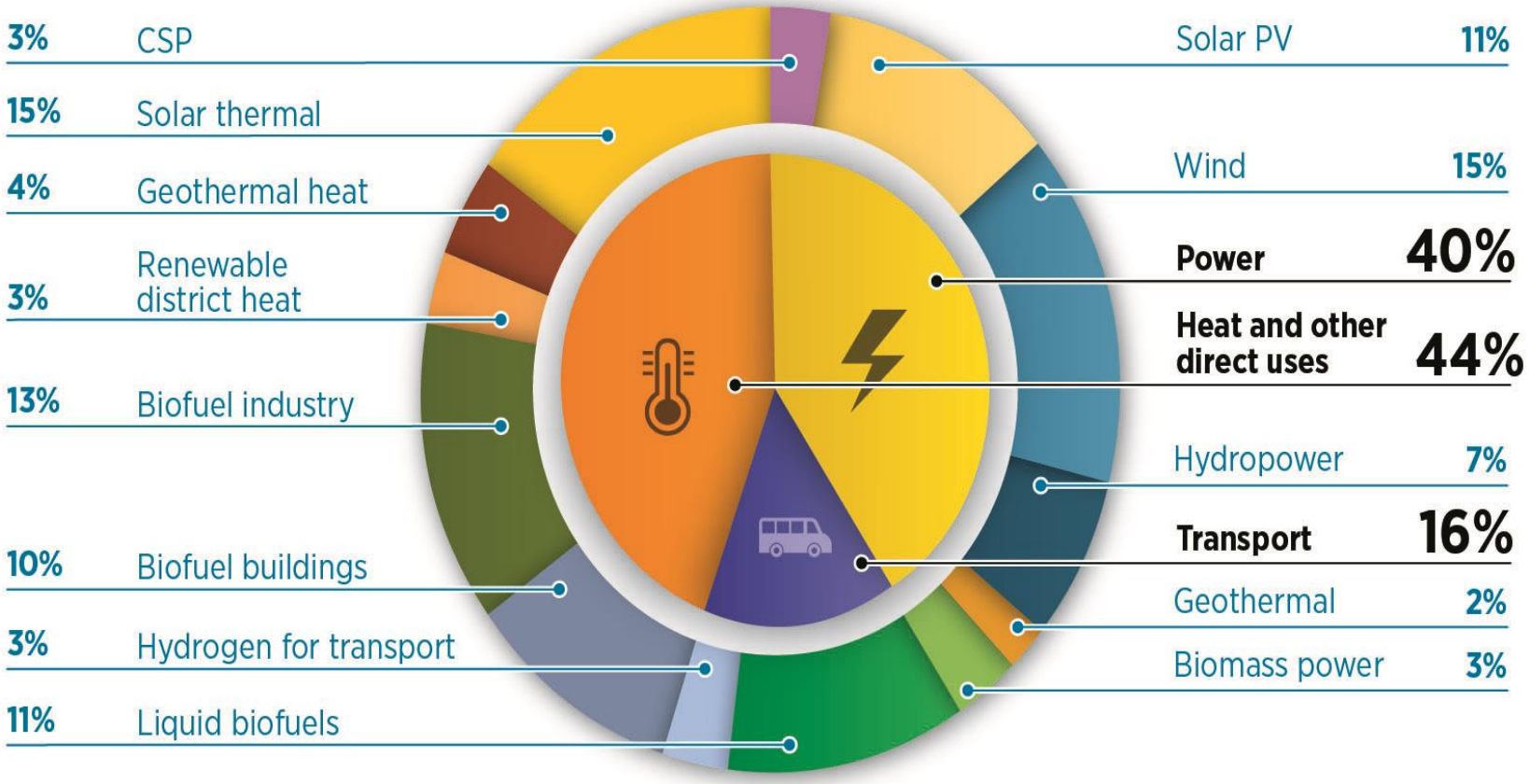
Biomass is a highly versatile resource with many applications

- Power generation
  - Dedicated biomass plant
  - Cofiring
  - Biogas
- Heat generation
  - Residential heating systems
  - Industrial heating and cogeneration applications
  - District heating systems
  - Biomethane
- Liquid and gaseous transportation fuels
- Feedstock for synthetic organic chemicals (methanol, olefins, aromatics, new platform chemicals)
- Natural and engineered wood and fibre materials

Modern biomass can play a key role in the global energy transition

Overall 37% Biomass

Renewables options consistent with "well below 2 degrees"



Source: IRENA, 2017

Global Investment in Liquid Biofuels

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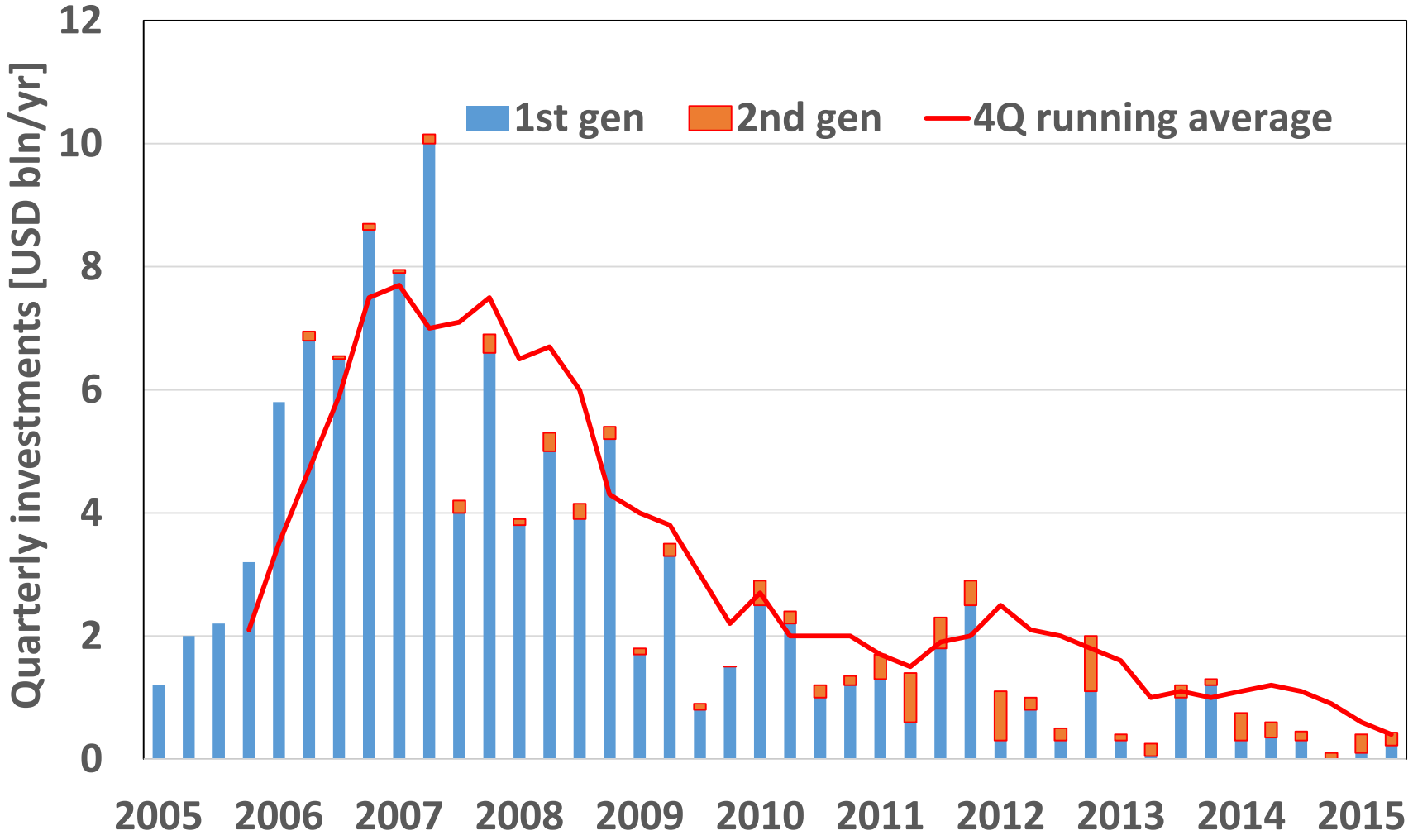
Sector is not developing as needed for energy transition



Source: BNEF

Biomass feedstocks

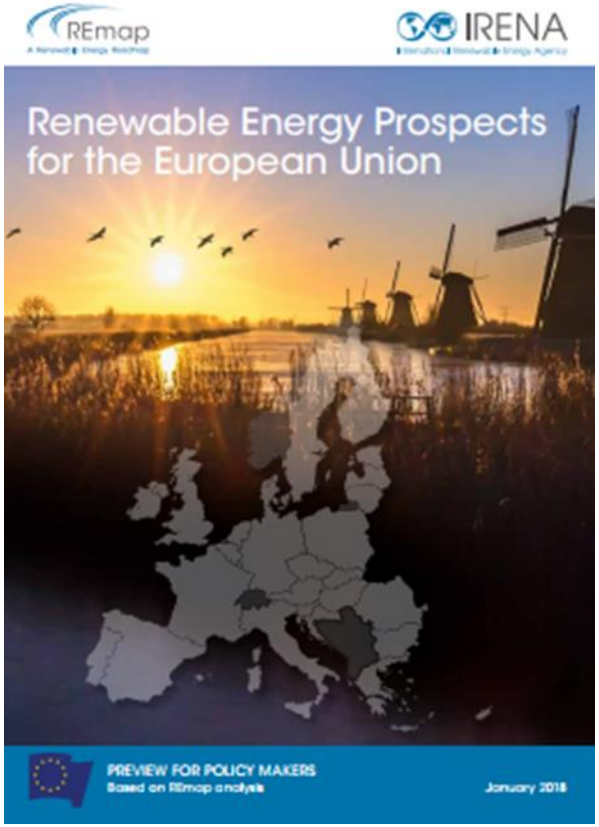
- Petrochemical feedstocks account for 10% of oil and gas use
- Biomass can be used for methanol, olefins, aromatics and other platform chemicals
- Biomass use around 20 Mt/yr or 0.3 EJ/yr today, could grow to 450 Mt/yr or 10 EJ/yr by 2050)
- Commercial plants exist, but economics are challenging in a low oil price environment
- Biorefineries continue to evolve (e.g. Finland)

Logistics key to sustainable biomass supply

- Sustainable, affordable and reliable feedstock supply is key for large scale applications

- Feedstock quantities and logistics matter
- Large scale applications require large volumes of biomass
- Commoditization for volume and market depth: bales, chips, pellets, torrefied pellets
  - Coastal deployment locations have an advantage
- Ensure agreed standards for CO_2 impact accounting
- Ensure sustainability of supply

Renewable Energy Prospects for the European Union: The outlook is brightening



February 2018

Aim

- Identify options to meet and potentially exceed the proposed 27% renewables target for 2030.
- Assess the aggregated impact of national renewable energy plans.
- Assess the role of renewables in long-term decarbonization.

Insights

- Doubling the RE share is feasible between now and 2030 to 34% RE share.
- This is cost neutral.
- RE technology improvements in recent years are the driver for greater potential.
- Accelerating renewable deployment will be key for Europe to be in line with Paris Agreement.
- Substantial economic and social benefits.

EU Leadership in Renewable Power

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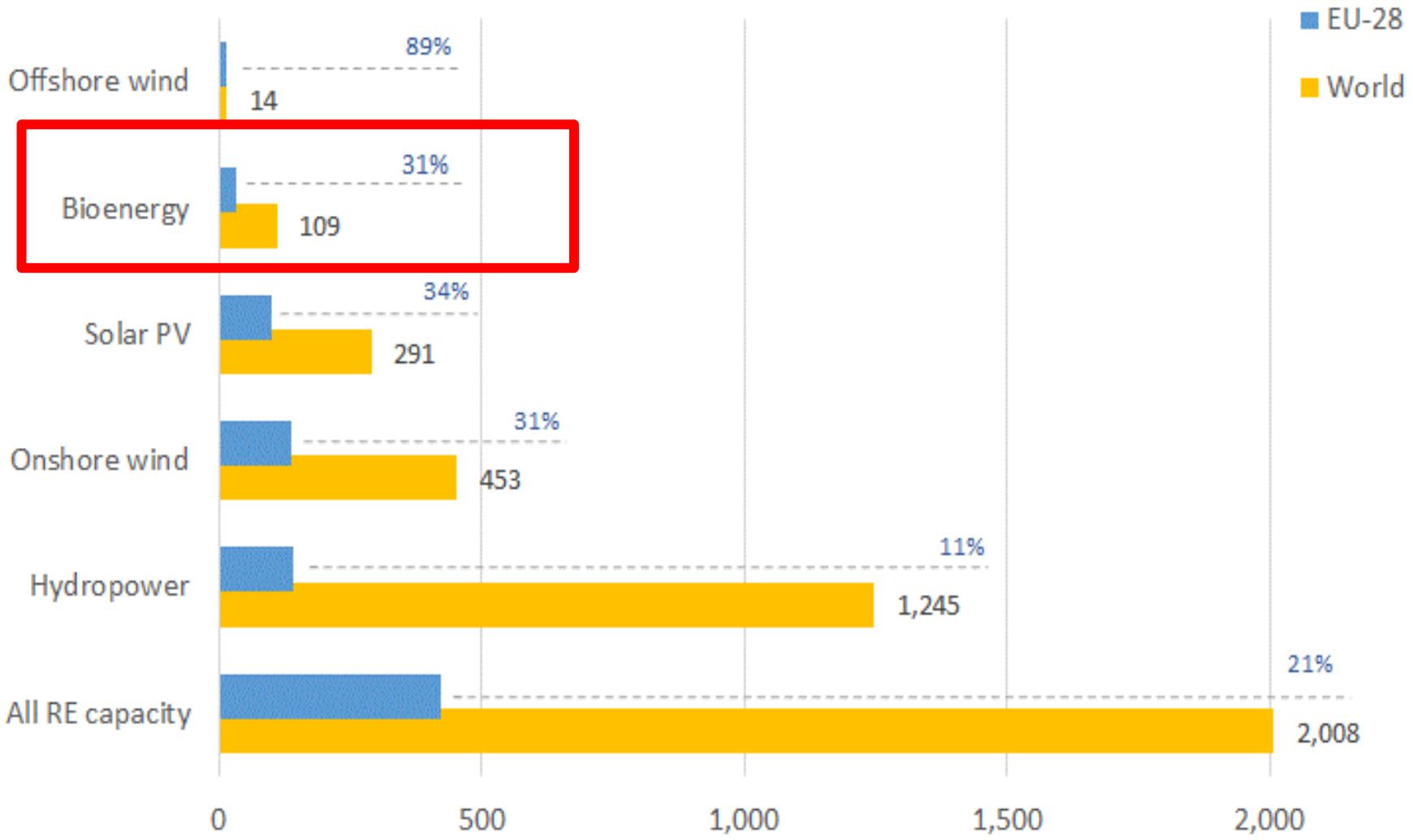
Global RE electric generating capacity in 2016 (GW) and EU-28 share of the global capacity



RE share of EU energy mix could double to 34%, cost effectively, by 2030

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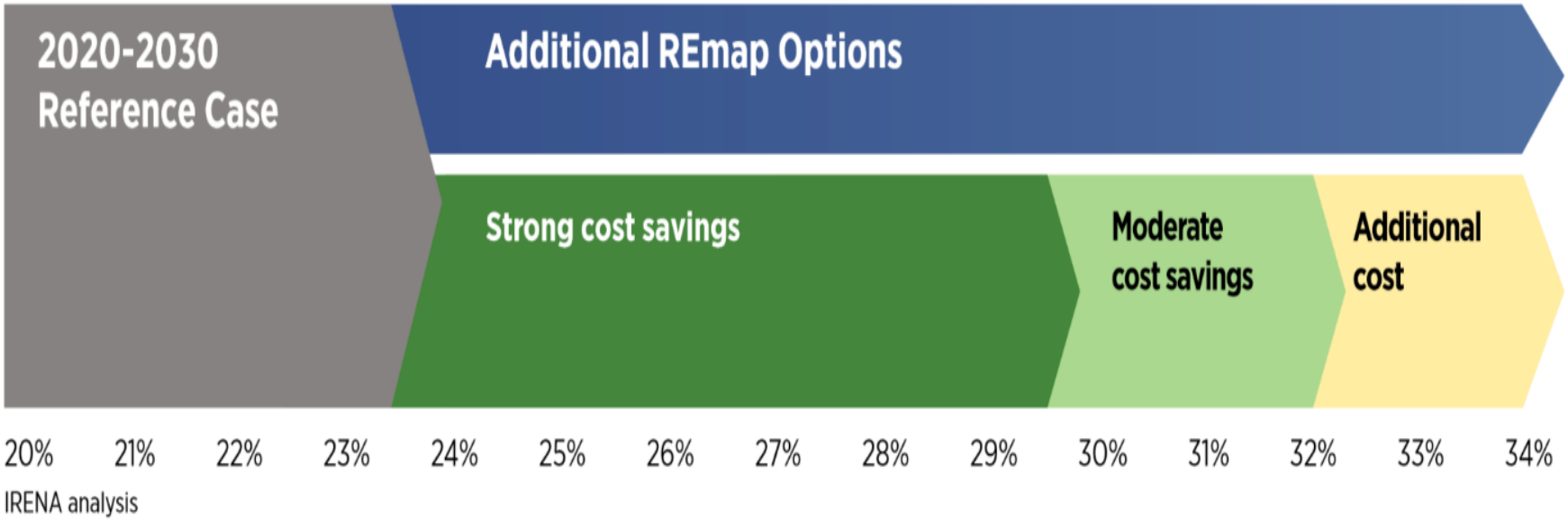


IRENA analysis

Strong cost savings

- Wind power
- Solar power
- Solar thermal in buildings
- Hydro power
- Geothermal power

Moderate cost savings

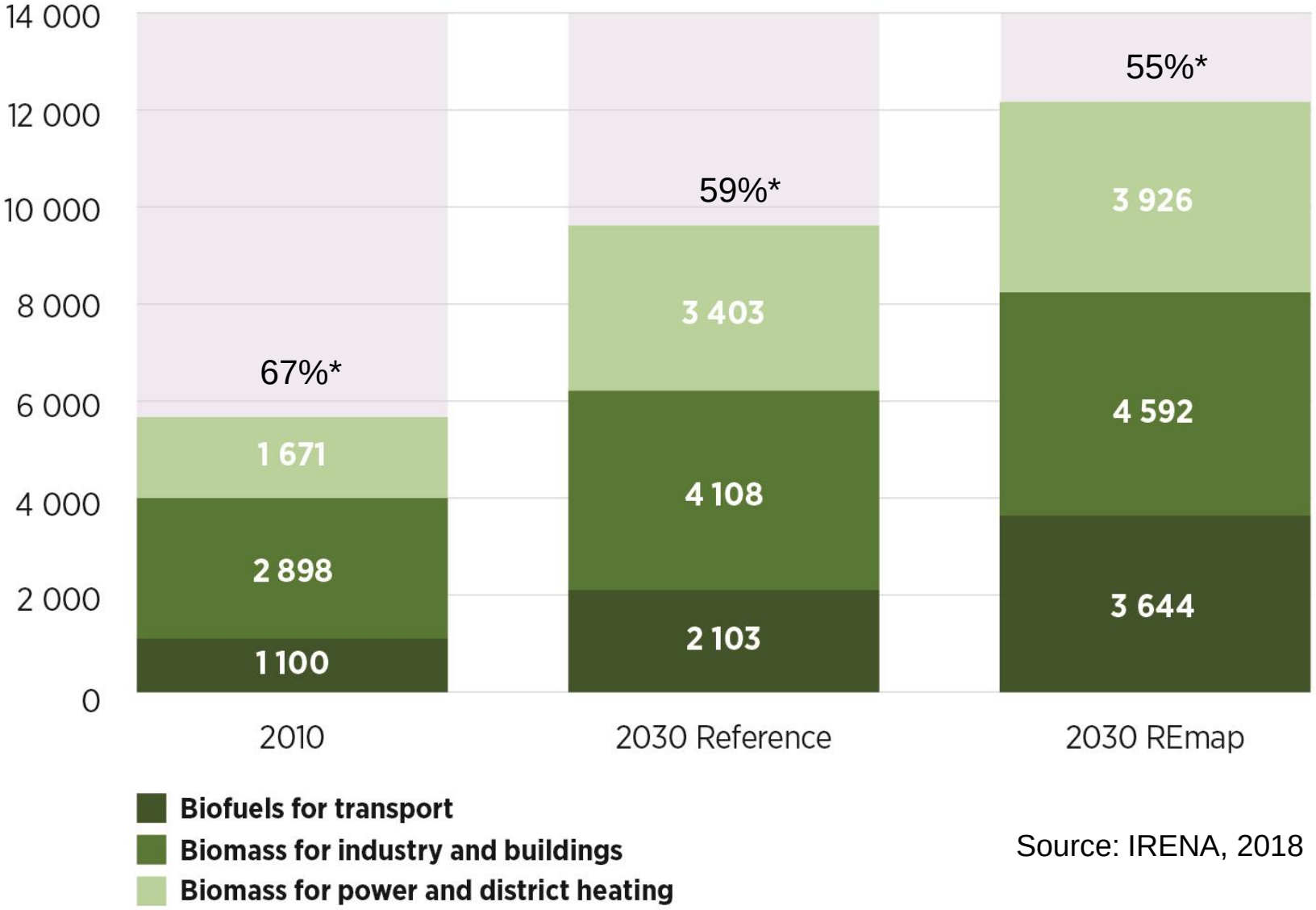
- Heat pumps
- Electric vehicles
- Biodiesel
- Geothermal district heating
- Solar thermal in industry

Additional cost

- Biomass in industry
- Conventional bioethanol
- Biomass in power and district heat
- Advanced bioethanol
- Biokerosene

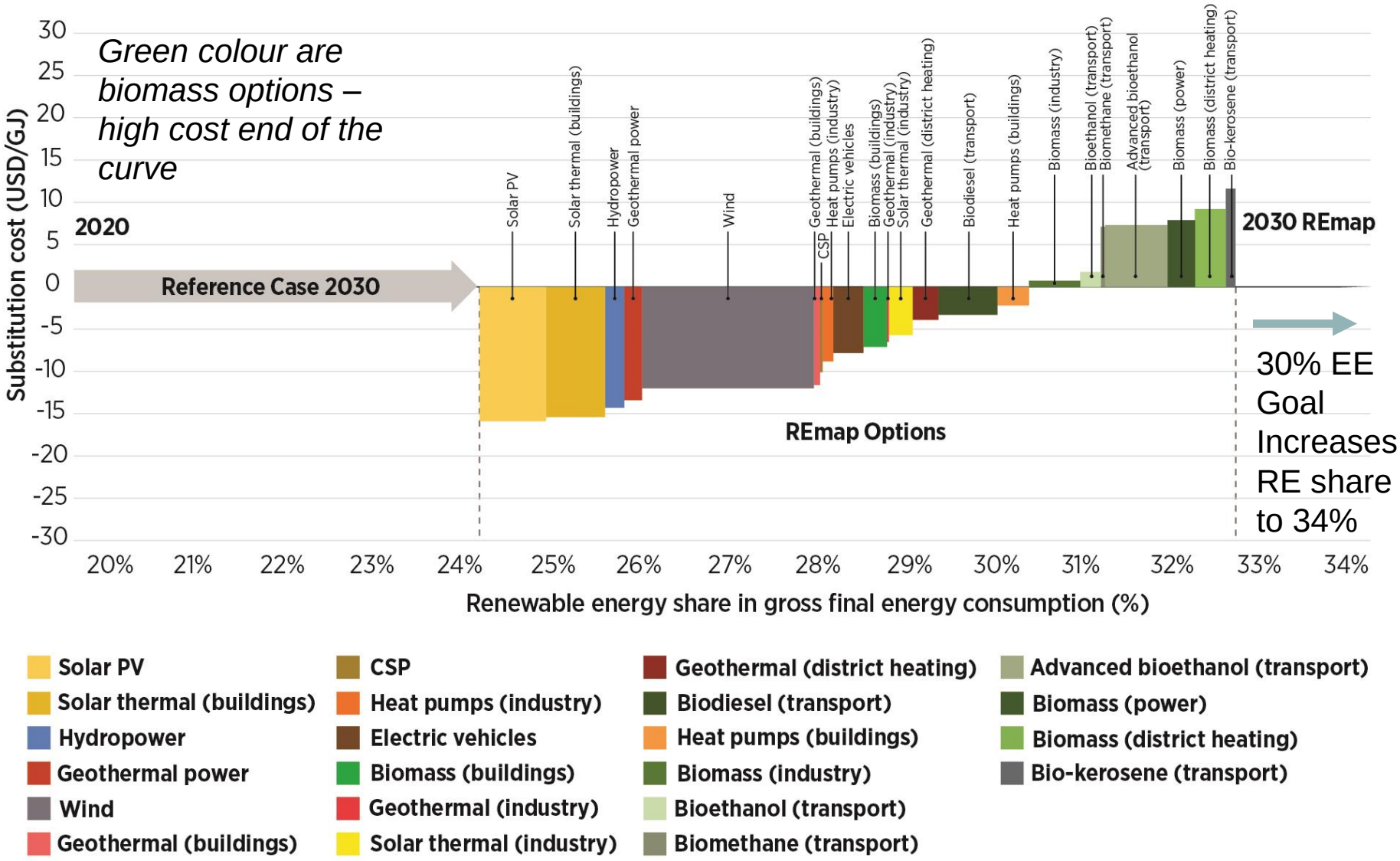
Bioenergy will remain EU's largest RE source

*biomass share of total RE deployment



Source: IRENA, 2018

Europe: REmap options in 2030



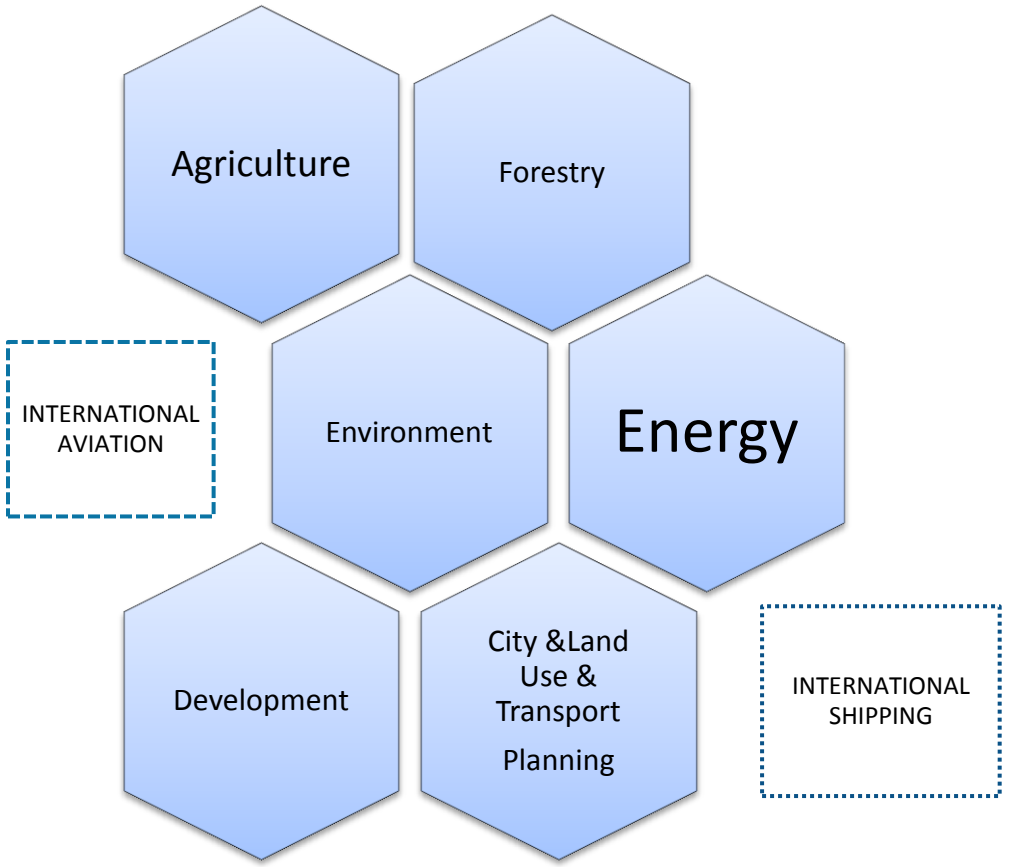
Note: PV = photovoltaic; CSP = concentrated solar power

Biomass cofiring

- Use economies of scale and efficiency of large plants that have logistical capacity (eg Amer in NL, Drax in UK, coastal plants in Japan and Korea)
  - Economics depend on affordable, reliable sustainable supply of biomass feedstock
- Use existing capital stock, avoid stranded assets
- A beneficial solution for next 15 - 20 years provided feedstocks remain affordable
- A starting point for biorefineries that supply power, chemicals, liquid biofuels and materials ?

Political Setting for Biofuel Markets

- **Biofuels markets face a complex political setting** due to a wide range of stakeholder concerns.
  - *Agriculture:* impacts on farming practices, farmer and smallholder livelihoods
  - *Forestry:* impacts on forestry practices
  - *Development:* impacts on nutrition and rural livelihoods in developing countries
  - *Energy:* impacts businesses through the whole value chain of fossil fuels
  - *Environment:* impacts on land use, greenhouse gas emissions, biodiversity
  - *Regional land use and transport planning*



Thank you!

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