

The Role of Renewable Fuels in Achieving the Global Climate Goals in the Transport Sector

3rd Autumn Seminar: The Necessary Focus on Fossil Free Fuels

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Toshimasa Masuyama



A ROADMAP TO
2050

About IRENA

- » **Established in 2011**
- » **Headquarters in Masdar City, Abu Dhabi, UAE**
- » **IRENA Innovation and Technology Centre – Bonn, Germany**
- » **160 Members and 23 States in Accession**

Mandate

To promote the widespread adoption and sustainable use of all forms of renewable energy worldwide



Bioenergy



**Geothermal
Energy**



Hydropower



**Ocean
Energy**



**Solar
Energy**



**Wind
Energy**

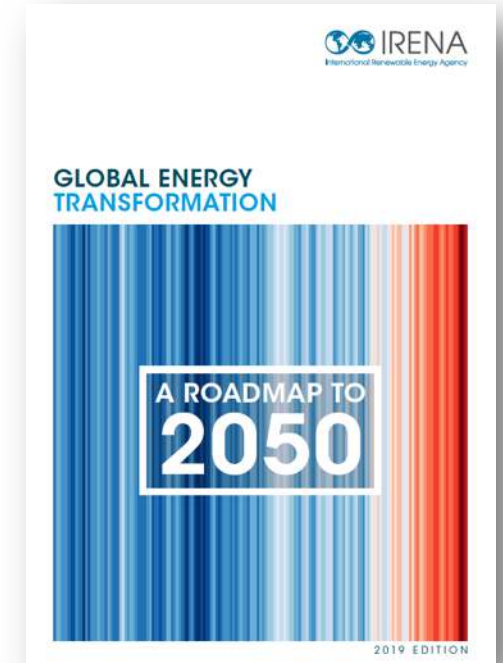
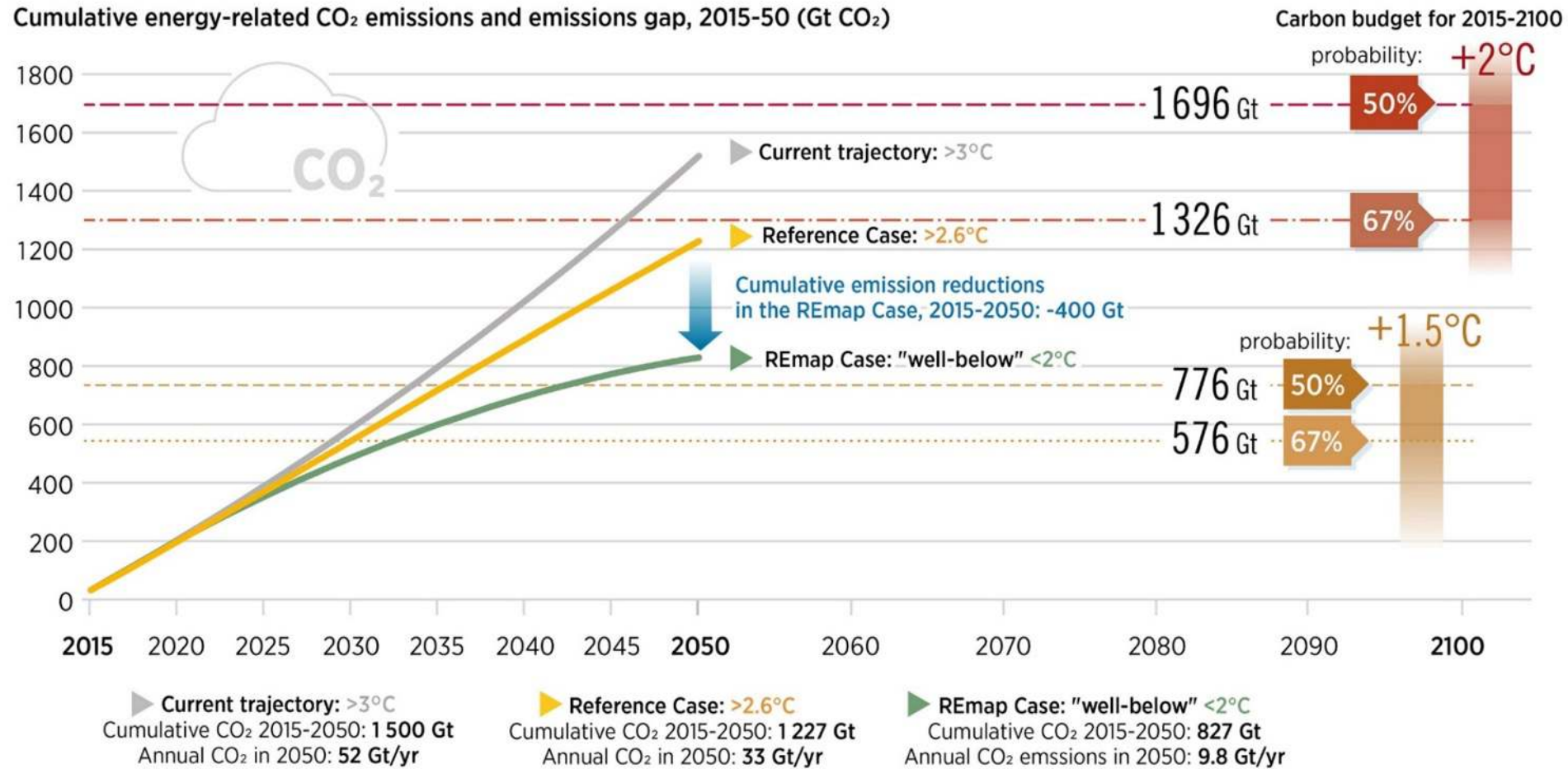
1. Global Energy Transformation: A roadmap to 2050

2. Unlocking investment in advanced biofuels to decarbonise the transport sector

3. Shipping sector decarbonisation

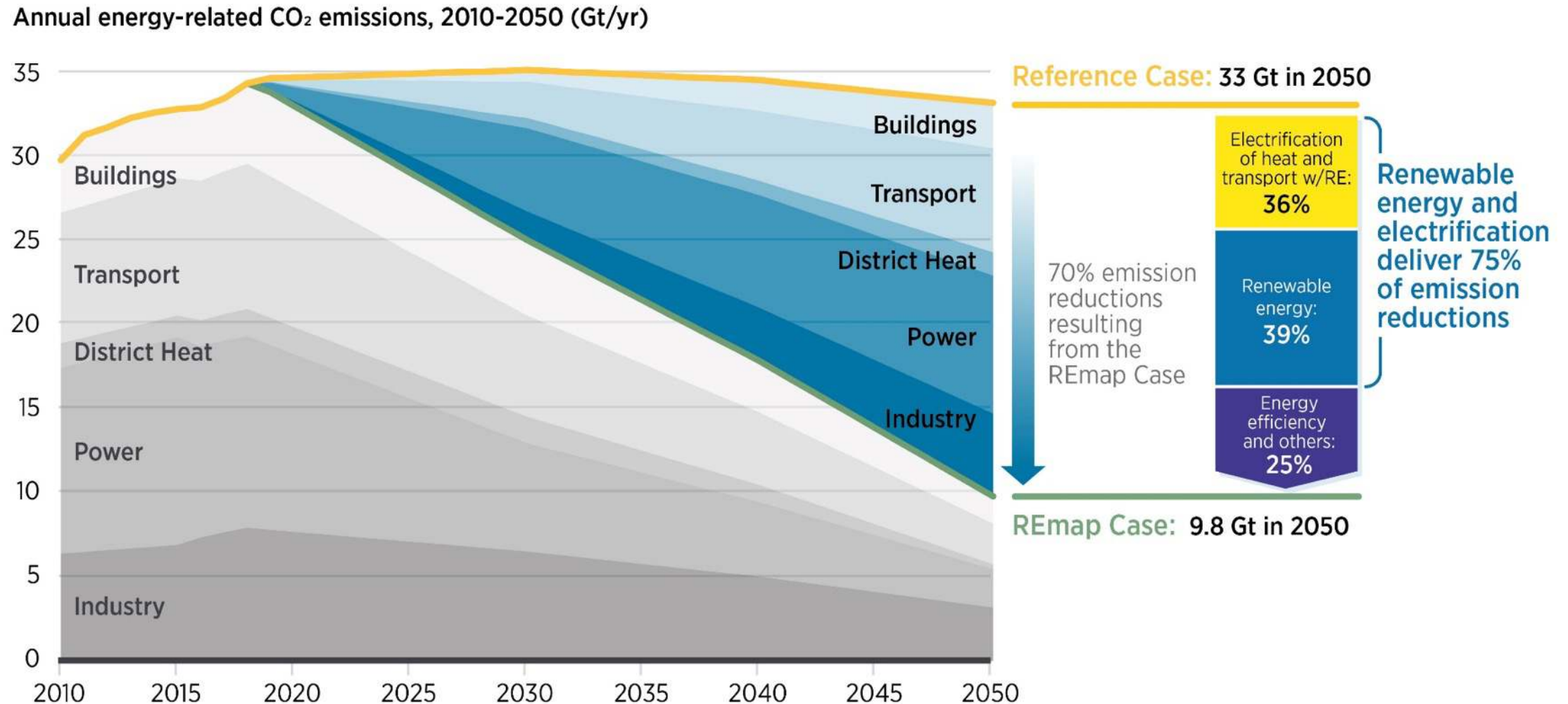
4. Conclusion

Energy policy must align globally to the well-below 2°C climate target



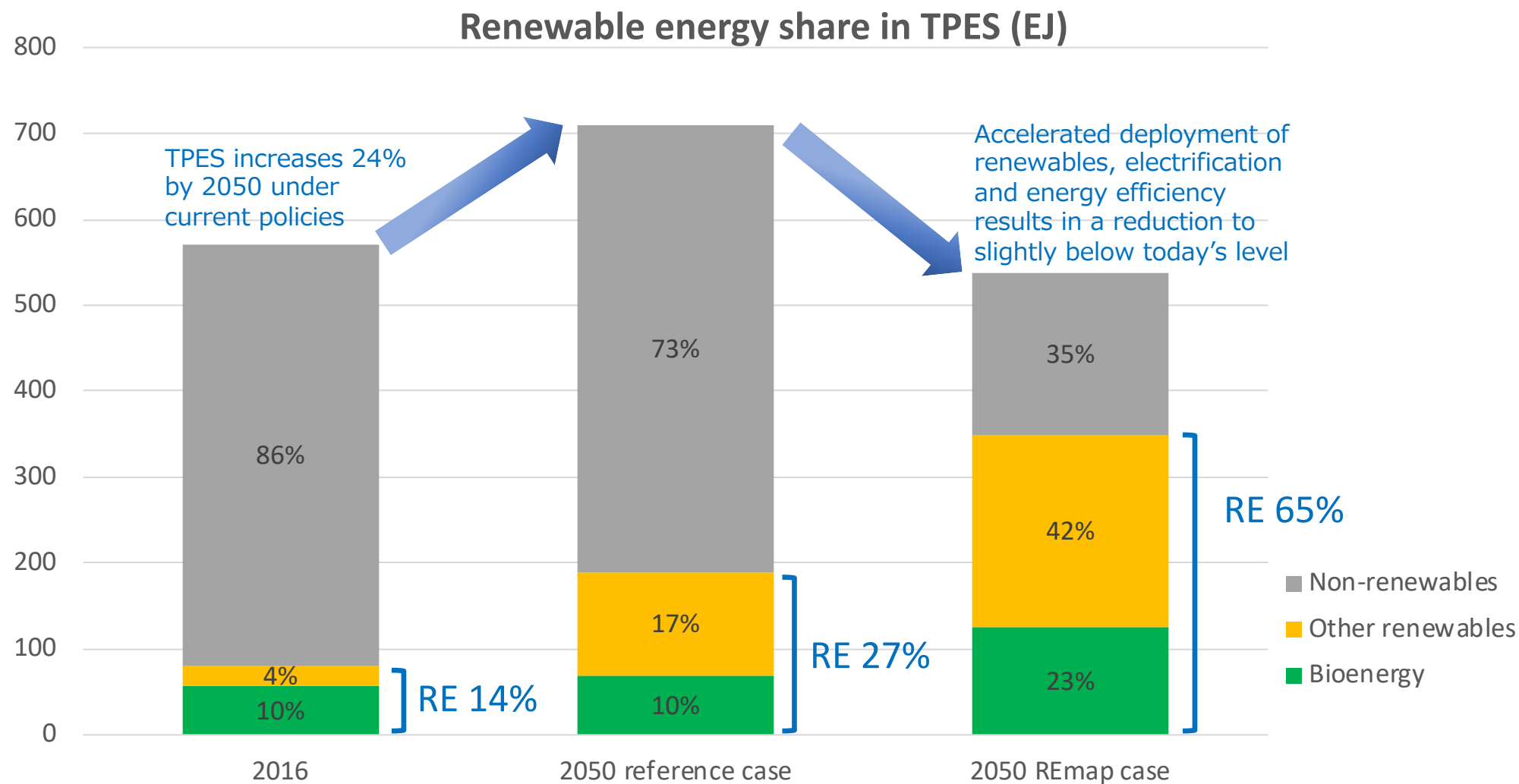
Data based on the Global Energy Transformation: A Roadmap to 2050 (IRENA 2019)

Renewable energy and energy efficiency can provide over 90% of the necessary reductions in energy-related CO₂ emissions



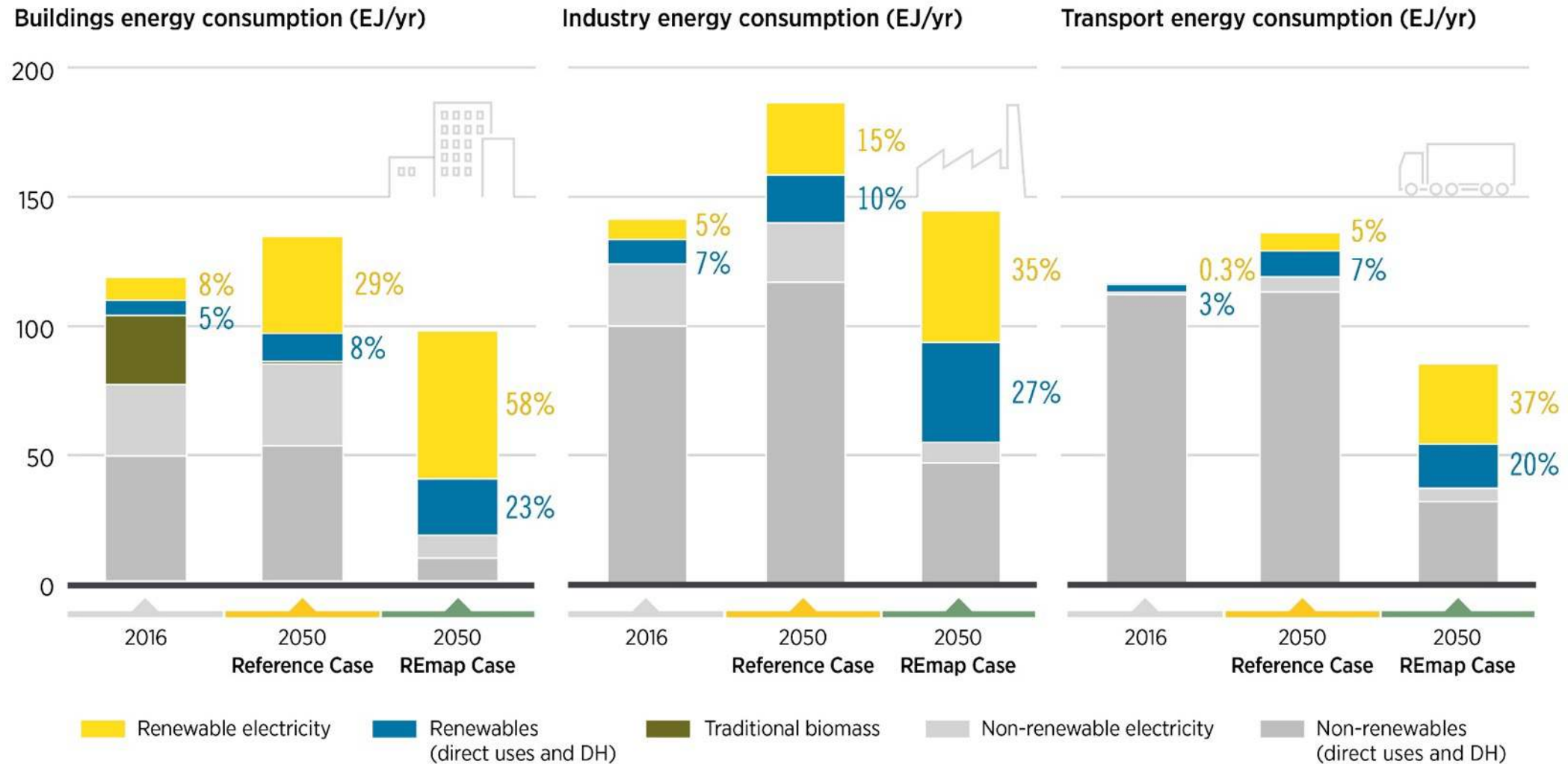
Data based on the Global Energy Transformation: A Roadmap to 2050 (IRENA 2019)

The global energy supply must become more efficient and more renewable

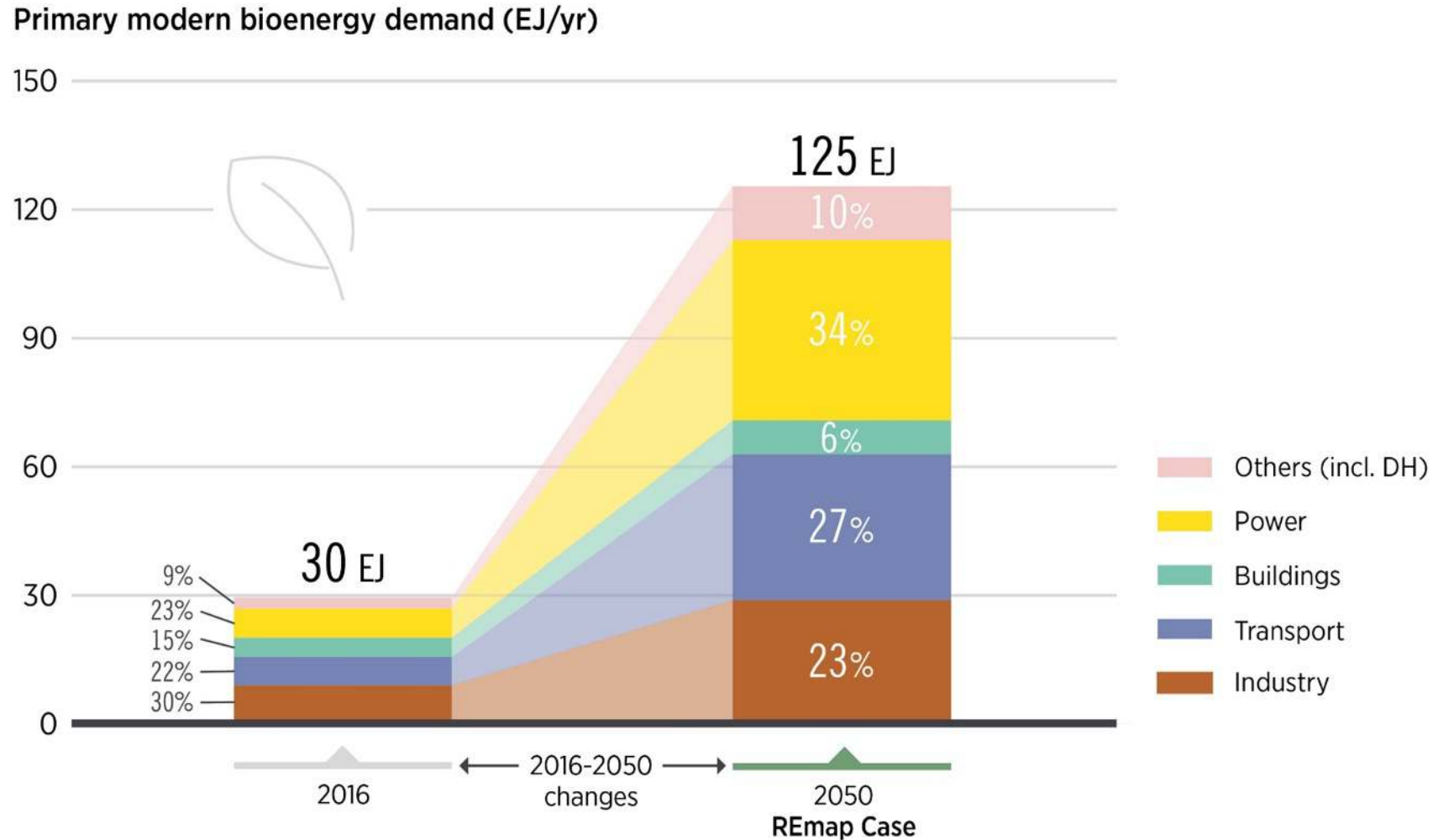


Data based on the Global Energy Transformation: A Roadmap to 2050 (IRENA 2019)

Renewable energy shares increase in all end-use sectors

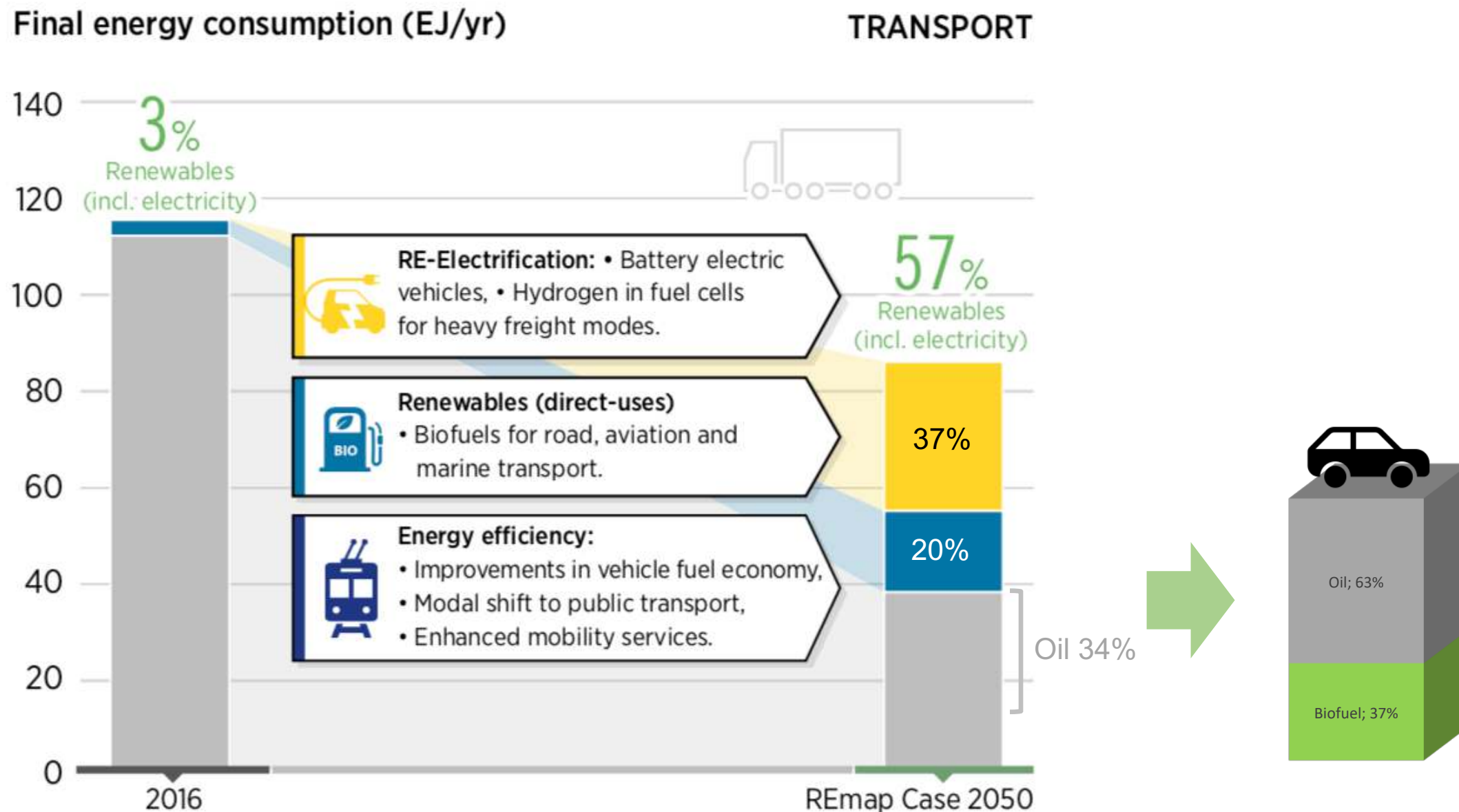


Modern bioenergy should be deployed more than four times larger than the current level

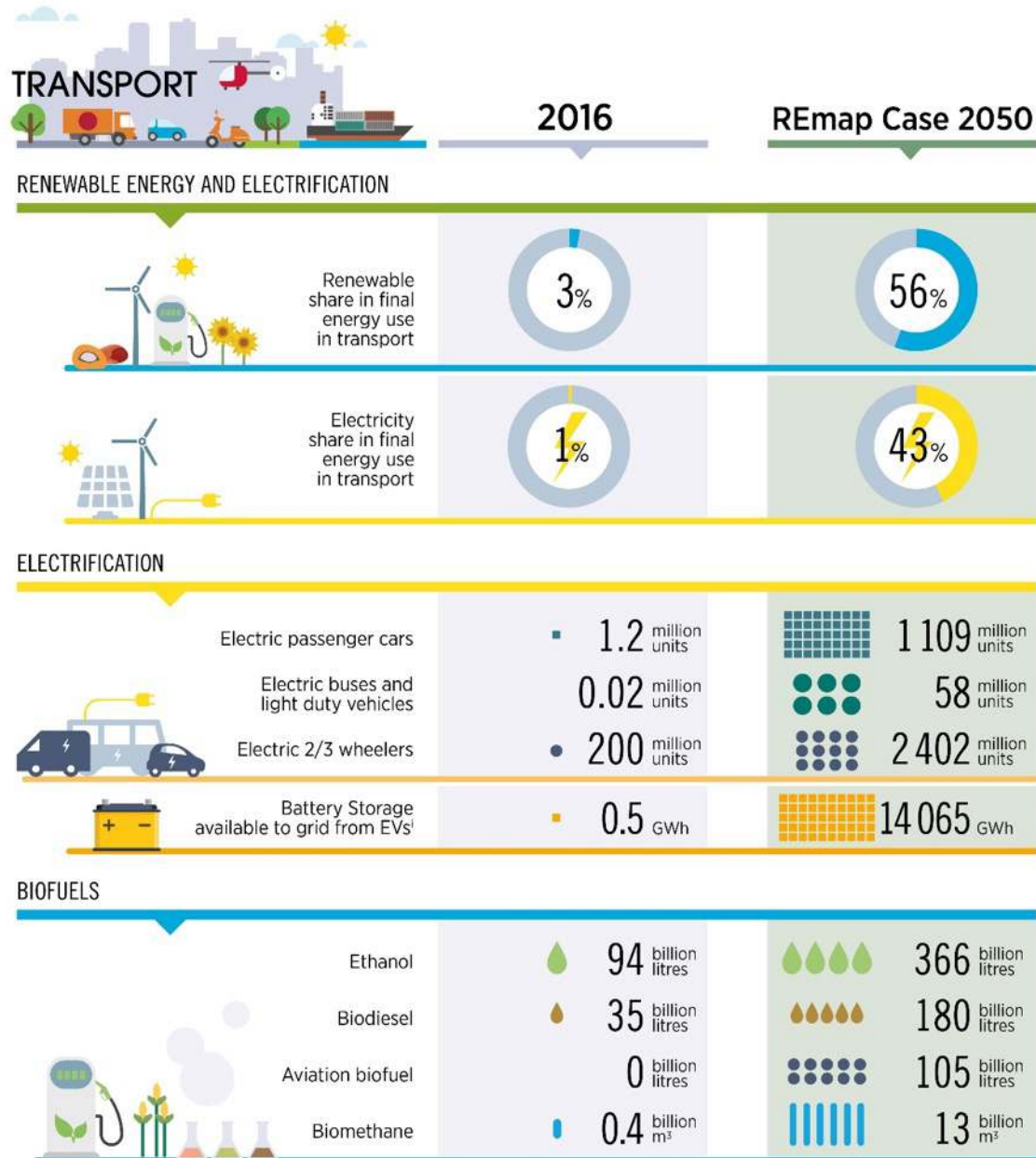


Data based on the Global Energy Transformation: A Roadmap to 2050 (IRENA 2019)

Transport sector decarbonization pathways (REmap)



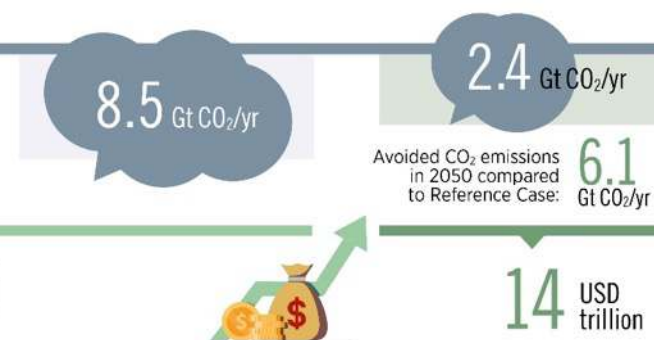
Transport sector key indicators infographic



ENERGY RELATED CO₂ EMISSIONS

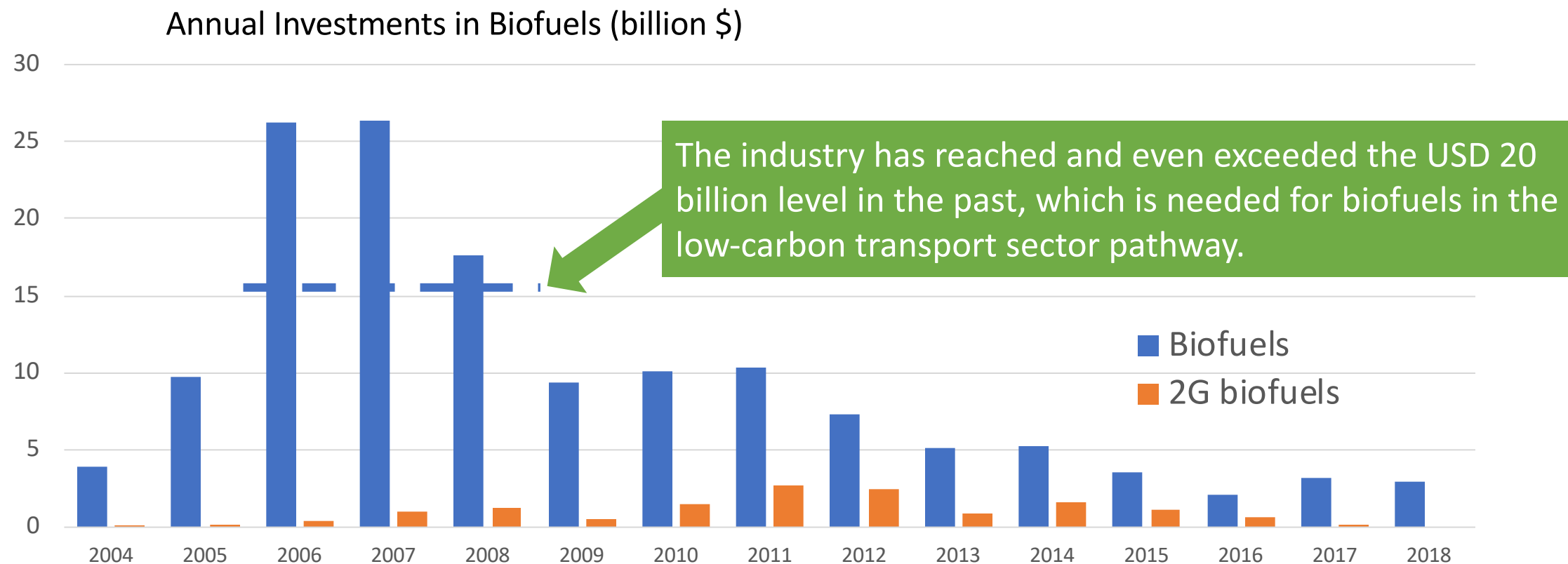
INVESTMENT

ⁱ Considering 50% grid connected Electric passenger cars and 25% grid connected electric 2/3 wheelers by 2050



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Global biofuel investments are on a declining trend



Source: BNEF

- To achieve the 5-fold increase goal, more than 100 refineries should be developed annually at an investment cost of USD 20+ billion.
- More than 10% of bioliquids should be allocated for aviation but the buildout of biojet refineries is slow.

Advanced Biofuels – what holds them back?

Scope of the study

(Objective)

- ✓ Clarify the factors explaining the stagnating investment activity in advanced biofuels

(Method of analysis)

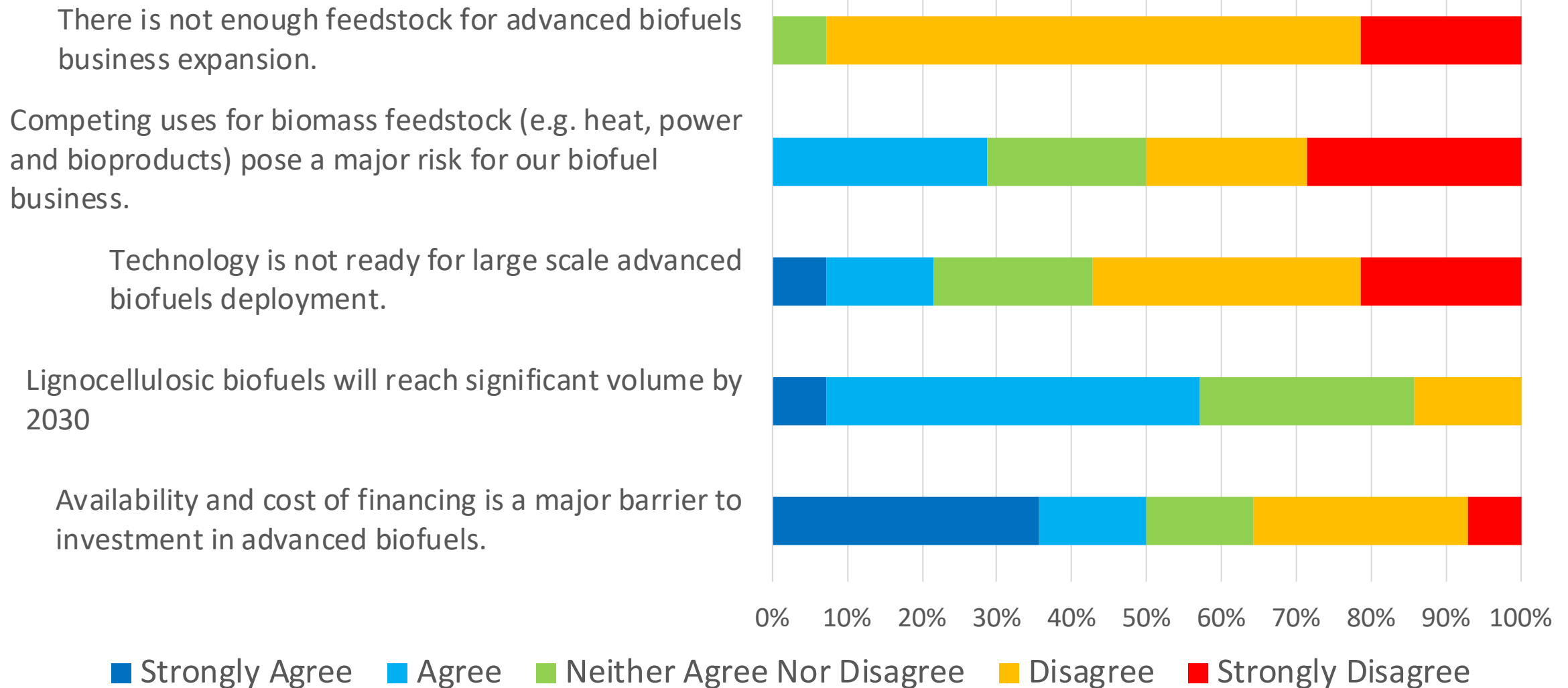
- ✓ A review of past literature + survey by questionnaire with industry executives in companies that have invested in 2G biofuel productions (14 respondents)
- ✓ Statements evaluated on a five-point agreement scale (the Likert Scale) under the five following groups
 - feedstock (8 statements)
 - technology and financing (7 statements)
 - markets through mandates and targets (16 statements)
 - trends in consumer demand (12 statements)
 - environmental and social concerns (11 statements)
- ✓ A ranking question about the level of various possible barriers (rank a minimum of three of the most important areas of risk or barriers from among 14 categories)
 - highest scored barrier = value of 3
 - second scored barrier = value of 2
 - third scored barrier = value of 1



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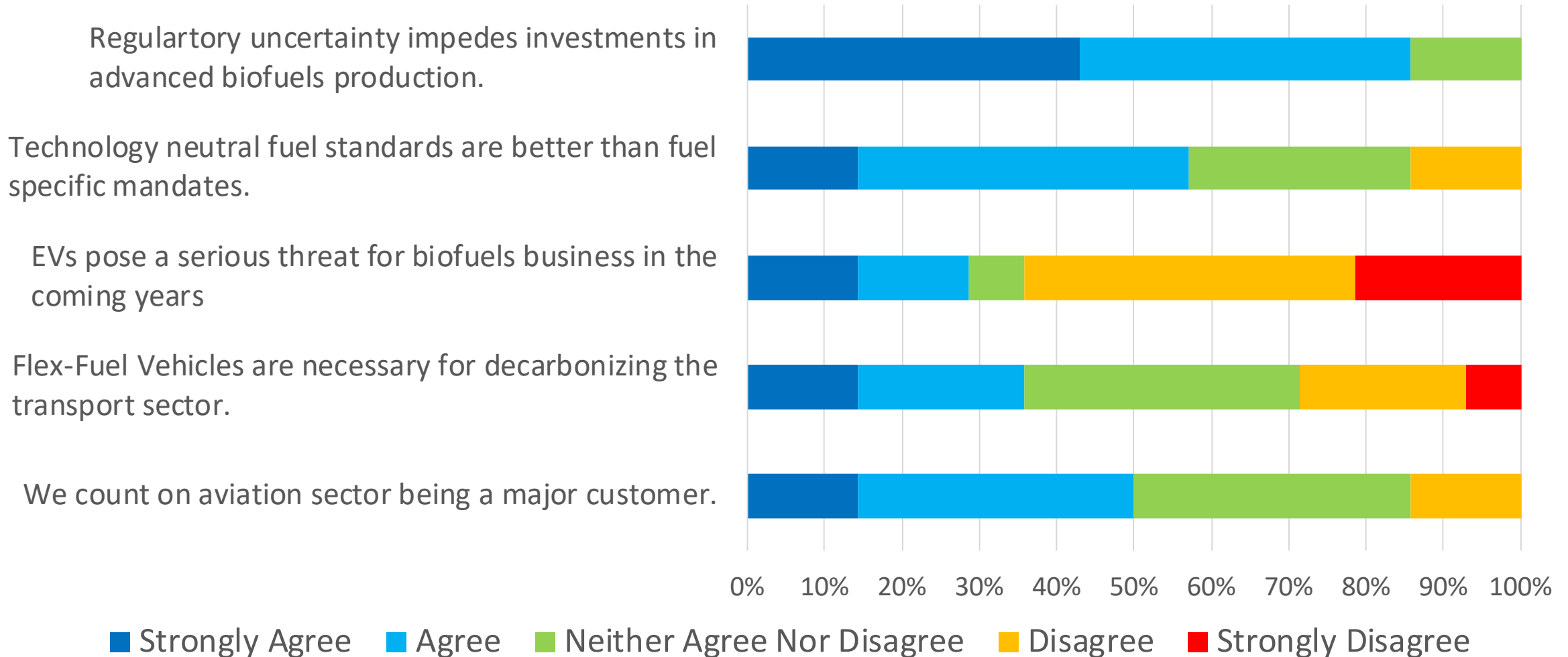
Barriers to investment in advanced biofuels

- feedstock, technology and financing -

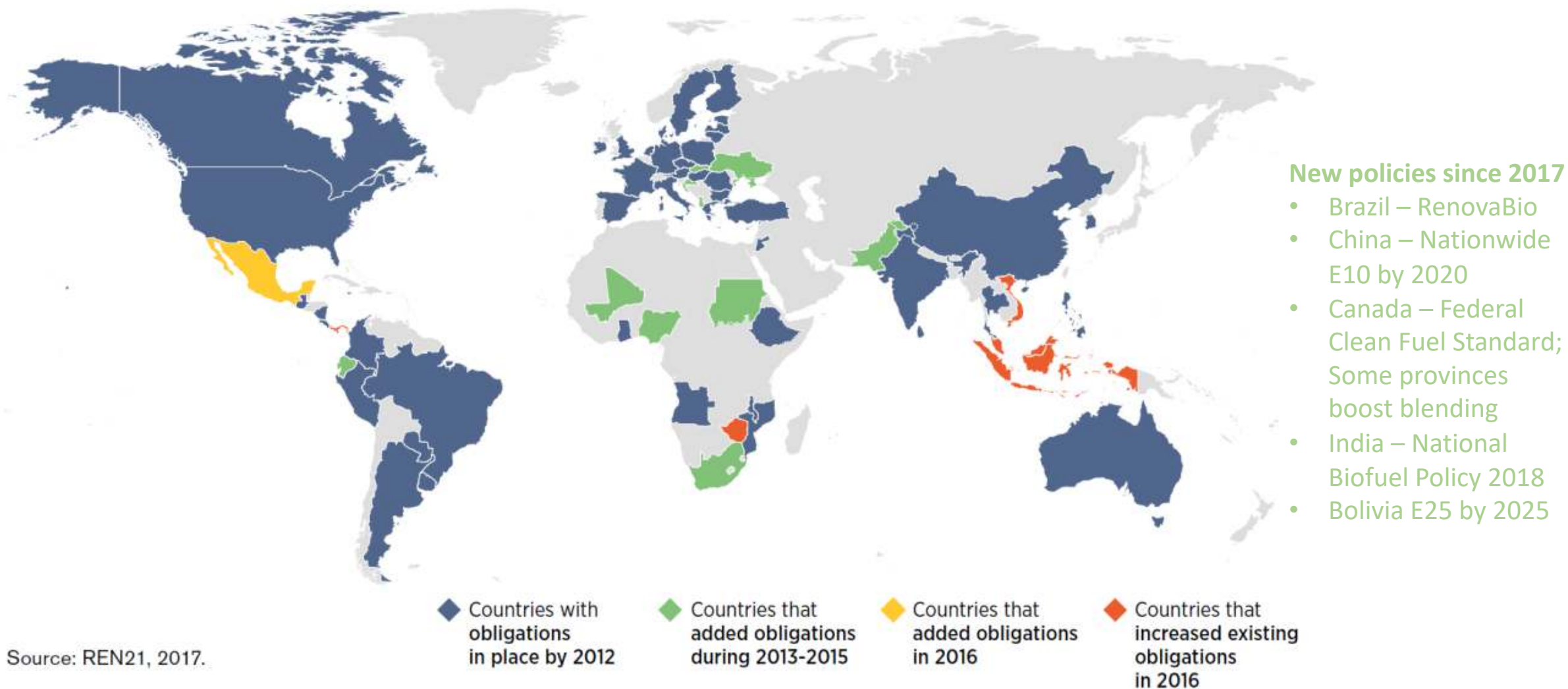


Barriers to investment in advanced biofuels

- mandates, targets and demand -



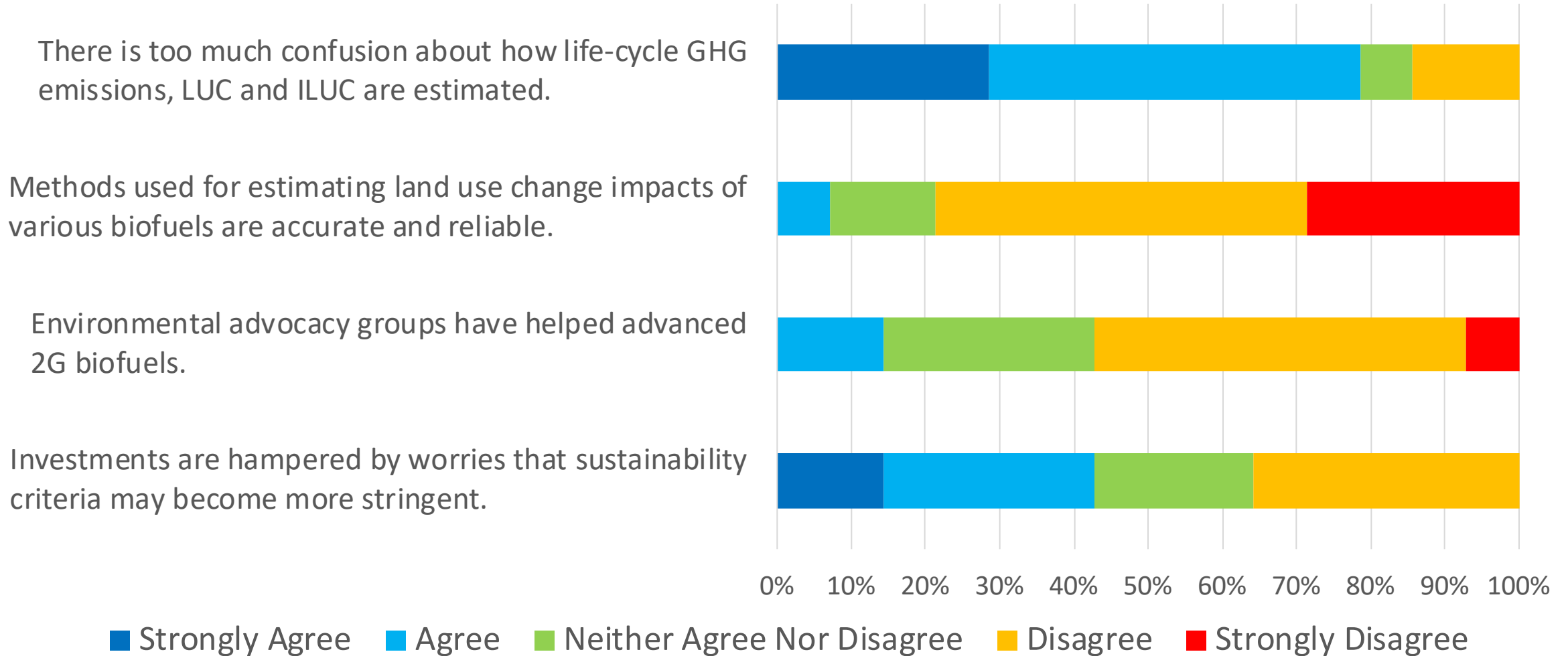
Countries with biofuel obligations for transport, 2016



Source: REN21, 2017.

Barriers to investment in advanced biofuels



- environmental and social concerns -



Ranking the barriers to investment in advanced biofuels

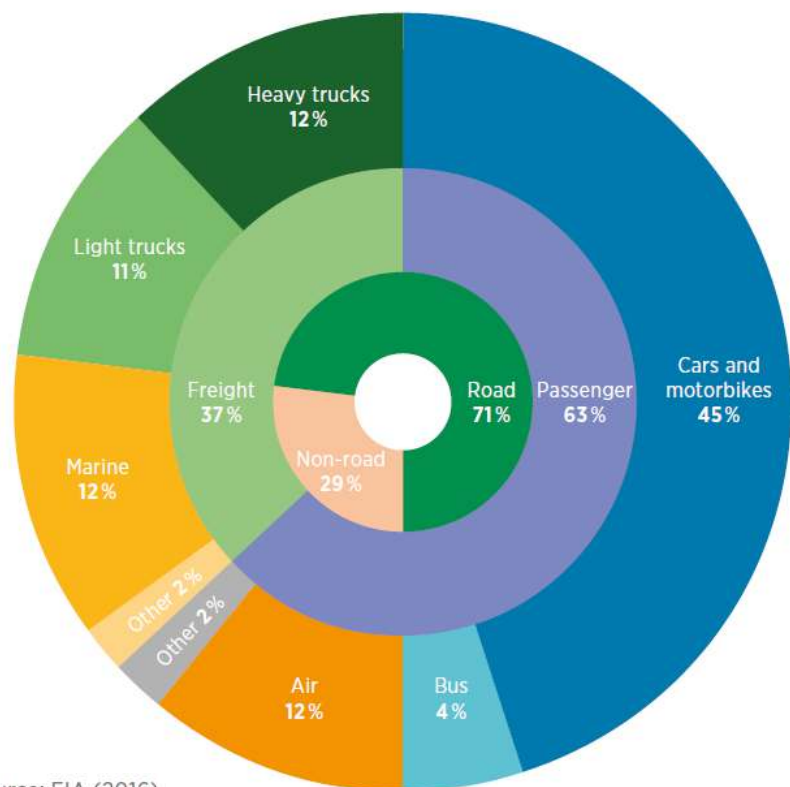


- The most important group of barriers relates to lack of stable regulation, including mandates and subsidies.
- It is followed by the difficulty of financing (availability and cost) and cost competitiveness of advanced biofuels production, including conversion efficiency & CAPEX.

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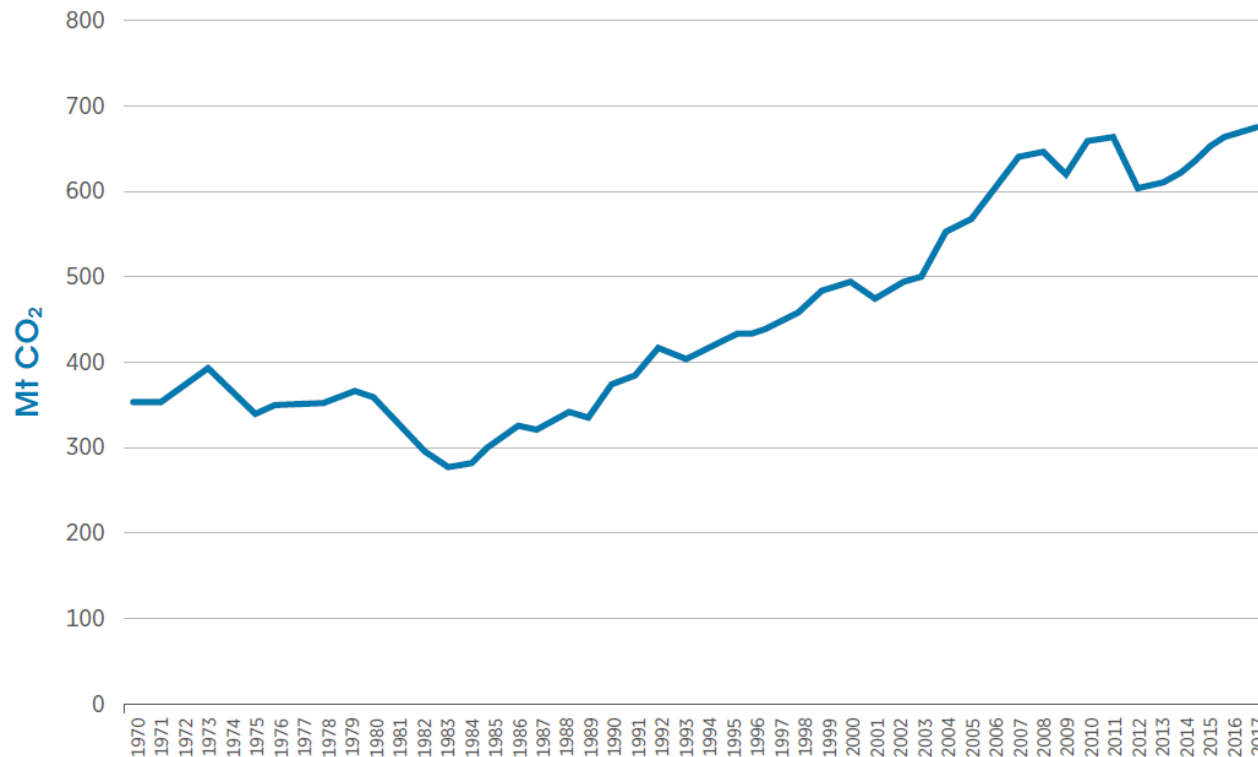
Global international bunkering for shipping accounts for 8.9 exajoules, this resulted in 677 megatons of CO₂ (2017).

Disaggregation of global energy consumption on the transport sector



Source: EIA (2016)

Annual CO₂ emissions associated with international shipping

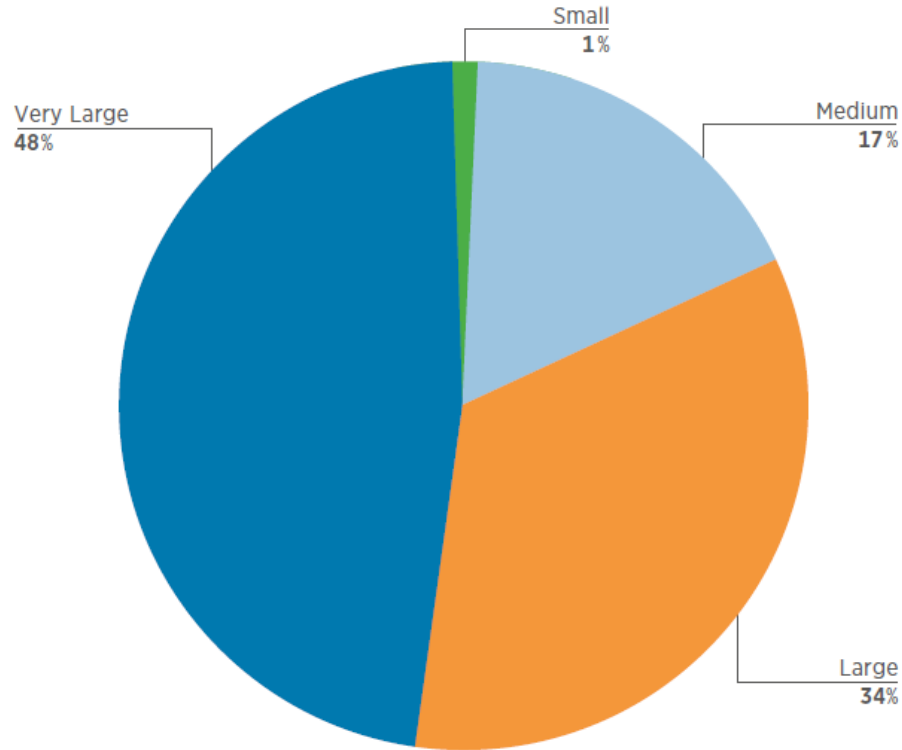


Source: JRC-EDGAR (2018)

- International shipping alone accounts for around 9% of global emissions associated with the transport sector.
- The current energy needs of the shipping sector are mostly met by heavy fuel oil (82%), marine gas and diesel oil (18%).
- Global trade volume is estimated to grow at 3.8% per year over the next five years.
- Between 2000 and 2017, the CO₂ emissions associated with the shipping sector grew at an average annual rate of 1.87%.

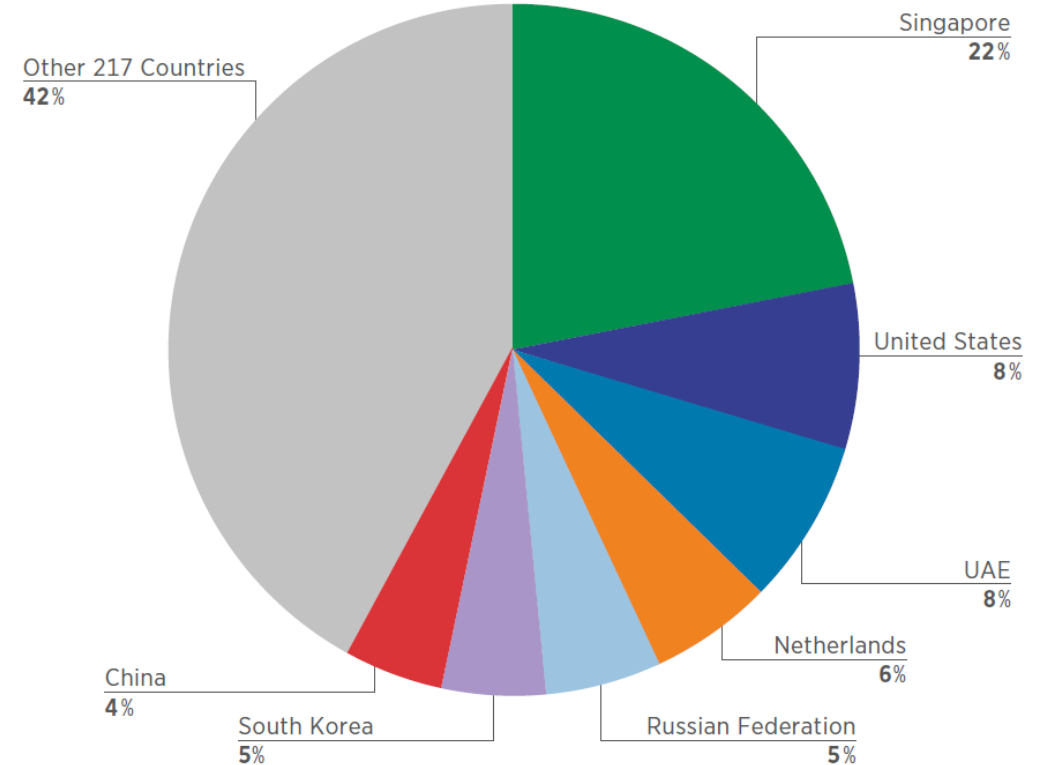
A shift towards a cleaner sector which incorporates renewable energies will require changes to port terminal infrastructure.

Gross tonnage of ships worldwide, by ship size



Source: Equasis (2017)

International shipping bunkering by country, 2017

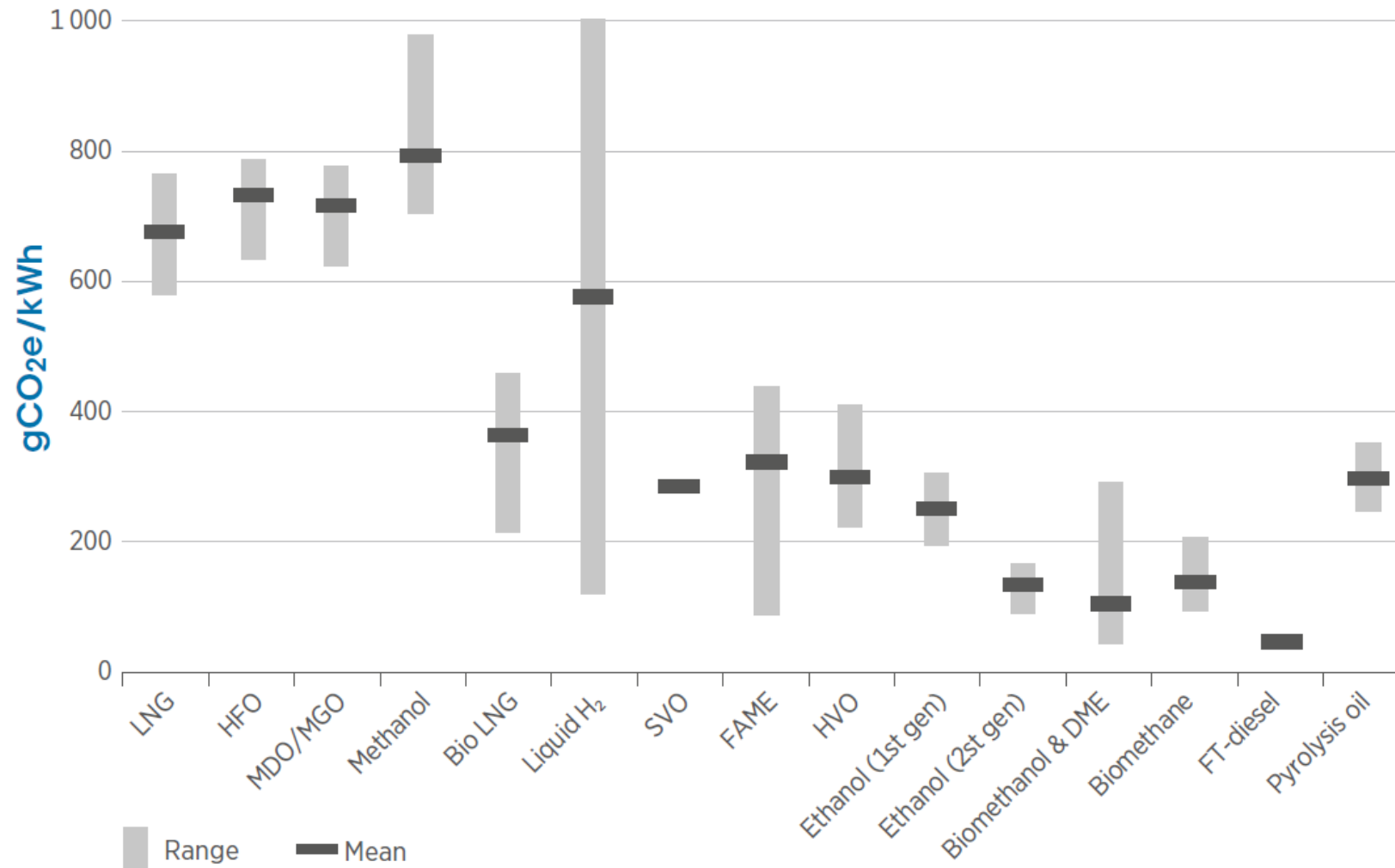


Source: IEA (2019)

- 82% of global cargo by weight is linked to very large ships and 85% of CO₂ emissions in the sector come from large ships i.e. mainly oil tankers, bulk and container carriers.
- A shift toward a cleaner sector will require changes to port terminal infrastructure and operational equipment.
- Considering the characteristics of the current infrastructure, the use of suitably produced biofuels appear as the immediate option.

Action focused in the reduction of GHGs by cutting down on the use of liquid fossil fuels must consider the total life cycle emissions of the alternative renewable options.

Total life cycle GHG emissions per kWh of engine output for different fuels



- The use of LNG would support the reduction of SO_x emissions but to achieve IMO targets, the shipping sector will need to fully shift to renewable fuels and alternative propulsion means.
- The characteristics of the clean fuels play an important role on the techno economic feasibility e.g. energy density, storage temperature and pressure.

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Summary & Conclusion

- Decarbonization of the transport sector needs to be substantially accelerated to meet the climate goals
- The level of investment in biofuels needs to be recovered to the tune of 20 billion USD
- Policy uncertainty is found to be the most significant barrier to investment in biofuels, making it important to have close dialogues between policy makers and business sector
- Transport sector decarbonisation calls for accepting several fuel alternatives simultaneously rather than resorting to a single, all-encompassing solution
- Low subsidy levels, high financing costs and limited availability of finance are seen by many executives as barriers in the current market
- Unless regulators devise specific promotional measures, the cellulosic ethanol segment will face uneven cost competition from first-generation ethanol producers in a declining market
- To go even further, breaking the “blend wall” is necessary to achieve the REmap target through such measures as FFVs.
- Industry executives question the accuracy and reliability of common methods for estimating GHG emissions, land-use change and indirect land-use change.

Summary & Conclusion – cont. –

- In the shipping sector, fuel price and availability will likely be the decisive factors in the choice of renewable fuel/propulsion technology
- Other key, decisive factors will include the infrastructural adaptation costs of ships and ports, technological maturity and sustainability issues (e.g. food security in the case of biofuels).
- As the adoption of clean technologies grows across sectors, technology improves, renewable fuel costs fall and regulation becomes more favourable, carbon-neutral options are expected to become more competitive in the medium to long-term.
- Decarbonising the shipping sector will require a global effort where the close cooperation between private and public stakeholders will be highly important.

