



IEA Technology Roadmap: Delivering sustainable bioenergy

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ETIP Bioenergy, 11 April 2018

IEA Bioenergy Roadmap launched on 30 November 2017 at joint IEA and Mission Innovation Event in Ottawa

- **Technology Roadmap - Delivering Sustainable Bioenergy**

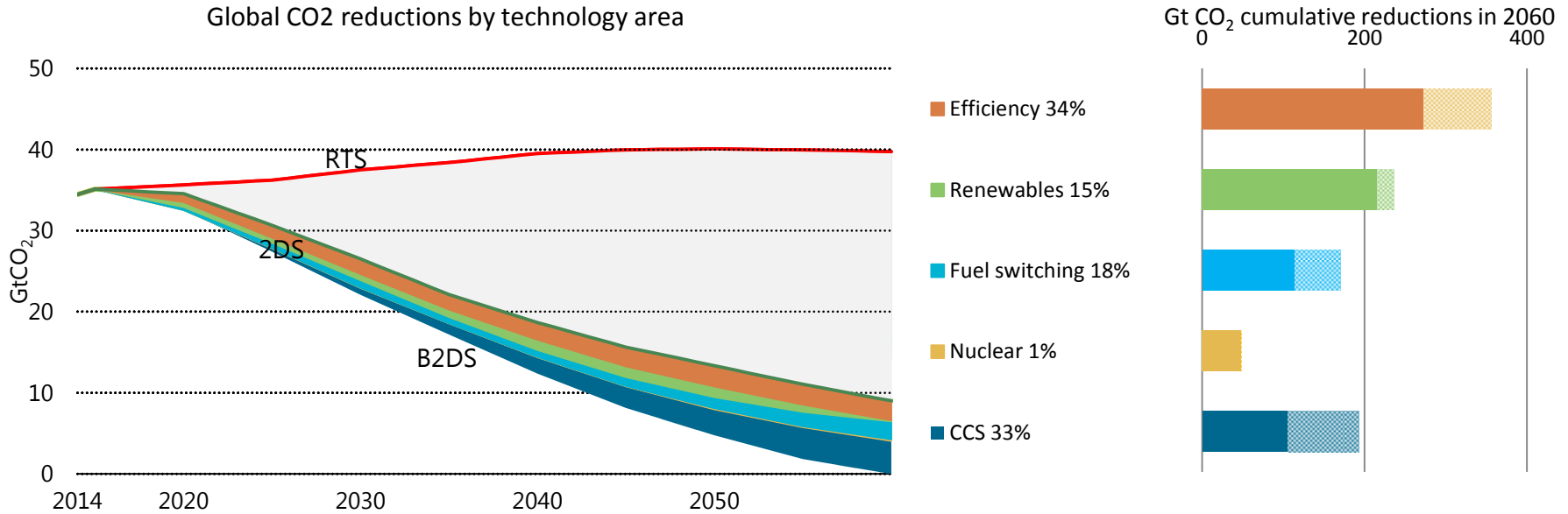
www.iea.org/publications/freepublications/publication/technology-roadmap-on-bioenergy.html.

- **Team effort!**



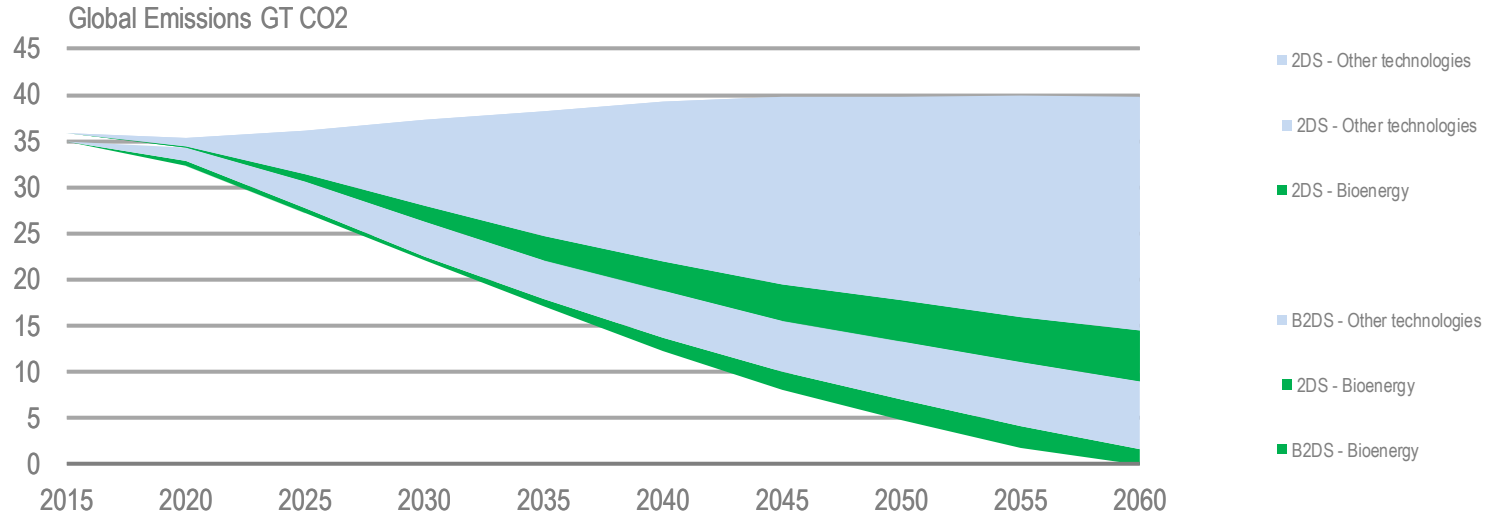
The full portfolio of technologies is needed for decarbonisation

Technology area contribution to global cumulative CO2 reductions



Delivering deep carbon emission reductions will require an unprecedented effort in technology innovation and diversification worldwide

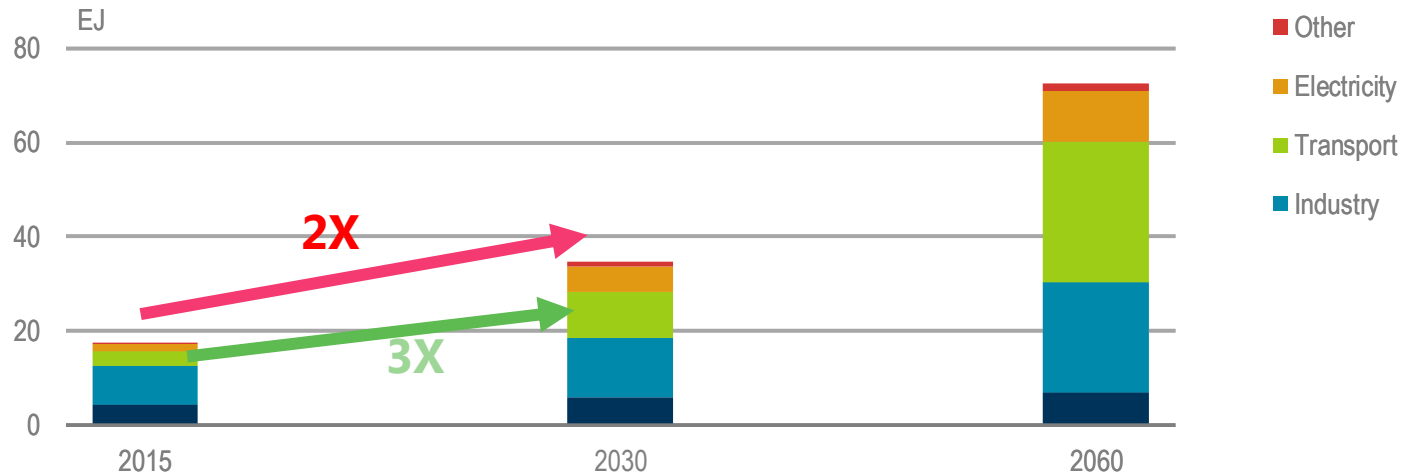
Role of Bioenergy



Bioenergy to provide some 17% of cumulative carbon savings to 2060 in the 2DS and around 22% of additional cumulative reductions in the B2DS, including an important contribution from BECCS

Strong acceleration needed between now and 2030

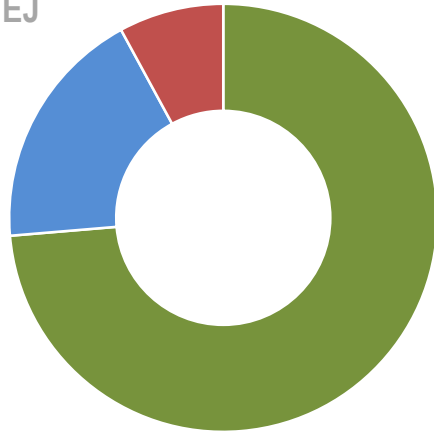
Modern bioenergy in final energy consumption in 2DS



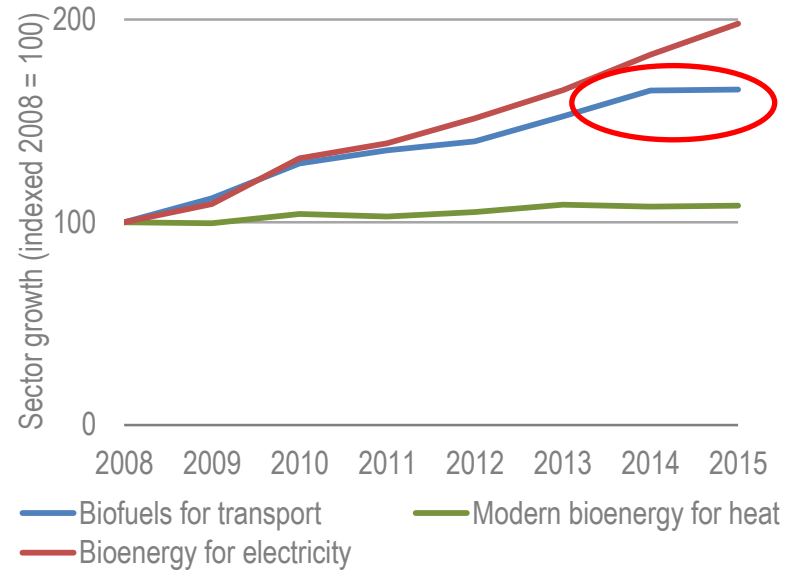
Bioenergy is already a significant global energy source

Modern bioenergy in final energy consumption 2015 (left) and growth by sector 2008-15 (right)

Total: 17 EJ

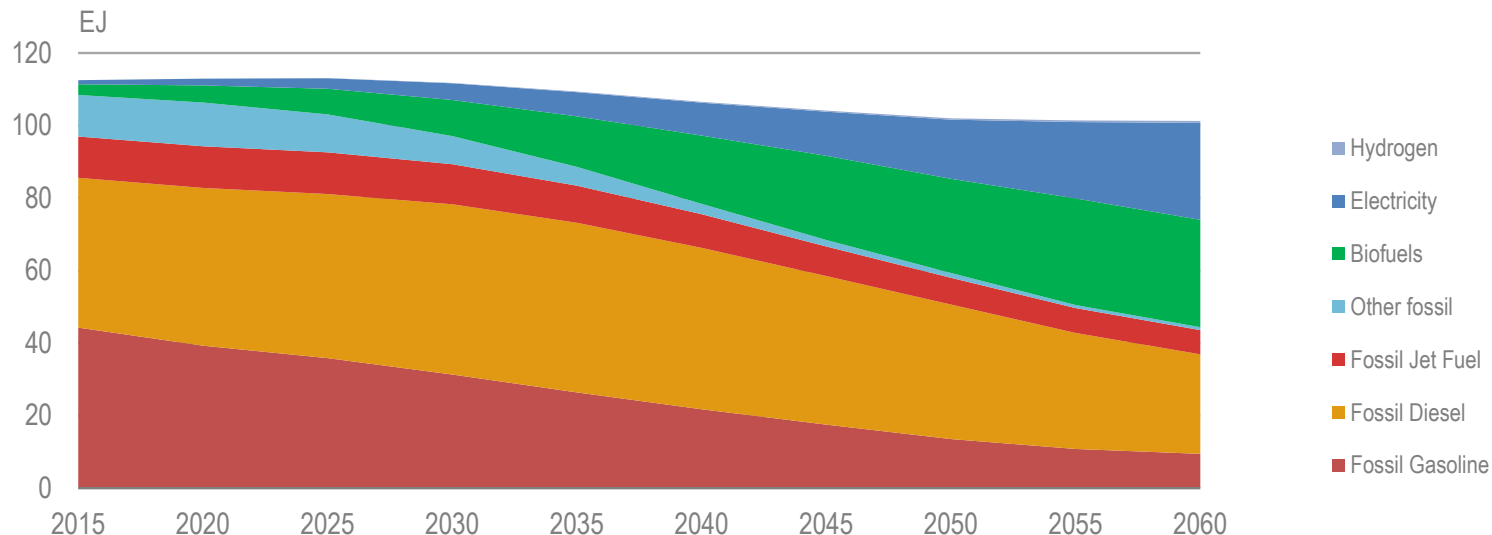


- Modern bioenergy for heat
- Biofuels for transport
- Bioenergy for electricity



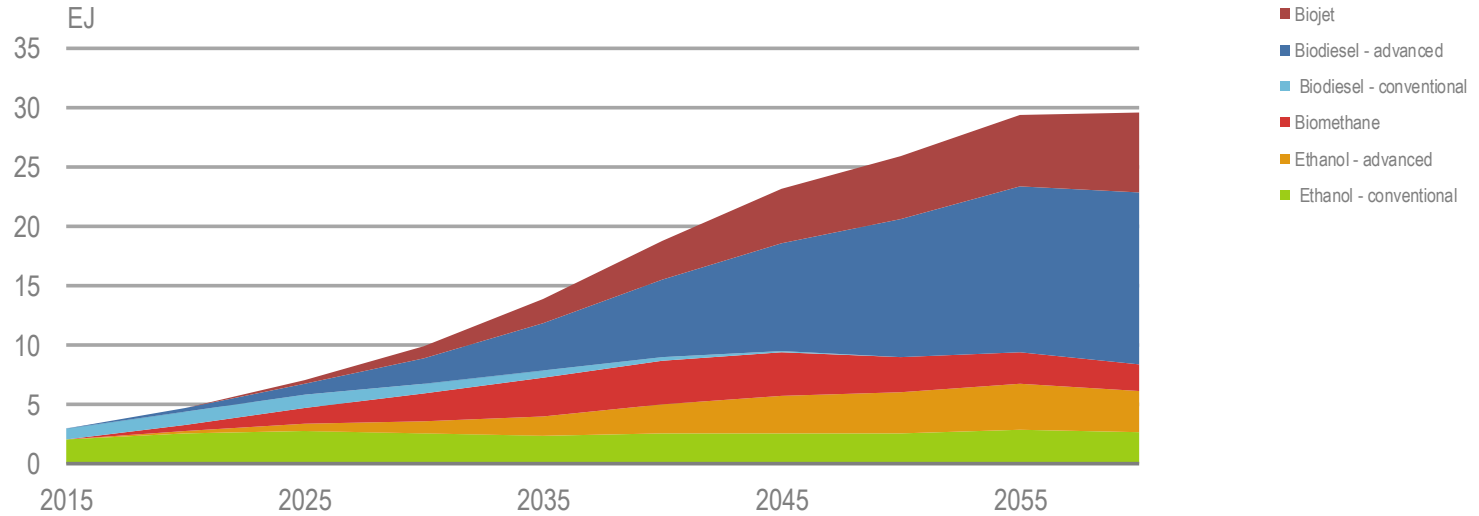
Modern bioenergy accounted for around half of renewables in final energy consumption in 2015, a contribution five times greater than wind and solar PV combined. However, growth rates vary by sector.

Transport Fuels – 2DS

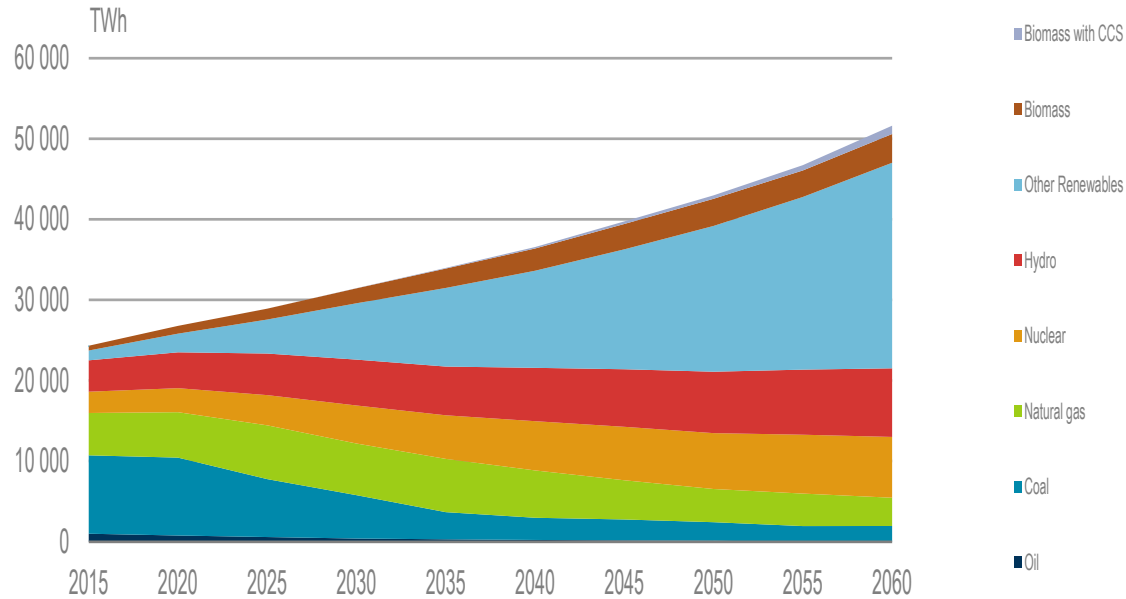


While demand of transport services more than doubles , biofuels complement end-use efficiency and strong growth in electricity, providing almost 30% of transport final energy demand in 2060

Advanced biofuels play a key role



Electricity generation in 2DS

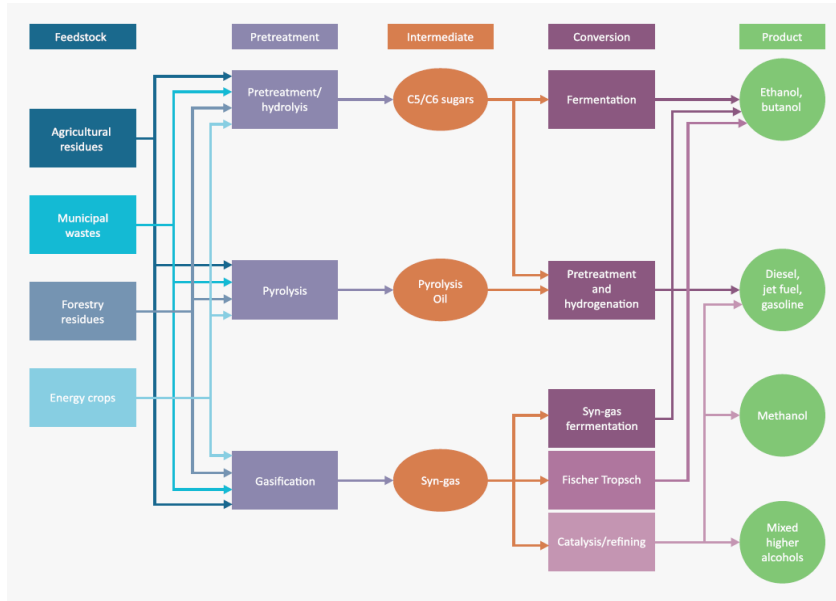


Bio-electricity grows 7-fold and goes from 2 to 7% of electricity generation

1. Promote short term deployment of **mature options**
2. Stimulate the development and deployment of **new technologies**
3. Deliver the necessary feedstock **sustainably**, backed by a supportive sustainability governance system
4. Develop capacity and catalyse investment via a coordinated **international collaboration** effort

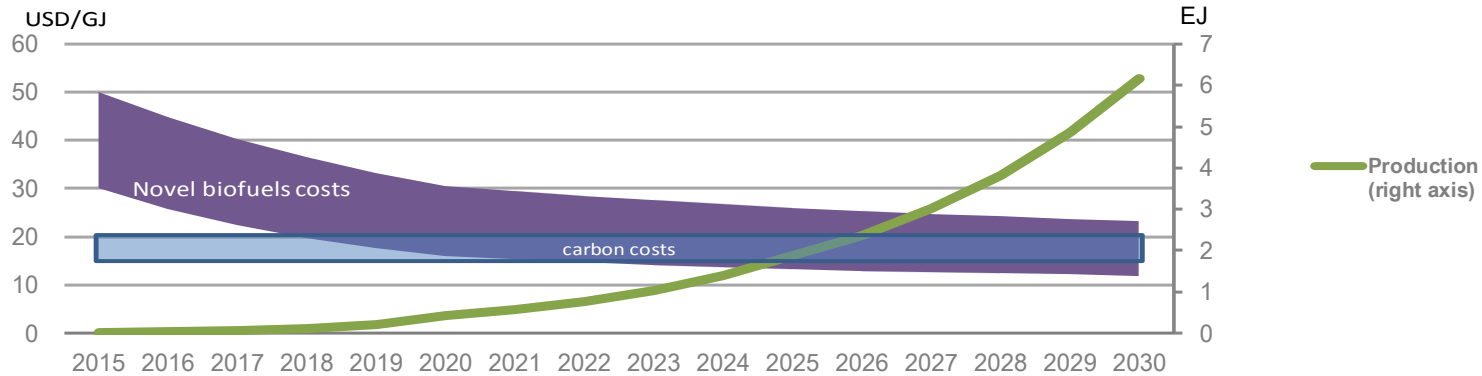
Need for appropriate policy frameworks

Some routes to new biofuels



- **New technologies needed with good carbon performance and adapted to market roles in 2DS.**
- Continued R,D and D to reduce costs and **improve GHG performance** of existing biofuels technologies
- Demonstrate **reliable performance** from existing “novel biofuels” plants
- Develop and demonstrate routes to diesel and biojet with **improved costs, better C balances and GHG performance** (link to RE H₂ production)
- Identify potential and development paths for **cost reduction**

Advanced biofuels cost reduction potential

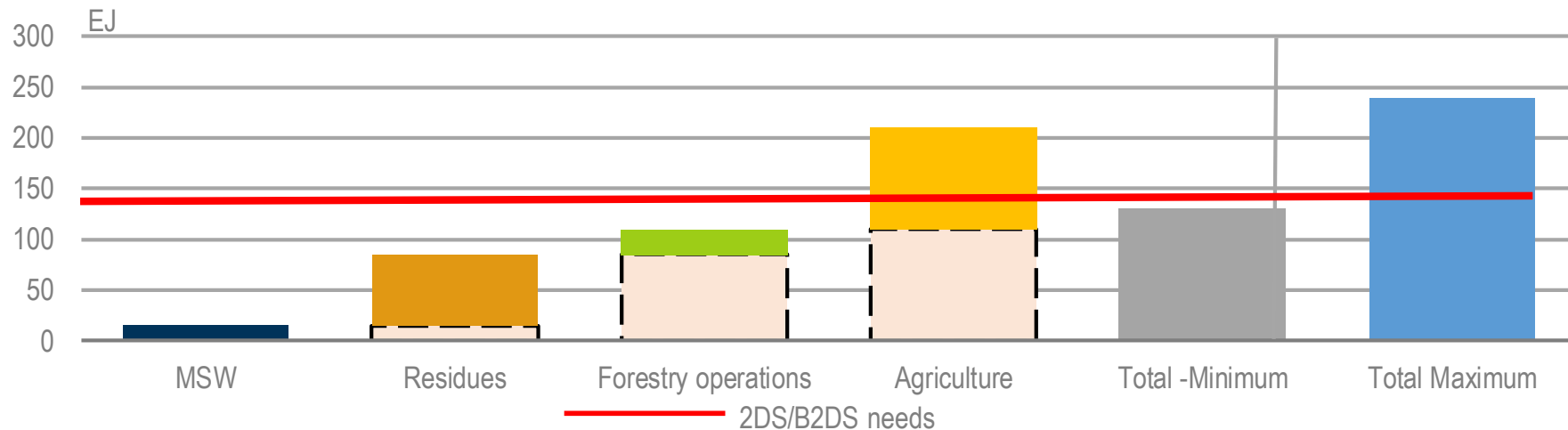


Costs can be reduced by

- the impact of R&D
- scale-up economies of scale
- experiential learning.
- scope for integration with other processes and leveraging/using existing infrastructure
- adding value to co-and by-products
- Reducing financing costs

Support costs to buy down costs c 100Bn\$ - 0.5% of fossil fuel costs in transport

Deliver the necessary feedstock sustainably



- **Deployment will need wastes, residues, forestry and energy crops**
 - Produced in line with sustainable resource management, forestry and agricultural practice
 - Produced with minimized impacts on land use change emissions by co-production with food, use of under-productive land, improved production
 - Supported by general effort to improve agricultural productivity and efficiency

- Influencing
 - Strategy for IEA Bioenergy
 - Biofuture Platform
 - MI Sustainable Bioenergy Challenge
- Follow up of key deployment indicators via IEA Clean Energy Progress Report.....
- Continued cooperation/coordination of international organisations
 - Potential for cost reduction for advanced biofuels
 - Potential for bioenergy in industry (along with other renewables)
 - Role of international aid agencies and lenders in bioenergy
 - Expanded work on synergies between bioenergy and wider bioeconomy
 - Identification of policy best practice for stimulation of sustainable bioenergy including novel biofuels
 - Effective application of sustainability criteria for bioenergy, including for forestry based biomass.

- Sustainable bioenergy is an essential element in the portfolio of measures needed for a low carbon scenario.
- Biofuels can play a particularly important role in the transport sectors.
- Advanced biofuels key to success – low emissions, use in aviation and shipping
- Progress is much slower than necessary so we need to:
 - Expand deployment of existing technologies
 - Commercialise the new technologies
 - Develop sustainable supply chains and appropriate sustainability governance systems
 - Build technical and regulatory capacity in a much wider range of countries and regions