



IEA Bioenergy Roadmap

Adam Brown

Oslo, 11 October 2018

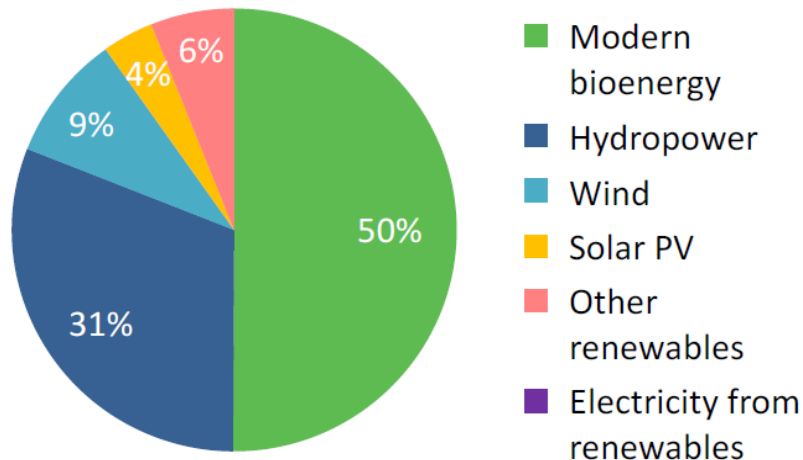
“Modern bioenergy is the overlooked giant of the renewable energy field,” said Dr Fatih Birol, the IEA’s Executive Director. “Its share in the world’s total renewables consumption is about 50% today, in other words as much as hydro, wind, solar and all other renewables combined.

We expect modern bioenergy will continue to lead the field, and has huge prospects for further growth. But the right policies and rigorous sustainability regulations will be essential to meet its full potential.”

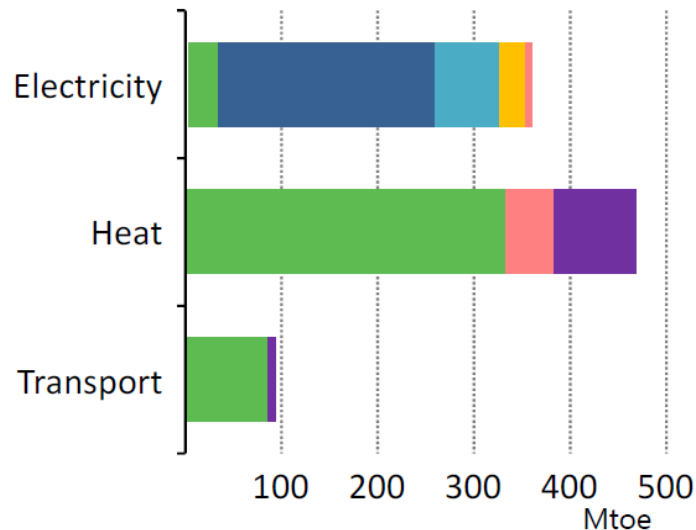
IEA Market Report Series: Renewables 2018, 8 October 2018
<https://www.iea.org/renewables2018/>

Modern bioenergy: the overlooked giant of renewables

Total final energy consumption
from renewables, 2017

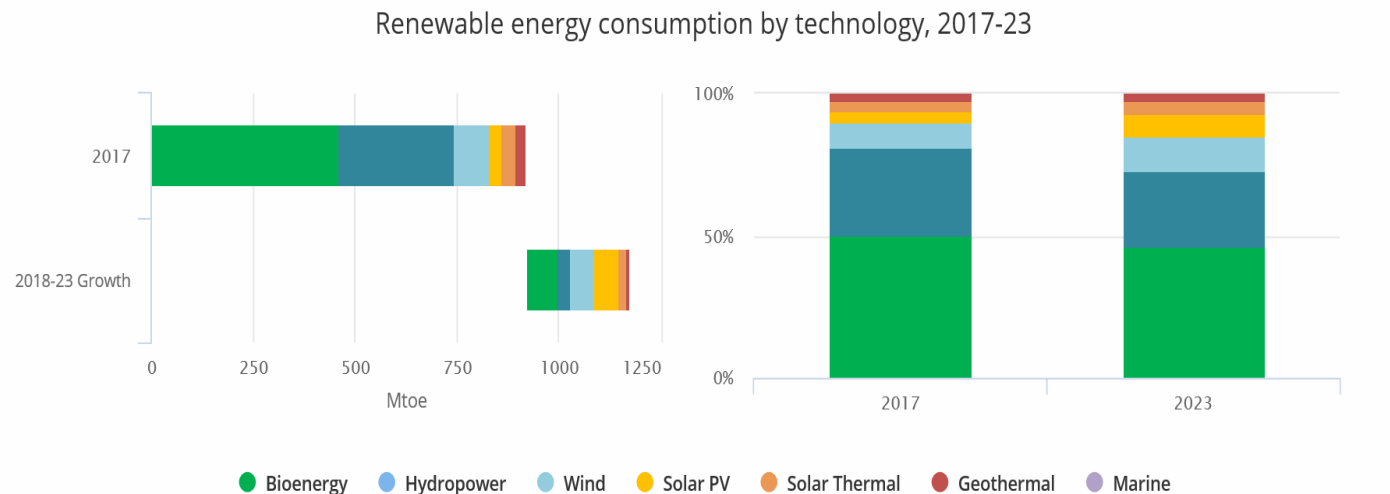


Total final energy consumption
from renewables by sector, 2017



Modern bioenergy is the only renewable source that can provide electricity, direct heat and transport fuels Two thirds of modern bioenergy heat is used in industry

Renewables increasingly central to total energy consumption growth

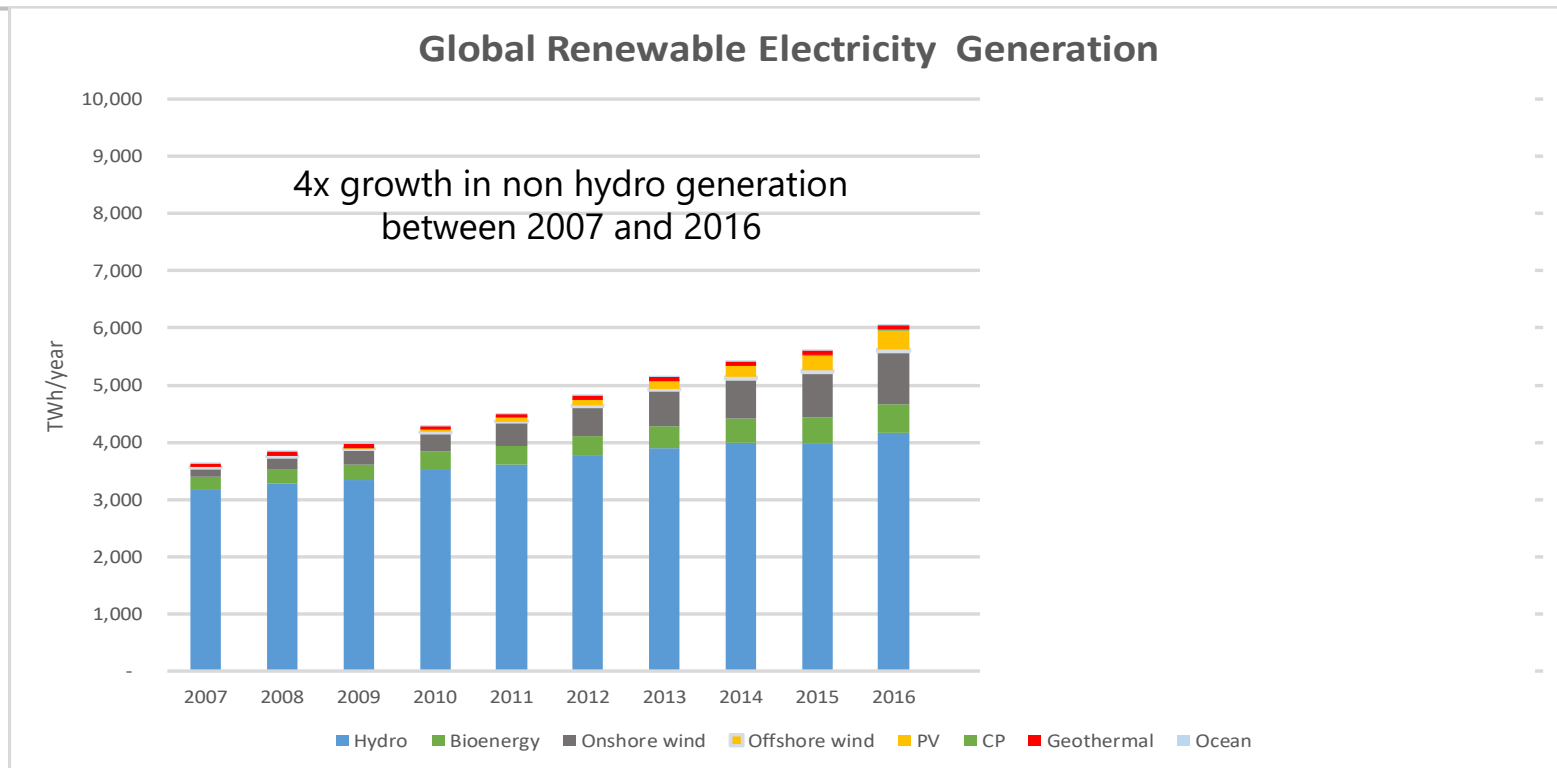


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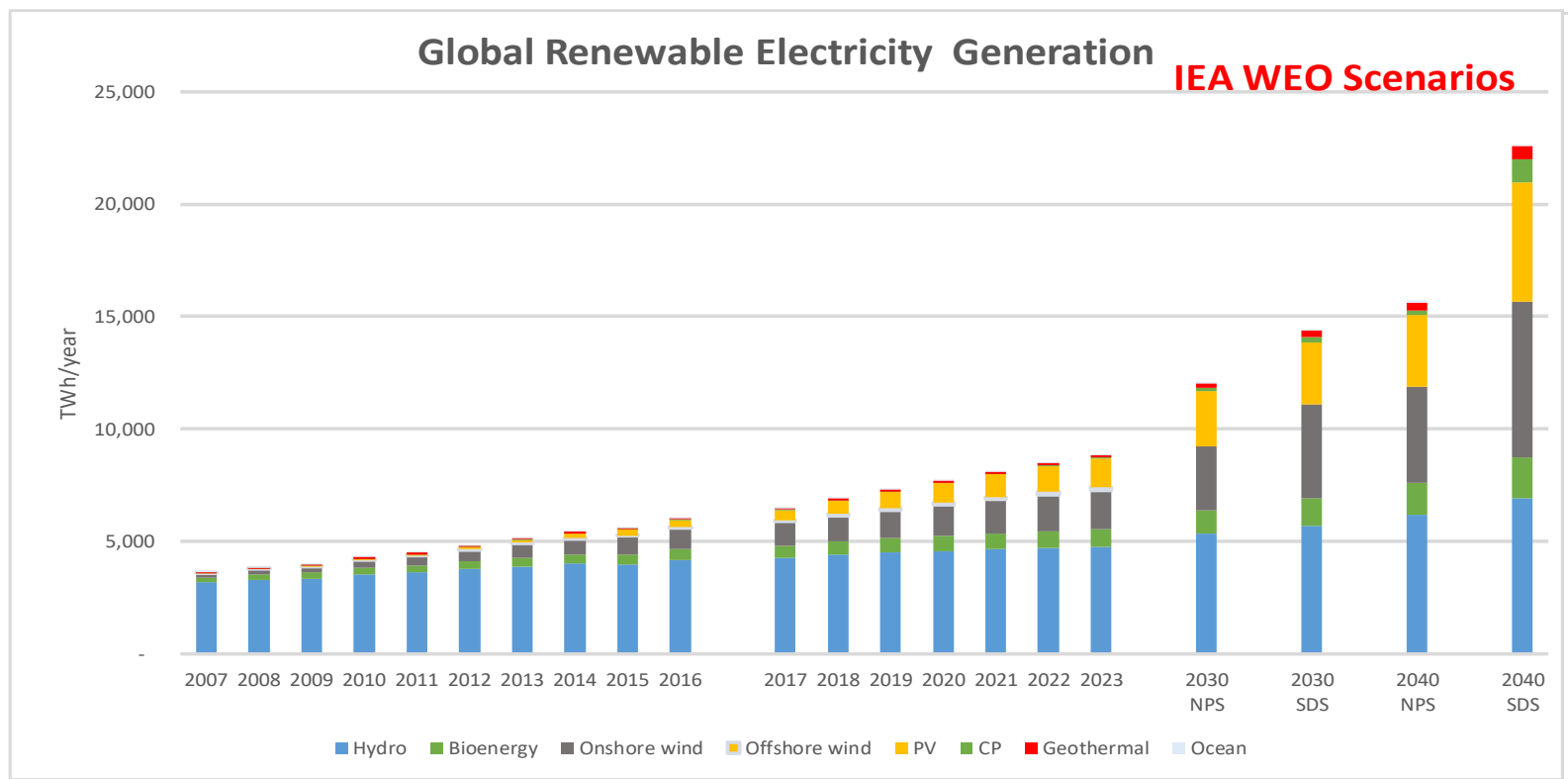
Rapid growth in renewables electricity generation led by wind and solar



Source: IEA Renewables Market Report
2017

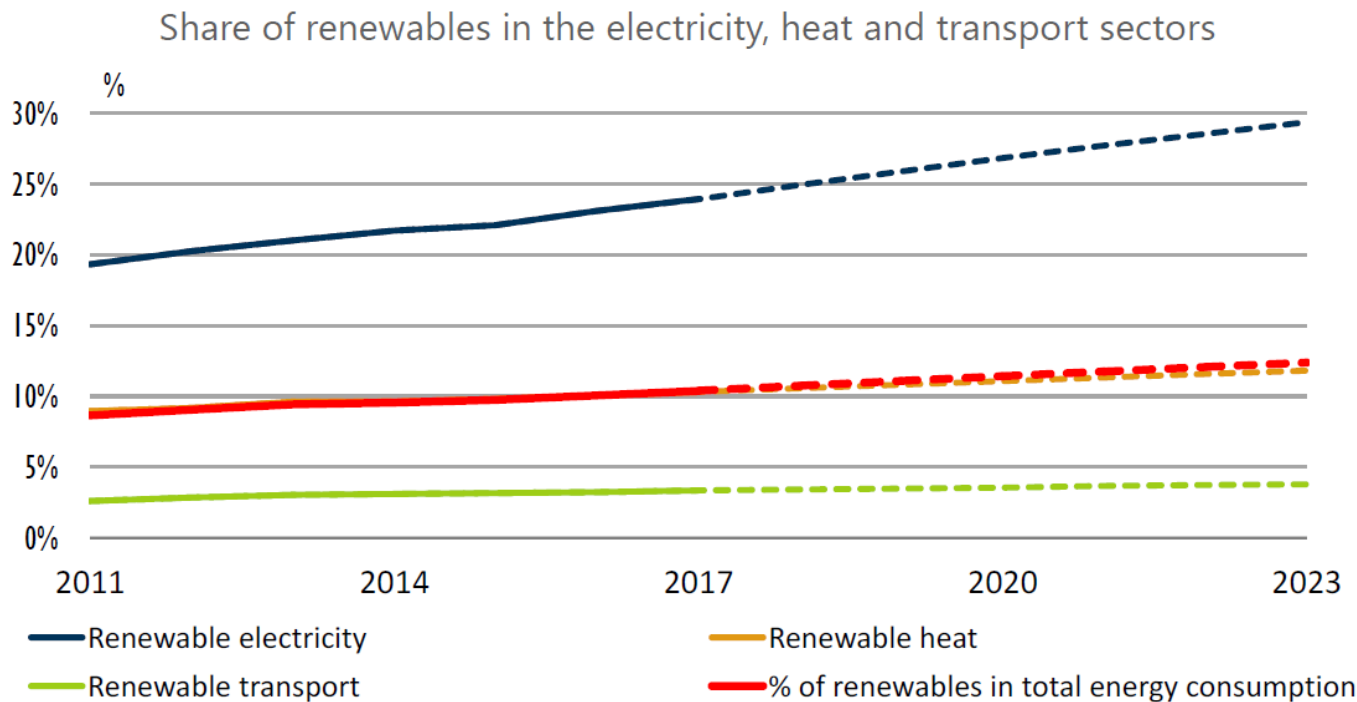
..forecast to continue!

Renewables generation key in future energy scenarios



Strong global growth led by wind and solar PV. Accelerated growth is needed under the IEA SDS, with renewables reaching over 60% of total global generation by 2040.

Renewables share of energy consumption increases by one-fifth



Electricity contributes two-thirds of renewables growth
But electricity accounts for less than 20% of total final energy consumption

IEA Technology Roadmap - Delivering Sustainable Bioenergy

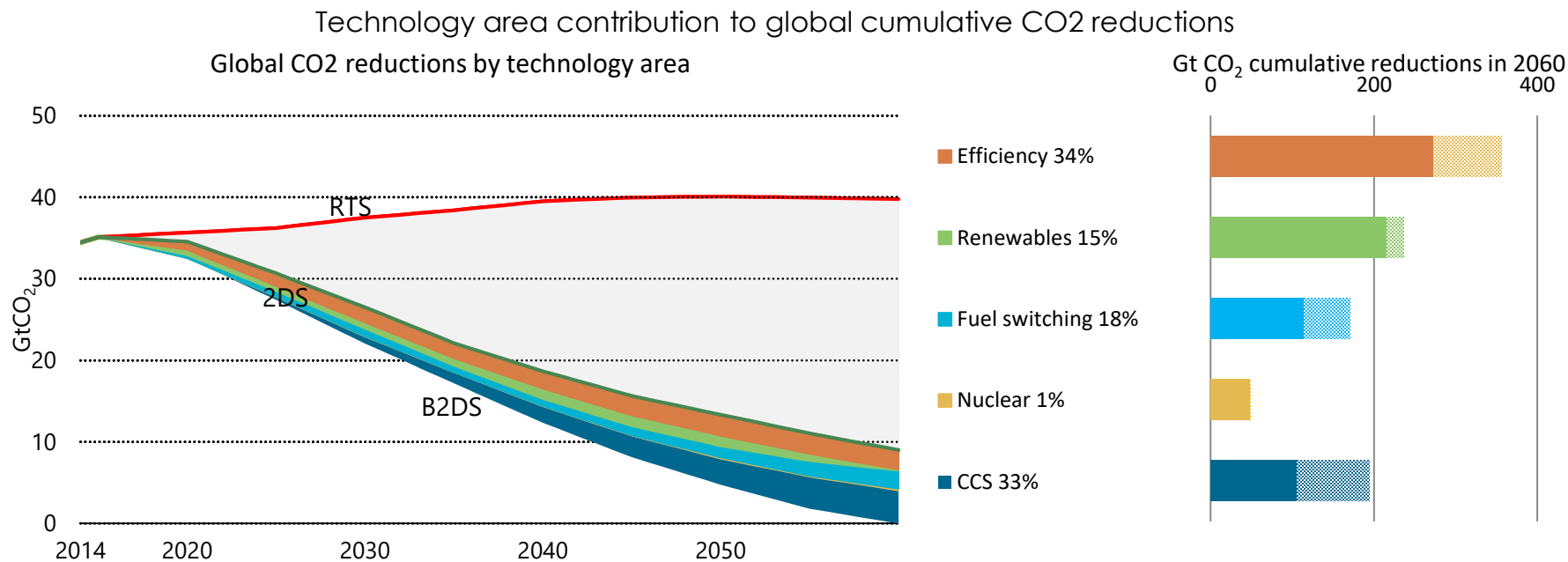
www.iea.org/publications/freepublications/publication/technology-roadmap-on-bioenergy.html.

IEA How2Guide for Bioenergy

<https://webstore.iea.org/how2guide-for-bioenergy>

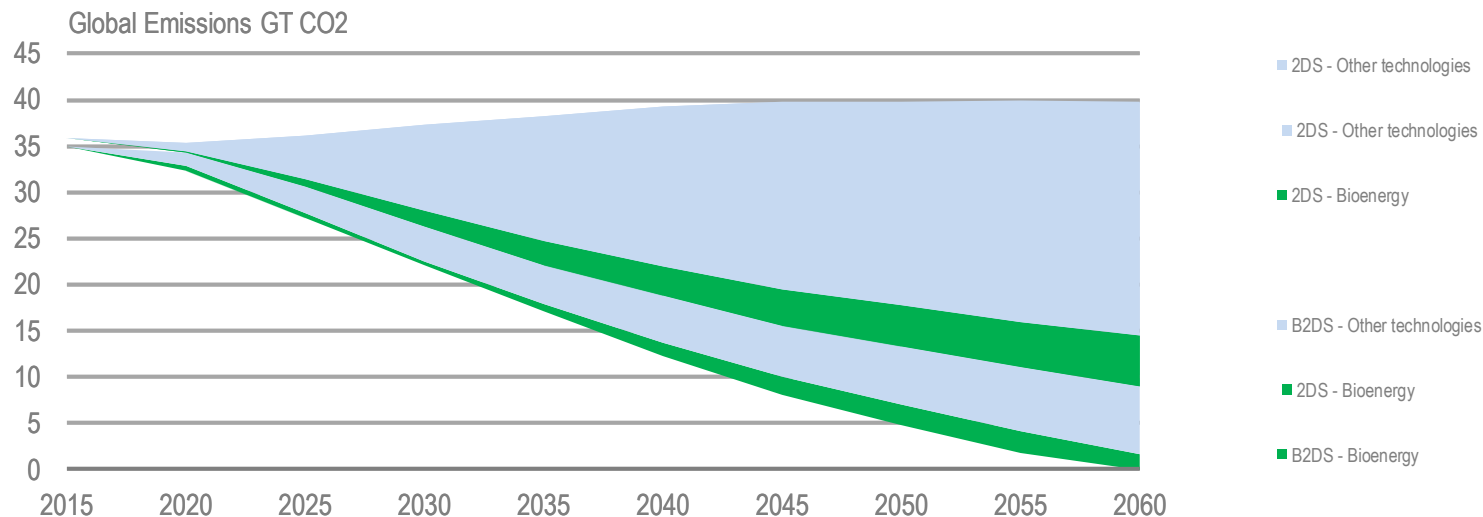


The full portfolio of technologies is needed for decarbonisation



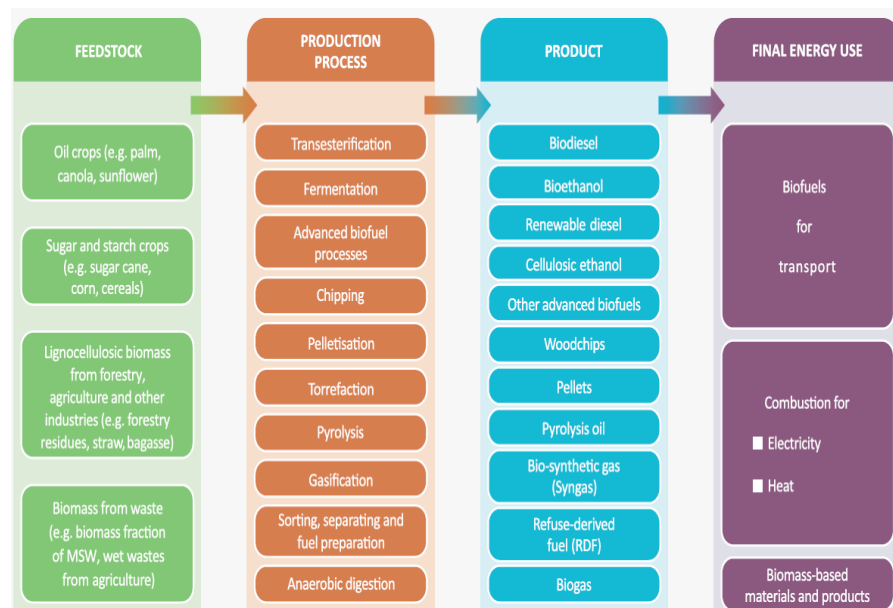
Delivering deep carbon emission reductions will require an unprecedented effort in technology innovation and diversification worldwide

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

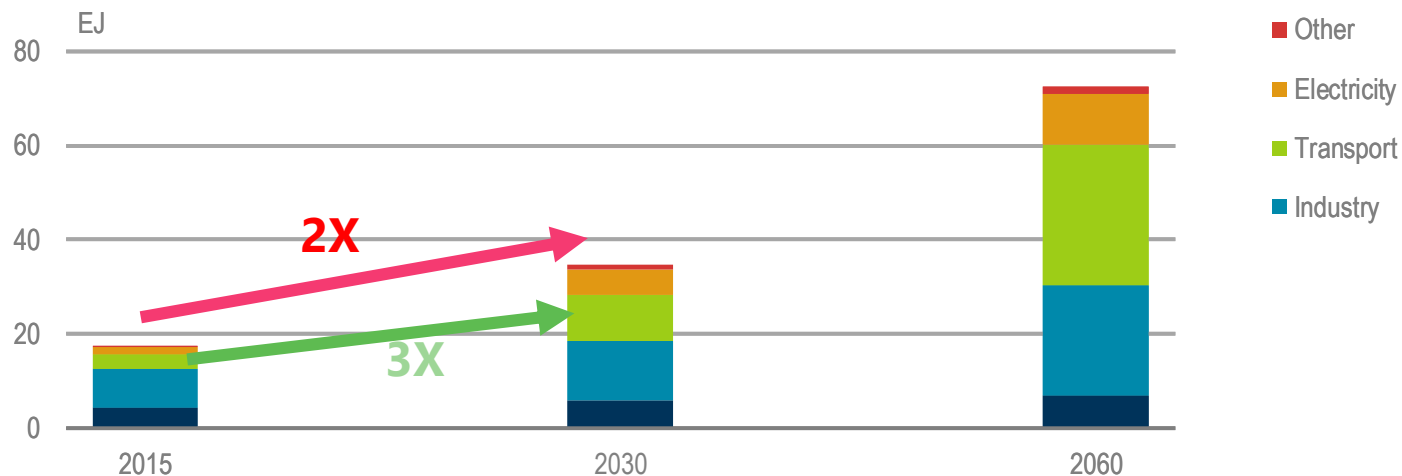
- Bioenergy can be a **major part of a low carbon energy system**, providing low-carbon transport fuels, electricity, and heat as part of a growing bioeconomy.
- To play these roles bioenergy must be deployed **sustainably**.
- But bioenergy is complex and sometimes **controversial**.
- General statements and oversimplification are unhelpful.**
- There is growing experience on what is sustainable good practice and how to manage it.



Bioenergy now needs a new impetus based on up to date evidence and experience

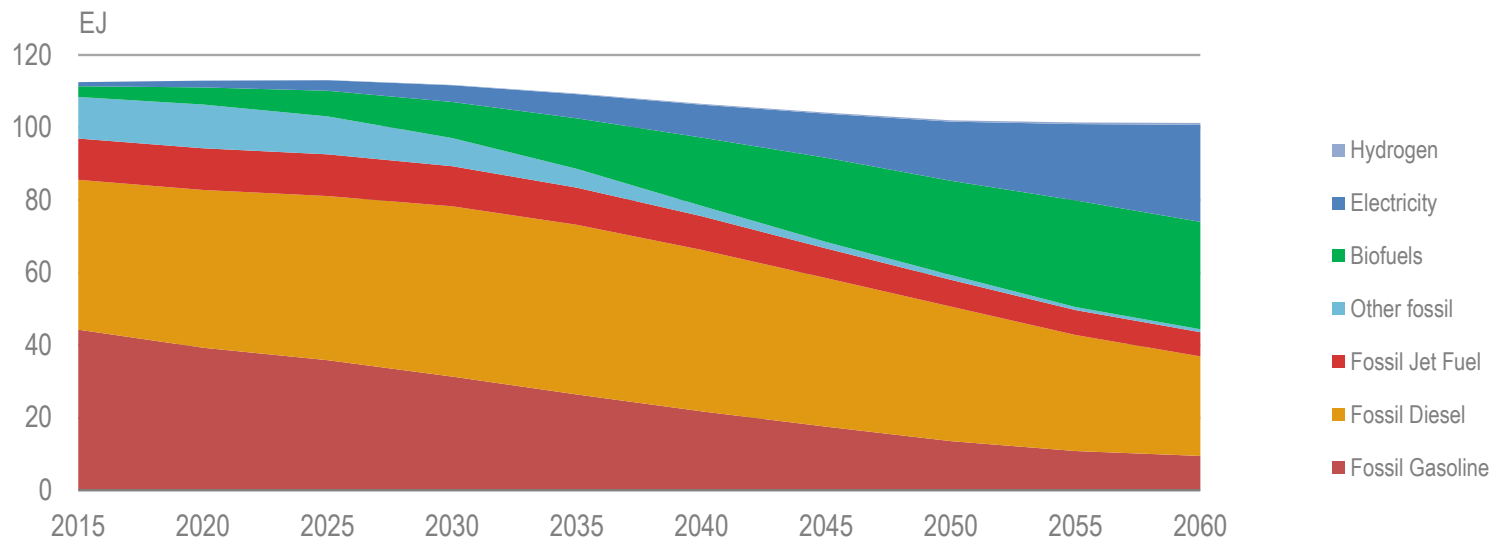
Strong acceleration needed between now and 2030

Modern bioenergy in final energy consumption in 2DS



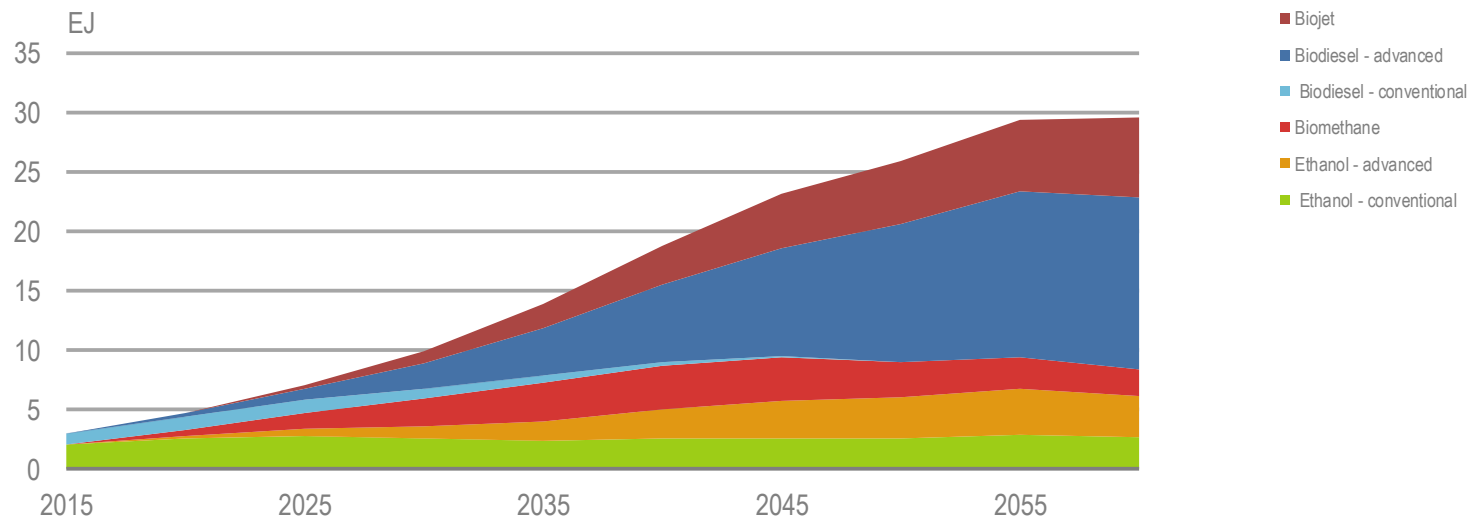
Bioenergy in final energy consumption needs to double by 2030, and biofuels in transport treble. Advanced biofuels will need a massive scale up

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



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

Appropriate policy frameworks essential for all of these

1. A range of mature bioenergy solutions can scale up immediately

Bioenergy solutions suitable for immediate scale-up

Biomethane from waste and residues for use as a transport fuel.

HVO / HEFA from waste and residues for use in heavy-duty road freight and aviation.

Higher ethanol blends and unblended ethanol in road transport.

Bioenergy-based district heating networks in urban areas.

The conversion of existing fossil fuel infrastructure for bioenergy use.

Energy recovery from municipal waste solutions.

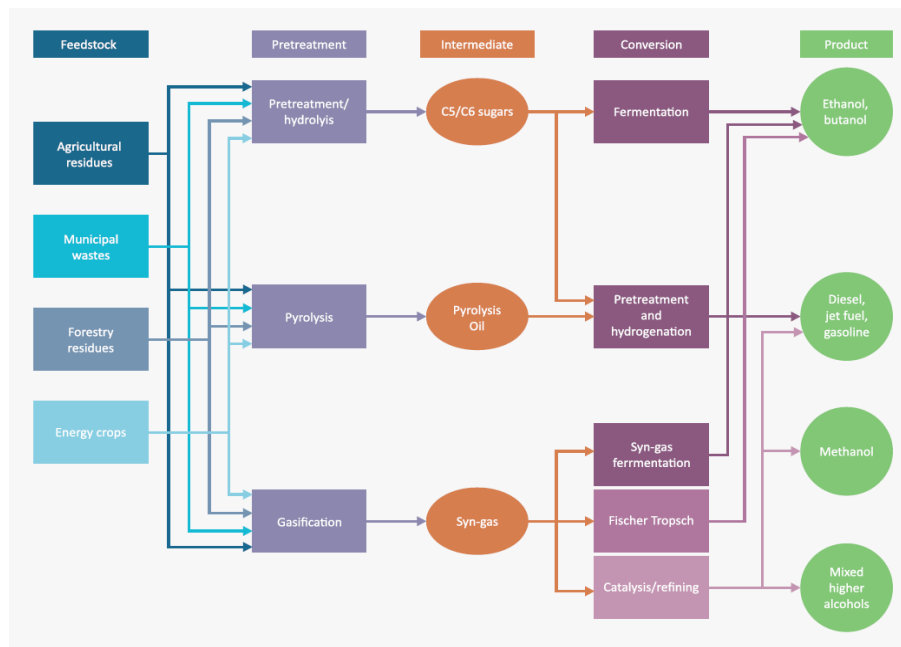
Maximising the efficiency of sugar cane residue co-generation in the sugar and ethanol industry.

Medium-scale biomass heating systems in commercial and public buildings.

Accelerating bioenergy deployment up to 2025 will depend on greater utilisation of technically mature solutions which can roll out quickly under supportive policies and market conditions.

2. Stimulate development and deployment of new technologies

Some routes to new biofuels



- **New technologies needed with good carbon performance and adapted to market roles in 2DS.**

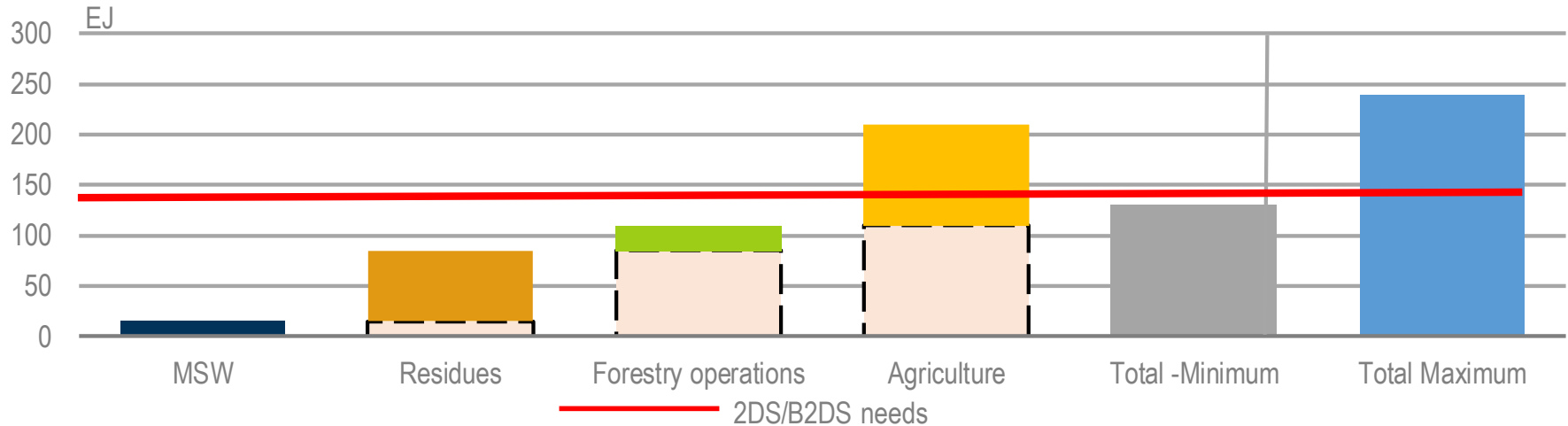
Continued R,D and D to reduce costs and **improve GHG performance** of existing bioenergy technologies

Demonstrate **reliable performance** from existing “advanced 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**

3. 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
 - Emphasis on sources with minimized impacts on land use change emissions by co-production with food and other, use of under-productive land, improved production
 - Supported by general effort to improve agricultural productivity and efficiency

Goals

Ensure C savings
Avoid other significant negative
sustainability impacts

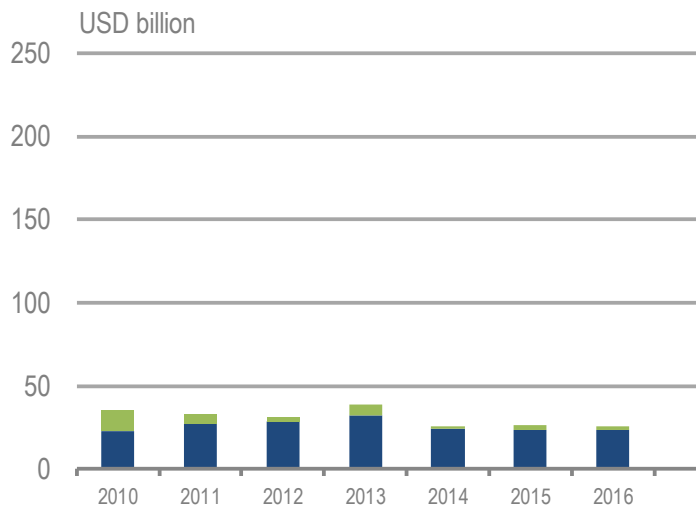
Promote good practice and provide
stable regulatory regime

Encourage best practice and stimulate
innovation

Principles

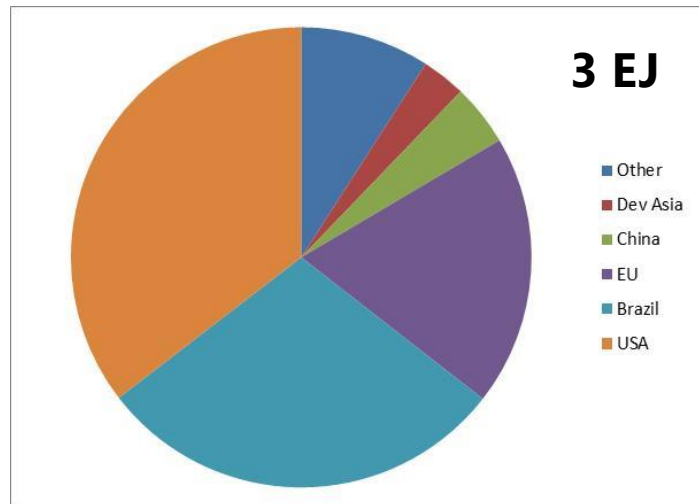
- GHG performance based rather than feedstock or technology specific
- Builds on and integrated with wider efforts to manage sustainability of the bioeconomy
- Recognises regional and sectoral differences
 - opportunities
 - risks
 - governance
- Increasingly based on real life data and feedback into best practice and regulation

4. Catalyse Investment needs to rise sharply

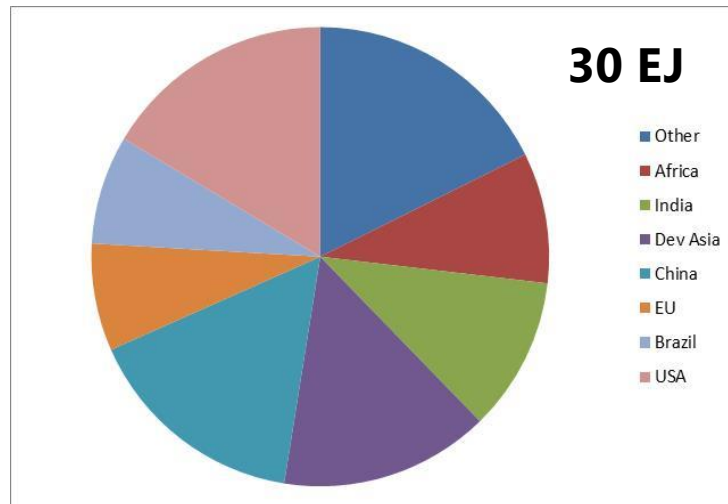


Need to catalyse finance: from \$30 Billion now to \$58 Billion and eventually over \$200 Billion/year

Regional Biofuels Demand 2015

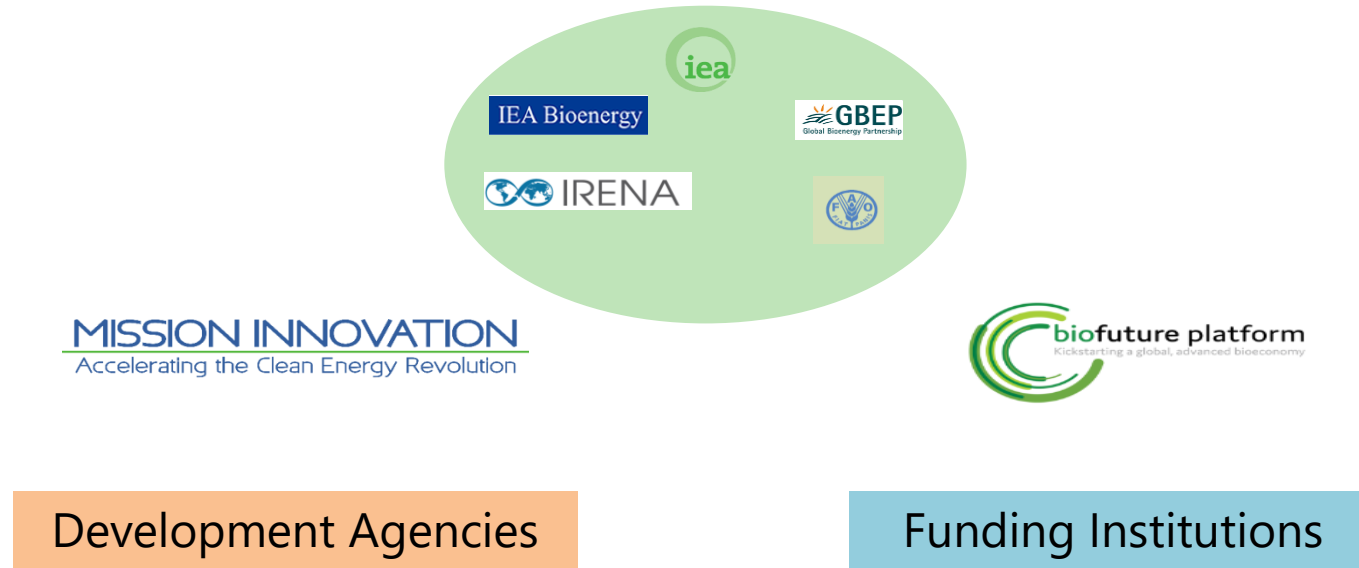


Regional Biofuels Demand 2060 – 2DS



- Very encouraging developments in China, India
- Engagement with rest of Asia, Africa essential

Develop capacity via a coordinated international collaboration effort



- Identify regional and local opportunities
- Build technical and regulatory capacity
- Build up finance pipeline

The ideal policy landscape.....

Level the playing field

- Balance subsidies
- Price in carbon externalities
- Remove other barriers to low carbon technologies

Provide low risk investment climate

- Market access and clear regulatory framework
- Long term goals and clear and specific targets
- Obligations
- Long term offtake arrangements
- Value non energy benefits

Catalyse and support innovation

- Obligations for new products
- Risk mitigation (e.g. loan guarantees)
- R,D and D Support

Fair, stringent and stable sustainability regime

We now have enough examples to identify best practice in policy too!

- Renewables are a key component on low carbon energy futures
- Excellent progress is being made in the electricity sector and growth is expected to continue
- But electricity is only a relatively small part of total energy demand and we will need to decarbonize heat and transport sectors too
- Bioenergy is a key technology in these areas but progress in deployment is much slower than necessary.
- To expand the role of sustainable bioenergy we need to:
 - Expand deployment of existing technologies
 - Commercialise the necessary 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



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