



NNFCC

Challenges, opportunities and issues in developing and funding innovation in biorenewables



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Today's Presentation

About the NNFCC

Biorenewable energy

Bio-based products

Financing Needs

Summary



NNFCC

The UK's National Centre for Biorenewable Energy, Fuels and Materials

An Independent '*not for profit*' company

Mission

The NNFCC is committed to the sustainable development of markets for biorenewable products. We promote the benefits of biorenewable energy, liquid fuels and materials for enhancement of the bioeconomy, environment and society.

Company Activity

Advisor to UK Government

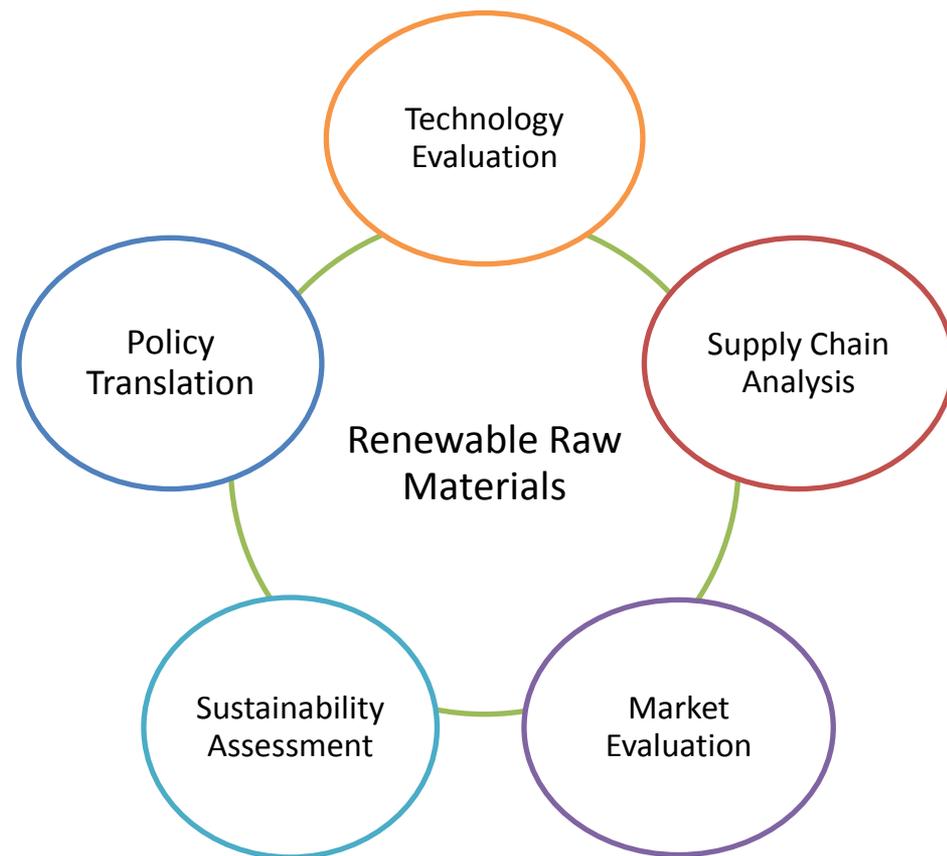
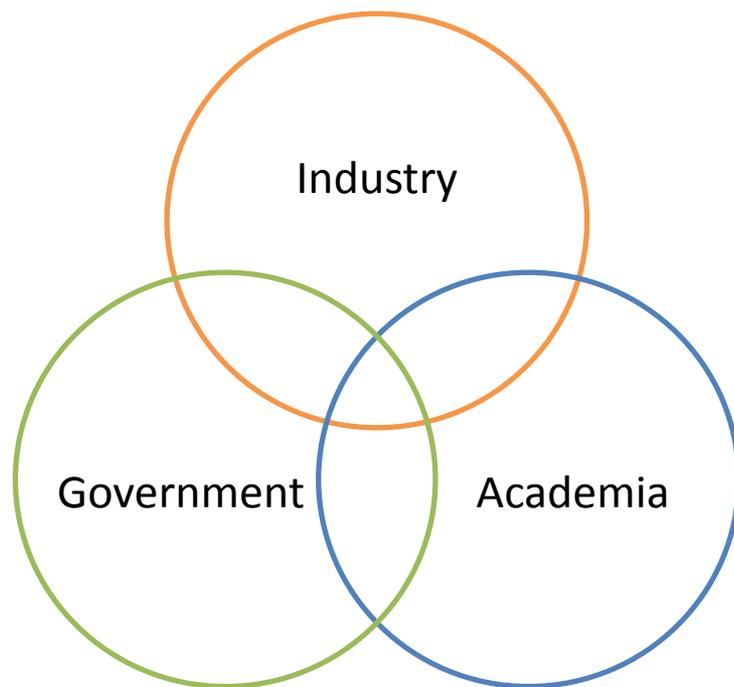
Commercial Consultancy

Member Services



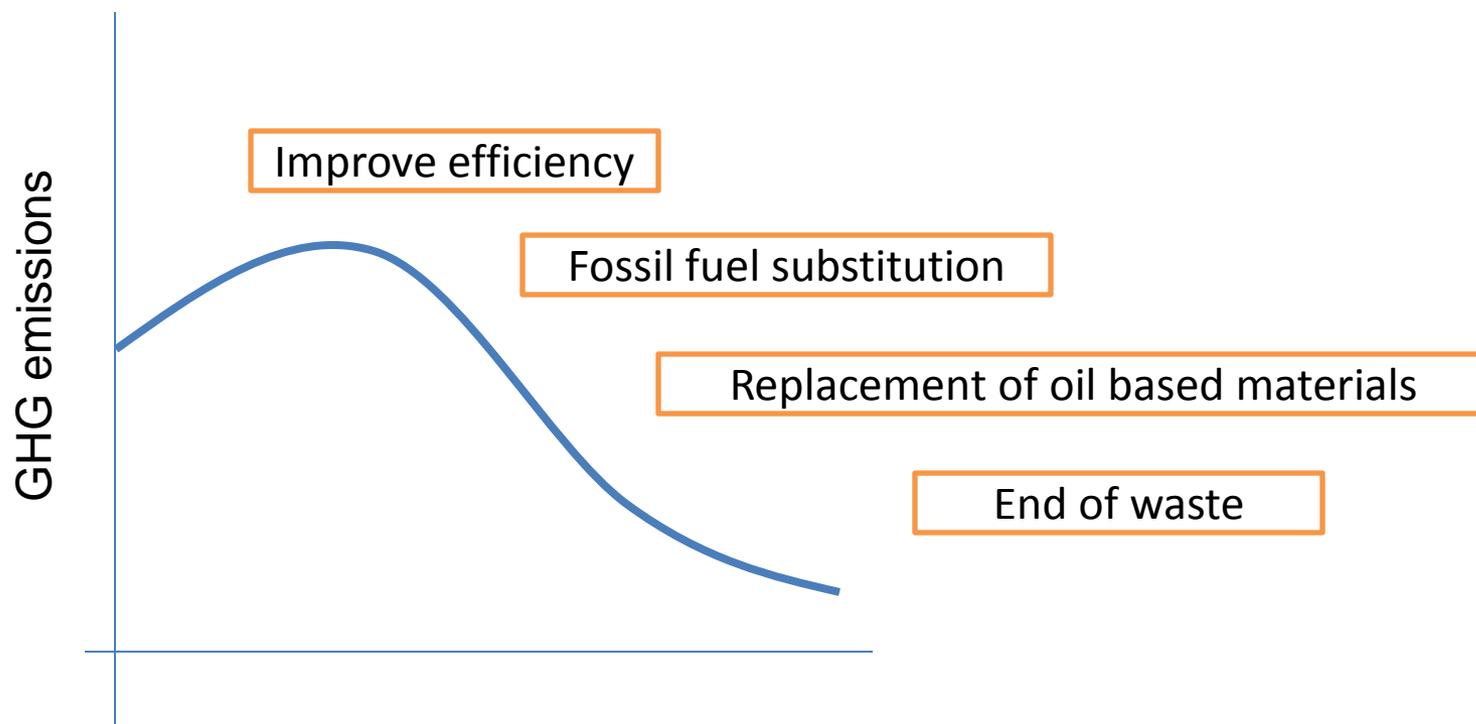
NNFCC Operating Space

Engagement





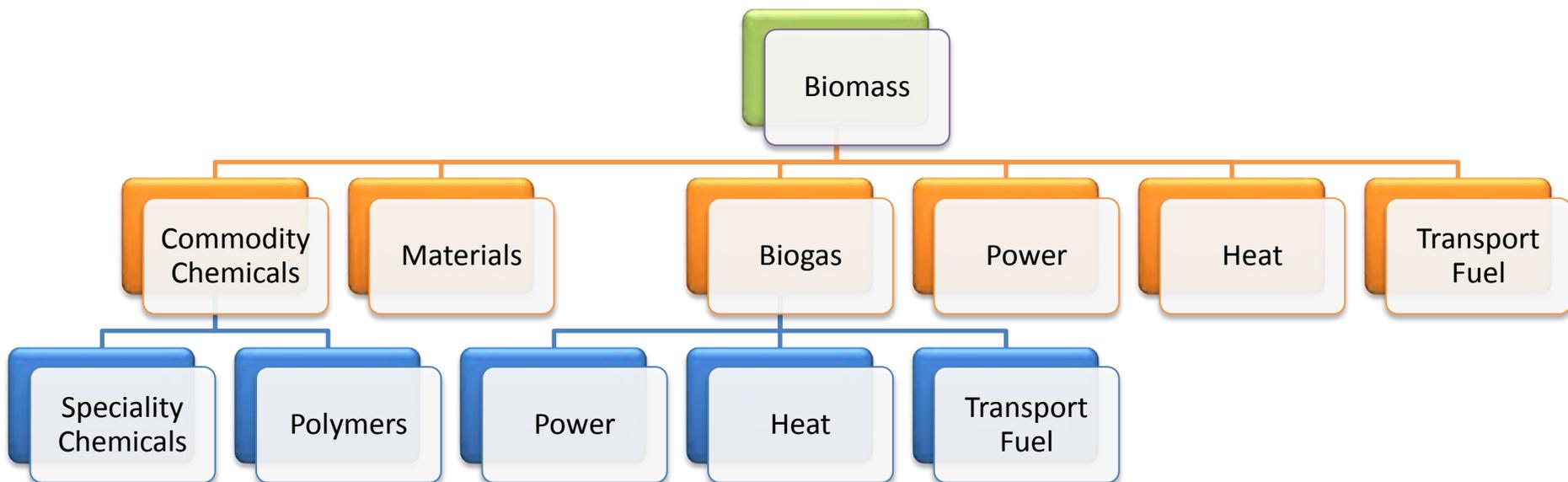
The NNFCC shares the vision of a low carbon economy



Source: Adapted from 'GHG Emission reductions with Industrial Biotechnology': Assessing the Opportunities, WWF & Novozymes



Biorenewables Markets





Biorenewables - Feedstocks

An industrial crop is a crop grown to produce goods to be used in the production sector

UK industry processes over 100 industrial crops

- Major crops include
 - Hemp
 - Wheat
 - Sugar Beet
 - Oilseed rape
 - Maize
 - Miscanthus
 - SRC Willow
 - Linseed
 - Sunflower
 - HEAR
 - Kenaf



The need for innovation?





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Combustion requires innovation

Energy Grasses

- Most acceptable crop to farmers
- Not well suited to current combustion technologies (high alkali metal, high ash)

Short Rotation Forestry

- Good combustion characteristics
- Low understanding of production potential (trials required)

Short Rotation Coppice

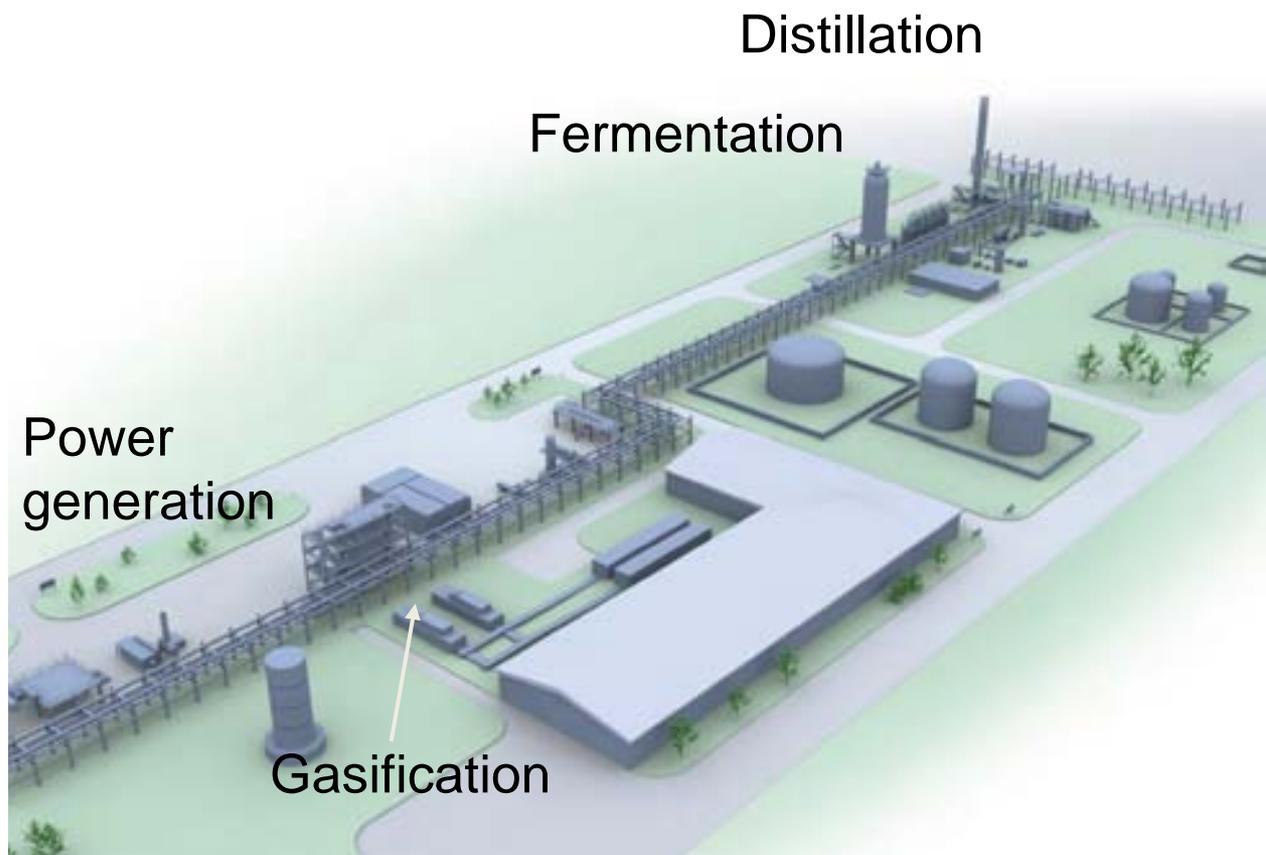
- Good combustion characteristics
- Considerable lag period until first income (cash flow issues)
- For poplar - Issues with disease

Technology

- Gasification technology immature, requires demonstration
- Cost of small scale biomass boilers is prohibitive



Integrating thermal & bio processing



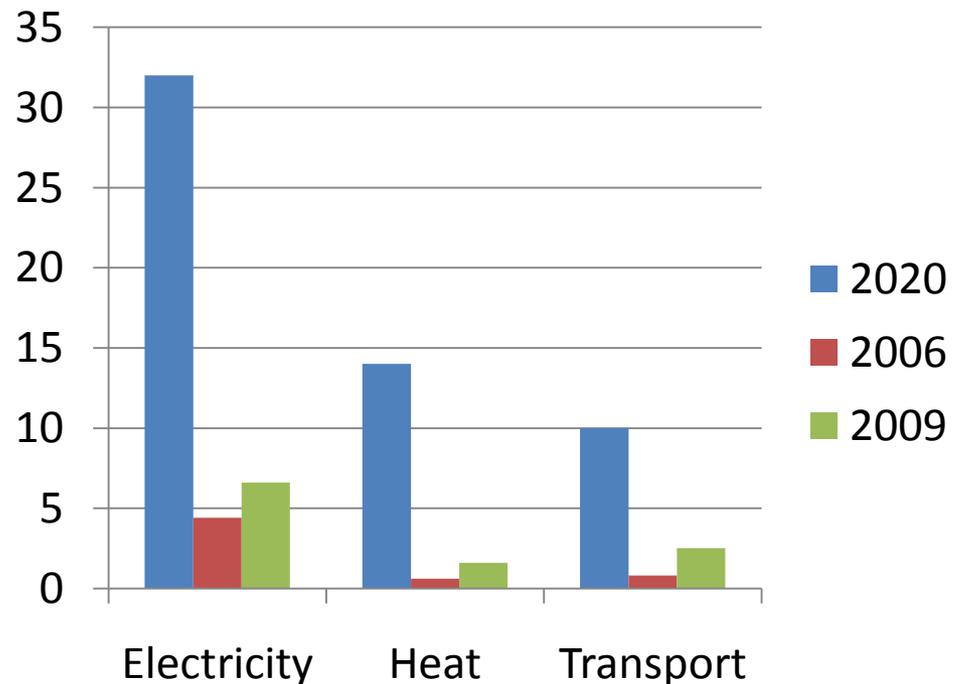
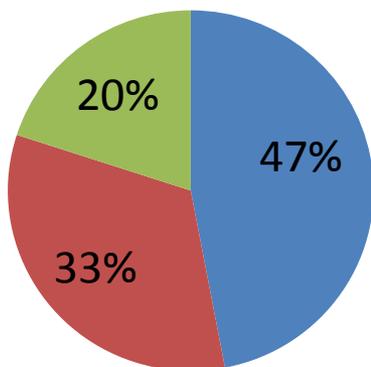


EU Renewable Energy Directive

European Governments focussed on Bioenergy
Mandatory EU target of 20% renewable energy in overall energy consumption by 2020

UK Target – 15%

■ Electricity ■ Heat ■ Transport





Anaerobic Digestion



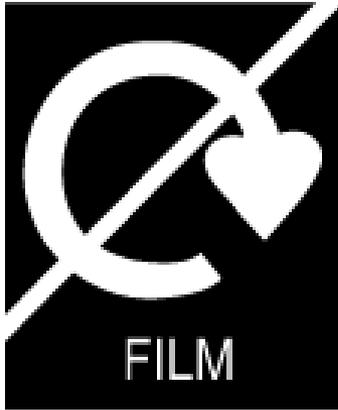
www.biogas-info.co.uk

The UK produces about 100 million tonnes of digestible waste each year which could generate up to 7.5% of the renewable energy required in the UK by 2020.





Reduce, Reuse, Recycle

 <p>SLEEVE</p>	 <p>TRAY</p>	 <p>FILM</p>
CARD widely recycled	METAL check local recycling	PLASTIC not widely recycled



AD suitable packaging - Innovation required

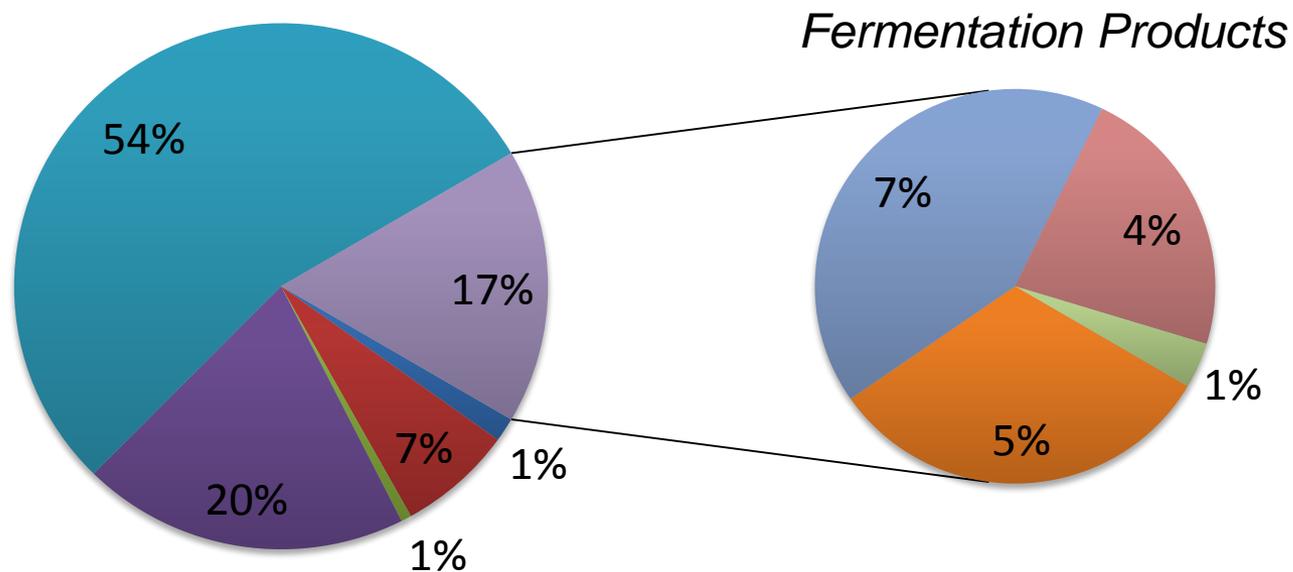
Material	Measured CV (MJkg ⁻¹ VS)	Actual CH ₄ yield (m ³ CH ₄ MJkg ⁻¹ VS)	Recovery as CH ₄ (MJkg ⁻¹ VS)	% Recovery of measured CV	% Calculated solids destruction
Cellulose film	17.23	0.413	14.79	85.8	98.0
Cellulose diacetate	20.20	0.050	1.80	8.9	10.3
Polylactic acid	18.39	0.097	3.47	18.8	20.2
Card packaging	14.34	0.274	9.81	68.4	70.3
Food waste	22.59	0.471	16.89	74.8	83.7
LDPE	46.58	0.018	0.64	1.4	1.5



Biorenewable Chemicals and Polymers

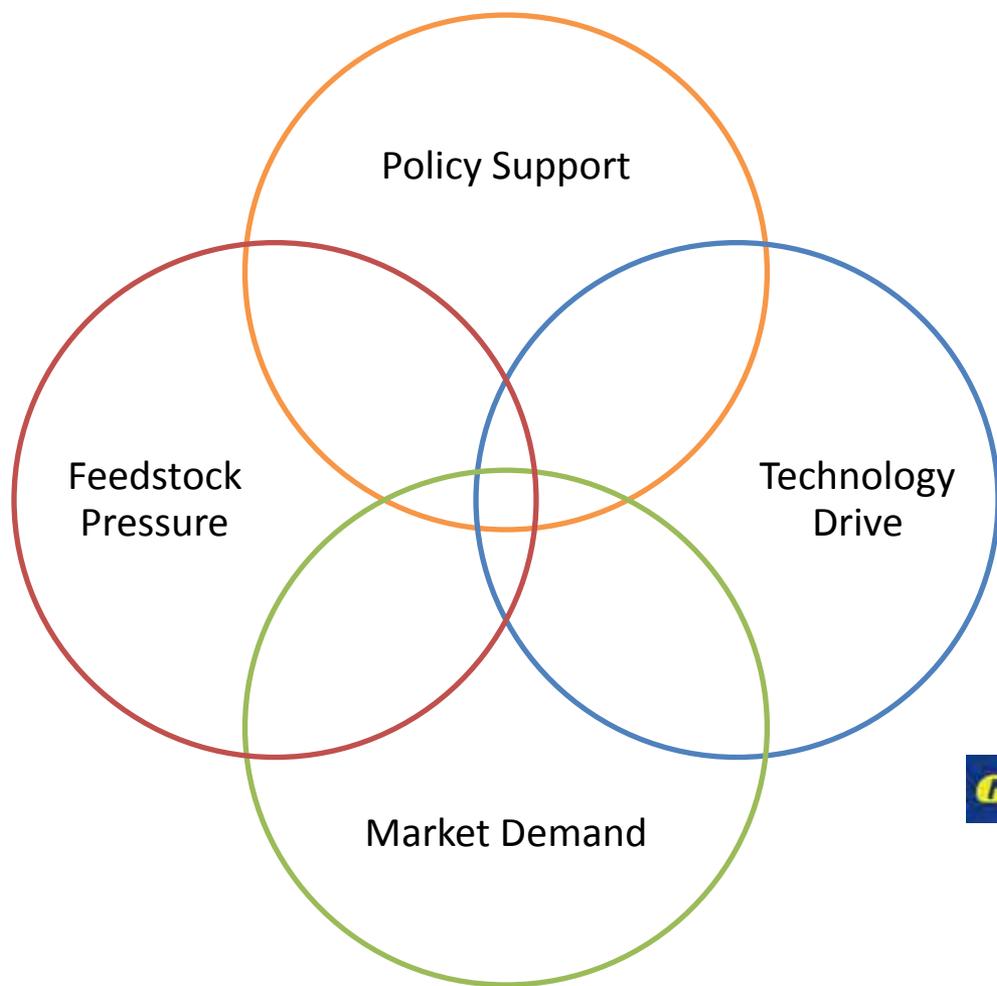
Market size ~ 50 million tones

- Chemical Derivatives
- Oleochemicals
- Alcohols
- Naval Stores
- Biopolymers
- Aliphatic acids
- Natural Products
- Amino Acids
- Other





Interest in bio-based chemicals - Why now?





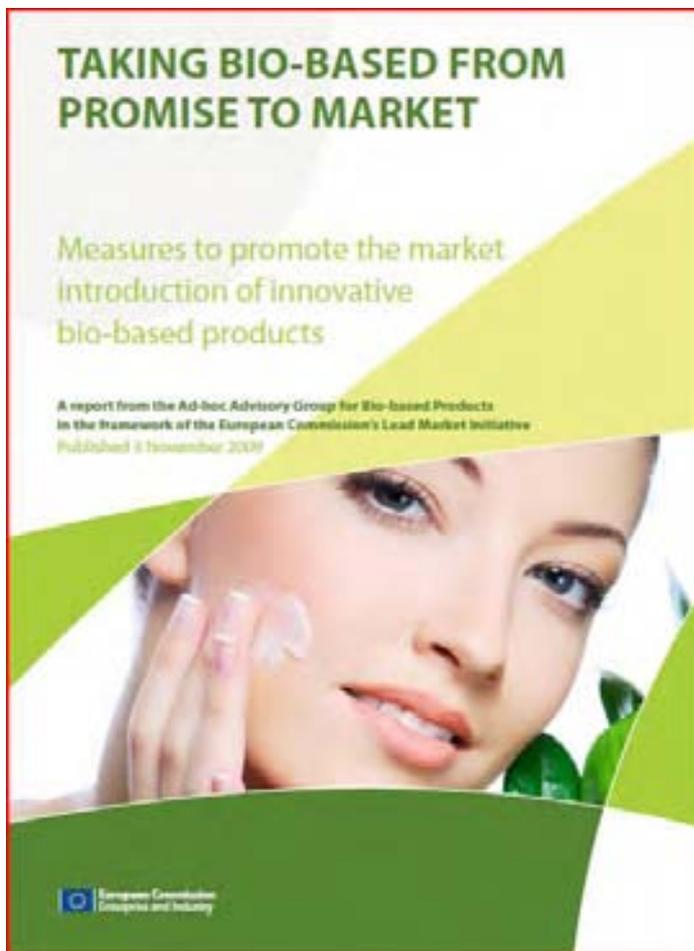
European Lead Market Initiative

Foster the emergence of lead markets of high economic and societal value by ...

- *creating innovation-friendly market framework conditions*
- *to reduce the time-to-market of new goods and services and to enable emerging sectors to grow faster.*



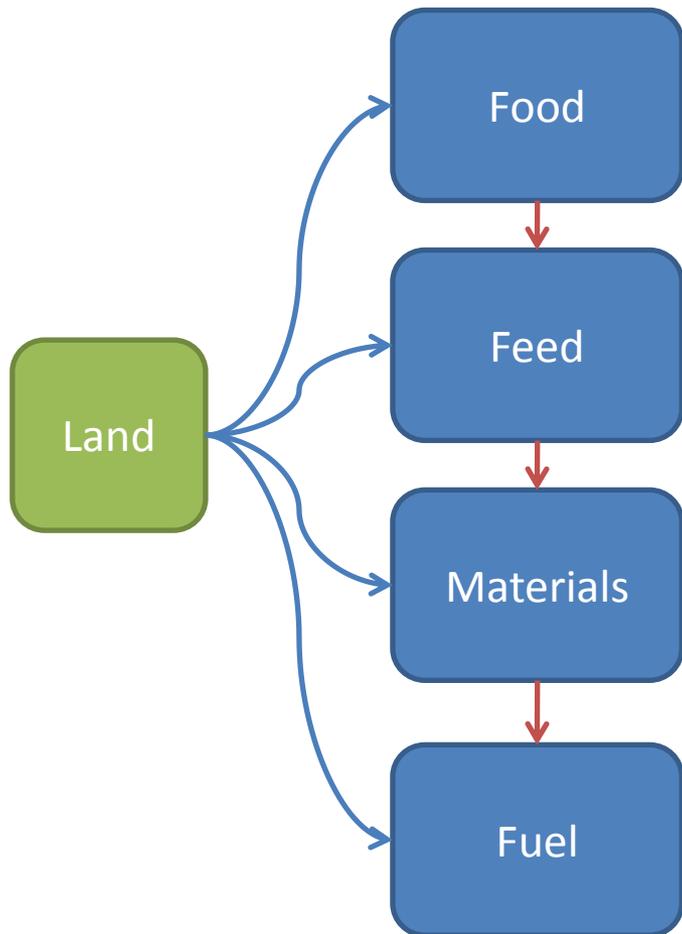
Bio-Based Products



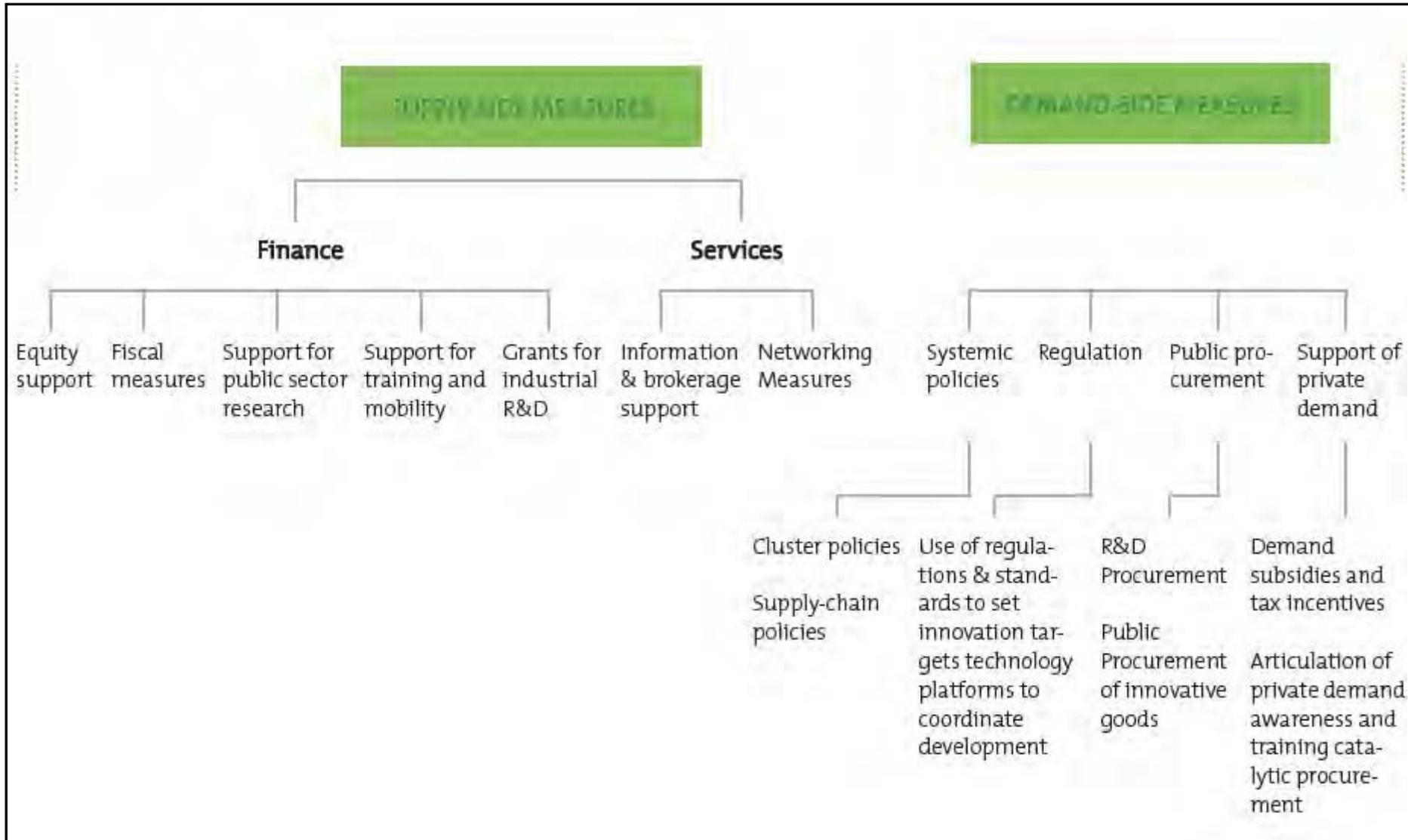
- Standards, labels and certification
- Legislation promoting market
- Product specific legislation
- Access to biomass
- Encourage Green Public Procurement
- Financing and funding of research



Access to biomass



- Increasing crop yield benefits all sectors (1st generation trait development)
- Future trait development aimed at improved crop processing e.g. Enogen – Corn Amylase Trait
- Innovative material processing and use required to deliver efficiency





Product/Process Development

TRL 1-2 Fundamental Research

TRL 2-3 Feasibility Testing

TRL 3-5 Technology Development

TRL 5-6 Technology Demonstration

TRL 6-9 System Development & Commercialisation



Research and Innovation

The main objectives to **share the risk of the development of innovative bio-based** products and processes

Should cover the entire value chain (from crop to bio-based product)

plant engineering, harvest and local processing, logistics, processing at the biorefinery through pre-treatment, enzymes, fermentation organisms, recovery, secondary manufacturing, downstream chemistry, compounding, shaping, side product valorisation and product recovery

Also

research on the social acceptance of the technology and products.



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Integrated Biorefining Research and Technology Club (IBTI Club)

EPSRC Engineering and Physical Sciences
Research Council

Knowledge
Transfer
Network
Bioscience

 **biocaldol**

bp


 **BRITISH SUGAR**

CRODA

green biologics


HGCA

 **InCrops
Project**

KWS


syngenta

TMO renewables


bbsrc
biotechnology and biological sciences
research council



BBSRC review of support for Bioenergy and Industrial Biotechnology

11 recommendations for BBSRC, including

1. increase the size of its IB portfolio
2. ensure that IB is recognised a priority for funding
3. promote IB nationally and internationally
4. identify, develop, and promote new and existing mechanisms for working with private sector
5. strategic allocation of training resources
6. industrial chemical production from living organisms
7. branched and straight chain alkenes from living organisms (synthetic biology)



The EU needs to bridge the gap between research and market

Europe's relatively poor record on innovation is partly due to insufficient expenditure and investment in research and development,

Also fragmented public funding

And the duration in transforming research results into innovative, marketable products

There is a risk of knowledge resulting from European research being used for commercialization of products by European companies in other parts of the world



Improve access to pilot and demonstration facilities

E.g. NIBF Demonstrator Facility

The NIBF's 10,000 litre Demonstrator is an open access facility of a unique scale in the UK.

The Demonstrator allows clients to produce material on a large scale.

The outcomes from this process include an understanding of:

- how the plant needs to be set up

- the likely cost of manufacturing

- and the production of data and material to help support the delivery of a reliable and consistent process.

<http://www.uk-cpi.com/>



Finance requirement of European IB SMEs

Seed financing of potential start-ups

- Approx. 60 new start-ups in Europe
- Approx. €2 million per start up

€120 million

Growth financing of existing start-ups

- Approx. 80 established start-ups in Europe
- Approx. 50% of start ups need financing
- Approx. €5 million per start-up

€200 million

Growth financing of existing SMEs

- Approx. 70 established SMEs in Europe
- Approx 50% of SMEs need financing
- Approx. €60 million per SME

€1,050 million

€1,370 million

Source: Festal Capital



Advisory group recommendations

Research

- 1) Further support for calls on bio-based products (FP7 & FP8)
- 2) Research initiatives focussing on market perspective and covering the full supply chain
- 3) Increase public funding for public private partnerships
- 4) Avoid fragmentation of resources in Europe

Development & Demonstration

- 1) Facilitate access to existing flexible research-oriented pilot and scale up infrastructure
- 2) Increase public funding for demonstration projects
 - a) Stimulate co-ordination and joint use of funding
 - b) EU innovation funds to bring end users and product developers together
- 3) Open up Structural Funds used to support bioenergy projects to bio-based materials



Advisory group recommendations

Improve access to finance for SME's

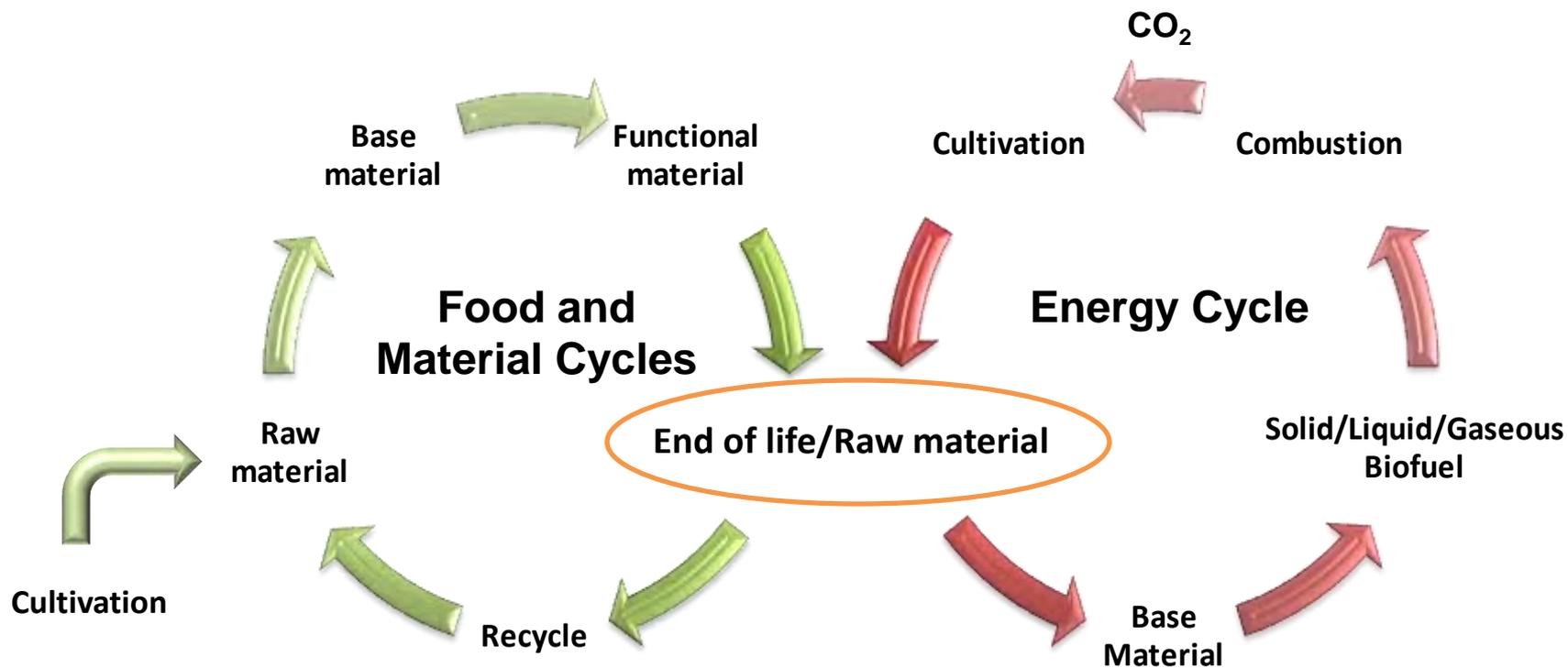
- 1) Improving access to public finance for “proof of concept studies”
- 2) Attract new investors through communication campaigns and development of a database of “player of excellence”
- 3) Develop adapted investment models lying between loans and private equity
- 4) EU evaluation of existing market instruments

Market Support

- 1) Develop incentives (taxation or state aid measures, grants) to support the development of new, sustainable bio-based products' production processes
- 2) Realize a binding political framework for supporting bio-based economy in a long-lasting manner



Carbon recycling and policy development





Summary

Biomass is a key resource within a low carbon economy

Multiple actions are required to develop the EU bio-based economy

- EU needs to ensure access to sustainable biomass
- Support for research must cover all aspects of value chain
- Access to facilities and funds for pilot and demonstration required
- Support SMEs through development
- Market mechanisms to support bio-based products?

THANK YOU FOR LISTENING



NNFCC

The UK's National Centre for
Biorenewable Energy, Fuels and Materials

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About Us

The UK's National Centre for Biorenewable Energy, Fuels and Materials

The NNFCC is committed to the sustainable
development of markets for biorenewable products.

We promote the benefits of biorenewable energy,
fuels and materials for enhancement of the
bioeconomy, environment and society.

[> About the NNFCC](#)

[> Our services](#)

Crops, Wood and Waste

The building blocks of the biorenewable industry

- [> Our Services in Crops, Wood & Waste](#)
- [> Case Study: Ely Power Station](#)



Crops, Wood & Waste

Energy & Fuels

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Latest News



Welcome to our new website

- [Request for responses to the SET Plan mapping questionnaire](#)
- [Solid & gaseous biomass GHG life cycle assessment tool – call for tenders](#)
- [DECC & TSB launch competition to measure energy yield from bio-based fraction of mixed waste](#)

[> More News](#)

Upcoming NNFCC Events

- [Linking Bio-Based Materials to Renewable Energy Production](#)
The Geological Society, London
01 Mar 2011
- [Branching out into Biomass - Nationwide Locations across England](#)
01 Mar 2011 – 31 Mar 2011

[> More NNFCC Events](#)

Just Published

- [Evaluation of Bioliquid Feedstocks & Heat Electricity & CHP Technologies, NNFCC 11-016](#)
- [NNFCC Newsletter - Issue 19: Advanced Biofuels](#)
- [NNFCC Annual Report 2010: Integrated Solutions to Drive the Bioeconomy](#)
- [NNFCC Crop Factsheet: Short Rotation Coppice \(SRC\) Willow](#)
- [NNFCC Crop Factsheet: Miscanthus](#)

[> More Publications](#)



Any Questions?

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