



The Algae Biofuels Challenge: *overcoming barriers to the commercialisation of microalgae biofuels*

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SAMS, Oban

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A decorative graphic at the bottom of the slide consisting of three overlapping, wavy bands in shades of blue and dark blue, curving across the width of the page.

Contents



- Background
- The Algae Biofuels Challenge (ABC)
- Phase 1
- Phase 2
- Supporting activities
- Q&A

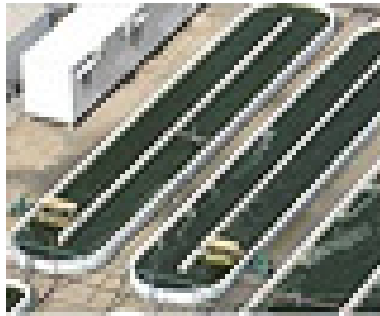
The Carbon Trust



- **Mission:** to accelerate the move to a low carbon economy
- **Established:** 2001
- **Backed:** by UK government
- **We cut carbon emissions now:** by providing expert advice, finance, and footprinting standards/accreditation for products/services
- **We cut future carbon emissions:** by addressing market failures to develop new low carbon technologies



Current Carbon Trust Research Challenges



The Algae Biofuels Challenge



The Polymer Fuel Cells Challenge



The Pyrolysis Challenge



The Advanced Photovoltaics Challenge

Microalgae biofuels vs other biofuels



Advantages

- **Yield:** high yields (x10)
- **Land:** doesn't require arable land
- **Fuel:** oil product
- **Water:** uses less and can grow in seawater
- **Carbon:** savings up to 80% relative to diesel using 'waste' CO₂
- **Fast growing:** fast R&D

Challenges

- **Technoeconomic:** yields not yet achieved at low cost and large scale
- **Location & resources:** needs minimum temperatures, high insolation, flat land, seawater, CO₂ source
- **Competition:** CCS?

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The Algae Biofuels Challenge (ABC)



Vision

To accelerate the development of algae biofuels towards commercialisation by 2020

Technology Focus

Mass-cultivation in open ponds in favourable climates outside of the UK using seawater

Targets

- Carbon savings up to 80%#
- Oil yields of >20,000 l/ha/yr *

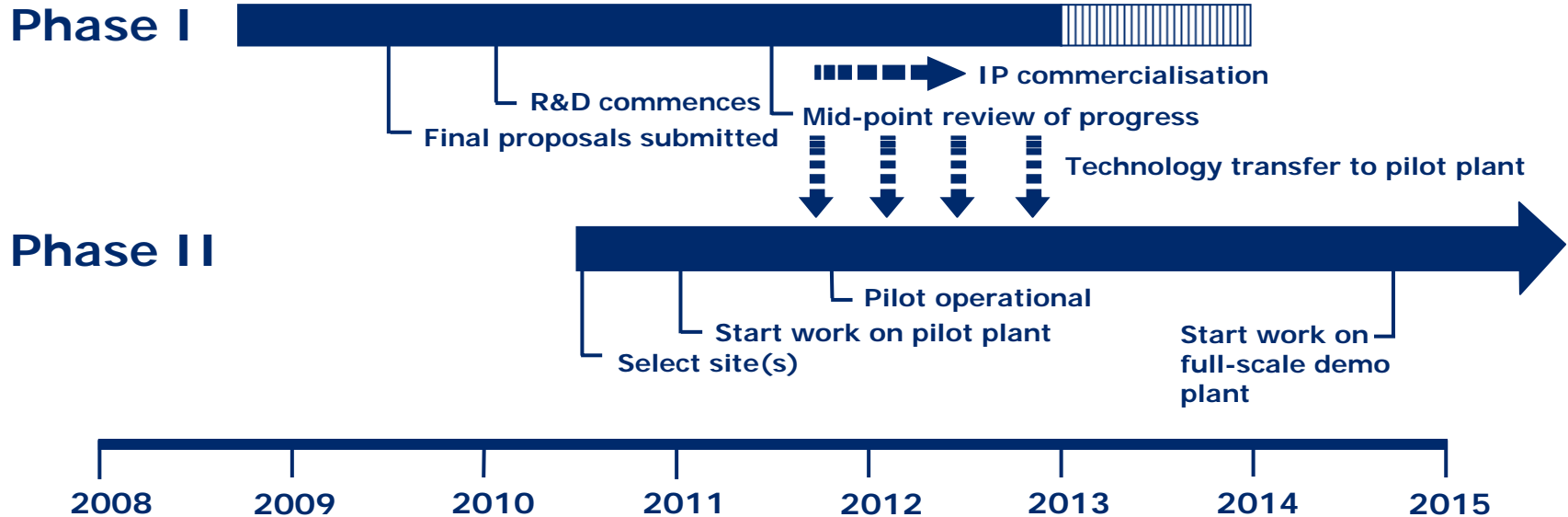
Investment Required

Up to £30m

relative to fossil fuels

* >60 ton/ha/yr dry biomass, >30% oil

ABC project structure



Phase I

- **Aim:** to address fundamental R&D challenges
- **Funding:** Up to **£8m** from the Carbon Trust

Phase II

- **Aim:** demonstration of large scale production of algal oil
- **Funding:** Up to **£10m** from the Carbon Trust

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ABC Phase 1

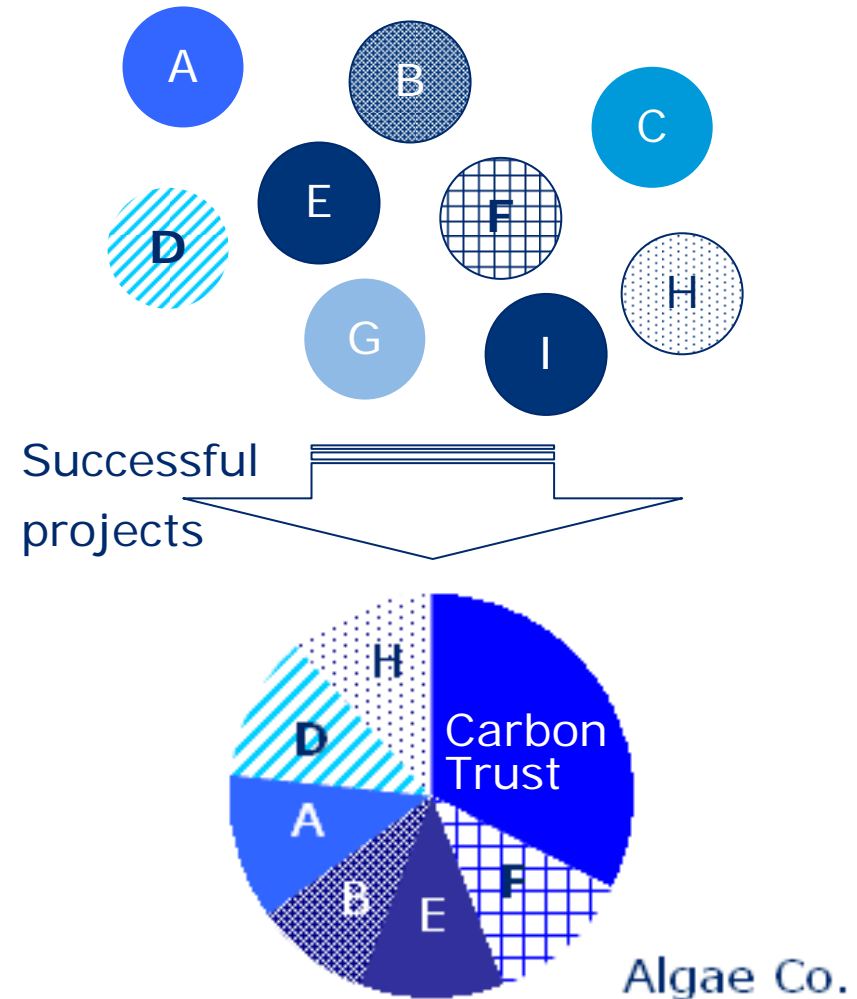
~£500k grant funding to up to 14 teams to conduct R&D to address five topics:

- Isolation and screening of algae strains suitable for mass culture
- Maximising solar conversion efficiency in mass culture
- Achieving both high oil content and high productivity in mass culture
- Sustained algae cultivation in open ponds
- Design and engineering of cost effective mass culture systems

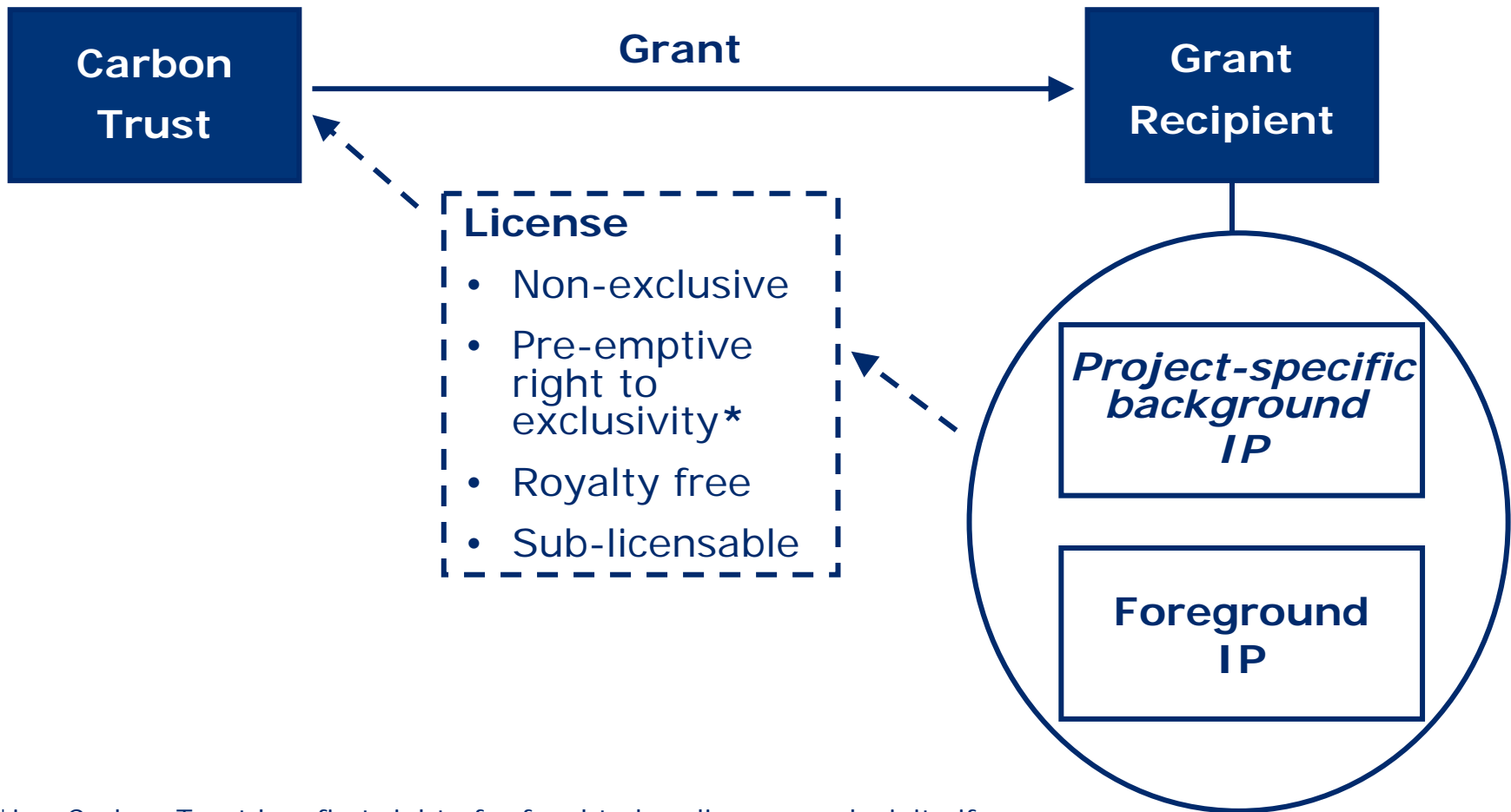
ABC Phase 1: commercial strategy



1. Carbon Trust will fund projects at up to 100% costs in return for non-exclusive licenses to IP
2. Carbon Trust will set-up a company (Algae Co.) to exploit commercial opportunity
3. Successful projects will be offered cash/equity in Algae Co. in return for exclusive access to IP



ABC Phase 1: proposed grant agreement license arrangement



*i.e. Carbon Trust has first right of refusal to buy license exclusivity if a third party makes an offer for a license

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ABC: Phase 2

Build and operation of a multi-hectare test and demonstration plant

- Plant will provide facilities for successful Phase 1 teams to scale-up and integrate their R&D
- Likely to be outside the UK
- Partners (UK or international) will be required

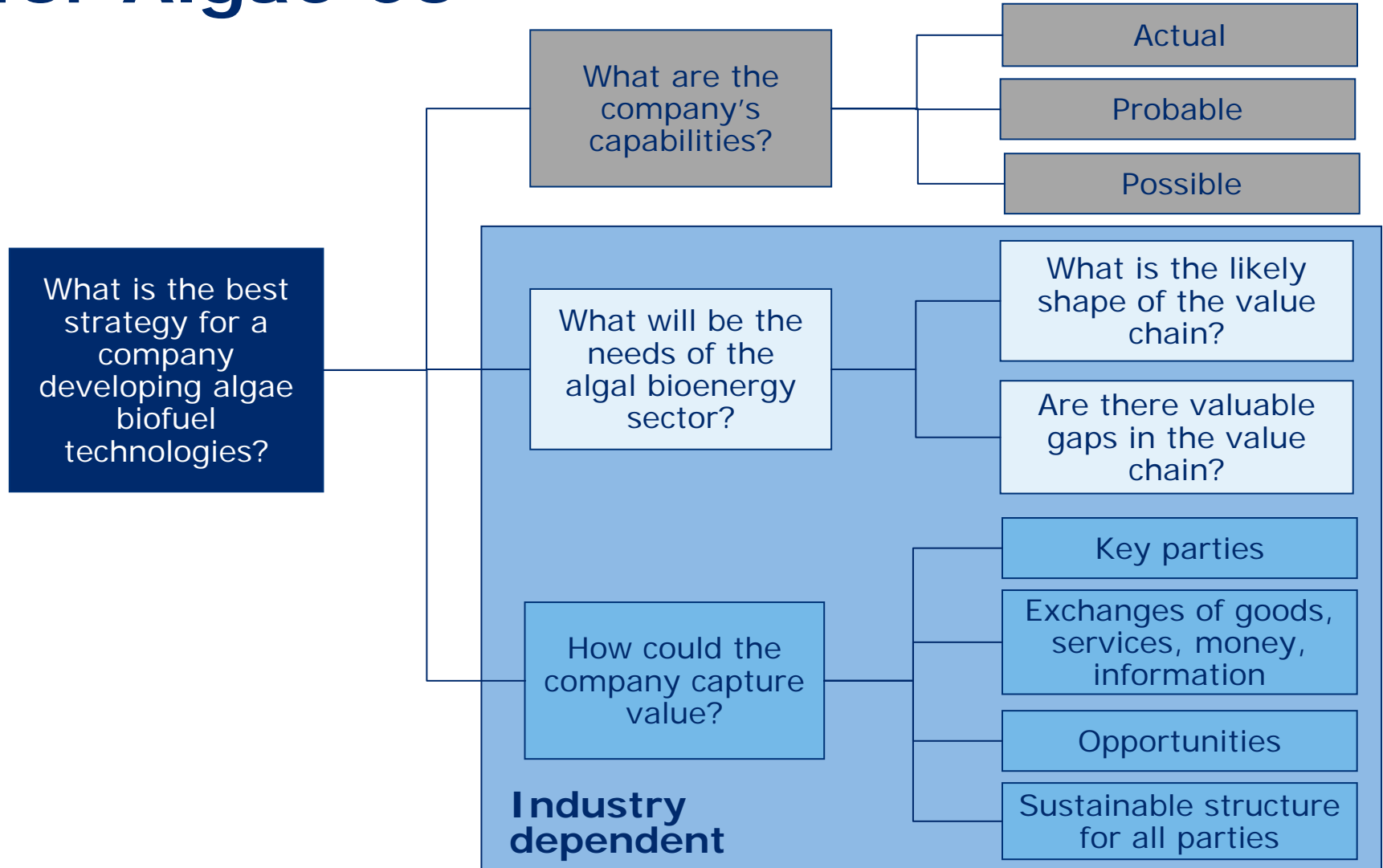


Image credit: Seabiotic

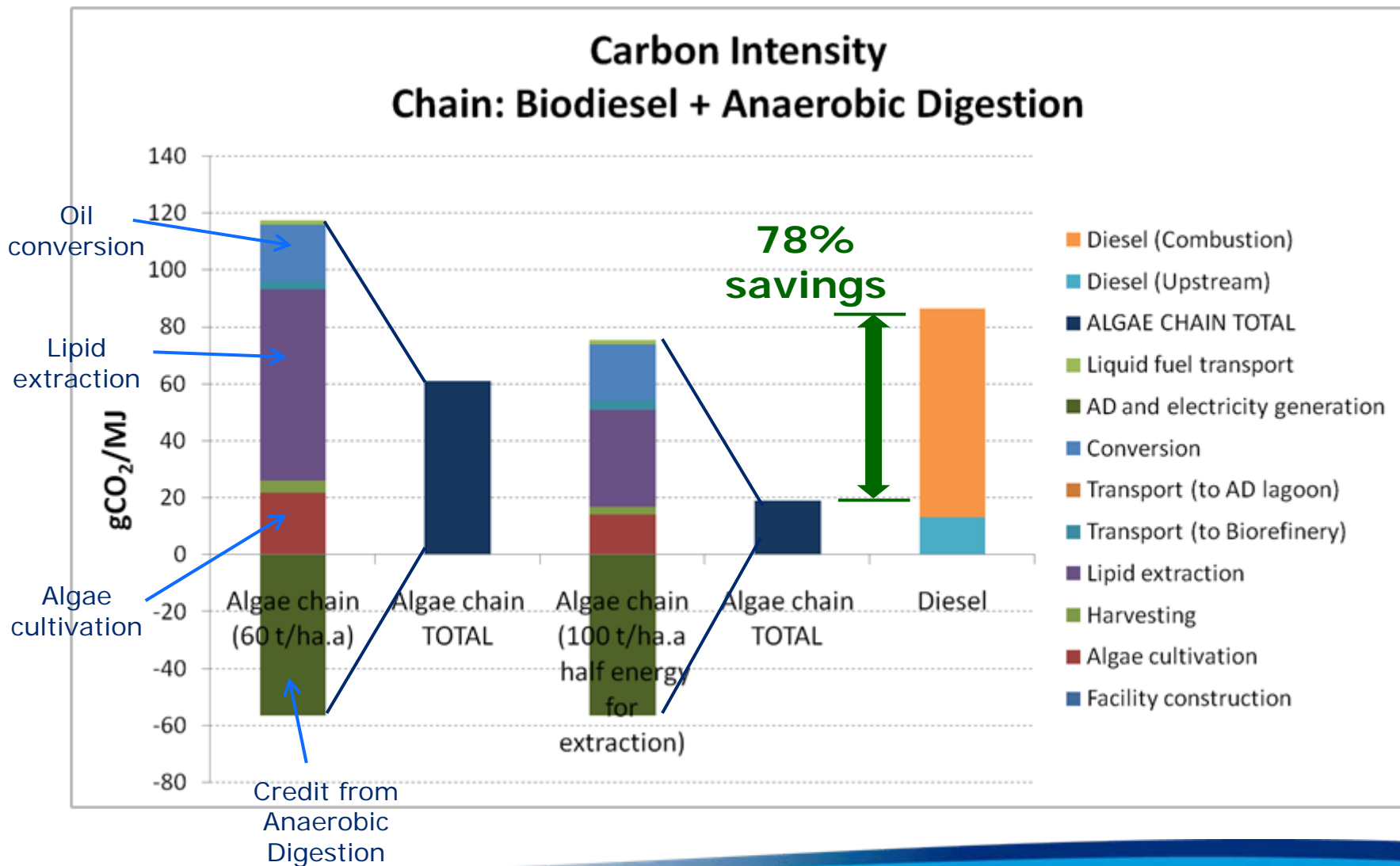
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Commercial considerations for Algae Co



Preliminary GHG LCA results: baseline vs future potential

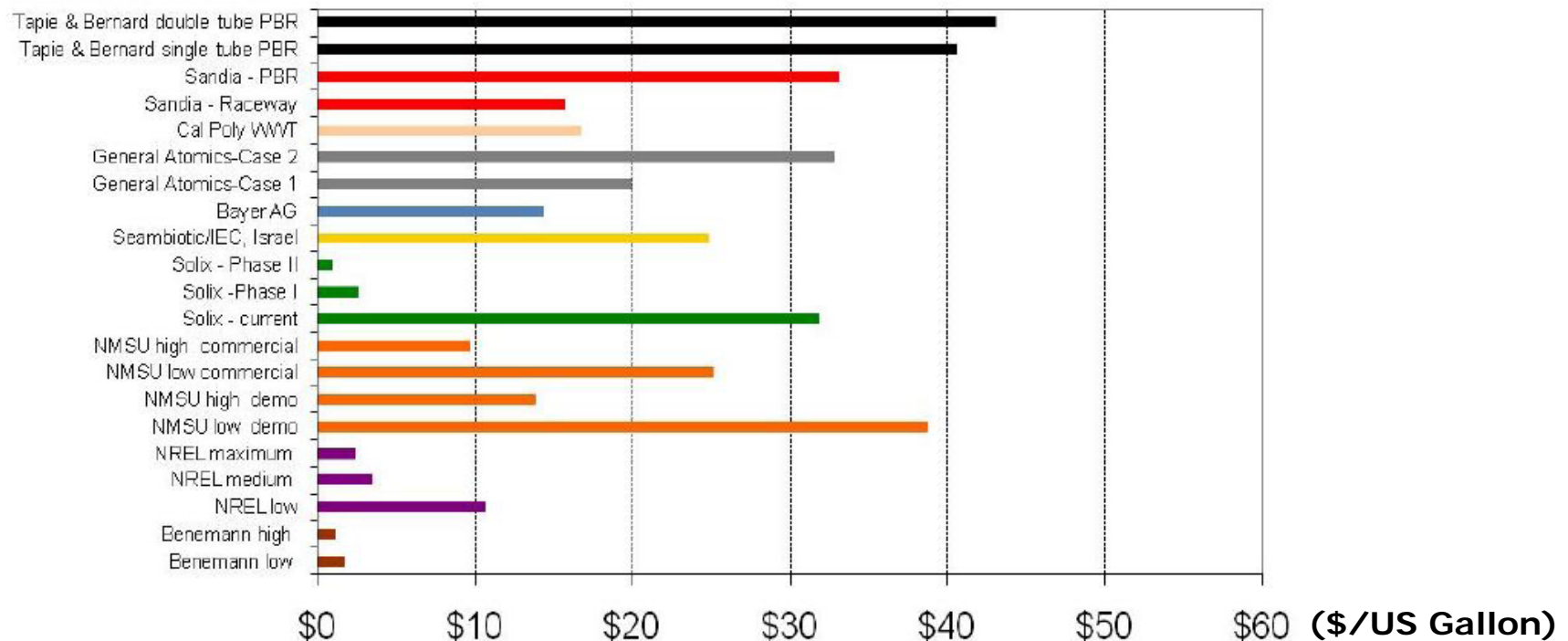


Technoeconomic analysis is ongoing



- Need to go from $> \$10/\text{litre}$ to $< \$1/\text{litre}$ production costs

Triglyceride Production Cost



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Thank you

Links:

The Carbon Trust: www.carbontrust.co.uk

Contact the ABC team: directedresearch@carbontrust.co.uk