

# Developing technology for 3<sup>rd</sup> generation biofuels



Newcastle University lead strategic research programmes to help underpin commercialisation of microalgae biofuels

Dove Marine Laboratory

## The need

The global biofuels market is predicted to reach \$247 million by 2020<sup>1</sup>. However, there is a need to develop new technologies and supply chains for the commercial deployment of 2nd and 3rd generation biofuels by 2020. These advanced biofuels have better sustainability criteria compared to first-generation biofuels (e.g. corn-based bioethanol<sup>2</sup>, OSR-based biodiesel<sup>3</sup>). 2nd generation biofuels (e.g. cellulosic ethanol) do not compete with food crops whilst 3rd generation biofuels (e.g. algae-based biodiesel) do not require agricultural land for production. The UK has a world-class science-base in plant and marine biosciences, microbiology, chemistry and process engineering. This provides a strong platform on which to capture value from the global biofuels market through development of new strains and technologies for algae-based biofuel production.

## The results

The Biosciences Knowledge Transfer Network worked with Professor Grant Burgess of Newcastle University to bring together a pan-supply chain consortium to anticipate solution delivery for biofuels production from algae-based feedstocks.

Early dialogue across the supply-chain has helped consolidate collaborative groups that can act to progress demonstration activities for biofuel production and to source funding to accelerate the development of a competitive UK position in the global biofuels market. The consortium was established to enhance co-ordination and industry engagement between consortium members.

The consortium submitted a series of project applications to the Carbon-Trust Algal Biofuels Challenge which has the vision to accelerate the commercialisation of algal biofuels by 2020. Up to £18 million is available through the Algal Biofuels Challenge.

Project development will proceed through 2 development phases:

- Phase 1 – R&D to address fundamental challenges
- Phase 2 – pilot-scale demonstration of technology for proof-of-concept

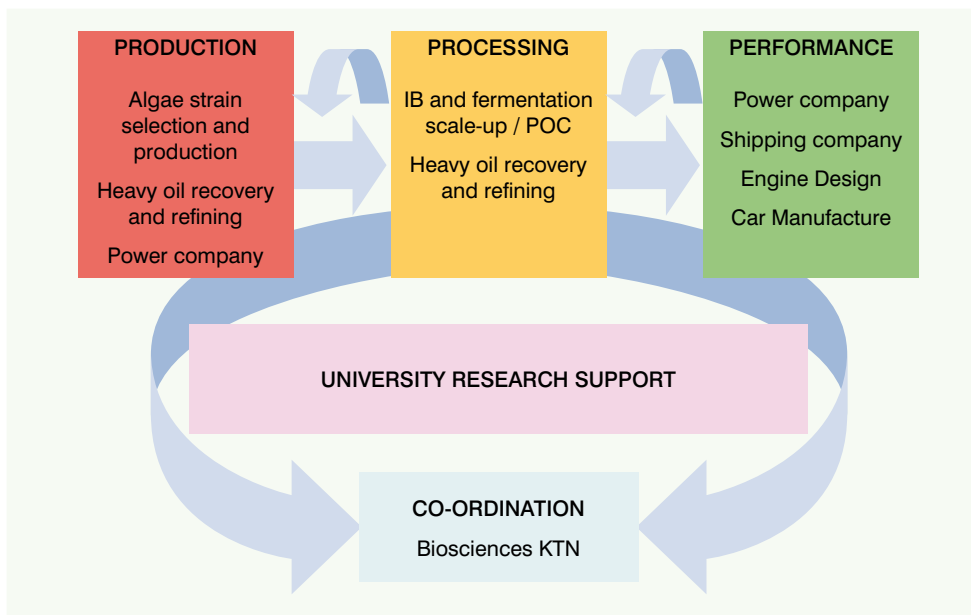
Dr Gary Caldwell, Newcastle University, is the Principal Investigator of a £580K Phase 1 project titled “**Order from Chaos: Application of Chemical Communication Principles to Sustained Mass Algal Culture**” which addresses commercial challenges associated with sustained algae cultivation in open ponds.

Dr Adam Harvey, Newcastle University, is the Principal Investigator of a £428K project titled “**Water-tolerant Extraction of Algal Biofuels**” which addresses commercial challenges associated with the design and engineering of cost effective mass culture systems.

<sup>1</sup><http://www.pikeresearch.com/research/biofuels-markets-and-technologies>

<sup>2</sup>[http://www.europabio.org/Biofuels/PressBrief/land\\_use\\_March08.pdf](http://www.europabio.org/Biofuels/PressBrief/land_use_March08.pdf)

<sup>3</sup>[http://www.europabio.org/Biofuels/Food\\_Biofuels%20factsheet.pdf](http://www.europabio.org/Biofuels/Food_Biofuels%20factsheet.pdf)



'The consortium provides a framework to target R&D efforts to industry needs and the practical and economic hurdles for large scale operations'

Professor Grant Burgess

'Using process intensification and green chemistry we can ensure maximum process efficiency and minimal environmental impact in the emerging algal biofuel and biorefining industry'

Dr Adam Harvey

'Part of the solution lies with learning how to manipulate biological signals to control the behaviour of mass cultures of algae'

Dr Gary Caldwell

The project partners are Biosciences KTN and Newcastle University.

The total project investment is £1.08 M and the Government funder is the Carbon Trust.

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**Next steps**

The technology focus for the Algal Biofuels Challenge has been prioritised around the targets and assumptions that:

- Mass cultivation of microalgae will be in open-ponds
- Optimisation of algal growth in a scalable and sustained manner is a major technological challenge
- Biofuels derived from microalgae feedstocks should deliver an 80% C-saving compared to petroleum

These selection criteria will help ensure that technology and intellectual property developed through the Algal Biofuels Challenge will have

commercial relevance to the global biofuels industry, predicted to reach \$247 billion by 2020. This will help generate future revenue through licensing of UK technology to international biofuel producers.

The KTN continues to catalyse expansion of the field, and brokered a funded partnership between Scottish BioEnergy and the Biopharmaceutical Bioprocessing Technology Centre, also at Newcastle University, focusing on the optimisation of algal systems for carbon capture and bioremediation at the Glenturret Distillery.



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