ALGAL SOLUTIONS
For Local Energy Economy

Xanthella
Illuminating algae

The ASLEE Project: Where we are and where we go next

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Empowering Rural Industries Conference

20th March 17, Glasgow

LOCAL ENERGY SCOTLAND

Greener Scotland
Scottish Government

THE CHALLENGE FUND

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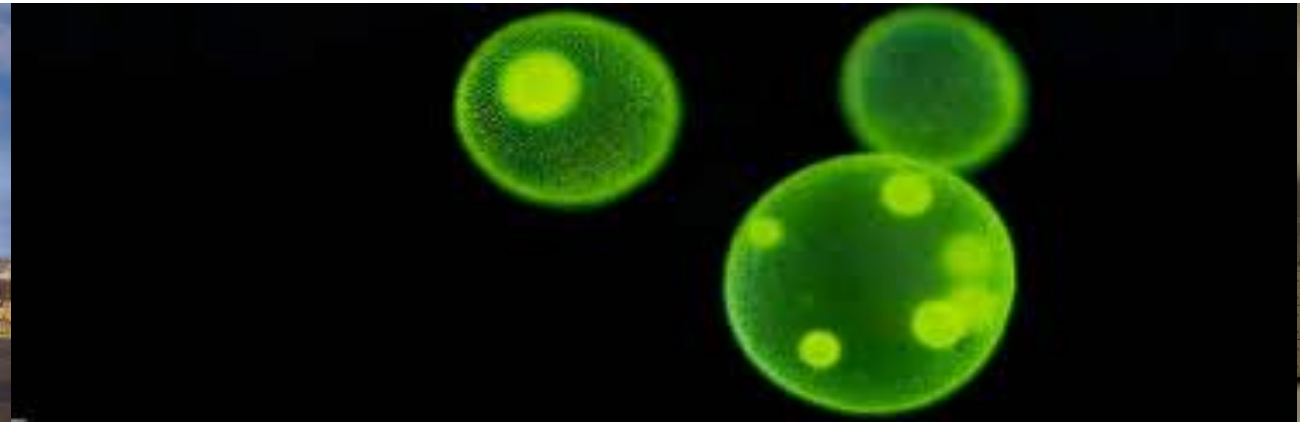
Design and manufacturing company based at European Marine Science Park, Oban. Founded 2009 to provide more cost effective systems for the production of microalgae

Current sales of systems for research purposes whilst undertaking further product development to expand range. Develop sector leading systems that become the industry and research standard

Future will be in supply of industrial scale systems and marketed globally. Looking at asset-managed/leasing model especially for community-owned facilities.



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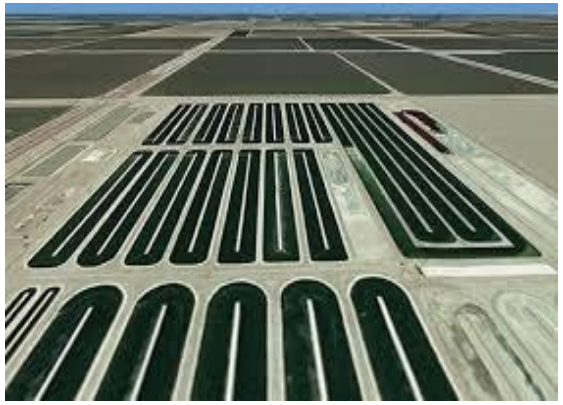
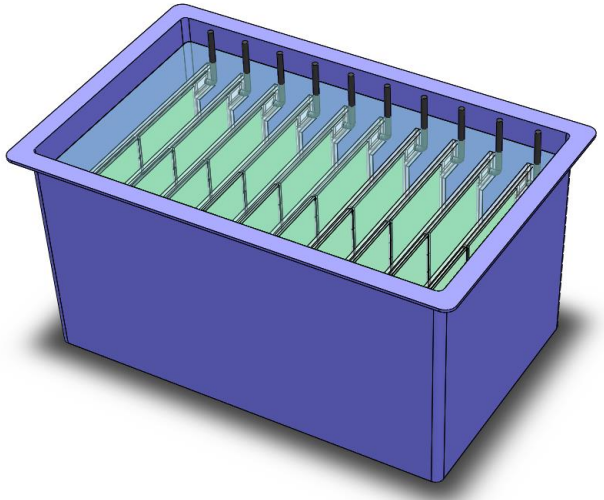
The problem in microalgae production is cost: Light is the critical feedstock



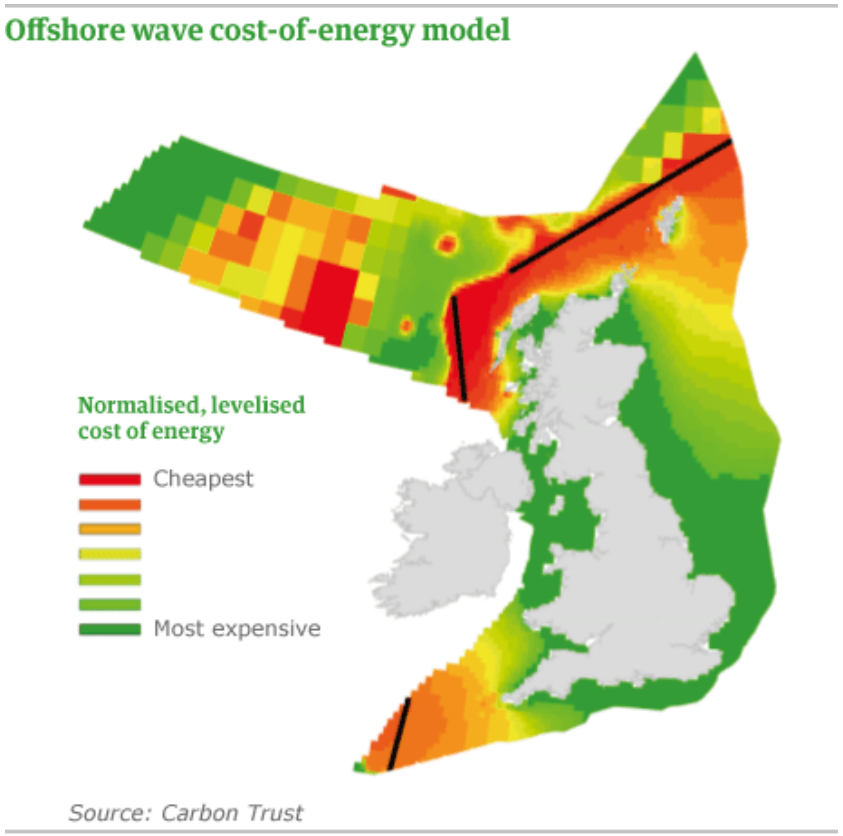
Solar light
Pros: free fuel
Cons: intermittent; poor space utilisation; high surface areas; inefficient; doesn't work for Scotland (tell us about it!)

Artificial light
Pros: high efficiencies; good control; good space utilisation
Cons: Expensive – use limited to high value products. Electricity cost main factor in affordability.



But what if electricity was effectively free?

The opportunity



The West Coast and islands of Scotland have some of the best potential for renewables in Europe. 36.5 GW wind; 7.5 GW tidal (25% of Europe's potential); 14 GW wave (10% Europe).

….and the pain

Grid weakness means that a great many renewable energy schemes are constrained or delayed. If we could use more electricity locally then constraint problems could be reduced or removed.

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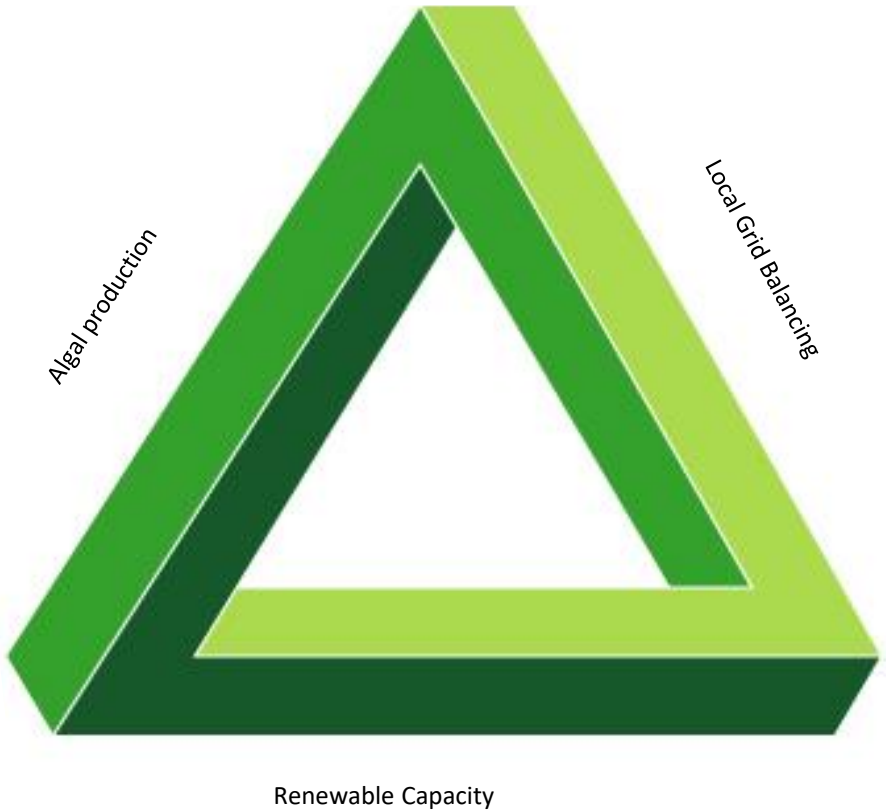
ASLEE: The Central Questions



How far can we address the issues of grid balancing and renewables while enabling economic algal production?

Can we produce systems that are viable at industrial scale and suitable for rural use?

How much does intermittency matter in producing algae?

What is the smallest economic scale; what is the potential upscaling?

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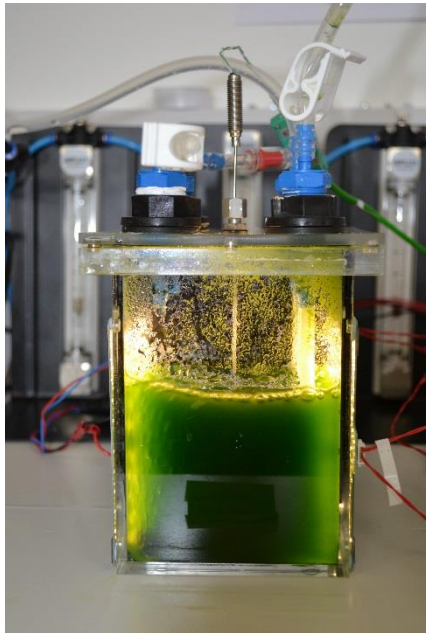
Where we are



Internally lit photobioreactor designed and components tested

Remote control tested

Proof of concept for use of algae as transactive load using intermittent light supply

Basic economic analysis suggests algal production using renewable electricity can be viable

No negative outcomes from first stage: project significantly de-risked

ASLEE project: stage 2

MERL/MACC

ARDNAMURCHAN ESTATES

Suitability of algae for rotifer feed

fai

Suitability of algae for oyster rearing

32,000l array at Ardnamurchan to establish business case at industrial scale:

Integration with estate renewables and businesses: 3-5 tonne annual production capacity: establish operational models

Unique project: largest algal production system in the UK – steep learning curve

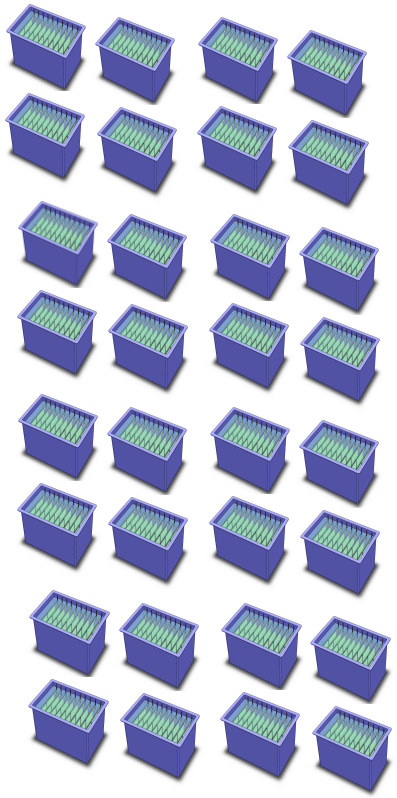
Ardnamurchan 32K litre array

32 1000l “Pandora” PBRs

Biomass CHP
210kW Electrical;
Heat 24 hrs; power ~ 9hrs

CO2
Fermentation or
Flue gases

Nutrients and water
Pot ale; Spent lees etc



Pandora 32K PBR array ~ 5 tonne annual production

Removes constraint on CHP by being able to use surplus power 24/7

Increases renewable and grid income

Increases value of whisky coproducts

Algae for cattle feed

Algae for aquaculture use

Algae for high value products and contract manufacturing

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Technology gaps in complete local feedstock supply:

Inexpensive small scale systems for capturing fermentation CO2
Biomass combustion as source of CO2

Inexpensive dewatering systems
Inexpensive systems for sterilising sea water
Water re-use

Systems for producing algae nutrients locally without biosafety issues

ASLEE: The Larger Picture

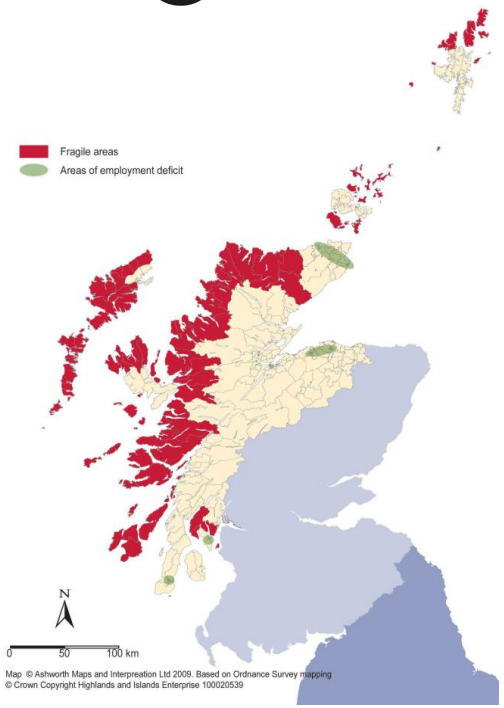
Low carbon, distributed & integrated bio-manufacture; stranded resources;

Sustainable feed production; Omega 3s; hatcheries

ASLEE PROJECT

Circular economy; use of CO2, nutrient recovery from waste streams

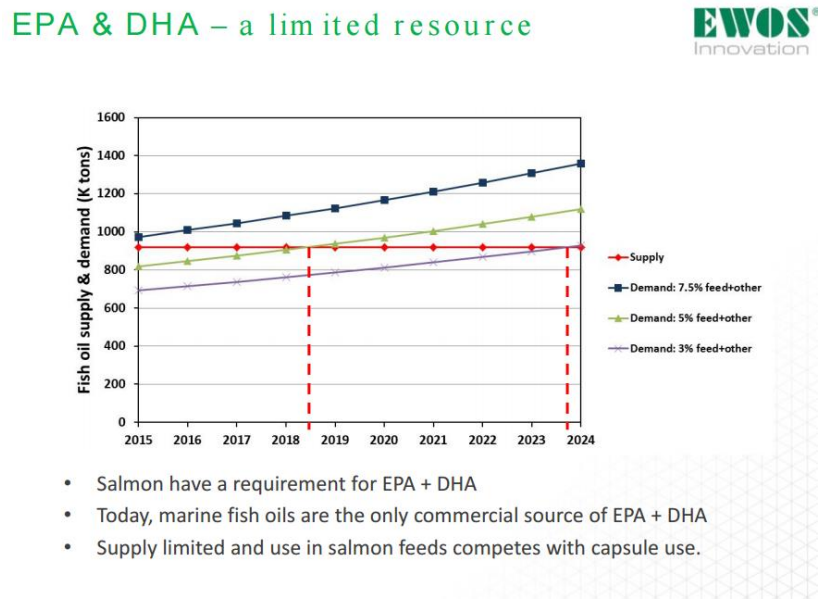
MBC proposal for EMSP; Development in fragile areas; greater use of renewables



The future is green?

““Omega 3 from algal sources, particularly autotropic algae using CO2 as an energy source” is the ingredient that Marine Harvest feed COO Ben Hadfield sees as the most promising”
Intrafish Media 10/12/2015

Algal supply would remove concerns over security of supply and quality; sustainable and allow much closer integration of omega 3 supply with feed manufacture. Could completely decouple salmon feed production from both marine and terrestrial sources. Can it be cost-effective? Would require 100,000 tonnes algae (300MWh per tonne): plenty of scope!



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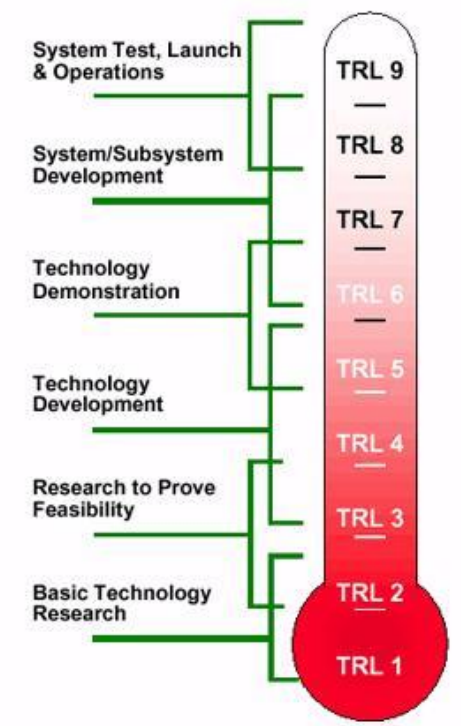
Where we are going 2017-2018



Industrial scale pilot: moving from TRL 4 to TRL 6/7

Refine technology; reduce costs; improve sustainability

Establish viability of business opportunity at different scales

Produce systems models for maximising economic return: monetise ability to use intermittent electricity

Disseminate the opportunity

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Iceland: super abundance of renewable electricity (mostly hydro and geothermal – minimal wind but large surplus capacity)

Base price is low but intermittency also an issue

One algae company already producing astaxanthin but power companies looking at algae for new use of electricity and for grid balancing

ASLEE: Conclusion

Why might we succeed?

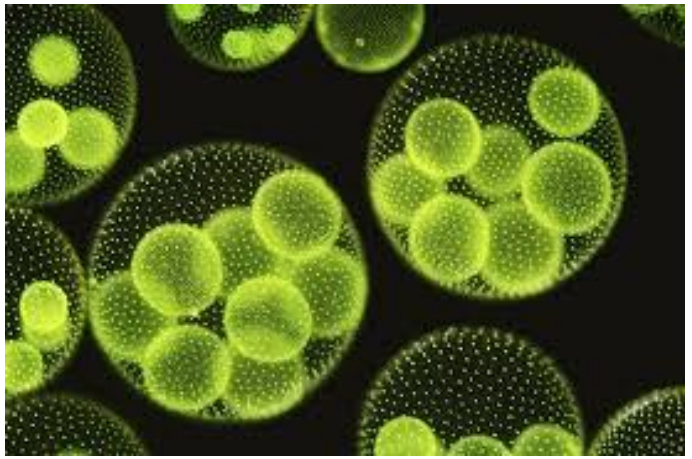
Appropriate scale: reduced risk and simple objectives

Displacing existing products at high end of value; enabling technology that allows other income streams

Part of a package of solutions using different technologies

Using sweet spots to further reduce costs

Watch this space: www.aslee.scot sign up for newsletter




Thank You
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