LOCAL ENERGY SCOTLAND

CARES CASE STUDY

THE ALGAL SOLUTION FOR LOCAL ENERGY ECONOMY (ASLEE) PROJECT

BACKGROUND

The Algal Solution for Local Energy Economy (ASLEE) partnership project is based on a radical and exciting solution to electricity grid constraint problems and economic viability issues for local renewable energy projects. The project investigates using curtailed energy from community wind turbines in rural areas to turn on lights in photobioreactor tubes, which will grow algae.

OVERVIEW

- **Project owner: 8 partners – Xanthella Ltd, ALIenergy, Ardnamurchan Estates, Wood Group, University of Stirling – Marine Environmental Research Laboratory, VCharge, FAI –Ardtoe Marine Research Facility, University of West of Scotland.**
- **Location: Argyll and Bute, Highlands and Islands**
- **Technology: photobiorectors, LED technology, power control system and software, algal bioproduction, grid frequency response**
- **CARES funding: £487,000**
- **Date installed: 2016 -17**

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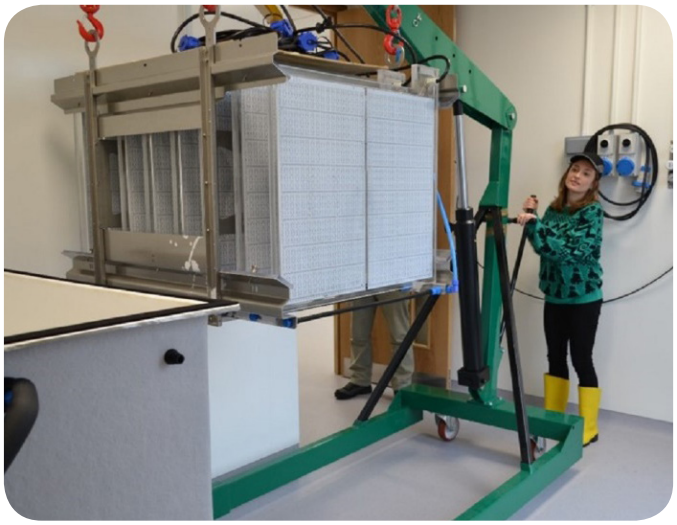
This allows an algal manufacturing process to act as a transactive load to overcome intermittency of supply and provide demand side management. The innovative project aimed to boost the economy in rural Scotland by using renewable power when and where it is generated to produce high-value microalgae. Algae production has an important role in Scotland's aquaculture industries – for use in hatcheries and addition to fish feeds – but can also be used for a wide range of products such as nutraceuticals, toxin standards, pigments, and biofuels. The ASLEE project was awarded £487,000 funding from the Scottish Government's Local Energy Challenge Fund in 2016.

PROJECT ACHIEVEMENTS

During the project an industrial scale, internally illuminated photobioreactor (Pandora PBR™) was designed and built for the production of microalgae. The Pandora PBR™ is a unique photobioreactor which contains a series of bespoke submersible LED lightsheets. A sophisticated Zeus Control System with specialised software (Xanthella and VCharge technologies) was also developed and integrated into the PBR to automatically and rapidly adjust the power load to the internal LED lighting. This level of control allows immediate response to changes in grid frequency, allowing the lightsheets to act as transactive loads for local energy demand.

The **Pandora PBR™** has been developed to be assembled in modular arrays. This means the algal bioproduction system can be scaled to suit the local availability of renewable electricity and businesses producing waste streams that can be used as feedstocks for algal production (nutrients, CO2) such as distilleries.



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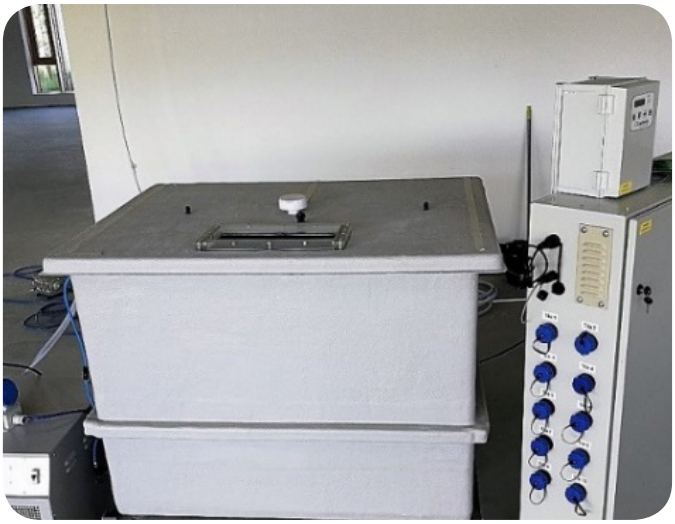
The electrical requirements and the effects of different light/dark cycles on the growth and productivity of the microalgae were investigated. The investigation showed that the algae were tolerant to patterns of intermittent light that imitated potential renewable power generation.



LESSONS LEARNED

- The project has demonstrated that marketable algal species, eg. Chlorella and Spirulina can be cultivated successfully at industrial scale.
- Renewable energy generation can be intermittent, and the project has shown that algae grow productively during variable periods of light and dark and are not adversely affected by intermittent power to the LEDs. In fact, the intermittency often enhanced the efficiency of the algal production.
- By using energy for the lights when it is at its cheapest rate, the cost of algal production becomes more competitive. Algae can be converted into high value products and create revenue which could be used to reduce investment return time for renewable capital expenditure. This could be of particular interest to locally-owned initiatives like communities and landowners.
- Using the algal PBRs to create on-site electricity demand could allow existing renewable projects to overcome grid constraints and increase income from the Feed-in Tariff.
- A preliminary business model was produced that showed the economic viability of this new bioindustry, producing high-value algal products with many potential markets and income streams.
- The project is being extended by building a sixteen 1000L Pandora PBR™ arrayat Ardnamurchan to demonstrate the viability of the project at industrial scale.

Website: **http://aslee.scot/**

Visit: **www.localenergy.scot/**