

## CASE STUDY

### Negative emission cogeneration technology



Designing, installing and operating a combined heat and power demonstrator plant with a carbon negative footprint. Showcasing climate repairing technology, and demonstrating the effectiveness of community-scale carbon capture technology plus clean energy using sustainably-sourced forestry waste.

Ricardo delivers innovative carbon capture technologies to support the transition to a low carbon future. Our team has over 20 years' experience in bioenergy and in CO<sub>2</sub> capture and utilisation technologies, advising governments worldwide as well as technology and project developers and operators on carbon capture and storage.

## CHALLENGE

Innovation is key to developing the green technologies needed to tackle climate change. The Net Zero Innovation Portfolio is a 1 billion GBP UK Government fund for low carbon technologies and systems, to accelerate the commercialisation of low-carbon technologies, systems and business models in power, buildings, and industry, to help enable the UK to end its contribution to climate change.

The Portfolio will decrease the costs of decarbonisation and set the UK on the path to a low carbon future. It will create world-leading industries and new green jobs, invest in regions, and help make the UK a science and innovation superpower. Funded by the Portfolio, Ricardo is leading a consortium which is delivering the demonstrator plant.

## APPROACH

- Ricardo is leading the consortium which combines an innovative carbon capture system developed by Ricardo with hot air turbine technology from Bluebox Energy and pyrolysis technology from Woodtek Engineering
- The demonstrator plant is located in West Sussex in the UK. It will demonstrate not only a highly innovative technology but also a realistic carbon negative technology that can significantly contribute to net zero targets
- The technology works by taking sustainably sourced waste wood from domestic timber production and then processing it in three ways:
  - producing biochar (a product similar to charcoal)
  - generating heat and power
  - capturing carbon dioxide from the exhaust
- Ricardo is currently in the process of completing the build of our demonstrator combined heat and power plant. The plant will be commissioned and operational early 2024

and biochar – which could be sold to the farmers who might well be producing ingredients for the manufacturers. Industry therefore benefits from security of supply and a virtuous circle of production

- **For the farming, agriculture and commercial growers sector**
  - the technology also enables the benefit of security of supply and a virtuous circle of production, as well as emissions reductions. Using sustainably sourced waste wood from domestic timber production the technology captures a significant amount of the carbon content in the wood. The biochar produced can be used by farmers to enrich soil and add to animal feed to reduce ruminant emissions
  - Our combined heat and power plant could be located on a farm, be fed by sustainable wood waste from local, indigenous sources at a lower cost than natural gas, and securely and continuously supply clean energy, heat, food-grade carbon dioxide and biochar

## RECOMMENDATIONS

- **For food and drink manufacturers**
  - the rising wholesale price of natural gas and uncertainty over the security of supply of both energy and industrial grade carbon dioxide necessitates a solution that can give them reassurance about supply and cost control to ensure that they can keep on making their products
  - Our combined heat and power plant could be located at a food manufacturing site, be fed by sustainable wood waste from local, indigenous sources at a lower cost than natural gas, and securely and continuously supply clean energy, heat, industrial-grade carbon dioxide

- **For all industry and manufacturing sectors**
  - across the UK, many existing combined heat and power plants are gas powered, so given the price hikes in natural gas, our recommendation for key industrial sectors is to explore domestic biomass options
  - Manufacturers seeking to decarbonise their operations will also be using carbon negative technology which is going to have a positive impact on their greenhouse gas emissions by removing and storing carbon

## RESULTS

- The technology targets demonstration of a 95% capture rate of the carbon content in the wood
- It also produces commercially marketable carbon products:
  - **Biochar** - can be used by farmers to enrich soil and add to animal feed to reduce ruminant emissions
  - **Industrial-grade carbon dioxide** - can either be used for making low-carbon concrete or in the food and drinks industry to replace carbon dioxide derived from industrial processes which typically rely on imported natural gas
- A full-size system will remove more than 10,000 tonnes of carbon dioxide per year from the atmosphere