

National Grower Regional Greenhouses

Invest Net Zero Cheshire

IKIGAI



CATAPULT
Energy Systems



Project reference number: 015

Project type: Development of a multi-site, multi-phase circular economy, greenhouse and vertical farming initiative, backed by a large national vegetable grower. The production yield will be enhanced through the reutilisation of locally captured waste heat and/or CO₂ and LED lighting. Power supplied from nearby private wire solar PV projects and CHP.

Project maturity: Early-stage development (pre-planning but with strong local authority and power, heat and CO₂ supplier support). Early market engagement has enabled optimal project design.

Key strategic drivers: A 10-year multi-phase vision to move from traditional greenhouse farming to state-of-the-art vertical farming in the Cheshire region with a fast growing and successful British grower, facilitating significant skills and jobs growth, innovation in collaboration with the University of Chester and other higher education facilities (such as Reaseheath College) while facilitating and monetising industrial decarbonisation.

Locations: At least three sites -

- Greenhouses located on land in the vicinity of United Utilities Ellesmere Port waste water treatment facility (“**WwTF**”) near the M56. See also **Waste Water Circular Economy** summary.
- Greenhouses located on land adjacent to a large industrial emitter of CO₂ (the CO₂ is currently being captured but released in the absence of an offtaker for value).
- Vertical farming located at the Thornton Science Park site, the exact building location is yet to be determined. See also **Thornton Net Zero** summary.

Proposed phases:

Subject to further due diligence, the development and construction of:

1. Up to two 10-hectare greenhouses and delivery of recovered waste heat, upgraded via a water source heat pump, and captured CO₂ from the United Utilities Ellesmere Port WwTF, together with the supply of solar and CHP power to serve greenhouse LED lighting requirements by private wire. Assuming both greenhouses are built, the construction of a co-located packing facility would be required. Commissioning forecast for 2023.
2. Up to four 10-hectare greenhouses and delivery of recovered waste heat and captured CO₂ from a large industrial emitter / the proposed local industrial heat network analysed as part of Invest Net Zero Cheshire, together with the supply of solar and CHP power to serve greenhouse LED lighting requirements by private wire (see also **Solar PV Portfolio**). Potential for construction of a co-located packing facility dependant on expansion of Phase 1. Commissioning forecast for 2023/4.
3. A single 1-acre vertical farm and delivery of captured CO₂ from a nearby large industrial emitter or the proposed CO₂ pipelines to be developed as part of HyNet, together with the supply of solar power by private wire from onsite generation at Thornton Science Park. Commissioning forecast for 2024/5.

Job Creation:

1. Phase 1: 120-240 permanent and 40-80 seasonal (excludes potential packing facility jobs)
2. Phase 2: Up to 480 permanent and 160 seasonal (excludes potential packing facility jobs)
3. Phase 3: To be confirmed.

Total estimated carbon savings p.a.:

1. Phase 1: Up to:
 - a. 9,200 – 11,500 tonnes / year from CO₂ utilisation
 - b. 6,400 – 7,300 tonnes from the displacement of natural gas through waste heat recovery
 - c. Total: 15,600 - 18,800 tonnes CO₂ / year**
2. Phase 2: Up to:
 - a. 24,000 – 30,000 tonnes from CO₂ utilisation
 - b. 38,500 – 44,000 tonnes from the displacement of natural gas through waste heat recovery
 - c. Total: 62,500 – 74,000 tonnes CO₂ / year**
3. Phase 3: To be confirmed.

Estimated project costs:

1. **Phase 1:** Total £40-£45 million per greenhouse solution (glasshouse £35-£40 million and heat pump £3 million)
 - a. Double if expanded to 2 glasshouses plus an additional £15-£20 million for a packhouse (which may be deferred to Phase 2).
 - b. Grid connection: Options include an independent connection or potential for a shared connection with United Utilities, further diligence required to determine optimal connection and cost of sharing. SP Energy Networks require further technical detail in order to provide a cost estimate.
2. **Phase 2:** Total £140-£160 million (four glasshouses, each £35-£40 million)
 - a. £15-£20 million if a packhouse is not part of Phase 1.
 - b. Grid connection: It's assumed an independent connection is required given the electrical requirement however SP Energy Networks require further technical detail in order to provide a cost estimate.
3. **Phase 3:** To be confirmed

Heat source specifications by Phase:

In respect of Phase 1: Heat recoverable from United Utilities WwTF at 30°C and at 95°C.

In respect of Phase 2 - Heat recoverable at 35°C and at 100°C from proposed industrial emitter.

Technology, construction and operation:

- Greenhouse design: Glass with galvanised steel and aluminium frame or film membrane. Vertical farm design: technology to be determined in consultation with national grower.
- Lighting: LED lighting (either as part of greenhouse turn-key solution or under a separate contract with greenhouse owner, such that supplier finance can be considered).
- Heat: to be delivered via pipeline (assuming distances are less than 1km in all cases) either on a bilateral basis or as part of the proposed local industrial heat network.
- CO₂: to be delivered via pipeline (assuming distances are less than 1km in all cases) or liquified, trucked and stored on site.
- Construction: EPCM/EPC, to be considered for each Phase further with prospective investors.
- O&M: Greenhouses will be operated by the national grower. Solar PV plants and pipelines for heat/CO₂ will be operated and maintained by the relevant owner up to the point of connection to the greenhouse/vertical farm.

Revenue streams: Long-term (circa 20 years) rental from national grower for the provision of a full service (including utilities and CO₂ distribution and storage costs), turn-key green greenhouse / vertical farm solution. Commercial terms to be discussed with prospective funders.

Initial stakeholders: National grower, United Utilities, Thornton Science Park / University of Chester, industrial emitter and HyNet North West Consortium.

Professional advisors to date: Ikigai (bankability); Atkins (heat); EA Technology (Electrical Technical); Energy Systems Catapult (Whole Systems Modelling).

Opportunity:

- Private sector investors with respect to turn-key greenhouse/vertical farming solutions (including the supply of power, heat and CO₂ elements)
- Technology, co-development and construction partners

Invest Net Zero Cheshire

www.investnzcheshire.co.uk