Thornton Net Zero

Invest Net Zero Cheshire

IKIGAI ea technology CATAPULT Energy Systems Cheshire and Warrington Local Enterprise Partnership Cheshire energy hub

Project reference number: 012

Project type: The University of Chester's Thornton Science Park is looking to implement a multi-vector energy strategy that secures its energy supply, decarbonises its operations, facilitates decarbonisation of neighbouring businesses and positions Thornton as a centre of energy and future farming excellence. Projects include Internet of Things ("**IoT**")-based onsite demand reduction and energy efficiency measures, onsite energy generation and vertical farming (for which it could be an offtaker of locally captured CO_2), as well as offtaking heat (for space heating).

Project maturity: Feasibility assessment (but with strong University, national grower, local authority and corporate partner support).

Key strategic drivers:

- Onsite energy security and cost reduction
- Decarbonisation of operations
- Research and development – becoming a centre of excellence and demonstrator for university campus-led energy innovation
- Local skills development

Locations: Thornton Science Park campus, Ellesmere Port. Coordinates: N53.2754, W2.8298

Proposed phases:

Project phases are contingent on the repurposing of campus land and the demolition of disused buildings.

Phase 1 – Demand reduction, energy efficiency and heat

- IoT – an upgrading of the building management system to incorporate additional sensors and 'edge IoT' including optimisation of lighting, compressed air, process-heating, HVAC, pumping and fan systems
- The site is currently served by a steam supply from a nearby industrial producer, primarily for heating water, and there are therefore a number of potential options for optimising this heat supply, reducing carbon emissions and cost:
    - Steam - small scale local/desktop steam generators could replace the current steam system and supply only to dedicated processes.
    - Hot water (primarily for use in laboratories). This hot water could be supplied from waste heat recovered from local industrial sites either directly or via a wider industrial heat network. An opportunity exists with one nearby manufacturer, who as part of their net zero ambitions, are considering recovering waste heat that could be used by Thornton. (See **Manufacturer Net Zero** summary.)

Phase 2(a) – Electrical

- Onsite solar generation
    - circa. 0.5 MW of rooftop solar potential on existing future use buildings;

    - circa. 0.9MW of carport solar potential on current car parking space, however further due diligence is required to ascertain whether this land may be repurposed; and
    - circa. 2.5MW of ground-mounted solar potential across two sites totalling 5.27 hectares, however further due diligence is required to ascertain how this land is to be redeveloped.
- Grid export connection – An 11 kV three-phase import connection exists however the required export connection will be dependent on the deployment and use case of battery storage and the solar PV sizing:
    - If 0.5MW, Low Voltage ("**LV**") export connection
    - If 1.4 or 3.9MW, an 11kV export connection & LV/11kV substation
- Battery energy system storage ("**BESS**") may be viable to time shift / accommodate intermittent usage / to provide front-of-the-meter services to the grid
- **Phase 2(b)** – Vertical farm
    - Site survey required to identify feasibility of existing disused buildings. One acre of growing space required for optimal size.

Total estimated carbon savings p.a.

- Phase 1(a) – IoT-led demand reduction: subject to further due diligence, up to 24% reduction in energy usage is achievable.
- Phase 1(b) – heat: by meeting the hot water demand on site through use of waste heat recovered from local industry, carbon savings of c.333 tonnes of CO_2/year can be expected.
- Phase 2(a) – onsite solar generation: circa. 295 tonnes of CO_2 / year, excluding the 2.5MW of capacity subject to further strategic land use considerations.
- Phase 2(b) – vertical farm: discussions are underway with national grower to estimate potential savings from proposed design assuming CO_2 will be captured from local sources and power supplied, at least partially, from onsite solar.

Estimated project costs:

Demand reduction: to be provided on a fully funded Software-as-a-Service basis such that there is very limited upfront capital expenditure required.

Heat:

- If using local waste heat to meet the site's hot water demand: a circa. 200kW heat exchanger will be required (£20,000 – £25,000).
- If the steam supply were to be replaced by new small scale steam generators, circa £1,000 per generator, number required to be confirmed in further technical due diligence.

Onsite solar and BESS:

- Solar PV: circa £1.3 million (assumes only the existing roof and carport projects totalling 1.4MW. Circa 2.5 million if all three projects went ahead)
- BESS: subject to further due diligence on sizing, but typically £500,000/MW for small scale projects, decreasing to circa £320,000/MW for a 50MW BESS
- Grid export connection: £40,000 (£14,000 without new transformer).

Vertical farming – cost of equipment and building design to be confirmed

Technology, construction and operation:

- **IoT / BMS:** Multiple options available to be considered further with prospective investors taking into account the complexity of the onsite energy consumption and other operations.
- **Heat:**
    - Steam supply – small scale steam generators. Options to be considered in the next phase.
    - Hot water - local waste heat supplied via a new pipeline and a new a heat exchanger to interface with the existing steam network from Essar.
- **Solar panels and BESS**: Multiple-options available to be considered further with prospective investors. Focus on proven technologies, warranted capacity, creditworthiness of the supplier and future-proofing.
- **Construction**: EPCM/EPC, to be considered further with prospective investors.
- **O&M**: Only highly experienced operators with strong sustainability credentials will be considered. A preference for local contractors.

Revenue streams:

Assuming all aspects of the project are developed under a separate special purpose entity to facilitate non-recourse/limited recourse financing (as opposed to procured directly by Thornton Science Park/University of Chester):

- electricity generated onsite will be sold under a power purchase agreement to Thornton Science Park (with a peppercorn rental for the land) and/or the vertical farming operations with the national grower, with any surplus generation will be spilled to the grid;
- operational savings resulting from demand reduction and energy efficiency measures would be shared with the project entity under an energy savings agreement (including a floor payment and upside sharing); and
- an all-in rent and services payment from the national grower utilising the vertical farming (and onsite power generation and procured CO_2) facilities (with Thornton Science Park / University of Chester benefiting from land rent)

Initial stakeholders: The University of Chester (site owner and energy consumer), multiple confidential local suppliers of CO_2 and heat and a national grower (vertical farming tenant).

Professional advisors to date: Ikigai (bankability), EA Technology (electrical technical) and Energy Systems Catapult (Whole Systems Modelling)

Opportunity:

- Public and private investment partners (for one or more aspects of the project).
- Technology and delivery partners (including with respect to innovative technologies with a view to participating in onsite incubators and demonstrators where aligned with Thornton Science Park's areas of research, educational and skills based interest).
- Additional tenants/users of the campus or strategic industrial partners with a focus on future farming or the hydrogen economy.

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