



Department for
Business, Energy
& Industrial Strategy

Translational Energy Research Centre

Financial Sustainability Report

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Introduction

This report provides an overview of how a Carbon Capture, Utilisation and Storage project, and the wider TERC project, plans to become sustainable, taking into account technology opportunities and its operating model.

Specifically financial sustainability will be achieved through diverse income sources which can generate surplus for reinvestment in the facility. The report will be limited to high level information, since detailed commercial and financial information will likely be sensitive. However, it will endeavour to provide a good overview of how sustainability of such a project can be achieved.

This report will also be supported by the Operations, Business Development, and Communications and Marketing strategies, which are intricately linked to delivering financial sustainability of the centre. For instance, the business development strategy will ensure that the Centre's utilisation is optimised through a balanced approach of grant funded and direct industrial utilisation, covering its operating and maintenance costs, working with the Business Development Manager and Operations Manager. The unique pilot-scale systems, designed to work both together and in parallel, will provide a first-of-a-kind insight into running a successful, financially sustainable, integrated project.

Our vision and strategy

We will enable businesses to explore different technology configuration scenarios to encourage the uptake of tried and tested low carbon technologies, processes and systems – in particular renewable energy generation.

Promoting research and innovation in, and adoption of, low-carbon technologies by stimulating, nurturing, and supporting collaborative R&D and fostering industry to industry and industry-research base collaboration and transfer of technology and ideas; underpinned by academic excellence at University of Sheffield.

Through shared and open access arrangements users will be able to access a wide range of standalone/integrated RD&D facilities to de-risk low carbon technology innovation and uptake. Such facilities would normally be too expensive or too cost-ineffective for individual organisations (and in particular SMEs) to establish and support.

The national-scale facility will act as a flagship to establish the Sheffield City Region as the leading national centre of excellence for Research Development, Innovation, and Demonstration of renewable and low carbon energy technologies including Hydrogen.

Research Alignment with regional and national policy - tackling climate change and delivering net zero

Technology selection at TERC is directly aligned to the following priority areas clearly defined within the Government Ten Point Plan and further elaborated on in the Energy White Paper and Hydrogen strategy amongst others. The new Centre helps to deliver these strategies and enables the UK to take full advantage of the opportunities.

Ten point plan November 2020: In November 2020 the Government announced the Ten Point Plan for a green industrial revolution. The plan seeks to mobilise £12 billion of government investment and potentially three times as much from private investment.

Points pertinent to the Translational Energy Research Centre are:

- Point 2: Delivering the growth of low carbon hydrogen (£500m in new hydrogen technologies)
- Point 6: Jet zero and Green ships – Jet zero council established, £15m Flyzero 12month study with ATI on strategic, technical and commercial issues in designing and developing zero emission aircraft by 2030. Moving to sustainable fuels is first step - £15m competition to support the production of SAF in the UK Green Fuels Green Skies competition
- Point 8: Investing in carbon capture usage and storage; Ambition to capture 10Mt of CO₂ a year by 2030. Invest up to £1billion to support the establishment of CCUS in four industrial clusters creating “SuperPlaces” CCUS £1billion by 2024 to support CCUS in industrial clusters and establish 2 sites as economic hubs for green jobs in line with ambition to capture 20-30Mt CO₂ per year by 2030 Hynet and East Coast cluster and 4 sites by 2030 (Teesside, Humber, Merseyside and North Wales and North East of Scotland as reserve clusters)
- Point 10: Green finance and innovation: £1billion net zero innovation portfolio, focussing on the ten points plan- already launched £100m GGR including DAC in November 2020, £100m for energy storage and flexibility innovation challenges

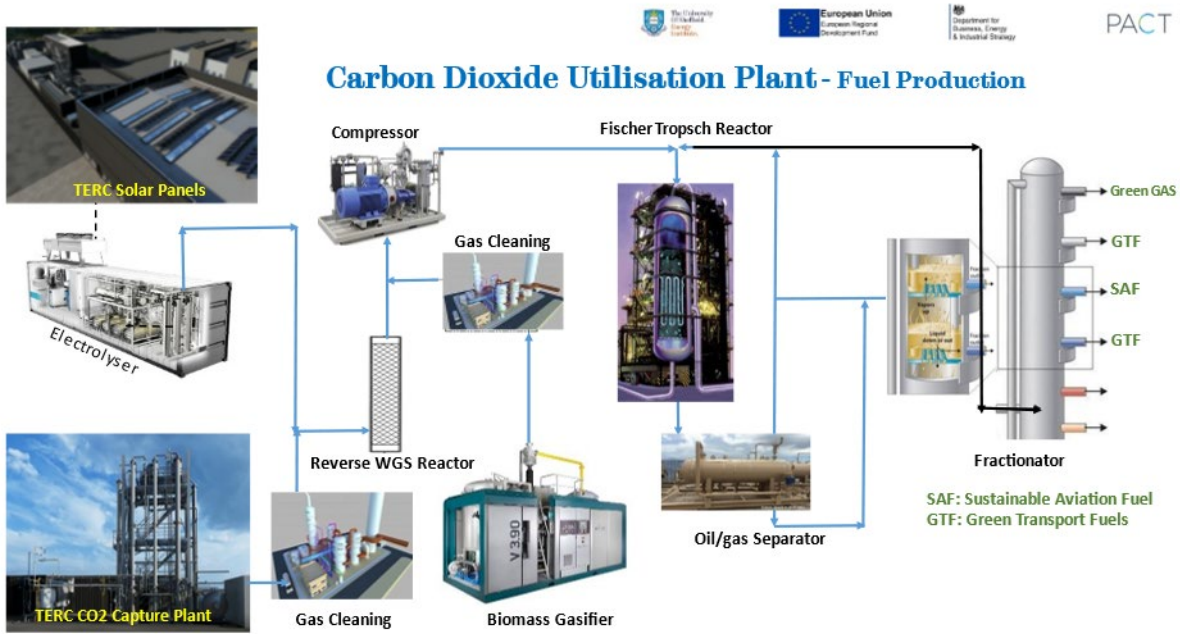
Energy White Paper (EWP) was published in December 2020 and the Industrial decarbonisation strategy was published in March 2021; these set out complementary plans for the transformation of the UK energy system and industries.

Net Zero strategy October 21 – policies and proposals building upon the ten point plan to keep UK on track for the coming sixth carbon budget (2033-2037)

Hydrogen Strategy August 21– 5GW of low carbon hydrogen production capacity by 2030. (£240m net zero hydrogen fund) sets out how the Government will drive progress in the 2020s to deliver the 5GW production ambition by 2030 and position Hydrogen to help meet the sixth carbon budget and net zero commitments.

Research Equipment portfolio

Diagram 1: The following diagram explains the interactions between the TERC equipment, further detail is provided in Table 1.

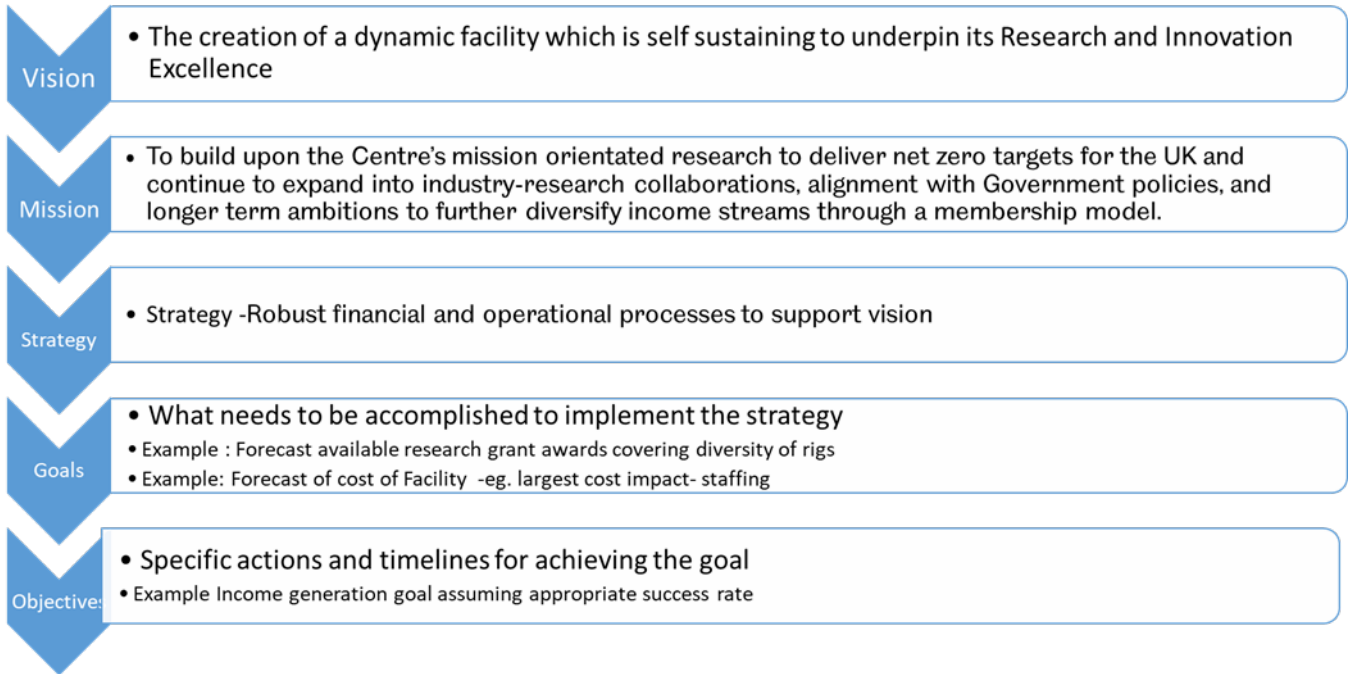


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Table 1: Description of the TERC equipment capabilities

| Equipment | Capability |
|--|---|
| Bioenergy/ biomass | For low carbon power and industrial synthesis including Waste to Energy and integration with Carbon Capture technologies for net negative carbon emissions Thermal and non-thermal conversion of bio material to look at high and low energy power generation |
| Carbon capture & use (CCUS) including next generation technology | Advanced carbon capture equipment to strip out carbon dioxide from a range of flue gases; and then the ability to use that CO2 in newer products or processes, including high pressure (150-200 bars) test beds to enable technology development and innovation incl solar fuels |
| Conventional power | To investigate higher efficiency, zero emission power generation and Organic Ranking Cycle (ORC) for waste heat recovery |
| Transport sustainable fuels | Equipment to test the behaviour and characteristics of new (non-fossil) transport fuels generated through integration of carbon capture and on-site generated renewable hydrogen |
| Smart integrated Energy systems | Fuel cell and solar energy system for integrated and smart energy systems R&D Relatively modest cost to install additional control systems and sensors to create a programmable mini-grid out of the generation equipment on site. |
| Energy storage and | Electrical and potentially thermal energy storage facilities, mostly utilising external space. |

Financial Strategy - Vision and Strategy on managing the financial sustainability in a research excellence focused Innovation Centre



Financial sustainability - will be achieved through a clearly defined business development strategy targeting diverse income sources supported by a marketing and communications strategy

Building on the proven, sustainable operating model of PACT, the new facilities will be open access and support industrial and academic RD&I through collaborative or contract projects. The Table 2 below summarises the facilities' access arrangements (in line with State Aid rules) for different types of projects. Many projects will be publicly funded, collaborative industrial/academic projects (benefiting from our operational experience and expertise), with a small proportion of contract research and services (limited to 20% by its public research organisation status).

Table 2: TERC project descriptions

| | Type of partner organisation | | | |
|--------------------|---|------|---|------|
| Type of project | Business | | University | |
| Publicly funded | Collaborative | fEC* | Collaborative | fEC* |
| | Non-collaborative (engaged as subcontractor/service provider - see Contract/Services) | MR | Non-collaborative (engaged as subcontractor/service provider - see Contract/Services) | MR |
| Collaborative | Costs fully covered by partner | fEC | Costs fully covered by partner | fEC |
| | Results fully disseminated | fEC | Results fully disseminated | fEC |
| | Non-IPR results are disseminated, and either: <ul style="list-style-type: none"> The originator retains IPR/is compensated to market value of IPR IPR is shared, reflecting partner contribution and interest | fEC | Non-IPR results are disseminated, and either: <ul style="list-style-type: none"> The originator retains IPR/is compensated to market value of IPR IPR is shared, reflecting partner contribution and interest | fEC |
| Contract/ Services | Results and IPR retained by purchaser | MR | Contract awarded through either: <ul style="list-style-type: none"> Open tender, OR Open, transparent, non-discriminatory, non-preferential selection procedure AND either: <ul style="list-style-type: none"> IPR results allocated to purchaser and others disseminated The purchaser is granted free unlimited access to any IPR retained + access to 3rd parties under market conditions | MR |
| | UoS retains part/whole ownership/access to IPR | MR** | | |

A marketing and communications strategy to support the business development approach has been formulated:

Intended outcomes are

- Brand definition and clarity
- Understanding what our stakeholders, nationally and internationally, want and need
- Content strategy to support that

Income analysis

The graphical analysis (Graph 1) provides projections of the forecasted categories of income associated with the Centre.

TERC’s primary activity is non- economic focusing on conducting independent (including collaborative) research and disseminating its results by way of teaching, publications and technology transfer with all profits reinvested in these activities.

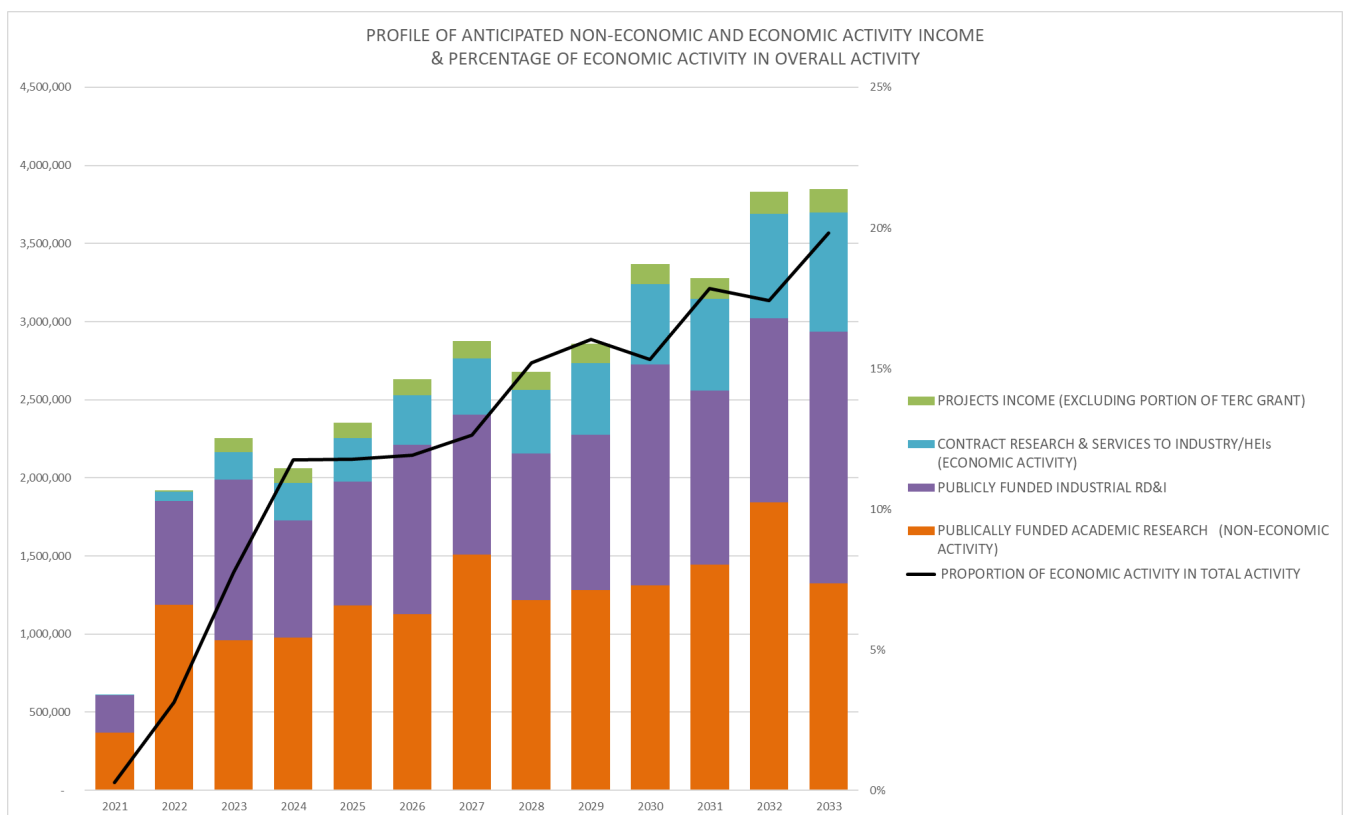
Non-Economic Activities, include education, independent R&D and dissemination of research results, including through joined publicly funded research with industry for the advancement of knowledge; these activities comprise of:

- Publicly funded academic research

- Publicly funded collaborative industrial research (including ERDF) where the results are widely disseminated and or IP is allocated to the University, or the University is compensated for its IP at market value.

Economic activity, includes consultancy to business, certification, and testing services on a commercial basis; bespoke training courses and contract research including publicly funded collaborative research with industry where results are not published.

Graph 1: Analysis of 12-year future income projections



Financial sustainability will be achieved through efficient use of resources, stringent cost control and realistic costing methodology in accordance with the TRAC guidance with Research Facilities

The operations strategy underpins the efficient use of resources and in turn enables financial sustainability, as is comprehensively presented in KKD 6. The operations management process must consider and balance the requirements of the research programme, asset capacity, capability and availability, constraints and dependencies, costs, competence and availability of workers, and availability of raw materials (Figure 1)

Figure 1 Resource management model

Costs Analysis



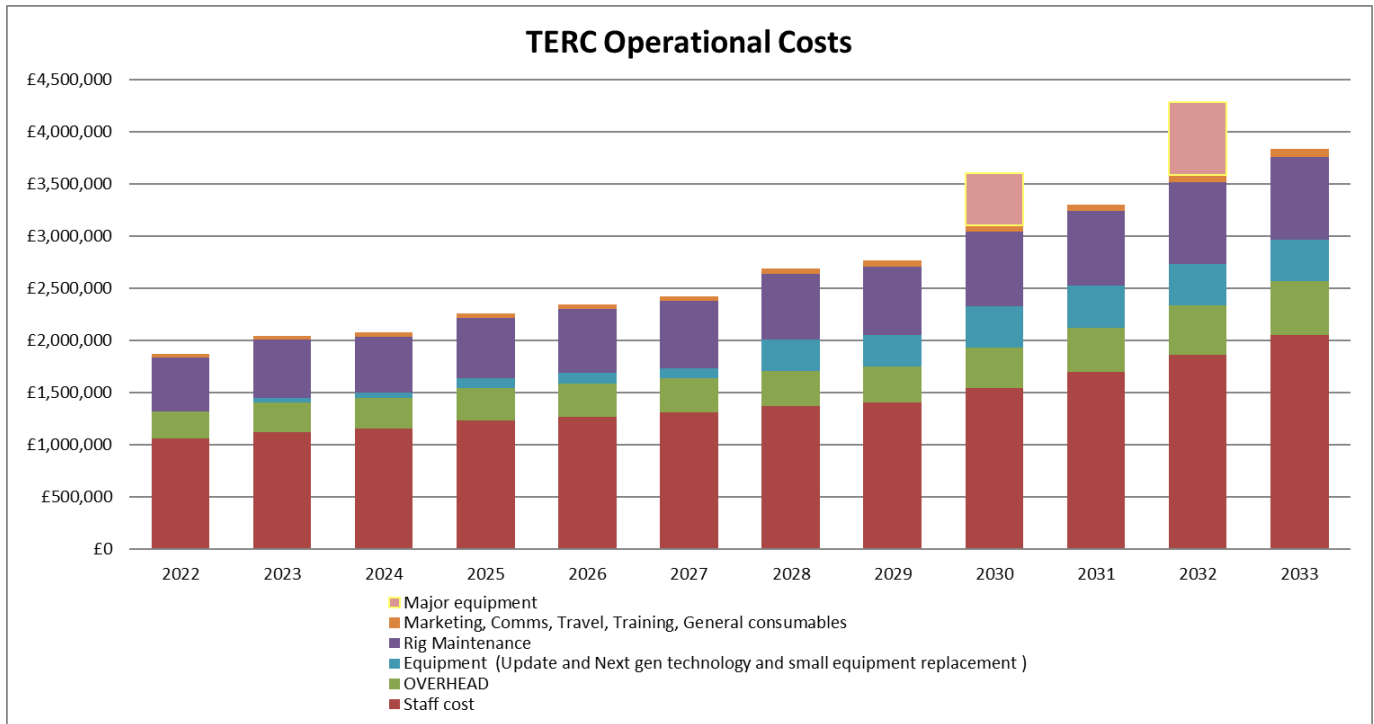
Costs Analysis

The analysis of operational and investment costs has been represented at Graph 2.

The costs have been projected based on experience of the previous PACT facilities and the proposed associated services required for the new equipment. There is a clear plan of reinvestment into continued upgrades for next generation technology and major items of replacement equipment are planned in years 2030 and 2032.

There are currently 23 staff members within the facility and the projected costs include an assumption of continued growth in numbers employed to facilitate the activity of the Centre; with over 30 staff members being employed by 2033.

Graph 2: TERC operational and investment costs analysis



TERC Financial operating balance

The projected financial balance of income and costs are represented in Graph 3. The financial strategy is to cover costs and create surplus in most years to reinvest in next generation technology and replacement of key items of equipment when they reach end of life. The graph lines represent both net results by year, cumulative reserves built up and investment in capital equipment. The reserves policy for the Facility is to maintain a minimum fund of c. £400k, to manage financial risk.

Graph 3: TERC Financial operating balance



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