



# TYSELEY ENERGY PARK POWERING CLEAN ENERGY GROWTH

COMPRESSED NATURAL GAS REFUELLING



WASTE WOOD BIOMASS POWER PLANT



HYDROGEN REFUELLING

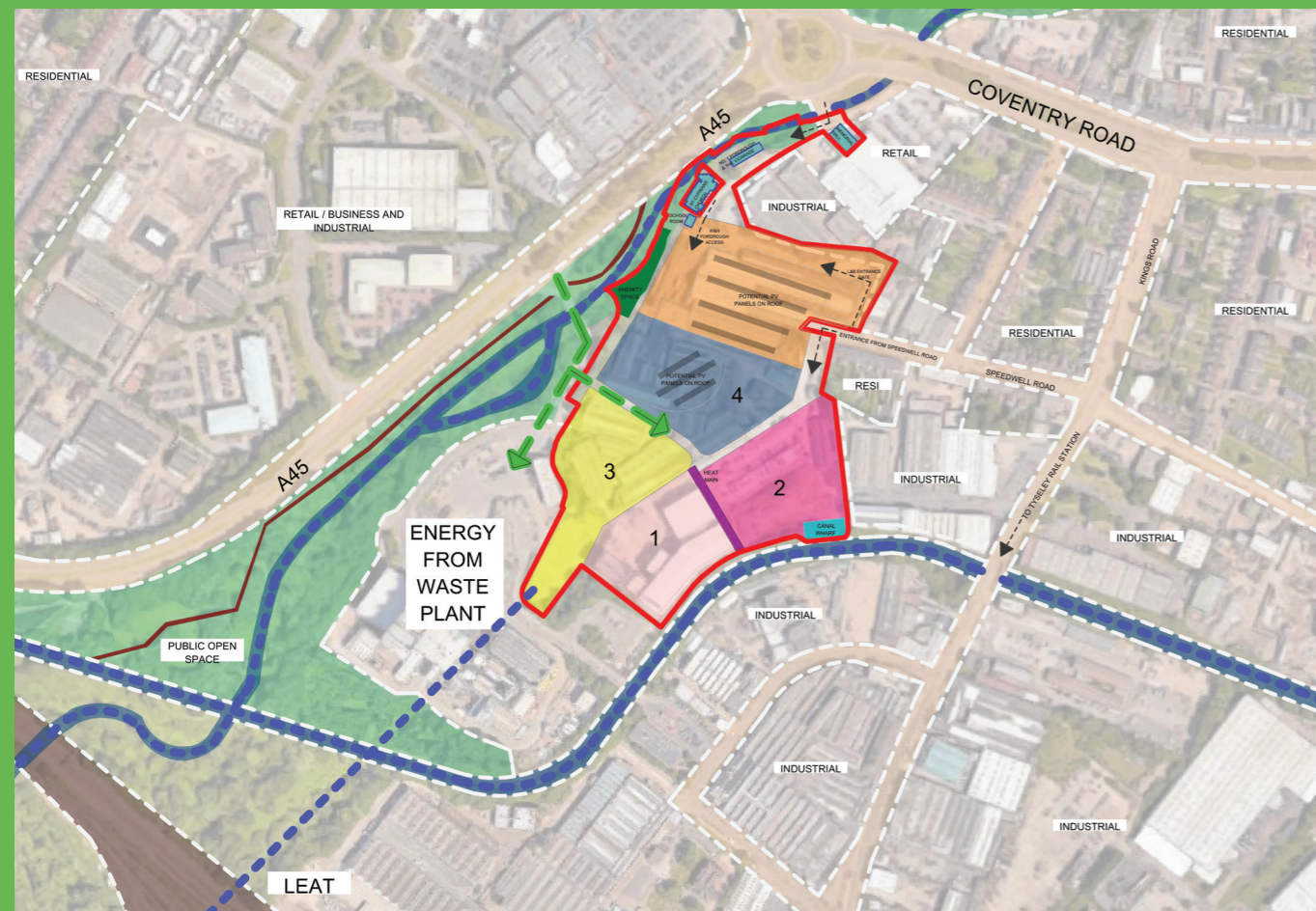




# TACKLING KEY SOCIETAL CHALLENGES

**TYSELEY ENERGY PARK (TEP) IS CHANGING ENERGY INNOVATION WITHIN TYSELEY AND BIRMINGHAM. TACKLING THE KEY SOCIETAL CHALLENGES SUCH AS DECARBONISED ENERGY AND POOR AIR QUALITY THROUGH THE DELIVERY OF CLEAN ENERGY AND LOW AND ZERO CARBON TRANSPORT FUEL. THROUGH COLLABORATIVE PARTNERSHIPS WITH EXPERTS FROM ACADEMIA, GOVERNMENT AND INDUSTRY, TEP WILL SHAPE THE WAY THE CITY DEVELOPS INFRASTRUCTURE FOR RENEWABLE HEAT AND POWER, ENERGY STORAGE, CLEAN TRANSPORT FUELS AND ADVANCED WASTE PROCESSING.**

TEP lies in the heart of Tyseley and Birmingham's Energy Innovation Zone and is also identified within Tyseley Environmental Enterprise District (TEED). The TEED is described as the principal location in Birmingham for CO<sub>2</sub> reduction as part of a low carbon, low waste economy through encouraging recycling, energy production and renewables.



- 1. Waste Wood Biomass Power Station
- 2. The UK's first low and zero carbon refuelling station
- 3. Next generation of waste processing technologies
- 4. University of Birmingham Innovation Hub

# THE MASTERPLAN

**THROUGH OUR AMBITIOUS FIVE-PHASE DEVELOPMENT PLAN, OUR SIXTEEN-ACRE SITE IS BECOMING THE ENERGY AND WASTE NEXUS FOR THE CITY OF BIRMINGHAM.**

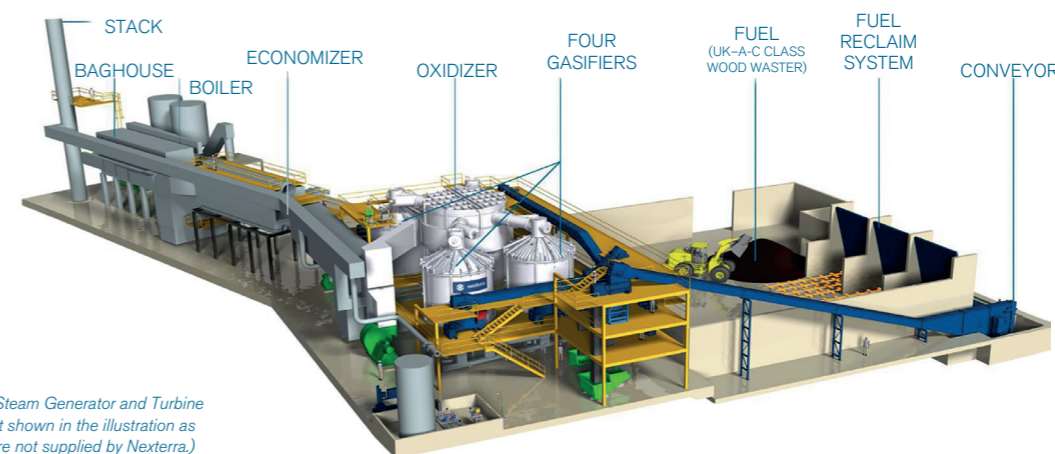
On the first phase of Tyseley Energy Park, £47 million was invested into a 10MW waste wood biomass power plant. This plant supplies Webster and Horsfall's manufacturing operation and tenants across the sixteen acre site with renewable electricity. The biomass power plant has created 19 new jobs and diverted 72,000 tonnes of waste wood from going to landfill. The sustainable power generated is equivalent to the amount required to power 17,000 local homes.

Phase two at TEP is the UK's first low and zero carbon refuelling station. Strategically located between the city centre and Birmingham airport, this station supplies public and commercial vehicles with a range of sustainable fuels that reduce emissions. The fuels available include; hydrogen from ITM Power, commercial scale electric chargers, compressed natural gas from CNG Fuels and drop-in biodiesels with reduced emissions such as Shell GTL fuel from Certas Energy.

As part of a relentless drive to make industry in the city greener, the next generation of waste reprocessing technologies will be developed on phase three, using clean energy linked to city-wide grid infrastructure. Power generated within the site will be from renewable sources including the biomass plant on phase one and the energy from waste plant planned for phase three. This clean energy will be used to support the growth of the Webster and Horsfall Group's manufacturing operation helping to achieve its' sustainability goals and reduce the unit price of products manufactured.

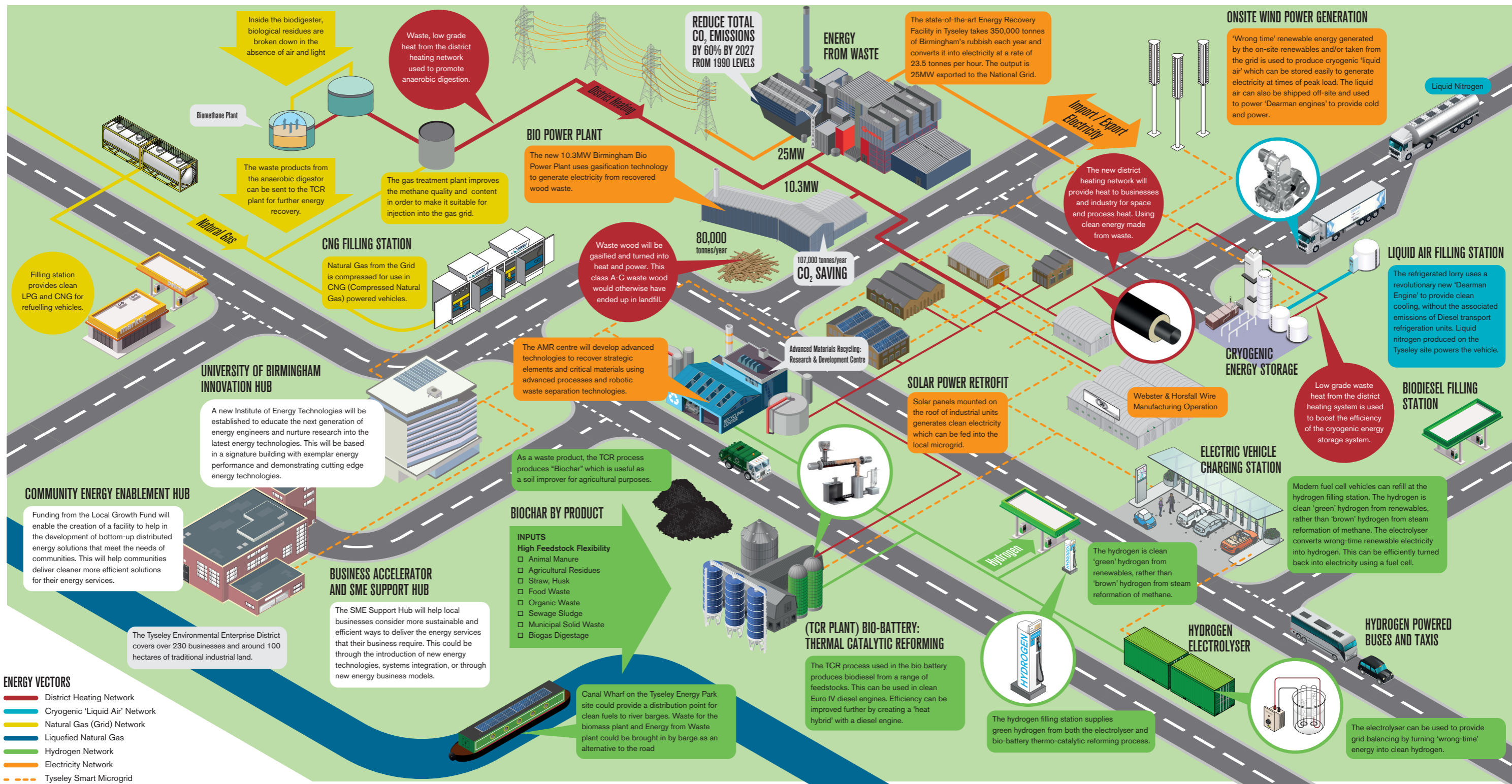
Phase four of the TEP site will be home to the University of Birmingham's Innovation Hub. The first phase of the building will have space for research facilities around thermal energy storage, strategic elements and critical materials, hydrogen and fuel cells and thermo-catalytic reforming. This hub will also have facilities to support teaching and business development. A later phase of development include a business incubation space, skills academy and community hub.

As well as housing Webster and Horsfall's manufacturing operation, existing industrial units across phase five are being transformed into a business incubation hub to support the commercialisation of emerging recycling, energy generation and storage technologies. As a part of the phase five development the University of Birmingham are going to base their rare earth magnet recycling facility on this phase of development whilst the innovation hub is under construction.



(Note: Steam Generator and Turbine are not shown in the illustration as they are not supplied by Nexterra.)





# THE BIRMINGHAM AND TYSELEY ENERGY INNOVATION ZONE

In 2018, a Policy Commission chaired by Sir David King was established by Energy Capital and key partners.

The report places the government's policy drivers and ambition for clean growth within a local framework and advocates a requirement for system change with the development of Energy Innovation Zones (EIZs) to act as a stimulus to local action and system change.

EIZs are significant geographic areas where energy market regulations might be varied to encourage investment in infrastructure to meet specific local needs. There are five proposed pilot areas in the West Midlands – including Central Birmingham and Tyseley, which provide the opportunity to attract significant external investment in energy infrastructure to meet the needs of local people and industry.

TEP is the most developed of the five EIZs and is striving to help Birmingham overcome severe energy, business and social challenges. These include electricity grid constraints, poor air quality, unemployment and having one of the worst rates of energy poverty in the UK. The ambition for the TEP EIZ is to reduce emissions and stimulate growth by creating a platform to test and demonstrate new technologies. It will integrate low carbon technologies to develop the business models and infrastructure needed to support new approaches to clean energy.

# THE ENERGY INNOVATION ZONE: KEY FEATURES

## ENVIRONMENTAL AND ECONOMIC:

Aims to reduce emissions and costs, and stimulate growth and improvements in productivity, by speeding the progress of clean energy technologies and business models to market.

## COMPETITIVE:

Creates a competitive market in clean energy infrastructure to meet local needs and priorities, and does not pick low-carbon winners; 'demand pull' not 'technology push'.

## REGIONAL:

Bridges the yawning gap between people and national energy markets, and taps regional identity to build support for energy innovation.

## DEMOCRATICALLY ACCOUNTABLE:

Through local authorities and regional mayors.

## SOCIAL:

Providing appropriate levels of protection for domestic customers, especially those in fuel poverty.

## COLLABORATIVE:

Brings together universities, companies, local authorities and regulators. Lessons about local energy markets, regulation and innovation are shared regularly between EIZs and externally.

## INDEPENDENT:

Independent of major commercial interests in current or future energy infrastructure, and with transparent governance.

## INNOVATIVE:

Creates a space in which new technologies can be deployed, demonstrated at scale and de-risked for future investment to take to market. Also supports technologies that have already been shown to work, but which need commercial-scale demonstration of the business model. Extends to SMEs the capacity to conduct commercial demonstrations at a scale only previously possible for incumbents with large balance sheets.

## CLEARs REGULATORY AND CULTURAL BARRIERS:

Where legislation allows, specific regulations are waived, amended or introduced to permit cost-effective commercial demonstrations. Different EIZs would flex different regulations depending on priorities – district energy, domestic heating, hydrogen, EVs etc. This may in turn lead to the development of new national regulations.

## FLEXIBLE:

Size and focus varies according to local needs and priorities, but an EIZ should be large enough in terms of energy demand to support the development of supply chains, commercial clusters and regional markets.

## LIGHT ON THE PUBLIC PURSE:

EIZs could be funded by reallocating existing funding streams such as the Energy Company Obligation (ECO), or through other innovative 'value capture' mechanisms, so avoiding the need for substantial extra public expenditure. EIZs could also – like Enterprise Zones – be financed through tax incentives, and in some places it might make economic sense to integrate an EIZ with an existing Enterprise Zone.





## KEY TECHNOLOGIES

### CRYOGENIC 'LIQUID AIR' NETWORK

#### THE UNIVERSITY OF BIRMINGHAM HAS EXTENSIVE EXPERTISE WITH CLEAN COLD TECHNOLOGIES.

Cryogenic energy storage systems use renewables and/or off-peak electricity to liquefy air which involves compression and expansion processes. The cryogenic liquid has a temperature below  $-190^{\circ}\text{C}$ , and is stored in a vessel. It is then pumped to a high pressure (150 bar), when electricity is needed, and then vaporised into a gas and superheated, using either or both heat and waste heat, if available. It then goes through an expansion process in a turbine to generate electricity.

### DISTRICT HEATING

- Energy from waste infrastructure across Tyseley is capable of producing large amounts of heat that is capable of decarbonising Birmingham's district heating network.
- Birmingham District Energy Company (BDEC)/ Engie – a district heating network established in 2007 which provides financial and carbon savings to several high-profile city buildings and dwellings accounting for a distribution network of over 12km and 18,000 tonnes of CO<sub>2</sub> savings.
- Engie reports that within the scope of the Birmingham District Energy Scheme, there is demand for some 70MWt of new connections for heat and within the current scheme, they are unable to fulfil the new demand. In addition, there is a drive towards decarbonising the system which is currently powered by gas fired combined heat and power (CHP).
- The Tyseley ERF plant currently processes 350,000 tonnes of municipal waste per annum and generates approximately 85MWt of heat.
- Birmingham Biopower generates approximately 25MWt of heat as an output to its facility.
- The energy system across Tyseley Energy Park presents an opportunity to integrate with the University of Birmingham's award winning Cryogenic energy storage facility.
- The University of Birmingham's ATETA programme has been working with TEP to identify local businesses and industry within the area with heat and power requirements.

### SMART GRID / DISTRIBUTED ENERGY SYSTEMS

#### TYSELEY ENERGY PARK AND THE UNIVERSITY OF BIRMINGHAM HAVE JOINTLY COMMISSIONED SIEMENS TO COMPLETE A 'STRATEGIC ENERGY REPORT' TO BUILD AN UNDERSTANDING OF THE ENERGY SUPPLY AROUND TYSELEY ENERGY PARK AND TO MATCH SUPPLY WITH ENERGY DEMANDS WITHIN THE TYSELEY ENVIRONMENTAL ENTERPRISE DISTRICT AND THE EASTERN CORRIDOR OF BIRMINGHAM.

TEPs ultimate ambition is to develop a Distributed Energy Management (DEM) system that will monitor and control energy generation and consumption across the site and could be linked to a wider system for the area. DEM systems can deliver a range of benefits, including plant optimization, energy efficiency, energy cost savings and additional revenue from export of surplus energy to the grid.

It is widely recognised that there is much inefficiency in the energy system through a lack of integration between systems and technologies. Local generation tends to be more flexible to demand variation which, in turn, means that the system naturally starts to become more efficient. It is this which has driven the current trend towards decentralised energy, district energy and energy parks – such as at Tyseley.

The existing industry, medium-scale energy generation, alternative fuels, permissions for energy generation, private wire, intermediate pressure gas connection and heat capability provides a unique opportunity at Tyseley Energy Park. Tyseley Energy Park itself is significant enough in size and scale to influence positive change in the local area and if successful, could have the potential to impact the trajectory of Birmingham. It is also an opportunity to create future-proofed jobs and resources to decarbonise.

Tyseley Energy Park is modelling input and output capabilities as well as existing and future on-site scenarios in terms of air quality and green house gas emissions.

## DEMONSTRATOR TECHNOLOGY

#### THROUGH THE USE OF DEMONSTRATORS WE ARE ABLE TO TEST THE FEASIBILITY OF PROJECTS BEFORE COMMERCIALISATION AND ALSO TRIAL NEW APPROACHES FOR INNOVATIVE SOLUTIONS.

#### FRAUNHOFER INSTITUTE – THERMO-CATALYTIC REFORMING (TCR®)

This technology converts all types of biomass residues under thermal pyrolytic and catalytic conditions into three main products, 1) H<sub>2</sub> rich syngas, 2) stable biochar and 3) primary liquid bio-oil, with superior fuel chemical and physical properties. The demonstration of a fully integrated pre-commercial scale plant will allow important research objectives to be addressed. Planning permission was granted for this scheme on phase five and will be operational between March 2017–March 2020.





# OUR PARTNERS

SINCE THE BEGINNING OF 2018, TEP AND THE UNIVERSITY OF BIRMINGHAM HAVE IDENTIFIED AND ASSEMBLED A GROUP OF KEY STAKEHOLDERS FROM THE PUBLIC SECTOR, PRIVATE SECTOR AND ACADEMIC INSTITUTIONS. A MEMORANDUM OF UNDERSTANDING HAS BEEN DEVELOPED FOR THE GROUP WHICH CONFIRMS THE PARTNER ORGANISATION'S COMMITMENT TO SHARE IDEAS AND WORK TOGETHER.

The core objectives within the MoU are as follows:

- Developing advanced technologies to deliver optimal value from waste and resources
- To deliver investment into renewable heat and power infrastructure
- Developing low and zero carbon transportation infrastructure
- Gathering data and creating the platform for testing and validating new innovative technology that develops new business models and employment opportunities
- Creating a blueprint for systems thinking that is capable of being applied at a city scale, supporting Birmingham City's transition to a lower carbon future
- Developing skills and training in a commercial environment
- Attracting inward investment to support the regeneration of Tyseley and the surrounding area
- Working with regulators to overcome barriers to investment
- To develop and deliver funding bids aligned with the commercial ambitions of the co-creation group



# INVESTING IN OUR COMMUNITY

TEP IS PART OF THE WEBSTER AND HORSFALL GROUP, A 300 YEAR OLD BUSINESS WITH DEEP ROOTS ACROSS BIRMINGHAM.

Over the past 170 years, W&H has been a major employer in the Tyseley and Hay Mills area and has played a key role in the development of local infrastructure including the construction of the first School, St Cyprians Church, the Memorial Hall and a number of homes across the area. Tyseley Energy Park is continuing this tradition by working with the local community and local businesses to support the regeneration of the area which has been in a downward spiral as a result of industrial decline since the 1970's.

TEP is committed to supporting the regeneration of the area making Tyseley a destination that is recognised for its clean energy, green space and deep-rooted history of manufacturing. Working with local councillors, TEP and local Stakeholders intend to create better places and spaces for people to live, work and play across Tyseley and Hay Mills.

A series of stakeholder events were organised over the course of 2019 in which hundreds of residents and local business owners were given the opportunity to identify issues and opportunities in the area. A series of litter picks have also been undertaken in which members of the community were given the opportunity to explore and discuss how green spaces in the area could be improved, and to take the first steps to empower local people and businesses to take control of their surrounding environment. A community interest group known as the 'Friends of the Lost World' has been formed. The group is in the process of delivering transformational projects led by the local community, including the regeneration of the River Cole Corridor.







Celebrating 300 years of Continuous Innovation

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