

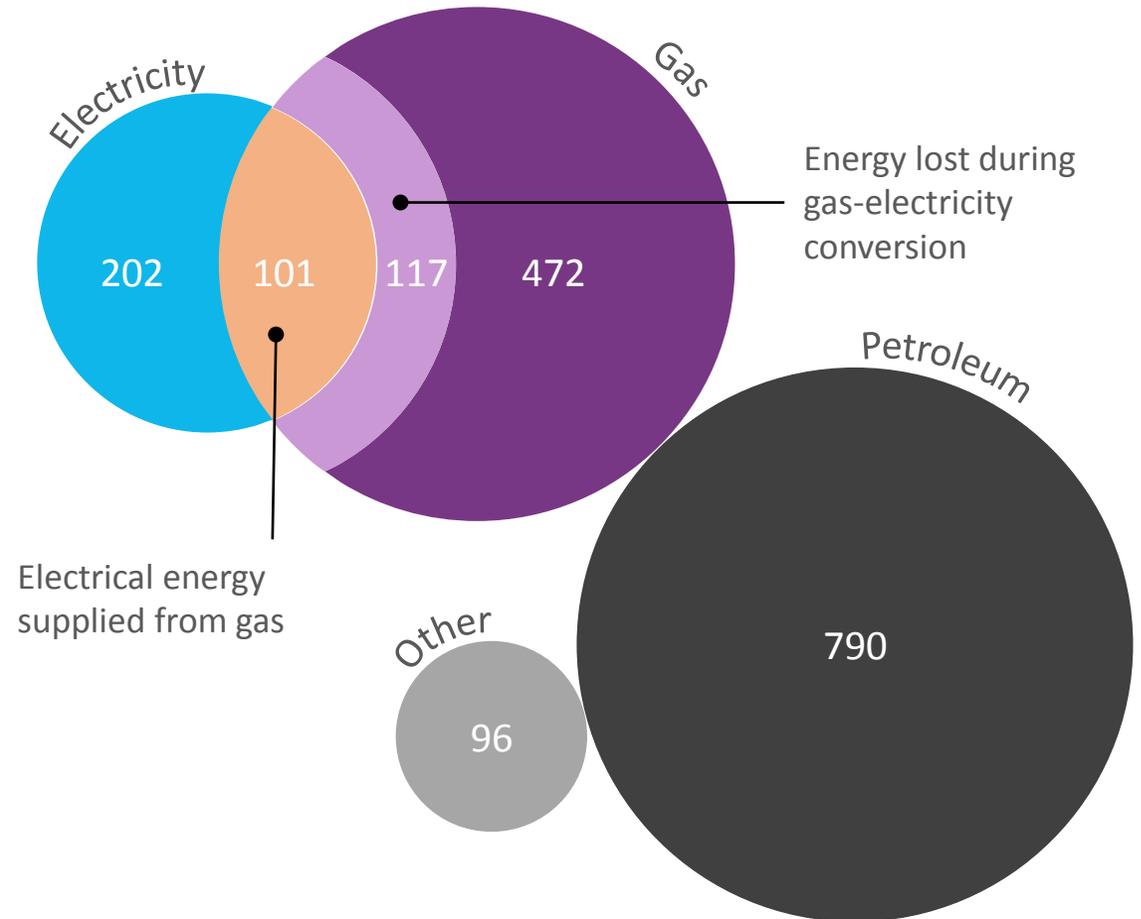


Insights and Forward Look

Strategy Manager
Liam Lidstone

Energy networks as a part of the energy system

- Energy networks are a core part of a functioning energy system – enabling the right amount and type of energy to be delivered to where and when it is needed
- Long term changes are expected for:
 - energy generation type and geographic location
 - demand patterns and energy use requirements
- The UK's energy network infrastructure will need to evolve to manage these fundamental long term changes

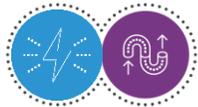


Energy carried by networks in the UK (TWh/yr)

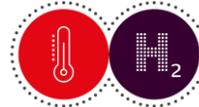
Estimated from data published by DECC (2014)

Network transition challenges

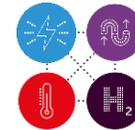
Adapting and enhancing existing networks



Creating efficient and effective new networks



Integrating networks to optimise performance across energy vectors



Electricity



Handling increased capacity

Delivering new connections

Balancing supply and demand

Gas



Decommissioning (especially within the distribution network)

Operating at much lower utilisation

Integrating low carbon fuels at significant levels

Heat



Cost reduction and technology advancement

Supply-chain scale-up

Adoption

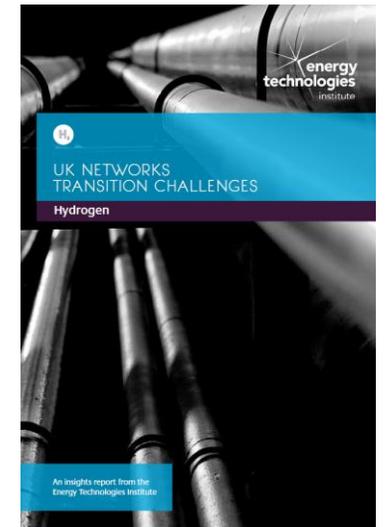
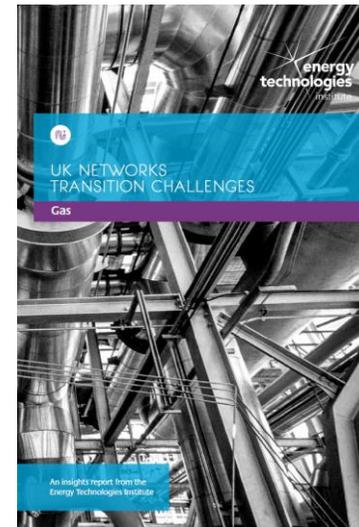
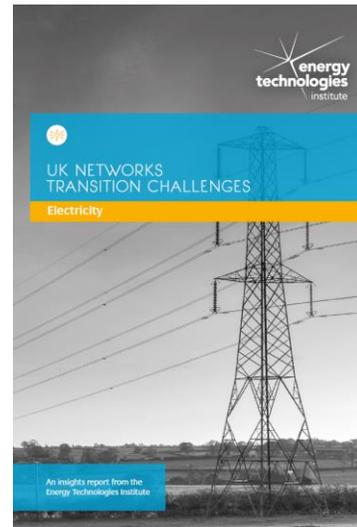
Hydrogen



Meeting the needs of different sectors

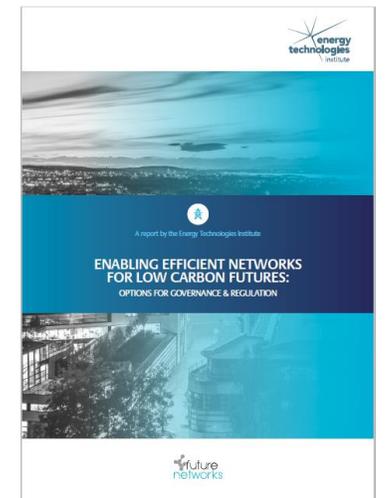
Scale-up

Insights from the programme



Available at: <http://www.eti.co.uk/insights/uk-network-transition-challenges-a-system-view>

Or search for: **ETI network transitions** or **network transition challenges**



NETWORK CAPACITY

NOVEMBER 2009

A research project into new technology solutions that can enhance transmission and distribution capacity in the UK



HEAT STORAGE

NOVEMBER 2010

This research project examined the feasibility of capturing large quantities of waste heat from power stations and industrial processes and then storing it underground for later use in homes and offices.



DISTRIBUTION SCALE ENERGY STORAGE

JUNE 2012

Technology developed by Hampshire SME Isentropic - using a combined heat pump/heat engine to generate electricity to create temperature difference for storage efficiency now taken forward by Newcastle University



NETWORK LIFECYCLE COSTING

JULY 2014

The aim of the project was to investigate further developments in, and the future proofing of, the assessment of operating expenditure costs associated with energy infrastructure



IMPACT ANALYSIS

NOVEMBER 2014

This project developed network modeling using the ETf's Infrastructure Cost Calculator to deliver increased capability for assessing the costs of network infrastructure and improve the understanding of network innovation on overall network costs.



TRANSITIONS ANALYSIS

OCTOBER 2017

This project aims to cost and understand how fixed energy infrastructure will need to change to supply different future energy systems.



2007

2008

2009

2010

2011

2012

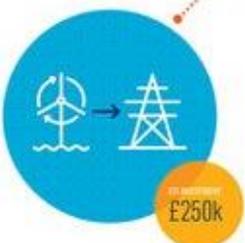
2013

2014

2015

2016

2017



OFFSHORE CONNECTION

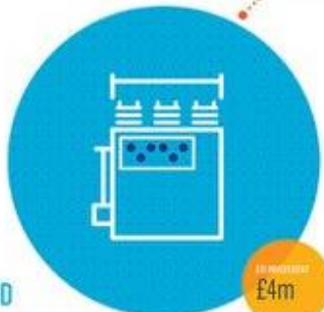
NOVEMBER 2009

This project examined the specific challenges and opportunities arising from the connection of offshore energy to the UK grid system and considered the impact of large-scale offshore development.

PRE-SATURATED CORE FAULT CURRENT LIMITER

JULY 2011

The Fault Current Limiter, developed during this project by GridON, was commissioned into service in May 2013 at a UK Power Networks main substation in Newhaven. It has successfully suppressed multiple faults during its service.



INFRASTRUCTURE COST CALCULATOR

MARCH 2012

This project led by international consulting engineers Buro Happold provides data on the costs and performance associated with key types of fixed energy infrastructure.



HEAT INFRASTRUCTURE DEVELOPMENT

NOVEMBER 2015

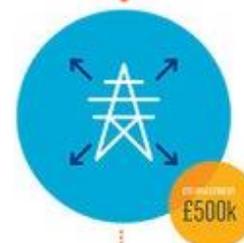
The project will identify the innovative solutions needed to deliver major reductions in the capital cost of heat network infrastructure, whilst contributing to reductions to through-life costs.



CONSUMERS, VEHICLES AND ENERGY INTEGRATION (CVEI)

SEPTEMBER 2015

A project to understand the required changes to market structures and energy supply systems in order to encourage wider adoption of plug-in vehicles and their integration into the energy system.



STORAGE FLEXIBILITY AND MODELLING

APRIL 2016

A project to develop energy system modelling capability to increase understanding of the role of energy storage and system flexibility in the future energy system.



MULTI VECTOR INTEGRATION ANALYSIS

JUNE 2016

The project aimed to improve the understanding of the opportunity for and implications of moving to more integrated multi vector energy networks in the future.

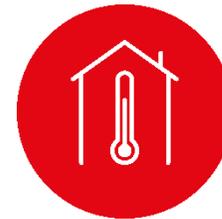
Developed capability: Knowledge

A significant body of knowledge and skills developed in the Energy Storage and Distribution programme will be transferring to the Energy Systems Catapult

Areas where outputs are already being utilised within the Energy Systems Catapult are:

- Multi-vector integration
- Heat network innovation
- Transport decarbonisation

Two programmes specifically benefitting from this are:



Smart Systems and Heat (SSH)

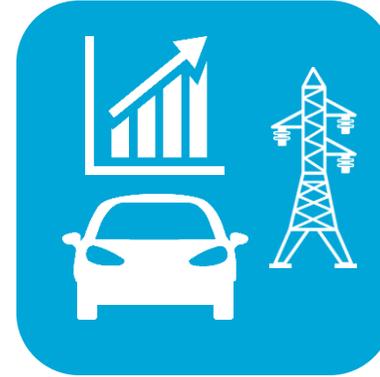


Future Power System Architecture (FPSA)

The ongoing work will see continued development of insights

Developed capability: Analysis tools

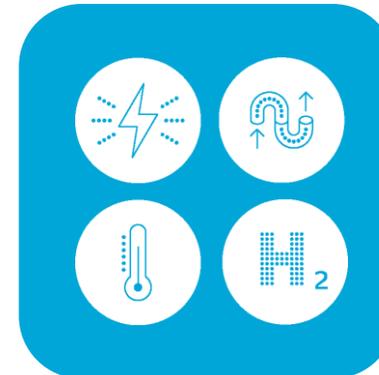
- Analysis tools have been developed within the Energy Storage and Distribution programme to complement the analysis tools across the ETI's programmes
- The tools cover:
 - Vehicle decarbonisation
 - System storage and flexibility
 - Multi-network cost analysis
 - Heat network cost analysis
- Being licensed to the Energy Systems Catapult and others to carry on the work



Consumers, Vehicles and Energy Integration Model



System Flexibility Model



Infrastructure Cost Calculator



Heat Network Cost Model

Summary

- Through the work of the Energy Storage and Distribution programme and its examination of the energy system transition, the ETI has identified the:
 - **Major challenges** facing energy networks
 - **Key decisions** that will need to be taken over the next decade
 - **Influencing factors** that will need to be considered
- **Systems thinking is critical** which means across vectors and up and down the energy supply chain.
- Decisions should be founded on **evidence-based data and analysis**
- The next decade is critical to develop and refine the evidence, through ongoing research and demonstrations at increasing scale
- The capability that has been developed in this field is being made available through ongoing and further projects, expert organisations and more widely to Government, industry and academia



Thank You

Come and speak to us at the
Energy Storage and Distribution Zone
if you would like to know more