



www.eti.co.uk

IET, London - The Future of Heating - Meeting the Challenge

Heat and the Smart Energy System

Jeff Douglas

25 November 2013

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Energy Technologies Institute (ETI)

Innovating to deliver affordable, secure, sustainable low carbon energy for the UK



CATERPILLAR



e-on



Rolls-Royce



Technology Strategy Board
Driving Innovation

Affordable

Secure

Sustainable

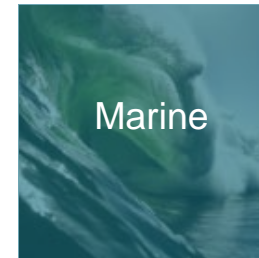
ETI Technology Programme areas

- Providing new technology and business concepts
- An informer of policy
- Building better understanding of energy challenges
- Generating UK economic development

ETI's industry and government partnership shares risk and creates affordability for development and demonstration of new technologies



Offshore Wind



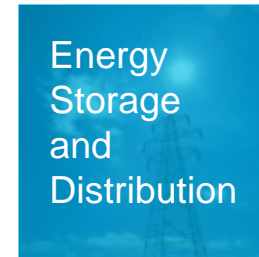
Marine



Distributed Energy



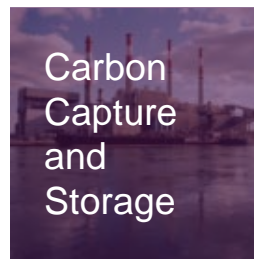
Buildings



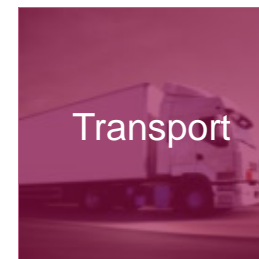
Energy Storage and Distribution



Smart Systems and Heat



Carbon Capture and Storage



Transport



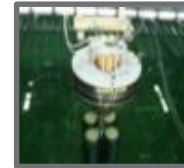
Bioenergy

Delivering innovation: Strategic planning through technology demonstration

Knowledge Building <£5m, 6-24 months



Bioenergy
Multi-site field trial to study impact of bioenergy crops on soil carbonisation and greenhouse gas emissions



Marine
Optimising wave and tidal array yields



Carbon Capture & Storage
First comprehensive UK CO₂ storage database

Developing Technology £5-15m, 2-4 years



Energy Storage & Distribution
New approach to storing electricity at scale



Marine
3 phase 11kv wet-mate connector with integrated communications



Transport
Increasing efficiencies of HDV land and marine vehicles by up to 30%

Demonstrating technology and system solutions



Offshore Wind
New designs for Floating turbine platforms reducing generating costs



Offshore Wind
World leading facility to increase reliability of new turbines



Marine
1MW tidal generator providing environmental impact and performance

**£15-30m+,
3-5 years**

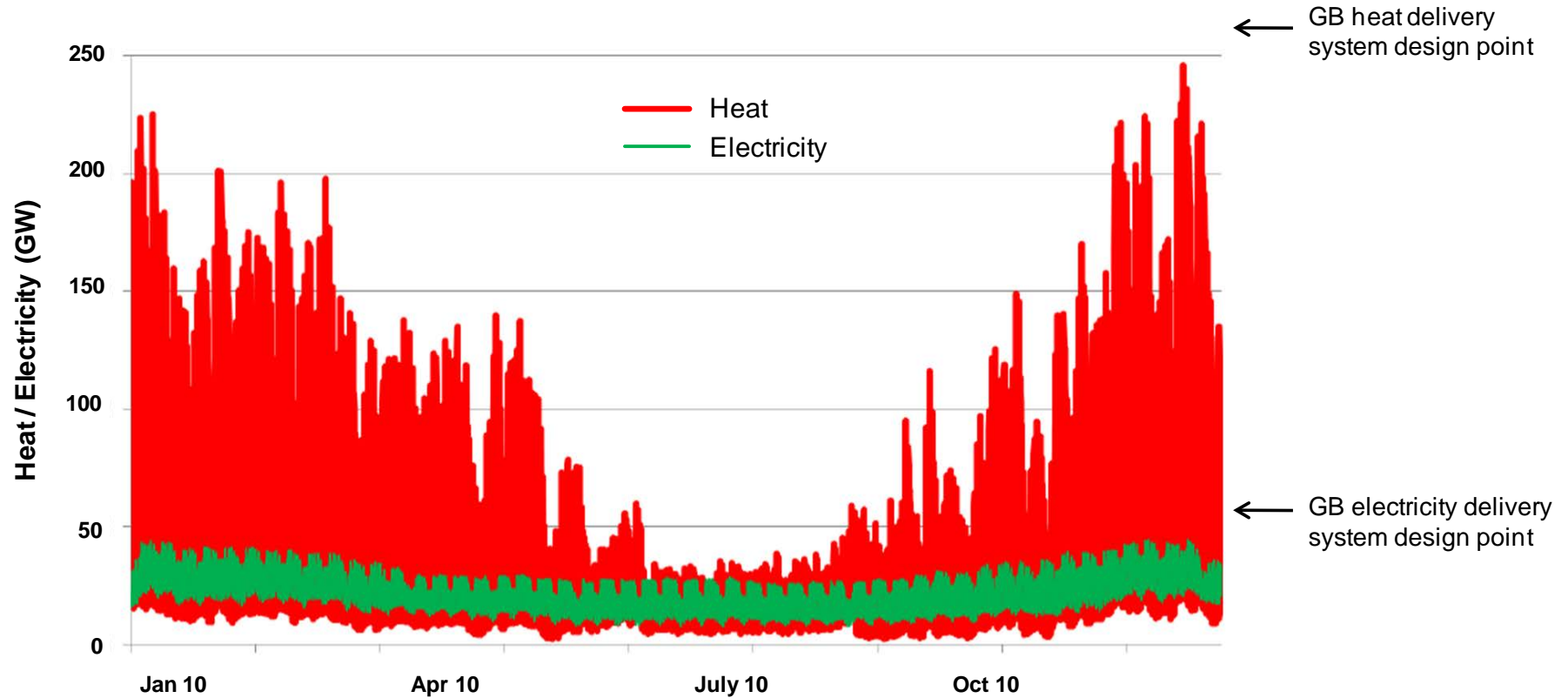


A national energy system design tool

Integrating power, heat, transport and infrastructure

Searching for the lowest cost solution

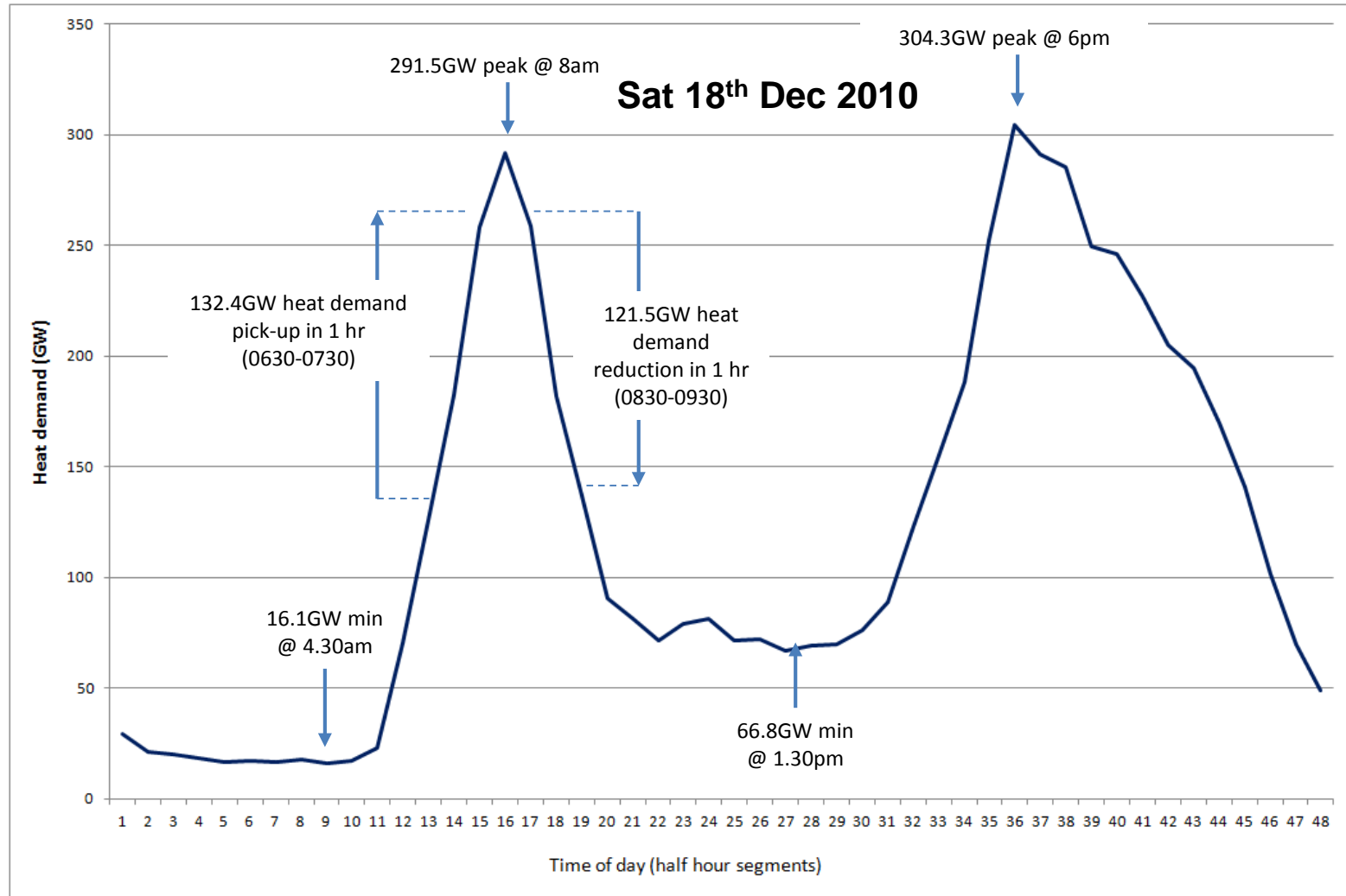
Why heat?



Annual demand for electricity and heat

Source: UKERC (2011)

UK heat challenge - supply



UK heat challenge – demand



Pre 1919 Mid Terrace
2,090,000 homes
13,450,000 tCO₂



Pre 1919 Detached
780,000 homes
13,940,000 tCO₂



1919-44 Semi
1,920,000 homes
13,820,000 tCO₂



1945-64 Semi
2,040,000 homes
12,850,000 tCO₂



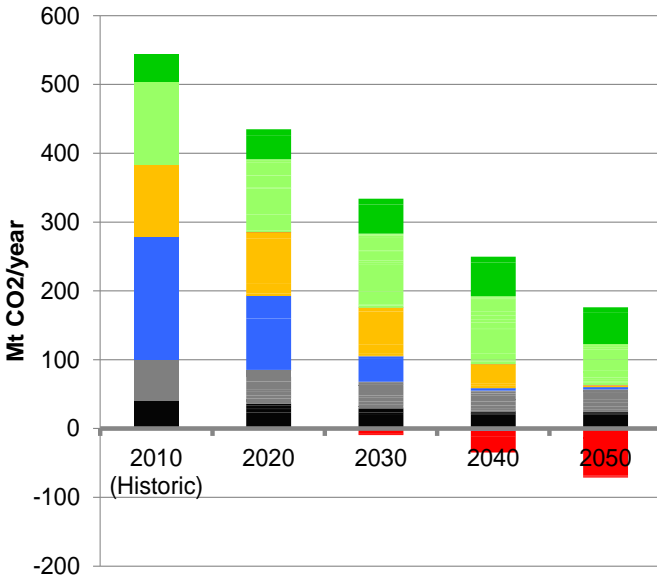
Post 1980 Detached
1,840,000 homes
12,720,000 tCO₂



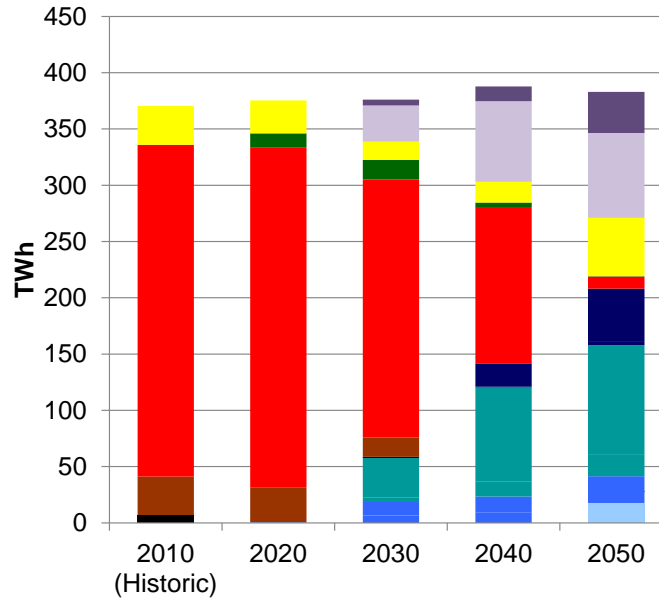
(Total annual CO₂ emissions)

Energy system overview

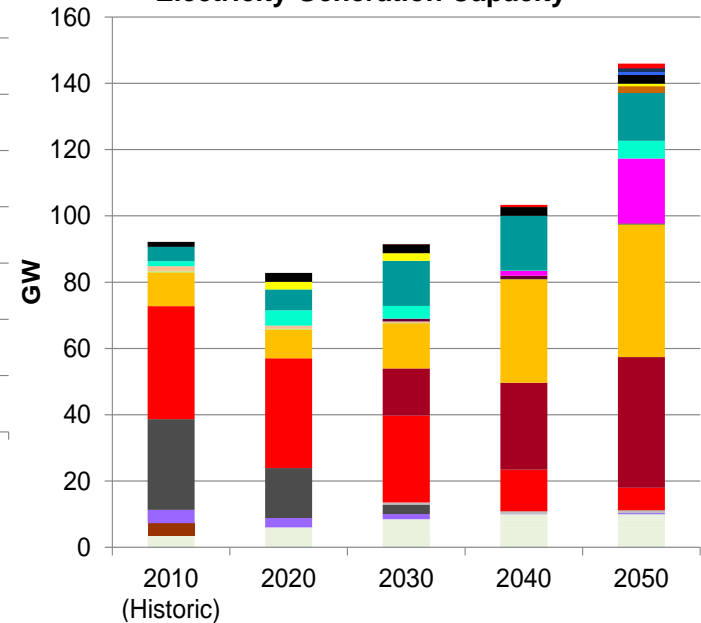
Net CO2 Emissions



Space Heat Production



Electricity Generation Capacity

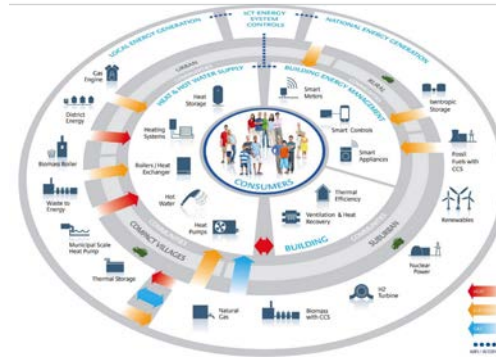


- International Aviation & Shipping
- Transport Sector
- Buildings Sector
- Power Sector
- Industry Sector
- Biocredits
- Process & other CO2

- Ground Source Heat Pump
- Air Source Heat Pump
- Electric Resistive
- Biomass Boiler
- Micro CHP
- Gas Boiler
- Oil Boiler
- District Heating (detached)
- District Heating (semi-detached & terraced)
- District Heating (flats & apartments)
- District Heating (commercial & public)
- Solid fuel boiler

- Geothermal Plant
- Wave Power
- Tidal Stream
- Tidal Range
- Severn Barrage
- Hydro Power
- Micro Solar PV
- Large Scale Ground Mounted Solar PV
- Onshore Wind
- Offshore Wind
- H2 Turbine
- Anaerobic Digestion CHP Plant
- Incineration of Waste
- Biomass Fired Generation
- Nuclear
- CCGT with CCS
- CCGT
- IGCC Coal with CCS
- IGCC Coal
- PC Coal with CCS
- PC Coal
- OCGT
- Macro CHP
- Oil Fired Generation
- Interconnectors

What's needed?



Whole system consumer solutions based upon consumer requirements
Whole energy system optimisation and control

Integrated technology solutions

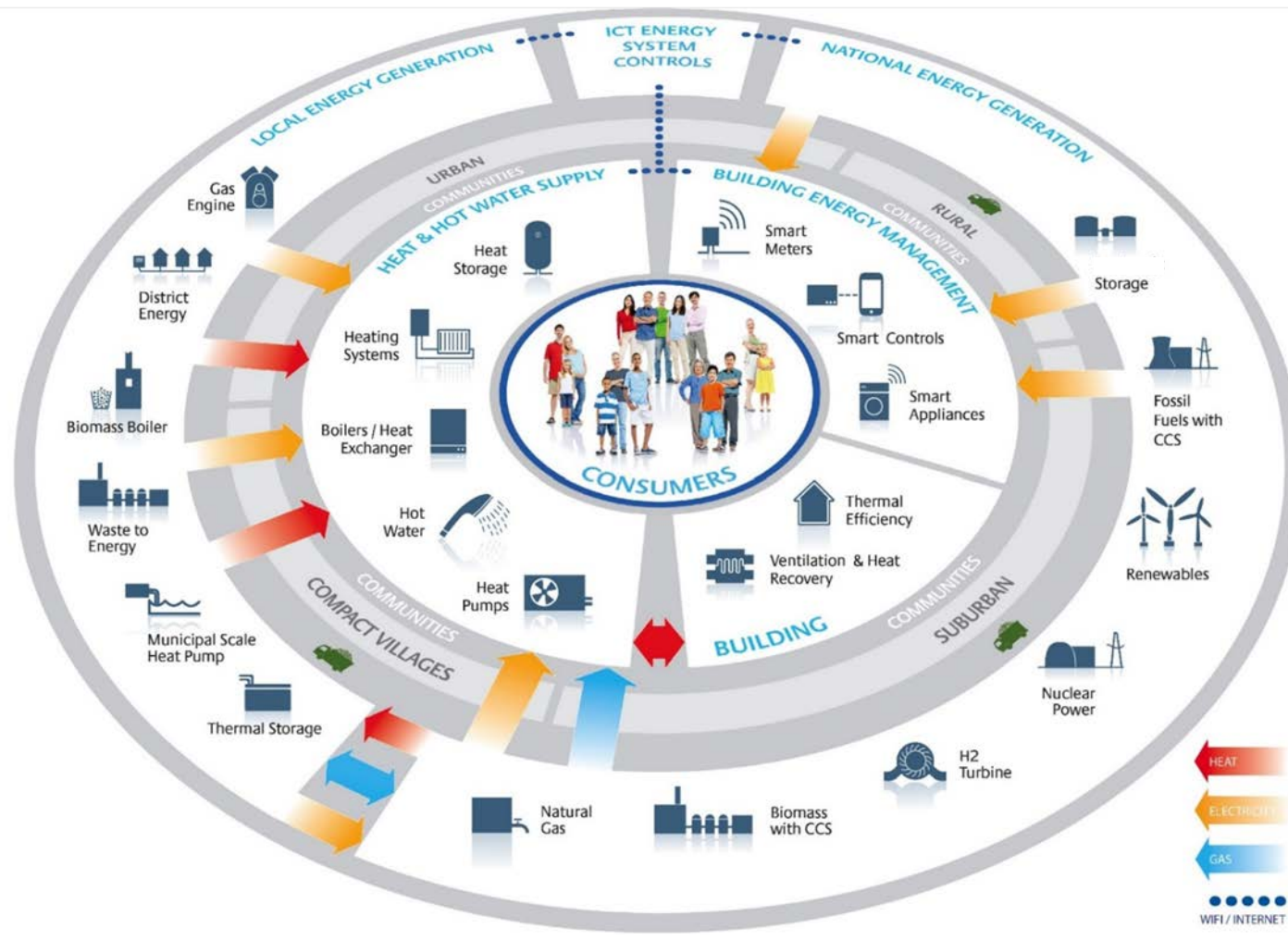
Systems roadmap to 2050

Policy requirements

Planning and engagement of supply chain

The Smart Energy System

...The programme is developing a local energy system design tool that will meet local residents needs while cost-effectively balancing supply and demand measures.





Energy Technologies Institute
6620 Bishops Court
Birmingham Business Park
Birmingham
LE11 3UZ



For all general enquiries
telephone the ETI on 01509
202020.



For more information about
the ETI visit www.eti.co.uk



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