Urban AD:
Context, challenges and opportunities

"Sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Camden

wrap

Working together for a world without waste

Vision: “Future Proofing”

A robust, decentralised, flexible, integrated waste, energy, transport, food & data management system

London Borough of Camden TSB Future Cities

LEAP micro AD

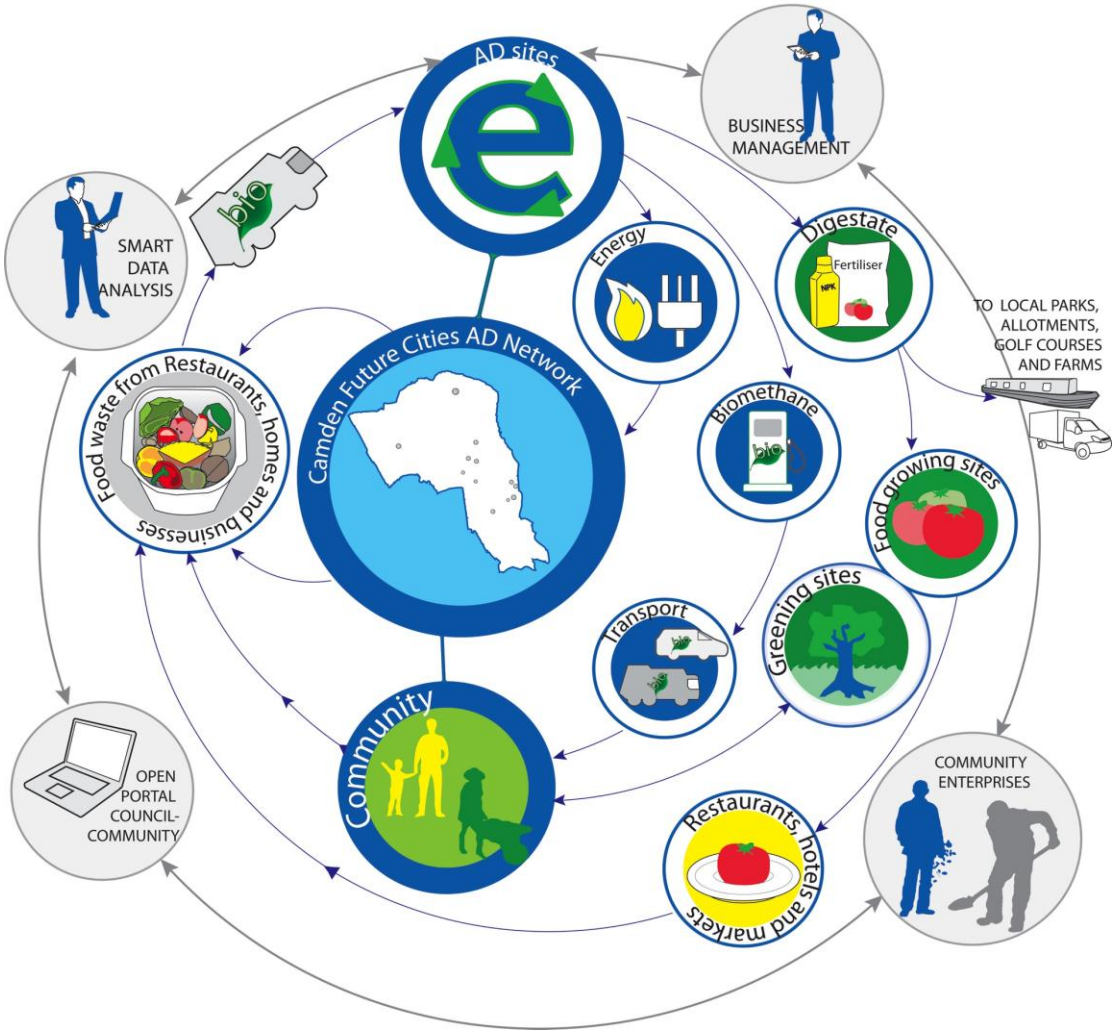
Project Partners:

- Methanogen UK Ltd
- Guy Blanch (Alvan Blanch)
- Dr David Neylan
- Leeds University: Dr Mark Walker, Davide Poggio
- Aleka Design Ltd
- Community Composting Network
- Community by Design
- Valorgas

What might urban AD look like?

- Biomethane vehicles collecting organics such as food waste, shredded paper, non-woody green waste
- Network of micro-AD units in housing blocks, urban growing spaces, markets, parks, golf courses, micro breweries, hotels, food/drink manufacturers and processors
- Varied biogas uses: micro-CHP, micro-biomethane upgrading, cooking heating INTEGRATED as necessary with PV, solar thermal, H fuel cell
- Digestate used on food growing, urban greening, in gardens and households

Urban closed loop demonstration



Drivers for Urban AD

- Waste management savings / waste minimisation
- Pressure on LA's: financial / sustainability eg London Plan
- Emissions targets
- Smart management of energy / resources, energy security

Challenges & Opportunities

- Equipment at this scale: collection; pre-processing; handling; upgrading
- Cost: but volume scale economies are possible
- Regulation: eg PAS110 did not consider community micro-AD networks; a regulatory crack?
- Digestates can vary in odour and composition, so handling & use are considerations
- Awareness: Can we do this? Need more demonstration sites

Benefits

- Dealing with waste at source
- Ability to access local wastes too diffuse or small in quantity to transport

- Can support waste reduction element of the waste hierarchy: move them or access further local wastes
- Support urban food production using organic fertiliser, local food security
- Reduced waste miles

Community benefits:

- Local training, enterprise and employment opportunities,
- Community engagement, reducing waste, food growing, healthy eating
- Educational opportunities, schools programme,

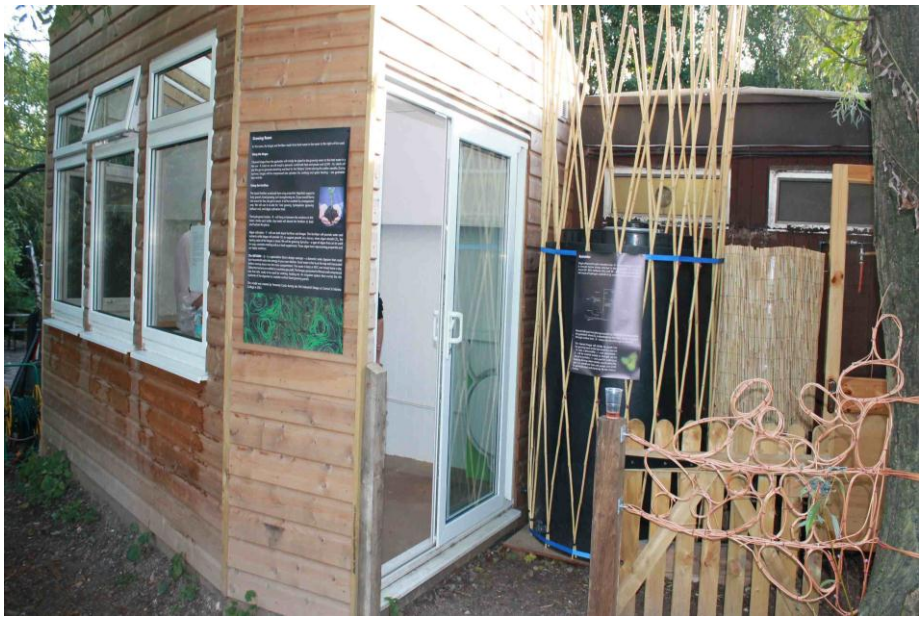
The Sites:

- 1m3 - Calthorpe
- 2m3 - Camley Street
- 6m3 - Alara
- 20m3 - Loop (N.W. London)

Camley Street Natural Park:

- Mill & pre-digester tank;
- 2m^3 digester;
- Digestate settling tank and storage;
- Gas scrubbing (H_2S, moisture and CO_2)
- Monitoring and control system
- Stirling engine CHP unit
- Micro algae scrubbing and hydroponics trials

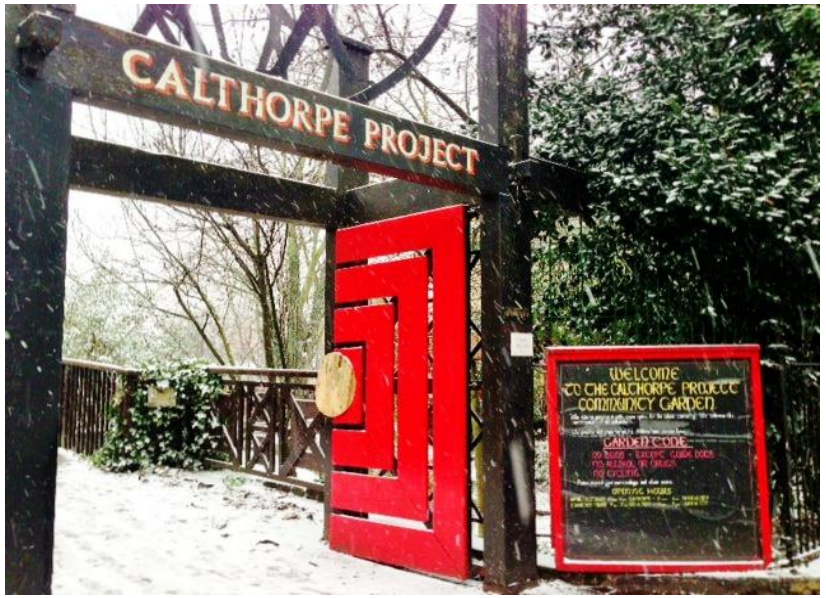
The launch




tion system
rganic waste
r.
ctricity and
d for water
g bicycles
mill - A - where it milled
tank - B - were it is mixed
ester - C. Here digestion
rganisms breaking down

Calthorpe Project:

- 1m3 – simple DIY
- Heated by solar PV array
- Gas use: polytunnel and greenhouse heating
- Community garden
- Closed loop demonstration with café and food growing



Alara Wholefoods:

- 6m3 digester
- Upgrading to biomethane to run local food delivery vehicle
- Settling tank, storage and irrigation system
- Orchard, vineyard & forest garden
- Compost community ‘hub’ and the first company to achieve zero waste in 2008

LEAP micro AD

Loop Management Services:

loop

- 20m3 digester
- Pre-feed system
- Gas upgrading to biomethane for vehicle use
- Gas compression and cylinder storage
- Stirling engine CHP utilising surplus gas

Cost benefit analysis

	1m3	2m3	6m3	20m3
Feedstock				
Feedstock (food waste) handled / day (kg)	20	40	120	400
Feedstock (food waste) handled / yr (kg)	7,300	14,600	43,800	146,000
COSTS				
System Costs				
Total capital cost	**5,984**	**18,395**	**37,664**	**91,416**
Annualised capital cost	239	736	1,507	3,657
Total operational costs (£/yr)	967	1,905	3,456	3,604
Total electrical cost	-	282	1,287	4,228
TOTAL OPERATING COSTS (Waste handling, parts, digestate, maint, electricity)	967	2,187	4,743	7,832
TOTAL ANNUALISED COST	**1,206**	**2,922**	**6,249**	**11,488**
OFFSETS TO COSTS				
Saved on disposal costs (£/yr):	-	-	3,000	9,620
Total recovered fertiliser value	33	66	196	652
Equivalent fuel cost (£)	3,044	5,730	5,326	17,752
Biomethane (RTFC) (£/yr)	-	-	1,000	860
Total Annualised Offsets	3,077	5,796	9,522	28,884
TOTAL NET INCOME (LOSS)	**1,871**	**2,874**	**3,272**	**17,395**
Simple Payback	3.2	6.4	11.5	5.3

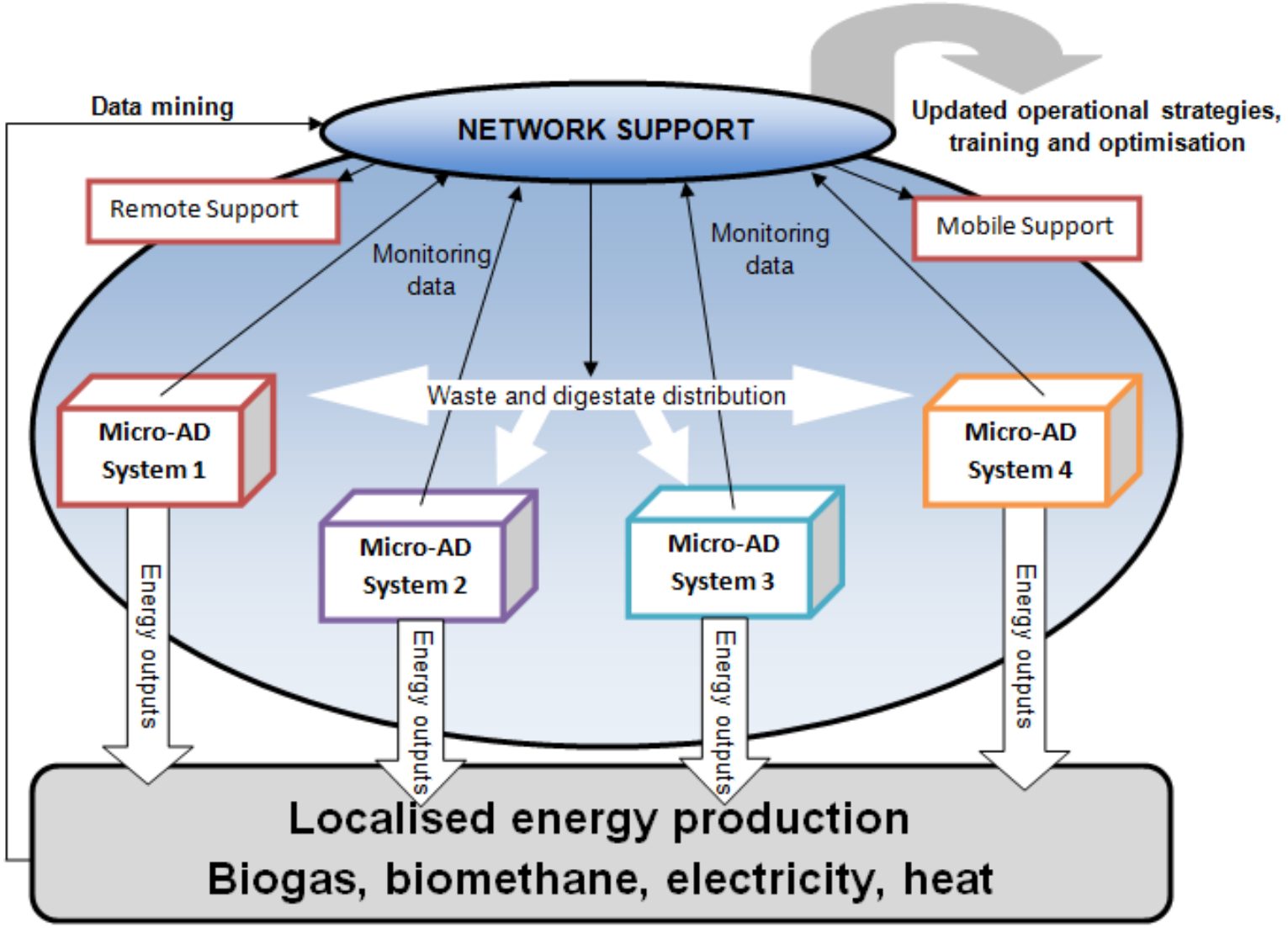
Food waste collections

- Initial collections on cargo bikes
- Biomethane energy recovery vehicles as network expands

Attracting interest

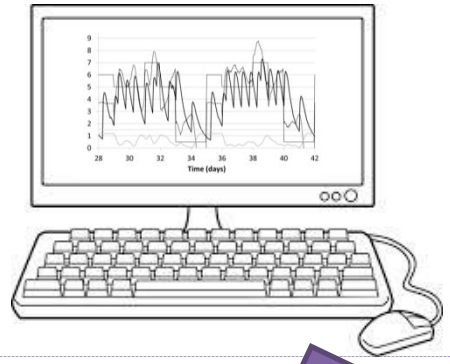
- Kier Group
- BAM Construct and Google
- Sturgis
- London Zoo
- University College London
- North London Waste Authority
- GLA
- DEFRA

Micro-AD Network Concept

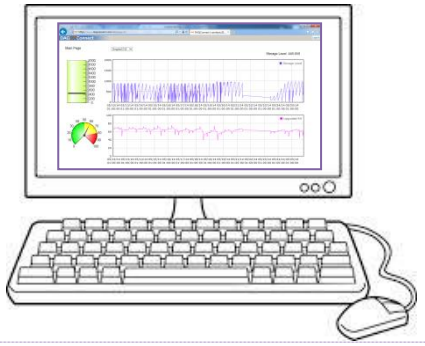


Local and remote monitoring: Overview

Local PC



Remote PC or Smartphone



Cloud data services

ThingSpeak

xively by LogMeIn

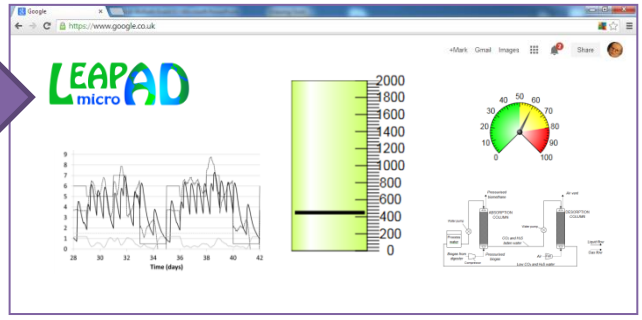
Monitoring System

Data acquisition and processing

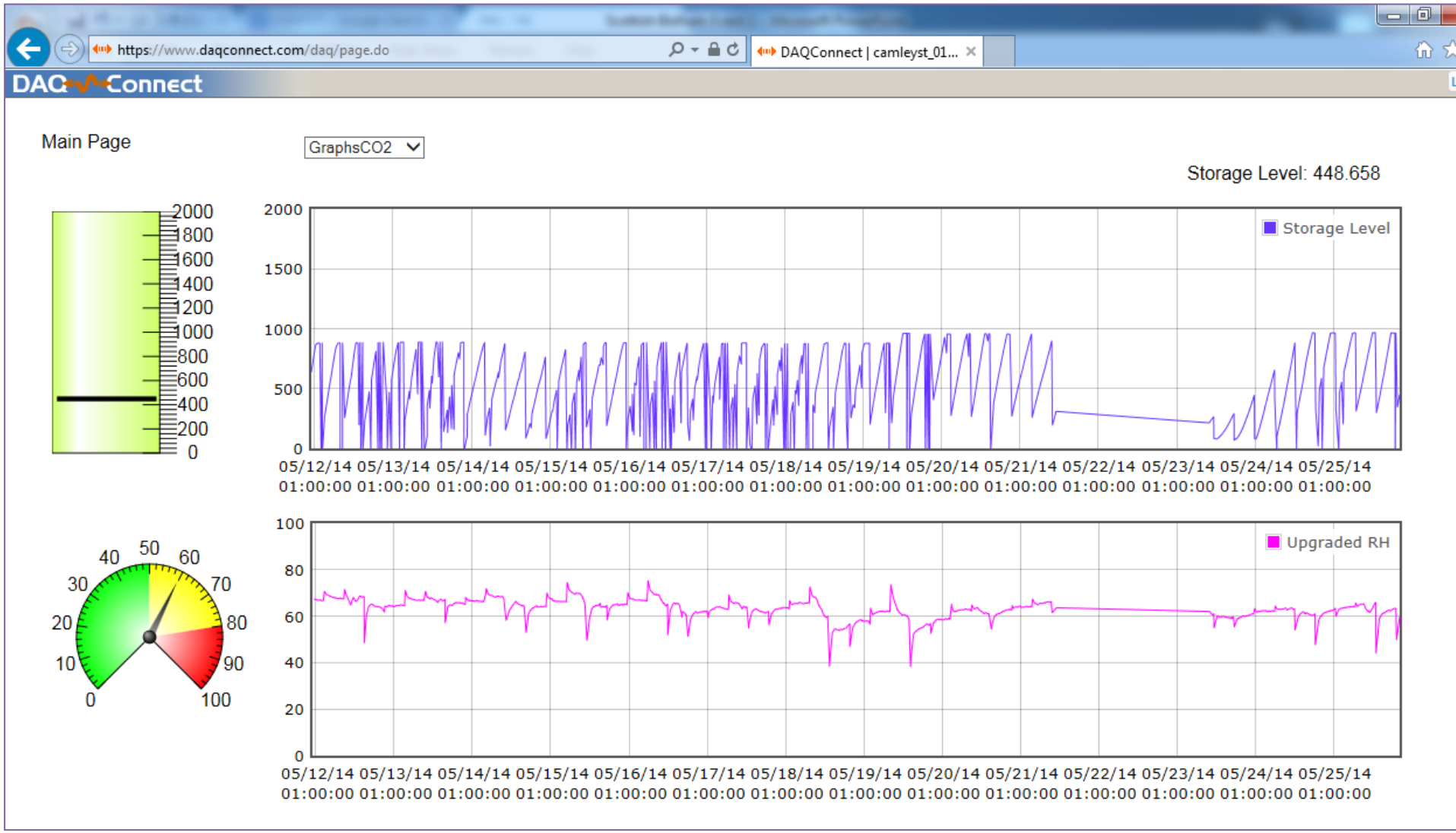
Low cost robust sensors

Micro-AD System

Public websites



Local and Remote Monitoring: Monitoring dashboard

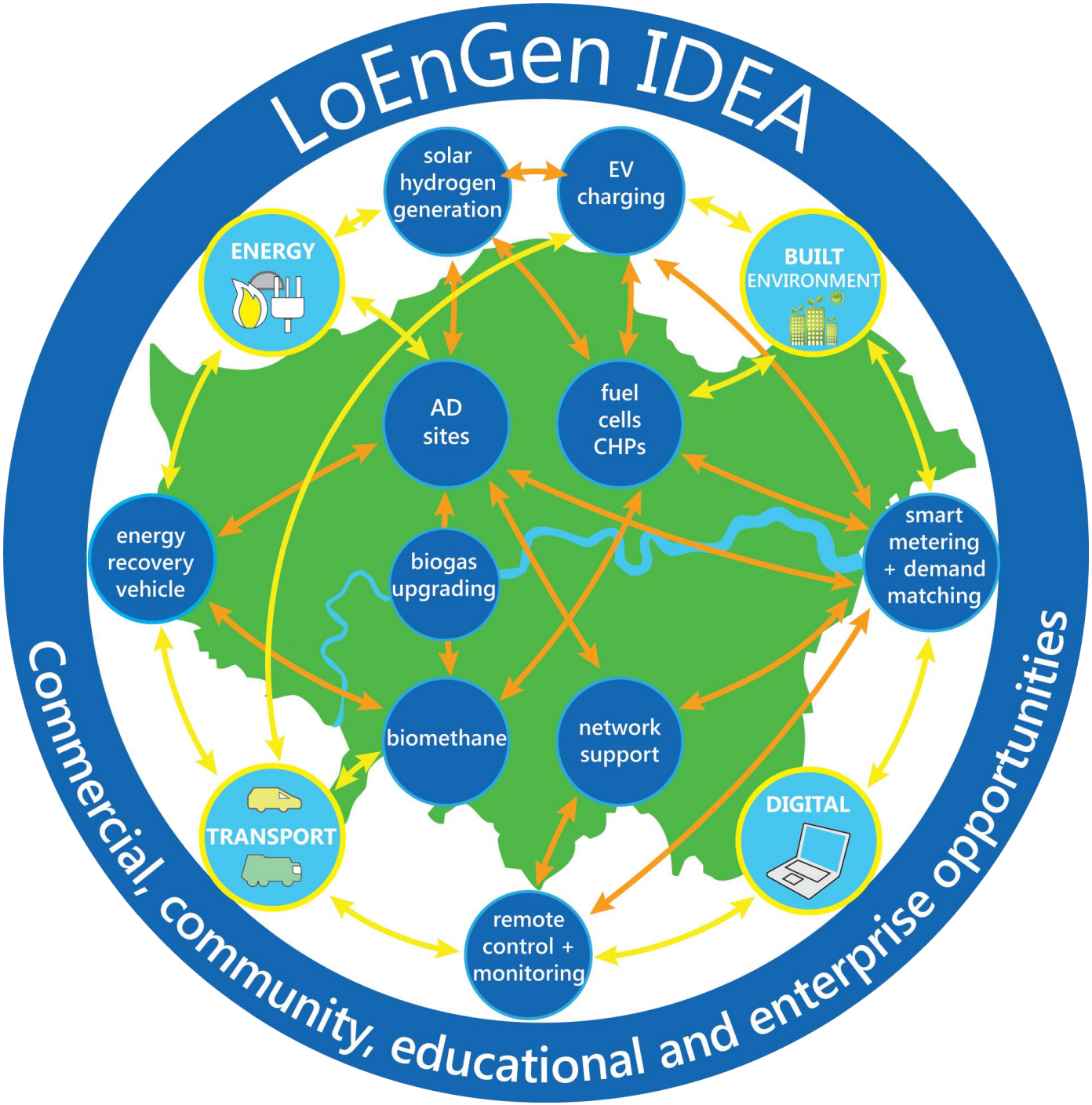


Site Benefits

- **Reduced operational costs**
  - No expert knowledge required
  - Pooled expert resources
  - Feedstock and digestate logistics can be centralised
- **Process optimisation**
  - Remote and mobile technical support
  - Smart monitoring → automatic alerts etc.
  - On-going CIWM accredited operator training
  - Sharing best practice/expertise
  - Commissioning and start-up management
- **Publicity/promotion**
  - Live data for local display and websites
  - Statistics on GHG reduction, carbon savings, waste miles etc.
  - Social media feeds → integration with cloud data services

Network Benefits

- **Exploiting key economies of scale**
  - Feedstock and digestate logistics
  - Pre-treatment
  - Expert technical support
- **Centralising specialist knowledge**
  - Regulatory compliance
  - Planning
  - Operation optimisation and technical support
- **Maximising system-wide efficiency**
  - Reduced waste miles, GHG emissions, waste to landfill
  - Increased income streams to local businesses
- **Data-mining and knowledge sharing**


LoEnGen IDEA
solar hydrogen generation
EV charging
ENERGY
BUILT ENVIRONMENT
AD sites
fuel cells CHPs
energy recovery vehicle
biogas upgrading
smart metering + demand matching
biomethane
network support
TRANSPORT
DIGITAL
remote control + monitoring
Commercial, community, educational and enterprise opportunities

LEAP micro AD

closed loop recycling

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