Smarter Energy Management
for Liverpool City Region

Workshop presentation: 13th July 2016

Liverpool City Region Local Enterprise Partnership

GROWTH DEALS

LIVERPOOL CITY REGION

Agenda

1. **Introductions – Who is in the Room?**
2. **FE Colleges Low Carbon Investment**
3. **DEBATE - DEMAND SIDE - Supplier introductions**
4. **Smarter Energy Management for LCR**
5. **SUPPLY SIDE - Supplier introductions & Debate**

INTRODUCTIONS

Who is in the room?

Building Operators/Facilities/Energy Managers/Project Funding

- Further Education Colleges
- Local Councils, Fire Services, Merseytravel
- Hospitals & Universities
- Visitor Attractions

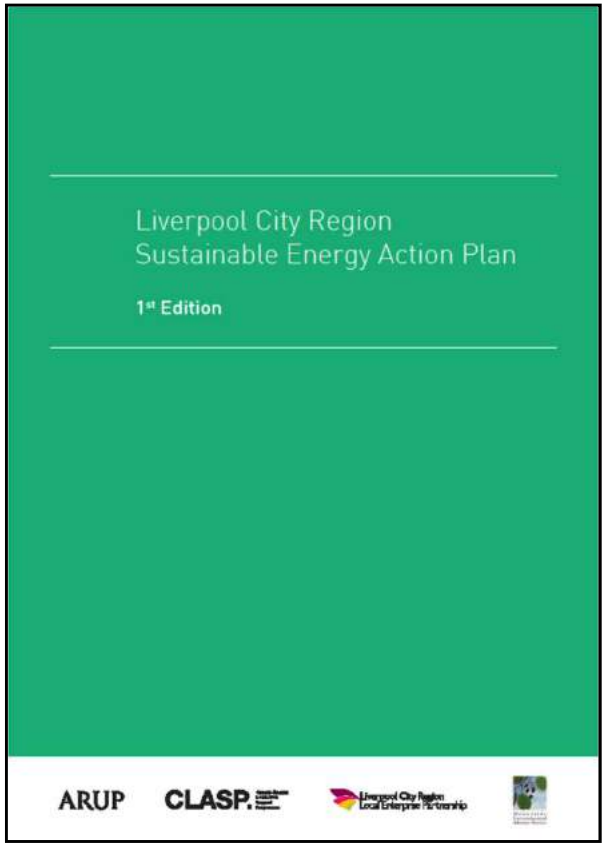
Suppliers

- **Demand Side:** Building Controls, Lighting, IT Equipment
- **Supply Side:** Energy Storage, Aggregation, Contracts, Project Design

Advisors

- Low Carbon & Sustainability Advisors, Local, Regional & National
- SALIX ‘Invest to Save’

Sustainable Energy Action Plan (2013)



Liverpool City Region SEAP

- Existing Energy Infrastructure Assets
- Carbon targets and low carbon goals
- Promote Sector strengths
- Mapping of opportunities
- Project Pipeline
- District Heating Projects
- Decentralised generation
- Enabling activities and joint working
- Promote energy master-planning
- Financial models: Special Purpose Vehicles

Energy Plan (2017?)

Liverpool City Region

Energy Plan

?

2017-2030

1. **Strategy & Project Development**
2. **Place Based Approaches to Energy**
3. **Major Energy Projects**
   - Tidal Energy
   - Heat Networks
   - Wind Supply Chain
   - Housing
   - Community Energy
   - Alternative Fuels
   - Energy Supply and Finance
   - **Civic Buildings & Energy Management**

Today's event

- Brings together building managers, funders and suppliers
- Discuss what works and what does not
- Think about best practice in building controls and technology
- Think about innovation in energy contracts and procurement
- **What should the LEP recommend to leaders about a city region strategy?**
- **Is there scope for a region wide programme?**

Questions?

- What to focus on?
- What advice to seek from whom?
- How to fund it?

Smarter Energy Management
Conclusions

- Today's slides will be circulated to all attendees
- Building operators – **expression of engagement** –
  - Have you identified projects to improve energy management?
  - Do they require additional funding outside of normal budgets?
  - Is there an appetite for coming into a regional programme?
- Suppliers – Your contact details will be circulated to the attendees

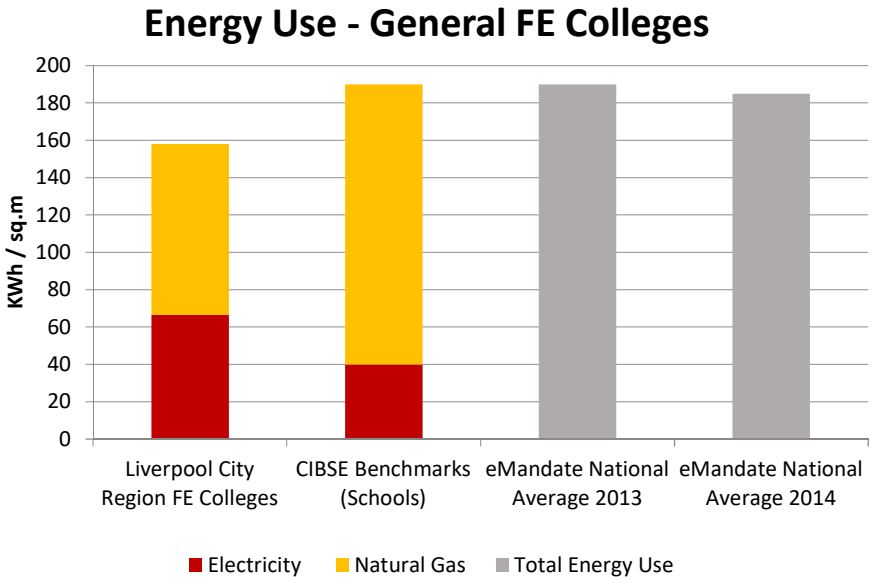
FE COLLEGES – LOW CARBON INVESTMENT

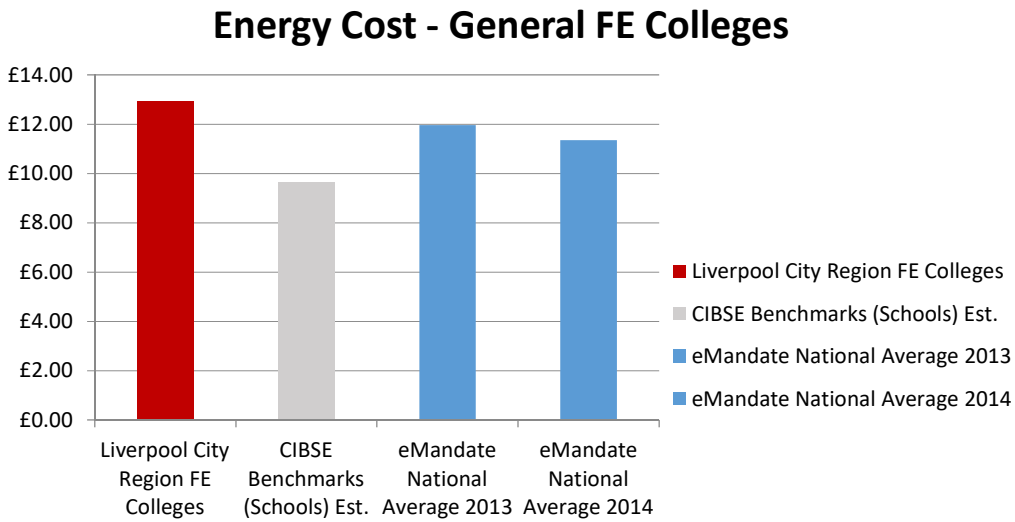
GROWTH DEALS

Skills Capital - Low Carbon Investment

- **Low Carbon Strand: A** unique ask of Government as part of the **City Region Local Growth Deal**
- **LEP Business Case** in **Spring 2015** (**£6.5M**)
  - Grant vs. Loan Options = Levy Model
  - Approved by Dept. Business and Skills
- **Stakeholder Engagement - Summer 2015**
- **Round One Implementation Plan (£1.5M)** in **October 2015**
- **Final Approval – Combined Authority December** 2015:
- **Investment Complete: March 2016**

Business Case: Energy use in FE Colleges





We are using less energy but spending more on what we do use…..

Energy Use by Liverpool City Region FE Colleges

Our Liverpool City Region FE Colleges spend £2.8M on fuel bills annually. This energy bill is 15% above the national average for the Further Education sector. It represents over 20% of FE Colleges annual operational running costs.

£2.8 Million Annual expenditure by **FE Colleges** on Energy Bills

An Energy Target – reduce energy bills by more than **10%** to save **£1.5M** in **5 years**

The Low Carbon Strand will have a legacy of improving building estates energy efficiency and sustainability so that our region is competitive with than the national average within 2 years.

Aims of the Skills Capital Low Carbon Strand

The **Low Carbon Stand** will promote investment in capital projects which:

- Improve the energy management of **Further Education Colleges**
- Enable better value from the **purchase of energy**
- Improve **energy efficiency** of owned and occupied building estates
- Enable localised generation of **renewable energy**
- **Demonstrate low carbon technologies** to learners
- Engage with the wider community to **promote environmental sustainability.**

Round One of funding will support three 'Fast Track' categories of activity. These activities will enable the overarching aims of the Low Carbon Strand in future years. Round one will establish a shared Liverpool City Region baseline of energy management capability.

GROWTH DEALS

Energy Management Commitment

- **Promote Energy Management as part of Funding Award**
  - Senior Management Awareness
  - Nominate an **Energy Champion**
  - **Working with LEP** to assess outcomes & promote success
  - Carbon Trust **Energy Management Matrix** (Start and End)
  - Coordinate **existing data** to understand energy saving

- **Levy Payment (15% of the project savings)**
  - Low Carbon Advisor Working Across the City Region
  - Funding to reinvest in promoting **Smarter Energy Management**

LCR Further Education Colleges

Energy Management Working Group

- Informal Meetings
- Ad-hoc Basis
- Hosted by the LEP
- Share lessons learnt
- Supplier presentations
- Feedback on Funding Process
- Shared scopes for e.g. metering
- Cost-comparison across projects

LEP OFFICES – 12 PRINCES PARADE

Liverpool City Region
Local Enterprise Partnership

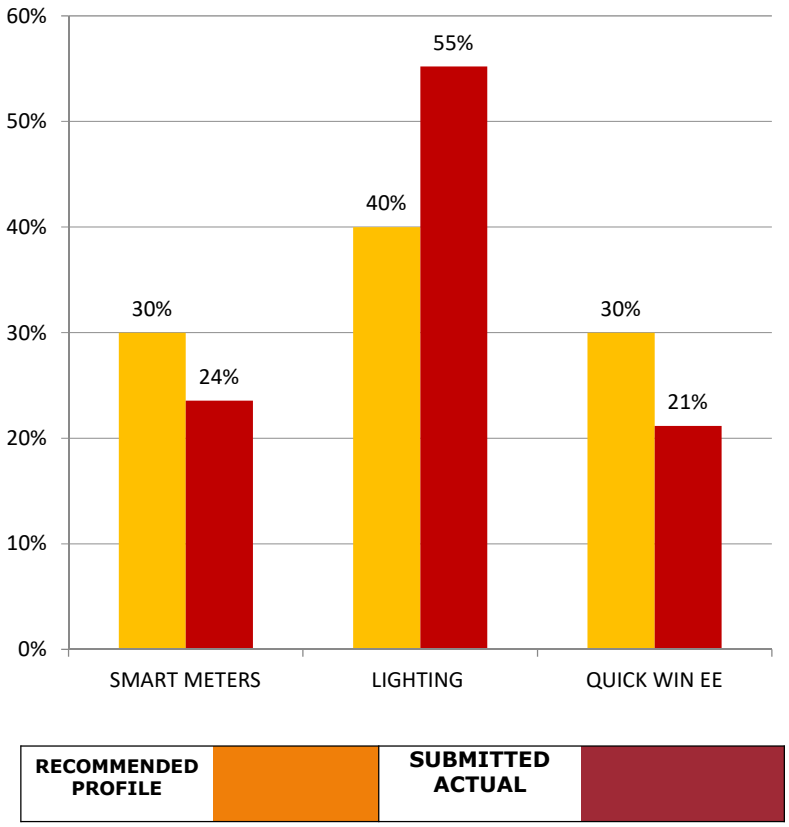
Educational Added Value

- Energy use to be shown on display screens in circulation areas visible to learners
- Energy data of potential use to learners on electrical syllabus, and more widely
- Promotion of the outcomes of investment to raise awareness to wider community
- Proportion of energy savings retained to reinvest in energy management
- Student energy champions mooted as a possibility
- **Improve the student experience**

GROWTH DEALS

Fund Allocation Profile

- Three ‘categories’ of activity in scope
- Recommended split
  - 30% M&T
  - 40% LED lighting
  - 30% ‘Quick Win’
- FE Colleges were given scope to re-profile
- Funding was ‘Allocated’ to colleges based on their building footprint



CASE STUDIES

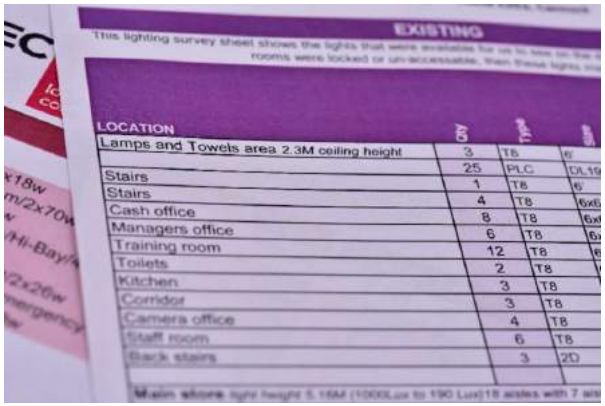
Low Energy Commercial Light

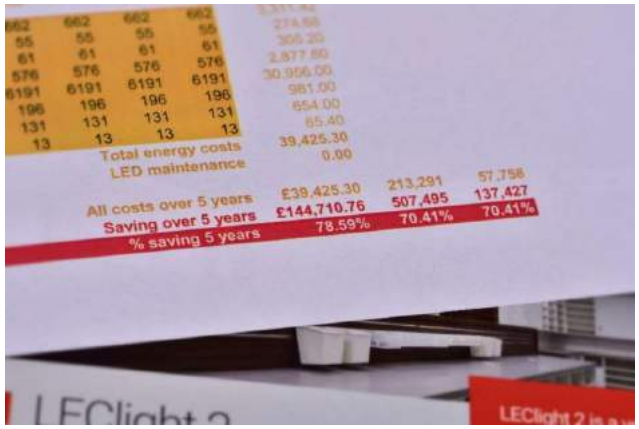
LEC light
low energy commercial

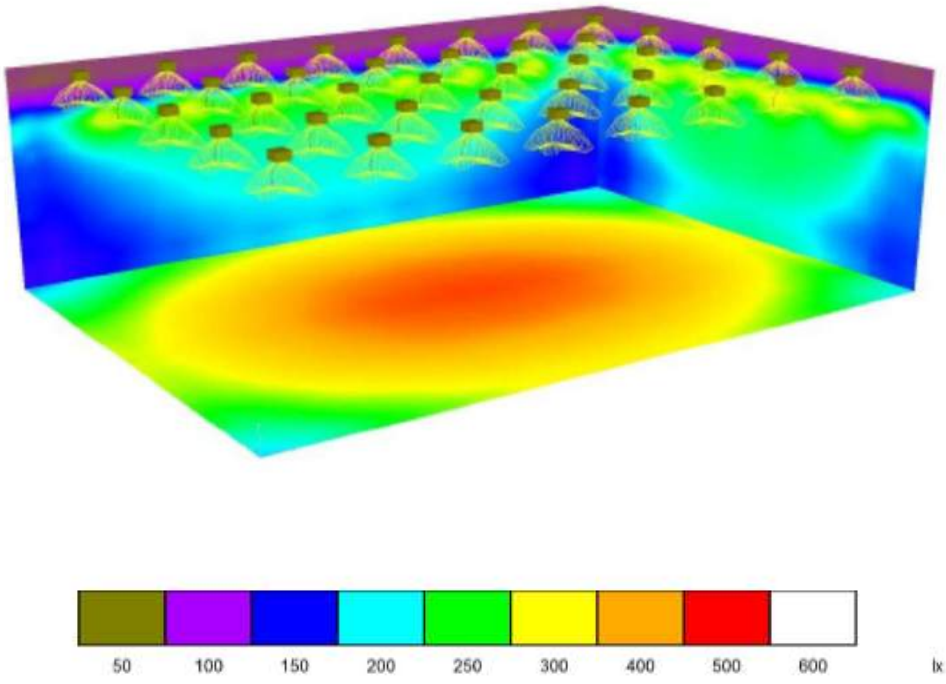
LEC light
low energy commercial

Hugh Baird COLLEGE

Lighting surveys



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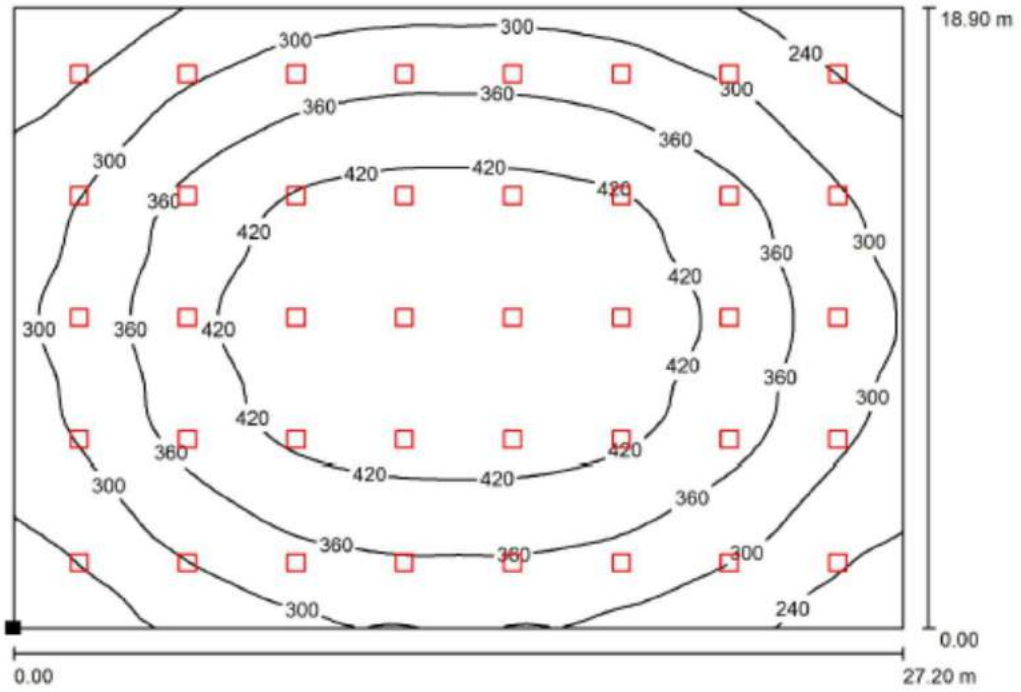
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420
240

Energy savings	*per year*
Total energy existing lights *(kWh)*	583,695
Total energy LED lighting *(kWh)*	177,537
Saving *(kWh)*	406,158
Saving	70.00%

Cost savings	*5 years*
Total cost existing lighting	£382,320.23
Total cost LED lighting	£116,286.74
Saving	£266,033.49
Savings per year	£53,206.70

Cost of Lights and Installation	£90,826

Return on investment *(years)*	1.71
ROI with ECA	1.42

Carbon saving	*5 years*
C02 *(metric tonnes)*	1,100.00
Carbon *(metric tonnes)*	284.00

LEC light low energy commercial

Business proposal

Funding agreed in January 2016

Re-surveyed the site

Assessment of most beneficial areas

Area's were agreed to fit the budget

Issued a revised quotation

Order placed

We worked with 2 electrical contractors

6th form block and Tower block

The contractors made suggestions
and our process is flexible enough
to change the installation as required.

All the work was done out of hours

at no extra cost

With virtually no disruption to College life


COSTA


TASTE
NATION

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Merseyside
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Wirral Met College

WIRRAL MET COLLEGE

AWARDS WON: RIBA NATIONAL AWARD 2016

Presentation To:

Liverpool City Region Local Enterprise Partnership

By George Norrie of Scotia Energy Ltd

www.scotia-Energy.co.uk

Email: Info@scotia-energy.co.uk

Scotia Energy are energy consultants and engineers based in Carluke Lanarkshire Scotland and Sunderland Tyne and Wear. We also have associates in the south of England to allow us to cover the whole of the UK. The company and its associates have many years experience in the operation, Installation, monitoring and control of all energy related installations.

Projects range from energy monitoring targeting & reporting, Building HVAC, lighting design and installation and heating control through to more sophisticated process systems, such as steam boiler plant installation, automation and control and industrial process control and information management. We have recently installed a site wide real time energy product costing system at a paper mill in Aberdeen and are Installing a new steam boiler house , site steam distribution and product costing system at a clients site in Lincoln.

We have carried out Industrial energy monitoring for the Department of the Environment and Climate Change across a large number of UK industrial sites as part of the Carbon Trust Industrial Energy Accelerator Program.

We have identified over 30% savings in most organisations for which we have carried out surveys and are at present actively implementing measures.

Some of Our Clients

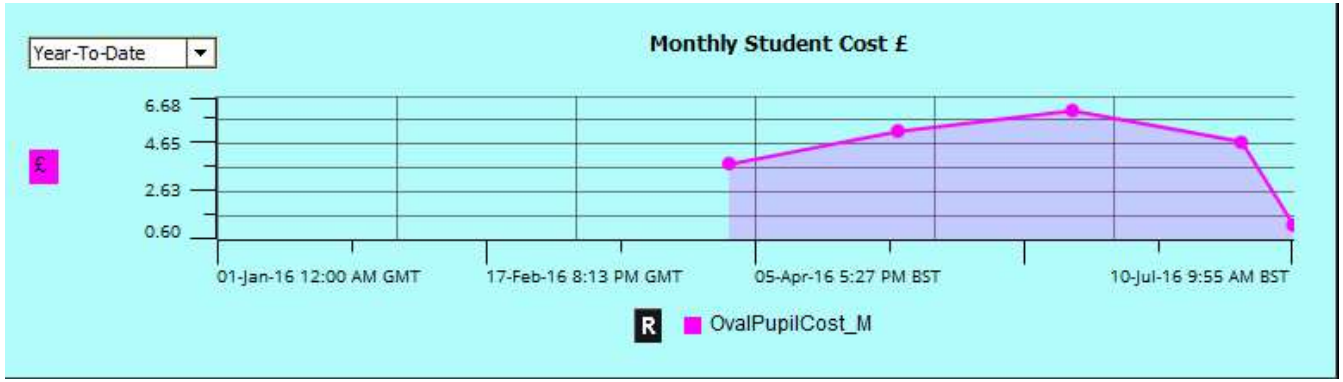
Commercial / Education

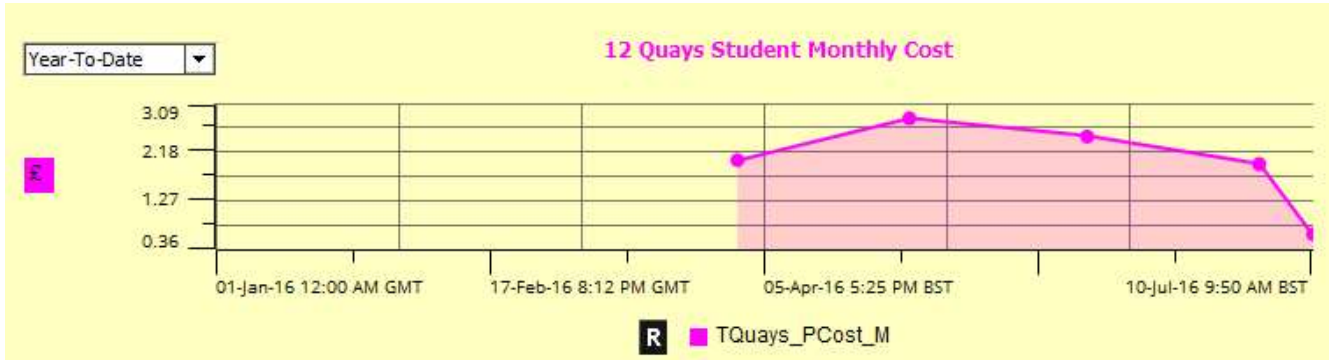
London Borough of Hillingdon
East Lothian Schools
East Devon College
Ayrshire College
Middlesex College
VERCO
Cigna Group
The Carbon Trust
Ricardo AEA energy
Mitie Group
British Government
Scottish Government
Victoria Quay Edinburgh
Atlantic Quay Glasgow
Saughton House Edinburgh
St Andrews House Edinburgh
North East Scotland College
Aberdeenshire
Capability Scotland
Forth Valley Sensory Centre
Knowsley Council Liverpool
Sodexo Ltd
Wirral Metropolitan college Liverpool
Skills Development Scotland

Health Authorities

Lothian Health Board
Lanarkshire Health Board
London Heart Hospital
NHS 24

Wirral Met College - Typical Data





Southport College

- **Smart Metering:**
  3rd party quote at outset

- **LED lighting**:
  Focus on corridors and high use areas

- **Quick Wins:**
  - Better zoning & valves
  - Link to BMS

FE - Case Study

The City of Liverpool College

Energy Strategy

- Reduce energy costs through improved energy management and energy efficiency
- Engage with students and staff on the impact of energy consumption and carbon emissions
- Utilise 3rd party funding for capital projects
- Recycle savings to fund future projects

Energy Audit

Identified energy saving opportunities -

- LED lighting
- Invertor drives
- Metering and BMS upgrades
- Air conditioning upgrades

aaprojects

FE - Case Study

The City of Liverpool College

Funding Secured - £1.1million

- Salix – College Energy efficiency fund
- LEP – FE Low Carbon Strand Round 1

Project Management

- Tender Specification
- JCT D&B Contract
- 24 Week Programme
- 6 College Buildings

Benefits

- Annual cost savings = £190,000
- Annual carbon savings = 700 Tonnes
- Improved energy awareness / behavioural change via real time energy screens

aaprojects

aaprojects
MANAGEMENT AND PROPERTY CONSULTANTS

Independent Property Consultancy

Specialise in Energy Management

Energy Audits / Business Case Development

Project Funding (Salix, RGF, ESIF, EPC)

Measurement & Verification

Project Management

Skills Capital Investment – Low Carbon

Lessons Learnt

- Short funding timescale reduce the options available
- Some costs imposed by evening working
- LED lighting really improves the look of a place
- There is a willingness of Senior Management to invest for energy savings
- Preference for Grant Funding rather than Loans
- Productive joint working on energy management
- Energy metering - impact to be determined over the coming year
- Available budget £5M – must be designed for ‘harder to reach’ savings
- **We have created a data baseline and capacity for future work**

Skills Capital Investment – Low Carbon
Lessons Learnt

- Low Carbon Advisor @ LEP via Combined Authority
- Promoting this approach to joint working
- Today is about widening out the lessons learnt
- Engaging with local suppliers
- Looking at trends in the energy market so we are ready with projects

Smarter Energy Management for LCR - 1

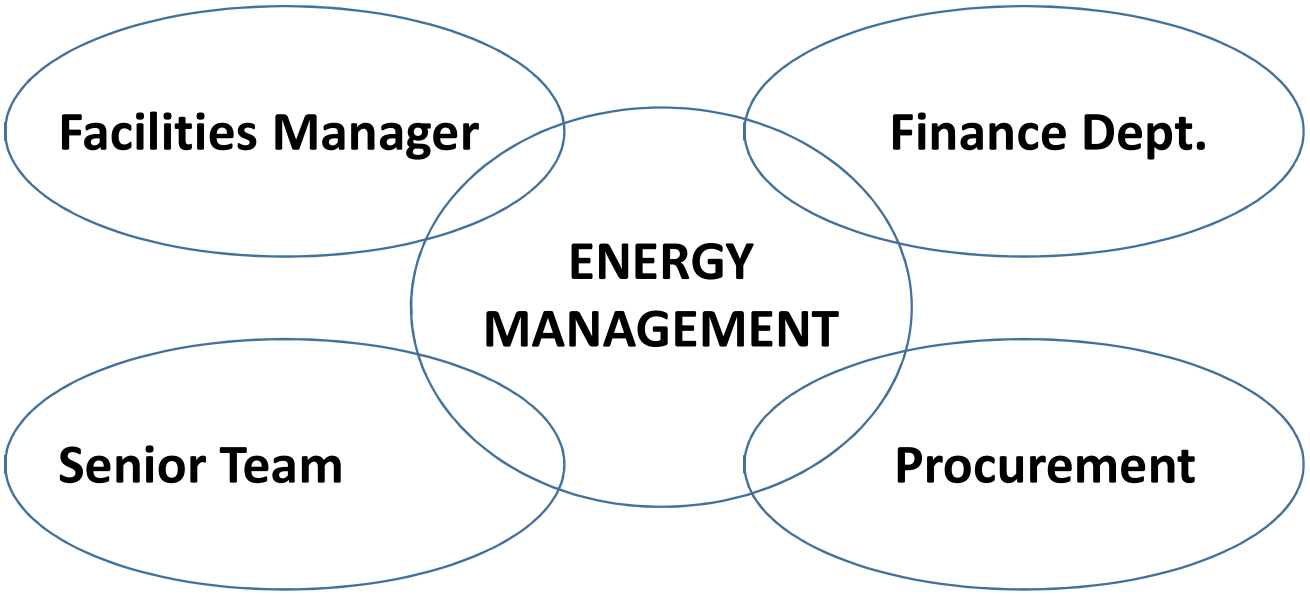
Context: Changes in the UK energy system…

- Some political uncertainty…
- Delays to major infrastructure projects
- Power grid peak capacity shortfall (NISMs)
- Capacity Market & Energy System Balancing
- Demand Side Response (DSR)
- Smart Meter Roll-Out
- Energy Regulation - Current Consultation (Future of ESOS / CCL)
- Ofgem - P272 - Half Hourly metering for smaller users

Smarter Energy Management?

- Energy Management as an objective
- Energy Data & Controls
- Invest in Energy Efficiency
- Energy Load Profile Improvement
- Demand Aggregation across Estates
- Better Energy Contracts
- Joint Working

Energy Management



THE WIDER QUESTION:

How do we empower our civic institutions to manage their energy more smartly?

Civic institutions require (non-financial) reasons to invest ?

Energy Data & Controls

- Building Data – Requires an educated user
- Automation – Only where impactful
- Multiple Systems – Should be able to talk?
- The Audience - Converting KWh into KPIs

QUESTIONS:

How do we make energy data accessible to decision makers?

Does the software platform matter (TREND/KNX/MODBUS)?

Energy Efficiency and Generation

- Civic Buildings – Do they have broadly Similar Energy Use ?
- Hospitals are a different category ?
- Onsite Energy Generation – Relies on subsidy
- Facilities management – sometimes by a third party
- Low Carbon Drivers – Vary across institutions

QUESTIONS:

Which measures should be targeted?

Is there any value in Low Carbon technologies now subsidies have been withdrawn/reduced?

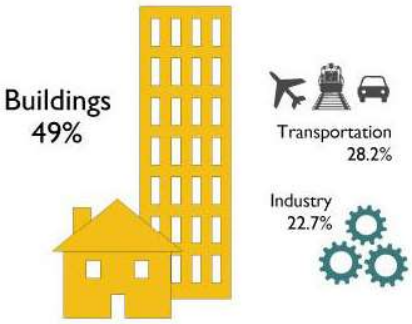
DEBATE – DEMAND SIDE

- ABB Group
- Extreme Low Energy
- IBT Group
- LEC Light
- Senselogix

Power and productivity
for a better world™

Energy Efficiency in Buildings
What role do Buildings play?

Buildings consume more energy than any other sector!



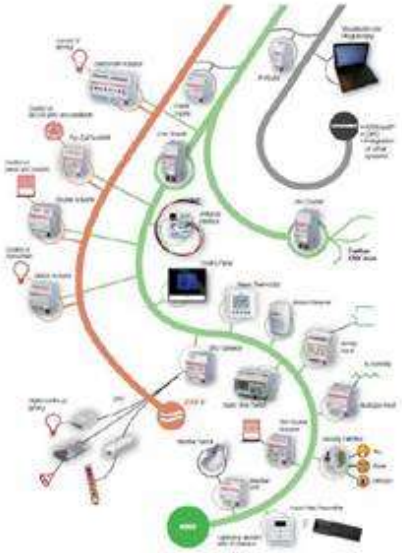
U.S. Energy Consumption by Sector

Source: www.architecture2030.org

- **The Facts:**
  - Nearly ½ of all primary energy and almost ¾ of all electricity generated is used in buildings.
  - Electricity generation accounts for 31% of global fossil fuel usage and around 40% of all energy-related CO_2 emissions.
  - The energy consumption of buildings is still growing ..... and faster than any other sector!

- **The Conclusion:**
  - Increasing the energy efficiency of buildings can make a considerable contribution to energy saving and global climate protection

Energy Efficiency in Buildings
What is ABB i-bus® KNX?



- **ABB i-bus® is an electrical installation system optimised for applications found in smart home and intelligent building control.**
- **ABB i-bus® is a de-central, programmable, bus system for residential and non-residential buildings.**
- **ABB i-bus® conforms to the KNX standards, the world's first and only approved building & home automation technology standard ISO/IEC 14543**

Energy Efficiency in Buildings
Case Study - the ABB i-bus KNX solution

Energy Calculation

New System	
Reduced hours per day	9.50
KW/H per day (KW/H)	2,052.00
KW/H per month (KWH)	41,040.00
KW/H per year (KW/H)	492,480.00
10% Dim saving	443,232.00
PIR & Daylight saving (35%)	288,100.80
Revised cost per year	20,167.06
Carbon emission per year (Tonnes)	211.77
Saving per year	**34,264.94**
Carbon reduction per year	**122.60**
Cost of installation	262,563.00
Payback period (yrs)	7.66
Enhanced capital allowances (30%)	78,768.90
Revised capital cost	**183,794.10**
Final payback period (yrs)	**5.36**

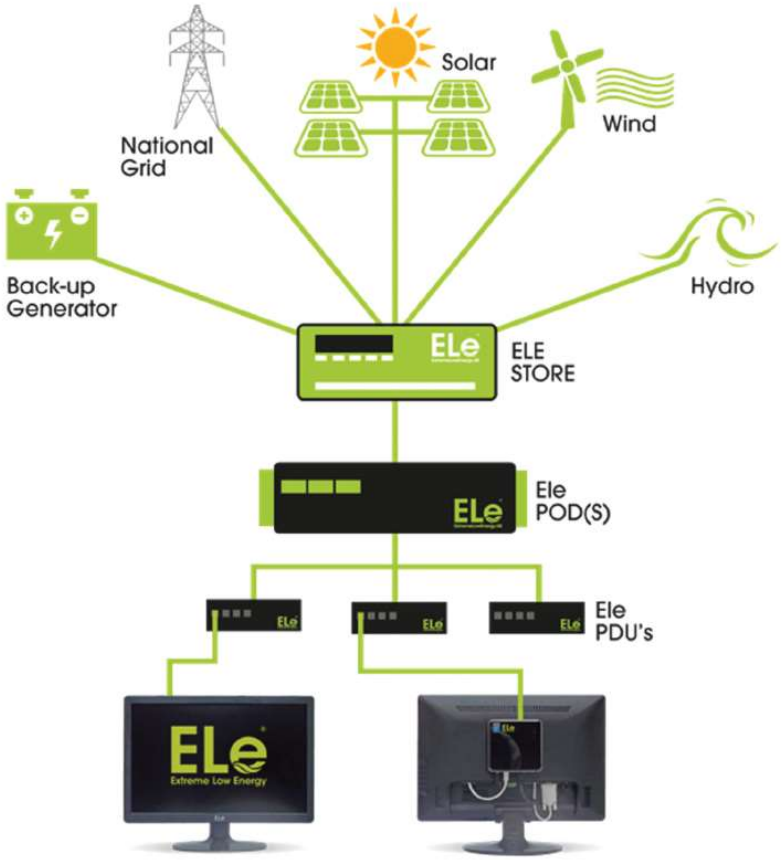
ELe®
Extreme Low Energy

Minimising energy wastage saving energy costs

ELe® technologies are designed to:

- eliminate wasteful AC/DC conversion
- store energy to benefit from off-peak tariffs or local energy generation
- disperse electricity only when needed
- replace inefficient UPS battery systems
- minimise the need for air-conditioning equipment

A significant reduction in your carbon footprint will also create a more positive environmental profile for your business.



KNX Energy Efficiency Nomination 2015

Leicester University Centre for Medicine

ibtgroup Case Study

Entech provided a totally integrated BACnet / KNX solution to the UoY Centre for Medicine .

- Open Protocol Lighting & HVAC Control
  - Lighting Control
  - Radiator Control
  - Damper Control
  - Temp / Humidity / CO2 Monitoring
  - Blind Control & Automated Façade control
  - Fancoils
- Bacnet Integration into site wide supervisor
- Designed to BSEN15232 rated A
- Largest Passivhaus project in the UK

Entech Energy Technologies

KNX BeMS DALI

senselogix™

Solutions Products Sectors

The EnergyLogix product range is an award-winning energy management platform designed to manage energy across multiple building types and enterprises. So whatever your building type is; a school, university, retail outlet, commercial office or a factory, SenseLogix has a solution to meet your needs.

EnergyLogix Enterprise

Enterprise-wide, energy management platform that manages all of your energy data in one place

Energy Metering Services

Turnkey metering services including survey, system design, installation and ongoing management

Water Monitoring

Affordable monitoring solutions to help manage consumption and leaks.

Small Power Control

Managing small power distribution and eliminating out of hours' energy waste

PC Power Management

Managing PCs and IT peripherals effectively reduces their out of hours energy use by up to 85%

Demand Response

Linking the building's user environment to the Smart Grid for a more efficient network

Questions – Session 1

1. Which energy demands should we target in civic buildings?

2. Invest-to-save & Payback. Can the technology recoup its costs?

3. Open data: Trend/KNX/ ModBus – Does the data platform matter?

4. Who do suppliers need to convince when explaining the opportunity?

5. Audience Questions

Smarter Energy Management for LCR - 2

Load Profile Flattening

- P272 – An incentive to flatten load profiles
- The Future – Dynamic Pricing Tariffs Linked to Half Hourly Metering
- Demand side response – Payments for energy saving at peak times
- Do we look to Storage as the next trend in the sector?

QUESTIONS:

How do we flatten our energy demand profile?

Can we procure cheaper energy if we have better contracts?

P272 – Electricity Meters to Half-Hourly (Class 05-08)
Deadline 1st April 2017

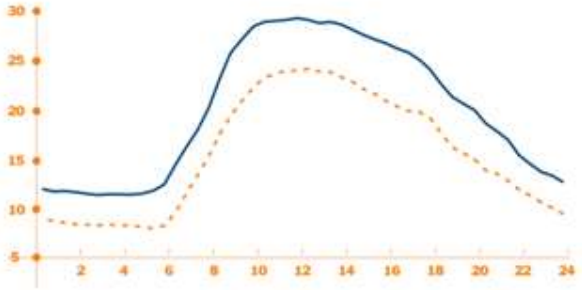
Questions

Does this change represent an opportunity to save on energy bills

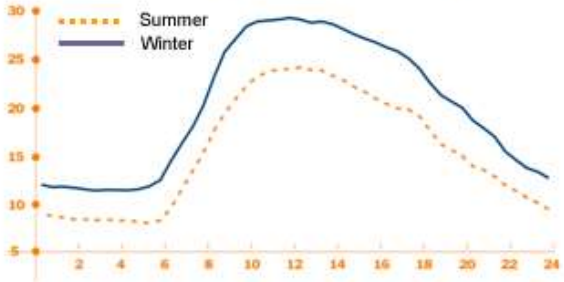
Will it change the market for energy purchase (dynamic pricing)?

Are our civic buildings ready for the change?

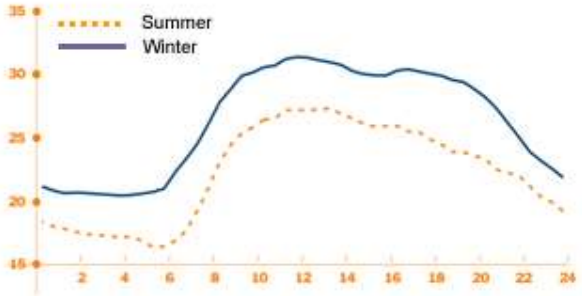
05 Non-Domestic Maximum Demand 0-20% Load Factor



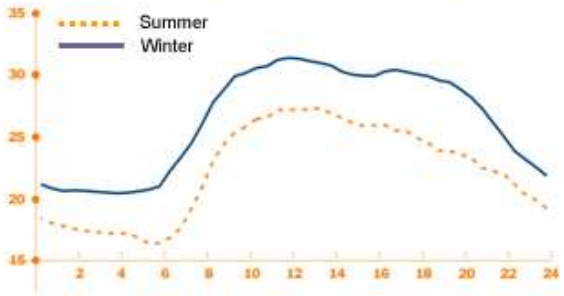
07 Non-Domestic Maximum Demand 30-40% Load Factor



06 Non-Domestic Maximum Demand 20-30% Load Factor



08 Non-Domestic Maximum Demand >40% Load Factor



Demand Aggregation

- Demand aggregation – control multiple buildings at once
- Align multiple buildings with single energy contract – flatten the contract – save on energy tariffs
- Third party management of energy intensive equipment

QUESTIONS:

Do civic buildings lend themselves to aggregation for management and energy contracts ?

Energy Purchase

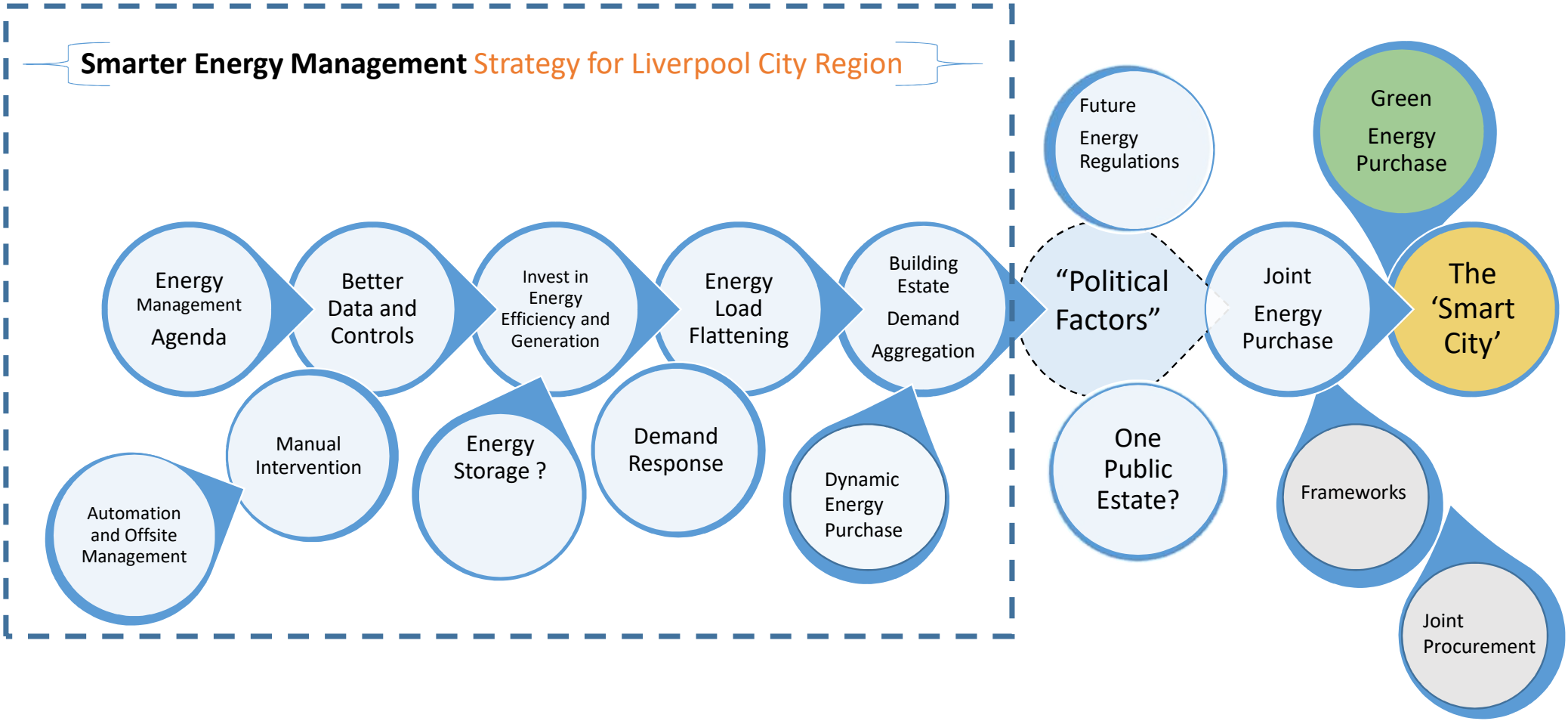
- Wide variation in approach across the city region (Brokerage / Contract Length / Frameworks /)
- Public Sector Procurement – In dynamic pricing future - contracts belong with the Energy Manager not centrally departments?
- Providers can pay for upgrades (EPC model)
- Energy purchase is not a priority of Senior Managers at a time of cheap energy costs.

QUESTIONS:

Should we seek single contract for a single building estate?

Can we procure cheaper energy if we have better contracts?

A route to Smarter Cities…



Liverpool City Region - Joint Projects

Sensor City – ERDF Funded Research Venture

European Union
European Regional Development Fund

- Low Carbon ERDF Funding
  - **OPEN CALL until October 2016**
  - £1M minimum project value
  - No single stakeholder has a project this larger
- Horizon 2020 Funding for Smart Cities
- **<u>A Consortia approach to attract funding</u>**
  - Separate projects into a programme
  - Paperwork Co-ordinated by a regional body

A Regional Programme – Possible Example ?

Central
Programme
Management

Funding Application /
Recipient of funds

Reporting and monitoring /
Carbon Accounting / ERDF Process
---
1 No. Staff as go-between /
coordinator

Independent projects under a shared programme
Shared objectives
Separate project scope / contracts and suppliers

Project 1: Local Authority
All buildings into single monitoring system with automated controls

Project 2: Hospital
New Build Site adds state of the art environmental sensors 'extra over' mandatory design requirements

Project 3: Transport Authority
Energy Display linked to solar and storage at Bus Depots

Project 4: University Research
Experts in Sensors review project delivery and outcomes as part of PHD.

Shared city region Energy Management objectives

Normal Practice

- Invest-to-save
- Calculate payback
- Better Data and Processes

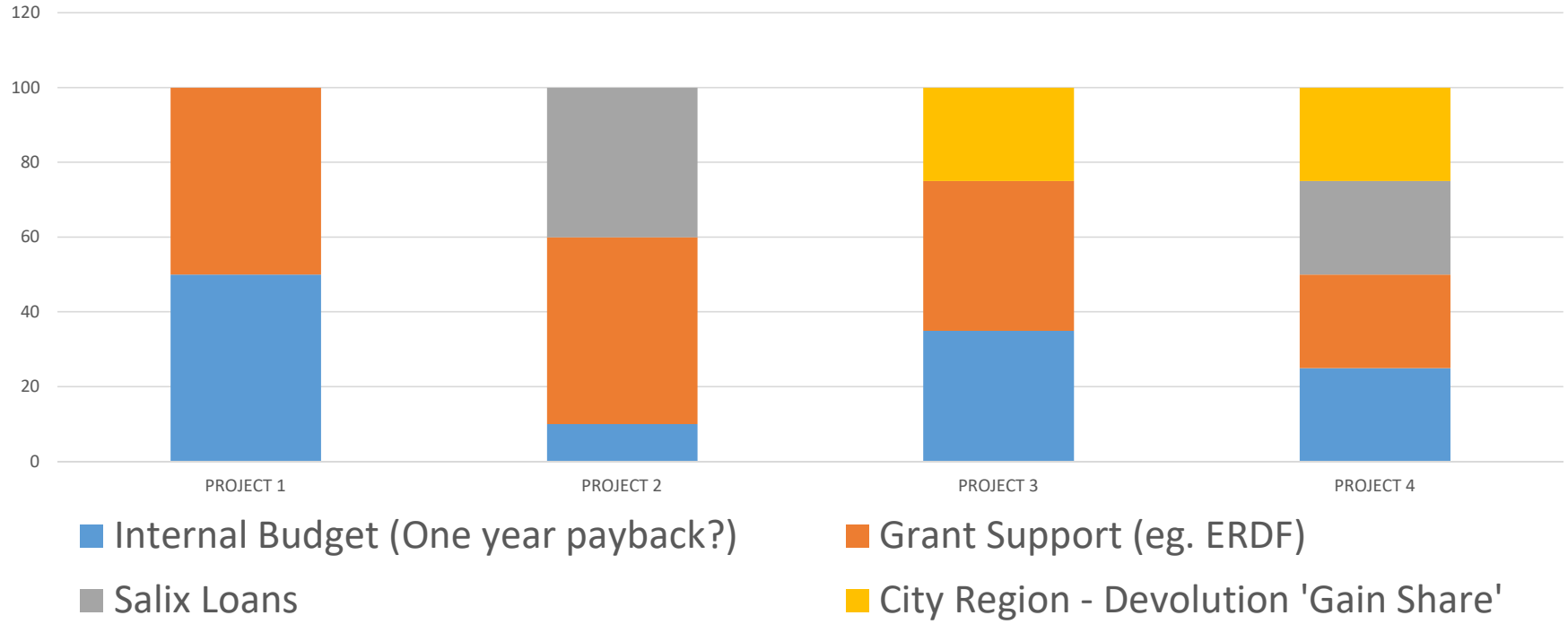
- Energy Hierarchy (lean, clean, green)
- Holistic Approach to decisions
- Energy Management Strategies

To Scale Up and to access funding…

- Demonstrate innovation
- Trial Technologies
- Modified payback periods
- Drive Efficiencies & Economies

- Align with the Smart Cities Agenda
- Work with surrounding buildings
- Joint Working across region
- Centralise paperwork and loans?

Funding Cocktails?



SALIX

- **£295M in this parliament**
- Public Sector Energy Efficiency
- Invest to save loans
- Standard: Payback < 5years + Carbon Savings
- Bespoke: Other options can be discussed..
- Option to discuss: Regional devolved SALIX recycling fund?

DEBATE – SUPPLY SIDE

- Kiwi Power
- Utilities Purchasing Group
- Scotia Energy
- AA Projects

KiWiPOWER
demand management

Energy demand management
A Brief Introduction to KiWi Power

KiWiPOWER
demand management

KiWi Power : Delivery

KiWiPOWER
demand management

Retail	Commercial operations	Public sector	Hospitality	Utilities and more...
MARKS & SPENCER	TATA STEEL	NHS	Park Plaza	United Utilities
Sainsbury's	Trinity Mirror plc	Crown Commercial Service Supplier	Marriott	sembcorp bournemouth water
ocado	Time Inc UK		Hilton	COMMERZBANK

What is Demand Side Response

- Demand response is used by National Grid to help balance the electricity system and reduce electricity consumption at peak times

How we work:

- Number of framework agreements in place with National Grid and strong relationships with DNO's
- Provide I&C & Public Sector clients access to DSR
- Aggregate these loads, package & sell these MW's into the various National Grid balancing markets
- In return clients receive revenue
  - 1 MW load reduction/generator could achieve a benefit of income and savings of £60,000 - £120,000 per annum

What we do:

- Start generating assets and reduce load/consumption to respond to:-
  - Short term demand spikes
  - System Frequency
  - Capacity Market Security
- End to end project management, defensively engineered, automated & robust
- Broad sector experience
- Public bodies - CCS Framework Agreement

Why We are Here

As experienced option energy traders and asset optimisers, we:

- Understand the financial value of flexible generation and demand;
- Have a proprietary trading framework where we can work with some end customers allow them to receive an income, within their existing supply arrangements for flexible generation and/or demand.
- We are also working with our strategic energy partner to enable customers to consume when prices are negative and sell back to us when prices are high
- We can provide market access under our “new generation agreement” which is asset optimised by us for up to 15 years.

If you have power consumption we:

- Make use of 4th generation analysis to predict power prices on a short term basis;
- We have sophisticated battery strategy optimisation processes which support the long term trading & optimisation of some customers;
- Our framework is risk controlled so much that we work to very small risk measures;
- Our trading platform can make 20mn calculations per second to we can trade flexible generation and consumption down to the half hourly level and the meter point;
- While we import the customer’s data, we check the 3rd party charges and metering data to highlight the mistakes on the bill, enabling bill validation with the supplier within 3 seconds

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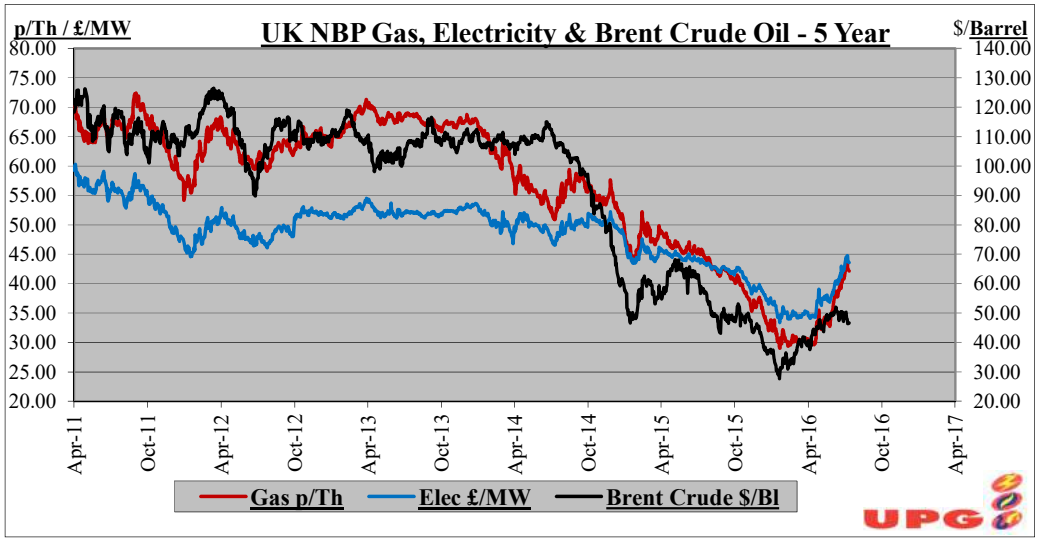
0207 871 3064

The Utilities Procurement Group Limited

Introduction

- UPG are a specialist Energy Consultancy.
- We have significant experience in both private and public sector procurement.
- We understand the energy challenges facing organisations in the current market.
- We strive to provide the best possible value and service.
- Other services UPG offer include Energy Monitoring/Reporting, Market Intelligence to inform purchase timing, Metering Changes/Upgrades, Fixed / Energy Only Pass Through / Flexible Purchasing, Load Advice, Supplier Liaison & Bill Validation.



- STOD Pricing (Seasonal Time of Day) matched to unique load shapes.
- P272 – Mandatory NHH to Half Hourly upgrades for 05-08 profile classes.
- Current Market Position, Drivers and Future Market Direction.
- Load Management and Demand Side Response – DUoS & TNUoS.

Questions – Session 2

1. Does Energy Management come into play when purchasing Energy?

2. What are the industry trends we should be aware of?

3. How can I improve procurement of energy contracts?

4. Can I store or demand manage my energy to flatten my energy profile?

5. Audience Questions

Smarter Energy Management
Next Steps

- Today's slides will be circulated to all attendees

- Building operators – **expression of engagement** –
  - Have you identified projects to improve energy management?
  - Do they require additional funding outside of normal budgets?
  - Is there an appetite for coming into a regional programme?

- Suppliers – Your contact details circulated to attendees

THANK YOU FOR JOINING US TODAY

Liverpool City Region
Local Enterprise Partnership