

Apse Energy Event – Newcastle City Council Energy Systems Catapult & The Smart Systems and Heat Programme.

CATAPULT
Energy Systems



David Lynch
Smart Systems & Heat - Regional Development Lead

Overview of presentation

- Introduction to ESC
- Overview of SSH Phase 2 Programme
- Opportunities and challenges for heat decarbonisation
- Heat as a service concepts

Overview



Our purpose is to ‘unleash’ opportunities of low carbon energy transition for UK – supporting UK economic growth, building and leveraging assets and capabilities that the UK lacks today.

We aim to accelerate the energy transition by sharing expertise and building capacity at local, city, national and international levels

- **Established April 2015; Currently ~ 160 employees across range of specialist disciplines**
- **Core funding from InnovateUK to develop capabilities for use by 3rd parties**
- **Non-profit and institutionally independent**
- **Innovation hub established in Birmingham**
- **Working across whole sector: power, heat, transport, industry and energy infrastructure**
- **Whole systems approach informs the capabilities we are building and our skills**

Portfolio of Assets and Capabilities

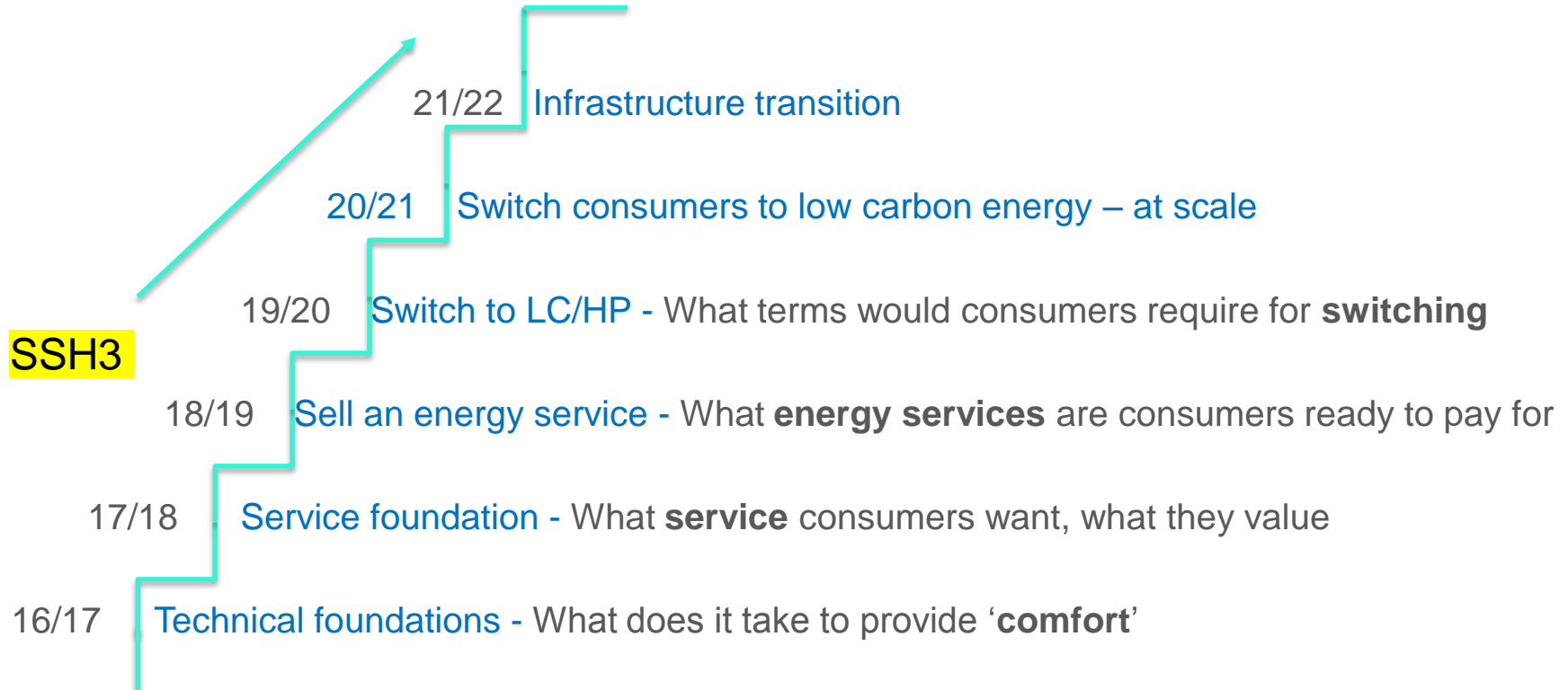
| Modelling | Consumer Insight | Digital | Systems Integration | Infrastructure & Engineering |
|--|---|--|---|---|
| <ul style="list-style-type: none">▪ National Energy System Modelling – ESME▪ Storage & Flexibility Modelling – SFM▪ Local Energy System Modelling – EPN▪ Building Energy System Modelling – IEHeat | <ul style="list-style-type: none">▪ Panel▪ Design – User Experience and Service▪ Trials▪ Heat as a Service▪ Domestic Energy Segmentation▪ Fair Future | <ul style="list-style-type: none">▪ Home Energy Services Gateway (HESG)▪ Living Lab▪ Data Science▪ Data Systems▪ Energy Knowledge Exchange | <ul style="list-style-type: none">▪ Systems Engineering▪ Integration▪ Architecture▪ Energy System Simulation – EPO▪ Business Models▪ Energy System Integration Guidelines (ESIG)▪ Future Power System Architecture (FPSA)▪ Utility 2050 | <ul style="list-style-type: none">• Bioenergy• CCS, Industry and Hydrogen• Infrastructure and Energy Storage• Nuclear• Renewables• Transport |

Challenges

- Current energy transformation “owned” by consumers (vs industry)
- Resistance to change:
 - Lack of knowledge / Fear of unknown
 - Installation pain / risk
 - Investment cost & no obvious return on investment for consumers
 - Enforcing policies would be terribly unpopular
- New technologies weaknesses:
 - Alternatives not readily available – plumbers only propose boilers
 - Heat pumps slower and take up more space
 - DHN offer less “freedom” to consumers to switch

- Incumbent technology weakness
 - Unfriendly user interfaces
 - **Kwh – language and semantics not well understood**
 - Costs unpredictable
 - **Poor temperature control**
 - House vs rooms
 - Reprogramming needed when the external temperature changes
- **Consumers willing to buy a service**
 - Examples: Optic fibre & Telephone, Pay TV, Car leasing
- Other markets showed path to decarbonisation led by industrials
 - Example: Automotive

SSH 2 Roadmap



SSH Phase 2: Aims

SSH Phase 2 Development builds on SSH1 to **engage Energy Service Providers** and support development of **new service offering** which will facilitate the **transition to low-carbon domestic heat** across the UK.

SSH Phase 2 has delivered, **a living lab** allowing industrial partners to understand the needs of **energy consumers** in order to **develop and evaluate new service offerings**, as well as developing an understanding of the related **policy implications**.

SSH Phase 2: Deliverables

- Developed the software and hardware for HESG research platform, capable of collecting the data Energy Service Provider's (ESPs) need to design and test domestic consumer energy services
- Field Trial: test the research platform in 100+ houses to collect data and consumer insights that will enable a potential ESP to design domestic consumer energy services – **55 here in Newcastle**

Consumers have little interest in how heat is produced
...they care about the experiences energy affords.

Pleasant air quality **Feeling in control** Quiet, especially at night

No damp build-up

Quick heat-up on-demand

Resilient to wear-and-tear

Home cool when/ where wanted



Minimum use of space in the home

Foreseeable running costs

Pleasant aesthetics

Minimise upfront capital outlay

Home warm when/ where wanted

Avoiding exposure to energy price volatility

SSH Concept

Sell a Service: “Heat as a Service” (vs kWh)

- Provide a level of comfort for a price
 - Based on smart systems offering a high level of service
 - Temperature control
 - Zonal / Schedule
 - Taking into account Building Physics & Consumer Behaviour
 - Cost control
 - Can be “all inclusive” (maintenance, installation...)
 - User interface
 - Adapted to consumer profile (detailed control vs simplicity)
 - Smartphone / Tablets / Laptop...
- Energy transformation owned by Provider (ESP)
 - Outcome controlled by Consumer

Change **target warmth** in Lounge (Weekdays)

(Currently scheduled target: 16-18°C)

| | | | | |
|---------|-----------------|-----------------|-----------------|-----------------|
| Standby | -2°C 14-16°C | -1°C 15-17°C | +1°C 17-19°C | +2°C 18-20°C |
|---------|-----------------|-----------------|-----------------|-----------------|

For 1 hour

Just this once

Heating in Lounge will be increased by 2°C for 1 hour, just this once

Estimated cost increase per day **£5.00**

CANCEL APPLY

Heating Event already running

Change **target warmth** in Main Bedroom (Weekdays)

(Currently scheduled target: Standby)

| | | |
|---------|---------|---------|
| 16-18°C | 19-21°C | 22-24°C |
|---------|---------|---------|

Room in Standby

SSH Concept – Impact for consumers

Sell a Service: “Heat as a Service” (vs kWh)

- Right temperature when and where wanted
- Understand cost
 - Where is the money spent?
- Allows cost reduction and/or comfort improvement – consumer’s choice
- No unexpected bill (e.g. boiler replacement or repair)
- Choice of user interface: simple or detailed level of control
- Potential of new services / offering
 - Example: all inclusive, packages (elec + heat + wifi + storage...)

SSH Concept – Impact for industry

Sell a Service: “Heat as a Service” (vs kWh)

- Energy providers “master of their destiny”
 - Evolve from ‘margin model’ to ‘low-carbon services’
 - Secure return on investment
- Control of energy demand
 - Allows leverage of energy production => reduces investment for peak demand
- Possibility for new service offerings
 - Example: electric car charging, storage
 - **‘Energy as a service’...**

SSH Concept – Impact for Government & Local Authorities

Sell a Service: “Heat as a Service” (vs kWh)

- Planning with the industry (vs consumer)
- Policies agreed with the industry
 - **Facilitating vs enforcing**
- Cost of transition reduced
- Supply and DNO regulatory frameworks still to be confirmed
- Potential for new revenue streams

What next...

- Delivery of Smart Energy Plan – End of October 2018
- Development of projects to support priority themes identified within the plan:
 - Hybridisation
 - Development of district heat networks
 - Development of commercial business models and consumer propositions
 - Research and analysis to inform decarbonisation of heat

If you have any queries, please contact



David Lynch

Smart Systems and Heat - Regional Development Lead

David.lynch@es.catapult.org.uk

For further information about the catapult please visit:

<https://es.catapult.org.uk/>

GIVE EKX a TRY! – A free knowledge exchange service for energy innovators.

