

# EAUC – SUSTAINABLE CONSTRUCTION TSN October 2020

# BUILDING CAPACITY FOR LOW CARBON INNOVATION IN CONSTRUCTION AND THE BUILT ENVIRONMENT



Head of Energy & Utilities University of Edinburgh



# **Our Context:**

- $\circ~$  Approaching 1,000,000  $m^2~GIA$
- o 6 main campuses
- o 5 heat & power networks
- o >500 properties
- National research computing infrastructure
- o >£20M p.a. utility spend



# **Zero by 2040**

The University of Edinburgh has committed to 'net zero' carbon by 2040.

This includes an ambition for zero emissions from heat and power.



# **Energy Masterplan**

## 'Right Size' Buildings & Services

- Evaluate space use and efficiency
- Evaluate service provision, function and risks
- Enable shared services and flexible use of space

## **Enable 'Deep' Energy Efficiency**

- Eliminate energy waste
- Minimise heat and power demands
- Invest in appropriate dynamic HVAC control
- Enable continuous commissioning / IoT analytics
- Plan for effective building fabric upgrades
- Plan for upgraded building heat emitters

## **Exemplary Construction Standards**

- Step change in quality and performance standards
- Certified 'Passive' new build and refurbishment
- Re-design of our process/project management guidelines
- Emphasis on digital tools (digital twins)

### Low Temperature Heat Networks

- Hydraulic modelling / network digital twins / IoT analytics
- Transition away from gas fired CHP
- Next generation operating temperatures (50/30°C)
- Future proof buildings (see deep efficiency)
- Future proof energy centres (heat pump / hydrogen)
- Local heat sources (sewer / aquafers / ground / air)

## **Enable 'Smart Energy' Research Hubs**

- Campus as a 'Living Lab' for technology and digital tools.
- Energy centres as teaching, learning and research space
- Smart local grid opportunities



# What is our project about?

- 1. Targeting systemic challenges to achieving low carbon construction
- 2. Developing skills, knowledge and awareness with industry partners.
- 3. Piloting advanced analytics and digital tools on new and existing properties
- 4. Disseminate learning



# Outputs

- Early engagement with construction partners outside tender / contract
- Capability and capacity improvements
- Re-prioritised objectives, design guidelines and strategies
- Improved contracting and delivery processed

- Enhanced specification for building performance monitoring
- Pilot digital tools and advanced analytics



# **Digital Tools & Advanced Analytics**

# 1. Dynamic Thermal Modelling

- Design Development
- Calibrated Digital Twin (In Use)

# 2. Continuous Commissioning

- o BMS data
- Space utilization data
- Energy data
- **3. Hydraulic Models of Heat Networks** 
  - Design Optimization
  - Calibrated Digital Twin
  - Continuous Commissioning / IoT analytics

Influencing the world since 1583

IoT / Analytics

























▼ Portfolio 1 ALARMS Rolex, Netherland Active Unacknowledged (5) JFK Airport Active Acknowledged (5) Boston Aquariun Zurich Airport Harvard ALARM TEXT-This is ▶ Yale CLIENT 1 2019-01-21 051215 Chiller No 2 Fault Alarm - Contact PB Helpdesk Rolex, Netherlands Boston One Campus Von Hyperberginstien 2 2019-01-21 05:12:15 Chiller No 2 Fault Alarm - Contact PB Helpdesk. STATISTICS Rolex. Netherlands Open > 4 Hours Open: 1 2019-01-21 05:12:15 Acknowledged: Chiller No 2 Fault Alarm - Contact PB Helpdesk. Total Alarms: 20 Rolex, Netherlands 1,290 Boston One Campus Von Hyperberginstien Avg. Time to Acknowle 00:01:12 33 23:45:17

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#### **Energy Dashboard**

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### **DEAN DROBOT**

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