Modelling Beyond Compliance

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Energy Modelling - RIBA Stages
Design Energy Modelling

Desktop Virtual Environment (IES-VE)

- Building Design
- BIM
- M&E / HVAC / Energy
- Code Compliance (Part L2 + EPC)
Operational Energy Modelling

- Operational Energy
- Utility Metering
- ESCo Services
- BMS Analytics
- Building Tuning
- Big Data
Beyond Compliance

- CIBSE TM54
- Government Soft Landings (GSL)
- Post Occupancy Evaluation (POE)
- Monitoring Based Commissioning (MBCx)
- Measurement & Verification (M&V)
Data Driven – Continuous Improvement

CONTINUOUS IMPROVEMENT

DATA DRIVEN

- TM54
- GSL
- POE
- MBCx
- M&V

Beyond Compliance
WHY DO WE FALL OVER AT HANDOVER?
When Modelling Paths Diverge
Calculations for Building Regulations code compliance are commonly mistaken for predictions of in-use energy.

- Design assumptions out of touch with in-use performance
NCM vs Real Energy Use

Annual Energy Consumption

(Pie chart including Equipment end-use)

E 10%
L 25%
H 58%
HW 2%
A 2%
C 4%

CIBSE Energy Performance Group

@CIBSEepg
NCM vs Real HVAC Systems
HVAC – Waterside Loop Configuration
Virtual Sub-Metering

- Understand the Electrical Distribution Board (DB) strategy
- Develop the Sub-Meter hierarchy within the Energy Model
- Assign Lighting/Power/HVAC energy components to associated sub-meter
- Simulate and interrogate results at Sub-Meter level
Freeform Profiles

- Zone lighting profile applying NCM
- Zone lighting profile from Sub-Metering

- It’s about capturing diversity
Proxy Modelling Methods

- Hybrid between MS Excel calculations and Dynamic Thermal Simulation (DSM)
- A powerful solution for TM-54 Analysis
- Integrates with Smart Building data streams
- Geometry not required!
Operational Modelling in Practice
Riverside Museum, Glasgow

Metered Energy Use x4-5 higher than EPC
Riverside Museum, Glasgow
National Library of Scotland, Edinburgh

Energy Performance Certificate
Scotland

Address 1, Address 2, Address 3, City, Postcode

Date of assessment: 01 Apr 2008
Date of certificate: 27 Apr 2012
Total conditioned area: 14325.4 m²
Primary energy indicator: 292 kWh/m²

Building Energy Performance Rating

Excellent

Carbon Neutral
A (0 to 15)
B (16 to 30)
C (31 to 45)
D (46 to 60)
E (61 to 80)
F (81 to 100)
G (100+)

Recommendations for the cost-effective improvement of energy performance

1. Add local time control to heating system.
2. Consider switching from gas to biomass.
3. Consider installing building mounted wind turbine(s).
4. Consider installing PV.

THIS PAGE IS THE ENERGY PERFORMANCE CERTIFICATE, WHICH MUST BE ATTACHED TO THE BUILDING AND NOT BE REMOVED UNLESS REPLACED WITH AN UPDATED CERTIFICATE.
National Library of Scotland, Edinburgh

- AMR: 1,176,680 kWh
- Sub-metered: 657,160 kWh
  - Lighting: 137,900 kWh
  - Power: 130,520 kWh
  - Ventilation: 112,360 kWh
  - Essential: 104,310 kWh
  - Humidifiers: 760 kWh
  - Vent + Power (Combined): 28,850 kWh
  - Data Room: 141,930 kWh
  - Kitchen: 530 kWh

- Not sub-metered: 519,520 kWh

- Power
- Humidifiers
- Ventilation
- Vent + Power (Combined)
- Not Sub-metered

- Lighting: 12%
- Essential: 10%
- Data Room: 9%
- Kitchen: 11%
- Power: 44%
- Ventilation: 12%
- Vent + Power (Combined): 2%
ESFA Schools, London | Bowmer + Kirkland
ESFA Schools, London – Enhanced Model Method

Step 1: Operational Data
Collected from Existing
Building systems e.g. AMR &
BMS infrastructure

Step 2: Data analysis
techniques used to filter
data and extract value

Step 3: Energy Modelling
team use operational
data to refine and
enhance model inputs

Step 4: Accuracy of Energy predictions output
from Energy Model are increased, leading to
greater certainty and risk mitigation

@CIBSEepg
ESFA Schools, London - Classroom Overheating Checks
Modelling Beyond Compliance?
Thank you!

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