



PERFORMER

Portable, Exhaustive, Reliable, Flexible and Optimized
appRoach to Monitoring and Evaluation of building
eneRgy performance

Sep 2013 – Aug 2017

Energy Innovation Cardiff
19th October 2016
SSE Swalec Stadium Cardiff



Our Business



smsplc



Connections Management

Gas Connections
Electricity Connections
Major Projects
Estate & Wayleaves
Design
Embedded Generation



Metering & Data

Domestic
Gas I&C
Electricity I&C
Electricity Data Management
Gas & Water Data Management



Energy Management

Utility Bureau
Bill Validation
Recoveries
Energy & Environmental
Management

Project Partners



SMS PLC is the project coordinator, managing the work of 13 partners from four countries.

Industry	Research	Building Operators
SMS PLC (UK) Dragados (Spain) Euroconsult (Spain) St-Gobain (France) ASM (Poland)	CSTB (France) CEA (France) Cardiff University (UK) BRE Wales (UK)	Engie (France) Cardiff Council (UK) Iberostar (Spain) Sea Developments (Poland).

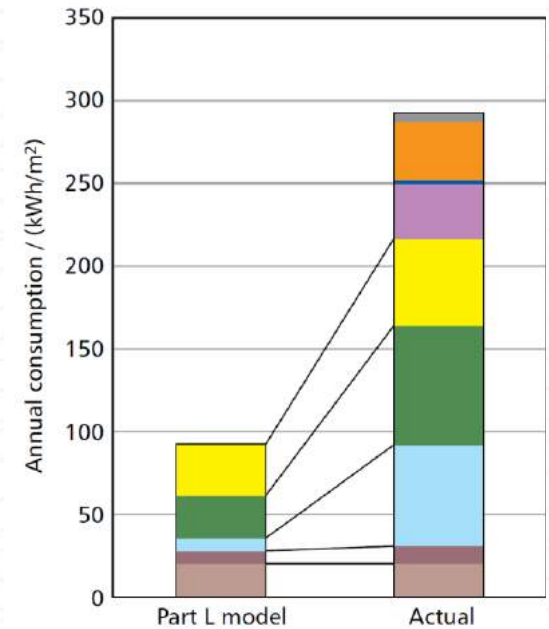


Project Context

The Problem

There is a significant gap between the predicted energy demand of buildings and their real operational energy performance. Causes of this performance gap include:

- **Understanding** prediction model scope and assumptions. Does it include small power?
- **Commissioning and maintenance** are inadequate to ensure buildings and their equipment operate efficiently.
- **Modelling capability** – modellers do not have adequate information and methodologies for simulating patterns of real operation.



PERFORMER Pilot Sites



Baltic Plaza Hotel, Poland



Hotel de las Letras, Spain



St Teilo's High School, Cardiff



WOOPA, France

PERFORMER Pilot Sites



Site	Hotel de las Letras	WOOPA	St Teilo's High School	Baltic Plaza Hotel
Description	Luxury hotel Madrid, Spain	Office Lyon, France	Secondary School Cardiff, UK	Apartment Hotel Kolobrzeg, Poland
Size	109 rooms 6 storeys 7,896 m ²	500 occupants 7 storeys 11,000 m ²	1,382 students 12,724 m ²	8,536 m ² 78 suites
Age	1917 (built) 2005 (refurb as hotel)	2011	2013	2011
Energy pa	€130,000 143 kWh/m ² Elec 124 kWh/m ² gas	€33,000 32 kWh/m ² Elec 49 kWh/m ² veg oil 2 kWh/m ² biomass 24 kWh/m ² p.a. PV	€140,000* 60 kWh/m ² Elec 41 kWh/m ² Heat *Elec & Gas only	€108,000 Elec 77 kWh/m ² Elec 121 kWh/m ² gas
Building Services	Gas boilers solar hot water Room Fan Coils Room VRFs Central AHU	Veg Oil CHP Biomass Boilers 128 kWp Solar PV Ground water cooling	Biomass boiler Gas boilers Nat Vent & MVHR VRF Air Con in IT suite 50 kWp Solar PV	Gas boilers Roof top Chillers Central AHUs Room Fan Coils
Other details	7 x Jacuzzis Bar & Restaurant	Net zero energy design	Underfloor heating Ceiling radiant panels	Swimming pool Bar & Restaurant

Project Objective

The Solution

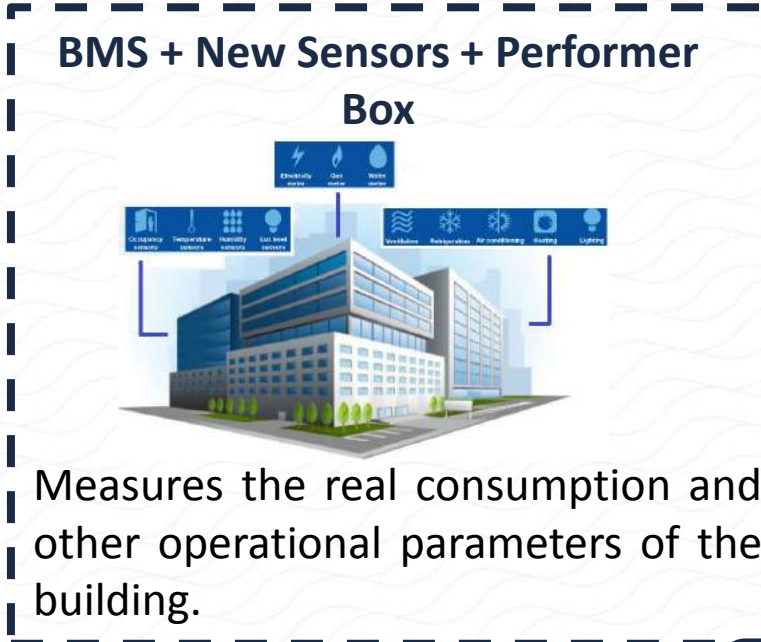
Address the building energy performance gap by developing a system to enable dialogue between building management systems and energy performance models.

A **query engine** compares information (e.g. temperatures and energy demand) from the building management system (BMS) with the predictions of the model. It will then act on this information by:

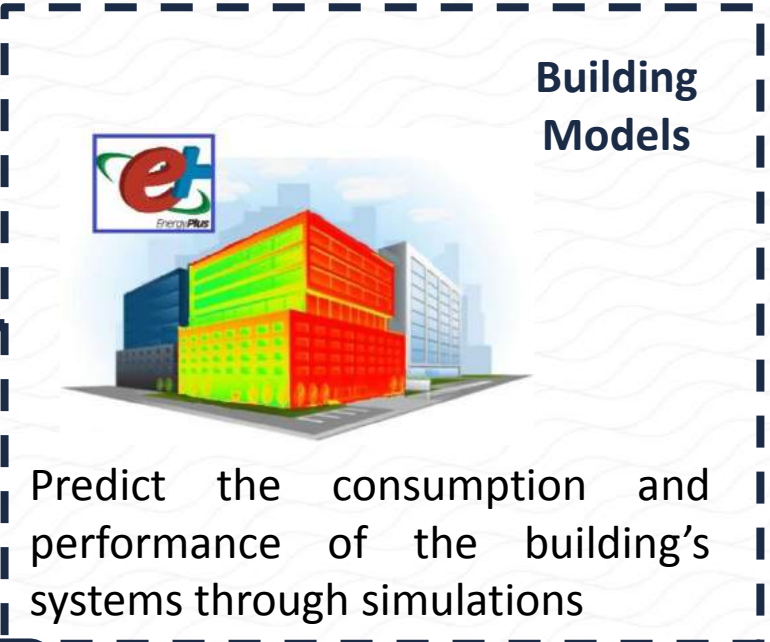
- **Providing Expert Reports** to enable the building operator the investigate causes of poor energy performance.
- **Provide inputs to enable optimisation of the BMS**

It is intended to be a **P**ortable, **E**xhaustive, **R**eliable, **F**lexible and **O**ptimized appRoach to **M**onitoring and **E**valuation of building eneRgy performance (PERFORMER).

PERFORMER has also enabled learning among participants, support advice to building operators and optimise operational systems in the 4 case study sites.



Performance Data



PERFORMER Data Warehouse

PERFORMER Modelling

PERFORMER Smart Analytics, FDD & Expert Rules

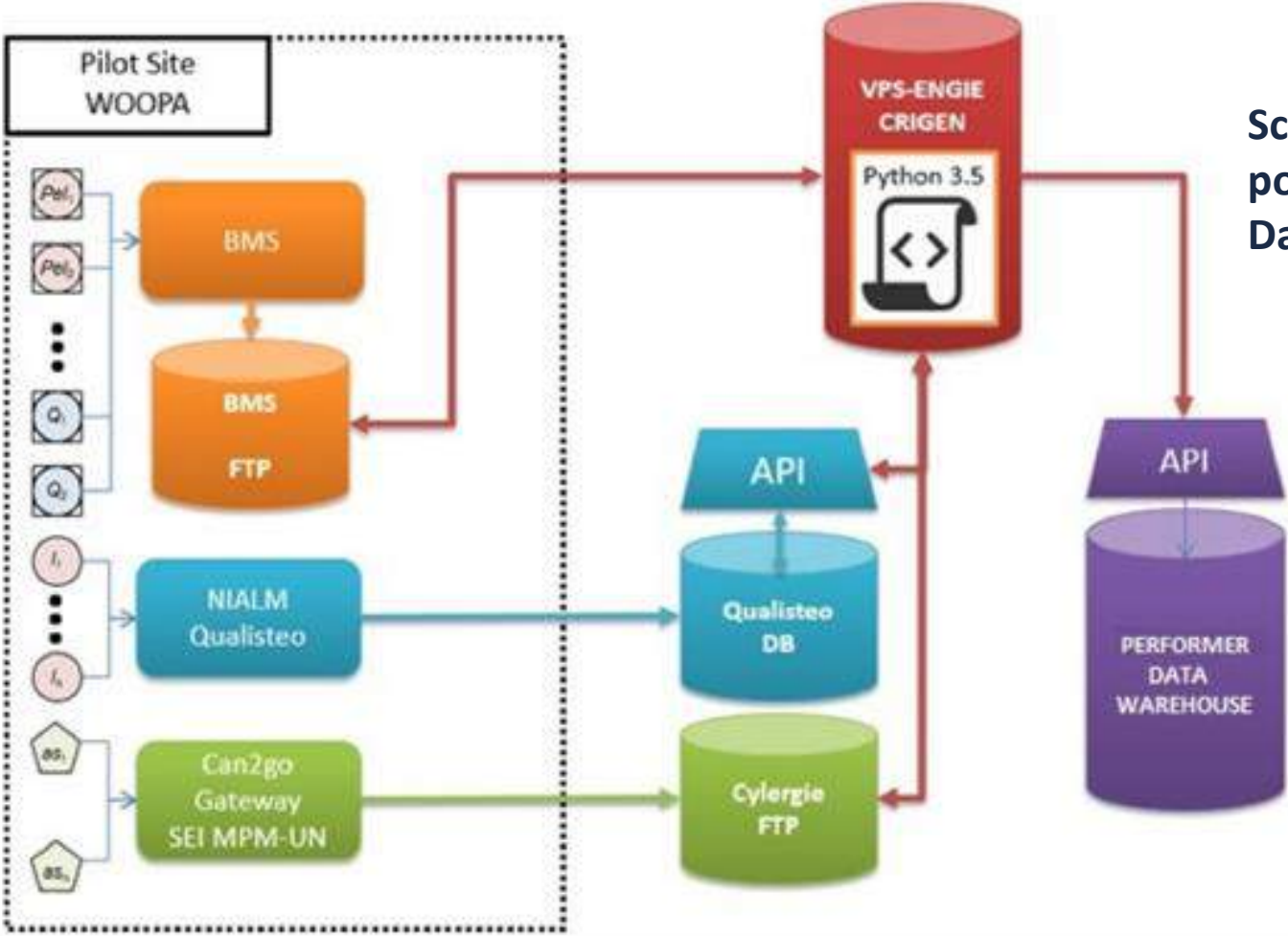
Investigation and Correction

Expert Reports

Direct parameter changes (e.g. weather)

Assumption changes

PERFORMER: Data Acquisition



Script gathers data and posts it to PERFORMER Data Warehouse

PERFORMER Data Analysis

Data acquired from sites used to model the following at each Pilot Site

Site	Modelled Data
Hotel de las Letras	Energy use by zone. E.g. Bedrooms, gym, restaurant, meeting rooms
WOOPA	Temperature, humidity, energy use & water use PV system output using temp, wind speed & RH
St Teilo's High School	Space temperature & room CO2 levels PV system output and site energy use
Baltic Plaza	Energy use by site and main HVAC systems Space temperature

Smart Analytics, Expert Rules & FDD Modules

Model outputs and actual data analysed in Smart Analytics & FDD modules. Inputs generated for Expert Rules modules to provide feedback on building energy performance to end user / building operator

Potential Markets

- Building Types
 - Offices
 - Hotels
 - Hospitals
 - Shopping Centres
 - Educational Buildings
 - Sports and cultural centres
 - Shops
 - Light Industrial
 - Communal Housing
- Owners / managers of large commercial estates:
 - Local Government
 - NHS
 - Private Healthcare
 - Commercial Landlords
 - Retail Chains
 - MOD
 - Leisure sector
 - Facilities Management providers

Learning points & results

- Extracting data from existing BMS is time consuming and complex
- Replicable scripts developed for extracting and transmitting building data from market leading BMS (Trend & Siemens)
- Accurate modelling requires additional sensor installations (sub-meters, environmental sensors)
- Data from 4 remote sites being successfully collected daily and stored in web accessible PERFORMER Data Warehouse
- Software created to model multiple building characteristics and expected performance based on historic data collected from PERFORMER Pilot Sites
- Smart Analytics, Expert Rules and Fault Detection & Diagnosis modules developed to provide automatic guidance on variation from expected performance.
- In depth experience gained in deployment of new building sensors and data collection components
- Skills, experience & knowledge retained within Welsh businesses and public sector for future deployment within wider Welsh & UK economy