Gaming the Refurbishment of a Hospital District using EU Streamer methods

The Rotherham NHS
NHS Foundation Trust

AEC 3

SUSTAINABLE PLACES 2017
JUNE 28 – 30, 2017
MIDDLESBROUGH, UK

Gaming Energy Refurbishment

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Streamer
European research on energy-efficient healthcare districts

EU STREAMER GOALS

Main aim: 50% reduced energy use and CO_2 emission of healthcare districts in 10 years

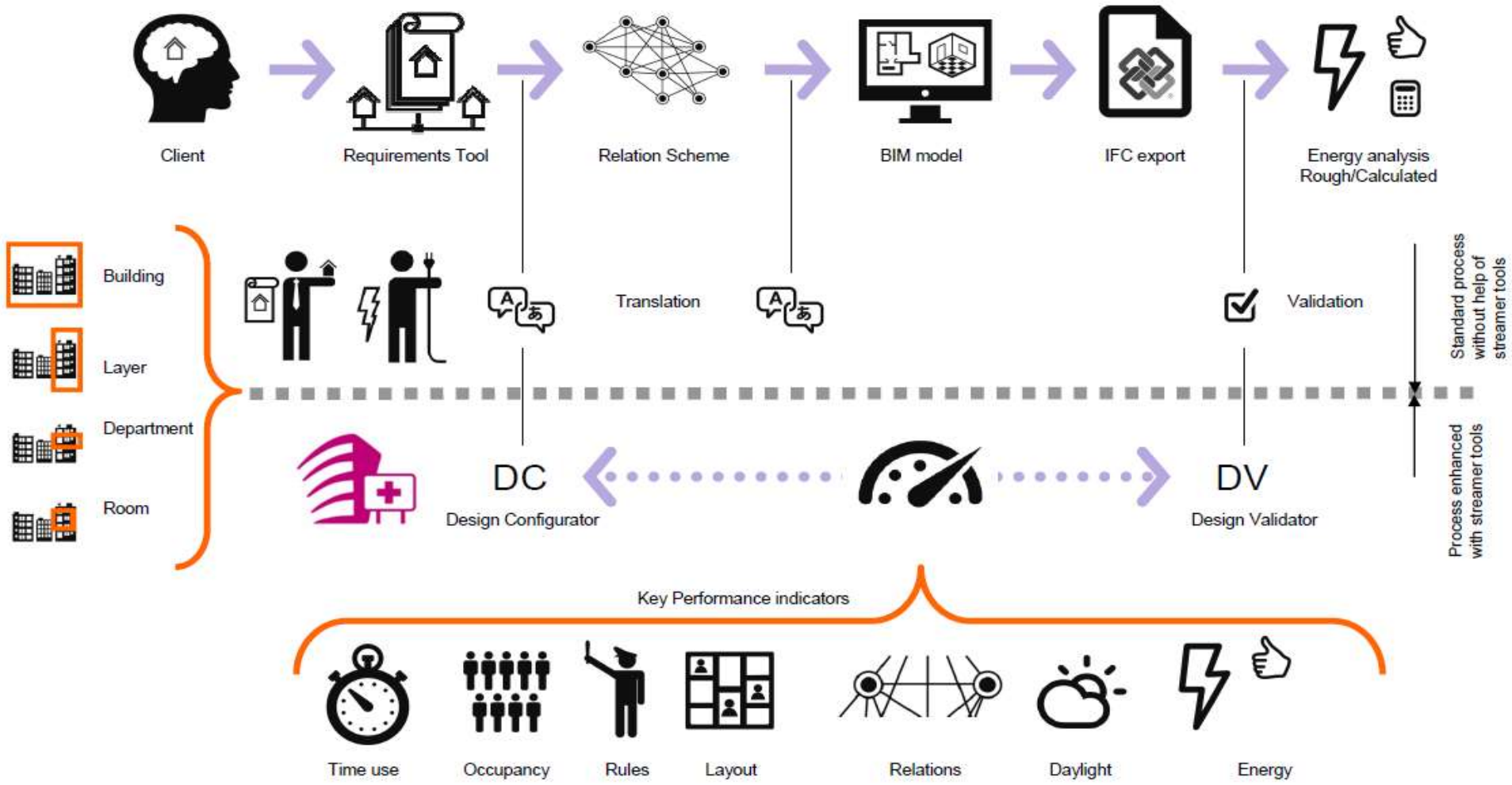
Achievements:

- Create generic semantic BIM+GIS typology models of Energy-efficient Buildings in healthcare districts
- Create a framework for BEM (Building Energy Model) lifecycle model inter-connecting BIM, BAM, BOOM
- Create a design decision-support tool as an interactive tool which accommodates: BIM+GIS models; KPIs for energy, life-cycle cost, fuctional quality; and stakeholder requirements

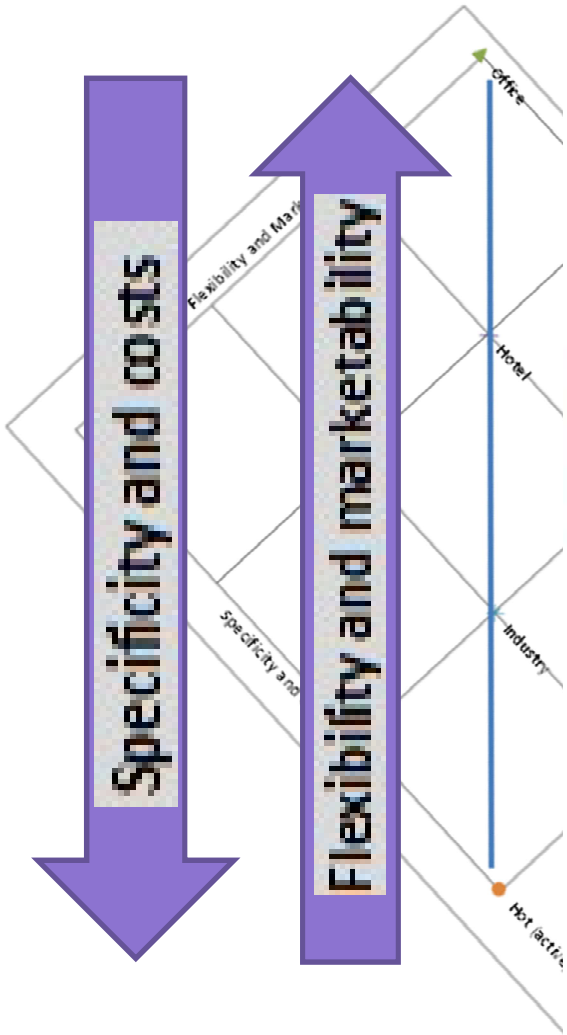
EU STREAMER OUTPUTS

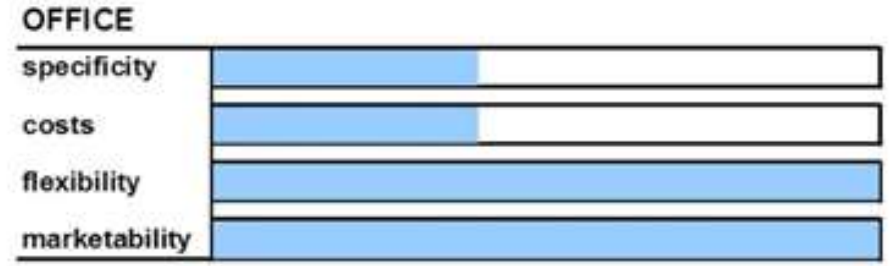
- Semantic labelling methodology
- KPI tools (energy – quality – cost)
- *Design configurator – design validator*
- *Design rules (rooms – MEP – façade technology)*
- Data requirements checking
- Participatory design process
- Dashboard (decision support tool)

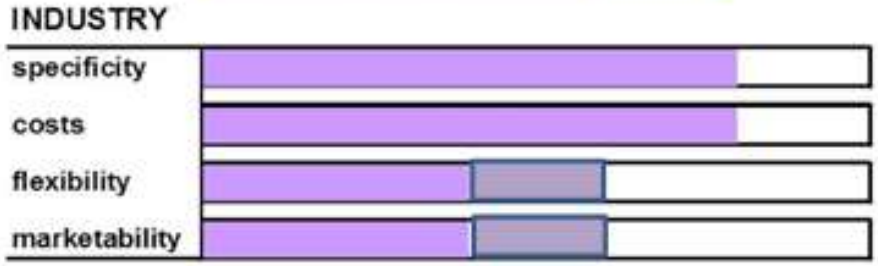
EU STREAMER DESIGN PROCESS



EU STREAMER labelling

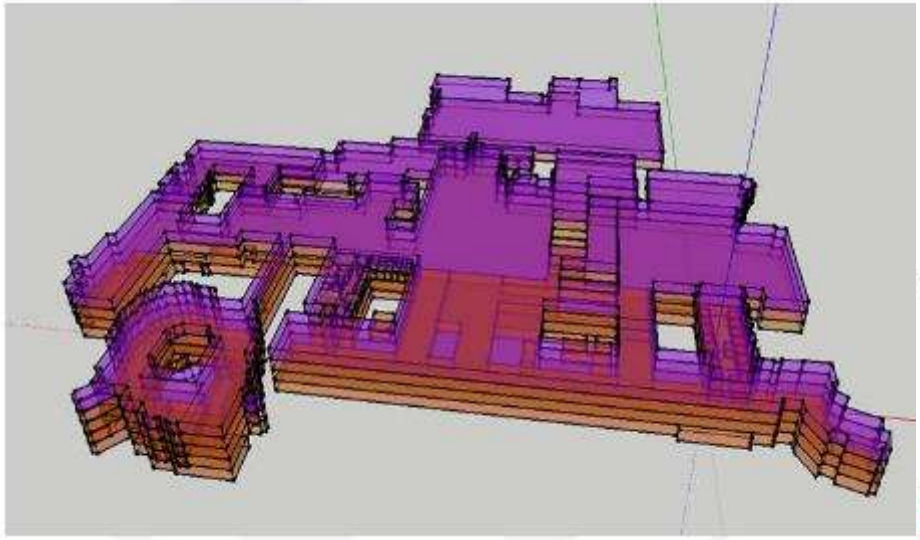


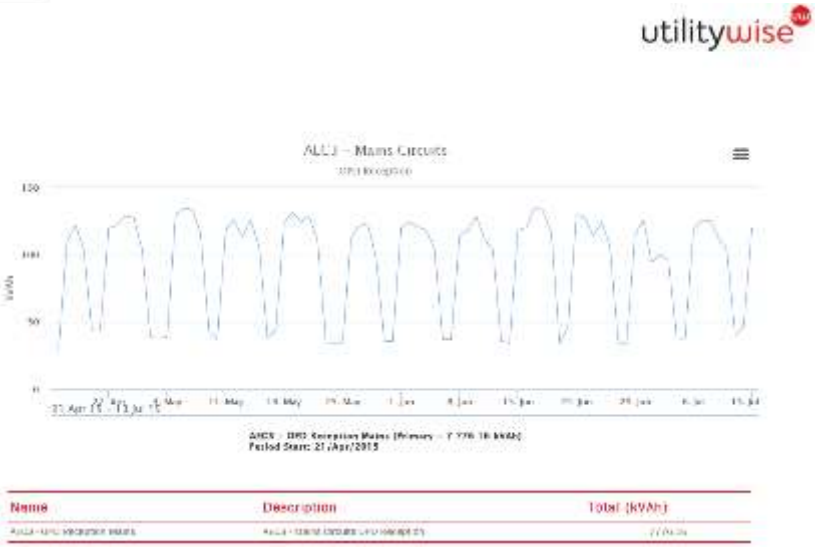




Introduction

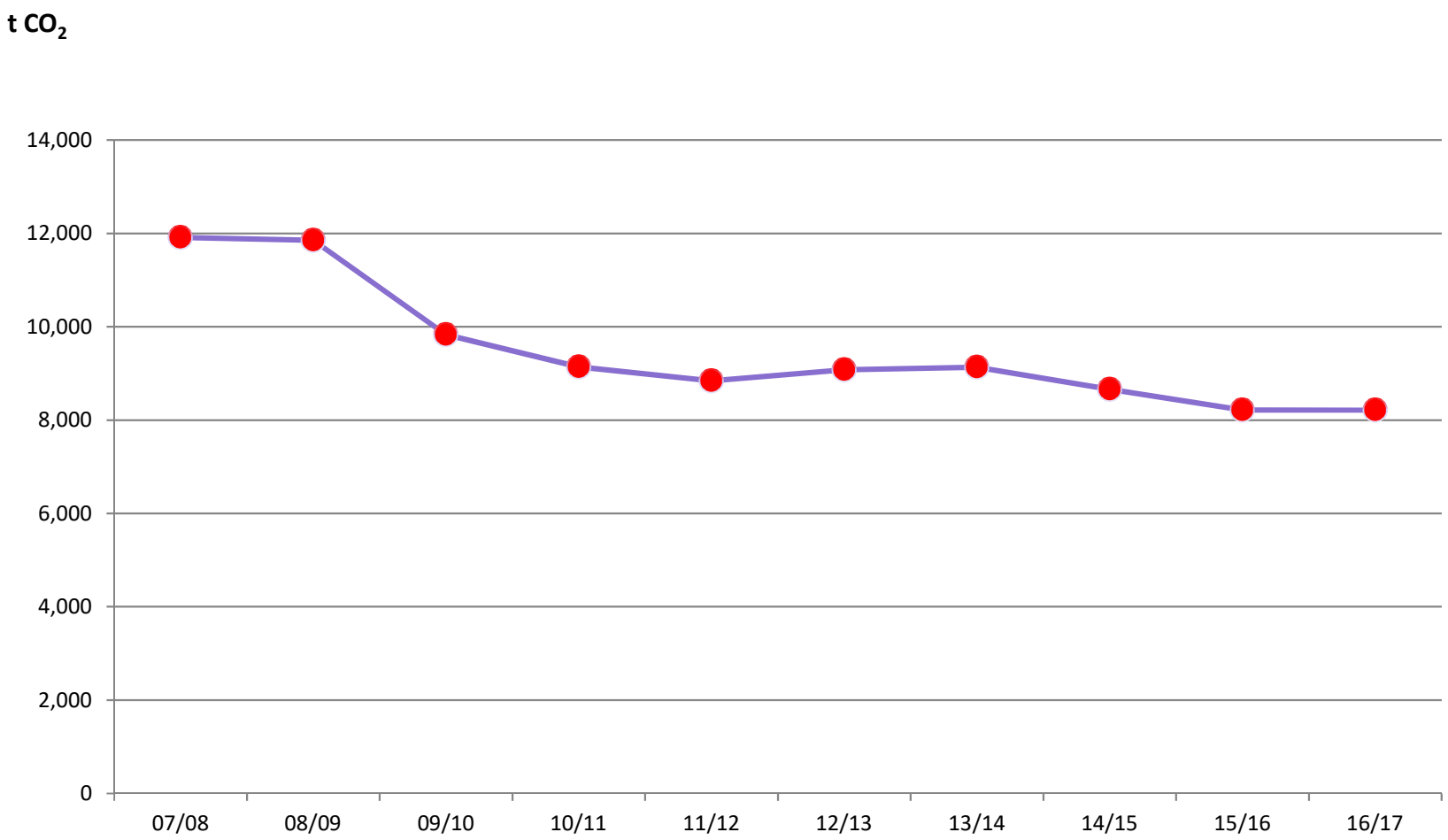
- TRF has been reducing its energy bill for a decade
- TRF is currently obtaining electrical and thermal data for the test areas on a monthly basis





- Atttention is now focussing on more local and specific refurbishment and upgrades

Progressive improvement



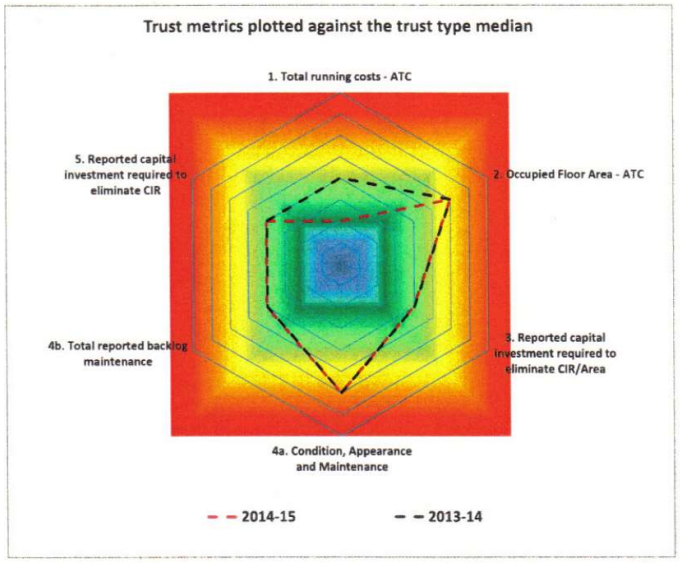
NHS ESTATES AND FACILITIES DASHBOARD 2014-15

CODE	RFR	TRUST NAME	THE ROTHERHAM NHS FOUNDATION TRUST

TRUST OVERVIEW

Organisation type	ACUTE - MEDIUM
Commissioning region	NORTH OF ENGLAND

		2014-15	2013-14
Total occupied floor area	m2	77,404	76,998
Total estates and facilities running costs	£	14,653,529	16,404,280
Potential total E & F running cost saving by moving to the trust type median	£	0	0
Potential targeted E & F running cost savings from individual cost elements	£	127,976	551,916
Potential cost savings from improved utilisation of space	£	To be confirmed	
% of occupied floor area operated under a PFI contract	%	0%	not collected
% of occupied floor area under direct NHS management	%	100%	not collected
E & F running cost of floor area operated under a PFI contract	£/m2	0.00	not collected
E & F running cost of floor area under direct NHS management	£/m2	189.31	not collected

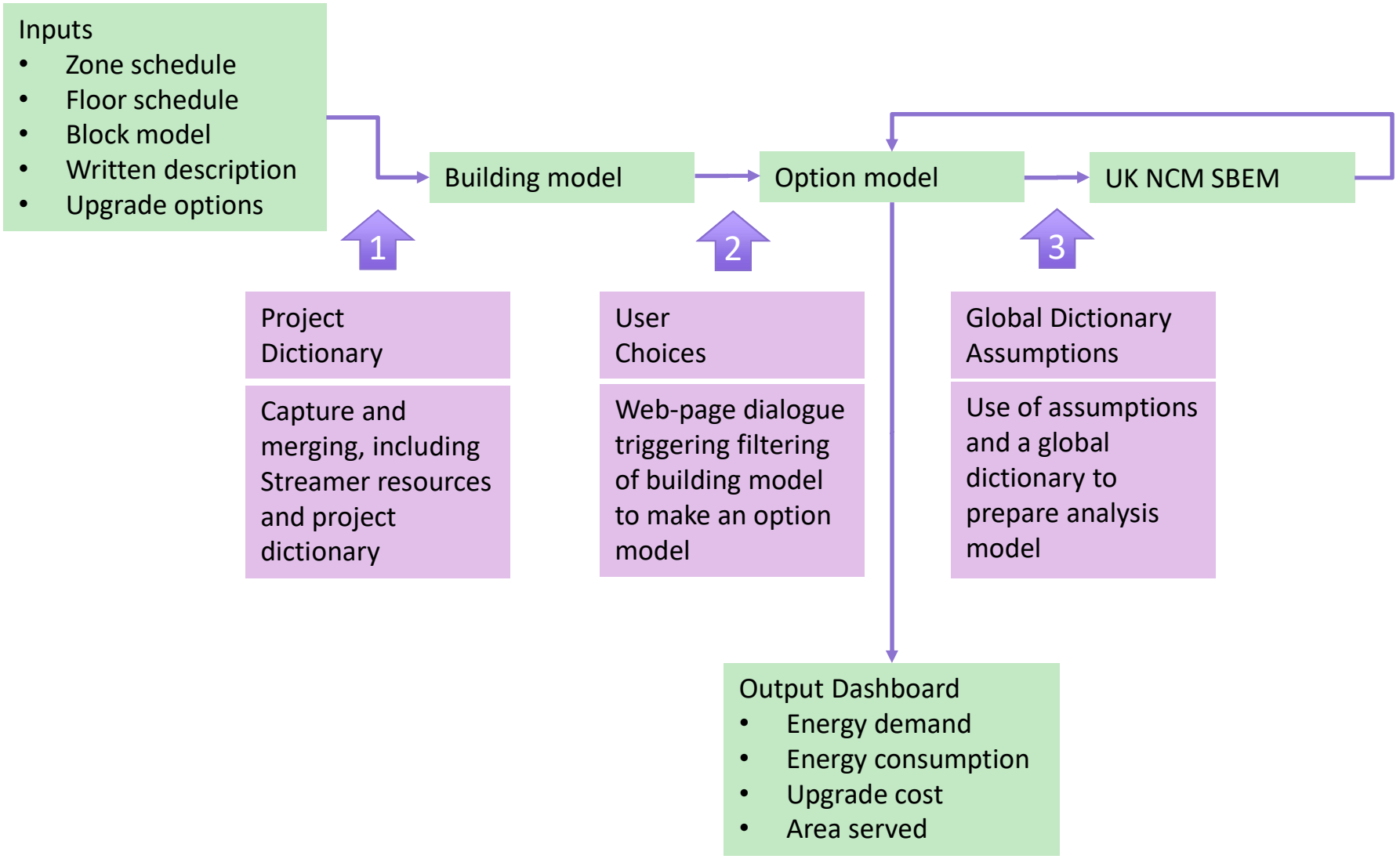


METRICS SCORING METHODOLOGY	
Quartile 1	Blue
Quartile 2	Green
Quartile 3	Amber
Quartile 4	Red

METRICS SOURCED FROM NATIONAL DATA

		TRUST METRIC 2014-15	Trend	TRUST METRIC 2013-14	2014-15 QUARTILES FOR ACUTE - MEDIUM Lowest	Lower Quartile	Median	Upper Quartile	Highest
Domain 1 - Efficiency - Cost									
Total estates and facilities running costs / ATC	£ 1,000 / ATC	62.56	↓	64.76	45.17	68.55	94.68	119.54	243.59
Total estates and facilities running costs / area	£ / m2	189.31	↓	213.05	115.44	210.60	301.16	396.09	678.81
Total Hard Facilities Management costs	£ 1,000 / ATC	23.68	↓	27.27	6.76	17.80	23.70	30.69	59.12
Energy costs	£ / Units	0.04	→	0.04	0.03	0.05	0.06	0.07	0.11
Building and engineering maintenance costs	£ / m2	13.60	↓	36.87	0.00	22.73	27.25	36.17	63.70
Portering	£ / m2	12.22	n/a	not collected	6.31	12.47	14.81	17.87	24.13
Water and sewage costs	£ / m2	3.48	↑	3.26	1.10	2.87	3.48	4.33	7.86
Waste costs	£ / tonnes	245.63	↑	242.07	62.99	203.43	227.09	288.26	640.98
Total Soft Facilities Management costs	£ 1,000 / ATC	32.78	↑	27.52	9.20	30.85	39.10	48.15	72.52
Laundry and linen costs	£ / item	0.38	↑	0.35	0.16	0.29	0.31	0.43	4.87
Food costs	£ / meal	3.18	↑	2.99	2.10	3.17	3.92	4.83	11.20
Cleaning costs	£ / m2	36.85	↑	35.47	14.40	31.26	39.50	45.70	89.27
Domain 2 - Effectiveness - Produ									
Occupied Floor Area - ATC	1,000 m2 / ATC	0.33	↑	0.30	0.18	0.26	0.31	0.38	0.51
Amount of utilised space	%	97.2%	↑	96.8%	63.8%	96.2%	97.9%	99.9%	100.0%
Amount of non-clinical space	%	34.2%	↑	34.0%	17.2%	34.3%	41.1%	45.7%	52.8%
Total income earned per area	£ / m2	3.138	↑	3.055	1,917	2,592	2,974	3,443	5,127
Estates and facilities staff sickness absence rate	%	5.2%	→	5.2%	0.0%	4.5%	5.2%	6.1%	7.4%
Amount of energy used	Units / m2	498.96	↓	569.81	242.39	372.29	464.01	525.36	828.42
Portering	Beds/WTE	13.70	n/a	not collected	5.66	8.88	11.24	14.08	19.43
Waste - ATC	ATC ratio*	4.78	↑	4.05	2.52	4.33	4.77	5.71	10.95
Laundry and linen - ATC	ATC ratio*	7.33	↑	6.10	1.71	8.22	8.87	10.45	14.95
Food service productivity	Meals / Beds / Day	3.03	↓	3.28	0.44	2.02	2.68	2.96	4.09
Cleaning productivity	m2/WTE	648	↓	668	405	530	624	735	928
Domain 3 - Safety									
Reported Critical Infrastructure Risk (CIR)/Area	£/m2	55.89	↑	51.39	0.00	12.84	79.22	155.84	429.36
Reported Critical Infrastructure Risk	£	4,325,835	↑	3,956,586	0	1,762,705	6,847,959	13,741,583	36,475,939
Fires recorded	No.	2	↓	3	0	0	2	3	21
False Alarms	No.	48	↓	66	10	50	68	82	161
Number of people injured resulting from fire(s)	No.	0	→	0	0	0	0	0	1
Number of patients sustaining injuries requiring evacuation	No.	0	→	0	0	0	0	0	0
Domain 4a - Quality - Patient Environment									
Condition, Appearance and Maintenance	%	85.10%	↓	91.08%	77.07%	82.80%	89.08%	94.01%	99.56%
Cleanliness	%	96.63%	↑	94.84%	90.64%	95.24%	97.60%	99.11%	100.00%
Food	%	80.20%	↓	83.28%	77.71%	84.52%	87.61%	91.18%	96.87%
Privacy, Dignity, Wellbeing	%	76.01%	↓	82.71%	75.36%	81.83%	85.71%	89.10%	98.24%
Condition, Appearance and Maintenance	%	85.10%	↓	91.08%	77.07%	82.80%	89.08%	94.01%	99.56%
Dementia	%	59.72%	n/a	not collected	49.31%	66.79%	72.64%	81.28%	92.04%
Domain 4b - Quality - Infrastructure									
Total reported backlog maintenance	£/m2	79.35	↓	96.01	0.00	70.28	211.19	340.56	581.65
Amount of functionally suitable space	%	99.11%	↑	99.08%	44.05%	89.53%	99.04%	100.00%	100.00%
Single bedded rooms	%	24.4%	↓	28.9%	11.6%	20.0%	22.2%	27.7%	53.3%
CO2 emissions	kg/m2	96.62	↓	124.43	46.21	100.07	112.61	139.63	199.66
Domain 5 - Organisation Governance Processes									
Capital investment required to eliminate CIR	£	4,325,835	↑	3,956,586	0	1,762,705	6,847,959	13,741,583	36,475,939
Capital investment required to eliminate backlog	£	6,137,539	↓	8,627,978	0	6,443,458	19,942,998	32,994,420	59,120,000
Capital spend as % of NBV of land and buildings	%	3.8%	↑	0.7%	0.1%	2.0%	3.8%	5.5%	36.0%
Retail Income	£/m2	405.66	n/a	not collected	0.00	180.58	405.66	874.69	6093.75

EU STREAMER REFURBISHMENT PROCESS



Rotherham Hospital

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- Block model
  - Blocks and floors
  - Geo-location and rotation
  - Topography
  - Map
- Departments
  - Areas and volumes
- Zone and System model
  - Two zones (OPD and WB6), spaces, floors
    - attributes
    - key groupings
  - Systems, component, type
    - fixed
    - options
- Meter model
  - systems, component, type
    - annual estimated consumption
  - served zones
    - sharing cross factors

TRF RH1 Federation

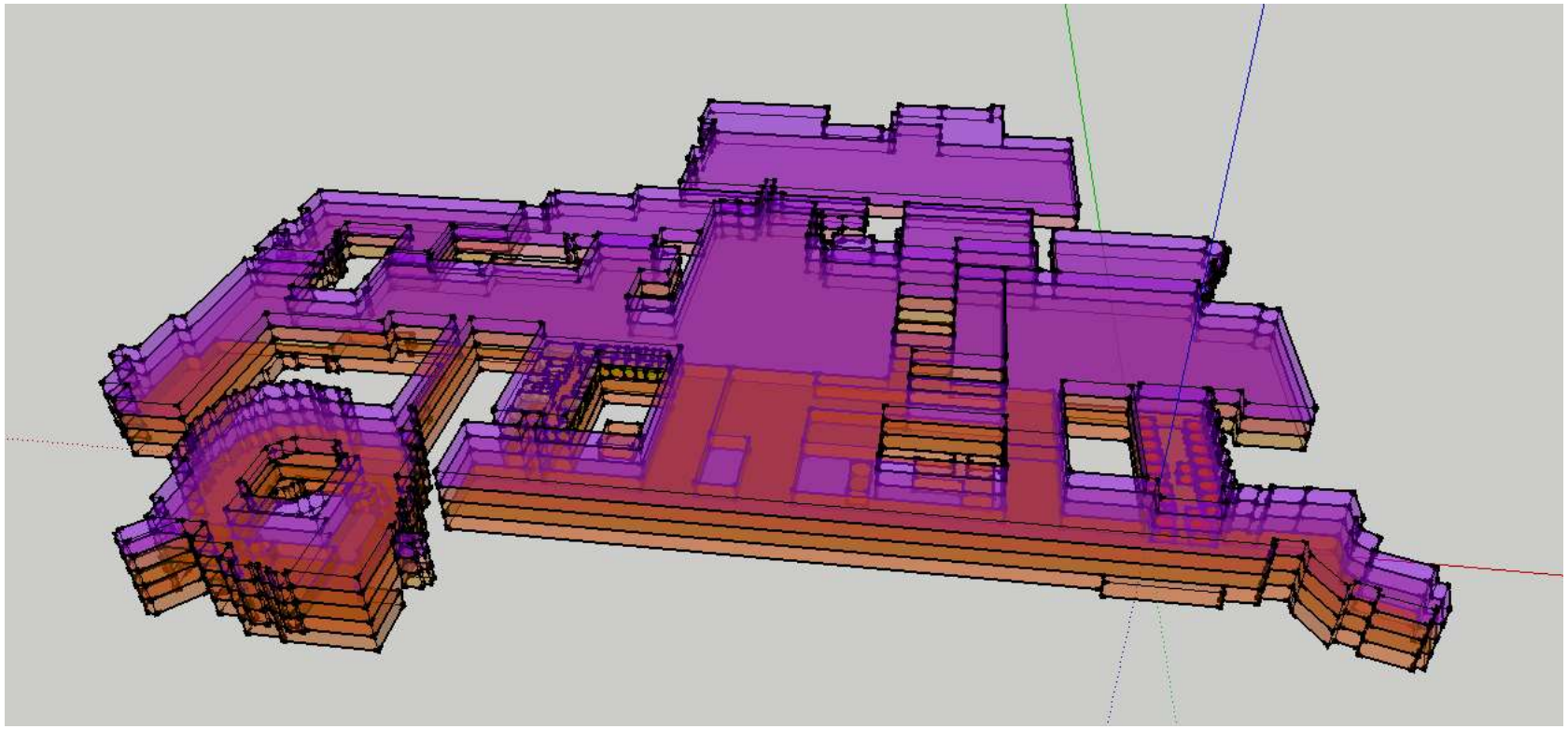
Multiple sub-models
COBie format

	A	D	E	F	G	H	I	J	K	L	M	N
1	Name	Category	ApprovalBy	Stage	SheetName	RowName	Directory	File	ExtSystem	ExtObject	ExtIdentifier	Description
2	TRF_RH1_floors	Closeout Submitt	ifcReferen	Submitted	Facility	TRF_RH1	C:\Users\nick\Documents\My Projects\EU Streamer\WP7\models\TRF_RH1_floors_floor.ifcxml	n/a	AEC3 UK B	IfcDocume	n/a	TRF_RH1_floors
3	TRF_RH1_zones	Closeout Submitt	ifcReferen	Submitted	Facility	TRF_RH1	C:\Users\nick\Documents\My Projects\EU Streamer\WP7\models\TRF_RH1_zones_zone.ifcxml	n/a	AEC3 UK B	IfcDocume	n/a	TRF_RH1_zones
4	TRF_RH1_storeys	Closeout Submitt	ifcReferen	Submitted	Facility	TRF_RH1	C:\Users\nick\Documents\My Projects\EU Streamer\WP7\models\TRF_RH1_storeys_storey.ifcxml	n/a	AEC3 UK B	IfcDocume	n/a	TRF_RH1_storeys
5	TRF_RH1_systems	Closeout Submitt	ifcReferen	Submitted	Facility	TRF_RH1	C:\Users\nick\Documents\My Projects\EU Streamer\WP7\models\TRF_RH1_systems_system.ifcxml	n/a	AEC3 UK B	IfcDocume	n/a	TRF_RH1_systems
6	TRF_RH1_massing	Closeout Submitt	ifcReferen	Submitted	Facility	TRF_RH1	C:\Users\nick\Documents\My Projects\EU Streamer\WP7\models\TRF_RH1_massing.ifcxml	n/a	AEC3 UK B	IfcDocume	n/a	TRF_RH1_massing
7												

Zone Type Component System Assembly Connection Spare Resource Job Impact **Document** Attribute Coordinate Issue

- Massing
- Departments
- Storey
- Zones and Systems
- Meters

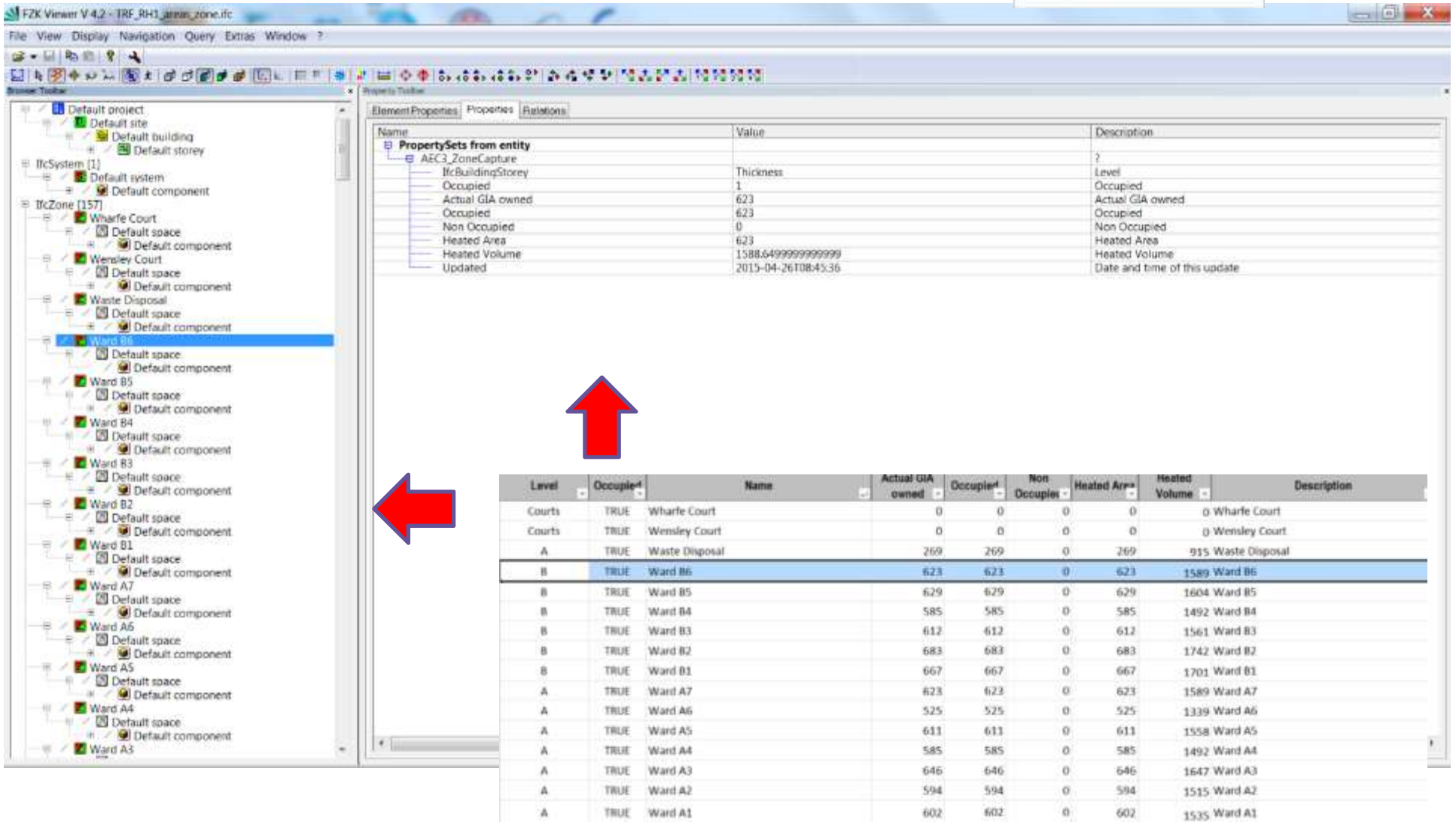
Massing



Sketchup Pro with IFC import/export

Q1 space design tool

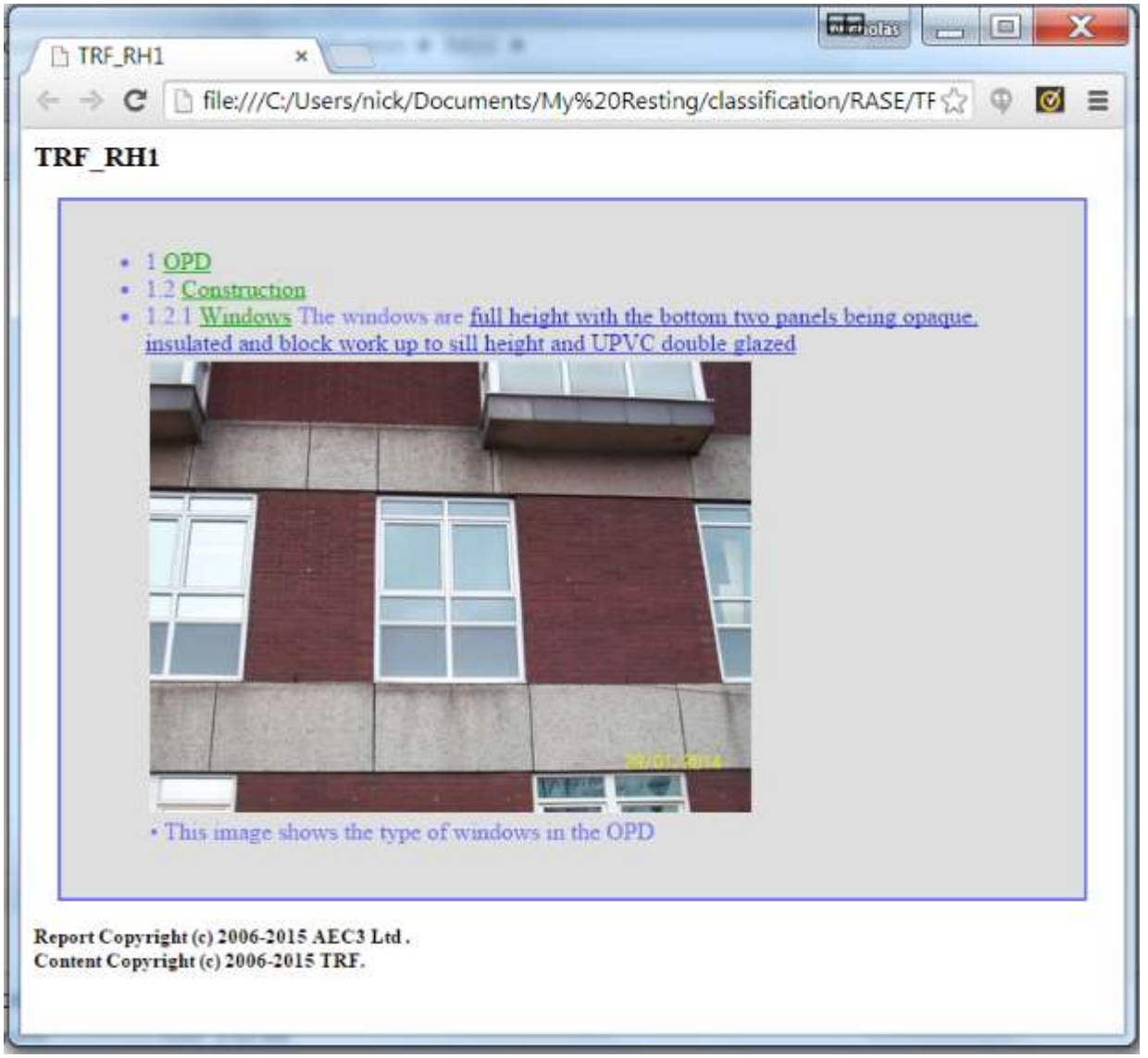
All departments



Level	Occupied	Name	Actual GIA owned	Occupied	Non Occupied	Heated Area	Heated Volume	Description
Courts	TRUE	Wharfe Court	0	0	0	0	0	Wharfe Court
Courts	TRUE	Wensley Court	0	0	0	0	0	Wensley Court
A	TRUE	Waste Disposal	269	269	0	269	915	Waste Disposal
B	TRUE	Ward B6	623	623	0	623	1589	Ward B6
B	TRUE	Ward B5	629	629	0	629	1604	Ward B5
B	TRUE	Ward B4	585	585	0	585	1492	Ward B4
B	TRUE	Ward B3	612	612	0	612	1561	Ward B3
B	TRUE	Ward B2	683	683	0	683	1742	Ward B2
B	TRUE	Ward B1	667	667	0	667	1701	Ward B1
A	TRUE	Ward A7	623	623	0	623	1589	Ward A7
A	TRUE	Ward A6	525	525	0	525	1339	Ward A6
A	TRUE	Ward A5	611	611	0	611	1558	Ward A5
A	TRUE	Ward A4	585	585	0	585	1492	Ward A4
A	TRUE	Ward A3	646	646	0	646	1647	Ward A3
A	TRUE	Ward A2	594	594	0	594	1515	Ward A2
A	TRUE	Ward A1	602	602	0	602	1535	Ward A1

TRF RH1 description

- Summary report
- Text description
- Manual markup



Out-Patients Department

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Ward B6 : Surgical Ward

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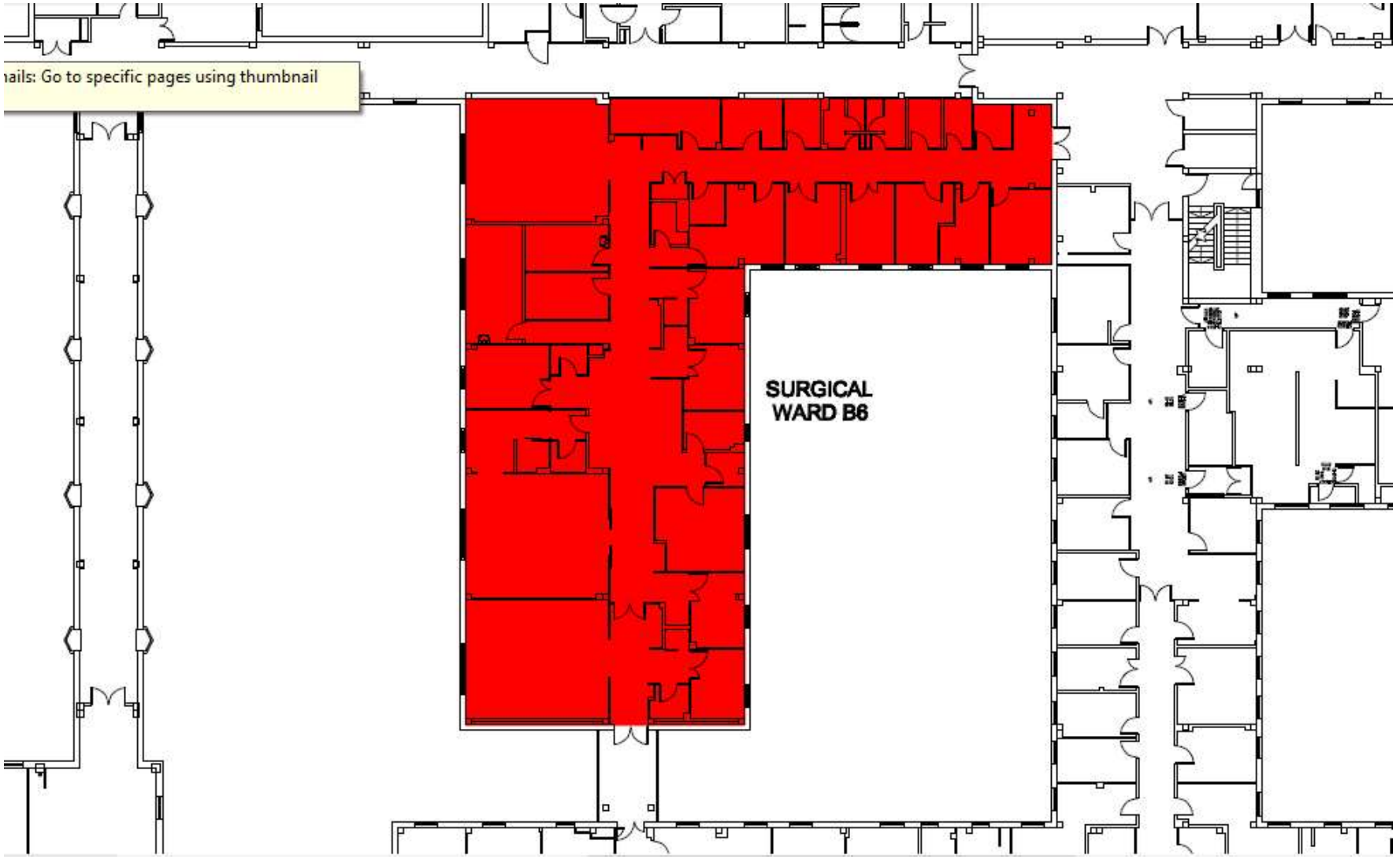
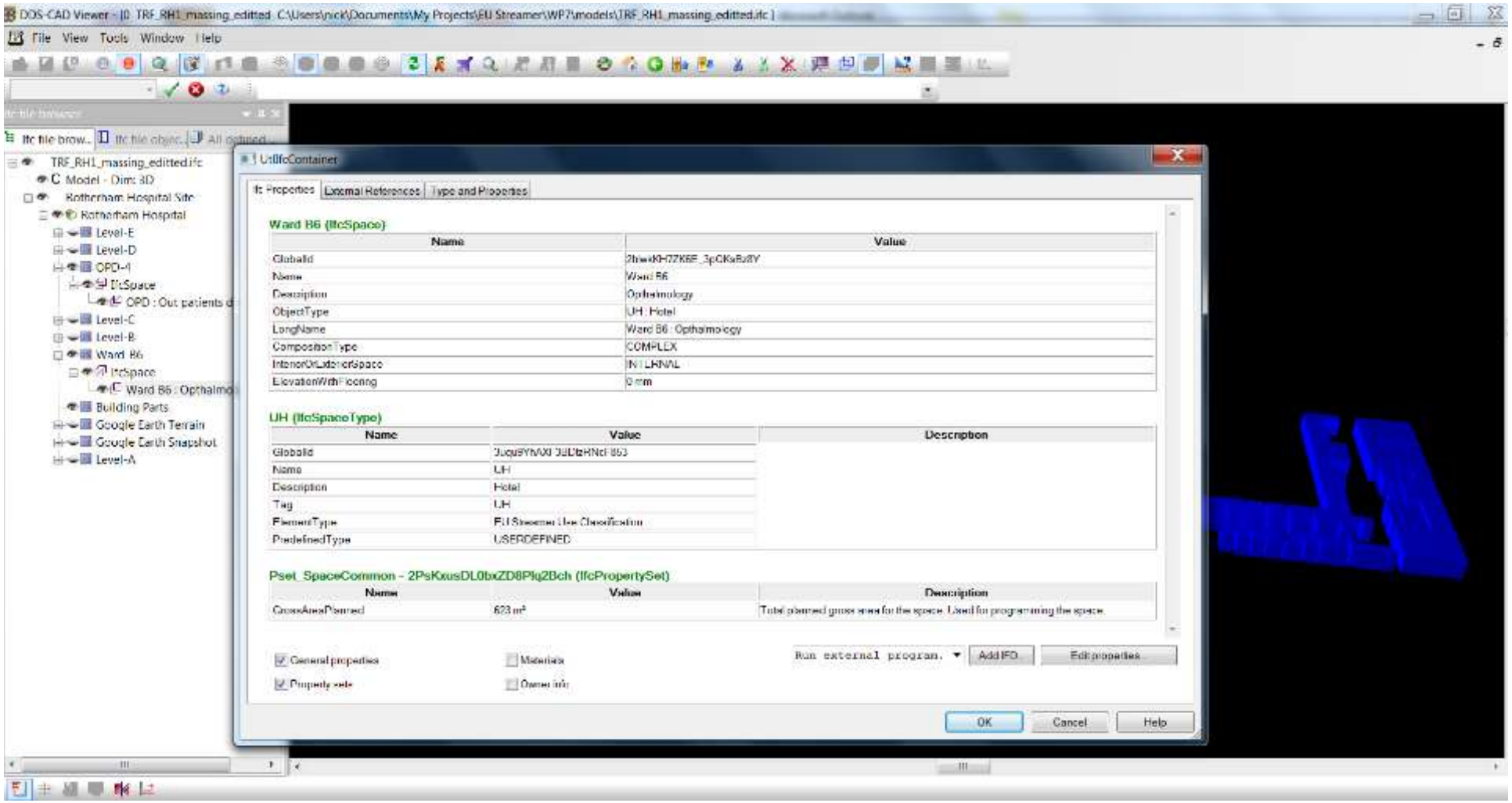
NHS Foundation Trust

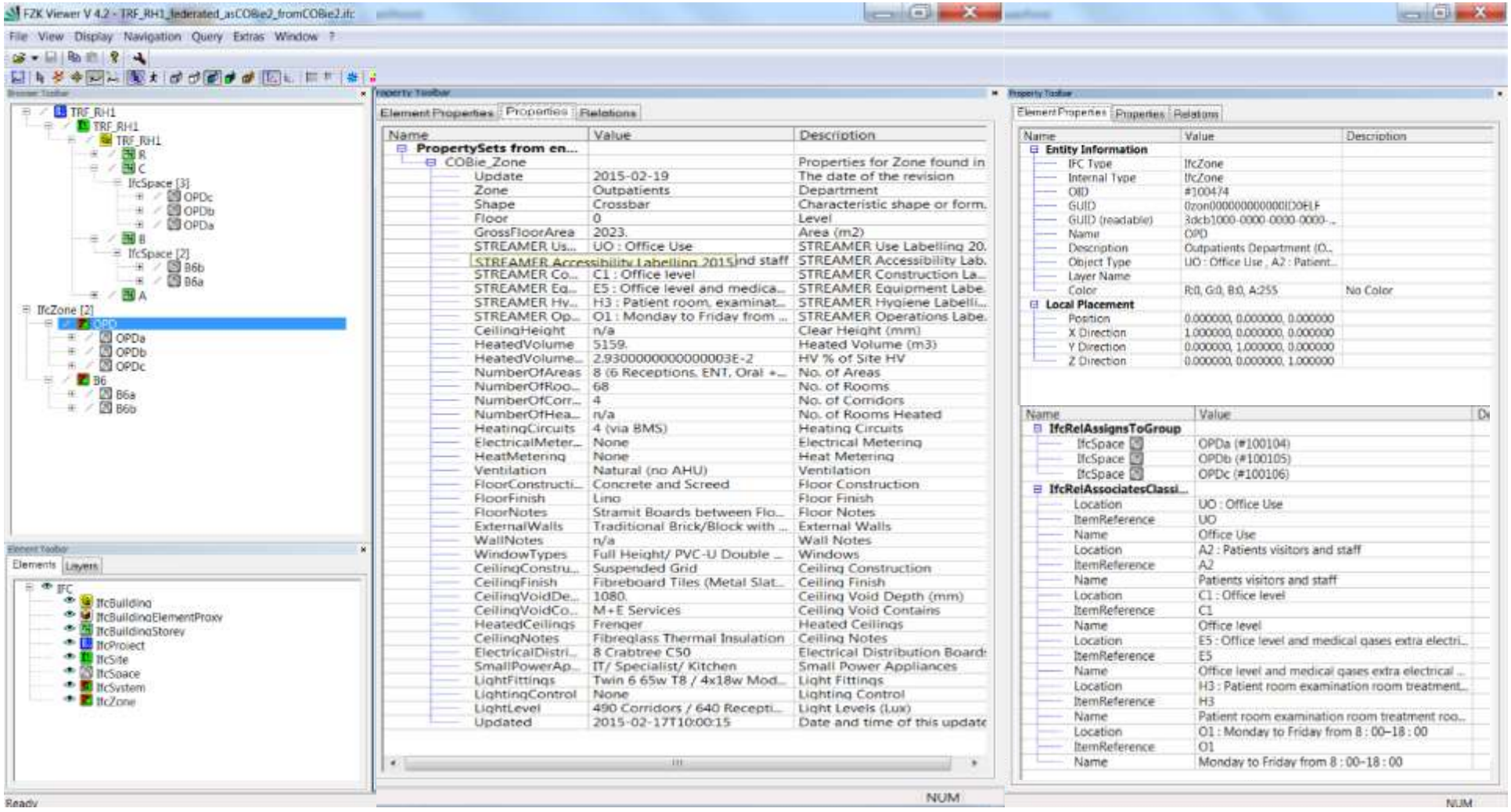


Ward B6


DOS-CAD Viewer
File View Tools Window Help
TRF_RH1_massing_editted.ifc
Model - Dim: 3D
Rotherham Hospital Site
Rotherham Hospital
Level-E
Level-D
OPD-1
IfcSpace
OPD : Out patients
Level-C
Level-B
Ward B6
IfcSpace
Ward B6 : Opthalmo
Building Parts
Google Earth Terrain
Google Earth Snapshot
Level-A
UtIfcContainer
Ifc Properties
External References
Type and Properties
Ward B6 (IfcSpace)
Name
Value
GlobalId
2hwdKH7ZK6F_3pQKsBu8Y
Name
Ward B6
Description
Opthalmology
ObjectType
UH : Hotel
LongName
Ward B6 : Opthalmology
CompositionType
COMPLEX
InteriorOrExteriorSpace
INTERNAL
ElevationWithFlooring
0 mm
UH (IfcSpaceType)
Name
Value
Description
GlobalId
Name
UH
Description
Hotel
Tag
UH
PredefinedType
USERDEFINED
Pset_SpaceCommon - 2PsKxusDL0bxZD8Plq2Bch (IfcPropertySet)
Name
Value
Description
623 m²
Total planned gross area for the space. Used for programming the space.
General properties
Materials
Property sets
Owner info
Run external program...
Add IFD
Edit properties
OK
Cancel
Help

OPD

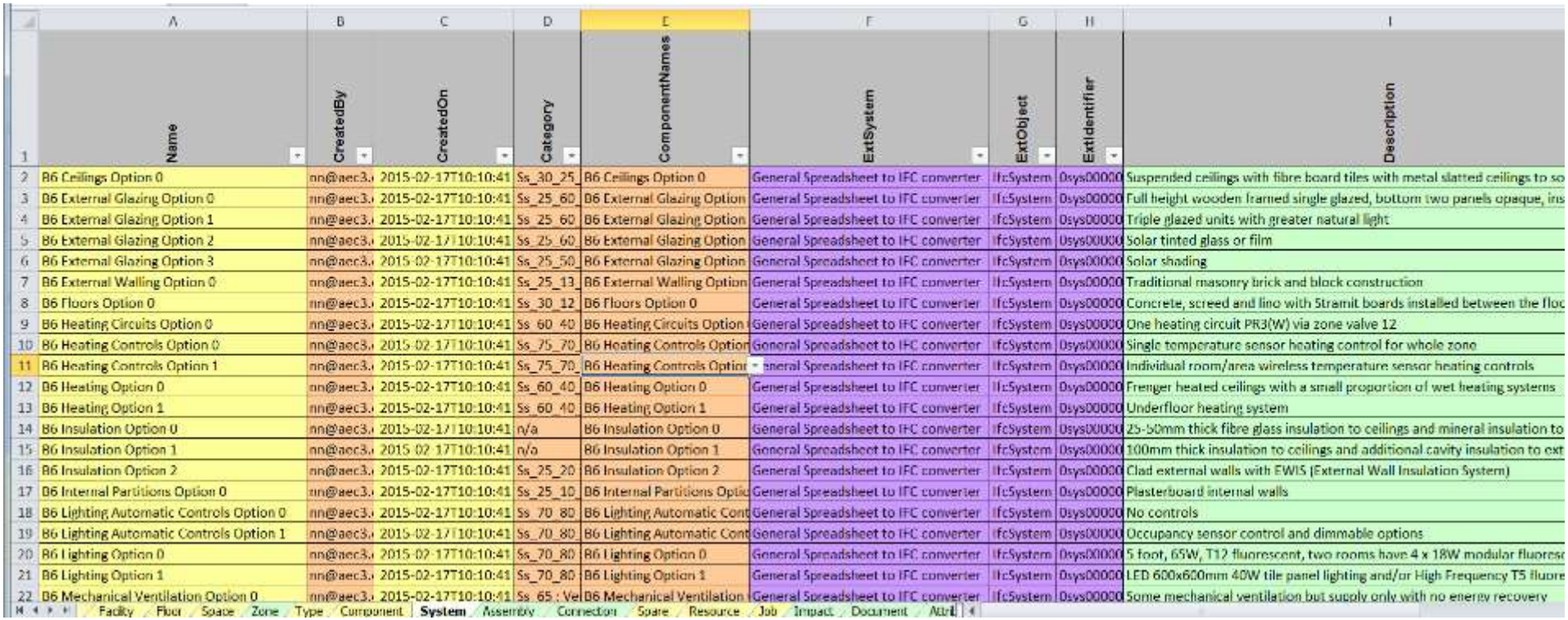
Identity, placement, relationships and properties



TRF RH1 Systems

- Multiple options
- COBie format

•Existing and possible fabric and MEP system options automatically captured
•Centralised CHP and DHW also documented

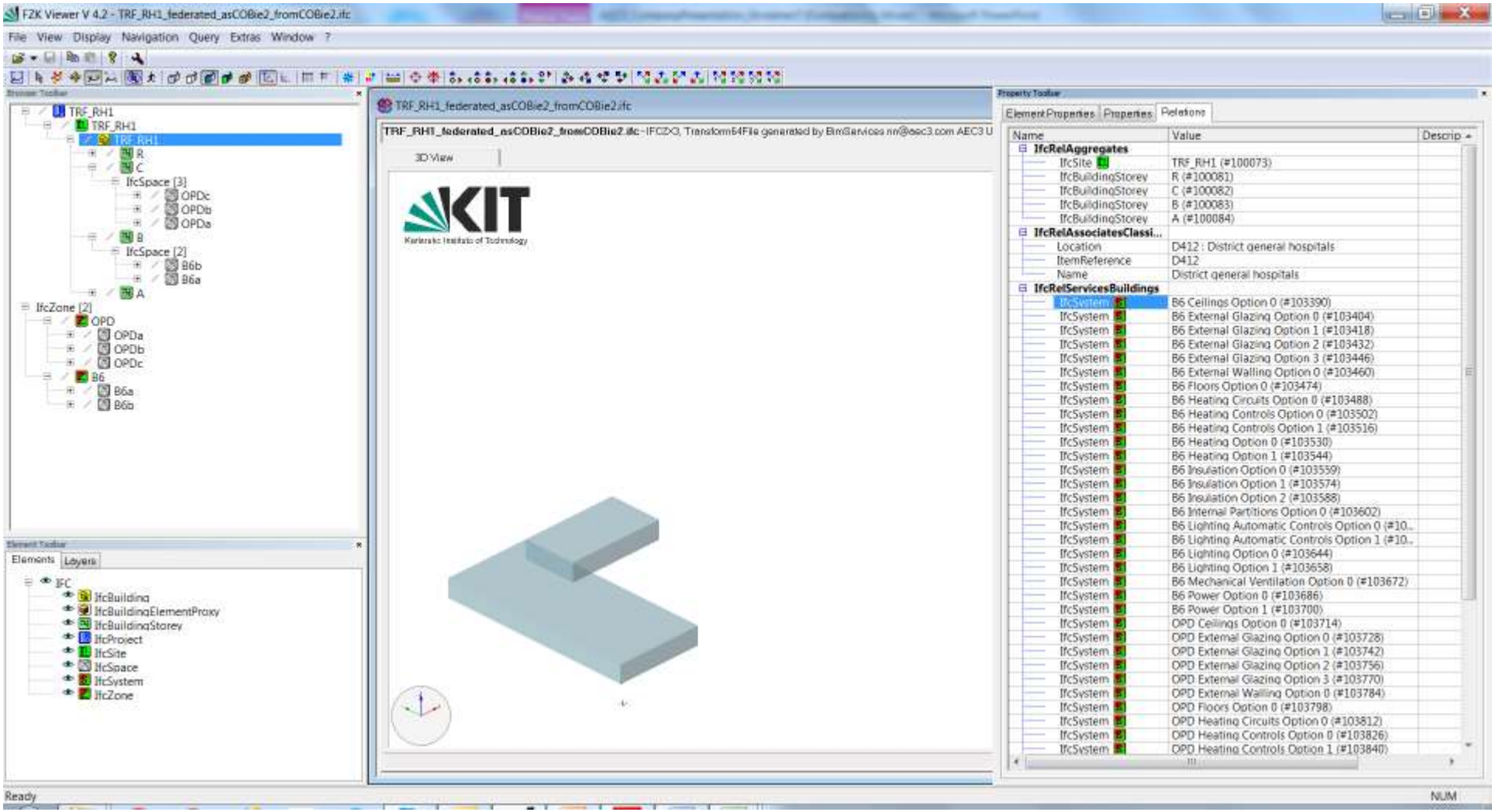


	A	B	C	D	E	F	G	H	I
1	Name	CreatedBy	CreatedOn	Category	ComponentNames	ExtSystem	ExtObject	ExtIdentifier	Description
2	B6 Ceilings Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_30_25_	B6 Ceilings Option 0	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Suspended ceilings with fibre board tiles with metal slatted ceilings to so
3	B6 External Glazing Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_25_60_	B6 External Glazing Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Full height wooden framed single glazed, bottom two panels opaque, ins
4	B6 External Glazing Option 1	nn@aec3.(	2015-02-17T10:10:41	Ss_25_60	B6 External Glazing Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Triple glazed units with greater natural light
5	B6 External Glazing Option 2	nn@aec3.(	2015-02-17T10:10:41	Ss_25_60	B6 External Glazing Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Solar tinted glass or film
6	B6 External Glazing Option 3	nn@aec3.(	2015-02-17T10:10:41	Ss_25_50	B6 External Glazing Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Solar shading
7	B6 External Walling Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_25_13_	B6 External Walling Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Traditional masonry brick and block construction
8	B6 Floors Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_30_12	B6 Floors Option 0	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Concrete, screed and lino with Stramit boards installed between the floo
9	B6 Heating Circuits Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_60_40	B6 Heating Circuits Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	One heating circuit PR3(W) via zone valve 12
10	B6 Heating Controls Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_75_70_	B6 Heating Controls Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Single temperature sensor heating control for whole zone
11	B6 Heating Controls Option 1	nn@aec3.(	2015-02-17T10:10:41	Ss_75_70_	B6 Heating Controls Option	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Individual room/area wireless temperature sensor heating controls
12	B6 Heating Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_60_40_	B6 Heating Option 0	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Frenger heated ceilings with a small proportion of wet heating systems
13	B6 Heating Option 1	nn@aec3.(	2015-02-17T10:10:41	Ss_60_40	B6 Heating Option 1	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Underfloor heating system
14	B6 Insulation Option 0	nn@aec3.(	2015-02-17T10:10:41	n/a	B6 Insulation Option 0	General Spreadsheet to IFC converter	IfcSystem	0sys00000	25-50mm thick fibre glass insulation to ceilings and mineral insulation to
15	B6 Insulation Option 1	nn@aec3.(	2015-02-17T10:10:41	n/a	B6 Insulation Option 1	General Spreadsheet to IFC converter	IfcSystem	0sys00000	100mm thick insulation to ceilings and additional cavity insulation to ext
16	B6 Insulation Option 2	nn@aec3.(	2015-02-17T10:10:41	Ss_25_20	B6 Insulation Option 2	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Clad external walls with EWIS (External Wall Insulation System)
17	B6 Internal Partitions Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_25_10_	B6 Internal Partitions Optic	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Plasterboard internal walls
18	B6 Lighting Automatic Controls Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_70_80	B6 Lighting Automatic Cont	General Spreadsheet to IFC converter	IfcSystem	0sys00000	No controls
19	B6 Lighting Automatic Controls Option 1	nn@aec3.(	2015-02-17T10:10:41	Ss_70_80_	B6 Lighting Automatic Cont	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Occupancy sensor control and dimmable options
20	B6 Lighting Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_70_80	B6 Lighting Option 0	General Spreadsheet to IFC converter	IfcSystem	0sys00000	5 foot, 65W, T12 fluorescent, two rooms have 4 x 18W modular fluores
21	B6 Lighting Option 1	nn@aec3.(	2015-02-17T10:10:41	Ss_70_80	B6 Lighting Option 1	General Spreadsheet to IFC converter	IfcSystem	0sys00000	LED 600x600mm 40W tile panel lighting and/or High Frequency T5 fluore
22	B6 Mechanical Ventilation Option 0	nn@aec3.(	2015-02-17T10:10:41	Ss_65_; Vel	B6 Mechanical Ventilation	General Spreadsheet to IFC converter	IfcSystem	0sys00000	Some mechanical ventilation but supply only with no energy recovery

Facility | Floor | Space | Zone | Type | Component | System | Assembly | Connection | Spare | Resource | Job | Impact | Document | Attril

Fabric and MEP systems

- including Options

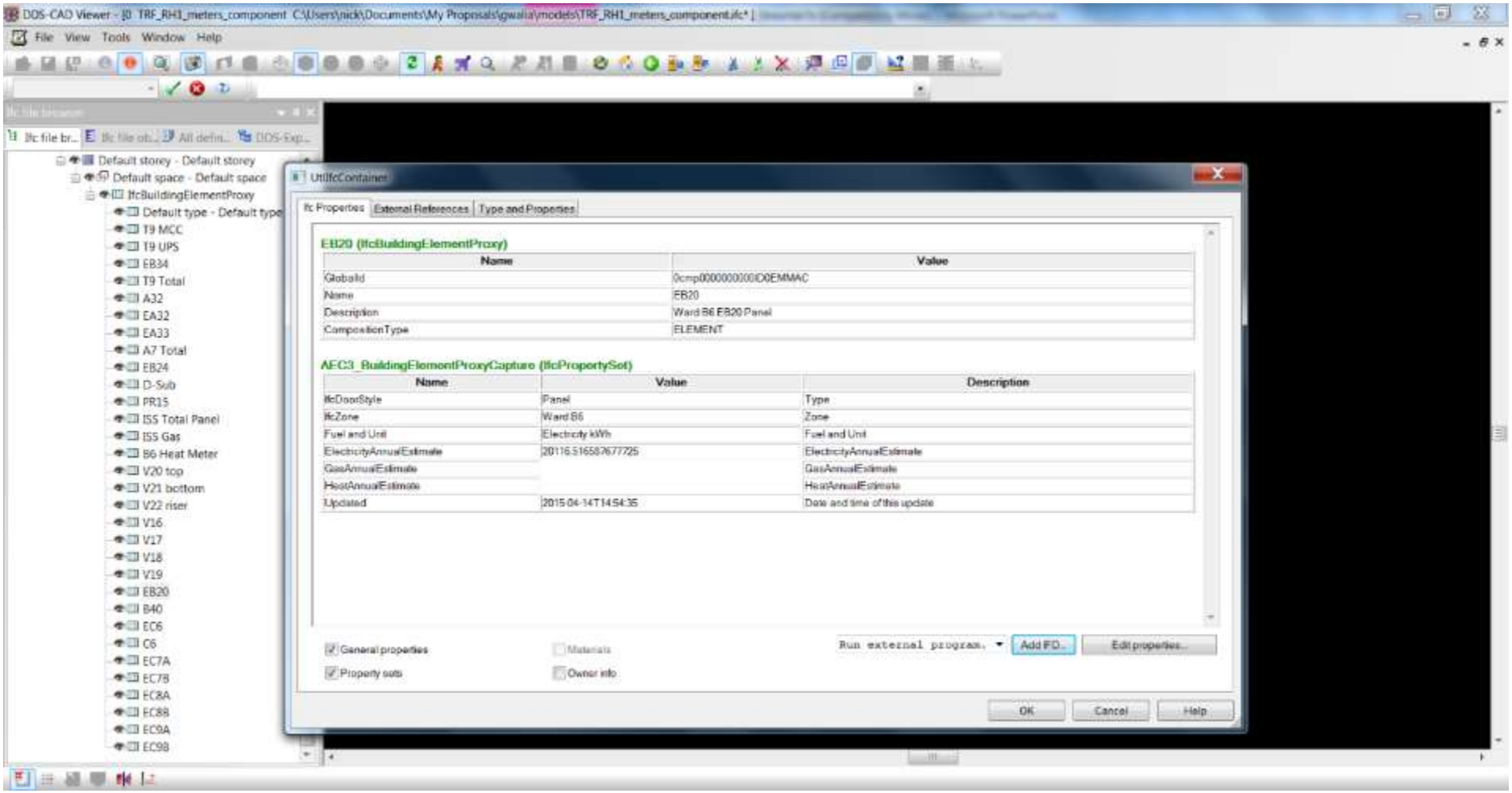


Metering

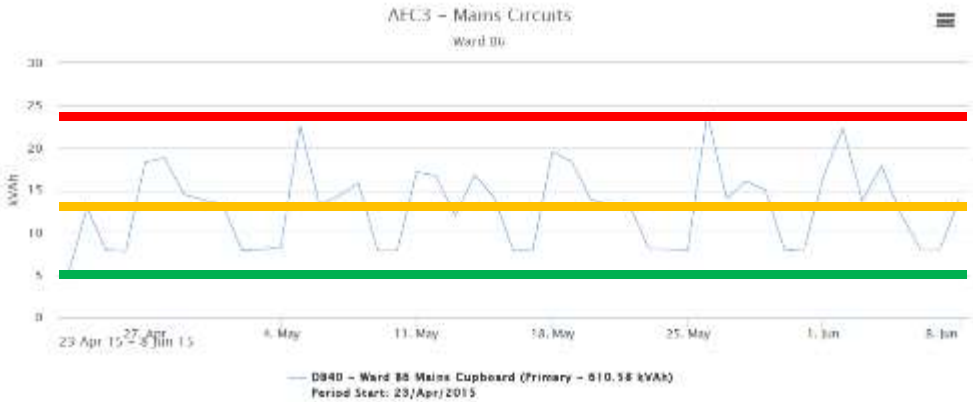
AnnualEstimate = 365 * (EndReading – StartReading) / (EndDate – StartDate)

Description	Name	Type	Zone	Fuel and Uni	ElectricityAnnualEstimate	GasAnnualEstimate	HeatAnnualEstimate
Audiology V16 Heat Meter	V16	Heat Meter	Audiology	Heat kWh			0.025
Audiology V17 Heat Meter	V17	Heat Meter	Audiology	Heat kWh			40.200
Audiology V18 Heat Meter	V18	Heat Meter	Audiology	Heat kWh			5.810
Audiology V19 Heat Meter	V19	Heat Meter	Audiology	Heat kWh			1.390
Estates Admin EB24 Panel	EB24	Panel	Estates Admin	Electricity kWh	15577		
Eye Clinic EC7A Panel	EC7A	Panel	Eye Clinic	Electricity kWh	42317		
Eye Clinic EC7B Panel	EC7B	Panel	Eye Clinic	Electricity kWh	38077		
Eye Clinic V22 riser Heat Meter	V22 riser	Heat Meter	Eye Clinic	Heat kWh			1.515
Ward B6 B40 Panel	B40	Panel	Ward B6	Electricity kWh	9526		
Ward B6 B6 Heat Meter Heat Meter	B6 Heat Meter	Heat Meter	Ward B6	Heat kWh			111.983
Ward B6 EB40 Panel	EB40	Panel	Ward B6	Electricity kWh	20117		
Oral maxillo EC6 Panel	EC6	Panel	Oral maxillo	Electricity kWh	8214		
Reception A EC8A Panel	EC8A	Panel	Reception A	Electricity kWh	22250		
Reception A EC8B Panel	EC8B	Panel	Reception A	Electricity kWh	17935		
Reception A V20 top Heat Meter	V20 top	Heat Meter	Reception A	Heat kWh			0.298
Reception A V21 bottom Heat Meter	V21 bottom	Heat Meter	Reception A	Heat kWh			0.149
Reception D EC9A Panel	EC9A	Panel	Reception D	Electricity kWh	41747		
Reception D EC9B Panel	EC9B	Panel	Reception D	Electricity kWh	34836		
Theatre 9 EB34 Panel	EB34	Panel	Theatre 9	Electricity kWh	33364		
Theatre 9 T9 Main Main	T9 Main	Main	Theatre 9	Electricity kWh	123478		
Theatre 9 T9 MCC Panel	T9 MCC	Panel	Theatre 9	Electricity kWh	65169		
Theatre 9 T9 Total Panel Total	T9 Total	Panel Total	Theatre 9	Electricity kWh	113061		
Theatre 9 T9 UPS Panel	T9 UPS	Panel	Theatre 9	Electricity kWh	14529		
Ward A7 A32 Panel	A32	Panel	Ward A7	Electricity kWh	12107		
Ward A7 A7 Total Panel Total	A7 Total	Panel Total	Ward A7	Electricity kWh	52083		
Ward A7 EA32 Panel	EA32	Panel	Ward A7	Electricity kWh	11475		
Ward A7 EA33 Panel	EA33	Panel	Ward A7	Electricity kWh	28501		
Ward B6 B40 Panel	B40	Panel	Ward B6	Electricity kWh	9526		

Metering


DOS-CAD Viewer - [0 TRF_RH1_meters_component C:\Users\nick\Documents\My Proposals\gwalia\models\TRF_RH1_meters_component.ifc*]
File View Tools Window Help
Default storey - Default storey
Default space - Default space
IfcBuildingElementProxy
Default type - Default type
T9 MCC
T9 UPS
EB34
T9 Total
A32
EA32
EA33
A7 Total
EB24
D-Sub
PR15
I55 Total Panel
I55 Gas
B6 Heat Meter
V20 top
V21 bottom
V22 riser
V16
V17
V18
V19
EB20
B40
EC6
C6
EC7A
EC7B
EC8A
EC8B
EC9A
EC9B
UtilIfcContainer
Ifc Properties
External References
Type and Properties
EB20 (IfcBuildingElementProxy)
Name
Value
GlobalId
0cmp000000000IC0EMMAC
Name
EB20
Description
Ward B6 EB20 Panel
CompositionType
ELEMENT
AEC3_BuildingElementProxyCapture (IfcPropertySet)
Name
Value
Description
IfcDoorStyle
Panel
Type
IfcZone
Ward B6
Zone
Fuel and Unit
Electricity kWh
Fuel and Unit
ElectricityAnnualEstimate
20116.516558767725
ElectricityAnnualEstimate
GasAnnualEstimate
GasAnnualEstimate
HeatAnnualEstimate
HeatAnnualEstimate
Updated
2015-04-14T14:54:35
Date and time of this update
General properties
Materials
Property sets
Owner info
Run external program...
Add PD...
Edit properties...
OK
Cancel
Help

Sub-circuit monitoring



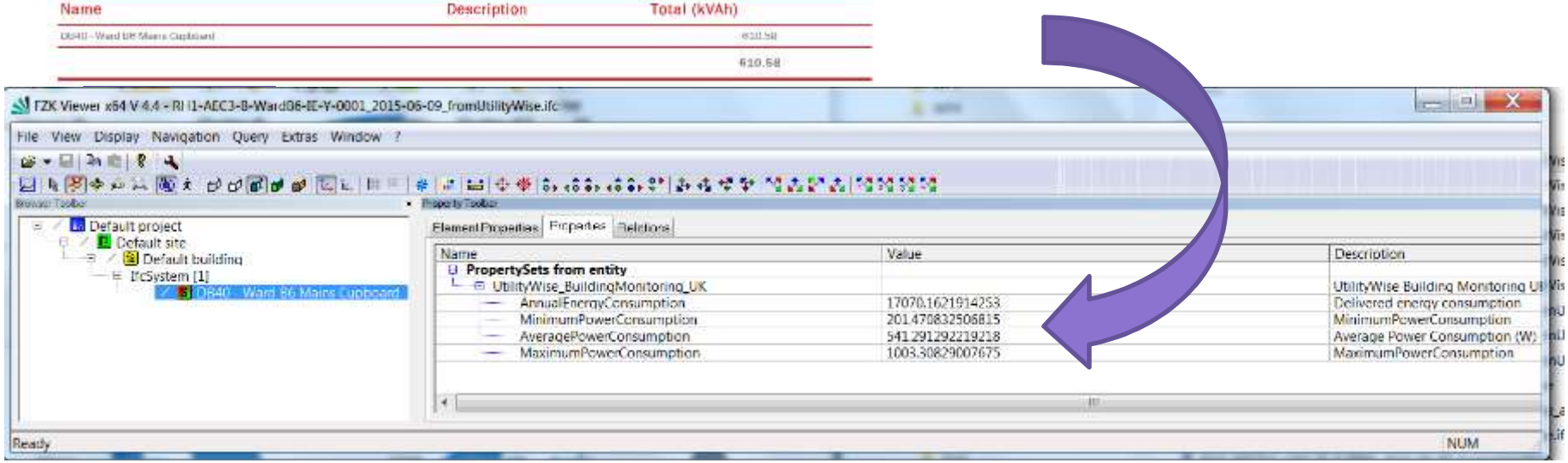
Name	Description	Total (kVAh)
D840 – Ward 86 Mains Cupboard		610.58
		610.58

Power consumption

1003 W: Maximum– Highest daily rate

541 W: Average

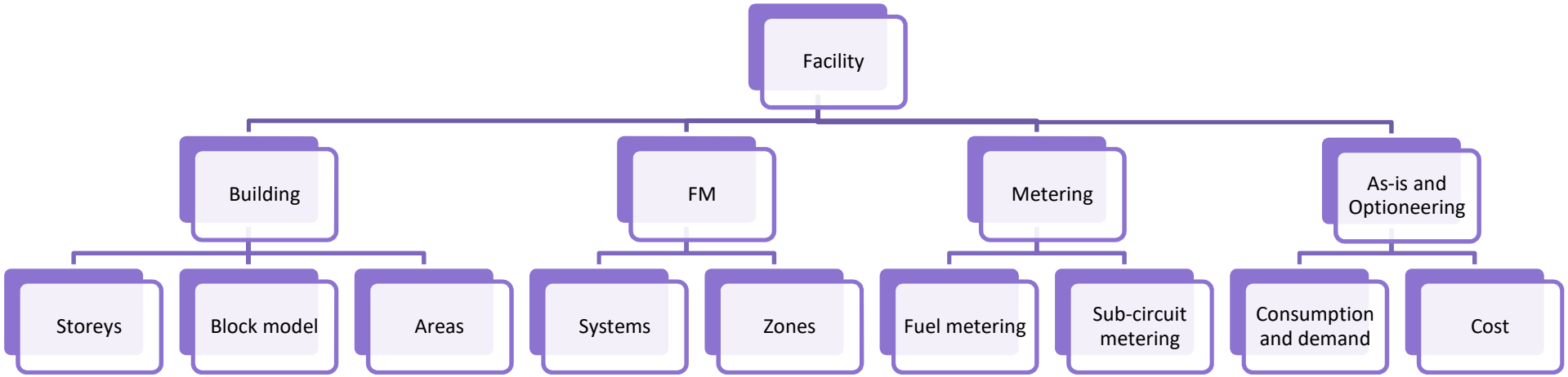
201 W: Minimum – Lowest daily rate



Model requirements checking

- Xbim Xplorer

Asset Information Model



Rotherham Hospital

CHOOSING AN UPGRADE STRATEGY

SPEAKER: NICK NISBET

IMPLEMENTERS WORKSHOP 1, SESSION 7

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EU STREAMER

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Rotherham Hospital Challenge

The challenge is to determine the most cost effective options for key fabric/systems upgrades to specific departments of Rotherham Hospital to achieve the best payback over a 10 year period.

Workshop :

- **Rotherham Hospital Proposal**

 nn@aec3.com

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NHS Foundation Trust

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Streamer

The Rotherham Hospital NHS Foundation Trust (TRF) Workshop

Please enter your Workshop Team/Table Name:

Workshop Team:

Team/Table name:
Table1

Please enter your Workshop Team/Table Member Names and Organisations:

Team Members:

Name:	Bob Wakelam	Email:	bw@aec3.com
Name:	Nick Nisbet	Email:	nn@aec3.com
Name:		Email:	
Name:		Email:	
Name:		Email:	
Name:		Email:	
Name:		Email:	
Name:		Email:	
Name:		Email:	
Name:		Email:	

OPC

Streamer Proposal: **OPC - Heating**

Options:
- (•) Frenger heated ceilings with a small proportion of wet heating systems
- ( ) Underfloor heating system

Streamer Proposal: **OPC - Heating Controls**

Options:
- (•) Single temperature sensor heating control for whole zone
- ( ) Individual room/area wireless temperature sensor heating controls

Streamer Proposal: **OPC - Lighting**

Options:
- (•) Twin 6 foot 65W fluorescent T8, 4 x 18W modular fluorescent fittings and 38W 2 D fittings
- ( ) LED 600x600mm 40W tile panel lighting and/or High Frequency T5 fluorescent fittings

Streamer Proposal: **OPC - Lighting Automatic Controls**

Options:
- (•) No controls
- ( ) Occupancy sensor control and dimmable options

Streamer Proposal: **OPC - External Glazing**

Options:
- (•) Full height uPVC double glazed, bottom two panels opaque, insulated and blockwork to cill
- ( ) Triple glazed units with greater natural light
- ( ) Solar tinted glass or film
- ( ) Solar shading

Streamer Proposal: **OPC - Insulation**

Options:
- (•) 25-50mm thick fibre glass insulation to ceilings and mineral insulation to external walls
- ( ) 100mm thick insulation to ceilings and additional cavity insulation to external walls
- ( ) Clad external walls with EWIS (External Wall Insulation System)

Rotherham Hospital

EVALUATION: HAVE WE FOUND A GOOD STRATEGY?

SPEAKER: NICK NISBET

IMPLEMENTERS WORKSHOP 1, SESSION 10

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Result page

RH1 Refurbishment

The Rotherham NHS Foundation Trust

EU STREAMER REPORT

Streamer — European research on energy-efficient healthcare districts

Project: : RH1 Project

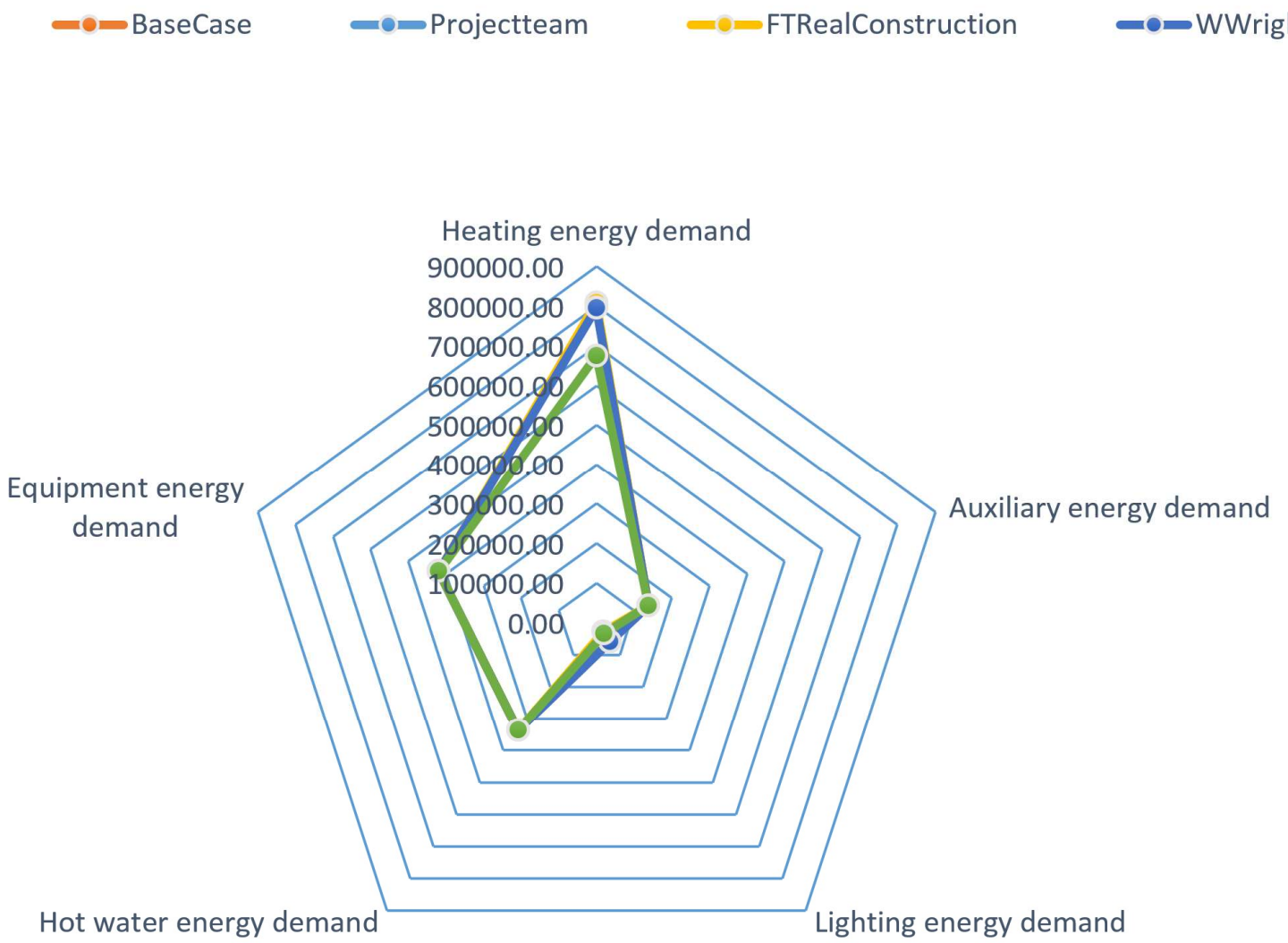
Date: : 2016-06-08T12:06:08

Prepared by: : AEC3 UK Ltd

rdash-OPCLT1-OPCEG1-OPCIN1-WB6HT1-WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1

Results			
Name	**Description**	**Value**	**Unit**
Project	**RH1 Project**	**RH1 Refurbishment**	
Phase	Option	rdash-OPCLT1-OPCEG1-OPCIN1-WB6HT1-WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	
Name	**Description**	**Value**	**Unit**
Site	**RH1 Site**	**Rotherham Hospital, Moorfield Road, Rotherham, RH1 9QX**	
Name	**Description**	**Value**	**Unit**
Building	**RH1 building**	**Rotherham Hospital**	
GrossAreaPlanned	GrossAreaPlanned	1123.00	m2
AnnualEnergyDemand	Energy demand	1603154.37	MJ
AnnualEnergyConsumption	Energy consumption	1183493.76	MJ
Capital Cost	Capital Cost	147954.75	£
Heating energy demand	Heating energy demand	675609.15	MJ
Auxiliary energy demand	Auxiliary energy demand	138790.45	MJ
Lighting energy demand	Lighting energy demand	33003.85	MJ
Hot water energy demand	Hot water energy demand	336094.81	MJ
Equipment energy demand	Equipment energy demand	419656.12	MJ
Natural gas energy consumption	Natural gas energy consumption	1011699.47	MJ
Grid Supply Electricty energy consumptions	Grid Supply Electricty energy consumptions	171794.29	MJ
Name	**Description**	**Value**	**Unit**
Zone	**OPC**	**OPC**	
BouwcollegeLayer	Four way classification of hospital spaces by activity	O	
AccessSecurity	Accessibility	A2	
Construction	Construction complexity	C1 C1 : Office level Concrete and Screed Suspended Grid	
Equipment	Equipment density	EQ5 EQ5 : Office level and medical gases, extra electrical power and extra ICT data point	
HygieneClass	HygieneClass	H3	
UserProfile	Usage profile	U1	
GrossAreaPlanned	GrossAreaPlanned	500.00	m2
Internal Gains from Persons	Internal Gains from Persons	109236.00	MJ
Internal Gains from Appliances	Internal Gains from Appliances	242072.00	MJ
Internal Gains from Lighting	Internal Gains from Lighting	1379.70	MJ
Internal Gains Total	Internal Gains Total	352688.00	MJ
Name	**Description**	**Value**	**Unit**
Zone	**Ward-B6**	**Ward B6**	

Workshop 1: UK NCM SBEM Simulation results

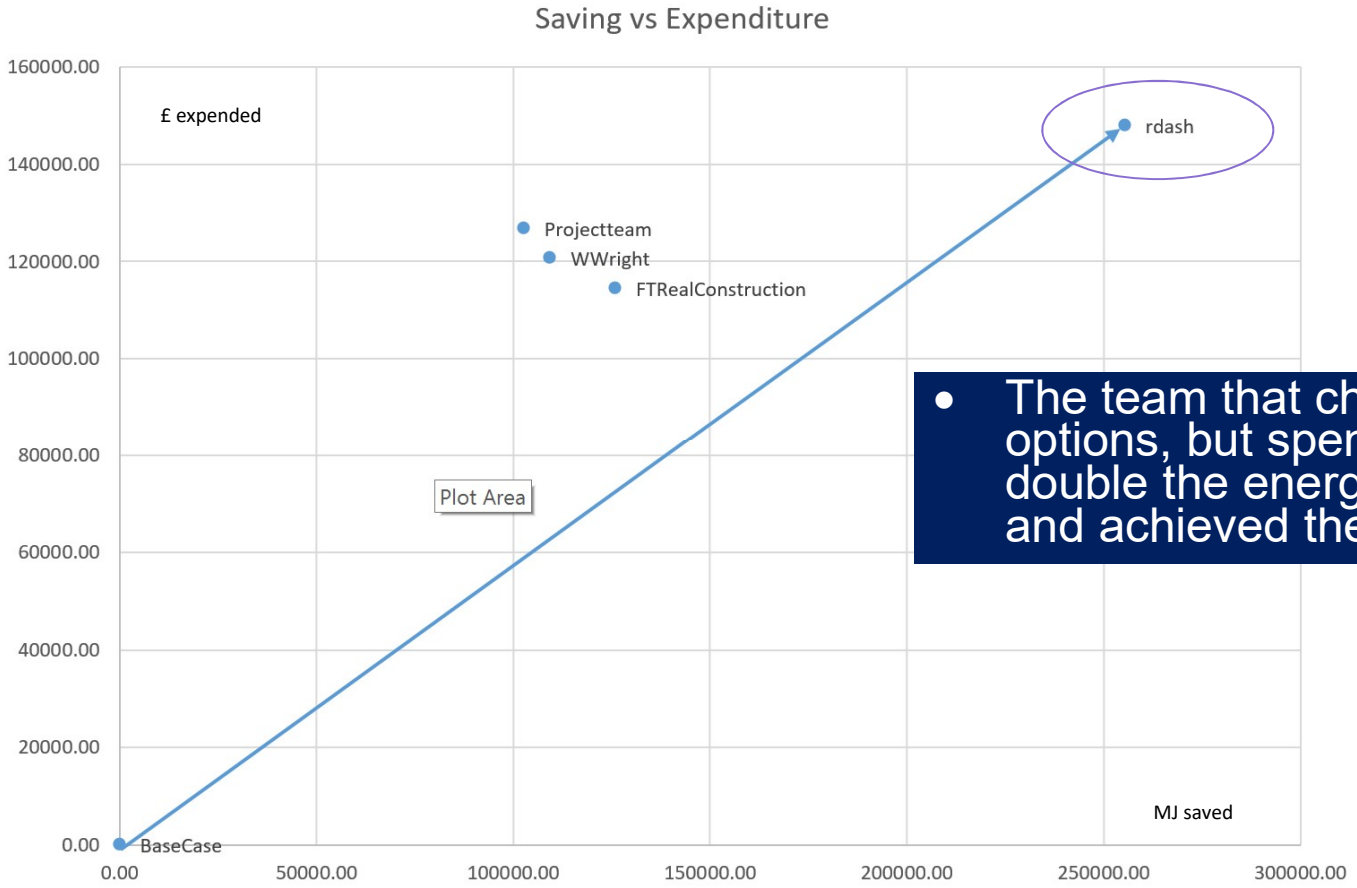


Workshop 1 Simulation results

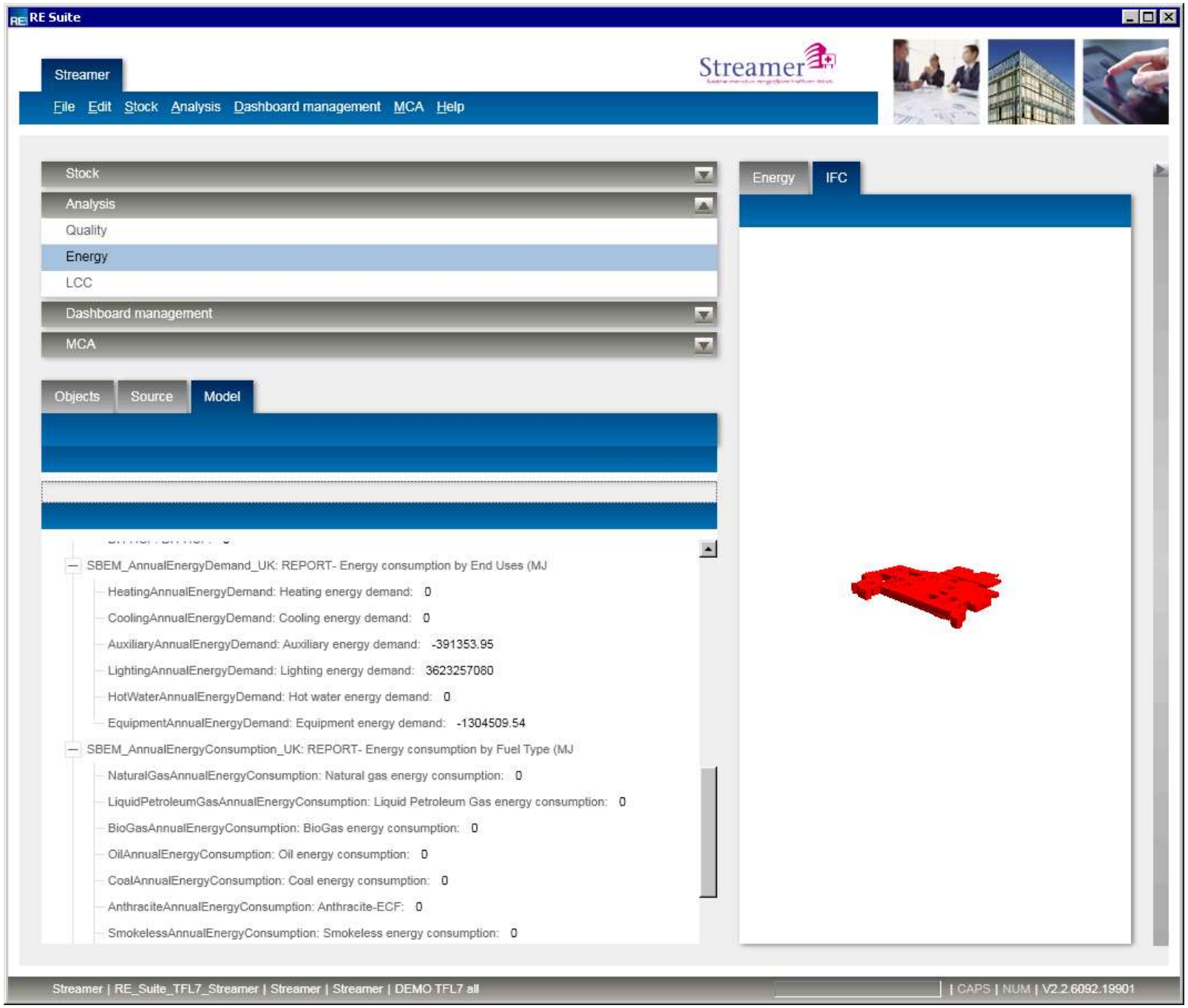
Team	Proposal	Energy MJ Saving	Cost	MJ/£
BaseCase	-	0.00	0.00	0.00
Project team	OPCHC1-OPCLT1-OPCLC1-OPCEG3-OPCIN1—WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	102731.00	126736.75	0.81
WWright	OPCHC1-OPCLT1-OPCLC1-OPCEG2-OPCIN1—WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	109394.88	120664.75	0.91
FTReal Construction	OPCHC1-OPCLT1-OPCLC1-OPCEG2-OPCIN2—WB6HC1-WB6LT1--WB6EG1-WB6IN2	125996.75	114473.50	1.10
rdash	OPCLT1-OPCEG1-OPCIN1-WB6HT1-WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	255430.81	147954.75	1.73

Interactive graphing of results

Option		Saving (MJ)	Cost (£)	Saving/Cost (MJ/	Payback at 1p/M	Payback at 8p/M
BaseCase	-	0.00	0.00	0.00		
Projectteam	OPCHC1-OPCLT1-OPCLC1-OPCEG3-OPCIN1--WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	102731.00	126736.75	0.81	123	15
WWright	OPCHC1-OPCLT1-OPCLC1-OPCEG2-OPCIN1--WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	109394.88	120664.75	0.91	110	14
FTRealConstr	OPCHC1-OPCLT1-OPCLC1-OPCEG2-OPCIN2--WB6HC1-WB6LT1--WB6EG1-WB6IN2	125996.75	114473.50	1.10	91	11
rdash	OPCLT1-OPCEG1-OPCIN1-WB6HT1-WB6HC1-WB6LT1-WB6LC1-WB6EG1-WB6IN1	255430.81	147954.75	1.73	58	7



- The team that chose the fewest options, but spent the most, saved double the energy savings of the others and achieved the best pay-back.


RE Suite
Streamer
File Edit Stock Analysis Dashboard management MCA Help
Streamer
Stock
Analysis
Quality
Energy
LCC
Dashboard management
MCA
Objects Source Model
SBEM_AnnualEnergyDemand_UK: REPORT- Energy consumption by End Uses (MJ
HeatingAnnualEnergyDemand: Heating energy demand: 0
CoolingAnnualEnergyDemand: Cooling energy demand: 0
AuxiliaryAnnualEnergyDemand: Auxiliary energy demand: -391353.95
LightingAnnualEnergyDemand: Lighting energy demand: 3623257080
HotWaterAnnualEnergyDemand: Hot water energy demand: 0
EquipmentAnnualEnergyDemand: Equipment energy demand: -1304509.54
SBEM_AnnualEnergyConsumption_UK: REPORT- Energy consumption by Fuel Type (MJ
NaturalGasAnnualEnergyConsumption: Natural gas energy consumption: 0
LiquidPetroleumGasAnnualEnergyConsumption: Liquid Petroleum Gas energy consumption: 0
BioGasAnnualEnergyConsumption: BioGas energy consumption: 0
OilAnnualEnergyConsumption: Oil energy consumption: 0
CoalAnnualEnergyConsumption: Coal energy consumption: 0
AnthraciteAnnualEnergyConsumption: Anthracite-ECF: 0
SmokelessAnnualEnergyConsumption: Smokeless energy consumption: 0
Energy IFC
Streamer | RE_Suite_TFL7_Streamer | Streamer | Streamer | DEMO TFL7 all
CAPS | NUM | V2.2.6092.19901

BSRIA benchmarks for general hospitals	W/m²
Electricity	10.3
Small power	25.0
Heating	80.1

Table 3: Energy benchmarks based on BSRIA [10] Blue Book 2017

Rotherham Hospital	W/m²
Electricity from supplier	1.9
Renewable electricity	0.3
On-site electricity generation	13.8
Total electrical energy consumed	16.0
Natural gas for heating	19.9
Natural gas for CHP	38.8
Natural gas for process use (cooking, labs, etc)	0.4
Primary fossil energy	59.2
Thermal energy utilised from CHP	1.2
Total thermal energy consumed	21.0
Energy need	74.6

Table 4: Energy metrics published by TRFT (2017)

W/m2	Published	SBEM	Metered
Electricity Power Consumption 2007	17.5	34.7	
Gas Power Consumption 2007	53.3	24.9	
Electricity Power Consumption 2015	2.4		
Gas Power Consumption 2015	66.1		
Power Consumption		59.5	
Heating power demand (gas)		17.9	
Auxiliary power demand (electricity)		3.8	
Lighting power demand (electricity)		19.0	5.9
Hot water power demand (gas)		6.9	
Equipment power demand (electricity)		11.8	3.0

Table 5: Energy metric published by TRFT, predicted for two departments by SBEM and monitored

RDaSH proposal package	Delta W/m2
Heating power demand (gas)	-25.0
Lighting power demand (electricity)	+2.3

Table 6: Change in RDaSH [11] power demand density from an example upgrade proposal

- Strong methodology
  - Merging of existing data sources
  - Use of simple labelling
  - Automated energy modelling
  - Collaborative gaming
- Weakness of energy simulation tool
  - CHP
  - Heating controls
  - Known loads and activities
- Opportunity
  - ‘Gaming’ and ‘Learning’
  - Online self assessment
  - Mixed modelling tools
- Threats
  - Over modelling
  - Confusion of comparative and absolute predictions

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Colophon

PowerPoint: Rotherham Implementers Workshop 1
Issue Date:
Author:
Version:

The Streamer project is co-financed by the European Commission under the seventh research framework programme with contract no.: 608739. The information in this publication does not necessarily represent the view of the European Commission.

SEVENTH FRAMEWORK PROGRAMME

Thank you
Any questions?

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European research on energy-efficient healthcare districts

Nick Nisbet **nn@aec3.com**