

Portsmouth City Council

Decarbonisation of Leisure Centres



The Mountbatten Leisure Centre

Survey & Investigations

Existing Energy Consumption
& Costs

Load Monitoring, Building
Modelling & Data Analysis

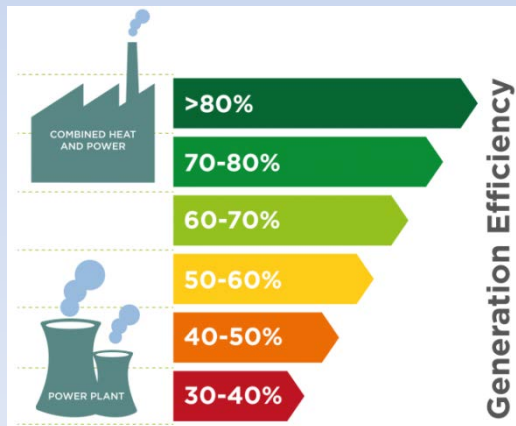
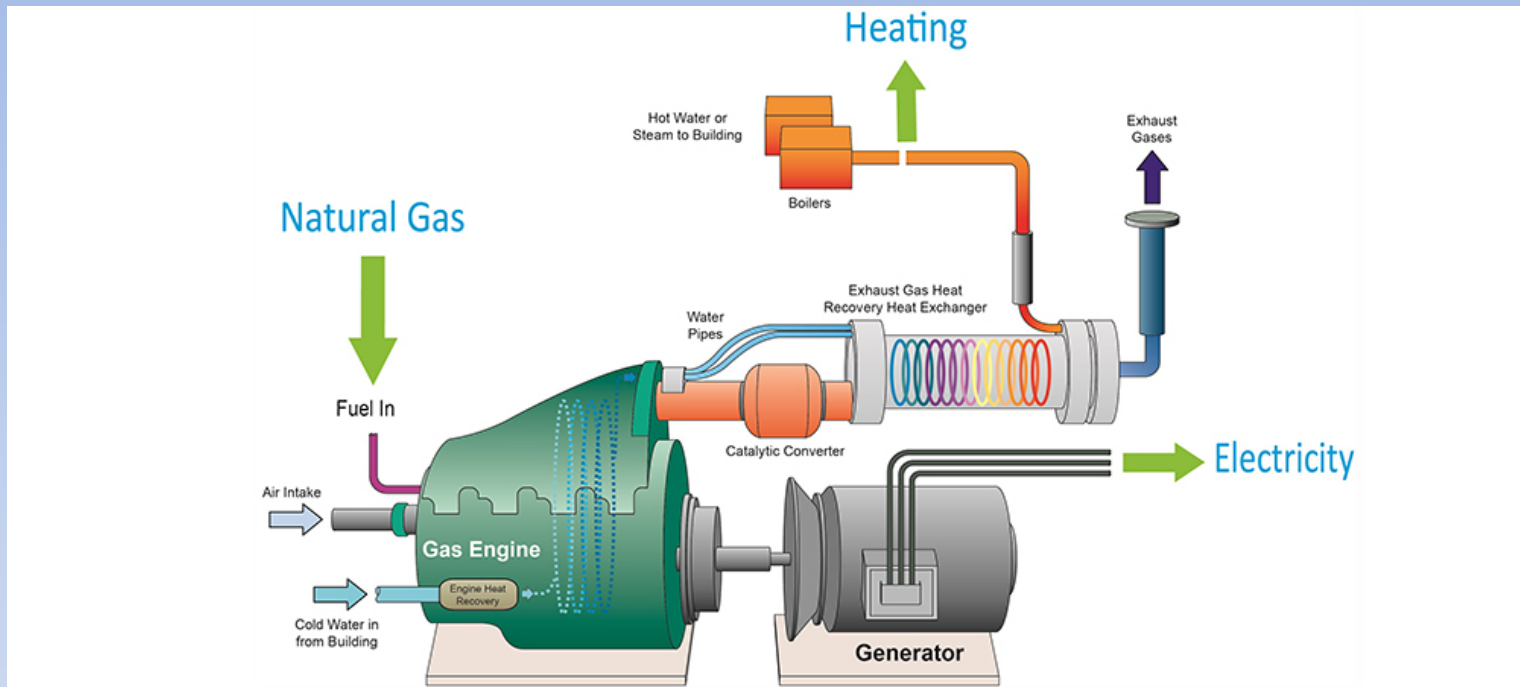
Options Appraisal

Business Case

Comparison with Competitive
Offers

Contractual Arrangements

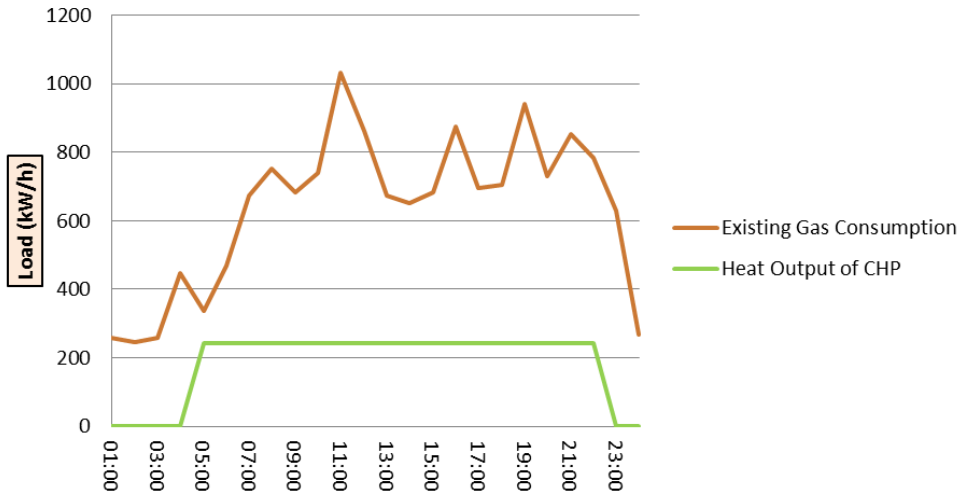
Combined Heat and Power



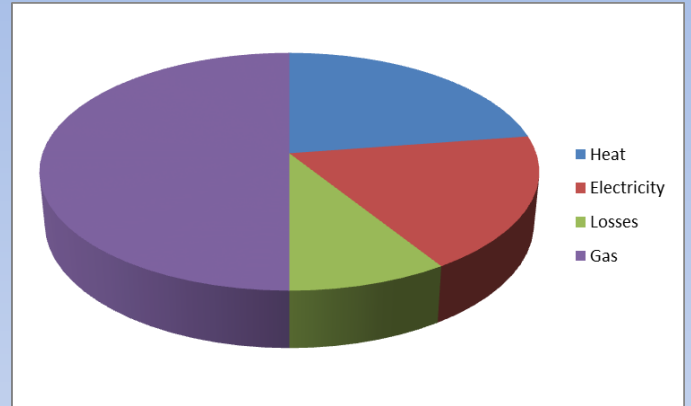
Advantages

- Efficient Electricity Generation
- Low Cost Electricity Generation
- Resilience to Electricity Price Increases
- Carbon Emission Savings

Mountbatten Centre - Daily Profile - Winter Load Vs CHP



Capacity	Heat Output (kW)	Electricity Output (kW)	Gas Consumption (kW)
100%	242	200	538
75%	200	150	426
50%	155	100	312
40%	137	80	291



Performance

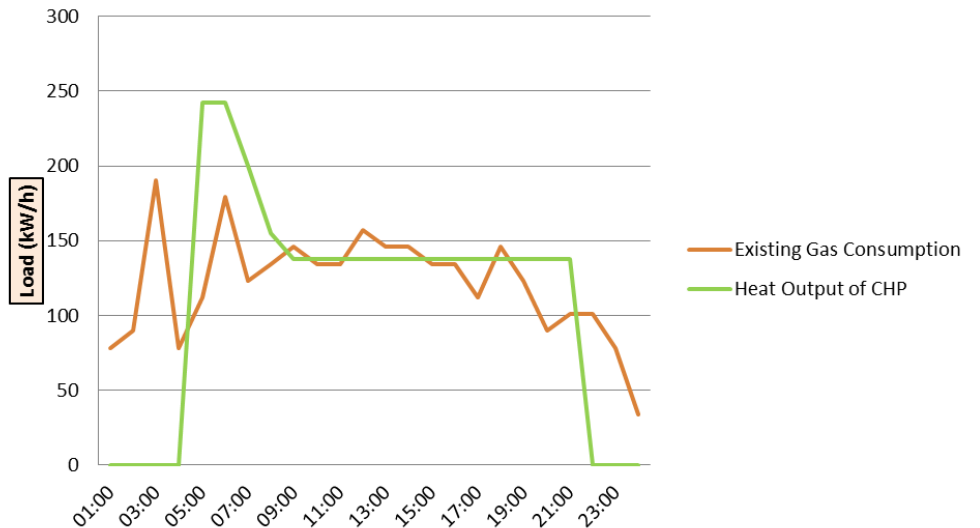
- 242kW_{th}
- 1.3m kWh Heat Output per Annum

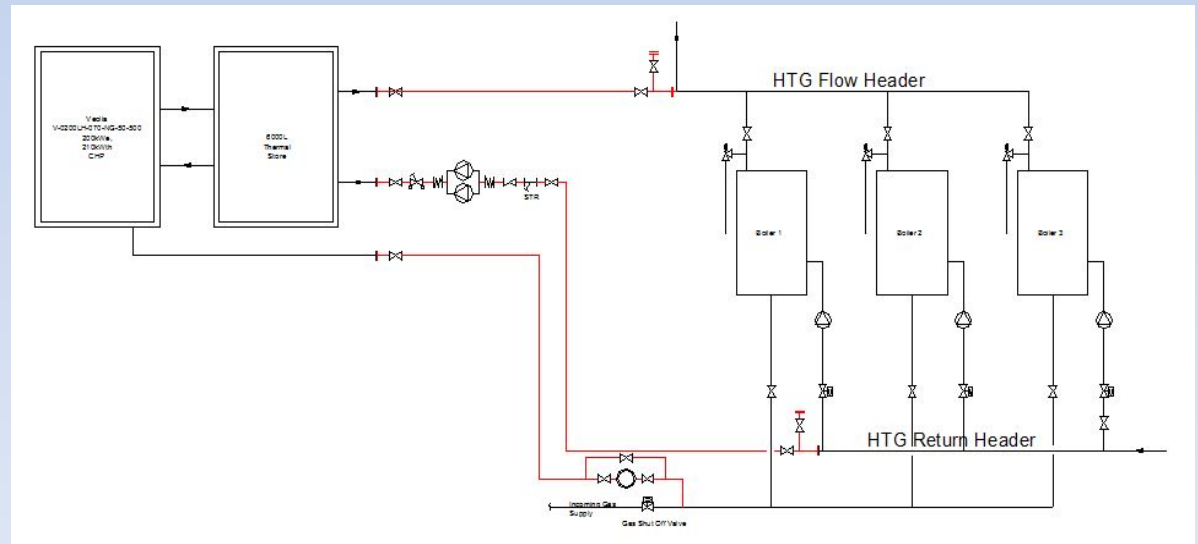
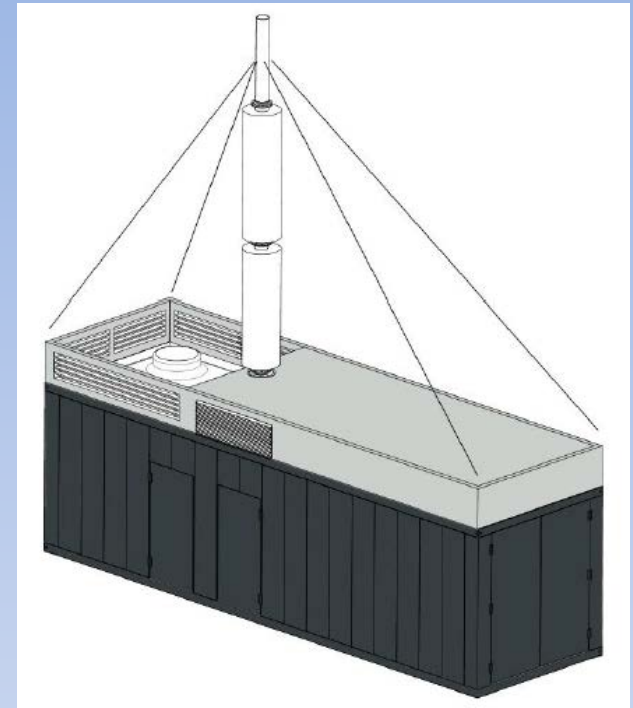
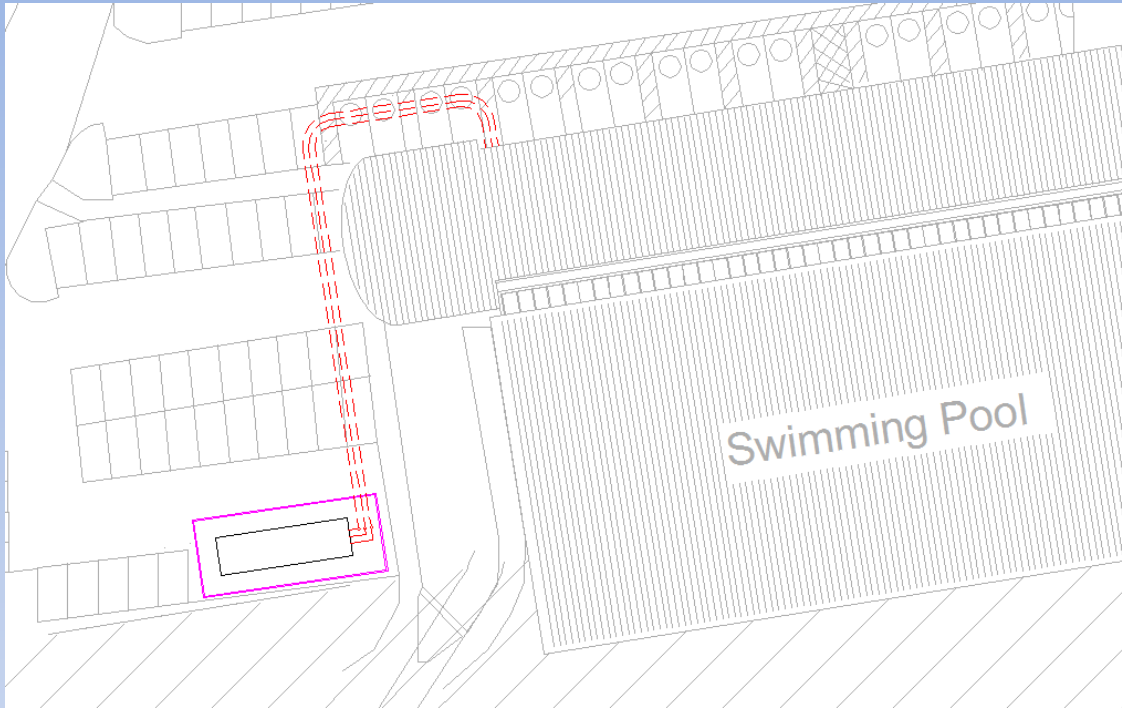
- 200kW_e
- 1.05m kWh Electricity Output per Annum

- 538kW Gas Consumption
- 2.87m kWh Gas Consumption Per Annum

- 82% Efficient

Mountbatten Centre - Daily Profile - Summer Load Vs CHP





CO2

Carbon Savings
264 tonnes CO2/ Year

Cost Savings
£95,000 per Annum



CAPEX

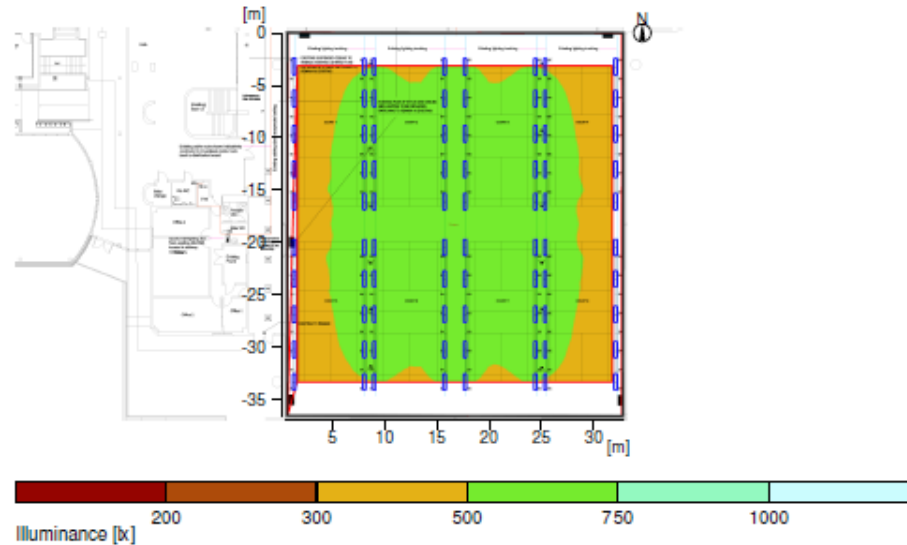
Project Capital Cost
£330,000

Payback in 3.5 Years

Payback

Sports Hall Relux

2.2.2 Result overview, Evaluation area 1



General

Calculation algorithm used	Average indirect fraction
Height of luminaire plane	9.10 m
Maintenance factor	0.80
Total luminous flux of all lamps	756000 lm
Total power	6000.0 W
Total power per area (910.29 m ²)	6.59 W/m ² (1.22 W/m ² /100lx)

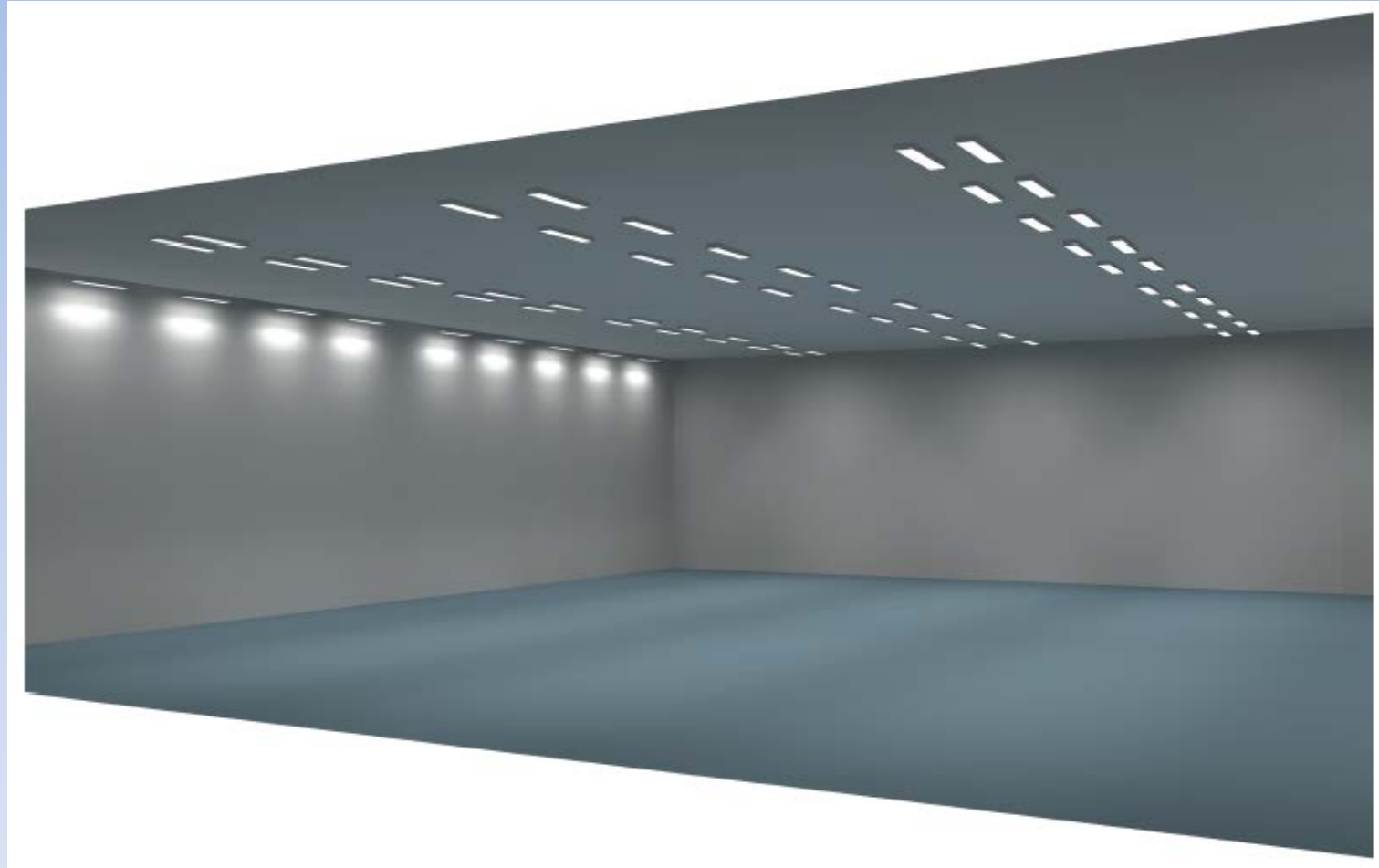
Evaluation area 1

Reference plane 1.1

User profile: Educational premises - Educational buildings
5.36.24 (EN 12464-1, 8.2011) Sports halls, gymnasiums, swimming pools (Ra >80.00)

Horizontal	
Em	542 lx (>= 300 lx)
Emin	367 lx
Emin/Eav (Uo)	0.68 (>= 0.60)
Emin/Emax (Ud)	0.55
UGR (4.1H 4.7H)	<= 20.4 (< 22.00)
Position	0.00 m

Sports Hall 3D Luminance



Original T12 luminaires

|

New LED luminaire



CO2

Carbon Savings
98tonnes CO2/ Year

Cost Savings
£32,100 per Annum



CAPEX

Project Capital Cost
£160,000

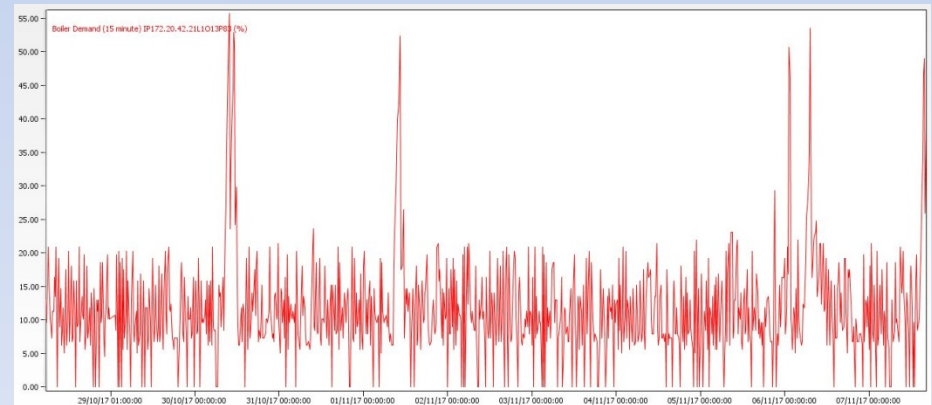
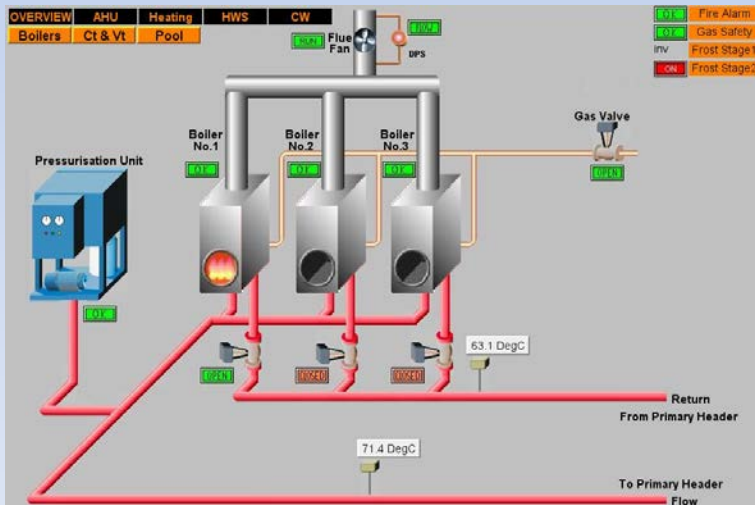
Payback in 4.5 Years

Payback

Building Management System

Reprogramming & Control Upgrade

TREND





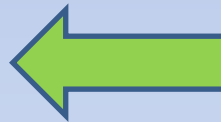
SERVICE REPORT

OS23 - AHU03

Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit
23-01-01	23-01-02	23-01-03	23-01-04	23-01-05	23-01-06	23-01-07	23-01-08	23-01-09	23-01-10

Schedules

- 23-01-01
- 23-01-02
- 23-01-03
- 23-01-04
- 23-01-05
- 23-01-06
- 23-01-07
- 23-01-08
- 23-01-09
- 23-01-10



optimise BeMS

- ✓ Easy to do
- ✓ Low cost
- ✓ High impact

Scope of Works

RECONFIGURATION OF EXISTING CONTROL PARAMETERS

- Set point temperatures and dead-bands
- Heating demand signals
- Tune control loops

PROVISION OF NEW CONTROL STRATEGY

- Heating optimum start/ stop
- Internal and external high limit temperatures
- Boiler anti-dry cycling (optimisation)
- Boiler Auto-changeover and pump run-on
- Frost protection systems

CO2

Carbon Savings
46 tonnes CO2/ Year

Cost Savings
£4,700 per Annum



CAPEX

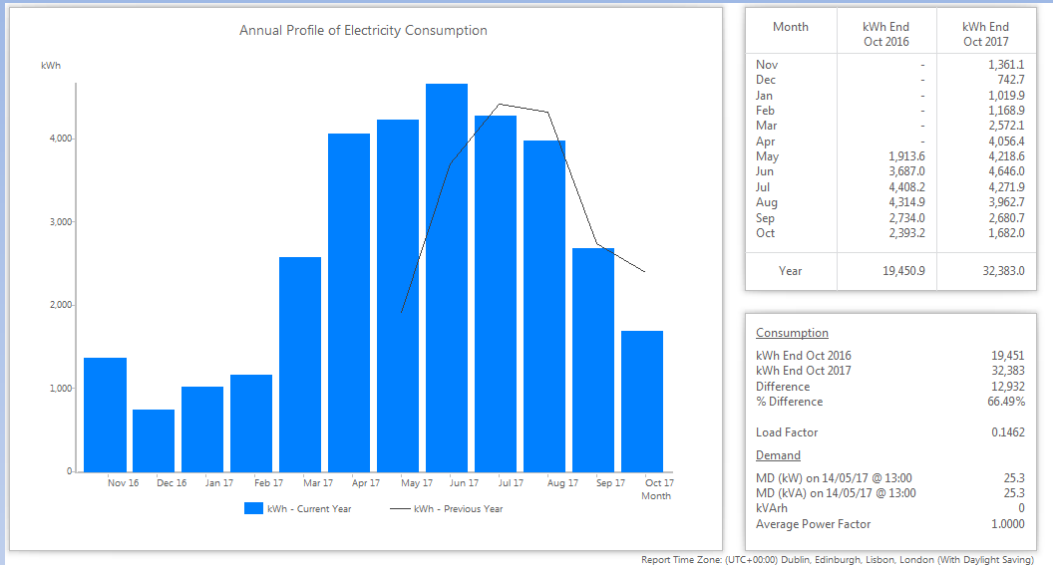
Project Capital Cost
£16,500

Payback in 3.5 Years

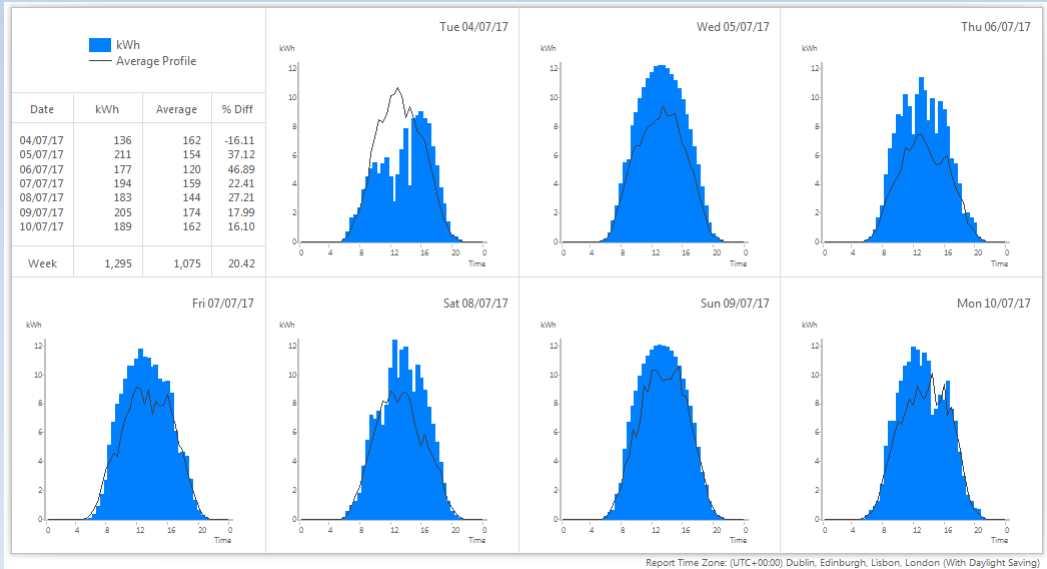
Payback

Solar Photovoltaics

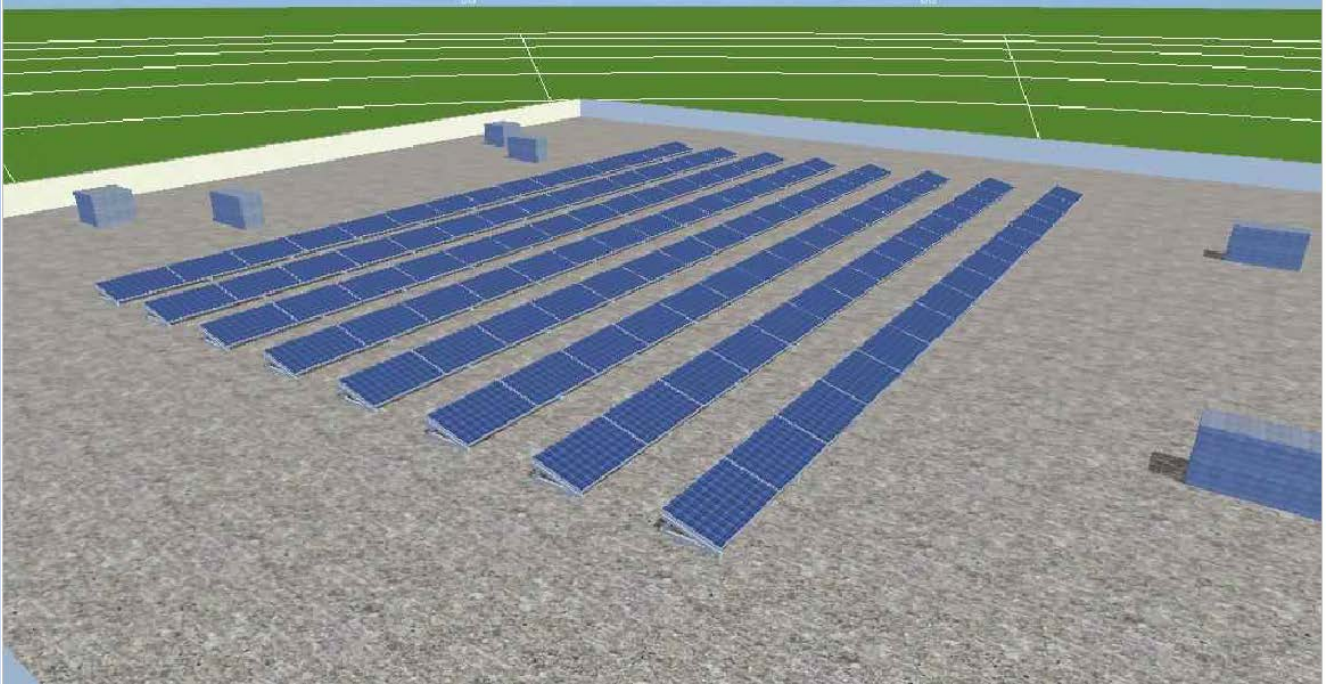
- Large unshaded sports hall roof
- Sized with the other technologies in mind in order to give highest payback on investment
- Tendered via PCC's PV framework; capital cost of £27,000 for full install
- 30kW(p) string and inverter PV system using:
 - 120no. 250W C-Sun, Tier 1 panels
 - Single Samil 3000TL inverter
- System produced 32,500kWh electricity in year 1; all of which was used in-house
- Total income and savings in year 1 were £6,000; with increases in electricity prices £180,000 in 20 year lifetime
- Saved 14.3 tonnes CO₂/a from the site; 330 tonnes over 20 years



Report Time Zone: (UTC+00:00) Dublin, Edinburgh, Lisbon, London (With Daylight Saving)



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CO2

Carbon Savings
17tonnes CO2/ Year

Cost Savings
£7,500 per Annum



CAPEX

Project Capital Cost
£43,500

Payback in 5.8 Years

Payback

Business Model

- Complicated benchmarking contract made it difficult for both parties to realise savings
- Proposed an Energy Performance Contract
 - PCC provided the capital through borrowing
 - Split savings 80/20 with leisure operator
 - 10 year contract with option to extend

CO2

Carbon Savings
435 tonnes CO2/ Year

Cost Savings
£142,500 per Annum



CAPEX

Project Capital Cost
£550,000

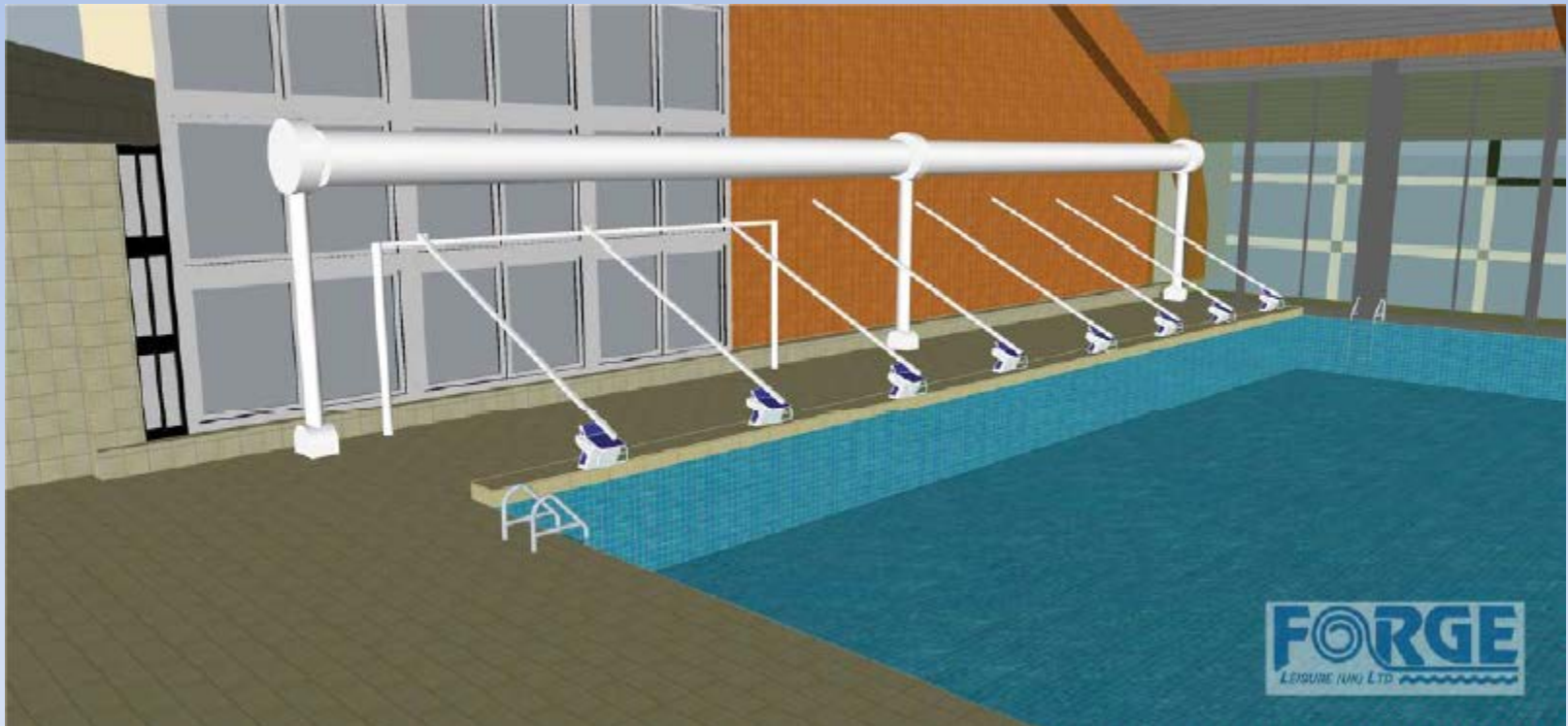
Payback in 3.8 Years

Payback

Further Projects – External LED Floodlights



Further Projects - Pool Cover



What next?

- Using the principles and expertise developed during the Mountbatten project; PCC has been able to approach other clients
- These include third party operators of PCC buildings and independent public and private organisations including:
 - Other leisure providers
 - Academies and schools
 - Other authorities
 - Private organisations
- PPAs have become the principle way in which these services are sold, however there is also potential with some clients to set up bespoke EPCs
- Most are principally concerned with reducing their energy overheads, however in the private sector CSR is a strong driver
- Investment opportunity is improved by assessing all technologies as a whole