



SolaVeil[®]
THE NATURAL ENERGY SOLUTION

CARDIFF MARRIOTT HOTEL

Whole Building

SOLAVEIL
Carbon Reduction Solution

SOLAVEIL Energy Saving Calculation Estimate

Building Name

Cardiff Marriott Hotel - Whole Building

General Building Information

1. 11 floors , 181 rooms , 3 suites
2. 9 meeting rooms,

Lighting

1. Lighting Type & Qty - Appendix A
2. Lighting Controls - Manual

Assumptions / recommendations

- a. Lighting on after room made up
- b. Manual override (wall switch available)

HVAC SYSTEM

1. Air Conditioning System - Multiple Fan coil
2. Average SEER Rating 4 - Estimate
3. Annual Heating energy (no information)

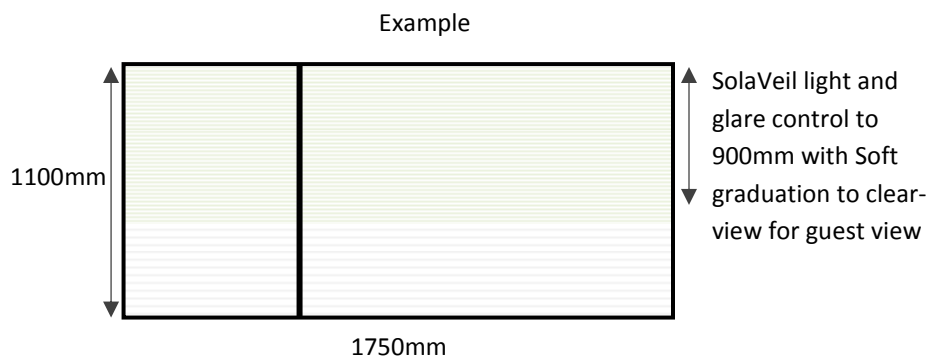


Solar Heat Gain - Annual

1. Base load from 710 m² glazing = 238,010 kWh (93 W/m²)
2. Estimated reduced level with SolaVeil = 45,220 kWh (18 W/m²)
3. Approximately 81% reduction

Base load calculation information

1. Average electrical kWh rate 9.3p (including standing charge, DC DA charge and CC Levy)
2. Defra conversion factor for electricity = 0.537
3. Defra conversion factor for gas 0.185



Proposal - SolaVeil Installation

Following the successful trial application of SolaVeil, we have taken some quantitative measurements and reviewed the feedback. With the meeting room now updated to the new style developed for the bedroom, the feedback from the hotel is all positive so far. Derek Harvey commented that Rajesh has not received any negative feedback from guests. Jeremy Kinsman commented that the meeting room (Henry Moore) seems much cooler and now looks very good.

I understand that it is normal for the hotel to leave lights on and curtains closed, after rooms have been made up, in an attempt to keep room cool but inviting. Therefore all treated rooms, curtains can be left open and all lighting switched off.

We monitored the following on Wed 08/06/11- Ref outside temp 16 deg Sunny at 14:30pm: -

Temperature readings

Room 1007 (Treated)	Window sill and surround	23 deg c
	Ambient air temperature	21 deg c
	Air con off (curtains fully open)	
Room 1006	Window Sill and surround	25 deg c
	Ambient air temperature	21 deg c
	Air con fully on (Curtains closed - no view)	

Savings of between 3kW and 4kW per/day per/room, on average, are likely but more importantly the guest arrives to see a view out and a cooler room instead of dark, curtains closed and no view.

The installation will have the following additional benefits: -

1. Stable controllable internal temperature
2. Naturally lit interior
3. Improve external appearance of the building
4. Reduce external light pollution from artificial lighting
5. Eliminate internal glare
6. Reduce running costs of air conditioning systems
7. Allow internal artificial lighting to be used more efficiently
8. Significantly improve impact of the Carbon Reduction Commitment

Estimated Installation costs

Based on an estimated 715 m² and design as per the trial installation a whole building project: -

SolaVeil Budget Cost £98,900

Energy Saving Analysis

Lighting

Based on averaged lighting quantities, and operation of 34% of the rooms reduced by 8 hours per day, the following savings are estimated based on the assumptions listed and more efficient operation of the lighting in meeting rooms / corridor areas.

Saving	21,834 kWh	£ 2,024	11,725 kg CO ₂
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Cooling

It is estimated that SolaVeil will provide energy savings from the cooling system of approx 28% by reducing the solar heat gain by > 192,000 kWh per annum.

Saving	167,243 kWh	£ 15,503	89,809 kg CO ₂
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Heating

No data available for heating however an estimated +5% improvement is expected over base-load due to minor heat loss improvements and enhancement of any Low-E coating on north facing elevations.

Summary of Saving - PA

Total Savings	189,077 kWh	£ 17,527	101,535 kg CO ₂
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Additional Savings

Carbon Credits (CRC Scheme)

Reduction in total carbon emissions will have a positive effect on the CRC scheme in terms of financial saving. This calculates, at the current rate, to **£1,300** per annum.

Lighting - lamp life

By optimising the use of the existing lighting, it is estimated that the energy saving of 34% will extend lamp life by the same amount and so a reduction in lamp replacement will result in approximately **£12,540** saving per annum, based on a lamp cost of £1.50 each and extended life by 2.0 times.

Total Estimated Annual Savings	£ 31,370
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Total Estimated Pay back (ROI)	3.15 years
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Projected savings

Illustration of future benefits based on increases in cost/kWh over the payback period.

Cost p/kWhr	9.3p	11.3p	13.3p
Project Savings	£ 2,844	£ 3,188	£ 3,532
Payback (years)	3.2	2.8	2.5

Summary

An Installation of SolaVeil designed specifically for the building, will provide significant reductions in solar heat gain and therefore saving in electrical cooling energy. With the expected additional savings detailed, the project is expected to provide an excellent return on investment on a whole site basis.

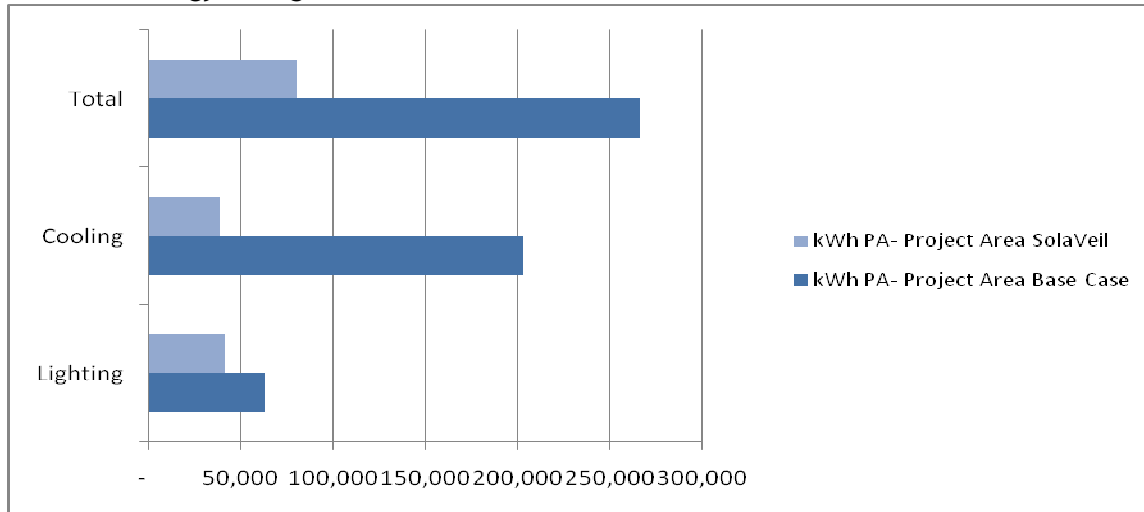
The additional savings do not take into account any forecast increases in the CRC scheme, so a whole site project, would provide significant CO₂ and Financial savings.

Obviously will the enhanced effect of cooling for a whole building and expected increases in energy costs, it is likely that a whole site project will provide a pay back in under 3 years.

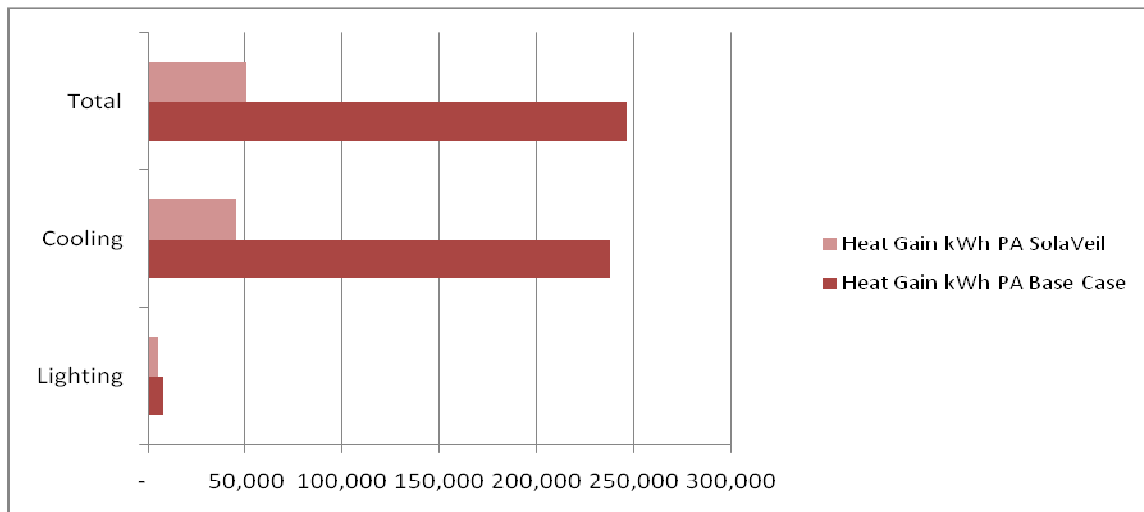
It is anticipated that we will case study the project to provide evidential information from before and after installation. I suggest we discuss this once we have agreed to proceed and review the details, locations and practicalities of this.

The installation will provide energy saving benefits and thermal comfort for 10 years. In addition, the frequency of window cleaning could be reduced providing further cost savings.

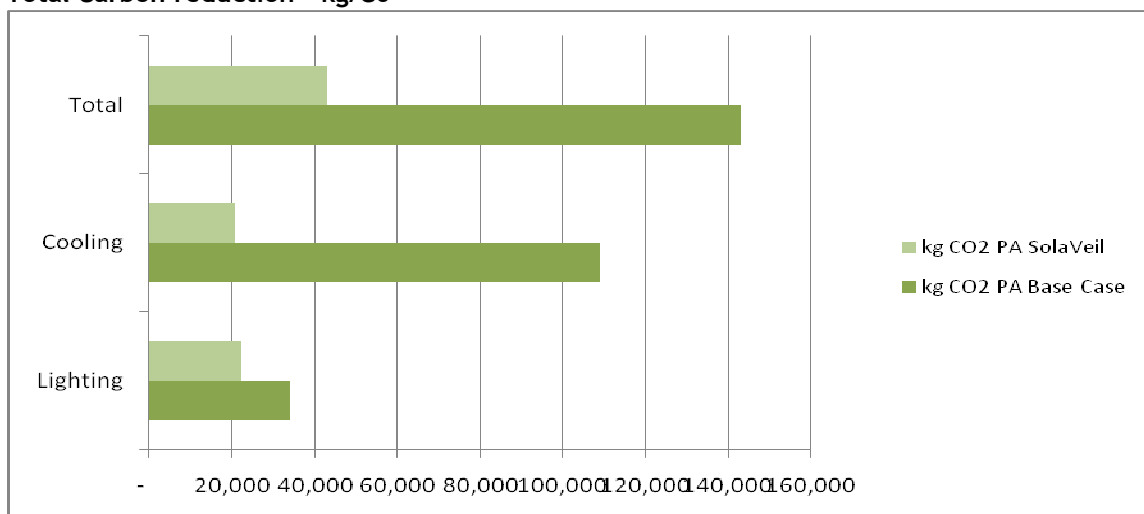
Electrical Energy Savings - kWh / PA



Heat Gain Reductions - kWh / PA



Total Carbon reduction - kg/CO²



APPENDIX A

D1 - Building Details			
Client name:	MARRIOTT		
Name of Project or Building:	Cardiff Marriott		
Name of sample / Survey Area:	Whole Building		
Total floor area of survey:	a		M ² of Sample area
Total number of floors:	b	11	For calc of whole building
Estimated whole building area:	c	0	M ² of whole building

D2 - Cooling System	
Air Conditioning SEER	4
Air Conditioning COP	
Please enter only one rating (SEER or COP)	
Used rating:	4.0

D3 - Glazing Details									
Measured SQM by elevation			Sample / Survey Area				Estimate for Whole Building (x D1b)		
			Unshaded	Shaded %	Shaded	Expansion	Unshaded	Shaded	Actual
M ² Elevation	N	a		0%	0				
M ² Elevation	NE	b	2.4	0%	0		26		
M ² Elevation	E	c		40%	0				
M ² Elevation	SE	d	26.4	0%	0		290		
M ² Elevation	S	e		0%	0				
M ² Elevation	SW	f	2.4	0%	0		26		
M ² Elevation	W	g		30%	0				
M ² Elevation	NW	h	33	0%	0		363		
Off-set for SolaVeil coverage			0						
			64.2	Total SQM of Glazing			706		

D4 - Occupancy Details		With ref to survey area	
Total Number of Occupants:	184	Regular users	
Estimate of equipment load:		kW for all equipment	
Estimate of BTU for area:	0	M ² of whole building	
Estimate of BTU for Building:	0	M ² of whole building	

D5 - Type of Glazing		(currently not used)
Effective Shading Factor:	0.8	
Change in Variables - V7		

D6 - Lighting Details									
Description of lighting types			Sample / Survey Area						
Type			Unit Watts	Rating f *	Total	Description			
Luminaire Type	A	a	58	1.1	63.8	2 x CFL 7W			
Luminaire Type	B	b	35	1.3	45.5	1 x CFL 20W			
Luminaire Type	C	c		1.3	.0	1 x CFL 24W			
Luminaire Type	D	d		1.1	.0	25 x 35W Tungsten (meeting rooms)			
Luminaire Type	E	e		1.1	.0				
Luminaire Type	F	f		1.1	.0				

*Rating f = factor circuit watts are multiplied by for ballasts & control gear, (user can modify).

D7 - Total Lighting Load					
Location of each lighting types		Qty of fittings	Ref Tyoe (fromD4)	Total	
(Type & Qty for each row/s)					
Window Row	a	17	a	1.08	kW
Window Row	b	3	b	0.14	kW
1st Row	c	5	b	0.23	kW
1st Row	d			0.00	kW
2nd Row	e	3	b	0.14	kW
2nd Row	f			0.00	kW
3rd Row	g			0.00	kW
3rd Row	h			0.00	kW
Total Floor circuit load				1.59	kW

D8 - Site Energy Costs	
9.27 p	Electricity - p/kWh
-	Site Annual kWh
£ 138.00	Annual bill £000's
	Not used

D9 - Site working Hours	
10	Hours per Day
7	Days per Week
52	Weeks per Year
3640	Total Hours/Year