CASE STUDY

Technology for Creating

COOL, COST EFFICIENT BUILDINGS

Rex Lehmann
C.E.O. SkyCool Pty Ltd

SkyCool
Eliminates Solar Heat Load

PRINCIPLE:

The most cost-effective energy is the energy no longer required to achieve the same result.

APPLICATION:

- Reducing the air conditioning power demand and consumption.
- Improving health and safety in non-conditioned buildings.

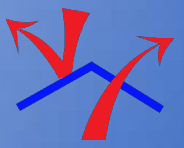
NEED:

"*Air conditioning & refrigeration systems consume 17% of electricity generated worldwide and are responsible for 10% of global greenhouse gas emissions.*" Stamford University

In many wide area buildings, the A/C is ~50% of energy consumption.

Why is this?

Because a roof heats to more than twice the ambient temperature.



Traditionally, we combat this solar-heated radiator with:

- **Insulation**
- **Roof air vents**
- **Ceiling fans**
- **Mechanical cooling systems.**

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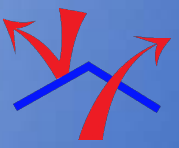
All those solutions have one common limitation:

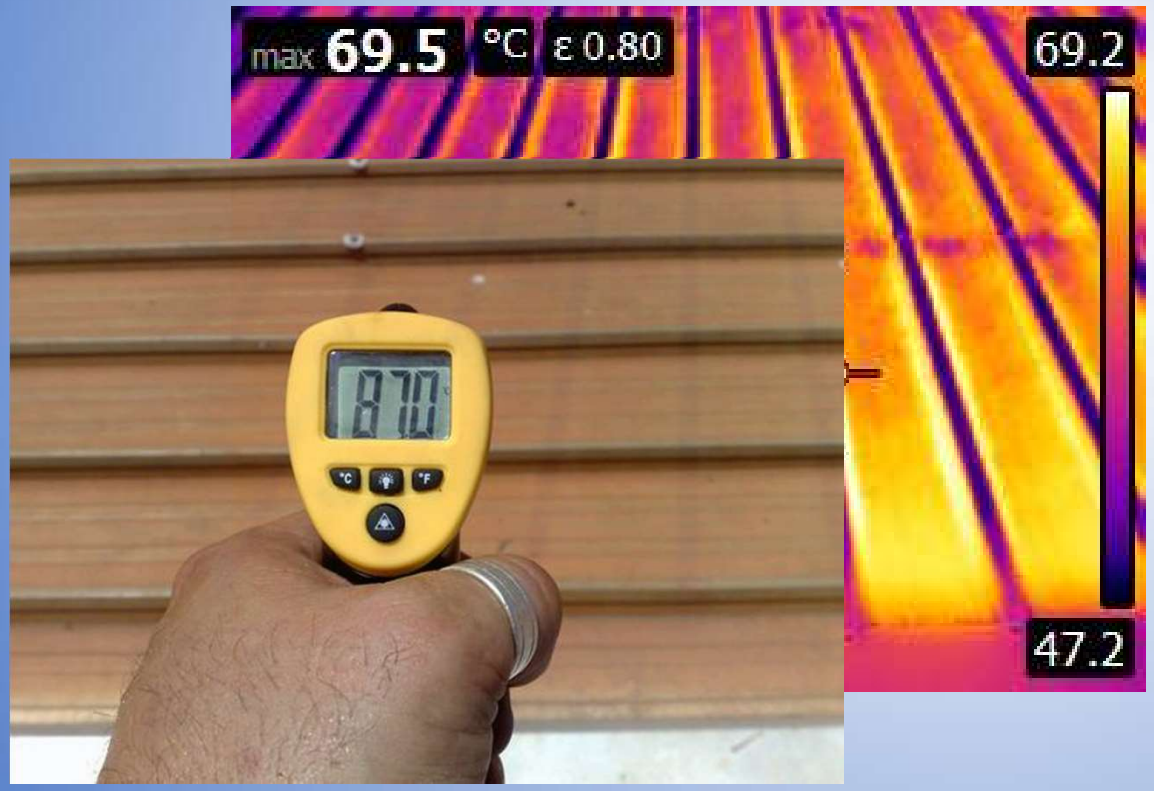
They can only address the solar heat load <u>after</u> it has heated the building.

<u>Each approach has its price</u>:

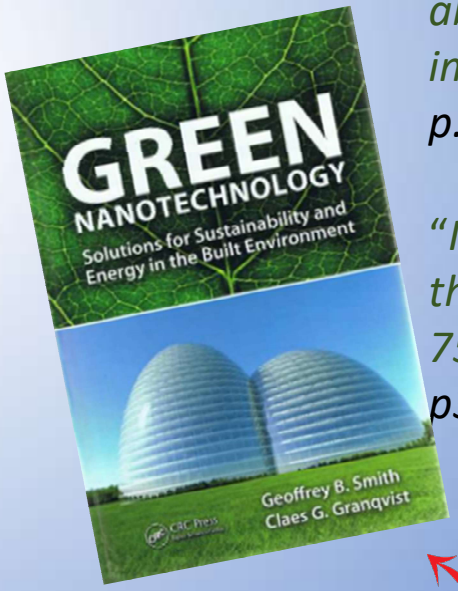
- **Insulation** can only slow the ingress of heat, then trap it inside.
- **Roof air vents** can only allow low-speed hot air outflow.
- **Ceiling fans** force the hottest air downward.
- **HVAC** - significant capital, operational and maintenance costs.



Under relatively clear skies, how hot can a roof become?



In his publication, ***Green Nanotechnology***, **Professor G.B. Smith** of the University of Technology, Sydney and NSW Scientist of the Year in 2011, observes:



"Typical roof materials absorb 75 to 95% of the incident solar energy"
p. 306

"It is not uncommon that roofs reach 60°C to 75°C under clear skies ."
p314

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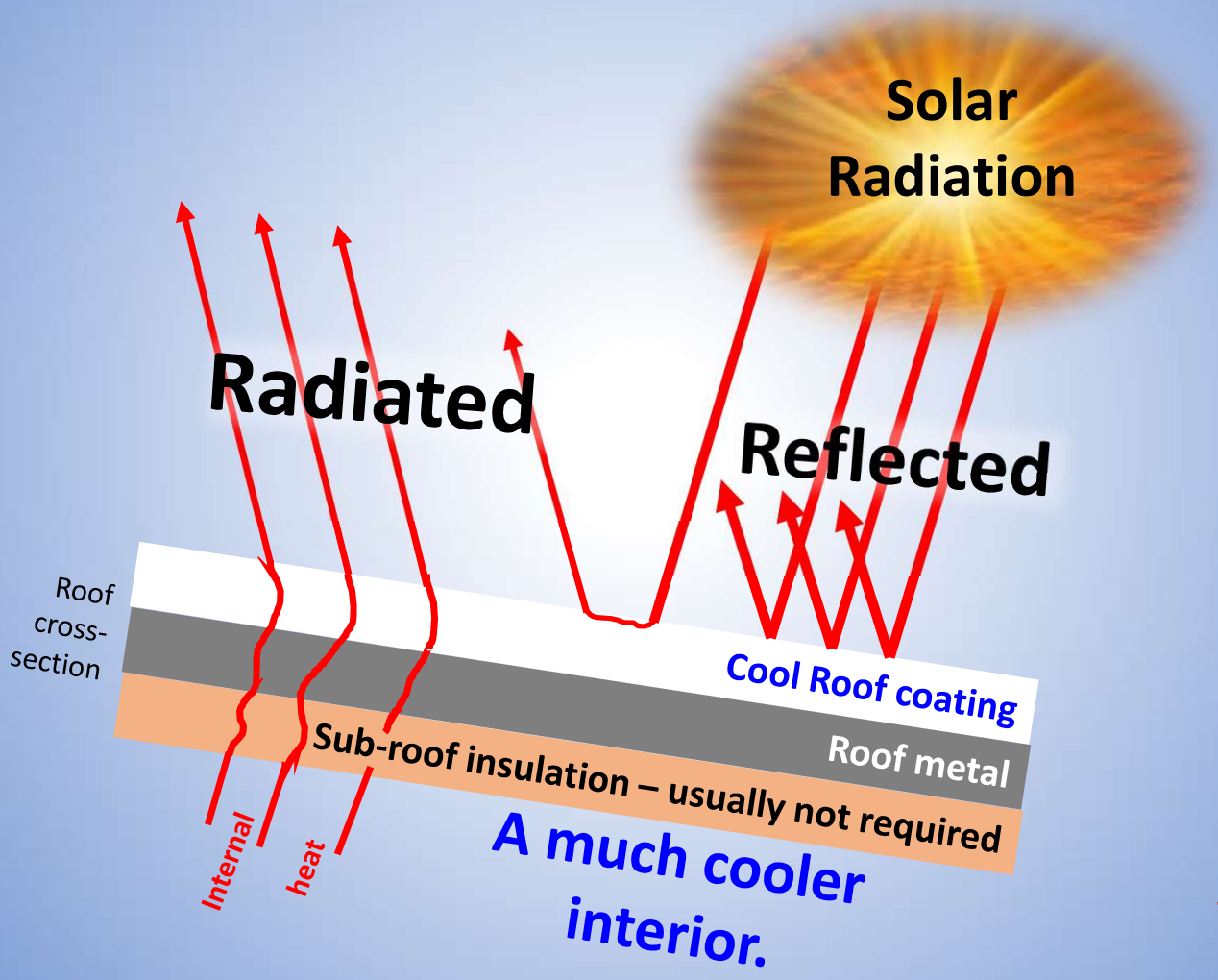
WHAT IF . . .

we could reduce (or remove) that energy demand?

The key would be to address the common denominator of preventing the roof from reaching those high temperatures in the first place.

Enter: **COOL ROOF TECHNOLOGY**

COOL ROOF TECHNOLOGY



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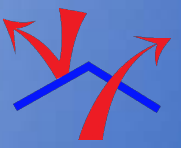
COOL ROOF TECHNOLOGY

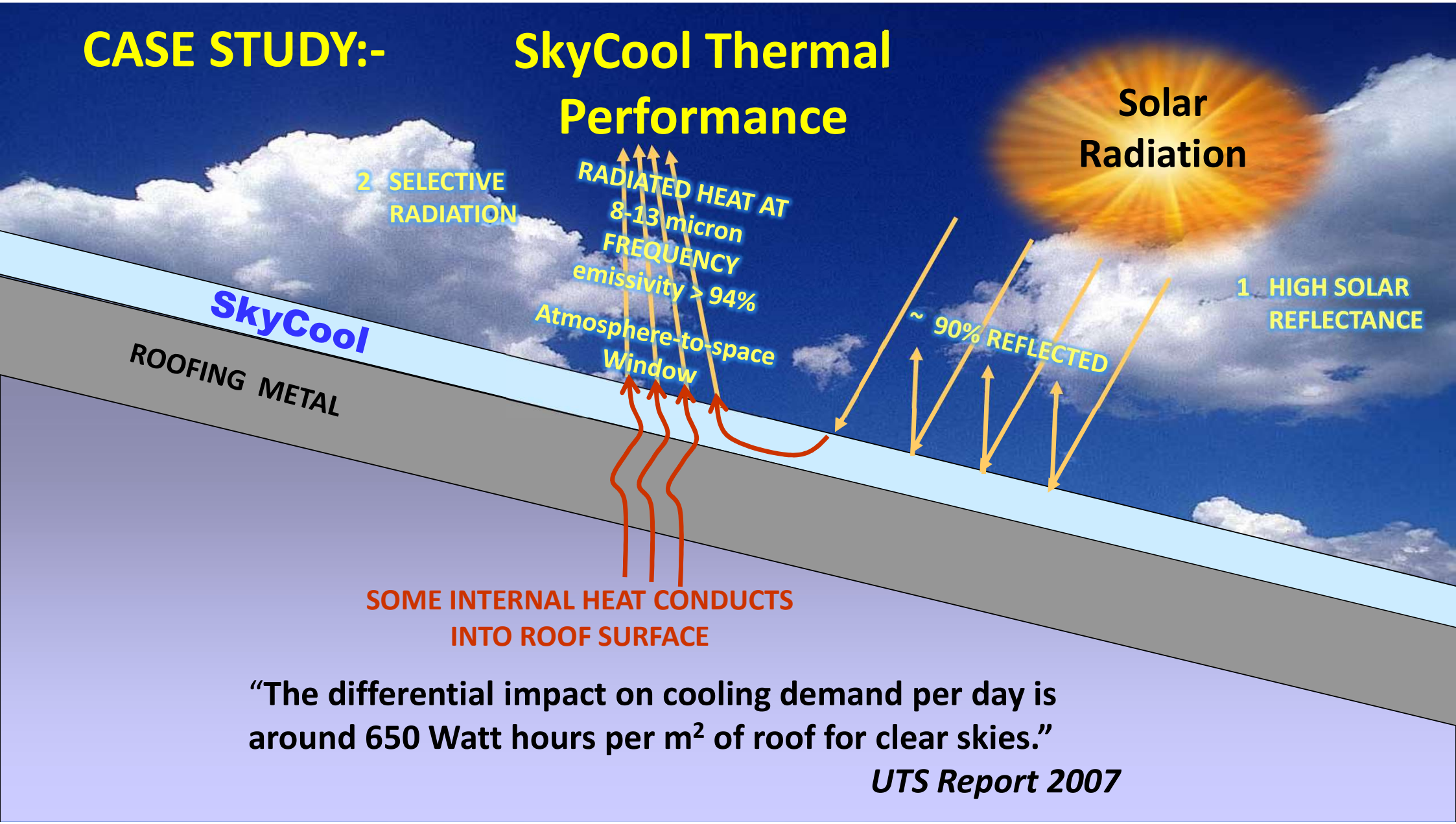
Smith, Granqvist, Green Nanotechnology, p 313.

"The thermal performance of facades and roofs in buildings is a key to determine the need for heating or cooling energy and for the thermal comfort of the occupants.

"The improvement potential is huge, and it has been estimated that retrofitting of facades and roofs to make them more thermally efficient can reduce today's demand for heating and cooling by 50 to 60%.

"The need for action is urgent, particularly in warm countries undergoing rapid development, since improved living standards tend to rapidly accelerate the use of electrically powered air conditioning."





"The differential impact on cooling demand per day is around 650 Watt hours per m^2 of roof for clear skies."

UTS Report 2007

Case Study

COOL ROOF TECHNOLOGY

SkyCool* ENERGY SAVING - Field Measurement & Verification

MEASURED SITE	HVAC Reduction	R.O.I Years	Operational Improvement
South Hedland Mall – Charter Hall	31%	1.3	57 kWh/m^2/a
Gordon Shopping Centre – Charter Hall	37%	1.5	68
Woolworths supermarket – S.E. Qld	47%	3.0	67

*SkyCool is Australian invented & produced and has been patented in 6 countries

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Case Study

COOL ROOF TECHNOLOGY

SkyCool* ENERGY SAVING - Field Measurement & Verification

MEASURED SITE	HVAC Reduction	R.O.I Years	Operational Improvement
Woolworths – Big W – S.E. Qld	53%	2.6	80 kWh/m²/a
Woolworths – Calamvale, Qld	55%	1.8	45
Westfield Mall, Wollongong NSW	31%	3.1	75

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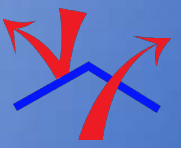
Case Study

COOL ROOF TECHNOLOGY

SkyCool* ENERGY SAVING - Field Measurement & Verification

MEASURED SITE	HVAC Reduction	R.O.I Years	Operational Improvement
Melbourne International Airport (43,000m^2)	41%	16 units made redundant	
Plumpton Mall – Sydney DEXUS	31%	2.4	35 kWh/m^2/a
Bunnings – North Qld	51%	2.5	94
Club Menai – Southern Sydney	37%	3.1	42



Case Study

COOL ROOF TECHNOLOGY

SkyCool* ENERGY SAVING - Field Measurement & Verification

MEASURED SITE	HVAC Reduction	Operational Improvement
NATIONAL AVERAGE	**42%**	**62** kWh/m²/a

- for an advanced cool roof coating

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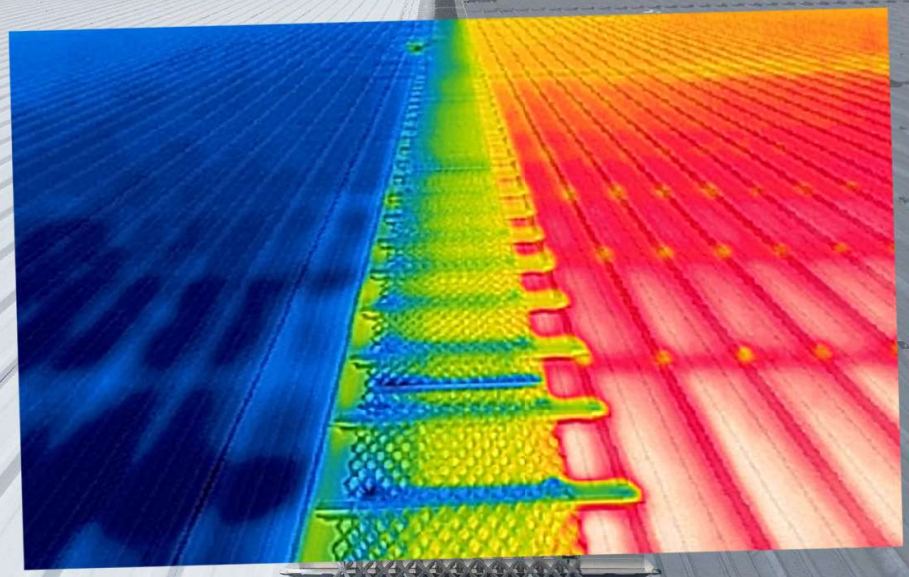
Cool Roof Creation

Thermography taken on a 28°C day showing a 39°C surface temperature reduction, making the roof 4°C cooler than ambient air.



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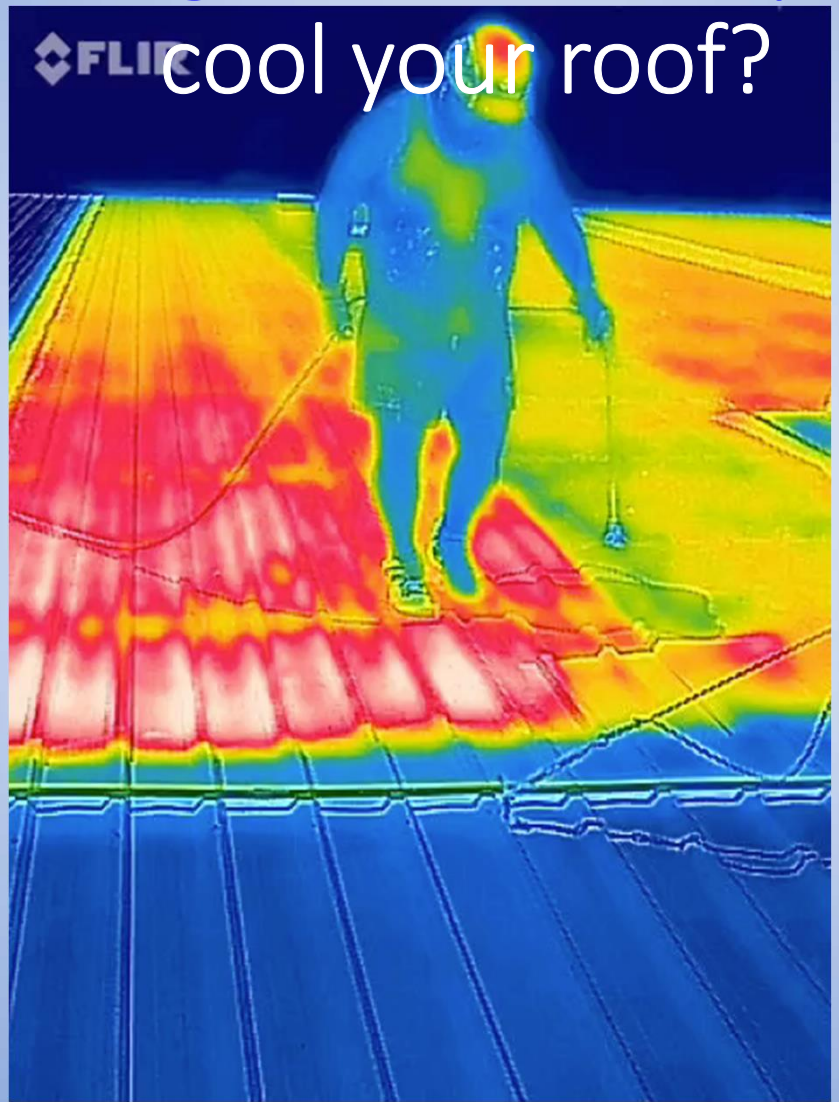
Standard

How long will it take SkyCool to cool your roof?



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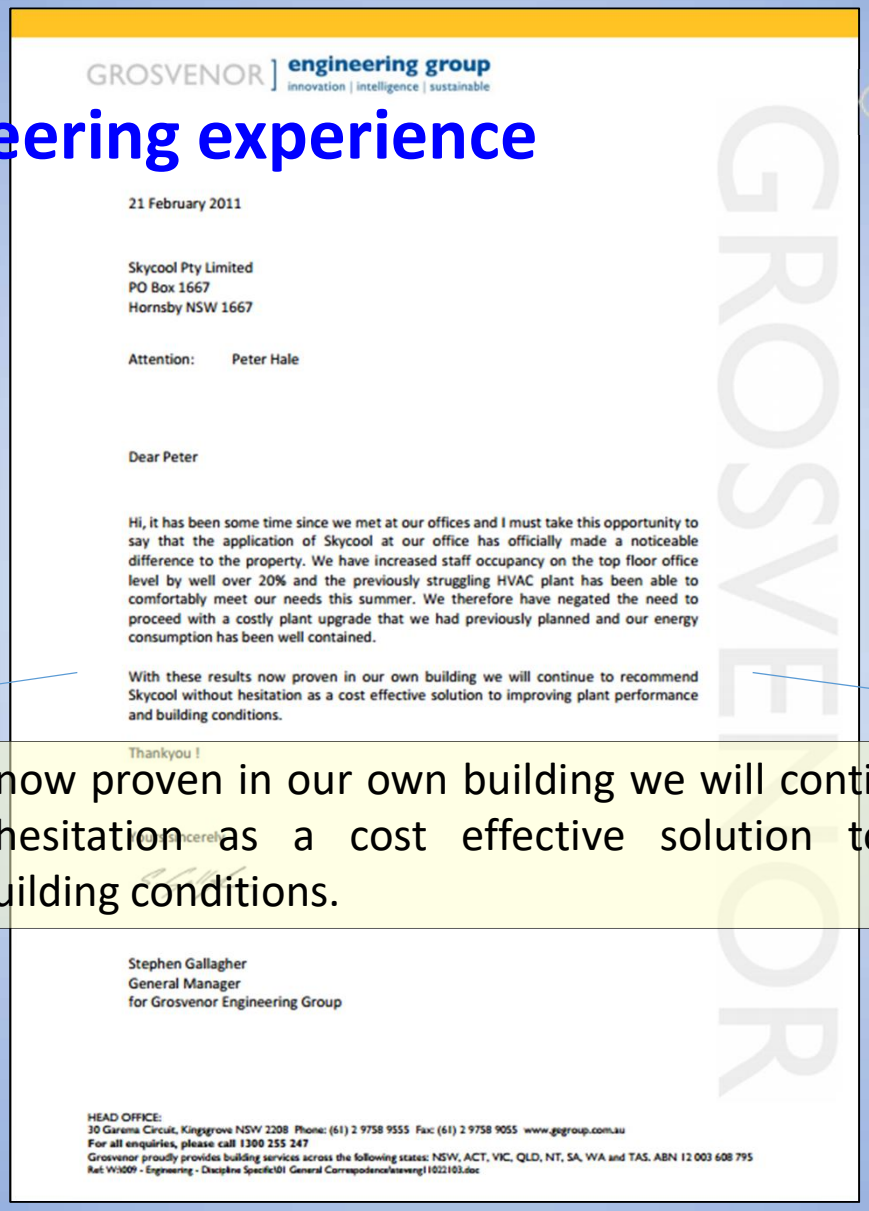
Grosvenor Engineering experience



GROSVENOR] engineering group
innovation | intelligence | sustainable

21 February 2011

Skycool Pty Limited
PO Box 1667
Hornsby NSW 1667

Attention: Peter Hale

Dear Peter

Hi, it has been some time since we met at our offices and I must take this opportunity to say that the application of Skycool at our office has officially made a noticeable difference to the property. We have increased staff occupancy on the top floor office level by well over 20% and the previously struggling HVAC plant has been able to comfortably meet our needs this summer. We therefore have negated the need to proceed with a costly plant upgrade that we had previously planned and our energy consumption has been well contained.

With these results now proven in our own building we will continue to recommend Skycool without hesitation as a cost effective solution to improving plant performance and building conditions.

Thankyou !

Stephen Gallagher
General Manager
for Grosvenor Engineering Group

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For all enquiries, please call 1300 255 247
Grosvenor proudly provides building services across the following states: NSW, ACT, VIC, QLD, NT, SA, WA and TAS. ABN 12 003 608 795
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innovative | intelligent | sustainable

Building Services Provider

Established: 1994
Assets under management: $2.2B
Sites under Management: 16,800
Services include:
HVAC, Fire, Electrical

With these results now proven in our own building we will continue to recommend SkyCool without hesitation as a cost effective solution to improving plant performance and building conditions.

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Case Study

COOL ROOF TECHNOLOGY

Additional Key Benefits

- Reduce thermal shock on both steel & concrete roofs.
- Seal pin-hole leaks in steel & fracture lines in concrete.
- Protect & extend a weathered roof for at least 10 more years.
  - Melbourne Airport advised that benefit alone saved them in excess of $1.5 million
- Reduce stress on mechanical plant

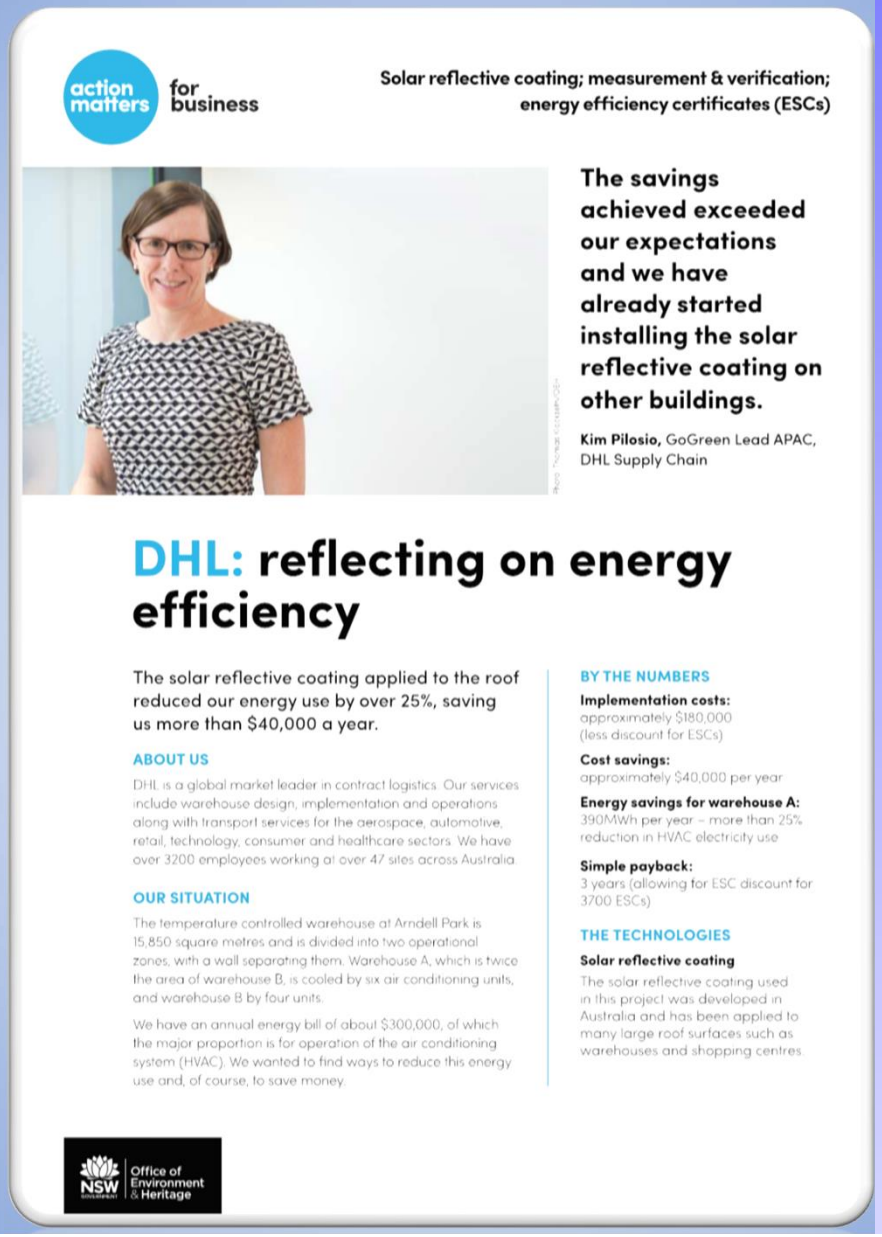
NSW GOVERNMENT | Office of Environment & Heritage

DHL case study

PIAM&V METHODOLOGY

This is the first time cool roof technology has been awarded

Energy Saving Certificates



action matters for business

Solar reflective coating; measurement & verification; energy efficiency certificates (ESCs)

The savings achieved exceeded our expectations and we have already started installing the solar reflective coating on other buildings.

Kim Pilosio, GoGreen Lead APAC, DHL Supply Chain

DHL: reflecting on energy efficiency

The solar reflective coating applied to the roof reduced our energy use by over 25%, saving us more than $40,000 a year.

ABOUT US

DHL is a global market leader in contract logistics. Our services include warehouse design, implementation and operations along with transport services for the aerospace, automotive, retail, technology, consumer and healthcare sectors. We have over 3200 employees working at over 47 sites across Australia.

OUR SITUATION

The temperature controlled warehouse at Arndell Park is 15,850 square metres and is divided into two operational zones, with a wall separating them. Warehouse A, which is twice the area of warehouse B, is cooled by six air conditioning units, and warehouse B by four units.

We have an annual energy bill of about $300,000, of which the major proportion is for operation of the air conditioning system (HVAC). We wanted to find ways to reduce this energy use and, of course, to save money.

BY THE NUMBERS

Implementation costs: approximately $180,000 (less discount for ESCs)

Cost savings: approximately $40,000 per year

Energy savings for warehouse A: 390MWh per year – more than 25% reduction in HVAC electricity use

Simple payback: 3 years (allowing for ESC discount for 3700 ESCs)

THE TECHNOLOGIES

Solar reflective coating

The solar reflective coating used in this project was developed in Australia and has been applied to many large roof surfaces such as warehouses and shopping centres.

NSW Office of Environment & Heritage

Highlights

Saving:

- 390MWh / year for 10 years
- > 25% of air-con energy
- $40,000 per year
- Thermal alarms in hottest weather

Awarded:

- > 3,700 ESCs by

National Carbon Bank of Australia

nationalcarbonbank.com.au

Value:

- ESC = $81,000 (today's value)
- R.O.I. in 3 years


DEXUS
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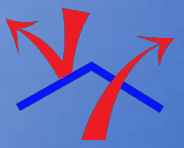
australand
THE UNIVERSITY OF
MELBOURNE
mirvac
PERTH
AIRPORT
BUNNINGS
warehouse
FUJITSU
MELBOURNE
AIRPORT
Woolworths
the fresh food people
SkyCool
MONASH University
BIGW
Charter Hall
Lend Lease
Westfield
SOUTH EAST
WATER
Roche
News Corporation
Metcash
LINFOX
ANZ
DUPONT
TARGET
Stockland

COOL ROOF TECHNOLOGY

Status:

- Technology has advanced substantially in the last decade.
- Scientifically well established – UTS, NTU, QUT, Lawrence Livermore Laboratories, Lend Lease and other key institutions.
  - GBS: "The best cool roof paints combine a high hemispherical solar reflectance of ~90% with a blackbody thermal emittance of ~95%, and are able to maintain these characteristics for many years . . ." p315
  - "Because cool roofs save both money and energy, in October 2005 they became part of the prescriptive requirements of California's energy code, the **Title 24 Building Energy Efficiency Standards**.
- Conveniently retrofitted – no effect on the business of the building, even airports.
- Suited to buildings where the roof is the dominant area for solar heat incursion.



COOL ROOF TECHNOLOGY

BUILDING HEAT MANAGEMENT

that is:

- **Proven.**
- **Highly cost-effective energy saver.**
- **Backed by universities, governments and robust field trials.**
- **Maintenance-free – install & forget for at least 10 years.**
- **Used by sophisticated building owners / operators.**

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Eliminates Solar Heat Load

SkyCool.net.au