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## CSIRO Energy Centre

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# CSIRO Energy Centre



**Project size - 10,000sqm**

**Construction Cost - \$34M**

**Annual Electricity Consumption - 950 MWh**

**Annual Natural Gas Consumption - 225,700 MJ**

**Annual Energy Consumption per sqm - 131 kWh/sqm**

**Estimated Greenhouse Gas Saving per annum - 2000 tonnes**

## **Embedded Generation Systems**

102 kW Monocrystalline Photovoltaics

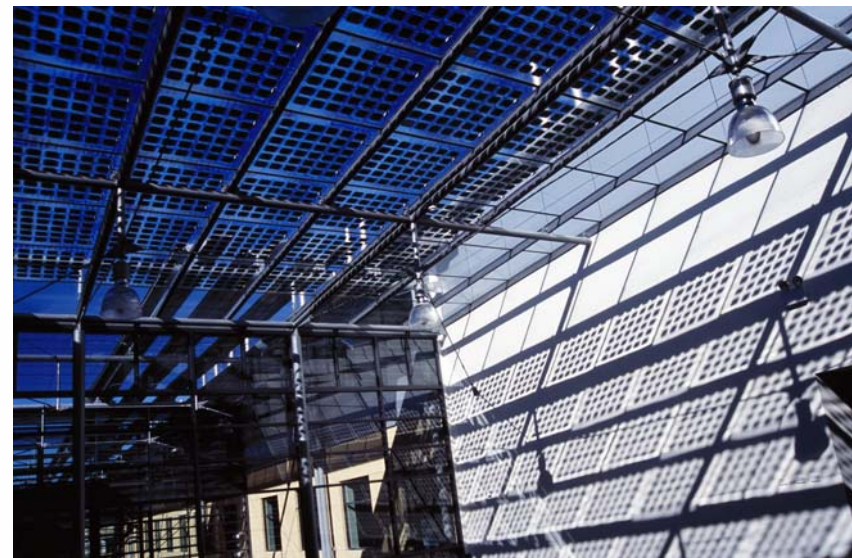
12.3kW Polycrystalline Photovoltaics

6 kW Titania Dye Photovoltaics

120kW Micro-gas Turbines

3x20kW Wind Turbines

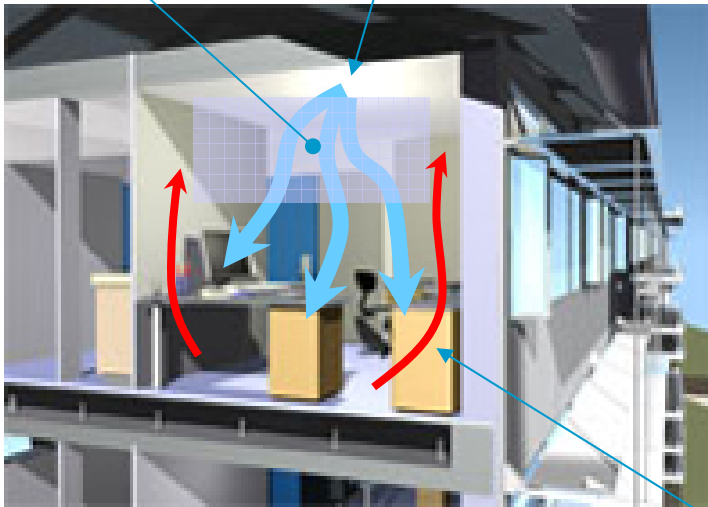
100kW Wind Turbine (future)



# Active Energy Conservation Measures

Cooling provided in this zone is wasted energy

Conventional air conditioning system forces cool air down from diffusers in ceiling



445 MWh



Estimated energy consumption per annum for conventional air conditioning system

## Underfloor Air Conditioning System

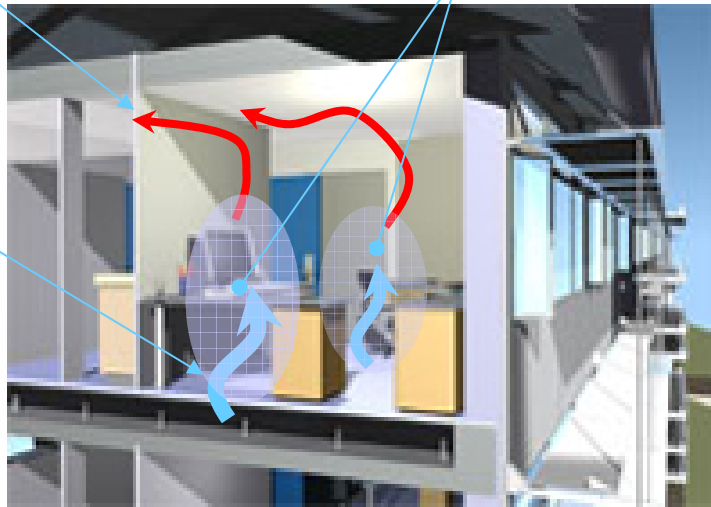
Considerable energy expended forcing cool air down into workspace to displace warm air

# Active Energy Conservation Measures

Warm air rises and is drawn off by return air system in corridor

Conditioned air delivered only to the small volume of space requiring it

Underfloor system at Energy Centre provides low velocity cool air directly to workspace



Greenhouse Gas Savings

262,640 kgCO<sub>2</sub>e

445 MWh



Estimated energy consumption per annum for conventional air conditioning system

178 MWh



Actual energy consumption per annum for Energy Centre office under floor A/C system

## Underfloor Air Conditioning System

# Passive Energy Conservation Measures

## Building Natural Ventilation Mode

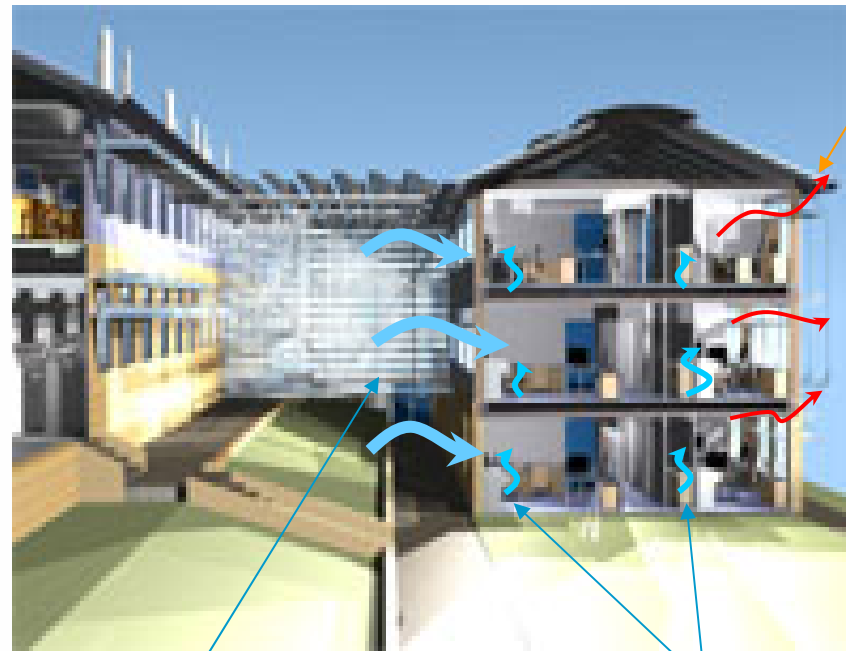
Warm air escapes via automated louvres on building façade due to natural convection

Estimated number of working days per annum when conditions would be suitable for implementing the natural ventilation mode at the Energy Centre

100 days per year

Potential Greenhouse Gas savings per annum achievable through implementation of the natural ventilation mode

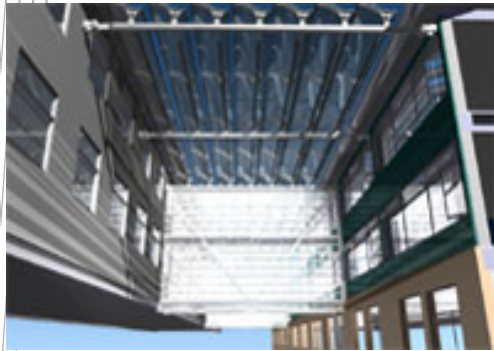
75,000 kgCO<sub>2</sub>e



Cool air drawn in from shaded courtyard space

Cool air drawn in from building sub-floor voids

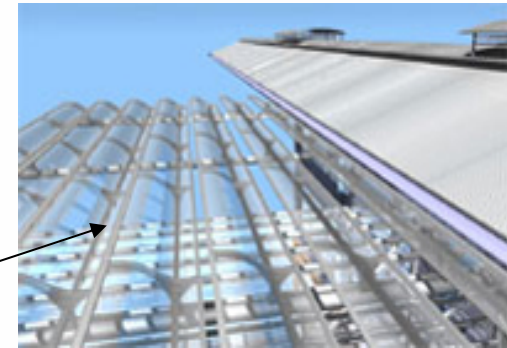
# Passive Energy Conservation Measures



Optimised Siting and Massing



Optimum Use of Shading



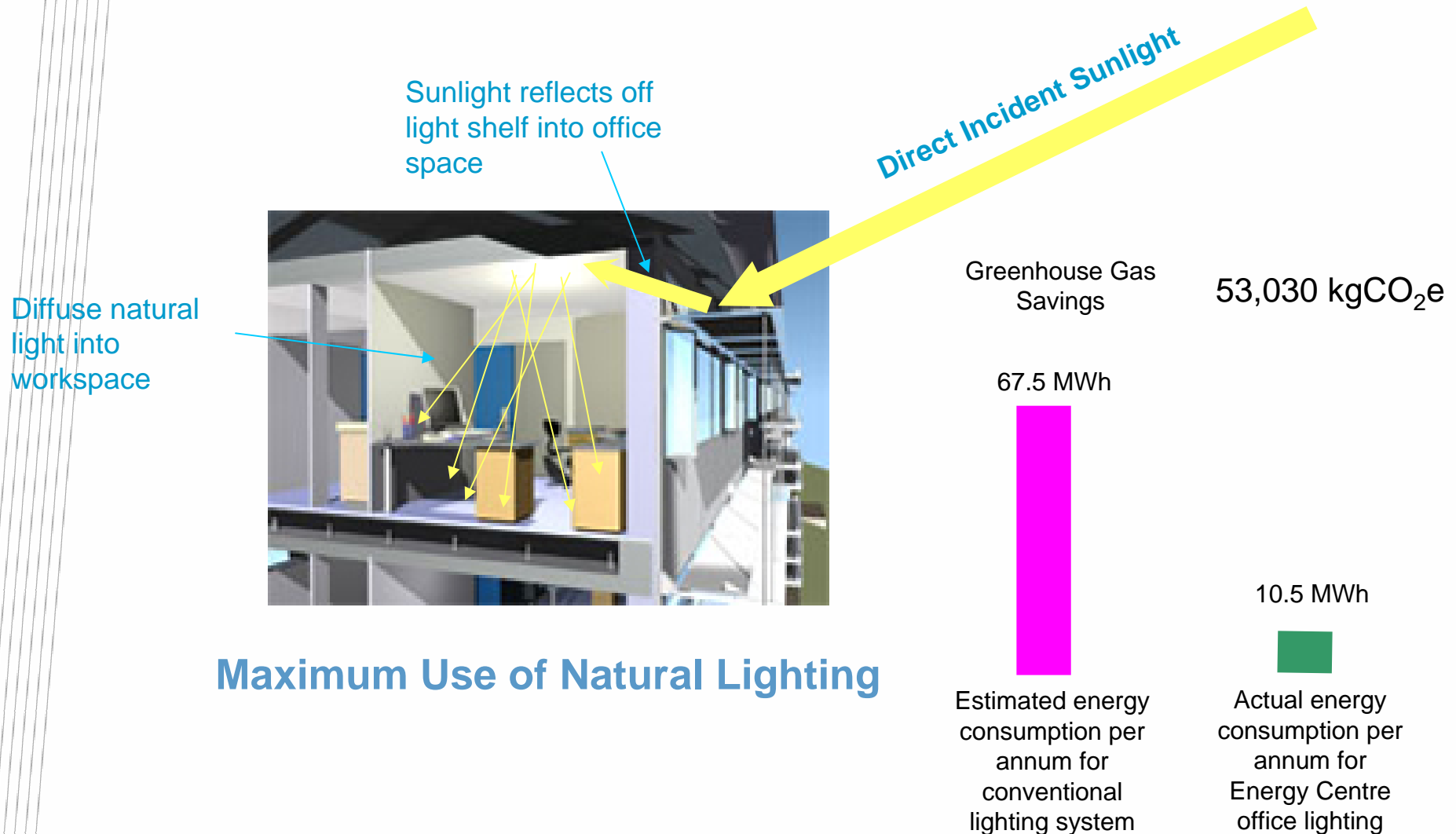
Selection of Insulating Materials for Building Fabric

Openable Windows for Natural Ventilation



Maximum North/South Exposure

# Combining Passive and Active Energy Conservation Measures



# Distributed Energy Generation

Various Embedded Distributed Generation Systems are Utilised on the Site



950 MWh



Total Site  
Demand per  
Annum

# Distributed Energy Generation

Various Embedded Distributed Generation Systems are Utilised on the Site



## Micro Gas Turbines

2 x 60kW Capstone Microturbines

Features Include

- Air bearings > 90,000rpm
- NOx < 9 ppm
- Electrical Efficiency 26%
- CHP Efficiency up to 85%

950 MWh



Total Site  
Demand per  
Annum

MGT  
530 MWh



Embedded Generation  
Output per Annum

# Distributed Energy Generation

Various Embedded Distributed Generation Systems are Utilised on the Site



## Various Photovoltaic Applications

- Process Bays - 23kW Façade Integrated Array
- Auditorium - 12kW Surface Mounted Array
- Library Roof - 3.3kW Glass Encapsulated Integrated Array
- Office and Laboratory Wing –
  - 42kW Roof Integrated Array (Office)
  - 33kW Roof Integrated Array (Laboratory)

950 MWh



Total Site  
Demand per  
Annum



PV  
130 MWh

MGT  
530 MWh

Embedded Generation  
Output per Annum

# Distributed Energy Generation

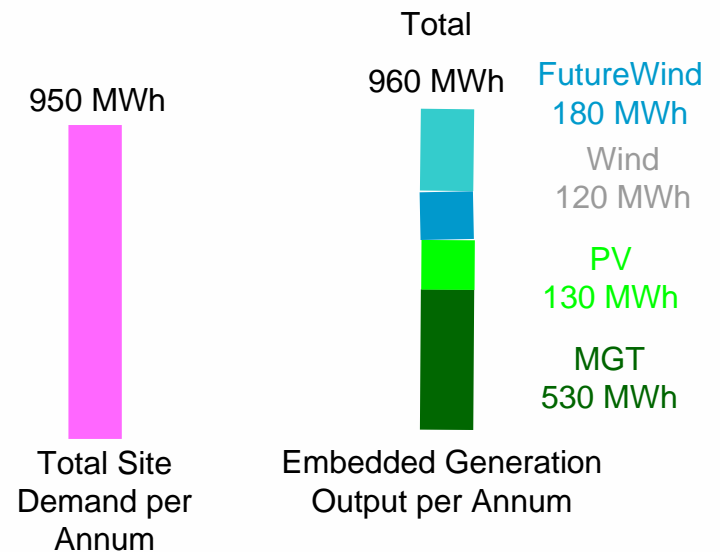
Various Embedded Distributed Generation Systems are Utilised on the Site



## Wind Power

3 x 20kW Wind Turbines

1x100kW Wind Turbine  
(Future)



# Awards

- Winner – 2004 Engineers Australia Engineering Excellence Award
- National Finalist – 2004 Australian Engineering Excellence Awards
- Winner – NSW Urban Taskforce 2004 Sustainable Developments Excellence Awards for Environmentally Sensitive Developments.
- Winner – Highly Commended for NSW Department of Energy Utilities & Sustainability (DEUS) 2004 Green Globe Awards – New Power Generation Projects.
- International Finalist - Royal Institute of Chartered Surveyors Award for Sustainability 2006 (Ranked amongst the top 13 sustainability projects in the world)

**CSIRO Energy Technology**

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Thank you

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