



# CSIRO Energy Centre



- Embedded Energy Initiatives
- Showcase what is possible in contemporary sustainable designed building
- Catalyst and attractor for CSIRO and partners promotion
- Public interface



# CSIRO Energy Centre

**National focal point for research excellence in the fields of:**

- Energy Transformed Flagship**
  - developing and implementing technologies leading to zero emissions power from fossil fuels and eventually, large scale hydrogen generation
  - developing cost-effective electricity and hydrogen from renewable sources
  - increasing the fuel and traffic management efficiency of urban transport, paving the way for a transition to hydrogen powered vehicles
  - doubling the efficiency of fuel (natural gas and eventually hydrogen) use by the generation of power/heat/ cooling at point-of-use (distributed energy) applications
- Sustainable energy - including energy storage and renewable energy**
- Environmental impacts of energy generation and consumption**
- Cost competitive and environmentally acceptable fossil fuel research and development**

# What was our design brief?

- **Functional, multi use work spaces for a research enterprise**
  - offices
  - laboratories
  - process bays
- **The building to demonstrate energy efficiency**
- **The building to be**
  - an icon for the mixed energy services of the future
  - an inspirational place to work



# What were we trying to balance?

- Leading edge vs bleeding edge
- Greenfield startup costs vs incremental costs
- Contribution of technology v technology for its sake





# CSIRO Energy Centre Initiatives

**Energy demand reduction**

**Energy conservation**

**Energy generation**

**Energy management**



**Sustainable development**



# Energy Conservation

- Active Energy Initiatives
- Variable speed pumps and fans
- Separate air handling plant for laboratory modules
- Outside air cycles to lab areas
- Variable volume air handling technology
- Interconnection of exhaust and a/c systems
- Multiple step control chillers
- Dedicated automatic lighting control system-time clock control, passive infra-red detectors, photo electric controls
- Power factor correction to transformer supplies
- Underfloor air conditioning system
- Building Management System



# Energy Conservation

- Passive Energy Initiatives
- Orientation - maximum north/south exposure
- Optimised building siting and massing
- Minimisation of infiltration
- Thermal mass for heat/cold retention
- Insulation of building fabric
- Glazing optimisation
- Natural daylighting maximisation (light shelves)
- Sun shading to north façade
- Openable windows for natural ventilation
- Low 'E' glass

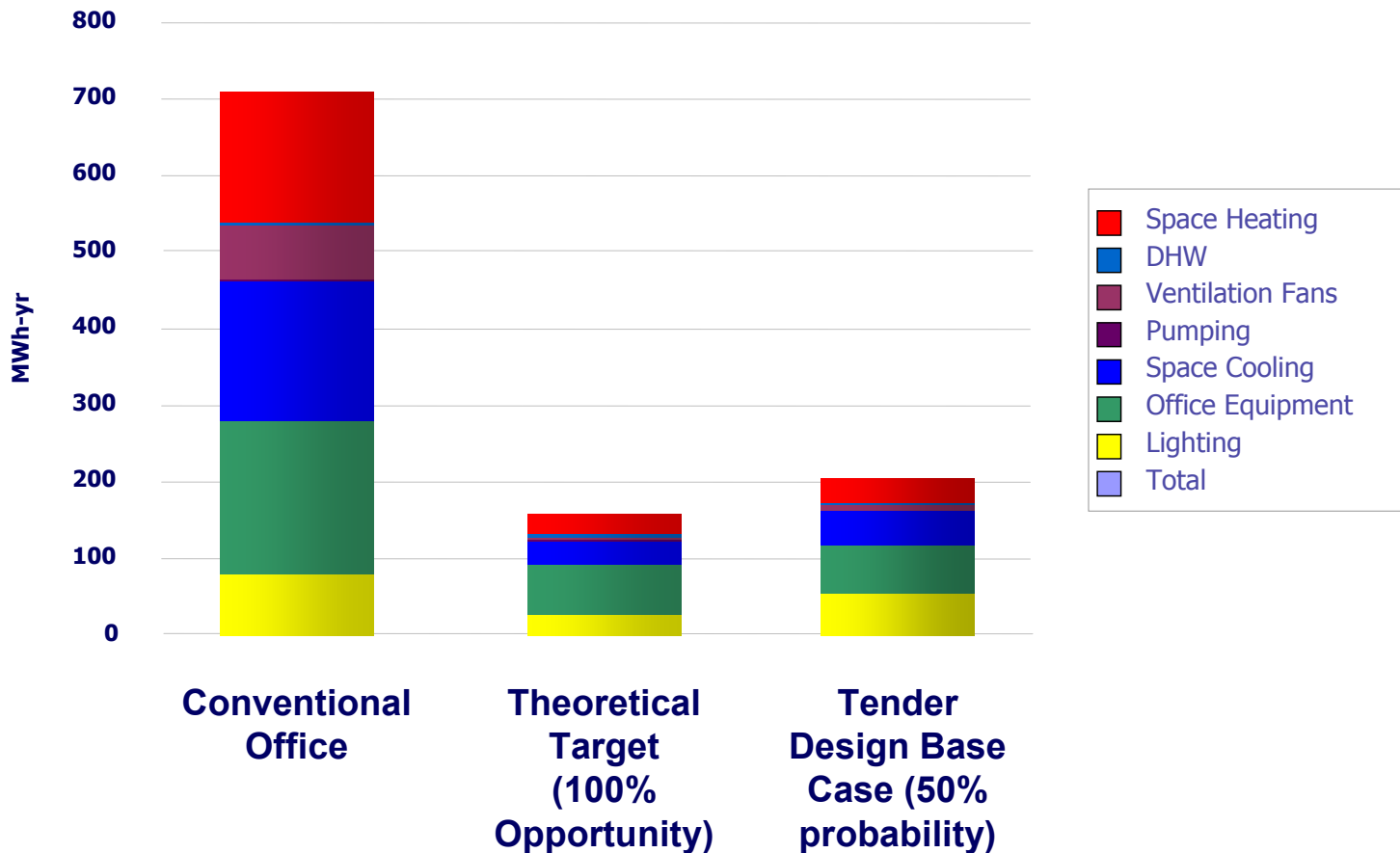


# Ecologically Sustainable Development Initiatives

- Rainwater collection, retention and use
- Water saving devices on hydraulic fitting and fixtures
- Full site energy systems control and data display/accessibility
- Heat recovery from energy generation
- Monitoring of air quality, particularly for carbon dioxide
- Waste treatment
- Sustainable use of site indigenous native vegetation



# Base building energy demand 30 – 50% of comparable “conventional” building



# Energy Generation

- 2 x 60kW Capstone / Tyco microturbines



- 3 x 20kW Gridlink windturbines
- 100kW windturbine (to be installed)

## Features

- Air bearings > 90,000rpm
- NOx <9ppm
- Electrical efficiency 26%
- CHP up to 85%
- 13m blade diameter
- 20kW @ 9m/s
- 70rpm @ 20kW



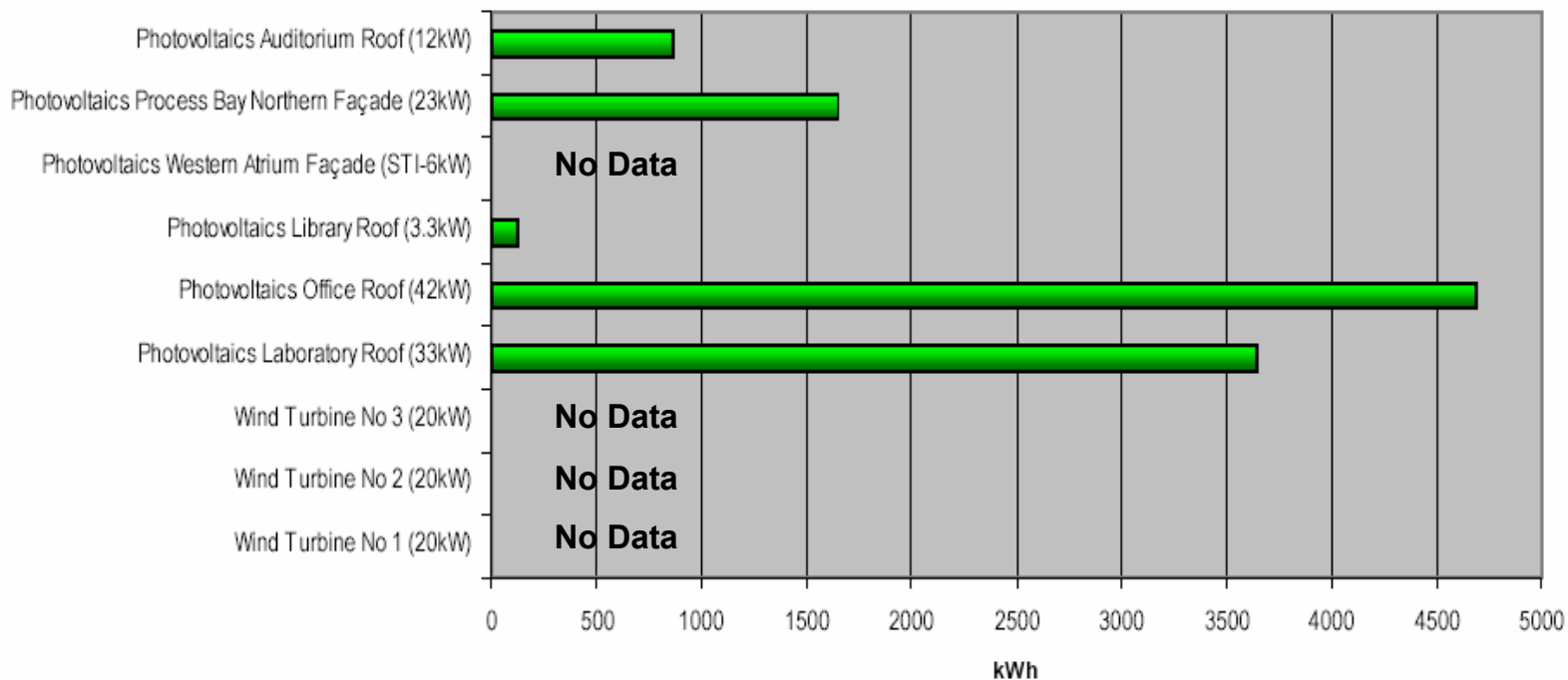
# Photovoltaics

• Pacific Solar	Auditorium	Plug and Play 8kW
• BP Solar	Library Roof	2kW
• BP Solar	Laboratory Roof	30kW
	Office Roof	37kW
• STI Titania Dye	Process Bay	19kW
	Atrium Wall	Expected 6kW



# PV Performance

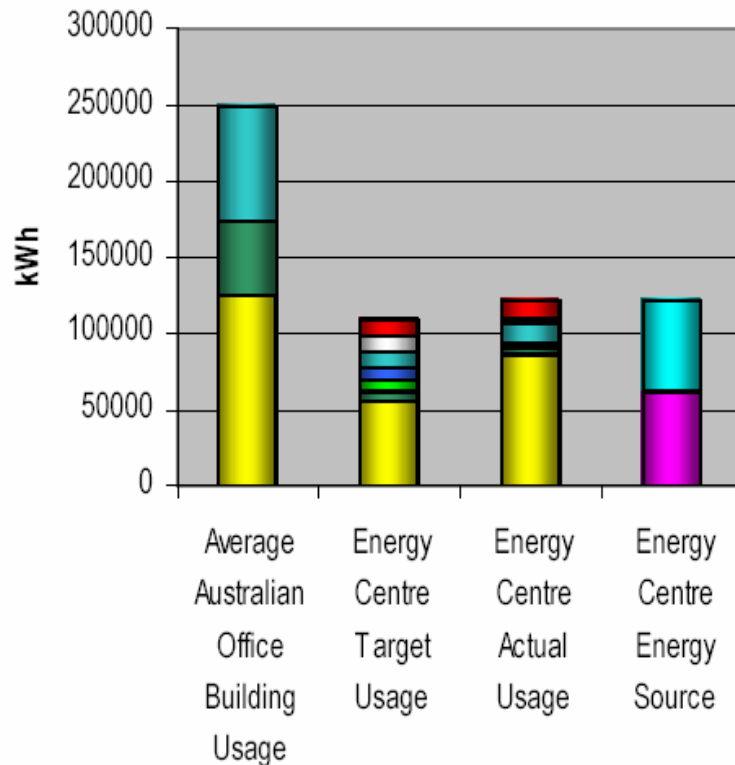
Renewable Energy Output for February 2004



**Total Renewable Energy Output  
10,930 kWh**

# Performance so far

Energy Profile for February 2004



-  Embedded Generation
-  Grid
-  Process Bay Equipment
-  Lab Equipment
-  Office Equipment
-  Lighting - Process Bays
-  Lighting - Laboratory Building
-  Lighting - Office Building
-  HVAC



# Overall Performance Rating



**CO<sub>2</sub> Saved by Renewable  
Energy Systems**

10,980 kg

**CO<sub>2</sub> Saved through Building  
Performance**

127,582 kg

**Monthly  
Greenhouse Gas  
Emission Target  
(kgCO<sub>2</sub>/m<sup>2</sup>)**

11.2


**Monthly  
Greenhouse Gas  
Emission Actual  
(kgCO<sub>2</sub>/m<sup>2</sup>)**

12.7



# Energy Centre Outcomes

- Maximum energy savings will not be achieved without “energy educated” occupants
- The facility will also provide a ‘people laboratory’ for living in an ESD (“green”) environment
- Results of actions and operations can be immediately seen on the building management system monitors
- A program based on these ecological / behavioural aspects is to be prepared - ideally in collaboration with others

A decorative graphic at the top of the slide features several overlapping, wavy lines in shades of teal and light blue, creating a sense of motion and energy.

# The Energy Centre – A National Platform for World Class Energy Research, Development and Demonstration