2015 INTERNATIONAL WORKSHOP ON ENVIRONMENT AND ALTERNATIVE ENERGY

"Increasing Space Mission Ground Structure Resiliency through Sustainability“

ESA Facilities Environment and Energy Management

Paul Cannock

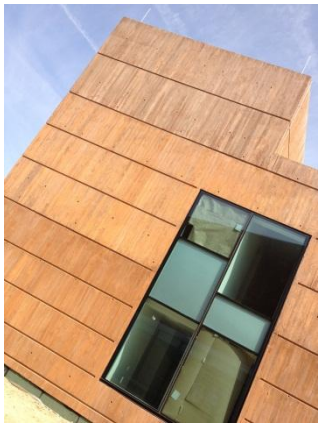
10/11/2015 ESAC – Madrid, Spain

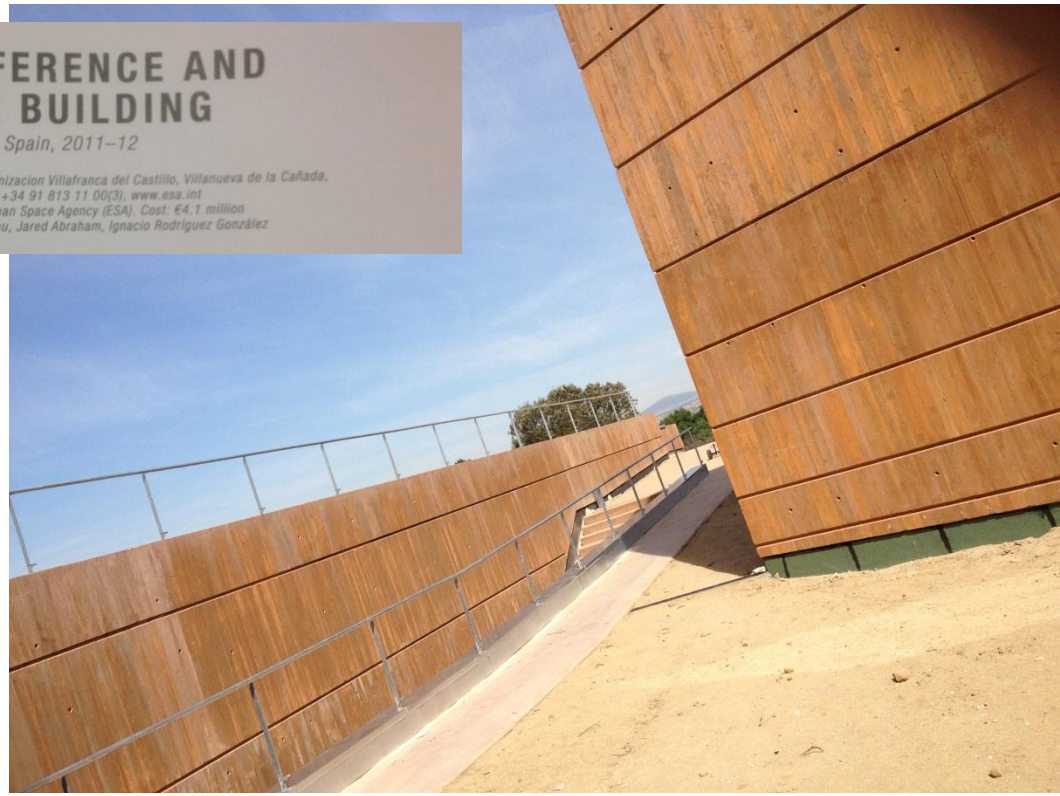
NGC 6302, captured by the NASA/ESA Hubble Space Telescope

ESA CONFERENCE AND OFFICE BUILDING

Madrid, Spain, 2011–12

Address: Camino bajo del Castillo s/n, Urbanizacion Villafranca del Castillo, Villanueva de la Cañada, 28692 Madrid, Spain, +34 91 813 11 00(3), www.esa.int
Area: 2527 m². Client: European Space Agency (ESA). Cost: €4.1 million
Collaboration: Sebastian Guivernau, Jared Abraham, Ignacio Rodríguez González





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ESA at a Glance

headquarters
Located in Paris, home to the main programme directorates that steer and formulate ESA policy.

estec
The European Space Research and Technology Centre, Noordwijk, the Netherlands, is the largest site and the technical heart of ESA.

esoc
The European Space Operations Centre, Darmstadt, Germany, tracks and controls European spacecraft.

esrin
ESA's centre for Earth observation activities, near Rome, Italy, also develops information systems and hosts the Vega launcher project.

eac
The European Astronaut Centre, Cologne, Germany, trains astronauts for missions to the International Space Station and beyond.

esac
The European Space Astronomy Centre, near Madrid, Spain, hosts the science operation centres and archives for ESA's astronomy and planetary missions.

redu
Redu Centre in Belgium is part of ESA's ground station network and is also home to ESA's Space Weather Data Centre.

harwell
Harwell Centre, in Oxfordshire, UK, is focusing on commercialisation and partnerships in space activities.

guiana space centre
ESA's launchers lift off from Europe's Spaceport in Kourou, French Guiana. It is jointly operated by the French space agency (CNES) and Arianespace with the support of European industry.

More premises:

- **Liaison offices** : Brussels, Washington, Moscow
- **Ground stations :** Kiruna (Sweden), Cebreros (Spain), Kourou (French Guiana), Perth (Australia)…
- **Integrated teams :** Baltimore (NASA), Pasadena, (NASA), Toulouse (CNES)

- **More than 250,000 m² building surface**
- **5,000+ on-site employees**

ESA Sustainability Objectives: The Y 2020 Targets

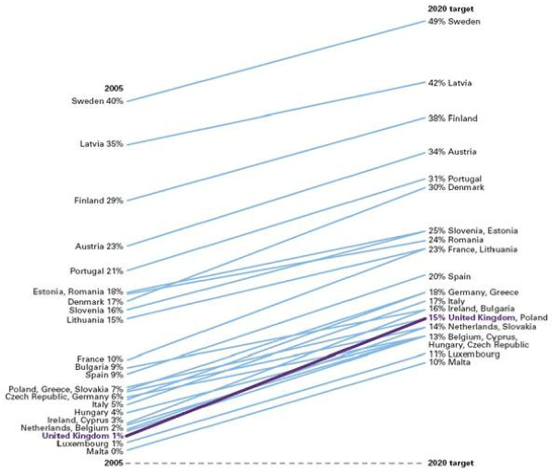
The 20-20-20 Targets

20|20|20

Agency commitment to mitigating environmental impacts, reducing CO2 emissions, promoting the use of renewable resources and improving efficiency (Agency Framework Policy on Sustainable Development [ESA/C(2010)29]).

The **20-20-20** targets:

- 20% reduction of CO2 emissions
- 20% improvement in energy efficiency
- 20% increase in use of renewable energy



(*EU Countries performances and targets*)

….by the year 2020, referring to the baseline year 2007.

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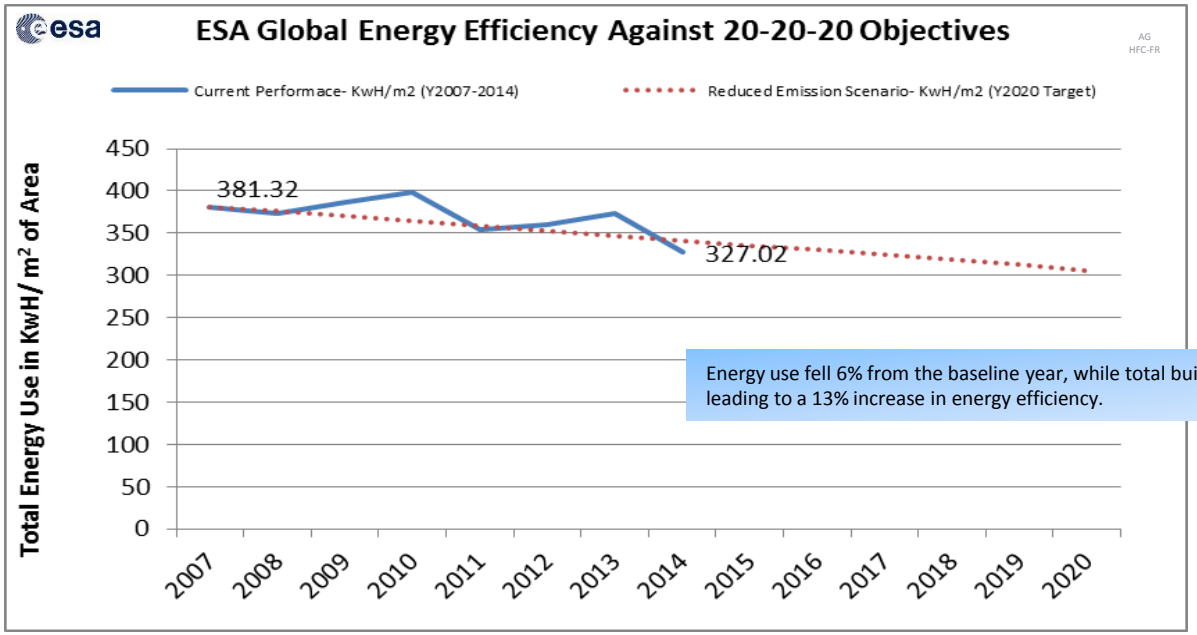
A Snapshot of ESA Global Performance Against Y 2020 Targets

- **CO_2 emissions and renewable energy targets have been met**
  - **CO_2 emissions were down 58% against the baseline year (Y 2007) in Y 2014**
  - **Use of renewable energy was up 65% against the baseline year (Y 2007) in Y 2014**
- **Our primary challenge now is to increase energy efficiencies**

Energy Efficiency Target



Energy use fell 6% from the baseline year, while total building surface increased 10%, leading to a 13% increase in energy efficiency.

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ESA FM Management Initiatives

A renewed focus on practical activities can greatly support efficiency objectives:

- **Maintain communication and awareness/ encourage behavioural change**
  - *Energy saving campaigns/ shut-down protocols for users*
  - *Mobility awareness – Bicycle availability; Electric car plug-in – ESTEC, ESAC, ESRIN*
  - *Sustainable Procurement – FM services contracts*
  - *Advanced recycling programmes*
  - *Increased availability of video-conference space to reduce business travel*
- **Investments in new energy efficient technologies**
  - *LED for building and street lights*
  - *Energy efficient management solutions for Data Centres*
  - *Incubator for emerging technologies – ex. Smart Impulse – a "current signature" based technology for monitoring facilities' electricity consumption by equipment*
- **Encourage projects which bring sustainable environmental benefits, taking into account:**
  - *Relevance to achievement of Environmental objectives*
  - *Costs and R.O.I*
  - *Examples include:*
    - *Renewable energy produced from photovoltaic panel installations at ESRIN and ESAC (accounting for 0.5% of total ESA electricity consumption)*
    - *The purchase of electricity provided by renewable sources at ESTEC, ESOC, ESRIN, ESAC and REDU (accounting for 93% of total ESA electricity consumption)*
    - *Carbon offsets for gas use (ESTEC)*

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Going Forward – Focus on Improvement of Energy Efficiencies

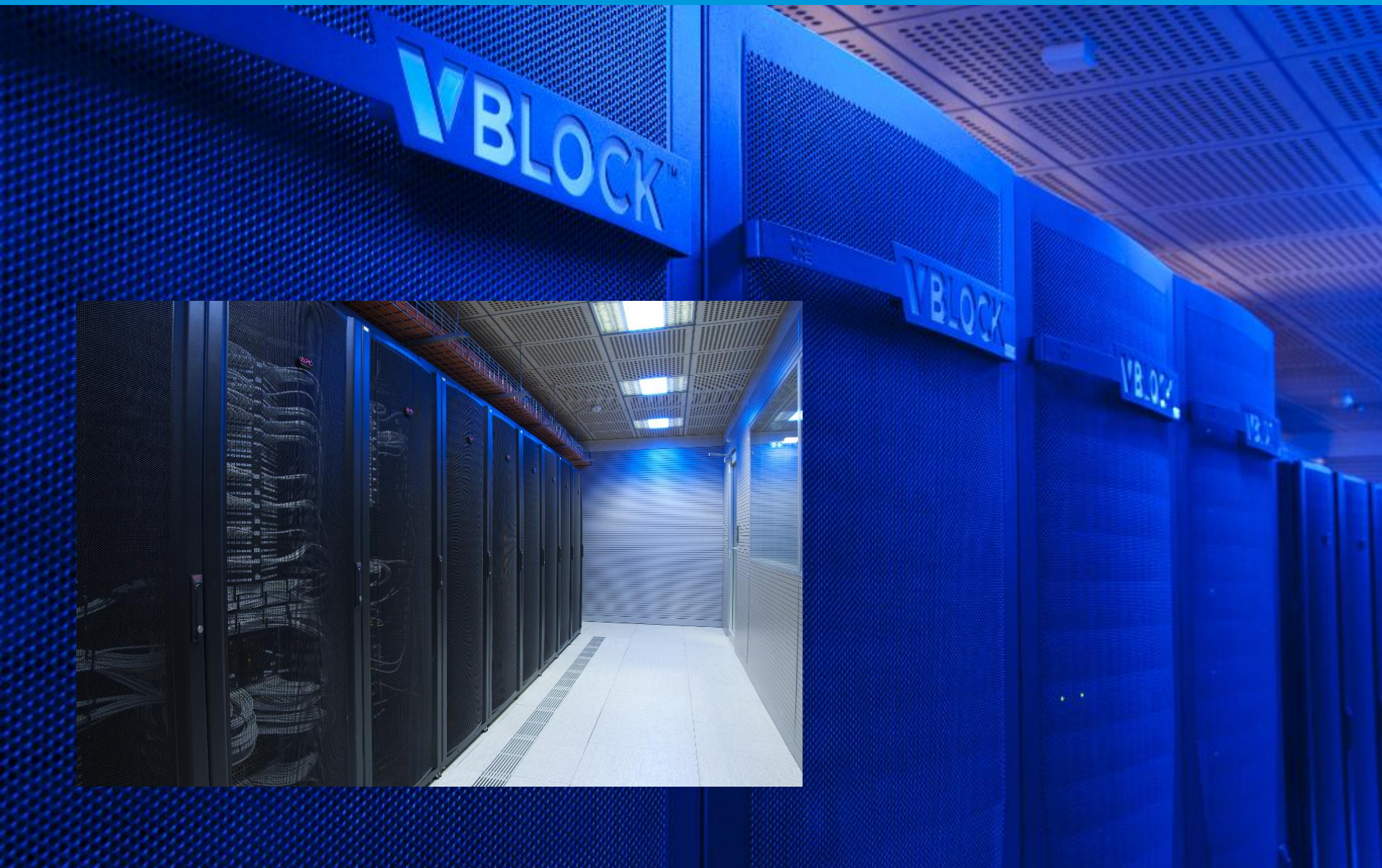
⇒ **To respond to further challenges, we must address :**

- ⇒ The aging infrastructure, the budgetary constraints, the increased legal framework

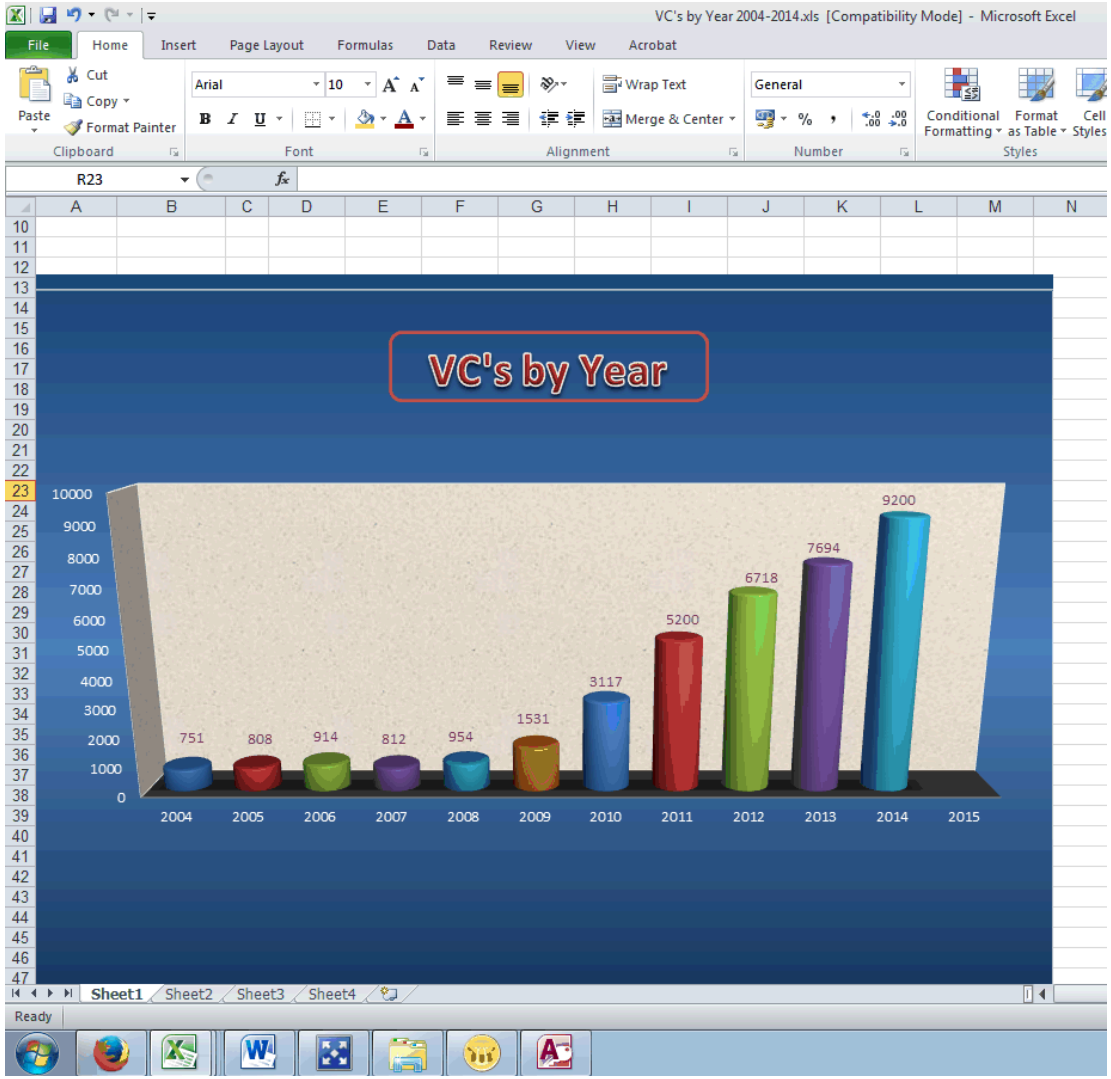
⇒ **Efficiency achievement is a challenge (7 – 8% increased efficiency sought within 5 year time frame), it will require essentially:**

- ⇒ Continuous review of environmental project plans, taking into practical opportunities for increased efficiencies and new technologies
- ⇒ Focus on efficiencies in buildings and infrastructure (enhanced thermal envelope performance, Lighting replacement, …..)
- ⇒ Streamlined building operations (operating mode, tuning, …)
- ⇒ Enhanced user awareness and involvement

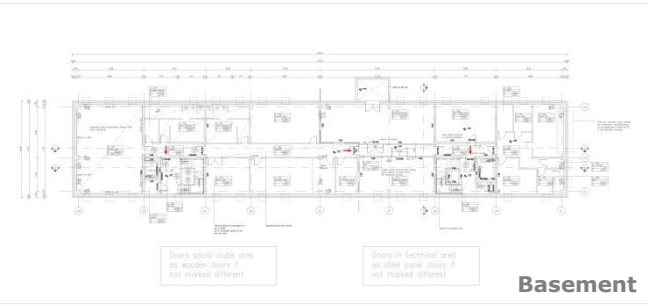
ESA Data Centres

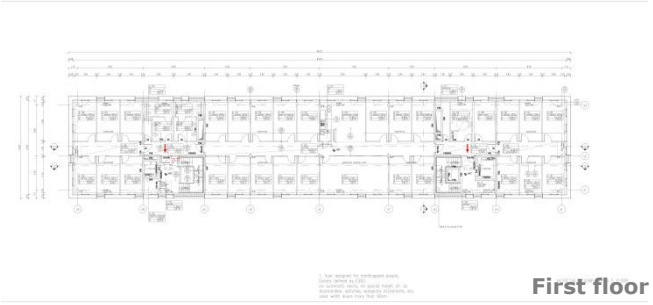


ESA Video Conferencing



ESA's New Buildings





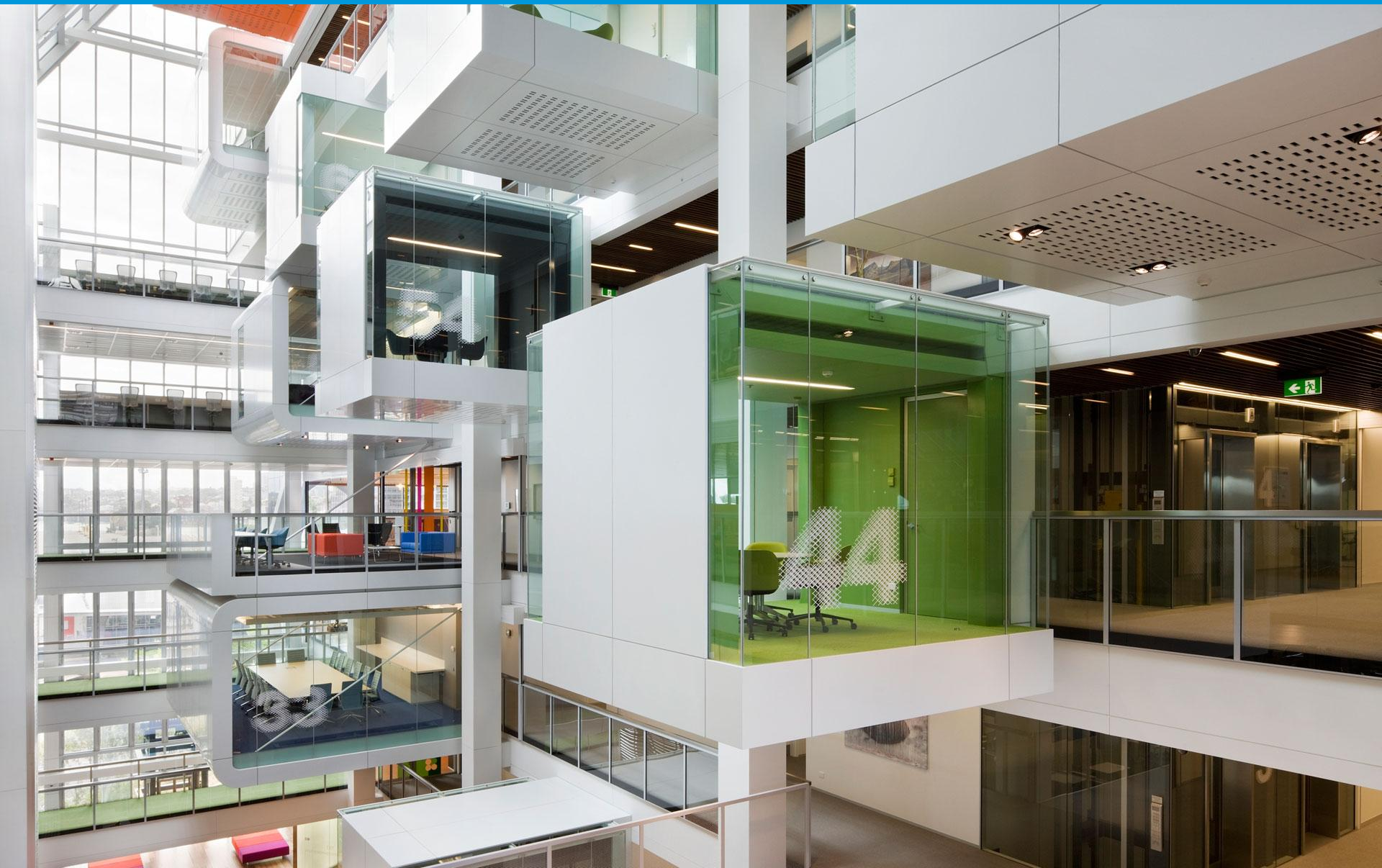
Building Inauguration

9th July 2015

Building completed and occupied

Sep 2015

Challenges: Activity Based Workplaces



Cannock’s Office of the Future