

# **GREEN IN SILICO**

## **- Sustainable Scientific Computing for Smart Science**

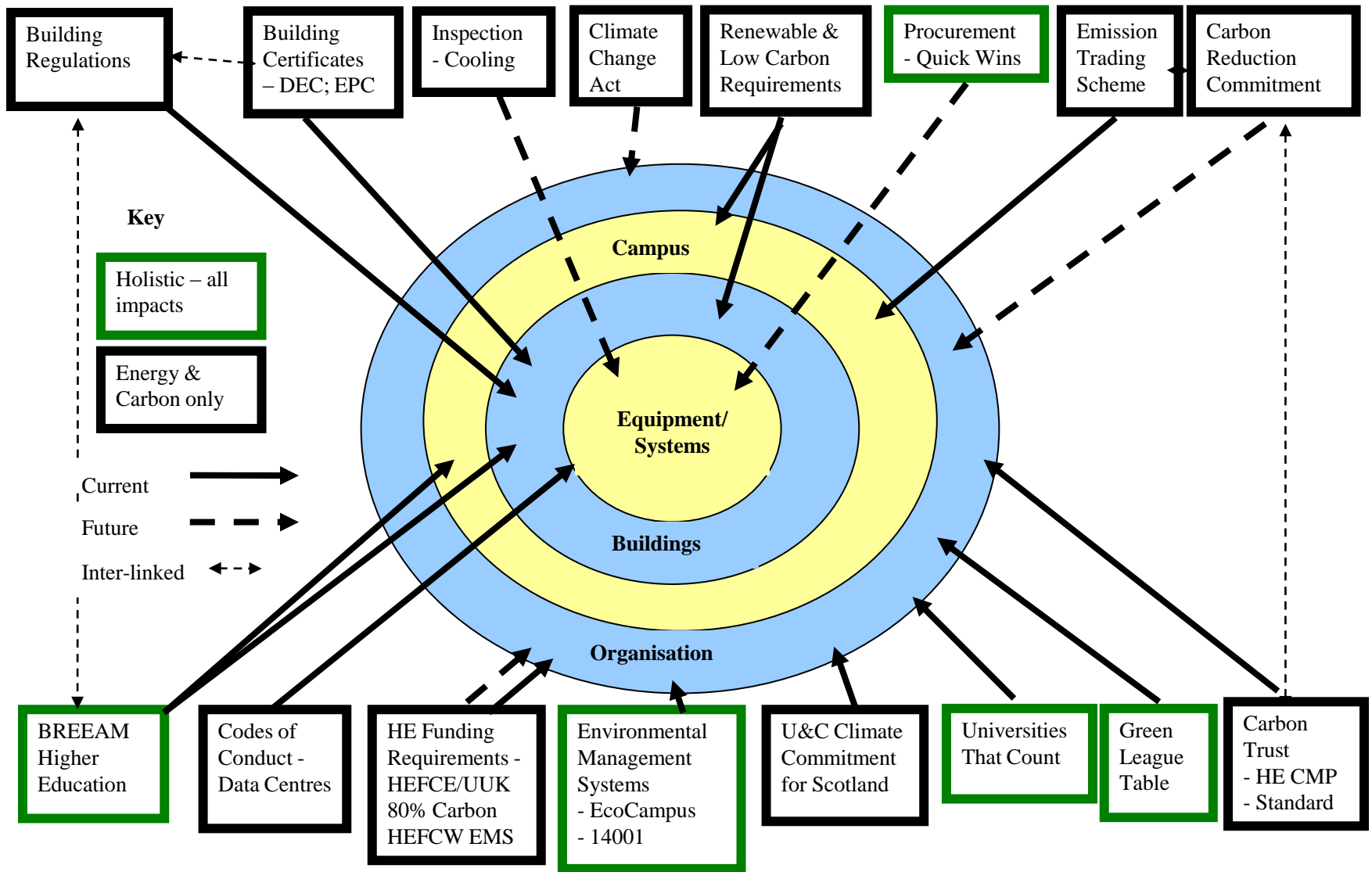
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# ABOUT US

- Higher Education Environmental Performance Improvement (HEEPI)
  - [www.goodcampus.org](http://www.goodcampus.org)
- SusteIT
  - conferencing
  - greening scientific computing
- S-Lab
  - safe, successful, sustainable
  - more IT intense



# SUSTEIT FINDINGS

- 2% of global CO<sub>2</sub> emissions
- Sheffield
  - £1 million + electricity bill
  - 47% desktop related
- HE sector wide
  - 760,000 PCs
  - 215,000 servers
  - 147,000 networked printers
  - £60 million + energy bill
  - 35/40% data centres/HPC



JISC

# THE DARK FOOTPRINT OF THE KNOWLEDGE ECONOMY

Heavy Burdens and ....



Steam Computers



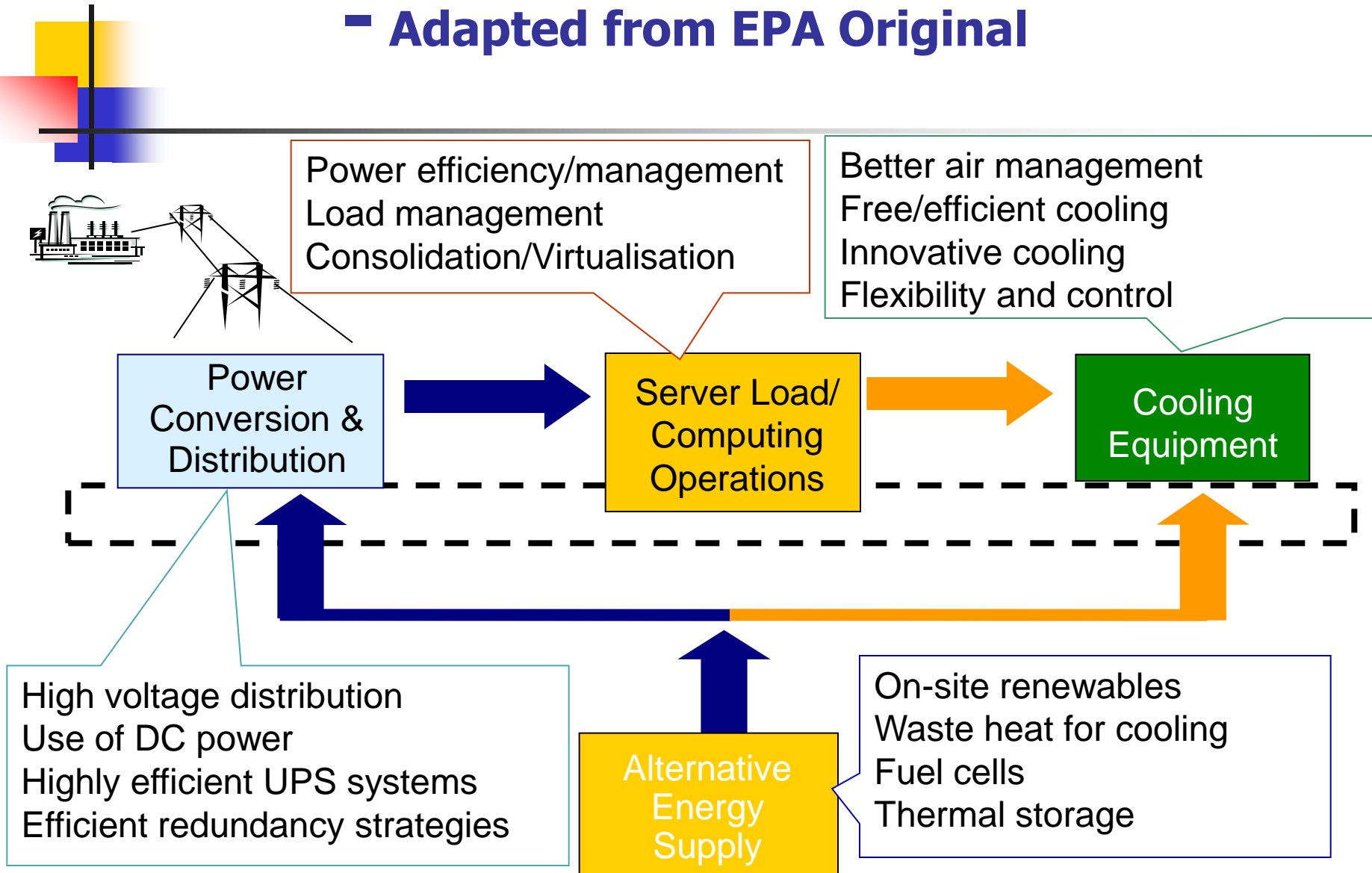
# GREEN IT AGENDAS 2010

- Desktop energy efficiency
  - low power
  - power management
- Synergistic architectures
  - thin/thick/think client
  - virtualisation (& powerdown)
- Incentive mechanisms
- Data centre energy efficiency



# DATA CENTRE OPPORTUNITIES 2010

Adapted from EPA Original



# DATA CENTRE PUE

- Power Utilisation Effectiveness
  - ratio of total energy (ie servers + support) to server energy
- 1990s centres 2.0 +
- Cardiff University HPC cluster 1.3
- University of St Andrews new facility 1.2
- Cap Gemini, Swindon 1.08
- Carbon PUEs below 1

# GREEN IT 2020

- SMART 2020
  - ICT can cut global CO<sub>2</sub> emissions by 12% net
- Large per unit efficiency improvements
- But offset by increased numbers & functionality
  - near desktop HPC,
- New applications
  - cloud, smart buildings
  - deep sampling, visualisation, automation
- Cambridge Chemistry Laboratory
  - 30% of £1.2 million energy bill IT-related

# NET ZERO CARBON DATA CENTERS

- High efficiency equipment
- Process efficient software
- Innovative cooling
- Heat recovery?
- On-site renewables
- More power storage
- Integrated planning

