UKNOF4 Presentation

Data Centre Power and Cooling

May 2006

Data Centre Power and Cooling

- Historical Trends – Power/Cooling Growth
- Data Centre Design Problems
- Colocation Companies' Problems
- The Future

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ITconstruct Credentials

- Over 25 years telecoms construction and data centre experience
- Data Centre Specialists
- In past 5 years the directors have:
  - **Built and operated 17 commercial data centres totalling over 600,000 sq ft**
  - Built over 100 data suites
  - Performed feasibility high level design and cost plans of 25 data centres
- Complete understanding of entire project lifecycle from inception to full operation of a commercial scale data centre

ITconstruct's USP:
Directors have built and operated 17 data centres as the client ourselves

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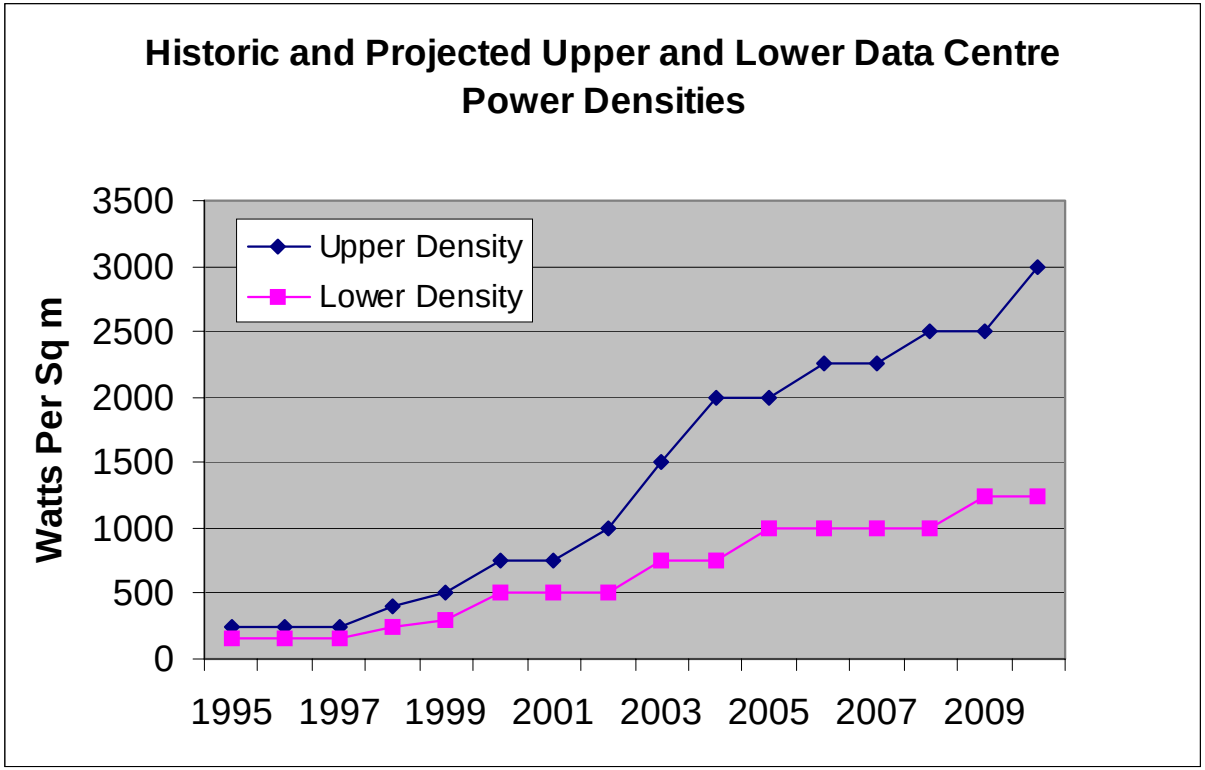
Industry Changes

Increasing power and cooling requirements for IT equipment

- Power increases of this scale are hard to predict
- **Blade Servers Everywhere**
- SUN F15 – 25kw heat
- HDS 9980 SAN – 63amp 3 phase supply
- Far more stringent manufacturer environmental requirements or warranties voided



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Power Density Benchmarking

Organisation	Power Density - watts per sq metre	Facility Size - sq metre	Facility Designed - Date
LIFFE	1,200	1,000	
BT Cardiff	2,000	3,000	2001
BT Locate - Exchanges	500		
Barclays	2,000		
Chase Manhattan	750		
Bank of America Canary Wharf	750	1,000	2001
Citi Group Lewisham	1,000	6,600	
Citi Group Canary Wharf	1,000	4,000	
Centrica	1,000	6,500	2000
HP	2500		2004
IBM	3000		2004

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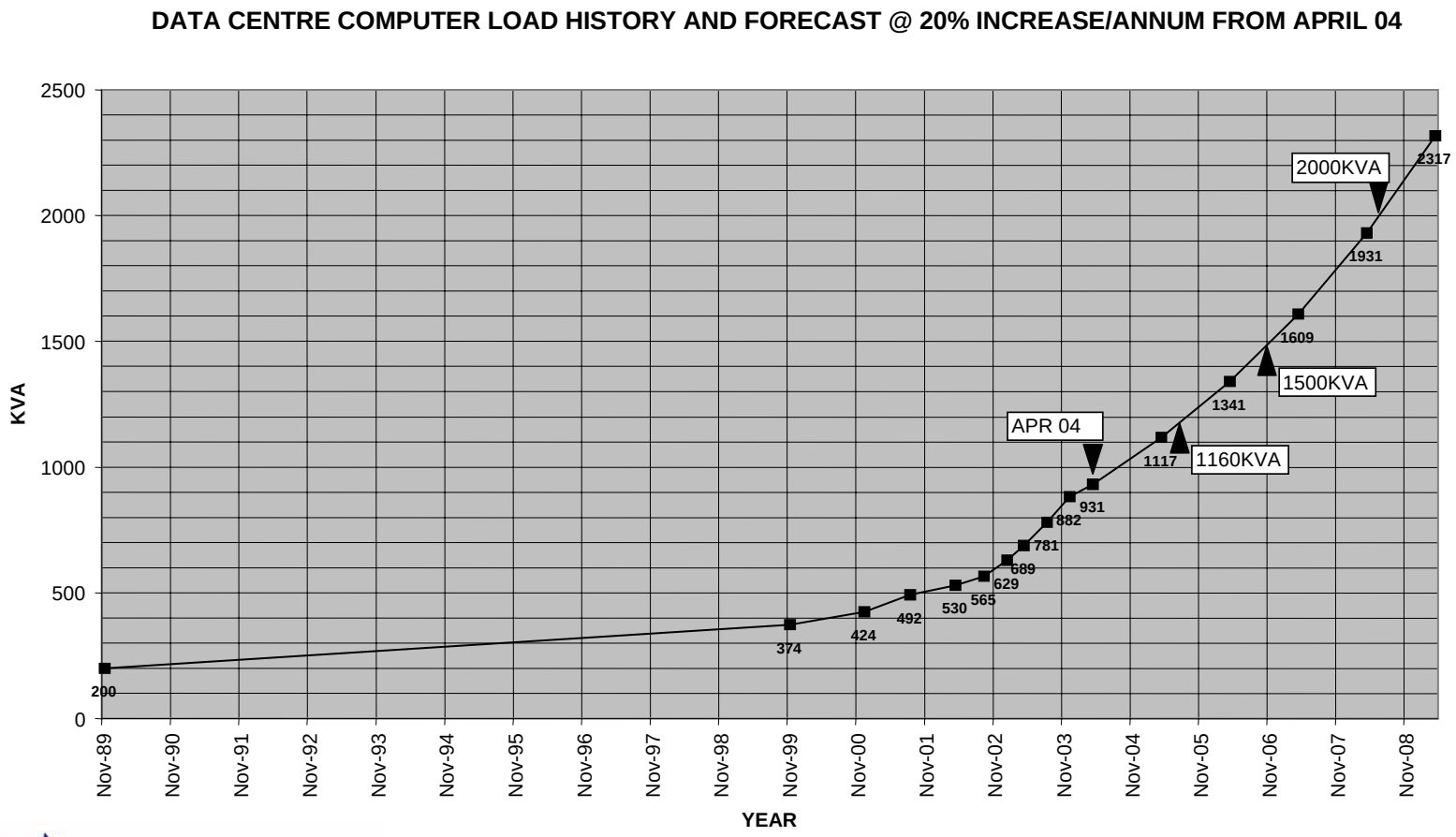
UK Bank Actual Power Growth



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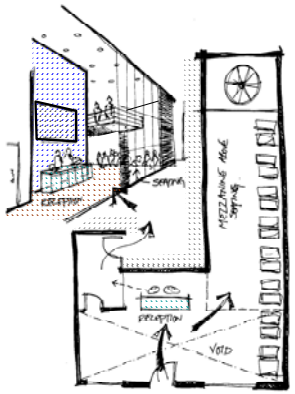
Actual ITconstruct Projects



- 2003 BT Tunnels
  - 1500 w/m^2
- 2004 ClarityBlue
  - 1000 w/m^2

- 2004 UAE Airline Co
  - 1500 w/m^2
- 2005 UK Bank
  - 2000-3000 w/m^2

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Actual ITconstruct Projects

- 2005 Texaco
  - 1000 w/m^2
- 2005 UK Bank
  - 1500 w/m^2

- 2006 Colo provider
  - 1250 w/m^2
- 2006 Tiscali (Colo)
  - 1000 w/m^2 Upgradeable to 1500 w/m^2

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Future Power?

- The new “average” power density we believe is therefore in the region of:

- 1000-1500 w/m^2 for Colo Sites
- 1500-2500 w/m^2 for high spec facilities such as banking sites
- Is this enough?

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Conundrum

- IT equipment lifecycle is 2-3 years or even less
- Data centre lifecycle is typically 15-20 years or more
- Power and Cooling requirements continuing to increase exponentially
- Future IT developments unknown

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Where Will the Power Growth End

- 2000 Watts/Square Metre?
- 3000 Watts/Square Metre?
- 5000 Watts/Square Metre?

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However…

- Its not the power it's the cooling…..
- Physical constraints for conventional cooling systems (raised floor plenum) dictate around 3000 w/m^2. Above this specialist air treatment methods are required such as hoods, canopies and above ceiling plenums
- Higher cooling densities than this would mean the flow of air across the room would begin to blow people over as they walked around

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Colo Design Strategy

- Most Colo facilities designed around years 1999-2001 at around 450 – 750 watts per square metre
- Designs based on historical thinking and power growth trends with some thought for increased demands of power
- Designed to last for 15-20 years
- M&E designers “a pretty staid bunch”
- Colo strategy was… “A race to build”

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Colo's Problem

- Most facilities in service for just 4-5 Years
- Most facilities now experiencing problems with levels of power and cooling requirement
- Most colo companies are "cash strapped"
- Most facility designs do not accommodate ability to upgrade without loss of service
- Most facility designs now obsolete
- ……(Although the Colo's won't tell you that)

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How to Spot the Problems

- Data Centre Managers unwilling to allow additional IT equipment into facility
- Facility feels generally too warm and has “hot spots”
- IT equipment often fails for no apparent reason, normally assumed to be faulty IT kit, probably running too hot though
- Outages occurring more frequently

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Risks to Colo's and their Customers

- Continued IT growth with M&E expansion or upgrade constrained will potentially result in a collapse of the data centre infrastructure:

Potential MELTDOWN Scenario

- Data centres will be physically unable to support new IT equipment that is required for continuing customer growth and new business activities.

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Result

- Colo's increase prices to restrict further demands on power and cooling
- Colo customers business activities are therefore restricted

- **Expect further price increases as power/cooling demands get even more critical and energy prices continue to increase**

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What can be done

- Upgrade existing facilities
  - Major work required (especially for cooling systems)
  - Costly
  - No budget
  - No power available in location
  - Potential outages (planned and un-planned)
  - High Risk
- Build new more energy efficient facilities
  - Costly (but easier than upgrading)
  - Timescale issues
  - Migration issues
  - Low Risk

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Avoiding the Same Mistakes

- The IT function needs to have a better appreciation of the M&E complexities of designing and building a Data Centre
- The M&E designers and contractors must appreciate the “essentials of modern life” for the IT company
- Facilities need to be designed with flexibility to adapt to ever changing IT requirements
- Incorporate energy efficient technology
- Utilise wasted heat
- IT equipment manufacturers to give more consider to the environment within which their equipment will be installed

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Fundamentals

- IT must understand M&E…….
- M&E must understand IT…….
- Data Centre Design MUST be flexible and able to “Evolve” to accommodate changes/upgrades without outages

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Conclusion

- With the benefit of hindsight of course….

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