Meeting the Energy Efficiency and Financial Challenges in IT

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Recognising the Problem

Recognising the Problem - Energy

Energy and Cost Crisis

- Data Centres: 1.9% of UK grid power
- Power Availability & Cost
- Cooling Capacity
- “90% of business will be impacted by power issues within 5 years” EPA

Recognising the Problem - Business

Business Demand for IT Services

- Rising Demand
- Rising Impact
- Application Design

Recognising the Problem – Energy & Business

Environmental Accounting

- Green House Gas Accounting (GHG)
- Kyoto
- EU Emissions Trading Scheme (EU ETS)
- Mandatory Cap & Trade
- Brand Value
- Public Pressure

Recognising the Problem – Energy & Business

IT Costs are fundamentally changing

- Demand > Moore's Law (1)
- Servers cheaper and faster
- Servers using more power
- Power bill > Server Cost
- Data Centre Infrastructure > Server Cost

(1) The Uptime Institute;

The Invisible Crisis in the Data Center

Recognising the Problem – Energy & Business

Business Cost & Management Accounting

- Understand the Infrastructure and energy costs of IT systems
- Data Centre capital and power cost is currently “general overhead”
- This must change as costs rise and new costs arrive (Cap and Trade)
- Start carbon accounting now
- Carbon accounting will impact the supply chain

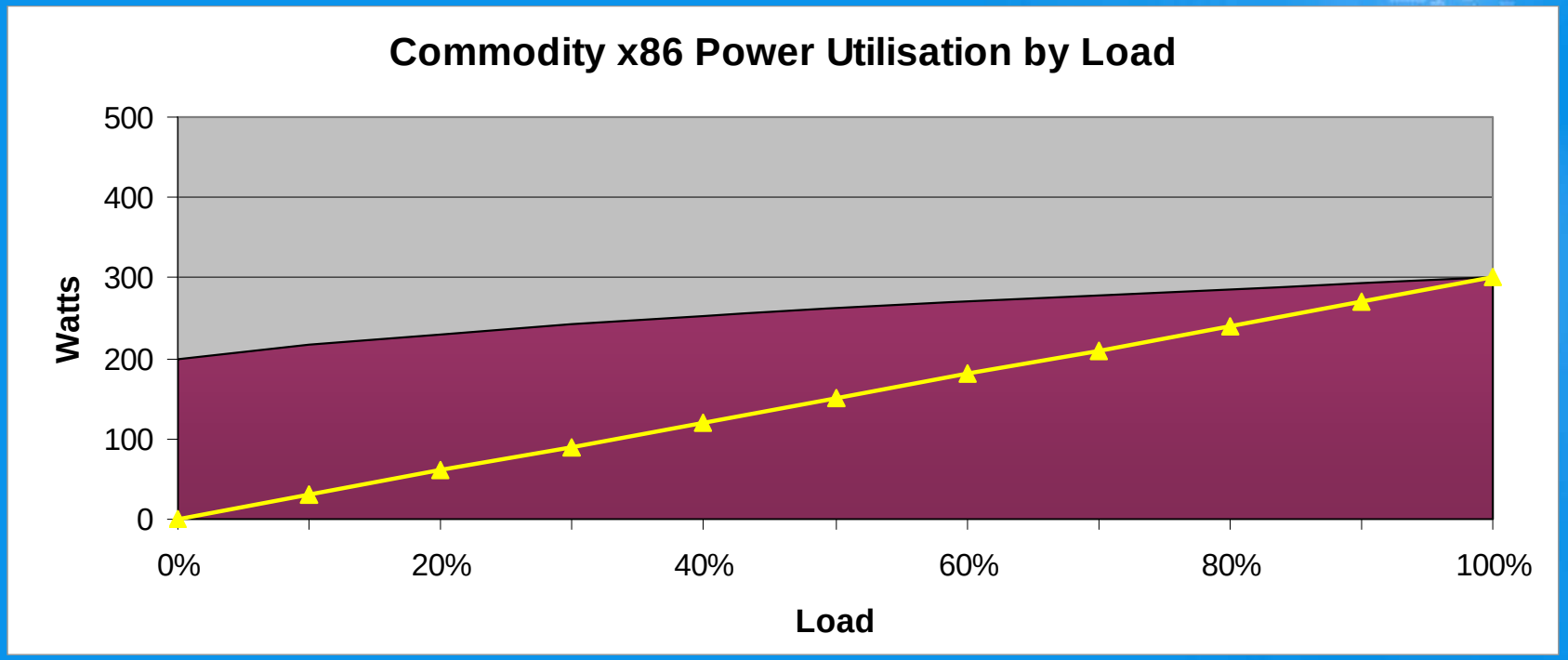
Recognising the Problem - Business

Communication failures

- CXO
- Business Owner
- IT Architect
- IT Operations
- Mechanical & Electrical

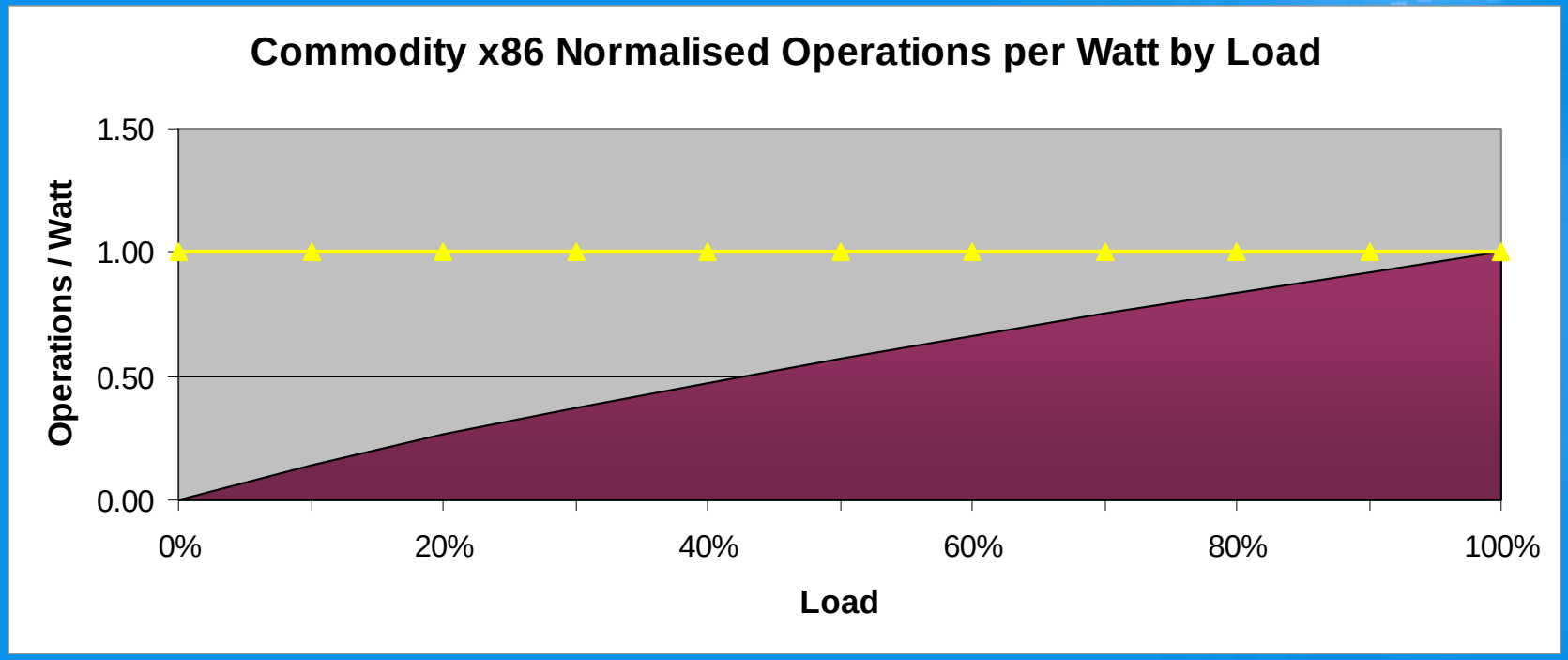
Recognising the Problem - Technology

Server Power vs. Workload



Recognising the Problem - Technology

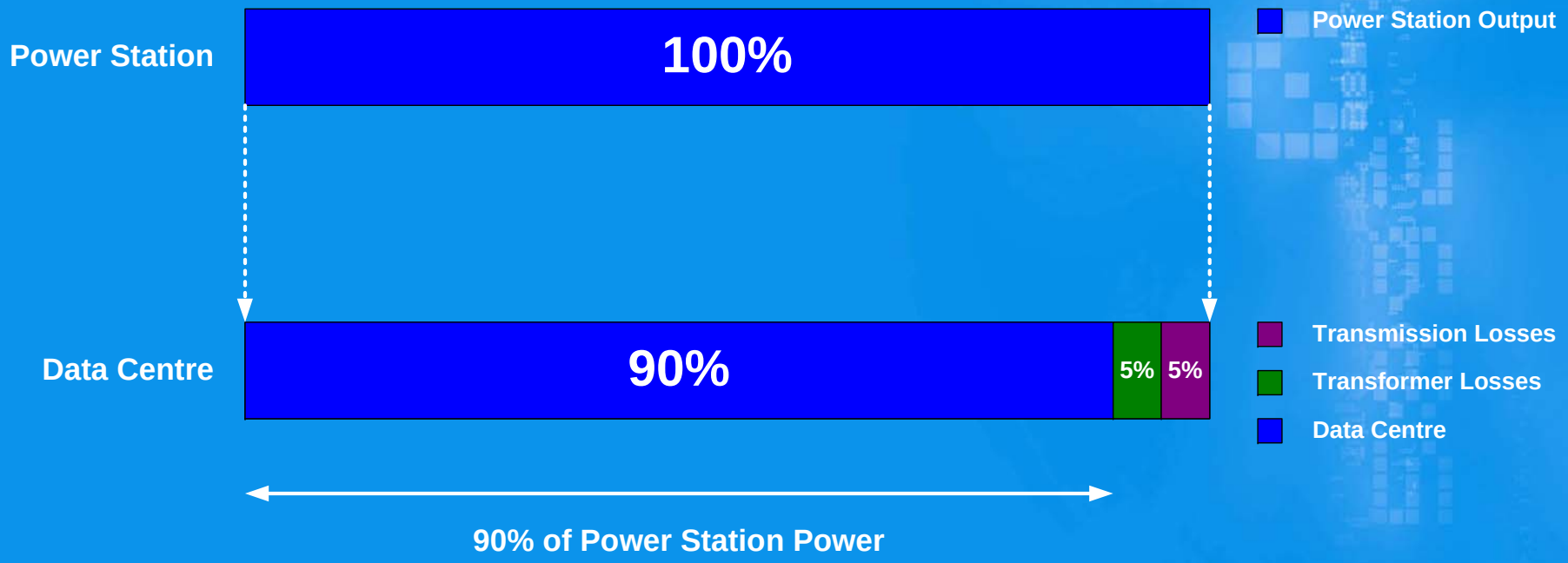
Server Power vs. Workload



Recognising the Problem - Technology

Power Loss Chain

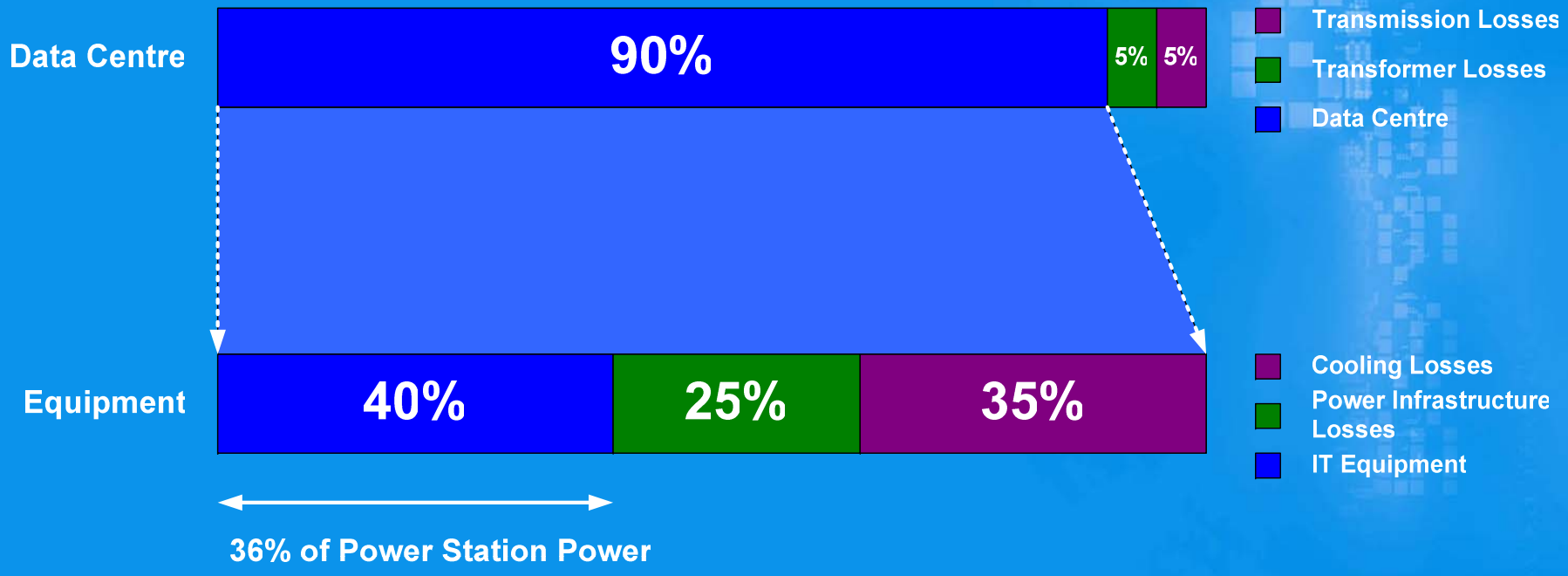
Power Station – Data Centre



Recognising the Problem - Technology

Power Loss Chain

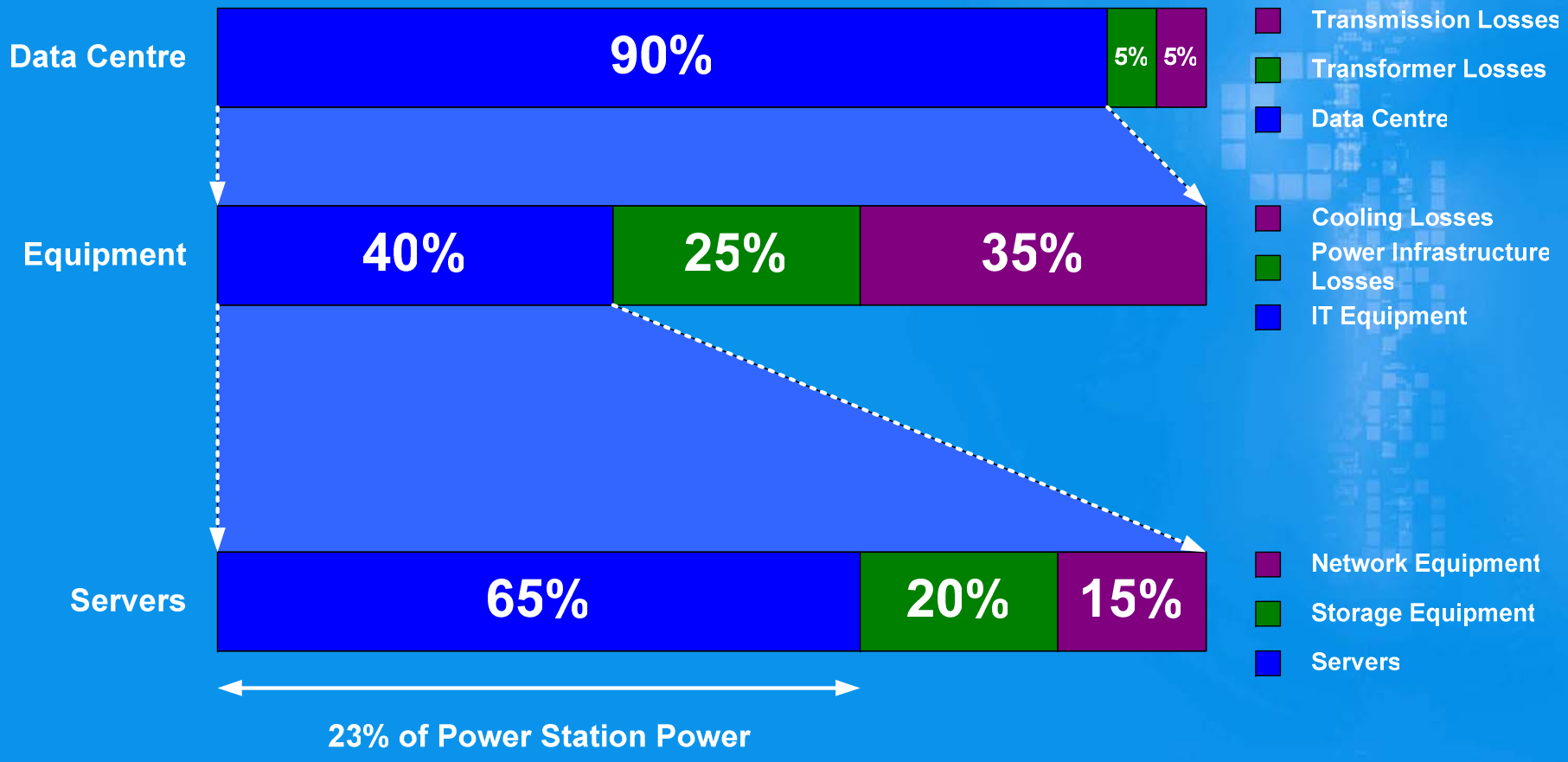
Data Centre - Equipment



Recognising the Problem - Technology

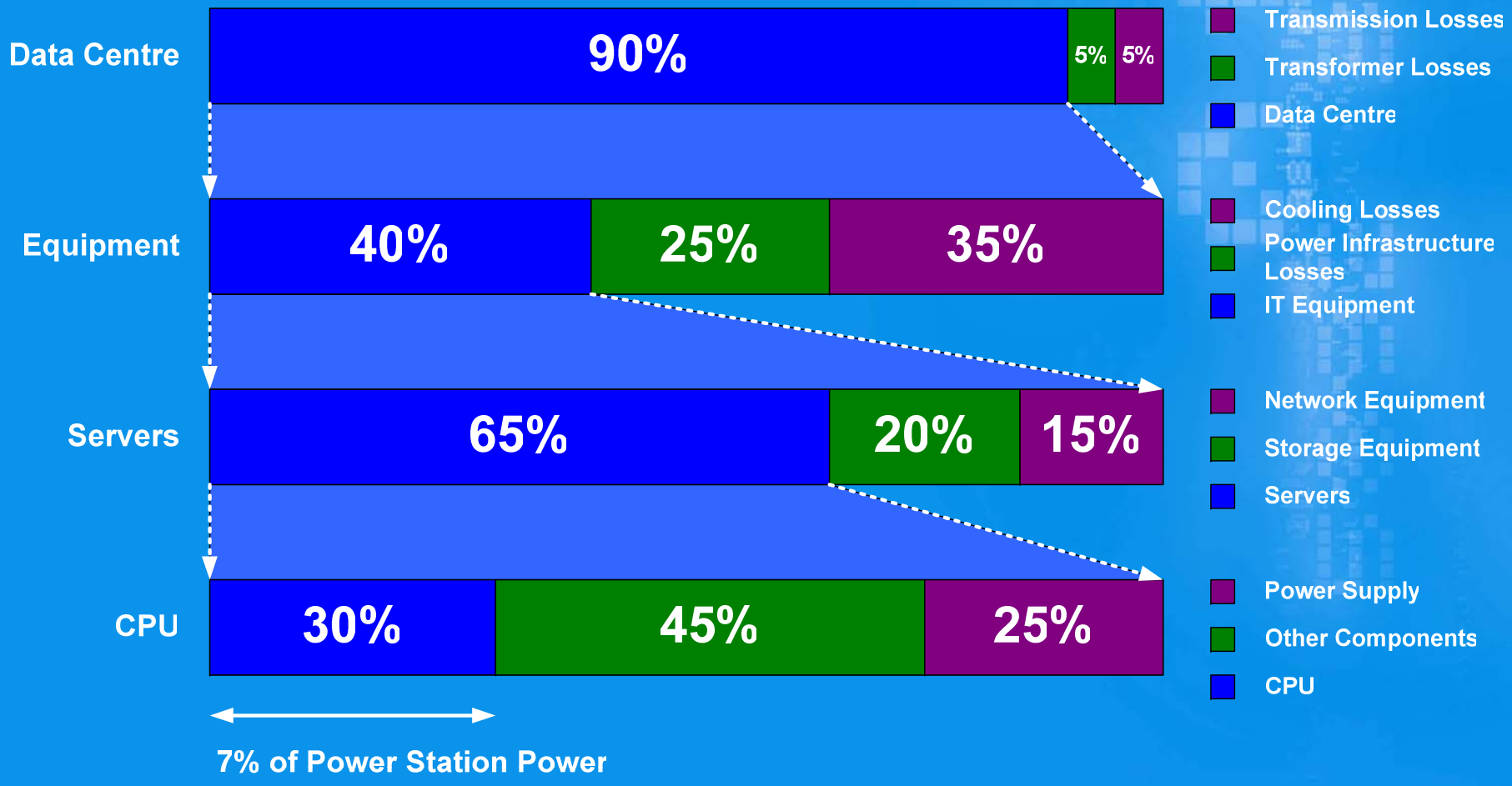
Power Loss Chain

Data Centre - Servers



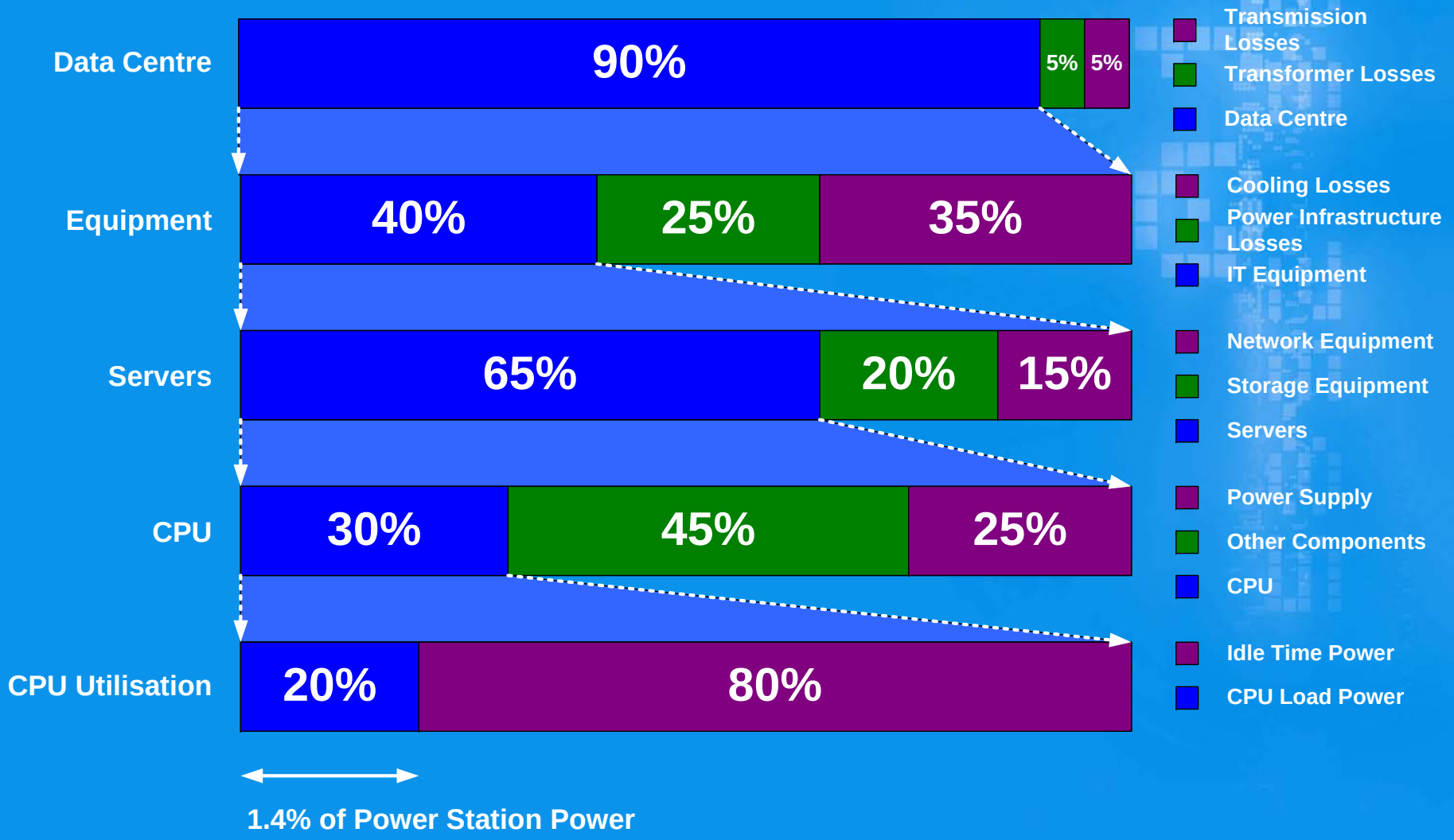
Recognising the Problem - Technology

Power Loss Chain - Data Centre - CPU



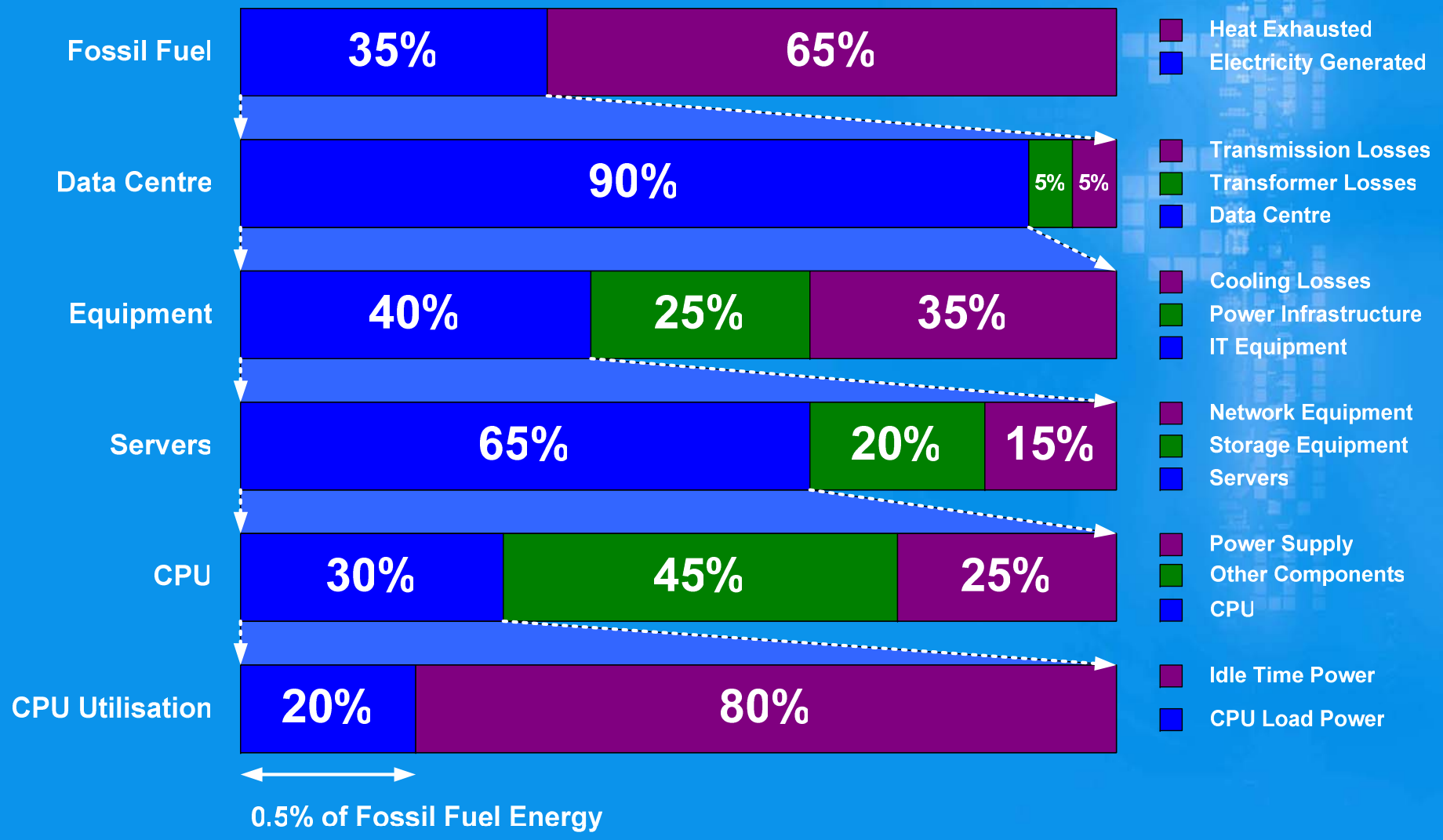
Recognising the Problem - Technology

Power Loss Chain - Data Centre – CPU Used



Recognising the Problem - Technology

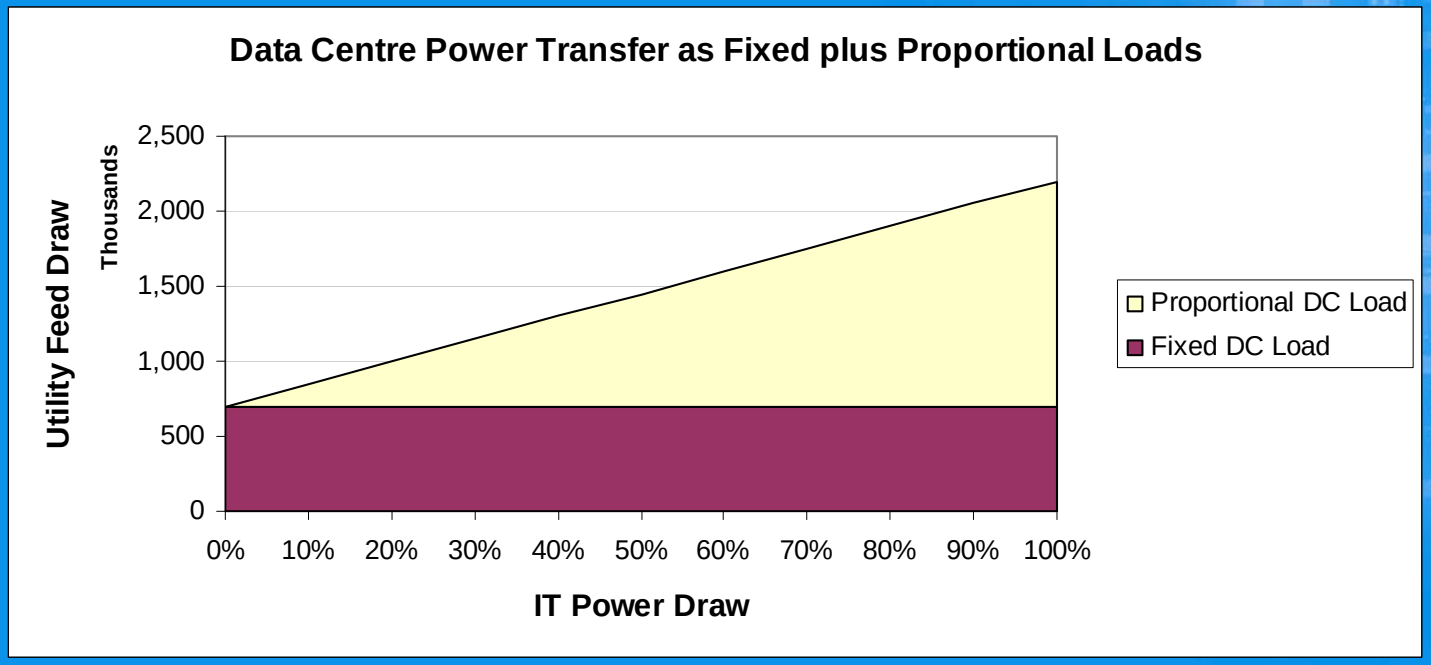
Power Loss Chain – Fossil Fuel – CPU Used



Recognising the Problem - Technology

Data Centre Power Transfer function

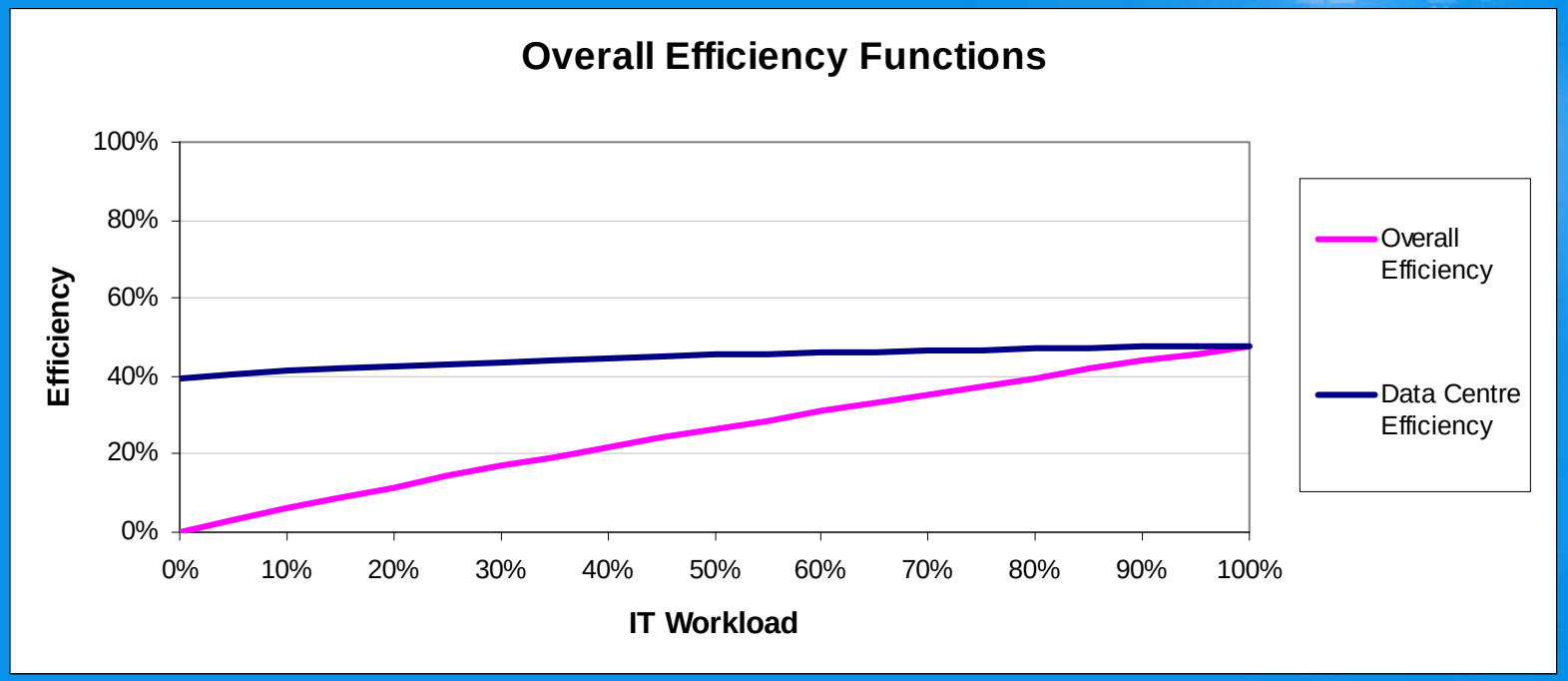
- Data Centres use much of their power just being turned on



Recognising the Problem - Technology

Data Centre Power Transfer function

- How does this translate into efficiency?



Recognising the Problem - Technology

Green Data Centre = Unreliable?

- This is a myth
- Power or Cooling constrained Data Centres have higher risks
- High Power density gives increased risk

How the Industry is Reacting

How the Industry is Reacting – Research & Policy

Energy Research and Standards

- EPA report to Congress
- ASHRAE
- EU Data Centre Code of Conduct
- UK Mandatory Cap and Trade
- UK Market Transformation Program
- The Green Grid
- Intellect UK
- BCS Carbon Footprint working group

How the Industry is Reacting – Products & Technology

Why is IT equipment so inefficient?

- Historically equipment was selected based only on price : performance
- Redundant Components
- Vendors responded to this demand through the entire chain
- Manufacturing and Disposal ~75%

How the Industry is Reacting – Products & Technology

Many new products and services from vendors in all parts of IT and M&E

- Products are pitched within their own layer and compared within that layer
- Lack of generally accepted metrics and models to compare equipment
- Vendors creating their own, proprietary metrics to present their equipment in best light
- Near impossible for IT user to effectively compare servers / UPS etc in their scenario

How the Industry is Reacting – Products & Technology

But Virtualisation (insert name of current high margin product) will save us!

- No it wont, virtualisation is a one shot deal with diminishing return
- Same applies to many other ‘savior’ technologies
- High power density ‘solutions’ such as blades just move the problem around

How the Industry is Reacting – Products & Technology

New breed of equipment based on energy efficiency now that there is market demand

- New servers present new challenges as well as solutions
- Power demands will still rise
- Propose target to increase performance without increasing power demand of servers
- IT equipment labeling

How the Industry is Reacting – Metrics

Metrics, how do I choose equipment?

- Sun SWAP
- SPECPower & Energy Star
- What about Data Centre Infrastructure?
- Broader measurement and analysis tools and standards

Required Changes in our Industry

Required Changes - Technology

New breed of Data Centre designs and equipment

- Fresh air cooling
- DG & CHP, absorptive chillers
- High efficiency UPS etc
- Fully enclosed air flow

Choosing a Design Reliability

Data Centre specification excessive

- ‘best practice’, ‘best you can afford’
- not based on requirements

Data Centre specification

- dominated by 5% most critical systems,
- overkill for the other 95%

Required Changes - Process

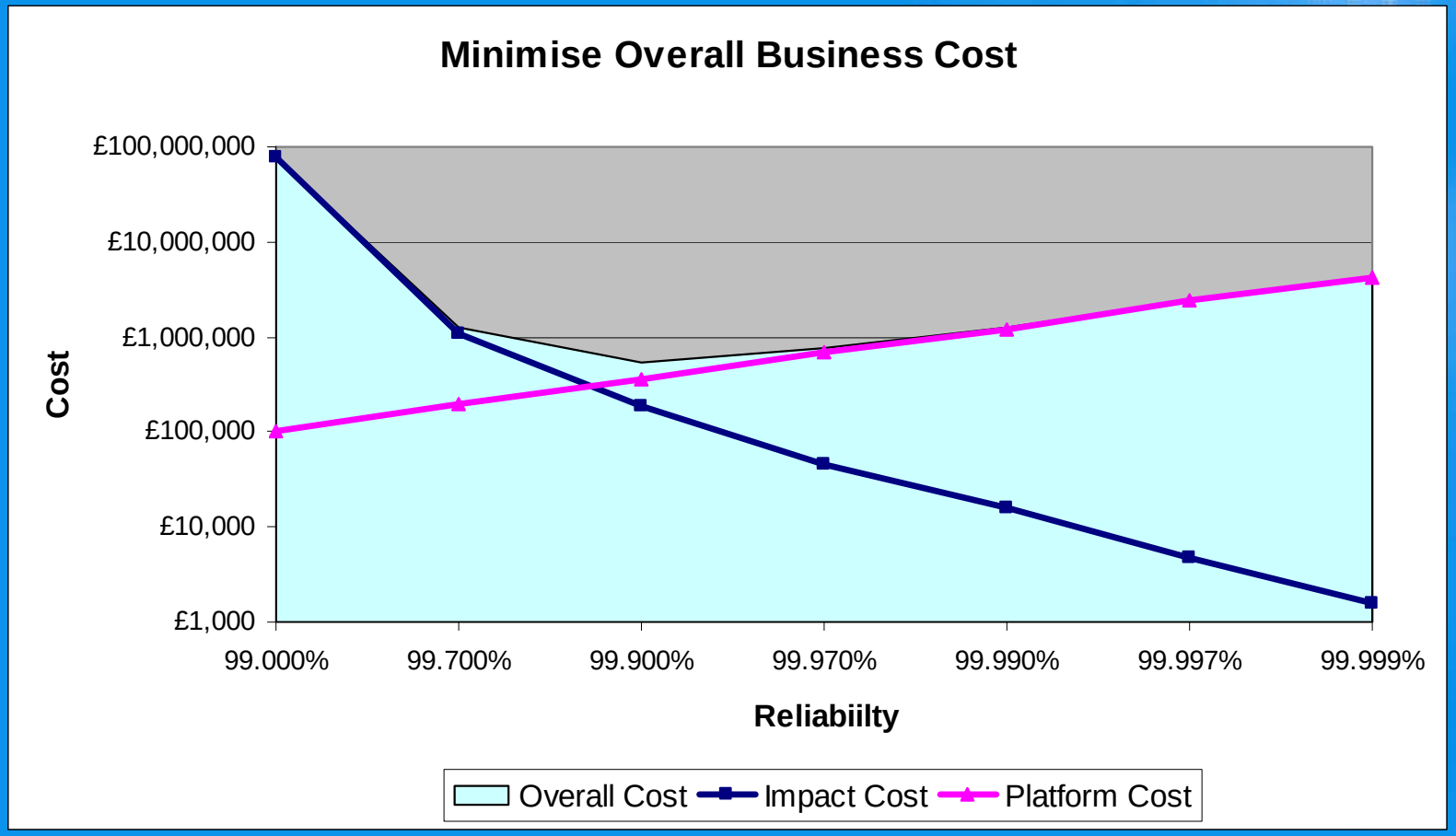
Achieving Real Reliability

Multiple Tier2/3 sites can reduce cost and improve availability

Tier	Redundancy	Annual Downtime	Single Site Availability	Dual Site Availability
1	N	28.8	99.7%	**99.999%**
2	N+1	22	99.75%	99.999%
3	N+1 / N+2	1.6	99.98%	99.99999%
4	2(N+1)	0.4	**99.995%**	99.9999998%

Required Changes - Process

There is an optimum reliability for any service defined by minimum overall cost



Required Changes - Process

Problems with Design Reliability

High Design Reliability can be an illusion

- 10% Hardware
- 40%-80% Human error

Failures Happen, Accept this and Design for it

- Fault tolerance
- Fault containment
- Maximum independence
- Not more monolithic hardware

Required Changes – Modelling and Metrics

DCSG energy and cost models for IT equipment and data centres

- What does a model need to include?
  - IT workloads
  - Server models
  - Data Centre Infrastructure Models

Required Changes – Modelling and Metrics

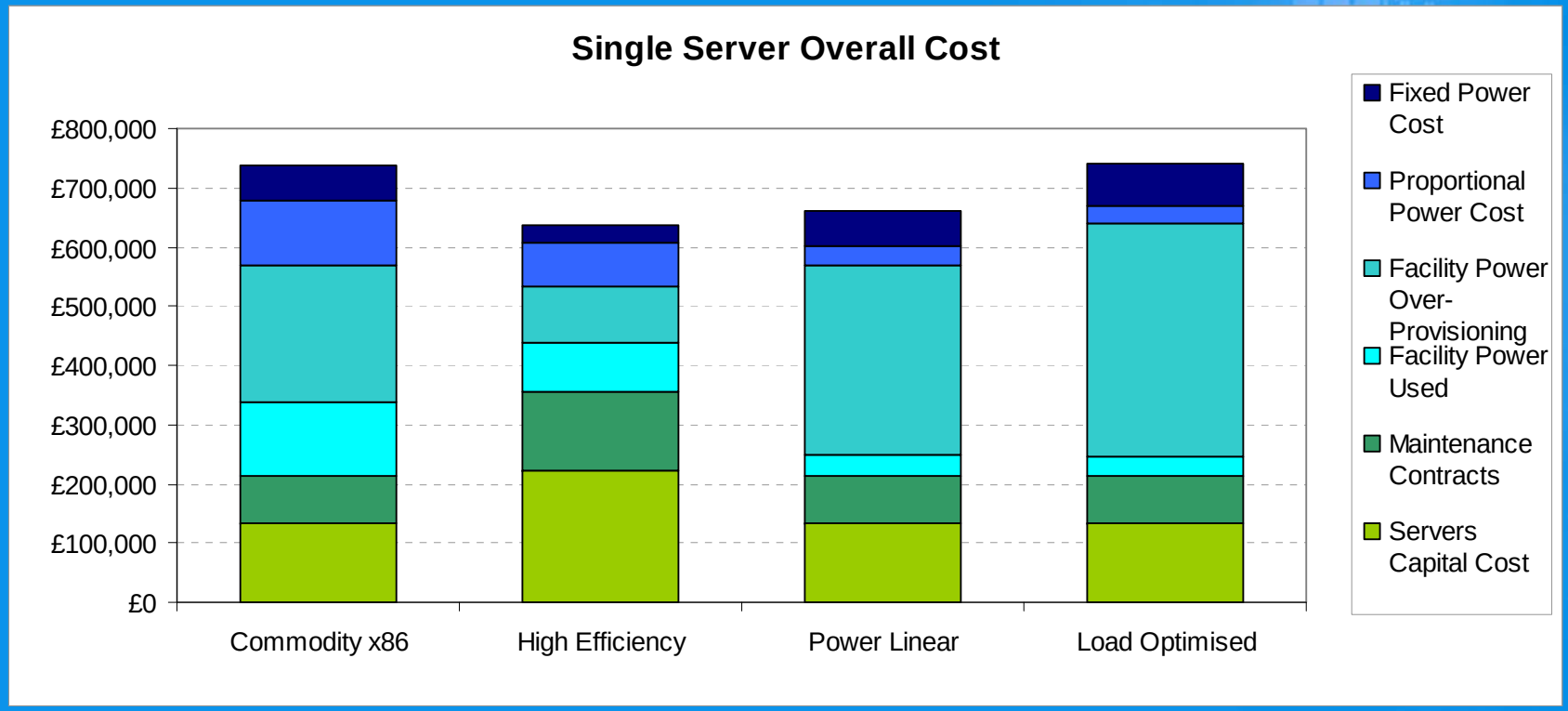
DCSG energy and cost models for IT equipment and data centres

- Open Source, public review, no need for multiple models, unbiased
- What can a model tell you?
  - Efficiency of existing equipment
  - Efficiency of proposed new equipment
  - Benefits of virtualisation
  - Impacts of data centre operational process

Required Changes – Modelling and Metrics

What has our analysis told us about Date Centres?

- DC / M&E costs dominate IT equipment costs



Required Changes – Modelling and Metrics

What has our analysis told us about DC Operations?

- Data Centres are not individual components, they are complex systems, view them as such
- Component Improvements can be masked
- Consider Merging your IT and M&E groups now

Required Changes – Modelling and Metrics

What has our analysis told us about DC Operations?

- There is considerable capacity locked up in your current data centre
- Stop nameplate provisioning
- Retrofit with airflow control, blanking plates and contained hot / cold aisle

Required Changes – Modelling and Metrics

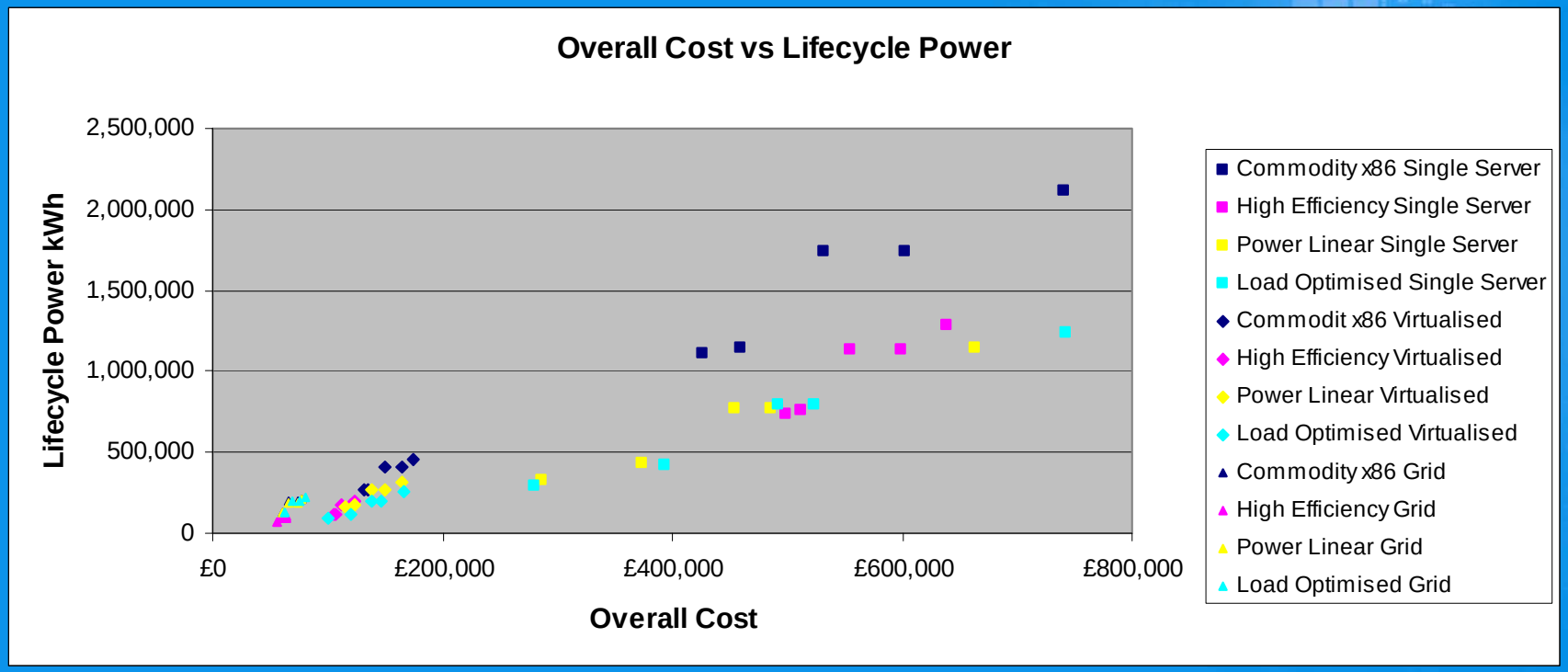
What has our analysis told us about DC Operations?

- Buy servers by Performance / Watt not Performance / £
- One-App per server - buy the lowest power servers
- Build lower Tier data centres and achieve reliability at the systems / network level
- Build modular data centres to keep the utilisation levels high
- Crop Rotate your data centre to sweep out the disused equipment

Required Changes – Modelling and Metrics

What has our analysis told us about Data Centres?

- Green is Good Business



BCS 50 YEARS

Thank you

Find out more

http://dcsg.bcs.org

Creating the IT Profession