



# Energy Efficiency Across the Traditional Enterprise

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**Thomson Reuters Markets**

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# Overview

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-  **Estate & Green Vision Benefits**
-  **Future Risks & Taxes**
-  **Efficiency Initiatives - IT**
-  **Efficiency Initiatives – Data Centre**
-  **“Holistic” Monitoring**
-  **End to End “True” Efficiency**
-  **Future Concepts**
-  **Industry collaboration and recognition**



# Estate & Green Vision Benefits

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- “ Global Estate . 20+ data centres
- “ Greater than 30 MW of power consumed
- “ Greater than 400,000 sqft of space
- “ Greater than 15,000 cabinets
- “ Many locations across the world

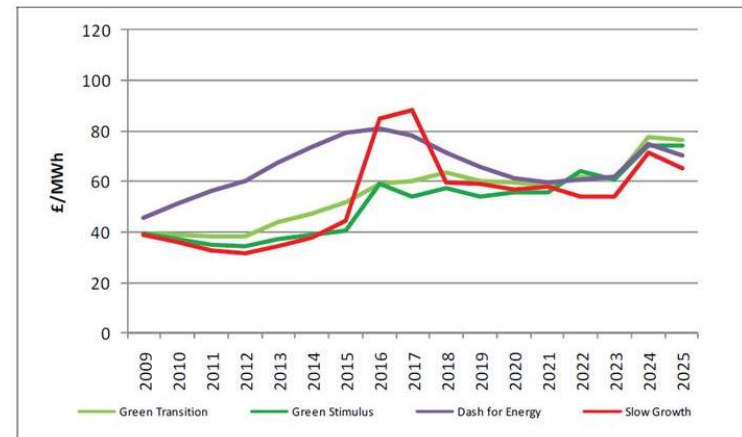


- “ Revenue Protection/Generation
- “ Brand improvement
- “ Cost reduction
- “ Mitigation against future cost increases
- “ Legislation/Regulation
- “ Environmental benefits

# Future Risks & Taxes

- “ Energy prices increasing across the globe
  - . US grid requires significant investment as per US EPA
  - . UK grid requires £200 billion investment . OFGEM predicts nearly doubling of wholesale electricity prices over the next 15 years\*
- “ Water prices predicted to increase due to global shortages

UK Wholesale Electricity Price Projection



- “ Global Carbon Trading Schemes/Taxes
  - . UK CRC Energy Efficiency Scheme
  - . ACES (American Clean Energy & Security Act)
  - . European countries developing variants of Cap and Trade
  - . Local initiatives - Amsterdam/Tokyo
  - . Copenhagen 2009/Mexico 2010 . World leaders formulating a global climate change agreement

# Efficiency Initiatives . IT

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- “ Server decommissioning . different runs
  - . DC audits
  - . Server utilisation perspective
  - . Change request perspective
  - . Compute Characteristics
  - . Business need . low business value
- “ Incentive schemes
- “ Server virtualisation and consolidation
- “ Technology refresh
- “ Power management
- “ Utilise sensors in servers
- “ Collaborate with Vendors



# Efficiency Initiatives . Data Centre

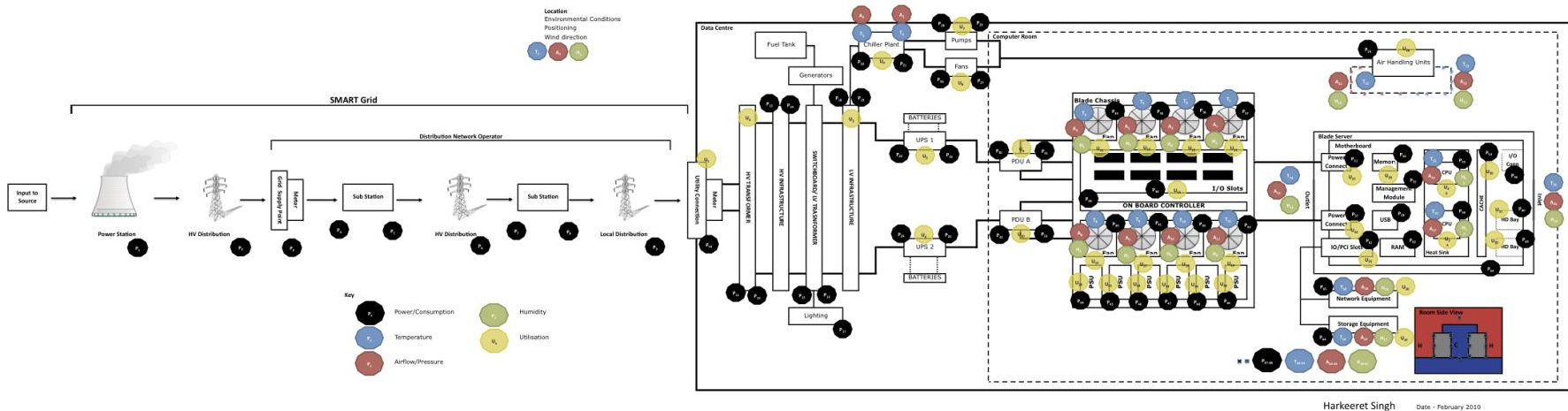
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- “ Measuring Data Centre Efficiency . PUE
- “ Lighting - high efficiency/LED's/timer or sensor
- “ Best Practices (EU CoC for DCs)
- “ Variable flow fans and motors
- “ Modular components/Pods
- “ Hot/cold aisle containment
- “ Raising Temperature/Humidity
- “ Economisation
- “ LEED/BREEAM for building sustainability
- “ Utility Bill Verification
- “ End to End Efficiency



# %holistic+Monitoring

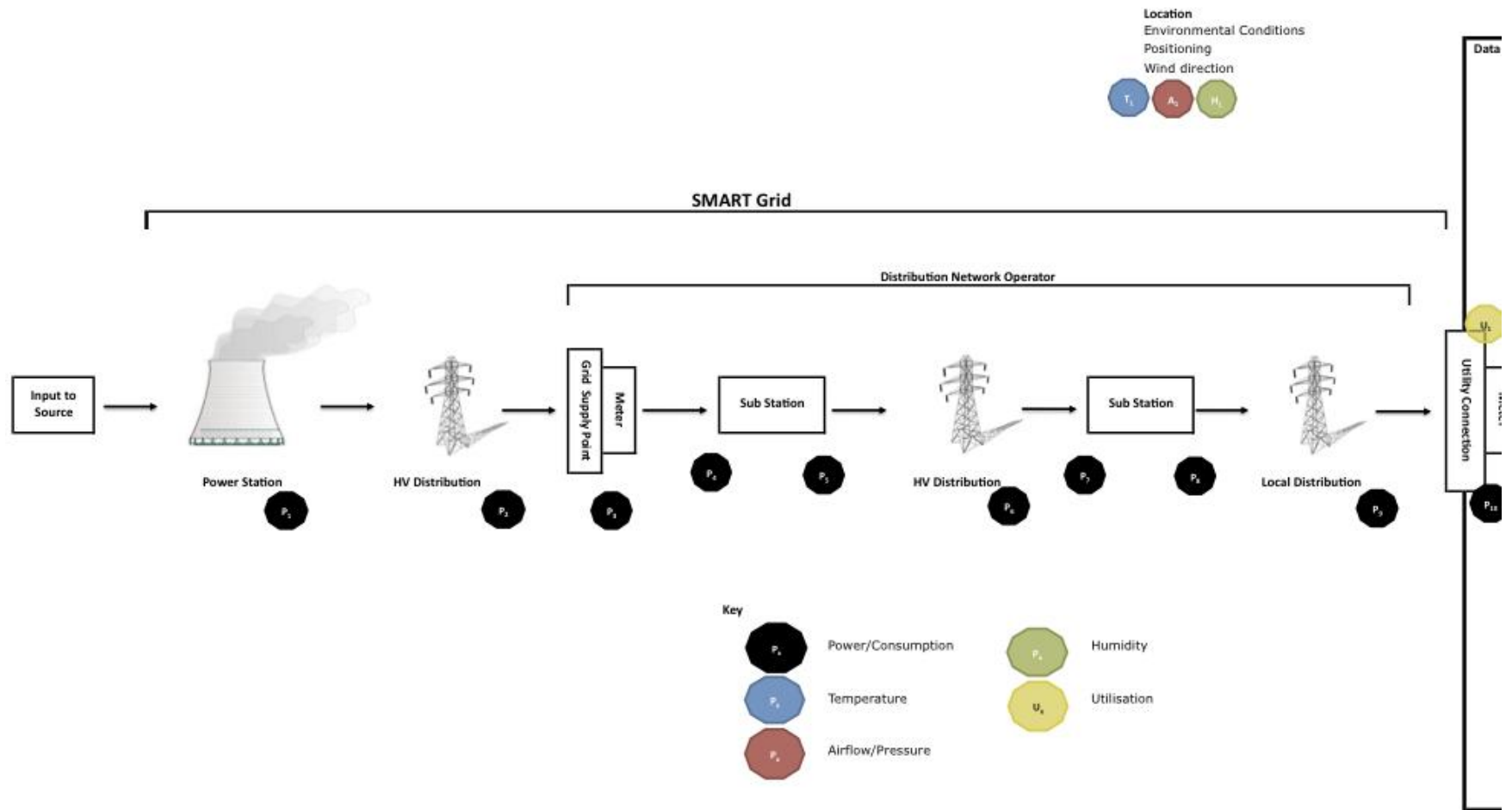


Harkeeret Singh Date - February 2010

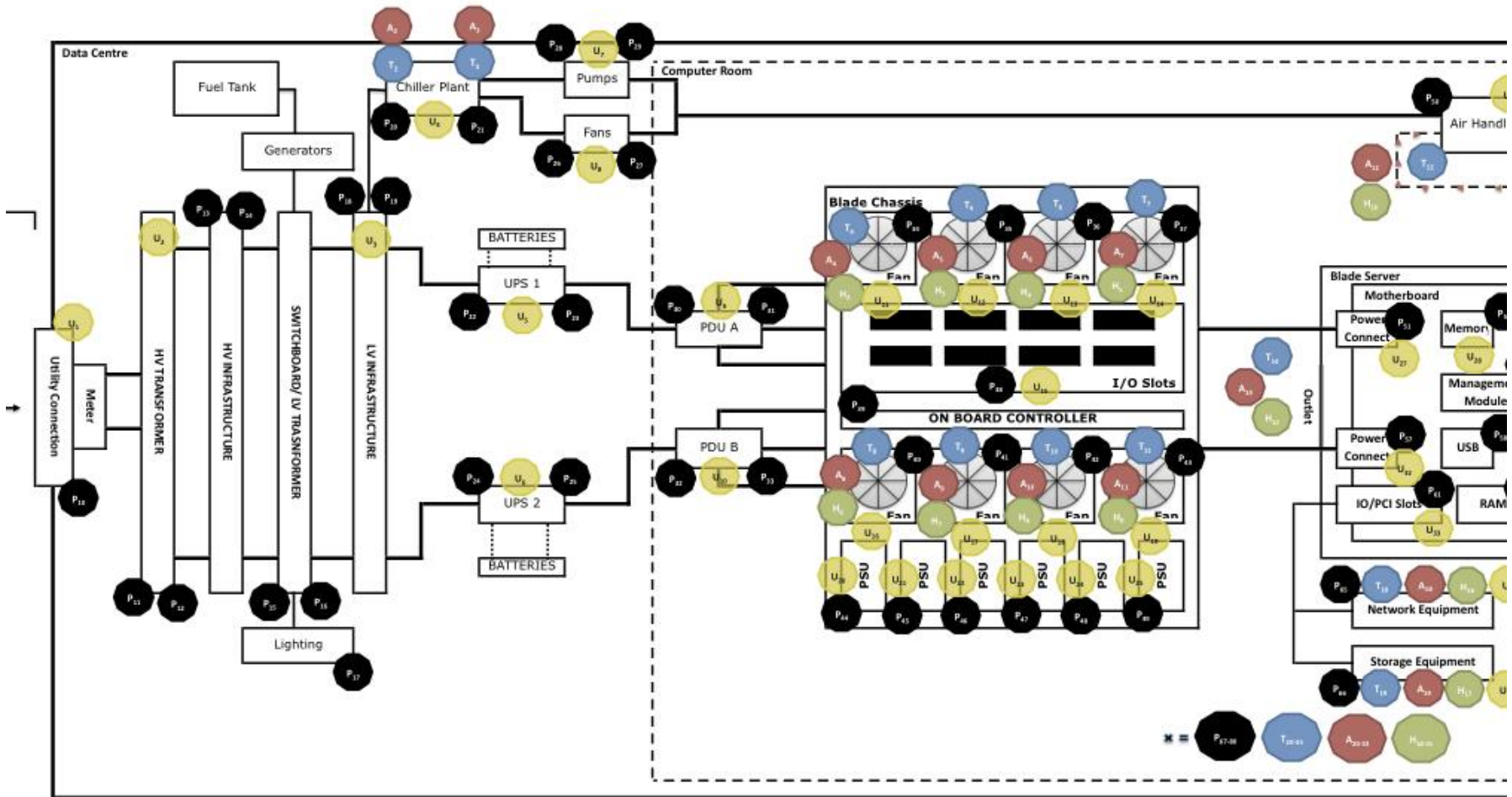
## Benefits

- “ Transparency of efficiency . source to chip . focus investment and effort
- “ Opportunities for optimisation . key enabler for basing business decision on real data rather than feel
- “ Upstream benefits . data centre optimisation - air flow improvement initiatives, containment, raising temperature, etc.
- “ Utilisation data (peak/average) for CPU, Network, Memory and I/O slots will identify servers and assets which are prime candidates for . Decommissioning, Virtualisation, Power Management etc.
- “ Many moreõ

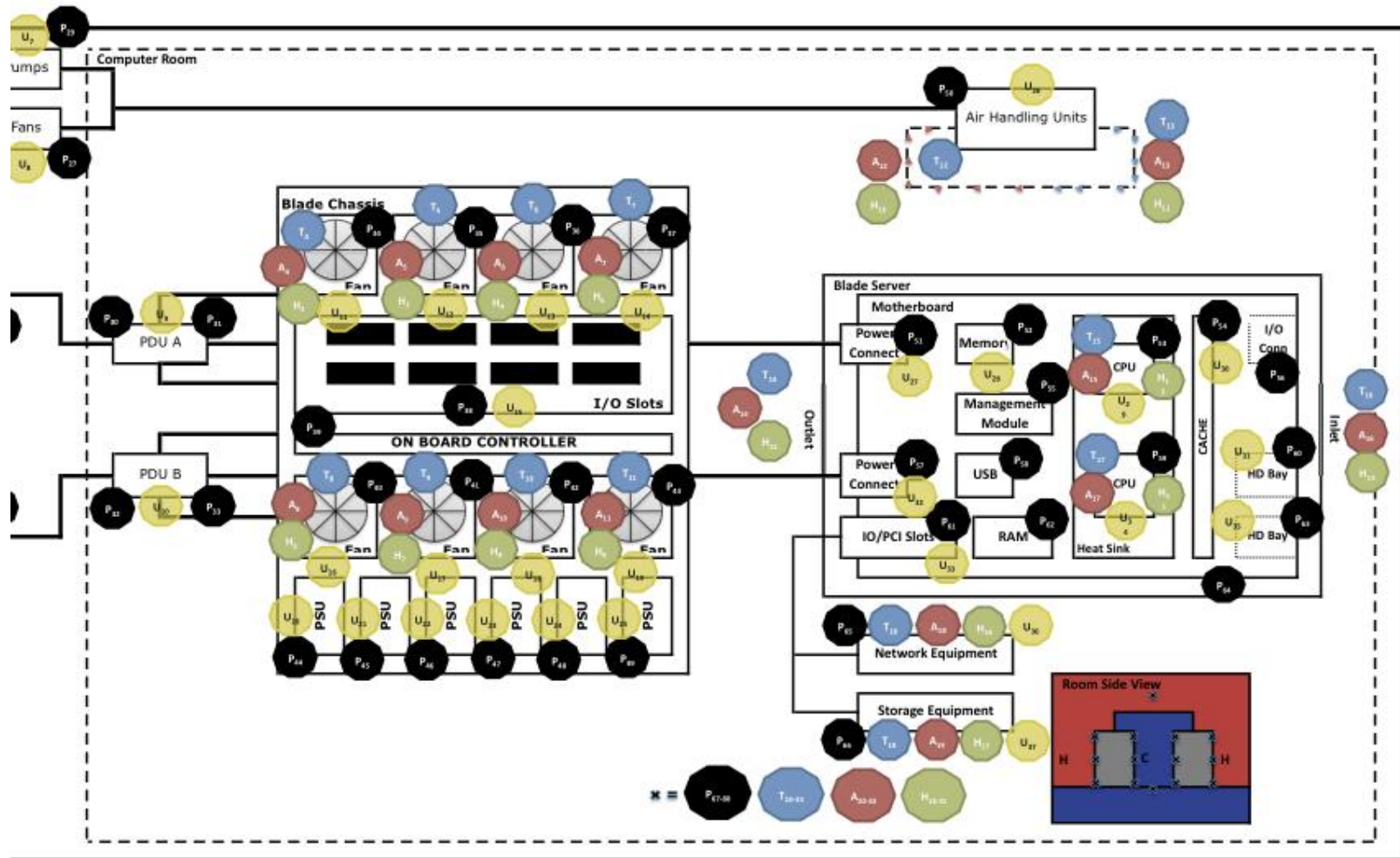
# holistic+Monitoring



# holistic+Monitoring



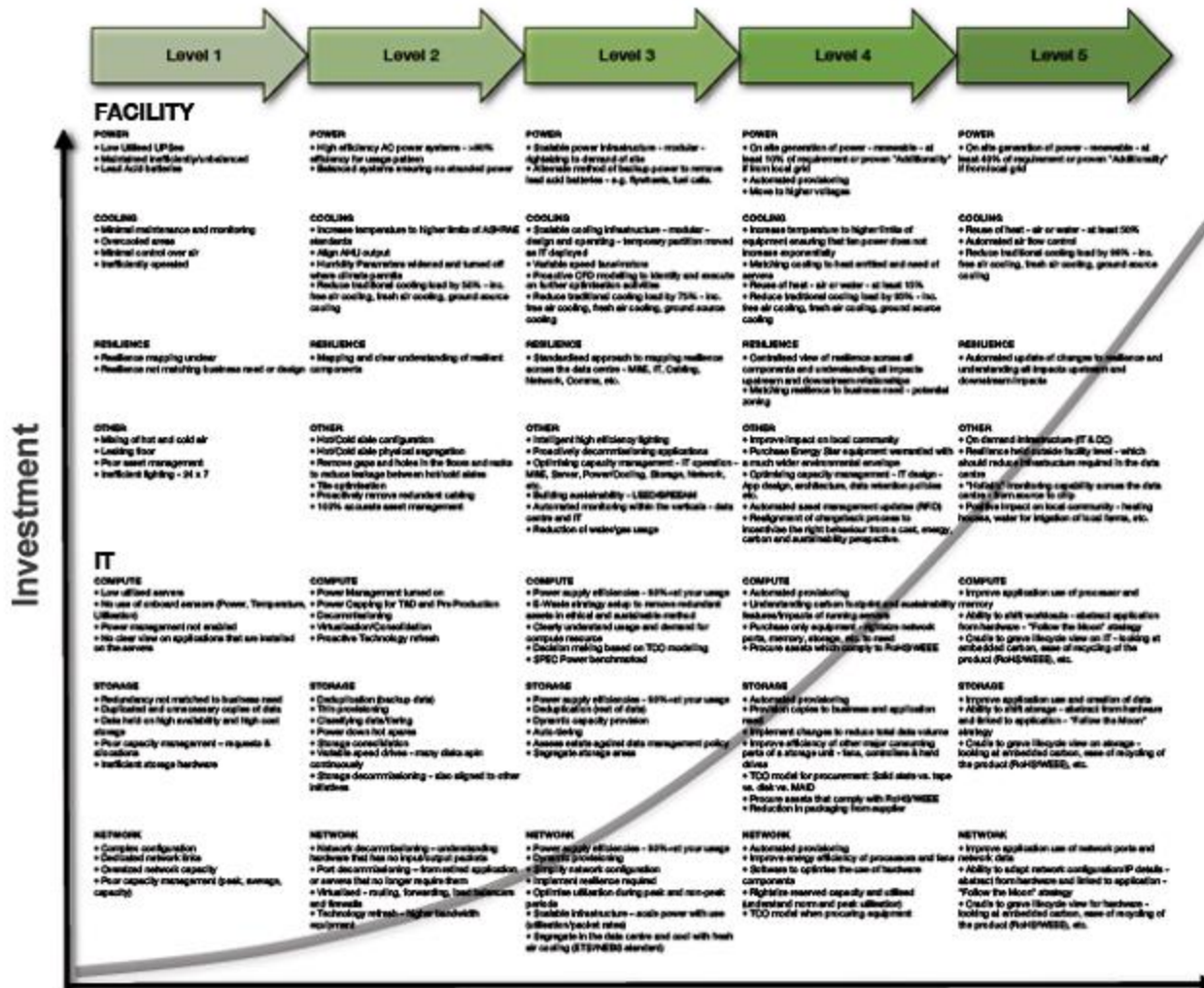
# holistic+Monitoring



# End to End %True+Efficiency

True Efficiency & Sustainability - End to End View															
IT Design & Architecture						IT Operations						Suppliers			
APPLICATIONS	APPLICATION DESIGN	APPLICATION ARCHITECTURE	SOFTWARE	DATABASES	OPERATING SYSTEMS	DESKTOP	INTERNAL NETWORK	STORAGE & BACKUP	SERVERS	DATA CENTRE - MECHANICAL & ELECTRICAL	BUILDING	EXTERNAL BUSINESS INTERFACE	EXTERNAL NETWORK	UTILITY PROVIDER	ENERGY SOURCE
Business Units	<ul style="list-style-type: none"> <li>Application Rationalisation</li> <li>Application Decommissioning</li> <li>Application Prioritisation</li> <li>Strict standard for application creation</li> <li>Revenue generation</li> <li>Profit generation</li> <li>Regulatory compliance</li> <li>Customer need</li> <li>Mission critical</li> <li>Strategic</li> <li>Research &amp; Development</li> <li>Changes in support of above</li> </ul>	<ul style="list-style-type: none"> <li>Virtualisation Standards</li> <li>Design only to user requirements - functional</li> <li>Utilise reusable components/API's</li> <li>Code efficiently</li> <li>Code optimisation</li> <li>Design to resilience required</li> <li>Size to scale needed</li> <li>Minimise data movement</li> <li>Optimise for processing power requirements</li> <li>Optimise for reduction of memory IO operations</li> <li>Optimise for network and latency requirements</li> </ul>	<ul style="list-style-type: none"> <li>Standard virtual building blocks for compute, storage, network</li> <li>Standard and optimised templates</li> <li>API's</li> <li>Simplification of architecture and applications</li> <li>Scalable infrastructure - automated rightizing</li> <li>Application tiering</li> <li>Resilience tiering</li> <li>Service Oriented Principles and Migration Path</li> <li>Platform decommissioning - change request perspective</li> </ul>	<ul style="list-style-type: none"> <li>Optimisation tools</li> <li>Configure to user needs</li> <li>Standardise software usage</li> <li>Efficient software and associated downstream impact</li> <li>Power management features</li> <li>Utilise only software required - no additional "bells and whistles"</li> <li>Version selection based on features and energy performance</li> <li>Software identification and rationalisation (associated licenses)</li> </ul>	<ul style="list-style-type: none"> <li>Database rationalisation</li> <li>Optimisation and simplification of databases and whole estate</li> <li>Clearly understand relationships - upstream and downstream</li> <li>Upgrading to later versions for efficiency improvement through better tools</li> <li>Decommission redundant or replicated databases</li> <li>Indexation of databases</li> <li>Reference rather than replicating</li> </ul>	<ul style="list-style-type: none"> <li>Power management features</li> <li>Optimise standby settings</li> <li>Virtual OS instances</li> <li>Version selection based on energy performance</li> <li>Power management policies</li> <li>Printer management policies</li> <li>User behaviour and incentivising efficient behaviour</li> <li>Asset rationalisation</li> <li>Printer and peripheral consolidation</li> <li>Intelligent power strips</li> <li>Replacing monitors with more efficient TFT monitors</li> <li>Facial recognition monitors</li> <li>Thin client computing</li> <li>Energy efficient hardware - Energy Star</li> <li>Optimise standby settings</li> </ul>	<ul style="list-style-type: none"> <li>Simplify configuration</li> <li>Implement resilience required</li> <li>Optimise utilisation</li> <li>Virtualised routing, forwarding, load balancers and firewalls</li> <li>Scalable infrastructure</li> <li>Technology refresh</li> <li>Real time provisioning</li> <li>Segregate with fresh air cooling</li> <li>Reduce infrastructure through higher bandwidth technology</li> </ul>	<ul style="list-style-type: none"> <li>Deduplication</li> <li>Thin provisioning</li> <li>Classifying data/ tiering</li> <li>Auto Tiering</li> <li>Power Management (Hard Disk)</li> <li>Storage consolidation</li> <li>Spin down technology (MAAD)</li> <li>Assess estate against data management policy</li> <li>Storage decommissioning infrastructure</li> <li>Review solid state, tape and disk technology against use looking at TCO</li> <li>Segregate storage areas</li> <li>Improve user behaviour</li> <li>Implement changes to reduce total data volume</li> </ul>	<ul style="list-style-type: none"> <li>Decommission redundant and idle servers</li> <li>Virtualisation</li> <li>Consolidation</li> <li>Compute farms</li> <li>Technology refresh/ lease servers</li> <li>Power regulator/ capping technology</li> <li>Power management features (CPU, Disk, Sleep, BIOS, Chipset)</li> <li>Power supply efficiency</li> <li>Modular/scalable infrastructure</li> <li>Rightsize demand and capacity</li> <li>Multi-core servers</li> <li>Operate in wider environmental conditions</li> <li>Fan power scalability</li> <li>Productivity benchmark - level 1, 2 and 3</li> <li>Dynamically move compute to lowest TCO site</li> </ul>	<ul style="list-style-type: none"> <li>Cooling/Airflow optimisation</li> <li>Best practice adherence</li> <li>Modular/scalable infrastructure</li> <li>Optimise environmental conditions</li> <li>Set point optimisation - air/water/chilled water</li> <li>Fan load efficiency (fans, sensors, LED, auto-dimming)</li> <li>Containment</li> <li>Economisation</li> <li>Efficient lighting</li> <li>Air conditioning co-ordination</li> <li>Chillers with high COP</li> <li>Zone cooling areas</li> <li>Reuse of heat</li> <li>Build to resilience required - modular/ rooms</li> </ul>	<ul style="list-style-type: none"> <li>LEED certification</li> <li>BREEAM certification</li> <li>Onsite generation (Solar, Wind, etc.)</li> <li>Recycling (waste, e-waste)</li> <li>Empower individuals (clubs, champions, etc.)</li> <li>Improve user behaviour</li> <li>Lighting efficiencies (fans, sensors, LED, auto-dimming)</li> <li>Optimise building control systems</li> </ul>	<ul style="list-style-type: none"> <li>Utilities management (Electricity, Water, Gas, etc.)</li> <li>Telecoms management</li> <li>Supplier management</li> <li>Industry engagement</li> </ul>	<ul style="list-style-type: none"> <li>Rightsize reserved capacity and utilised (understand norm and peak utilisation)</li> <li>Initial resilience required</li> <li>Location impact on availability, cost, and latency</li> <li>Distance between sites - impact on backup and costs</li> <li>Connectivity type - fibre, cable, satellite, etc.</li> <li>Investor in low carbon and 'green' technologies</li> </ul>	<ul style="list-style-type: none"> <li>Minimise transmission losses</li> <li>Efficient transmission infrastructure</li> <li>Investor in low carbon and 'green' technologies</li> <li>Rightsize reserved capacity and demand</li> <li>understand norm and peak loads</li> <li>Oil, Gas, Water supplier evaluations</li> <li>Utility incentives</li> <li>Optimise to rate schedules</li> <li>Switching opportunity - regulated/unregulated market</li> <li>Purchase 'Green' tariff</li> </ul>	<ul style="list-style-type: none"> <li>Clean electricity</li> <li>Low carbon source</li> <li>Green power - including ethical considerations</li> <li>Renewable sources - long term commitment</li> <li>Efficient generation/ production</li> <li>Onsite generation</li> </ul>
	<p>Processes and Policies - efficient capacity management, resource efficiency (waste management), data retention, shared infrastructure, asset management, paperless processes, changeback of service, power management software at the macro level (preparing services) etc.</p>														
	<p>Measure, Monitor, Manage components in line with holistic monitoring strategy: tools and metrics to gather utilisation, optimisation, cost and efficiency data. Provide future targets for each component. Align to standardisation, consolidation, virtualisation, automation and incentivising the right behaviour</p>														
	<p>Understand supply chain and optimise 3rd party contracts in the following areas - efficiency standards and future targets, development, manufacture, transport/delivery, in-life support, reuse, collection, sorting/recycling and disposal of products and services</p>														
<p>Employee engagement/awareness, Technology Innovation, Organisation Structure/Transformation all in alignment with future vision and business strategy</p>															
<p>Carbon Reduction Target - EPA Climate Leaders/Carbon Trust Standard</p>															
External Organisations & Standards	<ul style="list-style-type: none"> <li>Energy Star SJS EPA</li> <li>EPEAT</li> <li>EU Code of Conduct on Efficiency of External Power Supplies</li> </ul>	<ul style="list-style-type: none"> <li>ETSI standard</li> </ul>	<ul style="list-style-type: none"> <li>Energy Star for Enterprise Storage (US EPA)</li> <li>ENSA (Storage Network Industry Association)</li> </ul>	<ul style="list-style-type: none"> <li>Energy Star for Enterprise Servers (US EPA)</li> <li>SPEC Power 2008 benchmarked</li> <li>80Plus programme</li> <li>Climate Savers</li> <li>DMTF</li> <li>Network/PCI card, Disk I/O, Memory comparison</li> </ul>	<ul style="list-style-type: none"> <li>The Green Grid</li> <li>The Uptime Institute</li> <li>ASHRAE</li> <li>EU Code of Conduct for Data Centres/UPS efficiency</li> </ul>	<ul style="list-style-type: none"> <li>US EPA - Green Building Council</li> </ul>	<ul style="list-style-type: none"> <li>EU Code of Conduct on Energy Consumption of Broadband Communication Equipment</li> </ul>	<ul style="list-style-type: none"> <li>US Green Power Partnership</li> </ul>							

# Data Centre Efficiency Maturity Model



Efficiency Improvement (e.g. PUE)  
Cost & Carbon Reduction

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# Future Concepts

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## “ Build Data Centre to reduce facility resilience

- Implement flexible resilience so that once resilience moves into the network/application the data centre can be reconfigured to take advantage of the capacity (i.e. Tier 3 to Tier 1)

## “ Data Centres with no traditional cooling

- Creating sites with very low PUE values taking away the power consumed by traditional cooling units
- Liquid cooling to the chip - remove fans from the servers

## “ Fully scalable M&E

- M&E to scale as much as possible with IT deployments . modular UPS
- Shifting workloads . M&E to switch off with the movement of workloads and applications

## “ “Follow the Moon” Strategy

- Shifting workloads to locations across the world with the lowest TCO



# External Industry Engagement

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- Industry Engagement . working with industry groups, government organisations and thought leaders to develop metrics, best practices, standards and public policy for energy efficient data centres



## Green Grid

Global consortium to reduce energy consumptions of data centers



## Energy Star

A joint program of the U.S. EPA and the U.S. DoE to help identify energy efficient products and practices.



## Uptime Institute

Improving data centre uptime and the Worlds IT productivity through benchmarking and collaborative learning



## SNIA

Global consortium of leaders helping to define energy efficiency and efficiency in the storage space



## ASHRAE

American Society of Heating, Refrigeration and Air conditioning Engineers



## EU Code of Conduct for Data Centres



**Confederation of Business Interest** . Energy Policy Committee



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