

Energy & Cost Management in Data Centre (Accredited by British Computer Society)

Introduction – Cost & Energy monitoring and reporting in the data centre (2 hours)

The purpose of this unit is to explain the basics of cost & energy usage monitoring and reporting

- 1.1 Identify and explain the legislative drivers for energy management and reporting (specifically EU ETS and CRC in the UK) this includes the conversion of carbon to cost or cost equivalents
- 1.2 Identify the corporate drivers for energy management, corporate social responsibility, brand value etc - Discuss own organizations
- 1.3 Describe and explain the concept of supply and demand side measures and where the data centre and ICT organizations sit on that scale
- 1.4 Understand why the data centre industry with its scale of energy consumption is not identified as a sector as for steel and others – ICT energy in the context of overall business energy
- 1.5 Understand the principle of reflecting energy and cost to the demand side and how this changes demand behavior

Introduction – How to manage energy and cost (2 hours)

The purpose of this unit is to help the candidate to comprehend how to manage cost & energy

- 2.1 Describe the basic measurement points for data centre and IT systems energy
- 2.2 Define and explain the basic metrics for data centre efficiency (include DCIE / PUE but also introduce the entire stack and where metrics are still required or under development)
- 2.3 Explain how to benchmark the performance of a facility
- 2.4 Describe the concept of a proxy measure where no common measure is available as well as the weaknesses and lack of portability inherent in such measure
- 2.5 Assess the metrics dashboard to assist candidates in considering metrics in the context of their own environment
- 2.6 Understand the data centre energy usage and cost implications – example of single 1U server over 4 year lifetime ~ £8K

Introduction – Roles (1 hour)

Specifically, candidates must understand key roles and responsibilities:

- 3.1 Estate management – physical buildings, location and planning
- 3.2 Facilities management – plant management, safety
- 3.3 Data centre manager – operational management, capacity management
- 3.4 IT management - delivery of IT service platforms from hardware through to shared services and virtual infrastructure
- 3.5 Analysts – mapping of business requirements to IT solutions, application selection and delivery
- 3.6 Business management – consumption of ICT resource, from grids of processors to outlook mailboxes

Interdisciplinary teams – interactions and communications (1 hour)

- 4.1 Describe the importance of establishing a cross-functional team
- 4.2 Define and explain the potential from interaction
- 4.3 Define and explain the role of such a team

Energy Management (2 hours)

The purpose of this unit is to help candidates understand the roles, terminology and technology of other groups.

- 5.1 Identify space, power and cooling capacity as constraints on the data centre including the various units of each (kW, BTU kVA etc)
- 5.2 Identify resilience grades in the data centre, dual corded loads and the impact on device load points and achieved efficiency
- 5.3 Identify design constraints in the data centre, power and thermal density etc.
- 5.4 Understand different types of IT equipment, storage, network, compute
- 5.5 Understand the different criticality of different IT services and thus equipment
- 5.6 Understand that reliability may be achieved at several levels
- 5.7 Understand the impact of IT device power management on the infrastructure – transitioning from a constant load

Energy Performance Efficiency (3 hours)

The purpose of this unit is to help the candidate to comprehend and apply energy performance efficiency concepts in the context of the data centre

- 6.1 Explain – goals and objectives of energy efficiency management in this context
- 6.2 Apply – basic energy efficiency management techniques in the following areas:
 - IT device energy use and efficiency – power provisioning, moving from nameplate to peak or mean – the future DCM etc
 - IT device environmental constraints – impacts on IT device efficiency
 - Cooling systems efficiency – humidity controls, supply temperatures, economizer systems, part load, staging etc
 - Electrical systems efficiency – operating modes, part load, modular provisioning
 - Systems level efficiency

Efficiency Metrics (2 hours)

The purpose of this unit is to explain the various efficiency metrics in the context of the data centre

- 7.1 Refresh -what metrics represent – metrics dashboard for candidate evaluation
- 7.2 Identify – list the major metrics that are in use
- 7.3 Identify how these metrics are affected by load and external factors such as temperature – why they vary (use DCIE against load example charts)
- 7.4 Describe the concept of a perverse incentive and why it is inappropriate to target on – the PUE
- 7.5 Analyze – the capabilities and limitations of metrics, how to use these metrics as:
 - Reporting metrics
 - Analysis and diagnostic metrics
 - Predictive metrics

Metering (2 hours)

The purpose of this unit is to explain the various methods of metering used in the data centre

- 8.1 Explain -what can and what can't be metered (electricity, water temperature, water flow, air temp, processor load etc)
- 8.2 Explain -types of metering from heavy plant to power sockets in a rack
- 8.3 Describe power factor and how kW relates to kVA
- 8.4 Identify -what metering can reveal (look for the daily ripple)
- 8.5 Understand -the capabilities and limitations of metering
- 8.6 Shared use buildings – how to meter the part that is data centre
- 8.7 Define and explain the concept of energy versus power measurement
- 8.8 Progression in metering from utility meter to fully instrumented
- 8.9 Progression in energy reporting from monthly written to live dashboard
- 8.10 Integration of IT and M&E reporting

Reporting Energy and Carbon e.g. for CRC (1 hour)

- 9.1 Explain benchmarking & the reporting options for a data centre
- 9.2 Define the energy reporting requirements and schemes
- 9.3 Explain the concept of carbon intensity – convert energy consumption to carbon
- 9.4 Explain how to include non electrical energy sources

Reporting Cost – the challenge of per cost accounting (1 hour)

- 10.1 Describe how to report data centre costs
- 10.2 Explain the limitations in achieving per service level detail
- 10.3 Examine the per service requirement

Note: The timings, for reference only, show the relative weightings for each area of the syllabus. Weightings reflect the approximate percentage of examination questions which will be devoted to this topic.