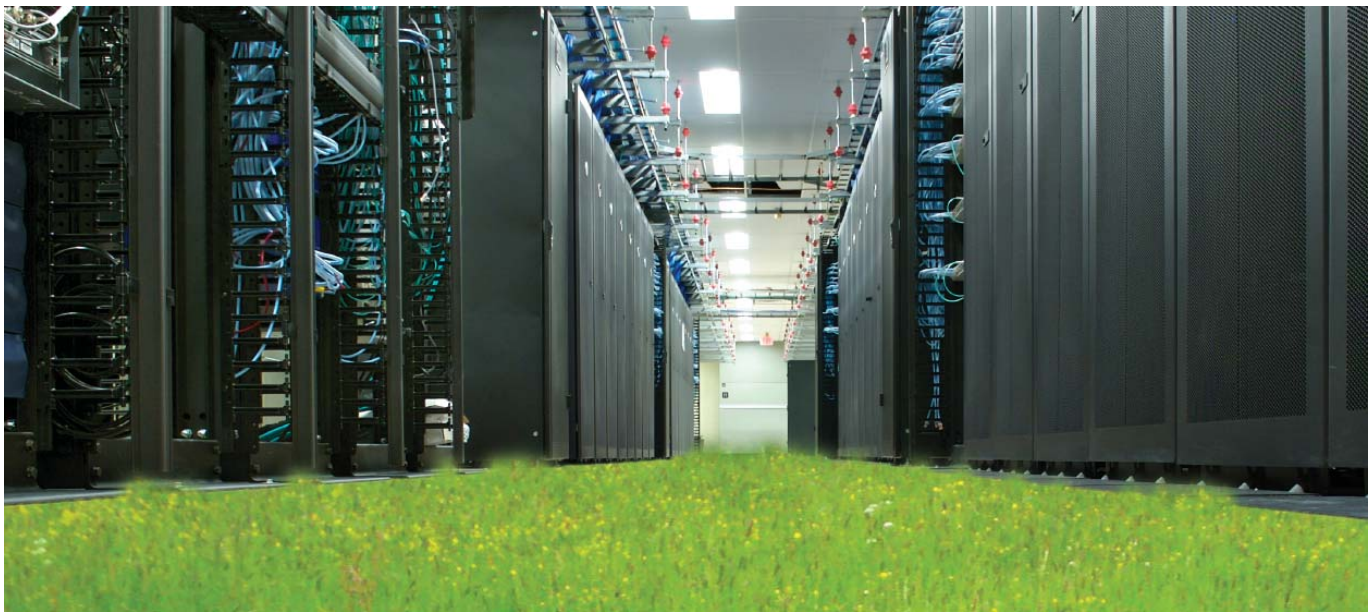
Data centre solutions - energy efficient by design



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scalable data centre energy
management solution

Workspace
Technology Limited

Creating an effective workspace environment

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scalable data centre energy management solution

EcoMeasure™ - Scalable Data Centre Energy Management & Efficiency Measurement Solution by Workspace Technology Ltd

Metering total energy is important, but it does not show how energy consumption is being used within a data centre facility. Without measurement it can be hard to understand why and where energy performance is poor and how to improve it. It is a recommendation of the Carbon Trust* that sub metering of high energy consumption infrastructure is implemented.

EcoMeasure™ is a service which enables data centre managers to accurately measure the performance and energy consumption of any data centre facility. EcoMeasure™ can be deployed in new or retrofitted within existing environments. The system provides direct information on power and energy consumption and delivers accurate benchmarking of data centre energy efficiency.

EcoMeasure™ will deliver a comprehensive range of metrics and readings including Power Usage Effectiveness** (PUE), Data Centre Infrastructure Efficiency** (DCiE), UPS efficiency, mechanical services; and critical equipment loads. The more granular the measurement the more effective EcoMeasure™ becomes.

EcoMeasure™ provides equipment level metering for customer billing when combined with our metered ePDU technology.

Workspace Technology provides expert analysis and interpretation of energy data through our "Managed" EcoMeasure™ service. This service ensures peak performance is maintained throughout the life of the data centre. This is achieved by constant configuration adjustment which compensates for the inevitable on-going changes to the critical equipment profile.

EcoMeasure™ empowers data centre managers to track energy costs and to validate savings when investments are made in either infrastructure or technology.

* Carbon Trust is a UK Government body which works with business and the public sector to cut carbon emissions and capture the commercial potential of low-carbon technologies.

** Data Centre Infrastructure Efficiency / Power Usage Effectiveness are industry recognized standards for data centre room efficiency measurement introduced by the Green Grid.

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EcoMeasure™ Deployment Benefits

- Assists in reducing the cost of energy consumption, minimising environmental and economic impacts associated with excessive energy use
- Green Grid Category 2 / 3 Compliant measurement of PUE within a data centre
- Room, PDU and rack level customer billing and power consumption verification where chargeback is required.
- Scalable configurations to suit individual data centre and server room topologies what ever the size and complexity of the power distribution
- Instant confirmation of Data Centre PUE efficiency ratings
- Accurate proof of any “claimed” energy efficiency deployments throughout the life of the facility
- Measurement of energy consumption, critical load trends, power quality and response time of emergency power plant
- Ensure utility bills are correct
- Opportunities to improve a server room or data centres operational efficiency
- Shows how a server room or data centre compares to other internal or competitive facilities.

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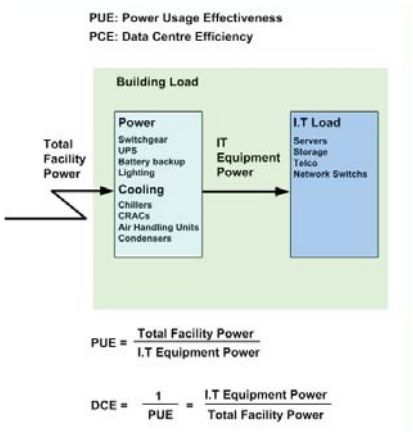


EcoMeasure™ Efficiency Metrics

EcoMeasure™ provides data centres with an impressive array of power and energy measurements. In addition to traditional measures, the solution will provide data centre managers with PUE and DCiE energy efficiency metrics.

Power Usage Effectiveness (PUE) = Total Facility Power / I.T Equipment Power

and its reciprocal, the DCiE is defined as:

Data Centre Infrastructure Efficiency (DCiE) = I.T Equipment Power / Total Facility Power

I.T Equipment Power

This includes the load associated with all of the I.T equipment, such as compute, storage and network equipment, along with supplemental equipment such as KVM switches, monitors, and workstations/laptops used to monitor or control the data centre.

Total Facility Power

This includes everything that supports the I.T equipment load such as:

- Total I.T equipment power
- Power delivery components such as UPS, switch gear, generators, PDU's batteries, and distribution losses external to I.T equipment
- Cooling systems components such as chillers, computer room air conditioning units, direct expansion air handler (DX) units, pumps, and cooling towers
- Other misc. loads including lighting, BMS panels etc.

Why Does Data Centre Energy Efficiency Matter?

Data centre managers may ask, "Does it matter what the energy efficiency rating of my room is?" Table 1 below demonstrates the answer to this question in financial terms. Table 2 shows the answer in terms of CO^2 emissions.

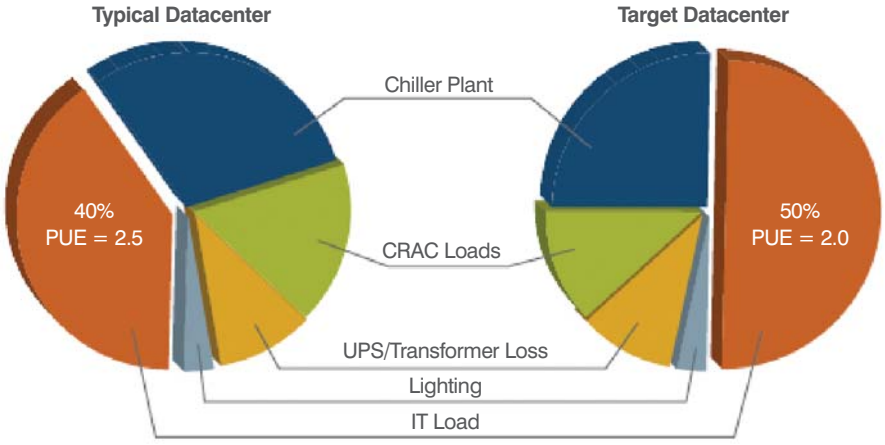
Table 1 – Comparison of energy running costs for typical data centre's with different efficiency ratings (10p per KW/hr).

Critical Load Kw	DCiE 25% PUE 4.0	DCiE 50% PUE 2.0	DCiE 66% PUE 1.5	DCiE 80% PUE 1.25	DCiE 100% PUE 1.0
10	£35,040	£17,520	£13,140	£10,950	£8,760
20	£70,080	£35,040	£26,280	£21,900	£17,520
25	£87,600	£43,800	£32,850	£27,375	£21,900
50	£175,200	£87,600	£65,700	£54,750	£43,800
100	£350,400	£175,200	£131,400	£109,500	£87,600
150	£525,600	£262,800	£197,100	£164,250	£131,400
200	£700,800	£350,400	£262,800	£219,000	£175,200
300	£1,051,200	£525,600	£394,200	£328,500	£262,800
500	£1,752,000	£876,000	£657,000	£547,500	£438,000
750	£2,628,000	£1,314,000	£985,500	£821,250	£657,000
1000	£3,504,000	£1,752,000	£1,314,000	£1,095,000	£876,000
			Rate £ per KwH		0.1

Table 2 – Comparison of CO^2 with different efficiency ratings

Critical Load Kw	DCiE 25% PUE 4.0 CO^2 Tonnes	DCiE 50% PUE 2.0 CO^2 Tonnes	DCiE 66% PUE 1.5 CO^2 Tonnes	DCiE 80% PUE 1.25 CO^2 Tonnes	DCiE 100% PUE 1.0 CO^2 Tonnes
10	2,102	1,051	788	657	526
20	4,205	2,102	1,577	1,314	1,051
25	5,256	2,628	1,971	1,643	1,314
50	10,512	5,256	3,942	3,285	2,628
100	21,024	10,512	7,884	6,570	5,256
150	31,536	15,768	11,826	9,855	7,884
200	42,048	21,024	15,768	13,140	10,512
300	63,072	31,536	23,652	19,710	15,768
500	105,120	52,560	39,420	32,850	26,280
750	157,680	78,840	59,130	49,275	39,420
1000	210,240	105,120	78,840	65,700	52,560
			Kw to CO^2 Kw Conversion		0.006

Table 2 – Comparison of CO^2 with different efficiency ratings



The relationship between power and energy.

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Technology Platform

The EcoMeasure™ solution is delivered through the deployment of equipment provided Schneider Electric, the industry leader in power metering and power management software products.

PowerLogic* ION Enterprise® software is a complete power management solution which comprehensively delivers the management functions of the EcoMeasure™ service. It is a scalable software platform with options to support different numbers of remote devices and clients. Additional data servers are also available depending on the application.

Characteristics

- Compatible with all PowerLogic ION-series meters, PowerLogic PM800 series, PM750 and PM710, PM210 as well as MicroLogic A, P and H breaker control units
- Supports third-party meters, sensors and other equipment through Modbus protocol or OPC
- Connects to remote devices over internet, ethernet, wireless, modem, satellite, and serial connections
- Integrates metering of all utilities (e.g. electricity, gas, water, air)
- Customisable ION architecture
- Multi-site meter aggregation and trending, coordinated control functions, complex calculations and alarming
- Inter-operability with third-party systems, applications and services (e.g. BAS, DCS, ERP, web) through ODBC, OPC, XML, email, FTP, CSV, PQDIF (power quality)

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- Scalable architecture, Windows SQL Server 2005 database, ODBC-compliant, support for multiple distributed servers and clients
- Enterprise web portal access to system-wide display of real-time measurements, equipment status, event and historical logs, customizable graphics, trends, captured waveforms
- Preconfigured and custom reports, report wizard, scheduled distribution via email or web
- Trend graphing for any measured parameter, load aggregation
- Power quality analysis including compliance monitoring to international standards (IEC 61000-4-30, EN50160), wide-area event monitoring and tolerance curve plotting, waveform viewer, measurement of harmonics, K-factor, crest factor and symmetrical components
- Trigger on complex conditions, alarming, event logging
- Manual or coordinated setpoint-triggered control of loads, generators, and other equipment.

PM700 services metre front/rear view

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PowerLogic® PM750* meter

The PM750 digital meters, provide flexible metering deployment within custom panels, switchboards, switchgear, gensets, motor control centres and UPS systems as required to deploy a complete EcoMeasure™ client solution.

The PM750 meter supports direct connection up to 480V AC and seamlessly integrates with the PowerLogic energy management system. The PowerLogic PM750 meter combines quality, versatility and functionality in a cost-effective, ultra compact unit.

It can be easily retrofitted into an existing metering system, and is simple to use and configure with user-friendly software and a large, bright LCD display for easy readability, even in extreme lighting conditions and viewing angles.

Complete with power, demand, energy, power factor and frequency measurements, the PM750 meter is available in a variety of configurations and has IEC 62053-21 Class-1 and IEC 62053022 Class 0.5S certification for basic sub-billing or cost allocation. The meter produces high accuracy measurements that can be used for bill verification, monitoring back-up power for critical systems and cost-effective energy management solutions. In addition, the PM750 meter allows for monitoring down to tool level to help manage cost centers, identify opportunities for demand control and check energy consumption patterns.

For greater control over the performance and overall health of a system, the PM750 meter comes equipped with remote monitoring and control capabilities, allowing it to diagnose and isolate impending problems before they lead to equipment malfunctions or downtime. It features 15 user-configurable alarms, covering the most prevalent over and under conditions in typical power systems.

Combining any of the PM750 meters I/Os with these alarms allows for communication through its two-wire RS-485 port for remote monitoring and control.

Characteristics:

- Requires only 50mm behind mounting surface
- Large back lit display with integrated bar charts
- Intuitive use
- Power and current demand, THD and min/max reading in basic version
- Energy class 1 as defined by IEC 61036

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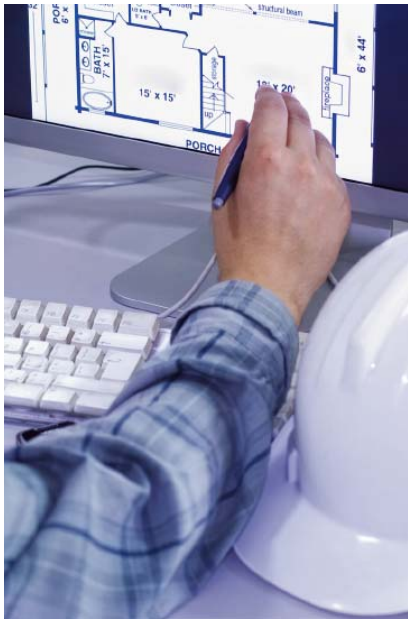
PowerLogic® EGX100* Ethernet Gateway

The EGX100 gateway serves as an Ethernet coupler for PowerLogic System devices and for other communicating devices that use RS485 Modbus protocol. The EGX100 gateway offers complete access to all measurements and status information from connected devices.

Characteristics:

- 10/100Base-Tx ethernet port
- RS485 / RS232 serial port, optically isolated
- 2-wire and 4-wire compatibility
- Support for serial master to ModbusTCP/IP routing
- P30, DIN rail mounted enclosure
- Web Interface for configuration, diagnostic and maintenance
- Advanced security through ModbusTCP/IP filtering with configurable access levels (read-only or full access)
- Secure user interface including user's name & password log-in
- User interface in English, French, German, and Spanish
- Control power through PoE (Power over Ethernet) or 24 Vdc power source
- Rated for use in industrial environments (-25 to 70oC).

* Registered Trademarks of Schneider Electric.



EcoMeasure™ Integration Services

The deployment of EcoMeasure™ consists of sequenced activities to ensure that full and accurate measurement can be achieved for each server room or data centre environment.

Step 1 - Electrical Services Audit

The initial step will require site audit to establish potential measurement points to ensure as a minimum "Total Facility Power" and "I.T Equipment Power" readings are captured. In addition we will investigate the deployment of further meters which will help provide wide range of metrics for the facility.

"Total Facility Power" is measured at the input power feeds to the data centre. This should represent the total power entering the data centre (for which the utility supplier will charge).

The practical measurement point for **"I.T Equipment Power"** is the output of the UPS, UPS bypass switch, or critical distribution power boards which support the critical I.T equipment load. Ideally this is measured at the equipment power intake.

Site sketches, photographs and initial recommendations will form the output of this step.

Step 2 - EcoMeasure™ Design

Following the initial EcoMeasure™ audit, Workspace Technology engineers will generate a configuration to deliver a range of practical readings and metrics which will include:- **Total Facility Power** and **I.T Equipment Power** as a minimum design target.

The output of this step is a high level electrical schematic with identified measurement points, PowerLogic equipment schedule, wiring configuration and software configuration parameters.

Step 3 - EcoMeasure™ Installation

Measurement technology will be deployed within power distribution boards as specified during the audit phase. Works will be programmed to ensure minimum disruption to services with out of hours installations where power downs are required.

Installation services include all metres, CT's, control cable, gateway connections, PoE and Ethernet connectivity.

The result of this step is a fully installed and wired measurement and analysis solution.

Step 4 - Configure and Commission EcoMeasure™ Software

Workspace Technology consultants will configuration and software set up the PowerLogic* ION Enterprise software to deliver all agreed metrics and measurements.

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Managed EcoMeasure™ Service

The power consumption and associated energy efficiency within any data centre is in a constant state of flux. Typically the critical load will increase or decrease in response to user compute demands, ICT refresh and deployment of additional services.

Very often Data Centre Managers are focused on performance and availability of core ICT services, with little opportunity or the means to manage optimum energy efficiency within their facilities, and as a consequence the data centre PUE will slowly drift from the peak design capability

Workspace Technology's Managed EcoMeasure™ service provides on-going analysis and interpretation of readings and metrics for data centre facilities. The Managed EcoMeasure™ service helps Data Centre Managers maintain peak "PUE" performance.

Continued use of the Managed Service will ensure that performance levels are maintained throughout the life of the facility. Peak performance will be achieved through facility adjustments to compensate for the inevitable on-going changes to the IT critical load profile.

Workspace Technology's EcoMeasure™ service will achieve tangible reductions in data centre carbon emissions, and reduced energy consumption.

The Managed service pricing model consists of a one of set up costs with monthly, bi monthly or quarterly reporting charges as mutually agreed for the facility. Additional charges apply to system changes and modifications inline with recommendations.

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is part of Workspace Technology's Ecodesign® range of products and services.

Making the difference

Connecting with our clients

Workspace Technology's Data Centre Solutions division offer clients Data Centre, Server and Communications Room solutions and services which are "Energy Efficient by Design". By engaging you and taking the time to understand the business and performance related issues Workspace Technology is able to effectively address the demands of your business.

Workspace Technology welcomes this opportunity to connect with you as a valued customer. We would like to share our vision and expertise through a partnership approach. Our ability to deliver integrated, scalable, energy efficient solutions has made us the preferred choice for many public sector and commercial businesses today.

Operating throughout the UK, Workspace Technology offers clients an enthusiastic and refreshing approach, combined with teamwork that takes performance and service to new levels of excellence.

The design and implementation EcoMeasure™ solutions forms part of Workspace Technology's overall strategy, providing clients with a complete turnkey approach to the design and build of data centre and server room solutions.

Further details of Workspace Technology's products and services can be found at **www.workspace-technology.com**.

Approved "Endorser" EU "Code of Conduct on Data Centre Efficiency"

APC Elite Partner
Data Centre Certified

ecodesign™

Workspace Technology's "Commitment to help clients reduce their carbon footprint through the deployment of energy efficient technology and design".

ISO 9001 REGISTERED FIRM

ISO 14001 REGISTERED FIRM

Workspace Technology Limited

Creating an effective workspace environment

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