

**THE ENERGY EFFICIENCY IMPERATIVE**  
**WHY CFOS NEED A FINANCIAL STRATEGY FOR ENERGY AND CARBON**

**V** **ERDANTIX**  
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# THE ENERGY EFFICIENCY IMPERATIVE

## WHY CFOS NEED A FINANCIAL STRATEGY FOR ENERGY AND CARBON

October 2009

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### EXECUTIVE SUMMARY

Increasing oil and electricity prices, the hidden cost of carbon, growing risks from energy supply disruption and board-level climate change compliance issues make energy efficiency a new imperative for the CFO. Verdantix analysis of energy and carbon trends indicates that finance executives need a multi-year energy efficiency plan to maximise cost savings, help the CEO meet carbon reduction goals and make financial decisions based on total cost of ownership. Enterprise-wide energy efficiency programmes that focus on strategic solutions ensure CFOs identify the full range of financial benefits. Analysis of over 30 categories of energy efficiency products and services identified 15 strategic solutions that firms should prioritise for investment. Proven solutions with the highest business value include voltage power optimisation, variable speed drives and intelligent HVAC controls. Energy efficiency solutions deliver compelling carbon reduction benefits in addition to energy cost reductions.

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## CFOS NEED A FINANCIAL STRATEGY FOR ENERGY

The spike in energy prices in 2007 and 2008 focused the minds of executives on the need to overhaul their financial plans for energy management. Despite the impact of the global recession, this study finds that the cumulative impact of increasing energy costs, price volatility and carbon compliance risks has put energy back on the agenda. To avoid being caught off-guard, CFOs should draft a financial plan to ensure robust management of energy and carbon.

### Energy Prices Will Spiral Upwards Again

Given the need to manage cash flow, idle plants and restructure the workforce, CFOs may be forgiven for taking their eye off energy management. But this is a dangerous mistake because:

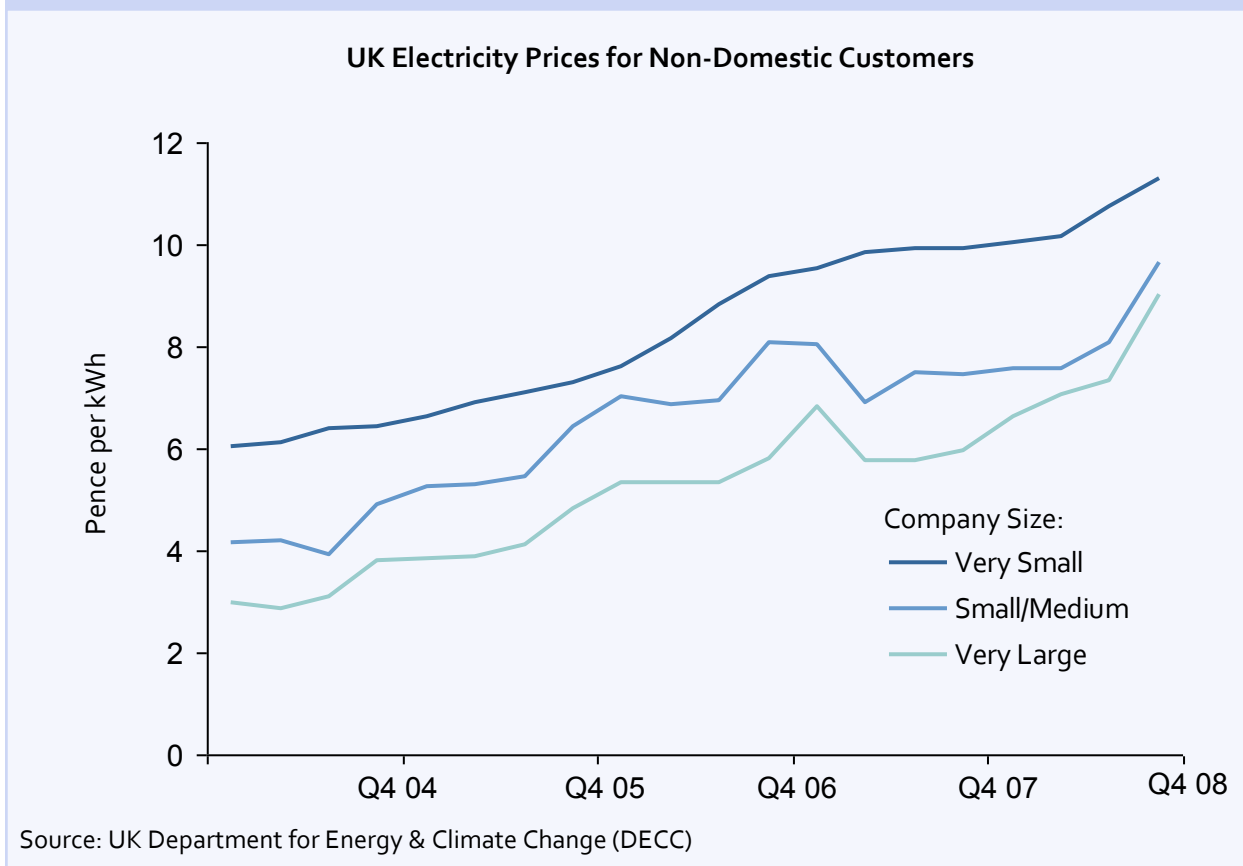
- **UK electricity prices will continue to trend upwards.** Between the beginning of 2004 and the end of 2008, UK electricity prices for large firms increased from 3 pence per kilowatt hour to almost 8 pence per kilowatt hour (see **Figure 1**). This trend will continue as government legislation and supply constraints drive up energy costs. High prices today and in the future should make energy cost reduction a priority for the CFO.
- **Oil prices have already rebounded to their 2006 level.** Oil trades between \$50 and \$80 a barrel. Compared with the last 20 years, this range is higher than all other years apart from 2007 and 2008. Specialist energy analysts such as the International Energy Agency and Goldman Sachs expect the oil price to reach \$80 to \$100 a barrel in 2010. OPEC expects oil to trade between \$100 and \$150 a barrel in the medium term.
- **Carbon prices are forecasted to quadruple from 2009 lows.** Few CFOs realise that carbon is a component of the wholesale price of electricity. Energy policy specialists like ICF International forecast a carbon price of €70 per tonne of CO<sub>2</sub> by 2020. The reason? In the UK and around the world, governments implement greenhouse gas cap-and-trade schemes covering both emissions intensive and non-emissions intensive sectors.

### Electricity Bills Conceal Growing Carbon Costs

Finance departments may lack an understanding of the arcane world of the European Union's Emissions Trading Scheme (ETS) and the UK Government's Carbon Reduction Commitment (CRC). But they need to take note as tighter emissions caps and more auctioning of CO<sub>2</sub> allowances invisibly flow into higher prices for gas and electricity. Specifically:

- **Aggressive auctioning of allowances in the UK inflates energy bills.** The UK government will auction 7 per cent of the UK's allocation of European Union Allowances (EUAs) for CO<sub>2</sub> emissions during the 2008-12 trading period of the ETS. This means that UK power generators like Drax Group must buy more allowances. The net result of Drax Group and other power generators covering their costs is to increase the wholesale price of electricity (see **Figure 2**). With public finances under severe pressure for the next 5 years, increased revenue raising by HM Treasury from "ethical carbon taxes" is a real possibility.

**Figure 1. Electricity Prices Move In One Direction — Upwards**



**Figure 2. CO<sub>2</sub> Auctions Drive Up The Wholesale Price Of Electricity**

	2007	2008	Year-on-Year Change
Free allocation of CO <sub>2</sub> allowances (EUAs)	14.6 Mt	9.5 Mt	- 36%
Average purchase cost of CO <sub>2</sub> allowances	£1.5 / tonne	£17.4 / tonne	+ 1,060%
Average fuel cost (ex. CO <sub>2</sub> allowances)	£18.5 / MWh	£25.0 / MWh	+ 35%
Average fuel cost (inc. CO <sub>2</sub> allowances)	£18.9 / MWh	£33.8 / MWh	+ 79%
Cost of sales	£546m	£1,070m	+ 96%

Source: Verdantix, Drax Group Annual Report

- **CRC obliges firms to buy emissions allowances.** The baseline year for the UK's CRC began on April 1, 2009 with the first compliance year starting on April 1, 2010. Five thousand UK organisations that consume more than 6,000 megawatt hours of electricity a year need CRC allowances to cover their emissions. By 2013 the worst performing organisations could face penalties equal to 0.5 per cent of profit before tax (see Verdantix [Best Practices For The Carbon Reduction Commitment](#), September 2008). Performance in 2013 will be driven by investments from 2009 to 2011.
- **Electricity bills conceal low carbon transition costs.** The UK Climate Change Levy, introduced in April 2001, adds 0.47 pence per kilowatt hour to the price of electricity for UK businesses. Additional low carbon transition measures such as the Carbon Emissions Reduction Target (CERT) requires retail utilities like Scottish and Southern Electric to fund energy efficiency investments. But the utilities have negotiated the right to pass on the full cost of the energy efficiency grants to end customers.

## The UK Energy Supply Gap Increases Price Volatility Risks

Following the liberalisation of the UK energy sector, the UK government must now negotiate with French and German-owned utilities like EDF, E.On and RWE who provide the bulk of the UK's electricity. Without direct UK government control over power generation investment decisions, UK firms face an increased risk of energy price volatility due to:

- **Uncertainties over new generation capacity.** The high cost of debt finance during 2008 and 2009 put major renewable energy projects on hold like the planned 1,000 megawatt, 341 turbine offshore wind farm called the London Array (see Verdantix [UK Offshore Wind: Broken Economics?](#), January 2009). New nuclear plants planned by EDF face potent public opposition. The looming energy gap could result in blackouts if the maximum generation capacity can not meet peak demand.
- **UK dependence on imported natural gas.** Despite investments since the mid-1990s in pipeline interconnects that enable the UK to import large volumes of natural gas from continental Europe, the EU's own reliance on non-EU imports from countries like Russia and Libya poses security of supply issues. The EU depends on Russia for 25 per cent of its natural gas and 80 per cent is pumped via the Ukraine. Pipeline shutdowns in 2006 and 2009 show that UK businesses face increased risks of price spikes and disruption.

## New Legislation Makes CO<sub>2</sub> A Board-Level Compliance Issue

Finance teams will need to include the cost of carbon in their financial plans and forecasts. Firms directly involved in the emissions business, like National Grid, have already adopted carbon budgets. Energy management is now a boardroom compliance issue because:

- **Legislation across all sectors puts a price on carbon.** By putting a price on carbon in the context of a compliance regime, the CRC and ETS legislation requires that energy data is accurate and auditable. In addition, any organisation that spends approximately £500,000 a year on electricity (through half-hourly meters) will need to include the cost

of buying CRC allowances in its cash flow and profit and loss forecasts. Audit firms like Deloitte will require this data to sign off the annual accounts.

- **Investors and other stakeholders demand carbon reporting.** Aside from mandatory compliance, the CFO also needs to comply with investor demands for transparency on exposure to carbon costs. The National Association of Pension Funds encourages firms to disclose their carbon exposure to improve financial performance and manage reputational risk. Due to the financial implications of carbon reporting, the CFO should be involved in signing off submissions to bodies like the Carbon Disclosure Project.

### PRIORITISE ENERGY EFFICIENCY FOR MAXIMUM RETURN

The cumulative impacts of constantly increasing energy prices, hidden carbon costs and board-level compliance issues compel CFOs to take ownership of energy and carbon management. How should they address these pressing financial issues? The research conducted by Verdantix with energy managers, finance directors, industry experts and suppliers puts energy efficiency at the top of the action list for an energy and carbon management strategy (see **Figure 3**).

#### The Payback From Energy Efficiency Is Compelling

When compared to alternative approaches to energy and carbon management, energy efficiency accomplishes several concurrent objectives: cost reduction, energy price risk mitigation and alignment with sustainability goals. Verdantix research into energy efficiency reveals that:

- **Inefficient use of energy is a widely recognised problem.** The Energy Saving Trust estimates that the UK wastes £8.5 billion a year through inefficient use of energy. The Carbon Trust estimates that UK businesses waste 10 to 20 per cent of their energy use. The McKinsey Global Institute published a recent study that concluded global energy demand could be cut by 22 per cent using existing solutions.
- **Potential return on investment stretches above 100 per cent.** When finance directors run their slide rule over which business cases to fund energy efficiency projects are overlooked as being non-core. However, Verdantix research with energy managers at firms like Aviva indicates compelling return on investment are achieved, starting at 20 per cent and reaching as high as 300 per cent.
- **Energy cost savings go straight to the bottom line.** Financial directors need cost reductions and top line growth to deliver profit targets agreed with the Board. CFOs who have been alerted to energy efficiency paybacks find that even a moderate reduction in energy costs can have a significant multi-year impact on profitability. For example Tesco's energy management programme has enabled a £600 million boost to their profits over the last eight years (see **Case Study 1**).

Figure 3. Energy Efficiency Is The Top Priority For Energy And Carbon Management

Prioritisation of Actions	Benefits		
	Improve Sustainability	Reduce Cost	Mitigates Risk
1. Energy Efficiency	✓	✓	✓
2. On Site Generation	✓	✗	✓
3. Green Electricity	✓	✗	✗
4. Voluntary Offsets	✓	✗	✗

Source: Verdantix

### Potential Energy Cost Savings Drive Investment Priorities

Energy managers and industry experts agree that the financial case for an energy efficiency programme is compelling. Our research, covering over 30 energy efficiency products and services found that a handful of solutions should be prioritised for investment. CFOs have four main levers to tackle energy efficiency:

- 1) **Optimising electricity voltage of entire sites.** Voltage power optimisation (VPO) has a comprehensive impact on energy efficiency because it lowers the voltage of electricity supplied to an entire site and improves supply quality. For example, powerPerfactor VPO technology typically enables all equipment on a site to operate 12 per cent more efficiently (see **Figure 4**). Transformers, which just reduce voltage, are also used but offer less significant efficiency improvements compared to voltage power optimisation.
- 2) **Applying controls to optimise the energy use of different assets.** A wide range of controls can be applied to assets such as motors, IT equipment, boilers, and HVAC units to minimise wasted energy. Examples include variable speed drives from Rockwell Automation and Schneider Electric, building management systems from the likes of Johnson Controls and PC power controls like 1E’s Nightwatchman.
- 3) **Altering employee behaviour.** An alternative course to controlling asset output is to actively engage employees in energy efficiency. For instance switching equipment off rather than putting it on standby. This approach is prone to significant human failings,

## Case Study 1. Tesco: A High Value Energy Efficiency Programme in Action

Tesco is the UK's largest retailer, generating global sales of £59.4 billion during 2008/09 and running 2,282 stores nationwide. Their operations consumed 3.8 million megawatt hours of electricity in the UK in the year ending March 2008, costing the firm £180 million or approximately 0.5% of operating costs. Tesco's financial resources, energy spend and scale support an ambitious energy efficiency strategy.

### Tesco takes a strategic approach

The firm's strategy is driven from the top down, with multi-year targets being set at a group level. These are achieved through the collective savings of centrally driven process refinement and initiatives installed at a site level. The £100 million Sustainable Technology Fund provides the capital for the installation of large scale energy reduction technologies. Each energy efficiency initiative has to have its own business case and produce financial benefits. Typically schemes are expected to pay for themselves within 24 months. According to the Group Energy Manager, "Energy efficiency projects deliver great returns, generally around 2 years or less depending on what tariff you're on so Tesco sees it as common sense business". Voltage Power Optimisation (VPO) from powerPerfactor plays a major role in the Tesco programme. Having installed 150 units up to the end of 2008, Tesco are continuing the roll out of this technology with installations in a further 480 Tesco stores in 2009 that will deliver an annual saving of 123.5 GWh which is £8.2 million in electricity costs. This equates to a reduction of 53,000 tonnes of CO<sub>2</sub> based on 0.43kg CO<sub>2</sub> / kWh.

### "Stop the drift" programme monitoring

Tesco implemented a strategy called "stop the drift", whereby energy consumption is accurately monitored to ensure initiatives remain effective. Meters and/or sub-meters are installed in all Tesco premises to collect, store and analyse consumption data. The reports are scrutinised by the team of energy managers. Where possible, problems are fixed through remote controls and regional energy managers carry out site visits to amend problems. In 2008 £1.5 million of drift was prevented. The data also produce savings through electricity invoice validation. Tesco employ BIU for this service and have annually saved an average of £850,000 over the past five years.

### Operational control

The control of energy production and consumption generates substantial savings for Tesco, with over 100 power generators and 5,000 consuming systems. The

operational control team manages the running time and modulates the output of all Tesco circuits, including store HVACs, lighting and baking systems. Where possible these processes are automated.

### Technology integration

In order to stay up-to-date with latest technological innovations, Tesco has a team with responsibility for identifying and trialling new technologies in stores and for other business processes. Before mass roll out, each solution is trialled for an 8 week period in a number of stores to ensure suitable energy reductions are achieved. This system has led to the installation of technologies including lighting control systems, VPO, natural ventilation, energy efficient T8 fluorescent lights, power factor correction, variable speed drives, high efficiency compressors and efficient baking ovens. VPO has now been installed by powerPerfactor in 480 Tesco sites. Tesco have employed Evolve Energy to install lighting control schemes at their Tesco Extra stores, which have on average reduced lighting costs by 30%. Tesco's dedication has been shown in the £132 million they invested last year in the above technologies, constituting 3% of their total capital expenditure for 2008/09.

### £600 million in energy cost reduction

In 2008 Tesco achieved a major group target, set for 2010, of halving energy use per square foot of selling space, relative to the 2000 level. Over the 8 year period, Verdantix estimates that Tesco's cumulative energy spend would have been approximately £600 million higher without the implementation of their energy efficiency programme. In 2008 alone Tesco reduced energy consumption by 8%, despite growing as a company.

### ...And still going

Looking to the future Tesco has integrated the energy efficiency programme with the carbon management programme. The latest targets are to cut emissions from stores and distribution centres by 50% before 2020. This will be accompanied by rolling out low energy eco-stores. In January 2007, Tesco CEO, Sir Terry Leahy said: "I am determined that Tesco should be a leader in helping to create a low carbon economy. In saying this, I do not underestimate the task. It is to take an economy where human comfort, activity and growth are inextricably linked with emitting carbon. And to transform it into one which can only thrive without depending on carbon. This is a monumental challenge. It requires a revolution in technology and a revolution in thinking."

Sources: BIU, Carbon Disclosure Project, DECC, Evolve Energy, powerPerfactor, Tesco, Verdantix

**Figure 4. CFOs Should Focus On A Small Number Of Strategic Initiatives**

Electricity Consumption		Electricity Energy Saving by Solution			
Electricity Consumption by Category in the Services Sector		Voltage Power Optimisation	Lighting Solutions*	Variable Speed Drive	HVAC Demand Man.
Lighting	40%	12%	20-40%	-	-
Heating	14%	12%	-	-	-
Catering	14%	12%	-	-	-
Cooling and Vent.	9%	12%	-	30%	20-50%
Computing	6%	12%	-	-	-
Hot Water	3%	12%	-	-	-
Other	13%	12%	-	-	-
<b>Total Saving</b>		<b>12%</b>	<b>8-16%</b>	<b>3%</b>	<b>2-5%</b>

Notes:

Actual energy savings are dependent on conditions pre solution installation

\* Based on using energy efficient lights in combination with lighting controls

Source: DECC, Verdantix

therefore strong follow up strategies need to be put in place to ensure continued staff engagement.

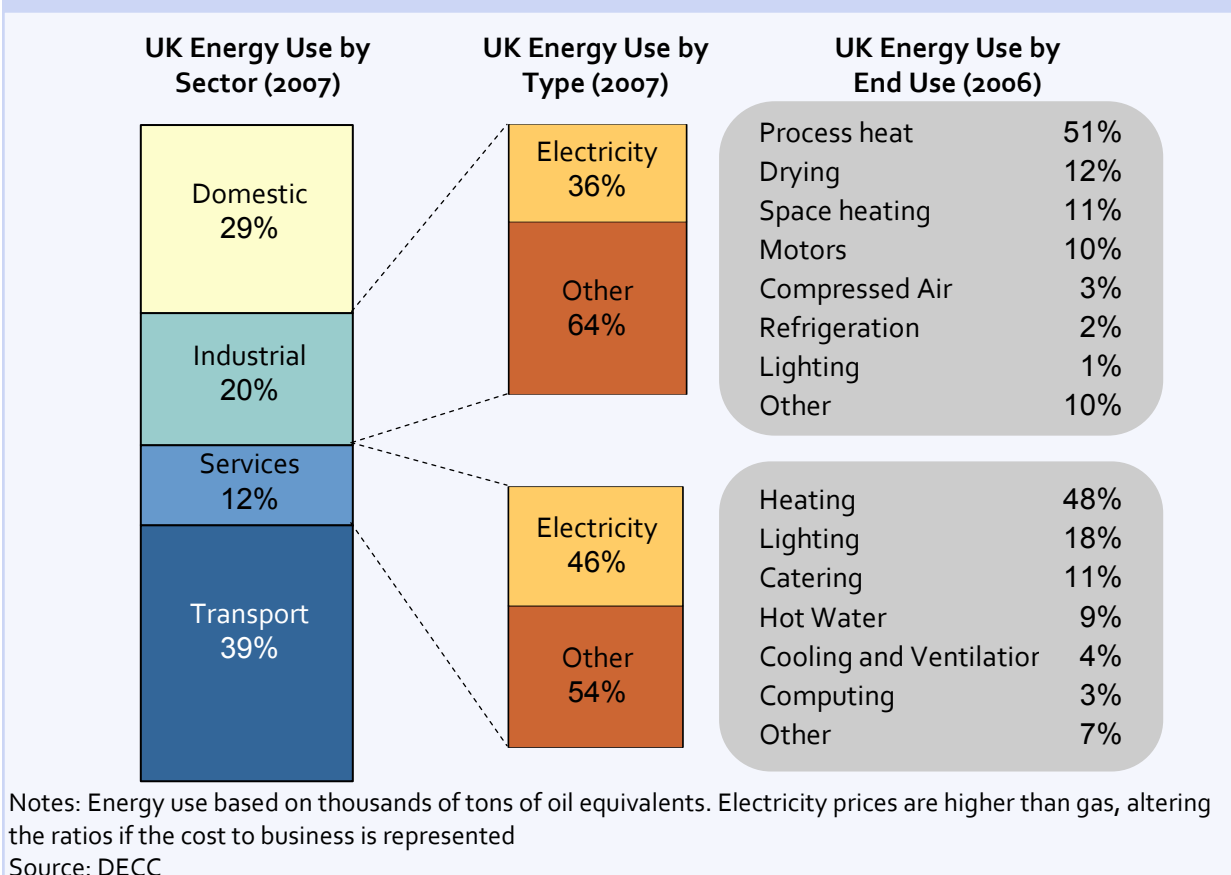
- 4) **Replacing inefficient assets with more efficient assets.** Capital expenditure on new equipment with a multi-year payback period is often the last thing the CFO wants to do. But higher energy prices, risks from unobtainable spare parts, growing maintenance costs and phase out rules for inefficient equipment push firms to invest in more energy efficient heaters, chillers, motors and lights. Frequently cited examples include T5/T8 fluorescent lights and better building insulation.

### Energy Efficiency Helps The CEO Achieve Carbon Reduction Goals

No sector, no firm and ultimately no CO<sub>2</sub> emission will escape UK government policies aimed at reducing emissions by 80 per cent by 2050. By making carbon management a mandatory part of “business as usual” the government has turned energy management into a strategic issue. With carbon reduction goals on the agenda CFOs need to:

- **Explain why energy efficiency makes financial sense for carbon management.** Firms can invest in multiple approaches to achieve carbon reduction goals. From a financial perspective — and also from a sustainability perspective — energy efficiency is a clear priority. Firms with sophisticated energy and carbon management strategies like BT advocate this prioritisation.

**Figure 5. Enterprise-Wide Programmes Maximise Energy Cost Savings**



- Draft a multi-year investment plan that delivers significant absolute savings.** When the CEO makes a CO<sub>2</sub> reduction commitment anchored in the future, the CFO needs to deliver that goal with a multi-year investment plan focused on energy efficiency. This requires investments with a short payback period, such as lighting controls, as well as setting funds aside for bigger energy efficiency projects like voltage power optimisation that provide much larger absolute savings measured in cash and carbon.

### Enterprise-Wide Energy Programmes Maximise Benefits

Verdantix research with heads of energy and financial executives found that investments in energy efficiency projects get stalled because the scale of savings from point solutions are insufficient compared to other cost saving initiatives. To identify the true scale of potential energy efficiency cost savings CFOs should take a strategic programme-based approach. This should include:

- An analysis of total cost of ownership.** Increasing energy costs mean that the finance team should undertake frequent reviews of total cost of ownership of energy consuming assets, not just replacement costs. Executives face difficult decisions when balancing commissioning, operating, and disposal costs. Assessed over a period of years, maintenance and energy costs can exceed the cost of installing new technologies. For instance the purchase cost of a large motor is only a fraction of its lifetime cost.

- **Process re-engineering.** The biggest energy efficiency wins in the industrial sector often arise from process changes because most of the energy spend relates to process heat and steam generation (see **Figure 5**). For example, Nestlé implemented energy efficient extrusion of chocolate at low temperatures based on advances in food processing science. Cost savings from new processes can therefore deliver significant margin improvements.
- **Alignment of procurement and efficiency objectives.** Savings are available when the electricity providers impose penalties and surcharges for poor power factors and if a site oversteps its agreed peak load. Power factor correction solutions such as those provided by Schneider Electric and also voltage power optimisation are specifically designed to address these problems.

## FOCUS ON STRATEGIC ENERGY EFFICIENCY SOLUTIONS

Soaring energy costs, boardroom compliance requirements and significant untapped cost savings make energy efficiency a priority for investment. Due to fundamental market drivers, the business case for energy efficiency will get stronger. To simplify the investment decision facing the CFO the Verdantix analysis zooms in on strategic energy efficiency solutions that represent a subset of the myriad solutions available on the market.

### What Are The Strategic Energy Efficiency Solutions?

The Verdantix research team selected energy efficiency solutions that:

- **Report and analyse energy consumption**
- **Optimise voltage and improve electrical supply quality**
- **Increase control of energy consuming assets**
- **Improve the energy efficiency of assets**
- **Consume less energy than the assets they replace**

The solutions identified here do not include industrial equipment nor industrial process solutions due to their high degree of specificity. Behavioural actions have been excluded from the analysis due to the unreliability and range of their potential value to businesses.

The analysis of energy efficiency solutions is based on interviews and meetings with 17 suppliers, 5 industry experts and 16 energy and financial managers. Contributing firms include: ABB, Astral Web, Ceravision, Eco Instruments, Energy ICT, Environ, Enviros, Evolve Energy, Meneiscus, Monodraught, Philips Lighting, PowerPerfector, Rockwell Automation, Schneider Electric, SDC Industries, Siemens, Trend, Weishaupt.

## PHASE 3. LAUNCH

### 3.1 LED Lighting

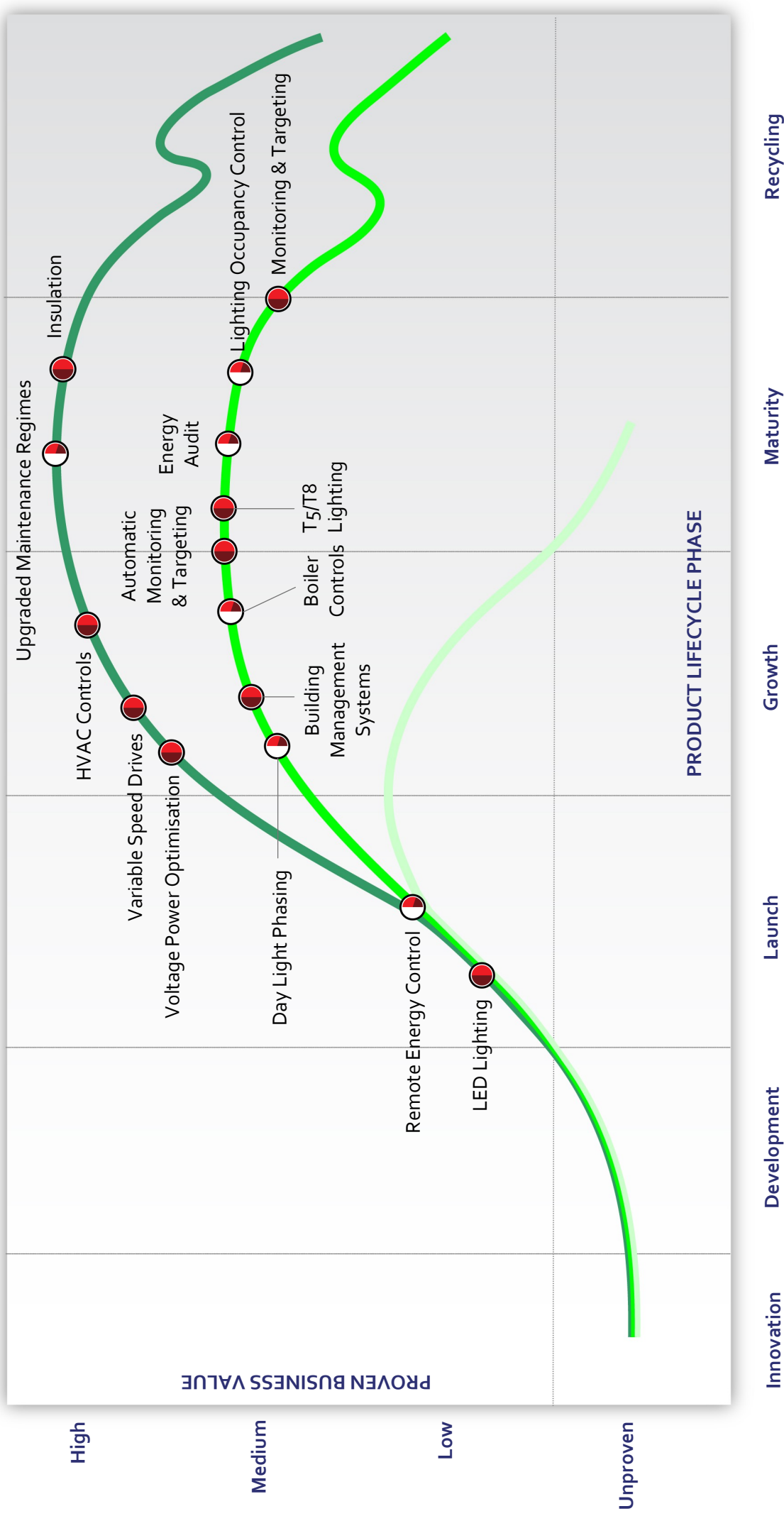
**Definition:** Light emitting diodes are diodes (electronic components that let electricity pass in only one direction) that emit visible light when electricity is applied. They are more efficient and generally longer lasting compared to incandescent and halogen lights.

**Maturity Phase:** Launch. LEDs are in the early stage of adoption but are being taken up by the market rapidly. Technological developments increasing output and reducing costs will occur over the next two years.

**Business Value:** Moderate. The initial cost of LEDs is currently more than most conventional lighting sources, with the bulbs emitting lower levels of light. However given their long life span and added efficiency their total cost ownership surpasses that of incandescent and halogen sources.

**Sustainability Rating:** 4. LEDs provide immediate reductions to energy consumption for lighting and have negligible environmental impacts in production and disposal.

# Figure 6. Strategic Energy Efficiency Solutions



**Investment Advice:** This lighting solution is suited to applications requiring point light solutions as can be required in some architectural and retail lighting and is frequently found in signalling and signage lights.

**Example Suppliers:** Abacus, Aurora, Cree, Elektroled, GW Supplies, Lumileds, Lyco, Nichia, Osram, Philips Lighting, Sylvania, Toyoda Gosei.

## 3.2 Remote Energy Control

**Definition:** Remote control of a site's equipment by off-site personnel acting on information received from metering. This can be an outsourced service.

**Maturity Phase:** Launch. This service acts on remote meter data, typically from automated monitoring and targeting which is widely adopted but not yet standard within the market. Remote energy control lags the uptake of these services.

**Business Value:** Moderate. Remote energy management provides an added element of control for equipment. It provides an alternative to a BMS at a cheaper cost, yet still facilitates the energy management and therefore energy savings.

**Sustainability Rating:** 4. Remote energy control was designed to, and successfully achieves a reduction in energy consumption throughout a site or a portfolio of sites.

**Investment Advice:** Remote energy control is suited to firms managing a portfolio of buildings, which in their own right don't warrant the installation of a BMS. The installation of remotely activated controls increases capital costs, so best returns are achieved when operational hours are irregular which means time switched controls are ineffective.

**Example Suppliers:** Astralweb, Energy Matrix Solutions, Mardix, Schneider, Siemens, T-Mac.

## PHASE 4. GROWTH

### 4.1 Voltage Power Optimisation (VPO)

**Definition:** Optimisation device installed in series with the mains electricity supply to lower the voltage supplied to the site, typically down from 240V to an optimum of 220V where equipment operates more efficiently. The device also improves power quality by improving power factor and filtering harmonics and transients from the supply.

**Maturity Phase:** Growth. Within the UK voltage optimisation is in the early phases of adoption, with a sole provider, powerPerfector having the UK rights to the technology which many major firms have already installed. The technology was launched in Japan and 300,000 units have been installed since the 1990s.

**Business Value:** High. Installation of VPO has a payback period of one to three years,

reducing annual electricity consumption and costs by 10-20% throughout its lifespan (over 30 years). Although in early stages of adoption some major firms such as Tesco, RBS, DEFRA and Hilton hotels have installed VPO devices.

**Sustainability Rating:** 4. Voltage optimisation significantly reduces onsite energy consumption thus producing carbon savings. This solution's high efficiency and low heat losses maximises sustainability benefits.

**Investment Advice:** The technology is suited to firms of all sizes and produces significant energy savings. Voltage optimisation differentiates itself from other voltage reduction measures by its greater efficiency, size of savings and the protection of equipment from disruptive harmonics and transients, and the fact that it is specially designed for installation at the source of a building's power supply. The technology has a lifespan of over 30 years producing long-term savings.

**Example Suppliers:** powerPerfector.

## 4.2 Variable Speed Drives (VSD)

**Definition:** Devices installed to control motor output to a required rate. When used for pumps or fans it allows control over the flow rather than a constant fixed flow.

**Maturity Phase:** Growth. Variable speed drives are sophisticated in design and are well known in the market. Uptake has been slow and has been hit recently by the economic downturn as firms are wary of making large capital investments.

**Business Value:** High. Capital expenditure can be up to £400,000 and result in payback periods ranging from 3 months to 3 years. Substantial savings can be achieved by providing only the motor output required, and can sometimes result in a longer motor lifespan as the average temperature of operation is lowered.

**Sustainability Rating:** 4. Variable speed drives were designed to maximise process efficiency and therefore produce substantial savings to a site's energy consumption, which are immediately recognised on installation.

**Investment Advice:** Variable speed drives provide an effective means of cutting energy consumption for motors of all sizes. Proportionally larger savings are achieved when installed for large motors. They can work as a complementary measure to demand control equipment in HVAC systems, and are also controlled from BMSs.

**Example Suppliers:** ABB, Alldales, Eriks Industrial Services, Invertek Drives, KEB, Lowara UK, Omron Electronics, Rockwell Automation, Schindler, Schneider Electric, Siemens.

## 4.3 HVAC Control

**Definition:** HVAC controls modulates output through the installation of motor controls, typically a variable speed drive. The information regulating supply is provided by humidity,

temperature, pressure, carbon dioxide and/or occupancy sensors.

**Maturity Phase:** Growth. HVAC control systems are frequently applied. However their intelligence has increased dramatically due to rising energy prices in the past 4 years, and the resultant desire for higher efficiency. Much progress has been made from original, unsophisticated controls, such as time switches.

**Business Value:** High. The use of an intelligent HVAC system can reduce operational hours by 20-50%, thus lowering consumption and increasing the operational lifespan of equipment. The installation of demand management has a typical payback period of 6 to 18 months.

**Sustainability Rating:** 4. There are substantial energy savings to be made from syncing HVAC supply to building demand, thus reducing emissions.

**Investment Advice:** demand management is particularly important for firms operating in extreme climates where heating or air conditioning consumes large amount of energy. The controlling condition (e.g. temperature, CO<sub>2</sub> ...) should be chosen to deal with current defining issues with HVAC supply.

**Example Suppliers:** Balfour Kilpatrick, Colt Group, Delta Controls, Honeywell, Johnson Controls, Mitie, Sabien, SCD Buildings and Mechanical Services, Siemens, Toshiba, Trend.

## 4.4 Lighting Daylight Phasing Control

**Definition:** Automated dimming system which monitors levels of natural light in a building and alters the intensity of artificial lighting to provide a constant overall lighting level.

**Maturity Phase:** Growth. This is the most sophisticated of the lighting control systems and is widely used in businesses.

**Business Value:** Moderate. The cost of investment varies with the sophistication of the system installed with costs ranging from £10,000 up to £200,000. Two years is the common payback period with savings generated by shorter lighting hours.

**Sustainability Rating:** 3. The system maximises the natural light available, reducing lighting energy consumption.

**Investment Advice:** This technology is suitable for office environments with the most sophisticated systems having the capability to control the colour of the light, maximising employee energy levels and productivity.

**Example Suppliers:** Apollo Lighting, Chalmor, Danlers, Ex-Or, Philips, Schneider Electric, Sparks, Toolbase Services.

## 4.5 Building Management System (BMS)

**Definition:** A building management system is a computer-based control system installed to

control and monitor the building's mechanical and electrical equipment. This includes ventilation, heating, lighting, fire systems and security systems. The system can also be referred to as a building energy management system (BEMS).

**Maturity Phase:** Growth. BMSs have been used to increase building efficiency for 30 years. Their market uptake has surged in the past 3 years due to energy prices and government legislation. BMSs are evolving constantly as new IT and electronic solutions enter the market creating new system integration opportunities.

**Business Value:** Moderate. Investment costs range from £25,000 to £3 million depending on the building size and system sophistication. Payback periods on investments are typically achieved within 3 years. A well running BMS is a key measure in reducing site energy consumption producing financial savings. However their complexity means that over time they become sub-optimally set up.

**Sustainability Rating:** 4. BMSs produce a substantial decrease in building energy consumption by integrating a range of solutions to ensure that maximum efficiency is achieved.

**Investment Advice:** Firms operating out of large buildings without a BMS should consider an installation as an important aspect of their energy efficiency programme. Even those operating BMSs should review their system to ensure optimal set up and consider upgrades.

**Example Suppliers:** Chalmor, Dalkia, Honeywell, Integrated BMS, Johnson Controls, Siemens, Swift Automation and Control Systems, TAC, Trend, WATT Solutions.

## 4.6 Boiler Controls

**Definition:** the harmonising of a boiler's output to match site demand through automated modulation of the boiler. More intelligent systems will prevent boiler cycling, associated with oversized boilers. They can be installed as a standalone system or integrated within a BMS.

**Maturity Phase:** Growth. This solution has been widely implemented within the commercial and industrial sectors. Infiltration into the market of smaller energy consumers has been limited, whilst uptake of intelligent controls is still growing.

**Business Value:** Moderate. Through automatic output modulation and the limitation of boiler cycling, gas consumption and CO<sub>2</sub> emissions can be reduced by 10 to 25%. The payback period for boiler controls is typically between 6 months and 2 years.

**Sustainability Rating:** 3. Increases in efficiency result in lower consumption rates and reduced CO<sub>2</sub> emissions. However the boiler remains a significant consumer of energy.

**Investment Advice:** boiler controls are advised for both commercial and industrial sector. The effectiveness of linking boiler controls to a BMS depends on the level of intelligence. When looking to avoid boiler cycling it is advised companies install stand alone controls.

**Example Suppliers:** Aztec, Cochran, Eurotherm, Honeywell, Johnson Controls, Kanmor Control Systems, Sabien, Siemens, Spirax Sarco, Weishaupt.

## 4.7 Automated Monitoring and Targeting (AM&T)

**Definition:** AM&T collects and stores data from energy meters and uses software to process analyse and report the information received. Automated meter readers (AMR) are required in data collection.

**Maturity Phase:** Growth. This is a well established technology which has been developed from conventional monitoring and targeting practices. It is widely used within energy efficiency programmes.

**Business Value:** Moderate. AM&T has no direct payback, but it creates opportunities for energy savings from the resulting analysis and benchmarking. It is more efficient and effective than its predecessor, standard monitoring and targeting. Maximum energy reductions are achieved when sub-meters are used in data collection to provide greater resolution to energy profiling.

**Sustainability Rating:** 4. AM&T is a critical step with in energy efficiency programmes. It is used to ensure that initiatives are targeted at underperforming areas and can be used to check that currently running schemes are being effective. The knock on savings that AM&T generates are substantial.

**Investment Advice:** This is an important technology for any energy efficiency programme. With action required on energy measurement and reporting for the CRC looming, firms should look to either install a sophisticated system, or upgrade their current AM&T to benefit from latest technology and software.

**Example Suppliers:** AEA, Astralweb, BIU, Broadfern, Environ, Enviros, Evolve Energy, Honeywell, Inenco, Nifes, Power Efficiency, Rockwell Automation, Siemens.

## PHASE 5: MATURITY

### 5.1 Upgraded Maintenance Regimes

**Definition:** This incorporates a variety of maintenance procedures including equipment servicing, auditing, retro fits, refurbishments, and predictive maintenance software. Maintenance can be provided as an outsourced service.

**Maturity Phase:** Maturity. Effective maintenance has always been pivotal in the achievement of energy efficiency and in recent years has developed through the introduction of predictive maintenance.

**Business Value:** High. An effective maintenance regime maximises equipment lifespan and efficiency, thus reducing operational and capital expenditure. Simple actions, such as the

cleaning of filters, can prevent the upwards drift of energy consumption.

**Sustainability Rating:** 3. Maintenance regimes are installed to maximise machine's output and protect equipment from deterioration. This reduces energy usage and requirements for equipment upgrading.

**Investment Advice:** Maintenance regimes are a highly effective element of any energy efficiency programme. They should be employed to ensure that efficiency initiatives have longevity, especially within manufacturing industry.

**Example Suppliers:** DMG Delta, Honeywell, IMS, Johnson Controls, Maintech, Matrix Energy Solutions, Schneider, Symtrex.

## 5.2 Insulation

**Definition:** The minimisation of unwanted heat dissipation from buildings and pipes through the initial design or the installation of insulating materials, such as foam.

**Maturity Phase:** Maturity. This is one of the earliest energy efficiency solutions and will always be an important element in reducing heat loss.

**Business Value:** High. Insulation provides a simple and effective means of cutting heating costs. Payback periods vary from 1 – 6 years, with installation providing substantial savings for over 25 years and minimal levels of maintenance.

**Sustainability Rating:** 4. Insulating buildings and pipes significantly reduces energy loss and therefore consumption. It produces immediate energy savings without consuming energy itself, however does require the production of the materials for fitting.

**Investment Advice:** Ensuring adequate insulation throughout a site should be one of the first steps a business makes when looking to cut energy consumption. Installation will also maximise the return of subsequent initiatives.

**Example Suppliers:** A&M Insulations, Celotex, Dow Building Solutions, Eaga Insulation, Excel Industries, Gendex, Knauf, Mark Group, Miller Pattison Ltd, npower.

## 5.3 T5/T8 Lighting

**Definition:** T5 and T8 fluorescent bulbs are similar to standard fluorescent bulbs but use an electronic lighting ballast, as opposed to the conventional electromagnetic. This increased sophistication lowers the current required to operate the light.

**Maturity Phase:** Maturity. This solution has been available in the market for over 10 years and is has been widely adopted.

**Business Value:** Moderate. T5 and T8 fluorescent bulbs are three times more efficient than standard fluorescent bulbs, whilst their 20,000 hour lifespan reduces maintenance costs.

**Sustainability Rating:** 3. T5 and T8 lamps provide an energy efficient and effective means of lighting commercial buildings. Energy consumption is significantly lower than standard fluorescent and their long lifespan reduces disposal rates.

**Investment Advice:** These light bulbs should be used to replace standard fluorescent bulbs, as they will provide more efficient lighting source whilst maintaining the quality of output. The quality and dispersal of their light distribution makes them well suited to office blocks.

**Example Suppliers:** Abacus, AEI, GE Lighting, GIGB Ltd, GW Supplies, Lyco, Osram, Philips Lighting, Pulse Lighting, Sylvania.

## 5.4 Energy Audit

**Definition:** A service that identifies and quantifies energy usage at a disaggregate level. It is typically performed at a site or an industrial process level.

**Maturity Phase:** Maturity. Energy auditing is a mature service which has become increasingly technical in the appraisal of energy consumption, for example through the use of thermal imaging.

**Business Value:** Moderate. There is no direct ROI from carrying out an energy audit; however it is a necessary step for the identification of potential energy savings. It can result in quick wins being identified and therefore producing significant energy savings.

**Sustainability Rating:** 3. The service itself doesn't act to produce energy savings but enables future reductions in energy consumption which can be substantial in scale.

**Investment Advice:** Companies who haven't had an audit of their site and process energy spend should do so to identify potential savings. Repeating audits bi-annually can ensure that energy cuts are being achieved.

**Example Suppliers:** AEA, BIU, Broadfern, Carbon Trust, Ecofys, Environ, Enviros, ERM, Evolve Energy, Hurley Palmer Flatt, ICF, Inenco, McKinnon Clarke, Nifes, Power Efficiency, WSP.

## 5.5 Lighting: Occupancy Control

**Definition:** A lighting system connected to motion sensors to ensure lights are only turned on when people are in the vicinity.

**Maturity Phase:** Maturity. The system's technology is mature and has few potential future development opportunities.

**Business Value:** Moderate. Installing lighting occupancy controls costs upwards of £10,000 but has a payback of typically 2 years. It is preferential to the installation of energy efficient lighting products, producing faster paybacks and savings of up to 50% of a firm's lighting

spend.

**Sustainability Rating:** 3. Lighting is a major energy consumer within real estate and commercial sectors (circa 20%), so occupancy control can generate substantial energy savings.

**Investment Advice:** The installation of a separate lighting occupancy control system should be considered for building retrofits. Within new builds, installation should be integrated with a BMS to maximise savings.

**Example Suppliers:** Apollo Lighting, Chalmor, Danlers, E.On, Ex-Or, Philips, Procom Controls, Schneider Electric, Sparks, Toolbase Services.

## PHASE 6: RECYCLING

### 6.1 Monitoring and Targeting (M&T)

**Definition:** A service which includes the following steps: monitoring energy consumption, analysing data (establishing baselines and benchmarking), and targeting a new consumption profile. When this is outsourced it is included within energy bureau services.

**Maturity Phase:** Recycling. This service is now outdated and has been overtaken by automated monitoring targeting. The sophistication of monitoring and targeting has progressed in recent years with the increasing installation of sub meters and half hourly meters.

**Business Value:** Moderate. Monitoring and targeting doesn't have a direct ROI but is important for the establishment of potential energy savings. The service is time consuming and needs to be efficiently run for the best results.

**Sustainability Rating:** 4. M&T is a key step in the formation of an energy efficiency programme. It identifies where major energy savings can be made and monitor on the effectiveness of schemes implemented. Subsequent investment is required to achieve these savings.

**Investment Advice:** Firms looking to track their energy consumption should install an automated monitoring and targeting service for optimum savings.

**Example Suppliers:** AEA, BIU, Broadfern, Ecofys, Environ, Enviros, Evolve Energy, Hurley Palmer Flatt, Inenco, McKinnon Clarke, Nifes, Power Efficiency.

## METHODOLOGY OVERVIEW

### Six Market Phases Segment Solution Maturity

The Total Portfolio methodology tracks a solution from its inception through to replacement, recycling and retirement. The six maturity phases are defined as follows:

- **Innovation.** Innovations that are still being worked on in the labs or by product development teams. Strong role for academic institutions and in-house R&D. Few innovations make it through to the slope of development phase.
- **Development.** Prototypes presented at trade fairs, tested with a small number of visionary customers or implementations. Not yet commercially available but the solutions are in the open and on the radar .
- **Launch.** Solutions launched and suppliers attempt to demonstrate tangible business value. Over time the relative success of each solution becomes apparent leading to a split in product lifecycles and proven business value. The business ecosystem partly determines solution success — not simply its capabilities.
- **Growth.** Following the split of success, a product or service typically continues along a product lifecycle of either high value, medium value or low value. High and medium value product lifecycles generate sufficient benefits for the ecosystem to grow rapidly. Low value products or those lacking a business ecosystem decline quickly.
- **Maturity.** The product or service has been widely adopted and has a significant customer base with recurring revenues. The supply-side has consolidated and an entire ecosystem and value chain supports the continued purchase and use of the product or service.
- **Recycling.** In this phase, the product or service moves into the final phase of the lifecycle as customers switch to more innovative substitutes, they no longer have a need for the solution and decommission or recycle.

### Three Solution Lifecycles Differentiate Business Value

The Total Portfolio analysis differentiates between three different solution lifecycles. While this oversimplifies the reality of product and service evolution it is crucial to assess the likely survival and future business value of new or existing solutions. The solution lifecycles are:

- **Short-lived success followed by failure.**
- **Proven success and moderate business value.**
- **Rapid success and high business value.**

### Solution Adoption And Success Influence Positioning

Verdantix analysts position solutions on the Total Portfolio graphic based on evidence

provided by suppliers and the expert opinion of the Verdantix team. Positioning decisions may also include data and insights provided by end users and independent industry experts. Questions that must be answered to determine positioning include:

- **Is the solution commercially available?**
- **How many customer references can suppliers provide?**
- **What is the scale of leading suppliers?**
- **What evidence is there of growing customer demand?**
- **How many years have elapsed since the solution was launched?**
- **What evidence demonstrates a positive ROI?**

## **Sustainability Ratings Cut Through The Greenwash**

The potential to sell more products and services by highlighting sustainability benefits has driven many vendors to exaggerate the sustainability credentials of their solutions. Total Portfolio assessments use standardised rules to establish the proven sustainability benefits of each solution. The scores are based on the following questions:

- **Was the solution originally designed to deliver sustainability benefits?**
- **Does the solution automatically result in sustainability benefits?**
- **Does the solution collect or analyse data critical to a sustainability programme?**
- **What are the negative sustainability impacts created by the solution?**
- **What is the quality of customer evidence supporting sustainability claims?**
- **What is the scale of the sustainability benefits that the solution delivers?**

## **Investment Decisions: How To Use Total Portfolio Analysis**

The Total Portfolio methodology helps P&L owners and change leaders to review new solutions in the context of the existing assets they currently own and operate. This “total portfolio” approach enables decision-makers to combine financial information specific to their own operations with analysis of the capital costs and operating costs of new solutions. Verdantix clients use the methodology to:

- **Develop a shared understanding of the solutions landscape.**
- **Align investment decisions with risk appetite.**
- **Simultaneously compare installed and new solutions.**

## **Portfolio Management: How To Use Total Portfolio Analysis**

The market transition created by climate change, resource scarcity and energy insecurity requires product managers and portfolio managers to plan for product substitution and launch innovative solutions. Solution owners in all industries can use the Verdantix Total Portfolio methodology to:

- **Assess the sustainability threat to mature products and services.**
- **Understand the ecosystem for new solutions.**
- **Identify opportunities for sustainable innovations.**

## Sustainability And Climate Change Business Research

Verdantix is the leading provider of business research and strategic analysis to help firms change profitably with the climate. Clients access our research through individual reports, annual subscriptions and multi-client engagements.

### Your Business Challenge

We live in an age of inevitability and uncertainty. It is inevitable that climate change will affect your business in the future. But do you know when climate change will have a material impact on profitability? And do you know which climate change factors - regulations, customer perceptions, weather risk, energy costs and competitive actions - will affect your business? Our research helps climate change leaders incorporate, professional services firms and carbon markets to manage the tension between inevitability and uncertainty.

### Our Knowledge Service

Verdantix conducts ground-breaking research on the climate change market to help you change with the climate. Our solution combines high quality business research with continuous client needs assessment to deliver a uniquely powerful knowledge service. We help you to successfully manage the tension between inevitability and uncertainty by delivering evidence-based research designed to meet your specific knowledge requirements.

*"Equity analysts divide into three groups based on their climate change perspective: believers (30%), skeptics (28%) and cynics (30%). This should influence how CEOs communicate their climate change strategy."*

*- Verdantix Survey: How Equity Analysts Link Company Valuation and Climate Change (June 2008)*

### How You Benefit

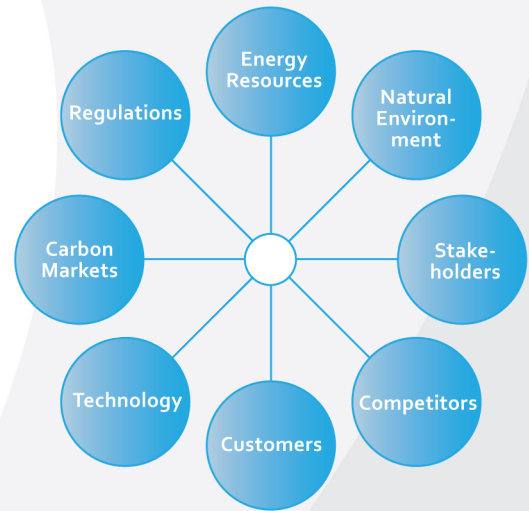
Our knowledge services help you to:

- Plan effectively for regulations.
- Keep pace with competitive actions.
- Make connections with new customers.
- Inform senior executives with evidence.
- Develop climate change propositions.
- Quickly shortlist suppliers.
- Spot hidden business opportunities.
- Validate your thinking and proposals.
- Speed up business case assessments.
- Track new customer trends.

*Help you change with the climate*  
*Save you time by leveraging best practices*  
*Save you money by offering cost effective advice*  
*Offer independent thought leadership*

## Research Plus

The Verdantix research agenda is defined collaboratively with our subscription clients. We call this collaborative approach Research Plus. This element of our service ensures we align our research activities with client needs. Through experience we know that clients find it hard to articulate what they don't know today. It's also a challenge for clients to explain what they will need to know tomorrow. Our Knowledge Needs Tool stimulates thinking, identifies knowledge gaps and prioritizes research projects. The tool is based on Verdantix research into the drivers behind climate change and sustainability risks and opportunities.



## Why Choose Verdantix

**Unique.** Verdantix offers a unique knowledge service for individuals in charge of climate change or sustainability strategy, innovation, projects, products and services.

**Cost effective.** Our subscription research model shares costs across multiple firms resulting in a much lower price point than consulting.

**Connected.** We have privileged access to thousands of decision-makers in companies, service providers, academia, governments and financial markets.

**Quality.** Our research is based on robust methodologies such as the Green Quadrant and Smart Vendors developed by experienced research professionals.

**Commercial.** The Verdantix knowledge service focuses on providing commercial insights to help P&L owners deliver financial results and win support in budget negotiations.

## For More Information

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