Best Practice Energy, Cost & Carbon Reduction

A Practical Guide to the Implementation of the Most Cost Effective Energy and Cost Reduction Technologies

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Agenda

- Introduction
- Policy & Regulatory Business Drivers
- Systematic Approach To Energy, Cost & Carbon Reduction
- Building the Solution – Top Ten
- Financing Energy & Carbon Projects
- Summary
The Siemens “Environmental” Portfolio: > £20 Billion!

Siemens Environmental Portfolio

- In fiscal 2008/9, products and solutions in our environmental portfolio saved about 210 million tons of CO₂ for our customers.

- …which exceeds the total CO₂ emitted by New York, London, Paris and Hong Kong.

- …and is more than 40 times greater than our own annual emissions.

Siemens’ Industry Sector makes the largest contribution to the overall Environmental Portfolio.
### Policy & Regulatory Business Drivers

#### Global, EU & UK Policy
- Kyoto Protocol and targets on greenhouse gas reduction
- IPCC reports
- Stern report on the financial implications of climate change
- UK government targets – 80% CO$_2$e reduction by 2050
- UK energy policy
- Climate Change Act
- Low carbon strategy:
  - Transport
  - Manufacturing

#### EU Regulation & Standards
- Eco Design directive (“EuP” & “ERP”)
- Energy performance of buildings directive
- Landfill directive
- Waste Incineration directive (WID)
- Measuring instruments directive (MID)
- Environmental permitting – EPR/IPPC
- European emissions trading scheme (EU ETS)
- International standards:–.
  - EN 16001
  - EN 15232
  - Pr EN 15900

#### UK Specific Measures
- Climate change levy (CCL)
- Renewable obligations & ROCs
- Climate change agreements (CCAs)
- Feed In Tariffs (FITs)
- Building regulations – “Part L2”
- Carbon reduction commitment (CRC EES)
- Enhanced capital allowances (ECAs)
- Landfill tax
Pressure On Company Expenses

"Energy costs represent an average of 12% of total cost for UK business" - RWE NPower Business Energy Index
Systematic Approach To Energy, Cost & Carbon Reduction

The effective implementation of a systematic energy efficiency and cost reduction programme can multiply savings by a factor of 4 compared to ‘ad hoc’ improvement measures

Key features
- A comprehensive and complete programme
- Industry specific expert consulting resources applied
- Propositions include innovative financial solutions

Environmental value
- Typical utility reductions are 20 – 30% of the complete site consumption based on improvement measures that provide a payback within 3 years
- Reduction carbon emissions
- Reduced liquid and gaseous emissions

Customer value
- Delivers maximum energy & carbon reductions
- Simplifies regulatory compliance
- Enhances brand equity
- Facilitates accreditation to international standards such as EN16001

The effective implementation of a systematic energy efficiency and cost reduction programme can multiply savings by a factor of 4 compared to ‘ad hoc’ improvement measures.
The Energy & Carbon Reduction Journey

Source: Camco Global

- **Zero carbon infrastructure**
  - New ways of delivering services
  - Redefined objectives

- **Organisational realignment**
  - Policy change & process review

- **Renewable Technologies**
  - Biomass boilers, Wind
  - Solar thermal, GSHP, etc

- **Better design & asset management**
  - Low CO₂ new build
  - Property rationalisation
  - Procurement changes

- **Invest to Save**
  - Insulation, heat recovery
  - Lighting and controls
  - Combined heat and power (CHP)
  - Plant / fleet replacement

- **Good Housekeeping**
  - Monitoring and Targeting
  - Behaviour change and training
  - Regular inspection & Audit

- **Radical approach**
  - Lifetime cost
  - Commercial & social partnerships
  - Managing new risks

- **Innovative approach**
  - Higher cost
  - New skills
  - Longer term

- **Methodical approach**
  - Lower cost
  - Existing skills
  - Shorter term
Energy Saving Measures as Building Evolves

- Combined Heat & Power
- Heat-Pump
- Photovoltaics
- Cooling with Ground Water
- Geothermal Energy
- Solar Cooling
- Thermal Solar Energy
- Reduced Air-Flow
- Free Cooling
- Efficient Drives
- Energy Monitoring
- High Efficient Facade
- Intelligent Lighting Controls
- Optimized Planning Process
- Controlled Forced Ventilation
- Exhaust Heat Exchanger
- Low-Loss Transformer
- BUS Technology
- Solar Control Systems
- Pre-Warming of External Air
- Efficient Office Equipment

Pre-Warming of External Air Reduced Air-Flow

Efficient Drives Energy Monitoring
e1     BG-Bild eingefügt
esc, 12/02/2009
### Combined Heat & Power

**#01**

Combined Heat and Power [CHP] is the simultaneous generation of usable heat and power [electricity] in a single process.

Heat output typically used in steam and LTHW applications, with units commercially available from 4 KW, with smaller 1KW domestic units also available

- Only a good option if you can utilise the all / majority of heat generated
- Reduces both cost and CO2 emissions if sized correctly
Building the Solution – Top Ten

Efficient Heating & Cooling Technologies 2-5 Years

#01 The use of efficient heating and cooling technologies can help reduce the overall energy use of the building.

- Condensing boiler (95% eff) vs. Conventional Boiler (80% eff)
- Variable Speed Chiller (COP = 6) vs. Standard Chiller (COP = 4)
Building the Solution – Top Ten

Building Controls [BEMS]

#01
Savings of up to 30% can be achieved through the installation of an effective BEMS.

The three basic functions of a BEMS are:

- **Controlling** – Improve control of building services
- **Monitoring** – Energy usage
- **Optimising** – Plant operation

However, improperly configured systems can lead to an increase in energy so it is important that the system is used correctly.
Building the Solution – Top Ten

Supply Voltage Optimisation  1-4 Years

#01  Optimising your supply voltage from the UK average of 240V to 225/220v can generate up to 15% saving on electricity consumption;

- Benefits also included harmonic filtering & voltage transient protection.
- Reduced benefits on high efficiency equipment such as VSD and HF lighting
- Lower benefits can also be achieved for low / no cost through
  - tapping down transformers
  - replacing old transformers
Building the Solution – Top Ten

Increase Automations Levels 1-4 Years

#01 Increase Automations Levels 1-4 Years

Significant savings can be achieved through increasing the level of automation in the production plant. (existing automation required)

Examples include:

- Increased Production Rates
- Improve Operational Efficiency (kWh per widget)
- Improved Performance & Maintenance

#02 #03 #04 #05 #06 #07 #08 #09 #10
Building the Solution – Top Ten

### Power Controls Solutions

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**Switch it On – Switch of Off**

- **Generate**
  - e.g. Standby Generators, CHP
- **Schedule**
  - Auto-Domestic
- **Shed**
  - e.g. delay/stop production
Building the Solution – Top Ten

High Efficiency Electric Motors

#01
The energy cost to run a motor can be greater than the initial capital cost to purchase the motor in 2 weeks and over 20 years period energy cost > 500 x capital cost.

All new motors supplied after 16th June 2011 need to conform to IEC2 HEM’s

Siemens motors up to 7.8% more efficient than CEMAP min standards for IE1

Simple payback for new motors < 18 months (retrofit)
Variable Speed Drives [VSD’s] can be used in all variable volume applications to reduce the speed of the motor against measured demand parameters and therefore reduce energy consumption. With energy recovery and process optimised closed loop speed control savings of up to 50% are achievable. Examples include:

- Supply & Extract Fans
- Chillers and Air Compressors
- Pumps
The use of efficient lighting, fittings and controls can reduce the power consumed by lighting systems by up to 50%.

- Efficient lamp technologies can provide significant savings.
- Occupancy and day light linking controls can also provide significant savings.
- Developments in LED technologies are providing efficient light sources.
- In commercial buildings lighting accounts for 30% of total energy usage. In Industry, lighting forms a significant percentage of the base load and therefore good to target.
Building the Solution – Top Ten

**aM&T - Metering**

1-3 Months

- Critical part of any energy management programme, enables sites to continuously improve performance through
  - Quantify the Energy Management Business Case
  - Monitoring & Reduce Energy Abuses
  - Benchmark Metrics
  - Budget Forecasting
  - CRC Reporting
## Building the Solution – Top Ten

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<tr>
<th>#</th>
<th>Technology</th>
<th>Duration</th>
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<td>aM&amp;T - Metering</td>
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<td>#02</td>
<td>Lighting &amp; Lighting Controls</td>
<td>1-12 Months</td>
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<td>Variable Speed Drives [VSD’s]</td>
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<td>High Efficiency Electric Motors</td>
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<td>Efficient Heating &amp; Cooling Technologies</td>
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<td>Combined Heat &amp; Power</td>
<td>3-7 Years</td>
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Metering Strategy – “Profile” Metering aM&T

**Daily (4 Point analysis)**
- Base load – permanent load drivers
- Peak usage – Efficiency of current plant
- Shoulders – Identification of load matching to usage

**Weekly / Monthly / Annually (periodic anomalies)**
- Bank holiday loads
- Weekend usage

If you can’t measure it – you can’t manage it
Building the Solution

Intelligent energy management, innovative energy saving functions and effective processes reduce energy costs.

Cost Reductions achieved through a systematic approach are typically 4 times greater than compared to ‘ad hoc’ stand alone measures. The process involves a combination of on site audits, data analysis and strategic recommendations forming the basis of a long term continuous improvement programme. You can achieve significant energy savings while at the same time benefit from a pleasant room climate, optimum comfort and maximising your contribution to ‘carbon’ reduction targets.
## Competitor versus Technology

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<tr>
<th>Building market</th>
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<th>Distribution</th>
<th>Lighting</th>
<th>Security</th>
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<th>Building Automation</th>
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Reduced Energy Consumption

Before

100%

Energy Costs

Heating

Cooling

Lighting

30% Energy Saving

After

100%

Energy Costs
Financing Energy & Carbon Projects

- Grants (e.g. RDA, others?)
- Carbon Trust Loans Scheme
- Salix
- Private finance
- SFS......
Example Proposition: Built Environment

- Energy cost reduction: £149k (40%) per year
- Carbon emissions reduction: 618 tonnes (38%)
- Total project costs £327k with an overall average “payback” of 2.2 years
- Financing:
  - Monthly financing costs = £11k
  - Reduction in utility costs = £12k
  - Net opex contribution = £1k / month
  - After 3 years, client enjoys full benefits
- Compliance with regulations (e.g. Part L2)
- Reduction of CRC implications for 2011 onwards
Summary

- We aim to deliver a Systematic Approach to Energy Efficiency
- Facilitate “Holistic” and “Best Practice” solutions
- We are the world’s largest provider of technology and solutions for building, factory and process automation
- The Siemens “energy efficiency and environmental care” portfolio provided over £20 billion sales in 2009