Making Permanent Savings through Active Energy Efficiency

by Jean-Jacques Marchais

Executive summary

Installing low-consumption lighting is an example of passive energy efficiency. Such an initiative mitigates energy loss, but generates only modest savings. Active energy management practices, on the other hand, offer a systematic structure that can generate savings of up to 30%. This paper examines approaches for active energy efficiency within both new and existing commercial, industrial, public, and residential buildings.

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Schneider Electric

Summary

Executive Summary

This white paper argues strongly that meeting greenhouse gas emissions targets set within the Kyoto Protocol will fail unless Active Energy Efficiency becomes compulsory.

Active Energy Efficiency is defined as effecting permanent change through measurement, monitoring, and control of energy usage. Passive Energy Efficiency is regarded as the installation of countermeasures against thermal losses, the use of low consumption equipment, and so forth.

It is vital, but insufficient, to make use of energy-saving equipment and devices such as low-energy lighting. Without proper control, these measures often merely militate against energy losses rather than make a real reduction in energy consumed and in the way it is used.

Everything that consumes power – from direct electricity consumption through lighting, heating, and, most significantly, electric motors, but also in HVAC control, boiler control, and so forth – must be addressed actively if sustained gains are to be made. This includes changing the culture and mindsets of groups of individuals, resulting in behavioural shifts at work and at home, but clearly this need is reduced by greater use of technical controls.

Making permanent savings through Active Energy Efficiency

Introduction

That energy efficiency is high on the agenda of most people is now clear. However, understanding of what energy efficiency really involves and how energy saving initiatives can be implemented remains fragmented.

For this reason some companies, such as Schneider Electric™, have defined two approaches to energy efficiency: Passive Energy Efficiency and, more significantly, Active Energy Efficiency.

For many, energy measures revolve around the consideration of thermal issues in the building fabric with remedies such as insulation, glazing, and heat loss countermeasures. For others, it is lighting, albeit often constrained to merely installing low consumption systems. Those with significant heating requirements may see efficient boiler systems as the answer.

All of the above are laudable and necessary, but they are really only passive countermeasures that largely mitigate energy loss rather than the energy deployed.

Active Energy Efficiency can be achieved when energy-saving devices are not only installed, but controlled to use only the energy required. It is this aspect of control that is critical to achieving the maximum efficiency. To illustrate, consider an energy-efficient lamp that is left turned on in an empty room. All that is achieved is that less energy is wasted than would have been using an ordinary lamp!

It is the management of energy use through measurement, monitoring, and control that effects permanent change. Moreover, compared with the costs (and technical skills necessary to avoid risks) of installing thermal solutions, energy control can be implemented at a relatively modest price and with a very rapid payback. This is especially true when measured against escalating energy prices – most energy control solutions can be amortized within a few years.

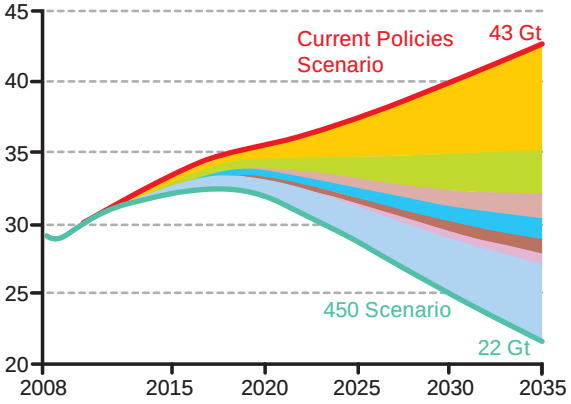
Another very important factor that should drive Active Energy Efficiency from this point forward is the need to meet ambitious carbon reduction targets set by those governments in alliance with the Kyoto Protocol. In the built environment, for example, it is a fact that unless existing buildings (as well as all new buildings) are made energy efficient, it will simply be impossible to reach the targets set for 2020.

Reducing greenhouse gas emissions was a global target set at the Kyoto Earth Summit in 1997 that was finally ratified by 169 countries in December 2006.

Under the Kyoto Protocol, industrialized countries have agreed to reduce their collective emissions of greenhouse gases by 5,2 per cent by 2012 compared to the year 1990. (Compared to the emissions levels expected by 2012 prior to the Protocol, this limitation represents a 29 per cent cut.) The target in Europe is an 8 per cent reduction overall with a target for CO_2 emissions to fall by 20 per cent by 2020.

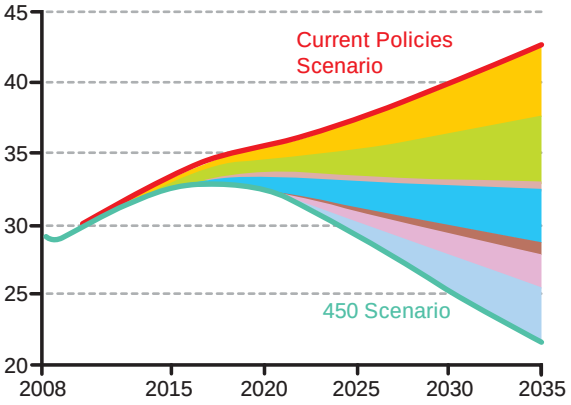
This white paper looks at the approaches to Active Energy Efficiency that can be applied within new and existing buildings – in commerce, industry, private, public, and residential – as well as in manufacturing, industry, and the transportation infrastructure.

World energy-related CO_2 emission savings by region in the 450 Scenerio



	Abatement	
	2020	2035
China	27%	35%
United States	11%	14%
India	8%	8%
European Union	13%	8%
Middle East	5%	5%
Russia	2%	4%
Rest of world	34%	26%
Total (Gt CO_2)	3.5	20.9

World energy-related CO_2 emission savings by policy measure in the 450 Scenerio



	Abatement		
	2020	2030	2035
Efficiency	71%	49%	48%
End-use (direct)	34%	24%	24%
End-use (indirect)	33%	23%	23%
Power plants	3%	2%	1%
Renewables	18%	21%	21%
Biofuels	1%	3%	3%
Nuclear	7%	9%	8%
CCS	2%	17%	19%
Total (Gt CO_2)	3.5	15.1	20.9

Source: IEA – World Energy Outlook 2010

European Union Emission Reduction Targets

Kyoto commitment

- Reduction of GHG emissions by **5%** over the period 2008 - 2012*

March 2007 Spring Council Commitment

- Reduce at least **20%** of GHG emissions before end of 2020*

- Reduce at least **80%** of EU emissions before end of 2050*

Target of 80% to 95% reduction of EU CO_2 emissions is part of the 2050 Low Carbon Roadmap

* base = 1990 level

The Current Situation

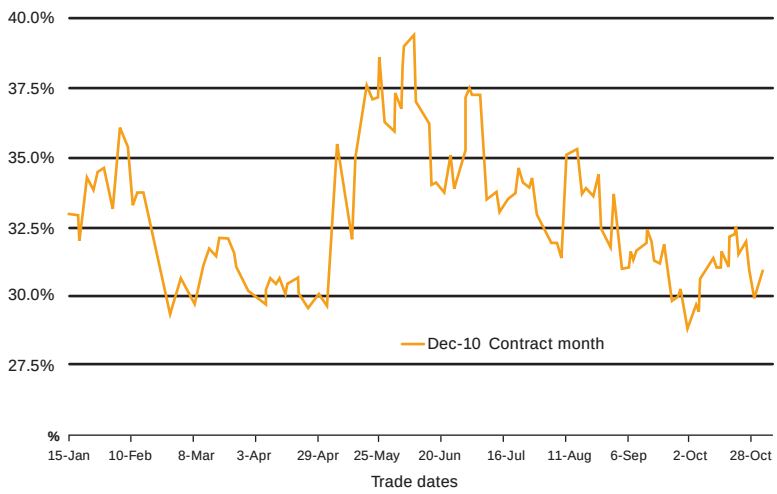
Energy is consumed in a broad variety of ways across all sectors of life, from the provision of vital resources such as water, oil, and gas, to the lighting and heating in homes and the power required by industry and commerce. Much of that energy is consumed usefully, but huge amounts are wasted every day. It is the waste or inefficient use of energy that must be addressed.

This white paper explores every aspect of the use of electricity and its impact on the environment. With greenhouse gas emissions in sharp focus around the world, the time has come for everyone to take action to economize on energy use by the intelligent application of technology to bring about Active Energy Efficiency.

At a European level, the Energy Performance in Buildings Directive (EPBD) has been recasted. This requires all buildings — including in the residential sector — to have energy ratings, similar to those seen on consumer white goods today, and to display these ratings in the building's public areas or, in the case of residential buildings, within the documentation about the property. Some EU governments have stated that they expect an average 25% reduction in energy consumption from the introduction of this bill.

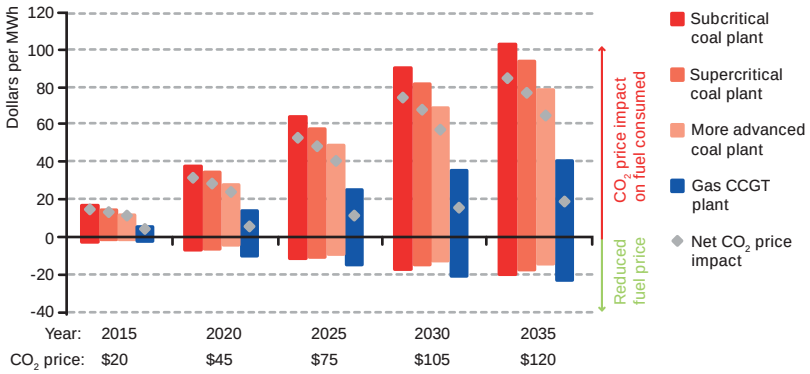
As far-reaching as the legislation is, perhaps the biggest impact on businesses is the steep rise in the cost of energy. This poses a big problem for businesses as their profit margins are squeezed and they are faced with the dilemma of whether to take the cut on their bottom line or to pass the cost increase through to the prices of their products and services, and therefore risk being uncompetitive.

World Trade Index (WIT) implied volatility evolution



Sources : US. EIA. CME Group

Additional price impact of the cost increase to the electricity producer in selected OECD+ countries resulting from the CO_2 price in the 450 Scenario.



Source = IEA - World Energy Outlook 2010

Economies are readily possible in electricity generation and distribution, in its use, and in the way electricity can be used wisely to make efficiencies in the use of other energy.

The technology is available to maximize the effectiveness of electricity – including its application in controlling other energy usage – and the way in which it is distributed.

The technology is there to control buildings' energy use in lighting, HVAC, building controls, and distribution. Lighting alone can account for 40 per cent of a typical commercial enterprise's electricity consumption. In offices, the explosion of information technology has also brought huge increases in electrical consumption, as has the preference for air conditioning systems. The prolific growth of data centres and new industries has also contributed to a dramatic rise in electrical power usage.

In industry there are proven systems to reduce the power consumed by electric motor systems and to better control the application of electrical power throughout a plant. Two thirds of electrical energy used by industry is used powering motors. In most countries less than 10 per cent of those motors have any kind of control and therefore cannot be slowed down or switched off automatically. Automation and the increasing use of electrical power, as well as inefficient hydraulic and pneumatic systems, have also grown in industrialized regions.

In the home, new products enable lighting and heating controls that enhance living standards while saving electricity. In most countries, every single domestic dwelling (including individual apartments) contributes about 6.5 tonnes of CO_2 each year — or, to put it another way, enough gas to fill six hot-air balloons! Yet, just switching off lights in unoccupied rooms could save 2.2 tonnes per household. Computers, multiple televisions sets, modern electrical appliances, air conditioning, and even outside lighting and powered equipment have seen an exponential growth in consumption. Indeed, in many western economies, domestic electricity consumption outstrips even industrial use.

In short, there is no reason not to be able to actively save electricity and other energy, provided there is the understanding of what is at stake, and a desire to do something about it.

World energy demand is projected to rise by 36 per cent by 2035 according to the World Energy Outlook 2010 – with the steepest increase coming from emerging economies, where the use of new electrical equipment is growing and where much of the populations of certain regions currently without electricity supplies will subsequently get them.

It would be hard for most people to imagine a life without electricity, but that does not mean consumption cannot be controlled to deliver Active Energy Efficiency. Indeed, without firm resolve to apply Active Energy Efficiency measures, governments will be compelled to act legislatively in order to stand any chance of meeting Kyoto objectives and targets.

Taking Action on Energy

Everyone can take positive action to conserve energy or use it more wisely. The technology is in place, is relatively inexpensive in most cases to install, and provides rapid payback.

On the premise that it is impossible to manage what cannot be measured, for large energy users – i.e. those other than residential – the Active Energy Efficiency process should start with an assessment of how and where energy is used, and how much of it is consumed.

Fundamental questions that every organization must ask:

- *Is your organization equipped for energy efficiency?*
- *Changes in legislation and regulations are forcing building occupiers to get ready for carbon management. Is your staff trained?*
- *Can your financial teams find their way through any grants and incentives offered?*
- *How would you evaluate your success?*
- *Can you demonstrate this to your customers?*
- *How much of your energy usage (including electricity, gas, water, oil and steam) can you account for?*
- *Who uses your energy? Applying effective monitoring and targeting measures to energy consumption increases the success of energy efficiency. However, without the buy-in of the people who are using energy in an organization, savings will be unsustainable.*
- *Do you monitor awareness levels and attitudes towards Active Energy Efficiency in your company?*

Further assessment needed:

- *Do you know your requirements? In order to determine where to start, you need to know where you are now. However, taking advice can be a risk, unless the advice is backed with experience and knowledge. Begin with a study of your facilities built around your objectives.*
- *Do the recommendations show you your route to energy efficiency?*
- *Do you understand the next steps?*
- *Who delivers on energy efficiency? You are in the driver's seat, and with the right investments come savings. A poor implementation of an energy efficiency scheme could significantly reduce the potential for savings.*
- *Do you have the resources to manage the procurement and installation of equipment and ensure you stay on track?*

Expert audits of energy consumption, together with recommendations, are a good starting point. There are also some remarkably accurate, inexpensive, and easily installed consumption meters and controls now available that allow wasteful consumption to be better identified and managed.

ISO 50001

In 2011, ISO will publish its new ISO 50001 standard on Energy Management. This ISO 50001 standard will help establish management systems and processes to improve energy performance, in particular energy efficiency. It will define all requirements for an efficient Energy Management system: how to develop and implement an energy policy, how to set objectives, targets and action plans.

Schneider Electric is committed to reducing energy consumption for its customers by offering a wide range of Active Energy Efficiency products and services including advice, implementation strategies, monitoring and control solutions, and compliant products, all backed by excellent service to help maintain the savings.

Energy audits

Specialist energy consultants can measure and analyse energy consumption across a site or business and identify areas where energy savings can be made.

Remote monitoring of energy consumption

Energy managers or outside experts can remotely monitor energy consumption via wired or wireless links to the electrical installations. Based on data collected, these experts make recommendations that can be applied in real time.

Variable-speed drives (VSDs)

Because so much energy is consumed through electric motors (about two-thirds of energy used by industry is consumed this way), variable-speed drives offer more efficient management of energy-intensive applications such as ventilation, pumping, and compressed air installations. These products can be integrated into a new plant or used to upgrade existing equipment.

Technical solutions

Technical solutions for optimizing electrical installations can include an extensive range of products, equipment, intelligent controllers, and control devices, but these are relatively inexpensive and can reduce the energy consumption of a commercial or industrial facility by typically 20 per cent.

Lighting solutions

Lighting control solutions that enable optimization of lighting systems in terms of both function (comfort and safety) and energy usage are available. Lighting makes up about half of the energy consumed in commercial buildings.

Power quality

Two areas frequently overlooked are those of harmonics and power factor. These invisible characteristics of an electrical system can influence consumption, costs, and even life expectancy of equipment. There is European legislation relating to harmonics and electromagnetic interference, but even without such legislative concerns, it is beholden on businesses to ensure they do not pollute the electricity supply infrastructure with reflected harmonics – in the UK these are measured all the way to the 50th harmonic!

Of even greater direct impact is power factor. Consumers with poor power factor waste electricity and incur additional costs – often without knowing it. Yet power factor correction equipment is easy to specify and install. A further consideration is that because capacitors lie at the heart of power factor correction equipment, as these devices deteriorate towards their natural half-life, upgrades may be required to maintain the highest possible power factor. Maintenance can therefore also be a key to maximizing savings.

This white paper will now examine some specific sectors in which Active Energy Efficiency measures can be applied.

Active Energy Efficiency in the Built Environment

Active Energy Efficiency in new public and commercial buildings

It is difficult to understand these days why so many buildings are ultimately energy inefficient. There is the possibility for Active Energy Efficiency to be considered at so many points in the design, development, construction, and eventual occupancy of a building. However, the differing vested interests of those involved in a building's design and ultimate use, far from motivating energy management, can sometimes impede it.

For instance, architects may consider energy conservation in terms of the materials and insulation regimes they adopt – that is, Passive Energy Efficiency. It is rare for energy management controls to be considered at the design stage, since this tends to remain within the remit of the building services engineering.

Construction companies are not always concerned with energy issues – their prime focus is in meeting budgets, cutting construction costs, and avoiding punitive penalty clauses. Only if strictly instructed do they readily embrace building systems or energy management during the construction phase.

Building services engineers are the most likely to consider building controls. However, even here there is a stronger imperative to add perceived value in terms of comfort and access control, mood lighting, and sophisticated IT arrangements than in energy control.

Where commercial property is concerned, even the end users sometimes care little for energy conservation or measurement. Often resident on short-term leases, the perception is that although it is they, the occupiers, that foot the energy bill, they are powerless, or too late, to do much about it.

In short, getting proper and effective Active Energy Efficiency controls onto the agenda is made easier when it is integrated with other compelling BMS offers. The same argument can bring about savings in the installation phases by enabling shared use of structured cabling, combined data and power cable pulls, and orchestrated accessory fixes (power control, data outlets, HVAC control, access control, and lighting controls on common networks).

Legislative drivers

Many consider the imposition of the Climate Change Levy to have had far less effect on energy conservation than anticipated. While there has been an increase in the specification of the likes of energy-efficient motor controls in heating and ventilation systems, for example, there is little evidence of wide-scale retrofitting. But, the need to embrace energy management is becoming impelled by new legislative measures.

It is fair to state that for most, it is less the quest to save the planet than to reduce costs that focuses attention. Utility price is the most obvious and volatile driver for energy efficiency, but increasingly environmental legislation and the business benefit of company reputation, of ‘being a good corporate citizen’, has real value.

The Energy Performance of Buildings Directive (EPBD) will also force many organizations to regularly evaluate and publicly display their energy performance, giving further visibility, impetus, and business value to their energy credentials.

Using energy-efficient equipment (Passive Energy Efficiency) is vital but not the whole story. To be effective, sites have to be monitored, managed, and controlled to achieve consistent performance and prevent deterioration — it is just as important to focus on procurement, operation, management, and maintenance as it is to implement physical plant changes. Moreover, cost and carbon savings are often achieved quickly and at low or moderate cost.

EE Dedicated Directives

Energy Performance in Buildings	Dec 02 EPB 2002/91
Energy Labelling of Domestic Appliances	July 03 ELDA 2003/66
Emission Trading Scheme	Oct 03 ETS 2003/87
Combined Heat & Power	Feb 04 CHP 2004/8
Energy-Using Products	July 05 Eco Design 2005/32
End Use of Energy & Energy Services	April 06 EUE & ES 2006/32
Renewable Energy Sources	April 09 Renewables 2009/28
Energy Trading Scheme	April 09 Recast ETS 2009/29
Carbon Capture & Storage	April 09 CCS 2009/31
Energy-Using Products	Recast EUP Labeling
Energy Performance in Buildings	May 10 Recast EPBD 2010/31

Communication

- June 05 EE green book
- Oct 06 Action Plan for EE
- Jan 07 Energy Package
- Nov 08 2nd Strategic Energy Review
- Nov 10 Energy Strategy 2020
- Nov 10 Energy Infrastructure Package

The European Commission imposes a dynamic framework through dedicated energy efficiency directives and ongoing communication

Active Energy Efficiency in existing public and commercial buildings

Focus is beginning to shift to how much energy a building consumes in the operational phase. Inefficient management of buildings during this phase can needlessly waste valuable energy. Intelligent energy metering provides a vital insight into the building's consumption and can help identify areas where potential savings can be made. In addition, evidence shows that operating costs typically amount to three times the capital cost of the building; and maintenance costs can be twice the building costs. Investing in systems that help reduce energy consumption naturally also reduce operational costs.

Traditionally, maintenance roles have always been reactive, but with intelligent building control systems in place, maintenance becomes intuitive and can be planned and scheduled. The advantage of this is that maintenance can be planned and budgeted, rather than considered only when the need arises. Such practice often results in maintenance works being delayed or even ignored. In addition, it is now possible for a single system to monitor gas, electricity, water, air, and steam.

Apart from simplifying the roles of maintenance staff, intelligent energy management is inexpensive. In fact, experience shows that installing the technology to meter and monitor energy consumption could have an average payback period of less than six months. A small increase in capital expenditure can reduce operational expenditure significantly. Studies of metering solutions show an average of 5 per cent reductions in utility bills in a diverse range of buildings. But the financial rewards do not stop here. Savings in the region of 2-5 per cent can be achieved by better equipment utilization, and as much as 10 per cent savings potential can be reached by improving systems' reliability.

Retrofit need not inconvenience

Accurate metering is the first requirement in energy efficiency measures.

There is technology and equipment that can be very conveniently installed if commissioned at the right time in a building's construction or refurbishment. Specific to energy management, many building and facilities managers have opted for more accurate utility metering in an effort to identify usage and control costs. In most cases, the best that can be identified is peak times of day, or a metaphorical stick with which to threaten regional energy companies when negotiating tariffs. In practicality, it is better to know exactly where what is consuming electricity, and when. Power metering can do this.

Accurate metering is the first requirement in energy efficiency measures

Active Energy Efficiency Solutions for Medium and Large Commercial Markets

Buildings

Renovation can yield energy savings of up to 30%

HVAC control
Lighting control
Building management systems
Power factor correction

Consume 20% of total energy

- 3 key areas: HVAC, lighting, and integrated building solutions
- Account for 20% of total energy consumption
- Motors consume over 35% of electricity

- **Enabling products**
  - > Dimmers, timers, movement and presence detectors, switches
  - > Thermostat, floor heating control
  - > Variable-speed drives for HVAC, pumps, fans, and motors
  - > Power compensation and filtering products
- **Management systems**
  - > Building management systems
  - > Power monitoring and analysis
- **Added value services**
  - > Site audits
  - > Data collection and analysis
  - > Financial analysis and ROI validation
  - > Planning of improvement plan
  - > Remote monitoring and optimization

Many people worry that the installation of such technology during retrofit is expensive and will cause too much disruption to the building's occupants. In reality, the equipment and systems can be fitted cost-effectively and without causing problems, in both new and retrofit installations. In both situations, an existing Ethernet network can be used and usually there is sufficient in-house IT knowledge to maintain it. Wireless and Ethernet technologies enable 'plug-and-play' and convergence to allow centralized control. Indeed, all Schneider Electric buildings in the UK have had this technology successfully installed during retrofit.

In retrofit installations, there is the additional benefit that it is easy to benchmark energy savings. When a building has been operational for a period of time without this technology, the effects and advantages of intelligent energy management are immediately obvious.

The human angle

There is also a human side to the Active Energy Efficiency arguments. The greatest assets in the majority of buildings are the occupants. Comfort and safety are not negotiable. Typically, a building may have a change of use many times in its lifespan. The ease with which these changes can be made is a further significant cost consideration and can impact the energy management issue.

The bottom line is that for minimal investment, intelligent control and Active Energy Efficiency can be delivered without penalty. The net result is an attractive building that benefits the occupiers in terms of comfort, convenience, function, and costs, but also offers long-term savings in energy bills.

Solutions for Residential and Small Commercial Markets

Residential

Energy Efficiency products may save 10 to 40% in electricity

Lighting control
Heating monitoring
Shutter control

20 to 25% of the consumed energy (EU & US)

- Heating is 30% of energy usage
- Lighting & appliances are more than 40%

- Enabling products
  - > Lighting products: dimmers, timers, movement and presence detectors, specific switches, light-sensitive switches
  - > Power compensation and filtering products: thermostat, floor heating control
- **Management systems**
  - > Shutter control systems
  - > Lighting control systems
  - > Home control systems

Active Energy Efficiency in residential buildings

Residential buildings are rarely, if ever, appropriate for precise metering and measurement. However, there are still steps that can be taken towards adopting Active Energy Efficiency practices.

Again, in the residential sector, emphasis has been on installing Passive Energy Efficiency measures. Cavity wall insulation, loft space insulation, double-glazing, and draught exclusion are all common in both new and existing properties.

Moves, such as the intention to see the discarding of tungsten filament lamps in favour of low-energy luminaires in retail stores, will further bolster essential Passive Energy Efficiency initiatives.

It is reasonable to suggest that the biggest influence on domestic residential energy consumption will come from changing the public's habits, but that is a very long process. The instinct to turn off equipment that is on stand-by (the LEDs in equipment such as TVs, DVD players, hi-fi, home PCs, etc., consume huge amounts of electricity collectively) will take time to instil. In the meantime, there are technological aids that can effect big savings. One possibility is to install inexpensive lighting controls. These range from the most sophisticated home automation to simple room occupancy sensors. Families with teenage children know that it's not uncommon to have almost every light in the home switched on even when just a single room is occupied!

In multiple occupancy dwellings such as apartment buildings, there is scope for Active Energy Efficiency to be applied in communal areas with occupancy controls for lighting, heating, and ventilation. With a growth in mixed-occupancy building where apartments, for example, are constructed above commercial premises, the benefits of metering can also be applied. Again, judicious lighting and heating controls also contribute.

Solutions for Industry and Infrastructure Markets

Industry & Infrastructure

Average facility can reduce consumption by 10 to 20%

Electric motor systems
Power metering
Energy management systems
Automation solutions

- A 25% savings would save 5% of the world's electricity consumption
- The largest motors account for over 60% of electricity usage

- **Enabling products**
  - > Variable-speed drives for motors
  - > PLC for production through-put optimization and machine 'mute' mode management
- **Management systems**
  - > Power monitoring and analysis
  - > Process supervisory systems
- **Added value services**
  - > Site audits
  - > Data collection and analysis
  - > Financial analysis and ROI validation
  - > Planning of improvement plan
  - > Remote monitoring and optimization

Active Energy Efficiency in industry

Energy consumption in industry varies enormously according to what the business makes or does. Clearly, there are many highly energy-intensive industries such as glass works, smelters, and anyone using heating processes. However, on the assumption that the energy used in manufacturing processes is essential usage, there remain many areas where substantial and significant savings can be made – whatever the industry.

For the purposes of this white paper we have separated process-related applications from the building or plant's infrastructure.

The building and its plant infrastructure

The infrastructure considerations of an industrial plant are in many ways similar to those of any building. Unnecessary lighting, heating, and ventilation must be avoided, but so too must additional facilities such as air or fume extraction (provided it is safe to do so). The provision of compressed air is often continuous even when there is no demand. Conveyors are frequently left running when there are no goods or products on them. Oils and coolants are circulated irrespective of need and so on. There are countless areas of potential waste that go undetected and unaddressed. Just as in other commercial buildings, intelligent metering can help pinpoint many of these areas.

A further factor that can have a significant effect in industry is poor power factor. Power factor relates to the electricity used in simply energizing the internal coils of a piece of equipment. Commonly, many types of equipment in manufacturing plants can adversely affect the power factor – including computers, variable-speed drives, and even fluorescent lighting ballasts. Yet, the charges for this 'useless' or wasted energy can be hard to identify. The remedy is very simple, and power factor correction equipment (pictured opposite) that uses capacitors to store power is readily available.

The processes and their technical requirements

Two thirds of all the electricity consumed by industry goes into powering electric motors. This statement is true for just about every industrialized nation in the world. It is also true that in most countries no more than 10 per cent of these motors are controlled.

In processes, understanding where energy can be saved can be more technical. Many fluid power applications (hydraulics, pneumatics, and other air movement) can present opportunities for savings.

For example, many processes still use mechanical vanes and vents to route air to atmosphere when it is not required. An easily installed VSD can be used to control turning the fan on or off. Moreover, such fan arrangements frequently use configurations (such as centrifugal fans) that can be slowed down without significant loss of performance. Consider that a 22 kW fan that is reduced in speed from 50 Hz to 47 Hz could save double its price and installation costs in the first year!

Because the nature of Active Energy Efficiency in process applications is essentially a technical one, there are inherent problems with the

implementation. What is fundamentally needed within industry is for the responsibility for energy consumption to be passed from the building management function to the plant management one. Most production facility managers are preoccupied with producing greater volumes at lower prices, rather than addressing 'overhead' costs such as energy.

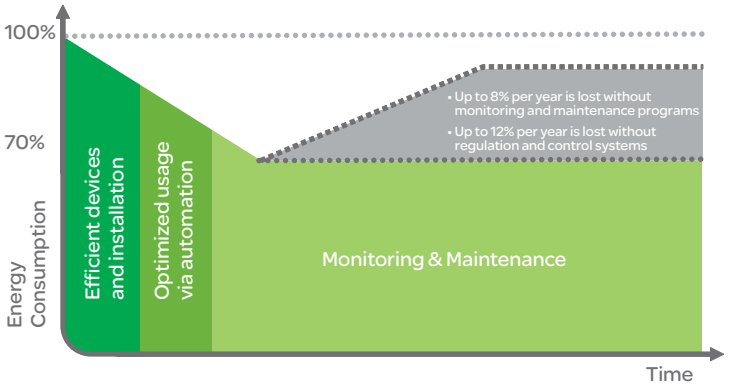
Variable-speed drives for AC motors are easily installed and now simple to operate – saving substantial amounts of energy

Conclusion

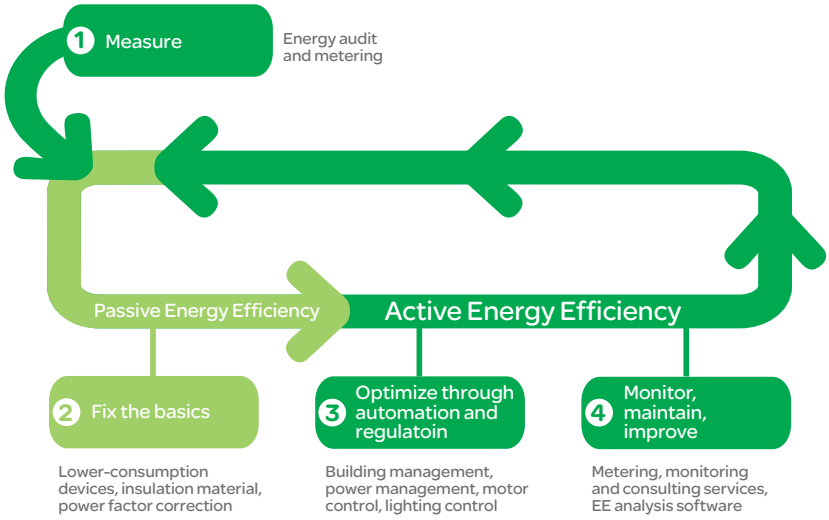
Active Energy Efficiency in a nutshell:

- Start with measurement (you don't change what you don't know, you don't know what you don't measure)
- Use the 'necessary only' energy and only when 'necessary' thanks to automation and control
- Make permanent improvements to processes, maintaining consistent performance through monitoring and maintenance services
- Remember, many measures are easy to install, with a low implementation cost and a quick payback — specifically when retrofitting an existing building or installation
- Active Energy Efficiency can be implemented in all sectors (residential building, commercial building, industry, infrastructure)
- Active Energy Efficiency is vital in addition to Passive Energy Efficiency measures in order to reach the CO_2 emissions reduction targets

Robust automation, control, and monitoring of energy usage can deliver up to 30% energy savings



Our approach to active energy efficiency



Passive + **Active EE** Solutions = Sustained Energy Savings

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