



Large **Industry Energy Network**
Annual Report 2003

Contents

Section 1: **Large Industry Energy Network**

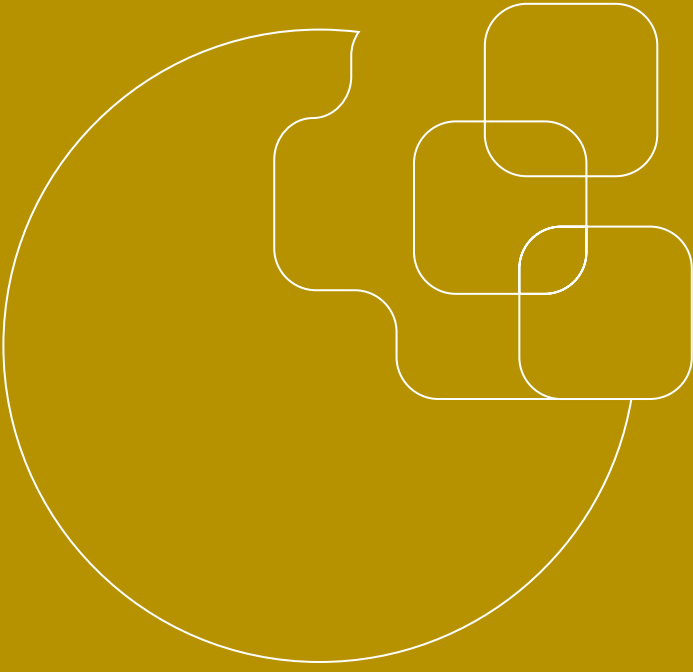
page 02	1.1	Introduction from Andrew Parish
03	1.2	Message from Mr. Noel Dempsey, TD
04	1.3	The Large Industry Energy Network
06	1.4	Networking and Events
12	1.5	Awards and Recognition

Section 2: **Company Profiles**

14	2.1	Aughinish Alumina
15	2.2	Bausch & Lomb Ireland
16	2.3	Braun Oral-B Ireland Ltd
17	2.4	Glanbia Plc, Ballyragget
18	2.5	IBM International Holdings
19	2.6	LEO Pharma
20	2.7	Pfizer Ireland Pharmaceuticals, Loughbeg API
21	2.8	Smurfit Paper Mills Ltd
22	2.9	Tyco Healthcare, Mulhuddart
23	2.10	Wyeth Medica Ireland Ltd

Section 3: **Results and Analysis**

26	3.1	Results and Targets 1995–2003
30	3.2	Analysis of Results for 2003
33	3.3	Members' Graphs & Statements
61	3.4	The LIEN Objectives and Contact Details
63	3.5	Member Listing
64	3.6	About Sustainable Energy Ireland



1

page	02	1.1 Introduction from Andrew Parish
	03	1.2 Message from Mr. Noel Dempsey, TD
	04	1.3 The Large Industry Energy Network
	06	1.4 Networking and Events
	12	1.5 Awards and Recognition

1.1 Introduction from Andrew Parish

Unit Leader – Industry Networks, Sustainable Energy Ireland

This year we launch the seventh annual report of the Large Industry Energy Network against a background of significant energy price rises and a changing energy market. The members of the LIEN, while well positioned to implement strategies to mitigate against some of the impact of the price rises, still face considerable challenges in managing budgets and controlling costs.

The EU Emissions Trading Scheme which comes into operation in 2005 directly affects half of the LIEN membership and will require them to account and budget for their carbon dioxide emissions for the first time. Emissions trading will indirectly affect the remaining firms in the Network through further increased electricity prices, as generators pass on the costs of their permits. Clearly, then, the drivers that encouraged firms to join and participate in the LIEN originally are stronger than ever. The challenge for the Network is to ensure continued relevance in this volatile environment.

Also, in response to the Government's decision not to introduce a carbon tax and instead to intensify action on the non-tax measures of the National Climate Change Strategy, SEI plans to develop new sustainable energy initiatives for industry, including more structured voluntary agreement programmes.

This, of necessity, will require a fundamental review of the LIEN - to assess its usefulness and impact, and to ensure maximum complementarity with any new initiative. The involvement of the members of the Network in this review will be important and valued, but it is certain that strategic energy management will have a central role in any programme. To this end, SEI is already proceeding with the development

of an Irish Energy Management Standard, which will provide a valuable systematic approach to the management of energy.

The value of a strategic approach to managing energy is once again evidenced by the savings achieved by the members of the LIEN, as presented in this report. The mutual support and learning through the networking activities of the LIEN continues to be beneficial to members, particularly in this time of volatility and change. And the LIEN members' commitment to energy management represents an important example to the rest of the business sector.

SEI remains committed to working in this collaborative manner with large energy users. We look forward to the development of further activities to assist firms in moving towards best international practice in all aspects of energy management over the coming year.



Andrew Parish

Unit Leader – Industry Networks, Sustainable Energy Ireland



1.2 Message from Mr. Noel Dempsey, TD

Minister for Communications, Marine and Natural Resources

The challenges facing us today in relation to energy are considerable. High energy prices present difficulties for all sectors of the economy, and for the industrial sector volatility in energy costs are a challenge in maintaining competitiveness. At the same time, there is an urgent need to minimise energy related carbon dioxide (CO₂) emissions in order to meet our international obligations under the Kyoto agreement, and this is an issue for all businesses and all sectors of the economy.

With the above as context, the need for close attention to the management of all aspects of energy use has never been greater. I am fully aware of the need for high quality professional energy management throughout industry, and of the central role to be played by energy management in the coming years. For this reason, I support the role played by the Large Industry Energy Network, and in particular its emphasis on improving the quality of energy management throughout large energy users in the industrial and tertiary sectors.

The achievements of the LIEN members in living up to their commitments to the scheme are very evident throughout this report. It is clear to me that the member companies are devoting considerable resources to the management of energy and emissions, and the results are very encouraging. The results summarised in this report indicate that the members have together achieved a reduction of 43,400 tonnes of carbon dioxide in 2003 as a direct result of their efforts to improve energy efficiency throughout their operations. This could not have been achieved without close attention to energy management and a commitment to invest in efficient energy technologies.

It is important to ensure that all businesses address the objective of greater energy efficiency within their operations, and for that reason I fully support Sustainable Energy Ireland's initiative to pursue a partnership approach with the industrial and tertiary sectors to managing energy-related costs and emissions. Given the experience of the LIEN members, it is logical to pursue this through the further development of energy management policies and practices. The LIEN member companies are important role models to the rest of industry, and I am anxious to see this important group participating fully in the proposed energy agreements being developed by SEI with the business sector.

As in previous years, I congratulate the members of the LIEN on their achievements. I am also happy to confirm my own commitment to Sustainable Energy Ireland's ongoing work in supporting and further developing the network.



Noel Dempsey TD

Minister for Communications, Marine and Natural Resources



1.3 The Large Industry Energy Network

The Large Industry Energy Network is a voluntary networking initiative of companies who are committed to reducing their energy intensity on an individual basis, and who recognise the benefits that can flow from collaborating with like-minded organisations on innovations and best practices in energy management.

The structured approach to energy auditing and management, and an annual statement of energy accounts, which is a condition of Network membership, is a valuable tool for successful energy management. The Network is an efficient mechanism for energy professionals to access and assess valuable information on new energy technologies and improved energy management practices, with a view to applying them to their own plant. Member companies have a common focus on exploring and implementing cost-effective energy-efficient practices and the best way of learning is in shared experience of this kind.

Benefits of the LIEN are in two categories – those contributing to national energy policy objectives and those benefiting the individual enterprise. The LIEN, in common with other Sustainable Energy Ireland programmes, addresses the three principal energy policy objectives. The first of these is to ensure security of supply, which a number of LIEN members contribute to through embedded generation projects. The second is to ensure environmentally sustainable energy production and consumption, which is demonstrated through the numerous energy-management initiatives of members resulting in a progressive reduction in their energy intensity and related emissions. Thirdly, this reduction in energy intensity leads to improved competitiveness on an individual basis by reducing energy operating costs and the risk of exposure to energy price fluctuations, which in turn contributes to the competitiveness of Irish industry as a whole. So, along with contributing to national policy objectives, members themselves derive the benefit of increased competitiveness. Additionally, the resultant emissions reduction helps members to meet legislative regulations such as IPC licensing, while preparing for future mandatory requirements. Actively seeking to minimise environmental impact is also a positive platform for public relations. As the importance of how we use energy changes,

it is essential that the way we record and report energy use develops accordingly. The proposed introduction of an EU-wide greenhouse gas emissions-trading scheme by 2005 places a greater



importance of recording and monitoring energy usage and reporting accurate energy-usage figures. For this reason, all energy use recorded by LIEN members is reported as primary energy use. This means that all energy use for 2003 and all previous years is converted back to the primary energy source (e.g. coal, gas, oil, renewables) used to generate it. As such, it creates a more comprehensive picture of energy usage.



New member

2003 marked the first year of Bulmers' involvement in the LIEN. Indeed, the company is the newest signatory to the Network programme.

Industrial sectoral representation within the LIEN (2003)

During 2003, membership in the Food/Drink sector increased from 23 to 24. Membership in the Electronics sector has decreased from 7 to 6; in the Print/Paper sector from 3 to 2; and in the Textiles sector from 2 to 1. Representation across the sectors is indicative of the relative importance of these sectors to the Irish economy.



Industrial sectoral representation within the LIEN

Pharm/Chemicals	24
Food/Drink	24
Metal/Engineering	6
Non-metallic Minerals	4
Healthcare	4
Electronics	6
Print/Paper	2
Oil/Gas	2
Textiles	1
Mining	2
Plastics	1
Air Transport	1
Wood/Timber	1
TOTAL	78

Membership losses

During 2003, three companies left the Network. Unfortunately these were due to scheduled site closures or resizing of these sites. The three companies are:

- 3Com Technologies
- Buckeye Technologies Ireland Ltd
- Unifi Textured Yarns Europe Ltd

1.4 Networking and Events

Against a background where the industrial sector is facing ever-increasing energy costs, coupled with demands to minimise energy-related emissions in order to meet Ireland's international obligations, the need for close attention to the management of all aspects of energy use has never been greater.

Promoting energy efficiency technologies and methodologies is one of Sustainable Energy Ireland's key activities. The Large Industry Energy Network (LIEN) plays an important role in organising information-sharing events for Network members.

Workshops

The series of workshops organised by Sustainable Energy Ireland each year provides an environment for members to learn from energy experts and other specialists, as well as from other energy managers.

Workshops are typically hosted by a member of the Network, thus enabling participants to see how other members have translated energy efficiency theory into practice; what adaptations or technological innovations were required; what problems and challenges were encountered; how these challenges were surmounted; what expenditure was incurred; what energy savings were achieved; and what environmental or financial benefits were gained.

■ In November 2003, two one-day workshops—the first on the topic of carrying out an industrial energy survey, and the second on the topic of monitoring and targeting (M&T) - were given by Enviros, a UK-based environmental consultancy firm.

The two workshops, which were held in Dublin, were attended by 15 representatives from 13 LIEN member companies.

The first workshop was led by Joe Flanagan, Consulting Group Manager with Enviros. He described how an energy survey frequently marks the first step in delivering effective energy management. This is because it provides a technical investigation of the control and flow of energy, and establishes energy costs and energy usage – with the aim of identifying cost effective energy-saving measures. He also briefed the workshop participants on the range of energy-saving technologies now available,

and how to achieve best practice with these technologies.

At the second workshop, which was led by Andrew Ibbotson, Senior Consultant with Enviros, participants were shown how monitoring and targeting (M&T) can become a key tool in energy management, helping to reduce both energy consumption and usage of utilities. M&T was highlighted as an important technique for identifying new cost-saving opportunities and tracking major emissions-reduction projects.





■ **December 2003 saw the launch of the sixth Annual Report of the Large Industry Energy Network**, an important event that recognises the joint efforts of LIEN members in reducing their energy consumption and related emissions.

At the launch, the first copy of the report was presented to the Minister for Communications, Marine and Natural Resources, Mr Dermot Ahern T.D. by David MacSweeney, Head of Engineering at Merck Sharp & Dohme.

The Minister welcomed new LIEN member, Tayto Limited, Coolock, Dublin, and he congratulated the eleven companies that had contributed the case studies featured in the 2002 report for their willingness to share best practice solutions for energy efficiency improvements, which have the potential to be replicated by other companies.

In reaffirming the government's commitment to the National Climate Change Strategy and its commitment to promoting sustainable development, he congratulated LIEN members on achieving energy savings of up to 90GWh compared to 'business-as-usual', equivalent to 23,650 tonnes of CO₂, despite the difficult economic operating conditions that applied during the years 2002/2003.

■ **In March 2004, LIEN members including 15 representatives from 12 member companies, attended a one-day workshop held in Cork, which focused on the methodology used for running a successful energy awareness campaign.**

During the sessions led by Tom Lynch and Steven Flint of Energy Services Ltd, a Cork-based energy consultancy firm, workshop participants heard presentations on the key elements of effective energy campaigns; how to identify and fine-tune the objectives of such campaigns; and how to develop messages that motivate staff to pay continual attention to energy conservation.

Towards the end of the workshop, companies which were planning to undertake an energy awareness campaign, or had already undertaken an energy awareness campaign, were invited to share their concerns/experiences with the workshop leaders and fellow workshop participants.

Refrigeration has a number of applications in industry, including cooling and freezing products, condensing vapours, and maintaining environmental



1.4 Networking and Events (continued)



conditions i.e. temperature and humidity, and cold storage. Refrigeration consumes a significant amount of electricity – particularly in the food, drink and pharmaceutical manufacturing operations.

■ **In April 2004, Merck Sharp & Dohme (Ireland) Ltd, hosted a workshop entitled Energy Efficient Refrigeration and Cooling.** The event, which was aimed at providing updates on the many opportunities available to improve plant performance, featured presentations on optimising control systems to match the refrigeration load; energy auditing for refrigeration systems; water treatment for efficient operation of refrigeration systems; and the range of factors that affect overall plant efficiency.

Workshop participants learned how the correct selection of refrigeration and cooling equipment could yield major savings. The day's programme concluded with a tour of the Merck Sharp & Dohme pharmaceutical manufacturing facility in Ballydine, near Clonmel. Here, LIEN member company participants had the opportunity to view energy-efficient refrigeration and cooling systems in operation.

■ **In May 2004, The Energy Show, a major two-day national showcase for energy-related issues in Ireland, took place at the RDS in Dublin.**

The Show's series of workshops attracted more than 100 suppliers of sustainable energy solutions and services, and created a unique environment in which participants had the opportunity to interact, share views and transact business.

The main themes of the 2004 event were the move towards a lower carbon economy; an examination of ways in which overall energy demand might be reduced effectively through energy-efficient technologies and practices; and ways of meeting a greater proportion of high energy demand from renewable, non-fossil fuel based resources.

1.4 Networking and Events



LIEN members attending the 2004 Energy Show were invited to a special briefing session entitled Investing in Energy.

The briefing session was centred on the launch of a new SEI publication designed to show Energy Managers how to put together convincing financial proposals for energy projects, and how to maximise the chances that proposals for such projects will be accepted by the company.

The briefing, which was given by Kevin Gaughan, lecturer in engineering at the Dublin Institute of Technology and previously Managing Director of a power electronics company, drew on his considerable practical experience of investing in energy technologies.

■ **In July 2004, 26 representatives from 22 LIEN member companies attended workshop held in Kilkenny, which focused on the issue of energy pricing and projected trends.**

During the workshop presentations, participants learned that while electricity and gas prices will continue to rise in the short, medium and long term, it is also becoming easier for companies to negotiate favourable energy contracts with independent suppliers. Indeed, one of the main benefits of operating in an environment where gas and electricity markets have been deregulated is that customers may benefit from improved services and cost management initiatives. However, these improved services and cost management practices may be accompanied by increased energy prices, where the increased prices reflect the 'true' cost of producing and distributing energy – costs which up to now may have been mitigated by State subsidies.

Some companies may assess their energy requirements and costs, and then opt to remain with the default supplier, ESB Public Electricity Supplier (PES) or Bord Gáis. Others may sign supply contracts with

independent suppliers or, if on-site generation produces an ongoing surplus of electricity, they may opt to take out a supply licence.

One of the workshop presenters, Peter Duffy of Enercomm, suggested that any company currently engaged in the process of considering unregulated electricity tariffs should first carry out a demand forecast. Contracts could then go to tender, requesting both one- and two-year contract proposals, in order to compare tender offers against actual energy requirements. In some cases, it may be worth seeking the advice of an independent energy consultant in order to determine which tariff provides the best savings in the long term.

As a general recommendation, Peter Duffy's view was that two-year fixed price contracts provided a better deal, unless companies wished to fix short-term costs. A two-year contract allows for planning and risk mitigation against a rise in gas prices. Finally, he stressed that when considering any proposal, it is important to ensure that there are no hidden costs, and that there is a clear understanding, on the part of the supplier that any cost increases in the second year of the contract would require CER approval.

Another Energy Pricing and Trends Workshop presenter, Rory O'Neill of the Vayu Group, warned of a common pitfall in long-term gas contracts where, under the Regulated Tariff Formula, the actual contract price was not fixed until two days before being 'locked-in'. Although not a popular option, he recommended that Energy Managers hedge their contracts, as this allows for better cost control and improved long-term planning.

In his presentation, Padraig Fleming of the Commission for Energy Regulation (CER) described the CER's role in the energy market, and outlined details of the programmes that the CER has been involved in as well as details of the major factors

1.4 Networking and Events (continued)

influencing some of the recent decisions taken by it. He also remarked that companies could use demand-side management options to reduce their costs. For example, if the CER were to introduce a tariff structure featuring three key time bands, companies could obtain considerable financial benefits by concentrating their on-site operations in off-peak periods.

problems facing their companies.

Improved knowledge of the energy sector also allows companies to control costs, and to plan for upcoming electricity and gas price increases. Among the key drivers of increases in electricity charges are:

- Massive growth in electricity demand in recent



Moreover, the ESB plans to run the Winter Peak Demand Reduction Scheme (WPDRS) again from November 2004 to March 2005. The Scheme will reward companies that are able to reduce their loads in the critical 5pm to 7pm period with rebates, thus offering greater opportunities to generate cost savings. In his presentation, Dr Michael Walsh of ESB National Grid outlined details of the format/rules of the 2004 Scheme and dealt with detailed questions from delegates in relation to the challenges and

years, which has led to a situation where demand peaks require a high level of generating capacity. Indeed, the current lack of investment in generation capacity by electricity companies could lead to shortfalls as early as 2007, according to energy expert Dr Gareth Davies of Oxera Consulting Ltd.

- Increasing fuel costs, which will continue to affect electricity prices.

1.4 Networking and Events

- The EU Emissions Trading Scheme, which could affect electricity charges, as generators may have the option of passing on the cost of emissions permits, from 2006 onwards. In this case, the value of the permits allocated to generators by government will be 'clawed back' and channelled into distribution charges.

due to factors such as their indexing to fuel oil prices. Additional negative pressures on prices will be created by the additional costs of transporting gas to the UK, and onwards to Ireland.

- As Ireland will be at the end of the gas transport link, the issue of storage will become crucial in order to guarantee security of supply. Additional



Gas market drivers are similarly affected by infrastructure and fuel cost issues. Some major cost drivers here are as follows:

- Ireland is now 80% dependent on imported natural gas, mostly from the UK. However, the UK is also experiencing resource depletion, and it is expected that by 2010 it will import approximately 40% of its gas from continental Europe. Irish prices will then reflect EU prices, which are high

shipping and storage charges may reflect the inadequate infrastructure that currently exists in the UK.

1.5 Awards and Recognition

Members of the Large Industry Energy Network (LIEN) tend to be leaders in their field, recognised for their commitment to good corporate citizenship and to best practice in energy management. Not surprisingly, these companies are strongly represented in the annual National Boiler Awards, IBEC Environmental Awards, Food and Drinks Industry Awards, and other forums.

During the past year, several members of the LIEN have received awards from government-sponsored organisations and industry bodies for their achievements in the promotion of sustainable energy use and wider environmental protection.

Food and Drinks Industry Awards

Klinge Pharma won the 2003 IBEC Managing for Sustainable Development Award, an award which they also won in 2001. In 2002, they reached the finals of the EU Environmental Management Awards (one of only six companies in Europe to have achieved this standard), and received an honourable mention from EU Commissioner, Margot Walstrom. Glanbia Plc, Ballyragget won both a Food Safety Award and an Environmental Best Practice Award at the Food and Drinks Industry Awards ceremony organised jointly by Bord Bia and IBEC. The ceremony took place at the Four Seasons Hotel Dublin in June 2003.

Health and Safety Awards

In October 2003 **Bausch & Lomb Ireland** received the National Irish Safety Organisation's (NISO) Supreme Safety Award for its consistent achievements in applying safety standards. The award was presented by Mr Frank Fahey, TD, Minister of State at the Department of Enterprise, Trade and Employment at a function held in Killarney. Bausch & Lomb also received the RoSPA Gold Medal, which was presented to George Brett, European EHS Manager, and to Amy Butler, VP Global EHS, at a ceremony held in Birmingham.

Merck Sharp and Dohme received the NISO Gold Award for continued plant safety performance while **Waterford Crystal Ltd** won the NISO South East Region Consistency in Safety Award.

ISO 14001

During 2003 both **Lisheen Mine** and **Klinge Pharma** earned accreditation to ISO 14001, the voluntary international Environmental Management System

Standard validated in this country by the National Standards Authority of Ireland.

Pfizer Ireland Pharmaceuticals, Loughbeg API was highly commended in its ISO 14001 surveillance audit, which was carried out by external auditors in February 2004. Since then, the surveillance frequency has been altered: in future, audits will be carried out at two-yearly intervals.

ISO 9001: 2000

During 2003 **Premier Periclase Ltd** earned accreditation to I.S. EN ISO 9001:2000.

PA Consulting and Sunday Times Management Award for Management Excellence

In April 2004, at a ceremony held at the National Museum Collins Barracks, Dublin, **Fruitfield Foods Ltd** was presented with the PA Consulting and Sunday Times Management Award for Management Excellence by the Taoiseach, Mr Bertie Ahern, TD.

IBEC Environmental Awards

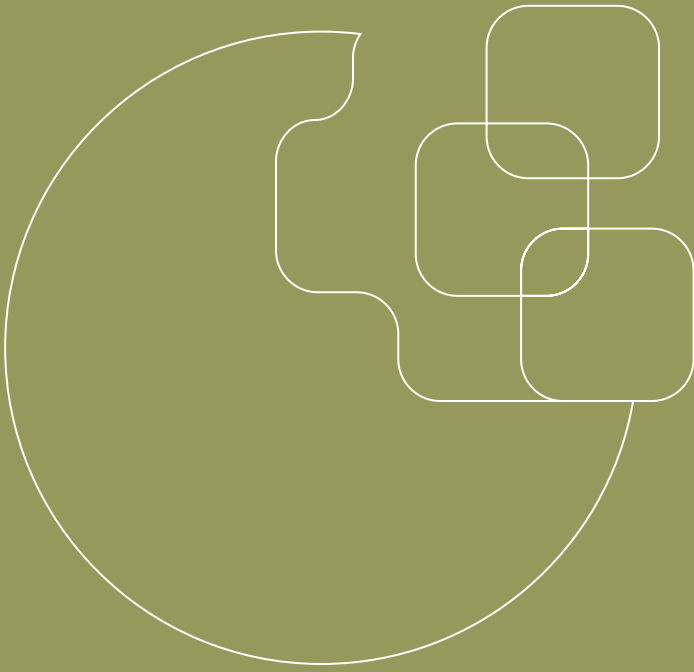
The IBEC Environmental Awards were established to give recognition to the successes and achievements made by Irish industry in both maintaining and improving environmental quality standards in Ireland. **Merck Sharp & Dohme** received the prestigious Judges' Commendation in the IBEC Environmental Excellence category at the annual IBEC Environmental Awards, which were held in Dublin in November 2003.

Also at this event, **Thermo King Europe** won the IBEC Environmental Award for Sustainable Development.

Schering-Plough (Avondale) Co was short-listed in the 2004 IBEC Cleaner Technologies Award for an on-site waste minimisation project.

Q Mark

In 2004, **Pure Fresh Dairies Ltd** was awarded the Q Mark by Excellence Ireland Quality Association.



2

page	14	2.1	Aughinish Alumina
	15	2.2	Bausch & Lomb Ireland
	16	2.3	Braun Oral-B Ireland Ltd
	17	2.4	Glanbia Plc, Ballyragget
	18	2.5	IBM International Holdings
	19	2.5	LEO Pharma
	20	2.7	Pfizer Ireland Pharmaceuticals, Loughbeg API
	21	2.8	Smurfit Paper Mills Ltd
	22	2.9	Tyco Healthcare, Mulhuddart
	23	2.10	Wyeth Medica Ireland Ltd



2.1 Aughinish Alumina

Aughinish Alumina (AAL) is Europe's largest alumina refinery, producing more than 1.5 million tonnes of alumina annually by treating bauxite ore, which is then exported to smelters for processing into aluminium.

The plant, located on the 1,000 acre island of Aughinish in Co Limerick, is one of Ireland's largest users of both electricity and fuel oil – only the Electricity Supply Board consumes more fuel oil. Natural gas will be used from late 2005, when the new gas-powered 150 MW CHP plant comes on stream. (The contract for constructing the CHP plant was signed in December 2003). Approximately 110 MW of the electricity generated there will be supplied to the national grid.

The boilerhouse and the calcination plant account for all on-site fuel oil consumption. The boilers use fuel oil to generate steam (most of which is used in the digestion process), whilst the calcination plant uses it to convert hydrate ($\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) to alumina (Al_2O_3).

Up to 30% of the electricity consumed on the site is used by the high-pressure digestion pumping system, and by motors in the three ball mills where approximately three million tonnes of bauxite are crushed each year. Other significant consumers are the large number of fans and pumps throughout the site.

In 2003, following its participation in SEI's Negotiated Energy Agreements Pilot Programme, the company committed to implementing the Danish Energy Management Standard DS 2403. An audit will be carried out in October 2004, which, if successful, will make AAL the first company outside Denmark to achieve this certification.

AAL expends huge resources on energy monitoring throughout its operations. An elaborate PI system provides 'real time' data on virtually every aspect of plant activity, and a network of several hundred meters continuously records power usage on individual items of equipment, and fuel oil usage in each processing area. An automated system calculates energy-to-output ratios, instantly accessible on more than 250 computers throughout the plant, and enabling prompt corrective action where necessary.

A team of process engineers meets each morning to review energy usage in the previous 24 hours. The company's internal Energy Consultant, Brendan Thorne, meets regularly with the process engineering team, and presents a written energy report to the Management Team every three months.

Raising staff awareness is also a high priority. Brendan has developed a comprehensive information pack on energy conservation, and an Energy Awareness Training Course, attendance at which is compulsory for all employees.

Given AAL's extremely high energy bill, even small gains in energy efficiency have a significant impact on operating costs. For this reason, the Management Team has embarked on a major project aimed at improving production by 15%. The new system, known as 'sweetening', utilises excess energy within the digestion process. When completed in 2005, Aughinish Alumina will be one of just a handful of companies in the world using this novel 'sweetening' technology.



2.2

Bausch & Lomb Ireland

With an output of 150 million units per year, Bausch & Lomb Waterford is one of the largest contact lens manufacturers in the world.

Most of the thermal and electrical energy consumed across the 30-acre site, and within a 275,000 sq. ft. buildings complex, is produced by a 3MW CHP plant, which generates 25 million kWh of the total of 30 million kWh of electricity used annually. 50.7 kWh of natural gas is used annually to run the CHP plant; this accounts for the bulk of the company's annual €2.5 million energy spend.

The CHP operation is one of the most energy- and cost-efficient in Ireland, with 100% of the unit's steam and 90% of the hot water being used in process operations. The CHP plant saves Bausch & Lomb around €450,000 per year.

Cooling loads and compressed air generation account for 50% of the on-site energy usage; process activities account for 30%, with 10% each for lighting and nitrogen generation.

Bausch & Lomb Ireland has a written energy policy, with a stated objective of 4% savings, year on year. Energy management at the 275,000 sq ft plant is overseen by a five-person Energy Team, representing different interests. The team, which is led by Facilities Engineering Manager Billy Matthews, regularly reviews energy targets and projects, four of which are normally under way at any time. In addition to these day-to-day measures, the company ensures that a comprehensive site-wide energy audit is carried out by a firm of energy consultants every three years.

The plant's energy monitoring system is fed by a network of four electricity and steam meters (one for each unit in four different areas, across five self-contained buildings). Significantly, in its first year of operation, the system reduced

the company's overall energy bill by 4%, from the steam trap programme alone. The plant's five areas are treated as Energy Accounting Centres, and are billed individually for electricity, gas, steam and nitrogen usage.

A major project implemented during 2003 involved the installation of variable-speed drives (VSDs) on eight air handling units. A previous experiment had shown that a reduction in hourly air changes from 20 per hour to 15 would meet the healthcare plant's stringent hygiene and air quality standards. Now all remaining 17 units will be fitted with VSDs.

Another recent project was the refurbishment of the Building Management System, involving new software and hardware systems delivering stricter control. In 2003 alone, this yielded a 5% overall energy reduction, €100,000 in savings and a payback on the project of only one and a half years.

As an ISO 14001 approved site, environmental conservation is a top priority.

The Waterford plant has a comprehensive waste management programme: during 2003 alone, for example, 70% of all waste was recycled. The site also has a nitrogen generation plant, another manifestation of the company's commitment. Incidentally, it saves the company in excess of €250,000 each year.

One of the energy projects planned for 2004 is the upgrading of some of the older chilled water systems. This initiative will result in major efficiency improvements in package chiller utilisation.



2.3 Braun Oral-B Ireland Ltd

Braun Oral-B Ireland is the Irish subsidiary of Braun GmbH Germany, whose parent, The Gillette Company, is headquartered in the USA. The Irish plant, which has 600 employees, manufactures lens filter caps for ear thermometers, cartridges for shaver service units, replacement toothbrush heads for power toothbrushes, and gas-powered hair stylers on a 30-acre site outside Carlow town.

Typically, annual energy consumption throughout the 20,000 square metre plant totals about 15 million kWh, of which electricity usage accounts for 12 million kWh/year and natural gas usage accounts for 3 million kWh/year.

Approximately 70% of all energy consumed is used for powering production process equipment. Of the balance, compressed air accounts for 10%; chilled water 15%; heating and ventilation 5%.

As an ISO 14001 approved site, and in line with corporate environmental policy, Braun Oral-B Ireland continually demonstrates energy savings through audits on initiatives implemented to date, including the installation of a Building Management System and an Energy Focus system (the latter interprets data from gas, air and electricity meters, and it also tracks energy costs for discrete production-related activities). In addition, boiler efficiencies are measured during servicing operations; electricity capacitor banks and transformers are checked regularly to ensure that they are operating at optimum levels; and at all times the 15 million kWh of electricity needed to meet the plant's annual operating requirements is sourced from the most cost-effective energy suppliers.

Responsibility for on-site energy management falls to a four-person team led by John Egan, Quality and Plant

Services Function Head, and Eamonn Bates, Facilities and Safety Manager.

As well as driving energy efficiency programmes, John Egan, Eamonn Bates and their fellow energy management team members, Pat Considine, Health Environmental and Safety Engineer and Tom Nolan, Facilities Team Leader, work closely with the company's procurement team when decisions on new equipment purchases are being made, to ensure that the most energy-efficient options are chosen.

Each December, the senior management team and the energy management team meet to agree energy-reduction targets for the following twelve months. Typically, targets are of the order of 1% energy-reduction per year: the plant has consistently met its targets each year since 1999.

Among the energy-efficiency initiatives that have contributed to this success was the reconfiguration of the compressed air supply. This involved the installation of a variable-speed compressor, which delivers a 10-15% saving on the cost of compressed air. In addition, variable-speed drives have been fitted on all major pumps and motors, on the chilled water network, and on the heating system. Finally, high-frequency lighting has been installed in all areas of the plant undergoing refurbishment. This technology is 10% more efficient than conventional lighting. In one 2,500 sq metre area of the plant alone, the new lighting generated savings of €5,000 in a single twelve-month period.

During 2004, the company plans to carry out a compressed air survey, and it also plans to carry out a study on compressors – to see if it is possible to improve control in general and sequencing in particular.



2.4

Glanbia Plc, Ballyragget

The Glanbia Plc plant in Ballyragget, Co.Kilkenny is one of Europe's largest producers of dairy products, including butter, cheese, casein powders, whey protein concentrate powders, lactose, and skimmed milk powder.

Natural gas accounts for the most significant portion of the company's annual €8 million energy bill. It fuels the CHP plant, which has two gas turbines, each with a 5MW electrical output. All but 3 million of the site's total electrical demand of 63 million kWh/year are provided by the CHP unit, and its thermal output is fully used on site.

The evaporation and drying accounts for 65-70% of all energy consumed, refrigeration accounts for 14% of electricity usage, and other ancillary services account for the remainder.

Energy is Glanbia's biggest item of expenditure apart from raw material and labour costs; so usage is monitored very closely. It impacts on all procurement decisions: only the most energy-efficient motors and equipment are purchased. Energy considerations are also a prime driver of the company's preventive maintenance policy.

During September/October each year, energy-saving projects for the following year are identified – usually based on site energy audits. Budgets for electricity, steam and gas consumption are allocated to individual production areas, taking account of historical usage, planned production output, and planned energy projects.

Energy targets are set for each production area. Daily usage of electricity, steam, gas, water and effluent generation is recorded on a network of 120 meters. Results are measured

against production output; findings are reviewed at the Energy Team's weekly meetings; and recommendations are delivered to the company's production and management teams.

The most significant energy-efficiency investments in recent years have been in three areas – installation and subsequent expansion of the CHP plant, refrigeration projects, and the installation of variable speed drives. Refrigeration systems have been upgraded extensively, and almost 200 variable-speed drives have been installed, mainly on pumps and fans. The company has invested heavily in membrane technologies, which are used to remove water from milk and whey products. This eliminates the necessity for evaporation, which requires substantial heat inputs.

In addition to actively participating in SEI's Energy Awareness Week, Glanbia invests significant resources in raising awareness of the need for resource conservation by regularly publishing information leaflets relating to specific on-site energy issues. These help to encourage the active participation of all staff in energy conservation.

Glanbia is a member of the Emissions Trading Scheme. Environmental Manager John Finlay says that Glanbia faces a tough challenge because prior energy-saving actions (including the CHP plant, which reduces emissions by up to 30,000 tonnes/year) are not reflected in its current carbon allocation: if Glanbia were to expand its operations at Ballyragget in the future, then this carbon allocation issue would become a source of some considerable concern.



2.5 IBM International Holdings

Energy conservation policy, as set by the IBM International Holdings' Corporate Environmental Affairs Department in the US, drives day-to-day operations at the company's 100-acre site in Dublin. The main aims of this policy are to ensure responsible use of energy throughout the business; to conserve energy; to improve energy efficiency and to give preference to renewable energy sources where feasible.

In line with IBM's corporate target of improving energy efficiency by 4% each year, the Dublin plant's Energy Team follow an energy master plan. The team, which is led by Joseph Graham and Claire Penny, details targets for normal production-related activity as well as targets for all new energy-conservation projects.

IBM's energy conservation policy is also applied at the implementation stage of any new expansion/construction project: the best available technology must be used and the most energy-efficient equipment procured.

Testing activities and cooling requirements in the two divisions located in IBM's Mulhuddart plant, account for the most significant portion of the 35 million kWh of electricity consumed each year. Natural gas consumption, which totals approximately 25 million kWh annually, is mainly used for space heating and cooling across the plant.

Site facilities management has been outsourced to Johnson Controls, whose energy co-ordinator works with an internal IBM Energy Team, which meets fortnightly.

In addition to formalised energy-saving projects, the company uses various media formats to promote practical energy-saving initiatives among the 3,000 staff on the site.

Electronic formats used include Target Vision, a 'roaming' TV monitor, and Link Me, an on-line newsletter. Print formats used include posters and information stickers for doors and computer monitors.

IBM's 'War on Waste' campaign, which is aimed at encouraging staff to save electricity by switching off lights, computer monitors, printers and mobile phone chargers when not in use, has proved hugely successful and has resulted in staff implementing these energy-saving initiatives both at home and at work. In the plant, key energy-consuming equipment is targeted for 'switch off' measures, and this has led to significant savings.

In 2003, savings of 269,900 kWh were achieved as a result of installing a new automatic drying system that monitors humidity and regenerates only when required. A further 765,000 kWh/year savings were achieved by increasing the temperature in the microelectronic manufacturing area by 1-2 degrees in order to achieve optimum humidity control.

Among the more ambitious renewable energy initiatives currently under consideration are the installation of a geothermal system to heat/cool offices on the site and the installation of wind turbines to generate electricity. The former has the potential to cut on-site heating bills by up to 70%.



2.6 LEO Pharma

LEO Pharma's 24,257 sq metre plant in Crumlin, Dublin, produces human and animal healthcare products for world markets. These include ointments, creams and gels for the treatment of skin diseases such as eczema, psoriasis and conjunctivitis; a range of penicillin products in tablet, cream and injectable forms; and diuretic active pharmaceutical ingredients (APIs), which are used in the treatment of kidney disease and congestive heart failure.

Natural gas and electricity are the primary fuels used on site. In 2003, on-site gas consumption totalled 18.5 MWh. The main uses are in maintaining critical cleanroom temperatures, the production of pure steam, and the production of different grades of hot water. In the same period, 14.1 MWh electricity were consumed which is used throughout the manufacturing process and in general utilities, with cleanroom HVAC being one of the main users.

LEO Pharma is currently investigating the feasibility of using back-up electricity generation for critical cleanroom HVAC systems. The feasibility of investing in CHP is also being investigated: this is LEO's second CHP feasibility study in a five-year period.

LEO Pharma has a comprehensive written energy policy, and this shapes many of the company's activities, where energy conservation and management are co-ordinated jointly by the Engineering Services Manager Lorcan O'Toole and by the Process/Utilities Support Engineer Diarmaid Murrinan.

Each year, one site-wide energy audit and two technology-specific audits are carried out in the Dublin plant: in 2003, for example, the technology audits focused on compressed air and steam distribution respectively.

Other manifestations of LEO Pharma's energy policy include a stipulation that best available/most energy-efficient technology be specified in all tenders for new equipment; a PEMAC system ensures that preventive maintenance schedules are strictly adhered to; the plant has a Building Management System including M&T; 72 meters record electricity, gas, steam, compressed air, nitrogen and water usage throughout the plant; PIR detectors are installed in many areas of the site; and 'reminder' stickers aimed at raising staff awareness of energy conservation issues are made available to all employees for computer monitors and light switches.

Novel energy conservation projects include the use of membrane technology to generate nitrogen on site, an initiative that is now yielding savings of €75,000 annually.

Major energy-saving projects implemented in the past three years include the overhaul of two ageing boilers and of the steam distribution system, which involved the repair/replacement of faulty steam traps. A new control system on the main boiler yielded gas savings of about 5% per year, while an economiser on the main boiler delivers annual savings of €35,000.

The next major energy project involves a plan to duct waste heat from the air compressor into the air intake of the boiler – the principle being that the higher the air intake temperature to the boiler, the greater the efficiency levels that may be achieved.



2.7

Pfizer Ireland Pharmaceuticals, Loughbeg API

Pfizer Ireland Pharmaceuticals, Loughbeg API, is a division of Pfizer Global Manufacturing. One of six Pfizer sites in Ireland, it employs approximately 400 people at its 24,000 m² plant near Cork city, where it produces a wide range of finished pharmaceuticals and pharmaceutical intermediates.

Natural gas and electricity are the primary fuels used on the site. Gas is consumed mainly in the generation of steam and hot water, and for running the thermal oxidation plant. Electricity is used mainly for driving utility processes such as water chilling and cooling, industrial refrigeration, heating and ventilation, air compression; for generating nitrogen, and for running the wastewater treatment plant. Other significant users of electricity are pumps, used for transferring solvents and cooling water around the site.

Gas consumption and electricity consumption total approximately 75 million kWh and 55 million kWh respectively.

In line with Pfizer's corporate environmental policy statement, the plant is committed to reducing on-site energy consumption by 5% year on year. Its environmental management programme conforms to the internationally recognised environmental standard ISO 14001, to minimise its impact on the environment. As part of its operation of that system, a team representing all departments on the site meets every month to review progress in relation to energy-reduction targets and productivity increase initiatives; to agree action plans on foot of energy audit recommendations; to provide briefings on issues such as the plant's membership of the Emissions Trading Scheme.

The company's Utilities Engineer Martin Corkery works closely with SEI on a range of initiatives. In his role as 'energy champion' he presents regular energy performance reports to senior management; he commissions at least three energy audits each year; he participates in a monthly forum with Utilities Engineers from the other Pfizer sites in Ireland, to share information on their innovations, successes and difficulties – an initiative that has helped all sites to make significant energy efficiency improvements over the past few years.

Measures that have proved particularly successful in terms of generating energy efficiencies have included the fitting of variable-speed drives on demand-side systems; carrying out annual leak detection surveys to assess air loss and nitrogen loss; improvements to thermal oxidiser heating; the installation of an extensive metering network across the site; the remapping of refrigeration systems; the replacement of over-sized cooling pumps; and improvements to energy awareness-raising schemes.

A recent Pfizer innovation is the development of a web-based portal, which enables site personnel to access information on best practice in relation to a wide range of energy-related processes.

Current initiatives include a continued pump upgrade scheme; making adjustments to chilled water and HVAC system controls; improvements in compressed air generation; and the commissioning of an energy monitoring system in the new 5,000 m² Spray-Dried Dispersion (SDD) building, which will be incorporated into the Digital Control System (DCS), and is expected to deliver further improvements in energy management.



2.8

Smurfit Paper Mills Ltd

Smurfit Paper Mills specialises in the manufacture of testliner and fluting, used by the corrugated board industry to make cardboard boxes. The 8,000 sq metre plant, located on the River Dodder in Dublin, operates on a 24-hour basis, and consumes approximately 87 million kWh of gas and 16 million kWh of electricity annually: the former is mainly used to generate steam, while the latter is mainly used to power motors, pumps and dryers.

The company operates under an IPC license from the EPA, and is included within the EU-Emissions Trading Scheme.

General Manager Colm O'Connor runs the plant within agreed energy-reduction parameters. Targets are agreed by management each year, and all related activities, together with the management of on-site energy resources, are co-ordinated by a four-person team incorporating the General Manager, Project Engineer, Management Systems Co-ordinator and Shifts Manager.

The company operates an ISO 14001 environmental management system and has written procedures for a range of energy-related issues. All gas, water and electricity usage is metered; energy consumption reports are generated daily, weekly and monthly, and production meetings (at which energy-related issues are discussed), are chaired several times a week by the company's General Manager. A sophisticated planned maintenance programme ensures regular servicing and upgrading of equipment.

Most of the plant's raw material comes in the form of compacted 500-700 kg bales of waste paper. This is mixed with water and put through a series of cleaning, refining and filtering processes. While these processes are

energy-intensive, the motive power required for agitating, pumping and filtering vary considerably depending on the level of extraneous matter present, and are difficult to predict.

Because energy is one of the company's top three areas of expenditure, achieving improvements in efficiencies is a major priority. Where possible, only the most energy-efficient equipment is purchased; in recent years, the steam condensate system has been redesigned; a boiler economiser has been installed; pipe insulation has been optimised; new steam traps have been fitted; and the thermal compressor has been upgraded.

One of the interesting technologies in use at the plant is a dryer that emits infrared radiation: its key function is to expel unwanted water. This drying technology is 40% more energy efficient than a conventional steam dryer.

Smurfit Paper Mills has set itself a target of reducing overall energy usage by approximately 1% year on year, and some notable successes have been recorded. Between 1992 and 2003, it achieved a 14% improvement in gas efficiency and a 15% improvement in electricity efficiency, per tonne of output. In 2004 a new low-vacuum foil box to facilitate the paper sheet drying process was installed: this will further improve electrical energy efficiency by an estimated 0.5% annually.



2.9 Tyco Healthcare, Mulhuddart

Tyco Healthcare, Mulhuddart produces Ioversol, the bulk active ingredient in Optiray, a contrast media product, which is used by radiologists to carry out x-ray imaging procedures on the heart and other internal organs.

Natural gas consumption at the Mulhuddart plant totals approximately 50 million kWh annually and is predominantly used for raising process steam to manufacture the product and for heating buildings. Electricity consumption totals 12 million kWh/year. Most of this demand is used for motive power, pumps, blowers, fans and lighting.

Energy-related expenditure accounts for a significant proportion of the plant's operating budget, with the spend on utilities such as water, electricity, gas and nitrogen totalling more than €2 million annually.

Energy conservation is a major focus for the company's management team. Consumption across the plant is monitored closely, and energy performance reports based on metered readings of utilities such as gas, electricity, water purchased and wastewater discharge are produced on a monthly basis. These readings allow for detailed analysis of the plant's production output/energy consumption ratio – data that is in turn used by operating personnel to demonstrate how each month's energy performance compares with budgeted energy performance for that year.

The Mulhuddart operation is one of seven large Tyco healthcare/electronics manufacturing sites in the Republic of Ireland, all of which have a common electricity supplier. It is also a member of a pan-European Tyco energy group, which, as part of its brief, is examining energy conservation policies and practices across all Tyco manufacturing operations in Europe.

By end-2003, plans were well advanced for the establishment of a scheme to train a team of European energy auditors who would assist sites in the optimisation of energy usage.

One of the resource conservation measures that has proved highly successful for the Mulhuddart operation is Six Sigma, a statistical method used to optimise processes and systems. As a direct result of employing this method, Tyco has reduced water consumption by 25% and, based on this success, plans are now in place to use Six Sigma to optimise energy utilisation.

Conservation measures that have yielded positive results in recent years include a major process change, which has resulted in a reduction of approximately 25% in energy usage; the installation of an economiser and oxygen trim control on a second boiler increased operating efficiencies by about 4%; a 15% cost saving was achieved as a result of fitting integral air dryers on all compressed air units; and installation of 25 new steam traps is expected to have a payback period of less than two years.

Energy conservation plans currently under consideration include the improvement of lighting utilisation. This would involve installing high-efficiency luminaires/fittings and occupancy detectors across the site.



2.10

Wyeth Medica Ireland Ltd

Wyeth Medica Ireland manufactures a range of pharmaceuticals including anti-inflammatories, tranquillisers, antidepressants, oral contraceptives and hormone replacement therapy medications.

Natural gas and electricity are the primary fuels used across the 120-acre site in Newbridge, Co Kildare. During 2003, the six boilers accounted for the highest consumption of on-site gas usage (i.e. 58.6 million kWh), while the 2.7MW CHP plant on the Wyeth site consumed 26,189 MWh gas. The 3,924 MWh of heat generated by the CHP served to meet approximately 15% of the 90,000 sq metre manufacturing plant's heating needs.

Of the 47.8 million kWh of electricity required to meet on-site energy demand during 2003, the CHP plant generated 9.2 million kWh (i.e. about 19% of total requirements). Equipment such as air handling units, compressors and chillers used most of the 38.6 million kWh of the electricity imported from the national grid.

In July 1997, Wyeth's US-based parent company launched the Wyeth Energy Programme (WEP), an initiative aimed at reducing energy costs, energy consumption and CO₂ emissions in all Wyeth facilities worldwide. Since then, the WEP environmental conservation programme has been driving developments in areas such as the design and construction of new building/refurbishment projects; the creation and application of energy design standards; reliability and regulatory compliance; renewable and sustainable energy options. The WEP represents the framework within which the plant's Energy Manager, Pat Jackson, operates.

The WEP programme is reviewed every three months by a Steering Committee, incorporating representatives

of Wyeth companies worldwide as well as representatives of PWI Energy, a Philadelphia-based energy consultancy firm.

Energy management at the Newbridge site is overseen by an eight-person Energy Committee, incorporating representatives of the Engineering, Manufacturing, Finance, Purchasing, and Quality Control Departments. They meet monthly to discuss on-going energy-monitoring measures; evaluate potential energy-reduction projects; plan awareness-raising initiatives aimed at the site's 1,550 employees; review progress on the implementation of recommendations made on foot of energy audits.

On-site energy usage is monitored through the Building Management System, and through the TEAMSIGMA monitoring and targeting system, which can provide real-time readings of current electricity, gas, water and air usage.

The two most significant on-site energy conservation measures implemented at the Newbridge site in recent years were the construction of the CHP plant, and the switch from heavy fuel oil to natural gas. Other significant energy-saving projects included the retrofitting of variable-speed drives on air handling fans; the implementation of efficiency improvements to boilers and compressed air generation systems; installation of a Monitoring and Targeting system; and installation of lighting power-reduction units throughout the plant.

The search for new ways to save energy continues apace, with efforts currently concentrated on changing to more efficient lighting systems in the packaging buildings and all plant rooms and utility chases. In addition, plans are in place to provide multi-user access to the TEAMSIGMA monitor system, by linking it to a network of computers across the site.

Company Profiles Overview 2003



Aughinish Alumina



**Pfizer Ireland Pharmaceuticals
Loughbeg API**



Bausch & Lomb Ireland



IBM International Holdings



Smurfit Paper Mills Ltd



Braun Oral-B Ireland Ltd



LEO Pharma



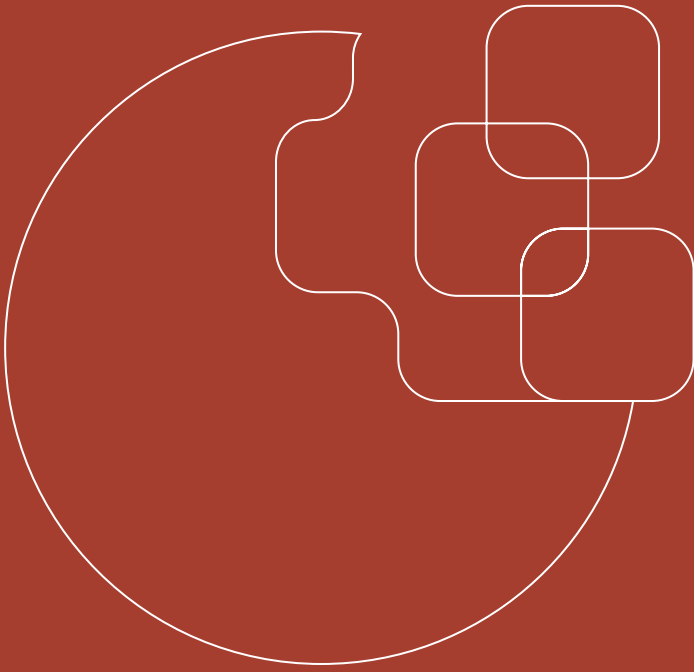
Tyco Healthcare, Mulhuddart



Glanbia Plc, Ballyragget



Wyeth Medica Ireland Ltd



3

page	26	3.1 Results and Targets 1995–2003
	30	3.2 Analysis of Results for 2003
	33	3.3 Members' Graphs & Statements
	61	3.4 The LIEN Objectives and Contact Details
	63	3.5 Member Listing
	64	3.6 About Sustainable Energy Ireland

3.1 Results and Targets 1995–2003

In the following pages the result for each company is expressed in the form of an energy performance index (EPI). This is based on the ratio of annual primary energy consumption to aggregate product output, measured in a format developed individually by each company to reflect their unique mix of products and processes. For a member's first year of joining the Network, this index is normalised to 100, and subsequent improvements or deteriorations in energy performance are reflected in a decrease or increase in EPI respectively.

The results for 2003 are presented as follows:

- The table starting on page 27 lists the members of the scheme and highlights their yearly EPI performance since joining the LIEN, also featuring their targets for the 2004.
- An analysis of the results and the factors effecting them for the group as a whole are discussed on page 30.
- In the subsequent pages, members' EPIs and targets are again presented, this time in chart form, along with a short statement from each of the companies summarising the key elements of their energy management programmes, the factors that have influenced their EPIs and their plans for the future.

EPI figures for previous years have been re-calculated for some companies due to reviews on their reporting format, or to improve the accuracy of past results.

3.1 Results and Targets 1995 to 2003

COMPANY	ENERGY PERFORMANCE INDEX (EPI)									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	TARGET 2004
Abbott Ireland, Cavan		100.00	93.06	122.92	115.53	119.74	105.83	105.07	119.87	119.87
Allergan Pharmaceuticals Ltd				100.00	102.31	122.81	114.73	115.29	127.61	133.99
Analog Devices BV						100.00	123.40	157.79	137.94	133.80
Atlas Aluminium	100.00	98.01	96.72	75.84	92.42	92.98	122.24	108.34	108.69	107.60
Aughinish Alumina	100.00	97.43	96.61	96.60	96.22	94.22	95.06	93.84	92.00	92.00
Bausch & Lomb Ireland	100.00	74.59	46.17	68.02	111.02	79.97	66.35	63.83	56.64	54.37
Baxter Healthcare S.A.	100.00	100.27	96.34	94.89	95.02	83.63	81.30	92.21	78.75	76.39
Boliden Tara Mines Limited	100.00	107.86	110.23	110.87	113.12	117.53	128.85	129.42	116.94	120.45
Boston Scientific Ireland Ltd, Galway					100.00	83.46	86.19	86.01	74.29	72.06
Braun Oral-B Ireland Ltd	100.00	101.29	105.96	120.37	102.08	82.83	58.78	54.73	38.57	38.19
Bristol-Myers Squibb, Swords			100.00	100.81	108.82	94.92	109.85	109.81	107.70	105.54
Bulmers Ltd									100.00	97.50
Cadbury Ireland Ltd, Dublin			100.00	97.08	101.63	86.65	88.68	80.45	76.38	79.44
Cadbury Ireland Ltd, Kerry	100.00	90.67	87.07	87.60	84.88	83.51	83.50	83.28	81.65	81.65
Cantrell & Cochrane, Cork				100.00	109.02	104.60	77.06	73.27	77.17	73.31
Cantrell & Cochrane, Dublin								100.00	95.09	87.49
Carbery Milk Products Ltd	100.00	96.53	83.95	71.55	72.34	74.05	77.75	63.37	73.74	73.74
Cognis Ireland Ltd		100.00	104.03	114.99	116.48	113.64	108.70	106.31	95.14	88.48
ConocoPhillips, Whitegate Refinery		100.00	96.13	97.52	92.03	99.38	103.03	118.58	107.34	102.51
Dairygold Co-op Society	100.00	101.31	90.93	90.34	89.80	89.65	83.06	80.68	80.99	78.97
Dawn Meats, Ballyhaunis						100.00	96.67	99.56	88.53	88.53
Diageo Ireland, St James's Gate			100.00	72.21	74.78	83.60	87.73	86.04	85.04	85.04
Dublin Airport Authority (Aer Rianta)	100.00	92.93	84.60	90.72	90.88	94.89	94.78	90.55	89.69	80.72
Dundalk Brewery	100.00	93.42	84.51	85.65	84.97	85.22	106.85	98.46	87.73	83.35
Elan Pharma			100.00	87.41	93.39	187.26	200.26	224.24	289.89	252.20
Element Six			100.00	79.25	68.49	63.04	54.74	49.78	35.64	33.86

3.1 Results and Targets 1995–2003

COMPANY	ENERGY PERFORMANCE INDEX (EPI)									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	TARGET 2004
Eli Lilly S.A. – Irish Branch	100.00	89.21	89.12	77.65	77.12	69.21	89.83	76.67	83.40	73.39
Fruitfield Foods Ltd				100.00	105.78	138.76	187.54		172.21	149.82
Glanbia Plc, Ballyragget	100.00	94.33	93.68	93.03	83.03	79.89	70.30	72.28	72.34	71.98
Glanbia Plc, Inch		100.00	103.71	109.80	112.10	106.25	126.41	110.93	114.30	114.30
Glanbia Meats, Roscrea	100.00	87.56	79.43	71.97	73.41	76.41	75.95	72.85	71.21	65.51
Glanbia Meats, Ruskey	100.00	101.86	102.37	126.91	100.79	113.91	124.69	114.72	114.75	111.31
Glanbia Ingredients, Virginia	100.00	96.16	92.87	96.03	98.94	96.99	95.75	94.76	94.78	93.71
GlaxoSmithKline, Cork		100.00	64.19	67.90	62.00	56.27	53.71	57.15	52.98	51.29
GlaxoSmithKline, Dungarvan							100.00	90.85	86.08	88.66
Gypsum Industries Ltd				100.00	104.06	106.63	103.11	105.17	103.54	100.43
Hewlett-Packard (Manufacturing) Ltd			100.00	92.99	9538.00	72.69	60.56	55.20	58.33	60.67
HJ Heinz			100.00	84.64	74.29	80.15	79.25	79.82	82.81	72.87
Honeywell Turbo Technologies (Garrett Engine Boosting Systems)			100.00	78.74	89.36	50.29	49.15	35.64	31.00	30.53
IBM International Holdings					100.00	76.08	68.65	54.26	55.42	53.20
Intel Ireland Ltd	100.00	92.29	40.69	110.57	70.36	57.75	64.62	72.94	108.02	87.50
Irish Shell Ltd			100.00	89.96	89.08	95.19	117.19	116.46	97.64	97.64
Irish Sugar Ltd	100.00	92.49	83.12	84.06	83.75	91.48	95.82	93.33	79.69	82.08
Janssen Pharmaceutical Ltd		100.00	100.59	96.39	49.61	50.40	38.51	31.43	35.55	35.55
Klinge Pharma		100.00	77.99	59.35	54.33	55.48	54.86	49.01	47.74	47.74
Kostal Ireland GmbH							100.00	101.99	98.63	96.66
Lakeland Dairies, Bailieboro	100.00	94.61	92.01	92.61	96.79	94.36	101.99	95.26	92.33	92.33
LEO Pharma		100.00	102.52	102.57	107.16	122.05	116.32	106.43	109.50	125.92
Lisheen Mine						100.00	105.70	97.98	90.33	90.33
Masonite Ireland							100.00	75.92	68.05	64.65
Merck Sharp & Dohme (Ireland) Ltd						100.00	92.15	72.37	81.00	69.90
Micro-Bio Ireland Ltd, Fermoy		100.00	95.46	81.03	76.33	74.84	78.85	81.40	80.58	79.37

3.1 Results and Targets 1995 to 2003

COMPANY	ENERGY PERFORMANCE INDEX (EPI)									TARGET
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
NEC Semiconductors Ireland Ltd	100.00	139.63	115.46	97.98	128.87	82.97	97.10	75.82	79.78	75.80
Novartis Ringaskiddy Ltd		100.00	59.08	48.16	52.61	38.95	25.40	23.20	19.89	18.78
Pfizer Ireland Pharmaceuticals, Little Island API						100.00	70.05	59.86	51.01	48.97
Pfizer Ireland Pharmaceuticals, Loughbeg API		100.00	126.41	231.57	364.70	299.94	212.34	182.82	162.56	154.43
Pfizer Ireland Pharmaceuticals, Ringaskiddy API	100.00	109.11	87.66	83.62	76.72	87.87	125.36	117.94	100.72	97.70
Premier Periclase Ltd	100.00	93.81	92.84	93.57	98.82	93.40	97.13	109.08	105.15	103.57
Pure Fresh Dairies Ltd	100.00	97.62	93.20	94.78	93.99	99.25	92.65	97.92	109.10	103.64
Roche Ireland Ltd	100.00	97.32	101.75	234.89	252.76	211.18	183.30	174.16	164.31	164.31
Saehan Media Ireland Ltd	100.00	88.53	91.68	104.03	95.28	83.48	90.12	92.04	85.23	85.23
Schering-Plough (Avondale) Co.	100.00	81.28	80.47	82.81	127.68	124.64	180.32	167.22	196.40	361.38
Schering-Plough (Brinny) Co.	100.00	83.33	82.87	80.94	66.75	59.69	73.22	62.99	88.59	88.59
SerCom Solutions	100.00	95.54	98.46	89.22	83.03	77.60	83.70	66.19	73.12	69.46
Smurfit Paper Mills Ltd	100.00	94.82	91.75	91.80	91.45	90.78	91.58	88.06	88.83	86.79
St Francis Abbey Brewery		100.00	101.49	104.02	102.80	106.90	123.95	132.52	138.02	140.78
Takeda Ireland Ltd					100.00	79.94	56.45	40.07	29.82	28.33
Tayto Limited								100.00	92.76	85.77
Thermo King Europe	100.00	100.62	94.19	77.13	76.19	85.16	75.76	55.61	49.50	47.02
Transitions Optical Ltd				100.00	110.88	129.16	153.89	118.43	120.02	114.02
Tyco Healthcare, Athlone		100.00	101.04	92.42	102.06	98.71	100.05	163.63	160.97	160.97
Tyco Healthcare, Mulhuddart	100.00	89.53	75.42	71.63	78.14	76.61	76.72	74.90	72.84	72.65
Waterford Crystal Ltd	100.00	90.48	64.27	61.74	47.05	40.67	43.40	95.85	102.89	102.89
Wellman International Ltd	100.00	100.42	100.24	102.59	103.79	101.76	101.66	95.67	96.13	95.13
Wessel Energy Cables Ltd	100.00	94.73	83.58	81.04	97.32	102.51	100.42	89.37	88.87	97.75
Western Proteins						100.00	97.13	99.66	87.89	95.80
Wyeth Medica Ireland Ltd	100.00	97.86	81.72	90.44	92.06	85.19	84.56	87.66	99.68	99.68
Yamanouchi Ireland Co. Ltd	100.00	68.31	103.44	88.77	94.75	173.38	145.30	119.07	128.67	124.81

3.2 Analysis of Results for 2003

One of the principal requirements of membership of the LIEN is that members each year publish a statement outlining their achievements in relation to their activities to reduce energy consumption and related emissions. They also produce data for calculating their Energy Performance Indicator, which is a measure of the productivity of their energy use during the year, along with targets for their EPIs for the next year and a summary of their plans for the future. The results published in the LIEN annual report are based on these inputs from the members.

As will be clear from the members' statements and EPI results shown elsewhere in this report, 2003 was again a year of change for many members. Market and product changes, changes to capacity, and changes to plant and facilities all had their impact, and while some members were able to achieve significant reductions in energy use, others found that despite their best efforts their EPIs increased rather than fell. For 2003, 46 of the LIEN members achieved improvements in their EPIs, with 14 achieving EPI reductions of greater than 10 points – considerably fewer than the 20 members who achieved this level of reduction last year. Only one member – Pfizer (Loughbeg) – achieved a greater than 20-point reduction, compared with seven last year.

This might suggest that the LIEN members' performance for 2003 fell short of their performance in 2002. However, this is not the case. Although there were fewer spectacular individual performances, a large number of member companies enjoyed more modest but still noteworthy reductions; this may be due to a general recovery in trading conditions, with fewer major drops in demand for output than was the case last year. And the overall result for the LIEN members as a whole was an improvement in aggregate EPI of 1.13 (see table 3.2.1), compared with an improvement of 0.48 for 2002. The aggregate EPI for the LIEN as a whole was 86.45: since the base (starting) value for EPI is 100, this means that the LIEN members have achieved an overall improvement in their energy efficiency of 13.55% since the start of the scheme.

Such a reduction in EPI is significant in terms of the energy consumed by the members, and consequently of the CO₂ emissions attributable to their energy use. As Table 3.2.1 shows, members' total consumption of primary energy – on which all of the EPI calculations are based – amounted to 16,129 GWh, compared with 16,012 in 2002. That is, in absolute terms energy consumption increased slightly, mainly as a result of increased market demand. However, this increase would have been substantially higher were it not for the members' efforts in improving their energy efficiency.

Energy related emissions from the LIEN members amounted to 3,962,534 tonnes CO₂ for the year as a whole. This is equivalent to a reduction compared to 2002 of 220,271 tonnes CO₂ (0.22 Mt CO₂). The bulk of this very sizeable reduction is largely attributable to a reduction in the carbon content of electricity consumed by the members: new electricity generating capacity coming on stream is substantially lower in CO₂ emissions than existing capacity. The savings in CO₂ emissions directly attributable to the members' own energy efficiency actions amounts to 43,419 tonnes, or a 1.04% reduction compared with 'Business as Usual'.

Since the LIEN members together account for some 42% (see Chart 3.2.1) of the industrial sector's Total Primary Energy Requirement (TPER), such a saving is significant for the industrial sector as a whole, especially among a group of companies which have been working on continuous improvement in energy efficiency for many years. This means that for most of the members the easy, low-cost opportunities have generally been taken previously, and the kinds of savings achieved in 2003 were in general as a result of a programme of investment in new technologies and process improvements.

Finally, total TPER for the LIEN members represents 9% of total national TPER (Chart 3.2.2); so that even on a national scale the reduction achieved is significant.

3.2 Analysis of Results for 2003

Table 3.2.1 Large Industry Energy Network – Overall Performance

LIEN Total Primary Energy Requirement 2002	16,012 GWh
LIEN Total Primary Energy Requirement 2003	16,129 GWh
Energy avoided due to energy efficiency measures 2003	123.6 GWh
Aggregate EPI for LIEN in 2002	87.58
Aggregate EPI for LIEN in 2003	86.45
Improvement in EPI (2002 to 2003)	1.13
Total CO ₂ emissions from LIEN sites 2002	4,182,805 tonnes
Total CO ₂ emissions from LIEN sites 2003	3,962,534 tonnes
Reduction in CO ₂ emissions 2002–2003	5.27%
CO ₂ emissions avoided due to energy efficiency measures 2003	43,419 tonnes
Reduction in CO ₂ emissions arising from energy efficiency measures 2003	1.04%
National Total Primary Energy Requirement 2003	172.0 GWh
Industrial Sector Total Primary Energy Requirement	2003 38.0 GWh
LIEN as a percentage of national TPER 2003	9.37%
LIEN as a percentage of industrial sector TPER 2003	42.41%

Chart 3.2.1 LIEN Primary Energy Requirement V Industry Sector TPER

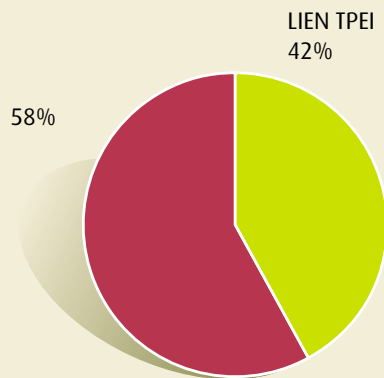
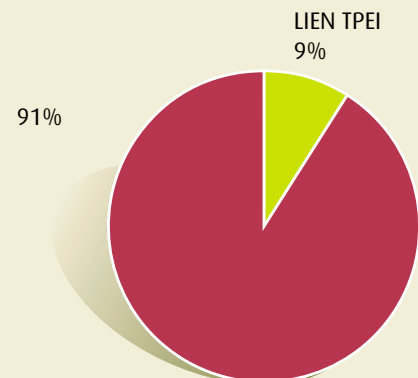


Chart 3.2.2 LIEN Primary Energy Requirement V National TPER



3.2 Analysis of Results for 2003

Factors underlying the LIEN members' changes in EPI for 2003

Table 3.2.2 shows a listing, in descending order of frequency, of the positive and negative factors that impacted on the LIEN members' changes in energy performance for 2003. A number of points are of interest in relation to the factors identified.

First, the impact of variations in production throughput is striking, and it works in both directions. Increased production output often leads to better energy performance. However, sometimes it impacts negatively: this is most usually the case when a factory is already working to capacity, and when a further increase in demand leads to unproductive use of plant and equipment. Reduced production output almost invariably leads to a deterioration in energy performance.

Second, changes in product mix also lead to changes in EPI in both directions. Most usually product mix changes are in the direction of increased added value, which in turn usually implies an increase in energy consumption. However, for the LIEN companies in 2003, changes in product mix or specifications led to an equal number of improvements and disimprovements. The same is true for process changes: nine companies suffered worsened EPIs as a result, while a further nine enjoyed improved EPIs because of changes to process.

Third, a major factor leading to disimprovement in the productivity of energy use is plant expansion and upgrades to equipment: in 10 member companies this led to disimprovements in energy performance. This has been the case for a large number of LIEN companies every year since reporting started. It is something that companies should plan for as part of their expansion and upgrade programmes.

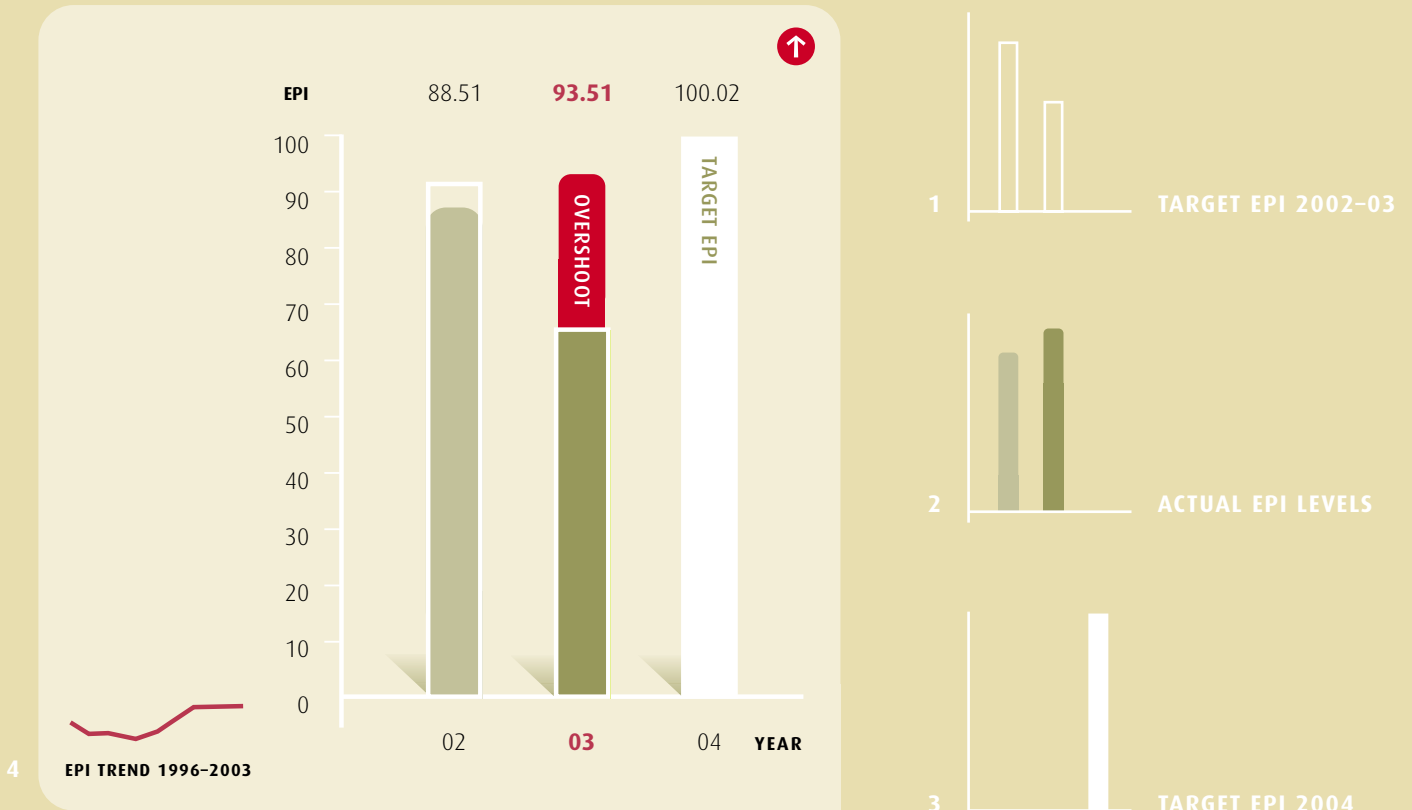
Finally, the wide number and range of energy efficiency projects should be noted: members reported some 105 different actions covering 22 different topics from technical upgrades to changes in energy management policies and practices. In particular, 12 member companies upgraded their metering and monitoring systems during 2003: this is an important area for attention in most companies, since effective energy management is extremely difficult when there is inadequate information on the distribution of energy use across the plant. Timely knowledge of changes in energy consumption allows managers to take prompt corrective action. Metering and monitoring are important first steps for any company wishing to manage its energy properly.

Table 3.2.2 Positive and negative influences on energy performance

Positive influences			
Increased production output	13	Energy policies	2
Metering, monitoring, M&T	12	Outsourcing of energy-intensive operations	2
Boiler and related projects	9	Insulation	2
Process changes	9	Heat recovery projects	1
Energy teams	9	Building Management Systems/upgrades	1
Staff awareness programmes	8	Electrical Distribution projects	1
Improved energy management	8		
HVAC projects	7	Negative influences	
Energy-efficient motors/VSDs	6	Reduced production output	10
Product mix changes	6	Plant expansion and upgrade projects	10
Compressed air projects	5	Process changes	9
Energy audits	5	Changes in the product specification, mix or raw materials	6
Lighting projects	5	Increased production output	5
Water treatment/reduction programmes	5	Other changes in production	3
Improved maintenance	5	Reduction in CHP use	3
Improved controls on processes	5	High summer temperatures	1
Refrigeration/cooling projects	4	Equipment failure	1
Fuel switching	3		

3.3 Members' Graphs & Statements 2003

Key to Member EPI bar graphs





1 Target EPI 2002-03

The white outline surrounding each bar indicates the Target EPI level for that year.

2 Actual EPI levels

The coloured bar indicates the Actual EPI level achieved. If the Target EPI level is achieved, the company is within target and is shown solely as a green bar whereas if the target is exceeded, the overshoot amount is shown in red.

For the current year, a company which is within its Target EPI is indicated with a  symbol; conversely, a company which overshoots its Target EPI is indicated with a  symbol. In the bar graph shown above, the company was within target in 2002 but has exceeded its EPI target in 2003.

3 Target EPI 2004

The white bar indicates the Target EPI level for the coming year.

4 EPI trend

The EPI trend in the bottom left shows the trend in EPI achieved by a company since it commenced reporting.

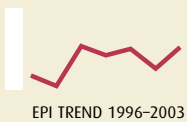
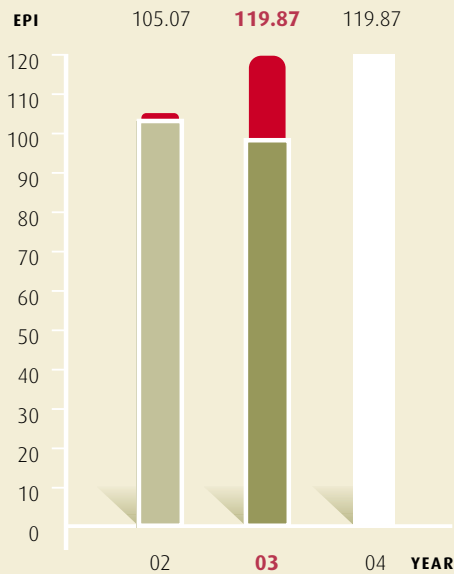
↑ Abbott Ireland, Cavan

Factors influencing 2003 results

- Major work on the expansion of our process and utility operations began in 2003. The deterioration in our EPI in 2003 is due mainly to on-site construction activity.
- Energy consumption decreased by 2.6% by virtue of improved production efficiency.

Future plans

No new energy conservation projects are planned for 2004 due to the commissioning of our new process and utility facilities, which will lead to a doubling of our output by 2006. This commissioning work will mainly account for the anticipated 100% rise in on-site energy usage next year.



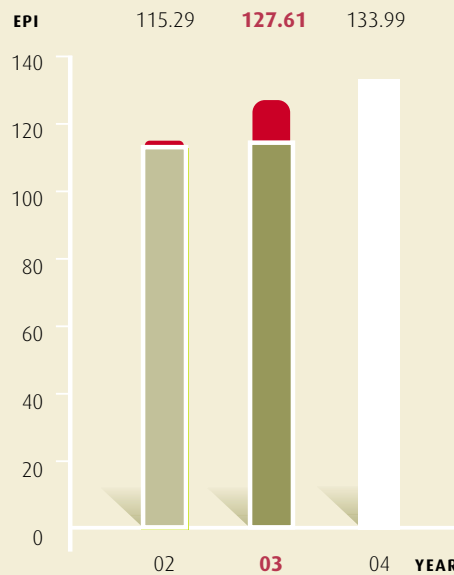
↑ Allergan Pharmaceuticals Ltd

Factors influencing 2003 results

- Primary energy usage increased slightly i.e. by 1.64%. This was largely due to:
 - the implementation of a number of new mandatory FDA and IMB regulatory standards.
 - increased demand for more energy-intensive processes following alterations to the product mix.

Future plans

- We expect on-site energy usage to increase by 2% in 2004, on foot of a 5% increase in overall production output.
- We expect our 2004 EPI to remain more or less at 2003 levels. However, plant expansion and a significant change in product mix will lead to a deterioration in 2005.
- By 2006, the on-site restructuring work should have created an improvement in our overall energy efficiency, as new production areas will be equipped with the most energy-efficient, state-of-the-art technology available.



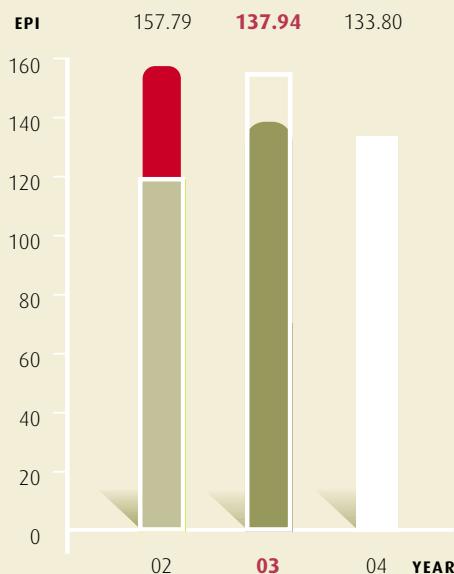
↓ Analog Devices BV

Factors influencing 2003 results

- On-site energy consumption was lower than originally targeted. This was due in part to our bringing forward the date for the restructuring of on-site manufacturing operations.
- Increased product demand also helped in reducing our energy consumption per unit output.
- Climatic conditions were favourable for HVAC clean room operations and this resulted in a significant reduction in natural gas consumption.

Future plans

We expect to achieve further improvements in our production output/energy consumption ratio following the restructuring of our production processes and the introduction of more efficient manufacturing systems. As a result, energy usage on-site should fall by 5%, even though we anticipate a further increase in production output during 2004.



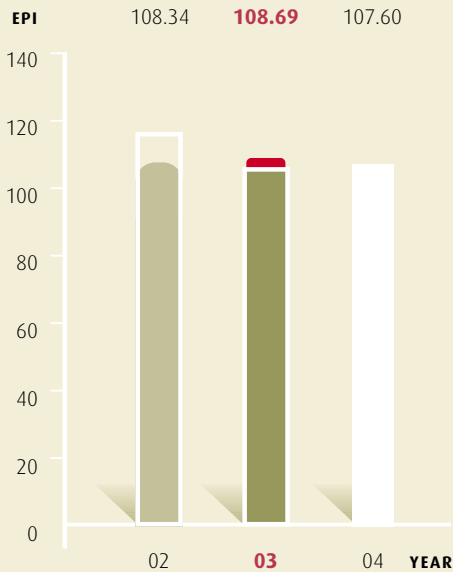
Atlas Aluminium

Factors influencing 2003 results

- Our EPI disimproved slightly as a result of a series of process changes and variations in our product portfolio, which created higher than anticipated electricity demand.
- Budgetary constraints prevented any major capital investment energy-reduction projects during 2003. However, we expended considerable effort in implementing low-/no-cost energy conservation projects such as the optimisation of furnace usage/ insulation, and the improvement of lighting and compressed air utilisation.

Future plans

- Q1–Q2 energy consumption is expected to increase in line with increased production demand.
- Q3–Q4 Atlas will start replacing its electric furnaces with gas furnaces where return on investment is attractive.



EPI TREND 1995-2003

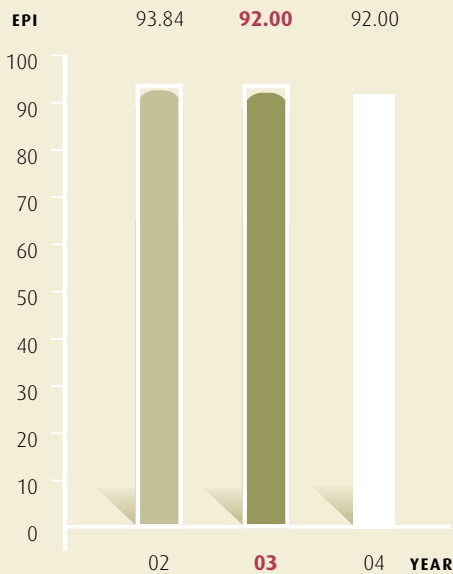
Aughinish Alumina

Factors influencing 2003 results

- Fuel oil consumption for 2003 reduced by 2.9%, while electricity consumption increased by 2.4%. The improved fuel oil performance resulted from operating changes plus switching to low sulphur fuel oil, which has a higher calorific value. The main operating change was the introduction of sweetening, which produces alumina in a more energy efficient way.
- Power consumption increased due to a restriction in the digestion units. When cleared in October, power usage improved significantly.

Future plans

- The sweetening system introduced in 2003 was a batch process; no more than 5% of alumina can be produced this way with the current plant. In 2004 and 2005 AAL will modify the plant to allow 15% of alumina production to come from sweetening.
- AAL is installing 2x75 MW gas turbines as part of a CHP project that will come online in December 2005.



EPI TREND 1995-2003

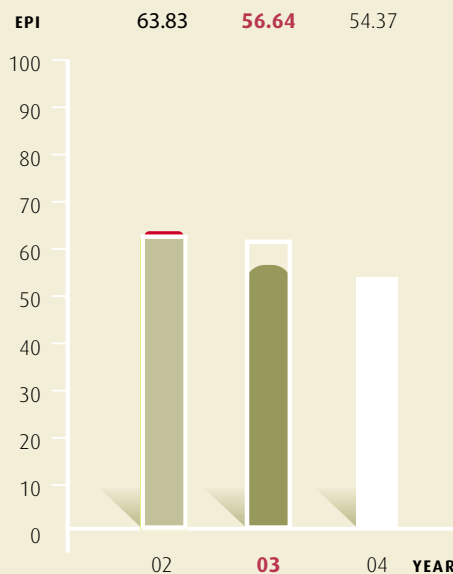
Bausch & Lomb Ireland

Factors influencing 2003 results

- Our success in achieving a 2.8% reduction in energy usage is attributable to our ethos of continuous improvement.
- Due to serious technical problems, we were obliged to shut down our CHP units for four months, forcing us to purchase electricity and to operate our steam boilers.
- Plant-wide initiatives such as reducing total air changes per hour, and upgrading the BMS not only offset the losses from the CHP shutdown, but also increased our savings from a targeted 3% to 5.5%.

Future plans

- In 2004 we plan to introduce a "LEAN" programme in the energy area, with the aim of eliminating all energy wastage in the manufacturing facility.
- Energy-reduction projects planned for 2004 include efficiency improvements to the chilled water system and the installation of variable-speed drives on six air conditioning units.



EPI TREND 1995-2003

↓ **Baxter Healthcare S.A.**

Factors influencing 2003 results

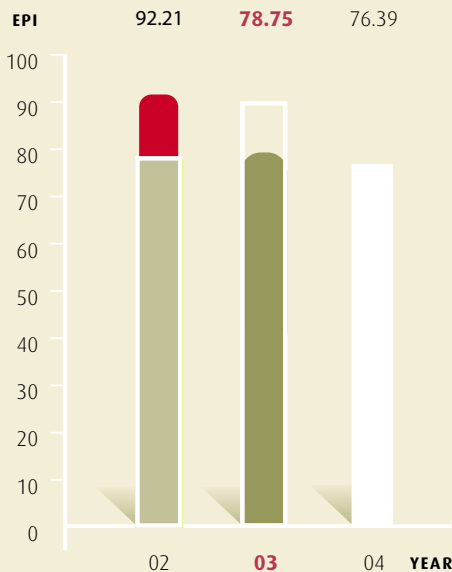
The large improvement in our EPI is primarily due to the continued focus on the major energy intensive processes and continued capital investment and resource allocation to our energy programme.

Effective measurement of key energy indices, coupled with effective energy management, continue to be areas of particular focus for Baxter Healthcare S.A. Other factors that influenced this year's EPI are:

- Demand control of cooling; boiler scheduling; and several heat recovery projects
- Efficiency gains in our autoclave processes

Future plans

We expect to achieve further significant improvements in our EPI in 2004 on foot of the implementation of improvements in our chilled water system, compressed air management system, water and heat recovery; – energy-saving initiatives, which we are confident will result in us reaching our target of 50% improvement in our EPI over the period 1990 to 2005.



↓ **Boliden Tara Mines Limited**

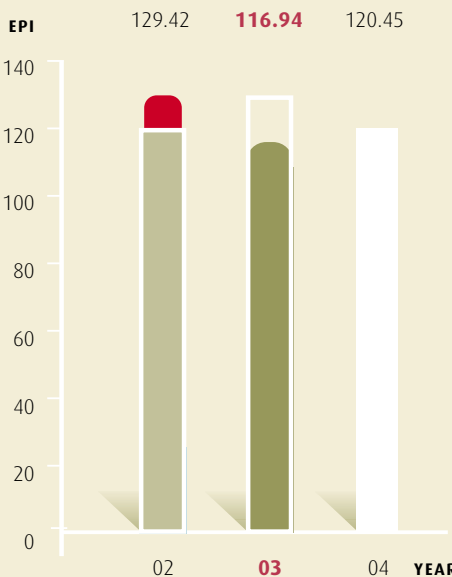
Factors influencing 2003 results

The large improvement in our EPI is largely attributable to the following:

- A focus on reducing energy use over all usage areas, despite increasing distances to, and depth of, the orebody.
- Bringing the South Western Extension (SWEX) project into production. SWEX is one of the most efficient installations of its kind both in terms of electricity and thermal energy usage.

Future plans

A temporary increase of 5% in energy usage is expected in 2004 while preparatory developmental work is being carried out on additional new energy-saving projects. Energy consumption is also likely to rise due to additional demand for ventilation and pumping services on the site caused by operating factors such as increasing distances between working faces and the hoisting centre, as the mine expands.



↓ **Boston Scientific Ireland Ltd, Galway**

Factors influencing 2003 results

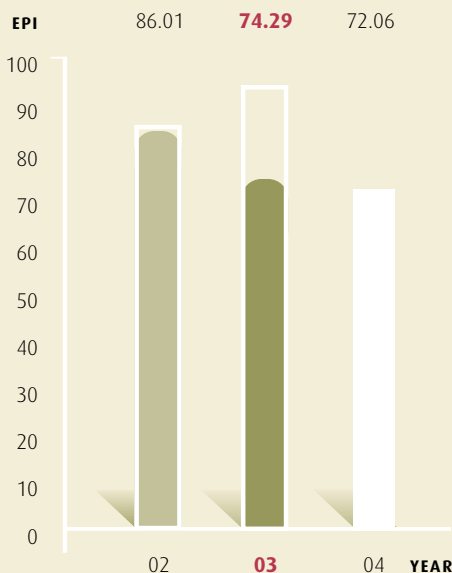
During 2003, we continued to implement new, 'leaner' manufacturing methods, new products and production processes. This resulted in running the conventional production line and the 'lean' production line in parallel for several months.

- A 6.7% increase in total energy use was largely due to:
- Increased production output
- The introduction of new processes
- Production and product mix changes
- The operation of large sections of the plant on a 24-hour, seven-day-week basis.

However, our energy performance index (output/energy) showed a reduction of 11.72%, which is a direct result of the energy savings projects implemented and an increase in output.

Future plans

New products and production processes and an increase in R&D work and plant expansion will lead to increases in energy demand going forward. However, a review of all energy-saving initiatives implemented to date will be carried out in 2004. New energy-saving initiatives will include cold spray humidification, chiller upgrades and the conversion of boilers from oil to natural gas.



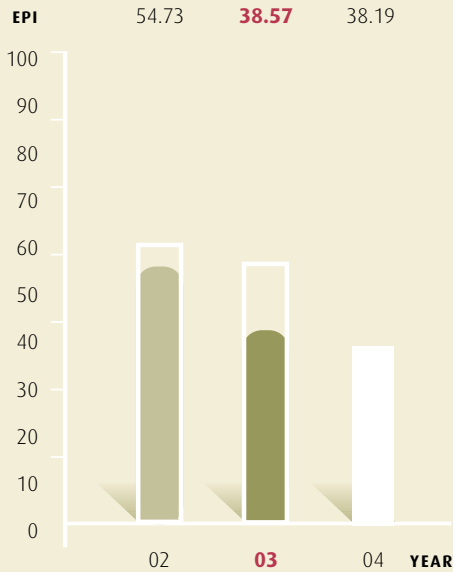
↓ Braun Oral-B Ireland Ltd

Factors influencing 2003 results

- Key among the factors responsible for achieving a 16.16% improvement in our EPI was our programme of continuous energy monitoring and ongoing energy-saving initiatives.
- We also increased output of several key products and introduced one significant new product. All of these products are manufactured using highly automated production methods, and all achieve high production output/energy consumption ratios.

Future plans

During 2004, we will continue to monitor on-site energy usage closely. Based on monitoring reports to date, we have decided to target inefficiencies in our compressed air system, where we aim to achieve major cost savings. We will also be investigating energy-saving opportunities in areas such as lighting and refrigeration.



↑ Bristol-Myers Squibb, Swords

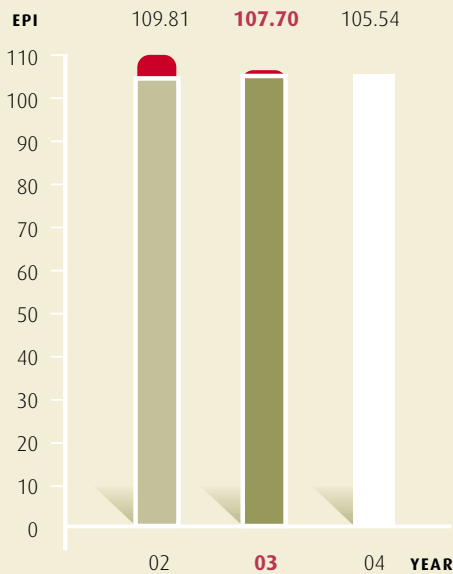
Factors influencing 2003 results

The improvement in our EPI is due to the continued focus on energy reduction on site during 2003, along with benefits realised from energy-reduction projects implemented in 2002. Other factors that influenced this year's result included:

- New boiler plant, incorporating best practice energy efficiency and energy-recovery technologies.
- An overall increase in electricity consumption, due to a high level of on-site activity coupled with the commissioning of new wastewater treatment plant aerators and circulation pumps.
- Improved maintenance of our steam traps and condensate recovery pumps.

Future plans

While further energy-reduction measures such as refrigeration plant optimisation and the installation of a centralised HVAC control system and M&T system will be implemented in 2004, these gains may be offset by continued plant expansion work. Nonetheless, we envisage a 4% to 6% reduction in energy consumption.



Bulmers Ltd

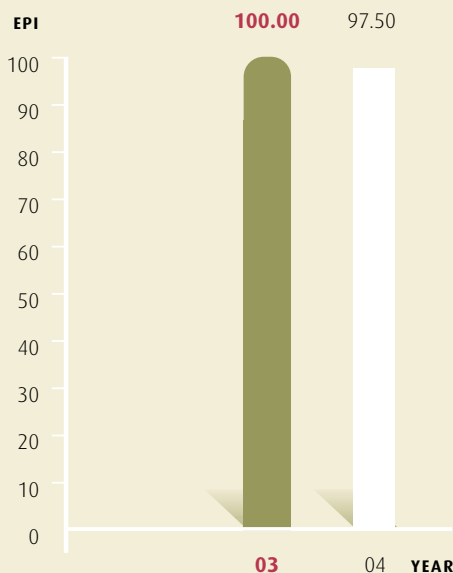
Factors influencing 2003 results

2003 marked the first year of Bulmers' involvement in the LIEN.

We have embarked upon an ambitious on-site energy conservation programme. The first phase of this programme involved the installation of an electronic sub-metering system which records and analyses consumption at energy-usage points in strategic locations across the site. This was completed in December 2003. We have also formed a cross-functional Site Energy Team, with monthly reviews of progress and an active energy awareness campaign.

Future plans

We aim to reduce on-site energy usage by 2.5% in 2004. We plan to achieve this by introducing a number of energy management and conservation initiatives in areas such as refrigeration, compressed air, and power-down/restart programmes. These initiatives will be driven by our Site Energy Team.



EPI TREND 1995-2003

EPI TREND 1997-2003

BASE YEAR

↓ **Cadbury Ireland Ltd, Dublin**

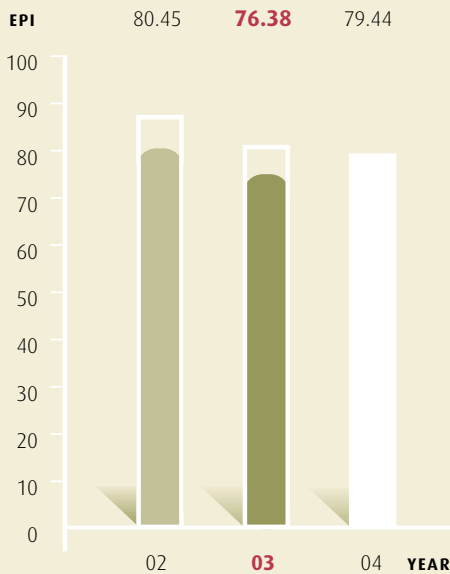
Factors influencing 2003 results

The significant 4.07 reduction in our EPI was achieved against a background where a series of variations in demand for different production lines made it difficult to minimise energy consumption.

Future plans

Due to the transfer of certain processing activities to a sister Cadbury operation in Poland, production output at our Coolock plant will fall by 3,000 tonnes. As a result, on-site energy consumption will decrease by 2%, but the reduced output, combined with high base loads, will lead to a 4% increase in our EPI.

During 2004 and beyond we aim to create the type of on-site conditions that will deliver sustainable energy savings in the medium to long term, while simultaneously reducing carbon emissions from the plant.



EPI TREND 1997-2003

↓ **Cadbury Ireland Ltd, Kerry**

Factors influencing 2003 results

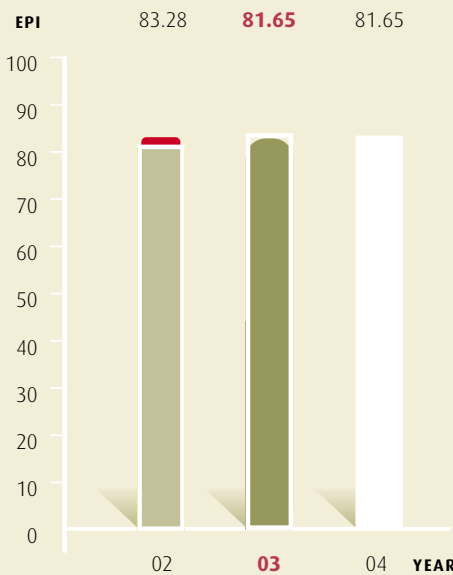
Heavy fuel oil consumption decreased by 2.3%, and electricity consumption decreased by 1.3%. The following contributed to these decreases and to a 1.6 point improvement in our EPI:

- Work carried out on the steam flash recovery system during 2003
- Slightly higher than expected production output
- Our ongoing emphasis on monitoring and targeting, together with active energy management.

Future plans

We are forecasting a 2.5% drop in production output in 2004. In addition, we will be carrying out replacement work on the boiler hotwell over a six-week period. During this time, it will not be possible to operate the condensate recovery process as efficiently as usual.

The combination of lower production output and higher energy consumption will make it difficult to maintain energy efficiencies at 2003 levels.



EPI TREND 1995-2003

↑ **Cantrell & Cochrane Ltd, Cork**

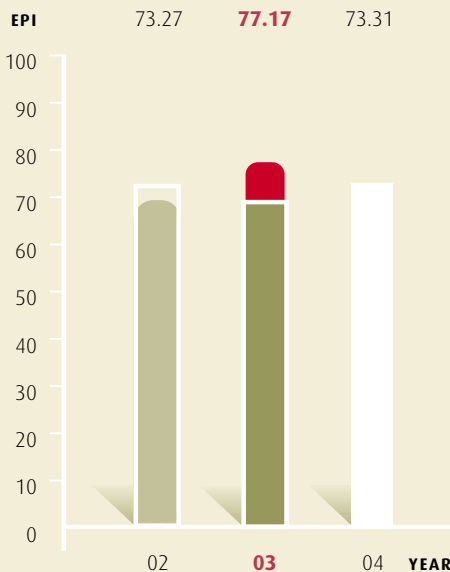
Factors influencing 2003 results

The site did not achieve its targeted improvement in its EPI of 5% for two reasons:

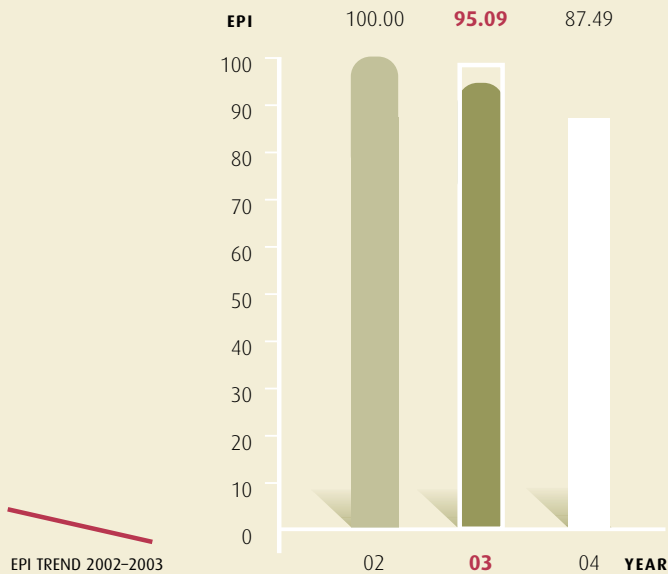
- A 7.94 million litre reduction in volume throughout the plant in 2003.
- An upgrade to our Cleaning-in-Place (CIP) plant, which substantially increased our Natural Gas consumption.

Future plans

Because projected throughput is unlikely to exceed the 2003 level, further reductions in energy usage will require significant effort and major investment in energy saving projects. In 2004 we will be implementing two significant energy-saving projects, installation of an air recovery unit in our moulding plant and an upgrade of our refrigeration plant in order to optimise product cooling.



EPI TREND 1998-2003



↓ Cantrell & Cochrane Ltd, Dublin

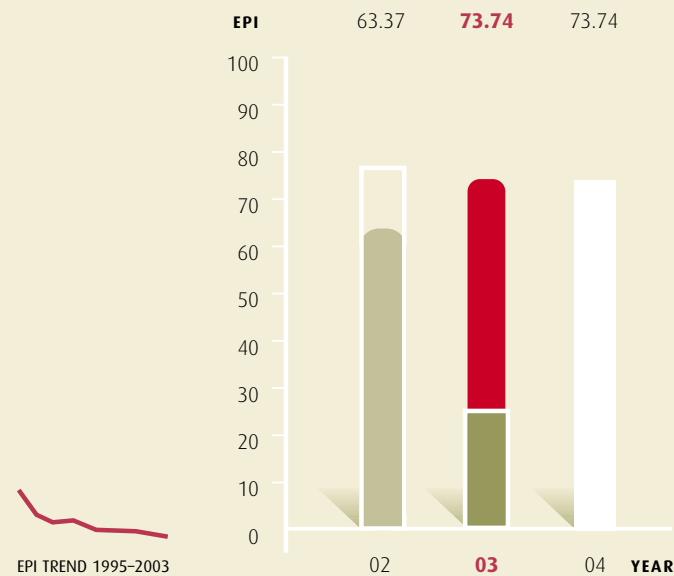
Factors influencing 2003 results

While our on-site energy awareness and energy-reduction programme was not fully implemented until the second half of the year, it led to a much higher than expected improvement (over 5%) in our EPI. The main components of our programme were as follows:

- Introduction of a plant-wide 'Switch off' programme, which operates at weekends and during other downtime periods.
- Implementation of an energy awareness campaign
- Establishment of an Energy Team to drive energy reduction
- Installation of a computerised energy monitoring system.

Future plans

Based on the success achieved in 2003, our Energy Team aims to achieve an 8% reduction in energy usage in 2004, continuing our employee awareness and Switch-Off programmes. We also plan to complete air recovery work on all blow-moulding machines.



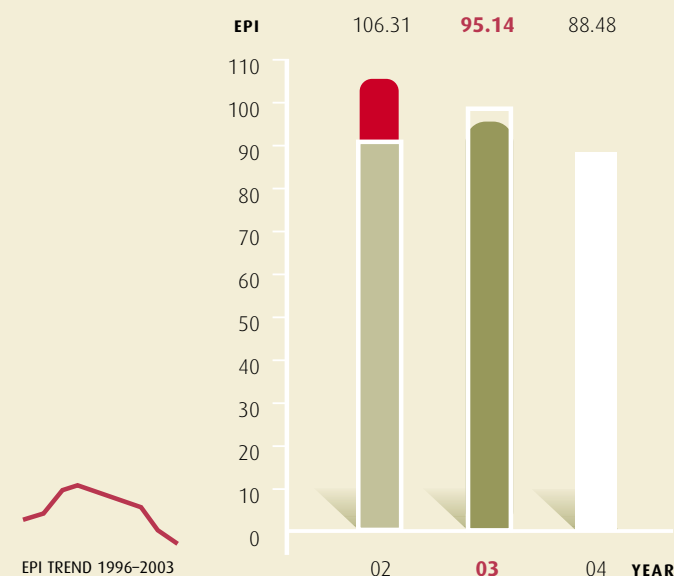
↑ Carbery Milk Products Ltd

Factors influencing 2003 results

The major disimprovement in our EPI for 2003 is largely attributable to changes in our product mix, with a 27.5% increase in output of whey protein concentrate and smaller increases in cheese and alcohol production. These products require significant quantities of steam, and hence our gas consumption increased.

Future plans

A number of possible energy-efficiency projects are currently under consideration



↓ Cognis Ireland Ltd

Factors influencing 2003 results

- While our new Monitoring and Targeting (M&T) system was not fully in place by end-2003, nonetheless it yielded sufficient information to enable us to reduce on-site energy usage significantly.
- Production volumes increased significantly and we achieved high levels of production utilisation.
- On-site energy consumption was 13% lower than originally targeted.
- When compared with our 2002 results, gas oil consumption reduced by 1.32 GWh oil, and heavy fuel oil consumption by 13.71 GWh.
- Carbon dioxide emissions decreased by 3,875 tonnes/a.

Future plans

As additional energy streams are incorporated into our M&T system, and reporting methods are refined, we are confident that the system will deliver timely and accurate information that will enable us to determine precise plant-specific indices. As such, we expect to achieve further energy savings during 2004 and beyond.

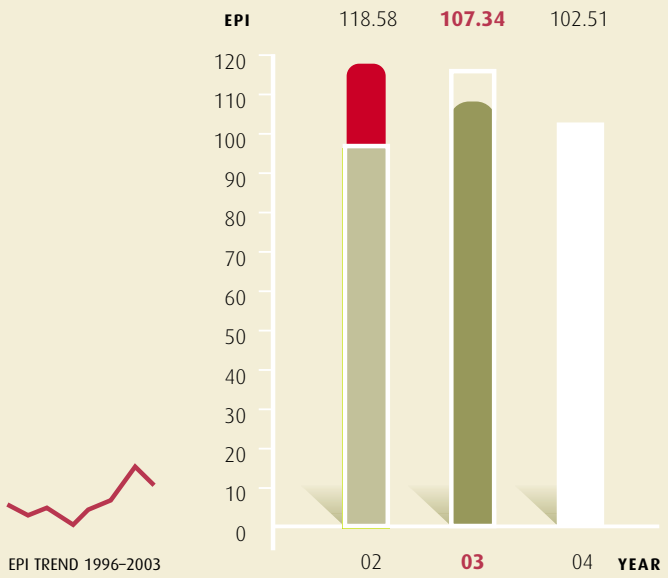
↓ **ConocoPhillips, Whitegate Refinery**

Factors influencing 2003 results

- Processing of crude oil increased by approximately 50,000 tonnes in 2003.
- Despite the increase in production volumes, and a mix of crude oil that required a higher heat input than in previous years, on-site energy consumption remained more or less at 2002 levels.

Future plans

Every four to five years we shut down the refinery to carry out essential maintenance work and repair/replace major items of equipment. The next shutdown is scheduled for April 2004 when, over a period of five weeks, fuel consumption will be reduced to negligible levels. During the overhaul process, we plan to replace the burners in five furnaces. As a direct result of this intervention we expect to reduce fuel consumption by over 8,500 tonnes annually.



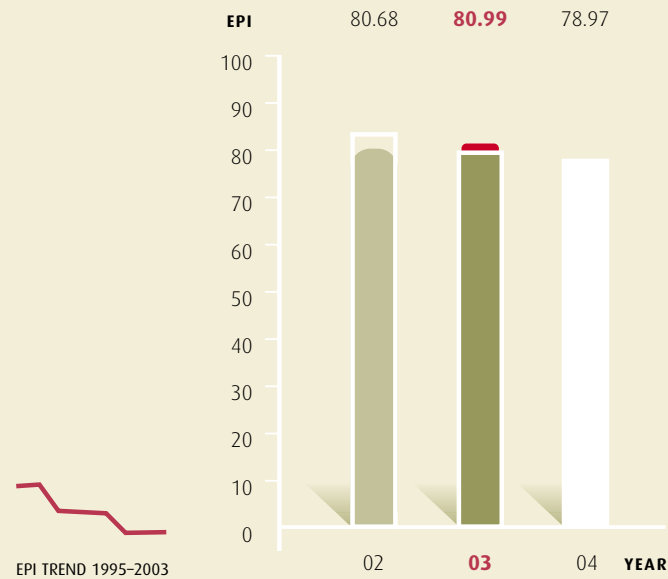
↑ **Dairygold Co-op Society**

At Dairygold we believe that the key to energy management and in turn a reduction in fuel consumption is to gain accurate data in relation to fuel usage. Variation in the production of our product range impacted on our EPI target for 2003.

Over the past twelve months we have invested both time and money developing our Energy Monitoring System, which monitors gas, electricity and steam. Our future aim is to be able to calculate energy usage by plant/production area.

Investment in Energy saving projects continues with the installation of of visual-display unit's wherever possible, to make the operation more efficient and more reliable.

We have introduced a policy of replacing high-energy use motors with more energy efficient ones wherever possible when replacement is required. Although our EPI target was not achieved we will continue to strive to reach our target into the future.



↓ **Dawn Meats, Ballyhaunis**

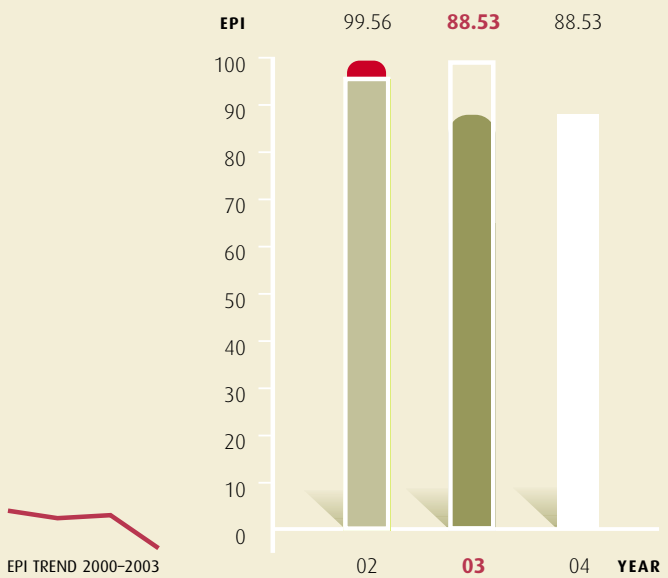
Factors influencing 2003 results

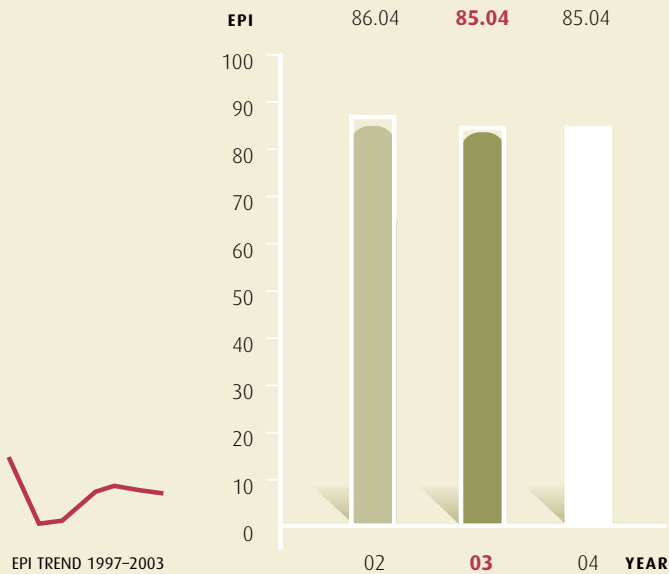
- Production output was 20% higher than forecast
- However, energy consumption increased by only 5.9%
- The significant improvement in our EPI was primarily due to:
 - Ongoing investment in on-site energy-saving projects
 - Our staff members' commitment to energy monitoring and energy conservation practices
- Energy-saving initiatives undertaken included the implementation of projects designed to reduce heating requirements. This involved the introduction of various steam replacement and heat recovery measures as well as the installation of a system which allows us to regulate the boiler to suit varying production demands.

Future plans

We plan to achieve additional energy efficiencies in 2004 and future years by:

- Investing in energy-management technology
- Further improving our processing efficiency
- The ongoing commitment of staff to energy conservation.





↓ Diageo Ireland, St James's Gate

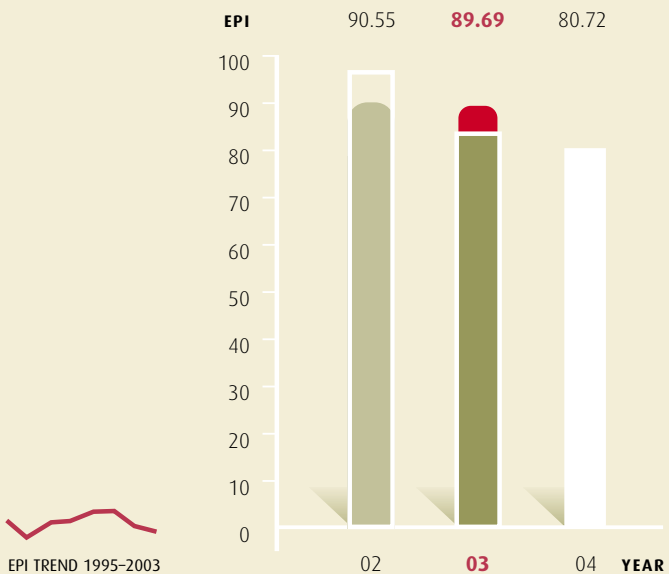
Factors influencing 2003 results

- The improvement in our EPI is largely attributable to our success in achieving better energy conversion efficiencies.
- Among the energy-saving projects implemented during 2003 was a major overhaul of all three CHP plant turbines.
- Production output levels at the site remained stable.
- During 2003, the brewery underwent a major restructuring and rationalisation programme, which included the outsourcing of all on-site utility services to a management services company.

Future plans

Based on the success achieved in 2003, we plan to sustain a similar level of improvement in our EPI for 2004.

The brewery is now well placed to seek additional production volumes for the site. In the future, economies of scale will be as important as energy efficiency initiatives, in achieving further EPI improvements.



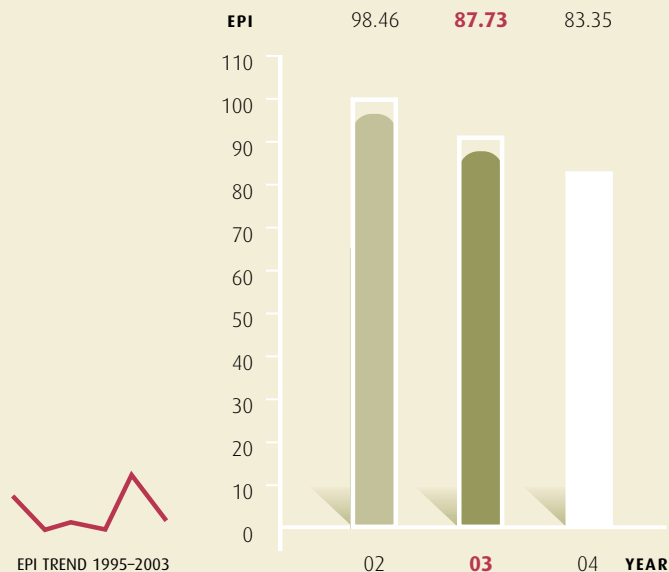
↑ Dublin Airport Authority

Factors influencing 2003 results

- Electricity consumption was higher than anticipated due to increased demand from sources including the air-conditioning system in the passenger terminal areas, the new extension in the Air Traffic Control building, and new kitchen and restaurant facilities in the new food court and Passenger Terminal.
- Our third CHP unit did not come into operation until April 2003.

Future plans

- Continued operation of CHP units, subject to electricity and natural gas tariffs and we plan to improve our utilisation of heat from these units.
- We plan to improve operational control of our Building Management System.
- Other energy conservation projects planned for 2004 include further upgrading of our monitoring and targeting systems and the installation of additional lighting controls.



↓ Dundalk Brewery

Factors influencing 2003 results

- Trials with new products, and lower than expected production output affected our results negatively. During 2003 Diageo outsourced its utilities operation to a specialist company – RWE Solutions; the utilities plant accounts for 45% of our electrical and all of our gas consumption. A number of investments have already been made in plant improvements.
- We are moving to self-sufficiency in CO₂, by recovering this gas from the process. This increases site energy usage but avoids transporting liquid CO₂ from the UK to Dundalk.

Future plans

The new arrangement with RWES provides a framework for continuous improvement of energy efficiency, with the rewards being shared by RWES and Diageo.

↑ Elan Pharma

Factors influencing 2003 results

- Energy consumption rose by 25.7% due to:
 - Increased demand created by the construction of a new facility
 - Increased energy demand created by lighting, heating and air-handling facilities in the new 180,000 sq ft building.

Future plans

- Although production volumes are expected to rise by 10% during 2004, we aim to achieve a 5% reduction in energy consumption.
- We plan to implement a number of the recommendations made on foot of the recent energy audit, carried out to comply with IPPC requirements. These energy-reduction projects will be in place by end-2004.
- Awareness campaigns will be an important element in our ongoing focus on energy efficiency.

↓ Element Six

Factors influencing 2003 results

- Our product mix changed significantly during 2003
- The achievement of a 28% improvement (14.14 points) in our EPI was largely due to:
 - Improved methods of production
 - Delivering greater flexibility in operating conditions
 - Optimising machine capacity
- The overall result was a production increase of 45%, for an increase in energy consumption of only 3%.

Future plans

- Further product mix changes and increased production output are indicated for 2004. As a result, we are forecasting a 7% increase in energy consumption.
- As outlined in last year's annual report, we plan to continue seeking further improvements in our EPI by carrying out a major upgrade of our production plant. This upgrading programme will be ongoing for several years.
- An energy 'awareness and control' campaign is in the planning stages.

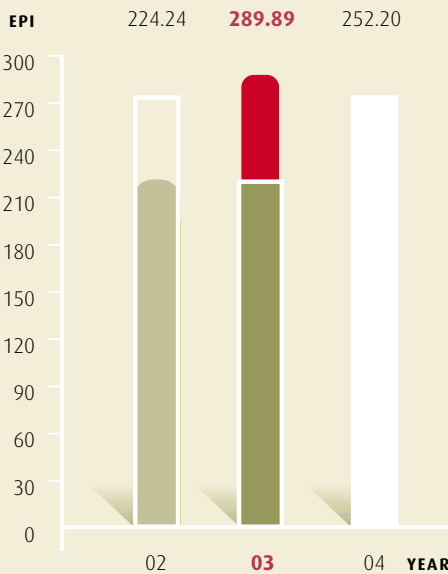
↑ Eli Lilly S.A. – Irish Branch

Factors influencing 2003 results

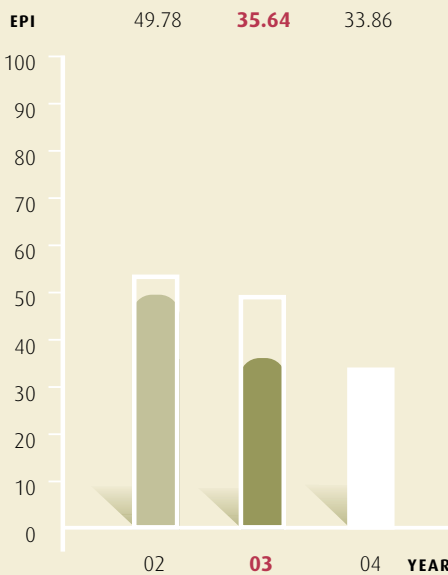
- Steam usage was lower than expected due to:
 - A decrease in solvent recovery activity
 - Later than expected occupancy of the new Administration /Laboratory building
 - Lower-than-forecast production output
- LPG usage was also lower than anticipated
- Cessation of a large-volume, energy-intensive product line improved our overall energy performance.
- On-site construction activity threatened to increase our EPI but was countered by the above positive influences.
- The operation of high-efficiency equipment and front-end metering on all major equipment helped greatly in the monitoring of on-site energy usage and energy trends.

Future plans

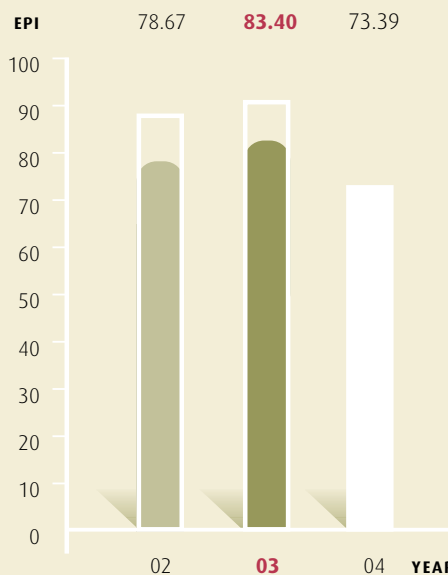
We envisage a 6-10% improvement in our EPI performance in 2004 when the new production facilities will be operated at almost full capacity.



EPI TREND 1995-2003



EPI TREND 1997-2003



EPI TREND 1995-2003

↓ Fruitfield Foods Ltd

Factors influencing 2003 results

The major improvement in our EPI was due to the installation of two additional water cooling towers, and a focus on good housekeeping practices.

Future plans

Following a comprehensive energy audit in early 2004, we aim to achieve a 10% reduction in electricity consumption, and a 15% reduction in natural gas usage in 2004 through good housekeeping practices and through the application of best practice technologies.

We are currently reviewing plans to install an M&T system, which would deliver details of our energy-to-output ratio on a weekly basis: this data could also be used to increase staff awareness of on-site energy costs.

Other energy conservation projects currently under consideration include improved time scheduling via our BEMS; reductions in compressed air usage; installation of variable-speed drives; improvements in lighting control, and reduction of steam boiler losses.

↑ Glanbia Plc, Ballyragget

Factors influencing 2003 results

Improvements in energy management practices, and the promotion of greater awareness among our staff of the need to drive down on-site energy consumption, continued to be a particular focus for the company's management team – not least because energy consumption is increasingly a key component of our cost base.

Against this background, unit energy consumption was marginally up (0.09%) on last year despite a significant increase in more energy intensive products. CHP plant output was also down because of a scheduled major overhaul and the high price of gas during the winter months.

Future plans

We plan to implement a number of the recommendations made on foot of the energy audit carried out in 2003 as part of our participation in the SEI negotiated agreements pilot project. Among the energy-reduction projects earmarked for implementation in 2004 are the insulation of service pipes and the installation of flowmeters on the compressed air system. Both measures should deliver considerable savings.

↑ Glanbia Plc, Inch

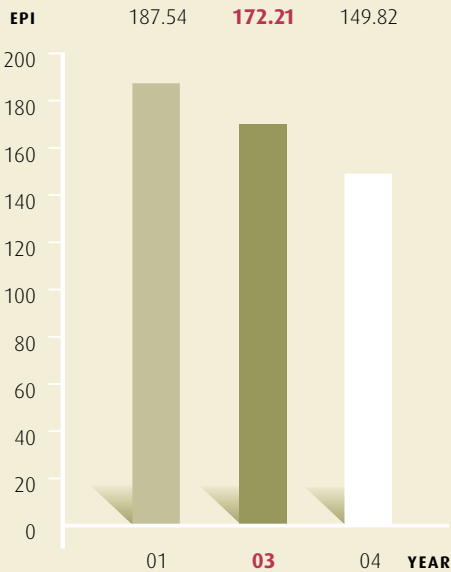
Factors influencing 2003 results

- Because of customer service requirements, we have had to increase the number and frequency of production-run changes, leading in turn to an increase in line changeovers. This impacts negatively on our EPI.
- Our demand for steam fell due to outsourcing one of our product lines.

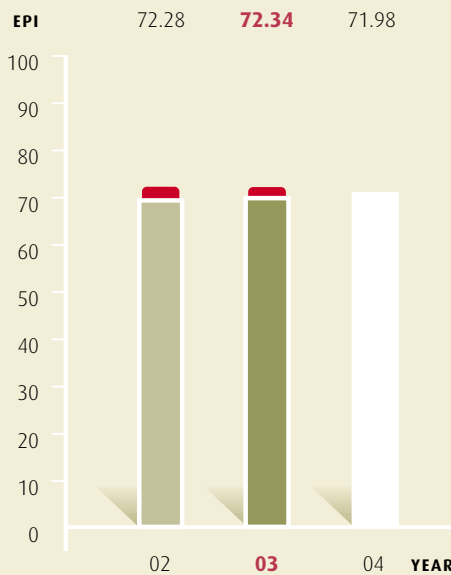
Future plans

During 2004, we will:

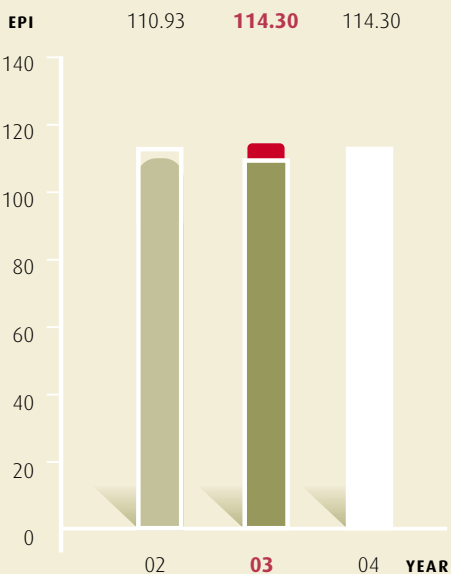
- Continue to eliminate or outsource non-value-added activities wherever possible
- Implement water conservation projects – an area where we believe significant savings could be made in both water and energy consumption
- Improve our planned maintenance programme in order to maintain an internationally competitive cost base



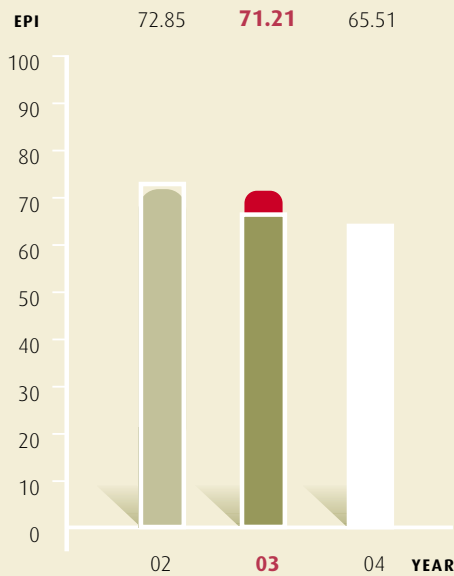
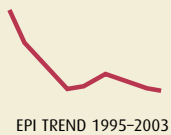
EPI TREND 2000-2003



EPI TREND 1995-2003



EPI TREND 1995-2003



↑ Glanbia Meats, Roscrea

Factors influencing 2003 results

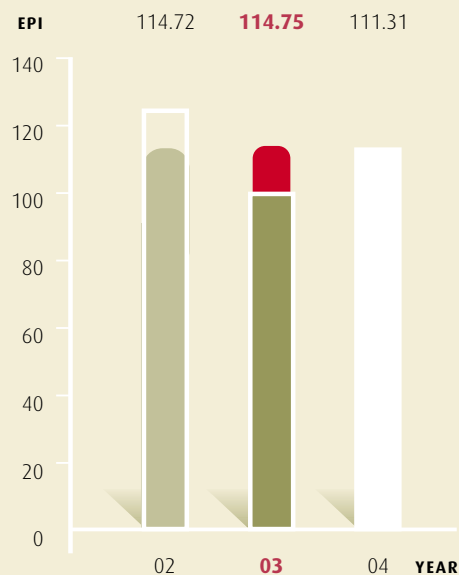
The improvement in our EPI was due to:

- An increase in production throughput, with a smaller percentage increase in energy usage

Future plans

- We expect electricity consumption to rise as a result of
 - A further increase in throughput
 - Introduction of a new blast freezer, requiring lower production room temperatures

Although energy consumption will rise by 5%, our EPI will only deteriorate by 1%. Energy efficiency projects will include heat recovery from our refrigeration condensers and singeing stack.



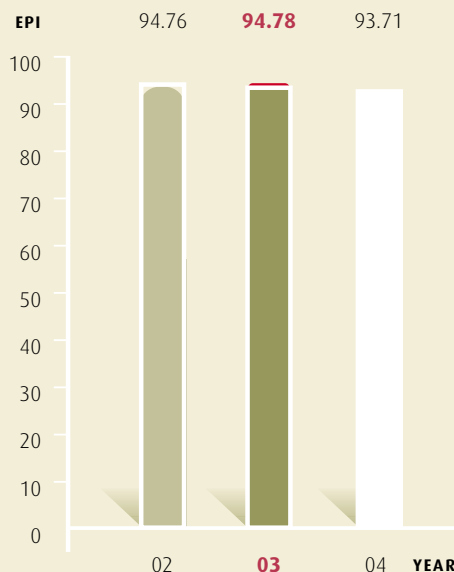
↑ Glanbia Meats, Ruskey

Factors influencing 2003 results

- Energy usage dropped by 66% in 2003 due to a complete cessation in slaughtering activity following a fire at the plant in May 2002.
- Energy reduction continued to be a prime focus for our staff, with comprehensive reviews of potential energy-saving opportunities carried out on a weekly basis.

Future plans

- Energy Consumption will be approx. 6% lower than 2003 levels which is allowing for:
 - The fact that the full impact of the upgrade to be carried out in our meat intake area will not be felt until Q4, 2004.
 - Production output in 2004 is expected to be approx. 3% lower than 2003.



↑ Glanbia Ingredients, Virginia

Factors influencing 2003 results

Our success in achieving a slight improvement in our EPI for 2003 is due to our programme of continuous improvement in energy management and energy conservation across the site.

Future plans

Our programme for 2004 includes a plan to implement a number of the recommendations made on foot of the recent energy audit on our boiler services, which was carried out by independent specialists. As a result of implementing these recommendations, it should be possible to achieve an initial reduction of 0.5% in overall energy usage as well as a significant reduction in energy consumption per unit of production output. Our inclusion in the EU Emissions Trading Scheme emphasises the need for sustainable use of energy resources.

↓ GlaxoSmithKline, Cork

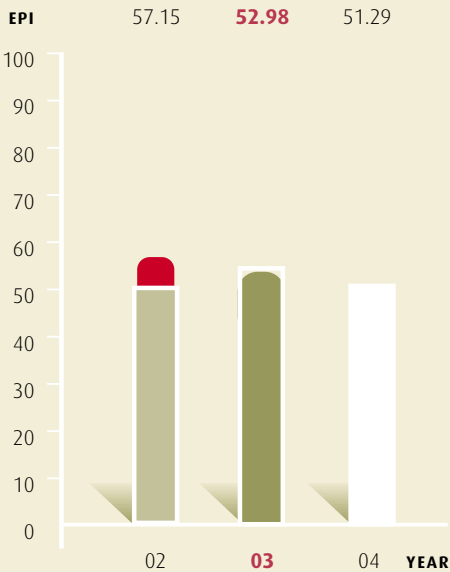
Factors influencing 2003 results

A 7.28% improvement in our EPI was due to:

- Close energy monitoring and targeting of all utilities
- Regular energy audits of all on-site utilities
- Lower than expected electricity consumption arising from delays in starting an expansion of our offices and production facilities rephrasing of some capital projects.
- Shutdown of the site's thermal oxidiser – a project with a payback of only 0.4 years.
- Reduced incinerator gas consumption as a result of improved segregation of waste streams by calorific value.

Future plans

- Production output is expected to decrease by 20% in 2004, leading to reduced overall energy efficiency.
- Energy consumption is expected to fall by 2.8% following the decommissioning of the thermal oxidiser in 2003.
- New projects planned include the installation of a boiler economiser, auto-lighting upgrade, air & nitrogen surveys and high efficiency motors, which will further reduce gas consumption.



↓ GlaxoSmithKline, Dungarvan

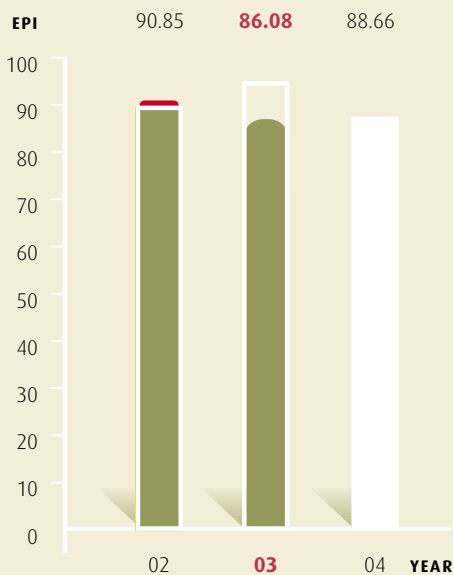
Factors influencing 2003 results

Our improved EPI arose from:

- Timely and effective commissioning of construction projects incorporating energy-efficient building designs
- Continual attention to energy conservation through monthly staff awareness programmes, monthly self-audits etc.
- However, energy consumption rose by 8%. This was due to:
 - A 7.2% rise in production output at the plant
 - High electricity usage generated by the AHU's, lighting and other equipment in the new laboratory area
- The introduction of new production processes.

Future plans

Further improvements in on-site energy utilisation will be achieved by installing a new chiller incorporating the most up-to-date energy-efficient technology. A number of boiler upgrade projects will improve stability and energy efficiency. We also plan to install a PIR system to improve lighting efficiency across the site.



↑ Gypsum Industries Ltd

Factors influencing 2003 results

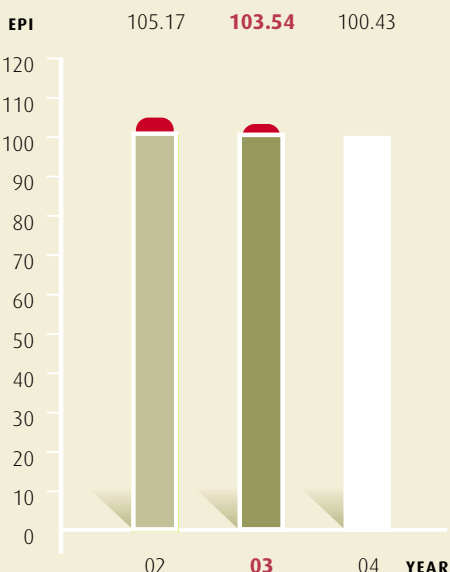
Our improved EPI for 2003 was achieved through a sustained focus on energy management, and more specifically through:

- Reductions in major electrical equipment energy consumption
- Optimising process control
- Minimising waste, and recycling wherever possible

Although energy usage increased because of increased production throughput, the above actions more than compensated for this, and resulted in an improvement in our energy productivity.

Future plans

- We are aiming for a 3% improvement in our EPI, despite a projected 7% possible increase in energy usage arising from further increases in production volume
- Our main focus during 2004 will be on projects to reduce gas consumption.



↓ **Hewlett-Packard (Manufacturing) Ltd**

Factors influencing 2003 results

Overall energy consumption rose by 5%. This was due a combination of factors including:

- A 2% increase in general services loads which followed the hiring of 100 additional staff in our Financial Services office.
- A 5% increase in air-conditioning loads. This was due to two factors – warmer weather conditions during 2003, and the creation of additional workspace for the 100 new staff members.
- A 12% increase in compressed air loads, following the failure of the compressor sequence controller.
- New equipment and processes, and the introduction of a new paper finishing operation on the site, the output of which has not yet been incorporated into our EPI calculations.

Future plans

- We envisage implementation of a number of projects identified in the audit carried out as part of SEI's pilot project on negotiated agreements
- A priority is to reinstate automatic compressor sequencing
- Our Energy Management Team will continue their focus on day-to-day policing of energy use.

↓ **HJ Heinz**

Factors influencing 2003 results

- Hard work by team members across the site helped in achieving impressive gains in line running efficiency.
- A number of energy-saving projects were implemented, including installation of spray balls in vessels and improvements to the sanitation ring main.
- A 23% reduction in our production output, coupled with a high base load for electricity, caused significant pressures on our EPI.

Future plans

During 2004, a planned change in production mix is expected to lead to significant improvements in gas consumption efficiency.

↓ **Honeywell Turbo Technologies**

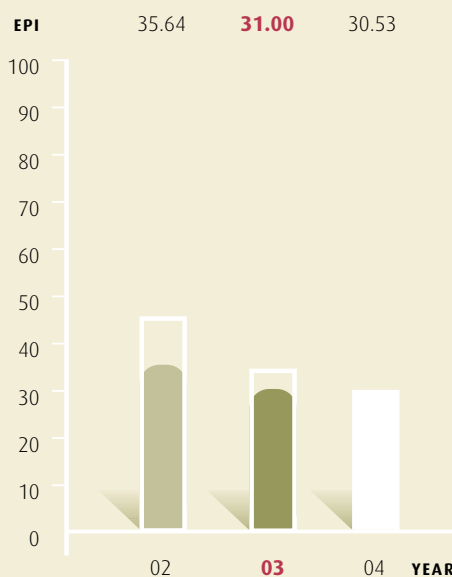
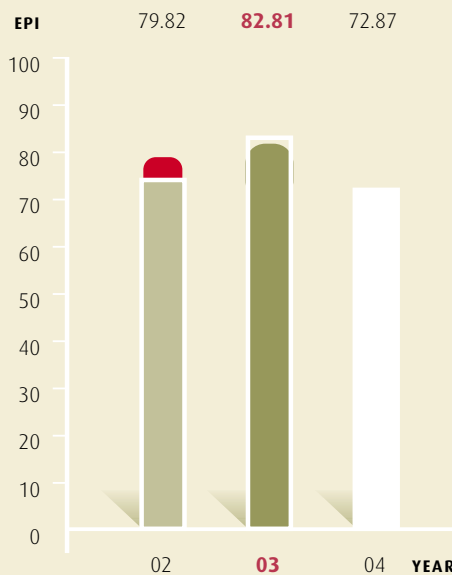
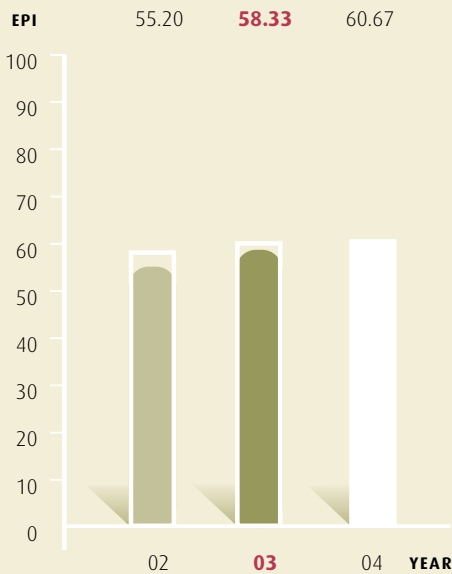
Factors influencing 2003 results

Removal of a pre-heat oven was the main reason for a 6% reduction in energy usage on site.

Future plans

As production continues to increase, we aim to counteract the negative impact of increased throughput by:

- Further improving the performance of our existing plant and equipment
- Increasing the rate of automation expansion across all business units
- Refining specifications for all new equipment in order to minimise energy consumption



↑ IBM International Holdings

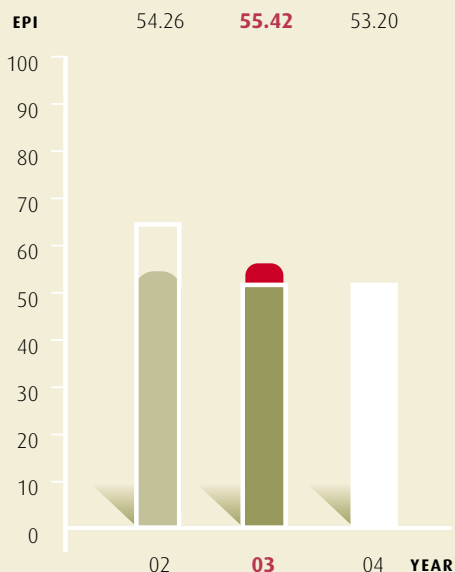
Factors influencing 2003 results

- A large level of on-site construction activity, coupled with an increase in production output in one of our business units, meant that our energy usage increased by 0.7% compared with a target of a 4% reduction.
- Energy conservation projects implemented during 2003 included the optimisation of air-handling units and fan coil units, which are now programmed to shut down when they are not required. We also carried out upgrading work on our air dryers. These helped in preventing our EPI from deteriorating more than it did.

Future plans

During 2004 our Energy Team will continue to focus on improving energy efficiency – highlighting and implementing energy conservation programmes as well as ‘avoidance’ projects at the design stage.

IBM has set a target of 4% reduction in energy use in 2004.



EPI TREND 1999-2003

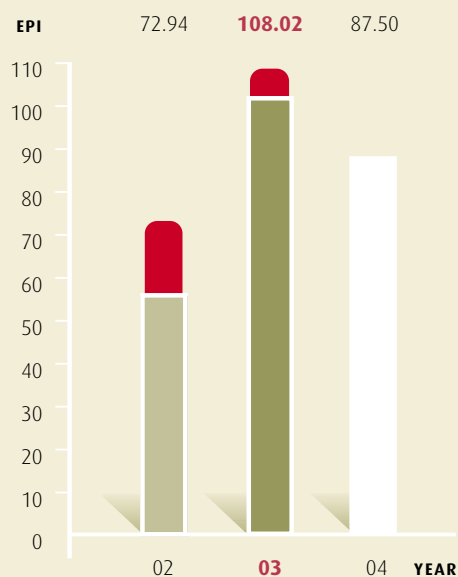
↑ Intel Ireland Ltd

Factors influencing 2003 results

- We implemented a number of energy-saving initiatives during 2003. These included:
 - Fitting servo-controlled burners on the boilers in Fab 10
 - Optimising controls on 46 AHUs
 - Reduction in site water demand by recycling ultra-pure water and by implementing operational changes in the cooling towers.
- The energy used in commissioning FAB 24, without any production output, impacted negatively on our EPI. As output from FAB 24 ramps up, this negative factor should be removed.

Future plans

Increases in wafer output from FAB 10, 14 and 24 will lead to increased energy demand. However, production of larger (300mm) wafers in FAB 24 will contribute to an EPI improvement.



EPI TREND 1995-2003

↓ Irish Shell Ltd

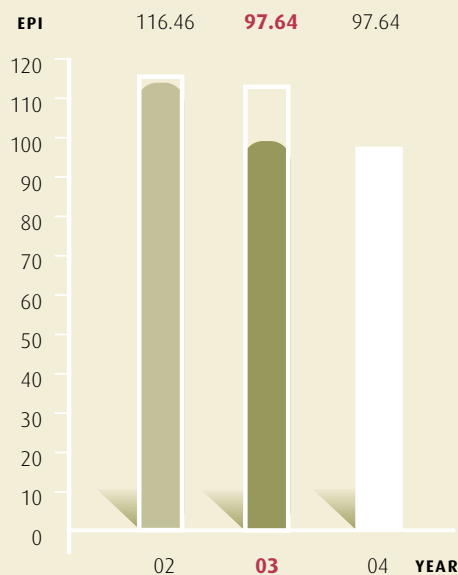
Factors influencing 2003 results

Active streamlining of our heavy, medium and light fuel oil storage facilities have decreased our overall fuel oil consumption.

While the ongoing operation of our vapour recovery unit for environmental reasons has contributed to additional electricity consumption in 2003, installation of two 75kW derv-loading pumps with variable speed drives at our white oils site has helped contain electricity consumption. These pumps have allowed us to increase our overall loading capacity.

Future plans

A number of possible energy-efficiency projects are currently under consideration



EPI TREND 1995-2003

↓ Irish Sugar Ltd

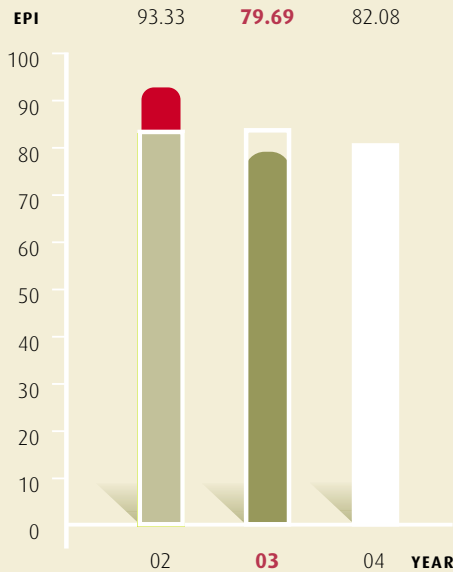
Factors influencing 2003 results

The large improvement in our EPI was due to:

- Record low levels of energy usage per unit of production output.
- Good operations management.
- Minimum interruptions to plant operation, partly as a result of almost perfect harvest conditions and good plant reliability.
- Reduced co-product production.
- Use of recovered biogas from our on-site anaerobic digester.

Future plans

It will be challenging to repeat last year's success, however, we are reasonably confident that energy consumption will not rise more than 3% above the 2003 result. Co-product production is expected to return to normal.



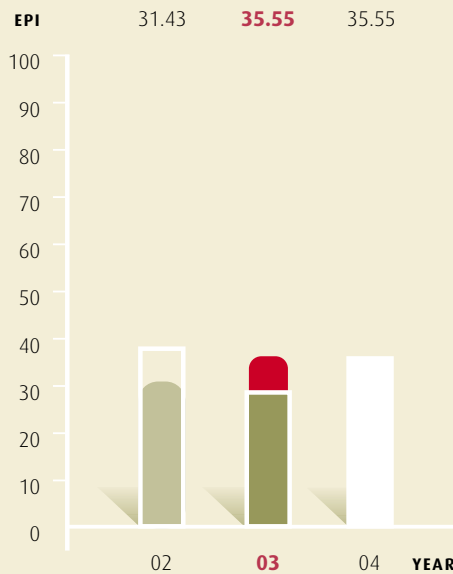
↑ Janssen Pharmaceutical Ltd

Factors influencing 2003 results

Site CO₂ reductions associated with natural gas, electricity and diesel usage were achieved in 2003 through a programme of specific projects, including 83% implementation of the Johnson & Johnson Energy Enhanced Best Practices (e.g. Green Lights, Building Tune-up, Management Practices) against a target of 80%. Energy avoidances were achieved based on compressed air optimisation, technical services building air conditioning and Plant 2 utility hot water tank lagging projects. A cross functional Facilities Energy Management team is used to develop and implement the site energy management programme including publishing energy newsletters and energy reports to improve energy awareness.

Future plans

- Our main focus will be on incorporating energy-saving features in the design and construction of the new plant.
- We have adopted the Johnson & Johnson 'Next Generation Goals' (NGGs) for environmental protection. These goals include maintenance of our 'Beyond Compliance' policy.



↓ Klinge Pharma

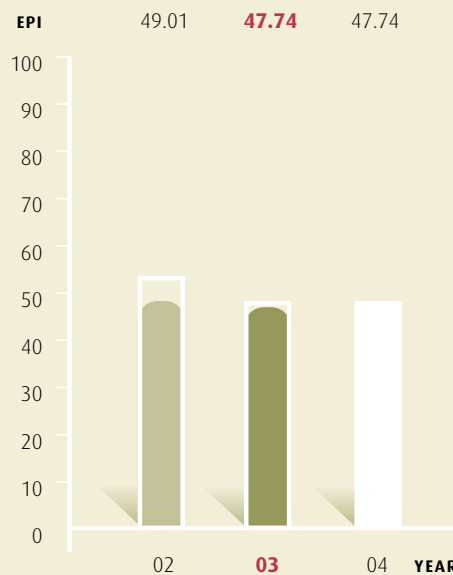
Factors influencing 2003 results

- The achievement of a slight improvement in our EPI is due to our policy of constantly seeking to improve energy efficiencies across the plant.
- Energy consumption was in line with our agreed targets for 2003.

Future plans

Against a background where plans are already in place for the formalisation of an Energy Management System through the adoption and implementation of a Responsible Care Energy Management Code, we are confident that it will be possible to achieve further improvements to our EPI in 2004 and beyond.

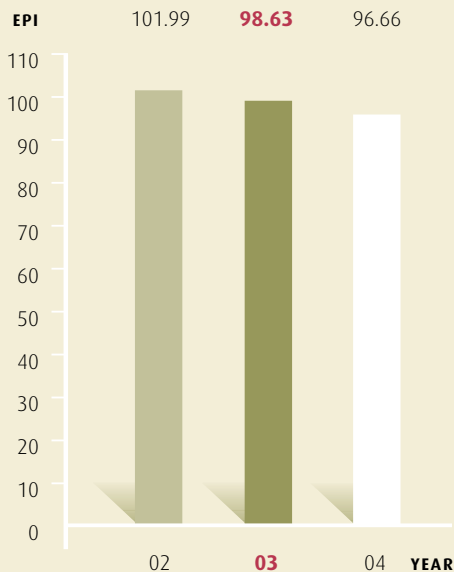
Energy consumption is set to increase by 8% in 2004 as a result of a change to more energy-intensive product lines.



EPI TREND 1996-2003

EPI TREND 1995-2003

EPI TREND 1995-2003



Kostal Ireland GmbH

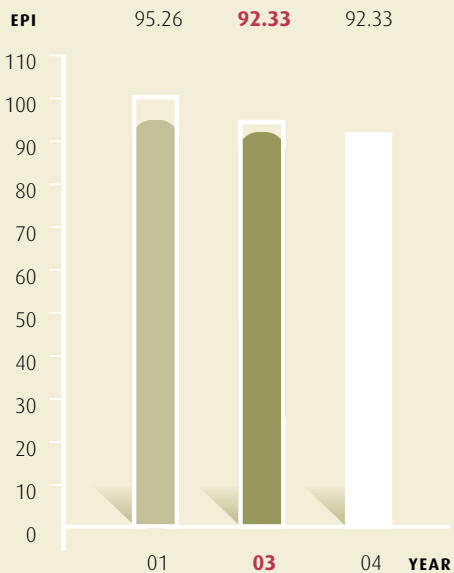
Factors influencing 2003 results

Both the 2001 and 2002 submission from Kostal Ireland drew attention to the unsuitability of the "units produced" method of reporting production output. In 2003 we have changed to a system of measuring "standard hours produced" and we are now using the year 2001 as our new base year.

Future plans

We are continuing with our programme of replacing Surface Mount Technology placement equipment with more energy efficient machines. We also expect a reduction in the number of our products using wave-soldering technology. Both of these factors will help improve our EPI index over the next number of years.

↓ Lakeland Dairies, Bailieboro



Factors influencing 2003 results

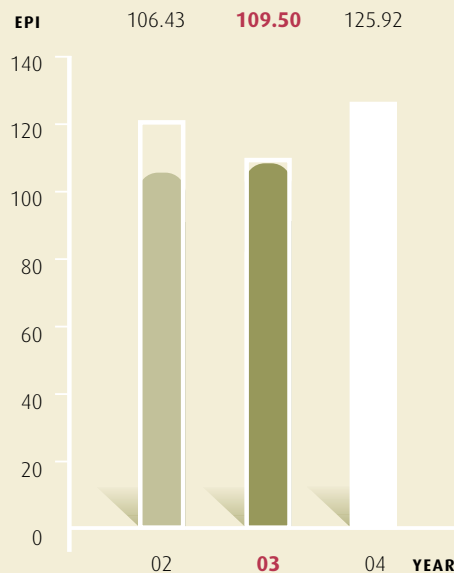
As in previous years, during 2003 we continued to review opportunities for the improvement of energy efficiency in areas such as utility systems and process control.

- 2003 saw a major expansion in butter production on the site. As a result of centralising all butter production in our Bailieboro plant, our production run time has increased, thus creating significant energy efficiencies. This is despite the increase in electricity demand caused by increased on-site cold storage and compressed air requirements.

Future plans

- We will continue to seek further opportunities for improved energy efficiencies in our processes and in our utility systems.
- We are currently monitoring usage very carefully, with a view to the possible introduction of CHP.

↓ LEO Pharma



Factors influencing 2003 results

- Energy usage decreased by 2% due to two factors:
 - Better than expected performance of the new boiler control system.
 - The re-routing of all steam pipework from underground to above ground in order to deliver more cost-efficient maintenance and repairs (with the discovery and repair in 2003 of a number of underground steam leaks).
- Despite increased energy demands from the recently installed clean store, (which for process reasons must be kept at > 27°C), we managed to minimise energy consumption by installing industrial freezer-grade insulation panels, passive infra-red (PIR) motion detector light switches and high-efficiency lighting.

Future plans

We expect our EPI to disimprove in 2004, as we will be beginning to phase out a number of products but we will continue to maintain the Good Manufacturing Practices (GMP) standards in these areas of the plant.

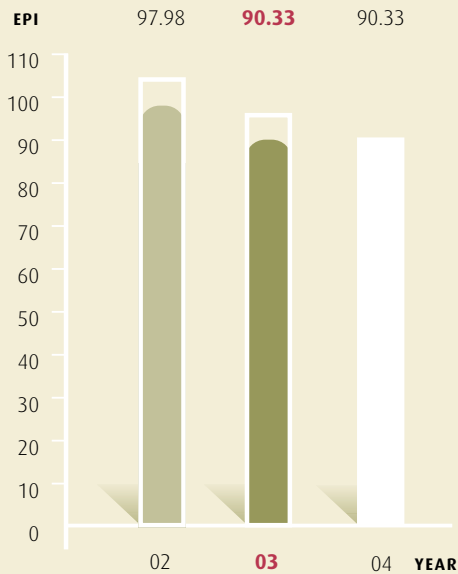
↓ Lisheen Mine

Factors influencing 2003 results:

- The quantity of lead and zinc produced at the mine rose by more than 12%
- Benefits obtained from the implementation of many energy saving initiatives and the continuous monitoring and awareness programmes overseen by our Energy Management Team.

Future plans

- Production for 2004 is expected to be similar to 2003, but as the underground mine expands and new underground areas are developed, this creates a greater demand for extra ventilation and pumping as well as lighting and other services.
- Despite these extra demands our target is to push hard and maintain our EPI for 2004 by further focusing on achievable savings.
- During the latter part of 2004 a backfill plant will be commissioned, resulting in additional power consumption.



↓ Masonite Ireland

Factors influencing 2003 results:

Whilst production output increased by 2.2% in 2003 the Company managed to reduce primary energy usage by 8.4%. Electricity accounts for more than 85% of energy cost, and this was a main focus in 2003.

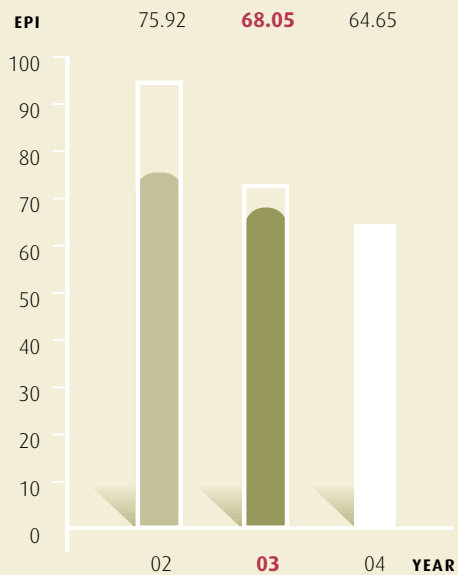
- The most significant energy reduction success of the year was achieved by transitioning to a new design of wood refiner plates on the main production lines. The technical and operational teams have as a result achieved major electrical efficiency improvements at the same time as improving product quality.
- Other energy saving initiatives that contributed to production efficiency gains included:
 - Modified compressor sequencing
 - Fitting variable speed drives on two large air fans

Future plans

Significant capital is to be spent on energy projects in 2004.

These projects will include:

- Upgrading our Monitoring & Targeting system
- Installing two large variable speed drives
- Implementing an energy efficient lighting scheme.



↑ Merck Sharp & Dohme (Ireland) Ltd

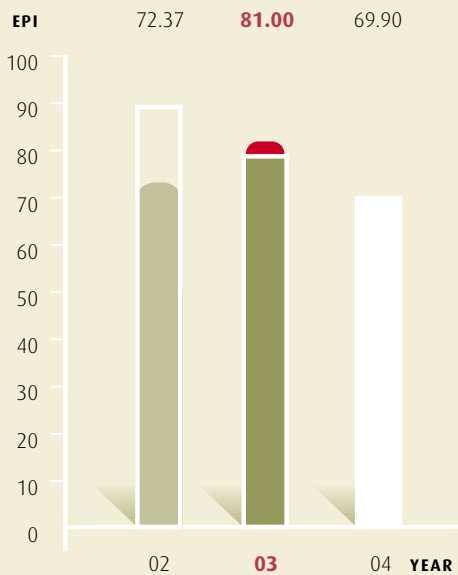
Factors influencing 2003 results

In addition to a variance in the product mix during 2003, the improvement in our EPI is due to:

- Implementation of a number of energy-saving projects in areas such as compressed air generation, lighting, and steam distribution
- Taking high energy-consuming equipment off-line when not required for production processing purposes
- Replacing a river water pump with an energy-efficient submersible model
- Fitting fixed motors with variable-speed drives on the glycol supply tank.

Future plans

Our site objective is a reduction in energy spend of 3.5% of the 'business as usual' 2004 spend. We envisage a 13.7% improvement in our EPI for 2004. Our main focus will be on condensate recovery and refrigeration optimisation.



↑ Micro-Bio Ireland Ltd, Fermoy

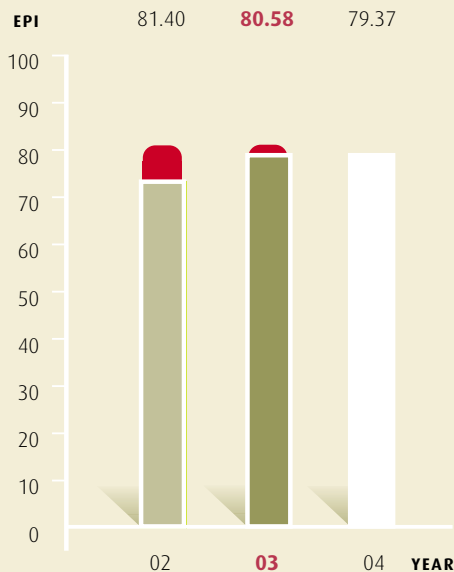
Factors influencing 2003 results

We implemented a number of the energy-saving recommendations made on foot of the energy audit carried out by independent specialists in January 2003. This included installing a chlorine decomposer, which was designed to harness steam from the brine process.

- The conversion of a 4kW boiler from gas oil to natural gas was completed in September. This initiative yielded some savings in Q4 2003, and it will continue to deliver substantial energy savings in 2004 and beyond.
- Although we had forecast a 1.8% increase in energy consumption for 2003, we managed to reduce energy consumption by 0.3%.
- Specific factors that militated against a more improved EPI included a lower than expected volume of production output

Future plans

A number of possible energy-efficiency projects are currently under consideration.



EPI TREND 1996-2003

↑ NEC Semiconductors Ireland Ltd

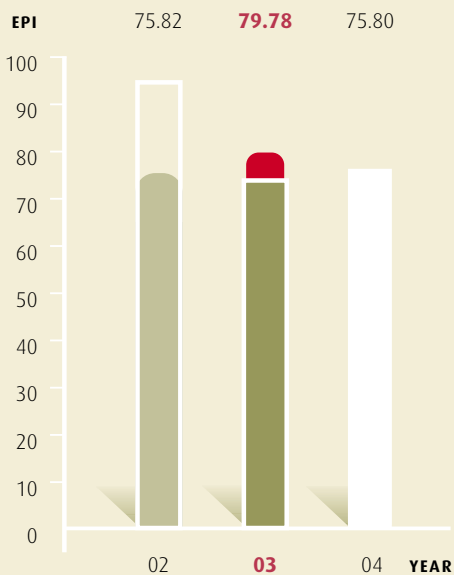
Factors influencing 2003 results

Our EPI value has increased this year as a result of extra m/c's being installed. These m/c's have been installed for a forecasted increase in output over the next 2-3 years. The main features of our 2003 programme included:

- Running staff awareness campaigns to promote the importance of resource-conservation and energy-saving practices
- Investigating and costing the installation of variable speed drives on machines e.g. plating machines
- Introducing cold air humidification
- Investigating the possibility of using local humidification in order to reduce energy loads.

Future plans:

Though we expect our energy consumption to increase, we aim to achieve a 5% EPI improvement for 2004, mainly through the full operation of these new machines which will increase production and energy efficiencies. The new equipment will include a plating machine, bonders and testers.



EPI TREND 1995-2003

↓ Novartis Ringaskiddy Ltd

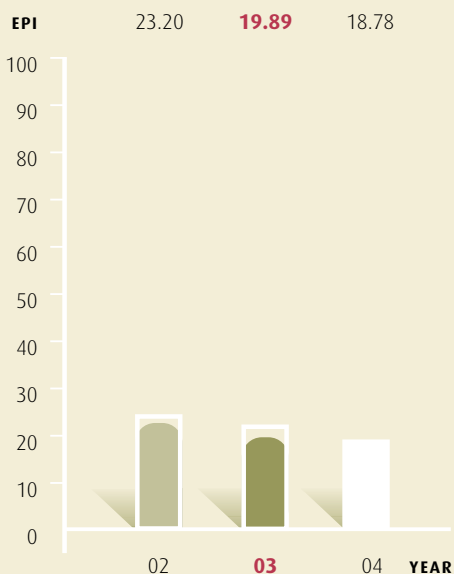
Factors influencing 2003 results

- The further improvement in our EPI is largely due to changing production volume and significant capital investment in energy-saving initiatives. Projects carried out during 2003 included changes to condensate return hydraulic pumping and boiler blowdown water systems. Energy initiatives resulted in a CO₂ reduction of over 1,000 tonnes/a.
- During 2003, we launched our new Energy Information Centre, which delivers data from on-site energy meters directly to the PCs of our Energy Review Group members and to production personnel. The system enables rapid analysis of energy usage data, thus facilitating prompt corrective action where necessary.

Future plans

Although production output is expected to increase in 2004, we are targeting at least the same level of savings as in 2003. As a result, we expect to reduce energy consumption by 1%, despite the increase in production output.

The main focus of on-site energy conservation activity will be on further production process optimisation and efficiencies in our chilled water condensers.



EPI TREND 1995-2003

↓ Pfizer Ireland Pharmaceuticals, Little Island API

Factors influencing 2003 results

Against a background where production output increased by 12.5% in 2003, we managed to reduce energy usage by 5.8%. This was largely due to our integrated approach to energy management, which combines a number of measures ranging from actively encouraging energy reduction in all engineering projects to running staff awareness programmes to carrying out continuous improvements in our site operations. We have been equally as successful in applying the same approach to water conservation.

The main engineering improvements made in 2003 were the optimisation of energy consumption by our thermal oxidiser and the improvement of HVAC controls in our clean room.

Future plans

We plan to implement a number of energy-saving projects in 2004. These projects will be specifically aimed at achieving a reduction of 4% of total energy usage in 2003.

↓ Pfizer Ireland Pharmaceuticals, Loughbeg API

Factors influencing 2003 results

We have a policy of continuous investment in programmes that are specifically designed to reduce on-site energy costs as well as reduce the impact of our operations on the environment.

During 2003, total energy use decreased by more than 10% due to:

- Significant reductions in the generation of steam, chilled water and refrigeration fluid
- Improvements in project controls
- Careful selection, use and maintenance of equipment
- Greater awareness of the importance of resource conservation and energy-saving measures among on-site staff.

Future plans

We had hoped to meet our corporate target of a 5% annual reduction in energy usage in 2004. However, this may not be possible due to the high level of on-site construction activity that will be taking place in Q4 2004.

↓ Pfizer Ireland Pharmaceuticals, Ringaskiddy API

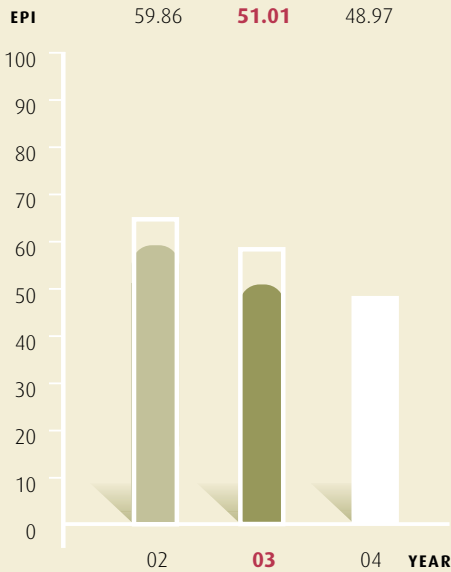
Factors influencing 2003 results

Energy consumption was 13.5% lower than forecast despite the ramping up of a new production facility. Among the factors underlying this were:

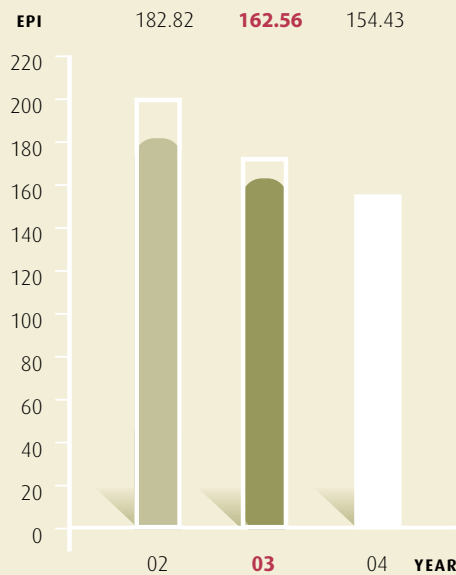
- Constant monitoring of on-site electricity consumption, using a computerised Monitoring and Targeting system, which was installed in 2003.
- Consistent delivery of energy management and resource conservation best practice by on-site staff (in 2003 the site achieved a 100% compliance score in a corporate audit of our energy management systems).

Future plans

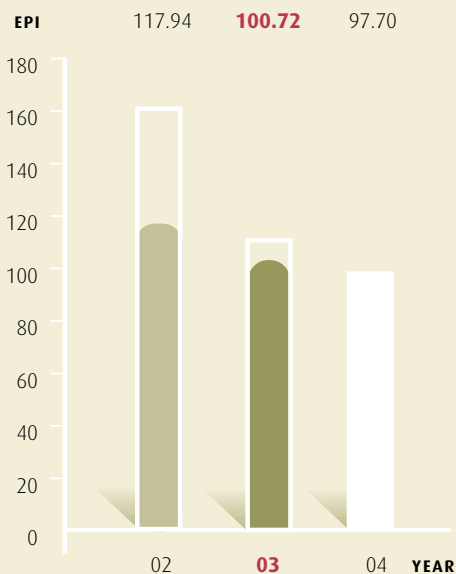
- Production output – largely of a new, energy-intensive product – will increase in 2004, leading to an expected 20% increase in energy consumption.
- In spite of this, we are planning to further improve our EPI through ongoing identification and implementation of energy-saving projects.



EPI TREND 2000-2003



EPI TREND 1996-2003



EPI TREND 1995-2003

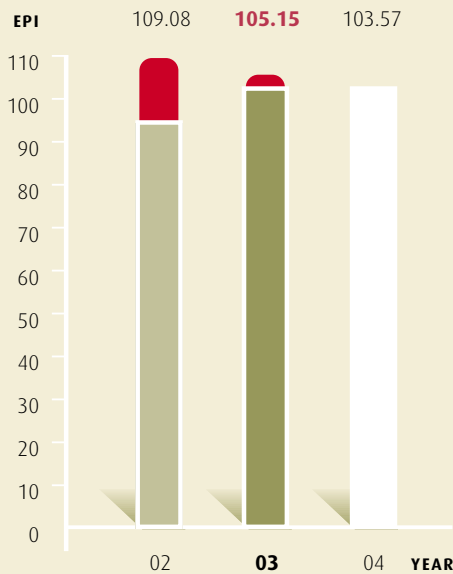
↑ Premier Periclase Ltd

Factors influencing 2003 results

- A further increase in sales of intermediate products from our production process has affected our EPI, and we have altered its method of calculation to take account of this change (intermediate products now account for some 8% of total output). We are also now taking account of stock changes when calculating our annual output.
- We have been able to switch from natural gas to petroleum coke as a result of further optimisation of coke usage in 2003.

Future plans

While energy consumption is expected to rise by 7% in 2004, higher plant throughputs should enable us to achieve improved energy efficiencies.



↑ Pure Fresh Dairies Ltd

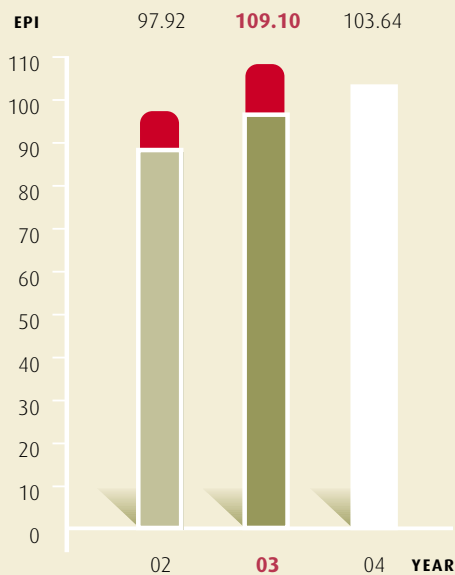
Factors influencing 2003 results

The disimprovement in our EPI was due to:

- Higher on-site electricity usage, which resulted from renting out part of our premises
- The installation of a second hand boiler with a higher capacity than is required, leading to increased oil usage.

Future plans

- Changing the production shift cycle from a six-day week to a five-day week will eliminate the heavy energy load required for production start-up on the sixth day, thus improving our EPI.
- We plan to install a new refrigeration system to improve onsite energy efficiency.



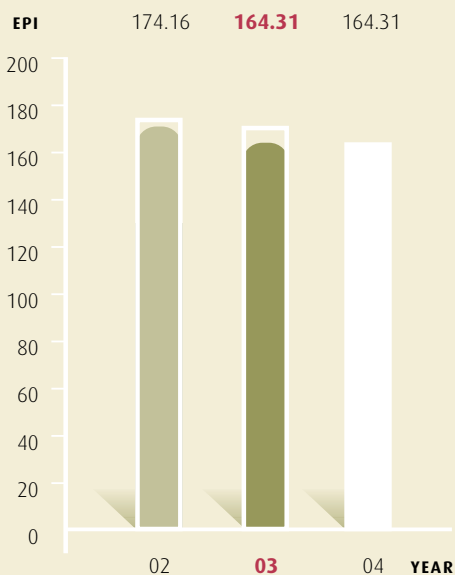
↓ Roche Ireland Ltd

Factors influencing 2003 results

- Our positive EPI result is largely due to a number of process improvement initiatives carried out during 2003.
- Overall energy usage dropped slightly, despite an increase in production output.
- We again achieved a significant improvement in our EPI.
- These improvements were largely driven by process improvement initiatives.

Future plans

- Roche Ireland gained access to the natural gas network in 2003, and a boiler and one other facility was converted from diesel to gas in late 2003. This will provide significant benefits in 2004 and beyond.
- While an increase in production output will lead to a rise in energy consumption, it will also deliver greater production efficiencies and energy savings, thus helping to further improve our EPI.
- Plans for 2004 include the installation of extensive energy-monitoring infrastructure, focusing on electricity, compressed air, nitrogen and refrigeration.



↓ **Saehan Media Ireland Ltd**

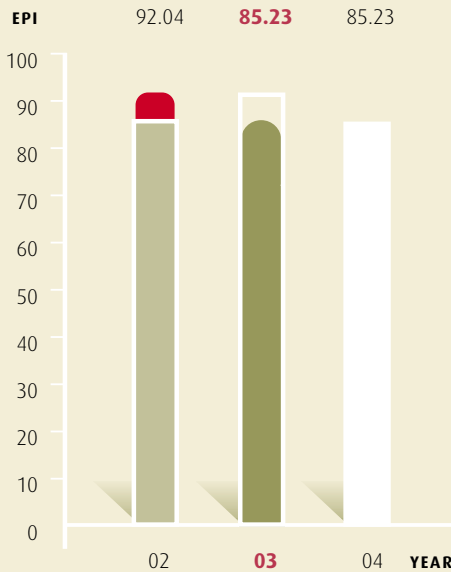
Factors influencing 2003 results

The main factor underlying the disimprovement in our EPI was worldwide drop in demand for video tape, which affected Saehan Media's Irish operations. Although our energy consumption fell by 8%, the drop in throughput led to a higher level of energy per unit output.

Future plans

Our energy usage is likely to fall by as much as 70% during 2004 and 2005, arising from an ongoing worldwide recession in video tape sales. With this as backdrop:

- We plan to take one of our steam boilers out of service and to decommission our solvent recovery plant
- In line with corporate policy, we will maintain our focus on energy saving projects, with new projects under way in 2004 and scheduled for 2005
- From 2005, we will focus our energy awareness programme on electricity savings, with the main emphasis on changes in operating practices.



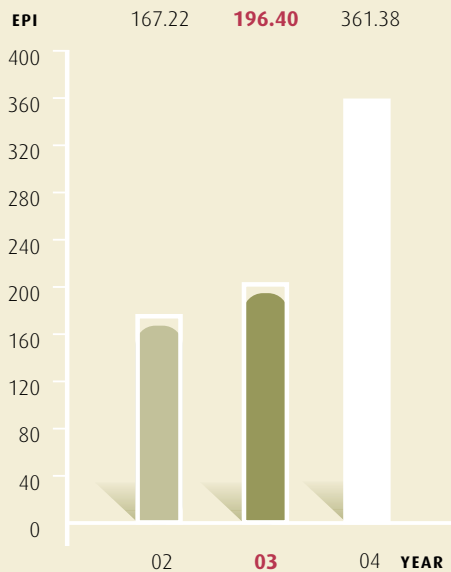
↓ **Schering-Plough (Avondale) Co.**

Factors influencing 2003 results

- Energy consumption fell by 9.3%, 3% due to a drop in production output.
- Two projects carried out in 2003 resulted in a 25-45% reduction in fuel usage in the thermal oxidiser plant:
 - A steam stripper was commissioned to strip volatile organic compounds (VOCs) from our waste water. These VOCs are now routed to the thermal oxidiser. This has resulted in a significant net energy saving.
 - Reduction of air volumes in the thermal oxidiser resulted in a 25% saving in unit energy consumption.

Future plans

The company has a large baseline energy load. A low percentage of overall load is directly related to production volume. Because of decreases in production volumes and the addition of new buildings/extensions, the EPI is forecast to rise significantly through-out 2004 and into 2005. It should fall again as new production activities come on stream.



↑ **Schering-Plough (Brinny) Co.**

Factors influencing 2003 results

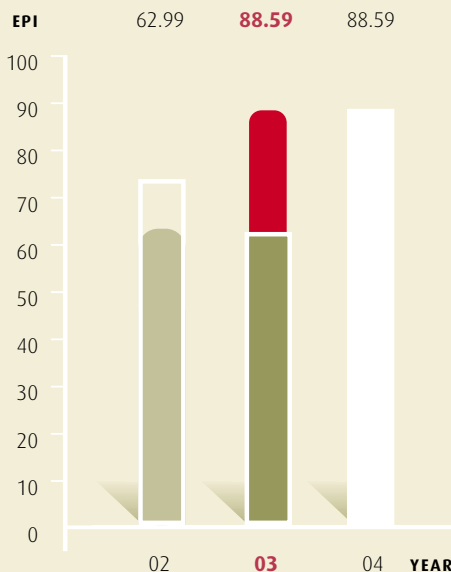
The deterioration in our EPI for 2003 was due to:

- A 26% decrease in total production output
- A 33% increase in the number of batches produced in the fermentation process, which is the most energy demanding of the process steps, and which contributed significantly to an overall 7.7% increase in energy usage.

The most significant energy-related project completed in 2003 was the installation of new compressors with an associated distribution system incorporating the most up-to-date energy-efficient technology.

Future plans

A sophisticated Energy Management System (EMS) will be fully commissioned by Spring 2004. This will enable us to implement a comprehensive Monitoring and Targeting programme. We also plan to implement a number of the recommendations made on foot of recent energy audits carried out on the site.



↑ SerCom Solutions

Factors influencing 2003 results

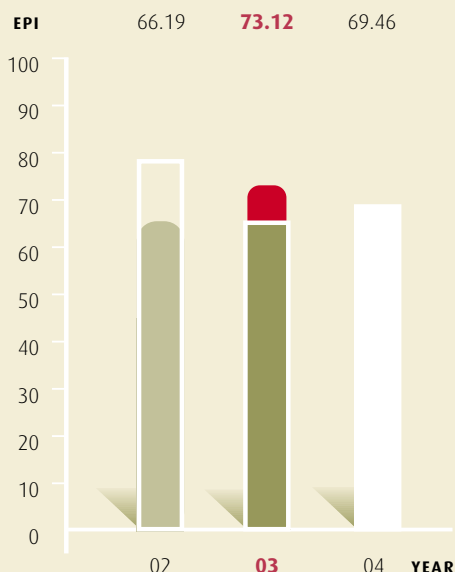
The deterioration in our EPI this year is largely attributable to changes in customer and product mix. However, site energy usage has continued to fall. Continuous monitoring of energy consumption, a vigorous long term staff awareness programme, and implementation of a number of energy-related projects have contributed to this ongoing reduction in energy usage.

Among the initiatives completed during 2003 were:

- Further installation of passive infra-red lighting, and other lighting improvements
- A new timing system for compressors and chillers
- Servicing of all space heaters
- Removal of gas-fired suspended heaters
- Staff training on energy efficiency

Future plans

We will continue to fine-tune our energy strategy, and we plan to implement a number of additional energy-saving initiatives in 2004.



↑ Smurfit Paper Mills Ltd

Factors influencing 2003 results

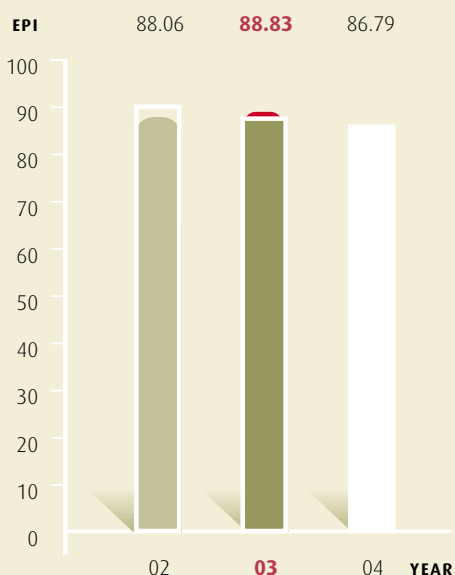
While our energy-to-output ratio deteriorated last year, this was greatly ameliorated by our on-going programme to improve energy efficiencies. During 2003, this included a major overhaul of the steam condensate system. Improvements in air temperature controls and machine time controls also paid dividends.

Specific factors that militated against an improved EPI included:

- Variations in the quality of our waste paper raw material, some of which required a greater use of process energy
- Lower efficiencies achieved for steam cycle usage.

Future plans

A higher energy-to-output ratio should be achievable in 2004, following further improvements to steam condensate controls. In addition, better drainage on the paper machine should lead to lower motor loadings, and a corresponding reduction in energy consumption.



↓ St Francis Abbey Brewery

Factors influencing 2003 results

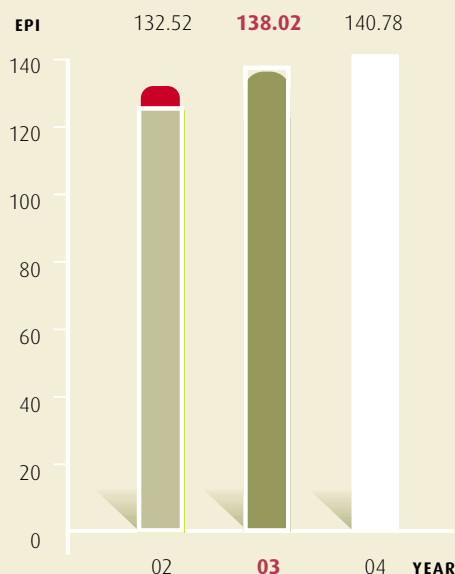
- As a result of lower than expected sales volume, lower key energy usage ratios were achieved – particularly in refrigeration and steam-generation, areas that are the highest consumers of energy in the overall brewing process.
- Our usage of CO₂ increased following the introduction of stricter quality specifications.

Future plans

As both sales volumes and production output are expected to remain static in 2004, we will be seeking new opportunities to reduce energy usage.

We expect to make some savings in electricity usage through the installation of high-efficiency compressor motors in the refrigeration plant.

We are anticipating a slight deterioration in our 2004 EPI on foot of increased CO₂ usage. However, this deterioration could be counteracted by savings made on electricity usage.



EPI TREND 1995-2003

EPI TREND 1995-2003

EPI TREND 1995-2003

↓ **Takeda Ireland Ltd**

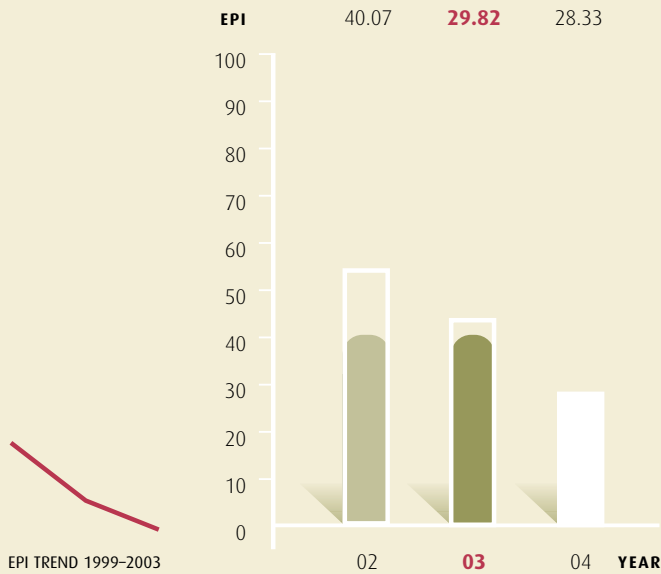
Factors influencing 2003 results

Improvement in our EPI was due to:

- A 1.6% reduction in energy consumption
- Improved house keeping and monitoring

Future plans

- The construction of new manufacturing facilities and associated support utilities and services will generate a high level of on-site construction activity during 2004. This will increase our primary energy usage by at least 5%.
- Energy conservation and management initiatives planned for 2004 include:
 - The optimisation of compressed air and steam distribution systems
 - Lighting efficiency projects
 - The thermal optimisation of plant rooms
 - A review of our LPHW-generation and distribution systems



↑ **Tayto Limited**

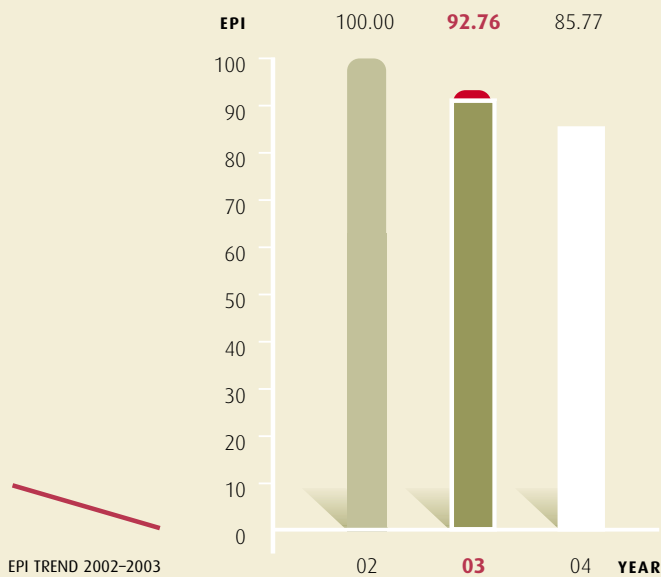
Factors influencing 2003 results

The 7.24% improvement in our EPI was due to:

- The Energy Management Team's success in achieving an energy consumption reduction of 7.24% per unit of production output came through the implementation of a wide range of energy saving measures.
- The installation of an additional packaging line, and the fact that the energy monitoring system became fully operational in the last six months of 2003, meant that the target of 8% was not fully realised for energy reduction per unit output.

Future plans

- Target for energy reduction per unit output for 2004 is 8%.
- Energy-saving/resource management initiatives planned for 2004 include:
 - A major drive to reduce natural gas consumption
 - The introduction of a water management system
 - A re-run of the successful 2003 wide energy awareness campaign
 - The installation of a new high tension transformer, which will significantly reduce costs to the electricity supply
 - A range of smaller projects i.e. installing of energy efficient motors.



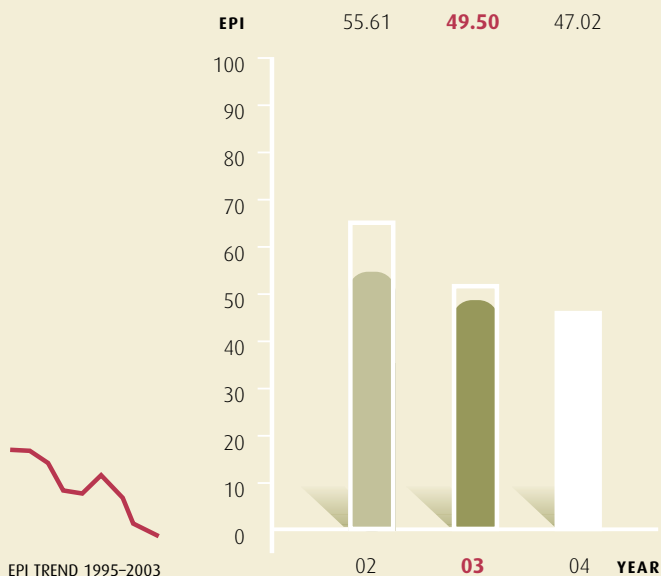
↓ **Thermo King Europe**

Factors influencing 2003 results

- Energy reduction is a key aspect of our overall business plan. Our success in achieving a 16% decrease in energy usage in 2003 is largely a result of our environmental strategy, which consists of a series of projects designed to reduce energy consumption.
- We installed a sensor-activated lighting system in the manufacturing area of the plant.

Future plans

While we expect to achieve a significant level of energy reduction in 2004, it is unlikely that we will be able to match the level of success achieved in 2003. Nonetheless, we are targeting a further 5% reduction in both our energy consumption and our EPI.



↑ Transitions Optical Ltd

Factors influencing 2003 results

We had hoped to be well placed to generate significant energy reductions during 2003, following the installation of a plant-wide energy monitoring system. However, because the new system did not come into operation until the end of the year, it was not possible to meet our original objective.

Future plans

In 2004, we aim to install variable-speed drives on all air-handling units. The implementation of this measure will enable us to deliver a significant reduction in air changes during production downtime periods.

In 2004, we will focus on utilising our energy monitoring system to drive energy reduction projects. We will target high-energy usage areas such as our compressed air system and air-handling units. We believe that the energy monitoring system will allow us to quantify savings achieved through systems optimisation.

↓ Tyco Healthcare, Athlone

Factors influencing 2003 results

Our continuing focus on good house-keeping and best practice helped us to reduce our energy usage beyond reductions caused by changes in production levels.

Future plans

We hope to achieve some reductions in energy costs on foot of the replacement of the plant's 25 year-old boiler with an up-to-date model.

We plan to implement stringent energy-conservation measures, aimed at ensuring that all production related equipment is shut down when not in use.

↓ Tyco Healthcare, Mulhuddart

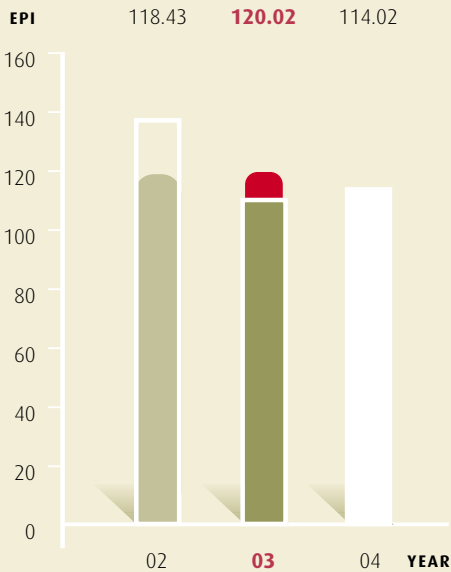
Factors influencing 2003 results

During 2003, electricity utilisation improved by 5% and boiler fuel utilisation improved by 3.1% due to:

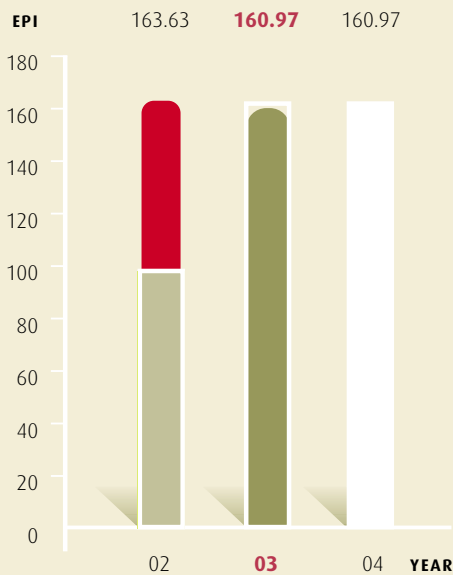
- Improved performance of the steam condensate capture and recovery systems, following extensive remediation work
- Use of our highest efficiency boiler for the maximum time possible
- Reduced requirement for standby air blowers, arising from the excellent performance of our on-site wastewater treatment plant.
- Actions such as these, combined with a further increase in production volume, led to a reduction of 2.06 points in our overall EPI.

Future plans

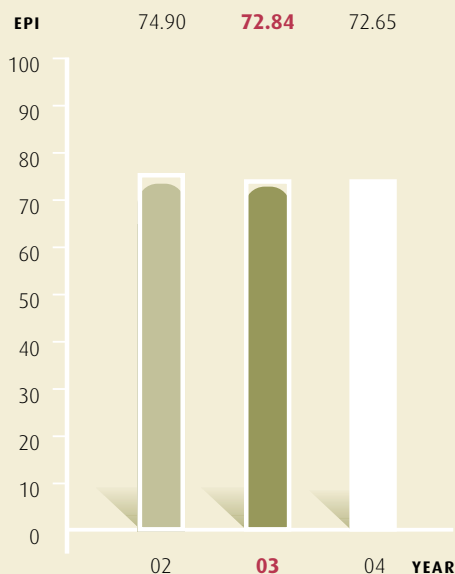
We plan to implement a number of the recommendations made on foot of the recent energy audit carried out by external consultants arising from our participation in SEI's pilot project on negotiated agreements. Areas of particular focus for 2004 will be condensate recovery and lighting. Further efficiency gains are more difficult as our plant is now reaching maximum possible output.



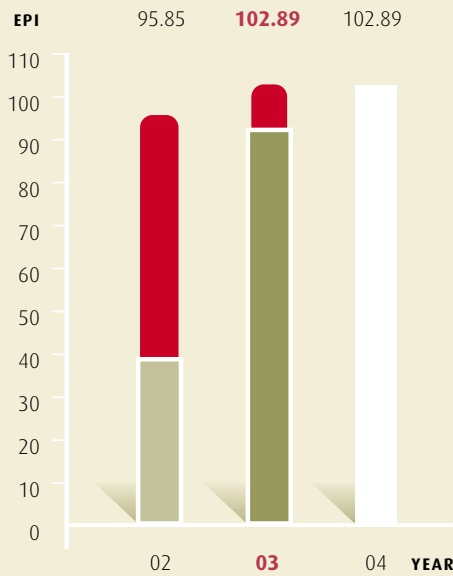
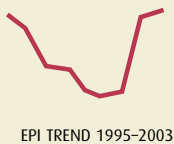
EPI TREND 1998-2003



EPI TREND 1996-2003



EPI TREND 1995-2003



Waterford Crystal Ltd

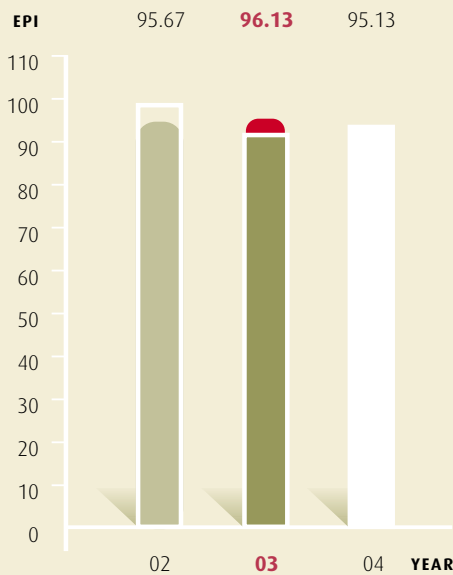
Factors influencing 2003 results

Although our EPI worsened in 2003, we achieved a 5.95% reduction in overall energy consumption, due to:

- The incorporation of Best International Practices into our rebuilt glass melting furnace at our Kilbarry facility, reducing its overall rating by 350kW
- Design modifications to glass-delivery and forming devices on the new furnace, allowing us to maintain output for a lower energy input.
- The installation of a new ventilation/air-conditioning system to cover the furnace area, reducing the load by some 90kW.
- Reorganisation of our manufacturing plants with a significant improvement in productivity
- Expansion of our Energy Monitoring Programme plant-wide.

Future plans

- Production is set to remain at 2003 levels.
- A 2% reduction in energy consumption should result from the modifications made to the Kilbarry factory furnace.



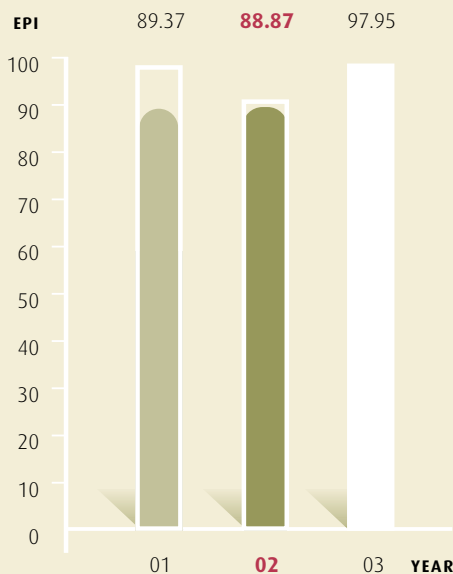
Wellman International Ltd

Factors influencing 2003 results

- Electricity consumption fell by 1.1% as a result of further improvements to polymer transfer equipment insulation.
- Natural gas consumption increased by 3.7% on foot of a 1% rise in production output and the effects of alterations to the product mix
- With the aid of ultrasonic equipment, we improved the maintenance of our steam traps and compressed air lines.
- We installed two active filters in our electrical distribution system in order to reduce harmonic content, which also yielded savings in energy consumption.

Future plans

- Long-term plans include the installation of a second 110kW (810 CFM) screw compressor.
- Tough trading conditions in the international fibre business resulted in reduced investment in energy saving projects in 2004, however Wellman remains committed to energy saving and an improvement in the overall environmental impact.



Wessel Energy Cables Ltd

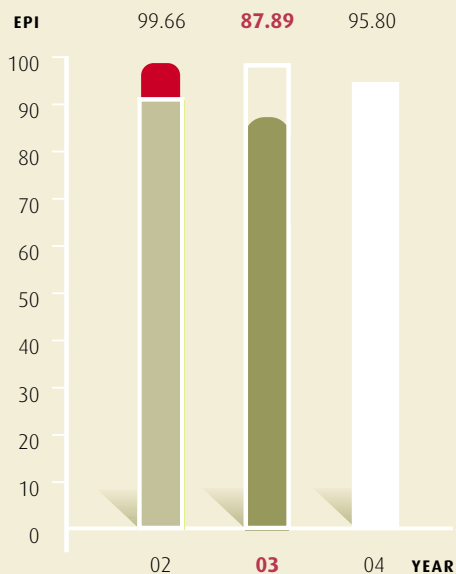
Factors influencing 2003 results

While our EPI for 2003 showed an improvement over the previous year, we failed to reach our agreed target. Unexpected factors included:

- Lower production output at our Finglas plant as a result of reduced marketplace demand
- Smaller economies of scale in relation to energy usage
- A significant reduction in natural gas usage following the introduction of a new polyethylene compound, which cross links at room temperature and thus eliminates the need for steam.

Future plans

Our Finglas plant will cease operation in 2004, after which production will be transferred to our sister plant in Longford. As production at the plant ramps down from October 2004 onwards, our energy-to-output ratio will deteriorate.



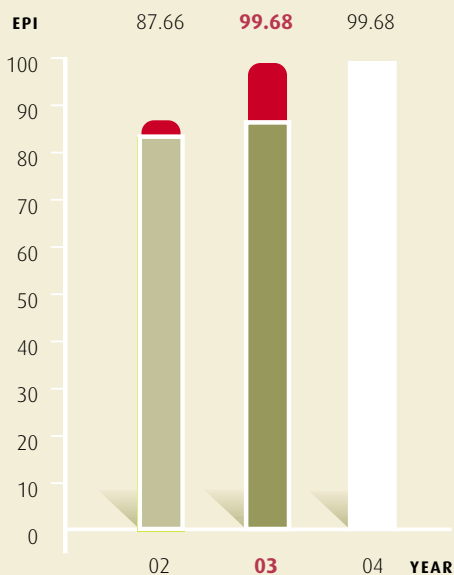
Western Proteins

Factors influencing 2003 results

- We enjoyed a substantial reduction both in energy consumption and in our EPI. Among the energy-saving initiatives that contributed to this success were the completion of:
 - A programme of machinery insulation, aimed at reducing the loss of steam to air.
 - A two-year condensate recovery programme, which is consistently delivering a 12% increase in production efficiencies.
- We installed 'Best Available Technology' (BAT) automated control technology in our wastewater treatment plant. This initiative has eliminated manual operation practices, which are less energy efficient.

Future plans

We anticipate a deterioration in our EPI because additional processing requirements increase our energy consumption per unit output.



Wyeth Medica Ireland Ltd

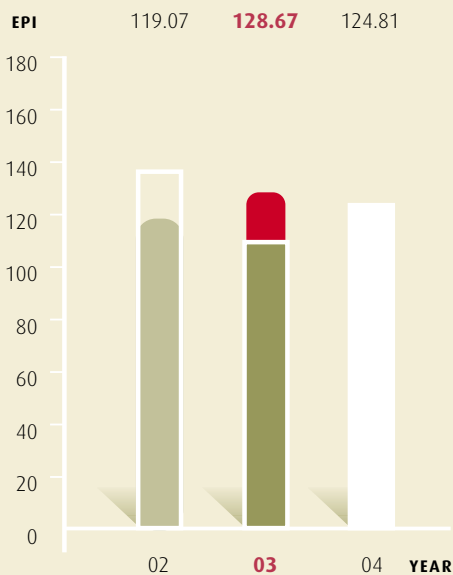
Factors influencing 2003 results

- Reduced use of our CHP plant in 2003 led to a 6% reduction in gas consumption, but an increase in imported electricity. Nonetheless, the increase in electricity consumption was 5.4% less than we had forecast. The benefits of previous energy saving projects - some of which were identified as a result of participating in SEI's negotiated agreements pilot project - were a factor in this.
- An on-site Energy Committee was established in 2003, with members drawn from the main factory functional areas.

Future plans

Our CHP plant has been operating at more than 90% utilisation since November 2003, and we plan to maintain this. This will increase gas usage but reduce imported electricity. However, increased production will lead to a net increase in electricity consumption.

The implementation of energy saving projects is ongoing in order to minimise energy consumption and decrease CO₂ emissions.



Yamanouchi Ireland Co. Ltd

Factors influencing 2003 results

- The significant disimprovement in our EPI was due to two factors:
 - A 10% increase in energy usage arising from a major construction project on site, and the installation of additional air treatment units across the site
 - A 10.5% drop in production output during 2003

Future plans

A new process will start up early 2005, which is likely to have a negative affect on our EPI.

An energy audit to be completed in 2004 will result in a programme of energy-reduction projects for 2004 and beyond.

We expect to carry out research into water reduction and reuse techniques, which should lead to a reduced energy demand.

3.4 The LIEN Objectives and Contact Details

For the members of the Large Industry Energy Network, the primary objectives are to adopt a responsible approach to managing energy use, and to minimise their energy bills. For Sustainable Energy Ireland, the objectives are somewhat broader than that; the principal current objectives of the LIEN include the following:

- 1 To develop a core of major players within Irish industry who are publicly and proactively committed to an ongoing voluntary programme of energy and emissions reduction.
- 2 To create a network of companies which are willing to share knowledge and experience with one another in order to maximise the energy savings that are possible.
- 3 To contribute to the competitiveness of Irish industry by assisting in reducing energy costs to a minimum, using the most effective means available.
- 4 To engage not less than 33 per cent of the overall Irish industry spend on energy in active energy management.
- 5 To achieve overall energy cost savings, within the members of the Network, and to reduce emissions to the environment.

The LIEN contact details:

Orla Thornton

LIEN Membership Support

t +353 1 808 2087

e orla.thornton@sei.ie

Patrick Liddy

LIEN Technical Advisor

t +353 1 808 2098

e patrick.liddy@sei.ie

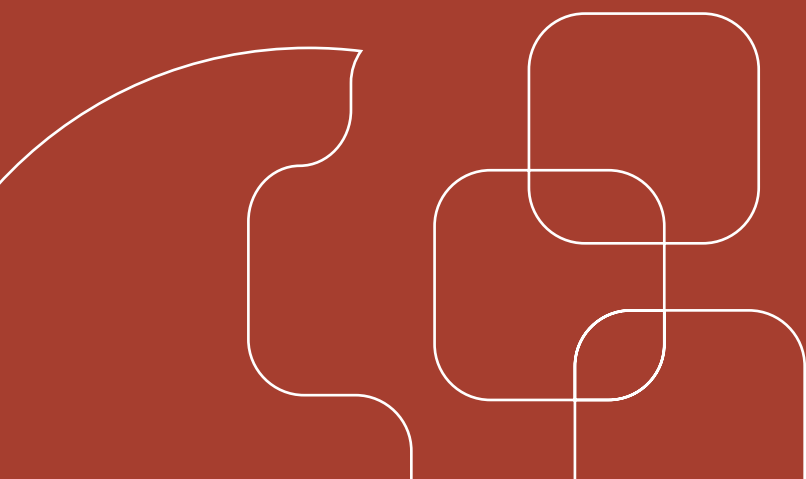
Andrew Parish

Unit Leader – Industry Networks

t +353 1 808 2077

e andrew.parish@sei.ie

w www.sei.ie/lien



3.5 Member Listing

Abbott Ireland, Cavan
 Allergan Pharmaceuticals Ltd
 Analog Devices BV
 Atlas Aluminium
 Aughinish Alumina
 Bausch & Lomb Ireland
 Baxter Healthcare S.A.
 Boliden Tara Mines Limited
 Boston Scientific Ireland Ltd, Galway
 Braun Oral-B Ireland Ltd
 Bristol-Myers Squibb, Swords
 Bulmers Ltd
 Cadbury Ireland Ltd, Dublin
 Cadbury Ireland Ltd, Kerry
 Cantrell & Cochrane, Cork
 Cantrell & Cochrane, Dublin
 Carbery Milk Products Ltd
 Cognis Ireland Ltd
 ConocoPhillips, Whitegate Refinery
 Dairygold Co-op Society
 Dawn Meats, Ballyhaunis
 Diageo Ireland, St James's Gate
 Dublin Airport Authority (Aer Rianta)
 Dundalk Brewery
 Elan Pharma
 Element Six
 Eli Lilly S.A. - Irish Branch
 Fruitfield Foods Ltd
 Glanbia Ingredients, Virginia
 Glanbia Meats, Roscrea
 Glanbia Meats, Ruskey
 Glanbia Plc, Ballyragget
 Glanbia Plc, Inch
 GlaxoSmithKline, Cork
 GlaxoSmithKline, Dungarvan
 Gypsum Industries Ltd
 Hewlett-Packard (Manufacturing) Ltd
 HJ Heinz
 Honeywell Turbo Technologies (Garrett Engine Boosting Systems)

IBM International Holdings
 Intel Ireland Ltd
 Irish Shell Ltd
 Irish Sugar Ltd
 Janssen Pharmaceutical Ltd
 Klinge Pharma
 Kostal Ireland GmbH
 Lakeland Dairies, Bailieboro
 LEO Pharma
 Lisheen Mine
 Masonite Ireland
 Merck Sharp & Dohme (Ireland) Ltd
 Micro-Bio Ireland Ltd, Fermoy
 NEC Semiconductors Ireland Ltd
 Novartis Ringaskiddy Ltd
 Pfizer Ireland Pharmaceuticals, Little Island API
 Pfizer Ireland Pharmaceuticals, Loughbeg API
 Pfizer Ireland Pharmaceuticals, Ringaskiddy API
 Premier Periclase Ltd
 Pure Fresh Dairies Ltd
 Roche Ireland Ltd
 Saehan Media Ireland Ltd
 Schering-Plough (Avondale) Co.
 Schering-Plough (Brinny) Co.
 SerCom Solutions
 Smurfit Paper Mills Ltd
 St Francis Abbey Brewery
 Takeda Ireland Ltd
 Tayto Limited
 Thermo King Europe
 Transitions Optical Ltd
 Tyco Healthcare, Athlone
 Tyco Healthcare, Mulhuddart
 Waterford Crystal Ltd
 Wellman International Ltd
 Wessel Energy Cables Ltd
 Western Proteins
 Wyeth Medica Ireland Ltd
 Yamanouchi Ireland Co. Ltd

3.6 About Sustainable Energy Ireland

Sustainable Energy Ireland (SEI) is Ireland's national energy agency. Established on May 1st 2002 under the Sustainable Energy Act 2002, SEI has a mission to promote and assist the development of sustainable energy.

This encompasses environmentally and economically sustainable production, supply and use of energy, in support of Government policy, across all sectors of the economy.

Its remit relates mainly to improving energy efficiency, advancing the development and competitive deployment of renewable sources of energy and combined heat and power, and reducing the environmental impact of energy production and use, particularly in respect of greenhouse gas emissions.

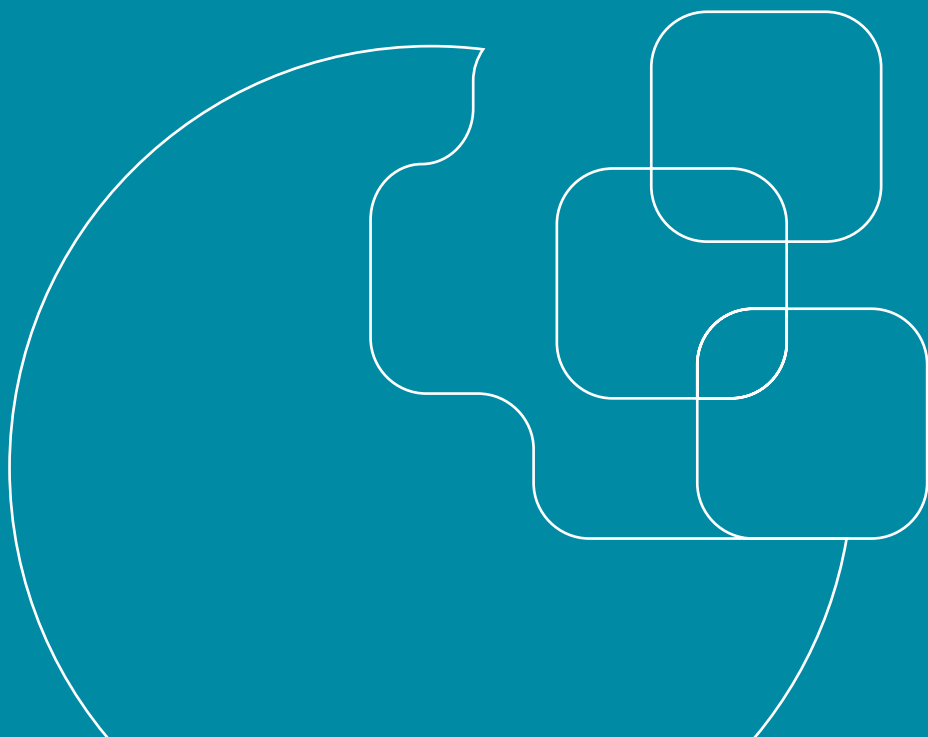
SEI is charged with implementing significant aspects of the Green Paper on Sustainable Energy and the National Climate Change Strategy as provided for in the National Development Plan.

SEI manages programmes aimed at:

- **assisting deployment of superior energy technologies in each sector as required;**
- **raising awareness and providing information, advice and publicity on best practice;**
- **stimulating research, development and demonstration;**
- **stimulating preparation of necessary standards and codes;**
- **publishing statistics and projections on sustainable energy and achievement of targets.**

SEI is responsible for advising Government on policies and measures on sustainable energy; implementing programmes agreed by Government and stimulating sustainable energy policies and actions by public bodies, the business sector, local communities and individual consumers.





Facilitated by



Glasnevin
Dublin 9
Ireland

t +353 1 836 9080
f +353 1 837 2848
e info@sei.ie
w www.sei.ie



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