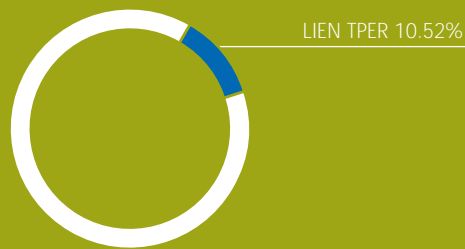
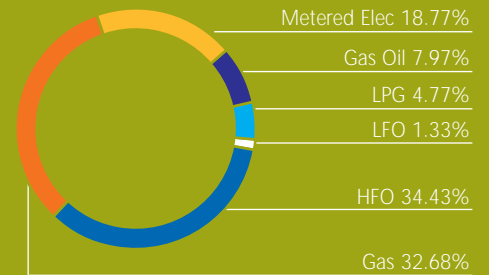


2005 Results

**LIEN Primary Energy Requirement as percentage of National**



**Breakdown of fuel consumption for LIEN in 2005**



**Overall Energy Performance**

|  |              |
|--|--------------|
| LIEN Total Primary Energy Requirement (TPER) 2005 (GWH)        | 18282.48     |
| Energy avoided due to energy efficiency measures 2005 (GWH)    | 771.83       |
| <b>Avoided energy requirement</b>                              | <b>4.22%</b> |
| National TPER 2005 (GWH)                                       | 173729.81    |
| LIEN as a percentage of national TPER 2005 (GWH)               | 10.52%       |
| Total CO <sub>2</sub> emissions 2005 (Tonnes)                  | 3932444.73   |
| CO <sub>2</sub> avoided due to energy efficiency measures 2005 | 173647.14    |
| <b>Avoided CO<sub>2</sub> emissions</b>                        | <b>4.42%</b> |
| Aggregate EPI for LIEN in 2004                                 | 84.44        |
| Aggregate EPI for LIEN in 2005                                 | 81.78        |
| <b>Improvement in EPI (2004-2005)</b>                          | <b>2.66</b>  |



A photograph of an industrial facility, likely a power plant or refinery, featuring large white cylindrical storage tanks and complex piping systems. The image is partially obscured by a green overlay on the right side.

# 1

## Section One

### Large Industry Energy Network

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## Introduction from Declan Meally

In this, the eleventh year of this initiative, members of the Large Industry Energy Network (LIEN) are continuing to deliver on their commitment to reduce greenhouse gas emissions by significantly reducing their energy usage. The consistency with which they have delivered these reductions represents a remarkable achievement for everyone involved.

This publication reports on the achievements of LIEN members in adopting and utilising best practice in energy management and demonstrates that they are operating at the highest levels of energy efficient manufacturing. The case studies featured provide an indication of the types of projects being implemented; however they represent only a small amount of the good work being done. It also reports on the companies who have adopted Energy Management Systems as a structured approach to tackling energy usage.

Evidence of the benefit of adopting a strategic approach to energy management is demonstrated by the considerable savings made by LIEN members. During 2005 for example, members avoided €27 million in energy costs and achieved a saving of 173,647 tons of carbon dioxide.

Building on this these learning, SEI recognises the potential for companies to embrace an Energy Management System. In 2005 SEI worked with NSAI and LIEN members to develop the Irish Energy Standard, IS393. This ground-breaking standard provides a structure which is designed to help companies identify savings and minimise energy use.

To complement the initiative, SEI has developed the Energy Agreements programme. This programme aims to assist companies who are committed to achieving the Energy Management Standard, and act as role models for Irish industry, to demonstrate the level to which industry can react positively to the current energy crisis. In May the first 10 companies formally signed up to the programme and are expecting to see significant results over the coming 3 years.

Furthermore, recognising that the commitment required to achieve the Energy Management Standard would be too onerous for smaller industries, SEI, again with consultation for LIEN members, has developed the Energy Management Action Plan (Energy MAP) website. This website will act as a tool for industries who wish to follow a structured approach to Energy Management, but do not feel that they can put the resources towards achieving the Energy Management Standard. This website will also act as an information database on energy related technologies and solutions.

Finally, I would like to comment on the impressive level of participation of LIEN members in workshops and training courses this year. Attendance levels have risen steadily over the past year and our most recent workshops have been fully subscribed.

Based on the level of activity SEI is currently seeing within the Industry Sector, we feel confident that Ireland is well placed to weather the storm we are currently experiencing with energy prices. While the challenge it poses to the competitiveness of our economy is significant, business leaders such as those in the LIEN can act to ensure the country remains successful.



**Declan Meally**  
Head, Industry

## Message from Mr Noel Dempsey, TD

While the task of mitigating the damaging effects of greenhouse gases on the world's climate must be a major focus for all sectors, the challenge to industrial competitiveness as a consequence of rising energy prices is of particular concern. The role of energy efficiency in assisting to address these challenges is critical and both the EU and the Irish Government are placing increased emphasis on the need for efficient use of energy.



**“Increasing energy costs and concerns about security of supply have meant that energy is now a critical issue for industries, both large and small.”**

The LIEN has been particularly proactive and successful in this regard. Eleven years ago, when what is now the Large Industry Energy Network was launched, energy efficiency was only a consideration for the country's largest energy users. However, increasing energy costs and concerns about security of supply have meant that energy is now a critical issue for industries, both large and small. For businesses who take a more prudent approach to energy management there are clear competitive advantages. The LIEN has paved the way for industry to recognise the benefits of such an approach and I am particularly grateful to its members who act as exemplars of best practice in this area. Their leadership continues to be critical in assisting companies seeking to develop efficient energy use practices.

I am also particularly impressed with the rate of uptake of the Energy Management Standard IS 393 which many of the LIEN members are now committing to. Sustainable Energy Ireland's Energy Agreements programme allows large energy users to take a structured approach to reducing energy usage, and aims to assist them in implementing IS 393. Indeed, the results that have already been seen by companies that have embraced these systems are very impressive, with even the most advanced companies recording further efficiencies.

The establishment of the Energy Agreements programme and its take up by industry is testament to the increased importance that companies are placing on managing energy use.

I commend the members of the Large Industry Energy Network for their efforts in managing their energy and emissions during the past year in a difficult economic climate. The LIEN network has demonstrated the competitive advantages of taking a strategic approach to energy use. This report reveals that this approach resulted in an overall primary energy saving of 770 GWh in 2005, with a reduction of 173 thousand tonnes of carbon dioxide emissions.

These results clearly show what can be achieved through partnership with industry. I would encourage Sustainable Energy Ireland and the LIEN to continue its efforts and to encourage more companies to engage in a collaborative approach. The wider commercial sector should be encouraged by the progress of the LIEN whose achievements are benefiting not just its members, but also the environment and the State.

This annual report clearly demonstrates the success of the LIEN in 2005 and indeed over the last eleven years. I commend both SEI and the members of the LIEN for the progress that has been made through a collaborative, proactive and strategic approach. I look forward with confidence to the development of the Network in the coming years.

**Noel Dempsey TD**  
Minister for Communications,  
Marine and Natural Resources

## The Large Industry Energy Network and its Membership

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 central pillar 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 fall into two categories – those which contribute to national energy policy objectives and those which benefit individual enterprises. The LIEN, in common with

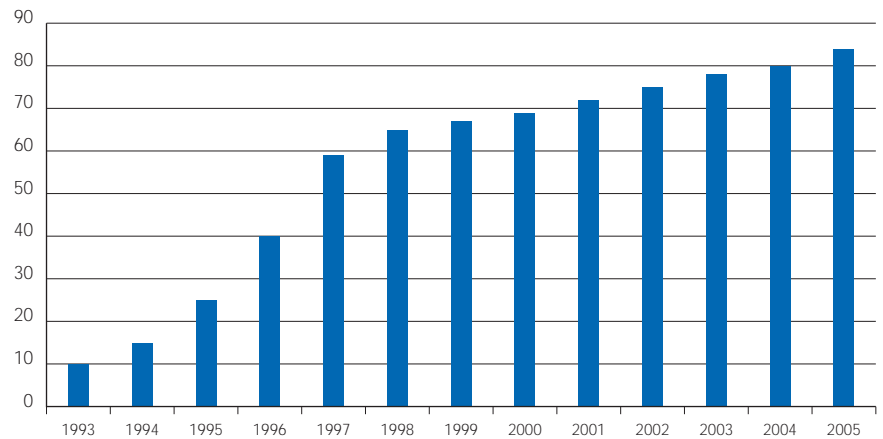
other Sustainable Energy Ireland programmes, addresses the three principal energy policy objectives. The first of these is to ensure security of supply, which a number of LIEN members contribute to through embedded generation projects, interruptible load and winter load shedding. The second is to ensure 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 IPPC licensing, while preparing for future mandatory requirements. Actively seeking to minimise environmental impact is also a positive platform for public relations.



## Development of the Network

### LIEN Membership



During 2005 a number of companies joined the LIEN. These companies are interested in reducing their energy dependency and see the LIEN as a good way to reduce the problem.

- Glen Dimplex
- Donegal Meats
- Cara Partners
- EMC
- Genzyme

### Membership losses

During 2005, four companies left the Network. Unfortunately these were due to scheduled site closures or resizing of these sites. The four companies are:

- Abbott Ireland, Cavan
- Smurfit Paper Mill
- Irish Shell
- Saehan Media Ireland Ltd



## Network Activities for LIEN Members

Networking and the sharing of information are regarded as some of the most important benefits of LIEN membership. During 2005, members participated in a number of SEI-organised workshops and energy-related events. These events give members an opportunity to inform themselves about the most recent innovations in energy efficient technologies along with the chance to discuss their integration into systems with other energy managers. Among the highlights were:

### Energy Market Forum – August '05

As the price of energy increases, its position as a line item on many companies' budgets means that there is increasing pressure on Energy Managers to predict future energy costs. This workshop, held in Kilkenny, acted as a chance for Energy Managers to directly interact with policy makers and influencers from the Department of Communications, Marine and Natural Resources (DCMNR) and the Commission for Energy Regulation (CER), while discussions on the issue of consultation with industry as part of the Government's review of the energy sector accounted for a major part of the day's proceedings.

### Annual Report Launch – September '05

Minister for Communications, Marine and Natural Resources, Mr Noel Dempsey TD launched the LIEN annual report for 2004 at the Merrion Hotel, Dublin. At the event Mr Jim Hoey of Masonite presented the Minister with a copy of the 2004 annual report, which both marked 10 years of the initiative and record savings for the scheme.

The Minister welcomed new LIEN members and congratulated existing members for their willingness to share information and best practice solutions for energy efficiency improvements.

### The SEI Sustainable Energy Awards 2005 – October '05

The Sustainable Energy Awards for 2005 took place in Dublin in October. Again this year the LIEN had a strong presence among the prizes. The awards are designed to focus on individuals and groups who demonstrate a commitment to include energy management as part of their overall management structure, along with specific innovative projects undertaken which have delivered significant savings.

The awards ceremony, which was attended by Minister Noel Dempsey, took place on 20 October at a gala dinner attended by major players in the industrial, commercial and public sectors.

### Energy Usage in Buildings – November '05

While energy usage in most LIEN sites is primarily centred in production, the energy used in buildings plays a significant part in energy bills and savings there can be particularly visible. This workshop, held in UCC gave members a whistle stop tour of most of the common methods of energy saving in buildings, including lighting, air leakage, and air conditioning. Of particular interest to all the participants was an update on the Energy Performance in Buildings Directive, which will be phased in over the next 3 years.

### LIEN Future Energy Challenges Workshop – January '06

The first LIEN workshop of 2006 was hosted by Pfizer Ireland Pharmaceuticals, Loughbeg API at the end of January and considered the challenges facing sites due to changes in the regulations governing refrigeration. The Ozone Depleting Substances regulation and F-Gas regulation will effectively end the use of CFCs and R22 and restrict the use of HFCs for industrial and commercial purposes. As many sites will need to replace or redesign their refrigeration and chilling systems, it makes good sense to now consider the energy implications of the possible replacement systems.



### Launch 2006 SEI Sustainable Energy Awards – February '06

The launch of the 2006 Sustainable Energy Awards took place in February. At this event, many of the 2006 Award recipients took the opportunity to make presentations on their winning projects to the large number of guests in attendance.

### The Energy Show – May '06

The Energy Show took place in May. This bi-annual event which took place in the RDS in Dublin gives companies a chance to compare offerings from various suppliers of energy efficient technologies. The show also offered an opportunity for some LIEN Networking events.

### – Energy MAP

*Energy MAP, or Energy Management Action Plan is SEI's new Energy Management website. The website offers users a fully systematic approach to energy management, along with technical actions which can be taken to reduce the energy demand for specific energy users. This workshop introduced members to the website, which SEI is asking LIEN members to pilot.*

### – Energy Agreements

*The Energy Agreements programme is a support programme for Irish industries who have committed to reaching the new Irish Energy Management Standard, IS393. Implementation of an energy management standard has been shown to provide an excellent basis for identifying energy saving opportunities.*

### Launch of Energy Agreements Programme – May '06

Energy Agreements was formally launched at the end of May. The programme, which is aimed at assisting companies who are committed to becoming certified to the Energy Management Standard, expects to see the first 10 companies who have signed up to collectively save up to €20 million over the next three years. Launching the programme in Dublin Castle, Mr Noel Dempsey, Minister for DCMNR said "I am right behind the effort of these companies and encourage all major industrial energy users to come on board"







# 2

## Section Two

### Company Profiles

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## Energy Agreements

**Ever increasing energy costs in Ireland are a major concern for Industry in the fight to remain competitive in today's marketplace. Organisations need to commit to the control of these costs in order to support the long term growth of their businesses.**

Sustainable Energy Ireland (SEI) is committed to assisting Irish companies with structured energy management programmes, available for both large industry and small and medium enterprises. Participation in these programmes will provide companies with savings in operational overheads and increased profitability.

For the large, more intensive users of energy, SEI has developed the Energy Agreements Programme. The Energy Agreement is an undertaking between SEI and each participating organisation for an initial three year period. It centres on the development of best energy management practices, structured through the new Irish Energy Management Standard IS 393. The Agreement requires top

management support and a real commitment to a structured approach to energy management. The benefits will include significant reductions in energy costs through best energy management practices, special investigations of energy efficiency on plant and processes, and implemented profitable projects described by investment, savings and payback.

In May of this year, Mr. Noel Dempsey T.D., Minister for Communications, Marine, and Natural Resources, officially launched the Programme with ten of Ireland's leading companies entering into Energy Agreements with SEI. The companies are Aughinish Alumina Limited; Astellas Ireland Company Limited (Dublin Plant); Glanbia Ingredients; Intel Ireland Ltd; HJ Heinz Frozen and Chilled Foods Ltd; Lagan Cement; Pfizer Ireland

Pharmaceuticals, Little Island; Pfizer Ireland Pharmaceuticals, Loughbeg; Wyeth Medica Ireland (Newbridge) and Xerox (Europe) Limited. The Programme is to be expanded to incorporate the top energy users in Ireland. SEI estimates that if the 50 largest energy using firms participated in the programme, up to €50 million could be saved over a 3-year period.

The Programme comes at a time when energy costs are at an all time high. Industrial competitiveness could be threatened if industry does not respond effectively. SEI has based its programme on similar successful programmes in other European countries where participating firms have achieved typical savings of over 15% of their energy bills over several years of consistent action.

Mr David Taylor, Chief Executive of SEI commented: "The sustained increase in energy costs and the associated price volatility have added to the competitiveness pressures on Irish business. When combined with additional concerns about future availability, and the cost of environmental compliance, energy becomes a strategic priority for many Irish companies. The Energy Agreements Programme provides a strategic framework within which large energy users can address their energy needs and by doing so experience immediate bottom line benefits through reduced operating costs and improved profitability. It will also assist industry to prepare and respond to a climate where energy supply has become increasingly uncertain and volatile".



## Carbery Milk Products Ltd



The Carbery Milk Products manufacturing plant in Ballineen, Co Cork produces cheeses, food ingredients, alcohol and flavourings. Carbery Milk Products is part of the Carbery Group which employs 200 people at its Ballineen plant and at its various production, R&D and marketing operations in Ireland and the USA.

In 2005, Carbery Milk Products, in consultation with specialist consultants, carried out an extensive audit of production processes at the Ballineen plant; this exercise marked the first step in a concerted effort to achieve a significant reduction in the site's energy consumption.

The audit team recommended that Carbery Milk Products consider the installation of 'pinch technology' across the site; the use of this technology would result in all heating and cooling processes across the site being integrated into a single heat exchanger network. Moreover, the use of this technology would mean that it would be possible to maximise regeneration across the site, thus significantly reducing the use of utilities including steam, refrigeration and electricity.

Due to factors such as the differing operating times of individual production units, it can prove difficult if not impossible to fully integrate all site heating and cooling loads on a continuous basis. For this reason, it was decided that, as a first step, it would be preferable

to attempt to integrate all heating and cooling loads into single production units wherever possible. One such production unit is the Ultra-filtration Department; here, liquid whey is converted into whey protein concentrate and permeate. The permeate is then further processed in the Distillery and converted into ethanol.

During the filtration process, steam is required in order to:

- 1) *preheat purchased whey from 8°C to 36°C.*
- 2) *heat difiltration water from 10°C to 51°C.*
- 3) *pasteurise whey to 78°C.*

(Prior to implementing the 'pinch technology' project, the cost of producing steam using this method totalled €475,000 a year.)

The whey protein concentrate produced was cooled down from the processing temperature of 51°C to 4°C through the use of a combination of both mains water and chilled water.

The permeate was then pumped to the Distillery where it was cooled from 51°C to 32°C, using cooling tower water; it was then fed into fermentation tanks. (Prior to the implementation of the project, electricity costs associated with operating the cooling tower for this particular purpose totalled €25,000 a year.)

Wormwald & Associates carried out a full thermodynamic analysis of all the heating

and cooling processes; this indicated that the permeate could be used for:

- a) *preheating all purchased whey*
- b) *heating difiltration water to 48°C*
- c) *providing 75% of the heat required for pasteurisation*

In short, the team concluded that if the company were to choose the 'pinch technology' option, then the requirement for both the heat exchanger and cooling tower in the Distillery would be eliminated.

In addition, the team concluded that by cooling the whey protein concentrate from 51°C to 4°C it could also be used for heating difiltration water to 48°C, thereby reducing the use of steam as well as consumption of both mains water and chilled water.

The integration of the heating and cooling loads in the Ultra-filtration Department would represent a 70% reduction in steam heating demand; moreover, significant electrical savings would be achieved as a result of costs associated with the reduced use of chilled water and the operation of the cooling tower.

Finally, the analysis showed that the remaining 30% of steam demand would be provided by heat recovered from the Distillery condensers.

Carbery Milk Products began the process of implementing the 'pinch technology' project in October 2005; the system became fully operational in June 2006.

The introduction of 'pinch technology' has proved to be an unqualified success. Specifically, the Ultra-filtration Department has virtually eliminated its original annual steam heating costs of €475,000; annual electrical energy savings of approximately €45,000 have also been achieved.

The payback period on this project will be very swift, with the total capital cost (€600,000) being recouped within one year.

The payback calculations take account of the fact that €200,000 had already been allocated for heat exchanger replacement for 2006.

## Bulmers Ltd



**With its main manufacturing plant in Clonmel, Bulmers is Ireland's largest apple processor. Employing more than 500 people, it distributes more than 80% of all cider products marketed in Ireland, while its export business has grown to 15 countries.**

The minimisation of environmental impact and the reduction of energy usage are key corporate goals for Bulmers. The company has consistently placed a strong emphasis on maintaining high environmental standards – as evidenced by the publication of its environmental policy and its commitments under the environmental standard ISO 14001.

In 2003, the Site Energy Team introduced an ambitious energy conservation programme aimed at generating cost savings and reducing annual CO<sub>2</sub> emissions. As well as targeting the site's main energy-usage areas – motors and lights (electricity), steam generation (natural gas), and forklifts (LPG) – the programme is targeting areas such as refrigeration, compressed air, and power-down/re-start programmes. A site-wide awareness campaign focused on these particular usage areas has been incorporated into the overall programme.

In recent years, sales of the company's Bulmers and Magners cider brands have been performing exceptionally well. Against this background, the company's management team decided that additional processing and packaging facilities would have to be built at the Clonmel plant in order to cope with increased product demand. From the outset, it was agreed that creating the most energy-efficient building possible would be a key priority.

The Site Energy Team in conjunction with the C&C group energy coordinator and an external consultant carried out a detailed review of the various production-related processes planned for the building. This exercise was designed to analyse operational and energy trends; it was also aimed at identifying where opportunities for energy savings and energy reductions might be created. The team concluded that five specific areas – building design, refrigeration, factory space heating, lighting and compressed air – offered the best potential in terms of delivering thermal efficiencies and energy consumption reductions.

Among the most significant energy-efficient features of the new structure are steel-framed cladding rails with double-skin insulated metal panels; these panels have been installed on all external walls as well on the roof structure. The wall cladding has a u-value of 0.32w/m<sup>2</sup>k, while the roof cladding has a u-value of 0.25w/m<sup>2</sup>k; these extremely low u-values will help greatly to reduce building heating energy costs. Moreover, in addition to being thermally efficient, the cladding is environmentally sustainable; eurobond cores are rated zero ODP and are free of HCFs.

Roll-fast doors have also been fitted throughout the building; this type of door fitting reduces the amount of air change when doors are opened for goods being delivered or dispatched. The door opening/closing is controlled by an automatic vehicle detection device located at floor level.

### Refrigeration

The design brief for the building's refrigeration system was to create a highly efficient and environmentally friendly industrial system which would be capable of chilling process water to +1.5°C. It was estimated that a capacity of 2MW would be required initially, but the system also had to be flexible enough to expand to 4MW if necessary. The final design features a skid-mounted, flooded ammonia chilling system comprising a 4MW separator vessel which feeds saturated liquid ammonia to a 2MW PHE evaporator.

Both full-load and part-load efficiencies are extremely high. The use of ammonia-flooded PHEs and evaporative condensers ensures both a minimum pressure lift and a high co-efficient of performance. The parallel operation of all heat exchangers on a common system ensures that when operating on part load, full advantage is taken of all heat exchange surface areas, while the selection of reciprocating compressors provides efficient part-load operation.

The additional capital costs associated with the ammonia-based system will be recouped within 3-4 years.

### Space Heating

The new building consisted of 5000m<sup>2</sup> of manufacturing floor area. Instead of attempting to heat the entire building, the heating system is focused on those areas where production operatives will be based.

Space heating will be provided by direct gas-fired infrared heating systems using approximately 10 tubular infrared gas-heated tubes measuring 3.5 metres to 10 metres long, and suspended at a height of 7 metres above floor level. Comfort heat will be provided for occupants by generating radiation directly from the tubes, and also via convective upward currents.

### Lighting

The design brief for the lighting supplies company was to produce a highly efficient and environmentally friendly industrial lighting system which would deliver lighting levels in the region of 400 lux with a colour-rendering index of 85. The luminaries selected feature an IP 54 enclosed fitting with extremely high optical efficiencies; these provide excellent lighting levels without creating the inherent glare associated with typical standard line metal halides.

The rated life for the light source is 20,000 hours. This compares favourably with metal halides used elsewhere on the Bulmers site, which have a rated life of 8,000 hours. The projected payback on the extra initial cost of these luminaries is 1.25 years.

### Compressed Air

The new plant air-flow profile varies depending on the product being produced and on the levels of plant activity. A variable-speed drive compressor will generate savings only when it is run below 90% speed capacity; as a result, it is important to have an appropriately sized compressor fitted for the task.

In order to determine the correct size of compressor, air was supplied from an existing installation and the airflow profile was measured. The air intake to the compressor was ducted from the outside of the compressor house; the hot air generated by the compressor was ducted to the outside, with an option of ducting into the raw material store area during the winter.

The projected payback of the extra cost of a VSD compared to a fixed speed compressor is between 1 and 2 years.

## Cuisine de France

Cuisine de France has a state-of-the-art production facility located in Tallaght, Dublin. This is the main manufacturing and distribution depot for the Republic of Ireland. It is a fully automated plant, which produces a complete range of French breads maintaining Cuisine de France as a leading manufacturer of French bread in Europe.

In line with its environmental policy, Cuisine de France aim to minimise energy consumption and energy costs throughout its operations, utilising an energy management system across all its sites.

The compressed air system was identified by the energy management team as an area where energy costs could be reduced. An audit was conducted by a compressed air specialist and the following issues were raised and tackled:

- *Installation of a variable speed drive to eliminate unloaded hours – which are costing €1,250 per year.*
- *Monitoring indicated that use of electric tray blowers could save up to €4,000 per year if used in place of the current compressed air models. Installation of 3 tray blowers on lines*

- *An air dryer and 3 air receivers have been installed on the system. This will help with system maintenance and also to deal with fluctuations in demand, which result in load/unload cycle.*
- *Fix leaks in the compressed air system*
- *Adequate pipe sizing to reduce pressure losses*
- *Control of air compressors*
- *Set equipment at the correct pressure level.*
- *Heat recovery to water and/or space heating*
- *Take cold air from outside. Direct cool air from an A.H.U to the compressor.*

The maximum air pressure in the system has been reduced from 7.6 bar to 6.8 bar. This is due to the expanded capacity in the system as a result of installing additional air receivers, the removal of the compressed air tray blowers, the reprogramming of the controls on the compressors and the repair of all minor leaks identified through an air leakage audit.



## Glanbia Meats, Roscrea



The Glanbia Meats operation in Roscrea Co Tipperary is one of 5 in the Glanbia Meats Group. The Roscrea plant, which specialises in pig processing and produces pork and bacon products for the Irish and International markets, has the capacity to slaughter up to 16,000 pigs a week.

The energy resources required for the high volumes of slaughtering and processing activity taking place at the Roscrea plant are substantial; the plant consumes over 600,000 of fuel oil specifically related to hot water production each year.

While the Glanbia management team has long since moved to address the issue of reducing the cost of hot water production by implementing initiatives such as the installation of heat recovery units on refrigeration oil coolers and the Synger exhaust, these initiatives have proved insufficient to meet on-site hot water demand.

Against a background where energy costs have been increasing by significantly in recent years and are expected to rise by up to 30% in 2006 and 2007, the Glanbia energy management team is currently examining a number of novel energy conservation concepts.

One particular method being evaluated would involve the installation of a heat pump "on top of" the existing refrigeration plant. Refrigerating systems by their nature reject vast quantities of low grade heat to the atmosphere. The proposed project would involve redirecting this waste heat and increasing it to a higher temperature so that it could be used for water heating thereby displacing fuel oil.

*"Obviously, while the heat pump would consume additional electricity, this increase would be offset by the pumps' ability to generate seven units of heat for every single unit of electricity consumed",* explains Frank Begley, the plant's engineering manager.

*"As well as the huge cost savings that would result from the implementation of such a system, it would have the added bonus of delivering significant environmental benefits. For example, instead of wasting a valuable on-site resource such as the quantities of low-grade heat consistently produced by our condensers, we would be able to exploit this resource in order to generate the required temperatures for specific production-related activity on the site",* he notes.

Kovara, an Irish firm of energy consultants has advised the Glanbia team that the technology has been applied successfully elsewhere in Europe; its adoption in Ireland is inevitable given increasing energy prices and the current electricity-to-fuel price ratio.

## Cadbury Ireland Ltd, Dublin



**Cadbury Ireland Ltd, Dublin is the Irish subsidiary of Cadbury Schweppes, the world's largest confectionery company. Cadbury Schweppes recognises its responsibilities as a major international manufacturing company and aims to ensure that it minimises its impact on the environment around the world. It also works towards the objective of long-term sustainability, seeking opportunities to improve the local environment in the communities in which it operates.**

The generation of compressed air accounts for a significant proportion of electricity consumption at Cadbury's Coolock plant, and against a background of rising electricity costs, the Cadbury energy management team recently set out to identify potential areas of electricity wastage.

Anecdotal evidence indicated that there was a significant problem with compressed air leaks across the site. However, the scale of the problem was difficult to confirm. While many leaks were easily identifiable, most were inaudible to the human ear; therefore special equipment had to be utilised in order to provide the necessary confirmation.

Early in 2005, the company commissioned a consultancy firm to carry out leaks survey across the site. During the course of the four-day survey, the consultants identified areas where leaks were occurring and listed the nature and the type of repairs that would be required.

They then provided the company with an on-line software system designed to track repairs, calculate the cost savings that would result in each case, and enumerate the various benefits associated with carrying out these repairs.

All repairs were carried out by Cadbury's in-house maintenance team. While the initial repair programme was completed within one month, ongoing repairs will be required. Apart from reducing annual electricity costs by at least €23,000 a year, the immediate benefits of the compressed air leak repair programme included a decrease in noise levels, a reduction in wear and tear on the company's air compressors, a reduced requirement for maintenance work, and a significant reduction in CO<sub>2</sub> emissions from the plant.

According to Tom Byrne, Site Energy Manager, Cadbury Ireland Ltd, Dublin, carrying out an exercise such as this compressed air detection survey is absolutely essential in a competitive manufacturing market – particularly a market such as the one in which his company must operate.

*"Not only did this survey generate significant cost savings, it also created other immediate benefits, thus enabling us to deliver on our responsibilities in terms of long-term sustainability and improvements to the local environment", he notes.*

## Energy MAP

Recognising that Irish companies need to structure their approach to Energy Management if they are to achieve significant savings, SEI, in consultation with industry, has developed an innovative web-based tool to assist with reducing energy usage and related energy costs.

Energy MAP (Energy Management Action Programme) allows the user to follow a structured approach to energy management, while also allowing the user to pick and choose the areas they feel they need to concentrate on, depending on their needs. The long-term vision is that Energy MAP will become an online, one-stop-shop to support all businesses that wish to maximise their energy efficiency while minimising their energy costs.

Energy MAP is focused at a broad business market and will be useful to both Large Industry and SMEs alike. The online programme element is designed to attract three user profiles:

1. A user who is new to energy management.
2. A user who has limited knowledge but who is interested in energy management.
3. A user who has advanced knowledge of energy management but who would like to adopt a more structured approach to their company's energy plan.

The Energy MAP website provides comprehensive information on managing energy use in business. Users who register will be able to gain access to a 'tracking tool' where they can record the actions taken and the savings made by following the step-by-step programme within the 5 defined pillars of excellent energy management.

Each of these pillars refers to an important facet of energy management - Commit, Identify, Plan, Take Action and Review. Within each of these pillars are a number of steps with supporting guides on how to progress through each stage. If followed, these steps will lead to the strategic management of energy in the selected firms and can lead to savings of up to 20% in energy costs.

In addition to the steps and guides, case studies of best practice in businesses in all relevant sectors are also available online. An optional series of workshops following the steps and guides will be available to companies which wish to increase and exchange their knowledge with firms in the same sector.

Long term, it is envisaged that Energy MAP will become an online 'one-stop resource' designed to support all businesses and organisations which wish to maximise their energy efficiency while simultaneously minimising their energy costs, reducing greenhouse gas emissions and thus benefiting the environment.

[www.sei.ie/energymap](http://www.sei.ie/energymap)







# 3

## Section Three

### Results and Targets

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## Reporting of Results

A primary principle of LIEN membership is the annual reporting of members' energy usage along with details outlining their activities to reduce energy consumption and related emissions. This data is used to calculate the Energy Performance Indicator (EPI), which is an indication of the energy intensity of the site during the year, and allows target EPIs to be set for the coming year. The results published in this report are based on these inputs from the members and provide a summary of their plans for the future.

The table below gives an overview of the results of the group as a whole, while the bar charts which follow outline the individual companies' performances.

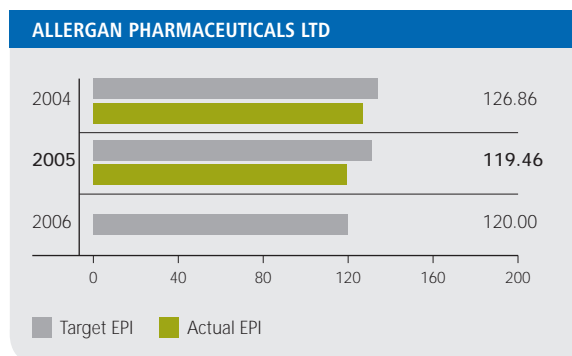
### Overall Energy Performance

|   |              |
|---|--------------|
| LIEN Total Primary Energy Requirement (TPER) 2005 (GWH)       | 18282.48     |
| Energy avoided due to energy efficient measures 2005 (GWH)    | 771.83       |
| <b>Avoided energy requirement</b>                             | <b>4.22%</b> |
| National TPER 2005 (GWH)                                      | 173729.81    |
| LIEN as a percentage of national TPER 2005 (GWH)              | 10.52%       |
| Total CO <sub>2</sub> emissions 2005 (Tonnes)                 | 3932444.73   |
| CO <sub>2</sub> avoided due to energy efficient measures 2005 | 173647.14    |
| <b>Avoided CO<sub>2</sub> emission</b>                        | <b>4.42%</b> |
| Aggregate EPI for LIEN in 2004                                | 84.44        |
| Aggregate EPI for LIEN in 2005                                | 81.78        |
| <b>Improvement in EPI (2004-2005)</b>                         | <b>2.66</b>  |

## Index: Members' Results and Targets

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## Members' Results and Targets

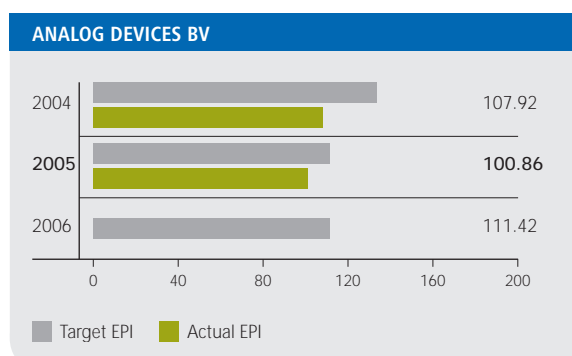


### Factors influencing 2005 results

- 9% increase in production volumes
- site-wide monitoring and control of energy usage
- implementation of energy conservation measures on chilling equipment
- phasing-out of high energy-usage machinery/equipment
- decommissioning of a significant number of machines; installation of new automated lines

### Future plans

- Energy usage to decrease by 5% in 2006 as a result of using Lean Six Sigma model to drive site-wide energy-reduction initiatives
- 2006 EPI to improve on foot of restructured manufacturing processes; changes in our product mix; implementation of significant energy conservation projects

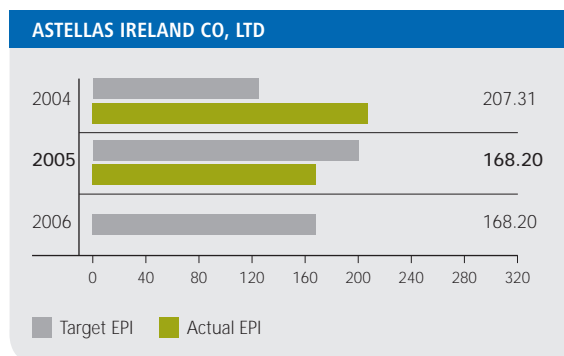


### Factors influencing 2005 results

- Higher production output due to increased demand for our product
- Energy audit carried out; recommended corrective actions implemented
- Improved energy efficiency as a result of carrying out various energy awareness initiatives across the site

### Future plans

- New production processes, which are due to be introduced throughout 2006, may impact negatively on our overall energy performance for the year

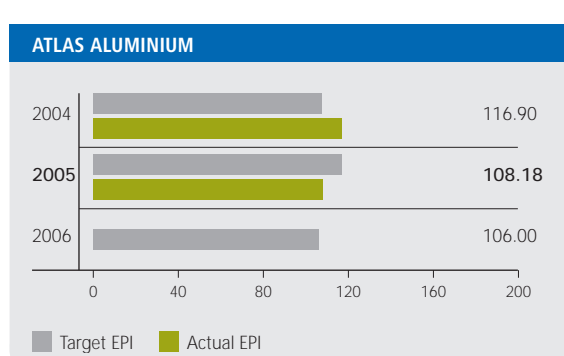


### Factors influencing 2005 results

- Installation of more energy-efficient chiller fitted with VSD-driven screw compressor; this delivers greater process temperature control
- Boiler house efficiencies achieved following installation of auto-flame system on steam boilers; this delivers increased combustion control and reduces excess CO<sub>2</sub> emissions

### Future plans

- We aim to achieve the new Irish Energy Standard (IS 393) and to systemise a site-wide energy conservation programme
- Steam operating pressure to be reduced to minimum acceptable level following detailed thermal system review in Q3 2006
- Lighting costs set to fall by 10% in 2006 following site-wide audit



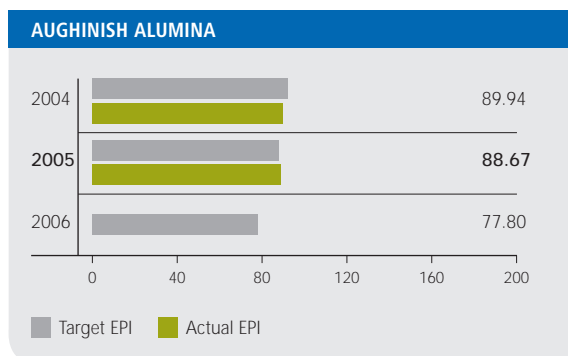
### Factors influencing 2005 results

- Improved energy efficiency gains due to conversion of a percentage of our energy load from gas to electricity
- Large reduction in machine utilisation due to changing business structure; equipment shut-down energy efficiencies generated as a result

### Future plans

- Change in our product mix – the move from small to large product units will yield greater energy efficiencies
- Wet dust extractor to be decommissioned
- Lighting-related energy reduction measures to be implemented

## Members' Results and Targets (continued)

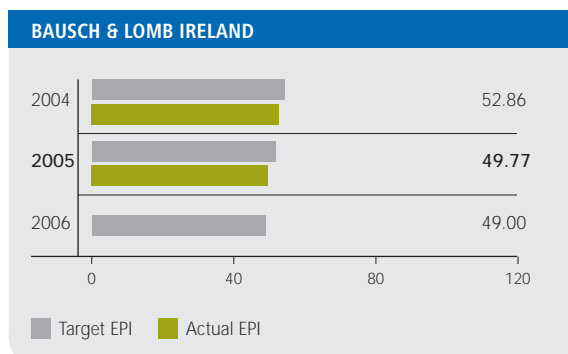


## Factors influencing 2005 results

- Higher than expected energy consumption due to negative impact on heat recovery system following the introduction of the new sweetening process; negative influencing factors included a higher than normal scaling rate in heaters as well as problems with heater maintenance

## Future plans

- New CHP system will generate 150 MW electricity annually; some of this will be exported to the national grid
- 2006 will mark the first full year of operation of the all elements of the new \$120 million CHP project

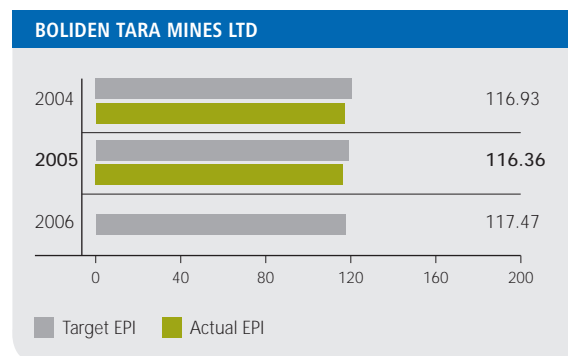


## Factors influencing 2003 results

- Electronic Expansion valves attributed to better efficiencies on chillers
- Pressure Regulation on steam boilers allow balancing of pressure levels relative to those of the CHP, allowing better utilisation of the full free steam from the CHP Plant.
- New heat exchanger installed utilises the CHP waste hot water & substitutes for steam generated by steam boilers

## Future plans

- Product and production floor changes will have a negative effect on EPI in the short term
- Automation of existing and future product lines will increase energy usage

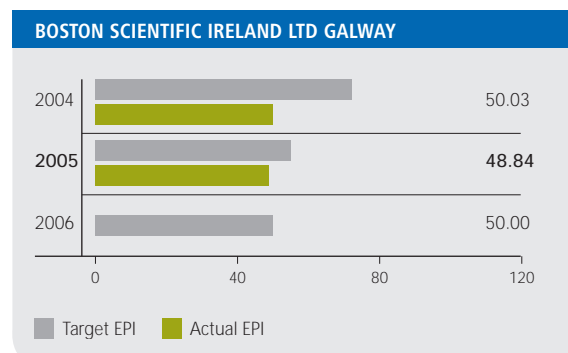


## Factors influencing 2005 results

- Ore-handling systems continuously operating at optimal energy-efficiency loads
- Fitted timers on ventilation systems to ensure that air movement is minimised during shift handovers and other production process adjustment periods
- Processing plant energy efficiencies maintained by switching off power during production downtime/maintenance periods

## Future plans

- The commissioning of two new shafts will deliver some improvements in the overall ventilation system
- New concentrate drying system using VSDs to be commissioned
- Major research study to be carried out on energy-saving strategies adopted by other mining operations



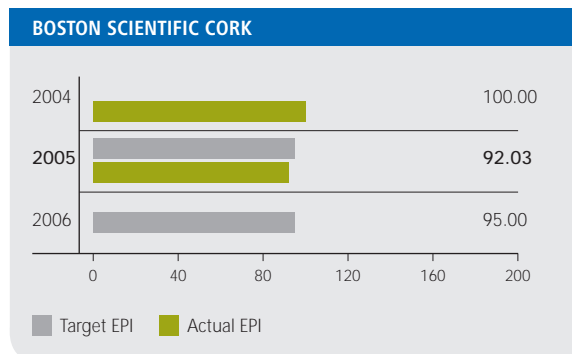
## Factors influencing 2005 results

- Increase in number of night-time and weekend operating shifts
- Significant increase in on-site staff numbers
- Commissioning of energy focus system late 2005

## Future plans

- Replacement of older chillers and compressors with more energy-efficient models
- Independent energy audit to be carried out; audit recommendations to be implemented

## Members' Results and Targets (continued)

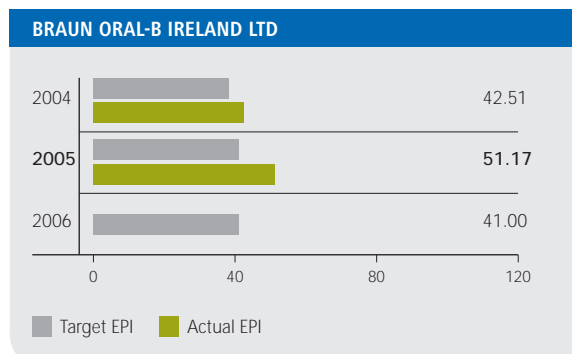


## Factors influencing 2005 results

- Higher energy consumption due to the introduction of new product lines and also due to greatly increased numbers of night-time and weekend shifts, coupled with a significant increase in on-site staff numbers

## Future plans

- Number of weekend operating shifts set to rise further due to increased demand for our product
- All business units expected to reduce energy consumption by 5%
- Further improvements to be made to the communication of on-site energy awareness issues

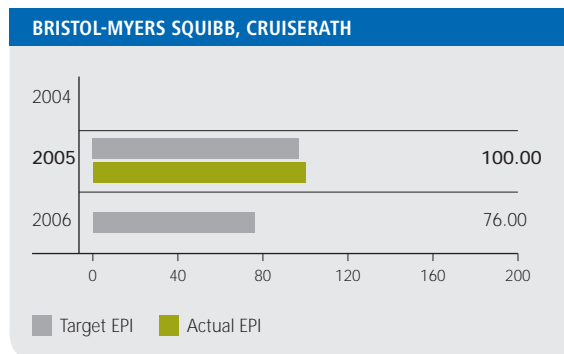


## Factors influencing 2005 results

- Changes in our product mix
- We have become a 24/7 production plant; on-site energy consumption has risen significantly as a result

## Future plans

- Major energy efficiency drive being spearheaded across the site; planned energy-saving projects include the implementation of a free-cooling system to meet the plant's chilled water requirements and the carrying out of power factor correction work on our electrical network

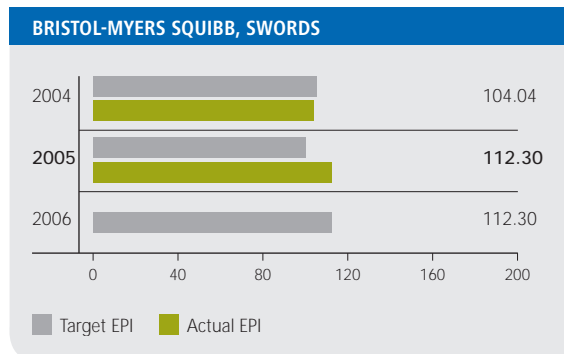


## Factors influencing 2005 results

- Substantial increase in production output
- Decrease in liquid nitrogen consumption following site installation of nitrogen generation unit
- Reduction in gas consumption following modifications to the waste-heat boiler gas feed

## Future plans

- Production output set to rise further in 2006
- Solvent recovery operations will increase steam usage on site
- Steam-reduction opportunities survey planned for 2006



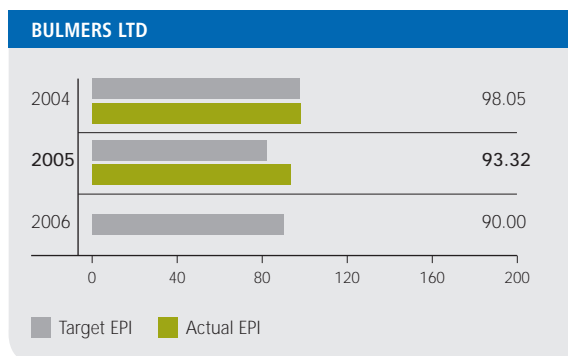
## Factors influencing 2005 results

- Cancellation of scheduled shutdown of P8, our largest production plant
- P4 plant operational for 12 months following major upgrade in 2005
- Thermal oxidiser uptime increased to 99.3%
- New centrifuge production line introduced in P3

## Future plans

- Move to seven-day-week operation by the small-scale plants will lead to increased fuel consumption
- New 1,780m<sup>2</sup> warehouse fully operational from February 2006
- Examining operation of Thermal Oxidiser to reduce Gas usage
- Increased on-site nitrogen generation will result in higher electricity consumption

## Members' Results and Targets (continued)

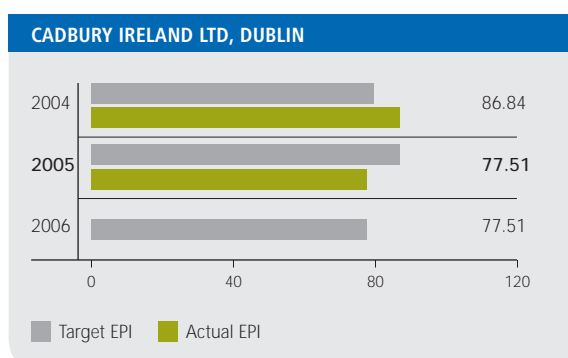


## Factors influencing 2005 results

- Production output rose by 27%
- Overall rise in energy usage, with effluent plant electricity consumption increasing by 50kWhrs and steam generation-related gas consumption increasing by 33%
- A total of nine separate energy-saving initiatives introduced in 2005

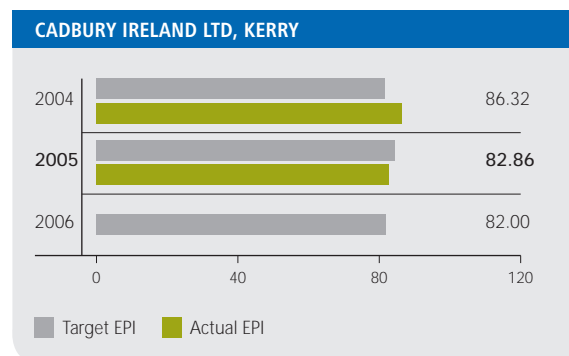
## Future plans

- Further increases in production output expected in 2006
- Energy efficiency potential to be a key consideration when making equipment purchasing decisions
- Implementation of programme of ongoing leak surveys/repairs and ongoing work on internal lighting controls
- Gas-reduction initiatives to focus on the steam generation area, with boiler controls modified and more efficient collection and use of condensate for boiler feed water



## Future plans

- Decrease in production volumes anticipated in 2006
- We hope to see a 1% reduction in energy usage per ton of production output
- Electricity consumption during the summer months set to rise as a result of installing air conditioning in the plant

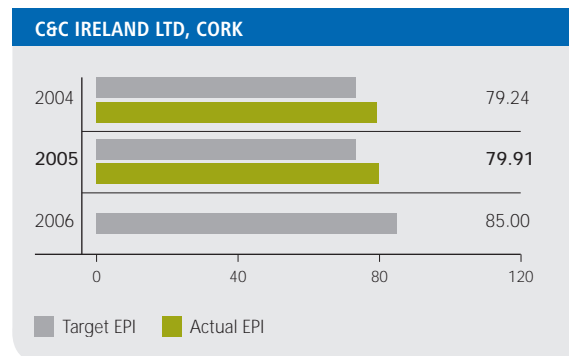


## Factors influencing 2005 results

- On-site energy audit identified a number of energy-saving opportunities; some audit recommendations already implemented
- Steam trap survey and compressed air leak survey recommendations implemented
- Significant increase in production volumes resulted in improved energy efficiency/production output ratios
- Operation of ISO 14001 Environmental Management System continued to deliver benefits

## Future plans

- Steam generation efficiency project to be implemented
- Phased implementation of heat recovery plant; this is designed to ensure effective utilisation of on-site air and water emissions



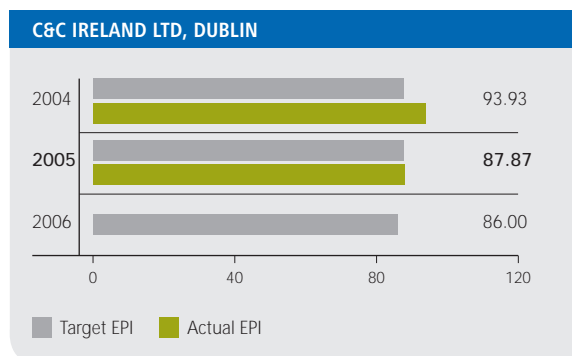
## Factors influencing 2005 results

- Production volumes decreased by 7.3%, compared to 2004
- Retrofit of air-recovery system failed to deliver projected energy savings
- Lower production volumes coupled with smaller runs as well as increased changeovers and greater numbers of high-energy consuming CIPs

## Future plans

- Installation of automated palletiser/de-palletiser on the glass-bottling line will lead to higher electricity consumption
- Gas consumption set to increase following installation of both new in-line pasteuriser and new stand-alone CIP system

## Members' Results and Targets (continued)

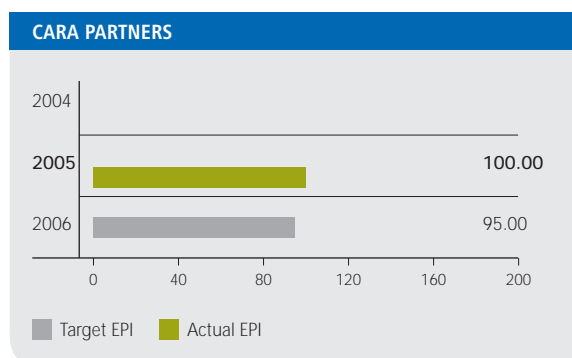


## Factors influencing 2005 results

- A 1% decrease in production volumes
- Various energy-saving initiatives implemented; these included the ongoing fine-tuning of the control of major loads when not in use; on-going improvements to space heating; maintenance of air and steam lines
- Energy savings offset by losses caused by increase in number of weekend hours for operating plant equipment

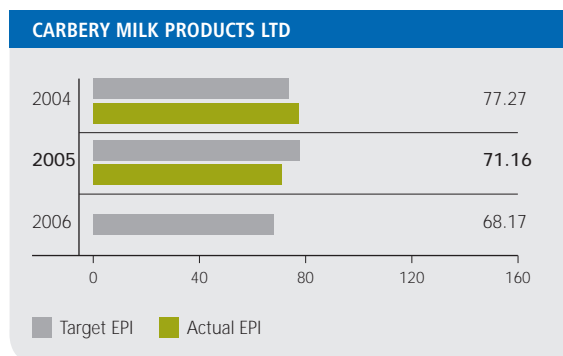
## Future plans

- Use of centralised real-time control to be extended to cover downtime production periods such as weekend nights and public holidays
- Second phase of heat recovery project to be implemented prior to winter 2006



## Future plans

- Production output to rise by more than 10% in 2006
- 2006 plant operating hours will be higher than 2005 figures
- Anticipated gains in machine operating efficiencies in the area of boiler steam, chilled water and compressed air generation
- Improvements to cooling water pump circuit to be completed before end 2006
- Implementation of boiler house burner controls project

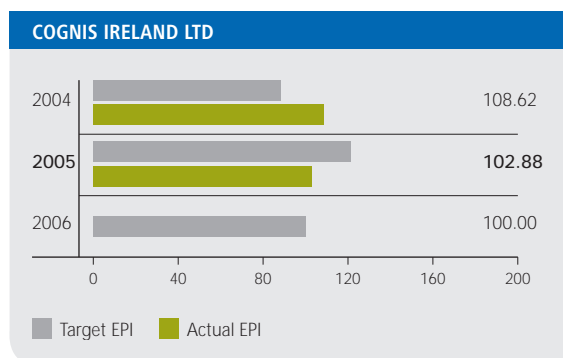


## Factors influencing 2005 results

- Shut-down of CHP plant for a six-week period due to high gas prices; as a consequence, electricity had to be imported from the national grid
- Two energy-saving heat recovery projects completed

## Future plans

- An additional three major energy-saving heat recovery projects almost completed
- VSDs which are being installed on drier air intake fans will further reduce electricity consumption
- Operation of main boilers being modified, in order to reduce steam production requirements



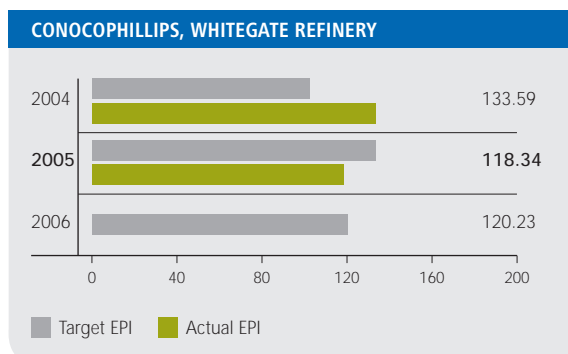
## Factors influencing 2005 results

- Optimisation of energy utilisation across the site due to a high level of production output and plant activity generally
- Implementation of project aimed at maximising condensate recovery rates

## Future plans

- High level of plant utilisation expected in 2006, with one of our manufacturing units due to increase production output during Q4 2006
- Site-wide energy awareness campaign planned for 2006

## Members' Results and Targets (continued)

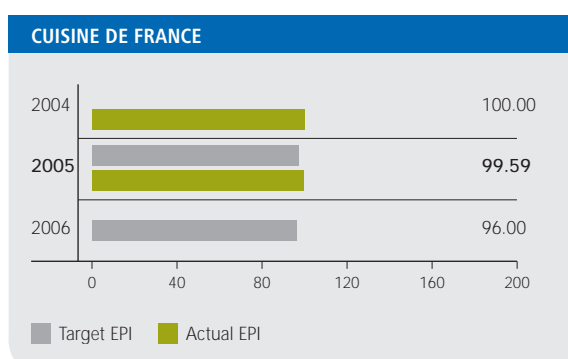


## Factors influencing 2005 results

- SG5 boiler operated on gas turbine exhaust gases for most of the year
- New SG6 boiler more efficient than the original unit
- Improved furnace operating efficiencies achieved, particularly in the case of the new F901 unit

## Future plans

- Further improvements to be made to furnace operation as well as CHP operation and reliability

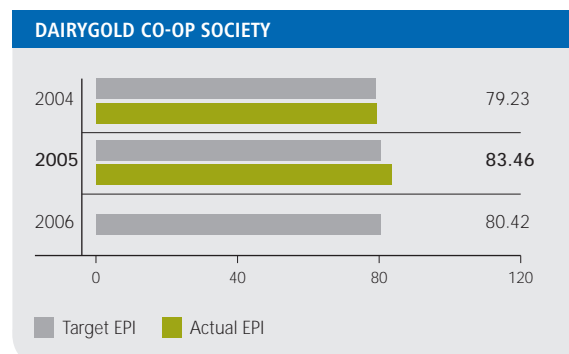


## Factors influencing 2005 results

- Various 2005 energy audit recommendations implemented; these included making modifications to our cold store (to improve the energy efficiency of the building envelope); making changes to our refrigeration plant (to lower the evaporating temperature); reducing the operating pressure of the compressed air system

## Future plans

- Production volumes set to remain at 2004 and 2005 levels
- Future projects may include carrying out improvements to our HVAC system; improving the energy efficiency of lighting in both the production and storage areas
- Implementation of an employee energy awareness and training programme



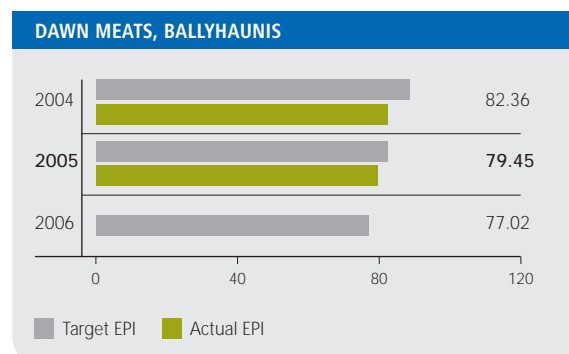
## Factors influencing 2005 results

Increased Natural Gas costs prompted:

- A reduction in Electricity generated by our CHP Plant
- A reduction in the Electricity exported to the National Grid
- An increase in the use of our Stand-by Generator

## Future plans

- Potential development of alternative Renewable Energy solutions such as Biomass, Biogas, and Wind
- Analysis of thermal system using pinch technology, a number of opportunities have been identified to reclaim energy and utilise in a number of processes



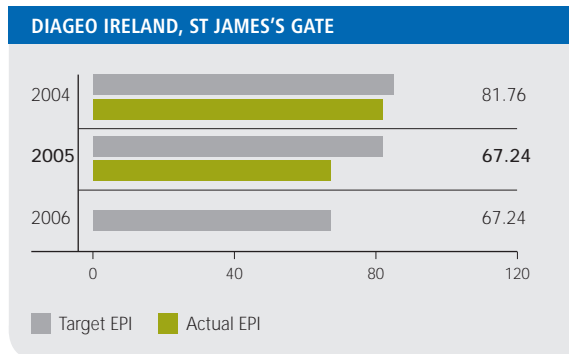
## Factors influencing 2005 results

- Improved EPI due to increased productivity in our slaughtering and deboning operations; this enabled us to reduce plant operating hours, which in turn led to lower energy consumption
- Conversion of our main oil-fired boiler during Q4 2005; boiler now runs on tallow

## Future plans

- All boiler energy requirements to be generated by tallow; this should deliver significant cost savings in 2006

## Members' Results and Targets (continued)

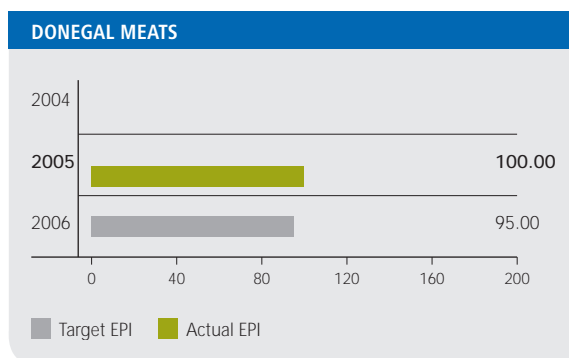


## Factors influencing 2005 results

- Production output levels at St James's Gate were increased due to plant rationalisation and the closure of the Park Royal Brewery in London
- The EPI improvement is attributable to:-
  - Improved economies of scale
  - Investment in additional process plant capacity
  - Investment in new and efficient utilities plant
  - Increased utilisation of existing CHP Plant

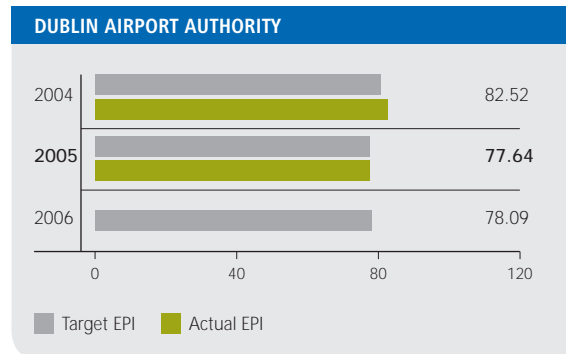
## Future Plans

A comprehensive energy study and programme of energy reductions is planned for 2006. In the future, economies of scale as well as energy improvement initiatives will be the key factors that will sustain or lead to further improvements of the EPI figure for the site



## Future Plans

- Installation of mechanical boning equipment will increase output
- Energy Checklists and ad hoc audits to be completed by Environmental Manager
- Implementation of IS 393 with the help of SEI through the Agreements Programme
- Surveys to include Lighting; Heating Systems; Energy Wastage etc

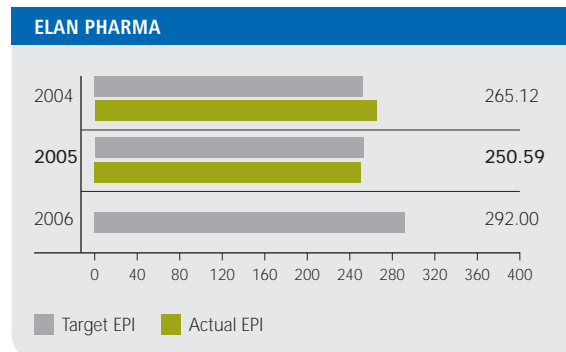


## Factors influencing 2005 results

- Output from our CHP units fell by 7.68% as a result of outages on all three CHP units

## Future plans

- Passenger numbers expected to increase to 19.5 million
- Factors such as the commencement of construction work on Pier D, the introduction of a new basement check-in facility, and the completion of a new baggage hall extension will combine to increase overall electricity consumption by 5% in 2006



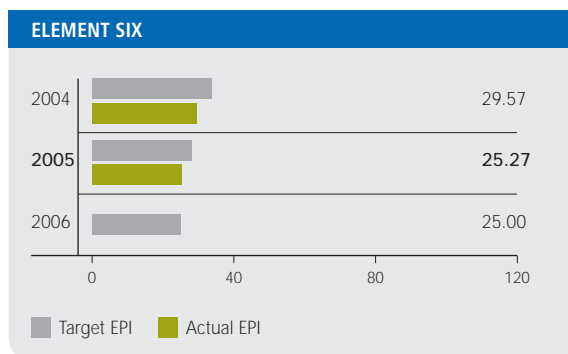
## Factors influencing 2005 results

- Both energy consumption and production output were slightly higher than had been anticipated

## Future plans

- Energy consumption is expected to rise slightly due to increased activity in one particular area of the plant
- Production volumes expected to drop slightly in 2006
- Higher consumption of natural gas envisaged

## Members' Results and Targets (continued)

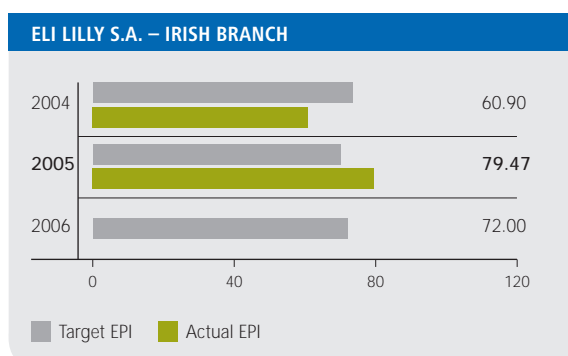


## Factors influencing 2005 results

- Continuous drive to achieve production method efficiencies as well as improved energy consumption/production output ratios
- Continuous monitoring of energy usage across the site
- Improved energy performance in both new and upgraded machinery

## Future plans

- Product mixes set to change; energy consumption expected to rise
- Comprehensive energy audit to be carried out in 2006; this will take account of new environmental factors such as changed production methods and plant relocations

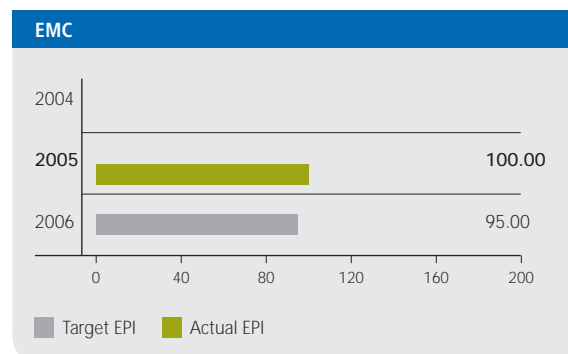


## Factors influencing 2005 results

- Increased electricity consumption, primarily due to on-site construction work during the year
- Slightly increased fuel consumption; higher steam usage required to meet space heating requirements during the commissioning of new plant facility
- Production output marginally lower than expected

## Future plans

- Installation of plant-wide M&T system planned for 2006
- Site-wide energy awareness campaign should lead to energy conservation initiatives/reduced energy consumption in 2006

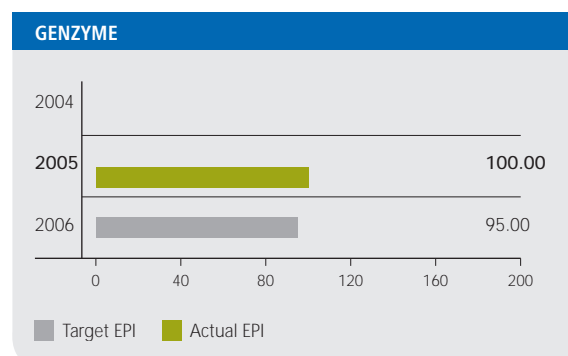


## Factors influencing 2005 results

- Additional Test Room and headcount requirements

## Future plans

- High energy consumption anticipated in 2006 due to:
  - rise in production output
  - provision of additional testing facilities for Symmetrix units
  - provision of additional office accommodation for new employees
- Plant lighting optimisation measures to include the installation of timers on some areas of the plant and the rewiring of other areas; electricity consumption associated with car park lighting to fall by 30% following introduction of voltage reduction
- Controls on eight AHUs to be upgraded with VSDs

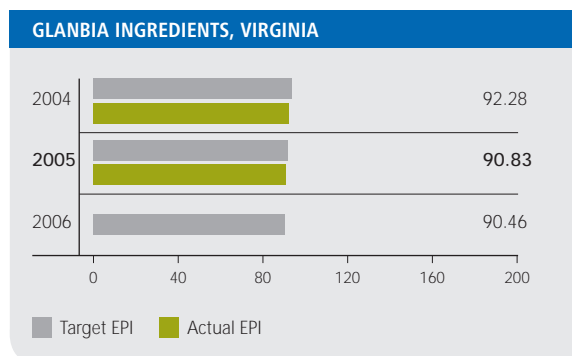


Genzyme is a new member of the LIEN. As 2005 marks its first full year of report results, energy performance factors were not recorded throughout 2005

## Future plans

- Energy consumption is set to rise in 2006 when our fill finish facility begins producing lyophilised product for the world market and also when Pack Line 2 is commissioned and becomes fully operational
- Construction of Renagel plant extension is due to be completed and commissioned in latter half of 2007

## Members' Results and Targets (continued)

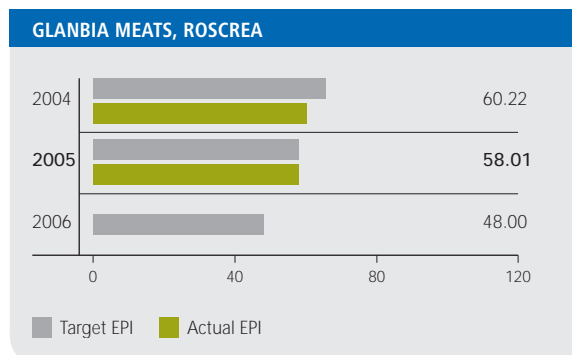


## Factors influencing 2005 results

- Slight improvement in our rate of energy usage to unit of production output
- Survey aimed at identifying heat loss in our steam distribution system carried out in 2005; implementation of programme of repairs to blocked steam traps and improvements to lagging of steam pipes

## Future plans

- A new programme of energy efficiency initiatives will be have to be put in place; this will be designed to offset the impact of continuing steep rises in gas prices

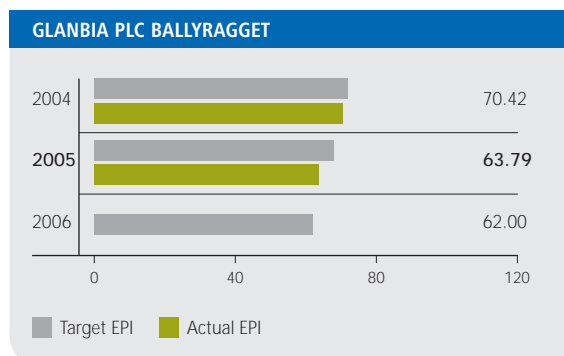


## Factors influencing 2005 results

- An increase in production throughput
- Greater awareness of energy consumption and associated costs across the site

## Future plans

- Three heat recovery measures to be implemented:
  - refrigeration heat recovery to be achieved with various technologies including oil cooling; use of a de-super heater; use of a liquid-based sub-cooler
  - Synger stack to deliver LPG-heated air
  - Air compressor heat recovery should create savings of 1,377 kwh per day

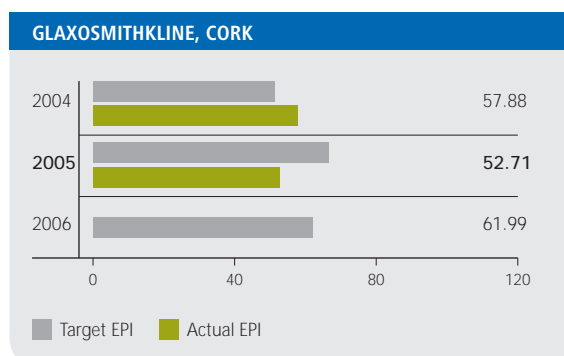


## Factors influencing 2005 results

- Production output increased thereby creating greater economies of scale
- Improvements in performance of plant equipment and machinery
- Various on-site energy projects implemented. These included an ongoing programme of tank and pipe insulation; the installation of heat recovery equipment, and a reduction in both water usage and effluent losses

## Future plans

- New Energy Management Standard for the site due to be implemented in 2006
- New heat recovery projects planned



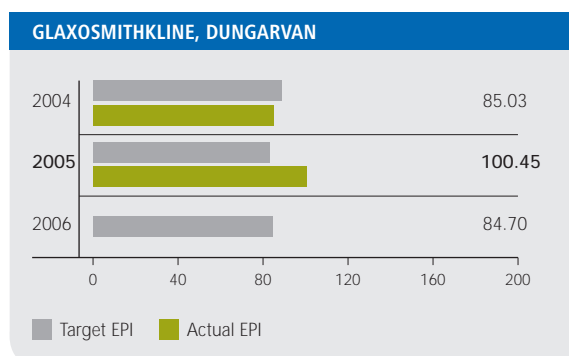
## Factors influencing 2005 results

- Production output increased
- Switch from LPG to diesel oil on new fleet of fork-lift trucks
- Energy reductions achieved as a result of various modifications carried out to lighting units across the site coupled with modifications carried out on a large cooling water system

## Future plans

- Various energy-saving projects planned including optimisation of both instrument air compressors and refrigeration system; addition of synchronisation equipment to 1.25MW stand-by generator to allow for peak load shedding
- Planned installation of both M&T system and GEM steam traps

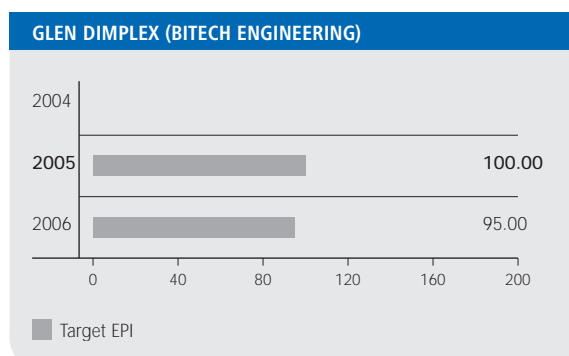
## Members' Results and Targets (continued)

**Factors influencing 2005 results**

- Major plant expansion work comprising warehouse and office accommodation completed
- GMP HVAC upgrade work carried out

**Future plans**

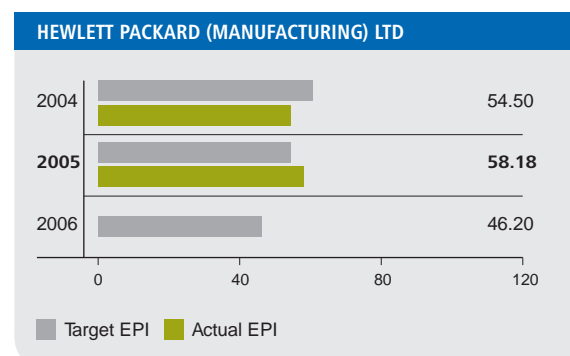
- Major production facility to be constructed and commissioned
- New VSD compressor to be installed



Glen Dimplex is a new member of the LIEN; 2005 marks its first year of reporting results.

**Future plans**

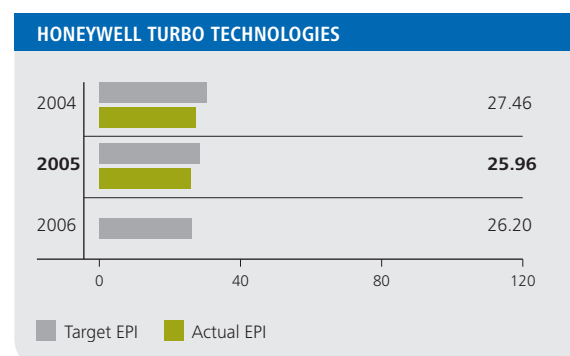
- Improved Efficiency of steam through insulation and controls
- Improved Efficiency through leak maintenance and review of system requirements
- Investigate alternative technologies and operating parameters
- Proposed installation of heating management system.

**Factors influencing 2005 results**

- Production output fell by 9%
- Energy consumption decreased by 2%

**Future plans**

- Planned installation of compressed air sequencer control panel which will reduce energy consumption when the compressed air network is running offload
- Redesign of compressed air system and use
- Removal of FD refrigerant dryers

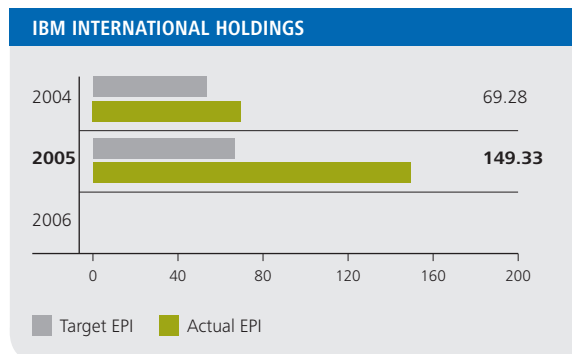
**Factors influencing 2005 results**

- Shutdown of BM 1 Cell for five months due to market downturn
- Commissioning of DF 2 Cell

**Future plans**

- Our gas consumption forecast for 2006 cannot be completed until the EPA confirms operating parameters for our plant afterburners
- Installation of Block Washer 3 to be completed by Q3 2006. Equipment features include energy-efficiency controls, energy/process-related data logging and tracking technology; a 5% reduction in energy consumption expected as a result

## Members' Results and Targets (continued)

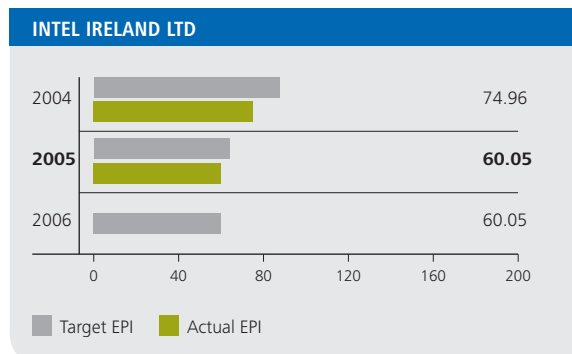


## Factors influencing 2005 results

- Significant changes in on-site activity i.e. move from manufacturing-based activities to predominantly service-based activities

## Future plans

- IBM Corporation agreed energy-reduction target of 4% year on year
- Specific plans for 2006 to include energy awareness programme aimed at reducing on-site gas consumption; further research into utilisation of green energy; implementation of project aimed at identifying ways to increase efficiency of gas boilers

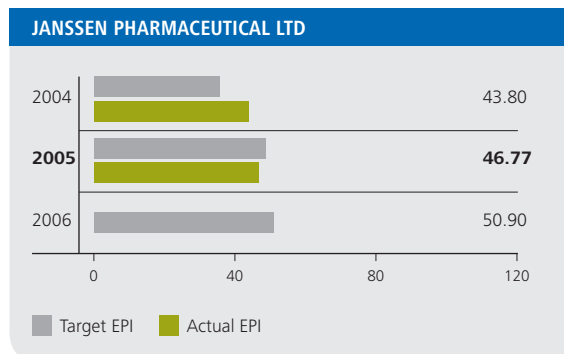


## Factors influencing 2005 results

- Higher electricity consumption due to construction work/commissioning of FAB 24/FAB 24-2
- 20% reduction in gas consumption achieved in first half of 2005, following implementation of various energy-reduction projects, offset by higher gas consumption in second half of 2005; this increase was related to construction work on FAB 24
- Altogether, 15 separate energy-reduction initiatives implemented

## Future plans

- Consumption of both electricity and gas will rise in 2006 following the installation of production equipment in FAB 24 and FAB 24-2
- A total of 19 energy-reduction initiatives to be implemented in 2006

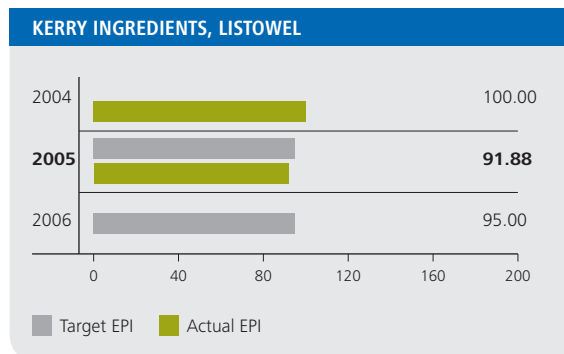


## Factors influencing 2005 results

- On-site energy consumption significantly impacted by the start up and commissioning of our new production facility, Plant 3

## Future plans

- Energy consumption will be significantly affected by the commissioning and validation of Plant 3 and by the commissioning of a new boiler for this plant
- Plans for 2006 include
  - implementation of the various energy-conservation measures identified during the Plant 3 design process
  - upgrading work on the Plant 1 cooling tower



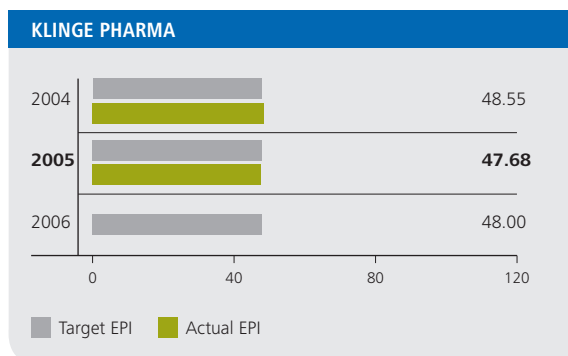
## Factors influencing 2005 results

- Implementation of energy recovery project focused on the re-use of waste heat to warm inlet air on spray driers
- Improvements in the metering, reporting and tighter management of on-site water consumption
- Tighter controls on refrigeration system during off-peak periods

## Future plans

- Planned upgrade of refrigeration system including the implementation of energy consumption optimisation measures

## Members' Results and Targets (continued)

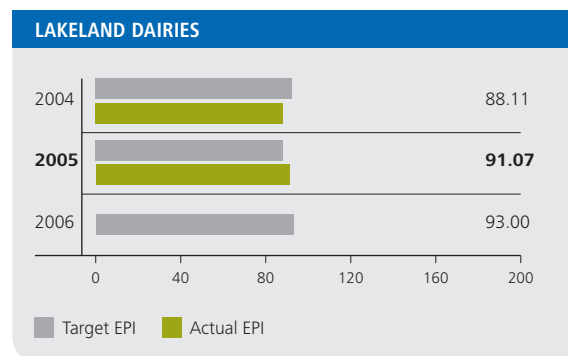
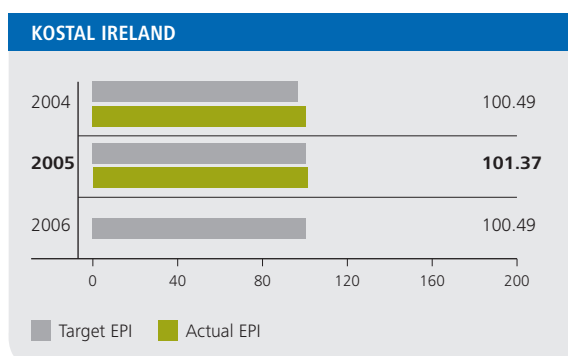


## Factors influencing 2005 results

- Both production output and on-site energy usage increased slightly in 2005

## Future plans

- 2006 production output to remain static
- We aim to reduce energy usage in order to counteract rising costs
- Two surveys planned for 2006. These are designed to:
  - assess our compressed air and nitrogen distribution systems, detect leaks and identify areas requiring repair
  - focus on steam generation and distribution systems; identify potential areas where wastage is occurring

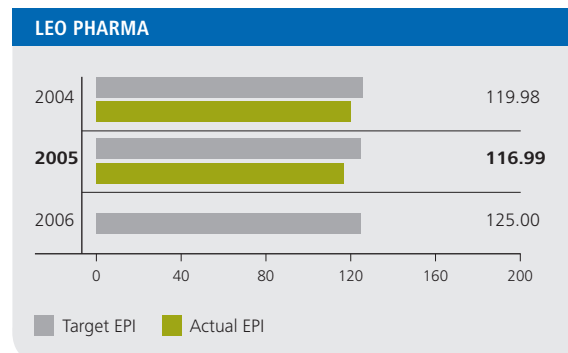


## Factors influencing 2005 results

Specialising in the manufacture of milk powder and butter, the energy efficiency of the site is related to volume efficiency and product mix. The opportunities for improved energy efficiency are being continually reviewed both in the process and the utility systems and negotiations on CHP are being continued. The process for a new butter product was installed requiring additional energy inputs. Increased control of product losses was implemented. The use of tallow for boiler fuel was revived.

## Future plans

New butter process requiring more heating and cooling and additional CIP operations. Increased use of tallow as boiler fuel, while carbon neutral and cheaper also results in soot and reduced boiler efficiencies. Successful planning application for CHP plant and negotiations on CHP conditions commenced with the other potential stakeholders.



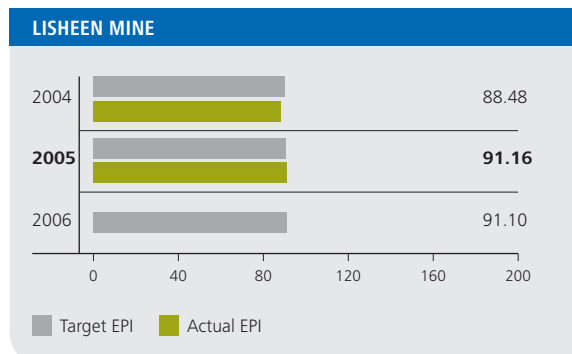
## Factors influencing 2005 results

- Increased manufacturing tonnage/batch size for one particular product delivered benefits in terms of product yield and energy/water usage
- Energy-conservation projects included implementation of flash steam recovery system; elimination of leaks in steam and condensate pipes; installation of a more energy-efficient chiller

## Future plans

- Temporary disimprovement in 2006 EPI due to commissioning of new production facility
- Implementation of heat recovery project postponed until Q3 2006
- Manufacturing of one of our products to be moved to another location
- 2006 energy-conservation projects to include installation of stand-by electricity generator; upgrading work on steam/condensate pipes; investigation of feasibility of implementing heat recovery from the main air compressor

## Members' Results and Targets (continued)

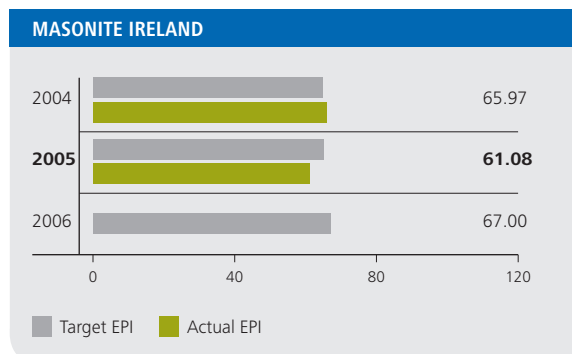


## Factors influencing 2005 results

- Production output and consumption of gas/diesel were in line with previous years, whereas electricity consumption showed 5% increase
- Maintained progress on the programme of energy-saving initiatives already in place

## Future plans

- The anticipated 100,000 ton rise in production output in 2006 should lead to the delivery of better overall energy efficiencies
- Energy demand set to increase due to production activity in new area of the mine

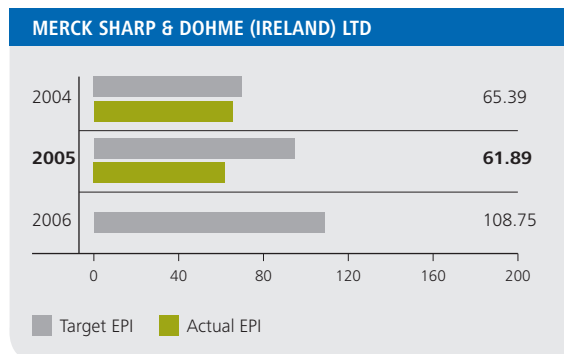


## Factors influencing 2005 results

- Production volumes 21% higher than anticipated; greater energy efficiencies achieved due to longer production runs
- 23% energy savings achieved due to installation of energy-efficient refiner plates
- The upgrading of the M&T system delivered expected improvements in energy consumption/production output ratios

## Future plans

- Lower production volumes expected in 2006; related energy efficiencies set to decrease following bi-annual shutdown of plant for maintenance work
- Further development work on both the refiner plates and the M&T system
- Annual energy savings of 245,000 KWhr and 336,000 KWhr respectively anticipated following installation of VSDs and improvements in the monitoring and control of air compressors

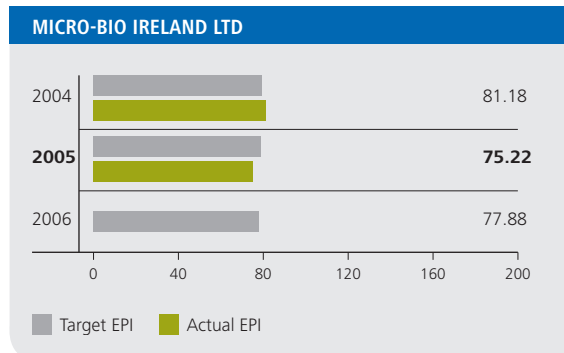


## Factors influencing 2005 results

- Energy consumption reduced by 9.8%. This may be attributed to an effective on-site energy awareness campaign coupled with the implementation of 12 discrete energy-saving projects: these included the installation of heat exchangers, low-energy lighting, timers on waste water treatment aerator motors, and an energy monitoring and tracking system; the remediation of heat losses on steam and condensate lines; the optimisation of both HVAC control and boilers; condensate recovery
- Production volumes were almost 1.5 times higher than forecast

## Future plans

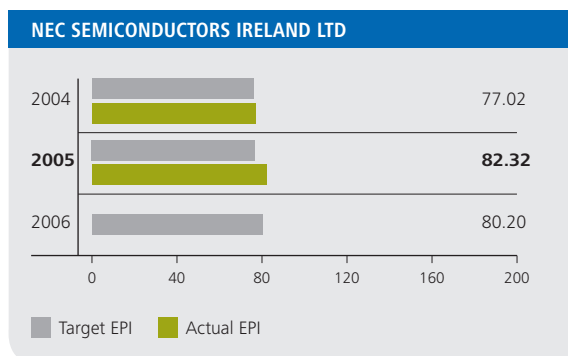
- Production volume set to decrease significantly in 2006
- Ambitious energy reduction targets set for 2006: actual consumption expected to be 13.3% less than 2004 figure



## Future plans

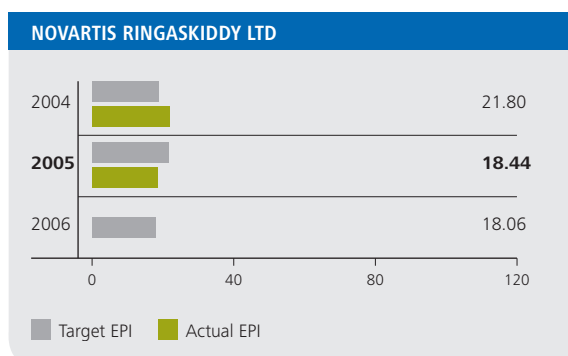
- Production capacity set to increase
- New cooling tower to be installed in 2006

## Members' Results and Targets (continued)



## Factors influencing 2005 results

- Installation and commissioning of high energy usage equipment including a second plating machine, a new tester and additional bonders
- Increased oil usage for humidification and heating purposes during cold weather in the first half of 2005
- Energy conservation measures implemented included the ducting of hot air from testers and the decreased use of the steam boiler

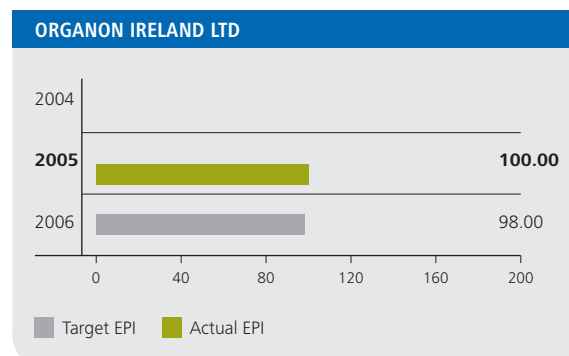


## Factors influencing 2005 results

- A 3.19% reduction in energy usage achieved following implementation of energy management programme comprising 23 separate initiatives. Our active energy management programme has continued to improve our EPI

## Future plans

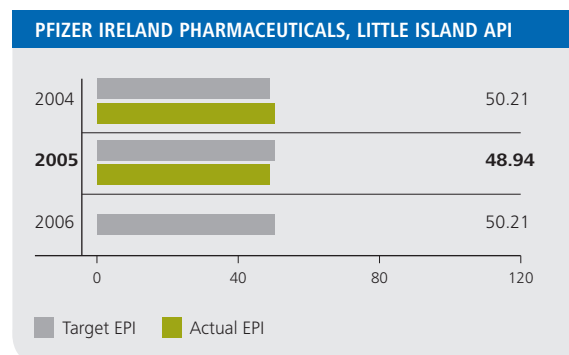
- We are planning to generate a further 5% reduction in electricity savings in 2006. These should be achieved as a result of implementing an energy management programme comprising 26 separate initiatives. With this energy management programme we estimate that our EPI will be reduced by 2%



Organon is a new member of the LIEN; 2005 marks its first year of reporting results.

## Future plans

- Reduced energy consumption in the warehouse as a result of installing more efficient light fittings and making changes to switching arrangement
- Investigate the possibility of installing a bigger air receiver as well as lowering the delivery pressure on all air compressors
- New team to be charged with responsibility for raising awareness of the importance of implementing energy conservation measures across the organisation



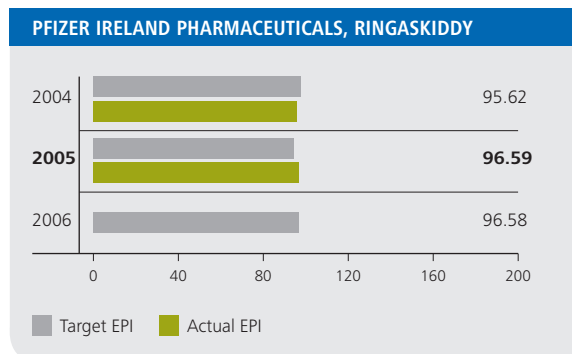
## Factors including 2005 results

- A lower than expected decrease in production volumes
- Eight energy-saving initiatives implemented during 2005; significant energy savings generated as a result
- A 6.6% reduction in electricity consumption following the installation of a VSD air compressor on the compressed air ring main system
- A 4.7% reduction in thermal energy consumption following boiler house upgrading work

## Future plans

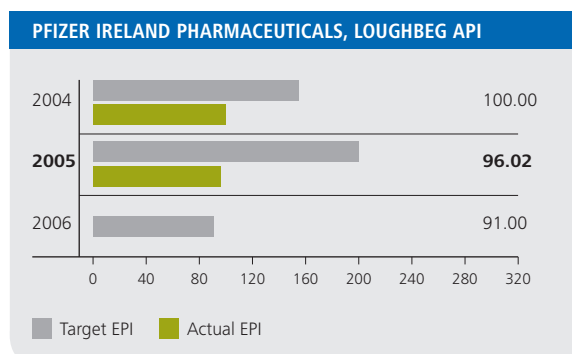
- Plant capacity to increase following completion of extension to one of the new production buildings

## Members' Results and Targets (continued)



## Factors influencing 2005 results

- Reduction electrical energy usage and thermal energy usage
- Changes in production volumes
- Installation of a VSD Air Compressor on the Compressed Air Ring-Main system
- Boilerhouse upgrade

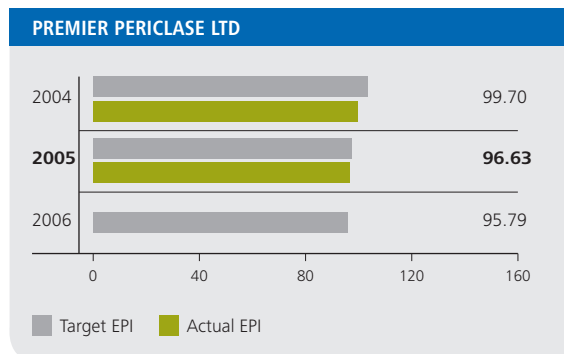


## Factors influencing 2005 results

- Production output increased
- New energy management programme implemented; this aims to reduce consumption by 2% year on year
- Some 35 energy-reduction initiatives implemented ranging from pump switch-off programmes to large-scale measures such as HVAC demand optimisation, chiller and refrigeration optimisation, and energy awareness campaigns

## Future plans

- Plans for 2006 include implementation of the new Irish energy management standard, IS 393, and completion of 20 energy-reduction initiatives ranging from the fitting of a VSD on the HVAC chiller to the installation of a heat recovery system on the new air compressor

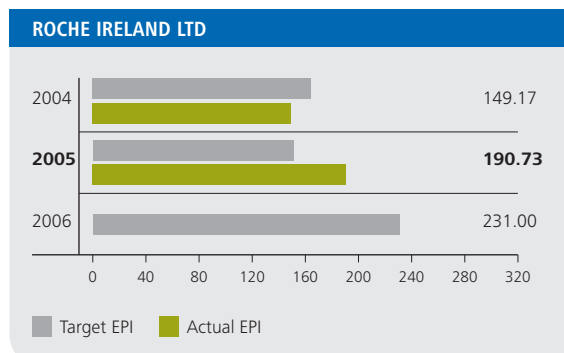


## Factors influencing 2005 results

- changes to limestone feed size made in Q.3 2004 had a positive impact on energy efficiency
- A reduction in production capacity had a negative effect

## Future plans

Fixed energy losses will be covered by increased production at one stage of the process, thereby improving energy efficiency slightly.



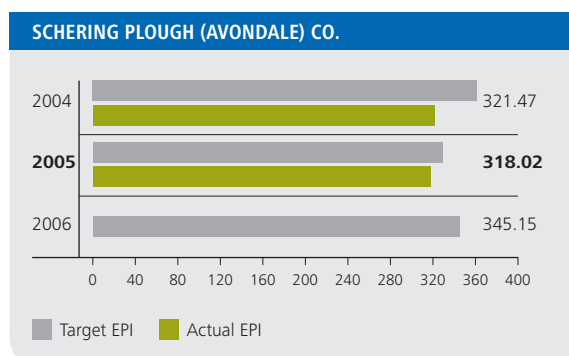
## Factors influencing 2005 results

- Significantly reduced output on our highest volume production item
- Implementation of energy-saving initiatives such as fitting VSDs on process water pumps and upgrading our nitrogen plant

## Future plans

- The expected additional 300-ton reduction in output on this production item (following the closure of one of our plants in July 2006) will be somewhat offset by increased production output elsewhere
- Energy savings expected in 2006 due to initiatives such as new energy metering project; reconfiguration of the refrigeration plant; repair work on the instrument air distribution system

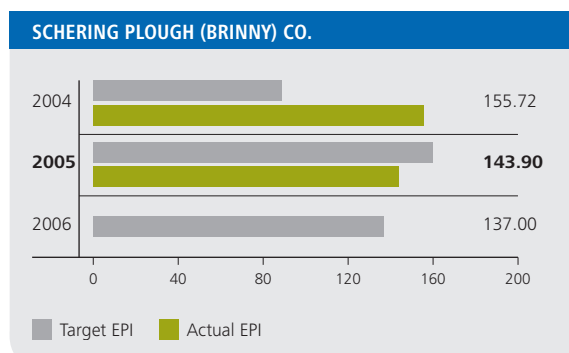
## Members' Results and Targets (continued)

**Factors influencing 2005 results**

- Significant improvement in our EPI due to measures such as decreasing supply of dilution air to thermal oxidiser (in order to reduce gas consumption); carrying out air leak detection and repair programme on our air compressors (in order to reduce electricity consumption)

**Future plans**

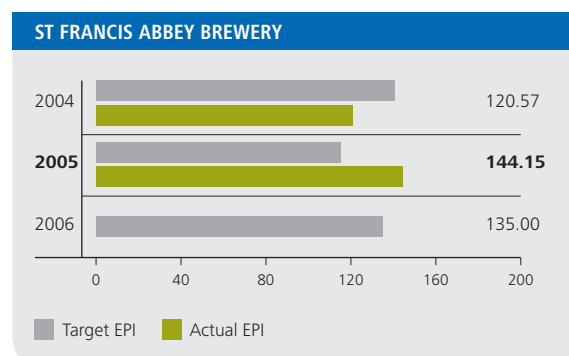
- Additional energy consumption associated with newly extended production building expected in 2006
- Energy audit to be carried out across the site
- 2006 production output set to remain close to 2005 level

**Factors influencing 2005 results**

- Electricity savings achieved as a result of:
  - identifying water wastage areas
  - reducing process chillers operation; optimising HVAC operation
  - installing PIR controls on lab/office/plant room lighting
- Gas savings achieved as a result of optimising combustion efficiency on our three boilers

**Future plans**

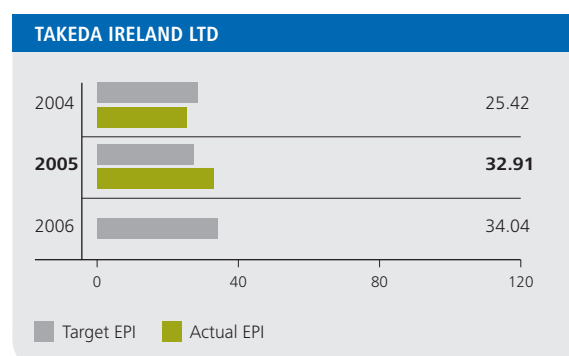
- Improved returns from new main condensate line anticipated in 2006 due to installation of GEM steam traps
- 2006 energy-reduction campaign to focus on:
  - condensate return from utility packages
  - improved sequence control on boilers
  - improved TDS control on boilers
- Possibility of using renewable energy in Administration Building to be investigated

**Factors influencing 2005 results**

- Production output dropped by 18% due to downturn in overall beer market; high base energy load (50%) not offset by reduced output
- Planned appointment of specialist utilities contractor postponed
- Commissioning of refrigeration plant (coupled with parallel operation of the original system) resulted in higher electricity consumption

**Future plans**

- Production output set to drop further in 2006
- Utilities contractor to be appointed late 2006
- Some energy savings may be achieved due to commissioning of upgraded refrigeration system, installation of new cooling tower and steam traps upgrading work
- Plans for 2006 include site-wide energy audit and energy awareness campaign

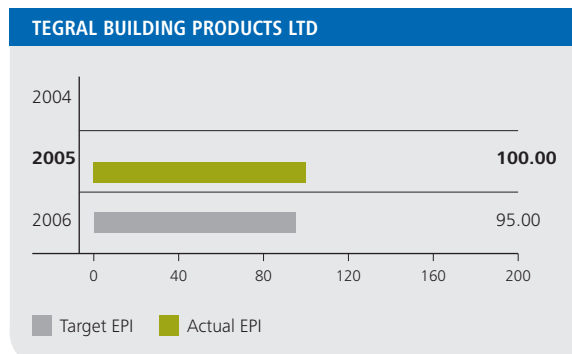
**Factors influencing 2005 results**

- Production output 10% lower than forecast
- Decrease in production output did not generate a corresponding decrease in energy consumption
- New process trials during Q3 and Q4 created high energy demand but did not deliver any other energy-related benefits

**Future plans**

- Production output set to rise by approximately 10% in 2006

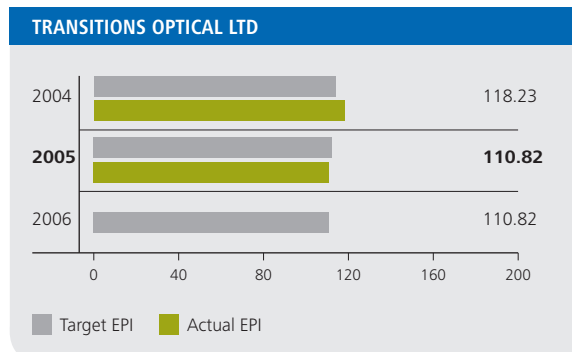
## Members' Results and Targets (continued)



Tegral is a new member of the LIEN; 2005 marks its first year of reporting results.

#### Future plans

- We will install a system which will allow us to monitor electricity and natural gas consumption on a daily/weekly/monthly basis
- In line with IS 393 protocols and procedures, we will be carrying out a detailed energy audit during 2006
- We will examine the feasibility of controlling ovens and coolers using product temperature measurement methods

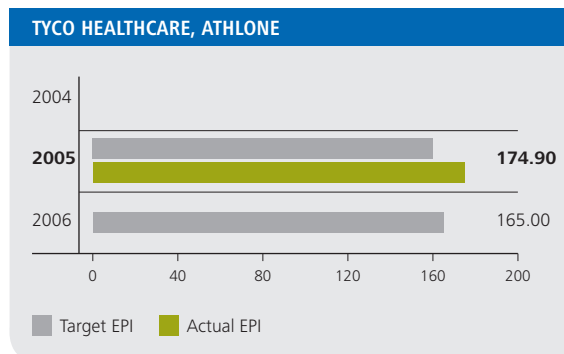


#### Factors influencing 2005 results

- Completion of new 1,680m<sup>2</sup> extension
- Commissioning of new production facility and cleanroom
- Introduction of new transbonding process

#### Future plans

- Implementation of new Project Management system, which will be integrated into our energy management policy

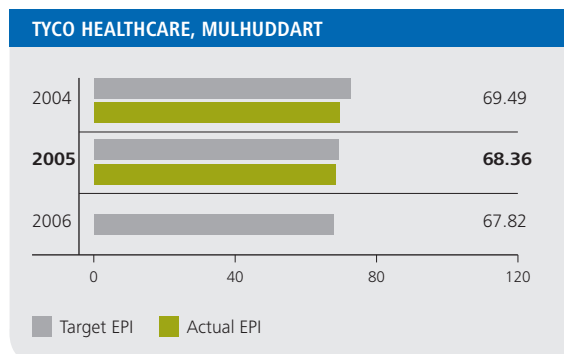


#### Factors influencing 2005 results

- Alteration in shift operating schedules – increased from three cycle to four cycle
- Rise in number of people employed at the plant

#### Future plans

- Several new items of equipment/machinery to be installed
  - VSD-operated air compressor
  - all-electric injection moulding machine



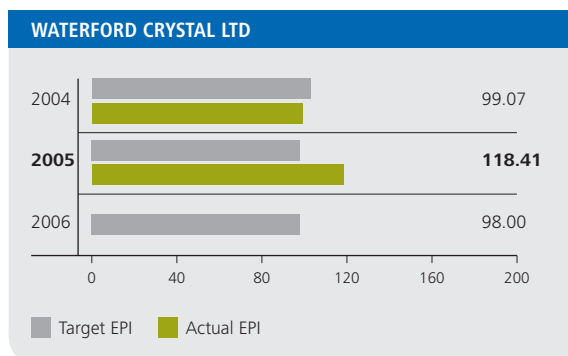
#### Factors influencing 2005 results

- Implementation of extensive steam trap repair and replacement programme, including the replacement of thermodynamic traps with GEM steam traps
- Improved boiler utilisation; high-efficiency boiler used as the lead boiler for longer periods than in previous years

#### Future plans

- Major upgrade of our building lighting system to be carried out, including the replacement of out-of-date high-energy consumption fittings with energy-efficient alternatives using built-in occupancy sensors; this will generate 150,000 kWhrs electricity savings

## Members' Results and Targets (continued)

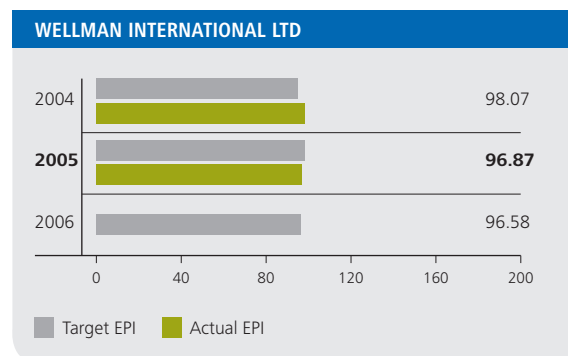


## Factors influencing 2005 results

- Benefits of our CHP plant greatly reduced as a result of CHP plant downtime for ten weeks
- Overall energy consumption increased

## Future plans

- Comprehensive review of CHP plant operating costs/savings
- Detailed energy monitoring programme to be implemented across the site in 2006; installation of new gas meters; relocation of electricity meters; introduction of weekly energy reporting system
- Oil consumption to fall following conversion of remaining lehr to natural gas
- Potential savings of €90,000 annually if issue of noise attenuation on standby generators can be addressed successfully



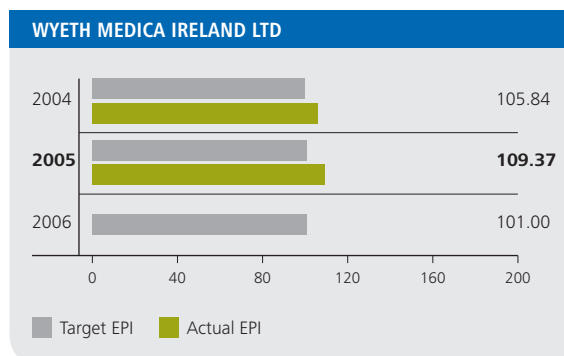
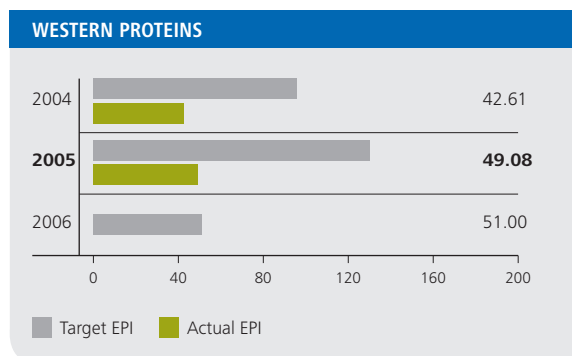
## Factors influencing 2005 results

- Overall energy reduction of 2.91% achieved
- Electricity consumption reduced following installation of high-efficiency motors and VSDs; installation of harmonic filter on electrical distribution system transformer; continuation of insulation replacement programme for transfer tubes on polymer lines
- Programme to identify/repair steam traps and air leaks put in place

## Future plans

- Plans for 2006 include:
  - implementation of selected 2005 energy audit recommendations
  - programme to optimise air management/control systems
  - four thermal projects designed to improve boiler performance/heating output
  - electrical projects to include installation of VSDs on a number of fans and pumps; fitting of lighting controls in some areas

## Members' Results and Targets (continued)



## Factors influencing 2005 results

- Continuing reduction in energy efficiency due to a fall in production throughput
- Rise in electricity consumption due to processing requirements

## Future plans

- Volume throughput is expected to fall further in 2006; this will have a negative impact on our EPI in 2006
- Energy audit to be carried out in 2006, in order to identify areas where energy efficiency improvements could be created

## Future plans

- Plan to implement a number of energy projects – all specifically designed to reduce gas and electricity consumption
- Energy survey to be carried out across the site as part of our implementation of IS 393, the new Irish Energy Management Standard
- Overall energy consumption set to rise due to a number of plant expansion projects

**The following companies did not report for 2005:**

Baxter Healthcare SA; Dundalk Brewery; Glanbia Meats, Ruskey; Glanbia Plc, Inch; Gypsum Industries Ltd; HJ Heinz; Pure Fresh Dairies Ltd; Tech Group Europe, Dublin; Thermo King Europe.

**The following companies left the LIEN in 2005:**

Abbott Ireland, Cavan; Smurfit Paper Mills Ltd; Irish Shell Ltd; Saehan Media Ireland Ltd.

## 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.

## Members List

Allergan Pharmaceuticals Ltd

Analog Devices BV

Astellas Ireland Co, Ltd

Atlas Aluminium

Aughinish Alumina

Bausch & Lomb

Baxter Healthcare SA

Boliden Tara Mines Ltd

Boston Scientific Ireland Ltd, Galway

Boston Scientific Ltd, Cork

Braun Oral-B Ireland Ltd

Bristol-Myers Squibb, Cruiserath

Bristol-Myers Squibb, Swords

Bulmers Ltd

Cadbury Ireland Ltd, Dublin

Cadbury Ireland Ltd, Kerry

C&C Ireland Ltd, Cork

C&C Ireland Ltd, Dublin

Cara Partners

Carbery Milk Products Ltd

Cognis Ireland Ltd

ConocoPhillips, Whitegate Refinery

Cuisine de France

Dairygold Co-op Society

Dawn Meats, Ballyhaunis

Diageo Ireland, St. James's Gate

Donegal Meats

Dublin Airport Authority

Dundalk Brewery

Elan Pharma

Element Six

Eli Lilly S.A. – Irish Branch

EMC

Genzyme

Glanbia Ingredients, Virginia

Glanbia Meats, Roscrea

Glanbia Meats, Ruskey

Glanbia Plc Ballyragget

Glanbia Plc, Inch

GlaxoSmithKline, Cork

GlaxoSmithKline, Dungarvan

Glen Dimplex (Bitech Engineering)

Gypsum Industries Ltd

Hewlett-Packard (Manufacturing) Ltd

HJ Heinz

Honeywell Turbo Technologies

IBM International Holdings

Intel Ireland Ltd

Janssen Pharmaceutical Ltd

Kerry Ingredients, Listowel

Klinge Pharma

Kostal Ireland GmbH

Lakeland Dairies, Bailieboro

LEO Pharma

Lisheen Mine

Masonite Ireland

Merck Sharp & Dohme (Ireland) Ltd

Micro-Bio Ireland Ltd

NEC Semiconductors Ireland Ltd

Novartis Ringaskiddy Ltd

Organon Ireland Ltd

Pfizer Ireland Pharmaceuticals, Little Island API

Pfizer Ireland Pharmaceuticals, Ringaskiddy API

Pfizer Ireland Pharmaceuticals, Loughbeg API

Premier Periclase Ltd

Pure Fresh Dairies Ltd

Roche Ireland Ltd

Schering Plough (Avondale) Co.

Schering Plough (Brinny) Co.

St Francis Abbey Brewery

Takeda Ireland Ltd

Tech Group Europe, Dublin

Tegral Building Products Ltd

Thermo King Europe

Transitions Optical Ltd

Tyco Healthcare, Athlone

Tyco Healthcare, Mulhuddart

Waterford Crystal Ltd

Wellman International Ltd

Western Proteins

Wyeth Medica Ireland Ltd