

The first year with PFE

**2005 Report on the Programme for
improving energy efficiency in industry.**

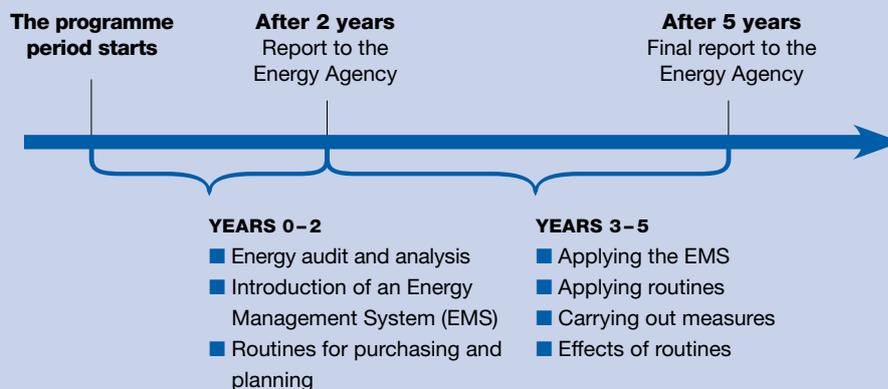


The first year with PFE

A year has now passed since the Programme for improving energy efficiency in energy-intensive industry (hereafter "PFE") was commenced. By the end of 2005, 126 companies had joined PFE. These companies use nearly 30 TWh of electricity, or about 84% of the electricity that can become non-taxable through the programme. This high percentage was achieved despite the refraint of many qualified companies to join the programme. Thus, after the first year, Sweden's most energy-intensive companies have joined PFE. The paper and pulp, wood, chemical, food, steel and mining industries are the sectors with the highest percentage of participation. Each participating company contributes to saving money and conserving the environment.

A programme for improving energy efficiency

PFE was introduced in January 2005 by the Swedish Energy Agency as a voluntary energy efficiency programme. PFE is an economic policy instrument directed to energy-intensive industrial companies in Sweden. The background of the programme was an EU directive that led to a new tax on electric power beginning on 1 July 2004. The new energy tax of 0.5€/MWh affected Swedish industrial companies, with the exception of certain manufacturing processes. PFE is a way of compensating for this tax. Companies who join the program are eligible for a tax reduction, provided that they work systematically with energy issues and carry out energy saving measures in their own companies.



The time chart shows how a company must work to improve energy efficiency during the five-year programme period. An energy audit forms the basis for the measures the company will take and is also an important prerequisite for the introduction of a standardised energy management system (EMS). The system must be certified within the first two years. Within the remaining three years, the company must carry out its planned measures and follow its routines for planning and purchasing high-consumption electrical equipment. Companies can apply to join at any time during a calendar year.

An important step towards a more energy-effective industrial sector

Decreasing energy consumption by energy-intensive industries is crucial to creating an economically and ecologically sustainable energy system for Sweden.

The Swedish rules regarding taxation of energy-intensive industries in the country did not comply with the EU requirements introduced in 2004. As a result, a specific programme for improving energy efficiency in energy-intensive industries (PFE) was developed, and the Swedish government and Riksdag commissioned the Swedish Energy Agency to administer it in co-operation with industrial companies.

A year has now passed since the inception of PFE, and 126 companies now participate in the programme. Experiences so far have been predominantly positive.

Participating companies can receive a double benefit thanks to the tax exemption and the long-term reduction of energy expenses. The Energy Agency has had good experiences with this programme, and is looking forward to continuing to contribute to improved energy efficiency and increased competitiveness for Swedish industries. This report accounts for the experiences in 2005, the first year of PFE.



Thomas Korsfeldt
Director General



126 companies are improving their energy efficiency with PFE

On 3 January 2005, energy-intensive industrial companies could start applying to join the Swedish Energy Agency's PFE. A new tax on electric power was introduced on 1 June 2004, and companies could receive a tax reduction retroactively from July 2004, provided they submitted their applications by 31 March 2005.

In 2005, the Energy Agency received 136 applications, all but two by the end of March. Six companies did not meet the requirements for joining and thus chose to withdraw their applications. Another four companies have since then withdrawn their applications. These were relatively small companies who would have received only a relatively modest tax reduction. The costs for additional administration and EMS certification have also been mentioned as reasons for not joining the programme.

With only a few exceptions, companies have applied online using the Energy Agency's e-services. Here, companies can enter their information and immediately receive an answer as to whether they meet the basic criteria for joining PFE. Authorised company personnel can then follow the handling of the application until the agency's decision.

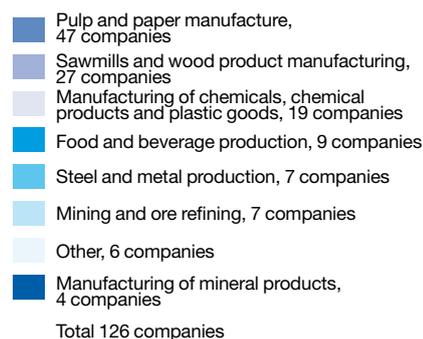
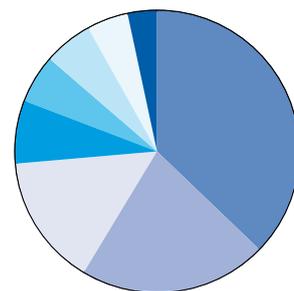
All 126 companies participating in PFE belong to the manufacturing industry, Industrial classification 10-37.

Companies joining PFE must:

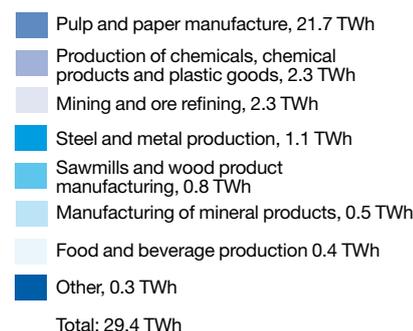
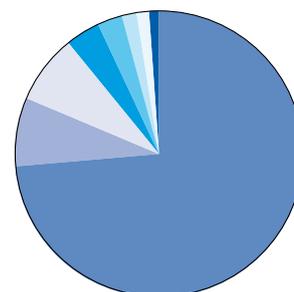
- Be engaged in the manufacturing industry, Industrial classification 10-37.
- Use electricity in their manufacturing process.
- Be energy-intensive (i.e. energy costs of at least 3% of the production value, and/or paying energy, carbon dioxide and sulphur taxes amount of at least 0.5% of the value added.
- Have the economic means for carrying out the programme.

In total, the companies in the programme consume 31.5 TWh of electricity per year (including both bought and self-produced electricity). This is more than a fifth of total Swedish consumption, and more than half of the industrial sector consumption. Of the 31.5 TWh, 29.4 TWh is taxed at 0.5 €/MWh. The 126 companies participating in PFE are exempt from this tax, provided they meet the programme requirements. The tax reduction of these companies totals SEK 147 million per year (based on the consumption during the base year indicated).

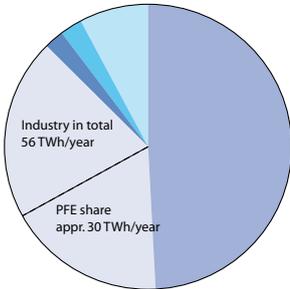
Participating companies by industry



Electricity consumption by industry



Electricity consumption in Sweden

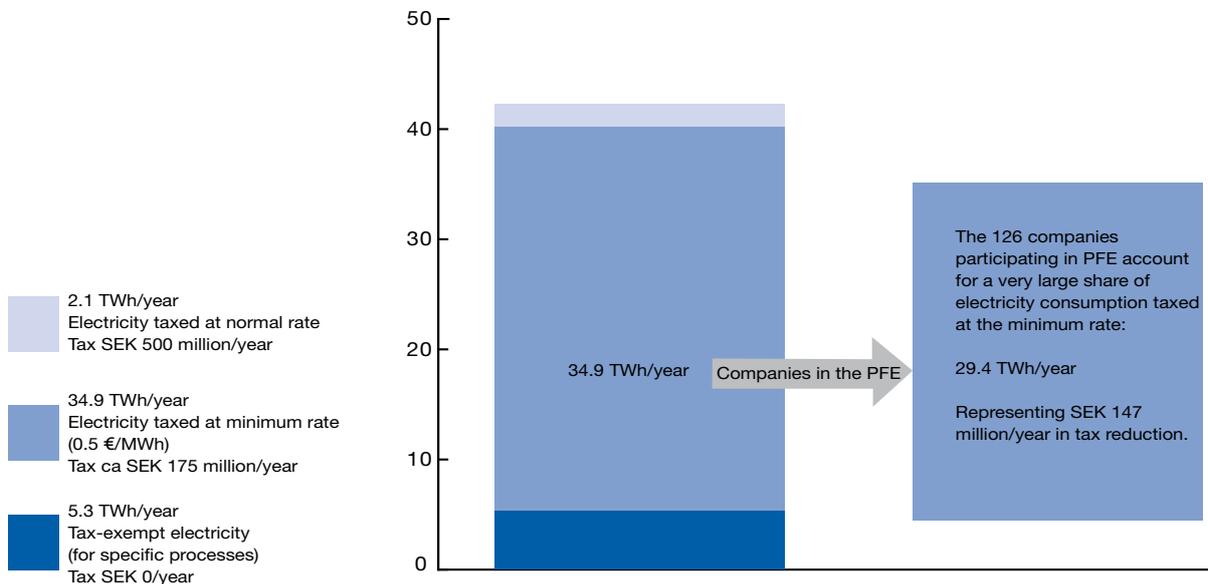


- Dwellings and services 72 TWh
 - Industries, 56 TWh
 - Domestic transports, 3 TWh
 - District heating, refineries, 4 TWh
 - Distribution losses, 11 TWh
- Total: 146 TWh

The largest electricity consumers participate in PFE

According to a target group analysis by the Swedish Energy Agency, based on data from Statistics Sweden (2002), 1150-1330 companies would be qualified to join PFE. However, most of these would save less than SEK 50,000 per year on electricity tax reductions. As joining PFE also entails certain additional costs, such as EMS certification, the Energy Agency estimated that around 100 companies would consider it profitable enough to join the programme. All companies qualified according to the analysis, would probably save even more money by systematically improving energy efficiency than on the tax reduction itself, and this is something that companies not participating in PFE can do as well.

Total target group electricity consumption and result



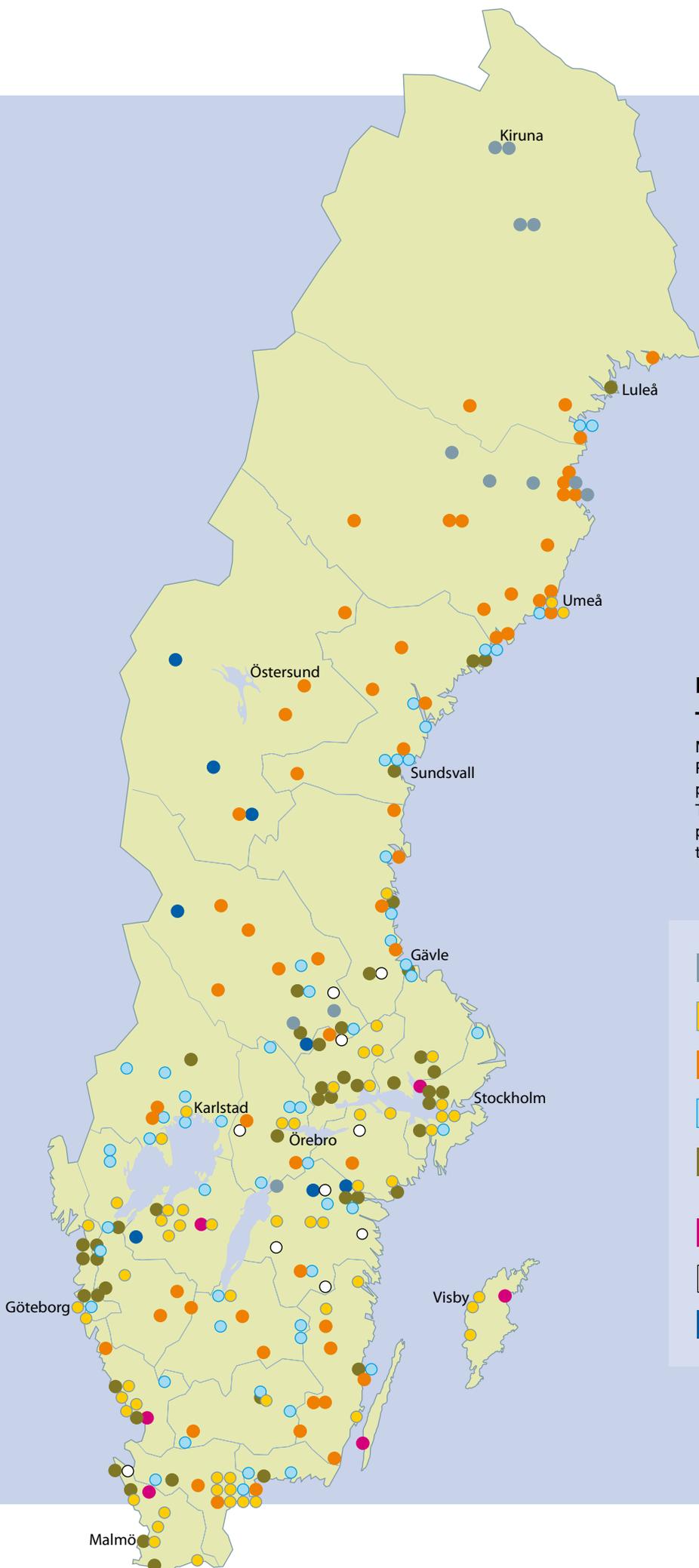
The left bar shows the total electricity consumption of the target group, i.e. the 1150-1300 companies qualified to join PFE, according to Sweden Statistics. These companies pay electricity tax at up to three different rates, depending on where in the company the electricity is consumed.

Electricity taxed at normal rates is used in offices, etc.

Electricity taxed at the minimum rate is used in most manufacturing processes, and it is this tax, 0.5 öre/kWh, that companies can reduce to 0 €/MWh by joining PFE.

Completely tax-exempt electricity is used in processes exempt from electricity tax. These are metallurgy, chemical reduction and electrolysis.

The right bar shows the minimum taxed electricity consumption of the companies in PFE. The target group's total consumption amounts to 84 percent of the electricity – 34.9 TWh – that could be made tax-exempt by joining PFE.



Plants taking part in PFE – from North to South

Many of the companies participating in PFE have several plants. A total of 270 plants are taking part in the programme. The map shows where in Sweden the plants are located and to which industry they belong.

- Mines, ore refining
- Food and beverage production
- Sawmills and wood product manufacturing
- Pulp and paper manufacture
- Manufacturing of chemicals, chemical products and plastic goods.
- Manufacturing of mineral products
- Steel and metal production
- Other

Energy management systems – an efficient tool

The purpose of PFE is to help companies improve their energy efficiency. One of the prerequisites for participating is to implement a standardised energy management system (EMS). Energy management makes it easier for companies to work consistently and systematically with energy matters to achieve increased energy efficiency, reduced energy costs and improved control of energy consumption. A standardised EMS shows how a company can constantly streamline its energy consumption, and increase its share of renewable energy as well as its energy exchange with the surrounding municipality.

Energy consumption and thus costs can decrease through:

- Increased knowledge of where and how energy is consumed
- Monitoring of how energy consumption changes over time
- Decisions to implement measures that improve energy efficiency

The energy management system must be certified by an accredited certification body. As of the end of 2005, seven certification bodies had applied for accreditation at the national accreditation body, SWEDAC. One of these bodies obtained its accreditation in connection with the first certification of a PFE-company, LKAB.

Special routines for PFE-companies

Besides introducing a standardised energy management system, the companies joining PFE are also required to follow specific routines when purchasing high-consumption electrical equipment. When purchasing high-consumption electrical equipment (more than 30 MWh per year), companies have to choose the highest energy efficiency class. Alternatively, they can calculate the life cycle cost (LCC) of the equipment and compare it with the cost of conventional equipment. If the surplus cost for an energy-efficient solution will pay itself back within three years, the company must choose it over the conventional one.

THE COMPANIES COMMENTS ON PFE:



Anna Altner, Process engineer, Södra Cell Värö.

“PFE has helped us get better at measuring and following up on energy. Most importantly, PFE has made us focus more on how to use electricity efficiently, no matter what the scale. You have to be aware of the whole chain down to object level, which has made the energy issue more concrete.”



Peter Nilsson, R&D engineer, Norra Skogsägarna

“When we heard of this we decided right away that this was something we wanted to be a part of. We are right in the middle of the energy audit and are introducing an energy management system. The industry I work in has not paid much attention to these issues before. But thanks to PFE, we’re now starting to, and we’ll be more interested in electricity consumption in the future. It’s difficult to know

what is required, as we’re supposed to be the pioneers, but the supervisors at the Energy Agency have been very service-minded. What I’d like to see next is the programme expanding to the smaller companies. Those we buy our machinery equipment from should also share this approach.”



Susanne Lindqvist, Energy engineer, Sandvik Materials Technology

“Naturally, we have worked with energy matters in the past, but thanks to PFE we are now more focused on them. PFE makes industries concern themselves with energy efficiency, and that’s good, because it’s an important issue. Not just for the companies, but also for society as a whole. Having said that, I think the programme is still having teething problems. It needs a running-in period.”

Audits will lead to energy saving measures

During the first two years of the programme, companies taking part must perform a thorough audit and analysis of their total energy consumption. The main objective, for participating companies, is to find measures that can improve energy efficiency and to start using more environmentally adapted, renewable forms of energy.

In addition to what the standard for energy management systems dictates regarding audit and analysis, companies joining PFE must also carefully audit and analyse their energy consumption with focus on electricity.

The audit and analysis must:

- Be carried out while maintaining a systems perspective, which means companies have to determine how all or parts of manufacturing processes and auxiliary systems can co-operate to obtain energy efficiency.
- Take both long and short term effects into account, which means companies have to analyse which changes can have an impact on energy consumption in the course of a ten year period. This long-term analysis will then be considered when decisions are taken, regarding energy use.
- Result in electricity saving measures. Companies should implement measures that have a payback period of less than three years, within the programme period.

Tools for improving energy efficiency

The Energy Agency has designed handbooks and other aids that make it easier to participate in PFE. These can naturally also be used by others who want to improve energy efficiency in a company environment.

- Handbook on energy management systems
- Handbook on energy audits and analysis
- Handbook on routines for purchasing and planning
- A template for calculating the LCC according to PFE requirements.

These can be downloaded at www.stem.se/pfe at "Energikartläggning och energiledningssystem med krav på rutiner".



Solveig Eriksson, Manager Business System, SCA Timber and SCA Graphic

"Our group has been working with energy saving for quite some time, but PFE has contributed to giving us a new focus on the issue, and also made it easier for us to communicate with our environmental authorities. Information and education efforts, forming energy management groups and so on has prioritised energy matters on our agenda. You can also notice this from the commit-

ment in the field – energy issues concern us all, so we're getting suggestions for improvements all the time. Since we already carried out a major energy saving project similar to PFE at our pulp factory in the late 80's, we just took our established way of working, and made it more structured."



Alf Schedin, Project manager, Lantmännen - the Swedish Farmers Supply and Crop Marketing Association

"Today we're working in a more goal-oriented way to improve energy efficiency, and PFE has been factor in this. Energy costs and our efforts towards a sustainable development have played a role as well. We have around 120 plants spread all over Sweden, which means accounting for all our measures can be quite burdensome. But we still want to be a part of this.

Improving energy efficiency is the main reason, but the tax exemption works as a stimulus and puts the energy issues on the agenda throughout the company."



The positive effects of the programme

PFE was created in a period of rising electricity prices, and a time when the energy issue had become an increasingly inherent part of environmental thinking. For competitive and environmental reasons, industrial companies have showed interest in new ways of working that can affect energy consumption and costs.

PFE reduces energy costs

Companies who join PFE are exempted from electricity tax in their manufacturing processes. In addition, companies can further reduce their expenses, because the programme's requirements regarding energy audits and management systems provide good opportunities to identify and carry out measures that improve the energy efficiency.

PFE contributes to increased competence

Joining PFE is a strategic decision that company managements should make. Implementing an EMS results in more persons in companies becoming involved with energy issues. All personnel who can affect the company's energy consumption must be identified and educated in how energy can be used more efficiently. All company functions, including operating and maintenance staff, buyers, co-ordinators for environmental and quality matters, project leaders and managers should be involved in the work.

PFE helps to save the environment

For companies, PFE means increased awareness and expertise regarding effective and sustainable energy use. The required energy audits and EMS provide companies with tools for structured energy efficiency improvement efforts. At the same time, the EMS requires companies to identify measures leading to improved energy efficiency, decreased use of fossil fuels and increased energy exchange with surrounding society. The requirements on routines for purchasing high-consumption electrical equipment and planning, in turn, lead to a greater demand for energy efficient equipment.

PFE decreases environmental impact as participating companies learn to use electricity more efficiently. As a rule, they should achieve this without increasing their consumption of other (fossil) fuels.

Quantifying environmental benefit is not so simple. The environmental impact of electricity consumption is in some dispute and depends on what the system boundaries are and on variations over time (such as time of day and year), among other things. Below is a calculation example:

Together, the companies in PFE use about 30 TWh of electricity per year. Consequently, each saved percentage unit corresponds to 0.3 TWh/year. The decrease in electricity consumption means a decrease of the marginal electricity in the system. Supposing the marginal electricity is produced from coal or, in a few years' time, from natural gas, a decrease in electricity consumption also means a decrease in carbon dioxide emissions – 1 MWh of coal produced electricity corresponds to 820 kg and 1 MWh of natural gas produced electricity to 350 kg of CO₂ emissions. The companies have not yet accounted for the amount of electricity they are expecting to save, but based on the marginal electricity example, an average electricity efficiency improvement of one percent for the companies in the programme would amount to a total decrease of 100,000-250,000 metric tons in CO₂ emissions per year.

Co-operating participants

The initial year of PFE has been successful. The large, energy-intensive companies in Sweden are participating in the programme, which has increased the importance of energy matters in these companies, with energy efficiency improvement efforts having now begun in earnest. The Swedish Energy Agency is the supervisory authority for the programme and issues directives and information.

Other participants, too, perform important functions to make PFE work. The co-operation between the industries and authorities is of key importance in the development of PFE. The companies contain the knowledge of what opportunities they have for improving energy efficiency, while PFE provides the framework for this work.

The Swedish Energy Agency supervises PFE

Companies wishing to join the programme submit their applications to the Energy Agency, which decides on the matter. Once a company has joined, it has to inform the agency of the electricity saving measures it is planning to carry out and account for its introduction of an EMS. The agency then follows up on the results. If a company cannot meet its commitments, or discontinues the programme, the Energy Agency can revoke its decision.

The programme council represents the industries

On 1 April 2005, a programme council was set up, consisting of representatives from trade associations, responsible authorities and companies in the energy, pulp and paper, forest, mining, steel, wood and chemical industries. The council meets four times per year to discuss issues that come up as PFE progresses, such as possible changes in directives issued by the Energy Agency. The council should help to improve the program by representing the interests of the various industries. The council will also comment on the yearly report on PFE that the Energy Agency presents to the government.

The Swedish Tax Agency manages the exemptions

The role of the Tax Agency is to manage the tax exemption participating companies are eligible for if they meet PFE requirements. Companies submit their tax exemption applications here. If requirements are not met, the Tax Agency can revoke its decision. For more information: www.skatteverket.se.

PFE programme council

Thomas Korsfeldt	The Swedish Energy Agency (chairman)
Andres Muld	The Swedish Energy Agency (reporter)
Annette Brodin Rampe	E.ON Sverige AB
Karin Emilsson	Södra Cell
Erik Eriksson	The Swedish Tax Agency
Christer Larsson	The Swedish Paper Workers' Union
Mikael Möller	The Swedish Plastics & Chemicals Federation
Peter Pernlöf	Boliden AB, SVEMIN
Birgitta Resvik	The Confederation of Swedish Enterprise
Maria Sandqvist	The Association of Swedish Engineering Industries
Arnold Silverhult	Sandvik Materials Technology
Sven Wird	Holmen AB

An eventful year with PFE

It is the Energy Agency's task to disseminate information about the programme. At the end of the 2004 and 2005, the agency arranged several seminars. PFE was also presented at a number of other conferences and meetings, arranged by consultants and certification bodies. Before the start of the application period, some 300 company representatives were informed. On 16 June, the Energy Agency arranged a kick-off meeting for PFE companies, providing information, inspiration and a chance to exchange experiences. 130 company representatives participated. Since the autumn of 2004, the Energy Agency has disseminated information on PFE via the Internet, printed materials and news releases and designed handbooks to facilitate participation. PFE has also been visible in daily newspapers and trade publications, in the form of articles and advertisements. The agency website www.stem.se/pfe always contains the latest information on what is going on in the programme.

Effective processing through e-services

Virtually all, or 94 percent, of the companies applying for joining PFE did so via the Energy Agency's e-services between 4 January and 31 March 2005. This contributed to fast processing of the applications, of which 80 percent had been processed within a month. In the second and fifth years, the companies will also have to submit their reports through the e-services at www.stem.se.

THE PROGRAMME COUNCIL COMMENTS ON PFE:



Birgitta Resvik, Director, Energy and Climate Policies, Confederation of Swedish enterprise

"The programme has become a success as so many companies have joined. The energy issue has climbed high up on the agendas, including those of company managements. Commitment is getting stronger. I hope we are able to develop the programme and expand it to other, less energy-intensive, industries. I can only see this having positive effects. In addition, the Energy Agency has been very realistic and sensitive to our needs."



Mikael Möller, Energy and climate matters, The Swedish Plastics & Chemicals Federation

"As an incentive, PFE is very positive. They expect companies to carry out audits, but at the same time they give us freedom to choose what measures to take. The companies know their facilities best, so it's good that we have some latitude to decide on how to improve efficiency. I believe companies have felt very positive about the programme, and we've had a good dialogue with the Energy Agency. I hope that improving efficiency will make companies more competitive. Knowledge of energy management systems is increasing and I think this can also spread outside the sphere of PFE."



Peter Pernlöf, Vice President - Energy, Boliden AB

"PFE makes companies focus on and analyse their situation in the energy area. The focus is mainly on the processes rather than on the side effects. But this produces an audit of the whole company, of both its productive and non-productive parts. It gives us an overall view, which is useful. The ambition is that we can decrease our consumption of electricity, or at least improve efficiency. If production increases, electricity consumption doesn't need to follow. It's about minimizing the unnecessary parts."



Sven Wird, Senior Vice President, Holmen Group

"PFE has been positive so far. The Energy Agency, on their part, has done a good job. They are very willing to fix apparent weaknesses or to clarify their instructions. I believe PFE has put electrical energy efficiency on the agenda in most companies. Of course PFE is not the only reason, but taxes have always been a concern to managements and so the programme has struck a chord. This is a side of PFE that I think has been underestimated."

Co-ordination with other policy instruments

Several policy instruments have been introduced in recent years to make the energy system more sustainable. These do not need to conflict with PFE or vice versa. On the contrary, there can be positive synergy effects for companies who participate in PFE and are also subject to the following:

- The Emissions Trading System (some companies)
- The Electricity Certificate System (all participating companies)
- The Environmental Code (all participating companies)

The Emissions Trading System

Joining PFE gives companies increased knowledge of improving energy efficiency and using non-fossil energy forms. PFE's requirement of an audit and analysis of energy consumption also improves companies' chances of controlling their carbon dioxide emissions. This means that companies participating in PFE are able to operate more efficiently within the framework of the Emissions Trading System.

The programme EMS requirement also improves companies' chances of defining responsibility, authority and routines for dealing with energy issues. One example is monitoring and documenting of emissions, which makes it easier for companies to comply with the rules of the emissions rights trading system.

Read more at www.utslappshandel.se.

The Electricity Certificate System

The purpose of the Electricity Certificate System is to increase the use of renewable energy forms in electricity production (solar, wind and water energy as well as bio-fuel). Electricity intensive companies benefit from performing audits and analyses of their energy consumption, as improved control and decreased energy consumption lowers the price of the companies' electricity certificates.

In addition, a large part of the electricity intensive companies that form the target group for PFE are exempted from the quota obligation according to the electricity certificate system. These companies can thus benefit even more from joining PFE.

Read more at www.stem.se.

The Environmental Code

Introducing an energy management system and carrying out energy analyses can help companies achieve the level of knowledge that they must have according to the Swedish Environmental Code:

- "Persons who are engaged in an enterprise or who take a measure or intend to do so, must possess the knowledge that is necessary in view of the nature and scope of the activity or measure to protect human health and the environment against damage or detriment." (Chapter 2, Section 2, the Swedish Environmental Code, General rules of consideration)
- "Persons who are engaged in an enterprise or who take a measure shall conserve raw materials and energy... Preference shall be given to renewable energy sources." (Chapter 2, Section 6)



Do you want to know more about PFE?

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