Energy Efficient Electric Motor Systems in New Member and Candidate Countries

Report on the Project Results
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1 Introduction

Motor Challenge Programme (MCP), belonging to the SAVE group, was developed by European Commission as one of the diverse measures undertaken to counteract the decline of the energy efficiency improvement rate in Europe (later reported in The Green Paper on Energy Efficiency published 22 June 2005). MCP was designed as a voluntary initiative dedicated to efficiency improvement of motor driven systems. It was estimated that those systems account for 69% of industrial electricity consumption in Europe¹ and offer high savings potential at a relatively low cost.

Motor Challenge Programme and the associated MCP Tool Set were first implemented in Western Europe (DEXA-MCP) with the aim of promoting cost-effective measures related to motor-driven systems through an integrated approach based on:
- creating a European framework to encourage top level decision makers to adopt energy savings measures as management priority;
- raising awareness of the potential for energy and money saving measures;
- focusing on the performance of entire systems, so as to provide maximum reliability, quality of service and cost effectiveness;
- making a wide range of information tools available;
- public recognition of the efforts made by companies that have committed to energy saving “Action Plans” through the use of the MCP logo, catalogues, etc.

Project 4EM-MCP launched in January 2006, as an extension of MCP initiative to New Member States and Candidate Countries, was based on the same framework as DEXA-MCP and made effective use of the tools developed and experience gained by its predecessor.

The 4EM-MCP was undertaken by the Consortium consisting of 9 Project partners from 6 countries: Bulgaria, Romania, Hungary, Italy, Portugal and Poland. Project coordination was done by Polish Copper Promotion Centre.

Project Participants:

1) Polish Copper Promotion Centre (PCPC), Poland
2) Engineering Consulting and Design (ECD), Italy
3) Centre for Promotion Clean and Efficient Energy (ENERO), Romania
4) ISR-University of Coimbra (ISR-UC), Portugal
5) ESD – Bulgaria, ltd.
6) Polish Foundation for Energy Efficiency (FEWE), Poland
7) Black Sea Regional Energy Centre (BSREC), Bulgaria
8) Energy Efficiency Agency (EEA), Bulgaria
9) Systemexpert Consulting, ltd. (SC), Hungary

¹ “Actions to Promote Energy-Efficient Electric Motors”, DG XVII, October
In the course of the Project implementation new national Partners were brought into 4EM-MCP from the Czech Republic, Slovakia, Latvia and Estonia. (This geographical Project extension is further developed in Chapter 3.7)

On the request of the Commission Austrian Energy Agency joined the Project in order to play the role of the link between DEXA-MCP and 4EM-MCP.

Figure 1 – 4EM-MCP geographical coverage

2 The 4EM-MCP Project objectives

The chief objective of 4EM-MCP was to reach out to industry in the new member and candidate countries and seek the involvement of enterprises either as Partners or Endorsers.

The companies that become Partners to the MCP do not have any legal obligations, but have to show strong commitment to Programme principles. They are required to draft an Action Plan in which they commit to undertake certain energy efficient measures with respect to their motor driven systems. The scope of such a Plan is defined by the companies themselves. Companies making that commitment receive advice and technical assistance from the National Contact Points. The benefit MCP offers to its Partners is the public recognition given through the programme’s promotional campaign.

Organizations willing to support the MCP with their knowledge and help in promoting the Programme to industry become Endorsers. They need to write and execute MCP
Promotion Plan defining specific actions to disseminate information and support MCP Partners in putting recommendations into practice. In return, the Endorsers receive public acknowledgement similar to that of MCP Partners.

Equally important Project aim to recruiting Partners and Endorsers was to support and popularise the MCP programme and its ideas in the new member and candidate countries in general. Thus the main stream of project activities was chiefly focused on promotion and education. More technically 4EM-MCP main objective was to disseminate, extend and apply the MCP tools already developed by DEXA-MCP through national programmes in Eastern European Countries. These programmes were mostly executed by National and Regional Energy Agencies or other specialized organizations, in order to build capacity and to raise awareness of policy makers and industry in this area by:

1. **Dissemination**, through a comprehensive programme of technically sound publications, seminars, show cases projects, training courses and communication through websites focused on target audience and through engaging new MCP Partners and Endorsers.
2. Adapting to the target countries’ markets **MCP and other evaluation tools** designed to lower the "entry barrier" to energy efficiency, so as to ease their application in SMEs, including situations where no publicly sponsored intervention is carried out; developing software with the database for supporting decision process.
3. Gathering information on the **market penetration of energy efficient electric motor systems**, on past, ongoing and planed activities for efficiency improvements in electric motor systems and by **evaluating the energy efficiency potential in electric motor systems in the geographical area of programme**.
4. Conducting **enterprise interventions** of the various types such as: demonstration projects, audits and EE investments projects, proposal of financial sources,. Enterprise interventions will result in show cases projects and will be used in the dissemination activities.
5. Extending the application of MCP to new territories by involving new national partners and prepare the ground for further MCP partner and endorser.

3 Summary of the achieved results during the project

3.1 Major project achievements

Chief results of 4EM-MCP achieved throughout the project period with respect to the aforementioned key objectives were:

Main achievements regarding dissemination can be represented by the number of activities done:
- 17 new partners and 19 new endorser recruited
− 69 energy audits and 40 enterprise interventions performed
− over 40 events (workshops, training seminars, etc) organized
− participation to 36 seminars, 11 trade fairs, 23 conferences
− 48 topic-related articles published
− vast numbers of leaflets and MCP brochures disseminated.
− training modules for industries developed

The process of integration of the MCP Toolset at national level entailed market investigation conducted in all countries involved. On the basis of the available data collected and analyzed by the Partners, ENERO drafted a market investigation report. The results of this report are summarized in Chapter 3.4.

Another achievement in adoption of MCP toolset was translating technical modules and the Paper and Software Tool into Project Partners national languages. (Further information related to this topic can be found in Chapter 3.3)

Bringing 4 new countries into 4EM-MCP can be regarded as the Project achievement in extending MCP application. Intensive dissemination conducted by the newly added National Contact points in those countries produced very good results and drawn new Partners and Endorsers to the Project.

3.2 Dissemination activities
The major role of the 4EM-MCP project was assigned to dissemination activities including widely understood information activities focused on promoting energy efficiency in electric motors driven systems. As the project was not intended to provide any financial support to the entities who decided to invest in retrofitting motor systems being used by them, the 4EM-MCP project was expected to provide information and good practice examples in order to involve next entities into the European action that resulted from the Motor Challenge Programme.

The objective of the dissemination action, according to the project assumptions, was to achieve a massive dissemination of Motor Challenge Programme (MCP) tools through partners’ communication channels and integration with national programmes. Another objective was the announcement of the MCP program, communication campaign, recruitment of new MCP Partners and Endorsers.

Taking into account the promotional and informative role of the 4EM-MCP project in the new member states and candidate countries, it shall be highlighted that the core of this project was to disseminate a variety of information among the largest possible number of electric motor system users, producers, designers and researchers. Dissemination of information was intended to show also the past and ongoing EU activities with focus on Motor Challenge Programme. Its objective was to create awareness of the motor systems users about cost-effective efficiency improvement. It was intended to use the MCP frame, and to perform this task by organising training, show cases projects, brochures and websites in national languages.
Within the dissemination scope, one of the main tasks of the 4EM-MCP was to disseminate the toolset developed and used by the Motor Challenge Programme among the target groups in the countries who participated in the 4EM-MCP project. According to the pre-assumed project objectives, dissemination included integration of this toolset into national energy agency programmes and practices.

This toolset includes educational materials, such as guidelines, technical guides, training modules to be presented to the representatives from industry, papers and articles published in specialist periodicals, other kinds of professional press, and also in other mass-media. In that respect, a full set of the tools developed under auspices of the Motor Challenge Programme was translated into national languages of all target countries of the 4EM-MCP and after that distributed in thousands of hardcopies and through innumerable internet links and locations. Finally, after completion of the 4EM-MCP project, it can be stated that the project results became fully integrated with the Motor Challenge Programme ideas and practice.

All the Project participants managed to involve new MCP Partners and Endorsers and carried out educational and promotional work in hundreds of enterprises and entities.

A key role in creating the link between the MCP programme and its ‘subsidiary’ branch that was 4EM-MCP was played by the web page (www.mcpeurope.net), dedicated to the 4EM-MCP, edited in all national languages of the participating countries and closely linked to the master web page of the Motor Challenge Programme and to many other web pages, national as well as international. Because the internet is a very powerful tool of information dissemination it was the subject to special attention from the 4EM-MCP executing entities to keep this web page updated and to continuously upgrade its linkage with other similar projects.

Another key action was the organisation of training courses for companies, motor users, producers and designers to provide the basic knowledge about energy efficient motors and to promote investments in energy efficiency. In that respect it was very helpful to find some sort of support coming from other programs focused on helping investors to retrofit electric drives. An outstanding example in this area was the close cooperation carried out in Poland with the Polish Energy Efficient Electric Motors Programme, (PEMP) powered by Global Environment Facility and with other investment-supporting projects such as ECOFUND. Other countries can also present similar synergy of the 4EM-MCP programme with their domestic projects related to energy efficiency.

The activities described above were carried out according to the previously made dissemination plan, discussed and accepted by all participating countries. Based upon this plan, the national coordinators, under the supervision of the Executive Committee produced national dissemination schedules (containing schedules for seminars, trade fairs, training courses, and articles for magazines). It was very important to follow the project pre-assumptions related to the components of the dissemination activities in order to fill the wide and strictly defined scope of this action.
The overall scope of dissemination action included many various kinds of activities pre-defined in details and fulfilled to a high extent.

Specific tasks pre-defined for this project, (bolded and underlined in the text below) in particular contributed to the dissemination action.

It was necessary to define the User requirements in order to correctly define the target groups in individual countries and to develop a country-specific approach, in order to achieve good communication and wide dissemination of the project ideas. Relevant documents defined these groups and helped to build national strategies to implement the 4EM-MCP project. Once the action started, a detailed Dissemination plan was accepted by the participating countries. This plan included detail breakdown of the tasks to be performed in individual countries along with the time schedule in each case. Such approach proved to be very helpful to manage the project and control its duration. However, these two tasks were an internal project management tool.

One of the most important tasks directly aimed at dissemination process was to adopt the Motor Challenge Toolset into the national language versions and to distribute it in a form available to wide audience in every country. The MCP toolset includes project modules that describe in technical language methods, steps and expected results of energy efficiency related issues. The MCP modules refer to specific kinds of equipment (fans, pumps, drives, refrigeration plants, compressors) and describe methods of energy efficiency actions related to energy management. The dissemination activities included distribution of the project modules in the form of hard copies as well as ‘e-copies’. Hard copies were usually distributed during specific events, such as seminars, conferences and distributed directly to the companies and entities invited to the project or hosting the project team during energy audits or other kinds of on-site activities.

A specific group of information materials in that context are the Articles published in specialist professional magazines, booklets, brochures, conference proceedings, etc. This kind of information addresses professionals usually interested in research works, but also professional magazines promoting the ideas of the MCP programme.

It is important to highlight at this moment that apart from Project Modules that have a purely technical and educational profile, this kind of publishing of the 4EM-MCP materials included also a very widely performed action of disseminating the project advertising materials. The group of commonly available and very widely disseminated materials consists of : brochures, leaflets, flyers and other similar popular forms of promotion. Training, education and advertising the project by means of printed (or ‘e-printed’) materials can be therefore very generally divided into two groups of actions: the first that was specifically technical-oriented, addressing the target group of specialists and the second one – operating at a popular level, presenting the MCP programme and its background to a wide group of potentially interested recipients, not necessarily technicians. Such popular materials described
the idea of the programme, referring to its general philosophy that has its roots in the idea of protecting Earth’s climate by improving energy efficiency.

The number of hard copies of information carriers that can be included in the above mentioned groups of education and training modules or brochures is difficult to be precisely determined. The combined value of edition sizes in the participating countries can be counted in many thousands of distributed hard copies, especially the more popular ones.

Project dissemination activities included an important task, which was one of the major strategic objectives of the MCP programme. This aim was to acquire New MCP Partners and Endorsers, from all countries that participate in the 4EM-MCP programme. More subject-related information can be found in a separate chapter devoted exclusively to the issue of New Partners and Endorsers.

Information and knowledge gained or transmitted through the 4EM-MCP actions, based upon MCP ideas and documents as well as other ones, needed to be presented to a possibly wide group of recipients. A good opportunity to carry out such tasks was to participate in or organise training-educational events. The most popular forms of such activities are seminars, trainings, workshops and similar events aimed at direct contact with the audience. Although the project framework distinguishes between different types of training, it is reasonable to summarise this group of activities as a single item. The number of persons who took part in this kind of events performed within the 4EM-MCP programme reaches several hundred in the project countries. Presentations shown to the audience during such events can also be divided into few types of materials, apart from hard copies of information carriers described in the paragraph above. Some presentations in a form of lectures, usually presented as multimedia were event-specific and some other – were more general. The modules of MCP and the Training Modules are the best examples of the latter ones. The more general presentations and materials can be reused as training input also after completion of the 4EM-MCP Project, because their contents – although based upon the MCP guidelines – is quite universal in terms of energy efficiency issues related to electric motors and drive systems.

Seminars and workshops are usually topical events so that some event-specific presentations must have also been prepared. The project experience, at least in Poland, showed that the most efficient way of training is an inter-active formula, in which the seminar participants not only listen to the presentations, but also participate actively, e.g. taking part in actual software exercise. The MCP programme seemed much more inviting when presented at the background of other energy efficiency actions, such as PEMP (www.pemp.pl) in Poland, for example. The Project ideas will have their follow-up, even after completion of the PEMP programme.

One of the most important lessons learned during the seminars and workshops was that it is very reasonable and effective to show synergy between different kinds of actions that generally aim the same target. In our case this was of course energy efficiency and climate protection.
Similar scope of work and very similar conclusions come from other forms of direct communication with the recipients, namely from **Conferences** as well as **Trade Fairs**, during which the project performing institutions presented the 4EM-MCP and MCP programs very widely. A brilliant occasion taken by the project team in Poland was the IPCC 14th Conference of Partners (COP 14) held in December 2008 in Poznan, during which the project was presented (among other) on the stand of the **Climate Coalition**, established under auspices of the Polish Ecological Club (the Warsaw branch).

A specific, important group of project tasks the dissemination involved was the sector of **Energy audits** and **Enterprise interventions**. In practice, every country used its own, site-specific procedure, tailored to its individual requirements. Energy audits usually involve energy consumption measurements and computations of possible energy and cost savings, that differ very much from one country to another. The objective of these actions was to collect good practice examples that might be shown to other enterprises and institutions. Enterprise interventions included a variety of activities, beginning from measurements or computations and finishing on consultancy related to on-site project financing.

Generally, the information and materials resulting from the performed energy audits and enterprise interventions have commercial value so that they can be presented only upon individual permission from the respective enterprises. Some of them agreed to publicize the action results and these case studies were presented as good practice examples during seminars and conferences and were also described in professional magazines. Energy audits were always performed on sites of the present MCP Partners who had been acquired during the 4EM-MCP activities. In such cases the audit results became an integral part of the relevant Action Plan and the results were presented to the public.

Short summary of the achieved results of the enterprise interventions is made in the paragraph 3.5.2.

### 3.3 Tools developed

#### 3.3.1 Adaptation of the existing MCP tools

The aim of WP3 was to translate and adapt to the countries the programme is addressing decision aid tools developed in order to motivate company managers to invest in energy efficiency. The tools translated and adapted under the scope of WP3 were the pre-existent MCP Tool Set: MCP Technical Modules, MCP Guidelines, MCP Brochure and MCP Self-Evaluation Tool (Paper tool and Software tool).

All the seven MCP Technical Modules, Guidelines and Brochures were translated into national languages:

- Compressed Air Systems Module
- Drives Module
- Pumping Systems Module
- Fans module
- Management Policies Module
- Electrical Distribution Module
- Refrigeration Systems Module
- Partner Guidelines
- Endorsers Guidelines
- MCP Brochure
- One Page Synopsis

The MCP Self-Evaluation Tool is a user friendly, non-technical tool, designed to incite the managers of enterprises to take the first step towards energy efficiency: becoming aware of the potential savings. This tool has two versions: a Paper Tool and a Software Tool.

The Paper Tool is a small and attractive brochure, which leads the reader through the first steps in identifying potential energy savings:

![Figure 2 – Technical guide](image)

The Paper Tool covers six MCP Technical Modules. This tool is a guide with an attractive graphic design and large number of tips and information about the typical flaws, their energy impact and ways to improve the systems. The Paper Tool had been completed in DEXA-MCP project and was translated and adapted into national languages in 4EM-MCP.

The Software Tool has the same graphical aspect as the Paper Tool. The software has for each one of the six Technical Modules a list between ten to around twenty questions to which the user has to answer. When all the questions have been filled in, a summary report can be printed, with some advice for each one of the question.
The Software Tool was originally prepared within the scope of DEXA-MCP and then translated and adapted to national languages of 4EM-MCP. There are still some problems in the printing of the final report due to character incompatibility. Since the access to the source code was not permitted, nothing could be done to try to solve these problems.

3.3.2 Training Modules

The main objective of the 4EM-MCP project was to support and popularise the MCP programme and its ideas in the new member and candidate countries. Such attitude meant that the main stream of project activities should have been focused on promotion and education. Therefore, within the 4EM-MCP project it was particularly important to adopt supporting tools developed by the MCP programme and either to adopt or create new tools to be used for achieving the 4EM-MCP goals. Translation and dissemination of the toolset produced within MCP, however, was not the only task. Promoting the Project during numerous meetings and presentations and also through the web pages dedicated to 4EM-MCP it proved necessary to develop a universal tool useful for project presenting and promoting on different occasions and during educational events addressing various target groups. A set of documents developed for this purpose was named Training Modules.

Generally it contained two basic documents. One of them was dedicated to the ‘political’ side of the 4EM-MCP. This material, despite general information about MCP and its subsidiary programs (4EM-MCP and DEXA-MCP) contained guidelines and
information conveyed to the audience about programme MCP Partners and MCP Endorsers. The module presented a general approach and detailed requirements defined for the potential Partners and Endorsers, presented steps of becoming MCP Partner or Endorser and some statements showing advantages to the companies who decide to join the MCP programme. Of course, the reference material used to prepare this Training Module derived directly from the MCP source materials, namely Partner Guidelines and Endorser Guidelines, because 4EM-MCP served as an intermediate system used to acquire new Partners and Endorsers to the master MCP programme. The module has been primarily prepared in English as a kind of template or pattern intended to be translated into national languages in the 4EM-MCP countries. The module was flexible enough to be used elsewhere without disturbing the main MCP objectives. The MCP countries have had a ‘freehand’ in adopting and presenting this module.

A similar situation was with the technical part of the Training Module system. This presentation set included detailed descriptions of steps and methodology of preparing documents useful for energy auditing and for preparing documents necessary to become a Partner or an Endorser. The module contained detailed guidelines useful for preparing Action Plans and yearly reports to be presented to the EC. The module was divided into sub-sections addressing the energy efficiency related activities specific for different types of equipment that uses electric motors: fans, pumps, refrigerating systems, drives, compressors. A separate sub-section was dedicated to general issues of energy management and electric power distribution techniques. All materials included in this Training Module also derived directly from the training guidelines and education materials developed and distributed by the MCP programme. This module was primarily prepared in English as a kind of template or pattern intended to be translated into national languages in the 4EM-MCP countries. And, similarly to the Training Module addressed to Partners and Endorsers, this module was also flexible enough to be used elsewhere for promoting the main MCP objectives. The MCP countries could choose the way of adopting and presenting this module.

Such Training Modules were developed for multiple presentations, not dedicated to any special event or kind of recipients. The main idea of this activity was to have a tool ready for use in many educational situations, widely understood.

In Poland, in addition to these modules, the basic information related to the MCP programme and its master ideas (inviting Partners and Endorsers as well as use of methods for achieving energy efficiency in different motor driven systems) was inserted as part of universal presentation of the PEMP programme. A common element of these two synchronised types of training modules were the demonstration projects launched in Poland under auspices of PEMP and supported by 4EM-MCP. Such universal presentation was sometimes slightly adjusted to the scope of individual events during which it was presented, but the general idea of using universal tools was always followed in this aspect.
Among such universal tools it is worth to point put the EFEmotor software tool initiated years ago in Poland, developed and upgraded under the PEMP programme and strongly popularised and disseminated by means of the 4EM-MCP linkage. Although this software is not a tool having its origin strictly connected with 4EM-MCP, it was used as a supportive tool during this project.

3.4 Market Investigation and evaluation of energy efficiency potential in East European Countries - main results.

Below are the main findings of the market investigation conducted in the countries involved in the 4EM-MCP. The report is one of the Project’s chief results.

3.4.1 The market for electric motor systems

All traditional national motors manufacturers are still conservative and address the traditional market. However, some attempts for EE motors implementation can also be observed.

New efficient motors pose technical difficulties to the national designers because they have to add about 25 to 30 % materials inside the motors for getting the new improved efficiencies, at the same time preserving the old correlation between height of shaft and range of powers.

In Poland for example the number of three-phase electric motors manufactured during the year 2004 is of 804 thousand units, having a total rated capacity of 2979 MW. This number, however, also includes small units (below 0.75 kW). Export represents 70 – 80% of annual production; customers are from all around the world (Germany, the Netherlands, Switzerland, France, Austria, Turkey, Slovakia, Poland, Russia and Thailand).

Besides the national manufacturers, on the CEE countries market there are also West European or world wide companies, offering highly efficient motors and systems. The most significant among them are ABB, Siemens, Schneider Electric.

The factors that negatively influence the efficiency of motor systems operating in targeted countries may be ranked as follows:

- proper sizing
- motor efficiency itself
- end-use mechanical efficiency (pump, fan, compressor, etc).
- lack of motor speed control systems
- maintenance practices

The users do not think of the system as a whole when addressing the efficiency of the motors systems. The traditional motor manufacturers feel responsible only for motors efficiency itself, while the most important part of the concept (proper sizing, motor speed control, mechanical transmission, maintenance practices, end-use mechanical efficiency) is left to the users.

Also VSD systems have a very low penetration.
The following barriers on HE motors systems penetration in new EU accessed countries have been identified:

- **Shortage of capital:** the management decisions are to buy the cheapest offer. Banks find it more difficult to give small loans for such investments. Energy services companies (ESCOs) can help to overcome this barrier, but ESCOs development in new accessed countries is delayed too.

- **Oversizing** due to lack of knowledge of mechanical characteristics of load. Oversizing is also perceived as a greater reliability, or is determined by start-up,

- **Lack of correct definitions of motor system efficiency.** It requires an advanced expertise, sometimes not available at the level of end-users. Usually the efforts here are resumed to a component by component treatment regarding the efficiency

- **Lack of management time and knowledge** to address carefully specific activities like repairing/replacing a motor. More general, electricity and therefore motor systems consumption is usually treated as a general overhead item in companies.

- **Reluctance to change** a working process associated to lack of operational experience with efficient motor systems operation

- **Lack of Information and education** regarding advantages of energy efficiency in general

On the other side, some strengths and opportunities for efficient motor systems development may be signalled:

- the absorption of the EU energy policy, including energy efficiency, it is a “must” in view of competitiveness on the EU market;

- development of specific projects within European Union implemented through national programmes (MCP, IEE etc.);

- good indigenous engineering know-how;

- the industry has good capability of transferring and implementing modern technologies;

- increasing need and interest for clean energy, manifested by commercial companies and by civil society as well.

Another specific problem is the partial dissipation of skilled working force, which at its turn, reoriented to other activities, building their own business or/and working outside in Western countries. Therefore, the qualified workers group in electrical sector grows smaller.

**3.4.2 Evaluation of motor penetration to end users**

Motor electricity consumption by sector

There are no country statistical data regarding the share of motor electricity consumption. The following estimation made for the target countries is based on the
“standard” quotas of motors consumption related to the total electricity consumption in industry sectors, as mentioned in previous European studies [1]. The standard quotas are amended according to specific country conditions: e.g. Romanian industry has high electricity consumption in aluminum production sector, therefore the resulted quotas for motors electricity consumption in metallurgy is lower than the “standard” value.

Table 1 shows the estimated electricity consumption of motor systems in each economy sector.
<table>
<thead>
<tr>
<th>Motor consumption</th>
<th>Bulgaria</th>
<th>Czech Republic</th>
<th>Hungary</th>
<th>Latvia</th>
<th>Poland</th>
<th>Romania</th>
<th>Slovakia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power sector</td>
<td>1630</td>
<td>7400</td>
<td>1244</td>
<td>450</td>
<td>5224</td>
<td>2989</td>
<td>1818</td>
<td>20755</td>
</tr>
<tr>
<td>Industry</td>
<td>6312</td>
<td>17700</td>
<td>6441</td>
<td>1030</td>
<td>36654</td>
<td>15500</td>
<td>7554</td>
<td>91191</td>
</tr>
<tr>
<td>Tertiary</td>
<td>1970</td>
<td>3100</td>
<td>6882</td>
<td>970</td>
<td>11153</td>
<td>1255</td>
<td>2920</td>
<td>28250</td>
</tr>
<tr>
<td>Agriculture</td>
<td>60</td>
<td>500</td>
<td>967</td>
<td>50</td>
<td>1571</td>
<td>108</td>
<td>120</td>
<td>3376</td>
</tr>
<tr>
<td>Residential</td>
<td>1314</td>
<td>700</td>
<td>4233</td>
<td>370</td>
<td>8437</td>
<td>1206</td>
<td>1927</td>
<td>18187</td>
</tr>
<tr>
<td>Transport</td>
<td>251</td>
<td>1800</td>
<td>651</td>
<td>130</td>
<td>5795</td>
<td>970</td>
<td>250</td>
<td>9847</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11537</strong></td>
<td><strong>31200</strong></td>
<td><strong>20418</strong></td>
<td><strong>3000</strong></td>
<td><strong>68834</strong></td>
<td><strong>22028</strong></td>
<td><strong>14589</strong></td>
<td><strong>171606</strong></td>
</tr>
</tbody>
</table>

*Table 1 - Electricity consumption in motors, in different sectors in 2004, GWh.*
Data on electricity consumption in motors for Estonia are not available.

Motors electricity consumption in the seven of the above countries is estimated to exceed **171 TWh**, representing:

- 60 % of total electricity consumption in these countries (including the power sector)

Industry is by far the sector which accounts for the major part of electricity consumption in motors, 91.2 TWh/year in Bulgaria, Czech Republic, Hungary, Latvia, Poland, Romania and Slovakia.

The motors consumption in industry represents, for the mentioned countries:

- 27.4% of total electricity consumption (power sector included);
- 74 % of total electricity consumption in industry. In EU-15, the studies [1] showed that the electric motor driven systems account for 69% of industrial electricity consumption.
- 52% of total electricity consumption in motors (all sectors, power sector included)

**Motor electricity consumption by industry.**

To estimate the share of motor electricity consumption by type of industry, we have to rely on best expert estimations and similarity to figures known in Europe. There is no specific information issued in statistics or studies for the targeted countries.

In general, the main motor electricity consumption appears in the metallurgic industry, food and tobacco, chemical and petrochemical industry, the machine building industry and non metallic minerals industry.

In Bulgaria, the industrial sectors of steel, non-ferrous metal, chemic, food, drink and tobacco sectors are responsible for 54% of the total industrial electricity consumption in Bulgaria.

In Hungary the proportion of tertiary, service industry’s electricity consumption is higher than that of the conventional heavy and chemical industry’s in the overall electricity consumption. This trend which can be considered typical in the EU reached Hungary in the last five years.

In Romania, the metallurgic industry, food & tobacco, chemical and petrochemical industry, the machine building industry, the non metallic minerals industry, the water supply and treatment, pulp, paper, cardboard and publishing and wood processing are the main electricity consumers. These industrial sectors are responsible for 88% of the total industrial electricity consumption in Romania.

The energy efficiency in industrial processes improved slowly, and the specific consumption per product unit is still high.
Motor electricity consumption shared by end user process in industry.

Motor electricity consumption is very difficult to be disaggregated by power range and by the main end-use applications, such as pumps, fans, compressors, conveyors and others. Pumps, fans and compressors are the main electricity consumers in industrial sectors. Again we should rely on expert estimations to approach the figures specific for target countries. These first estimations will serve as basis for further improvements and checks.

The greenhouse gas emissions due to the motors electricity consumption depends on the mix of technologies for electricity production in each country. In Bulgaria the consumption of industrial motor systems of 6.31 TWh for year 2004 is responsible for the emission of 5.24 million tones CO_2 equiv. In Hungary the consumption of
electrical motors in the industrial sector (excluding the tertiary sector) is 6441 TWh, which accounts for around 3.920 Mt CO₂ emissions. In Romania the consumption of industrial motor systems of 15.5 TWh is responsible for an emission of 7.51 million tones CO₂.

3.4.3 Estimation of the saving potential

A bottom-up approach is to develop audits in companies chosen as representative industrial end users, and generalize the results of the audits to the national scale.

As an example, such audit was performed to a ceramic manufacturing factory in Romania, producing 350 tones ceramic pieces/month. It was estimated that a 45% electricity consumption reduction is possible by replacing the existing motors and motor systems with efficient drives.

Another way is to analyze the present electricity intensity indicators known from countries statistics, in comparison to the same indicators in EU-15 countries, considered as a target. The electricity saving potential results from the difference between the present indicators and the targeted ones. The savings potential in motor driven systems may be the corresponding quota of the motors electricity consumption versus the total electricity consumption in each specific industrial sector.

If we consider the targeted electricity intensity, in Romania, for example, the savings in industry motors consumption may reach 6.5 TWh/year by the year 2020, and some 8.7 TWh/year of the motors consumption savings in the whole economy. It means 4.5 million tones CO₂ reduction (with a specific CO₂ emission of 0.56 kg/kWh on medium term).

In Slovakia, the potential saving is assumed to equal about 20% of electricity consumed by motor systems representing 1.52 TWh/year.

Considering all information obtained during the market investigation in the target countries, and scaling the estimation also to the other EU-12 New EU Member Countries, it may be considered that a saving potential in electricity industrial motors consumption in new EU-12 countries reaches around 31 TWh/year.

3.4.4 Conclusions:

- Market investigation and an analysis of the present situation of electrical motors and motor systems were conducted in several New Member States: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Poland, Romania and Slovakia. Also it was carried out an estimation of the electricity savings by introduction of energy efficient motors.

- In 7 countries, Bulgaria, Czech Republic, Hungary, Latvia, Poland, Romania and Slovakia, the estimated total electricity consumption in motors equaled 171 TWh/year, representing more than half of the total electricity consumption.
• As expected, **industry is by far the sector which accounts for the major part of electricity consumption in motors, 91.2 TWh/year** in the above mentioned countries.

• Main electricity and motors electricity consuming industries are: chemical, metallurgy, food and tobacco, machinery and metal works.

• **Pumps and fans are responsible for more than 54% of total motors system consumption.**

• In all countries there is a good tradition of motors manufacturing. Today most of the indigenously produced equipment is **eff3** class.

• EU aligned legislative framework and strategy regarding energy efficiency are in place, but more emphasis should be given to their implementation.

• Efficient motors and motors systems are far to have a significant quota from the today operating equipment.

• This unsatisfactory situation underlines the strong need for specific activities in the area, both for technical and non-technical oriented audiences.

• The estimation of the potential of energy efficiency improvement in motor systems and of the related electricity savings is difficult. A case study was performed for Romania, resulting in estimated savings in industry motor consumption of 6.5 TWh/year by the year 2020.

• Considering all information obtained during the market investigation in the target countries, and scaling the estimation also to the other EU-12 New EU Accessed Countries, it may be considered a saving potential in electricity industrial motors consumption in new EU-12 countries of around 31 TWh/year. The most new EU states like Romania and Bulgaria, contribute together with some 9 TWh.

• Consequently, **the market potential on short and medium term for energy efficient motors and systems is high. The motors users should change gradually their actual motors fleet to more efficient equipment, in order be competitive on the EU market**

### 3.5 National activities

#### 3.5.1 Summary of activities at the national level - Beneficiaries.

**Poland**

Two Partners acquired to the Programme (Waste Water Treatment Plant, Namysłów) and Cogeneration Plant, Lublin) provided very good practice examples, that have been disseminated all over Poland. Based on several declarations obtained, there are good prospects of attaining new MCP Partners in Poland in the foreseeable future.
Acquiring KOMEL as an Endorser guarantees continuation of the project ideas in the future, as this institution is specialised in electric motors designing and research, including their optimisation. In the market are, the Endorser STERNET company will promote the MCP ideas among its clients. Moreover, very promising for further realization of MCP goals in Poland is the presence in the group of Polish Endorsers one of the Institutes of the respectable Technical University in Krakow, known as AGH. AGH is an influential educational platform that for many years has supported and will support MCP idea by educating future generations of engineers about energy efficiency related issues in the context of motor driven systems. It has declared to actively promote the 4EM-MCP through its disseminating channels. Promotion of MCP will also be sustained thanks to another Endorser – Bricks&Bits Poland. This company promotes energy efficient solutions in electrical drives, lightning and many other areas. Bricks&Bits branches also support 4EM-MCP as Endorsers in the Czech Republic and Hungary.

In Poland a number of training and educational events, co-organised or just attended by the Polish project team strengthened the idea of electric motors efficiency and shown the range of possible energy savings in the Poland’s economy. The electric motors drive systems efficiency issue was included into the National Energy Efficiency Action Plan, after positive and successful lobbing action of the Polish team. The team representatives took part in the movie for EACI, promoting energy efficiency achievements gathered under auspices of the Intelligent Energy Europe programme.

A continuously running and very successful activity in Poland was the very close cooperation with the PEMP programme, powered by Global Environment Facility.

Publishable education materials developed within the MCP, like MCP Modules and training modules have been widely distributed all over country, during numerous direct meetings and through the internet.

The project was appreciated by the Polish Ministry of Economy, by granting its Patronate to the 4EM-MCP action.

**Bulgaria**

Within the framework of the project, a lot of formal and informal meetings were organized with the representatives of enterprises, considering involving them as partners and endorsers under the 4EM project.

Most of the contacted companies and organizations were impressed and showed interest in 4EM program, but no one agreed to become partner or endorsers. ESD-Bulgaria was constantly communicating and encouraging the companies, emphasizing the benefits and granting support.

The meetings and discussions demonstrated that in spite of the desire of the enterprises to implement energy efficiency measures, practically it is very difficult. The main reasons are as follows:
• The commercial banks very rarely provide credits for investment energy efficiency projects;
• The requirement for financial security is 110% cash, which is far beyond the abilities of the companies;
• The National Energy Efficiency Fund operates with conditions, similar to the ones provided by the banks.

The Bulgarian enterprises are still not convinced that the replacement of the old electric motor systems with the new ones (High energy efficiency) is currently their higher priority, from a point of view of application of energy efficiency measures. They prefer to implement other EE measures, with shorter payback period, as well as measures closely connected to their technological production line.

ESD-Bulgaria also tried to attract partners and endorsers using the successfully implemented in other countries document provided by the Austrian Energy Agency called “4 EM - Information for Getting MCP Partners or Endorsers” but without any success.

On the 28 November 2008 ESD Bulgaria organized a regional training seminar in Stara Zagora. The Motor challenge program and National Energy Efficiency Policy in Bulgaria were presented. All the presentations and the described below additional materials were distributed to all participants:

• Compressed Air System Module
• Fan System Module
• Drives System Module
• Pumping Module
• Refrigeration Module
• Motor Challenge Brochure
• Technical Guide
• Management Policy
• Electricity Policy
• Partner Guideline
• Endorsers Guideline
• Article

As a result of the active dissemination process - brochures, tools, etc., the stakeholders got acquainted with the program and the benefits from replacing old motors with energy efficiency motor systems, thus encouraging the implementation of the 4EM ideas.

The development, translation and dissemination of the user friendly “software tool" was very important, due to the fact that the software can be used as key computer model by non-experts for preliminary assessments of the current situation of the electric motors and electric motor driving systems in the industrial enterprises.
Hungary
The 4EM project received strong formal support from the stakeholders in governmental agencies, and a Letter of Endorsement from the Ministry of Economic Affairs.

As a result of the country team’s active follow-up of the 4EM project’s guidelines and project agenda two 4EM-MCP endorsers were successfully enlisted. The first endorser was Grundfos Hungary Ltd., specialising in various range of pumping applications. Our second endorser Bricks and Bits Ltd. is active in the area of efficient lighting, heating and ventilation systems solutions provision.

Throughout a project a strong dissemination activity balanced up the occasional project weaknesses. Dissemination was manifested in energy audits, company interventions, seminars, a national project website, strong presence on energy related conferences, workshops, and forums, and trade fairs. One of the key success points of the project was the Energy and Environment conference organised under the auspices of the 4EM project in the Hungarian Academy of Sciences with the participation of the Minister of Environment, the State Secretary of Ministry of Economic Affairs, the UNFCCC Focal Point representative, the Head of the Parliament’s Committee of Environmental Protection and the President of the Hungarian Energy Office (power system and grid regulator, energy price setting authority) with over 100 participants. The dissemination was aided by the properly translated MCP documents, brochures and the software tool paper and electronic version.

As a result to the efforts, some companies involved in the energy audits decided to take part in the project, to date this means four companies (Heves County Waterworks, Makó County Waterworks, Citibank, Q-Wipes, with an optional fifth and sixth participant, Tesco Global, and Pécs City Waterworks).

Based on the feedback from the companies, the project could have had an even bigger impact should some governmental support come in more than a formal support, e.g. 4EM Partners would have received benefits in governmental application systems after realized and audited investments.

Romania
Acquiring new partners and endorsers to the Motor Challenge Programme
Acquiring new MCP partners/endorsers was an activity more complex that we have assumed at the beginning of the project, because of an unexpected lack of interest of the companies for getting this quality. Even the free audit offered to the potential partners was not attractive for them, because of the fact that they are legally obliged to have a much more complex audit, which is to be done by authorised consulting companies.

The first two years of the project, did not lead to any success, despite of the efforts of the ENERO representatives and the expression of interest showed by some
contacts. The concrete results were obtained only in the final year of the project, which proved inertia of the business in adopting a new concept.

Through the reasons for not implementing energy efficiency measures to motors driven systems the main one was the lack of financial means, and their concern for the production chain itself above all. It is also true that solid, serious incentives for these kinds of measures are not in place, so simply declaring the necessity of raising energy efficiency does not help.

Even so, even ENERO did not achieved yet the target assumed (seven partners/endorsers), we can appreciate that, after accomplishing the activities in the framework of the 4EM-MCP project, a good share of SMEs have now a better understanding of MCP and an increased awareness regarding energy savings.

The new partners & endorsers from Romania are the following:

Endorsers: The Research Institute for Electrical Machines (ICPE-ME); Global Energy Services Ltd. (GES); ICPE ACTEL SA
Partners: Carmeuse Romania, Fieni Lime Plant; Carmeuse Romania, Deva Lime Plant; Carmeuse Romania, Campulung Lime Plant

Other achievements in Romania within the 4EM-MCP Project:

Within the 4EM-MCP project the tools and instruments of the Motor Challenge Programme were translated into Romanian) are known and available for anyone interested [http://www.enero.ro/proiecte/motor/index.php](http://www.enero.ro/proiecte/motor/index.php) or [http://www.mcpeurope.net/4em/download_area.asp](http://www.mcpeurope.net/4em/download_area.asp)

Presenting 4EM-MCP within nine national events, so that an important number of Romanian stakeholders is now familiarised with the objectives of the Motor Challenge Programme energy audits.
Two national workshops were organized in collaboration with other important players in the field of EMS (The Research Institute for Electrical Machines (ICPE-ME) and University “Politehnica” Bucharest), in order to amplify the impact

3.5.2 Short summary of the achieved results at the enterprise interventions

A specific, important group of project tasks involved with the project related activities to be carried out at national level was the package of Energy audits and Enterprise interventions. In practice, every country applied its own, site-specific procedure, tailored to its individual requirements. Energy audits usually involve energy consumption measurements and computations of possible energy and cost savings that differ very much from one country to another. The objective of these actions was to collect good practice examples that might be shown to other enterprises and institutions. Enterprise interventions included a variety of activities, beginning from measurements or computations and finishing on consultancy related to on-site project financing.
Generally, the information and materials resulting from the performed energy audits and enterprise interventions have commercial value so that they can be presented only upon individual permission from the respective enterprises. Some of them agreed to publicise their action results and these case studies have been presented as good practice examples during seminars and conferences and also have been described in professional magazines. Energy audits were always performed on sites of the present MCP Partners who have been acquired during the 4EM-MCP activities. In such cases the audit results became an integral part of the relevant Action Plan and the results have been presented to the public.

Individual countries were obliged to carry out energy audits and enterprise intervention according to the project provisions. The number and scope of these actions varied from one project country to another, so that the results and effects of this activity are also different. More detailed overview of the project results gives the breakdown of auditing and intervention activities. It is also important to highlight that both the audits and the interventions contributed significantly to the dissemination objective of the 4EM-MCP project.

Polish project institutions carried out 45 audits and interventions, in total. The number of energy audits reaches 22 events. Scope of the audits usually overlapped with other parallel activities, such as searching for additional co-financing from other projects. Energy audits were carried out in district heat producing and distributing plants, waste water treatment plants, cogeneration plants, production enterprises (e.g. paper mills, plastic plants, diary and foundry). Also enterprise interventions addressed dairies, metallurgical plants, coal mines and pharmaceutical plants. The forms and scope of interventions have been diversified in terms of scope and range as well as the form of intervention.

The Bulgarian team (ESDB, BSREC & EEA) carried out energy audits and energy scanning actions that were provided on the basis of criteria and technical parameters for assessment of energy efficiency of electric motor systems, preliminary defined by the Bulgarian partners and the Project coordinator. Audits and scanning actions of the motor driven systems were performed in 11 enterprises, in total. The audits and ‘energy screening actions’, resulted in conclusions and recommendations to enterprises. The results from the audits were published and presented at one of the 4EM-MCP seminars. Interventions in 7 enterprises, each consisting of a training on the economic evaluation of investments in efficient motors and the available financial sources for such investments and an on-site demonstration of efficient motor systems were also carried out by the team.

The Hungarian team (SYSTEMEXPERT) carried out 11 Energy audits including measurements, economic evaluation of the systems. The audits focused on water supply plants, dairies and other kinds of industry and public service institutions. Enterprise interventions were undertaken at 4 next enterprises.
The Romanian team (ENERO) carried out energy audits in 16 enterprises and companies, representing water management, treatment and distribution enterprises, food industry and other branches. Some of the audits were performed with the collaboration of specialized auditor companies. The number of enterprise interventions carried by the Romanian team is 4 events, including lime plants in the country.

The institutions acquired to the extended project group, representing Czech Republic (SEVEn), Estonia (ESB), Slovakia (ECB) and Latvia (ECODOMA) also carried out the project defined audits. SEVEn completed 2 audits with the 2 next ongoing in the time of writing this report, while ECB completed 3 energy audits and ECODOMA completed 3 energy audits – interventions.

This bunch of audits and intervention supported the project idea in the target countries and helped to invite new MCP Partners and MCP Endorsers to the Programme.

3.6 New Partners and Endorsers

The number of Partners and Endorsers to be invited into the MCP project was pre-defined in the 4EM-MCP project assumptions. In fact, as it usually happens to any important strategic tasks, this one occurred to be the most difficult one in the 4EM-MCP package. Despite the fact that overall target of Partners recruited was not reached, the final result produced proved to be quite good: 17 Partners acquired (target 37) and 19 Endorsers (target 10). The list of MCP Partners and Endorsers can be found on the MCP home page. The Partner and Endorsers involved to MCP through the 4EM-MCP activities are also present in that specification.

Partners and Endorser invited to the MCP Programme through 4EM-MCP usually came from industry or from scientific/research institutions. This general observation can be applied to all countries participating in the 4EM-MCP action. In order to successfully invite new Partners and Endorsers it was necessary to disseminate as much knowledge as possible about the MCP Programme and the project itself among the potential participants. This process of pre-informing the potential participants required a lot of time and required to take part in many technical events that were expected to assure wide and competent audience for the MCP promoting institutions. There is an important lesson coming from performing this particular task, namely such ‘involvement’ action needs time and multiple working contacts to become successful. Especially because the subject of the programme is relatively specific – narrow, because it refers to energy efficient electric motors and driven systems, usually managed by a group of highly skilled and very professionally experienced specialists. The several Partners and Endorsers acquired through the 4EM-MCP actions represent all those features very clearly.
3.7 New countries involvement

In the course of the Project implementation its geographical scope was enlarged by new countries: the Czech Republic, Slovakia and two Baltic States: Latvia and Estonia. In this way 4 new National Contact Points were established:

- SEVEn for the Czech Republic
- Energy Centre Bratislave for Slovakia
- Ekodoma for Latvia,
- Energy Saving Bureau for Estonia.

The expertise of these centres together with their commitment to the Project goals contributed to reaching the main Projects targets. Below is the short summary of the national activities conducted in the countries mentioned above.

Czech Republic

The registration of respectable efficient motor-driven systems solution providers like Grundfos and ABB as the (future) Endorsers of the MCP in the Czech Republic, together with the development/translation of a number of useful tools for assessing energy efficiency of various MDs, we see as one of the most valuable results of our activities undertaken under the framework of the 4EM-MCP project.

A total of 5 Endorsers to MCP in the CR, give hope that the promotion of the Programme and its goals will be in the country maintained beyond the 4EM-MCP project end and that the our agency's role as the NCP to the Programme will justify its existence also in the next years.

With all those companies have been established close co-operation both on a general level (exchange of information on technology solutions) and also in implementation of concrete projects (like that started with Prazska teplarenska Corp. or Energie Holding Corp.).

As a very important fact for the future existence of the Programme can be seen also the tools developed during the 4EM-MCP project - they provide useful guidelines for basic assessment of potential energy savings which may be then subject of further precision (using concrete metering etc.).

This leads us to the conclusion that the introduction of MCP in the CR was a beneficial step and will find its continuation in further years.

Slovakia

Two endorsers in Slovakia have been involved in 4EM-MCP programme: Vonsch, s.r.o. Brezno and ABB, s.r.o.Bratislava. Both of them promote Programme via their marketing activities, using translated tools disclosed at MCP webpage that has been translated to Slovak language. They concluded status of endorser to their promotion materials and disseminate information about opportunity to decrease energy intensity...
via using electric motor drive systems. They found tools developed by 4EM-MCP programme as very valuable instruments for promotion of their activities.

4EM-MCP programme has been promoted on several professional events mostly for industrial customers where training modules as well as other tools developed even during of MCP duration was introduced as important and useful instrument for energy efficiency projects.

National contact point established in our organization ECB is going to continue with information of potential savings dissemination that can be reached by means of tools developed by MCP. Direct connection to MCP webpage is permanently possible via banner positioned on main webpage of ECB.

4EM-MCP programme will be promoted in next years also by Association of Energy Managers as well as Association of Industrial Energy Consumers.

**Latvia**

Thanks to active involvement of the Latvian National Contact Point in the 4EM-MCP, Project implementation brought very promising results in this country. Altogether 3 new partners (AS Valmiera Piens, SIA TKF LATEKSS, AS “Lavijas Balzams”) and 2 new endorsers SIA Sinhro, SIA “Dumvadu Centrs” were recruited for the MCP. Latvian Partner also carried out many dissemination activities like article publication, seminar organization and participation, distributed Project materials during events and finally conducted 2 energy audit interventions in AS Valmiera Piens and SIA TKF Latekss.

**Estonia**

The Motor Challenge program in Estonia included translation of several motor and electricity based documents that give guidelines as well as examples of energy savings from more efficient use of electricity.

The package of documents gives a handful of guidelines and methodology to examine electricity systems and calculate potential electricity savings.

Because of the small scale of industry in Estonia, the program was not very successful in finding project partners and endorsers.

Estonia produces its own electricity from its natural resource (the oil shale), which has high CO₂ emission and according to EU regulations will be significantly reduced in the near future. Also, the electricity market will open for competition in the coming years, which all means higher price for electricity. The relatively cheap electricity in Estonia is one of the reasons end users have been passive about electricity savings.

Since the situation is about to change, because of the rising electricity price, the translated package of documents is a good tool to explore the energy efficiency potential. Also, because of the information sent out to companies, the knowledge of
energy efficiency potential will motivate them in reducing the energy consumption and switching to more efficient motors. Because of this, the buyers of electric motors are more aware of these issues and will more likely purchase a more efficient motors in the future, which brings to the conclusion that the project in sufficient.

3.8 Quality report (quality survey results)

To monitor and ensure project quality, a comprehensive set of templates for project documents were prepared to ease the preparation of project related documents, presentations, publications, etc. and to ensure documentation quality and accessibility. A project logo was designed to ensure project visibility, identity and, most of all, belonging to the original Motor Challenge Programme. An intranet was used for sharing project files developed in the course of the 4EM-MCP implementation. This web-based tool was designed to facilitate partners’ communication and the work management. All the relevant project files were uploaded to the intranet to be available for all partners and key project actors. A new tool aiming to ease activities monitoring and work management was developed too:

The Quality Report Platform. This web-based database allowed all project partners to regularly update deliverables and performance indicators status. All project deliverables and performance indicators were regularly reported to the platform to be available for all partners for continuous monitoring.

In addition, always on the quality control side, two types of surveys were developed:

– user satisfaction survey;
– market penetration survey.

Project partners were distributing them to key actors in order to gather information on project quality and penetration.
3.8.1 User Satisfaction Survey

Introduction
User satisfaction survey consisted of nine questions aiming to monitor quality of actions performed by project co-beneficiaries. Questions referred to the actions in which the user was involved, as partner or endorser, or as a training course, seminar (or other event) participant, etc.
Main problem faced with the survey was the lack of feedback from users. Only 38 of the thousands of surveys distributed were returned.
Overall result coming from the answers gathered is that the average quality of actions was considered excellent.
Main comments received were:
- Lack of co-operation between project and colleges and technical universities
- There is a need for a wider dissemination of the opportunities to save energy in motor driven systems
- There is a strong need for more real case studies, in order to facilitate the audience perception.

Results

Actions in which customer was involved

- 6% Became partner
- 2% Became endorser
- 19% Event (training course, seminar)
- 13% Energy audit
- 60% Enterprise intervention
1. Completeness and clarity of administrative information

![Pie chart showing the distribution of ratings for administrative information]

- Awful: 0%
- Poor: 16%
- Fair: 39%
- Good: 45%

2. Completeness and clarity of technical information

![Pie chart showing the distribution of ratings for technical information]

- Awful: 0%
- Poor: 5%
- Fair: 32%
- Good: 63%
3a. Quality of available tools - Website

- 0% Awful
- 0% Poor
- 16% Fair
- 35% Good
- 49% Excellent

3. Quality of available tools - Evaluation Tools

- 0% Awful
- 0% Poor
- 19% Fair
- 31% Good
- 50% Excellent
3. Quality of available tools - Modules

- Awful: 0%
- Poor: 0%
- Fair: 20%
- Good: 50%
- Excellent: 30%

3. Quality of available tools - Training Materials

- Awful: 0%
- Poor: 3%
- Fair: 26%
- Good: 31%
- Excellent: 40%
4. Knowledge and skills of your contact

- Awful: 3%
- Poor: 0%
- Fair: 0%
- Good: 48%
- Excellent: 49%

5. Kindness and courtesy of your contact

- Awful: 11%
- Poor: 0%
- Fair: 0%
- Good: 16%
- Excellent: 73%
6. Lead time in providing the service

- 11% Awful
- 47% Poor
- 42% Fair
- 0% Good
- 0% Excellent

7. Quality level of help service

- 11% Awful
- 32% Poor
- 57% Fair
- 0% Good
- 0% Excellent
8. Direct and indirect benefits of the programme

9. Overall quality level of the programme
3.8.2 Market Penetration Survey

Introduction
Market Penetration survey consisted of twelve questions aiming to monitor penetration of energy efficiency knowledge and European energy efficiency support project among users. Main problem encountered with the survey was again the lack of feedback from users. In fact, only 51 of the thousands of surveys distributed were returned. Main results based on the feedback received appear to be the following:

- Stakeholders are familiar with energy efficiency issues and energy efficient motors
- Half of them never perform any action in order to improve efficiency. Main reason can be found in having more profitable investment opportunities.
- Half of them doesn’t know the Green Paper on Energy Efficiency and the IEEA SAVE Programme
- There is a strong need for dissemination of Energy Efficiency programmes.

Results

1. To what degree you are familiar with energy efficiency issues?

![Pie chart showing the results of the survey]

- 31%: Excellent
- 39%: Good
- 20%: Fair
- 10%: Poor
- 0%: Awful

4EM-MCP is supported by:

Intelligent Energy Europe
2. How much do you know the benefits of using high efficiency motors?

- 8% Awful
- 29% Poor
- 25% Fair
- 36% Good
- 2% Excellent

3. Do you think optimizing your motor driven systems can save you money?

- Yes: 93%
- No: 7%
4. Did you optimize your systems at least once?

- Yes: 78%
- No: 22%

4a. If not, why?

- No particular reason: 50%
- More profitable investments: 25%
- Other: 25%
5. Did you obtain economical benefits?

- Yes: 81%
- No: 19%

6. Do you know the Greenpaper of European Union on energy efficiency?

- Yes: 59%
- No: 41%
7. Do you know the Save Programme of European Union?

- Yes: 76%
- No: 24%

8. Do you know the MCP Programme?

- Yes: 88%
- No: 12%
9. If yes, how did you know it?

- Internet: 44%
- Seminar: 16%
- Conference: 11%
- Personal Contacts: 21%
- Magazine: 3%
- Other: 5%

10. Would you like to be informed on high efficiency motors and MCP Programme?

- Yes: 93%
- No: 7%
4 Lessons learnt

Educational component of the project, including presentations, lectures, training and publicizing of the project during conferences drew a relatively good level of interest on the audience's side. An important observation, however, is that such specific, rather and narrow issues like energy efficiency of electric motors, should always be presented to the recipients against a wider background. This is a good way to involve not only professionals who are perfectly acquainted with efficiency issues but also users and recipients who are involved in branches of economy and science other than motor technologies.

On the other hand, energy audits and enterprise interventions revealed a very wide potential for saving energy that still can be exploited in the industry and national economies and environmental policies. Numerous examples of obtaining savings in some individual industrial plants became good practice examples that can be repeated and multiplied in plenty of other plants having similar profile. This observation refers to all countries who participated in the 4EM-MCP project.

The project also led to some other conclusions and lessons. An important practical dissemination lesson is that during most of events co-organized within the education activity, a combined formula of training / lecturing was applied, by using an interactive work with the event attendees. Such way of education, promotion and dissemination was considered to be optimally efficient, however, it entailed difficulty to strictly segregate such training – educational events according to commonly used nomenclature.

Another very important lesson deriving from the undertaken actions is, that generally the 4EM-MCP project and the MCP itself do not offer sufficiently interesting motivation to the potential project Partners and Endorsers. Even with close collaboration under the PEMP program (in Poland), which was offering financial investment support to the project participants, dissemination and communication regarding the MCP was rather difficult. It was much easier to invite new Endorsers than new Partners.

5 Conclusions

The results achieved in the last year of 4EM-MCP implementation were incomparably greater than in the initial years, which points to the fact that this type of Project seems to improve “with exposure”, and consequently takes longer time to bring the desired effects.

The project by far contributed largely to increasing the awareness of the energy consumption and potential saving measures in motor driven systems among industrial managers, energy specialists at enterprises, and government decision makers. However, in some countries, it still seems to be low. Therefore the ideas and objectives of Motor Challenge Programme should be further implemented, until a
reasonable level of readiness of ‘the ground’ is reached. 4EM-MCP proved that new member states and candidate countries have considerable potential for cost-effective energy measures. The question still remains how to transform this potential into demand and application.

Another conclusion is that introduction of fiscal and financial incentives (forms of grant) for investments in energy saving projects such as 4EM-MCP, will help to reduce pay-back period of investments and increase the number of implemented projects, which will, as a result, contribute to the achievement of the goals of national energy efficiency policy.