

**PRESS RELEASE:**

Energy Efficient Motor Driven Systems  
...can save Europe 200 billion kWh of electricity consumption  
and 100 million tonne of greenhouse gas emissions a year

Report edited by  
*The European Copper Institute (ECI)*  
with the support of the *Motor Challenge* Programme

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Full study available on [www.eurocopper.org](http://www.eurocopper.org)

## 1 – Executive Summary

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Switching to energy efficient motor driven systems can save Europe up to 202 billion kWh in electricity consumption, equivalent to a reduction of €10 billion per year in operating costs for industry. It would also create the following additional benefits:

- A saving of €5-10 billion per year in operating costs for European industry through reduced maintenance and improved operations (EU-25).
- A saving of €6 billion per year for Europe in reduced environmental costs (EU-25, calculated using the EU-15 fuel mix).
- A reduction of 79 million tonne of CO<sub>2</sub> emissions (EU-15), or approximately a quarter of the EU's Kyoto target. This is the annual amount of CO<sub>2</sub> that a forest the size of Finland transforms into oxygen. If industry is allowed to trade these emission reductions based on energy saved, this would generate a revenue stream of €2 billion per year. For EU-25, the reduction potential is 100 million tonne.
- A 45 GW reduction in the need for new power plant capacity over the next 20 years (EU-25).
- A 6% reduction in Europe's energy imports (EU-25).

To achieve this, a four-year package of measures is suggested, investing €400 million in the motor systems market. The Motor Challenge Programme should continue to be the forum for developing common tools and fast learning, and ensure that the national programmes are implemented and achieve their goals.

The package of measures should include:

- introduction of audits of energy systems in industrial installations
- financial support for training and certification of energy auditors
- fiscal and financial incentives for investments in energy saving projects
- a framework for claiming emissions credits for investments in electricity saving (e.g. the 'White Certificates' in Italy)
- An information campaign based on the Motor Challenge Programme.

Benefit	Beneficiary	Annual Benefit (€ billion for EU-25)
Energy cost saving	Industry	10
Non-energy saving benefits	Industry	5-10
Reduced environmental costs	Society	6

### ***Benefits of switching to energy efficient motor driven systems***

## 2 – About *Motor Challenge* Programme

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The Motor Challenge Programme is a voluntary programme promoted by the European Commission to help companies improve the energy efficiency of their electric motor driven systems. The Challenge focuses on electric drives, compressed air, fan and pump systems, for which it has been demonstrated that there exists a large technical and economic potential for energy savings.

Any organisations wishing to contribute to the Motor Challenge Programme objectives can participate.

- Companies that use motor driven systems can request **Partner** status.
- Organisations (in particular companies that supply motor driven systems and components) wishing to assist the Commission and Member States in carrying out the Motor Challenge Programme may become **Endorsers**.

More information can be found at <http://energyefficiency.jrc.cec.eu.int>

### Paolo BERTOLDI

Paolo Bertoldi obtained a PhD in Electrical Engineering (Padova – Italy) in 1985. He is now Principal Administrator at the Joint Research Centre (JRC) of the European Commission. Paolo Bertoldi is in charge of research activities for energy efficiency policies, the efficient use of electricity and industrial energy efficiency. He is responsible for the European Green Light, Green Building and Motor Challenge Programmes and contributing to the EU electricity end-use policies and programmes. Author of over 50 papers on energy efficiency and the rational use of electricity, he has also published four books on the subject.

## 3 – The Authors

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### Hans DE KEULENAER

#### *European Copper Institute*

Hans de Keulenaer is the Electric & Electronics Programme Manager of the European Copper Institute (ECI), joint venture between the world's mining companies (represented by the International Copper Association, Ltd) and the leading European fabricators. ECI's mission is to promote copper's benefits to modern society across Europe, through its Brussels office and a network of 11 Copper Development Associations. ECI is active in 4 key areas in Europe: Electricity & Energy, Building Construction & Automotive, Environment and Health.

More information: [www.eurocopper.org](http://www.eurocopper.org)

### Prof. Ronnie BELMANS

#### *Katholieke Universiteit de Leuven*

**Prof. Ronnie J.M. BELMANS** obtained his PhD in 1984 and a special PhD in 1989. In 1993 he obtained the Habilitation of the Rheinisch-Westfälische technische Hochschule (RWTH) in Aachen (Germany). He is currently a full professor teaching electrical energy, variable speed drives and power quality at the K.U.Leuven. His field of research ranges from power quality and variable speed drives to the technical aspects of the electricity market deregulation. Since 1997 he has been an invited lecturer at the RWTH in Aachen and since 1999 at Imperial College in London. Prof. Belmans is a Fellow of the IEE (United Kingdom), senior member of the IEEE and member of the Royal Flemish Association of Engineers (KVIV). Since June 2002, professor Belmans has been president of the Board of Directors of Elia, the Belgian transmission system operator.

**The research group 'Electrical Energy' of the K.U.Leuven** conducts research on the production, transport, distribution and use of electrical energy. About forty researchers were active in the group, making it the largest group in this field in Belgium.

The group hopes to continue growing into a European and worldwide renowned centre of excellence in electrical power, dependability and reliability as well as in the related digital signal processing.

More information: <http://www.esat.kuleuven.ac.be/electa/>



Peter RADGEN

*Fraunhofer Institut Systemtechnik und Innovationsforschung (Karlsruhe)*

**Peter Radgen** obtained a Master of Science in Mechanical engineering from University of Karlsruhe, with a focus on energy technologies. He holds a PhD from the University of Duisburg where he was working in the field of the energetic optimization of chemical process plant.

Since 1995 at the Fraunhofer Institute for Systems and Innovation Research (Germany), Peter Radgen has large experience in the field of rational use of energy in the energy intensive sectors of industry and the efficient supply of energy: knowledge in systematic technical and economic assessment of conventional and non conventional energy systems; experience of optimization models of energy systems. His research areas include energy efficient process technologies with a focus on high temperature processes and cross-cutting technologies (e.g. compressed air systems, fans, heat recovery). His research focuses on innovative and energy efficient process technologies in different sectors of industry and CHP.

**The Fraunhofer Institute for Systems and Innovation Research (ISI)** is an internationally leading institute for innovation research. The institute researches the area of conflict between technology, industry and society and develops sustainable options for decision-makers in politics and businesses.

Using energy more efficiently is not only a key to avoiding air pollution and shifts in the global climate, it also strengthens the competitive position of industry and export-oriented capital goods manufacturing. Energy services will open up large markets in the coming decades both at home and abroad and constitute one element on the path to a sustainable development. The task and objective of the Department Energy Technology and Energy Policy is to contribute to handling energy in a sustainable way. We work on projects in international, European and national for clients from industry, commerce and public authorities. In research and application-related studies we examine technical, economic and organizational possibilities of efficient energy use and the use of renewables on a microeconomic and macroeconomic level. Other areas affect analyses of supportive factors and obstacles as well as the development of technical and policy concepts to reinforce the factors of success. The studies are characterized by a high degree of specialist knowledge, a systems approach and interdisciplinary links.

More information: <http://www.isi.fhg.de/e/index.htm>

**Prof. Aníbal DE ALMEIDA**

*ISR - University Of Coimbra*

**Aníbal T. De Almeida** has a Ph.D., in Electrical Engineering, Imperial College, University of London. Currently he is a Professor in the Department of Electrical Engineering, University of Coimbra. He has been a consultant of the European Commission 4th and 5th Framework Programmes. He is the co-author of five books on energy efficiency and more than one hundred papers in international journals, meetings and conferences. He has coordinated four European projects dealing with energy-efficient motor technologies, including electronic variable speed drives. He was a Member of the NATO Scientific Affairs Division Panel on High Technology. He has also participated as a consultant in several international projects to promote energy efficiency in developing countries and he is a Senior Member of the Institute of Electrical and Electronic Engineers (USA).

**The University of Coimbra** was founded in 1290 and has about 24.000 students. ISR is a research and technology transfer institute, associated with the University which promotes the penetration of advanced energy-efficient technologies and renewable energies through innovative projects, demonstration, education, training, dissemination, energy monitoring, energy audits, and design of energy policies, with collaboration with the industry, local and regional authorities, building operators, and gas and electricity utilities. Recent motor related projects include:

- Coordinator of a SAVE II project of DGXVII, "Improving the Penetration of Energy-Efficient Motors and Drives" involving EdF, ENEL, ETSU, FhG-ISI, NESA (1997-1999).
- Coordinator of a SAVE II project "Barriers against Energy-Efficient Motor Repair", (1998-1999).
- Coordinator of a SAVE study for the Directorate General of Energy of the European Union, "Actions to Promote Energy-Efficient Electric Motors in the European Union", involving EdF, ENEL, ETSU, FhG-ISI, NESA, NOVEM, (1995-1996).
- Participation in the SAVE II study "Technical / Economic and Cost / Benefit Analyses of Energy Efficiency Improvements in Industrial Three Phase Induction Motors, (1998-1999).
- Coordinator of a SAVE Pilot Action: "VSDs for Electric Motor Systems", (1999-2001)

Other contributors : Edgar BLAUSTEIN, Consultant on Energy Policies, David CHAPMAN, *Copper Development Association (UK)* and Bruno DE WACHTER, *Forte*.

## 4 – Copper’s Contribution to Energy Efficiency

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### Improving Energy Efficiency

In 1997, the Kyoto protocol established for industrialised countries, different objectives for reducing global greenhouse gas emissions by 2010. The overall objective is a 5% reduction worldwide, including: -8% for the European Union, -7% for the USA, -6% for Japan and Canada, and 0% for Russia and Ukraine. These objectives relate to all six types of greenhouse gas, the three most important of which are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), and will be calculated on average over the period 2008 - 2012, and compared to 1990.

One of the most effective ways to achieve the goals established in Kyoto is to improve energy efficiency. This allows operating expenses to be reduced for the user, while decreasing the greenhouse gas emissions caused by the use of fossil fuels.

### How can we make a significant improvement to energy efficiency?

Motor driven systems account for 65% of industrial electricity consumption in Europe. There are many ways to improve energy efficiency. A highly promising solution consists of using more efficient equipment: energy efficient electric motor driven systems, energy efficient distribution transformers, correctly sized cables, etc. Making such investments, or simply improving processes and maintenance, can save 30% of the electricity consumed.

### How Copper contributes to energy efficiency?

Copper is the best conductor of electricity among all non-precious metals. Optimal use of copper reduces energy losses and thus improves energy efficiency. Therefore, optimising copper contents in electrical applications such as motor driven systems, transformers or, electric cables can reduce energy losses up to 70%, thus generating energy savings and reducing CO<sub>2</sub> emissions.

### Copper, an ally for sustainable development

Durable from several years up to hundreds of years, depending upon the application, copper is also known as the « green metal »: 100% recyclable, without any loss of quality or performance, copper is used, easily recycled and reused in exactly the same way as new copper from a mine. Recycled material made up 41.3% of copper usage in Europe in 2002. And recycling copper also enables energy savings of 85%<sup>1</sup> compared to the extraction of new copper.

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<sup>1</sup> Source: BIR (Bureau of International Recycling)