Environmental Management Report
Toward Sustainable Development

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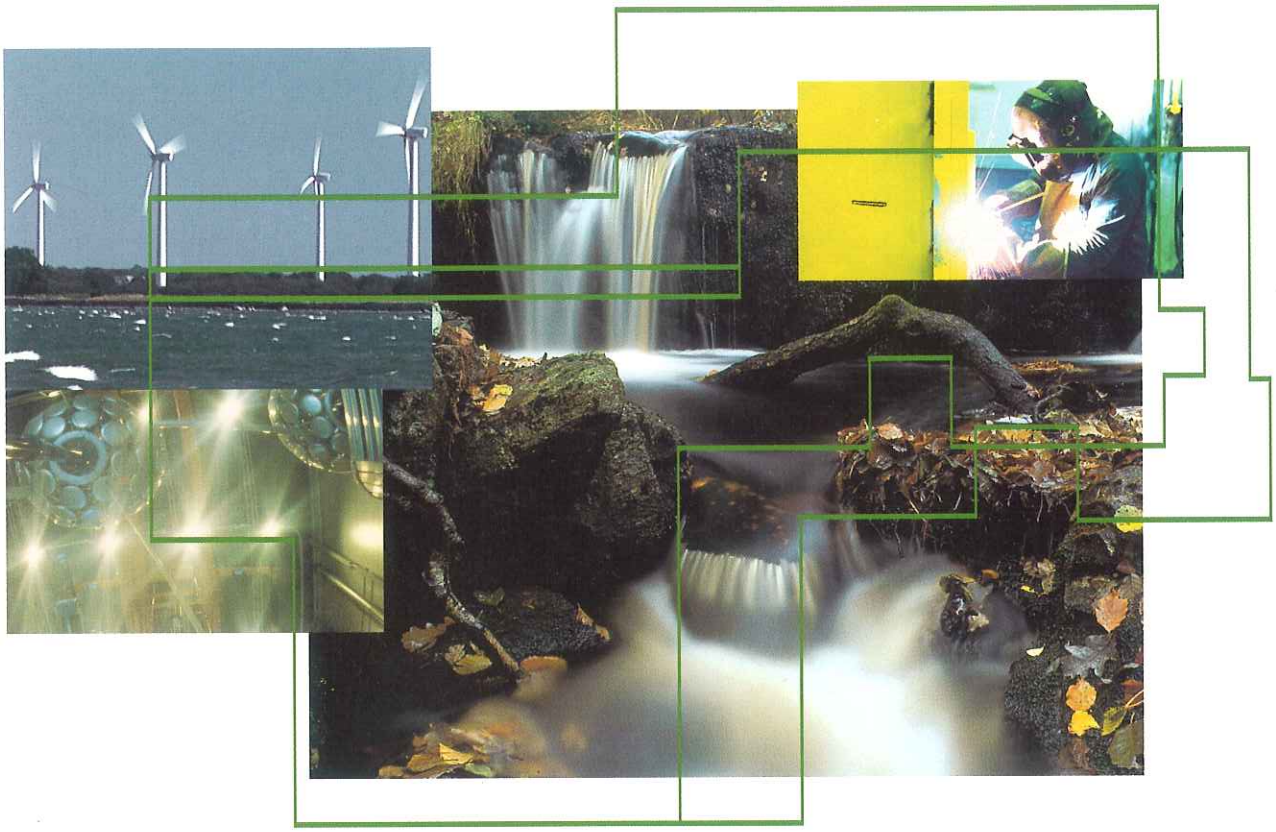

Brain Power.

ABB

1999 environmental highlights

- A sharp focus on products characterized 1999. Most of the 23 Business Areas completed their first environmental product declarations. They describe the environmental aspects of ABB core products over their whole life cycle, including environmental goals and programs.
- The Environmental Affairs organization within ABB was broadened by the appointment of 23 Business Area Environmental Controllers, responsible for the environmental performance of their core products and Business Area activities.
- In five seminars, more than 150 Business Area personnel were trained in the EcoLab life cycle assessment tool—a prerequisite for the production of environmental product declarations.
- To contribute to a "carbon-restrained world," ABB has invested resources supporting the World Energy Council in the launch of its program to reduce greenhouse gas emissions by 1 billion tons of carbon dioxide by 2005—an initiative first proposed by ABB's President and CEO, Göran Lindahl.
- At the end of 1999, ABB came close to implementing the ISO 14001 environmental management system in all of its manufacturing and service facilities. The number of sites that have implemented ISO 14001 has increased to 519, corresponding to 96 percent of the total.
- Five more operational performance indicators have been added, increasing the number to 33.
- The President's message in the 1998 report and a synopsis of the complete report were translated into 22 languages and distributed widely throughout the Group.
- Environmental statements were produced to serve as the basis for all relevant internal and external communication activity. These are now published on the "Environment" pages of ABB's website.

The ABB Group

ABB is a global technology company serving customers in power transmission; power distribution; automation; oil, gas, and petrochemicals; industrial products and contracting; and financial services. The company has its headquarters in Switzerland and employs about 165,000 people in more than 100 countries. The joint venture ABB ALSTOM POWER* serves power generation customers.

ABB fulfills its commitment to sustainable development by developing and supplying ecoefficient products and systems, sharing state-of-the-art technologies with emerging markets, contributing to common efforts to protect the environment, and continuously improving its own environmental performance.

* All data relating to facilities, products and services of companies and sites transferred to the new joint venture ABB ALSTOM POWER have been excluded from this report.

ABB's Environmental Management Report 1999 is available on the Internet; www.abb.com

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Beyond debate and into action

The past 30 years have witnessed an unprecedented surge in environmental awareness and calls for action. We have debated new concepts and principles: Sustainable Development, Ecoefficiency, the Polluter Pays Principle, the Precautionary Principle. We have seen the emergence of environmental accounting, environmental indexes, life cycle assessment, and environmental awards.

Green campaigns have multiplied and attracted wide publicity. Environmental consultants now offer advice on almost every issue. The Internet has many environmental websites, which together with environmental magazines and newsletters provide rallying points for the champions of green causes.

But the character of the environmental debate has changed. Thirty years ago it focused on the damaging impact of pollution on human health and on nature, and demanded action to curb an industry that was often seen as the enemy. Now we realize that care for the environment, and a determination to use its resources responsibly and sustainably, has to drive all sectors of society. Industry and commerce, as generators of social wealth and manufacturers of goods essential to human welfare, have to lead in the development of new practices and products that give us benefits without blemishes.

Time to reflect

All this gives us plenty to reflect on. Could the 1990s have been used more effectively by society—by politicians, scientists, industrialists, and consumers—to address with real action the environmental problems that were the subject of so much rhetoric and so many calls to arms?

There has been obvious progress. The Executive Director of the United Nations Environment Program has recently pointed out that thanks to concerted international action by governments—and work by industry to develop and introduce substitutes for ozone-depleting chemicals—the ozone layer is now on the slow road to recovery. Air pollution has been reduced in many large cities, and deforestation has been halted and reversed in parts of both Europe and North America. Voluntary action by many of the world's major industries is reducing resource use and eliminating waste.

But the list of "things to do" still exceeds the list of "problems solved" and in many parts of the world, the list is getting longer. In the 1990s more and more scientific experts have become convinced that greenhouse gases—mainly released when we burn fossil fuels such as coal, oil and gas—are causing a warming of the global climate, with consequent rising sea level, changes in rainfall patterns, and major impacts on wildlife, agriculture and society as a whole.

More than half the world's coral reefs are under threat. Water shortages are increasing: if present trends continue, two-thirds of the world's population will experience water stress by 2025. Soil degradation threatens the livelihoods of a billion people. While the richer countries are curbing air pollution, urban air quality is getting worse in many parts of the developing world, and acid rain is becoming a problem there also.

We need real progress

I conclude that while the slogans and rhetoric indeed have helped to heighten awareness of environmental issues in many countries, and while public pressure on politicians has been an important spur to action, real progress toward reducing environmental damage and ensuring that development is sustainable has lagged far behind the need. There is even a danger that all the talk about the environment, and the much-publicized events such as the Earth Summit in Rio de Janeiro in 1992, have lulled some communities into a false sense of security.

So, we need to devote more effort to solving the real problems—and such effort has to be community wide. For example, the use of fossil

fuels and the emission of greenhouse gases continue to rise a decade after the United Nations Framework Convention on Climate Change was negotiated, eight years after an unprecedented number of Heads of State and Government signed it in Rio, and two years after the conference in Kyoto set the first targets for action.

Technologies are now available to build far more efficient power stations and transmission systems, to create far more effective combined heat and power systems, and to use cost-effective renewable energy. While we realize that it takes time for the market to accept innovation, we regret that inefficient assets are not being retired more quickly.

Industry can and must do more to bring forth products that use far less energy and generate far less waste. It must lead in the development of alternatives to our fossil fuel dominated economies. But industry can only deliver these things within societies that are working together, in the same direction.

By their choices and behaviors, consumers profoundly affect the environment. The largest energy inefficiencies today are found in private households. As consumers, we can all do more for the environment. We can influence the production of environmentally sound products. And as voters, we can see to it that politicians set in place the policies, international agreements, national regulations and economic instruments that will deliver a sustainable future.

What can ABB do?

Companies as large as ABB, working in areas that have many interfaces with the environment, can and must contribute to achieving real progress. We can do this in four principal ways.

We can run our own operations in a way that causes minimal avoidable damage to the environment and develop methods that are cleaner and more efficient.

We can develop and manufacture products that give people the benefits they seek without harming the environment or using its resources unsustainably.

Göran Lindahl, President and Chief Executive Officer

We can share our new technologies with developing countries to help them avoid the mistakes that industrialized countries made during their own development.

And we can take our own initiatives to participate in international common efforts to improve the world's environment.

Social aspects

And then there are social aspects to consider—after all, corporate social responsibility is a cornerstone of sustainable development.

Managing an organization, whether a large multinational or a small local firm, and keeping it fit and profitable requires the acceptance of a wide range of social responsibilities. Although many aspects are regulated or legislated, I believe most CEOs have the ambition to reach far beyond mere compliance. I would like to see the establishment of specific standards to ease fulfillment of corporate social responsibility.

Exercising good corporate citizenship everywhere is a major challenge for a global organization such as ABB. Here, we can learn from our experience with environmental performance. Initially, we did not know how to manage it. Now we have practical standards in place.

During 1999, we conducted a survey throughout ABB to establish a "baseline" for our specific social contributions. Some examples of recent, ongoing and planned projects are described in the main chapter of this report. We intend to build from this baseline year by year and report on our progress in this area.

I think that industry so far has achieved more in social performance than in environmental protection. This is only to be expected because the social stakeholders speak for themselves, but nature does not. Furthermore, mitigating social

impacts often result in negative environmental impacts. And social considerations will usually take priority over environmental ones. So, we must continue to keep the environment in focus for a very long time to come.

This does not mean that we should ease up trying to address all three dimensions—social, environmental, and economic. But the environmental cornerstone of sustainable development is the weakest and must be reinforced.

A charter for sustainable development

As the basis for its environmental policy, ABB has taken the 16 principles of the International Chamber of Commerce (ICC) Business Charter for Sustainable Development (reproduced on page 58). I believe they provide a good basis for social and environmental performance and serve as a helpful guide for good environmental management.

The first three principles set the tone for both environmental and social performance. Principles 5 to 12 speak out on behalf of the environment and health. Principles 13 to 15 consider the social dimension.

Out of this charter, we have developed our own mission and strategy (reproduced on page 53), suited to the particular nature of our business. This takes us far beyond compliance with the legislation and regulations of many of the countries in which we operate.

Focus on common efforts

Previous ABB environmental management reports have focused on ecoefficient products and services (1996, 1997 and 1998), on sharing technology (1998), and on our own environmental management program (all years). These are three elements of our strategy to pursue sustainable development. The main chapter of this year's report focuses on the fourth and last element—ABB's participation in common efforts to protect and improve the environment.

This requires the commitment of substantial ABB funds and the participation of many ABB experts in international projects. Our biggest project is the China Energy Technology Program, led by ABB for the Alliance for Global Sustainability. It involves an international team of 75 scientists, academics and engineers on three continents, the majority representing Chinese institutions and utilities. The objective is to develop methods for analyzing the "true" impact of electric power generation from cradle to grave, taking energy technologies and their environmental impact into account and using the fast developing country of China as a case study.

Other important projects

ABB represents Switzerland as a very active member of the International Energy Agency's (IEA) greenhouse gas research and development program. To support this program, ABB runs its own greenhouse gas laboratory at its Corporate Research Center in Switzerland. One research project, for example, concerns the conversion of carbon dioxide (CO_2) with hydrogen to methanol as fuel for power generation and vehicles.

In a further project, ABB is collaborating with institutions in Japan, Norway, and the United States on ocean disposal of CO_2.

Several other projects with international research institutions are described in this year's environmental management report, together with the latest progress, involving my personal involvement in the World Commission on Dams and the 1 gigaton CO_2 reduction initiative with the World Energy Council.

Before embarking on such common effort projects, we evaluate them against strict criteria. They must be concrete, results-oriented, full-scale, with full commitment from all partners, and all important stakeholders, including governments, must be involved.

ABB's environmental management program

In 1993, the International Organization for Standardization (ISO) took on the challenge of developing global standards for environmental management. Today, ISO 14001 is steadily gaining acceptance, not only in industry and business but also among politicians and nongovernmental organizations. Almost 13,000 entities are certified to ISO 14001, and tens of thousands more are undergoing implementation. This standard does not stop at certification, but continues year after year with compulsory reviews in a process of continuous improvement and higher goals.

ISO is now completing additional standards in the 14000 series, widening the scope of environmental management systems to include environmental auditing, labeling, performance evaluation, and life cycle assessment. Harmonization of standards and practices for trade, technology and environmental protection is a necessity for international companies such as ABB. ISO's experience in this area is unmatched by any other standards organization.

ABB made an early start, also in 1993, to implement the new ISO standard and to develop our skills with life cycle assessment. Today, most of ABB's sites worldwide have implemented ISO 14001.

We have now taken the next important step—to include our products in the scope of ISO environmental management standards by developing environmental product declarations for all our core products, hardware as well as services. These declarations employ life cycle assessment to show how products relate to the environment, presenting their significant environmental aspects and our goals to improve their environmental performances.

Examples of our first attempts in this direction are published in the second main chapter of this report. Our ambition is to improve these product declarations considerably by the time we produce the second generation. We would very much value your comments to guide us in this work.

External assessment

For the third year running, we have commissioned Det Norske Veritas (DNV), an internationally accredited classification society, to assess how we comply with our declared environmental policy. The last chapter of this report compares DNV's 1999 assessment with those for the previous two years. I believe external assessment, performed by a third-party organization that is already experienced in environmental management, is a good way to keep our whole organization alert and striving to do better.

Eight years after ABB signed the ICC Business Charter for Sustainable Development, DNV's assessment shows that we are making progress in all four elements of our strategy for sustainable development. We apply ecoefficiency to the development of all products, hardware as well as services, with environmental product declarations for all core products. We transfer advanced technologies to developing countries through more than 300 companies with more than 30,000 employees in these regions alone. We continually improve our own environmental performance by the implementation of ISO 14001 in practically all our sites. We commit substantial funds, personnel, and resources to common effort projects to help improve the environment.

I believe ABB is moving in the right direction, and I am proud of the environmental benchmarks achieved through the coordinated effort of ABB's employees worldwide. As we close ABB's environmental balance sheet at the end of this millennium, I am pleased to see that it is strong and healthy and will serve as a sound basis to meet the challenges of the new era.

Göran Lindahl, President and CEO

ABB's Environmental Advisory Board

In 1992 ABB signed the ICC Business Charter for Sustainable Development, and based its environmental policy on the 16 principles of the Charter. At the same time it set up an environmental advisory board to have the views of independent experts help it develop this policy and integrate its commitment to sustainable development as a core value of the Group.

Today's Advisory Board is made up of seven external members and Göran Lindahl, ABB's President and CEO, as chairman. These eight members have impressive track records and represent a wide variety of interests—shareholders, customers, business, nongovernmental organizations, government, academia and science. They come from six different countries, bringing ABB the benefit of a wide spread of international views on business, environmental and social performance—the three cornerstones of sustainable development.

A major activity of the Board is the continous monitoring of ABB's environmental management program, covering the environmental performance of ABB's sites and facilities and of ABB's core products during their complete life cycles.

Secretary to the Board is the head of ABB's Corporate Staff for Environmental Affairs. This helps ensure that the Board's advice, recommendations and decisions are implemented throughout the Group.

Below are background details of the external members of ABB's Environmental Advisory Board, together with brief comments from each on the changing environmental scene as we leave one millennium and move on to the next.

David T. Buzzelli

is a senior consultant to the Dow Chemical Company, and a member of its Board of Directors where he serves as Chair of the Environment, Health, Safety and Public Policy Committee. He was previously Vice President and Corporate Director of Dow Chemical's Environment, Health & Safety, Public Affairs and Information Departments and co-chair of President Clinton's Council on Sustainable Development.

"Environmental issues have changed dramatically over the past decade, and the business response to these issues has changed too. In many ways, ABB has been at the forefront of these changes by listening and responding early to environmental concerns through increased public outreach and dialogue. As a result, ABB has vastly strengthened its commitment to sustainable development and improved its environmental performance."

José Goldemberg

is a Full Professor and former Rector of the University of São Paulo. He was previously President of the Energy Company of the State of São Paulo and has served as Minister of State of Education, Secretary of State for Science and Technology, and Secretary of State for the Environment in the federal government of Brazil.

"In the 1990s most ABB facilities were certified according to ISO 14001. It has been extremely interesting for me to observe this process from the inside. A main task for ABB in the coming years will be to help its suppliers and users of its products to comply with environmentally sound procedures and methods."

Sir Martin W. Holdgate

has an earlier background in research, focusing on the ecology and biogeography of the Antarctic and Subantarctic regions. He later served as Chief Scientist at the United Kingdom's Department of the Environment, and as President of the United Nations Environment Program, before becoming Director General of the IUCN—the World Conservation Union—until his retirement.

"In the past decade, we have begun to edge round the world's environmental corner. But it's a big corner and we still have a long turn to make. We will not round it unless leading companies deliver the clean technologies and clean products we need. The good news is that many now understand that good environmental policy is good business policy. ABB is one of them, which is why I am so pleased to serve on ABB's Environmental Advisory Board."

Ken F. McCready

is a Corporate Director and independent consultant focusing on sustainable energy development. He is a former CEO of TransAlta Corporation—Canada's largest investor-owned electric utility, recognized for sustainable development leadership—and served as a founding member of the World Business Council for Sustainable Development.

"ABB's disciplined implementation of ISO 14000 standards and application of life cycle assessment to innovative product development have led to continuing improvements such that if today's technology could be applied everywhere the environmental gains would be enormous. But still the world, particularly developing countries, needs much more energy at much reduced environmental impact to make the economic and social progress that is vital to achieving the vision of sustainable development. Meeting these needs is the challenge we face for the future."

From the left; José Goldemberg, Björn Stigson, Jan Strömblad, David T. Buzzelli, Göran Lindahl, Ken F. McCready, Ingar Palmlund.

Sir Martin W. Holdgate

Ulrich Steger

Ingar Palmlund

combines research and consulting on environmental policy. She is Associate Professor for Technology and Social Change at Linköping University, Sweden, and also lectures at the Department of Urban and Environmental Policy, Tufts University, United States. She has written several books and scientific articles and publishes "Human Environment—The International Environmental Policy Analysis Newsletter."

"In the early nineties ABB made the enlightened decision to adopt environmental protection and sustainable development as part of its corporate mission. The company has worked hard through trial and error to achieve that mission. Although much still remains to be done, the recent emphasis on developing environmental declarations for all business areas and core products will greatly speed up progress."

Ulrich Steger

is Professor of Environmental Management at IMD, Switzerland. He is also Director of the Research Institute for Environmental Management and Business Administration, Oestrich-Winkel, Germany. He was previously Minister of Economics and Technology for the State of Hesse, Germany, elected to the German Government, and is a former member of the Managing Board of Volkswagen.

"Over the last years, most of Europe and North America has become clean, but not sustainable. Now, the most important task is to get the consumer more involved in resource conservation and to spread best industry practice in environmental management across the globe."

Björn Stigson

is President of the World Business Council for Sustainable Development. He is also a member of the China Council for International Cooperation on Environment and Development. He was previously President and CEO of the Fläkt Group, Sweden, and later Executive Vice President on the ABB Group Management, responsible for the Environment Segment.

"Since the creation of ABB, the environment has been one of the company's top management priorities. ABB's achievements during the 1990s in building an environmental management system based on the implementation of ISO 14001, the application of life cycle assessment, and environmentally driven R&D are impressive. This will be a learning experience for others on how to implement sustainable development in corporations."

Common efforts: toward being a good corporate citizen

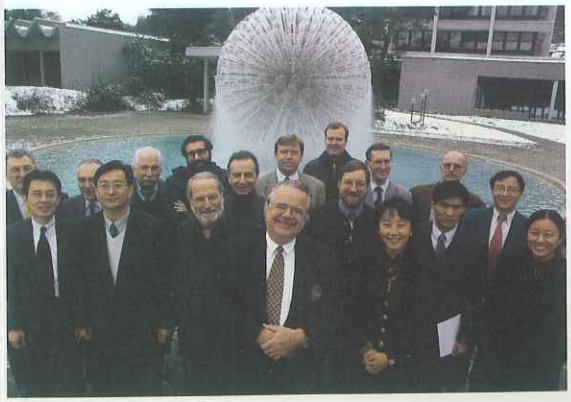
ABB was among the first companies to sign the International Chamber of Commerce (ICC) Business Charter for Sustainable Development when it was formulated in 1991. The fourteenth of its 16 principles is entitled Contributing to the common effort. It calls for signatories to "contribute to the development of public policy and to business, governmental and intergovernmental programs and educational initiatives that will enhance environmental awareness and protection."

We believe that our expertise in advanced technologies, products and services can generate added value, when it is placed at the disposal of international research and project teams working for the common good of humankind.

Actions speak louder than words

Our best response to this challenge is through our participation in specific collaborative pilot projects and research programs, where the work is transparent and the results can be measured.

Such projects are tested against rigorous criteria. They must address real problems. They must be results-oriented. They must make a real contribution to sustainable development, with its three aspects: economic, environmental, and social. They must be soundly based: we look for effective partners with serious complementary interests, who can give their full commitment. We also look for the involvement of multiple stakeholders, including governments.



Some of these projects are described in this chapter. They involve substantial commitments both in cash terms and through participation of our scientists, engineers, and support staff, together with their project and research facilities. In most cases, ABB's involvement in projects is actively sought because of our expertise, and our specialized research and development operations.

We intend that all sides should gain. We hope our partners in industry and utilities get answers to the various challenges they face; our academic partners extend their knowledge; governments are helped to frame environmentally friendly policies; and perhaps ABB also acquires knowledge that helps improve its business—as well as some satisfaction for our employees in having been of service to society at large.

Setting the right direction

An important catalyst at the outset of ABB's common efforts activities was the Energy and Global Change (EGC) team, established ten years ago as part of ABB's Corporate Research Center in Switzerland.

The EGC team's role was (and is) to investigate what global change—climate change, global environmental problems, and a global marketplace—might mean for ABB's business.

It quickly established that global change would radically transform ABB's business. The shift in the growth of energy consumption from West to East; divergent demands in developing and developed countries; global environmental threats, including global warming; all would have an impact on our technologies and markets.

The EGC team tracked these developments, reporting their findings to ABB's top management. Some of the team's reports are publicly available: they are listed at the end of this report under "Further reading."

This work brought the EGC team into close contact with other leading organizations, research centers and universities around the world, some of which are mentioned later in this chapter.

Today's headline issues

As so many environmental issues are global in their context, so many of ABB's initiatives and involvements are global in nature. But the efforts of local ABB companies to be good corporate citizens, participating in social, educational and economic initiatives outside the scope of merely providing employment, are equally important. This chapter presents examples of both global and local activities.

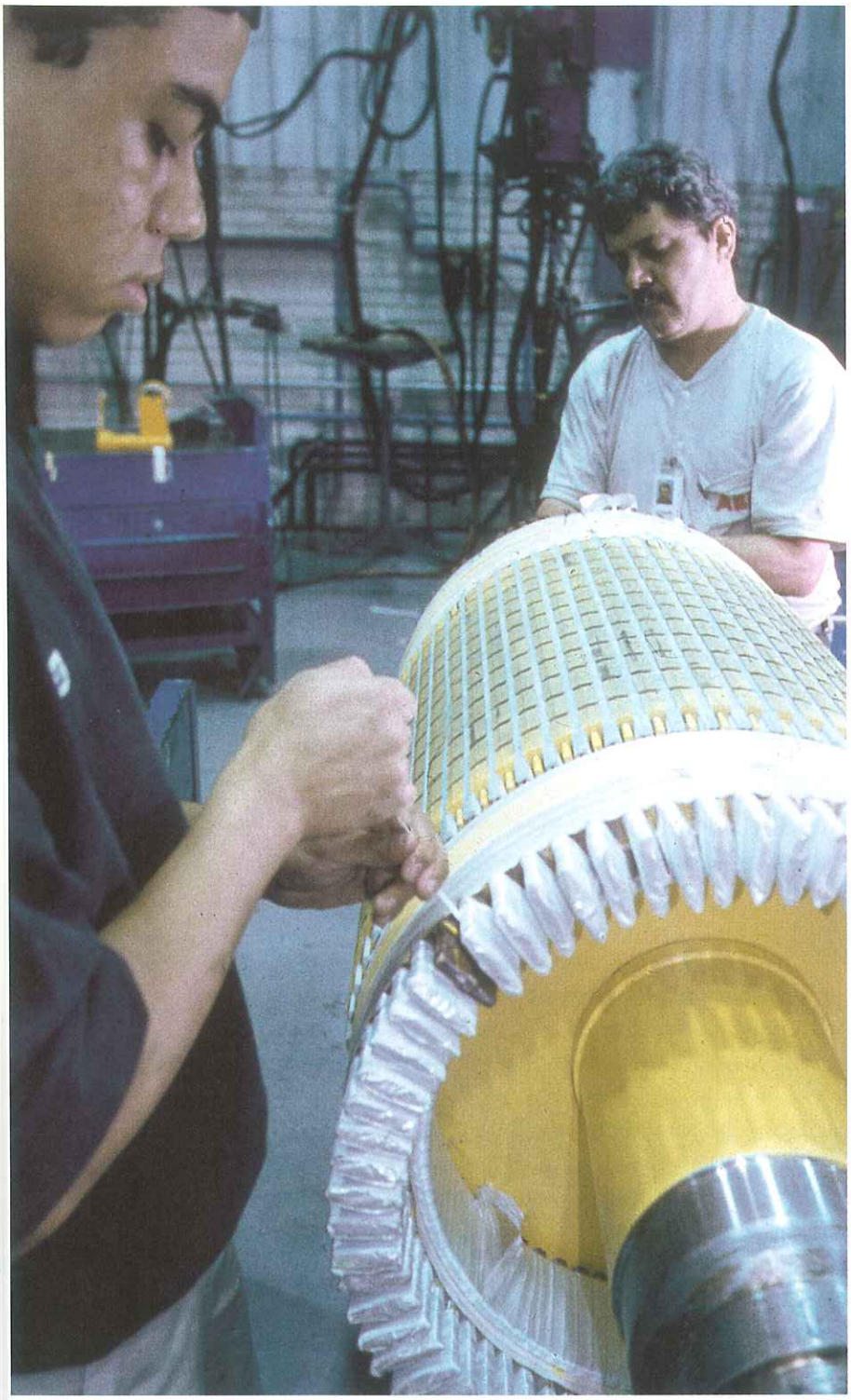
Management support is strong: ABB's President and CEO, Göran Lindahl, initiated the World Energy Council's pilot project to reduce greenhouse gas emissions, and he is one of the 12 Commissioners of the World Commission on Dams (more about each of these projects later). In addition, Göran Lindahl is a regular keynote speaker on environmental issues at international conferences, seminars and other events.

Management support for common effort activities is provided by cross-functional teams coordinated by ABB's environmental affairs staff, who themselves participate actively in international forums on environmental topics.

ABB is a large organization. We employ 165,000 people in more than 100 countries; counting their dependents, we are more or less directly responsible for the welfare of more than a million people. Our aim is to improve their quality of life, as well as that of the local community and society at large, while contributing to economic development and maintaining the highest ethical standards.

In measuring social performance, we come up against the same problems we did when we began to try to measure environmental performance some years ago—there are no accepted standards or measures at present. So, much of what we report now is anecdotal.

During 1999, we conducted a survey throughout ABB to establish a "baseline" of our present specific social contribution—in effect, an inventory of recent, ongoing or planned projects or actions that demonstrate good corporate citizenship. Some examples from this survey are included at the end of this chapter. We hope to build from this baseline year by year, and to report on our progress in this important dimension of sustainable development.



The World Energy Council's pilot program on greenhouse gas emissions reduction: the 1 billion ton challenge

Worldwide man-made emissions of greenhouse gases, according to the best estimates, will reach the equivalent of 33 billion tons of carbon dioxide (CO_2) in the year 2000. These emissions are growing at the rate of about 2 percent per year.

In 1997, the Third Conference of the Parties to the United Nations Framework Convention on Climate Change was held in Kyoto, Japan. It reached a set of binding agreements—the so-called Kyoto Protocol, setting targets that would achieve an overall global reduction of almost 3 percent in greenhouse gas emissions in the years 2008–2012, using 1990 emissions as a base.

This Protocol is now needing ratification by the participating countries for the targets and commitments to come into effect.

This is an ambitious target—in absolute numbers, it calls for a cut of about 4 billion tons of CO_2 equivalent from today's emission levels. But—perhaps because the years 2008–2012 still seem a comfortably long way away—very little has so far been achieved. Far from stabilizing or falling, greenhouse gas emissions continue on their upward trend.

This was the background to a proposal put forward by ABB's President and CEO, Göran Lindahl, at the triennial World Energy Congress (WEC) in Houston in September 1998. He proposed a pilot program, over a shorter timescale, to find real, practicable projects that would reduce emissions by 1 billion tons (1 gigaton) annually, by 2005.

The WEC has been established for over 75 years. Its member committees are drawn from approximately 100 countries, each representing local energy-related interests, both governmental and commercial. About 92 percent of the world's energy consumption is represented by the WEC membership. Power-generating companies, oil and gas companies and technology companies such as ABB, as well as governments and national regulators, are among the interests typically represented in the WEC member committees.

Unlike other global organizations, the WEC does not represent any single energy source, such as oil or nuclear. Instead, it encompasses all forms of energy, from fossil fuels to nuclear, hydropower and renewables such as solar and wind energy. Its mission is to promote the sustainable supply and use of all forms of energy for the greatest benefit of all—which gives it a

natural focus on energy efficiency and conservation.

"With our mandate for sustainable energy use, it's natural that the WEC should take a leading role in stating the business case for preparing for a carbon-constrained world," explains Gerald Doucet, the WEC's Secretary General. "More and more, we'll take on the role of prescribing policy and setting environmental and ethical standards —through a consensus of our members."

"Göran Lindahl's proposal gave us an opportunity to move from scientific debate to a more practical, business-driven agenda. We are a nongovernmental organization, so there's little point in replicating the kind of work that gets done between governments—as for instance at Kyoto. We needed to do something different, taking advantage of the unique position we have."

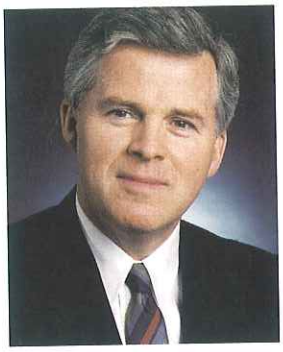
The WEC immediately moved to set up a task force and start identifying candidate projects around the world. Projects included in the program had to be effectively evaluated, to have clear approval and a feasible time schedule, and to have all necessary financing secured—and they had to be onstream by 2005.

Within a year the task force, with specialists from the WEC National Committees, supported by ABB, had identified more than 420 projects in 73 countries, which represented an aggregate possible reduction of more than 880 million tons.

The largest share of the projected savings came from power generation and distribution, with industry being the next largest contributor.

Just over 100 of the projects are located in developing countries. "We're particularly pleased at the participation of developing countries," says Gerald Doucet. "Some developing countries were lukewarm about the Kyoto Protocol, but they see this project as a way of publicizing, and perhaps securing funding for, their own emissions-reduction projects."

In September 1999 the WEC reviewed the project. It decided to complete the project database to meet the initial 1 gigaton target, and refine the methodology and definitions used in the project, in order to enhance its value. "Most of our members wanted to go full speed ahead with the program," says Gerald Doucet. "A few had reservations about our methodology, and about issues of sovereignty—whether they should be giving information to a nongovernmental organization like ourselves, and what would happen to that information."



Gerald Doucet, Secretary General of the World Energy Council.

By early 2000, it is expected that the database will have reached the 1 gigaton target, even allowing for the weeding-out of doubtful projects as the criteria are tightened. "From there, the logical thing is to raise the target, and look perhaps for 2 or 3 gigatons. We can extend the program by looking at sectors like transportation, agriculture and energy-intensive industries like chemicals and pulp and paper."

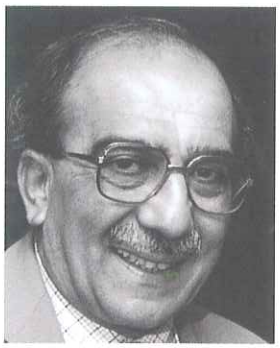
Once the database has reached its initial target, the WEC will begin to actively publicize it. The entire database will be available at the WEC's website (*www.worldenergy.org*). "Public visibility is very important for a project like this," explains Gerald Doucet. "The WEC is in no position to guarantee the validity of the information in the database, but when it is on the Web, anyone can see what is being claimed and by whom—and challenge any claims that they feel are inflated."

The World Commission on Dams: "There are those who thought this Commission would only meet once."

With those words the chair of the World Commission on Dams (WCD), Professor Kader Asmal, opened the interim report that was published in July 1999, marking the halfway point in the WCD's two-year mandate.

The WCD arose out of an unusual gathering in the Swiss town of Gland in April 1997. Hosted by the World Bank—a major provider of funding for large-scale dam projects around the world—in conjunction with the World Conservation Union (IUCN), the Gland workshop was the first serious attempt to gather all interested parties, proponents as well as opponents of dams, together to discuss the issues.

The WCD was born out of the success of this workshop, and the realization that if it were possible to systematically gather together information and viewpoints from all parties affected by large dams projects, some valuable results could be achieved. Specifically, it was hoped that the WCD could arrive at a set of criteria for examining future large dam proposals, which could be put at the disposal of all those involved in the decision process to help them determine whether a particular dam should be allowed to proceed.



Professor Kader Asmal

The WCD has 12 Commissioners, chosen to represent a balance of all stakeholder groups, with no single interest or group predominating. The chair, Professor Asmal, was Water Affairs and Forestry Minister in the South African government, and led a fundamental review and reform of the country's water resource management policy. The other 11 Commissioners are drawn from nine countries and all continents. Among them are academics, human rights campaigners, environmentalists and an anthropologist, as well as those actively involved in building and operating dams. Göran Lindahl, ABB's President and CEO, is the sole representative of private industry on the Commission.

Little wonder, perhaps, that the Commission's chair could refer to widespread initial skepticism about the WCD's prospects for success. Yet, as its task draws near to completion, the prospects for success seem good.

The Commission's work program is proceeding as planned. Studies of complete river basin systems with multiple dams are under way in nine countries. A global survey of 150 large dams has been initiated to identify broad trends and developments; and 17 different global thematic reviews, each looking at a different aspect of the impact of large dam projects, have been commissioned.

The WCD has been especially active in reaching out to interested parties and gathering submissions. The Commission itself has access to a large group of experts, the WCD Forum, with 55 members. Five regional consultations, each of two days' duration, have been scheduled (the last one, for East and Southeast Asia, will take place at the end of February 2000).

The WCD has also been involved in conferences and workshops with other bodies, for in-

stance, a two-day consultative workshop in Geneva in conjunction with the annual meeting of the UN Working Group on Indigenous Peoples; the annual meeting of the World Bank and International Monetary Fund; the Stockholm Water Symposium; and a Reuters Foundation-IUCN seminar for the world's media, in London. Meetings with the Organisation for Economic Co-operation and Development (OECD), and the International Hydropower Association have also been scheduled.

Last but not least, the WCD is active on the World Wide Web. Much material is available on its website (www.dams.org), and a five-week web conference in May–June 1999 attracted some 40 submissions and over 100 participants.

As the WCD prepares to publish its final report in August 2000, such intense outreach activities are very important, according to Professor Asmal. "A commission such as ours, midway through its brief two-year mandate, must invest heavily in reaching out to interested parties, to ensure they are aware of the WCD's work and thus able to inform and contribute to it," he says. "The Commission also must position itself in the global arena of decision-making and policy dialogue. Otherwise, its report will only be noticed by its printer and a few die-hard followers."

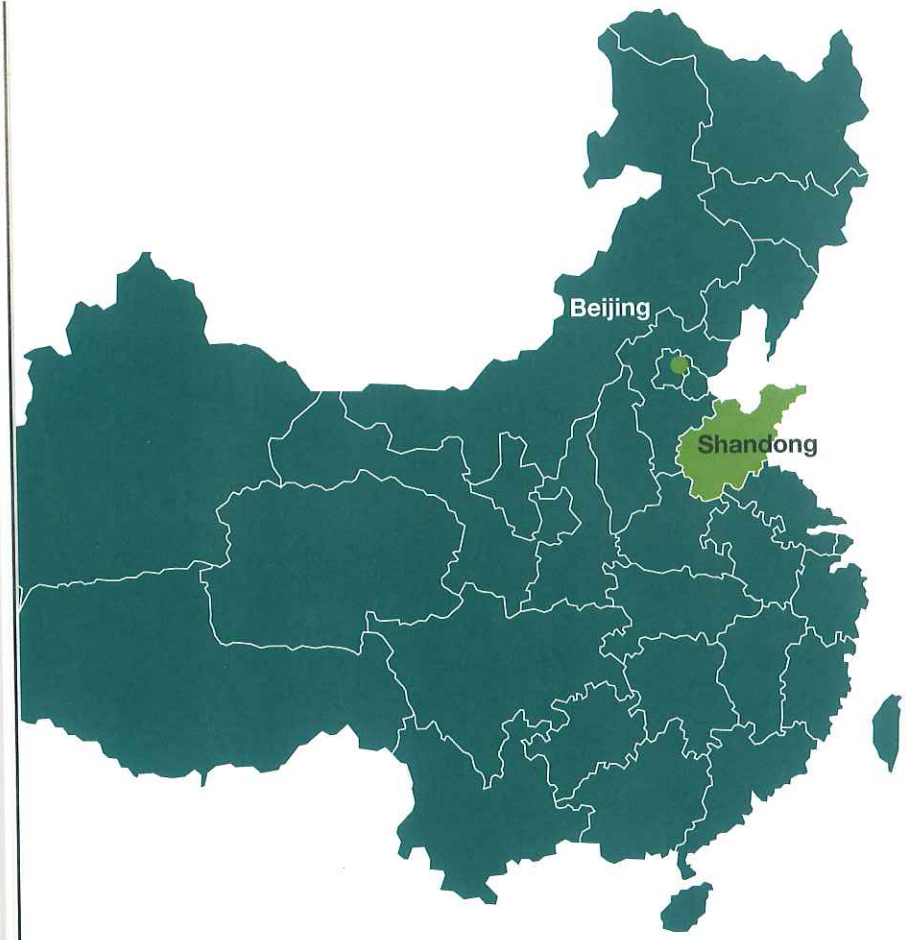
The China Energy Technology Program: assessing a complete energy system

With over 1.2 billion inhabitants, China is the world's most populous country. Its economy is growing fast, and so is its use of energy. It is the world's largest producer and consumer of coal, which provides about three-quarters of all the commercial energy consumed. China ranks second in the world after the United States in terms of carbon dioxide (CO_2) emissions, but it is catching up fast: each year, China brings online new electricity-generating capacity equivalent to more than the entire output of Switzerland.

The China Energy Technology Program is one of ABB's most ambitious common effort projects. Undertaken in conjunction with the Alliance for Global Sustainability (AGS), it is a two-year program that started in May 1999. It involves a team of 75 scientists, academics and engineers on three continents, from business, utilities, universities, and research institutions. ABB is contributing financially as well as with expertise, facilities and program management.

The project's aim is to develop a global methodology for assessing the "real" impact of electric power generation from cradle to grave, taking energy technologies and their environmental impact into account. Given the rate of growth in energy consumption, and the severe environmental impact of coal-burning for power generation, environmental protection will remain a huge challenge for decision-makers and scientists in China in the coming years.

To limit the scope of the project to a manageable level, it focuses on just one province, Shandong, chosen principally because of its independent power grid and diversified energy supply. However, the methodology developed should be applicable to other provinces in China and other countries.



No fewer than eleven organizations, in four countries, are involved in the project. Together, they possess an outstanding capability and command a powerful set of analytical tools to identify sustainable energy and electrical power systems under real-world political, infrastructural and economic constraints.

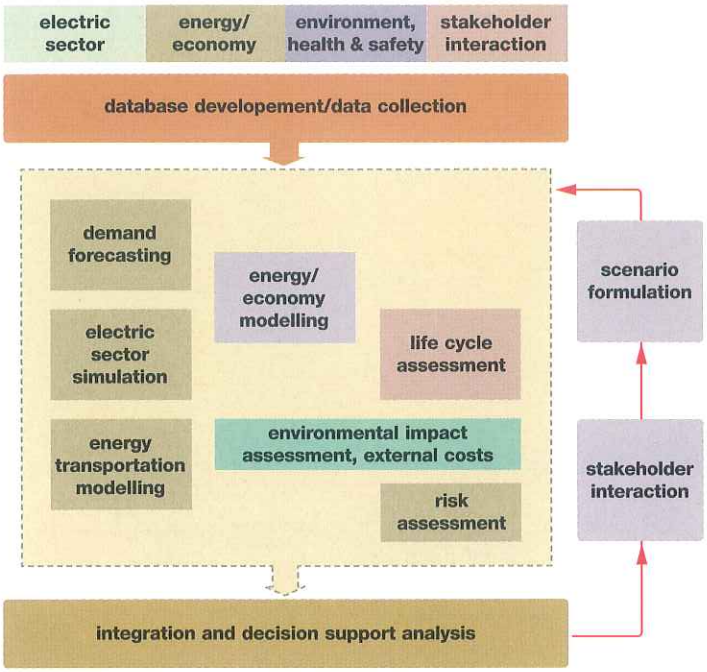
Each of the key elements of the project (see box) is coordinated by a principal investigator, who acts as the interface with other elements of the project (see the flowchart on page 17). Regular review meetings and symposia are planned, rotating around the principal countries, and project staff will themselves rotate among the various partners to better coordinate the collaborative research work.

The Chinese participants, as pivotal stakeholders and the main data providers, have a decisive role to play in many key areas. A Chinese stakeholder advisory group will be formed to facilitate the formulation of scenarios and multi-criteria decision analysis.

Key elements of the research program	China Energy Technology Program partners
Overall project management	ABB Corporate Research, Baden, Switzerland
Database development	ABB China, Beijing, China
Data collection	ABB China, Jinan, China
Demand forecasting	Energy Research Institute of the State Development Planning Commission (ERI), Beijing, China
Energy/economy modelling	Massachusetts Institute of Technology (MIT), Cambridge, United States
Electric sector simulation	Paul Scherrer Institute (PSI), Villigen, Switzerland
Energy transportation modelling	Policy Research Center for Environment & Economy of the State Environmental Protection Administration (SEPA), Beijing, China
Life cycle assessment	Swiss Federal Institute of Technology (ETHZ), Zurich, Switzerland
Environmental impact assessment	Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland
Risk assessment	Global Climate Change Institute of Tsinghua University (TU), Beijing, China
Integration and decision support analysis	University of Tokyo (UT), Tokyo, Japan
Outreach and technical exchange	

COMMON EFFORTS

CETP Flowchart



The project will focus on four main concepts:

- An integrated approach, using databases, knowledge bases and simulation methods, linked to electricity supply and demand options under sustainable and economic driving forces, and to technology assessment.
- The development and use of specialized databases and models based on life cycle assessment, health and safety, economic and social factors, environmental impacts, legal and institutional considerations, technology assessments and operational data.
- The improved use of decision support techniques such as multicriteria decision analysis.
- Engaging the active participation of stakeholders—the State Power Corporation, the Shandong Electric Power Group Corporation and provincial and central Chinese government policy-makers and advisors—in the decision-making process and in the development of the attributes and scenarios for the energy/electricity mix.

Ultimately, the program should give a clear picture of the relative costs and environmental performance of different strategies for meeting power demands. The methodology will not be optimized for just one parameter, such as cost or CO_2 emissions; it will examine the trade-offs of many different options, including choices of technology.

The China Energy Technology Program has the potential to bring significant benefits for the environment, not just in China but globally. Above all, it should help China to raise its people's living standards toward Western levels, without repeating the mistakes the West has already made.

Building better boilers

Another important common effort project, with ABB as the lead sponsor, aims to improve the efficiency of coal-fired industrial boilers. Again the focus is on China, where more than 500,000 industrial boilers are in use, accounting for nearly one-third of all the coal burned in China.

These boilers have particularly poor efficiencies: they waste natural resources and cause serious air pollution. To solve this problem, ABB has collaborated with scientists at Tsinghua University in Beijing, as well as the Massachusetts Institute of Technology (MIT) and the University of Utah in the United States, in a project entitled "A study of the reactivity of unburned carbon in fly ash for improving the combustion efficiency of industrial boilers."

Unburned carbon reduces boiler efficiency; it also means that the fly ash cannot be reused in the cement industry, which requires a low carbon content. Scientists at Tsinghua University, together with ABB experts, have experimented with circulating fluid-bed (CFB) boilers, in search of a good solution. It is estimated that if combustion efficiencies could be raised to those achieved in OECD countries, China could cut its coal consumption by 10 percent and CO_2 by 300 megatons which is equivalent to the combined emissions of Spain and Portugal.

The work on this project was completed during 1999 and has now led to a new study on the formation and reduction of nitrogen oxide (NO_X) and nitrous oxide (N_2O)—a strong and persistent greenhouse gas—in fluidized bed combustion.

Through experimental work at Tsinghua and Utah universities, we hope to better understand these processes and to find ways to limit the production and emission of such unwanted gases.

The International Energy Agency Greenhouse Gas Program: taking carbon dioxide out of the environment

Increasing the efficiency of energy conversion, power generation and transmission can cut greenhouse gas emissions by reducing the amount of fossil fuel that we need to burn. Another method, more futuristic but none the less interesting, is to prevent carbon dioxide (CO_2) from getting into the atmosphere in the first place. Options for achieving this are currently being studied by the International Energy Agency (IEA), based in Paris and funded by 18 countries and the European Commission. ABB Corporate Research, on behalf of the Swiss government, provides the Vice Chairman and represents Switzerland in the IEA Greenhouse Gas Program.

ABB has world-leading technology in this area. It built the world's first commercial CO_2 capture facility for a coal-fired facility, at a 300 megawatt power plant at Shady Point, Oklahoma, United States. This captures 200 tons of CO_2 per day from the plant's flue gas; after catalytic purification, the gas is liquefied and sold to the food-processing industry.

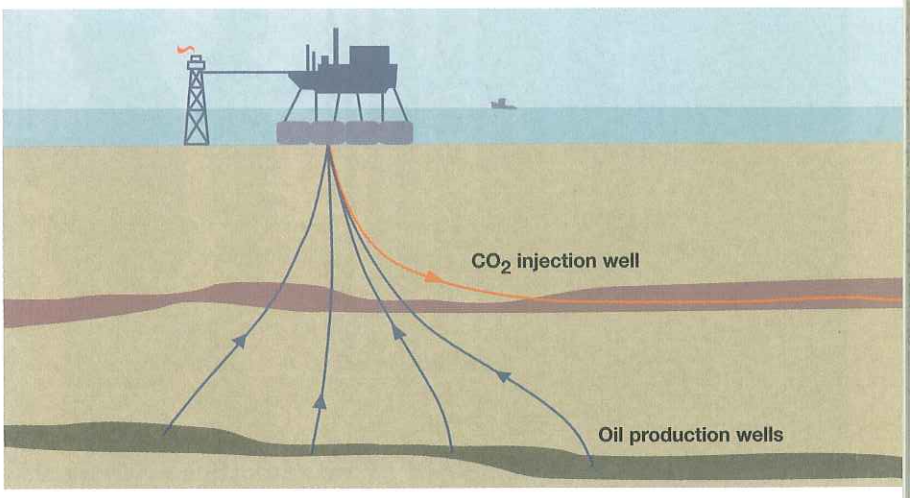
There are several other potential opportunities to remove CO_2. Fifty times more CO_2 is dissolved in the world's oceans than is present in the atmosphere. ABB is a member of the steering committee of another project looking at the ocean sequestration of CO_2. Supported by Australia, Canada, Japan, Norway and the United States, the four-year project is under way at the Pacific International Center for High Technology Research and the National Energy Laboratory of Hawaii Authority, in association with the University of Hawaii. The study is assessing the feasibility of injecting liquid CO_2 into the ocean depths.

Experiments are scheduled to begin in the summer of 2001. One hundred tons of liquid CO_2 will be pumped down a tube to a depth of 800 meters, near the island of Hawaii. The researchers will monitor this experiment to study its effects, and to check whether the CO_2 remains stable.

ABB is following another project coordinated by the IEA Greenhouse Gas Program, which is monitoring the storage characteristics of a subsea cavity in the North Sea, into which liquid CO_2 has been injected. The gas—about a million tons a year—comes up from an offshore natural gas field operated by Statoil, a Norwegian oil and gas company. Instead of being vented to the atmosphere, as happened previously, it is liquefied and injected into an aquifer about 800 meters below the seabed. The strategy is encouraged by a tax of US$ 50 per ton of industrial CO_2 emission imposed by the Norwegian government. The sequestration facility has been operating successfully since October 1996, and further units are contemplated.

One final aspect of ABB's common effort activities in the field of CO_2 mitigation was a lead role in organizing and chairing the most recent International Conference on Greenhouse Gas Control Technologies, at Interlaken in Switzerland in August 1998. This conference—the fourth in a series—was the first to cover all greenhouse gases, not just CO_2, and all aspects of mitigation: technical, economic and political.

The conference addressed ways to increase the efficiency of power production and use; and proposals to encourage the development of renewable energy sources. The main emphasis, however, continued to be on practical, real-world greenhouse gas mitigation technologies that are being planned and implemented today. The conference attracted 530 delegates from 49 countries, including strong representation from developing countries, showing the increasing concern over climate change.



Converting greenhouse gases into fuel: modern-day alchemy

To support its international common effort programs, ABB's Corporate Research Center runs a laboratory in Switzerland, undertaking long-term research into ways of recycling greenhouse gases.

One research program uses a catalytic technique to combine CO_2 with hydrogen, to form methanol. If the hydrogen comes from a renewable source, such as hydropower, solar energy or biomass, then the net result is a very effective way of reducing overall CO_2 emissions. By volume, methanol has more than twice the energy content of hydrogen.

The second method being researched focuses on the oxidation of another greenhouse gas, methane. Using exotic catalysts, methane can be combined with CO_2 to produce methanol. Laboratory research into this technique is ongoing in Switzerland, in collaboration with a team of scientists at Tianjin University in China, which has the largest chemical engineering research program in China.

Both of these cases transform man-made greenhouse gases into liquid fuels—methanol or other higher hydrocarbons—which can be easily transported and stored. Methanol can be used in vehicles, in fuel cells and for heating—and may in the future be used to fuel gas turbines. At present, methanol produced using these processes is considerably more expensive than methanol obtained from other sources, such as natural gas or coal. However, the imposition of "carbon taxes" on fossil fuels could change the

economics and make this development more attractive.

The Massachusetts Institute of Technology Global Change Program: looking to the future

As we noted earlier, ABB's Energy and Global Change Department is naturally drawn into discussions and collaborations with other interested parties analyzing the whole field of global change.

One of the most far-reaching of these collaborations is with the Massachusetts Institute of Technology (MIT). In 1993, MIT began its Joint Program on the Science and Policy of Global Change—a ten-year program encompassing research, independent policy analysis, and public education about global environmental change. It is one of the most complex, integrated studies of the Earth's climate system under way, and helps to prepare for the difficult choices facing nations in the "post-Kyoto" era.

The program's main work is centered on MIT's Integrated Global System Model, which is used to analyze potential global climate change and its environmental and social consequences. There are three main components: emission prediction and policy analysis, atmospheric chemistry and climate predictions, and the prediction of impacts of climate change.

The program is sustained by an international consortium of government, industry and foundation sponsors, totaling 29 supporting partners from seven countries. It currently costs US$ 2.7 million a year, three-quarters of which comes from industrial sponsors, such as ABB, and institutes.

To be effective, the program's results need to be made available regularly to international and national policy-making bodies, and to other investigators. To this end, six monthly forums are held to communicate results, bringing together climatologists, economists, policy analysts, industry experts and policy-makers. These forums also bring researchers into regular contact with the policy debate, so they can frame their work agendas in line with evolving needs.

The Pew Center: rallying action on climate change

Another United States based initiative actively supported by ABB is the Pew Center on Global Climate Change. This organization was founded in May 1998 by the Pew Charitable Trusts, in the belief that climate change would be one of the most difficult environmental challenges of the new millennium—a challenge further complicated by the wide divergence of views on the nature and extent of the problem itself.

The Pew Center has four main aims:

- To develop credible, understandable information on global environmental, economic and policy issues related to climate change.
- To educate policy-makers, industry and the public by communicating this information.
- To develop and communicate policies and programs that reduce greenhouse gas emissions in a cost-effective and equitable way.
- To foster greater global participation in meeting the challenges of climate change.

Recognizing the important role of the business community in climate change issues, the Pew Center formed a Business Environmental Leadership Council (BELC). This acts as an advisory board to the Pew Center. It has 21 members, including ABB. As an active member, ABB draws on its own expertise to review and comment on the Pew Center's communication activities, and provides technical support for its conferences and publications.

Despite its youth, the Pew Center has already emerged as a respected resource for policy-makers, business leaders, nongovermental organizations and the general public. Its reputation is due in part to a series of analytical reports by respected authorities on the political, environmental and economic impacts of climate change. Focused communication, including public presentations, targeted advertising, participation in international conferences, and the efforts of the BELC members, have boosted the impact of these reports.

These international efforts are supplemented by United States policy initiatives. Since the signing of the Kyoto Protocol, the United States Congress has shifted from outright rejection and criticism of the agreement, to consideration of incentives for early action. There have been many legislative proposals related to this issue. The Pew Center has contributed to this shift through congressional testimony, conferences and reports on the subject. ABB, like other members of the BELC, believes that complex problems, such as climate change, require multifaceted solutions.

This is the main reason why ABB supports the Pew Center, as well as its own research and development to reduce greenhouse gas emissions.

ABB's corporate social contribution

There are many interpretations of the meaning of sustainable development. However, there is a good consensus that it is built on three cornerstones: economic, environmental and social performance. We know quite well what we mean by both economic and environmental performance—they are both measurable to a large extent. But to measure social responsibility is not so easy.

The social area is huge and complex. Industry already has a large social responsibility, regulated both by laws and by social pressures. Most socially responsible companies, including ABB, have the ambition to go well beyond compliance with national and international regulations.

We can start by focusing on our own employees, raising working conditions and human rights beyond local norms to a global ABB standard. Under these headings are a wide range of topics—health and safety, labor conditions including child labor, security, equal opportunities, discrimination, personal development, to name but a few.

We can also seek to identify and demonstrate examples of our social contribution, using them to raise awareness, encourage similar initiatives throughout ABB, and thereby steadily improve our performance everywhere.

The remaining part of this chapter outlines some examples that came to light in our recent worldwide survey to establish a baseline for our present social performance.

Austria: ABB has involved itself in a project promoted by the Ministry of Education to "Ecologize our schoolchildren." Besides sponsoring the project, experts from ABB Austria gave children from some 250 schools practical tips on how to optimize energy-saving in their schools and therefore contribute to conserving resources, reducing emissions and improving the environment. ABB supported the project with a financial contribution and presented "energy-saving kits" (movement detectors and heating and water controls) as prizes to the winning teams for their schools' energy-saving initiatives.

Brazil: ABB has published for the first time a "Social Balance" report describing the social activities of its Brazilian companies. The report addresses a selection of Articles taken from the Universal Declaration of Human Rights and describes the ways ABB employees in Brazil are helping their colleagues and local communities.

Projects cover a wide range of topics, such as sport and leisure, health and safety, recycling, enhanced employee representation and information facilities, cultural, educational and house purchase financing schemes, and social action by the employees to help the plight of slum children,

hunger, AIDS victims and school construction. ABB's "Social Balance" report was distributed to over 13,000 employees, customers, politicians and opinion leaders in Brazil and was judged the Best Published Social Report in 1999 by the Brazilian Business Communications Association.

Canada: ABB provides financial support to the Centraide/United Way voluntary action organization, which builds community teams to respond to a broad range of human needs on a national scale. For every dollar given by an employee, ABB gives another dollar.

Every year, ABB Canada also provides a guide dog to a blind teenager to help him or her integrate into a mainstream school.

Central America: ABB was the first company to donate money to countries affected by Hurricane Mitch, namely Honduras, Nicaragua, Guatemala and El Salvador. This scheme was organized by the First Ladies of these countries and the Red Cross.

Czech Republic: ABB employees have taken the Czech Orphanage for Disabled Children at Opava under their wing to provide practical and financial support. This patronage dates back to the nationwide floods of 1997 when ABB employees selected this orphanage in one of the most affected areas to receive funds they had collected for reconstruction.

ABB also sends a team of employees to every Paralympic Games to support the needs of the Czech disabled athletes.

Egypt: ABB is a sponsor of the very active Association of Upper Egypt, which runs programs to enhance the development, education, and living standards in this deprived area.

The work focuses on the needs of 36 free-tuition schools and 75 social welfare centers in the region.

Germany: ABB is active in a wide range of social commitment projects and has received several awards and individual staff decorations. ABB's Country Environmental Controller was decorated this year by the German government for his outstanding service in the pursuit of "sustainable development in companies—concepts for the 21st century."

Young ABB staff have recently won prizes in a poster design competition under the slogan "Open-mindedness creates jobs," aimed at fostering cultural tolerance in the Federal State of Brandenburg and showing that international cooperation and mutual acceptance are musts for global companies such as ABB.

Greece: For the last five years, ABB has sponsored the publication of a book, focusing on an environmental or cultural issue. Earlier editions have presented unknown and unprotected Greek biotopes, and the archeological site of Ilis—the town in ancient Greece responsible for the Olympic Games. Recent publications present the complete works of two important Greek painters, Volonakis and Nicolau. For the year 2000, ABB is sponsoring, in collaboration with the National Gallery, an anniversary publication on the centenary of the National Gallery, which presents four centuries of masterpieces of Greek painting.

India: ABB factories have adopted their local communities and taken responsibility for specific social development projects.

Canada

For example, ABB trainee engineers at the Peenya factory near Bangalore assist with education and literacy improvement programs for the local community, whereas ABB's Maneja factory in Western India is active in hygiene, medical support and the organization of blood donation sessions. At a pediatric camp organized by ABB, a boy's sight was restored through a cornea transplant. ABB has sponsored "tree guards" in Delhi and the planting of over 2,500 trees in Vadodara.

Italy: ABB has sponsored and promoted many musical events at La Scala in Milan. The profits from the concerts were given by ABB to the Italian SOS organization (for social support). ABB has also responded to the wishes of its employees to participate in waste recycling schemes that provide employment to disabled people.

Nigeria: ABB has started a scheme to provide wheelchairs to disabled people to enhance their self-reliance and mobility.

In partnership with NEPA, the Nigerian power utility, ABB is initiating a program to provide 100,000 copies of a textbook entitled *Electricity in our Lives.* To help raise the quality of the local educational system, ABB is joining in schemes to provide educational assistance for the children of employees, to help staff pursue further educational qualifications and to sponsor local government engineers to undertake training courses in Europe.

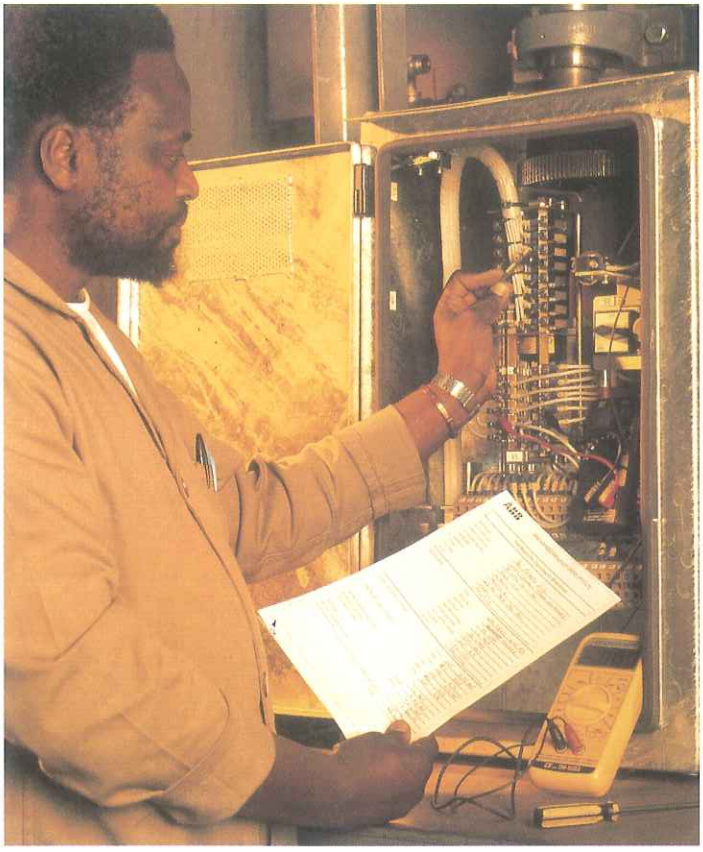
Norway: ABB companies in Norway sponsor an SOS Children's Village located in Almaty, Kazakhstan. The contributions have covered the construction and running expenses of one house—the "ABB House." In addition, more than 700 employees contribute privately to the welfare of the SOS children.

Peru: ABB goes well beyond local compliance in providing extra benefits for its employees and their families, including health care, schooling, family grants, security and insurance. In addition, ABB contributes to several specialist social organizations that help Peru's homeless, deprived, poor, sick and orphaned children.

While building the Aguaytia Power Project, ABB helped the local community with medical and sanitation facilities and collaborated with the Peruvian Navy to provide Christmas gifts for the children of the region.

South Africa: ABB is responding to a challenging social environment, characterized by disadvantaged communities, unemployment, crime and drug abuse. To make an effective impact in improving things, ABB has developed a Corporate Social Investment Program that focuses on the people closest to its operations—employees, business associates and the disadvantaged com-

Germany


South Africa

United States

munities from which it draws labor—and addresses two main areas: education for employment and community support.

In the first area, ABB has established education and training centers that help members of local communities learn engineering skills and establish themselves as contractors and entrepreneurs.

In the second, ABB supports organizations that offer career guidance, adult literacy training, crisis counseling, youth development and other services that contribute to alleviating deprivation and raising social conditions.

Sweden: ABB has made particular efforts in two areas: the education of children and students and the further education of its own employees.

In the first area, ABB sponsors "houses of experiments" in two Swedish cities, where schoolchildren can learn about science and technology through practical experiments, as well as an "environmental house" in a rich wetland area, where children can study bird life. For highschool students, ABB runs two industrial high schools, with an annual intake of some 90 students. In addition, ABB has sponsored the production of school textbooks on environmental topics, information technology, and the basics of stock markets.

In the second area, ABB has established a facility called the "ABBeum," where young employees can socialize and listen to speakers on various issues and topics of interest. To promote further education, the company runs an "ABB Business Academy" to train employees in business and project management.

Switzerland: ABB's 21 manufacturing companies in Switzerland are working to enhance conditions for all their employees, above and beyond what is required by law. For example, ABB's insurance benefits for young mothers exceed both the

requirements of existing Swiss law, and the latest government proposals to raise benefits.

ABB has launched a campaign to enhance working conditions and promote healthy lifestyles. "Non-smokers are cool" was just one of the initiatives carried out within ABB's Swiss facilities.

Externally, ABB is very active in a wide range of social activities—sponsoring organizations to care both for the disabled and for women and children in crisis situations. ABB also assists students with research projects, providing financial support and practical facilities. Further education forms an important part of ABB's sponsorship portfolio in Switzerland.

United Kingdom: ABB has launched a Local Agenda 21 initiative, "Energy for Education," to encourage ABB companies worldwide to work with local schools on a broad range of environmental projects. The initiative uses the Internet to bring together schoolchildren from different countries. It gives them insights into the environmental issues facing their own communities, as well as those of people thousands of miles away.

For example, schoolchildren in Coventry, United Kingdom, are working with their peers in Beijing, China on an urban transportation project. Pupils in Vaasa, Finland, and Stevenage, United Kingdom, are collaborating on a packaging project. And a school in Calcutta, India, is working with one in Derby, United Kingdom, on an environmental project. An ABB project manager supports each school and each project will result in a teacher resource pack that will be made available to any school, anywhere, via ABB's website.

United States: ABB has been a strong supporter over the last ten years with funds and employee participation in the Special Olympics, which provides year-round training and competition for more than 1 million athletes with mental retardation in nearly 150 countries and all 50 states of the United States.

In addition to having contributed financially over the last decade, hundreds of ABB employees have volunteered each time to assist in the running of the main competition events (450 ABB employees at this year's World Games at Raleigh, North Carolina, United States).

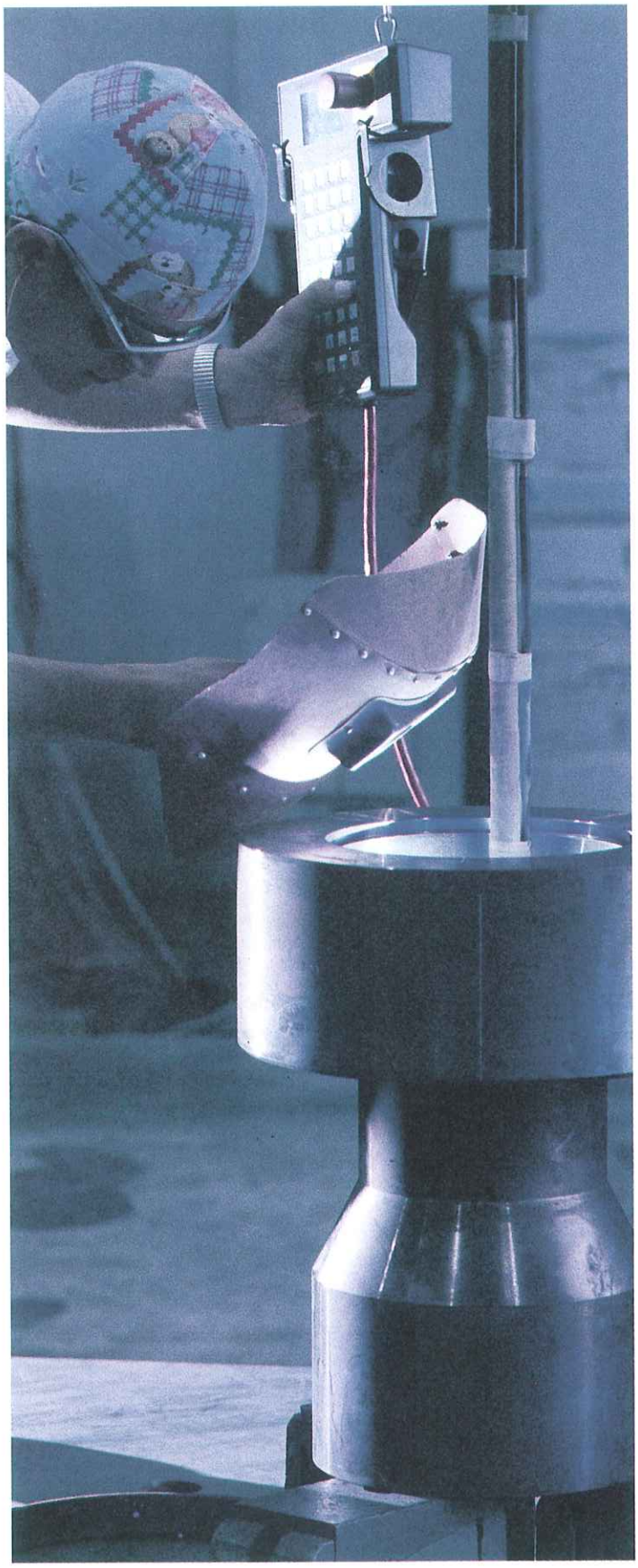
ABB is also a major sponsor of the Susan G. Komen Breast Cancer Foundation National Race for the Cure. This five kilometer race raises money for breast cancer research, education, screening and treatment and has become the largest event of its kind in the United States. Vice President Al Gore and his wife—honorary co-chairs of the race for the last seven years—take part, along with members of Congress. In addition to the financial support that is provided by the company, ABB employees and their families in the Washington, DC area participate in the event each year.

In ***Portugal***, ABB contributes to the National Committee for Children's Rights; in ***Saudi Arabia***, it donates to the kidney dialysis center in Riyadh. And the list continues.

We believe that to focus on the environmental performance of only our own facilities, products and services is not enough. We can do more to raise both local and global environmental awareness and strengthen the three cornerstones of sustainable development by making available for the common good the range of expertise and global reach that our company possesses.

We believe that the best way forward is not through participation in committees and conferences, but rather through specific pilot programs addressing all the elements of sustainable development and spanning regional, technical and sectoral interests.

This chapter has given examples of ABB's direct action on a global and local scale to support the common effort—an important principle of the ICC Charter. This fourth element of ABB's strategy is as strong as the other three in our efforts toward sustainable development.



The scope has changed, but the direction and ambition have not

ABB is undergoing a rapid transformation. For example, the power generation business has been transferred to the ABB ALSTOM POWER joint venture. Other operations have been added through the acquisition of Elsag Bailey Automation.

The focus is shifting toward products with a high technology content: information technology, knowledge-based services, and complete solutions to customers' problems, including financing, turnkey deliveries, maintenance and even operation of customer facilities. This also means that the scope of ABB's environmental management program has changed, making comparisons between 1999 and previous years difficult.

But this does not mean a change of course. Implementation of ISO 14001 remains a cornerstone of the environmental management program—with implementation now at 96 percent of all ABB sites and workshops in 38 countries. The scope of ISO 14001 is being expanded to include products by introducing environmental declarations for Business Areas and environmental product declarations for all core products and product lines.

The process of developing these declarations is already well under way. Business Area Environmental Controllers have been appointed. The tool that ABB is using for life cycle assessment has been further improved. The CPM database model, developed at Chalmers University of Technology in Gothenburg, Sweden, is providing higher-quality data for life cycle assessment. Training in the use of these tools has been intensified.

ABB continues to participate very actively in

the further development of ISO 14000. We consider this extremely important. Environmental problems are international. Solving them requires international participation and an international language.

Today, the challenges for ABB's environmental work are to maintain what we have achieved, to improve our performance continuously, in particular to reduce carbon dioxide emissions even further, to complete implementation of ISO 14001 at the few remaining sites, and to coordinate our ISO 14000 work with the new ISO 9000–2000 standard for quality assurance. Both series of standards are undergoing revision to ensure that common elements of the two can be readily implemented without unnecessary duplication or conflicting requirements.

The ISO 14001 standard for environmental management systems has proved to be a winner and a great contributor to environmental protection. Almost 13,000 operations in 78 countries have now been certified to this standard. More than 3 percent of these are ABB operations. (See details at *www.ecology.or.jp/isoworld/english*)

ISO 14001 is action-oriented and makes it easy to establish priorities for improvement. It brings order to the environmental work and encompasses the whole value chain—from purchase of materials to disposal of products that have served their time. ABB was among the first to adopt ISO 14001. We are applying most standards in the ISO 14000 series (see box below) to our environmental work as soon as they are completed and published.

I believe ABB has made great progress during the eight years that our environmental management program has been in operation. We have built a firm foundation for our continuous efforts to live up to the vision of sustainable development.

Jan Strömblad
Senior Vice President, Environmental Affairs

The ISO 14000 series of environmental standards

Designation	Scope	Status
ISO 14001	Environmental management systems	Published
ISO 14010-15	Environmental auditing	3 published 1 draft
ISO 14020-25	Environmental labeling	3 published 1 draft
ISO 14030-32	Environmental performance evaluation	2 drafts
ISO 14040-49	Life cycle assessment	3 published 2 drafts

Highlights of the 1990s

1992

- ABB signs the International Chamber of Commerce (ICC) Charter.
- Environmental Advisory Board is formed.
- Corporate Staff for Environmental Affairs (CS-EA) is established.
- First life cycle assessment (LCA) is performed.

1993

- Country Environmental Controllers and Local Environmental Control Officers are appointed.
- 38 countries participate in the program.
- Initial environmental reviews begin at manufacturing sites.
- The first procedure for reporting on environmental performance is introduced.

1994

- Initial reviews are completed.
- The decision is made to implement environmental management systems (EMSs).
- ABB publishes its first environmental report.
- 43 countries participate in the program.

1995

- Fifteen ABB sites are certified to BS 7750 and/or Eco-Management and Audit Scheme (EMAS).
- The first set of corporate environmental objectives is published.
- The first "train-the-trainers" seminar for internal EMS trainers is conducted.
- The ABB CS-EA international environmental communication database is established.
- The first design tool for LCA studies of products is launched.

1996

- ISO 14001 is published.
- Full-scale implementation begins.
- 50 ABB sites are certified to ISO 14001.
- The first ABB construction site (South Humber Bank power station in England) is certified to ISO 14001.
- The first ABB site in China, ABB Switchgear in Xiamen, is certified to ISO 14001.

1997

- 123 sites in 20 countries are certified to ISO 14001.
- A second-generation LCA strategy is developed.
- The first external certification of an ABB environmental lead auditor is achieved.
- A second generation of environmental objectives is introduced by ABB's President and CEO (Goal 2000).

1998

- ISO 14001 is implemented at 449 sites in 32 countries.
- Sixty ABB employees graduate as Internal Environmental Auditors.
- The concept of environmental declarations is introduced.
- A second-generation LCA software tool and database is introduced.
- Environmental management report synopsis in 23 languages and the complete report on ABB's website improve communication.

1999

- ISO 14001 is in place in 519 workshops and sites, representing 96 percent of ABB sites in the targeted scope.
- Five new Operational Performance Indicators are introduced, bringing the total to 33.
- Business Areas Environmental Controllers are appointed.
- First-generation environmental declarations (EDs) and environmental product declarations are published.
- Environmental statements are produced to serve as a basis for internal and external communication.
- Five internal training seminars on EDs and ten training seminars on LCA techniques are conducted.
- World Energy Council's feasibility study for 1 gigaton greenhouse gas reductions is conducted.
- ABB Karebo Manufacturers is the first company in South Africa's Black Empowerment Company scheme to receive ISO 14001 certification.

Environmental Affairs organization

Environmental Advisory Board (EAB)

A panel of independent experts, chaired by ABB's President and CEO, acts as a sounding board, bringing their expertise to ABB's environmental management program, and offer objective opinions (see page 8).

Corporate Staff for Environmental Affairs (CS-EA)

Reporting directly to the President and CEO of ABB, CS-EA, with a staff of four, is responsible for developing, communicating, implementing, monitoring and improving the environmental management program. It also develops and conducts training programs to increase environmental awareness and proficiency.

Business Area Environmental Controllers (BAECs)

The 23 BAECs are responsible for initiating and coordinating the environmental management program in their respective Business Areas, including the development of environmental declarations; the implementation of environmental goals and programs; education and training of personnel; follow-up and reporting of progress; and reviewing environmental performance within the Business Area.

Country Environmental Controllers (CECs)

Forty-seven CECs, reporting to their country managers and to CS-EA, are responsible for establishing and communicating ABB's environmental policies, programs and procedures to all facilities within their countries. They also commission independent environmental audits and prepare environmental performance reports.

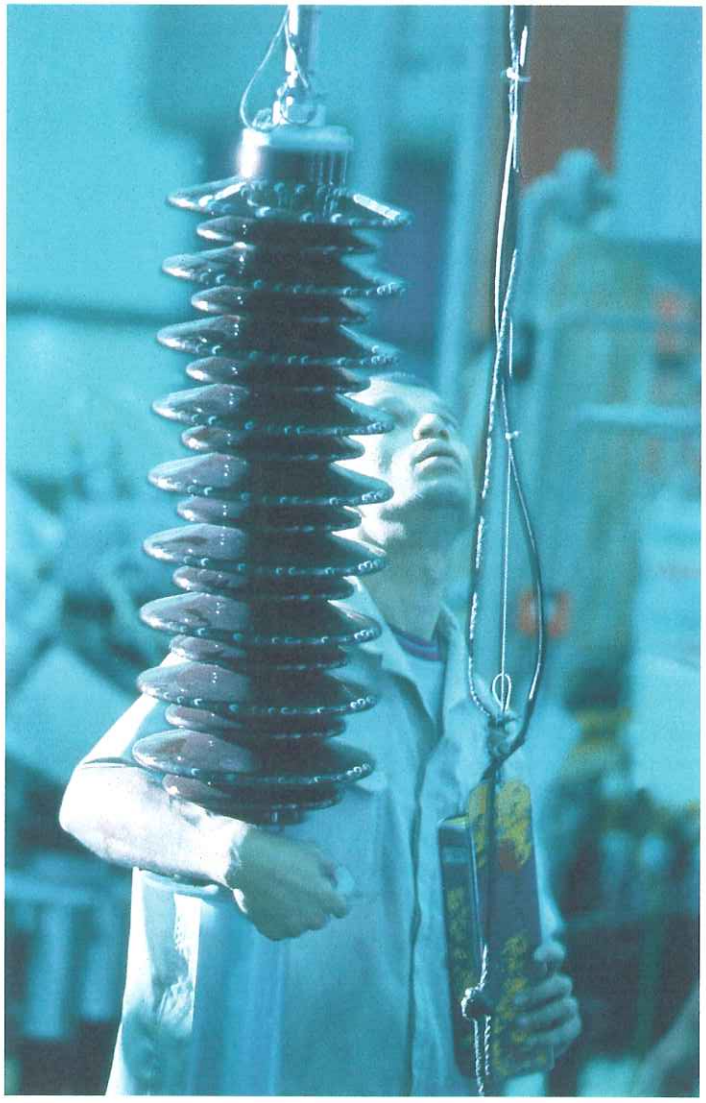
Other responsibilities include promoting new, ecoefficient technologies and developing country-specific education and training programs. CECs also work with Local Environmental Control Officers to coordinate with local authorities.

Local Environmental Control Officers (LECOs)

There are approximately 500 LECOs at ABB manufacturing, service and construction sites. LECOs report to local site managers and to the CECs.

LECOs facilitate the implementation and maintenance of environmental procedures, including local environmental manuals. They initiate plans for continuous improvement, ensure that plans are implemented, and follow up recommendations from environmental audits.

Focus on products



How can buyers make informed choices about how "green" one product is compared with another? To choose suppliers with a clear commitment to the environment is one step. But increasingly, customers are asking for factual, comparable environmental information about the products and systems they are buying. These demands are motivated by similar demands further along the supply chain, and ultimately from consumers and end users.

Environmental product declarations (EPDs) are intended to satisfy these demands. They aim to describe the environmental impact of individual products more accurately, and to communicate environmental performance to customers and other interested parties.

The ISO 14001 standard covers the environmental impacts of manufacturing and other operations, as well as those over the life cycle of the product. ISO 14040, the standard for life cycle assessment, allows a closer focus on products themselves. ABB's approach to evaluating and improving the environmental performance of individual products is to make EPDs according to ISO 14025—which is based on the ISO 14040 standard for life cycle assessment.

Using the ISO standard is the best way of ensuring comparability, and also allows certification to be made by an independent, accredited organization, adding to the credibility and value of the process.

Getting a true picture of a product's environmental performance may depend on many factors. These include:

- The full life cycle of the product, which may be measured in decades.
- The "boundaries" around an individual product. A product may be part of a larger system, where the environmental impact of the system as a whole is more important than the impact of individual components. The system into which a product fits is often outside the producer's control.
- The way the product is used—which also is outside the producer's control—is often the most important factor affecting environmental performance.

ABB, of course, has a very diverse range of products. To evaluate their environmental performance, we have divided them into three types according to their environmental aspects:

A. Products that transform significant amounts of energy, use significant amounts of material, and generally have a long service life (10–50 years). These include generators, transformers, trans-

mission and distribution systems, drives, motors and installations. Here, the main focus is in improving efficiency and reducing energy losses. This gives us a competitive advantage, and this is also where the greatest environmental savings can be attained. Also important are extending product lifetimes and serviceability, and making careful choices of materials (nontoxic and recyclable).

B. Products that do not transform or lose significant amounts of energy, but use significant amounts of material. These include switchgear, controls and robots. Here, the most important aspects are lifetime, serviceability, and materials choice.

Products in groups A and B are normally considered in isolation from the systems of which they form a part, because this is the only way to come up with meaningful, comparable data for environmental performance.

C. Products that use relatively little energy and material, such as instrumentation, service and engineering. With these products, the main focus is in improving the overall performance of the engineered or served system or the system of which the products are a part. In this way, products in this category usually have a positive environmental impact. But even if energy and materials are less important, they are still considered.

In 1998, ABB launched a pilot program to develop environmental declarations. Four Business Areas participated. The pilot program showed a need for environmental declarations on two levels.

For products in groups A and B, environmental declarations should cover individual product lines or products. These Environmental Product Declarations (EPDs) will be specific, with quantitative descriptions of the environmental aspects over the product's whole life cycle, including environmental goals.

For products in group C, the main need was for a declaration covering entire Business Areas: mainly specifying overall goals, defining methods and stating policies to be applied to achieve the goals. This we have called an Environmental Declaration (ED).

The pilot program was intensified during 1999. The new Business Area Environmental Controllers (BAECs) have been given responsibility for coordinating the development of environmental declarations for products, product lines and Business Areas as appropriate. More than 150 staff were trained in the use of the EcoLab life cycle assessment tool. As a result, most of the 23 Business Areas completed their first environmental declarations during the year. Some examples are given on pages 38–45.

Environmental declarations now and in the future

Dr. Sven-Olof Ryding is Director of the Swedish Environmental Management Council, and an associate professor in limnology. He was previously research head at the Swedish Environmental Research Institute, and served as the senior environmental adviser at the Federation of Swedish Industries.

Widely recognized as a specialist in life cycle assessment, Dr. Ryding has spent many years researching the interaction between industry and the environment.

An interview with Dr. Sven-Olof Ryding

1. What exactly is an environmental product declaration (EPD)?

An EPD lists information on the significant environmental aspects of the life cycle of a product or product line. The life cycle means all phases from raw material acquisition to waste disposal and decommissioning.

2. What are the main objectives of an EPD?

One principal objective is to support the continuous improvement of a product's environmental performance by detailing its significant environmental aspects.

Another objective is to provide environmental data for each component that goes into a system. Only when this is done along the entire supply chain can a customer produce a declaration on the environmental performance of the total system.

A third objective is to provide information to customers. When buying goods or services, many organizations are legally bound to select those with the least environmental impact. EPDs help buyers select the most suitable alternative based on sound information from suppliers.

3. How does an EPD relate to ISO 14001?

An EPD is supplementary to ISO 14001 in the sense that it provides in-depth information about the product's significant environmental aspects.

4. How does a life cycle assessment (LCA) relate to an EPD?

Both an LCA and an EPD should describe the environmental aspects of a product over its entire life cycle.

The LCA can be seen as the scientific version providing the input data to the EPD. The EPD is a standardized description (in accordance with ISO 14025), which is easier to compare and communicate.

5. How do you see ABB's initiative to develop environmental declarations (EDs) as complements to EPDs?

For me, this is a sign that the ISO 14020 series might need to be adapted to also include less tangible, knowledge-based and service-oriented products.

6. What are the main benefits of EPDs to manufacturers and their customers?

The main benefit is that EPDs provide useful environmental information, particularly for product development.

For customers, it should be possible to easily compare the environmental performance of different products matching a required specification. This is the great benefit of having a standard format.

7. Which industrial sectors do you think will show the most interest in EPDs?

I think we will see much interest from a large number of both public and private sectors, for example, transportation, energy, forestry and process industries.

8. What are the main target groups for EPDs?

The targets are very diverse, and come from within the organization as well as from the out-side. The main external groups are those involved in the procurement and use of the products.

Internal groups are, for example, product development and communications staff.

9. Which countries show the strongest interest in EPDs?

Canada and Sweden already have EPD programs in place. Japan, Germany, Korea, Denmark, Norway, the Netherlands and Austria are all implementing such programs. Other countries are sure to follow.

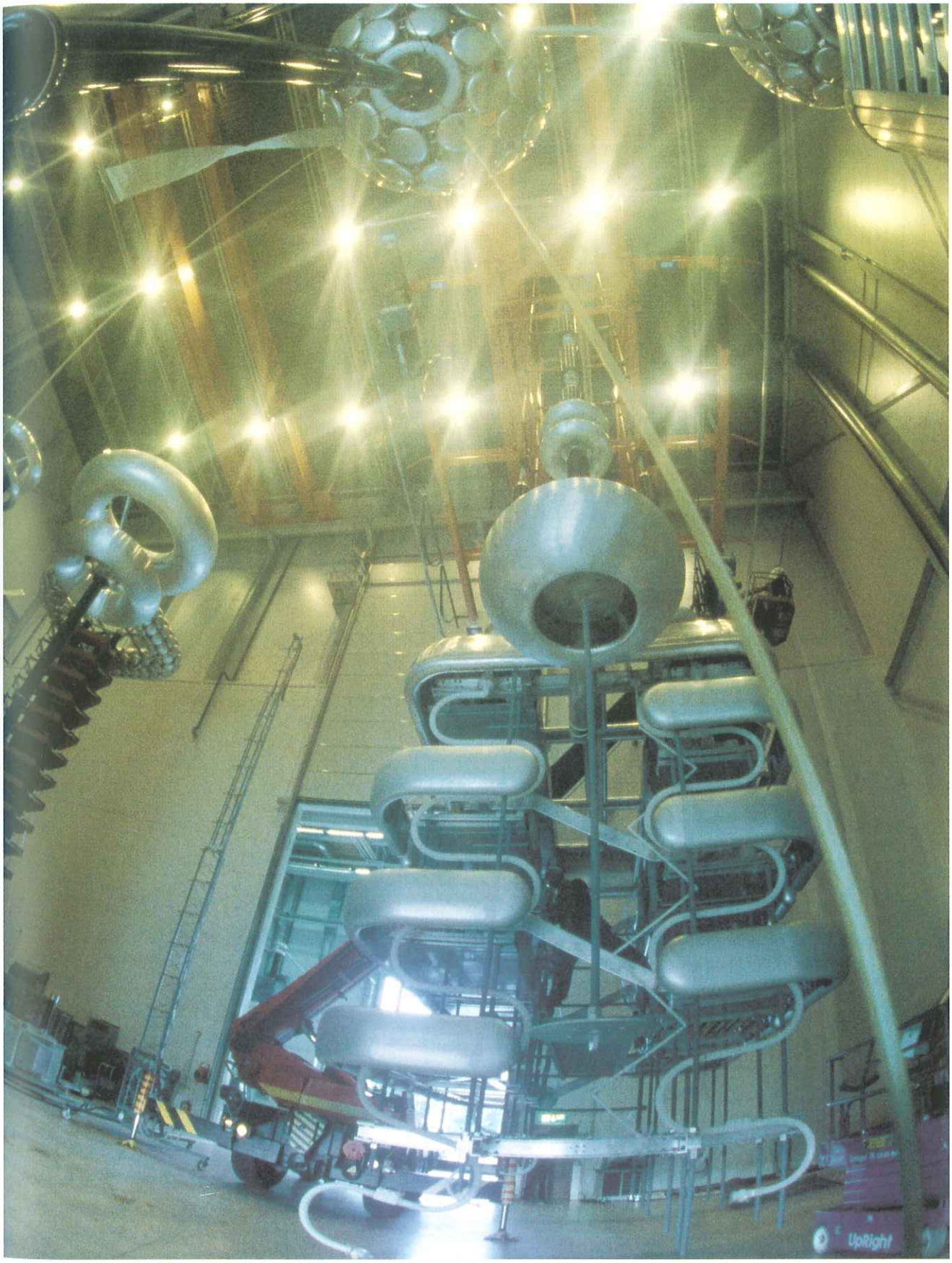
10. Do you recommend that organizations seek external certification of their EPDs?

Yes, if they want to provide objective, comparable and verified environmental information to customers, I think they should go for external certification.

But it may not be necessary for an organization to certify all its EPDs. Many organizations will have a great number of declarations, so I think the need should be assessed case by case, depending on the demand from the marketplace.

Business Area Environmental Controllers

Business Area	Activities	Environmental Controller
AUTOMATION SEGMENT		
AFA	Flexible Automation	Klaus-Werner Thomer
AIC	Instrumentation and Control Products	Doug Lincoln
AMM	Metals and Minerals	Bernard Nacke
AMT	Marine and Turbochargers	Arthur Bollier
APC	Petroleum, Chemical & Consumer Industries	Odd Natvik
API	Pulp and Paper	Ken Morris
APP	Automation Power Products	Timo Miettinen
AUT	Utilities	Klaus Oeder
POWER DISTRIBUTION SEGMENT		
DDS	Power Distribution Solutions	Ed Walsh
DDT	Distribution Transformers	Reiulf Wilhelmsen
DMS	Medium Voltage Equipment	Thor Endre
FINANCIAL SERVICES SEGMENT		
FEV	Energy Ventures	Tony Shea
PRODUCTS & CONTRACTING SEGMENT		
IAH	Air Handling Equipment	Per-Olof Dahlin
ICO	Contracting	Sami Massinen
IPS	Low Voltage Products & Systems	Gerhard Kuehl
ISV	Service	Carl Foss
OIL, GAS & PETROCHEMICALS SEGMENT		
OGP	Oil, Gas & Petrochemicals	Dave McGinigal
POWER TRANSMISSION SEGMENT		
TCC	Cables	Björn Dellby
THS	HV Products and Substations	Kjell G Pettersson
TPL	Power Lines	Bo Göran Persson
TPS	Power Systems	Rolf Bogren
TPT	Power Transformers	Kjell Magnusson
TSS	T&D Service and Support	Rolf Rotterdam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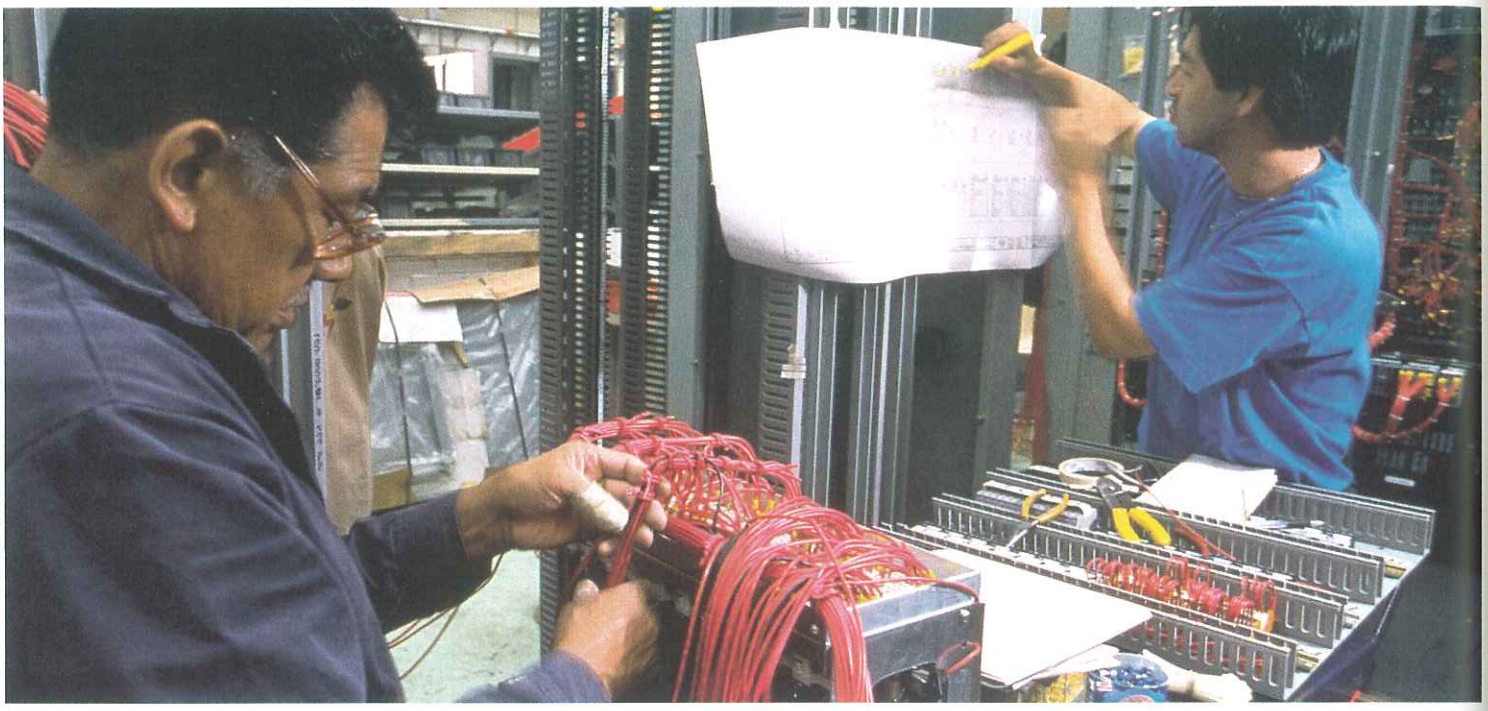
Environmental declarations and environmental product declarations



Introduction

The purpose of environmental product declarations (EPDs) is to describe in a credible and understandable way the environmental performance of a product, a system, or a service, over its entire life cycle.

ABB has a broad range of activities—from turnkey systems to standard products, from engineering to service. Consequently, we have found that in addition to EPDs (according to ISO 14025) for individual products, we also need declarations that cover engineering, construction and service. We refer to these as environmental declarations, (EDs). Usually, characteristics of EPDs are also applicable to EDs.

Characteristics of an EPD

According to ISO 14025—and the Swedish Environmental Management Council—an EPD should be:

- Based on a full life cycle assessment (LCA) according to ISO 14040–43.
- Comparable with similar products.
- Updated when the product is significantly changed.
- Transparent, for example, published on the Internet.
- Credible, for example, through certification by a third party.
- Cost-effective through inclusion in the scope of ISO 14001.

Structure of an ABB EPD

A standardized structure and content make it easy to develop and understand ABB's EPDs:

1. Organizational framework: This is an introduction to the Business Area and its Business Units, main activities, product lines and organization. This also explains how environmental management is integrated, the role of the Business Area Environmental Controller, implementation of ISO 14001 at manufacturing sites, use of LCA, etc.

2. The product and product description: This is a description of the product, its main functions, and its role in the system in which it operates.

3. System boundaries and functional unit: System boundaries define which parts of the system are included in the LCA study, for example, environmental aspects of raw material extraction, manufacturing processes, use of the product and recycling or disposal.

The functional unit is the product or product system to be used as a reference in an LCA study, for example, a specific function, a specific amount, (such as kg or meter, of a product), or a unit of output or input, (such as 1 megawatt or 1 megawatthour). The choice of functional unit depends on the type of product and how the customer normally uses the product.

4. Environmental aspects of the functional unit—full life cycle: This is a summary of the environmental aspects generated during phase 1 (manufacturing), phase 2 (use of the product during its lifetime), and phase 3 (recycling or disposal).

5. Environmental impact and weighting: The environmental aspects, mentioned in item 4 above, are converted into the nine environmental impact categories and equivalent units shown in the table on this page.

Criteria have been selected from global environmental concerns listed by environmental protection agencies.

In some cases, summaries of the environmental impact weighted by recognized methods or indexes provide additional information. Examples of methods used are Centre of Environmental Science (CML), Eco-indicator 95, Ecoscarcity, Environmental Theme (ET), Environmental Priority Strategies (EPS), and Tellus.

6. Continuous improvement: ISO 14025 does not require a declaration of planned or targeted improvements of the product's environmental performance. But since the product is included in the scope of ISO 14001 and so in the standard's mechanisms for continuous improvement, ABB EPDs may also describe how the product's environmental performance will be improved.

7. Life cycle assessment (LCA): The EPD shall be based on a complete LCA study.

Classification units for life cycle assessment

Environmental effect	Unit	Examples
AD. Abiotic Depletion: the annual use of the material.	kg/year	Fossil resources, metals
AP. Acidification Potential: potential for releasing hydrogen ions (H^+) compared with SO_2.	kg SO_2	Sulfur dioxide, NH_4^+ nitrogen oxides
ECA. Ecotoxicity for aquatic ecosystems: the toxic effect of a substance on water organisms based on maximum tolerable concentrations.	m^3 of water	Cadmium, oil, phenol
GWP. Global warming potential in a 100 year perspective: absorption of infrared radiation compared with CO_2.	kg CO_2	CO_2, CH_4, N_2O, CFC, HCFC, SF_6
HCA. Human toxicity for air: related to the tolerable daily intake (TDI) based on human toxicology considerations.	kg	Mercury, lead, carbon monoxide, dioxins
HCW. Human toxicity for water: related to the tolerable daily intake (TDI) based on human toxicology considerations.	kg	Same as HCA
NP. Nutrification Potential: the capacity to form biomass compared with phosphate.	kg PO_4^{3-}	Nitrogen oxides, phosphates
ODP. Ozone Depletion Potential: ozone breakdown in relation to an equal quantity of CFC-11.	kg CFC-11	Freons, HCFCs, halogenated hydrocarbons
POCP. Photochemical Ozone Creation Potential: change of ground-level ozone concentration in relation to the change that an equivalent ethylene emission would cause.	kg ethylene	Propane, ethanol, VOCs

Environmental product declarations

(This is an abridged version of the full environmental product declaration.)

Product: Type DMI DC machine.

Business Area: Automation Power Products, part of the Automation segment.

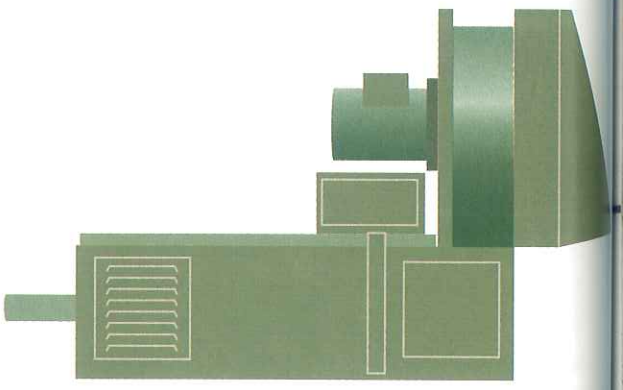
Product lines: Electric drives, motors, traction motors, generators, large AC machines, DC machines, power electronics, customer service.

Business Unit: Motors & Machines, with 19 sites. The subunit Machines has seven sites in Sweden, Finland, Switzerland, Italy, France, Spain, and Brazil.

Environmental management: The ISO 14001 international environmental management standard is implemented at six of the seven sites of subunit Machines. The application of life cycle assessment is ongoing. A Business Area Environmental Controller has been appointed.

Product description

DC machines, such as the type DMI, are used when there is a need to vary the speed of the drive. In particular, DC machines provide a high efficiency factor when the required speed range exceeds the ratio of 2:1. The type DMI machine is outstanding in this respect and is used for variable-speed and variable-load applications, such as pumps, cranes and lifts, and in the process industry for paper machines, winders, dryers, extruders and mixers.



Environmental characteristics and resource demand

The functional unit is defined as 1 GWh of useful mechanical output of a DC machine, operating 6,500 hours per year for 15 years. For this declaration, the DMI 180 kW machine with a useful output of 17.6 GWh is used as a reference.

The boundaries include all environmental aspects—energy use, raw material, emissions to air and water, hazardous waste—applicable to manufacturing, use and end-of-life phases of the machine.

Resource demand

Material	kg	kg/GWh
Nonenameled electro plates	576	32
Normal rolled steel	61	4
Steel tubes and special steel	80	5
Cast iron	90	5
Copper	121	7
Insulation material	8	1

Energy	Total MWh		MWh/GWh	
	Manufacturing*	Use	Manufacturing*	Use
Electrical	0.87	1,715	0.05	97.7
Heat	0.49	–	0.03	–
		* gate to gate		* gate to gate

Other examples. Environmental declarations and/or environmental product declarations for type A products (those that transform significant amounts of energy, use significant amounts of material and have a long service life) have also been prepared by, for instance, the FEV Business Area (Energy Ventures) for private-sector infrastructure, the ICO Business Area (Contracting) for building installations, and the AMT Business Area (Marine and Turbochargers) for systems and drives in ships.

Environmental aspects of the functional unit (1 GWh)

(Based on a complete LCA study by ABB Corporate Research Center, Västerås, Sweden.)

Environmental aspects (Kg/GWh)		Manufacturing	Use	Recycling
Resources	Coal	53	26,600	25
	Oil	0	2,820	3
	Gas	5	1,850	1
	Uranium	0	1	–
	Steel	40	–	26
	Cast iron	5	–	4.5
	Copper	7	–	6.3
	Insulation	0.5	–	–
Emissions	CO_2	215	47,000	80
	SO_2	1	231	–
	NO_X	1	99	–
	VOC	0.1	–	–
Effluents		0.7	–	–
Waste		1	–	4

Manufacturing and recycling
The environmental aspects of the manufacturing phase include the total amount of material needed to produce the unit, the energy to produce and transport this material and the energy used for the assembling of the unit.

The aspects are reduced through recycling.

The aspects of the manufacturing phase assume production at the Swedish Business Unit and the use of Swedish mix of electricity source.

Use
The environmental aspects for the user phase assume using average European mix of electricity.

Environmental impact and weighting

Environmental impact categories		Unit	Total amount	Distribution %	
				Manufacturing includes recycling	Use
Global warming	GWP	kg CO_2	49,400	0.1	99.9
Ozone depletion	ODP	kg CFC-11	–	–	–
Acidification	AP	kg SO_2	310	0.3	99.7
Abiotic depletion	AD	kg/year	171	0.1	99.9
Ecotoxicity—water	ECA	m^3 of water	1	–	100
Human toxicity—air	HCA	kg	437	0.5	99.5
Human toxicity—water	HCW	kg	0.5	–	100
Nutrification	NP	kg PO_4^{3-}	13	1.1	98.9
Photochemical ozone creation potential	POCP	kg ethylene	11	2.0	98.0

In all impact categories, the environmental impact of the use phase dominates over that of the manufacturing and recycling phases. For instance, the global warming potential is 1,000 times greater during use than during manufacturing and recycling.

Weighted with the environmental theme index, the total environmental impact is approximately 14 million ET Points/GWh from the use of the machine and 40,000 ET Points/GWh from manufacturing and recycling. This means that the impact from use is about 350 times greater than from manufacturing and recycling.

Continuous improvement

- This DC machine is a new design that went into production in 1999.
- The focus is now on marketing. Replacing old, inefficient machines with new, more efficient ones will yield important environmental advantages.
- Short-term, the ISO 14001 process is used to improve manufacturing. This includes, among other things, introducing monomer-free resin for impregnation, increasing the use of recycled copper for windings and changing to water-based paint.

Environmental product declarations

(This is an abridged version of the full environmental product declaration.)

Product: Type SGF 245 kV rotary disconnector.

Business Area: High Voltage Products and Systems, part of the Transmission segment.

Product lines: Circuit breakers, high-voltage disconnectors, surge arresters, instrument transformers.

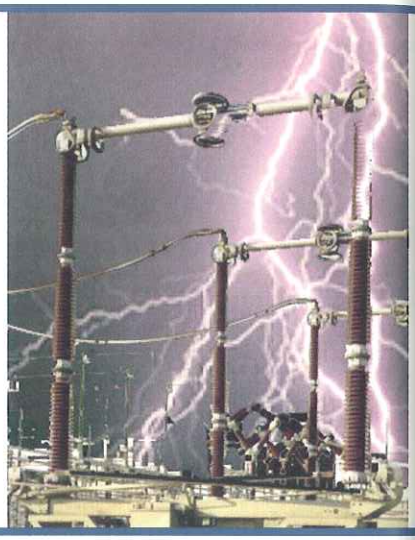
Business Unit: High Voltage Disconnectors, with six manufacturing sites in Australia, Egypt, India, Poland and Russia.

Environmental management: The ISO 14001 international environmental management standard is implemented at six sites; the application of life cycle assessment is ongoing. A Business Area Environmental Controller has been appointed.

Product description

Disconnectors are main components of substations and power plant switchyards. They are mechanical off-load switching devices that, in the open position, provide a visible isolating distance between sections of the substation. The disconnectors are operated mostly after the adjacent sections have been deenergized. However, they can also open or close under high-voltage conditions, providing the currents involved are negligible, for example the capacitive charging currents of bushings, bus bars, connections, voltage transformers, and of short lengths of cable.

The product range of the SGF disconnector extends for voltages between 66 and 420 kV and for rated currents up to 4,000 A when in the closed position. The operating mechanism can be either manual or motorized. Each pole, or phase, of the disconnector can be fitted with a grounding switch.



Environmental characteristics and resource demand

The functional unit is defined as a device that can serve as a disconnector in a 3 phase AC 245 kV–2500 A transmission system.

The reference device is motor-operated, fitted with a grounding switch and operational for 20 years.

The boundaries include all the environmental aspects—raw material, transportation, emissions, over the entire life cycle of the disconnector from manufacturing, through 20 years of operation, and service to end-of-life disposal or recycling.

Material kg	Manufacturing	Use
Aluminum	140	–
Copper	62	24
Plastic	9	–
Porcelain	540	–
Steel	500	–
Wood (packaging)	165	–
Other	1	–

	Total MWh	
	Manufacturing*	Use
Electrical energy	153	2,515

* gate to gate

Other examples. Environmental declarations and/or environmental product declarations for type B products (those that transform insignificant amounts of energy but use significant amounts of material) have also been prepared by, for instance, the IPS Business Area (Low Voltage Products and Systems) for low voltage apparatus, the DDT Business Area (Distribution Transformers), and the THS Business Area (High Voltage Products and Substations).

Environmental aspects of the functional unit

(Based on a complete LCA study by ABB Corporate Research Center, Poland.)

Environmental aspects		Manufacturing* kg	Use kg	Recycling kg
Resources	Coal	1141	1565	732
	Oil	462	40	226
	Gas	255	10	47
	Steel	534		424
	Aluminum	142		136
	Copper	62	24	75
	Zinc	1		
	Chrominum	0.5		0.4
	Manganese	0.2		0.2
	Nickel	0.2		0.1
Emissions	CO_2	4,857	2,586	2,424
Effluents	Suspended solids	96	1	0.4
	Sulphates	5	11	3

* Cradle to gate

Manufacturing and recycling
The environmental aspects of the manufacturing phase include the total amounts of material needed to produce the unit, the energy to produce and transport this material and the energy used for the assembling of the unit.

The aspects are reduced through recycling.

The aspects of the manufacturing phase assume production at the Polish Business Unit and the use of Polish mix of electricity source.

Use
The environmental aspects for the user phase assume using average European mix of electricity.

Environmental impact and weighting

Environmental impact categories		Unit	Total amount	Distribution % Manufacturing includes recycling	Distribution % Use
Global warming	GWP	kg CO_2	5,954	60	40
Ozone depletion	ODP	kg CFC-11	10	40	60
Acidification	AP	kg SO_2	27	55	45
Abiotic depletion	AD	kg/year	17	80	20
Ecotoxicity—water	ECA	m^3 of water	0.1	50	50
Human toxicity—air	HCA	kg	35	55	45
Human toxicity—water	HCW	kg	0.1	30	70
Nutrification potential	NP	kg PO_4^{3-}	1.9	60	40
Photochemical ozone creation potential	POCP	kg ethylene	0.7	70	30

The table shows the contributions of the functional unit to the nine environmental impact categories and the division of the impact between, on the one hand, manufacturing and recycling and, on the other hand, use of the product. Use represents about 60 percent and manufacturing and recycling about 40 percent of the environmental load as weighted by both the Tellus and the Eco-indicator methods.

Continuous improvement

The environmental performance of SGF rotary disconnectors is improved in two ways:

1. By continuous improvement of manufacturing through the ISO 14001 process.
2. By improvement of the design and functions of the device through research and developement. The current design was launched in 1974, and improved in 1995. The next revision is planned for the year 2000. The objective is to reduce the environmental impact by between 5 and 15 percent for all environmental impact categories.

Environmental declaration

(This is an abridged version of the full environmental declaration.)

Business Area Service: Operates under the name ABB Service Worldwide, offering solutions ranging from testing and commissioning, maintenance and support for products, systems and plants, to maintenance, consulting, training programs and comprehensive full-service partnerships.

Products: Component Service and Full Service Partnerships.

Environmental management: Environmental management focuses on the implementation of the ISO 14001 International Environmental Management Standard. To date, this standard is implemented in most of our service shops. Implementation in the remaining sites is scheduled for completion before the end of the year 2000. A Business Area Environmental Controller has been appointed.

Product description

Component Service takes place mainly in ABB Service workshops, which repair mechanical and electrical equipment such as rotating machines, transformers, switchgear, pumps, valves and gearboxes. ABB's Component Service operates from 128 workshops in 34 countries, employing 5,000 people.

Full Service is a long-term partnership agreement with the customer. ABB Service takes over the design, execution and management of a customer's maintenance function.

This includes taking over the customer's maintenance personnel, maintenance activities, and maintenance equipment. Typical examples of Full Service Partnerships are within the process industries and building maintenance fields. Currently, ABB Service has Full Service contracts in 22 countries, contributing to over half of its business, and employing 6,000 people.

Environmental performance

Because service is labor-intensive, environmental performance demands are focused on the standards and behavior of employees. To this end, ABB Service has a defined environmental policy, backed by a policy action statement, followed by all employees in combination with the policies of customers and suppliers and in accordance with applicable national and international laws.

The environmental policy aims to minimize environmental impact caused by service activities and addresses the following aspects:

- Employee education, training and motivation.
- Openness and dialogue with employees, customers, suppliers and the public.
- Innovative and environmentally sound research and development.
- Best use of resources with minimum waste.
- Increased value of customers' assets—performance and lifetime.

The environmental policy action statement commits service employees to individual compliance with procedures, regulations and organizational requirements, such as:

- Training and development for best environmental performance.
- Individual environmental responsibility for each employee's actions.
- Compliance with relevant acts, regulations and standards.
- Provision of quality resources to meet environmental objectives.
- Continuous improvement through self-assessment and performance reviews.
- Individual manager responsibility for the implementation, control and supervision of this policy and action statement.

Other examples. Environmental declarations for type C products (those that transform insignificant amounts of energy and use insignificant amounts of material) have also been prepared by, for instance, the TSS Business Area (Transmission and Distribution Service and Support), the AUT Business Area (Automation for Utilities), and APP (Automation Power Products) for AC converters.

Environmental aspects

The criteria for assessing the significance of the environmental aspects generated by service activities are based on recognized global environmental concerns as defined in the life cycle assessment database used for comparing the impact of alternative technical solutions. In addition, local considerations are applied case by case to provide additional environmental protection where necessary for example, watercourses, catchment areas, spills, refueling, storage and disposal dumps.

In addition to addressing environmental aspects of ABB workshops and customers' full service sites, our service contracts include, where applicable, the take-back, sorting, recycling or disposal of products and waste.

Because service activities cover the handling of a wide range of materials and substances—some toxic and hazardous—compliance with specific procedures to minimize environmental aspects is mandatory. These include:

- Pollution control: *Watercourse protection, handling of chemicals and ozone-depleting products*
- Waste minimization: *Oil, grease and solvents, materials, water, paper, ordering and logistics*
- Liquid storage: *Fuel, oil, water*
- Oil handling: *recycling and waste disposal*
- PCB handling
- Gas handling: *Cylinders, vessels, special procedures for* SF_6
- Chemical handling: *Paints, thinners*

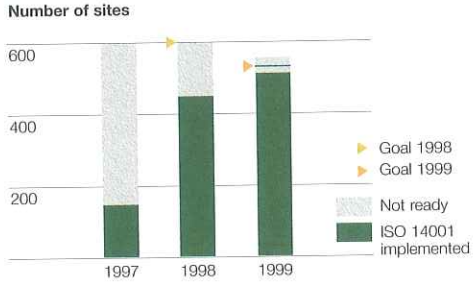
Continuous improvement

The Business Areas are committed to continuous improvement of their environmental performance. This requires employees to identify environmental aspects based on recognized environmental concerns, to set goals and to develop improvement procedures to address those that are significant for example, waste minimization, reduced energy use, reduced emissions to air and water. It also requires the application of life cycle assessment to find the best solution to service challenges from an environmental viewpoint.

Furthermore, ABB Service activities offer maintenance, consulting and training programs to improve the environmental performance of customers' products, processes and plants. Repair, reconditioning, upgrading and maintenance will enhance the functional and environmental performance and extend the products lifetime.

Service work requires highly trained employees possessing not only technical skills but also the ability to listen to customers and to understand their particular needs. We aim to be able to recognize and seize opportunities to continually improve customers' processes and practices from both an economic and an environmental point of view.

Management performance indicators



For several reasons the scope of ISO 14001 implementation changed in 1999 compared with 1998. As a result, the number of sites eligible for ISO 14001 certification as part of Goal 99 declined from 600 to 541.

The establishment of the new power generation group, ABB ALSTOM POWER, removed more than 30 sites, the majority of which were already certified to ISO 14001.

The acquisition of Elsag Bailey Automation added some 20 sites. It was decided to exclude these from Goal 99, as they needed to focus on merging into the ABB organization. Other restructuring and divestments removed an additional 26 sites.

Of the 541 sites remaining in Goal 99, ISO 14001 was implemented in 519 by the end of the year, which means that we achieved 96 percent of Goal 99. But 22 sites did not make it. Several of these sites failed for the same reason as they did in 1998: severe economic recession. Other sites are undergoing substantial changes, in some cases including relocation, and it is sensible to wait until these changes are completed.

Five new ABB countries have completed their first implementation: the United Arab Emirates, Estonia, Korea, South Africa and Bahrain. So all in all, we have 39 countries showing visible progress out of the 49 countries participating in the program.

Environmental costs

Estimated costs (US$ millions)	1997	1998	1999
ABB Environmental Affairs network	35	36	32
Implementation of ISO 14001	29	43	12
Maintenance of ISO 14001	0	1	5
Development of LCA	1	2	2
Total	**65**	**82**	**51**

ABB accounts separately only for costs related to its Environmental Affairs network, to ISO 14001 implementation and maintenance, and to the development of environmental databases and life cycle assessment. The costs of environmental declarations and environmental product declarations have not been included.

Other costs could also be classified as environmental because they contribute to improved environmental performance. However, in practice, it is often difficult or impossible to separate environmental costs from other costs. For example, investments in research and development, or investments to boost productivity, usually improve both business and environmental performance, but it is not possible to apportion these costs meaningfully between the two.

ISO 14001 implementation

Country	No. of sites	CEC	Phone
Argentina	8	Justo Gonzales-Litardo	54-1142295590
Australia/New Zealand	23	Peter Kinsey	61-293560999
Austria	1	Erwin Wippel	43-1601092361
BeNeLux area		Joost Kuijpers	31-104078556
- Belgium	13	Joseph Billet, deputy	32-27186599
- Netherlands	7	Joost Kuijpers	31-104078556
Brazil	11	Sérgio dos Santos	55-1170889392
		Manoel Siqueira, deputy	55-1170889950
Canada	7	Randy Plener	1-9054603485
China	11	Jean-Jie Gao	86-1065956688
Colombia	1	Albert Tibavizco	57-15464645
Czech Republic	2	Frantisek Dobes	420-222832245
Denmark	25	Erik Klixbüll	45-66147080
Egypt	2	Hassan Sharawi	20-22940199
Estonia	1	Bo Henriksson	372-6711801
Finland	27	Sakari Hakkarainen	358-102241597
France	12	Jean-Luc Raphet	33-141974418
		Valérie Rimonteil, deputy	33-130286008
Germany	40	Christoph Huf	49-6221701831
		Helmut Sogl, deputy	49-6221701842
		Udo Weis, deputy	49-6221701844
Great Britain	37	Marc Slater	44-1332204205
Gulf Area		Gary Foote	971-43347788
- Bahrain	1		
- United Arab Emirates	4		
Hungary	3	István Horváth	36-13399399
India	10	Satinder K Maira	91-334901811
Indonesia	1	vacant	–
Ireland	4	Tom O'Reilly	353-429385181
Italy (to 30.11.99)	19	Guido di Renzo	39-0226232050
(from 1.12.99)		Antonio Giacomucci	39-0226232151
Japan	3	Kenichiro Shibata	81-335843495
Korea	1	Heung-Soo Lee	82-4175292111
Latvia	0	Tomas Gustavsson	371-7249795
Malaysia	0	Leong-Seng Ng	60-34528098
Mexico	0	Rodolfo Montelongo	52-53281459
Norway	41	Nils Børstad	47-66843060
		Ivar Bjørseth, deputy	47-22874119
Peru	0	César Férnandez	51-15610404
Philippines	0	vacant	63-28238970
Poland	10	Piotr Ciechanowski	48-124111199
Portugal	1	Carpinteiro Albino	351-14169353
Romania	0	Andrei Guran	40-13220600
Russia	0	Alexander Burov	7-0952628444
Saudi Arabia	1	Ferenc Remenyi	966-14762644
Singapore	2	Boon Eng Ong	65-7738845
South Africa	3	Clive Govender	27-112367369
Spain	8	Roberto Sellés	34-936810402
Sweden	86	Marja Widell	46-21323081
		Gunnel Wisén, deputy	46-86588065
Switzerland	58	Jakob Weber	41-562057133
Thailand	1	Siamwalla Manoonsak	66-27093346
Turkey	1	Refik Can Erkök	90-2164873750
United States	33	David Onuscheck	1-9198562368
Venezuela	0	Milagros Soto	58-22031739
Total	**519**	**sites**	

Operational performance indicators (OPIs)—inputs

(The OPIs for 1999 include Elsag Bailey automation sites but not sites now belonging to ABB ALSTOM POWER.)

Energy used

GWh used	Electricity	District heating	Oil	Coal*	Gas	Total	MWh per employee**	Comments
1998	1,680	445	323	118	1,386	3,952	26	Electricity, energy from district heating and gas are as MWh. Oil and coal are converted into MWh using conversion factors: 1 ton of coal = 7.56 MWh, 1 ton of oil = 9.96 MWh.
1999	1,914	371	274	59	557	3,175	22	

* Adjusted by elimination of the amounts used external to ABB.

** Employed on the sites

Materials and chemicals (metric tons)

Organic substances		1996	1997	1998	1999	Comments
Resin	In-house PVC compounding	12,900	16,280	11,769	10,228	Increased share of the new halogen free-cable
Phthalates	Softener for PVC	n. acc.	n. acc.	4,893	2,709	99: as DEHP, DOP—will be gradually replaced with DIDP
					1,417	99: as DIDP
Chloroparaffin	Softener/flame retardant	n. acc.	n. acc.	n. acc.	103	Will be phased out
Organic lead	Stabilizer in plastics	n. acc.	n. acc.	n. acc.	65	Will be replaced by lead free stabilizers
PBB and PBDE	Flame retardant in plastics	92	75	82	77	Specification requirements
Insecticides	Control of insects	n. acc.	1.2	0.4	0.7	
Fungicides	Control of water fungi	n. acc.	0.4	0.5	1.3	In closed loop systems
Nonylphenoletoxylate	Used as degreasing agent	n. acc.	n. acc.	2	1.7	Will gradually be replaced by other products
Inorganic substances						
Lead	Submarine cables	n. acc.	n. acc.	n. acc.	4,586	Specification requirement, used under controlled conditions
	Counterweights in robots	n. acc.	n. acc.	n. acc.	1,981	Will be replaced in next generation of standard robots
Cadmium	Rechargeable batteries	n. acc.	n. acc.	n. acc.	1.3	Will gradually be replaced by Cd-free batteries
	Micro-element in Pb-alloy in submarine cables	n. acc.	n. acc.	n. acc.	3.6	Specification requirement, used under controlled conditions
	CdO plating of contacts	n. acc.	n. acc.	n. acc.	0.2	Restricted use until replacement is available
Mercury	Instruments and galvanizing	n. acc.	n. acc.	n. acc.	0.012	Will be phased out within one year
Gases						
CFC class I	Customer plants/products	27	12	0	0	
CFC class II	Customer plants/products	222	74	65	48	Handling by well-defined procedures only
SF_6	Insulation gas in breakers	440	450	353	334	Handling by well-defined procedures only
Liquids						
Water	For cooling of processes	n. acc.	n. acc.	n. acc.	7,355,000	Will be reduced by closed-loop technology

In use

Equipment	1996	1997	1998	1999	Comments
No. of transformers with PCB oil	109	103	78	57	The quantity of oil in transformers and capacitors still in use was 105 tons in 1999. The program to completely replace these transformers and capacitors will continue.
No. of capacitors with PCB oil	45,560	19,314	5,416	5,318	
Substances					
Mercury (kg)	n. acc.	n. acc.	10	16	A few sites use mercury in seam welding machines and pressure gauges. The use is carefully managed as a significant aspect of the ISO 14001 program. In addition, local environmental agencies monitor the use.

Operational performance indicators—outputs

CO_2 emissions

	1998		1999		
	CO_2 kton	CO_2 ton per employee*	CO_2 kton	CO_2 ton per employee*	Comments
ABB total	1,445	10	1,173	8	When assessing the amount of CO_2 emission we have used official conversion factors per region for electricity and district heating and average qualities for coal, oil and gas.
Europe	856	8	777	7	
Americas	355	18	231	13	
Asia Pacific, Africa and Middle East	234	13	165	11	

*Employed on the sites

Waste and emissions other than CO_2 (metric tons)

Hazardous waste	1996	1997	1998	1999	Comments
Solid	10,100	9,850	8,820	5,652	Reported amounts are based on national definitions.
Liquid	5,100	7,334	7,044	5,295	These may vary between countries.
Emissions to air					
VOC	1,863	1,817	1,623	1,276	Increased use of VOC-free paint systems and subcontracting.
VOC_{Cl}	152	179	197	149	The three remaining sites still using VOC_{Cl} have started to phase it out.
SF_6	n. acc.	n. acc.	n. acc.	4	Assessed as 1 percent leakage of the amount of SF_6 used in production.

Recycling

Scrap (metric tons)	1996	1997	1998	1999	Comments
Solid	120,000	123,300	195,198	210,316	Changes in ABB's structure have affected the amounts of waste significantly. This makes it difficult to compare 1999 with previous years.
Liquid	6,800	4,200	4,437	2,995	
Scrap oil	n. acc.	n. acc.	51,432	49,730	
Temporary storage for future disposal (metric tons)					
PCB contaminated oil	78	58	32	29	The storage of PCB in ABB facilities is subject to strict control.

Continuous improvement

Continuous improvement of environmental performance is a cornerstone of ABB's environmental management program. This pervades all ABB's activities—related to sites as well as to products. In 1999 there was a particular focus on products, as can be seen from the introduction of environmental declarations, described elsewhere in this report, and from product development, described in the Technology Report—a companion volume forming part of ABB's Annual Report.

More than 500 sites are involved in the environmental management program, and more than 4,000 improvement projects are under way.

The improvement projects address many different concerns, local as well as global. About one-third are aimed at reducing greenhouse gas emissions: ABB is committed to cutting emissions by 1 percent annually over the next five years, starting in 1999. We have described a typical case at the end of this section.

Below are some examples of continuous improvement spotlighting case stories from South Africa and the Middle East.

South Africa and the Middle East are important areas for ABB with their expanding populations and increasing pressure on improving the infrastructure and raising living standards. Although in the past environmental performance has not always been a top priority everywhere, ABB has continued to pursue its corporate objective of implementing ISO 14001 in all countries. It is encouraging to report on the achievements of ABB facilities in South Africa, Egypt and the Gulf States in raising their environmental performance to match Group-wide levels.

There are many more examples, and we have concluded this section with a case story from Denmark.

South Africa

1999 saw the approval of an important piece of new legislation in South Africa: the National Environmental Management Act. This act extends existing legislation that concentrates on prevention and conservation and shows how environmental issues are climbing up the political agenda.

ABB also reached an important milestone with its first ISO 14000 certification in South Africa. ABB Karebo Manufacturers (Pty) Ltd. is the first Black Empowerment Company to achieve certification, and the first electrical engineering company in South Africa to do so.

ABB Karebo Manufacturers assembles high-voltage (44 to 800 kV) substation equipment, and is the country's sole manufacturer of surge arresters and 400 kV disconnect switches. Its environmental certification came less than a year after the company had gained its ISO 9002 quality management certification. According to Martin de Grijp, the company's General Manager, certification "will significantly add to our company's global competitiveness, enabling us to export to a number of markets."

"We have involved all our employees in the process through extensive training, which has helped to ensure successful certification."

ABB Powertech Transformers and ABB Kent Measurement are ready for certification.

Egypt

ABB has six facilities in Egypt. Two of these are already certified to ISO 14001: ABB ARAB—a manufacturer of substation equipment—and ABB Metal & Plastics—a component manufacturer. A third facility—ABB Industrial Systems, which designs and manufactures electronic and electrical devices—is ready for certification, which it expects to achieve by the end of the first quarter of 2000. According to Hassan Sharawi, Country Environmental Controller for Egypt, the remaining three units, ABB High Voltage, ABB Turbochargers, and ABB Transformers, are all planning for ISO 14001 implementation by the end of the year 2000.

In the two sites already certified, power-factor improvement projects have been implemented to avoid power losses and to raise the efficiency of the electricity supply system.

Throughout ABB companies in Egypt, housekeeping projects have been introduced to minimize waste and to raise overall performance and environmental awareness among the staff. ABB Metal & Plastics has taken measures to control and reduce the emission of gases in the plastics molding shop.

ABB has also shared its experience in environmental management by participating in an international conference organized by the nongovernmental organization Egyptian Society for Quality & Environment. ABB presented two papers that focused on each of the title topics.

ABB is studying two additional projects in Egypt. One is with the Association for the Protection of the Environment. It aims not only at protecting the environment but also at realizing a personal development program to improve the quality of life for the women of Mokattam—one of Cairo's poorer areas. The other project is with the Alexandria Council and aims at improving the quality of life in one of the poorer areas of Egypt's second largest city.

The Gulf States

In October 1999, all four of ABB's companies in the Gulf area—two in Bahrain and one each in Kuwait and Dubai—were certified to ISO 14001. This was achieved in less than a year from the introduction of environmental management systems (EMS), demonstrating the benefits of sharing experiences and best practices within the ABB group. In parallel with the EMS program, all four companies implemented quality management systems, or integrated their existing system with the EMS.

"The focus on environmental issues in the Gulf companies has generated very favorable responses both from employees and from government authorities," says Gary Foote, Country Environmental Controller, ABB Gulf Area.

ABB Dubai Ltd is located in the Al-Jadaf Dubai Ship Docking Yard area, which is situated alongside Dubai Creek and recognized as an environmentally sensitive area. The company was the first in the area to achieve ISO 14001 certification, and is now sharing its experience with other members of the local business community. With the support of ABB's Corporate Staff for Environmental Affairs, ABB Dubai has conducted public workshops on implementing an EMS, and identifying environmental aspects.

"We are now looking forward to supporting the environmental work of the Government of Dubai, which is implementing an EMS for the entire Al-Jadaf area," Foote continues.

In Kuwait and Bahrain, ABB companies have also been among the first to receive ISO 14001 certificates. As in Dubai, the companies are working to increase environmental awareness with governmental authorities and the business community. This is an especially sensitive topic in Kuwait, which experienced an environmental disaster when more than 700 oil wells were blown up at the end of the Gulf War.

The EMS and ISO 14001 projects in the Gulf companies have generated between five and ten

improvement programs on each site, all of which will mitigate environmental impacts. Many of these programs will also save costs and pay for themselves quickly.

Denmark

ABB Motors A/S manufactures small and medium sized electric motors, mainly for the European market. Manufacturing includes almost all production steps: casting of housings, machining of rotors, stamping of stator sheets, winding of coils, assembly and painting. All these processes consume large amounts of energy. Energy represents a large part of production costs.

ISO 14001 was implemented during 1997 and 1998, and energy consumption was of course identified as a significant environmental aspect. ISO 14001 provided a platform for working with energy issues in a systematic and well-organized way.

The company now uses considerably less energy than it did five years ago for equivalent production volumes. The most important steps in cutting energy consumption were:

- In 1994, a baseline study of energy use revealed many opportunities for improvement, such as improved insulation of pipes and switching to natural gas for process heating.
- In 1995 and 1996, the air conditioning and heating systems were modified to include heat recovery from exhaust air.
- In 1996, a system was installed to monitor the distribution of electricity to manufacturing processes. This identified substantial opportunities for energy conservation.
- In 1997, an old, large air compressor was replaced with four small compressors. This enables the facility to provide compressed air in exact amounts and at precise times required by the production processes, resulting in much improved efficiency. The resulting reduction in energy consumption is more than 50 percent.
- In 1998, with ISO 14001 certification completed, the company participated in a project with the Danish Energy Board to demonstrate good energy management in the following ways:

1. Monitor energy consumption for typical manufacturing processes, including suppliers' use of energy.
2. Establish an action plan to conserve energy for each process.
3. Establish documented instructions for saving energy, including processes performed by suppliers.
4. Establish follow-up methods, including statistical methods.
5. Provide general education of personnel and special training of personnel involved in heavy energy processes.
6. Communicate results to the public.

Because of this project, sub-projects to reduce energy consumption by another 10 percent have been identified. The company is now communicating the results to the public.

In addition, water consumption has been reduced by about 65 percent throught the implementation of ISO 14001 and systematic energy management.

Outlook for 2000

Sites

ABB is committed to continuous improvement. The ICC Charter specifies in its third principle that improvements in environmental performance must be continuous.

In 1999, ABB published a new, revised statement of its *Mission and Values*—the first revision since 1994. ABB's environmental mission is described in a section on sustainable development, which is reproduced below.

Sustainable development

We support sustainable development by developing and supplying ecoefficient products and systems; sharing state-of-the-art technology with emerging markets; continuously improving our own environmental performance; and being an active partner in common efforts to improve the environment. We see sustainable development as integral to all aspects of our business management, striving to keep a balance between social, economic and environmental requirements.

Guidelines

- Take sustainable development factors into consideration in all aspects of our business.
- Assure that all operations and processes comply with environmental standards and legislation.
- Assure that every operating unit develops and implements an environmental management system that sets goals of constantly improving environmental performance.
- Develop and produce products, systems and services with tomorrow's standards in mind.
- Focus on reducing total environmental impacts throughout products' life cycles.
- Share state-of-the-art technologies with emerging markets.
- Favor and reward suppliers who have environmental policies and management systems similar to our own.
- Join with external organizations and with governments in initiatives to improve sustainability and/or reduce environmental impacts.

The mission focuses on four areas: products, processes, shared technology, and common efforts. Here we examine the outlook for the coming year, grouped under these four headings.

Products

Most product-related activities are undertaken by the Business Areas and Business Units. For 2000, one specific activity will be to expand and refine the program of environmental declarations (EDs) and environmental product declarations (EPDs). As our experience with these grows, we will improve their format and contents. The program will also be expanded to cover additional core products and Business Units.

During 2000, we expect to identify and submit the first EPDs for external certification according to the new ISO standards.

The use of life cycle assessment (LCA) is critical for these activities. The LCA tool will be further improved to be more instructive and easier to use and update.

Efforts will also be made to enhance the cost-effective handling and sharing of environmental information throughout the entire supply chain. The potential for web-based solutions will be pursued.

Processes

The implementation of ISO 14001 will continue. At the end of 1999, some 96 percent of ABB's sites have ISO 14001 in place. Those that are not yet ready will be supported and encouraged to catch up.

The continuing evolution of ABB's business adds new sites through mergers and acquisitions. So, the target is constantly moving. Starting the certification process in newly acquired sites not already on the road to certification is a top priority. The large body of experience throughout ABB will help to accelerate certification at these sites.

Those sites—the vast majority—that have already implemented the system will not be allowed to rest on their laurels. No "dead systems" will be permitted. To this end, the implementation and maintenance of environmental management programs will be subject to the rigors of the new quality management standard ISO 9001:2000.

The processes used by our suppliers are also important. We monitor suppliers' environmental performance using our supply management database and the ISO 14001 process. The new global processes introduced in ABB during 1999 will help ensure that only suppliers with high environmental performance are selected.

Shared technology

The transfer of clean technologies to developing countries is one of the most effective ways a global company can support the vision of sustainable development. At its best, it brings these countries economic growth, higher living standards, and a better environment resulting from cleaner products and factories.

ABB believes the best way to share technology is to be "an insider, not an invader." We work for the long term. We put down deep local roots through acquisitions and joint ventures, adding value and manufacturing locally.

In less than a decade, this policy has increased ABB's presence in developing countries considerably. Eleven years ago we employed just a few thousand people in the developing markets. In 1999, we had more than 30,000 employees in these countries. In 2000, there will be further growth and expansion. We will establish more joint ventures and be present in more markets.

Sharing technology builds islands of excellence—high-performance companies, manufacturing modern, competitive products to international standards of design, quality and environmental performance. All these companies are integrated into the ABB Group and included in our environmental management program.

Most stimulating of all is the clear evidence that sharing technology works. The local companies create a benchmark for industrial and environmental practice, and help local communities boost their economies and living standards. ABB's global marketing network provides export opportunities that improve the host countries' trade balances. And ABB gains by growing its business in developing countries.

Common efforts

In a separate chapter in this year's report, we examined ABB's contribution to "common efforts": initiatives to improve sustainability and/or reduce environmental impacts. Our participation in common efforts, at local, national and international levels, will of course continue. ABB receives approaches to join initiatives of various types all the time and we actively seek out programs and initiatives of the right kind to join.

The ones we do join, however, must match the criteria we set for them. First, they must deliver benefits in all three dimensions of sustainable developments: economic, environmental, and social. Second, they must be full-scale or at least pilot programs, creating real-world solutions to real-world problems—we are not interested in

pure desk studies. Third, both sides must benefit from ABB's participation. We want to add value to the programs we are involved in. Equally, the programs must in some way—through improved knowledge or enhanced corporate citizenship—add value to ABB.

Social aspects

In 1999, for the first time we have reported on ABB's specific social contributions. In 2000, we will continue to monitor this performance, although we are aware that social aspects are very complex and very open to subjective interpretations.

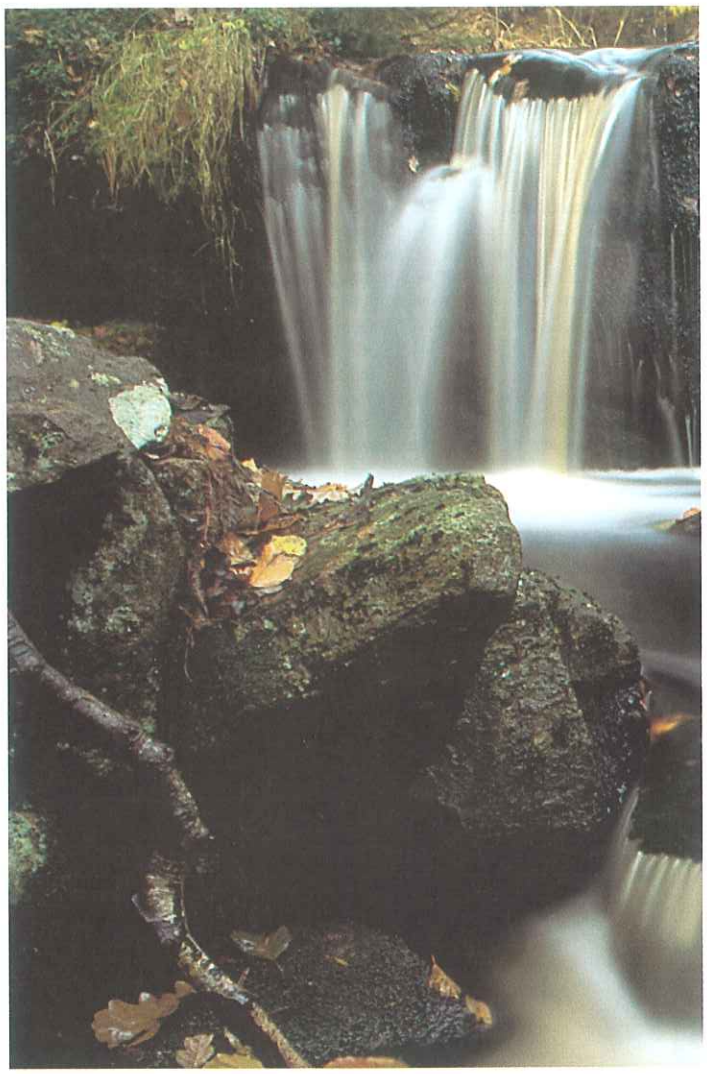
In the hope of improving reporting standards, we will pursue the formal definition of social aspects, and their addition to the growing list of things that can be objectively measured and reported. We believe that a standard like ISO 14001 would be well suited for expansion to include social aspects, and we will work toward this with standardization bodies.

Openness and reporting

Every year the number of operational performance indicators we report at the corporate level grows: in 1999 there are 33, compared with 28 in 1998. We will continue to add more.

Added to this, there are many global environmental issues and ABB can contribute to their debate, and move toward concrete actions. Reaching out through our corporate communications organization, and through our experts and managers in international forums, will continue to be a hallmark of ABB's environmental activism. The environmental statements that we recently formulated will be an important part of our corporate communications strategy.

Publicizing the positive contributions we can make to environmental well-being can only help to keep environmental management at the forefront of good corporate policy, as well as at the top of everyone's minds in their day-to-day activities. In 2000, we will continue to work to expand our dialogue with interested parties, non-governmental organizations, environmental agencies and the media.



Statement by Det Norske Veritas, 1999

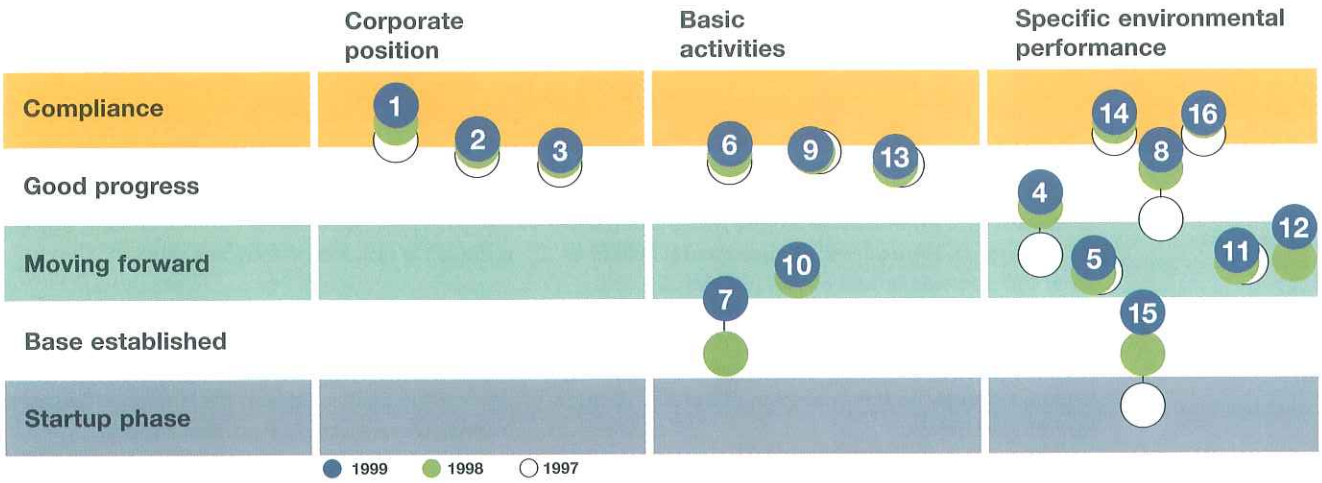
For the third year running, ABB asked Det Norske Veritas (DNV) to conduct an independent assessment of the Group's environmental performance. The benchmark for our assessment was the ICC Business Charter for Sustainable Development. In addition, our extensive knowledge of best practice regarding environmental management serves as a reference point. We have used the same methodology that has been adopted for the last two assessments.

Our assessment covered interviews and discussions with management from CEO to corporate staff, at the segment, Business Area and country levels. In addition we have reviewed relevant documents made available to us by ABB.

This year we have observed clear signs of progress within several of the Business Areas integrating environmental aspects into their product development and marketing communication efforts, though some Business Areas are still in the start-up phase.

We have grouped the 16 principles into three categories: principles regarding corporate position, basic activities, and specific environmental performance. Scores for each are compared with the last two years' performance.

ICC principles	Findings and conclusions
① **Corporate priority**	Management commitment is shown through strong support of the environmental management program at all management levels. A revised version of the Group's Mission & Values now includes a section on "Sustainable development." The CEO had environmental issues on the agenda at the Top Management Council meetings where key managers participate. ***Conclusion:* Compliance; improvement over 1998**
② **Integrated management**	In 1999 it was decided to include environmental performance in the annual strategic planning process. The Business Areas have started the process to identify indicators and establish systems for monitoring progress. All Business Areas have appointed Business Area Environmental Controllers. ***Conclusion:* Good progress; same level as in 1998**
③ **Process of improvement**	Findings under principles No.1 and 2 show initiatives to improve corporate policies and programs. There are more than 4,000 defined environmental improvement projects at ABB sites worldwide. Consolidated data for the Group show improvement for indicators, such as VOC emissions, hazardous waste, CFC and PCB. ***Conclusion:* Good progress; same level as in 1998**
④ **Employee education**	During 1999, 19,000 employees received basic environmental awareness training as part of the ISO 14001 implementation. Around 150 professionals from all Business Areas participated in courses on environmental declarations/environmental product declarations. Still there is a need for strengthening competences within this area. ***Conclusion:* Good progress; improvement over 1998**
⑤ **Prior assessment**	Corporate Staff for Environmental Affairs as well as ABB experts at the country level are more regularly involved in due diligence. We were given examples of comprehensive assessments, for example, in connection with the Elsag Bailey Automation acquisition. ***Conclusion:* Moving forward; improvement over 1998**
⑥ **Products and services**	Goal 2000—to have quantifiable, visible and communicated environmental goals and programs for all core products—has resulted in 20 first-generation environmental declarations/environmental product declarations ready for publication and more are in the pipeline. In addition, activity in performing life cycle assessments has increased. However, not all the Business Areas are at the same level. ***Conclusion:* Good progress; improvement over 1998**
⑦ **Customer advice**	There is a variation in the level and depth of the advice to customers depending on the particular products and services. We have seen examples of progress toward long-term partnerships and dialogues with key customers. ***Conclusion:* Base established: improvement over 1998**
⑧ **Facilities and operations**	ISO 14001 was implemented at 519 ABB sites, of which 432 are certified. If we do not include new ABB sites, for example, from the Elsag Bailey Automation acquisition, almost 96 percent of all ABB sites now have an ISO 14001 system. Modified and new core environmental performance indicators are established at all sites. Transportation (own fleet and internally purchased) is especially worth mentioning as a new performance indicator. ***Conclusion:* Compliance; improvement over 1998**
⑨ **Research**	In 1999, 50 percent of ABB's long-term research program was allocated to projects that directly address environmental issues or where environmental issues are one of the main drivers. The ABB Technology Report for 1999 will have a section on "Green Drive." Two of five research and development laboratories are ISO 14001 certified. ***Conclusion:* Compliance; same level as in 1998**
⑩ **Precautionary approach**	The environmental declarations/environmental product declarations give useful information for a precautionary approach. In addition, ISO 14001 requires a precautionary approach at site level. The initiative to reduce CO_2 is an example of a precautionary approach. In addition renewables, especially wind power, and the means to connect wind and solar power to existing networks, are now a part of ABB's activities. We have noticed signs of a more precautionary approach in large projects. ***Conclusion:* Moving forward; improvement over 1998**



ICC principles	Findings and conclusions
(11) **Contractors and suppliers**	ISO 14001 includes contractors and suppliers. Life cycle assessments and environmental declarations/environmental product declarations may include the supply level. Some countries and Business Areas have Supply Management that includes environmental issues in the standard requirements. We were given examples of countries running environmental training seminars for their suppliers. ***Conclusion*: Moving forward; improvement over 1998**
(12) **Emergency preparedness**	Emergency preparedness at the local level is taken care of within ISO 14001. Extensive work has been done at the country and corporate level for the year 2000 issue. Crises Management and Business Continuity Management Teams are established in most companies. The CEO has stated that these efforts will be established on a permanent basis and include an increasing number of different risks. Corporate Risk Management and Corporate Environmental Affairs closely cooperate as there is a clear synergy in coordinating property and environmental risk. ***Conclusion:* Good progress; improvement over 1998**
(13) **Transfer of technology**	ABB is actively transferring technology within the company. For example, the Elsag Bailey Automation acquisition results in a large flow of technology transfer worldwide. The China Energy Technology Program 1999–2001 and the moving of the CO_2 laboratory from Switzerland to China are other examples. Not all Business Areas have an optimal process for cross-border transfer of new environmental know-how. ***Conclusion:* Good progress; improvement over 1998**
(14) **Contributing to the common effort**	ABB is holding steady last year's focus on contributing to the common effort. For example, the CEO's initiative to establish the World Energy Council Pilot Project for monitoring CO_2 reduction has been prepared by ABB and is now being adopted by WEC. In addition, we were given many examples of ABB contributions at universities, conferences, seminars, etc. ***Conclusion:* Compliance; improvement over 1998**
(15) **Openness to concerns**	Three Round Table meetings with nongovernmental organization have been held in 1999. The ABB Group's Internet format has been improved. We have also seen examples of local Internet pages supporting interaction; thus increasing the dialogue with the public and other stakeholders. Key environmental speeches by the CEO have been published and distributed widely. ***Conclusion:* Base established; improvement over 1998**
(16) **Compliance and reporting**	In addition to the corporate environmental report, websites, countries and business segments have to some extent published their own environmental reports. There has been extensive use of the Internet and intranet to aggregate and report environmental progress data. The number of core environmental indicators has increased in 1999. ***Conclusion:* Compliance; same level as in 1998**

Oslo, 10 January 2000

Henrik O. Madsen Anne Cathrine Johnsen

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DNV

The ABB policy for sustainable development

Environmental protection is among ABB's top corporate priorities. We address environmental issues in all of our operations and public policies.

ABB is a signatory to the ICC Business Charter for Sustainable Development and is working toward fulfilling its requirements. Our environmental policy is based directly on the principles of the ICC Charter, reproduced below.

ICC principles

1. Corporate priority
To recognize environmental management as among the highest corporate priorities and as a key determinant to sustainable development; to establish policies, programs and practices for conducting operations in an environmentally sound manner.

2. Integrated management
To integrate these policies, programs and practices fully into each business as an essential element of management in all its functions.

3. Process of improvement
To continue to improve corporate policies, programs and environmental performance, taking into account technical developments, scientific understanding, consumer needs and community expectations, with legal regulations as a starting point; and to apply the same environmental criteria internationally.

4. Employee education
To educate, train and motivate employees to conduct their activities in an environmentally responsible manner.

5. Prior assessment
To assess environmental impacts before starting a new activity or project and before decommissioning a facility or leaving a site.

6. Products and services
To develop and provide products or services that have no undue environmental impact and are safe in their intended use, that are efficient in their consumption of energy and natural resources, and that can be recycled, reused or disposed of safely.

7. Customer advice
To advise and, where relevant, to educate customers, distributors and the public in the safe use, transportation, storage and disposal of products provided; and to apply similar considerations to the provision of services.

8. Facilities and operations
To develop, design and operate facilities and conduct activities taking into consideration the efficient use of renewable resources, the minimization of adverse environmental impact and waste generation and the safe and responsible disposal of residual wastes.

9. Research
To conduct or support research on the environmental impacts of raw materials, products, processes, emissions and wastes associated with the enterprise and on the means of minimizing such adverse impacts.

10. Precautionary approach
To modify the manufacture, marketing or use of products or services or the conduct of activities, consistent with scientific and technical understanding, to prevent serious or irreversible environmental degradation.

11. Contractors and suppliers
To promote the adoption of these principles by contractors acting on behalf of the enterprise, encouraging and, where appropriate, requiring improvements in their practices to make them consistent with those of the enterprise; and to encourage the wider adoption of these principles by suppliers.

12. Emergency preparedness
To develop and maintain, where significant hazards exist, emergency preparedness plans in conjunction with the emergency services, relevant authorities and the local community, recognizing potential transboundary impacts.

13. Transfer of technology
To contribute to the transfer of environmentally sound technology and management methods throughout the industrial and public sectors.

14. Contributing to the common effort
To contribute to the development of public policy and to business, governmental and intergovernmental programs and educational initiatives that will enhance environmental awareness and protection.

15. Openness to concerns
To foster openness and dialogue with employees and the public, anticipating and responding to their concerns about the potential hazards and impacts of operations, products, wastes or services, including those of transboundary or global significance.

16. Compliance and reporting
To measure environmental performance; to conduct regular environmental audits and assessments of compliance with company requirements, legal requirements and these principles; and periodically to provide appropriate information to the Board of Directors, shareholders, employees, the authorities and the public.

GLOSSARY

Abiotic depletion, AD. The exhaustion of resources that are not produced by living beings. For example, depletion of iron ore in the Earth's crust.

Acidification. Chemical alteration of the environment, resulting in hydrogen ions being produced more rapidly than they are dispersed or neutralized. Occurs mainly through fallout of sulfur and nitrogen compounds from combustion processes. Acidification can be harmful to terrestrial and aquatic life.

Acidification potential, AP. The index used to translate the level of emissions of various gases into a common measure to compare their contributions to acidification. APs are calculated as the potential for releasing hydrogen ions (H^+) of 1 kg from a substance compared with that of 1 kg of sulfur dioxide.

Agenda 21. A world action plan for sustainable development, adopted in 1992 by 178 national governments at the United Nations Conference on Environment and Development, in Rio de Janeiro, Brazil.

Air pollution. Accumulation in the atmosphere of substances that, in sufficient concentration, endanger human health or produce other measurable effects on living matter and other materials. Major types of pollutants are carbon dioxide, carbon monoxide, hydrocarbons, nitrogen oxides, particulates, sulfur dioxide, and photochemical oxidants, including ozone.

Alliance for Global Sustainability, AGS. A partnership involving the Massachusetts Institute of Technology (MIT), the Swiss Federal Institutes of Technology (ETH) and the University of Tokyo (UT). The alliance was formed in 1994 to work on integrated aspects of environment and sustainability problems through research, education, and global outreach.

Annex I Parties. Industrialized countries that, as parties to the Framework Convention on Climate Change, have pledged to reduce their greenhouse gas emissions by the year 2008–2012 to 1990 levels. Annex I Parties consist of countries belonging to the Organization for Economic Cooperation and Development (OECD) and countries designated as Economies-in-Transition.

Aromatics, or aromatic hydrocarbons. Highly stable organic compounds, including benzene, toluene and xylene. Certain aromatic hydrocarbons, found in gasoline and exhaust emissions, have carcinogenic properties.

Biofuel. Fuel derived from biomass i.e., a substance produced by living organisms but not fossil fuels, for example, wood from energy forests and timber waste.

Biomass. See biofuel.

Biotic depletion, BD. The exhaustion of resources in the form of living things. For example, deforestation and species extinction, but not the sustainable use of renewable resources.

BS 7750. The first national standard for environmental management, published by the British Standards Institution in 1992.

Business Area Environmental Controller, BAEC. An ABB manager who reports to Business Area management and coordinates all environmental management activities in that Business Area, with a particular focus on their products and services.

Byproduct. A secondary product resulting from the production of a primary product.

Cadmium, Cd. A cumulatively toxic element used in the manufacture of batteries, for electroplating, in submarine cables, and in circuit board contacts.

Carbon, C. A nonmetallic element found widely in nature. 94 percent of all known compounds (more than 4 million) contain carbon. Its most abundant compound is carbon dioxide, which constitutes approximately 0.04 percent of the atmosphere and is found in a dissolved state in all natural waters. Carbon compounds make up approximately 18 percent of all living matter (the remainder being mostly water). During this century, carbon-based fuels have provided most of the world's energy needs.

Carbon cycle. Circulation of carbon in various forms through nature.

Carbon dioxide, CO_2. A colorless and, at room temperature, gaseous substance found in the atmosphere as part of nature's life cycle. Human activities, especially the burning of fossil fuels, can increase levels of carbon dioxide in the atmosphere, which is believed to affect the climate. The primary greenhouse gas is carbon dioxide.

Carbon monoxide, CO. A colorless, odorless gas found in trace amounts in the atmosphere. Produced by incomplete combustion of carbonaceous materials, CO is highly toxic because of its high affinity for hemoglobin in red blood cells.

Carbon sink. Something that absorbs carbon dioxide from the atmosphere. Vegetation is the most important carbon sink. Using photosynthesis, land plants and marine plants convert great quantities of carbon dioxide, water, and sunlight energy into oxygen and carbohydrates.

CIGRE. Conference Internationale pour les Grands Réseaux Electriques.

Chlorinated paraffins. Highly complex, stable compounds containing chlorides that are resistant to degradation and oxidation. Used as softeners in plastics and rubber, as flame retardants and as components of cutting fluids in metalworking. Harmful primarily to aquatic life.

Chlorinated volatile organic compounds, VOCcls. Compounds containing chlorine that are highly volatile and easily disperse into the immediate environment and the atmosphere. They are often directly, or indirectly, hazardous to the environment and to health. Large quantities of VOCcls were previously used as industrial solvents, for degreasing and in dry cleaning. Other substances are now gradually replacing them. VOCcls include trichloroethane, trichloroethylene and perchloroethylene.

Chloroflurocarbons, CFCs. See freons.

Climate. Temperature, humidity, precipitation, winds, radiation, and other meteorological conditions characteristic of a locality or region over an extended period.

CML (Centre of Environmental Science). A department of Leiden University in the Netherlands that has developed the most widespread method for classification and characterization of environmental threats (such as global warming, acidification and euthrophication).

Cogeneration. Use of heat from a combustion process (that would otherwise be released into the environment) as an additional source of electricity generation, or as a heating or cooling source.

Conference of the Parties, CoP. The more than 150 nations that have ratified the Framework Convention on Climate Change (FCCC). The first conference (CoP 1) took place in Berlin in 1995.

CoP. Conference of the Parties to the UN Framework Convention on Climate Change. The most recent sessions were in Kyoto in 1997 (CoP3), in Buenos Aires in 1998 (CoP4) and in Bonn in 1999 (CoP-5).

Corporate Staff for Environmental Affairs, CS-EA. ABB's central environmental staff, reporting directly to the CEO, with overall responsibility for developing and implementing the environmental management program throughout the ABB Group.

Country Environmental Controller, CEC. An ABB manager who reports to country management and coordinates all environmental management activities in that country.

Design for environment, DFE. An engineering approach for optimizing environmentally related characteristics of a product, process, or facility.

Diisodecyl phthalate, DIDP. See phthalates.

Dioxin. A group of chlorinated organic chemicals formed in very small quantities in most combustion processes and as accidental byproducts of the manufacture of certain herbicides, bactericides, wood preservatives, and other products. Of the 210 dioxins, about a dozen are considered highly toxic, causing skin disorders, cancer and genetic disorders.

Ecoefficiency. The combination of efficiency and ecological aspects in the pursuit of sustainable development. An environmental management program is an instrument for achieving ecoefficiency. The term ecoefficiency was introduced by BCSD. See WBCSD.

Eco-indicator 95. A Dutch method for classification, characterization and weighting of environmental threats related to political goals. Eco-indicator 97 is a more comprehensive version.

Ecology. The scientific study of the interrelationship of organisms and their environments.

Eco-Management and Audit Scheme, EMAS. An EU regulation promoting continuous improvement of the environmental performance of industrial activities. Once an organization has set up an EMAS-approved environmental management system, an independent, accredited person or organization audits the environmental work. The organization can then seek registration by a competent body designated by the governments of the member states.

Ecoscarcity. A Swiss method for weighting the environmental impact of emissions and developing indexes. Based on the relationship between the current impact and the maximum acceptable impact within a specific geographical area. Indexes (Ecopoints) based on Belgian, Dutch, Norwegian, Swedish and Swiss political goals have been developed.

Ecosystem. A functional unit of nature comprising both organisms and their inorganic environment intimately linked by a variety of biological, chemical and physical processes.

Ecotoxicity. The potential of a substance to harm ecosystems. Usually refers to ECA, ecotoxicity for aquatic systems, the toxic effect on water organisms based on maximum tolerable concentrations. See human toxicity factor.

Emission. Release or discharge of any substances, effluents or pollutants into the environment.

Emissions trading. A tool for reducing emissions of greenhouse gases. Sources of a particular pollutant (most often carbon dioxide) are given permits to release a specified number of tons of the pollutant. A government or trading agency issues only a limited amount of permits consistent with the desired level of emissions. The owners of the permits may keep them and release the pollutants, or reduce their emissions and sell the permits. The fact that permits have a value and can be sold or traded gives owners an incentive to reduce emissions. In 1997, the Kyoto Protocol included emissions trading as a means of controlling greenhouse gases.

Environment. The terrestrial human habitat, including air, water, land, natural resources, flora, fauna, humans and the interrelation of these and other constituents.

Environmental Advisory Board, EAB. At ABB, a panel of outside experts who advise the Group on environmental matters.

Environmental aspects. Elements of an organization's activities, goods or services that can interact with the environment.

Environmental declaration, ED. A description of the environmental impact of activities such as engineering, construction and service. The concept of environmental declarations as a complement to environmental product declarations has been introduced by ABB. EDs cover entire business areas, not individual products, and specify overall environmental goals, state policies, and define methods to achieve the goals.

Environmental fee. Economic means of control to limit environmental damage. Several countries levy environmental fees, for example, on nitrogen oxides and carbon dioxide emissions from combustion processes and on the use of certain other substances.

Environmental impact. Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products, or services, or from human activities in general.

Environmental management system, EMS. That part of an overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining an environmental policy.

Environmental performance. The measurable results actually attained by an organization through environmental management.

Environmental performance indicator, EPI. Standardized metrics that provide information for measuring and motivating progress toward environmental goals, serving the needs of business managers and interested parties outside the corporation. According to the ISO 14031 standards, the three main classes of EPI are management performance indicators (MPI), operational performance indicators (OPI), and environmental condition indicators (ECI).

Environmental Priority Strategies in product design, EPS. A Swedish method for weighting the environmental impact of products over their entire life cycle on biodiversity, human health, production capacity of ecosystems and depletion of non-renewable resources. Based on the willingness in OECD countries to pay to avoid specific environmental impacts.

Environmental product declaration, EPD. A description of the environmental performance of a product, system or service over its entire life, from raw material acquisition, manufacturing and use to waste disposal and decommissioning. ABB's EPDs are based on full life cycle assessments as specified in ISO 14025.

Environmental strategy. A business strategy with environmental improvement as an explicit objective or expected outcome.

Environmental theme. A method for classifying and characterizing environmental threats in effect categories and developing weighting indexes (ET Points). Indexes related to political goals in the Netherlands and Sweden have been developed.

Eutrophication. Enrichment of bodies of water by nitrates and phosphates from organic material or the surface runoff. This increases the growth of aquatic plants and can produce algal blooms that deoxygenate water and smother other aquatic life.

Fossil fuels. Fuels found in earth strata, deriving from organisms of an earlier geological age. Fossil fuels include oil, natural gas, coal and peat.

Framework Convention on Climate Change, FCCC. The international treaty unveiled at the United Nations Conference on Environment and Development (UNCED, also known as the "Rio Summit"), in June 1992. The FCCC commits signatory countries to stabilize greenhouse gas emissions to levels that would prevent dangerous interference with the climate system.

Freons. (CFCs) A group of halogenated hydrocarbons in which fluorine atoms, chlorine atoms, or both have replaced one or several of the molecule's hydrogen atoms. The name is derived from the Freon trademark registered by DuPont in the 1930s. Freons, or CFCs (chloroflurocarbons) were previously used widely as cooling agents and as expanding agents in insulation foam. because they contribute to both the depletion of the ozone layer and the greenhouse effect of global warming, their use is now banned in many countries.

Global warming. The increase in the Earth's mean temperature that is, or is believed to be, occurring as a result of human activities affecting the Earth's atmosphere.

Global warming potential, GWP. The index used to translate the level of emissions of various gases into a common measure to compare their contributions to the absorption by the atmosphere of infrared radiation. GWPs are calculated as the absorption that would result from the emission of 1 kg of a gas to that from emission of 1 kg of carbon dioxide over 100 years.

Greenhouse effect. The effect that certain variable constituents of the Earth's lower atmosphere have on surface temperatures. Greenhouse gases keep ground temperatures at a global average of approximately 15°C. In their absence, the global average would be below the freezing point of water. Environmental scientists are concerned that changes in the atmosphere's CO_2 content, caused by human activities, could have a dangerous warming effect on the Earth's atmosphere.

Greenhouse gases. Gases that contribute to the greenhouse effect and global warming. The most significant are carbon dioxide (CO_2), water vapor (H_2O), methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Halogenated hydrocarbons. Hydrocarbons in which halogen atoms have replaced one or several hydrogen atoms, for example fluorine, chlorine, bromine and iodine. Solvents, cooling agents, insect repellents, fire retardants, and transformer oil often contain halogenated hydrocarbons. They are chemically and biologically stable, and their large-scale use has led to environmental damage and health risks. Bans in many countries have drastically reduced usage of halogenated hydrocarbons.

Halons. See halogenated hydrocarbons.

Hazard. A material condition that may cause damage, injury, or other harm, frequently established through standardized assays performed on biological systems or organisms. Hazard and exposure constitute risks.

Hazardous waste, HW. Waste requiring special disposal techniques. Different countries have different definitions and regulations, and national standards are frequently changed.

Human toxicity factor. The potential of a substance to harm human beings. Usually expressed as HCA, human toxicology factor for air, and as HCW, human toxicology for water. Both express the relation of the substance to a person's

tolerable daily intake, which is dependent on body weight.

Hydrocarbons. Chemical compounds consisting of carbon and hydrogen. There are many different hydrocarbons, mainly extracted from petroleum. Hydrocarbons are increasingly replacing freons (CFCs and HCFCs) as cooling agents and insulation gases. They do not contribute to ozone depletion and contribute only negligibly to the greenhouse effect. Most hydrocarbons are highly flammable, and many are hazardous to health.

Hydrochlorofluorocarbons, HCFCs.. Also known as soft freons. Alternative to CFCs, with only approximately one-tenth of the ozone-destroying properties and greenhouse effect potential of CFCs.

Hydrofluorocarbons, HFCs. A major substitute for chlorofluorocarbons and halons. HFCs contain no chlorine or bromine, only fluorine, which is benign toward the ozone layer. Therefore, their ozone depletion potentials are essentially zero. The major HFCs are CF_3CFH_2 (134a), CF_3CF_2H (125), CHF_3 (23), CF_3CH_3 (143a) and CF_2HCH_3 (152a). In particular, HCFC-134a has begun to be widely used in air-conditioning and refrigeration applications.

Interested party. An individual or organization directly affected by the fortunes of an enterprise. Corporate management has a responsibility to interested parties, including customers, employees, shareholders, suppliers, communities, and others.

International Chamber of Commerce, ICC. A nongovernmental organization, founded in 1919, that serves world business by promoting trade and investment and the free market system. The ICC helps the international business community to develop solutions for environmental problems, while striving to ensure that intergovernmental organizations concerned with the environment consider business views.

International Energy Agency, IEA. An agency established in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD). One of the IEA's basic aims is to promote cooperation among participating countries, in order to increase energy security through conservation, development of alternative energy sources, and energy research and development.

International Organization for Standardization, ISO. Founded in Geneva in 1946, ISO is concerned with standardization in all technological or nontechnological fields, except for electric and electronic engineering, which are the responsibility of IEC, the International Electrotechnical Commission. Membership comprises more than 80 countries.

ISO 9000. A series of international standards for quality assurance, adopted in 1987. A revised series is to be published in 2000.

ISO 14000. A series of international standards for environmental management systems, life cycle assessment, environmental auditing of processes, environmental labeling, environmental performance evaluation and terms and definitions.

IUCN. The World Conservation Union, established in 1948. A union of governments, government agencies and nongovernmental organizations working with scientists and other experts to protect the environment. IUCN advises and helps governments, organizations, and local communities in devising and implementing conservation strategies.

Joint Implementation. Agreements made between two or more nations under the auspices of the Framework Convention on Climate Change to help reduce greenhouse gas emissions.

Kyoto Protocol. A legally binding agreement under which industrialized countries will reduce their collective greenhouse gas emissions by 5.2 percent. The agreement was reached in Kyoto on December 11, 1997, at a meeting arranged by UNEP, and attended by delegates from 160 nations.

Lead, Pb. A metallic element used in many industrial processes. Accumulates in biological systems and is linked to behavioral change, paralysis and blindness. Use of tetraethyl lead as an anti-knocking petroleum additive has resulted in its widespread release along roads.

Life cycle assessment, LCA. A management tool for appraising and quantifying the total environmental impact of products or activities over their entire lifetime by analyzing the entire life cycle of particular materials, processes, products, technologies, services or activities. Life cycle assessment comprises three complementary components-inventory analysis, impact analysis and improvement analysis.

Local Environmental Control Officer, LECO. An ABB executive who reports to a local site management to ensure that the appropriate environmental procedures are carried out at that site.

Mercury. A heavy metal used in mercurial catalysts and the paper industry and released by the combustion of fossil fuels. Organic mercury compounds, such as methyl mercury, act as cumulative poisons that affect the nervous system.

Methane, CH_4. A hydrocarbon that is the main component (approximately 85 percent) of natural gas and is widely distributed in nature as a byproduct of the decay of organic matter. In addition to its use as a fuel, methane is used to manufacture many organic chemicals. The gas is nonpoisonous, but atmospheric methane is a greenhouse gas.

Nitrogen. A gaseous element that forms the major part (78 percent) of the atmosphere. Nitrogen is an important building block for all forms of life. It is transferred in a continuous cycle between the atmosphere and the biosphere.

Nitrogen oxide, NOx. Nitrogen forms a number of oxides such as nitrogen dioxide (NO_2), nitric oxide (NO) and nitrous oxide (N_2O). Human activities, primarily industrial processes and fossil fuel combustion, release large amounts of nitrogen oxides into the atmosphere. They contribute to acidification, eutrophication and to the formation of smog and ground-level ozone.

Nitrous oxide, N_2O. Also known as laughing gas. A greenhouse gas.

Nonrenewable energy resources. Irreplaceable energy resources, representing an energy capital that must be conserved and utilized wisely. These include coal, oil and natural gas, and fuels for nuclear energy, such as uranium for fission, as well as lighter elements for fusion.

Nonylphenoletoxylates. Complex hydrocarbons used in industrial cleaning and degreasing, in paint manufacture and as components of cutting fluids in metalworking. May be harmful to aquatic life.

Nuclear energy. Energy obtained from nuclear fission and fusion.

Nuclear fission. The splitting of a heavy nucleus, such as uranium, into two parts, releasing neutrons and energy. Nuclear fission is the process used in nuclear reactors, as well as in nuclear weapons.

Nuclear fusion. A nuclear reaction in which atomic nuclei with low atomic numbers fuse to form a heavier nucleus, accompanied by the release of large amounts of energy. Nuclear fusion is used in nuclear weapons but not yet for power generation.

Ozone, O_3. A form of oxygen with three oxygen atoms. The upper atmosphere's ozone layer protects life against harmful ultraviolet radiation, while ground-level ozone is a pollutant that is harmful to life forms and can cause breathing disorders.

Ozone depletion. Degradation of stratospheric ozone due to the photochemical reaction of ozone, primarily with CFCs. A global phenomenon with regional variations, characterized by holes in the ozone layer over the Antarctic, the Arctic and other regions.

Ozone depletion potential, ODP. The index used to translate the level of emissions of various substances into a common measure to compare their contributions to the breakdown of the ozone layer. ODPs are calculated as the change that would result from the emission of 1 kg of a substance to that from emission of 1 kg of CFC-11 (a freon).

Particulates. A collective term for very small solid and/or liquid particles found in the atmosphere. Particle sizes range from 0.005-500 micrometers. Particulates can be generated by natural processes but more commonly result from human activities, as from operational diesel engines, power plants, and from other industrial processes. Particulates have been linked to a number of significant health problems, including respiratory afflictions and heart disease.

Peat. Fibrous debris produced by the partial disintegration of vegetation in wet places. Classified as a fossil fuel as it is not part of the carbon cycle.

Photochemical oxidants, smog. Mixture of pollutants produced by the photochemical effect of sunlight on a range of chemicals, including nitrogen oxides, hydrocarbons and ground-level ozone. Primarily an urban phenomenon caused by inhibition of pollutant dispersal due to topological or meteorological conditions.

Photochemical ozone creation, POPC. The index used to translate the level of emissions of various gases into a common measure to compare their contributions to the change of ground-level ozone concentration. POPCs are calculated as the change that would result from the emission of 1 kg of a gas to that from emission of 1 kg of ethylene.

Phthalates. Salts or esters of the aromatic hydrocarbon phthalic acid. Used as softeners in plastics. Up to half the weight of PVC can sometimes consist of phthalates. It is suspected that phthalates diffusing into the environment might harm living creatures' capacity for reproduction.

Polybrominated biphenyls, PBBs. A group of biologically persistent organic compounds containing bromine used as fire retardants in plastics, as in the housings of electrical apparatus. The negative effects of PBBs are similar to those of PVC.

Polybrominated diphenyl ethers, PBDEs. A group of biologically persistent organic compounds containing bromine used as flame-retardants in plastics. The negative effects of PBDEs are similar to those of PVC.

Polychlorinated biphenyls, PCBs. A group of biologically persistent organic compounds containing chlorine previously used in electrical transformers and capacitors for their insulating and fire resistance properties. PCB compounds are toxic to marine life. Now being phased out and disposed of.

Polyvinylchloride, PVC. A plastic with a wide range of applications, used in pipes, profiles, bottles, cable insulation, etc. Its environmental impact, which has been the subject of intensive debate, involves especially the discharge of heavy metals from stabilizers and from phthalates used as softeners, as well as dioxin formation during combustion.

Precautionary approach. The approach promoted under the Framework Convention on Climate Change to help stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.

Primary energy. Energy that has not undergone transformation. Sources of primary energy that can be transformed into electricity and heat include crude oil, coal, natural gas and water used to generate hydroelectric power.

Recycling. Reintroduction of used materials or liquid residual products into manufacturing processes. A natural part of resource conservation. Today, most products are designed and manufactured with recycling in mind.

Renewable energy sources. Energy sources that replenish themselves naturally within a short period, making them continuously available. Sources of renewable energy include hydroelectric power, geothermal energy, ocean thermal energy, wave power, solar energy, wind power, peat, and fuel wood.

Residual product. Something left over from manufacturing or consumption, such as waste heat, scrap metal, rubber and plastic parts or leftover paper. Depending on the utility value, residual products are classified as return products, recyclable products, or waste.

Resource. A known and accessible supply that constitutes a means by which to achieve a specific goal. In a wider sense, everything that an organization can use to create value for customers is a resource, including employees, knowledge and expertise, capital, materials and energy. In a narrower sense, resources are those that are used in manufacturing, mainly materials and energy.

Solvent. A medium, usually a liquid, in which other substances can be dissolved without being chemically altered. Solvents are used in industrial processes as part of paints, lacquers, and plastics. Many solvents can affect human health and/or damage the environment.

SO_X. A collective name for sulfur oxides: sulfur dioxide (SO_2) and sulfuric trioxide (SO_3).

Stakeholder. See interested party.

Sulfur. A nonmetallic element, one of the most common in the Earth's crust and vital to all living organisms. Sulfur compounds take part in a continuous cycle that encompasses living organisms, bedrock, land, water, and air. Human activities have seriously altered the sulfur cycle, mainly due to extensive combustion of coal and oil.

Sulfur dioxide. A colorless, poisonous gas. Affects breathing, damages plants and contributes significantly to terrestrial and aquatic acidification. Large amounts are produced as an unwanted byproduct from the combustion of sulfurous fossil fuels. Sulfur dioxide can also be oxidized to sulfur trioxide, which forms sulfuric acid when exposed to air (humidity), contributing to acidification of land and water.

Sulfur hexafluoride, SF_6. A gaseous insulator used in some electric circuit breakers, substation connections, transformers, and power cables. SF_6 is a greenhouse gas.

Sustainable development, or sustainability. Meeting the needs of the present without compromising the ability of future generations to meet their own needs; combining economic growth and greater prosperity with environmental and social quality for people around the world.

Tellus. An American method for weighting the environmental impact of emissions, primarily to air, and widely used for evaluating the impact of toxic substances. Based on society's willingness to pay for cleaning up emissions.

United Nations Conference on Environment and Development, UNCED. This conference, in 1992, marked the beginning of systematic efforts by nations and companies to save and improve the environment.

United Nations Environment Program, UNEP. An organization within the UN, formed as a consequence of the 1972 Stockholm Conference on the Human Environment. UNEP's mission is to provide leadership and encourage partnerships in caring for the environment by inspiring, informing and enabling nations and people to improve their quality of life without compromising that of future generations.

Volatile organic compounds, VOCs. Compounds that easily evaporate and spread in close surroundings and in the atmosphere. Often directly or indirectly hazardous to the environment and to health. The largest releases of volatile organic compounds stem from combustion of fossil fuels. Other sources are solvents and paints. VOCs include toluene, xylene, styrene, naphthalene, and ethanol.

Waste. Different types of residues considered as lacking any utility value. The opposite of waste is a resource i.e., something considered useful. What is considered waste or resource may depend on its location and on who is doing the defining.

World Business Council for Sustainable Development, WBCSD. An organization established on January 1, 1995, through the merger of BCSD (Business Council for Sustainable Development) and WICE (World Industry Council on the Environment).

World Energy Council, WEC. A nongovernmental energy-policy forum founded in 1923, with headquarters in London. Its objective is to promote the sustainable supply and use of energy for the greatest benefit of all.

World Bank. An agency of the United Nations, with headquarters in Washington, D.C. The World Bank (officially, the International Bank for Reconstruction and Development, or IBRD) was established in 1944. It offers loans and technical assistance to promote balanced growth of international trade and economic development, especially in developing regions. Funds from loans support long-range projects in such fields as energy, agriculture, and transportation, with the aim of improving living standards. Providing technical assistance to member nations is a major World Bank activity.

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