25. ENERGY, RENEWABLE ENERGY AND NUCLEAR ENERGY

I. Introduction

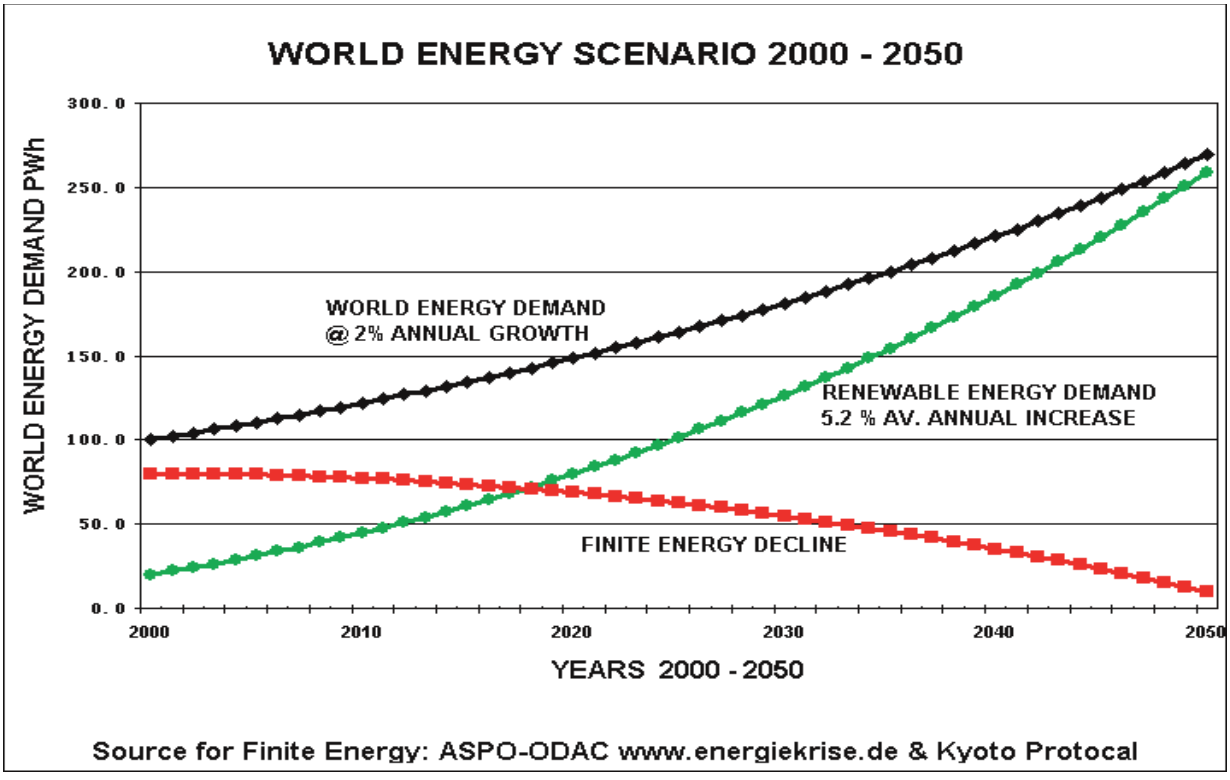
1. Challenges of Sustainable Energy

1. Over the last two centuries, industrial evolution resulted in many innovations for human civilization. Today, the ready availability of plentiful, if only affordable energy would allow many people to enjoy unprecedented comfort, mobility and productivity. However, access to and use of energy varies widely among countries. Two billion people, representing one third of the world population, are deprived from taking advantage of this commericial form of technology. Most importantly for this Chapter, current energy generation and use are accompanied by environmental impact at local, regional and global levels.

2. Sustainable energy can be defined as energy produced and used in ways that support human development over the long term, in all its social, economic and environmental dimensions. However, as noted in the Agenda 21, much of the world's energy is currently produced and consumed in ways that could not be sustained if technology were to remain constant and overall quantities were to increase substantially. Aspects of the unsustainability of the current system include:

- Commercial fuels including electricity are not universally accessible,
- The current energy system is not sufficiently reliable or affordable to support widespread economic growth, and
- Negative local, regional and global environmental impacts of energy production and use threaten the health and well being of current and future generations.

3. Since the 1970s, serious warnings about the "limits to growth" sounded alarm around the world with little effect. Resource exploitation and wasteful consumption habits diminished non-renewable energy resources at an accelerated pace. Still, the amounts of energy needed are increasing. Unless policies change, energy demand will continue to grow steadily, whereby fossil fuels will continue to dominate the energy mix and most of the growth in demand will come from developing countries. Energy use by developing countries has increased three to four times as quickly as that by the Organization for Economic Cooperation and Development ("OECD") countries. This is a result of lifestyle changes due to rising incomes and higher population growth. Consequently, the share of developing countries in global commercial energy use increased from 13% in 1970 to 30% in 1998.



4. One of the most serious consequences of the fossil fuel age is the unbalancing of the biosphere and climate to a degree that is irreversibly affecting our life base. Growing deserts and acid rains spoil fertile lands. Rivers, lakes and ground waters are poisoned, which spoils badly needed drinking water for a growing world population. Increasingly frequent weather disasters, retracting glaciers, melting ice caps, landslides, more violent storms, and flooding of highly populated coastal areas and islands endanger people and species. All this to a certain extent is linked to the incessantly growing fossil fuel emissions, which cause global warming.

5. The Brundtland Report not only introduced the concept of sustainability but also placed strong emphasis on the importance of energy generation and use as part of this crucial concept. The Brundtland Report considered energy to be a major feature of sustainability, and identified the following key elements:

   - Sufficient growth of energy supplies to meet the needs of humanity (including an allowance for development in non-developed countries);
   - Energy efficiency and conservation measures;
   - Public health, recognizing the safety risks posed by use of certain energy types; and
   - Protection of the biosphere and elimination of local pollution problems.

6. The current unsustainable practices in energy use and production have led to most pressing environmental problems, such as:

   - Climate change, for which energy production is over 60% responsible;
   - Acid rain, caused primarily by coal burning;
   - Increasing desertification, caused by unsustainable but inevitable use of firewood for heating and cooking in developing countries;
   - Ozone depletion, caused by the use of hydrofluorocarbons in refrigerators and air-conditioning units;
   - Risks of nuclear radiation where nuclear energy is used and particularly the problem of nuclear waste;
   - Soil pollution, caused by oil and geothermal exploration and production;
   - Loss of habitat, caused by large-scale hydropower projects;
   - Pollution of the sea, caused by oil spills from large ocean-going tankers;
   - Urban air pollution, caused by fossil-fuel burning; and
   - Significant public health risks from use of biomass energy (especially where poor ventilation is widespread).

7. Some of these problems have already been, to some extent, tackled by the introduction of national legislation and/or international conventions. In Europe, acid rain is controlled by the 1979 Convention on Long-Range Transboundary Air Pollution together with its Protocols. Oil spills and oil pollution at sea are regulated by the International Convention for the Prevention of Pollution from Ships ("1973 MARPOL") and the 1982 Uinted Nations Convention on the Law of the Sea. Ozone depletion is being tackled by the 1985 Vienna Convention on the Protection of the Ozone Layer and its 1987 Montreal Protocol on substances that deplete the Ozone Layer. A Climate Change regime has been introduced through the 1992 United Nations Framework Convention on Climate Change and reinforced by the 1997 Kyoto Protocol. Also, the 1994 Convention on Desertification touches upon the issue of climate change and thus energy. The instruments regulating nuclear safety issues will be discussed later in this Chapter. However, notwithstanding the number of agreements that touch upon different aspects of energy generation and consumption, energy as an issue, has not, of its own been comprehensively addressed by an international convention up to now.

2. Energy Efficiency and Renewable Energies

8. The Brundtland Report stated that energy efficiency "should be at the cutting edge of national energy policies for sustainable development." However, for a number of reasons, the technical and economic potentials of energy efficiency have traditionally been under-realized. Today, the global energy efficiency of converting primary energy to useful energy is about one-third. In other words, two-thirds of primary energy is dissipated in the conversion processes, mostly as low-temperature heat. Further losses occur in the end-use of useful energy. Numerous and varied economic opportunities exist for energy efficiency improvement, particularly in this final conversion step from useful energy-to-energy services. Such measures include structural changes in economies by shifts to less energy-intensive industrial production and switching to highly efficient appliances, machinery, processes, vehicles, and transportation systems. Taking advantage of these opportunities has the largest potential for cost-effective efficiency improvements, particularly in developing countries and economies in transition, where the potentials of efficiency gains are highest.

9. The Brundtland Report further emphasized the need to shift the current energy mix more towards renewable energy resources. Such resources include solar energy (space and water heating and photovoltaics), wind energy, biomass, geothermal, small-scale hydropower, wave and tidal power. However, many political issues and vested interests are at stake and do not allow for radical change. Many oil-producing and oil-dependent nations are reluctant to accept the need to reduce their heavy reliance on fossil fuels fearing economic detriments. It is, therefore, no wonder that despite best intentions on the part of the international community, energy issues were neither specifically included as a specific chapter in Agenda 21, nor elaborated as a key aspect in the Millennium Development Goals of the United Nations.

10. Environmental law is traditionally focused on the environmental harm caused by energy use and production, rather than on energy itself. In relation to energy efficiency and renewable energies, promotion thereof is stipulated in various agreements, such as article 2 of the 1997 Kyoto Protocol. However, even though a strong factual interrelationship exists, international agreements adopted on climate change do not comprehensively address the energy side of the equation; and the link between desertification and energy has not even been officially recognized. This is particularly unfortunate, since scientific and technological advances in the energy sector have proceeded apace over the past decade. In terms of renewable energies, the efficiency of photovoltaic cells has increased dramatically, enabling the cells to be cost-effective in many regions of the world. New efficient designs of wind generators have been developed to enable the establishment of offshore wind generators. As far as energy efficiency and conservation is concerned, new super-efficient motors have been manufactured, enabling substantial energy savings in a wide range of industrial and domestic products possible. Also, much progress has been made in the development of alternatives to petroleum for motor fuels, such as ethanol, methanol and hydrogen.

11. The WSSD Plan of Implementation adopted at the World Summit of Sustainable Development ("WSSD Plan") in Johannesburg in 2002, makes references to energy efficiency and renewable energy. However, the WSSD Plan does not contain any binding national commitments in relation to energy, and the move to impose a mandatory percentage increase in the use of renewable energy resources was rejected. Nevertheless, it is part of the environmental instruments referred to as non-legally binding, which traditionally has played an important role in paving the way to stronger legal commitments. The WSSD Plan introduced a number of provisions relating to energy in its chapter II on "poverty reduction" (clause 9) and chapter III on "production and consumption" (clause 20). The WSSD Plan calls upon governments to:

- Take joint efforts to improve access to reliable and affordable energy services,
- Promote sustainable use of biomass, and
- Support the transition to cleaner use of fossil fuels. Some of the commitments made by the countries with regard to sustainable energy are to:
  - Promote the internalization of environmental costs and the use of economic instruments,
  - Establish domestic programme of energy efficiency,
  - Accelerate the development, dissemination and employment of affordable and cleaner energy efficiency and energy conservation technologies,
  - Recommend that international financial institutions' and other agencies' policies support countries to establish policy and regulatory frameworks that create a level playing field,
  - Support efforts to improve the functioning, transparency and information about energy markets with respect to both supply and demand,
  - Strengthen and facilitate, as appropriate, regional cooperation arrangements for promoting cross-border energy trade,
  - Implement transport strategies for sustainable development, and
  - Promote investment and partnerships for the development of sustainable energy efficiency, and multi-modal transportation systems.

12. As seen above, most of the issues resulting from unsustainable use and production of energy are implicitly dealt with in other areas of environmental law and thus in other chapters of this Training Manual. With regards to renewable energies, no comprehensive international regime is yet in place. This, however, does not derogate from the great importance to be attached in this source of energy particularly to the developing world. For the purposes of this Manual, this chapter will consequently mainly deal with nuclear energy safety and introduce the Energy Charter Treaty, which is the only legally binding instrument

providing for inter-governmental cooperation in the energy sector. In the second part, examples of national legislation in the fields of renewable energies and energy efficiency will be discussed.

3. Nuclear Energy

Safety Risks Posed by Energy Use and Production

13. As seen above, the Brundtland Report identified public health and safety of energy use and production as one of the key elements of sustainability. This touches upon the issue of nuclear energy and nuclear safety.

> On 26 April 1986, as a result of a combination of factors, a sudden, uncontrollable surge in power took place at Unit 4 of the Chernobyl nuclear power plant, resulting in the destruction of the reactor and a fire in the graphite moderator. This caused a prolonged release of radioactive materials into the environment and was followed by further releases, associated with the high temperatures reached in the core, between day seven and ten after the initial event.
>
> Radioactive contamination affected the territories of 19 subjects of the Russian Federation, with a total population of over 30 million people. The area of these territories contaminated was more than 56 thousand square kilometres. Approximately 3 million people live in the contamination zone.
>
> Over an area of 3,000 hectares which received high doses, 25% to 40% of pine forests died, and 90% to 95% of the trees showed some damage to reproductive functions. Direct deposition from the Chernobyl plume occurred in rivers, lakes and seas. Livestock and farm animals in this exclusion zone were destroyed and buried. In the resettlement zone, where contamination levels are lower, it has still been necessary to suspend most agricultural activities.

14. The accident at the Chernobyl nuclear power plant was a major humanitarian catastrophe of the twentieth century. However, it was not the first such accident. In 1979, a malfunction in the cooling system at the Three Mile Island Nuclear Generating Station (Pennsylvania, USA) led to the most serious commercial nuclear accident in American history and paved the way for reforms in the way nuclear power plants are operated and regulated. As these accidents show, modern nuclear technology creates unavoidable risks for all states, whether or not they choose to use this form of energy. Nuclear installations are potentially hazardous undertakings whose risk to health, safety and the environment is best met by regulation. Since the consequences of failure may cause injury or pollution damage to other states and the global environment, international regulation, the setting of common standards, supervised by international institutions, offers the best means of ensuring a generally accepted minimum level of environmental protection.

15. The International Atomic Energy Agency ("IAEA") was established in 1956, in response to the deep-rooted fears and great expectations resulting from the discovery of nuclear energy. Originally, IAEA's main task was to encourage and facilitate the development and dissemination of nuclear power, ensuring that nuclear power is used for peaceful purposes only. To set standards for health and safety in collaboration with other international agencies was a secondary responsibility. The Chernobyl accident, however, resulted in a significant alternation of the IAEA's priorities. The IAEA provided the main forum for consideration of measures made necessary by the accident. The IAEA thus should promote better exchanges of information among states on safety and accident experience, develop additional safety guidelines and enhance its capacity to perform safety evaluation and inspections on request.

II. International Framework

1. International Legal Regimes: Nuclear

a) Convention on Early Notification of a Nuclear Accident

16. The Convention on Early Notification of a Nuclear Accident ("1986 Nuclear Accident Convention") was adopted and entered into force in 1986, following the Chernobyl nuclear plant accident. It establishes a notification system for nuclear accidents that may potentially be of radiological safety significance for another state. The 1986 Nuclear Accident Convention requires states to report the accident's time, location, radiation releases, and other data essential for assessing the situation. Notification is to be made to affected states directly or through the IAEA, and to the IAEA itself. Reporting is mandatory for any nuclear accident involving facilities and activities listed in article 1. Pursuant to article 3, states may notify other accidents as well. The five nuclear-weapon States (China, France, Russia, the United Kingdom, and the United States) have all declared their intent to also report accidents involving nuclear weapons and nuclear weapons tests.

b) Convention on Assistance in the Case of a Nuclear Accident Emergency or a Radiological Emergency

17. The Convention on Assistance in the Case of a Nuclear Accident Emergency or Radiological Emergency ("1986 Nuclear Emergency Convention") was also adopted following the Chernobyl nuclear plant accident and entered into force in 1987. The 1986 Nuclear Emergency Convention sets out an international framework for cooperation among states parties and with the IAEA to facilitate prompt assistance and support in the event of nuclear accidents or radiological emergencies. The Convention requires states to notify the IAEA of their available experts, equipment, and other materials for providing assistance. In case of a request, each state party decides whether it can render the requested assistance as well as its scope and terms. Assistance may be offered without costs taking into account, *inter alia*, the needs of developing countries and the particular needs of countries without nuclear facilities. The IAEA serves as the focal point for such cooperation by channeling information, supporting efforts, and providing its available services.

c) Convention on the Physical Protection of Nuclear Material

18. The Convention on the Physical Protection of Nuclear Material ("1979 Nuclear Material Convention") entered into force in 1987. The 1979 Nuclear Material Convention obliges Contracting states to ensure during international nuclear transport the protection of nuclear material within their territory or on board their ships or aircraft. At the first Review Conference in 1992 the parties considered, in particular, that the 1980 Nuclear Material Convention provides an appropriate framework for international cooperation in protection, recovery and return of stolen nuclear material and in the application of criminal sanctions against persons who commit criminal acts involving nuclear material.

d) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

19. The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ("1997 Joint Safety Convention") was adopted in 1997, and entered into force in June 2001. The 1997 Joint Safety Convention is the first international instrument that deals with the safety of management and storage of radioactive waste and spent fuel in countries with and without nuclear programme. The Convention also considerably elaborates on the existing IAEA nuclear safety regime and promotes international standards in the area. The 1997 Joint Safety Convention is aimed at achieving and maintaining a high level of safety in spent fuel and radioactive waste management, ensuring that there are effective defenses against potential hazards during all stages of management of such materials, and preventing accidents with radiological consequences. The Convention covers the safety of spent fuel and radioactive waste management from civilian applications. It also applies to the management of military or defense-originated spent fuel and radioactive waste if and when such materials are transferred permanently to and managed within exclusively civilian programme.

20. The 1997 Joint Safety Convention calls upon the contracting parties to review safety requirements and conduct environmental assessments, both at existing and proposed spent fuel and radioactive waste management facilities. It provides for the establishment and maintenance of a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management. The 1997 Joint Safety Convention establishes rules and conditions for the transboundary movement of spent fuel and radioactive waste that, *inter alia*, require a state of destination to have adequate administrative and technical capacity and regulatory structure to manage spent fuel or radioactive waste in a manner consistent with the Convention. It obligates a state of origin to take appropriate steps to permit re-entry into its territory of such material if a transboundary movement cannot be completed in conformity with the Convention.

21. The 1997 Joint Safety Convention provides for a binding reporting system that will address the measures taken to implement obligations under the Convention, including reporting on national inventories of radioactive waste and spent fuel. Each contracting party shall take, within the framework of its national law, the legislative, regulatory, and administrative measures and other steps necessary to implement its obligations under the 1997 Joint Safety Convention. In the event of a disagreement between two or more contracting parties concerning the interpretation or application of the Convention, the contracting parties shall consult within the framework of a Meeting of the Parties ("MOP") with a view to resolving the

disagreement. In the event that the consultations prove unproductive, recourse can be made to the mediation, conciliation and arbitration mechanisms provided for in international law, including the rules and practices prevailing within the IAEA.

e) The Convention on Nuclear Safety

22. The Convention on Nuclear Safety ("1994 Nuclear Safety Convention") entered into force in 1996. The 1994 Nuclear Safety Convention's aim is to legally commit participating states operating land-based nuclear power plants to maintain a high level of safety by setting international benchmarks to which states would subscribe, and to maintain a high level of nuclear safety in civil nuclear power plants and related facilities to protect individuals, society and the environment from harmful radiation and to prevent or mitigate accidents.

23. The 1994 Nuclear Safety Convention reaffirms that responsibility for nuclear safety rests with the state having jurisdiction over a nuclear installation. The Convention requires each party to establish and maintain a national legislative and regulatory framework for the safety of nuclear installations, which includes a system of licensing. The Preamble calls for a "commitment to the application of fundamental safety principles for nuclear installations rather than of detailed safety standards."

24. The obligations of the parties are based, to a large extent, on the principles contained in the IAEA Safety Fundamentals document "The Safety of Nuclear Installations." These obligations cover, for example, siting, design, construction, operation, the availability of adequate financial and human resources, the assessment and verification of safety, quality assurance and emergency preparedness.

25. Parties are also required to take 'appropriated steps' to ensure that

    - Safety at nuclear plants is given due priority,
    - Levels of trained staff are adequate;
    - Quality assurance programmes are established;
    - Comprehensive and systematic safety assessments are carried out periodically;
    - Radiation exposure is as low as reasonable achievable; and
    - Emergency plans are prepared.

26. The 1994 Nuclear Safety Convention is an incentive instrument. It is not designed to ensure fulfillment of obligations by parties through control and sanction but is based on their common interest to achieve higher levels of safety, which will be developed and promoted through regular Meetings of the Parties ("MOP"). The Convention obliges parties to submit reports on the implementation of their obligations for "peer review" at MOPs to be held at the IAEA. This mechanism is the main innovative and dynamic element of the 1994 Nuclear Safety Convention.

2. International Cooperation on Energy

a) The Energy Charter Treaty

27. After the nuclear catastrophe at Chernobyl and in the presence of other unsafe nuclear power plants in the former Soviet Union and other central and Eastern European states, Western countries in Europe have become strongly interested in the development of energy and nuclear energy in Eastern Europe. Furthermore, the competing interests of the necessity to import fossil fuels and the need to remain independent from foreign powers stimulated East/West interstate cooperation in Europe.

28. The 1994 Energy Charter Treaty was adopted in 1994, and entered into force in 1998. As of November 2005 the 1994 Energy Charter Treaty has 46 parties. The Treaty was developed on the basis of the European Energy Charter of 1991. Its main purpose is the guaranteed delivery of fossil fuels from the East to the West by means of investment protection, liberal trade connections, transit facilities and dispute settlement. The fundamental aim of the 1994 Energy Charter Treaty is to strengthen the rule of law on energy issues, thus minimizing the risks associated with energy related investments and trade. The 1994 Energy Charter Treaty is the only one legally binding multilateral instrument dealing specifically with inter-governmental cooperation in the energy sector. The treaty focuses on several areas:

    - Protection and promotion of foreign energy investments,
    - Free trade in energy materials,
    - Freedom for energy transit for pipelines and grids,
    - Reducing the negative impact of energy cycle through improving energy efficiency, and
    - The mechanisms for the resolution of State-to-State or Investor-to-State disputes.

29. Environmental issues, including energy efficiency, are limited to article 19, which reads in pertinent part:

1994 Energy Charter Treaty
Article 19

(1) In pursuit of sustainable development and taking into account its obligations under those international agreements concerning the environment to which it is party, each Contracting Party shall strive to minimize in an economically efficient manner harmful Environmental Impacts occurring either within or outside its Area from all operations within the Energy Cycle in its Area, taking proper account of safety. In doing so each Contracting Party shall act in a Cost-Effective manner. In its policies and actions each Contracting Party shall strive to take precautionary measures to prevent or minimize environmental degradation. The Contracting Parties agree that the polluter in the Areas of Contracting Parties, should, in principle, bear the cost of pollution, including transboundary pollution, with due regard to the public interest and without distorting Investment in the Energy Cycle or international trade. Contracting Parties shall accordingly:

"[...[

(d) have particular regard to Improving Energy Efficiency, to developing and using renewable energy sources, to promoting the use of cleaner fuels and to employing technologies and technological means that reduce pollution.

[...]"

30. Improving Energy Efficiency is defined in article 19(3)(c) as "...acting to maintain the same unit of output (of a good or service) without reducing the quality or performance of the output, while reducing the amount of energy required to produce that output."

    Unfortunately, the wording of article 19 is phrased in a non-binding form. There is no possibility of international enforcement of any of these obligations and adherence by contracting parties can be regarded as discretionary. Furthermore, it is indicated that such environmental obligations are only secondary to economic considerations. Thus, each contracting party must strive to minimize harmful environmental impacts "in an economically efficient manner".

b) The Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects ("PEEREA")

31. The Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects ("1994 PEEREA") was added to the 1994 Energy Charter Treaty and was drawn up as a declaration of political intent to promote East-West energy cooperation. As of November 2005 it has 46 parties.

32. 1994 PEEREA requires its parties to formulate clear policy aims for improving energy efficiency and reducing the energy cycle's negative environmental impacts. These obligations are contained in articles 3, 5 and 8. Article 3 requires the parties to develop and implement energy efficiency policies, laws and regulations, while article 8 states that each party shall develop, implement and regularly update energy efficiency programmes best suited to its circumstances.

33. The major parts of article 3 read as follows:

"[...]
(2) Contracting Parties shall establish energy efficiency policies and appropriate legal and regulatory frameworks which promote, inter alia:
(a) efficient functioning of market mechanisms including market-oriented price formation and a fuller reflection of environmental costs and benefits;
(b) reduction of barriers to energy efficiency, thus stimulating investments;
(c) mechanisms for financing energy efficiency initiatives;
(d) education and awareness;
(e) dissemination and transfer of technologies;
(f) transparency of legal and regulatory frameworks.
[…]
(3) Contracting Parties shall strive to achieve the full benefit of energy efficiency throughout the Energy Cycle. To this end they shall, to the best of their competence, formulate and implement energy efficiency policies and cooperative or coordinated actions based on Cost-Effectiveness and economic efficiency, taking due account of environmental aspects.
[...]"

34. Through the implementation of 1994 PEEREA, the 1994 Energy Charter Treaty provides economies in transition with a menu of good practices and a form in which to share experiences and policy advice on energy efficiency issues with leading OECD states. Within this form, particular attention is paid to certain aspects of national energy efficiency strategy, such as taxation, pricing policy in the energy sector, environmentally related subsidies and other mechanisms for financing energy efficiency objectives.

35. The development of 1994 PEEREA is currently focused on a series of in depth energy efficiency reviews, designed to produce concrete recommendations for individual governments concerning ways of improving their national energy efficiency strategies. To date, such reviews have been conducted in Slovakia, Lithuania, Poland, Hungary, Bulgaria and Romania.

III. National Implementation

1. Republic of Korea

36. Over the past 30 years, the Republic of Korea has sustained rapid economic growth, which has transformed the country from an agrarian society into the industrialized middle-income nation it is today. As the Republic of Korea has no significant energy sources, it has had to import almost all energies from abroad to fuel the growing economy. Therefore, energy efficiency and conservation, together with a stable supply of energy, has had the utmost priority in the Republic's energy policies. In the wake of the second world oil shock, Republic of Korea established the Ministry of Energy and Resources in 1978 (now incorporated into Ministry of Trade, Industry and Energy ("MOTIE")), to administer the planning and enforcement of national energy policies. The Republic of Korea also promulgated the Rational Energy Utilization Act ("REUA") in December 1979, to ensure energy security in an emergency and promote energy efficiency and conservation.

37. The Republic of Korea's energy conservation programmes and activities as introduced below are based on the REUA. They have been put into action by the Republic of Korea Energy Management Corporation ("KEMCO"), established in 1980. KEMCO acts as the national energy efficiency center and is responsible for the implementation of national energy efficiency and conservation programmes.

a) Energy Conservation Policy

38. Every five years, the Minister of MOTIE drafts the Basic National Energy Plan and the Basic Plan for Rational Use of Energy. The latter is reviewed and assessed by the National Energy Conservation Promotion Committee, which is comprised of not more than 25 members and headed by the prime minister. On the basis of these national plans, the heads of the authorities concerned and city/province governors draft the Action Plan for Rational Use of Energy.

b) Policy Objectives

39. Based on the 1997 Basic Plan for Rational Use of Energy, the Republic of Korea's energy conservation policy objectives and directions are to:

- Improve trade deficit by reducing energy imports;
- Strengthen industrial competitiveness by reducing production costs resulting from reduced energy use;
- Contribute to global environment protection by minimizing CO_2 emissions;
- Enhance efficiency in the whole energy flows of production, distribution and consumption to develop an energy-efficient socio-economic structure;
- Strengthen Demand-Side Management ("DSM") in power sector;
- Best use market mechanism to encourage energy efficiency investments;
- Intensify regulations to an appropriate level in key areas (including energy efficiency standards of the energy equipment and appliances);
- Foster an energy and resource-saving lifestyle by raising energy conservation awareness, adjusting energy price levels properly, and the like; and
- Strengthen international cooperation.

c) Major Energy Efficiency and Conservation Programmes

40. Over the past 20 years, the government of the Republic of Korea has made concentrated efforts to foster energy-intensive industries such as iron and steel, petrochemicals and machinery. This has led the industrial sector to account for more than half the nation's total energy consumption. The government has extensive energy efficiency programmes particularly aimed at these energy-intensive industries.

41. Article 25 authorizes the Minister of MOTIE to designate some heavy energy users as Energy Management-Required Users who must report to the government their annual production, energy facilities, equipment, annual energy use, and corporate energy conservation plan along with the results of implementing the previous year's plan. Two hundred specially identified companies account for approximately 50 % of the total industrial energy use. The specially identified companies are required to set up and implement their own 5-year Corporate Energy Conservation Plan. The Minister of MOTIE may announce Energy Management Guidelines to be adopted by heavy energy users.

d) Energy Audits and Technical Support

42. Article 30 states that the Minister of MOTIE may order the energy users to have an energy audit by the designated institution if a need is established by the Korean government's energy management guidance. Energy audits have been conducted mainly by KEMCO since 1980. KEMCO offers a fee-based detailed audit called a technical service

audit for large companies and a free audit for small and medium companies. Identified energy-saving measures are recommended coupled with technical assistance.

43. Article 35 instructs energy users to try to recover and utilize waste heat produced in their workplace or to help other third companies utilize it. The Korean government furthermore supports energy service companies by providing them with relevant information on new commercializable energy efficiency technologies, financial and taxation incentives and by holding relevant seminars in an attempt to induce investments in energy efficiency and conservation through third party financing.

e) Financial and Taxation Assistance to Energy Efficiency Investments

44. Since 1980, the government of the Republic of Korea has provided long term and low interest rate loans for energy efficiency and conservation through the Fund for Rational Use of Energy. Every fiscal year, a given amount is allotted to the eligible loan applicants. Loans are provided among others for research and development, installation of energy conservation facilities. The Korean government also offers tax credit for energy efficiency. Replacement of inefficient industrial furnaces and kilns, installation of cogeneration facilities, alternative fuel-using facilities and other facilities that are assessed to achieve more than 10% of energy saving are all qualified for a 5% income tax deduction both for domestic and foreign products.

f) Regional Energy Planning

45. Every five years, all local governments are required to make and implement their own regional energy plan suitable for the geographical and socio-economic needs and conditions of their respective regions and in tune with the Basic National Energy Plan. KEMCO provides training and education to the local governmental and produces a guidebook on the fundamentals of regional energy.

g) Energy Impacts Assessment on Energy-intensive Projects

46. Articles 8, 9, 10 and 11 provide for a reporting and consultation system of large-scale, energy-intensive projects. If a governmental or public institution desires to carry out a high energy-consuming project such as urban development projects, energy resources development projects, industrial site or complex preparation projects, port and railroad construction projects, airport complex construction projects or tourist complex development projects, the institution should set up an energy use plan and ask MOTIE for consultation before execution of the project. If a private organization desires to execute projects that are estimated to consume energy in excess of a certain scale, the organisation should prepare an energy use plan and report it to KEMCO before it initiates the projects.

h) Demand-side Management

47. Because of growing difficulties in securing suitable sites and the huge investment capital for constructing new power supply facilities in the Republic of Korea today, DSM is progressively pursued. In July 1995, the government, through a revision of REUA in 1995, made it mandatory for all utilities to establish and implement a DSM investment plan on an annual basis and to report the plan and its implementation to the Korean government.

i) Management and Publication of Energy Statistics

48. The Minister of MOTIE should gather, analyze and manage domestic and foreign energy statistics and publish them, in order to use the information in establishing and implementing effectively the National Energy Basic Plan and related policy measures.

j) Public Awareness Programmes

49. On behalf of the Korean government, KEMCO engages in public campaigns. It produces and distributes films and leaflets and uses mass media such as television, radio, newspapers and to communicate its messages. KEMCO carries out joint activities with businesses and Non-Governmental Organizations to boost people's awareness and participation on a voluntary basis. KEMCO also organizes exhibitions and diverse cultural events on a regional basis to showcase successful energy conservation activities and projects.

k) Energy Equipment Efficiency Management: Standards and Labelling

50. Target Energy Performance Standards (“TEPS”) and Minimum Energy Performance Standards (“MEPS”) are currently applied to six items: electric refrigerators, air-conditioners, fluorescent lamps, lamp ballast, incandescent bulbs and passenger

cars. MEPS aim at expelling inefficient designs from the market, while TEPS are designed to encourage manufacturers to produce more energy-efficient goods.

51. Article 48 prescribes the labelling duty of the heat-using equipment manufacturers/importers. The label must contain specifications, performance and other features of the product. In addition, the Rating Labelling Programme provides the consumer with a relative ranking of the energy use of equipment and appliances. Product models are classed into one of five different grades, thus providing consumers with better information for decision making. Rating labelling is applied to electric refrigerators, electric air-conditioners, incandescent lamps, fluorescent lamps and fluorescent lamp ballast.

l) Inspection of Heat-using Equipment

52. Some kinds of heat-using equipment are to be inspected by the city/province governor during their manufacture, installation, re-installation, modification or replacement. Currently, six items (steel boiler, cast iron boiler, water heating boiler, pressure vessels group I, and metal heating furnace) in three categories of the heat-using equipment are subject to inspection.

m) Promotion of Research and Development of Energy Technologies

53. The government leads Research and Development ("R&D") activities in collaboration with industry, universities and research institutes. Priority projects are financed by the government budget and energy-related funds from the government and industry.

54. The Research and Development Center for Energy and Resources ("RACER") was founded as an affiliate of KEMCO in 1992, to take charge of managing the whole R&D process. At present, a 10-Year Energy Technology Development Plan is being implemented. This Plan focuses on the following three categories of energy conservation technologies:
    - Core technologies such as photovoltaic, solar thermal, fuel-cell and IGCC;
    - General technologies such as waste, bio, wind power and coal utilization technology; and
    - Basic technologies such as small hydro, ocean, hydrogen and geothermal.

55. Renewable Energy Technologies are regulated by the 1987 Alternative Energy Development Promotion Act. Under this Act, a Basic Plan for the Development of New and Renewable Energy Technologies was established in 1988. The Basic Plan sets out four phases for enhancing new and renewable sources of energy. Upon completion of the fourth phase by 2006, new and renewable sources of energy are planned to contribute 2% of total energy demand.

56. Currently, eight energy sources (solar, bio, waste, small hydro, wind, hydrogen, ocean and geothermal) and two related technologies (fuel cell and coal utilization technologies) are defined by the Alternative Energy Development Promotion Act as target technologies. RACER is responsible for managing R&Dfor new and renewable energy sources through selection, support, operation, evaluation and management of the research and development projects. RACER receives applications for research projects for the following year, selects the appropriate research projects and provides full funding to universities and research centers and a portion of the funding to private companies.

2. Germany

57. Worldwatch Institute stated in the 2003 edition of its "State of the World" report:

> When the 1990s began, Germany had virtually no renewable energy industry, and in the view of most Germans the country was unlikely ever to be in the forefront of these alternative energy sources. … Yet by the end of the 1990s, Germany had been transformed into a renewable energy leader. With a fraction as much potential in wind and solar power as the United States, Germany has almost three times as much installed wind capacity (more than one third of total global capacity) and is a world leader in solar photovoltaics as well. In the space of a decade, Germany created a new, multibillion-dollar industry and tens of thousands of new jobs. This metamorphosis provides helpful lessons for the scores of countries that have not yet determined how to unleash the potential of their own indigenous renewable energy sources.

58. The promotion of renewable energies started in 1998, with the promulgation of Germany's Renewable Energy Act. The Act has quadrupled the amount of electricity produced and fed into the public grid from regenerative sources. It has