



Science Forum: Research and Education as a Basis for the Wide-spread Employment of Renewable Energies

1st June 2004

Sustainable future only with R&D on renewable energies

Sustainable development is inevitably connected with Research and Development (R&D) on renewable energies. Therefore, the Solar Energy Research Association (ForschungsVerbund Sonnenenergie) is hosting a Science Forum in the context of the renewables 2004 conference in Bonn (Germany) on the 1st of June. Prof. Dr. Jürgen Schmid, scientific manager of the Science Forum, emphasises: "Research and development enable cost reductions, and they are pre-requisites for access to modern energy and for poverty reduction. The renewable energy technologies have to be adapted to the diverse conditions of the countries in the world; and the knowledge about the utilisation of renewable energies must be made available through a world-wide education process."

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Energy R&D needs a global perspective

R&D are pre-requisites for the evolution of global civilisations towards sustainability in its various aspects: New technologies have to be developed. For existing renewable energy technologies cost reductions have to materialise. Additionally, sociological and economic issues for integrating renewable energies into energy supply structures have to be investigated and taken into account. Country-tailored approaches are therefore an essential element of research planning.

Research requirements have to be well-analysed in respect of time and place. For some countries, it might be beneficial to work primarily on the adaptation of existing technologies to local needs. For some countries it appears to be advantageous to develop novel high-technologies.

BMBF strengthens renewable energy research

Dr. Hermann Schunck, head of the Department Research at the German Ministry of Education and Research (BMBF), states that the BMBF strengthens renewable energy research by supporting basic and applied research in science, engineering, economics, social sciences and other areas. BMBF supports multidisciplinary research on renewable energy sources by funding National Research Centres and project networks. Dr. Schunck underlines the need for additional targeted research and development with particular emphasis on affordability and reducing cost, on innovative business and financing models and on cost-effective, consumer-friendly cost-recovery models, recognizing that different renewable technologies offer different opportunities and face different constraints.

Education of experts on all levels

For a successful deployment of renewable energies, education and training is a key element. There is a lack of appropriate educational material, in developed countries as well as in developing countries. By means of modern communication structures, it is possible to improve information transfer and education in this field very efficiently.

During the Science Forum existing initiatives will be presented and discussed. Recommendations on the set-up of an international network in research, education and training will be discussed.

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UNESCO fosters Education Networks to build up capacities

In 1997 the UNESCO established the "Global Renewable Energy Education and Training" (GREET programme) which aims at improving the use, maintenance and management of renewable energy projects and programmes, as well as transfer of technological know-how. Beside UNESCO the international organizing partners are UNDP and the European Commission, as well as institutions and organisations at the national and regional level.

Prof. Walter Rudolf Erdelen, UNESCO Assistant Director, states: "To achieve the Millennium Developmental targets, UNESCO will continue to advocate for renewable energies, capacity-building, and development of competent human resources with emphasis on improving the living conditions in rural areas of poor countries, especially in the developing countries and small Island States, particularly for women, young people, and girls, and facilitating the extension of learning opportunities. In the years 2004-2005 the UNESCO's GREET programme will involve the design and field implementation of training platforms, elaboration and dissemination of learning and teaching tools, the introduction of training programmes at the various educational levels, the establishment of educational standards and the certification of centres of excellence, which will serve as a catalyst. Concurrently, support will be given to the formulation of national energy strategies and experimentation of pilot projects aiming at developmental purposes."

According to Erdelen, the UNESCO has also launched the European Network on Education and Training in Renewable Energy Sources (EURONETRES) established as a regional voluntary framework, uniting universities and other educational academic institutions of the European countries, interested in capacity building at national and regional level for the extended use of RES in Europe as well as in other regions of the world. Similar regional networks for Africa, Latin America and the Caribbean region as well as other regions are planned to be launched during the current biennium 2004-2005.

In conclusion, Erdelen heads the following call: "UNESCO invites all Governments and concerned institutions to joint efforts and partnership for the implementation of this initiative related to the human resources development and networking. Furthermore we aim at enabling actors in this specific area to share investment costs for research and education as well as outcome."

BMU strengthens communication link between science and politics

Rainer Hinrichs-Rahlwes, Director General within the German Federal Ministry for the Environment (BMU), announces that the BMU will strengthen renewable energy research: "At present the research programme comprises annual funds of EUR 65 million and is aiming at driving the high level of technological innovation in the photovoltaics, offshore wind energy and concentrating solar power stations. The support focuses on projects carried out by private enterprises and academic institutions as joint ventures, and on accompanying socio-ecological research, in order to sustain the use of renewable energies. Environment and climate have one thing in common with the sciences: national borders become more and more meaningless."

Furthermore Hinrichs-Rahlwes adds: "It is important that the political implementation of a sustainable energy system with a steadily increasing share of renewable energies receives continuous support through independent scientific research and promoting awareness. It is essential to shift this scientifically based knowledge into various options for action as a basis for policy-making bodies to adopt preventive strategies and bring existing policies into line with new challenges."

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For that purpose a global science network with a policy mission, an "International Science Panel on Renewable Energy (ISPREE)", composed of universities and research institutes, shall be established. The ISPREE will be charged with analysing and evaluating global R&D activities in the field of renewable energies. ISPREE shall be initiated at the conference renewables 2004 aiming at manifold support from various institutions, with a small secretariat to set up the initial phase. Other countries as well as research institutes are invited to participate actively. This panel will function as a vital link between the scientific community and political decision makers."

Active role of UN for a strategic research and development

R&D activities in developing countries are quite limited, and it is evident that only a small number of the larger countries have real R&D programmes on renewable energy technologies in place. Thus it is necessary to build up R&D programmes fostered by the UN including the many smaller countries that are in need of renewable energies but yet not able to invest in R&D. A strategic global fund for R&D on renewable energies should be established perhaps within the UN system.

Alarming global trend in R&D expenditure

From 1974 to 1998 in the twentythree IEA-Member countries only a 10% share of the respective budget was spent on renewable energies, while about 70% of the energy related expenditure was spent on nuclear fission and fusion. The overall energy R&D expenditure peaked in 1980. Since then it has been continuously declining to less than half its maximum level. (Fig. 1 and 2) Since less investment means less innovations, this global trend of cutting energy-related R&D funds is in clear contrast to the importance of the energy sector for evolution in general and especially to the ever-rising importance of renewable energies. In order to give renewables the necessary support, the average direct state expenditure for R&D in the renewable energy sector in industrialised countries have to increase at least ten-fold until 2020. At the same time, significant international support must also be directed to R&D in developing countries.

Goals of R&D

Both non-technical and technological R&D on renewable energies are essential for the evolution of the energy sector towards sustainable schemes.

The wide span of interrelated R&D challenges includes e.g.:

- R&D on non-technological aspects (economic, sociological, political)
- R&D on renewable energies for electricity production
- R&D on renewable energies for the production of heating and cooling energy
- R&D on solar and energy optimised buildings
- R&D on renewable energies for fuel production
- R&D on comprehensive technological aspects

In all these fields two main approaches must be followed:

1. New technologies have to be developed in some areas. Three examples: biogenic-energy carriers for a decentralised supply of storable energy, low-cost energy efficient houses, storage technologies for high quality energy.
2. Cost reductions for existing renewable energy technologies have to materialise. This includes: higher efficiencies of energy conversion, longer service life of technical components, less maintenance, less material consumption.

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Renewable Energies need politically supported markets

Modern energy and its sustainable provision is necessary for nearly all fields of development. Most renewable energy technologies are local, they can start locally based value chains, renewable energies and related knowledge-based services generate income, improve the environment as well as health situation, and foster education in developing countries. As such renewable energies help to reduce poverty and build up capacity. The Science Forum contributes to the development of a strategy how to produce new knowledge and how to disseminate it most widely in industrialized as well as developing countries.

A significant time lag between R&D and market launch must be considered. R&D on renewable energies is therefore a strategic field of research and industry policy which is inadequately steered and supported at present. Governance following the logic of political management, on the one hand and self organised processes following the logics of markets, on the other hand must complement one another.

Internet based education

Properly managed, internet-based dissemination, education and training will provide a huge support for renewable energy deployment for a relatively small effort in budget and hardware.

Internet-based education can be realized directly by interactive procedures, but knowledge transfer into different cultures may need special preparation in addition to simple translation.

Based on modern IC-technologies, dissemination to an unlimited amount of users is possible. It can also be made affordable for those having no access to conventional educational materials such as books and journals.

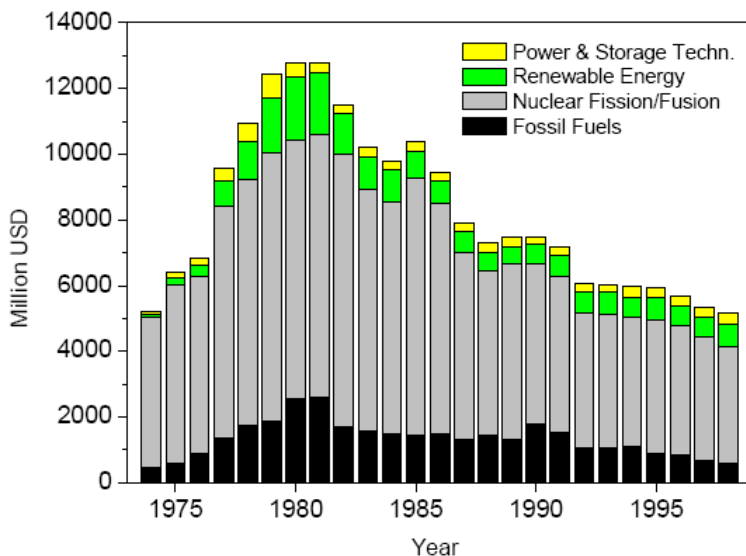
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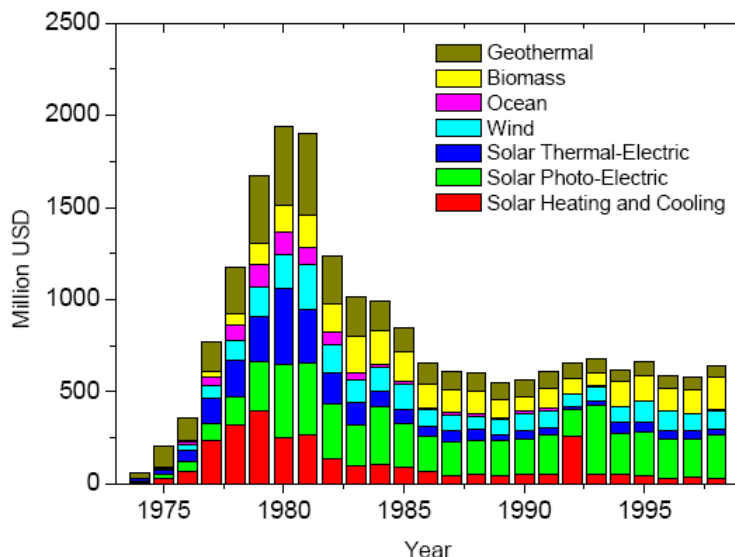
Figur 1:
Public RD&D Budgets of 23 IEA member countries for selected fields of energy related research



Only 10% of the energy-related expenditure was spent on renewable energies, while about 70% was spent on nuclear fission and fusion. The overall energy R&D expenditure peaked in 1980 and has continuously been declining to less than half its maximum level since then.

Source: IEA Energy Technology R&D Statistics Service

Figure 2:
Budgets of 23 IEA-member countries for Research on Renewable Energies



RD&D expenditure on renewable energies follows the trend in regressing overall RD&D expenditure on energy: It peaked in 1980 and has since declined to about one third of its maximum level.

Within the overall renewable energy RD&D budget, biomass and photovoltaics show a trend to rising proportions, while the other sectors remain on a constant or slightly decreasing relative level.

Source: IEA Energy Technology R&D Statistics Service

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