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International Open University for Renewable Energies (OPURE)

One of the major results of the international conference for renewable energies in Bonn is the initiative for an International Open University for Renewable Energies (OPURE). The memorandum of the World Council for Renewable Energy (WCRE) of their conference, 29th to 31st May, Bonn, renewed the proposal, originally stemming from EUROSOLAR, at the World Renewable Energy Forum, held in Bonn in the days before the renewables2004, and put it in the focus of attention.

During the renewables2004, the Solar Energy Research Association (ForschungsVerbund Sonnenenergie, FVS) organised the Science Forum, funded by the Federal Ministry for Education and Research (Bundesministerium für Bildung und Forschung, BMBF), as an official side event. In the final panel discussion Hermann Schunck, representative of the BMBF, indicated, when approached by the chairperson of EUROSOLAR Germany Hans-Josef Fell, the willingness of Federal Minister Edelgard Bulmahn to financially support the start up of the university for renewable energies.

This was an important signal, initiating many talks and activities during the Bonn conference in order to start the foundation process. The initiative mainly came from FVS's vice spokesman Jürgen Schmid, director of the Institute for Solar Energy Research (Institut für Solare Energieforschung, ISET) in Kassel, MoP Hans-Josef Fell, chairperson of EUROSOLAR Germany, and Osman Benchikh, UNESCO, Paris.

Fortunately, the Call for Actions of the renewables2004 responded immediately and accepted to include OPURE in the International Action Plan, one major outcome of the international conference.

The name OPURE stands for Open University for Renewable Energy. This name indicates that

the university will be organised initially as an internet platform. The long term goal, though, is to transform the internet university into an ordinary university. Most important mission of the university will be generally speaking: the exchange of know-how, education and training, and networking of renewable energy research.

All national as well as international institutions can be participating actors, particularly those which are universities, research centres, and institutions specialised in renewable energy research.

For the time being, the foremost task of OPURE will be to organise the exchange of information, communication and cooperation in science and research for renewable energies. At the centre of activities will be training programmes on all levels of education, translated in as many languages as possible, programmes for research and development, the exchange of results of most recent research as much as the development of national strategies and policy tools for renewable energies.

Thus, the Bonn conference signalled other Governments, the private sector, and NGOs to contribute to the financing of OPURE.

Under the roof of UNESCO's active support to coordinate individual activities soon and global acceptance will be achieved.

Now, it is necessary to elaborate a realistic concept for which the BMBF will provide the funds as promised. A such concept will be worked out by and in the responsibility of Prof Schmid and the FVS in the next weeks. EUROSOLAR will continue to actively support that process.

Nationally as internationally the idea has received great attention. Many institutions,



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universities, or other educational organisations have already stated that they were interested to participate in OPURE, approaches have been coming even from China and Brazil.

It is remarkable that the German parliamentary committee for education and research has made the decision to support OPURE in their first session immediately after the renewables2004 and that all parties agreed on this question unanimously. And last but not least, this decision proves that the proposals of EUROSOLAR and of the FVS receive wide support from all sections of society, in politics and science.

International Organisations Concerned with Energy Issues

AFREPREN (SF chair Kithyoma)

African Energy Policy Research Network

Network of more than 100 energy researchers in Africa who conduct technological research as well as policy research to provide policy makers with information and recommendations.

Leading actor in → [GNESD](#) for the subject of access to energy.

BEE

Bundesverband Erneuerbare Energien/ German Renewable Energy Federation

Lobbying for renewable energies, coordinating activities of members, providing policy makers with expertise and studies on renewable energies.

CENERG (SF speaker Mayer)

Centre d'Énergétique

Conducting research on the environmental impacts of human made technologies of energy supply and conversion.

Belongs to École des mines, Paris.

CRS (SF speaker Hamrin)

Center for Resource Solutions

Independent research institution. Fostering human capacity building for sustainable technologies and international leadership in sustainability to meet economic, environmental, and cultural needs. Disseminating knowledge, promoting demonstration projects.

CSIR (SF speaker Mongameli)

Council for Scientific and Industrial Research

Conducting research on the context of labour, environment, and man, and disseminating knowledge. (South Africa)

Member of → [GRA](#).

DAAD

Deutscher Akademischer Austauschdienst/ German Academic Exchange Service

promotes financially and in various programmes the exchange of foreign academic staff and students coming to Germany and German academic staff and students going abroad.

Funded by German Federal Government.

DLR

Deutsches Zentrum für Luft- und Raumfahrt/German Aerospace Center

Conducting research among others on thermal solar power, fuel cells, and system technology.

Member Institute of → [FVS](#).

ERC

Energy Research Centre

Conducting policy research, consulting policy makers, building human capacity in Africa.

Member institute of → [GNESD](#), and other international cooperations.

EREC

European Renewable Energy Council

Umbrella organisation of European renewable energy industry and research associations, as for example → [EURECA](#).

EREF

European Renewable Energy Federation

Building a network of renewable energy producers and raising awareness in Europe.

Lobbying for feed-in systems, labels on electricity, levelling playing field.

Cooperates with UN organisations and European organisations devoted to renewable energies.

ESMAP

Energy Sector Management Assistance Program

Comprising all particularly energy focussed activities of the Worldbank.

Belongs to the Worldbank.

SF – Science Forum
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EUEI

European Union Energy Initiative

Aims to eradicate poverty and to promote sustainable development focussing on the role of energy. Disseminates knowledge. Builds capacity. Develops strategies. Works through partnerships with civil society, private sector, financial institutions, end users.

Secretariat within the EU Commission's DG Development, Type II partnership of the → **WSSD**. Funds coming from partners. Cooperates with NEPAD, GVEP, GNESD, UNDP, UNIDO Energy Initiative, GFSE

EUREC Agency (SF speaker Mayer)

European Renewable Energy Centres Agency

Disseminates knowledge, fosters contacts and cooperation between the scientific community and the industry as well as policy makers, develops strategies for R&D. Manages projects, promotes professionalisation of education and training. Cooperation of renewable energy R&D centres in Europe.

EURONETRES (SF speaker Kyritsis)

European Network on Education and Training in Renewable Energy Sources.

EUROSOLAR (SF panellist Fell)

Lobbies for renewable energies as basis for a sustainable development and for the mitigation of climate change. Produces studies, raises awareness.

Forschungszentrum Jülich

Research Centre Juelich

Member Institute of → **FVS**.

Fraunhofer ISE (SF speaker Luther)

Fraunhofer Institute for Solar Energy Systems

Member Institute of → **FVS**.

FUE

Forum Umwelt und Entwicklung /

Forum Environment and Development

Awareness raising for environmentally sustainable development.

Association of German development NGOs (VENRO) and German Nature Protection Circle (DNR), funded by the German Federal Ministry for Economic Cooperation (BMZ).

FVS (SF speaker Schmid, Luther, Lux-Steiner)

ForschungsVerbund Sonnenenergie /

Solar Energy Research Association

Coordination and cooperation of research on renewable energy technologies in networks in Germany.

Research association of nine independent research institutes carrying out research on renewable energies.

GEF

Global Environment Facility

Provides funds for environmental projects in developing countries, focusses under its climate programme on renewable energies. Partners with private sector, promotes market-oriented solutions. Aims to reduce costs, where high investment costs might hinder long term-developments of new technologies. Founded at the → **UNCED**. Run by → **Worldbank**, → **UNDP**, → **UNEP**, which are the implementing agencies.

GEPROP (SF speaker Curbelo)

Gerencia de Programas y Proyectos Priorizados del Ministerio de Ciencia, Tecnologia y Medio Ambiente

GFSE

Global Forum on Sustainable Energy

Multistakeholder platform for dialogue. Supports networks of donors, holders of technological know-how, project promoters from developing countries. Organises events, conferences, annual meetings.

Cooperates with EUEI. Funded by Austrian Government.

GFZ

GeoForschungsZentrum Potsdam

Member Institute of → **FVS**.

GNESD

(SF chair Christensen, SF speaker Pacudan)

Global Network on Energy for Sustainable Development

Network of 20 academic institutions of high excellence in the field of energy. Major foci on energy access and renewable energy. Promotes research on those topics, coordinates, builds capacity.

→ **UNEP** funds GNESD secretariat.

GRA (SF speaker Luther)**Global Research Alliance**

International research alliance of nine knowledge-intensive technology organisations from industrialised as well as developing countries. Aims to use resources of members efficiently in order to produce knowledge to the benefit of society at large. Energy is one of the research topics among others. Independent research association.

GREET (SF speaker Benchikh)**Global Renewable Energy Education and Training Programme**

Aims at training and education, and dissemination of information at global, regional, and national level. Develops ways of financing, and raises awareness. Programme of → UNESCO.

GTZ**Gesellschaft für Technische Zusammenarbeit / Society for Technical Cooperation**

German Organisation which carries out technical development assistance of the German Federal Government. Supports renewable energies and energy efficiency through capacity building, developing markets, disseminating knowledge, building of networks of relevant actors, and strategic consulting/analysing energy policies. Cooperates with private sector (public private partnerships), → EUEI, → GVEP.

GVEP**Global Village Energy partnership**

Promotes coordination of energy development projects in developing countries, managing relations of different actors. Originally funded by Worldbank and UNDP, in the meantime independent, secretariat decentralised at the moment.

HMI (SF speaker Lux-Steiner)**Hahn-Meitner-Institut Berlin**

Member Institute of → FVS.

IEA**International Energy Agency**

Agency of the OECD for all energy concerns of OECD as well as developing countries, not particularly for renewable energies. Belongs to OECD.

IEEU**Institute for Energy and Environment**

Conducting research on different environmental topics.

IIRE (SF speaker Rakwichian)**International Institute for Renewable Energy**

Develops human resources globally (capacity building), facilitates research on renewable energies and disseminates information on them (knowledge sharing) in order to meet the needs of a successful implementation of renewable energy technologies. Six founder universities, cooperation with/funding supposed to come from various international organisations.

IÖW (SF speaker Hirschl)**Institut für ökologische Wirtschaftsforschung / Institute for Ecological Economy Research**

Combining economic and environmental research questions, developing strategies for a sustainable economy, and providing expertise on evaluations of urban, transport and business developments.

IPCC**Intergovernmental Panel on Climate Change**

International scientific panel, which elaborates regular updates of conclusions on the knowledge about climate change and recommends necessary action. Independent scientific panel.

IRENA**International Renewable Energy Agency**

Proposed originally by the Brandt-Commission in their North-South-Report, 1980. In analogy to International Atomic Energy Agency, in order to support the technological transfer and dissemination of renewable energy technologies in developing countries, and to develop markets. German Bundestag decided that the Federal Government should take the initiative to found an IRENA.

ISFH**Institut für Solarenergieforschung**

Member Institute of → FVS.

ISET (SF speaker Schmid)**Institut für Solare Energieversorgungstechnik**

Member Institute of → FVS.

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ISES

International Solar Energy Society

Supporting the advancements of renewable energy technology, implementation, and education, to the benefit of sustainable development, a multisectoral global community. Disseminating knowledge and connecting actors in the field of renewable energies. Collaborates in international networks.

ISUSI (SF speaker Lehmann)

Institute for Sustainable Solutions and Innovations

Providing expertise in eco-evaluations and the elaboration of scenarios for the transition to a completely renewable energy based energy system.

JREC

Johannesburg Renewable Energy Coalition

First international leadership initiative, founded at the WSSD, consists of approximately 80 countries (EU and Small Island States), committed to promotion of renewable energies for a sustainable development and to stop climate change.

Secretariat at the EU Commission, Bruxelles.

REEEP

Renewable Energy and Energy Efficiency Partnership

Implementation-oriented initiative, which works through knowledge sharing and match-making of different partners whose resources complement each other.

Funded by UK, Spain, Austria, Netherlands, EU.

SEFI

Sustainable Energy Finance Initiative

Provides information, develops partnerships, facilitates networks. Organised by → UNEP.

SERT (SF speaker Rakwichian)

Solar Energy Research and Training Centre, Thailand

SESAM (SF speaker Rehling)

Sustainable Energy Systems and Management

International MSc course for the promotion and implementation of sustainable development strategies.

Partnership with UNDP/Nepal.

UNCED

United Nations Conference on Environment and Development

3 till 14 June 1992 in Rio de Janeiro:

→ UNFCCC, Rio Declaration on Environment and Development (raises the significance of the complementarity of human development and environmental sustainability), Agenda 21 (blueprint for (local) action towards global sustainability).

Belongs to the UN-system.

UNCSD

United Nations Commission on Sustainable Development

Founded at → UNCED to monitor and report on the follow-up process on local, national, regional, and global level. Organising sessions annually to particular topics of sustainability. The 9th session, 16–27 April 2001, was on energy, and established an Ad Hoc Inter-Agency Task Force on Energy for coordination and cooperation among UN agencies and programmes.

Belongs to the Division on Sustainable Development of the United Nations Department for Economic and Social Affairs (UNDESA)

UNDP (SF speaker Pacudan)

United Nations Development Programme

Organises the technical development assistance of the UN, supposed to coordinate development assistance within UN-system. Improves access to modern energy as a means of poverty reduction, considers sustainability goals through energy efficiency, renewable energy, low greenhouse gas-emitting technologies.

Belongs to the UN-system. Programme status implies that UNDP' funding depends on donations, no independent regular funding as an organisation has. Implementing institution of → GEF.

UNEP (SF speaker Pacudan)**United Nations Environment Programme**

Supposed to promote coherent implementation of policies regarding the environment within the UN-system. Works through analyses, dissemination of information, fostering international cooperation, providing policy advice, and serving as a link between scientific community and policy makers. Focusses on sustainable use of natural resources and the protection of the environment for a better human well-being. Belongs to the UN-system. Funded by the Environment Fund, made up of voluntary contributions. Launched the → SEFI, implementing institution of → GEF.

UNESCO (SF speakers Benchikh, Erdelen)**United Nations Educational, Scientific and Cultural Organization**

Promotes environmental research, free dissemination of information, and education for all as a means to human development and peace, protecting cultural and natural heritage. Belongs to the UN-system. Independent funding as status of an organisation.

UNFCCC**United Nations Framework Convention on Climate Change**

Negotiated at the → UNCED, amended by the Kyoto-Protocoll 1997.

UNIDO**United Nations Industrial Development Organisation**

Supports development of industrial capacities, and of cleaner and sustainable development. Belongs to the UN-system.

WBGU**Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen
Scientific Council of the Federal Government for Climate Change**

Expert group to the German Federal Government on questions of global change regarding environment and development. Regular reports with conclusions and recommendations for action and research.

WCRE**World Council for Renewable Energy**

Analyses potentials of and barriers to renewable energies, and disseminates information on best practices. Lobbies for policies to introduce renewable energies. Secretariat at EUROSOLAR.

WERCP**World Energy Research Co-ordination Programme**

Proposed by the WBGU, in analogy to World Climate Research Programme. Shall coordinate national research activities, and provide consulting. Possibly established within the UN-system.

WI**Wuppertal-Institute for Climate, Environment, Energy**

Exploring and developing strategies and models for a sustainable development on local, national, and international level. Conducting research on the interrelation of society, environment, and economy, in order to decouple the increase of wealth and the exploitation of natural resources.

Worldbank (IBRD)**International Bank for Reconstruction and Development**

Energy is part of the infrastructure vice-presidency, though there all over the Worldbank people concerned with energy topics. The environmentally sustainable access to modern energy for the poor is the goal, not particularly the transition to a renewable energy system. Since there is no particular energy department, the Worldbank has established → ESMAP. Implementing institution of → GEF.

WSSD**World Summit on Sustainable Development**

26 Aug till 4 Sep 2002 in Johannesburg. One of the major outcomes was the recognition of "type II partnerships", which comprise partnerships with the private sector. These partnerships may promote private investments in the development process and organise it closer to free markets. Four bigger energy-related partnerships: GVEP, GNEED, EUEI, REEEP.

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WWI

World Watch Institute

Research organisation. Works for social and environmental sustainability, provides information in order to encourage new lifestyles, investment patterns, and policies. Promotes renewable energies. Independent NGO.

ZSW

**Zentrum für Solar- und Wasserstoffforschung /
Centre for Solar and Hydrogen Research**

Conducting research in key technologies of future industries, like photovoltaics, battery/fuel cell technology, renewable fuels, energy systems.

Press Conference

The Solar Energy Research Organisation / ForschungsVerbund Sonnenenergie (FVS) has published a press release in cooperation with United Nations Educational Scientific and Cultural Organization (UNESCO) and the German Federal Ministries for Research and Education (BMBF) and for Environment, Nature Protection and Nuclear Safety (BMU). (See page 161).

On the 1st of June 2004 the FVS organized a press conference with the participating organisations to present the science forum to the public.

Participants:



UNESCO
Walter Rudolf Erdelen
Assistant Director-General for
Natural Sciences



BMU
Rainer Hinrichs-Rahlwes
Director General



BMBF
Hermann Schunck
Ministerialdirektor/Head of the
Department Research



FVS
Jürgen Schmid, ISET
Responsible for the scientific program
of the Science Forum

Press Release

Research and Education as a Basis for the Wide-spread Deployment of Renewable Energies

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."

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.

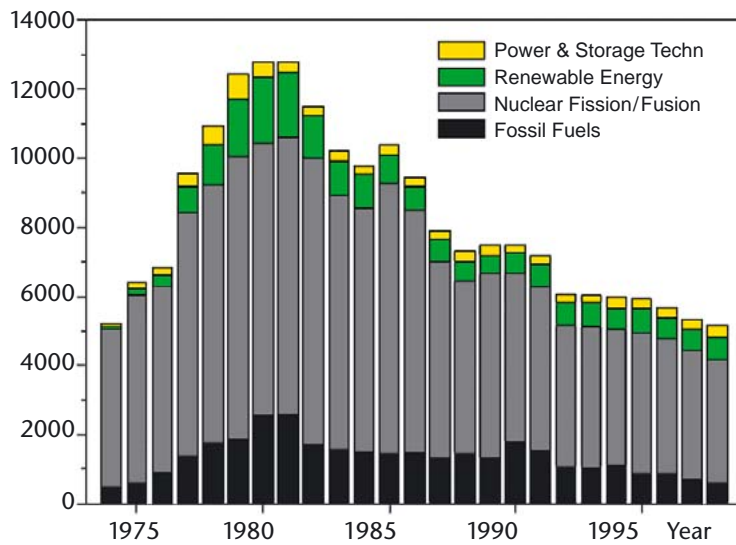
Education of experts on all levels

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

Press Release Partner:

UNESCO
BMU
BMBF
FVS



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

network in research, education and training will be discussed.

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

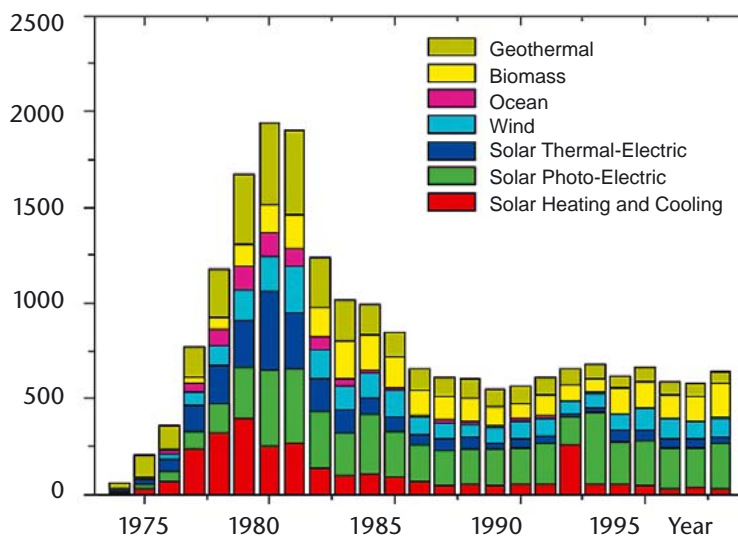
Rainer Hinrichs-Rahlwes, Director General within the German Federal Ministry for the Environment (BMU), announces that the BMU will strengthen renewable energy research: "At present the research programme comprises annual funds of EUR 65 million and is aiming at driving the high level of technological 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. For that purpose a global science network with a policy mission, an “International Science Panel on Renewable Energy (ISPRES)”, composed of universities and research institutes, shall be established. The ISPRES will be charged with analysing and evaluating global R&D activities in the field of renewable energies. ISPRES 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.



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 photo-voltaics 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

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.

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

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:

- 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.
- 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.

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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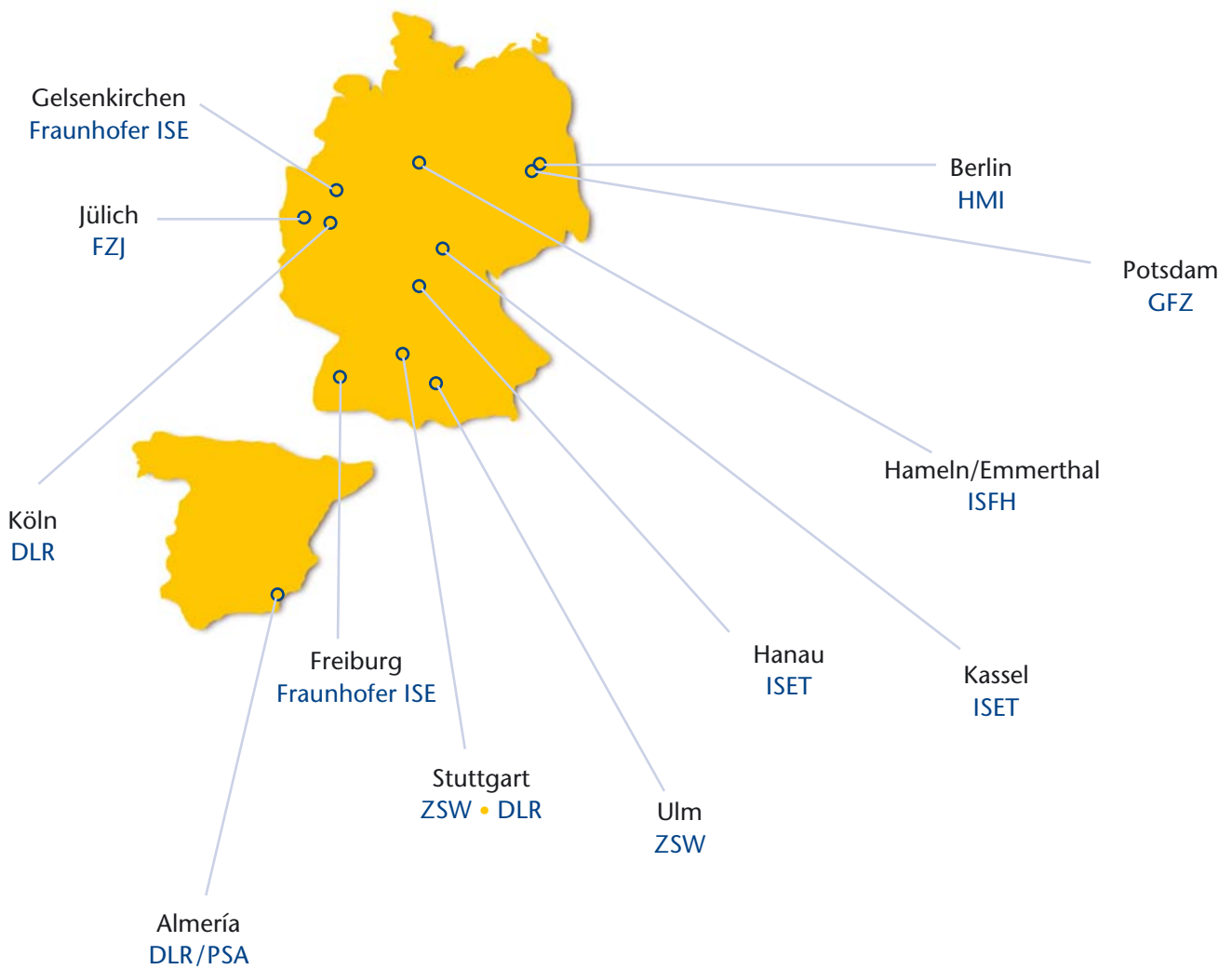
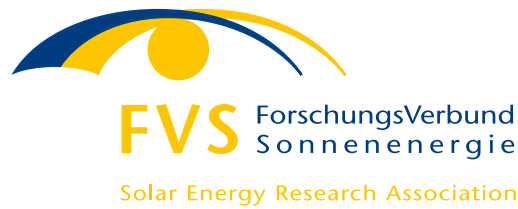
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