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Capacity Development, Education & Training

Integrated and sustained action is the key

Thematic Background Paper

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This is one of 12 Thematic Background Papers (TBP) that have been prepared as thematic background for the International Conference for Renewable Energies, Bonn 2004 (renewables 2004). A list of all papers can be found at the end of this document.

Internationally recognised experts have prepared all TBPs. Many people have commented on earlier versions of this document. However, the responsibility for the content remains with the authors.

Each TBP focuses on a different aspect of renewable energy and presents policy implications and recommendations. The purpose of the TBP is twofold, first to provide a substantive basis for discussions on the Conference Issue Paper (CIP) and, second, to provide some empirical facts and background information for the interested public. In building on the existing wealth of political debate and academic discourse, they point to different options and open questions on how to solve the most important problems in the field of renewable energies.

All TBP are published in the conference documents as inputs to the preparation process. They can also be found on the conference website at www.renewables2004.de.



Executive Summary

Capacity development including education and training is going to be crucial for increased contributions from RETs to sustainable energy development. The rapid development of individual RE technologies along with basic changes in the institutional and market structures governing the energy sectors in most countries presents new challenges for any capacity development effort. It is evident that “Integrated and sustained action is the key” to success. Important areas for action include Policy, planning and legislation – a well designed and sustained policy framework is key to market development and scale-up for RETs. Finance – With the increased commercialisation of energy markets and RETs implementation, a key area of capacity development and increased awareness is with the international and national financial institutions. Resource and technology data – this is an area for CD mainly for developing countries, but also in many industrialised countries is the lack of appropriate data on resources and technology performance important barriers to increased RETs implementation. Entrepreneur and business development are crucial components in strong private sector involvement and RETs offer good opportunities especially for small and medium scale enterprises both in developing and industrialised countries.

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1. Introduction and Rationale

“Capacity development, education and training” are generally recognised in the scientific literature, practical experience and political reality as cross cutting issues crucial to implement not only to promote renewable energy activities but also to move towards generally more sustainable development paths. The quote from Agenda 21 illustrates the general needs perception and also describes some of the generic elements of capacity development (CD). While this paper will not discuss various approaches to CD in theoretical detail, it is important to keep in mind that there has been significant development in both the theoretical and practical understanding of the CD concept over the last decades. Vast experience with CD exists in most sectors in both industrialised and developing countries. The key issue is therefore to understand what the specific needs for CD are in relation to the energy sector and as a subset of that how to ensure that the specific conditions and requirements for CD for RETs are understood and addressed.

In the preparation process for the World Summit on Sustainable Development (WSSD) five areas (Water, Energy, Health, Agriculture and Biodiversity) were identified as key for sustainable development, the so-called WEHAB agenda. The Framework for Action on Energy, developed as part of the WEHAB agenda, outlines 17 potential action areas including RETs, efficiency, access etc. It is

significant that for almost all potential areas some elements of CD are identified as important crosscutting action areas, indicating the crucial role of CD in energy sector development.

Agenda 21, Chapter 37:

Creating Capacity for Sustainable Development

A country's ability to develop more sustainably depends on the capacity of its people and institutions to understand complex environment and development issues so that they can make the right development choices.

People need to have the expertise to understand the potential and the limits of the environment. They will face difficult policy choices when dealing with such complex problems as global climate change and protecting biodiversity. This will require scientific, technological, organizational, institutional and other skills.

Similarly the G8 Renewable Energy Task Force in its report (G8, 2001) assesses the barriers and recommends action to encourage the use of RETs in developing countries and concludes, as one of four key barriers:

Barriers

To secure sustainable commercial success, renewables must overcome a number of key barriers, including:

- a) insufficient human and institutional infrastructure
- b) limited capacity to support projects and markets, owing to a lack of experience and investment

(G8 Task Force Report)

These references to Agenda 21, WEHAB, G8 etc. are all implicitly linked to CD in relation to developing countries. This is logical in the sense all these initiatives are aimed at stimulating development, and the general capacity to undertake and implement development action is generally much more limited in developing than in industrialised countries.

The paper here will also focus predominantly on CD in relation to developing countries, but it must be underlined that in many industrialised countries the capacity to develop and implement both RET policies and technologies is still quite limited and often a real barrier to increased utilisation of RETs.

The theme of this paper is closely linked with many of the other Thematic background Papers (TBPs) for the International Conference for Renewable Energies. Establishment of *National policy instruments*, setting and implementing *Targets*, mobilising *Financing for RETs* are only a few examples of areas where capacity and skills are required if action is to be successful and sustained. The paper will in the following section describe the changing conditions for CD in the energy sector and then in Section 3 present a brief assessment of CD experiences in the energy sector from the last decades. On this basis Section 4 synthesises the analysis and presents some broad priority action areas, which then in Section 5 are used for specific proposal for action by the International Conference on Renewable Energies.

2. Changing Conditions for Capacity Development in the Energy Sector

When assessing CD activities undertaken in the past in the energy sector and specifically related to promoting the application of RETs, as is done in the next chapter, it must be realised that several parallel developments

affecting both CD approaches and the energy sector have been and are still taking place. These developments are discussed in the following sections along with the implications for CD in the energy sector.

2.1 Changing the capacity development paradigms

The understanding of capacity development changed especially over the last decade from a narrow focus on capacity building (assuming that none were present) closely linked with

institutions building, towards much broader approaches where capacity development is seen as an interrelated set of activities taking place at principally three levels:

- **Individual** – enabling individuals to embark on a continuous process of learning – building on existing knowledge and skills, and extending these in new directions as fresh opportunities appear.
- **Institutional** – this also involves building on existing capacities. Rather than trying to construct new institutions, existing initiatives are identified.
- **Societal** – this involves capacities in the society as a whole, or a transformation for development. This creates the opportunities, whether in public or private sector, that enable people to use and expand their capacities to the fullest.

Implied in these new CD paradigms is that they must pay attention to the impact of the context in which capacity development programs occur - e.g. political, social, cultural, economic. Effectiveness is influenced as much by forces external to the organization as by internal forces.

Indigenous commitment and control are critical for the success of capacity development programs, which depend on local knowledge and energy for their effectiveness. Participation by beneficiaries is thus essential at all levels of identification, planning, implementation and evaluation of an activity.

2.2 Structural changes of the energy sector

A second development to consider when designing CD activities is related to the fact that in the last decade macro level structural reform programmes and specifically reforms in the power sector in many countries have changed the institutional, legal and regulatory frameworks for energy sector development. This has evidently led to a number of new challenges, since the number of stakeholders has increased substantially along with the

Capacity development implies a process of human change, which has different rhythms - cultural, political, psychological - than those prescribed by the organizational requirements of donor organizations. The processes leading to capacity development - learning, adjusting, collaborating, teaming, partnering, performing, consulting, participating, managing etc. - are complex human activities involving uncertain means and ambiguous ends.

Capacity problems, solutions and constraints need to be analysed from a systems perspective. This implies a focus on the dynamics and interrelationships among the various actors, components and levels and a sense of the interrelationships between projects, programs and other groups and organizations within the wider context. Attention must be given to the limiting factors that constrain system performance.

No single CD activity can probably address all aspects adequately. Programmes therefore need to be developed as interlinked and mutually reinforcing activities with a temporal dimension where more immediate needs should be addressed in the short term, while ensuring with longer-term activities that the overall framework is developed which will help sustain the short-term achievements.

complexity of their interrelations. At the same time the structural changes have also altered the functions and tools of existing institutions exemplified with typical traditional policy making institutions which in the new and more market oriented structures have to adapt and apply new types of policy instruments which in most cases require targeted CD in the form of training and education.



2.3 Parallel evolution of RETs

The assessment and recommendations for capacity development for RETs evidently needs to be linked with the realistic contribution from the technologies both technically and economically and many early examples of RETs programmes probably failed partly because the expectations for performance and costs were not fully realistic.

The World Energy Assessment (UNDP, 2000) states that many renewable technologies, although often commercially available are still at an early stage of development and not all technically mature. They demand continuing research, development, and demonstration efforts. Only a limited number of renewable energy technologies can compete with conventional fuels on cost, except in some niche markets. But substantial cost reductions have been and can still be achieved for most renewables, closing cost gaps and making them more competitive.

In recent years significant progress has for example been made in the development of wind turbines for electricity production. Around 1980 the first modern grid-connected wind turbines were installed. In

2.4 Implications for RETs programs and capacity development

Martinot et al have exemplified what this transition in the energy sector could mean for activities related to RETs moving from what they call the old paradigm which was generally characterised by donor driven technology

1990 about 2,000 megawatts of grid-connected wind power was in operation worldwide - at the beginning of 2000, about 13,500 megawatts. Positive developments although at smaller scale have also been experienced with Photovoltaic (PV) solar technologies and modern bio-energy. So the whole Renewable Energy industry turnover is now in the multi-billion dollar range and global installed capacity is projected to more than double over the next 10 years even under present political conditions. If national efforts to support RETs market competitiveness are enhanced, e.g. as a result of international agreements coming out of the International Conference on Renewable Energies, this projected development can be significantly increased.

As discussed in the recommendation section the changes in energy markets and the rapidly increasing commercialization of RETs call for new and innovative efforts on capacity development focusing on the private sector, finance institutions etc. combined with sustained efforts related to more traditional strengthening of policy and especially the new regulatory bodies.

demonstration projects, as is discussed in the next section. Towards more user oriented approaches focusing on building business environments and more sustainable markets for RE technologies and services.

Fig 1: Renewable Energy Markets in Developing Countries

<u>Old paradigm</u>		<u>New paradigm</u>
Technology assessment	→	Market assessment
Equipment supply focus	→	Application, value-added, and user focus
Economic viability	→	Policy, financing, institutional, and social needs and solutions
Technical demonstrations	→	Demonstrations of business, financing, institutional and social models
Donor gifts of equipment	→	Donors sharing the risks and costs of building sustainable markets
Programs and intentions	→	Experience, results, and lessons

Source: Eric Martinot, et al. (2002)

In order to design CD programmes reflecting the new and more complex sector structure, it is necessary to have a clear picture of all the relevant stakeholders and Bouille & McDade (B & M, 2002) have identified 14 key groups of stakeholders presented in Table 1. B&M groups the stakeholders broadly in government (1 to 7), private sector (7 to 10) and the rest are a mixed group with NGOs and energy experts/researchers. The latter group may both be the target of CD activities and at the same time act as providers of CD for the other stakeholders. This grouping is useful in designing CD activities and B & M presents an elaborate analysis of the potential CD needs of the different types of stakeholders. It will lead

too far to go into this detailed analysis in this paper and actual programmes evidently need to start off with an assessment of the existing capacities and the actual needs.

It should be emphasized that any capacity development programme has to be seen as a process rather than a product delivery activity. This implies that CD is open ended, but for programme delivery and assessing effectiveness evidently targets and milestones should be established realising that it is not always possible to make quantitative and objective assessments of the CD outcomes.

Table 1: Stakeholders in energy for sustainable development

STAKEHOLDER	FUNCTION / ACTIVITIES
1. Legislative authorities/elected officials	Set national political priorities; social, economic, and environmental goals; legal framework conditions.
2. Government macro-economic and development planners	Define development goals and macro policy; general economic policies; cross-cutting issues; subsidies and trade policy; sustainable development goals, and frameworks.
3. Government energy authority or ministry	Set sectoral goals; technology priorities; policymaking and standard-setting functions; legal and regulatory framework; incentive systems; federal, state, and local level jurisdiction.
4. Energy regulatory bodies	Have monitoring and oversight functions; implement the regulatory framework; administer fees and incentives.
5. Market coordination agencies	Dispatch entities; have operational coordination functions; interface with industry investors; information brokers.
6. Non-energy governmental authorities/ministries	Sector policies; cross-cutting issues; inter-relation with energy policies; public sector energy consumers; require energy inputs for social services provision.
7. Energy supply industry	Private companies and public utilities; manage energy supply, electricity generation; fuels management and transport; finance some R&D.
8. Entrepreneurs and productive industries	Business development; economic value added; employment generation; private sector energy consumers.
9. Energy equipment and end-use equipment manufactures	Supply equipment for the energy industry and other industries, including vehicles and appliances; impact energy end-use efficiency; adapt/disseminate technology; finance some R&D.
10. Credit institutions	Financing options for large- and small-scale energy generation; capital provision for energy using enterprises; financing options for household energy consumers.
11. Civil society/non-governmental organisations	Consumer participation and awareness; oversight and monitoring; environmental and social advocacy; equity considerations.
12. Energy specialists and consultants firms	Strategic advice, problem definition and analysis; systems development; specialist services delivery; options analysis; information sharing.
13. Academia and research organisations	R&D, knowledge generation, and sharing; formal and informal education; technical training; technology adaptation, application, and innovation.
14. Media	Awareness raising, advocacy; information sharing; journalistic inquiry, watchdog functions; monitoring, public transparency.

Source: Bouille & McDade (2002)

Indicators and qualitative approaches are available, although this is still an area requiring further work. The list of stakeholders seems to miss the end users but this may be due to differences in definitions of CD, which in this paper is seen to include also educational activities of end-users and different levels of

formalised education which may not be directly aimed at building targeted capacity but rather increase the general level of awareness and understanding of energy issues especially in relation to the possible contributions of RETs.

3. Experiences with Capacity Development in the Energy Sector

Capacity and institutional development in the energy sector related to RETs have gone through different stages and a quick and qualitative historical assessment is presented in

3.1 The institutions building phase

The oil “price-crises” in the mid-seventies and early eighties generally put energy higher on the political agenda with a focus on security of supply, development of domestic and renewable energy resources and increasing efficiency in both supply and demand. The typical reaction was creation of institutional frameworks to develop either relevant policy or initiate new but limited efforts on R & D on RETs technologies or both.

the following, reflecting that very little systematic assessment of RETs capacity development has been undertaken apart from at the individual project or programme level.

Examples are institutions like NREA in Egypt, DNES/MNES in India, NREL in the US and several similar institutions mainly in OECD countries and the larger developing countries. These institutions were largely created through national acts and initially developed with national funding. Not all institutions have survived but several have managed to develop into key national actors in the energy policy or RETs area.

Egypt:

The New and Renewable Energy Agency (NREA) was established in 1986 as a government R&D body working under the Ministry of Electricity. The primary objectives in establishing NREA were:

- to contribute to Egypt’s need for increasing the share of renewables in the power supply mix.
- to conduct various research projects on issues pertaining to renewable energy technologies.
- to act as a renewable energy focal point and counterpart agency for all international organizations interested in the renewables sector in Egypt.
- to advise the Ministry of Electricity on renewable energy technologies and their applications in the country.
- to collaborate with other government and non-government institutions in various research projects.

NREA is currently (2003) staffed with 122 scientists and engineers, 109 technicians, 63 administrative staff. NREA’s budget is provided by the Ministry of Electricity.



It is virtually impossible in retrospect to assess if these institutional developments were the most appropriate. Several national institutions have, as mentioned, developed into important national entities promoting energy for sustainable development (see examples in boxes) while others had a short lifetime and never made an impact. In the Indian and Egyptian examples the institutions have grown into important national actors and have no doubt played an important role in establishing the strong RETs programmes in the two countries.

In parallel with these dedicated national CD initiatives, energy issues gradually received priority in development assistance leading to a large number of institutions building activities typically assisting developing countries establish similar types of energy policy

institutions and technological development and training centres.

The creation of the WB/UNDP ESMAP facility was an expression of this donor interest and in the eighties ESMAP supported a large number of national energy plans and institutional development efforts. The CD approach adopted by ESMAP and most other donors reflected the contemporary paradigm with focus on narrow institutional development. Although experiences have not been thoroughly analysed individual programme evaluations show that results have been very mixed for the exact same reasons, which are behind the general CD paradigm development. Simply stated institutional strengthening efforts, even successful ones, taking place without the related developments at the individual and societal levels will encounter barriers both related to sustained development and long term impact.

India

The rising price of oil led to the revival of interest in renewable energy in India. In 1981, the Government of India established a Commission for Additional Sources of Energy (CASE) in the Department of Science and Technology,. In 1982, a separate Department of Non-Conventional Energy Sources (DNES) was created in the Ministry of Energy. Ten years later, in 1992 a separate Ministry was created, the only country in the world to have an exclusive Ministry for Non-Conventional Energy Sources (MNES). The primary role of MNES in the Renewable Energy sector is to

- promote renewable energy technologies,
- create an environment conducive to promoting renewable energy technologies
- create an environment conducive for commercialization of RETs
- renewable energy resource assessment
- research and development
- demonstration
- extension

MNES has nine Regional Offices, three specialised Technical Institutions and one Financing Agency under it which function to promote the policy and programme initiatives



3.2 RETS Demonstrations phase

There was especially in the 1980s selected donor interest in what may broadly be termed RETs demonstration projects. Martinot et al. estimates that from 1980 to 2000 approx. 3 billion USD of official development assistance went into RETs and the vast majority of these funds was spent on technical demonstration activities or projects which may have been self sustained but not replicable.

Many projects were considered failures due to absence of institutional and commercial viability and poor suitability to the user needs. National policies and institutions in addition showed limited interest for these small scale and often decentralised RETs activities, as they were not high on the political agendas and to a large extent donor rather than needs driven.

The generally poor results led to a downturn for RETs supported activities in the early nineties, but this has been reversed the last years with impetus coming partly from the increased focus on sustainability and especially climate change concerns, combined with gradual maturing of individual RETs in terms of technical and economic performance, as discussed in section 2c.

RETs developments in OECD countries were also in the eighties limited to relatively small demonstration programmes and generally with limited success. One of the exemptions was the Danish experience with wind energy development, which has resulted in a continued development of the turbine technology into now large units, which are

cost-competitive with fossil fuel generated power. Initially this development was, however, not driven by national policy or dedicated CD or market development programmes but predominantly by co-operations, NGOs and small-scale industries, which then later accelerated through dedicated government support.

This very simplified historic assessment does not imply to do full justice to the many good and valuable RETs efforts that were also undertaken in the eighties and nineties, but presents a broad-brush picture of the overriding trend of activities. To illustrate the points made, a quote is included below from the ESMAP 1999 activity review.

“The financial viability of projects powered by renewable sources of energy (including co-generation) depend greatly on getting the institutions framework right and providing the necessary levels of support. ESMAP's work suggests that institutional change is everything (even the technologists are saying this). But this is the area that takes time, patience, and the creation of new human and institutional capacities. For their part, the Bank's clients will need to insist upon a genuine partnership and transfer of skills when operating with ESMAP, and that the building of local capacities should be targeted as an objective of the work, even if it takes more time” (ESMAP 1999).



3.3 Market orientation and scaling up

During the last decade the different transitions described in section 2 have started to impact activities related implementation of RETs. With individual technologies becoming more cost competitive compared with traditional fossil options and industries gradually maturing, new types of CD activities have evolved focusing on business development and finance.

Danish experiences in the area of wind turbine development is an example of both positive and negative approaches. Many factors have contributed to the unique development of the Danish wind industry, but clearly a major reason was dedicated and sustained government support policies at the crucial period of development. As mentioned earlier the industry is rooted in private initiatives, initially opposed by government but with demonstrated value and changed politics, support moved from initially strong investment subsidies which were gradually phased out, through production price support to now operating with green energy certificates and close to full market conditions. This systematic set of subsidy policies were combined with dedicated R & D support plus a strong mandatory licensing and approval system ensuring high quality standards, and the combination of these actions made the rapid expansion experiences in the 90'ies possible.

Stable policy environments are important for emerging industries and frequent policy changes e.g. in the US on RETs have led to the raise and fall of many initially promising industries which never reached a mature state. It is therefore also an interesting case to see if the Danish wind industry is strong enough on the expanding global market to cope with the recent changes in policy focus and institutional arrangements in Denmark i.e. separating energy and environment policy institutions, abandoning much of the support for RETs

research and the independent Council for Sustainable Energy, etc. Initially these changes have led to a rapid decline in domestic RETs activities affected also by the fact that the reform of the power sector happening in parallel. It seems the wind industry will manage to continue its positive development based on global market competitiveness, in spite of the fact that a combination of a changing domestic market and lack of appropriate policy support is a classic example of how reforms in many countries have adversely affected RETs implementation.

Market based approaches are also increasingly being promoted in developing countries both on national initiative and with donor support. Real assessments of the effectiveness of these more recent initiatives are not available but judging from the actual implementation results there seems to be positive experiences to build on and expand.

Several examples of such programmes could be mentioned but here reference will only be made to a couple due to the limited size of the paper.

A major multi-donor activity in China - the "China Capacity Building for Rapid Commercialisation of Renewable Energy" has strengthened the already existing programmes for RETs promotion in China by supporting capacity development in a number of critical areas like

- business development
- establishment of standards and certification
- strengthening resource data and collection
- project development and entrepreneur training



In addition the project has involved policy makers and industry leaders in order to ensure that the commercial potential in RETs is better understood and reflected in policies and decision making.

Project results are in the process of being mid-term assessed (started in 1999), but so far results show a number of promises, including development of businesses for village scale power components and industrial scale biogas components. Programmes have been established for national testing and certification for the solar water heater industry, national wind resource measurement and the China Renewable Energy Industries Association has been established and already facilitated a number of business development activities including large scale wind development.

In the area of PV technology a number of initiatives have been taken over the last decade with the Global Environment Facility being a major sponsor of activities implemented via UNDP or the World Bank in for example

3.4 Environmental policy push

Even if the discussion of capacity development in this paper mainly focuses on donor-supported activities in developing countries, it is as mentioned in the introduction important to realise that many of the points are also valid for industrialised countries.

Only limited systematic assessment of capacity development efforts related to RETs in OECD countries is available, maybe partly because capacity has emerged as a result of gradual processes and partly because the issue has not been given enough attention.

However, in the last years the issue of appropriate institutional structures has re-emerged as a result of the increased focus on environmental and especially climate change concerns in relation to the energy sector. This

Zimbabwe, Sri Lanka and Indonesia only to mention a few. Many of these projects have tested and applied different institutional and market delivery models ranging from using the existing electric utilities, private sector leasing arrangements to cash sales maybe subsidised via favourable lending schemes. Many of these projects are aimed at rural applications – the main market niche for PV technology at present – and results are again promising although the magnitude of the underlying access problem is immense, but successful models are emerging for larger scale applications.

It must however be emphasized like it is expressed in the TBP on national policy instruments (Sawin, 2004) that along with the market oriented approaches to implement RETs there is in many cases still a need to combine these approaches with sustained government policies facilitating a “levelling of the market playing field” including some form of government support to RETs activities in order to ensure a sustained stimulation of market development and increasing the scale of the involved industries.

is for obvious reasons mainly a trend in the industrialised countries reflecting the agreements in the Framework Convention on Climate Change and the Kyoto Protocol, but similar developments are likely to take place in developing countries.

An interesting analysis of the institutional tasks and structures has been presented in the Energy Review (Performance and Innovation Unit, 2002 and Hartley, 2003) undertaken as input to UK policy development. This analysis of policy tasks related to implementing a more sustainable energy strategy notes that since countries differ on policies and organisation there can be no single “right” institutional answer and established structures do have the ability to adapt to new priorities and tasks. But in order to ensure concerted action and



implementation the Review concludes that responsibilities in the UK most effectively could be concentrated in a “sustainable energy policy unit”. Hartley sees the Sustainable Energy Ireland (the Irish energy authority) as a possible model to be considered for the UK.

Sustainable Energy Ireland was established under the Sustainable Energy Act 2002 and has the mandate to promote and assist environmentally and economically sustainable production, supply and use of energy, in support of Government policy, across all sectors of the economy. Its remit relates mainly to improving energy efficiency, advancing the development and competitive deployment of renewable sources of energy and combined heat and power, and reducing the environmental impact of energy production and use, particularly in respect of greenhouse gas emissions. The Austrian Energy Agency (EVA) has similar mandates while the institutional arrangement is somewhat different. Institutions of this type are under consideration in several countries in response to the climate change challenge.

4. Synthesizing Knowledge into Action Proposals

Taking into account the described on-going transitions both related to CD paradigms and energy sector structures what are then the priority areas to focus on in future efforts related to CD for promoting RETs, as part of a broader transition towards more sustainable energy systems.

- Broad awareness raising and strengthened educational efforts at all levels will be essential for expanding RETs applications, this applies both for decision makers in public and private entities and for the end-users. RE education can contribute effectively to disseminate the information and provide appropriate training for RE developers, engineers, technicians and end

Within Europe a number of such existing policy and research institutions are linked in the European Energy Network, which was founded in 1991 and is an association of 15 European organisations carrying responsibilities for the planning and management of national R&D, demonstration and dissemination programmes in the fields of

- a) rational use of energy (RUE)
- b) and renewable energies (RE).

The results and effectiveness of this type of institutional arrangement and capacity development are, as mentioned already, very difficult to assess since their impact on policy and implementation is interlinked with a number of other contributing factors. The key issue is, however, to have RETs policies and enabling institutional frameworks established and especially sustained over long periods to ensure stable market conditions, which is a prerequisite for RETs industries to develop.

users as well as decision makers, businessmen and industrialists.

- Getting the policy framework right will be crucial for expanding beyond the present limited niche areas for RETs. This means that ministries involved in policy development need to acquire the necessary skills to deal with both the new more market oriented supply structures and the political demand to be able to address increasingly social and environmental aspects. This will require new analytical capabilities, understanding of market oriented policy tools and an ability to implement such tools in practice.
- A specific sub-set of the framework conditions will be to target the upcoming

regulatory institutions and regulators, who will be in a central position to facilitate appropriate market structures for increased introduction of RETs. This is especially important in view of the fact that most studies indicate that most national power sector reforms in their structuring process have paid very limited attention to environmental and social issues. Therefore the reforms in many cases have affected general access by the poorer parts of the population to electricity in adverse ways and in parallel created systems where it is more difficult for RETs to penetrate the market.

- Private sector involvement both in terms of large scale industries for the commercial markets and small and medium sized enterprises for the rural and peri-urban markets will be required for increased RETs development and deployment. Companies need to have a wide range of technical, business, management and regulatory skills to enter new RE markets. These skills need to be developed locally to promote technology development and transfer and flow of international capital. Access to information and capacity to assess it are also essential for technology development. For SMEs new types of intermediaries are required that can provide them with both appropriate forms of financing (e.g. seed capital) and enterprise development support.
- Financing and lending institutions will play a crucial role especially because of the nature of RETs with generally high up front investment costs combined with low running and delivery costs. This cost structure generally makes RETs inaccessible without financial institutions providing the investment capital and arranging the flow of payments. As with many other new areas of intervention

financial institutions are relatively conservative in order to protect the interests of their investors. In many cases it is however the lack of information and skills needed to assess, quantify and manage the risks associated with RET projects that prevents investments from going forward. Like with all new process development, financiers must overcome a learning curve when taking their first investments in a new sector such as RE. Often the incentives do not exist to motivate financiers to become first-movers in the RE sector. Without stronger incentives, loan officers may pay only limited attention to renewable energy investments, focusing instead on the traditional benchmarks of rapid loan disbursement with minimal risk. Changing the way a financial institution considers new RE investments therefore requires both better information and new mandates to combine social and environmental factors – both risks and returns – as integral measures of economic performance.

- Several recent project initiatives have targeted financial institutions to show that it can make good business sense both to invest in RETs technologies and provide financial services for end users wanting to purchase RETs systems. Some recent examples of such innovative finance mechanisms are presented below based on the report Energy for the Poor (DFID, 2002)
- R & D institutions in many developing countries are extremely resource constrained and CD efforts therefore need to be focused on supporting activities, which have high local policy relevance. At the same time it is important to emphasize with policy institutions that they involve and utilise local expertise as far as possible

instead of often preferring to rely on international expertise. One way of strengthening local research groups is by establishing regional and international

networks to share information and undertake joint activities. Bouille and McDade have also identified this as a specific recommendation.

Table 2: Innovative Finance Mechanisms and Partnerships for Energy Provision

<ul style="list-style-type: none"> ■ UNEP's African Rural Energy Enterprise Development (AREED) initiative, funded by the United Nations Foundation, seeks to develop sustainable energy enterprises that use clean, efficient and renewable energy technologies to meet the energy requirements of the poor. AREED provides enterprise development services to entrepreneurs and early-stage funding, in the form of debt and equity, to help build successful businesses that supply clean energy technologies and services to rural African customers. ■ The Renewable Energy and Energy Efficiency Fund (REEF), which became operational in March 2002, was launched by the World Bank together with support from the Global Environment Facility (GEF) and several other private and public sector groups. It is the first global private equity fund devoted exclusively to investments in emerging market renewable energy and energy efficient projects. ■ GEF funding for the Grameen Shakti organisation in 1998 enabled it to offer improved credit terms, increasing the payment period for solar home systems from one to three years. This had a significant effect on demand: between 1997-9, Grameen Shakti sold 1500 systems; in 2000, it installed 2000 to 2500 systems. 	<p>Grameen Shakti believes that after three or four years of profitable growth, it will be able to obtain financing from commercial banks. Thus, use of GEF financing to support a high risk project, which is unable to attract commercial financing on its own, can result in significant growth and provide the means by which organisations can obtain commercial financing.</p> <ul style="list-style-type: none"> ■ The Public-Private Advisory Infrastructure Facility (PPIAF), a multi-donor technical assistance facility aimed at helping developing countries to improve the quality of their infrastructure through the use of private sector resources. This has now been operational for three years and has attracted support from twelve donors including DFID. Current demands exceed resources and DFID is seeking to build on this success. ■ DFID launched the Emerging Africa Infrastructure Fund (EAIF), in January 2002, with an initial capital base of US \$300 million, in order to provide long-term debt finance for infrastructure in sub-Saharan Africa. The feasibility study for the facility showed an immediate need for US \$11 billion of investment. There is obviously scope to increase the capital base of EAIF and to establish a similar mechanism to cover urgent needs in the poorer countries of Asia (and possibly elsewhere).
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Source: DFID – Energy for the Poor (2002)

The listing of priority areas for CD is in no way exhaustive and should be expanded. At the same time it would be relevant to stress that there is a need urgently to make a better and thorough assessment of CD experiences in the energy sector and specifically the activities undertaken to support RETs. At present there

is virtually no comprehensive analysis available, which means that CD activities often are designed in a piecemeal and fractioned way, which is exactly the opposite approach to what is recommended in this paper.



5. Specific Recommendations for the International Conference on Renewable Energies

The International Conference on Renewable Energies could consider recommending a concerted international programme on capacity development as a core component of a larger effort to promote the increased development and implementation of RETs.

Such a programme would need to be based on the recognition that **“Integrated and sustained action is the key”** to successful expansion of RETs utilisation and that activities on capacity development needs to be designed to the specific national circumstances and involve all relevant stakeholders. A programme with general application in both developing and industrialised countries should generally cover areas such as:

- **Policy, planning and legislation** – a well designed and sustained policy framework is key to market development and scale-up for RETs and should include awareness raising with policy makers to better understand the current energy market “distortions”, their consequences and what realistic contributions RETs can make in the short and long term. This will need to be combined with enhancing the capacity of energy planners and analysts to e.g. assess the full costs of different supply options, design policy intervention matching the reformed energy sectors and ensure that RETs are considered in a realistic manner in the range of supply options. The legislative framework for the energy sector needs to be part of the policy development focus, as it is generally recognised as one of specific barriers to RETs promotion in many countries. Legislative issues goes beyond the energy sector and for example relates to import tax policies where numerous examples exist of import duties

negatively affecting transfer of modern RE technologies compared with more traditional energy systems.

- **Finance** – With the increased commercialisation of energy markets and RETs implementation, a key area of capacity development and increased awareness is with the international and national financial institutions. The TBP on *Mobilising Finance for Renewable Energies (Sonntag-O’Brien & Usher, 2004)* deals extensively with this issue. The TBP emphasises the need to increase the awareness and skills for example in areas such as: independent evaluation of RETs projects emphasizing long-term opportunities that may offset the up front investment costs, and making financing of RETs include risk assessment and hedging strategies. Financing institutions are typically “conservative” in their project investments to protect the interest of shareholders, which often means that “new” areas like RETs investments move very slowly. Recent experiences do, however, show that if the initial reservations can be overcome through targeted support programmes, it is possible to get commercial investors interested in even large scale RETs investments. The new opportunities offered through **“Carbon funds”** related to the flexible mechanisms (emissions trading, clean development mechanism and joint implementation) under the Kyoto Protocol has potential to become a new important source of finance for RETs, but both national entities responsible for carbon credits and trade, and financial institutions need to build the capacity to manage make full use of these new opportunities.

- **Resource and technology data** – this is an area for CD mainly for developing countries, but also in many industrialised countries is the lack of appropriate data on resources and technology performance an important barrier to increased RETs implementation. A recent major UNEP/GEF project on Solar and Wind Resource Assessment (SWERA) is an important contribution to addressing the resource data issue, but such a project evidently only covers a limited part of the countries needing better information, but can provide training and information for a broader group.
 - **Testing and licensing** – as described earlier an important contribution to the successful development of the Danish wind industry was the enforcement of strict testing and licensing procedures – still applicable – which helped ensure that quality of the developed turbines was high and in this way increased the credibility of a new technology. The Danish experience has recently been transferred to India where testing facilities have been established for wind turbines. Similarly in the case described from China the quality issue was also identified as crucial. Another example of recent approaches is the World Bank, who in the area of PV for example has issued a series of training programmes on quality for PV in partnership with the PV-Global Approval programme. So experience is available for larger scale CD in this area, which evidently links closely with the need to establish legal measures and implementing capacity to support licensing schemes.
 - **Entrepreneur and business development** – the increased market orientation of the energy sector has been extensively discussed along with the potential for larger scale RETs contributions. A crucial component in such a development is strong private sector participation and RETs offer good opportunities especially for small and medium scale enterprises both in developing and industrialised countries. But capabilities both on the technological and business aspects of RETs need to be strengthened. The AREED programme mentioned in the DFID figure above is one example of an approach that couples enterprise development ‘hand-holding’ with modest amounts of start-up financing and in this way engages the private sector to provide distributed energy services based on clean and renewable energy technologies.
- The listing of action areas is in no way comprehensive and will need to be combined with dedicated efforts on education and training to ensure that the necessary expertise is available and on R & D, as presented in the TBP dealing with that topic.



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