G8 Renewable Energy Task Force

Chairmen's Report

Annexes

July, 2001

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ANNEX 1

STRATEGIC PATHWAYS ANALYSIS

Introduction

The G8 meeting in June 2000 invited stakeholders to prepare recommendations "regarding sound ways to better encourage the use of renewables in developing countries". Considering policy measures and energy plans already in place or being considered both in industrialised and developing countries, a group of experts have investigated possible outcomes to policy options from "business as usual" up to scenarios based on enhanced policy options as recommended by the Task Force. The Strategic Pathways Analysis (SPA) aims at quantifying such scenarios in energy terms, and assessing the consequences in economic terms and for technology development. Technology deployment is local, but technology learning is global, and it is therefore necessary to consider the interplay between technology markets in the developing and industrialised world. Indeed, without parallel efforts in developed markets, one would expect the efforts in developing countries to be unnecessarily costly and lead to the criticism that developed countries are forcing high-cost and inefficient solutions on the developing world.

The G8 Task Force has a focus on developing countries with special attention to the needs of the rural populations in these countries. A decisive input to our analysis is the demand for energy services identified by the developing countries themselves and expressed, for instance, in their plans for development and the need for energy to support this development. Additional important input to our analysis is the market plans, targets and possible trends in OECD countries (see Annex 5). The IEA World Energy Outlook 2000 Reference Scenario is used to provide a baseline for our analysis and the Alternative Power Generation Case is the benchmark for our enhanced scenarios.

The analysis concentrates on renewable technologies and does not go into any detail on the benefits of renewables vis-à-vis other streams of fuels and technologies, nor on the design of total energy efficient technology portfolios for developing countries. Such a portfolio will contain technologies from all the major groups of fuels, renewables, fossil and possibly nuclear. For the poorest countries, there is also a need to bring immediate, inexpensive solutions to alleviate pressing needs based on improved fossil energy solutions as well as those from renewable energy technologies. The following analysis thus discusses the renewable energy part of a complete portfolio.

The following section discusses the needs for electrical services and cooking in rural areas in developing countries, based on reports written for the SPA (Appendix 1 Sub B and Sub C). Section 3 extends this discussion to renewable technology options and the infrastructures and logistics needed to bring renewable electric technologies on a large scale to rural areas (see complete report in Appendix 1 Sub C). Technology scenarios and the consequences of acting on the Task Force recommendations for technology costs and economic and financial flows are presented in section 4 (see more details in Appendix 1 Sub D). Appendix 1 Sub A provides the "map" for the analysis project.

Renewable Energy Technology and Welfare Needs

Rural electrification

The analysis both for rural electric and cooking services relies on the International Development Goals/Targets (IDT), to which the G8 Heads of States committed themselves at the Okinawa meeting. The relations between IDT and electricity requirements were discussed at a meeting with a rural off-grid study group in London on February 8, 2001. For the quantitative analysis of electricity demand, a person is considered served by renewables if there is 30 W installed capacity to provide him or her with lighting, potable water, education and local medical services.

Table SPA1 provides some examples of electric services in rural areas.[1] For an individual household of five persons, the most basic needs for lighting can be served by, e.g. a solar panel of 40-50 W[2], while other installations might be used to serve collective needs such as water pumping, health and education. Financing for the installations would then come from different sources, beside household budgets, including budgets for sanitary installations, health and education.

Development NEED	**ENERGY SERVICE SPECIFICATION FOR POVERTY ALLEVIATION**	**BASIC ENERGY SERVICE**		**QUALITY ENERGY SERVICE**	
		Energy Demand Wh / day, per capita	**Energy Demand kWh / year, per capita**	**Energy Demand Wh / day Per capita**	**Energy Demand KWh / year per capita**
Potable water	Electric pump providing the community with 5 litres per day per capita	5	2	5	2
Lighting	5 hours / day at 20W for a household	20	7	20	7
TV	5 hours per day at 50W per household			50	18
Music	5 hours per day at 5W per household	5	2		
Refrigeration	0.5 kWh per day per household			100	36
Medical services	(say) 2.5 kWh per day for lighting and medical refrigeration in a clinic for 100 households	5	2	5	2
Education	(say) 2.5 kWh /day for lighting, water pumping, copying, computer, copier, etc in a school for 100 households	5	2	5	2
Productive activities	(say) 5 kWh / day for equipment used by workers from 10 households	100	36	100	2
TOTAL		**140**	**51**	**285**	**103**

Table 1: Basic and quality energy service from electricity in rural areas in developing countries.

Cooking[3]
More than two billion people in the developing world use biomass for cooking. The total requirement of biomass for cooking in developing countries is around 350 Mtoe[4]. About 60% of the population may switch to more sustainable use of biomass. The financial costs to provide this portion of the population with more efficient cooking stoves are estimated to 12 billion US$.[5] Estimates indicate that, outside China, fewer than 100 million people get their meals cooked on the more efficient stove. Providing energy-efficient cooking stoves to an additional 200 million people would amount to a total cost of 2 billion US$.

Switching to more efficient cooking stoves may however encounter both financial and cultural barriers. There is a need to follow up financial programmes with other types of promotional programmes. The stove programme in Kenya was successful for a number of reasons[6]: the central production of key components, the use of small enterprises to produce and market stoves in areas where users could afford to pay, the use of women's groups for stove dissemination in rural areas, and the tailoring of designs to meet local conditions. The decrease in cost for the Kenyan cooking stove is consistent with an experience curve of 82% progress ratio or a learning rate of 18%.[7] If such a learning rate could be assumed for all local production of cooking stoves, the cost to supply such stoves could be considerably less than the 12 billion US$ estimated above. Acting on the G8 recommendations with targeted programmes to provide cooking stoves on a large scale could then lead to considerable cost reduc-

[1] Report provided to the G8 Task Force by the off-grid study group, chaired by Bill Gillet, DG Transport and Energy, EC
[2] Report provided to the G8 Task Force by Shell International Ltd. (see Appendix 1Sub C)
[3] T. Malyshev 2001, IEA (Appendix 1 Sub B)
[4] WEO 2000
[5] T. Malyshev 2001, IEA
[6] WEA 2000a
[7] Such a learning rate means that the cost is reduced by 18% for each doubling of cumulative production of cooking stoves.

tions on local markets.

Providing improved biomass cooking stoves for additional 200 million people within the next ten year period seems feasible from cultural, logistical and financial standpoints.

Market Scale and Production[8]
The dominant share of new renewable energy is expected to come from PV solar home systems (SHS). Small wind electric generators can be an ideal solution in certain regions, but is much more limited geographically. Biomass or biomass/PV hybrid systems, are preferred in some locations, particularly where mini-grids can be economically installed and where significant agricultural waste is available as a low cost fuel[9]. Micro hydropower can also be a rural resource where minigrids and stream resources are available. However, the logistical challenge of providing biomass based or other systems will be similar to stand-alone PV systems.

Assuming that 300 million people should be served by electricity from renewable energy would correspond to roughly 60 million households. The logistical challenge to provide such off-grid electrification can be assessed from experiences with providing solar home systems today. Fewer than 100,000 SHS are currently installed each year worldwide[10]. To install 60 million systems by 2012 would require a 60-fold increase in activity. Individual electrification projects should comprise about 10,000 households to achieve scale economies. Over 5,000 such projects would therefore be required over a decade, while less than 20 have ever been initiated and these are not yet completed. The challenge on capacity building is thus very large.

Many enterprises supplying solar home systems in developing countries have less than 30 employees and achieve few installations per year. PV service businesses generally are “small, struggling, entangled in government policies and unprofitable, hardly the foundation or a suitable model for the many PV service businesses that will be needed if the PV market potential is to be reached”. Medium sized enterprises engaged in solar home supply achieve around 3,000 installations per year while employing some 200 employees and 30 regional solar centres. Even at this scale, more than 2,000 new enterprises would need to be established to meet a 60 million target.

Experience over the last decade points to a series of key success factors:

- Establishment of a local business infrastructure to directly service the end customer over a long period of time
- Expert knowledge of both customer and PV products
- Local/community participation
- Co-operation and co-ordination with local governments prior to project initiation and their long term commitment
- Business excellence
- Long term capacity and commitment to maintain the local business infrastructure reinforced through audits
- Targeted and achievable financial rewards for participating companies
- Subsidies and financial mechanisms which overcomes low consumer affordability and the high capital cost of PV

Several commercial models have been used, including fee for service, cash sales and third party service[11]. For adapting technology to rural markets a clear division of labour between the international and the national/local suppliers seems to be the most efficient solution, at least for the next decade. However, the obvious benefit of lowering costs through use of suitable local capabilities, will be identified by foreign suppliers quickly. This is likely to apply to “balance of system” components in solar home systems, which represent some ¾ of the total costs.

A more detailed discussion of resources and logistics needed to build up an enterprise to manage the installation of 10,000 solar homes is given in Appendix 1 Sub C

[8] Based on a Report from Shell International Ltd (Appendix 1 Sub C)
[9] The low density of many rural villages makes mini-grid development uneconomic.
[10] FAO 2000
[11] See Appendix 1 Sub C for details

Technology Scenarios with Global Technology Learning

Scenario analysis is used to assess the consequences of the goal on cost of technologies and financial flows in the global electric systems. The technology scenarios are reviewed by co-workers of members in the G8 Task Force. Technology scenarios are made for three markets: OECD, Non-OECD on-grid and Non-OECD off-grid or rural areas. An accounting energy technology model (SIMULI)[12] with representation of technology learning through experience curves is used for the analysis of the technology scenarios. The model relies on earlier work with experience curve models[13] and has been presented at an international seminar in November 2000.[14] A detailed description of model, technology scenarios and model results will be provided in a separate report[15]. More details on the technology scenarios are given in Appendix 1 Sub D.

Assumptions for the Technology Scenarios
Two technology scenarios are analysed: Business as usual (BAU), Diversify-Renewables. The latter scenario will provide 800 million people with electricity for residential needs by 2012 (see Appendix 1 Sub D for details). BAU is assumed to represent a world without any concerted action on introduction of renewables taken by the G8 governments and is used to compare the other scenario in order to assess the economic consequences of realising the G8 prospective pathways.

Business as usual (BAU). This scenario has the same electricity production from different fuels and renewable energy sources between 2000-2020 in the OECD and Non-OECD on-grid markets as the Reference Scenario in the World Energy Outlook[16]. For the period 2020-2030, see Annex 1 Sub D[17]. The supply of electricity to rural off-grid areas is assumed to grow by 8%/year leading to electrification of most rural areas by 2030. In this technology scenario, most of the electricity comes from fossil fuel and is generated, e.g., by diesel generators.

Diversify-Renewables. This is the main scenario for the analysis of the G8 prospective pathways. For the OECD markets, it follows the Alternative Power Scenario in the World Energy Outlook until 2020, with three exceptions, see Figure SPA 1. The technology scenarios classify “Small hydro” as new renewables where learning in the developed markets may benefit the developing markets, while this type of technology is subsumed under “Hydro” in the WEO report. The difference to WEO for small hydro power plants therefore reflects different accounting principles. The difference regarding Photovoltaic Power Systems (PVPS), however, reflects real differences in policies and alignment of policies among G8 and ultimately IEA governments. Concerted action and alignment of policies between USA, Japan and EU are assumed to lead to global market growth for PVPS of 35%/year until 2012. The historical growth rate between 1983-2000 has been 16%/year, but the growth rate in the last six years is 25-30%/year. The third exception concerns advanced technologies for electricity production from biomass, such as fuel cells and IGCC, which assumed to have entered the market by 2012. For the rural off-grid markets, the G8 prospective goals are assumed to lead to a higher overall growth of electric supply providing electricity for basic services to practically all the rural population in developing countries by 2020. Until 2012, all this accelerated growth is taken up by renewable technologies.

Table SPA2 shows installed capacity and technology growth rates in the ”Diversify-Renewables” scenario.

Table SPA2 - Installed global capacity (GW) in Diversified-Renewables scenario

	coal IGCC	gas FC	bio conv.	bio IGCC	bio FC	small hydro	wind	solar PV	solar thermal	geo-thermal
2000	0.3	0.3	24.3	0.3	0.1	0.3	12.5	1.0	1.4	6.9
2012	14.3	14.3	34.6	15.7	15.8	18.9	90.5	31.8	9.7	17.4
2020	39.7	35.7	36.7	28.9	28.9	38.8	196.3	118.8	32.6	27.6
2030	142.5	114.0	40.5	68.0	67.5	95.8	554.6	655.8	156.4	49.5

[12] SIMULI stands for SIMUlation of Learning Investments. The model is developed at the Energy Systems Technology Division, Chalmers University of Technology, Göteborg, Sweden.
[13] Mattsson/Wene 1997; Mattsson 1997
[14] Mattsson/Wene 2001
[15] IEA 2001a
[16] Notice, however, that there are only two on-grid markets in SIMULI, while WEO provides a much more disaggregated view of the world electric markets.
[17] For details in extrapolation beyond 2020, see Mattsson/Wene 2001

Table SPA3 - Global annual growth rates for advanced fossil fuel and renewable energy technologies in Diversify-Renewables scenario

	coal IGCC	gas FC	bio conv.	bio IGCC	bio FC	small hydro	wind	solar PV	solar thermal	geo-thermal
2000-2012	38.0%	38.0%	3.0%	39.1%	55.4%	40.4%	17.9%	33.3%	17.5%	8.0%
2012-2020	13.6%	12.1%	0.7%	7.9%	7.8%	9.5%	10.2%	17.9%	16.4%	5.9%
2020-2030	13.6%	12.3%	1.0%	8.9%	8.8%	9.5%	10.9%	18.6%	17.0%	6.0%

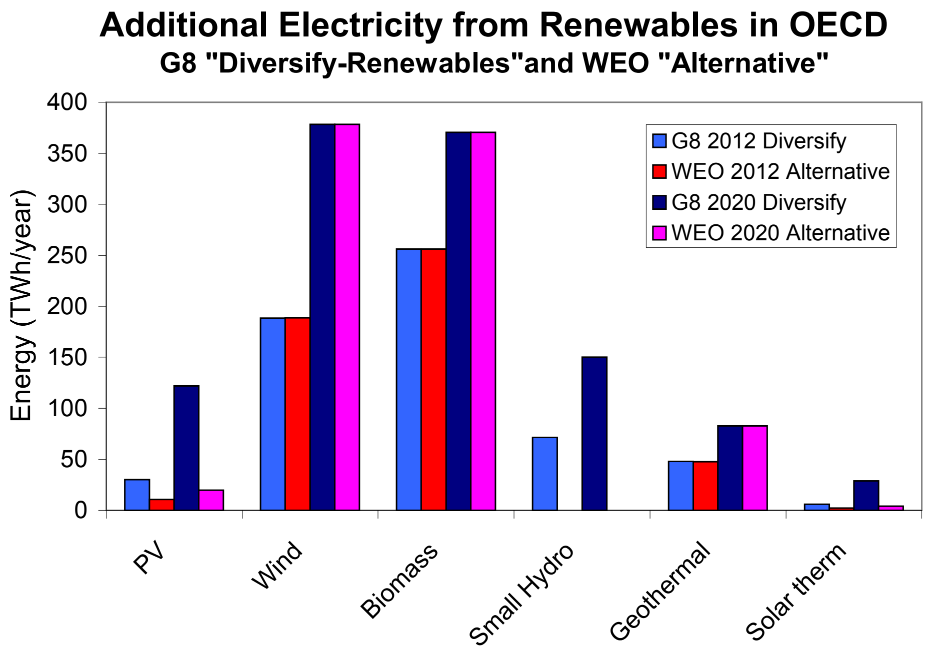


Figure SPA1. Comparison between the scenario “Diversify-Renewables” and the World Energy Outlook Alternative Power Scenario for the OECD countries

Analysis: Technology costs

As a result of the technology learning through market deployment, the costs of renewable technologies decrease. Figure SPA2 and SPA3 show this effect for three renewable technologies in the Reference scenario and in the Diversify-Renewables Scenario. Due to the aligned policy efforts for PVPS in the Diversify-Renewables scenario, this technology reaches market take off at 3000 US$/kWp in 2007, but this does not happen until 2015 in the Reference scenario. Wind is a relatively mature technology and does not show the same cost reductions as PVPS and Biomass Fuel Cells. Figure SPA4 shows the relationship between the investment costs for PVPS and the willingness to pay in the PVPS niche markets. The analysis of the niche markets relies on experiences from the Japanese residential PV programme[18] and report on US Green Markets[19]. Figure SPA5 shows the effect on the cost of renewable technologies if the renewables–led expansion of electricity in rural areas in the developing world is carried through without any parallel efforts in the on-grid markets. This means that the rural areas are following the “Diversify-Renewables” scenario while the on-grid markets are following the “Business as usual” scenario.

[18] IEA 2000b
[19] Swezey/Bird 2000

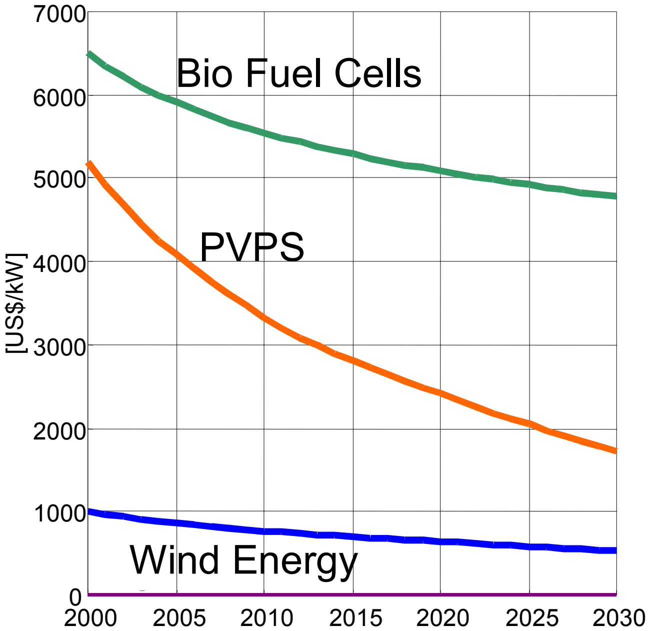


Figure SPA 2. Business as Usual
Investment cost in on-grid markets

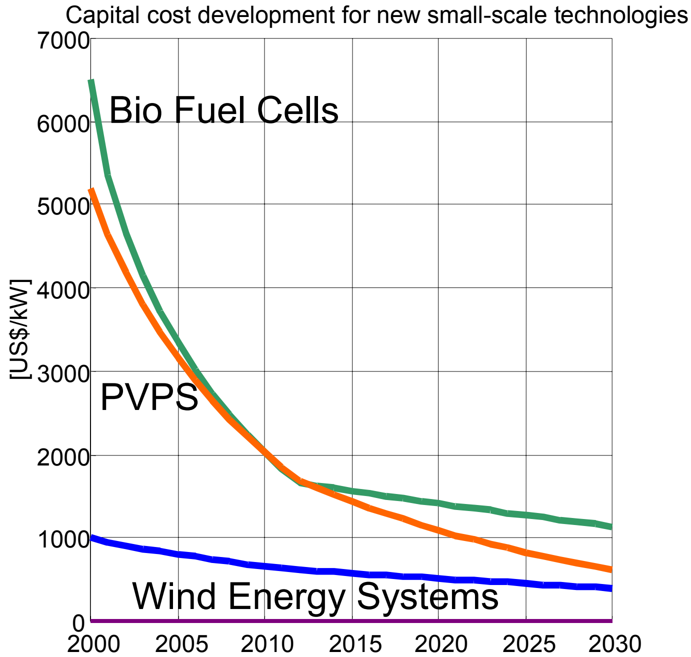


Figure SPA 3. Diversity-Renewables :
Investment cost in on-grid markets

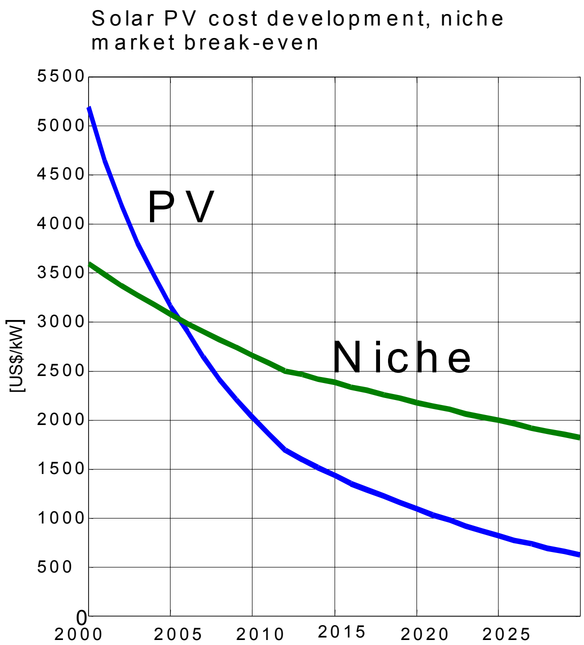


Figure SPA 4. Cost curve for PVPS and Niche Markets

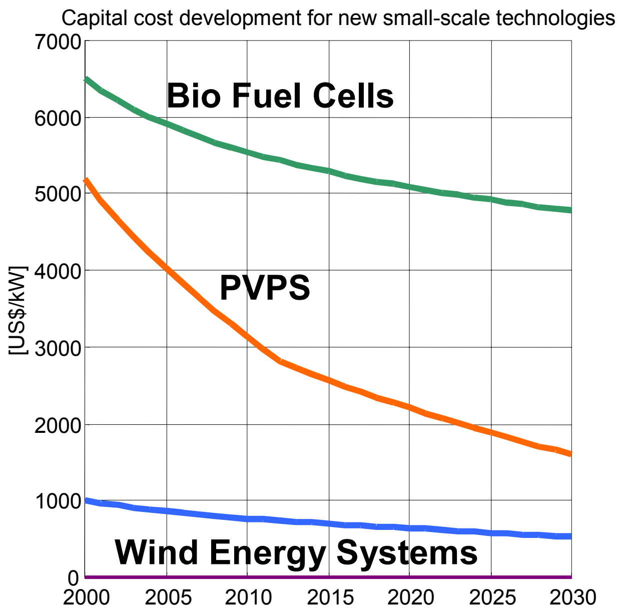


Figure SPA5. No additional on-grid. Investments cost in on-markets

Analysis: Economic consequences

Figure SPA6 compares the revenue neutral annual system cost for the electricity markets for the Reference and Diversify-Renewables scenarios. The calculation of the system cost is described in detail in reference[20] and represents the sum of annual investments, fuel and O&M costs, but credited for the extra value to electricity generated by renewable energy technologies. Presently, in the analysis with

[20] IEA 2001a

SIMULI, such credits are only given for electricity produced by PVPS where a niche market analysis is available (see fig. SPA3 above). In principle, however, such corrections should be applied to all technologies which would reduce the cost for Diversify-Renewables relative to Reference.

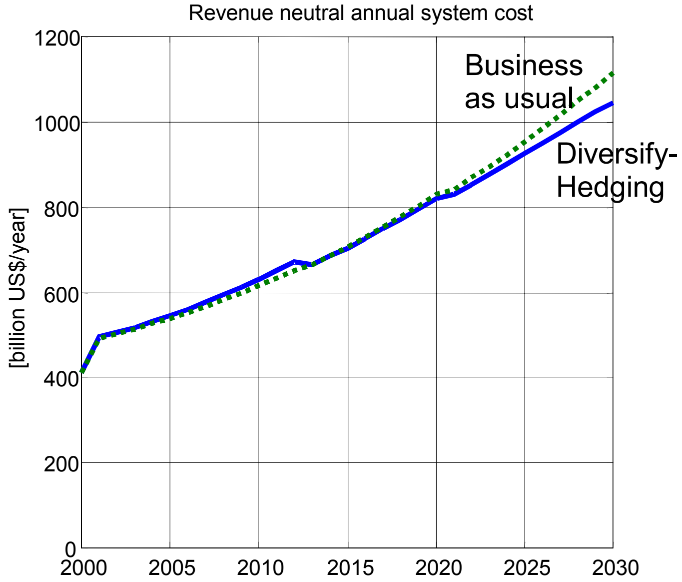


Figure SPA 6. Diversify- Renewables versus BAU.

The annual system costs are slightly larger for the Diversify-Renewables scenario than the Reference until 2012. The summed effects of decreasing investment cost and increasing fossil fuel prices starts to reduce the cost for the alternative scenario after 2012. The effects of crediting the costs for the value of renewables technologies have a visible impact on the costs after 2015.

Figs. SPA 7 and 8 show fossil fuel costs in the two scenarios for the OECD and the Non-OECD on-grid markets. Fig 9 shows the impact on cash flows in the Diversify-Renewables scenario relative to the Reference scenario. The impact on cash flow is calculated assuming a real rate of interest of 8%. Figure 10 shows the effect on investments in rural off-grid areas if the renewables led expansion in these areas is not accompanied by parallel efforts on market introduction of renewable energy technologies in grid markets. The SIMULI model has been run assuming “Diversify-Renewables” in rural markets but “Reference” in the two on-grid markets. Investment requirements for the *same services* in the rural areas increase by 5 billion US$ until 2012. The thrust of our argument is that continuing and aligning vigorous efforts to deploy renewable technologies in the markets of the industrialised countries, are prerequisites for any efforts to provide cheap and reliable renewable technologies for the developing countries. Without parallel efforts, an expansion in rural areas will in fact subsidise technology learning in the rest of the world.

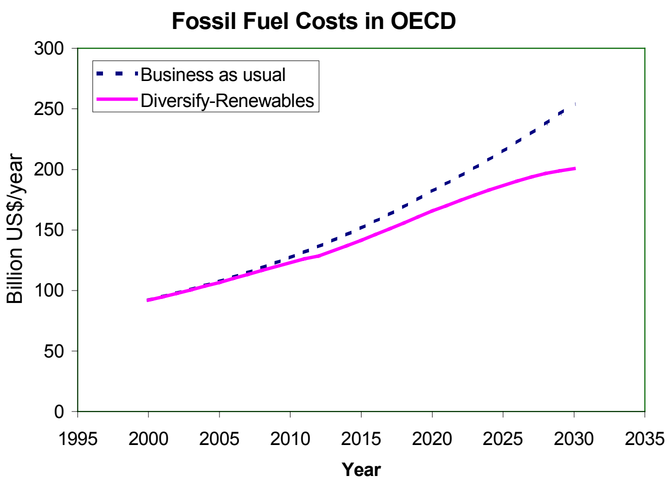


Figure SPA 7. Annual fossil fuel cost for OECD electric system

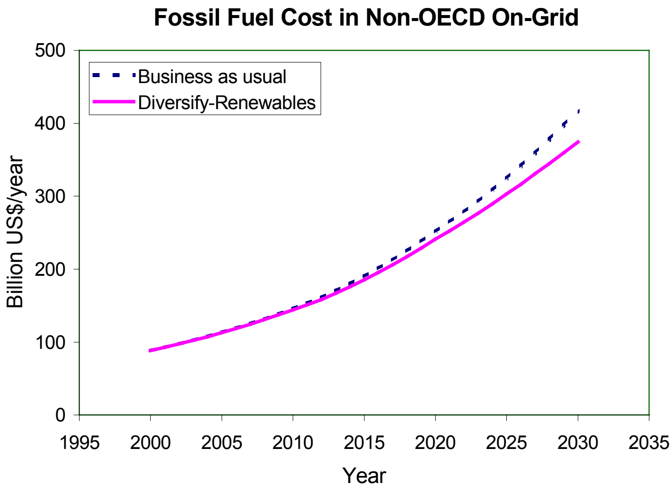


Figure SPA 8. Annual fossil fuel costs in non-OECD on-grid markets

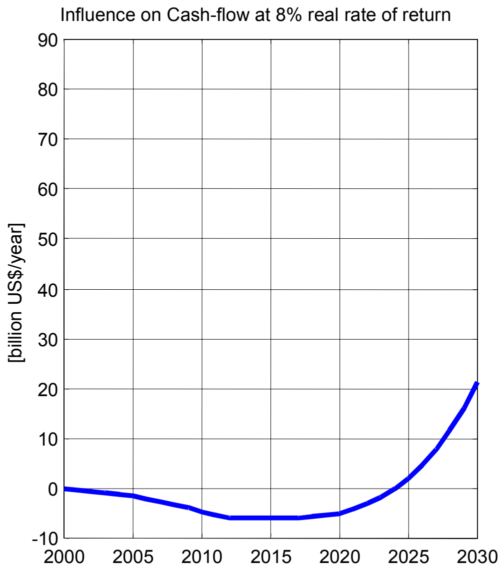


Figure SPA 9. Cash-flow impact at global level from Diversify-Renewables relative to Business as usual

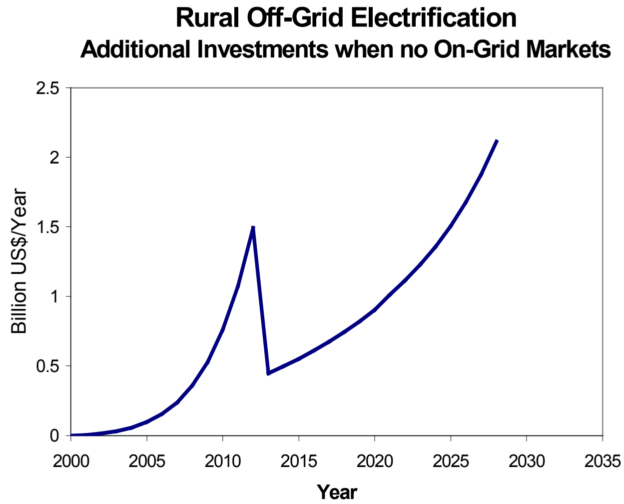


Figure SPA10. Additional investments for rural off-grid electricification without parallel efforts on technology learning in on-grid markets.

Conclusion

Presently four preliminary conclusions can be made:

- Providing improved biomass cooking stoves for additional 200 million people within a decade is feasible from cultural, logistical and financial standpoints.
- Providing 60 million families, or about 300 million people, in rural areas in the developing world with electricity from renewable sources until 2012 is feasible but represents a large logistical challenge requiring strong financial resources. It will be 15-20% less expensive if on-grid markets for renewable energy technology are aggressively developed.
- A global technology pathway leading to additional 800 million people served by electricity from renewable sources until 2012 is feasible. The total annual system costs may rise to be maximally 2-3% higher until 2012 compared with a business as usual case, but these extra costs are recovered after 2012. Fossil fuel costs are successively reduced by 20-25% until 2030. There will probably be a small negative impact on cash flow which needs to be further investigated. The additionally required resources may come from existing energy sector cash flows, including customers paying for value (niche markets) and existing energy subsidies for already mature technologies.
- Global efforts linking the market segments are required to enhance technology learning and reduce costs. This means that efforts to provide developing countries with renewable energy technologies must be coupled to efforts in the G8 domestic markets.

APPENDIX 1 SUB A- FRAMEWORK FOR THE ANALYSIS

Figure SPA1.1 shows the “map” the strategic pathway analysis is following. The pathway analysis is driven by the requirements for improving the welfare in the developing world.   The map distinguishes three major interconnected issues:

Welfare and Technology (“Green”). Based on energy plans in developing countries and expert advice, welfare needs are interpreted in capacity and energy needed and requirements for renewable energy technology portfolios.

Transfer of Technology (“Blue”). The need for development of logistics support and infrastructure in order to provide a renewable energy portfolio to meet the G8 pathways for a developing world.
Technology Learning and Financial Flows (“Red”). Assessing the effects of technology learning and requirements on financial flows from fulfilling the G8 pathways for the three markets (OECD On-Grid, Non-OECD On-Grid, Non-OECD Off-Grid)

G8 Task Force: Map for the Strategic Goal Analysis

(Scale 1:100.000.000)

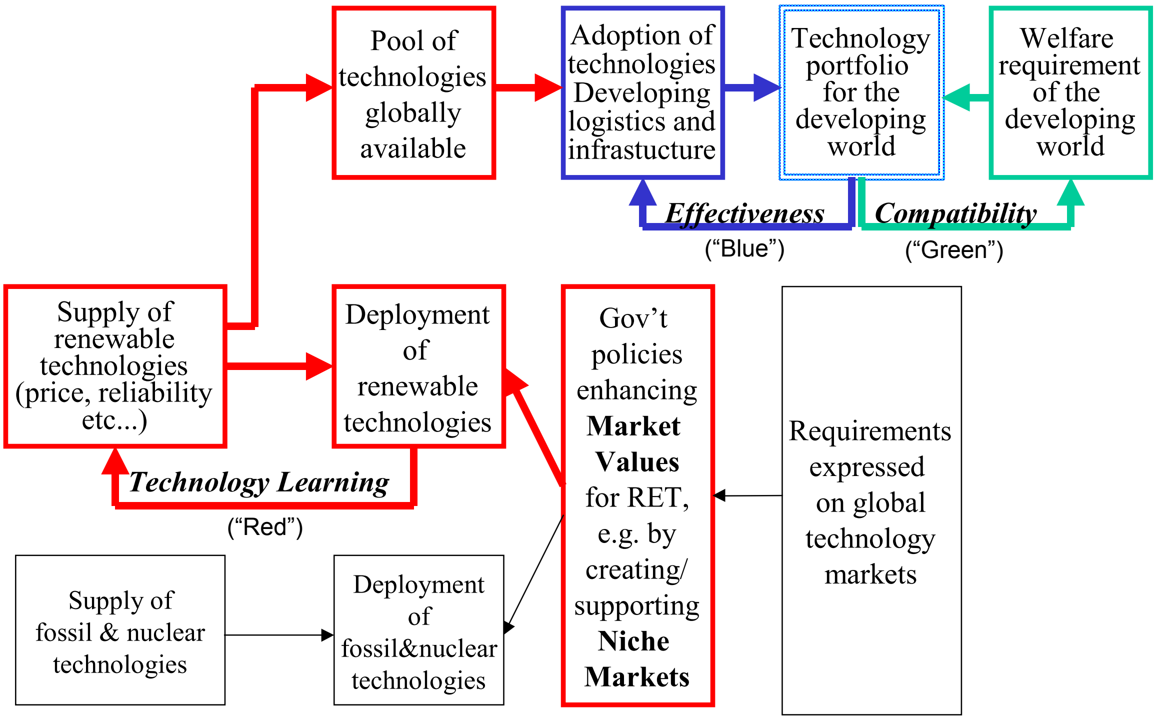


Figure SPA1.1. Relations between the analytic issues for the strategic pathways analysis.

Appendix 1 sub B- Estimation of the Cost of Serving Rural, Off-Grid Population with Efficient Biomass Cooking Stoves

Source: Economic Analysis Division, IEA

The following analysis estimates the cost of providing efficient cooking stoves to the off-grid, rural population in developing countries. It is based on current biomass consumption levels and consumption per capita in developing countries and on available information on the population, which is the most likely to switch to more sustainable biomass cooking technology. The cost of more efficient stoves is calculated given estimates of the price of stoves in various developing countries.

In general some one-half of global final biomass consumption in developing countries is estimated to occur in the rural, household sector. About 80% of rural biomass consumption is used for cooking. According to data in Table 1, some 350 Mtoe of biomass was used for cooking in developing countries in 1997 (i.e. 352 Mtoe = (886 Mtoe/2)*0.8). The population using rural biomass in developing countries is estimated to be 2832 million (Table 2). The portion of the population, which may switch to more sustainable use of biomass, is 1504 million people, or some 60% of the total population which uses biomass currently.

The cost of supplying efficient cooking stoves to the 1504 million people who may choose to switch can be broken down by broad region. The cost of cookstoves in India, China and Africa is shown in Table 3. Using the figures in Table 4, average per capita biomass use is estimated to be 200 kgoe per capita in developing countries. If the population using more sustainable biomass technology for cooking (1504 million in Table 2) is assumed to consume 200 kgoe per capita of biomass use, this would require 300 Mtoe.

Several assumptions are required to determine the cost of supplying efficient cookstoves to the off-grid, rural population in developing countries. The cost of cookstoves in China is assumed to hold for East Asia, likewise the cost in India is applied to stoves in South Asia. Stoves in Latin America are assumed to cost the average of ones in Asia and Africa. Using the population data in Table 2 and the cost data in Table 3, the total financial cost of supplying efficient cookstoves to the population which is expected to switch to more sustainable biomass technology for cooking is $12 billion (i.e. $10*577 + $9*546 + $5*45 + $3*336 = $11917 million)

These results are based on available information on current biomass consumption patterns and off-grid, rural population in developing countries. More rigorous results would rely on projections for biomass used and on quantifying rates of technology penetration for efficient biomass cooking stoves. These rates are important because assuming a fixed market share for sustainable biomass technologies does not consider comparative economics or the ability of these technologies to supply the market. It would be useful to determine the average efficiency of existing and advanced cookstoves in order to determine energy demand per stove. The estimates for costs of cookstoves also need to be carefully evaluated. Nevertheless, the results here represent a simple methodology for calculating the costs of providing sustainable, efficient biomass cookstoves to the likely population which would switch to more advanced technology.

TABLE 1: BIOMASS, CURRENT CONSUMPTION AND PROJECTIONS (MTOE)

	1997	*2010*	*2020*	*1997-2020 (aap)*
China	208	217	221	0.2
Rest of East Asia	115	129	140	0.9
India	193	213	223	0.6
Rest of South Asia	49	62	71	0.9
Brazil	40	46	49	0.8
Rest of Latin America	48	49	51	0.5
Africa	231	294	347	1.8
Developing Countries	**886**	**1010**	**1103**	**1.0**

Source: *World Energy Outlook 2000*.

TABLE 2: ESTIMATION OF POPULATION USING EFFICIENT BIOMASS FOR COOKING (MILLION)

	Population Using Rural Biomass	*% which might change to advanced biomass for cooking*	*Population Using More Sustainable Biomass Technologies for Cooking*
China	650	60	390
Rest of East Asia	*312*	*60*	*187*
India	700	60	420
Rest of South Asia	*210*	*60*	*126*
Latin America	90	50	45
Africa (Sub-Saharan)	420	80	336
Developing Countries	**2382**		**1504**

Source: *FAO; estimation for East Asia and South Asia using population shares*.

TABLE 3: ESTIMATED COST OF IMPROVED COOKING STOVES BY REGION

	Cost ($)
China	10
India	9
Africa	1-3

Source: World Energy Assessment, 2000.

TABLE 4: FINAL BIOMASS USE IN SELECTED COUNTRIES, 1997

	Total biomass in TFC (Mtoe)	*Per capita biomass use (kgoe)*
India	193	200
China	208	169
Thailand	12	200
Brazil	34	210

Source: World Energy Outlook 2000.

Biomass Consumption for Cooking[21]

A wide variety of technologies are available or under development to provide inexpensive, reliable and sustainable energy services from renewables. In particular, there is an enormous biomass potential that can be tapped by improving the utilisation of existing resources and by increasing plant productivity. Much more useful energy could be extracted from biomass than at present. More efficient and sustainable biomass consumption is needed to reverse the trends in loss of environmental resources.

The share of biomass in the residential sector in India is close to 90%. Biomass accounts for 54% of India’s final energy consumption. The share is much higher than that for China and East Asia and closer to those found in Africa (59% of final consumption). India accounts for about one-fifth of world biomass energy uses.

A large part of biomass energy is consumed in rural households. In India, this involves heavy use of animal waste, some 20% to 30% of the biomass total, and very limited use of charcoal. This probably occurs because India has relatively less wood than China and East Asia. Agricultural residues make up another 20% to 30%. Data for India show an impressive increase in household consumption of LPG and kerosene in the last 20 years. But surveys suggest that urban households absorbed most of this increase, with little or no effect on rural areas. According to some estimates, the share of bio-

[21] This section has benefited significantly from comments from the director general of Agence de l'Environnement et de la Maîtrise de l'Energie (ADEME) – the French Agency for Environment and Energy Management, Mr. François Demarcq, who is a member of the G8 Task Force, and from Mr. Philippe Girard of the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Mr. Jean-Louis Bal and Mr. Claude Roy (ADEME).

mass in rural energy consumption has remained relatively unchanged, while the total use of biomass has increased with rural population growth, alternative fuels being unavailable. Gradual changes have occurred in the shares of the different biomass fuels, with shifts from dung and agricultural residues to wood, and from collected wood to marketed wood.

Dominating the traditional use of biomass in developing countries is firewood for cooking. Fuelwood accounts for some 10% of total biomass use in the world. It provides some 20% of rural household consumption in Latin America and about 50% in Africa. (Foundation for Alternative Energy (FAE), Slovakia) Fuelwood accounts for 11% of energy consumption in China, 30% in India and over 80% in Bhutan, Cambodia, Laos and Myanmar. (FAO-RWEDP) It is the major source of cooking in poor developing countries.

Traditional cooking techniques are inefficient (the three-stone hearth), as are charcoal-making techniques. Schemes to distribute improved cooking stoves have been set up with some success, even though it is hard to measure their impact on actual consumption in the absence of reliable statistics. With properly mastered charcoal-making methods, including traditional techniques, the mass and energy yields of the most commonly used techniques can be double or tripled. The transition to charcoal will not upset the economic balance if it is properly managed, except in areas that are already excessively vulnerable. When the improved output due to the use of new charcoal hearths is factored in, it appears that, overall, this supply chain can offer a practically unchanged ratio of useful energy to primary energy, while providing a higher level of service.
In addition charcoal is two to five times denser than wood with the same energy yield. The costs and energy consumption incurred for transport are thus reduced. With equivalent emissions, greater transportation distances can be achieved while remaining economically acceptable, allowing supply sources to be diversified and forest resources better managed.

In the near term in most developing countries, however, the use of fuelwood for cooking will not decline dramatically. Improved woodstoves (such as examples in India, China and Africa) and biogas stoves will improve efficiency and use biomass in a more sustainable way. More importantly, advanced cooking stoves will improve health in rural areas in developing countries. In the medium term other technologies such as producer gas, natural gas and Dimethyl Ether (DME) stoves will increase efficiency even more.

Given the importance of fuelwood to rural households and the likelihood that the reliance on this traditional fuel for cooking and heating will not decline dramatically in the near future, there is a clear and immediate need to provide more sustainable and efficient cookstoves to the developing world. Introducing improved cookstoves can be implemented on a grand scale, since only a few percent of developing countries' households currently have them.

Action Plan for Sustainable Biomass Use[22]

Specific action plans and targets for biomass energy should figure among the objectives adopted at the Rio+10 conference. These plans and targets should take the following characteristics into account:

- ✓ unlike other renewable energies, "sustainable" mastery of this resource is crucial; quantitative increases in biomass use are possible only if this condition is fulfilled; there are thus cases in which international programmes will have to promote the use of fossil fuels, or if possible other forms of renewable energy, to replace biomass;
- ✓ changes in biomass uses must not jeopardise the significant economic sector of forestry operations which today provide income in rural areas, and thereby ensure better management of forest resources.

Different types of action plans should be proposed, depending on the current status of forest resources, and would include:

- ✓ dissemination of efficient cooking methods using wood and charcoal
- ✓ professionalisation of charcoal making activities
- ✓ institution of sustainable management of forest regions, and development of industrial and/or community silviculture where necessary

[22] This section is taken from *The Specific Role Played by Biomass Resources in Quality of Life Improvement and in Climate Change Mitigation* submitted by Mr. François Demarcq (ADEME), member of the G8 Task Force.

- ✓ promotion of co-generation technology for the production of electricity where this is the best economic choice; it is possible to initiate implementation of these technologies using by-products of the wood and food processing industries without delay.

The G-8 countries should also encourage their own business sectors to develop and transfer more efficient technologies targeting new uses for biomass. As for funding mechanisms, they should take into consideration the above-mentioned features of biomass, i.e. the prime importance to be granted to resource management.

Appendix 1 sub C- Transfer of Technology - Renewable Energy Delivery to Rural Markets

Source: Doug McKay, Shell International Ltd.

The Scale of the Challenge

To reach the goal of providing renewable energy to 500 million additional poor people in rural communities by 2012, around 100 million households will require new or improved energy supply. It is anticipated that around 200 million people, or 40 million households, could benefit from improved cookstoves. A further 300 million people or 60 million households might obtain access to new renewable energy supply.

The dominant share of the new renewable energy is expected to come from PV solar home systems (SHS). Wind power is generally not economic for the low population density typically found in rural areas. Biomass or biomass/PV hybrid systems will be preferred in some locations, particularly where mini-grids can be economically installed and where significant agricultural waste is available as a low cost fuel[23]. However, the logistical challenge of biomass based systems will be similar to standalone PV systems. This report assumes the majority of the 60 million household target is met by SHS, even though in practice a material share should come from biomass based systems.

Fewer than 100,000 SHS are currently installed each year worldwide[24]. To install 60 million systems by 2012 would require a 60-fold increase in activity. Individual electrification projects should comprise about 10,000 households to achieve scale economies. Around 6,000 such projects will be required over a decade, while less than 20 have ever been initiated. Each project must overcome some or all of the following challenges: remote environments with difficult terrain and no infrastructure, low population and housing density and cultural differences. Financial support is currently vital for renewable energy supply to rural poor consumers and this is likely to remain so for the next 5 years at least[25].

Many enterprises supplying solar home systems in developing countries have less than 30 employees and achieve few installations per year. PV service businesses generally are “small, struggling, entangled in government policies and unprofitable, hardly the foundation or a suitable model for the many PV service businesses that will be needed if the PV market potential is to be reached”[26]. Medium sized enterprises engaged in solar home supply achieve around 3,000 installations per year while typically employing some 200 employees and 30 regional solar centres[27]. Even at this scale, more than 2,000 new enterprises would need to be established to meet the 60 million target.

Key Success Factors

The following section summarises key success factors for large-scale solar home system or other renewable energy installation in rural regions of developing countries, based on lessons from projects undertaken over the past decade.

Establishment of a local business infrastructure to directly service the end customer over a long period of time

This is the most critical but most neglected part of the task. The key is not just to supply systems, but

[23] The low density of many rural villages makes mini-grid development uneconomic.
[24] FAO 2000
[25] Shell Solar internal estimates
[26] GEF 2000
[27] Wouters 1997

to build a commercial enterprise that will service the system over decades. Selling modules at a border and expecting local third parties to install and maintain the SHS is rarely viable. Around 15% of installations do not work the first time and need professional attention[28].

Expert knowledge of both customer needs and PV products
Customer needs should drive product solutions, but this is rarely the case. Equipment that does not fit customer needs and circumstances will result in failure just as much as faulty equipment. Meeting customer needs requires fully understanding local customer attitudes and purchase drivers as well as cultural attitudes towards debt, ownership and property – all of which vary widely across the world. Adoption of international standards and specifications for products would be a positive step”[29], but this is not a complete solution, as it does not encompass the differences between customers.

Local/community participation
Recruitment and training of appropriate local staff, effective consumer education and communication and involvement of local officials and members of the community who are committed to the region and to customers are essential.

Co-operation and co-ordination with local governments prior to project initiation and their long term commitment
Planning co-ordination with governments including commitments and plans for grid expansion and PV awareness campaigns, along with financial arrangements including taxation and import duties. are important.

Business Excellence
Successful PV businesses need to provide their customers with reliable equipment and rapid maintenance and service under challenging conditions. They must manage large numbers of employees and thousands of monthly revenue collection and tracking transactions. This requires professional management, sophisticated and tested business processes, experience and proficiency in a variety of business models.

Long term capacity and commitment to maintain the local business infrastructure reinforced through audits
Only those companies with financial strength and stability can ensure the successful execution of a long term project -- “Don’t underestimate the efforts required to develop and support a maintenance program”[30].

Targeted and achievable financial rewards for participating companies
Companies need to see a reasonable and achievable payback to encourage long term participation in difficult markets (e.g. currency exposure). Market concessions are used by some countries (Argentina, Chile, Morocco, and South Africa) to encourage suppliers to undertake the high up-front investment in installation and service networks.

Subsidies and financing mechanisms which overcome low customer affordability and the high capital cost of PV
Affordability is an issue for most communities and most customers are low-skilled and illiterate farmers, so customer own-labour contributions cannot be expected to lower installation costs.

Commercial Models

Commercial models worldwide are varied. Rural renewable energy is an immature business so many experiments are underway to identify preferred models. Experience shows that one size or model does not fit all. There appears to be a place for fee-for-service, micro-credit, manual collection and other commercial models. Institutional arrangements may also differ by country. The appropriate model depends on social, demographic, legal and economic conditions. The Municipal Solar Infrastructure Project in the Philippines, for example, employs 14 different types of “service packages”[31].

[28] Shell Solar internal estimates
[29] NREL 1998
[30] NREL 1998
[31] FAO 2000

Equipment Adaptation to Rural Markets

Existing PV systems appear to be broadly suitable for rural energy markets and suppliers should be able to meet specific local circumstances with current technology. Improvements in battery configurations, the weakest link in SHS, would be valuable but current technologies are acceptable. Promising equipment such as biomass power generators using agricultural waste will benefit from further technology development and local adaptation, but this also appears to be achievable with current and expected designs.

PV and other renewable energy technologies will likely change significantly over the next 2 decades. Fragmenting PV manufacturing will hinder the creation of important global scale economies in manufacturing and the associated manufacturing learning and cost reductions could be slowed. However, the obvious benefit of lowering costs through use of suitable local capabilities, should be maximised. This is likely to apply to "balance of system" components in solar home systems, which represent some ¾ of the total costs.

Meeting the Logistical Challenge

The resources and characteristics of a hypothetical 10,000 SHS project are outlined below. The figures are not meant to be precise but indicative of the logistical challenges. The numbers will also vary widely depending on population density, geography and cultural factors.

Hardware costs: $500 USD per system providing 130-180 watt hours daily (40-50 watt peak module), including a controller, battery, and 5-10 lights.

Product replacement: batteries replaced every 4 years, controller every 5 years and the module after 10+ years.

Subsidy payment: 100% up-front hardware subsidy on systems and $500,000 business development subsidy per 10,000 home project to assist the set-up of local operations and staff training.

Customer deposits, fees, and effective rate of money collection: Deposit of $10-$25 USD and a monthly fee of $10 USD/monthly. The number of customers who can afford over $10 USD/month has been shown to be extremely low. Money collection is 80%-95% and variable, depending on the source of family income (farm incomes, for example, can vary significantly year to year).

Rate of Installation: 10,000 systems in place within 3 years

Personnel: 25 office and warehouse support, 50 installation and maintenance staff and 50 to 125 sales and collection personnel depending on collection success rate. A decline from 99% to 90% in collection success adds considerably to costs if the objective of 10,000 systems is maintained. Ongoing customer relations for widely dispersed communities, along with uncertain timing of equipment component failure, are other key cost sources. External support which reduced the level or impact of collection losses could significantly lower costs.

Connecting 60 million rural households over a decade would require 2,000 such sub-enterprises or around 20-40 per country. The most feasible, if not the only feasible, option would be for the small number of well capitalised international PV suppliers to undertake around 1,000 projects each over 10 years along with the creation of 400 sub-enterprises. This level of effort will require a long-term perspective and strong financial resources, because cash flow will not be immediate and will vary with volatile rural farm incomes. The expected number of projects which these firms can bank on will be an important policy decision. The ambitious 10-year target does not leave time for gradual build up of capacity project by project.

This target also creates a tremendous training challenge, which could benefit from public support, both in OECD and developing countries. At least 200,000 personal would require training in SHS installation and maintenance. A limited number of regional training centres could accelerate this process by creating training for trainers. Standardised training programs could significantly lower training and overall costs.

APPENDIX 1 SUB D

Technology Scenarios

Following consultations with development experts and in order to create a focus for the strategic pathways analysis the tentative outcome of having one billion people served by renewable energy within the next ten years was established as a benchmark, and is interpreted as meaning:

500 million additional people served by renewable energy in rural off-grid areas in developing countries by 2012, of which 200 million served with improved biomass technologies for heating & cooking.
300 million additional people served on-grid by electric energy from renewable sources in countries outside OECD by 2012
200 million additional people served by electric energy from renewable sources in OECD-countries by 2012

For OECD and for the grid connected areas in the non-OECD countries we will consider a person served when the equivalent of his or her total annual demand is produced by renewable sources and fed into the grid. We thus ignore demands for industrial production and transportation. From the point of view of the electric system, this distinction is of course artificial because an on-grid renewable technology serves all which are connected to the grid. However, it is highly relevant for the G8 SPA because it puts the focus on residential demands and needs in all three markets.[32] Figure SPA5.1 shows the production of electricity from different renewable energy technologies to serve one billion people in the three markets. For the OECD market we rely on the analysis for the Alternative Power Generation Case in the IEA World Energy Outlook[33] with the exceptions for Photovoltaic Power Systems and small hydro stations discussed in section 4 below. The demand for non-OECD on-grid assumes 0.6 MWh_e/person/year. Note that this market consists of economies in transition and developing countries and the per capita consumption is therefor an average for these two markets. The requirement for rural off-grid was discussed in the main text and we adopt for the quantitative analysis that 30 Wp/person is necessary to provide basic electricity services. Figures SPA5.2-SPA4 show the technology scenarios from the Simuli model for the electricity systems in the three markets and summed to a global electricity supply.

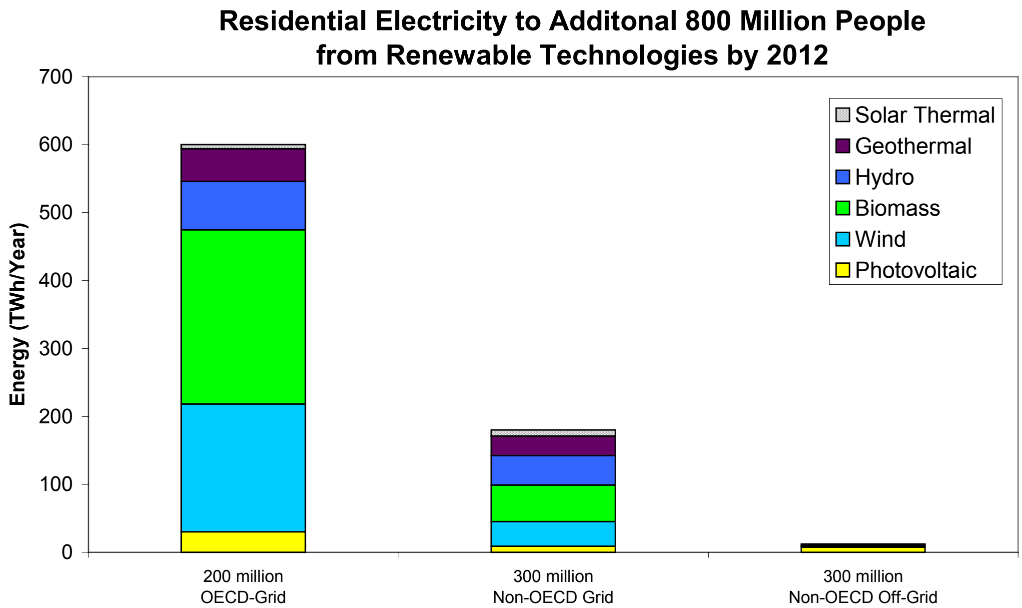
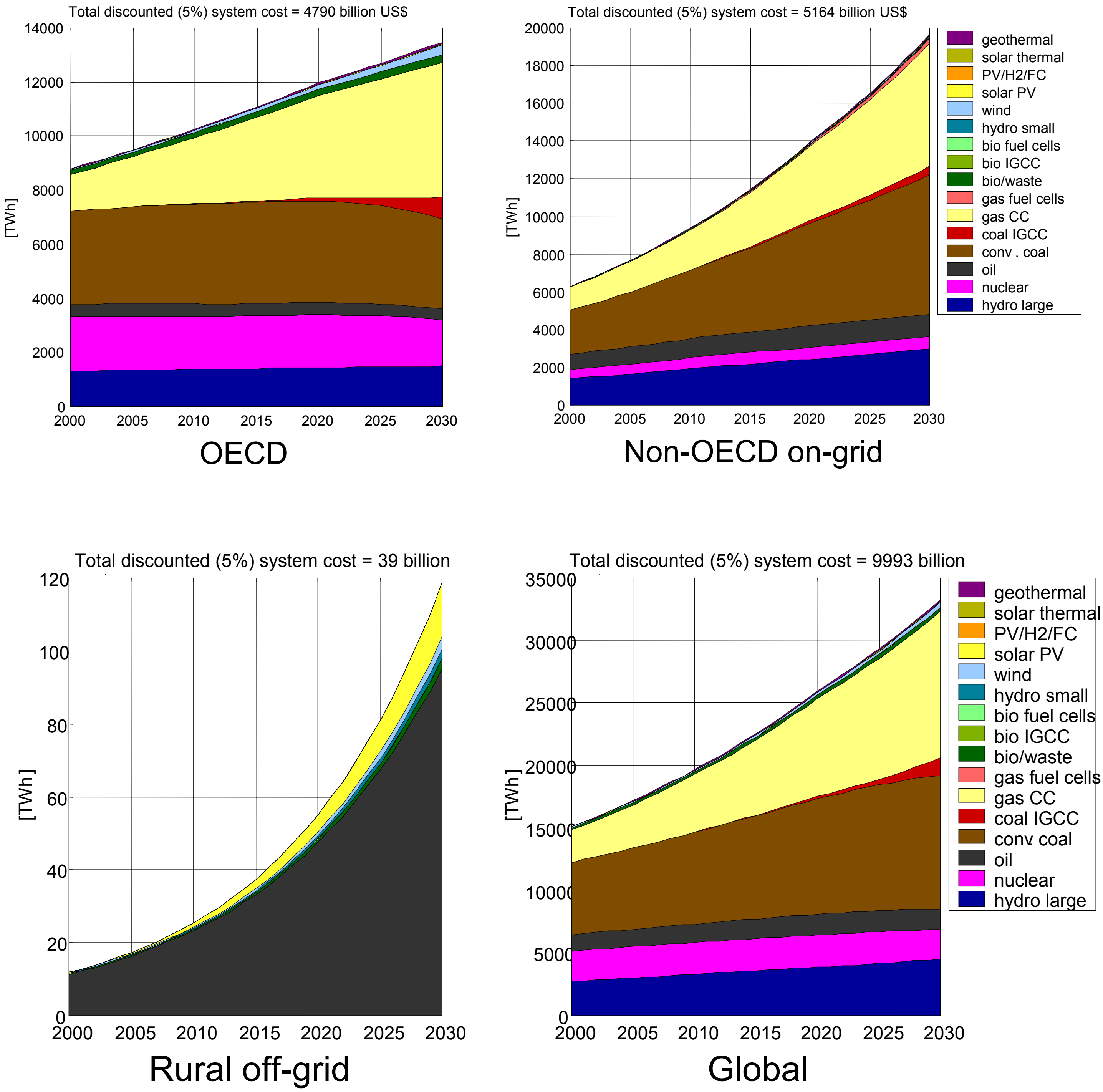


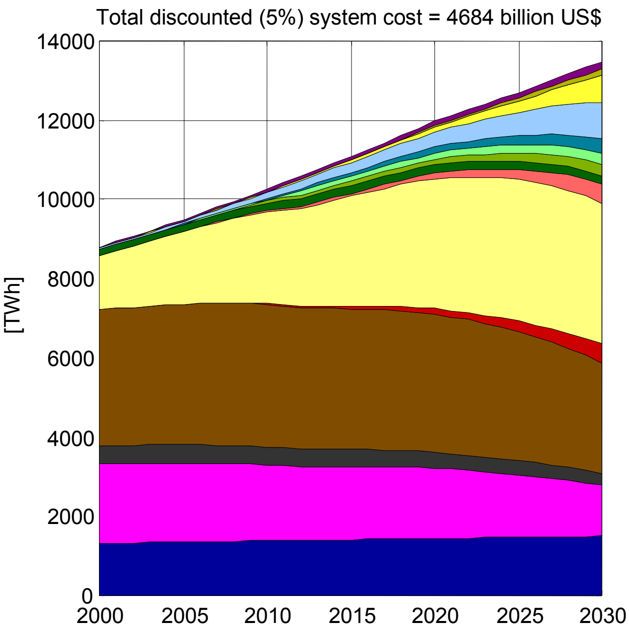
Figure SPA5.1. The aspirational goal of 800 million people served by electricity from renewable energy technology is broken down into markets and technologies.

[32] There will also be no physical person connected to the grid who can claim that he or she has all their residential electricity demands from renewable sources as long as there are dispatches from fossil and nuclear technologies. Strictly speaking, "a person served" should therefore be interpreted as "serving on an annual basis the equivalent of one persons residential electricity demand", however, this is a rather obvious and uninteresting technicality.
[33] WEO 2000, p. 277

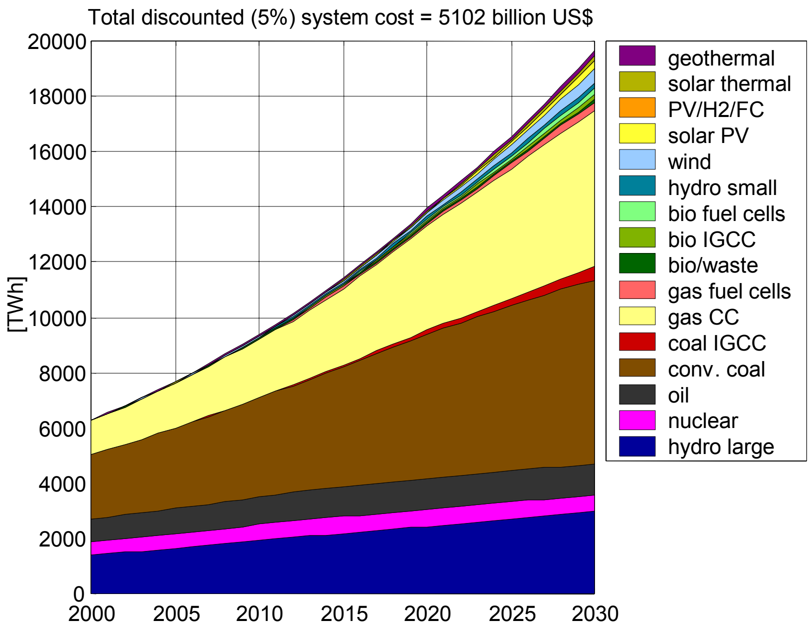
FIGURE SPA5.2 BUSINESS AS USUAL



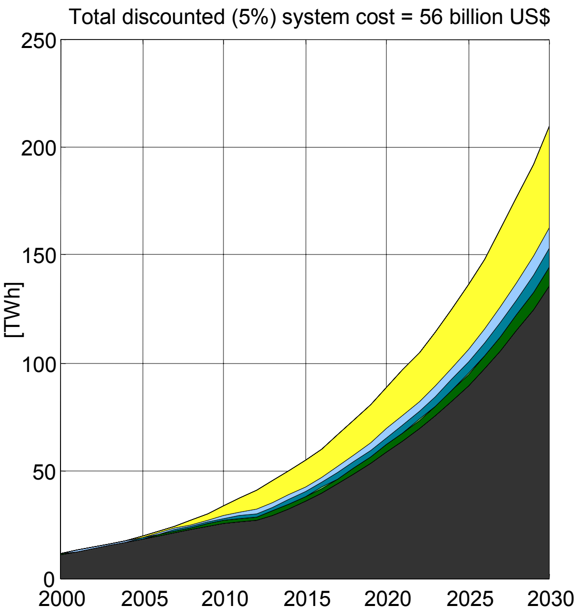
SPA 5.3 DIVERSIFY - RENEWABLES



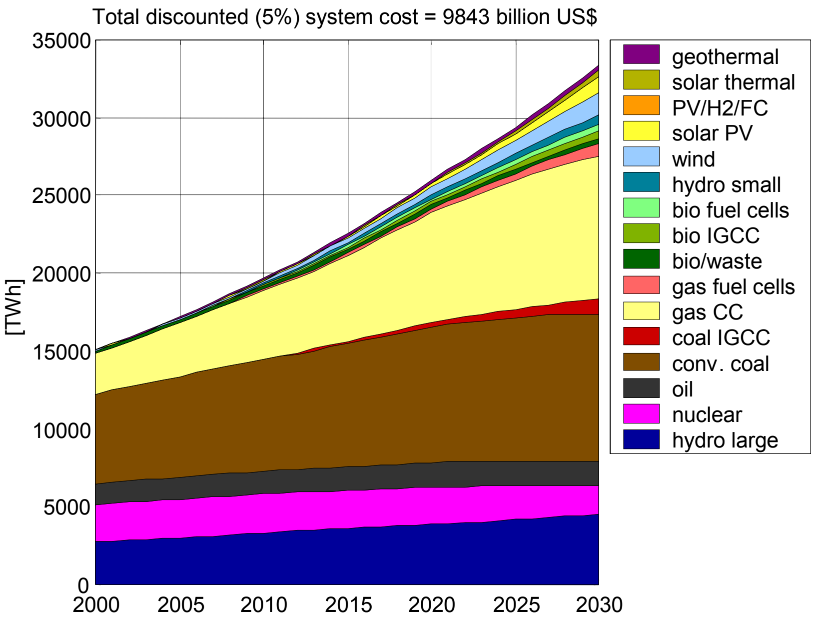
OECD



Non-OECD On-Grid



Rural off-grid



Global

ANNEX 2

BILATERAL ODA COMMITMENTS TO ENERGY AND RENEWABLES

BILATERAL ODA COMMITMENTS TO ENERGY, 1989 –1999
Amounts are in million US$
Source : DAC

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
AUS	7.23	4.35	2.87	17.85	37.38	28.99	22.49	18.62	15.68	10.40	4.05
AT	20.32	8.67	88.21	77.20	68.40	62.48	12.96	9.39	1.90	2.14	4.30
BE	5.71	4.49	13.25	10.86	9.64	9.26	3.52	3.87	2.26	1.15	1.35
CA	70.63	40.28	61.72	44.32	50.85	24.03	20.39	82.12	55.40	47.05	43.71
DK	10.30	23.11	28.67	11.79	38.23	87.81	26.79	56.66	32.10	30.65	19.34
FI	72.80	15.59	139.21	17.33	19.39	1.60	2.10	30.53	4.18	5.28	9.48
FR	342.74	600.08	222.13	234.09	239.16	172.08	155.65	183.40	103.82	208.53	-
DE	517.31	667.47	505.04	358.13	668.19	227.09	300.66	448.84	506.73	189.38	300.50
GR	-	-	-	-	-	-	-	-	-	0.13	-
IE	-	-	-	0.32	-	0.05	0.79	0.79	-	0.00	-
IT	243.51	282.31	564.53	237.37	35.93	129.10	116.77	34.61	28.59	0.14	6.63
JP	495.24	546.95	1959.95	1141.94	1898.44	2565.89	4144.17	2061.27	3084.33	1747.44	1244.53
LU	-	-	-	1.31	0.98	-	-	-	1.09	1.41	1.56
NL	18.13	37.35	2.21	19.11	24.65	37.63	77.43	68.45	40.60	34.21	15.23
NZ	-	-	1.02	0.92	0.97	2.35	2.35	-	-	1.22	1.05
NO	13.50	45.17	118.28	24.54	62.24	25.15	140.68	76.18	61.55	53.09	36.34
PT	-	-	-	0.19	-	1.91	0.09	0.27	1.78	0.55	0.09
ES	-	-	485.55	113.67	53.56	110.38	34.84	79.79	32.23	60.51	5.09
SW	195.90	50.06	59.77	69.31	103.92	70.53	55.29	103.56	73.95	31.71	29.45
CH	14.84	4.09	15.24	1.42	1.10	4.24	2.12	0.10	-	1.24	9.29
UK	227.62	206.50	486.69	133.11	127.72	125.93	123.28	95.87	77.67	80.82	119.75
USA	282.94	308.32	308.32	293.56	276.22	206.80	213.40	166.00	91.52	135.80	87.56
EC	-	-	-	-	-	-	28.05	-	-	-	-
Sum	2538.72	2844.79	5062.66	2808.34	3716.97	3893.30	5455.77	3520.32	4215.38	2642.85	1939.30

ODA COMMITMENTS TO RENEWABLE ENERGY, 1989-1999
Amounts are in million US$
Source:
CRS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
AUS	0.48	-	-	-	0.38	-	0.01	18.44	8.20	1.32	1.64
AT	-	-	1.63	25.20	21.01	52.27	-	5.44	0.42	0.84	1.47
BE	-	-	-	-	2.27	3.52	1.03	0.08	0.27	0.55	0.29
CA	1.34	4.78	5.85	14.26	21.28	11.17	11.54	36.32	27.53	3.23	30.68
DK	-	8.17	5.52	0.34	0.14	33.32	5.37	19.19	20.19	9.29	7.61
FI	4.84	0.93	41.57	7.93	9.31	-	-	15.24	0.91	0.84	-
FR	261.48	239.27	24.57	8.16	33.50	28.45	42.06	42.66	71.37	88.43	23.07
DE	-	27.29	66.22	112.22	10.28	108.08	134.56	251.55	91.22	190.12	238.54
IT	214.71	92.41	112.32	82.67	1.14	123.37	74.87	3.02	23.40	0.09	2.60
JP	283.12	145.14	701.19	121.06	584.94	680.06	1518.77	943.28	816.01	389.23	35.38
NL	0.39	0.37	0.76	5.57	0.94	2.44	2.87	27.96	18.91	19.11	9.26
NZ	-	-	-	-	-	-	0.46	-	-	-	-
NO	0.03	7.91	62.82	6.62	6.19	4.60	87.53	13.58	4.66	9.54	2.36
PT	-	-	-	-	-	-	0.30	-	-	-	-
ES	-	-	58.19	37.78	-	2.91	-	10.00	0.64	41.07	19.80
SW	307.87	-	39.37	-	0.04	0.92	33.64	11.95	0.07	1.13	9.92
CH	-	0.70	13.11	-	1.01	0.74	2.09	0.59	0.73	-	-
UK	28.68	44.67	7.94	53.26	43.36	35.93	3.12	0.39	4.33	3.64	0.09
USA	-	-	-	-	-	-	-	10.97	3.70	7.14	6.89
CEC (EDF)	38.71	10.77	54.39	1.39	2.52	3.86	0.19	24.26	0.32	5.92	20.46
Total (Sum)	1141.66	582.41	1195.42	476.45	738.29	1091.64	1918.40	1434.92	1092.88	771.51	410.04

Share of Renewable ODA commitments to total energy commitments, 1989 – 1999
Amounts are in million US$
Source: DAC

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total ODA Energy	2539	2845	5063	2808	3717	3893	5456	3520	4215	2643	1939
ODA Renewables	1142	582	1195	476	738	1092	1918	1435	1093	771	410
RE share (%)	45.0	20.5	23.6	17.0	20.0	28.0	35.0	40.8	26.0	29.2	21.2

ANNEX 3

ENERGY SUBSIDIES

Most OECD countries have reduced or eliminated direct and indirect subsidies over the past two decades as part of a general move away from heavy government intervention in energy markets and other sectors of the economy. Few OECD countries now use price controls to achieve social, economic or environmental goals, preferring in general to accomplish political purposes through grants, taxes, regulatory instruments and support for R&D. These trends largely reflect a profound shift in government attitudes resulting from the perceived failure of past interventionist policies. However, a substantial amount of funds still go to fossil, nuclear and other forms of energy for a variety of reasons, including difficulty of reform and continued research or support measures to promote security of supply and employment.

There is no comprehensive computation of energy subsidies around the world, however, several examples from both OECD and developing countries can illustrate the dimension of subsidies.

OECD coal producer subsidies – selected countries

PSE measurement provides an estimate of funds going to producers by measuring the price gap between world market prices and prices paid to producers. Producer Subsidy Equivalent payments to coal producers in OECD countries are still significant in 1998. In a nutshell, in 1998, 6 Billion USD went to directly supporting coal production in these countries. Almost 10 billion dollars were spent on social and other programs related to coal sector reform.

Coal Subsidies in OECD countries, 1998

Millions of USD	PSE Budget	Assistance not benefiting current production
Germany	4982	8242
Spain	944	278
Japan	469	684
France	160	702
Total	**6555**	**9906**

[1] Coal Production Subsidies in IEA Countries –PSE tables; internal working document; IEA, May 2000

OECD country subsidies – USA

Comparison of budgets to different energy sectors in the United States provides an idea of the evolution of funds but still shows a strong bias in favor of fossil fuels. Considering historical trends, there is still a way to go before total renewable R&D subsidies reach levels devoted to other fuel sources. Budgets for renewable energy transformation are among the lowest.

Cumulative Direct and Off-Budget Federal Subsidies for Select Electricity Technologies, 1947-99[3]

Category	Subsidy (billion 1999 dollars)	Share of total
Direct program (on-budget subsidies only)		
Nuclear	115.07	95.4
All Solar	4.37	3.6
Photovoltaics	2.45	2.0
Solar thermal electric	1.92	1.6
Wind	1.12	0.8
Total direct program budget	**120.56**	**100**
Direct program plus off-budget		
Nuclear	145.36	96.3
All Solar	4.42	2.9
Photovoltaic	n.a.	n.a.
Solar thermal electric	n.a.	n.a.
Wind	1.20	0.8
Total direct and off-budget	**150.98**	**100**

3: Federal Energy Subsidies: Not all Technologies are Created Equal, M. Goldberg, Renewable Energy Policy Project (REPP), July 2000

OECD country subsidies – USA – continued

Summary of Primary Energy and Energy Transformation and End Use Subsidy elements in Federal Programs by fuel and program type on a budget outlay basis, FY 1999[2]:

Fuel Budgets: Millions 1999 USD	**Type of Subsidy**				
	Direct Expen-diture	**Tax Expenditure**			**Total**
		Income	**Excise**	**R&D**	
Primary Energy					
Oil	0	263	0	49	312
Gas	0	1048	0	115	1163
Coal	0	85	0	404	489
Combined Oil, Gas & Coal	0	205	0	0	205
Nuclear	0	0	0	640	640
Renewables	4	15	725	327	1071
Electricity	0	40	0	33	73
Subtotal	**4**	**1656**	**725**	**1567**	**3953**
Energy transformation and End-Use					
Oil	255	0	0	0	255
Gas	501	0	0	0	501
Renewables	40	0	0	0	40
Electricity	459	155	0	0	614
Conservation	166	110	0	0	276
End-Use	0	105	0	454	559
Subtotal	**1421**	**370**	**0**	**454**	**2245**
Total, All energy	**1425**	**2026**	**725**	**2021**	**6198**

2: Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy, Energy Information Administration, Washington, DC, September 1999

Total primary energy federal budget subsidies for Oil, Gas, Coal and Nuclear amounted to 2.8 billion USD while renewables accounted for 1 billion USD of which 725 Million USD is represented by the alcohol fuels excise tax. Total funding for R&D was 1.6 Billion USD of which 327 was spent on renewable energy.

Energy Subsidies in Non-OECD Countries

A recent report by OPEC suggests that the share of fossil fuel subsidies in OPEC countries can present a strong drainage on public funds.

Fossil fuel subsidies in OPEC countries
(price gap analysis, domestic Vs border prices)

Millions of USD	Total subsidy	Share of oil export earnings	Potential additional export earning
Indonesia	1887	34.2	1886
Iran	3776	31.5	4365
Venezuela	37	2.2	603
Algeria	13	0.4	45
Total	**5713**		**6899**

[1] Nadir Gurer, Jan Ban; The Economic Cost of Low Domestic Product Prices in OPEC Member Countries; OPEC Review; June 2000

Comparison of direct subsidization of these resources with earnings from oil exports give an order of magnitude of the share of these subsidies in public budgets. Were these budgets used for similar purposes (social, health, etc...) in a more direct way, the impact on target populations would be much higher.

Energy Subsidies in Non-OECD Countries –continued-

The 1999 edition of the WEO, "Looking at Energy Subsidies: Getting the Prices Right", assesses how removing fossil fuel consumer subsidies in selected non-OECD countries could reduce emissions of CO_2 from energy consumption. It suggests that energy subsidy removal could decrease carbon dioxide emissions by 16% in the eight countries which were studied (China, Russia, India, Indonesia, Iran, South Africa, Venezuela, Kazakhstan), equivalent to a 4,6% reduction in global CO_2 emissions.

The analysis illustrates the extent to which the environment could benefit from the removal of subsidies. However, fossil fuel subsidies are most often implemented to answer social, economic or health issues in developing countries (for example, subsidising kerosene to replace biomass as a cooking fuel, to decrease respiratory diseases). This is one of the reasons why they are so difficult to reform, although the problems they were supposed to address often remain unsolved while special interest groups fight to keep what is essentially a state "rent". Nonetheless, there is a growing pressure in countries that heavily subsidise energy to reform these systems.

Estimated Subsidies in non-OECD countries
(price-gap analysis, domestic Vs international market prices)

Millions of USD	Total fossil fuel subsidies	Annual economic efficiency gain (% of GDP)	Reduction in CO2 emissions %
Russia	19401	1.54	17.10
India	8633	0.34	14.15
Indonesia	1168	0.24	10.97
Iran	13153	2.22	49.45
South Africa	1156	0.10	8.11
Venezuela	4608	1.17	26.07
Kazakhstan	1402	0.98	22.76
Total	**49521**		

[1] World Energy Outlook, Looking at Energy Subsidies, Getting the Prices Right; IEA/OECD; 1998

In many cases, power generation from renewables is not *competitive under current market assumptions*. Lack of perceived competitiveness can be explained:

- Current pricing systems often reflect past development priorities, creating a competitive disadvantage for renewable and distributed energy generation.
- Public legislation can also be considered to contribute to this status quo (siting, permits, etc..).
- Benefits from renewable and distributed generation deployment are not necessarily expressed in energy markets.

In other words, renewable and distributed energy deployment is beneficial from an economic point of view, but markets do not always reflect this value.

Balancing the playing field

Previous data from OECD PSE tables and IEA estimates of non-OECD fossil fuel subsidisation shows how non-renewable energy sources are still being subsidised. It is possible that these incentives may be applied in a different manner to achieve a similar goal (supporting local employment, valuing national resources, etc...). However renewables will face a competitive disadvantage where these subsidies are not equivalent for all energy sources.

The energy market pricing system strongly influences the relative competitiveness of resources:

- tariffs for electricity transportation do not necessarily reflect the full cost of the transmission infrastructure.
- postage stamp pricing of transportation does not provide an incentive to those producing energy closest to consumers.

These issues should be factored in future market liberalisation rules to ensure that all energy sources are chosen for their own value instead of their temporary market advantages.

The legislative framework may also disadvantage distributed generation:

- Siting permits can be more difficult to obtain for renewable and distributed generation;
- Tax systems may also advantage low initial capital cost projects with higher variable costs.

Despite the will to develop renewables in OECD countries, it is apparent that existing legislation and pricing structures still impose barriers to market entry. Tariffs and legislation are only part of a complex set of issues which need to be addressed in order to level the playing field.

Valuation, incentives and investment in future energy systems

Renewable and distributed generation projects provide benefits to the energy system and to the economy which are not always monetised or reflected in the price paid for delivered energy:

- Installation of small generation units to answer local demand can help reduce pressure on grid capacity, avoiding the need to develop new infrastructure;
- Grid congestion can be reduced through distributed generation development, obviating the need for expensive transportation infrastructure investment.

Ancillary benefits raise other issues. Impacts on local employment and health are difficult to value in energy prices. However, developing these resources can reduce social and health costs. While this value could be informally recognised in the past by developing the resources despite a higher cost, deregulation does not allow this. Instruments need to be developed to reflect this value in the market.

The environment is valued through pollution taxes and green certificate schemes to help promote clean energy. Climate change negotiations may help value clean energy sources through carbon emission reduction trading, while green electricity now gives consumers the option to choose renewable energy. The insurance industry is also considering ways to reflect the environmental value of energy sources since it will be the first affected by adverse effects of climate change.

Other more intangible values are more difficult to promote. By developing the use of local and regional resources, renewable energy contributes to energy diversification while serving security of supply. Renewables also decrease country exposure to strong energy market price fluctuations.

Incentives

Previous examples show how renewables are disadvantaged under current market assumptions, but could become competitive if their benefits were properly valued. However, there may be a case for renewable energy subsidisation. Political will to develop technologies over time has produced significant long term support to research, development and deployment programmes in many, if not all conventional power generation technologies. Most initiatives were implemented to address national and international concerns over energy, social and environmental issues. Renewable energy technologies have the potential to answer, if not alleviate, many current environmental, climate change and energy security concerns in OECD and developing countries.

Well-targeted subsidies can help jump start markets for technologies which are considered to offer the potential to respond to these needs. In this case, subsidies should be considered as a catalyst which will help deploy those technologies on a significant scale in order to benefit from the impacts ahead of the time in which they would have been deployed otherwise. These incentives could be qualified as “learning investments”, helping to decrease unit costs over time through higher capacity additions, leading to faster progression over the technology’s experience curve.

The most difficult, when implementing subsidies, is to avoid distorting markets to an extent where other potentially environmental, commercially sound technologies will be excluded. Lock-in effects can be avoided through careful, well thought and transparent implementation of subsidies. However, the priority should be to properly value benefits in order to choose renewables for their intrinsic value instead of the possibility of obtaining subsidies and grants.

ANNEX 4

OVERVIEW OF DEVELOPING COUNTRY NATIONAL PLANS

Country	**RE Plan** (national, regional, timeframe)	**Targets** (installed capacity, people served, rate, by technology, by energy source) *from official sources*	**Targets** *from other sources*[34]	**Incentive mechanisms for implementation** (tax credits, subsidies, etc.)	**Status** (adopted in parliament, national /state level legislation, announced, or seriously considered)	**Assistance** needed from G 8 to implement – investment, capacity building, etc.
Argentina	National / World Bank and GEF Renewable Energy in the rural market		Supply electricity to 66,000 households with SHS, size 50-400 Wp, 1,100 public facilities with PV-systems and 3,500 with hybrid systems[35]	RE market subsidised by government, World bank and GEF		
Bangladesh *(8)*	National Rural Electrification Board and Micro finance institutes using GOB funds and loan from WB & IFC.	Biogas plants 600. 850 SHS Installed by REB and 2000 by Grameen Shakti	Additional SHS service to 16000 households by 2005. Market of 0.5 Million households eligible to use SHS[36].	Tax exemptions for RE equipment import, investment depreciation favourable	Renewable Energy Policy by the Government is under review for the Sixth Five Year Plan.	Access to international financing will be needed with suitable financing mechanisms.
Bolivia *(9)*	National rural electrification PRONER		Number of new connections 1998-2001: small hydro: 25,000 , PV / wind: 49,000 Investment costs (incl. Grid extension) $103 m		PRONER serves as frame of reference for the Investment Program	
Brazil	National rural by 2005 CEPEL		PV - 50 MW Wind – 1 GW Solar thermal – 3 M m^2 Small hydro – 2.5 GW *(2)*		RE being considered in regulatory proposals for reformed electricity sector PRODEEM created by Presidential Decree *(2)*	Access to international financing and participation of international companies (esp. bagasse co-generation) *(2)*

[34] For the extent possible this information has been derived from original sources. A part of the information is based on personal communication. Input has been received from
(1) Mike Bess, ESD
(2) Clive Caffall, DFID
(3) Ajit K. Gupta, Ministry of non-conventional energy sources, India
(4) Enno Heijndermanns, World Bank
(5) Ted Kennedy, World Bank
(6) Jean Ku, NREL
(7) Eric Martinot, World Bank/GEF
(8) Hasna Khan, Prokaushali Sansad.
(9) Kilian Reiche, World Bank
(10) GTZ, Germany (German Technical Co-operation)
(11) Wenqiang Liu, State Economic and Trade Commission China
(12) Shadzli A. Wahab

[35] Martinot/Reiche 2000

[36] Prokaushali Sangsad 1998

China	National Plan (Tenth 5-year plan to 2005)	Targets for 2005: Solar PV: 53 MW; Solar water heater: 64 million m^2; Wind farm: 1500 MW; Off-grid wind turbine- 35 MW; High temperature geothermal generation: 45 MW; *(11)* Middle/low geothermal space heating: 14-15 million m^2; Installed biomass gasification and generation :80 MW; Tidal and wave energy: 2 MW installed capacity (per year) *Source: report of national plan*	Targets for 2010: PV 174 MW (about 28 counties 10,000 townships 1,000 islands w/o electricity); 2.7 billion m^3 biogas; 50 MW tidal power; Small hydro 32.5 GW; Wind 4,900 MW; 13.4 m hectares fuel wood plantation0 Biomass electricity about 300 MW; The total volume of utilisation of NRE will increase to 390 million tons of standard coal[37] *Sources: National Plan 1996 –2010[38], (11), (2)* Proposed 5% renewables as share of annual investment in power generation[39] *(7)*	Competitive solicitation for wind farm concession and PPA, Development of standards, Demonstration projects, RE electrification program for Western Provinces includes subsidies *(2), (10)*	Interim targets achieved by year 2000: Small Hydro 23.5 GW Wind 344 MW Solar PV 16.5 MW *(11)* Biomass electricity 50MW Standard for improved stoves adopted *(2)*	Investment, assistance in project development and implementation *(6)*
Guatemala	National		Depends on IPPs	Proposed tax exemptions for local inputs, imports (inc. expertise), initial operation	State level legislation to be announced *(2)*	Planning a Centre of Information for Renewable Energy and a Fund (with IADB and Winrock help) *(2)*
India	National within 5 year plans (current one to 2002) State level targets and implementation	Improved stoves (>20% efficiency) 120Mpotential 33M achieved @ 3M/yr Family biogas 12M pot., 3.1 M achieved 180k/yr Solar 150 MW by 2002 PV pumps @ 2,000/yr SHS @ 100k/yr -> 0.5 million by 2002 Lanterns @ 200k/yr Wind 120 GW potential, 1267 MW achieved, 1800 MW under discussion Small hydro 10GW pot., 1550 MW achieved Bagasse co-gen 3500 MW,273MW achieved *(2), (1) referring to the Ninth 5-year plan*	Proposed 10% renewables as share of annual investment in power generation[40] *(3)*	Tax concessions such as equipment duties and investment depreciation Subsidies (interest and capital) drive the progs for each technology type. Soft loans available through the Indian Renewable Energy Development Agency (IREDA)	Dedicated Ministry for Non-Conventional Energy Sources (MNES) Interim targets written into national economic development 5-year plans *(2)*	MNES might welcome assistance to accelerate progress towards their long term potential targets
Indonesia	No explicit plan for RE State utility (PLN) accepts proven grid-connected RE technologies		RE most likely option for 6,000 of the villages still to be electrified - Small hydro 60 MW - PV SHS 2M (potential) - Wind 1.4 MW - Bagasse co-gen 100MW *(2)*	Policy to permit IPPs Small Power Purchase Tariffs Low interest loans and credits to help rural consumers get connected		Several donor funded energy projects are already under implementation or in preparation *(2)*

[37] Source – “Program on New and Renewable Energy” by Ministry of Science & Technology, state Development and Planning Commission, State Economic and Trade Commission

[38] Most of these numbers derive from national plan and do NOT include the regional plans for renewable energy made by the provinces.

[39] Annual power increments are running 20,000 MW, so this would be 1000 MW/year, or $1 bil./year (7)

[40] Annual power increments are running 10,000 MW, so this would be 500 MW/year, or $0.5 bil./year (7)

Malaysia			Likely to introduce RE for the 7% of rural households still without electricity *(2)*	Incentives for companies utilising biomass: Income tax exemption of 70%, import duty & sales tax exemption *(12)*		
Mexico	National RE-based rural electrification plan PRONASOL		Only geothermal considered to be mainstream 335 MW additional geothermal plants under construction *(1)*	Financial support for RE		
Morocco	Government Electrification program PERG		Provide power to almost all households by 2010 through grid extension 80-85% and RE solutions Wind actually 50 MW, planned 200 MW *(1)*		PERG-program for off-grid – Solar Home Systems, Wind, Biomass and small hydro - launched in 2000 *(1)*	
Nigeria	National Rural electrification plan Target of additional 52 million people served		Rural electrification plan / currently 40 % have access, aiming for 85% by 2010, in off-grid regions mainly by Solar		Not adopted by now	
Philippines	National 2000 – 2009 Energy Resources for the Alleviation of Poverty(ERAP)		By 2009: (MMBFOE) Hydro: 19.55 Geothermal: 24.80 NRE: -fuelwood: 49.48 -bagasse: 13.33 -charcoal: 5.33 -agriwaste: 22.05 -others: 2.13 Overall NRE 15% of all electricity by 2025 1,400 communities by decentralised NRE by 2004 (was 2008) *(2)*	Tax exemptions for power generation facilities that do not utilise petroleum fuels (e.g. on imported kit and spare parts) US$30M allocated as a financial facility for private sector participation in NRE projects	Department of Energy, Non-Conventional Energy Division runs NRE programme National Electrification Administration - Alternative Energy Division delivers rural electrification projects *(2)*	Improved climate for investment in renewable energy by eliminating the market-distorting effects of tied aid & donor-driven projects with unsustainable subsidies. The ERAP Program would require at least US$300M, so the Government requests assistance to achieve its target. *(2)*
South Africa	No specific policy for RE, although mentioned in Energy Policy White Paper 1998		PV targets for 1995-99 met 1.5 million households served by SHS within 10 years[41] Industry proposed target for Wind 7-10% of electricity by 2020 *(2)*	Innovative approaches to reducing the risks to financial institutions "need to be exploited"	Future targets being negotiated, based on funding availability	Standards and codes of practice, based on international practice and adapted for South African conditions and cost efficiency requirements. *(2)*
Sri Lanka	World Bank / GEF		"Energy service delivery project" will electrify 32,000 rural customers with SHS, mini-hydro and wind *(4)*			

41 This means 50% of the potential

Uganda	National (Rural Electrification Strategy and Plan), World Bank, GEF, GTZ (policy) *(10)*	To achieve for the year 2010 a rural electrification rate of 10% (400,000 new consumers including 20% PV) *(10)*	Rural electrification by development of renewable energy sources, including solar PV, biomass, mini-hydro, wind and geothermal with target of 70 MW *(5)*	The World Bank Energy for Rural Transformation (ERT) project with a GEF component will provide subsidies on investment costs Presently, exoneration on RE equipment And sales on a commercial basis *(10)*	Strategy approved by Cabinet in 02/2001 ERT/AFRREI programme in preparation; GEF component approved by GEF council in May 2000 Implementation in mid-2001 *(10)*	GoU and World Bank are looking for other contribution to finance the ERT programme *(10)*
Vietnam	*No specific policy for RE*		National rural electrification program of Vietnam to electrify 90% of rural households by 2005, 10% (175 - 300,000 households) likely by RE *(2), (5)*		In 2000 71% of rural households electrified *(2)*	

ANNEX 5

COMPILATION POLICIES AND MEASURES IN OECD COUNTRIES

	Monetary, future investment **(subsidises, tax, feed-in)** [42]	**Past investment in RE**, direct and indirect (tax exemptions, guaranteed prices) subsidies	1998 **R&D** Budgets for RE[43]	**Future Share of RE**	**Incentive Mechanism**	Remarks **Name of programme**
Australia	$6.5m over 4 years[44] for conversion from diesel to REs $Aus 264 m $ 1bn for greenhouse gas reduction		$ 5.2 m (in 1997)	9,500 GWh/year by 2010[45]	Taxes Guaranteed market Renewable certificates	Renewable Remote Power Generation Programme Measures for a better environment Mandatory renewable Energy Target
Austria		E 64 m subsidies[46] Investment fund E 5.8m Reduced VAT tax	$ 10.9 m		Guaranteed market (4%), grants for investment, Guaranteed minim. Prices Biomass has reduced VAT	Promotion Instrument for Electricity from Renewables Number of support by the Laender
Belgium		Since 1995 feed-in, E 1 m[47]	$ 3.4 m (1997)	3% by 2004 electr., 4% by 2005[48]	Europe-wide renewable certificate trade[49] Guaranteed tariffs investment assistance 15%	
Denmark		CO2 tax with feed-in: E 126 m by 1998[50]	$19.7 m	20% 2020 primary[51] 20% 2003 electr.	CO2 –quota with trading guaranteed tariffs RE exempted from electr.taxes assistance in investment	Wind and CHP National Plan Energy 21
European Union	RE part of the 5th RTD programme E 120 m/year ALTENER 2 (1998-2002) E 15 m/year[52]	About E 50 m from structural funds RE part of share E 1.2m[53]		12% (22%) by 2010[54]	Financial support Co-ordination Renewable Certificates	Financial support from structural funds Co-ordination from Campaign for take off PHARE programme Research support under the 5th Framework RTD programme

[42] IEA 2001b
[43] IEA 1999b
[44] IEA 2001b
[45] IEA 2001b
[46] IEA 1998
[47] IEA1998
[48] IEA 2001b
[49] The Europe-wide Renewable Energy Certificate System has been formed on a voluntary basis by 50 power Companies from Norway, Sweden, the Netherlands, Denmark, Belgium, Italy and the UK.
[50] Oosterhuis 2001
[51] Third White Paper 1996
[52] Oosterhuis 2001
[53] Oosterhuis 2001
[54] This target is not additive to the European country national plans, but makes a regional goal.

France	Total charge FF 4.4bn by 2010[55] Euro 75m per year for dissemination & R&D, E 20m in regional budgets[56]		$ 4.2 m	by 2006: 4000 MW wind power[57] By 2010 total RE: 21% electricity[58] [59]	Guaranteed tariffs Tax credit for RE installation Grants for solar heat and PV(mostly DOM-TOM)	Electrification in DOM-TOMs HELIOS 2006 (solar heat) EOLE 2005 (wind power)
Germany	Renewable Energy Act, May 2000	Tax exemption: E118m Feed-in 1996: E 400m[60] $ 520 m	$84.4 m	10% of electricity by 2010	Guaranteed price for RE and Co-generation Low interest loans for PV Renewable certificate trade	Renewable Energy Law since April 2000 Co-Generation Act since May 2000 100,000 – Roof- Program (for PV)
Italy		Guaranteed market: E 300m, CO2 tax E52m[61]	$35.0 m	2008-2012:additional 7,600 MW of RE[62], 2 % of produces energy from RE[63]	Guaranteed premium tariffs Solar systems reduced VAT CO2 –Tax Certificate trade(footnote1)	
Japan	$ 462 m for New Sunshine PV-programme[64]		$ 105.3 m	3,7% by 2010 of primary energy[65], PV: +5000 MW by 2010[66]	Investment support of RE projects with low interest loans Guaranteed buy-back tariffs	Law Concerning Promotion of the use of New Energies 1997 New sunshine programme
Netherlands		Budget 1999: E76.5m[67] Tax exemption E 14m Other subsidies E128 m	$ 30.0 m (1997)	17% (10%) by 2020 electricity (primary)\	Investment assistance [68] Tax exemption of renewable project Quota Certificate trade(footnote1) Feed- in tariffs	Renewable certificate Market CO2 reduction plan Action program Renewable Energy 1997-2000
Spain		Direct subsidies: E32 m Feed-in: E 100 m	$ 14.1 m	10-12% by 2005 primary energy	Investment assistance by low interest loans Premium price tariffs	Energy Savings and Efficiency Plan, include. Renewable Energy Program
UK		NFFO 97/98: E 193 m	$ 6.0 m	10% by 2010 electricity	Renewable certificates (footnote1) Quota	British Climate Change Strategy
USA	Tax incentives of $4 bn over 5 years, dispensed RE[69]		$ 244.7 m	Renewable Portfolio considered: 2.4% by 2004 electricity 7.5% by 2010 electricity[70]	Tax incentive quota in 9 states by 1999 Renewable Portfolio Standard Net metering	*SUPPORT DEPENDS VERY STRONG ON THE STATES; 30 states have introduced or passed restructuring bills in the electricity market* Energy Policy act Public Utility Regulatory Policy Act Climate Change Action Plan Million Solar Roof

[55] IEA 2001b
[56] Jean-Louis Bal, ADEME, referring to National Program
[57] Jean-Louis Bal, ADEME, referring to National Program
[58] PlanetArk 12/11/00
[59] PlanetArk 12/11/00
[60] Oosterhuis 2001
[61] Oosterhuis 2001
[62] Italian White Paper for the valorisation of Renewable Energy Sources, 1999
[63] IEA 2001b
[64] New Sunshine Programme, New Energy and Technology Development NEDO
[65] National Plan Energy 21, 1996
[66] New Sunshine Programme, New Energy and Technology Development NEDO
[67] Oosterhuis 2001
[68] Law Concerning Promotion of New Energies 1997
[69] IEA 2001b
[70] Comprehensive electricity Competition Act CECA

ANNEX 6

TRADABLE RENEWABLES CERTIFICATES

Draft conclusions

RECOMMENDATIONS OF THE EXPERT MEETING ON
TRADABLE RENEWABLE CERTIFICATES (TRC'S)

held at the IEA-headquarters in Paris on 12th February 2001 with specialists from developed and developing countries

Considering that:

All countries and the global environment will benefit from increased use of renewables:[1][71]

- There is a growing global market for renewable energy that is providing environmentally-friendly energy with important other benefits.
- Renewables can also contribute to economic development, social equity, and lowered vulnerability to fuel supply and price fluctuations.
- The market for renewable energy is more dynamic than at any time in history, suggesting the need to strengthen and streamline the rules for international trade.

Disclosure is crucial [2]

- Due to its increased value, renewable energy can often be sold at a higher price than 'conventional' energy. These additional values underpin the feasibility of Tradable Renewable Certificates.
- Trade in renewable energy is threatened by the risk of fraud and double counting of renewable energy and/or its certificates.
- Full disclosure of information on the market for renewable energy is crucial.

TRC-systems provide an economic tool to stimulate investment and act as a method for full disclosure of information [3]

- Tradable Renewable Certificate systems have been developed in several countries (particularly in Europe, USA and Australia).
- TRC systems provide a mechanism for tracking and verification.
- TRC systems potentially offer an efficient, liquid, and flexible economic tool, allowing the efficiencies of the marketplace to come to the fore, since the TRCs act like a currency, representing the value of the non-energy attributes of renewable energy.
- If linked internationally, TRC systems may be useful in supporting renewable energy trade between countries.

Possible role of a global system for TRCs [4]

- World-wide trade could advance the market for renewable energy in developing countries.
- World-wide trade could strengthen the position of developing economies in the world market.
- World-wide trade could benefit G8 countries via demand for technology and services.
- World-wide trade could stimulate technology development and lead to lower costs.
- World-wide trade could lead to efficient development of global renewable energy resources.
- World-wide trade could have substantial benefits for the environment.

TRC-systems need further development

- Without special attention TRC-systems may conflict with other renewable energy support mechanisms.
- The TRC-systems that are currently being developed are bottom-up approaches, which are not mutually harmonised.
- Little is known about the details of each TRC system, other than by those who have initiated the systems.

[71] The figures refer to the explanatory notes at the end of the document.

- Little is known about the acceptability of the TRC systems to end-users and individual governments, although the prospects appear to be good.
- The potential interactions between TRC systems and carbon trading systems, the Clean Development Mechanism and Joint Implementation are unclear.
- A series of social, economical and legal barriers could potentially obstruct TRC trading.

Experts agree on the usefulness of action

- A world-wide expert seminar on the topic was organised at the headquarters of the IEA in Paris in February 2001.
- Delegates agreed that national TRC systems can be an important mechanism to promote domestic markets for renewable energy, and that support for countries desiring to explore or establish TRC systems should be made available.
- The possibility of international trade of certificates, beyond that already contemplated in Europe, may be attractive in certain circumstances, and deserves additional investigation.

It is recommended that:

An expert network on TRCs be established to:

- Exchange information on TRC systems being developed around the world.
- Assess the functioning, effectiveness, and potential of TRC systems to better understand how they can be successful.
- Develop and disseminate TRC "best practices", by supporting a series of seminars in interested countries, including in developing countries (China, India, Brazil, Mexico, South-Africa, and others)[72].
- Undertake several pilot initiatives in these regions, to facilitate 'learning-by-doing'[73].
- Investigate the pros, cons and barriers to the development of an international TRC system within and between continents.
- Organise research[73] on:
    - the ways in which TRCs can be linked to multi-lateral funding as a complement and supportive mechanism for renewable energy development,
    - the interaction between TRC systems and various government support mechanisms used in developing countries,
    - the possible negative impacts of an international TRC system on developing countries, and the potential mitigating actions that could prevent detrimental outcomes,
    - the risks of international TRC trade driving up domestic prices of renewable energy, or reducing the development of domestic renewable energy projects,
    - the cross-border trade impediments that will need to be addressed,
    - the compatibility between TRC trading and carbon trading regimes,
    - the potential role of TRC-trade in the CDM and in burden-sharing processes,
    - the interest of consumers and governments in supporting international TRC purchases that are devoid of carbon benefits,
    - the opportunities for using similar certificates to stimulate the market for commodities other than electricity (e.g. renewable energy used for heat purposes and transport fuels).

The network could include:

- the designers of the existing systems in Europe, USA and Australia,
- representatives from the developing economies,
- policymakers who are able to implement the conclusions of the discussions,
- stakeholders that are active in the design of international carbon trading systems.

Explanatory notes:

[1] Benefits of world-wide trade in renewables

There is an increasing body of evidence that, beyond the energy they produce, renewables contribute to society in many ways, including to economic development, to alleviating local environmental problems, to social equity, and to reducing vulnerability to fossil fuel supply and prices. For markets to work more efficiently, international trade must be encouraged. This can be done through strengthening the market links between countries and businesses, and by establishing harmonised market rules.

[72] Action can be taken by the IEA in co-operation with the designers of the current TRC systems.

[2] Disclosure
Both the electricity generated from renewable energy resources and the environmental benefits of their use have a market value. Systems will need to be put in place in order to prevent misuse, double-counting and double-selling of renewable energy. Certificates that are directly linked to the output of an operating power plant, and thus are tied to performance rather than the size of the capital investment, provide the required guarantees and at the same time provide incentives for efficient construction and operation of renewable energy schemes. Both government agencies and voluntary certification programs can use the certificates to track purchases and verify marketing claims.

[3] The role of Tradable Renewable Certificates (TRCs)
TRCs have two primary roles. The first is that of providing a reliable and efficient tracking and verification mechanism for renewable energy sales. This can be used within both mandated and voluntary markets. Both government agencies and voluntary certification programs can use these certificates to track purchases and verify marketing claims. The second role is that of an efficient, liquid, and flexible economic tool that allows the efficiencies of the marketplace to come to the fore. In this role, the TRC acts like currency representing the value of the non-energy attributes. The TRC is effectively unbundled from the physical energy component. The TRC thus can be marketed in any geographic location, including locations where the physical energy would not otherwise be used. This is particularly useful when local renewable resource sites have been exhausted while local demand for renewable resources remains.

[4] Possible role of global system for TRCs
These benefits are increasingly relevant to developing economies, which are currently expanding their power sectors. Trading renewable energy with other countries could strengthen their link to the world-market and stimulate local technical development. In developed countries international trade will create demand for technology and services, and stimulate cost-effective technology development. On top of that, trade offers an efficient way to channel development support. An overall benefit of a worldwide approach is that global renewable energy resources will be used efficiently.

More information about TRCs and the Symposium can be found at: www.iea.org/trc

ANNEX 7

CASE STUDIES

The following case studies have been collected to demonstrate the issues discussed in the report. They are listed in the order they appear in the report for ease of reference.

Case study #	Section	Country	Demonstrates:
1	1.5.1	Morocco	RE can be economic compared to conventional
2	1.5.1	Japan	Importance of R&D/ demonstrations to stimulate learning effect
3	1.5.1	USA	Texas Portfolio Standards
4	1.5.1	Sahel	Job creation through renewables projects
5	1.5.2	Africa	Greenstar
6	2.1.2	Kenya	A Comparison of Programmes to Introduce Improved Cookstoves in Developing Countries
7	2.2.1	South Pacific/ Tuvalu	Value to reliable energy services
8	2.2.2	India	PVMTI
9	2.2.2	Peru	Revolving Fund
10	2.2.2	Bangladesh	Seed funding for solar home
11	2.2.2		Solar Development Group – SME and capacity building
12	2.2.2	France	AREED, Sustainable development energy enterprises
13	2.2.3	Madagascar	Development benefits of RE
14	2.4.1	Netherlands	Tax incentives for green incentives
15	2.4.1	Germany	Feed in laws
16	2.4.2	California	Costs of disruptions of electricity in California
17	3.2	China	A national plan
18	3.2		TCAPP
19	3.2	Uganda	National planning process, WB/GEF strategic partner-ship: the example of Uganda
20	3.2	France	National plan
21	3.3.1	Sri Lanka	Importance of IPP regulation
22	3.3.1	Italy	Green electricity
23	3.3.2	Argentina	Privatisation/ concessions scheme combined with smart subsidies
24	3.4.1		REEF
25	3.4.1		Tool to increase financing for RE in IFI's is a program like ESMAP
26	3.4.2		ASTAE Demonstrates mainstreaming RE in IFI
27	3.6	Canada	RET screen, tool for market coherence
28	3.6	South East Asia	PRESSEA

CASE STUDY 1 MOROCCO

Morocco has a very ambitious Global Rural Electrification Programme (PERG) which aims to boost the rate of village electrification from close to 20% in 1995 to 80 % by 2008, which means bringing electricity to more than 1,500,000 households in a little over ten years. This scheme has been launched by the Office National d'Electricité (ONE) in August 1995 and approved by the government of Morocco and envisions electrification through grid extension as well as through decentralised power (mainly from renewable resources).

The principal criterion of eligibility is the per-household cost of energy supply and the geographic dispersion of households. The maximum allowable cost for grid connection is 25,000 dirhams per household (1 Dirham = 9 cents). This limits grid connection to fairly sizeable groups of households, and eliminates extremely isolated villages with dispersed settlements. Using this method, some 200,000 households have been identified as potential candidates for off-grid electrification.

The decision of implementation and the choice of the mode of electrification is left to the initiative of either the Communes, or village associations. The financial contribution from the district is set at 25% of the average cost resulting from a cost balancing mechanism at the national level and at another20% to be paid by the household. The contribution of the end-users can be paid over a period of 5 years which works out to 500 Dh per household per year. The simplest solution and the one best suited to meet the needs of population isolated from the main grid and living in dispersed settlements are individual Solar Home Systems (SHS). This is also less expensive for the community, in as much as the consumers only require small amounts of power.

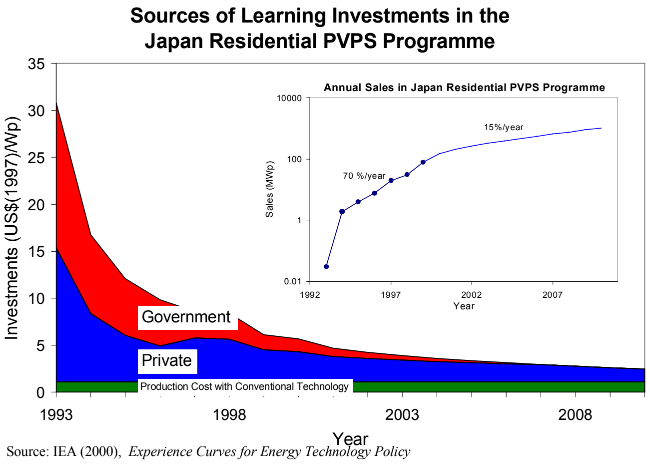
Source: adapted from information provided by ONE, Morocco, Web site: www.one.org.ma

CASE STUDY 2 RESEARCH, DEVELOPMENT AND DEPLOYMENT OF PV SYSTEMS IN JAPAN

In June 1998 Japan set a target for new installed capacity of PV to be 5000MW by the end of 2010. In order to realise this target (and make it affordable), an R&D program "Development of Technology for Practical Application of PV Power Generation Systems" was developed with the principal aim to drive down the costs of PV. At that time, generation costs for household electricity with PV were three times as expensive as conventional generation. The programme is targeting to establish a new PV market and to demonstrate system endurance, and includes the following areas:

- Collaborative demonstration projects between private companies, local governments and other organisations where the government meets 50% of the costs.
- Subsidy programme for residential PV owners and for the use of PV by local governments
- Government subsidies of 33% of costs of PV installations for companies

So far, the R&D programme has been very successful. Under the demonstration programme, approximately 200 MW of PV has been installed by the end of the 1999. In the residential sector, over ten thousand systems have been installed annually as a result of the subsidies. The programme has achieved economies of scale and as a result, significant price reductions. This figure demonstrates the effect of such 'learning investments' on the producer costs of PV: the costs are coming down rapidly as sales increase. The main drawback of the program is that it promotes market development which is dependent on subsidies.



Source: IEA (2000), *Experience Curves for Energy Technology Policy*

Source: adapted from information provided by NEDO, Japan. http://www.nedo.go.jp, and IEA 2000b

CASE STUDY 3 TEXAS PORTFOLIO STANDARDS

Under the Renewable Energy Portfolio Standard (RPS) in Texas retail electricity suppliers have a requirement to include a specified percentage of renewable energy in their generation portfolio. Early indications show that the policy is successful, with projections that the first year target of 400MW of new capacity to be installed during 2002 and 2003 will be exceeded significantly. The key factors considered to be contributing to the success of the policy are clear renewable energy targets, specific renewable resource eligibility requirements, stringent non compliance penalties, a tradable Renewable Energy Certificate system that encourages flexibility and minimises costs, and a dedicated regulatory commission that fully involved numerous stakeholders during the detailed design of the policy.

Renewable Energy Certificates (RECs) are used by the retail electricity suppliers to demonstrate compliance with the RPS. Due to the ability to trade certificates the electricity suppliers have the choice of meeting their RPS requirement in the following ways: building renewable energy projects, buying power from renewable energy projects or buying the RECs from a credit trading exchange or another party. The policy is backed up by annual renewable energy generation targets. To ensure that the renewable energy purchase obligation is met, retail electricity suppliers that do not meet their RPS requirement are penalised by the lesser of either 5 cents/kWh or double the market value of a renewable energy credit for every kWh shortfall. Wind energy is currently dominating the new installed capacity of renewables. It has proven to be a low cost resource in Texas, with supply costs of around 3 cents/kWh (which includes a 1.7 cent/kWh federal production tax credit). A major lesson from Texas is that, while the RPS is new and relatively untested as a policy tool, it has the potential to cost-effectively support the establishment of a robust renewable energy market.

Source: adapted from information provided by USA DOE, http://www.eia.doe.gov

CASE STUDY 4 LESSONS FROM THE EUROPEAN COMMISSION FUNDED REGIONAL SOLAR PROGRAMME IN SAHELIAN COUNTRIES

Between 1991 and 1997, the Regional Solar Programme installed 626 PV pumping systems and 644 community systems (including refrigerators in dispensaries, lighting in rural health centres and schools) in nine Sahelian countries: Burkina Faso, Cap Verde, Chad, Gambia, Guinea Bissau, Mali, Mauritania, Niger and Senegal. Due to the size of the programme, the RSP has changed the perception of the role of PV for village water supply in the Sahelian countries. For villages, of between 1500 and 3000 inhabitants, PV has become the common choice, with diesel taking second place.

Under the programme, the villagers were required to pay for the water supplied through the PV pumping systems, thereby contributing towards cost of renewal of the equipment. This was undertaken through a village water committee. Education was required initially to overcome the concept that provision of water should be free, but once fully informed, villagers became supportive of the idea that the price of water should be sufficient to cover operation, maintenance and renewal costs. This understanding was achieved by encouraging a strong involvement of the end users and building a sense of ownership for the water supply service. The villagers become stakeholders in the service through a compulsory down payment required before the start of the installation. The village water committee takes on the end-user responsibilities as a community, undertaking daily caretaking, collection and management of water payments including the fund for operation, maintenance and replacement.

The RSP has paid particular attention to the development of local knowledge through training programmes and the adoption of an integrated quality control approach, which covers system design, specifications and laboratory performance measurements. Local installers are trained and the performance of the systems are measured after five years of operation. By adopting this quality approach, the high reliability of PV technologies has been proven. The scheme showed that after 5 to 10 years of operation, more than 95% of systems are still providing water and the mean time between failures averages at 6 years.

Source: adapted from information provided by FONDEM, France

CASE STUDY 5 GREENSTAR

Greenstar delivers solar power, health, education and environmental programs to small villages in the developing world – and connects people in those villages, and their traditional culture, to the global community. To deliver these services efficiently and quickly, Greenstar has designed a portable community centre. Using solar power generated by large photovoltaic panels, Greenstar can drive a water purifier, a small clinic, a vaccine cooler, a classroom, a digital studio and a satellite or wireless link to the Internet. Greenstar works with the people of each village to develop an e-commerce web-site, employing local musicians, teachers and art professionals to record the voice of the community. Greenstar packages the materials for various markets, both direct to the consumer, and through licensing to businesses. This formula provides new jobs and skills, strengthens local culture and language, and affirms people's independence. Villagers own the Greenstar Village Centre themselves, and become shareholders in Greenstar. Greenstar is a profit-making business. The first priority is to profit its partners in developing countries, then investors (who come from all over the world), and then to profit Greenstar itself, in order to fund ultimate expansion to 300 centres world-wide over the next five years. The "future building" process helps bring people up the literacy curve in practical, measurable ways, based on their inherent cultural assets and not on mining of the resources of their land, or on exploitation of their cheap labour. Future Building is a process that stimulates community involvement, and enhances an understanding of their priorities for development.

Source: adapted from information provided by Greenstar. http://www.greenstar.org/

CASE STUDY 6 A COMPARISON OF PROGRAMMES TO INTRODUCE IMPROVED COOKSTOVES IN DEVELOPING COUNTRIES

Previous efforts to develop and disseminate improved biomass stoves have met with mixed success. Three of the largest programmes have taken place in China, Kenya and India. China implemented the most sweeping and successful improved stove programme in the world, with some 90% of world-wide installations of improved cooking stoves over the past two decades. From 1982-1999, 175 million rural households had improved stoves installed. Kenya also implemented relatively successful stove programmes both for urban and rural areas, disseminating over 780 000 stoves by the mid-1990s. (Karekezi and Ranja, 1997) Some 16% of rural homes are presumed to currently use the more efficient jiko stove. Since 1985, the National Programme on Improved Chulhas in India has implemented an extension programme to provide efficient cooking stoves (chulhas) to rural and semi-urban households. So far, 309 000 improved chulhas have been promoted against the potential coverage of 1 200 000 rural and semi-urban households. (Ministry of Non-Conventional Energy Sources, Annual Report, 2000).

The successful improved cookstove programmes in developing countries were characterised by the following key factors: they targeted regions with adequate interest as well as technical, financial, and managerial capability; government subsidies were limited; key stove components were produced centrally; women's groups were used for stove dissemination in rural areas; performance was evaluated through independent testing and monitoring; designs were tailored to meet local conditions; and small enterprises were utilised to produce and market stoves in areas where users could afford to pay. Factors which have limited the success of improved cookstove programmes in some countries include: government subsidies which lowered the cost of the stove orientated producers' incentives towards the government; low-quality manufacture lead to short lifetimes for many stove designs; the absence of adequate training and support services, because improved cookstoves were a seemingly simple household technology; lack of market research to determine concerns of the women who would be using the stoves – some programmes targeted men or extension workers; and lack of research into different cooking habits across regions or countries lead to many stoves lying unused.

Source: adapted from information provided by T. Malyshev, IEA

CASE STUDY 7 SOUTH PACIFIC- TUVALU

Box in text provides full case study

CASE STUDY 8 PV MARKET TRANSFORMATION INITIATIVE (PVMTI) IN INDIA

The annual PV market in India was approximately 10 MWp/year in 1997. Government PV purchasing and subsidy programmes have played a significant role in supporting the development of this PV industry. There are substantial government incentives offered including subsidies in the form of financial support and cost-sharing, a wide range of fiscal incentives, and concessional finance. However the market is characterised by: an unacceptably high incidence of system failure in the field; inadequate marketing, distribution, customer support and after-sales service; often attributable to private sector markets being suppressed by subsidy programmes; general lack of consumer awareness of PV technology and its benefits; dependence on end-user subsidy; underdeveloped availability of consumer finance which is crucial to make SHS affordable.

The Photovoltaic Market Transformation Initiative (PVMTI) was launched by the International Finance Corporation (IFC) as an innovative investment facility designed to provide finance to private sector ventures that encourage further market development for PV. A total of US$25 million of Global Environment Facility (GEF) funds are available for investment by the IFC in PV projects in India, Kenya and Morocco. A total of US$15 million is allocated for India and US$5 million each for Kenya and Morocco.

The principal aim of PVMTI is to accelerate the sustainable commercialisation and financial viability of PV technology in these three countries of the developing world. PVMTI aims to address market barriers by making available appropriate financing and stimulating business activity. The specific focus is to stimulate PV business activities in India, Kenya and Morocco. This is achieved through: (i) providing finance for sustainable and replicable commercial PV business models, according to individual business plans through a competitive bidding process; (ii) financing business plans with commercial loans at below-market terms or with partial guarantees or equity instruments and; (iii) provision of technical assistance (through the EMT) to PV businesses on planning, financing operations and technology. PVMTI is managed by Impax Capital and IT Power through local managers, with IFC making final investment decisions. To date a total of seven investments have been approved with four in India.

Source: adapted from information provided by Vikram Widge, IFC and IT Power, UK

CASE STUDY 9 REVOLVING FUND FOR THE IMPLEMENTATION OF SMALL HYDRO SCHEMES IN PERU

The revolving fund for the implementation of micro hydro power plants is a project that began in 1994 with an agreement between the non-governmental organisation ITDG-Peru and the sector of the Inter-American Development Bank (IDB) that provides aid to small companies. The project is an example of a successful financial model that combines subsidised loans and technical assistance, through shared efforts between technical co-operation agencies and government institutions. Its purpose is to meet the small-scale electricity requirements in isolated rural areas of Peru which are impossible to serve with the conventional grid systems. The fund has provided loan finance for the implementation of 21 rural electrification schemes, of which 15 are owned by municipalities, 5 by the private sector and one co-operative. $700,000 of loan funds leveraged $2.5 million of government and other funds to provide electricity to 15,000 people. The model has developed over time and has demonstrated that loan finance to communities and the private sector can leverage local capital and government funds for locally owned and sustainable decentralised rural electrification.

It was found that promotional work was necessary to encourage projects to come forward and activities included the organisation of regional or local workshops attended by authorities, small scale producers and community members as well as participating in fairs or other events. Technical assistance was provided for the preparation of technical and financial case proposals for funding and in the construction and operation of schemes. In terms of the construction process, ITDG either supervised or inspected the quality of the scheme if the construction was undertaken independently. Potential scheme operators were selected as soon as possible during the construction process, so that they could be trained in operation and maintenance during construction. A small firm (AFIDER) was contracted for the purpose of loan recovery and to conduct financial appraisals of each project. To date loan recovery has been 100%.

In this programme, the use of a revolving fund has proved itself to be viable and has enabled the speeding up of the rural electrification process.

Source: adapted from information provided by ITC, UK

CASE STUDY 10 BANGLADESH-SEED FUNDING FOR SOLAR HOME SYSTEMS

Grameen Shakti, a new not-for-profit subsidiary of Grameen Bank in Bangladesh is involved in the range of PV solar home system-related business activities including: marketing, sales, servicing, credit provision, payment collection and credit guarantees. Grameen Shakti found the process of building customer confidence in systems time consuming and costly. In addition; long distances, poor transport infrastructure, impassable roads during monsoons, low literacy rates, cash-and-barter based transactions and lack of technical skills, all contributed to the high transaction costs of operating the rural PV business. In 1998 the IFC/GEF SME Program utilised GEF funds to supply a concessional loan to Grameen Shakti which enabled them to offer improved credit terms to their customers to three years. This had a significant effect on demand. From 1997 to 2000, Grameen Shakti grew sales to 2000 systems, and plans to install 2000 systems in the coming year. Grameen Shakti found that after a “critical mass” of installations (e.g., 100 systems), the process of building customer confidence and demand became less time consuming. Grameen Shakti believes that after three to four years of profitable growth they will be able to obtain additional financing from commercial banks. This project has shown that use of GEF loan financing to support a “high risk” project, which was unable to obtain commercial financing, can enable significant growth and provide the scale-up required for a PV distributor to eventually obtain commercial financing.

A Project entitled ‘Opportunity for Women in Renewable Energy Utilisation in Bangladesh’ has been funded by the ESMAP since September of 1999, where a co-operative of rural women are commercially engaged in rural energy service delivery, which include assembly and sale of lamps and battery charging stations. During 2001-2, an innovative financing mechanism for solar electrification service will be adopted. Following purchase of DC lamps with cash, and batteries with 6 months credit, the rural homes will be provided 3 years micro credit to purchase solar panel from the women’s co-operative or the local NGOs. Such approach to move up the energy ladder at a suitable pace will allow households of multiple income levels to access solar electrification and modern lighting. Discounted loan from local development bank will be used to finance the capital cost of 200 SHS during the initial stage of project development, and extend to 2000 households within 2 years. Local NGOs will replicate the project in other 6 islands of the area.

Source: adapted from information provided by Doug Slalom, IFC and Dana Younger, IFC, Eric Martinot, GEF and Hasna Khan, Prokaushali Sansad Ltd.

CASE STUDY 11 THE SOLAR DEVELOPMENT GROUP

Drawing on its experience of successful SME investing, where financing is preceded by technical assistance, the World Bank and IFC along with a number of charitable foundations and the GEF, have developed the Solar Development Group (SDG). SDG is structured to be both a financing window for small PV enterprises in developing countries which will leverage private sector funds into this emerging sector and a business advisory service. The mission of SDG is to accelerate the development of viable, private sector business activity in the distribution, retail sales and financing of off-grid rural electrification applications in developing countries, initially concentrating on PV because that appears to be where the greatest demand is at the moment. Formidable barriers, in particular weak physical distribution systems, lack of credit and the high initial cost of off-grid systems, often keep this technically feasible technology beyond the reach of most middle and upper income rural families. The major energy companies that are also manufacturers and developers of systems have also generally remained marginal actors in the developing world because there are increasingly lucrative developed-world markets which are easier to access.

SDG has a target capitalisation of US$ 50 million of which more than US$ 42 million has been committed. SDG will consist of two separate programs: (i) Solar Development Capital (SDC) which is an investment fund of approximately US$ 30 million for financing private sector PV or PV-related companies and financial institutions; and (ii) Solar Development Foundation (SDF) which is expected to disburse approximately US$ 20 million in grants or "soft" loans both to companies and programs that further SDG's mission. A total of 10 local PV companies have already received financial support through SDF and another 12 are expected to be funded during 2001. A pipeline of over 200 companies in 57 countries have been identified and are under evaluation for possible support. Both SDC and SDF are operational and thus are managed by Triodos PV partners.

Source: adapted from information provided by Dana Younger, IFC and Richard Spencer, World Bank along with Triodos PV Partners.

CASE STUDY 12 AFRICAN RURAL ENERGY ENTERPRISE DEVELOPMENT (AREED) INITIATIVE

The United Nations Environment Programme, in partnership with E&Co, have set up the African Rural Energy Enterprise Development (AREED) Initiative with funding support from the United Nations Foundation. The AREED initiative seeks to develop sustainable energy enterprises that use clean, efficient, and renewable energy technologies to meet the energy needs of the poor, thereby reducing the environmental and health consequences of existing energy use patterns.

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. Services include training, hands-on business development assistance and, for promising businesses, early-stage investment and assistance in securing financing. Providing business development services builds capacity in entrepreneurs allowing them to reach the level where they can interest a financial institution into considering an investment. Many of the entrepreneurs AREED works with would not be able to advance their business ideas due to lack of business knowledge and/or access to early-stage capital. AREED currently has a pipeline of more than 30 projects.

In each country, AREED is partnering with a local NGO or development organisation to which it will seek to transfer the technique of energy enterprise development. This is a major project goal because it is recognised that in order to foster sustainability of the AREED energy enterprise development approach, local capacity must be created to support long-term rural energy enterprise development. The main barrier faced in the project to date has been the challenge of increasing the capacity of local organisations to deliver business development services. AREED has found that effectively transferring the technique of energy enterprise development to local organisations requires a significant time commitment. Another challenge has been the lack of experience of many of the African entrepreneurs. Many of the enterprise activities are at a young development stage, requiring significant amounts of enterprise development services, and small amounts of investment capital. Fortunately, the project is structured to be able to provide both.

Source: adapted from information provided by E&Co, USA.
For further information on AREED visit www.areed.org.

CASE STUDY 13 MADAGASCAR: PV FOR SOCIAL, DOMESTIC AND PRODUCTIVE USES

Together with the Ministry of Health and the Directorate for Energy, the French NGO Fondation Énergies pour le Monde (FONDEM) has launched in1998 a rural electrification project in Madagascar, comprising three components: Social: electrification of rural health centres; Domestic: electrification of households through micro-credit; Economic: electrification for productive applications through fee for service.

The objectives of the project are to:

- Electrify approx. 50 rural health centres through PV systems and set up a sustainable scheme of operation and maintenance;
- Promote the use of PV for surrounding households within a province of Madagascar through appropriate financial and distribution mechanisms(micro-credit scheme with a local bank and sales, erection, maintenance through local retailers); and to
- Supply electricity for the needs of economical development of the surrounding entrepreneurs.

A specific attention is paid at the awareness and involvement of the various local stakeholders (institutional, banks, retailers and suppliers, users) in the global process. Actions include: awareness of the local partners concerning the renewable energies features (institutions as health ministry, local bank and distributors who do not know about and how renewable can meet the local demand; awareness of the future consumers about assets and limits or renewable energies; information concerning operational costs; assistance for the set up of a sustainable financial and technical scheme for maintenance.

To combat barriers the following two things have been done: for the systems powering health centres, a scheme for maintenance and provision for replacement of components involving the users, the ministry of Health and UNICEF, has been set up; for PV systems powering households and workshops, the micro credit scheme has been adapted for the duration of the credit.

Lessons that have been learnt indicate there is need for: complementary interests between the stakeholders (government, bank, distributors, end-users); a range of systems to match the various needs and financial capacities, strong awareness raising among the various stakeholders.

Source: adapted from information provided by FONDEM, France

CASE STUDY 14 GERMAN RENEWABLE ENERGY LAW

The German Renewable Energy Law was passed in March 2000, in order to set a framework for the country to double the share of renewable energy sources in total energy consumption by 2010. The law sets specific tariffs (Renewable Energy Feed-In Tariffs) for each individual renewable energy technology, based on their real cost. The aim of the tariffs is to initiate a self-sustaining market for renewables and to create a critical mass through a large-scale market introduction programme, whilst not imposing any additional burden to the taxpayer. The new law has been developed building on experiences with previous feed in laws.

The earlier 1990 Electricity Feed Law, which was successful in creating a boom for wind power, had related renewable energy feed in tariffs to average electricity prices. When electricity prices fell as a result of liberalisation and increasing competition, the renewable energy tariffs fell. This started to limit the viability of both existing and proposed projects which were increasingly being developed on less economic inland sites in response to site restrictions in the more windy coastal areas.

The law covers power generated from wind (onshore and offshore), solar, geothermal; hydro, landfill, sewage or mine gas plants of 5MW or less; and biomass plants of 20MW or less. The tariffs for wind energy differentiate between sites of different wind speeds, in order to avoid concentration of deployment in high wind speed areas. It is planned to decrease the tariffs in the future, as renewable energy development costs decrease. For example, the buy-back tariff for electricity generated by PV-systems will decrease by 5% annually starting the January 1st 2002

In the law the amount of energy from renewables is distributed equally amongst all grid operators, according to the total amount of electricity supplied to customers. This is referred to as the flexible quota system on the transmission system level. All electricity suppliers are obliged to purchase from their regional grid operator an equal share of electricity from renewable energy (flexible quota on the electricity supplier level).

The success of this law (most effective in terms of installed capacity for wind energy) is due to:

- the consideration of the learning effect of RE technologies through decreasing feed-in tariffs
- the reaction on the liberalised market and the set up of systems in this deregulated market.

Source: adapted from information provided by Hans Neef, IEA, Wolfgang Langen and taken from the German Renewable Energy Act

CASE STUDY 15 DUTCH GREEN FUND SYSTEM

The Green Fund System was introduced in the Netherlands in 1992, as a co-operation between the government and the financial sector. It combines a tax incentive, a framework for designation of green projects and the active involvement of the financial sector. The basic principle behind the system is that the general public receives an income tax exemption for investments in Green Funds, i.e. the income derived from capital invested in the funds is not subjected to income tax. This makes an investment in a Green Fund more or less competitive with other funds. The Green Funds are used to provide soft loans with low interest rates to green projects. These projects are screened on their economic, environmental and social merits. It strongly promotes investments in new (green) technologies and projects. Initially only projects in the Netherlands were eligible for funding, but in 1995 the scope was extended to projects in developing countries and economies in transition.

The Green Fund System has successfully set up a self supporting market development programme for green projects, which is based on existing financing infrastructures and encourages the active support of the financial sector and general public. The enthusiasm of the public has been an important factor in the success of the Green Funds system. At the beginning Green Funds were heavily oversubscribed. The public pushed the banks to set up more Green Funds. Another important aspect of the GFS is the involvement of financial companies. When the fund was introduced the banks had solicited sufficient interest among investors, but did not line up sufficient green projects to invest in. The banks then had to actively solicit green projects, which in itself contributed to awareness raising in the financial sector.

As the banks bear the risks of the development of projects, they submit the projects to their normal scrutiny. Banks are in a better position to perform this type of screening than government agencies. The banks then control the projects during the investment life span. The Government role in the process is to award green certificates. This is based on a transparent process using a published list of eligible green projects. The government is also responsible for the auditing of the system.

Between 1995 and 1999 over 1400 projects were issued with green certificates, to a value of over 1.8 million EU. This included over 300 sustainable energy projects and nearly 700 wind turbines.

Source: adapted from information provided by Theo van Bellegem, Ministry of Environment, The Netherlands.

CASE STUDY 16 CALIFORNIA ELECTRICITY CRISIS - COST OF DISRUPTIONS

The California power crisis appeared first in summer 2000 when demand increased sharply because of the load of air-conditioners under a record-breaking heat-wave. The second phase has been in the winter months of 2000/2001, due to a combination of seasonally low hydropower output and heavy withdrawals from service of old thermal power plants for maintenance. According to a recent World Bank study the main reasons for the crisis have been a strongly rising demand, no new capacity, decline in hydropower output, and surging natural gas prices.

The California electricity crisis provided a close view into the imperfect behaviour of the energy marketplace. The costs seem to be tremendous:

- The utilities say they are near bankruptcy because wholesale prices have risen sharply with the shortage and they have lost more than US $11-billion[(1)].

(1) New York Times, January 12, 2001

- A recent one-day power outage in the San Francisco Bay Area is reported to have cost manufacturers in Silicon Valley over $75-million in lost production. During the last heat wave, the California Independent System Operator spent over $200-million to obtain emergency power to stabilise the system[(2)].

Table 1[(3)] illustrates in economic terms the problems unreliable power can create for businesses in the USA. Some companies have begun to address these problems by installing on-site power generation components such as gas turbines, gas engines, and phosphoric acid fuel cells.

Table 1. Selected Outage Costs

Industry	Average Cost of Downtime	Source
Cellular Communications	$41,000 per hour	Teleconnect Magazine
Telephone Ticket Sales	$72,000 per hour	Contingency Planning Research – 1996
Airline Reservations	$90,000 per hour	Contingency Planning Research – 1996
Credit Card Operations	$2,580,000 per hour	Contingency Planning Research – 1996
Brokerage Operations	$6,480,00 per hour	Contingency Planning Research – 1996

Source: adapted from information provided by Lucien Bronicki, ORMAT, Israel and a World Bank publication from March 2001: The California Experience with Power Sector Reform

CASE STUDY 17 CHINA NATIONAL RENEWABLE ENERGY PLAN

The Government of China has developed plans to accelerate renewable energy deployment. This is reflected in the China Agenda 21, Guideline of the ninth-five-year plan and 2010 Long-term objectives on economic and social development in China. The State Planning Commission (SDPC), State Science and Technical Commission (MOST) and State Economic and Trade Commission (SETC) jointly formulated a program on renewable energy development in China (1996-2010). However, renewable energy can not yet satisfy the large market demand in China. There are several barriers to the deployment of renewables which include: no state or local level detailed action plans, therefore a lack of a clear guidance from the Government; planning and implementation methodologies are proving unreliable and targets are not being met; lack of commercialisation experience; lack of related legislation and fiscal policies for renewable energy development; complicated and ambiguous procedures for investors in renewable energy projects.

The government of China has started to give attention to developing renewable energy, in order to achieve this they need to give attention to developing policies to support renewables. There is also a need for financial mechanisms to encourage investment into renewable energy. In addition quality and standards need to be addressed and legal and regulatory infrastructure put in palace. The targets and research contents of the renewable energy program include: to study the motivation for renewable energy in the world; to assess barriers to renewable energy development in China; to identify appropriate strategies and policies to encourage renewables; to set development objectives to support the Tenth Five Year Plan; to make an action plan for the development of renewable energy.

The objective is for renewable energy to increase its contribution to China's energy supply so that it contributes between 34.7 and 36.1 million tce by 2005, and 42.3 to 44.6 million tce by 2010, with electricity from renewables contributing 71.6 - 83.4 TWh by 2005 and 100 – 135 TWh by 2010. In order to achieve these increases a number of measures will be implemented. These will include establishing a strong technical capability, taking steps to reduce the costs of producing energy from renewables which is currently perceived as being costly, and opening up markets for electricity and heat. These measures will include implementation of a renewable Portfolio Standard which will ensure that renewable energy maintains or increases its share of the electricity market. Targets will be set nationally and regionally, standards developed, international co-operation encouraged, and a promotional campaign which aims to raise public and official awareness of the environmental benefits of renewable energy. Efforts of various ministries and commissions with a role will be co-ordinated via a nation-wide action plan to ensure that resources are used effectively and that policies are complementary.

(2) Wall Street Journal, June 26, 2000
(3) Distributed Energy Resources (DER) Strategic Plan, U.S. DOE, 2000

Source: adapted from information provided by Li Jingjing, CRED, China

CASE STUDY 18 TECHNOLOGY COOPERATION AGREEMENT PILOT PROJECT, TCAPP

The Technology Co-operation Agreement Pilot project was launched in 1997 by three US government agencies: the US Agency for International Development (USAID), the US Environmental Protection Agency (USEPA), and the US Department of Energy (USDOE). TCAPP is designed to achieve the following major goals:

- Foster private investment in clean energy technologies that meet development needs and reduce greenhouse gas emissions
- Engage host country and international donor support for actions to build sustainable markets for clean energy technologies
- Establish a model for international technology transfer under the United Nations Framework Convention on Climate Change.

The project employs a strategic and collaborative approach to facilitate large-scale international investment in clean energy technologies consistent with sustainable development needs of developing countries. TCAPP is currently facilitating voluntary partnerships between the governments of Brazil, China, Egypt, Kazakhstan, Korea, Mexico and the Philippines, the private sector, and the donor community on a common set of actions that will advance implementation of clean energy technologies. TCAPP is also assisting 14 countries in the Southern African Development Community with a regional technology co-operation needs assessment that was recently initiated by the Climate Technology Initiative.

The countries participating in TCAPP have made significant progress in developing strategies for building sustainable technology markets and have begun to implement actions aimed at mobilising private investment and donor support to address country specific technology co-operation needs.

Source: adapted from information on the TCAPP web site: http://www.nrel.gov/tcapp

CASE STUDY 19 UGANDA ENERGY FOR RURAL TRANSFORMATION PROJECT

Uganda: Energy for Rural Transformation is the first project submitted under the World Bank/Global Environment Facility Strategic Partnership for Renewable Energy.

The principles of the Strategic Partnership include:

- Targeted increases in GEF resources, with a proposed interim target of $150 million annually
- Long term country based business planning approach, i.e. five to ten year development plans
- Simplified approval process

The Strategic Partnership was set up to expand and increase the effectiveness of the renewable energy activities of the World Bank and GEF and shift efforts from an individual project approach to long term, programmatic pathways. In this way, providing developing countries with the time and resources required to develop renewable energy markets and technologies in a comprehensive and sustainable way.

The project in Uganda will provide resources to remove market barriers for the development of around 70 MW of biomass, hydro and solar renewable energy capacity concentrated in the private sector. It is anticipated that the development of rural energy sources will be significantly accelerated in line with rural development needs and objectives, and rural electricity connections will be increased from 1% to 10% over the life of the project. This will provide a significant shift away from diesel power sources. Investments will build on new energy supply opportunities created by a recently enacted private power law. Activities will be directed at capacity building, institutional strengthening and the introduction of ‘light regulation’ approaches designed to facilitate growth in environmentally sustainable private sector delivery mechanisms.

The loans are to be divided into three tranches which are linked to the accomplishment of key objectives. The key objectives include the achievement of specific infrastructure changes, finalisation of long term renewable energy plans and targets for renewable energy system installations.

It is anticipated that the long term commitment to the development of renewables in the country with stated targets backed up by funding, will provide the stability and confidence necessary for private sector market development.

Source: adapted from information provided by Ted Kennedy, World Bank. For a copy of the project brief see http://www.gefweb.org/.

CASE STUDY 20 OECD NATIONAL PLAN (FRANCE)

The Ministry of Environment and the Secretariat of State for Industry launched a National Programme for Energy Efficiency Improvement in December 2000. It concerns Rational Use of Energy and Renewable Energy Sources Development and is an integral part of the National Plan for Climate Change Mitigation. There are 2 main targets to the RES part of the Programme: to improve economical competitiveness of renewable energy technologies and to increases the share of renewable energy sources in the national energy consumption. The means decided by the government to achieve this are to support to research and development and direct financial incentives to RES investments including:

- improved feed-in tariffs for RES electricity production(e.g. 0.07 Euro/kWh during 15 years for wind energy)
- Subsidies for equipment using RES for heating purposes
- Fiscal incentives for RES investors(both individuals and enterprises)
- Training for professionals
- Information and communication

Beyond the improved feed-in tariffs, the main financial resources are:

- 75 millions of Euros per year in the ADEME's budget (50 millions for dissemination and 25 millions as seed money R&D)
- 20 millions of Euros per year from regional authorities' budgets

The targets agreed between the government and ADEME for the time frame 2000-2006 are as follows:

RES Technology	Cumulative installed capacity during the period
Wind energy	4,000 MW
Mini Hydroelectricity	250 MW
Bioelectricity	560 MW
Geothermics	20 MW
Solar heating	630,000 m2
Thermal uses of biomass	1410 ktoe

Additional objectives concerning photovoltaic systems are under consideration (March 2001)

Source: adapted from information provided by Jean-Louis Bal, ADEME

CASE STUDY 21 REGULATION FOR INDEPENDENT POWER PRODUCERS IN SRI LANKA

In Sri Lanka the World Bank/GEF Energy Services Delivery project was set up to encourage the development of power projects in the private sector. The project developed regulatory frameworks for independent power producers which included standardised non-negotiable power purchase tariffs and contracts. These were then adopted by the national utility. Incentives such as import duty waivers and income tax concessions were made available for small hydro. The policies achieved their aims of encouraging small hydro development by private developers, which had previously only been undertaken by the national electricity utility. As a result of the project, more than 21 MW of small hydro was installed by private developers.

However, the power purchase tariffs were variable and were tied to avoided utility costs based on the international price of oil. During 1997 and 1998 the tariffs had the equivalent value of 5 cents/kWh and during this period small hydro development flourished. When oil prices fell in 1998/9, the value of the tariff fell to 3.5 cents/kWh and correspondingly small hydro development ceased in 1999. The fluctuation in the tariffs has seriously affected the long term plans of private small hydro developers in Sri Lanka.

Source: adapted from information provided by Eric Martinot, GEF

CASE STUDY 22 ITALY TRADABLE RENEWABLES CERTIFICATES

The total electricity consumption in Italy is about 279 TWh/year (1998), losses included. The renewable electricity production in Italy by 1998 is 48 TWh.

An incentive scheme for Renewable Energy based on electricity supplier's obligation (thermal generators, importers) for quotas and Green Certificates is legally in force since 1st April 1999. This 'Compulsory Renewable System' (CRS) follows defined rules regarding certificate issuing and trading.

At the same time, regulation distinguishes another system, according to which certificates of origin can be asked for renewable power that does not have to fulfil the obligation requirements. This 'Market Renewable System' (MRS) can in principle be used with voluntary Green Pricing programmes targeted at either eligible or captive consumers.

The quota system, legally in force since March 16 1999, states that each supplier (excluding renewable energy generators and importers) is obliged, from 2002 on, to feed electricity from renewable energy sources (2% of the non renewable electricity generated or imported in the previous year) into the Electrical National System. Suppliers can meet this obligation by building their own RE-plants or by buying certificates. The quota level can be increased in the following years by decree of the Ministry of Industry, basically to contribute to meet Kyoto Protocol obligations.

Although Italy created its own Certificate system already, the Ministry for Industry, Commerce and … (Ministero dell' Industria, del Commercio o dell' Artegianato) has an open eye for the international context. The Italian government considers separate trading of green certificates and electricity to be one of the best options to promote renewable sources inside the European common market. The Italian government strongly advocates a common market, where all participants share similar rules and where green certificates are not merely a proof of origin, but a title per se, which can be sold separately.

Initiatives addressed at pointing out requirements to harmonise and standardise the different national systems are welcomed by the Italian government, provided that they allow a fair representation of all different situations, both on the side of production and consumption. The system should verify the fairness of the use of the certificate, whatever the scope for trading is. In this context the Italian government is more than willing to learn from and co-operate with other countries, and it is actually doing it, setting a clear example for others, e.g. developing countries.

Source: adapted from information provided by an Advisory Group member

CASE STUDY 23 ARGENTINA: GOVERNMENT DEREGULATION AND SMART SUBSIDIES

Argentina has made substantial progress in the reforming and privatisation of the power sector. While it has a relatively high overall rate of electrification (95%), substantial numbers of the rural population still remain without either electricity services (30%) or other basic infrastructure. In 1995 the Argentine Secretaria de Energia created the Programma de Abastecimiento Electrico a la Poblacion Rural de Argentina (PAEPRA) for the provision of off-grid electricity to the dispersed rural population and to provincial public services such as schools, police stations and health centres. The programme aim is to ensure electricity supply to a rural population of about 1.4 million people living in 314,000 households and 6,000 public services distributed in 16 provinces, which are distant from the power distribution grids. PAEPRA aims to give preference to renewable energy systems for electricity production.

Lack of funds thwarted progress of the PAEPRA and in order to overcome these difficulties, the Argentine government and the World Bank initiated the PERMER project (Proyecto de Energia Renovable en el Mercado Electrico Rural) as a component of PAEPRA in eight participant provinces. Financing is being provided by the World Bank, the GEF, the Electricity Investment Development Fund, the concessionaires and the customers over an implementation period of six years. PERMER aims at providing electricity for lighting, radio and TV to about 70,000 rural households and 1,100 provincial public service institutions through eight private concessionaires using mainly renewable energy systems.

In PAEPRA and PERMER, a concession approach has been chosen for rural electrification, mainly due to the country's experience with concessions for the provision of infrastructure services such as telecommunications and water. The concessionaire obtains the monopoly of a given province in turn for the obligation to connect the service when requested by the customers, and to maintain its continuity over the duration of the concession. The concession contracts are tailored to the particular conditions of each province and awarded through a competitive bidding process that minimises subsidies. Provincial governments assist concessionaires by preparing detailed market studies, conducting information dissemination workshops and preparing studies on how to improve the availability of DC appliances compatible with solar home systems in dispersed rural areas. Concessionaires are eligible to re-bid for their business every 15 years up to a total of 45 years, competitively against other eligible firms. Tariffs are renegotiated every 2 years. Once a concession is awarded, the concessionaire chooses the least cost technologies, best suited to meet the demand and willingness to pay of each village.

Source: adapted from information provided by and Killian Reiche, World Bank

CASE STUDY 24 Renewable Energy and Energy Efficiency Fund for Emerging Markets, Ltd. (REEF): A Private Equity Investment Fund

The World Bank Group's International Finance Corporation (IFC) together with support from the GEF and several other private and public sector groups has launched the global Renewable Energy and Energy Efficiency Fund for Emerging Markets, Ltd. (REEF). REEF, which became operational in March 2000 is the first global private equity fund devoted exclusively to investments in emerging market renewable energy and energy efficiency projects. REEF has equity funding of US$65 million at its first closing including US$15 million from IFC. REEF actively seeks to make minority equity and quasi-equity investments in profitable, commercially viable private companies and projects in sectors that include: on or off-grid electricity generation primarily fuelled by renewable energy sources, energy efficiency and conservation, and renewable energy/efficiency product manufacturing and financing. REEF's investment criteria are as follows:

- **Technology sectors:** Low impact hydro, wind, solar, biomass, geothermal, energy conservation and energy efficiency
- **Geographic Focus:** Emerging market countries worldwide eligible for IFC financing, including markets in Africa, Mexico and Latin America, the Caribbean, Asia, and Central and Eastern Europe.
- **Investment size:** The REEF will consider investment in projects with total capitalisation requirements of between US$ 1 million and US$ 100 million.
- **Instruments*:*** REEF's investments may take a variety of forms including common and preferred stock, partnership and limited liability company interests, and convertible or subordinated debt with equity warrants/options. REEF may also make loans to projects or project sponsors on a bridge or permanent basis. Equity transactions are typically structured so that the entrepreneur retains the majority of shares and/or management of the company.

The Fund, which is managed by EIF group, will be supported by a parallel discretionary debt facility of up to US$100 million consisting of an IFC "A" loan of US$ 20 million and up to US$ 80 million in IFC "B" loans. The Fund will also have access to a unique co-financing arrangement with up to US$ 30 million in concessional funds from the GEF. This will allow REEF to invest in smaller and more difficult projects in addition to making its larger commercial investments.

Source: adapted from information provided by Dana Younger, IFC and EIF Group, USA

CASE STUDY 25 ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAM (ESMAP)

The overall goal of the donor funded ESMAP program is to increase the availability of energy services for poverty alleviation and economic and social development. The areas of strategic focus are: (i) Increasing access to energy services; (ii) providing efficient energy services through the development of energy markets; and (iii) ensuring environmentally sustainable energy services. ESMAP id managed by the World Bank but also includes support from UNDP.

These goals set the general framework for the ESMAP program, but the emphasis and the direction of work are adapted to the changing policy emphasis amongst donors, clients and in the Bank. In its recent direction of work, the program places emphasis on access and its links with poverty and gender, on environment through Energy Environment Reviews and Social Impact Assessments, and on markets with the program's Just-in time and Medium-term Technical Assistance activities. A key function of the ESMAP program is dissemination of the knowledge generated through projects.

ESMAP's principal objective under the renewable energy theme is the mainstreaming of the technologies, including solar, wind, small hydropower, and large biomass, into the agendas of local governments and development institutions in order to contribute to international efforts to provide clean energy use. ESMAP's approach includes regional or country pre-investment work, country specific project identification and technical assistance and in some circumstances the introduction and commercial demonstration of new or non-conventional energy or hybrid sources with potential for promising application in rural or peri-urban poor areas.

Source: adapted from information provided by Charles Feinstein, World Bank

CASE STUDY 26 ASTAE: Greening the Energy Sector Portfolio of Multilateral Banks

The Asia Alternative Energy Program (ASTAE) was established by the World Bank in 1992. The goal of ASTAE was to mainstream sustainable energy in Asia by 'greening' the World Bank lending to the power sector in this region. The program has been so successful that the target of increasing the share of alternative energy in its Asian power sector loan portfolio to 10 percent has now been met and exceeded. In the financial year of 1999 the share was as high as 46.3%. As of June 2000, 38 projects were either in the pipeline, approved or completed and it is projected that the implementation of these projects will avoid around 1GW of conventional capacity.

ASTAE was formed to implement a new concept, Financing Energy Services for Small Scale Energy Users (FINESSE). This concept had been developed by the United Nations Development Programme, the World Bank, and The Netherlands Ministry of Development Co-operation and had the aim of making financial resources available to small scale urban and rural energy users for technically feasible and economically viable, sustainable energy services. Under the concept, small decentralised, renewable energy and energy efficiency projects are bundled into larger loan programmes.

The factors that have contributed to the success of ASTAE are: a sectoral/regional focus; a results oriented approach with clear mandates and lending targets; mobilisation and strategic use of funds, where ASTAE funds are used for preparatory work and World Bank and other sources including public and private ones are used for subsequent work; partnerships both within the Bank between ASTAE and other programmes and outside the bank between ASTAE and stakeholders in governments, private sector, NGOs, multilateral institutions and research institutes; long term donor support; the support to reach the '10% target' was over 7 years; timely implementation; ASTAE has tapped into the client countries' growing energy demands, local private sector interest, the World Bank's increased emphasis on poverty alleviation and environmental protection and the commitment of bilateral and multilateral donors. ASTAE has mobilised regular World Bank and IDA loan funds as well as GEF co-financing for its projects.

The achievements of ASTAE have been significant, with the development of the alternative energy-lending portfolio. To have a wider impact, however, in poverty alleviation and reduction of environmental damage in Asia there needs to be a shift from the project by project approach to programmes that create an enabling environment for alternative energy project implementation. This should include the development of favourable policy and regulatory frameworks, effective institutional structures and the building of broad based local capacity to develop and implement alternative energy projects and programmes.

Source: adapted from information provided by Enno Heijndermans, World Bank

CASE STUDY 27 RETSCREEN: RENEWABLE ENERGY PLANNING TOOL IN CANADA

RETScreen is a decision support and capacity building tool for assessing potential renewable energy projects developed by the Energy Diversification Research Laboratory of Canada. The tool evaluates the energy production, life cycle costs and greenhouse gas emission reductions for renewable energy technologies at any geographic location. Renewable energy technologies included are: wind, small hydro, biomass heating, solar thermal, solar PV and ground source heat pumps.

The tool enables planners and decision makers to routinely consider renewable energy technology projects at the critically important initial planning stage. The tool has been used widely to date for example for: preliminary feasibility studies, project lender due-diligence, market studies, policy analysis, information dissemination, training, sales of products and/or services, project development and management, product development and research and development.

Source: adapted from information provided by Natural Resources Canada. Further information: http://retscreen.gc.ca

CASE STUDY 28 PROMOTION OF RENEWABLE ENERGY SYSTEMS IN SOUTH EAST ASIA (PRESSEA)

The PRESSEA project was set up with European Commission funding to initiate a renewable energy network in the participating countries of Indonesia, Malaysia, Thailand, Vietnam and the Philippines. The network was used under the project to improve communication between organisations in South East Asia and the European Union. Through the network information was collected and disseminated, such as information on national policy, national incentives, renewable energy resources, business opportunities and contacts in South East Asia and renewable energy capabilities and contacts from the European Union.

The network has succeeded in gathering and disseminating the necessary information to attract investment in the participating countries. The network is relatively new, so has not resulted in any business deals yet, although the provision of information is a necessary precursor to this by setting up the necessary tools for investors to make decisions. In order to generate investment, trade missions need to be undertaken between the organisations and regions involved in addition to information gathering and dissemination activities and this was a recommendation to come out of the experiences of the project.

The network was set up through existing relationships in the ASEAN region. This is considered to be a significant factor in the successful development of a sustainable networking infrastructure. The network will continue, following completion of the European funded project, under the auspices of the ASEAN New and Renewable Sources of Energy Sub Sectoral Network (ASEAN NRSE SSN) and the authority delegated to it through the ASEAN 5-year plan of energy co-operation. The ASEAN NRSE SSN reports to the ASEAN Senior Officials Meeting on Energy, which itself it accountable to the ASEAN Ministers of Energy Meeting, which undertakes regional co-ordination on energy matters.

The network has also attracted the interest of other countries in the region. It is anticipated that PRESSEA activities will be expanded to include: Cambodia, Myanmar, Laos PDR, Brunei and Singapore. The formation of the network has successfully set up the framework necessary for inward investment to the ASEAN countries and, through the use of existing local relationships and national support, is expected to be a self sustaining entity.

Source: adapted from information provided by AEA Technology Environment, UK; further information can be found at http://www.ace.or.id/pressea

ANNEX 8

OUTREACH ACTIVITIES

Outreach events have been carried out around the world to raise awareness of the G8 Renewable Energy Task Force and to give a broad range of stakeholders the opportunity to submit information and ideas to the Task Force based on their experience. A web site was also set up for people to submit information to the Task Force: www.renewabletaskforce.org. In particular, stakeholders were asked to provide information and ideas on what the main barriers to renewable energy are and how to overcome these barriers. They were also asked to provide information on suitable case studies that could be used in the report.

Outreach events were combined with existing relevant events were possible as either a presentation during the event, a side session or a meeting directly after the event. In regions of the world where there were no suitable existing events to piggyback, dedicated meetings were organised. The list below summarises the events at which outreach sessions have taken place, and the dedicated events that were organised.

Event	Location	Date
One Day Workshop	Paris, France	27 October, 2000
APEC Energy R&D and Technology Transfer Seminar "Fostering the Commercially viable Deployment of New and Renewable Energy Technologies for Rural Development" organised by NEDO of Japan	Cuernavaca, Mexico	30 October - 1 November, 2000
UN-ESCAP meeting on Energy for Sustainable Development	Bali, Indonesia	20-23 November, 2000
Climate change COP-6	The Hague, Netherlands	21 November, 2000
'Village Power' in Washington, Empowering people and transforming markets - World bank/ ESMAP	Washington, USA	4-8 December 2000
First meeting of the Global Forum on Sustainable Energy	Laxenburg, Austria	11-13 December, 2000
African minister's meeting	Durban, South Africa	mid December
ACP-EU Parliamentary Assembly – RE working party	Brussels, Belgium	24-25 January 2001
World Economic Forum	Davos, Switzerland	25-30 January 2001
Round Table on Renewable Energy Dissemination in the Asia Pacific Region.	Chiang Mai, Thailand	29 January 2001: Round Table 27-28 January: Technical tours.
UNEP Governing Council	Nairobi, Kenya	9 February 2001
Delhi Sustainable Development Summit (DSDS)	New Delhi, India	7-9 February, 2001 10 February, Outreach Session
Mediterranean Energy Ministerial.	Casablanca, Morocco	13 February, 2001
The Role of Renewable Energies in providing Clean Rural Energy.	Lima, Peru	12-13 February 2001, Outreach on 14 February
Meeting organised after the Policy discussion meeting on the proposed RPS in China	Sanya City, Hainan Province, China	14-15 February
UN Commission on Sustainable Development – Ad-hoc expert Group meeting on Energy	New York, USA	26 February – 3 March 2001
Dedicated meeting, organised by ESKOM and EDRC, University of Cape Town.	Johannesburg, South Africa	30 March, 2001
UNCSD	New York, USA	18 April
Business and investment forum for Renewable Energy Sources in the Mediterranean region	Marrakech, Morocco	14-17 May

ANNEX 9

TASK FORCE MEMBERSHIP

G8 RENEWABLE ENERGY TASK FORCE

Co-Chairmen	
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Sir Mark MOODY-STUART	Chairman, Royal Dutch/ Shell Group of Companies
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Göran LINDAHL	Board Member, ABB
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Aloys WOBBEN	ENERCON GmbH, Germany
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TASK FORCE ADMINISTRATOR

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ANNEX 10

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ANNEX 11

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