ANNUAL PLANNING 2009/2010

on

Energising Development – Phase 2

Partnership between

The Netherlands Minister for Development Cooperation

and

The Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)

executed by

The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

In cooperation with:

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Contents

A. Overview – country activities in 2009 and 2010 under EnDev II

In September 2008 BMZ and DGIS decided to implement a second phase of the successful Energising Development programme between Germany and The Netherlands. In the new phase (EnDev II) the programme will provide additional 3 Mio people with access to modern energy services. Most country activities being supported by EnDev II can build on the experiences of the first phase of the programme. They will continue those activities which proved to be most successful regarding outcomes, cost efficiency and impact.

In May 2009 the first governing board meeting of the programme already approved 8 country activities, which started in the first half of 2009. They are listed in table 1.

Table 1: Overview ongoing EnDev II activities, which started in the first half of 2009

Country	Activities	Project Duration		Funding	Outcomes on household level
		Start	End	in Euro	Persons
Bangladesh	R.E., Stoves, Biogas	06/09	06/10	3.500.000	660.000
Indonesia	Rural Electrification	05/09	09/12	8.000.000	170.000
Kenya	Improved Stoves	06/09	12/11	2.500.000	850.000
Mali	Rural Electrification	04/09	12/11	2.000.000	19.800
Nepal	Rural Electrification	05/09	04/11	700.000	11.825
Peru	Rural Electrification	06/09	12/11	2.900.000	160.000
Senegal	Rural Electrification and Stoves	04/09	12/11	7.200.000	459.700
Uganda	Rural Electrification and Stoves	04/09	05/11	4.000.000	1.129.000
Total				**30.800.000**	**3.460.325**

In table 2 those country activities are listed which still need approval through the governing board and are scheduled to start in the second half of 2009. The country activities will provide access to modern energy services on household level as well as for social institutions and small and medium enterprises.

Table 2: Overview on EnDev II activities scheduled to start in the second half of 2009

Country	Activities	Project Duration		Funding	Outcomes on household level
		Start	End	in Euro	Persons
Benin	Stoves	10/09	12/12	2.000.000	400.000
Bolivia	Rural Electrification, stoves	10/09	12/12	5.000.000	277.000
Burkina Faso	Stoves	10/09	12/12	1.000.000	200.000
Ethiopia	Rural Electrification, Stoves	10/09	06/12	6.000.000	526.000
Ghana	Energy for Productive Use	10/09	12/11	900.000	Not applicable
Honduras	Rural Electrification	10/09	12/11	2.000.000	29.300
Mauretania	Stoves	01/10	12/12	400.000	70.000
Mozambique	Rural Electrification	10/09	12/12	3.000.000	35.600
Nicaragua	Rural Electrification	10/09	12/11	2.200.000	29.000
Rwanda	Rural Electrification/Biogas	10/09	12/11	5,000.000	30.700
Total				**27.500.000**	**1.597.600**

In some countries final activities of the current EnDev 1 phase have to be financed out of the EnDev 2 budget due to financial constraints of EnDev 1. The costs of these activities will have to be added to the above listed budgets. The exact budget to cover these costs will be calculated in the beginning of 2010, once all EnDev 1 activities have ended.

B. Ongoing Country Activities in Brief

Bangladesh

Country/ Region	**Bangladesh**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	06.2009 – 06.2010		**Project Budget:** 3.500.000 EUR			
Target Groups	Rural/peri-urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.				220.000	
	Cooking Energy for Households				440.000	
	Electricity for social infrastructure					
	Cooking/ Heating Energy for social infrastructure				2.500	
	Energy for prod.use/income generation				14.350	
Technology applied	[X] Solar	[ ] Biogas	[X] Stoves	[ ] MHP	[ ] Grid	**other**
Summary of Key interventions and outputs	Provision of funds for buy-down grants and institutional development grants for participating organisations for the sale of 40.000 SHS Provision of funds for management and monitoring of the use of the refinancing loans and grant components by IDCOL Support of governmental and partner institutions in the realisation of the programme through advice and networking activities Dissemination of improved cooking stoves for households. Training of producers and trainers for improved stove technology. Assistance for business start-up and marketing support; provision of start-up subsidies for business expansion via local MFI **Expected output:** 40.000 SHS installed, 80.000 stoves constructed					
Short description of expected Impacts	• Reduction of household expenditures because of lower kerosene and battery consumption; • In individual cases increase of income through productive use of the light, • Improved access to information and communication • Improved working conditions at home • Increased reading and writing by children • Increased safety • More social activities during night time • Less CO2 emissions, less indoor air pollution					
Involved Bilateral Pro grammes	Renewable Energy and Energy Efficiency/ Sustainable Energy for Development (SED)					
Lead Executing Agency	Ministry of Power, Energy and Mineral Resources					
Implementing Partner	IDCOL, NGOs					
Project Manager	**Name, email**	Otto Gomm, otto.gomm@gtz.de				

Indonesia

Country/ Region	**Indonesia**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	05.2009 – 09.2012		**Project Budget:** 8.000.000 EUR			
Target Groups	Rural Poor in Indonesia (focal regions: Sumatra, Sulawesi and Papua)					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					170.000
	Cooking Energy for Households					---
	Electricity for social infrastructure					Tbd by end 2009
	Cooking/ Heating Energy for social infrastructure					---
	Energy for prod.use/income generation					Tbd by end 2009
Until 2015	Energy for lighting and el. HH Appl.					340.000
Technology applied	[] Solar	[ ] Biogas	[ ] Stoves	[X] MHP	[ ] Grid	**Other**
Summary of Key interventions and outputs	EnDev Indonesia consists of two complementary components: A Technical Support Unit (TSU) for micro hydro power plants implementation under the green facility of the Indonesian Community Empowerment Programme PNPM to • support and facilitate the preparation and implementation of micro hydro powered village grids within the Green PNPM framework • provide on the job training for PNPM staff, public institutions and NGOs and to local craftsmen to produce and service MHP turbines A micro hydro sector capacity development component to: • identify key stakeholders and demand for capacity development and institutionalisation of know-how and experiences **Expected outputs:** 250-350 micro hydro power plants have been installed and the relevant involved institutions and organisation have the capacity to independently implement further schemes. The capacity and institutional framework (e.g. feed-in conditions) of the micro hydro sector is improved.					
Short description of expected Impacts	Replacement of kerosene and torches for illumination (reduced indoor air pollution, improved safety, improved light quality for education) Improved quality of social services, income generation option by productive use of electricity/direct power e.g. for milling, husking etc.					
Involved Bilateral Pro grammes	Indonesian-Netherlands Bilateral Energy Working Group/Renewable energy Programme					
Lead Executing Agency	For the TSU component: Ministry of Home Affairs, for the sector development component: Ministry of Energy and Mineral Resources					
Implementing Partner	PNPM, NGOs, PSOs, CSOs					
Project Manager	**Name, email**	Roman Ritter, roman.ritter@gtz.de				

Kenya

Country/ Region	**Kenya**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	06.2009 – 12.2011		**Project Budget:** 2.500.000 EUR			
Target Groups	Rural and urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					
	Cooking Energy for Households					850.000
	Electricity for social infrastructure					49.000
	Cooking/ Heating Energy for social infrastructure					49.000
	Energy for prod.use/income generation					1.000
Technology applied	[] Solar	[ ] Biogas	[X] Stoves	[] MHP	[] Grid	[] Hybrid
Summary of Key interventions and outputs	• Scale up production and promotion of improved household stoves • Scale up production and promotion of improved institutional stoves • Scale up promotion of energy saving devices for productive use (e.g. stoves, baking ovens, food driers, heaters for nurseries etc.) • Massive awareness creating on the use of efficient biomass energy devices • Interventions to ensure sustainability **Expected output:** • 45.000 improved stoves per year are disseminated to households, 700 stoves to social institutions and 250 stoves for productive use					
Short description of expected Impacts	• Poverty reduction by increased income generation • Improvement of Health • Protection of environmental resources in particular forests					
Involved Bilateral Pro grammes	Promotion of Private Sector Development in Agriculture (PSDA)					
Lead Executing Agency	Ministry of Agriculture					
Implementing Partner	Ministry of Energy, Ministry of Education, NGOs					
Project Manager	**Name, email**	Reimund Hoffmann, reimund.hoffmann@gtz.de				

Mali

Country/ Region	**Mali**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	04.2009 – 12.2011		**Project Budget:**		2.000.000 EUR	
Target Groups	Rural municipalities					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.				19.800	
	Cooking Energy for Households				-	
	Electricity for social infrastructure				124.250	
	Cooking/ Heating Energy for social infrastructure				-	
	Energy for prod.use/income generation				-	
Technology applied	[X] Solar	[ ] Biogas	[ ] Stoves	[ ] MHP	[ ] Grid	**Other**
Summary of Key interventions and outputs	• Set-up of institutional framework in 7 communes based on a public-private approach by agreement on (1) management committee selection; (2) assignment on duties/rights for operator and committee including fee-for-service models; (3) stakeholder supervision • Training of (1) communal staff and management committee on their respective tasks as owner and supervisory body; for (2) service providers on operation and maintenance of PV solar systems and business tools • Financing of the installation of solar PV-systems for the electrification of four key communal services: schools, health centres, town halls, solar street lights and battery charging stations **Expected output:** • 50 solar-powered battery charging stations established • 50 schools, 20 health centres, 10 city halls and 100 street lighting facilities provided with solar energy					
Short description of expected Impacts	• Improvement of health • Increased access to education and communication • Improvement of living conditions in rural areas					
Involved Bilateral Programmes	Programme Promotion of Local Government (PACT)					
Lead Executing Agency	Ministère de l'Administration Territoriale et des Collectivités Locales (MATCL)					
Implementing Partner	Direction Nationale de Collectivités Territoriales (DNCT)					
Project Manager	**Name, email**	Dr. Dirk Betke, dirk.betke@gtz.de				

Nepal

Country/ Region	**Nepal**					
	New Project [X]		Follow-up Project of EnDev 1 []			
Project Phase	05.2009 – 04.2011		**Project Budget:**		700.000 EUR	
Target Groups	Rural poor in mountainous regions					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.				11.825	
	Cooking Energy for Households				-	
	Electricity for social infrastructure				6.947	
	Cooking/ Heating Energy for social infrastructure				-	
	Energy for prod.use/income generation				633	
Technology applied	[] Solar	[ ] Biogas	[] Stoves	[X] MHP	[] Grid	**Other**
Summary of Key interventions and outputs	Set up and financially support the establishment of a micro-hydropower debt fund providing investment capital to communities intending to build and operate their own power station in remote communities.Advise and support the partner bank in developing credit appraisal procedures which factor in the capacity/willingness to pay of end user, the own contribution by the community, the potential for productive end use, etc.Advise and support communities in their technical capacities to efficiently run their own power stations, set tariffs and collect revenue, and in making better productive use of the energy through investment in new business opportunities.**Expected outcomes:** 15-20 MHPP with approximately 416 kW installed.					
Short description of expected Impacts	Lack of electricity means little business opportunities for rural households, bad pre-conditions for education for the youths, and less-than-optimal usage of facilities such as health posts and community centres. The project supports the initiative by rural communities to organize themselves, invest their own money into a viable power station which benefits its households, and helps people in creating business opportunities and development in remote areas of Nepal. This leads to better living standards, better health, higher levels of education, and increased incomes through stimulation of the local economy.					
Involved Bilateral Programmes	Programm zur Förderung sozial ausgewogener Wirtschaftsentwicklung (INCLUDE)					
Lead Executing Agency	Ministry of the Environment, Science and Technology (MEST)					
Implementing Partner	Alternative Energy Promotion Centre (AEPC)					
Project Manager	**Name, email**	Dr. Thomas Labahn, thomas.labahn@gtz.de				

Peru

Country/ Region	**Peru**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	06.2009 – 12.2011		**Project Budget:**		2.900.000 EUR	
Target Groups	Rural/peri-urban/urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.				100.000	
	Cooking Energy for Households				60.000	
	Electricity for social infrastructure				15.000	
	Cooking/ Heating Energy for social infrastructure				320.000	
	Energy for prod.use/income generation				5.000	
Technology applied	[X] Solar	[X] Biogas	[X] Stoves	[X] MHP	[X] Grid	**other**
Summary of Key interventions and outputs	• Strengthen the capacities of local and regional governments to formulate politics, programmes and projects on modern energy services to improve the access of households and social organisations to these modern energy services • Develop and facilitate the access of producers and producer associations to modern energy services for their productive needs. • Give advice to producers, dealers and distributors to improve their offer of modern and innovative energy services and appliances and to open the market for their products. • Improve the awareness of the population of the positive impact of modern energy services for their health and the environment **Expected outputs:** • Approximately 20.000 households electrified • Approximately 12.000 improved stoves in households • Approximately 3.200 social institutions with electricity or improved cooking stoves • Approximately 500 small enterprises use solar dryers or biogas for productive use					
Short description of expected Impacts	• Improvement of Health • Increased access to education and communication • Improvement of living conditions in rural areas					
Involved Bilateral Pro grammes	None					
Lead Executing Agency	Agencia Peruana de cooperación internacional APCI, Presidencia del consejo de Ministros PCM					
Implementing Partner	Ministerio de Energía y Minas, Ministerio de Agricultura, Ministerio de Salud, Programa de Apoyo a los más pobres Juntos, Gobiernos Regionales, Gobiernos Provinciales,					
Project Manager	**Name, email**	Peter Pfaumann, peter.pfaumann@gtz.de				

Senegal

Country/ Region	**Senegal**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	04.2009 – 12.2011		**Project Budget:**		7.200.000 EUR	
Target Groups	Rural and urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.				59.700	
	Cooking Energy for Households				400.000	
	Electricity for social infrastructure				122.985	
	Cooking/ Heating Energy for social infrastructure				9.000	
	Energy for prod.use/income generation				166.000	
Technology applied	[X] Solar	[ ] Biogas	[X] Stoves	[] MHP	[X] Grid	[X] Hybrid
Summary of Key interventions and outputs	• Electrification of households, schools, health posts, community centres and productive use applications by installation of SHS, hybrid village grids (mainly PV/Diesel) and grid extension • Set-up of institutional framework and management based on private operation and fee-for-service models • Training of personnel for operation and maintenance • Increase of production capacity for improved stoves through set-up of semi-industrial manufacturing • Awareness raising campaigns • Improvement of finance mechanisms in collaboration with MFIs **Expected output:** • 5,970 households, 163 schools, 153 health centres, 233 street lighting facilities and 145 SME electrified • 80,000 improved household stoves disseminated					
Short description of expected Impacts	• Poverty reduction by increased income generation • Improvement of Health • Increased access to education and communication • Protection of environmental resources in particular forest					
Involved Bilateral Pro grammes	Promotion of Renewable Energies, Rural Electrification and Sustainable Supply of Household Fuels (PERACOD)					
Lead Executing Agency	Ministère de l'Energie (ME)					
Implementing Partner	Direction de l'Energie (DE), Agence Sénégalaise de l'Electrification Rurale (ASER)					
Project Manager	**Name, email**	Dr. Jörg Baur, joerg.baur@gtz.de				

Uganda

Country/ Region	**Uganda**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	04.2009 – 05.2011		**Project Budget:**		4.000.000 EUR	
Target Groups	Rural and urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.				29.000	
	Cooking Energy for Households				1.100.000	
	Electricity for social infrastructure				65.960	
	Cooking/ Heating Energy for social infrastructure				32.000	
	Energy for prod.use/income generation				10.500	
Technology applied	[X] Solar	[ ] Biogas	[X] Stoves	[X] MHP	[X] Grid	**Other**
Summary of Key interventions and outputs	• Dissemination of improved stoves (Rocket Lorena, Shielded Fire, Metal Rocket and Improved Charcoal stoves) for households • Dissemination of improved institutional stoves and ovens for social institutions and small and medium enterprises • Dissemination of solar PV systems for households, social institutions and small and medium enterprises • Electrification of trading centres through micro-hydro power and grid extension/densification schemes **Expected output:** • 220.000 improved household stoves disseminated • 320 Institutional Stoves and ovens for SI and PU disseminated • 5.800 households electrified by solar systems, 4 micro hydropower plants and 4 grid extension facilities • 48 schools, 44 health centres and 22 local councils electrified					
Short description of expected Impacts	• Poverty reduction by increased income generation • Improvement of Health • Increased access to education and communication • Protection of environmental resources in particular forest					
Involved Bilateral Pro grammes	Promotion of Renewable Energy and Energy Efficiency Programme (PREED)					
Lead Executing Agency	Ministry of Energy and Mineral Development (MoEMD)					
Implementing Partner	Energy Department (ED) in the MoEMD					
Project Manager	**Name, email**	Philippe Simonis, philippe.simonis@gtz.de				

C. Planned Country Activities in Brief

Benin

Country/ Region	**Benin**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	10.2009 – 12.2012		**Project Budget:** 2.000.000 EUR			
Target Groups	Poor rural/peri-urban and urban households					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					n.a.
	Cooking Energy for Households					400.000
	Electricity for social infrastructure					n.a.
	Cooking/ Heating Energy for social infrastructure					n.a.
	Energy for prod.use/income generation					n.a.
Technology applied	[] Solar	[ ] Biogas	[X] Stoves	[ ] MHP	[ ] Grid	**Other**
Summary of Key interventions and outputs	Component 1: Scaling-up of stove promotion for rural households in the North of Benin: • Promotion of fixed rocket stoves for cooking with firewood • Promotion of clay stoves for cooking on charcoal or wood Component 2: Promotion of improved cook stoves in urban and peri-urban areas in the South of Benin: • Promotion of Rocket for cooking with firewood • Promotion of pure clay stove using wood or charcoal • Testing of market opportunities and possible promotion of mobile household rocket stove (locally produced or import of industrial products from Asia); **Expected output:** 80.000 stoves sold					
Short description of expected Impacts	• Reduction of deforestation • Households and institutions (social and productive use) spend less money for wood fuel • Households spend less time on firewood collection • Higher income for stove producers • Less CO2 emissions, less indoor air pollution					
Involved Bilateral Pro grammes	ProCGRN – Programme of Conservation and Management of Natural resources					
Lead Executing Agency	Ministry of Energy					
Implementing Partner	Ministry of Energy and Ministry of Agriculture and Ministry of Environment (both partner Ministries of mother programme ProCGRN)					
Project Manager	**Name, email**	Paul Lutz, paul.lutz@gtz.de				

Bolivia

Country/ Region	**Bolivia**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	10.2009 – 12.2012		**Project Budget:** 5.000.000 EUR			
Target Groups	Rural/peri-urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					200.000
	Cooking Energy for Households					77.000
	Electricity for social infrastructure					60.000
	Cooking/ Heating Energy for social infrastructure					25.000
	Energy for prod.use/income generation					41.000
Technology applied	[X] Solar	[X] Biogas	[X] Stoves	[X] MHP	[X] Grid	**Other**
Summary of Key interventions and outputs	Support governmental and partner institutions to: • Design policies and finance mechanisms to improve access to energy • Train, advise producers/retailers/providers in the provision of innovative modern energy products and services and in opening up markets for them (Stoves, Pico PV, Biogas) • Support local stove and biogas plant installers • Support awareness and public relations campaigns about IAP, productive energy use, proper use of natural gas and safe indoor electric installations • Advise and financially support financing institutions that offer loans to producers/retailers and households • Facilitate and support networking between stakeholders in the energy sector, e.g. through workshops, working groups **Expected output:** 40,000 HH connected to the grid, 15,400 improved stoves disseminated to families, 1,200 social institutions with electricity, 420 social infrastructures with improved stoves, 80 social infrastructures equipped with solar water heaters.					
Short description of expected Impacts	• Reduction of household expenditures because of lower kerosene and battery consumption • Increase of income through productive use of electricity • Improved access to information and communication • Increased reading and writing by household members • Increased safety • Less CO2 emissions, less indoor air pollution					
Involved Bilateral Pro grammes	PROAGRO					
Lead Executing Agency	Ministry for Hydrocarbons and Energy, Vice ministry for Electricity and Renewable Energy					
Implementing Partner	Vice ministry for Electricity and Renewable Energy, NGOs, communities					
Project Manager	**Name, email**	Klas Heising, klas.heising@gtz.de				

Burkina Faso

Country/ Region	**Burkina Faso**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	10.2009 – 12.2012		**Project Budget:** 1.000.000 EUR			
Target Groups	Rural/peri-urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					
	Cooking Energy for Households					200.000
	Electricity for social infrastructure					
	Cooking/ Heating Energy for social infrastructure					200 welfare institutions
	Energy for prod.use/income generation					2000 SMEs
Technology applied	[] Solar	[] Biogas	[X] Stoves	[] MHP	[] Grid	**other**
Summary of Key interventions and outputs	1. Promotion of household stoves by supporting the private sector to produce and sell high quality improved stoves in big and small cities and rural areas and by supporting loans from finan. institutions to stove producers 2. Promotion of stoves for restaurants, beer brewers, shea butter producers and other SMEs 3. Promotion of stoves for social institutions 4. Promotion of efficient charcoal production by introducing new carbonization methods 5. Support government institutions to create conditions favouring the introduction of improved stoves as an obligatory tool in the production process of the most biomass consuming processes **Expected outputs**: 40.000 improved household stoves, 10.020 stoves for productive use and 500 for institutional use disseminated					
Short description of expected Impacts	• Reduced spending of households for wood fuel (at least 30 %); • Increased income of stove producers; • Reduced spending of business operators on wood fuel (e.g. up to 80 % in the case of beer brewers); • Health improvements for operators of small businesses; • Preservation of forestry resources;					
Involved Bilateral Pro grammes	PASE					
Lead Executing Agency	Ministry of Environment					
Implementing Partner	Stove producers associations, IRSAT, city and regional councils, private sector (PR specialists)					
Project Manager	**Name, email**	Annette Schmid, annette.schmid@gtz.de				

Ethiopia

Country/ Region	**Ethiopia**					
	New Project [ ]			Follow-up Project of EnDev 1 [X]		
Project Phase	10.2009–06.2012		**Project Budget:**		**€ 6.000.000**	
Target Groups	Rural, peri-urban and urban population of Ethiopia					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					25.000
	Cooking Energy for Households					500.000
	Electricity for social infrastructure					50 Comm.Centres
	Cooking/ Heating Energy for soc. infrastructure					300 Schools
	Energy for prod. use/income generation					50 bat.charg. stations 10 Solar Kiosks
Technology applied	[x] Solar	[ ] Biogas	[x] Stoves	[x] MHP	[ ] Grid	**other**
Summary of Key interventions and outputs	**Component 1: Access to Modern Energy Services-Cooking** • Promotion of Household stoves in 4 old and 3 new regions • Market introduction and scaling-up of Institutional Rocket Stove Main Outputs *Stove production capacity of annual 60.000 stoves* **Component 2: Access to Modern Energy Services-Electricity** • Train suppliers of institutional PV systems • Development and market introduction of a low cost SHS • Establish solar and hydro Training- and Maintenance centres • Advising the construction of MHP-plants • Advisory services to communities, cooperatives and associations Main outputs: a) *50 comm. centres with PV plants, b) 25.000 people benefit from SHS, c)5 Solar and 3 MHP training centres established* **Comp.3: Acc. to Mod. Energy Services-Policy/Sustainability** • Support to the review of policies, strategies, laws, regulations • Promote info-sharing and awareness creation amongst programme partners, stakeholders, GTZ entities and the general public • Support partners in identification of interventions for improved access to modern energy services and funding opportunities						
Short description of expected Impacts	• Reduced use of dry cells, wood fuel, lighting fuel • Reduction of indoor emissions (improvement of indoor air quality) • Income-/job creation, savings of expenditures for lighting/cooking • Improvement in businesses (activity extension in rural areas) • Increased number of employees in SME-sector • Improved education through better access to ICT and information • Increased number of qualified service providers					
Involved Bilateral Programmes	Sustainable Land Management, Urban Governance and Decentralization Progr., Engineering Capac. Building Progr.; SNV Biogas.					
Lead Executing Agency	Ministry of Mines and Energy					
Implementing Partner	Governmental institutions, Business associations, NGOs					
Project Manager	Name Dirk van Eijk Mail: dirk.vaneijk@gtz.de					

Ghana

Country/Region	**Ghana**		
	☐ New Project	☒ Follow-up Project of EnDev 1	
Project Phase	10/2009 – 12/2011	**Project Budget:** 900.000 EUR	
Target Groups	☐ Rural, ☒ peri-urban, ☒ urban poor in district capitals		
Expected Outcome until project end(Number of people with access to modern energy services)	Energy for lighting and electric HH Applications		300
	Cooking Energy for Households		n/a
	Electricity for social infrastructure		6 electric connections
	Cooking/ Heating Energy for social infrastructure		n/a
	Energy for productive use/ income generation		300 electric connections
Technology applied	☐Solar ☐Biogas ☐ Stoves ☐ MHP ☒ Grid:☐ Other		
Summary of Key interventions and outputs	• Support public-private dialogue between local governments, private sector and electricity utility (co-financed by PSED) • Co-finance the electrification of light industrial zones • Facilitate linkages between local governments and potential financiers for other infrastructure in industrial areas • Improve business skills of entrepreneurs in newly electrified industrial zones (co-financed by PSED) • Support introduction of economically and environmentally sustainable management in the zones • Support Min. of Trade and Industry, Min. of Energy and Env. Protection Agency in scaling-up the approach • 6 additional new light industrial zones established • Sustainable management in place in all industrial areas • MSMEs use the grid electricity productively		
Short description of expected Impacts	• 1000 firms have located in the industrial zones (baseline280). The share of women owned enterprises in the industrial zones has increased from 5% to 15% • Income of firms in industrial zones has developed significantly better than the income of comparable firms outside the industrial zone. The number of additional jobs created in start-up firms in all supported industrial areas has increased from 150 to 1500 • Public service delivery in supported districts has improved;		
Involved Bilateral Programmes	Programme for Sustainable Economic Development (PSED)		
Lead Executing Agency	Ministry of Trade and Industry (MoTI)		
Implementing Partners	Ministry of Energy, District, Municipal and Metropolitan Assemblies, Local Business Associations, Regional Coordinating Councils, Environmental Protection Agency		
Project Manager	Julius Spatz; julius.spatz@gtz.de		

Honduras

Country/ Region	**Honduras**					
	New Project [ ]	Follow-up Project of EnDev 1 [X]				
Project Phase	10.2009 – 12.2011	**Project Budget:** 2.000.000 EUR				
Target Groups	Rural/peri-urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					14.000
	Cooking Energy for Households					15.300
	Electricity for social infrastructure					20.000
	Cooking/ Heating Energy for social infrastructure					8.500
	Energy for prod.use/income generation					11.000
Technology applied	[X] Solar	[X] Biogas	[X] Stoves	[X] MHP	[] Grid	**Other**
Summary of Key interventions and outputs	Training and financial assistance for NGOs and communities to promote:: • Micro hydro and PV based electricity supply for welfare institutions and households • Battery charging station for remote households • Dryers for productive use. • Improved Stoves Further development and follow up of training courses for developers in renewable energy projects, in order to improve knowledge of cooperating institutions and related technicians **Expected output:** 2.745 HH connected to the grid or provided with a SHS, 3.000 improved stoves disseminated to families, 40 welfare institutions with electricity, 10 welfare institutions with improved stoves,					
Short description of expected Impacts	• Reduction of household expenditures because of lower kerosene and battery consumption • Increase of income through productive use of dryers • Improved access to information and communication • Increased reading and writing by household members • Increased safety • Less CO2 emissions, less indoor air pollution					
Involved Bilateral Programmes	Natural Resources and Economic Development Programme					
Lead Executing Agency	Secretaría Técnica y de Cooperación Internacional					
Implementing Partner	NGOs, communities					
Project Manager	**Name, email**	Monika Grossmann, monika.grossmann@gtz.de				

Mauretania

Country/ Region	**Mauretania**					
	New Project [X]		Follow-up Project of EnDev 1 [ ]			
Project Phase	1.2010 – 12.2012		**Project Budget:** 400.000 EUR			
Target Groups	Rural/peri-urban poor in Guidimakha					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					n.a.
	Cooking Energy for Households					70.000
	Electricity for social infrastructure					n.a.
	Cooking/ Heating Energy for social infrastructure					n.a.
	Energy for prod.use/income generation					50 bakeries
Technology applied	[] Solar	[] Biogas	[X] Stoves	[] MHP	[] Grid	**Other**
Summary of Key interventions and outputs	1. Promotion of improved firewood cook stove (VITA stove) a. Training of producers on technical and business skills b. Introduction of a quality control system c. Market development (distribution system in rural and peri-urban areas) d. Awareness campaigns e. Networking with government institutions 2. Product development and pilot testing (bakery oven) **Expected outputs:** 22,500 improved stoves are sold in Guidimakha (2010-2012); 50 bakery ovens are replaced or improved.					
Short description of expected Impacts	1. Environmental: - Reduction in household consumption of wood fuel - Long-term regeneration of the vegetation's wooded components 2. Economical: - Increases in employment - Increases in stove producers' revenues - Reduction in household expenses/ time needed to collect firewood 3. Social: - Improved schooling opportunities - Improved family health - Increased access to economic opportunities for women 4. Support for national energy policies					
Involved Bilateral Programmes	ProGRN: Natural Resource Management Programme / GTZ					
Lead Executing Agency	Ministry of the Environment					
Implementing Partner	Regional Representative of the Ministry of the Environment and the Ministry in charge of Women Affairs NGOs					
Project Manager	Karl P. Kirsch-Jung, karl-peter.kirsch-jung@gtz.de					

Mozambique

Country/ Region	**Mozambique**					
	New Project [ ]	Follow-up Project of EnDev 1 [X]				
Project Phase	10.2009 – 12.2012	**Project Budget:** 3.000.000 EUR				
Target Groups	Rural/peri-urban poor in central and southern Mozambique					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					35.600
	Cooking Energy for Households					
	Electricity for social infrastructure					37.000
	Cooking/ Heating Energy for social infrastructure					
	Energy for prod.use/income generation					1.500
Technology applied	[X] Solar	[] Biogas	[] Stoves	[X] MHP	[X] Grid	**Other**
Summary of Key interventions and outputs	• Provide access of poor households to electricity services through prepaid service connections (4,000 connections) • Foster marketing of small PV and Hydro technologies (1.000 small solar home systems and 8 micro/24 pico hydro power schemes) • Establish PV battery charging stations (20 stations) • Electrify social institutions with PV (65 schools and 65 offices) • Support the establishment of institutional structures and processes for testing and quality assurance of PV appliances. • Support the establishment of sustainable structures for PV and hydro technologies by training and capacity development of the private sector.					
Short description of expected Impacts	• Improved living conditions through better lighting, less smoke and less risk of houses burning down or persons getting hurt through the use of fossil fuel lamps. • Cleaner air in households through reduced fossil fuel lighting. • Savings in energy expenses by reducing the share of household revenue spent on lighting, radio playing and cell phone charging. • Time savings by reducing time spent on buying or collecting lighting fuels, which can be used for other productive or social activities. • Increased studying and reading hours of school children by providing better quality light (CFL) • Improved studying conditions at schools by provision of electrical light for evening classes. • Increased use of information and communication means by easier access to cell phone charging, and increased use of TV. • Reduction of toxic waste by reduced use of dry cell batteries.					
Involved Bilateral Programmes	Decentralisation Programme (PPFD) and Education Programme (PEB)					
Lead Executing Agency	Ministry of Energy (MoE)					
Implementing Partner	EdM, FUNAE, MFIs, NGOs and private enterprises					
Project Manager	**Name, email**	Peter Luhmann, peter.luhmann@gtz.de				

Nicaragua

Country/ Region	**Nicaragua**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	10.2009 – 12.2011		**Project Budget:** 2.200.000 EUR			
Target Groups	Rural/peri-urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					29.000
	Cooking Energy for Households					
	Electricity for social infrastructure					25.000
	Cooking/ Heating Energy for social infrastructure					
	Energy for prod.use/income generation					8.000
Technology applied	[X] Solar	[] Biogas	[] Stoves	[X] MHP	[X] Grid	**Other**
Summary of Key interventions and outputs	Support the connection of at least 20 villages to the grid through grid extension Support grid densification in villages with low connection rate Support the dissemination of at least 700 solar home systems Support installation of Micro Hydro Power Plants					
Short description of expected Impacts	• Reduction of household expenditures because of lower kerosene and battery consumption • Improved access to information and communication • Increased reading and writing by household members • Increased safety • Less CO2 emissions, less indoor air pollution					
Involved Bilateral Pro grammes	Sustainable Management of Natural Resources and Strengthening of Entrepreneurial Competencies					
Lead Executing Agency	Ministerio de Energía y Minas					
Implementing Partner	NGOs, communities					
Project Manager	**Name, email**	K.v.Loebenstein, karin.loebenstein-von@gtz.de				

Rwanda

Country/ Region	**Rwanda**					
	New Project [ ]		Follow-up Project of EnDev 1 [X]			
Project Phase	10.2009 – 12.2011		**Project Budget:** 5.000.000 EUR			
Target Groups	Rural/peri-urban poor					
Expected Outcome until project end (Number of people with access to modern energy services)	Energy for lighting and el. HH Appl.					700
	Cooking Energy for Households					30.000
	Electricity for social infrastructure					2 electrified Health Clinics
	Cooking/ Heating Energy for social infrastructure					5 Health Clinics with biogas
	Energy for prod.use/income generation					20 electrified SMEs
Technology applied	[] Solar	[X] Biogas	[] Stoves	[X] MHP	[] Grid	**Other**
Summary of Key interventions and outputs	**Summary of key interventions** Development of MHP plants to connect off grid health clinics to electricity *through support to private developers for the construction and management of MHP plants and local grids* Consolidation of the participation of private MHP developers in the energy sector: Institutional support Support to the pilot phase for **institutional biogas** programme (training programmes, applied research) Provision of subsidy (75%) and support to promotion, training, quality control, applied research, M&E for domestic biogas **Expected Outputs** 1. 2 health clinics connected to new MHP plants 2. 2 new private companies engaged in MHP 3. Biogas theory training included in the curriculum of at least 2 training institutions for technical and engineering plus practical through construction of 5 digesters in health clinics 4. Installation of 5.700 domestic biogas digesters by mid of 2011 supported by a market driven mechanism					
Short description of expected Impacts	Improved services offered by health centres through: better vaccination, improved autoclave, improved cooking facilities Biogas for 5700 households will result in 1) reduction in costs and/or collection time of firewood/residues 2) reduced smoke related diseases 3) changes in children's education and nutrition. MHP: New electricity access for 700 people					
Involved Bilateral Pro grammes	GTZ Health Programme Rwanda					
Lead Executing Agency	Ministry of Infrastructure (MININFRA): Energy Sector					
Implementing Partner	MININFRA, Private sector (MHP), SNV (Biogas)					
Project Manager	**Name, email**	Rainer Krischel; rainer.krischel@gtz.de				

D. Annex: Planned Country Activities Proposals

Benin

1. Situation Analysis

1.1 Energy situation

Biomass energy constitutes a major contribution to the national energy mix of Benin. Main sources are the forests in the North of the country. Wood products – particularly charcoal – are transported to the South of the country to supply the urban energy markets. Sawdust and agro-waste are other biomass energy sources of minor importance.

According to the Ministry of Energy, 69% of the energy consumed in Benin is based on biomass. The major consumers are households. While in urban areas charcoal is the main fuel, the rural households predominantly use firewood. Wood is also used for artisanal food processing (e.g. fish smoking, bread baking and in restaurants). Some industries generate their electricity from agro-waste.

Biomass as a fuel is still available in all parts of the country. However, in urban settings – particular in the South – it has become an expensive commodity.

The Kenyan Ceramic Jiko – locally called “Nansu” – is the major improved charcoal burning stove available in the country. According to a study implemented in the first EnDev phase, 23% of the households in the three major cities in the South have at least one improved stove (out of usually 2 stoves usually used parallel in the homes).

Key problems of the energy sector

The key problem of the biomass energy sector in Benin is the unsustainable use of the forest resources. This problem has a supply and a demand side.

On the supply side, it is first of all not very clear how much forest is left. Studies (FAO, CENATEL) indicated that the area of forest is decreasing every year. There is a loss of about 116.000 ha of forest per year (situation of 2006). However, a new study is currently undertaking under the supervision of the Ministry of Energy to generate an up to date picture of the situation and this study will be the baseline of EnDev 2 for impact analysing on forests. The exploitation of the forest is at large not planned or controlled. This is the result of a lack of capacity in the national authority responsible for this task.

On the demand side, due to low purchase power and cooking habits of larger parts of the population, it is impossible to use other fuels than Biomass-energy. Indeed, according to a study of the Ministry of Energy (2003), 88% of rural population and 85% in urban population use firewood for cooking purpose and 13% of rural population and 36% of urban population uses charcoal for cooking purposes (study made on a national level).

The current system of biomass energy-use creates increasingly difficulties for urban and rural households because of rising wood fuel prices. In some areas, cooking and grinding has become one of the biggest items on the list of household expenditures.

The government is planning projects on alternative energies to biomass-energy but no concrete actions have been undertaken today. The main “modern energy” alternative for cooking is LPG. However, this is expensive and there are already by now shortages in the supply.

1.2. Policy framework, laws and regulations

The Poverty Reduction Strategy is the key document of the Benin development strategy. The final version of April 2007 was updated and the provisional version of June 2009 is available. In both versions it is mentioned that the "promotion of rational utilization of Energy in all sectors of activities" and/or the "promotion of […] systems to save wood-energy" as elements of a sustainable and equilibrated development of the national territory. The provisional version of June 2009 talks about the "rational management of the biomass-energy and the energies of substitutions".

The Energy Policy and Strategy of Benin was formulated under the supervision of the Ministry of Energy in 2003. According to this document, the overall goals of Benin energy policy are:

- Improve the situation of the commercial balance through the reduction of the energy bill and the improvement of the competitiveness of enterprises producing goods and services,
- Better control of energy and of the national energetic system through a better valorisation of natural resources and a reduction of negative impacts of energy activities on environment,
- Utilization of energy in rural areas for production and a slowing-down of rural exodus to cities,
- A better spatial and technical coherence in investments in energy sector in communal, departmental, national and if possible in over-national plans.

Within the above mentioned "Energy policy and strategy in Benin", there are two specific quotes related to Biomass Energy:

> "…the introduction of improved cooking stove in rural and urban areas is marginal in our country. The programs of promotion of improved stoves have not succeeded to increase rapidly the penetration of this kind of stoves" (page 34). This statement was made before the start of EnDev 1 (end of 2005).
>
> "…the policy of the Benin government in the sector of biomass-energy is to improve the efficiency of the consumption of wood-energy at household level and in the sector of artisanal production by a policy to favouring the access to improved cooking stoves" (page 44).

The national directorate of forests and of natural resources is mandated with the control of the forest exploitation. However, the current tax policy does not allow for a substantial control of the wood exploitation as the commercial value of wood remains low. Also the laws are not enforced by the state servants.

Some actions are planned with Directorate of Forests and Natural Resources together with Directorate of Energy:

- Revision of legislation and forestry rules in the taxation in order to favour planed exploitation of natural resources combined with reforestation,
- Creation of wood-energy markets,
- Organization of the commercial chain in wood-energy.

Based on the above it can be shown, that the promotion of improved cook stoves is fully in line with the energy policy targets and strategy of the Ministry of Energy.1.3. Institutional set up in the energy sector, activities of other donors

Governmental institutions

The Ministry of Energy will be the direct partner of the EnDev Programme. The project will share information with that Ministry and will establish a memorandum of partnership with that Ministry.

Under the Ministry of Energy is the General Directorate of Energy. It is responsible for:

- Energy policy,
- Elaboration and follow up of documents concerning the sector,
- Follow the national poverty reduction strategy linked with energy issues,
- Coordination and implementation of energy projects,
- Monitoring of quality control.

The EnDev programme will closely work with this directorate.

Another important player in the field of biomass-energy is the Ministry of Environment. This Ministry intervenes in:

Environmental policy;

- Policy for conservation of natural resources, Elaboration and follow documents on environment,
- Monitor national poverty reduction strategy with a focus on greening,
- Control and Monitoring of environment issues.

EnDev programme will search for synergies with this Ministry and share information. The Ministry of Environment has officers on the ground able to work with EnDev (schema already in place under EnDev 1).

The Ministry of Agriculture is an important player in rural areas. It has a good extension system on the ground and a history of promoting "rural development". As the Ministry of Energy does not always have extension officers in the project implementation area, the EnDev programme seeks collaboration with the Ministry of Agriculture for the implementation of rural stove promotion.

Private sector (enterprises)

Major private companies take an important role for the production and provision of electricity and petroleum products. However, they do not have a role (yet) for the promotion of a sustainable wood fuel market.

The private business actors in the field of biomass energy are rather small (e.g. charcoal producers, stove producers and vendors). In the context of this proposal they are rather to be considered as beneficiaries or target groups of programme activities than being a partner to the programme.

Activities of other donors, activities of NGOs

The only other major donor active in the promotion of improved cook stoves in Benin is the World Bank through Ministry of Energy. They are promoting the Kenya Ceramic Jiko – "Nansu" – under the PFSE programme (Programme de fourniture de services énergétiques) in South of the country. Their target is the sale of 20,000 stoves until June 2010. Their objective is to create a credit line with an institution of micro finance to enable the selling of theses stove. However, at the present date, they haven't started their activities.

There is also a programme of the Ministry of Environment (programme PANA) that has an improved stove component. However, this programme is still in the reflexion level.

There are a few small initiatives of other donors and NGOs concerning improved cook stoves in the South of the country. However, their efforts are very small both in number of stoves as well as geographical outreach.

Short explanation to what degree EnDev activities will be coordinated with other donor activities

In the Northwest of Benin, there will be no coordination as there are so far no other donors activities in the field of improved stoves. However, activities will be coordinated to a certain extent with activities of the GTZ Programme for Conservation and Management of Natural

Resources (ProCGRN) as this programme intervenes in the agricultural sector and some people transform agricultural products using improved “institutional stoves”. The ProCGRN however does not finance to any extent the activities concerning the improved stoves.

In the urban areas of the South, it is important to consider the current interventions of the PFSE World Bank funded programme. As the implementation area is overlapping, it will have a big impact on the baseline situation analysis as well as on the market situation in which the EnDev promoted product will be entering. As the World Bank funded Programme is implemented through the direct partner of the EnDev Programme, there will be exchange of information, synergy of actions and harmonizing of strategies.

Short explanation to which degree EnDev will be in line with capacity development needs of the partner

According to the official document on the “Energy policy and strategy in Benin” elaborated in December 2003 under the supervision of the Ministry of Energy, the directorate of Energy needs capacity development in the following fields:

- financial facilities,
- Trainings in the following fields:
  - Processing and organization of information in the energy sector,
  - Financial and economic analysis,
  - Analysis of risks in the energy sector,
  - Strategic sector management,
  - Development of programmes and operational planning,
  - Energy and environment.

The EnDev activities in the field of improved cook stoves will cover the needed capacity development in the Biomass energy sector through:

a. Involvement of MoE in the execution of all studies,
b. Involvement of MoE staff in the implementation of training activities,
c. Support MoE staff participation in selected international conferences related to Biomass Energy issues,
d. Joint planning of the EnDev programme activities in Benin.

1.4. Other major activities in the country financed by BMZ or DGIS

The Benin-German development cooperation is focussing on three focal areas:

a. Program of decentralization and municipal development (PDDC) that also promotes connecting rural settlements and municipalities to the national power grid. This Programme is supported by DGIS;
b. Program to integrated water resource management and drinking water supply in urban and rural areas (PEP);
c. Program of conservation and sustainable management of natural resources (ProCGRN).

Benin is part of the regional Public Private Partnership “Cotton made in Africa”. The objective is that an alliance of major retail businesses regularly buys ‘Cotton made in Africa’, that African cotton producers practice sustainable cultivation methods and that Cotton growers turn in a greater profit thanks to higher demand and improved productivity.

The BMZ also finances a project in Macroeconomic advising on poverty. The objective is that the project’s partner ministries are successful in formulating, implementing and monitoring the national poverty reduction strategy. They initiate reforms in the management of public finances and harmonise the various development projects in accordance with the Paris Declaration on Aid Effectiveness (2005).

The Netherlands are among the most important technical and financial partners of Benin. In 2001 Benin was added to the 19 + 3 list of partner countries. The bilateral development programme has been under construction since then and seeks to harmonise with the PRSP.

The following organisations are also active in Benin: SNV, whose programmes have been running there for the past 30 years, IUCN Netherlands, Agriterra, the National Federation of Christian Trade Unions' World Solidarity Programme (CNV/AKO), Plan International, ICCO, VNG and the Netherlands Management Cooperation Programme (PUM). Benin is an active partner to the Netherlands in promoting policy coherence on cotton subsidies. The embassy of the Netherlands focuses on four main fields:

- Water and sanitation,
- Education,
- Governance,
- Improvement of business climate.

The embassy of the Kingdom of the Netherlands is promoting the development of the private sector through different programmes for stimulating the world of business. There is collaboration with the harbour, activities to promote good governance and also some project to help enterprises in a direct manner. There is the PSOM that favours the investments of Dutch enterprise together with a local partner in a developing country. In Benin there is for example a Cashew factory. There is also the PUM with advices from senior experts, the CIB that promotes the importation of products from development countries for example in advising in laws and regulation of development countries.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	0
Cooking Energy for Households	400.000
Electricity for social infrastructure	0
Cooking/ Heating Energy for social infrastructure	0
Energy for prod.use/income generation	0

3. Project Approach

The EnDev1 Programme is implemented in the rural North-west area. The target group are rural households. Under the new programme phase EnDev 2, there will be 2 regional components, which also impact on the technology selection and the promotional approaches:

Component 1: Scaling-up of stove promotion for rural households in the North of Benin

Component 2: Promotion of improved cook stoves in urban and peri-urban areas in the South of Benin.

3.1. Energy technologies/services promoted by the EnDev project

3.1.1 Selected technologies/services and approaches

Component 1: Scaling-up of stove promotion for rural households in the North of Benin

The technologies selected under Endev1 shall be continued under EnDev2.

a) Firewood stoves:

The main biomass-energy used in this region is wood (nearly every household uses wood in at least one stove) and baseline technology is the 3-stone fire. During EnDev 1, the fixed Rocket stove made out of banco (clay), straw and other dry grasses was successfully promoted. It is a massive stove that needs some time to heat up and is not suitable for fast-cooking. However, it suits well cooking habits as meals do take time to cook and where the pot needs to be very stable. With a correct maintenance, this stove lasts for 3 years.

b) Charcoal stoves:

The baseline stove for cooking of charcoal is the so called “cloporte” stove (inefficient metal stove). Under EnDev1, a simple stove out of unfired clay was promoted. Theses stoves are well accepted and production is easy. They do perform well. Based on the experiences made under EnDev1, the lifespan is estimated to be 1 year. This will be further investigated under EnDev2.

Component 2: Promotion of improved cook stoves in urban and peri-urban areas in the South of Benin.

For the urban population in the South, charcoal is a much more common fuel to be used as compared to the rural North where the programme worked under EnDev1. However, particularly in the peri-urban areas there is also extensive use of firewood for cooking. Some households are also using both firewood and charcoal.

The baseline stove for the majority (about 2/3) of urban charcoal users in the South is a simple metallic stove (called “cloporte” in Benin) with low efficiency. The Kenya Ceramic Jico (“Nansu”) is also used by app. 23% of the households. Under EnDev2, the programme will promote both improved firewood and charcoal stoves in the South. As these products have not yet been tested on the market there, there will be still an orientation phase of 6 months to define which products can be scaled up under component 2.

a) Firewood stoves:
    - Promotion of Rocket,
    - Promotion of pure clay stove using wood,
    - Another possible option is a Rocket stove with a fired clay chamber and a metallic body. This can be either produced in country and/or imported from industrial production in China or India. Further studies on technologies, markets and user preferences have to be done in the onset of the new phase.

b) Charcoal stoves:
    - *Replicating the clay stove model from the North in the South of Benin:*
      The clay charcoal stove in the North performed well under EnDev1. It is there cheap and efficient. But it would not be suitable to produce stoves in the North and sell them in the South due to the anticipated breakages. Nor would it be economical to transport the clay from the North for production of stoves to the South. Hence it will be tested to produce the stove design from the North by using the artisans and the clay from the South. Only after assessing the durability and performance of the product in the South it can be decided if this product complies with the EnDev criteria and if it has a market case.
    - *Further observation of the “Nansu” (Kenya Ceramic Jiko):*
      The “Nansu” is a well established product in the big cities in the South. 23% of the households are using at least one of these stoves. In preparation for this proposal, the “Nansu” was tested in respect of the EnDev criteria against the baseline stove “cloporte”. The results available so far are not verifying the required 40% savings. However, as the main project partner, the department of Energy, is implementing with support of the World Bank a programme for the commercial dissemination of 20,000 Nansu/KCJ stoves, the EnDev programme has at least to coordinate its efforts with the Ministry.

Household stoves	Component 1 rural areas	Component 2 urban and peri-urban
Firewood stoves		
baseline	3-stone fire	3-stone fire
Improved stoves	Rocket Stove	Rocket Stove
	Pure clay stove	Pure clay stove,
		Rocket stove out of metal and fired clay
Charcoal stoves		
baseline	Simple metallic stove ("cloporte")	Simple metallic stove ("cloporte"); partially Nansu/KCJ
Improved stove	Pure clay stove (fired and unfired)	Pure clay stoves (to be confirmed after testing)

Overview over technology promoted

3.1.2 Rationale of the approach

Component 1: Scaling-up of stove promotion for rural households in the North of Benin

Based on the experiences under Endev1, the same technologies will be further promoted as they have proven successfully accepted by local population under EnDev 1. The concept is local production of stoves by local artisan for a local demand out of locally available materials. An extension to the North-East is envisaged.

Component 2: Promotion of improved cook stoves in urban and peri-urban areas in the South of Benin.

The urban areas in the south are new territory for EnDev in Benin. Some preparatory studies have been implemented to better understand this market. First results are indicating good opportunities for the urban and peri-urban markets. As the South is characterised by (a) a commercialised urban fuel market and (b) a high population density, it is assumed that the commercial promotion of improved cook stoves should be a cost efficient option for EnDev.

a. Particularly in peri-urban areas, firewood is still the major fuel used by households. But there are no improved firewood stoves available on the market. This is an opportunity under EnDev2.
b. For the charcoal users, there is already a market for improved cook stoves in the South (mainly Kenyan Jiko Stove called "Nansu" using charcoal). The objective is to have a more efficient and cheaper product for the same market as the Nansu.

Within the first 6 month of the programme, the opportunities for the promotion of (a) firewood stoves and (b) charcoal stoves in the South will be assessed and a detailed planning will be finalised.

3.2. EnDev approach

Market situation for different energy technologies and services

Component 1: Scaling-up of stove promotion for rural households in the North of Benin

a) Rocket stove

Under EnDev1, app. 20,000 stoves have been commercially constructed and sold by artisan to rural homes (no subsidy). This indicates that there is demand for this product amongst smallholder farmers. In the new programme phase under EnDev2, this approach will be further promoted and achievements of the first phase consolidated. In this process, it is foreseen to phase out step by step in the initial project intervention areas and go to new rural areas (North-East with same climate and same population).

The implementation will be done jointly with the extension staff of the Ministries of (a) Energy, (b) Environment as well as (c) Agriculture.

Key interventions are:

- Training of artisans in construction of Rocket stove and business skills,
- Quality control (through project/consultants),
- Certification of qualified producers (shall on the long run replace quality control),
- Awareness campaigns using radio and market demonstrations etc.,
- Marketing campaigns focussing on the logo for quality products.

Experiences under EnDev1 show that it is important to stress the professionalism of stove producers. Right from the beginning, quality control and certification are important tools to promote the qualified producers.

b) Clay stoves for wood or charcoal

Under EnDev1, app. 30,000 stoves have been sold to households in small rural towns or settlements. In the new programme phase under EnDev2, this approach will be further promoted and achievements of the first phase consolidated.

The implementation will be done jointly with the extension staff of the Ministries of (a) Energy, (b) Environment as well as (c) Agriculture.

Key interventions are:

- Training of artisan in construction of clay stoves for charcoal and on business skills,
- Quality control (through project/consultants),
- Certification of qualified producers (shall on the long run replace quality control),
- Awareness campaigns using radio and market demonstrations etc.,
- Establishment of a logo for certified quality products,
- Marketing campaigns focussing on the logo for quality products.

Component 2: Promotion of improved cook stoves in urban and peri-urban areas in the South of Benin.

The South is a new intervention area for EnDev 2. A market study has been conducted that showed good potential for improved stoves using wood or charcoal.

a) Rocket banco

This stove is not known in the South and will be introduced by EnDev 2 as a market potential was shown by EnDev market study for peri-urban households and many small restaurants that use a lot of wood-energy.

Key interventions are:

- Training of artisans in construction of Rocket banco and on business skills if found necessary;
- Quality control (through project/consultants);
- Awareness and marketing campaigns using radio, TV and market demonstrations etc.

b) Clay stove for wood or charcoal

The clay stoves using wood are not known in the South but according to the households implicated in the market study, they are interested in theses stoves. Also, pure-clay stoves are not expensive and will be able to compete with traditional stoves.

Key interventions are:

- Training of artisans in construction of local clay stoves and on business skills if found necessary;
- Quality control (through project/consultants);
- Awareness and marketing campaigns using radio, TV and market demonstrations etc.

c) Rocket stove with metal body and ceramic core

This type of stove does not yet appear on the market for improved stoves. It is a technology for the use of firewood for cooking. It will be necessary to assess the market firewood stoves around the big centres in the south. EnDev 2 expects to enable the selling of about 15,500 stoves of that type (urban and rural together).

If it is found that (a) there are many firewood users in the South and (b) that they are in the position to spend money on an improved cook stove (e.g. as their access to firewood is commercialised), household rocket stoves do constitute an interesting option.

Within the programmes funded under EnDev1 there are several programmes that developed successfully a production and a market for portable household rocket stoves (e.g. Uganda, ProBEC, etc.). Other Programmes are in the process of building up that market under EnDev2 (e.g. Ethiopia). Hence this is also an opportunity for EnDev Benin if there is a cliental looking for such kind of product.

Alternatively, there are new industrial stoves produced in India and China through Envirofit and Aprovecho respectively. Some GTZ programmes are testing the markets for these products (e.g. ProBEC). EnDev Benin could follow this example if there are customers who are able and willing to afford such product. This needs to be tested at the beginning of EnDev2.

Originally, the current phase of EnDev1 was supposed to go until the end of 2010. Hence the development of concepts for EnDev2 was foreseen for the last year of implementation. Because of the early change-over to the new phase of EnDev, some opportunities for a cost-effective scaling up where not yet fully assessed.

d) Collaboration with programme of Ministry of Energy financed by Work Bank

In the South of the country, the World Bank funded programme is focusing on energy services in general and improved stoves are only a small component. Collaboration with this programme may constitute both a risk as well as a great opportunity. It depends on the negotiations at Ministry level to what extent a joint approach can be negotiated. The opportunity would be that jointly the market stimulation through large awareness campaigns

could reach many urban and peri-urban households. The danger is that pressure to deliver results in short time may motivate government partners to engage in application of product subsidies under the World Bank funding and hence spoiling the market. For now, the World Bank programme mechanism is to put in place a credit line with an institution of microfinance for producers and distributors. It has to be the ambition to harmonize the approaches.

3.3 Risks for implementation

Component 1: Scaling-up of stove promotion for rural households in the North of Benin

Main risk in a local artisan approach based on local materials is the quality deterioration due to design drift. It is therefore stressed in the proposal that quality control, certification of qualified producers and awareness campaigns to promote the importance of quality aspects of stoves are central for the long term success of this component.

Component 2: Promotion of improved cook stoves in urban and peri-urban *areas in the South of Benin.*

Entering a new territory is always associated with risks. Several studies have been undertaken under EnDev1 to better understand the urban market in the South. Some more studies are still underway and their results will be available at the onset of EnDev2. Still, important questions remain to be answered:

a. There is no experience with the promotion of improved firewood stoves in the peri-urban areas of the South available. User acceptance and readiness to pay for the service might be different as compared to the North.
b. Clay can have very different properties from one place to another. It is not yet clear if the stoves from the North can be replicated in the South. And even then it still has to be shown that the “South-Clay-stove” is fulfilling the EnDev criteria. Thereafter, user acceptance and market case still need to be established.
c. The market case of clay charcoal stove might be undermined if the World Bank funded programme is changing its course and is using a market-distorting approach with direct product subsidies;
d. As the clay charcoal stove may only save 40% over the original baseline stove “cloporte” (and not against the Nansu/KCJ), a methodology has to be developed how to establish that only those stoves are counted where a “cloporte” is replaced.
e. metal stoves are always subject to price increases due to the fluctuation of the availability of metal

At the end of the first 6 months, these risks have to be assessed before making a decision on the approaches used under component 2.

4. Impact Monitoring & Evaluation

Expected Impacts of project intervention

The promotion of efficient wood cook stoves has positive impacts for both users as well as producers of these technologies.

Users benefit directly from a reduction of their specific fuel wood consumption. Depending on the setting this reduction translates into a reduction of time spend for collection of wood or in money saved. EnDev 2 expects at least weekly savings per household of about 625 FCFA (average) for wood and 1,200 FCFA (average) for charcoal. Theses impacts will be analysed/verified under EnDev 2.

Reductions in the wood-fuel consumption may also impact on the rate in which wood is harvested from the forests. This is a complex impact which will be difficult to verify. However,

as there is currently a study carried out by the ministry of Energy on the forest cover it will be tested under Endev2 if it is feasible to monitor a change after at the end of the programme. A comparison of a zero scenario (utilisation of wood without improved stoves) has to be compared with the new reality of people using improved cook stoves.

At the end of EnDev 2, it is expected that improved stoves save more than 25,000,000 kg of wood per year in rural areas and more than 10,000,000 kg in urban areas. Concerning the consumption of charcoal, it is expected that the disseminated stoves save at least 245,000 kg of charcoal per year in rural areas and 1,000,000 kg in urban areas in comparison to traditional stoves.

The producers of stoves will benefit from higher income through stove sales. This expected impact – as well as what they do with the money earned – will have to be assessed within EnDev 2.

In collaboration with the Ministry of Environment the reduction of Indoor Air Pollution will be analysed.

Planned Impact Monitoring & Evaluation Methodology

Please tick:

(X) a baseline survey for impact evaluation is planned and scheduled for February-March 2010

( ) a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for ……(approx. date)

( ) the project will use other methods for impact monitoring (please specify……..)

(X) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

(X) the project would be interested to get financial support for impact evaluation.

5. Budget

		EUR
1	**Human Resources and travelling**	**600.000**
2	**Equipment and Supplies**	**200.000**
3	**Funding Financing Agreements/Local subsidies**	**300.000**
4	**Other direct costs**	**600.000**
5	**Total direct costs**	**1.700.000**
6	**Mark up costs/administrative overheads/imputed profit/**	**300.000**
7	**Cost price**	**2.000.000**[1]

[1] The budget is based on the assumption that component 2 can be realized as planned. The budget may be reduced if a project progress review in 2010 provides evidence that the targets of component 2 cannot be achieved.

Bolivia

1. Situation Analysis

1.1 Energy Sector

Bolivia, with a population of approximately 10 million inhabitants, is considered the poorest country in South America. While urban areas such as La Paz and Santa Cruz are modern cities with a relatively good supply of modern energy services, the majority of Bolivia's rural and peri-urban areas still lack most basic services, including reliable and affordable access to electricity and improved biomass cooking stoves. Thus, in 2005, total access to electricity in Bolivia was 67%, one of the lowest in Latin America. Urban access was 87%, while rural access remained as low as 30%.

Bolivia is a net exporter of gas and oil. Electricity is mainly generated by private companies from hydropower (53%), gas (27%) and oil (18%). Installed capacity in 2006 was 1,43 GW. The contribution of renewables beside hydropower is negligible.

Traditional biomass (wood, dung, charcoal and green residues) still accounts for nearly 90% of total energy consumption by rural households and is used for cooking by more than 70% of households. Annual electric power consumption per capita in 2006 was 588 kWh (a 19% increase since 1996).

Within the "Interconnected System" (La Paz, Cochabamba, Sta. Cruz, Sucre, Oruro, Potosi) electricity is supplied in concession areas by private companies. Rural areas are supplied by cooperatives, prefectures, municipalities and to a lesser amount, by ENDE, a state-owned company. Usually these isolated systems generate electricity with diesel.

1.2. Policy framework, laws and regulations

In the new constitution from 2009, the universal access to services such as electricity is a fundamental right (Art.20).

In 2002, the government of Bolivia developed an ambitious rural electrification plan (PLABER – Plan Bolivia de Electrificación Rural) to increase access to electricity in rural areas from 25% to 45% within five years. However, implementation of the plan has been slow due to the ongoing political and economic crisis. A new Rural Electrification Decree was approved in 2005 (Supreme Decree No. 28567). This new decree aims at increasing rural access through the extension and densification of electric networks, development of renewable energy and a change in the energy mix (substitution of diesel by natural gas, biomass and other renewable energies) and an increase in distribution capacity. The Rural Electrification Decree and its associated regulatory framework encourage stakeholders in the energy sector to establish partnerships with other government agencies to implement the rural electrification plan.

In the National Development Plan 2006 - 2010, electric energy is defined as a strategic sector with four general policies:

- Development of electric infrastructure in order to comply with national necessities and the generation of excess for export,
- Increased coverage in rural and urban areas, making the service universal,
- Energetic Sovereignty and Independence,
- Consolidation of the State in the development of the electric industry with sovereignty and social equity.

Within the National Development Plan grid densification is explicitly mentioned. Also in 2006, a new Law for Universal Access to Electricity (Ley de Acceso Universal) was proposed. Under the framework of this Law, in 2008, the Programme "Electricity for a life with dignity" was established to improve both rural and urban electrification. The short term goal (2006-2010) of the programme is to increase rural electrification to 53% (connection of 210,000 new households) and urban electrification to 97% (connection of 460,000 new households).

The agreement between the ministry for Energy and GTZ/EnDev is an integral part of this programme and being responsible for 45% of total households to be granted access with the overall existing funds.

1.3. Institutional set up in the energy sector, activities of other donors

The Viceministry of Electricity and Alternative Energy, within the Ministry of Hydrocarbons and Energy, is in charge of establishing policies and designing the regulation for the electricity sector. The work of the once independent Superintendencia de Electricidad is now assumed by a general Directorate within the ministry.

The electricity sector in Bolivia was privatized in the early 1990s and was unbundled into generation, transmission and distribution. Like in other countries, Bolivia's electricity sector consists of National Interconnected System (SIN) and off-grid systems (known as the Aislados).

Other donors within the programme "Electricity for a life in Dignity" are KfW, UNDP (small hydropower), World Bank (grid extension, Solar Home Systems), and the EU (community solar and wind hybrids). Also, EnDev cooperates with the World Bank regarding improved stoves and Pico PV.

EnDev will continue to work with governmental institutions on all levels: National, prefectural and municipal, as well as with cooperatives, NGOs and the private sector.

Improved stoves will also be part of the National Waterbasin Plan. The counterparts for Biogas plants, small irrigation and product transformation (energy for productive use) usually are entire communities or cooperatives. The connection of social infrastructure to the natural gas grid has been declared national policy by the Ministry for Energy and Hydrocarbons in 2006, while photovoltaic and thermal hot water usually are implemented together with municipalities.

EnDev applies the subsidiarity principle according to the need of the partners and structures and the characteristics of the technology. For example, while strengthening the capacities for improved stove dissemination on the community level, municipal and national partners are also being involved. Grid densification usually works with national, prefectural and municipal governments and the private sector (utilities), complementing with training for electricians on the community level.

1.4. Other major activities in the country financed by BMZ or DGIS

- DGIS is supporting the National Gas and Petroleum holding YPFB in its restructuring process,
- DGIS financed the NGOs Energetica and ETC to provide complementary technical assistance as well as awareness campaigns to the Cochabamba prefecture,
- KfW is financing a small hydroelectric programme which is currently being revised,
- The BMZ has been asked by the Bolivian Government to support the development of wind energy,

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	200.000
Cooking Energy for Households	77.000
Electricity for social infrastructure	60.000
Cooking/ Heating Energy for social infrastructure	25.000
Energy for prod.use/income generation	41.000

3. Key Interventions

EnDev Bolivia will support governmental and partner institutions to……

- Design policies and finance mechanisms to grant better access to energy,
- Train, advice producers/retailers/providers in the provision of innovative modern energy products and services and in opening up markets for them (Stoves, Pico PV, Biogas),
- Support local stove and biogas plant installers to pursue this in the long run as a complementary job opportunity,
- Support awareness and public relations campaigns about IAP, productive energy use, proper use of natural gas and safe indoor electric installations,
- Advise and financially support financing institutions that offer loans to producers/retailers and households,
- Facilitate and support networking between stakeholders in the energy sector, e.g. through workshops, working groups.

Expected output: 40.000 HH connected to the grid, 15.400 improved stoves disseminated to families, 1.200 social institutions with electricity, 420 social infrastructures with improved stoves, 80 social infrastructures equipped with solar water heaters. Indonesia consists of two complementary components:

4. Project Approach

4.1 Energy technologies/services promoted by the EnDev project

The EnDev Bolivia project will consist of nine complementary components: (1) Grid Densification, (2) Pico PV (portable photovoltaic modules), (3) Improved Biomass Stoves, (4) Photovoltaic Systems for Social Institutions, (5) Solar Hot Water Heaters for Social Institutions, (6) Access to Natural Gas for Social Institutions, (7) Small Biogas plants for farmers, (8) Small Irrigation Systems, (9) Technology for Food Processing and Transformation (Solar Dryers, Toasters etc.)

4.2 Rationale of energy technologies/services

4.2.1 Grid densification

The national Government (Viceministerio de Electrificación y Energías Alternativas) has established a plan for the electrification of the whole country until 2025, setting concrete targets. The target for 2010 is to increase electrification rate from 33 % to 53 %. Private distribution companies are in charge of the grid connection and operation of urban and rural centers within the departments. Once a village is having access to the grid, the connection of households, social institutions and enterprises is within their own responsibility. The connection of individual customers to the grid costs around 70-90 €. The amount consists in the costs for the electric meter (around 200 Bs = 22 €) and the installation costs (400-600 Bs

= 44 - 66 €). The in-house wiring costs additional 160 Bs = 20 €. The big utilities do not charge for the electric meter but for the installation costs.

Many poor households never got connected due to the high installation cost and complicated paperwork and procedures.

4.2.2 Pico PV

Given the dispersion, many rural households will not be connected to the grid soon, nor can they afford a Solar Home System. Pico PVs are portable solar units with at least enough light to illuminate one room during 5 hours a day. Thus they reduce significantly the expenses for candles and batteries. Also, since some agricultural tasks are scheduled at night, e.g. irrigation, portable illumination supports productivity. Some Pico PV devices have additional features like radios or cell phone chargers.

4.2.3 Improved biomass stoves

More than 70% of rural households still use biomass for cooking. The most important household fuels are: firewood, cow dung, lama dung, shrubs and grass as well as agricultural residues. Usually, women and children are collecting the fuel and prepare the food on three stone or simple shielded fires, sometimes indoor, according to altitude, and climatic conditions. Fuel is scarce in many regions of Bolivia and the indoor air pollution is a major problem of public health. In schools it is usually the parents taking turns in preparing food.

4.2.4 Photovoltaic systems for social institutions

Many schools in rural areas have no access to the electricity grid in the near future. Photovoltaic seems to be the one feasible solution to provide lighting and power for modern communication technologies. Also, health centres need electric power for refrigeration (vaccines) and laboratory equipment.

4.2.5 Solar hot water systems for social institutions

The very cold water in the Bolivian Altiplano is a major obstacle in the improvement of hygienic conditions and habits. Through the installation of Solar Hot Water Systems in schools and health centres health education campaigns are successfully complemented and thus environmental health improved.

4.2.6 Access to natural gas for social institutions

Extension of and Access to the Natural Gas Grid is a national priority in Bolivia. Schools and Health Centres often lack access to natural gas and its installations for cooking, water heating and –in the highlands- space heating. Potosi for example has more than 300 nights below zero Celsius. Without space heating, the learning environment in the morning is not adequate.

4.2.7 Small biogas plants for farmers

Milk production in Bolivia usually is in hands of small farmers with 3 to 6 cows per family. The cow dung is usually used as a cook fuel. Small biogas technology has been successfully adapted to the different Bolivian environments including the Altiplano. The small plants produce biogas for cooking and water heating as well as liquid fertilizer, thus improving agricultural productivity and soil quality.

4.2.8 Small irrigation systems

Many small farmers in the Altiplano farm more for subsistence than for the market. Also, due to climatic conditions, they have little choice of crops. Small irrigation systems allow them to

yield higher returns and also farm new crops, e.g. onions in the Altiplano. This way the nutrition of the family can be enhanced as well as additional monetary income generated.

4.2.9 Technology for product transformation (solar dryers, toasters etc.)

Many farm products are sold as harvested, leaving only a small part of the value chain to the farmers. Also, logistics may make impossible the timely sale of fresh products, leaving them to rot. Solar Dryers for medicinal plants and roots such as MACA and peanut toasters and other technologies increase significantly the incomes of primary producers.

4.3 EnDev approach for the different technologies/services

EnDev II will continue with the key interventions that proved successful in EnDev I. EnDev II will strengthen the transition of developed technologies, strategies and processes into national, regional and municipal programmes, policies and finance mechanisms, requiring additional efforts in capacity development activities in order to reach long range sustainability of the already implemented improved energy access as well as ongoing implementation beyond the project. The political instability in Bolivia requires nevertheless great flexibility regarding planning, partners, technologies and strategies and also the outcome portfolio. Any necessary major change will be timely communicated to SenterNovem and GTZ headquarters on order to reach consensus. Activities will be developed towards improving alignment and donor harmonization (Paris, Accra) as well as –given the social and political tensions- the concept of “Do-no-harm”.

4.3.1 Grid Extension

Target Group: Poor Households, Social Infrastructure and Small Enterprises in rural and peri-urban areas

Target geographic area: Nationwide

Implementing Partners:

- Ministry of Energy and Hydrocarbons (Viceministerio de Electrificación y Energías Alternativas)
- Prefectures and Municipalities
- Utilities of the Interconnected System
- Cooperatives

Key interventions/ activities/ outputs:

EnDev Bolivia supports the supply of grid electricity to households and social institutions or productive, local, private or communal enterprises in rural and/or peri-urban areas close to the grid. It is intended to densify the existing grid through a partial subsidy for the connection. In addition, a novel concept in the financial mechanism is implemented to facilitate and cover the costs of connection through the electricity distribution company in the area. The project selected communities that have a strong need for access to electricity, a solid organizational structure, as well as the commitment of local authorities and beneficiaries. EnDev-Bolivia developed an offer to those communities, combining 3 different instruments:

- EnDev-Bolivia pays a subsidy of aprox. 20 US$ per household to reduce the fee further (interconnected system),
- The clients have to pay only a part in cash upfront (e.g. 40 US$), while some of the utilities offer a credit scheme for the remaining amount, free of interests, which is repaid along with the electricity bill during a period of 3 months to 1 year (interconnected system),
- EnDev-Bolivia trains locals to be electricians to improve the quality of indoor installations and safety.

In areas that are not served by the interconnected system, the subsidy may be the same or higher due to poverty and/or especially high connection costs.

EnDev established cooperation agreements with a significant number of utilities, amongst them EMPRELPAZ, ELFEC, CETAR, CESSA, EDELSAM, ELFEO and CEPSA.

In addition, the project cooperates with regional and local Governments who support rural electrification with their own funds. In most of the Prefectures rural electrification is a high priority.

On the national level, and within the framework of the programme “Electricity for a life in dignity”, a cooperation agreement for a total of 50 000 household connections was signed, the subsidy being financed equally among the partners. Endev Bolivia counts for 23 000 households already connected.

The programme trained 588 technicians throughout different regions and in different topics related to electricity, mostly concerning internal installations.

At a national level, together with the Ministry, a multilingual diffusion campaign in TV and Radio was launched. This resulted in an increased demand.

Connecting households, social institutions and enterprises to the grid means in technical terms usually the installation of a monophase low voltage line and the electricity meter. It is expected that rural households don’t consume more than 100 kWh a month.

The Electricity tariffs in Bolivia are far lower than average tariffs in Latin America. The average residential tariff in 2006 was US$ 0,0614 per kWh (compared to US$ 0,115 per kWh weighted average in LAC), while the average tariff for the industry was US$ 0,044 per kWh (compared to US$ 0,107 per kWh weighted average in LAC).€ 70-80. Electricity prices charged by the distribution companies to their regulated clients include energy costs (including generation and transmission costs) and all the distribution costs, including a specific return on investment. However, as it was mentioned before, some distribution companies resell electricity to communal organizations or rural enterprises. The price and conditions of those transactions are not regulated, which causes an important legal void in the sector.

In March 2006, the Bolivian government approved the Tarifa Dignidad (“Dignity Tariff”) by Supreme Decree 28653. This tariff grants a 25% discount in their electricity bills to those consumers whose monthly consumption is below 70 kWh in the urban areas and 30 kWh in the rural ones. This subsidy, which will be covered for four years by the electricity companies that operate in Bolivia, will benefit about 480.000 households. Additionally, millions of CFLs have been distributed free of charge in a national campaign, helping households to lower consumption for illumination.

Quality control is based on:

- Comparison of households claimed to be connected by the providers / installers versus the households reported as active clients to the General Directorate for Control and Auditing of the energy ministry,
- Continuous Reports of household visits by an independent evaluator (households are randomly selected),
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.3.2 Pico PV

Target Group: Poor rural Households

Target geographic area: Nationwide

Implementing Partners:

- Ministry of Energy and Hydrocarbons (Viceministerio de Electrificación y Energías Alternativas)
- World Bank

- Prefectures and Municipalities
- Cooperatives and Associations
- Private Sector

Key interventions/ activities/ outputs:

In an alliance with other EnDev projects, the Fraunhofer ISE Institute and the World Bank, commercially available Pico PV devices have been tested first in laboratory and then in the field. The Bolivian field test was encouraging regarding the demand and usefulness of the devices in lighting and also in productive uses. EnDev Bolivia plans a second field test focusing on market mechanisms, distribution channels and marketing in order to assess the degree in which the private sector could provide

4.3.3 Improved Biomass Stoves

Target Group: Poor rural Households

Target geographic area: Nationwide

Implementing Partners:

- Ministry of Energy and Hydrocarbons (Viceministerio de Electrificación y Energías Alternativas),
- PROAGRO/GTZ,
- World Bank,
- Prefectures and Municipalities,
- Cooperatives and Associations,
- Communities,
- Private Sector,
- NGOs.

Key interventions/ activities/ outputs:

For Stove Dissemination three Strategies are being implemented:

- Strategy A: Supporting commercial stove producers,
- Strategy B: Introducing mud/adobe Stoves in existing activities of NGOs,
- Strategy C: Disseminating mud adobe Stoves via local installers that are paid by the family.

Strategies were developed in chronological order in EnDev I and relevance has shifted first from A to B and now to strategy C not only in quantity, but also in quality. In our impact monitoring, use, maintenance, laboratory and field performance and user satisfaction have shown better results for the mud/adobe stove than for the metal stoves disseminated by commercial producers.

The current mud/adobe “Malena” stove has been adapted to the different climatic and social environments of Bolivia. Research at the La Paz University (UMSA) Stove testing Centre is continuous to further enhance performance (time to boil 5 litres, fuel consumption, Indoor PM and CO emissions, Safety), the construction process and user satisfaction (universality of potholes, fuel feeder etc.).

For institutional use, special mud/adobe stoves have been designed. They are usually implemented together with municipalities and the students’ parent associations in schools and are being used mainly for preparing breakfast/lunch in rural schools.

While in EnDev I activities were mainly on micro and meso levels, the macro level is getting more involved showing windows of opportunity for insertion in national policies and programmes such as e.g. the National Water Basin Plan and others.

Cooperation with EnDev Peru is proving mutually beneficent.

Quality control is based on:

- Continuous Reports of household visits by an independent evaluator (households are randomly selected)
- Laboratory and field tests according to PCIA protocols: Water boiling and Controlled Cooking tests (WBT and CCT)
- Control visits in the field by our staff
- Base Line versus Impact Monitoring Results

4.3.4 Photovoltaic Systems for Social Infrastructure

Target Group: Rural Schools and Health Centers

Target geographic area: Nationwide

Implementing Partners:

- Municipalities,
- Prefectures,
- Private Sector.

Key interventions/ activities/ outputs:

The Counterpart for Photovoltaic systems usually is the municipalities. Systems are subsidized with 20% to 40% of system cost, the rest and complementary measures being financed by the municipalities. EnDev helps with the tender process and makes sure proper project dimension and training.

Quality control is based on:

- Continuous Reports of visits to facilities by an independent evaluator (facilities are randomly selected),
- Quality control of installed systems,
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.3.5 Solar Hot Water Systems for Social Infrastructure

Target Group: Rural Schools and Health Centers

Target geographic area: Nationwide

Implementing Partners:

- Municipalities,
- Prefectures,
- Private Sector.

Key interventions/ activities/ outputs:

The Counterpart for Solar Hot Water systems usually is the municipalities. Systems are subsidized between 20% to 40%, The rest is financed by the municipalities. EnDev helps with the tender process and makes sure proper project dimension and training.

Quality control is based on:

- Continuous Reports of visits to facilities by an independent evaluator (facilities are randomly selected),
- EnDev support to update the national norms,
- Quality control of installed systems,
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.3.6 Access to Natural Gas for Social Infrastructure

Target Group: Peri-urban and urban Schools and Health Centers

Target geographic area: Towns with natural gas grid

Implementing Partners:

- YPFB (national natural gas supplier),
- CEDES (Foundation of private firms),
- CAF,
- Municipalities,
- Prefectures,
- Private Sector.

Key interventions/ activities/ outputs:

As far as connection to the gas grid is concerned, the project works with the state-owned oil and gas company YPFB, the private distribution company Transredes and the Bolivian Business Council for Sustainable Development (CEDES) to connect SI institutions that are located in proximity to the existing grid. Additional funds for financing the connection to the gas grid and the installation in schools (cooker, boiler for warm water, heating system) have been provided by the Andean Development Corporation (CAF), YPFB and local authorities. Besides co-financing these investments, the project provides every school with an intensive training in regards to energy issues, targeted at teachers, pupils and the parents to ensure the sustainability of access.

Quality control is based on:

- Continuous Reports of visits to facilities by an independent evaluator (facilities are randomly selected),
- Quality control of installed systems,
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.3.7 Small Biogas plants for farmers

Target Group: Rural families

Target geographic area: nationwide

Implementing Partners:

- Producer associations,
- Municipalities,
- Prefectures,
- World Bank,
- Private Sector.

Key interventions/ activities/ outputs:

Together with municipalities and rural associations for different agro-products, the project offers technical assistance and monetary incentives for micro and small producers of agricultural products. The project finances up to 50 US$ per family of the total material costs of 200 US$. Local installers and promoters are trained and being paid by interested families and/or associations.

Quality control is based on:

- Continuous Reports of visits to families by an independent evaluator (families are randomly selected),

- Quality control of installed systems,
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.3.8 Small Irrigation Systems

Target Group: Rural families

Target geographic area: nationwide

Implementing Partners:

- Producer associations,
- Municipalities,
- Prefectures,
- Private Sector.

Key interventions/ activities/ outputs:

Together with municipalities and rural associations for different agro-products, the project plans improvements in energy supply for micro and small producers of agricultural products. The project finances up to 50 US$ per family for start-up projects with high propagation potential. Additionally, the project assists the beneficiaries in finding financing alternatives for energy investments with a social impact: employment, improvement of working conditions and increase of income. The project also supports the process of choosing technologies that are adequate for the needs and economic conditions of employees, and provides technical assistance as well as capacity building measures through job training and seminars. Additionally, it supports as well small enterprises that work in the production and development of efficient technologies. The creation of a sound demand for the local produced technologies is another important activity for the stimulation of a market. The small irrigation systems usually consist of motor driven or electric pumps and portable hoses.

Quality control is based on:

- Continuous Reports of visits to families by an independent evaluator (families are randomly selected),
- Quality control of installed systems,
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.3.9 Technology for Product Transformation (Solar Dryers, Toasters etc.)

Target Group: Rural families

Target geographic area: nationwide

Implementing Partners:

- Producer associations,
- Municipalities,
- Prefectures,
- Private Sector.

Key interventions/ activities/ outputs:

Together with municipalities and rural associations for different agro-products, the project plans improvements in energy supply for micro and small producers of agricultural products. The project finances up to 50 US$ per family for start-up projects with high propagation potential. Additionally, the project assists the beneficiaries in finding financing alternatives for energy investments with a social impact: employment, improvement of working conditions and increase of income. The project also supports the process of choosing technologies that

are adequate for the needs and economic conditions of employees, and provides technical assistance as well as capacity building measures through job training and seminars. Additionally, it supports as well small enterprises that work in the production and development of efficient technologies. The creation of a sound demand for the local produced technologies is another important activity for the stimulation of a market. Technologies of choice so far have been: Solar Dryers, Toasters etc.

Quality control is based on:

- Continuous Reports of visits to families by an independent evaluator (families are randomly selected),
- Quality control of installed systems,
- Control visits in the field by our staff,
- Base Line versus Impact Monitoring Results.

4.4 Risks for implementation

Bolivia is one of the poorest countries in Latin America and characterized with great political instability and little institutional continuity on National, Regional and Local level. Internal tensions between regions result in political instability, the blocking of important roads and continuous political campaigning; (elections and referendums on a national level having being scheduled almost every six months.) This may lead to operative problems affecting the implementation with one or other counterpart.

5. Impact Monitoring & Evaluation

The Impact M&E activities are designed accordingly to the framework of the Sustainable Development concept of GTZ, considering the Economic, Environmental and Social dimensions.

Continuing with the work done in EnDev1, every key intervention and activity will be accompanied by M&E activities not only regarding the Impact level but also following up on Activities, Processes and Outcomes; each level counts with a specific set of tools and instruments applicable in the flied.

The project has developed a data gathering methodology, surveys, sampling terms and other instruments in EnDev 1 in order to have relevant, accurate and timely information regarding all key interventions. The project currently counts with 6689 directly interviewed surveys in the database (Base line and Impact, usually on the HH level).

With the Output Based Approach, where outcomes are key aspects to reach visible impact and scaling-up, the Impact M&E activities are a key element and invaluable input for the project management in order to have constant feedback for our orientation towards “Impact” and the MDGs.

Under the EnDev 2 Impact M&E the following activities are planned:

- Annual Impact data gathering campaigns for strategy reviewing and adaptation as well as for the annual reports,
- Continuous field trips for follow-up by staff and external consultants: Results and outcome observation including additionality and sustainability criteria verification,
- Improved Reporting processes and formats (on-line reporting per Energy Service Segment),
- Internal bi-monthly M&E findings follow-up meetings,
- Further Integration of the Impact Monitoring in the ongoing process of “Continuous Optimization within the framework of Capacity Works”,

- Active involvement of counterparts in Impact M&E activities, with field trips and M&E planning,
- Trimester field trips for Monitor and Evaluation,
- Use of the results for National Strategy involvement/introducing successful experiences in National Policy levels,
- Support to other EnDev projects in their Impact M&E activities.

It is also expected to have the following Impact M&E print material:

Annual report regarding the impacts which will summarize and explain the analysis done on the bases of the base line and impact survey data base; considering the indicators of the EnDev 2 M&E Impact evaluation line.

Elaborate every three monthly impact “Fact – sheets” each relating our work to one or two MDGs: To what extend do we contribute to the MDG? Under what specific proves we can establish this correlation?

Socialize the M&E Strategy in national counterpart projects and other EnDev projects.

Expected Impacts of project intervention

a. Economic impacts:

- Income generation: new or existing productive activities (increase in productivity or time availability),
- Alternative job creation activities,
- Savings in energy expenses,
- Food security,
- Secured basic energy supply for productive activities,
- Market creation for technology producers.

b. Social impacts:

- Improve living conditions,
- Improve social life inside the family/community,
- Better learning/studying conditions for children and adult population,
- Improve information and communication opportunities.

c. Environment/ecological impacts:

- Less pressure to the environment components (wood and water supply/availability),
- Green House Gas mitigation by reducing products of incomplete combustion (PICs),
- Slowing down glacier melting by reducing black carbon depositions.

d. Health impacts:

- Decrease IAP exposition and thus respiratory problems and eye diseases,
- Cleaner air in the household,
- Increase hygiene and safety.

e. Gender

- Promote Women participation in decision making activities,
- Awareness creation in men regarding benefits of improved stoves.

Each expected impact has one or more relations to one or other MDGs. The project has a strong linkage with the following MDGs:

- MDG 1: Eradicate extreme poverty and hunger.
- MDG 2: Achieve universal primary education.

- MDG 3: Promote gender equality and empower women.
- MDG 4 and 5: Reduce child mortality and Improve maternal health.
- MDG 7: Ensure environmental sustainability.

Also, each expected impact is related in general to the goals of the National Development Plan of the National Government in some and more specifically in relation with the National Sector Programmes and Policies: Electricity to live with dignity, of the Vice-ministry of Electricity and Alternative Energy, the National Waterbasin Plan, the provision of natural gas to social infrastructure etc…

Impact M&E methodology

Building on the experience from the EnDev 1, the planned Impact M&E methodology will follow the participatory approach, involving the operative project personnel. The staff is aware of its importance in their daily activities and as a tool for strategy reviewing and improvement towards the projects outcomes and beyond.

The Impact M&E will be carried out by EnDev staff and independent consultants.

The use and optimization of surveys, interviews and other tools for data gathering is also considered to be of great importance in this phase.

The Impact M&E strategy, understood as a tool for continuous improvement, will follow the profound analysis of the interventions (strategies and concepts improvement), as well as an instrument to satisfy the internal and external information demands (knowledge). It is considered to become an instrument of great importance for the counterparts (legitimacy) and an instrument to measure and control the achievements quality; questioning the validity of the outcomes resulted from the implemented strategies and structures of cooperation for each Energy Service Segment (control and auto evaluation).

Please tick:

(x) a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned annually

(x) the project will use other methods for impact monitoring: Continuous field verification trips, resulting in structured qualitative reports.

(x) the project would be interested to continue its cooperation with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

(x) the project would be interested to get financial support for impact evaluation.

6. Budget

		EUR
1	Human Resources and travelling	2.040.000
2	Equipment and Supplies	900.000
3	Funding Financing Agreements/Local subsidies	1.000.000
4	Other direct costs	536.588
5	Total direct costs	4.476.588
6	Mark up costs/administrative overheads/imputed profit/	523.412
7	Cost price	5.000.000

Burkina Faso

1. Situation Analysis

1.1 Energy situation

In Burkina Faso more than 80 % of the energy supply is covered by biomass (wood and charcoal), in rural areas this ration accounts for nearly 100 %. Nation average is a consumption of 0,69 kg firewood per person, but this ration can rise in some areas up to more than 1 kg, depending on low firewood prices and higher humidity that causes higher consumption. In addition, urban households prefer charcoal to wood – this is considered to be more proper and "modern". Charcoal production causes thus high wood consumption in rural areas, even if it has been re-organized and concentrated in five production areas in 2005. As the population is growing, pressure on forest resources is growing as well. Nevertheless, scarcity of fuel is not really sensible in many parts of the country: wood collection is still a by-product of agricultural activity and firewood can still be found at least near the remote bush fields of each family, where people often are not sensible enough to avoid cutting fresh, green trees. Situation is different in the north, where scarcity even in rural areas is growing, and in the towns, where wood and charcoal are commercial products and scarcity is reflected by rising fuel prices thus affecting the poverty situation of most households.

The most used alternative energy for household cooking is gas: but while nearly 35 % of households in big towns and still some 10 – 25 % in smaller towns own gas equipment, gas only counts for 0,4 % of the urban consumption due to the lack of reliability of gas provisions. An enlargement of gas consumption, although officially wanted by the government, is not very likely due to the high investment costs for the households (and the inability of the government to support the subsidies necessary to keep gas affordable).

The baseline stoves for firewood (3-stone-stove) and charcoal (simple metal stove called "le Malgache") are very cheap. Hence any "new" technology has to compete with the expectation of low technology prices. In addition, stoves have to be low and very stable, because the traditional daily food is a millet porridge that has to be "beaten" during preparation – a work that is very demanding for the cook as well as for the stove equipment.

The improved stoves conceived in Burkina Faso at the end of the 1970s and the beginning of the 1980s take this aspects into account, and they cost around 3 – 4 €. In addition, they can also be constructed in bigger sizes to cover the needs of extended families and professional users. For the moment, other improved wood or charcoal stoves on the international market that could eventually be imported (e.g. the Aprovecho stove) do not seem to be adapted to the cooking habits: they are not stable enough to support the impact during porridge preparation and the standard sizes could not cover the needs of extended families.

For the same reasons, the existing solar and plant oil cooker models cannot reasonably be diffused in Burkina Faso in large numbers. In addition, they are too expensive and – regarding the plant oil cooker – fuel supply is not guaranteed.

The main problems are thus to raise the awareness for the necessity of fuel economy even outside the big cities and to make stable, durable and cheap stoves available even for poorer and remote parts of the population.

1.2. Policy framework, laws and regulations

Burkina Faso's Poverty Reduction Strategy Paper (PRSP) does not have a particular accent on energy or environment issues. The current version (2009-2011) has chapters in "reduction of pollution" and "sustainable management of natural resources". However, the solutions proposed are only dealing with the enlargement of urban street capacities and the maintenance of natural resources for pastoralist respectively. From 2010 onwards, the PRSP format should be replaced by a "Strategy of accelerated growth" that stresses merely

exclusively on economic growth relying on the development of some urban economic pools and counting on a “trickle down effect” for the urban poor and the rural areas.

More indicative for further DGIS interventions are the regional development plans and strategies, that are mostly considering environmental and energy issues in the sense that they are aiming at a sustainable management to assure provision even for future generations. In its 2008 version, the development plan of the capital’s region views the access to modern energy as a measure of poverty reduction. According to this, FAFASO has already undertaken joint activities with the Regional Council of the Central (the capital’s) region to enlarge access to improved stoves to wider population groups, in first line in the semi-rural parts around the capital.

Regarding access to biomass, the environmental services have as mission to regulate access to wood supply (and to tax any fresh wood cut anyway) even for individual cutting in the villages, but they are too badly equipped to assume this role. Nevertheless and quasi as an “heritage” of the 1980s revolutionary period, the control of big scale wood transport is still functional (in large parts): only specially accredited (painted in green and white) transporters are allowed to transport fire-wood and they are still controlled automatically on the overland streets. For the charcoal sector, the government decreed, in 2005, a nationwide stop of artisanal production for several months and gave afterwards licenses to some defined production areas. This system seems to work more or less.

1.3. Institutional set up in the energy sector, activities of other donors

Since the 1970s, Burkina Faso has been one of the leading countries in the sub region in regards to the development and the dissemination of improved stoves. As a result, the country has today a huge experience in terms of technology. A considerable choice of adapted stove types is available. On the other hand, most of the projects of the past have been donor or state driven – they cracked down in the moment when the donor retired or state politics changed (as it was the case after the “revolution” in the 1980s).

In consequence, a kind of institutional setup is existing, but for the most part this concerns institutions believing that the dissemination of improved stoves should forcedly pass by them, without really having the (personal and financial) capacities to assume their roles. On the research and technology side, the “Institute of Research in Applied Sciences and Technologies” (IRSAT), a department of the Ministry of Secondary Schools and Research, has kept its standards and is still the only institution capable of accreditation for improved stoves and defining standards. But IRSAT has no capacities (and no ambitions) in dissemination. On the other side, the Ministry of Environment is seeing itself as the agency to be implied in stoves’ dissemination, eventual assisted by the Ministry of Women’s Rights. In this, the Ministry of Environment is not only contested by other governmental departments (e.g. the Ministry of Energy, not only in charge with a World Bank Programme for the Dissemination of improved stoves at the moment, but also responsible for the implementation of the national strategy for domestic energies, developed by CILSS-PREDAS), but its real capacities to lead a sustainable stoves’ programme have never shown up even in the past: all strategies relying on the Ministry for the dissemination of stoves broke down at latest when the donor retired (and notwithstanding the efforts the donors made in the strengthening of the Ministry’s capacities).

Most of the dissemination strategies in the past relied on subsidies (with the argument that Burkina’s poor population could not afford the real prises) and passed by the Ministry of Environment and several NGOs to spread the stoves and the technology. Used to ever new upcoming project, none of these actors was, at the beginning of FAFASO’s activities in 2005, really willing to adhere to a sustainable strategy that directs the use of the project funds rather to the producers and other actors of the private sector than to state or civil society institutions.

To establish a sustainable system, FAFASO has since the beginning of its activities in 2006 fully relied on structures in the private sector and followed a commercial approach, counting on the producers interests in disseminating the stoves (to earn money for themselves) and on the users acceptance of the stoves' advantages. With the extension of activities in rural areas, FAFASO started in 2008 to integrate provincial divisions of the Ministry of Environment in the training and dissemination process. However, the ministry's agents failed to deliver at all – even if they have been promised to get paid for this. With its overall experience (65.000 stoves sold without subsidies and without government structures as intermediates, proved inactivity of stately agents), FAFASO is now in a position where the project can negotiate partnership with the state actors in favour of a real sustainable approach.

Beside some little NGOs, the biggest other actor in the sector is a World Bank Programme (PASE), officially started in February 2008, launched in October of the same year and having as objective the dissemination of 250.000 stoves within five years. Even if PASE always pointed that they will not pay direct subsidies on the sales prises, there exists the danger that they will change the strategy in face of a situation, where by now, after 1 ½ year of official existence, no single stove has been disseminated by them – pressure to achieve the goal could thus bring PASE to change strategy.

1.4. Other major activities in the country financed by BMZ or DGIS

In Burkina Faso there are no other DGIS programmes. On the BMZ side, several partners can be identified:

- Having been, during its 2nd phase, part of GTZ "Decentralisation Programme", FAFASO has acquired some kinds of experience in the communal sectors and a huge knowledge of communal actors and procedures,
- Concerning the stoves' segment, the KfW component FICOD has been touched to disseminate stoves for institutions, e.g. for school canteens,
- The GTZ "Health and Human Rights" Programme is a potential partner also with respect to school canteens, but also for the realisation of awareness campaigns on health issues related to stoves,
- The GTZ "Agricultural programme" has a big stress on the transformation and commercialization of agricultural products. They already manifested their interest in integrating improved stoves for professional use (especially the shea butter cashew stoves still to be conceived by IRSAT) in their production chain.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	n.a.
Cooking Energy for Households	200.000
Electricity for social infrastructure	n.a.
Cooking/ Heating Energy for social infrastructure	200 social institutions
Cooking for prod.use/income generation	2,000 small businesses

3. Project Approach

3.1. Energy technologies/services promoted by the EnDev project

3.1.1 Selected technologies/services and approaches

The technologies promoted by the EnDev project can be distinguished by…

a) The fuel they are using;
b) The category of user they are produced for.

	Category of user		
Technologies	**households**	**Social institutions**	**Productive use**
Firewood	Mud stove Ceramic stove Ouaga métallique (metal stove) Burkina Mixte (metal stove) Multimarmite (metal stove)	Mud stove Ouaga métallique (metal stove)	Mud stove Ouaga métallique (metal stove)
charcoal	Ceramic stove Burkina Mixte (metal stove) Multimarmite (metal stove)	n.a.	n.a.
agrowaste	n.a.	n.a.	Cashew-nut “Shea butter nut”

On the fuel supply side, the project will work on the introduction of more efficient charcoal production technologies.

3.1.2 Rationale of the approaches

As biomass remains the main fuel for urban and rural households for a foreseeable future, the EnDev project is focussing on the promotion of a variety of products for different target groups. This includes urban and rural households, productive use and social institutions.

Under EnDev1, the activities were mainly focused on urban households. These efforts shall be further promoted and consolidated under EnDev 2 with the target of a step by step phasing out of support for the EnDev1 producers by the end of the second phase.

Rural household stoves and large scale stoves for productive use (beer brewing, restaurants) and social institutions (schools) were piloted under EnDev1. These pilots shall be scaled up under EnDev2.

New technology development including testing and limited scaling-up shall be taken on board under EnDev2 for improved charcoal production and the use of agro waste as fuel for the processing of cashew nuts and shea butter nuts.

3.2. EnDev approach

The approaches for the Endev2 project phase are structured by the main type of products/uses: Households stoves, Productive use, Social institutions and Improved charcoal production.

3.2.1 Household stoves

Under EnDev 1 (since 2006) the project has concentrated on the promotion of portable household stoves. As a result, around 65.000 stoves were sold. At the beginning, urban households were the main target group. A portable metal stove was the main product under promotion. With the extension of the project into peri-urban and rural areas, ceramic and fix mud stoves have also been integrated into the activities (since the middle of 2008 and beginning of 2009 respectively). All these stoves types have been developed and are produced in the country and had already been promoted by former projects. But in contrast to the former projects' approaches – which were largely based on subsidies and the promotion of the stoves by associations – FAFASO developed a commercial strategy based for large parts on the engagement (and the interests) of the producers. For the metal stoves, which make up to today around 98 % of the improved stoves sold, 200 small scale producers have been trained in technical and marketing skills and, at least in the two big cities, organized in producers associations. FAFASO further supported them by launching publicity campaigns and by creating the commercial chain.

For EnDev2, separate plans for the household stove promotion in the big cities and the small cities and rural areas have been developed.

Household stoves in big cities

As the stove producers in the big cities have been working with the project already since its 1st phase, the next two years are designed to a phasing out for Ouagadougou and Bobo Dioulasso. The three levels of interventions are planned as follows:

Marketing	Since 2008, the producers associations in Ouagadougou and Bobo Dioulasso have been more and more integrated in the preparation and execution of marketing activities (sales activities in the quarters, fairs, festivals etc.). Today, the producers already organize small scale activities and are able to present their objectives in the media. What is still lacking is the calculation of marketing expenditures in the sales prizes of the stoves. In addition, it can't be expected that the producers will ever be able to make big, TV- or media-based marketing activities on their own budgets. FAFASO thus tends to prepare a maximum of TV supports (reportages, product placement etc.) on which the producers can rely after the project has retired.
Rationalization of production	The traditional structure of production is based on small-scale, informal, for the most part illiterate producers coming from traditional blacksmiths castes. This form of production has many limitations. A semi-industrial production had been intended by the project right from its beginning but was not yet achieved. After more than two years work within their association, it is now the producers themselves who understand and ask to be organized in bigger and better equipped working units. The objective is to install these working units in all (9) "arrondissements" of the big cities. For this, not only the equipment has to be bought, but also the administrative conditions have to be created (negotiating the space with the communes etc.).
Microfinance	Even if the producers in the big cities are organized in associations and have thus theoretically access to micro-credits, in reality this does not work. FAFASO plans thus to intervene with the Microfinance-Institutions to negotiate special access conditions for the producers (creating adapted micro-finance "products" for them). In the same dynamic, microfinance-products on the smallest scale should be developed to create access to stoves even for the poorest populations in the suburbs (and for professional users) and to thus enlarge the market capacities for the producers.

Regarding commercialization structures, the structures in the big cities can still be improved, but they seem to be roughly sufficient at the moment. Most of the sales rely already on structures created by the producers themselves (and often already existing before the existence of the improved stoves); the structures invented by FAFASO (the special shops) are already run by the producers associations completely autonomously.

Household stoves in small cities and rural areas

Metal stoves:

Since 2007 FAFASO has trained some 100 metal stove producers in around 30 towns all over the country. But as the project had been concentrating on the official main intervention regions of the German Cooperation in Burkina Faso (the South-West and the East), a consequent support to most of the producers, special in the regions most necessary of improved stoves (e.g. the Sahel and the cities around Ouagadougou) has not been possible. In the next phase, FAFASO wants to increase activities in the other regions especially by intensifying awareness rising campaigns there and strengthening the commercial chains.

Ceramic stoves

Ceramic stoves have the same performance as metal stoves, but they are much cheaper. Problems are transport in cause of the breakages due to bad road conditions. Since the beginning of 2009, some 250 potters have been trained in the production of improved ceramic stoves in three regions: the Centre (around the capital), the South-West and the East. During the next phase, FAFASO tends to train potters in the most important ceramists centres in the country, to intensify the integration of the ceramic stoves in the publicity activities and to facilitate market access.

Mud stoves:

Former projects much relied on fix mud stoves ("improved three stones") for the dissemination overall in rural areas. The arguments were that these stoves are considered to be for free for the users (as constructed from locally available material) and could easily be built by any user himself. The projects and the "revolutionary" government in the 1980s counted on a "snow ball" strategy, supposing that people being trained will train other people until to install a sustainable chain all over the country. But even if, in the 1980s, over 80 % of the country's villages had been covered by fix mud stoves, today they can't nearly be found anywhere. Projects that tried to reactivate the activity afterwards always needed to install promoters in the respective villages and production broke down when this personnel left. Even if FAFASO has, since 2008, trained some 300 people in the construction of fix mud stoves, the project is not sure to continue this approach. Evaluation is on track, but beforehand there is the impression…

- That people trained do not hand over the knowledge to others. Stoves actually built after the trainings are thus very few, and the cost-outcome ratio for the project extremely unfortunate,
- That stoves built do not have a really good quality, over all in cases where the construction is done by a person not directly trained by the project but being "2nd generation".
- That quality is also bad, because the preparation of material is not as easy as presumed.

Under reserve of the evaluation's results, it is thus not very likely that FAFASO will invest much in the dissemination of fix household mud stoves in the next phase.

Approach aspect	Household stoves
Market Situation	Even if several types of improved wood and charcoal stoves had been known in Burkina Faso since the 1970s, production had totally broken down until the start of FAFASO's activities in 2006. The project has established today a network of app. 500 stoves producers and a recognized label. Gas stoves are promoted by several multinational (TOTAL) and national firms and there is no need of the project's support in commercialization their products.
Target areas	FAFASO has concentrated its activities in the beginning in the two biggest towns of the country (Ouagadougou and Bobo Dioulasso); later activities have been extended to smaller towns and rural areas with a special accent on the main intervention areas of the German Cooperation, but also touching other regions of the country. For EnDev2, interventions outside the main intervention areas will be targeted (as the main intervention areas of German Cooperation are not the areas most in need for improved stoves) and to the suburbs of the big towns, accommodations of the poorest of the poor.
Target groups	While the metal stoves are designed for the average urban population, the ceramic and mud stoves are designed for the poorer target groups.
Implementing partner	The most important partners are the producers (private sector). Government structures will be integrated in the lobbying work.
Capacity development	Production and marketing capacities are concentrated in the two big cities, where for instance 100 of the 200 metal stove producers are concentrated. The project task for the next phase will be to intensify production and commercial capacities in the suburbs of the big towns and in the small towns and villages in the regions most in need for improved stoves (the Sahel, the middle towns around Ouagadougou).
Subsidy/credit	No direct subsidies (= subsidies on sales prices) have been or will be paid by the project. The subsidies consist in the indirect services of the project, e.g. the expenses for training, publicity and the installation of the commercialization chain. Credit schemes do not exist for the moment; they will be negotiated during the next phase with several Microfinance Institutions (for raw material for the producers, and for purchase).
Quality management	While quality control was initially assured by the partner IRSAT, it has been taken over – at least in the case of the producers' groups in the big cities – by the producers' associations. All producers are, in general, trained in quality issues. In the peri-urban and rural areas, quality is, for the moment, assured by FAFASO personnel. A sustainable system has still to be developed.
Sales strategy	Even the metal stoves are affordable to the biggest part of the population. Through savings in the purchase of fuel, a stove's price can be recovered during one month of use. For the poor, microfinance systems will be developed. For the rural populations, the cheaper ceramic and mud stoves are available. Prices (and thus profit margins) are fixed by the producers themselves. The project task consists in making the stoves known and accessible.
Marketing and awareness raising	The project runs a wide range of activities in awareness raising, using a whole lot of tools depending on social contexts: television and radio spots, posters, gadgets (T-Shirts, cloth etc.), participation at fares and cultural events, cooking demonstrations, special animations to target groups (leading persons), sponsoring of public events (football competitions, fashion shows etc.), theatre sketches, lobbying work to decision makers etc.

Productive use

The portable metal stoves can also be produced in big dimensions that can be used by restaurant owners. From these, around 6000 stoves have been sold since the beginning of production in 2007. Nevertheless, huge metal stoves are too expensive overall for the rural areas (costing around 40 €) so that adapted mud stoves have still to be developed/improved.

A particular interesting target group are traditional beer brewers: in the single city of Ouagadougou, around 5000 of these beer brewers are working and they consume (according to official figure of the Ministry of Environment) 52 % of the wood coming into town. Since mid 2008, trainings for masons to construct beer-stoves have been organized in four regions and app. 250 stoves have been built.

Other high fuel consuming professional activities are for example the production of shea butter (with rising importance due to rising export opportunities), and cashew nut transformation. FAFASO has assigned IRSAT to make tests for improved stoves for shea butter and cashew net production (by eventually even replacing wood by shea and cashew nut shells) and results are waited for until the end of 2009. Based on this, FAFASO aims for the following three years in three areas in productive use: a) Beer brewing, b) Restaurants, c) Processing of Cashew nuts and other agricultural products

Beer brewery stoves:

IRSAT has developed special mud stoves for beer breweries that at the actual stage of development economise 80 % in comparison to traditional three stone fire and still 50 % in comparison to former improved stove models. Normally beer brewers cook twice a week and each time they prepare around 120 l. In the single city of Ouagadougou around 5000 beer brewers are counted, that consume (after official numbers of the Ministry of Environment) 52 % of the wood entering into the town. If thus FAFASO was be able, during the two years to come, to equip a major part of these women with improved stoves, overall wood consumption in the town could easily be reduced by at least a quarter. The effects are thus much bigger than can be seen in the simple number of people touched (4 persons/beer brewery).

The mud stoves are produced by professional masons, whereas the beer brewer herself has to deliver some basic materials (argil, sand, water). Prizes are depending of the number and sizes of pots to be integrated into the stoves, but they turn in general around 8 – 20 €. By the economy of firewood, the beer brewer is normally able to compensate this expenditure within one or two preparations.

FAFASO's work will consist in training sufficient number of masons, integrating the beer brewers stoves in public presentations (TV-reportage etc.) and to do lobbying work to the communal authorities for the impose and control the use of improved stoves by the beer brewers.

Restaurant stoves:

Already in its first two phases, FAFASO did disseminate around 6000 big metal stoves that can either be used by extended families, by restaurants or by school canteens. As the number used in school canteens can be considered as negligible (see next paragraph), and also the families buying a big metal stove only for household use can't be too considerable (most of them will buy them for professional purposes and then take them to their families in case of need: big festivities etc.), we count simply all of these big stoves sold as stoves for professional use. To boost the sales figures for this kind of stoves, publicity has to be intensified over all in the areas outside the big cities and microfinance models have to be developed to make the stoves accessible.

As the big metal stoves are a bit expensive (around 40 € depending on size), it should be aimed for the conception of mud stoves adapted to restaurant runners' needs overall in peri-urban and rural areas.

Production of shea butter and transformation of other agricultural products

Shea butter becomes an ever more important item in Burkina Faso especially for export (for cosmetics and chocolate industry in Europe and the US). In the most producing shea butter regions, shea butter trees are planted and protected. But as the shea butter production consumes lots of wood, it destroys at the same time the natural resources in the regions concerned, leaving a monoculture of shea butter trees only. Tests have shown that the shells of the shea nuts are a good fuel and there exist semi-industrial production units in Bobo Dioulasso that use the shells. To this respect, tests have to be intensified to deliver provable data. At the same time special kinds of stoves have to be conceived (using less firewood or working with shea nut shells).

In the same logic, tests for cashew transformation will be added and eventually other sectors can be prospected (transformation of "néré"-fruits etc.). In collaboration with producers' associations, these stoves will be tested in praxis during the two years and, in case of success, be disseminated in greater extend afterwards.

Approach aspect	Situation for the promotion at productive use
Market Situation	The market situation for large scale stoves refer to both the commercial sector (productive use in restaurants, beer brewing) and in social institutions. FAFASO has, by its relation to IRSAT, a monopole situation on the dissemination of big stoves, designed for productive use and for institutions. There are both large scale cook stoves in metal as well as mud (cheaper) available. They can save up to 80% of the firewood as compared to the baseline stoves. However, the mud stove can still be improved and afterwards integrated into the dissemination system. For some other productive uses (e.g. processing of cashew nuts and shea butter nuts), technologies still have to be developed.
Target areas	All over the country; starting in big cities.
Target groups	Traditional beer brewers are the most important target group, as they consume app. 50% of the overall wood consumption. Restaurants, processors of cashew nuts and shea butter nuts;
Implementing partner	Professional stove producers; IRSAT to develop new stove models; communal and regional authorities (beer brewing);
Capacity development	Training of professional stove producers on technical and marketing skills
Subsidy/credit	n.a.
Quality management	Metal stoves (for restaurants and institutions) are integrated in the general quality control system
Sales structure	Make the producers known (more essential for the fix stoves), show the stoves at fares, construct prototypes etc.
Marketing and awareness raising	Integration of the big stoves in television/radio spots, special emissions addressed to the different target groups, sketches for the target groups, cooking demonstrations, lobbying in direction of deciders (to create pressure to introduce improved stoves).

Social Institutions

Many Social Institutions prepare meals for their clients. The food is prepared in large pots using a three stone fire as stove technology. Under EnDev1, the promotion of improved large scale cook stoves to schools has been piloted. Since 2008, around 50 schools have been

equipped with stoves for their canteens. The school canteens merit a special attention due to…

- The reduction of firewood possible (around 50 %),
- The improvement of meals' quality in favour of the pupils,
- The alleviation of the working charge of the cooks,
- The alleviation for the children (who bring the firewood to school),
- The exemplary effect to cooks, pupils and teachers.

However, this has not yet developed into a self-sustaining market as other schools did not take up this example.

In this respect, FAFASO plans to

- Intensify the lobbying to the Schools' Ministry to introduce improved stoves in the canteens,
- Integrate institutional stoves in the publicity activities (TV reportages on the subject etc.),
- Looking for other partners to equip schools with improved stoves (WFP and Bornefondein already touched),
- Look for other institutions that can be equipped (military camps: contacts with Ministry of Defense already taken, health centres etc.).

The health centres can serve as model places for a clean kitchen and can thus hopefully inspire users (patients are accompanied by parents who do the cooking themselves in the kitchens). These persons often come from remote villages that can only hardly be touched by other measures of awareness raising.

Approach aspect	Situation for the promotion at social institutions
Market Situation	The market situation for large scale stoves refer to both the commercial sector (productive use in restaurants, beer brewing) and in social institutions. FAFASO has, by its relation to IRSAT, a monopole situation on the dissemination of big stoves, designed for productive use and for institutions. There are both large scale cook stoves in metal as well as mud available. However, the mud stove can still be improved and afterwards integrated into the dissemination system.
Target areas	All over the country
Implementing partner	Professional stove producers; IRSAT to develop new stove models.
Capacity development	Training of professional stove producers on technical and marketing skills
Subsidy/credit	n.a.
Quality management	Metal stoves (for restaurants and institutions) are integrated in the general quality control system
Sales structure	Make the producers known (more essential for the fix stoves), show the stoves at fares, construct prototypes etc.
Marketing and awareness raising	Integration of the big stoves in television/radio spots, special emissions addressed to the different target groups, sketches for the target groups, cooking demonstrations, lobbying in direction of deciders (to create pressure to introduce improved stoves).

Improved charcoal production

Charcoal is the preferred fuel of the urban middle class for its perceived cleanliness and convenient handling. On the other hand, its current mode of production is very wasteful. If for an ecological perspective the banning of charcoal would be the preferred option, in reality it is rather required to improve the efficiency of its production. As the charcoal sector in Burkina Faso is rather well organised since 2005 (with the restriction of production centres in well defined and controlled regions), it is possible to address the sector through the existing structures for the introduction of efficient charcoal production technologies.

In this respect, FAFASO plans to…

- Review and adjust with the Ministry of Environment former approaches to the introduction of more effective carbonization methods,
- Integrate the charcoal "problematic" into the publicity campaigns in order to raise awareness concerning the disadvantages of charcoal use.

3.3 Risks for implementation

Even if metal stove production has been rather consolidated during the first phases, risk persists that the producers' association could brake down and go back to individual production. In addition, rising metal prices do either reduce producers' profit margins or rise prises for the consumer. This could provoke new demands for subsidising – even if the PASE-World-Bank-Programme does not opt in the meantime for this strategy.

Regarding stoves for productive use, one private entrepreneur has just started a programme to commercialize gas run stoves for millet beer. But as the beer brewers have rather bad experience with a similar stove that TOTAL tried to introduce in 2006, they are not really likely to engage in this. In addition, the stoves are extremely expensive and not really affordable to the average beer brewer. On the other hand, if this stoves can really be diffused, this can be considered rather than a complement that as a concurrence to the FAFASO's stoves.

Political frameworks are not likely to deteriorate and are rather more likely to develop in favour of FAFASO's activities.

4. Impact Monitoring & Evaluation

At the onset of the programme, FAFASO implemented a baseline study of the cook stove sector in 2005. An internal impact evaluation on effects to producers and households has been done in May 2009, covering all metal stove producers in Ouagadougou and Bobo Dioulasso and 900 households, 750 thereof stove users.

In the context of its awareness rising activities (e.g. for TV-documentations), FAFASO is constantly interviewing different kinds of user groups.

Expected Impacts of project intervention

Impacts with respect to MDGs:

Goal 1: eradication of poverty and hunger

Target 1: poverty reduction:

- By using improved stoves, an average urban family serves up to 5 € / month. This represents 10 % of the official lowest income barrier,
- Professional users can more than double their income by saving money for fuel purchase,
- Stove producers incomes are considerably improved in comparison to their former occupation.

Target 2: creation of employment:

- Stove producers engage new man labour (attention has only to be laid on the risk of child labour).

Goal 2: achieve universal primary schooling

- Better nutrition for pupils through equipment of school canteens (school children are often worthier nourished than children at home cause of lack of feeding possibilities in the schools and their absence from home).

Goal 7: Ensure environmental sustainability

Target 1: government policies in favour of sustainable resource management

- Counselling of Burkina Faso's government with respect to adapted and realistic approaches to save natural resources (with respect to improved stoves).

Target 2: reduce biodiversity loss

- Reduce forestry resources use for professional and household cooking.

Planned Impact Monitoring & Evaluation Methodology

Please tick:

(x) a baseline survey for impact evaluation is planned and scheduled for Nov. 2009

( ) a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for ……(approx. date)

( ) the project will use other methods for impact monitoring (please specify……..)

(x) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

( ) the project would be interested to get financial support for impact evaluation.

5. Budget

		EUR
1	**Human Resources and travelling**	300.000
2	**Equipment and Supplies**	150.000
3	**Funding Financing Agreements/Local subsidies**	150.000
4	**Other direct costs**	300.000
5	**Total direct costs**	**900.000**
6	**Mark up costs/administrative overheads/imputed profit/**	100.000
7	**Cost price**	**1.000.000**

Ethiopia

1. Situation Analysis

1.1 Energy situation

The vast majority of Ethiopia's energy needs are met from natural sources. Nationally, biomass fuels constitute more than 94% of the final energy consumption, with 77% being derived from woody biomass, 8.7% from crop residues and 7.7% from dung. Per capita energy consumption in Ethiopia is among the lowest in the world (0.30 toe). However, the energy requirements of the large and fast growing population and the fact that the major proportion is supplied by traditional energy sources have serious implications on the natural resource base. Looking at biomass supply and demand balances, there is a huge and constantly widening gap between demand and sustainable fuel wood supply. Currently the estimated demand for fuel wood is five times the sustainable supply.

Most of the forests in Ethiopia, including the Forest Priority Areas, are already in a stage of degradation. The natural forest cover of the country has diminished to less than 3% of the total land area within a few decades, and the rate of depletion is estimated at 150.000 to 200.000 ha per annum. Dense and homogeneous patches of forest cover remain only on steep slopes and in remote areas. The expansion of farmlands and pastures and the dense population heavily drain on the forest resources.

The demand for wood products, especially fuel wood, is expected to increase at about the same rate as the population, around 3% annually. Without substantial mitigation measures, major fuel deficits are likely to result, leading to intensified "energy poverty". Already there is a notable fuel deficit in certain areas. In the Tigray region, for example, fuel-wood has become so scarce that households are digging up roots for fuel. Also, agricultural residues and dung are widely used as fuel alternatives far above what is considered normal. The use of these resources as fuel instead of fertilizer has been identified as one of the major factors for the exacerbated diminishing soil fertility, lower agricultural productivity and food security problems. Inadequate supply of fuel-wood and inefficient use in cooking of fuel-wood directly impacts rural women's health and workload.

At household level access for the traditional energy resources is becoming increasingly remote. In the majority of the rural areas women and children spend an estimated 5 to 6 hrs a day to collect fuel wood and in town centers where fuel wood is purchased, energy expenditures contributes about 20% of the household expenditure. These national figures disguise regional differences. The situation is severe on the highlands of the country, which constitute about 33% of the countries surface area and is inhabited by more than 75% of the population, and is specifically acute on the northern highlands.

The Electricity sector

The total Electric power supply in Ethiopia is about 720 MW of which about 95% is hydro, about 4% diesel and about 1% thermal generated. Only about 11% of the population has access to the electric power supply. Inability to connect large new commercial and industrial customers, due to the overloading of the distribution network; and high cost of future generation investments mark the Ethiopian electricity sector. The vast majority of the people with access are supplied by the Government-owned Ethiopian Electric Power Corporation (EEPCo). EEPCo has about 600,000 customers, most of them in Addis Ababa and a few other main towns that are connected to the main grid. There are very few rural consumers connected to the grid. Apart from the low per capita incomes, other main constraints to increasing access have been a shortage of investment resources because of low tariffs over a long period of time and limitations in management and technical expertise. Low levels of access to infrastructure services, including to electricity, is a major barrier to economic development and to the provision of social services in towns and rural areas. EEPCo's limited capacity to speedily connect large new consumers, upon request, is thus constraining

commercial and industrial growth. Further, the poor quality and variability of existing service, characterized by voltage levels far below nominal, frequent breakdowns and delays in restoring supply after a breakdown has occurred, is an ongoing problem.

Renewable Energy sources

Ethiopia is well endowed with renewable energy sources. These include solar, wind, hydro, geothermal as well as biomass. In the biomass sector, in addition to woody biomass and other plant related resources, there is also large quantity of cattle dung which might be used for biogas production. In looking at the possible future uses of these sources, three potential types of applications can be considered: in conventional rural electrification; in complementary rural electrification; and in the provision of non-electrical energy.

One of the most important weaknesses in the work carried out to date is an almost complete lack of analysis of the economic viability of renewable energy applications and their competitiveness relative to their conventional alternatives. Nor has there been any significant amount of investigation into whether potential markets exist for the technologies or how such markets might be developed. Hence it is very important to consider facilitating for proper and sustained mechanisms for data collection, analysis and knowledge management to establish the feasibility and market potentials of different RE applications.

1.2. Policy framework, laws and regulations

Promotion of renewable energy and energy efficiency and capacity development of the energy sector constitute the major component of the existing policy legislations and strategies of Ethiopia. The promotion of cooking energy efficiency, Solar PV an micro hydro technologies for rural electrification, the related capacity development measures and facilities as well as the ongoing and planned intervention in the policy development and stakeholder dialog under AMES-C and AMES-E directly correspond to these stated policies and strategies and as a consequence the Ethiopian Ministry of Mines and Energy signed a comprehensive memorandum of Understanding with GTZ Ethiopia for intensive cooperation on issues encompassing all activates conceived under the EnDev intervention in Ethiopia. Following are some the major highlights from the policies and strategies of the country.

Energy development

a. Fuel wood plantation: encouragement of the private sector and different communities to be involved in plantation schemes,
b. Conversion of biomass in different forms of energy purposes: enhancing conversion efficiency in charcoal making, encourage and promote the modern use of agricultural residues and dung (Biogas etc.),
c. Hydro power development: utilization of the vast hydropower potentials (of which only about 2 % is currently utilized),
d. Other Energy sources: the policy states that whenever the economic potential is realized geothermal, coal, solar, wind and other sources of energy shall be used to generate electricity or other energy services,
e. Oil exploration and development of the natural gas potential.

Energy conservation and efficiency

a. Improving the energy efficiency in the transport sector, the agriculture sector, the industry and at household level is to be enhanced,
b. Regarding the household sector, enhancing the supply of fuel wood, encouraging fuel wood substitution and taking other measures to narrow the gap between energy demand and supply, such as the promotion of fuel efficient stoves.

Encouragement of private sector to be involved in energy sector

The Energy policy also dedicates a special section for the encouragement of the private sector to be involved in the development of the Energy resources of the country specially by being involved in the construction of energy structures, a field that has been and still is seen to be mainly the responsibility of the government.

Environmental Policy of Ethiopia

"The policies are:

a. To adopt an inter-sectoral process of planning and development which integrates energy development with energy conservation, environmental protection and sustainable utilization of renewable resources,
b. To promote the development of renewable energy sources and reduce the use of fossil energy resources both for ensuring sustainability and for protecting the environment, as well as for their continuation into the future."

Forest, Woodland and Tree Resources

"The policies are:

a. To ensure that forestry development strategies integrate the development, management and conservation of forest resources with those of land and water resources, energy resources, ecosystems and genetic resources, as well as with crop and livestock production,
b. To find substitutes for construction and fuel wood whenever capabilities and other conditions allow, in order to reduce pressure on forests."

Conservation Strategy of Ethiopia

"The Strategies in: Development and Conservation of Biomass Energy Resources are to:

a. Boost technical and social research on the design of improved cooking stoves,
b. Promote local manufacture and distribution of improved charcoal and biomass stoves,and
c. Locate, develop, adopt or adapt energy sources and technologies to replace biomass fuels.

Development of Alternative Energy Resources and their utilization are to:

Acquire, develop, test and disseminate appropriate and improved energy use technologies (e.g. improved stoves, charcoal kilns, solar powered cookers and heaters).

Capacity Building and Institutional Strengthening are to:

a. Strengthen research, planning and project implementation capability of the federal and regional energy agencies,
b. Establish a centre for testing alternative and efficient energy sources, technologies and appliances,
c. Promote and assist the private sector to assemble and manufacture energy development facilities and end-use appliances."

1.3. Institutional set up in the energy sector, activities of other donors

At the Federal Government level, there exists a number of institutions involved in the energy sector in the Country. The Ministry of Mines and Energy (MoME) is responsible for the overall development of the energy sector in the country. The MoME has six main agencies and departments that deal with energy issues:

1. Ethiopian Rural Energy Development and Promotion Centre (EREDPC) – with the mandate to carry out national energy resources studies, data collection and analysis, rural energy policy formulation, technology research and development and to promote appropriate renewable energy technologies in rural areas; the Centre also serves as the Executive arm of the Rural Electrification Fund (REF).
2. To assess and implement projects under the REF the EREDPC has established a core team as the Rural Electrification Executive Secretariat REES. The REES being

responsible for project appraisal shall also provide advisory services, capacity building, and training to Regional Energy Bureaus and cooperatives.

3. Rural Electrification Fund (REF) - to enable the private and cooperative engagement in rural electrification activities through loan based finance and technical support.
4. Energy and Regulation Department – to formulate energy policies, energy regulations, and monitoring of implementations of these;
5. Petroleum Operation Department – for petroleum exploration and development, licensing, and project coordination;
6. Ethiopian Electricity Agency (EEA) – to regulate the electricity generation, transmission, distribution and sale of electricity. The EEA controls quality, standards of electricity and licensing of electricity operators and contractors including tariff settings.

MoME is working closely with two public enterprises: the Ethiopia Electric Power Corporation (EEPCO) for the electricity sub-sector, and the Ethiopian Petroleum Enterprise (EPE) for the petroleum sub-sector. EEPCo is mandated to generate, transmit, distribute, and sell electricity. The corporation disseminates electricity through two different power supply systems: the Interconnected System (ICS) and the Self-Contained System (SCS). The ICS, which is largely generated by hydropower plants, is the major source of electric power generation. The SCS is mainly based on diesel generators and to a minor portion on small and medium hydropower plants.

At a regional level, energy activities are mainly supported by regional energy bureaus, which are part of regional governments, and by regional energy institutions, such as the Oromia Mines & Energy Agency and the Regional Rural Electrification Executive Secretariat Offices with support and advice from the EREDPC.

There are only few private companies active in the energy sector. The number of manufacturers, assemblers and dealers of renewable energy technologies in Ethiopia is in all technology area lower than 10

Other donors:

World Bank
Electricity Access--Rural Expansion Phase II (2007 - 2011): The development objective of the 2ndd Electricity Access Rural Expansion Project is to establish a sustainable programme for expanding access to electricity in rural communities, thus supporting broad-based economic development and helping alleviate poverty. The Project will significantly expand access to and services provided by electricity in rural towns and villages. The Project has a major component: Grid-Access Expansion which will extend the grid to connect customers.

The World Bank, acting as administrator for the Global Partnership on Output-Based Aid (GPOBA), has signed a grant agreement for US$8 million with the Ethiopian Electric Power Corporation (EEPCo) to support increased access to electricity in rural towns and villages with grid access, within the context of the Universal Electricity Access Programme (UEAP). Up to 228,571 low-income households will benefit from the scheme through a new or regularized electricity connection and the provision of two energy-efficient Compact Fluorescent Lamps (CFLs).

Energy Access Project (GEF): This project's main objective is to contribute to the reduction of greenhouse gas as a portion of the diesel used for power generation would be displaced by the renewable energy. The Energy Access project will also provide affordable electricity to a large number of rural and small town dwellers on a sustainable basis, and support income-generating activities made possible by the new power supply. It will target villages and rural centres where local distribution grids are appropriate.

Austrian Development Agency (ADA)
In the current planning phase energy has been set as a priority.

Italy
Italy is active in financing large hydropower plants, for example HP Gilgel Gilbe II and III.

France
France finances grid extension projects. In May 2009 Ethiopia has signed a financing agreement with France amounting to 210 million Euros for the implementation of the Ashegoda Wind Power Project in Tigray State.

Coordination with EnDev Activities

It has been agreed with the MoME to promote the current and planned joint interventions to the level of national programmes, namely a national Pico to Small Hydropower as well as a national solar energy programme in order to harness the momentum created by the EnDev intervention and utilize the synergy with other interventions. The planned development of a national biomass development strategy is also a similar undertaking.

1.4. Other major activities in the country financed by BMZ or DGIS

BMZ

In the focal areas of bilateral development cooperation in Ethiopia, the following programmes are implemented:

- Urban Governance and Decentralization Programme (UGDP),
- Engineering Capacity Building Programme (ECBP),
- Sustainable Land Management Programme (SLM).

DGIS

SNV is implementing a National Biogas Programme in Ethiopia in partnership with the Ethiopian Rural Energy Promotion & Development Centre (EREDPC). Implementation started in May 2008 with the construction of 100 demonstration biogas plants in 4 regions (Tigray, Oromia, Southern region and Amhara). In an initial phase (2008-2013), constructing a total of 14.000 biogas plants is targeted.

The Netherlands Embassy (DGIS) temporarily finances the Horn of Africa Regional Environmental Centre (Addis Ababa University initiative) that is involved in stimulating carbon financing in some of its own developed energy projects and as part of a small platform pushing on carbon/CDM problem solving. Other partners of the platform are the Min. M&E, UNDP, EPA, GTZ.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	25.000
Cooking Energy for Households	500.000
Electricity for social infrastructure	50 Communities Centres (PV Systems)
Cooking/ Heating Energy for social infrastructure	300 Schools with stoves
Energy for prod. use/income generation	50 battery charging stations 10 Solar Kiosks

3. Project Approach

3.1. Energy technologies/services promoted by the EnDev project

3.1.1 Selected technologies / services by the EnDev project

The technologies promoted under the cooking energy component can be distinguished twofold:

a) Stoves for the use in households or institutions,

b) Stoves for „injera-baking“ or cooking.

Therefore the technologies considered in the programme can be structured as follows:

Technology / approach	Injera baking	Cooking
Household	MIRT (old and new) Aprovecho stove Gonziye (testing) Awramba (testing)	Tikikil (old and new) Solar Cookit (survey)
Institution	MIRT modified for Institutions	Institutional Rocket Stove

The technologies promoted under the electrification component can be distinguished in:

a) Solar energy for households or institutions,

b) Micro hydropower for households, institutions and productive use.

Technology / approach	Solar	Micro Hydro
Households	Market introduction of low-priced SHS in rural areas for lighting mainly	Lighting, info/entertainment
Social institutions	Community centres	Schools, Churches, Community-/Association centres
Productive use	Solar kiosks SHS assembly companies Workshops for maintenance and repair	Machinery and electric tools for workshops, light for shops and bazars
Others	Development of low-priced basic SHS Training-, testing- and maintenance workshops attached to Universities or Vocational Training Facilities	Training-, testing- and maintenance workshops (maintenance for existing plants, information on RE, advertisement for RE-firms)

3.1.2. Rationale of the approaches

GTZ sticks to a commercial approach as opposed to some other players in this field that give stoves away for free. In some areas a geographical overlap occurs. An intensified communication with the other players is planned for.

Injera baking stoves

The main emphasis is given to the promotion of more efficient Injera baking stoves, as this cooking task is the one consuming most of the firewood in households. The MIRT stove is

the proven technology. It has been revised to safe on material costs. Meanwhile the new version has been fully taken over the market.

There are other Injera baking technologies in development and testing stage. It remains to be seen if these other technologies reach dissemination status for specific target groups. Particular Gonziye (clay stove) and Awramba (mud and stone stove) are cheaper products, which could be suitable for rural target groups.

Cooking stoves

For the household cook stoves, the old Tikikil stove (a household rocket stove) is currently the established product under EnDev 1. However, a new model has been developed to offer a cheaper product. The product is in the process to enter the market in various regions.

The Solar Cookit is a low cost solar cooking technology promoted by a local NGO. It is envisaged to make a survey on existing users of this technology to assess its suitability for a promotion under the conditions of EnDev 2 as a supplement to the Tikikil promotion.

Institutional stoves

Institutional Rocket stoves have been developed for Ethiopia based on the Aprovecho concept. It is therefore a technology based on a proven concept. However, the stoves are not yet tested over a longer period in Institutions to proof durability.

Institutional Injera baking is done on MIRT stoves by adding a chimney and reinforcing it with mud.

Solar

The project will focus on the development and market introduction of an affordable energy efficient solar lighting system. It will also generate income possibilities, as the solar products will be assembled and partially produced in local workshops. Also people will be trained in maintenance and repair.

Many remote villages are not connected to the grid, and they will not be connected in the nearby future. Providing community centres with solar energy will give the community the opportunity to run battery charging facility. Through this facility people living in remote village will have some energy services available.

Setting up training, testing and maintenance workshops will contribute to reach a sustainable improvement of education and training in the solar field of Ethiopia.

Micro Hydro

Ethiopia has a high potential for hydro power. And hydro power can give many people that live in remote areas that are not reached by the grid access to energy. To promote micro hydro power in the country and to develop the private sector, it is essential to support the construction of exemplary plants in remote areas.

Aside the construction of new micro hydro power plants, existing grain mills can be extended. Many communities have shown interest in extending the grain mill so that power can be generated for household uses and productive use. At least for the next 2 years the planning and construction of plants has to be supervised by the programme,

To develop the micro hydro power sector, centres of MHP-development and dissemination of MHP-technology will be established.

3.2. EnDev approach

3.2.1. Component 1 – Access to Modern Energy Services-Cooking (AMES-C)

Target group: Rural, urban and peri-urban households

Target geographic area: Amhara, Oromia, Tigray, Addis Ababa, Harari and Deredawa.

Implementing partners

- World Bank: Energy Access Fund,
- UNHCR: promoting Tikikil stove in refugee camps,
- EREDPC (Ethiopian Rural Energy Development & Promotion Centre),
- MoARD (Ministry of Agriculture and Rural Development),
- Regional Energy Bureaus (in line with government structure),
- Regional Bureaus of Agricultural and Rural Development ,
- Environmental Protection Authority,
- ECBP (quality and standard authority),
- Regional women's association,
- Regional women's affair bureau,
- Regional Bureau of Trade and Industry,
- NGOs like Worldvision and Zoa International,
- World Food Programme: promoting the institutional rocket stove.

Key interventions/ activities/ outputs

Consolidation and Sustainability of MIRT stove and scaling-up of Tikikil stoves by

- Involving producers and local government in promotion activities,
- Follow-up on quality control (random check whether system is still working),
- Preparing awareness documents on quality of stove,
- Dissemination of moulds to MIRT producers,
- Marketing (e.g. testing of stoves by MIRT producers, cooking demonstrations) and promotion.

Output:

- Consolidation or increase of annual production (mid 2011 – 2012),
- Producers and local government have taken over the promotion and marketing of stoves,
- Quality control system is in place.

Reviving MIRT production and starting-up new household stove promotion in selected regions by:

- Training or retraining of producers in production and marketing of MIRT technology and Aprovecho stoves,
- Repeat marketing and promotion efforts from other regions (except coupon system),
- Set-up quality control system with local government parties (including capacity building),
- Awareness work among governments parties,
- Establishing production capacity,
- Certification for products: brand developed – for quality control Promotion and awareness campaigns,
- Marketing introduction.

Output:

- Stove production capacity is available,
- Producers have good technical and business skills,
- Quality control system is in place.

Market introduction and scaling-up of Institutional rocket stoves

- Further development of marketing materials and promotion campaigns,
- Continuation of promotion, marketing and awareness campaigns (targeting decision makers),
- Follow-up on quality control ,
- Maintaining numbers of producers in existing regions and training new producers in new intervention regions.

Output:

- Marketing and promotion material is available,
- Stove production capacity is available,
- Quality control system is in place.

Development, testing and piloting of new cooking stove technologies (particular for rural areas) and new dissemination approaches

- Development of institutional rocket stove,
- Development of new MIRT and Tikikil stove,
- Development of Aprovecho stove,
- Assessment of Solar Cookit.

Output:

- Reliable test results on technologies in investigation ,
- Efficient stoves adjusted to needs of rural population,
- A rural approach for stove dissemination.

Development of information and educational materials on the topic of efficient cook stoves:

- Scaling up by disseminating in other regions,
- Involve other NGOs and educational bureaus.

Output:

- Information and educational materials on efficient cook stoves are available,
- NGOs and educational bureaus use the developed materials.

Enhancing of biomass supply side - Promotion of Tree planting on private and communal used land

- Follow up of previous planting activities to check if cooperation conditions are honoured,
- Training on how to harvest trees (forest management) and marketing to sell sustainable fuel wood,
- Extending to new regions: designing the right approach and implementing it

Output:

- 400,000 trees are planted in the three new regions,
- With 80% of survival rate of the trees planted (though the survival rates depend on the agro-ecological situation and other factors, this figure is taken from the EnDev 1 experience).

Experiences and lessons learnt of EnDev 1

- The coupon system has proven to be difficult to operate; many players are involved and customers experience it as a price reduction. It is better to develop the market without a subsidy scheme,
- Continuous product improvement through research that would enable it responds to the changing market conditions, consumer preferences, and improves the affordability and marketability of the products,
- Ongoing research and testing to find cheaper raw materials that are easily available in most parts of the country is needed.

Risks for implementation

- Raw material: availability of metal and price of cement ,
- Trained staff in government organisation changes frequently,
- Sales of MIRT stove might drop due to end of coupon system,
- In some regions, NGOs are handing out stoves for free,
- Subsidized foreign imports of stoves.

3.2.2. Component 2 – Access to Modern Energy Services-Electricity (AMES-E)

3.2.2.1 Solar applications for Households and Institutions

Many remote areas in Ethiopia will not be connected to electricity through the national grid within the next years. The rural poor communication will benefit through the installation of various types of Solar PV generators. As target groups for the PV interventions rural household using Solar Home Systems and charging batteries at PV charging stations, people in the catchment areas of Health centres with PV Power and people in communities being supplied with community plants will benefit. Furthermore Employees of SMEs assembling, installing, operating and servicing as well as selling PV systems are targeted to achieve increased their income situation.

PV Systems for community centres and schools will mainly be implemented in the eastern regions, preferably in communities in which a health centre has a PV system, too. The specific project sites will be selected in consultation with the project partners. The Solar workshops shall be attached preferably to Universities and Vocational Training Centres in eastern and northern regions. Where it will be possible integration with ECBP, SUN-E and SLM activity (Bahir Dar, Mekele in the north) will be realized.

Implementing partners for the PV interventions will be the Ministry of Mines and Energy (MoME) (national, regional and local structures), the Federal Ministry of Health (FMoH) and the Ministry of Education (MoE) both in their regional and local structures. Close cooperation is planned with the communities and existing universities and vocational training centres (SELAM, University of Berlin). Furthermore the Project will work with additional players in the solar sector in Ethiopia (e.g. Solar Association, Stiftung Solar) and several institutes of the finance sector.

Key interventions/ activities/ outputs

As key interventions in the Solar Component the development and dissemination of a low cost SHS is planned. The installation of PV plants in communities will focus on institutions. For ensuring quality and sustainability the PV sector in Ethiopia will be tackled through Training-, Testing- and Maintenance Workshops (TTMW) attached to Universities or Vocational Training Facilities.

The installations of PV plants in communities will be funded by the project. Capacity building on the supply side as well as on the operation and maintenance side will be enhanced through the introduction of a operation, service and maintenance system and the trainings held at the TTMWs. The introduction of low cost solar home systems will be achieved through Training and setting-up production entities, promotion and marketing campaigns. Quality standards will be set and ensured through training. Sales points for the SHS (Solar Kiosks) will be established. All solar activities which include the use of solar batteries the replacement and recycling of the batteries will be considered in the planning and a recycling system will be set up.

It is planned to supply 50 communities with PV Systems. Through the low cost SHS, 5.000 households will gain access to modern energy and about 25,000 households will gain access to battery charging facilities. At least 50 households are expected to created income through being employed in the Solar Kiosk and battery charging facilities. The TTMWs will be established and official credited by the government.

Experience EnDev1:

In EnDev 1 100 PV systems have been installed in Health centres and 30 in schools and community centres by 10 trained companies. Trainings of construction companies and users have been held in cooperation with SELAM.

Risks for implementation

The PV Systems for the institutions need to be imported which underlies a certain risks (Currency, duties, transport). Furthermore ownership of the PV systems and the resulting

quality of operation and maintenance need to be considered a risk factor for success of PV systems in institutions.
Risk factors for the implementation of the low cost SHS are the material supply chain, the production quality of product and after sales services. Costs of the systems could be above the price users will be willing to pay.

3.2.2.2 Set up of Training-, Testing- and Maintenance Workshops attached to Universities or Vocational Training Facilities.

Target group:

- Communities with a potential for MHP power generation,
- Investors in MHP power generation,
- Planners, constructors of MHP.

Activities:

- Establish a network of MHP workshops ,
- Training of key persons, future trainers and MHP managers,
- Establishment of:
  - site survey (scouts) and project planning,
  - manufacturing according recognized standard,
  - project implementation system with formats for contracts, financing and organization,
  - water resource action plan of community i.e. of catchment areas,
  - establish community model for operation of power units,
  - information on effective productive use of the generated energy,
  - introduction of an appropriate energy and water management.

Output / Indicators

- A system for MHP implementation is established
  - The existing units and actors have the skill to play their role as:
    - designers, planners,
    - manufacturers and installers,
    - guiding in management, coordination, technical, organizational and financial service.
- at least the construction of 3 water mills with power generation is technically supported by AMES-E and they are operated by the relevant communities in the area of each centre (9 plants in total).

Experience EnDev1:

In EnDev 1 4 MHP have been installed in 3 communities. Trainings of construction companies, turbine manufacturers, hydro scouts and users/operators have been held. Experience has been gained in procurement of MHP components.

Risks

Environmental conditions might change (Draught/climate change) and influence the potential of the selected sites. Disputes over water rights can lead up to a lack of water at the Power House. Another risk could be delays in Feed-in regulation which deter investors in MHP power generation. Additional it needs to be noticed that import restrictions might hamper MHP-business (e.g. extremely high duties on imported material, lack of foreign currency).

3.2.3 Component 3: Improved policy framework for sustainable access to modern energy services – Access to Modern Energy Services-Policy/Sustainability AMES-PS

The success and the sustainability of the key interventions under component 1 (AMES-C) and component 2 (AMES-E) are highly dependent on the level of support through the policy

framework in Ethiopia. This applies both to the implementation within the programme phase as well as the follow-up after the end of the programme. The following key interventions are designed to support the long-term sustainability of the improved access to modern energy services.

Key Interventions:

1) Support MoME, other relevant ministries and other stakeholder in the development of suitable policies and strategies for the promotion of improved access to modern energy (e.g. National Energy Policy, Biomass Strategy, feed-in law),
2) Advise MoME and GTZ entities and Projects in Ethiopia on improved energy access,
3) Support governmental structures for awareness creation and advocacy activities related to improved energy access,
4) Develop and strengthen the capacity of governmental and sub-governmental institutions to manage the implementation of programmes related to access to energy,
5) Liaise with donor organisations on policies and programmes for the improvement of access to modern energy,
6) Support governmental structures in the assessment of needs for the improvement of access to modern energy in Ethiopia,
7) Strengthen public awareness of energy access matters (Information services, Educational Sector...),
8) Support Ethiopian stakeholders in the exploration of opportunities to fund programmes for energy access (e.g. carbon financing).

Risks:

The personnel in governmental and sub-governmental institutions tend to undergo fast changes over time. The continuity of capacity development processes is therefore partially undermined. Changes in personnel also can lead to changes in priorities.

4. Impact Monitoring & Evaluation

<u>Component 1: AMES-C</u> - main anticipated impacts and possible indicators:

Impact	Possible indicators
Environment	• Change in use of wood fuels • Change in wood cutting
Health	• Change in emissions from burning of wood fuel • Change in indoor air quality • Change in medical costs for diseases related to indoor air pollution
Poverty/livelihood	• Increased income • Monitory changes in cooking fuels • Changes in time spent on obtaining cooking fuels • Changes in time spent on cooking • Modernization of kitchen (Improved ventilation and ergonomic arrangements) • Job creation in stove business
Gender	• Change in workload • Income generated through production • Better working condition for women • More safety in the kitchen

Component 2: AMES-E - Main anticipated impacts and possible indicators:

Impact	Possible indicators
Environment	• Change in use of dry cells
Health	• Change in emissions from burning of liquid fuels – higher indoor air quality • Change in medical costs for diseases related to indoor air pollution • Improved maternal health
Poverty/Livelihood	• Change in income • Changes in businesses • Monetary changes in energy costs
Education	• Amount of hours used for studying and reading at home • Amount of hours schools are used • Access to ICT and information (ICT is the technological choices and information is another qualitative issue) • Number of trained people • Change in level of education

Component 3: AMES-PS - Main anticipated impacts and possible indicators:

Impact	Possible indicators
Good Governance	• Access to key energy figures/indicators • Updated Policies and strategies • Shortened process of investments • Increased volume of large and small scale power production plans (the MHP site identification and development shall be part of the development endeavor) • Carbon financing options developed and returns coming in • Quality labeling structure for energy technologies developed • National energy sector programme in place and running, including small and micro hydro, PV, solar thermal and biomass

Planned Impact Monitoring & Evaluation Methodology

Please tick:

(x) a baseline survey for impact evaluation is planned and scheduled

for 2009 and 2010

- Stoves:
  - Baseline study in new regions (SNNPRS, Harari and Dire Dawa) on technologies uses, cooking habits plus on the indicators where main impacts are anticipated
- Rural electrification:
  - Base line micro hydro and health, done.,

- Baseline for hydro plants, community centres, planned. Impact health centres contracted,
- Baseline on economic development potential around hydro schemes, contracted,
- Yearly workshop impact monitoring/ stakeholders response planned.

- DGIS impact evaluation on EnDev programme planned for 2009/2010 including Ethiopia.

5. Budget

EnDev 2 Ethiopia		EUR
1	**Human Resources and travelling**	1.875.289
2	**Equipment and Supplies**	1.542.700
3	**Funding Financing Agreements/Local subsidies**	625.000
4	**Other direct costs**	1.249.931
5	**Total direct costs**	**5.292.920**
6	**Mark up costs/administrative overheads/imputed profit**	707.080
7	**Cost price**	**6.000.0000**

Ghana

1. Situation Analysis

1.1. Energy Situation

The electricity infrastructure in Ghana is underdeveloped because of problems on both the supply and demand sides. On the supply side, low electricity generation capacity, shortages in foreign exchange, inefficiency of service providers, imperfections in energy markets and lack of infrastructure are some of the problems. Total installed capacity to date is 1,986 MW. According to the Minister for Energy (speech 21 October 2008), the total installed capacity in Ghana will reach 3,300 MW in 2013, which is 500 MW below the envisaged target...

Hydro power is the major source of electricity in Ghana. In addition, gas and crude oil run power plants have been installed in recent years. The Volta River Authority (VRA), a government owned company, is the sole producer of electricity and is through its subsidiary Northern Electricity Department (NED) one out of two companies distributing electricity nationwide. In the southern part of the country electricity supply is being handled by Electricity Company of Ghana (ECG). A separate company called GridCo has been created to operate the transmission grid.

Ghana boasts an extensive electricity grid. Access rates are the second highest in Sub-Sahara-Africa, only surpassed by South Africa. The proportion of households with access to electricity increased from 45% in 2005 to 54% in 2007 including more than 17 % of the rural population connected. All rural district capitals and most villages in Ghana have access to the national electricity grid. However, the grid being available in the town or village does not necessarily mean that any prospective customer can easily be connected. Distance to the next pole and unsolved land issues still remain an access barrier, especially for MSMEs. Although the grid might potentially be available in the towns, MSMEs have difficulties in accessing land where it is actually legally for them to operate, which is a pre-conditions to being connected to the grid. This results in many MSMEs not having access, even with the grid being present in the area.

The per capita consumption of electricity has not increased significantly from 481kWh in 2005 primarily due to the 2007 electricity crisis. During the year under review, the average number of hours of electricity outages per consumer per year far exceeded the minimum threshold of 100 hours/year set under the Ghana Poverty Reduction Strategy II (GPRS II). These values have however been influenced strongly by a power crisis with extensive load shedding schemes. The power crisis has been overcome since 2008 and power supply has stabilised thanks to improved water levels in the Volta Lake, serving the two largest hydro power plants and the installation of emergency power generation plants. The situation is expected to further improve with the arrival of natural gas from Nigeria through the West African Gas Pipeline. Further improvements on power availability, stability and a reduction in generation cost will be achieved once the Bui hydro-power station is finished in 2012.

In Ghana the tariff setting is rather complex. Several tariffs depending on consumption and type of activity apply.

[1 GHS = 100 pesewas]	Residential (pesewas)	SMEs (pesewas)
Service charge per month	50	50
0 - 150 kWh	7,87	14
151 - 300 kWh	12	14
301 - 600 kWh	16	17
600+ kWh	19	19.5

In general all tariffs are cost covering for generation, transmission and distribution but not for investment and financing cost, which means, in connection with the debt accumulated during the energy crisis, that VRA and ECG cannot establish funds for future investments. Budget for new connections needs to come from the government and donor organisations, otherwise communities have to pay themselves for putting in place a distribution network (self help). VRA and ECG were mandated by the Public Utilities Regulatory Commission to charge a rural electrification levy of 1.5 – 2.0 % on tariffs. This has to be collected and transferred to the Ministry of Energy.

Distribution companies charge a connection fee of around 100 GHS, which some micro and small enterprises a have difficulty to pay.

Due to their location in unauthorised places, many MSMEs presently have to rely on informal/illegal electricity connections from neighbours. These so called “extensions” apart from being a serious security threat, are often extremely expensive (sometimes more than 10 times as expensive as official connections).

Key problems of the energy sector

In the last two decades the demand for electricity has been growing by 10-15 % annually. The expanding commercial and industrial sectors are, together with the high population growth, the main drivers of this process. In order to meet the demand and promote the decentralisation of economic growth and to support the development of small industries outside the main growth centres in the capital and along the coast, it is not only necessary to build additional generation capacity, but especially to provide urgently needed transmission and distribution facilities for productive use. Even where there is sufficient generation capacity to serve the demand of commercial customers, the electricity company has problems to provide enough equipment (meters, transformers etc.) to connect commercial users and the costs for the installation exceed the financial capacities of most enterprises. Moreover, individual business people have hardly any influence and means to push their interests and applications vis-à-vis the electricity company.

1.2. Policy framework, laws and regulations

A key objective of the Government’s energy policy focus is to ensure universal access to electricity particular for the rural communities in a reasonable time period. The Ghanaian government also embarked on a project to extend electrification to more than 5 communities in every district of the country. The government projects to achieve universal access by 2015, but this seems hardly realistic. Due to their poor financial situation both VRA and ECG have no funds to connect new residential areas and industrial zones. To realise connections three financial schemes apply:

- Government Projects: The Government (Ministry of Energy) allocates budget for new connections, the distribution companies will carry out the projects.
- Self Help Electrification: The self help electrification project (SHEP), requires communities use own budget to build a distribution network (poles) while lines and controls are financed by the ministry to install hardware to connect their distribution network to the grid.
- Private investment: Households or companies fully finance the hardware and installation to be connected to the grid.

The same financial constrains apply to connecting new industrial zones to the grid. In situations where the entrepreneurs (or others) provide and install all the necessary equipment, VRA-NED or ECG will connect the area to the grid.

The broad policy objectives of the government as outlined in the Medium Term Development Framework (MTDPF) include the following:

- Improving and sustaining macroeconomic stability,
- Expanding productive infrastructure,

- Accelerating agriculture modernization and agro-based industrial development,
- Developing human resources for national development,
- Ensuring transparent and accountable governance,
- Reducing poverty and income inequalities.

There is a clear focus on:

- Energy supply – To ensure increased access of households and industry to reliable and adequate electricity. This will involve diversifying the national energy mix, including the use of indigenous sources of energy and ensuring efficient management of the energy sector.
- Poverty Reduction – To promote income generation opportunities for the poor and vulnerable including food crop farmers; facilitate and enhance the empowerment of the poor in terms of their economic, social and human rights and environmental protection and security; promote inclusive development processes through decentralization and gender equity; develop and enhance social protection for the poor by ensuring fair and equitable distribution of national wealth.

Another key element of the governmental policy is the Private Sector Development Strategy (PSDS II). The objective of the PSDS is to foster the development of sustainable corporate strategies for enterprise growth and job creation.

The Endev 2 intervention has been planned within the framework established by the Second Private Sector Development Strategy (PSDS II) Concept Document of the Ministry of Trade and Industry (Lead Executing Agency). This concept document was recently affirmed by the President. The concept paper sets out the framework for the design and development of the second phase of the Medium-term Private Sector Development Strategy (PSDS II).

The GTZ-supported Programme for Sustainable Economic Development (PSED) will provide support for the implementation of the PSDS II. EnDev Ghana activities will be incorporated into the structure of the bi-lateral Programme for Sustainable Economic Development to ensure alignment.

There is a draft National Renewable Energy Strategy together with a draft Strategic National Energy Plan 2006 – 2020. The strategy set the target to achieve 10% of renewable energy (not including large hydro power) in the energy mix by 2020, including wind, mini-hydro, modern biomass resources and solar-PV. Ghana has significant potential for hydropower, biomass, wind and solar power.

A renewable energy law is under preparation and yet to be finalised. The objective is to develop and enforce standards and codes for renewable energy technologies. This will include standards for bio-fuels, solar lighting and solar water heaters. This draft renewable energy bill was ready for submission to Cabinet as of December 2008. It has to be reviewed again by the new administration to reflect their vision for the energy sector.

As the national policies and strategies on renewable energy are still being established, EnDev Ghana will for the time being continue to focus on the energy for productive use interventions started under EnDev I and not include further activities in the field of renewable energy.

There are plans under World Bank co-funded GEDAP to create a new institutional and policy platform from which to launch an innovative, multi-faceted approach for expanding electrification in Ghana. This includes the establishment of an independent Rural Electrification Agency (REA), which will coordinate all rural electrification programmes and determine areas to receive electrification based on transparent eligibility criteria and commercial principles.

1.3. Institutional set up in the energy sector, Activities of other donors

The electricity sector in Ghana is run through 6 institutions:

Ministry of Energy (MoE): The MoE is the body responsible for the formulation, coordination, monitoring and review of policies and programmes for the overall development and utilisation of energy resources in Ghana.

Volta River Authority (VRA): VRA is the state-owned electricity utility responsible for the generation and transmission of electricity in Ghana and supplies electricity in bulk to its subsidiary NED, and to ECG.

Northern Electricity Department (NED): NED is the subsidiary of VRA responsible for the distribution of electricity in the northern part of Ghana.

Electricity Company of Ghana (ECG): ECG is the utility responsible for the distribution of electricity in the southern part of Ghana.

According to the provisions of the Statutory Corporations (Conversion to Companies) Act, 1993 VRA and ECG have been converted into companies under the Companies Code.

Ghana Grid Company (GRIDCO): GRIDCO is a Power Transmission Utility company formed as part of the Power Sector Reforms to be responsible for the Operation and Maintenance of all Transmission Lines. This was to enable the VRA to focus on its core task of generation. The objective is to ensure an open access to national grid by all generators of electricity, particularly Independent Power Producers (IPPs). This provides a level playing field for both private and public sector investors in the electric power generation to be able to enter into power purchase agreements with consumers.

Public Utilities Regulatory Commission (PURC) PURC has been set up as a fully independent body to regulate the setting of tariffs for and enforcement of customer service obligations of all public utilities. The PURC's regulatory mandates are:

- To provide guidelines on rates chargeable for electricity services. These guidelines provide a transparent and predictable mechanism for setting rates. An Automatic Adjustment Formula has been introduced to allow for quarterly revision of tariffs to reflect fluctuations in crude oil prices and foreign exchange rates, the hydro-thermal generation mix and changes in the consumer price index. Major tariff reviews take place every four years. The tariff review process is quite transparent and the public and consumers are involved through the public hearings system. Nevertheless, there has been a fair degree of political interference in the tariff setting process in the past years. In 2008, a dispute between government and PURC over the setting of end-user electricity prices led to the resignation of the then PURC president,
- To examine and approve the tariffs,
- To protect the interests of consumers and providers of public utility services,
- To monitor the standard of performance of these utilities,
- To promote fair competition among service providers in electricity, as well as in water.

Energy Commission (EC) The EC's regulatory mandates are:

- Advise the Minister on national policies for the efficient, economical, and safe supply of electricity, natural gas and petroleum products having due regard to the national economy,
- To receive and assess applications and grant licenses to utilities for the transmission, wholesale supply and distribution of electricity, and to qualified operators in the energy sector,
- To establish and enforce, in consultation with PURC, standards of performance for the relevant utilities,
- To promote and ensure uniform rules of practice for the transmission, wholesale supply and distribution of electricity.

Energy Foundation (EF) The Energy Foundation Ghana is a non-profit, public-private partnership institution, devoted to the promotion of energy efficiency and renewable energy, as a key strategy to managing Ghana's growing energy needs in a sustainable manner.

It was established in November 1997, by the Private Enterprise Foundation in collaboration with the Government of Ghana to promote sustainable development and efficient consumption of energy in all of its forms in Ghana.

Activities of Donors

A number of donors are providing financial and technical support to the Government of Ghana through her implementing agencies. These include the World Bank (IDA), African Development Bank (AfDB), Global Environmental Fund (GEF), Switzerland, Japan, France, Spain, India and China. The biggest energy sector project which is running currently is the Ghana Energy Access and Development Project (GEDAP) which consolidates funding from Multilateral, Bilateral and Government. Within this framework, the participating donors are providing support in the areas of (1) national level institutional, policy development, organisation and capacity building; (2) Generation sub-sector organisation, capacity building and upgrading of facilities; (3) Transmission sub-sector organisation, capacity building and upgrading of facilities; (4) rural electrification and renewable energy development, institution, policy, organisation, business model and new facilities.

The coordination of donor support takes place within the framework of the Donor Sector Group, established under the Multi Donor Budget Support (MDBS) framework. The Energy Sector group meets every other month to coordinate activities within the sector. Donors that are very active in the sector group include: The World Bank (Sector Lead), France (AFD), Switzerland, African Development Bank, Japan (JICA).

To a very large extent there is division of labour. The EnDev Team in Ghana attends the Sector Group Meetings as observers to share information and to ensure that interventions are in line with current policy and programmes of the MoE. The EnDev Team will continue to participate in the Sector Group Meetings and will coordinate activities with donor colleagues and policy makers at the MoE with regard to the Productive Uses of Energy.

Short explanation to which degree EnDev will be in line with capacity development needs of the partner

Capacity Development for local governments:

- Local governments recognize the need for small industrial development through the planning and dialogue sessions, this will improve their internal planning and budgeting processes; Local governments will improve private sector involvement in participatory planning processes. They will also appreciate of the needs of the micro small businesses and re-orient themselves towards meeting these need by pursuing local economic development vigorously and improving the public services delivered to businesses,
- Local physical planning units will gain experience in providing space for local economic development activities,
- Local governments will also gain understanding of the (electricity) infrastructure needs of enterprises and customers and seek to provide them alongside other social infrastructure. Hitherto infrastructure development in the local area was mainly to meet the social needs to the neglect of productive infrastructure, and
- Local Governments will learn how to use synergies between larger infrastructure interventions and EnDev.

Capacity Development for business associations:

- Members of local business associations will be supported to improve their general business skills, especially in cash-flow-management and book-keeping. This is achieved through a tailor-made adaptation of the CEFE methodology, taking into account the special needs of the pre-dominantly illiterate target group,
- Business associations will develop the capacity to adequately manage the industrial areas in an economically and environmentally sustainable way,
- Local businesses are enabled to better voice out their needs and concerns towards the local administration through public-private dialogue.

Capacity Development on national level:

- The Ministry of Trade and Industry will use the industrial zones as an example for a decentralized economic growth strategy. The project will assist the Ministry in using the experiences for the development of national policies and strategies,
- The Ministry of Energy will be supported in better addressing small enterprises' needs within its Energy for Productive Uses Project,
- The Ghana Environmental Protection Agency is being supported in tackling environmental issues, resource and energy efficiency in MSMEs in a business friendly manner, through a series of educational materials. So far, only large enterprises have been within the focus of EPA's activities.

1.4. Other activities of BMZ and DGIS

Apart from EnDev, neither Germany, nor the Netherlands are supporting the Energy Sector in Ghana.

Under its Multi-Annual-Strategic Plan, the Dutch Embassy supports Ghana in the following sectors and priority themes:

- general budget support
- health/HIV Aids,
- environment/natural resources,
- water,
- gender,
- good governance.

BMZ has defined the following focal areas for the development cooperation with Ghana:

- Agriculture,
- Good Governance and Decentralization,
- Employment-Oriented Private Sector Development.

Within these focal areas, EnDev Ghana is closely co-operating with the BMZ financed Programme for Sustainable Economic Development (PSED). EnDev is part of PSED's activities in the field of local and regional economic development.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	300
Cooking Energy for Households	
Electricity for social infrastructure	6 electricity connections
Cooking/ Heating Energy for social infrastructure	
Energy for prod.use/income generation	6 electricity connections

3. Project Approach

3.1. Energy technologies/services promoted by the EnDev project

3.1.1 Selected technologies/services and approaches

The focus of EnDev 2 will continue to be the extension of grid electricity to the selected industrial zones. The selected industrial zones fall within areas where the national grid is available and accessible. These are mainly 11 kV or 33 KV medium voltage lines from which electricity will be tapped and extended to the industrial zones. A dedicated transformer is then installed at the industrial zone together with a low voltage network which provides single or three phase electricity to the enterprises. The enterprises apply to the Utility Company for the service connection and pay the full costs for their individual connections. The project provides all the hardware comprising:

- High tension poles and bare aluminum cables,
- Transformers and accessories,
- Low tension poles and cables,
- Control equipment and switchgear,
- Street lighting (in some cases).

The Municipal and District Assemblies pay the costs of labour for the installation of the electrical hardware. The business associations contribute labour in kind and individual enterprises pay for their connection fee.

3.1.2 Rationale of the approaches

The rational is that the grid electricity is available in all district capitals of Ghana. Generally speaking, all communities with significant economic activity have access to the grid. Therefore grid electricity has been selected to be the most appropriate source of energy for an energy for productive use intervention. Secondly, some of the enterprises like wood processors and metal fabricators use energy intensively hence a reliable supply of grid electricity is the most preferred option.

3.2. EnDev approach

3.2.1 Target Customers

The customers or beneficiaries are MSMEs that are already operating scattered about in urban towns. Many of them are encroaching on the roadsides and residential plots. Operating in un-authorised locations, they lack access to electricity and other basic services and are under the risk of forced relocation at any time. Further, many of the industrial enterprises can benefit from operating in clustered environments, as they are heavily specialised and depend on other enterprises' services.

These are micro enterprises in the vehicle/tractor repair sector; metal fabrication and welding sector, wood processing and wood work and agro-processing. There are other MSMEs that provide support services to the major ones. These are caterers, mobile phone services, vehicle spare parts shops and other hardware retail.

3.2.2 Target geographic area

The focus of the intervention has been expanded beyond the Brong Ahafo region. District capitals willing to establish industrial zones throughout the country will be able to apply for support by EnDev Ghana. Based on the current list of districts to be supported, the Northern, Brong Ahafo, Ashanti, Eastern, Western and Central Regions will be covered.

The selection process highlights a set of criteria, following a clear assessment scheme. Only the best qualifying districts will be selected for inclusion in the programme (score of around 30 is needed). The main categories used in the assessment are cost effectiveness (number of beneficiaries, suitability of land, population), stakeholder commitment (public sector and private sector) and readiness for implementation (land issues solved, availability of funds for infrastructure, organisational capacity of business association).

3.2.3 Implementing Partners

Within EnDev 2 the Ministry of Energy (MOE) supervises and monitors the Utility Companies that we collaborate with at the local level with regard to the extension of electricity to industrial zones. We will seek to renew the existing Memorandum of Understanding with the Ministry.

The local level partners, the Metropolitan, Municipal and District Assemblies (MMDAs),are responsible for the planning and development of the communities. They will be supported by EnDev to fulfil their roles in promoting local economic development.

- They are responsible for urban planning and zoning of the industrial zones,
- They are responsible for promoting local economic development, providing services the enhance business activity,
- They liaise with the Traditional Authority and other stakeholders to provide secured land for the project,
- They are (through their own budget or through funds acquired from other development partners) responsible for the provision of access roads, drains, water supply and sanitary facilities in the industrial zones,
- They also issue development permits and ensure a controlled development of the zones,
- They will finance the full costs for the installation of the electrical hardware,
- They will also oversee the management of industrial zones and enforce appropriate by-laws.

The Regional Coordinating Councils (RCCs) are regional level partners responsible for the coordination of development initiatives of districts.

- They harmonize development plans of districts to ensure that they conform to national policy objectives,
- They ensure that districts invest to improve the business environment by making adequate budgetary provisions,
- They monitor implementation of projects and programmes of MMDAs and send reports to the National Development Planning Commission,
- They provide support for dialogue with other Agencies and Departments to ensure the smooth implementation of EnDev 2.

Local Business Associations are crucial for the success of the interventions because they are the direct users of the outputs.

- They organize their members and continue to engage the local government in consistent dialogue on economic development issues,
- Support the implementation through participation in planning,
- Sensitize their members to move to the new site,
- Develop their plots, apply and pay for electricity connections, and
- are supported to set-up environmentally and economically sustainable management structures for the industrial areas.

Institute of Local Government Studies (ILGS) is a training institution dedicated to the capacity building of Local Government Practitioners to enhance local governance and local level management. It shall be the main partner for training of MMDAs in Local Economic Development and shall also serve as a knowledge centre for dissemination of experiences and best practices.

The Department of Planning of the Kwame Nkrumah University of Science and Technology (KNUST)will become a knowledge centre for Profitable Environmental Management (PREMA). They shall support with PREMA training in all the industrial zones and become a platform for up scaling PREMA in collaboration with the Environmental Protection Agency (EPA).

The Environmental Protection Agency (EPA): has the mandate to monitor industrial and other activities regarding their environmental impacts. They enforce environmental regulations and issue environmental permits. Business Associations are required to complete environmental impact assessments with EPA for the operation of light industrial areas.
In the context of EnDev, EPA will be involved in PREMA trainings and the establishment of sustainable management structures for the industrial areas through their regional offices. On national level, EnDev is supporting EPA with the development of educational materials on environmental management, energy and resource efficiency and health and safety in MSMEs.

3.3. Key interventions and key activities

Key Intervention 1: Support public-private dialogue between local governments, private sector and electricity utility.

Main Activities: a) Identify key private sector dialogue partners with Assemblies BACs, b) Support the dialogue process with strategy, know how; c) Support in the organisation of participatory planning workshops.

Expected Outputs: a) Agreements and action plans; b) Key sectors identified; Sites identified and acquired; c) Layouts prepared; d) Plans for IZ implementation with budgets and time frame; *e)*Sites cleared and basic access provided, f) Plots allocated.

Key intervention 2: Co-finance the electrification of newly established or extended light industrial zones.

Main Activities: a) Liaise with Utility and prepare design for network, materials schedule and cost estimates; b) Agree on contributions of Assemblies and private sector c)

Procure and finance materials, d) support districts in selecting contractor **for installations.**

Expected Outputs: Material procured and electricity network installed.

Key intervention 3: Facilitate linkages between local governments and potential financiers for roads, water access and sanitary facilities in industrial areas.

Main Activities: a) Identify potential financiers (public agencies and large private sector companies) in the district and beyond; Support districts in seeking collaboration.

Expected Outputs: a) Agreement to provide other facilities; b) Basic infrastructure (roads, water, sanitation) available; c) Movement to zones starts.

Key intervention 4: Improve business skills of entrepreneurs in newly electrified industrial zones and support private sector association and local governments in introducing economically and environmentally sustainable management structures in the light industrial zones.

Main Activities: a) Carry out workshops to qualify trainers in Profit Oriented Environmental Management (PREMA), b) Carry out PREMA trainings in districts, involving EPA, MMDAs and Business Associations, c) Ensure follow-up on agreed action plans, d) Document success stories in case studies, e) Further qualify Ghanaian CEFE trainers, f) Carry out CEFE training for association members.

Outputs: a) Pool of PREMA Trainers b) Pool of CEFE Trainers, c) Associations have PREMA and CEFE know how and are able to apply it; d) Capacity of MMDAs and Business Associations developed to manage Industrial Zones; e) Educational materials for PREMA are available through EPA; f) Local radios disseminate PREMA know how.

Within this key intervention, both EnDev 1 and EnDev 2 districts will be supported. The follow-up support of EnDev 1 areas ensures further growth of the industrial zones, resulting in additional people being reached.

Key intervention 5: Feed experiences from industrial zones into national policy dialogue and support Ministry of Trade and Industry (MoTI), Ministry of Energy (MoE) and Environmental Protection Agency (EPA) in replicating and scaling-up the pilot interventions.

Main Activities: a) Carry out peer learning sessions with representatives from local level, b) Discuss and document processes, challenges and lessons; c) Engage stakeholders in policy discussions; d) Discuss replication and up scaling strategies with Ministries and Agencies.

Expected Outputs: a) Agreed up scaling strategy; b) Agreed policy are part of national policy.

The experiences and lessons learnt will be mainly drawn from EnDev 1 districts that have already reached advanced stages of implementation.

3.4 Experiences and lessons learnt of EnDev 1

Discussions with the Ministry of Energy on financial support of the project started only when it became obvious that the energy crisis, which could not have been foreseen, made it impossible for VRA/NED to participate in this project. For the second phase, the Ministry will be involved from the beginning and EnDev is part of the Ministries Energy for Productive Use Project, assuring support by the Ministry for implementation.

It became clear that local authorities must be in the position to provide other infrastructure such as access roads and drains, water supply and sanitary facilities, because without such infrastructure, industrial zones cannot function properly. To support districts in raising funds for the other infrastructure, EnDev will in the new phase actively link up districts with possible infrastructure financiers. Only districts where financing for additional infrastructure is secured will be selected for implementation.

Suitable land seems not to be readily available in some towns because of the lack of long term urban development plans and also the lack of appreciation of local economic development issues in Districts. In the new phase, the broader issues of local economic development in the supported will be tackled through LED interventions of the bi-lateral Programme for Sustainable Economic Development. (BMZ financed).

The EnDev approach of not strictly determining target group and area in the planning process has proven valuable for EnDev Ghana. The project was able to shift operations from the originally selected to more promising towns and to include households as an additional target group. During EnDev 2, no fixed list of supported districts will be compiled from the beginning. To the contrary, selection of districts will be an ongoing process and districts will only be formally included in the programme once a set of pre-conditions has been fulfilled.

Once network installation has been finished, movement of enterprises to the site has taken off slowly. Business Associations and District Assemblies need support in making enterprises aware of the benefits of moving to the new sites. These efforts need to be accompanied by awareness creation on how to access micro-finance.

Provision of electricity alone does not yield the intended impacts, complementary measures like PREMA and CEFE training are necessary features of a successful energy for productive use intervention. PREMA and CEFE activities will be intensified under EnDev 2.

3.5 Risks for implementation

The framework conditions of EnDev 2 which will be integrated into the activities of the Programme for Sustainable Economic Development are comparatively stable and conducive. Ghana's economic performance over the past 15 years has been characterized by steady growth and a decline of the national poverty rate. The financial crisis has so far had only little impact on the Ghanaian economy and financial system, but a slowdown of economic growth is expected. Main economic problems are the surging inflation rate as well as the unequal distribution of the past growth process, resulting in increased inequality. Despite Ghana being one of the worldwide top reformers, major obstacles in the business environment, like access to finance, corruption and undefined property rights remain. The difficult access to finance is due to a relatively dynamic but still underdeveloped financial system.

Ghana's political landscape recently saw a change in power, after the opposition won the general elections in 2008. The political change appears to be peaceful. In its course, strategies and objectives of governmental bodies at all levels will alter. The implications for the EnDev 2 can so far not be predicted. The engagement of development partners in the private and financial sector development in Ghana is high. Their efforts are coordinated and harmonized in several sector groups.

Fiscal decentralization is still incomplete and local governments lack the financial capacity for large infrastructure interventions. This poses the risks of District Assemblies not being able to set-up the additional infrastructure (roads, water, sanitation) in the industrial zone. This risk is being mitigated by Key Intervention 3 (Facilitate linkages between local governments and potential financiers for roads, water access and sanitary facilities in industrial areas).

The financial situation of the two main electricity utilities (ECG and VRA) is still characterized by huge amounts of debts accumulated during the energy crisis and earlier. A financial recovery plan for the utilities is being prepared. Should such a recovery plan not be implemented, there is a risk that the approach cannot be implemented in further districts after project end, due to a lack of funds for investment in electricity infrastructure.

It is largely beyond the project's control, if MSMEs actually move to the industrial zones. As a lesson learnt from the rather slow movement process in the past, the project will focus more strongly on making business owners aware of the benefits of being located in industrial areas. A local media campaign is being designed that will promote the industrial zones and the key concepts of profitable environmental management through local radio stations. However, even with these additional measures, the risk of slow re-location remains.

4. Impact Monitoring & Evaluation

4.1 Expected Impacts of project intervention

EnDev Ghana through its energy for productive use in industrial zones intervention is expected to contribute to the MDGs 1, 2, 3 and 7.

The public private dialogue around but also be beyond the industrial zones will improve the business environment in the district and the political and economic participation of the population, especially women. Through the electricity, infrastructure and service package provided to firms located in the supported industrial zones, their business performance is expected to increase, resulting in higher incomes and additional employment opportunities.

The business and site management trainings will build the capacity for the target group to more successfully manage their businesses, their industrial site as whole and their business associations. The strong focus of the training on linking environmental with economic issues will improve income, environmental sustainability and the health of the workers, too.

As a by-product, the education situation in the supported districts will be improved through the electrification of schools and private households located near the industrial zones.

4.2 Planned Impact Monitoring & Evaluation Methodology

During EnDev I, the Ghana project has conducted an extensive baseline study for MSMEs in three (small, medium and large) district capitals in Ghana's Brong-Ahafo Region covered by the project. Additional observations in an industrial zone outside the project area were sampled to serve as a control group for future impact evaluation of the project. An extensive profound enterprise survey was carried out, covering all sorts of enterprise characteristics, including Energy, Waste & Water, Credit, Markets and BDS among others. The data has already been used for an ex-ante impact assessment. The ex-ante study provides for some indications that electricity enables enterprises to perform better than firms that do not use electricity. For instance, the longer opening hours and higher quantity and quality of lighting put electricity users into a favourable situation. These positive intermediate impacts are also reflected in better integration with external markets of users, which is a fundamental pre-condition to expand production. Yet, our indicators for income generation suggest that connected firms do not necessarily contribute to higher incomes on the employee side: They hire fewer workers than non-connected firms do. This might be interpreted as support to the hypothesis that electricity contributes to the replacement of human labour by capital. However, this ex-ante study has almost exclusively focused on the impact of electricity alone. The project is designed to provide electricity as a part of a larger package of services, including tailor-made BDS, clustering and public-private dialogue. The expected stronger impact of this integrated approach will only show after the project has been running for some time.

Consequently, a follow-up enterprise survey is planned for September 2010. This follow-up study will be used for in-depth ex-post impact analysis of the industrial area intervention. It will include a systematic analysis of the impact of access a service package including reliable electricity and other services and infrastructure in small-scale industry clusters over time, as a viable control situation will be available. Possible comparisons will be between the treatment group and the control group as well as between the enterprises who stayed in town and those who moved to the industrial zones.

Apart from this scientific impact evaluation, the project will continuously monitor the outcome and impacts of the interventions in the existing and newly included industrial areas. For all industrial areas, data on No of firms in zones, No of connected firms in zones, No of newly connected firms in zones, No of firms owned by women, No of employees and No of start-up firms will be complied on a bi-annual basis.

Additionally, the improvements in environmental sustainability of the industrial zone's operations will be documented in case studies, as it was already done in EnDev I.

Please tick:

( ) a baseline survey for impact evaluation is planned and scheduled for _____ (approx. date)

(X) a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for September 2010

( ) the project will use other methods for impact monitoring (please specify……..)

( ) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

(X) the project would be interested to get financial support for impact evaluation.

5. Budget

		EUR
1	**Human Resources and travelling**	402.260
2	**Equipment and Supplies**	230.000
3	**Funding Financing Agreements/Local subsidies**	6.000
4	**Other direct costs**	149.322
5	**Total direct costs**	**787.582**
6	**Mark up costs/administrative overheads/imputed profit/**	112.418
7	**Cost price**	**900.000**

Honduras

1. Situation Analysis

1.1 Energy situation

Honduras has one of the lowest rural electrification rates in Latin America after Nicaragua. About 55 percent of the rural population still lacks access to electricity. In absolute terms, it is estimated that more than 400.000 households or more than 2,2 Million people in rural areas remain unserved. The national electricity system is concentrated on the western part of Honduras while the sparsely populated eastern part remains mainly beyond economic line-extension distances. The population density in Honduras is about 58 inhabitants / km2. While in the western departments the density reaches proportions of 137 Inhabitants per km2 (Francisco Morazán) and 306 Inhabitants per km2 (Cortés) in the eastern part it declines to 17.5 (Olancho) and 4 (Gracias a Dios - Mosquitia). In Rural areas population is highly dispersed and access is often difficult (for example, there is only river access to most of the Mosquitia Region). These two characteristics prevent provision of electric services by the conventional grid, and call for site-specific off-grid solutions like the diesel plants, solar or hydropower. Off-grid electrification in Honduras today consists mainly of installing diesel minigrids, operated by independent companies to serve some larger villages on the bay islands (Roatán Electric Company" RECO, "Utila Power Company" UPCO, "Bonaca Electric Company" BELCO) and in Puerto Lempira in the department Gracias a Dios (INELEM and ELESA). In a few cases hydroelectric and solar home systems have been implemented.

1.2 Policy framework, laws and regulations

Honduras is one of five lowest income countries in Latin America. Its per capita income in 2004 was estimated at $1,030, slightly above that of Guyana, Bolivia and Nicaragua, though more than twice that of Haiti. The population of about seven million grows at 2.5 % per year. Poverty is widespread, particularly in rural areas where four out of ten people live in extreme poverty. Neither set of estimates shows any significant improvement over the past several years. In 2001, Honduras worked out a poverty reduction strategy which has become the guideline for the national development strategy. Although Honduras made some progress in reducing poverty, four of the Millennium Development Goals (MDGs) targets are not currently on track to be met by 2015 according to an evaluation of the World Bank.

The Honduran government considers the improvement of the infrastructure especially that of energy services, a key factor for economic growth and for the alleviation of poverty in rural areas. In November 2007 the Government of Honduras obtained a new IADB $27 million credit to promote rural businesses. The programme will be implemented by the Ministry of Agriculture's National Office for Sustainable Rural Development (DINADERS) in the departments Olancho, El Paraiso, Colon and Gracias a Dios. It could offer opportunities for cooperation in the area energy for productive use.

For the electric sector, all policy is based on the Electricity Law of 1994, which defines roles and responsibilities of the institutions.

On 31.5.2007 the national congress passed the new law on renewable energy which will replace the law from 1998. The law promotes the use of renewable energies for the electricity generation by custom tax exoneration. The valued added tax (12 %) is not part of the exoneration. In addition the law foresees income tax exoneration for the power producer. Additionally ENEE is obliged to buy power generated from renewable energy plants at an increased tariff. As the last point does not address off grid power plants the incentives favor the larger grid connected power plants. Thus the new law has only minor impact on small renewable energy projects.

SERNA approved in 2005 a sustainable energy action plan which is currently updated for the period up to 2025 (Plan de Acción para la Implementación de una Política Energética

Nacional Sostenible). The plan covers the whole range of renewable energy, energy efficiency and rural electrification and defines several milestones including the goal to reduce the national fuel wood consumption by 10 % and to disseminate 40.000 improved stoves by the year 2010. However, SERNA does not implement any off-grid projects. Its mandate is to define the general energy policy of the government and the dissemination of improved stoves is spearheaded by the two NGOs “PROLEÑA” and “AHDESA”.

As described above the policy regarding rural electrification is mainly developed and executed by ENEE via the OES-FOSODE. FOSODE was able to raise significant funds of international donors in the last decade, resulting in an annual budget of around $10 million per year.

1.3 Institutional set up in the energy sector, Activities of other donors

Energy policy in Honduras remains highly disorganized with many different institutions involved without a clear separation of responsibilities and tasks. The main conflict lies in the fact that the Ministry for Natural Resources and Environment (Secretaría de Recursos Naturales y Ambiente - SERNA) through its subsection Dirección General de Energía (DGE) has the formal responsibility while the national electricity utility Empresa Nacional de Energía Electrica (ENEE) whose director takes up even the rank as minister of the government is de facto more powerful and keeps the control of all the activities connected to the SIN.

Even the “Fondo Social de Desarrollo Eléctrico” (FOSODE) which has been founded in 1994 with the aim to increase the electrification rate is managed by the “Oficina de Electrificación Social” (OES) as a subsection of the ENEE. Consequently all grid connected activities are implemented by the ENEE while SERNA in cooperation with some international donor’s implements off grid projects based on solar and hydro energy. At the same time even the ministries of health and education and the “Consejo Hondureño de Ciencia y Tecnología” – COHCIT (with the rank of a ministry as well) have implemented some off grid renewable energy projects in Honduras parallel and without coordination.

Also, during the restructuring in 1994 based on the law “Marco del Sub Sector Eléctri co, Decreto Legislativo No. 158-94” the Comisión Nacional de Energia was founded, which was supposed to regulate the Energy market. But currently this institution seems to have no power and importance at all.

Honduras has participated in the HIPC initiative and developed a Poverty Reduction Strategy. During this process, sector tables for the coordination of national policy with international donors and the participation of the civil society have been set up. The former ‘subsector table’ for energy has been validated by the new government as an own ‘sector table’, but is currently not working.

Energy is only a side topic for most Honduran NGOs and also the umbrella organization of development organizations, the “Federación de Organisaciones Privadas de Desarollo” – FOPRIDEH with currently 73 members, is not focusing on the field of rural energy supply. There are two Honduran NGOs, AHDESA and PROLEÑA which have experiences in the field of the introduction of improved stoves. They are both partners of the EnDEv-HO Project. The project involved several NGOs in the dissemination of stoves and SHS of which the most important is “Hermandad de Honduras”. In the field of rural electrification almost no information exists about Honduran NGOs that implement own projects. This reflects the strong monopoly of ENEE, which still is regarded by the majority of the Hondurans as responsible for rural electrification. However, some very small scale activities have been carried out by the “Fundación Hondureña de Investigación Agrícola” (FHIA) in the field of micro hydropower. As FHIA is also a partner of EnDev-Ho.

In the field of photovoltaic systems about 8 providers work in Honduras of which Solaris, Soluz, CADELGA and Soluciones Energeticas are the most important. The Solar companies in general have difficulties to develop markets in rural areas. The different subsidy schemes of international donors make the commercial distribution even more difficult. Especially Soluz accumulates interesting activities in the field of cash and credit sale as well as in offering fee

for service options. About 6.000 SHS have been sold to rural customers. The credit offer requires a 50 % down payment and 3 to 6 monthly rates with an interest rate of 3 % per month. The fee for service approach with 1.500 SHS had to be terminated after the end of World Bank credit support, as the service fees have not been sufficient to cover the primary investment costs of the systems. SOLUZ has calculated that a monthly fee of 18 $ would be required while the customer has to pay the battery by himself. There are just a few producers of agriculture machines that produce hydropower turbines and the technical level is very low as well. Customers are mostly owners of coffee farms. Therefore FHIA started to produce hydropower turbines itself.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	14.000
Cooking Energy for Households	15.300
Electricity for social infrastructure	20.000
Cooking/ Heating Energy for social infrastructure	8.500
Energy for prod.use/income generation	11.000

3. Key Interventions

Training and financial assistance for NGOs and communities to promote:

- Micro hydro and PV based electricity supply for social infrastructure and households,
- battery charging station for remote households,
- Dryers for productive use,
- Improved Stoves.

Further development and follow up of training courses for developers in renewable energy projects, in order to improve knowledge of cooperating institutions and related technicians.

Expected output: 2745 HH connected to the grid or provided with a SHS, 3000 improved stoves disseminated to families, 40 welfare institutions with electricity, 10 welfare institutions with improved stoves.

4. Project Approach

4.1 Energy technologies/services promoted by the EnDev project

The EnDev Honduras project will promote xx energy technologies/services: (1) Improved biomass stoves, (2) Micro Hydro Power, (3) Solar Home Systems (4) dryers for food processing and (5) Small Biogas plants for farmers.

4.2. EnDev Approach

4.2.1 Improved stoves

Target Group: Poor Households, Welfare Institutions and Small Enterprises in rural and peri-urban areas

Target geographic area: Nationwide

Implementing Partners:

- AHDESA,
- PROLENA.

Key interventions/ activities/ outputs:

EnDev-Honduras will support the training of local NGOs on how to construct Justa stoves and provide financial resources for some materials needed for the construction of stoves. For this purpose EnDev will make financial agreement with trained organization. It is planned to limit subsidies to 50% of the costs of a stove. The owner is expected to contribute to the purchase either in cash or materials and labour (minimum 50%).

4.2.2 Micro Hydro Power

Target Group: Poor Households, Welfare Institutions and Small Enterprises in rural and peri-urban areas

Target geographic area: Northern provinces of Honduras

Implementing Partners: FHIA

Key interventions/ activities/ outputs:

EnDev-Honduras will continue to promote micro hydropower to improve the energy situation for lighting and household applications.

At least three additional micro hydropower systems will be installed feeding into a mini grid. Battery charging stations will be attached to the MHP to extend the grid's outreach where demand exists. Training on both technical and business skills will be provided. The mini grids and battery stations will be the property of the village and run by village committees, as it is common practice in other sectors, such as water. In order to reduce management and metering costs, tariffs for households will be based on a flat rate system. Battery charging stations will be operated by a local workshop or trader or the village committee. Financing will take the form of a mixture of local contribution (cash and/or labour, 15–30 % of the cost), subsidy (35-60 %) and technical support of non profits organizations. On the supply side, workshops will be held on how to produce efficient turbines. In order to ensure that the market is up-to-date with the latest developments in the sector, technology will be transferred from other hydropower projects.

4.2.3 Solar Home Systems

Target Group: Poor Households and Welfare Institutions in rural and peri-urban areas

Target geographic area: Nationwide

Implementing Partners: Hermandad de Honduras and other NGOs

Key interventions/ activities/ outputs:

EnDev-Honduras will promote the dissemination of at least 1000 solar home systems to rural families in close cooperation with the NGOs "Hermandad de Honduras" and "PRORENA Olancho". EnDev funds will be used to subsidize up to 60% (maximum) of the end consumer prize.

4.2.3 Solar dryers and biogas for productive use

Target Group: Small Enterprises in rural and peri-urban areas

Target geographic area: Nationwide

Implementing Partners:

- Coffee and cacao cooperatives as well as stock farmer associations

Key interventions/ activities/ outputs:

Coffee and cacao cooperative will receive training to build and maintain solar dryers by themselves. The plastic parts of the dryers (ca. 54% of the total costs) are subsidised by EnDev, while the cooperatives provide local materials and working power. In specific cases this intervention might be accompanied by improved drying ovens (for emergency use during the rainy season, when solar drying is not sufficient) or diesel generators to improve local value adding and processing efficiency of cacao and coffee producers.

Additionally, the project will promote the construction of small bio digesters to produce gas for cooking and organic fertilizer.

4.3 Risks for implementation

Honduras is currently characterized by great political instability. The international community did not recognize the new government. Up to now the political conflict did not affect the activities of NGOs working in rural areas, but this may change if political stability doesn't come back. It is expected that the situation will calm down with the elections planned for November 2009.

5. Impact Monitoring & Evaluation

The Impact M&E activities are designed accordingly to the framework of the Sustainable Development concept of GTZ, considering the Economic, Environmental and Social dimensions.

Continuing with the work done in EnDev1, every key intervention and activity will be accompanied by M&E activities not only regarding the Impact level but also following up on activities, processes and outcomes;.

Planned Impact Monitoring & Evaluation Methodology

(X) a baseline survey for impact evaluation is planned and scheduled for 2010

(X) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

6. Budget

		EUR
1	Human Resources and travelling	545.000
2	Equipment and Supplies	633.000
3	Funding Financing Agreements/Local subsidies	287.000
4	Other direct costs	315.000
5	Total direct costs	**1.780.000**
6	Mark up costs/administrative overheads/imputed profit/	220.000
7	Cost price	**2.000.000**

Mauretania

1. Situation Analysis

1.1 Energy situation

Supply and Demand

The Islamic Republic of Mauretania consists up to 80% of desert. Wood and charcoal are the main sources for energy and cover nearly 90% of the nation's household energy needs. The sources of fuel wood are found almost exclusively in the south of the country, especially the Senegal Valley. Despite the importance of wood for the national energy balance (two ministries are responsible for the management of this resource), the current inventory of the nation's forests is not well known and available data are not always reliable.

According to a study carried out by FAO in 2005, the country's forests have a natural production capacity of only 560.000m3/year. This is contrasted with an annual wood consumption of over 1 million m3. As shortly as 30 years ago, much of this wood had its origin in the governorates of Gorgol and Assaba; quite recently, however, Guidimakha has become the principal source of charcoal due to the virtual disappearance of the forest resources in other governorates.

So far Guidimakha's forests have been relatively spared but pressure on the remaining forest resources is mounting. A GTZ study carried out in 2002 estimated the region's production capacity of wood at 180.000m3/year, a reduction of 32.000m3 from figures a decade earlier. However, only 25 per cent of this production was thought to be accessible for its inhabitants. This poor accessibility has caused localized overexploitation of forest resources in the vicinity of towns and villages and it is not uncommon now for women and children to walk up to three hours a day on average in search of firewood.

Domestic consumption of fuel wood in Mauritania is estimated at 109 kg wood and 35 kg charcoal per capita annually (Djedje, 2007). Estimations of wood consumption in Guidimakha are somewhat higher (Prakti Consultants, 2009). The estimated regional demand for wood of 106.000m3/year cannot be met, especially since much of the charcoal produced in the region is transported to Nouakchott. Hence the fuel wood prices have doubled in the past six years.

Market situation and access rate

In 1999 the use of fuel wood covered 87% of the national energy needs - 60% by wood and 27% by charcoal. The remaining 13% of total energy needs involved gas (9%) and electricity (4%). The greater part of the charcoal (approx. 66%) is consumed in Nouakchott, home to more than a quarter of Mauritania's population; in the rural areas, the use of wood predominates.

A recent study, conducted by the National Statistic Office and UNICEF in 2007, indicated that more than 97% of the population in Guidimakha used fuel wood as the primary energy source (77% from wood and 20% from charcoal).

The use of butane gas, although gaining in importance both among urban households and even rural households, faces two important obstacles: the monopoly of the distribution company "Somagaz" and an institutional support that is weak and irregular. The poorest segments of society do not have the means to access this source of household energy.

Despite the importance that the population attaches to its use, only a limited number of households in Guidimakha (1.8%, according to the same UNICEF study) utilize gas as a secondary source of energy (second to fuelwood) for such tasks as reheating meals or the brewing of tea. Electricity as an energy source for cooking is only marginally used but solar energy is becoming more popular since a number of years.

Key problems of the energy sector

1. The current level of fuel wood consumption is unsustainable as demand is exceeding natural growth. Efforts to contain wood fuel consumption on a sustainable level, e.g. banning the felling of live trees and the production of charcoal, have not (yet) succeeded. Policies in general suffer from a lack of coordination between the Ministry of the Environment and the one of Energy.
2. Past efforts to reduce the consumption of fuel wood through the promotion of butane gas in the eighties did not yet yield widespread results. As long as the marketing of butane gas is managed by a single, inefficient company, the increased demand for this product will not be met, given the company's limited storage capacity and supply constraints.
3. The introduction of the improved Sakkanal charcoal stove in the nineties had positive effects – a population interested in the use of improved stoves – but not to the extent that was originally anticipated. Design drift and poor availability in rural areas have been seen as reasons for these limitations.

1.2. Policy framework, laws and regulations

The fight against poverty is a major challenge for the Mauritanian Government. With a Human Development Index of only 0.465 (rank 154), Mauritania is one of the least developed countries. Nearly 47% of the population lives on less than $ 1 per day according to a study carried out in 2004 (Enquête permanente sur les conditions de vie).

Despite a significant decrease in the poverty rate since 2001 (51.0% to 46.7%), poverty remains high in the rural areas. Guidimakha, the poorest region of Mauritania, is particularly affected: the incidence of poverty is nearly 62% amongst a population of approximately 200,000 inhabitants.

A Poverty Reduction Strategy (PRSP) was adopted in 2001 and renewed in 2004. The PRSP sets among other objectives a reduction in the level of poverty from 46.7% in 2004 to 25% in 2015, in line with the Millennium Development Goals. As far as the energy sector is concerned, the strategy envisages actions to ease the domestic burden of rural women. It was supported by a Sector Policy Note developed in 2004, in consultation with the European Union and CILSS (Inter-State Committee for the Fight against Drought in the Sahel), and by a National Action Plan for Household Energy, drafted in 2008.

The Action Plan's strategy revolves around the protection and expansion of forest resources and improvements in the energy efficiency of wood (promotion of improved stoves, better charcoal production techniques). The promotion of alternative sources of energy such as butane gas and the use of other natural sources such as peat or Typha are to be stimulated as well. The plan also advocates the decentralized management of natural resources; in this respect, the State had already adopted a new forestry code in 2007.

Finally, the Ministries of Environment and Energy are supposed to create a national agency that will have to implement this national strategy. (Plan d'Action National en Energie Domestique, 2008).

Given this context, the proposed EnDev project will fit perfectly in the strategy to fight poverty as spelled out in the national Strategy and, more broadly, contribute to achieving the Millennium Development Goals. This applies especially to the project's intervention zone of Guidimakha, where the desire to preserve the environment is one of the priority components of a strategy to curb poverty in the region (Regional Programme for the Fight against Poverty, PRLP Guidimakha 2004). Moreover, the project will contribute to a reduction of poverty through the creation of jobs, revenues and improved standards of health.

In the same vein, the EnDev project will participate fully in efforts to achieve the goals set under the National Action Plan for Domestic Energy, one of which is the dissemination of improved stoves on a large scale to reduce the demand for fuel wood. The proposed project

will reach 70,000 people - more than one third of the population in the country's poorest governorate. It will also lay the base for up-scaling activities to other intervention zones of the German Technical Assistance Programme.

1.3. Institutional set up in the energy sector, activities of other donors

Since 2000, GTZ has been implementing natural resources management projects in Mauritania. The on-going ProGRN supports rural communities in the two southern regions of Guidimakha and Hodh El Gharbi to conserve and rehabilitate natural resources. At present, ProGRN works with 35 associations with a membership of approx. 18,000 in Guidimakha. It collaborates closely with two local NGOs, one of which, ADIG, has some experience in promoting the use of improved stoves.

As a complementary activity to its other interventions, the ProGRN has supported the introduction of improved stoves (cement fixed stove) in the past. Although the advantages of these stoves were demonstrated and the population showed much interest, the chosen approach was seen at the time as not sufficiently producer and market-oriented. A study conducted in April 2007 analyzed once more the domestic energy situation in Guidimakha and proposed a reinforcement of the same activity within ProGRN but on a wider scale and with more emphasis on the quality and commercial aspects of the technology adoption process. As a result, in 2008 the programme re-established its "stove component". Already the stove component cooperates closely with ProGRN's extension workers who are based in the region's larger villages.

1.3.1 Governmental institutions

Two Ministries are relevant at the national level for the implementation of an energy conservation project: the Ministry of Environment and the Ministry of Energy. In Guidimakha, the Ministry of Environment is represented by the "Service Régional de l'Environnement", which at the present is the main partner of the GTZ's ProGRN programme. The "Service" is already regularly updated on progress of the stove component. The Ministry of Energy is not represented at the regional level but is considered by the project as an important future partner.

In contrast, the Ministry of Women Affairs, which in the past has supported an improved stove ('Maslaha') project, has a regional representative at Sélibaby, Guidimakha's administrative centre. This Ministry will be included in EnDev's awareness-raising and capacity-building efforts, and future scaling-up activities.

The University of Nouakchott includes the Research Centre for Renewable Energy. This institution will be integrated in project activities, especially those related to quality control.

1.3.2 NGOs and local associations

Other international organizations implementing natural resource management, food security, and rural development projects in the region include KfW Bankengruppe, GRDR (Groupe de Recherche et de Réalisations pour le Développement Rural), COUNTERPART and ACTION CONTRE LA FAIM, all with activities aimed at poverty reduction at the household level. GRDR envisions the development of a local radio station that will cover the proposed EnDev intervention zone.

The GTZ is present in the region with a second programme that envisages the strengthening of the position of women in local society. Its interventions have been instrumental in the formation of a new NGO "RavDev" composed of experienced female community workers. In addition, there exist a number of dynamic local associations, many of which are aimed at promoting the interests of women. They have the potential of becoming effective partners in communication and marketing within the proposed project.

In just one other region of Mauritania (governorate of Brakna), the introduction of improved stoves ('Jiko') is being promoted by the Mauritanian NGO, Banlieues du Monde. The EnDev

project will exchange experiences with this and other organizations working on the same issues within Mauritania and the sub region.

As to the private sector, working relationships have already been established with a large number of metal workers, bakery operators, masons, retailers and businessmen in an effort to study existing market mechanisms and to initiate collaborative and participatory approaches.

1.4. Other major activities in the country financed by BMZ or DGIS

BMZ finance three main projects in Mauritania, implemented by GTZ:

Management of natural resources:

Natural resources are being sustainably managed in Mauritania's more significant ecosystems, with the population organised into stakeholder groups. The programme also aims for policy advising on the national level, enabling the population to make better use of their possibilities in regard to the local regulation of resource use, and improving the competencies of advisory organisations.

Good Governance:

National institutions, municipalities and civil society organisations all apply the principles of good governance. Democratic principles such as a commitment to human rights, power sharing, popular participation and not least the strengthening of the rights and position of women in Mauritanian society are taken seriously and applied in reality.

Sustainable management of fishery resources:

GTZ is supporting Mauritania in implementing a sustainable economic policy for the fisheries sector. The GTZ project makes a contribution to achieving a balance between preserving and utilizing resources.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	n.a.
Cooking Energy for Households	7.,000
Electricity for social infrastructure	n.a.
Cooking/ Heating Energy for social infrastructure	n.a.
Energy for prod.use/income generation	50 bakeries

3. Project Approach

3.1. Energy technologies/services promoted by the EnDev project

3.1.1 Selected technologies/services and approaches

Two different technologies will be promoted:

(a) Improved cooking stove (VITA stove)

It is a household cook stove for the use of firewood. It is manufactured out of metal by local artisans. The product has been developed in West Africa on the initiative of CILSS. It has been successfully introduced to the market in other countries of the region.

Based on good experiences in other countries, some mud stove models will also be tested.

(b) Improved bakery oven

Product development is already ongoing in Senegal in the Centre de Recherches en Energie Renouvelable (CERER) in Dakar. The programme will pilot the results of this research in the implementation area.

3.1.2 Rationale of the approaches

a) Improved cooking stove (VITA stove)

The VITA is using at least 40% less firewood than the three stone fire and the currently available "improved" wood stove Maslaha. It is easy to manufacture at relatively low costs and has been well accepted in other African countries.

50% of the target population is already using the Maslaha stove which is produced by local metal workers. The basic rational of the approach is to use the existing structures of the Maslaha stove for the introduction of a new and better product.

b) Improved baking ovens

Bread is an extremely important product in Mauritania. Estimated consumption in Guidimakha is two local breads per person per day (Djedje, 2007). About 50 baking ovens are in use in the regional capital of Sélibaby and it is assumed that there is at least one bakery in each village with more than 300 inhabitants, bringing the total to about 600 bakeries in the region. An average bakery consumes between 86 and 103 kg of wood per day, which amounts to an expenditure of about 100 Euros per month. With improved baking technologies, the enterprises can reduce their energy expenditures and improve their competitiveness, resulting in additional income.

Even in areas of Guidimakha where electricity is available, bakeries do not produce bread with this source of energy because consumers have demonstrated a strong preference for bread baked with wood. The two types of baking oven that are in use in Sélibaby are not energy efficient (Prakti Consultants, 2009) and it has been recommended that the project promote improvements to existing baking ovens to reduce their consumption of firewood.

The objective of the project is to form a group of specialists who will be able to build and improve existing ovens in Sélibaby and the larger surrounding villages using experiences acquired in the subregion.

3.2. EnDev approach

a) Improved cooking stove (VITA stove)

In Guidimakha, more than 50 % of the households that use wood as a fuel already own the locally available "improved" wood stove (Maslaha). Controlled cooking tests carried out by Prakti Consultants in Guidimakha in February 2009 have shown that locally manufactured VITA stoves used at least 40% less firewood than the locally produced 'Maslaha' wood stove, which in fact did not perform any better than the traditional 3-stone stove.

Based on the results of these tests, the purchase of a VITA stove at an estimated price of approx. 8 Euros will be amortized in two months or less, dependant on the frequency of use. In terms of energy-saving, an average sized household could save about 550 kg of wood per year or about 50 Euros when it switched use from the Maslaha to the VITA.

A recent study carried out by ProGRN (June 2009), indicated that people are ready to buy an improved stove such as the VITA at prices that range between 7 Euros in urban area and 12

Euros in rural areas. People in rural area are ready to pay an improved stove at a price that is higher than people in urban area for two main reasons:

Rural households are bigger and spend more money on fuelwood:
The governorate of Guidimakha is composed of 3 main ethnies: Maure, Fulbe and Soninké. While in Sélibaby, these ethnies are largely represented, it is not the same in rural area, where Soninké families are more present. In average, a Soninké family consists of 14 adults and 21 children and can even reach up to 100 inhabitants in a same household, while the Fulbe households are composed of only 7 adults and 9 children and the Mauren households 9 adults and 13 children. Soninké families spend therefore more money on firewood than the other families and are even more aware of the scarcity of fuelwood.

Rural households have access to social transfer money from migrants:
Soninke families take also advantage of the migrants, who live in Europe and send their monthly financial contributions, which is not always the case among other ethnies.

At present, a real demand for energy-saving stoves exists that can only be satisfied with imports of the 'Maslaha' charcoal and wood stove, from the capital of Mauritania, Nouakchott, and Mali. These prices also constitute an attractive income for stove producers. In addition, women who already use the VITA (about 20) have indicated that they would again buy another one to replace the current stove at the end of its useful life.

The project's approach will be to stimulate existing market mechanisms and to expand on them by introducing new distribution networks, especially in the rural areas.

Vita Stove	
Target customers	Rural and peri-urban households; Accumulative app. 22,000 stoves to be sold; between 1-2 stoves per household.
Target geographic area	The region of Guidimakha and its regional capital in particular
Implementing partner and intermediaries	ProGRN Local stove producers and retailers NGOs/microfinance institution Research Centre for Renewable Energy, Nouakchott
Capacity development	Training of producers in technical skills
Quality Management	Introduction of a quality label certified by a committee composed of producers, distributors and consumers, supported by the national research centre for renewable energy (Centre de Recherches en Energies Renouvelables, Nouakchott)
Marketing and sales strategy	The price of these stoves will be held at affordable levels by introducing techniques that will improve local production capacity and lower per-unit production costs. Well-established women's associations and travelling salesmen who are very active in the region will be included in a distribution network capable of reaching potential customers in remote villages. The dissemination of the stoves will be supported by proper branding and a professionally designed promotional campaign that uses, next to more traditional means of communication, radio spots in the various regional languages.
Subsidies/credit scheme	Direct subsidies that may interrupt existing market mechanisms will be avoided but the use of a revolving fund is contemplated to stimulate and support a first round of production and sales of the new stoves, particularly in the rural areas.

Key interventions/activities/outputs

1. Capacity building and support to stove producers on technical and entrepreneurial skills through an optimization of production techniques and assistance in getting materials and equipment.

Main activities are the organization of training courses in production techniques and management, and exchanges with experienced stove producers in the sub region. A partnership will be forged between producers and businessmen to guarantee an uninterrupted supply of raw materials. The project will also introduce tools and production methods aimed at improving the quality and the quantity of energy-saving stoves.

The expected outputs of these activities are:

50 producers capable of producing quality stoves at affordable prices in quantities (about 150 stoves per producers/year).

2. Introduction of a quality control system for locally manufactured stoves managed by a committee of stove producers, distributors and end-users, supported by a nationally recognized research center.

A control system will be developed that checks the quality at every stage of the production process: quality of material used, standardized production techniques, verification of final product for labelling.

The expected output is a locally recognized standard of stove quality accepted as the norm by distributors and consumers.

3. Organization of marketing campaigns for improved stoves.

Different communication channels will be used to position improved stoves on the markets, following the recommendations of a national agency for communication and media utilization.

Awareness-raising on the stoves' advantages will be supported through village-meetings, demonstrations during special events and role play (theatre). Local (under development) and sub regional radio will be used for communicating on efficient energy use and improved stoves. Regular monitoring of consumer reactions and satisfaction will take place.

The expected output is a high level of awareness among households regarding the benefits of improved stoves and an increased and sustained demand for these products.

4. Creation of new market outlets

Retailers' knowledge about improved stoves and the importance of quality control will be improved. Project will also support stove producers wishing to sell their products to the consumer without intermediaries. In other cases, collaboration will be sought with women associations interested in distributing improved stoves in rural areas. A revolving fund will be set up for these women to finance their first round of orders. Finally, the existing door-to-door sales system will be used for the distribution of improved stoves.

The expected outputs are increased sale figures for improved stoves and a sustained demand.

5. Networking and coordination with the regional representatives of the Ministry of Environment and the Ministry in charge of Women Affairs, and contact with the Ministry of Energy in Nouakchott on the promotion of energy saving technologies in line with the guidelines of the National Action Plan for Domestic Energy.

Workshops will be organized to present the objectives and approach of the EnDev project to local and national authorities. A regular exchange of information with the representatives of the three ministries will take place on project progress and experiences. Ministry representatives will be invited to participate in the evaluation of project implementation.

The output is a contribution to the national strategy for domestic energy. Furthermore, the ministries are informed about the project progress.

b) Improved baking ovens

The project will implement improvements on bakery ovens of the kind that were adopted in the North Eastern of Senegal. It will collaborate in this respect with CERER in Dakar. Oven builders will be trained in proven construction techniques.

An awareness campaign will be implemented among bakery operators, emphasizing in particular the financial benefits resulting from fuel wood savings with the use of improved stove technology.

A credit arrangement for the bakery operators will be sought with one of the local (micro)finance institution.

The expected output is a large number of bakers deciding to invest in energy-saving improvements to their ovens.

Baking oven	
Target customers	50 bakeries (250 bakery owners and employees)
Target geographic area	The region of Guidimakha
Implementing partner and intermediaries	ProGRN The association of bakers of Guidimakha Oven producers NGOs/microfinance institution Research centre in Senegal (CERER)

3.3 Risks for implementation

3.3.1. Political situation

Political instability could delay the implementation of activities, especially those that would require the involvement of government officials. Likewise, any change of emphasis in Mauritania's fight against poverty or in its strategy for domestic energy, especially with regard to the use of butane gas, could affect the relevance of this project's objective to reach a large number of persons with improved stove technology.

3.3.2. Availability of material

At present most metal stoves are produced from oil drums. These metal drums are increasingly being replaced by plastic ones, which causes serious problems for the procurement of raw materials. The inevitable gradual switch to the use of metal sheets, necessary for the production of the VITA, will be influenced by fluctuations in the prices of the base materials.

3.3.3. Climate

Severe droughts have not been unusual in Guidimakha. If such an event were to take place during the project's life-span, household interests would quickly shift from energy-saving and environmental protection activities to more survival-oriented behavior with concomitant change in household expenditures patterns that would negatively impact the uptake of improved stove technology.

4. Impact Monitoring & Evaluation

Expected Impacts of project intervention

With the implementation of the EnDev project, approximately 13,000 households will use at least one improved stove. Compared to the stoves actually in use in Guidimakha, the use of these new stoves will have positive impacts in three principal areas. In the health domain, respiratory diseases caused by harmful and smoke will be reduced. This will make a contribution to increased maternal health and lower child mortality levels (MDG 4 and 5).

In the socio-economic domain, production of improved stoves will create employment and increase the revenues of local metal workers and bakers. As a result of household savings in time on wood collection and in expenditures on fuelwood purchases, households will have the potential to spend more on health and education and to seek other sources of income. These impacts contribute to a number of millennium development goals (1: eradicate extreme poverty and hunger; 2: universal primary education; 3: gender equality and women empowerment).

Finally, the reduction in wood consumption for energy purposes will support an environmental regeneration and thus contribute to MDG 7 (environmental sustainability).

These various direct and indirect impacts of improved stove use will be monitored and evaluated with assistance of EnDev's M&E Unit. The environmental impacts will be examined using ProGRN's ecological monitoring system.

Planned Impact Monitoring & Evaluation Methodology

Please tick:

(x) a baseline survey for impact evaluation is planned and scheduled for November 2009 - January 2010 (approx. date). First data have already been collected.

( ) a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for ……(approx. date)

(x) the project will use other methods for impact monitoring (ProGRN executes an annual natural resource survey (vegetation cover index) in the proposed project zone since 2004)

(x) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

(x) the project would be interested to get financial support for impact evaluation.

5. Budget

		EUR
1	**Human Resources and travelling**	140.000
2	**Equipment and Supplies**	64.000
3	**Funding Financing Agreements/Local subsidies**	37.000
4	**Other direct costs**	114.000
5	**Total direct costs**	355.000
6	**Mark up costs/administrative overheads/imputed profit/**	45.000
7	**Cost price**	400.000

Mozambique

1. Situation Analysis

1.1. Energy situation

Mozambique has considerable energy resources with an estimated hydropower potential of 12,000 MW and also gas reserves (estimated at reaching 700 billion cubic metres) and vast coal reserves (estimated to reach 140 million TJ) with the potential of generating approx. 500 MW and 5,000 MW respectively. Peak electricity demand was 416 MW in 2008 with an energy consumption of approximately 3,032 GWh. The increase in power consumption has been significant during recent years with average annual increases in the order of 6 to 8 % over the last 10 years. These figures reflect supply to domestic, commercial and industrial consumers in the national power network supplied by Electricidade de Moçambique (EdM) the national power company.

Approx. 136 MW (61 MW from hydro and 75 MW from diesel and gas) are supplied by EdM's own generation, mainly by ageing plants requiring refurbishment. The remaining demand is supplied through a purchase agreement with Cahora Bassa, a hydropower plant at the Zambezi River with an installed capacity of 2,075 MW.

The number of consumers has grown with more than 10% annually since the year 2000 and was about 614,510 in 2008. At present still only 13.2%2 of the population has access to electricity.

Power demand forecasts indicate that with an average projected growth rate of 6% p.a. Mozambique will reach a maximum demand of 1,350 MW by 2030 and a projected consumption of 8,300 GWh. From 2009 until 2013, it is foreseen that demand will reach 560 MW by 2013. For meeting the country’s electricity needs in a timely manner, it is imperative given that the Cahora Bassa’s reserve for domestic market requirements of 400 MW is almost exhausted. Therefore it is important that stakeholders urgently embark on implementing a major scheme based on the Generation Master Plan underway.

Biomass coming from an estimated 30.6 million hectares of forest lands for wood fuel and charcoal represents about 80% of the total energy consumed by the households. This value is even bigger in remote rural areas. Every year it is estimated that 16,000,000 m3 of forestry resources are burnt to meet rural energy requirements3.

The present consumption of oil products is in the order of 600 million litres per year, transport being the lead user followed by agriculture. The turbulence in international oil markets since 2004 resulting in abrupt fluctuations of oil prices have become a source of social unrest. The reduction of the Mozambican energy bill, especially for imports of liquid fossil fuels, which in 2006 amounted to 14% of national imports, deserves special attention. Today both liquid petroleum gas (LPG) and kerosene have only a small impact in terms of the national energy balance. LPG is mainly used in the urban centres of Maputo, Matola, Beira and Nampula. However due to bottlenecks in supplies the national consumption does not exceed 14,000 tons.

Mozambique´s considerable energy resources enable the country to meet its internal demand and still export energy to Southern and East African countries. The availability of energy resources including hydro, natural gas and coal, plus the geographical positioning of the country – acting both as route to the countries inland well served by harbours, railway and pipeline systems, and as an interface between the Southern African Development Community (SADC) and the Eastern African Community (EAC) gives Mozambique a privileged, strategic position and role in the regional energy sector.

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[2] Source: 2008 – Unit for Management and Commercial Performance of EdM.

[3] Amir Ghazvinian, Impacts of Deforestation in Mozambique

However despite the countries significant electric power potential there should be no rapid shift expected from biomass to electricity use because Mozambique is a vast country with the majority of the population living in rural communities dispersed throughout the provinces. Energy solutions must take into consideration this reality and adapt to it by combining an intensification of electrification in those areas served by the national electricity grid and the adoption of modern technological solutions and energy services in particular for remote areas, using sustainable biomass, solar and hydropower resources.

The market situation for photo-voltaic (PV) and hydro power technologies and services is still in a very incipient stage. In the case of micro and pico hydro there are no readily available products available in the country which makes prices prohibitive for communities and individual households. However there is a good potential for local manufacture of water wheels and pico turbines, although the market is still very limited and therefore local services tend to be rather expensive. In its first phase, ENDEV MOZAMBIQUE has started pioneer activities in the local manufacture of water wheels for upgrading traditional maize mills and the manufacture of pico turbines with most promising results. Therefore it is envisaged to upscale micro/pico hydro power activities sustainably on a local level with an appropriate and cost effective approach for technical capacity building, technology transfer and market development.

The market for PV is divided into steadily growing local market spots and mainly capital based PV providers working with directly imported equipment for government projects funded by donors. The local market is efficient and reliable but informal, with low quality products of Chinese origin coming mainly from RSA. Market actors are lacking technical knowledge. In parallel to the dissemination of products from the local market ENDEV MOZAMBIQUE has started designing an energy efficient compact small solar home system (SSHS) with a local enterprise. In the case of PV for household lighting, technical capacity building, technology transfer and market development is envisaged within a Public Private Partnership (PPP) measure with German enterprises and higher quality products.

In addition to the overarching need for developing the countries extensive energy resources (hydro, coal, gas and biomass) for both domestic and regional consumption the main challenges in the power sector in Mozambique are:

- Ensuring that affordable electricity supply is available to meet the rapidly growing domestic demand. In the near term, this will involve the continued extension of the grid with a focus on loss reduction and intensification of the grid,
- Reaching the vast areas of the country beyond the national grid managed by EdM. The GoM is committed to supporting decentralized electrification of social infrastructure (rural schools, clinics and administrative offices) and to increase access to modern energy services to villages and rural enterprises through PV systems, micro/pico-hydro schemes, modern biomass energy, and other Renewable Energy Technologies (RETs),
- Ensuring that power shortages do not become a constraint on economic growth. Several GoM proposed generation and transmission “mega-projects” will address sufficiency and security of supply for the medium to long-term,
- Institutional strengthening and capacity development of the main sector public institutions (MoE, EdM, FUNAE and CNELEC) but also of the private sector composed of NGOs, MFIs, and local enterprises working with RETs, in order to improve their respective performance, governance and effectiveness.

1.2. Policy framework, laws and regulations

Within PARPA (PRSP), the programme for reduction and alleviation of absolute poverty, the GoM has been granting high priority to efforts to increase access to electricity for the population. Within the PARPA II the GoM has affirmed the critical role of the energy sector in reducing poverty. Adequate and equitable access to energy resources and services such as the provision of energy services to households, rural schools, administrative offices, and

hospitals in rural areas is defined as a key driver of growth and poverty alleviation. The energy-related goals set in the PARPA are being operationalised by GoM through a number of strategies, investments and studies that have been prepared or are under way. The PARPA II (§507ff) outlines a programme for the energy sector, which entails: Electrification, Liquid Fuels, Renewable Energy, and Intersectoral Collaboration.

The Energy Policy approved March 3rd 1998 by the Council of Ministers under Resolution 5/98 established with the following objectives among others relevant for ENDEV MOZAMBIQUE.:

- Guarantee reliable supply of energy, at lowest possible cost, in order to meet present demand and future levels based on economic development trajectories,
- Increase the energy options available for household consumption,
- Secure better efficiency in energy utilization,
- Promote the development of environmentally friendly conversion technologies, namely hydro, solar, wind and biomass,
- Promote competitive, dynamic and more efficient entrepreneurs.

In March 2009 the Policy for Renewables was defined with the following objectives among others with relevance for ENDEV MOZAMBIQUE:

- Increase the access to modern energy services of high quality and accessible prices,
- Reduce poverty and contribute to the Millennium Development Goals,
- Contribute to the generation of local and national income and employment.

The revised Energy Strategy aims to align Mozambique with best international practices for efficient energy utilization, raising awareness amongst its citizens about good environmental practices, diversifying the energy supply matrix, giving particular emphasis to new and renewable sources of energy and to the opportunities contained within the Clean Development Mechanisms, under the Kyoto Protocol. It should ensure energy availability to sustainably meet the requirements of national socio-economic development by undertaking the necessary actions to increase access to diversified energy sources in a sustainable way, contributing to the welfare of the population and the country's socio-economic development.

The strategy recognizes accelerating electrification efforts, giving priority to rural areas, through the expansion and intensification of the national grid, the utilization of Renewables, the optimization of low cost solutions, and the introduction of measures which will ensure productive and efficient use of electricity (as low consumption/high efficiency light bulbs).

The GoM aims to support regional integration and reflects in its national legal framework the best practices in environmental protection. Mozambique has its own Oil Law and Electricity Law. A Regulation defines the licensing of electricity installations, another Regulation establishes the competencies and procedures regarding concessioning of production, transmission, distribution and marketing of electricity, as well as its importation and exportation. Other regulations establish the norms for the national grid, the instructions for CNELEC and its regulatory functions, and the Technical Unit for Implementation of Hydroelectric Projects (UTIP).

Based on the new Energy Sector Strategy with its specific subsectors of Electrical Energy and New and Renewable Energies, as well as the Energy Strategic Plan 2009 – 2013, the GoM has prepared a comprehensive 5-year plan for energy development and access. ENDEV MOZAMBIQUE is fully aligned and consistent with this plan, with PARPA and with the new sector strategy. ENDEV MOZAMBIQUE will specifically support: (i) grid densification by scaling-up electricity connections in peri-urban areas; (ii) promote market development for renewable energy technologies for household lighting and social infrastructure; and (iii) technology transfer and capacity building for the main implementing partners mainly, but not exclusively of the private sector.

1.3. Institutional set up in the energy sector, Activities of other donors

The public sector is represented by:

- The Ministry of Energy (MoE) is responsible for national energy planning and policy formulation and for overseeing the operation and development of the energy sector. The MoE is composed of three main thematic areas (Power Sector, Renewables and Liquid Fuels) and a central services management group. The MoE is represented in the provinces through the Provincial Directorates of Mineral Resources and Energy (DIPREME).
- Electricidade de Moçambique (EdM), is a vertically-integrated, government-owned electric utility responsible for generation, transmission and distribution of electricity in the national grid. EdM buys most of its power supply (apr. 400 MW) from Hidroelectrica de Cahora Bassa (HCB), owner and operator of the Cahora Bassa hydro power plant on the Zambezi (2,075 MW). The GoM owns 82 percent of HCB which operates as an Independent Power Producer (IPP) The bulk of the electricity generated at HCB is exported to South Africa, with a small amount to Zimbabwe. EdM sells any excess electricity on the Southern Africa Short Term Energy Market. The Mozambique transmission grid is currently interconnected with South Africa, Zimbabwe and Swaziland.
- The Fundo Nacional de Energia (FUNAE) was established in 1997 as a public institution to promote rural electrification and rural access to modern energy services, in a sustainable manner, and as a contributor to economic and social development in the country. Since its establishment FUNAE has implemented numerous projects using renewable energy technologies to electrify schools, clinics and communities.
- The Conselho Nacional de Electricidade (CNELEC) was re-established as an independent advisory regulatory body for the electricity sector in early 2008 with support from the World Bank Energy Reform and Access Project (ERAP). CNELEC was instructed to give its highest priority to an evaluation of EDM's performance under its Performance Contract with the GoM. This Performance Contract covers the years 2007 to 2009 and sets out the goals and indicators to be met annually by EDM and GoM. CNELEC was also instructed to conduct a review of the current methodology used by EDM in setting tariffs. In performing the review of EDM's performance, the directive instructed CNELEC to conduct its review in an open and transparent manner with public hearings in several locations throughout the country.

The private sector is represented by various licensed private enterprises which participate in the grid extension and household connection works of EdM and private enterprises for the provision and installation of PV products, often situated exclusively in the capital Maputo. A microfinance sector with banks and NGOs is active throughout the country but often exclusively restricted to the province and/or district capitals. The NGO sector is characterized by relatively weak institutional profiles and technical specialisation, as well as weak implementation structures and technical competences.

The World Bank is one of the main donors in the energy sector in Mozambique. Since July 2007, it has served as co-chair with the GoM on the "Energy Sector Working Group" that was established within the framework of the Paris Declaration. The Bank is in preparation of the second phase of the Energy Reform and Access Project (ERAP), which will now be called Energy Development and Access Programme (EDAP) The proposed project will help establish the necessary operational framework for increasing electricity access to un-electrified areas nationally in a sustainable and programmatic manner, aiming at mainstreaming a sector-wide approach (SWAp) by establishing a comprehensive donor partnership framework for coordinated and sustained financing of investment and capacity strengthening aligned with national priorities and procedures (WB, ADB, ADF, OFID, BADEA, IsDB, Kuweit Fund) With Norway, the World Bank is also co-financing the Mozambique-

Malawi Transmission Interconnection Project and the Mozambique Regional Transmission Backbone Project.

Sweden is engaged together with co-financing of Norway and Denmark in rural electrification (grid extension and household connections) in Sofala, Manica, Tete and Niassa Provinces. Norway is financing rural electrification in Cabo Delgado and grid extension in Gurue - Cuamba – Lichinga and Namacurra – Pebane. Technical assistance (TA) and capacity development for EdM in mega project development for power generation, as well as for the MoE are delivered by Norway and Sweden. Sweden also is embarking on the rehabilitation of the hydro power stations in Mavuzi and Chicamba.

The European Commission (EC) is financing rural electrification in Cabo Delgado, Tete and Sofala with EdM, PV electrification in rural areas with FUNAE and capacity building in energy planning and management for the MoE. DFID is giving TA on Biofuels to the National Directorate of Renewable Energy of the MoE.

ENDEV MOZAMBIQUE will mainly coordinate its activities with the new EDAP Programme as there will be several common intervention areas as grid densification, PV electrification of social infrastructure and market development of PV systems for households.

The ENDEV MOZAMBIQUE activities are in line with the capacity development needs of the implementing partners of the private sector, mainly NGOs, communities and local entrepreneurs, which will receive business development services and will be trained on the job during the implementation of the activities in the PV and hydro power components.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	35.600
Cooking Energy for Households	---
Electricity for social infrastructure	37.000
Cooking/ Heating Energy for social infrastructure	---
Energy for prod.use/income generation	1.500

3. Key Interventions

EnDev Mozambique will focus on the following key interventions:

- Provide access of poor households to electricity services through prepaid service connections (4,000 connections),
- Foster marketing of small PV and Hydro technologies (1.000 small solar home systems and 8 micro/24 pico hydro power schemes),
- Establish PV battery charging stations (20 stations),
- Electrify social institutions with PV (65 schools and 65 administrative offices),
- Support the establishment of institutional structures and processes for testing and quality assurance of PV appliances,
- Support the establishment of sustainable structures for the management and maintenance of PV and hydro technologies by training and capacity development of the private sector.

4. Project Approach

4.1. Energy technologies/services promoted by the EnDev project

4.1.1. Selected technologies/services and approaches

EnDev Mozambique will promote (1) grid densification, (2) Solar Home Systems, (3) PV for social institutions, (4) battery charging stations and (4) micro and pico hydro power.

4.1.2. Rationale of the approaches

Grid densification

Many households in areas that are already electrified do not have access to electricity and have asked for a connection. However after knowing the connection costs these people could not afford to pay. The connection to the grid and the prepaid meter are private property and have to be financed by the household, although they would still have the ability to pay for their consumption. By this fact a large number of potential consumers in the outskirt areas around Maputo have no electricity. ENDEV MOZAMBIQUE will subsidize part of the connection costs for these households (around 80%).

Solar Home Systems

The market for SHS in Mozambique is still in an initial stage although the potential to commercial photovoltaic systems to households, social institutions and small enterprises is huge. Household expenditure on energy services that could be substituted by a SSHS is higher than expected: approximately USD 11 per month (USD 132 per year) for illumination, batteries and cell phone charging, USD 6 per month (USD 72 per year) for lighting only. Therefore, the ability to pay for small solar home systems is also higher than expected (up to USD 50 upfront). However, the availability of cash income is strongly seasonal in many areas, limited to the 2-3 months following harvesting of cash crops.

One important challenge of the solar market is the availability of a small solar home system (SSHS) that is at the same time of appropriate design and size, of affordable price and of acceptable quality. Also, it proved to be necessary to work together with micro-credit organisations that are already well-established in the intervention area. Working together with a local firm, EnDev Mozambique has developed a small compact SHS that offers power for lighting, radio and phone charging. In the second phase, based on the results and experiences of the first phase, a local company will continue the local assembly of the SSHS, following well-defined and internationally accepted quality control standards.

Photovoltaic systems for social Institutions

To date, ENDEV Mozambique has not been active in the electrification of social infrastructure. Entering this area was recommended in the project's mid-term evaluation late 2008. In Mozambique, there currently exist approximately 500 rural health centres and approximately 4,000-6,000 rural schools without access to the electricity grid.

Currently, the programmes foreseen by other donors are expected to cover the PV electrification needs of rural health centres. However, in the education sector as well as for local administrative posts (Postos Administrativos) there is still an important need for electrification that could be addressed by ENDEV Mozambique.

Presently, ENDEV Mozambique is carrying out a study analysing the performance of existing PV systems in social infrastructure. In the second phase, ENDEV Mozambique will work together with the National Energy Fund (FUNAE) to define a sustainable approach to the electrification of schools and administrative offices with solar PV. FUNAE will be the implementing partner for the social infrastructure PV systems, preparing the technical specifications, carrying out the tender process and overseeing installation and commissioning.

The approach needs to suitably address the long-term functioning of the PV systems, which requires a well-defined maintenance concept, addressing human resources, funds and spare parts. In order to establish such a maintenance concept, coordination between FUNAE and the Ministry of Education will be central. Also, the coordination between the national government level and the Provinces is of great importance. ENDEV Mozambique aims to support these coordination processes in order to ensure a workable maintenance concept for the installed PV systems.

Ideally, maintenance could be carried out by local firms, which are contracted by the provincial and district authorities. Given the capacity of electrical engineering firms in Mozambique, capacity development for such firms is expected to be important. ENDEV Mozambique can contribute to the creation of this capacity through the technical and business training provided to the BCS managers.

The lack of well-trained technicians is an important factor in shaping the propagation of solar products in the Mozambican market. Existing systems are often ill-sized and do not contain the proper components (e.g. charge controllers). Also, the maintenance and thereby the long-term functioning of solar PV systems at schools or health centres is hampered by the lack of suitably qualified persons and/or enterprises who can realise the necessary maintenance services.

The Mozambican Government's Integrated Technical and Vocational Education and Training Programme (PIREP) develops a curriculum and training programme for solar technicians. GTZ is one of the development partners supporting the PIREP. As part of the rehabilitation of technical and vocational training institutes, two to three institutes will be equipped with solar systems that serve for demonstration and training purposes.

In close coordination with PIREP/GTZ, ENDEV Mozambique will participate in the financing of one such solar system. This allows ENDEV Mozambique to reach a large number of trainees and contribute to the quality improvement of training outcomes. At the same time, the cooperation assures that ENDEV Mozambique experiences gained by working with practitioners in the field and with the private sector are channelled back into curriculum development and technical training.

Photovoltaic battery charging stations (BCS)

The up-front cost of a SHS is an important challenge to its propagation in rural areas. Possibilities to address this challenge include the provision of credit through MFIs. Another option is to avoid the high one-off cost by offering the rural population access to solar battery charging stations. In rural Mozambique, small informal battery charging stations exist in some villages. Usually they are run by an individual trader or mechanic who purchased one or two good quality solar panels and offers charging services to the neighbouring households as one component of his business.

The batteries that can be charged at such a station are suitable to provide lighting, power a radio, charge cell phones, or for black and white TV. Battery charging is done approximately every 7 to 12 days, depending on the client's battery use. The payment pattern for this energy source is more similar to that of the family's purchase of kerosene and dry cell batteries: the family spends limited amounts of money at certain, foreseeable time intervals (7 -12 days).

Micro and pico hydro power

In Manica Province the communities have been using water turbines since the 1940's, when gold mining settlers used water driven machines to process minerals and for grain milling. For the Micro hydro schemes EnDev Mozambique will continue to apply the revolving fund concept for the community following the example applied in Chua Village where the operators pay back 50% of the costs for the improvement of the machines. The households pay a connection fee and pay back 50% of the inhouse installation costs. The repayments are paid into an account that is managed by a committee selected by the community and

supervised by the local administration office. The fund is used for maintenance of the infrastructure and for other small income generating projects and food security. A Participatory Impact Monitoring System (PIM) will be introduced in the participating communities at the early stage of implementation. This tool will be used by ENDEV Mozambique and the community members to monitor progress, the achievement of targets and impacts.

ENDEV Mozambique has also trained 26 local artisans to produce six pico hydro turbines. With this experience and promising artisans from local enterprises, ENDEV Mozambique is now geared to expand the production, marketing and installation of pico hydro turbines. For these schemes ENDEV Mozambique will work hand in hand with MFIs that are willing to support individual households and/or groups that are interested in purchasing the machinery. Those MFIs will be preferred that are prepared to contribute with their own finance.

Both technologies can easily be integrated into irrigation or water supply schemes thereby increasing synergy and benefits while sharing costs among several actors.

Because of the small size of the individual schemes they allow active local involvement from initial planning, throughout the implementation stages to operation and maintenance. The schemes will become fully owned by the local operators, and where applicable by the communities, thereby guaranteeing sustainability.

4.2. EnDev approach

4.2.1 Grid densification

The primary aim of grid densification is to facilitate the access to electricity services to as many poor peri-urban households as possible, which are still using traditional lighting technology. Households with ability to pay for the services but cannot afford the connection costs, are connected to the national grid managed by EdM and are provided with service connections based on prepaid meters.

At least 4.000 households will be connected to the national grid in nine neighbourhoods of the outskirt areas around Maputo. Implementing partner is the national utility EdM which selects a contractor for the implementation of the works on a key turn basis through an open public tender process. The specific interventions are as follows:

- Focus grid densification on peri urban settlements already existing for several years with a high percentage of poor households (>90%),
- Identify customers without service connection in the neighbourhoods selected and prepare customer contracts by the local EdM office,
- Increase the customer contribution of the households to a minimum of 850 MZN (25 Euro) per connection through a special promotion campaign and credit-based payment system that allows the reinvestment into 1.000 additional new connections and/or street lighting after a payback period of up to six months,
- Implement household service connections and monitor outputs and impacts,
- Provide up to three energy saving CFL bulbs of 14W for each new electrified household, to reduce electricity consumption costs and increase energy efficiency,
- In coordination with ProBec, promote the use of energy efficient stoves by delivering information to the households and by promotion activities as demonstration cooking in the neighbourhoods organised by ProBec.

4.2.2 Photo-voltaics (PV)

The project interventions in the solar PV components are based on 3 principles:

1. Foster market development in the role as a facilitator,

2. Support approaches that also allow the poorer segments of the rural population to access modern energy services and
3. Contribute to the development of favourable framework conditions.

Small Solar Home Systems (SSHS)

Generally, ENDEV Mozambique will contribute to the development of a market for solar products in a facilitating role only. That is to say that whenever possible, ENDEV Mozambique will not be an actor of the supply chain, but will advise and link supply chain actors. Given that the solar market in Mozambique is very little developed to date, this may not always be feasible, but shall be observed to the extent possible.

Whenever possible, ENDEV Mozambique aims at working with partner institutions that purchase, own and sell material. Also, ENDEV Mozambique aims at working with established micro-finance institutions for credit provision, and will avoid to the extent possible providing credit directly through the project.

It is expected that around 1000 SSHS will be sold to households that previously had no access to modern energy services, To achieve this output, main activities include the following:

- Capacity development for local engineering firm(s) for the production of compact SSHS regarding design, business plan development, and marketing,
- Realisation of marketing and awareness raising campaigns for SSHS,
- Develop credit product for SHS clients together with MFIs that are well-established in rural areas,
- Quality assurance of (a) components used in the assembly of SSHS and (b) the assembly process; the SSHS should be sold with clear terms of guarantee and replacement in case of faulty material or assembly.

No direct subsidy for the SSHS is foreseen; there is, however, an important indirect subsidisation of the product, in that ENDEV Mozambique provides for business development services and supports the elaboration of the marketing strategy.

To assess the viability of the approach, in a first step the activities will be spatially limited to a range that can be served by one producer. Once market introduction has proven successful, additional assembly firms or associations can be identified in other areas of the country.

For the marketing of small solar home systems, a PPP approach will also be pursued to attract experienced solar firms to the Mozambican market. While financing of the PPP has been sought through the specific PPP-facility of KfW, ENDEV MOZAMBIQUE would support the venture by establishing networks for technical and business training, facilitating contacts and supporting quality control of products brought to the market.

ENDEV Mozambique will also support the establishment of quality assurance infrastructure (test lab) for solar PV components, and aims at opening recycling pathways for solar components (most importantly batteries, but also lamps).

To date, the experience with inexpensive solar products that are affordable for poorer rural households shows that often product quality may not be acceptable for wide-spread distribution through a development project. Alternatively, poorer households may be able to afford a solar product of acceptable quality either if a credit is available, or if the product is subsidised.

ENDEV Mozambique will facilitate the availability of consumer credit for SSHS through existing micro-finance institutions. During the first phase, it has become clear that the lack of suitably trained solar technicians and the existence of solar components of variable quality in the local market hinder the spread of sustainable solar technology solutions. The lack of

suitably qualified technicians affects both the sustainability of PV technology propagated through the market and PV systems installed at social infrastructure.

Also ENDEV Mozambique will contribute to the establishment of in-country expertise for testing and quality assurance of solar photovoltaic components. The project will support the development of a quality assurance infrastructure, in collaboration with a local university. Apart from establishing a testing laboratory and training the technicians, even more importantly this requires the definition and establishment of institutional structures that allow the test laboratory to realise its tasks effectively. ENDEV Mozambique will support the establishment of the appropriate institutional structures and processes.

Through its collaboration with the PIREP, ENDEV Mozambique will also contribute to the availability of skilled solar technicians. This on the one hand improves job prospects for individuals, and on the other hand is an important prerequisite for the development of a sustainable solar market and the maintenance of PV systems for social infrastructure.

PV systems for social institutions

EnDev Mozambique will also promote the installation of solar home systems on social institutions. It is planned to install 65 solar PV systems on schools (secondary or primary), and another 65 at local administration offices. This provides access to modern energy services to approximately 400 persons per school, and to approximately 5,000 persons for each administration office.

Main activities include:

- Definition of an approach that offers prospects of sound functioning and a viable maintenance concept of the installed systems; this shall be done in coordination with FUNAE, the Ministry of Education, Provincial Authorities, and the GTZ Decentralisation and Education Programmes,
- Accompany and advise FUNAE during preparation, realisation and monitoring of the tender process for supply and installation of the systems,
- Monitor commissioning of the systems and the implementation of the maintenance concept.

ENDEV Mozambique will (co-)finance the cost for procurement and installation of the material. It is desirable that FUNAE will co-finance the systems with own funds, however this remains to be confirmed. As ENDEV Mozambique will work very closely with FUNAE in the inception and realisation of the activities, this will contribute to strengthened capacities at FUNAE, both with regard to technical aspects and the management of institutional processes.

Finally every year, 140 – 160 students of a technical and vocational training institute will receive improved hands-on training working with a PV demonstration system.

ENDEV MOZAMBIQUE will co-finance the material cost for procurement of the system. This measure allows reaching a large number of trainees and contributes to the quality improvement of training outcomes. Also, the PV system will provide electricity for the operation of a part of the training institute, thereby raising awareness about the potential of electricity generated by solar PV.

Battery charging stations

As regards support to the development of battery charging stations (BCS), ENDEV Mozambique's role will be to identify suitable BCS owners and managers, and support the elaboration of a workable business plan. The crucial element in the establishment of battery charging stations will be the definition of the management system and staff. Generally, in Mozambique, there are few successful examples of community-managed infrastructure assets. It is therefore considered preferable to foresee management of the BCS through a private entity (individual or association). Finding the right person for the BCS management

will be central in shaping the success of the station. For the identification of suitable individuals, ENDEV MOZAMBIQUE will apply the CEFE-methodology (Competency-based Economies through Formation of Enterprise). The CEFE approach aims at improving the entrepreneurial performance of economic actors through guided self-analysis, stimulation of enterprising behaviour and by developing and strengthening of business competencies. Persons with a potential for and interest in managing a battery charging station attend the CEFE training process. In the course of the process, they self-select into definitive candidates and those that do not pursue the idea further.

ENDEV Mozambique will subsidise part of the BCS investment cost, depending on the existing market financing conditions available to the BCS owner. Given the reduced investment cost, the BCS can offer services at a cost affordable to a larger range of households.

ENDEV Mozambique will also aim at linking up the management of BCS with maintenance for PV systems at schools and administrative posts; the owner of the BCS could be hired by the local authorities to perform maintenance services of PV systems. It is expected that around 20 battery charging stations will be established, each providing services to 40 households. ENDEV Mozambique will subsidise the investment cost for the establishment of the BCS; the level of the subsidy will depend on the technology chosen and the own financial capacity of the manager of the charging station. Should it turn out that households cannot afford to purchase batteries, credit provision through an MFI will be arranged for. The project may also evaluate the option of subsidising batteries for poor households.

4.2.3 Micro and pico hydro power

ENDEV MOZAMBIQUE will continue to focus on Micro hydro power plants with less than 100 KW, preferably in the range between 6 and 30 KW. Pico hydro power plants with a capacity of up to 5 KW will be added as a new technology for promoting access to electricity in areas, distant from the EdM national grid.

The micro hydro machines will be for community electrification by minigrid and battery charging stations and/or small scale processing activities, while the pico machines will be for individual households or small groups of neighbours.

In the case of micro hydro the electrification services will also be extended to the rural social infrastructure like schools, health centres, administrative offices, community centres and public lighting.

Both schemes will also focus on the productive uses of the electricity generated like processing of agricultural products, battery charging stations, sewing, barber saloons, kiosks, etc.

The component will build upon the local knowledge of the communities in the improvement of water wheels that are used for running maize mills by replacing the traditional water wheels with standardised turbine runners.

The intervention area will be in areas where sufficient water flows from the mountains through out the year. This is mainly along the western border of Manica Province with a range of mountains that stretch from Ruenha River in the north to Save River in the south. Priority will be given to areas with high economic potential where the schemes can be linked to productive use, as irrigation and agricultural processing.

The main target customers for micro hydro will be operators of traditional maize mills that are using their own hydro power systems and the households of the communities that are willing to pay for the connection fee and parts of their inhouse installation. ENDEV MOZAMBIQUE will involve the communities, local NGOs, Church Organisations, Farmers Organisations and MFIs that are operative in the selected areas. Schools, administration offices, health centres and traditional birth attendance will also be considered. These will have to source finance through their respective institutions or through NGOs.

Requests for the installation of pico hydro turbines have already been received from local tourist enterprises in the highlands of Chimanimani, Vumba and Maridza. Commercial farmers have also shown a keen interest in the technology.

The activities of the component will be expanded to other districts within Manica Province. The target districts are Sussundenga, Mussorize, Barue and Guro that are situated on the western highlands.

The Provincial Directorate of the Ministry of Energy (DIPREME) will continue to be the main partner while the individual schemes will be implemented by the private sector (local NGOs and private enterprises) The number of participating NGOs will be increased from one (AKSM) up to three with the aim of balancing expansion and also creating competition between them. NGOs that have expressed interest are ADIPSA with projects in Manica and MAGARIRO with Projects in Barue and Guro. ENDEV MOZAMBIQUE will work closely with the local administration offices to supervise the management of the community funds. Linkages will also be created to the Government Fund for Income Generating Activities which is managed at district level. Through the District Administrations and DIPREME the project will link to other organisations and institutions with interventions in the project areas like FUNAE and PRACTICAL ACTION. The project will also link with MFIs for the clients to access financing for the pico hydro machines.

The key activities for the micro and pico hydro component of AMES M will be as follows:

- Setting up the partners arrangements and contracting,
- Scouting of sites to determine power capacities and feasibility of potential schemes,
- Planning and designing of the individual schemes,
- Training of local artisans in manufacture of the technology,
- Marketing of the technology through publicity, road shows and trade fairs,
- Build linkages to MFIs and other stakeholders of the educational, health and public administration sectors,
- Implement baseline surveys of the target areas to measure the impact at a later stage,
- Management, supervision and control of project implementation, operation and maintenance of the individual schemes,
- Monitoring and evaluation of the operation and maintenance of the schemes.

The outputs will be measured in terms of number of micro hydro power plants and pico hydro turbines that are successfully installed, operated and maintained by the operators themselves.

Micro Hydro plants from upgraded maize mills	8
Pico Hydro plants for lighting and battery charging stations	24
Social infrastructure lighting installations of schools	8
Social infrastructure lighting installations of health centres and traditional birth attendants	6
Public lighting lamps	70
Lighting installations of community centres	10
Productive use installations of milling, micro processing industries, battery charging stations, tourism, kiosks, etc.	120

During EnDEV1 ENDEV MOZAMBIQUE has upgraded four traditional maize mills in Chua Village of Manica Province, that today are functioning as micro hydro power plants rendering milling services during half the day and electricity services during late afternoon and at night. The experiences gained have shown that individual scheme implementation can be quick and direct benefits can be realised immediately.

The revolving fund concept induced empowerment of the community for self management and control by collecting tariffs, connection fees, and contributions to the in-house installations and depositing cash into a special bank account. On the job capacity development measures will be implemented with the local partners (NGOs, communities, operators and private enterprises).

4.3 Risks for implementation

Main risks for the different technologies/services are:

Grid densification:

- EdM´s local technical department and the contractor are implementing household service connections as planned, once the financing agreement and customer service contracts are on track,
- Once connected, households are willing and able to pay the tariffs for their consumption and will not be disconnected by EdM,
- Higher customer contributions, low cost connection technologies and applied metering system allow gradual lowering of connection costs as agreed with EdM.

Photo-voltaics

- Political conditions: The electrification of rural areas through PV is mentioned as a priority in the National Energy Strategy (adopted in early 2009). A national electrification master plan exists, indicating the areas that will not be covered by the grid within the next years. However, the indications of the master plan are subject to modifications, depending on policy shifts,
- Import regulations and taxes: The existence of import duties and taxes on PV components produced outside the SADC region increases the landed material cost by approximately 25-50%. While this is not prohibitive, it is an important factor when aiming at making an affordable SSHS available to the rural population in Mozambique.
- The institutional capacity of FUNAE requires strengthening of aspects regarding the implementation of projects according to defined specifications and suitable procedures for commissioning of the installed PV systems. ENDEV MOZAMBIQUE plans suitable interventions to support FUNAE in these areas, but the development of relevant capacities at FUNAE for long-term sustainability of their interventions will depend on factors beyond ENDEV MOZAMBIQUE's reach, including activities developed by other donors.
- The lack of suitably qualified (solar) technicians is an important factor impacting on project implementation and outcomes, and requires intensive project activities in the area of technological capacity building and quality assurance.

Micro and pico hydro power

- Compared to the prices of EDM for household connections to the national grid, the connections of the hydro power schemes will be higher. If the communities would have to pay 100% of the cost they would resist. Subsidies have to be incorporated with care not to undermine the private business initiatives,
- Political promises of extending the national grid to remote areas are likely to de-motivate people from adopting pico and micro hydro schemes because of the limited volume of energy produced by these schemes. Besides DIPREME other local political levels have to

be involved in setting up the implementation strategies, including Provincial Governors and Directors of the Education, Health, Industry and Commerce Sectors,

- Government regulations are not very specific on the use of pico and micro hydro power, causing farmers who would like to be operators to find it prohibitive to follow all the regulations involved. DIPREME will assume the task of coordinating and clarification of regulations implied,
- Limited experiences of local NGOs and the private sector in the implementation of micro and hydro power schemes as well as the necessary community processes are likely to cause delays in setting up the individual schemes. However ENDEV MOZAMBIQUE will include a component of capacity development for the implementing partners (NGOs, communities, operators and private enterprises).

5. Impact Monitoring & Evaluation

5.1 Expected Impacts of project interventions

The most important impacts of the key interventions for household lighting and other domestic appliances accrue to the households in the form of:

- Improved living conditions (MDG 1) through better lighting, less smoke and less risk of houses burning down or persons getting hurt through the use of petroleum or kerosene lamps,
- Savings in energy expenses (MDG 1), by reducing the share of household revenue spent on lighting (petroleum/kerosene), radio playing (dry cells) and cell phone charging (transport to charging opportunity),
- Time savings by reducing time spent on buying or collecting lighting fuels (esp. of women) Saved time can be used for other productive or social activities (MDG 1),
- Increased studying and reading hours of school children (MDG 2 and 3), by providing better quality light (CFL),
- Increased use of information and communication means (MDG 2, 3, and 6), through easier access to cell phone charging, and increased use of TV,
- Cleaner air in the household (MDG 4, 5, and 6) through reduced use of petroleum and kerosene for lighting,
- Reduction of toxic waste (MDG 7) through reduced use of dry cell batteries.

The most important impacts of the key interventions for the electrification of social infrastructure accrue in the form of:

- Participatory management of community electrification schemes increasing the self esteem of the communities (hydro component),
- Increased income for the hydro power operators (MDG 1),
- Improved studying conditions at schools (MDG 2) through provision of electrical light for evening classes.

5.2. Planned Impact Monitoring & Evaluation Methodology

Please tick:

(x) a baseline survey for impact evaluation is planned for the PV electrification of social infrastructure and the establishment of the battery charging stations (approx. date to be defined)

(x) a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for th grid and hydropower component (approx. date to be defined)

(x) the project will also use other methods for impact monitoring (Participatory Impact Monitoring (PIM) for the hydro power component)

(x) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

(x) the project would be interested to get financial support for impact evaluation.

6. Budget

		EUR
1	**Human Resources and travelling**	890.000
2	**Equipment and Supplies**	50.000
3	**Funding Financing Agreements/Local subsidies**	1.550.000
4	**Other direct costs**	150.000
5	**Total direct costs**	2.640.000
6	**Mark up costs/administrative overheads/imputed profit/**	360.000
7	**Cost price**	3.000.000

Nicaragua

1. Situation Analysis

1.1 Energy situation

Nicaragua has one of the lowest rural electrification rates in Latin America. About 89 percent of the rural population still lacks access to electricity. In absolute terms, it is estimated that a total of about 400,000 households in both urban and rural areas remain unserved, of which about 160,000 live in off-grid areas being beyond economic line-extension distances. The national electricity subdivided in two concession areas covers only the western part of the country. More than half of the country remains outside of these concession areas (see figure below). Source: CNE - PLANER More than half of the country on the Caribbean and Atlantic coasts remains out of the concession area, including half of the Rio San Juan Region, the Region Autonoma Atlantico Sur (RAAS), the Region Autonoma Atlantico Norte (RAAN) and two thirds of the Jinotega region, Matagalpa, Boaco, Chontales and Rio San Juan. The area not covered by the SIN is called the “Open Area.” This area remains open to be divided into smaller concession areas on a case-by-case basis. The Open Area is characterized by very low population density—only 6 inhabitants per square kilometre. There are 15,584 households in an area of 124, 433 square kilometres, while density in the two concession areas reaches approximately 80 inhabitants per square kilometre. Population is highly dispersed and access is often difficult (for example, there is only river access for most of the Atlantic Region). These two characteristics prevent provision of electric services by the conventional grid, and call for site-specific off-grid solutions like the diesel plants, or if hydro resources allow, a micro, mini or small hydropower plant. Off-grid electrification in Nicaragua today consists mainly of installing diesel minigrids, operated by ENEL to serve some larger villages in remote rural areas, often at heavy financial losses which need to be financed by the Government of Nicaragua on a continuous basis. In a few cases hydroelectric and solar home systems have been implemented.

1.2 Policy framework, laws and regulations

Based on the National Development Plan (PND) CNE worked out a national programme for rural electrification (PLANER). The aim of the programme is to achieve a national electrification rate of 70% by 2013. In absolute figures it means to provide 1,585,909 people with access to electricity. The programme costs are calculated to be 344 million US $ or 189 US $ per person. The Government's sees the expansion of electricity services in the rural areas as part of its strategy to improve the competitiveness of the country through the strengthening of rural economic activities, and as a tool to improve the living standards of the rural population. The Government however, is also aware, that the electricity sector would be able to contribute to the achievement of this ambitious goal only if electrification is combined with the promotion of economic activities in rural areas. Therefore, the Government's strategy aims at strengthening rural businesses by upgrading agricultural technology, promoting integrated clusters and networks for the dairy and coffee sector, and by training trainers to deliver business development services to rural areas. In October 2000 the Nicaraguan government created the public fund “Fondo para el Desarrollo de la Industria Eléctrica” (FODIEN) to finance rural electrification projects. The fund is managed by MEM. FODIEN is designed to finance feasibility and pre-feasibility studies, project design, execution of projects, and education and communication campaigns in the field of rural electrification. FODIEN resources come from multilateral agencies, bilateral donors, and from the states via the general budget of the republic. In addition, the fund will be filled up through concession and licence fees and fines. FODIEN can finance projects through grants, soft loans, loans without interest, and commercial loans. FODIEN has only recently become operational and so that first electrification projects in rural areas receive financial contributions through that mechanism. The Government of Nicaragua has decided to encourage specially the development of the renewable energy resources in the country as an essential element in the

growth of the national energy system. In the beginning of 2009 the government announced that they will invest 2,104 billion dollars in renewable energies in the next four years with funds coming from México, Russia, Brazil and Iran. It is planned to produce additional 856 MW for the national electricity system. 350 million dollars coming from Brazil will be used to construct a new hydropower plant. Russia will provide funds for geothermic plants whereas Iran and México are also interested in hydroelectric projects. 64,9% of the new electricity will be based on hydropower, 23,4% on geothermal plants and 11,7% based on charcoal. The projects are planned to be realized from 2009 to 2013. It is expected that the importance of bunker and diesel for power generation will decrease from 65,1% to 12%. The projects include the electrification of 23 000 rural villages and the installation of solar system for schools and health centres.

The legal situation for renewable energies is quite favourable. In the law for the promotion of power generation with renewable energy sources from 2005 the use of renewable energies is declared of national interest. The law established the following incentives for all equipment and materials necessary to establish power generation with renewable energies:

- exoneration of import taxes,
- exoneration of value added tax,
- exoneration of income tax for seven years for the operation of renewable energy power plants,
- exoneration of all local taxes as well as other taxes, and
- the obligation of utilities to buy power generated from renewable energy plants.

1.3. Institutional set up in the energy sector, Activities of other donors

Nicaragua's power sector underwent a deep restructuring during the late 1990s, when the generation, transmission and distribution divisions of the state-owned Empresa Nicaraguense de Electricidad (ENEL) were unbundled, and the privatization of the generation and distribution activities allowed. A wholesale market was created, which allowed electricity trading through long term contracts between generating companies and utilities or large users (more than 2 MW of installed capacity). A spot market also exists. Four generation companies (GEMOSA, GEOSA, HIDROGESA, and GECSA) a transmission company ENTRESA and two distribution companies (DISNORTE and DISSUR) were created. Two generation companies were sold and are now privately operated; the transmission is expected to remain public and the two utilities were sold to the Spanish company Unión Fenosa in September 2000, with a concession that covers the Western, Central and Northern zones of the country. In the concession areas, Unión Fenosa holds a monopoly on distribution and retail supply except for final consumers with a power demand higher than 2 MW, who can contract directly with generators if so they wish. Unión Fenosa was unable to reduce the system losses. As INE refuses to approve tariff increases covering all system losses Unión Fenosa Nicaragua is currently not profitable. The eastern part of the country along the Atlantic Coast remains in the responsibility of ENEL which manages some mini-grids at the Atlantic coastline.

In the public sector the “Ministerio de Energia y Minas (MEM)” is in charge of formulating, coordinating, and setting overall objectives, policies, strategies, and general directives for the entire energy sector. It is also in charge of undertaking strategic indicative planning for the energy sector aimed at achieving development goals and optimising the use of national energy resources. MEM reviews energy demand and supply balances, pricing policies, energy conservation programmes, service coverage, and investment and financing strategies. It undertakes studies, issues criteria for investment projects, promotes private sector participation, and proposes concessions for use of natural resources by the private sector to the National Assembly. The mandate of MEM includes also the development of rural electrification initiatives in coordination with multilateral and bilateral agencies and the promotion of national and foreign investment. INE (Instituto Nicaragüense de Energía) is the national regulatory authority for the power and hydrocarbon sub sectors, responsible for

applying energy policies adopted by Comisión Nacional de Energía (CNE). In the power sector INE approves tariffs, adopts technical norms, and undertakes planning functions. The mission to issue concessions and licenses to operators has currently been transferred to the MEM. As many concessions have been pending since more as a year due to slow processing by INE an increased speed can be expected in the near future. As remaining state owned electricity company, ENEL manages some 30 diesel powered mini-grid in the non concession areas which are heavily subsidised to meet national electricity prices. The Ministerio para el Fomento, la Industria y el Comercio (MIFIC) is in charge of granting concessions for the use of water in hydroelectricity projects. The Ministerio del Ambiente y Recursos Naturales (MARENA) develops policies and defines norms for the ambient sector. Based on environmental impact studies, MARENA gives permits for all activities regulated by the environmental law (Ley del Medio Ambiente).

Nicaragua has a well developed NGO sector with several organisations working in the field of energy as well as micro finance institutions.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	29.000
Cooking Energy for Households	---
Electricity for social infrastructure	25.000
Cooking/ Heating Energy for social infrastructure	---
Energy for prod.use/income generation	8.000

3. Key Interventions

EnDev Nicaragua will focus on the following key interventions:

- Support the connection of at least 20 villages to the grid through grid extension,
- Support grid densification in villages with low connection rate,
- Support the dissemination of at least 2000 solar home systems,
- Support installation of Micro Hydro Power Plants.

4. Project Approach

4.1. Energy technologies/services promoted by the EnDev project

4.1.1. Selected technologies/services and approaches

EnDev Nicaragua will promote (1) grid extension and densification, (2) Solar Home Systems, and (3) micro hydro power.

4.1.2. Rationale of the approaches

Grid extension and densification

Although large parts of the country are still not electrified the utility Unión Fenosa is not interested in grid extension into rural areas, as the profitability of the investment is

considered low. The same refers for establishing mini grids in rural areas. Private companies generally don't invest in this sector as cost of providing access are high due to remoteness of the sites, dispersed nature of the populations and difficulty of the terrain. Local communities don't dispose of sufficient proper financial resources to make infrastructure investments in their community. Consequently, only the central government and NGOs are left for this kind of investment. NGOs are specialized on small systems whereas the MEM is involved in middle size systems. However, both depend to large degree from international donations to be able to carry out mayor investment in rural electrification. In the case of MEM less than 30% of the calculated costs of the national rural electrification plan are currently covered by international grants and loans.

In addition, many households in areas that are already electrified do not have access to electricity and would like to be connected. However, high connection costs and complex application procedures prevent that these households are connected. By subsidising a certain percentage of the connection costs and by helping households to fulfil all application requirements, the connection rate can be increased.

Solar Home Systems

A significant part of the population in non-electrified areas lives too far away from the main grid, so that grid extension to their communities is too expensive. Many households are interested to obtain electricity through solar home systems. However, marketing and maintenance structures for solar systems in rural areas are lacking. Almost all retailers are established in cities with no outlets in rural communities. Thus, clients have to travel to cities to purchase energy devices and for repair orders, which is difficult for most rural families. Establish rural outlets are considered not to be profitable due to the high costs for transportation and mobilization, the dispersed nature of the populations and the low income and low demand of the local population. Thus, the promotion of market structures is crucial for a successful dissemination of solar home systems in rural areas.

Micro Hydro Power

Nicaragua has a huge hydropower potential is the northern mountainous regions. However, only three small companies are active in the field of micro hydropower machinery, none at the level of mini or small hydropower. The commercial demand for micro hydropower equipment is low (probably less than 30 systems a year). Micro and mini hydro plants in Nicaragua are neither attractive for the national nor for the international private sector as the expected profit margin is too low. Thus, the market situation depends almost completely on public investments and donor financed projects. MEM has identified 21 sites with high hydro electrical potential for micro plants, but the number of appropriate sites is estimated to be much higher. In addition, 30 sites with hydro electrical potential for mini plants were identified in pre-feasibility studies.

4.2. EnDev approach

4.2.1 Grid extension and densification

EnDev Nicaragua is promoting the supply of grid electricity to households and social institutions or productive, local, private or communal enterprises in rural and/or peri-urban areas close to the grid. It supports the MEM in its plans to electrify rural communities in concession areas to increase the electric coverage of rural villages with good economic and social potential. EnDev Nicaragua will provide a partial subsidy for the grid extension. In cooperation with MEM communities will be selected that have a strong need for access to electricity, a solid organizational structure, as well as the commitment of local authorities and beneficiaries.

The aim of grid densification is to facilitate the access to electricity services to households with ability to pay for the services but cannot afford the connection costs, or have difficulties

to fulfil the application requirements. EnDev Nicaragua will partially subsidize the connection fees and support poor households to apply for connections.

It is expected that in this component around 2.500 households (= around 14.500 people) will get access to electricity.

4.2.2 Solar Home Systems

EnDev Nicaragua promotes the dissemination of Solar Home Systems in close cooperation a) with the Deutsche Entwicklungsdienst (DED) and its Nicaraguan Partner organizations Unión de Cooperativas Agropecuarias Héroes y Mártires de Miraflor (UCA – Miraflor), Federación para el Desarrollo Integral entre Campesinos y Campesinas (FEDICAMP) and Fundación Entre Mujeres (FEM) in the departments Estelí, Madriz and Nueva Segovia and b) with local NGOs in other regions of Nicaragua. EnDev funds will be used to subsidize around 50% of the final prize of a system. The other 50% have to be paid by the customers in advance. In addition local technicians will be trained in the installation and maintenance of SHS system. Approximately 2000 households (=11600 persons) will get access to electricity through SHS.

4.2.3 Micro Hydro Power

EnDev Nicaragua will continue to promote micro hydropower to improve the energy situation for lighting and household applications in communities in the northern region of Nicaragua.

At least three additional micro hydropower systems will be installed feeding into a mini grid. The grids shall electrify around 500 households (=2900 persons). Training on both technical and business skills will be provided. The power plant and mini grids will be the property of the village and run by village committees, as it is common practice in other sectors, such as water. In order to reduce management and metering costs, Financing will take the form of a mixture of local contribution (cash and/or labour, 15–30 % of the cost), subsidy (up to 70 %) and technical support by the MEM.

4.3 Risks for implementation

Grid extension and densification depends on the stability of the power supply. Nicaragua faced in recent time some power shortages, but it is expected that the power supply will not deteriorate but rather improve due to new power generation projects.

The results of the SHS component depend to a large degree on the international price for panels and batteries. Currently the prices are quite favourable, but this may change once the world economic crisis is over.

5. Impact Monitoring & Evaluation

The Impact M&E activities are designed accordingly to the framework of the Sustainable Development concept of GTZ, considering the Economic, Environmental and Social dimensions.

Continuing with the work done in EnDev1, every key intervention and activity will be accompanied by M&E activities not only regarding the Impact level but also following up on activities, processes and outcomes.

Planned Impact Monitoring & Evaluation Methodology

(X) a baseline survey for impact evaluation is planned and scheduled for 2010

(X) the project would be interested to cooperate with the EnDev M&E Working Group and to obtain materials and guidelines for impact M&E etc.

6. Budget

		EUR
1	Human Resources and travelling	485.000
2	Equipment and Supplies	470.000
3	Funding Financing Agreements/Local subsidies	600.000
4	Other direct costs	375.000
5	Total direct costs	**1.930.000**
6	Mark up costs/administrative overheads/imputed profit/	270.000
7	Cost price	**2.200.000**

Rwanda

1. Situation Analysis

1.1 Energy situation

Rwanda's energy balance shows that about 85% of its overall energy comes from biomass (99% of all households use biomass for cooking),11% from petroleum products (transport, electricity generation and industrial use) and 3% from hydro sources for electricity.

In 2009 about 6% of the total population had access to electricity and the government has started a roll out programme to rapidly increase this to 16% by 2012 and at least 30% by 2020. The country has currently about 65 MW installed generating capacity (hydro and diesel) but there are a number of new sources coming on line within the coming years.

The economic sectors with highest potential for growth (agricultural processing, tourism, IT) depend heavily on energy supply. While larger enterprises work mainly with expensive diesel generators, most of the small businesses in rural areas have no power supply. This limits their options for expansion and hinders productivity. At the same time, due to the shortage of energy, the greater part of the social infrastructure is unable to provide services efficiently.

Hydro sector

There are only few providers of decentralized energy systems in the country. The PSP Hydro project will provide technical and business expertise to support the creation and development of economically sustainable small and micro energy providers. This will contribute to improve the power supply in Rwanda for productive applications (small and medium-sized enterprises), as well as the social infrastructure and electricity for households.

A survey in 2007 prepared a micro hydro atlas which identified about 300 sites for small and micro hydro power which can be used for minigrids or connected to the national grid, depending on the location. There have already been a number of projects implemented through the Ministry with assistance of UNIDO, BTC and EU. These are constructed under direct supervision of the ministry and once operational, will be handed over either to the national power utility or will be managed through private companies or in joint venture.

Biomass sector

Biomass (firewood, charcoal and residues) remains practically the only source for cooking. LPG consumption is extremely low (consumption per capita is 1/50 only of Kenya, the market leader in the region) while kerosene is practically only used for lighting. The Government's Vision 2020 asks for a reduction of biomass consumption by 50% by 2020, but is it not clear what the alternative sources of energy will be.

Government programmes have focused on the increase of wood production (already 80% of the country's firewood and charcoal come from eucalyptus) through plantations and agro forestry programmes and to increase efficiency in charcoal production and the use of improved stoves. Already over 50% of all households have improved stoves (different models depending on the fuel used) and the Government wants to increase this percentage to 100% while at the same time improving the efficiencies of the improved stoves.

Biogas

Biogas has been introduced in the country many years ago and Rwanda has gained international recognition for its programme in the prisons and large institutions. The Government in 2008 announced a policy to introduce biogas digesters in all boarding schools (estimated at around 600 schools), large health centres and institutions with canteens to reduce the consumption of firewood. The Ministry organised in 2009 a training programme for about 25 technicians and craftsmen. No further activities are taking place as there are no funds allocated to institutional biogas in the financial year 2009/10.

Activities in the domestic biogas sector started much later. It is estimated that over 120,000 households have dairy cows that are kept under zero grazing conditions to reduce soil erosion and also due to lack of grazing areas. These numbers are increasing due to the governments programmes to increase the number of families with dairy cows. The National Domestic Biogas Programme started in 2007 with the construction of 101 pilot digesters funded by Ministry and with technical assistance from SNV. GTZ/EnDev inputs became available Jan 2008. Since that time the focus has been on capacity building, training of technicians and entrepreneurs, awareness campaigns and promotion. In total another 201 digesters were build up to 30 Sept 2009.

About 30 large biogas digesters have been constructed in institutions and Rwanda has received international recognition for the biogas systems that have been installed in the prisons over the last decade reducing firewood consumption by up to 40% and improving hygienic conditions. The Government has announced a policy for boarding schools, health centres and other large consumers to install biogas systems within the coming years.

Key problems of the energy sector

The following problems are noted for the energy sector:

1. Access to electricity remains low and in particular so in the rural areas even if roll out plans are implemented as scheduled. Additional efforts are required to provide electricity to those will not be close to the national grid,
2. Costs of new connections are at least $500/household and are beyond the reach of most households in Rwanda,
3. There is general a lack of entrepreneurial capacity in the country and this hampers small commercial electricity projects,
4. The increasing population and rising incomes per capita will result in a higher demand for cooking energy,
5. Government wants a reduction of the consumption of biomass (firewood/ charcoal) but there are only few alternatives such as LPG and kerosene. However, these are more expensive while electricity is no real option due to the high costs and the low connection rate.

1.2 Policy framework, laws and regulations

Vision 2020 (published in 2000) is Rwanda's long-term development blueprint seeking to transform the country into a middle income position. The Policy statement includes a pillar on infrastructural development, including energy with high priority to access to electricity for the population but also a reduction of the use of wood energy from 94% in 2000 to 50% in 2020.

The EDPRS refers to Vision 2020 and for the energy sector has four main elements:

a) Increased access to electricity for enterprises, households, health centres, schools and local government administrative offices,

b) Reduced costs of supply of electricity and the cost of imported petroleum products,

c) Diversified sources of energy supply and enhance energy security, and

d) Strengthened governance framework and institutional capacity.

The EDPRS requires the increase of electricity generation form a variety of sources such as hydro and methane gas. It specifically asks for at least 50 MW of additional hydro power to be installed before 2012. The EDPRS has specific targets for the number of electricity connections to be reached by 2012 (initial target 200,000 but this has been increased to 350,000), 100% of all health and social centres to be connected to the grid or equipped with PV systems and 50% of all schools covered. The power supply grid had an extension of about 3,230 km in 2006 and it is targeted to reach 5,000 km in 2012. The international donor

community has pledged 228 M$ to support the implementation of the five year National Electricity Access Programme (2009-2013). There are also targets given for improved cook stoves (from 40 – 100% coverage) and 20% of cattle farmers using biogas.

The Ministry has updated its energy policy 2008 – 2012 covering the EDPRS period with assistance from the EUEI. The policy covers all types of energy: electricity, biomass, petroleum, methane gas, geothermal, wind, PV etc.

A specific Biomass Energy Strategy (BEST) was developed more or less simultaneously. Initially the BEST focused on the charcoal value chain for the urban areas but this was later expanded with a special energy survey among the rural population and specific recommendations.

Some of the most important aspects of the policies for the EnDev programme are:

1. Electricity tariffs which are currently around 0.23 US$/kWh but are subject to further studies and recommendations in order to reduce the costs to consumers and businesses,
2. Feed in tariffs are mentioned but there are no clear policy guidelines as such that may guide investments in small scale renewables such as micro hydro. An overall study was carried out in 2008 describing the tariffs and tax structures. This is to be followed up by a special tariff study which is provided more details,
3. A new Law for the electricity sector is under preparation. This law will regulate the liberalisation of the electricity sector in Rwanda and set the basis for the creation of an electricity market similar to those in place in the EU countries or the US. The Government has a proposed a draft to the Parliament for its revision,
4. The two key interventions of the PSP Hydro project, the development of MHP plants to increase power capacity in the country and the consolidation of the participation of private MHP developers in the energy sector, are in line with the national energy policy and complementary to the Government's efforts.
5. In the biomass sector a three pronged approach is recommended
    a) on the supply side, increased wood production through higher yields,
    b) higher efficiency in the value chain through improved legislation, more efficient charcoal techniques and improved cook stoves, and
    c) Promotion of alternatives such as LPG, kerosene and peat.

1.3 Institutional set up in the energy sector, Activities of other Donors

Institutions in the energy sector

A number of Ministries and agencies play a significant role in the energy sector depending on the type of energy and the nature of activities covered. The most important institutions are listed below with a short description of their role.

Electricity Sector

The Ministry of Infrastructure, Energy Sector is responsible for the strategies, planning and monitoring of the implementation of the different programmes. The ministry also plays an important role in attracting private sector investment and coordinating support of development partners.

The Energy and Water Board (created in 2009) is under development and this will take over the role of the coordination of energy programmes. Under the Board there will be an energy agency that will be charged with the implementation of the different programmes (a function that is currently still implemented directly by the Ministry)

Electrogaz is the utility company (which is being separated into RECO and WASCO) is a public company but operates along commercial principles for the transmission and

distribution of electricity. Currently most of the electricity is also generated by Eletrogaz but the government is promoting private companies to take over that function such as in the case of electricity production from Lake Kivu methane gas.

Rwanda Utilities Regulatory Authority (RURA), which is among others responsible for ensuring that electricity tariffs reflect recurrent costs and all energy activities have to be approved and registered.

Private sector role has been limited in the past but the Government is encouraging electricity production through PPPs at large scale (for example Lake Kivu methane projects) as well as in the hydro power sector to support management and construction.

Micro Hydro

District Governments play an important role in the decentralized governance structure in Rwanda and have the capacity to authorize the installation of MHP plants and mini grids in their territory.

Biomass Sector

The Ministry of Infrastructure focuses on efficient use of the available biomass resources through improved charcoaling and stove technologies. The energy sector is implementing a number of efficiency programmes in the sector and also investigating and promoting of alternatives such as biogas for domestic use and for institutions, LPG, kerosene, peat, papyrus and waste briquettes.

The Ministry of Natural Resources and it agency NAFA is responsible for the regulations and the management of natural forests, plantations.

The Ministry of Agriculture is promoting agro forestry which also is a source of biomass.

The Ministry of Local Government which through the district and sector authorities is responsible for the implementation of forestry laws, the issuance of tree cutting and charcoal production permits and the protection of the natural environment.

Sector-comprehensive organizations and institutions:

Rwanda Environment Management Authority (REMA): this institution has to approve the environmental suitability of all electricity and distribution electricity activities in the country.

Private Sector Federation (PSF): most of the private companies in Rwanda are registered at the PSF. This institution guaranties the application of good practices within the private sector.

PSP Hydro works in coordination with all these institutions. Their collaboration is essential in order to obtain the necessary permissions. In addition, PSP Hydro advice these institutions whenever this is required and keeps then informed about the progress of the ongoing activities.

Other Government and donor activities in the energy sector related to the EnDev programme

In March 2009 the Ministry entered into a sector wide programme with the developing partners that are involved in the energy sector. This has resulted in a large scale programme for the roll out of electricity network and the increase of household connections from 100.000 to 350.000 by 2012. The costs of this programme are estimated at US$ 380 million and will be implemented mainly through the utility company. The Government and Electrogaz are contributing 20% of the budget while the balance is provided by the donors including the WB, ADB, Arab Funds, EU, BTC, DGIS, JICA and others. The implementation has started in 2009.

There are a few programmes in the energy sector that more directly related to the EnDev programme as these are activities in the hydro and biomass sector but none directly engaged in the biogas area. The most relevant programmes are:

1) UNIDO programme constructing 4 micro hydro power plants. The plants are funded by the Government and UNIDO,
2) Government funded hydro power plants, 8 units in various stages of progress. Total 6.4 MW,
3) BTC programme for the construction of 5 SHPP. Costs of the construction are supported by BTC, management of the plants will be through Electrogaz. In addition, BTC participates in rural electrification based on photovoltaic systems and they will carry out the wind atlas for Rwanda in the coming months,
4) EU programme that supports the construction of 2 SHPP with a total output of 3 MW,
5) Forestry programmes by BTC (with additional funding of the Netherlands and agro forestry programmes (MINAGRI/IFDC with Netherlands funding) to increase supply of (fire) wood,
6) The Ministry of Infrastructure has a number of programmes to support the efficient production and use of biomass focusing on regulation, cookstoves and charcoal kilns. These programmes are funded through the Government budget,
7) The Ministry also has started a programme to support the Government's policy for the construction of institutional biogas systems for all boarding schools and hospitals. In 2009 about 50 technicians and engineers received theoretical and practical training which included the construction of three biogas systems in schools,
8) GTZ supports the health sector in Rwanda and it has a plan for 2009/10 to introduce and test biogas systems in a limited number of health centres especially as a source for energy for cooking and possibly for the sterilizing equipment,
9) Manna is a US based organization will introduce PV/UV water purification systems in schools. The programme is expected to generate carbon credits that will be used to support biogas installation in the same schools. However, the methodology of the approach still needs to be proven. Also MANNA does not have the expertise in biogas and will require technical support from MININFRA to set up a large scale programme in this sector,
10) The WB/GEF is preparing a programme of US$ 5m to support the energy sector and is expected to start early 2010. The programme will work in number of areas including:
    a) private sector development and entrepreneurship development through an incubation approach,
    b) support to the private sector in the micro hydro area,
    c) promotion of PV and stand alone renewable energy systems,
    d) promotion of improved stoves and charcoal kilns.

The EnDev programmes contribute towards the Governments energy policies and the EDPRS.

PSP Hydro also works in continuous coordination with BTC and EU for the development of local capacities, the planning of the new sites and the sharing of experiences.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for lighting and el. HH Appl.	700
Cooking Energy for Households	30.000
Electricity for social infrastructure	2 health clinics
Cooking/ Heating Energy for social infrastructure	5 health clinics
Energy for prod.use/income generation	20 SMEs

3. Project Approach

3.1. Energy technologies/services promoted by the EnDev project

3.1.1. Selected technologies/services and approaches

Micro Hydro

Electricity produced by micro hydro power provides a predictable constant power supply. Reliability of the power for technical equipment is essential for the quality of services delivered at a health clinic (e.g. cool chain, power in the theatre). The MHP sector in Rwanda currently is weak. Hence it needs to be build up and strengthened to create capacity in Rwanda. Considering the high investment into the technology as compared to other technologies a high level of ownership is required to ensure sustainable operation of the plants. EnDev intends to develop a private electricity generation sector in Rwanda. To reach this objective, EnDev Rwanda is building capacity in Rwandan SMEs with technical and business assistance as well as co-financing. By the end of the project these enterprises (PSP implementing partners) have to be able to work independently to build and operate micro-hydro plants and local electricity grids to supply rural and peri-urban areas with electricity. The strategy for capacity development of these companies focuses on:

- Technical assistance and training on design, construction, operation and maintenance,
- Advice and training on business development, management and provision of services,
- Political support and institutional guidance,
- Assistance and tutorage for sector consolidation.

Biogas

Biogas provides an energy supply which is of various benefits for the users independent of the scale of the plant. First of all less other fuels need to be provided to fulfil the thermal requirement (cooking, heating) with hardly any emission of smoke or other harmful exhaust gases. A very positive impact comes through improved hygienic conditions as dung and toilet water are treated in an enclosed environment. Result of the process in a biogas plant of course is the gas, additional the slurry can be used as fertilizer which improves the nutritional situation.

Domestic Biogas

The household biogas technology proposed and implemented under the programme has been based on experiences in Nepal where masonry digesters have been built for about 20 years. These digesters have a fixed dome which simplifies the maintenance but provides some constraint for the amount of gas stored and the gas pressure which varies during the cooking process. The baseline survey showed the keen interest of the households in addition of gas light and this has been included into the programme.

The masonry type digesters have many strong points but one of the drawbacks of the design is the long construction period (about 3 weeks and a large part of this time is needed for drying of the concrete) plus the need for high skills to construct the dome to avoid possible cracks and possible gas leakages once the digester is in operation. The programme with funding of the Ministry has carried out an experiment with Chinese made fibre glass digesters (100 units were imported and installed). The performance of these digesters will be evaluated after one year of operation. Other technologies and improvements are being considered but mainly through learning form experiences from SNV biogas programmes in other countries.

Institutional Biogas

Rwanda has wide experience with the Tanzania/CAMARTEC design of bio digesters as many experts and technicians were engaged in the construction of large digesters with capacity of 100 mtr3 per chamber and in some cases up to 10 chambers. This technology is well proven but there is also much to be gained from the experiences in countries such as China and Vietnam among others where there are a range of different models. This requires a programme of adaptation, testing and training in Rwanda to increase the options available to the various institutions, schools, health centres and others which have different requirements.

Rationale of the approaches

Micro Hydro

In Rwanda, there is a large potential for hydro power with more than 330 small and micro sites already identified and with many appropriate areas for the development of pico hydro installations. The philosophy of the new Law for the electricity sector reflects the will of the Government to engage private entrepreneurs in the development of the sector. In addition, one of the main lessons learnt from former experiences in the country is that neither local governments nor communities have the capacity to efficiently build and manage this kind of installations. As a consequence, the MININFRA will apply a private participation approach for the development of the new plants that will construct. This shows that after more than three years of PSP Hydro activities in the country, the Government accepts that the private sector participation approach is the most appropriate for the development of small and micro hydro plants in Rwanda.

Biogas

The domestic biogas programme is based on a market driven approach whereby the ultimate decision for the investment is taken by the household. Apart from subsidy (37,5% of the estimated costs), the programme focused on awareness raising, promotion and quality control. Once the technology is accepted by the households and becomes more widespread, it is anticipated that the prices for the digesters will reduce (through increased competition and economies of scale) and that the need for support of the programme will reduce over the years. The long term sustainability of the programme will be supported by the revenues from carbon credits for reduced emissions and this will grow with the number of digesters completed.

Health centres, schools, and other large consumers have in 2009 been instructed by the Government to install biogas digesters where feasible to reduce wood consumption and

improve hygienic conditions. The high upfront costs of a digester (€ 25,000 in average) are a big burden for the ministries of education and of health and ways have to be found to reduce costs as well as search for new sources of finance, including carbon credits.

3.2 EnDev approach

3.2.1 Micro hydro

The targeted geographic areas of PSP Hydro are off grid communities in rural and peri-urban regions of the whole territory of Rwanda. Therefore, the final costumers of the project are social institutions (health centres, education centres, community and public administration centres and parishes), households and private businesses, from SMEs to large factories.

Key interventions

The two key interventions of Phase 2 of the PSP Hydro are

a) Development of MHP plants and
b) Consolidation of the participation of private MHP developers in the energy sector.

Four main activities will support the implementation of these two key interventions.

Key intervention A - Development of MHP plants to create new access to electricity

Activity A: Support private developers for the construction and management of 2 MHP plants and local grids

This was the main activity under Phase 1 and will remain the main activity also for Phase 2. The focus of phase 2 will shift on electrifying off grid communities with health clinics.

Phase 1 of the project will be concluded with the construction of three plants, by three different developers, which capacity varies between 100 and 400 kW. In one case, the electricity produced will be sold to the host community through a local grid; in the second case, the electricity will be sold to both the local community and the national grid; one of the plants will be exclusively connected to the national grid. A grant of 50% of the cost of the plant was available for these projects. The private developers had to raise the rest of the financing themselves with the condition of providing at least 15% of the total cost with own resources.

Preparation of Phase 2 has already started and new project proposals have already been submitted in 2009 for this new phase. Two of the proposals have been submitted by developers of Phase 1, which shows the capacity of PSP Hydro in building capacity and confidence among private entrepreneurs.

The power capacity of these plants ranges between 50 kW and 2 MW. These potential sites of Phase 2 have a total capacity of 3.5 MW, which would represent a substantial contribution to the electricity sector in Rwanda. The financing mechanism for Phase 2 has two significant innovations. First, the available grant will not go beyond 35% of the cost in order to make the conditions closer to the real market, where there are no grants available. Second, venture capital providers (VCP) will be invited to participate. It is expected that they will provide a part of the economic resources and will also contribute their expertise in financial management of projects in order to build the managerial capacities of the developers. Again, private developers will have to rise the remaining part of the required funds with a minimum contribution of 15% in own resources. PSP Hydro is currently helping the developers to improve the project proposals and two of the best projects will be chosen to receive a grant. The criteria for the selection will be to provide electricity to isolated communities including health clinics without access to the national grid. It is expected that negotiations with financing partners will be carried out during the first quarter of 2010.

According to the experience in Phase 1, plant analysis plus financing negotiations can take between 9 and 12 months and, depending on the delivery period of the main components,

construction plus set off of the plant can take between 18 and 24 months. This is not necessarily slower - or faster - than the way public MHP projects have been realized in Rwanda, through tenders mainly among foreign companies. It however certainly builds more capacity of local firms to carry out these tasks.

Key intervention B - Consolidation of the participation of private MHP developers in the energy sector

Activity B: Institutional support

This activity is designed as an umbrella of smaller actions and is a continuation of complementary actions that PSP Hydro has undertaken from the start in order to support MININFRA in the engagement and consolidation of private stakeholders in the MHP sector.

The MININFRA sees the PSP Hydro project as the ideal partner to support the development of capacities of private companies in the MHP field. Special requests from the MININFRA that should be included under 'institutional support' during Phase 2 are:

- Delivery of training for developers on managerial and operational skills. This will be very useful once the construction of the plants is finished and the exploitation phase starts,
- Delivery of training on maintenance for technicians. Also essential during the exploitation phase,
- Support the organisation of missions to other countries with successful experiences from which relevant actors of the private electricity sector in Rwanda could learn.

Other foreseen actions in order to increase the impact of the work done by PSP Hydro are:

- Support local institutions in the promotion of productive uses of electricity in rural and peri-urban areas. With this objective, a study will be carried out in order to identify the most appropriate technologies and a dissemination plan will be designed. Such an initiative could present an opportunity to work with the Eco-Emploi Programme of GTZ in Rwanda in order to increase the impact of the developed hydro plants,
- Organise regular meetings with all PSP Hydro implementing partners and relevant institutions in Rwanda in order to discuss the main concerns and share experiences. This action would consolidate the relationships among all the actors within the MHP sector,
- Develop guidelines for the development of MHP in Rwanda. The idea is to reflect the accumulated experience of the PSP Hydro in a very practical document that would be a very useful tool for MININFRA and all other actors within the sector. A comprehensive business plan template has already been developed as one of the components of the guidelines and it is being applied in the feasibility analysis of the projects for Phase 2.

This key activity will be done to strengthen the private sector and enable the various players to developed further off grid sites in the future.

3.2.2 Domestic Biogas

The target group for the domestic biogas programme are those households in the rural areas that own at least 2 – 3 cows in a stable near the homestead under zero grazing conditions. A survey carried on 2007 indicated that there are more than 120.000 households that qualify technically for biogas digesters. The programme is aiming for 15.000 of those households during the initial 4 years of the programme. These households are distributed over practically all 30 districts in Rwanda as keeping of dairy is wide spread and continuously being promoted by other government programmes. The programme will work closely together with the BPR as the credit programme is starting in a limited number of areas before rolling out all over the country.

Drawing upon the experiences during the period 2007/Sept09 the programme for October 2009 to June 2011 will focus on the following key interventions:

1) Promotional activities such as awareness and promotion campaigns through radio (weekly broadcasts), media and direct contacts, printed materials. In addition the programme will built a demonstration digester in 420 out of the 461 sectors in the country. These digesters will be built by the contractors and staff that have been trained in May 2009 and will therefore also be part of the practical training programme,
2) Training of contractors and technicians to increase the number of local enterprises that are engaged in the programme from the current 40 to about 100 small companies. These enterprises will play an increasingly important role as well in the identification of potential farmers in the area where they are based. The trainings are being conducted through technical colleges for the theoretical aspects (5 days) and in the field for on the job training with other companies (60 days),
3) Training of users (through user groups) as well as extension agents that are working in the districts and rural areas to increase the knowledge on biogas and support the promotional activities. These are mostly 1 -2 day training courses,
4) Disbursement of subsidy for digesters that are built according the programme's standards and by the approved contractors. The subsidy of Rwf 300,000 (agreed for at least the financial year 2009/10) will be disbursed in three tranches through the Banque Populaire du Rwanda in combination with the credit. The payments will be approved by the NDBP technicians and will be direct to the contractors' bank account in the BPR,
5) Quality control of the work delivered by the contractors through inspection by field technicians. In July 2009, the programme had 3 field technicians but they will be expanded to 10 field staff by October 2009 (and depending on the results with another 10 staff for the year 2010/11. Each of these technicians will be equipped with a motor bike and basic office and field equipment (GPS, camera, laptop) to be able to carry out the assigned duties in the field. Initially the technicians are expected to visit all the digesters under construction but in the course of the programme, the quality inspection will move towards the contractors who will be fully responsible for their work. The programme will start to use sampling methods and in case of underperformance, the contractor will be suspended from the list of approved contractors,
6) Applied research in digester improvements (to reduce costs and increase performance), the use of slurry as fertilizer (this will be implemented with the help of a national institutions with the necessary competence in this area) and to connection of household toilets to the digester (which is technical feasible but has cultural implications),
7) Data collection and management to monitor progress but also to provide a data base that is required for the registration of a carbon project. This will require the development of an appropriate database system (including digesters specific information, subsidy and credit disbursements requiring close cooperation with the Bank.

A detailed work plan and budget with monthly targets and estimated expenditures for the financial year 2009/10 has been prepared by the team. A similar plan will be prepared for the second year in May/June 2010.

3.2.3 Institutional biogas

Within the institutional biogas sector, the programme will have a cautious approach focusing during the first year on training of engineers and technicians through theoretical curricula to be introduced in the most relevant institutions such as KIST (engineering university) , TCT (technical college) and technical training institutes. The training will also be put in practice through the construction of a limited number of digesters in selected health centres.

From experience with institutional biogas plants in the past in Rwanda it can be observed that management of the plants is a crucial success factors. Hence the programme will put emphasis on users training at the pilot sites and will develop a concept for management and operation of institutional biogas plants especially in the health centres.

The programme will also asses the opportunities to introduce other digester models in Rwanda based upon experiences in countries like China, Vietnam where these technologies are more wide spread. 3.2.5 Experiences and lessons learnt from EnDev1

A) Micro Hydro

Project management

A closer supervision and monitoring is needed - It has been identified that the main problem of the PSP Hydro project is the lack of capacity of the implementing partners (developers), which prevents them from identifying problems quickly and, once the problems have been identified, reacting on time, which causes excessive delays and stops. Therefore, in order to avoid this problem, closer supervision and monitoring of plant progress and closer support to the developers is necessary. In order to achieve this, a local engineer will be contracted as a staff member of the project. Also, it is expected that the participation of venture capital providers in Phase 2 will help to do a closer supervision of financing issues.

The time planning of the new projects should reflect former experiences - The process of improving business plans, obtaining institutional permits and securing financing, which includes significant capacity building of the project developers, should be planned for a period of 9 to 12 months. The construction of the plants themselves should be scheduled to take between 18 and 24 months, due to the long delivery times for key equipment (especially turbines) from Europe or Asia. The guidelines for the development of MHP plants in Rwanda (Activity 2.2) aim to help to standardise and optimise these activities and reduce the periods.

Sector development

Private sector participation pushes Government to set regulatory and legal frameworks - PSP Hydro was the first attempt to engage private companies in the energy sector in Rwanda which, immediately, appeared to be very beneficial. Private developers of the PSP Hydro project pushed the Government to establish a clear and stable framework within which to be able to develop their businesses. As a consequence, in Rwanda, there is a regulatory body for activities within the energy sector, environmental regulations for power plants are in place and a feed-in tariff has been created.

B) Domestic Biogas

The programme supports the development of a market driven marketing of the masonry digesters based on the design used in Nepal and other Asian countries where SNV has been involved in similar programmes for over 10 years. The technology was introduced in 2007 in 4 districts surrounding Kigali through the Government funded pilot programme with technical inputs of SNV and 101 digesters were constructed in the period July 2007 to April 2008.

The pilot phase also trained 10 contractors and their staff (masons, plumbing technicians) who were subsequently engaged in the construction of more digesters in the districts. While in the pilot phase, households only paid for the collection and transport of sand, stones and some labour (valued at Rwf 150.000) in the implementation phase the costs to the farmers were much higher as the programme provided a subsidy of Rwf 200.000 only (75% from GTZ/EnDev funds, 15% from the Ministry budget). Credit was not available during this stage of the programme and by Aug 2009 only another 201 digesters were constructed through the programme.

In the preparation phase the costs of a typical 6 mtr3 digester were estimated to be Rwf 480,000 (€675). However, experience over the last year has shown that the costs plus the necessary margins for the contractors arrive at Rwf 800,000 (€950). It was therefore suggested to increase the subsidy to Rwf 300,000 starting from 1st July 2009 and this amount will be re-considered after one year. To reach the targets, credit should be available to the farmers and NDBP has been in contact from the start of the programme with the Banque Populaire du Rwanda (BPR, which has over 140 branches and outlets in the

country). Unfortunately, negotiations were prolonged (BPR is now in partnership with the Dutch RABO bank) and only in May 2009 an agreement was signed between BPR and FMO providing a support loan of €4m for the biogas programme. Households will get access to this credit at Rwf 320,000 for each digester to be repaid over 3 years. Actual disbursements will start in Sept 2009 and it is expected that this will provide a significant boost to the market for biogas systems.

C) Institutional biogas

During the EnDev1 phase, survey was carried out to collect data of the existing institutional biogas digesters in the country and to learn about their performance. The survey found that 28 biogas systems have been installed in institutions since 2001 while another 8 are under construction. Of the total of 36 units, 13 were installed in secondary schools, 11 in prisons, 7 in community households, 2 in military camps, 2 in training centres and one in a hospital. KIST/CITT has played a leading role not only in the development of the technology but also as a contractor as it has build 24 out of the 36 systems in the country (five of these are still to be completed). Over the last years, some private companies have entered the market, first under supervision of CITT but now also implementing independent contracts. In 14 (50%) of the 28 operating biogas digesters only human waste is being used (typically for the prisons and some schools) while others use a combination of human and animal waste, mainly cow dung. It has been found that 11 of 28 completed digesters operate very well, 5 operate with major defects while 6 were abandoned or even never operated due to wrong design. The major causes for malfunctioning of the systems were found to be lack of commitment of the management and/or a lack of a qualified biogas operator and this was found more the case in the bigger institutions than in small systems operated by missions and farms. There is also a serious shortage of technical support to assist institutions in carrying out simple modifications and reparations of leakages and damaged stoves. The survey also provides data on the costs and states that investment costs can be recovered in 4 – 17 years depending on the management. It was found that digesters which use a mixture of human waste and cow dung (many boarding schools have dairy cows to help feed the children) perform better than those based on human waste only.

3.3. Risks for implementation

A) Micro Hydro

One of the main priorities for the energy authorities in Rwanda is the extension of the national electricity grid. This initiative is bringing electricity to many areas where electricity was not available when Phase 1 started. As a consequence, many developers of Phase 2 conceive their MHP plants connected to the grid in order to sell as much electricity as possible and optimise their financing calculations. The risk exists that financing institutions will prefer national grid connected plants instead of local grid connected plants.

Financing institutions, including banks and venture capital providers (VCPs), have expressed their interest in MHP plants develop under a private approach. However, as mentioned before, it will be difficult to get new bank loans or VCP engagement unless the project can set off two or three plants and show results. This is the major earliest challenge that Phase 2 will encounter.

Grant contribution for Phase 2 of PSP Hydro will not go beyond 35% of the cost. This is a substantial reduction compared to the 50% of Phase 1 or the 70-100% of other hydro projects within EnDev. The rational is to make the conditions closer to the real market, which is necessary in order to consolidate private sector capacities. However, lower contribution also means less decision capacity and less control capacity on the performance of the implementing partners, which may bring PSP to a position closer to advisor than partner.

As mentioned before, a new sector needs to reach a minimum critical mass of private companies that guaranties a sustainable independent sector. With only two new plants, PSP

Hydro will not make a decisive contribution for the consolidation of a private electricity sector in Rwanda.

B) Biogas

A major risk is the willingness of the households to invest in the technology which is costly and many potential customers may have other priorities. If this is the case, the programme will not be able to reach the targets that are mentioned in for this phase of the project and may not be able to reach the overall target of 15.000 units at the end of the programme. If this will be the case, the costs per digester (which was in the original project document calculated at € 250/digester will increase even above the €450 that is the current estimate based upon an increase of the subsidy (in relation to increase of the construction costs) and the much higher programme costs for promotion, training, quality control and management.

For the institutional biogas the major risk will be the lack of funding in the ministries of education and of health to raise the funds for the construction. A suitable financing mechanism needs to be developed based on credit as well as carbon financing.

4. Impact Monitoring & Evaluation

4.1 Expected Impacts of project intervention

Micro Hydro

The PSP Hydro project will have a significant impact on the host communities of the new MHPP. This is because the expected impacts that a MHP plant can have in rural and peri-urban areas in Rwanda are many and related to all MDG; with a reduced impact on the environment, the construction of a MHP plant can have direct positive impacts on social infrastructure (health, education and public administration) and economic development (for example, creation of micro businesses and implementation of productive activities such as transformation of agricultural products), which contribute to poverty alleviation and gender equity, prevents deforestation and facilitate water management. Special mention deserves the contribution to health. Electricity availability will improve the quality of the services provided by local health centres and also in households, where electricity for lighting will prevent smoke from paraffin lamps.

Biogas

The impact of the biogas programme will be; 1) reduction in workload in particular for women and children 2) reduced respiratory diseases among women and children, 3) positive impacts on environment (difficult to segregate from other changes): 4) improved nutrition through changes in food preparation and frequency and 5) changes in education of the children who profit from better and longer light.

A base line survey among 1200 households was carried out in 2007 under the EnDev1 programme and this will assist in the impact evaluation.

4.2 Planned Impact Monitoring & Evaluation Methodology

Micro Hydro

Please tick:

- ☒ a baseline survey for impact evaluation is planned and scheduled for October 2010
- ☒ a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for June 2011 and December 2012
- ☒ the project would be interested to get financial support for impact evaluation.

Biogas

Please tick:

☒ a baseline survey among 1200 HHs for impact evaluation was carried out in 2007

☒ a baseline survey for coming impact evaluation is already available, follow up household interview studies are planned for 2011 earliest

☒ the project will use other methods for impact monitoring. Such as:

Brief technical and consumer survey among 50 digesters has been programmed for Sept/Oct 2009 to evaluate the performance of the masonry and fibre glass digesters which will generate socio economic data as well.

5. Budget

	EUR
1 Human Resources and travelling	500.000
2 Equipment and Supplies	400.000
3 Funding Financing Agreements/Local subsidies	3.500.000
4 Other direct costs	200.000
5 Total direct costs	**4.600.000**
6 Mark up costs/administrative overheads/imputed profit/	400.000
7 Cost price	**5.000.000**

E. Statement of GTZ

GTZ complied during planning and will comply during the implementation of the country activity with the respect for human rights and adherence to democratic principles, rule of law and good governance.

GTZ will disclaim any liabilities in respect of funds from the Co-Donor.

In respect to procurement procedures, GTZ applies the respective provisions of the general principles and guidelines for bilateral development assistance, in particular EU procurement law, German procurement law and the General Agreement between BMZ and GTZ including using procurement procedures of the partner country if they comply with the above principles.

All GTZ Offices and projects managing EnDev activities are supplied with funds by the Head Office, generally by letters of credit. The letters of credit are generally opened in favour of the Office or the projects, represented by the Country Director or officer responsible for the contract and cooperation. National personnel are not granted unlimited individual power of attorney for letters of credit. Existing foreign exchange regulations of the partner countries are complied with.

Project funds will only be kept for direct actual needs avoiding accumulation of funds (including any interest according to the principles and regulations defined in the corporate rules and directives “orientation and rules”.

GTZ has in place systems of monitoring the use of funds and the achievement of objectives including financial and narrative reporting, audit and access to information following the agreed standard between BMZ and GTZ.