ANNUAL PLANNING 2012 – UPDATE

on

Energising Development – Phase 2

Partnership between:

The Netherlands Ministry for Foreign Affairs

The Norwegian Ministry of Foreign Affairs

and

The Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)

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Energising Development

Responsible:
Dr. Carsten Hellpap

Eschborn, Germany, April 2012

Contents

A. Overview Over Planned Country Projects

The Governing Board of EnDev approved the Annual Planning 2012 during the 5th meeting on November 28th and 29th. The approved Annual Planning 2012 document had been prepared in October 2011, when the Norwegian Ministry of Foreign Affairs had not joined the EnDev partnership yet and the co-financing from Irish-Aid and the EU-commission had not been agreed yet. Meanwhile, Norway is a member of the partnership and Irish Aid and EU are co-financing certain activities of EnDev, so that an update of the Annual Planning 2012 document has become necessary.

Chapter B summarizes the key data of ongoing country activities to be up-scaled. Chapter C presents the key data of new country activities. Chapter D comprises the up-scaling proposals of the different country activities and chapter E the proposal for a new country acitivity.

Tab. 1: Approved country activities in 2012 under EnDev II without changes

Country	Activities	Project Duration		Funding	Planned outcomes on household level
		Start	End	In Euro	In persons
Benin	Rural electrification	01/10	12/12	1,600,000	15,399
Benin	Stoves	10/09	12/13	2,000,000	400,000
Burkina Faso	Stoves	10/09	12/14	1,500,000	300,000
Burundi	Rural electrification	09/10	08/12	900,000	11,000
Mali	Rural electrification	04/09	06/13	2,000,000	19,800
Mongolia	Rural electrification	01/10	finished	580,000	Reported under EnDev1
Mozambique	Rural electrification	10/09	12/12	3,800,000	45,600
Rwanda	Rural electrification, biogas	10/09	12/13	7,200,000	30,700
Senegal	Rural electrification, stoves	04/09	12/14	7,200,000	459,700
Uganda	Rural electrification, stoves	04/09	12/12	4,000,000	1,129,000

Tab. 2: Country activities intended to be scaled up and extended

Country	Activities	Project Duration			Funding in 1000 Euro		Planned outcomes on household level in persons	
		Start	Old End	New End	Old Funding	New Funding	Old target	New target
Bangladesh	Stoves, solar	10/10	12/12	03/14	5,850	7,850	962,500	1,240,000
Bolivia	Grid, solar, stoves	05/09	12/12	12/14	5,400	8,400	277,000	462,000
Ethiopia	Solar, stoves, hydropower	01/10	06/12	12/13	6,830	10,920	525,421	656,454
Ghana	Grid	01/10	03/13	06/14	900	1,650	300 MSMEs	600 MSMEs
Honduras	Grid densifi-cation, stoves, hydropower	10/09	12/12	12/14	2,630	4,130	29,300	49,300
Indonesia	Solar, hydropower, others	05/09	12/13	06/14	8,000	9,000	90,000	112,000
Kenya	Stoves, solar	05/12	12/12	12/14	3,300	6,800	1,020,000	3,730,000
Nepal	Grid extension, hydropower	05/09	12/13	12/13	1,640	2,640	127,427	141,177
Nicaragua	Grid densifi-cation, solar, hydropower	06/09	06/12	12/12	2,640	4,140	29,000	49,000
Peru	Grid densifi-cation, stoves,	06/09	06/12	12/14	3,400	6,400	160,000	315,000

Tab. 3: New country activities

Country	Activities	Project Duration		Funding	Planned outcomes on household level
		Start	End	In 1000 Euro	In persons
Liberia	Solar, stoves	05/12	12/13	750	10,500

B. Country Activities Intended to Be Scaled up in Brief

Bangladesh

Project Phase	10.2010 – 03.2014					
Project Budget	Old: € 5,850,000 New: € 7,850,000					
Target Groups	Rural population of Bangladesh					
Expected Outcome at Project End					**Old target**	**New target**
No. of People	Energy for lighting & electric household appliances				687,500	740,000
	Cooking energy for households				275,000	500,000
No. of Institutions or Enterprises	Electricity and/or cooking energy for social infrastructure				**-**	**-**
	Energy for Productive use/income generation				-	-
Promoted Technology	**[x] Solar**	**[ ] Biogas**	**[x] Stoves**	**[ ] MHP**	**[ ] Grid**	**[ ] Other**
Summary of Key Interventions and Outputs	• Support producers, retailers and sales agents to offer affordable, energy efficient high quality products (solar systems and stoves) and to develop rural distribution chains through capacity development (e.g. Training of masons and technicians for solar home systems and improved cooking stoves) and financial incentives. • Improve the framework conditions necessary for the market based dissemination of solar home systems, picoPV systems and improved cooking stoves • Organisation and coordination of awareness raising and marketing activities					
Coordination with other programmes	ICS Project: UPPR (UNDP) and IPAC S/SHS Project: IDCOL donor organizations (IDA, ADB, SIDA, DFID, KfW)					
Lead Political Partner	Power Division, Ministry of Power, Energy and Mineral Resources					
Implementing Partners	SSHS project: IDCOL PicoPV project: NGOs and private organizations, IDCOL ICS project: NGOs, private entrepreneurs, local government boards					
Project Manager	Name: Erich Otto Gomm Mail: Otto.Gomm@giz.de					

Bolivien

Project Phase	Old: 05.09 – 12.12 New: 10.09 –12.14					
Project Budget	Old: € 5,400,000 New: € 8,400,000					
Target Groups	Rural population of Bolivia					
Expected Outcome at Project End					**Old target**	**New target**
No. of people	Energy for Lighting & Electric HH Appliances				200,000	300,000
	Cooking Energy for Households				77,000	162,000
No. of institutions or enterprises	Electricity and/or Cooking Energy for social infrastructure				1,700	2,700
	Energy for productive use/ income generation				8,200	11,200
Promoted technology	[x] Solar	[ ] Biogas	[x] Stoves	[ ] MHP	[x] Grid	[ ] Other
Summary of Key Interventions and Outputs	• Support connection to the grid (potential appr. 80,000 households) through grid densification. Financial incentives provided by EnDev will also be included in the new electrification programmes. Thus 2 new loans (IDB and WB) for rural electrification projects are planned. A national fund will be created with the fees applied to the electric market administrated by the VMEEA that partly will be used for the connection fee. This strategy will be executed consider the experiences of EnDev activities. • Promotion of improved cook stoves in close cooperation with all stakeholders involved (national and local governments, NGOs, research institutions, private sector). A specific focus will be placed on (a) strengthening the market (supply chains and after-sales services) (b) capacity building for cook stove installers (c) promoting evaluation of cook stoves (technology testing centre, cook stove and spare part certification, gender aspects, stove research) (d) support the installation of 5000 stoves funded by World Bank • Promotion of improved cook stoves for social infrastructures institutions (schools, health centres, communal centres) by strengthening the supply chain (working with local suppliers or introducing new suppliers, awareness raising, finance mechanisms). • Promotion of productive use of energy by supporting farmer's associations to be connected to the grid or by facilitating access to processing technologies. .					
Coordination with other programmes	WB energy programme and German bilateral programmes, especially PROAGRO					
Lead Political Partner	Ministry for Hydrocarbons and Energy, Vice Ministry for Electricity and Renewable Energy					
Implementing Partners	Vice Ministry for Electricity and Renewable Energy, business association, NGOs, municipalities, communities, cooperatives, electricity utilities					
Project Manager	Name: Dr. Michael Dreyer Mail: michael.dreyer@giz.de					

Ethiopia

<table>
<tr><td>Project Phase</td><td colspan="5">Old: 01.2010 – 06.2012
New: 01.2010 – 12.2013</td></tr>
<tr><td>Project Budget</td><td colspan="5">Old: € 6,830,000
New: € 9,900,000 up to € 10,920,000, thereof € 6,830,000 + € 2,570,000 (Norway) + € 500,000 (Irish Aid), plus an additional variable up-scaling of up to € 1,020,000 depending on achievement of milestones.</td></tr>
<tr><td>Target Groups</td><td colspan="5">Rural population of Ethiopia</td></tr>
<tr><td>Expected Outcome at Project End</td><td colspan="3"></td><td>Old target</td><td>New target</td></tr>
<tr><td rowspan="2">No. of people</td><td colspan="3">Energy for Lighting & Electric HH Appliances</td><td>25,000</td><td>35,000</td></tr>
<tr><td colspan="3">Cooking Energy for Households</td><td>500,000</td><td>620,000</td></tr>
<tr><td rowspan="2">No. of institutions or enterprises</td><td colspan="3">Electricity and/or Cooking Energy for social infrastructure</td><td>361</td><td>450</td></tr>
<tr><td colspan="3">Energy for productive use/ income generation</td><td>60</td><td>1000</td></tr>
<tr><td>Promoted technology</td><td>[X] Solar</td><td>[ ] Biogas</td><td>[x] Stoves</td><td>[x] MHP</td><td>[ ] Grid</td><td>[ ] Other</td></tr>
<tr><td>Summary of Key Interventions and Outputs</td><td colspan="5">Component 1: Electrification of 7000 households with solar PV equipment (lanterns/ lamps, small PV systems) and with hydropower
a) PV systems
• Training of solar companies in providing reliable, affordable lanterns/lamps and Pico PV systems
• Training of young solar entrepreneurs/solar vendors
• Facilitation of financial incentives for promotion of high quality products with guaranteed lifespan
• Facilitation of financial incentives for the development of distribution chains or sales outlets in rural areas
• Facilitation of financial incentives and training for the establishment of battery charging stations and solar kiosks
• Facilitation of start-up capital for young entrepreneurs and vendors
• Establishment of 2 solar training centres
b) Pico and micro hydropower
• Training of project developers
• Training of turbine producers
• Training of municipalities, communities and operators in maintenance, repair, tariff setting etc.
• Facilitation of investment capital mobilisation for the construction of minimum 2 hydropower plants
Component 2: Dissemination of clean cook stoves (such as Mirt, Tikikil) among 124,000 households
• Extension of the project activities from 5 to at least 9 regions
• Awareness raising and consumer information on cooking technologies
• Training of cook stove building trainers
• Assistance for business start-ups
• Marketing support for stove producers and vendors
• Enhance a quality check system
• Promotion of a network of stove producers</td></tr>
</table>

- Facilitation of financial incentives (up to 20% of stove price) for initial stove dissemination in order to stimulate regional stove market development
- Enhancement of biomass-based fuel supply (such as marketing of briquettes and bio-ethanol as well as firewood planting and marketing by different parts of the community and private sector)

Component 3: Electrification of 60 social institutions (such as health centres, schools, community centres) with solar PV systems or with hydropower

- Ensuring procurement of high quality systems
- Installation inspection of commissioned fitting and installation companies
- Support of solar companies in set-up, maintenance and repair services
- Installation of solar pumps and solar water heaters on up to 10 health centres
- Train operators of the solar systems (staff of the social institutions) to guarantee a sustainable use of the installed plants
- Connection of social institutions to hydropower driven mini grids

Component 4: Dissemination of clean cook stoves among 390 social institutions

- Awareness raising on cooking technologies among social institutions
- Training of institutional cook stove producers
- Support cook stove producers in marketing activities
- Facilitation of financial incentives for institutional cook stoves
- Enhance a quality check system for stoves for social institutions

Component 5: Electrification of small and medium size enterprises with solar PV systems and with hydropower and providing clean cook stoves to small and medium size enterprises (in total 1000 enterprises)

- Training of solar companies providing reliable, affordable PV systems for enterprises
- Training of young solar entrepreneurs/solar vendors
- Facilitation of financial incentives for promotion of high quality products with guaranteed lifespan
- Support of solar companies in set-up, maintenance and repair services in major regions
- Connection of small and medium size enterprises to hydropower driven mini grids
- Awareness raising on cooking technologies for enterprises
- Training of producers of cook stove suitable for productive purposes
- Marketing support for stove producers and vendors

Component 6: Policy, Private Sector Development & Services

- Support to the review/formulation of policies, strategies, master plans, programmes, laws and regulations in close coordination with Energy+ and SE4A stakeholders
- Support and supervise the Energy Sector Mapping and Database Development (ESMAD) Study Phase 2
- Promote Public-Private Partnerships in Renewable Energy Development
- Promote information sharing & awareness creation and advise on options for improved access to modern energy services among program partners, stakeholders, and the general public
- Support capacity development in partner institutions related to promotion of improved access to modern energy service
- Support the Ministry of Health and the Ministry of Education in integrating energy supply in the design of new health centres and schools

	• Support partners & stakeholders in identification of interventions for improved access to modern energy services and funding opportunities • Support the promotion of renewable energy activities/programs relevant for private sector development. • Improve the capacity of relevant institutions, NGOs & universities to ensure development of RE enterprises • Facilitating adequate quality assurance systems for products and services in the RE Sector
Coordination with other programmes	**DE:** Sustainable Land Management (SLM) Program; Engineering Capacity Building Program (ecbp), Urban Governance & Decentralisation Program (UGDP); **NL:** Biogas Programme; Africa Regional Environmental Centre (HoA-REC); **WB:** Energy Access and Electricity Access (Rural) Expansion; Lighting Africa; GPOBA; **NO:** Energy +; **IE:** Health care programme; **CIF:** SREP-Ethiopia Investment Plan
Lead Political Partner	Ministry of Water and Energy (MWE)
Implementing Partners	MWE incl. REF, Ministries of Agriculture, Health, Education and Trade; REA; EPA; Regional Governments / Bureaus of Energy, Education, Health and Agriculture; Universities/IoTs/TVETs; Chamber of Commerce & Sectoral Associations; Solar Energy Development Association of Ethiopia (SEDA-E); Ethiopian Hydro Power Society (EHPS); Regional (Development) Associations; private solar energy installation & maintenance companies; other private companies in the energy sector value chain (from input supply to end use); NGOs, Women's Associations.
Project Manager	Name: Dr. Gerd-Henning Vogel Mail: Henning.Vogel@giz.de

Ghana

Project Phase	Old: 10.2009 – 12.2011 New: 1.2012 – mid 2014					
Project Budget	Old: € 900,000 New: € 1,650,000					
Target Groups	MSMEs in new light industrial zones					
Expected Outcome at Project End			**Old target**		**New target**	
No. of people	Energy for Lighting & Electric HH Appliances		300		300	
	Cooking Energy for Households		n/a		n/a	
No. of institutions or enterprises	Electricity for Social Infrastructure		6 electricity connections		6 electricity connections of SI or street lanterns	
	Energy for productive use/income generation		300 MSMEs with new connections		600 MSMEs with new connections	
Promoted technology	[ ] Solar	[ ] Biogas	[ ] Stoves	[ ] MHP	[x] Grid	[ ] Other
Summary of Key Interventions and Outputs	• Provide a total of 600 Micro, Small and Medium Enterprises (MSMEs) with new or improved electrical connections within industrial zones. • Co-financing of hardware for connection of new industrial zones to the national electricity grid; • Facilitate dialogue between District Assemblies, and Northern Electricity Department (NED) of the Volta River Authority (VRA), Electricity Company of Ghana (ECG) and Associations of Entrepreneurs for the establishment of new industrial zones; • Establishment of a management and maintenance structure involving District Assemblies and Business Associations; • Consulting and training of enterprises located in the industrial zones in sustainable business development, esp. eco-efficiency; • Improve business skills of entrepreneurs in newly electrified industrial zones.					
Coordination with other programmes	Programme for Sustainable Economic Development (PSED)					
Lead Political Partner	Ministry of Trade and Industry (MOTI)					
Implementing Partners	Ministry of Trade and Industry (MOTI), The Ministry of Energy (MOEn), Metropolitan, Municipal and District Assemblies (MMDA's), Regional Coordinating Councils (RCCs), Local Business Associations, Institute of Local Government Studies (ILGS), Environmental Protection Agency (EPA)					
Project Manager	Name: Torsten Schlink Mail: Torsten.Schlink@giz.de					

Honduras

Project Phase	Old: 10.09 –12.12 New: 10.09 –12.14					
Project Budget	Old: € 2,630,000 New: € 4,130,000					
Target Groups	Rural and peri-urban households					
Expected Outcome at Project End					**Old target**	**New target**
No. of people	Energy for Lighting & Electric HH Appliances				14,000	26,000
	Cooking Energy for Households				15,300	23,300
No. of institutions or enterprises	Electricity and/or Cooking Energy for social infrastructure				150	225
	Energy for productive use/ income generation				50	250
Promoted technology	[x] Solar	[ ] Biogas	[x] Stoves	[x] MHP	[x] Grid	[ ] Other
Summary of Key Interventions and Outputs	• Electrification of approximately 26,000 persons, 225 social infrastructure institutions and 250 rural businesses and provision of improved cook stoves for about 23,300 beneficiaries by providing financial assistance for NGOs and communities. • Promotion of micro hydro and grid based electricity supply for 2,350 households and 75 social institutions by building capacities of village committees in charge of operation and maintenance, by supporting mobilisation of public funds and by providing subsidies. • Access to 1,600 improved stoves for households and productive use. EnDev will support training of local technicians for construction and maintenance and will subsidize stove cost. • Installation of solar dryers for drying of coffee • Training courses to improve knowledge of cooperating institutions, related technicians and users					
Coordination with other programmes	Natural Resources and Economic Development Programme (PRORENA), SNV Honduras, BORDA					
Lead Political Partner	Forest Conservation Institute (ICF)					
Implementing Partners	NGOs, communities, private enterprises					
Project Manager	Name: Klaus Hornberger Mail: Klaus.Hornberger@giz.de					

Indonesia

Project Phase	Old: 05.2009 – 12.2013 New: 05.2009 – 06.2014					
Project Budget	Old: € 8,000,000 New: € 9,000,000					
Target Groups	Rural population of Indonesia					
Expected Outcome at Project End					**Old target**	**New target**
No. of People	Energy for lighting & electric household appliances				90,000	112,000
	Cooking energy for households				-	-
No. of Institutions or Enterprises	Electricity and/or cooking energy for social infrastructure				160	200
	Energy for Productive use/income generation				290	340
Promoted Technology	[x] Solar	[ ] Biogas	[ ] Stoves	[x] MHP	[ ] Grid	[x] Other
Summary of Key Interventions and Outputs	• select suitable partners (mainly GoI programs) and sites for rural electrification through (least cost, non preferential) renewable energy options • safeguard technical quality through consolidation of commissioning protocols • consolidate training of village O&M teams • introduce networking and benchmarking between village O&M teams • promote productive use • build capacity of rural electrification service providers • strengthen responsible GoI institutions in their role of safeguarding and advocating sustainability in rural electrification schemes.					
Coordination with other programmes	DME (NREEC), DAK (NREEC – local government), PNPM MP (Weltbank and contributing donors)					
Lead Political Partner	Ministry of Energy and Mineral Resources (MEMR) – Directorate General for New and Renewable Energy and Energy Conservation (NREEC)					
Implementing Partners	Main implementing partner: Ministry of Energy and Mineral Resources (MEMR) – Directorate General for New and Renewable Energy and Energy Conservation (NREEC) Other implementing partners in GoI Rural Electrification programs: DAK, DESA Mandiri Energy (both MEMR), PNPM (MoHA), Ministry of Underprivileged Regions, NGO's Local RE service providers, NGO's					
Project Manager	Name: Dr. Rudolf Rauch			Mail: Rudolf.Rauch@giz.de		

Kenya

<table>
<tr><td>Project Phase</td><td colspan="5">Old: 06.2009 – 12.2012
New: 06.2009 – 12.2014</td></tr>
<tr><td>Project Budget</td><td colspan="5">Old: € 3,300,000
New: € 6,800,000 up to € 6,800,000, thereof
€ 3,300,000 + € 1,500,000 (Norway) + € 1,000,000 (DGIS+BMZ), plus
an additional variable up-scaling of up to € 1,000,000 depending on achievement of milestones.</td></tr>
<tr><td>Target Groups</td><td colspan="5">Rural population of Kenya</td></tr>
<tr><td>Expected Outcome at Project End</td><td colspan="3"></td><td>Old target</td><td>New target</td></tr>
<tr><td rowspan="2">No. of people</td><td colspan="3">Energy for Lighting & Electric HH Appliances</td><td>0</td><td>40,000</td></tr>
<tr><td colspan="3">Cooking Energy for Households</td><td>1,020,000</td><td>1,730,000</td></tr>
<tr><td rowspan="2">No. of institutions or enterprises</td><td colspan="3">Electricity and/or Cooking Energy for social infrastructure</td><td>350</td><td>600</td></tr>
<tr><td colspan="3">Energy for productive use/ income generation</td><td>140</td><td>600</td></tr>
<tr><td>Promoted technology</td><td>[X] Solar</td><td>[X] Biogas</td><td>[X] Stoves</td><td>[ ] MHP</td><td>[ ] Grid</td><td>[ ] Other</td></tr>
<tr><td>Summary of Key Interventions and Outputs</td><td colspan="5">Component 1: Electrification of households with solar PV equipment (lanterns/ lamps, small PV systems)
Facilitation of well functioning distribution chains through improved linking of solar wholesalers, retailers and local sales agents
Training of young solar entrepreneurs/solar vendors in rural areas
Facilitation of the development of distribution chains or sales outlets in rural areas
Explore and strengthen the use of existing distribution chains and networks in rural areas (SNV, GIZ, Total, NGOs etc.)
Support the set-up of a decentralized after sales service system through training and financial incentives
Facilitation of micro-finance and other financial schemes for consumers of PV products
Awareness raising among consumers about PV products
Component 2: Dissemination of clean burning cook stoves
Extension of the project activities into new districts
Awareness raising and consumer information on cooking technologies
Identification and training of new cook stove manufacturers and vendors
Assistance for business start-ups
Marketing support for stove producers and vendors
Enhance a quality check system
Disseminate stoves through cooperation with several rural projects (GIZ-DETA, USAID, SNV, KTDA; Tchibo)
Support to the stove producer association
Component 3: Electrification of social institutions (such as health centres, schools, community centres) with solar PV systems
Promote electrification of social institutions through cooperation with several rural projects (e.g. GIZ-DETA)</td></tr>
</table>

	• Installation inspection of commissioned fitting and installation companies • Support of solar companies in set-up, maintenance and repair services • Train operators of the solar systems (staff of the social institutions) to guarantee a sustainable use of the installed plants **Component 4: Dissemination of clean burning cook stoves among social institutions** • Awareness raising on cooking technologies among social institutions • Training of institutional cook stove producers • Support cook stove producers in marketing activities • Facilitation of financial incentives for institutional cook stoves • Enhance a quality check system for stoves for social institutions **Component 5: Electrification of small and medium size enterprises with solar PV systems and providing clean burning cook stoves to small and medium size enterprises** • Training of solar companies providing reliable, affordable PV systems for enterprises • Training of young solar entrepreneurs/solar vendors • Facilitation of financial incentives for promotion of high quality products with guaranteed lifespan • Support of solar companies in set-up, maintenance and repair services in major regions • Awareness raising on cooking technologies for enterprises • Training of producers of cook stove suitable for productive purposes • Marketing support for stove producers and vendors
Coordination with other programmes	GIZ Project Promotion of Private Sector Development in Agriculture
Lead Political Partner	Ministry of Energy, Kenya
Implementing Partners	SNV Kenya, GIZ Project Support to Host Communities Dadaab, PPP GIZ Total, WB/IFC Lighting Africa program
Project Manager	Name: Reimund Hoffmann Mail: Reimund.Hoffmann@giz.de

Nepal

Project Phase	05.2009 – 12.2013					
Project Budget	Old: € 1,640,000 New: € 2,640,000 including € 1,000,000 (Norway)					
Target Groups	Rural population of Nepal					
Expected Outcome at Project End					**Old target**	**New target**
No. of people	Energy for Lighting & Electric HH Appliances				127,427	141,177
	Cooking Energy for Households				-	-
No. of institutions or enterprises	Electricity and/or Cooking Energy for social infrastructure				30	33
	Energy for productive use/ income generation				40	44
Promoted technology	[ ] Solar	[ ] Biogas	[ ] Stoves	[x] MHP	[x] Grid	[ ] Other
Summary of Key Interventions and Outputs	• Support the electrification of approximately 14,000 persons, 18 social infrastructure institutions (health posts, schools) and 24 rural businesses by facilitating the access to credit for rural micro hydropower schemes in Nepal • Provide investment capital to rural communities for operating their own MHP plant in remote areas • Organisation of Awareness raising meetings and interaction programmes to inform the Hydro User Committees on the MHP Debt Fund • Advice, train and provide support to partner banks and MFI in developing a credit appraisal procedures for micro hydropower • Organisation of exposure visits to the hydro sites • Support the rural communities in establishing rural businesses by using electricity and close coordination with existing Productive Use activities of RREP (Rural and Renewable Energy Programme) • Close alignment with the existing ESAP II / RERL programmes and its successor RREP for supporting the single modality programme approach for promoting rural electrification in Nepal					
Coordination with other programmes	Nepal Energy Efficiency Programme (GIZ-NEEP), Energy Sector Assistance Programme (DANIDA/NORAD), Renewable Energy for Rural Livelihood (WB/UNDP), FMO					
Lead Political Partner	Ministry of Energy (MoE)					
Implementing Partners	a) Hydro: Alternative Energy Promotion Centre (AEPC) b) Grid Extension: Nepal Electricity Authority (NEA)					
Project Manager	Name: Roman Gruener Mail: Roman.Gruener@giz.de					

Nicaragua

Project Phase	Old: 06.09 – 06.12 New: 06.09 –12.14					
Project Budget	Old: € 2,640,000 New: € 4,140,000					
Target Groups	Rural population of Nicaragua					
Expected Outcome at Project End					**Old target**	**New target**
No. of people	Energy for Lighting & Electric HH Appliances				29,000	49,000
	Cooking Energy for Households				-	-
No. of institutions or enterprises	Electricity and/or Cooking Energy for social infrastructure				110	160
	Energy for productive use/ income generation				115	165
Promoted technology	[x] Solar	[ ] Biogas	[ ] Stoves	[x] MHP	[x] Grid	[ ] Other
Summary of Key Interventions and Outputs	• Support the electrification of approximately 49,000 persons, 160 social infrastructure institutions and 165 rural businesses by continuing successful access strategies and introducing pico-PV and pico-hydro systems. • Promotion of access for households, social infrastructure and productive use by grid extension and densification. EnDev-Nicaragua will work in areas close to the grid, but beyond the scope of the national utility (150 m). The project will also provide technical and financial support to the national sustainable electrification programme in its grid extension activities for rural areas. • Dissemination of 1,000 SHS and Pico PV systems in cooperation with farmers' organisations and local NGO's. EnDev will subsidise the products and train local technicians in maintenance and after-sales services. • Installation of 20 Pico Hydro Power Plants (300 W – 5 kW) in the coffee-growing sector, providing access for productive use but also neighbouring families. EnDev will provide subsidies and technical training.					
Coordination with other programmes	Water and Sanitation Assistance Program (PROATAS), SNV Nicaragua Program, BORDA					
Lead Political Partner	National Sustainable Electrification and Renewable Energy Program (PNESER-FODIEN)					
Implementing Partners	NGOs, cooperatives, communities and private enterprises					
Project Manager	Name: Klaus Hornberger Mail: Klaus.Hornberger@giz.de					

Peru

Project Phase	Old: 06.09 – 06.12 New: 06.09 –12.14					
Project Budget	Old: € 3,400,000 New: € 6,400,000					
Target Groups	Rural population of Peru					
Expected Outcome at Project End					**Old target**	**New target**
No. of people	Energy for Lighting & Electric HH Appliances				100,000	175,000
	Cooking Energy for Households				60,000	160,000
No. of institutions or enterprises	Electricity and/or Cooking Energy for social infrastructure				3,200	4,700
	Energy for productive use/ income generation				500	2,500
Promoted technology	[x] Solar	[ ] Biogas	[x] Stoves	[ ] MHP	[x] Grid	[ ] Other
Summary of Key Interventions and Outputs	• Support the electrification of approximately 315,000 persons, 4,700 social infrastructure institutions and 4,700 rural businesses by replicating and consolidating successful access strategies. • Promoting grid densification through safe basic electricity connections, thereby benefitting households, social infrastructure institutions and productive use applications. • On community level, EnDev-Peru will focus on strengthening the sustainability of its grid densification approach by training electricians, supporting the supply chain for quality and safe material, and by raising awareness among the population. • On local, regional and national level, EnDev-Peru will provide advisory services to government institutions and local governments, the private sector and training institutions in order to help these partners promote rural electrification. • Promotion of SHS and Pico-PV-Systems in areas without grid access by working with government partners on the implementation of viable business models (e.g., a lease in combination with subsidies). The aim is to assure profitability of rural electrification operators. • Improved cook stoves will be further promoted by building on success of prior phases of the project in close cooperation with all stakeholders involved (national and local governments, NGOs, research institutions, private sector). A specific focus will be placed on (a) promoting good use and maintenance of stoves (b) strengthening the market (supply chains and after-sales services) (c) capacity building for cook stove installers (d) promoting evaluation of cookstoves (technology testing centre, cook stove and spare part certification, gender aspects, stove research) • Promotion of solar water heaters and improved cook stoves for social infrastructures institutions (schools, health centres, communal centres) by strengthening the supply chain (working with local suppliers or introducing new suppliers, awareness raising, finance mechanisms). • Productive use of energy will be promoted by working with farmer's associations. EnDev-Peru will no longer subsidise investment cost, but facilitate access to the technology (capacity building along the supply chain)					

	and support the farmer's association to access national funding programmes.
Coordination with other programmes	German bilateral programmes in Democracy, Water and Rural Development; IDB & World Bank (energy advisory services to Ministry of Energy); Energy and Environment Alliance (Finland, Andean region); EC and Jica (renewable energy promotion with Ministry of Energy). UNDP for cook stove promotion and carbon financing.
Lead Political Partner	Agencia Peruana de cooperación internacional APCI, Presidencia del consejo de Ministros PCM
Implementing Partners	Ministries for Social Inclusion, Energy and Mines, Housing, Agriculture, Environment, Health, and Education, Support programmes for the poorest (JUNTOS, ...), Regional Governments, Governments of the Provinces. Private companies especially from the mining sector. Farmer's associations.
Project Manager	Name: Ana Isabel Moreno Mail: Ana.Moreno@giz.de

C. Planned New Country Activity in Brief

Liberia

Project Phase	05.2012 – 12.2013					
Project Budget	€ 750,000 plus an additional variable up-scaling of up to € 240,000 depending on achievement of milestones.					
Target Groups	Rural, peri-urban and urban population of Liberia					
Expected Outcome at Project End					**Target**	
No. of people	Energy for Lighting & Electric HH Appliances				5,500 people	
	Cooking Energy for Households				5,000 people	
No. of institutions or enterprises	Electricity and/or Cooking Energy for social infrastructure				10 institutions	
	Energy for productive use/ income generation				1,500 family enterprises	
Promoted technology	[x] Solar	[ ] Biogas	[x] Stoves	[x] MHP	[ ] Grid	[ ] Other
Summary of Key Interventions and Outputs	**Component 1: Electrification of 1000 households with Pico Photovoltaic equipment (lanterns/lamps, Pico Solar Home Systems)** • Support local wholesalers in importing reliable, affordable lanterns/lamps and Pico PV systems • Develop a marketing system for PicoPV using already existing and new distribution chains. • Training of sales agents of existing distribution chains in solar technology • Training of new solar entrepreneurs/solar vendors • Facilitation of financial incentives for the development of distribution chains or sales outlets in rural areas • Facilitation of start-up capital for new entrepreneurs and vendors • Establishing of a monitoring systems for lanterns on households level • Capacity Development of the Rural Renewable Energy Agency in managing solar lantern program • Capacity Development of organisations implementing solar lantern dissemination activities **Component 2: Mini-grid based on micro hydropower, river turbine, PV or hybrid (500 people)** • Identification of suitable sites • Implementation of a detailed feasibility study • Identification and Training of local project developers • Training of municipalities, communities and operators in maintenance, repair, tariff setting etc. • Facilitation of investment capital for the construction **Component 3: Dissemination of clean cook stoves (especially charcoal stoves) among 1000 households** • Identification of suitable stove models • Introduction of improved charcoal stoves • Awareness raising and consumer information on cooking technologies • Training of local technicians in cook stove construction						

	• Marketing support for stove producers and vendors • Enhanced quality check system • Facilitation of financial incentives (up to 30% of stove price) for initial stove dissemination in order to stimulate regional stove market development **Component 4: Electrification of 5 social institutions (such as health centres, schools, community centres) with solar PV systems** • Identification of suitable institutions • Ensuring procurement of high quality systems • Installation inspection of commissioned fitting and installation companies • Support of solar companies in set-up, maintenance and repair services • Train operators of the solar systems (staff of the social institutions) to guarantee a sustainable use of the installed plants **Component 5: Solar drying for small and medium size farmers (in total 1500 farmers)** • Training of local technicians in constructing solar dryers for cacao and other agricultural products. • Facilitation of financial incentives for the use of solar dryers • Support local technicians in set-up, maintenance and repair services for dryers
Coordination with other programmes	World Bank Energy Programs, Norwegian Energy Programs, EU energy projects,
Lead Political Partner	Ministry of Lands, Mines and Energy
Implementing Partners	Rural Renewable Energy Agency, GIZ Development Oriented Emergency and Transitional Aid in Lofa, Agro Action (Welthungerhilfe), Lighting Africa

D. Upscaling Proposals

Bangladesh

1. Situation Analysis

Bangladesh is one of the world's poorest and most densely populated nations (population of approximately 160 million, 1,150 inhabitants/km²), with large parts of its people living in poverty. Data from the Household Income and Expenditure Survey 2005 revealed that 40% of the country's population was classified as poor, with incomes below the upper national poverty line. In rural areas this rate is even higher, counting 44% of the population as poor (urban areas 28%). One fourth of the population is considered extremely poor (urban: 15%; rural: 29%), having incomes below the lower poverty line. Lack of access to modern energy services is one of the reasons for poverty and low economic development.

Today only 43% of the Bangladesh population is connected to the electricity grid. The electricity supply is not reliable though and peak demand cannot be met. In the rural areas only about 25% have electricity. A mere 6% of the entire population has access to natural gas, primarily in urban areas. Biomass fuels, such as wood, cow dung and agricultural residues are collected mainly from the local environment and have become a traded commodity as cooking fuel as access to local biomass becomes ever more difficult. Inefficient, kerosene based lamps are the most common sources of light.

1.1. Energy Situation

About 72% of the population of Bangladesh lives in rural areas. Due to the lack of electricity supply in rural areas, the rural population depends mainly on biomass and kerosene as sources of energy for cooking and lighting. Over 70% of the total primary energy supply is biomass, mainly agricultural waste and wood. This represents around 50% of Bangladesh's total energy demand.

Over 90% of all Bangladeshi households use biomass such as wood, cow dung, jute sticks or other agricultural wastes for cooking. Inefficient and poorly ventilated clay stoves produce fine particles, polycyclic aromatic hydrocarbons, carbon monoxide, dioxins and other carcinogens. Housewives are exposed to high levels of these toxins between three and seven hours a day. Research revealed that this indoor air pollution (IAP) occurs not only in the kitchen but only slightly lower in the living area therewith affecting also other family members such as children. The World Health Organization states IAP causes 4% of all diseases and 46,000 deaths in Bangladesh alone.

<u>Electricity Sector</u>

Bangladesh is one of the world's lowest electricity producers. Electricity, critical to economic growth, has reached only about 43% of all households, despite the country's successful rural electrification program. This number includes households that receive only very few hours of electricity per day. With the exception of kerosene, commercial fuels are beyond reach for many. Bangladesh's reliance on biomass for cooking will continue for several decades. Different types of power plants generate electricity and synchronize it with the national grid. There are some isolated diesel power stations at remote places and islands that are not

connected to the national grid. In the Eastern Zone (eastern side of river Jamuna), electricity is generated from indigenous gas and a small percentage through hydropower.

In the Western Zone, coal and imported liquid fuel is used for generation of electricity. The fuel cost per unit generation in the Western Zone is much higher than that of the Eastern Zone. Therefore, as a policy, low cost electricity generated in the Eastern Zone is transferred to the Western Zone through the 230 kV East-West Inter connector transmission line.

The installed capacity of power generation in Bangladesh today is about 6,300MW. The peak production averages about 4,500MW with a maximum 5,000MW. The demand exceeds the installed capacity by far. According to reports, the supply gap varies around 1,000-1,500 MW. Bangladesh´s electricity supply strongly relies on gas: More than 80% of the power plants are fired by gas. Hydropower contributes 4.4% of the total electricity supply.

Bangladesh suffers from regular 'load-shedding'. A situation that deteriorates during irrigation seasons, when the demand-supply gap reaches up to 1,500 MW. Domestic and industrial sectors consume about 43% and 44% electrical energy respectively, i.e. a total of about 87% of power consumption occurs in these two sectors. Out of this, a large part of electrical energy is consumed for lighting. It is estimated that the lighting load alone is about 1,200 MW. Accordingly, the maximum power gap occurs primarily during the evening. A way to manage the evening load is the introduction of energy efficient lights/lighting systems.

Dissemination of solar home systems (SHSs) is being promoted mainly by private sector companies and NGOs; presently, projects are mainly based on the direct-sale approach. This approach is successfully demonstrated by an IDA/GEF-supported project, which provides participating organizations (mostly NGOs) with refinancing funds for micro-financing of SHSs. In the past the concept comprised of a buy-down grant and an institutional development grant for the participating organizations to build capacities for promotion of SHSs in rural areas as well as a service fee from IDCOL for their intense monitoring efforts. The buy-down grant has declined over the years from 90$ to 25$ now. The institutional development component was 20$ in the beginning reduced to 3$ over the years and will from next year onwards only be paid out to new partners in the program.

1.2. Policy Framework, Laws and Regulations

All mentioned problems related to inefficient biomass use and indoor air pollution are addressed in the Bangladesh Poverty Reduction Strategy Paper (PRSP), chapters 5.H.1 'Conservation of Nature' and 5.H.2 'Combating Pollution':

"The relationship between the amount of the fire wood use and level of income is clearly positive and monotonic. This means that the poor has much less access to quality fuel for cooking. Income poverty thus translates into energy poverty." (p. 164)

"Population pressure on land has been leading to conversion of forest land and land under tree cover into other uses. This at the same time further lowers the supply of biomass and fuel wood for cooking raising their market value including further deforestation and cutting down of trees. Smoke due to fuel wood burning also is a major cause of a significant rise in the level of indoor air pollution affecting adversely the health of women and children." (p.164)

"Air pollution needs to address both the outdoor and indoor sources of pollution. […] Indoor air pollution is mainly caused by cooking fuels such as firewood and dried cow dung. Most of

the poor families use these as fuel and women and children are the main victims of indoor air pollution. Due to air pollution the number of people suffering from respiratory diseases is on the rise." (p. 167)

The PRSP derives the following national strategies to address the mentioned problems:

"For controlling indoor air pollution use of natural gas, biogas and LPG may be encouraged through various means including policy supports for their lower relative prices as well as more efficient and cost- effective cooking stoves." (p. 167)

The introduction of energy efficient cook stoves was set one of the key targets to control air pollution in rural settings:

"Building coalitions with NGOs for wider dissemination of fuel-efficient cooking stoves" and *"Promote R&D to change building and construction standards and designs for pollution-free kitchens"* were the respective planned actions on the policy agenda for the fiscal year 2005/06 (p. 301).

The Bangladeshi Energy Strategy of 1996 with its actualization in 2002 was the main document of the promotion of RE. It focuses on energy supply in rural areas. In 2009, the Renewable Energy Policy for Bangladesh (REP) was adopted by the present Government.

The REP contains the following parts:

- Overview of potentials of RE sources
- Institutional arrangements in the RE sector (above all the responsibilities of SREDA)
- Resource, technology and program development
- Investment and fiscal incentives
- Regulatory Policy

and provides incentives for renewable energy promotion.

Some of them are as follows:

- All renewable energy equipments and related raw materials in producing renewable energy equipments will be exempted from charging 15% VAT.
- A network of micro-credit support system will be established especially in rural and remote areas to provide financial support for purchases of renewable energy equipment.
- SREDA will consider providing subsidies to utilities for installation of solar, wind, biomass or any other renewable/clean energy projects.
- Renewable energy project investors both in public and private sectors shall be exempted from corporate income tax for a period of 5 years from the date of notification of this policy in the official gazette and it will be extended periodically following impact assessment of tax exemption on renewable energy.
- An incentive tariff may be considered for electricity generated from renewable energy sources which may be 10% higher than the highest purchase price of electricity by the utility from private generators.
- Furthermore a lot of procedures will be simplified and investment in renewable energy and energy efficiency projects will be facilitated.

The Private Sector Power Generation Policy shall attract private investment for installing new power generation capacity on build-own-operate (BOO) basis. The vision of the Government of Bangladesh is to provide access to electricity to all households of Bangladesh within 2020.

Under the circumstances that only 43% of the population has access to electricity in 2011, this vision is almost impossible to be materialized. To reach the government's vision of universal electrification, renewable energy sources, in particular solar energy will have to play a vital role for off-grid electrification. The small solar home systems (SSHS) and upcoming PicoPV systems/solar lamps (SL) will provide subsistence electric light to households. The cost of a solar lamp would be within the reach of the most of the households of Bangladesh and even the extreme poor will be able to afford this if a proper financing mechanism is in place. The envisioned solar lamp project will promote the solar lamp and create its market that is expected to amount to over 10 million households in the next five years. Together with the improvement of the IAP situation in the households through replacement of kerosene based lamps through the solar appliances and the dissemination of improved cooking stoves the EnDev activities are well consistent with the national policies mentioned above.

1.3. Institutional Set-up in the Energy Sector

Bangladesh Energy Regulatory Commission (BERC): BERC has authority over consumer protection, approval of tariffs and pricing, issuance of generation and distribution licenses, and promotion of competition.

Power Cell: Within the MPEMR power division, the Power Cell oversees power sector reform.

Rural Electrification Board (REB): REB oversees operations of consumer-owned rural electric cooperatives (PBSs). It performs supervisory and regulatory duties to ensure that technical standards are met and performance is monitored.

Sustainable and Renewable Energy Development Agency (SREDA): SREDA will act as a focal point for sustainable energy development and promotion, 'sustainable energy' comprising renewable energy and energy efficiency. (This institution is not established yet but concrete steps have been taken in this regard by the Government, with SED support).

Bangladesh Power Development Board (BPDB): BPDB operates most publicly owned generators and some urban distributors; it acts as a single buyer, purchasing from public and private generators and selling to distributors.

Power Grid Company of Bangladesh (PGCB): PGCB is a wholly owned subsidiary of the BPDB, operates the national transmission grid, schedules grid operations and wheels energy to distributors.

The Dhaka Power Distribution Company Ltd. (DPDCL): DPDCL distributes energy and conducts commercial operations in Dhaka and adjoining areas, except for Mirpur and Gulshan.

Dhaka Electricity Supply Company Ltd. (DESCO): DESCO distributes energy and conducts commercial operations in the Mirpur and Gulshan jurisdictions of the Dhaka metropolitan area.

West Zone Power Distribution Company (WZPDC): The WZPDC is responsible for regional distribution in Khulna.

Private sector (enterprises, NGOs):

Summit Power Company: A private power company that operates some smaller size power plants.

EnergyPac: A private sector enterprise that produces transformers, energy saving lamps, etc.

Rahim Afrooz: The biggest manufacturer of batteries in Bangladesh. Besides battery manufacturing, it is also involved in the import of solar panels and installation of solar home systems:

Infrastructure Development Company *Limited (IDCOL)*: IDCOL is a government owned company. Although its mandate is to finance all types of infrastructure projects in Bangladesh, its main activity is to manage the *Rural Electrification and Renewable Energy Development Project* (REREDP) which aims to provided SHS and biogas projects supported by KfW and SNV.

Grameen Shakti (GS): The biggest NGO involved in the dissemination of renewable energy technologies in Bangladesh.

Rural Services Foundation (RSF): A foundation established by Rahim Afrooz. It is engaged in the dissemination of renewable energy technologies.

Bangladesh Rehabilitation Assistance Committee (BRAC): One of the biggest NGOs in the world and internationally active. The focal areas are wide, in Bangladesh they comprise of poverty allevation, micro-finance, health, environmental protection, and social empowerment, also through provision of improved energy services with a focus on solar household systems.

1.4. Major Donor Activities

Asian Development Bank (ADB)

The ADB as the major donor took the coordinating role and acts as the chief negotiator with the Government of Bangladesh. All international donor activities in the energy sector are coordinated by the Local Consultative Group led by ADB. Since recently ADB is providing funds to the REREDP program implemented by IDCOL.

The World Bank (WB)

The WB is providing funds to the Government of Bangladesh to increase the electricity generation, transmission and distribution capacity. The WB initiated the REREDP program and is still financing the credit part of the program.

Japan International Cooperation Agency (JICA)

JICA is helping Bangladesh in the generation of electricity. Currently, JICA is also providing funds to REREDP program.

Global Environment Facility (GEF)

GEF has supported REREDP from the very beginning and plans to undertake projects in the areas energy efficiency and improved brick kilns.

SNV: SNV is active in the field of biogas technology dissemination and is showing interest in improved cook stoves.

Urban Partnership for Poverty Reduction (UPPR)

Under UNDP initiated UPPR is collaborating with SED in the cook stove sector and is also open for cooperation in biogas plants in urban settings.

U.S. Agency for International Development (USAID)

USAID has been supporting rural electrification program of Bangladesh for the last 35 years. Currently, USAID supported the implementation of the project “Integrated Protected Area Comanagement” (IPAC). SED and IPAC are collaborating in the promotion of improved cook stoves.

Practical Action (PA)

PA is mostly active in infrastructure and livelihood improvement in poor urban areas. As part of their efforts to provide energy access to the poor, they are interested to cooperate with SED in the promotion of improved cook stove as well as related monitoring and evaluation activities.

Swedish International Development Agency (SIDA)

SIDA is planning to start improved cook stove activities in Bangladesh. It is not yet decided whether this will happen in cooperation with GIZ.

UK Department for International Development (DFID)

DFID has made tremendous funds available for electrification projects. They have indicated strong interest in SHS/SSHS, PicoPV as well as improved cook stove activities. Also they will be active in the field of political advisory, e.g. they are working on the topic of reallocation of subsidies for energy services and fuels.

Climate and Clean Air Coalition (CCAC)

CCAC is a new partnership represented by the USA, Canada, Sweden, Mexico, Ghana and Bangladesh. This group is focussing on the reduction of short lived pollutants such as black carbon and methane by promoting new environmentally friendly technologies and processes like improved cook stoves, brick kilns and rice parboiling system. Detailed discussions for cooperation have taken place in Toronto and Paris recently.

Kreditanstalt für Wiederaufbau (KfW)

Besides their efforts in rehabilitation of old power plants and grid efficiency, KfW has been a strong promoter and supporter of the SHS and SSHS dissemination under IDCOL. Further cooperation can be envisaged also for PicoPV.

<u>Short explanation to what degree EnDev activities will be coordinated with other donor activities:</u>

The activities proposed under EnDev 2, especially the solar lamp project, are new for Bangladesh. GIZ through its program Sustainable Energy for Development (SED) is in the driving position in the renewable and also to some extent in the conventional energy sector of Bangladesh, in particular in the area of energy efficiency improvement. It closely coordinates activities with the Government of Bangladesh and other donor agencies.

GIZ initiated the dissemination of SSHS and convinced IDCOL to adopt the technology in 2007. IDCOL, World Bank and KfW supported this initiative. Thus it has become a part of REREDP program. As per last year's dissemination rate, systems of around 20W have a share of 27% of the total dissemination now and will be the focus for future IDCOL Efforts. Subsidies for SHS will be phased out by end of 2013, while the support for the dissemination of SSHS is foreseen to be extended until 2014.

Solar lantern (SL) dissemination is again an initiative of GIZ. GIZ has started discussions with the Government of Bangladesh and potential donors on this project. The Government, especially the Ministry of Power, Energy and Mineral Resources, is keen to support this initiative. Among the donors, DFID is interested to see the progress of the SL project and combine this with their project "Char Livelihood Project". The national NGOs like BRAC, Gono Shaysthaya Kendra as well as IDCOL have shown their interest to work with GIZ on solar lamps.

The successes in the ICS sector have lead to increased interest on the government side. Besides the GoB, the above mentioned CCAC has also indicated interest to cooperate with GIZ on upscaling the improved cook stove and other SED initiatives.

2. Planned Outcome

Energy Service Segment	Old target	New Target
Energy for Lighting & Electric HH Appliances	687,500	740,000
Cooking Energy for Households	275,000	500,000

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev-Bangladesh currently improves access to energy of poor households through its activities to promote energy efficient technologies and solar energy systems as well as through its efforts to make beneficial technologies available and affordable in the local markets. The training of technicians and masons for the construction of these products as well as awareness raising and user training are integral components of the project.

3.2. Approach to Provide Electricity

3.2.1 Small Solar Home Systems (SSHS)

In 2007 GIZ started to promote small solar home system (SSHS) of size 10-21 Wp to improve affordability of solar home appliances for poorer target groups that are not able to purchase the systems of 30Wp and above. Affordability is still the main barrier for poor households. Although, the monthly sales of around 40,000 home systems indicates the establishment of a healthy market for SHS the coverage amongst the poorest part of the population remains low. IDCOL has therefore decided to phase out the subsidy for larger SHS from 2013 but continue with subsidy support of SSHS until end of 2014.

The SSHS are installed by partner NGOs of IDCOL. The SSHS are acquired by individual households or small/micro enterprises through micro-financing schemes offered by the partner organizations (Pos). Awareness raising and promotion for SSHS is carried out by the POs as part of their normal business activities. Business development services are provided by IDCOL. IDCOL monitors the activities of partner NGOs and ensures the quality of systems. IDCOL provides POs with the market development grants for customers and organizes and manages the funds for the credit component of the scheme.

The estimated technical lifetime of a solar panel of SSHS is about 20 years, battery five years and charge controller one year. Maintenance and after-sale service are provided free of charge within the first three years after purchase. During this time the systems are regularly checked by PO staff when collecting the monthly installments. After the three years payback period, maintenance is provided by the POs for a monthly fee. As SSHS users are owners of their systems, motivation to keep the system running will be high. As there are no further monthly installments after the payback period, the payment of a small monthly service fee as well as the replacement of the battery every five years will not be a major financial obstacle.

As per today the SSHS of around 20Wp represent a share of around 17% of the total and 27% of last year's sales of SHS. The projections for the market especially for SSHS indicate a further increase in demand. SED and EnDev will continue to support the promotion and dissemination of SSHS in Bangladesh together with IDCOL and help to keep these systems affordable for the poor and energy starved target groups. Around 187,000 SHS have been supported from EnDev (1+2) funds so far. 52,000 of those are SSHS with panel sizes of around 20Wp.

IDCOL's target until end of 2014 is 2,500,000 SHS (including SSHS). EnDev will continue to support the grant element (financing contribution) of the scheme to support the dissemination of another 45,000 SSHS (updated household size of 4.5 equals 202,500 people). The existing financing structures provided by IDCOL will be used for provision and management of refinancing loans, and the micro-finance organizations (NGOs). These are already experienced in promoting and financing of SHSs and will be involved in promotion and selling of SSHS. Funds for refinancing will be provided by IDCOL, whereas the proposed partnership project will only provide the buy-down grant component. This project will be implemented by IDCOL through about 30 partner organizations from the private and NGO sectors.

Experiences and lessons learnt from EnDev 1+2:

Experience with SSHS during previous phases is quite satisfactory. It has created a demand of SSHSs within the indigent section of the rural population, which cannot afford the bigger systems (e.g. 50 Wp). In fact, 27% of last year's total dissemination were SSHS. A large section of people, especially the impoverished section of the population cannot afford SHS, but can afford the SSHS. The same subsidy of 20+5$ (buy down grant + IDCOL Fee) reduces the prices significantly. Experience in the existing SSHS market shows that the buyers of SSHSs are aware of and can afford the recurrent costs for replacement of system components, thus after the sale of a SSHS there is no further need for financial support.

The funds required for continuation of the promotion of SSHS will be taken from finances originally foreseen for the promotion of solar lamps in the last proposal phase, as the rollout

there has been delayed significantly (See below for a description of the delays as well as the revised plan and targets).

3.2.2 PicoPV systems / Solar Lamps (SL)

As mentioned above, there is a clear and growing demand, especially for small solar appliances. The introduction of SL systems is therefore a logical step and will help to widen the market for smaller but highly efficient solar systems to the 45% of the people of Bangladesh who live under poverty line and who cannot afford a SHS or even the SSHS which still cost around 90-160Euro.

With EnDev support high quality and efficient solar lamps will be promoted. LED lighting and lithium based batteries will ensure environmental soundness and long lifespan of the systems. These technologies still have their price but, as they focus on the basic need for lighting, will maximise the potential benefit for poor customers in terms of monetary savings.

Preliminary results from a baseline survey indicate that a typical Bangladeshi household on average employs 3 kerosene based lamps and uses around 4L of kerosene per month. This amounts to a cost of approximately 2Euro per month for kerosene. The solar lamp systems will comprise of 1-4 light sources, a small panel of below 10 Wp (mainly 2.5Wp-5Wp) and will provide between 200lm and 400lm for about 3 days from a full battery. Most of the systems will provide a facility for cell phone charging as well. The intended quality and performance based subsidy scheme will make these lamps affordable for a price, almost equivalent to the savings that can be generated within the system's warranty period. Further it will incentivise the sales as well as protect the customers from unnecessary financial risks that would arise from an investment in low quality products that are already available on the market

Adjustments of the recommended minimum system specifications additional requirements and changes in the Dollar-Taka exchange rate have lead to new estimates regarding the pricing of these systems and funds required for buy down grants. As per today a target of 180,000 beneficiaries is more realistic, as also the national statistics and baseline survey indicate that the average household size has decreased from 5.5 to 4.5 people per household.

As mentioned above, the efforts to disseminate solar lamps in Bangladesh have been delayed for about a year already. There are several reasons for this delay: In the initial planning phase the duties such as VAT and CD for the import of solar lamps was still around 150%. Under these circumstances large-scale dissemination would have been impossible. Discussions with the responsible authorities lead to a reduction of these duties to 35%. A further decrease is possible but not decided yet and the project is keeping up discussions regarding this topic. Anyway, the interest on the suppliers' side is high and a few lamp providers were already able to import and sell a small number of lamps.

The comparably high technical requirements and the mandatory quality tests under the framework of Lighting Africa delay availability of lamps for the rollout significantly. These tests take about 5 months and lamp systems with the standard required by the project are not so common yet. Some systems of this class can be found in the range of 70-130Euro. Not all suppliers show high interest in these tests initially and need to be convinced first, though. Anyway, some companies have already come up or shown interest to develop lamps

according to the specifications required by SED. More systems in this class are expected to appear on the market during the next few years.

The solar lamp systems will be acquired by individual households and disseminated through established NGOs, especially the partner NGOs of IDCOL as well as through private sector entrepreneurs. These institutions offer cash payment as well as hire purchase modalities. The partner organizations will undertake awareness-raising activities in their respective business areas as part of their normal business activities. The project will support these efforts through complementary and supportive activities.

The estimated technical lifetime of a solar panel will be at least 10 years. All other parts of the lamps will have warranty of at least two years. The LED based lamps come almost without exception with Li-ion or LiFePo4 batteries with a high cycle life that will ensure usability of the lamp for 2-3 years before the battery needs to be replaced. In many cases usability of five years (and sometimes above) can be expected without real need for regular maintenance.

As lamp users will be the owners of their systems, motivation to keep the system running will be high. Maintenance of the systems is hardly necessary and replacement of batteries can be offset in relatively short time through the savings generated by kerosene replacement. The focus therefore must be to ensure warranty support instead of regular servicing.

IDCOL is interested to become a partner for the monitoring of the dissemination of lamps and management of refinancing funds. The (compared to retail price) high management fee of about 5$ per system as under the current SSHS poses a burden for the available funds though. The retail price of one solar lamp system should ideally not exceed around 55$, if amortization through kerosene replacement is the target. This will be difficult to achieve for a lamp that follows the high technical standards chosen for Bangladesh. Currently it is under discussion how IDCOL's monitoring procedures can be optimized for SL to reduce the average cost per system without increasing the risk of monitoring shortcomings.

Experiences and lessons learnt from EnDev 1+2:

There is no experience with SL in Bangladesh. Preliminary discussions with stakeholders show that there is a market of over 10 million solar lamps. Experiences with SHS/SSHS have shown that people accept solar light and indicate that they would purchase solar lamps, if these are reliable and affordable for them. The solar lamps can be made available at an appropriate financing scheme.

3.3. Approach to Provide Clean Cooking Energy

The project has so far supported the dissemination of 302,325 improved cookstoves through grants and marketing support. Between 06/2010 and 12/2011, 33,500 concrete stoves have been constructed with EnDev support and registered under CDM. CDM revenues will be used to ensure monitoring and quality of the stoves on the long run.

Stove support from EnDev side has been phased out after the approach switched to a more marketing and awareness oriented approach. Direct subsidies for the stoves are not paid anymore from EnDev funding. As for Bangladesh the additionality rules are less strict though, direct funding can be an option for other donors.

While concrete stoves result in higher material cost in the production, these costs can be offset through the reduction of time required for the installation of the stove in the households. Mudstoves averagely required a week to be installed in the household and dry properly. The concrete stoves can be installed within a day. Concrete stoves can thus be sold for about the same price as the mudstoves and are less inconvenient to the customers, who can now use the new cooking device one day after installation. A further benefit of concrete stoves is easier quality control in the production, as the relevant measurements of the stoves are less dependent on individual skills, due to the introduction of forms that are used in the production. Under the revised approach, the project will focus on the support of awareness raising, marketing and monitoring, as well as capacity development activities in the stove sector, which are seen as the most critical last steps towards a sustainable market for improved cooking appliances.

The increased participation of the private sector and local government levels is a priority target in this regard. While in the past cooperation with NGOs were mostly envisaged the project will now aim to involve private businesses, such as sanitary shops in stove building, as these businesses are already familiar with concrete products and their handling and well established trading agents for household appliances. These activities will be carried out by dedicated stove promotion teams (“Champions”), which are constantly active in assigned regions.

Good experience has been made with an Aprovecho stove design workshop in December 2011, which could be followed up upon. This is another viable option for SED to build capacities in the sector and ensure the establishment of improved cookstoves in Bangladesh. The workshop in December received very positive feedback from participating stove builders and especially lead personnel of partner organizations. Currently it is being discussed to include one additional stove (rocket stove design) with even higher fuel efficiency under the CDM PoA. This can be envisaged in cooperation with other Donors, who are active in this field. As further stove tests are planned anyways, stove design workshops can be held on a more regular basis as well. If a suitable stove design can be identified, it could be integrated into the current CDM scheme and promoted with EnDev support.

Further objectives on the marketing side include the improvement of market intelligence efforts together with their effectiveness, as well as awareness raising and training on the user side. Therefore a stronger involvement of lower levels of local governments in promotion and support of stove activities in the villages is planned. These activities can be combined with regular stove efficiency tests in the field, which are obligatory under CDM and also a valuable measure for quality control. GIZ will ensure the EnDev conformity of these tests. Lab based water boiling tests are already planned to be conducted before end of June.

Training on stove building will be offered by the managing entity of the CDM PoA and in cooperation with GIZ. Monitoring and quality control will be conducted by SZ as part of their obligations under CDM. GIZ will complement and support these activities whenever required, to meet the EnDev testing standards.

There is a strong interest of GoB to expand the ICS dissemination further. GoB has declared willingness to make funds available to support the dissemination of improved cookstoves in cooperation with GIZ. Cooperation is already conducted with UNDP and USAID in the UPPR and IPAC project.

The Ministry of Environment and Forests (MoEF) is interested to undertake a joint project with SED. The project under discussion is called “Market Development Initiative for Improved cook stove” to be jointly financed by the Climate Trust Fund of MoEF and GIZ and implemented by GIZ. The project cost is 543 million Taka (about 5.3 million Euro), of which MoEF may provide 250 million Taka. GIZ’s part of project cost may derive from available CDM money (the managing entity has agreed to this), and EnDev. In cooperation with the above project EnDev will support the dissemination of 50,000 improved cook stoves and benefit 225,000 people.

3.4. Risks for Implementation

Following risks may influence the implementation of SSHS, solar lamps and ICS during EnDev 2:

- If the political situation of the country worsens so that GIZ becomes unable to continue work in Bangladesh
- If the Government imposes any barrier to the import of panels or batteries or lamps (which is not to be expected in the near future)
- If the prices of panels, batteries or lamps rise so that the offered subsidy under EnDev 2 cannot make SSHS or solar lamps affordable
- If the quality of products (SSHS/PicoPV/ICS) cannot be sustained
- If customers do not accept solar lamps or ICS
- If no financing for POs for instalment sale becomes available

4. Expected Impacts of the Project Intervention

The SSHS and SL projects will improve the access of low income households to modern energy. From the solar lamp project the extreme poor will be mostly benefitted, since they are otherwise deprived of access to modern energy. They will create in the longer term a self sustaining market for SSHS and solar lamps in Bangladesh.

Both SSHS and SL will:

- replace fossil fuel (kerosene) lamps through modern electricity from renewable sources,
- provide bright and better light for education in the evening hours of the school going children,
- provide more security for household members, especially women and children
- help to save money for kerosene or candles,
- help to save time needed for purchasing kerosene,
- improve indoor air quality and health by avoiding burning of kerosene.

The improved cooking stoves promoted by the project so far are very low cost items and improve the lives of people (especially women and children) who have to rely on biomass (especially wood fuel) as source of energy for cooking.

ICS contribute to environmental and economic benefits, such as:

- monetary or time savings due to less fuel consumption
- less wood burned in households and reduced deforestation
- reduced CO2 and black carbon emissions

- reduced indoor air pollution
- better living and working conditions in the household
- creation of jobs in the stove manufacturing sector

5. Budget

	EUR
1 Human Resources and travelling	210,000
2 Equipment and Supplies	20,000
3 Funding Financing Agreements/Local subsidies	1,200,000
4 Other direct costs	394,045
5 Total direct costs	1,824,045
6 Mark up costs/administrative overheads/imputed profit/	175,955
7 Cost price	2,000,000

Bolivia

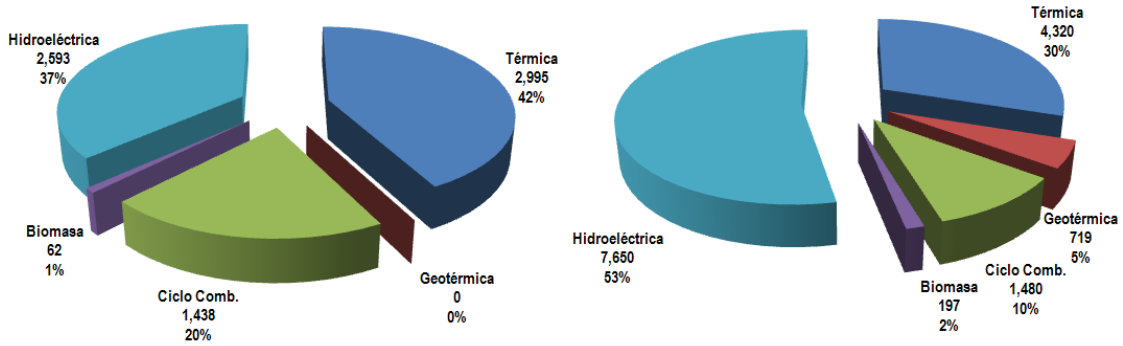
1. Situation Analysis

1.1. Energy Situation

1.1.1 General Situation of the Energy Sector.

Bolivia is currently facing several problems in the energy sector such as black outs, cutting of power services, and a very small security reserve. Due to this, the issue of power supply (electricity) is under great pressure and is part of the national immediately agenda.

To overcome the difficulties, the Government has developed a new plan of electric matrix expansion. The Optimal Expansion Plan for the National Power Grid takes in account and harmonizes the principles of supply and access to power services that are assigned by the Bolivian Constitution. In that expansion plan, the energy matrix will be changed in a significant way from 2012 to 2022 as shown in the following graphics1.



2012 **2022**

The national government is also working in the elaboration of a new Electricity Law, which is in line with the new National Constitution. Within this new law it is foreseen some new incentives for the introduction of renewable energy in the national electricity generation matrix. Also new considerations are introduced regarding isolated generation systems. This new law will bring structural changes regarding the roles and responsibilities of many actors in the electricity sector which will bring resistance and possible conflicts.

Traditional biomass (wood, dung, charcoal and green residue) accounts for 30.74% of primary energy consumption inside the household and is the second most important source of energy after LPG[2]. This is mainly due to the important role of biomass for the energy supply in the country's rural areas. Traditional biomass represents nearly 90% of total energy consumption by rural households and is mainly used for cooking (70%), the remaining 10% are mainly used for Lighting[3]. In the year 2009, close 53,1% of rural households met their energy demands for cooking from biomass sources (fire wood and dung, principally)[4]. The access to it in some regions of the country is becoming scarce so people have to walk every day longer distances in order to find their daily primary fuel. Biomass provision in these areas is practically unsustainable.

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[1] Comité Nacional de Despacho de Carga. Plan Óptimo de Expansión del Sistema Interconexión Nacional 2012-2022.
[2] Ministerio de Hidrocarburos y Energía. Balance Energético Nacional: Periodo 2000 - 2010. La Paz, 2011. Tabla 3.2 pag. 70.
3 Energypedia. Bolivia Country Situation; online at https://energypedia.info/index.php/Bolivia_Country_Situation#Energy_situation_especially_in_rural_areas.
[4] Most recent data available is from 2009. Instituto Nacional de Estadísticas (INE). Vivienda y Servicios Básicos, segun Encuesta de Hogares, cuadro 3030107; online at http://www.ine.gob.bo/indice/EstadisticaSocial.aspx?codigo=30301

In general, the energy sector is suffering big changes with the introductions of two new laws that will change many important aspects of the sector regarding electricity and hydrocarbon. This introduction of a new regulatory framework still needs a long path to follow in order to have all the needed regulations and norms elaborated and promulgated.

1.1.2 Access to Energy

Bolivia's efforts to improve delivery of energy services to the poor have been quite intensive in recent years, however, it should also be noted that while the scale-up of energy programs in rural areas would appear particularly desirable, it is also extraordinarily costly in the Bolivian context: Bolivia has the lowest population density and one of the most difficult geographical conditions in Latin America.

Through the last years, and especially since 2005 when EnDev started working, modern electricity access has improved in Bolivia. This means that in 2005, 71,1% of rural households had no access to electricity; and in 2009 there are still around 36,5% of rural households without access to electricity[5]. If we try to estimate these percentages under number of Households we can say that this increase in electricity access is represented by around 212.800 new households with electricity access. Thus considering that the program EnDev had supported more than 53.000 since 2005, it is estimated that the EnDev support contributed to 24% of this increase.

Currently the National Government has an ambitious plan within the objective of the Universalization of the access to electricity in the country, in which EnDev activities are part of. It is also confirmed that the country will have a loan from the Interamerican Development Bank (60 mio USD) that will work in electrification projects and also another with the World Bank (25 mio USD). All with the main objective to increase the availability of electricity access in the country. However, both do not consider the support to overcome the connection fee barrier. This is confirmed by a request from the Viceministry for an additional support from EnDev.

It is expected that in a near future the government will have a new source of funds that will warranty the economic resources for subsidies for connection fees for rural poor population. These resources will scale up the strategy developed by EnDev; strategy that has been assumed as National Policy as part of the Supreme Decree of the program for electricity for a dignity living (DS 29635).

1.1.3 Barriers to Energy Access

Among various analyses of the barriers for the expansion of the access to electricity, the following aspects were mentioned by government staff in the National Energy Diffusion Workshop, held in December 2011:

- Geographical dispersion;
- Remoteness to settlement centres and existing power grids.

[5] Most recent data available is from 2009. Instituto Nacional de Estadísticas (INE). Vivienda y Servicios Básicos, Encuesta de Hogares, cuadro 3030106; online at http://www.ine.gob.bo/indice/EstadisticaSocial.aspx?codigo=30301.

- The participation of alternative energies in the energy matrix of the electricity sector is still very small, due to the dominance of fossil fuels and hydropower as power generation sources.
- There is no institutional experience with alternative energies, and the autonomous territorial entities are facing difficulties to channel public investment to an energy development based on alternative energies.
- The lack of inventories and quantification of hydropower, biomass, wind, solar and other energy potentials.
- The necessity of counting with adequate technologies, a clear legal framework, and qualified and trained human resources.
- Financial resources.

Most of the mentioned barriers are also issues for providing “cleaner fuel access” like LPG, for cooking in rural areas; meaning difficult access due to roads and high levels of poverty as some to be added.

Likewise, many of the approximately 20.000 public facilities, among schools, hospitals, social institutions, are lacking a sufficient power supply. Normally, the rural schools don´t have the fuel to prepare the daily meals for the students. Nurseries and rural infirmaries are lacking of hot water required for hygiene, sanitation and cooking, and it is the same with a minimum of lighting and communications. The municipalities that are responsible do not have the even small amounts required for investment in better energy supply.

In many regions, the lack of power supply does not allow the development of a productive sector that should be able to generate surplus values to its products and market them by small or medium enterprises.

The deficiencies of the energy infrastructure also contribute to the impoverishment of the incomes in rural areas, resulting in a loss of quality of life. The supply of water for irrigation and expansion of the agricultural production along with power supply would increase productivity and higher income for the producers.

Altogether, the potential for specific actions for a better power supply is big, both in peri urban zones and rural areas.

1.2. Policy Framework, Laws and Regulations

1.2.1 Energy Sector

Bolivia is undergoing a process of changes and structural reforms for some years, beginning in 2006 when Evo Morales Ayma assumed power. On February 7, 2009, the new Constitution of the newly “Plurinational State of Bolivia” came into force. The Electricity Law of 2004 stayed in force, but due to the regulations of the new Constitution, it is expected that in the course of 2012 a new legal framework will be implemented that will guide the activities related to electrification, alternative energies, and renewable energies in a clearer manner and according to the Constitution.

The Constitution establishes a right on universal and equal access to – among others – electricity for any person. It is responsibility of the State, by all its levels, to provide the basic

services, by means of public, private, mixed, cooperative or common entities. In the case of power supply, the service may be provided based on contracts with private companies. The services supplied must meet with criteria of universality, responsibility, accessibility, continuity, quality, efficiency, fair charges, and required supply areas; with participation and social control.

The MHE by means of the Viceministry of Electricity and Alternative Energy (VMEEA) and the Vice Ministry of Energy Development (VMDE) has established the main features of the National Energy Policy. By this way, the Optimal Plan for the Expansion of the National Power Grid (POES) is part of the plans of the energy sector. Likewise, it is an instrument to guarantee energy security and supply of the domestic market, and to diversify of the energy matrix by a rational and efficient use of energy resources, development of the infrastructure and logistics, and the development of the countries' hydropower potential. The plan has been coordinated and revised by the institutions that constitute the Energy Development Commission.

1.2.2 Social Inclusion and Poverty Reduction

Bolivia has an extensive and complex social, ethnic and cultural background, and suffers from high levels of poverty and social exclusion, which affect the majority indigenous population, women and children particularly. After years of weak economic growth, the Bolivian economy has been showing signs of recovery since 2003. However, national poverty reduction policies need to be strengthened and implemented effectively in order to achieve a fairer distribution of the benefits of growth for the most vulnerable sections of the population.

Although previous national development strategies have led to some improvement in social development indicators, they have not had a significant impact in terms of reducing poverty, especially in rural areas with a primarily indigenous population. There is a broad consensus at national level that achieving poverty reduction and meeting the Millennium Development Goals in Bolivia will require an increase in per capita income by means of employment generation.[6]

Reducing extreme and marginal poverty is one of the priorities of the Bolivian Government. There are numerous inequalities and social conflicts. The people living in remote areas where conventional electrification will not be provided, due to geographical barriers, high levels of poverty, or other reasons, will need help on access to energy services, as a key element of support to vulnerable groups. Likewise, disposing of an efficient cook stove, reducing fire wood consumption, using of Pico-PV, among others, are key technologies for social inclusion and poverty reduction in those areas.

1.2.3 Health

Improvements in public health and sanitation, coordination for a better infrastructure, promotion of training and information, coordination with programs that are working on the improvement of public health in rural areas, and working with "Vivienda Saludable" ("Healthy Dwellings"), are another important part of the mentioned strategy.

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[6] Unión Europea. Bolivia Country Strategy Paper 2007-2013. http://eeas.europa.eu/bolivia/csp/07_13_en.pdf Página 5.

1.2.4 Environment

Bolivia has an enormous biodiversity, water, minerals, and a large energy potential. The National System of Protected Areas (SNAP) has identified 21 protected areas. Bolivia is counting with one of the largest forestry reserves certified for a sustainable exploitation. Nevertheless, the capacity of the public institutions is weak, implying discussions on the protection of wood lands, demonstrations of indigenous peoples aimed to avoid that protected areas to be affected by the construction of roads, among other issues.

1.2.5 Agricultural Policy

To provide Access to energy for productive uses is of great importance for a country like Bolivia, because – in that way: improving production, productivity, and continuity of some products, the access to energy for electrical and mechanical uses will have an impact on the producers associations and families thus would be notable on the local, regional, and national markets. Therefore, EnDev is working with institutions of the agricultural sector that require technical assistance on energy issues, with the aim to get to the communities and push the productive family units towards an improvement of their income and generation of employment in a better way.

1.3. Institutional Set-up in the Energy Sector

In Bolivia, the Viceministry of Electricity and Alternative Energy (VMEEA), within the Ministry of Petroleum and Energy (MHE), is in charge of establishing policies and designing the regulation for the electricity sector. The VMEEA and the Viceministerio de Desarrollo Energético (VMDE) are in charge to develop policies to promote energy efficiency and renewable energy. A Working group of VMDE and VMEEA, the "Unidad de Desarrollo Energético", develops the National Plan for Rural Electrification.

The Superintendencia de Electricidad (SE) is responsible for applying the regulation set by the VMEEA and it grants and supervises concessions. It controls the Comité Nacional de Despacho de Carga (CNDC), which coordinates the activities of the actors in the three markets (generation, transmission and distribution). The CNDC consists of delegates of the relevant companies.

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).

1.4. Major Donor Activities

1.4.1 Activities of Germany

The BMZ financed programs are mainly concentrated in three sectors. First, the support to the decentralization and support to the regional and municipal autonomies; second, the support to water and sanitization programs and last, the support to agriculture development.

There are also small projects in other sectors like the support to the justice reform and the strengthening of the state of civil rights. EnDev had a strong coordination with all project and programs and also tries to complement activities in a perspective of having interventions that will provide higher impacts.

1.4.2 Activities of Other Donors

The Interamerican Development Bank and the World Bank are currently the most important donors in the energy sector. In addition the programme “Electricity for a life in Dignity” is supported by KfW, UNDP (small hydropower), World Bank (grid extension, Solar Home Systems), and the EU (community solar and wind hybrids)..

2. Planned Outcomes

Energy Service Segment	Total Number of HH	Total Number of People served
Energy for lighting and electric home appliances	20,000	100,000
Cooking energy for households	17,000	85,000

Energy Service Segment	Total Number of institutions served
Electricity for social infrastructure	200
Cooking/ heating energy for social infrastructure	800
Energy for productive use/income generation	3,000

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev will support grid densification, the dissemination of solar systems especially PicoPV systems and the promotion of improved stoves. It will continue with the key interventions that proved being successful in its previous phases by strengthening the transfer of the developed technologies, strategies and processes into national, regional and municipal programs, policies and finance mechanisms; working with the logic of subsidy minimization and local resource mobilization with active local participation and sustainability approach.

There is an increased demand for the support to the access to the energy across the beneficiaries and a felt need of some actors who work with the project for developing their capacities. It is clear that this demand cannot be satisfied by the end of 2012. In this sense, the extension proposal for the period In January, 2013 to December, 2014, helps to consolidate the initiatives, emphasizing sustainability and of “scaling – up” across the access to energy for more than 200 thousand persons that include the 20 thousand households with access to the electricity, pico PV systems or with micro hydro power stations; 18 thousand households with improved stoves and 3 thousand micro and small enterprises (rural farmers' households) that will be supported by energy for productive uses and by technologies that

use electricity. Also EnDev will give technical advice for the system installation (thermal and photovoltaic) in social infrastructures mobilizing local resources for investment; mainly municipal funds and national programs. In the same way it is expected to support social Infrastructures with conventional electric power and improved stoves. The different actions will be coordinated with the public, private sector and civil society in all the levels: national, regional and local.

3.2. Approach to Electricity to Households

EnDev will support grid densification by cooperation with all distribution companies. It will partially subsidise the connection fee with 160 Bs (18 €) and finance the electricity meter in some areas. The subsidy will partly cover the installation costs. EnDev will promote the adaptation of the approach inside a National Policy Plan as a “pro-poor” approach which reduces the household connection payment and that in the future will be part of a National Fund built upon fees to the companies in the electricity sector.

In the field of solar energy EnDev and VMEEA will support small scale entrepreneurs with training in technologies and business skills and with financial incentives to commercialize solar lanterns in rural areas and to provide after-sales service. In addition, it will support the development of national quality standards and control systems.

3.3. Approach to Provide Cooking Energy to Households

EnDev will establish and reinforce new or current alliances with the objective of scaling-up the introduction of improved stoves under a market concept intervention, in where suppliers will be contracted and introduce their work in the field.

Since the beginning, the Endev project has been working in developing a technology that can suit the demand of the rural families while supporting the creation of a market of improved biomass stove; reaching today a point of having a mud and metal stove called “Malena” that has proved to have a very well acceptance.

The project will work on the supply side with local manufacturers, transferring the design of “Malena” stoves and the necessary technical know-how. The support to a selling structure will have positive impacts also on the already trained technicians and new actors interested in the stove dissemination at great scale. It is also expected to support other types of stoves if they do pass the required standards established under the Norm N° 83001 that will be tested in the Stoves Testing Center already established at the public University of San Andrés in La Paz.

On the demand side, the project will closely work with rural communities as well as institutions belonging to the social infrastructure. Promotion of the technology (benefits and advantages), and support to the suppliers in order to reach the demand, will create a positive scenario.

The main activities are:

- Selection and training of local manufacturers.
- Introduction of a quality control system for the stoves (every model shall be tested and certified before sale).

- Establishment of a maintenance service.
- Survey of local demand and workshops with target groups and relevant actors to promote the stoves.
- Definition and establishment of financing schemes within National, Regional and Municipal budgets.
- Household inside training during the installation and starting phases of building the stoves.

3.4. Energy for social infrastructure

The following activities are planned for technical assistance to social institutions:

- Selecting the institutions and Municipalities that will participate.
- Setting-up an institutional and financial framework, as well as sustainable technical and administrative management structures.
- Capacity building of teachers, health care takers, community centers, enterprises, etc.
- Elaborating manuals for operation and maintenance.
- Installing integrated energy systems (e.g. PV-panels, thermo solar systems and stoves).
- Establishing a mechanism for a continued technical assistance service (together with national programs).

The project's aim is to ensure that social infrastructure in the Bolivian rural area has effective access to electricity for lightening, multimedia equipment or communication, as well as to warm water for personal hygiene or medical purposes.

In the new phase the project will work mainly providing technical assistance to the selected social institution and municipality by means of measuring technology size and type selection (design), follow-up and preparation a viable project. This is oriented to identify the specific needs of each institution and community by means of directly working "in-site" and with municipal technicians in identifying projects and data gathering.

It is also expected to closely work with the solar sector small entrepreneurs in order to create their own market and entrepreneur development. In this proposal it is foreseen a strong local involvement and funds utilization, the project can benefit a large number of social infrastructures in a specific area with a minimum expenditure. The idea of involving local actors with strategic alliances does minimize the risk associated to failure due to appropriation.

Training of people in use and maintenance of the technology is an important matter that is carried out by the installing SME.

3.5. Energy for productive uses

Lack of knowledge of potential uses of electricity and lack of financial means to acquire relevant equipment are two of the most important barriers to productive use of electricity in rural areas. Experience shows that lack of cross-sector planning and implementation has resulted in suboptimal effects on economic development and poverty reduction from electrification.

In this context, complementary initiatives to stimulate small-scale business and productive use of electricity are considered to be part of all rural electrification projects financed by EnDev in Bolivia. The strategy is to support ongoing initiatives of rural development that could be maximized in terms of possible impacts with the use of energy. This means to use it either to generate value to the product or to increase the production with it. Having access to the technology is also part of having access to energy. The use of renewable energy technologies will be strongly supported, e.g. solar dryers. During this phase the EnDev support is expected to have a more integrated strategy in where the impacts should later be evaluated in terms of job creation and/or income increase inside the supported household.

Especially for those who want to process the agricultural products, access to energy is the essential factor for value added activities. Economically sound demonstration projects with the possibility to multiply these experiences will be implemented with local actors in a multi level governmental support approach. Trainings and technical assistance regarding operation and maintenance are considered also to be part of each project intervention. Local capacity development is strongly integrated in the EnDev II activities.

3.6. Risks of Implementation

The principal risks and assumptions that must be monitored will be the following:

Social and political conflicts

Currently, Bolivia is undergoing a phase of change and uncertainty on various fields. In this context, for example, it is expected that the framework law on autonomy and decentralization of 2010 (Ley 031 de 19 de julio de 2010 “Ley marco de Autonomías y Descentralización”) will define roles and responsibilities related to various issues. This law establishes the framework for the creation, deepening, and perfecting of the instruments of the autonomous governments, including their competencies. Therefore, it is assumed they have adequate funding and will improve their institutional functioning, considering the social rights of their citizens. There are autonomies created, being: native indigenous („indígena originaria campesina“), at different levels such as: Departments, Municipalities, and regional areas. In this context, there is a lack of clarity on some aspects of the autonomies, e.g. the energy and responsibilities issues according to the law, where there is a possibility of conflicts related to frontiers and populations that might compromise the precarious balances between municipalities, departments, and others.

Challenges of policy

The Morales Government has nationalized many enterprises of the electricity sector, communications, natural gas reserves, and other sectors. This can generate in new challenges related to the energy sector in the country.

The law of electricity (Ley 1604, Ley de Electricidad) was promulgated in 1994 and counts with several regulations. Due to the changes established by the new Constitution, it is not applicable anymore, but it is still valid. This implies a new form of acting by the government and the formulation of a new law or laws that will support the sector. However, it is an activity of many others; therefore it is important to keep it in mind for following up, considering a possible challenge or an opportunity for the renewable energies and/or the non conventional alternative energies.

Climate Change

The work may be affected in areas that are suffering from El Niño or La Niña events, with either extreme droughts or excessive rainfall in short time. These events affect the economics of the area, and the purchasing power of the population.

Migration and lack of interest in capacity development

In many communities, a migration from the rural to the urban areas as well as to foreign countries can be observed. In some cases, these migrations are seasonal, but in other cases are quasi persistent. In this context, in some places it might be necessary to count with a population very old or very young for the execution of the project.

4. Expected Impacts of the 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.
- Secured basic energy supply for productive activities.
- Market creation for technology producers.

b. Social impacts:
- Improve living conditions.
- Improve social live 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 having better energy access.

Since EnDev started working in Bolivia, a team of national experts and CINER (Information Center on Renewable Energy), conjointly with the responsible staff of GTZ (now GIZ) headquarters, implemented a M&E system designed to coordinate activities, results (outputs), and impacts. These aspects became subsequently important for decision making and a continuous optimization process. The participation of CINER provides an external perspective and recommendations based on the feedback and joint learning in an independent manner.

Building on the experience from the EnDev I and II, 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 system, 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 a 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).

Socialize the M&E Strategy in national counterpart projects and other EnDev projects: Training needs at all levels will be assessed and addressed as part of project execution. This includes both governmental staff, public and private companies, local communities, providers and consumers. When new organizations are established as part of the project (energy to new areas, local ownership models, etc.) the need for technical and managerial capacity building is considered to be substantial. Capacity building and/or technology transfer will be considered in the planning phase and discussed as early as possible with the cooperating partner in each component of the project.

Key aspects to measure sustainable impact of energy services in human wellbeing	**Main indicators**
Access to energy services	1. Number of households with access to energy services facilitated by EnDev.
	2. Number and percentage of households that use technologies according to given technical recommendations.
Accessibility in terms of payment capacity and maintenance	3. Fuel expenditures for energy services per household.
	4. List of expenditures in fuel for energy services compared to household total revenues.
Effect on health, education, economy and environment.	5. Percentage of households that perceive there has been a reduction in health problems that were caused by the use of fuels in inefficient systems for cooking and lighting.
	6. CO and PM (PM 2.5 and PM 10) concentration in the kitchen following use of a certified improved cook stove.
	7. Percentage of households with improved cook stoves that use less firewood to cook.
	8. Frequency and time for recollecting and/or buying fuel for household energy services.
	9. Percentage of households with solar and electricity systems for lighting that use less batteries.
	10. Household perception on information and communication opportunities as well as changes related with access to lighting services.

	11. Womens´ perception regarding improvement of living conditions in the household thanks to the new energy services.
	12. Household use of money saved in buying fuels.
	13. Small farmers' revenue increase following use of new energy services.
	14. Household (and farmers) use of additional revenues from productive activities.

5. Budget

	EUR
1 Human resources and travelling	**1,350,000**
2 Equipment and supplies	**100,000**
3 Funding financing agreements/local subsidies	**950,000**
4 Other direct costs	**200,000**
5 Total direct costs	**2,600,000**
6 Mark up costs/administrative overheads/imputed profit	**400,000**
7 Cost price	**3,000,000**

Ethiopia

1. Situation Analysis

1.1. Energy Situation

Data of 2004 showed that about 71.1% of the total households use kerosene for lighting followed by firewood (15.7%) and electricity (12.9%). A higher proportion of urban residents use electricity (75.3%) for lighting, while the use of kerosene (80.1%) and firewood (18.5%) are predominant in rural areas. Major types of cooking fuel used by all households are firewood (81,4%), leaves, dung cakes (11,5%) and kerosene (2,4%). The use of modern source of cooking fuel such as butane gas, electricity and kerosene for cooking is uncommon in the rural areas (0.4 %). Use of kerosene is common in urban areas and stands at 13.8 % following firewood (65.4 %). Charcoal (7.7 %), electricity (2.4 %) and leaves (5.3 %) are also used by urban households. On the other hand, only 0.2 % of the households in rural areas are observed to use charcoal for cooking. Thus, the vast majority of Ethiopia's energy needs are met from local natural resources, mainly from biomass.

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.

Fig 1: Final Energy Consumption by Fuel Type:

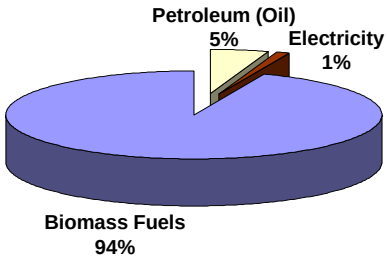
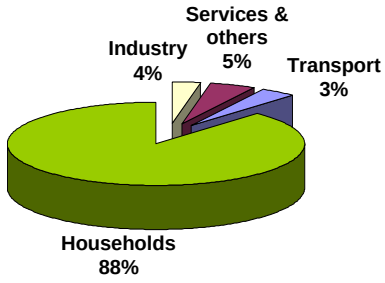


Fig 2: Final energy consumption by sector:



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, i.e. around 3% annually. Without substantial mitigation measures, major fuel deficits are likely to result. 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. Inadequate supply of fuel-wood as well as inefficient use for cooking has a direct negative impact on rural women's health and workload.

At household level, access to 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 contribute 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 country's surface area and is inhabited by more than 75% of the population, and is specifically acute on the northern highlands.

1.1.1 Energy Situation of Rural Health Centres in Ethiopia

Starting in 2006, the Ethiopian Federal Ministry of Health (FMoH) in collaboration with regional governments constructed more than 2000 health centres (HC) all over Ethiopia to provide a better health service to the rural population. Health centres mainly provide basic curative health care services but also support governmental initiatives like the Health Extension Program. Acting as referral and technical assistance centres for health extension workers they are clustered to provide service for 25,000 people each. Accordingly, a standard is set to the service they deliver, the number of professionals employed as well as type and number of equipment.

A reliable water and electricity supply of the new HCs is an essential precondition for the proper operation and an appropriate supply of service, but only around 50% of them are connected to the national electricity grid and/or have access to clean water.

1.1.2 Electricity Sector

Ethiopia has one of the lowest annual per capita electricity consumption in the world (100 kWh per year compared to 510 kWh for Sub-Saharan Africa). The total installed electric power generation capacity in Ethiopia is about 2100 MW of which about 95% is hydro, about 4% diesel and less than 1% geothermal. While approx. 41% of the population has access to the electric power supply (defined living in a kebele where a distribution passing though) only about 14% of the population actually has electricity supply in their dwellings. Problems to connect large new commercial and industrial customers, due to the overloading of the transmission and distribution networks; and high cost of future generation investments characterise 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 1.4 million 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 (less than 2%) 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 instability of the existing supply service, characterised by

voltage levels far below nominal, frequent breakdowns and delays in restoring supply after a breakdown has occurred, is an ongoing problem.

In the field of power generation, especially hydro, wind and geothermal as well as coal and natural gas as future options, the private sector involvement is highlighted as essential in the power sector development strategy. There are already some ongoing activities and joint measures between EEPCo and the private sector regarding this issue. So far, despite some enabling legislation is under preparation, independent power producers (IPP) are politically not encouraged and still absent in Ethiopia. Only traditional Engineering, Procurement and Construction (EPC) contracts and Build-Operate-Transfer (BOT) management models are currently accepted. This means that EEPCo is always the owner of the generation plants while private management over a contractually agreed period is permitted.

1.2. Policy Framework, Laws and Regulations

The government's declared aim, described in the Growth and Transformation Plan for 2010/11-2014/15 and in the Climate Resilient Green Economy Initiative, launched in November 2011, is a huge expansion of the infrastructure in the energy sector. The main target is to increase the electricity generation from currently approx. 2,100 MW to the range of 10,000-12,000 MW in 2015 and some 25,000 MW in 2030. To these 25,000 MW, hydro shall contribute approx. 22,000 MW, geothermal 1,000 MW and wind 2,000 MW. The number of customers connected to the grid shall increase from the current level of 2 million to 4 million and the general access rate from 41% to 75%. The augmentation of the generation capacity will mainly (>90%) base on the construction of new large hydropower plants with calculated generation costs of 5 USD cent/kWh – such estimates are regarded as too low by international experts and may well go up to 10 US¢/kWh if all related infrastructure and secondary costs are properly attributed.

The improvement of efficiency of the existing energy resources is another target. In the last years, the government tried to pave the way for more private investors to generate electricity and feed it into the grid. Proclamation 37/1997 opens domestic investors the possibility to invest in plant capacities of up to 25 MW. Only foreign organisations are permitted to invest in power stations with a capacity of over 25 MW. Council of Ministers Regulations No. 7/1996 and No. 36/1998 introduced additional tax relief and improved import regulations as incentives for private investment. Nonetheless, the electricity sector is still controlled by the state. Following are some of the major highlights from the policies and strategies of the country.

The government realizes that the rural areas are not yet adequately included in the ambitious infrastructure expansion plan. It assumes that the rural energy usage will remain to be dependent on traditional fuel, especially for cooking purposes. Therefore, the government plans to scale up the dissemination to 9 million stoves by 2015 and to 34 million stoves by 2030. Parallel off-grid solution will be needed to electrify rural households that will not be reached by the grid.

The rural program is expected to reduce significantly CO2 emissions, to increase the rural household income by up to 10%, reduce deforestation and create an industry for the manufacturing of cook stoves.

1.3. Institutional Set-up in the Energy Sector

At the Federal Government level, there exist a number of institutions involved in the energy sector of the country. The Ministry of Water and Energy (MoWE) is responsible for the overall development of the energy sector. MoWE has several directorates and agencies dealing with energy issues, in particular:

The two Directorates of Alternative Energy Technology Development (AETD) and Alternative Energy Technology Promotion and Dissemination (AETPD) – with the mandate to carry out national energy resource studies, data collection and analysis, rural energy policy formulation, technology research and development, and to promote appropriate renewable energy technologies in rural areas;

Rural Electrification Fund (REF), under supervision of the AETPDD – to enable private and cooperative engagement in rural electrification activities through loan-based finance and technical support;

Directorate of Energy Development and Planning – among others in charge of energy database and policy development, information and planning, including renewable and non-renewable energies, supervision of electricity and petroleum subsector operations;

Ethiopian Electricity Agency (EEA) – to regulate the electricity generation, transmission, distribution and sale of electricity. The EEA controls quality standards in the electricity sector and licensing of electricity operators and contractors including tariff settings. In addition, the EEA also has an Energy Efficiency Department, dealing among others with solar-thermal applications, especially solar water heating.

MoWE is working closely with two public enterprises: the Ethiopian 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 fed 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/agencies, 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 MoWE-AETPDD.

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 areas lower than 30.

1.4. Major Donor Activities

1.4.1 Activities of BMZ and DGIS

As with the co-financing of EnDev, DGIS generally focuses on renewable energy promotion programmes: SNV is implementing a National Biogas Programme in Ethiopia in partnership with the MoWE-AETPDD. Implementation started in May 2008 with the construction of 100

demonstration biogas plants in 4 regions (Tigray, Oromia, SNNPR and Amhara). In an initial phase (2008-2013), constructing a total of 14,000 biogas plants is targeted. The biogas programme in Ethiopia is part of the comprehensive biogas programme for Africa launched at the end of 2007.

DGIS temporarily finances the Horn of Africa Regional Environmental Centre (HoA-REC) based at Addis Ababa University. In the energy sector, HoA-REC is involved in renewable household energy projects and in stimulating carbon financing in some of its own developed energy projects, originally as part of a small platform pushing on carbon/CDM problem solving. Other partners of the platform are MoWE, UNDP, EPA and GIZ. In 2011, the Platform has been enlarged and upgraded to become the Climate Partners Group.

1.4.2 Activities of Other Donors

World Bank

Electricity Access – Rural Expansion Phase II (2007-2011): The development objective of the Second Electricity Access Rural Expansion Project in Ethiopia is to establish a sustainable program 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. A major component of the project is grid access expansion aiming at grid extension and increased customer connections.

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 Program (UEAP) in Ethiopia. Up to 228,571 low-income households will benefit from the scheme through a new or regularised electricity connection and the provision of two energy-efficient Compact Fluorescent Lamps (CFLs). The lamps will reduce their electricity consumption by 55 percent and make their bills more affordable.

The World Bank also provides financial support to the Rural Electrification Fund and the Lighting Africa Programme in Ethiopia. In addition, it participates in funding high-voltage interconnectors with neighbouring countries, geothermal investigations and regional initiatives such as the “Nile Basin Initiative” (NBI).

Energy Access Project (GEF) – The main objective of the project is to contribute to the reduction of greenhouse gas emissions as a portion of the diesel used for power generation would be displaced by 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. In this context, 35 MUSD are provided for EEPCo to facilitate customer credits for newly connected households. It targets villages and rural centres where local distribution grids are appropriate.

African Development Bank (AfDB)

The scope of interventions is similar to World Bank though with a lower financial volume. The Rural Electrification Project II envisages grid connection of 335 rural towns and villages.

AfDB is also involved in funding interconnectors and promotion of regional initiatives, especially the “Eastern Africa Power Pool” (EAPP).

European Investment Bank (EIB)

The focus is on (co-) financing of large hydropower projects and improved power transmission, distribution and load management, including participation in cross-border power interconnectors.

European Union (EU)

The EU funding covers a wide range of interventions under various programmes and projects, including various renewable energy supply systems at regional and local levels, interconnectors and regional initiatives, in particular EAPP and NBI. In addition, large-scale global programmes such as the European Union Energy Facility (EU-EF), the European Union Energy Initiative (EU-EI, PDF Programme) and the EU/Africa Partnership in Infrastructure are also funding activities in Ethiopia, e.g. through EU-EF the Renewable Energy Capacity Building Project to be implemented by MoWE as leader and GIZ ECO as partner and the just started Household Energy Project led by HoAREC and with GIZ ECO and MoWE as 2 out of 6 partners.

Climate Investment Fund – Scaling up Renewable Energy Program in Low Income Countries (SREP)

The SREP Ethiopian Investment plan supports the exploration of the Aluto Langano geothermal field and the installation of a wind power farm at Assela. In addition, it will provide 4 Mio. USD for training, capacity building and financing to SME’s in the period 2012-2015. All SMEs are eligible that sell: (i) energy access devices (improved cook stoves, lighting devices, solar home systems); (ii) efficient energy conversion systems for institutions (institutional cook stoves, solar water heaters, rooftop solar systems); or (iii) modern fuels (biomass briquettes, sustainably-produced charcoal). Specifically, SREP will build capacity and provide commercial financing that allow companies to develop new, professionalize existing and, ultimately, grow businesses that provide high-quality modern energy services in Ethiopia. The Project will be divided in two phases: Phase I: Capacity building of market players: The project will focus on removing barriers to the development of a strong supplier base for energy products that help to meet the Government's energy access and GHG emissions priorities; Phase II: Financing of Market Players (SMEs): The project will help to increase access to financing for market players by providing both capital for establishing new and expanding existing manufacturing facilities, and working capital.

Austrian Development Agency (ADA)

In the current development programme phase, energy has been set as a priority, focusing on rural electrification by grid extension and decentralised solar PV systems.

France (AFD)

The current focus is on the Ashegoda Wind Park Project in Tigray with an installed capacity of 120 MW and an annual energy production of 400-450 GWh. In May 2009 Ethiopia has signed a financing agreement with France amounting to 210 million EUR. Ashegoda Phase 1 (30 MW) is under construction and completion is expected early in 2012. The French Development Agency (AFD) intends to expand its activities, considering co-financing the interconnector from Ethiopia to Kenya as well as engaging in geothermal projects.

Great Britain (DFID)

The main interest of DFID is initiating climate funding projects including the energy sector. DFID is playing an important role in the newly established Climate Partners Group. Although related investment programmes are under preparation in cooperation with the Ethiopian Government so far no specific projects are in the planning or implementation pipeline. DFID also supports the establishment of a Climate Innovation Centre (CIC) intended to develop and promote suitable technology applications.

Negotiations with DFID to join the EnDev Programme under a climate funding oriented perspective are forthcoming in 2012.

Italy

Main activities consist of planning, financing and construction of large hydropower plants, such as HPPs Gilgel Gilbe II and III.

Norway

So far, the focus has been on planning larger hydropower projects and support of the East African Power Pool (EAPP). Currently, negotiations with Norway on becoming a pilot country in energy+ initiative are at an advanced stage.

Irish Aid

So far, Irish Aid has not been involved in the energy sector. Focal areas of the Irish Development Cooperation with Ethiopia are health and good governance.

Coordination of Activities

There is also a close cooperation and coordination of the international and bilateral cooperation organisations in the Energy Sector Partners Group which is active since almost two years and has monthly meetings.

2. Planned Outcome

Energy Service Segment	**Old target**	**New Target**
Energy for Lighting & Electric HH Appliances	25,000	35,000
Cooking Energy for Households	500,000	620,000
Electricity and/or Cooking Energy for social infrastructure	361	450
Energy for productive use/ income generation	60	1,000

For each outcome category baseline data will be collected allowing an analysis of progress.

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev-Ethiopia currently improves access to energy of poor households to three types of modern energy services: a) mini-grid electricity based on micro hydropower, b) electricity for individual households based on photovoltaic devices/systems and c) energy efficient, clean cook stoves.

In addition, EnDev is providing electricity generated by mini hydro power or photovoltaic systems to social institutions and small enterprises as well as energy efficient cook stoves to social institutions and small enterprises.

EnDev originally also planned to connect poor households to the grid which live in electrified villages and towns and are willing and able to pay the required tariffs, but cannot afford the connection fee or other costs. The activities were abandoned due to a lack of interest of the utility EEPCo. However, it is planned to discuss such a component again with EEPCo.

With this approach EnDev supports the Ethiopian government's plan on extension of renewable energy infrastructure as defined in the Climate Resilient Green Economy Initiative and the Growth and Transformation Plan.

3.2. Approach to Provide Electricity to Households

3.2.1 Mini Hydro Power

EnDev has identified several sites suitable for small hydro power as well as water mills that can be easily upgraded so that they generate electricity.

To utilize this potential EnDev will:

- Carry out detailed feasibility and socio-economic studies about the sites;
- Select together with partner organisations the most promising sites;
- Design the construction and installation of the power plant and the village grid;
- Develop a financing scheme for the construction and installation that includes financing from different sides;
- Train the local community, the millers and other operators in the operation, maintenance and repair of the hydropower plant;
- Support the community and operators in developing a sustainable tariff and management system;
- Support the monitoring of the construction/installation work as well as the operation of the power plants;
- Provide **RBF** (results-based financing) for each household connected to the mini-grid.

3.2.2 Photovoltaic Systems

EnDev is promoting household electrification based on solar lamps/lanterns, batteries, solar kiosks and Pico PV systems.

- Many Ethiopian households use batteries (non-rechargeable batteries and/or car batteries) as energy source for lighting, radio and TV. EnDev is planning to establish PV-based battery charging stations mainly in villages where social institutions were

already electrified with a PV system. The battery charging stations shall sell high quality batteries (preferably solar batteries), provide battery services and charge batteries for consumers. The charging station can be owned and operated by the community or as a private business.

- In some villages, charging stations will be upgraded to solar kiosks offering not only battery charging services, but also other services like charging and lending lanterns and Pico PV systems to households.
- In addition, the project will support the development of a Pico PV (low cost solar lighting systems) market in Ethiopia. Special focus will be on the introduction and dissemination of solar LED lamps and lanterns. For this purpose it is planned to support a) well established local solar companies to commercialize Pico PV systems especially in rural areas and b) young entrepreneurs and start-ups that are eager to establish a small Pico PV business. The component will be implemented in cooperation with the Lighting Africa programme of the World Bank and IFC.

For 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.

Main activities will comprise:

- Designing the charging station;
- Procurement of the equipment;
- Support owners and operators in setting up a tariff system;
- Support owners and operators in managing the charging station;
- Awareness raising for electric lighting;
- Technical and Business training of solar entrepreneurs and start up enterprises;
- Facilitate business to business contacts;
- Support the establishment of a warrantee system for solar products;
- Providing financial incentives for establishing distribution channels in rural areas;
- Providing initial working capital for young entrepreneurs;
- Providing financial incentives (**RBF**) for selling high quality products in remote areas.

3.3. Approach to Provide Clean Cooking Technologies to Households

EnDev has been promoting energy-efficient and clean cook stoves in Ethiopia since 2005. The stoves promoted are: the “Mirt” injera baking stove, the “Addis” injera baking stove, and the household rocket stove (“Tikikil”). So far, interventions focused on the five regions of Amhara, Oromia, Tigray, SNNPR (Southern Nations, Nationalities and Peoples Region) and Addis Ababa. It is planned to extend the activities in the coming years to four additional regions, being Diredawa, Harar, Somali and Afar. EnDev will cooperate closely with the Ministry of Water and Energy (leader and owner of the National Stove Programme), the World Bank, UNHCR which are promoting the Tikikil stove in refugee camps, Ministry of Agriculture that is involved in implementation of special rural stove programmes, Regional Energy Bureaus, Regional Bureaus of Agriculture, Environmental Protection Authority (EPA); the Energy Sector and Climate Partners Groups and all other institutions involved in the CRGE investment plan, the quality and standard authority ESA, regional Women’s Associations, regional Women’s Affairs Bureaus, regional Bureaus of Trade and Industry, NGOs like World Vision and ZOA International and the World Food Programme: promoting the institutional rocket stove and MIRT stoves.

Main activities will be:

- Awareness raising, elaboration of different promotional tools/materials on the benefits of the improved stoves such as leaflets, posters, banners, radio and TV clips:
- Technical and business training of stove producers and start-up enterprises in close collaboration with experts of the Ministry of Water and Energy;
- Marketing support for stove producers and vendors;
- Dissemination of moulds to Mirt producers, plus information & re-training and introduction & promotion of extruders to increase production of stoves;
- Establishment of a Mirt producer association;
- Enhancement of biomass-based fuel supply (such as briquettes, bio-ethanol, firewood planting and marketing by different parts of the community and private sector);
- Regular testing of the quality of produced stoves; certification of products, development of a brand for quality control;
- Support of fast market penetration by financial incentives (producer subsidies of up to 20% of stove price) for initial stove dissemination in order to stimulate regional stove market development in new areas as **RBF**;
- Testing of innovative stove models such as Gonziye and Awramba.

3.4. Approach to Provide Access to Modern Energy Services for Social Institutions

Social institutions will receive access to electricity and to energy-efficient clean cook stoves. The focus of the electrification activities will be on providing solar systems to health centres. In addition, a small number of social institutions will get connected to mini-grids of newly installed hydro power plants. The focus in the field of cook stoves will be all-day and boarding schools.

3.4.1 Photovoltaic Systems Including Solar Water Pumps

PV Systems for Health Centres will be implemented in the SNNP Regional State, preferably in regions where some health centres have already been equipped with PV systems. PV systems for community centres and schools will mainly be implemented in the eastern regions, again preferably in communities with PV electrified health centres.

Partners for the PV interventions will be the Ministry of Water and Energy (MoWE), the Ministry of Health (FMoH), and the Ministry of Education through their national, regional and local structures. Close cooperation is planned with universities (in particular the universities of Adama, Mekelle, Bahir Dar, Awassa, Addis Ababa, Jimma and Arba Minch) and vocational training centres (SELAM). Furthermore the Project will work with additional players in the solar sector in Ethiopia, such as the Solar Energy Development Association of Ethiopia (SEDA-E) as well as several institutes of the finance sector.

Major activities are as follows:

- Conduction of a baseline survey;
- Specification, design and procurement of the PV power supply systems;
- Supervision of installation and commissioning at identified health centres;
- Supervision of the after-sales service;

- Conduction of further installation and commissioning training;
- Quality control;
- Conduction of a need assessment for a maintenance and repair system for health centres and pump stations;
- Implementation of an appropriate maintenance system;
- Training of operators and stakeholders;
- Identification of level of stock for HC PV power supply and water pumping systems;
- Identification and securing of a location for stock;
- Organisation of stock management;
- Supervision and integration of the system.

3.4.2 Energy-efficient Cook Stoves for Social Institutions

EnDev/ECO has developed an Institutional Rocket Stove (IRS) based on the proven technology of the Aprovecho stove center. Marketing and promotion are gradually on the way since the start of EnDev 2. Injera baking for institutions is done on Mirt stoves (old version) by adding a chimney and reinforcing it with mud.

Main target group of the activities will be schools. In addition, discussions with the World Food Program are underway about the possibilities to promote IRS in schools supported by the World Food Program. Tertiary educational institutions, prisons and health centres (as far as providing meals) are also targeted.

Activities in the field of institutional stoves are identical or similar to the ones for households.

3.5. Approach to Provide Access to Modern Energy Services to SMEs

It is planned to provide at least 70 SMEs with electricity as well as with improved cooking technologies as part of general electrification and cook stove activities. Especially in the case of hydro power based mini grids, it is important that the consumption of higher amounts of electricity is combined with commercial activities so that additional income will be generated. However, also small systems can have a positive economic effect. Solar lanterns may help shopkeepers to extend their sales hours and make the shop safer. Improved cook stoves reduce costs of restaurants and canteens.

Main activities in this component will be:

- Training of solar companies in providing reliable, affordable PV systems for enterprises;
- Training of young solar entrepreneurs / solar vendors;
- Facilitation of financial incentives for promotion of high quality products with guaranteed lifespan;
- Support of solar companies in set-up, maintenance and repair services in major regions;
- Connection of small and medium size enterprises to hydropower driven mini grids;
- Awareness raising on cooking technologies for enterprises;
- Training of producers of cook stoves suitable for productive purposes;
- Marketing support for stove producers and vendors.

3.6. Policy, Private Sector Development & Services

In the last four years the Ministry in charge of Energy with its different national and regional departments as well as REA often involved EnDev/ECO in discussions and advice on different topics the energy policy of the country. This also offered an opportunity to share and discuss the results and experiences gained from the project implementation including the MRV system of EnDev. In fact EnDev has been asked to support and, together with MoWE, supervise the Energy Sector Mapping and Database Development (ESMAD) Study and to comment on the formulation of the Energy and Feed-in Tariff Proclamations.

The participation in the formulation of policies, strategies, master plans, programmes, laws and regulations has gained increasing importance due to the efforts of the government to harmonize different donor contributions within the context of the Energy+ and Sustainable Energy for All initiatives. Both initiatives underline the crucial role of the private sector and Public Private Partnerships. EnDev/ECO already established close relations to international and national enterprises and intends to enhance their investments in the energy sector. ECO will continue its active involvement in the coordination of sector partners as member of the Energy Sector Partners Group and the Climate Partners Group, in close liaison with international organisations, such as World Bank, African Development Bank, EU, as well as bilateral development partners, including the Embassies of the Netherlands, Norway and Germany.

EnDev/ECO is extensively working on scaling up and enhancing the production and commercial capacities of producers and retailers of electric appliances and cook stoves. It trains SMEs not only in technical but also business skills. Successive monitoring and technical follow up is being underway to ensure a high quality of products and services. Moreover, the project will continue working in networking of the producers and retailers with different potential institutions.

EnDev/ECO will promote information sharing & awareness creation and advice on options for improved access to modern energy services among program partners, stakeholders, and the general public. In addition, EnDev/ECO will support capacity development in partner institutions related to promotion of improved access to modern energy services.

4. Expected Impacts of the Project Intervention

Impact	Possible Indicators
Environment	Reduced use of kerosene and dry cells batteries
Health	Reduced emissions from burning of liquid fuels Improved maternal health improved medical service for the poor
Poverty/Livelihood	Improved living conditions Increased income Increased number and diversification of businesses
Education	Improved access to ICT and information for HC staff Increased number of qualified service providers, i.e. crafts people, technicians, etc. Improved level of education
Governance	Improved investment climate for energy production and delivery Improved capacity/service delivery (processing times)
Climate Change	Reduced or avoided emissions Access to climate finance

EnDev Ethiopia will specifically focus impact monitoring and evaluation on the reduction of indoor air pollution, on improved services of electrified health centres and on the reduction of greenhouse gas emissions. The following impacts are expected:

The health situation of at least 620,000 persons among them 400,000 women and children has been improved due to reduced indoor-air pollution till 2015 (source: interviews of households, measurements of indoor air pollution).

At least 50% of the clients of recently electrified health centers confirm that the quality of the service has improved as a result (source: interviews with clients).

Green House Gas emissions as a result of EnDev 2 activities will be reduced at least by 50,000 tons CO2 per year (source: calculation of the reduction of greenhouse gas emissions based on the savings of fuel wood through energy efficient stoves and the replacement of kerosene lamp with electric lamps)

5. Risks for Implementation

Certain risks with regard to the general development within the Ethiopian political and energy sector environment might affect the project. During the 2012 initiative of the International Year of Energy Access for All the risk might occur that other institutions start providing support based on subsidies, which could disturb the fragile development of private markets, supported under EnDev. This risk can be addressed through active participation in donor meetings and by providing advice to the national government. Similarly massive Chinese infrastructure investments in Ethiopia might influence the market development. In this case it might be more difficult for the project to intervene.

The highly dynamic infrastructural development going on in Ethiopia might lead to a faster electrification rate in large cities compared to what is currently foreseen. If this materialises, households and especially productive use enterprises might start purchasing electric stoves. Electric Mirt stoves are already available in urban markets at large scale at the costs of around 10 times more than those for the ICS distributed by EnDev. However those entrepreneurs, who start being in the position to save money, might soon be able to invest here. EnDev might react on this risk by moving out of urban markets and entering new remote areas for stove activities.

Similarly the National Electricity Grid might eventually reach the sites, where EnDev has built off grid hydropower plants, causing a risk for their sustainable operation. This risk is addressed by providing advice at government level to introduce a reasonable feed-in tariff legislation and operations regulation.

Finally the risk of occurring bureaucratic obstacles remains, due to high fluctuation within the Ethiopian government agencies. This might specifically lead to complications with regard to tax- and import regulations, since agreements made with specific persons are not necessarily also considered as valid with their respective successors.

The project has now started to assess possibilities to alternatively sign agreements with government agencies at regional government level, where the level of cooperation is more intense and stable, to overcome the bureaucratic hurdles.

6. Budget

Old: € 6,830,000
New: € 9,900,000 up to € 10,920,000

- € 6,830,000 old budget
- + fixed up-scaling of € 3,070,000 (€ 2,570,000 Norway + € 500,000 Irish Aid)
- + variable up-scaling of € 1,020,000.

The fixed up-scaling includes € 2,570,000 from Norway + € 500,000 from Irish Aid. The variable up-scaling up to € 1,020,000 depends on achievement of the following milestones.

Milestones

Category	**Aggregated no. of persons receiving access**			
	I.2012	II.2012	I.2013	II.2013
1. Household Electrification	1,215	2,965	14,740	35,290
2. Clean Cook Stoves for HH	345,000	420,000	520,000	620,983
	Aggregated no. of institutions/enterprises receiving access			
	I.2012	II.2012	I.2013	II.2013
3. Electricity/Stoves for Social Institutions	325	385	415	450
4. Electricity/Stoves for SMEs	945	955	975	1,000

The following rules are applied:

- The project budget is increased by € 85,000 per every achieved milestone (+/- 10%) for the period I.2012 to I.2013.
- It is possible to compensate missing of one milestone by certain percentages with overachievement of a milestone in another category by the same extend.
- Delays can be compensated by accelerated activities in the following periods.
- Any change of the milestones needs approval by the Governing Board.

Annex 1 – Schedule of Estimated Expenditures

		EUR
1	Human Resources and travelling	**5,240,000**
2	Equipment and Supplies	**1,930,000**
3	Funding Financing Agreements/Local subsidies	**10,000**
4	Other direct costs	**2,231,556**
5	Total direct costs	**9,411,556**
6	Mark up costs/administrative costs/imputed profit	**1,508,444**
7	Cost price	**10,920,000**

Ghana

1. Situation Analysis

1.1. Energy Situation

The electricity infrastructure in Ghana is strained and at the same time underdeveloped, because of problems on both the supply and demand sides. On the supply side, insufficient generation capacity, shortages in foreign exchange, inefficiency of service providers, imperfections in energy markets, aging infrastructure in some areas and lack of infrastructure in others are some of the problems.

Hydro power has been the major source of electricity in Ghana. However to meet the rising demand, the government has increasingly relied on diesel und crude oil plants, as well as natural gas. Total installed capacity to date is 2,185.5 MW, half from the large dams on the Volta Lake, with the rest coming from thermal plants. An additional 265 MW is planned to be added in 2012 with the completion of the Bui Dam and the Takoradi 3 Thermal Project. The government hopes to have 5000 MW of generating capacity in 2015, some from small hydro and renewable energy sources.

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. VRA-NED and ECG have offices in all district capitals, where they provide power to households and commercial customers.

Despite the challenges, Ghana boasts an extensive electricity grid in comparison to most Sub-Saharan African countries. 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 55% in 2008, and according to government estimates, was 72% in 2011. Projects to extend the grid and increase the transmission infrastructure are ongoing with donor support.

All rural district capitals and most towns in Ghana have access to the national electricity grid, although the access rates are significantly lower in the three northern regions. However, just because the grid reaches the town does not mean that all prospective customers can easily be connected. Distance to the next pole and unsolved land issues still remain an access barrier, especially for MSMEs. MSMEs also have difficulties in accessing land where it they can legally operate, which is a pre-condition to being connected to the grid. This results in many MSMEs not having access, even with the grid being present in the area. Furthermore, they most often have access to a single phase network, although productive activities often require three-phase power.

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) for the MSMEs.

A key objective of the Government’s energy policy focus is to ensure universal access to electricity by 2015—although it seems overly ambitious. Due to their poor financial situation, both VRA and ECG have no funds to connect new residential or commercial areas.

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, mainly with support from donors.
- 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.
- Non-residential (commercial/industrial) customers do not qualify for most government and donor initiatives. 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.

In Ghana the tariff setting is rather complex. Several tariffs apply, depending on consumption and type of activity. Recently after pressure from donors, the tariffs have been increasing and are now adjusted quarterly, although the revenues still are not sufficient to pay for more than routine maintenance or to pay off old debts. Non-residential customers, i.e. MSMEs, pay a higher rate, beginning with the service charge, which is 0.267 GHS[7] (~0,120€) per kWh a month for businesses and only 0.165 GHS (~0,074€) per kWh for households and continuing to the tariffs, a company using under 300 kWh a month pays 0.2611 GHS (~0,118€) per kWh, while a household pays only 0.1707 Pesewa[8] (<0,1 €ct). Distribution companies charge a connection fee of around 100 GHS, which some micro and small enterprises have difficulty to pay.

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, the young oil and gas industry, and high population growth are the main drivers of this process. In order to meet the demand and promote the decentralisation of economic growth it is necessary to build additional generation capacity and also to provide urgently needed transmission and distribution facilities for productive use.

Other problems within the sector not addressed by the project include the following:

- Much of the country's high voltage transmission system is ageing badly and increasingly unreliable, so the risk of outages remains significant as electricity demand continues to rise faster than the rate of economic growth. Upgrading of the transmission system is a clear investment priority for the sector.
- The electricity distribution sub-sector (ECG and NED) suffers from poor commercial and operational performance, with high losses due to old and overloaded networks in many areas, combined with problems of metering, billing, electricity theft and inadequate revenue collection.

[7] 1€ = 2,219 GHS ; 1GHS = 0,451 €
[8] 1 GHS = 100 Pesewa

Both issues are being addressed under the WB/AfDB/SECO Energy Access & Development Project (GEDAP) (USD 200m).

1.2. Policy Framework, Laws and Regulations

The EnDev 2 intervention is consistent with the broad policy objectives of the Government of Ghana as outlined below.

1.2.1 Broad Policy Objectives for 2010 – 2013

The broad policy objectives of the government as outlined in the Medium Term Development Framework (MTDPF) include provisions for expanding productive infrastructure in the Energy Sector.

There is a clear focus on:

- Energy – 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.

1.2.2 Private Sector Development Strategy (PSDS II)

A key strategic 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) Document of the Ministry of Trade and Industry (Lead Executing Agency). This document was affirmed by the President. The document sets out the framework for the design and development of the second phase of the Medium-term Private Sector Development Strategy (PSDS II).

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

One key component of the PSDS II strategy re-enforces the objective of EnDev 2. It focuses on building and enhancing capacity of firms to achieve enterprise growth and deliver sustainable jobs as well as enhanced livelihoods.

PSDS II has three key outputs:

- Output 1: Micro-economic framework to comprehensively support value chain, cluster and local/regional economic development established
- Output 2: Selected value chain, cluster and local/ regional economic development projects implemented
- Output 3: Innovative projects for delivering sustainable livelihoods and incomes implemented

The EnDev 2 Intervention will contribute to Outputs 2 and 3 of the PSDS. It supports the creation of industrial clusters and enhances local and regional economic development. It is an innovative project that seeks to improve access to modern energy services, promote energy efficiency, provide access to land, increase the productive uses of energy with the view to providing sustainable livelihoods and increased incomes.

1.2.3 National Energy Policy

A national energy policy was approved by Cabinet in late 2009 and is being pursued by the GoG.

1.2.4 Renewable Energy Strategies and Laws

A renewable energy law is in parliament and is expected to be passed soon. The BMZ is prepared to support the implementation of the law and establishment of appropriate legislative instruments such as a feed-in tariff. As the national policies and strategies on renewable energy are still being established, EnDev Ghana will continue to focus on the energy for productive use interventions. Support the use of renewable energy for productive use for example in the wood-working sector or in agro-processing could be considered once the RE law is implemented,

1.2.5 Electricity Access and Rural Electrification

The EnDev intervention is consistent with current GOG activities to intensify rural electrification and the Productive Uses of Electricity (PUE) Programme, which is being implemented by the Ministry of Energy (MoEn). The project will continue to work within the existing framework to rollout the extension of electricity to selected industrial zones. The project will also liaise with the MOEn and others to seek further collaboration in the area of Productive Use of Electricity.

1.3. Institutional Set-up in the Energy Sector

The promotion of productive uses of energy in Ghana is not governed specifically by one body. However, the promotion of local economic development and micro, small and medium-sized businesses is under the purview of the *Ministry of Trade and Industry (MoTI)*, which is also the main political and implementing partner for the Private Sector Economic Development Programme of the GIZ and thus also of EnDev Ghana.

The electricity sector in Ghana is run mainly by the institutions described in the following.

Ministry of Energy (MoEn):

The MoEn 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.

Energy Commission (EC)

The EC advises the Minister of Energy on energy policy, grants licenses to electricity utilities and qualified operators in the energy sector, establishes performance standards for utilities with PURC, promotes and ensures uniform rules of practice for 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.

Current Regulatory Framework

The current regulatory framework for the electricity industry is provided by Acts 538 and 541 which established the Public Utilities Regulatory Commission and Energy Commission (EC) respectively, to ensure the proper functioning of all players in the electricity sector and to create the required environment for stakeholders and for private investment in the sector.

Licensing decisions rendered by the EC are subject to appeals to the Minister of Energy or the courts but tariff decisions are not subject to appeal.

1.4. Major Donor Activities

1.4.1 Activities of BMZ and DGIS

Apart from EnDev, the BMZ is now preparing a project to support the MOEn in implementing the upcoming Renewable Energy Law, but is not otherwise active in the energy sector.

The Dutch government currently supports Ghana in the following sectors and priority themes:

- general budget support
- health/HIV Aids
- education and school meals
- environment
- water and sanitation
- gender
- good governance

From 2012 to 2015 the Netherlands will focus on water, sexual and reproductive health and rights (SRHR) and food security.

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

- Agriculture
- Good Governance and Decentralization
- Sustainable Economic Development

Within these focal areas, EnDev Ghana is integrated in 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 in the component for industrial zone development.

1.4.2 Activities of Other Donors

The biggest energy sector project that is currently running is the Ghana Energy Access and Development Project (GEDAP), which consolidates funding from Multilateral, Bilateral and Government sources.

Within this framework, the participating donors are providing support in the areas of:

- national level institutional, policy development, organisation and capacity building;
- Generation sub-sector organisation, capacity building and upgrading of facilities;
- Transmission sub-sector organisation, capacity building and upgrading of facilities;
- rural electrification and renewable energy development, institution, policy, organisation, business model and new facilities. Since 2010, support for developing and managing oil and gas reserves has taken an increased priority, and drawn new donors to the table.

The coordination of donor support takes place within the framework of the Donor Sector Group, established under the Multi Donor Budget Support (MDBS) framework, although China and India do not take part. The Energy Sector group meets every other month to coordinate activities within the sector. Donors that are very active in the power sector

include: The World Bank, France (AFD – Sector Lead), Switzerland, African Development Bank, Japan (JICA). Major donors in the oil and gas sector include the US and Norway.
The EnDev Team in Ghana attends the Sector Group Meetings as observers. The team will continue to do so, also to stay informed about the development of the renewable energy sector, and developments related to grid power.

2. Planned Outcome

Energy Service Segment	Old target	New Target
Energy for Lighting & Electric HH Appliances	300	300
Cooking Energy for Households	-	-
Electricity and/or Cooking Energy for social infrastructure	6 electricity connections	6 electricity connections of SI or street lanterns
Energy for productive use/ income generation	300 MSMEs with new connections	600 MSMEs with new connections

3. Project Approach

The focus of this topping-up of EnDev II is to make the operation of the PESD supported zones sustainable in economic, social and environmental sense, and to improve monitoring on the effect of the EnDev interventions. The component will support additional districts, but it will also scale-up trainings on eco-efficiency and business skills for the MSMEs, and increase facilitation of public-private dialogue to improve service delivery related to construction and maintenance of the light industrial zones.

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev Ghana will continue to promote productive use of energy by MSMEs through grid extension to light industrial zones and will enhance advisory and capacity building measures to promote business growth and the use of electricity in production.

Selected technologies, services and approaches

The zones supported under EnDev Ghana are near the national grid and tap from 11 kV or 33 KV medium voltage lines. One or more dedicated transformer(s) is (are) 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 aluminium cables;
- Transformers and accessories;
- Low tension poles and cables;
- Control equipment and switchgear;

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, as well as building their own structures for their businesses.

The project further supports the local stakeholders, in cooperation with PSED, with capacity building measures for:

- Improved public-private dialogue and service delivery, to facilitate the construction and management of the light industrial zone through facilitation, organisational coaching, and support for dialogue on local radio stations
- Profitable Environmental Management (PREMA) for eco-efficiency in the management of the MSMEs and the industrial area; and improved coaching in occupational health and safety and waste management
- Improved business entrepreneurial skills with the Competency Based Economies for Formation of Enterprise (CEFE) methodology

3.2. Approach to Provide Access to Modern Energy Services to SMEs

The experience gained in support of the light industrial zones since 2007 has shown that more than infrastructure is required to ensure that the industrial areas develop to their potential and support sustainable local economic growth.

The owners of the MSMEs targeted in this intervention are mainly in the informal sector and have had little formal education, and hesitant to contact government officials about hindrances to their business. Government officials are also unused to dialoguing with enterprises from the informal sector. Thus capacity building and frequent follow-up visits to the MMDAs (Metropolitan, Municipal and District Assemblies) and the private sector associations have proven crucial for the development of the zones, in order to complete the infrastructure and allocation of plots, but also to encourage enterprises to move their businesses, and or establish new businesses at the zone. Furthermore, the MSMEs continue to practice unsafe and polluting habits at the new industrial zones, which can only be addressed by training and awareness raising.

EnDev Ghana will use the additional funds on the one hand to support three additional light industrial zones in addition to the zones that are currently being supported. These new zones will be ones that have previously applied for support, show high potential for development, and that are already moving forward in implementing their plans for a light industrial zone, but which could not be supported with the current funding.

On the other hand, the project will use the funds for enhanced advisory and capacity building measures at the already supported district capitals to accelerate first, the completion of last infrastructural and administrative measures and second, the establishment of enterprises at the site.

The focus of these supportive measures will be to increase the sustainability of the EnDev impacts by:

- increasing support for sustainable management structures, including organisational support for more effectiveness in the associations and better service delivery from the MMDAs.

- increasing business training and advisory support for the target entrepreneurs to help them take advantage of the improved conditions at the light industrial zones and to establish or relocate their business more quickly,
- improving the environmental and social sustainability of the components work through increased training and awareness raising on eco-efficiency, environmental and occupational safety, and sustainable waste management. This will allow the enterprises to operate more safely and profitably, and will also benefit the community by reducing pollution from enterprises and the incidence of work-related injuries.
- harmonizing EnDev activities with a new component of PSED for technical and vocational education and training that begins in 2012, which will target the informal sector and among this also entrepreneurs in the car-repair, wood and metal-working sectors, including electricians.

One benefit of this increased attention to advisory and capacity building measures in the already completed zones will be a more effective monitoring structure that will allow EnDev to continue to learn more about the conditions that lead to more productive use of energy.

The goal is to reach at least 300 additional enterprises that establish their businesses at the light industrial zones and that did not previously use electricity; and to reach at least 500 other enterprises at the industrial zones that benefit from the improved electricity access, but either had an electrical connection before, or do not have their own electricity connection.

Nearly all of the growth in enterprises until spring 2014 will be from entrepreneurs that will move to the 15 zones already being supported. This strategy builds on the lessons learned since 2007 in the promotion of light industrial zones for productive use of energy. There are two central lessons. First, small business owners in the informal sector need more time and or coaching than thought in order to take advantage of new conditions. Second, that the district assemblies and associations heads need more follow-up advice than supposed to fulfil their responsibilities for developing and managing the industrial zones.

The training and advisory services provided so far under EnDev Ghana have in fact, been relatively minimal due to budget constraints. Even with substantial co-funding from PSED, the project has not been able to provide more than one eco-efficiency and one business training for the associations at each location. That means that a group of 20-35 businesses per zone, depending on the overlap for each training, has received training, although there are some 80-300 businesses for each location that may move to the industrial zone. Furthermore, the follow-up measures for each training, and follow-ups with the district assembly and association heads on the development of the zone has been minimal, due to budget constraints.

Thus, for the promotion of productive use of electricity, EnDev Ghana is learning that capacity building, including follow-up measures over an extended period, plays a more important role in helping beneficiaries take advantage of improved business conditions than supposed. Although lack of dependable electricity supply and land for businesses is always identified as a key restraint for growth, micro and small businesses often lack the skills to quickly adapt their strategy to move and improve their business when these restraints are lessened.

3.2.1 Target Customers

The 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 legal electricity connections 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

EnDev Ghana supports district capitals in the Ashanti, Brong Ahafo, Central, Eastern, and Western districts.

3.2.3 Implementing Partners

Ministry of Trade and Industry (MOTI)

MOTI is the main political partner for PSED and EnDev Ghana's main implementing partner as well, as they are responsible for local economic development at the district level, and promotion of the light industrial zone approach. This proposal has been developed in collaboration with MOTI.

The Ministry of Energy (MOEn)

Within EnDev 2 the MoEn supervises and monitors the Utility Companies that EnDev collaborates with at the local level, and influences tariffs and other externalities affecting energy service for MSMEs.

Metropolitan, Municipal and District Assemblies (MMDAs)

MMDAs are the local level partners who are responsible for the planning and development of the communities. They are supported by EnDev to fulfil their roles in promoting local economic development. They are responsible for urban planning and zoning of the industrial zones; for promoting local economic development, and providing services that enhance business activity. They also liaise with the Traditional Authority and other stakeholders to provide secured land for the project. Funding for buying the land is also generally provided by the MMDAs, unless the private sector association has been proactive in gathering funds themselves. MMDAs are also responsible for the provision of access roads, drains, water supply and sanitary facilities in the industrial zones as well as the installation of the electrical hardware. Finally they issue permits and ensure a controlled development of the zone.

Regional Coordinating Councils (RCCs)

The RCCs are regional level partners responsible for coordination of development initiatives of districts. In particular, they monitor implementation of projects and programmes of MMDAs

and send reports to the National Development Planning Commission; provide for dialogue and knowledge-sharing between districts.

Local Business Associations

They are key to the success of the interventions because they are the direct users of the outputs. They organise their members and continue to engage the local government in dialogue on economic development issues. They also sensitise their members to move to the new site; develop their plots, apply and pay for electricity connections; and they should support environmentally and economically sustainable management structures for the industrial areas

Institute of Local Government Studies (ILGS)

A training institution dedicated to the capacity building of Local Government Practitioners to enhance local governance and local level management. It is becoming a main partner for training of MMDAs in Local Economic Development and in CEFE business entrepreneurial training.

Environmental Protection Agency (EPA)

EPA has the mandate to monitor industrial and other activities regarding their environmental impacts. Business Associations are theoretically required to complete environmental impact assessments with EPA for the operation of light industrial areas. In practice, this does not occur, although the local planning office has to approve the plans for development of the light industrial areas. The project will continue to involve the EPA in awareness-raising on environmental issues at light industrial zones, and in follow-up on PREMA trainings.

3.3. Risks for Implementation

The framework conditions of EnDev 2 which will be integrated into the activities of the Program 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.

With the development of the oil and gas sector and increased government revenues from petroleum products, the rate of inflation but also economy in the country is expected to grow rapidly. This rapid revenue and economic growth may contribute to social unrest if the benefits from oil and gas are seen to be benefiting only coastal regions, or select elite in the government and private sector. EnDev Ghanas interventions might help mitigate these social risks.

Elections will be held in 2012. The risk of political instability can be seen as minimal, after the peaceful hand-over of power in the last three elections. Changing governments will however mean that government officials at districts will be reassigned, which lowers MMDA ownership for the industrial zone projects. This can be addressed through increased follow-up with the MMDAs.

Local governments still sometimes lack the financial capacity for 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 careful screening and advisory services to help budgeting for local economic development.

The utilities continue to be plagued by debt and a burgeoning demand for service. Though the situation is improving, VRA and ECG may increasingly be unable to provide meters and replacement materials in a timely manner. This slows implementation, but does not pose a major threat.

It is largely beyond the project's control, whether MSMEs actually move to the industrial zones or not. However, the project has learned that advisory and capacity building measures, as well as awareness raising measures, can have significant impacts on the readiness and ability of MSMEs to establish themselves at the zone.

4. Expected Impacts of the 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 intervention is expected to contribute to decentralized local economic development, increased revenues for MSMEs and job growth in MSMEs, better conditions for women-entrepreneurs in the target sectors, improved sustainability of MSME businesses and lower environmental pollution, improved urban planning and public-service delivery.

Planned Impact Monitoring and Evaluation Methodology:

In 2011, EnDev Ghana re-evaluated their results-chain and implemented enhanced monitoring schedules, which will include tracer surveys of enterprises trained in PREMA and CEFE, and benchmarks for MMDAs in fulfilling their responsibilities related to the industrial zone development. The half-yearly monitoring will be continued and gathers data from firms at the light industrial zones about their activities, electricity use, employees and average customers per day.

In 2007,EnDev Ghana conducted an extensive baseline study for MSMEs in four district capitals in Ghana's Brong-Ahafo Region on their business activities, constraints and energy-use. The data were re-analysed in 2009 and were used for an ex-ante impact assessment. An impact study surveying MSMEs in three of the same districts was initiated in September 2011, and the full analyse of the impacts of EnDev I in these zones will be available in spring 2012. In the upscaling it is proposed to conduct a second impact study for 3-4 other selected zones supported by EnDev 1 and 2.

5. Budget

	EUR
1 Human Resources and travelling	**260,000**
2 Equipment and Supplies	**242,174**
3 Funding Financing Agreements/Local subsidies	**50,000**
4 Other direct costs	**100.000**
5 Total direct costs	**652,173**
6 Mark up costs/administrative overheads/imputed profit/	**97,826**
7 Cost price	**750,000**

Honduras

1. Situation Analysis

1.1. Energy Situation

The energy situation in Honduras is characterized by the dependence on the import of fossil fuels. It is the country of the region that presents the highest increase in fossil fuel imports. A wide traditional sector, including most of the rural and peri-urban households and small-scale and agricultural industries cover its energy needs mostly with firewood, wooden residues and other fuels.

Honduras has one of the lowest rural electrification rates in Latin America after Nicaragua. About 38% percent of the rural population still lacks access to electricity. In absolute terms, it is estimated that more than 350,000 households or more than 1.7 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 grid extension distances. In rural areas population is highly dispersed and access is often difficult or only possible by river access. These two characteristics prevent provision of electric services by the conventional grid, and call for site-specific off-grid solutions like diesel plants, solar or hydropower.

According to The Statistical Bulletin of the National Electric Power Utility (ENEE) Honduras is provided with an installed capacity of 1,721.6 MW with an available power of 1,260.9 MW and a demand of 1,233 MW. This fact stresses the urgent need to substantially improve the energy balance and the energy matrix of the country, which is characterized by a high consumption of firewood and fossil fuels, both contributing to 85% of the national energy consumption.

In Honduras firewood is an energy source of supreme importance, especially for rural households. The importance of firewood is such that many households with access to electricity keep on using firewood as their main energy source for cooking. In the urban and peri-urban areas 55% of all households use firewood, of which almost half (21%) combine firewood with other energy sources. In the marginal zones of peri urban areas more than 500,000 families depend on buying firewood for cooking. In rural areas firewood is the prevailing fuel, used by close to 82% of all households. Although readily accepted by the rural users, the introduction of improved energy efficient cook stoves has been limited. Its current coverage is of scarcely 10% in rural areas and of 3% in urban areas. It is estimated that still approximately 800,000 traditional stoves exist in the country.

The statistics of the Institute of Forest Conservation (ICF) indicate more than 8 million m^3 of annual firewood consumption for energy needs by illegal cutting, contrasting with almost 700,000 m^3 of annual timber production by the legally constituted industry. Firewood is also widely used by rural small and medium enterprises principally in the extraction of salt, production of bricks, in bakeries, production of brown sugar loafs and in coffee processing.

For this reason it is of utmost importance considering the energy issue in Honduras from the perspective of micro watershed and forest buffer zone management, where the rural population generally is living with no access to sustainable energy sources. The promotion of access to energy sources must be linked with multi sector strategies that promote sustainable environmental and human development issues, improve management capacities

for autonomous rural power supply, and unfold the opportunities energy services offer for productive uses and information and communication for market access.

1.2. Policy Framework, Laws and Regulations

Honduras is one of five lowest income countries in Latin America. 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 developed 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 likely not to be met by 2015 according to an evaluation by the World Bank.

The Honduran government considers the improvement of the infrastructure, especially concerning energy services, a key factor for economic growth and for the alleviation of poverty in rural areas. For the electric sector, all policy is based on the Electricity Law of 1994, which defines roles and responsibilities of the institutions.

In 2007 the National Congress passed the new law on renewable energy which replaces the law from 1998. The law promotes the use of renewable energies for electricity generation by custom tax exoneration. The value 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 favour the larger, grid-connected power plants. Thus the new law has only minor impact on small renewable energy projects.

In 2005 SERNA (Ministry of Natural Resources and the Environment) approved a Sustainable Energy Action Plan covering 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 other public institutions from the forestry sector, NGOs and international cooperation organizations.

The policy regarding rural electrification is mainly developed and executed by the National Electricity Utility ENEE via the Energy Office and the Social Fund for Electrical Development (FOSODE), administered by ENEE and created by the Electricity Law for financing electrification studies and projects of social interest. However in 2010 FOSODE was scarcely provided with an approved budget of little more than a million dollars. Newer information is not available but funding has since declined.

1.3. Institutional Set-up in the Energy Sector

The Energy Office, responsible for the definition and formulation of the energy policy, is the superior organism composed of the President of the Republic and the State Secretaries of Natural Resources and Environment, Industry and Commerce and Finance. The policies and

strategies of the energy sector are implemented by the Secretariat of Natural Resources and Environment (SERNA) through the General Directory of Energy (DGE) Regulative activities are in charge of autonomous and decentralized institutions like the National Commission of Energy (CNE), which also regulates tariffs. Finally the institutional structure is dominated by ENEE, a vertically integrated monopoly utility created by decree No 48 of February 20, 1957. Although the Electricity Law established the unbundling of ENEE and the privatization of the distribution networks, ENEE turned into the central player, being in charge not only of generation and transmission, but also of the operation of the National Interconnected Grid (SIN) and the Central Load Office (CDC), thus preserving its dominating presence in the sector. In rural electrification activities ENEE shares its function with municipalities, private investors and other institutions.

The weak institutional framework of the energy sector affects the quality and efficiency of rural electrification efforts and the massive dissemination of efficient firewood use. The main problem remains that Honduras is not provided with an integrated policy for rural energy issues. While FOSODE manages resources for implementing grid extension projects, other institutions like SERNA, ICF and the Honduran Fund of Social Investment (FHIS) are promoting renewable energy projects with their own resources and financial resources of the international cooperation community, although they do not have a formal mandate in electrification. The fact that several entities are promoting electrification programs is further weakening the institutional framework and the incentives for attraction of private investors.

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 73 members, is not focusing on the field of rural energy supply. There is AHDESA with experiences in the field of the introduction of improved stoves. It is a partner of EnDev-Honduras. 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. In the field of micro hydropower, some activities have been carried out by the “Fundación Hondureña de Investigación Agrícola” (FHIA), which is also a partner of EnDev-Honduras.

In the field of photovoltaic systems several providers are working in Honduras of which SOLARIS and SOLUZ are the most important. The solar companies in general have difficulties to develop markets in rural areas. Different subsidy schemes of international donors make the commercial distribution even more difficult. SOLUZ accumulates experience in the field of cash and credit sale as well as in offering fee for service options. However, as the service fees have not been sufficient to cover the primary investment costs of the systems the approach failed. It was calculated that a monthly fee of 18 $ would be required while the customer would have to pay for the battery by himself. There are only a few producers of agriculture machinery that produce hydropower turbines but the technical level is very low. Therefore FHIA started to produce turbines itself. Customers are mostly coffee farmers.

1.4. Major Donor Activities

The *World Bank* is currently working on a US$30m investment plan for the Scaling Up Renewable Energy Program (SREP) together with the *IFC* and *IDB*. The grant facility aims at supporting (i) strengthening of the national regulatory framework; (ii) the development of renewable energy connections to the grid and; (iii) rural electrification through small-scale renewable sources. There is an ongoing US$13 million component for off-grid solar electrification through the Rural Infrastructure Project.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for Lighting and Electric Household Applications	12,000
Cooking Energy for Households	8,000
Electricity for Social Infrastructure	75 SIs
Cooking / Heating Energy for Social Infrastructure	
Energy for Productive Use / Income Generation	200 SMEs

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev-Honduras will promote the following energy technologies and services: (1) Improved cook stoves, (2) Micro and Pico Hydro Power, (3) Solar Home Systems and Pico PV and (4) Solar dryers for food processing.

With the up scaling EnDev Honduras will focus on the following key interventions:

- Promotion of PV, micro and pico hydro and grid based electricity supply for households, social infrastructure and productive use
- Installation of solar dryers for productive use
- Dissemination of improved stoves for cooking and productive use
- Further development and implementation of training courses for developers of renewable energy projects, in order to improve knowledge of cooperating institutions, related technicians and user groups.

Expected output: 2,350 households (about 12,000 beneficiaries) provided with electricity for household lighting and 75 social institutions provided with electricity; 1,600 improved stoves for cooking or productive use.

3.2. Approach to Provide Electricity to Households

3.2.1 Hydropower

EnDev will continue to promote hydropower to improve the energy situation for household lighting and small electric appliances in remote rural areas far from the national grid. 20 additional micro / pico hydropower systems will be installed within this upscaling proposal. Training on both technical maintenance and management skills will be provided. The micro

hydro systems and micro grids are the property of the villages and are operated and maintained 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 are based on a flat rate system. The pico hydro systems will be operated on a private basis. The owner will connect as much neighbouring families as possible depending on the potential power generation of his water source and access to financing sources for the technology. EnDev will contribute with a subsidy based on the number of families connected. For each hydro site co-financing arrangements will be negotiated between the local government, AHPROCAFE, ICF, the community and the families. EnDev will contribute financially and/or by providing a part of the machinery in addition to technical assistance and backstopping. On the supply side, workshops will be held on how to produce efficient turbines or how to use pumps as turbines or motors as generators. 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 in neighbouring countries.

3.2.2 Solar Home Systems and Pico-PV

EnDev will continue to promote the dissemination of solar home systems and start with the promotion of pico PV products of the second generation as an alternative for families that have no access to financing sources and cannot afford the down payment for a solar home system. At least 1,000 solar systems will be installed with rural families in close cooperation with the NGO “Hermandad de Honduras” and ProRena Olancho. EnDev funds will be used to subsidize up to 40% (maximum) of the end consumer prize for the solar system. In case there is access to additional financing sources such as credit financing, or funds by AHPROCAFE or ICF, the EnDev subsidy will be adjusted accordingly to a lower basis.

3.2.3 Grid extension

EnDev will enhance its participation in up to five grid extension projects, on the basis of individually negotiated co-financing arrangements between the local Government (fund raising), the community (internal connections), local NGOs (organization and logistics) and ENEE-FOSODE (grid planning and design, approval of standards and quality control, and management of public funds approved by congress). Usually EnDev is supporting the leverage of selected projects with the procurement of materials (posts, transformers) for covering additional villages at the tail of the grid extension project concerned. Other options could be participating with a subsidy for household connections or internal wiring.

3.3. Approach to Provide Clean Cooking Technologies to Households

EnDev will support the training of local technicians, NGOs and training institutions on the construction and maintenance of improved stoves (model “Justa”). Subsidies of maximum 50% will be provided for households interested in the new fuel wood saving technology for materials as the plates and/or chimneys, which are not available in the rural areas. Villages participating in the activity must cooperate with and are assisted by a local organization or NGO for organizational, logistical, training and backstopping purposes. Installation of the improved stoves and training of the households is done by the partner AHDESA, a private

organization active in the field for many years and with specialized skills and experiences. Households are expected to contribute to the cost of the new stoves with a 50% share by allocating cash or locally available materials and labour. Together with ProRena it is envisaged to start working with indigenous villages in the Mosquitia Region introducing a stove based on the Peruvian Incahuasi model without plate but with chimney and constructed with local material. In these areas it is planned to start working with biomass gasification stoves and replacement of firewood by saw dust and other available biomass waste materials.

3.4. Approach to Provide Electricity to Social Infrastructure Institutions

3.4.1 Hydropower

Social infrastructure institutions will also be electrified in the framework of the micro hydropower plants promoted by EnDev-Honduras (mentioned above under households).

3.4.2 Grid extension

Social infrastructure institutions in the areas concerned by grid extension (mentioned above under households) will be served, too.

3.5. Approach to Provide Electricity to SMEs

3.5.1 Hydropower

A special training program for site evaluation, cost calculation, procurement, installation, operation and maintenance of pico hydro systems with power generation of up to 5 kW will be implemented with AHPROCAFE, IHCAFE and private enterprises for the electrification of households and for productive use in coffee growing areas. Individual coffee growers will participate with financing from AHPROCAFE and a subsidy from EnDev, based on the number of households connected.

3.5.2 Grid extension

The grid extension intervention line mentioned above will not only benefit households, but also SMEs in the areas concerned.

3.6. Approach to Provide Clean Cooking Technologies to SMEs

3.6.1 Improved Kilns

As fuel wood consumption is larger in productive processes than it is on household level, EnDev Honduras will continue the promotion of improved energy efficient kilns for productive use in the communities for bread baking, brown sugar production, and indigenous pottery. At least 1,600 additional stoves will be constructed locally.

3.6.2 Solar Dryers and Biogas

One of the major problems in the coffee sector in Honduras is the shortage of coffee drying infrastructure during the harvest season. Therefore coffee cooperatives will receive further training to construct and manage 300 additional solar dryers. The plastic parts of the dryers are subsidised by EnDev (50% of total costs), while the cooperatives provide locally available materials and labour. The EnDev subsidy will be reduced according to co-financing opportunities with AHPROCAFE and IHCAFE. Additionally, EnDev will cooperate with SNV Honduras in a pilot of applying specific technology transfer for the promotion of biogas applications for the sanitation of coffee processing waste waters and electrification of coffee processing plants.

3.7. Risks for Implementation

In the moment there seem to be good opportunities for unlocking national financing instruments for the promotion of renewable energy technologies mainly with the coffee and forest and nature conservation sectors. Their interest is mainly in the electrification for productive use and in the conservation of the country's watersheds. However, opening up national co-financing resources for the promotion of renewable technologies and universal access to modern energy services is still a tedious task, translating into a risk for sustainability in the long term (lacking ownership). The growing interest in renewable energies in the country is also generating a series of national regulations by the central government, which if not adjusted to the reality of the communities could lead to conflicting views and disincentives for the promotion of these technologies. Although Honduras has currently returned to political stability, the need to consider increased safety measures for the people working in remote rural communities is growing.

4. Expected Impacts of the Project Intervention

The impact M&E activities are designed according to the framework of the Sustainable Development Concept of GIZ, considering economic, social and environmental dimensions. Continuing with the work done in EnDev 2, the key interventions and activities will also be accompanied by M&E activities following up on activities, processes and outcomes.

5. Budget

		EUR
1	Human Resources and travelling	**408,000**
2	Equipment and Supplies	**215,000**
3	Funding Financing Agreements / Local subsidies	**474,000**
4	Other direct costs	**236,000**
5	Total direct costs	**1,333,000**
6	Mark up costs/administrative overheads / imputed profit	**167,000**
7	Cost price	**1,500,000**

Indonesia

1. Situation Analysis

1.1. Energy Situation

Indonesia has shown impressive economic growth over the past decade. This came along with an even faster increase in electricity consumption, which has reached 7% per annum in recent years. However this growth took mainly place in the densely populated areas on Java and some other economic centres, leaving out remoter islands and rural areas. Presently 32 GW of electrical capacity are installed in Indonesia, out of which 80% are installed in the Java-Bali grid. The remaining 20% are dispersed over 17000 islands spanning 6000 kilometres east to west, leaving many rural areas in the dark. To electrify the world's biggest archipelago is by no means a small challenge.

The effect of this unique geography is, that Indonesia has a comparatively low overall rate of electrification for a middle-income country. Figures and interpretations diverge, but as much as 30-35% of the population may not have access to electricity leaving about 80 million people without access to modern energy services. About half of these people are living in remote rural areas without any possibility to get access to local or national grids in the near future. Provisional energy sources such as diesel gensets, batteries, or kerosene are costly, require a high share of the household income and harm the environment. Insufficient energy supply also hampers the further development of small businesses and social infrastructure. The other half of "un-electrified" people are actually living in (already) electrified areas and would need grid densification programmes at estimated costs of US$ 290 per connection.

The remote rural areas can either be targeted through grid extension or dedicated off-grid solutions. The World Bank Regional Electrification Master Plan for Indonesia made some estimation about least cost options coming to the following conclusions:

- Grid expansion is the least-cost means of electrification up to distances of around 7 km where good micro-hydro resources are available
- Where this is not the case, grid expansion is least-cost up to distances of around 16 km, where biomass isolated grids become lower-cost
- In cases where good micro-hydro and biomass resources are not available, then grid expansion remains least-cost at distances up to 28 km, where diesel isolated grids are to be preferred
- Household level solutions are only to be preferred where practical constraints on access prevent the use of isolated grids or for smaller villages where it is not economic to install isolated grids.

Villagers in non-electrified areas rely on candles, kerosene lamps, dry cells and car batteries to satisfy part of their energy needs. Rural households typically spend a significant share of their income on these energy sources – despite the inconvenience and the environmental and health hazards associated with them.
The current National Energy Management Blueprint identifies ambitious short- and long-term developmental objectives for the electricity sector including the increase of the electrification ratio to 90% of all households by 2020 and to 93% of all villages by 2025. In the past GOI has stayed considerably behind its set targets, reflecting the difficulties to electrifying the world's biggest archipelago. The grid extension program lies under the responsibility of the state utility PLN. Since Indonesia is heavily subsidizing electricity prizes, PLN is continuously

short of funds to extend its grid and to invest in new power generation, especially in rural areas where cost of electrification are much higher than in densely populated areas. PLN operates more than 5000 power plants with an average capacity of 5 MW. Average generation cost of electricity is 1200 IDR/kWh while the average selling price is around 700 IDR/kWh. PLN's operation costs for diesel generated local grids in rural areas are in the range of 2500 - 9000 IDR/kWh, depending on location and keep on rising. This clearly hampers PLN's enthusiasm for grid extension measures.

Whilst the application of MHP technology is not new to Indonesia, only a minor proportion of the country's huge mini and micro-hydro power (MHP) potential has been exploited so far. Unfavourable framework conditions for stand-alone systems and on-grid schemes, lack of specialist know-how and a basic lack of awareness of the available potential have been the main reasons for this sluggish progress in the past. Meanwhile however, in remote rural areas, hydro power has become the least cost option compared to fossil fuel-powered systems. Other renewable energy technologies like Solar Home Systems, small wind turbines or biogas plants and other bio-energies are spread to a different extend in rural areas, but lack for the technical maturity or sustainable operation and service models that are necessary for large scale dissemination.

The majority of off grid electrification measures is carried out under various government schemes. Presently more than half a dozen ministries are involved in rural electrification schemes. The main players are listed in chapter 1.3 under institutional set up, while policy frame work, laws and regulations are summarised in chapter 1.2. And the support of main donors in this field is laid out in chapter 1.4. The various government programs are carried out with little coordination and there are villages in which some households are connected to the PLN grid, others to a PV-mini grid, and a part to a MHP system, each of them implemented under different programs paying different tariffs.

Currently the Ministry of Energy and Mineral Resources (DAK, Desa Mandiri Energi), the Ministry of Home Affairs (PNPM MP) and the Ministry of Disadvantaged Regions (KPDT) and several civil society organisations are implementing renewable energy-based rural mini-grids. In the case of GoI though, the support is focused exclusively on hardware. It is well accepted that a hardware-only approach will result in defunct systems within a short period of time. While GoI is certainly aware of this, their budget provisions do not allow (as yet) for addressing a sustainability process.

All government schemes have in common that they are providing equipment and installation free of charge. Many of these off grid schemes fail within a short period of time after installation. As main reasons for this failure can be listed:

- Faulty planning and design of systems
- Technical failure of components or the system
- No functioning management system in place
- Weak structure of financial operation

An evaluation of 54 MHP sites constructed from 2006 -2009 under the Ministry of Disadvantaged Regions showed that already within a 3 years period 23 sites (43%) where no longer in operation (whereas an impact assessment performed by RWI showed a nearly 100% sustainability rate of "EnDev1 villages" after 2 years). Failure rates for PV-systems are even higher.

1.2. Policy Framework, Laws and Regulations

Several laws and regulations touch on rural electrification with a strong trend to incorporate more renewable energy resources.

The current National Energy Plan sets ambitious targets for rural electrification: 90% of all households by 2020.

The Ministerial Decree on Renewable Energy Resources and Conservation (Ministerial Decree No. 002/2004) pursues such objectives as optimising and improving the efficiency of renewable energy resources, securing sustainable, environmentally compatible forms of power generation, increasing public awareness and improving consumer behavior with regard to energy conservation. The targets for renewable energies have been increased to 25% (18% renewable and 7% other new energies) by 2025.

The Coordinating Ministry of People's Welfare is responsible for the development and administration of poverty reduction policies and programs. In the last years government programs have been consolidated in 3 major clusters focusing on (1) individual assistance and social protection (subsidised staple food and scholarships for the poorest), (2) national program for community empowerment (PNPM) and (3) strengthening of small and medium enterprises (mainly by providing cheap credits). As a core element of the national poverty reduction strategy PNPM has been up-scaled in 2009 covering the whole country with a budget over 2 billion US$. The PNPM follows the philosophy of community driven development (CDD), providing institutional training and support to communities, who then can apply for funding for self-defined community development projects. The core PNPM cycle is foreseen to be implemented for three consecutive years building the institutional base in the villages for later intervention of other sector programs. As communities are free to define their priorities they can also opt for local energy infrastructure projects like hydro powered mini grids.

The energy policy for rural electrification is developed by the Directorate General for Electricity and Energy Utilisation (DGEEU) of the Ministry for Energy and Mineral Resources (MEMR). A rural electrification program is jointly implemented by the DGEEU and the Indonesian electricity utility PLN. PLN provides assistance at two different levels: either for establishing a stand-alone (isolated) grid including power generation, or for establishing a village network for connection to the PLN-operated central power grid. However, the program has been criticised as inefficient and too bureaucratic. Rural electrification is generally not financially attractive to PLN because Indonesia's off-grid areas are sparsely populated, have very low load factor, and are dominated by low-end household consumers who are charged a heavily subsidized tariff (average revenue for household consumers was IDR 628 kWh in 2006. Most off-grid regions are supplied by diesel power plants that consume high priced diesel oil. This increases PLN's cost of production far above IDR 2000/kWh.

In 2002, MEMR issued a new regulation for small renewable energy projects interested in selling power to PLN known as PSK Tersebar. The regulation requires PLN to purchase electricity generated from RE sources by non-PLN producers for projects of up to 1 MW capacity. Institutions eligible to participate are cooperatives, private companies and government-owned companies. Purchase tariffs are calculated at 80% for medium voltage and 60% for low voltage of PLN's announced Electricity Base Price, which is supposed to be its marginal production cost at the location, where the plant is to be built. The ministry also introduced some benchmark tariffs on the cost of power production by area subsystems.

An additional program to foster rural energy supply is the Energy Self-sufficient Villages program (DME), set-up by Indonesia's president in 2005. All rural energy related activities by Indonesian ministries are considered under this program if they result in a village's energy self-sufficiency of at least 60%. Because the ministries do not receive extra funding, ongoing activities are integrated into the DME program. The implementation of the DME is significantly delayed and the target for 2009 was not reached.
Recently the GOI has also established a new allocation fund for rural electrification called Dana Alokasi Khusus (DAK). The Ministry of Finance approved the DAK. The technical guidelines have been worked out by the DGEEU and have still to be approved by the MEMR. The current budget of DAK is 15 Mio US$. It will increase to 100 Mio US$ per year. DAK is providing 200,000- 800,000€ to local governments. They can use the money to construct new or rehabilitate MHPs, extend the grid of MHPPs or install solar systems. The districts have to contribute at least 10% of the costs. Funds can only be used for hardware. Local governments have to design and construct the plant. Consultant activities are not included, but can partly be financed by the MEMR.

1.3. Institutional Set-up in the Energy Sector

- The Ministry of Energy and Mineral Resources (MEMR) is responsible for the national energy policy and is supervising state-owned utilities and energy service companies. Important aspects of implementation have been transferred to the provincial and district level in the course of the ongoing decentralisation process.
- The Ministry of Finance has taken over a leading role in responding to climate change issues. MoF leads an inter-ministerial working group on climate change and low carbon issues.
- The Directorate General of Electricity and Energy Utilisation of the MEMR (DGEEU) is responsible for the electricity sector policy and its regulation. DGEEU also chairs the Rural Electrification Steering Committee, which is responsible of ensuring inter-agency coordination and cooperation in matters related to the government's rural electrification program. In addition, DGEEU co-ordinates and supports small power purchase agreement project developments.
- The Directorate General for New and Renewable Energies and Energy Conservation (NREEC) started up in February 2011. NREEC was set up as a focal point for renewable energy in Indonesia. As the central governmental institution for renewable energies including hydro power it is also the central counterpart on the policy level for the ongoing ENDEV measure.
- BAPPENAS (National Development Planning Agency-Bureau for Electricity, Energy Development and Mining) prioritizes renewable energy projects, special rural electrification projects, determines level of government support, and appoints Government project partners. BAPPENAS is the agency responsible for preparing long- and medium-term (five-year) national development plans.
- The National Energy Council (DEN) is chaired by the president, with the objective to define procedures to elaborate a National Energy Master Plan and Regional Energy Master Plans and to clarify the authorities of the central and local governments.
- The Directorate General for Community and Village Empowerment (PMD) within the Ministry for Home Affairs (MOHA) implements the Rural PNPM and it is supporting the Green PNPM program, a new grant facility established under the country-wide

PNPM. For this special fund the World Bank acts as trustee via the PNPM Support Facility (PSF). The objective of this facility is to provide additional funding to the existing block grants provided under PNPM for activities contributing to the sustainable management of natural resources (NRM). The Green PNPM is jointly financed by Australia, Canada, Denmark, and the Netherlands and provides for grants for MHPs until 2012.

- Ministry of Public Works (MPW) is responsible for hydro power resource surveys. In a few cases, the operation of hydro plants and building codes.
- Ministry of Cooperatives and Small Enterprise Development (MOC) is responsible for enhancing the role of cooperatives in rural electrification and in some cases initiator of electrification projects.
- The national electricity system is managed by the state owned utility company PLN that holds a monopoly for the power generation, transmission, and distribution, as well as power retailing. PLN currently operates 5,233 power plants, which comprise around 44% of the generation capacity outside the Java-Bali network. PLN is managing at least 600 mini-grids. The utility is currently unable to expand its power-generating capacity due to financial difficulties.
- NGOs play an important role in Indonesia's energy sector. They are advisers, project developers, and managers of energy programs. NGOs are active in different RE fields

1.4. Major Donor Activities

Germany

BMZ is funding the ASEAN Renewable Energy Support Programme (ASEAN– RESP), a regional project aiming to accelerate the exchange and best practices in the ASEAN region. This project can be used to disseminate results from the ENDEV measure to other ASEAN countries with low electrification ratios like Laos, Cambodia and Myanmar and vice versa. The Hydro Power Competence Center which was established under this project in Bandung is equipped with a hydro power laboratory and can be essential in providing high quality training and testing of equipment for ENDEV projects worldwide.

BMU is funding the project Least Cost Renewables (LCORE), which has been commissioned in March 2012. This project is aiming to promote renewables in those fields where they are already cost competitive like replacement of diesel generated power. There is good potential for cooperation with ENDEV especially regarding upscaling of pilot projects.

Norway

Development cooperation is primarily focused on climate and forests. In 2010 Norway and Indonesia signed a declaration with the 4 main pillars: (1) cooperation on international political issues, (2) focus on energy and climate, (3) democracy and good governance and (4) economic cooperation. Cooperation potential exists in an exchange programme through which villages are electrified against clear forest protection and rehabilitation activities.

World Bank

The World Bank has been supporting clean energy and clean development in Indonesia since the mid-1990s. One of the first WB-executed RE projects was the Indonesia Solar Home Program with the aim to provide PV systems for 200,000 Indonesian homes. However, the project was not very successful. WB published in 2005 a study "Electricity for All: Options

for Increasing Access in Indonesia". Based on the findings WB is supporting grid expansion in rural areas.

Green PNPM

The Netherlands, Denmark, Australia, UK and Canada support the Green PNPM. The Green PNPM is the five years (2008 – 2012) US$54.8 million environmental pilot-project of the GOI's Program Nasional Pemberdayaan Masyarakat–Rural (PNPM-Rural), or the National Program for Community Empowerment in Rural Areas. The pilot-project disburses block grants and provides technical assistance to beneficiaries within target locations in eight provinces on the islands of Sulawesi and Sumatra for community investments in 'green sub-projects' – activities focused on natural resource management (NRM), environmental conservation, and renewable energy (RE).

Asian Development Bank

The Asian Development Bank (ADB) is active in a range of projects from upstream gas field development to off-grid rural electrification using renewable energy. A project initiated in 2002 provided over $150 million in lending for connecting about 76,000 new customers to the power grid, including providing 10,000 low-income families in Indonesia's outer islands with solar home systems and hydro based mini-grids.

The Netherlands

The Netherlands have financed the "Casindo" program which supports regional multi stakeholder forums to plan energy investment and support local universities and vocational school in the field of renewable energies and a number of other projects however have meanwhile phased out from energy sector.

Denmark

Denmark is supporting in addition to the Green PNPM an energy efficiency program and recently had a planning mission to support new projects in the field of NRM.

Others

- The EC-ASEAN Energy Facility (EAEF) had supported some projects. However, the program ended in 2007.
- IFC has showing increasing interest in financing and providing advisory services to climate change initiatives, clean energy development and energy efficiency options, and are implementing advisory services in the geothermal and biomass fields.
- Different other actors as UNDP (Integrated Microhydro Development and Application Program - IMIDAP) have been active in the MHP sector in the past, but have phased out now.
- MCC´s $332.5 million Green Prosperity Project is designed to increase productivity and reduce dependence on fossil fuels by expanding grid connected bigger renewable energy schemes, to increase productivity and reduce land-based greenhouse gas emissions by improving land use practices and management of natural resources.

2. Planned Outcome

Energy Service Segment	Old target	New Target
Energy for Lighting & Electric HH Appliances	90,000	112,000
Energy for social institutions	160	200
Energy for productive use/ income generation	290	340

3. Project Approach

The submitted proposal is an upscaling of the ongoing country measure ENDEV2 Indonesia. Its main objective is to support and ensure sustainable electricity access by assisting public and private rural electrification programs in Indonesia to put mechanisms in place that would safeguard 1) the technology investment from premature failure and 2) the sustainable operation of the schemes. The project will build on the experiences of the ongoing country measure and systematical upscale into new fields.

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev2 Indonesia has focused its activities on electrification based on hydro power. It aims to provide 90.000 people with electricity, to connect 160 social Institutions and to support 290 productive use of energy appliances. Additionally it shall establish self-supporting structures beyond 2012: The capacity of relevant institutions and organizations, villagers, PNPM field staff and 3rd party contractors to develop MHP energy in an additional 300 villages – after the function period of the TSU in 2012 and until 2015 – is in place.

3.2. Approach to Provide Electricity

3.2.1 Current concept

The EnDev2 country measure Indonesia began in May 2009. It comprises two closely linked components; (1) the Green PNPM Micro Hydro Power Technical Support Unit (MHP-TSU), and (2) the Micro Hydro Power Project for Capacity Development ($MHPP^2$).

The EnDev2 country measure Indonesia is embedded in a complex multi-stakeholder landscape, and the projects are being implemented with two different partner institutions. The MHP-TSU is providing technical assistance to the planning and implementation of 137 micro hydro power plants under the Green PNPM community empowerment programme, which is implemented by the Ministry of Home Affairs (MOHA). The MHPs are financed by Green PNPM's block grants, funding which is specifically earmarked for community projects on natural resources management and renewable energy, and which derives from a multi donor trust fund, administrated by the World Bank (WB). The technical part of the implementation is contracted out by GIZ to the company PT ENTEC. The MHP – TSU component will end in December 2012.

The $MHPP^2$ project is working on a policy and strategy level to develop and institutionalize sustainable micro hydropower schemes in Indonesia including the extraction, documentation, conceptualization, and institutionalization of lessons learned and best practices from the

previous EnDev1 country measure Indonesia and from the present MHP-TSU component. Since the end of 2010 this is done in cooperation with the recently established Directorate General for New and Renewable Energy and Energy Conservation (NREEC) under the Ministry of Energy and Mineral Resources (MEMR). The MHPP[2] project is scheduled to end in December 2013.

3.2.2 Up-scaling Concept and Strategy

In order to provide more rural people with access to electricity and to increase sustainability of the measures, the submitted proposal up-scales the ongoing ENDEV2 country measure in 4 ways:

a) Open the project to all off- grid rural electrification schemes in Indonesia (new partners)

Regarding the access to electricity the ongoing project relied heavily on one partner, the PMD under MOHA as the implementing agency for the Green PNPM, funded through a World Bank administered multi donor trust fund. When certain counterpart commitments were not met, like facilitators in the field or funds for MHPs were reduced from 250-300 down to 137 sites, the project was left with little alternatives (especially since 90% of the budget was bound in a subcontract to an international hydro power consultant). Using whatever flexibility was left, the only way to make up for the missing target was, to shift some of the activities from the TSU component to the MHPP2 project with the partner NREEC/MEMR. However, considering the resources available these activities can only aim at low hanging fruit of off grid MHP rehabilitation and implementation of some pilot projects that promise good potential for scaling up.

The up-scaling proposal considers the above mentioned shortcomings and directly pursues a mitigation strategy by opening up to all potential public and private partners involved in off grid rural electrification in Indonesia (see chapter 1.2). In that way the most promising partners can be selected (who show the highest ownership and commitment to the project) and MHP sites clearly identified for both rehabilitation and new developments. Selection criteria remain to be finalised, but would likely include: actual implementation budget committed, site feasibility has been conducted, supply tendering has commenced, and other (further criteria under consideration are listed in Section 3.3 [i]).

Engaging new partners more intensively is a main element of scaling up the present project and to widen the outreach. Indonesia has a vast number of rural electrification schemes and development programs that are carried out by various organisations both governmental and non-governmental as well as private sector. Some of the potential partners and programs that shall be reached in the up-scaling are listed in the table below.

Across Indonesia there are a number of defunct MHP plants, which were funded by various sources of funding (e.g. Ministry of Disadvantaged Regions, PLN, and MEMR) and implemented through a variety of arrangements, most often by contractors and equipment suppliers, without sufficiently safeguarding the quality and sustainability aspects. As an example, some 50 MHP schemes have been implemented with funding through the Ministry of Disadvantaged Regions and half of these are either not functioning, or functioning sub-optimally.

Rural electrification projects with the potential to be picked up under the up-scaling program:

Partner	Program	Hydro/PV	Total No of Sites	Potential for up-scaling support	New	Rehab.
NREEC	DME	Hydro, PV	60	30	x	x
NREEC + Local govt.	DAK	Hydro, PV	57	40	x	
MOHA	PNPM-MP	Hydro, PV	475	50	x	x
KUKM		Hydro, PV	5	5	x	
KPDT		Hydro	35	25		x
CSR		Hydro	Unknown	2	x	
PLN	Pico program	PV	Unknown	Unknown	x	
NGO		Hydro	Unknown	10	x	x
TOTAL				**160**		

Number of previous projects:

1. DAK 2011: 18 recipients for MHP project which only 8 are actually constructed/installed
2. DAK 2012: granted for 57 districts with various types of projects namely MHP installation, MHP rehabilitation, solar PV mini-grid, and grid extension.
3. MHP project under PNPM-MP 2008-2011: 475 sites
4. MHP project proposal under PNPM-MP for 2012 budget (status Oct. 2011; Installation: 77 sites; Upgrade: 10 sites; Rehabilitation: 4 sites)

One of the most common reasons is the lack of the community sense of belonging which leads to the lack of their capability to maintain and operate the scheme in a sustainable manner. In many cases, the community is not ready to run the scheme on a day-to-day basis and have no guidance on how to carry out the management. Past experience shows that enabling the community since the earliest possible would improve the scheme's sustainability.

According to presently available data there are about 130 potential sites that could be addressed under the up-scaling program. To reach the up-scaling target of 22000 people electrified, about 30 projects need to be selected and developed.

b) scale up to other regions in Indonesia

Under the ongoing project only selected districts in Sulawesi and Sumatra are included. There are requests from various sides to provide support also to other regions in Indonesia. For example from NREEC to support their electrification projects in West and East Nusa Tengara, or from "The Heart of Borneo" initiative to provide villages in natural parks with electricity against the condition to protect the rain forest. These initiatives could eventually be linked to REDD programs.

Opening up to new regions means quite often to open up to new technologies. Since the eastern islands are drier, MHPs might be not be applicable there and instead solar PV or hybrid systems might be suitable.

The up-scaling proposal will spread its impact beyond the current regions and seek MHP and other renewable energy mini-grid initiatives according to resource availability and enhanced financial viability.

c) expand to include other renewable energy technologies

Expanding to other regions in Indonesia incorporates a strong element of choosing the least cost renewable energy option (in terms of cost-reflective tariffs) that offers opportunities to identify financially attractive and marketable opportunities. Many of the administrative and managerial requirements between MHPs and other rural mini-grids are similar and this

requires minimal adaptation of the already compiled documentations and training programmes devised by MHPP[2]. However, specific technology operation and maintenance programmes will need to be developed under the up-scaling proposal.

Being RE technology neutral and open will significantly increase the likelihood of providing more people with modern access of energy. Previously the project focused exclusively on micro hydro power projects. The up-scaling proposal seeks for other sources of rural electrification i.e. solar power. This strategy is in line with the plans of GoI as well as PLN to boost the application of PV for solar home and centralized systems.

Since Indonesia's market regarding non-MHP renewable energy technologies (particularly solar) is presently underdeveloped (and government programmes have been wrought with past failures), this up-scaling proposal will dedicate resources towards establishing and promoting best practices regarding technical, financial and policy issues amongst private and public stakeholders. The timing is essential, since NREEC is seeking to establish a 15kW solar PV mini-grid programme and under DAK 30 districts (out of 57 districts) have submitted proposals for centralised solar PV installations.

Solar energy market development in Indonesia is reaching a critical point, especially since international technology cost and quality has improved dramatically over the last decade. With enhanced financial feasibility and increasing market demand, this offers new opportunities for result-based financing (RBF) mechanisms pursued through EnDev.

d) develop and apply sustainability concept

Through MHPP2 and MHP/TSU a substantial sustainability concept has been developed and is still being refined. This primarily includes developing and conducting training programmes for village management teams, compiling best practice guidelines for policy makers, and producing specialised and general awareness materials. The training and skills development programmes are an integral part of the terms for the TSU consultants. While this has been sufficient under the Green PNPM, the up-scaling proposal will take this sustainability concept to another level, by expanding the skills development programme to district (e.g DINAS) and national level (e.g. NREEC) as well as identifying and capacitating private sector institutions to provide such services on a commercial basis.

At the district level a clear need was identified to build up capacity for determining the quality of MHP site feasibility studies, assess the comprehensiveness of technical designs, improved tender evaluation and contracting procedures, and conducting installation commissioning to ensure infrastructure quality.

The private sector (within this context, the private sector will comprise NGOs, training institutions and private companies) will be actively engaged through the up-scaling proposal to provide consulting, maintenance and training services. Deficiencies of service providers will be identified and addressed through training measures. This approach will be complemented with the development of planning and decision-making tools. So far there is little demand for private service providers in off-grid rural electrification schemes. The up-scaling programme will undertake measures to stimulate the private sector involvement, be it through initial provision of project and government budget for this services or by increasing the capability of the villagers themselves to pay for this services due to improved management and economics of their power plants.

Ultimately, the result will be a set of training and decision-making tools, and commercial Indonesian providers that can meet the demand for services on village, district and national levels.

3.2.3 Planned Activities

The implementation activities are going to address the core problems of rural mini grids: Technical failure and insufficient management on village level, including tariffs, operation and maintenance. This will be done through a sequence of interconnected measures.

a) selection of most suitable sites and partners

In the past the project was connected with a specific electrification programme. Although NREEC/MEMR will be the main counterpart on the central government level, the up-scaling proposal will not be bound to a specific rural electrification programme. It is proposed to select the sites and partners according to the following – to be further elaborated – criteria.

- actual construction budget committed
- site feasibility has been conducted
- supply tendering has commenced
- cost efficiency (up-scaling cost per "electrified" person, social institution, productive use)
- electricity available per household (Watt/household)
- ownership of the village
- agreement on minimum electricity tariffs
- agreement on independent commissioning of sites according to approved protocols
- agreement to install meters at the MHP facility to monitor power output
- willingness to join benchmarking program
- potential for productive use applications
- open to innovative business models (metered electricity in households, service contracts etc.)
- potential for innovative technologies
- village and/or DINAS pays for private sector training service providers

b) introducing commissioning through qualified independent service providers following a clear protocol

Safeguarding the construction quality through a comprehensive commissioning approach is another key activity of the up-scaling proposal. A high quality of the energy supply system is the foundation for sustainable energy access. The ongoing ENDEV project has worked intensively on quality assurance issues. The use of electronic load controllers, operating hour and electricity meters have been made mandatory in all MHPs.

An extensive commissioning protocol and procedures have been established and field tested under the present project. This will be followed by a training of relevant stakeholders (consultants, suppliers, government officials at local and district level, facilitators, etc).

So far this protocol is only applied within the Green PNPM program, where it ensures quality as well as save operation. In all other projects commissioning is basically done by the supplier himself. The result is, that many sites do not comply with the specification and that suppliers of low quality products are at an advantage. Therefore acceptance by independent

consultants and commissioning protocol will be made a precondition for the selection of sites under this proposal.

c) comprehensive training of the village energy team in close vicinity to the commissioning

Strengthening the operation sustainability through enabling the community is a key element of the strategy. The community has to be sensitized and prepared before the RE scheme is installed. This can be done by engaging a local grass-root organisation to mentor the community very closely. Providing an intensive assistance in the establishment of the management team should be one prominent activity. This method shall allow the community to understand the scheme more comprehensively and encourage them to dedicate their time to operate and maintain the scheme.

- Transparent organisational structures: The EnDev Indonesia village set-up has proven itself successful during the last project phases: An elected management team, consisting of a team leader, an accountant and two operators is responsible for the energy supply. A clear tariff system ensures revenues for maintenance and repairs, as well as salary and commitment of the operating team.
- Well capacitated: The management team members receive a training that enables them to fulfill their specific tasks. The operators learn how to run and maintain the system, the team leader and the accountant get trained in book keeping, tariff setting and other necessary organisational tasks
- Long term access: Permanent maintenance measures, together with the monthly revenues assures that the system runs smoothly, and that in case of break downs enough money is put aside to pay for spare parts and repair.

d) introduce a post commissioning benchmarking program to insure sustainability of the systems

So far there is no government support after the site has been installed. So far there is also no systematic process of continuous improvement and learning among the villages and neither among the involved private and public stakeholders on local and central level.

The newly established NREEC plays a key role as a focal point for continuous improvement and learning among the various GOI rural electrification schemes. However there is a lack of data from the field what is really working and what not and what might be needed to improve things.

To kick start this learning and improvement process all village energy teams and DINAS, which have been selected for rehabilitation or new installation, will be part of a benchmarking program, which regularly bring together different villages and DINAS to compare their monitoring results and experiences. These benchmarking activities will be carried out every 3 to 4 months over a period of one year after commissioning. They will be facilitated under the up-scaling program through the private sector facilitators. The project will collect data on the technical and economic performance of each site, tariffs, and productive use of electricity. Where meters are not available they will be installed. Data and experiences will be shared among the villages and best practices will be rewarded. In this way the benchmarking meetings will become a convenient tool to accelerate best practices among the villages and to provide essential data for further improvement to local and central government institutions and the private sector. This activity also offers scope to include the result-based financing (RBF) mechanism by establishing a reward system for energy saved (or rational energy use)

and additional houses connected, or funds saved for future maintenance expenses, or similar measures.

e) other supporting activities to increase access to electricity and sustainability of the projects

- Promoting beneficial PUE application in respective villages: One strategy towards achieving the sustainability of MHP sites is to encourage productive use of energy (PUE). Within MHPP[2], PUE is defined as a small-scale activity, using a renewable energy-based electric energy source for providing a service or adding value to a product in order to sell the product and/or service to a willing market. MHPP[2] has compiled a database of PUE options possible at rural RE-based plants in Indonesia and is currently seeking to test the appropriateness, acceptability and financial feasibility of some of these options. If successful the up-scaling phase will integrate productive use wherever possible in the individual schemes.
- Building the capacity of the RE service providers: The backbones of this proposal are small local NGOs and RE service providers. They are ideally based in the respective regions of the targeted RE schemes and gained experiences in rural electrification. NGOs and service providers will be capacitated by local training institutions, such as the ASEAN Hydro Power Competence Centre (HYCOM), and contracted to commission schemes, and to capacitate villagers. This approach ensures, that the gained knowledge and experiences stay within the country and region and that small service providers and NGOs will offer their services to other programmes on a commercial basis.
- Capacity building measures to strengthen key players in the government sector: This would comprise training of district authorities (DINAS) for tender evaluation, commissioning and contracting of private contractors and service providers, and training of central government agencies (NREEC) on monitoring performance of MHPs and the efficiency of rural electrification programs. This includes the development of a feed-back loop on the sustainability of rural electrification projects to NREEC, in order to support the latter to influence other ministries' RE programmes to take up appropriate sustainability measures.

3.3. Project Monitoring and Evaluation

Under the ongoing country measure a comprehensive database with over 500 MHP sites has been built up. This database will be extended for the projects under the up-scaling program and will serve as a valuable reference. A set of key performance indicators (KPI) has been defined and the database will be used to update quarterly on performance of the schemes. In addition to the ENDEV indicators on number of "electrified" persons, social institutions and productive use, the KPIs will deliver information on the economics, management, quality and sustainability of the schemes.

- Pre-commissioning KPIs comprise among others: total capacity installed, total investment, costs per kW installed, Watts per household connected, and electricity tariffs.
- Post-commissioning KPIs include: operating hours, kWh generated, availability factor, capacity factor, fees collected per month/capacity installed, savings/capacity installed, estimated costs per kWh generated.

These data will be shared among participating villages and DINAS during the benchmarking program, but will serve as well as foundation for government institutions to further improve rural electrification programs in Indonesia, foremost the focal point NREEC under MEMR.

In addition the KPIs will serve as a reference to ENDEV projects in other countries allowing a country by country benchmarking providing valuable input to the ENDEV management, leading to a continuous improvement of projects.

3.4. Risks for Implementation

Overarching risks in Indonesia are natural disasters, such as earthquakes and volcanic eruptions. No mitigation measures can be established. Besides these disasters additional risks have to be considered: The lessons learnt from the TSU project was, that governmental programmes could change their targets significantly during their implementation. Green PNPM reduced the previously aimed number of 250 – 300 MHPs to 137 sites without further notice. However such a reduction would not affect this up-scaling proposal since it is not bound to a specific programme but can support different programmes (list of possible programs in Appendix Q).

This proposal depends heavily on the capacity of local NGOs and small commercial service providers. To mitigate the risk of non-performance of some service providers the project will not just cooperate with one or two but with more. They will be capacitated for their work and monitored on regular basis. Finally the villages themselves should see the value of service providers and a commercial market for service providers should pick up.

4. Expected Impacts of the Project Intervention

Low electrification in rural areas is a major impediment for development in Indonesia. Lack of electricity means little business opportunities for rural households, bad pre-conditions for education for the youths, and less-than-optimal usage of community facilities such as health posts, schools and public administration.

Livelihood/ Poverty: In comparison to the amount a household spent on kerosene, the new electrification by micro hydro power, PV mini- grids and hybrid systems will save energy costs as the tariff will be comparably lower as traditional energy sources and diesel based gensets.

The promotion of PUE can increase the economic sustainability of the RE scheme. With the availability of reliable and cheap power local production will become more economic and quality of products will be improved. Existing businesses can decrease their energy costs (e.g. diesel-powered gensets) and increase their production, hence, increase income.

Communication/Education: It will increase studying and reading hours of school children that can use light in the evenings. It also contributes to providing new access to information and communication means by charging mobile phones and increased use radio and TV.

Health: The electrification of rural areas in Indonesia will improve living condition through better lighting, less smoke and less risk of houses burning down or persons getting hurt through the use of petroleum or kerosene lamps. It will also improve the quality of service from local health posts that can provide treatment at night or use refrigerators for vaccines.

Environment: The power produced by the RE stations will reduce emissions from kerosene and diesel.

Government institution: through the sustainability concept the long-term operation of MHPs/Solar minigrids can be enhanced, prompting GoI to expand rural electrification through renewable energy in a sustainable way

Indicators of Expected Impacts:

Approach	**Indicators**
Strengthening the operation sustainability through enabling the community	Maintained RE-based schemes (database, KPIs, benchmarking reports) Rising fee collection and savings (KPI, benchmarking) Improved community ownership (survey)
Safeguarding the construction quality through a comprehensive commissioning approach	Quality RE schemes according to design (commissioning protocol, database) Long lasting and reliable RE schemes (KPIs, benchmarking reports)
Promoting beneficial PUE application in respective villages	Application of income generating PUE (survey, benchmarking reports) PUE application which supports the operational of RE-based schemes (benchmarking reports, survey)
Building the capacity of the RE service providers	Improved capacity of private sector as well as civil society organisation to provide quality RE services (survey on number of service providers and customer satisfaction
Commercialisation of consulting, training and maintenance services	Demand for services increased (survey)

In addition to the above mentioned indicators it is proposed to introduce two other indicators:

- Dissemination factor: at the end of the project a survey should be done how far other projects and programs have benefitted from the measures. For example under the ongoing country measure manufacturers have been trained which led to an overall improvement of the MHPs provided under rural electrification programs.
- Sustainability factor: In a post evaluation it should be measured how the projects under the up-scaling measure compare to other programs who have not received this support.

5. Budget

Old: € 8,000,000
New: € 1,000,000, summing up to € 9,000,000

		EUR
1	Human Resources and travelling	**150,000**
2	Trainings and Benchmarking	**150,000**
4	Hardware & Equipment	**300,000**
5	local Consulting	**150,000**
5	Total direct costs	**100,000**
6	Mark up costs/administrative costs/imputed profit	**150,000**
7	Cost price	**1,000,000**

The up-scaling proposal suggests a stepped implementation period, combined with stepped budget allocation, according to indicators achieved. All payments are made in advanced.

	Time frame	**Indicators achieved**	**Budget allocated**
1	12 months	11,000 beneficiaries connected (50%)	60% of total
2	6 months	5,500 beneficiaries connected (25%)	20% of total
3	6 months	5,500 beneficiaries connected (25%)	20% of total

Kenya

1. Situation Analysis

1.1. Energy Situation

Over 30 million Kenyans are without access to the grid. The majority of Kenyan households depend on traditional biomass resources, including fuel wood and charcoal for cooking and kerosene for lighting. The Ministry of Energy highlighted in its 2009 Annual Report that 84 % of Kenyans without access to electricity are willing to invest in photovoltaic solar lanterns (PSL).

Kenya's current effective installed (grid connected) electricity capacity is 1,429 MW. Electricity supply is predominantly sourced from hydro and fossil fuel (thermal) sources. This generation energy mix comprises 52.1% from hydro, 32.5% from fossil fuels, 13.2% from geothermal, 1.8% from bagasse cogeneration and 0.4% from wind respectively. Current electricity demand is 1,191 MW and is projected to grow to about 2,500 MW by 2015 and 15,000 MW by 2030. To meet this demand Kenya's installed capacity should increase gradually to 19,200 MW by 2030.

Electricity access in Kenya is low despite the government's ambitious target to increase electricity connectivity from the current 15% to at least 65% by the year 2022. The government acknowledges the crucial role renewable energy can play in enhancing this energy access especially in rural areas and is working to increase renewable energy use particularly for rural electrification. Nevertheless, due to funds constraints, priority has been given to provide access to district headquarters, secondary schools, health facilities, and trading centers for productive use. This leaves out rural households and equally needy small towns.

Households in Kenya source their energy for lighting as follows:

- Electricity - about 15% of the national populace
- Use of electricity in urban areas as the source of lighting - 42%, although kerosene lamps still remain the main source of lighting for 55% of households.
- Kerosene for lighting in rural households - 87%

It is important to realize that there are differences in energy use between female-headed and male-headed households. About 15% of male-headed households versus 11% of the female-headed ones use electricity for lighting. Lack of clean energy for lighting has major gender related repercussions such as indoor air pollution and adverse effects on eye sight due to poor quality lighting for studying, especially for children. By extension, education standards are likely to be adversely affected as a result of lack of quality lighting.
It costs approximately Ksh 35,000 (EUR 318.18) to connect to the national grid (if in the vicinity) and about 0.1145 EUR per kWh of electricity service. These are relatively high costs that pose a major obstacle to the expansion of electricity connections to low-income households and small businesses, which can therefore benefit from more cost efficient decentralized alternative sources of energy such as solar.

Both investment and running costs for lighting with kerosene are quite costly. A simple kerosene lamp with wick and no cover goes for approx. 3.8 EUR, and one with glass cover is sold for 6.1 EUR. The average annual consumption amount is up to 60 liters per household, which cost approx. 49 EUR. These figures make small photovoltaic systems an economically

viable solution. The Government of Kenya states in its Vision 2030 the aim to make Kenya "kerosene free" and therefore promotes such systems.

Kenya is naturally blessed with a good solar regime and receives an average daily insolation of 4-6 kWh/m^2. This energy can be utilized for a variety of applications such as electricity generation, lighting, farm product drying and water pumping amongst others. It is estimated that about 200,000 PV solar systems are currently in use in Kenya generating about 9 GWh of electricity annually. These systems are mainly used for lighting in about 1.2% of the households in Kenya. There are about 4 million households in rural Kenya alone which present a vast potential for this virtually untapped technology. The off grid market is estimated to be over 40 MW. Some interventions are being made by the government to offer solar for social institutions such as schools and hospitals as well as developing hybrid power plants to substitute part of the generation provided through fossil fuels particularly in arid and semi-arid areas.

The challenges to widespread adoption of solar in Kenya include high initial capital costs, low awareness of the potential opportunities and economic benefits offered by solar technologies, lack of adherence to system standards by suppliers and installation technicians, few policy incentives to invest in the sector and lack of formal training courses on solar energy. Nonetheless, attempts are being made to address these challenges by various stakeholders. It is especially important to provide innovative payment models for low income groups. Such models could include leasing, consumer financing and an improved distribution network through local retailing to reduce the costs of availing solar products to end users. As a result of this, these products in many cases do not reach beyond the main urban areas and hence only partially reach the huge customer base in the rural and peri-urban areas.

1.2. Policy Framework, Laws and Regulations

The relevant policy and legal framework for solar energy in Kenya includes:

- Sessional Paper No. 4 on Energy of Kenya
- Energy Act 2006
- Kenya rural electrification master plan
- Kenya Vision 2030
- The Kenya National Climate Change Response Strategy

The current Least Cost Power Development Plans and Feed in Tariff of Kenya do not cite solar as their priority areas for current intervention. However, since these documents are open to review, interventions can still be made by engaging policy makers. The Energy Regulatory Commission currently has prepared draft documents that will regulate the Solar PV and Solar Water heating issues in Kenya. These are still open for public input.

Kenya's Vision 2030 is the current economic development strategy which has the aim to drive the country into a globally competitive and prosperous economy with high quality of life. Energy has been recognized as a key driver to achieving the strategy since it calls for escalating access to electricity. Guided by Vision 2030 two government energy programmes have been set up to enhance access to electricity, namely the:

- The Energy Access Scale-Up Programme

- The Rural Electrification Programme

Kenya does not provide incentives or subsidies for household solar PV systems. Although some strides have been made to improve energy efficiency and renewable energy in Kenya by the government, some planned reforms in the Energy Act are yet to be effected.

These include:

- Establishment of a Centre of Excellence for Energy Efficiency and Conservation
- Establishment of energy and equipment testing laboratories
- Development of standards and codes of practice on cost-effective energy use

Stockholm Environment Institute (SEI) conducted a study on the economic impacts of climate change in Kenya in 2009 and found that the country's greenhouse gas emissions are rising quickly. The energy sector emissions are estimated to have increased by as much as 50% over the last decade. As such Kenya's Climate Change Response Strategy is keen to reduce these impacts through various avenues including promoting use of environmentally friendly energy.

1.3. Institutional Set-up in the Energy Sector

There are a number of public and private institutions that are relevant for the solar energy sub-sector in Kenya.

Institutions dealing with electrification in general:

- Ministry of Energy (MoE) is the primary government organization responsible to develop and articulate energy policy and govern the energy sector in Kenya. It is mandated to provide an enabling environment for the energy sector.
- Rural Electrification Authority (REA) was founded in 2006 and is mandated to implement the Rural Electrification Programme in Kenya, as well as update the rural electrification master plan and promote renewable energy in Kenya. It reports to the Ministry of Energy.
- Energy Regulatory Commission (ERC) was also established in 2006 and is the government agency responsible for technical and economic regulation of the energy sector. Currently they have two solar documents open for public debate and input to regulate solar photovoltaic and solar water heating.
- Kenya Energy Generation Company (KENGEN) is a parastatal company and generates the bulk of Kenya's electrical power, mainly through geo-thermal and hydro power plants.
- Kenya Power & Lighting Company Limited (KPLC) is the institution responsible for electricity distribution and supply in Kenya. It buys all the power generated in Kenya through negotiated purchase power agreements and then distributes it onwards to consumers. KPLC only deals with grid connected power supply.

Institutions dealing with rural electrification and solar in particular:

- Kenya Renewable Energy Association (KEREA) is a membership association founded to lobby and advocate for issues relevant to the renewable energy sector in Kenya.

- Kenya Solar Technician Association, KETSA is another membership association that was founded in 2006 to galvanise the activities of freelance solar technicians and advocate for effective solar business especially at grass root level (rural areas).
- The Task Force on Accelerated Green Energy Development at the Prime Minister's (PM) office is a committee that was founded to fast track development of green energy for achievement of national development goals, particularly realization of Kenya Vision 2030. This is mainly through assisting with mobilization of technical and financial resources for the implementation of green energy programs and projects, including public private partnerships and favorable carbon finance projects.

In addition, the Kenya Bureau of Standards KEBS is responsible for setting the standards of all products manufactured and sold in Kenya.
MoE, ERC, KEREA, KETSA, KEBS, and the task force at the PM's office will be the main partners in implementation for EnDev.

1.4. Major Donor Activities

The initiatives by development partners on renewable energy in Kenya are the ones described in the following.

AFD

- Conversion of diesel generators into hybrid generators (wind, solar, biomass) and construction of new generators and associated mini-grids in rural areas
- Scaling up of a pilot revolving fund to enhance connectivity in Kenya, complemented by a CFL distribution component
- Support to the Geothermal development company and funding of a national master plan
- Credit line to commercial banks to promote renewable energy and energy efficiency projects in the agri-business and hostelry sectors

European Commission

- Installation of energy systems in 20 target institutions, installation of two wells using solar technology to pump water, installation of one community well using wind energy to pump out water and planting of 20,000 trees
- Increase access to modern, affordable and sustainable energy services for 268,000 households, 48 institutions and 48 rural community based groups in rural and peri-urban areas in Kenya
- Improving the access of poor people to sustainable and affordable energy services in a perspective of combating climate change.

European Commission and DGIS

Provision of the support necessary to enable the development of a sustainable and widespread industry of micro and small energy enterprises in Kenya, Uganda and Tanzania

EU Energy Facility and HIVOS

A four year initiative was established in 2011 to provide energy entrepreneurs with access to affordable funding as well as 9,000 households to modern energy access. Project in Kenya Uganda and Tanzania

Government of Finland

Village lighting, and electrification for productive purposes

Government of Spain

Provide electricity to schools, health facilities in Arid and Semi-Arid Lands

IDA/WB

Generation, transmission, distribution, off-grid, renewable energy (small hydro, solar, wind, or biogas)

IDA/ IFC/ GEF

Support to innovative renewable energy lighting products (Lighting Africa)

JICA

Empowerment of Rural Communities through Renewable Energy Technologies in Kenya: 1. Project for Capacity Development for Promoting Rural Electrification Using Renewable Energies in Kenya; 2. Project for Establishment of Rural Electrification Model Using Renewable Energy

UNEP/GEF

Reduction in CO_2 emissions resulting from increased energy efficiency within Kenya's small and medium enterprises

UNDP

- Promotion, development and distribution of sustainable energy services to serve basic household needs, income generating opportunities and service economy. This will address areas of capacity building, solar thermal, bio-fuels, pico and micro hydros, wind energy, feed in tariffs for wind, solar and biomass, biogas development, biomass gasification and East African Energy scaling up strategy.
- Support to remove barriers to market transformation to energy efficient products and services in Kenya with a replication effect to the four other East African Countries (EAC)

2. Planned Outcome

Energy Service Segment	Old target	New Target
Energy for Lighting & Electric HH Appliances	0	40,000 people
Cooking Energy for Households	1,020,000 people	1,730,000 people
Electricity and/or Cooking Energy for social infrastructure	350 institutions	600 institutions
Energy for productive use/ income generation	140 enterprises	600 enterprises

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev Kenya will continue to promote the proven clean household cooking technologies as well as energy efficient cook stoves for institutions and small businesses.

In addition, the programme will start with the implementation of photovoltaic systems for households and SMEs. The aim is to increase access to and use of modern lighting for households at the Base of the Pyramid (BoP) by establishing and strengthening sustainable and commercially viable supply and distribution models for small quality products (PicoPV: 1 – 10 W) and services at the local level. This includes end user awareness creation, capacity development for rural entrepreneurs, the set-up of a decentralized after sales service system and the establishment of payment models that match BoP customers' irregular cash flows.

The established distribution model will be:

- profitable: at each level, the margins and incentives will be clear and sufficient;
- commercially viable: self-sustaining without requiring continuous subsidy;
- environmentally safe: with increasing volumes of lamps being rolled out, recycling of especially batteries will be developed and addressed in partnership with the PicoPV central distributors, and;
- scalable: the model can be expanded to new areas and the product range can grow as new products and product innovations and improvements become available.

The joint IFC and World Bank programme Lighting Africa has already developed quality standards. EnDev Kenya Country Programme will use these quality criteria and will work with approved products to counter market flooding with low quality products, while avoiding duplication in testing and certification. The solar products will be tailored to the needs of the poor (affordable quality lighting and phone charging), products they really want and for which there is a sizeable national market.

The key areas for interventions are:

- ambient lighting in households;
- studying and reading;
- communication;
- conducting housework;
- perceived security
- business.

The key product design requirements as defined by Lighting Africa, are: affordability; recharging method; adequate light intensity; multipurpose; portability; product placement (standing as well as hanging); long battery life; ease of use; safety (fire) and security (theft).

3.2. Approach to Provide Electricity to Households

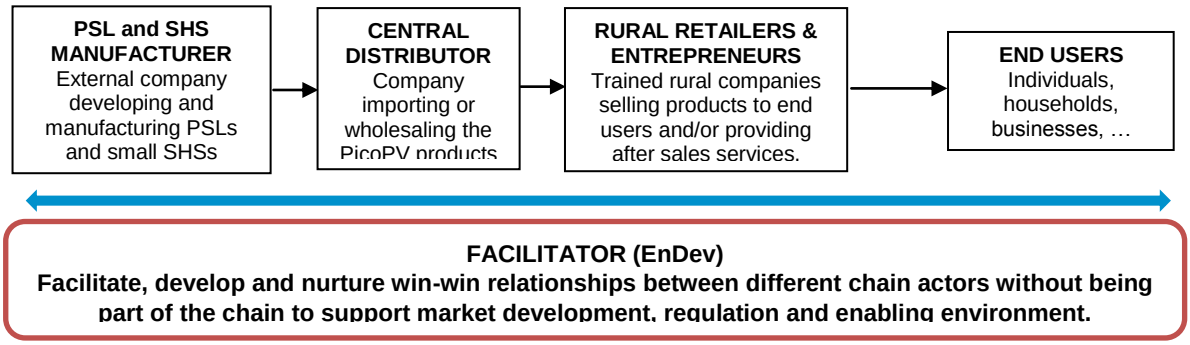
3.2.1 Photovoltaic Systems

Due to raising prices and unsecure availability for kerosene in the recent years, photovoltaic systems have established themselves quite successfully in the Kenyan market. Currently there is a variety of choices for potential users, but many of them are not viable due to low quality.

Until now EnDev Kenya was not involved in photovoltaic activities. As a first step, a stakeholder analysis and a stock taking of available solar system in the country will be undertaken in conjunction with the GIZ Total PPP measure and Lighting Africa. For the time being, EnDev will focus on PicoPV systems of 1 – 10 W being the most appropriate technical and economical solution for the poorer segment of Kenya's rural population. These systems include both solar lanterns (PSL) and solar home systems (SHS).

To reach the rural areas it is most probably necessary to follow a multi-level approach. A number of decentralised distributors (level 2) in rural centres are identified, who purchase the photovoltaic systems from the manufacturers (level 1). Local entrepreneurs (level 3) will buy the systems from these wholesalers and sell them to the end users in the villages (level 4).

Fig 3: A typical PicoPV distribution chain



Once the manufacturers and distributors of such systems are determined EnDev will select the most promising ones and start the dissemination activities. These include production/adaptation of sensitization materials, identification of potential additional distributors and training of the same. EnDev will use the wide network of stove builders, installers and marketers as well as existing partner organizations in the existing and new stove clusters and identify suitable entrepreneurs and community based organizations (COBs) as well as non-government organizations (NGOs). EnDev will work closely with the Improved Stoves Association of Kenya (ISAK – see below) for this exercise. As technology requirements are completely different between stoves and photovoltaic system, only a limited number of stove technician are also capable to sell and maintain solar technology.

In promotion of photovoltaic systems EnDev will pursue the same proven and successful commercial approach like in the energy-efficient stoves sector. There will be no subsidies; sale, installation and maintenance of the systems will be left to private sector actors. EnDev's role will be strictly limited to awareness creation, capacity building and creation of linkages between manufacturers, marketers and installers on one hand and consumers on the other hand. It might be necessary to strengthen in particular distributors in rural centres, who act as whole sale outlet for manufacturers and know how hub for local marketers.

A close cooperation with SNV is envisaged following the same approach. SNV will make use of various channels that have been tried in pilots carried out in 2010-2011.

These channels include:

- Use of SNV Kenya's value chain work as entry points for renewable energy products. Relationships have been established with the Kenya Domestic Biogas Programme and dairy and horticultural production groups in the north rift region, reaching out through established agro-vet shops, dairy hubs, collection centres, biogas mason teams and outgrower schemes. Another chain to be included is the Lake Naivasha Basin Water Resource Users Associations with a catchment of over 1 million people;
- GreenBelt Movement community groups distribution channel. The GreenBelt Movement works through 6000 established community groups and has used tree planting in nine districts to create a society of people who consciously work for continuous improvement of their environment and a greener, cleaner Kenya.

Across these channels, the following business strategies will be used:

- Savings and Credit Societies and other layaway payment methods
- Business to Business sales model
- The hub and spoke distribution model.

A recently launched Public Private Partnership (PPP) between GIZ and Total France promotes solar lanterns and solar home systems following the same dissemination approach mentioned above. The approx. 170 Total filling stations would serve as central distributor. The PPP measure will identify around 50 entrepreneurs to sell these appliances to the end users in the rural areas, develop/adapt training materials for them for capacity building in technical (including maintenance) and business skills. The PPP measure will also arrange for sensitisation packages and organise recycling of broken solar systems. EnDev has already agreed on close cooperation, in particular in the areas of identification of potential entrepreneurs, capacity building and awareness creation, especially in the stove clusters where EnDev has already a significant outreach in the rural areas. EnDev and the PPP measure have agreed to leave the photovoltaic market around the filling stations to Total.
EnDev will also build on existing partnerships with implementing organizations like national and international NGO's, government departments and donors using their activities on the ground as entry points for the promotion of photovoltaic systems.

Capacity building for distributors and marketers will be one of EnDev's focal areas. Curricula for tailor made training courses, especially for levels 2 and 3, will be further developed, also covering improvement of managerial and business skills. The decentralized distributers (level 2) should be capacitated to serve as reference centre for all type of technical matters including trouble shooting. The local entrepreneurs need basic technical know-how for larger photovoltaic system curricula development that will be done in conjunction with the PPP supported solar academy. Collaboration in this respect will be established with an on-going project for capacity development for promoting rural electrification using renewable energy, funded by JICA and implemented by the Jomo Kenyatta University of Agriculture and Technology.

After identification of technical and economical viable photovoltaic systems and a robust number of potential distributors and marketers within the existing and new clusters, EnDev will start dissemination activities. Co-marketing activities for photovoltaic systems and energy-efficient cook stoves could be designed in new EnDev cluster areas.

The Sustainable Energy Market Acceleration (SEMA) project, funded by the EU and HIVOS, works on expanding sustainable energy markets by developing partnerships between rural

energy enterprises and rural financial service providers, such as commercial banks with rural presence, microfinance organizations (MFIs), as well as Savings and Credit Cooperatives (SACCOs), Community Savings Schemes and Village Banks. SEMA's objectives are to enable 6 MFIs and 20 SACCOs in developing partnerships with rural energy enterprises and rolled out financing programmes for sustainable energy products. EnDev will cooperate with SEMA in creating linkages to rural energy enterprises with financing institutions for up-scaling of their economic activities. Other financing options will also be explored.

The Development oriented Emergency and Transitional Aid (DETA) GIZ project "Stabilizing host community livelihoods and enhancing peaceful conflict management in the area around the Dadaab refugee camp" started late 2011 and has planned activities to improve the livelihood situation of households in Dadaab and Fafi districts. Distribution of appropriate photovoltaic systems could be part of the project, either in connection with food for assets or as part of the livelihood interventions. EnDev will advise the DETA project on the appropriate photovoltaic systems and support in capacity building measures for local technicians in maintenance skills to assure sustainability.

Under the GIZ programme Promotion of Private Sector Development in Agriculture more than 750 biogas plants have been constructed. Ten of them are larger plants with a potential to increase the current gas production beyond the user's requirements. EnDev will explore pilot opportunities of power co-generation using biogas and photovoltaic systems to establish a mini grid in households around the biogas plant. There are more than 1,000 isolated farms nation-wide with no grid connection, which currently run diesel generators for their power generation. Dairy farms especially produce sufficient organic waste for biogas production exceeding the farms' need. A pilot plant would demonstrate the feasibility of such a system.

3.3. Approach to Provide Clean Cooking Technologies to Households

The on-going activities for promotion of fuel saving cook stoves will be scaled up in two ways: Expansion in new areas within the existing clusters and opening of a fourth cluster in areas like Nakuru or Ukambani. In both cases assessments of potential for up-scaling will be undertaken before final decisions of where to go are made.

The current proven approach will be further applied, i.e. the EnDev will focus on awareness creation, identification and capacity building of stove producers, installers and marketers, creation of linkages between as many relevant stakeholders and assurance of quality. Monitoring of all activities will be integral part of the project.

Existing collaboration with Kenya Tea Development Agency (KTDA) will be expanded. As KTDA shifted from use of coal in their furnaces to firewood, there is a great interest in the agency to preserve as much firewood as possible around the factories. KTDA foundation, the arm of the agency that coordinates activities with factories and the communities, has environment as one of its components. The factories are the entry points for stove promotion.

Aphia plus is a USAID funded health project working in four zones in Kenya. EnDev collaborates already in zone 1 (Western Kenya) with Aphia plus, mainly in the areas of awareness creation and capacity building of stove producers, marketers and users. Entry points for these activities are Aphia plus implementation partners like NGOs and CBOs. It is planned to expand the collaboration to the three other zones (Central Kenya and Nairobi, Coast and Rift Valley) applying the same approach.

In addition EnDev will increase the number of collaboration partners in the field, especially outside the cluster areas. The on-going SNV agricultural projects in parts of Rift Valley will be used as one entry point. The current EnDev approach will be applied in the areas covered by SNV.

Financing aspects for the promotion of energy-efficient cook stoves (credits to producers, installers, marketers or users) will be done in collaboration with the SEMA project (see above) as well as with the already established banks and cooperatives.

The USAID funded Centre for Disease Control (CDC) does research work on the most common diseases among the poor population and has a network on collaborating partners on the ground. One of the main reasons for respiratory diseases among women and children is exposure to smoke in the kitchen. CDC therefore encourages the partners to promote fuel saving cook stoves. EnDev will use them as entry points applying the proven approach.

Under its corporate responsibility activities the Tchibo coffee company runs a capacity building project for the Baragwi Farmers' Cooperative Society in Embu. Among other interventions, promotion of fuel saving cook stoves is part of it. Areas of collaboration will include capacity building, sensitization and organisational development.

Firewood has become a very scarce commodity in the areas due to the high demand in the refugee camps. Therefore promotion of energy efficient cook stoves will be part of the DETA project (see above), either in connection with food for assets or part of environmental interventions. EnDev will advise the project on the appropriate type(s) of stoves, build capacity for stove producers, marketers, installers and consumers, and assist with adaptation of materials and campaigns for awareness creation and quality control.

The Improved Stoves Association of Kenya (ISAK) will remain an important partner in all activities. ISAK was formed in 2007 and launched in 2011 with EnDev's support; partly as an exit strategy for the project and also to lobby and articulate improved cook stoves (ICS) at various platforms, while networking members with investors, stakeholders and users for mutual benefits. ISAK is currently only organized at national level, but has still very weak structures in the counties. EnDev will support ISAK to further implement its strategic plan, support country wide branch elections, support ISAK's presence at public fora and link the association to relevant government and other statutory bodies in developing its administrative and organizational structures.

3.4. Approach to Provide Access to Modern Energy Services for Social Institutions

3.4.1 Photovoltaic Systems

EnDev Kenya will focus on households, however if monitoring shows that social institutions in other regions are also reached, these figures will be reported. In this context one can think of schools for dormitory and class room lighting. The proposed PicoPV systems in this project are suitable products for this market.

The DETA project (see above) has started rehabilitation of social institutions like schools and health centre, which will be equipped with photovoltaic systems. EnDev will support the project with capacity building for the respective heads and care takers in management and maintenance matters.

3.4.2 Energy-efficient Cook Stoves for Social Institutions

During the ongoing phase the dissemination of energy efficient cook stoves for social institutions promoted by EnDev has not been as successful as the dissemination of household stoves.

The main reasons for the slow speed are assessed as follows:

- Budgetary problems in public institutions, i.e. if an investment in stoves is not captured during budget preparation, the institution needs to wait for another year. Due to change of responsibilities this is often forgotten while preparing the new budget. In case of budget reductions, new investments are often seen as non-priority areas.
- The decision making process for public institutions is very long and tedious making it not very attractive for private builders to pursue this market.
- Many private institutions have already installed improved cook stoves; hence this market is widely saturated.
- Builders do not have adequate skills to market the stoves in schools.

Under this proposal EnDev will address these issues more intensively. EnDev is part of an inter-ministerial working group on standards and legislation. It is foreseen that the legislation makes installation of standardized energy-efficient cook stoves mandatory for all institutions, which would give a tremendous market boost to the sector. In addition, EnDev will use school board meetings to sensitize the decision makers at local level. EnDev will also contact the prison department and the Ministry of Medical Services (through GIZ health programme) and to better open up the prisons and hospital markets for energy-efficient cook stoves. EnDev will train stove producers and marketers in marketing their products better in social institutions.

3.5. Approach to Provide Access to Modern Energy Services to SMEs

In the on-going phase the results for this segment are also low due to various reasons:

- Most hotel and eating house operators do not own the premises they work from making it difficult to install permanent Institutional Stoves.
- The economic downturn has increased cost of quality materials for Improved Rocket Stoves, thus making it too costly for most operators to install.
- Most artisans still find it difficult to access credit from lending institutions to undertake “big” jobs. On the other hand, the Public Health Department is taking smoke emission in public places as a serious threat to health. This opens an opportunity to collaborate with the department to educate hotel operators to adopt Improved Cook Stoves. Therefore EnDev will (through GIZ health programme) contact and inform the department accordingly. EnDev will train stove producers and marketers in marketing their products better in social institutions.

The opportunity to use the suggested photovoltaic systems at social institutions under the DETA project for productive use like battery charging stations and refrigeration for human and veterinary drugs and vaccines will be explored. If proven viable, EnDev will train the private entrepreneurs how to run and maintain the systems and build capacity in managerial and business skills.

4. Expected Impacts of the Project Intervention

Impact	Possible Indicators
Environment	With additional 600,000 stoves in use, the annual firewood reduction will amount up 636,000 tons, which is equivalent to approx. 35,000 ha of prime forest. It also reduces annual CO2 emissions by 432,000 tons. In 43,000 households with photovoltaic lighting systems kerosene consumption is reduced by 2,580 tons per year, which leads to reduction of CO2 emissions approx. 116,000 tons
Health	In at least 1,800,000 households indoor air pollution is reduced by at least 30%, thus reducing respiratory diseases the risk, especially for children, of burns is reduced by at least 50%
Poverty/Livelihood	The costs for purchase of firewood is reduced by at least 50% The time for firewood collection is reduced by at least 50% The time for cooking is reduced by at least 30% The annual income from stove production and sales amounts up to 200 million Kenyan Shillings (approx..2 million Euros) Up to 13,000 households have improved their living conditions through the provision of clean lighting energy
Education	Up to 129,000 children have improved their learning facilities by availability of light
Governance	None

5. Budget

		EUR
1	Human Resources and travelling	**1,400,000**
2	Equipment and Supplies	**1,223,000**
3	Funding Financing Agreements/Local subsidies	**1,875,000**
4	Other direct costs	**1,322,000**
5	Total direct costs	**5,820,500**
6	Mark up costs/administrative overheads/imputed profit	**979,500**
7	Cost price	**6,800,000**

This upscaling budget caters for the following intervention areas:

stoves 1,750,000 EUR
solar 1,750,000 EUR

Old: € 3,300,000
New: € 5,800,000 up to 6,800,000

- 3,300,000 old budget
- + fixed up-scaling of € 2,500,000 (€ 1.500.000 Norway + € 1.000.000 BMZ+DGIS)
- + variable up-scaling of €1,000,000

The variable up-scaling up to € 1,000,000 depends on achievement of the following milestones.

Milestones:

Category	Aggregated number of persons receiving access				
	II.2012	I.2013	II.2013	I.2014	II.2014
1. Household Electrification	2,000	5,450	11,450	21,900	40,000
2. Clean Cook Stoves for HH	3,050,000	3,185,000	3,345,000	3,520,000	3,730,000

The following rules are applied:

- The project budget is increased by € 125,000 per every achieved milestone (+/- 10%) for the period II.2012 to I.2014.
- It is possible to compensate missing of one milestone by certain percentages with overachievement of a milestone in another category by the same extent.
- Delays can be compensated by accelerated activities in the following periods.
- Any change of the milestones needs approval by the Governing Board.

Nepal

1. Situation Analysis

1.1. Energy Situation

More than 80% of Nepal's population lives in rural areas. Despite this high number only about 35% of the rural population has been electrified by either grid-based or decentralised energy supply. Nepal is ideal for the development of hydropower due to its vast water resources and steep topography. Nevertheless, about 87% of the energy supply in Nepal is provided by biomass including fuelwood (78%), agricultural residues (3.5%) and animal dung (5.5%). Fossil fuels account for 10% which consist of mainly Diesel as well as LPG and coal. Electricity accounts for about 3%. The only significant source in Nepal which is used for electricity generation is large-scale hydropower. The present technically and economically feasible potential (given the state of infrastructure and price of fossil fuel) in the country is estimated to be around 43,000 MW. Until today less than 1.7 % of the feasible hydropower capacity has been developed. Only a small part of the population has access to grid electricity in Nepal which is mainly limited to urban areas. In addition, rural electrification in Nepal is very expensive due to the topographical conditions and at the same time the purchasing power of consumers is very low. Nepal's economic and social development is hampered by its inadequate energy supply. In addition, deforestation remains a serious problem in particular in hill and mountain areas. Only 25% of the country remains forested in comparison to 37% in 1990.

Electricity Sector

The Nepal Electricity Authority (NEA) as the major state utility has a monopoly on producing, selling and distributing electricity. However, it faces an immense increase in electricity demand (approximately 9% p.a.), whereas at the same time production and transmission capacities are limited. Though ambitious development targets are announced by politics, the development of plants and transmission lines cannot keep up with economic development and its induced demand increases. Between 2001 and 2011 peak demand has more than doubled from 391 to 946 MW. Likewise, national annual energy demand has levelled at 4883 GWh with an annual electricity production of 3858 GWh out of which 694 GWh (18.42%) have been imported from India. The resulting gap has to be bridged by frequent load-shedding in particular in urban areas. This has resulted in up to 16 h of load shedding during the dry season (December-March) in major cities in the country. Currently, 652 out of 706 MW installed capacity is hydropower. Around 478 MW (68%) of hydropower capacity is NEA-owned, while 175 MW (25%) is privately owned and operated by so-called Independent Power Producers. Due to rising fuel prices two diesel power plants with a total installed capacity of 53.4 MW were almost abandoned within the last years.

There is not a single institutions having full responsibility for rural electrification. AEPC (Alternative Energy Promotion Centre) is promoting rural electrification by stand-alone renewable generation systems (Micro Hydro, Solar Power,etc.) and NEA is responsible for rural electrification through grid extension of the national distribution system. AEPC has the mandate to implement micro hydropower projects up to 500 kW financially and up to 1 MW with technical and advisory services. In rural areas there is a lot of potential to replace traditional fuel consumption and provide new households with electricity. There are more than 1,800 micro hydropower potential sites with a total installed capacity of around 27 MW.

In 2008/09 consumption of electricity was almost balanced between industrial sector (37.37%) and households (41.4%), while the commercial sector (firms that are not engaged in manufacturing, transport or agriculture) consumed only 7.2%. However, the industrialized and urban areas account for the majority of electricity demand. Disparity in access is stark with the rural population being mainly dependent on fossil and biomass-based fuels.

1.2. Policy Framework, Laws and Regulations

General Nepalese Energy Policy

The energy sector is considered as a key sector with regard to future economic growth and the realization of Nepal's development goals, as formulated in the Poverty Reduction Strategy Paper of the Nepalese Government: "Key objectives in the power sector include: expanding electricity coverage in a sustainable and environmental friendly manner by generating low-cost power; accelerating rural electrification to promote economic growth and improve living standards in the rural areas and to develop hydropower as an important export item".

Energy Policy - 3-Year Interim Plan

Up to now, the energy policy objectives have been set up as a part of the general 5-Year Plans by the National Planning Commission. Targets for the sustainable use of energy or the efficient use of commercial energy sources have been little discussed. After the national five-year plan ended in 2007, the government opted for three-year interim development plans instead of an eleventh five-year-plan. The energy policy of the latest 3-Year Interim Plan (2010/11 – 2012/13) has the following objectives:

- Increase public, private, community/cooperative investment in electricity generation and transmission for domestic use.
- Extend electricity transmission line with high priority.
- Increase electricity generation capacity to minimize load shedding.
- Make hydropower projects sustainable and cost effective by making them environment friendly and climate change adaptation.
- Develop electricity access as an inseparable part of poverty alleviation.
- Prepare investment friendly environment for construction and development of hydropower projects.

With regard to renewable energies, the strategy is as follows:

- Emphasize the development and expansion of renewable energy under decentralized energy system.
- Give priority on integrated programs for improving the socioeconomic standard of rural people and environmental sustainability through alternative energy.
- Promote partnership and coordination with related stakeholders like local bodies, private sector etc. for the development and expansion of alternative energy.
- Develop the rural energy in consideration with sustainability and appropriateness.
- Give emphasis on research and technology transfer of alternative energy.

The tariffs and prices for electricity and petroleum products, however, are politically determined. They are geared to the lower limit of acquisition costs or not cost-covering at all. Tariff increase has been denied to the National Electricity Authority (NEA) since 2001.

Therefore, NEA's budget is in deficit and has to be balanced by the state. Discussions over the last months hint at a future increase in electricity prices which could give NEA a better standing and could also help to develop new potential sites for hydropower plants.

The EnDev project is in line with the sector strategy as envisaged by the Nepalese government. Moreover, it enables the Nepalese government to implement its ambitious rural electrification targets. EnDev supports the Government of Nepal in the implementation of programs regarding grid-connection as well as off-grid solutions as to be elaborated below.

1.3. Institutional Set-up in the Energy Sector

The energy sector in Nepal is strongly fragmented on the governmental side. Responsibilities are shared between different ministries and the grid-connected sector is fairly separated from the off-grid sector which makes a common and organised planning between the two sectors difficult.

Public Institutions

Several ministries have mandates affecting energy policy issues and the use of energy. Most importantly the Ministry of Energy (MoE) has been created in 2009 after splitting the Ministry of Water Resources and separating the irrigation specific functions from hydropower development. It is mainly working on the grid-connected energy sector. On the other side, there is the Ministry of Environment (MoEnv) which is responsible for decentralized solutions (i.e. Micro Hydropower, Solar Home Systems, Biogas, Improves Stoves) in the sector. The Ministry of Forest and Soil Conservation (MoFSC) plays a role in the biomass sector and the Ministry of Housing (MoH) in the building sector. The Ministry of Commerce and Supplies is responsible for questions regarding the use of fossil fuels.

Nepal Electricity Authority (NEA)

The state-owned utility NEA was founded in 1985 and is affiliated with the Ministry of Energy. Its exclusive field of operation is the generation, transmission and distribution of electricity and the development and operation of the electricity grid. Furthermore, the NEA is co-responsible in the preparation of energy planning and in education and training of professionals in the field of power generation, transmission and distribution. NEA is also responsible for the grid-based rural electrification activities. The NEA cannot decide on electricity tariffs, but depends on the decisions of the "Electricity Tariff Fixation Commission" (EFTC). The revenues from electricity tariffs are not cost covering. The last tariff adjustment was approved in 2001. According to its own data, the long-term liabilities of the NEA amounted to 62 billion NRs (about 590 million EUR) at the end of the financial year 2007/2008. Due to the daily power cuts, the NEA is publically criticized. It tries to bridge the gap between electricity demand and supply by importing electricity from India. Therefore, a contract for the provision of 150 MW was stipulated. However, due to technical problems during transmission this capacity currently cannot be retrieved.

Alternative Energy Promotion Centre (AEPC)

The Alternative Energy Promotion Centre (AEPC) was founded in 1996 to promote the development and deployment of renewable energies and alternative energy technologies in Nepal. It is a semi-autonomous institution formally attached to the Ministry of Environment. AEPC acts as an intermediary institution between the operational level NGOs / private

promoters of renewable energy and the policy decision levels in relevant ministries. Its activities include renewable energy policy formulation, planning and facilitating the implementation of the policies/plans. It is also the main actor for the delivery of subsidies and financial assistance for off-grid Rural Electrification and monitoring, evaluation and quality control during the process of electrification projects. The technologies AEPC is working with comprise Biofuel, Improved Cooking Stoves, Mini-/Micro-Hydropower, Improved Water Mill, Solar Energy (Solar Home Systems), Wind Energy and Geothermal Energy.

1.4. Major Donor Activities

1.4.1 Activities of Germany, The Netherlands and Norway

There is currently no direct involvement of DGIS in Nepal. In the past, however, there was DGIS participation in Nepal via supra-regional SAARC programmes which focused on environmental protection (including biodiversity and renewable energy) and good governance (mainly supporting decentralization and local governance). There is also a strong and long-term involvement of SNV in Nepal. One of SNV's major programs (*Next Generation Biogas)* was developing Nepal's domestic biogas schemes into a viable and vital part of the economy. Up to now, 200,000 families in Nepal have gained access to domestic biogas plants. In order to accommodate the demand for *Improved Water Mills*, SNV supports the Centre for Rural Technology to upscale its programme to 40 districts (from current 16) which has been integrated into *ESAP II* since 2011. With the program *Inclusive Biofuels* SNV is exploring possibilities to promote Jatropha sourced biofuel. It will demonstrate the full value chain of Jatropha, from planting, cultivation to processing a final user-product that will include biodiesel.

The focal areas of BMZ in Nepal are Renewable Energies and Energy Efficiency, Local Governance and Health and Family Planning. Apart from those and due to the tense situation after the conflict that ended in 2006 and still dominates current politics, there are three GIZ programs working on support of the national peace process. In addition, there is a programme on business promotion and economic development.

Nepal Energy Efficiency Program (NEEP): The programme assists the Nepalese Government in preparing a national energy strategy with a particular focus on energy efficiency and the sustainable use of biomass. Furthermore, it supports the national institutions to introduce energy consumption labels and develop energy efficiency standards for domestic appliances. In collaboration with non-governmental organisations and the private sector the range of uses for energy-efficient stoves is to be increased and their dissemination considerably accelerated. The programme also assists the private sector in establishing an energy efficiency centre.

In the past, *KfW* has provided financial support for the Middle Marsyangdi Hydropower Project (76 MW) which became operational in 2009. Beside the mentioned support for the ESAP II-based Solar Home System Programme *KfW* has supported the Domectic Biogas Programme in Phase III which was implemented in close cooperation with SNV.

The *Norwegian government* has been active as a donor in the Nepalese Energy Sector for many years. Its main focal areas in the energy sector are to use bilateral assistance strategically to leverage Hydro Power Investments, to support Rural and Renewable Energy Supply as well as Technical Energy Research. Its largest involvement in Nepal supports the

off-grid energy supply through the ongoing ESAP programme and its planned successor RREP. In the grid-based sector Norwegian government has also recently decided to support NEA in funding of transmission network in cooperation with *ADB*. Furthermore, it has supported research institutions for establishing laboratories on hydropower research in Nepal.

In the private sector, the 83% Norwegian owned Himal Power Limited (HPL) has successfully operated the 60 MW Khimti Hydro power plant for more than ten years. The shareholders of HPL are planning to develop the 67 MW Kirne Hydro Power project. One of the shareholders, the 100% Norwegian government owned SN Power, is also planning to develop other hydro power projects, such as the 660 MW Tamakoshi III Hydropower project. In addition, Butwal Power Company has received long-term Norwegian support and are active for increasing generation capacities by implementing varies hydropower projects.

1.4.2 Activities of Other Donors

Many donor agencies are active in the area of off-grid rural electrification whereby AEPC is the main actor. It receives basic funding from the Nepalese government but is financed to a large extend by international cooperation projects.

Firstly, there is the *Energy Sector Assistance Program (ESAP)* which is currently in its 2nd phase, mainly financed by *DANIDA* and *NORAD*. This program aims at improving the rural energy supply (solar home systems, small hydropower plants, biogas plants and efficient stoves). ESAP manages the Rural Energy Fund, which facilitates the partial financing of investments in rural electrification measures. The German *KfW Entwicklungsbank* participates in the promotion of SHS with a financial contribution to ESAP. Similarly also *DFID* has started to provide a financial contribution to ESAP for SHS. ESAP II comes to a close by mid-2012, the planning process has started to design the new programme RREP (Rural and Renewable Energy Programme) which shall act as a single-programme approach for donors in the off-grid sector.

Another important program which works currently close with AEPC is the Rural Energy for Rural Livelihood Programme (RERL) by *UNDP* and *World Bank* which is supporting the government in implementing the Rural Energy Policy in all districts. In addition, it works on clean energy access through community mobilisation models which involves mini and micro hydro, biogas, improved cook stoves and solar home systems.

The Renewable Energy Project (REP), a joint effort by the *European Union* and the government of Nepal focuses on the provision of solar energy systems in rural areas for social institutions (hospitals, schools, etc.). Furthermore, there are additional smaller projects focusing on improved watermills, biogas and climate change adaption strategies. REP is, however, currently at its closing stage.

The Asian Development Bank has also several large-scale projects in the energy sector for developing the countries' hydropower resources, providing financial assistance for large-scale hydropower development, upgrading the transmission grid (in particular in the west of the country) and improve the distribution system by constructing new substations and switching stations.

Beside its support for the RERL Programme the *World Bank* has financed the construction and rehabilitation or the NEA transmission and distribution system and provided loans for the improvement of transmission capacities between India and Nepal.

1.4.3 Coordination of Activities

As many international cooperation projects come to an end during the year 2012 there is a planning process ongoing to create a single-programme approach in the field of decentralised energy supply under which all donor agencies should align to improve coordination and efficiency for rural electrification in Nepal. The general intention is that all financial contributions, financial contributions for technical assistance or in-kind technical assistance from international donor agencies will be aligned with the new RREP. Intensive planning and preparation is still going on at this moment and the main mission for planning the final programme documents will be in Nepal by late April. It is planned that the new programme can start by mid-July. Any programme that would like to be involved in the decentralised energy sector will have to align with RREP and use its approved implementation modalities. As a successor of the currently used Rural Energy Fund, a common Central Renewable Energy Fund (CREF) is planned to be founded for disbursing subsidies as well as having credit components to complement a stronger market-based approach in Rural Electrification and bring the private sector in. Due to the early planning stage of RREP not all modalities are finalized as yet. The new approach will strengthen the coordination and increase the efficiency for an improved implementation and avoid duplication and fragmentation in rural and renewable energy sector in Nepal.

2. Planned Outcome

Energy Service Segment	Old target	New Target
Energy for Lighting & Electric HH Appliances	127,427	141,177
Cooking Energy for Households	-	-
Electricity and/or Cooking Energy for social infrastructure	30	33
Energy for productive use/ income generation	40	44

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev Nepal started in 2008 and has supported rural communities in receiving access to electricity. Firstly, it supports the Community Rural Electrification Programme of NEA for connecting 49 rural communities to the national grid. Once connected, the NEA sells bulk power to Community Rural Electrification Entities (CREEs), which are responsible for the operation, maintenance and management of the distribution network as well as collection of revenues from villagers. Among the most important activities are technical as well as finance and accounting trainings to the CREEs. Furthermore, it includes financial support to the

CREEs to raise their own contribution, promote productive use of electricity and provide advisory services to their umbrella organisation National Association of Community Electricity Users in Nepal (NACEUN). To current date, 24 communities with around 19,000 HH have been successfully electrified.

Secondly, EnDev Nepal supported the set up and implementation of the Micro Hydropower Debt Fund for enabling rural communities to receive electricity from their own plant. It is implemented with the Alternative Energy Promotion Centre (AEPC) and based on the existing and subsidy-approved MHP projects of ESAP II and RERL. The intervention of EnDev aims to provide access to energy for rural communities (approximately 2,100 HH) and bring the private sector into financing of MHP schemes. Both ESAP and RERL provide subsidies which cover between 30-50% of total investment costs. The local community consequently faces high own contributions. Including equity and subsidy there is still a funding gap of approximately 30% of total costs. Commercial banks could be in a position to fill this gap. However, due to insufficient experience in dealing with renewable energy projects and lending to rural areas, there is a high perceived risk and commercial banks either reject any involvement or ask for high securities and interest rates which the community cannot provide. Consequently, many viable MHP projects are not implemented. A solution is to build partnerships between commercial banks and local micro finance institutions (MFIs) in a way that they act as the banks' local agent. These financial institutions have the local knowledge and willingness to invest but do not have sufficient funds for lending whereby EnDev can come in preparing the ground for commercial banks to follow with their own funding with more "normal" loan conditions.

The debt fund was tendered to two commercial banks and a debt fund agreement has been signed between them and AEPC. Then, interaction programmes were organized whereby the banks and MHP User Committees did participate. At present, the 2 banks have received 19 loan applications which they are currently processing. They range from 16kW to 100kW and loans have been approved to 4 MHP projects currently. Involving local MFI's, where this might reduce the banks risk perception, can be a next step in the process.

3.2. Approach to Provide Electricity to Households

3.2.1 Micro Hydro Power

This proposal for scaling up will exclusively focus on the Micro Hydropower Debt Fund component. The private sector - namely banks and local financial institutions - sees the potential of the micro hydropower sector but does not have the capabilities and the know-how needed to enter this sector. The proposed debt fund will make a number of power stations feasible which are currently in the pipeline but cannot be build due to lack of suitable financing. It will also expose local financial institutions to the micro hydro power sector in order for them to gain experience with MHP projects. At a later stage banks are expected to efficiently serve such projects increasingly from their own funds. In that stage, the EnDev support for access to energy will be increasingly directed towards a RBF approach (Result Based Financing). In order to speed up the process only those projects will be eligible which have already received TRC (Technical Review Committee) approval for subsidy, which checks the technical, socio-economic, environmental and financial feasibility of the planned MHP. In addition, priority will be given to those that have already finished their civil works.

3.2.2 Proposed Activities

Provide investment capital to rural communities for operating their own MHP plant in remote areas

The debt fund which is currently in operation consists of EUR 0.5 million and will be substantially scaled up by additional funding. Once in operation it will be able to provide investment capital for at least 500kW additional generating capacity which on average will result into financing approximately 15 MHP plants. The contractual modalities with AEPC, development partners and banks will be established and due to the existing Micro Hydro Debt Fund and the previous experience of setting-up, the preparation time can be substantially reduced. The project will work out a mode of providing additional support to the communities which have successfully commissioned the MHP plants. The support will be linked to the number of HH connected and shall be used for either maintenance and repair savings or productive use purposes. Other possibilities include the provision of connected battery charging stations to serve households too distant from the MHP or to extend the local grid. Details of this **"Result Based Financing"** will be designed in a later stage.

Organisation of awareness raising meetings and interaction programmes to inform the Hydro User Committees on the MHP Debt Fund

In cooperation with the regional centres of AEPC awareness meetings are organised with banks, MFIs, MHP User committees and district representatives to inform about the criteria and loan conditions of the credit fund. This will make the fund public and interested communities can apply which will assist in creating a pipeline of projects to be assessed by the banks after. The projects should have subsidy approval and being already in and advanced stage of construction.

Advice, train and provide support to partner banks and MFI in developing a credit appraisal procedures for micro hydropower

It will be important to continue the capacity development for partner banks and MFI (Micro Finance Institutions) to assess viability of loan requests by communities intending to build and operate MHP plants. The partner banks will be supported in developing an appraisal process which factors in the capacity-to-pay of the end users, the own contribution by the community and the potential for productive end use among others. This also includes assessing communities in successfully operating a MHP plant and the envisaged tariff setting. From the project pipeline which is already created after assessing the current MHP proposals, bankable projects can be chosen and processed quickly for the available funding. In addition, if bankable projects cannot be financed out of this fund it will be very useful for the upcoming credit facility of the new RREP programme which could provide further credit to viable MHP sites.

Organisation of exposure visits to the hydro sites

The banks and the MFI will be assisted in visiting the sites which will be necessary to have a full picture for the loan appraisal. In addition, qualified personnel from the regional centres and their energy officers can accompany them to receive a better understanding of the sites which will apply for the debt fund.

Support the rural communities in establishing rural businesses by using electricity and close coordination with existing Productive Use activities of RREP (Rural and Renewable Energy Programme)

Capacity development to communities to increase productive end use of energy is crucial to sustainably operate MHPs. In the new RREP programme there will be a component which is specifically dedicated to the productive end use promotion of the supported MHP plants. EnDev will coordinate closely with those activities and if required support complementing activities.

Close integration and alignment with the existing ESAP II/RERL programmes and its successor RREP for supporting the single modality programme approach for promoting rural electrification in Nepal

EnDev in Nepal supports the new single programme modality in the rural and renewable energy sector and will align its activities with RREP. In the previous arrangement between EnDev and AEPC, the financial contribution to the debt fund was aligned with the existing Rural Energy Fund (REF) which is the current modality for the subsidies and credit-based funding of decentralized energy supply. The new Central Rural Energy Fund (CREF) as the successor which will also have a credit component is not yet operational and the modalities are not yet finalised. The newly EnDev-provided tranches which will be channelled through REF can be transferred and outstanding tranches will be channelled via the newly established CREF in coordination with the relevant stakeholders.

3.3. Risks for Implementation

An overarching risk in Nepal remains the political stability of the country and the finalisation of the ongoing peace process after a decade of conflict which ended in 2006. Therefore, the country is still in a state of post-conflict instability until a new constitution is passed. However, increasing the electrification efforts will remain a priority for any government ruling the country. Furthermore, social tensions in various parts of the country could adversely affect the implementation of the project and restrict movement to certain areas. As the activities will benefit communities located in different parts of the country, overall implementation of the project should not be affected to a large extent. The current subsidy system for rural electrification is under review by the Government of Nepal and there is the expectation that its level will be raised. This could interfere negatively with the market-based approach of financing rural electrification more and more on credit. The project will together with other development partners provide constant advice on sustainable modalities but ultimately it will be a sovereign government decision. The government bureaucracy and slow implementation of reforms might prevent AEPC from becoming more autonomous and effective. This might affect the general implementation in the off-grid electrification sector, delay the start of RREP and leaving a long transition gap. Although the influence on the political level is low the close alignment with the already existing programme as well as planned alignment for the new programme can mitigate the risk to some extent. The MHP User Committees will not be able to pay back their loans to the banks and default. As the banks have to contribute substantially from their own funds in case of default they will assess the loan proposals very carefully and not choose risky ones.

4. Expected Impacts of the Project Intervention

Low electrification in rural areas is a major impediment for development in Nepal. Lack of electricity means little business opportunities for rural households, bad pre-conditions for education for the youths, and less-than-optimal usage of community facilities such as health posts, schools and public administration.

Livelihood/ Poverty: In comparison to the amount a household spent on kerosene, the new electrification by micro hydro power will also save energy costs as the tariff will be comparably lower as the transport of kerosene to remote locations is difficult and expensive.

The access to credit will provide communities in rural area the opportunity to receive infrastructure which will improve their daily living conditions. The experiences of the community as well as the finance institutions will show that lending money to rural areas can be a profitable business and be applied to many other infrastructure activities serving the community which require credit.

The promotion of new businesses which can be established with the availability of power will increase income to the community through stimulation of the local economy. Existing businesses can decrease their energy costs (e.g. diesel-powered rice mill) and increase their production, hence, increase income. The experience of access to credit will also show entrepreneurs how they can finance their essentials for setting their business (e.g. machinery). The project will focus on monitoring the impact of available electricity on the productive purposes, i.e. the income, turn over, employment of SMEs with a new electricity connection.

Environment and Climate: The power produced by the MHP station will reduce emissions from kerosene and diesel in some cases as well as dry cells. The project will calculate the amount of avoided GHG emissions in detail for each constructed MHP according to UNFCCC standard calculation methods – especially taking into account the new approved methodology for surpassed demand. The expected amount of CO2 reduction / avoided CO2 emission will be based on size of the MHP scheme and number of connected households. It is therefore not yet possible to specify the GHG mitigation.

Communication/Education: It will increase studying and reading hours of school children which can use light in the evenings. It also contributes to providing new access to information and communication means by charging mobile phones and increased use radio and TV.

Health: The electrification of rural areas in Nepal will improve living condition through better lighting, less smoke and less risk of houses burning down or persons getting hurt through the use of petroleum or kerosene lamps. It will also improve the quality of service from local health posts which can provide treatment at night or use refrigerators for vaccines.

5. Budget

Old: € 1,640,000
New: € 1,000,000 up to € 2,640,000

		EUR
1	Human Resources and travelling	**190,000**
2	Equipment and Supplies	**10,000**
3	Funding Financing Agreements/Local subsidies	**650,000**
4	Other direct costs	**70,000**
5	Total direct costs	**920,000**
6	Mark up costs/administrative overheads/imputed profit	**80,000**
7	Cost price	**1,000,000**

Milestones

Category	**Aggregated no. of persons receiving access**			
	I.2012	II.2012	I.2013	II.2013
1. Household Electrification		2,000	7,875	13,750
2. Clean Cook Stoves for HH	-	-	-	-
	Aggregated no. of institutions/enterprises receiving access			
	I.2012	II.2012	I.2013	II.2013
3. Electricity/Stoves for SIs			6	18
4. Electricity/Stoves for SMEs			8	24

Nicaragua

1. Situation Analysis

1.1. Energy Situation

Nicaragua has still one of the lowest electrification rates in Latin America although it was increasing from 53% to 70% during the period 2007-2011, which is equivalent to an annual average increase of more than 3%. The construction of 2,351 kilometres of grid extension and the installation of 5,690 solar home systems resulted in access for almost 51,000 families, representing approximately 303,000 persons of 1,053 communities in the rural areas of the country. During this period, seven small and twenty micro hydroelectric power stations were constructed, increasing the generation capacity in remote areas by over 2.5 MW and benefiting 1,814 rural households.

The total energy generation capacity was 3,659 GWh in 2010. Between 2007 and 2011 the generation capacity was increased by 343 MW (280 MW thermal and 63 MW wind power) with an average annual increase of 69 MW, which represents the major growth in capacity installed in Central America.

However, about 70 percent of the rural population still lacks access to electricity. In absolute terms, it is estimated that a total of about 350,000 households in both urban and rural areas still remain unserved. About 160,000 households are living in off-grid areas beyond economic grid extension distances. The national electricity system, subdivided into two concession areas, covers mainly the western part of the country. More than half of the country remains out of these areas. The “open area” outside the national interconnected grid includes 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 and Chontales. This area is characterized by a very low population density with only 6 inhabitants per km², while density in the two concession areas reaches approximately 80 inhabitants per km². Population is highly dispersed and access is often difficult. There is only river access for most of the Atlantic Region. These two characteristics prevent provision of electricity services by the conventional grid, and call for site-specific off-grid solutions like diesel or hydropower plants and solar home systems.

With the intention of favouring a sustainable development directed to the alleviation of poverty, the Government of Nicaragua is further increasing the electrification rate of the country and is changing the energy matrix by intensifying the use of renewable energies such as water, solar, wind, geothermic and biomass resources.

1.2. Policy Framework, Laws and Regulations

The “Law of the Electrical Industry” (Law N° 272), approved in 1998, is the normative framework for the generation, transport, distribution and commercialization activities of the electricity sector. Since 2003 Nicaragua has a National Rural Electrification Plan (PLANER) based on the National Development Plan which essentially establishes to increase the electricity coverage of the country in order to contribute to sustainable poverty reduction by orienting public investments towards the areas where economic growth opportunities exist and were development possibilities can be tapped by creating employment opportunities and

supporting the delivery and improvement of basic services. The objective of PLANER was to increase the national electrical coverage to 71.5% by the year 2013.

In April 2005 the National Assembly approved the “Law for the Promotion of Electricity Generation with Renewable Sources” (Law N° 532) to promote the development of renewable energies in order to improve the power generation capacity with renewable energy sources as water, solar, wind, geothermic and biomass resources, and to establish fiscal, economic and financial incentives that could contribute to their increased use. Examples of these incentives are the exoneration from import and value added tax as well as all local and other taxes, exoneration from income tax for seven years for the operation of renewable energy power plants and the obligation of distribution utilities to buy power generated from renewable energy plants.

The government energy policy today is focused on changing the energy matrix and enhancing energy efficiency in public institutions, private households and industry. In the present energy matrix thermal generation (bunker and diesel) stands out with 70%, resulting in relatively high (cross subsidized) tariffs with high dependence on fossil fuel causing greenhouse gas emissions and contributing to climate change. This situation is planned to be changed in a medium-sized term until 2017, when thermal energy is supposed to count for only 15% and renewable sources for a total of 85%, principally by the generation of hydroelectric, wind and geothermic power in the range of 681 MW.

Regarding environmental regulation, the Nicaraguan Institute of Energy (INE) is in charge of safeguarding the compliance of the environmental laws (Law N° 272, Art. 69), according to the policies and norms dictated by the Ministry of Environment and Natural Resources (MARENA) Any activity with characteristics of eventually causing any detrimental impact on the environment or the natural resources requires an environmental permission granted by MARENA prior to its implementation.

The Government views the expansion of electricity services in 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 standard of rural populations. 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 2000 the public fund “Fondo para el Desarrollo de la Industria Eléctrica” (FODIEN) managed by the Ministry of Energy and Mines was created to finance rural electrification projects. It 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. Its resources are coming from multilateral agencies, bilateral donors, and from the general budget of the republic. The Government of Nicaragua encourages especially the development of renewable energy resources as an essential element in the growth of the national energy system.

1.3. Institutional Set-up in the Energy Sector

In 2000 the Law N° 272 led to the unbundling of the energy sector and to the privatization of energy distribution within the national interconnected grid. The two public distribution utilities DISNORTE and DISSUR were sold to the transnational corporation Union Fenosa (today Gas Natural). Another distribution concession covering the Autonomous Regions RAAN and RAAS and isolated grids powered by diesel generators was transferred to the Nicaraguan Electricity Company (ENEL) which had been created in 1994 as the public company in charge of generation, transmission, distribution and commercialization of electricity. Transmission was transferred to the National Transmission Company ENATREL, in charge of the medium and high voltage grids and the substations.

The Nicaraguan Institute of Energy (INE), the regulatory authority in charge of regulation, supervision and inspection of the energy sector, maintains a regulatory framework covering the main aspects of interest for investment decisions in the electricity sector. The INE maintained its former functions of planning, policy making, regulation and fixation of tariffs and adopting technical norms.

Law N° 272 also created the National Commission of Energy (CNE) for the formulation of the targets, politics, strategies and general guidelines of the energy sector. One of its main functions consisted of impelling the politics and national strategies for rural electrification. The Ministry of Energy and Mines (MEM) was created in replacement of CNE, as the public institution responsible for implementing the country's energy policy (Law of Organization, Competition and Procedures of Executive Power, No. 162)

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 programs, 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.

The Law N° 272 also established the Fund for the Development of the National Electrical Industry (FODIEN), administered by MEM with the target to mobilize internal and external resources as grants and loans of bilateral and multilateral agencies to finance the electrification of rural areas, in which grid extension is too expensive. Thus FODIEN was made responsible for the development of rural electrification, being the specialized structure in charge of planning, programming, implementing and controlling rural electrification activities. FODIEN consists of three Directorates: Concession Areas and Grid Extension, Small Hydro Power and Rural Electrification in Isolated Areas.

In 2010 the civil society association RENOVABLES was founded with the objective to promote the development of efficient energy generation with renewable resources; consolidate the renewable energy sector and develop its capacities and knowledge base. Members of RENOVABLES are about 30 organizations of the private, non governmental and academic sectors involved in the renewable energy issue. It is playing an important role in

enhancing reformations of the legal and political framework for the sustainable promotion of renewable energies in the country.

In the framework of the National Development Strategy, which is an integral part of the National Human Development Plan (PNDH), sustainable poverty reduction is targeted by public investments to improve the living conditions of the rural population and by stimulating productive activities and educational and public health services in the period 2012 – 2016. During this period the challenge will be taken up of pooling and managing the financial resources to assure universal access to electricity and energy for cooking to all Nicaraguan families.

Behind this challenging background a new reorganisation is taking place affecting mainly MEM and FODIEN. MEM is supposed to restrict itself mainly to strategic policy issues and normative and legalisation duties (concessions and licenses), giving up its former role as implementation structure for the national energy policy and rural electrification programs. FODIEN is now forming an integral part of the national transmission company ENATREL, which is in charge of the national grid. Within MEM, a Directorate for Renewable Energies and Energy Efficiency was created to improve the policy framework conditions for the promotion of renewable energy and energy efficiency.

1.4. Major Donor Activities

The Fund for the Development of the National Electrical Industry (FODIEN) has received significant support of the international cooperation community by the Swiss Cooperation – COSUDE, Alianza en Energía y Ambiente con Centroamérica – AEA, PNUD-GEF and DGIS/GIZ (for Micro and Small Hydro Power), by Norway, Canada and DGIS/GIZ for grid extension and densification, and by financial institutions as the World Bank (for rural electrification in isolated areas), Interamerican Development Bank – BID, Banco Centroamericano de Integración Económica – BCIE and KFW for power generation and transmission infrastructure projects. The donor contributions were complemented by own investments of the Nicaraguan Government for the electrification of peri-urban and rural areas.

The National *Program of Sustainable Electrification and Renewable Energies (PNESER)* is financed by the Nicaraguan Government, bilateral cooperation agencies and multilateral and regional financing institutions like WB, BID, BCIE, the Nordic Development Fund, the European Investment Fund and others. The objective of PNESER is the increase of the electrification rate by an additional 20%, to improve the quality and standard of living of approximately 1.2 million inhabitants, facilitating access to basic energy services and new productive opportunities. It is expected to invest a total of US$185.4 million for:

- the electrification of rural areas by grid extension,
- the densification of the grid in urban areas,
- small and micro hydro power and photovoltaic systems or other renewable energy solutions in remote areas,
- for improving services in rural areas attended by ENEL

Although exact figures are unknown, it is expected that more than half of the investment will go to rural areas.

2. Planned Outcome

Energy Service Segment	Total Number of People Served
Energy for Household Lighting and Electric Appliances	20,000
Cooking Energy for Households	
Electricity for Social Infrastructure	50 SIs
Cooking / Heating Energy for Social Infrastructure	
Energy for Productive use / Income Generation	50 SMEs

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

EnDev Nicaragua will promote (1) grid extension and densification, (2) Solar Home Systems, and Pico PV Systems (3) Pico Hydro Power (300 W up to 5 kW).

The up-scaling EnDev-Nicaragua will focus on the following key interventions:

- Connection of 2,345 households to the grid by grid extension and densification
- Dissemination of 1,000 solar home systems and pico PV systems
- Installation of 20 Pico Hydro Power Plants (300 W up to 5 kW)
- Capacity development for operation and maintenance of renewable energy technologies

3.2. Approach to Provide Electricity to Households

3.2.1 Hydropower

Nicaragua has a huge hydropower potential in the northern mountainous regions. However, only three small companies are active in the field of micro hydropower machinery as the commercial demand for micro hydropower equipment is still low. Micro hydro plants in Nicaragua are neither attractive for the national nor for the international private sector as the expected profit margins are too low. Thus, the market situation for micro hydro power depends completely on public investments and donor financed projects. EnDev has contributed to the installation of 12 micro hydro power and two small hydro power sites. FODIEN-PCH has identified 20 new sites with good hydro electrical potential for micro plants that are planned to be developed with funds from the Norwegian Cooperation. As an alternative to the limited power generation of SHS (up to 85 Wp per familiy) it is envisaged to start a new intervention line with the dissemination of pico hydroelectric plants between 300 W and 5 kW for basic household electrification and productive use for coffee growing farmers with access to credit financing. This lower hydro technology segment is well-developed in South America but still unknown in Central America. Technology transfer and technical capacity development will be organised between Andean Countries and local small and medium mechanical engineering firms, rural machinery providers, technical professional education institutions and the coffee industry.

In the hydro intervention area EnDev-Nicaragua will open a new line in promoting pico-hydropower within the coffee growing sector to improve the energy situation for household

lighting and productive use of energy in the northern region of Nicaragua. In a first instance 20 pico hydropower systems will be installed, each feeding into a micro grid for up to five households. Approximately 100 households (= 600 people, depending on the household size of the specific sites) will be connected by the systems. Training on technical planning, installation, maintenance and business skills will be provided with the technology transfer. The pico power plants and micro grids will be the property of the coffee growers that qualify for credit financing and will be run by them on a private enterprise basis. Financing will take the form of a mixture of local contribution (credit financing and labour up to 75% of the installation cost per kW), EnDev subsidy (up to 25 %) and technical support by the coffee sector and EnDev. The subsidy scheme is based on the subsidies for SHS and is designed in a way that the subsidy augments per family connected. The subsidy is meant as a contribution to initiate the development of this market segment, which will be further developed by the demand for this promising technology in the coffee sector.

3.2.2 Solar Home Systems and Pico-PV

A significant part of the population in remote rural areas is living too far away from the national grid, so that grid extension to their communities is still too expensive. Therefore many households are interested in obtaining electricity through solar home systems. In addition to other actors (PERZA / WB, BID, BCIE and bilateral cooperation agencies) EnDev has contributed to SHS market development and the improvement of installation and maintenance structures for solar home systems in rural areas of Nicaragua. Meanwhile two retailers have established subsidiaries in the most important regional towns as outlets for rural communities. Although clients have to travel to these regional towns to purchase SHS and for repair orders, the situation has improved but is still difficult for many rural families. Market penetration of the technology, falling prices and cooperation with the coffee growing sector and its financing opportunities allowed for a reduction of subsidies from 60% to 23% of the system costs within five years. However the establishment of service structures is still considered not to be profitable due to the high costs for transportation and mobilization, the dispersed nature of the population and their low income and demand. Thus, the promotion of service structures is still crucial for the further dissemination of solar home systems in rural areas. The market for Pico PV products is also developing fast in the region. It is planned to open a new line with the dissemination of Pico PV systems of the second generation with Ni-MH or Li-Ion batteries, mainly as an alternative for low-income families that cannot afford the high upfront payment necessary for the purchase of a SHS.

EnDev Nicaragua promotes the dissemination of Solar Home Systems in close cooperation a) with farmers' organizations and cooperatives and b) with local NGOs or local government structures in the central and northern regions of Nicaragua. EnDev funds are used for prize subsidies against upfront advance payments by the customers. Pico PV products of the second generation will be disseminated with poor households that cannot afford the upfront advance payment for a SHS. In addition, local technicians will be trained in the installation and maintenance of SHS and after-sales services will be established with the main suppliers of these products. Approximately 1,000 households (= 5,800 people, depending on the household size of the area in question) will benefit from access to electricity through SHS and Pico PV products.

3.2.3 Grid extension and densification

Distribution companies generally do not invest in grid extension as costs of providing access are high due to remoteness of the sites, dispersed nature of the population and difficulty of the terrain. Besides, the profitability of the investment in grid extension into rural areas is considered low because of the low electricity consumption of rural households (≤ 20 kWh / month). The local communities in general do not dispose of sufficient financial resources to allow for infrastructure investments in their community. Consequently, only the central government as owner of the national interconnected grid is interested in this kind of investment. Some municipalities and NGOs are active in small isolated systems whereas PNESER-FODIEN is involved from middle-size systems (100-900 kW) to the interconnected national grid. However, all the actors depend to a large degree from international donations to be able to carry out investments in remote rural areas. Grid extension and densification within a 150 m radius of the existing interconnected national grid is formally a task of the distribution utilities ENEL (public) and Gas Natural (formerly Unión Fenosa). EnDev will co-finance grid extension and densification outside this range and concentrate on connecting new villages in areas where the access to the grid is feasible with the least possible costs implied.

EnDev Nicaragua is promoting the supply of grid electricity to households in rural and / or peri-urban areas close to the grid, but outside the range of 150 m around the existing grid. It supports PNESER-FODIEN in its plans to electrify rural and peri urban communities in the two concession areas of the country to increase the electric coverage of areas with good economic and social potential. EnDev Nicaragua will co-finance grid extension and densification activities. It is expected that in this component around 2,345 households (=13,600 people) will receive access to electricity.

3.3. Approach to Provide Electricity to Social Infrastructure Institutions

3.3.1 Grid extension

In the grid extension and densification line of intervention (described under households above), social infrastructure institutions will also benefit from electricity.

3.4. Approach to Provide Electricity to SMEs

3.4.1 Hydropower

The intervention line of Pico hydropower described above will work closely with coffee cooperatives. Their workers, but also their productive uses, will benefit from access to electricity.

3.4.2 Grid extension

SMEs located in areas concerned by grid extension and densification will also benefit from access to electricity.

3.5. Risks for Implementation

Grid extension and densification depend largely on the stability of the power supply. Nicaragua has effectively overcome power shortages of previous years and the power generation is higher than the consumption. It is expected that the power supply will further improve due to the new power generation projects which are in the pipeline in Nicaragua.

The results of the SHS component depend to a large degree on the international prices for panels, batteries and other system parts, as well as for the new Pico PV products. Currently prices are quite favourable and the prices and guarantee coverage for Pico PV products are getting more interesting, but this may change in future.

The results of the Pico Hydro Power activities depend on the access to the financing instruments of the coffee industry, the power demand of the organized producers, the number of families that can be connected and the installation costs per kW installed (turbines, generators and micro grids). Installation costs are estimated at 1,000 USD for a system with 1 kW, which equals the costs for 200 Wp photovoltaic generation. If these estimations can be verified in the field, Pico Hydro Power has the potential to increase power generation and access rates fivefold compared to photovoltaic generation with approximately the same investment cost.

4. Expected Impacts of the Project Intervention

The impact M&E activities are designed according to the framework of the Sustainable Development Concept of GIZ, considering economic, social and environmental dimensions. Continuing the work done under EnDev 2, the key interventions and activities will also be accompanied by M&E activities following up on activities, processes and outcomes.

5. Budget

		EUR
1	Human Resources and travelling	**330,000**
2	Equipment and Supplies	**320,000**
3	Funding Financing Agreements / Local subsidies	**412,000**
4	Other direct costs	**255,000**
5	Total direct costs	**1,317,000**
6	Mark up costs / administrative overheads / imputed profit	**183,000**
7	Cost price	**1,500,000**

Peru

1. Situation Analysis

1.1. Energy Situation

Within the framework of providing access to modern energy services to rural and peri-urban populations, it is relevant to highlight that the concept of universal access to energy has been included as one of nine objectives in the recent declaration of Peru's 2010-2040 National Energy Policy launched at the end of 2010 (SD Nº 026-2010-EM). Likewise included is the objective of developing an energy sector with a minimum environmental impact and low carbon emissions within the framework of sustainable development.

These objectives directly respond to the alarming energy situation in Peru. This is reflected in the 2009 national energy balance, since 50% of all the energy consumed by the residential block is sourced directly from biomass, 23% from liquid or gas hydrocarbons, and only 27% from electricity. Besides, according to the 2009 National Household Survey, 84% of Peruvian households had access to electricity. As it can be expected, there are differences according to areas: while 97% of urban households have electricity, only 56% of rural households have it, meaning around 600,000 households, or 3 million people, lack electricity. The 2009-2018 National Rural Electrification Plan, prepared by the General Rural Electrification Directorate of the Ministry of Energy and Mines, has fixed a target for the end of that period of having at least 80 out of every 100 rural households reach access to electricity. For these millions of Peruvians, the only economically feasible possibility in the short and mid- term is local generation of electricity, mainly based upon renewable resources: water, wind, sun, and biomass energy. The Peruvian government has already started concrete actions to acquire island systems it expects to grant in concession among companies that currently operate the rural networks.

According to the 2007 Population and Housing Census, 2,036,901 households (30.2%) use firewood to cook, followed by manure used by 282,660 households (4.2%) and charcoal used by 170,643 households (2.5%). In rural areas, firewood is more relevant since it is used by 77.4% of households and manure is used by 14.5% of rural households. Similarly, 95% of schools in rural areas use firewood to prepare the daily food for pupils which also means that these meals are not appropriately prepared. In an attempt to counter this problem, the Presidency of the Council of Ministers allied with public and private organizations, among them GIZ, launched in 2009 the campaign "Half a Million Improved Cook Stoves for a Peru without smoke". This campaign has allowed covering 20% of the overall demand for improved cook stoves and has helped to make progress in technical regulations of those technologies and to match supply and demand in this formerly inexistent market concession.

Except for solar water heaters and chaff, the other non-traditional renewable sources have their scope in rural areas. The solar water heater market -limited until lately only to Arequipa- is expanding to the central highlands and is still a niche market. Only 10% of health care centres have hot water, which limits the possibility of providing quality service to patients and properly manipulating the instruments.

A similar situation is seen when implementing small businesses due to the lack of energy services that could add value to their productive processes. At the same time, the scattering of producers prevents access to capital and hence to greater capacity technologies that would allow taking the leap for necessary competitiveness and productivity. Post-harvest

transformation processes are still traditional in almost all of the productive chains, coffee production being one of the most competitive of them, thanks to the fact that coffee farmers are organized in associations, reaching a national record of 30% of organized coffee producers.

1.2. Policy Framework, Laws and Regulations

Extension of the Peru EnDev Project second stage is framed in a new political scenario resulting from the 2011 presidential elections. A new government has been elected which mainly aims at promoting economic growth with social inclusion, one of the important gaps to be closed. The government's main challenge is eradicating poverty by improving access to still lacking basic services. This means that interventions being promoted by EnDev Peru are welcomed and supported by different public institutions, which are project partners nationwide such as Social Inclusion Ministry, Housing Ministry, Health Ministry, Environment Ministry, Energy and Mines Ministry and Agriculture Ministry. The following describes how the legal objectives and frameworks of each of these ministries are allied with EnDev Peru's objectives.

1.2.1 Energy Sector

The new government will continue driving transformation of the current national energy mix going from depending on hydrocarbons to a mix where renewable resources are more relevant.

As for access of rural households to electricity, the present government aims to go from 60% in 2010 to 80% in 2016. The transition will occur through the interconnected grid within the framework of the "General Rural Electrification Law" (Law Nº 28749), which will permit promoting access to electricity services in rural areas -through Safe Basic Interior Electricity Connections- in cooperation with the Energy and Mines Regional Directorate, the electricity distribution companies, and regional and local governments. However, there are families in isolated areas which will not have access to conventional rural electrification.

The "2010-2020 Master Plan for Rural Electrification with Renewable Energy" proposes necessary mechanisms to have access to renewable energies. In this framework, EnDev Peru will promote sustainable access to isolated generation systems emphasizing photovoltaic and pico photovoltaic systems.

1.2.2 Social Inclusion and Poverty Reduction

One of the main policy guidelines in the current government is achieving social inclusion and reducing poverty within a framework of macro-economic stability. Using tax revenues to expand social expenditure for the poorest people will reduce rural poverty, chronic malnutrition, gaps in access to electricity, and connect development and social inclusion policies to productive development policies.

The new Ministry of Development and Social Inclusion – MIDIS – has been created to look after this area. One of its main functions is coordinating social and poverty alleviation

programs plus the programs generating opportunities to exit poverty, with productive sectors such as the Agriculture or Production Ministry.

For the identification of households living under the poverty or extreme poverty line, EnDev uses available public data, like that in the “System of Households Focalization” (SISFOH in Spanish) of the Economy Ministry, the National Census 2007 of the “National Statistics and Informatics Institute” (INEI, in Spanish) and the databases of public social programs like JUNTOS, a conditional cash transfer program for the poorest. SISFOH provides information about socio-economical aspects at local level and the National Census gives an overview about access to electricity, type of fuel for cooking or presence of a chimney. The database of social programs helps to validate the information of these sources and to complement the information until community level. On this basis, EnDev has developed a “Social and Energetic Poverty” matrix, which serves as reference for the identification of beneficiaries and the elaboration of intervention analyses.

In this context, access to quality energy services as an element to reduce poverty and improve environmental conditions of the most vulnerable groups becomes relevant. This includes the use of low carbon and energy-efficient technologies such as improved cook stoves, (pico-) photovoltaic systems, solar water heaters, and improved ovens among other technologies promoted by EnDev.

1.2.3 Health

Improving housing infrastructure, basic sanitation, hygiene, promoting improved cook stoves and small productive activities through joint actions with other sectors are some of the main strategies at the Health Ministry, implemented through the “Healthy Houses and Families” program.

EnDev Peru will coordinate with this program in promoting sustainable access to energy (conventional and renewable) through safe basic electric connections and through photovoltaic systems. EnDev Peru will also work on the sustainable use of improved cook stoves and access to energy for productive uses, thus pointing at having safe and “energized” houses that foster people’s and families’ better health.

1.2.4 Environment

One of the guidelines of the National Environment Policy is promoting investment, development and use of biofuels, renewable energies, and reduced carbon emissions within the framework of a new energy matrix. The policy also establishes measures to prevent and mitigate the effects of air pollutants on people’s health. In its Action Plan for Adapting to and Mitigating Climate Change, two of the objectives are: reducing greenhouse gas (GHG) emissions and promoting their capture. In this regard, EnDev will promote participation in the carbon bond market among the institutions that take part in the improved cook stove Campaign. For that purpose, EnDev will exchange with them important and critical experiences with running a stove carbon funds program called “Qori Q’oncha”, coordinated by Microsol (see below, next chapter). In this sense, EnDev encourages other institutions with running stove projects to join “Qori Q’oncha”, which would contribute to the sustainability strategies of each partner within the campaign.

1.2.5 Agricultural Policy

Agricultural Policy aims to reduce Peruvian agriculture competitiveness gaps under a sustainable development approach. Its targets include increasing the productive inclusion of 40% of peasant producers who live with subsistence strategies into the market, an annual Agriculture GDP growth of 5%, an annual agro export increase of 20%, and a doubling of the formal financing for agricultural production. This political framework will enable EnDev Peru's strategy on providing access to energy for productive use, which aims at having a greater impact on total productivity and hence on individual revenues as well as on farmer associations which act as a single commercial unit in the market.

1.3. Institutional Set-up in the Energy Sector

In Peru, the Ministry of Energy and Mines is the central and ruling body of the energy sector. It aims at promoting comprehensive development of mining and energy activities. It rules, controls and/or supervises, per case, compliance with standards, looking at the rational use of natural resources in harmony with the environment. The Ministry is, therefore, one of EnDev's main partners. However, other ministries such as Health, Environment, Social Inclusion, Housing and Agriculture nationwide, as well as regional and local governments that aim at improving quality of life and social equity for poor families through access to basic services are also important partners to achieve EnDev Peru's goals and consolidate the sustainability of its initiatives. There are public and private institutions in Peru which are interested in promoting access to energy because they are aware of the connection between energy, poverty, and economic development. The following are some of these institutions:

Among public institutions promoting access to energy they are: Social Inclusion, Energy and Mines, Housing, Agriculture, Environment, Health and Education Ministries, and Regional and Local Governments. The *Social Inclusion Ministry* aims at overcoming poverty and promoting social inclusion and equity. It also aims at protecting vulnerable and abandoned people at risk through social programs such as the Juntos Program, which supports the poorest population and Foncodes and Pronaa, which aim at improving nutrition, health, education, and identity services for the most vulnerable sectors of the country. The *Ministry of Energy and Mines* promotes universal access to energy, particularly rural electrification in its 2010-2040 National Energy Policy, as well as energy development with minimum environmental impact, especially in isolated populations. In this context, pico photovoltaic systems promoted by EnDev are a pre-electrification solution the ministry is interested in. Likewise, the *Housing Ministry* aims mainly at promoting bioclimatic and energy-efficient houses for high Andean zones. The *Agriculture Ministry* promotes several projects to improve small farmers' competitiveness. EnDev has a strategic alliance with Agroideas, which aims at improving competitiveness of small and micro size producers by encouraging association and adopting energy services already implemented in the country and thus ensure their sustainability. Similarly, regional and local governments develop several programs to provide their population with access to energy.

There are currently several NGOs, companies and schooling institutions in the private sector that promote access to different energy services and EnDev Peru works in synergy with them. *ITDG-Peru Soluciones Prácticas* is among the most important since they have implemented several generation projects for isolated areas through photovoltaic systems and micro hydropower units. Together with EnDev, the energy regional office is developing a

management model for isolated systems in the province of San Martin. In addition, an instrument to perform energy needs comprehensive assessments is being adapted to improve access to energy in families of the rural areas of the country. In the case of photovoltaic systems, there are several companies focused on selling them. *Peru Microenergias* is a basic electricity service provider (lighting and communication) that operates solar home systems in isolated rural communities ensuring sustainability through the monthly fee they collect from users. Companies such as *Genera* and *Q-Energy* are devoted to providing non-conventional energy solutions using technologies such as pico photovoltaic systems.

Regarding improved cook stoves, several institutions have created a promotion platform having its origins in the National Improved Cook Stove Campaign. The platform is made up by research institutions such as: *Grupo de Apoyo al Sector Rural de la Pontificia Universidad Católica del Perú (The Catholic University of Peru's Rural Sector Support Group), Instituto de Altura de la Universidad Cayetano Heredia (the Altitude Institute of Universidad Cayetano Heredia).* There are also NGOs such as: *Instituto Trabajo y Familia a través del Programa Sembrando* (Work and Family Institute through its Sembrando program), *ADRA, PRISMA, CARE, CARITAS.* Another important player in this platform is *MICROSOL***,** a social company that works in alliance with the Swiss foundation *myclimate.* They have developed the *"Qori Q'oncha" (Golden Hearth) Program* which is one of the first voluntary carbon programs in the world in issuing carbon bonds for improved cook stoves. Microsol supports every institution that has built more than 500 improved cook stoves by providing them with technical advisory services so that their cook stoves generate value in the carbon market. In September 2010, the Peruvian program issued its first carbon bonds which were received by Sembrando and Properu. Both NGOs will use the generated bonds to ensure the sustainability of the installed improved cook stoves.

1.4. Major Donor Activities

1.4.1 Activities of Germany and The Netherlands

Peru is a partner country of German development cooperation (GIZ). GIZ has been working in Peru on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) since 1975, and on behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) since 2009. As one of the major bilateral donors, Germany is contributing to sustainable development and poverty reduction in Peru. In recent years, cooperation with other international donors has increased. The Government of the Netherlands, the Swiss Government, and the European Commission are co-financing some projects.

Peru has just experienced a decade of exemplary economic growth in which it has succeeded in doubling its per capita GDP. The number of people living in poverty has fallen from 54 % in 2001 to 35 % in 2009, with the share of people living in absolute poverty more than halved from 24 % in 2001 to 11.5 % in 2009. Notwithstanding these achievements, the country still has large income gaps and a high concentration of poverty in rural areas. Structural problems, such as the still strongly centralized state, are obstacles to more efficient and more transparent governance and to the provision of basic services to the population.

Moreover, Peru is one of the countries which are most affected by climate change. More than 50% of the population lives in the narrow desert belt along the Pacific coast, where shortfalls in water supplies are a growing problem. Peru has the fourth largest area of tropical forest in the world after Brazil, the Democratic Republic of the Congo, and Indonesia. These vast forest reserves are being steadily destroyed as a result of overexploitation and the extraction of natural resources. This is also threatening Peru's biodiversity, which is regarded as one of the richest in the world.

In accordance with the agreement between the German government and the government of Peru, GIZ's work focuses on three priority areas:

- Democracy
- Water
- Rural development

1.4.2 Activities of Other Donors

IDB and the *World Bank* are advisors to the Ministry of Energy and Mines concerning regulation, promotion and implementation of the National Rural Electrification Plan, as well as on the productive uses of energy. The *Finnish Cooperation* finances the *ENERGY AND ENVIRONMENT ALLIANCE PROGRAM* with the Andean Region, which is executed by the *Inter-American Institute for Cooperation on Agriculture (IICA).* This alliance encompasses renewable energy, bioenergy and energy efficiency aspects. The *European Union* and the *Japanese Cooperation* support the Energy and Mines Ministry in implementing renewable energy projects.

2. Planned Outcomes

Energy Service Segment	Total Number of HH	Total Number of People served
Energy for lighting and electric home appliances	15,000	75,000
Cooking energy for households	20,000	100,000

Energy Service Segment	Total Number of institutions served
Electricity for social infrastructure	500
Cooking/ heating energy for social infrastructure	1,000
Energy for productive use/income generation	2,000

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Project

This extension proposal (June 2012 to December 2014) for the Peru EnDev project aims at consolidating initiatives implemented in its first stages and making them sustainable and providing additional access to energy for more than 175,000 people including 15,000

households with lighting systems and 20,000 households with improved cook stoves in new developments. 2,000 micro enterprises (farmers) will be supported regarding energy for productive use so that they can have access to technologies that work with electricity and thus increase their productivity in association arrangements. In addition, other technologies will be promoted in the infrastructure of 1,000 social institutions such as solar water heaters, biomass ovens, and improved cook stoves. Finally, safe interior electricity connections or photovoltaic systems will be promoted in 500 social infrastructure institutions. In cooperation with both public and private players at national, regional and local levels this objective shall be achieved.

3.2. Approach to Electricity to Households and Social Institutions

The lighting energy line is currently working to promote access to conventional and renewable energy through safe basic electricity connections and photovoltaic systems, respectively. Regarding safe basic interior electric connections (CEIBS, in Spanish), a strategy was developed and implemented that complements the effort of the rural electrification plan that produces conventional energy. The intervention is called “Safe Rural Home.” It has benefited 18,808 households until December 2011 in the country. However, it is necessary to ensure sustainability of the proposed strategy in the last stage that consolidates such access. Sustainability will be treated at two levels:

At community level, promoting and establishing market structures in rural areas which have:

- Qualified electricians, who offer quality services: They are people from the participating villages, which have received specific training by local capacity building institutes in cooperation with EnDev.
- Supply and delivery structure: Appropriate electric materials and devices, which comply with current regulations and can be found in local shops. The owners took part in a sensitization campaign, which was driven by EnDev together with local electricity suppliers and local agents from the municipality.
- Appropriately informed population regarding quality products to be bought and service to be hired in order to have a safe connection, besides training on the importance of electricity, its safe use, and the development and improvement opportunities to be achieved through it.

As support to community sustainability and considering that families will face the cost of electric installation in every room in a household (3 in average), EnDev will enhance local electricians to manage their earnings so that materials are bought with the initial payment and the technician is paid with the final payment.
Coordination of different players related to rural electrification at national and local levels will be promoted so that they promote implementation of this proposal from their political, technical, and/or social jurisdiction.

- Education and promotion audiovisual material will be developed by EnDev so that government executive organs (MINEM, GOREs - DREMs), as well as Electricity Distribution Companies **(**EDEs) promote safe access and use of electricity among the rural population, who are beneficiaries of electrification projects of the Peruvian government .

- Technical education institutions (SENATI, SENCICO, technical institutes and schools) will be promoted by EnDev so that they offer training courses to people in rural and remote areas. Such courses are aimed at educating local electricians and reinforcing the sustainability proposal at community level.
- Participation of local governments (municipalities) and socially responsible companies in the development of communities with rural electrification projects within their area of operation will be coordinated by EnDev so that they execute support proposals regarding safe access to electricity services, mainly for localities that are being provided with electricity services.

Sustainability assurance should permit 15,000 additional households / 75,000 persons to have access to electricity and EnDev Peru plans to benefit 500 institutions from July 2012 to December 2014.
Regarding renewable energies, especially photovoltaic systems, EnDev Peru has been able to identify and validate innovative isolated generation technologies and has benefited 179 households / 895 people until December 2011. The first positive results of field tests of Pico PV systems has permitted to commit authorities from the Energy and Mines Ministry and its regional instances to consider Pico PV systems as an alternative technology to cater to the need of communities that have not been considered within the rural electrification plans with renewables.

The solar home systems (SHS) considered in the rural electrification plans shall be further distributed under a leasing concept. During this consolidation stage it is foreseen to continue advising mainly public institutions at national and regional level for the development of management models to ensure sustainability. This management model describes a combination of a monthly payments by the users and public subsidies for SHS (>50Wp) to cover costs. This should ensure profitability for actual rural electricity providers, who will be in charge of the operation and maintenance of the SHS.

Both safe basic electricity connections and photovoltaic systems continue being proposed in the following intervention model which has four components.

- Development of authority sensitization processes at all levels regarding the need to implement management models and technologies appropriate to rural communities. The leasing scheme and subsidy tariff for SHS (> 50 Wp) shall be expanded to include lower capacity systems, such as Pico PV systems (< 50 Wp). The expansion of this tariff will allow Pico PV systems to be acquired by private or public inversion and operated and maintained by electricity providers in rural areas. Public subsidies of ~ 70-80% and user payment of the remaining 20-30 % should cover the costs and allow for more accessibility for rural poor households.
- Building local capacities to install systems and ensure local technical service, which are a key factor for full user satisfaction.
- Strengthening community leaders and local governments, by providing advice during the implementation of technical and management processes, to ensure good use and maintenance of the systems (CEIBS or PV systems). The communication among local operators and suppliers (of systems or electricity service) shall be reinforced to reach clear guarantee conditions and solutions to failures in a quick and effective way.
- Promotion of development of local markets to supply materials, spare parts and even new systems. Given that PV industry in Peru is growing, but still very slowly, this

sector still needs support. The investment made by the Peruvian government in rural electrification provides supportive conditions to expand and to develop local businesses around electricity supply, whether through conventional grids or PV or Pico PV systems. In actuality, PV providers operate only in Lima. EnDev is working on a PPP with one of them to organize some representations in San Martin.

3.3. Approach to Provide Cooking Energy to Households

During the exit strategy period of *Cooking Energy for Households,* the program will benefit 20.000 families/100.000 people with improved cook stoves, focusing on positioning existing supply of improved cook stoves through distribution, sale promotion, and post-sale service of cook stoves' parts. Such strategies will allow development and expansion of the market with new consumers. These new consumers might be, on the one hand, state institutions that may wish to subsidize improved cook stoves for the poorest population and/or on the other hand, people who may wish to buy them. Assistance, maintenance, and repair of these cook stoves by suppliers and/or installers will ensure the sustainability of the improved cook stoves that EnDev has supported within the framework of the *National Campaign for Half a Million Improved Cook Stoves for a Smokeless Peru*. In this regard, this activity line will comprise of four components implemented through the coordination between ministries and actors with a cross-cutting gender approach and emphasizing capacity building. Each one of the components is generated on earned experience and will be transferred as knowledge and tools to ministries responsible for the sustainability of actions undertaken in the Campaign for a Smokeless Peru.

3.3.1 Component 1: Good Use and Maintenance of Improved Cook Stoves

Aiming at assuring the sustainability of the economic and social investment made in building certified improved cook stoves, EnDev will strengthen adoption of the technology among the families by promoting good use and maintenance of improved cook stoves. At the same time, insertion of projects into the carbon market will be promoted.

Implementing promotion tools for the good use and maintenance of improved cook stoves. Capacity building and implementation of the best strategy for the adoption of cook stoves will be promoted, due to the direct relationship between information, education, and the use and maintenance of cook stoves towards their long useful life and good operation. The main tools will be a guide and a tool kit that will be made available to different entities that develop improved cook stove projects. In coordination with the *Education Ministry* the subject will be inserted in primary school study programs. EnDev will reinforce work among community health agents with the *Health Ministry* within the framework of Healthy Houses and Families as well as promote the inclusion in social programs such as JUNTOS which promote change of practices among families through their local agents, hand in hand with the *Development and Social Inclusion Ministry*.

Promoting mechanisms created in the country to access the international carbon market. The "Qori Q'oncha" program developed in Peru by Microsol, a social enterprise, permits improved cooker projects, which comply with carbon market criteria and processes, to generate carbon bonds from the savings of firewood due to improved cook stove energy efficiency. This program is one of the first in the world to issue carbon bonds for improved cook stoves.

Together with *UNDP,* EnDev will promote the most viable mechanisms for improved cook stove projects among Regional and Local Governments in the country, so as to have access to the carbon market. The generated bonds will contribute to improved cook stove sustainability strategies by financing activities around good practices and maintenance like radio spots or workshops and even subsiding some of the reparation costs.

3.3.2 Component 2: Improved Cook Stove Market Strengthening

This component aims at strengthening coordination of the existing supply (improved cook stove spare part suppliers and installers) and the potential demand (regional and local governments, private companies and population at large interested in implementing improved cook stoves). In addition, improved cook stove post-sale services will be promoted.

3.3.3 Component 3: Capacity Building

Improved cook stove installer training: The project, together with Servicio Nacional de Capacitación para la Industria de la Construcción – SENCICO (National Training Service for the Construction Industry), provides a short course on improved cook stoves. The qualification of different local installers trained by public and private institutions within the framework of the National Campaign for Improved Cook Stoves will be promoted. Thus, EnDev will formalize technical knowledge that complies with construction standards proposed by the Housing Ministry. Besides, SENCICO should have become by the end of this new phase acknowledged as the entity in charge of training qualified installers in the country.

Strengthening capacities of public and private institution´s personnel: At this stage, public and private institutions' personnel capacities will be strengthened in developing and formulating sustainable mainstreaming strategies for improved cook stoves by promoting short and/or specialization courses together with State scholarly entities such as Universidad Nacional de Ingeniería (National Engineering University).

3.3.4 Component 4: Improved Cook Stove Evaluation

This component will allow showing air pollution decrease in homes as a contribution to the country's priority policy: reducing poverty and achieving social inclusion. This component proposes:

Base evaluation indicators system for improved cook stoves: In a process coordinated with the Development and Social Inclusion Ministry and the Women Ministry, EnDev will promote a unified indicator system to show the impacts of improved cook stoves installed by institutions belonging to the initiative for a Smokeless Peru. Such system should include a cross-cutting gender approach.

Improved cook stove evaluation and certification: After having evaluated 22 models of improved cook stoves in the lab together with SENCICO, EnDev will provide technical assistance to consolidate evaluation and certification in the lab as well in the field, so that EnDev will support SENCICO to promote the supply of this service at this new stage. Along

this line, new evaluation technical teams will be trained in managing procedures, using equipment, and analyzing data from different improved cook stove evaluation tests.

Spare part certification: The technical assistance of EnDev will support SENCICO to promote and develop a certification process to make sure that improved cook stove spare parts (combustion chamber, grid, chimney and slabs) fulfil quality criteria. This will guarantee their durability.

Research and technology improvement: By applying acquired knowledge, EnDev will promote the design of improved cook stoves with complementary uses, such as heating. This will respond to the cold climate problem which affects high Andean populations and it will help develop other technological issues.

3.4. Approach to Provide Clean Cooking and Heating Energy for Social Institutions

EnDev supports this action line promoting the matching of the supply of appropriate technologies for social infrastructure with its potential demand. Under appropriate technologies, the project considers mainly solar water heaters and improved cook stoves for schools, health centers, and communal institutions. The supply of these technologies is not widespread in the country and EnDev tries to expand their horizon by introducing them into new markets in other regions and at the same time promoting their demand.

The intervention model begins with the identification of specific regions with good potential for a successful implementation of the above mentioned technologies. It means regions with good solar radiation and a high demand of firewood for cooking purposes. The next step is the search of local suppliers of the technologies and in their absence, the expansion of the market of existing suppliers from other regions. This negotiation is promoted by the simultaneous development of financing mechanisms in the target region. This gives the suppliers more security about access to the new market. Once the supply of the technologies exists in the target region, EnDev promotes public or private investment in these technologies for a better service supply in social institutions. This investment doesn´t always happen over the financing mechanisms developed by the project, but helps to broaden the chances of investment of different kind of actors like parents associations or the beneficiaries themselves.

EnDev Peru plans to benefit 1,000 institutions with these technologies by following the aforementioned strategies during the phase 2 extension. The inclusion of these technologies into the product portfolio of small micro-financial institutions in the country contributes to the sustainability of the developed markets in new regions.

3.5. Approaches to Provide Energy to SMEs

The strategy aimed at giving access to energy for productive use is based on the cooperation with farmers' associations. EnDev supports these associations collectively by giving them access to higher-capacity technologies for their overall production. The aim is to achieve a greater impact on their total productivity and hence on their individual income, since associations act as a single commercial unit in the market. With this method, 2,024 farmers have increased their productivity through the improved processing performance of their associations based on better access to energy for productive use.

In addition, before the cooperation with associations started, individual micro enterprises improved their productivity with individual technologies such as improved cook stoves and ovens, bio-digesters, solar water heaters, or solar dryers.

Technologies that benefit collective production are usually of a higher capacity, guarantee and efficiency, but also imply a larger investment. During stage 2, EnDev has supported farmers associations assuming at most 20% of the investment. This corresponds to the down payment of the loan that the associations take to acquire the technology. During this consolidation and sustainability stage, EnDev will not follow this subsidy modality, but will support partnership in two ways:

- Regarding the subsidized technologies, EnDev´s final contribution is the promotion of the commercial provision of the service facilitated by the technology. The association receives further resources from the use of the technology by other farmers and associations, who pay for the service. These extra earnings are divided among the members of the associations, thus creating a double way to impact their income.
- An additional path to support well-organized associations aligns at the same time its intervention with the policies of the Peruvian agrarian and energy sector. The Agriculture Ministry is promoting associability by financing up to 80% of a maximum amount of half a million dollars for the adoption of technologies, experts in agrarian management, commercial issues, and the formalization costs of associated farmers. Furthermore the Energy Ministry is promoting, in cooperation with the World Bank, the productive use of electricity in newly electrified regions, where associations are still weak and do not have much experience performing as a single production and commercial unit. The idea is to empower one association in a production cluster such as coffee and then promote its cooperation with other associations, reducing equipment costs for each of them and promoting a higher level of associability. Our support for this initiative is to help associations formulating their business plans, which are mandatory and almost the only requirement for obtaining government funds. Unfortunately, this requirement is the reason why the public incentives have not been capitalized massively so far.

The intervention model begins with identification of an association lacking modern forms of energy supply along its post-harvest production chain. In cooperation with the head of the association, one technology is then chosen to improve productivity in the most critical step of the production chain. The third step is selecting the provider and the fourth is installing the technology. The latter are quick steps, because the chosen technologies already exist on the market. The selection and installation of one technology are the first of two steps of our system of quality assurance. In this context, the next steps are periodical visits to the association’s premises where the technology was implemented in order to ensure the dynamic interaction between users and technology.
Up to now, the strategy described above should give access to modern energy services for the production of at least 2,000 farmers.

3.6. Risks of Implementation

There are several main risks that should be considered.

Assumption: Micro-economic Conditions

Possible anti-crisis plan proposed by the national government to mitigate the economic impact of international crisis has been considered as a risk. Despite the fact that Peru keeps positive growth indicators for this and the following year -a favourable indicator for the development of this project- the global uncertainty concerning the crisis can change this situation.

Assumption: Climate Change

Since EnDev is working in rural areas, the impact of adverse climate events (drought, floods or other similar problems) may very seriously affect the economy in the region, the people's revenues, and finally their capacity to access the technologies the project promotes.

Assumption: Regional Economies

Most of the people in the rural area depend on a main economy activity such as animal raising and agriculture, especially for self-consumption. Price fluctuations or demand decrease for their products might negatively impact the families' economy. Therefore, EnDev will identify localities with different local economy types, especially those that do not entirely depend on one economic activity (agriculture, animals) to minimize impact in the economy when the main products suffer decreases in their prices or demand falls.

Assumption: Migration/Disinterest in Developed Capacities

The model strongly depends on communal organization and participation. Local and communal capacities will be developed and accompanied. However, the local population may migrate or become disinterested in the process halfway, which would hurdle continuity and increase costs due to the need of new communal advisory work.

4. Expected Impacts of the Project Intervention

Limited access to modern energy services to light, cook and carry out productive activities affects different dimensions of social life, damages health and habitat, decreases family economic income, generates State expenditures on health and environmental management, and limits the mothers' time to educate their children -in particular their daughters- and to carry out other domestic and labour activities. All of this reproduces and increases the vulnerability of poor families, gender inequality, and environmental degradation. Within this framework and considering the impact suggested by EnDev's monitoring group, the line that develops lighting energy for households should focus in measuring the safety and reliability conditions generated by interior electricity connections and solar lighting systems. It should also measure its impact on the environment due to a reduced use of batteries. Another important measurement in this line is the increase of information dissemination through a greater access to the mass media. The component which develops cooking energy for households should focus in measuring impact on health improvements stemming from the reduction of respiratory diseases and eye infections, as well as the reduction of accidental burns. Likewise, it should also measure firewood consumption decrease since it helps with environmental care. Improved cook stoves also impact money and time savings that can be invested in other household education and work activities. As for the line that develops

productive uses, impacts to be measured are related to improvements in productive capacity, service quality, and economic revenues of small farmers, and producer associations which are generated thanks to a better use of modern and renewable energy services.

The impact monitoring and evaluation proposal is built around EnDev's sustainability approach. Such sustainability is achieved following success in the key dimensions below:

- Access to efficient and renewable energy services.
- Affordability of operation and maintenance along time.
- Effects on family wellbeing in terms of health, education, economy and environment improvement.

Monitoring and evaluation of these dimensions generate a holistic outlook of the results to be reached with the project's management model. In this line, a number of indicators have been identified to collect information in order to learn about the effect of EnDev's intervention in the wellbeing of target populations. The indicators are proposed at global level, same which will then be specified for each intervention line. The proposal is supported on empirical studies that EnDev has already undertaken in Peru. It is also supported on EnDev's monitoring group's proposals.

Key aspects to measure sustainable impact of energy services in human well-being	**Main indicators**
Access to energy services	Number of households with access to energy services facilitated by EnDev.
	Number and percentage of households that use technologies according to given technical recommendations.
Accessibility in terms of payment capacity and maintenance	Number and percentage of technologies that receive regular maintenance.
	Number and percentage of technologies which are repaired or substituted.
	Fuel expenditures for energy services per household.
	List of expenditures in fuel for energy services compared to household total revenues.
Effect on health, education, economy and environment.	Percentage of households that perceive there has been a reduction in health problems that were caused by the use of fuels in inefficient systems for cooking and lighting.
	CO and PM (PM 2.5 and PM 10) concentration in the kitchen following use of a certified improved cook stove.
	Percentage of households with improved cook stoves that use less firewood to cook.
	Frequency and time for recollecting and/or buying fuel for household energy services.
	Percentage of households with solar and electricity systems for lighting that use less batteries.
	Household perception on information and communication opportunities as well as changes related with access to lighting services.
	Women's perception regarding improvement of living conditions in the household thanks to the new energy services.
	Household use of money saved in buying fuels.
	Small farmers' revenue increase following use of new energy services.
	Household (and farmers) use of additional revenues from productive activities.

5. Budget

	EUR
1 Human resources and travelling	**1,815,644**
2 Equipment and supplies	**82,490**
3 Funding financing agreements/local subsidies	**562,221**
4 Other direct costs	**82,226**
5 Total direct costs	**2,542,582**
6 Mark up costs/administrative overheads/imputed profit	**457,418**
7 Cost price	**3,000,000**

E. Proposal for New Country Activity

Liberia

1. Situation Analysis

1.1. Energy Situation

Energy consumption in Liberia is dominated by biomass with a share of more than 90% of the used primary energy sources. Over 95% of the population depends on firewood and charcoal for cooking needs. Approximately 70% of the urban population (85% in Monrovia) use charcoal for cooking and 5% of the rural population. Thus, 95 % of the rural population uses firewood.

Modern energy services based on electricity and petroleum products are predominantly used for economic activities and transportation. The use of modern energy services such as electricity, and liquefied petroleum gas for lighting, cooking, and entertainment is limited to very few higher income households in urban areas.

According to the data of the government, about 10% of urban residents and less than 2% of rural residents have currently electricity access largely from self-generation with gasoline or diesel generators using expensive imported fuel. The access rate to public electricity is less than 1%. In March 2012 LEC served about 5,600 connections in Monrovia (approximately 2,500 residential connections from an estimated number of 210,000 households). A baseline study carried out by NORAD estimates that close to 90,000 households and businesses in Monrovia may be served by small gasoline and diesel generators.

1.1.1 Energy Supply

Electricity

The currently installed generation capacity is 23 MW of Diesel power. All stations are in or near Monrovia. With the exception of Gbarnga, capital of Bong County, there is no generation capacity outside of Monrovia beyond privately-owned generators and scattered donor-funded pilot projects. A number of Government agencies, community organizations and private sector establishments in rural locations in several counties have been able to receive diesel generators and solar power systems through USAID, the United Nations Development Programme, and some NGOs. However, data on the energy supply outside Monrovia is scarce. The amount and location of households using solar PV systems in Liberia is not known. There is no data on biogas or wind energy projects identified in the country. Only one small wind turbine has been noticed in Monrovia. The wind resource is generally considered to be poor. Currently, there is no data on the number of people using stand alone diesel plants in the country.

Liberia has one of the highest public tariffs in the world at a range of $0.40/kWh to $0.56/kWh. The tariff is calculated on a quarterly basis taking into account the price of the fuel and the equipment, service schedule, cost of overhauls, 20 percent of technical and nontechnical losses, US$0.02/kWh for distribution operation and maintenance costs, the LEC’s administrative costs, and 93 percent efficiency in collections. The generation cost is estimated at US$ 0.32/kWh. The total cost of self-generation is estimated at not less than US $0.75/kWh; while the marginal cost is about 0.60 US$/kWh. The GoL subsidizes the balance

of LEC's costs and is expected to continue doing so during the transition to cheaper medium-term generation options now under active investigation and planning.

Liberia has considerable potential for hydroelectric power. At the onset of civil war there were three (3) operational hydroelectric power plants in Liberia: Harbel (Firestone), 4MW; Mount Coffee (LEC), 64MW; and Yandahun (a community micro hydro in Lofa County), 30KW. The Mount Coffee and Yandahun plants were destroyed during the war, but the Harbel plant is still operational. At least 14 sites for large scale schemes were identified in feasibility studies over the period 1976-1983. The major drawback is that all suffer from the problem of low-head flow, requiring huge investment in storage or reservoir to maintain firm capacity during the dry season. About 24 other sites have been identified for small hydroelectric schemes (up to 5 MW).

Biomass

With some 60% of the land covered with forests (5.7 million hectares), there is no lack of trees in Liberia. There are 11 designated National Forests in the country (under limited protection), and two legally protected areas, Sapo National Park (approximately 149,000 ha) and East Nimba (about 15,000 ha).

In addition, a significant amount of biomass waste is produced as a result of logging operations and agricultural activities. The US national Renewable Energy Laboratory (NREL) estimates that the annual waste from logging operations could reach 20 million m^3 (162,645 TJ/year), of which 10.9 million m^3 at sawmills and the remainder at the logging site; most of that waste would be lost. The annual waste at the sawmills would be able to produce 100 million bags of charcoal, if all waste were convertible into charcoal; this is much more than is currently used in the country.

NREL further estimates that of the total cropland in Liberia, 37% of the territory, only 6% is currently cultivated. The remaining cropland amounts to some 3 million hectares, which indicates that in addition to existing resources, there is a large potential for new crops including tree crops that could yield resources suitable for charcoal production. Large-scale rubber plantations (>800 ha) in Liberia today cover an area of approximately 58,000 hectares, some of which are in close vicinity of Monrovia. There are also smaller rubber plantations (5-800 ha) and numerous household plantations below 5 ha each. An active rubber plantation annually generates considerable amounts of wood residues from pruning and replanting activities, which are used for making charcoal. Trees need replacement after 25-30 years when these cease to be productive; approximately 81 dry tons of wood (trunks, branches) can be obtained per hectare of old trees (about 180 m3 of green wood).
Oil palm trees are abundant in the coastal regions, on family plots, in the wild, and on abandoned plantations (30,000 ha). Most trees are at the end of their productive life. It is unknown if old trees are converted into charcoal.

The average household farm is 1.2 ha, and 6% of the 353 thousand farms have coconut trees as a cash crop, 13% have oil palms, and 32% cacao trees.

1.1.2 Energy Consumption

Electricity

Estimates of the current level of electricity demand range from 11 to 25 MW. The International Finance Corporation (IFC) forecasts a total demand for Monrovia and its environs of 34 MW by 2015, and 41 MW by 2020. However, the demand may easily be in excess of 350 MW by 2020 and reach the pre-conflict level of 400 MW. Industries which are large consumers of energy are looking at Liberia for opportunities to re-invest. Cement processing, rubber processing, breweries, and other factories and industrial operations have a huge demand for power. Prior to the civil conflict, the iron ore industry consumed about 210 MW of electricity. Although none of these former mines are currently in operation, the Government has prioritized their re-opening in the short to medium term, beginning with a recent concession agreement with ArcelorMittal for one of the former mines. The next two concessions for the Western Cluster iron ore deposits and the Old Bong Mines will be awarded soon. Furthermore, aggressive mineral exploration and resource appraisal programs for additional iron ore deposits are underway. The prospects for new hard rock mines for minerals such as gold, diamonds, uranium, and bauxite are very promising. The demand for energy for these operations in the medium and long term will be very significant, and without a strong Government energy policy, the requisite power to fuel these mining operations will not be developed.

Almost 74% of Liberia's population resides in rural areas, while the remaining 26% live in and around the urban center of Monrovia. Rural households spend a significant amount of their meager income on inferior forms of energy such as candles, flashlights, and kerosene or oil lanterns for lighting. Higher fuel costs are a result of long transportation distances, fragmented delivery systems, and absence of economies of scale.

Biomass

According to the Central Bank of Liberia (CBL), a total of 255 tons of commercial charcoal was consumed in 1999. These official figures highly underestimate actual charcoal consumption. The National Charcoal Union of Liberia (NACUL) estimated that charcoal consumption in Liberia went up to 36,500 tons in 2005 and that 960,000 trees were cut around Monrovia every year. Recent studies estimate a charcoal consumption of 280 tons per day with a value of 43,000 USD or 102,200 tons per year. Charcoal production and commercialization are entirely run by private operators and community-based organizations.

There is no reliable data on firewood consumption in Liberia, but findings from a survey conducted by CSET in 2004 indicate that scarcity of firewood could become a problem in some parts of Liberia, especially in Montserrado County. Annual consumption of firewood in rural Montserrado County is estimated at $18m^3$ per household. Forecast for the country estimates an annual increase in demand of about 0.6 m^3 per household. Other estimates foresee an annual increase in demand of about 0,43 m^3 per person. However, the number of trees available is still so large and the population density is relatively low so that collection of firewood most likely does not pose a problem in the short and medium run. The potential for serious environmental damage to wood resources as a result of charcoal production is more severe.

1.2. Energy Policy and Energy Strategy

The Government of Liberia (GOL) is considering energy access for the population, particularly for the previously neglected rural poor a cornerstone of its policy. The GoL published in 2007 a Renewable Energy and Energy Efficiency Policy and Action Plan. In the document the government outlines its policy to build and increase the application of renewable energy and energy efficiency technologies in Liberia by promoting investment, technology transfer, market development and local capacity building. In 2009 a National Energy Policy (NEP) was formulated which further developed the ideas of the Policy and Action Plan. NEP defines as principal objective of the national energy policy to ensure universal access to modern energy services in an affordable, sustainable and environmentally-friendly manner in order to foster the economic, political, and social development of Liberia. In addition, the GoL declares its intention to drive Liberia towards a carbon neutral economy by 2050.

Short term objectives of the policy are that by 2015:

- 40% of Liberian citizens living in rural and peri-urban areas and using traditional biomass for cooking shall have access to improved stoves and kerosene or efficient-gas cookers in order to reduce indoor pollution;
- 30% of the urban and peri-urban population shall have access to reliable modern energy services enabling them to meet their basic needs (lighting, cooking, communication, and small production-related activities);
- 15% of the rural population and 25% of the schools, clinics, and community centers in rural areas shall have access to modern energy services to meet the same basic needs.

The GoL expects to achieve its access goals for 2015 while reducing greenhouse gas emissions by 10%, improving energy efficiency by 20%, raising the share of renewable energy to 30% of electricity production and 10% of overall energy consumption, and increasing the level of biofuels in transport fuel to 5%. The NEP is considered a key contribution to the poverty reduction policy of the government as outlined in the Poverty Reduction Strategy (PRS).

1.3. Institutional Set-up

Ministry of Lands, Mines and Energy (MLME): The key roles and responsibilities of the Ministry especially the Department of Energy (DoE), among others, are to facilitate the provision of energy to the domestic, commercial and industrial users by public enterprises and the private sector, through the development of an efficient regulatory, planning and implementation framework. It also supports research and promotes the development of local energy resources such as hydro-power, biomass, solar, wave and wind energy. Furthermore it promotes energy conservation measures which improve both technical and economic efficiency in energy use.

Rural and Renewable Energy Agency (RREA): The RREA is the agency dedicated to the commercial development and supply of modern energy services to rural Liberia with emphasis on utilizing available local renewable energy resources. The RREA's mandate includes integrating energy into rural development planning; promotion of renewable energy technologies; facilitating delivery of energy products and services through

rural energy service companies (RESCOs) and community initiatives; and facilitating the funding of rural energy projects including managing a Rural Energy Fund (REFUND). The REFUND aims to provide for the coordinated and sustainable financing of projects and programs for the delivery of modern energy services for rural development. REFUND is intended to become the channel through which all domestic and international financial resources intended for rural energy delivery in Liberia shall be managed. REFUND shall mobilize funding through a) energy taxes, levies, and fees; general taxes; user fees and capital contributions; voluntary corporate social responsibility contributions in the country and b) bilateral and multilateral loans and grants; carbon finance.

The three main uses of the REFUND will be:

- Capacity building – Support for the operating budget of the RREA, marketing and promotion of renewable energy technologies, and technical assistance (research and development, feasibility studies, business planning, training and development, etc.).
- Project and consumer finance – This includes provision of grants to match community contributions for approved rural and renewable energy projects and programs; provision of subsidized loans for projects that cannot be funded through commercial financial services; provision of consumer loans through micro-credit financial institutions.
- Risk management – This includes provision of partial or full guarantees for approved rural and renewable energy projects and programs that can be funded through commercial financial services but where the project promoters do not have the collateral needed.

RREA plans to work out a Rural Energy Master Plan, which will provide a prioritized development program to achieve universal energy access. Together with a Grid Development Master Plan, the country's long-run marginal cost can then be derived to serve as a strategic planning guide.

Energy Regulatory Board (ERB): ERB approves the tariffs of the national grid and shall also approve tariffs and prices set by the operators of mini-grids once they exist. The general policy is that energy services should be provided on a full cost-recovery basis to those who are able to pay and on a targeted subsidized basis to those who can only afford to pay a portion of the cost. The Government intends to establish a regulatory process for monitoring all costs – economic, financial, social, and environmental – and allocating these to the user (rate payer or polluter) or public (taxpayer) as appropriate.

Bureau of Standards: is responsible to establish standards to ensure accuracy of meters and gauges, product safety, security, reliability, consistency, purity, and availability as well as timeliness in responding to stakeholder service requests.

Liberia Electricity Company (LEC): The utility is managed by a joint venture between Manitoba Hydro International and Kenyan Power and Light Corporation based on a 5-year Management Contract (MC) that started on July 1st, 2010. The management is supervised by a Board that is supported by NetGroup (RSA) in its monitoring and supervisory role. The MC incorporates a results based financing component. It includes performance fees and penalties for over and under performance, respectively, on key indicators. In addition, reduction/increases in operational costs will lead to performance/penalty fees.

A key aspect of the MC is that the target indicators were to be based on the initial (tentative) commitments from donors for investment contributions, totaling $53million over the 5 years.

Thus, the Operator has a strong incentive to use donor contributions effectively and achieve improved results. In addition, the World Bank has committed some $2million per year in OBA financing. Further to the performance indicators, the Operator is required to carry out a range of training activities and has rather extensive reporting requirements.

Performance indicators include:

- reduction of technical and non-technical losses from 23% to 12%,
- generation efficiency,
- increase of the billing and collection rate from 94 to 97%,
- removal of illegal connections/networks and correction of metering discrepancies and
- to connect additional 10000 customers.

1.4. Major Donor Activities

1.4.1 Main Energy Programmes and Activities in the Past:

In 2006, the Emergency Power Program (EPP) started to re-establish public power supply as part of the Government's political stabilization and economic reconstruction program. Several international partners, including the United States Agency for International Development (USAID), Norway, the European Commission, and the World Bank provided over US $40 million in grant funding and technical assistance. As a result of EPP, power generation based on diesel with a capacity of 9.6 MW, 80 km of transmission and distribution network were restored, 1,000 street lights installed and over 2,500 customers in Monrovia served. As a next step power generation capacity was increased to 23MW with 10MW financed by USAID and 3MW by Norway

The Liberia Energy Assistance Program (LEAP) was a parallel initiative undertaken by the International Resources Group (IRG). LEAP was composed to support LEC, e.g. on prepaid meter systems, the Energy Sector Reform (establishment of a Rural and Renewable Energy Agency (RREA) and the development of a National Energy Policy (NEP). LEAP also financed installation of different energy systems including PV system on social institutions.

1.4.2 Ongoing or New Energy Programmes

Norway provides roughly 50 million EUR for the support of the energy sector. Several programs are implemented that cover nearly all aspects of the sector's development:

The "Gaps" Project has been providing funds to improve access to electricity among the residents of Monrovia (3,500 new connections). Additionally, the project has improved safety through installing street lights (100).

The project to support the Liberian Electricity Corporation contributes a) to strengthen the management of LEC through an international operator and to develop LEC towards a competent, professional, financially robust and responsible electric utility, and b) to implement the investment plans among other the rehabilitation of the hydro power station Mt Coffee.

The institutional programme between the Norwegian Water Resource and Energy Directorate (NVE) and Ministry of Lands, Mines and Energy (MLME) (2010 to 2015) has the objective to

develop skills at monitoring and managing water and energy resources through capacity building at the Ministry of Lands, Mines and Energy.

The programme is based on the following six components:

- Preparation of a legal and regulatory framework for the power sector
- Capacity building in the MLME and the LEC, and other government agencies.
- Generation, planning and coordination
- Upgrading of the national hydro meteorological network and database
- Rural and renewable energy
- The gender aspects and women's empowerment in the energy sector

Germany has committed funds from a regional programme to finance the rehabilitation of Mount Coffee hydro power plant through **KfW development bank**. Through the same programme, Germany supports the integration of the national Liberian electricity grid into the West-African Power Pool (WAPP).

The **World Bank** is carrying out the Liberia Electricity Enhancement Project (LESEP) since 2010. The total project budget was 51 m USD (10 m IDA, 10 m GPOBA, 2 m AFREA and 29 m NORAD). The project includes the following components:

Component A. Enhancing delivery of distribution services, including for low-income households;

- Sub-component A.1: Distribution network reinforcement and extension (IDA).
- Sub-Component A.2: Connection of new low-income costumers (GPOBA).
- Sub-Component A.3: Distribution network reinforcement and extension (Government of Norway).

Component B. Enhancing options for power generation (IDA)

Component C. Providing modern renewable energy services to off-grid users

- Sub-component C.1: Renewable energy pilot activities in rural areas (AFREA, GEF).
- Sub-component C.2: Technical Assistance (AFREA, GEF).

Component D**.** Technical assistance for the Ministry of Lands, Mines and Energy (IDA).

As part of the program GPOBA is financing new connections to the grid, so that the targets for additional connections for 2012 and 2013 are 20,000 customers of which approximately 16,000 will be poor or low income residential. The budget is 10 Mil. USD or 500 USD per connection.

LESEP was recently up scaled with additional $ 56,9 m (including 33 m from JIPCA, 1,45 m GEF and 0.5 m Norway) in support of grid and off-electrification.

USAID – New Renewable Energy Programme:

$24 m over 4 years; $4 m into power generation; $4 m into institutional support for implementation of NEP

Focus:

- (community-run) MHP
- Biomass (residue use)

Winrock International has a four-year (2010 to 2014) contract to support USAID/Liberia in their efforts to increase access to affordable, renewable energy services in geographically focused rural and urban areas. The project is entitled the Liberia Energy Sector Support Program, LESSP. The focus of this programme is capacity development of governmental institutions to strengthen the GOL's capacity to implement plans for rural electrification as expressed in the national energy sector policy.

2. Planned Outcome

Energy Service Segment	Target
Energy for Lighting & Electric HH Appliances	5,500 people
Cooking Energy for Households	5,000 people
Electricity and/or Cooking Energy for social infrastructure	10 institutions
Energy for productive use/ income generation	150 enterprises

3. Project Approach

3.1. Energy Technologies and Services Promoted by the EnDev Programme

It is suggested that EnDev should promote Pico PV systems, mini-grids based on hydro power or PV/Diesel hybrid systems in the electrification of households category, improved charcoal stoves in the cooking energy for households category, PV systems for social institutions in combination with charging stations or solar kiosks and, solar dryers for productive use.

EnDev should not invest resources in grid extension. Grid activities are already financed by several other donors. In addition, costs to connect a household are relatively high (500-1000 USD) so that the cost efficiency is around 100-200 USD per person).

3.2. Approach to Provide Electricity to Households

Pico Photovoltaic Systems

EnDev will use a commercial approach to promote the use of Pico PV. Systems will preferably be disseminated that have a brightness of at least 50 lumen. The chances to develop a self sustainable market for these products are good. Households in Liberia already spend roughly 5 USD per month on inferior lighting technologies such as candles, flashlights, small battery-operated LED lamps, and kerosene or oil lanterns; they also create "jack-o'-lanterns"—crude lamps using milk cans, cloth wicks, and palm oil, which create dense and harmful smoke. Many of them are willing to spend at least 10 USD a month to have electric light.

EnDev will closely cooperate with the Lighting Africa program and help to implement the program. The Rural Renewable Energy Agency, which is in charge of the program, needs urgently experienced human resources to manage the program including monitoring progress and impacts. In addition, EnDev will test new approaches that could accelerate market development for PicoPV products:

- Selling Pico PV products through existing distribution chains for kerosene, electric products or other supply chains. A possible implementing partner is Total that is interested to market solar products through their “bonjour” gas station shops. Total has a network of currently 20 gas stations all over Liberia that will be expended to 50 stations in the near future. The gas station could also serve as warehouse for local sales agents that sell lanterns in their community.
- Selling innovative Pico PV products through local sales agents, shops and outdoor markets. Possible partners are the solar retailers participating in the Lighting Africa program, Agro Action (Welthungerhilfe), SOS Child Villages and GIZ “Development Oriented Emergency and Transitional Aid” program.

It is expected that 2000-3000 PicoPV system of different size will be sold providing basic electricity to 5000 persons.

Mini-grids

EnDev will support the installation of one pilot mini-grid up to a size of 100 kW to develop local management and operations skills. The total costs should not be more than 5000 USD per kW. Three technical options will be evaluated in detail beforehand: a) mini-hydro power plant, b) river turbines and c) PV/diesel hybrid systems. The purpose of the pilot would be to gain experience with construction and operation of such a system in Liberia. Different ownership and operation models as well as experiences of other organisations will be assessed beforehand. Selection of a suitable site and technology will include geographical, technical as well as social aspects including the existence of a structure at place able to manage and operate such a mini-grid. It is expected that the mini-grid will provide roughly 50 households with electricity. The design will also include urgently needed energy efficiency measures.

3.3. Approach to Provide Clean Cooking Technologies to Households

EnDev will carry out some pilot activities to see to which extend urban and rural households respond to the availability of energy efficient and clean-burning cooking technologies. It cannot be expected that these cooking technologies will disseminate quickly and have a huge demand as the frame conditions are not as favourable as in other countries. People in rural area face no serious lack of firewood. The distances needed to collect enough fuel wood for household consumption are not high. Households in rural areas generally cook outside their huts, so that indoor air pollution is not such a severe health problem motivating them shift to a more clean-burning stove.

Prices for charcoal are relatively low so that also for urban household there is no strong incentive to buy energy efficient stoves. However, the cost recovery period of any energy efficient charcoal stove that does not cost more than 10 USD and reduces charcoal consumption by at least 20% would be less than three months. The challenge is to create sufficient awareness among consumers to understand and appreciate that benefit. EnDev will import some charcoal stoves that are successfully disseminated in other African countries. The stoves will be offered to local retailers for marketing. If the demand is sufficient, local craftsmen may be trained in the production of the most accepted stoves. Parallel a marketing campaign will be carried out to create awareness among the households about the advantage of modern stoves.

3.4. Approach to Provide Access to Modern Energy Services for Social Institutions

SHS for schools and other social institutions should preferably be installed in combination with battery charging stations or solar kiosks that offer charging services to the community. The system could be managed by teachers or selected operators. Selection of suitable institutions should be done in cooperation with the different ministries and the above mentioned cooperation partners. In a pilot phase 10 SHS will be installed.

3.5. Approach to Provide Access to Modern Energy Services to SMEs

EnDev will support the dissemination of solar dryers for agricultural products for small and medium enterprises. A close cooperation with the GIZ program “Development Oriented Emergency and Transitional Aid (DOETA)” is recommended. The program is supporting farmers in the Foya district in Lofa County in rice and cacao production and processing. The project activities will soon be extended to the Kolahun district. Cocoa which is harvested during the rainy season must be dried for commercialization. EnDev will support the design and construction of 150 solar dryers, which will be owned by farmers associations and benefit roughly 1500 families. In addition farmers will be trained in drying technologies and local technicians in the construction of solar dryers.

4. Expected Impacts of the Project Intervention

Impact	Possible Indicators
Environment	Reduction of charcoal consumption through the newly introduced stoves. Reduced CO^2 emissions through reduced firewood and charcoal and kerosene consumption. Exact figure will be calculated according to international standards.
Poverty/Livelihood	Up to 1,100 households have improved their living conditions through the provision of clean lighting energy
Education	Up to 500 children have improved their learning facilities by availability of light
Governance	RREA will be more effective in managing projects in the field of access to modern energy services Several cooperating partner organisations will be qualified in solar technologies

5. Budget

	EUR
1 Human Resources and travelling	**200,000**
2 Equipment and Supplies	**100,000**
3 Funding Financing Agreements/Local subsidies	**330,000**
4 Other direct costs	**40,000**
5 Total direct costs	**670,000**
6 Mark up costs/administrative overheads/imputed profit	**80,000**
7 Cost price	**750,000**

The budget will be up-scaled with 240,000 EUR if the following milestones are achieved:

Milestones:

Category	**Aggregated number of persons receiving access**	
	II.2012	I.2013
1. Household Electrification	1,200	3,500
2. Clean Cook Stoves for HH	1,000	2,500

The following rules are applied:

- The project budget is increased by € 60,000 for every milestone (+/- 10%) being achieved for the period II.2012 to I.2013.
- It is possible to compensate missing of one milestone by certain percentages with overachievement of a milestone in another category by the same extent.
- Delays can be compensated by accelerated activities in the following periods.
- Any change of the milestones needs approval by the Governing Board.