PPR report

Country: Peru

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Lead executing agency:

GTZ in cooperation with COPASA

Evaluation team:

Dr. Carsten Hellpap, GTZ

Verena Brinkmann, GTZ

Els Huntjens, SenterNovem

GTZ officer:

Gustavo Wachtel

Date:

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1 Summary

Around 40% of the population of Peru has to live with less than 2 USD (1,34 EURO) a day. Poverty is widespread especially in rural areas, where mostly indigenous people live. Main reasons for the poverty are the limited access to natural resources such as land and water, lack of productive and public infrastructure and inefficient production technologies. The problems are even aggravated by deforestation caused by a high consumption of firewood. Poor families have generally no access to modern energy services. In addition, the living conditions of poor families in the Andean regions are affected by natural disasters such as earthquakes, drought, and landslides.

Peru has an electrification rate of 78,7% on national level. However, 60% of the rural population does not have access to this service, which is one of the lowest rural electrification rates in Latin America. The service quality in the electricity sector is relatively good. Several factors handicap rural electrification in Peru; the main factor however is a lack of financial resources for investments in grid extension and installation of minigrids.

In rural areas the predominant energy source is biomass, which is used for cooking. Out of the total of Peruvian households, 42% (around 9 Mio people) use biomass (firewood, charcoal, dung, agricultural waste) to cook. In most cases they cook with traditional open fire stoves.

Since the weather is cold and windy in the Peruvian Andes, women generally cook in kitchens with small windows and almost no air circulation, causing a serious and constant threat for the health of their families.

Fuel from biomass is scarce and firewood is becoming a commodity. There is a growing energy crisis, most of all in areas over 3.800 meters above sea level, where the key source of energy for families is wood. Other biomass resources are exploited with consequences like erosion and decrease of plant species.

Energy for social infrastructure resembles the families' situation, both for cooking and for hot water availability. In 90 % of the health care centres in the Andean area of Arequipa exists a lack of warm water that is required for patient care instruments and material handling.

EnDev Peru is improving the access to modern energy in rural areas, for households, social institutions and small enterprises. The types of modern energy services are: a) grid electricity, b) energy efficient stoves and c) solar thermal water heaters.

The project runs from March 2007 until July 2008. The target number of people to be reached is estimated at approximately 79.000 with a budget of €700.000. The number reached until the end of April 2008 is almost 32.000.

Beneficiaries state that the impacts of the project intervention are noted. The main impacts mentioned are:

- Improved living standard and comfort in households due to electricity or improved cooking devices;
- A saving of money due to a saving on lightning devices or firewood.
- Reduced risk of accidental burns of houses due to the change of kerosene lamps and candles for electric bulbs and the change from open fires to improved cooking devices.

Most of the interventions are in compliance with the so-called EnDev Criteria:

- Cost efficiency: The overall cost efficiency, meaning the cost per person with access to modern energy, comes to €12,66. It is a very cost efficient operation compared to other projects. The main reason for this low figure is due to the low cost for grid connections; people who get connected to the grid pay a large amount of the money needed.
- Sustainability: the project pays a lot of attention to this criterion, e.g. by training local people in the maintenance of the services provided. Especially for improved cooking devices it is important to develop a commercial market.
- Scaling-up potential: for all interventions there is a great potential for scaling up.
- Additionality and newly provided access: all interventions provide new access, as government, private companies and the customers themselves are not able to afford the provision of energy.
- Accountability: In the region of Arequipa there are no other donor-funded projects working on the same theme.

The main recommendations are:

- Upscale the project with 1 Mio from EnDev 1 and another 1 Million from the EnDev II budget.
- Continue with the activities in Arequipa at least with the same approaches and intensity, plus extent the project activities to for example ICA
- Develop a strategy to reduce subsidies on the long run and develop a local market
- Pay more attention to the business interests of the different producers in the value added chain (may include increase of the fees for the installers)

2 Situation analysis and framework conditions

2.1 Poverty situation

The Human Development Index for Peru is 0.773, which gives the country a rank of 87th out of 177 countries. Around 40% of the population has to live with less than 2 USD (1,34 EURO) a day. Poverty is widespread especially in rural areas, where mostly indigenous people live. In rural areas of the Arequipa regional state for example a family owns only 100 to 300 Soles per months, equal to € 25 to 75. It is estimated, that 95% of the population in the remote areas of Arequipa are poor, out of them 25% extremely poor. Main reasons for the poverty are the limited access to natural resources such as land and water, lack of productive and public infrastructure and inefficient production technologies. The problems are even aggravated by deforestation caused by a high consumption of firewood. Poor families have generally no access to modern energy services (see table below).

Table 1: correlation between poverty and biomass use (source INEI, Peru's National Statistics Institute)

Poverty level	Percentage (%)		
	1997	2001	2002
Extreme poverty	34.45	80.21	77.75
Poverty	28.36	51.28	46.03
Not poor	37.2	24.19	23.49
Total	39.22	45.75	42.97

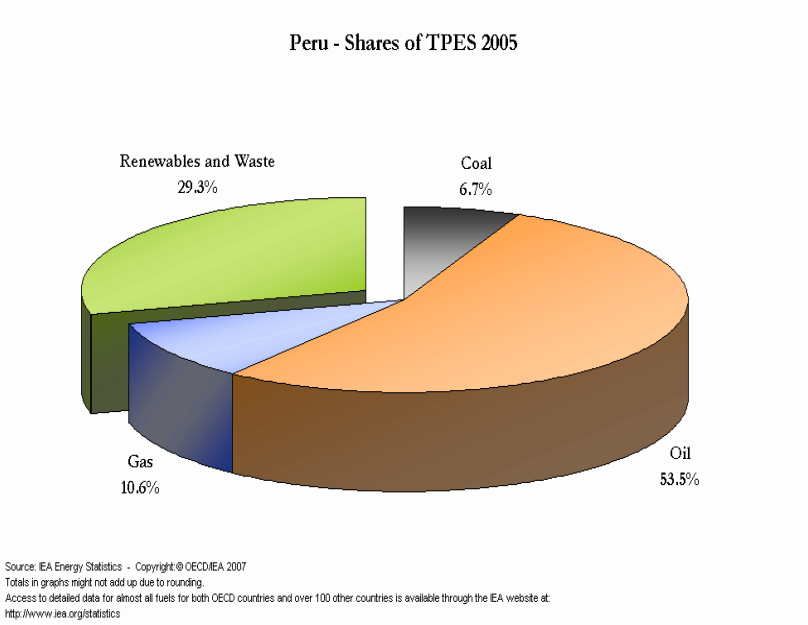
Source: INEI 2001.

In addition, the living conditions of poor families in the Andean regions are affected by natural disasters such as earthquakes, drought, and landslides. In 2001, an earthquake destroyed part of the infrastructure of Arequipa and left many households without shelter. The same happened to many households in the regional states Ica, Lima y Huancavelica on August 15th, 2007 when one of the strongest earthquakes in the last 50 years shaked the country. The supply of water and electricity was interrupted and could be partially restored. In addition hundreds of social institutions, such as health centres and schools were seriously damaged.

2.2 Energy situation especially in rural areas

2.2.1 Energy for electricity generation

The gross electricity generation of Peru is currently around 27,000 GWh, based on a installed generation capacity of 6,7 GW. The annual electricity consumption is around 22,3 billion kWh. Power is generated by thermal plants using gas or oil (52%) and hydroelectric plants (48%), with a negligible share of other renewable sources. Even though installed capacity is evenly divided between hydroelectricity and conventional thermal, 72 percent of Peru's total electricity generation generally comes from hydroelectric facilities: conventional thermal plants generally operate only during peak load periods or when weather factors dampen hydroelectric output.



Peru is producing some oil, but it is not sufficient to cover domestic demand. Besides, natural gas has started to be exploited for domestic and industrial use in Lima and for exporting. The electricity sector of Peru is quite dynamic with an estimated 9.3% increase in generation during 2007, which is expected to reach 30 TWh. This increase is mainly due to the existing positive conditions for thermal generation through the use of natural gas in new plants and also to an increase in hydroelectric generation due to the availability of hydrological resources in the existing hydroelectric facilities.

Peru has an electrification rate of 78,7% on national level. However, 60% of the rural population (more than 6 Mio. people) does not have access to this service, which is one of the lowest rural electrification rates in Latin America.

The service quality in the electricity sector is relatively good. In 2005, the average number of interruptions per subscriber was 14.5, while duration of interruptions per subscriber was 18.3 hours. Both numbers are very close to the averages of 13 interruptions and 14 hours for the Latin-American region. Distribution and transmission losses in 2006 amounted to 11% of total production. Distribution losses were 6.3%, down from 22 % a decade before and below the 13.5% average in Latin America. Transmission losses for the same year have been estimated at 4.7%.

2.2.2 Energy for cooking purposes

In rural areas the predominant energy source is biomass, which is used for cooking. Out of the total of Peruvian households, 42% (around 9 Mio people) use biomass (firewood, charcoal, dung, agricultural waste) to cook. In Arequipa and some other regional states the percentage is lower (25%), as 72% of the 1.3 Mio inhabitants live in the city of Arequipa, where the predominant cooking energy fuels are kerosene, gas and electricity. But also in these regional states rural families use almost exclusively firewood for cooking. In most cases they cook with traditional open fire stoves. Thus, 90% of Andean families use this resource intensive technology.

Since the weather is cold and windy in the Peruvian Andes, women generally cook in kitchens with small windows and almost no air circulation, causing a serious and constant threat for the health of their families. Very often the level of indoor air contamination recommended of WHO is exceeded by far because of the inefficient burning of biomass. Hence, respiratory infections are quite common among poor and rural people. Studies carried out by the Pan American Health Organization in Peruvian districts, have shown direct

correlations between respiratory infections and the years of exposure to smoke from traditional fires. Usually women and young children are affected mostly. Exposed to thick smoke they spend minimum five hours daily in the kitchen, which has a serious impact on their health. The older the women the more they have been exposed to this indoor air pollution and the more they suffer from respiratory illnesses as bronchitis and cough. Further, it was proven that the risk of chronic bronchitis is connected with the exposure to smoke from biomass burning in the childhood. Especially infants under 5 years are affected by acute respiratory infections (ARI), which is responsible for almost 20% of all deaths in this age group.

The WHO published the IAP National Burden of Disease Estimates in 2007. To compare, globally in 2000, indoor air pollution was responsible for more than 1.5 million deaths and 2.7% of the global burden of disease (GBD). For Bolivia the GBD is 1,9%, Guatemala 3,1%, Colombia 0,4% and Ecuador 0,1%. In Peru the percentage of national burden of disease attributable to biomass fuel use is 0,9 %.

Fuel from biomass is scarce and firewood is becoming a commodity. There is a growing energy crisis, most of all in areas over 3.800 meters above sea level, where the key source of energy for families is wood. Instead they have to use dry grass, dung and yareta, an almost extinguished plant that needs 850 years to grow. Biomass resources are exploited with consequences like erosion and decrease of plant species.

Energy for social infrastructure resembles the families' situation, both for cooking and for hot water availability. In 90 % of the health care centres in the Andean area of Arequipa exists a lack of warm water that is required for patient care instruments and material handling.

2.3 Institutional set up and actors in the energy sector

Peru's energy sector was privatised in the 90s and concessions were granted for power generation, transmission and distribution. Nevertheless, the Peruvian government still maintains an important position within the sector. While investment in generation, transmission and distribution in urban areas is predominantly private, resources for rural electrification come solely from public sources.

2.3.1 Public institutions

The National Electricity Office (DGE - Dirección General de la Electricidad), under the Ministry of Energy and Mines (MEM), is in charge of setting electricity policies and regulations and of granting concessions. It is also responsible for elaborating generation and transmission expansion plans and has to approve the relevant procedures for the operation of the electricity system.

The Energy and Mining Investment Supervisory Body (OSINERGMIN - Organismo Supervisor de Inversión en Energía y Minería), is in charge of enforcing compliance with the Electricity Concessions Law (LCE) of 1992 and is also in charge of ensuring the electricity public service. OSINERG is as well the body responsible for enforcing the fiscal obligations of the license holders as established by the law and its regulation. Finally, it is responsible for monitoring compliance of the System Economic Operation Committees (COES) functions and for determining biannually the percentages of market participation by the companies.

In 2000, OSINERG was merged with the Electricity Tariffs Commission (CTE), currently known as Adjunct Office for Tariff Regulation (GART). Together, they are in charge of fixing generation, transmission and distribution tariffs and the tariff adjustment conditions for the end consumers. They also determine the tariffs for transport and distribution of gas by pipeline.

As for rural electrification, the National Rural Electrification Office (DGER) is in charge of the National Rural Electrification Plan (PNER), which is framed under the policy guidelines set by the Ministry of Energy and Mines. DGER is in charge of the execution and coordination of projects in rural areas and regions of extreme poverty.

Finally, the National Institute for Defense of Competition and the Protection of Intellectual Property (INDECOPI) is in charge of monitoring compliance with the Anti-monopoly and Anti-oligopoly Law of 1997.

2.3.2 Electricity companies

Power Generation:

In 2006, 38 companies generated electricity for the market, while 78 companies produced electricity for their own use. Among the 38 companies supplying energy to the market, four of them accounted for 70% of the total capacity:

- EDEGEL S.A.A.: 1,574MW
- Electroperú S.A. (ELP): 1,032 MW
- Energía del Sur S.A. (ENERSUR): 725 MW
- EGENOR: 522 MW

ELP dominates hydroelectric production, with 32% of the total, while EDEGEL leads thermal generation also with 32% of the total.

Private companies dominate the generation sector. In terms of participation, state companies hold 31% of generation capacity, with the remaining 69% in private hands. Production percentages are 40% and 60% for the public and private companies respectively.

The single largest generating company in Peru is Electroperu, majority-owned by the Peruvian government, which operates the Mantaro hydroelectricity complex, the largest hydroelectric facility in the country.

The main electricity producer of Arequipa is the enterprise “La Empresa de Generación Eléctrica de Arequipa S.A. – EGASA”, which is running 6 hydroelectric and 4 thermal plants.

Transmission:

In Peru, 100% of the transmission activities are in private hands. In 2006, there were 6 purely transmission companies that participated in electricity transmission in Peru: Red de Energía del Perú S.A. (REPSA), with 28% of the transmission lines; and Consorcio Energético Huancavelica (CONENHUA), Consorcio Transmantaro S.A. (S.A. Transmantaro), Eteselva S.R.L, Interconexión Eléctrica ISA Perú (ISAPERU) and Red Eléctrica del Sur.S.A. (REDESUR), with 15% of the lines. Generation and distribution utilities and the companies

that generate electricity for their own consumption operate the remaining 57% of the transmission lines. The largest electricity distributor in Peru is Edelnor, a subsidiary of Endesa, which operates in Lima and the surrounding area. Peru has two main power transmission grids, one covering the north and centre parts of the country, the other serving the south. An interconnector runs between the two along the Pacific coast. The largest transmission company in Peru is the Colombia-based ISA Group, which controls over half of the transmission grid in the country through its subsidiaries Red de Energia del Peru and Interconexion Electrica ISA. Peruvian law ensures that all generating and distributing companies have fair, non-discriminatory access to the national transmission grid.

Distribution:

In 2006, 63% of the electricity was commercialised by 22 distribution companies , while the remaining 37% was commercialised directly by generation companies. The companies that stood out for their sales to end-consumers were: Luz del Sur (21%), Edelnor (21%), Enersur (9%), Edegel (8%), Electroperú (5%), Hidrandina (4%), Termoselva (4%) and Electroandes (4%).

Public distribution companies supply electricity to 55% of the existing clients, with the remaining 45% in hands of the private utilities. However, in terms of electricity distributed, private companies have the lead with 71% of the total as opposed to 29% for the public ones.

The main distribution company in Arequipa Is SEAL (Sociedad Eléctrica de Arequipa Ltda). SEAL is mainly state owned (84% of the shares) with 15% private shareholders. It is also running 6 power plants (3 hydropower and 3 thermal plants).

2.4 Policy framework

2.4.1 Energy policy

After the power sector reform in the early 1990s, rural electrification in Peru has been limited to direct investment by the central government, without any additional funds from communities, regional governments or service providers. One important issue deterring electricity distribution companies from investing in rural electrification is the fact that they hold concession areas concentrated in small areas around urban centres and are only under the obligation to meet service requests within 100 meters of the existing network. In order to expand coverage, the Government of Peru is implementing the “plan nacional de electrificación rural 2005-2015” which defined as objective to achieve a national electrification rate of 93,1% till the year 2015 and a reduction of the electrification gap, aiming to increase rural coverage from 30% to 75% by 2013. The investment requirement are calculated to be US $ 928,9 million (€ 623 million) benefiting 4,8 million people. The plan is backed by a Rural Electrification Law, which states that electrification of rural areas, and isolated localities in the country are a national need and are publicly required.

The government has been spending an average of US$ 40-50 (€ 27-34) million per year in the last ten years for electrification. These investments were carried out through social funds (e.g. FONCODES – Cooperation Fund for Social Development) and, to a larger extent, by the Executive Office for Projects (DEP), a division of the Ministry of Energy and Mines

(MEM). The DEP, which is currently in the process of being absorbed by the National Rural Electrification Office (DGER), which is in charge of planning, designing and constructing the rural electricity systems. The EMPRESA DE ADMINISTRACION DE INFRASTRUCTURA ELECTRICA S.A. ADINELSA is the main implementing company in the field of rural electrification. It is a state owned company, which administers publicly funded rural electrification activities outside the concession areas in rural areas.

Once they are finalized, the rural electricity systems are handed over for operation either to state-owned distribution companies or to a specially created state-owned asset-holding company that manages the systems under operation contracts with state-owned companies, or municipalities.

In addition to funds for projects the government created an Electricity Social Compensation Fund (FOSE). This Fund established a cross-subsidy system among consumers that benefits users with monthly consumption below 100kWh through fixed and proportional discounts. The fixed discount applies to consumers between 30 and 100 kWh and the proportional discount is targeted to those with consumptions below 30 kWh. The amount of the discounts is financed through a surcharge in the tariff paid by the regulated consumers with monthly consumptions above 100 kWh. The number of households that benefit from this scheme is over 2.4 million (out of the 3.6 million connected households at the national level). In July 2004, the FOSE was extended to cover up to 50% of the bill in the National Interconnected System (SEIN) and 62.5% in the isolated systems for the users with consumption below 30kWh, including as well a special focus by geographic location (rural-urban).

2.5 Key problems hampering access to modern energy services in rural areas

2.5.1 Obstacles for grid based rural electrification

Several factors handicap rural electrification in Peru:

a) insufficient financial resources for investments in grid extension and installation of minigrids. Private companies generally don't invest in this sector as cost of providing access are high due to remoteness of the sites, dispersed nature of the populations and difficulty of the terrain. Local communities don't dispose of sufficient proper financial resources to make infrastructure investments in their community. Consequently, only the central government and NGOs are left for this kind of investment. NGOs are specialized on small systems whereas the MEM is involved in middle size systems.

b) Difficulty to operate mini-grid profitability due to the low purchasing power and the low energy demand of rural clients.

2.5.2 Obstacles for off grid energy technologies and services

a) Insufficient financial resources to carry out dissemination programs for off-grid technologies due to reasons described under 2.4.1.

b) Insufficient availability of micro-finance schemes for energy technologies in rural areas. Large parts of the country have almost no access to institutional micro-finance services

and must rely largely on moneylenders, suppliers, family and friends for short-term seasonal loans. There are no secure liquid savings options available to these households, which would enable them to build assets over time. Existing micro-finance institutions often have a narrow credit product line, limited experience in rural markets and a lack of access to best practice information and technical tools.

c) Lack of a marketing and maintenance structure for energy technology devices in rural areas. Almost all retailers are established in cities with no outlets in rural communities. Thus, clients have to travel to cities to purchase energy devices and for repair orders, which is difficult for most rural families. Establish rural outlets are considered not to be profitable due to the high costs for transportation and mobilization, the dispersed nature of the populations and the low income and low demand of the local population.

3 Analysis and Assessment of the EnDev activities

EnDev Peru is improving the access to modern energy in rural areas, for households, social institutions and small enterprises. The types of modern energy services are: a) grid electricity, b) energy efficient stoves and c) solar thermal water heaters.

The project started in March 2007. Interventions were implemented until December 2007 in three provinces. Since January 2008 the project is implemented in six out of the eight provinces in Arequipa.

The local partner is the Regional Government of Arequipa (GRA), in particular the project unit “Cooperación Peruana Alemana de Seguridad Alimentaria (COPASA)”.

The target numbers of people as planned to be served until the end of June 2008 are as follows: 15.000 people receive access to electricity; 46.125 people receive access to efficient cooking energy; 7.273 people receive access to electricity, improved cooking devices or warm water in social institutions and 10.500 people receive access to energy for productive use. The total number of persons to be reached is 78.898.

3.1 Grid electricity

EnDev-Peru is promoting the connection of households to the grid through **grid densification**.

3.1.1 Market situation

Based on the national plan for rural electrification the MEM is financing the extension of the national electricity grid to the departments. Private distribution companies are in charge of the grid connection and operation of urban and rural centres within the departments. In Arequipa this is SEAL. Once a village is having access to the grid, the connection of households, social institutions and enterprises is within their own responsibility. The connection of the individual customers to the grid is generally not subsidized by SEAL and 100% covered by the respective customer. The connection fee is around 70-80 € (280 to 320 Soles in Arequipa) including the cost for the electricity meter. In 80 % of all households of a village are connected to the grid. This is mainly due to the high cost of connecting to the grid.

In 2006, the average residential tariff in Peru was USD 0,1046 (EURO 0,07) per kWh (Latin America average in 2005 was US$ 0.115 (€ 0,077). In the unregulated market, the average tariff for final customers was US$ 0.0558 (€ 0,037) per kWh for the electricity supplied directly from the generators and US$ 0.0551 (€ 0,036) per kWh for the electricity supplied by distribution companies.

The average electricity cost for a rural household is around 12 to 15 soles (between € 3-4).

3.1.2 Activities of other stakeholders

The Inter-American Development Bank is providing technical assistance for a Sustainable Energy Services project in Peru. This is a US$ 850.000 (€ 570.000) project of which the IDB is contributing US$ 750,000 (€ 503.000).

The World Bank is funding a rural electrification project. It is a 5 year, US$145 (€ 97) million project of which the World Bank is contributing US$ 50 (€ 33,5) million in lending and the Global Environment Facility (GEF) is contributing a US$ 10 (6,7) million grant. The objective of the Rural Electrification Project is to increase access to efficient and sustainable electricity services in rural areas of Peru. The project's global environmental objective is to achieve reduction of greenhouse gas emissions through use of renewable energy in rural areas for provision of electricity. The Project has five main components:

(a) investment in rural electrification sub-projects by private and state-owned enterprises, supported by central government subsidies, to provide new electricity connections for rural households, businesses and public facilities, using both conventional grid electricity or renewable energy systems that would serve dispersed or remote populations;

(b) technical assistance to catalyse private sector participation and create capacity for a demand driven approach for rural electrification (projects proposed by service providers in coordination with local communities and governments), as well as particular promotion of renewable energy;

(c) a pilot program to promote productive uses;

(d) a small hydro generation financing facility to provide project financing, during the construction and initial operation period, for grid-connected plants; and

(e) project management.

3.1.3 EnDev activities

Together with the Sociedad Eléctrica del Sur Oeste S.A. (SEAL), the project is providing access to electricity within the following 6 provinces of Arequipa: Castilla, Condesuyos, La Unión, Arequipa, Islay and Caravelí.

EnDev-Peru supports grid densification in rural areas by subsidising the connection fee for poor households and by facilitating an arrangement between SEAL and the customer about a payment in monthly instalments, which otherwise would not be able to afford the connection. The collection of demand as well as the selection of beneficiaries (poor households) is carried out in coordination with municipal authorities. These forward the request to the regional electricity distribution company SEAL, responsible for assessing the technical files.

3.1.4 Technical aspects of the promoted energy services

Connecting households, social institutions and enterprises to the grid means in technical terms the installation of a 1 phase low voltage line and the electricity meter. It is expected that rural households don't consume more than 100 kWh a month.

3.1.5 Financial and socio-economic aspects of the promoted energy service

The connection fee (including connection and meter) is currently € 70-80. It has continuously fallen in the last year from € 90 to the current level. The EnDev subsidies vary between € 18 and 25 depending on the family income and whether the households have additional connection costs in form of a cement post for the electricity meter. Around € 30 is covered by the household immediately for the installation and additional € 25 is paid in monthly instalments as part of the monthly electricity bill.

The monthly bill is paid to the local utility of SEAL. The tariffs in Arequipa are depending on the location and type of electricity generation. The average tariff is US $ 0,10 (€ 0,67) per kWh for a monthly power consumption of up to 50 kWh. At a consumption rate of 50 kWh per month, which is common for rural households, electricity costs would be US $ 5 (€ 3,35). It is estimated that this expenditure is affordable even for poor households. Poor households in Arequipa pay between 8 and 12 Soles, equal to € 2 to 3.

3.2 Improved cook stoves

The project provides energy efficient and smokeless cook stoves for households, social institutions and small enterprises for productive use. Different variations of rocket stoves are available.

3.2.1 Market Situation

In Peru more than 40% of all households cook with biomass on traditional stoves (three-stone or clay construction). Although there is a general need for improved stoves, a market for such items has not yet developed. Almost all initiative to introduce biomass saving stoves comes from international projects. In the last years there were no larger cooking energy interventions targeting the improvement of cooking conditions in Arequipa. Only few isolated NGO-based measures without overall outreach. Thus the EnDev intervention is covering a considerable service gap.

The demand however is still reserved since cooking habits are very traditional and not easily changed. But representatives of government, health, education institutions, at all levels (departmental, provincial and municipal) are very concerned and convinced. They support the dissemination of improved stoves by creating knowledge and awareness. Families benefiting from improved stoves are important promoters as well.

3.2.2 Activities of other stakeholders

In the cooking energy sector no other organisations were and are active in Arequipa. Through the exchange of the project with private sector (mining companies) and academic

sector (University of Arequipa), interest could be generated. Interest for future cooperation was expressed. A collaboration agreement has been subscribed with Compañía de Minas Buenaventura and Empresa Distribuidora de Energia Electrica. A third agreement with Hochschild Mining Ares is under discussion. These companies have interest to provide efficient stoves within their community development programmes.

Beyond Arequipa social and health programs of the central government are running stove dissemination interventions. These are the program for poverty reduction "JUNTOS", the social program CRECER and the mass campaign for stove dissemination at national level by the NGO SEMBRANDO, led by Peru's First Lady.

3.2.3 EnDev activities

The project is implementing cooking energy interventions in six of eight provinces: Condesuyos, Castilla, La Union, Cailloma, Arequipa and Islay.

In each province at least one provincial coordinator of activities is employed ("promotores").

Main focus of the work was to establish a supply structure for the different stove components. For the production of combustion chambers and the chimney, groups of local artisans were identified and trained. In April 2008 three production centres of combustion chamber (Pampacolca (Castilla Media), Huilluco / Chilcaymarca (Castilla Alta) and Mollebaya (Arequipa)) and four producers of chimney and metal parts (Pampacolca (Castilla Media), Orcopampa (Castilla Alta) and Arequipa (Arequipa)) are established in Arequipa. The production of combustion chambers and chimney reached a satisfying level with regards to quality and quantity.

The combustion chambers of institutional and business rocket stoves are produced in Lima. The quality and temperature resistance is higher due to material and firing equipment and the price as well, instead of 4€ (production Arequipa) it costs 8€.

In addition 122 technicians were trained for the installation of stoves in the villages. Six of these technicians received special technical training and provide backstopping regarding stoves technology ("tecnicos"). The other 116 are "instaladores" building stoves. Further seven "promotores locales" supervise the installers.

The stove is constructed by the installer, supervised by the local promoter. The household is contributing the material (Adobe) and manual support. After construction and drying of the stove it should be fired by the installer. In addition the installer is supposed to inform and instruct the user in correct usage and firing, providing information material (Flyer and Poster).

3.2.4 Technical aspects

The project is promoting the "Inkawasi stove", a rocket technology which was developed earlier ("Cocina con Lena"). The common type is provided to households and a larger version to social institutions. In addition the project supported the development of an improved stove for other fuels especially dung for firewood-scarce high Andean zones ("Cocina mixta").

The Cocina mixta is a stove build with mud bricks (Adobe) with two sunken pots and chimney. It has a modified ceramic combustion chamber with feed tube and ash removal

port, insulated with wood ash. The fuel mix used is 70% dung of Lama/Alpaca, 20 % cow dung and 10% wood. The price is about € 45.

The “Cocina con Lena” is with two sunken pots and chimney as well and costs about € 35. It has a ceramic combustion chamber insulated with wood ash. This technology was developed for the overall Peru.

The quality of the stoves and the combustion chamber proved to be very good. The stoves have been tested by APROVECHO in October 2007. The stoves were certified according to international testing standards and Aprovecho benchmarks regarding their efficiency and emission reduction. A complete set of Water boiling tests (WBTs) and controlled cooking tests (CCT) was conducted.

The results in short: Inkawasi wood: according to WBT the specific fuel consumption is 60% of Apro benchmark. Inkawasi mixed: according to WBT the specific consumption is less than 50% of Apro benchmark. And according to CCT: Inkawasi requires 80% less fuel than traditional open fire. IAP (CO and PM measurements with Inkawasi mixed and traditional stove): result was IAP level 5% - 46% of traditional stove. (These results however represent the maximum efficiency available in laboratory conditions.)

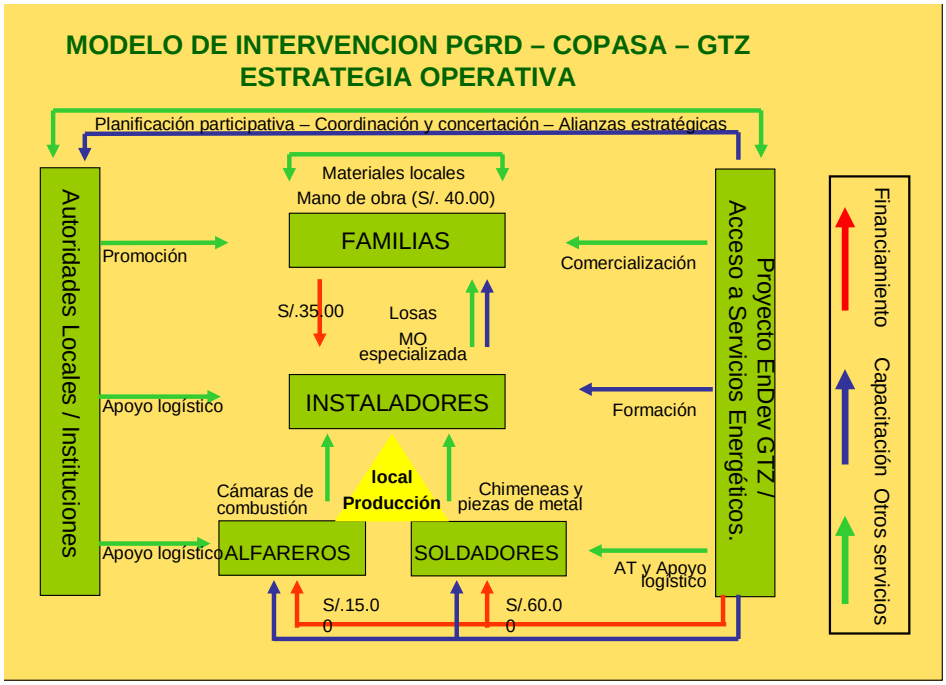
EnDev Peru is planning to introduce a new type of combustion chamber, which is square instead of round. The square chamber is a recent development and can be produced more easily and more efficient, so that the production numbers can be doubled.

3.2.5 Financial and socio-economic aspects

The total direct cost to construct an improved stove for households is 150 Soles (approximately € 36), which consists of the following individual costs:

- 60 Soles for chimney
- 15 S. for the combustion chamber
- 8 S. for cement
- 27 S. for the installer
- 40 S. for local materials and local work force

The beneficiaries pay S. 35 to the installer, which is providing the cement. This payment is documented in a contract between the two parties. Including the costs for local materials and the opportunity costs (in kind contribution) the family contribute a total of S. 75 (€ 16). The combustion chamber and the chimney are provided by the project representing another S. 75. EnDev subsidises further the transportation costs for the combustion chambers and chimneys and is providing training to the installers. If these costs are added to the construction costs the total costs of a stove rise to S. 250 (€ 59).



3.3 Solar Water heating

The project is supporting the installation of solar water heater in schools, health centres and communal institutions. The hot water is mainly used for hygienic purposes.

3.3.1 Market Situation

There are around 60 enterprises in Arequipa producing solar water heaters. Out of them 5 provide a warranty for their products. Sales of the solar heaters are concentrated on the urban and peri-urban market. The market in remote areas is very weak and depends almost completely from projects. Commercial solar heaters cost between 3.750 and 5.000 Soles (between € 890 and 1250). In comparison an electric boiler costs around 300 Soles (or around € 75).

3.3.2 Activities of other stakeholders

No other international organisations have been active in the field of solar heaters. There are also no international organisations supporting the equipment of schools and health centres.

3.3.3 EnDev Activities

The project is promoting solar water heater for social institutions in rural areas by subsidising 50% of the installation costs. The other half is equally financed by the social institution and the community. The project informs the municipal authorities about products available from the different solar water heater companies. Based on the information the municipalities selected a heater system they considered to be appropriate. The installation was done by the contracted company.

3.3.4 Technical aspects of the promoted energy services

The solar water heater had generally a capacity of 300 l. In two cases the capacity was 150 l. The heater system consists of solar collector with copper tubes and a thermal tank with polyurethane isolation.

3.3.5 Financial and socio-economic aspects of the promoted energy service

A commercial solar water heater with 300 l capacity costs between € 900 and 1200. The price is depending on the altitude and required material. The payment is shared among the social institution (25%), the community (25%) and the project (50%). The 25% of the SI is in many cases covered by the parents.

Social institutions save 100-130 Soles (€ 24-31) per month with the solar water heater in comparison to electric boilers. Thus, the initial investment is compensated by the savings within 3-4 years.

A technician from the university in Arequipa constructed to water heater for 2000 Soles (around € 500). He developed recently a new prototype, which will cost around 700 Soles (€ 167). The project is planning to promote the heater, if it proved to be of sufficient quality.

4. Outcomes, project impact and EnDev criteria

Intervention line	Target numbers	Reached numbers	Grid	Stoves	Solar heater
Energy for Households:	15.000	3.635	3.635		
Energy for cooking:	46.125	17.115		17.115	
Energy for social infrastructure:	7.273	9.941	2.206	6.564	1.171
Energy f. prod. use/income generation:	10.500	1.075	575	500	0
Total No. of People	**78.898**	**31.766**	**6.416**	**24.179**	**1.171**
Subsidy costs		153.827	12.178	136.114	5.535
Budget incl indirect costs	**700.000**	402.000	31.825	355.710	14.465
Indirect cost in % of total cost		62	62	62	62
Cost efficiency	**8,87 €**	**12,66 €**	**4,96 €**	**14,71 €**	**12,35 €**

4.1 Grid electricity

In the sector of grid connection and densification the project established a contractual basis with SEAL. All services are within the responsibility of SEAL. The coordination at community level is the responsibility of community authorities and administration. The project provides financial support of 20%.

4.1.1 Outcome

Until April 2008 727 families in 12 provinces were connected to the power grid, benefiting 3.635 people. In addition 23 social institutions, community centres, schools and health centres, benefiting 2.206 people, as well as 4 small businesses for productive consumption benefiting 575 people have been connected.

As part of the strategy for the development of local capacities, 42 local young people - both men and women - have been trained as electricians. They have taken charge of basic household installations.

4.1.2 Project Impact as contribution to MDGs:

According a recent self –evaluation of the project the following impacts were stated by the beneficiaries:

- Improved access to communication and information
- Improved living standard and comfort in households
- Households with access to electricity pay less for their electricity bill as previous costs for candles and kerosene.
- Households use fewer batteries for their household devices, which reduces the toxic battery waste normally not treated and just thrown into the nature.
- Reduced risk of accidental burns of houses due to the change of kerosene lamps and candles for electric bulbs.
- Income generation through higher effectiveness of local production. Small businesses can work beyond daylight hours and run their machines with electricity instead of gasoline engines or manually.

4.1.3 Fulfilment of EnDev Criteria

a) Cost efficiency:

The average EnDev costs for subsidising the connecting of households in the villages including the administration costs of GTZ are about € 25 per connection or € 5 per person.

b) **Sustainability:**

There is always a risk that rural customers are unable or unwilling to pay the bill for electricity. However, experiences show that the percentage of household not paying for electricity is low in rural areas. The strategy of local households is rather strict limitation of electricity consumption. Expenditures are around € 2-4, which is in general affordable even for poor households.

In terms of local capacity, electricians are trained locally so that energy services and respective knowledge are locally available.

c) **Scaling-up potential:**

SEAL is distributing the electricity net in all 8 provinces of Arequipa. SEAL is planning to provide grid for 20.000 connections until the end of 2008, of which 7.000 connections are planned for rural areas. In cooperation with EnDev 2.500 connections are planned until end of June 2008 (phase 1). Further 4.500 are possible until December 2008 in case of an up scaling.

The potential for the next years is estimated at more than 25.000 connections according to latest developments. Around 9.000 of these connections are estimated for rural areas: interconnections are planned for the provinces Caraveli, Camana, Castilla, Condesuyo and La Union.

Furthermore for 2009 SEAL is planning to provide grid extension to parts of the Peruvian departments Ica and Ayacucho.

According to the visits of different villages, the connection to the electricity grid through the support of the project ranges from 10% of households (Pampacolca) to 30% of households (Huancarqui) to the local grid through the project interventions.

There is high potential for scaling up in two ways: further densification within the already connected villages as well as grid densification in further villages, planned for interconnection by SEAL for 2008 and 2009.

d) **Additionality and newly provided access:**

The households targeted by the EnDev intervention are additional customers for SEAL. The subsidy and the payment arrangements provided by the project supports electricity access for families, which don't have sufficient economic resources (income: € 25-75 per month) to pay the full price at once for their own connection.

Further the economic support of beneficiaries allow SEAL to provide grid distribution to rather remote villages, which for economic reasons otherwise would not have been connected. For SEAL the grid interconnection is only profitable, when the electricity is used by roughly 70% of households (certainly depending on village size).

Without EnDev support, SEAL would for economic reasons not be able to offer reduced connection fees and special payment arrangements. The latter however might be a point for discussion, after SEAL developed routine with the instalment payment system.

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e) Accountability:

The connected households, social institutions and SMEs are at 100% accountable for DGIS. No other financial support is involved other than EnDev and the beneficiaries.

f) **Intensity and complementarity of cooperation:**

Grid extension is a key component of the government's policy to electrify rural areas. Grid densification is complementary to that policy and helps that poor households get access to the established infrastructure. At the same time electrification of villages is an important element to stimulate economic activities in the project area.

4.2 Improved stoves

4.2.3 Outcome

To date, the project has supported the construction and dissemination of 3.423 improved stoves at household level benefiting 17.115 people, 50 institutional stoves in social infrastructure benefiting 6.564 people and 10 stoves in small businesses for 500 people.

4.2.4 Project Impact as contribution to MDGs:

A household Impact Study (April 2008) provides information about the usage of improved stoves. The utilisation rate is around 90% and 80% of the households use the improved stove daily. Provided with information from the installer, 78% of the households are aware of the correct usage and respective techniques.

In Arequipa about 20% of the firewood is purchased and 80% is collected. These figures however change in Andean areas where wood is scarce and mostly a commercial product. There the purchase goes up to 50%.

A second study provides information about the following impacts stated by beneficiaries:

- Avoiding smoke inside kitchens, this improves the health situation, especially for women and children, reduction of respiratory and eye diseases.
- Living condition changes, kitchens become a meeting point for family and friends
- Improved hygiene in the kitchen with closed stoves, reduces among others diarrhoeal
- The improved stoves are safer than open fires causing accidental burns especially of children.
- Women are capacitated as installers and promoters. They gain self-confidence and proud doing the same work as men and often in a better quality (especially when it comes to user information and instruction).
- The stove is reducing the smoke emission inside the kitchen to about zero. Therefore the kitchen becomes a room for social interaction with family members or visitors.
- Reduction of deforestation
- Families save about 50% of fuel wood with improved stoves, which amount to about € 6 per week. (The saving rate in a school, which offers one dish per day is even higher with € 10 per week.)
- Reduction of time consumption for all family members involved in fuel collection.
- Improved income situation: Local production of fire chambers and chimneys as well as the construction of stoves contributes to local economic development and directly created 140 jobs in the project region. Families using the stove for productive purposes have a higher profit margin.

4.2.5 Fulfilment of EnDev Criteria

a) cost efficiency:

The projects direct subsidy per stove is about € 20, or € 4 per person. Further indirect costs are estimated to be about € 25 per stove. In total the project costs per person are about € 9.

b) Sustainability:

The project is emphasising on capacitating and qualification of local technicians and promoters in all targeted provinces. In that way cooking energy competence and technologies are locally available. Maintenance of stoves can be provided locally in the future.

Further the project establishes close cooperation with local authorities, local population and public sector in the communities. Local ownership is strong in the communities. Schools and health institutions are involved to create awareness and promote efficient technologies.

And thus sustainability and the utilisation of the stoves is the highest priority rather than big numbers of dissemination.

The challenges remaining are at production side the strong involvement of the project as "broker" between producers, installers and beneficiaries. The subsidy of 50% of installation costs is supposed to go down as soon as the stove are more popular in the communities.

The producers and installers still depend on the project for their business. Nevertheless the motivation of producers and installers is very high as well as the quality of their work. The combustion chamber technology is under further development to ease production.

The main challenge at consumer side is to convince people to change their traditional cooking habits. As soon as people are convinced and using the improved stoves, they realise the benefits. The satisfaction is immediate and very high. Therefore households which use the stoves are convinced to never go back to 3 stone fires and even to pay the full price of about € 60 (250 Soles) once they need to replace the stove.

It is important to establish direct commercial relationship between the producers, installers and costumers. Installers and producers require more marketing and business skills. The costumers require more awareness. More positive examples will convince the remaining households. According to community heads, many families would be able to pay the full price for a stove without any subsidy, even more if they use the stove for productive purposes.

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c) Scaling-up potential:

The coverage rate within the targeted districts is ranging from 10% (like in La Campina) to 40% (like in Pampacolca).

The production capacity per installer goes up to 30 stoves per month.

There is a high potential for scaling up; to increase the coverage rate within the targeted is as well as to include more districts within the provinces.

d) Additionality and newly provided access:

No activities of other donors in the intervention area, no endogen dissemination of stoves are taking place. Therefore all beneficiaries reached through EnDev activities are additional.

e) Accountability:

The stove component has been exclusively financed by EnDev, 100% of the intervention can be counted.

f) Intensity and complementarity of cooperation:

Stove dissemination is part of government policy goals in Peru but lacking sufficient funding.

In Arequipa the cooperation with local authorities is very strong. Especially the health sector with public health programmes, health centres and communal health committees contributes to high level of communication and awareness rising within the communities.

But also the Alcalde (the mayor) is a key person, coordinating the demand and the support and the communication, facilitating the installations and providing financial resources if needed.

The education sector plays a vital role for communication as improved stoves and solar water heaters in schools as well as energy topics within school curricular have multiplication effect for many families.

The relevance to the partner country's development strategies is high. The Peruvian national programmes for energy-efficient stoves interventions: JUNTOS and CRECER as well as the first lady's NRO SEMBRANDO raised interest in the stove models and dissemination strategies of PGRD EnDev. Positive resonance of national government and demand for advisory and backstopping for national programmes.

4.3 Solar water heaters

4.3.1 Outcome

Until the end of April 2008, the project has supported the installation of 15 solar water heaters in schools, health centres and community centres. 1.171 people benefit from the intervention.

4.3.2 Project Impact as contribution to MDGs:

For health centres warm water means better working conditions: patients can shower and there is warm water to wash tools. AL these provide more hygiene.

The benefit in schools is hot water to wash and shower, which most of the families cannot offer their children.

4.3.3 Fulfilment of EnDev Criteria

a) Cost efficiency:

The cost efficiency, meaning the costs per person, is €12,35. The project provides a subsidy of 50% on the solar heaters.

b) Sustainability:

There are around 60 enterprises in Arequipa producing solar water heaters. Sales of the solar heaters are concentrated on the urban and peri-urban market. The market in remote areas is very weak and depends almost completely on projects.

Solar heaters are quite expensive, especially for people living high up in the Andes, as transport costs are high.

The university has developed a new prototype for a solar water heater, which will cost around 700 Soles (€175). This might increase the market demand.

For the solar heaters supplied by the project, a guarantee on the heaters for 5 years has been given, Furthermore, in communities where solar heaters are supplied, local people have been trained in the maintenance of the system.

The beneficiaries of the solar heaters appreciate the service very much. It is assumed that they will replace the solar heater with a new one when the old one breaks down.

c) Scaling-up potential:

There is a great demand for solar heaters by schools, health centres and community centres. As said before, the price of using electricity to get warm water is too high for many institutions. But also the current price for solar heaters is too high for them.

d) Additionality and newly provided access:

No other international organisations are active in the field of solar heaters.

However, some social institutions are also connected to the grid. But getting warm water by using the electricity is too expensive for the institutions. The price for the boiler is only € 100 – 200. But the monthly fee to be paid to the electricity company will come to € 20.

The price for a solar heater comes to € 850, but no monthly fee has to be paid.

e) Accountability:

35% of the people living in the catchments area have been taken, because it is only one institution that is provided with energy. 100% of energy need for social infrastructure in an area is covered when all social services, schools, health centres and community centres, have access to energy.

Furthermore it is assumed that the counting share of warm water is 50%, because it only covers one need. Next to warm water most institutions will need energy for cooking and energy for heating.

f) Intensity and complementarity of cooperation:

In the Arequipa area the cooperation with local authorities is strong. The health and educational public sector is very interested in the intervention as it contributes strongly to the improvement of the health situation. The project finances the solar heaters with 50%, the rest has to be paid by the social institutions and communities. Both are prepared to contribute to the investment costs of the service.

5 Observations and Recommendations for the next project phase

5.1 SWOT analysis of the project

Strengths

- high degree of professionalism (planning, implementation, self evaluation)
- highly motivated and dedicated team with a lot of new ideas
- good networking, strong ownership by the local and regional government
- high outcomes in relation to the investments (high cost efficiency)
- visible and considerable impact regarding MDGs
- good fulfilment of the EnDev criteria
- good balance between electricity and improved stoves
- high degree of capacitating at local level: technicians, electricians, and final users
- high level of satisfaction of beneficiaries
- creative communication and awareness creation mechanisms via schools, via health sector, via local governments
- appropriate high quality cooking stove technology available
- well trained and technically skilled producers of fire chamber, installers and technical support staff
- modes of cooperation developed with SEAL

Weaknesses

- strategy to develop commercial local markets for the different technologies still weak
- high dependency of especially the stove supply chain on the project, through subsidies, transportation, logistic support and lacking business skills of producers and installers
- insufficient information about the size of the potential demand for the different technologies
- non transparent monitoring system

Opportunities

- gained experiences can be used for other projects
- prestige can be used to influence national activities in the field of stoves
- high coverage rate can be reached in Arequipa regional state due to very convinced partner structures and high level of dedication; leading to change of living standard
- technological experiences with new technologies (like dung stove) can be interesting for other countries with similar climatic conditions
- cooperation with universities can allow scientific backing of experiences and impacts as well as support technical developments
- private sector cooperation with mining companies can provide further outreach of the EnDev interventions and vice versa contribute to community development interventions of the companies

- increasing income generation can be achieved in the regional state through production and installation of energy technologies as well as through productive use of energy

Threats
- subsidies can affect the development of a commercial market on the medium and long run
- dependency of producers of fire chambers and chimneys as well as installers on the projects support can distort the market and prevent ownership
- dependency from SEAL and individual experts can affect the implementation of different key interventions
- high costs of products are possibly not affordable for very poor families
- changes in regional government can affect the success, since the cooperation with local and regional government has an important influence

5.2 Recommendations

Recommendations to DGIS and BMZ
- upscale the project with 1 Mio from EnDev 1 and another 1 Million from the EnDev II budget

Recommendations to GTZ and the project
- continue with the activities in Arequipa at least with the same approaches and intensity
- extent the project activities to ICA
- develop a strategy to reduce subsidies on the long run and develop a local market
- pay more attention to the business interests of the different producers in the value added chain (may include increase of the fees for the installers)
- promote a regular maintenance service for the different technologies
- develop transparent and well-documented monitoring scheme and procedures for regular monitoring at project and provincial level, with regards to achievements as well as potential as well as to demand and offer.
- analyse the possibilities to establish micro finance schemes in cooperation with micro credit institutions. Exchange with other projects like Bolivia, which developed strategies for involvement of micro credit institutions into the dissemination chain of stoves.

5.3 Future opportunities

Cooperation Disaster management GTZ:

- Inclusion of an energy component in the upcoming Disaster management project in ICA, Lima and other Earthquake destroyed regions (EON).
- SFF (Studien- und Fachkräftefond) in cooperation with Ministerio de Viviendas: Each rural household affected by the Earthquake receives an emergency kit of the value of 6000 Soles (targeting at 43.000 families in all regions affected). Cooperation opportunity: offering improved stoves within the emergency kit (AP in Peru, Florian Krüger).

Cooperation with DED (AP in Peru, Michael Pollmann):

- Community projects e.g. in the regional states of Apurimac (Abancay) and Junin. Cooperation opportunity: promotion for energy access – improved stoves as well as access to electricity.
- KfW/DED tourism project in Alto Andina regions (especially Lima and Junin). Cooperation opportunities: solar water heaters and improved stoves for small businesses offering services to tourists (small hotels, small restaurants).

Cooperation with JUNTOS and CRECER

- The two government programs are carried out on 680 of the 2.800 districts in Peru, targeting at 400.000 women in rural areas. The topics are construction, health, education and infrastructure for those families which are according to national statistics the poorest households in the country. About 90% of them use firewood for cooking. Therefore measures to provide them with improved cooking stoves are included. However the technology as well as the dissemination approach are not in line with the GTZ intervention: low quality stoves and free dissemination 100% subsidised. Therefore government representatives showed interest in cooperation with GTZ.
- Ministry of Health: the ministry has about 7.500 local health centres within the 2.800 districts of Peru. The main topics are healthy households (houses), cooking and alimentation for children and social mobilisation. These include improved cook stove as well. There is an interest from the Ministry in cooperation with GTZ to gain more experience with technology and dissemination approach.

  A cooperation shall be tested in a pilot in Puno, close to the borders of Arequipa and Bolivia, to include the Bolivian experience as well as the experience from Arequipa.

Annex

Annex 1: Terms of Reference for the PPR appraiser

1. Kurzinfo zum Projekt

Das Vorhaben **Katastrophenrisikomanagement zur Ernährungssicherung im Departement Arequipa** führt seit März 2007 eine vom niederländischen Directorate General for International Cooperation (DGIS) finanzierte Komponente durch, die zum Ziel hat, über 78.000 Menschen den Zugang zu modernen Energiedienstleistungen bzw. -technologien zu schaffen.

Für April 2008 ist jetzt eine Projektevaluierung geplant, die zwei Ziele verfolgt::

a) Evaluierung des Fortschritts der Energieaktivitäten des Vorhabens, die mit DGIS-Mitteln finanziert wurden,
b) Erstellung eines Projektkonzeptes für eine mögliche neue 2-3 jährige Phase.

2. Themen der Verlaufskontrolle

Die Projektverlaufskontrolle wird sich mit folgenden Themen und Aspekten befassen:

Situation analysis

- Energy situation especially in rural areas of the department Arequipa
- energy demand and supply in the household sector;
- Institutional set up in the energy sector
- Policy framework, laws and regulations
- common practises of cooking and lighting
- health needs related to energy;
- local environmental concerns such as deforestation
- poverty incidence and rate in Arequipa,

Analysis and Assessment of the EnDev activities

2.1 Energy services promoted by the EnDev project

short description of two approaches

- grid densification
- improved stoves

2.2 Technical aspects of the promoted energy services

- technical description of the technologies
- quality parameters
- necessary household appliances
- operation and maintenance requirements
- technical, construction and operation risks

2.3 Financial and economic aspects

a) production of improved stoves

- capital requirements to produce improved stoves
- production costs
- delivering costs
- service costs
- cash flow
- break-even analysis
- business development requirements
- critical risk factors

b) acquisition of an improved stoves

- costs/price of improved stoves
- costs/price of additional household appliances
- cost-savings due to lower fuelwood consumption
- time-savings

c) connection to the grid

- connection costs
- costs/price of additional household appliances
- electricity costs

- costs savings

2.4 Market viability for improved stoves

- potential target customers
- potential target geographic area
- estimated market size
- expected sales without project intervention levels for 10 years
- benefit for the customer
- level of actual market demand
- critical market risk factors

2.5 Social and political feasibility

- knowledge on and experiences with improved stoves
- socio cultural acceptance of improved stoves

3. Project implementation

3.1 Implementation concept

- Project region
- Target group
- Partner institutions (political partner, executing partner, implementing partner)
- Key interventions/activities
- Production and dissemination of the energy technologies and services
- Quality control
- Micro-finance
- Marketing and sales strategy (pricing strategy, payment terms, warranty, distribution/selling system, profit margins)
- Awareness raising
- Training
- Subsidies

3.2 Assessment of the implementation strategy

- Relevance to the partner countrys development strategies
- Relevance to BMZ country concept, priority strategy and/or cross sectoral themes
- Relevance to DGIS country concept, priority strategy and/or cross sectoral themes
- Interaction with other development cooperation measures

4. Outcomes and project impact

4.1 Achieved outcomes and impacts

- Outcomes in the different categories
- Counting system
- Impact (economic, ecological and social)

4.2 Assessment of the outcomes and impacts

- Progress towards the project objective
- Cost efficiency
- Additionality
- Sustainability
- Contribution to MDGs

4.3 General assessment of the activities

- Strengths
- Weaknesses
- Opportunities
- Threats

5. Lessons learnt for the EnDev-programme

6. Outline for a second project phase

including

- intended objective, output, activities,
- indicators and milestones
- time schedule
- institutional set up

- role of GTZ, management structure
- role of other development agencies
- risks and assumptions
- budget, needed funding (how much and when)

Zusammensetzung des Gutacherteams

Das Gutachterteam setzt sich aus Herrn Dr. Hellpap, Koordinator des EnDev-Programms in der GTZ (Federführung), Frau Verena Brinkmann, Projektmitarbeiterin im Sektorvorhaben HERA und Frau Els Huntjens, Mitarbeiterin der holländischen Organisation SenterNovemr zusammen.

Der federführende Gutachter, Herr Dr. Hellpap, ist für die Erstellung der Studie im Entwurf bis zum 15.05.2008 und in der Endfassung bis zum 31.05.2008 zuständig.

Annex 2: PPR procedure / time schedule

Día	Lugar / hora	Actividad	Participantes	Obs.
21.4.	Lima - Arequipa	Viaje	• Verena Brinkmann	Arribo a las 21:20 Confirmar No. de vuelo, y cia ¿LAN? Recoger en el aeropuerto. Reservar hotel Indicar requerimientos hotel.
22.04	Arequipa 09:00 hrs.	Reunión institucional de coordinación.	• Verena Brinkmann • Jorge Lira, D.E. COPASA • Carlos Leyton, Vicepresidente GRA, • Carlos Steinmetz, Experto Integrado CIM / GRA • Maricarmen Carranza, Coordinación Proyecto	Afinar programa de campo
	11:30 hrs.	Reunión de trabajo con SEAL	• Verena Brinkmann • Ricardo Velazquez, Gerente Comercial de SEAL • Johonny Granda, Gerencia Proyectos • Jorge Lira, D.E. COPASA • Maricarmen Carranza, Coordinación Proyecto	
	14:30 hrs.	Reunión de oficina Presentación resultados L2	• Verena Brinkmann • José Humberto Bernilla • Ileana Monti • Miguel Tinajeros • Maricarmen Carranza	Consultores, presentación resultados seguimiento interno sobre las cocinas mejoradas e investigación termas.
	16:00	Reunión de oficina	• Verena Brinkmann • Jorge Lira • Maricarmen Carranza	Preparación visitas de campo
23.04	Arequipa – Aplao – Viraco	**Visita de Campo** Huancarqui, Alcaldía, usuarios L1 – L4 **Reunión de trabajo** Técnicos, promotores, instaladores y productores locales	• Verena Brinkmann • Jorge Lira • José Humberto Bernilla • Maricarmen Carranza	07:00 hrs. Salida Arequipa 10:00 a 12:00 visita Huancarqui. 12:30 a 17:00 Reunión trabajo Se pernocta en Viraco
24.04	Viraco – Pampacolca – Tipan	**Pampacolca** Visita talleres de producción, usuarios L1, L2, L3, L4 **Tipa** Reunión de trabajo	• Productores locales y usuarios • Alcaldes de AMCAME • Micro Red de Salud de Castilla • Directores Centros Educativos y de Salud	07:00 hrs. Salida Viraco 08:00 a 11:30 visita Pampacolca. 12:30 a 17:00 Reunión trabajo Tipan Salida para Arequipa

Día	Lugar / hora	Actividad	Participantes	Obs.
25.04	Arequipa - La Campiña	**A.M.** Vista La Campiña **P.M.** Reunión Sector Alto - andino, convocado por el GRA	• Alcalde • Talleres y Usuarios • ONG • Empresas mineras • Autoridades e instituciones locales	Se almuerza donde Dolores (Restaurante apoyado). Opción de visitar Maucallacta. Traslado a Aplao.
26.04	Islay	Opción para visitar zonas recién aperturadas. Solo una de ellas	• Usuarios, autoridades e instituciones locales	Provincia Islay, zona costera, diferentes distritos con intervenciones en las 4 líneas. A 2 hrs. de Arequipa
27.04	Arequipa			Coordinar llegada de Carsten y Els Huntjens Y de Roberto Duarte
28.04	Arequipa	Reunión de trabajo Reunión GRA	• Equipo Evaluación • D.E. COPASA • Coordinación Proyecto	Evaluación del primer phase
29.04	Arequipa	Reunión de trabajo interna Viaje a Lima (a las 17:55)	• Equipo Proyecto • Equipo Evaluación	Planificacion del segundo phase
30.04	Lima	Reunión GTZ	• GTZ Perú • PDRS • Misión evaluación • Coordinación Proyecto • Embajadas Alemana y Holandesa • Programa UNETE, OPS • Proyecto JUNTOS / CRECER/ Dr. Acchinelli	09:00 a 11:00 hrs. Reunión entre la Misión de Evaluación y W. Liehr y Ellen Roof (embajada Holandesa) 11:30 a 12:30 hrs. Reunión con DED 14:30 a 15:000 hrs Reunión con CRECER / JUNTOS 17:00 a 18:00 hrs. Reunión con el minster de Salud

Annex 3: List of sources

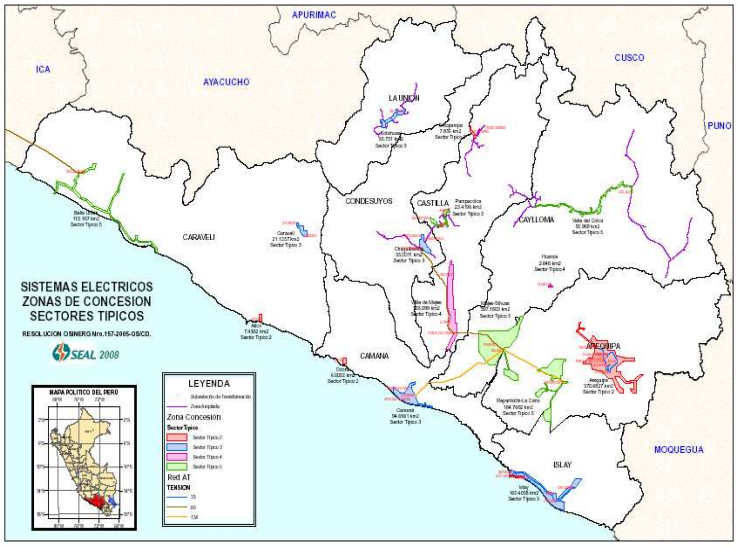
1. http://www.eia.doe.gov/emeu/cabs/Peru/Electricity.html
2. http://en.wikipedia.org/wiki/Electricity_sector_in_Peru
3. http://hdrstats.undp.org/countries/data_sheets/cty_ds_PER.html
4. http://www.copasa-gtz.org.pe
5. http://www.fao.org/
6. http://www.iea.org/

Annex 4: Photo documentation

Visitas en las Provincias de Arequipa

Reuniones con
Alcaldes, autoridades
de salud, directores de escuelas,
familias, instituciones sociales,
micro interpresas,
promotores, instaladores, productores

Zonas de concesión de SEAL



Conexión

Conexión + medidor + muro + extensión
cuesta 360 Soles

gtz

Proy: 80 Soles (20%)
Fam: 100 Soles (directo)
Fam: 80 Soles (en cuartos)

Valor conexión = 260 Soles

Muro: 100 Soles (Fam)

gtz

10% (Pampacolca) hasta 30% (Huancarqui) de las cases tienen conexión a través del proyecto

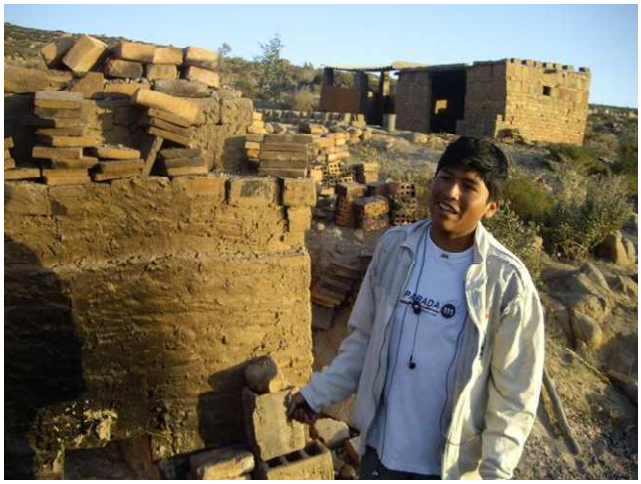
Beneficiarios muy contentos – un cambio en cualidad de vida enorme

Instaladora – capacidad de construcción es una cocina por día

Las mujeres buenas constructoras y buenas entrenadoras

Producción de las nuevas cameras de combustión

Productores de cameras de combustión con su horno



Producción a nivel local por artesanos capacitados

Con las nuevas cameras la producción doblar

Terma Solares en un Centro Salud

Cuesta 1150 $
por 300 L.

Pagan:

25% centro salu
25% comunidad
50% proyecto

Cocina social

comen
30-80 personas cada día

y pagan 2 Soles por menú
(almuerzo)

Conexión de una panadería –
el panadero con su machina para amasar puede trabajar con luz y produce mas

Restaurante con cocina nueva y antigua

El le gusta la nueva cocina –
y ella vende ricas alfajores

Lo que falta son hornos