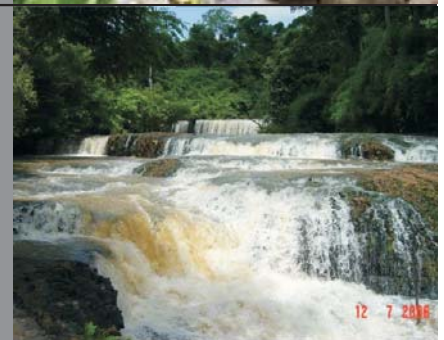


Experiences in HYDROPOWER Projects

- ▶ **Technical Assistance Projects**
- ▶ **Hydropower Planning & Construction**
- ▶ **Hydropower Feasibility Studies**



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Hydropower Experiences



Technical Assistance Projects

INTEGRATION has wide experience in implementing energy projects, especially renewable energy (RE) programmes including hydropower, photovoltaic systems, solar thermal and wind energy.

- We specialise in the implementation of RE programs; our approach is to combine the technical features of the project with socio-economic, socio-cultural and gender-specific activities.
- Thus we focus on the development of adapted tariff structures and the implementation of private ownership systems as well.
- We are implementing country strategy studies, feasibility studies and we are involved in construction of SHP plants.

Hydropower planning and construction

INTEGRATION has broad experience in micro hydropower planning and construction for power plants smaller than 1 MW. This includes detailed planning of all components including hydrology, headrace and tailrace canal, inlet and outlet bay, power station complex, major equipment, electrical design and transmission line and interconnection. As a rule the complete construction works are undertaken by local companies and manpower under supervision of the project. The future power plant staff and management are trained to undertake operation and maintenance, metering and billing independently as much as possible. Furthermore, the population is supported in productive use of electricity for income generation.

Hydropower feasibility studies

INTEGRATION has broad experience in reconnaissance studies, feasibility studies and examination reports of small hydropower stations larger than 1 MW. This includes both run-of-river and high head power plants. Reconnaissance studies determine overall economic, engineering, environmental and social feasibility of hydropower and make recommendations for further studies. Feasibility studies include topography, hydrology and power potential, geology, geotechnics and seismicity, alternative layout structures, project design, cost estimates, access facilities and construction planning, power market, environmental impact assessment, economical and financial analysis and resettlement plans. Examination reports test the existing feasibility study for plausibility, correctness and profitability and support local decision makers.

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References in Hydropower Technical Assistance Projects

Country/ Region	Title and Description	Date	Contract value	Client
Afghanistan	<p>ENERGY SUPPLY IN RURAL AREAS OF AFGHANISTAN (ESRA), PHASE II</p> <p>The Consultant plans and constructs two new small hydro power plants in Takhar, and is responsible for rehabilitation / improvement of water management in Badakshan (Faizabad and Jurm), the sustainable use and management of the SHP's, user education and counselling and activities concerning productive use of energy (PURE). The performance of power plants is designed for 450 kW (Chal) and 500 kW (Warsaj).</p>	01/2001 - 12/2012	€ 6.95 Mio.	GIZ
Afghanistan	<p>DEVELOPMENT OF MINI HYDROPOWER PLANTS IN BADAKHSHAN AND BAMYAN PROVINCES</p> <p>The objective of the project is to improve the quality of life of rural communities through the provision of electricity services supplied by mini hydropower plants (MHP) with generating capacity below 1,000 kW.</p> <p>The project outputs are the identification, planning and establishment of a maximum of four off-grid MHPs, each with an installed capacity in the order of magnitude of 500 kW. Target areas are district centers which are not planned for grid connection in the foreseeable future or are being supplied through expensive and unreliable diesel generation. Communities will receive support to establish income-generating activities during the day-time (i.e. off-peak hours).</p>	01/2011 - 12/2013	\$ 3.66 Mio.	ADB / DABS
Afghanistan	<p>ELECTRICITY SUPPLY AND PRODUCTIVE USE KAPISA PROVINCE</p> <p>The overall objective of the project is to improve living conditions in the selected project areas through provision of electric power as one key factor for an economic development of the rural area. Major activities are:</p> <ul style="list-style-type: none"> • Rehabilitation and construction of 20 Micro Hydro Power Stations (MHPS) in Nijrab district incl. tender preparation and construction supervision; • Extension of the transmission line from Mahmood e Raqi to Nijrab and connection of 7 villages; • Conduction of load flow analyses for various supply options; • Training of operators and introduction of adjusted tariff and billing systems; • Conduction of business trainings and establishment of electricity information centres. 	11/2010 - 12/2011	€ 5.9 Mio.	AFD
Indonesia	<p>PARTICIPATORY CAPACITY NEEDS ASSESSMENT IN THE (SUB-) SECTOR OF MICRO/MINI HYDROPOWER IN INDONESIA</p> <p>The "Participatory Capacity Needs Assessment" (PCNA) was one of the first activities of the new Micro/Mini Hydro Power sector capacity development project (MHPP²). After 10 years of successful cooperation in this sector between Indonesia, Germany and since 2006 the Netherlands, the goal of MHPP² (2009-2012) is to consolidate the MHP sector and to institutionalize MHP knowledge and experiences in Indonesian institutions. To this end the PCNA identified existing strengths and strategic gaps for the further development of the sector in a participatory approach with key stakeholders, strategies for consolidation and institutionalisation of MHP knowledge and recommended key intervention areas for MHPP².</p>	10/2009 - 03/2010	€ 34.150	GTZ
Indonesia	<p>MICRO HYDRO POWER TECHNICAL SUPPORT UNIT (TSU)</p> <p>The project is one component of the Indonesian Country measure under the globally active German-Dutch Energy Partnership "Energizing Development" implemented by the German Technical Cooperation (GTZ). The project supports the Green PNPM's block grant component by contributing approximately \$8,000,000 to establish a Technical Support Unit (TSU) which will provide technical assistance to communities that will receive grants for the</p>	07/2009 - 06/2012	€ 6.2 Mio.	GTZ

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Country/ Region	Title and Description	Date	Contract value	Client
	implementation of approximately 250 to 300 MHP schemes for 170.000 villagers. The tasks of the TSU include support in site identification, quality supervision of feasibility assessments, design guidance, productive use promotion and training for local MHP hardware and service providers, and the establishment of a proper community-based management model.			
Pakistan	<p>MANAGEMENT, DESIGN AND SUPERVISION OF MACHAI HYDROPOWER PROJECT (2.6 MW)</p> <p>The project shall provide overview/oversee, supervision, coordination and engineering review services sufficient to perform a continuous due diligence to avoid oversight in the execution of Machai HPP, a 2.6 MW plant to be built in NWFP. These services shall provide project support beginning with the selection of the EPC Contractor through to Final Commissioning of the project. It includes preparation of tender documents, review of PPA, preparation of power tariff model, training of SHYDO staff.</p>	07/2009 – 06/2013	€ 1.6 Mio.	ADB / SHYD O
Afghanistan	<p>ENERGY SUPPLY IN RURAL AREAS OF AFGHANISTAN (ESRA), PHASE I</p> <p>In a joint effort with Financial Cooperation, several small hydropower projects designed to supply medium-sized cities with electric power are to be promoted, with funding coming from KfW while GTZ provides the appropriate services, e.g. establishment and reinforcement of operation and management structures, productive use of energy. The supply of electric power generated from renewable energy sources will be improved in one pilot region. Activities include:</p> <ul style="list-style-type: none"> • Construction supervision of six small hydropower plants and electrification of four communities, • Promotion measures for productive use of electricity, • Realization of business trainings, • Information and advice on technological issues, • Policy advice at regional and national level, • Support in networking of actors and capacity building activities, • Support of private sector business development services 	03/2008 - 12/2010	€ 6.17 Mio.	GTZ
Afghanistan	<p>PROGRAMME DECENTRALIZED POWER SUPPLY THROUGH RENEWABLE ENERGIES</p> <p>COMPONENT 1: REPAIR/REHABILITATION OF CHAK-E-WARDAK POWER SUPPLY SYSTEM (3.3 MW). Activities include analysis of the hydro power plant and distribution system, identification of rehabilitation needs and elaboration of a proposal for the most appropriate set-up and procedures to execute the rehabilitation. Furthermore INTEGRATION will manage, organise, procure the required supplies, control and supervise the rehabilitation of the plant and system in all technical and financial aspects including all required procurement procedures and up to the commissioning of the plant.</p> <p>COMPONENT 2: REHABILITATION AND/OR CONSTRUCTION OF SMALL HYDRO POWER PLANTS IN THE NORTHERN PROVINCES (1 to 3 MW) Activities include preliminary assessments and ranking of the sites, taking into account not only technical, but also financial, socio-economic, environmental and development aspects. The Feasibility Phase shall be concluded by a meaningful ranking of the sites/systems and by reports on each of the potential developments for decision making on the stations/systems to be retained during the next phase. Furthermore INTEGRATION will carry out the tender design for the schemes and shall prepare tender documents for national and international competitive bidding (supply and erection of hydro-mechanical/electrical equipment). The beneficiary will be assisted during tendering, tender evaluation and contract award process and supported by technical site assistance to the commissioning of the electricity supply scheme.</p>	12/2007 - 12/2013	€ 5.50 Mio.	KfW

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Country/ Region	Title and Description	Date	Contract value	Client
P.R. China / A.R. Tibet	<p>RENEWABLE ENERGY, RURAL DEVELOPMENT AND QUALIFICATION IN A.R. TIBET</p> <p>This project builds on the success of the previous 5-year project 'Rural Infrastructure and Vocational Training'. The overall objectives are to improve the working and living conditions of the rural population involved in Tibet and to increase their incomes. One of the four components is sustainable operation of small hydropower plants. The activities include introduction of private operator model at all sites and an advice service for the productive use of electricity; creation of an intranet supported database and consulting, maintenance and services teams at the provincial level.</p>	11/2006 - 10/2010	€ 2.39 Mio.	GTZ
Afghanistan	<p>RENEWABLE ENERGY AND ENERGY EFFICIENCY IN RURAL AREAS</p> <p>The overall goal of the project is that renewable energy and offers for increasing energy efficiency are used by households and small industry in selected rural areas of Afghanistan. The project covers the three central themes: strategy development, pilot projects and capacity building of the relevant stakeholders. Major activities are:</p> <ul style="list-style-type: none"> • Development of an overall concept for market development of renewable energy and increase in energy efficiency in rural areas • Communication to decision makers in politics and economics • Pilot projects for the employment of renewable energy and energy efficiency technologies, e.g. rehabilitation of the hydro power station Chak-e-Wardak • Baseline study in technical and socio-economic aspects including training needs assessment • Development of simple processes for site evaluation • Development of operator models and support of independent energy service operators • Promotion of income increasing activities • Implementation of community development measures together with WIRAM and other actors • Training and qualification of communal actors 	11/2005 - 10/2007	672.000 €	GTZ
Cambodia	<p>INSTALLATION OF SMALL HYDRO POWER PLANT AND PRODUCTIVE USE</p> <p><u>Project Objectives</u></p> <p>Cambodia faces a formidable array of development challenges. Access to modern energy services and electricity is extremely limited in rural Cambodia. The main objective of this project is to contribute to the alleviation of poverty through provision of energy services based on renewable energies for productive use and income generation.</p> <p>The target beneficiaries of the project comprise the:</p> <ul style="list-style-type: none"> • population in general and the rural poor in particular who will improve their living standards • government, public sector and institutions that will develop new skills through involvement in energy/rural planning and project development • private entrepreneurs, energy service providers and productive users of energy • national and regional institutions, associations, universities, etc. <p><u>Services</u></p> <ul style="list-style-type: none"> • Realising a mini hydropower plant (150 kW) in the province of Rattanakkiri • Develop financing models and marketing activities through strong links with institutions and ongoing activities for non-energy issues • Building local capacities among the private and public sector to realise the business model • Establishment of regulatory framework with clear policy on Independent Power Producers (IPP) 	04/2006 - 09/2007	118.000 \$	UNID O

INTEGRATION

Hydropower Experiences



Country/ Region	Title and Description	Date	Contract value	Client
Mongolia	<p>PROMOTION OF RENEWABLE ENERGY</p> <p>The purpose of the project is to enhance the utilization of locally available renewable energy (RE) resources, mainly solar energy, hydropower and wind, and to strengthen market-driven mechanism for RE dissemination in urban and rural areas. Emphasis is laid on the productive use of RE generation systems for income generation.</p> <p>The main activities focus on</p> <ul style="list-style-type: none"> • a better integration of RE into national energy policies, • design and construction of Tosontsengel HPP (375 kW); Tsetsen Uul HPP (150 kW); Zavkhanmandal HPP (138 kW), • the provision of advisory services to private enterprises on the manufacture and marketing of RE technologies and on establishing a service infrastructure 	04/2002 - 09/2007	5.1 Mio. €	GTZ
Mongolia	<p>PRIVATIZATION OF RURAL RENEWABLE ENERGY POWER SUPPLY SCHEMES</p> <p>In the framework of the "Promotion of Renewable Energy Programme" privatization of three village supply schemes including the provincial capital with about 20,000 inhabitants is a major activity. The activities include:</p> <ul style="list-style-type: none"> • Set up of an organizational and management structure • Developing a privatization concept for approval by the Government • Elaboration of tender documents and Tendering • Evaluation of tender, contract negotiations • Setting up of power supply regulations including a appropriate tariff and billing system • Coaching of the new utility. 	03/2006 - 07/2006	See above	GTZ
Madagascar	<p>LOKOHO SMALL HYDRO POWER FOR RURAL DEVELOPMENT</p> <p>In the framework of a PPP project of the e7-group with GTZ we have been entrusted to implement a comprehensive feasibility study for a 6 MW hydropower station in northeast Madagascar that will serve two of the major cities of the region Andapa and Sambava, as well as about 30 rural villages. The feasibility study has been undertaken covering the following aspects: topography, hydrology & power potential, geology, geo-technique & seismicity, Environmental Impact Assessment, layout planning, resettlement plan, design of civil structures and equipment, power & energy calculations, cost estimates.</p> <p>In addition the following sub-studies were carried out:</p> <ul style="list-style-type: none"> • A representative baseline study for the project area to determine social, ecological, economic and technical indicators; • Concept development for productive, income generating energy use (building on existing investigations); • Development of an adapted business model for rural electricity distribution (Rural Energy Service Company - RESCO or similar); • Concept development for participation of local labour; • Examination of the suitability of a glass fibre cable integrated into the electricity transmission for ICT purposes. 	07/2005 - 09/2006	425.000 €	GTZ / e7
P.R. China / A.R. Tibet	<p>RURAL INFRASTRUCTURE AND VOCATIONAL TRAINING</p> <p>The program's objective is to create income possibilities by productive use of electricity provided by small hydro power plants and by improved agricultural production. Productive use of power is supported by technical and business trainings and micro financing facilities. The program components include:</p> <ul style="list-style-type: none"> • Informal vocational training (in rural areas) • Irrigation and water management and (rural infrastructure) • Rehabilitation of small hydropower plants (rural infrastructure) • Micro-credit facility. <p>It is envisaged that by the end of the program 70% of the qualified people will find a job or create a business and that the average monthly income of the graduates will be 20% higher than the local average.</p>	03/2001 - 10/2006	3.4 Mio. €	GTZ

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Hydropower Experiences



Country/ Region	Title and Description	Date	Contract value	Client
Pakistan	<p>RENEWABLE ENERGY DEVELOPMENT PROJECT <u>Project Objectives</u> The objective of the action was to “prepare a project to develop indigenous, non-polluting, and renewable sources of energy to help meet Pakistan’s power shortage and improve the quality and reliability of the power system, especially in rural areas”. Main outputs were 12 preparatory studies, namely</p> <ul style="list-style-type: none"> • the analysis of the RE potential of four selected provinces and • feasibility studies of 8 selected projects to be financed under the ensuing loan. <p><u>Services</u></p> <ul style="list-style-type: none"> • Analyses of RE potentials in 4 provinces • Prioritisation and selection of 8 sub-projects • Feasibility studies for these hydropower projects • Model feasibility studies for future application 	05/2005 - 01/2006	546.000 \$	ADB
Pakistan	<p>NATIONAL PROGRAMME FOR THE PROMOTION OF HYDROPOWER <u>Project Objectives</u> Under the overall goal to develop small hydropower, the project pursued four results:</p> <ul style="list-style-type: none"> • Capacity building in the Ministry of Water & Power to plan and coordinate national hydropower development; • Improvement of capacities for planning and implementation on provincial, regional and local level; • Capacity building in training institutes relevant to hydropower development; • Planning and implementation of selected (pilot) small hydropower stations. <p><u>Services</u></p> <ul style="list-style-type: none"> • Training seminars and workshops • Website and documentation • Ranking criteria and study (38 hydropower sites) • Promotion for hydropower development • 7 examination reports on Feasibility Studies 	08/2003 - 07/2006	1.64 Mio. €	GTZ
Pakistan (Chitral)	<p>PRODUCTIVE USE OF ELECTRICITY IN RURAL AREAS Project design of ‘Productive Use of Energy in Chitral District, Pakistan’. Project idea was conceived and a report produced which covered problem statement, project objectives, methodology, current situation in the region and implementation aspects. Concept for alleviating poverty by utilising electricity for productive uses was included as well as data sheets with technical data, infrastructure and economic activities for 43 potential hydropower sites in Chitral District.</p>	04/2004 - 06/2004	30.000 €	UNDP / GEF / GTZ
Nepal	<p>PROMOTION OF SMALL-SCALE HYDROPOWER UTILISATION Based on the results of the previous GTZ project “Electric Master Plan Nepal” this project focus on the establishing of a market for small-scale hydropower plants as a vehicle for electrification and associated economic progress especially in rural areas. The project activities concentrate on enhancements of the legal and regulatory framework and support efforts to encourage private sector investment in small-scale hydropower development. To make such investments more attractive, the project helps establish a committee that represents all involved parties and is in charge of improving the regulatory setting and investment climate for small-scale hydropower development. The project familiarises local banks, insurance companies and pension funds with business opportunities provided by hydropower development. Activities include also the ease of ways for economic viable electricity generation through optimised governmental regulations, power purchase agreements, regulations for operation, sale of power to own or into the national grid, support of productive utilisation of electricity to increase consumption and to improve economic feasibility of plants in rural areas.</p>	01/2000 - 12/2002	2.60 Mio. €	GTZ

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Hydropower Experiences



Country/ Region	Title and Description	Date	Contract value	Client
Ecuador	<p>SUSTAINABLE USE OF HYDROPOWER RESOURCES</p> <p>The project's objective is to provide advanced access to electricity through hydropower usage in the under structured forest area of Gran Sumaco – Napo Galeras at the spring of the Amazonas River.</p> <p>Following targets have to be achieved:</p> <ul style="list-style-type: none"> • The local IPP ERDESU (Energia Renovable & Desarrollo Sostenible) is able to implement the planning work for sustainable use of hydropower; • A pre-feasibility study for a 12 MW hydropower plant at Jondachi River is implemented; • The financing of the feasibility study and engineering planning of SHP Jondachi is secured; <p>With the construction of another decentralized SHP the hydropower resources are utilized in order to improve the living conditions of the local target groups in the Nature Preserve Area of Gran Sumaco.</p>	01/2003 - 12/2005	970.000	GTZ
P.R. China	<p>RURAL ELECTRICITY SUPPLY STUDY</p> <p>The ultimate aim of rural electricity supply reforms is to ensure that rural consumers benefit from increased and reliable electricity supply, efficiency gains and downward pressure on electricity prices through improvements at all levels in the rural power system- The TA recommends a package of reform measures and a plan for their implementation. The main objectives of the TA are to (i) identify the scope and focus of the rural electricity supply reforms, (ii) recommend reform measures based on international experience, (iii) identify actions needed to implement the reforms and the entities responsible for such actions, (iv) identify related institutional, legal and regulatory changes needed to put the suggested reforms into effect, (v) study the impact of improved rural electricity supply on poverty reduction, (vi) draw up a time-bound action plan for implementing the reforms, and (vii) identify the benefits that can be expected from the recommended reforms.</p>	03/2001 - 12/2004	800.000 \$	ADB
P.R. China / A.R. Tibet	<p>REHABILITATION OF SMALL HYDROPOWER STATIONS</p> <p>Rehabilitation of selected mini-hydropower stations in Tibetan rural areas. The objective is to achieve sustainable electricity supply for the rural population, to initiate productive use of electricity in small industries and create sources of income. Emphasis is laid on the introduction of a private based management structure of the power supply systems, cost covering tariff and billing systems.</p>	05/1995 - 04/2002	2.09 Mio. €	GTZ
Mongolia	<p>UTILIZATION OF RENEWABLE ENERGY SOURCES</p> <p>The purpose of the project is to enhance the utilization of locally available renewable energy (RE) resources, mainly solar energy, hydropower and wind, and to strengthen market-driven mechanism for RE dissemination in urban and rural areas.</p> <p>A key measure is to assist the selected counterpart, the Renewable Energy Corporation (REC), in project implementation and capacity building, so that REC graduates to a clearinghouse and communication centre for RE issues. Basically, the project focuses on a better integration of RE into national energy policies, the creation of more efficient framework conditions for RE, and the provision of advisory services to private enterprises on the manufacture and marketing of RE technologies and on establishing a service infrastructure.</p>	09/1999 - 03/2002	700.000 €	GTZ
Indonesia	<p>MICRO HYDROPOWER PROJECT (MHPP)</p> <p>Assist the MHP and the Indonesian Government in selection of a suitable region for the implementation of the "Sustainable Energy Supply Project" in Indonesia. Aim of the project progress assessment was to</p> <ul style="list-style-type: none"> • Review data and information available on energy potentials, supply situation and energy demand; • Visit different areas concerned and analyse the capabilities of possible partner. 	09/2001	20.000 €	GTZ

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Hydropower Experiences



Hydropower feasibility/reconnaissance studies

Country	Name	Size (MW)
Afghanistan	Chata	0.11
Cambodia	Bay Srok	0.15
Afghanistan	Nalan	0.125
Afghanistan	Sangab	0.125
Afghanistan	Far Ghambow	0.28
Afghanistan	Jurm	0.45
Afghanistan	Keshim	2
Pakistan	Dhana	2.2
Pakistan	Machai	2.6
Afghanistan	Chak-e-Wardak	3
Afghanistan	Taloqaan	3
Pakistan	Pakpattan	3.2
Madagascar	Lokoho	3 x 2
Pakistan	Okara	4
Afghanistan	Faizabad	4 x 1
Pakistan	Deg Outfall	5
Pakistan	Chianwali	5.4
Pakistan	Chamfall	6.5
Pakistan	Marala	7.2
Pakistan	Ranolia	11.5
Ecuador	Jondachi	12
Pakistan	Hanzel	16
Pakistan	Daral Khwar	36.6
Pakistan	Jagran II	41
Pakistan	Kohala	600
Afghanistan	Chall	0.45
Afghanistan	Farghambol	0.28
Afghanistan	Jawzon	0.18
Afghanistan	Warsage	0.5

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Hydropower Experiences



Hydropower design/planning and construction

Country	Name	Size (kW)
P.R.China, A.R.Tibet	28 power stations	20 - 352
Afghanistan	Khozir	35
Afghanistan	Chata	112
Afghanistan	Sangab	125
Afghanistan	Nalan	125
Mongolia	Zavkhanmandal	138
P.R.China, A.R.Tibet	Hutuoshan	140
Mongolia	Tsetsen-Uul	150
P.R.China, A.R.Tibet	Samye	160
P.R.China, A.R.Tibet	Thunda	200
Afghanistan	Far Ghambow	280
Mongolia	Tosontsengel	375
Afghanistan	Jurm	450
Afghanistan	Khanabad	1600
Pakistan	Machai	2600
Afghanistan	Faizabad	4500
Afghanistan	Keshim	2000
Afghanistan	Farghambol	280
Afghanistan	Jawzon	180
Germany	Rübenau	30
Germany	Schwarzenberg	160