

**PROPOSAL FOR PDF BLOCK B GRANTS**

**COUNTRY:** Ghana

**FOCAL AREA:** Climate Change

**PROJECT TITLE:** Renewable Energy-Based Electricity for Rural Social and Economic Development

**AMOUNT OF FUNDING REQUESTED:** \$59,000

**CO-FUNDING:** NREL: \$10,000  
Government of Ghana: \$5,000

**REQUESTING AGENCY:** UNDP/Government of Ghana

**COLLABORATING AGENCY:** U.S. National Renewable Energy Laboratory (NREL)

**BLOCK:** BLOCK B

**DATE OF RATIFICATION OF UNFCCC:** 6 September 1995

**BLOCK A GRANT AWARDED:** None. Project concept initiated by the government and later developed with the help of the UNDP Country Office in Ghana and NRECA (US National Rural Electric Cooperative Association)

**I. Summary Project Objectives and Description:**

The Government of Ghana, in close collaboration with the private sector, non-governmental agencies, and the United Nations, proposes to design and implement a programme to demonstrate the potential for using small-scale renewable energy-based electric power technologies for decentralized rural delivery of essential electricity-based services to support social and economic development.

Under the proposed project up to twelve communities in one or two clusters will be selected as pilot sites within the Mamprusi East District of the Northern Region. Each of the communities will be equipped with (1) photovoltaic (PV) power systems only, or (2) a mix of stand-alone PV units and PV/diesel or PV/wind/diesel hybrid power units to supply local AC microgrid power systems. Individual PV systems will be used for residential lighting and entertainment, and for some community services and small commercial enterprises. Hybrid power systems will be used to support residential, community and economically productive activities. In some communities the most effective approach may be a mix of individual residential PV units for lighting and communication, and a renewable energy-based hybrid power system for full-time AC power for local "microenterprise zones" where they already exist.

This project will be established under the National Electrification Scheme (NES) as an extension of the Government's Self Help Electrification Program (SHEP). The Volta River Authority/Northern Electric District (VRA/NED) which will be responsible for system installation and checkout, will train the users in preventive maintenance, stock spare parts, provide both routine and urgent maintenance and repair services, and collect user fees. The utility will be responsible for operation and maintenance of the community microgrid systems. Periodic technical, social, and economic evaluations for all of the electrified communities will be carried out by the project implementation team. The project will be the first of its kind in Africa, and will be linked to similar projects in Asia and Latin America.

The proposed scope and scale of this pilot project is sufficient to evaluate the potential for widespread use of renewable energy technologies for off-grid rural electric power delivery in Ghana, and the requirements for these options to be sustainable. Sustainability may require that communities, through payment of market-based fees, will be able to pay a substantial fraction of the monthly costs, both for capitalization and for operation and maintenance (O&M). The renewable energy options will be compared directly with grid extension, isolated prime diesel, and isolated cycle-charge diesel power systems.

The objectives of the project are:

1. To increase the Government of Ghana's understanding of the technical requirements, equipment options, and capital and operating costs for the use of photovoltaic (PV)-based energy systems, both as stand-alone units and in hybrid power systems, for rural electric power delivery.
2. To demonstrate in Ghana the technical, economic, institutional, and social feasibility of sustainable largescale diffusion and application of small-scale PV units and hybrid power systems to the people of Ghana, government officials, the private sector, and the international development community.
3. To enable the Volta River Authority/Northern Electricity Department (VRA/NED) to integrate the use of renewable energy systems into its ongoing rural electrification activities.
4. To provide electricity services to about 12 communities in a remote area of Ghana and,
5. To catalyze large-scale use of these technologies in the country.

## II. Description of Proposed PDF Activities

Funds are required to send a mission to Ghana to finalize a GEF Project brief in accordance with GEF requirements. The team will include a senior staff member of the U.S. National Renewable Energy Laboratory (NREL) who is participating in similar projects in Latin America. The objective of these activities is to gather necessary information to determine:

1. the least-cost and most appropriate electricity supply options for rural Ghanaian communities and
2. the extent to which these options are affordable and can be adopted to contribute to a programme of rural electric power delivery which is sustainable and replicable.

The consultants will specifically

- a. Evaluate the potential for increased use of photovoltaic and hybrid power technologies to provide electricity in rural areas of the country through the expanded involvement of the private sector in providing energy services.
- b. Determine the necessary technical, financial, social, and institutional requirements to expand the market for PV and hybrid power systems on a demand-driven, full cost-recovery basis in an environmentally responsible manner.
- c. Conduct discussions with appropriate bilateral and multilateral donor agencies regarding possible project co-financing.

### III. PDF Outputs

The primary output from this PDF-funded mission will be a full GEF project brief for submission for consideration by the Council. The amount of funding required from UNDP, GEF, and other sources will be determined during the course of the preparation activity.

### IV. Eligibility

Ghana is a signatory to the U.N. Framework Convention on Climate Change and has ratified the convention (September 6, 1995).

The proposed project meets the interim guidance for 1995 which stipulates that "activities would not only be restricted to the installation of wind, solar or other renewable power systems but would also help sponsoring utilities agencies and other organizations to develop and implement strategies which would both reduce emissions and meet the energy service needs of rural and remote communities" (P.7)

The major output of the project will be a national utility-based programme of sustainable rural electric power delivery using renewable energy-based power systems for both pre-electrification and entry-level electrification. This will include a well-trained technical staff able to support all aspects of a renewable energy-based rural electrification programme in Ghana.

Specific outputs will include up to twelve clustered communities equipped with renewable energy-based power services, a trained staff within the VRA/NED electric utility, development of local operation and maintenance facilities and capabilities; a set of carefully designed assessments of

decentralized PV and hybrid power systems and hybrid power systems used for important rural development applications; and significantly increased understanding of the role of small-scale decentralized renewable energy-based power systems for addressing social and economic development needs of rural communities in West Africa. An additional output will be the information, experience, and analysis skills required to design a programme of investment in large-scale use of renewable for providing electricity to off-grid communities in a technically, economically, financially, and environmentally sustainable manner.

#### **V. National Level Support:**

The project is country-driven and has the full support and approval of the Government (letters from the Ministry of Energy and Mines are available upon request).

#### **VI. Justification:**

The goal of the project is to support the development of a national capacity, combining both private sector and public sector efforts, to use renewable energy-based technologies, primarily photovoltaics (PV) in stand-alone and hybrid configurations, for sustainable rural electric power delivery for both individual applications and centralized village electrification. The proposed project is a high priority of the Government of Ghana, which is committed to the extension of electricity services for social and economic development throughout the rural regions of the country.

The project will be unique in Africa (and in the GEF portfolio) in the elements that it will combine. These include the following:

1. A national electric utility parastatal company will assume the primary responsibility for the dissemination and support of the renewable energy-based electric supply equipment and systems,
2. The approach will combine both decentralized stand-alone applications and the use of renewable energy-based village AC electric power systems,
3. Innovative financing mechanisms will be established for suppliers of equipment and services, intermediaries (eg. NGOs) and end users (individuals, communities, cooperatives, commercial enterprises, etc.),
4. To the extent possible, investments in power systems will be linked with investments in social and economic development, and
5. Working links will be established with related programmes and projects in Africa, Asia, and Latin America, and on an ongoing basis with the village power programme at the U.S. National Renewable Energy Laboratory.

**VII. ITEMS TO BE FINANCED**

<b>Expense</b>	<b>GEF US\$</b>	<b>Cofinancing Sources US\$</b>	<b>Total US\$</b>
International consultants (3) fees*	30,000	10,000	30,000
International consultants travel	17,000		17,000
National consultant (1) and travel**		5,000	5,000
Preparation of Project Document	10,000		10,000
Project Support Services (including executing agency support costs)	2,000		
<b>TOTAL</b>	<b>\$ 59,000</b>	<b>\$ 15,000</b>	<b>\$ 74,000</b>

\* Fees of NREL expert financed by NREL

\*\* Provided by Government of Ghana

Project Name	Project Start	Project End	US\$	US\$	US\$
Project 1	1990	1995	10,000	10,000	10,000
Project 2	1995	2000	10,000	10,000	10,000
Project 3	2000	2005	10,000	10,000	10,000
Project 4	2005	2010	10,000	10,000	10,000
Project 5	2010	2015	10,000	10,000	10,000
Project 6	2015	2020	10,000	10,000	10,000
Project 7	2020	2025	10,000	10,000	10,000
Project 8	2025	2030	10,000	10,000	10,000
Project 9	2030	2035	10,000	10,000	10,000
Project 10	2035	2040	10,000	10,000	10,000
Project 11	2040	2045	10,000	10,000	10,000
Project 12	2045	2050	10,000	10,000	10,000
Project 13	2050	2055	10,000	10,000	10,000
Project 14	2055	2060	10,000	10,000	10,000
Project 15	2060	2065	10,000	10,000	10,000
Project 16	2065	2070	10,000	10,000	10,000
Project 17	2070	2075	10,000	10,000	10,000
Project 18	2075	2080	10,000	10,000	10,000
Project 19	2080	2085	10,000	10,000	10,000
Project 20	2085	2090	10,000	10,000	10,000
Project 21	2090	2095	10,000	10,000	10,000
Project 22	2095	2100	10,000	10,000	10,000
Project 23	2100	2105	10,000	10,000	10,000
Project 24	2105	2110	10,000	10,000	10,000
Project 25	2110	2115	10,000	10,000	10,000
Project 26	2115	2120	10,000	10,000	10,000
Project 27	2120	2125	10,000	10,000	10,000
Project 28	2125	2130	10,000	10,000	10,000
Project 29	2130	2135	10,000	10,000	10,000
Project 30	2135	2140	10,000	10,000	10,000
Project 31	2140	2145	10,000	10,000	10,000
Project 32	2145	2150	10,000	10,000	10,000
Project 33	2150	2155	10,000	10,000	10,000
Project 34	2155	2160	10,000	10,000	10,000
Project 35	2160	2165	10,000	10,000	10,000
Project 36	2165	2170	10,000	10,000	10,000
Project 37	2170	2175	10,000	10,000	10,000
Project 38	2175	2180	10,000	10,000	10,000
Project 39	2180	2185	10,000	10,000	10,000
Project 40	2185	2190	10,000	10,000	10,000
Project 41	2190	2195	10,000	10,000	10,000
Project 42	2195	2200	10,000	10,000	10,000
Project 43	2200	2205	10,000	10,000	10,000
Project 44	2205	2210	10,000	10,000	10,000
Project 45	2210	2215	10,000	10,000	10,000
Project 46	2215	2220	10,000	10,000	10,000
Project 47	2220	2225	10,000	10,000	10,000
Project 48	2225	2230	10,000	10,000	10,000
Project 49	2230	2235	10,000	10,000	10,000
Project 50	2235	2240	10,000	10,000	10,000
Project 51	2240	2245	10,000	10,000	10,000
Project 52	2245	2250	10,000	10,000	10,000
Project 53	2250	2255	10,000	10,000	10,000
Project 54	2255	2260	10,000	10,000	10,000
Project 55	2260	2265	10,000	10,000	10,000
Project 56	2265	2270	10,000	10,000	10,000
Project 57	2270	2275	10,000	10,000	10,000
Project 58	2275	2280	10,000	10,000	10,000
Project 59	2280	2285	10,000	10,000	10,000
Project 60	2285	2290	10,000	10,000	10,000
Project 61	2290	2295	10,000	10,000	10,000
Project 62	2295	2300	10,000	10,000	10,000
Project 63	2300	2305	10,000	10,000	10,000
Project 64	2305	2310	10,000	10,000	10,000
Project 65	2310	2315	10,000	10,000	10,000
Project 66	2315	2320	10,000	10,000	10,000
Project 67	2320	2325	10,000	10,000	10,000
Project 68	2325	2330	10,000	10,000	10,000
Project 69	2330	2335	10,000	10,000	10,000
Project 70	2335	2340	10,000	10,000	10,000
Project 71	2340	2345	10,000	10,000	10,000
Project 72	2345	2350	10,000	10,000	10,000
Project 73	2350	2355	10,000	10,000	10,000
Project 74	2355	2360	10,000	10,000	10,000
Project 75	2360	2365	10,000	10,000	10,000
Project 76	2365	2370	10,000	10,000	10,000
Project 77	2370	2375	10,000	10,000	10,000
Project 78	2375	2380	10,000	10,000	10,000
Project 79	2380	2385	10,000	10,000	10,000
Project 80	2385	2390	10,000	10,000	10,000
Project 81	2390	2395	10,000	10,000	10,000
Project 82	2395	2400	10,000	10,000	10,000
Project 83	2400	2405	10,000	10,000	10,000
Project 84	2405	2410	10,000	10,000	10,000
Project 85	2410	2415	10,000	10,000	10,000
Project 86	2415	2420	10,000	10,000	10,000
Project 87	2420	2425	10,000	10,000	10,000
Project 88	2425	2430	10,000	10,000	10,000
Project 89	2430	2435	10,000	10,000	10,000
Project 90	2435	2440	10,000	10,000	10,000
Project 91	2440	2445	10,000	10,000	10,000
Project 92	2445	2450	10,000	10,000	10,000
Project 93	2450	2455	10,000	10,000	10,000
Project 94	2455	2460	10,000	10,000	10,000
Project 95	2460	2465	10,000	10,000	10,000
Project 96	2465	2470	10,000	10,000	10,000
Project 97	2470	2475	10,000	10,000	10,000
Project 98	2475	2480	10,000	10,000	10,000
Project 99	2480	2485	10,000	10,000	10,000
Project 100	2485	2490	10,000	10,000	10,000
Project 101	2490	2495	10,000	10,000	10,000
Project 102	2495	2500	10,000	10,000	10,000
Project 103	2500	2505	10,000	10,000	10,000
Project 104	2505	2510	10,000	10,000	10,000
Project 105	2510	2515	10,000	10,000	10,000
Project 106	2515	2520	10,000	10,000	10,000
Project 107	2520	2525	10,000	10,000	10,000
Project 108	2525	2530	10,000	10,000	10,000
Project 109	2530	2535	10,000	10,000	10,000
Project 110	2535	2540	10,000	10,000	10,000
Project 111	2540	2545	10,000	10,000	10,000
Project 112	2545	2550	10,000	10,000	10,000
Project 113	2550	2555	10,000	10,000	10,000
Project 114	2555	2560	10,000	10,000	10,000
Project 115	2560	2565	10,000	10,000	10,000
Project 116	2565	2570	10,000	10,000	10,000
Project 117	2570	2575	10,000	10,000	10,000
Project 118	2575	2580	10,000	10,000	10,000
Project 119	2580	2585	10,000	10,000	10,000
Project 120	2585	2590	10,000	10,000	10,000
Project 121	2590	2595	10,000	10,000	10,000
Project 122	2595	2600	10,000	10,000	10,000
Project 123	2600	2605	10,000	10,000	10,000
Project 124	2605	2610	10,000	10,000	10,000
Project 125	2610	2615	10,000	10,000	10,000
Project 126	2615	2620	10,000	10,000	10,000
Project 127	2620	2625	10,000	10,000	10,000
Project 128	2625	2630	10,000	10,000	10,000
Project 129	2630	2635	10,000	10,000	10,000
Project 130	2635	2640	10,000	10,000	10,000
Project 131	2640	2645	10,000	10,000	10,000
Project 132	2645	2650	10,000	10,000	10,000
Project 133	2650	2655	10,000	10,000	10,000
Project 134	2655	2660	10,000	10,000	10,000
Project 135	2660	2665	10,000	10,000	10,000
Project 136	2665	2670	10,000	10,000	10,000
Project 137	2670	2675	10,000	10,000	10,000
Project 138	2675	2680	10,000	10,000	10,000
Project 139	2680	2685	10,000	10,000	10,000
Project 140	2685	2690	10,000	10,000	10,000
Project 141	2690	2695	10,000	10,000	10,000
Project 142	2695	2700	10,000	10,000	10,000
Project 143	2700	2705	10,000	10,000	10,000
Project 144	2705	2710	10,000	10,000	10,000
Project 145	2710	2715	10,000	10,000	10,000
Project 146	2715	2720	10,000	10,000	10,000
Project 147	2720	2725	10,000	10,000	10,000
Project 148	2725	2730	10,000	10,000	10,000
Project 149	2730	2735	10,000	10,000	10,000
Project 150	2735	2740	10,000	10,000	10,000
Project 151	2740	2745	10,000	10,000	10,000
Project 152	2745	2750	10,000	10,000	10,000
Project 153	2750	2755	10,000	10,000	10,000
Project 154	2755	2760	10,000	10,000	10,000
Project 155	2760	2765	10,000	10,000	10,000
Project 156	2765	2770	10,000	10,000	10,000
Project 157	2770	2775	10,000	10,000	10,000
Project 158	2775	2780	10,000	10,000	10,000
Project 159	2780	2785	10,000	10,000	10,000
Project 160	2785	2790	10,000	10,000	10,000
Project 161	2790	2795	10,000	10,000	10,000
Project 162	2795	2800	10,000	10,000	10,000
Project 163	2800	2805	10,000	10,000	10,000
Project 164	2805	2810	10,000	10,000	10,000
Project 165	2810	2815	10,000	10,000	10,000
Project 166	2815	2820	10,000	10,000	10,000
Project 167	2820	2825	10,000	10,000	10,000