

Executive Summary

Final Project Report Village Electrification Project For Jigawa State, Nigeria

May 2004

Submitted by the Solar Electric Light Fund
Under DOE Cooperative Agreement #DE-FC01-01IA30037

1. Project Description.

During the project period, the Solar Electric Light Fund (SELF) and its Nigerian NGO partner, the Jigawa Alternative Energy Fund (JAEF) implemented a comprehensive village solar electrification project affecting over 9,000 people in three villages in the Northern Nigerian State of Jigawa.

The villages of Wawan-Rafi, Baturiya, and Ahoto received photovoltaic (PV) systems that include village water pumping systems, streetlights, home lighting systems, lighting for mosques, schools and clinics, vaccine refrigerators for clinics, a computer for each school, a mobile irrigation pumping system, and micro-enterprise centers for small, developing businesses.

2. Project Goals.

The goals of this project were to model the utilization of renewable energy to support rural villages in the areas of health, education, security, water supply, agriculture and micro-enterprise development.

The successful implementation of this project has encouraged future involvement by Federal and State Governments within Nigeria, NGOs, and from international sources of aid.

JAEF gained the training and experience necessary to replicate this or similar projects.

3. Project Implementation.

Throughout the project, JAEF maintained a close partnership with SELF who, as the most experienced partner, guided the project. Specifically, SELF played the lead role in technical design and specification, PV system procurement, on-site training, installation supervision, and planning for sustainability. The tasks of site surveys, project design, village relations, installation and the creation of systems for sustainability were shared by both organizations.

4. Budget.

The total U.S. budget for this project was \$607,342, which included funds for planning and implementing two renewable energy conferences in Abuja, Nigeria. \$285,000 was spent on the purchase of equipment along with shipping and installation. The balance of funds were used for travel, training, communications, project management and general administration.

5. Impacts.

- **Village solar-powered water supply.** Time and labor savings by replacing either open wells or hand-pumped wells. Improvement in health and water quality by substituting a closed, deep water source in place of a shallow source of water open to disease-causing insects and pathogens.
- **Streetlights.** Increased security in the villages and the creation of both nighttime gathering places and places for nighttime commercial activity. (food selling)
- **Schools.** Lighting systems increase the time schools are being used – for adult education, for overflow classes and as a place for students to study at night. The furnishing of electricity and computers to each school introduce computers to the villages at the primary school level and the future ability to connect to the State’s broadband Internet network.
- **Clinic.** Improvements in village health. Lights enable the clinics to be used at night and refrigerators allow vaccines to be stored on site, enabling more effective vaccination regimes.
- **Mosque.** Lighting enables night use. Inverter and electrical socket enables audio equipment.
- **Micro-enterprise Centers.** Provides electricity for up to six businesses in each village such as tailors and barbers. Upgrading from manual to electrical machines increases productivity and income.
- **Home lighting systems.** Replacement of kerosene lamps means improvements for education, home commerce, socializing and the health benefits of eliminating kerosene fumes and fire hazard.
- **Mobile solar irrigation carts.** Enables small farmers to effectively water their fields with much less labor over hand-watering methods. Savings in labor can be converted to increased income.
- **Groundnut expeller.** Solar-powered electric unit can save a great deal of time and labor for the women who traditionally process the oil by hand.
- **Project continuation and expansion.** The perceived success of this project by the Government of Jigawa State has resulted in proposals being written to continue solar electrification to 30 additional villages. The project has also generated a great deal of media attention and interest beyond the State.

6. Sustainability.

Organizationally, JAEF is structured as a micro-utility and will continue to own and maintain the systems. The organization maintains two levels of technicians to maintain the systems -- local residents who are available to address minor problems and maintenance needs and more highly trained staff that visit each village at least once per month to address more complex problems.

Fees are collected each month from system users and are calculated to be both affordable and enough to maintain the systems indefinitely.

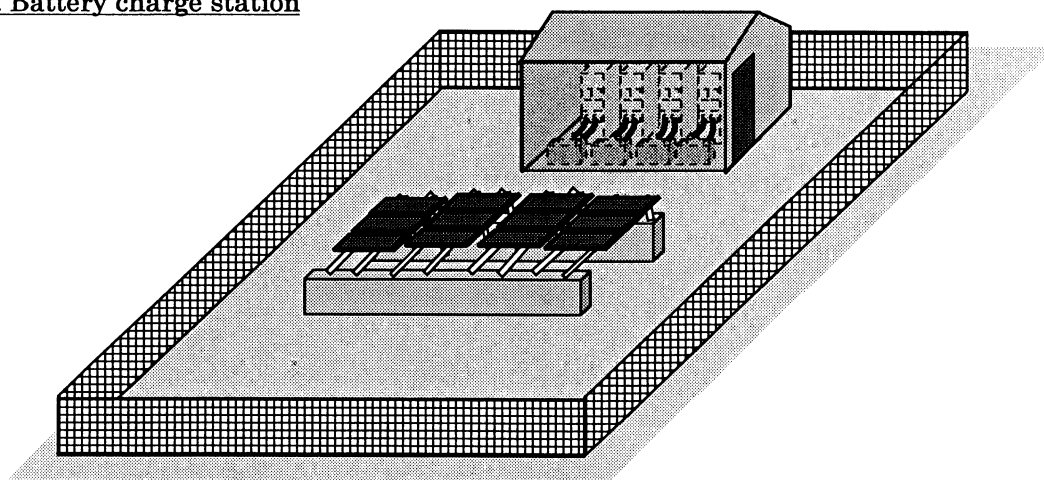
Enough spare parts have been provided to supply the project for a year from which time user fees will be used to buy replaceable items such as light bulbs and batteries.

SELF is currently assisting JAEF in designing a training program that will ensure that new technicians will periodically be trained and existing technicians will receive advanced training.

6. パイロットプロジェクト見積りに用いた資料

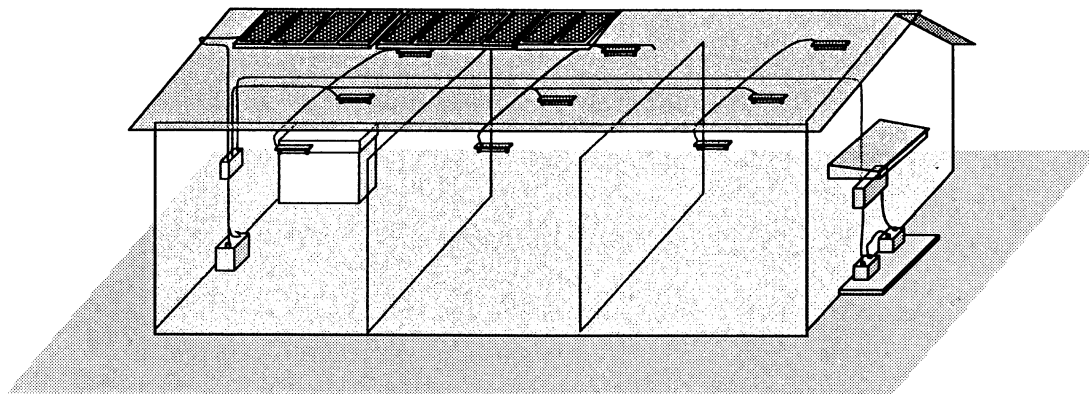
PV 見積りに用いた資料

1. Battery charge station



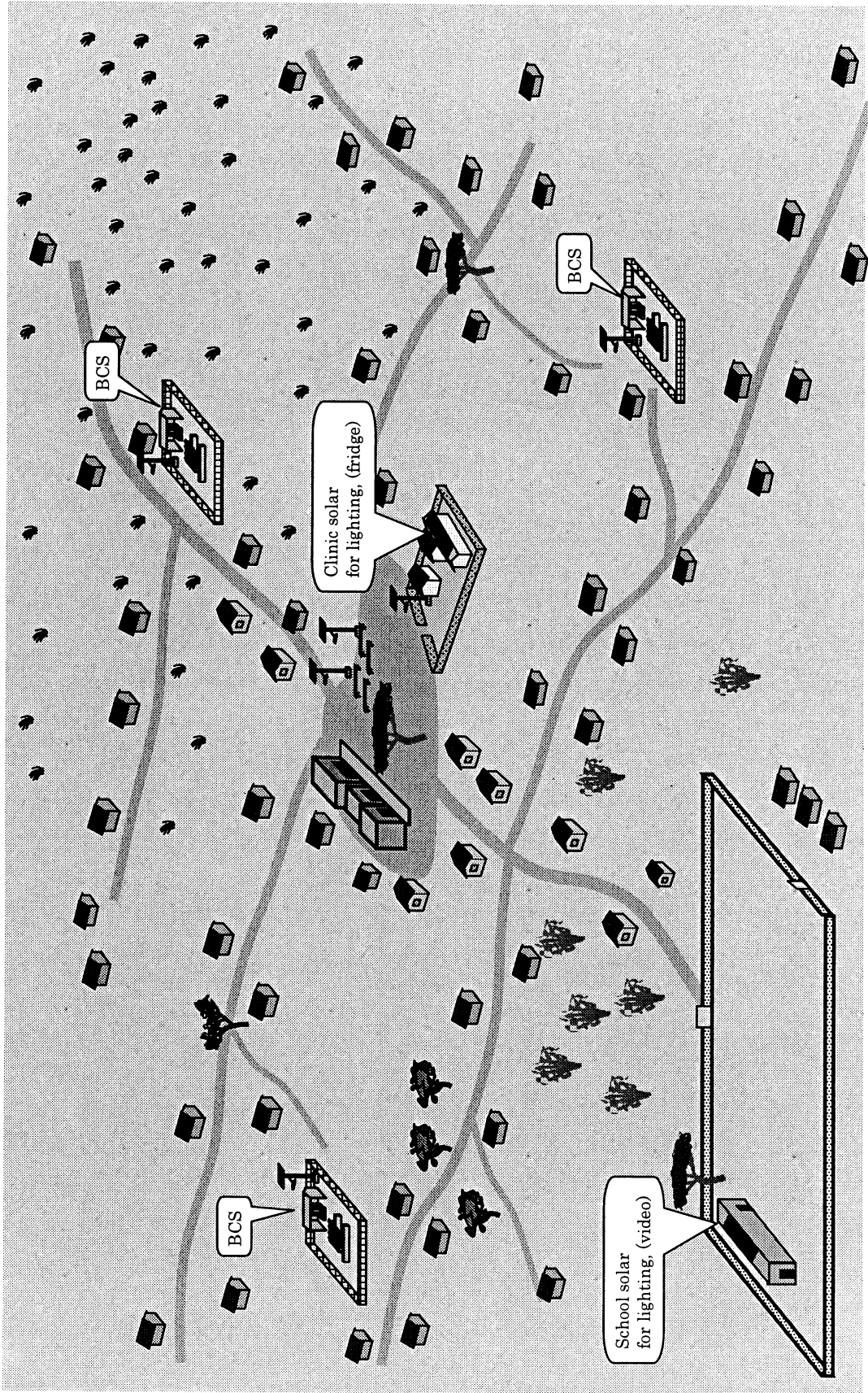
- Panels 50W×3×4 , with support frames, base)
- Charge controllers (10A) 4
- A house for accommodating charge controllers and batteries
- Fence
- Construction work

2. Community system



- Panels (50W×10, with support frames)
- Controler1 for in house use (20A) 1
- Controler2 for battery charge (10A) 1
- Fluorescent lamps 10
- Batteries (200Ah) 1
- Wiring and work

A village with BCS's



7. 村落社会経済調査コンサルタントリスト

村落社会調査コンサルタントリスト

FMST'S SUBMISSION:

LIST OF CONSULTING FIRMS, RESEARCH INSTITUTES AND NGOs
Specialised in Social Science to conduct Socio-economic surveys for
rural/community development

| <u>Organization</u> | <u>Contact Person</u> |
|--|--|
| 1. Nigerian Institute for Social and Economic Research (NISER) Ibadan, Oyo State | Director-General |
| 2. Sokoto Energy Research Centre Usman Danfodio University, Sokoto Sokoto State | Professor B. Garba Director Mobile: 08036783215 |
| 3. National Centre for Energy Research and Development University of Nigeria, Nsukka Enugu | Director, 042-771853 (phone) 042-771855 (fax) |
| 4. Solar Electric Systems Ltd Solar Electric Plaza 6 th Floor, Joseph Gomwalk House Jos, Plateau State | Mr. Muyi Lawal Managing Director 08043193177 (mobile) 073-231944 (phone) 073-450102 (fax) |
| 5. GC Tech. Nigeria Ltd: 9, Kashim Ibrahim Road Makurdi, Benue State | Mr. Fred Attah Head of Solar Division 08033588041 (mobile) 044-532376 (phone) |
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| 9. | Centre for Energy Research and Training, Ahmadu Bello University Kaduna State | Dr. I. M. Umar Director Tel: 069-550397 069-551397 069-551352 Fax: 069-550737 |
| 10. | Friends of the Earth International 4 th Floor 106/110 Lewis Street Obaiyede, Lagos Lagos State | Joana Maduka or Miss Gladys Fayomi Tel: 01-2633788 |
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8. その他収集資料リスト

収集資料リスト

FMPS (Federal Ministry of Power and Steel)

1. List of solar companies [FMPS からのメモ];
2. S.I.5 of 1996 Electricity Act, Electricity Installation Regulations; and S.I.6 of 1996 Electricity Supply Regulations, Official Gazette (1996, Federal Republic of Nigeria) [電力規制法]
3. Attachment-3 Estimated Power Demand per Population in each state [州毎の人口、電力需要];
4. Table-1 GN 2005 Capital Expenditure Budget Estimates, 2005-2007 on-going capital projects estimate summary; [発・送電プロジェクトの予算表]
5. Nigeria: Regulation and Power Sector Reform (世銀の行った電力改革セミナー資料の抜粋)

FMST (Federal Ministry of Science and Technology)

6. List of Consulting Firms, Research Institutes and NGOs [FMST が JICA 調査団に提出した村落社会経済調査再委託先候補のコンサルタント・調査機関・NGO のリスト].
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8. The Solar Energy Option by Garba, Eboatu & Sambo; [太陽エネルギーの技術入門書]
9. Briefs on Sokoto Energy Research Center (2000) [SERC の案内書];
10. Directory of Renewable Energy Research and Development Activities in Nigeria by Dr. B. Garba; [再生可能エネルギー論文リスト].
11. Nigerian Journal of Renewable Energy [再生可能エネルギー学会論文誌].
Volume 11, Number 1 & 2 (2003);
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Volume 1, 1990 (maiden issue).

NPC (National Planning Commission)

12. Nigeria Rural Development Sector Strategy : Main Report (2001, Federal Ministry of Agriculture and Rural Development) [1999 に設立した連邦農業農村開発省の農村開発セクター戦略ペーパー];
13. National Policy on Integrated Rural Development (2001, FMARD) [総括的農村開発

に関する国家施策。上記の概要版];

14. UNIDO Project Document: Dissemination of cost effective PV Technology for rural lighting and employment generation (UNIDO)) [BCS とソーラーランタンによる PV テクノロジー普及プロジェクトのプロポーザル];
15. List of Microfinance Institutions/MFIs in Nigeria (Central Bank of Nigeria)) [ナイジェリア国内各地の小規模金融機関のリスト];
16. Statistical News No.387 & No. 390 (October & December 2004, Federal Office of Statistics) [連邦統計事務所のニュースレター];
17. Small and Medium Enterprises Development Agency/SMEDA: A one stop shop for Small and Medium Enterprises Development (leaflets, SMEDA);) [中小企業振興庁のパンフレット]
18. List of Publications by Federal Office of Statistics[連邦統計事務所の発行物リスト]

ECN (Energy Commission of Nigeria)

19. Functions and Activities of the Commission 1999-2003 (ECN のソーラープロジェクト概要)
20. Annual Report 1999 , 2003 (ECN 年報ソーラープロジェクト部分);
21. Training Manual for the Installation & maintenance of Photovoltaic Systems in Nigeria (2002, ECN) [PV 技術指導書];
22. Technical Report No. ECN/EPA/02/3 [ナイジェリア PV 概要、PV 会社や設置実績のリストがある]

UNIDO

23. The Nigeria Country Service Framework: UNIDO Nigeria in Action (UNIDO)) [事業紹介パンフレット];
24. Millennium Development Goals: Report 2004 Nigeria (GoN and UN)) [ナイジェリア開発指針];
25. Journal of African Economies, Volume 12 Number 1 March 2003 (Oxford University Press) [UNIDO 特集のアフリカン・エコノミー誌];
26. Cluster Development Project in Eastern Nigeria (UNIDO)) [東ナイジェリアの 2 州で実施中の中小企業育成プロジェクトのパンフレット];
27. Renewable Energy for Rural Industrialization and Development in Nigeria (2003, UNIDO) [再生可能エネルギーの村落応用解説書]

USAID

28. Executive Summary: Final Project Report- Village Electrification Project for Jigawa State, Nigeria (May 2004); [Jigawa プロジェクト資料] 以下3つとも
29. Proposal for User Fees, Jigawa Solar Electrification Project
30. Information on USAID/DOE Jigawa Solar Electrification Project

31. Press Release: USAID Dedicate Solar Electrification Project in Jigawa State;

BPE (Bureau of Public Enterprise)

32. Power sector reform bill 2004[電力改革法]
33. National Electric Power Policy[電力改革法のポリシー]
34. Enterprises Marketing Profiles[ナイジェリア企業概要]

SERC (Solar Energy Research Center)

35. Community Water Supply Facilities Using Photovoltaic Systems, Progress Implementation Stage (Pilot Scheme) in Sokoto State Local Governments (Ministry of Local Government, Sokoto State Government) [ソコト州の地方政府における太陽光利用のコミュニティ給水施設整備状況];
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37. The Nigerian Statistical Fact Sheets on Economic & Social Development (April 2004, Federal Office of Statistics) [各種統計データ];
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40. Poverty Profile for Nigeria 1980-1996 (April 1999, Federal Office of Statistics) [世銀の支援により、消費支出調査をもとにナイジェリアの貧困状況についてまとめたもの];
41. Poverty and Agricultural Sector in Nigeria: Poverty Incidence of Farmers by Region (October 1999, Federal Office of Statistics Abuja) [世銀の支援により、各種の統計資料をもとに農業セクターの貧困状況についてまとめたもの];

民間会社

42. Triple “E” Systems Associates Limited (Lagos)
・ Corporate Profile [会社案内];
・ Proposed Financial Estimate [村落社会調査見積書]
43. Friends of the Environment (Lagos, NGO)
・ Profile: Friends of the Environment [組織案内];
・ Summary of Budget for JICA Survey [村落社会調査見積書];
・ Questionnaire for Household Survey [質問表の参考例];
・ FOTELINK [季刊のニューズレター].
44. The Nigeria Economic Summit Group (Lagos)
・ Brief on the Nigerian Economic Summit Group (NESG) [会社案内];

- ・ Summary of costs for JICA Study [村落社会調査見積書];
- ・ N ESG Economic Indicators [季刊ジャーナル]

45. ALTEQ (Abuja)

The JICA Socio-Economic Survey (Proposal): ALTEQ's Approach to JICA's Needs Assessment on Nigerian Rural Solar Energy Demand [村落社会調査のプロポーザルと見積書]

46. Quotation , Solarmate Enginnering Ltd. [PV 見積書]

47. Quotation , Rubitec Nigeria Ltd. [PV 見積書]

48. Quotation , Simon Engineering Ltd. [PV 見積書]