TECHNICAL ASSISTANCE PROGRAM

SOLARQUEST® MICRO-SOLAR DISTANCE LEARNING INITIATIVE

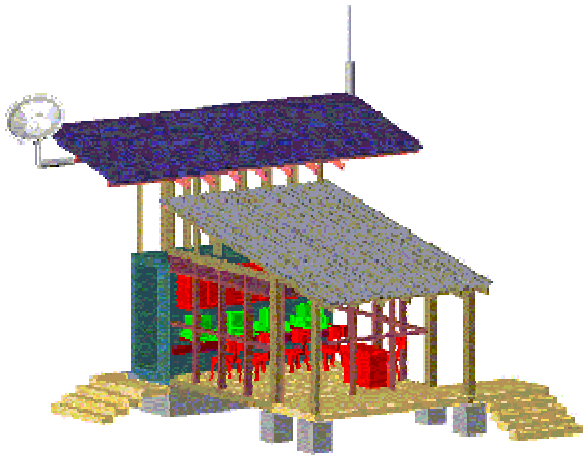
PHOTOVOLTAICS (PV)

AND

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

FOR

HUMAN CAPACITY BUILDING



Program Description

EcoSage Corporation

October 2001

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SECTION 1. INTRODUCTION

1.1. Background / Porvenir Pilot Project

EcoSage Corporation, in collaboration with the White House Millenium Council and public and private sector partners from the United States, the United Kingdom and Bolivia, established a micro-solar distance learning program in the deep-rural community of Porvenir, Department of Santa Cruz, Bolivia in October 2000. The program provides technical assistance to build human capacity in education, health care, governance, and commerce through a variety of learning activities focusing on sustainable economic development. Learning resources for the program are accessible primarily through the Internet. In-country program partners, including Friends of Nature Foundation, NUR University, Radio IRFA, and National Florida High School, visit Porvenir periodically to provide training and support. Long-distance learning resources include a Spanish language pen pal program with the Bluffsview Elementary School in Ohio (USA) and technical assistance and training from EcoSage Corporation. The on-line SolarQuest® Village Schoolhouse provided by EcoSage facilitates long distance learning.

Porvenir, Department of Santa Cruz, Bolivia is a deep rural village of 600 indigenous people in the Amazon River basin bordering Brazil.

Equipment deployed in Porvenir consists of a 2.5 kw photovoltaic (PV) system, a 5 kWh power supply (batteries), a Ku-Band satellite service, three computer terminals, wired fluorescent lighting in the elementary school (grades 1-6), and a small refrigerator for medical vaccines. On-site training included community-wide orientation to solar energy and information technologies, management and administration for facilities and personnel, information management systems (hardware and software), knowledge management practices, installation and maintenance of PV, and Information and Communication Technologies (ICT) systems operation and maintenance.

Installation training on the 2.5-kW photovoltaic system that powers 3 computers, lighting for the school, and a refrigerator for medical vaccines.

Seven youth ages 18 to 26 were certified as systems operators and have subsequently trained other key community members, including the village leadership, on basic energy and ITC systems operation during the past year. Porvenir now has the human capacity to undertake distance learning initiatives that can support the sustainable development objectives of the community.

With technical assistance from in-country program partners, a democratically elected Community Informatics Committee assisted the community with identifying development objectives in education, health

care, public health (water and sanitation), commerce, and governance to be supported by the newly installed energy and IT systems. Specific objectives included:

- Expanding educational opportunities in the tri-village region from the current grades (1 through 6) to grades 7 through 12 utilizing long-distance education.
- Implementing adult education programs utilizing long-distance education technologies in the key areas of literacy and economic development utilizing long-distance education.
- Improving health care delivery by connecting the existing medical clinic with a current staff of one nurse to professional health care services in urban centers in Bolivia and the United States utilizing tele-medicine technologies.
- Developing district water and sewage systems in the community by gaining access to donor agencies for technical assistance and project financing.
- Identifying and accessing high-end markets for locally produced organic Hearts-of-Palm and other potential high-end agricultural products.
- Obtaining land title to community property from the federal government to protect community resources from exploitation by external population pressures and economic forces.

The experience with the systems over the past year in Porvenir has empowered the community to undertake the challenges of building the human capacity that is required to meet their long-term sustainable development objectives. Several short-term challenges have been met successfully by trained operators, including the replacement of failed equipment. Perhaps the greatest impact is on the youth ages 16 - 26 who have become certified ICT systems operators, trainers, and information providers. The knowledge they have gained through training and continued support of in-country partners is transforming their lives. They are no longer socially and economically isolated. Youth are now assuming critical leadership roles and providing a sense of hope for the community.

The democratically elected Community Informatics Committee leads Porvenir residents in establishing information needs to achieve sustainable environmental and economic development.

1.2. Context

ICT development is a cornerstone of the structural reform programs of international donor agencies and represents approximately (US) $100 billion annually in donor support to developing nations. Donor investments in ICT today focus primarily on the infrastructure and human capacity building requirements of urban centers. In the last 24 months, however, advances in wireless telecommunications technologies (satellite and terrestrial) combined with a dramatic reduction in equipment costs are creating opportunities for ICT investments in deep rural communities.

Installation training on the 1.8 meter C Band satellite dish connecting the rural community of Porvenir to the Internet through a gateway in the U.S.

In a unique public/private partnership, EcoSage Corporation pioneered a deep rural installation in Porvenir that demonstrates the efficacy of expanding ICT investments to isolated communities by harnessing solar energy to information and communications technologies. A demonstration of the replicability and sustainability of the unique combination of these technologies will be required before donor agencies and developing nations implement this solution for human capacity development at a large scale.

SECTION 2. PROGRAM DESCRIPTION

2.1. Program

The SolarQuest® Micro-solar Distance Learning Initiative will install 30 learning centers in developing nations to demonstrate the replicability and sustainability of harnessing state-of-the-art photovoltaic (PV) systems to advanced information and telecommunications technologies (ICT). The initiative, at an estimated cost of (US) $2.1 million, will provide human capacity development through long-distance education, tele-medicine, e-commerce, and e-governance to support and accelerate sustainable economic development objectives of deep rural communities beyond the reach of existing power and telecommunications grids.

This initiative will build upon the proven experience of EcoSage Corporation and the local implementation team utilized in the initial pilot project.

2.2. Program Justification

In the past 50-years the global economy has been transformed into an information-based economy through successive developments of energy and information technologies. Yet rural populations in developing nations beyond the electric power and telecommunications grid are unable to benefit from participation in this information economy. Competing in emerging global markets depends upon reliable energy and real-time, or near-real-time, information and communications for an array of economic decisions and financial transactions.

Integrating low-cost, renewable energy and low-power IT hardware is the critical technology development required to deliver the benefits of the information economy to deep rural communities of developing nations.

The term "Digital Divide" has emerged to describe the growing chasm between the technology "haves and have-nots, know and know-nots." Examining the Digital Divide more carefully, one can conclude that it is *electricity* that is the essential prerequisite for the development of the information economy. As technology continues its rapid penetration into global markets, the Digital Divide in the future will be more accurately described as a "Power Divide." In this context, the proposed Micro-solar Distance Learning Initiative is an important step towards demonstrating that rural communities of developing nations can bridge the power divide in order to meet their information needs.

Donor agencies acknowledge that one the critical barriers to ICT development in deep rural communities of developing countries is the cost of electric power. By demonstrating that deep reductions in the cost of power is attainable, the Initiative may have a substantial impact on the ability of international donor agencies to increase funding for accelerated rural ICT development.

2.3. Public / Private Partnerships

The Information Revolution is transforming access to and delivery of knowledge. It is also changing the relationships between the information provider and the information consumer, and the relationships between information providers and other information providers. In developed nations, "convergence" is a term referring to a phenomenon of the Information Age in which information technologies---audio, video, text, data---are merging across technology sectors on a single, open platform. In the United States and Europe this phenomenon has had a profound impact on the information industry as demonstrated by a number of recent mergers between media and technology enterprises.

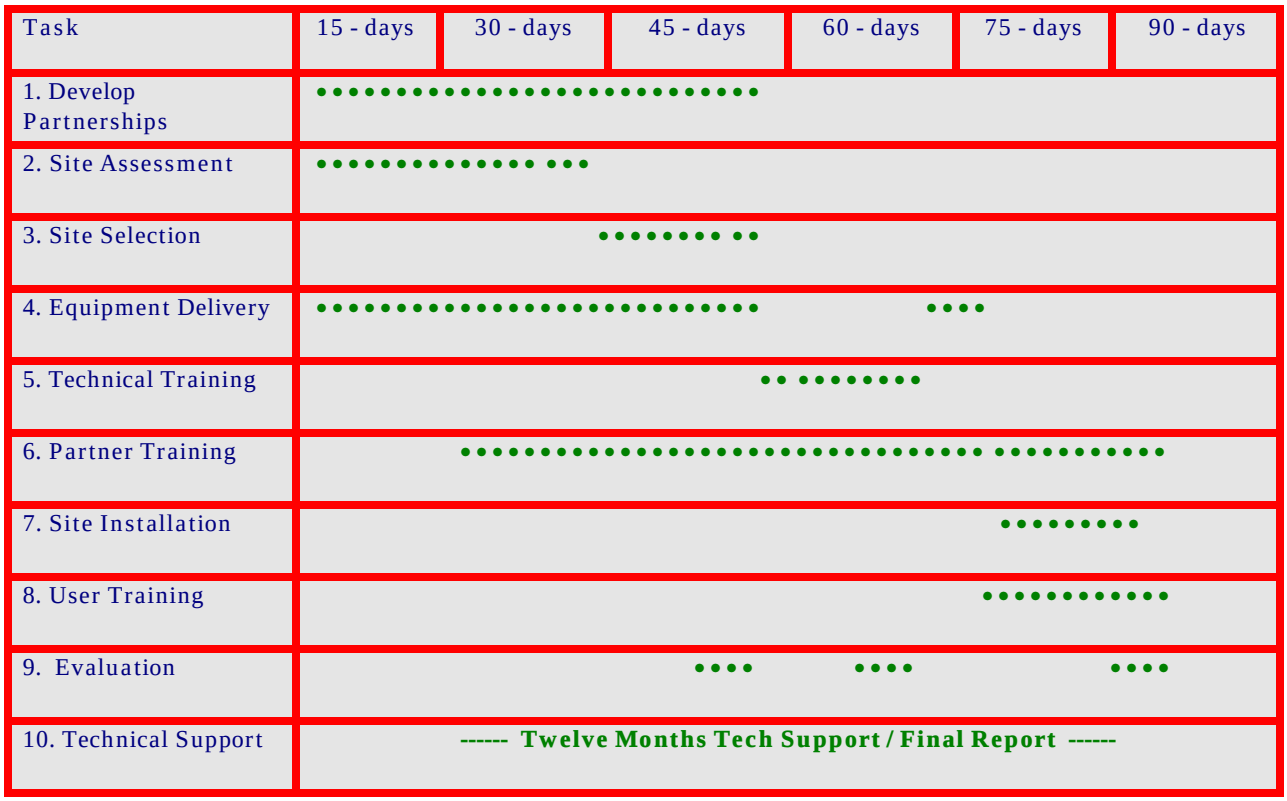
In developing nations, this phenomenon is appearing as an "institutional convergence" across diverse sectors in the form of public/private partnerships, transforming yet again the social infrastructure for the delivery of information services. Deep rural communities in developing nations traditionally have had limited information channels, such as radio and television, and no adequate voice and data transfer channels. The introduction of multiple information channels available through a single ICT portal requires complex information and knowledge management practices for both the information provider and the information consumer. Public/private partnerships are emerging to meet this challenge by converging across sectors to "bundle" services for human capacity building, and it is proving to be the key to the financial and cultural sustainability of rural ICT initiatives.

EcoSage Corporation pioneered such a public/private partnership with the implementation of the Porvenir pilot project. The Micro-solar Distance Learning Initiative presents an opportunity to demonstrate a sustainable program model from this partnership approach. The multiple project sites proposed under this initiative will provide opportunities for both public/private partnerships and program beneficiaries to provide peer-to-peer technical assistance through a best-practice review process, in real-time and near-real time.

2.4. Overview of Deployment Strategy / Implementation Schedule

A regional focus of phase 1 countries in Latin America underlies the Micro-solar Distance Learning Initiative rapid deployment implementation and cost containment strategies. (See Figure 1. Site Implementation Schedule, below.) With technical assistance from the Trust of the Americas, a division of the Organization of American States, tariff exempt PV and ICT equipment transfers are permissible. Spanish is the official language of all phase 1 countries, allowing for the development of a regional approach to technical assistance programs and permitting peer-review within a multiple installation network. ICT market demands in urban centers in Latin America, combined with liberalized telecommunications policies throughout the region, has resulted in cost efficiencies that have improved vendor capacity to meet program installation schedules and recurring systems hardware maintenance. Donor and corporate investments in regional ICT development have provided a climate of readiness for the adoption of ICT in deep rural communities.

Figure 1. Site Implementation Schedule



2.5. Phase 1 Countries

- **Argentina**
- **Bolivia**
- **El Salvador**
- **Guatemala**
- **Mexico**
- **Venezuela**

Figure 2. Map of Phase 1 Region

Delivering the benefits of the information economy to deep rural communities of developing nations is dependent upon the degree to which they are prepared to participate in the networked world---their "e-readiness." This is gauged by assessing the relative advancement of both the nation and the local communities in areas that are most critical for ICT adoption and by identifying the most important applications of ICTs for program beneficiaries. When considered together in the context of strategic planning and development, an assessment based on these elements provides a portrayal of e-readiness. The six phase 1 countries meet a critical standard of e-readiness with a demonstrated capacity to meet the rapid deployment and the recurring service requirements of the Micro-solar Distance Learning Initiative. Criteria for overall e-readiness cover a broad range of social, political, and economic factors. Key among these requirements that are currently in place in phase 1 countries to meet the e-readiness criteria of the Micro-solar Initiative are:

1. ICT INFRASTRUCTURE: Liberalized telecommunications policies and open, competitive frequency licensing for 2-way satellite telecommunications; vendors and regional partners with the capacity to meet rapid deployment scheduling demands and with capacity for on-demand PV equipment maintenance and servicing of satellite telecommunications equipment;
2. EDUCATION: Integration of ICT curricula into secondary and post-secondary education; collaborative, project-based learning; advanced ICT training opportunities available through vendor certification programs, employers, educational institutions, and private training centers; on-line educational content generated by educational institutions, government, and private voluntary organizations, as well as local program participants.
3. GOVERNMENT & INDUSTRY: Government agencies, financial institutions, and commercial industries on-line, networked, or connected to each other through external networks to facilitate delivery of social and economic services to rural communities.

2.6. Phase 2 Countries / Global Coverage

Liberalized telecommunications in developing countries throughout Africa, Asia, and Eastern Europe are providing new opportunities to expand the benefits of the Information Economy to deep rural communities. Unique opportunities exist for phase 2 installations on all continents as telecommunications infrastructure investment increases, although price structures, deployment timelines, and partnership opportunities are not uniformly available to establish a cost-effective regional program structure as is proposed for phase 1 developing countries in Latin America.

Program implementation partners will monitor telecommunications infrastructure investments in collaboration with international donors, regulatory agencies, and private corporations to identify new opportunities to expand the initiative. Monitoring for new opportunities will address technology access, price point, and new opportunities for partnerships with international donor agencies and in-country partners.

Figure 3. World Map / Phase 2 Regions

CURRENT RESEARCH FOR PHASE 2 DEPLOYMENT

- **AFRICA**
- **MIDDLE EAST**
- **EASTERN EUROPE**
- **SOUTHEAST ASIA**
- **PACIFIC ISLANDS**
- **CENTRAL ASIA**

2.7. Overview of Energy System and Research

Figure 4. Energy System

KEY COMPONENTS

- **1.5 kW PV Panels & Balance of Systems**
- **(DC) Charge Controller & (AC) Inverter**
- **5 kWh Uninterruptable Power Supply (Batteries)**
- **Energy Efficient Lighting, IT Hardware & Appliances**
- **Refrigerator for Medical Vaccine Storage**

EcoSage Corporation installed a 2.5 kW photovoltaic system to provide electricity for lighting of six classrooms and two offices, three computers, satellite telecommunications equipment, and a refrigerator/freezer for medicine and vaccines. Recent advances in energy efficient IT technologies and power controller devices have reduced the power requirement to 1.5 kW for equivalent services, dramatically reducing system costs. The Micro-solar Distance Learning Initiative will field-test new technology innovations to further reduce power and cost thresholds for basic ICT services to deep rural communities in developing nations.

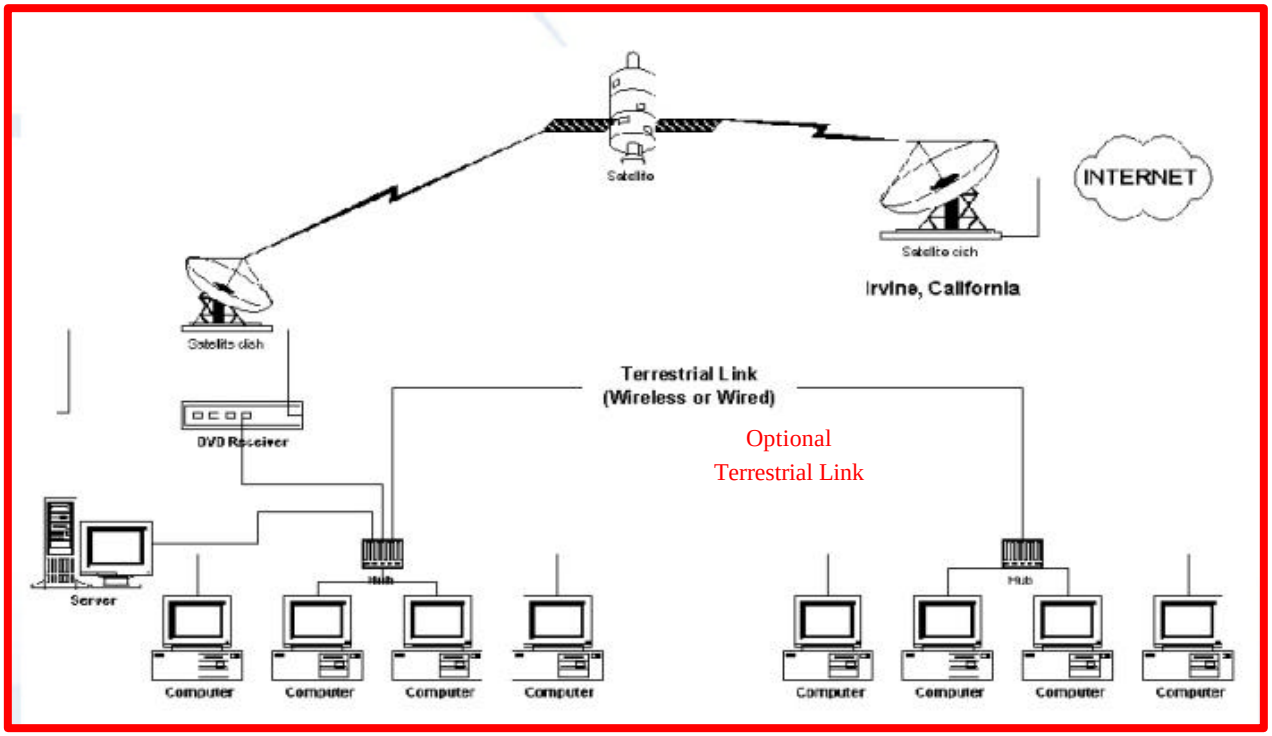
Each Micro-solar installation will be equipped with state-of-the-art energy monitoring devices that measure solar insolation and the production and consumption of energy. Measurement records based on 15-minute intervals 24-hours per day will be automatically transferred over the Internet to research databases in the United States. Quality of service data obtained from end-users in the field will be cross-referenced with power data to adjust consumption and production requirements for each installation and to obtain optimum systems design. The Micro-solar PV sizing goal is less than 1kW utilizing a mix of DC and AC power supplies to reduce purchase and maintenance costs associated with large inverters. Information on systems configuration, systems performance, and quality of service will be made available to energy researchers and international donor agencies.

Installation and maintenance training on the 2.5 kW photovoltaic system in the rural community of Porvenir. Energy efficiency has reduced power requirements to 1.5 kW.

Installation and maintenance training of in-country partners and local systems operators will include data monitoring protocol to achieve reliable and consistent field retrieval for quality of service data. The performance of each Micro-solar system may vary due to local climatic conditions and building envelopes. Detailed data will be obtained on micro-climates and existing building envelope specifications, specifically conditions in which the thermal loading of facilities may impact energy systems performance. End-use patterns will also factor into the energy research component of the Micro-solar Initiative with the goal to distribute energy demand uniformly and/or in accordance with available power requirements. Community decision making on facility end-use will factor into the energy research. Academic institutions will be invited to participate in the research component.

2.8. Overview of Satellite Space Segment and Terrestrial Network

Figure 5. Space Segment and Terrestrial Network



The Micro-solar Distance Learning Initiative will utilize a 2-way, high-speed (96 KBPS upstream, 2 MBPS downstream) broadband, synchronous, C-Band satellite service connected by SatMex 5 to an Internet gateway located in Irvine, California (USA).

On-site equipment includes a 1.8-meter C-Band antenna and transceiver, external access router, and mini-intranet HUB and LAN interface with capacity for network system expansion. Voice-Over-IP telephony services are configured into the system with services to the telecommunications backbone and available to end-users where permitted under federal regulatory policies. A virtual private network option is available under current regulatory policies to support peer-to-peer technical assistance. Satellite connectivity is available on demand 24 / 7. Audio, video, data, and text can be simultaneously broadcast in a number of standard applications over the network system within configured broadband speed limitations. The network can support a variety of specialized hardware including weather monitoring and diagnostic instruments used in tele-medicine.

Figure 6. Connectivity Equipment

KEY COMPONENTS

- **1.8 Meter C - Band Antenna**
- **Voice-Over-IP Telephony Services**
- **Mini-Intranet Hub & LAN Interface**
- **External Access Router**
- **Dedicated Space Segment to Internet Gateway**

2.9. ICT Applications

Figure 7. ICT Applications

KEY APPLICATIONS
· Long-distance Education
· Tele-medicine
· E-Commerce

Today, it is universally accepted that energy, information, and communications are essential preconditions for building human capacity. The application of ICT to educational programs can be an essential component to accelerate the requisite human capacity building for deep rural communities. The primary objective of the Micro-solar Distance Learning Initiative is to demonstrate solutions for and disseminate information about the performance and the impact of low-power ICT solutions to accelerate human capacity building for rural communities to achieve sustainable development.

In collaboration with international donor agencies and in-country partners, methodologies will be deployed to capture, retain, apply, and disseminate information and resources of existing funded programs in education, health care, governance, and commerce. These methodologies include standard community development activities, such as community informatics, social network analysis, and asset mapping. Information, personnel, and financial resources supporting community development objectives will channel through the new ICT capacity of the beneficiary communities. EcoSage Corporation implementation partners will utilize Internet-based information management software to coordinate technical assistance to the beneficiary communities. Monitoring and evaluation, peer-to-peer review and technical assistance, and energy research will also be managed utilizing the information management software.

Students participate in collaborative distance learning project. The Micro-solar Initiative will apply standards-based academic learning is to project-based activities focused on community sustainable development priorities.

Figure 8. Distance Education Software

SOFTWARE APPLICATIONS
· Remote Project Management Services
· Long-Distance Education
· Medical Consultation
· Knowledge Management Library
· Remote Technical Support
· Monitoring & Evaluation

The Micro-solar Distance Learning Initiative will measure success against five criteria: the performance of the energy and ICT systems, the development of local human capacity to fully utilize and benefit from the energy and ICT systems, the quality of ICT supported technical assistance programs, ability of beneficiaries to accelerate self-determined sustainable development objectives, and the dissemination of best practices throughout the development community.

2.10. Site Assessment and Selection

Site assessment and selection for phase 1 countries will be determined on available technical assistance from international donor agencies, and in-country site assessments. The objective is to select sites in which the addition of energy and ICT systems will aid the community in accelerating self-determined sustainable development objectives by applying new technologies and information management practices to existing development initiatives. Technologies integrated into existing technical assistance programs to develop human capacity are key to accelerated development, acceptance of the technologies, and the short-term financial sustainability of the initiative.

The Micro-solar Distance Learning Initiative activities described in Section 3 detail the approach to site assessment and selection in a developing country in which one or more projects are to be implemented. These activities are designed to aid communities in achieving financial sustainability to support the recurring operating and maintenance costs of a micro-solar distance learning center within three years of installation from a variety of revenue sources as referenced below in Figure 9. Recurring and operating costs, estimated at a range of (US) $1000 to $3,000 per month, will vary according to a variety of factors unique to each installation. Staffing patterns, local wage structures, quality of local systems maintenance and operations, and willingness to pay for services are key variables.

Figure 9. Sources of Revenue

FEE-FOR-SERVICE LOCAL	GOV. SERVICES NATIONAL	DONOR FUNDING INTERNATIONAL
· Education	· Education	· Education
· Medical	· Health Care	· Health Care
· Commercial Services	· Public Records	· Sustainable Development
· Entertainment	· Municipal Training	· Municipal Training
Utility Services	· Extension Services	· Civic Participation
· Battery Charging	· Economic Development	· Relief Services
· Potable Water	· Emergency Mgt.	
Objectives: Self-generate revenues and secure revenues from government and donor agencies to achieve financial sustainability within 3-yrs.		

2.11. Key Implementation Partner / Summary of Qualifications

EcoSage is recognized as an international leader in the application of ICT for rural development.

From 1998 to 2000, EcoSage pioneered the development of an Internet-based distance learning technology, the SolarQuest® Village Schoolhouse, based upon pedagogical standards used throughout the world. The schoolhouse software technology is structured in an outline format and features automated contact management through e-mail protocols. It can be utilized in a variety of instruction and project management applications in education, health care, governance, media and commerce. Applications have been field tested in domestic and international programs in partnership with the White House Millenium Council, including the National Town Meeting for a Sustainable America (1999), US-African Energy Ministerial (1999 and 2000), and in ICT pilot installations in Bolivia, Honduras and Guatemala. Educational institutions from primary schools to post-secondary institutions utilize the SolarQuest® Village Schoolhouse to deliver distance education programs. Recently the United States Department of Agriculture utilized the technology to teach a post-graduate course on ICT development to students participating from over nine countries on five continents.

EcoSage capacity, in addition to distance education technology and energy and ICT systems integration, includes electrical engineering and general contracting with specialization in energy efficiency and renewable energy technologies: photovoltaics, wind, solar thermal, and biomass. EcoSage principals pioneered early wind generating demonstration facilities in California (USA), applications for solar electricity in transportation, and continue to pioneer renewable energy for a broad range of new commercial applications. In 2000 - 2001, EcoSage joined with the Hewlett-Packard (H-P) World e-Inclusion initiative to redesign the LINCOS (Little Intelligent Communications Systems) telecenter originally prototyped by a Massachusetts Institute of Technology (MIT) design team. A systems integrated technology core design emerged from this research project which forms the basis of the technology systems for Micro-solar Distance Learning Initiative.

EcoSage's accomplishments with ICT pilot projects in Latin America resulted in strategic relationships to support the rapid deployment of the Micro-solar Distance Learning Initiative. EcoSage has relationships with key international donor agencies, with regional and country specific partners in Latin America, and with preferred vendors that have the capacity for rapid deployment and on-going technical assistance to deep rural communities. These strategic relationships represent a unique capacity for EcoSage to achieve program goals and objectives. EcoSage maintains corporate offices in Chelsea, Vermont. Corporate solar research facilities and IT backbone are located in Santa Cruz, California.

SECTION 3. PROGRAM ACTIVITIES

3.1. Donor Partnerships

Table 3.1. Donor Partnership Development Activities

3.1. Goals and Objectives

a. Establish key donor partnerships across sectors to provide technical assistance to Micro-solar Distance Learning Initiative.
b. Identify flow of donor resources across sector to phase 1 countries.
c. Identify in-country donor beneficiaries across sectors providing services to deep rural communities; develop donor profile, contact database, and program descriptions.
d. Establish in-country working groups and develop public/private partnerships.
e. Conduct preliminary site assessments with assistance from in-country partners.
f. Develop preliminary asset map across donor sectors identifying flows of donor resources to beneficiaries.

Activity	Description	Timeline
3.1.1. Secure Key Donor Agency Partnership	Establish partnerships with key international donor agencies and obtain technical assistance to establish primary working groups in phase 1 countries. Key donor agencies include but are not limited to: the World Bank, United Nations Development Program, Organization of American States, International Telecommunications Union, United States Agency for International Development, Inter-American Development Bank, and International Development Research Centre.	1 - 90 days from program approval
3.1.2. Secure Country Gov. Partnerships	Establish partnerships with key government agencies from each of the phase 1 countries---Argentina, Bolivia, El Salvador, Guatemala, Mexico, and Venezuela. Solicit technical assistance from the Inter-American Agency for Cooperation & Development of the Organization of American States and the United Nations Development Programme.	
3.1.3. Secure PVO Donor Partnerships	Establish partnerships with international Private Voluntary Organizations (PVOs) with technical assistance from the American Council for Voluntary International Action. Identify PVO technical assistance resources to phase 1 countries.	

Outcomes: Key donor partnerships, preliminary asset maps, contact database, in-country working groups, preliminary e-readiness assessment, preliminary sustainability indicators.

3.2. In-country Partnerships

Table 3.2. In-Country Partnership Development Activities

3.2. Goals and Objectives

a. Establish in-country key donor partnerships across sectors.
b. Develop asset map of donor resources across sectors to deep rural communities, develop contact list database, obtain program descriptions, and establish site selection / assessment criteria.
c. Conduct working group conference and seminars to identify geographical regions and specific sites. Finalize site assessment and selection criteria.
d. Obtain partner commitments for on-going technical assistance to beneficiary communities.
e. Direct site assessments and select site(s).

Activity	Description	Timeline
3.2.1. Secure In-country Agency Partnership	Conduct working group conference and seminars to establish partnerships with key in-country implementation partners across sectors, including government agencies, private voluntary organizations, universities, and corporate donors. Obtain technical assistance from funded programs for beneficiaries. Develop contact management and resource database.	1 - 45 days from country selection and funding
3.2.2. Prepare Asset Map	Prepare asset map with technical assistance from in-country partners to include regional economic data, donor funding, in-country partner infrastructure, and commitment of in-country funding and/or technical assistance.	
3.2.3. E-readiness Assessment / Partner Training	Establish partner e-readiness assessment criteria and evaluate partnerships for capacity to provide technical assistance within ICT platform. Identify partner technical training requirements and provide requisite technical assistance.	
3.2.4. Site Assessment and Selection	Establish site assessment criteria utilizing asset map data. Identify short-list of sites and conduct remote site assessment with technical assistance from in-country partners. Select sites from short-list and conduct detailed site assessment, including site visits if required. Select final sites matched to existing, in-country technical assistance programs.	
3.2.5. Sustainability Index	Establish project sustainability index and reporting protocol to provide metrics for measurement and evaluation of outcomes-based technical assistance and training.	

Outcomes: In-country donor partnerships and resource commitments, regional and site-specific asset maps, contact database, resource library, regional and site-specific e-readiness assessment, regional, site selection and site-specific sustainability indicators.

3.3. Procurement and Technical Training

Table 3.3 Procurement and In-Country Partnership Training Activities

3.3. Goals and Objectives

a. Maintain inventory of long-lead time equipment to meet rapid deployment schedule.
b. Establish priority procurement agreements for long-lead time equipment with preferred vendors to meet demands of rapid deployment shipping schedules.
c. Provide in-country training seminars for certification on PV and ICT systems equipment and maintenance to primary project partners.
d. Provide partner training on use of equipment to support user training in the field.

Activity		Description	Timeline
3.3.1	Inventory Long-Lead Time Equipment / Procure Equipment	Order long-lead time equipment for inventory. Procure equipment for multiple orders.	1 - 15 days from placement of order
3.3.2.	Prepare / Ship Equipment	Assemble and ship equipment to in-country partner training site. Arrange value-in-kind and/or discounted shipping.	60 - days from placement of order
3.3.3.	In-country Partner Equipment Training	Evaluate partnerships for capacity to provide technical assistance for energy and ICT equipment.	60 - 90 days from placement of order
3.3.4.	Repackage and Ship Equipment to Site	Reconfigure equipment packaging and ship to remote installation site for end-user training and installation.	65 - 70 days from placement of order
3.3.5.	Testing and Certification	Testing and certification of in-country partners and end-users on systems operation and maintenance. Multiple testing and review periods as required over ten-days.	80 - 90 days from placement of order

Outcomes: Rapid deployment preparedness and delivery schedules, technical assistance to in-country partners, testing and certification of in-country partners and end users.

3.4. Twelve-month Technical Assistance Activities

Table 3.4. Twelve Month Technical Assistance Activities

3.4. Goals and Objectives

a. Monitor and assess performance and durability of PV and IT hardware systems in high-maintenance impact climate zones. Measure energy production and consumption.
b. Monitor and assess long-distance maintenance and service program.
c. Maintain technical assistance for remote project management, including monitoring and measuring development impacts in education, health care, commerce, and governance of low-power, low-cost ICT networks.
d. Identify additional donor resources for beneficiaries.

Activity	Description	Timeline
3.4.1. On-going Technical Assistance	Measure and monitor the performance of energy and ICT systems with regard to user demand and quality of services to determine the low-power, least-cost PV systems application; Develop end-user human capacity to utilize ICT systems to maximum capacity with minimum power requirements; Improve quality of ICT supported technical assistance programs in collaboration with donors and in-country partners; Measure ability of beneficiaries to achieve self-determined, sustainable development objectives; Publish periodic reports of energy production and consumption; Compile best practice reports and disseminate to international donor community.	12 months following installation of systems and user training
3.4.2. Maintain Report Databases	Maintain report databases with current information with in-country partners and end-user participation, including asset maps, in-country partner technical assistance support activities and staffing patterns, community e-readiness assessments, progress reports on key sustainability indicators.	
3.4.3. Testing and Certification	Maintain on-going in-country partner and end-user testing and certification of systems operation and maintenance. Testing and review periods as required.	

Outcomes: Database of in-country donor partnerships and resource commitments, regional and site-specific asset maps, contact database, in-country partner and end-user e-readiness assessment, sustainability indicators.

3.5. Technical Assistance Report Activities

Table 3.5. Evaluation and Reporting Activities

3.5. Goals and Objectives

a. Disseminate information on the results of deploying low-cost, renewable energy from PV and low-power IT hardware systems for development in rural communities of developing nations.
b. Disseminate information on the cost-efficiencies and sustainable development impacts in education, health care, commerce, and governance to key international donor agencies of bundling donor services across sectors through low-power, low-cost ICT networks deployed in deep rural communities of developing countries.

Activity	Description	Timeline
3.5.1. Partnership Report	Prepare and publish Partnership Technical Assistance Report containing the following document types: Letters of commitment and/or cooperation agreements for technical assistance for Micro-solar Distance Learning Initiative; Contact database of donor agencies, in-country working group profiles by sector, including funding sources for in-country agencies; Inventory of technical assistance resources by donor sector allocated to rural communities; Asset map including technical assistance resource tables and overlay of donor resources across sectors; Summary of ereadiness assessment; Framework of sustainability indicators.	90 - 100 days from program approval and on-going through program operating period
3.5.2. In-Country Partnership Report	Prepare and publish in-country partner Technical Assistance Report containing the following document types: Letters of commitment or cooperation agreements for technical assistance for Micro-solar Distance Learning Initiative; Contact database of in-country partners, including profiles by sector and funding sources; Inventory of technical assistance resources by partner sector allocated to rural communities; In-country partner asset map and technical assistance resource tables across sectors cross-referenced to identify resources to deep rural communities; Summary of e-readiness assessment of in-country partners, site assessment criteria; Framework of sustainability indicators with technical assistance requirements to maximize IT resources.	60 - 70 days from placement of order for each Micro-solar site; followed by report 12 months after site installation
3.5.3. Final Project Report	Prepare and publish final project report assessing impacts of Micro-solar Distance Learning Initiative on sustainable development activities in deep rural communities of developing nations utilizing low-power energy and ICT systems.	12 months after final installation

Outcomes: Dissemination of program information to international donor agencies and in-country partners.

SECTION 4: PROGRAM COSTS AND EQUIPMENT SPECIFICATIONS

4.1. Overview of Project Costs and Sustainability

The objective of the Micro-solar Distance Learning Initiative is to design and test the first-least-cost energy and ICT systems, systems that are affordable for deep rural communities of developing countries and meet human capacity building requirements for sustainable development. The first-least-cost threshold on a per capita basis for each community will be determined according to population density and income, which varies greatly across continents and within regions of developing nations. The system costs described in Section 4.2 of this proposal are based upon the experience of EcoSage Corporation in Porvenir and continued research and development in collaboration with research partners and preferred vendors. It represents baseline system costs for a level of services to provide basic information needs for a community of approximately 600 to 1,000 residents with a server and four computer terminals. At the term-end of the Micro-solar Distance Learning Initiative, sufficient field operating experience will be obtained from energy monitoring and quality of service data to determine if further reductions in energy systems sizing can be achieved without compromising the quality or quantity of services. While field information from end-user sources to date indicates that more power and more services are better, no reliable sustainable economic development performance indicators are available to verify this information.

A simplified way of looking at cost and financial sustainability is represented in the figure below, which looks solely at per capita educational costs of energy and ICT services for a community of 1,000 residents and compares those costs to the costs of education in the United States.

Figure 10. Per Capital Cost / Comparison

SYSTEM / SERVICES COSTS	PER CAPITA COSTS	U. S. EDUCATIONAL COSTS
· Energy & Telcom · IT Hardware · Software · Training · Tech Support · Maintenance Total = US$70,000	Costs (based on 1,000 Residents) Systems & Services : US$70 Recurring Costs : US$2 monthly	Per Capita Costs Facilities & Services : US$17,778 Recurring Costs : US$660 monthly (Data: US Census Bureau)

4.2. Costs Schedule and Equipment

Table 4.1. Systems and Program Costs

FIRST PHASE INDIVIDUAL SYSTEM COSTS

COMPONENT	PREFERRED VENDORS	COSTS
CORE INFRASTRUCTURE Server, Monitor, Windows 2000/NT Server O/S, Router, HUB, and Switch (1 ea.); secure cabinet, rack and accessories, and cooling cell (1 ea.); solar panels (1272w), electric fuse panels, charge controller, inverter, batteries; fluorescent lighting fixtures (32w), ballasts (48 volt DC) (6 ea.)	TBD (Solar Panels) HP (IT Hardware) Microsoft (Software) Zomeworks (Equipment Cabinets) Long (Batteries) Exceltech (Inverters) EcoSage (Charge Controller) Nextek (Ballasts)	$16,900
TERMINAL INFRASTRUCTURE Branch Computers / Terminals (3) Branch Energy (1150w), Misc. Hdw.	HP Computers / Terminals TBD (Solar Panels)	15,750
TELECOMMUNICATIONS Satellite dish, radio transceiver, router, 1-yr. space segment, 1-yr. maintenance	SkyOnline (1ST Phase Countries)	7,780
PROJECT MANAGEMENT / TRAINING Partnership development, installation training, Internet-based distance learning software, technical assistance	EcoSage (partnership development, software, installation training, technical assistance) In-country partners (tech. assistance)	23,270
ENERGY MONITORING	Datapult	3,800
REFRIGERATOR	Solus	1,000
CONTINGENCY		1,500
TOTAL PHASE 1 INDIVIDUAL SYSTEMS COST:		**$70,000**

ADDITIONAL COSTS:

Shipping and Handling: Quotation upon country and site selection.
Import Tariffs: Quotation upon country selection.
Additional 2-years Connectivity: $5,280 per year (Phase 1 countries only.)
Travel and Per Diem: Quote upon country and site selection.

Total Program Costs based on Phase 1 Country Pricing US$2.1 million (30 sites)
Phase 2 Countries by Quotation