FINANCING SOLUTIONS FOR INNOVATION AND SUSTAINABLE DEVELOPMENT IN THE ENERGY SECTOR

DISCUSSION BRIEF NO. 14

Financing Solar Energy in Costa Rica: Case Studies

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7 June 2011

1. Background and Methodology

The public Costa Rican Institute for Electricity (ICE), together with private generators, as well as municipal and cooperatives distributors, provides integrated electricity and communication networks that cover 98% of the population. Nonetheless, 2% of total population live without access to electricity and the majority of them are in rural areas. Solar energy systems have been an option to provide electricity and other energy services to those populations, and increasingly in urban areas, too. Solar photovoltaic systems (PV), off-grid or on-grid, and solar thermal are main technologies in the sector; most of them micro (ranging capacities from 0.1-6 kWp to less than 100 kWp) and/or small (100 kW – 1 MW). These systems are used individually for household or company investment, or in communal organizations, e.g. health centers. Applications include lighting, running basic electric appliances (charging mobile phones, radio, TV, refrigerators, and computers) and water heating (shower, swimming pools, industries). Other applications are cooking, drying, distillation, sterilization, pumps for potable water supply, milling of grains or drinking canals, measuring equipment and electric generation systems.

Approaches to financing and governance structures are analyzed on the basis of empirical case studies on selected solar energy projects. The analysis is based on a study of project documents and guideline-based expert interviews. Besides twelve interviews on the solar energy market in Costa Rica and general financing approaches, the following cases were studied in more detail:

- ICE's project for the introduction of clean energy through systems of solar electricity generation;
- electrification with solar energy, pilot project with Coopeguanacaste (Chorotega Region);
- solar energy to illuminate students and families in communities of the Indigenous Territories of Talamanca (Huetar Region) project;
- solar Ovens for Sterilizing Bio-Infectious Waste, pilot project for the new Hospital of Heredia (Central Region) and other solar thermal applications;
- Rural Electrification with Renewable Energy Sources Program of ICE;
- Solar PV and Solar Thermal for the Humboldt school; and
- San Antonio On-Grid Solar Plant.

2. Empirical Findings

Communities involved in the different solar projects are located in remote areas isolated from the grid and/or where expanding the grid is more expensive than off-grid solar systems. Solar energy is functional in areas without access to the grid where it is difficult or not profitable to construct a line to supply electricity to the people. Grid construction costs are CRC 6 million per km (ca. USD 11,760) and operation and maintenance (O & M) costs are USD 1,000 p.a. covered by tariffs. Users are households and community organizations which use solar services mainly for lighting in labour or students chores as well as other leisure activities. Health service centres, police

Funded by the German Ministry of Education and Research (BMBF) under the thematic focus "Fields of action for innovation policy for sustainable development" within the Innovation and Technology Analysis (ITA) under grant numbers 16I1602/3.
The program is administered by the project management organization VDI|VDE-IT.

Bundesministerium für Bildung und Forschung

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station, and some households who can afford, complement the solar system with gasoline or diesel generators to supply the need of more electricity to run continuously other appliances (refrigerators, radio base, computers, etc). In the cases analyzed, productive applications of solar include a daily farm, micro enterprises like family stores as well as Small and Medium Enterprises (SMEs) in the tourist sector (e.g. B&B hotels).

People are aware of solar technology benefits, i.e. the substitution of candles or canfín (kerosene/petrol) and related health benefits and savings, as well as more time of light to study or improve work activities. However, users perceive that compared with needs and services provided by grid electricity, solar systems have to improve in terms of practicalities and capacity. Nevertheless, people from the territories expect further development of solar energy and other energy options, including hybrid systems.

Sources of financing of end-users in rural case studies include mainly own savings or savings from family members and neighbours (retained earnings), grants or subsidies, and third-party finance. Other financial options like consumer or corporate/business loans are suppose to grow. Still, these forms of financing were not detected in the cases studied. Regarding third-party finance two delivery models are used: fee-for-service and hire-purchase. The fee-for-service approach is used by energy utilities, like ICE and Coopeguanacaste. The hire-purchase approach is used e.g. by the non-profit organization ACEM. The ownership of the systems is transferred to buyers once they completely repaid their debts. In the case of ICE and Coopeguanacaste tariffs are low because of the application of cross-subsidies. Monthly instalments are USD 2-6 in case of the fee-for-service models and USD 20 payable in 12 months in the case of the hire-purchase model. Compared with expenses for energy before, this seems to be reasonable. However, due to the instability of earnings in these areas some users find it difficult to afford systems and pay the monthly fees. In case of difficulties to earn the money, users borrow from neighbors or ask collectors for an extension. Delays increased during attempts to raise tariffs in the Coopeguanacaste case.

In general, installation and O & M costs are shared between developers and users. In Talamanca e.g., users are responsible to give basic maintenance to batteries, change fuse and read the voltage regulator, while ICE assumes installation and other maintenance costs. In the case of systems purchased from ACEM users pay separately for maintenance by locally trained technicians. In the cases of Coopeguanacaste and ACEM, users pay separately for the installation. Among main challenges reported by the cooperative are maintenance costs of solar systems.

Financial institutions involved in solar PV projects and programs for rural areas in Costa Rica are related with bilateral or multilateral development cooperation, such as the United Nations Development Program (UNDP) and Fundecooperación, providing grant funds to project developers. Alternatively, ICE uses repayable funds from international and regional development banks, e.g. the Inter-American Development Bank (IDB) and the Central American Bank for Economic Integration (CABEI), to finance electrification projects or a group of projects. Usually, only after correcting for the value of avoided CO_2 emissions or savings of other energy sources in an extended cost-benefit analysis are these projects economically viable. At the end-user level, there is an increasing interest from financial institutions to establish credit programs. Concrete actions are still incipient, though. Interest rates are in a range of 16.5-19.5% p.a. in periods from 36-60 months.

The collection system together with an operational structure that guarantees maintenance and replacement of spare parts are decisive for the success of projects. Collection systems vary between the cases: In Talamanca an employee from the community is responsible to collect instalments once a month, while in Guanacaste the cooperative has more than 100 rural collectors going to the clients. In general, it is challenging to attain financial viability.

Main risks reported by the interviewees include, beside “normal risks” like construction, transport or theft, risks associated with performance and related social risks as well as interest rate and currency risks. Developers, suppliers, and financial institutions pursuing profits added the entrance into a new business to this list. Risks are mainly managed through contractual arrangements (risk-sharing) and collateral. A challenge is the lack of insurance available for solar energy projects.

The economic crisis had affected mainly the agricultural sector (esp. pineapples), cattle and small industries, reducing the availability to pay and making debt readjustments necessary. However, no direct effects on solar projects were observed.

3. Discussion

There are several obstacles to a wider deployment of electricity from solar energy (i.e. mainly PV) in Costa Rica:

- PV is not (yet) competitive: End-user costs are USD 0.50 per kWh compared with USD 0.08 from other sources. Moreover, electricity tariffs in Costa Rica are staggered according to the consumption level, i.e. the more you consume the higher are the prices per kWh. This certainly diminishes incentives to invest in production facilities for low-income areas.
- PV systems (Solar Home Systems, SHSs) allow only for a limited range of applications. Further developments may raise acceptance by end-users and through this spark the interest of financial institutions. Solar thermal is already considered by banks and credit programs for these technologies exist.
- Maintenance costs are reported to be an obstacle to the deployment of solar PV off- and on-grid even though the literature points at comparatively low costs due to the lack of moving parts. More comparative studies on maintenance costs in different world regions would be helpful to elucidate the source of this apparent discrepancy.
- Hydro as the traditional source of energy in Costa Rica is preferred over solar (PV) by utilities and customers. Therefore, beyond mere cost aspects for a transition to other sources of energy other barriers (here: acceptance) will have to be overcome as well.

Markets tend to be segmented: Private developers and electricity utilities concentrate in those areas with beach views and real estate developments, while programs and projects for rural electrification launched by public and development agencies are concentrated in highland areas without access to the grid. This segmentation will have to be overcome to create a sustainable solar market.

Two different conclusions from the lack of competitiveness of PV are possible:

- The state has to intervene and create more incentives to invest in PV, e.g. through feed-in tariffs or direct subsidies. Beyond an integration into national plans there is a need for more regional cooperation, e.g. under the framework of the Central America Strategy for Sustainable Energy or funding initiatives like EEP and CAREC (see also Discussion Brief #13).
- Alternatively, Costa Rica may wish to wait until costs for PV systems reach a (near) competitive level (on-grid). Until then, solar PV would be restricted mainly to not-for profit activities.

It seems that both paths are followed: For ICE rural electrification with solar PV is not profitable - costs exceed earnings. Rather, it is part of the social responsibility and the engagement is based on a norm of institutional solidarity. Some developers and financial institutions are working at creating new markets and assume that government policies and changes in legislation will open more opportunities for companies to invest in renewables in general. Nevertheless, profit-oriented private sector agents tend to focus on sectors or niches with higher return perspectives, e.g. the tourist sector. Yet, owners of electricity generators and distribution companies could use their expertise to make the new technology cheaper and transparent for users to adopt, much as they do today with centrally generated electricity (Bradford 2006).

Carbon finance does not yet work for solar PV in Costa Rica. High costs may be the major reason, but the other obstacles mentioned above will certainly also play a role.

The service provided from rural companies (e.g. cooperatives) is important to expand electricity cover and they have practical advantages to become “ideal distributors and installers of PV solutions”: economics of scale, large customer pools, and ample reserves of technicians, installers, capital, expertise and closeness to customers.

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