A case study on exclusive concessions for rural off-grid service in Argentina

Alvaro J. Covarrubias and Kilian Reiche

Message from the editors

Argentina, like Chile, has been a leader among developing countries in reforming and privatizing the production and delivery of energy services—and is also taking an activist approach, postreform, to expanding rural electrification. About 30 percent of rural Argentines lack electricity service. The government is piloting schemes to award concessions to electrify rural markets of between 3,000 and 25,000 customers, potentially using a variety of technological options. A key innovation in this case? To award concessions to the bidder requiring the lowest subsidy, with the objective of creating incentives to identify cost-effective technological and commercial solutions for supplying low-income customers. Argentina's initiative is in its early stages. But the initial evidence is that willingness and ability to pay fall well short of costs—suggesting that a major challenge for the future will be finding a sustainable source of financing for the subsidy.

Argentina is pioneering a new approach to provide electricity to the 1.4 million members of its rural population lacking basic service. Under this approach concessions will be granted to private bidders that require the lowest subsidy for serving a given area. The concessions will electrify rural markets of 3,000–25,000 consumers, using solar, wind, mini- and micro-hydropower, and other renewable energy technologies wherever they are the least-cost option.

A model concession contract applicable to all provinces has been designed to try to ensure that the concessionaire maximizes private investment and minimizes public subsidies. The concessions will not have an obligatory coverage target, but concessionaires will be required to provide service to consumers who ask for it. Once a concession is awarded, the concessionaire chooses the technologies best suited to meet the demand and willingness to pay of each village. The subsidy paid to the concessionaire and the customer is means-based and depends on the energy service level and chosen technology. Higher subsidies will be paid for renewable energy options. In the early years of the concessions, when subsidies are at their highest levels, the subsidies will be partially funded by donors. The subsidy can cover a share of the installation cost and, for the very poor, a share of the monthly tariff. But the subsidies will decline over the fifteen-year concession period.

The focus of this chapter is an off-grid concession being renegotiated in Jujuy province. This renegotiation is at the forefront of efforts to design effective subsidies and incentives to miminize them. Preparations for the Jujuy renegotiation got under way in 1999 and donor funding for project preparation and subsidies is scheduled to run until 2005. Beyond that date subsidy funding should decline to lower levels. Analytical work on market demand and ability to pay in Jujuy is complete and the amendment to the existing concession contract is due to be finalized by mid-2000. By 2005 all off-grid consumers in Jujuy who want service should have it.

Argentina's electricity policy

In the early 1990s the Argentine government unbundled and privatized its electricity generation and transmission sectors. Distribution companies, mostly owned by provincial governments, were privatized shortly afterwards. Privatization was done through concession contracts. Generation is competitive but distribution concessionaires receive exclusive coverage of their designated area. Any policies for rural electrification had to be compatible with this new pattern of ownership and market structure.

In 1995 the government of Argentina established a policy for the provision of off-grid electricity for lighting and social communications (radio and television) to the dis-

persed rural population and to provincial public services such as schools, health centers, and police stations. The federal Secretariat of Energy set up a program, Programa de Abastecimiento Eléctrico a la Población Rural de Argentina (PAEPRA), to promote electricity supply within six years to 314,000 rural households and 6,000 public services in sixteen provinces—all distant from power distribution grids. Wherever practical, PAEPRA was supposed to give preference to renewable energy systems for electricity production. PAEPRA's mandate was to articulate policy; the provincial governments were to fund the projects. In practice, and largely for political reasons, the provincial governments preferred grid extensions. Off-grid projects were starved of funds.

To help steer funding to off-grid projects, the World Bank is supporting a component concessioning project covering eight of these provinces over six years. The project, called Proyecto de Energía Renovable en el Mercado Eléctrico Rural (PERMER), aims to provide electricity to about 70,000 households and 1,100 public services. The project is expected to cost US$120 million. Funding will be allocated roughly as follows: the World Bank (US$30 million loan), the Global Environment Facility (US$10 million grant), Argentina's Electricity Development Fund for provincial projects (US$26 million), the concessionaires (US$44 million), and the customers (US$10 million).

PERMER has adopted the policy principles devised by the Secretariat of Energy for PAEPRA. In addition, to support PERMER, the Secretariat of Energy is preparing standards for electricity equipment based on renewable energy. It is training the staff of provincial regulatory bodies. It is improving databases on solar, wind, and mini-hydropower energy resources. And it is disseminating early implementation lessons through seminars and workshops. Within the project a number of tricky contract design decisions are still outstanding. How will concessionaires decide the least-cost solutions in "technology neutral" projects? How can the quality of off-grid energy service be assured and verified? How can system users be made to feel ownership—since the concessionaire will retain ownership of the electricity systems? How to ensure that enough capable bidders bid for a concession contract?

The case for rural concessions

The Argentine government decided to use concessions for rural electrification because of the country's successful experience in the 1990s with concessions for a range of infrastructure services, including energy, water, ports, roads, and railways. The main difference with the dealership approach used in many other countries is that the PERMER concessions are exclusive regulated monopolies, while dealerships allow open entry. Consequently, the selection and regulation of the concessionaire are vital to the success of the approach.

Subsidies to the rural poor for off-grid electricity can cover only basic lighting and communications.

Relative to a competitive market with private dealers, the concession approach was favored because it:

- Creates a market with sufficient critical mass for commercially sustainable business by granting exclusive rights over a large geographic area.
- Attracts larger, better-organized private companies with their own sources of financing.
- Permits easier administration and regulation.
- Offers better chances of covering a large number of customers in a few years.
- Has good potential for reducing unit costs of equipment (through volume discounts), transactions, operations and maintenance (through economies of scale), and overhead.
- Ensures service to the consumer over a long period—the fifteen-year contract life of the concession (World Bank 1999a).

But concessions also pose greater implementation challenges in provincial areas where regulatory expertise is less developed. Under the PERMER contract, for example, both the concessionaire and the regulatory agency will need the knowledge and tools to find the least-cost solution for each village. Quality of service is also hard to monitor. Formal competitive bidding takes time and is costly. Negotiated contracts may be much quicker but may be less politically acceptable.

In the case of PERMER there is an additional complication in concession design. There are two groups of participating provinces: those where there are already distribution concessionaires covering both urban and rural areas, and those where there is no concessionaire and a new, separate rural concession must be bid. If there is an existing concessionaire that agrees to participate—as in Jujuy—its concession contract is renegotiated with the provincial government according to principles set by the federal government. If an existing concessionaire does not agree to

participate, a new concession will be offered for competitive bidding.

Origins of the Jujuy concession

In 1995, just before its privatization, the Jujuy provincial-owned distribution utility was serving rural customers in nearly 1,200 households and nearly seventy public service buildings, as well as a larger, grid-connected market. The rural customers were connected to small, dispersed diesel generators and mini-hydropower, solar, and solar and wind systems. During the negotiations for the concession it became clear to the provincial government that bidders were much more interested in the grid business. So in 1996 the Jujuy provincial government split the concession in two and awarded them to two corporations: EJDESA for the grid-connected market and EJSEDSA for the off-grid (dispersed) market, EJSEDSA being a subsidiary of EJDESA.

The off-grid concession committed EJSEDSA to improving the off-grid rural system, to extending service to all rural households and public service buildings in Jujuy, and to exploring the possibility of providing electricity service for small productive activities. The rules for doing so were determined by PAEPRA. A market survey in 1996 found that about 6,000 households and 160 public service buildings (mainly rural schools) had no electricity service. EJSEDSA set an objective to extend electricity service to 600 rural households and public buildings a year, to complete about 4,500 over eight years.

Under the concession contract the provincial government was required to procure the equipment for the first 600 customers. However, the government did not buy the equipment, so in 1997–98 EJSEDSA limited its activity to connecting public buildings, mainly schools, and to maintaining existing systems. In 1999 EJSEDSA funded and

Table 1 **Distribution of income and spending on energy in Jujuy**

Monthly income category	Share of population (percent)	Monthly energy expenditure	
		U.S. dollars	Share of income (percent)
Low income: less than US$150	42	9	> 6
Low to middle income: US$150–250	31	15	6–10
Middle to high income: US$250–400	17	18	5–7
High income: more than US$400	10	21	< 5

Source: PERMER.

Table 2 **Installation and lifetime costs of solar home systems in Jujuy**
(U.S. dollars)

System size (peak watts)	Installation cost	Lifetime operations and maintenance cost	Lifetime battery cost	Lifetime total cost	Monthly recovery cost
50	764	390	216	1,370	16.8
70	1,074	390	299	1,763	23.1
100	1,347	390	418	2,155	26.7

Note: Assumes a 14 percent return on the concessionaire's investment and a fifteen-year life for solar systems, with batteries replaced every three years and operations and maintenance and controller replacement every seven years.
Source: PERMER.

installed photovoltaic systems in 556 rural households and 43 additional schools. It now serves 3,050 rural customers, 1,333 of whom have individual or collective photovoltaic systems.

To address the off-grid funding deficit, in 1998 the federal government proposed to the World Bank that the EJSEDSA off-grid electricity service be used as a pilot for the concession approach in the PERMER off-grid rural electrification project, using mainly photovoltaic systems. In 1999 Jujuy province confirmed to the national government its willingness to participate in PERMER and the interest of EJSEDSA.

Renegotiation in Jujuy

Considerable analytical work has been done under PERMER to assess consumers' ability to pay, set the correct tariff levels, estimate required subsidies, decide how subsidies will be paid, and design incentives to keep these subsidies to a minimum over time. This work will serve as a model for future PERMER concessions.

Matching service to income

Because of their low monthly income, most of Jujuy's rural residents can only afford to pay for small amounts of energy for lighting and communications. About 42 percent of households have a monthly income of less than US$150 and spend more than 6 percent of it (about US$9) on energy, in the form of kerosene, bottled gas, or batteries (table 1). Another 31 percent of households earn US$150–250 a month and spend about US$15 of it on energy. Those with higher incomes (US$250 or more a month) make up 27 percent of households and spend US$18–21 a month on energy.

Federal policy on subsidies for off-grid electricity for low-income populations requires that service be provided only for basic lighting and communications. Solar home systems appear to be the preferred technology in areas with high solar radiation, as in Jujuy province. Energy supplies with these systems cost an estimated US$17–27 a month (table 2)—considerably more than is now being spent by almost three-quarters of the rural population. Thus subsidies have been set so that rural consumers do not spend more than they now spend on energy.

To illustrate, a 100-peak-watt solar home system supplies about 7.5 kilowatt-hours a month. This system would allow a household to have four hours a day of light from two high-efficiency lightbulbs of 15 watts each, to listen to a 10-watt radio for three hours, to operate a 20-watt radio-cassette recorder for one hour, and to watch an 80-watt television set for one hour (table 3). For this service level a household with a monthly income of US$250 would require a monthly subsidy of about $12.

Table 3 **Service levels and customers' capacity to pay for solar home systems in Jujuy**

System size (peak watts)	Service level (kilowatt-hours a month)	Typical output				Customers surveyed	Capacity to pay (U.S. dollars)	
		Lamps	Radio	Radio-cassette recorder	Black and white television		Monthly tariff	Installation fee
50	3.75	2 of 11 watts 4 hours a day	10 watts 3.5 hours a day			361	3	50
70	5.25	2 of 11 watts 5 hours a day	10 watts 4 hours a day	20 watts 1 hour a day		516	5	80
100	7.50	2 of 15 watts 4 hours a day	10 watts 3 hours a day	20 watts 1 hour a day	80 watts 1 hour a day	688	10	100
150	11.25	1 of 15 watts 4 hours a day and 2 of 11 watts 4 hours a day	10 watts 3 hours a day	20 watts 1 hour a day	80 watts 2 hours a day	138	17	150
200	15.00	1 of 15 watts 4 hours a day and 2 of 11 watts 4 hours a day	10 watts 5 hours a day	20 watts 3 hours a day	80 watts 3 hours a day	17	25	200

Source: PERMER.

Designing tariffs for solar home systems

Under the terms of the concession, the provincial government regulates the tariff. Electricity tariffs based on economic and technical principles should generally recover investment and financing costs and operations, maintenance, and fuel costs, and deliver a profit to the provider. But the technical operation and cost structure of solar- or wind-based electricity service to off-grid customers differ substantially from those for grid-connected customers. For grid-connected customers, the electricity consumed is metered and tariff design takes into account the time of day, voltage level, and ways the electricity is consumed.[1] Off-grid electricity from a solar home system is not metered. The user pays for system size. Rural minigrids are somewhere in between, with energy and peak power limits.

The bidding documents indicate the tariff schedules with and without subsidies.

Fuel is not part of the life-cycle cost in solar home systems because the solar panel converts free solar energy into electricity. So, in this case the tariff design is based on the size of the solar panel and the storage battery—that is, on the cost of the initial investment. Thus the monthly tariff for a solar system recovers the initial investment and the net present value of operations and maintenance costs, including periodic replacement of the battery. In common with other technologies, the financial cost (annual interest rate) and the number of years over which the initial investment and operations and maintenance costs are recovered are also key ingredients in solar tariffs.

Setting subsidies for the rural poor

Three population segments are active in the market for electricity in dispersed rural areas. One segment has sufficient income to pay the full tariff, another needs financing to cover the high up-front cost, and the poorest segment needs a large subsidy because its income cannot even cover basic needs. Subsidies should be targeted to the latter two segments.

In Argentina the subsidy for rural electricity tariffs is based on household spending for lighting, radios, and the like in the absence of electricity or on household willingness to pay for electricity. Household spending on kerosene, candles, bottled gas, and dry batteries are a good indicator of the upper limit of electricity tariffs that households can afford. This baseline cost is assumed to be the rural poor's capacity to pay. From a social point of view, if the actual cost of providing electricity is higher than the baseline cost, the subsidy should fill the gap.

Households' willingness to pay for electricity is also a good indicator for defining the subsidy but—contrary to expectations—surveys have shown that willingness to pay is lower than capacity to pay. Households may believe that switching to electricity is worthwhile only if it lowers their energy spending, regardless of the other benefits that come with electricity. A lower willingness to pay may also be due to a lack of information on these benefits or the fact that regular monthly fees are harder to pay when income varies by season.

In PERMER the rules for collection and payment of subsidies to the rural poor for solar power services are relatively straightforward. The concessionaire will finance 40 percent of the installation cost of solar home systems, collect 10 percent from subsidized consumers, and collect the balance (as a subsidy to the consumer) from the provincial government. Two options can be considered for when to pay the subsidy. One is to pay the subsidy after the concessionaire has submitted proof of a system's purchase. The other is to pay the subsidy after the concessionaire has submitted proof of a system's installation. The first option reduces financial costs and assumes the concessionaire will install the system; otherwise the concessionaire will be fined or the contract revoked. The second option increases financial costs but provides an incentive for prompt installation. The option chosen is a matter for the province and the concessionaire to agree on.

The subsidy will gradually be reduced to account for expected cost reductions. Over time the monthly tariff to be paid by subsidized consumers recovers 40 percent of the installation cost plus operations and maintenance costs. In the case of the very poor, the concessionaire has to make arrangements with consumers for the payment of the 10 percent installation fee. In addition, the provincial government will subsidize part of the monthly tariff from the Tariff Compensation Fund, a fund that subsidizes electricity tariffs for low-income populations in the provinces. Low- and middle-income rural households are expected to receive subsidies of US$8–12 a month. High-income rural households will pay tariffs recovering the cost of service in full.

Providing incentives to minimize subsidies

A sustainable rural electrification market requires maximizing private investment while minimizing subsidies. The bidding process for PERMER is addressing this issue in several ways.

First, the regulatory agency calculates tariffs for off-grid electricity supplies by level of service—for example, 50, 70, 100, 150, or 200 peak watts for solar home systems. For this purpose the agency estimates costs based on indicative quotations and national and international experience. As noted, in PERMER it is assumed that the concessionaire will invest 40 percent and the household will pay 10 percent of the installation cost. The remaining 50 percent is the base subsidy. The bidding documents indicate the tariff schedules with and without subsidies.

Sustainability requires a certain, long-term source of financing for the subsidy.

Second, the concession is awarded to the most qualified bidder—based on technical, financial, and management criteria—offering the largest rebate to the unsubsidized tariff schedule. The rebate is applied to reduce the subsidy. The concession must be awarded through international competitive bidding following World Bank guidelines.

Third, where there is bidding for the concession contract, the concessionaire must procure (following its own procurement rules) and install solar home systems and obtain certification by the regulatory agency of having done so to receive payment of the consumer subsidy from the provincial government. Alternatively, the concessionaire can show evidence of purchase but incur fines or contract revocation if the equipment is not installed.

In Jujuy and all other PERMER provinces with an existing concessionaire, the tariff schedule and subsidy are fixed by the regulatory agency and the concessionaire must procure the equipment following World Bank guidelines. Any decrease (increase) in the cost of the equipment procured relative to the base cost used by the regulatory agency will be reflected in a decrease (increase) in the consumer subsidy to be collected by the concessionaire.

As noted, in PERMER the subsidy is being financed by the Electricity Development Fund, a World Bank loan, and a Global Environment Facility grant (the portion of this grant will be decreasing over time). Once the six years of project implementation have elapsed, only the Tariff Compensation Fund will finance the subsidy. The tariffs and subsidy will be reviewed every two years and revised if costs and market conditions have changed substantially. It is not clear yet how large that commitment will be.

Conclusion

If the poorest segments of the rural population are to be provided with basic electricity service, they need to be subsidized to close the gap between their capacity to pay for the service and the higher cost of providing it. The sustainability of such a solution requires a well-identified, long-term, sustainable source of financing for the subsidy, and the interest of private entrepreneurs in concessions of this sort.

Whether a concession system is the right choice for rural energy service delivery will depend on the institutional, social, and economic framework of a particular country or province. Several general issues remain to be studied during the implementation of PERMER, such as the relative advantages of monopolies and licenses and of bidding and negotiations, how to design a concession contract with a fair allocation of rights, obligations, and commercial risks among the concessionaire, the consumer, and the government, and the fair allocation of subsidy in the tariff design.

PERMER is expected to improve the quality of rural life in several ways. Electric lamps 200 times brighter than kerosene lamps will allow children to study in the evening and give adults the opportunity to extend income-generating work during evening hours. The cleanness of electric lamps will eliminate the health and safety hazards of using kerosene or candles for in-house illumination. Radio and television will improve access to national and worldwide information, reducing the isolation of rural residents and hence horizontal inequality in Argentina. Schools may provide better learning conditions by enabling the use of personal computers, the Internet, and satellite television for a wide range of programs.

Alvaro J. Covarrubias (acovarrubias@worldbank.org), World Bank, Latin America and the Caribbean Region, and Kilian Reiche (kreiche@worldbank.org), World Bank, Infrastructure Group, Energy Unit

Note

1. Electricity tariffs for grid-connected customers at low-voltage levels during peak demand hours are higher than tariffs for customers connected at high-voltage levels during low demand hours.

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