

Extending rural electrification

A survey of innovative schemes

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Output-based contracting for rural electricity services—using private providers and linking payments of subsidies to outputs—could deliver better results than traditional approaches to subsidized electrification. Even so, few rural electrification schemes have explicitly (and successfully) linked subsidies to output targets. This is probably because most electricity sectors remain highly centralized, politicians find it hard to move to cost-covering tariffs, standards are still tightly regulated, and entry is often illegal for small private operators. But recent initiatives provide useful lessons for developing full output-based contracting. Coupled with the examples in this book from other sectors, they suggest that by more precisely targeting subsidies, sharpening incentives for operational efficiency, and mobilizing private investment, output-based contracting could boost consumer access to services and cut funding costs and performance risks for taxpayers and donors.

As a result of low population density, difficult terrain, and low consumption, rural electricity schemes are usually more costly to implement than urban schemes. In addition, low rural incomes can lead to problems of affordability (though where electricity replaces other commercial fuels, such as kerosene, households' energy costs may fall rather than rise). And the long distances mean greater electricity losses and more expensive customer support and equipment maintenance. Thus rural electrification projects have often required subsidies to make them financially viable.

In the past most subsidized rural electrification schemes have been run by high-cost, centralized public utilities charging tariffs that do not cover costs. Cash-constrained governments generally have not explicitly made up the difference. As a result, electrification rates remain extremely low in many developing countries—as low as 10 percent in some African countries, for example. But the wave of electricity sector reform in the developing world—breaking up public monopolies and privatizing generation and distribution—provides an opportunity for a new approach, indeed, demands one.

One approach with much potential is output-based contracting. Its focus on outputs gives operators the flexibility and the incentive to innovate and to respond to consumer preferences. Several countries are implementing or developing rural electrification schemes using elements of output-based contracting.

This chapter reviews the lessons from these cases, focusing on decisions about who should receive the subsidy, how to link the subsidy to performance, how to select projects, and how to monitor contracts.

Emerging approaches

In Argentina a program of exclusive concessions pays private operators the lowest subsidy required to connect consumers in isolated rural areas far from the electricity grid to off-grid services based on renewable energy. Under this program concessionaires must provide service to all who ask for it within an exclusive area. The connection costs are partially subsidized by a World Bank loan, a Global Environment Facility grant, and a special electricity fund run by the Argentine government. Users must contribute at least 10 percent of the costs, with the share depending on capacity to pay in the province and on the size of the system. Connection subsidies are paid to the operator on proof of installation (checked by random audits) and decline over time. One province has negotiated a pilot concession with an existing provincial distribution concessionaire, and three others will award new (negotiated) off-grid electrification concessions in 2001. Where there is no local concessionaire or the operator does not

want to provide service, the new concessions will be offered in a competitive tender for the smallest subsidy. The program, estimated to cost US\$120 million, will cover about 70,000 households and at least 1,100 schools and clinics.

A similar approach has been proposed in Cape Verde. Under competitively bid concessions, subsidies would cover part of the cost of installing wind generators or solar photovoltaic systems for houses, street lighting, or electricity sales. Still in the design phase, the proposed scheme would disburse subsidy payments every six months on adequate proof of completed equipment sales or installations.

Chile uses a rural electrification fund with a planned life of 10 years to offer one-time, competitively awarded subsidies to local operators bidding to provide service. The goal of the scheme is 100 percent electrification by 2004. Local operators, often working with community groups, commit to a target for new connections. Their proposals are scored against a checklist of objective criteria, including a cost-benefit analysis, the operator's investment commitment, and social impact. Although grid connections are preferred, renewable off-grid systems can also get support. Operators receive the subsidy up front and must make a minimum contribution to project costs according to a formula set by the government. Operating since 1994 and using annual tenders, the fund had increased rural electrification by 50 percent in 1999. The subsidy paid over this period amounts to US\$112 million, while private operators have invested US\$60 million.

Panama is applying a variant of this approach—"open season" competition, in which blocks of money are offered to private companies bidding to construct the largest number of connections. Bidders can identify potential connections from a database maintained by the rural electrification office. A social fund (using donor and government funds) disburses payments against agreed construction milestones, with random audits to check installations. Once construction is complete, the assets are transferred to the local private distribution company, which commits to operate and maintain the infrastructure for 20 years. The distribution company calculates the subsidy required for the 20 years, and this is paid up front in a lump sum. In 1999 the program funded just over 100 projects, with an average size of 34 connections. Nonexclusive concessions are also allowed, but so far there have been no takers.

In Asia countries have more commonly turned to cooperatives for rural electrification, applying performance-based subsidies with mixed success. In Bangladesh and the Philippines cooperatives have to meet specified targets—21 in Bangladesh, 8 in the Philippines. Payout of the donor-provided subsi-

dies to the cooperatives depends in part on their achieving the annually negotiated targets, such as reducing system losses, increasing sales, meeting customer connection targets, improving collection rates, and repaying loans. In Bangladesh targets are also the basis for annual bonuses to cooperative employees. The cooperatives' performance has been mixed. While some have achieved the targets, others have suffered financial losses, requiring the diversion of subsidies to offset operating losses.

Deciding what to subsidize

Schemes with output-based characteristics have delivered subsidies as capital grants for extending or creating an isolated grid or for installing small generators powered by diesel or renewable energy. They have also delivered subsidies for connecting consumers. And some schemes have delivered subsidies for rehabilitating networks.

Capital grants have been paid to operators as they begin the construction works, as they complete the works, or in phases as they reach milestones. And sometimes when many areas are being electrified under a phased program, grants are paid as a certain number of villages gain access to electricity or a certain number of consumers get connections.

Most grants have partially funded investments, not consumption. (Consumption subsidies tend to erode operational efficiency and require long-term funding commitments.) Partial funding, requiring a supplementary contribution from users or operators, is a good test of user demand and preferences. The grants can be provided as one-time payments following a grant competition (as in Chile) or paid for the completion of specific investments (as in Argentina and Panama and as planned in Cape Verde). A few schemes plan to pay grants per household, but these tend to be for solar photovoltaic systems for individual buildings and are paid to the supplier on installation or through equipment financing.

In some rural electrification schemes that include off-grid systems (as in Argentina and as proposed in Cape Verde), grants are paid at a declining rate over the project period. The rationale is that the higher initial grants are needed to overcome "first cost" barriers, to help promote self-financing for later development, and to encourage a more rapid connection rate.

Linking payment to performance

Rural electrification schemes have used several output targets:

- Connecting all consumers in an area who wish to be connected and are willing and able to pay the required (subsidized) costs.

- Connecting groups of households or villages in an area.
- Installing systems (such as solar photovoltaics) in houses or buildings.

Other performance targets include reducing electricity losses and improving revenue collection. Measuring performance in these areas is more complex, however, and no known schemes have directly linked the disbursement of aid to such targets.

Where targets are insufficiently defined or monitored or the infrastructure to support delivery of electrification services is missing, problems can result. Grant funding targeted at equipment installation may end up supporting better-off households rather than the poor, because the wealthier are better able to pay their share of the costs. Moreover, even when installation targets are met, electricity services may not be delivered. In India the release of subsidy funds is based on the number of villages electrified. But sometimes the lines have been poorly constructed or household connections not made, so that little electricity flows to consumers. The cooperative schemes in Asia, which use many different performance measures, give greater attention to service delivery, but the weighting of different factors dilutes the direct incentive effect of linking payment to performance.

Choosing projects

Rural electrification projects can be quite small, so that in many countries the number of potential projects could run into the hundreds. In selecting projects, well-defined criteria are important to ensure that funds are allocated efficiently and the program is financially sustainable.

Rural electrification programs with output-based features have all developed a system for ranking and prioritizing projects, taking into account such factors as capital cost, number of consumers, and demand growth. In choosing areas to be electrified, programs need to avoid top-down selection and political patronage.

The key issue is whether projects will be financially viable (with the subsidy)—whether the communities will have sufficient demand and whether they will be able to afford the electricity payments to cover operating costs. Projects that are not financially viable tend to drag the entire program into losses, resulting in the diversion of subsidies to sustaining the existing system rather than expanding access to electricity.

A particularly effective approach to selecting projects is to emphasize the contribution—especially the financial contribution—to be made by the local organization sponsoring the project, whether the community, a cooperative, a

private company, a local authority, or a nongovernmental organization. In Panama the larger the share of financing to be provided by the community, the higher up the priority list a project moves.

The Chilean scheme requires both the users and the distribution company to contribute to the financing. Users must pay the costs of connection from the distribution transformers to the house and of the wiring within the house, roughly 10 percent of the cost of the project. This cost is initially financed by the operators and repaid by the user over time. While the distribution company must contribute a minimum amount calculated by a formula, it may contribute more to increase its chances of receiving a grant. This demand-driven approach to choosing projects helps to ensure that those selected have local support and that there is sufficient willingness to pay for electricity. It also improves the probability that the forecast demand for new connections and electricity will materialize rapidly, thus helping to ensure projects' financial viability, and that the allocation of capital costs and subsidies is targeted toward maximizing the desired output—the delivery of electricity services.

Selecting operators

For selecting operators, some recent schemes have introduced an element of competition, with the grant linked to the number of new connections. The competition has been based on either the smallest grant to supply a given number of consumers or the largest number of consumers for a given grant.

In some cases the competition gives the winner a concession to supply all potential consumers in an area (an exclusive concession). In others, the competition gives the winner only the responsibility to supply specified villages or households (open entry, in which other competitors could supply additional consumers).

The Chilean scheme uses competition for grants but does not offer an exclusive concession. Companies prepare submissions specifying the areas to be electrified and the number of consumers to be connected. These submissions compete for grants, but there is no direct competition between companies to electrify a given area. A drawback of the Chilean approach is the imbalance of information between the companies and local authorities. While municipalities and regional planning agencies may exert some pressure on the companies at the planning stage to keep costs low, their lack of information limits their effectiveness: municipalities have little understanding of electricity distribution, and regional planning agencies little knowledge of geographic constraints to electrification in particular areas.

The proposed scheme in Cape Verde would channel aid through private companies that successfully tender for concessions—one to supply electricity services on Santiago Island and another for the eight other inhabited islands. The companies, which will not have exclusive concessions, will be obligated to sell off-grid electricity systems based on wind or solar photovoltaics or to install such systems and sell the electricity. The successful tenderers will be those asking the smallest fee (subsidy) to start up and manage the concession to provide these services. Other companies might enter the same market, ensuring some competition, but they would have to compete against the subsidized concessionaire. Also possible, however, is that only one company would emerge, as the same company could bid for both concessions. A tender for the concessions was launched but did not attract sufficient interest, largely because the costs are high, the ability to pay is low, and the grant was insufficiently attractive. The scheme is being redesigned.

Nonexclusive area concessioning is also used in mini-grid or off-grid schemes, such as for village mini-grids or household photovoltaic systems, with the rights granted to firms resembling a license or dealership. Such schemes should aim to build the delivery capability of local private firms to sustain the connection rate and ensure equipment maintenance. They can provide incentives based on installations achieved or on equipment subsidies. More advanced forms focus on energy service companies, which provide consumers both equipment and ongoing maintenance for a regular fee. The companies also provide the financing for consumers, supported by a grant or equipment financing.

The concession approach appears attractive because it offers instant market aggregation, keeps transactions costs for the government relatively low, and simplifies the flow of finance. But in isolated rural areas markets may be neither large nor viable enough to attract substantial private participation and competition for the market at any level of subsidy. An alternative is to build delivery capability among small enterprises through business advisory services and business development and working capital financing. This approach, though initially slower, may ultimately be more financially sustainable. One variation of this approach, the “dealer sales” model for delivering household solar systems, is being tried in a number of countries, particularly in Asia, such as Bangladesh, China, and India.

Exclusive and nonexclusive concessions differ in the information rights and incentives they provide for identifying viable projects (“prospecting”). In an exclusive concession the concessionaire has the right to supply all consumers in a defined area but also the obligation to connect consumers. To determine whether extending the grid is economic and what it will cost, the concession-

aire needs to carry out preinvestment studies. In return for bearing the cost of these studies, the concessionaire gains exclusive right to the information.

For nonexclusive concessions, the information about prospective connections needs to be publicly available, so private companies would not be keen to carry out such studies. If public bodies provide the information (as the rural electrification office in Panama does), the costs of gathering the information could be subsidized, with the subsidy linked directly to the number or size of areas mapped.

Monitoring performance and ensuring accountability

Concessions and other models for subsidized private participation in rural electrification create a contractual relationship for carrying out such obligations as extending the grid at a specified rate, connecting new customers, meeting investment targets, and installing off-grid equipment. These obligations need to be monitored and enforced—by the local authority granting the concession, a national regulator, a rural electrification agency, or even the utility (for technical standards, for example). One well-tested approach is to have a dedicated rural electrification agency carry out the monitoring. The agency can also play a supporting role, acting as a catalyst for private sector and local participation and providing financial, technical, and managerial support. A dedicated, independent agency can provide a focused supporting framework for the effective disbursement of performance-related subsidies.

Where a demand-based approach is adopted, as in Chile, the local community will feel a close link to the scheme and can be expected to alert regulators or the government if promised programs are not delivered. Panama's scheme, which disburses subsidies in phases based on a schedule for connections, relies on random audits instead. But once a project is connected to the main grid, it becomes the responsibility of the distribution company, and the project area is regulated just as any other area would be. Isolated grids are regulated by contract with local communities. A similar arrangement is used in Chile.

In Cape Verde it was originally hoped that using multiple concessionaires, and thus introducing competition, would mean that prices to users would not need to be regulated. But with the redesign aimed at making the concessions more attractive, in part by reducing the threat of entry by competitors, it is now expected that stronger regulation of prices and standards will be needed.

Conclusion

Why has output-based contracting been so limited in electricity? Several factors play a role:

- Output-based contracting is best implemented by an organization in close touch with local conditions. But until recently most utilities have stayed under centralized control, and the stringent technical (safety) standards required tends to keep centralized utilities involved even where local participation is strong.
- The large funding required for rural electrification subsidies (including donor funding) has usually been administered centrally. In addition, utilities have found it hard to move away from using “hidden” cross-subsidies.
- The remoteness and small scale of individual connections have made it hard to put in place an effective monitoring system for measuring performance against output targets.

The experience with contracts using output-based elements suggests several lessons. Delegating responsibility for evaluating and selecting schemes to the lowest practicable administrative level (as in Chile and Panama) helps to ensure that the projects selected are those most likely to be financially viable. And combining demand-based project selection with community responsibility for a substantial share of project costs (by using tariffs that are not too heavily subsidized, as in the Philippines, or by encouraging the community to bear some of the investment costs, as in Chile) helps to ensure that projects achieve output targets.

There is strong evidence that subsidies should be directed toward access to electricity rather than consumption. Investment subsidies can directly link the disbursement of aid to the most important output indicator—the number of newly electrified villages or new household connections.

Competition for grants can lead to the lowest capital subsidy per new connection and create incentives to minimize operating costs. State-owned companies serving rural communities and cooperatives face no direct pressure to keep costs low unless the regulator, government, or municipality is vigilant. Private companies, having won a competition at a fixed or regulated tariff, have their own incentives to minimize costs.

Concessions, grant competitions, demand-based project selection, and disbursement against milestones are all promising approaches. Many variants on these methods are possible, and indeed, approaches will need to be fine-tuned to fit each country’s circumstances. Strong supporting measures can enhance success, including a sound investment climate and an agency dedicated to promoting efficient, financially sustainable schemes of rural electrification.