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THE BOTTOM LINE

Rwanda's rapid achievements in expanding access to electricity after 2009 were made possible by one of the first applications of a sector-wide approach (SWAp) in the electricity sector. The World Bank played a pivotal role in the operationalization of the SWAp, first by assisting in the formulation of an investment prospectus that laid the groundwork for technical, financial, and implementation planning. The Rwandan experience is instructive for countries considering the adoption of a similar approach, particularly those starting from a low base.

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Scaling Up Access to Electricity: The Case of Rwanda

Why is this case interesting?

Rapid scale-up of access is possible from a very low base

Rwanda's experience with electrification is an interesting case of how access to electricity can be quickly scaled up despite deficits in infrastructure and institutional capacity. The magnitude and pace of the successes achieved under the country's Electricity Access Rollout Program (EARP) surpassed even the ambitious targets set by the government. Those achievements were made possible by one of the first applications of a sector-wide approach (SWAp) in the electricity sector. Begun by the national government in 2009, EARP was designed to increase access to electricity from 6 to 16 percent of the population over a five-year period. Using the SWAp, the Rwandan electricity utility, the Energy, Water, and Sanitation Authority (EWSA), met the 16 percent target in 2012 (ahead of schedule) through rapidly scaled-up implementation. The current target under the Economic Development and Poverty Reduction Strategy for 2013–18 (EDPRS 2) is 70 percent of households by 2017 (Republic of Rwanda 2013). Effective coordination among stakeholders in planning, financing, and implementation—a result of the SWAp—has been central to the rapid successes achieved under the program.

The Rwandan experience is instructive for countries considering the adoption of a similar approach, particularly those starting from a low base. The Rwandan approach is likely to work best in countries with the following characteristics:

- Strong government ownership and the capacity to harmonize efforts of line ministries and other stakeholders in the sector.
- Very low initial electrification rate that suggests opportunities to pick low-hanging fruit and achieve rapid growth in access.
- Multiple donors with mutually agreed goals.
- Geographical attributes that support rapid scale-up. Although coordination and evidence-based planning should improve implementation in every setting, Rwanda's rapid successes were helped by its small size and high population density.[1]

What challenges did they face?

Need to scale up rapidly despite infrastructure and capacity constraints

Rwanda (box 1) has made great strides in the past 20 years to move forward from conflict and fragility. Over the past decade, the country has made robust progress on both social and economic indicators. Between 2004 and 2012, the average annual rate of growth in GDP was 8.1 percent, which brought the poverty rate down from 59 percent in 2001 to 45 percent in 2011.

To maintain a robust rate of economic growth, the government has emphasized private sector investment and improved its governance and regulatory capacities, in part by building accountability

[1] The population density of Rwanda was measured to be about 416 people per sq.km. in 2012 – the highest in Africa.

"A SWAp is a country-led, results-focused approach that provides a framework for coordination between development partners and country stakeholders to develop a coherent strategy for sector development through integrated technical, financial and implementation planning."

Box 1. Key facts about Rwanda

- Population: 11.46 million (2012)
- Per capita GDP: $620 (2012)
- Electrification rate: 6 percent (2009); 16 percent (2013)
- Installed generation capacity: 110 MW (2013)

mechanisms. In 2014, the country ranked 32 (of 189) on the IFC/World Bank ease-of-doing-business index, a huge leap from its 2005 position of 139. Despite these favorable trends, infrastructure and private-sector growth remain bottlenecks in the quest for social and economic prosperity. Improving access to electricity is one way to deal with those bottlenecks.

The Rwandan government established the EARP to achieve goals set under the Economic Development and Poverty Reduction Strategy (2009–12).[2] That strategy included aggressive targets to increase electricity connections from 110,000 in 2008 to 350,000 in 2012 and called for considerable increases in electricity connections to schools, health centers, and other social infrastructure. In 2008, the country's rate of electricity access was just 6 percent, with connected households concentrated in and around the capital, Kigali. The available generation capacity was 50 MW, with heavy reliance on imported automotive diesel oil, making electricity supply both unreliable and expensive.

What approach was taken?

The SWAp allowed development partners to coalesce behind a strong government vision

In contrast to traditional, project-focused development aid, a SWAp is a country-led, results-oriented approach that provides a framework for coordination between development partners and country stakeholders to develop a coherent strategy for sector development through integrated technical, financial, and implementation planning. Individual projects are embedded within the SWAp framework. Although SWAps have been used to coordinate investments in the education and health sectors, the Rwandan SWAp was one the first applications in the infrastructure sector.

Box 2. Members of the SWAp

- Energy, Water, and Sanitation Authority (EWSA), the organization responsible for all power-sector operations
- Ministry of Infrastructure (MININFRA)
- Ministry of Finance and Economic Planning (MINECOFIN)
- Rwanda Utilities Regulatory Agency (RURA)
- Other line ministries, including the Ministry of Local Government (MINALOC), Ministry of Health (MINISANTE), and the Ministry of Education (MINEDUC)
- Local governments
- Development partners, including the African Development Bank, the World Bank, the International Finance Corporation, and the governments of Belgium and the Netherlands

In 2006, in the run-up to the SWAp rollout, the national government adopted an aid policy aimed at harmonization and alignment. In 2008, the government began implementing the EDPRS—the strategy relied on a Common Performance Assessment Framework (CPAF) that used SWAps for various sectors, including energy.

The energy SWAp was implemented by a Sector Working Group made up of key stakeholders and development partners (box 2). The working group provided a forum for joint planning and coordination among all key stakeholders. Traditionally, a SWAp also streamlines finances by employing basket or pooled funding, where all development partners pledge their funds into a joint account managed by the government or a sector utility. In the case of Rwanda, however, funding was not pooled during the first phase of the program. At the time, Rwanda's government did not have adequate tracking mechanisms for or experience with joint funding. Instead, development partners were asked to pick activities to fund from a mutually agreed list. The intent was that the collaboration would gradually grow to a

[2] The government's action was also spurred by a severe drought in 2004 that resulted in severe supply shortages. The drought highlighted the urgent need to invest in reliable and resilient generation and distribution infrastructure.

"When expanding access to electricity, accurate monitoring helps maintain the momentum to achieve targets by identifying and building on successes and by addressing bottlenecks quickly."

point where the pooling of funds was possible. However, this has not yet happened due to the challenges of using the country systems under the Integrated Partnership Framework (IPF) modality.

Over the years, many development partners have supported the program—among them the African Development Bank (AfDB), the Arab Bank for Economic Development in Africa (BADEA), the Belgium Technical Cooperation (BTC), the European Union (EU), the Netherlands, Japan, the OPEC Fund for International Development (OFID), the Saudi Fund, and the World Bank. As of 2013, donor contributions of $273 million have been complemented by a Rwandan government contribution of $126 million.

Tracking systems are integral to any SWAp. When expanding access to electricity, accurate monitoring helps maintain the momentum to achieve targets by identifying and building on successes and by quickly addressing bottlenecks. In the case of Rwanda energy SWAp, the monitoring and evaluation system is aligned with the EARP, which in turn is part of the CPAF. The EARP results framework and key intermediate indicators encompass the entire program, as opposed to project-specific investments. Reporting on the CPAF indicators is done primarily at the sector level through biannual joint sector reviews in advance of the country's joint budget support review. Both types of review provide a forum for dialogue around the performance of both the government and its development partners in pursuit of the EARP goals. In addition, a comprehensive impact evaluation to assess the benefits of the program is in progress. The baseline survey was completed in 2014; an update is planned in 2016.

The EARP Coordination Unit is responsible for monitoring and reporting on program progress. In addition, the SWAp secretariat is responsible for producing the joint annual sector performance review and the quarterly program monitoring reports discussed at meetings of the Sector Working Group. The collection and analysis of data from the various reports and reviews not only improves the effectiveness of the SWAp, but also increases the quality and availability of data on the Rwandan electricity sector, which can be used for future planning and operations.

The World Bank played a pivotal role in the operationalization of the SWAp, first by assisting in the formulation of the EARP investment prospectus, which laid the groundwork for technical, financial, and implementation planning. This document, presented to a donor financing roundtable in 2008, provided a transparent and targeted implementation strategy for the least-cost achievement of Rwanda's electrification goals for the period 2009–12. The plan laid out clear roles for sector stakeholders, detailed funding requirements for proposed activities, and a robust framework for monitoring and evaluation. Based on financial analysis, it set clear financing targets for all partners: 80 percent from the national government and its development partners, 10 percent from the utility, and 10 percent from consumer connection fees. The prospectus was the main instrument used in leveraging stakeholder funding and informing the implementation strategy.

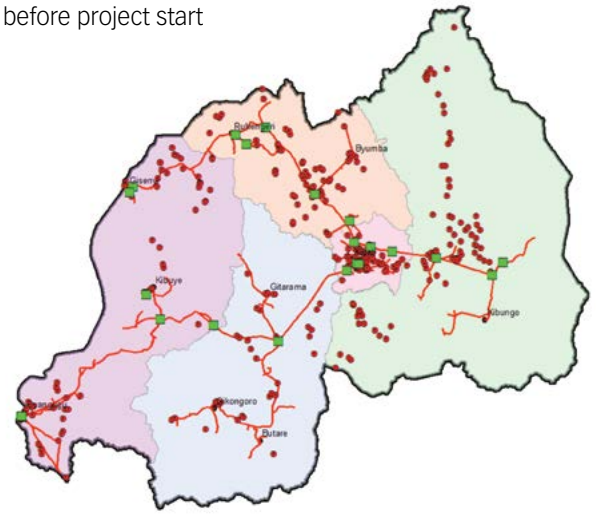
As the co-chair of the Sector Working Group, the World Bank displayed a strong commitment to the program and helped attract other donors. As the lead development partner, the Bank has contributed a total of $130 million, $70 million in zero-interest financing followed by another $60 million in additional financing.

Drawing on its global and regional experience in supporting governments in expanding access to electricity, the World Bank also contributed critical knowledge in the implementation of the SWAp (figure 1). With funding from the World Bank, a GIS-based spatial network plan was developed to optimize expansion. The plan was based on a spatial optimization of expansion through the year 2020, factoring in financial and economic considerations. With the population divided into 9,300 sublocations (cells), demand forecasts were developed for each sublocation and compared with the costs of electricity supply from alternative sources (grid and off-grid). Geospatial prioritization of network rollout was based on population, existing infrastructure, and estimates of what households in each location could afford. The affordability analysis, which was based on secondary household expenditure data, helped estimate the likely take-up of electricity connections in each location. It estimated a range of between 19 and 51 percent take-up by households that were offered connections.

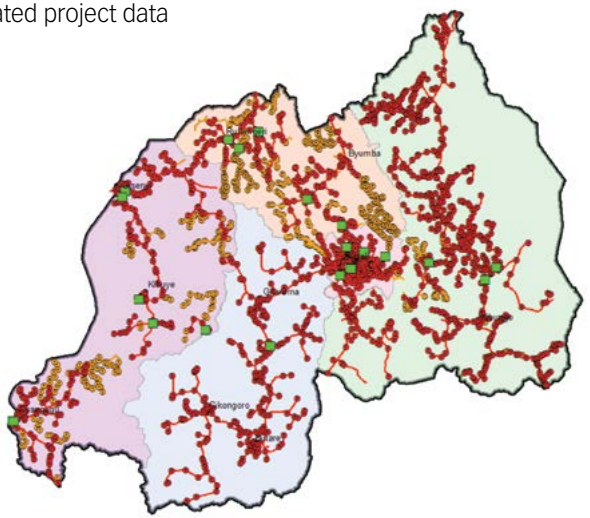
Drawing on the experience of other countries (including Tunisia), changes were made in design and technical features that lowered capital costs related to distribution infrastructure. For example, wooden and concrete poles replaced more expensive lattice-framed steel towers in rural areas.

Figure 1. Spatial Diagram of Planned and Existing Network

Data before project start



Updated project data



Source: EARP Coordination Unit.

Note: The GIS map is updated regularly to reflect existing grid infrastructure and planned extensions.

"Progress in the four years since the rollout of the SWAp has been rapid. Household connections were increased from 110,000 to 390,000 (about 16 percent of the nation's households) as of December 2013."

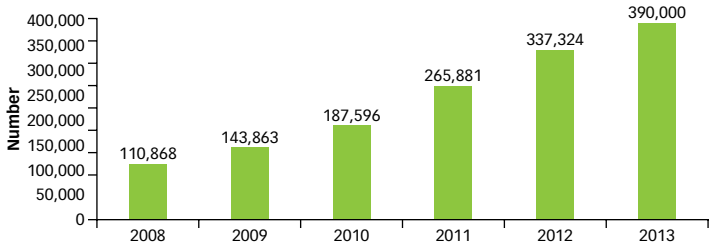
What were the results?

The rapid scale up of electricity access exceeded the government's original targets

New grid connections. Progress in the four years since the rollout of the SWAp has been rapid. Household connections were increased from 110,000 to 390,000 (about 16 percent of the nation's households) as of December 2013 (figure 2). The goal of the second phase of EARP is to connect 1.7 million households by 2017—a 70 percent connection rate. The program has also increased connections to social infrastructure such as schools, health centers, and administrative offices. Although the targets in this respect were not achieved, more than half of Rwanda's health centers and roughly 40 percent of its schools had access to electricity as of December 2013. The new target is to reach 100 percent of health centers and administrative offices and 80 percent of schools by 2017.

Reduced costs of connections. Before the EARP, the cost of a household electrical connection was in the range of $2,000. The SWAp was instrumental in bringing it down to $880 in the first phase of the EARP through technical changes inspired by network expansion in Tunisia and elsewhere. The program focused on

Figure 2. Growth in household connections to the electrical grid, 2008–13



Source: EARP Coordination Unit.

connecting households within 5 kilometers of the existing grid (which was estimated to cover 60 percent of all households). That choice accounts for a good part of Rwanda's success in bringing down connection costs and increasing connection rates. This prioritization of relatively low-cost connections has helped improve EWSA's connection capacity and experience in advancing expansion to more remote areas.

"As demand for electricity rises with the addition of more households to the grid and economic growth, generation capacity will have to increase apace if access targets through 2017 are to be met."

What challenges remain?

Low demand and costly supply are squeezing utility finances

Household electricity demand. Demand for electricity among newly connected households has been lower than anticipated. This has sapped EWSA's revenues and threatens the sustainability of the project. The program currently provides compact fluorescent lamps to newly connected households to promote energy efficiency and affordability. Because most such households use electricity only for lighting, the use of the energy-efficient lamps has kept electrical consumption very low. Experience from other countries shows that connected households in all income brackets tend to acquire domestic appliances over time (see, for example, Khandker and others 2009), gradually boosting electricity consumption, but the fast pace of Rwanda's electrification efforts has meant that a large number of low-consumption households has been added at the same time. It may take several years before a meaningful rise in consumption occurs.

With planned reductions in government support for the utility, the long-term sustainability of the EARP hinges on the ability to increase operating revenues. Reducing supply costs and ensuring that tariffs cover an increasing share of costs are the first steps; long-term financial sustainability will also require an increase in consumers' ability to pay for electricity driven by productive uses of the electricity to which they have recently gained access, as well as by economic growth.

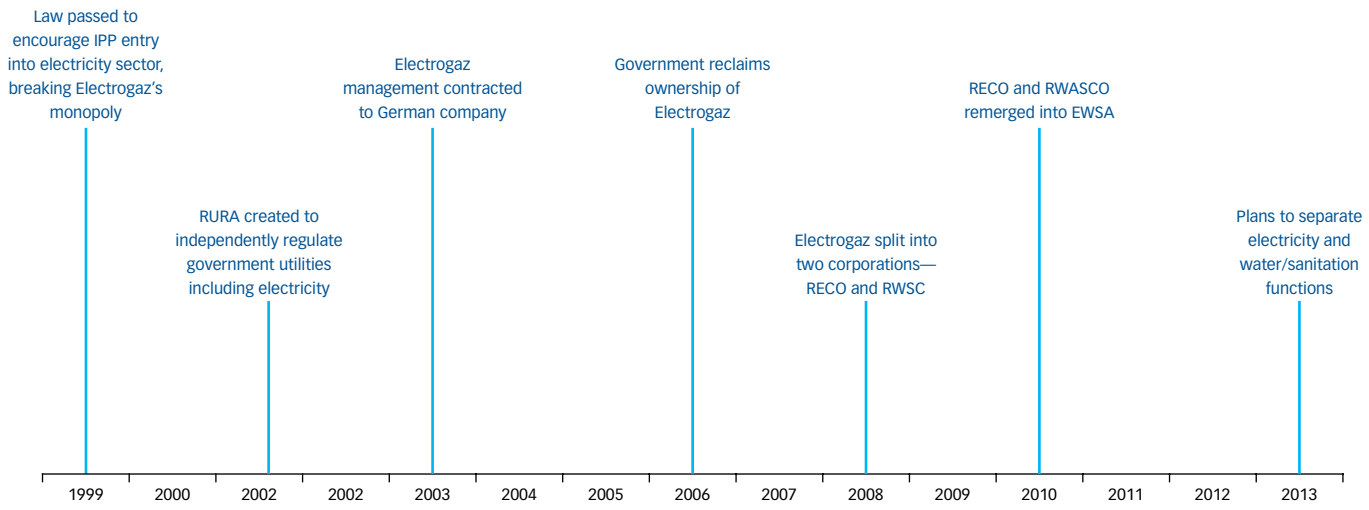
Generation. The EARP agenda includes expansion of generation as well as access. As noted, access is expanding rapidly and is projected to continue to do so. As demand for electricity rises with the addition of more households to the grid and economic growth, generation capacity will have to increase apace if access targets through 2017 are to be met. Currently, Rwanda has an installed capacity of about 110 MW. According to the energy sector strategic plan for 2013–17, the government foresees a five-fold increase in capacity, to 563 MW, by 2017–18, with 80 MW coming online by mid-2014. Most of the increase will come from hydropower, peat, methane, and geothermal and solar energy. Rwanda is quickly gaining experience with solar photovoltaic (PV) technology. The country's first utility-scale solar PV facility will contribute 8 percent (8.5 MW) of Rwanda's total generation once it is installed in 2014. Increases in supply from lower-cost sources will reduce EWSA's dependence on expensive thermal generators, thus helping to improve its financial situation.

Utility finances. Though the EARP has achieved outstanding results in terms of customer connections, EWSA's financial situation worsened in 2013 owing to growing reliance on thermal power and delays in key generation projects. Despite an increase in electricity tariffs, the utility's projected loss for the year ending in June 2013 was $11.7 million. The government is considering steps to improve the utility's performance by introducing cost-reflective tariffs and reducing the cost of generation through the use of cheaper energy sources, accompanied by steps to reduce system losses and to increase energy efficiency. It is also planning to corporatize EWSA and make other institutional changes.

Off-grid options. Under the first phase of the EARP, new connections were concentrated within a 5-km radius of the existing grid. To meet the targets set for 2017, connections will have to be extended into more remote areas of the country. This will increase connection costs. Coupled with low demand for electricity among newly connected households, the imminent rise in connection costs makes off-grid options the most viable alternative in some settings. Achieving national targets over the next few years, therefore, will require an effective strategy to promote suitable off-grid alternatives such as solar home systems, lanterns, and micro-grids.

Staffing and donor funds. Although evidence-based planning and multistakeholder coordination under the SWAp resulted in achievement of goals ahead of schedule, implementation problems did occur. For example, the difficulty of finding qualified staff for the EARP Coordination Unit led to delays in the deployment of

Figure 3. Institutional changes in the Rwandan electricity sector



Source: Authors.

"Coupled with lack of clarity on roles and responsibilities, the profusion of stakeholders has kept private sector investments lower than anticipated, especially in the area of generation."

monitoring and evaluation systems. Also, though the financing needs of the SWAp program were met by the stakeholders and their development partners, difficulties were encountered in ensuring a consistent flow of funds at various stages of implementation, thus emphasizing the importance of working out ahead of time how finances are to be made available over the course of implementation.

Institutional capacity and coordination. EWSA underwent significant managerial and restructuring changes in the first decade of the 2000s (figure 3). Those changes affected the utility's ability to build adequate institutional capacity to undertake its mandate. In addition, the multiplicity of stakeholders in the Rwandan electricity sector made coordination challenging. Coupled with lack of clarity on roles and responsibilities, the profusion of stakeholders has kept private sector investments lower than anticipated, especially in the area of generation.

What lessons have been learned?

An investment prospectus grounded in sound sector planning can be very effective if certain conditions are present

Strong government buy-in. Ownership by the government is key to the success of any SWAp. Recognizing the need for a rapid scale-up of electricity access to fuel the economy, the Rwandan government played a lead role in enabling the success of the SWAp by aligning it with national priorities and policies. Since the SWAp relies on existing institutions, the regulatory groundwork laid by the government and continued commitment by the various stakeholders were instrumental to the successes achieved.

Strong commitment from a lead partner. The access program in Rwanda (which is applicable to similar postconflict and low-income countries) benefited greatly from the World Bank's ability

Rwanda's experience has showed that with government ownership and alignment with national priorities, using SWAps in the electricity sector is a viable and attractive alternative to traditional project-based support.

to drive the process, convene development partners, and mobilize grant funds for the upstream analytics that resulted in the SWAp prospectus. The presence of a strong partner leading the process is essential, especially in countries where the government lacks requisite experience.

Coordination facilitated through the Sector Working Group. The primary mechanism under the SWAp is centralized management and planning though the Sector Working Group. By providing a platform for developing a joint, harmonized strategy, the SWAp reduces the coordination costs of stakeholders in the sector. Development partners are able to engage the sector as a whole through the working group, thus streamlining their efforts to achieve mutually agreed goals. Strategies optimized at the sector level, as opposed to the project level, can exploit complementarities in investment and thus deliver greater overall benefits. Although the traditional SWAp uses a basket funding approach to consolidate resources and increase transparency of resource use, the first phase of the Rwandan program showed that flexibility in the funding mechanism can help attract a diverse set of donors with differing but complementary interests and abilities.

Investment prospectus. The main tool used in the Rwandan SWAp was the investment prospectus. This document put forth a credible program framework for electricity sector development and provided rigorous technical and financial analyses to aid implementation. It helped leverage donor funding by providing a clear plan of action and by reducing the due diligence that donors had to conduct before approving funds.

Data collection. The collection of data from various sources was critical to developing a spatial network expansion plan based on demand assessment and affordability. The data-collection effort formed the basis of credible estimates of program costs and outcomes, improving the quality of planning and the speed of implementation. Further, with the focus on results, the program's monitoring and tracking systems generate key data on the electricity sector as well as on the progress of implementation. This helps identify successful components and address bottlenecks quickly. As a result, the overall quality and availability of data in the Rwandan electricity sector has improved and will be very useful in future planning.

Least-cost planning. The transfer of experiential knowledge on cost-lowering design and implementation features is always important, especially when affordability is a barrier. As highlighted above, the adoption of technical changes based on the experience of Tunisia helped lower the capital costs of distribution. In addition, the use of ready boards reduced the costs of readying households for connection. The program design also allowed for staggered connection payments to lower the amount that households had to pay up front.

Financial sustainability. While subsidies are often needed when increasing access to the poor, it is important to assess the financial sustainability of any access program by realistically forecasting loads based on consumers' ability to pay. Doing so makes possible an accurate estimate of the additional support needed from government (in the form of subsidies or transfers) and donors. While estimates were produced in the case of Rwanda, actual household demand has been lower than expected, thus constraining the utility's revenues. A greater programmatic emphasis on income-enhancing productive uses of electricity could be one of the lessons learned in this regard.

In all, the SWAp in Rwanda delivered tremendous improvements in electricity access over a relatively short period of time. Although challenges remain, the program is on its way to achieving the ambitious targets set for 2017 under the EARP II. Rwanda's experience has showed that with government ownership and alignment with national priorities, using SWAps in the electricity sector is a viable and attractive alternative to traditional project-based support.

Rwanda's positive experience with the SWAp has inspired other countries. Some elements of the approach, such as least-cost planning and the investment prospectus, have recently been applied in Ethiopia and Kenya. In Kenya, in particular, the investment prospectus has helped mobilize various development partners around a government proposal to develop geothermal energy. Lessons learned from Rwanda's planning process are also being applied in many countries that are now readying their plans for universal electricity access under the Sustainable Energy for All (SE4ALL) initiative.

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Live Wire 2014/21. "Scaling Up Access to Electricity: The Case of Bangladesh," by Zubair Sadeque, Dana Rysankova, Raihan Elahi, and Ruchi Soni.

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