

A utility approach to accelerate universal electricity access in less developed countries: A regulatory proposal

*Ignacio J. Pérez-Arriaga, Robert Stoner, Roxanne Rahnama, Stephen J. Lee, Grégoire Jacquot, Eric Protzer, Andrés Gonzalez, Reja Amatya, Matthew Brusnahan, Pablo Dueñas, and Francisco J. Santos**

Executive summary

According to the International Energy Agency (IEA), the volume of investment that would be needed to achieve universal access to electricity by 2030 is \$52 billion per year. Therefore, it is imperative to “think big” in order to address this problem in its true dimension. This necessarily means to create viable business models that can attract private investment. The supply of electricity requires the cooperation of activities of very different nature and electrification can adopt several modes. In this paper, we have focused on the activities that we have deemed as having the best chances for large investments for electrification purposes in developing countries: independent power production (IPP) with large generation, independent power transmission (IPT), electricity distribution and retail, mini/micro grids and stand-alone home systems.

The many experts consulted concur that the heart of the electrification deficit is in distribution. Incumbent distributors devote most of their efforts to grid extension, struggling with deteriorating assets and quality of service, theft and unpaid bills, poor reputation among consumers, and financial survival, while paying little attention to actual consumer needs. Since the distribution company collects the revenues from the end customer tariffs and has to pay the wholesale energy costs, transmission charges and other regulatory charges (taxes, diverse subsidies, etc.) to the corresponding parties, the distribution company absorbs any (usually substantial) deficit, leaving the firm chronically unprofitable, and even insolvent. Despite the many difficulties experienced today, distribution offers multiple possibilities for innovation in management, technology, regulation and consumer engagement, in particular for the last mile, where the direct interaction with the end consumers takes place. Until now, the dominant pathway for providing electricity access has been through grid extension. However, the wide array of system designs now available – off-grid, mini-grid, and on-grid solutions – with the rapidly declining costs of their associated technologies increase the number of pathways available to attain electricity access.

We propose the Electricity Company of the Future (ECoF), that tries to overcome the major limitations of the model that is present in most developing countries and pursues some key societal objectives: i) acceleration of the electrification process while guaranteeing that it will reach everybody with a planned incremental strategy; ii) efficient use of resources, minimizing duplication and waste; iii) reduction of the financial risk – and the cost of capital, as a consequence – for the expensive investment in and operation of network assets; iv) creation of a positive relationship of collaboration with the customers, making use of local expertise, leading to reduction of theft and unpaid bills; v) improvement of the technical and commercial quality of service; vi) leverage electrification to promote productive uses of electricity, and vii) make use of customer

* Universal Energy Access Laboratory, <http://universalaccess.mit.edu/#/main>, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA, and Institute for Research in Technology (IIT), Comillas Pontifical University, Madrid, Spain. Contact address of first author: ipa@mit.edu.

relationships to enter adjacent markets, such as ICT, agro-marketing, retailing of non-electrical goods, or banking.

The ECoF is built around the concept of an enhanced distribution utility that we shall term the “Integrated Distribution Company” (IDC). The key elements of the IDC are: 1) the distribution activity is defined as a zonal concession, i.e. a company with the obligation of electricity supply to all existing and potential customers in the assigned territory, by any electrification mode; 2) substantial private participation in the ownership and management of the incumbent distribution utility; 3) recognition of the different capability requirements and risk profile of the mostly-infrastructure and mostly-consumer centered business models; and 4) focus on a more integrated and consumer-centered approach.

The infrastructure-centered side of the IDC shall be responsible for the system operation at distribution level in the franchised area, and for making the electrification plan, i.e., the specification of the electrification mode corresponding to each customer, compliant with the quality of service target prescribed by the regulatory authority. The distribution company also builds, maintains and operates the main grid and the mini-grids specified in the electrification plan under regulated conditions of grid compatibility, quality of service, tariffs and subsidization.

The innovation in the proposed creation of the IDC mostly resides in the retail side, which is responsible for an ensemble of tasks, most of which require direct interaction with all customers connected to the main grid: i) collect the metering data and bill the customers connected to the main grid and to the mini-grids under the control of the distribution company; ii) perform activities necessary to reduce theft and unpaid bills according to any time schedule established by the regulatory authorities; iii) facilitate that those consumers that are supposed to be supplied with solar home systems within the concession territory of the IDC can get them, via microfinancing and even being the vendor of the equipment.

From a regulatory standpoint, the most obvious implementation challenge is the adaptation of the IDC approach to the existing regulatory framework in each country. From the political and social perspective, there are two acceptability-related dimensions to be concerned about. On the one hand, the compatibility with existing public policy regarding privatization or private involvement in the power sector. On the other hand, negative public perceptions of the private sector in electricity supply. Another potential issue is the social perception of a distribution utility that offers different kinds of electricity services (i.e., different electrification modes, each with its specific tariff and quality of service requirement) to households located in a given territory.

The ultimate test of the proposed approach is economic viability. The IDC business model will not be viable unless a solution can be found in general to any existing structural viability gap (difference between distribution costs & willingness to pay). The gap should be substantially reduced under the proposed approach, if the measures that have been proposed are implemented. However, the uncomfortable truth is that some viability gap can remain. How to address this potentially critical problem? First, the volume of the viability gap has to be quantified. Unless public funds exist to fill the gap, the only reasonable approach is to proceed gradually in time, addressing the least costly electrification targets first (the low hanging fruit), but within a comprehensive approach that includes all the population in the plan (nobody left behind), making progress in all electrification modes simultaneously.