Regulatory issues – 4
Electricity Company of the Future

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We have seen the difficulties faced by the power sector regarding the provision of universal access in many developing countries...
It seems clear that some new approach has to be introduced
We at MIT have questioned whether the future provision of electricity services (mostly in industrialized nations) would be done by the utilities as they exist today...
Perhaps we can also define a new model of company that is better adapted to the objective of universal access in the developing country context...
The electricity company of the future?
Are we in a quest for the Holy Grail?
A first attempt:
Understand the electrification landscape
Searching for the most promising combinations of business models & countries
# Approach

**#1: Analysis of the electrification landscape**

- Categorization of low access countries according to their potential for successful electrification & estimation of the market size for possible business models

**#2: Characterization of plausible electrification approaches**

- Analysis of well-established & potentially disruptive business models
We look at the countries first,

Criteria & metrics

at COUNTRY level
Considered countries


- **South and South East Asia**: Bangladesh, Bhutan, Cambodia, India, Indonesia, Lao, Myanmar, Nepal, Pakistan, Sri Lanka, and Vietnam.

- **Central and South America**: Mexico, Colombia, Bolivia, Brazil, Guatemala, Nicaragua, Dominican Republic, Peru, Ecuador, Venezuela, Honduras, and Haiti.
The search for the most attractive countries to invest in electrification activities by a global energy company has been based on three major global indicators:

- **Adequate governance**, which includes both sound policy and regulation, legal security and functioning institutions;
- The **level of development in information and communication technologies** (ICT); and
- Some global **estimation of the market potential** for business models devoted to electrification activities
Now countries & businesses together

Criteria & metrics

at BUSINESS MODEL & COUNTRY level
Business models archetypes

• Independent Power Production (IPP)
  • Large renewable plants
  • Other large plants
• Independent power transmission (ITP)
• Distribution utility
• Grid compatible & non grid-compatible microgrids
  • Cooperatives
• Stand-alone home systems
• Manufacturing, distributing and financing home appliances
• Battery charging
• Stand-alone solar appliances for income creation
A more complete set of criteria

- Size (to be electrified)
- General economic situation, debt
- Political / business situation, open to privatization & bilateral agreements
- Power sector structure: distribution
- Wholesale supply?
- Off-grid business situation, regulation
- Cost-reflective tariff, need for subsidies
- Losses
- National electrification plan
A second pass:
Focus on a plausible solution at the root of the problem
Hunch:
We more or less know that the search will end successfully & more or less how it will be.
We only have to accelerate the process & avoid the serious mistakes
Outline

• Things we can easily agree upon
• Let’s focus on distribution
  • The current situation
  • How to get out of this mess?
• An integrated distribution company (IDC)
  • Why integration?
  • Will it be viable?
  • Why a private investor would be interested?
• Implementation issues
  • Regulation
  • Electrification planning models
  • Technology
  • Consumer engagement
  • Experiences
  • Challenges
Things we can easily agree upon
We agree that…

• Accelerating electrification requires to **think big**
  • Electrification of entire provinces, states, countries
• A **very large volume** of investment is required
  • which has to be **mostly private**
• Electrification (**in general**) needs Generation, Transmission & Distribution
  • we have responses for G & T, which are supposed to work under some known conditions
  • but **we are stuck with D**
• Let’s **focus on D** and G & T may be integrated later
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• How can we be useful?
Let’s focus on distribution

The current situation
Why to focus on distribution?

• Distribution is at the heart of the problem of lack of access

• In most countries the existing distribution paradigm is not working & electrification is making insufficient progress, both in volume & quality of service
Making Power Affordable for Africa and Viable for Its Utilities

2016
Figure 2: Comparison of electric supply costs with cash collected in 2014 U.S. dollars per kWh billed.

The origin of the problems in distribution

- **Subsidized tariffs** (below supply costs) → poor financial condition of the distribution company → difficulty to invest & to use advanced technologies
- **High distribution costs** in regions with disperse & low demand + subsidized tariffs → more grid connections mean more losses for the distribution company
- Insufficient investment in distribution → poor quality of supply → **disaffection of consumers** → theft, bills non paid, grid defection → more losses for the distribution company
Let’s focus on distribution

How to get out of this mess?
Framing the search for a solution

• Universal electricity access (*i.e. nobody left behind*) needs **obligation of supply over a territory**

• Sustainability (*unlimited permanence in time*) requires a "utility-like model", with a long-term vision & commitment
  
  • mini-grid & solar-kit firms become also sustainable when integrated in such "utility-like model"

• The least cost electrification plan is a **mix of delivery modes** that evolves with time
Framing the search for a solution

• Do we need an “electricity (distribution) company of the future”, in developing countries with substantial deficit of electricity access, that is different from the company of today?

→ YES. A company with a territorial concession
  – with clearly defined responsibilities & default obligation for off-grid supply
  – using the least cost delivery modes with an adequate minimum level of performance for each one
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An integrated distribution company (IDC)

Definition
Key features of the IDC

• Define the distribution activity as a **territorial concession**, i.e. a company with a comprehensive obligation of electricity supply in the assigned territory, by any electrification mode.

• The necessary managerial, financial & operational change will be possible by some form of **PPP with a large private investor in partnership with the incumbent disco & small/local companies** with cutting edge technologies and the capability of effective consumer engagement.

• Recognize the different nature of the “**physical network assets & operation**” (i.e. strict distribution) & the “**consumer interaction**” (i.e. retail) components of the traditional distribution company.
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An integrated distribution company

Why integration?
Why integration (IDC)?

• The boundaries between electrification modes (*grid extension, micro-grids & stand-alone systems*) are getting increasingly blurred & will change with time
  • some customers use multiple modes, others transit from one to another, while others remain stuck in an inadequate one → lack of coordination leads to inefficient use of resources, duplication & waste

• If it is accepted that any electrification plan “should not leave anybody behind” →

  Then the distribution company should *take care of all existing & potential consumers in its assigned territory*, either directly or with delegated franchises
Why integration (IDC)?

• **Cross-subsidization** (as opposed to cherry picking) among delivery modes (if allowed by regulation) facilitates viability

• The integrated IDC business model (if viable) appears to be **more attractive for serious investors** than the fragmented ones

• IDC, with its objective of universal access, is more likely to get the **support of politicians, regulators & the public**

• If the business model (probably including some form of subsidies) proves to be sound, it should **deserve the attention of DFIs**
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Will it be viable?
Will the IDC be economically viable?

• The current **viability gap** of Discos (*difference between distribution costs & collected tariffs*) is presently met with expensive government bailouts

• The presence of a **strong private investor** would help in reducing (eliminating?) the viability gap in several possible ways
  
  • Use adequate **technology** & any required efforts in **consumer engagement** (*improved quality of service is critical here for consumer satisfaction*) to **reduce theft & unpaid bills**
  
  • **Cross-subsidize** tariffs between lower income households & other loads with lower price elasticity, such as “anchor generators & anchor loads”
Will the IDC be economically viable? (cont.)

• Try to bring back to the main grid those C&I customers that defected because of poor reliability &/or excessive cross-subsidization &/or improve their standalone supply (drive out diesel)

• Standardization in supply (suitable low cost equipment) & demand (appliances)

• Create activities around electricity access to stimulate additional residential demand, plus productive uses & community activities that need electricity

• And (by the regulator) apply cost-reflective tariffs, as needed, after all these measures have been employed or (by the government) pay any required compensation to cover the deficit
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Why a private investor would be interested?
Why a large investor would be interested in IDC?

• Large energy companies (*oil firms, in particular*) want to expand & diversify

• These companies may **not be interested in the fragmented business areas**, which do not have enough volume & potential for growth, and where
  • there is already much competition in solar kits
  • mini-grids without subsidies are not viable in general

• The investor may want to have a **permanent & visible presence**, with a long-term view (i.e. as a utility), in a new country
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Implementation issues

Regulation
The territorial concession for distribution

- **Some form of PPP**, where the global private firm is responsible for network operation & investment, as well as consumer interaction
  - The specific **format** will be very country-dependent
  - The **presence of public ownership** in the IDC will facilitate that the “universal access” social objective is not ignored
- **Private investment** will lessen the financial burden of the government presently subsidizing the disco
  - This can allow the government to provide subsidies targeted to facilitate basic access to the most vulnerable consumers
The territorial concession for distribution

- Topics that must be addressed when defining the concession
  - Responsibility in management of operation & decisions on new investments
  - Veto power by the public side
  - Participation (if any) in ownership
  - Allocation of costs & revenues
  - Responsibility in the relationship with the regulatory & administrative authorities
  - Branding
  - Duration of the concession & termination conditions
Other regulatory topics to be addressed

- Penalties & credits associated to preestablished performance targets
- Exposure to risks derived from changes in the determination of revenue requirements & tariffs, in particular for off-grid assets & customers
- Restrictions for distribution concessionaires from other activities in the sector; conditions for outsourcing
- Exclusivity conditions for the concessionaire in the concession area
- Mini-grid regulations, including customer tariff setting
- Non-paid bills by public institutions
- Obligations on customers relationships, etc.
Distribution & retail

• These two kinds of activities within the distribution company
  • Distribution: Investment, operation & management of the physical network assets
  • Retailing: Engagement with the customers, promotion of additional uses of electricity, metering, billing & theft control

must receive a different regulatory treatment

• cost-of-service remuneration with reliability & technical loss incentive for distribution

• mostly performance-based incentive remuneration for commercial losses & consumer satisfaction for retail
• A differentiated regulatory treatment of activities (distribution & retail) will result in better risk allocation,
  • with lower cost of capital for the expensive investment in network assets
  • & specialized local management of consumer engagement
Other businesses

• The “Energy Company of the Future” (ECoF) will be based on the IDC, but it can include other business models

• Other potential associated businesses
  • generation & transmission
  • microfinancing & sale of stand-alone systems
  • promotion of productive electricity uses & participation in these activities
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Implementation issues

Electrification planning models
The need for quantification...
Results obtained with the REM planning model

http://universalaccess.mit.edu/#/main

Legend:
- **Red**: Extension 11kV
- **Blue**: Extension 400V
- **Orange**: Microgrid 11kV
- **Green**: Microgrid 400V
- **Purple**: Stand-Alone
... & understanding the implications of policy choices...
Uganda – Southern territories
Forced 100% Grid Extension

Results obtained with the REM planning model
http://universalaccess.mit.edu/#/main
Uganda – Southern territories
100% Grid Reliability

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Implementation issues

Technology
Technology

- The participation of a strong external investor makes possible to incorporate advanced technologies:
  - metering & communication options with customers
  - integration of off- & on-grid supply under the same data platform
  - monitoring & control

  with positive impact on:
  - reduction of unpaid bills & theft
  - consumer engagement

- Initial investments expected to result in lower costs & increased revenues
An integrated distribution company
Implementation issues
Customer engagement
Consumer engagement

- This is a critical component of the IDC model: A change of public perception & customer mindset with respect to the electricity supplier
  - A satisfactory quality of service is a necessary condition for any attempt to cost reflective tariffs & reduction of unpaid bills & illegal connections
- A multidimensional approach has proven to be successful
  - Enhanced information & response time & quality
  - Recovery of defected customers & approach to new ones
  - Social activities at community level
  - New appliances & productive uses of electricity
An integrated distribution company

Implementation issues

Experiences
Rural Electrification Concessions in Africa: What Does Experience Tell Us?

Richard Hosier, Morgan Bazilian, Tatia Lemoondhava, Kabir Malik, Mitsunori Motohashi, and David Viar de Ferrenbach

Energy and Extractives Practice | Africa Region, World Bank
Concessions on the spectrum of public-private sector institutional engagement

- Supply and civil works contracts
- Subcontracting
- Technical assistance contracts
- Management contracts
- Leasing (affermage)
- BOT and concession (stricto sensu)
- BOO
- Divestiture by license

Pure public → Subcontracting → Technical assistance contracts → Management contracts → Leasing (affermage) → BOT and concession (stricto sensu) → BOO → Divestiture by license → Pure private
Experiences

• Successful experiences in urban environments
  • “Distribution franchises” in India: Delhi, Agra, several towns in Rajasthan & Gujarat
  • Also in rural areas: Argentina (Salto, Jujuy)
  • And less successful in Senegal

• Actual ongoing implementation of the IDC model in Kaduna & Kano (Nigeria)
IDC challenges
IDC: Challenges - 1

• Political & social acceptability
  • Regarding the existing public policy regarding privatization or private involvement in the power sector
  • Public perception of the participation of the private sector in electricity supply

• The need for regulatory reforms
  • The IDC concept may not be fully compatible with the existing regulatory framework
The entire IDC business model will not be viable until a solution is given to how to cover any existing viability gap.

- The viability gap must be estimated quantitatively *a priori* & a solution has to be adopted before any IDC could be launched.
- All approaches (*already mentioned: technology, consumer engagement, standardization, cost-reflective tariffs with any necessary cross-subsidization & productive & community uses*) to reduce the viability gap must be employed.
- If needed, resort to direct public subsidies & concessional loans coupled to a necessarily gradual electrification approach.
Comments & questions