How Will The Role of Utilities Evolve in Future Energy Systems?

Vivien Foster, Lead Economist
Energy & Extractives Global Practice

ESMAP Knowledge Exchange Forum
London, November 29-30 2017
Easter Parades on Fifth Avenue, New York

1900: No cars, just horses

1913: No horses, just cars
The new debate on Power Sector Reform

The time has come to start focusing:

- **more** on unleashing the transformational power of distributed generation; and
- **less** on traditional institutional reforms to fix ailing utilities?
The new debate on Power Sector Reform

The time has come to start focusing:

- more on unleashing the transformational power of distributed generation; and
- less on traditional institutional reforms to fix ailing utilities?

Outcome of vote by 200+ World Bank Energy Staff May 2017

For: 50%  Against: 50%
Disruptive technologies offer potential to transform power systems saving both money and carbon

- Rooftop solar
- Distributed generation
- Electricity storage
- Electric vehicles
- Advanced electronics
- Advanced metering
- Smart grids

Corporate direct purchase of renewable energy
Companies now sign direct power purchase agreements with large-scale off-site renewable developers.

Rooftop solar

Distributed generation

Electricity storage

Electric vehicles

Advanced electronics

Advanced metering

Smart grids

Renewable energy
Projections for installed wind and solar capacity in various countries suggest a growing share of renewables in the energy mix.

Energy storage
Progress in energy storage technology is anticipated to further reduce costs and to reduce intermittency of supply problems commonly associated with renewables.

Energy efficiency
Supply-side energy savings measures are very cost efficient. Various solutions such as the use of LED technology and energy efficient home appliances may change consumer energy use.

Electric vehicles
New solutions and decreasing battery costs are rapidly changing the economics of this technology. Demand for electric vehicles from individual consumers is expected to rise rapidly.

Carbon Capture & Storage
There are few projects in the world aiming to improve the viability and reduce costs, so CCS technology is not yet deployed at scale to have significant impact on emissions reduction.

Grid integration
Utilities have improved demand forecasting tools to deal with fluctuating supply of renewables and as a result grid operators can now supply up to 50% renewable capacity.

Historically, power generation has focused on large centralised power plants through the combustion of fossil fuels such as coal and gas, supplemented by nuclear and hydro power.

The current large scale shift from centralised to distributed generation based on renewables and other technologies can be disruptive for many electric utilities.
Unleashing this potential requires second wave of institutional and regulatory reforms

**ELECTRICITY PRICING**

- Volumetric charges no longer adequate
- Design charges that are more fully cost-reflective
  - By time-of-use and location
  - Symmetrical for injections and withdrawals
  - Based on use of peak coincident capacity
  - Tax users for ‘public good’ service provided by grid

**REGULATORY INCENTIVES**

- Introduce regulatory regimes with flexible incentives for innovation
  - Create forward-looking multi-year regimes
  - Equalize incentives for OPEX and CAPEX
  - Provide outcome-based performance incentives
  - Incentivize innovations with longer-gestation periods
  - Do automatic adjustment factors for forecast errors

**INSTITUTIONAL ROLES**

- Allocate institutional roles so to avoid conflicts of interest and abuse of market power
  - Full financial and legal unbundling of distribution system operator, system planning and market platforms
  - Consider introduction of data hub or exchange to provide non-discriminatory access to consumer data
Developing countries have struggled to implement first wave of power sector reform

- **Regulation**
  - Regulators fairly common but often lack capacity and independence

- **PSP in distribution**
  - Tried by almost half of countries but still only affects a quarter of utilities

- **Unbundling**
  - Only one in three countries have fully unbundled distribution utilities

- **Power markets**
  - Only one in five countries have power markets, typically larger middle income
Pace of market reforms has slowed since 2005

Global Average Power Sector Reform Index for Developing Countries, 1995-2015

- Regulation Index
- Competition Index
- Restructuring Index
- Private Sector Participation Index
Barely a dozen developing countries score above 80

<table>
<thead>
<tr>
<th>Country</th>
<th>Regulation Index</th>
<th>Restructuring Index</th>
<th>Competition Index</th>
<th>Private Sector Participation Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nicaragua</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jordan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominican Republic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanuatu</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaysia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kazakhstan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angola</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameroon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algeria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honduras</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venezuela, RB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egypt, Arab Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mongolia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Country Scores for Power Sector Reform Index, 2015
Growing political focus on rural electrification that was often overlooked by first wave of reform

- Global flat trend of rural electrification
  - High cost of grid extension
  - Affordability challenges
  - Weak incentives for utilities

- New technologies offer promise of accelerating electrification
  - Falling cost of Solar PV
  - Rising efficiency of appliances
  - Digital innovation in payment
  - Mini-grids and off-grid models

Rural Population with Access to Electricity (%)
The significance and impact of new technologies may differ at different stages of development

**Developed countries**

• **Context**
  - Universal access achieved
  - High quality of service
  - State of the art infrastructure platform
  - Advanced stage of market reform
  - Strong regulatory capacity

• **Implications**
  - Potential to improve efficiency and resilience of established urban networks
  - Contingent on suitable regulatory and institutional platforms being in place
The significance and impact of new technologies may differ at different stages of development

**Developed countries**

- **Context**
  - Universal access achieved
  - High quality of service
  - State of the art infrastructure platform
  - Advanced stage of market reform
  - Strong regulatory capacity
- **Implications**
  - Potential to improve efficiency and resilience of established urban networks
  - Contingent on suitable regulatory and institutional platforms being in place

**Developing countries**

- **Context**
  - Major access gaps
  - Poor quality of service
  - Deficient infrastructure platform
  - Market reforms proving challenging
  - Weak regulatory capacity
- **Implications**
  - Initial focus is on potential to accelerate electrification through off-grid approaches
  - Possibility to leap-frog in urban contexts where conventional grids deficient
Many key policy questions remain unanswered

• Do developing countries need to complete the first wave of power sector reforms before embarking on the second wave?
• How much of a difference can disruptive technologies make in traditional state-owned monopoly sectors?
• Is the threat of grid defection in developing countries larger (due to poor quality of service) or smaller (due to subsidized tariffs)?
• Is leapfrogging to decentralized generation with storage a real possibility in developing markets? If so, is it desirable?
• How do emerging policy prescription for OECD countries need to be adapted to the developing world context?
Break out into two parallel sessions

#1 Smart Delivery On and Off Grid
Moderator: Sheoli Pargal (go to room)

• From Traditional DISCOM to Smart Utility (Praveen Sinha, CEO, Tata Power Delhi)
• An Emerging Distance Model (Christopher Baker-Brian, CTO, BBOX)
• Table discussions and report back

#2 Drivers of Evolution of Utilities
Moderator: Vivien Foster (stay here)

• Utility of the Future in Developing Countries (Pradeep Pursnani, COO, Shell Foundation)
• Adapting Regulatory Models to Drive Innovation (Martin Crouch, Senior Partner, OFGEM)
• Table discussions and report back
Breakout Session #2 – Speaker Bios

Martin Crouch, Senior Partner, Improving Regulation, OFGEM

• 10+ years at OFGEM leading numerous departments on distribution, transmission, clean energy and European markets
• Currently responsible for regulatory development and innovation agenda

Pradeep Pursnani, Deputy Director, Chief Operating Officer, Shell Foundation

• Since 2010, with Shell Group leading their expanding cook stoves program
• Since 2012, with Shell Foundation leading all operational programs and responsible for strategy development
Breakout Session #2 – Discussion Questions

• What barriers and opportunities to implementing the “utility of the future” vision do you see in the country/context in which you work?

• What can governments or regulators do to help drive technological and institutional innovation the country/context in which you work?