Electricity is not a right

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Electricity Around the World

### Table 1
Key Electricity Summary Statistics, by Income Level

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Lowest</th>
<th>Lower-middle</th>
<th>Upper-middle</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: World Electricity Overview</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population (millions)</td>
<td>619</td>
<td>2,972</td>
<td>2,568</td>
<td>1,165</td>
</tr>
<tr>
<td>GDP per capita in 2016 (% of US)</td>
<td>2.9</td>
<td>10.7</td>
<td>26.7</td>
<td>79.8</td>
</tr>
<tr>
<td>Electricity consumption per capita (% of US)</td>
<td>1.1</td>
<td>5.9</td>
<td>27.2</td>
<td>69.9</td>
</tr>
<tr>
<td>Connection to Grid (%)</td>
<td>34.9</td>
<td>83.6</td>
<td>99.4</td>
<td>100.0</td>
</tr>
<tr>
<td>T&amp;D Loss (%)</td>
<td>22.8</td>
<td>16.2</td>
<td>9.6</td>
<td>6.1</td>
</tr>
<tr>
<td>Firm losses due to outages (% of output)</td>
<td>8.7</td>
<td>6.6</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Panel B: Pricing in Selected Countries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean consumption of electrified households (kWh)</td>
<td>98</td>
<td>103</td>
<td>162</td>
<td>574</td>
</tr>
<tr>
<td>Mean price at mean consumption level (US cents/kWh)</td>
<td>3.6</td>
<td>6.3</td>
<td>7.6</td>
<td>18.8</td>
</tr>
<tr>
<td>Mean power purchase cost (US cents/kWh)</td>
<td>6.4</td>
<td>7.2</td>
<td>6.6</td>
<td>6.2</td>
</tr>
<tr>
<td>Power purchase cost after T&amp;D loss adjustment (US cents/kWh)</td>
<td>7.8</td>
<td>8.3</td>
<td>7.5</td>
<td>6.6</td>
</tr>
<tr>
<td>Mean price less adj. power purchase cost (US cents/kWh)</td>
<td>-4.2</td>
<td>-2.0</td>
<td>0.1</td>
<td>12.2</td>
</tr>
</tbody>
</table>
Energy is Critical for Growth

There is no economic growth without energy. Continued growth in energy demand per capita is critical for improving quality of life in emerging economies. In this sense, expanded energy access is not only desirable, it is fundamentally imperative and inevitable.

Source: EPIC analysis based on World Bank data.
High Access Requires Low Losses

Global Trends in Transmission and Distribution (T&D) Losses

Source: World Bank data.

Countries which are trying to expand distribution (for example, into the countryside) face the highest rates of nonpayment for electricity. At the peak of the curve, countries with about 40% access to electricity lose 25% of their power before it is billed to any consumer. A 33% T&D loss rate implies the utility is giving away 1 in 3 units of electricity for free – in other words, the effective cost per kWh sold increases by 50%.
Discuss how (paradoxically) viewing electricity as a right limits access and rations supply

There are 4 steps

1. Electricity is seen as a right
2. Electricity distribution is loss-making
3. Distribution companies ration supply
4. Supply and payment become delinked

→ and back to 1 = viscous cycle
Step 1: Electricity is seen as a right

<table>
<thead>
<tr>
<th>Customer Beliefs about Enforcement in Bihar, India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage responses to:</td>
</tr>
<tr>
<td>If you did X, how likely would it be that you would incur any penalty from the distribution company?</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Paying your bill late</td>
</tr>
<tr>
<td>Likely: 10.1</td>
</tr>
<tr>
<td>Modifying your meter</td>
</tr>
<tr>
<td>Likely: 7.9</td>
</tr>
<tr>
<td>Having an informal hooked connection</td>
</tr>
<tr>
<td>Likely: 7.6</td>
</tr>
<tr>
<td>Bribing electricity officials</td>
</tr>
<tr>
<td>Likely: 12.2</td>
</tr>
</tbody>
</table>

Source: Bihar Electrification Project endline household survey
Notes: Responses are from a survey of 7,071 households in rural Bihar. Modifying a meter, having an informal hooked connection, and bribing officials all prevent a utility from observing actual electricity consumed, and therefore constitute power theft.
Step 1: Electricity is seen as a right

Figure 5
Explicit Subsidies in the Marginal Price of Power
Step 1: Electricity is seen as a right
Figure 1
Electricity Losses in Bihar, India

- Official Rate
- After Subsidies
- After Technical Losses
- After Unbilled Power
- After Unpaid Bills

Cost of Supply
Step 3: Distribution Companies Ration Supply

Cumulative Distribution Function of Hours of Power Supply in India

- Percent Households With N Hours or Fewer (%)
- Daily Hours of Supply

Lines represent:
- All
- Rural
- Urban
Step 4: Supply and Payment Become Delinked

Figure 2
Hours of Electricity Provided in Bihar vs. Fraction of Revenue Collected

- Hours of electricity supplied
- Revenue Rate
- Average Daily Hours of Electricity
  - Linear Fit
  - Distribution of Revenue Rate
Step 4: Supply and Payment Become Delinked

Non-Market Influences on Supply

Week

Pct of Feeder Non-Compliant due to reason X

Senior Official Order
Public Pressure
SBO Non-Compliance
Technical
Weather

Diwali-Chhath
Holi
RLSS Suspension
Durga Puja
Diwali-Chhath
New Year’s
Republic Day
Holi
Vicious Circle of Low Payment and Restricted Supply

People feel that electricity should be provided by the government.
Vicious Circle of Low Payment and Restricted Supply

People feel that electricity should be provided by the government.

Low payment rates.
Vicious Circle of Low Payment and Restricted Supply

People feel that electricity should be provided by the government

Low payment rates

Distribution Companies lose money
Vicious Circle of Low Payment and Restricted Supply

People feel that electricity should be provided by the government.

Low payment rates lead to:

Distribution Companies lose money.

To limit losses, they ration supply.

People feel that electricity should be provided by the government.
Vicious Circle of Low Payment and Restricted Supply

Companies lose money

To limit losses, they ration supply

People feel that electricity should be provided by the government

Low payment rates

Distribution Companies lose money

Government’s commitment to treating electricity as a commodity

Improved Supply
What can be done to break the cycle = challenge being taken up by IGC in India and elsewhere

1. Rationalize subsidies – DBT etc
2. Change the social norm – e.g. link hours of supply to payment – Anant
3. Incentivize bill collectors – ongoing
4. Bring in alternatives (e.g. off-grid solar) – Michael
5. Technology - better monitoring and enforcement (e.g. smart meters) – ongoing
6. Behavioral interventions
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