Cost of Supply

Discom’s Approach and Major Challenges
Outline of presentation

- Objective
- Meaning
- Legislative & Regulatory framework
- Methods to Estimate CoS
- International Practices
- Challenges
- Recommendations
Objective

Broad objective

- Review of approaches adopted by various Discoms in determining Cost of Supply
- Identify challenges faced by utilities in estimating category-wise/voltage wise Cost of Supply
- Develop guidelines in estimating Cost of Supply (CoS)
Meaning

CoS for various categories of consumers is the cost imposed by a particular category of consumers on the system in order to supply the electricity demanded by them.

Rationale:

- Determination of cost of supply is an integral part of tariff fixation process.
- Cost of supply to different categories of consumers varies depending on usage of distribution system resources and consumption pattern of consumer categories
- To assess the true impact of cross subsidy and to take remedial measures
Legislative & Regulatory framework of COS

### EA
- **Section 61**: Tariff should progressively reflect CoS and reduce cross subsidy
- **Section 62(3)**: Highlights the necessity of providing weightage of various factors in tariff determination
- **Section 65**: State government may provide direct subsidies to some tariff categories
- Proposed amendment to EA-2003, as of 2018-progressively eliminate cross subsidies in next three years

### NEP
- **5.5**: Recovery of Cost of service and Targeted subsidies:
  - **5.5.1**: Need for ensuring recovery of Cost of service from consumers to make sector sustainable
  - **5.5.2**: Tariff for low consuming BPL consumers should be 50% of average CoS

### TP
- SERC would notify roadmap with a target that latest by the end of year 2010-11 tariffs are within ±20% of the average CoS

<table>
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<tr>
<th>APTEL Order</th>
<th>Key interpretation</th>
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| Appeal Nos. 102 of 2010, Tata Steel Ltd. Vs. Orissa Electricity Regulatory Commission | - Determine *voltage-wise cost of supply* taking into account the major cost element which would be applicable to all the categories of consumers connected to the same voltage level at different locations in the distribution system  
  - Provide detailed *guidelines* for calculation of voltage wise cost of supply |
| Appeal Nos. 931 of 2007, SIEL Limited, v/s PSERC | - Cost to supply a consumer category is *not the same as average cost of supply for the distribution system* as a whole and the same cannot be used in calculation of cross subsidy instead of actual cost of supply |
Approach of Study

Understand the structure and contours of policies and regulations

Matrix development of state wise CoS methodology

Development of consultation framework

Stake holder discussion with Discoms

Development of discussion paper based on findings
Different Method / Approaches to Estimate CoS

**Simplified Approach**

COS is evaluated by taking simple ratio of total cost incurred to serve electricity to the total input electricity.

**Embedded Cost Approach**

Assign the historical/ accounting costs that make up a utility’s ARR to various voltage/consumer categories based on various allocation factors.

**Marginal Cost Approach**

Seeks to determine the incremental (marginal) change in total costs imposed on the system by a change in output.

ARR: Annual Revenue Requirement
Simplified Approach

\[
\text{Cost of Supply} = \frac{\text{Sum of Power Purchase Cost and Other costs}}{\text{Total Energy Input}}
\]

CoS can be calculated voltage wise / category wise, if respective losses, energy sales are available.

- Costs allocated based on input energy or energy sales
- Approach followed by **majority of the Indian Utilities**.
Embedded Cost Approach (1/2)

**Functionalization -**
Total Cost divided into G, T and D on the basis of function performed

- Generation (G)
- Transmission (T)
- Distribution (D)

**Classification -**
The G, T, D cost are divided into D, E, and C cost based on the nature of cost incurred

- Demand Cost (D)
- Energy Cost (E)
- Customer Cost (C)

**Allocation -**
The D, E, and C costs are then allocated among the consumer category based on factors such as peak demand, connected load

- Industrial
- Commercial
- Agricultural
- Domestic etc

Voltage wise / Category wise CoS using Embedded approach is being followed by Telangana, Maharashtra, Andhra Pradesh and Punjab.
Embedded Cost Approach (2/2)

**Demand Cost**
- All costs related to capacity creation including interest on debt, depreciation, RoE, etc
- Allocated on the basis of coincident peak demand of various consumer categories
- Basis of demand (kW) imposed on the system during specific peak hours

**Energy Cost**
- Costs dependent on the quantum of energy consumed like fuel cost.
- Allocated to various classes based on each class’ energy usage compared to the total energy usage from all classes.

**Customer cost**
- Costs related to the services provided to the consumers like metering, meter reading, service connection, etc.
- Allocated on the basis of the ratio of number of consumers of a particular category to total number of consumers.
## Comparison among Approaches

<table>
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<tr>
<th>Approaches</th>
<th>Advantages</th>
<th>Disadvantages</th>
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| **Simplified Approach**  | • Easy of implementation  
• Estimate actual loss level through load flow studies | • All consumer categories connected to the same voltage will have the same cost of supply |
| **Embedded Cost Approach** | • Historical data easily available  
• Verifiable and realistic  
• Embedded cost are closely aligned with revenue requirement of the utilities | • Requires a large quantum of data  
• Load research is mandatory |
| **Marginal Cost Approach** | • Represents true economic value and provides efficient price signals to consumers  
• Forward looking | • Requires large quantum of data  
• Not so accurate results due to use of forecasted values. |

- Collated and developed utility wide voltage wise asset register.
- Load research was carried out to estimate the proportion / allocation of demand cost.

## International Practices

<table>
<thead>
<tr>
<th></th>
<th>New Zealand</th>
<th>Australia</th>
<th>South Africa</th>
<th>Philippines</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population (Million)</strong></td>
<td>5</td>
<td>25</td>
<td>57</td>
<td>105</td>
<td>1340</td>
</tr>
<tr>
<td><strong>Per capita nominal GDP (2017 US$)</strong></td>
<td>42,941</td>
<td>53,800</td>
<td>6151</td>
<td>2989</td>
<td>1942</td>
</tr>
<tr>
<td><strong>Access to Electricity</strong></td>
<td>100%</td>
<td>100%</td>
<td>84.2%</td>
<td>91.0%</td>
<td>99% **</td>
</tr>
<tr>
<td><strong>Per Capita Electricity Consumption- kWh(2014)</strong></td>
<td>8,939</td>
<td>9,742</td>
<td>3,904</td>
<td>885</td>
<td>1,122</td>
</tr>
</tbody>
</table>

* Source – World Bank, 2016  
** as per Saubhagya
Stakeholder consultation

The selection was done with a view to include Discoms from each of the five grid regions and states having different consumer mix.

**Western Region** - Maharashtra (MSEDCL) and Madhya Pradesh (MPMKVVCL)

**Northern Region** – Punjab (PSPSCL)

**Eastern Region** – West Bengal (WBSEDCL)

**Southern Region** – Karnataka (BESCOM)

**North East Region** – Assam (APDCL)

5 Regions

6 Discoms

Managing Directors/ Directors, Chief Engineers/ General Managers

The selection was done with a view to include Discoms from each of the five grid regions and states having different consumer mix.
Challenges in adopting Embedded approach

❖ **Non availability of data**

❖ Non-availability of category wise data such as demand profile, category wise Technical and commercial losses, load factors etc. due to:
  • Mixed Feeders.
  • Lack of Metering at feeder level & DT level.

❖ **Improper indexing of Asset cost:**

❖ Old infrastructure and non availability of ERP system, categorization of Assets among different voltage levels / consumer categories is not available / maintained.
Recommendations

• 100% Feeder level Metering.

• Simplification / standardization of consumer categories

• Load research study needs to be conducted periodically.

• Implementation of ERP / SAP system to maintain proper record of category / cost center wise assets.

• Sensitisation of consumer in regard to subsidies - By presenting true picture of CoS and billed tariff in consumer electricity bill.

• An option of voluntary withdrawal of subsidies (to agriculture and domestic consumer) is to be mooted same as that of subsidies on LPG cylinder.
The Law of Win/Win says, *Let's not do it your way or my way; let's do it the best way.*

- Greg Anderson

Thank You

Raghav Pachouri  
Associate Fellow - Electricity and Fuel Division  
The Energy & Resources Institute (TERI)  
raghav.pachouri@teri.res.in  
8234952822, 9759583079