



كرسي الشركة السعودية للكهرباء لإدارة الأحمال ورفع كفاءة استخدام الطاقة الكهربائية

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Determining Electricity Tariff

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Major Tariff strategies

- ❖ Tariffs should be developed based on principles of economic efficiency.
- ❖ Tariff principles and procedures should be transparent and applied in an even-handed manner.
- ❖ The transition mechanisms should be provided in a manner which minimizes distortions to efficiency or consumption decisions.



Major Tariff strategies **Cont.**

- ❖ Uniform tariffs should be applied nationwide.
- ❖ Subsidization should remain for small residential consumers.
- ❖ For other consumer categories tariff should be designed to best reflect the marginal costs.



Electricity Cost Categories

The three main electricity cost components are:

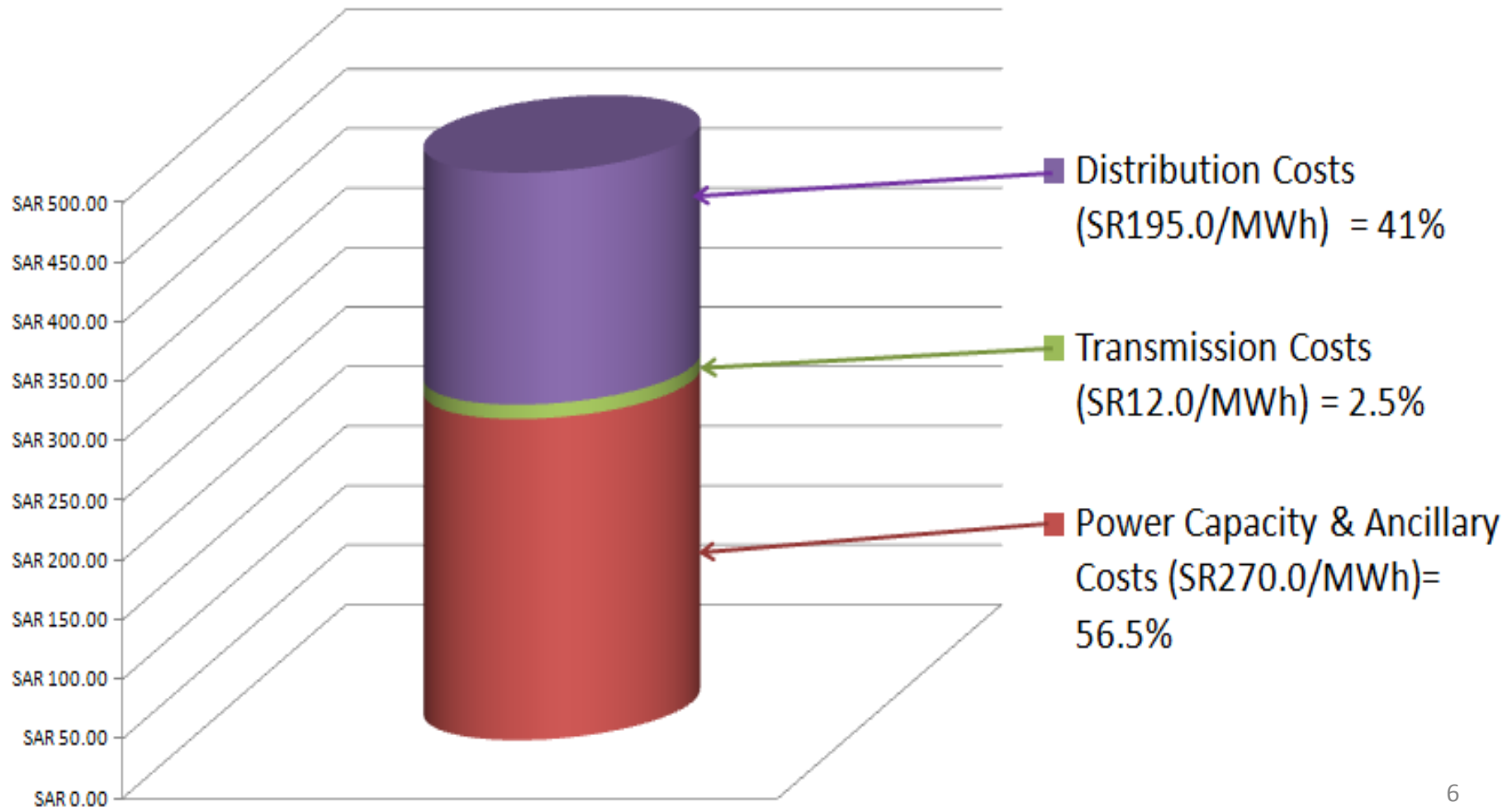
- 1) Transmission costs (which are small relative to the total costs).
- 2) Capacity Costs
- 3) Distribution costs

The last two cost categories are somehow at similar levels.

Each cost category can be further segregated into variable and fixed costs.



Components of the Average Retail Consumer Cost Total of SR477/MWh





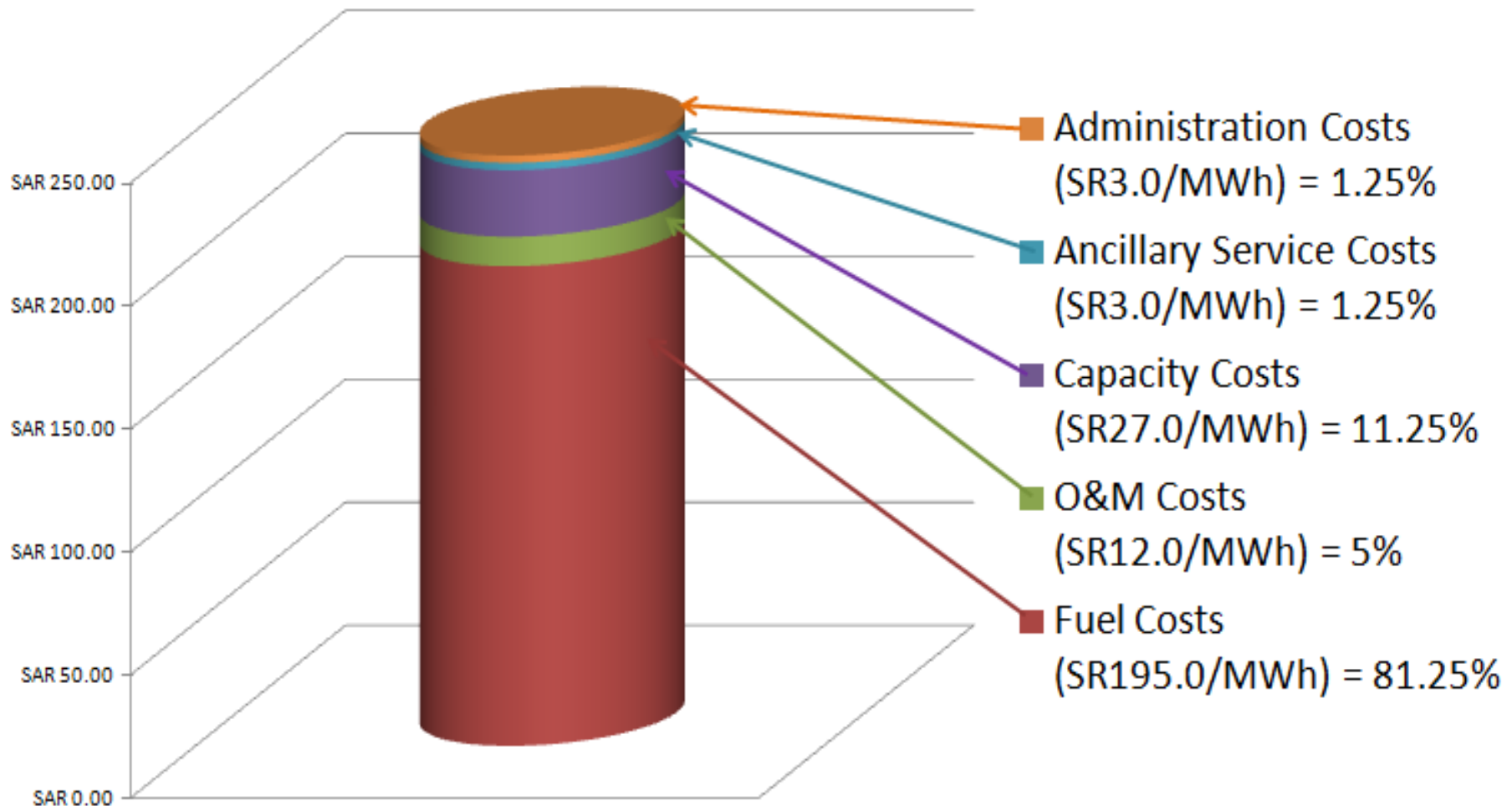
Electricity Cost Categories **Cont.**

Wholesale electricity costs can be separated into:

- 1) Fuel costs (the majority of wholesale electricity costs).
- 2) Variable operation and maintenance (VOM) costs,
- 3) Capacity costs,
- 4) Ancillary service costs.
- 5) Administration Costs



Components of the Wholesale Electricity Cost for the Margin Total of SR240/MWh





Tariff Structures

- 1) **Single-part Tariff:** Prices for all energy and capacity are set on a ₹/ kWh bases.
- 2) **Two-part Tariff :** It has two parts the fixed costs which is priced at ₹/kW ; and the energy charge (the variable costs) which is priced at ₹/kWh . Such that:



Tariff structures

Cont.

$$\text{Monthly Bill} = PCh * \sum \text{Power Capacity (kW)} + ECh * \sum \text{Energy (kWh)}$$

Where: *PCh: capacity charge*
ECh: energy charge

3) Three-part Tariff : Separates the charges further and includes a customer delivery charges (such as the metering, billing and customer service).



Tariff structures

Cont.

- 4) **Time-of-Use Tariff:** It reflects system costs (primarily the generation costs) that vary by time of day and by seasons.
- 5) **Incentive Tariff:** That give a certain reduction in the value of the tariff or even pay-back the consumer, as a result of his commitment to reduce his facility loads to some definite level during certain period of time.

And many others



Two-Part Tariff

The Two-Part Tariff (Capacity charge and Energy charge) provides a better economic signal to the purchaser than a single-part tariff in several aspects:

❖ **Economically:** Reflects both **variable** and **fixed** costs, including the high costs of new capacity leads to more fairness by charging more for those that impose higher costs on the system.



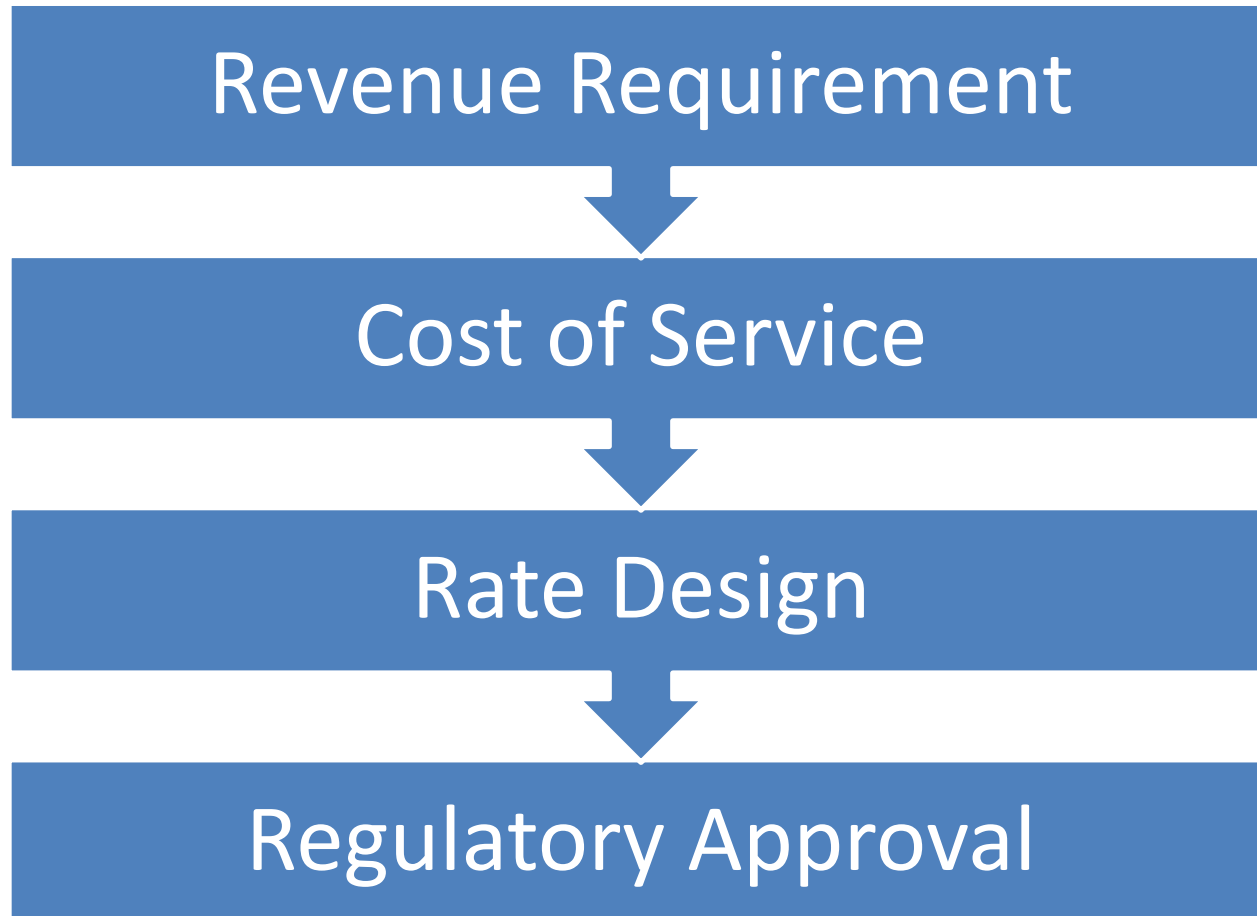
Two-Part Tariff

Cont.

- ❖ **Technically:** It provides incentives for improved operations (i.e. improved load factor and power factor). By improving the **load factor**, the unit costs of energy (₹/kWh) can be reduced and can help improve the overall efficiency of the system.
- ❖ **Fairness:** Each distribution company shares the overall system costs in relation to the costs that each imposes on the system for capacity requirements and energy needs.



Tariff Process





The Revenue Requirement

Defined as the total annual costs of the energy company; and segregated into two parts:

- 1) **Fixed Costs:** Costs that do not change with the amount of energy produced and transmitted to distribution companies (include the capital costs for required



Revenue Requirement

Cont.

infrastructure depreciation, taxes,
operation and maintenance, payroll,
return)

- 2) **Variable Costs:** Costs that are directly related to the amount of electricity produced and transmitted to the distribution companies (with fuel costs as the dominant component).



Tariff Design

The **fixed** costs are associated with the capacity tariff and the **variable** costs with the energy tariff, such that:

$$\text{Capacity Tariff} = \frac{\text{Total Fixed Cost (₪)}}{\sum \text{Distribution Company Billing Capacity (kW)}}$$

$$\text{Energy Tariff} = \frac{\text{Total Variable Cost (₪)}}{\sum \text{Distribution Company Billing Energy (kWh)}}$$



Designing a tariff involves:

- 1) The use of system costs and the components that comprise those costs.
- 2) Billing determinants; and.
- 3) Load data analyses.



Billing Determinants

Billing Determinant of the Distribution Companies



Month	Dist. Comp1		Dist. Comp2		Dist. Comp3		Dist. Comp4		Total	
	kWh	kW	kWh	kW	kWh	kW	kWh	kW	kWh	kW
January										
February										
March										
April										
May										
June										
July										
August										
September										
October										
November										
December										
Total										



Billing Determinants

Cont.

❖ There are two primary issues that need to be resolved concerning the billing capacity amount for each distribution company.

- 1) The distribution company should measure and record the energy and capacity that is provided by the company connection points. Then Apply one of the two main choices:



Billing Determinants

Cont.

a) Measure the hourly loads at each deliver point and sum them for each hour, to determine the total company peak load).

OR

b) Measure the daily peak load at each connection point, regardless of the hour of occurrence, and sum them to a total.



Billing Determinants

Cont.

Time (hrs)	Dis#1 (MW)	Dis#2 (MW)	Dis#3 (MW)	Dis#4 (MW)	Total
0	113	237	321	187	858
1	206	80	291	59	636
2	172	159	95	246	672
3	126	60	153	62	401
4	395	116	109	114	734
5	290	109	264	269	932
6	225	89	219	198	731
7	306	376	174	347	1203
8	290	335	184	269	1078
9	338	242	340	178	1098
10	152	198	139	86	575
11	336	377	261	297	1271
12	94	104	385	290	873
13	316	134	184	73	707
14	170	280	185	81	716
15	264	73	201	198	736
16	346	92	54	269	761
17	74	82	396	83	635
18	197	275	202	267	941
19	331	139	381	87	938
20	387	225	96	306	1014
21	291	159	129	224	803
22	306	191	321	318	1136
23	190	178	86	368	822
24	242	176	195	56	669
Max. /Dis	395	377	396	368	1271



Peak Of the Totals

Total of the Peaks

1536



Billing Determinants

Cont.

- 2) The time interval for measuring the capacity billing amount is the **one-hour time interval** as a common time interval for measurement used throughout the world. Deferent time intervals can also be used.



Load Data and Analyses

- ❖ The load data table can be used to evaluate monthly and seasonal differences in the system loads and provide important information that may lead to seasonal pricing differences.
- ❖ The monthly load factors also provide information about the overall load diversity within the system. Where:



Load Data and Analyses

Cont.

$$\text{load factor} \cong \frac{\text{average load}}{\text{peak load}}$$

$$\text{Annual load factor} = \frac{\text{total annual energy}}{\text{annual peak load} \times 8760}$$



Load Data and Analyses Cont.

Electricity Production Summary

<i>Month</i>	<i>Peak Local + Import - Export MW</i>	<i>Local Generation MWh</i>	<i>Net Import - Export MWh</i>	<i>Total Energy MWh</i>	<i>Monthly Load Factor</i>
<i>January</i>					
<i>February</i>					
<i>March</i>					
<i>April</i>					
<i>May</i>					
<i>June</i>					
<i>July</i>					
<i>August</i>					
<i>September</i>					
<i>October</i>					
<i>November</i>					
<i>December</i>					
<i>Peak (MW)</i>					
<i>Annual Load factor</i>					



Load Data and Analyses Cont.

- ❖ Other important historical information should also be summarized is **fuels consumed for electricity production and the electric energy balances**



Load Data and Analyses Cont.

Fuels Consumed For Electricity Production

Station	Gas	Crude Oil	Diesel
	Mm ³	(Tones)	(Tones)
Station#1			
Station#2			
Station#3			
Station#4			
Total			
Price (SR)			
Total Fuel Cost (SR)			



Load Data and Analyses Cont.

Electric Energy Balances (Year 1 to Year 5)

Years	Year 1	Year 2	Year 3	Year 4	Year 5	Notes
Category						
Net Domestic Generation						
Imports						
Subtotal						
Transmission Losses						
Dist. Co.'s Gross Consumption						
Distribution / Other Losses						
Dist. Co's Net Consumption						
Exports at Border						
Direct Customers						
Subtotal						



The Load Diversity

The load diversity of the distributors should be considered when calculating the peak demands. However, **the actual total generation needed is lower than the total requirement** of the distribution companies.



The Load Diversity

Cont.

$$\text{Diversity Factor} = \frac{\sum \text{Individual Max. Demands}}{\text{Coincident Max. Demand}}$$

$$\text{Super Max. Demand} = \text{Coincident Max. Demand} \times \text{Diversity Factor}$$



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Thanks

شكراً

The End

