Restructuring Electricity Tariff in Jordan and Introducing Time of Use (TOU) Tariff:

Electricity Regulatory Commission (ERC)

Economic and Studies Research Dept.

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Background and Objectives:

- **Current ERC's electricity tariff lists 10 main retail customer groups**

  [standard**,** Commercial, Small industries, Medium industries, Agriculture, Water pumping, Street lighting, Armed forces, Ports sector, Mixed tariff (Commercial/Agriculture)**]**.

- **Only the following retail customers subject to the TOU tariff:**
  - **Medium industries.**
  - **Agriculture → Optional for the consumers connected to the network before 14/3/2008. It was applied compulsory on the agriculture consumers whose connected to the network after 14/3/2008 and maximum load exceeding 100 KVA.**
  - **Hotels (under commercial tariff) → optional for 4 star hotels and above connected to the network before 14/3/2008. It was applied compulsory on the on the 4 star hotels whose connected to the network after 14/3/2008.**

Background and Objectives (Cont…):

- **Standard tariff is a Four-part block rate for households, electricity employees, government agencies, and charities:**

1. **From 1 to 160 kWh/month.**
2. **From 161 to 300 kWh/month.**
3. **From 301 to 500 kWh/month.**
4. **Above 500 kWh/month.**

Background and Objectives (Cont…):

- **Employees of electricity companies receive a reduction of 75%,**

- **A reduction of 25% is granted to government agencies, charities, and some of army forces consumptions,**

- **For street lighting the consumption not exceeding the amount of 1988 is free of charge,**

- **Other retail consumers are subject to a flat rate tariff.**

Background and Objectives (Cont…):

No	Group / Sector	Type of Tariff		Flat Rate Fils/kWh	Maximum Load JD/kW/month	Day Rate Fils/kWh	Night Rate Fils/kWh	Reductions
1	Standard tariff applicable	Four-part block tariff	1 - 160 KWh/month	32				Elecricity Companies Employees:75% Charieties:25%
2	for Households		161 - 300 KWh/month	71				
3	Electricity Companies employees,		301 - 500 KWh/month	85				
4	Government agencies and Charities		Over 500 KWh/month	113				
5	Commercial Sector applicable for commercials, TV & Broadcasting, and Hotels	Energy Charge (Flat Rate Tariff)		86				
6	Small Industries	Energy Charge (Flat Rate Tariff)		49				
7	Medium Industries	Maximum demand charge combined with day and night energy charge			3.79	46	36	
8	Agriculture	Energy Charge (Flat Rate Tariff) Optional maximum demand charge combined with day and night energy charge		47	3.79	46	36	
9	Water Pumping	Energy Charge (Flat Rate Tariff)		41				
10	Hotels	Energy Charge Optional maximum demand charge combined with day and night energy charge		86	3.79	81	70	
11	Street Lighting	free of charge for consumption equal to the 1988 level, for the exceeding consumption energy charge (Flat Rate Tariff)		51				
13	Army Forces	Energy Charge: 25% reductions for Part of the consumption		81				
14	Ports Sector	Energy Charge (Flat Rate Tariff)		58				
15	Mixed Tariff (Commercial/Agriculture)	Energy Charge (flat rate tariff) 2/3 of consumption charged as commercial 1/3 as agriculture						
16	Large Industries	Maximum demand charge combined with day and night energy charge			2.98	65	49	

Background and Objectives (Cont…):

- **No fuel clause available.**
- **Cross subsidy is already exists.**
- **No clear methodology in cost allocation between fixed and variable.**

Background and Objectives (Cont…):

Main objectives of the restructuring tariff study are:

- Determining the costs each consumer category imposes on the licensee's business.
- Estimating subsidies of existing tariff.
- Reducing the number of retail tariffs to derive to a more adequate or efficient tariff structure.
- Proposing new tariffs for retail consumers and bulk suppliers.
- Conducting a social impact analysis of the new tariffs and introducing lifeline tariffs.
- Introducing TOU tariff for more categories in order to increase the incentives for demand side management (DSM).
- Introducing fuel clause component.
- Providing ERC with a clear methodology in cost allocation between fixed and variable

Existing Electricity Law:

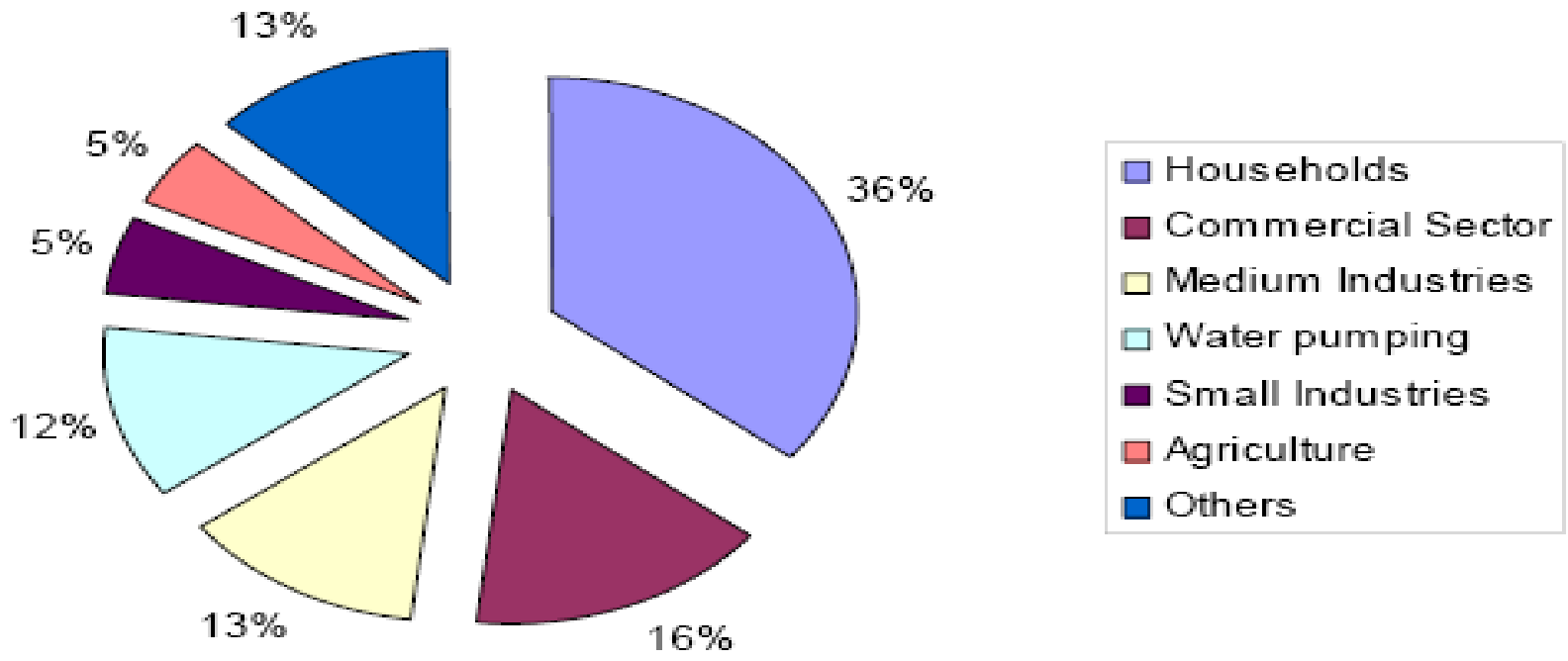
The electricity Law states in Article 47-C:

- **"C- When determining the tariff methodologies, the following shall be taken into consideration:…**

- **3- give to consumers economically efficient signals regarding the costs that their consumption imposes on the licensee's business;**

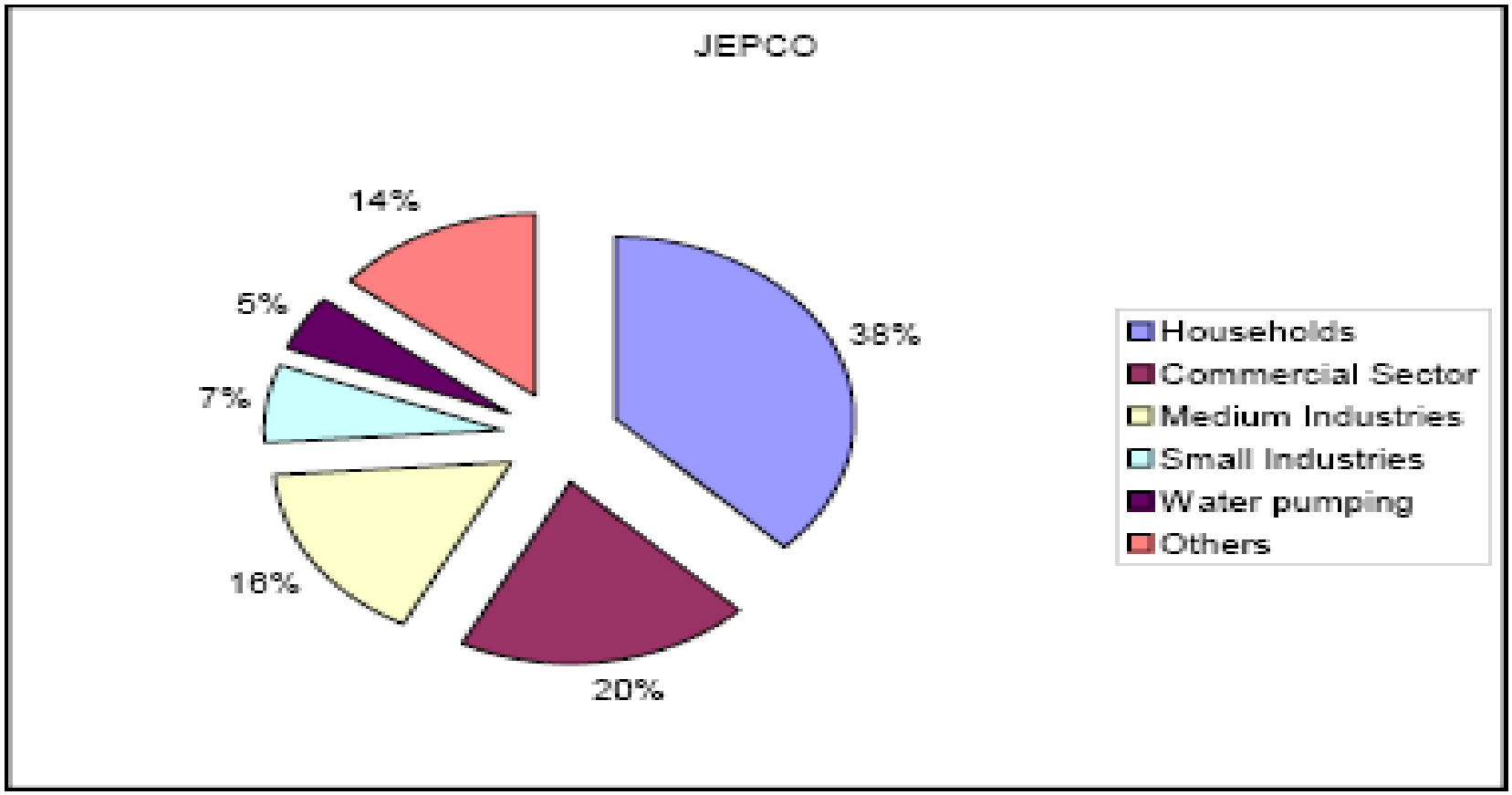
- **5- gradually phase out or substantially reduce cross subsidies, except while providing lifeline tariffs."**

Consumption Structure by Customer Groups (2008):

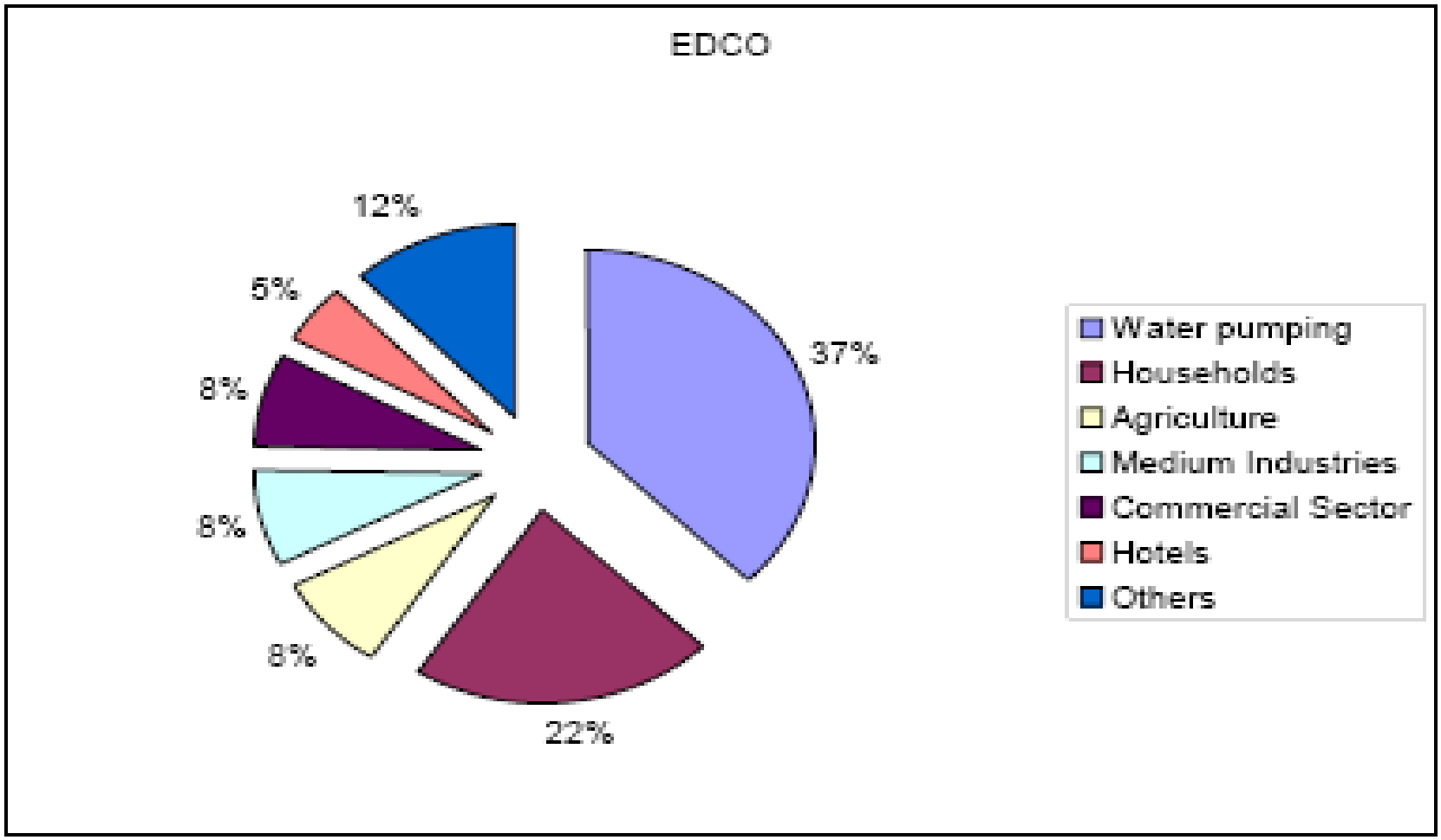


Consumption Structure by Customer Groups (2008) (Cont…):

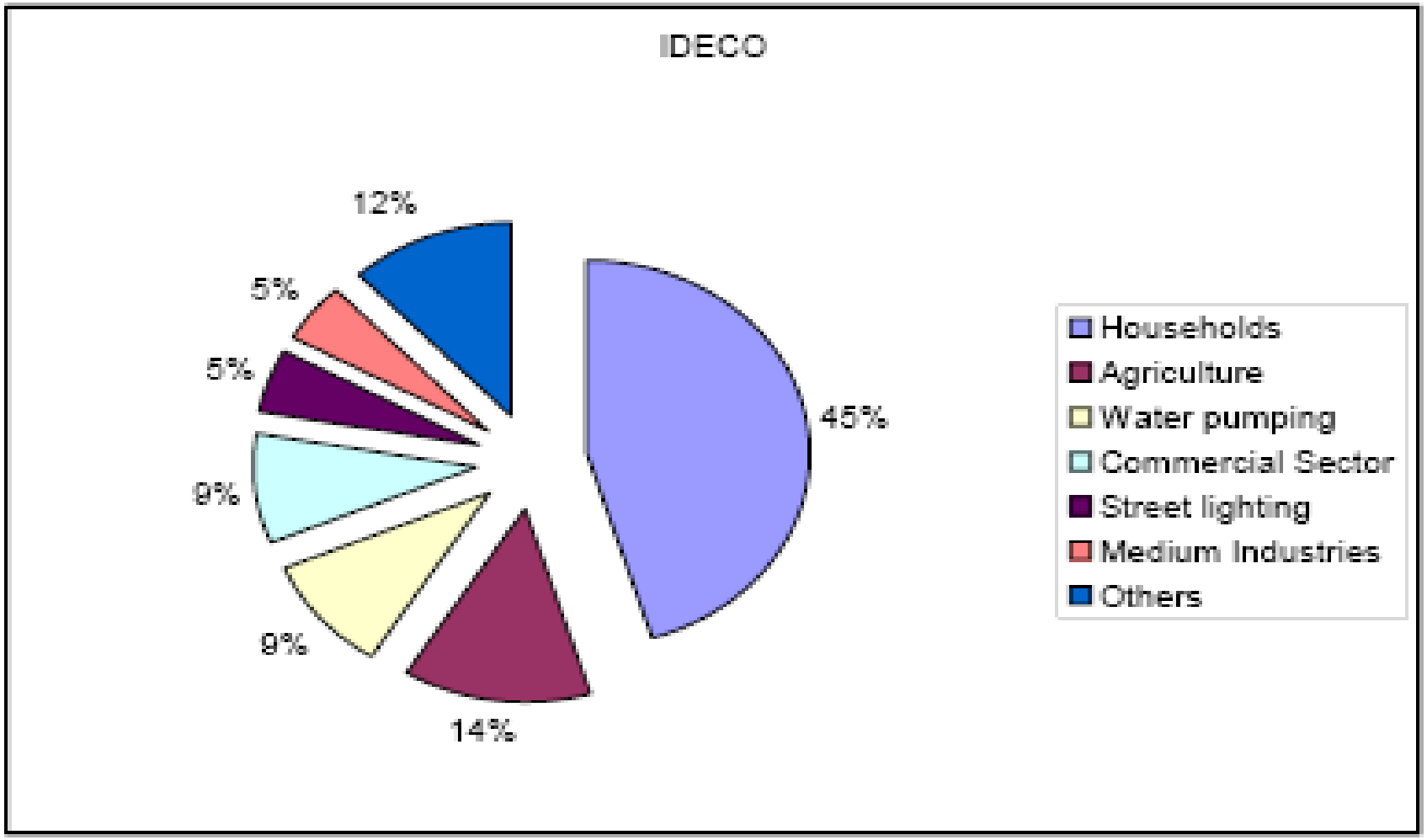
It should be mentioned that within the distribution companies the consumption shares differ



Consumption Structure by Customer Groups (2008) (Cont…):



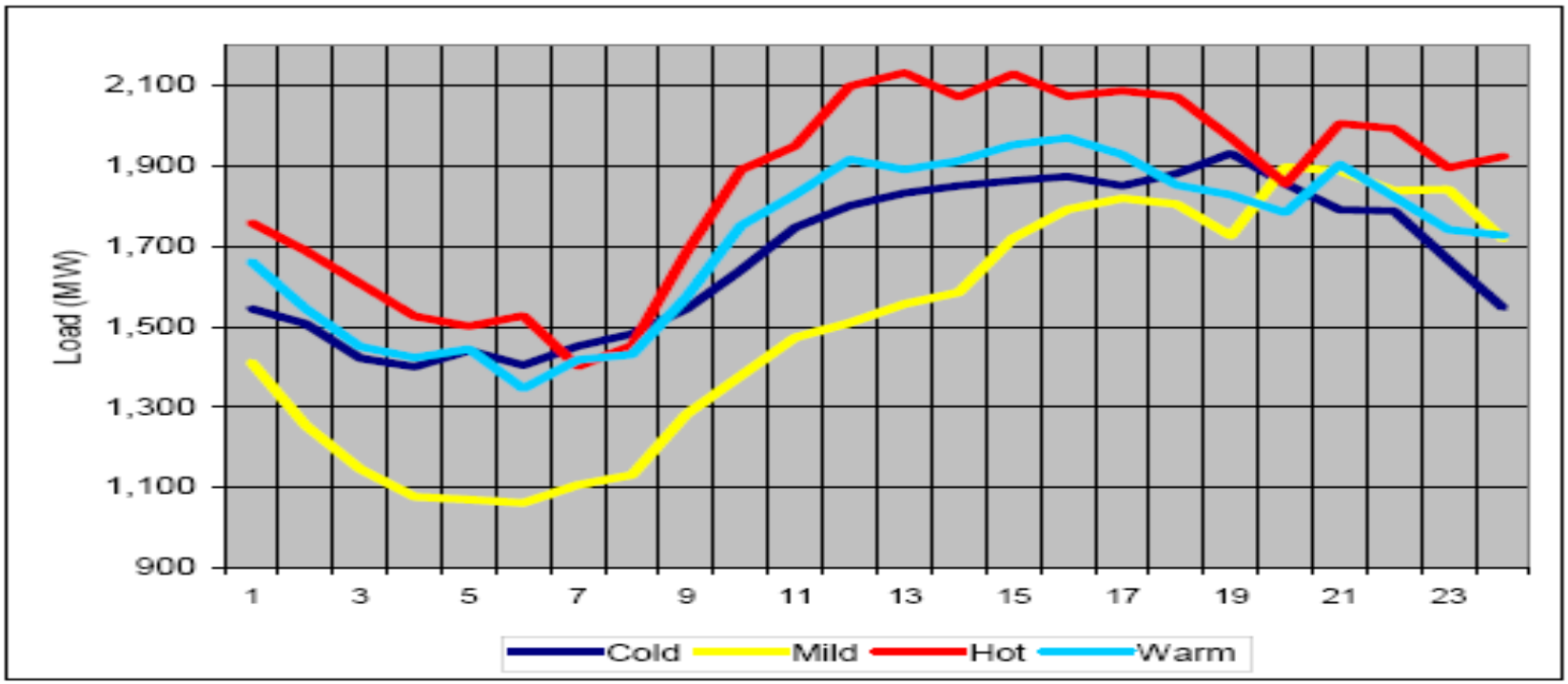
Consumption Structure by Customer Groups (2008) (Cont…):



System Load:

The maximum demand in 2008 was at transmission sent out 2,107 MW and occurred in July. At the time of system peak JEPCO had a load of 1,255MW, EDCO of 348, IDECO of 286 MW and principal customers of 149 MW.

Figure 1: Daily Load Curves by Seasons in 2007



Cold	1/21/2007 Sun	Jan, Feb, Dec
Mild	3/20/2007 Tue	Mar, Apr, Nov
Warm	9/2/2007 Sun	May, Jun, Sep, Oct
Hot	7/29/2007 Sun	Jul, Aug

Load Characteristics of Retail Customers:

- **For retail customers no comprehensive load analysis for Jordan had been available. Therefore, information on the peak load of the customer groups and the time of the group specific peaks is lacking.**

Load Factor of Retail Customers:

The Consultant and ERC get unreasonable values for some groups which had been adjusted to reasonable values based on the personal experience.

	Load Factor
Household + Employees	
- Up to 160 kWh/month	0.75
- Up to 300 kWh/month	0.76
- Up to 500 kWh/month	0.65
- Above 500kWh/month	0.46
Household Average	0.60
Government	0.28
Charities	0.78
Commercial Sector	0.45
Small Industries	0.72
Medium Industries	0.75
Agriculture	0.77
Water Pumping	1.10
Hotels	0.81
TV and Broadcasting	0.84
Street Lighting	0.41
Army Forces	0.78

Cost Allocation Approaches:

- To think of an allocation approach it is helpful to recall the kind of services the grid is providing. Electricity consumers mainly receive two products or services:

- The availability of load, ready whenever the consumer demand it, continuously at day and night, and The actual electricity they consume, measured in kWh,

- Thus the electricity supply costs by a grid have two main components: the fixed and the variable. The latter one represents the costs of the actual electricity supplied. The fixed component covers the expenses of always being ready to supply energy whenever it is wanted.

Cost Allocation Approaches (Cont…):

- **The variable component may be regarded as directly proportional to the number of kWh supplied. The fixed component depends on the demand for power. A large part of the fixed costs incur in financing and operating the necessary equipment for generating, transmitting and distributing electrical energy. These costs are influenced by the capacity of the equipment.**

- **Other services utilities provide are consumer services: installation of service connection and meters, maintaining and testing meters, meter reading, the keeping of customer accounts, and billing and collection. All of these costs are treated as part of the fixed costs.**

Cost Allocation Approaches (Cont…):

- For the costs allocation approach in this study the main criteria has been the availability of information of the load curves of the customer groups. Therefore, the peak responsibility method has been chosen to allocate fixed costs to bulk suppliers and to retail customers.

- The 'National Distributor' is a theoretical construct consisting of the three distribution companies. It is introduced into the tariff methodology to derive a uniform nation-wide retail tariff though supply costs differ between the discos due to varying consumption structures and distribution costs between JEPCO, EDCO and IDECO.

- The Costs allocation consider the complete supply chain:
  - Generation including imported energy.
  - Transmission.
  - Distribution.

Cost Allocation Approaches (Cont…):

- **Generation Level:**
  - **At generation level the fuel cost consists of two parts, night fuel cost, and day fuel cost.**
    - **The variable cost represents the variable O&M cost.**
    - **The fixed cost represents the capacity charge.**

- **Transmission Level:**
  - **All transmission costs are considered as fixed costs.**

- **Transmission Level:**
  - **5% of the distribution costs are considered as variable cost.**

Cost Allocation Approaches (Cont…):

		Total		Fixed Costs		Variable Costs		Fuel Costs	
		(Mill. JD/a)	(Fils/kWh)	(Mill. JD/a)	(JD/kW/m)	(Mill. JD/a)	(Fils/kWh)	(Mill. JD/a)	(Fils/kWh)
Generation and Imported El.		617.3		136.4		8.3		472.6	
Load	2,107 MW				5.91				
Energy deliverd	13,439 GWh		45.9				0.6	472.6	35.2
- Day	9,742 GWh							367.6	37.7
- Night	3,697 GWh							105.0	28.4
Transmission (T) costs (NEPCC		39.5	2.9	39.5	1.71				
Cost at T send out		656.8	50.3						
Load	2,038 MW			175.9	7.88				
Energy deliverd	13,047 GWh					8.3	0.6	472.6	36.2
- Day	9,458 GWh							367.6	38.9
- Night	3,589 GWh							105.0	29.3
Allocation at bulk supply									
Principal customers									
Load	149 MW	49.0	50.0	12.9	7.88				
Energy deliverd	981 GWh					0.6	0.6	35.5	36.2
- Day	711 GWh							27.6	38.9
- Night	270 GWh							7.9	29.3
Discos									
Load	1,889 MW	596.2	50.8	163.0	7.88				
Energy deliverd	11,748 GWh					7.7	0.6	425.5	36.2
- Day	8,516 GWh							331.0	38.9
- Night	3,232 GWh							94.5	29.3
Export (Syria)									
Load		11.5	36.2						
Energy deliverd	318 GWh							11.5	36.2
Distribution (D) costs of Discos		93.6	9.2	87.4		6.2			
Cost at Consumer send out									
Load	1,889 MW	689.8	67.5	250.4	12.07	13.9	1.4		
Energy deliverd	10,218 GWh							425.5	41.6
- Day	7,408 GWh							331.0	44.7
- Night	2,811 GWh							94.5	33.6

Subsidy Indicator:

The strictly financial costs shows the following subsidy indicator:

	Subsidy Indicator
Household + Employees + Min. Charges	
- Up to 160 kWh/month	1.95
- Up to 300 kWh/month	1.54
- Up to 500 kWh/month	1.22
- Above 500kWh/month	0.99
Government	0.94
Charities	0.82
Commercial Sector	0.96
Small Industries	1.39
Medium Industries	1.31
Agriculture	1.36
Water Pumping	1.38
Hotels	0.75
TV and Broadcasting	0.75
Street Lighting	2.18
Army Forces	0.84
Sum Retail Customers	1.16
Principal Customers	0.80
Total Including Principal Customers	1.13

Proposal for Retail Tariff:

After the allocation of supply costs to customers the formulation of tariffs follows, thus costs are translated into rates charged to consumers.

This pricing of electricity should be guided by several main principles:

- **Revenues raised by the tariff should cover actual cost of generation, transmission and distribution and should generate enough income to finance capital projects needed to cope with the growth of demand. The calculation of revenue requirements by ERC.**
- **The division of costs between customers should be fair. Each group should pay the costs according to the burden, its demand and consumption patterns impose on the supply system. In countries like Jordan, where poverty matters, a life-line tariff for the poor could be used. Other cross subsidization should be used very carefully.**
- **National economic resources should be efficiently allocated. Consumers should have incentives to save energy as much as possible.**

Secondary principles are that the tariff should be:

- **Understandable and accepted by consumers,**
- **Based on quantities, which are measurable at reasonable costs.**

Proposal for Retail Tariff (Cont…):

Types of tariffs most adequate for Jordan are:

- **Flat rate, also called energy rate,**
- **Two-part rates, and**
- **Block rates.**

- **The simplest form of a rate, and the most easily understood by unsophisticated consumer, is the energy rate measured in Fils per kilowatt-hour. As the flat rate makes no attempt to allow for the multipart nature of costs, it cannot be regarded as a scientific way of charging for electricity. Nevertheless, the energy rate would not be an irrational way of charging members of a consumer class whose individual load factors do not differ widely.**

- **The two-part rate takes the form a charging a consumer so much per month per kilowatt of maximum demand plus so much per kilowatt-hour. The first element is designed to take care of capacity costs (fixed costs) and the second element to take care of the variable costs. The rates are suitable for medium and large industrial consumers and for bulk supply.**

Proposal for Retail Tariff (Cont…):

- **A simple block might be usually described as a compromise between a flat rate and a two-part rate. The block rate applied currently in Jordan, and also proposed later, is an inverted block rate. Economists postulate that the minimum block should be fixed at not less the variable costs component. This would amount to a subsidy on the fixed component only at low consumption. Subsequent blocks would be so graded that a reasonable profit is ensured to compensate for the subsidization in the early stages when consumption is low.**

- **In view of the importance of the time of load incidence it would be good policy of the regulator to offer attractive rates to consumers who take supply at times other than that of system peak, so as to encourage the system load factor and the more effective use of the generating plant. Therefore, for several customer groups an energy rate for day and night, i.e. peak and off-peak is proposed.**

Proposed Consumer Groups:

- **Households with a monthly consumption up to 500 kWh (supply costs vary between 63 Fils (8.9 cent) /kWh and 67 Fils (9.4 cent) /kWh) – group 1,**
- **Households with a monthly consumption above 500 kWh (supply costs of 76 Fils (10.9 cent) /kWh) – group 2,**
- **Water pumping (supply costs of 56 Fils (7.9 cent) /kWh) – group 3,**
- **Customers with relatively high load factors: charities, small industry, medium industries, agriculture, hotels, TV & broadcasting, and army forces (supply costs vary between 60 Fils (8.4 cent) /kWh and 65 Fils (7.9 cent) /kWh) – group 4,**
- **Customers with lower load factors: Commercial sector and street lighting (supply costs vary between 74 Fils (10.4 cent) /kWh and 77 Fils (10.8 cent) /kWh) – group 5 -, and**
- **Government agency with a supply costs of 96 Fils (13.5 cent) /kWh (group 6).**

Proposed Consumer Groups (Cont…):

The proposed tariff structure for such consumer groups are:

	Groups	Day (Fils/kWh)	Night (Fils/kWh)	Average (Fils/kWh)
1	Household up to 500 kWh/m	68	56	65
2	Household above 500 kWh/m	79	68	76
3	Water pumping			56
4	Customers with relative high load Factor (Groups see below under 4)	66	55	63
5	Customers with relative low load Factor (Groups see below under 5)	80	70	77
6	Government			96

Group definition			
4	Charities	5	Commercial Sector
	Small Industry		Street lighting
	Medium Industries		
	Agriculture		
	Hotels		
	TV & Broadcasting		
	Army Forces		

Night rates refer to the consumption between 11pm and 7am, An extension of this period up to 9am could be suggestible.

Proposed Consumer Groups (Cont…):

Maximum Demand Tariff for Customers of Category4

Component	Unit	Rate
Capacity Charge	JD/kW	
Energy Charge Day	Fils/kWh	
Energy Charge Night	Fils/kWh	
Average	Fils/kWh	
1) including variable costs		

Maximum Demand Tariff for Principal Customers

Component	Unit	Rate
Capacity Charge	JD/kW	
Energy Charge Day	Fils/kWh	
Energy Charge Night	Fils/kWh	
Average	Fils/kWh	
1) including variable costs		

Metering Aspects:

- **Meters for the simple energy rate and the Maximum Demand Tariff already exist in Jordan. Meters measuring energy separately for day and night have to be introduced. ERC states that they cost 28 JD (39 $) (1-phase) and 60 JD (85 $) (3-phase), while the normal 1-phase meters could be purchased for 15 JD (21 $) . The difference in capital costs seems to be affordable; the impact on energy efficiency makes the investment worthwhile.**

- **It is recommended to begin the implementation for residential customers. Among them the blocks with the higher consumption should be equipped first with such meters.**

Financial Proposal with a Life-line Tariff:

- **To account for the poverty spread among households the strict financial proposal is amended by a life-line tariff for residential consumers with a monthly consumption up to 160 kWh. This life-line tariff is integrated into a four-part block tariff of household customers.**

- **To account for the low ability to pay of poor residential customers the rate for the first block (monthly consumption up to 160 kWh) remains at 32 Fils (4.5 cent)/kWh. Under the existing tariff the supply costs for households exceeded their revenues by 44.8 million JD (63.1 million $) . This loss has to be covered by increasing the rates for the other blocks according their revenue shares.**

Fuel Clause:

- **Tariff increased in March 2008. During the year 2008, fuel prices strongly rose, with NEPCO functioning as a "buffer" for these increased costs during the year 2008. As a result NEPCO's Income Statement as of 31 December 2008 showed a large operating loss.**

- **In conclusion, no adequate pass-through mechanism is currently functioning in the Jordan electricity sector. NEPCO did not recover the legitimate power purchase costs, putting under risk the economic viability of the firm.**

Fuel Clause (Cont…):

A solution would be a fuel clause. Two kinds of clauses could be applied:

- **Fuel Price Index Formula: this formula defines the increase of the tariff depending on the change of the fuel price and the share fuel costs have in total costs. The formula should be applied to bulk supply tariffs and retail consumer tariffs. Each month the fuel prices will be monitored and price movements will have determined from those used in the existing tariff. If the impact of variations in the fuel costs is greater than 2% of NEPCO's revenue requirements, the ERC will update the bulk supply tariff and subsequently the retail tariffs. If the impact is less than 2% the ERC might wait until the next month to take into account these variations.**

Fuel Clause (Cont…):

The Fuel Price Index Formula should applied by increasing and falling fuel prices.

- **The Fuel Fils. This is a charge in addition to the tariff charges and should compensate for fuel price changes. In case fuel prices increase, it compensates the licensees. When fuel prices drop electricity consumers benefit. The Fuel Fils will be shown on the electricity bill as separate item.**

- **This charge should be treated similar to the Fuel Price Index Formula. Each month the fuel prices will be monitored and price movements will have determined from those used in the existing tariff. If the impact of variations in the fuel costs is greater than 2% of NEPCO's revenue requirements, the ERC will update the bulk supply tariff and subsequently the retail tariffs. If the impact is less than 2% the ERC might wait until the next month to take into account these variations.**

…….Thank You…….