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TWO - PART WHOLESALE ELECTRICITY TARIFF DESIGN FOR AZERBAIJAN

AZERBAIJAN ENERGY ASSISTANCE PROJECT, CONTRACT NO. GS-10F-0017K, TASK ORDER 112-M-00-03-00022-00

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EXECUTIVE SUMMARY

PA Government Services Inc. (PA) efforts, on behalf of the United States Agency for International Development (USAID), have been on-going in the energy sector in Azerbaijan for several years. This report provides the recommendation for the development and implementation of a two-part tariff for wholesale electricity sales. It includes the purposes for such a tariff structure and provides information on the tariff design process, the tariff structure itself, and the steps necessary for implementation.

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1. BACKGROUND AND PURPOSE

1.A Introduction

PA Government Services Inc. (PA) efforts, on behalf of the United States Agency for International Development (USAID), have been on-going in the energy sector in Azerbaijan for several years. Two of the current tasks for PA are to provide advice and recommendations on wholesale electricity revenue requirements and energy tariffs.

In April 2004, PA presented it recommended tariff strategy[1] that contained three major principles:

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

Following that presentation, many discussions and much work has been done by PA, various Azeri government officials, Azerenergy and the distribution companies to move forward on the strategy.

This report provides the recommendation for the development and implementation of a two-part tariff for wholesale electricity sales. It includes the purposes for such a tariff structure and provides information on the tariff design process, the tariff structure itself, and the steps necessary for implementation. The two-part tariff structure recommended here is not unique to Azerbaijan; it has been adopted in many places throughout the world and is a very common retail tariff structure for larger customers.

It should be noted that this report and its recommendations do not address the issues of the detailed calculations of revenue requirements; nor the design of retail electricity tariffs (e.g. the tariffs of the distribution companies for electricity sales to their customers).

1.B Background

The methodology and spreadsheets for calculating the revenue requirements for wholesale electricity sales is being developed by PA under another sub-task under this USAID contract and should be completed at approximately the same time as this task. The revenue requirements are one of the major inputs into the development of the tariffs; therefore, this report refers to the PA proposed revenue requirement model.

In designing energy tariffs, there are several issues that must be considered: political (social), legal and economic. The social issues for Azerbaijan center around the ability of consumers to pay for energy services; care must be taken to reflect the social protection of the citizens. At the same time, there are legal issues that are considered in designing tariffs; the tariffs need to be at levels that allow the energy company to pay all of its costs so that it can continue with providing the service. And, the tariff structures, and the levels of the tariffs need to be sufficient to allow the energy company to collect the revenues necessary for paying all of its costs and also allow them to provide a return that allows for the borrowing of funds for expansion and replacement of old equipment.

[1] See "Azerbaijan Electricity Sector Near-Term Tariff Strategy: Issues and Approach", seminar presented in Baku by PA Government Services Inc. in April 2004.

1.B.1 Current Tariff Structure

The current wholesale electricity tariff structure of Azerenergy is a single-part tariff that is a price per kWh (i.e. 71 manat/kWh). This is a simple tariff that bills the distribution companies on the amount of energy that they purchase, regardless of the time period or the amount of peaking capacity that is needed to provide the service. All distribution companies pay the same price and there is no economic incentive for them to keep costs under control by doing such things as improving their load factor, which would result in more efficient use of generating units.

1.B.2 Options for New Tariff Structures

Tariff structures can be designed in several different ways. The most common structures include:

- Single-part – Prices for all energy (and capacity) are set on a manta/kWh bases. This price is applied to the meter readings of kWh sold to the distribution companies and the total is the monthly billing.

- Two-part – This tariff structure separates the capacity charge (usually based on the fixed costs) which is priced at manta/kW; and the energy charge (usually based on the variable costs) which is priced at manta/kWh. The total monthly bill is the sum of the capacity charge multiplied by the peak capacity plus the energy charge multiplied by the energy (kWh) usage during the month.

- Three-part – This tariff structure separates the charges further and includes a customer charge, which is based on the fixed costs for providing the service (such as the metering, billing and customer service) for each customer.

- Time-of-Use – These tariff structures are those that reflect system costs (primarily the generation costs) that vary by time period and may be differentiated by season or time of day.

- Other – there are also a variety of other tariff structures that are usually some variation of those described above. For example, there could be time-of-use tariff that also has two or three parts to the structure.

1.C Proposed Changes to Tariff Structure

In deciding on the structure of the tariffs, the energy company and the authority that approves the tariffs should decide on the overall strategy they want to adopt. The most common issues to consider are: fairness, ease of application and understandability, cost-based, other.

Under cost-based tariffs, the supposition is that the tariffs will be based on the cost of providing the service and that buyers of the energy service will be billed in relationship to the costs that they impose on the energy service provider. It is generally accepted by tariff experts that a two-part tariff (e.g. capacity charge and energy charge) is provides a better economic signal to the purchaser than a single-part tariff for several reasons.

1 Economic – A properly designed two-part tariff provides to the buyers a more correct economic signal of the actual costs of providing the service. Electricity prices that reflect 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.

2. Technical – Two-part wholesale tariffs provide incentives for improved operations (i.e. improved load factor and power factor). By improving its load factor, the distribution company can reduce it's unit costs of energy (AZM/kWh) and can help improve the overall efficiency Azerenergy's system. (e.g. better utilization of generation plants)

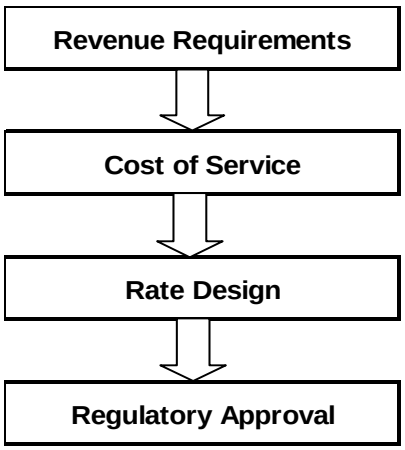
3. Fairness – Each distribution company shares the overall system costs in relation to the costs that each imposes on the system for capacity requirements and energy needs.

PA Consulting recommends that at this time, the Republic of Azerbaijan adopt a two-part wholesale electricity tariff. The methodology for developing this tariff is described in the next chapter of this report.

2. TARIFF DESIGN

The process of designing wholesale tariffs contains several aspects: (1) the determination of the appropriate revenue requirement (total annual costs); (2) the use of various technical data; and, (3) the design of the tariff structure. Generally, the tariff process includes four steps, shown in Figure No. 1.

Figure No. 1
Tariff Process



The revenue requirements provide the amount of annual revenues needed by the energy company to pay all costs of owning, maintaining and operating the electric system. Cost of Service studies is a study that allocates all of the revenue requirement elements to the various customer classifications. The study results determine the amount of the revenue requirement that each customer class should bear in relation to the overall revenue requirement. This step normally applies to retail tariffs where there are distinct customer classifications. For the wholesale sales in Azerbaijan, this step is not necessary since there are no differences in the types, or classes, of customers that purchase electricity from Azerenergy.

The next step is rate design, whereby the prices for electricity are determined and the tariff structures are designed. The tariff structures may be a single price per kWh, or multi-part tariffs that have prices for various elements of the electricity service provided. The last step, prior to implementation, is regulatory approval, the Tariff Council and the Council of Ministers.

2.A Revenue Requirements

The revenue requirement is defined as the total annual costs of the energy company that are approved by the Tariff Council for use in setting the tariffs levels. The wholesale electricity revenue requirements are the total revenues needed to cover all costs of owning and operating the generation and transmission systems. These costs include: annual operation and maintenance expenses (including materials and supplies), wages and salaries, taxes, social security benefits, fuel, depreciation, and a return.

Table No. 1, “Azerenergy 2004 Revenue Requirements”, provides an example of the summary of wholesale revenue requirements for Azerenergy for 2004. This example was produced from the PA proposed model for calculating wholesale revenue requirements. The

details of the model are provided in PA's report[2]. The table shows the revenue requirements by functional area (i.e. generation, transmission and headquarters) for Azerenergy.

Table No. 1
Azerenergy 2004 Revenue Requirements

Cost Description	Generation	Transmission	Headquarters	Total Company
I. Variable Costs				
Total Fuel costs	1,689,650.8	0.0	0.0	1,689,650.8
Imported Energy (Purchased Power)	0.0	0.0	252,396.8	252,396.8
Fuel for Heat	37,278.1	0.0	0.0	37,278.1
Total Variable Costs for Electricity	1,652,372.7	0.0	252,396.8	1,904,769.5
II. Fixed Costs				
O&M	13,753.4	888.2	22,130.7	36,772.3
Wages	33,314.5	14,565.1	18,435.0	66,314.6
Social fund	8,999.5	3,919.7	4,959.9	17,879.1
Depreciation	107,662.1	10,347.4	2,284.5	120,294.0
Other Costs	63,732.5	20,451.1	17,548.6	101,732.2
Total Fixed Costs	227,462.0	50,171.5	65,358.7	342,992.2
Fixed Costs for Heat	17,324.4	0.0	13,841.3	31,165.7
Net Fixed Costs w/o Economic Profit	210,137.6	50,171.5	51,517.4	311,826.5
Economic Profit				481,441.3
Total Fixed Costs for Electricity	210,137.6	50,171.5	51,517.4	793,267.8
III. Total Electricity Revenue Requirements				
Total Variable Costs	1,652,372.7	0.0	252,396.8	1,904,769.5
Total Fixed Costs	210,137.6	50,171.5	51,517.4	793,267.8
Total Annual Revenue Requirement	1,862,510.3	50,171.5	303,914.2	2,698,037.3

Revenue requirements are classified into two components; fixed costs and variable costs.

1. Fixed Costs – Costs that do not change with the amount of energy produced and transmitted to distribution companies (e.g. 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 (e.g. fuel costs).

[2] See " ", report by PA Consulting Services Inc. under USAID Contract No.

These cost elements are used with the billing determinants to calculate the actual prices contained in the tariffs.

Table No. 2, "Energy Deliveries and Cost Summary for Azeri Customers" provides the total energy deliveries from Azerenergy to the distribution companies and also shows the division of costs between fixed and variable cost components. As will be shown later in this report, this cost separation is necessary for the development of two-part wholesale electricity tariffs.

Table No. 2
Energy Deliveries and Cost Summary for Azeri Customers

Description	GWh	% of Energy	mm AZM
IV. Wholesale Rev. Req'ts for Azeri Customers			
A. Energy Deliveries			
Energy Delivered to Azeri Wholesale Customers	20,487.4	98.69%	
Energy Exported	271.1	1.31%	
Total Energy	20,758.5	100.00%	
B. Costs for Azeri Wholesale Customers			
Total Variable Costs			1,879,893.8
Total Fixed Costs			782,908.0
Total Annual Rev Req't for Azeri Customers			2,662,801.7

2.B Wholesale Electricity Tariff Design

Simple two-part electricity tariffs are calculated by dividing the total classified costs (fixed and variable) by the appropriate billing determinant, as shown below. The fixed costs are associated with the capacity tariff and the variable costs with the energy tariff. For a simple two-part tariff, the data for the calculations come from Table No. 2 and Table No. 3.

$$\text{Capacity Tariff} = \frac{\text{Total Fixed Cost}}{\Sigma \text{ Distribution Company Billing Capacity (kW)}} = \_\_\_ \text{ manat/kW}$$

$$\text{Energy Tariff} = \frac{\text{Total Variable Cost}}{\Sigma \text{ Distribution Company Billing Energy (kWh)}} = \_\_\_\_ \text{ manat/kWh}$$

Table No. 2, part B, provides the total revenue requirements which are divided into the fixed and variable cost components. Using the data from Table No. 2, the fixed and variable costs for this example (shown in mm AZM) are:

Fixed Costs =	1,879,893.8
Variable Costs =	782,908.0
	==========
Total Costs =	2,662,801,7

Table No. 4 provides the total billing determinants, divided into capacity (kW) and energy (kWh). These could be summarized as shown here in Table No. 3.

Table No. 3
Summary of Annual Billing Determinants

Billing Determinants	Distribution Companies				Total
	Baku	Gandja	Ali-Bayramli	Sumgayit	
Energy Purchases (kWh)					
Capacity (kW)					

2.C Two-Part Tariff Components and Analyses

Designing tariffs involves: (1) the use of system costs and the components that comprise those costs; (2) billing determinants; and, (3) load data analyses. The description of system costs components was described in the discussion on revenue requirements; this section describes the second two of these important aspects.

2.C.1 Billing Determinants

Under wholesale two-part tariffs, the bills of the distribution companies are based on the amount of energy (kWh) and capacity (kW) that they purchase. These measured billing quantities are called “billing determinants”. In the rate design phase, they are needed for calculating the tariff prices which later are used for billing. In calculating the prices, the summation of all billing determinants of each distribution company is absolutely necessary.

Table No. 4 provides an example of how the total amount of billing determinants needs to be summarized for pricing calculations. As shown, for each distribution company, the monthly energy, measured in kWh, and capacity, measured in kW, is summed to the total and the totals for the year is shown in the bottom right-hand corner of the table. These two numbers (total kWh and kW) are the total billing determinants used in the calculation of the prices.

Table No. 4
Billing Determinants of Azerbaijan Distribution Companies

Month	Baku		Gandja		Ali-Bayramli		Sumgayit		Total	
	kWh	kW	kWh	kW	kWh	kW	kWh	kW	kWh	kW
January										
February										
March										
April										
May										
June										
July										
August										
September										
October										
November										
December										
Total										

The determination of the capacity billing determinant, measured in kilowatts (kW) needs further discussion. While it may appear to be something straightforward, it is not as simple as the measurement of energy (kWh). It should be recognized that each distribution company is connected to the transmission system of Azerenergy at numerous locations[3]. There are two primary issues that need to be resolved concerning the billing capacity amount for each distribution company.

1. There are many connection points to each distribution company, all with meters to record the energy and capacity that Azerenergy provides. The first issue concerns the actual measurement of capacity that Azerenergy provides to each distribution company. There are two main choices for determining these amounts:

    a. the capacity could be based on the distribution company's total peak load (i.e. measure the hourly loads at each deliver point and sum them for each hour, the determine the total company peak load); or,

    b. the capacity could be based on the sum of the peak loads of all delivery locations (i.e. measure the peak load at each connection point, regardless of the hour of occurrence, and sum them to a total).

    With modern technology, both options are feasible. Essentially, the first option would result in a single bill for the entire distribution company; the second option would result in separate bills (which could be consolidated) for each connection point. The advantage of #1 for the distribution company is that it may allow them more flexibility in improving their load factor. PA recommends the first option since it provides the total peak load for each distribution company.

2. The second primary issue to resolve is the time interval for measuring the capacity billing amount. The peak demand may be measured over a one-hour interval, a 30-minute interval, or an interval of more or less time duration. However, a common

[3] Valeh Zeynalov, Director of the Commercial Department at Barmec said during a meeting with PA Consulting (October 28, 2005) that Barmec purchased electricity from Azerenergy at 64 different substations.

time interval for measurement used throughout the world is a one-hour[4] time interval and that is the recommendation of PA for Azerbaijan.

2.C.3 Load Data and Analyses

The use of accurate load data is very important in the development of tariff design. This section describes the important considerations and analyses that should be done prior to the development of actual prices.

Table No. 5, "Azerbaijan Electricity Production Summary" provides monthly and annual data for 2003 and 2004 concerning the system peak loads and the amount of energy produced and sold by Azerenergy within the country as well as imports and exports. The data from this 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.

[4] The energy sales amounts (kWh) are integrated each hour and a value of capacity is determined. All modern electronic meters are capable of performing this calculation and providing the user with hourly load data for all hours in the period.

Table No. 5
Azerbaijan Electricity Production Summary

	Own + Imports - Exports Max MW	Own Generation MWh	Net Import/Export MWh	Total Energy MWh	Monthly Load Factor
2004					
January	4,280	2,192,932	243,862	2,436,794	76.52%
February	4,245	2,047,154	194,156	2,241,310	78.57%
March	4,293	2,114,706	163,525	2,278,231	71.33%
April	3,972	1,819,700	143,600	1,963,301	68.65%
May	3,496	1,600,080	79,456	1,679,536	64.57%
June	3,052	1,456,153	33,178	1,489,331	67.78%
July	2,469	1,490,149	28,331	1,518,480	82.66%
August	2,977	1,469,063	18,461	1,487,524	67.16%
September	3,135	1,412,444	29,395	1,441,839	63.88%
October	3,495	1,621,574	102,938	1,724,512	66.32%
November	3,913	1,858,176	150,667	2,008,842	71.30%
December	4,264	2,256,600	177,515	2,434,115	76.73%
Peak MW	4,280			22,703,814	
Annual Load Factor	60.56%				
2003					
January	3,944	2,079,325	160,884	2,240,209	76.34%
February	4,065	1,905,017	146,206	2,051,223	75.09%
March	4,211	2,246,365	104,183	2,350,548	75.03%
April	3,808	1,896,534	91,306	1,987,840	72.50%
May	3,520	1,526,124	139,868	1,665,992	63.61%
June	3,034	1,341,814	143,700	1,485,514	68.00%
July	2,861	1,388,560	122,929	1,511,489	71.01%
August	2,955	1,486,819	62,311	1,549,130	70.46%
September	3,071	1,470,044	59,362	1,529,406	69.17%
October	3,629	1,647,512	76,386	1,723,897	63.85%
November	3,985	1,957,858	-192,060	1,765,798	61.54%
December	4,327	2,204,314	243,509	2,447,823	76.04%
Peak MW	4,327			22,308,870	
Annual Load Factor	58.86%				

Other important historical information should also be summarized. Table No. 6, “Fuels Consumed for Electricity Production” and Table No. 7, “Electric Energy Balances” provide important information on the fuel plant use and costs, and the amount of energy flowing through the system.

Table No. 6
Fuels Consumed For Electricity Producton

Station	Gas, 10^6 m^3	Mazut, 000 Tonnes
Baku Tets 1	212.79	1.34
Shimal	265.11	26.43
Azerbaijan DRES	1,406.71	1,345.82
Ali Bayramli	1,194.36	767.89
Total	3,078.97	2,141.48

Table No. 7
Electric Energy Balances (2003-2004)

	2003	2004	Source
Sources:			
Net Domestic Generation	20,165.7	20,351.7	03
Imports	2,436.3	2.373.1	04
Subtotal	22,602.0	22,724.8	
Uses:			
Transmission Losses	1,059.1	1,076.5	06+07
Distco Gross Consumption	20,566.5	20,504.5	08+09 (Nach)
Distribution / Other Losses	n/a	n/a	
Distco Net Consumption	n/a	n/a	
Exports at Border	870.8	1,008.0	21
Direct Customers	105.4	135.8	19+20
Subtotal	22,601.8	22,724.8	

The load diversity of the customers should be considered. Table No. 8, "Example of System Loads and Diversity" is an example[5] of the data needed to evaluate the actual load diversity of the system.

[5] It should be emphasized that this table is not actual data for Azerbaijan, but is used for illustrative purposes only.

Table No. 8
Example of System Loads and Diversity

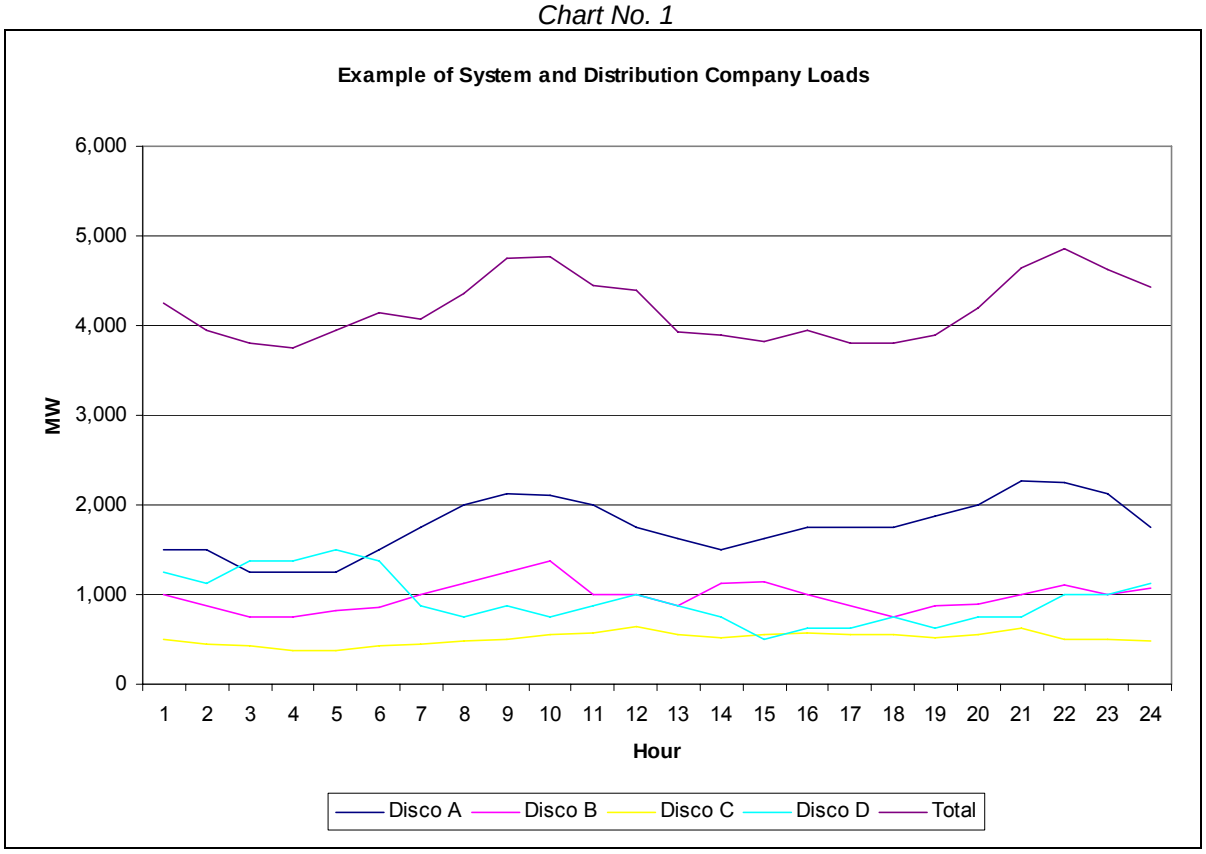
Distribution Company Loads					
Hour	Disco A	Disco B	Disco C	Disco D	Total
1	1,500	1,000	500	1,250	4,250
2	1,500	875	450	1,125	3,950
3	1,250	750	425	1,375	3,800
4	1,250	750	375	1,375	3,750
5	1,250	825	375	1,500	3,950
6	1,500	850	425	1,375	4,150
7	1,750	1,000	450	875	4,075
8	2,000	1,125	475	750	4,350
9	2,125	1,250	500	875	4,750
10	2,100	1,375	550	750	4,775
11	2,000	1,000	575	875	4,450
12	1,750	1,000	650	1,000	4,400
13	1,625	875	550	875	3,925
14	1,500	1,125	525	750	3,900
15	1,625	1,150	550	500	3,825
16	1,750	1,000	575	625	3,950
17	1,750	875	550	625	3,800
18	1,750	750	550	750	3,800
19	1,875	875	525	625	3,900
20	2,000	900	550	750	4,200
21	2,275	1,000	625	750	4,650
22	2,250	1,100	500	1,000	4,850
23	2,125	1,000	500	1,000	4,625
24	1,750	1,075	475	1,125	4,425
					Total
NCP	2,275	1,375	650	1,500	5,800
CP	2,250	1,100	500	1,000	4,850
Coin. Factor	0.9890	0.8000	0.7692	0.6667	0.8362

This data is represented graphically in Chart No. 1, “Example of System and Distribution Company Loads”. It is obvious that each of the distribution companies in this example are benefited by the diversity of their respective loads and the tariffs should reflect these benefits.

Both the table and the graph show the load diversity of the four distribution companies and the inherent costs that each places on the system to for meeting the load requirements at each hour of the day. In this example, the load diversity shows that if each distribution company was supplied by its own generation, there would be a total requirement of 5,800 MW needed. However, because of the diversity of the loads, and since the loads are provided service by a single generation and transmission company, the total generation needed is only 4,850 MW.

Obviously, this is a simplified sample since in reality the analysis would be done for all hours of each month and for the year. The diversity may even greater than the example if the seasonal loading is different for each of the distribution companies (i.e. summer or winter peaking).

Chart No. 1



A very important issue to analyze is the diversity within each of the distribution companies. Since each receives capacity and energy from Azerenergy at numerous connection points, there is load diversity amongst these delivery points. As described in Section 2.B.2, the treatment of the diversity issue affects the capacity billing determinants.

The analyses of monthly system generation, both peak load and energy requirements, shown in Table No. 3 and shown graphically here in Chart No. 2, "Monthly Peak Generation Plus Net Imports" and Chart No. 3, "Energy Generation Plus Net Imports". These two charts show graphically, for 2003 and 2004, the distinct summer and winter differences in the amount of electricity that is used within the country.

Chart No. 2

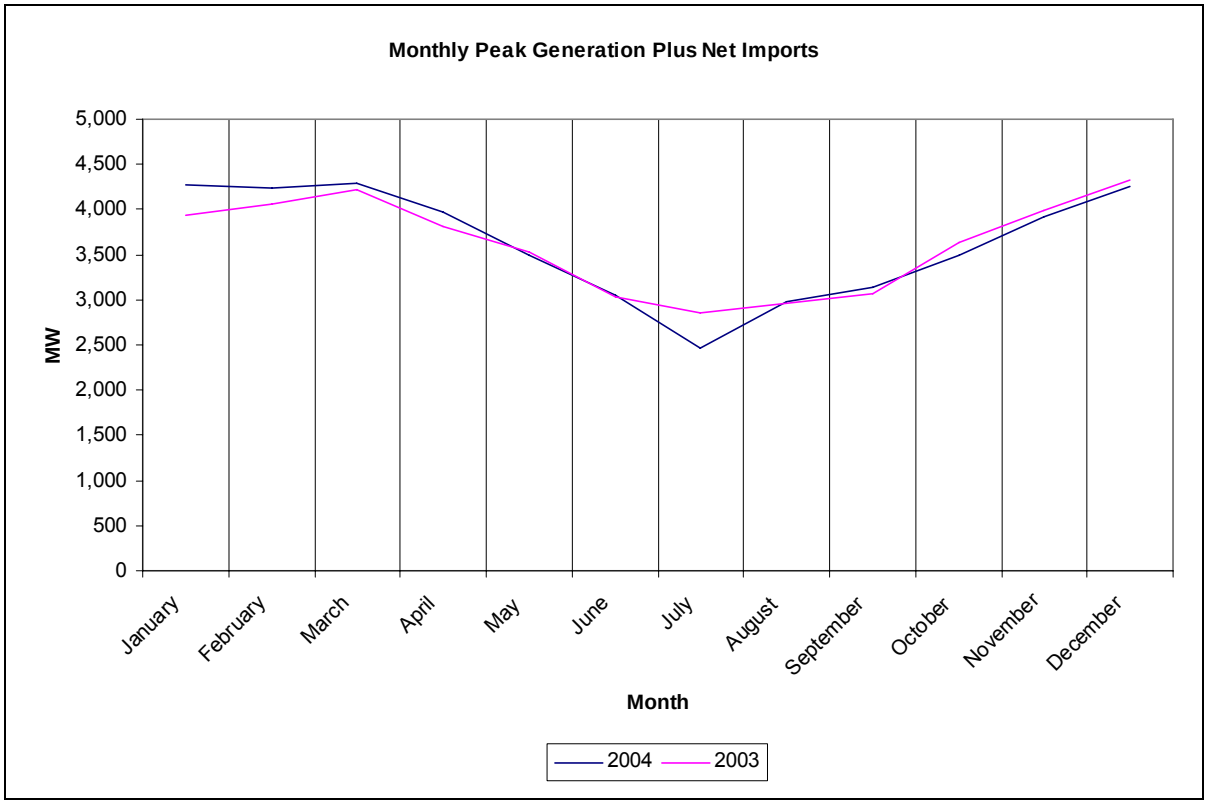


Chart No. 3

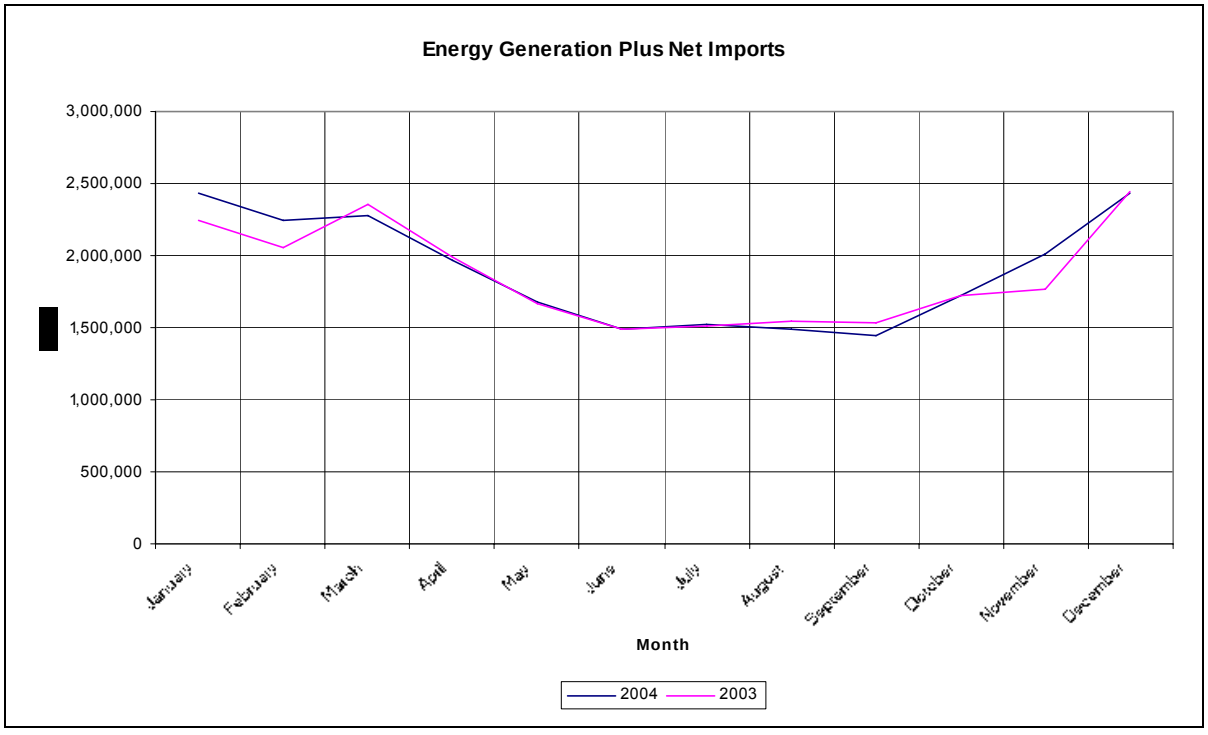
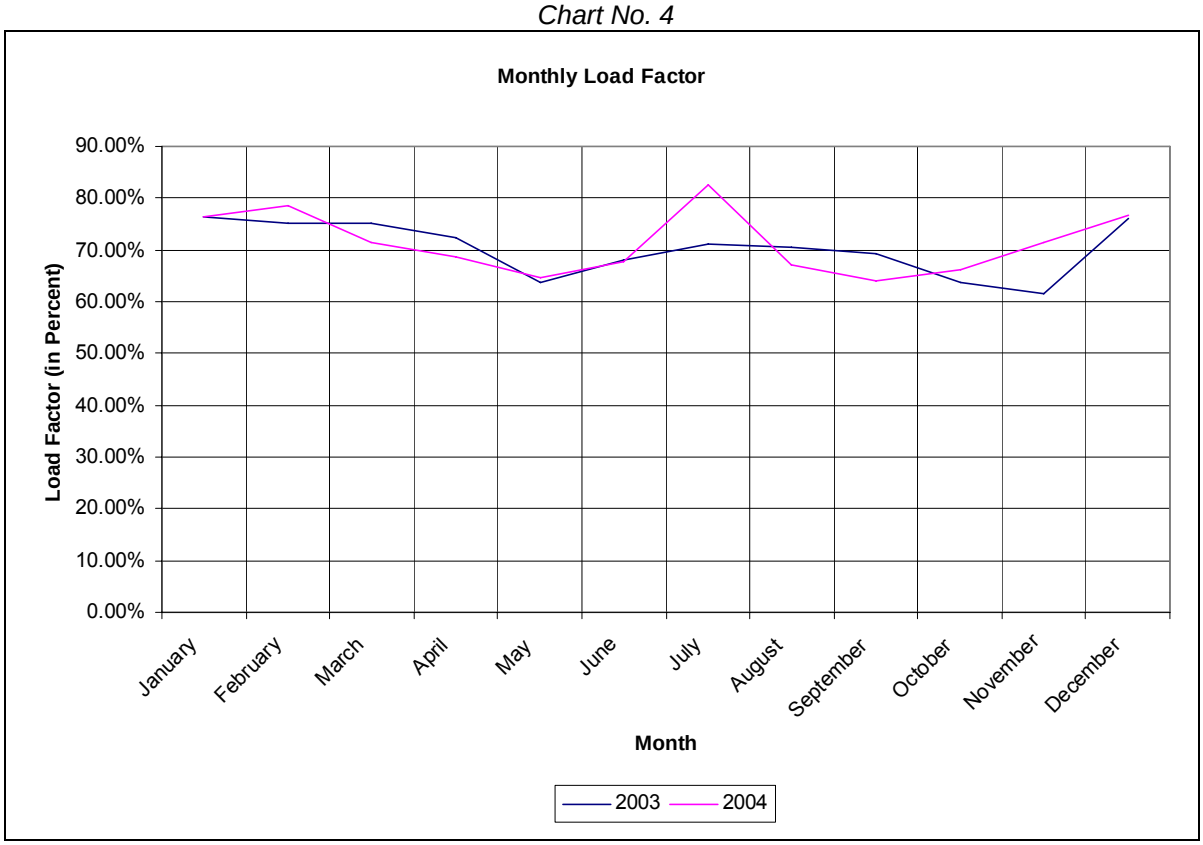


Chart No. 4, "Monthly Load Factor" provides the analyst with a graph that makes it easy to evaluate any significant differences in the load monthly load factors. If there are certain months, or seasons when the difference is significant, then different tariff structures could be

designed to provide incentives to customers for improvements. The data shown here does not reflect any significant differences from month to month.

Chart No. 4



2.D Requirements for Implementation

There are several requirements that must be addressed and appropriate actions taken before two-part tariffs can be designed and adopted. Designing rate structures for wholesale electricity requires detailed data about the system operations and sales. The data acquisition and analyses requires systems and infrastructure in place. This section describes these requirements.

2.D.1 Organization and Infrastructure

Azerenergy has the responsibility for providing information and data necessary for the development and implementation of two-part wholesale tariffs. It is recommended that a review of the organization and the current infrastructure be conducted to identify areas where changes will be needed in order to develop and implement the two-part tariffs. Most of the changes will likely be in the data collection and analyses, both of which are described in the next section.

2.D.2 Data Analyses Equipment and Capabilities

Also, prior to the implementation of a two-part wholesale tariff, there are several tasks on the technical side that must be completed. These include: metering, software and data acquisition system modifications, and billing changes.

1. Metering – The hourly metering installations at all distribution company points of delivery (connection points) needs to be in place. All meters must be high quality, reliable and able to record hourly data and store all data for at least 45 days. It is recommended that

all metering devices have re-chargeable batteries to maintain the time clock within the meter.

2. Software and Data Acquisition systems – Data acquisition systems and software must be in place to be able to record all metering data from each point of connection. The software must be able to consolidate all recorded data from each substation in order to provide the billing capacity amounts, as well as the total energy. The software must have the capability to summarize the data as illustrated here in Table No. 9, “”Distribution Company Peak Loads”

Table No. 9
Distribution Company Peak Loads

Month	Substations				
	No. 1	No. 2	No. 3.	Add columns	Total
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
Total					

The data in the “Total” column is the capacity (kW) data for each distribution company in Table 3.

As mentioned earlier, it needs to be decided whether the peak loads for each substation are those that are coincident with one another, or if they are the peak load at each substation.

3. Billing – Billing systems may need to be modified to allow for the billing of both the capacity element and the energy portion of the monthly bills.

3. NEXT STEPS

Following the acceptance of the concept of two-part wholesale tariffs, there are several steps necessary before the new tariff structure can actually be implemented.

3.A Training of Personnel

There should be some training for all participants, not only in the technical aspects of the implementation, but in the understanding of the economic implications. The training should include financial, accounting and operational principles for developing and implementing the two-part tariffs. The operational aspects include the data acquisition and analyses of metered data.

3.B Data Acquisition

Systems for acquiring and storing data need to be developed or modified from the current configurations. As described earlier, the billing data, particularly the capacity measurement, is vital for the two-part tariff. The data acquisition systems should be designed to provide hourly data, summed for all connection points for each distribution company. Metering equipment should all me configured to collect and store hourly data. Systems for collecting the hourly data from each meter need to be developed or modified. Azerenergy must be able to determine the peak collective load for each distribution company.

3.C Development of New Tariffs

Development of new two-part wholesale electricity tariffs should follow the principles outlined in Chapter 2 of this report.

3.D Adoption of Rate Structure

After the development of the new tariff structure, the process[6] of adopting them needs to be followed. It would be expected that those on the Tariff Council who approve the structure will be involved during the process so that they are all aware of the details involved in the development and the benefits that are expected.

[6] See "Procedures for consideration of issues in the Tariff (price) Council of the Azerbaijan Republic", Approved by the decision of the meeting of Tariff (price) Council of the Azerbaijan Republic, held on 12 April 2002; Protocol No. 2

4. FUTURE STEPS

The preceding chapters have described the recommendations for two-part tariffs at the wholesale level for Azerenergy. The evolving electricity sector will require future modifications that will provide additional benefits.

4.A Unbundling

In the wholesale electricity sector, unbundling means the separation of functional groups. In many parts of the world, unbundling has occurred long ago or is currently happening, most recently at the retail level. Unbundling in many countries involves not only separating the functions, but creating new companies for each function. The overarching goal is to create a competitive market which, theoretically, will reduce the energy costs for final consumers. Not all functions can justifiably become competitive; certain infrastructure, such as distribution lines, can not be economically feasible competitive markets (e.g. there can't be numerous lines belonging to different distribution companies on the same street).

For Azerenergy, unbundling means the separation into its generation, transmission and system operations functional groups. The accounting separation appears to already be nearly in place, thus the costs, and revenue requirement, of each functional group can be calculated.

4.B Generation Two-Part Tariffs

Following the implementation of two-part wholesale tariffs, the next step is the development and implementation of two-part tariffs for each generator. The purpose of this strategy is to provide incentives to the generators to become more efficient since they would then have to compete (albeit internally with Azerenergy) for sales.

Although the basic principles for tariff design are the same as those described for the total wholesale electricity tariffs, there are some additional technical considerations.

4.C Time-of-Use Tariffs

Time-of-Use (TOU) Tariffs are tariff structures whereby the prices are different for various time periods. The time periods associated with the tariffs may reflect: (1) seasonal differences; (2) differences that occur during each day; or, (3) a combination of both. The prices should be based on the cost of the electricity for each of the time periods. The development of proper cost-based TOU tariffs requires a considerable amount of data and experienced rate analysts. There are many issues to consider, some of which will be discussed here.

When analyzing possible time-differentiated tariffs, the load shapes for each month should be evaluated. Chart No. 5, "Typical Summer and Winter Loads" is based on 2003 data and provides an example of the differences in the typical summer load and the winter loads. There is obviously a significant difference in the magnitude of the loads, and most likely, a significant difference in the cost of providing the capacity and energy between winter and summer.

In the case of time-of-day tariff differentials, a further analysis of the relative load shapes for each season is also needed. Chart No. 6, "Relative Load Shapes" uses the same data as for Chart No. 5, however, for each season, the hourly loads are shown as a percent of the peak load of the day. In this example, the chart shows only slight differences in the relative load shapes between summer and winter, the peak periods are nearly identical with the only

major difference being that during the winter, the evening peak period is earlier in the evening.

Chart No. 5
Typical Summer and Winter Loads

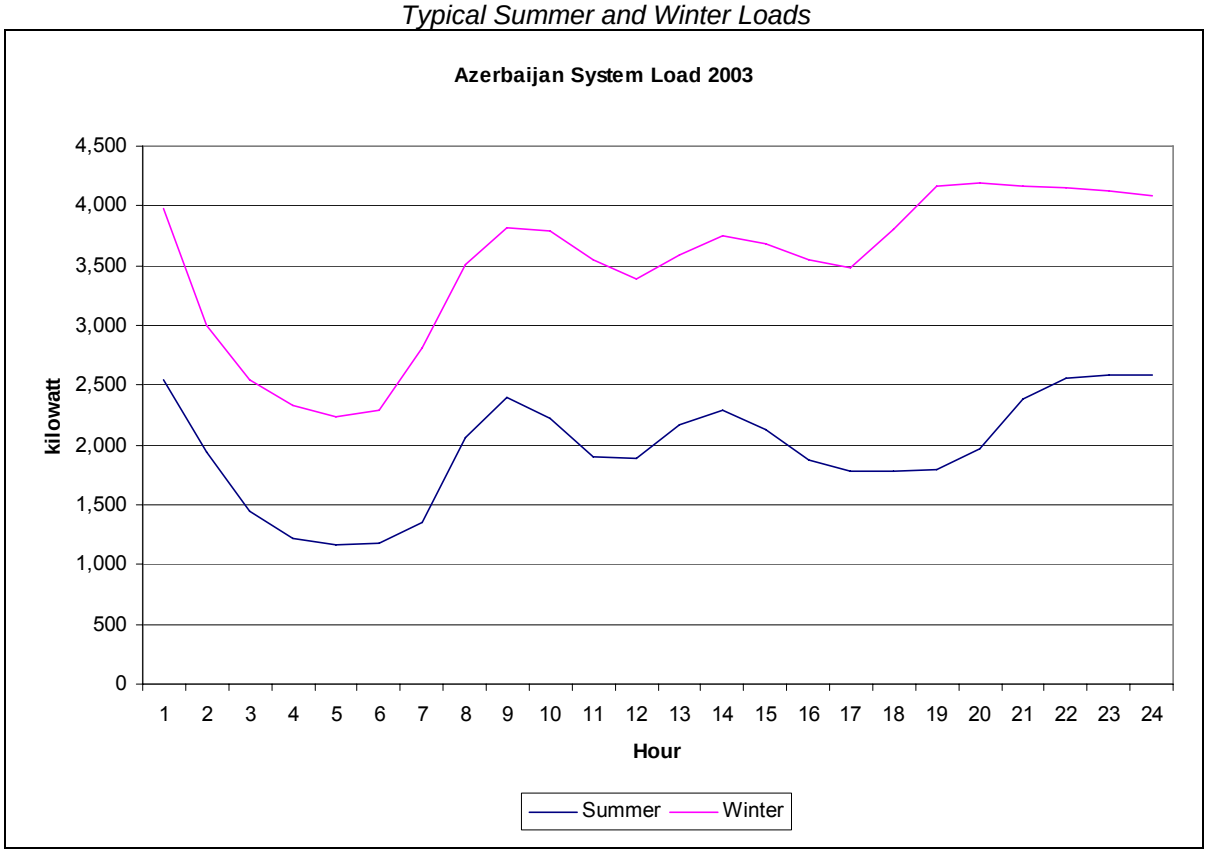
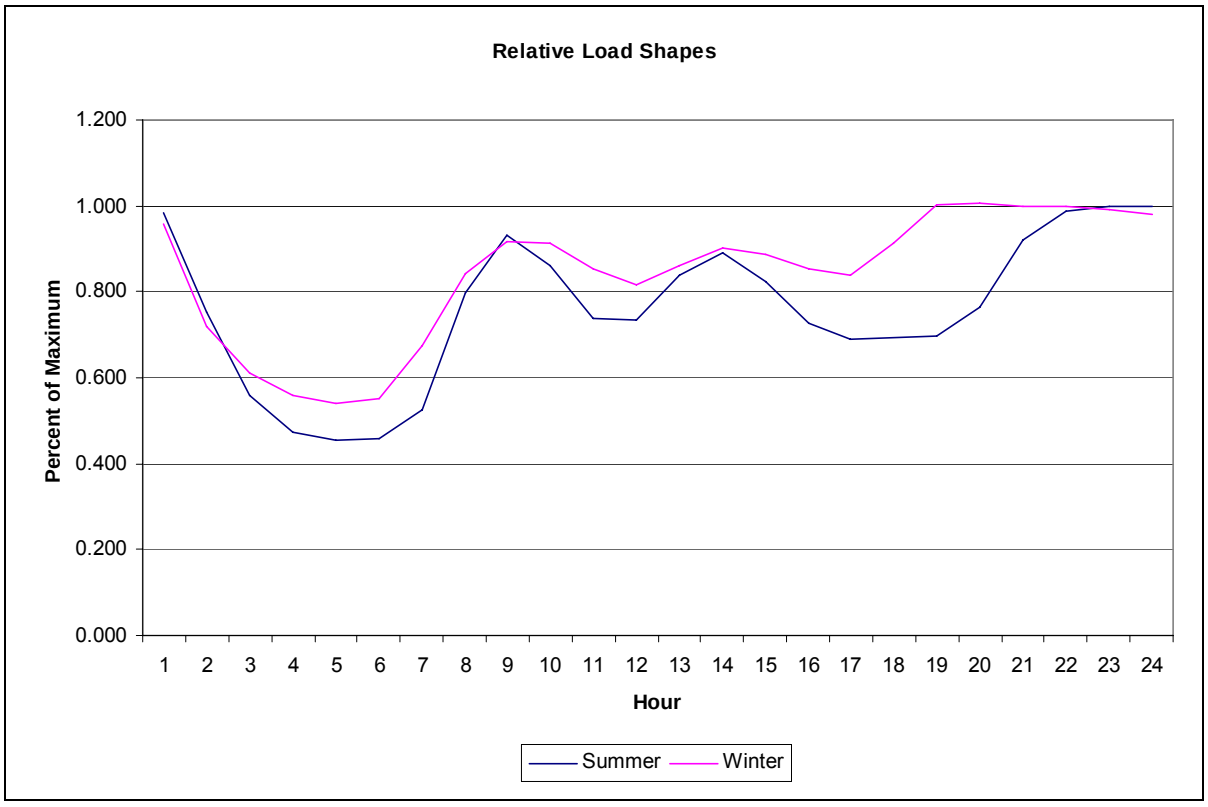


Chart No. 6



To develop the data for use in Chart Nos. 5 and 6, the hourly loads of all distribution companies need to be collected each month. Table No. 10, "Hourly Electricity Sales" provides an example of the information that would be collected for every day of the year.[7]

Table No. 10
Hourly Electricity Sales

Hour	Distribution Companies				Total
	Baku	Gandja	Ali-Bayramli	Sumgayit	mWh
100					
200					
300					
400					
500					
600					
700					
800					
900					
1000					
1100					
1200					
1300					
1400					
1500					
1600					
1700					
1800					
1900					
2000					
2100					
2200					
2300					
2400					

The hours for all days are summed for each month. Table No. 11, "Annual Summary of Hourly Sales" provides the monthly summary of the hourly sales to all distribution companies. If Time-of-Day pricing is introduced, then the billing determinants for each time period would be developed from the data that comprises this table.

Table No. 12, "Summary of Hourly Generation Costs", shows the hourly generation costs for all hours of the year. They variable costs are due to the fuel consumption for each hour at each plant, summed to the total. If TOU pricing is introduced, then the variable costs from this table are used to calculate the actual tariff prices for each time period.

[7] Note: The hourly sales for each distribution company are derived from a similar table that sums all of the hourly loads from all connection points (substations) with Azerenergy.

Table No. 11
Annual Summary of Hourly Sales

Hour	January	February	March	April	May	June	July	August	September	October	November	December	Total
100													
200													
300													
400													
500													
600													
700													
800													
900													
1000													
1100													
1200													
1300													
1400													
1500													
1600													
1700													
1800													
1900													
2000													
2100													
2200													
2300													
2400													

Table No. 12
Summary of Hourly Generation Costs

Hour	January	February	March	April	May	June	July	August	September	October	November	December	Total
100													
200													
300													
400													
500													
600													
700													
800													
900													
1000													
1100													
1200													
1300													
1400													
1500													
1600													
1700													
1800													
1900													
2000													
2100													
2200													
2300													
2400													

5. APPENDICES