PACIFICORP

Utah

2007 Analysis of System Losses

October 2008

Prepared by:

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October 22, 2008

Mr. Kenneth Houston, PE
Director, Transmission
PacifiCorp
825 NE Multnomah, Suite 1600
Portland, OR 97232

RE: 2007 LOSS ANALYSES –Utah

Dear Mr. Houston:

Transmitted herewith are the results of the 2007 Analysis of System Losses for the Utah operations. These results consist of an Annual analysis which develops cumulative expansion factors (loss factors) for both demand (peak-kW) and energy (average-kWh) losses by discrete voltage levels applicable to metered sales data. The loss calculations were made using a separate transmission loss model which was then incorporated into the Utah loss model to derive the final results prescribed herein.

On behalf of MAC, we appreciate the opportunity to assist you in performing the loss analysis contained herein. The level of detail, multiple databases, and state jurisdictions coupled with power flow studies and updates are consistent with prior loss studies and reflect reasonable and representative power losses on the PacifiCorp system. Our review of these data and calculated loss results support the proposed loss factors as presented herein for your use in various cost of service, rate studies, and demand analyses.

Should you require any additional information, please let us know at your earliest convenience.

Sincerely,

Paul M. Normand
Principal

PACIFICORP - UTAH

2007 ANALYSIS OF SYSTEM LOSSES

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This report presents PacifiCorp's 2007 Analysis of System Losses for Utah's power systems as performed by Management Applications Consulting, Inc. (MAC). The study developed separate demand (kW) and energy (kWh) loss factors for each voltage level of service in the power system. The cumulative loss factor results by voltage level, as presented herein, can be used to adjust metered sales data in Utah for losses in performing cost of service studies, determining voltage discounts, and other analyses which may require a loss adjustment.

The procedures used in the overall loss study were consistent with prior studies and emphasized the use of "in house" resources where possible. To this end, extensive use was made of the Company's peak hour power flow studies and transformer plant investments in the model. Using estimated load data provided a means of calculating reasonable estimates of losses by using a "top-down" and "bottom-up" procedure. In the "top-down" approach, losses from the high voltage system, through and including distribution substations, were calculated along with power flow data, conductor and transformer loss estimates, and metered sales.

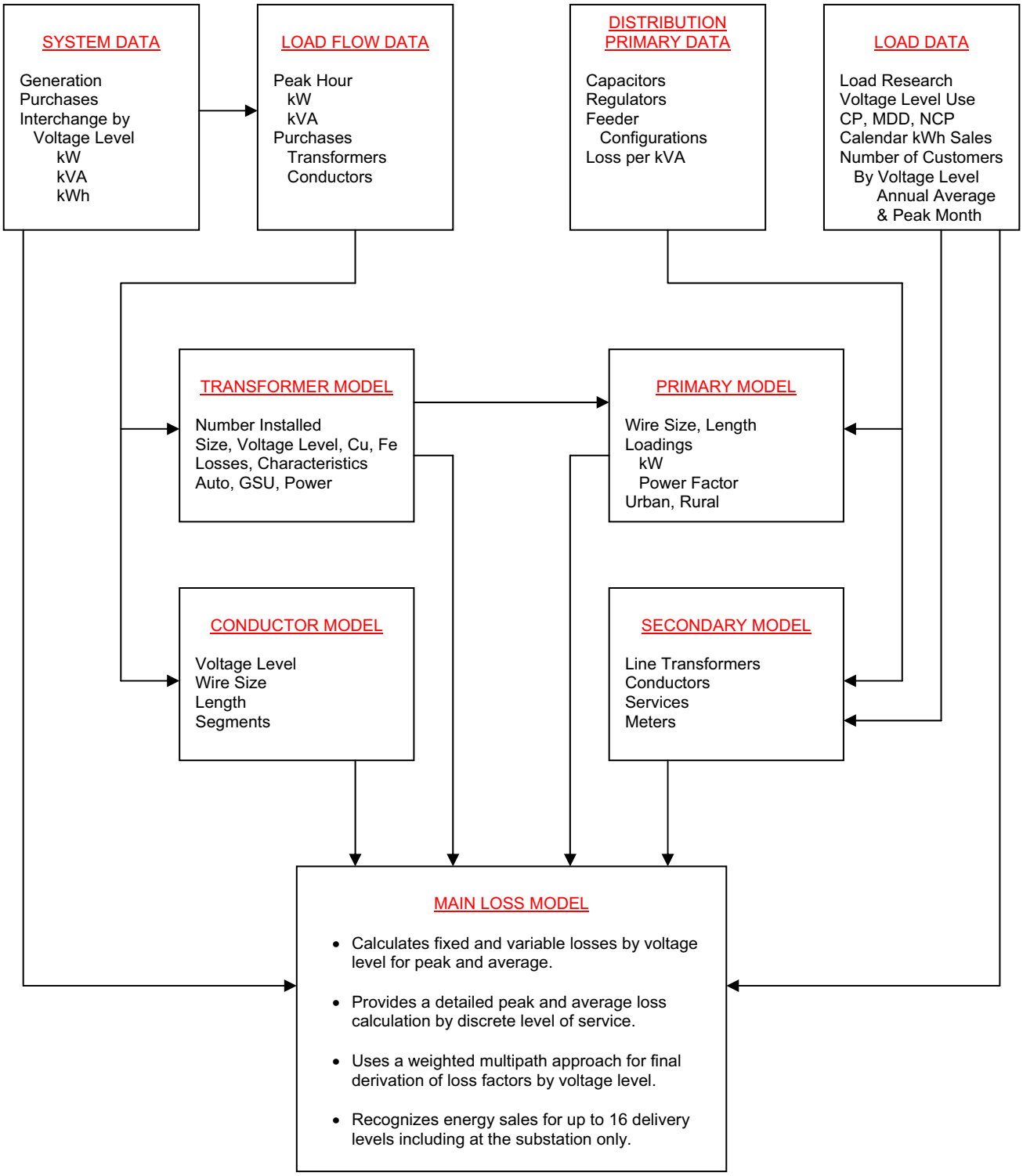
At this point in the analysis, system loads and losses at the input into the distribution substation system are known with reasonable accuracy. However, it is the remaining loads and losses on the distribution substations, primary system, secondary circuits, and services which are generally difficult to estimate. Estimated load data provided the starting point for performing a "bottom-up" approach for calculating the remaining distribution losses. Basically, this "bottom-up" approach develops line loadings by first determining loads and losses at each level beginning at a customer's meter service entrance and then going through secondary lines, line transformers, primary lines and finally distribution substation. These distribution system loads and associated losses are then compared to the initial calculated input into Distribution Substation loadings for reasonableness prior to finalizing the loss factors. An overview of the loss study is shown on Figure 1 on the next page.

Appendix A presents the results of the PacifiCorp system-wide Transmission 2007 Loss Analysis for the integrated PacifiCorp System. Appendix B presents the PacifiCorp Utah 2007 Loss Analyses.

Table 1, below, provides the final results from Appendix A and B for the calendar year. The distribution system losses are calculated in Appendix B for all voltage levels except transmission which was obtained from Appendix A. These loss expansion factors are applicable only to metered sales at the point of receipt for adjustment to the power system's input level.

These loss factors have shown an improving trend in system utilization and efficiency through investments, operations and load growth. Future studies should encompass an expanded review

MANAGEMENT APPLICATIONS CONSULTING, INC.
ELECTRIC LOSS MODEL OVERVIEW



of the power system by reviewing the detailed unbilled calculations and additional primary circuit analyses.

TABLE 1
Loss Factors at Sales Level
Utah

Voltage Level of Service	2007	2003	2002	2001
Demand (kW)				
Transmission[1]	1.04975	1.04775	1.05144	1.05697
Primary	1.07872	1.07851	1.08177	1.08878
Secondary	1.10963	1.10521	1.10774	1.11433
Energy (kWh)				
Transmission[1]	1.03605	1.03788	1.04020	1.04543
Primary	1.05892	1.05713	1.06134	1.06758
Secondary	1.09845	1.08275	1.08969	1.09720

Utah jurisdictional losses for 2007, when measured against total Net System Input (NSI) in this study represent 6.47% as shown on Exhibit 1 of Appendix B. These same losses, when measured against total annual sales output represent 6.92%.

[1]Reference Appendix A for development of Transmission loss factors.

2.0 INTRODUCTION

This report of the 2007 Analysis of System Losses for Utah provides a summary of results, conceptual background or methodology, description of the analyses, and input information related to the study.

2.1 Conduct of Study

Typically, between five to ten percent of the total kWh requirements of an electric utility is lost or unaccounted for in the delivery of power to customers. Investments must be made in facilities which support the total load which includes losses or unaccounted for load. Revenue requirements associated with load losses are an important concern to utilities and regulators in that customers must equitably share in all of these cost responsibilities. Loss expansion factors are the mechanism by which customers' metered demand and energy data are mathematically adjusted to the generation or input level (point of reference) when performing cost and revenue calculations.

An acceptable accounting of losses can be determined for any given time period using available engineering, system, and customer data along with empirical relationships. This loss analysis for the delivery of demand and energy utilizes such an approach. A microcomputer loss model[2] is utilized as the vehicle to organize the available data, develop the relationships, calculate the losses, and provide an efficient and timely avenue for future updates and sensitivity analyses. Our procedures and calculations are consistent with prior loss studies and rely on numerous databases that include customer statistics and power system modeling results.

Company personnel performed most of the data gathering and data processing efforts and checked for reasonableness. MAC analyzed the Company's various databases and performed calculations to check the reasonableness of results. A review of the preliminary results provided for additions to the database and modifications to certain initial assumptions based on available data. Efforts in determining the data required to perform the loss analysis centered on information which was available from existing studies or reports within the Company.

[2]Copyright by Management Applications Consulting, Inc.

From an overall perspective, our efforts concentrated on five major areas:

1. System information by state jurisdiction concerning peak demand and metered sales data by voltage level,
2. High voltage power system power flow data and associated loss calculations,
3. Distribution system (primary and secondary loss calculations),
4. Derivation of fixed and variable losses by voltage level, and
5. Development of final cumulative expansion factors at each voltage level reconciled to system input.

2.2 Description of Model

The Loss Model is a customized applications model, constructed using the Excel software program. Documentation consists primarily of the model equations at each cell location. A significant advantage of such a model is that the actual formulas and their corresponding computed values at each cell of the model are immediately available to the analyst.

A brief description of the three (3) major categories of effort for the preparation of each loss model is as follows:

- Main sheet which contains calculations for all primary and secondary losses, summaries of all conductor and transformer calculations from other sheets discussed below, output reports and supporting results.

- Transformer sheet which contains data input and loss calculations for each distribution substation and high voltage transformer. Separate iron and copper losses are calculated for each transformer by identified type.

- Conductor sheet containing summary data by major voltage level as to circuit miles, loading assumptions, and kW and kWh loss calculations. Separate loss calculations by voltage segment were made using the Company's power flow models and summarized by voltage level in this model.

Appendix A presents a separate loss study result which derived the loss factors for the Company's system wide transmission only portion of the PacifiCorp power system. These transmission results formed the basis and starting point with which to derive the final Utah loss factors for each remaining voltage level as presented in Appendix B and summarized on Table 1 of the Executive Summary.

3.0 METHODOLOGY

3.1 Background

The objective of a Loss Study is to provide a reasonable set of energy (average) and demand (peak) loss expansion factors which account for system losses associated with the transmission and delivery of power to each voltage level over a designated period of time. The focus of this study is to identify the difference between total energy inputs and the associated sales with the difference being equitably allocated to all delivery levels. Several key elements are important in establishing the methodology for calculating and reporting the Company's losses. These elements are:

- Selection of voltage level of services,
- Recognition of losses associated with conductors, transformations, and other electrical equipment/components within voltage levels,
- Identification of customers and loads at various voltage levels of service,
- Review of generation or net power supply input at each level for the test period studied, and
- Analysis of kW and kWh sales by voltage levels within the test period.

The three major areas of data gathering and calculations in the loss analysis were as follows:

1. System Information (monthly and annual)
   - MWH generation and MWH sales.
   - Coincident peak estimates and net power supply input from all sources and voltage levels.
   - Customer load data estimates from available load research information, adjusted MWH sales, and number of customers in the customer groupings and voltage levels identified in the model.
   - System default values, such as power factor, loading factors, and load factors by voltage level.

2. High Voltage System

   - Conductor information was summarized from a database by the Company which reflects the transmission system by voltage level. Extensive use was made of the Company's power flow data with the losses calculated and incorporated into the final loss calculations.

   - Transformer information was developed in a database to model transformation at each voltage level. Substation power, step-up, and auto transformers were individually identified along with any operating data related to loads and losses.

   - Power load flow analysis of peak condition was the primary source of equipment loadings and derivation of load losses in the high voltage loss calculations (greater than 46 kV).

3. Distribution System

   - Distribution Substations – data was developed for modeling each substation as to its size and loading. Loss calculations were performed from this data to determine load and no load losses separately for each transformer.

   - Primary lines - Line loading and loss characteristics for urban and rural circuits were obtained from distribution feeder analyses. These loss results developed kW loss per MW of load by Primary Voltage level. An average was calculated to derive the primary loss estimate after weighting the proper rural versus urban customer mix.

   - Line transformers - Losses in line transformers were based on each customer service group's size, as well as the number of customers per transformer. Accounting and load data provided the foundation with which to model the transformer loadings and calculate load and no load losses.

   - Secondary network - Typical secondary networks were estimated for conductor sizes, lengths, loadings, and customer penetration for residential and small general service customers.

   - Services - Typical services were estimated for each secondary service class of customers identified in the study with respect to type, length, and loading.

The loss analysis was thus performed by constructing the model in segments and subsequently calculating the composite until the constraints of peak demand and energy were met:

- Information as to the physical characteristics and loading of each transformer and conductor segment was modeled.
- Conductors, transformers, and distribution were grouped by voltage level, and unadjusted losses were calculated.
- The loss factors calculated at each voltage level were determined by "compounding" the per-unit losses. Equivalent sales at the supply point were obtained by dividing sales at a specific level by the compounded loss factor to determine losses by voltage level.
- The resulting demand and energy loss expansion factors were then used to adjust all sales to the generation or input level in order to estimate the difference.
- Reconciliation of kW and kWh sales by voltage level using the reported system kW and kWh was accomplished by adjusting the initial loss factor estimates until the mismatch or difference was eliminated.

3.2 Calculations and Analysis

This section provides a discussion of the input data, assumptions, and calculations performed in the loss analysis. Specific appendices have been included in order to provide documentation of the input data utilized in the model.

3.2.1 Bulk, Transmission and Subtransmission Lines

The transmission and subtransmission line losses were calculated based on a modeling of unique voltage levels identified by the Company's power flow configuration for the entire integrated PacifiCorp Power System. Specific information as to length of line, type of conductor, voltage level, peak load, maximum load, etc., were also provided based on Company records and utilized as data input summaries in the loss model.

MW and MVA line loadings were based on PacifiCorp’s peak load estimate. Calculations of line losses were performed by the Company’s power flow model for each line segment separately and combined by voltage levels for reporting

purposes as shown in the Discussion of Results (Section 4.0) of this report. The loss calculations consisted of determining a circuit current value based on MVA line loadings and evaluating the I^2R results for each line segment.

After system coincident peak hour losses were identified for each voltage level, a separate calculation was then made to develop annual average energy losses based on a loss factor approach. Load factors were determined for each voltage level based on system and customer load information. An estimate of the Hoebel coefficient (see Appendix C) was then used to calculate energy losses for the entire period being analyzed. The results are presented in Section 4.0 of this report.

3.2.2 Transformers

The transformer loss analysis required several steps in order to properly consider the characteristics associated with various transformer types; such as, step-up, auto transformers, distribution substations, and line transformers. In addition, further efforts were required to identify both iron and copper losses within each of these transformer types in order to obtain reasonable peak (kW) and average energy (kWh) losses. While iron losses were considered essentially constant for each hour, recognition had to be made for the varying degree of copper losses due to hourly equipment loadings.

Standardized test data tables were used to represent no load (fixed) and full load losses for different types and sizes of transformers. This test data was incorporated into the loss model to develop relationships representing copper and iron losses for the transformer loss calculation. These results were then totaled by various groups, as identified and discussed in Section 4.0.

The remaining miscellaneous losses considered in the loss study consisted of several areas which do not lend themselves to any reasonable level of modeling for estimating their respective losses and were therefore lumped together into a single loss factor of 0.10%. The typical range of values for these losses is from 0.10% to 0.25%, and we have assumed the lower value to be conservative at this time. The losses associated with this loss factor include bus bars, unmetered station use, and grounding transformers.

3.2.3 Distribution System

The load data at the substation and customer level, coupled with primary and secondary network information, was sufficient to model the distribution system in adequate detail to calculate losses.

Primary Lines

Primary line loadings take into consideration the available distribution load along with the actual customer loads including losses. Estimates were made by the Company of primary line losses by the different levels of distribution voltage and whether they were urban or rural. These estimates consider substations, feeders per substation, voltage levels, loadings, total circuit miles, wire size, and single- to three-phase investment estimates. All of these factors were considered in calculating the actual demand (kW) and energy (kWh) for the primary system.

Line Transformers

Losses in line transformers were determined based on typical transformer sizes for each secondary customer service group and an estimated or calculated number of customers per transformer. Accounting records and estimates of load data provided the necessary database with which to model the loadings. These calculations also made it possible to determine separate copper and iron losses based on a table of representative losses for various transformer sizes.

Secondary Line Circuits

Calculations of secondary line circuit losses were performed for loads served through these secondary line investments. Estimates of typical conductor sizes, lengths, loadings and customer class penetrations were made to obtain total circuit miles and losses for the secondary network. Customer loads which do not have secondary line requirements were also identified so that a reasonable estimate of losses and circuit miles of the investments could be made.

Service Drops and Meters

Service drops were estimated for each secondary customer reflecting conductor size, length and loadings to obtain demand losses. A separate calculation was also performed using customer maximum demands to obtain kWh losses. Meter loss estimates were also made for each customer and incorporated into the calculations of kW and kWh losses included in the Summary Results.

4.0 DISCUSSION OF RESULTS

A brief description of each Exhibit provided in Appendices A and B as follows:

Exhibit 1 - Summary of Company Data

This exhibit reflects system information used to determine percent losses and a detailed summary of kW and kWh losses by voltage level. The loss factors developed in Exhibit 7 are also summarized by voltage level.

Exhibit 2 - Summary of Conductor Information

A summary of MW and MWH load and no load losses for conductors by voltage levels is presented. The sum of all calculated losses by voltage level is based on input data information provided in Appendix A. Percent losses are based on equipment loadings.

Exhibit 3 - Summary of Transformer Information

This exhibit summarizes transformer losses by various types and voltage levels throughout the system. Load losses reflect the copper portion of transformer losses while iron losses reflect the no load or constant losses. MWH losses are estimated using a calculated loss factor for copper and the test year hours times no load losses.

Exhibit 4 - Summary of Losses Diagram (2 Pages)

This loss diagram represents the inputs and output of power at system peak conditions. Page 1 details information from all points of the power system and what is provided to the distribution system for primary loads. This portion of the summary can be viewed as a "top down" summary into the distributor system.

Page 2 represents a summary of the development of primary line loads and distribution substations based on a "bottom up" approach. Basically, loadings are developed from the customer meter through the Company's physical investments based on load research and other metered information by voltage level to arrive at MW and MVA requirements during peak load conditions by voltage levels.

Exhibit 5 - Summary of Sales and Calculated Losses

Summary of Calculated Losses represents a tabular summary of MW and MWH load and no load losses by discrete areas of delivery within each voltage level. Losses have been identified

and are derived based on summaries obtained from Exhibits 2 and 3 and losses associated with meters, capacitors and regulators.

Exhibit 6 - Development of Loss Factors, Unadjusted

This exhibit calculates demand and energy losses and loss factors by specific voltage levels based on sales level requirements. The actual results reflect loads by level and summary totals of losses at that level, or up to that level, based on the results as shown in Exhibit 5. Finally, the estimated values at generation are developed and compared to actual generation to obtain any difference or mismatch.

Exhibit 7 - Development of Loss Factors, Adjusted

The adjusted loss factors are the results of adjusting Exhibit 6 for any difference. All differences between estimated and actual are prorated to each level based on the ratio of each level's total load plus losses to the system total. These new loss factors reflect an adjustment in losses due only to kW and kWh mismatch.

Exhibit 8 – Adjusted Losses and Loss Factors by Facility

These calculations present an expanded summary detail of Exhibit 7 for each segment of the power system with respect to the flow of power and associated losses from the receipt of energy at the meter to the generation for the Company's power system.

Exhibit 9 – Appendix B Only – Summary of Losses by Delivery Voltage

These calculations present a reformatted summary of the losses presented in Exhibit 8 by power system delivery segment as calculated by voltage level of service based on sales.

Appendix A

Results of 2007 PacifiCorp Transmission System Loss Analysis

PACIFICORP TRANSMISSION

EXHIBIT 1

SUMMARY OF COMPANY DATA

ANNUAL PEAK	10,126	MW
ANNUAL ENERGY INPUT	69,950,667	MWH
ANNUAL SALES	65,563,650	MWH
Total System Losses	4,387,017	or 6.27%
TOTAL TRANS LOSSES	2,434,063	3.48%

SUMMARY OF LOSSES - OUTPUT RESULTS

SERVICE	KV	MW		% TOTAL	MWH		% TOTAL
TRANS	345,161,115	393.8		82.05%	2,016,370		82.84%
			3.89%			2.88%	
SUBTRANS	69, 57, 46	86.1		17.95%	417,694		17.16%
			0.85%			0.60%	
TOTAL TRANS LOSSES		479.9		100.00%	2,434,063		100.00%
(percent at input)			4.74%			3.48%	

SUMMARY OF LOSS FACTORS

CUMULATIVE SALES EXPANSION FACTORS

SERVICE	KV	DEMAND		ENERGY	
		d	1/d	e	1/e
TRANS	345,161,115	1.04975	0.95260	1.03605	0.96520
	69, 57, 46				

SUMMARY OF CONDUCTOR INFORMATION

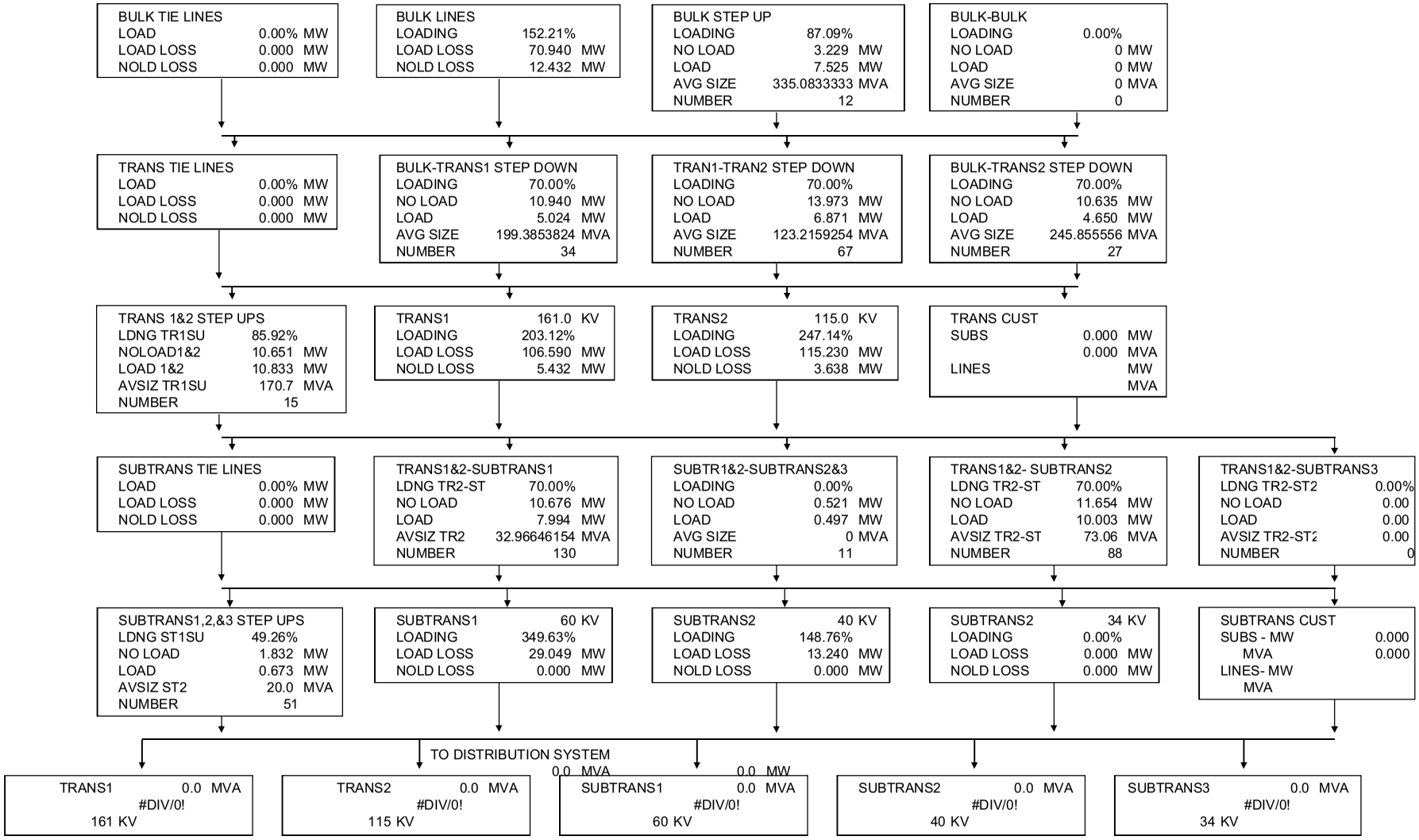
EXHIBIT 2

DESCRIPTION		CIRCUIT MILES	LOADING % RATING	----- MW LOSSES ----- LOAD	NO LOAD	TOTAL	---- MWH LOSSES ---- LOAD	NO LOAD	TOTAL
--- BULK ----------	345 KV OR GREATER ----------								
TIE LINES		0.0	0.00%	0.000	0.000	0.000	0	0	0
BULK TRANS		3,108.0	152.21%	70.940	12.432	83.372	317,553	183,496	501,049
SUBTOT		3,108.0		70.940	12.432	83.372	317,553	183,496	501,049
--- TRANS ---------	115 KV TO 345.00 KV								
TIE LINES		0	0.00%	0.000	0.000	0.000	0	0	0
TRANS1	161 KV	3,621.0	203.12%	106.590	5.432	112.022	358,552	80,169	438,721
TRANS2	115 KV	3,638.0	247.14%	115.230	3.638	118.868	478,537	53,697	532,234
SUBTOT		7,259.0		221.820	9.070	230.890	837,089	133,866	970,955
--- SUBTRANS ------	34 KV TO 115 KV								
TIE LINES		0	0.00%	0.000	0.000	0.000	0	0	0
SUBTRANS1	60 KV	2,978.0	349.63%	29.049	0.000	29.049	120,637	0	120,637
SUBTRANS2	40 KV	2,707.0	148.76%	13.240	0.000	13.240	39,377	0	39,377
SUBTRANS3	34 KV	0.0	0.00%	0.000	0.000	0.000	0	0	0
SUBTOT		5,685.0		42.289	0.000	42.289	160,014	0	160,014
TOTAL		16,052		335.049	21.502	356.551	1,314,656	317,362	1,632,018

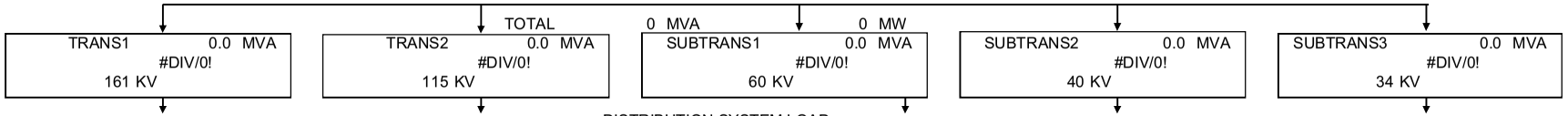
SUMMARY OF TRANSFORMER INFORMATION EXHIBIT 3

DESCRIPTION	KV CAPACITY VOLTAGE	MVA	NUMBER TRANSFMR	AVERAGE SIZE	LOADING %	MVA LOAD	MW LOSSES LOAD	MW LOSSES NO LOAD	MW LOSSES TOTAL	MWH LOSSES LOAD	MWH LOSSES NO LOAD	MWH LOSSES TOTAL
BULK STEP-UP	345	4,021.0	12	335.1	87.09%	3,502	7.525	3.229	10.755	36,248	27,690	63,939
BULK - BULK		0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
BULK - TRANS1	161	6,779.1	34	199.4	70.00%	4,745	5.024	10.940	15.964	16,901	95,830	112,731
BULK - TRANS2	115	6,638.1	27	245.9	70.00%	4,647	4.650	10.635	15.285	12,670	93,164	105,834
TRANS1 STEP-UP	161	2,560.0	15	170.7	85.92%	2,200	6.125	4.698	10.823	22,230	39,035	61,265
TRANS1 - TRANS2	115	8,255.5	67	123.2	70.00%	5,779	6.871	13.973	20.844	18,721	122,401	141,122
TRANS1-SUBTRANS1	60	3,171.4	52	61.0	70.00%	2,220	3.663	5.675	9.338	9,982	49,710	59,692
TRANS1-SUBTRANS2	40	450.5	10	45.0	70.00%	315	0.682	0.847	1.529	1,330	7,421	8,751
TRANS1-SUBTRANS3	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2 STEP-UP	115	2,202.8	71	31.0	59.02%	1,300	4.708	5.953	10.661	24,289	46,815	71,104
TRANS2-SUBTRANS1	60	2,571.4	78	33.0	70.00%	1,800	4.330	5.001	9.331	11,799	43,808	55,607
TRANS2-SUBTRANS2	40	5,698.6	78	73.1	70.00%	3,989	9.322	10.807	20.129	18,189	94,669	112,858
TRANS2-SUBTRANS3	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1 STEP-UP	60	182.3	32	5.7	49.26%	90	0.338	0.727	1.065	2,305	5,304	7,609
SUBTRAN2 STEP-UP	40	380.0	19	20.0	36.33%	138	0.335	1.105	1.439	1,743	5,887	7,630
SUBTRAN3 STEP-UP	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1-SUBTRAN2	40	253.4	11	23.0	70.00%	177	0.497	0.521	1.018	969	4,563	5,532
SUBTRAN1-SUBTRAN3	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2-SUBTRAN3	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
						DISTRIBUTION SUBSTATIONS						
TRANS1 - 161	33	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1 - 161	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1 - 161	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2 - 115	33	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2 - 115	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2 - 115	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1- 60	33	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1- 60	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1- 60	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2- 40	33	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2- 40	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2- 40	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN3- 34	33	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN3- 34	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN3- 34	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TOTAL		43,164	506				54.071	74.110	128.181	177,377	636,297	813,674

SUMMARY OF LOSSES DIAGRAM - DEMAND MODEL - SYSTEM PEAK 10126.06046 MW



FROM HIGH VOLTAGE SYSTEM



DISTRIBUTION SYSTEM LOAD

	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3
VOLTAGE	33	12	1	33	12	1	33	12	1	33	12	1	33	12	1
LOAD MVA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% SYS TOT	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
NOLD LOSS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOAD LOSS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AVG SIZE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NUMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIVERSITY	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RATIO															

SUMMARY of SALES and CALCULATED LOSSES

EXHIBIT 5

LOSS # AND LEVEL	MW LOAD	NO LOAD +	LOAD =	TOT LOSS	EXP FACTOR	CUM EXP FAC	MWH LOAD	NO LOAD +	LOAD =	TOT LOSS	EXP FACTOR	CUM EXP FAC
1 BULK XFMMR	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0	0
2 BULK LINES	4,882.0	15.66	78.47	94.13	1.019659	1.019659	38,104,961	211,187	353,801	564,988	1.0150503	1.0150503
3 TRANS1 XFMR	4,650.5	10.94	5.02	15.96	1.003445	1.023172	24,442,842	95,830	16,901	112,731	1.0046334	1.0197535
4 TRANS1 LINES	8,245.3	10.13	107.92	118.05	1.014525	1.027784	43,507,964	119,204	369,152	488,356	1.0113519	1.0225754
5 TRANS2TR1 SD	5,663.3	13.97	6.87	20.84	1.003694	1.031581	26,789,440	122,401	18,721	141,122	1.0052957	1.0279907
6 TRANS2BLK SD	4,553.7	10.64	4.65	15.29	1.003368	1.023094	21,540,996	93,164	12,670	105,834	1.0049374	1.0200620
7 TRANS2 LINES	11,556.0	9.59	119.94	129.53	1.011336	1.036191	59,198,406	100,512	502,826	603,338	1.0102967	1.0304693
SUB TOTAL TRAN	10,126.1	70.93	322.87	393.80	1.040463	1.040463	69,950,667	742,298	1,274,072	2,016,370	1.0296812	1.0296812
8 STR1BLK SD												
9 STR1T1 SD	2175.6	5.67	3.66	9.34	1.004311	1.032214	10,291,268	49,710	9,982	59,692	1.0058341	1.0285413
10 SRT1T2 SD	1,764.0	5.00	4.33	9.33	1.005318	1.041702	8,344,281	43,808	11,799	55,607	1.0067088	1.0373825
11 SUBTRANS1 LINES	4,069.5	0.73	29.39	30.11	1.007455	1.043016	19,952,395	5,304	122,943	128,246	1.0064692	1.0370206
12 STR2T1 SD	309.0	0.85	0.68	1.53	1.004972	1.032894	1,218,242	7,421	1,330	8,751	1.0072355	1.0299742
13 STR2T2 SD	3,909.2	10.81	9.32	20.13	1.005176	1.041554	15,410,225	94,669	18,189	112,858	1.0073776	1.0380717
14 STR2S1 SD	173.8	0.52	0.50	1.02	1.005889	1.049158	685,247	4,563	969	5,532	1.0081390	1.0454609
15 SUBTRANS2 LINES	4,535.4	1.10	13.57	14.68	1.003247	1.043320	18,095,489	5,887	41,119	47,006	1.0026044	1.0388602
16 STR3T1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
17 STR3T2 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
18 STR3S1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
19 STR3S2 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
20 SUBTRANS3 LINES	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
21 SUBTRANS LOSS FAC					0.000000						0.0000000	
22 TRANSMSN LOSS FAC	10,126.1	95.61	384.32	479.93	1.049754	1.049754	69,950,667	953,660	1,480,404	2,434,063	1.0360513	1.0360513
DISTRIBUTION SUBST												
TRANS1	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
TRANS2	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
SUBTR1	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
SUBTR2	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
SUBTR3	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
WEIGHTED AVERAGE	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
PRIMARY INTRCHNGE	0.0				0.000000		0				0.0000000	
Average Dist Sub Losses	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
TOTAL SYSTEM		95.61	384.32	479.93				953,660	1,480,404	2,434,063		

DEVELOPMENT of LOSS FACTORS

EXHIBIT 6

SYSTEM WIDE
DEMAND

LOSS FACTOR LEVEL	CUSTOMER SALES MW a	CALC LOSS TO LEVEL b	SALES MW @ GEN c	CUM SALES EXPANSION FACTORS d	1/d
BULK LINES	0.0	0.0	0.0	0.00000	0.00000
TRANS SUBS	0.0	0.0	0.0	0.00000	0.00000
TRANS LINES	9,646.1	479.9	10,126.1	1.04975	0.95260
SUBTRANS SUBS	0.0	0.0	0.0	0.00000	0.00000
SUBTRANS LINES	0.0	0.0	0.0	0.00000	0.00000
TOTALS	9,646.1	479.9	10,126.1		

DEVELOPMENT of LOSS FACTORS
SYSTEM WIDE
ENERGY

LOSS FACTOR LEVEL	CUSTOMER SALES MWH a	CALC LOSS TO LEVEL b	SALES MWH @ GEN c	CUM SALES EXPANSION FACTORS d	1/d
BULK LINES	0	0	0	0.00000	0.00000
TRANS SUBS	0	0	0	0.00000	0.00000
TRANS LINES	67,516,604	2,434,063	69,950,667	1.03605	0.96520
SUBTRANS SUBS	0	0	0	0.00000	0.00000
SUBTRANS LINES	0	0	0	0.00000	0.00000
TOTALS	67,516,604	2,434,063	69,950,667		

Adjusted Losses and Loss Factors by Facitliy EXHIBIT 8

Losses by Segment

	MW	MWH
46-57 kV Line Losses (ST2)	14.67940	47,006
T1 - ST2 Transformation Losses	1.52889	8,751
T2 - ST2 Transformation Losses	20.12853	112,858
ST1 - ST2 Transformation Losses	1.01764	5,532
69 kV Line Losses (ST1)	30.11445	128,246
T1 - ST1 Transformation Losses	9.33818	59,692
T2 - ST1 Transformation Losses	9.33132	55,607
115-138 kV Line Losses (T2)	129.52922	603,338
B - T2 Transformation Losses	15.28528	105,834
T1 - T2 Transformation Losses	20.84362	141,122
161-230 kV Line Losses (T1)	118.04657	488,356
B - T1 Transformation Losses	15.96387	112,731
345-500 kV Line Losses (B)	94.12659	564,988
Total	479.93356	2,434,063

Loss Factors by Segment

Deliveries from Sub Transmission 2 Lines	4535.41	18,095,489
ST2 Line Losses	14.68	47,006
T1 - ST2 Transformation Losses	1.53	8,751
T2 - ST2 Transformation Losses	20.13	112,858
ST1 - ST2 Transformation Losses	1.02	5,532
Input to ST2 System	4572.77	18,269,637
ST2 Loss Factor	**1.00824**	**1.00962**
Deliveries from Sub Transmission 1 Lines	4069.53	19,952,395
ST1 Line Losses	30.11	128,246
T1 - ST1 Transformation Losses	9.34	59,692
T2 - ST1 Transformation Losses	9.33	55,607
Input to ST1 System	4118.31	20,195,941
ST1 Loss Factor	**1.01199**	**1.01221**
Deliveries from Transmission 2 Lines	11555.99	59,198,406
T2 Line Losses	129.53	603,338
B - T2 Transformation Losses	15.29	105,834
T1 - T2 Transformation Losses	20.84	141,122
Input to T2 System	11721.65	60,048,700
T2 Loss Factor	**1.01434**	**1.01436**
Deliveries from Transmission 1 Lines	8245.27	43,507,964
T1 Line Losses	118.05	488,356
B - T1 Transformation Losses	15.96	112,731
Input to T1 System	8379.28	44,109,051
T1 Loss Factor	**1.01625**	**1.01382**
Deliveries from Bulk Lines	4882.00	38,104,961
B Line Losses	94.13	564,988
Input to B System	4976.13	38,669,949
B Loss Factor	**1.01928**	**1.01483**
Total Deliveries from Transmission	9646.13	67,516,604
Total Transmission Losses	479.93	2,434,063
Input to Transmission System	10126.06	69,950,667
Transmission Loss Factor	**1.04975**	**1.03605**

Appendix B

Results of PacifiCorp Utah 2007 Loss Analysis

PACIFICORP UTAH

EXHIBIT 1

SUMMARY OF COMPANY DATA

ANNUAL PEAK		4,373	MW
GENERATION & PURCHASES-INPUT		24,196,948	MWH
ANNUAL SALES	-OUTPUT	22,631,378	MWH
SYSTEM LOSSES	INPUT	1,565,570	or 6.47%
	OUTPUT		or 6.92%
SYSTEM LOAD FACTOR		63.2%	

SUMMARY OF LOSSES - OUTPUT RESULTS

SERVICE	KV	MW	% TOTAL	MWH	% TOTAL
TRANS	345,161,115	207.3	61.93%	841,978	53.78%
		4.74%		3.48%	
PRIMARY	69,34,12,1	75.1	22.45%	339,840	21.71%
		1.72%		1.40%	
SECONDARY		52.3	15.62%	383,752	24.51%
		1.20%		1.59%	
TOTAL		334.7	100.00%	1,565,570	100.00%
		7.65%		6.47%	

SUMMARY OF LOSS FACTORS

SERVICE	KV	CUMMULATIVE SALES EXPANSION FACTORS DEMAND		ENERGY	
		d	1/d	e	1/e
TRANS	345,161,115	1.04975	0.95260	1.03605	0.96520
PRIM SUBS	69,46,35	0.00000	0.00000	0.00000	0.00000
PRIMARY	69,34,12,1	1.07872	0.92703	1.05892	0.94436
SECONDARY		1.10963	0.90120	1.09845	0.91037

SUMMARY OF CONDUCTOR INFORMATION

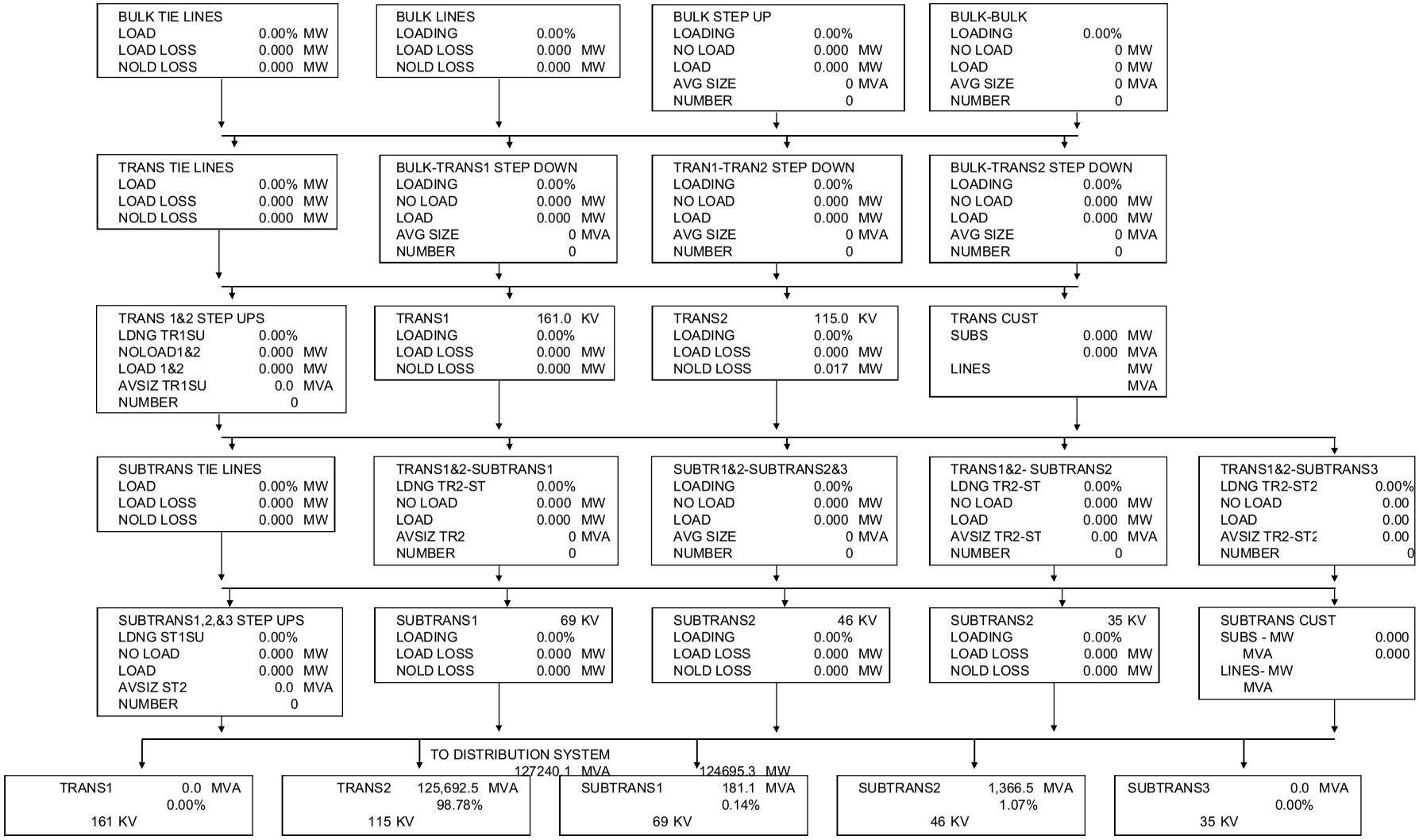
EXHIBIT 2

DESCRIPTION		CIRCUIT MILES	LOADING % RATING	MW LOSSES LOAD	MW LOSSES NO LOAD	MW LOSSES TOTAL	MWH LOSSES LOAD	MWH LOSSES NO LOAD	MWH LOSSES TOTAL
--- BULK ----------	345 KV OR GREATER ----------								
TIE LINES		0.0	0.00%	0.000	0.000	0.000	0	0	0
BULK TRANS		0.0	0.00%	0.000	0.000	0.000	0	0	0
SUBTOT		0.0		0.000	0.000	0.000	0	0	0
--- TRANS ---------	115 KV TO 345.00 KV								
TIE LINES		0	0.00%	0.000	0.000	0.000	0	0	0
TRANS1	161 KV	0.0	0.00%	0.000	0.000	0.000	0	0	0
TRANS2	115 KV	0.0	0.00%	0.000	0.017	0.017	0	150	150
SUBTOT		0.0		0.000	0.017	0.017	0	150	150
--- SUBTRANS ------	35 KV TO 115 KV								
TIE LINES		0	0.00%	0.000	0.000	0.000	0	0	0
SUBTRANS1	69 KV	0.0	0.00%	0.000	0.000	0.000	0	0	0
SUBTRANS2	46 KV	0.0	0.00%	0.000	0.000	0.000	0	0	0
SUBTRANS3	35 KV	0.0	0.00%	0.000	0.000	0.000	0	0	0
SUBTOT		0.0		0.000	0.000	0.000	0	0	0
PRIMARY LINES		21,095		53.226	5.726	58.953	185,168	54,847	240,015
SECONDARY LINES		8,939		2.287	0.000	2.287	9,837	0	9,837
SERVICES		18,732		5.423	2.347	7.770	23,318	20,557	43,874
TOTAL		48,766		60.937	8.090	69.027	218,323	75,553	293,876

SUMMARY OF TRANSFORMER INFORMATION EXHIBIT 3

DESCRIPTION	KV CAPACITY VOLTAGE	MVA	NUMBER TRANSFMR	AVERAGE SIZE	LOADING %	MVA LOAD	MW LOSSES LOAD	MW LOSSES NO LOAD	MW LOSSES TOTAL	MWH LOSSES LOAD	MWH LOSSES NO LOAD	MWH LOSSES TOTAL
BULK STEP-UP	345	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
BULK - BULK		0.0	0	0.0	0.00%	0	0	0.000	0.000	0	0	0
BULK - TRANS1	161	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
BULK - TRANS2	115	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1 STEP-UP	161	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1 - TRANS2	115	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1-SUBTRANS1	69	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1-SUBTRANS2	46	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1-SUBTRANS3	35	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2 STEP-UP	115	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2-SUBTRANS1	69	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2-SUBTRANS2	46	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2-SUBTRANS3	35	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1 STEP-UP	69	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2 STEP-UP	46	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN3 STEP-UP	35	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1-SUBTRAN2	46	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN1-SUBTRAN3	35	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2-SUBTRAN3	35	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
DISTRIBUTION SUBSTATIONS												
TRANS1 - 161	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1 - 161	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS1 - 161	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
TRANS2 - 115	34	20.0	1	20.0	55.00%	11	0.024	0.024	0.048	91	210	301
TRANS2 - 115	12	2,622.7	97	27.0	49.40%	1,296	2.411	2.936	5.348	9,086	25,723	34,810
TRANS2 - 115	1	14.0	1	14.0	49.40%	7	0.016	0.018	0.034	60	161	221
SUBTRAN1- 69	34	46.6	4	11.6	55.00%	26	0.066	0.066	0.131	248	575	823
SUBTRAN1- 69	12	307.3	51	6.0	49.40%	152	0.385	0.484	0.869	1,450	4,236	5,687
SUBTRAN1- 69	1	7.5	2	3.8	49.40%	4	0.011	0.015	0.026	43	132	175
SUBTRAN2- 46	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN2- 46	12	2,532.1	231	11.0	49.40%	1,251	2.748	3.428	6.175	10,353	30,027	40,380
SUBTRAN2- 46	1	234.1	35	6.7	49.40%	116	0.267	0.336	0.603	1,006	2,943	3,949
SUBTRAN3- 35	34	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN3- 35	12	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
SUBTRAN3- 35	1	0.0	0	0.0	0.00%	0	0.000	0.000	0.000	0	0	0
PRIMARY - PRIMARY		126.4	28	4.5	49.40%	62	0.156	0.205	0.361	587	1,795	2,382
LINE TRANSFRMR		9,666.1	168,883	57.2	21.04%	2,034	6.295	34.127	40.422	12,607	298,950	311,557
TOTAL		15,577	169,333				12.379	41.638	54.018	35,533	364,751	400,284

SUMMARY OF LOSSES DIAGRAM - DEMAND MODEL - SYSTEM PEAK 4372.986237 MW



FROM HIGH VOLTAGE SYSTEM

TOTAL 127,240 MVA 124,695 MW

TRANS1	TRANS2	SUBTRANS1	SUBTRANS2	SUBTRANS3
0.0 MVA	125,692.5 MVA	181.1 MVA	1,366.5 MVA	0.0 MVA
0.00%	98.78%	0.14%	1.07%	0.00%
161 KV	115 KV	69 KV	46 KV	35 KV

DISTRIBUTION SYSTEM LOAD

	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3	PRIM1	PRIM2	PRIM3
VOLTAGE	34	12	1	34	12	1	34	12	1	34	12	1	34	12	1	34	12	1
LOAD MVA	0	0	0	11	125,675	7	26	152	4	0	1,251	116	0	0	0	0	0	0
% SYS TOT	0.00%	0.00%	0.00%	0.01%	98.77%	0.01%	0.02%	0.12%	0.00%	0.00%	0.98%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NOLD LOSS	0.000	0.000	0.000	0.024	2.936	0.018	0.066	0.484	0.015	0.000	3.428	0.336	0.000	0.000	0.000	0.000	0.000	0.000
LOAD LOSS	0.000	0.000	0.000	0.024	2.411	0.016	0.066	0.385	0.011	0.000	2.748	0.267	0.000	0.000	0.000	0.000	0.000	0.000
AVG SIZE	0.0	0.0	0.0	20.0	27.0	14.0	11.6	6.0	3.8	0.0	11.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0
NUMBER	0	0	0	1	97	1	4	51	2	0	231	35	0	0	0	0	0	0
DIVERSITY	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
RATIO																		

PRIMARY LINES		
LOADING	2780.120	MW
@ SYS PF	2836.857	MVA
LOAD LOSS	53.226	MW
NOLD LOSS	5.726	MW
TOT LOSS	58.953	MW

PRIM/PRIM TRANSF		
LOADING	62.417	MW
NOLD LOSS	0.205	MW
LOAD LOSS	0.156	MW
AVG SIZE	4.51	
NUMBER	28	

PRIM CUST	LOADS	
NO LINES	0.000	MW
CUST SUB	0.000	MVA
NO LINES	0.000	MW
CO. SUB	0.000	MVA
PRIM WITH	846.613	MW
LINES	891.171	MVA

LINE TRANSFORMERS			
LOADING	1874.194	MW MVA	2074.482
NOLD LOSS	34.127	MW	
LOAD LOSS	6.295	MW	
AVG SIZE	57.2	KVA	
NUMBER	168883		

SECONDARY LINES		
LOAD	701.774	MW
LOAD LOSS	2.287	MW
NOLD LOSS	0.000	MW
TOT LOSS	2.287	MW

NO SECONDARY LINES		
LOAD	1131.998	MW

SERVICES		
LOAD	1831.485	MW
LOAD LOSS	5.423	MW
NOLD LOSS	2.347	MW
TOT LOSS	7.770	MW

CUSTOMER SECONDARY LOAD		
	1823.715	MW

SUMMARY of SALES and CALCULATED LOSSES

EXHIBIT 5

LOSS # AND LEVEL	MW LOAD	NO LOAD +	LOAD =	TOT LOSS	EXP FACTOR	CUM EXP FAC	MWH LOAD	NO LOAD +	LOAD =	TOT LOSS	EXP FACTOR	CUM EXP FAC
1 BULK XFMMR	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0	0
2 BULK LINES	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
3 TRANS1 XFMR	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
4 TRANS1 LINES	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
5 TRANS2TR1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
6 TRANS2BLK SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
7 TRANS2 LINES	0.0	0.02	0.00	0.02	0.000000	0.000000	0	150	0	150	0.0000000	0.0000000
TOTAL TRAN	0.0	0.02	0.00	0.02	0.000000	0.000000	0	150	0	150	0.0000000	0.0000000
8 STR1BLK SD												
9 STR1T1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
10 SRT1T2 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
11 SUBTRANS1 LINES	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
12 STR2T1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
13 STR2T2 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
14 STR2S1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
15 SUBTRANS2 LINES	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
16 STR3T1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
17 STR3T2 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
18 STR3S1 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
19 STR3S2 SD	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
20 SUBTRANS3 LINES	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
21 SUBTRANS TOTAL	0.0	0.00	0.00	0.00	0.000000		0	0	0	0	0.0000000	
22 TRANSMSN LOSS FAC	4,373.0	41.29	165.97	207.26	1.049754	1.049754	24,196,948	329,885	512,093	841,978	1.0360513	1.0360513
DISTRIBUTION SUBST												
TRANS1	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
TRANS2	1,269.7	2.98	2.45	5.43	1.004295	0.000000	7,194,337	26,094	9,238	35,332	1.0049353	0.0000000
SUBTR1	177.5	0.56	0.46	1.03	1.005816	0.000000	992,014	4,943	1,742	6,684	1.0067839	0.0000000
SUBTR2	1,339.2	3.76	3.01	6.78	1.005087	0.000000	7,484,665	32,970	11,359	44,329	1.0059579	0.0000000
SUBTR3	0.0	0.00	0.00	0.00	0.000000	0.000000	0	0	0	0	0.0000000	0.0000000
WEIGHTED AVERAGE	2,786.4	7.3	5.9	13.24	1.004773	1.054764	15,671,017	64,007	22,339	86,345	1.0055404	1.0417915
PRIMARY INTRCHNGE	6.3				1.000000		32,860				1.0000000	
PRIMARY LINES	2,780.1	5.93	53.38	59.31	1.021800	1.077758	15,615,204	51,959	185,168	237,127	1.0154198	1.0578557
LINE TRANSF	1,874.2	34.13	6.30	40.42	1.022043	1.101515	10,645,238	298,950	12,607	311,557	1.0301497	1.0897496
SECONDARY	1,833.8	0.00	2.29	2.29	1.001249	1.102890	10,333,681	0	9,837	9,837	1.0009529	1.0907880
SERVICES	1,831.5	2.35	5.42	7.77	1.004261	1.107589	10,323,844	20,557	23,318	43,874	1.0042679	1.0954434
		==========	==========	==========				==========	==========	==========		
TOTAL SYSTEM		91.04	239.29	330.32				765,657	765,361	1,531,019		

DEVELOPMENT of LOSS FACTORS EXHIBIT 6

UNADJUSTED
DEMAND

LOSS FACTOR LEVEL	CUSTOMER SALES MW a	CALC LOSS TO LEVEL b	SALES MW @ GEN c	CUM EXPANSION FACTORS d	1/d
BULK LINES	0.0	0.0	0.0	0.00000	0.00000
TRANS SUBS	0.0	0.0	0.0	0.00000	0.00000
TRANS LINES	1,368.0	68.1	1,436.1	1.04975	0.95260
SUBTRANS SUBS	0.0	0.0	0.0	0.00000	0.00000
SUBTRANS LINES	0.0	0.0	0.0	0.00000	0.00000
PRIM SUBS	0.0	0.0	0.0	0.00000	0.00000
PRIM LINES	846.6	65.8	912.4	1.07776	0.92785
SECONDARY	1,823.7	196.2	2,019.9	1.10759	0.90286
TOTALS	4,038.3	330.1	4,368.4		

DEVELOPMENT of LOSS FACTORS
UNADJUSTED
ENERGY

LOSS FACTOR LEVEL	CUSTOMER SALES MWH a	CALC LOSS TO LEVEL b	SALES MWH @ GEN c	CUM EXPANSION FACTORS d	1/d
BULK LINES	0	0	0	0.00000	0.00000
TRANS SUBS	0	0	0	0.00000	0.00000
TRANS LINES	7,618,569	274,660	7,893,229	1.03605	0.96520
SUBTRANS SUBS	0	0	0	0.00000	0.00000
SUBTRANS LINES	0	0	0	0.00000	0.00000
PRIM SUBS	0	0	0	0.00000	0.00000
PRIM LINES	4,732,839	273,822	5,006,661	1.05786	0.94531
SECONDARY	10,279,970	981,156	11,261,125	1.09544	0.91287
TOTALS	22,631,378	1,529,637	24,161,015		

ESTIMATED VALUES AT GENERATION

LOSS FACTOR AT VOLTAGE LEVEL	MW	MWH
BULK LINES	0.00	0
TRANS SUBS	0.00	0
TRANS LINES	1,436.07	7,893,229
SUBTRANS SUBS	0.00	0
SUBTRANS LINES	0.00	0
PRIM SUBS	0.00	0
PRIM LINES	912.44	5,006,661
SECONDARY	2,019.93	11,261,125
SUBTOTAL	4,368.44	24,161,015
ACTUAL ENERGY LESS THI	4,372.99	24,196,948
MISMATCH	(4.54)	(35,933)
% MISMATCH	-0.10%	-0.15%

DEVELOPMENT of LOSS FACTORS EXHIBIT 7

ADJUSTED
DEMAND

LOSS FACTOR LEVEL	CUSTOMER SALES MW a	SALES ADJUST b	CALC LOSS TO LEVEL c	SALES MW @ GEN d	CUM EXPANSION FACTORS e	f=1/e
BULK LINES	0.0	0.0	0.0	0.0	0.00000	0.00000
TRANS SUBS	0.0	0.0	0.0	0.0	0.00000	0.00000
TRANS LINES	1,368.0	0.0	68.1	1,436.1	1.04975	0.95260
SUBTRANS SUBS	0.0	0.0	0.0	0.0	0.00000	0.00000
SUBTRANS LINES	0.0	0.0	0.0	0.0	0.00000	0.00000
PRIM SUBS	0.0	0.0	0.0	0.0	0.00000	0.00000
PRIM LINES	846.6	0.0	66.6	913.3	1.07872	0.92703
SECONDARY	1,823.7	0.0	199.9	2,023.7	1.10963	0.90120
TOTALS	4,038.3	0.0	334.7	4,373.0		

DEVELOPMENT of LOSS FACTORS
ADJUSTED
ENERGY

LOSS FACTOR LEVEL	CUSTOMER SALES MWH a	SALES ADJUST b	CALC LOSS TO LEVEL c	SALES MWH @ GEN d	CUM EXPANSION FACTORS e	f=1/e
BULK LINES	0	0	0	0	0.00000	0.00000
TRANS SUBS	0	0	0	0	0.00000	0.00000
TRANS LINES	7,618,569	0	274,660	7,893,229	1.03605	0.96520
SUBTRANS SUBS	0	0	0	0	0.00000	0.00000
SUBTRANS LINES	0	0	0	0	0.00000	0.00000
PRIM SUBS	0	0	0	0	0.00000	0.00000
PRIM LINES	4,732,839	0	278,857	5,011,696	1.05892	0.94436
SECONDARY	10,279,970	0	1,012,053	11,292,023	1.09845	0.91037
TOTALS	22,631,378	0	1,565,570	24,196,948		
			0			

ESTIMATED VALUES AT GENERATION

LOSS FACTOR AT VOLTAGE LEVEL	MW	MWH
BULK LINES	0.00	0
TRANS SUBS	0.00	0
TRANS LINES	1,436.07	7,893,229
SUBTRANS SUBS	0.00	0
SUBTRANS LINES	0.00	0
PRIM SUBS	0.00	0
PRIM LINES	913.26	5,011,696
SECONDARY	2,023.66	11,292,023
	4,372.99	24,196,948
ACTUAL ENERGY LESS THIF	4,372.99	24,196,948
MISMATCH	0.00	0
% MISMATCH	0.00%	0.00%

Adjusted Losses and Loss Factors by Facitliy

EXHIBIT 8

Unadjusted Losses by Segment

	MW	MWH
Service Drop Losses	7.76	43,805
Secondary Losses	2.28	9,822
Line Transformer Losses	40.36	311,068
Primary Line Losses	59.23	236,754
Distribution Substation Losses	13.22	86,210
Transmission System Losses	207.26	841,978
Total	330.11	1,529,637

Mismatch Allocation by Segment

	MW	MWH
Service Drop Losses	-0.29	(2,289)
Secondary Losses	-0.08	(513)
Line Transformer Losses	-1.49	(16,254)
Primary Line Losses	-2.19	(12,371)
Distribution Substation Losses	-0.49	(4,505)
Transmission System Losses	0.00	0
Total	-4.54	(35,933)

Adjusted Losses by Segment

	MW	MWH
Service Drop Losses	8.05	46,094
Secondary Losses	2.37	10,335
Line Transformer Losses	41.85	327,322
Primary Line Losses	61.42	249,126
Distribution Substation Losses	13.70	90,714
Transmission System Losses	207.26	841,978
Total	334.65	1,565,570

Loss Factors by Segment

Retail Sales from Service Drops	1,823.72	10,279,970
Adjusted Service Drop Losses	8.05	46,094
Input to Service Drops	1,831.76	10,326,064
Service Drop Loss Factor	**1.00441**	**1.00448**
Output from Secondary	1,831.76	10,326,064
Adjusted Secondary Losses	2.37	10,335
Input to Secondary	1,834.13	10,336,399
Secondary Loss Factor	**1.00129**	**1.00100**
Output from Line Transformers	1,834.13	10,336,399
Adjusted Line Transformer Losses	41.85	327,322
Input to Line Transformers	1,875.98	10,663,721
Line Transformer Loss Factor	**1.02282**	**1.03167**
Retail Sales from Primary	844.81	4,722,804
Req. Whls Sales from Primary	1.80	10,035
Input to Line Transformers	1,875.98	10,663,721
Output from Primary Lines	2,722.60	15,396,561
Adjusted Primary Line Losses	61.42	249,126
Input to Primary Lines	2,784.01	15,645,687
Primary Line Loss Factor	**1.02256**	**1.01618**
Output from Distribution Substations	2,784.01	15,645,687
Adjusted Distribution Substation Losses	13.70	90,714
Input to Distribution Substations	2,797.72	15,736,401
Distribution Substation Loss Factor	**1.00492**	**1.00580**
Retail Sales at from Transmission	1,326.61	7,416,224
Req. Whls Sales from Transmission	41.40	202,345
Non-Req. Whls Sales from Transmission	0.00	0
Third Party Wheeling Losses	0.000	0
Input to Distribution Substations	2,797.72	15,736,401
Output from Transmission	4,165.72	23,354,970
Adjusted Transmission System Losses	207.26	841,978
Input to Transmission	4,372.99	24,196,948
Transmission System Loss Factor	**1.04975**	**1.03605**

DEMAND MW **SUMMARY OF LOSSES AND LOSS FACTORS BY DELIVERY VOLTAGE** **EXHIBIT 9**

	SERVICE LEVEL		SALES MW	LOSSES	SECONDARY	PRIMARY	SUBSTATION	SUBTRANS	TRANSMISSION
1	**SERVICES**								
2	SALES		1,823.7		1,823.7				
3	LOSSES			8.0	8.0				
4	INPUT				1,831.8				
5	**EXPANSION FACTOR**	**1.00441**							
6	**SECONDARY**								
7	SALES								
8	LOSSES			2.4	2.4				
9	INPUT				1,834.1				
10	**EXPANSION FACTOR**	**1.00129**							
11	**LINE TRANSFORMER**								
12	SALES								
13	LOSSES			41.9	41.9				
14	INPUT				1,876.0				
15	**EXPANSION FACTOR**	**1.02282**							
16	**PRIMARY**								
17	SECONDARY				1,876.0				
18	SALES		846.6			846.6			
19	LOSSES			61.4	42.3	19.1			
20	INPUT								
21	**EXPANSION FACTOR**	**1.02256**							
22	**SUBSTATION**								
23	PRIMARY				1,918.3	865.7			
24	SALES		0.0				0.0		
25	LOSSES			13.7	9.4	4.3	0.0		
26	INPUT				1,927.7	870.0	0.0		
27	**EXPANSION FACTOR**	**1.00492**							
28	**SUB-TRANSMISSION**								
29	DISTRIBUTION SUBS								
30	SALES								
31	LOSSES								
32	INPUT								
33	**EXPANSION FACTOR**								
34	**TRANSMISSION**								
35	SUBTRANSMISSION								
36	DISTRIBUTION SUBS				1,927.7	870.0	0.0		
37	SALES		1,368.0						1,368.0
38	LOSSES			207.3	95.9	43.3	0.0		68.1
39	INPUT				2,023.7	913.3	0.0		1,436.1
40	**EXPANSION FACTOR**	**1.04975**							
41	**TOTALS** LOSSES			334.7	199.9	66.6	0.0		68.1
42	% OF TOTAL			100%	59.75%	19.91%	0.00%		20.34%
43	SALES		4,038.3		1,823.7	846.6	0.0		1,368.0
44	% OF TOTAL		100.00%		45.16%	20.96%	0.00%		33.88%
45	INPUT		4,373.0		2,023.7	913.3	0.0		1,436.1
46	**CUMMULATIVE EXPANSION LOSS FACTORS** (from meter to system input)				**1.10963**	**1.07872**	**NA**		**1.04975**

ENERGY MWH **SUMMARY OF LOSSES AND LOSS FACTORS BY DELIVERY VOLTAGE** **EXHIBIT 9**

	SERVICE LEVEL		SALES	LOSSES	SECONDARY	PRIMARY	SUBSTATION	SUBTRANS	TRANSMISSION	
1	**SERVICES**									
2	SALES		10,279,970		10,279,970					
3	LOSSES			46,094	46,094					
4	INPUT				10,326,064					
5	**EXPANSION FACTOR**	**1.00448**								
6	**SECONDARY**									
7	SALES									
8	LOSSES			10,335	10,335					
9	INPUT				10,336,399					
10	**EXPANSION FACTOR**	**1.00100**								
11	**LINE TRANSFORMER**									
12	SALES									
13	LOSSES			327,322	327,322					
14	INPUT				10,663,721					
15	**EXPANSION FACTOR**	**1.03167**								
16	**PRIMARY**									
17	SECONDARY				10,663,721					
18	SALES		4,732,839.453			4,732,839				
19	LOSSES			249,126	172,546	76,580				
20	INPUT									
21	**EXPANSION FACTOR**	**1.01618**								
22	**SUBSTATION**									
23	PRIMARY				10,836,267	4,809,420				
24	SALES		0				0			
25	LOSSES			90,714	62,829	27,885	0			
26	INPUT				10,899,096	4,837,305	0			
27	**EXPANSION FACTOR**	**1.00580**								
28	**SUB-TRANSMISSION**									
29	DISTRIBUTION SUBS									
30	SALES									
31	LOSSES									
32	INPUT									
33	**EXPANSION FACTOR**									
34	**TRANSMISSION**									
35	SUBTRANSMISSION									
36	DISTRIBUTION SUBS				10,899,096	4,837,305	0			
37	SALES		7,618,569						7,618,569	
38	LOSSES			841,978	392,927	174,391	0		274,660	
39	INPUT				11,292,023	5,011,696	0		7,893,229	
40	**EXPANSION FACTOR**	**1.03605**								
41	**TOTALS**	LOSSES		1,565,570	1,012,053	278,857	0		274,660	
42		% OF TOTAL		100%	64.64%	17.81%	0.00%		17.54%	
43		SALES	22,631,378		10,279,970	4,732,839	0		7,618,569	
44		% OF TOTAL	100.00%		45.42%	20.91%	0.00%		33.66%	
45		INPUT	24,196,948		11,292,023	5,011,696	0		7,893,229	
46	**CUMMULATIVE EXPANSION LOSS FACTORS** (from meter to system input)				**1.09845**	**1.05892**	**NA**		**1.03605**	

Appendix C

Discussion of Hoebel Coefficient

COMMENTS ON HOEBEL COEFFICIENTS

The Hoebel constant represents an established industry standard relationship between peak losses and average losses and is used in a loss study to estimate energy losses from peak demand losses. H. F. Hoebel described this relationship in his article, "Cost of Electric Distribution Losses," Electric Light and Power, March 15, 1959. A copy of this article is attached.

Within any loss evaluation study, peak demand losses can readily be calculated given equipment resistance and approximate loading. Energy losses, however, are much more difficult to determine given their time-varying nature. This difficulty can be reduced by the use of an equation which relates peak load losses (demand) to average losses (energy). Once the relationship between peak and average losses is known, average losses can be estimated from the known peak load losses.

Within the electric utility industry, the relationship between peak and average losses is known as the loss factor. For definitional purposes, loss factor is the ratio of the average power loss to the peak load power loss, during a specified period of time. This relationship is expressed mathematically as follows:

$$(1)\ F_{LS} = \frac{A_{LS}}{P_{LS}}$$

where: F_{LS} = Loss Factor
A_{LS} = Average Losses
P_{LS} = Peak Losses

The loss factor provides an estimate of the degree to which the load loss is maintained throughout the period in which the loss is being considered. In other words, loss factor is the ratio of the actual kWh losses incurred to the kWh losses which would have occurred if full load had continued throughout the period under study.

Examining the loss factor expression in light of a similar expression for load factor indicates a high degree of similarity. The mathematical expression for load factor is as follows:

$$(2)\ F_{LD} = \frac{A_{LD}}{P_{LD}}$$

where: F_{LD} = Load Factor
A_{LD} = Average Load
P_{LD} = Peak Load

This load factor result provides an estimate of the degree to which the load loss is maintained throughout the period in which the load is being considered. Because of the similarities in definition, the loss factor is sometimes called the "load factor of losses." While the definitions are similar, a strict equating of the two factors cannot be made. There does exist, however, a relationship between these two factors which is dependent upon the shape of the load duration curve. Since resistive losses vary as the square of the load, it can be shown mathematically that the loss factor can vary between the extreme limits of load factor and load factor squared. The

relationship between load factor and loss factor has become an industry standard and is as follows:

$$(3)\ F_{LS} \doteq H*F_{LD}^2 + (1-H)*F_{LD}$$

where: F_{LS} = Loss Factor
F_{LD} = Load Factor
H = Hoebel Coefficient

As noted in the attached article, the suggested value for H (the Hoebel coefficient) is 0.7. The exact value of H will vary as a function of the shape of the utility's load duration curve. In recent years, values of H have been computed directly for a number of utilities based on EEI load data. It appears on this basis, the suggested value of 0.7 should be considered a lower bound and that values approaching unity may be considered a reasonable upper bound. Based on experience, values of H have ranged from approximately 0.85 to 0.95. The standard default value of 0.9 is generally used.

Inserting the Hoebel coefficient estimate gives the following loss factor relationship using Equation (3):

$$(4)\ F_{LS} \doteq 0.90*F_{LD}^2 + 0.10*F_{LD}$$

Once the Hoebel constant has been estimated and the load factor and peak losses associated with a piece of equipment have been estimated, one can calculate the average, or energy losses as follows:

$$(5)\ A_{LS} \doteq P_{LS} * [H*F_{LD}^2 + (1-H)*F_{LD}]$$

where: A_{LS} = Average Losses
P_{LS} = Peak Losses
H = Hoebel Coefficient
F_{LD} = Load Factor

Loss studies use this equation to calculate energy losses at each major voltage level in the analysis.