BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Energy Efficiency and Peak Demand Reduction Program Portfolio of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company	**Case No. 09-951-EL-EEC** **09-952-EL-EEC** **09-953-EL-EEC**

APPLICATION

Pursuant to R.C. 4928.66(A)(2)(d) and Section E.6.a. of the Stipulation and Recommendation filed February 19, 2009 in Case No. 08-935-EL-SSO, Ohio Edison Company, The Cleveland Electric Illuminating Company ("CEI") and The Toledo Edison Company (collectively, "Companies") request approval of the transmission and distribution ("T&D") projects listed on attached Exhibits C and E, respectively, for inclusion as part of their compliance with the energy efficiency benchmarks set forth in R.C. 4928.66(A)(1)(a). In support of this Application, the Companies state:

I. BACKGROUND

1. Each of the Companies is an electric distribution utility ("EDU") as that term is defined in R.C. 4928.01(A)(6).
2. R.C. 4928.66(A)(1)(a) requires an EDU, starting in 2009, to "implement energy efficiency programs that achieve energy savings equivalent to at least three-tenths of one percent of the total annual average, and normalized kilowatt-hour sales of the [EDU] during the preceding three calendar years to customers in this state."[1]

[1] Additional reductions required in subsequent years are not the subject of this application.

3. R.C. 4928.66(A)(2)(d) permits a utility to include, for purposes of compliance with the aforementioned statutorily mandated energy efficiency benchmark, "transmission and distribution infrastructure improvements that reduce line losses."
4. As part of their overall compliance strategy for 2009 and thereafter, the Companies intend to incorporate various T&D infrastructure improvement projects that they have completed between 2006 and 2009. Projects completed from January 1, 2009 through December 31, 2009 are included in this Application.[2]
5. These projects are only one aspect of the Companies' compliance strategy, which also currently contemplates new and historic mercantile customer projects, existing residential and other energy efficiency projects, and new projects that will be reviewed by a collaborative of interested stakeholders.
6. The use of the T&D projects is an important aspect of the Companies' overall compliance plan. Not only do these projects provide very real energy efficiency results, but they have virtually no incremental compliance costs associated with these particular projects – something that is especially critical during the economic crisis currently faced by Ohioans. The Companies are not seeking cost recovery for these projects in this filing.
7. Because the Companies must comply with 2009 energy efficiency benchmarks by December 31, 2009, the Companies respectfully request that the Commission rule on this Application no later than November 15, 2009.

[2] *Projects completed prior to January 1, 2009 are pending approval in a separate docket in Case Nos. 09-*384-EL-EEC, 09-385-EL-EEC and 09-386-EL-EEC.

II. APPLICABLE PROJECTS

8. Inherent in the operation of a power system is the loss of a portion of the power being transmitted due to the electrical resistance of the various elements within the power system (e.g., conductors, transformers and regulators.) The transmission of power at various voltage levels throughout the power system has different levels of losses attributable to the delivery of the power. The farther through the system the power must travel, the greater the loss component associated with the transfer. There are various system improvements that, if made, can reduce the amount of line losses, including, as examples, the re-conductoring of lines, substation improvements, the addition of capacitor banks and the replacement of regulators.

9. A typical re-conductoring project involves the replacement of existing wires with larger wires between either the transmission towers or distribution poles. Re-conductoring projects reduce line losses by lowering the resistance of the system through which energy flows, such that the power consumed to transmit that energy – or line loss – is lowered. Re-conductoring projects are analogous to improving traffic flow on a highway by adding an extra traffic lane.

10. Substation projects typically include tying together previously unconnected transmission or distribution lines, and/or the addition or upgrade of transformers and circuits in new or existing locations. These projects generally improve efficiency, and thus reduce line losses, by providing an additional energy transformation point closer to the load center. As a result, a greater portion of the energy flows across high-voltage lines instead of lower-voltage lines. This is analogous to driving along a fast-moving interstate highway and being able to exit closer to your destination rather than driving on a slower, secondary road to reach the exit. The addition of new

circuits on a distribution substation results in the transfer of load from one substation to another that is closer to the source, thus improving overall system operations. New distribution circuits are analogous to providing a new exit ramp along the highway closer to your destination.

11. Typical transmission capacitor bank projects include the addition or expansion of large capacitor banks at a substation location. These projects involve reducing line losses by placing reactive sources at, or near, a load center. By doing so, a portion of the reactive load no longer travels across the entire transmission system, over which line losses occur. Typical distribution capacitor bank projects include the addition of capacitor banks, or a series of banks, in parallel at a substation location or on distribution poles along the circuit. These projects involve reducing line losses by placing reactive sources at or near a load center. The addition or upgrade of transmission and distribution capacitor banks can be compared to smoothing out the hills and valleys along a highway for more efficient travel.

12. A typical distribution voltage regulation project involves the replacement of existing equipment with larger and/or more efficient equipment. These projects improve the energy efficiency of the distribution system by reducing the losses and heating associated with smaller equipment. As a result of the upgrades, the distribution system transfers electricity more efficiently to the customer. This is similar to the re-conductoring projects discussed above and is also analogous to improving traffic flow on a highway by adding an extra lane.

13. The Companies have made or will make some of the aforementioned types of improvements on their T&D systems during the period January 1, 2009 through December 31, 2009. Transmission- and distribution-related projects are listed on

attached Exhibits C and E, respectively. As indicated on attached Exhibit A, the completion of these projects results in a total annual contribution to energy efficiency savings in 2009 of 17,366 megawatt hours ("MWhs") for the Companies generally, and more specifically, 10,587 MWhs for Ohio Edison Company; 3,084 MWhs for CEI; and 3,696 MWhs for The Toledo Edison Company.[3] These annualized savings are based on models which are discussed in attached Exhibit B and which are consistent with those commonly used in the industry and/or by NERC.

14. Attached in support of this Application are the following exhibits:

Exhibit A:	A summary of Loss Reductions by Company, along with the allocation factors used to allocate transmission loss reductions among the Companies.[4]
Exhibit B:	A description of the methodology used to determine the Loss Factors for both transmission and distribution projects.
Exhibit C:	List of Transmission Projects included for consideration
Exhibit D:	Project summaries for the Transmission Projects (five pages)
Exhibit E:	List of Distribution Projects included for consideration (three pages)
Exhibit F:	Project summaries for the Distribution Projects (seven pages)

III. CONCLUSION

15. Based upon the foregoing, the Companies respectfully request that the Commission approve the energy savings set forth on attached Exhibit A for each of the Companies

[3] The Company will provide updated results in their filings required by proposed Section 4901:1-39-04(A) of the Ohio Administrative Code.

[4] Because losses occur at various points on the transmission system and the transmission system encompasses all three of the Companies' respective service territories, the loss reductions were allocated based on their individual line miles as a percent of the total FirstEnergy system line miles.

as part of their respective energy efficiency compliance with the energy efficiency reductions required in R.C. 4928.66(A)(1)(a) for 2009 and thereafter.

Respectfully submitted,

Kevin P. Shannon /NTA (0080713)

Kathy J. Kolich (Attorney No. 0038855)
FIRSTENERGY SERVICE COMPANY
76 South Main Street
Akron, OH 44308
Telephone: (330) 384-4580
Facsimile: (330) 384-3875
kjkolich@firstenergycorp.com

James F. Lang (0059668)
Kevin P. Shannon (0084095)
CALFEE, HALTER & GRISWOLD LLP
1400 KeyBank Center
800 Superior Ave.
Cleveland, OH 44114
(216) 622-8200
(216) 241-0816 (fax)
jlang@calfee.com
kshannon@calfee.com

ATTORNEYS FOR APPLICANTS, OHIO EDISON COMPANY, THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, AND THE TOLEDO EDISON COMPANY

Exhibit A

Summary of Energy Savings from Transmission and Distribution Projects

Projects placed in service 2009 (a)
Case No. TBD

(In MWhs)

	OE	CEI	TE	Total
Transmission System Annualized Energy Savings (b)	10,387	2,933	2,709	16,030
Distribution System Annualized Energy Savings	200	150	987	1,336
Total Energy Savings	10,587	3,084	3,696	**17,366**

(a) For Transmission project listing & sample projects, see Exhibit C and D; for Distribution project listing & sample projects, see Exhibit E and F

(b) Allocation of transmission energy savings is based on transmission line miles within each operating company compared to total FirstEnergy (Ohio) transmission line miles

	OE	CEI	TE
Loss Allocation %	64.80%	18.30%	16.90%

Exhibit B

Methodology for Determination of Energy Efficiency Savings on the Transmission and Distribution Systems

The calculation of energy efficiency savings associated with Transmission and Distribution infrastructure improvement projects is performed by modeling and documenting the pre-project and post-project electrical system parameters in a load flow analysis tool. The load flow analysis tool contains data base models that reflect the current and/or historic parameters of the electrical system. These tools are used to model the electrical grid at various system conditions and provide the electrical load flows resulting from those conditions. The measurement of the load flows throughout the electrical system, both before and after the improvements, allows for the calculation of the reduction in total losses in the system associated with the improvement projects.

DETERMINATION OF LINE LOSSES – GENERAL

For both the transmission and distribution systems, the loss factor is the ratio of the total system losses associated with supply to a specific voltage class, to the total system load connected to that voltage class. Ohio Edison Company, The Cleveland Electric Illuminating Company and The Toledo Edison Company (collectively, "Companies") use various modeling and analytic software tools to determine, among other things, line losses on various parts of the transmission and distribution systems. Transmission losses were determined by using PSLF (Positive Sequence Load Flow) software, a General Electric software product. Information on this software package can be found at http://www.gepower.com/prod_serv/products/utility_software/en/ge_pslf/index.htm, which is incorporated herein by reference. Distribution losses were determined through the use of Milsoft – Windmill. Background information on this software tool can be found at https://milsoft.com/smart-grid/windmill/analysis-funcitons, which is also incorporated herein by reference. The Companies determined the reduction in line losses on both the transmission and distribution systems by modeling both before and after scenarios, with the former representing conditions on the system prior to the identified project being implemented, and the latter representing conditions on the system after the project was complete.

In order to model these various scenarios, three critical values had to be determined: (i) Peak-Load Coincident Factor; (ii) Load Factor; and (iii) Loss Factor. The Peak-Load Coincident Factor is defined as the portion of a demand that contributes to the peak load. The Load Factor is defined as the average demand for a time period divided by the maximum demand for the same time period. And the Loss Factor is defined as the average losses for a time period divided by the maximum losses for the same time period. System losses are comprised of two major components that can generally be characterized as (i) no-load losses; and (ii) load losses. The no-load losses never vary. Load losses, on the other hand, vary with the amount of current being carried in the system. The more current that flows over a wire, the hotter the wire gets, expelling energy. This relationship of lost energy varies with the square of the current; so if the current is doubled, the losses increase by a factor of four. Similarly, if the current is reduced to half of its original value, the losses decrease by a factor of four. The method for determining these values for both the transmission and distribution systems is set forth below.

TRANSMISSION SYSTEM

When studying transmission system losses, it is necessary to determine the total energy consumed by losses over a given period of time, such as one year. It is not practical to perform an hour-by-hour evaluation of the losses. Therefore, the FE Companies, following an IEEE methodology, converted the losses evaluated at the peak hour into an average number that can be multiplied by the hours in a year to determine an annual loss factor. For a detailed discussion of the conversion methodology used, *see "The Equivalent Hours Loss Factor Revisited"*, Stone & Webster Management Consultants, (1988), which is incorporated herein by reference.

In order to determine the loss factor, the system load factor first needed to be calculated. Applying the IEEE methodology described above, the FE Companies obtained hourly load data through their energy management system. The system load factor is essentially the average load on the line over the period of time considered, which in this case was one year. It is determined by normalizing all the hourly load values so that the highest value (system peak hour) is 1.000, with all other hours being assigned values less than one. The normalized values were then summed and divided by the number of values used. This approach provides a way to convert the peak hour load for a year into a yearly total energy quantity.

The system loss factor calculation is then done by performing the same calculations as described above, except that the normalized values are squared before summing. This allows the user to evaluate the losses at the peak hour and still use the factor to obtain an energy value for the entire year.

DISTRIBUTION SYSTEM

The Peak-Load Coincident Factor was determined by first selecting a set of circuits to sample; and second, determining the top-five peak load periods for the overall distribution system. Using this information, the Companies determined the demand at each of the peak load periods as a percentage of the load's peak demand, taking the average of the results. For purposes of this calculation, the Companies studied a sample set of 98 Ohio distribution circuits, calculating the peak load coincidence factors at the operating company level based on the top-five peak load times.

The Load Factor was determined by using the same sample of 98 circuits and averaging the individual circuit load factors, using each circuit's average load as a weighting factor.

The Loss Factor was calculated by averaging the loss factor on each of the sample circuits, which was determined through the use of the following standard formula: (0.15 * Load Factor) + (0.85 * (Load Factor)^2) [David Farmer, *Distribution Planning*, Synergetic Design, Engineering Consultants, p. 26 (2008).]

Capacitor additions are calculated in two methods. For substation located (single location) capacitor banks, the same calculation applicable for distribution projects is applicable. For the distributed line capacitor additions, the line losses are determined through a different process. Distribution line capacitors reduce load losses by reducing the reactive portion of the current flow in the distribution lines and station power transformers. The Companies sampled 48 of their 161 existing capacitor banks and found that loss savings benefits ranged from a negligible change to as much as 8 kW/100 kVAR. Taking the average of all of the circuits studied, results in a 2.0 kW per 100 kVAR of capacitor additions at circuit peak load.

Exhibit C

FE-Ohio Transmission Level Projects

Based on new transmission facilities placed in service 2009.
Case No. TBD

A (column descriptions below)	B	C	D	E	F (D - E)	G
Ohio Projects	Pri KV	Actual In Service Date	FE-Ohio Total Losses (Before)	FE-Ohio Total Losses (After)	2009 MW Loss Reduction	2009 Annualized MWH Loss Reduction
RE-CONDUCTORINGS						
1 Cardington-Tangy 69kV line - Phase 3 - 2009 R/C	69	12/31/2009	408.105	407.404	0.701	2,598
TRANSMISSION SUBSTATIONS						
2 Avon 92-AV-T New Transformer	345	6/1/2009	409.903	407.404	2.499	9,260
TRANSMISSION CAP BANKS						
3 Babb (50 MVAR) (6/09)	138	6/1/2009	408.134	407.404	0.73	2,705
4 Lakeview 34.5 kV Cap Bank (18.9 MVAR) (11/08)	34.5	11/1/2009	407.404	407.106	0.298	1,104
5 Hubbard Sub - Add 23 kV, 7.2 Mvar capacitor bank	23	6/1/2009	407.404	407.306	0.098	363
		Total		Total	4.326	16,030

Column Description

- **A** Project description (see **Exhibit D** for projects detail)
- **B** Primary voltage
- **C** *Date project was put into service*
- **D** FE-Total Losses Before - system modeled using PSLF software prior to project completion. For a description of the system, see http://www.gepower.com/prod_serv/products/utility_software/en/ge_pslf/index.htm
- **E** FE-Total Losses After - system modeled using PSLF software after project completion
- **F** MW Loss Reduction (column D - column E)
- **G** *Calculation of MWhs*
  Formula: MW Loss Reduction x Average Loss Factor x 8760

FE-Ohio Transmission Level Projects **Exhibit D-1**

Reconductor Project
1. Cardington-Tangy 69 kV line – Phase 3 - 2009
Case No. TDB

Project Description:
This is the third step of a 3-step plan (2009 portion is final) of the Cardington -Tangy 69kV R/C project. The entire Cardington-Tangy 69kV line will be 336.4 ACSR conductor and remain built to operate at 69 kV. Reconductor 3/0 ACSR and 1/0 ACSR from Hartford Tap to Marengo Tap with 336.4 ACSR. Total length = 8.87 mi.

How loss values were obtained:
Used GE-PSLF software to perform analysis:
Utilized a 2009 Summer Peak load flow case.

Note: This case would have had the project to reconductor the line already modeled into the analysis since the project was completed in 2009.

Solved the case and obtained the loss report for the applicable areas/zones.

Losses (post-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.463 MW
Zone 1235 (Penn Power) – 33.059 MW
Difference (losses in FE-Ohio footprint only) – 407.404 MW

Utilized a 2009 Summer Peak load flow case.
Changed parameters of Cardington-Tangy 69 kV line from:

Hartford tap (HART +, bus # 240606) – Oxford (SROXFORD, bus # 240608)
R = 0.03220 X = 0.11510 B = 0
Oxford (SROXFORD, bus # 240608) – Marengo tap (MARENGO+, bus # 240626)
R = 0.00328 X = 0.01175 B = 0

to the former values (what it would have been prior to change in conductor to 336.4 ACSR) of:

Hartford tap (HART +, bus # 240606) – Oxford (SROXFORD, bus # 240608)
R = 0.09960 X = 0.13730 B = 0
Oxford (SROXFORD, bus # 240608) – Marengo tap (MARENGO+, bus # 240626)
R = 0.04280 X = 0.00400 B = 0

Re-solved the case and obtained loss report for the applicable areas/zones.

Losses (pre-project):

Area 202 – which includes Zone 1235 (Penn Power) – 441.165 MW
Zone 1235 (Penn Power) – 33.06 MW
Difference (losses in FE-Ohio footprint only) – 408.105 MW

MW Loss Savings:
The difference in losses (pre-project less post project values) is the net loss savings

Pre-project losses –	408.105 MW
Post-project losses –	407.404 MW
Loss Savings –	0.701 MW

FE-Ohio Transmission Level Projects

Exhibit D-2

Transmission Substation Project
2. Avon 92-AV-T New Transformer
Case No. TBD

Project Description:
This project is the addition of a new autotransformer, 92-AV-T, operating in parallel with existing unit (91-AV-T). This will involve the addition of new circuit breakers on both the 138 and 345 kV sides of the existing transmission substation.

How loss values were obtained:
Used GE-PSLF software to perform analysis:
Utilized a 2009 Summer Peak load flow case.

Note: This case would have had the project to add the new transformer already modeled into the analysis since the project was completed prior to summer 2009.

Solved the case and obtained the loss report for the applicable areas/zones.

Losses (post-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.463 MW
Zone 1235 (Penn Power) – 33.059 MW
Difference (losses in FE-Ohio footprint only) – 407.404 MW

Utilized a 2009 Summer Peak load flow case.
To simulate the pre-project condition, we had to switch off (change status to "0") the transformer #92 at the Avon substation between the 345 and 138 kV bus

Avon Substation 345 kV is bus #: 238551, bus name: "02AVON"
Avon Substation 138 kV is bus #: 238552, bus name: "02AVON"

The transformer between the two bus is identified with a circuit id of "92 "

Re-solved the case and obtained loss report for the applicable areas/zones.

Losses (pre-project):

Area 202 – which includes Zone 1235 (Penn Power) – 442.974 MW
Zone 1235 (Penn Power) – 33.071 MW
Difference (losses in FE-Ohio footprint only) – 409.903 MW

MW Loss Savings:
The difference in losses (pre-project less post project values) is the net loss savings

Pre-project losses –	409.903 MW
Post-project losses –	407.404 MW
Loss Savings –	2.499 MW

FE-Ohio Transmission Level Projects **Exhibit D-3**
Transmission Capacitor Bank
3. Babb Capacitor Bank (50 MVAR)
Case No. TBD

Project Description:
Install a 50 MVAR, 138 kV capacitor bank at Babb Substation.

How loss values were obtained:
Used GE-PSLF software to perform analysis:
Utilized a 2009 Summer Peak load flow case.

Note: This case would have had the project to add the 50 MVAR, 138 kV capacitor bank already modeled into the analysis since the project is scheduled to be completed prior to summer 2009.

Solved the case and obtained the loss report for the applicable areas/zones.

Losses (post-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.463 MW
Zone 1235 (Penn Power) – 33.059 MW
Difference (losses in FE-Ohio footprint only) – 407.404 MW

Utilized a 2009 Summer Peak load flow case.
To simulate the pre-project condition, we had to switch off (change status to "0") the SVD at the Babb 138 kV bus

Babb Substation is bus #: 238560, bus name "02BABB" that has a SVD with an id of "V"
The SVD is modeled as 1 steps of 47.5 MVAR

B Step = 0.475
No of steps = 1

* SVD stands for Static VAR Device - A controlled shunt consists of switched and/or continuously-controlled shunt elements whose admittance is adjusted in order to regulate the voltage at a bus

Ré-solved the case and obtained loss report for the applicable areas/zones.

Losses (pre-project):

Area 202 – which includes Zone 1235 (Penn Power) – 441.221 MW
Zone 1235 (Penn Power) – 33.087 MW
Difference (losses in FE-Ohio footprint only) – 408.134 MW

MW Loss Savings:
The difference in losses (pre-project less post project values) is the net loss savings

Pre-project losses –	408.134 MW
Post-project losses –	407.404 MW
Loss Savings –	0.730 MW

<u>FE-Ohio Transmission Level Projects</u> **Exhibit D-3**

Transmission Capacitor Bank
4. Lakeview 34 kV Capacitor Bank (18.9 MVAR)
Case No. TBD

Project Description:
Install 1 - 18.9 MVAR, 34.5 kV capacitor bank and 1 – 34.5 kV breaker at Lakeview Substation.

How loss values were obtained:
Used GE-PSLF software to perform analysis:
Utilized a 2009 Summer Peak load flow case.

Note: This case needed to have the project to add a 18.9 MVAR, 34.5 kV capacitor bank at Lakeview substation modeled into the analysis since the project was not scheduled to be completed prior to summer 2009.

Solved the case and obtained the loss report for the applicable areas/zones.

Losses (post-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.165 MW
Zone 1235 (Penn Power) – 33.059 MW
Difference (losses in FE-Ohio footprint only) – 407.106 MW

Utilized a 2009 Summer Peak load flow case.
To simulate the pre-project condition, we had to add a SVD (with a status of "1") at the Lakeview 34.5 kV bus

Lakeview Substation is bus #: 240751, bus name "LAKEVW" that has a SVD with an id of "v"
The SVD is modeled as 1 step of 18.9 MVAR

B Step = 0.189
No of steps = 1

* SVD stands for Static VAR Device - A controlled shunt consists of switched and/or continuously-controlled shunt elements whose admittance is adjusted in order to regulate the voltage at a bus

Re-solved the case and obtained loss report for the applicable areas/zones.

Losses (pre-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.463MW
Zone 1235 (Penn Power) – 33.059 MW
Difference (losses in FE-Ohio footprint only) – 407.404 MW

MW Loss Savings:
The difference in losses (pre-project less post project values) is the net loss savings

Pre-project losses –	407.404 MW
<u>Post-project losses –</u>	<u>407.106 MW</u>
Loss Savings –	0.298 MW

<u>FE-Ohio Transmission Level Projects</u> **Exhibit D-3**

Transmission Capacitor Bank
5. Hubbard Sub - Add 23 kV 7.2 MVAR Capacitor Bank
Case No. TBD

Project Description:
Add 23 kV, 7.2 MVAR capacitor bank with reactor at Hubbard Substation. The project will require the substation fence as well as the 23kV bus be expanded. Substation expansion should include enough space for a future additional cap bank with reactor in future. An additional bus sectionalizing switch was also required.

How loss values were obtained:
Used GE-PSLF software to perform analysis:
Utilized a 2009 Summer Peak load flow case.

Note: This case would have had the project to add a 23 kV, 7.2 MVAR capacitor bank at Hubbard Substation already modeled into the analysis since the project is scheduled to be completed prior to summer 2009.

Solved the case and obtained the loss report for the applicable areas/zones.

Losses (post-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.319 MW
Zone 1235 (Penn Power) – 33.013 MW
Difference (losses in FE-Ohio footprint only) – 407.306 MW

Utilized a 2009 Summer Peak load flow case.
To simulate the pre-project condition, we had to switch off (change status to "0") the SVD at the Hubbard 23 kV bus

Harding Substation is bus #: 240134, bus name "HUBBARD" that has a SVD with an id of "v"
The SVD is modeled as 1 steps of 7.2 MVAR

B Step = 0.072
No of steps = 2

* SVD stands for Static VAR Device - A controlled shunt consists of switched and/or continuously-controlled shunt elements whose admittance is adjusted in order to regulate the voltage at a bus

Re-solved the case and obtained loss report for the applicable areas/zones.

Losses (pre-project):

Area 202 – which includes Zone 1235 (Penn Power) – 440.463 MW
Zone 1235 (Penn Power) – 33.059 MW
Difference (losses in FE-Ohio footprint only) – 407.404 MW

MW Loss Savings:
The difference in losses (pre-project less post project values) is the net loss savings

Pre-project losses –	407.404 MW
Post-project losses –	407.306 MW
Loss Savings –	0.098 MW

Ohio Edison Distribution Level Projects

Based on new distribution facilities placed in service 2009.
Case No. TBD

Exhibit E
(1 of 3)

A (column descriptions below)	B	C	D
		2009	2009 Annualized
Project Name	Actual In Service Date	Peak Loss Reduction MW	Loss Reduction MWhs
RECONDUCTORING			
6 OE-Southington exit reconductor.	8/7/2009	0.073	200
Total 2009 Loss Reductions - Distribution Projects		0.073	200

Column Description

A Project description (see Exhibit F for sample projects)

B Date project was put into service

C MW Loss Reduction - Losses Before minus Losses After modeled in Milsoft engineering software. For a description, see https://milsoft.com/smart-grid/windmill/analysis-funcitons

D Calculation of MWhs
Formula: MW Loss Reduction x Average Loss Factor x 8760
Loss Factor = 31.2%; derivation based on annual calculation of load factor and associated loss factor.

(a) As explained in the Application, loss reductions were based on a 2kW loss per 100 kVAR. The MWh conversion is as described in (D) above.

Toledo Edison Distribution Level Projects
Based on new distribution facilities placed in service 2009.
Case No. TBD

Exhibit E
(2 of 3)

	A	B	C	D
			2009	2009
				Annualized
		Actual	Peak	Loss
		In Service	Loss Reduction	Reduction
	Project Name	**Date**	**MW**	**MWhs**
SUBSTATIONS				
44	Levis Park - Install 2nd Mod Sub	6/29/2009	0.040	109
45	Lime City - Install 2nd Mod Sub	5/22/2009	0.321	877
	Total 2009 Loss Reductions - Distribution Projects		0.361	987

Column Description

A Project description (see Exhibit F for sample projects)
B Date project was put into service
C MW Loss Reduction - Losses Before minus Losses After modelled in Milsoft engineering software.
D Calculation of MWhs
Formula: MW Loss Reduction x Average Loss Factor x 8760
Loss Factor = 31.2%; derivation based on annual calculation of load factor and associated loss factor.

(a) As explained in the Application, loss reductions were based on a 2kW loss per 100 kVAR. The MWh conversion is as described in (D) above.

CEI Distribution Level Projects
Based on new distribution facilities placed in service 2009.
Case No. TBD

A	B	C	D
		2009	**2009**
Project Name	**Actual In Service Date**	**Peak Loss Reduction MW**	**Annualized Loss Reduction MWhs**
Transformers			
Conversion			
Crestwood Transformer Replacement- Replace failed 138kV to 13.8kV 30 MVA	6/5/2009	0.055	150
Total 2009 Loss Reductions - Distribution Projects		0.055	150

Column Description

A Project description (see Exhibit F for sample projects)
B Date project was put into service
C MW Loss Reduction - Losses Before minus Losses After modelled in Milsoft engineering software.
D Calculation of MWhs
Formula: MW Loss Reduction x Average Loss Factor x 8760
Loss Factor = 31.2%; derivation based on annual calculation of load factor and associated loss factor.
(a) Capacitor projects included in this exhibit are not the same as those included on page 1 and 2 of Exhibit E.
Capacitor additions are calculated in two methods. For substation located (single location) capacitor banks,
the same calculation applicable for distribution projects is applicable.

<u>Ohio Edison Distribution Level Projects</u> **Exhibit F**

Feeder project

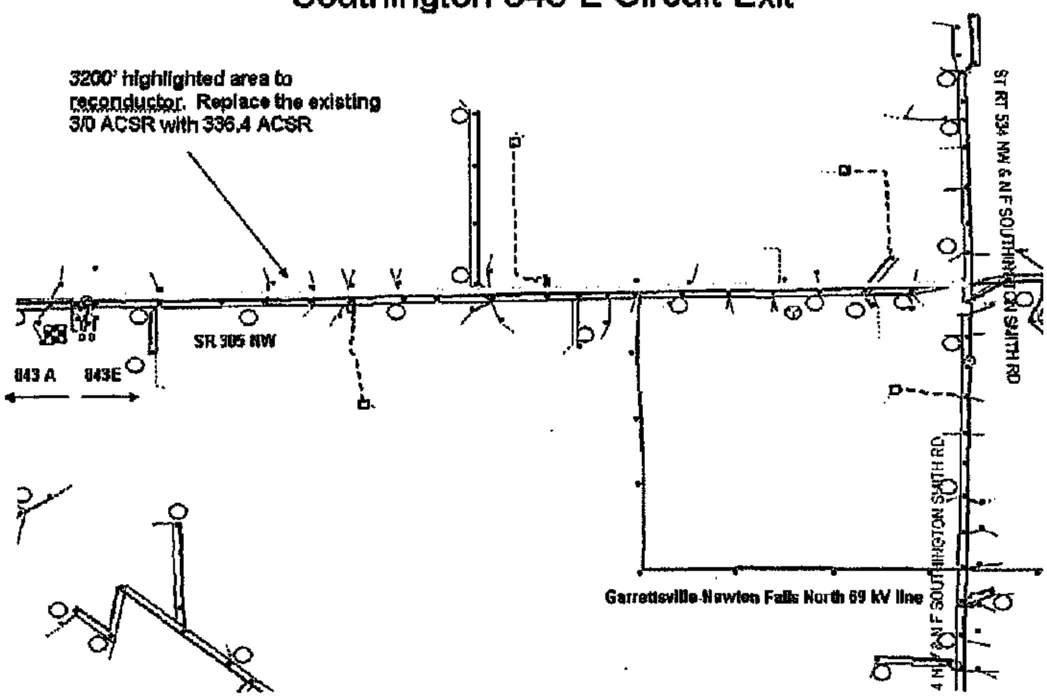
6. OE-Southington exit reconductor

Case No. TBD

<u>Project Description</u>: The exit conductors on the 843E circuit are 3/0 ACSR. The summer rating of these conductors is 360 amps. Changing to 336.4 ACSR will raise the rating to 625 amps. This will be an additional 265 amps or 5.7 MVA on the exit conductors.

Peak loads used in model from 5/27/2008: 843E- 350A, 350A, 350A

Southington 843 E Circuit Exit



843E Old	Load	Adjustment	Capacitance	Charging	Gen&Motors	Loops&Metas	Losses	No Load Losses	Total
KW	7075 .	0	0	0	0	0	703	0.00	7778
KVAR	3537	0	-1767	-50	0	0	1340		3060

843E New	Load	Adjustment	Capacitance	Charging	Gen&Motors	Loops&Metas	Losses	No Load Losses	Total
KW	7146	0	0	0	0	0	630	0.00	7776
KVAR	3620	0	-1807	-51	0	0	1296		3059

Loss Benefit = 703KW – 630KW = 73KW

Total Loss Benefit = 73 KW

Toledo Edison Distribution Level Projects **Exhibit F**
Modular Substation Project
7. Levis Park mod sub project
Case No. TBD

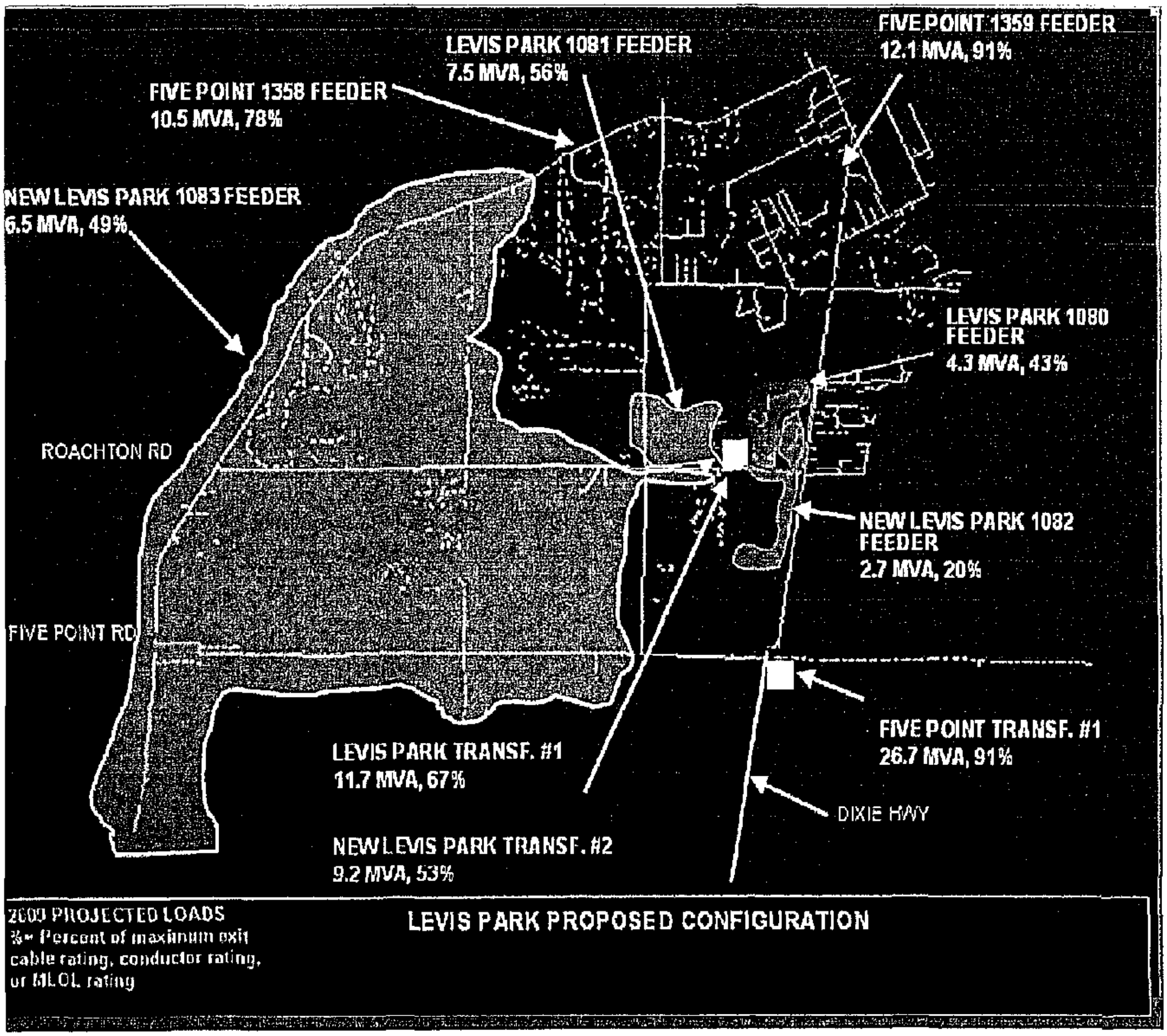
Project Description: A standard Mod Sub 138-12.47 kV, 11.2/14 MVA was added to the Levis Park Substation to relieve the #1 Levis Park and #1 Five Point Transformers which were projected to exceed their top planning rating. Two new feeders, 1082 and 1083 Levis Park were extended and absorbed some of the existing load from 1080 and 1081 Levis Park as well as 1358 and 1359 Five Point.

In Service Date: 5/29/2009

SUMMARY OF LOSSES

TRANSFORMER	BEFORE MW LOSS	AFTER MW LOSS	NET MW LOSS
Levis Park #1	.208	.032	.176
Levis Park #2	NA	.248	-.248
Five Point #1	.740	.629	.111
Total Loss MW	.948	.909	*0.04

* Total loss rounded to nearest hundredth of a MW.


FIVE POINT 1359 FEEDER
12.1 MVA, 91%
LEVIS PARK 1081 FEEDER
7.5 MVA, 56%
FIVE POINT 1358 FEEDER
10.5 MVA, 78%
NEW LEVIS PARK 1083 FEEDER
6.5 MVA, 49%
LEVIS PARK 1080 FEEDER
4.3 MVA, 43%
ROACHTON RD
NEW LEVIS PARK 1082 FEEDER
2.7 MVA, 20%
FIVE POINT RD
FIVE POINT TRANSF. #1
26.7 MVA, 91%
LEVIS PARK TRANSF. #1
11.7 MVA, 67%
DIXIE HWY
NEW LEVIS PARK TRANSF. #2
9.2 MVA, 53%
2009 PROJECTED LOADS
%= Percent of maximum exit cable rating, conductor rating, or MLOL rating
LEVIS PARK PROPOSED CONFIGURATION

Toledo Edison Distribution Level Projects **Exhibit F**
Modular Substation Project
8. Lime City Mod Sub Project
Case No. TBD

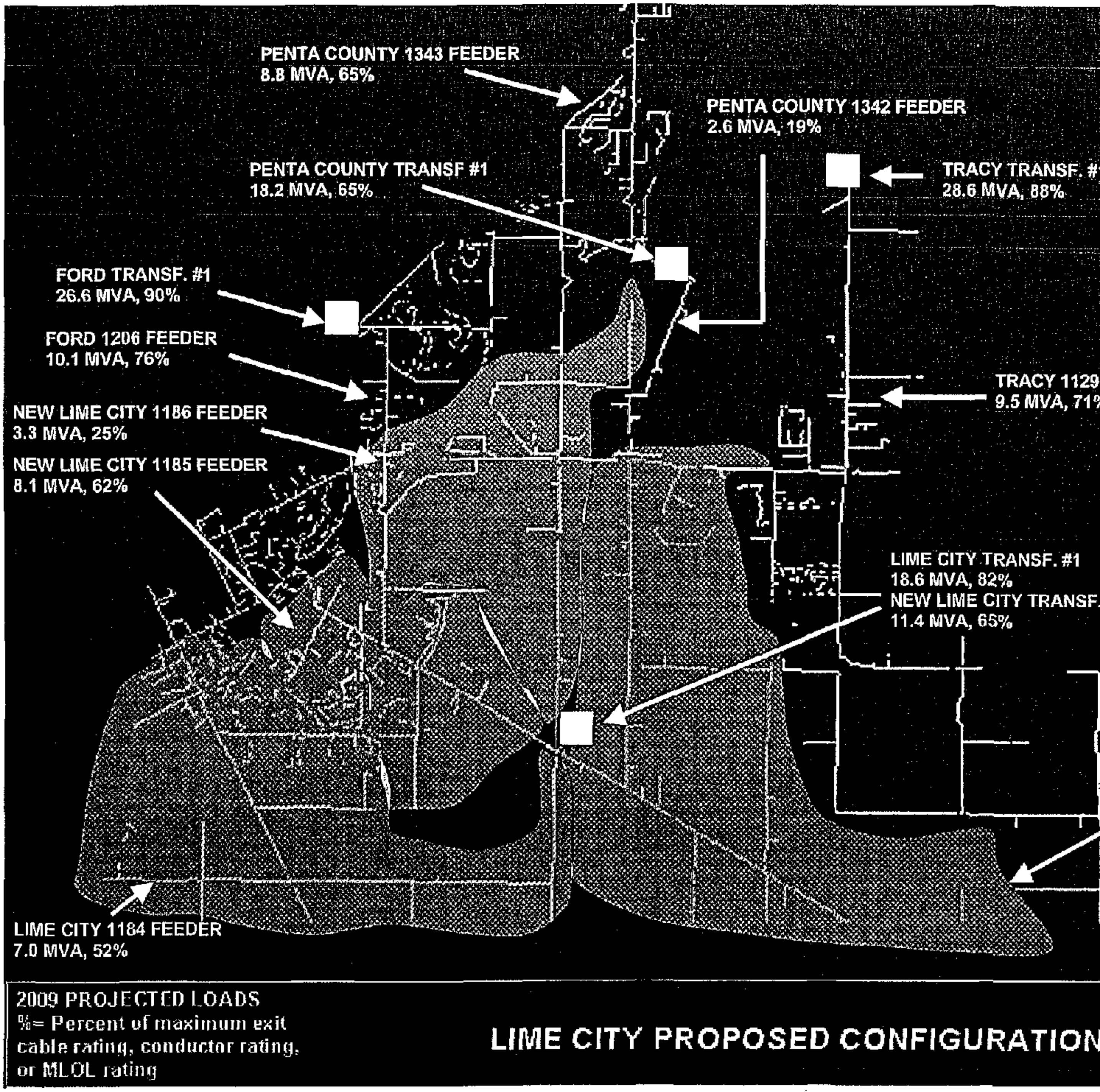
Project Description: A standard Mod Sub, 69 kV-12 kV, 11.2/14 MVA was added to the Lime City Substation to relieve the #1 Penta County Transformer which was projected to exceed its top planning rating. Two new feeders 1185 and 1186 Lime City were extended and absorbed some of the existing load from 1183 Lime City, 1129 Tracy and 1342 Penta County.

In Service Date: 5/22/2009

SUMMARY OF LOSSES

TRANSFORMER	BEFORE MW LOSS	AFTER MW LOSS	NET MW LOSS
Lime City #1	.320	.238	.082
Lime City #2	NA	.234	-.234
Penta County #1	.551	.120	.431
Tracy #1	.352	.310	.042
Total Loss MW	.1223	.902	*0.321

* Total loss rounded to nearest hundredth of a MW


PENTA COUNTY 1343 FEEDER
8.8 MVA, 65%
PENTA COUNTY 1342 FEEDER
2.6 MVA, 19%
PENTA COUNTY TRANSF #1
18.2 MVA, 65%
TRACY TRANSF. #1
28.6 MVA, 88%
FORD TRANSF. #1
26.6 MVA, 90%
FORD 1206 FEEDER
10.1 MVA, 76%
TRACY 1129
9.5 MVA, 71%
NEW LIME CITY 1186 FEEDER
3.3 MVA, 25%
NEW LIME CITY 1185 FEEDER
8.1 MVA, 62%
LIME CITY TRANSF. #1
18.6 MVA, 82%
NEW LIME CITY TRANSF.
11.4 MVA, 65%
LIME CITY 1184 FEEDER
7.0 MVA, 52%
2009 PROJECTED LOADS
%= Percent of maximum exit
cable rating, conductor rating,
or MLOL rating
LIME CITY PROPOSED CONFIGURATION

<u>CEI Distribution Level Projects</u> **Exhibit F**

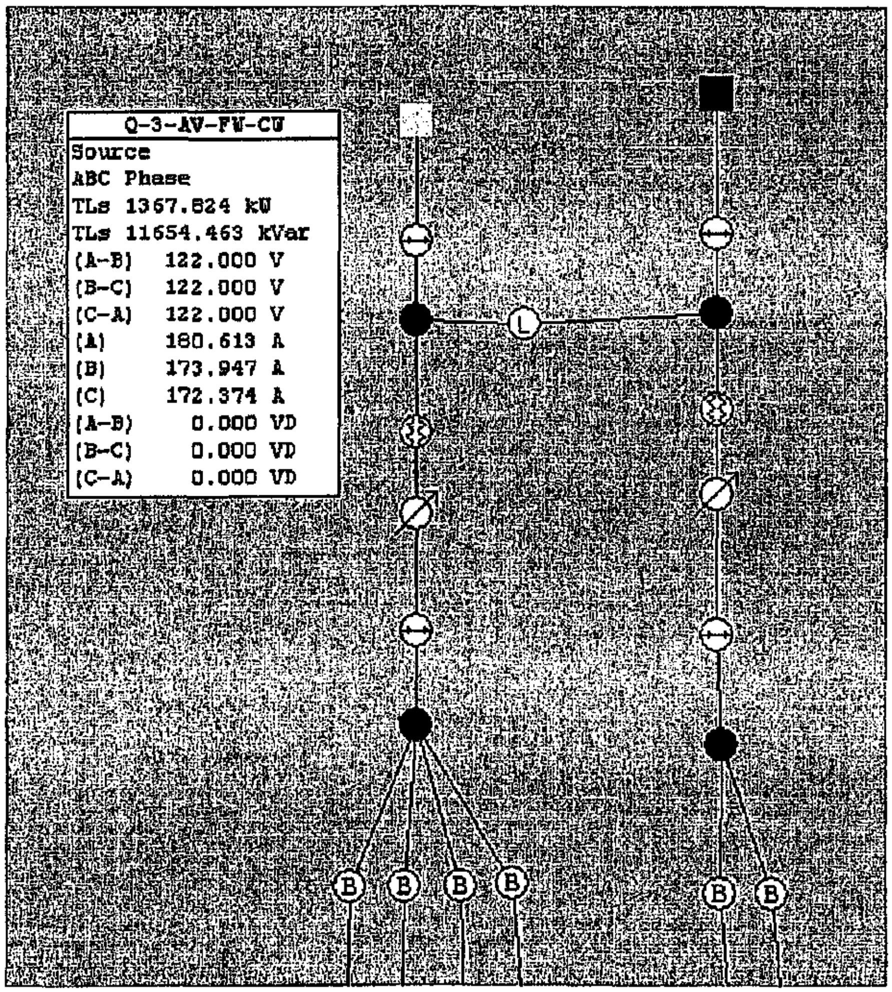
Transformer Project

9. Crestwood Transformer Replacement

Case No. TBD

<u>Project Description</u>: Replace failed 138kV to 13.8kV, 20.2/26.9/33.6 MVA transformer supplied from Q-3-AV-FW with 138kV to 13.2kV, 33.4 MVA transformer supplied from Q-3-AV-FW.
<u>In-service</u>: 6/5/2009

Peak loads used in model from 7/2008:

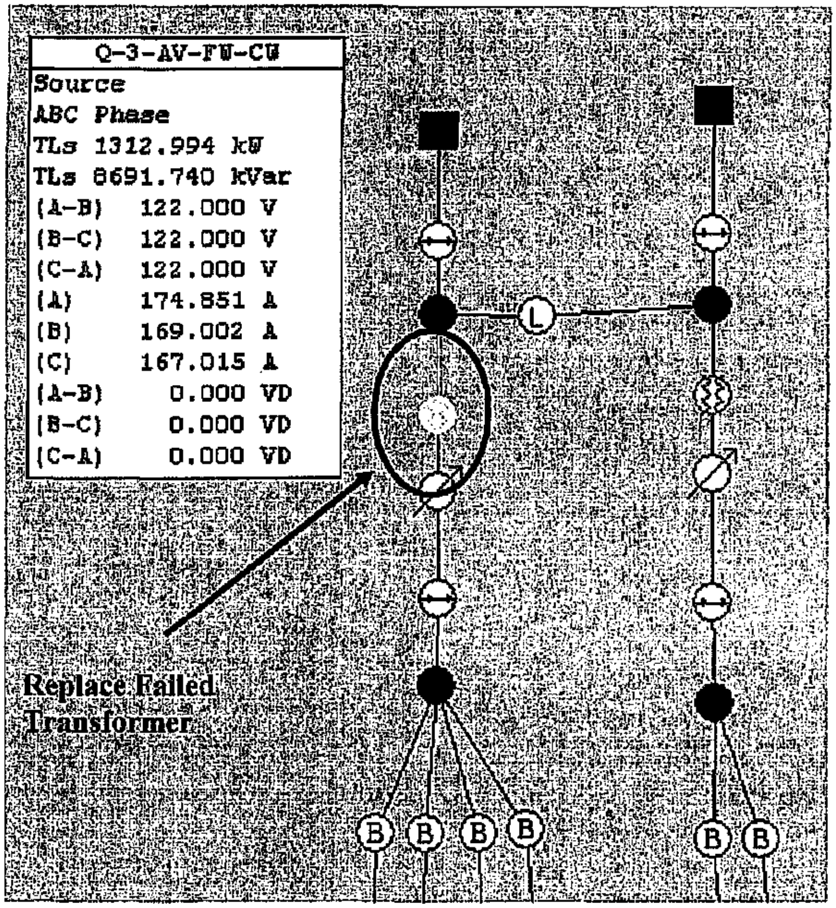


Model before transformer replacement

Substation Summary:

Substation	KW	KW Losses	KVAR	KVAR Losses	KVA	% Capacity
Q-3-AV-FW-CW	36792.00	1368.00	29155.00	11654.00	40818.41	0.00
Q-1-AV-FW-CW	15946.00	579.00	10674.00	2695.00	16776.51	0.00
Total:	52738.00	1947.00	39829.00	14349.00	57594.92	

KW losses = 1368KW



Model after transformer replacement

Substation Summary:

Substation	KW	KW Losses	KVAR	KVAR Losses	KVA	% Capacity
Q-3-AV-FW-CW	36737.00	1313.00	26193.00	8692.00	39574.52	0.00
Q-1-AV-FW-CW	15946.00	579.00	10674.00	2695.00	16776.51	0.00
Total:	52683.00	1892.00	36867.00	11387.00	56351.03	

KW Losses =1313KW

Loss benefit from project = 1368KW - 1313KW = 55KW