FILE

FirstEnergy

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May 8, 2009

Ms. Renee J. Jenkins
Director, Administration Department
Secretary to the Commission
Docketing Division
The Public Utilities Commission of Ohio
180 East Broad Street
Columbus, OH 43215-3793

Dear Ms. Jenkins:

Re: ***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 Application***
Cases No. 09-384-EL-EEC; 09-385-EL-EEC, and 09-386-EL-EEC

Enclosed for filing, please find the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company in the above-referenced Proceeding. Given the nature of this filing, the Companies respectfully ask that the Commission rule on this Application on or before July 1, 2009.

Thank you for your assistance in this matter. Please contact me if you have any questions concerning this matter.

Very truly yours,

Kathy J. Kolich/JR

kag
Enclosures

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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. 09-384-EL-EEC** **09-385-EL-EEC** **09-386-EL-EEC**

APPLICATION

Pursuant to R.C. 4928.66(A)(2)(d), 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 2009 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 are required in subsequent years, which are irrelevant for purposes 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, the Companies intend to incorporate various T&D infrastructure improvement projects that they have completed between 2006 and 2009. Projects completed through December 31, 2008 are included in this Application.

5. These projects are only one aspect of the FE 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 who will hold their first meeting on May 18, 2009.

6. Given the lead times necessary to launch new projects and the costs associated with launching such projects, the use of the T&D projects is an important aspect of the FE 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 this economic crisis currently faced by Ohioans. Moreover, the use of these historic projects is consistent with the Ohio General Assembly's recognition of the value of using such projects as part of a utility's compliance strategy.

7. Further, because of the fact that this entire process is new, the Companies must comply with 2009 energy efficiency benchmarks by December 31, 2009, and the ramp up time is significant for new projects, the Companies are filing this Application at the earliest possible date so as to afford the Companies sufficient time to adjust

their plans should the Commission reject any of the proposed projects. Accordingly, the Companies respectfully request that the Commission rule on this Application no later than July 1, 2009.

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 many of the aforementioned types of improvements on their T&D systems during the period 2006 through 2008. 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 103,057 megawatt hours ("MWhs") for the Companies generally, and more specifically, 58,265 MWhs for Ohio Edison Company; 27,217 MWhs for CEI; and 17,576 MWhs for The Toledo Edison Company.[2]

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.[3]
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 several Transmission Projects (three pages)[*]
Exhibit E:	List of Distribution Projects included for consideration (three pages)
Exhibit F:	Project summaries for several Distribution Projects (six pages)[*]

[2] These amounts are based on models which are discussed in attached Exhibit B. The Company will provide updated results in their filings required by proposed Section 4901:1-39-04(A) of the Ohio Administrative Code.

[3] 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.

[*] The Companies have similar summaries for each project listed on Exhibits B and E which will be provided upon request.

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

Respectfully submitted,

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ATTORNEY 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 2006-2008 (a)
Case No. 09-384-EL-EEC et seq

(in MWhs)

	OE	CEI	TE	Total
Transmission System Energy Savings (b)	35,607	10,056	9,286	54,949
Distribution System Energy Savings	22,658	17,161	8,290	48,109
Total Energy Savings	58,265	27,217	17,576	103,057

(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. The FE 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 – Windmil. 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 FE 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 FE 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 FE 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 FE 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 2007-2008
Case No. 09-384-EL-EEC et seq

A (column descriptions below) Ohio Projects	B Pri kV	C Actual In Service Date	D FE-Ohio Total Losses (Before)	E FE-Ohio Total Losses (After)	F (D - E) 2009 MW Loss Reduction	G 2009 MWH Loss Reduction
RE-CONDUCTORINGS						
1 Crissinger-Tangy 138 kV Reconductor R/C	**138**	**6/1/2007**	**410.205**	**407.404**	**2.801**	**10,379**
2 Edgewater-Johnson E 69 kV Line R/C	69	6/1/2008	407.761	407.404	0.357	1,323
3 Cardington-Tangy 69kV Line - 2007 R/C	69	1/1/2008	407.822	407.404	0.418	1,549
4 Cardington-Tangy 69kV line - Phase 2 - 2008 R/C	69	6/1/2008	407.811	407.404	0.407	1,508
5 Boardman-Lowellville #2 69kV - 2008 R/C	69	4/1/2008	407.448	407.404	0.044	163
6 Cook-Galion: Galion-Snyder 69kV line section, etc. R/C	69	6/1/2008	407.486	407.404	0.082	304
TRANSMISSION SUBSTATIONS						
7 London Add 138/69 kV Transformer	**138**	**6/1/2007**	**407.536**	**407.404**	**0.132**	**489**
8 North Medina 345-138 kV Substation	345	6/1/2008	412.578	407.404	5.174	19,172
9 Crissinger -Add 138/34.5kV Transfomer	138	4/1/2008	407.404	407.233	0.171	634
TRANSMISSION CAP BANKS						
10 Juniper Cap Bank (300 MVAR)	**345**	**6/1/2008**	**408.824**	**407.404**	**1.42**	**5,262**
11 Harding Cap Bank (300 MVAR)	345	6/1/2008	408.836	407.404	1.432	5,306
12 South Akron 138 kV Cap Bank (50 MVAR)	138	6/1/2007	408.065	407.404	0.661	2,449
13 Roberts -Add 138kV Cap Bank (50 MVAR)	138	6/1/2007	407.537	407.404	0.133	493
14 Cloverdale 138kV Cap Bank (50 MVAR)	138	6/1/2008	408.368	407.404	0.964	3,572
15 Columbia Sub - Install 69 kV Cap Bank (6/08)	69	6/1/2008	407.725	407.404	0.321	1,189
16 Lexington Substation - Add 69 kV Capacitor Bk. (6/09)	69	6/26/2008	407.716	407.404	0.312	1,156
		Total		**Total**	19.199	54,949

Column Description

- **A** Project description (see **Exhibit D** for sample projects in bold above)
- **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
  Loss Factor = 42.3%; derivation based on annual calculation of load factor and associated loss factor as described in Exhibit B.

FE-Ohio Transmission Level Projects

Exhibit D-1

Reconductor Project
1. Crissinger-Tangy 138kV Reconductor
Case No. 09-384-EL-EEC et seq

Project Description:
Reconductor Crissinger-Tangy 138 kV line, including replacing the ground wire. Reconductor 23.67 miles of transmission line, which is currently 336.4 ACSR, with 795 ACSR conductor.

How loss values were obtained:
See Exhibit B

Losses (post-project):
Losses in FE-Ohio – 407.404 MW

Utilized a 2009 Summer Peak load flow case.
Changed parameters of Crissinger-Tangy 138 kV line from:
R – 0.01782
X – 0.09816
B – 0.02935
to the former values (what it would have been prior to change in conductor to 795 ACSR) of:
R – 0.0358
X – 0.0154
B – 0.0244

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

Losses (pre-project):
Losses in FE-Ohio – 410.205 MW

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

Pre-project losses –	410.205 MW
Post-project losses –	407.404 MW
Loss Savings –	2.801 MW

FE-Ohio Transmission Level Projects

Exhibit D-2

Transmission Substation Project
7. London Substation Add 138/69 kV Transformer
Case No. 09-384-EL-EEC et seq

Project Description:
Add a second 138-69 kV transformer (#4) rated at 90/120 MVA at London Substation

How loss values were obtained:
See Exhibit B

Losses (post-project):
Losses in FE-Ohio – 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 #4 at the London substation between the 138 and 69 kV bus

London Substation 138 kV is bus #: 238908, bus name: "02LONDON"
London Substation 69 kV is bus #: 238909, bus name: "02LONDON"
The transformer between the two bus is identified with a circuit id of "4 "

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

Losses (pre-project):
Losses in FE-Ohio – 407.536 MW

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

Pre-project losses –	407.536 MW
Post-project losses –	407.404 MW
Loss Savings –	0.132 MW

FE-Ohio Transmission Level Projects

Exhibit D-3

Transmission Capacitor Bank
10. Juniper Cap Bank (300 MVAR)
Case No. 09-384-EL-EEC et seq

Project Description:
Add two 150 MVAR, 345kV capacitor banks at Juniper substation for a total addition of 300 MVAR.

How loss values were obtained:
See Exhibit B

Losses (post-project):
Losses in FE-Ohio – 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 Juniper 345 kV bus
Juniper Substation is bus #: 238850, bus name "02JUNIPE" that has a SVD with an id of "v"
The SVD is modeled as 2 steps of 150 MVAR
B Step = 1.5
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):
Losses in FE-Ohio – 408.824 MW

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

Pre-project losses –	408.824 MW
Post-project losses –	407.404 MW
Loss Savings –	1.420 MW

Ohio Edison Distribution Level Projects

Based on new distribution facilities placed in service 2006-2008.
Case No. 09-384-EL-EEC, et seq

Exhibit E
(1 of 3)

A (column descriptions below) Project Name	B Actual In Service Date	C Peak Loss Reduction MW	D 2009 Loss Reduction MWhs
RE-CONDUCTORINGS			
Central Ohio Projects			
1 Columbia Substation - SR 82 Recond Circuits 68-1	8/17/2007	0.054	148
2 OE-Brimfield Howe-Reconductor Mogadore Rd.	5/18/2007	0.216	590
3 OE - W Akron-Crystal - Reconductor Ridgewood Rd	5/25/2007	0.742	2,028
4 Stow Hiwood-Replace Urd Exit Cable	5/18/2007	0.003	8
5 Winckles 72-1 - Ohio St Area - Conv to 12.47 KV	8/24/2007		-
6 Winckles 72-2 - Abbe Rd Conv to 12.47 KV	7/13/2007	0.025	68
7 OE-Clinton Leaver - Reroute Leaver circuit	5/21/2008	0.103	282
8 **Southern Ohio Projects**			-
9 Perrysville reconductor	5/20/2008	0.07	191
10 Ontario 12053 reconductor	5/1/2008	0.138	377
11 Bellepoint 12006 reconductor	6/1/2008	0.354	968
12 Airpark 12031 line rebuild	3/15/2008	0.064	175
13 Avery Rd rebuild	6/1/2007	0.093	254
14 Polk 12542 reconductor	5/1/2007	0.015	41
Eastern Ohio Projects			-
15 OE - Hubbard D171 Reconductor	5/31/2007	0.002	5
16 OE-YN-Canfield D138 Reconductor	10/26/2007	0.106	290
17 OE - SA - Columbiana - Lisbon 69kV: Dist. Underbulid	5/27/2008	0.254	694
SUBSTATIONS			
Central Ohio Projects			
18 OE-Bellevue Substation - Inst New 12.47 kV Exit, Buckeye	6/24/2008	0	-
19 OE-South Bass Step Down Station	3/19/2008	0	-
20 Evans Sub - Add 23kV Source	5/29/2008	0.2	547
21 OE-Lais Sub - New 69-12.47kV Sub	5/30/2007	0	-
22 Fieldstone New MOD sub	5/31/2007	0.602	1,645
23 Slater Mod Sub (Former Avalon)	5/29/2008	0.317	866
24 Carmont -New Exit	8/1/2006	0	-
25 OE-Macedonia R/P transformer	5/10/2007	0.021	57
26 OE-Geauga New Exit Cannon Feeder	8/1/2006	0.053	145
Eastern Ohio Projects		0	-
27 OE-Tippecanoe Mod Sub	5/31/2007	0.053	145
28 OE-Sawburg Mod Sub	5/25/2008	0.187	511
REGULATOR REPLACEMENTS			
Central Ohio Projects			
29 Brunswick - Yale r/p reg.	4/27/2007	0.0228	62
30 Shawville 56-1 reg r/p	4/9/2007	0.0228	62
31 Baumhart Liberty reg r/p	3/29/2007	0.0228	62
32 Columbia 68-1 Regs R/P 328 A with 438 A	4/25/2008	0.0228	62
33 OE Quarry South Regulator R/P 328A with 437A	4/17/2008	0.0228	62
34 Regulator R/P OE Coventry Grand 219A with 328A	5/15/2008	0.0102	28
35 Regulator R/P OE Krumroy Ironwood 219A with 328A	5/17/2008	0.0102	28
36 Regulator R/P OE Tallmadge - Overdale 219A w/ 328A	4/12/2007	0.0102	28
37 Sheffield - Oster Reg R/P 328 A with 438 A	5/23/2008	0.0228	62
Eastern Ohio Projects			
38 Regulator R/P OE Greenford D144 Replace 219 A w/ 328 A	5/29/2008	0.0102	28
39 Regulator R/P OE Nevada W234 – R/P 328 A with 438 A	5/7/2008	0.0228	62
40 Regulator R/P OE Pidgeon W180 Replace 328A with 438 A	5/20/2008	0.0228	62
			10,646
Capacitors (a)		**Additions kVAR**	
41 2008 Distribution Capacitor Program	5/31/2008	90000	4,920
42 2007 Distribution Capacitor Program	6/25/2007	54150	2,960
43 2006 Distribution Capacitor Program	6/1/2006	75600	4,132
			12,012
Total 2009 Loss Reductions - Distribution Projects			22,658

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 2006-2008.
Case No. 09-384-EL-EEC, et seq

A	B	C	D
Project Name	Actual In Service Date	Peak oss Reduction MW	2009 Loss Reduction MWhs
SUBSTATIONS			
44 Wayne Transformer Replacement	11/1/2006	0.02	55
45 Oak Harbor Mod-Sub Addition	6/1/2007	0.57	1,558
46 Allen Junction Mod-Sub Addition	5/22/2008	0.481	1,315
47 Holgate Mod-Sub Addition	5/22/2008	0.114	312
48 Oakdale Mod-Sub Addition	4/30/2008	0.22	601
49 Wentworth Mod-Sub Addition	5/19/2008	0.478	1,306
Feeder Conversions			
50 Oakdale 641 Partial Conversion	6/1/2006	0.03	82
51 Gould 671 Partial Conversion	12/1/2007	0.01	27
REGULATOR REPLACEMENTS			
52 Frey 1379 Field Regulators	6/1/2008	0.01	27
53 Grand Rapids 1278 Field Regulators	4/23/2008	0.02	55
54 Woodville 1119 Field Regulators	4/28/2008	0.02	55
Other			
55 Hawthorne Feeder Reconfigure to Relieve 1198 MU	5/24/2007	0.07	191
56 Arrowhead UD Loop Load Relief	5/24/2007	0.08	219
57 Silica 1140 Feeder Commission	5/11/2007	0.08	219
58 Lynch 1373 Feeder Tie Extension	12/1/2007	0.002	5
			6,027
Capacitors (a)		Additions kVAR	
59 2006 Capacitor Additions	6/1/2006	6900	377
60 2007 Capacitor Additions	6/1/2007	18000	984
61 2008 Capacitor Additions	6/1/2008	16500	902
			2,263
Total 2009 Loss Reductions - Distribution Projects			8,290

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 Millsoft 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 2006-2008.
Case No. 09-384-EL-EEC, et seq

A	B	C	D
			2009
	Actual	Peak	Loss
	In Service	oss Reduction	Reduction
Project Name	Date	MW	MWhs
RE-CONDUCTORINGS			
Conversion			
62 DX H-7-WN 4kV Convert to 13kV	5/14/2007	0.362	989
63 DX H-2 & 4-FP Fairport 4kV Convert 13kV	2/26/2008	0.084	230
64 DX L-1-ASM Ashtabula Mall OH SRT Conversion	8/24/2007	0.02	55
65 DX L-1-MK OH SRT Conversion, Bellevue; N of Lakeshore	8/31/2007	0.021	57
66 DX L-3-SA OH SRT Conversion - Line Rd, 3PN of S Ridge	10/31/2007	0.018	49
67 DX L-1-DW Darwin OH SRT Conversion	5/25/2007	0.005	14
68 DX H-3 & 4-HR Harrington 4kV Convert to 13kV	12/31/2007	0.086	235
69 DX L-2-SP OH SRT Conv, Geneva-Wind, 5PN of Callahan Rd	4/30/2008	0.104	284
70 DX L-3-CF Clifford Reconductor	5/21/2007	0.222	607
71 DX L-4-AS Astor OH Line Reconductor	11/30/2007	0.005	14
72 SX R-19-MF 36kV OH Line Reconductor	11/30/2008	1.323	3,616
73 SX R-18-SN Sanborn 36kV OH Line Rebuild		0	0
74 SE Mark - New 36-13kV Mod Sub - Transformer Relief	11/21/2007	0.15	410
75 Queen - New 138kV-13kV Mod-Sub	6/7/2007	0.11	301
76 SE Oxford - New 36-13kV Mod Sub	6/7/2007	0.276	754
77 SW Maplecrest - 2 New Feeders for Relief - UG & SW	7/18/2007	0.327	894
78 SW Crestwood - Transformer Replacement	11/28/2007	0.014	38
			8,546
Capacitors (a)			
79 SE Jill Sub - Install 1 bank of bus capacitors	6/25/2008	0.007	19
80 SE Keith Sub - Install 2 banks of bus capacitors	6/25/2008	0.049	134
81 SE Lincoln Sub - Install 1 bank of bus capacitors	6/25/2008	0.02	55
82 SE Zenith Sub - Install 1 bank of bus capacitors	6/25/2008	0.013	36
83 SW Dunbar Sub - Install 3 banks of bus capacitors	6/25/2008	0.037	101
84 SW Inca Sub - Install 1 bank of bus capacitors	6/25/2008	0.002	5
85 SW Lake Shore Sub - Install 3 banks of bus capacitors	6/25/2008	0.03	82
86 SW Issler Install 2@4.2 MVAR Bus Capacitors	6/25/2008	0.009	25
87 SW Dell Sub- Install 2 banks of bus capacitors	6/25/2008	0.035	96
88 SW Horizon - Add 2-New 10.8 MVAR Bus Capacitor Banks	6/1/2007	0.5	1,367
89 DX Line Capacitor Program - Reactive Resource Planning	6/1/2008	0.1	273
90 DX Line Capacitor Program - Reactive Resource Planning	12/30/2007	0.1	273
91 DX Line Capacitor Program - Reactive Resource Planning	6/1/2007	0.1	273
92 SE Sanborn - Add 2-New 18 MVAR Bus Capacitors	2/18/2008	0.8	2,186
93 SE Sanborn Sub - Install 1 bank of bus capacitors	6/1/2008	0.7	1,913
94 SE Spruce Sub - Install 1 bank of bus capacitors	6/1/2008	0.65	1,777
			8,615
Total 2009 Loss Reductions - Distribution Projects			17,161

Column Description

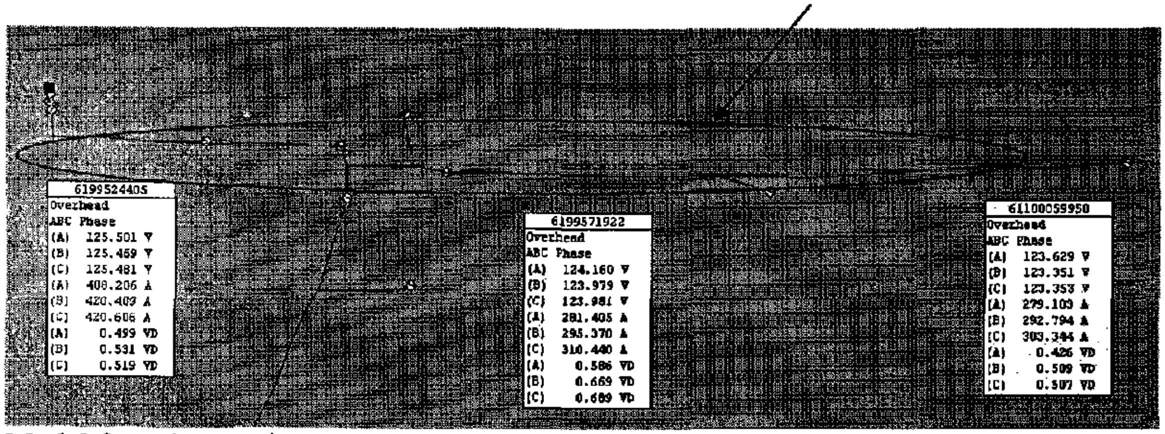
A Project description (see Exhibit F for sample projects)
B Date project was put into service
C MW Loss Reduction - Losses Before minus Losses After modelled in Millsoft engineering software.
D Calculation of MWhs
Formula: MW Loss Reduction x Average Loss Factor x 8760
Loss Factor = 31.2%; derivation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

Ohio Edison Distribution Level Projects **Exhibit F-1**

Reconductoring Project
1. Columbia Substation - SR 82 Reconductor Circuit 68-1
Case No. 09-384-EL-EEC et seq

Project Description: Replace approximately 2500' 3-3/0 ACSR with 3-336.4 Al along SR 82 from Columbia Sub to the Rocky River. In Service 8/17/07.
Peak loads used in model from 9/2007: 396A, 408A, 408A

reconductored

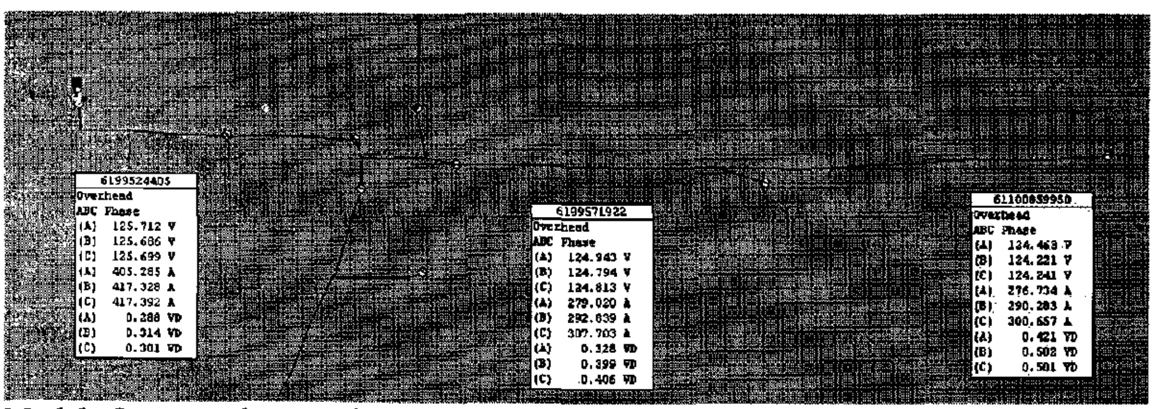


Model from 2007 using 3-3/0 ACSR

Substation Summary:

Substation	KW	KW Losses	KVAR	KVAR Losses	KVA	% Capacity
Columbia	9007.00	407.00	5791.00	970.00	9696.04	92.83

KW losses = 407KW



Model after reconductor using 3-336.4 AL

Substation Summary:

Substation	KW	KW Losses	KVAR	KVAR Losses	KVA	% Capacity
Columbia	8953.00	353.00	5746.00	925.00	9610.51	92.09

KW losses = 353KW

Loss benefit from project = 407KW – 353KW = 54KW

*The peak loads from 2006 were higher (432A, 408A, 528A), overloading the line all the way to the river. The benefits using those loads were 66KW.

<u>Ohio Edison Distribution Level Projects</u> **Exhibit F-2**
Regulator Replacement
36. Regulator – R/P OE Tallmadge – Overdale 219A w/ 328A
Case No. 09-384-EL-EEC et seq

<u>Project Description</u>: Replace the Tallmadge - Overdale 219 amp regulator with an existing 328 amp regulator.

Voltage Regulators Loss Calculations

Typical Regulator Impedances:

219 Amp	.023 + j0.130 ohms @ 7.62 kv $_{line\text{-}grd}$	.132 ohms
328 Amp	.015 + j0.086 ohms @ 7.62 kv$_{line\text{-}grd}$	.087 ohms

Loss Reduction Calculations:

Replace three 219 amp regulators with three 328 amp regulators: (assume MLOL rating of 219 amp units)

Losses = I^2Z for 219 amp Losses = $(274)^2(.132)$ = 9.91 kw
For 328 amp Losses = $(274)^2(.087)$ = 6.53 kw Loss Reduction = 3.4 kw
For three regulators the Loss Reduction = **10.2 kw**

Ohio Edison Distribution Level Projects **Exhibit F-3**

Distribution Capacitors
43. SW Dunbar Substation
Case No. 09-384-EL-EEC et seq

Project Name: SW Dunbar Sub - Install 3 banks of bus capacitors
RPA#: NOH-08-070726-140219

Project Description: Install 3- 4.2 MVar capacitor banks at Dunbar Substation

Loads used: Summer Peak 2007

L-1-DB: 232A, 216A, 269A
L-3-DB: 344A, 336A, 322A
L-4-DB: 236A, 249A, 235A
L-5-DB: 448A, 504A, 468A
L-6-DB: 459A, 463A, 489A
L-8-DB: 309A, 270A, 263A

Losses before Caps

71-DB-B	556.795kW	3547.076Var
72-DB-B	1211.625kW	8453.562kVar

Losses After Caps

71-DB-B	542.746kW	3294.220kVar
72-DB-B	1188.351kW	7626.093kVar

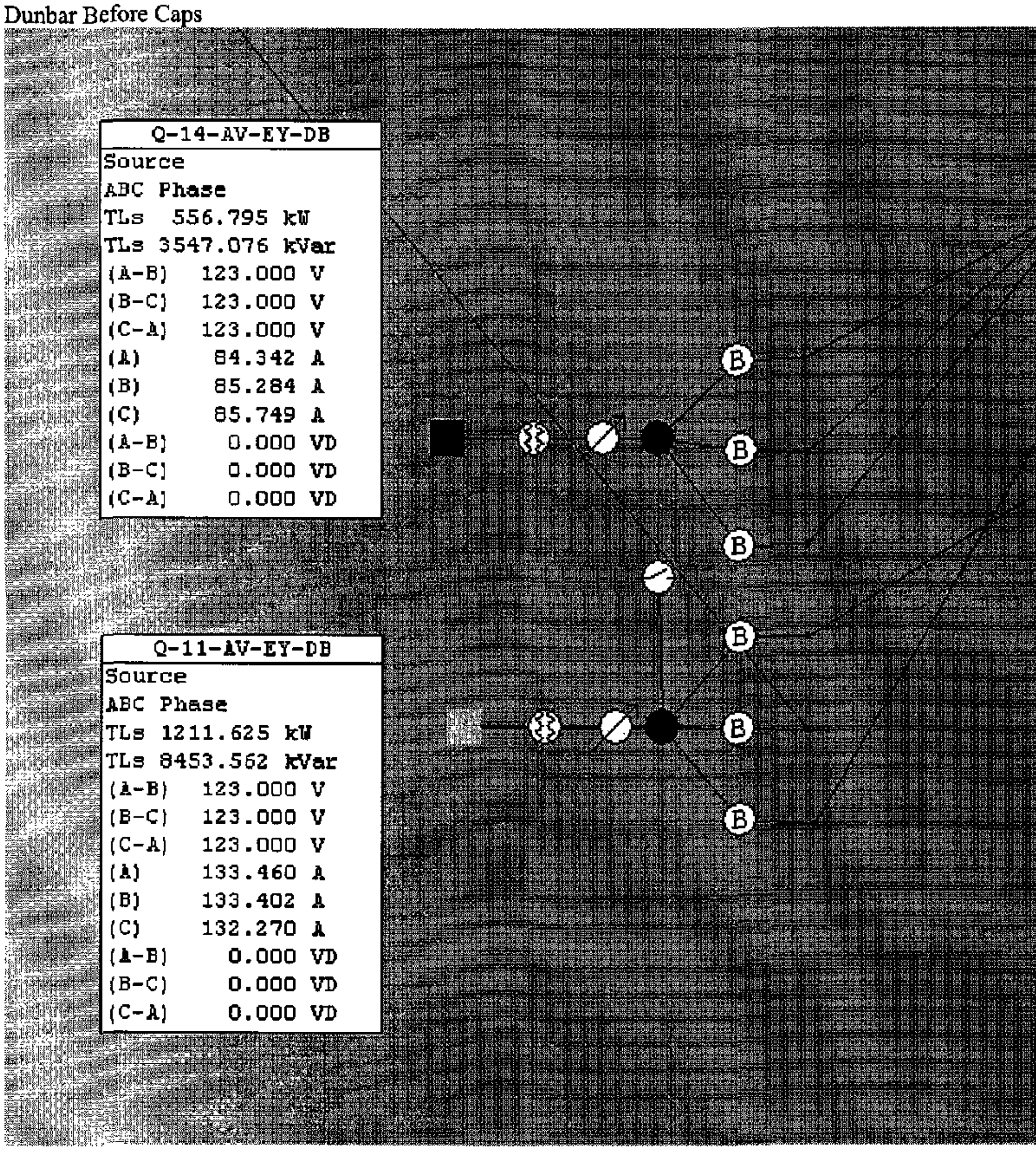
Loss Benefit

71-DL-B	556.795 kW – 542.746 kW = 14.049kW
72-DL-B	1211.625 kW – 1188.351 kW = 23.274kW
	Total = 37.323 kW

Ohio Edison Distribution Level Projects **Exhibit F-3**

SW Dunbar Substation
Case No. 09-384-EL-EEC et seq

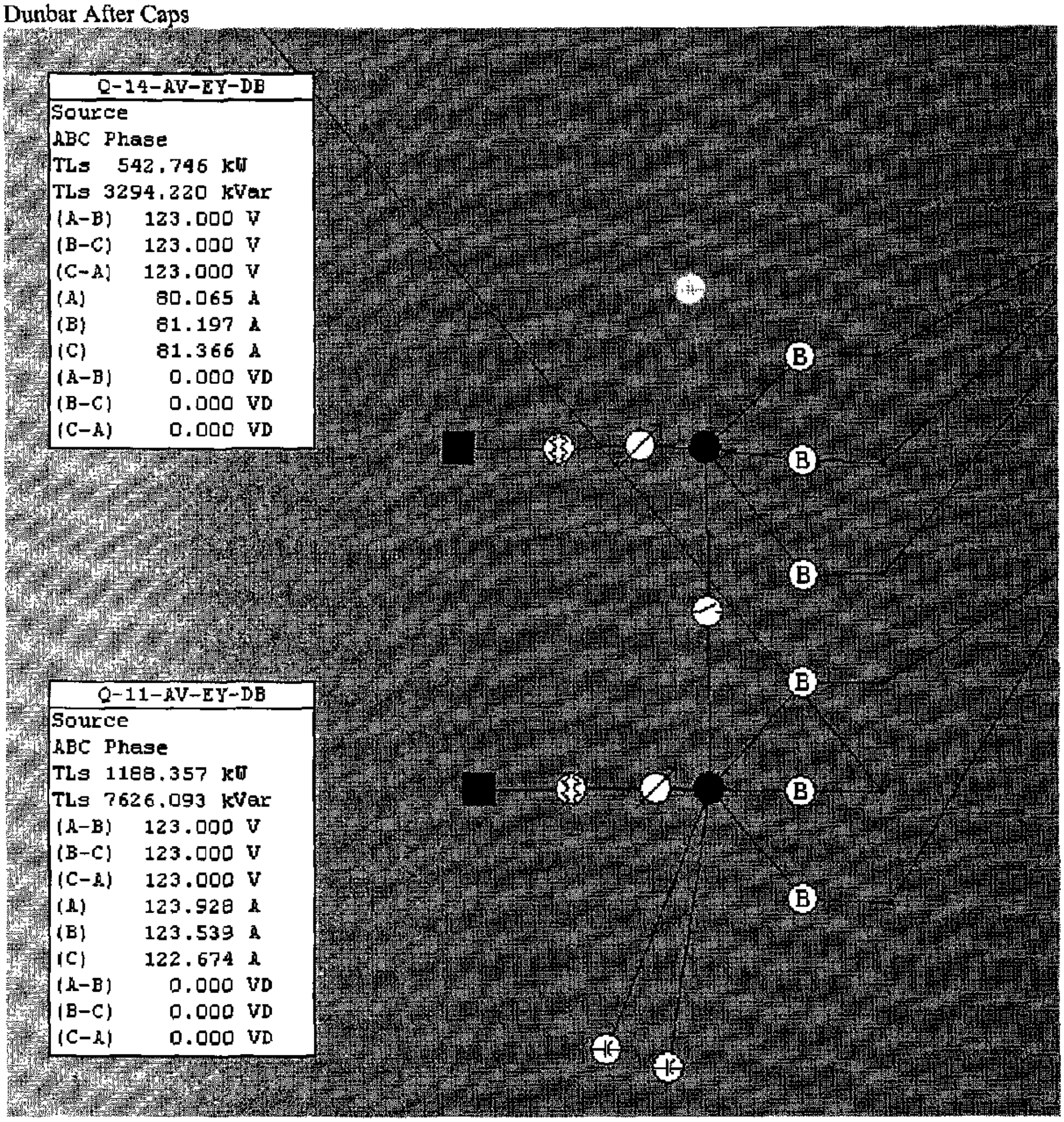
Dunbar Before Caps



Ohio Edison Distribution Level Projects
SW Dunbar Substation
Case No. 09-384-EL-EEC et seq

Exhibit F-3

Dunbar After Caps



Toledo Edison Distribution Level Projects **Exhibit F-4**

Distribution Substations
Load Loss for the Oakdale Mod Sub Project
Case No. 09-384-EL-EEC et seq

Project Description: Install a new 69/12.47kV mod sub & convert existing 7.2kV circuits to 12.47kV circuits. The recommended solution for the capacity shortfall in this area is to replace the 81 year old 69-7kv Oakdale transformer #1 with a new 69-12kv Mod Sub at the existing TE Oakdale property. The existing 7kv island loads from the Oakdale transformer #1 will be converted to area 12kv. The 2 new feeders from the new 12kv Mod Sub at Oakdale will accommodate the converted 7-to-12kv loads and 12kv feeder load transfers that will provide relief to both the Penta County and Tracy station transformers.

In Service Date: 4/30/2008

SUMMARY OF LOSSES

Substation Transformer	Before Load Loss in KW	After Load Loss in KW	Before-After Load Loss in KW
Oakdale #1	148	N/A	148
Oakdale #2	602	511	91
Oakdale #3	N/A	264	-264
Ravine Park #1	483	253	230
Tracy #1	898	784	114
Total	2131	1812	[redacted]

3/9