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BEFORE THE  
OHIO POWER SITING BOARD

**PUCO**

In the Matter of: )  
The Application of American Transmission )  
Systems, Incorporated and The Cleveland )  
Electric Illuminating Company for a )  
Certificate of Environmental Compatibility )  
and Public Need for the Geauga County )  
138 kV Transmission Line Supply Project )

Case No. 07-0171-EL-BTX

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**INITIAL DIRECT TESTIMONY OF**

**JAMES M. GALM, P.E., Ph.D.**

**ON BEHALF OF**

**CITIZENS ADVOCATING RESPONSIBLE ENERGY**

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1 Q. Please state your name.

2 A. James M. Galm.

3 Q. Are you related to Intervenor Citizens Advocating Responsible Energy?

4 A. Yes. I am President of CARE.

5 Q. Please describe your professional education.

6 A. I graduated from West Geauga High School in Chester Township, Geauga

7 County, Ohio in 1980. I received a Bachelor of Science degree in

8 electrical engineering and applied physics from Case Western Reserve

9 University, Cleveland, Ohio, in 1984. I was the 1984 recipient of the

10 Michael Wolfe award for outstanding creative design. I received a Master

11 of Science degree in electrical engineering from Case Western Reserve

12 University in 1987. My major fields of study were electromagnetic field

13 theory, lasers, optics and systems. I received a Doctor of Philosophy

14 degree from Case Western Reserve University in 1991.

15 Q. Do you have any certifications?

16 A. I am a registered Professional Engineer, licensed to practice in the state of

17 Ohio. I have been licensed to practice in Ohio since 1991.

18 Q. Do you have any patents?

19 A. I have been awarded four US Patents and have one application pending

20 with the PTO.

21 Q. Do you have any published papers?

22 A. I have authored numerous conference and refereed journal papers, both

23 in graduate school and afterward. My two most recent conference papers

24 were titled, "Reliability Data, Metrics and Architectures for Mission Critical  
25 Systems." and, "Reliability Improvement Through Present and Novel  
26 Redundant Architectures," both presented at recent 7x24 Exchange  
27 Society Conferences.

28 Q. Are you a member of any professional organizations?

29 A. I am a member of the Institute of Electrical and Electronics Engineers, the  
30 National Society of Professional Engineers and the Ohio Society of  
31 Professional Engineers.

32 Q. Do you own property in the area to be effected the proposed Geauga  
33 County power line?

34 A. Yes. I presently own a combination agricultural and natural property at  
35 11451 Madison Road, Huntsburg, Ohio, known collectively as our family  
36 farm. The property was purchased from Mr. Willard L. Strong by my  
37 grandparents, John and Bertha Bushner. My mother grew up on our  
38 family farm and graduated from Huntsburg School. Our family farm was  
39 inherited by my mother and aunt upon the death of my grandmother in  
40 1984. My aunt and mother have since died, and I am now the owner of  
41 our family farm.

42 Q. Please describe the property.

43 A. As a farm property owner, I take great pride in my land and know my  
44 property in great detail. The northern portions of my property are actively  
45 farmed, currently as three 5.2 acre fields and one 2.7 acre field. These  
46 fields are farmed by my neighbor, Dr. Michael Youshak. The fields are

47 carefully maintained and farmed using modern conservation tillage and  
48 no-till practices. The fields support crops of corn, soybeans, wheat, oats  
49 and alfalfa mixed hay. Through Dr. Youshak's expert management, soil  
50 erosion, soil compaction and other detrimental events that compromise  
51 the fertility and productivity of the cropland have been absolutely  
52 minimized.

53 Q. Dr. Galm, showing you what has been marked Exhibit \_\_\_\_, can you  
54 identify this photograph?

55 A. Yes. Exhibit \_\_\_\_ shows an aerial view of my farm including the center  
56 line of FirstEnergy's proposed cross country route. Note that the  
57 centerline crosses three fields, runs tangent to a lawn/part area, bisects an  
58 old growth forest and crosses a very high quality wetland.

59 Q. Dr. Galm, showing you what has been marked Exhibit \_\_\_\_, can you  
60 identify that photograph?

61 A. Yes, Exhibit \_\_\_\_ shows the view from the west end of the fields. This is  
62 the sunrise view to the east, over the fields of Geauga and Ashtabula  
63 counties to Pennsylvania. On clear nights, one can clearly see and enjoy  
64 the lights in the distance from Fredericksburg, Cherry Hill and Springboro,  
65 Pennsylvania.

66 Q. Describe how your property is used.

67 A. From the aerial photographs and topographic maps, one could easily be  
68 misled as to the use of the land below. The details of the land use can not  
69 be appreciated without a detailed examination of the land itself.

70 Q. Showing you what has been marked Exhibit \_\_\_\_\_, can you identify that  
71 photograph?

72 A. Yes, Exhibit \_\_\_\_ shows the area that would contain the transmission line,  
73 directly south of the fields, shown from the northwest corner. At the back  
74 of this area is a deer feeding area, where I feed the local white tail deer  
75 population hundreds of pounds of corn every spring. There is a tree stand  
76 just inside the tree line, where I make available to selected licensed and  
77 responsible hunters.

78 Q. Showing you what has been marked Exhibit \_\_\_\_\_, can you identify that  
79 photograph?

80 A. Yes. Exhibit \_\_\_\_\_ begins a north to south walk along the proposed corridor  
81 centerline. This photograph shows the three fields along the Project route.

82 Q. Showing you what has been marked Exhibit \_\_\_\_\_, can you identify this  
83 photograph?

84 A. Yes, this is a continuation of the north to south walk photographs. The  
85 yellow tape in this photograph marks the location of the corner pole at the  
86 transition from the fields to my yard.

87 Q. Showing you what has been marked Exhibit \_\_\_\_\_, can you identify this  
88 photograph?

89 A. Yes. This photograph is also of my property, and shows a Black Walnut  
90 seedling, directly under the transmission line path is shown in Figure 8.

91 Q. Showing you what has been marked Exhibit \_\_\_\_\_, please identify that  
92 photograph.

93 A. Exhibit \_\_\_\_ is another photograph of my property, showing the view from  
94 the corner pole along the edge of the transmission line path. Within the  
95 sixty foot corridor, a grove of Blue Spruce and Douglas fir trees is located.  
96 Most of these trees were family Christmas trees, purchased with roots  
97 attached and planted on the family property every year, after Christmas,  
98 by my father. I have protected and cared for these trees and cherish the  
99 memories that they hold for me. This cherished family pine grove would  
100 be destroyed by the proposed transmission line corridor.

101 Q. Showing you what's been marked as Exhibit \_\_\_\_, please identify this  
102 photograph.

103 A. The yellow tape is directly under the transmission line path. It is also at  
104 the entrance to my white tail deer feeding area.

105 A. Dr. Galm, please identify Exhibit \_\_\_\_.

106 A. Exhibit \_\_\_\_ is the view from the deer feeding area to the northwest  
107 toward my lawn. The north edge of the wetlands is located approximately  
108 100 feet from the end of the deer area.

109 Q. Dr. Galm, please identify the photograph marked as Exhibit \_\_\_\_.

110 A. Exhibit \_\_\_\_ is another photograph of my property showing the leading  
111 edge of the wetland area, as marked by the magenta colored wetland  
112 delineation flag.

113 Q. Dr. Galm, showing you Exhibit \_\_\_\_, please identify this photograph.

114 A. Exhibit \_\_\_\_ is another photograph of my property. The centerline of the  
115 transmission line is directly over the wetland area shown in this  
116 photograph.

117 Q. Showing you what has been marked Exhibit \_\_\_\_, please identify this  
118 photograph.

119 A. Exhibit \_\_\_\_ shows the view turning west from the view of the previous  
120 photograph, showing Exhibit \_\_\_\_.

121 Q. Please identify the photograph marked as Exhibit \_\_\_\_.

122 A. Exhibit \_\_\_\_ shows the wetland delineation flag I just mentioned. This  
123 photograph shows the stream and adjacent creek bed. This area is also  
124 under the transmission line path. Moving south across the wetland, the  
125 path transitions from wetland to old growth, high canopy forest a magenta  
126 colored wetland delineation flag. The forest area would be especially  
127 hard-hit by the proposed transmission line corridor due to the presence of  
128 tall trees adjacent to the corridor that could be classified by the applicant  
129 as danger trees.

130 Q. Dr. Galm, please identify the photograph marked as Exhibit \_\_\_\_.

131 A. After traversing the old growth woods, the proposed transmission line  
132 corridor crosses the property line at the transition from woods to  
133 productive field at the yellow tape shown in Exhibit \_\_\_\_.

134 Q. Please identify the photograph marked as Exhibit \_\_\_\_.

135 A. Exhibit \_\_\_\_ looks north across the field toward the woods transition, and  
136 this photograph attempts to capture this stunning scene of unspoiled rural

137 perfection. Imagine the view in this photograph, but now with a sixty foot  
138 clear cut utility corridor, danger trees removed for an additional forty-five  
139 feet on each side, and a two circuit 138 kV transmission line on 80 foot  
140 high poles located almost exactly down the center of the photo.

141 Q. Please describe your professional experience with power issues.

142 A. In 1991, I joined Cyberex, Inc, then based in Mentor, Ohio. Cyberex  
143 designed and manufactured advanced power electronic products such as  
144 uninterruptible power supplies and high power battery charging  
145 equipment. While at Cyberex, I designed or led design teams that created  
146 three new lines of uninterruptible power supply products.

147 Q. What are uninterruptable power supplies?

148 A. An uninterruptable power supply – also known as a UPS – is a device  
149 which substitutes for utility power either when that power fails or when the  
150 voltage from that power source is too high or too low. UPSes are common  
151 now not only in business and industry, but also in home applications, such  
152 as protecting your home computer (for example allowing it to shut off in an  
153 orderly fashion even after a power outage). These UPS products  
154 contained many technological firsts in the power industry.

155 Q. Describe in more detail the UPS devices you created at Cyberex.

156 A. I was responsible for solving power system problems presented by  
157 customers using modeling, computer simulation and direct analysis  
158 techniques. At Cyberex, I invented enabling technologies that created the  
159 class of power electronic products known as high speed solid state power



160 transfer switches. This class of product is now a 70 million dollar per year  
161 industry segment.

162 Q. What else did you do while at Cyberex?

163 A. I designed or led design teams that created both low voltage and medium  
164 voltage high speed solid state power transfer switch products. Our  
165 medium voltage products operated at up to 36 kilovolt class, at up to 600  
166 amp steady state ampacity. I collaborated with engineers with the Joslyn  
167 High-Voltage corporation in the development of high speed  
168 electromechanical power switching apparatus intended specifically for the  
169 electrical utility industry.

170 Q. Describe your job experience after Cyberex.

171 A. In 2001, I left Cyberex and co-founded LayerZero Power Systems, Inc.  
172 LayerZero Power Systems, Inc. designs and manufactures power related  
173 products for the mission critical industry. These products include but are  
174 not limited to, high speed solid state power transfer switches. I continue to  
175 be involved with design of power electronic products as well as solving  
176 power system related problems and creating solutions to power system  
177 needs.

178 Q. Dr. Galm, showing you what has been marked Exhibit \_\_\_\_, please  
179 identify this document.

180 A. This is an areal map of the Geauga County area affected by the proposed  
181 Geauga County power line project.

182 Q. Did you create the photograph?

183 A. The photograph was taken from on-line sources. I then took information  
184 from the Application in this case, the Application in the Rachel case, and  
185 the detailed information that is available (including areal photography and  
186 measuring devices) from the Geauga Auditor's website to depict where in  
187 his area the relevant corridors are and the lengths of those corridors.

188 Q. Dr. Galm, did you add in the superimposed routes shown on the Exhibit?

189 A. Yes I did, utilizing the information provided by FirstEnergy as well as the  
190 previously mentioned on line resources.

191 Q. Did you make the measurements depicting the link of lines that are on the  
192 Exhibit?

193 A. Yes I did.

194 Q. Are the links of those lines accurately portrayed on the Exhibit?

195 A. Yes.

196 Q. Dr. Galm, is Exhibit \_\_\_\_\_ a fair and accurate representation of the area of  
197 the Geauga project, showing not only the Proposed Route and the  
198 Alternate Route, but various other alternatives for the location of the  
199 proposed transmission line?

200 A. Yes.

201 Q. Dr Galm, showing you what has been marked Exhibit \_\_\_\_\_, (CON071)  
202 please identify that document.

203 A. This Exhibit is a memo from FirstEnergy's Ralph N. Delligatti dated  
204 03/20/2007. In the memo, Mr. Delligatti states that there is a five mile  
205 section of MF-22 along Mayfield Road (U.S. 322) that is constructed with

206 795 ACSR line and 138 kV phase spacing. The memo states that the  
207 section is presently constructed with 36 kV insulators and is being run at  
208 36 kV.

209 Q. Did you take any steps to verify the observations in Mr. Delligatti's memo?

210 A. I have personally driven and investigated the entire length of this section  
211 of the MF-22 circuit. The eastern end of this constructed segment is  
212 located at N 41° 32.08' W 81° 2.59', and its western end is located at N  
213 41° 31.92' W 81° 8.46', for a length of 5.08 miles. The phase spacing,  
214 conductor size and insulator length as viewed from the ground are  
215 consistent with the description in the Delligatti memo.

216 Q. What is the significance of this memo?

217 A. The Applicants have been previously queried about the possibility of using  
218 pre-existing rights of way along Mayfield Road. An example of a typical  
219 reply from FirstEnergy is a document it submitted in response to an inquiry  
220 about the Mayfield Road possibility by US Congressman Steve  
221 LaTourette. In this response FirstEnergy stated that Mayfield Road is an  
222 unsuitable location for a 138 kV transmission line. By contrast, The  
223 confidential Delligatti memo, written just last year, states not only that  
224 Mayfield Road is a suitable location for a 138 kV transmission line, but  
225 also that FirstEnergy has already installed the taller poles and greater line  
226 spacing and transmission line conductors and can turn this existing 36 kV  
227 line into a 138 kV line simply by changing insulators. Thus, when  
228 FirstEnergy told Congressman LaTourette that Mayfield Road was not

229 usable for a 138 kV transmission line to solve the Middlefield power  
230 problems, it was telling Congressman LaTourette something that  
231 FirstEnergy itself knows is untrue.

232 Q. In the documents you reviewed, did you find any indication that  
233 FirstEnergy thoroughly studied utilization of the Mayfield Road corridor as  
234 an alternative to acquiring privately-owned property as proposed for the  
235 Preferred Route and the Alternate Route?

236 A. No

237 Q. In your opinion, why should Mayfield Road have been studied?

238 A. At the western end of the area being studied is the Mayfield substation,  
239 located in Chester Township on Mayfield Road, just east of Chillicothe  
240 Road, which is also State Route 306. The Mayfield substation connects to  
241 the north-south bulk transmission corridor in western Geauga County and  
242 connects to the Q1-Q4 lines in that corridor. That connection transforms  
243 138 kV to 36 kV, supplying the three 36 kV lines, MF-20, MF-21 and MF-  
244 22, which currently serve Middlefield. Since Mayfield Road is a pre-  
245 existing civil corridor and already carries MF-21 and MF-22, that location  
246 would be more than suitable for the location of a 138 kV transmission line.  
247 In fact, a route from the Q3 circuit at or near the Mayfield substation to  
248 either the Ruth substation or to a new Stacy substation would have fulfilled  
249 the electrical requirements of the present project and met the need  
250 identified in Middlefield without creation of a new corridor or the use of  
251 eminent domain to acquire private property. Furthermore, the distance

252 from the Q3 circuit at the Chester substation to the present Ruth  
253 substation is 11.7 miles, which is shorter than either the cross-country or  
254 the Clay Street routes in the Application. In addition, the Mayfield to Ruth  
255 siting solution is a highly desirable siting alternative for a transmission line  
256 solution to the Middlefield energy issues in that (1) a Mayfield to Ruth  
257 route would be 100% exclusively sited on pre-existing civil corridors, (2) a  
258 Mayfield to Ruth route has been shown to be suitable to support a 138 kV  
259 transmission line in view of Exhibit \_\_\_\_\_ (CON071) (3) a Mayfield to Ruth  
260 route encompasses a distance from the Q3 circuit at the Chester  
261 substation to the present Ruth substation that is only 11.7 miles, less  
262 distance than either the cross-country or the Clay Street routes in the  
263 present Application, and (4) a Mayfield to Ruth route is a straight, direct  
264 and obvious route between the present Q1-Q4 bulk power transmission  
265 corridor and the identified load center described in the present  
266 Application.

267 Q. In preparing for your testimony herein, have you reviewed the Application  
268 in the Rachel proceeding, the Application in the present proceeding and  
269 the numerous documents, including confidential documents, produced by  
270 FirstEnergy in the present matter?

271 A. Yes.

272 Q. In your review of those documents, did you see any evidence that  
273 FirstEnergy gave a thorough evaluation to the pros and cons of whether  
274 the need for power in Middlefield as identified in the present application

275 could be met by installation of a 138 kV line from the Mayfield substation  
276 to the Ruth substation or to a new substation located in the area of the  
277 proposed Stacy substation?

278 A. No, I saw no such evaluation.

279 Q. Are you familiar with the Modified Rachel Route?

280 A. Yes I am.

281 Q. What is the significance of the Modified Rachel Route to the present  
282 Application?

283 A. The Modified Rachel route as approved and certificated by OPSB is  
284 unique among siting alternatives for a potential transmission line solution  
285 to the energy delivery issues purported to exist in Middlefield in that (1) the  
286 Modified Rachel route as certificated by OPSB in 1997, fulfills exactly the  
287 electrical need expressed in detail in the present Application, (2) the  
288 Modified Rachel route, as certificated by OPSB in 1997, is identified as the  
289 optimal and preferred solution by Jim Sears in Exhibit \_\_\_\_, (CON220)  
290 FirstEnergy's confidential "Middlefield Area Study", (3) the Modified  
291 Rachel Route was identified as an optimal solution in an April, 2006 study  
292 performed for FirstEnergy by URS (although URS predicted it "might not  
293 be possible" because the OPSB process duration for that route [and only  
294 for that route] was predicted to last 3 to 5 years because of community  
295 opposition), all of which is shown in Exhibit \_\_\_\_, (CON249) another  
296 confidential document produced by FirstEnergy; (4) the Modified Rachel  
297 route, as certificated by OPSB in 1997, utilizes a pre-existing civil corridor

298 for the majority of its length, (5) the Modified Rachel route, as certificated  
299 by OPSB in 1997, is shorter than either of the routes proposed in the  
300 present Application, and (6) the Modified Rachel route, as certificated by  
301 OPSB in 1997, has already been engineered, presented for application to  
302 the OPSB, approved by the OPSB.

303 Q. What about the fact that a portion of the Modified Rachel route is now  
304 occupied by the bike path owned by the Geauga Park District?

305 A. Even though the existence of the bike path and its ownership by Geauga  
306 Park District is claimed to be an impediment, those identical factors  
307 existed in 1997, since the property was then owned by the Geauga  
308 County Commissioners and the plans to construct a bike path on that  
309 property not only had nearly been finalized, but also had been disclosed to  
310 and considered by OPSB before certifying that route.

311 Q. What about FirstEnergy's claim that the Geauga project is an entirely a  
312 different project in an electrical sense than the Modified Rachel project?

313 A. Any claims by any party that the Modified Rachel route is substantially  
314 *different from the Geauga proposal ignores the fact that, from an electrical*  
315 *standpoint, the solution achieved and the need met by the modified*  
316 *Rachel Route are exactly the same as a solution achieved and the need*  
317 *met by the Preferred route and the Alternative route in the present case.*

318 Q. Do you have an opinion based upon a reasonable degree of engineering  
319 certainty that from an electrical standpoint, the need met by the Rachel

320 certificate is the same need met by the power line proposed in this  
321 proceeding?

322 A. Yes, it is the same need being addressed and the same need is being  
323 met. The only difference is the route being taken by the new 138 kV  
324 transmission line to accomplish that goal.

325 Q. Have you reviewed the Application filed in the present matter, the  
326 Application filed in the Rachel matter and the numerous documents  
327 produced by FirstEnergy in this matter?

328 A. Yes.

329 Q. In your review of those documents, did you see any suggestion that  
330 FirstEnergy thoroughly evaluated the pros and cons of meeting the need  
331 addressed herein through the use of the previously certificated Rachel  
332 Route or any reasonable modification thereof?

333 A. No. I saw no such through evaluation. However, the 2006 report by Jim  
334 Sears makes it clear that from an engineering standpoint, FirstEnergy  
335 believed that solution was the most optimum solution and a review of  
336 other documents suggests that one of the primary reasons for not using  
337 the previously certificated route was FirstEnergy's fear that obtaining  
338 approval might take substantially longer than simply using a rural  
339 agricultural route.

340 Q. What is the route known as the "Ruth-Pinegrove Combination Route"?

341 A. The Ruth-Pinegrove combination route (RP) is unique among siting  
342 alternatives for a potential transmission line solution to the energy delivery



343 issues purported to exist in Middlefield in that (1) the RP route is 100%  
344 exclusively sited on pre-existing civil corridors, (2) a significant portion of  
345 the RP route presently hosts 36 kV subtransmission circuits or distribution  
346 voltage circuits, (3) the RP route is inarguably the shortest reasonable  
347 route in terms of absolute distance, hence cumulative land use and  
348 environmental impact, possible to satisfy the electrical needs expressed in  
349 the present Application, and (4) over 60% of the RP route has already  
350 been engineered, presented for application to the OPSB and certificated  
351 by the OPSB.

352 Q. In your review of the documents related to this application, did you see  
353 any evidence that FirstEnergy thoroughly evaluated the pros and cons of  
354 whether the RP route could be utilized to meet the need for the 138 kV  
355 transmission line proposed herein?

356 A. I do not believe that FirstEnergy's legitimate evaluation of the route was  
357 either thorough or in good faith. For example, in exploring the bike path  
358 possibility, FirstEnergy insisted on placing its poles immediately adjacent  
359 to the asphalt path, even though the publicly owned right-of-way is 100  
360 feet wide, and the poles could have been placed significantly away from  
361 the bike path, similar to many other shared utility/recreational uses  
362 throughout this state. While I am aware that FirstEnergy responded to a  
363 staff interrogatory on the issue, I also do not believe that FirstEnergy's  
364 evaluation of this potential route was either thorough, accurate or in good  
365 faith.

366 Q. Have you evaluated the possibility that the need for power in the  
367 Middlefield area could be met utilizing a transmission line along the State  
368 Route 11 corridor?

369 A. Yes, in a general sense.

370 Q. Please describe that evaluation.

371 A. The State Route 11 siting solution and variants thereof are highly  
372 desirable siting alternatives for a potential transmission line solution to the  
373 energy delivery issues purported to exist in Middlefield in that (1) SR-11  
374 routes are 100% exclusively sited on pre-existing civil corridors, (2) SR-11  
375 is an enormous, multi-lane, limited access, wide median highway that  
376 presents a pre-existing right-of-way intrusion of hundreds of feet upon  
377 adjacent properties, and (3) SR-11 routes are consistent with FE's long  
378 term vision for networking its 138 kV CEI and 69kV Ohio Edison systems,  
379 as articulated in Exhibit \_\_\_\_ (CON220).

380 Q. In your review of the Application and various documents produced by  
381 FirstEnergy, did you see any evidence that FirstEnergy gave a thorough  
382 evaluation of the pros and cons for whether the need for power in the  
383 Middlefield area could be met by a 138 kV line in the State Route 11 area?

384 A. No, I saw no such thorough evaluation.

385 Q. Have you evaluated the possibility that modification to the Sanborn  
386 substation could be utilized to meet the current need for power in the  
387 Middlefield area?

388 A. Yes, in a general sense, but FirstEnergy did not provide sufficient data to  
389 perform a thorough evaluation of the specific calculations necessary to  
390 reach a final conclusion on this issue.

391 Q. What are the general parameters of a solution which would involve the  
392 Sanborn substation?

393 A. The Sanborn substation presently contains three 40 MVA transformers,  
394 although the Sanborn substation was built to accommodate four  
395 transformers. One transformer bay at the Sanborn substation is currently  
396 vacant. Adding a fourth transformer to the Sanborn substation would  
397 increase the capacity of the facility by at least 40 MVA, or at least 33%.  
398 The descriptions of the 36 kV subtransmission circuits between the  
399 Sanborn substation and the load center area are inconsistent. The  
400 Application states that two circuits, SN-18 and SN-19, each with a  
401 capacity of 42.6 MVA, are available to move power from the Sanborn  
402 substation to the load center area, while the confidential load flow  
403 diagrams, show only one circuit, SN-18, available to move power from the  
404 Sanborn substation to the load center area.

405 Q. In your review of the documents related to the Rachel Application, the  
406 present Application, and the additional documents produced by  
407 FirstEnergy, did you see any evidence that FirstEnergy thoroughly  
408 evaluated the potential Sanborn solution as a way to meet the need for  
409 power in Middlefield.

410 A. Yes, in fact FirstEnergy did perform such an evaluation.

411 Q. Dr. Galm, showing you what has been marked as Exhibit \_\_\_\_\_, can you  
412 identify that document.

413 A. Yes, this is a letter written to the Ohio Power Siting Board by Gavin  
414 Cunningham, an engineer for FirstEnergy and dated January 15, 1999.  
415 Attached to that document is a document entitled "Rachel Alternative  
416 Strategy Update." In that document, FirstEnergy represented to the Ohio  
417 Power Siting Board that FirstEnergy no longer needed to build the Rachel  
418 line because it had solved the need identified in the Rachel Application.  
419 That need was, according to FirstEnergy, solved by the implementation of  
420 a number of measures, including the installation of voltage regulators  
421 (which appear now to have been installed), the reconductoring of certain  
422 36 kV circuits (some of which appears to have been commenced) and the  
423 installation of a fourth transformer at the Sanborn substation. FirstEnergy  
424 represented to the OPSB that taking these steps would make the system  
425 adequate to serve double the current load of 84 MVA through year 2028.  
426 Thus, FirstEnergy has already studied the issue, and has represented the  
427 Ohio Power Siting Board that the solution to the Middlefield problem is the  
428 installation of a transformer at the Sanborn substation.

429 Q. Have you recently visited the Sanborn substation?

430 A. Yes, it is located in an area not too far from my family farm and I visited it  
431 earlier this month.

432 Q. Was the fourth transformer ever installed.

433 A. No, the pad for the forth transformer remains empty.

434 Q. Dr. Galm, based upon your experience and training and your review of all  
435 of the material related to this case, do you have an opinion to a  
436 reasonable degree of engineering certainty as to where along the  
437 Ashtabula to Mayfield Q1-Q4 corridor a tap or loop to remedy the  
438 Middlefield power problem needs to be placed?

439 A. Yes. From an electrical engineering standpoint, it does not matter where  
440 along that corridor a tap or loop is located. Simply put, it can be located  
441 anywhere along the line and still provide the needed power to Middlefield  
442 without adversely effecting the balance of the system.

443 Q. Dr. Galm, please explain how you reached that conclusion.

444 A. Exhibit \_\_\_\_ (CON297) shows the number of watts flowing into and out of  
445 various bus locations along Q3-AT-MF. These bus locations generally  
446 represent the 138 kV buses associated with existing or planned  
447 substations. Using simple calculations, the power capability from  
448 Middlefield westbound is not exceeded for any connection location and the  
449 power capability from Ashtabula westbound is not exceeded for any  
450 connection location.

451 Q. Dr. Galm, is the electrical configuration for the Rachel substation the same  
452 electrical configuration as the configuration for the Stacy substation?

453 A. No. the substation that was planned for Rachel was a dual tapped  
454 configuration and the substation planned for the Stacy substation in the  
455 Geauga proposal is a looped configuration.

456 Q. Describe the difference between a tapped configuration and a looped  
457 configuration.

458 A. For purposes of contingency planning and system operational versatility,  
459 most substations are powered from two or more circuits at the substation  
460 input voltage (that is the higher of the two voltages). Large substations  
461 such as Chester the Mayfield substation in Chesterland connected to eight  
462 138 kV input circuits, two per transformer. The existing Pinegrove and  
463 proposed Rachel and Stacy substations are designed to operate initially  
464 as single transformer substations and all are connected to two input 138  
465 kV circuits.

466 In the cases of Rachel and Pinegrove, the two 138 kV input circuits are  
467 established by tapping the AT-MF-Q3 and AT-MF-Q4 circuits at the  
468 connection point and running extensions of each tap to the Rachel or  
469 Pinegrove substation. This arrangement allows the Rachel or Pinegrove  
470 substation to be powered from either AT-MF-Q3 or AT-MF-Q4, and allows  
471 for paralleling AT-MF-Q3 and AT-MF-Q4 when switching or for long term  
472 operation from paralleled input circuits.

473 In the case of Stacy, the two 138 kV input circuits are established by  
474 opening the AT-MF-Q3 circuit at the connection point and extending each  
475 side of the open connection point to the Stacy substation. This creates a  
476 loop structure, where one input of Stacy is connected to the Ashtabula  
477 side of Q3 and becomes AT-ST-Q3 and one side of Stacy is connected to  
478 the Mayfield side of Q3 and becomes MF-ST-Q3. This arrangement

479 allows the Stacy substation to be powered from either AT-ST-Q3 or MF-  
480 ST-Q3, and allows for paralleling AT-ST-Q3 or MF-ST-Q3 when switching  
481 or for long term operation from paralleled input circuits.

482 Q. Does the fact that the Rachel design involved a pair of tapped circuits and  
483 the Geauga design involves a single loop circuit make the two proposals  
484 fundamentally different?

485 A. No. Fundamentally, a pair of tapped circuits and a single looped circuit  
486 achieve the same goal, which is to allow the substation to be powered  
487 independently from one or both of two circuits. The design choice is made  
488 based on secondary factors.

489 Q. Is the Pinegrove extension a tapped circuit or a looped circuit?

490 A. Pinegrove is a tapped circuit.

491 Q. If FirstEnergy chose to use a looped circuit to solve the Middlefield  
492 problem, does the fact that Pinegrove is a tapped circuit preclude the use  
493 of the suggested Pinegrove to Rachel route?

494 A. No. If it were desired to use the Pinegrove extension as a starting point  
495 for a circuit pair to power another substation located further south, either a  
496 pair of tapped circuits connected to AT-MF-Q3 and AT-MF-Q4 or a looped  
497 circuit connected to AT-MF-Q3 could be easily accommodated. For a pair  
498 of tapped circuits connected to AT-MF-Q3 and AT-MF-Q4, the two 138 kV  
499 circuits presently built along the B&O railroad grade from the AT-MF  
500 corridor to Pinegrove would simply be extended south along the railroad  
501 grade or whatever path is desired. No changes to the existing circuit

502 configuration would be required. For a looped circuit connected to AT-MF-  
503 Q3 at Pinegrove, one additional 138 kV circuit would need to be built  
504 between Pinegrove and the Pinegrove extension connection point. The  
505 tap point at AT-MF-Q3 would be reconfigured from a tap to a loop, where  
506 one side of the loop is the new circuit. From that reconfiguration, a looped  
507 circuit from AT-MF-Q3 would simply be an extension of the present Q3  
508 circuit and the new circuit at Pinegrove south along the railroad grade or  
509 whatever path is desired.

510 Q. Dr. Galm, explain, from the technical standpoint, why it does not matter  
511 where the tap for the new power line is located on the Ashtabula to  
512 Mayfield line.

513 A. Exhibit \_ (CON292), Exhibit \_\_\_\_ (CON293) and Exhibit \_\_\_\_ (CON294)  
514 show the number of watts flowing into and out of various bus locations  
515 along Q3-AT-MF for three contingency scenarios, as predicted by the  
516 PSLF program, based on a model of the system. These bus locations  
517 generally represent the 138 kV buses associated with existing or planned  
518 substations. Exhibit \_ (CON294) shows that under N-0 summer normal  
519 conditions, 49 MW will enter the Q3 circuit from Mayfield and 98 MW will  
520 enter the Q3 circuit from Ashtabula. Of the 147 MW entering the Q3  
521 circuit, 77 MW is consumed by the Stacy substation with 31 MW  
522 consumed at Pinegrove and 36 MW consumed at Sanborn. The 3 MW  
523 difference between the total power entering the Q3 circuit and the sum of  
524 the three loads on the Q3 circuit represents the losses in the system. The



power consumed by the Spruce, Leroy Center, and 02RA Q-3 buses (i.e. the Rachel bus) negligible. Consequently, locating the new Stacy connection to Q3 at Pinegrove, between Pinegrove and 02RA Q-3, at 02RA Q-3, between 02RA Q-3 and Leroy Center, at Leroy Center, between Leroy Center and Spruce, at Spruce, between Spruce and Sanborn, or at Sanborn neither increases nor decreases the loading on any circuits east of Sanborn or west of Pinegrove, nor does it change the power entering the Q3 circuit from either direction. It is therefore clear that the Stacy to Q3 connection may be located with equal efficacy anywhere between and including Pinegrove and Sanborn under N-0 summer normal conditions.

Q. Does this remain the case even under the N-1 planning criteria?

A. Yes. Exhibit \_ (CON293) shows that under N-1 summer normal conditions with the Ashtabula side of the Q3 to Stacy connection out of service, 109 MW will enter the Q3 circuit from Mayfield and 48 MW will enter the Q3 circuit from Ashtabula. With the Ashtabula side of the Q3 to Stacy connection out of service, the 75 MW of power consumed by Stacy is supplied by Mayfield. The power consumed by the Spruce, Leroy Center, and 02RA Q-3 buses is negligible, thus locating the Stacy connection to Q3 at Pinegrove, between Pinegrove and 02RA Q-3, at 02RA Q-3, between 02RA Q-3 and Leroy Center, at Leroy Center, between Leroy Center and Spruce, at Spruce, between Spruce and Sanborn, or at Sanborn neither increases nor decreases the loading on

548 any circuits east of Sanborn or west of Pinegrove, nor does it change the  
549 power entering the Q3 circuit from either direction. It is therefore clear that  
550 the Stacy to Q3 connection may be located with equal efficacy anywhere  
551 between and including Pinegrove and Sanborn under N-1 summer normal  
552 conditions with the Ashtabula side of the Q3 to Stacy connection out of  
553 service.

554 Q. Is this also true if the Mayfield side of the Q-3 to Stacy connection is out of  
555 service?

556 A. Yes. Exhibit \_ (CON292) shows that under N-1 summer normal  
557 conditions with the Mayfield side of the Q3 to Stacy connection out of  
558 service, 30 MW will enter the Q3 circuit from Mayfield and 118 MW will  
559 enter the Q3 circuit from Ashtabula. With Mayfield side of the Q3 to Stacy  
560 connection out of service, the 76 MW of power consumed by Stacy is  
561 supplied by Ashtabula. The power consumed by the Spruce, Leroy  
562 Center, and 02RA Q-3 buses is negligible, thus locating the Stacy  
563 connection to Q3 at Pinegrove, between Pinegrove and 02RA Q-3, at  
564 02RA Q-3, between 02RA Q-3 and Leroy Center, at Leroy Center,  
565 between Leroy Center and Spruce, at Spruce, between Spruce and  
566 Sanborn, or at Sanborn neither increases nor decreases the loading on  
567 any circuits east of Sanborn or west of Pinegrove, nor does it change the  
568 power entering the Q3 circuit from either direction. It is therefore clear that  
569 the Stacy to Q3 connection may be located with equal efficacy anywhere  
570 between and including Pinegrove and Sanborn under N-1 summer normal

571 conditions with the Mayfield side of the Q3 to Stacy connection out of  
572 service.

573 Q. Is it possible that the Q3 to Stacy connection could be located east of the  
574 Sanborn bus?

575 A. It is possible that the Q3 to Stacy connection could be located east of  
576 Sanborn, however the modeling and simulation study results presented in  
577 Exhibit \_ (CON292) through Exhibit \_ (CON294) are insufficient to make  
578 that determination.

579 Q. Dr. Galm, based upon your review of the documents and data produced  
580 by FirstEnergy, do you have an opinion, to a reasonable degree of  
581 engineering certainty as to where the Q3 connection to Stacy can be  
582 located along the 138 kV line that runs from Ashtabula to Mayfield?

583 A. Yes. Based upon the analysis about which I just testified, which is based  
584 upon the documents and data provided by FirstEnergy, it is clear that the  
585 Q3 to Stacy connection can be located with equal efficacy anywhere  
586 between and including Pinegrove and Sanborn under summer normal  
587 conditions at NERC A or B contingency categories.

588 Q. Dr. Galm, are you aware that FirstEnergy has filed with the OPSB in this  
589 proceeding a number of documents "under seal"?

590 A. Yes, I am aware of that and I am also aware that we were unable to see  
591 any of these documents until about one month ago, because FirstEnergy  
592 insisted on protracted negotiations regarding a confidentiality order and

593 demanded CARE stipulate to absurd terms. Even then, not all information  
594 was produced without delay.

595 Q. Describe the information and documents that were filed under seal in this  
596 proceeding.

597 A. There are two CD-roms containing substantial data. Most of the data,  
598 although viewable in a word processing program, is not usable without  
599 access to a proprietary program which is apparently available to OPSB  
600 and FirstEnergy, but which is not available to the general public. In  
601 addition, there were several significant detailed technical drawings which  
602 depicted and articulated much of that data.

603 Q. Dr. Galm, please review the following Exhibits and identify whether these  
604 are the drawings you referenced which have been filed under seal: Exhibit  
605 \_\_\_\_ (CON297), Exhibit \_\_\_\_ (CON298), Exhibit \_\_\_\_ (CON299), Exhibit  
606 \_\_\_\_ (CON300), Exhibit \_\_\_\_ (CON290), Exhibit \_\_\_\_ (CON295), Exhibit  
607 \_\_\_\_ (CON291) and Exhibit \_\_\_\_ (CON296).

608 A. Yes. These are the key diagrams and drawings containing the data upon  
609 which I relied in order to determine the need issues, the availability of  
610 alternate routes and the accuracy of certain statements made by  
611 FirstEnergy.

612 Q. Please describe why the documents filed under seal, which I will refer to  
613 as the "sealed documents" were important to your understanding and  
614 analysis of the application.

615 A. The sealed documents, in particular the base case load flow diagrams, are  
616 essential to evaluating the range of locations along the Q3-AT-MF circuit  
617 where a connection can be made to the proposed substation. The base  
618 case load flow diagrams are essential to evaluating the range of locations  
619 within the existing 36 kV system where a proposed substation could be  
620 located. Knowledge of the geographic ranges for the proposed system  
621 components is required to successfully argue against the proposed  
622 locations.

623 The load flow diagrams further permit verification of the location and  
624 magnitude of the 36 kV system loads and the system voltage at the loads  
625 and system busses. Knowledge of the 36 kV system load structure is  
626 essential to verifying the need for the proposed substation.

627 Q. Were you able, as an electrical engineering expert, to determine the  
628 accuracy of FirstEnergy's claims that Geauga was different from Rachel  
629 without examining the sealed documents and the information and data  
630 contained therein?

631 A. No.

632 Q. Why would it be important for CARE to have this data more than a month  
633 before the adjudicatory hearing?

634 A. CARE has been actively opposing this project, since its inception, and has  
635 been battling public relations wars with FirstEnergy with many of the  
636 communities involved. Indeed, it can be seen that many communities filed  
637 conflicting resolutions both opposing and supporting the projects, based in

638 part upon information they were told first by CARE and later by  
639 FirstEnergy. The sealed documents provide the proof that the present  
640 project was conceived to address the same electrical need as the Rachel  
641 project. Without the sealed documents, one can only speculate or rely on  
642 the vague descriptions in the Geauga and Rachel Applications to  
643 challenge the claimed difference between Geauga and Rachel.  
644 FE has vigorously asserted that the project is needed with extreme  
645 urgency, that the proposed substation location and transmission line  
646 route(s) are the only viable solutions, and that the present project  
647 addresses entirely different needs than those addressed by Rachel.  
648 Without the data in the sealed documents, communities and their leaders  
649 are left to accept FE's PR at face value. Had the sealed documents been  
650 publicly available from the start, communities and their leaders could have  
651 learned and understood the facts of the situation, allowing them to make  
652 more informed and better policy decisions. Indeed, even now, when we  
653 have learned important information from the sealed documents, CARE is  
654 prohibited from rebutting FirstEnergy's representations to those  
655 communities because of the stringent terms of the confidentiality  
656 agreement, and its prohibition against use of that data in any forum, even  
657 where it is to correct misrepresentations by FirstEnergy.

658 Q. Dr. Galm, please explain why not having the PSLF data contained in the  
659 information filed under seal is important.

660 A. The PSLF data provided by the applicants consists of 36 kV studies and  
661 138 kV studies. The 138 kV studies represent 70,122 kB of data for which  
662 only the raw binary files were provided, in addition to certain drawings.  
663 The 36 kV studies represent 175,104 kB of raw binary data. The 36 kV  
664 studies represent 130 pages (930 kB) of numerical output for the before-  
665 project case and 138 pages (955 kB) of numerical output for the after-  
666 project case. An additional 78 pages (658 kB) of numerical data describes  
667 the base and contingency results for the system elements.  
668 The binary files provide little useful information, since they are intended to  
669 be used by the PSLF program, which is apparently available to not only  
670 FirstEnergy, but also to OPSB as factfinder herein. By not having access  
671 to that analytical tool, any by allowing FirstEnergy to rely on certain results  
672 produced by that analytical tool, CARE and the public in general are  
673 deprived of the opportunity to evaluate fully FirstEnergy's contentions.  
674 That being said, the previously identified exhibits that were filed under  
675 seal, in particular the summary documents, are important in that they  
676 present system conditions for nodes that are outside of the scope of the  
677 drawings. This information allows improved understanding of the overall  
678 system condition. Not having this information until just before the  
679 adjudicatory hearing made it extremely difficult for CARE to assemble and  
680 present its case.

681 Q. Dr. Galm, does the Rachel project appear on any of the sealed documents  
682 in the Geauga case?

683 A. In the 138 kV studies, a bus named "02RA" is identified in multiple PSLF  
684 output files as a simulation node. A bus with this reference designator is  
685 shown on the 138 kV load flow diagram Exhibit \_ (CON292). Although the  
686 bus shown in 138 kV load flow diagrams Exhibit \_ (CON292) is not labeled  
687 with a name in the manner of the Pinegrove or Leroy Center busses, its  
688 location along circuit Q3 is consistent with the location of the certificated  
689 Rachel substation.

690 Q. If FirstEnergy has abandoned the Rachel project and does not plan to  
691 build that line, why would it leave the Rachel bus in its models?

692 A. I have no idea.

693 Q. Based upon the information in the sealed documents, what is the total  
694 load on the Stacy subdivision?

695 A. Exhibit \_ (CON291) shows the total load on the Stacy substation as 73  
696 MW.

697 Q. Do the documents show the current total load going to Middlefield?

698 A. Yes. Exhibit \_ (CON290) shows the base case 36 kV system load flow.  
699 Exhibit \_ (CON290) shows power flow into the Middlefield area on 36 kV  
700 circuits MF-20 (18 MW), MF-21 (17 MW) and MF-22 (11 MW), for a total  
701 of 46 MW.

702 Q. Why is this not the 73 MW load projected for Stacy?

703 A. Of the 73 MW projected load for Stacy, approximately 30 MW is being  
704 used to power loads that are not located in Middlefield.



705 Q. Are there any specific inaccuracies of the load data about which you are  
706 aware?

707 A. Yes, the load data contains significant loads for both Johnson Rubber (3  
708 MW) and Geauga Industries (1 MW). Both of these businesses have filed  
709 for bankruptcy, and neither is actively engaged in manufacturing.  
710 Therefore of the 46 MW shown going to Middlefield, 4 MW of that amount  
711 is no longer operational.

712 Q. Are you aware of any new businesses in Middlefield with substantial  
713 electrical loads since the Application was filed?

714 A. No.

715 Q. So based upon FirstEnergy's documents and these developments, what is  
716 the actual total load FirstEnergy shows going to Middlefield?

717 A. 42 MW.

718 Q. Did the sealed documents reveal any other information relating to  
719 FirstEnergy's claim that there is an immediate and urgent need for this  
720 project.

721 A. Yes. The sealed documents demonstrate that although a need may exist,  
722 it is neither urgent nor immediate. In fact, a careful analysis of the sealed  
723 documents demonstrates that certain loads have been shifted to maximize  
724 the impression that a need exists. The load on MF-21 is reduced from 24  
725 MW to 2 MW by the addition of the Stacy substation. The load on MF-22  
726 is reduced from 37 MW to 8 MW by the addition of the Stacy substation.  
727 The load on SN-18 is reduced from 15 MW to 5 MW by the addition of the

728 Stacy substation. These large reductions in circuit loading imply that the  
729 distribution of loads within the 36 kV system is initially shifted heavily away  
730 from Mayfield and Sanborn, to Stacy, causing Stacy to model as initially  
731 highly loaded ( $73 \text{ MW} / 80 \text{ MW} = 91\%$ ). Initial high load for Stacy implies  
732 an urgent need for construction of Stacy. In reality, a circuit configuration  
733 that yields a balanced distribution of loads would not cause Stacy to model  
734 initially as highly loaded, thus not as urgently needed. The apparent  
735 urgent need for Stacy is therefore more the result of the circuit  
736 configuration chosen, rather than genuine lack of capacity in the existing  
737 36 kV system.

### CERTIFICATE OF SERVICE

I hereby certify that a true and accurate copy of the foregoing Citizens Advocating Responsible Energy's Initial Direct Testimony of James Galm was served this 8<sup>th</sup> day of September 2008, via regular U.S. Mail upon the following:

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