Decision No. C06-0786

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

DOCKET NO. 05A-072E

IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE COMANCHE - DANIELS PARK 345KV TRANSMISSION PROJECT.

COMMISSION DECISION

Mailed Date: July 3, 2006
Adopted Date: June 29, 2006

Appearances:

Paula M. Connelly, Esq., Denver, Colorado, for Applicant Public Service Company of Colorado;

Anne K. Botterud, Esq., First Assistant Attorney General, Denver, Colorado, for Intervenor Staff of the Colorado Public Utilities Commission;

Stephen W. Southwick, Esq., First Assistant Attorney General, Denver, Colorado, for Intervenor Colorado Office of Consumer Counsel;

Mark A. Davidson, Esq., and Michelle R. Brandt, Esq., Denver, Colorado, for Intervenor Climax Molybdenum Company and for Intervenor CF&I Steel, LP, doing business as Rocky Mountain Steel Mills;

Leslie Glustrom, Boulder, Colorado, *pro se* Intervenor;

Kurt Steenhoek, Castle Rock, Colorado, *pro se* Intervenor; and

Kent L. Singer, Esq., Denver, Colorado, for Intervenor Tri-State Generation and Transmission Association, Inc.

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I. BY THE COMMISSION

A. Statement of the Case.

1. On February 16, 2005, Public Service Company of Colorado (Public Service, PSCo, or Applicant), filed an Application for Certificate of Public Convenience and Necessity with Specific Findings with Respect to Electromagnetic Fields and Noise (Application). That filing commenced this docket. We gave notice of the application on February 17, 2005.

2. Staff of the Commission (Staff) intervened of right.

3. Aquila, Inc., doing business as Aquila Networks - WPC (Aquila), filed a Petition for Leave to Intervene. This intervention was granted.

4. Leslie Glustrom filed a Petition to Intervene. This intervention was granted.

5. Climax Molybdenum Company (CMC) filed a Petition to Intervene. This intervention was granted.

6. CF&I Steel, LP, doing business as Rocky Mountain Steel Mills (CF&I), filed a Petition to Intervene. This intervention was granted.

7. The Colorado Office of Consumer Counsel (OCC) intervened of right.

8. Thomas Kellogg and Carol Padilla filed a Petition to Intervene and Request for Hearing. This intervention was granted.[1]

9. Castle Pines North Association, Inc. (CPNA), filed a Petition to Intervene and Request for Hearing. This intervention was granted. CPNA withdrew its intervention on May 26, 2005.[2]

10. Colorado Springs Utilities (CSU) filed a Petition to Intervene. This intervention was granted.[3]

11. Kurt and Kimberly Steenhoek filed a Petition to Intervene and Request for Hearing. This intervention was granted.

12. Tri-State Generation and Transmission Association, Inc. (Tri-State), filed a Petition to Intervene. This intervention was granted.[4]

13. We referred this matter for hearing before an Administrative Law Judge (ALJ) and deemed the Application complete as of April 4, 2005.

14. The ALJ held a prehearing conference in this matter. In Decision No. R05-0444-I and based on the prehearing conference, the ALJ discussed the scope of this proceeding, and established a procedural schedule and hearing dates of June 22 through 24, 2005.

15. By Decision No. R05-0526-I, the ALJ scheduled a hearing to take public comment on the Application. That hearing was held as scheduled on June 14, 2005. The ALJ

[1] Mr. Kellogg and Ms. Padilla did not participate actively in this proceeding.

[2] This renders moot CPNA's Motion for Clarification or Reconsideration of Decision No. R05-0526-I. As a result, this motion will be denied.

[3] CSU did not participate actively in this proceeding.

[4] Tri-State participated actively in the initial hearing in this matter but did not participate actively in the proceedings following the remand of this matter to the ALJ.

heard the testimony of five individual members of the public, and that testimony is part of the record in this proceeding.[5]

16. At the time and place scheduled, the ALJ held the hearing in this matter and heard testimony from nine witnesses. Public Service sponsored the testimony of Ms. Sandra Johnson,[6] Mr. Thomas Green,[7] Mr. Andrew Schaller,[8] Mr. Rick Thompson,[9] Mr. Michael Earley,[10] and Mr. Fredric C. Stoffel.[11] Mr. Kurt Steenhoek testified on his own behalf.[12] Tri-State sponsored the testimony of Mr. Ken Anderson.[13] Staff sponsored the testimony of Mr. Inez Dominguez.[14] Sixteen exhibits were marked, offered, and admitted into evidence. At the conclusion of the hearing, the evidentiary record was closed.

[5] Recommendations made during the hearing to take public comment are discussed below.

[6] Ms. Johnson is Manager, Transmission Reliability and Assessment, who is employed by Xcel Energy Services, Inc. Ms. Johnson's direct testimony is Hearing Exhibit No. 1, and her rebuttal testimony is Hearing Exhibit No. 2. Her oral direct testimony is found in the June 22, 2005 transcript (June 22 tr.) at 18-65, and her oral rebuttal testimony is found in June 24 tr. at 82-90.

[7] Mr. Green is Principal Transmission Planning Engineer who is employed by Xcel Energy Services, Inc. Mr. Green's direct testimony is Hearing Exhibit No. 3. His oral testimony is found in June 22 tr. at 66-75.

[8] Mr. Schaller is Manager of Transmission Engineering who is employed by Xcel Energy Services, Inc. Mr. Schaller's direct testimony is Hearing Exhibit No. 4, and his rebuttal testimony is Hearing Exhibit No. 5. His oral direct testimony is found in June 22 tr. at 75-178, and his oral rebuttal testimony is found in June 24 tr. at 66-69.

[9] Mr. Thompson is Senior Team Lead, Siting and Land Rights, who is employed by Xcel Energy Services, Inc. Mr. Thompson's direct testimony is Hearing Exhibit No. 6, and his rebuttal testimony is Hearing Exhibit No. 7. His oral direct testimony is found in June 22 tr. at 179-220, and his oral rebuttal testimony is found in June 24 tr. at 69-81.

[10] Mr. Earley is an Independent Fee Appraiser and Valuation Consultant who is employed by his own firm, Earley & Associates. Mr. Earley's rebuttal testimony is Hearing Exhibit No. 8. His oral testimony is found in June 23 tr. at 4-33.

[11] Mr. Stoffel is Vice-President, Policy Development for Excel Energy and its operating utility companies, who is employed by Xcel Energy Services, Inc. Mr. Stoffel's rebuttal testimony is Hearing Exhibit No. 9. His oral testimony is found in June 23 tr. at 33-90.

[12] Mr. and Ms. Steenhoek are residential property owners whose property abuts the right-of-way of the transmission line at issue. The answer testimony of Mr. and Ms. Steenhoek is Hearing Exhibit No. 13. Mr. Kurt Steenhoek's oral testimony is found in June 23 tr. at 92-112. Ms. Steenhoek did not testify.

[13] Mr. Anderson is Senior Vice-President, Transmission for Tri-State. Mr. Anderson's answer testimony is Hearing Exhibit No. 14. His oral direct testimony is found in June 24 tr. at 46-60.

[14] Mr. Dominguez is a Professional Engineer who is employed by the Commission. Mr. Dominguez's answer testimony is Hearing Exhibit No. 15. His oral direct testimony is found in June 23 tr. at 117-255 and in June 24 tr. at 3-45.

17. CMC and CF&I (jointly), Public Service, the Steenhoeks, and Staff filed post-hearing Statements of Position. CMC and CF&I (jointly) and Public Service filed Reply Statements of Position.

18. On November 14, 2005, the ALJ issued Recommended Decision No. R05-1349.

19. Public Service filed exceptions to that Recommended Decision. Staff responded, and Public Service filed a reply.

20. By Decision No. C06-0094-I (the Remand Order), we granted Public Service's exceptions, in part; denied those exceptions in part and without prejudice, and remanded the case to the ALJ for further proceedings. In that Order we also reopened the evidentiary record in this proceeding and directed the parties to file information concerning the noise levels of the proposed Project, options for design of the transmission line, and other states' actions with respect to transmission line noise levels. Finally, we directed the ALJ to consider three specific issues.[15]

21. On February 13, 2006, Public Service filed a Motion for Reconsideration of Decision No. C06-0094-I. In that filing Public Service stated that a portion of the Project needs to be completed by late 2008 and not by 2009 as stated in the Application. To accommodate the identified need for a Commission decision as soon as possible, we remanded the case to the ALJ for additional hearings and determined that the ALJ would issue an initial decision in this matter. Decision No. C06-0143.

[15] We envisioned in that Order that the ALJ would issue a Recommended Decision based on the evidence adduced during the original hearing and during the hearing on remand.

22. On March 14, 2006, Ms. Glustrom filed a Motion Requesting a Reexamination of the Likelihood of the Construction of the Proposed Pueblo Coal Plant. Public Service filed a response. For the reasons stated in Decision No. C06-0340, we denied that motion.

23. On May 1, 2006, Ms. Glustrom filed an Application for Rehearing, Reargument or Reconsideration (RRR) of Commission Decision No. C06-0340. For the reasons set forth in Decision No. C06-0576, we denied Ms. Glustrom's application for RRR.

24. The ALJ directed Public Service and Staff to file, and permitted other parties to file, testimony addressing the three issues we referred to her in the Remand Order. Decision No. R06-0148-I. In addition, the ALJ directed Public Service to provide specified information in its direct testimony on remand.[16] *See* Decision No. R06-0153-I. Finally, the ALJ granted extraordinary confidentiality protection to information provided by Public Service concerning the identity and location of potential winning bidders in its 2005 All-Source Request for Proposals. Decision No. R06-0228-I.

[16] In that Order the ALJ also informed the parties that the Commission would take administrative notice of certain materials and provided the parties with an opportunity to comment on those materials.

25. The hearing on remand was held on April 4, 5, 11, and 12, 2006. The ALJ heard testimony from five witnesses. Public Service sponsored the testimony of Mr. Thomas Green,[17] Mr. James F. Hill,[18] and Mr. Andrew Schaller.[19] Mr. Kurt Steenhoek testified on his own behalf.[20] Staff sponsored the testimony of Mr. Inez Dominguez.[21] Seventeen Remand Exhibits were marked and offered, and 16 Remand Exhibits were admitted into evidence.[22] At the conclusion of the hearing on remand, the evidentiary record was closed.

26. CMC and CF&I (jointly), Ms. Glustrom, Public Service, the Steenhoeks, and Staff filed post-hearing Statements of Position on remand. Given the need for a prompt decision in this matter, no responses were permitted.

27. To take into consideration all information presented during both the initial hearing and the hearing on remand, and to simplify the record in this matter, this Initial Commission Decision will supersede and replace Recommended Decision No. R05-1349. Consequently, in this Decision we make all findings of fact and reach all conclusions in this proceeding.

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[17] Mr. Green's public direct testimony is Remand Exhibit No. 5, and his highly confidential direct testimony is Highly Confidential Remand Exhibit No. 6. His oral direct testimony is found in April 4 tr. at 17-41, a portion of which is highly confidential; and his oral rebuttal testimony is found in April 12 tr. at 57-61. Mr. Green also testified at the previous hearing in this matter.

[18] Mr. Hill is Manager of Resource Planning and Bidding who is employed by Xcel Services, Inc. Mr. Hill's public direct testimony is Remand Exhibit No. 8, and his highly confidential direct testimony is Highly Confidential Remand Exhibit No. 9. His oral testimony is found in April 4 tr. at 8-17, a portion of which is highly confidential. Mr. Hill did not testify at the previous hearing in this matter.

[19] Mr. Schaller's direct testimony is Remand Exhibit No. 3, and his answer testimony is Remand Exhibit No. 6. His oral testimony is found in April 4 tr. at 42-186. Mr. Schaller also testified at the previous hearing in this matter.

[20] Mr. and Ms. Steenhoek's answer testimony is Remand Exhibit No. 10. Mr. Steenhoek's oral testimony is found in April 5 tr. at 10-109. Ms. Steenhoek did not testify. Mr. Steenhoek also testified at the previous hearing in this matter.

[21] Mr. Dominguez's direct testimony is Remand Exhibit No. 11. His oral testimony, a portion of which is oral rebuttal testimony, is found in April 5 tr. at 109-82; in April 11 tr. at 7-177; and in April 12 tr. at 4-57, a portion of which is highly confidential. Mr. Dominguez also testified at the previous hearing in this matter.

[22] Exhibits admitted during the hearing on remand are Remand Exhibits in order to differentiate them from the Hearing Exhibits admitted during the initial hearing held in June, 2005.

II. FINDINGS AND DISCUSSION

28. Applicant Public Service is a Colorado corporation in good standing. PSCo is a public utility which, as pertinent here, owns and operates facilities, including electric generating stations and electric transmission lines, used in the provision of regulated electric service to its customers in Colorado and, as pertinent here, in the provision of electric power to its wholesale customers in Colorado.

29. Intervenor Aquila is a public utility which owns and operates facilities used in the provision of regulated electric service to its customers in Colorado. Aquila's transmission system is interconnected with that of Public Service.

30. Intervenor CF&I is a large retail customer of Public Service.

31. Intervenor CMC is a large retail customer of Public Service.

32. Intervenor CSU is an electric utility which owns and operates facilities used in the provision of electric service to its customers in Colorado. CSU's transmission system is interconnected with that of Public Service.

33. Intervenor Leslie Glustrom is an individual who resides in Boulder, Colorado, and is a Public Service customer. Ms. Glustrom does not live near the right-of-way of the Public Service transmission line at issue in this proceeding.

34. Intervenors Thomas Kellogg and Carol Padilla are individuals who own residential property near the right-of-way of the Public Service transmission line at issue in this proceeding.

35. Intervenor OCC is a Colorado state agency established pursuant to § 40-6.5-102, C.R.S.

36. Intervenor Staff is Litigation Staff of the Commission.

37. Intervenors Kurt and Kimberly Steenhoek are individuals who own residential property which abuts the right-of-way of the Public Service transmission line at issue in this proceeding.

38. Intervenor Tri-State is a cooperatively-owned generation and transmission association which provides wholesale electric power to its 44 electric cooperative members, some of which are located in Colorado. Tri-State's transmission system is interconnected with that of Public Service.

39. In its Application Public Service requests: (a) that the Commission grant it a Certificate of Public Convenience and Necessity (CPCN) to construct the Comanche - Daniels Park 345kV Transmission Project (Project); (b) that the Commission grant it a CPCN to operate the Midway Substation - Daniels Park Substation eastern transmission segment at 345kV; (c) that the Commission find to be reasonable the projected Electric and Magnetic Fields (EMFs) which Public Service estimates will result from operation of the Project at 345kV; and (d) that the Commission find to be reasonable the projected noise levels which PSCo estimates will result from operation of the Project at 345kV. Each of these requests is discussed separately below.

A. Burden of Proof.

40. Applicant bears the burden of proof by a preponderance of the evidence. Section 13-25-127(1), C.R.S.; Rule 4 *Code of Colorado Regulations* (CCR) 723-1-1500. The preponderance standard requires the finder of fact to determine whether the existence of a contested fact is more probable than its non-existence. *Swain v. Colorado Department of*

Revenue, 717 P.2d 507 (Colo. App. 1985). A party has met this burden of proof when the evidence, on the whole and however slightly, tips in favor of that party.[23]

41. To obtain the requested CPCN for construction of the Project, Public Service must establish that the present or future public convenience and necessity require or will require construction of the Project.

42. To obtain the requested CPCN for operation of the Midway Substation to Daniels Park Substation eastern transmission segment at 345kV, Public Service must establish that the present or future public convenience and necessity require or will require operation at that level.

43. To obtain the requested finding regarding the projected EMFs, Applicant must establish that the projected EMFs levels are reasonable. On this issue, one must consider the provisions of Rule 4 CCR 723-3-18(i)[24] regarding prudent avoidance.

44. To obtain the requested finding regarding the projected noise levels, Applicant must establish that the projected levels are reasonable. On this issue, one must consider the provisions of § 25-12-103(12), C.R.S.

B. The FRP and the Comanche - Daniels Park 345kV Transmission Project.

45. The Public Service transmission system running between the Metro Denver area load center and generation resources located in the southern part of the state is known as the Front Range Path (FRP). The FRP originates at Comanche Generating Station (Comanche)

[23] For a party advocating that the Commission adopt its position (for example, Staff's and Mr. Steenhoek's proposal that the Commission adopt a maximum permissible noise level of 50 dB(A)), the party must meet the same preponderance of the evidence burden of proof.

[24] The Commission recently recodified its substantive *Rules Regulating Electric Utilities*, 4 CCR 723 Part 3. This proceeding, however, began prior to the effective date of these Rules. Consequently, the substantive rules in effect at the commencement of this case, including Rule 4 CCR 723-3-18(i), govern this proceeding. For the convenience of the parties, however, this Decision provides the citation to the current rules as well as the prior rules. *See* 4 CCR 723-3-3102.

in Pueblo, Colorado and terminates at Daniels Park Substation, just southeast of Denver, Colorado.

46. The FRP is approximately 125 miles in length. This corridor, which does not have a consistent width, has existed as a 230kV transmission corridor since the early 1970s and is an integral part of Comanche because the FRP moves the electricity generated at Comanche north to the Metro Denver area load center. In the future (the timeframe is unknown at present), the FRP will move electricity from future generating units located in southeastern Colorado. Also in the future, transmission corridors which may be located in eastern Colorado could tie into the FRP.

47. It is increasingly difficult to site transmission corridors, especially a high-voltage transmission corridor which terminates in or near the Metro Denver load center.[25] This is due to expanding suburban development around Denver and, in particular, to ever-increasing residential development. As a result, it is progressively more important to use, to the greatest extent possible, existing transmission corridors which terminate in or near the Metro Denver load center, as does the FRP.[26] *See* Hearing Exhibit No. 7 (testimony of PSCo witness Thompson) at 3:2-5.

48. The Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment has residential development near both its western and eastern right-of-way (ROW) boundaries.[27] There is also residential development near the ROW boundaries of the

[25] This issue exists nationwide. For that reason, the Red Book notes that electric utilities should optimize, and make better use of, existing transmission corridors. Remand Exhibit No. 1 at § 2.6.

[26] Greatest extent possible in this context refers to constructing transmission lines to achieve the largest transfer capability without constructing, and incurring the cost of, significant excess transfer capability that likely will not be used in the future.

[27] This is the Castle Pines area.

Comanche to Midway Substation section; this development is located near Pueblo on the southern end of this section.[28] For the most part, the remainder of the FRP is surrounded by ranches or sparsely-populated areas and has little, if any, residential development abutting the ROW boundaries. There is little or no information in the record with respect to other types of land use (*e.g.*, commercial, industrial) in the areas abutting the FRP. The FRP predates the construction of most of the structures now located on property which abuts the corridor.

49. The residential development on the western and eastern ROW boundaries in the Midway Substation to Daniels Park Substation, with 115kV parallel transmission line segment,[29] appears to be high-end homes on generously-sized lots. This is the area in which the Steenhoeks live. The Steenhoek property abuts the eastern edge of the ROW, and the Steenhoek residence is approximately 110' to the east of the ROW boundary. The Steenhoek residence is the closest residence to the edge of the ROW on either the western or the eastern side of the ROW in this area.

50. In April or May 2005, Public Service completed its rebuild of the Midway Substation to Daniels Park Substation segment of the transmission line (2005 Rebuild).[30] The Midway Substation to Daniels Park Substation transmission is now double-circuit 345kV-capable transmission, although at present Public Service operates it at 230kV. In this proceeding Public Service seeks a CPCN to operate this transmission section at 345kV.

[28] The extent of this residential development is unknown. In this docket, the principal information concerning residential development pertains to the Midway Substation to Daniels Park Substation, with a 115kV parallel transmission line area.

[29] This is the area of the 2005 Rebuild.

[30] The Commission authorized this construction and the operation of the line at 230kV in Docket No. 03A-276E (Decisions No. R03-1308 and No. C04-0051).

51. When a Public Service design team begins to design a new transmission line, the team considers numerous factors, including (but not only) the following: the aesthetics of the support structures, the structural capability of the support structures, the electrical requirements of the conductor, the ease with which the design can be constructed, any outage requirements, Public Service's ability to maintain the line, the phasing arrangement chosen to reduce the transmission line's magnetic field, the anticipated level of corona-generated noise, the weather conditions, the elevation at which the line will be placed, and any economic trade-offs that might be made in designing the line.

52. As proposed in the Application, the Project will include several elements. They are described here beginning with the southern-most facilities (located at Comanche) and continuing to the northern-most facilities (located at Daniels Park Substation).

53. The Project will interconnect the to-be-constructed Comanche 3 generating unit[31] to a new 345kV switchyard at Comanche. This new switchyard will be connected to the existing Comanche 230kV Substation with two new 560MVA 345/230kV autotransformers. In addition, 345kV line terminations will be added.

54. From Comanche to a point to the east of the Midway Substation, Public Service will construct new double-circuit 345kV transmission. The new transmission lines will connect directly to the double-circuit transmission completed in the 2005 Rebuild between Midway Substation and Daniels Park Substation. There will be no 345kV tie to Midway Substation. These two new transmission circuits will operate at 345kV from Comanche to Daniels Park

[31] The Commission has granted a CPCN for this generating unit. Docket No. 04A-216E (Decision No. C05-0049). Public Service expects this generating unit to be in commercial operation in October 2009.

Substation.[32] These double-circuit 345kV transmission lines going directly from Comanche to Daniels Park Substation are referred to as the Eastern Circuits.[33]

55. At Daniels Park Substation, Public Service will construct a new 345kV switchyard to terminate the Eastern Circuits and will connect the Eastern Circuits to Public Service's 230kV system with three 560 MVA 345/230kV autotransformers.

56. The existing single-circuit 230kV transmission which originates at Comanche goes to Midway Substation, taps Fuller Substation, and terminates at Daniels Park Substation will be rebuilt to double-circuit, 345kV-capable transmission between Midway Substation and Daniels Park Substation.[34] The tie into Fuller Substation will be maintained using one of the two 345kV-capable circuits. The existing Comanche to Midway Substation 230kV transmission will tie into Midway Substation from the south.[35] This will create double-circuit 230kV transmission from Comanche to Midway Substation. The rebuilt Midway Substation to Fuller Substation to Daniels Park Substation 345kV-capable transmission will tie into Midway Substation from the north. This Comanche to Midway Substation to Fuller Substation to Daniels Park Substation transmission is referred to as the Western Circuits.

57. At Daniels Park Substation, Public Service will terminate the Western Circuits and will connect the Western Circuits to its 230kV system.

[32] This requires Commission authorization to operate the Midway Substation - Daniels Park Substation segment at 345kV because, at present, Public Service is authorized to operate this transmission segment at 230kV only.

[33] The existing Comanche - Boone Substation - Midway Substation single-circuit 230kV line is not included in the Eastern Circuits which are involved in the Project.

[34] Although constructed as 345kV-capable, this transmission will be operated initially at 230kV.

[35] The Project includes tying one of the two existing 230kV lines from Comanche into the Midway Substation and is the only construction contemplated for these two lines. Thus, the Project does not include rebuilding any portion of the two existing 230kV lines between Comanche and Midway Substation.

58. The Project goes through seven local jurisdictions, each of which has site permitting authority.

59. When the Project is completed, the transmission corridor from Comanche to Daniels Park Substation (*i.e.*, the FRP) will contain two double circuits of overhead transmission: the Western Circuits and the Eastern Circuits.[36] When the Project is placed in service, the Western Circuits will operate at 230kV; and the Eastern Circuits will operate at 345kV.

60. The Project includes steel poles as support structures for the double-circuit 345kV-capable transmission lines. These support structures, which are similar to those used in the 2005 Rebuild, are self-weathering steel poles which are designed to darken over time to a brown earth-tone color similar to that of wood. Each pole is 100 to 130 feet in height and has two support cross-arms. The new poles will be placed near existing line structures.[37]

61. As proposed, the Project will use non-specular wire, which will minimize reflection (and, thus, glare) from the line. The Project will use 954 kcmil acsr, two conductor bundled conductor (2-954 conductor bundles), capable of carrying at least 1200 MVA (2000 Amps).[38] The Project will use low-corona hardware to minimize noise.

62. Public Service sizes the width of a given transmission corridor's ROW in accordance with the requirements of the National Electric Safety Code. These requirements are based on safety considerations, with the result that the width of a ROW depends in large part on the transmission voltage of the particular line. To meet the requirements of the National Electric

[36] For a diagram of the Project, *see* Hearing Exhibit No. 1 at 7 and Remand Exhibit No. 5 at 5. For a diagram of Public Service's transmission plan for 2010, *see* Highly Confidential Remand Exhibit No. 6 at 12.

[37] A sketch of the pole configurations used for the Eastern Circuits in the 2005 Rebuild (*i.e.*, as they exist today) is found in Hearing Exhibit No. 4 at Exhibit AS-1, Sketch # 1. A sketch of the pole configurations for the Western Circuits as they will exist between Midway Substation and Daniels Park Substation at the conclusion of the Project is found in *id.* at Sketch # 2.

[38] This is the same conductor bundle as that used in the 2005 Rebuild on the Eastern Circuits.

Safety Code, Public Service will need to purchase additional ROW to enlarge the existing corridor between Comanche and Midway Substation, a distance of approximately 50 miles.[39] In addition, Public Service will need to make small land acquisitions at Daniels Park Substation.

No upgrades on Public Service's system will be necessary as a result of the Project. Due to limitations at the termination points at Comanche Substation and Daniels Park Substation, Public Service will be unable in the future to operate the Western Circuits at 345kV, and thus take full advantage of the Project's transfer capability,[40] unless it makes upgrades at least to Comanche Substation and Daniels Park Substation[41] and unless there are generation additions at Comanche and/or at Midway Substation.[42] Whether the line is built with 2-954 conductor bundles or with 3-954 (or other triple-conductor) conductor bundles, substation upgrades will be required when the 230kV Comanche to Midway Substation section of the Western Circuits is upgraded to 345kV, which will need to be done if the Western Circuits are to operate at 345kV from Comanche to Daniels Park.[43] If the Project is constructed using triple-conductor bundles, then no upgrades

[39] This additional ROW may involve property near or in residential areas. Public Service will acquire this additional ROW according to its usual practice with respect to interaction with, and approval by, local jurisdictions; public involvement through meetings and hearings; and payment for the necessary easements.

[40] Transfer capability is "the measure of the ability of the interconnected electric system to move or to transfer power in a reliable manner, from one area to another, over all of the transmission lines or paths between those areas, under specified conditions." April 11 tr. at 115. The transfer capability of a particular path (for example, the FRP) is determined by powerflow studies and represents the maximum power that can be transferred across the defined path under the worst single outage contingency. Determination of a path's transfer capability is not a matter of simply summing the individual MVA ratings of the transmission lines in the path. (Summing the individual MVA ratings of the transmission lines in a path will yield the transfer capacity, the thermal rating of the path.)

[41] The substation upgrades would include, for example, additional autotransformers, protective equipment, bus, breakers, switches, relay protective equipment, and (possibly) land.

[42] Such generation additions may result from Public Service's 2003 Least-Cost Plan and from future Least-Cost Plans as well as generation additions planned by other utilities. *See, e.g.*, Staff's Statement of Position on Remand at 11-14.

[43] Powerflow studies will determine what, and where, additional transmission upgrades are required. The rough estimate of the cost of the needed upgrades at Comanche Substation is $7 million. The rough estimate of the cost for the Daniels Park Substation upgrades is approximately the same. As no powerflow studies and no contingency studies have been done and as there is no timeframe within which these upgrades will be needed, these are extremely preliminary and imprecise estimates.

(aside from some work at each substation to modify connections to the bus configuration so it can accommodate triple-conductor bundles[44]) to Comanche Substation or Daniels Park Substation will be necessary because the lines will operate at 230kV as proposed by Public Service.

63. Customarily, the cost of transmission system (including both line and substation) upgrades occasioned by a particular generation addition are associated with, or assigned to, that generation addition.[45] The Project is deemed necessary to accommodate the Comanche 3 generating unit and new generation which may be added as a result of Public Service's 2003 Least-Cost Plan. As a result, the costs of the Project are associated with, or assigned to, those generation additions. Because the transmission upgrades needed to operate the Western Circuits at 345kV from Comanche to Daniels Park Substation are not required for these particular generation additions, Public Services does not include the cost of those upgrades in the cost of the Project even though Public Service is aware that the upgrades will be necessary in the future when Public Service seeks to operate the Western Circuits at 345kV.[46] When Public Service adds generation which will require that the Western Circuits be upgraded to operate at 345kV, the cost of the transmission upgrades necessary to connect that generation to the Metro Denver load center will be associated with, or assigned to, that generation.

64. Powerflow studies and contingency studies are the means by which electric utilities investigate, *inter alia*, the need for, whether to undertake, and the impact of building a transmission upgrade project. Powerflow studies and contingency studies provide information

[44] There is no evidence with respect to the cost of these modifications. Staff witness Dominguez opined that the amount would be insignificant.

[45] This is an application of the well-known principle that, to the extent possible, the cost-causer pays.

[46] Public Service seeks authority to build the Western Circuits between Midway Substation to Daniels Park Substation as 345kV-capable because it anticipates operating that section as 345kV in the future.

concerning the impact of a proposed transmission project on the investigating utility's transmission system and on the systems of other utilities, where the power will flow, what transmission system upgrades and generation additions will be necessary to increase the total transfer capability of the transmission path, whether the additional costs are cost-effective vis-à-vis the benefits obtained, and what will occur in the event of an unplanned forced outage.

65. Based on the powerflow studies conducted, the Project as proposed will not adversely affect the operation of any adjoining utility's system during system normal operation. In one instance, powerflow studies and contingency studies revealed the possibility of an adverse impact on CSU's 115kV line between Monument Substation and Palmer Lake Substation[47] should there be an inadvertent outage on one of the higher voltage (*e.g.*, 230kV or 345kV) transmission lines. Public Service and CSU have developed operating procedures to manage the identified contingency.[48]

66. No party presented a powerflow study or contingency study which assumed that the Project was built using 3-954 conductor bundles or triple-conductor bundles of any size. Powerflow studies and contingency studies must be conducted to identify the impact, if any, of the use of this type of conductor on Public Service's system and on the parallel lower-voltage networks. There also is no dispute that any additional transfer capability and transfer capacity that might be derived from constructing the Project with triple-conductor bundles require that the Eastern Circuits have a termination (*i.e.*, tie-in) at Midway Substation and that, at present, Public

[47] This 115kV line runs parallel to the FRP through this section, which includes the area in which the Steenhoeks live. When modeling to determine projection level of EMF and noise was done, this section was specifically modeled. *See, e.g.*, Remand Exhibit No. 3A at 110-22 (Case 2A (115kV parallel)).

[48] To the extent that powerflow studies indicate the possibility of contingency overloads on any other neighboring utility's system, Public Service stated that it will work with that utility to address the issue. Hearing Exhibit No. 2 at 3:4-4:20. In addition, Public Service stated that it intends to continue to work with the Colorado Coordinated Long Range Transmission Planning Group and the Colorado Coordinated Planning Group on issues pertaining to transmission in Colorado.

Service has no plans to create such a termination (tie-in). Finally, there is no dispute that, generally speaking, triple-conductor bundles usually reduce the powerflow on parallel underlying (*i.e.*, lower-voltage) systems.[49]

67. Public Service originally estimated the cost of the Project to be $151.9 million (2009$).[50] Public Service considers this estimate to be high-level; it is possible that the final costs will be within +/- 30 percent of the estimate. During the hearing on remand, Public Service revised its estimation of the transmission cost portion of the Project downward to $81 million, a reduction of approximately $13.7 million.[51] Thus, it appears that the cost of the Project now is estimated to be $138.2 million. Assuming this is still a high-level estimate so that the final costs will be within +/- 30 percent of the estimate, the cost of the Project appears to fall within a range of $92.3 million to $175.6 million.

68. Public Service originally stated that the Project must be completed by May 2009[52] in order to provide sufficient time to test the transmission and to have it in-service when the Comanche 3 generating unit begins commercial operation in October 2009. During the hearing on remand, however, it became clear that the Project must be completed by late 2008[53] in order to accommodate generation which may be added as a result of project(s) bid under Public Service's

[49] This is a general statement. A powerflow study would determine the exact impact of a particular triple-conductor bundle on a specific transmission system.

[50] The estimated costs (2009$) as originally presented were: siting and land rights permitting/acquisition costs of $5.5 million; substation costs of $51.75 million; and transmission costs of $94.7 million.

[51] It is unclear whether the $81 million is stated in 2009$.

[52] The original Project schedule is found at Hearing Exhibit No. 1 at 28:25-29:20.

[53] Public Service did not provide a precise revised Project schedule during the hearing on remand. Public Service testified that the Project, if approved, could be built to meet the necessary in-service date if the Project is not changed significantly.

2003 Least-Cost Plan[54] All-Source Request for Proposals and now under consideration for contract negotiations.[55]

69. If the Project is built as proposed, excess transfer capability will exist that will be sufficient to accommodate the generation approved in Public Service's 2003 Least-Cost Plan. Whether the Project as proposed is sufficient to accommodate resource additions which may result from future Public Service Least-Cost Plans is unclear. Thus, the ability of the Project as proposed to accommodate the resource additions which the Colorado Long Range Transmission Planning Study (discussed below) estimates will be needed by 2013 is an unknown.

C. Certificates of Public Convenience and Necessity.

70. Public Service requests that the Commission grant a CPCN to construct the Project and grant a CPCN to operate at 345kV the 2005 Rebuild. As discussed here, we will grant the requested CPCNs.

1. Findings.

71. Public Service planned and designed the Project to meet these objectives: (a) accommodate existing and planned generation in the southern portion of Colorado, particularly the Comanche 3 generating unit; (b) provide reliable service and meet the reliability criteria established by the North American Electrical Council and the Western Electricity Coordinating Council; (c) do not interfere with neighboring electric systems (*e.g.*, no inadvertent powerflows, no unacceptable loading conditions); (d) allow for higher voltage transmission operation in the future when warranted; (e) make the best use of existing transmission facilities

[54] The Commission approved Public Service's 2003 Least-Cost Plan, as modified by the Comprehensive Settlement Agreement, in Decision No. C05-0049, entered in Dockets No. 04A-214E, No. 04A-215E, and No. 04A-216E.

[55] The particulars are detailed in Highly Confidential Remand Exhibit No. 9 and the highly confidential oral testimony of PSCo witness Hill (April 4 tr. at 14-17).

and corridors; and (f) be the most cost effective. These objectives are consistent with, and serve to implement, the conclusions and recommendations contained in an April, 2004, regional transmission study.

72. In April, 2004, the Colorado Coordinated Long Range Transmission Planning Group (CLRTPG)[56] issued the Colorado Long Range Transmission Planning Study (2004 Long Range Study).[57] All bulk transmission system owners within Colorado undertook this study in order to model several future generation addition scenarios and to determine the associated transmission necessary to get the needed generation to load centers.

73. The 2004 Long Range Study states:

> The [CLRTPG] was initiated in January 2004 to jointly explore the potential for the development of a "back-bone" transmission network in the State of Colorado that could benefit all electric load-serving entities (LSEs) in the state. Current forecasts predict that over the next ten years, the demand for power will grow 25% in Colorado's Front Range. To meet such a demand, over 2,750 MW of new generation resources will have to be acquired and robust high-voltage transmission will be needed to convey the power to major delivery points. In February 2004, Public Service Company of Colorado announced its intention to pursue the development of a new 750 MW coal-fired generation facility at the Comanche Station in Pueblo (Comanche Unit #3). **Since this was the only generation project planned with any degree of certainty, PSCo sought to design the transmission required for the Comanche Unit #3** in a manner that would meet the primary objectives of the CLRTPG.
>
> The proposed transmission to facilitate the Comanche Unit #3 will consist of new double-circuit 345kV transmission between the Comanche Station and the Daniels Park Substation southeast of Denver. **CLRTPG studies show and *there was Group consensus* that the Comanche - Daniels Park 345kV Transmission**

[56] The CLRTPG members are Aquila, CSU, Platte River Power Authority, Public Service, Tri-State, and Western Area Power Administration. Each of these entities owns a portion of, or is dependent upon or uses, the high voltage transmission system in Colorado. Generally speaking, the CLRTPG's primary objective is to avoid piecemeal transmission approaches and planning and to reduce overall costs to Colorado ratepayers by: (a) formulation of a comprehensive long-range transmission plan to support resource additions and growth in the Front Range over the next ten years; and (b) evaluation of potential generation sites to develop an optimized back-bone transmission system to facilitate future generation additions. The 2004 Long Range Study is Hearing Exhibit No. 1 at Exhibit SJ-4.

[57] The CLRTPG is scheduled to release a similar, but updated, regional transmission study in 2006 but has not yet done so.

> **Project will be the fundamental first phase toward the development of a back-bone transmission system in the Front Range**. The Project will establish 345kV transmission in the Front Range in a cost-effective manner and facilitate additional higher-voltage transmission development in the future.

Hearing Exhibit No. 1 at Exhibit SJ-4 at 3 (emphasis supplied).[58] In addition, Tri-State witness Anderson testified that the Project "will enhance the interconnected transmission grid and enable Tri-State and other electric utilities along the Front Range to serve their growing customer base." Hearing Exhibit No. 14 at 2:9-11.

74. Public Service describes the Comanche to Daniels Park Substation Project as

> the most essential component of the transmission path that facilitates the transfer of power along the Front Range of Colorado from generating plants in southeastern Colorado to electric customers in the metropolitan Denver area.

Remand Exhibit No. 5 at 14:8-11. To serve this purpose, it is "very important" that this Project be designed "to promote the highest degree of reliability." *Id.* at 14:16-17.

75. The "Comanche Unit 3 750 MW Generator Addition Transmission Study Report" (PSCo 2005 Study Report), prepared by PSCo Witness Green and dated February 2005, contains powerflow studies which show that the Project "enhances the performance of the southern electrical system by reducing pressure on the existing transmission paths. [The Project] does not prevent the expansion of additional transmission into eastern Colorado when conditions warrant." Hearing Exhibit No. 3 at Exhibit TG-1 at 4.

76. The Project is responsive to, and implements, the Commission's direction to Public Service that it “develop a comprehensive plan for deployment of a higher (than 230kV) bulk transmission voltage in the Front Range, and particularly, the Denver area.” Decision No. C01-0067, entered in Docket No. 00A-067E, at 23.

[58] The referenced Comanche Unit #3 is the Comanche 3 generating unit approved by the Commission.

a. Need.

77. Public Service estimates that, when Comanche 3 generating unit comes on-line in 2009, there will be approximately 1500 MW of generation at Comanche.[59] This level of generation requires high-voltage transmission to deliver the maximum amount of power to the Metro Denver load center with the greatest efficiency. In addition, Public Service needs transmission to accommodate the additional generation (other than at Comanche) which it anticipates acquiring as a result of its 2003 Least-Cost Resource Plan. Remand Exhibit No. 7 at 3;[60] *see generally* Remand Exhibit No. 5 and Highly Confidential Remand Exhibits No. 6 and No. 9. Finally, as established in the 2004 Long Range Study, load growth in Colorado's Front Range will result in the need for an estimated 2,750 MW of additional generation sources by 2013; and there must be available high-voltage transmission capable of delivering that power to the Metro Denver load center.

78. If operated at 345kV, the Eastern Circuits, which run between Comanche and Daniels Park Substation without a connection at Midway Substation, will serve to accommodate the output of the Comanche 3 generating unit and to transport that output to the Metro Denver load center. This is a principal reason underpinning Public Service's request for authority to operate the 2005 Rebuild at 345kV.

79. Assuming operation of the Eastern Circuits at 345kV, operation of the Western Circuits at 230kV is sufficient to accommodate transfer of the additional, *non*-Comanche 3 generating unit generation contemplated by Public Service's 2003 Least-Cost Resource Plan

[59] Up to 250 MW of Comanche 3 generating unit may be owned by other entities. Decision No. C05-0049. This does not affect, or reduce, the need for the Project.

[60] PSCo witness Green states there that "there is another generation project that will require … three of the four transmission circuits in the Midway - Daniels Park corridor to be operated at 345kV." Remand Exhibit No. 7 at 3:6-8.

until approximately 2013. Thus, Public Service proposes to operate the Western Circuits initially at 230kV. As part of the Project, however, Public Service requests authority to construct the Western Circuits between Midway Substation and Daniels Park Substation for future operation at 345kV.[61] Public Service contends that it is prudent to make the additional investment needed to construct for operation at 345kV now in order to accommodate anticipated future load growth.

80. Assuming construction of the Western Circuits between Midway Substation and Daniels Park Substation as 345kV-capable, conversion from 230kV operation to 345kV operation could be accomplished by additions and modifications at the substations at both ends of the line. No change in the towers, conductors, or insulators would be required. On the other hand, if the Western Circuits between Midway Substation and Daniels Park Substation are initially built to 230kV specifications and then future demand dictates a need for operation at 345kV, a complete rebuild of the 230kV structures would likely be necessary. This would require the installation of new foundations, new poles, and possibly new wires. It would also require a potentially lengthy planned outage on the FRP, an outage which could compromise system reliability. The cost of such a future rebuild would be substantially greater than the cost of converting a line constructed to 345kV specifications from 230kV operation to 345kV operation.

[61] The Western Circuits cannot operate at 345kV without additional facilities at, and modifications to, the affected substations. The Project does not include these substation changes. Thus, to operate the Western Circuits at 345kV in the future, Public Service will need a CPCN for authority to upgrade the affected substations.

81. The evidence does not establish a current need for operation of the Western Circuits between Midway Substation and Daniels Park Substation at 345kV, and Public Service does not seek authorization to operate that segment at 345kV.[62]

82. The PSCo 2005 Study Report contains the results of Public Service's powerflow studies of four bulk transmission alternatives.[63] Hearing Exhibit No. 3 at Exhibit TG-1. Of the four bulk transmission alternatives studied,[64] the Project had the fewest line losses and the highest powerflow into Public Service's system above Midway Substation (that is, into the Metro Denver load center); had the highest system reliability; did not require significant regional upgrades; and was the least expensive.

83. No party challenged the conclusions contained in either the 2004 Long Range Study or the PSCo 2005 Study Report.

84. The letters of support from Public Service's neighboring LSEs in Colorado and bulk transmission owners in Colorado provide evidence of the need for the Project from a Colorado bulk transmission system perspective. Hearing Exhibit No. 1 at Exhibit SJ-5.

b. Inadequacy of Existing Facilities.

85. At present, existing transmission facilities in the FRP are overtaxed and are

[62] Public Service will be required to submit a subsequent application for a CPCN seeking authority to operate the Western Circuits between Midway Substation and Daniels Park Substation at 345kV if and when the need arises. Public Service acknowledges this.

[63] One of these alternatives was that proposed by Staff witness Dominguez in Public Service's 2003 Least-Cost Resource Plan proceeding (Docket No. 04A-214E). In ¶ 27 of the Comprehensive Settlement Agreement approved by the Commission in that case, Public Service agreed to study Mr. Dominguez's proposal for transmission associated with the Comanche 3 generating unit. After review of the PSCo 2005 Study Report, Mr. Dominguez agreed with Public Service that the Project site was the appropriate selection; supported the Project (except as to the noise level, as discussed below); and did not advocate adoption of the proposal he made in the Least-Cost Resource Plan proceeding.

[64] Each of the four alternatives studied assumed double-conductor bundles. Because it had not yet been made, Staff's proposal to use triple-conductor bundles to ameliorate corona-generated transmission line noise was not modeled in the PSCo 2005 Study Report.

loaded during so much of the year that utilities (*e.g.*, Public Service and Tri-State) find it difficult to take transmission lines out of service for maintenance. Failure to do routine maintenance can lead to system reliability problems. Due to the heavy loading, utilities also find it increasingly difficult to upgrade transmission; this also raises a system reliability concern. The Project will relieve the pressure on the transmission grid so that maintenance and upgrades can be scheduled and completed.

86. Existing facilities are inadequate to deliver the expected future increase in generation to the Metro Denver load center. Without the Project, the reliability of the FRP will be compromised, thus adversely affecting both Public Service's system reliability and regional reliability (*e.g.*, Public Service's system, CSU's system, and Aquila's system). The recent addition of the 2005 Rebuild does not affect the need for the Project because, at present, that segment of the Eastern Circuits does not connect to Comanche.[65]

2. Positions of the Parties.

87. Staff,[66] Tri-State, and CSU endorse the Project and recommend that the Commission grant Public Service a CPCN to construct the Project and a CPCN to operate the 2005 Rebuild at 345kV. In fact, Tri-State witness Anderson testified that, because of the growing loads, "there is an urgent need for additional generation and transmission facilities." Hearing Exhibit No. 14 at 2:17-20. The Steenhoeks do not oppose the Project.[67]

[65] One purpose of the Project is to provide that direct connection between Comanche and Daniels Park Substation on the Eastern Circuits.

[66] Although agreeing that the Project is necessary and appropriate, Staff objects to the corona-generated transmission noise levels which Public Service estimates will result from the Project as proposed. *See* discussion *infra*.

[67] Although not opposing the Project, the Steenhoeks object to the corona-generated transmission noise levels which Public Service estimates will result from the Project as proposed. *See* discussion *infra*.

3. Discussion.

88. Public Service brings the Application under the provisions of § 40-5-101(1), C.R.S. As relevant here, that statute precludes a public utility from beginning the construction of a new, or extending an existing, facility, plant, or system without first obtaining a certificate from the Commission that the present or future public convenience and necessity requires or will require the construction or extension. To secure a CPCN, the utility must show by competent evidence: (a) that there is a need for the additional construction or extension; and (b) that existing facilities are not reasonably adequate and available. *Public Service Company of Colorado v. Public Utilities Commission*, 142 Colo. 135, 151, 350 P.2d 543, 551, *cert. denied sub nom. Union Rural Electric Association, Inc. v. Public Service Company of Colorado*, 364 U.S. 820 (1960) (*Public Service*).

89. The evidence in support of a need for the Project is substantial and uncontested.[68] The evidence showing that the existing facilities are inadequate is substantial and uncontested. Public Service has sustained its burden of establishing that there is a need for the Project and that existing facilities are inadequate to satisfy that need.

90. Notwithstanding the lack of a current need to operate them at 345kV, prudent transmission planning dictates that the Western Circuits between Midway Substation and Daniels Park Substation be constructed to accommodate future operation at 345kV. Constructing the Project to operate at 345kV will have an incremental cost. The current expenditure of an incremental amount is reasonable because of Public Service's likely need for additional transfer

[68] In Hearing Exhibit No. 15, Staff witness Dominguez stated that Public Service might consider developing a contingency plan to be implemented in the event the Project cannot be built after the Commission authorizes it. At the hearing, Mr. Dominguez testified that he was not recommending that the Commission order Public Service to develop such a plan. The Commission will not order Public Service to develop a contingency plan to be implemented in the event the Project cannot be built.

capability from southern generation sources to the Denver load area in the relatively near future, as shown in PSCo's 2003 Least-Cost Resource Plan and the 2004 Long Range Study. Assuming construction as 345kV-capable, conversion of the Western Circuits between Midway Substation and Daniels Park Substation from 230kV operation to 345kV operation could be accomplished with additional substation facilities and modifications. If and when needed, the Western Circuits between Midway Substation and Daniels Park Substation could achieve 345kV operation quickly, relatively inexpensively, and with minimal risk to system or regional reliability. In addition, we note that this Project comports with our direction to Public Service that it deploy higher voltage transmission capabilities in the Front Range area. *See* Decision No. C01-0076 at 23. Constructing the Western Circuits between Midway Substation and Daniels Park Substation for future operation at 345kV is consistent with this long-standing policy.

91. Public Service has met its burden of proof with respect to the present and future need for the Project and with respect to the inadequacy of the existing facilities. The Application for two CPCNs will be granted. A CPCN authorizing Public Service to construct the Project and a CPCN authorizing Public Service to operate the 2005 Rebuild at 345kV will be issued.

D. Modeling of Projected EMF and Noise Emissions.

92. In this proceeding Public Service asks the Commission to find reasonable the levels of Electromagnetic Fields (EMF) and of the corona-generated transmission noise projected to occur when the Project is built as proposed by Public Service and operated at 345kV.[69] In support of those requests, Public Service presented the results of modeling it performed[70] using

[69] This means that both double circuits from Midway Substation to Daniels Park Substation are operated at 345kV, that the western double circuit from Comanche to Midway Substation is operated at 230kV, and that the eastern double circuit from Comanche to Midway Substation is operated at 345kV.

[70] Hearing Exhibit No. 4 at Exhibit AS-2 and Exhibit AS-3 provides graphic depictions of the modeling results, and Remand Exhibit No. 3 provides the actual modeling outputs, for each of the nine cases.

the ENVIRO model, which was developed by the Bonneville Power Administration (BPA) and the Electric Power Research Institute (EPRI).[71]

93. As to noise levels, BPA and EPRI developed the ENVIRO model using thousands of field measurements taken in many states (not including Colorado) as the basis for the model's equations and algorithms. To verify the model's noise level results, BPA and EPRI compared those results against field readings. The ENVIRO results are usually within +/- two to three dB(A) of the field verification. The verification results were published in EPRI's *Transmission Line Reference Book 345kV and Above* (Red Book).

94. There is no evidence explaining the method employed by BPA and EPRI develop the ENVIRO model's EMF results. In addition, there is no evidence as to whether and, if so, how BPA and EPRI verified the model's EMF results.

95. Transmission line-related noise reflects from hard surfaces (*e.g.*, road surfaces, building) and, so, may be affected by the presence or absence of such surfaces. The ENVIRO model has no input screen which allows the modeler to input assumptions about the percentage of hard surface and the percentage of soft surface near the transmission line. There is no information in the record about the assumed percentages of each type of surface which may be incorporated into the ENVIRO model.

96. Using the ENVIRO model, Public Service modeled nine scenarios (or cases) and provided the results in this proceeding.[72] These inputs (among others) are held constant across the modeling: (a) system normal operation; (b) line loading based on the operation of the

[71] In the ENVIRO results contained in Remand Exhibit No. 3A, the noise-related EPRI/BPA model results are shown in the columns labeled "BPA method." Unless otherwise noted, the noise-related modeling results cited in this Decision are taken from those columns.

[72] In the hearing on remand, Public Service offered the results of additional cases. Except as noted, the modeling assumptions used were the same for these additional cases.

Comanche 3 generating unit and its expected use; (c) weather conditions (*i.e.*, fog, rain, and snow), duration of each type of weather condition, and precipitation rate; (d) use of reverse phasing[73] (all but one case); (e) a 115kV parallel line between Midway Substation and Daniels Park Substation (all but one case); (f) line elevation of 6000' between Comanche and Midway Substation and line elevation of 6900' between Midway Substation and Daniels Park Substation; and (g) 18" line spacing.

97. Due to the absence of a consistent ROW width between Comanche and Daniels Park Substation, due to differences in elevation, and due to the presence of a 115kV parallel transmission line in a portion of the Midway Substation to Daniels Park Substation section, one cannot model as a whole the entire length of the FRP from Comanche to Daniels Park Substation. Rather, one must model separately the section from Comanche to Midway Substation and the segment from Midway Substation to Daniels Park with the 115kV parallel transmission line. To determine the relevant results, then, one must look at the appropriate modeling case.

98. Although nine cases were studied, four are most pertinent: Case 1A, Case 2A, Case 5A, and Case 9. *Case 1A* depicts the Midway Substation to Daniels Park Substation section with a 115kV parallel transmission line.[74] The Eastern Circuits are operating at 345kV, and the Western Circuits are operating at 230kV. This case shows the expected EMF and noise levels when those lines go into service if the Application is granted and all lines are built using double-

[73] Reverse phasing occurs when the magnetic field of one line has the effect of canceling, at least in part, the magnetic field emanating from an adjacent line.

[74] This is the widest portion of the Midway Substation to Daniels Park Substation segment and contains the Castle Pines area of the 2005 Rebuild.

conductor bundles.[75] *Case 2A* depicts the Midway Substation to Daniels Park Substation section with a 115kV parallel transmission line. Both the Eastern Circuits and the Western Circuits are operating at 345kV. This case shows the expected EMF and noise levels when this entire segment is operated at 345kV and all lines are built using double-conductor bundles.[76] *Case 5A* is identical to Case 2A except that the Western Circuits between Midway Substation and Daniels Park Substation are built with triple-conductor bundles. *Case 9* depicts the Comanche to Midway Substation section with the Eastern Circuits operating at 345kV and the Western Circuits operating at 230kV. This case shows the expected EMF and noise levels with this assumed operation and all lines built with double-conductor bundles.

99. Each case assumes that the Comanche 3 generating unit is in service and is operated as a base load plant. It is important to note that *only* the output of the Comanche 3 generating unit is assumed to be carried on the circuits. This is contrary to the unrefuted evidence, detailed above, that the Project will be used to transport the output of *both* the Comanche 3 generating unit *and* other generating facilities. In addition, when the Western Circuits and the Eastern Circuits are operated at 345kV, the circuits can carry approximately three times the amount of current assumed in the ENVIRO modeling. Thus, modeling only the Comanche 3 generating unit does not reflect the most likely operating condition.

100. EMF levels and noise levels are measured at the edge of the ROW. The FRP's ROW, however, is not a consistent width from Comanche to Daniels Park Substation. Consequently, to assess the reasonableness of the expected levels, one must know those levels at the western and eastern ROW boundaries. As modeled for the Comanche to Midway Substation

[75] Public Service refers to this as the base case.

[76] This is the case which produces the projected EMF and noise levels which Public Service asks the Commission to find reasonable.

section, the western edge of the ROW is 225 feet, and the eastern edge of that ROW is 150 feet.[77] For the Midway Substation to Daniels Park Substation with a 115kV parallel transmission line segment, the western edge of the ROW is 147 feet, and the eastern edge of that ROW is 112.5 feet. For the Midway Substation to Daniels Park Substation section without a 115kV parallel transmission line, the ROW western edge is 112.5 feet and the ROW eastern edge is 112.5 feet.[78]

101. The ENVIRO results are stated in ten-foot increments, and no party presented projected EMF and noise levels calculated to the exact edges of the ROW. As a consequence, it is not always possible to obtain results for the ROW boundaries; yet, it is necessary to establish a point for comparison to understand the positions of the parties and the requests for reasonableness findings. To establish that point for the *Comanche to Midway Substation section*, the levels are measured at 230 feet for the western edge and at 150 feet for the eastern edge. To establish that point for the *Midway Substation to Daniels Park Substation with a 115kV parallel transmission line segment*, the levels are measured at 150 feet for the western edge and at 110 feet for the eastern edge.[79]

102. Staff also used the ENVIRO model. With the exception of the type of conductor used in the Project, Staff used the same assumptions in its modeling as those used by Public Service.

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[77] This is the width of the ROW following the purchase of additional ROW as proposed in the Application. Public Service's modeling assumed that the existing transmission corridor in this segment will be widened 150' to the east of its present eastern ROW boundary, that the new Eastern Circuits would be placed to the east of the existing ROW, and that the present western ROW boundary will not change. Hearing Exhibit No. 4 at Exhibit AS-2 at 2. These assumptions carry through Public Service's and Staff's modeling.

[78] Public Service provided ENVIRO results for the Midway Substation to Daniels Park Substation without the 115kV parallel transmission line. Remand Exhibit No. 3A (Case 1 through Case 8). To establish a point of comparison in order to determine the EMF values and the noise values for this segment, one would look at the relevant values at -120 (western edge of ROW) and 110' (eastern edge).

[79] This is consistent with Public Service's representation concerning the approximate edges of this section of the ROW. *See*, *e.g.*, Remand Exhibit No. 17 at 10 and 11.

103. Public Service has numerous high-voltage transmission lines in Colorado. Public Service has not conducted any field readings to determine whether the actual noise levels produced by a transmission line are consistent with the ENVIRO model's projected noise levels for the line.[80]

104. The ENVIRO model is a standard in the electric industry and is customarily used for EMF and noise analysis. No party objected to or questioned use of the ENVIRO model for prediction of EMF and noise levels. In this proceeding, the ENVIRO model is an appropriate and efficacious means to determine expected levels of EMF and of corona-related noise.

E. Electric and Magnetic Fields and Rule 4 CCR 723-3-18(i).[81]

105. Public Service requests these Commission findings: (a) that the Electric and Magnetic Fields (EMF) levels which Public Service estimates will result from future operation of the Western Circuits and Eastern Circuits at 345kV between Midway Substation and Daniels Park Substation (*i.e.*, Case 2A) and from future operation of the Eastern Circuits at 345kV and the Western Circuits at 230kV from Comanche to Midway Substation (*i.e.*, Case 9) are reasonable and (b) that Public Service used prudent avoidance techniques in the Project. As discussed here, we will not make the requested findings.

1. Findings.

106. In considering the reasonableness of the EMF levels of a transmission line, the Commission is interested principally in the magnetic field generated by the line because the

[80] It appears that Public Service has not conducted any verification testing of the ENVIRO model, either the EMF results or the noise level results.

[81] *See* 4 CCR 723-3-3102.

possibility exists that there may be adverse health effects from exposure to magnetic fields.[82] The magnitude of the magnetic field is determined by the current flows through the transmission line and by one's proximity to the transmission line. As the current increases, so does the magnitude of the field. As one moves closer to the line, the magnitude of the field increases. Magnetic field is measured in milliGauss (or mG).

107. There are neither federal nor Colorado standards or guidelines for, or limits on, the permissible level of transmission line magnetic fields. Florida and New York have established limitations on the magnetic field at the edge of a transmission line's ROW. Florida has set that limit at less than 150mG for 60kV to 230kV transmission lines. New York's requirement is set at less than 200mG. Rebuttal Exhibit No. 11 at Exhibit MN-5 at § 6.13. The record contains no additional information about these state-established limitations and contains no evidence regarding limits, if any, on the magnetic field generated by 345kV transmission lines.

108. In April, 2004, the Colorado Coordinated Long Range Transmission Planning Group issued its 2004 Long Range Study. The CLRTPG supported the Project because the group viewed it as a fundamental first step in building a back-bone transmission system in the Front Range. It appears that the CLRTPG focused on the transfer capability of the Project and did not consider the magnetic fields associated with the Project.

109. Public Service used the ENVIRO model to estimate the EMF levels in this proceeding. That model predicts EMF levels generated by a transmission line by considering

[82] This is not, and is not intended to be, a finding that, in fact, there are adverse health effects from exposure to magnetic fields. (In this proceeding there is no evidence on this issue or to the effect that exposure to magnetic fields results in adverse health effects.) Rather, this statement is merely a recitation of the reason for the interest in this particular type of field.

input variables such as the line phasing, the presence of a parallel transmission line, the load and current expected when the line is in service, the elevation of the line, weather conditions, and the size of the conductors used. With respect to the expected level of magnetic field at the edge of a transmission line's ROW, the ENVIRO output of interest is the RMS Resultant value.

110. The focus here is on the projected levels of magnetic fields under the following conditions: both the Western Circuits and the Eastern Circuits are operated at 345kV between Midway Substation and Daniels Park Substation, there is a 115kV parallel transmission line between Midway Substation and Daniels Park Substation, the Eastern Circuits are operated at 345kV between Comanche and Midway Substation, and the Western Circuits are operated at 230kV between Comanche and Midway Substation.

111. With respect to predicted magnetic field levels, the pertinent cases are Case 1A (the base case), Case 2A, Case 5A, and Case 9. Remand Exhibits No. 16 (Case 81) and No. 17 (Case 80) also provide data relevant to predicted magnetic field levels.

112. *Case 2A* models the Midway Substation to Daniels Park Substation with a 115kV parallel transmission line segment when both the Western Circuits and the Eastern Circuits are operated at 345kV. This is the case for which Public Service seeks a reasonableness finding. Due to the presence of the 115kV parallel transmission line, this case shows the highest magnetic field values likely to be seen in the Midway Substation to Daniels Park Substation section. This case depicts how the circuits will operate if the Project is built with 2-954 conductor bundles and models Public Service's Application as filed. For this case, the ENVIRO model predicts a

magnetic field of 13.11mG on the ROW western edge (-150') and 22.96mG on the ROW eastern edge (110').[83] Remand Exhibit No. 3A.

113. The EMF levels are the same for two-bundle conductor (Case 2A) and for three-bundle conductor (Case 5A). *Id.*

114. *Remand Exhibit No. 17* (Case 80) was prepared by Public Service for the hearing on remand.[84] This case models the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment with the Western Circuits built with 3-954 conductor bundles and the Eastern Circuits built with 2-954 conductor bundles. Both the Western Circuits and the Eastern Circuits are operated at 345kV. For this case, the ENVIRO model predicts a magnetic field of 13.04mG on the ROW western edge (-150') and 24.01mG on the ROW eastern edge (110').

115. *Case 9* models the Comanche to Midway Substation section when the Eastern Circuits are operated at 345kV and the Western Circuits are operated at 230kV. This depicts how the circuits will operate if the Project is built with 2-954 conductor bundles and models Public Service's Application as filed. For this case, the ENVIRO model predicts a magnetic field of 10.83mG on the ROW western edge (-230') and 18.28mG on the ROW eastern edge (150'). Remand Exhibit No. 3A.

[83] For the ROW eastern edge, this represents a predicted reduction from the magnetic field level in the base case. *Compare* RMS Resultant values for Case 2A *with* RMS Resultant values for Case 1A. Remand Exhibit No. 3A at 103, 117.

[84] Public Service intended this Remand Exhibit to depict Staff's recommendations in the remand hearing. This Remand Exhibit does not achieve that purpose because, as discussed below, Staff's recommendation is: build the Western Circuits in this section with 3-954 conductor bundles and rebuild with 3-954 conductor bundles the portions of the Eastern Circuits in this section which go past residential areas. Remand Exhibit No. 17 does not include rebuilding any portion of the Eastern Circuits built in the 2005 Rebuild.

116. *Remand Exhibit No. 16* (Case 81) models the Comanche to Midway Substation segment, assumes the Eastern Circuits are built with 3-954 conductor bundles and the Western Circuits are built with 2-954 conductor bundles, and was prepared by Public Service for the hearing on remand.[85] This case models the Comanche to Midway Substation segment when the Eastern Circuits are operated at 345kV and the Western Circuits are operated at 230kV. For this case, the ENVIRO model predicts a magnetic field of 10.83mG on the ROW western edge (-230') and 18.28mG on the ROW eastern edge (150').[86]

117. There was no evidence presented on the potential health effects of exposure to magnetic fields at the projected, or any other, levels.

118. Given the importance of the amount of current vis-à-vis the magnitude of the magnetic field, it is important to note that each case assumes that the Comanche 3 generating unit is in service and is operated as a base load plant. April 12 tr. at 58-60. PSCo witness Green predicts that one will see the modeled powerflows approximately 80-100% of the time. One may expect to see the predicted magnetic field approximately the same percentage of the time. *Id.*

119. Each case assumes that *only* the output of the Comanche 3 generating unit is carried on the circuits.[87] Public Service presented unrefuted evidence that the Project will be used to transport the output of *both* the Comanche 3 generating unit *and* of other generating facilities. In addition, when the Western Circuits and the Eastern Circuits are operated at 345kV,

[85] Public Service intended this Remand Exhibit to depict Staff's recommendations in the remand hearing. This Remand Exhibit does depict Staff's proposal that Public Service build the Eastern Circuits in this section using 3-954 conductor bundles and retain the existing 2-954 conductor bundles on the Eastern Circuits in the section. (The Eastern Circuits in the Comanche to Midway Substation section are not part of the Application, and Public Service does not propose in this docket to rebuild those circuits.)

[86] The identical magnetic field values for Case 9 and Case 81 demonstrate the point that it is the current through the line, and not the conductor, which determines the magnitude of the magnetic field.

[87] See Remand Exhibit No. 5; Hearing Exhibit No. 1.

the circuits can carry approximately three times the amount of current assumed in the modeling. Given the fact that the modeling did not take into account other generation apt to be in-service and using the transmission lines by late 2008, it is likely that the EMF levels projected by Public Service will be outdated when the Comanche 3 generating comes on-line in 2009. Further, as the FRP is used in the future to carry increasingly larger loads (*i.e.*, more current) to the Metro Denver load center,[88] the projected EMF levels become correspondingly less reliable.

120. Rule 4 CCR 723-3-18(i)[89] requires a public utility (such as Public Service here) to incorporate the concept of prudent avoidance in planning, siting, constructing, and operating transmission facilities. The Rule defines prudent avoidance as

> the striking of a reasonable balance between the potential health effects of exposure to magnetic fields and the cost and impacts of mitigation of such exposure by taking steps to reduce the exposure at reasonable or modest cost.

The Rule lists five steps which a utility might take to reduce exposure at modest or reasonable cost and, thus, meet the prudent avoidance criterion. The list is not all-inclusive, and the listed steps are not mandatory.

121. To minimize magnetic field levels and to comply with Rule 4 CCR 723-3-18(i), Public Service plans to use prudent avoidance techniques in constructing the Project. For the entire Project, these techniques include the use of structures designed with five feet of additional ground clearance (step 3 of Rule 4 CCR 723-3-18(i)) and the use of reverse phasing in such a way as to have the greatest impact on reduction of EMF levels at the edge of the ROW (step 1 of Rule 4 CCR 723-3-18(i)). For the Comanche to Midway Substation segment, Public Service will

[88] The 2004 Long Range Study estimated that, by 2013, over 2,750 MW of new generation will be needed to serve the Front Range's demand for power. The vast majority of that demand will be from Public Service's customers.

[89] *See* 4 CCR 723-3-3102.

use the additional techniques of avoiding populated areas (step 2 of Rule 4 CCR 723-3-18(i)) and of widening the ROW (step 4 of Rule 4 CCR 723-3-18(i)).[90]

122. Public Service does not plan to use the remaining EMF prudent avoidance steps described in Rule 4 CCR 723-3-18(i).[91] The other steps cannot be implemented for a moderate cost. For example, the cost of burying the transmission line would be approximately ten times greater than the cost for overhead construction and would increase maintenance and repair time and cost significantly; and widening the Midway Substation to Daniels Park Substation segment ROW, while it would reduce EMF, would require condemnation of homes and would be both very expensive and very unpopular.

123. In the hearing on remand, Public Service presented the ENVIRO model results for *Case 71*: operating the transmission lines at 345kV without reverse phasing and holding Case 2A constant in all other respects. Remand Exhibit No. 3A at 370-82. Reverse phasing is done solely for the purpose of reducing magnetic field; it is has no other value or benefit to the system. Public Service prepared this case to investigate the impact of reverse phasing on noise level mitigation. Case 71 yielded these EMF results for the Midway Substation to Daniels Park Substation with a 115kV parallel transmission line segment when both the Western and Eastern Circuits are operated at 345kV: 24.12mG on the western edge of the ROW (-150'), and 44.38mG on the eastern edge of the ROW (110'). While these appear to be increases over the values predicted for Case 2A, one cannot determine the potential health effects of exposure to these levels of magnetic field -- and, thus, the significance of the seeming increases -- due to the

[90] Public Service cannot use these techniques for the Midway Substation to Daniels Park Substation segment because Public Service is using existing ROW in that segment.

[91] These include routing the line to limit exposure to areas of concentrated population and group facilities (in the Midway Substation to Daniels Park Substation segment), widening the ROW corridor (in the Midway Substation to Daniels Park Substation segment), and burying the transmission line (the entire Project).

absence of evidence on this point. In addition, the magnetic field levels would be different, and probably lower, for areas of the FRP *without* a 115 kV parallel transmission line. These areas, however, were not modeled without reverse phasing.

124. Neither Public Service nor Staff modeled Case 9 without reverse phasing.

2. Positions of the Parties.

125. Staff and Tri-State support Public Service's request for a reasonableness finding with respect to projected EMF levels for operation of the Project at 345kV.

126. Staff agrees with Public Service that the Project included and used prudent avoidance techniques with respect to EMF.

127. No party opposed the Commission's making the requested finding regarding the reasonableness of the projected EMF levels when the Project is operated at 345kV. No party contended that the projected EMF levels for Project operation at 345kV are unreasonable. No party challenged the sufficiency of Public Service's prudent avoidance measures, described above.

3. Discussion.

128. To the end that EMF levels are minimized, Rule 4 CCR 723-3-18(i) requires a public utility (such as Public Service here) to include the concept of prudent avoidance with respect to planning, siting, constructing, and operating transmission facilities. The Rule provides the legal basis underlying Public Service's request for a Commission finding concerning the reasonableness of the EMF levels it projects will result from the Project when operated at 345kV. We note that no statute addresses the Commission's authority to determine reasonableness of EMF emissions.

129. Public Service included and used prudent avoidance techniques with respect to EMF levels expected when the Project is operated at 345kV because the described techniques strike a reasonable balance between the potential health effects of exposure to EMF and the cost and impacts of mitigating such exposure. In addition, the anticipated EMF levels for operation of the Project at 345kV as shown in Hearing Exhibit No. 4 at Exhibit AS-2 are reasonable if one considers only the Comanche generating unit 3 output as modeled by Public Service. Finally, so long as Public Service employs the prudent avoidance techniques discussed above and in the testimony of PSCo witness Schaller (Hearing Exhibit No. 4 at 10:11-22), the EMF from the Project as modeled by Public Service when only Comanche generation is considered and the Project is operated at 345kV in the future will be reasonable.

130. According to PSCo witness Green, currents of 636 amperes and 630 amperes used in Case 1A, Case 2A, Case 5A, and Case 9 correspond to Comanche output only and will be present 80-100% of the time due to Comanche's being a baseload unit.

131. However, the difficulty presented here is that PSCo did not model the expected EMF levels when operated with generation in addition to the Comanche generating station, and the evidence clearly demonstrates that there will be additional generation above that at the Comanche station.

132. We do not believe that Public Service has met its burden of proof on this issue. There is simply no evidence as to what the level of magnetic fields would be if the transmission lines are operated at full capacity.

133. PSCo has asked the Commission to make a specific finding that the levels of EMF predicted by the ENVIRO model presented by PSCo in this case are reasonable if the Project is built as PSCo proposes and if the transmission line is operated as PSCo proposes. This assumes,

of course, that the modeling accurately reflects how PSCo proposes to operate the line and the amount of current likely to be carried. The modeling does not reflect likely actual operation and current levels because the output of at least one known (or highly likely) generating unit is not contained in the modeling assumptions. We believe that Public Service has not met its burden of proof. Thus, the Commission cannot make the reasonableness finding as to EMF levels -- not yet addressing prudent avoidance -- because the most basic underlying assumption is not met. We decline to make any finding with respect to the reasonableness of the EMF emissions.

F. Noise Levels and § 25-12-103(12), C.R.S.

134. Public Service requests a Commission finding that the projected noise levels which Public Service estimates will result from the operation of the Project at 345kV are reasonable. Public Service asks that we make this finding pursuant to § 25-12-103(12)(a), C.R.S.; such a finding gives Public Service the protections of § 25-12-103(12)(b), C.R.S. As discussed here, we will not make the requested finding. Instead, we make what might be deemed a conditional finding of reasonableness.

1. Findings.

135. The Eastern Circuits of the Midway Substation to Daniels Park Substation section of the Project were the subject of a prior Commission proceeding, Docket No. 03A-276E. There, Public Service requested, and the Commission granted, a CPCN to build those circuits as 345kV-capable but to operate them at 230kV until such time as the Commission grants a CPCN to operate those circuits at 345kV.[92] In that case, because Public Service was not requesting a CPCN to operate the Eastern Circuits at 345kV, issues -- including projected noise levels --

[92] This is the same approach taken by Public Service in the instant proceeding with respect to the Western Circuits between Midway Substation and Daniels Park Substation.

pertaining to the circuits' operation at 345kV were deferred until such time as Public Service filed an application for a CPCN to operate them at 345kV. Decisions No. C04-0144, No. C04-0051, and No. R03-1308. This case is the one to which the issues were deferred.

136. In April, 2004, and subsequent to the Commission decision in Docket No. 03A-276E, the Colorado Coordinated Long Range Transmission Planning Group issued its 2004 Long Range Study. The CLRTPG supported the Project, which the group viewed as a fundamental first step in building a back-bone transmission system. It appears that the CLRTPG focused on the transfer capability of the Project and did not consider the transmission-related noise associated with it.

137. In May, 2004, § 25-12-103(12), C.R.S., became effective. That statute addresses the issue of transmission line-related noise and provides:

> (a) Notwithstanding subsection (1) of this section, *the [Commission] may determine*, while reviewing utility applications for [CPCNs] for electric transmission facilities, whether projected noise levels for electric transmission facilities are reasonable. *Such determination shall take into account* concerns raised by participants in the commission proceeding and the alternatives available to a utility to meet the need for electric transmission facilities. When applying, *the utility shall provide* notice of its application to all municipalities and counties where the proposed electric transmission facilities will be located. *The [Commission] shall afford* the public an opportunity to participate in all proceedings in which permissible noise levels are established according to the "Public Utilities Law," articles 1 to 7 of title 40, C.R.S.
>
> (b) Because of the statewide need for reliable electric service and the public benefit provided by electric transmission facilities, notwithstanding any other provision of law, *no municipality or county may adopt* an ordinance or resolution setting noise standards for electric transmission facilities that are more restrictive than this subsection (12). *The owner or operator of an electric transmission facility shall not be liable* in a civil action based upon noise emitted by electric transmission facilities that comply with this subsection (12).
>
> (c) For purposes of this section:
>
> > (I) "Electric transmission facility" means a power line or other facility that transmits electrical current and operates at a voltage level greater than or equal to 44 kilovolts.

> (II) "Right-of-way for electric transmission facilities" means all property rights and interests obtained by the owner or operator of an electric transmission facility for the purpose of constructing, maintaining, or operating the electric transmission facility.

Emphasis supplied. This is the first proceeding in which the Commission is asked to make a reasonableness finding under this statute.

138. There are no Commission regulations addressing noise-related reasonableness findings, and no prior Commission decisions applying this statute, that provide guidance in this case. Public Service, Staff, and Tri-State[93] generally agreed on the following factors that one ought to take into account when one is determining whether projected noise levels for 345kV transmission lines are reasonable:

> (a) level of noise in the overall context of the Project (*e.g.*, its purpose, the need to be addressed, general benefits of Project);
>
> (b) characteristics of projected noise levels (*e.g.*, the likely highest projected noise level, when and under what circumstances that noise level is likely to occur, the likely frequency of that noise level, the likely duration of that noise level);
>
> (c) information about the model used to determine projected noise levels (*e.g.*, its appropriateness and efficacy with respect to making such projections);
>
> (d) transmission as a linear asset, one which operates at the same dB(A) level irrespective of the neighboring uses;
>
> (e) description of, and information about, construction techniques and practices to be used (*e.g.*, whether they are best utility practices to reduce noise and to meet the National Electric Safety Code);
>
> (f) whether transmission line is sited properly within ROW to reduce noise and to meet the National Electric Safety Code;
>
> (g) information about areas through which the line passes (*e.g.*, uses of adjacent properties, ambient noise in adjacent areas, pertinent weather data);
>
> (h) whether placing transmission within an existing transmission corridor maximizes use of that corridor;

[93] The Steenhoeks expressed no opinion on this issue as their focus was on their recommendation that the Commission not authorize the transmission project to operate at 345kV. *See* discussion below.

(i) whether projected noise levels are reasonable compared to benefits and costs of alternative line design(s) which would reduce projected noise levels;

(j) information about maintenance and other activities required to assure that the line, over the life of the transmission asset, will stay within the levels the Commission has found to be reasonable (*e.g.*, both for the utility-proposed construction and for any alternative construction proposed, this includes: frequency of maintenance, complexity of maintenance, utility's familiarity with configuration used to mitigate noise); and

(k) considerations required by § 25-12-103(12), C.R.S. (*i.e.*, "concerns raised by participants in the commission proceeding," alternatives available to meet need for transmission facilities, and public input).

139. To understand the controversy surrounding the projected noise levels in this proceeding, it is necessary to have a basic understanding of noise measurement; of the causes of transmission line-related noise; and of the characteristics of corona-generated transmission noise. *See generally* Remand Exhibit No. 2 (Chapter 6 of the Red Book (1982 edition)).[94]

140. Audible noise is produced by sound pressure and, for the purpose of determining the human response to sound, is measured in units of sound pressure level called decibels (dB). The frequency (*i.e.*, pitch) of a sound is also a component of audible noise.

141. The decibel scale is logarithmic, and the ratio scale is linear. Thus, as the decibel levels increase, the ratio compounds at a higher rate. *See*, *e.g.*, Remand Exhibit No. 10 at Exhibit KS-1 at 2. This means, for example, that an increase from 58 dB(A) to 61 dB(A) (an increase of 3 dB(A)) is perceived as a 37% increase in noise level and that the perceived noise increases 10 fold for every 20 dB(A) increase. A 50 dB(A) sound is perceived as 10 times louder than a 30 dB(A) sound, and a 58 dB(A) sound is perceived as 2.5 times louder than a 50 dB(A) sound.

[94] This chapter discusses in detail transmission line-related noise, contains pertinent information, and is the chapter relied on by Public Service and Staff. *See also* Remand Exhibit No. 3 at Exhibit AS-8 (Chapter 6 of Red Book, 2nd edition revised (1987)). The two editions are substantially the same with respect to discussion of noise.

142. Although there are several scales used to rate frequencies[95] and sound pressure levels discerned by the human ear, the most commonly used is the A-weighted scale (dB(A)). This is the scale used to report the ENVIRO results.[96] No evidence in this proceeding states audible noise from the Project using any other scale.

143. Measuring audible noise is not precise because, when recorded, noise levels produce a fuzzy line, which line is approximately two dB in width. Conceivably, although stated at a specific dB level, measured audible noise from a particular source can fall anywhere within this two dB bandwidth. To address this lack of precision, noise is said to be a certain level "on average" and is reported using the L-level, which is the statistical descriptor for an exceedence level. For each case presented in this proceeding, the ENVIRO model reports two relevant L-scale results: L_{50} Rain and L_5 Rain.

144. L_{50} Rain is the sound level, expressed in dB(A), which is *exceeded 50 percent* of the time for an hour survey, when measured using an approved test procedure.[97] Although this result is labeled rain, it appears to incorporate all three types of wet weather modeled.

145. L_5 Rain is the sound level, expressed in dB(A), which is *exceeded five percent* of the time for an hour survey, when measured using an approved test procedure. Although this result is labeled rain, it appears to incorporate all three types of wet weather modeled.

146. Of the two, L_5 Rain has the smaller margin of error (*i.e.*, five percent as compared to 50 percent for L_{50} Rain) and, consequently, is the measure which more accurately states what

[95] Sound is composed of different frequencies. Each scale gives a greater importance (or weighting) to some frequencies than to others.

[96] There are other models, apparently, which are used to estimate noise levels. The record contains no explanation of these other models, and the focus of the proceeding was on the ENVIRO model and its results.

[97] An approved test procedure is necessary for consistency of measurement and comparability of results. No party in this proceeding proffered a suggested or recommended test procedure.

the noise level is likely to be. The parties in this proceeding tended to state their noise-related findings in terms of L_{50} Rain.

147. Transmission line-related noise is most often associated with corona, the small electrical discharge which surrounds an electric transmission line. Generally speaking, the higher the voltage on a line, the greater is the corona activity on that line. Corona-generated noise consists of buzzing, humming, hissing, random crackling, and random popping sounds and is the most common audible noise associated with high-voltage transmission lines. Corona-generated noise increases one dB(A) for every 1,000-foot gain in elevation. Corona-generated noise is most apt to occur when the line is damp or has droplets on it. According to the Red Book, the weather conditions most likely to produce corona-generated noise that is likely to be annoying and to interfere with sleep are fog and snow, each of which may produce comparatively high levels of noise while the ambient noise level is low. *See* Remand Exhibit No. 2. Wet lines may have noise levels as much as 25 dB(A) higher than dry lines.

148. The focus is on the projected levels of noise under the following conditions: both the Western Circuits and the Eastern Circuits are operated at 345kV between Midway Substation and Daniels Park Substation with a 115kV parallel transmission line, the Eastern Circuits are operated at 345kV between Comanche and Midway Substation, and the Western Circuits are operated at 230kV between Comanche and Midway Substation.

149. The ENVIRO model predicts noise levels generated by a transmission line by considering input variables such as the number and size of conductor bundles used,[98] the line

[98] As the voltage gradient of the line is reduced, lower overall levels of line noise and greater overall dispersion of line noise are achieved. The number and diameter of conductors in a phase bundle have the greatest effect on conductor surface gradient and, thus, on reduction of transmission line noise. Remand Exhibit No. 2 at § 6.3. Thus, a triple-conductor bundle can be assumed to have a lower noise level associated with it than a double-conductor bundle.

spacing used, the static wire dimensions, the overall geometry of the line, the corridor's elevation, the line's operating voltage, and the precipitation rate. Public Service used the following assumptions when it modeled the nine cases to determine projected noise levels: (a) readings taken at mid-span locations (*i.e.*, the conductor low points) and without the influence of the structures; (b) corridor elevation of 6,900 feet for the Midway Substation to Daniels Park Substation section and of 6,000 feet for the Comanche to Midway Substation section; (c) operating voltage as described above; (d) water droplets on the lines; (e) an unknown amount of noise reflection from the ground or other objects; and (f) after the burn-in period.[99] *See* Hearing Exhibit No. 4 at Exhibit AS-3 (results of Public Service's modeling of noise levels for various scenarios using these assumptions); Remand Exhibit No. 3A (ENVIRO results of cases modeled).

150. With respect to predicted noise levels, the pertinent cases in this proceeding are Case 1A, Case 2A, Case 5A, Case 9, and Case 71. Remand Exhibits No. 16 (Case 81) and No. 17 (Case 80) also provide relevant data with respect to predicted noise levels.

151. *Case 1A* models the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment. The Western Circuits are operated at 230kV, and the Eastern Circuits are operated at 345kV. This case depicts the circuits as operated at present (the base case) and shows the level of corona-generated noise predicted to occur when there are droplets

[99] The burn-in period is a period of time, usually several months, after the line is energized during which imperfections, residue, and other foreign material burn off. As a result of burn-in, the line becomes less noisy. In this proceeding, Public Service did not provide an estimate of the duration of the burn-in period for the Project when it operated at 345kV.

on the lines. For this case, the ENVIRO model predicts a L_5 noise level of 60.8 dB(A)[100] and a L_{50} noise level of 52.9 dB(A) on the ROW western edge (-150') and a L_5 noise level of 60.4 dB(A) and a L_{50} noise level of 56.6 dB(A) on the ROW eastern edge (110'). Remand Exhibit No. 3A.

152. *Case 2A* models the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment with both the Western Circuits and the Eastern Circuits operated at 345kV. This is the case for which Public Service requests the reasonableness finding. This case depicts how the circuits will operate if the Project is built with 2-954 conductor bundles, models Public Service's Application as filed, and shows the level of corona-generated noise predicted to occur when there are droplets on the lines. For this case, the ENVIRO model predicts a L_5 noise level of 60.4 dB(A) and a L_{50} noise level of 56.9 dB(A) on the ROW western edge (-150') and a L_5 noise level of 62.2 dB(A) and a L_{50} noise level of 58.7 dB(A) on the ROW eastern edge (110'). Remand Exhibit No. 3A; *see also* Remand Exhibit No. 14 (same as to L_{50} results; no L_5 results).

153. *Case 5A* models the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment. Both the Western Circuits and the Eastern Circuits are operated at 345kV. This case depicts how the circuits will operate if the Eastern Circuits are built with triple-conductor bundles and if the Western Circuits are built with double-conductor bundles and shows the level of corona-generated noise predicted to occur when there are droplets

[100] Public Service offered a reference chart found in Chapter 6 of the Red Book as a guide to how people may experience sound at various decibel levels. Hearing Exhibit No. 4 at 15:1-17; Remand Exhibit No. 2 at Table 6.2.1. According to this reference chart, 50 to 60 dB(A) is "typical business office." *Id.* At the June, 2005 hearing, PSCo witness Schaller, who sponsored the reference chart, could not explain the meaning of "typical business office" (or of any other description) and could not describe what is included within that description (*e.g.*, air conditioning or open window, typewriter or computer, cubicle or solid-wall office). As a result, there is insufficient evidence in the record to warrant reliance on any portion of the proffered reference chart.

on the lines. For this case, the ENVIRO model predicts a L_5 noise level of 57.3 dB(A) and a L_{50} noise level of 53.8 dB(A) on the ROW western edge (-150') and a L_5 noise level of 60.9 dB(A) and a L_{50} noise level of 57.4 dB(A) on the ROW eastern edge (110'). Remand Exhibit No. 3A.

154. *Remand Exhibit No. 17* (Case 80) was prepared by Public Service for the hearing on remand.[101] This case models the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment, assumes the Western Circuits are built with 3-954 conductor bundles and the Eastern Circuits are built with 2-954 conductor bundles, and shows the level of corona-generated noise predicted to occur when there are droplets on the lines. Both the Western Circuits and the Eastern Circuits are operated at 345kV. For this case, the ENVIRO model predicts a L_5 noise level of 56.7 dB(A) and a L_{50} noise level of 53.2 dB(A) on the ROW western edge (-150') and a L_5 noise level of 60.8 dB(A) and a L_{50} noise level of 57.3 dB(A) on the ROW eastern edge (110'). This case demonstrates the noise levels predicted to occur in *non*-residential areas in the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment assuming that the Staff's recommendations are accepted.

155. *Case 71* models the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment, assumes the Western Circuits and Eastern Circuits are built with 2-954 conductor bundles (*i.e.*, the Application as filed), and shows the level of corona-generated noise predicted to occur when there are droplets on the lines and *no reverse phasing*.[102] Both the Western Circuits and the Eastern Circuits are operated at 345kV.

[101] Public Service intended this Remand Exhibit to depict Staff's recommendations in the remand hearing. This Remand Exhibit does not achieve that purpose because, as discussed below, Staff's recommendation includes rebuilding with 3-954 conductor bundles the portions of the Eastern Circuits in this section which go past residential areas. Remand Exhibit No. 17 does not include that rebuilding.

[102] Reverse phasing is done solely for the purpose of reducing magnetic field. It has no other value or benefit to the system.

For this case, the ENVIRO model predicts a L_5 noise level of 56.0 dB(A) and a L_{50} noise level of 52.5 dB(A) on the ROW western edge (-150') and a L_5 noise level of 58.0 dB(A) and a L_{50} noise level of 54.5 dB(A) on the ROW eastern edge (110'). This case predicts the largest reduction in transmission line noise and costs virtually nothing.

156. *Case 9* models the Comanche to Midway Substation section. The Eastern Circuits are operated at 345kV, and the Western Circuits are operated at 230kV. This case depicts how the circuits will operate if the Project is built with 2-954 conductor bundles, models Public Service's Application as filed, and shows the level of corona-generated noise predicted to occur when there are droplets on the lines. For this case, the ENVIRO model predicts a L_5 noise level of 54.2 dB(A) and a L_{50} noise level of 50.7 dB(A) on the ROW western edge (-230') and a L_5 noise level of 59.1 dB(A) and a L_{50} noise level of 55.6 dB(A) on the ROW eastern edge (150'). Remand Exhibit No. 3A.

157. *Remand Exhibit No. 16* (Case 81) models the Comanche to Midway Substation section, assumes the Eastern Circuits are built with 3-954 conductor bundles and the Western Circuits are built with 2-954 conductor bundles, and was prepared by Public Service for the hearing on remand.[103] This case models the section when the Eastern Circuits are operated at 345kV and the Western Circuits are operated at 230kV and shows the level of corona-generated noise predicted to occur when there are droplets on the lines. For this case, the ENVIRO model predicts a L_5 noise level of 50.6 dB(A) and a L_{50} noise level of 47.1 dB(A) on the ROW western edge (-230') and a L_5 noise level of 50.0 dB(A) and a L_{50} noise level of 46.5 dB(A) on the ROW eastern edge (150').

[103] Public Service intended this Remand Exhibit to depict Staff's recommendations in the remand hearing, and this Remand Exhibit does so.

158. For the Midway Substation to Daniels Park Substation with a 115kV parallel transmission line segment, no case predicts a L_5 noise level of 50 dB(A) or less; and no case predicts a L_{50} noise level of 50 dB(A) or less.[104] For the Comanche to Midway Substation section, Case 81 (Remand Exhibit No. 16) predicts L_5 noise levels of 50 dB(A) or less and L_{50} noise levels of 50 dB(A) or less. This is the only case which would meet a 50 dB(A) noise standard.

159. There are no disputes about the modeling results. There is no difference greater than one dB(A) between the modeling results of Public Service and those of Staff.

160. Because corona-generated transmission line noise is most noticeable when a line has droplets on it, weather data can be useful in predicting the likely frequency and duration of corona-generated noise.

161. Public Service provided calendar year 2004 precipitation data[105] for Centennial Airport, for Pueblo Airport, and for Colorado Spring Airport. These data are cumulative (*i.e.*, not broken out by season, by month, or by time of day). According to the data, in that one year period Centennial Airport experienced 168 days of precipitation, Pueblo Airport 113 days of precipitation, and Colorado Springs Airport 169 days of precipitation.

162. Public Service provided precipitation data[106] for Castle Rock, for Colorado Springs (Peterson Air Force Base), and for Pueblo for the six-year period 1999 through 2004. The data are cumulative (that is, not broken out by year, by season, by month, or by time of day)

[104] Public Service acknowledges that it is possible to meet a 50 dB(A) level at the edge of the ROW but estimates that achieving that level would more than double the $81 million cost of the transmission portion of the Project.

[105] Any measurable precipitation, irrespective of amount, was included. Hearing Exhibit No. 5 at 4-6.

[106] Any measurable precipitation, irrespective of amount, was included. Hearing Exhibit No. 5 at 4-6.

and contained one year which overlaps with the calendar year 2004 data discussed above. According to the data, in that six-year period Castle Rock experienced 408 days of precipitation, Colorado Springs 512 days of precipitation, and Pueblo 382 days of precipitation.[107]

163. Public Service used these precipitation data to estimate the number of hours and the percentage of the year during which one might hear transmission line-related noise at the levels projected by the ENVIRO model. Hearing Exhibit No. 5 at 4-6. These data and estimations are of questionable value for the calculation of the likely duration and frequency of corona-generated noise. First, given the drought which has reduced precipitation in the recent past few years, there is some question about whether these data are useful in predicting precipitation and, thus, hours of noise in future years. Second, no information was provided about the time of day during which the precipitation occurred. Third, no information was provided about the duration of the precipitation.[108] The possibility exists, and is consistent with the data, that the weather conditions could continue for hours or days. Fourth, the reported data provide no information about the length of time it may have taken the lines to dry after the precipitation ceased or about the effect (if any) of evaporation from drying which occurred after precipitation ceased (*e.g.*, snow melt).

164. The precipitation data provide some evidence of the minimum number of days on which the lines may have been wet and may have produced noise at the projected levels. The data are useful to that extent.

[107] Staff witness Dominguez testified that the data presented satisfy his recommendation that the Commission order Public Service to provide weather data. Accordingly, this Staff recommendation is considered withdrawn.

[108] The durations shown in Hearing Exhibit No. 5 at 4-6 are assumed, not actual. Thus, the hours of increased corona activity and the percentages shown on those pages are assumptions, not actuals.

165. The Steenhoeks' property abuts the eastern edge of the ROW in the 2005 Rebuild area. Their recounted experiences with the duration of corona-generated noise from the Eastern Circuits when operated at 230kV (the current operating condition) cast doubt on Public Service's prediction that transmission line-related noise will occur two to four percent of the year. Exhibit No. 13; Remand Exhibit No. 10 at 5-6;[109] April 5 tr. (the experiences described occurred when the Eastern Circuits were operated at 230kV). The Steenhoeks presented neither a quantification nor an estimate of the percentage of the year during which they experience corona-generated transmission line noise.

166. The ENVIRO model contains a screen which allows the modeler to input specific values (for example, duration, precipitation rate, time of day) for fog, rain, and snow. Remand Exhibit No. 3 at Exhibit AS-7 at 6. Notwithstanding the acknowledged direct correlation between the lines being wet and the level of corona-generated noise, Public Service used the default settings for all cases it modeled.[110]

167. To address transmission line-related noise, Public Service proposes to use various techniques commonly employed in the industry to reduce corona-generated noise. These include: use of high quality bundled conductors (in this case, double-conductor bundles per phase); adequate spacing of phases to avoid creation of excessive voltage gradient;[111] use of corona-free attachment hardware; use of proper construction techniques such as careful handling of conductors; and proper line tensions.[112] The ENVIRO model assumes these techniques

[109] The experiences recounted in this testimony occurred over a continuous 48-hour period.

[110] It is the experience of PSCo witness Schaller, who ran the ENVIRO model, that changing the values on this input screen does not affect the L_{50} *calculations.* Consequently, he elected to use the default values. There is no information as to whether changing the default values has an impact on the L_5 *calculations*.

[111] Excessive voltage gradient could generate constant and excessive corona and, thus, noise.

[112] The looser the conductor, the louder is the sound level.

are used, and any noise mitigation effect created by the use of these techniques is already accounted for in the ENVIRO results. Taking these measures will not reduce the estimated noise levels below those predicted by the ENVIRO models, but Public Service's failure to use all of the specified techniques most likely would result in higher noise values than those predicted.

168. Staff recommends that the Commission order, for residential areas only, a 50 dB(A) cap on the corona-generated noise from the transmission line. To achieve this result, Staff recommends that the Commission (a) order Public Service to use 3-954 conductor bundles for the areas of new construction (*i.e.*, the Project), (b) allow Public Service to retain 2-954 conductor bundles in the Western Circuits between Comanche and Midway Substation,[113] and (c) allow Public Service to retain 2-954 conductor bundles in the 2005 Rebuild of the Eastern Circuits except for areas which pass residential areas. For those residential areas, Staff recommends that the Commission order Public Service to rebuild the transmission lines using 3-954 conductor bundles.

169. There are system benefits which, according to Staff, could result from building the transmission line in accordance with Staff's recommendations. With both the Western and Eastern Circuits in operation, there would be a significant increase in the FRP's transfer capability, and thus the amount of power which can be delivered to the Metro Denver load center, without widening the FRP or creating another transmission corridor.[114] In addition, use of

[113] In this Application, Public Service does not seek authorization to rebuild the existing 230kV circuits in this section.

[114] In system normal operation, the equivalent of a single-circuit 345kV line built with 2-954 conductor bundle is added. In a n-1 condition (circuit out), the equivalent of a single-circuit 230kV line built with 2-954 conductor bundle is added. To achieve these full benefits, at least these conditions must be met: there must be a termination (tie) to Midway Substation, the 3-954 conductor must tie into another circuit constructed with 3-954 conductor, and there must be more generation added on the southern part of the system (*e.g.*, tying into Comanche or tying into Midway).

triple-conductor bundles instead of double-conductor bundles would result in reduced resistance and, thus, reduced line losses. Further, use of 3-954 conductor bundles instead of 2-954 conductor bundles may serve to unload the underlying lower-voltage transmission lines to some degree.[115] Moreover, use of triple-conductor bundles increases the options available to future system planners and system designers because they will be able to bring additional generation output to the Daniels Park Substation and, thus, to the Metro Denver load center. Finally, use of the triple-conductor bundles instead of double-conductor bundles would result in a reduced level of line noise.[116]

170. There are no ENVIRO results which model Staff's recommendation, and there is no direct evidence of the noise level predicted if Staff's recommendations are accepted. However, Remand Exhibit No. 11 at Exhibits IGD-14 and IGD-15 provides useful information on this issue. Because the conductor size modeled in those exhibits is smaller than the 3-954 conductor bundles recommended by the Staff, one may reasonably assume that, if the 3-954 were modeled, the noise results would be at least comparable (if not better).

171. Exhibits IGD-14 and IGD-15 of Remand Exhibit No. 11 are ENVIRO model results. Each assumes the use of 3-795 kcmil acsr Drake conductor bundles in the areas in which Staff proposes to use 3-954 conductor bundles. These exhibits show the level of corona-generated noise predicted to occur when there are droplets on the lines.

172. Exhibit IGD-14 provides the L_{50} noise results of modeling bundles in the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment when both

[115] A powerflow study would establish the extent to which the unloading may occur.

[116] No powerflow study or other study shows that use of 3-054 conductor bundles is the most cost-effective means to achieve the identified benefits. Staff witness Dominguez based his recommendation on his professional judgment; on his years of experience as a transmission planner; and on the fact that locating high-voltage transmission lines, especially lines which serve the Metro Denver load center, is becoming increasingly difficult.

the Western Circuits and the Eastern Circuits are operated at 345kV. The ENVIRO model predicts a L_{50} noise level of 47.8 dB(A) on the ROW western edge (-150') and L_{50} noise level of 49.3 dB(A) on the ROW eastern edge (110'). No L_5 noise level is provided, and no EMF values are provided.

173. Exhibit IGD-15 provides the L_{50} noise results of modeling bundles in the Comanche to Midway Substation section when the Western Circuits are operated at 230kV and the Eastern Circuits are operated at 345kV. The ENVIRO model predicts a L_{50} noise level of 47.3 dB(A) on the ROW western edge (-230') and a L_{50} noise level of 47.4 dB(A) on the ROW eastern edge (150'). No L_5 noise level is provided, and no EMF values are provided.

174. There are costs associated with building the transmission line in accordance with Staff's recommendations. First, as is true for the Project as proposed by Public Service, the benefits cannot be achieved without upgrades to the Comanche Substation and the Daniels Park Substation and, probably, upgrades to the 230kV transmission lines between Comanche and Midway Substation.[117] Second, to achieve full use of the transfer capability of the Western Circuits would require a termination (or tie) of those circuits at Midway Substation.[118] Third, using the heavier 3-954 conductor bundles recommended by Staff will increase the estimated cost of the transmission portion of the Project from $81 million to approximately $103.7 million

[117] As discussed above, those costs would be associated with the generating units which, in the future, require the circuits to be operated at 345kV.

[118] At present, it appears that Public Service has no plans to create such a termination; and there is no evidence as to the cost of creating this termination.

(an increase of about 28 percent).[119] Fourth, rebuilding the 2005 Rebuild with 3-954 conductor bundles through the residential areas only will cost approximately $10 million, which is in addition to the $103.7 million. Fifth, in the future and depending on the powerflow study results, it may be necessary for Public Service to invest in the facilities of neighboring utilities if the studies identify problems created by use of 3-954 conductor bundles.[120]

175. One builds transmission lines to meet the technical requirements which are established for the line, and these technical requirements (which include legal requirements) may change from line to line. Nonetheless, it is undisputed that: there are no 345kV transmission lines on the Public Service system which use the configuration advocated by Staff; Tri-State does not use the configuration advocated by Staff for 345kV transmission; and there are no 345kV transmission lines in Colorado or in the western United States which use the configuration advocated by Staff.

176. If the Commission were to require that the transmission line not exceed a specified dB(A) level, PSCo witness Schaller acknowledged that Public Service would be able to meet that requirement by

> design[ing] a transmission project that [it] modeled to average approximately 3-5 dBA below the [Commission-established] number in order to allow for variances around the statistical average provided by the ENVIRO model and the uncertainty involved in field measurement.

Remand Exhibit No. 4 at 13:21-14:2. In Mr. Schaller's opinion, the three to five dB(A) would be sufficient to provide a margin of safety for Public Service so that it would not exceed the cap;

[119] This cost includes items such as the cost of larger support structures and the cost of the conductor. Approximately 60 percent (+/- $13.6 million) of the incremental cost is for the Western Circuits between Midway Substation to Daniels Park Substation, and 40 percent (+/- $9.1 million) of the incremental cost is for the Eastern Circuits between Comanche and Midway Substation.

[120] This last cost is highly speculative and, in any event, would not be incurred until some unknown time in the future.

and providing that margin would be reasonable design engineering. Staff witness Dominguez agreed with Mr. Schaller.

177. There is insufficient time for Public Service to rebuild the 2005 Rebuild portion of the Western Circuits to meet a reduced noise level requirement and still meet the in-service date necessary to support the Comanche 3 generating unit.

178. In accordance with the provisions of § 25-12-103(12)(a), C.R.S., Public Service mailed the Application and Public Service's direct testimonies to the municipalities and counties in which the Project will be located. None elected to intervene, or sought permission to intervene, in this proceeding.

2. Responses to Commission Questions.

179. In deciding to remand this matter for additional hearings and findings with respect to transmission line-related noise, we recognized that the

> competing interests of construction costs and reasonable noise emissions need to be fairly and accurately evaluated. A slight change in dB(A) can result in significant audible noise changes, so attempts should be made to limit the peak values. Optimized line engineering should balance performance with cost.

Decision No. C06-0094-I at ¶ 20. To that end, we stated that we need

> to be sure that reasonable steps have been taken in the design and construction techniques to minimize the noise level while balancing total project costs. Therefore, [we] order[ed] that additional evidence needs to be taken to ensure that all reasonably appropriate alternate design options have been evaluated. … [We] request[ed] that Public Service and Staff answer [several] questions and provide evidence

on those questions at the hearing on remand. *Id.* at ¶ 23.

180. First, the Commission asked that Public Service model the following configurations, enter the results in the record on remand, and provide estimated Project costs for the following configurations:

> Projected noise levels at the edge of ROW for the following conductor assemblies:
>
> Two-conductor, 954 MCM Cardinal, horizontal configuration, 18" spacing
>
> Two-conductor, 1033.5 MCM Curlew, horizontal configuration, 18" spacing
>
> Two-conductor, 1272 MCM Pheasant, horizontal configuration, 18" spacing
>
> Corresponding estimated Project costs for these configurations should be included with these additional projected noise study results.

Id. at ¶ 23(1).

181. The requested information was provided. *See* Remand Exhibit No. 3A at Cases 51, 53, 55, 56, 57, 61, 62, 63, 64, and 65; Remand Exhibit No. 3 at 7-10.

182. With the *double-conductor 1033.5 MCM Curlew* used on all four circuits, the ENVIRO model predicts a reduction of less than one dB(A) on the ROW western boundary and on the ROW eastern boundary when the four circuits are operated at 345kV (Case 56).[121] Because the 2005 Rebuild cannot support the weight of this type of conductor, if the Commission orders the use of this conductor, then the 2005 Rebuild would need to be rebuilt at a cost of approximately $50 million.[122] With the double-conductor Curlew used on the Project, the ENVIRO model predicts a reduction of 0.5 dB(A) on the ROW western boundary and of 0.2 dB(A) on the ROW eastern boundary when the four circuits are operated at 345kV. Use of the double-conductor Curlew in the entire Project increases the Project cost by an estimated $6-8

[121] The Project is double-conductor 954 MCM Cardinal. All comparisons, unless noted, are to the Project's projected noise levels for the Midway Substation to Daniels Park Substation 115kV parallel transmission line segment (Case 2A).

[122] The $50 million figure is the estimated cost of rebuilding the entire 2005 Rebuild to accommodate conductor heavier than the 2-954 conductor bundles now in use. It applies to *any* proposal the implementation of which would require the complete reconstruction of the 2005 Rebuild with heavier conductor bundles. This amount is in addition to the $6-8 million increase in the cost of the Project.

million. Public Service and Staff agree that this conductor has a minor effect on noise and should not be used.

183. With the *double-conductor 1272 MCM Pheasant* used on all four circuits, the ENVIRO model predicts a reduction of 2.7 dB(A) on the ROW western boundary and of 2.7 dB(A) on the ROW eastern boundary when the four circuits are operated at 345kV (Case 55). Because the 2005 Rebuild cannot support the weight of this type of conductor, if the Commission orders the use of this conductor, then the 2005 Rebuild would need to be rebuilt at a cost of approximately $50 million.[123] With the double-conductor Pheasant used on the Project and the existing 2-954 conductor bundles used on the 2005 Rebuild, the ENVIRO model predicts a reduction of 1.5 dB(A) on the ROW western boundary and of 0.7 dB(A) on the ROW eastern boundary when the four circuits are operated at 345kV (Case 61). Use of the double-conductor Pheasant in the entire Project increases the Project cost by an estimated $12-18 million.

184. In the Comanche to Midway section, with the double-conductor Pheasant used on the Eastern Circuits and leaving the Western Circuits at 2-954 conductor bundles, the ENVIRO model predicts 49.3 dB(A) on the western ROW boundary and 53.1 dB(A) on the eastern ROW boundary. Use of the double-conductor Pheasant in the Comanche to Midway Substation section only increases the Project cost by an estimated $6.5 million. Public Service and Staff disagree as to whether or not this additional cost is justified.[124]

[123] This amount is in addition to the $12-18 million increase in the cost of the Project.

[124] Public Service takes the position that the expenditure is not justified because transmission-related noise occurs only two to four percent of the year and because this would not be a cost-effective use of capital investment funds needed to build transmission projects throughout Colorado. Staff takes the position that, for the Comanche to Midway Substation section, an expenditure of an estimated additional $6.5 million is justified due to the relatively low noise levels achieved.

185. Transfer capability of a transmission line is limited by the smallest-sized conductor bundles used in the line. At present and assuming no rebuild of the 2005 Rebuild, the 2-954 conductor bundles used in the Eastern Circuits between Midway Substation and Daniels Park Substation are the limiting factor for those circuits.

186. Using double-conductor 1272 MCM Pheasant in the Project areas and not in the 2005 Rebuild area will not increase the transfer capability of the FRP because the transfer capacity of the Eastern Circuits will be limited by the existing 2-954 conductor bundles. To realize a transfer capability benefit from the double-conductor 1272 MCM Pheasant, Public Service would need to rebuild the 2005 Rebuild with the 1272 conductor.

187. Second, the Commission inquired as to the impact on transmission line-related noise if the subconductor configuration was changed from vertical to horizontal. Decision No. C06-0094-I at ¶ 23(1). EPRI investigated the effect of vertical versus horizontal subconductor configuration and concluded that there is no consistent difference in transmission line-related noise based on the subconductor orientation. Remand Exhibit No. 12 at § 10.4.9. In addition, it is Public Service's experience that the vertical configuration restricts, if not eliminates, the occurrence of line galloping, an event which may occur when the lines are icy and there is a windy condition.[125] Finally, the ENVIRO program cannot differentiate between a vertical subconductor orientation and a horizontal subconductor orientation; thus, this variable is not factored into the model's algorithms. Because the 2005 Rebuild subconductor has a vertical configuration, the 2005 Rebuild would need to be reconfigured at a cost of approximately $1.5-2 million. Because the Project has not been built, using a horizontal subconductor configuration in

[125] Line galloping can result in outages which cannot be addressed until the weather conditions which caused the line galloping cease.

the Project would have a minimal impact (estimated at less than one percent) on the cost.

188. Public Service and Staff agree that changing the subconductor configuration will have little or no effect on transmission line-related noise. Neither recommends changing the subconductor configuration.

189. Third, the Commission asked:

> Were there alternate Project conductor configurations, not listed above, and analyzed that were not included in the record? If so, what were they and what was the projected noise level performance and estimated Project costs? The Commission requests these results and corresponding Project estimates be entered into the record for any alternate conductor configurations studied for this Comanche-Daniels Park 345kV Transmission Project Application.

Decision No. C06-0094-I at ¶ 23(2). The results of the ENVIRO modeling, and associated cost estimates, were presented in the hearing on remand. *See* Remand Exhibit No. 3 (Public Service results and cost estimates); Remand Exhibit No. 3A (Public Service ENVIRO inputs and modeling results); Remand Exhibit No. 11 (Staff results).

190. Fourth, the Commission asked:

> What is the impact on noise if the transmission line is raised five feet? What analysis was performed to determine the optimal transmission line height that balanced cost and noise? The Commission requests any analysis performed relating to this issue be added to the record.

Decision No. C06-0094-I at ¶ 23(3). In response to this request, Public Service modeled Case 54, in which the assumptions of Case 1A were used[126] and the height of the conductor was raised five feet. With the conductor raised five feet and the circuits operating as described, the ENVIRO model predicts no noise reduction on the ROW western boundary and a reduction of 0.2 dB(A) on the ROW eastern boundary. Remand Exhibit No. 3A at 253-65. Because the 2005

[126] Case 1A is the base case: the Project built as proposed in the Application, the Western Circuits operated at 230kV, and the Western Circuits operated at 345kV. There is no modeling of all four circuits operated at 345kV and the lines raised five feet.

Rebuild is completed, the 2005 Rebuild would need to be rebuilt to raise the conductor five feet; this would cost approximately $25-30 million. Because the Project has not been built, raising the conductor an additional five feet would have a minimal, but not calculated impact, on the cost.

191. Public Service designs and builds its transmission lines to the minimum ground clearance prescribed by the National Electric Safety Code plus an additional five feet of clearance. The purpose of this additional five feet is to assure that the line will meet or exceed the minimum clearance requirement at all times. Public Service and Staff agree that raising the height of the conductor by five feet will have little or no effect on transmission line-related noise. Neither recommends this change.

192. Fifth, Commission wrote that,

> [w]ithin the Red Book, several other States' maximum noise levels are listed. It would be valuable to learn how other States and their Commissions are interpreting maximum allowable audible noise rules. The Commission asks Staff to introduce evidence how the Public Utility Commissions of Illinois, New Jersey, Oregon, Arizona, Ohio, Minnesota, Utah, and Georgia interpret their respective allowable audible noise rules when applied to transmission line noise.

Decision No. C06-0094-I at ¶ 23(4). In response to this request, Staff sent a questionnaire to the listed States and requested information concerning transmission line-related noise standards. The responses received are presented in Remand Exhibit No. 11 at 17-26, at Exhibit IGD-19 and following. Review of the material reveals that Arizona and Ohio have no specific standards and consider this issue on a case-by-case basis; that Georgia, Illinois, New Jersey, Ohio,[127] Oregon, and Utah do not have noise standards which apply to transmission lines; and that Minnesota has a rule which establishes a 50 dB(A) noise level (measured at the edge of the ROW) for night.

[127] The Ohio response noted that American Electric Power Company has adopted a voluntary maximum edge-of-the-ROW noise level of 55 dB(A). This company builds transmission lines at various voltages, including 345kV and higher. There is no additional information on this voluntarily-adopted level, its application, or its implementation in the record.

3. Overview of Intervenors' and Commentor's Positions.

193. No intervenor disputed the need for the Project and for the additional transfer capability and transfer capacity which it will provide. No intervenor disputed the general benefits which the Project will provide.

194. No intervenor objected to using the existing Comanche to Daniels Park Substation transmission corridor for the Project. PSCo witness Thompson testified that using the existing FRP has less impact on the public, and takes less time, than siting a new transmission corridor because land use is already established.

195. Staff, the Steenhoeks, and Ms. Glustrom object, however, to the projected noise levels within existing residential areas and urge the Commission to find those levels to be unreasonable within those areas.[128] Each supported a lower dB(A) level, and Staff and the Steenhoeks offered alternative solutions to achieve that level. In addition, Ms. Nuzum, the President of Castle Pines North Association, Inc., testified at the public comment hearing held in the proceeding. She suggested principles which the Commission ought to apply, and conditions which the Commission ought to impose, when considering a request for a finding that projected noise levels are reasonable.

[128] No one voiced an objection to those same projected noise levels within commercial, light industrial, or industrial areas.

4. Staff's Proposals.

196. Staff agrees with Public Service that the Project ought to be overhead construction.[129] Staff also agrees with Public Service that noise ought to be measured at the edge of the ROW.[130]

197. Staff objects to Public Service's request for a reasonableness finding because the projected noise levels measured at the edge of the ROW exceed the level established in § 25-12-103(1), C.R.S., for residential zones. As pertinent here, § 25-12-102(6), C.R.S., defines "residential zone" as "an area of single-family or multifamily dwellings where businesses may or may not be conducted in such dwellings. … [It] includes hospitals, nursing homes, and similar institutional facilities" and may include areas "containing .. motels and hotels and residential areas with limited office development[.]" Staff adopts this definition. Section 25-12-103(1), C.R.S., sets the noise limit for a residential zone at 55 dB(A) during the day and at 50 dB(A) during the night. Due to the nature of corona-generated transmission line noise, there is no dispute that, if Staff's recommendation is accepted, Public Service will have to build the Project to meet the 50 dB(A) standard.

198. Staff recommends the adoption of the 50 dB(A) level as a hard (*i.e.*, not to exceed) cap. Staff suggests the following implementation approach:

> the Commission should establish a temporary hard cap of 50 dB(A), which could then be verified by taking noise readings of the line in wet conditions after construction is completed and the burn-in period has elapsed. Once the noise on the line has been verified, the Commission should direct PSCo to file a report showing the test results. The Commission should then establish the permanent hard cap at 50 dB(A) or adjust the cap based on the results.

[129] In Staff's judgment, undergrounding is not a cost-effective way to mitigate noise in this case. In fact, no party supports undergrounding the Project. Due to the cost and the potential for adverse environmental impacts as detailed in the record, undergrounding the transmission line is not reasonable in this case.

[130] No party suggested that, or supported the idea that, pertinent measurements be taken anywhere other than at the edge of the ROW.

Staff's Statement of Position on Remand at 10. There is no discussion of, or elaboration on, the administrative process by which the permanent cap would be established or on what would occur in the interim.[131] In addition, there is no discussion of the impact of this implementation approach on the ability of municipalities or counties to adopt an ordinance or resolution setting noise standards for electric transmission facilities. *See* § 25-12-103(12)(b), C.R.S. Finally, there is no discussion of the impact of this implementation approach on the right of a person (an adjacent landowner, for example) to file a civil action based upon noise emitted by electric transmission facilities. *Id.*

199. It is Staff's position that one cannot build 345kV transmission lines without having a standard of some type and that the existing statutory 50 dB(A) level is the appropriate standard. In Staff's opinion, the Commission should adopt the existing statutory level "because there are residents that live adjacent to the proposed 345kV line that may be affected by the noise level" and because technically-feasible solutions to achieve that noise level are available. Hearing Exhibit No. 15 at 12:14-21. In addition, Staff suggests use of the statutory level because, when it passed that statute, the General Assembly determined that the levels stated in § 25-12-102(1), C.R.S., represent the upper limits of reasonable noise. The statute provides, according to Staff, a standard or reference which has been in effect for some time. Staff asserts that using the 50 dB(A) level in existing residential zones is a way to simplify the process because the standard already exists, is known, and already has been determined to be reasonable. Further, Staff argues that maintaining the noise level at 50 dB(A) within existing residential areas advances the purpose of § 25-12-101, C.R.S., *et seq.*; protects the public; and thus provides a

[131] For example, would Public Service be required to construct a transmission line which would meet the 50 dB(A) level? Would the 50 dB(A) level, although temporary, be the level to be enforced by civil or other action?

benefit to all citizens of Colorado. Finally, Staff acknowledges that no engineering-based reason underpins its recommendation and that it did not rely on anything other than § 25-12-102(1), C.R.S., in arriving at its 50 dB(A) recommendation.

200. Staff argues that, when the circuits between Midway Substation and Daniels Park Substation in the area with a 115kV parallel transmission line are operated at 345kV, the expected noise levels are two to three times louder than the noise levels experienced at present in that area.[132] Based on the experiences of the Steenhoeks, as related in this proceeding, Staff argues that such an increase is unacceptable and that the current level of roughly 50 dB(A)[133] should be maintained through use of the 3-954 conductor bundles.

201. To reach the 50 dB(A) level for existing residential areas,[134] one must address both the Western Circuits and the Eastern Circuits. Staff recommends that the Commission order, for residential areas only, a 50 dB(A) cap on the corona-generated noise from the transmission line. To achieve this result, Staff urges the Commission (a) to order Public Service to use 3-954 conductor bundles for the areas of new construction;[135] (b) to allow Public Service to retain the conductor bundles in the Western Circuits between Comanche and Midway Substation;[136] and (c) to allow Public Service to retain 2-954 conductor bundles in the 2005 Rebuild of the Eastern Circuits *except* for areas which pass through residential areas. For those residential areas, Staff

[132] To establish this increase, Staff relies on data which were presented in Docket No. 03A-276E but which are not in the evidentiary record of this proceeding. *See* Staff's Statement of Position on Remand at 4.

[133] The current level of noise is from the Docket No. 03A-276E data.

[134] Staff proposes to determine what residential areas exist along the entire length of the FRP using the following method: for each local siting authority, the residential areas within that authority's jurisdiction would be determined as of the date on which the siting authority issued the necessary permit. No additional residential areas would be designated after the date a permit issued.

[135] Staff witness Dominguez originally testified that any triple-conductor bundle which would reduce noise to 50 dB(A) would be satisfactory. In the hearing on remand, however, he recommended use of this particular triple-conductor bundle.

[136] In this Application, Public Service does not seek authorization to rebuild the existing 230kV circuits in this section.

advocates that the Commission order Public Service to reconstruct the new transmission lines using 3-954 conductor bundles.

202. If the Western Circuits between Midway Substation and Daniels Park Substation and the Eastern Circuits between Comanche and Midway Substation are built with 3-954 conductor bundles, Staff estimates a L_{50} Rain noise level of 47-48 dB(A).[137] There is no dispute that adopting this recommendation will increase the cost of the transmission line, and thus of the Project, by approximately $22.7 million (approximately a 28 percent increase in the $81 million cost of the transmission line-related portion of the Project).

203. If the 2005 Rebuild is reconstructed to achieve projected noise levels of 50 dB(A) within existing residential areas, Staff asserts (based on Public Service estimates) that approximately 20 percent of that area passes existing residential areas. Assuming use of 3-954 conductor bundles as Staff recommends, there is no dispute that implementing this portion of the recommendation will increase the cost of the Project by approximately $10 million.[138] Staff concedes that, without the reconstruction, its proposal does not reduce noise for the Eastern Circuits segment between Midway Substation and Daniels Park Substation with the 115kV parallel transmission line.

204. With respect to reconstruction of the 2005 Rebuild, there is an implementation issue. To reconstruct the 2005 Rebuild through residential areas, Staff recommended during the first hearing that the Commission order Public Service, as part of its normal planning and infrastructure upgrade process: (a) to rebuild the segment through existing residential areas in a practical timeframe which will allow Public Service to schedule generation when the line has

[137] No ENVIRO results were presented that model Staff's proposal. The results shown in Remand Exhibit No. 11 at Exhibits IGD-14 and IGD-15, however, tend to substantiate this estimate. No L_5 results are provided.

[138] This is in addition to the $22.7 million.

been taken out of service for the rebuild; (b) to perform this rebuild one section at a time beginning with the portion of the line that runs through Castle Pines; and (c) to complete the rebuild construction process before the date on which the line will need to be operated at 345kV to meet load requirements. Staff 2005 Statement of Position at 5-6. Staff did not expressly repudiate this position during the remand proceedings. Nonetheless, it is unclear whether this proposal is still applicable or Staff now recommends immediate reconstruction of the 2005 Rebuild.

205. Using 3-954 conductor bundles would require a change in the facilities used in the Project. For example, dead-end towers, which are heavier, have more mass, and are more visible than the structures proposed by Public Service, would be added. In addition, as compared to the Project as proposed, approximately two times the number of towers would be necessary. There would be numerous additional overhead wires. Finally, as discussed above, minimal changes to the substations would be required to accommodate triple-conductor bundles.

206. Staff argues that using triple-conductor bundles results in efficiencies, principally the reduction of line losses, which can benefit Public Service's system and reduce costs for ratepayers. There is no dispute that using three-conductor bundles may produce significant savings due to a reduction in line losses, which in turn is a benefit to Public Service's system and its ratepayers. The probable reduction in line losses is not quantified in the record. One cannot determine, therefore, the point in time (if ever) at which the cumulative savings from reduced line losses will equal or off-set the increased cost.

207. Using triple-conductor bundles may have other system benefits (*e.g.*, increase the transfer capability of a transmission line section[139] and increase transfer capacity). The transfer capability and the transfer capacity of a line are constrained by the segment which has the least capacity. If a portion of a transmission line is double-conductor and a portion is triple-conductor (as would be the case under Staff's recommendation for the Eastern Circuits), there is no increase in the transfer capacity or in the transfer capability of the line until the line is sectionalized and/or tied into another triple-conductor line.

208. Finally, in Staff's opinion, the Commission's adoption of, and Public Service's meeting, the 50 dB(A) standard would have intangible benefits for Public Service, such as increased corporate good will and the public's perception of Public Service as a good corporate citizen. In addition, according to Staff, adopting the 50 dB(A) standard for the Project would provide general, albeit intangible, benefits to all Coloradoans, irrespective of the utility from which they obtain electricity.

209. Adoption of Staff's proposed 50 dB(A) level in existing residential areas will increase the cost of the Project at least $32.7 million.[140] Staff argues that, compared to the cost of undergrounding the line and compared to the combined cost of the Comanche 3 generating unit and the Project,[141] the $32.7 million additional cost is a bargain and would be an acceptable increase in cost given the benefits.

[139] A section is the area between substations.

[140] Staff discussed other approaches or suggestions which, if adopted, would increase the cost of the Project by as much as $73.8 million. Hearing Exhibit No. 16 (exhibit prepared by Staff witness Dominguez at hearing). Staff does not recommend these other approaches.

[141] The additional $32.7 million is less than five percent of the combined estimated cost of the Project and the Comanche 3 generating unit.

210. Staff performed no analysis of the number of residences or persons who may be impacted by noise from the Project's transmission line. Staff provided no estimate of the cost per person or residence of its proposal.

211. Public Service opposes Staff's recommendation that the Commission adopt the 50 dB(A) noise standard in residential areas.

212. While conceding that the Staff proposal is technically feasible, Public Service argues that the estimated increase in the Project cost is not warranted to achieve a minimal noise reduction,[142] particularly when one considers that the noise is present less than five percent of the time according to Public Service's estimates. Public Service notes that the 50 dB(A) standard proposed by Staff is more stringent than the § 25-12-103(1), C.R.S., standard because Staff would measure the noise level at the edge of the ROW while the statute measures the noise level 25' from the edge of the ROW.

213. In addition, Public Service states that, once a transmission corridor is established, any development (residential or otherwise) is undertaken with the knowledge and understanding that the line may need to be upgraded; that the affected local governments apparently believe that the uses are compatible because they have approved residential developments abutting the corridor's ROW, and decided not to participate in this proceeding; and that each person has the option not to purchase along a transmission corridor's ROW if that person believes that the line's noise level is unacceptable.

[142] Based on the ENVIRO results, for the Comanche to Daniels Park Substation section when the Western Circuits are operated at 230kV and the Western Circuits are operated at 345kV, the L_5 Rain reduction would be approximately 3.6 dB(A) and the L_{50} Rain reduction would be approximately 3.6 dB(A) on the ROW western boundary (-230') and the L_5 Rain reduction would be approximately 19.1 dB(A) and the L_{50} Rain reduction would be approximately 9.1 dB(A) on the ROW eastern boundary (150'). For the Midway Substation to Daniels Park Substation with 115kV parallel transmission line segment when the Western Circuits and the Western Circuits are operated at 345kV, Public Service estimates the noise reduction would be two to three dB(A) at the edge of the ROW. Because this case was not modeled, there are no ENVIRO results which support this estimate.

214. Finally, while Public Service opposes adoption of any 50 dB(A) level, it also argues that adopting that limit for *existing* residential areas and not for all residential areas (both those now existing and those constructed in the future) may be preferential treatment and raises equity concerns.

215. CF&I and CMC support Public Service[143] and oppose Staff's proposed 50 dB(A) hard cap. *See generally* Post-Hearing Statement of Position of CF&I Steel, LP and Climax Molybdenum Company. Principally, they argue that there would be a significant -- and, in their view, unnecessary -- increase in the cost of the Project; that no case studied in this proceeding produced ENVIRO results which would meet the 50 dB(A) standard; and that it is unreasonable to require the use of 3-954 conductor bundles as advocated by Staff because that would produce excess transmission capacity for which Public Service ratepayers might pay in their rates. CF&I and CMC urge the Commission to reject the proposed 50 dB(A) hard cap and to find reasonable the projected noise levels. To do otherwise would be, in their opinion, an unreasonable exercise of the Commission's discretion under § 25-12-103(12), C.R.S.

5. Steenhoeks' Proposals.

216. Mr. and Ms. Steenhoek are homeowners in a subdivision in Castle Pines, Colorado and are ratepayers of Intermountain Rural Electric Association, which is a wholesale customer of Public Service. Their property abuts the eastern edge of the 2005 Rebuild. In this area, their home is the residence closest to the ROW on either the western edge or the eastern edge. When they moved into their home in 2002, the transmission corridor was already there;

[143] CF&I and CMC describe Public Service's requested reasonableness finding with respect to noise as a request that "the Commission establish a range of reasonableness for noise levels at the edge of the right-of-way for the transmission corridor[.]" Post-Hearing Statement of Position of CF&I Steel, LP and Climax Molybdenum Company on Remand at 2.

and the transmission line was operating at 230kV.

217. The Steenhoeks do not oppose construction of the Western Circuits as 345kV-capable transmission so long as the line is operated at 230kV. The Steenhoeks oppose Public Service's request that the Commission make a reasonableness finding in this proceeding. If the Commission decides to make a reasonableness finding, however, then the Steenhoeks support the Staff-recommended 50 dB(A) level.

218. First, the Steenhoeks contend that the Project is detrimental to the area because it will decrease property values. They did not provide data concerning, or attempt to quantify, the asserted diminution of property values due to the Project. Second, the Steenhoeks contend that the Project will affect adversely their ability to enjoy their property by impairing the aesthetics of the area, both visually[144] and through an increase in noise. The primary focus of the Steenhoeks' opposition was the projected increase in noise.[145]

219. At present, Public Service operates the transmission line at 230kV. When the line is operated at that voltage level, the Steenhoeks experience line buzzing on days which are overcast and foggy.[146] In their experience, a 15-minute rain can result in line noise that lasts for hours; a significant snow can result in line noise that lasts for days due to melting; and the transmission line generates substantial noise when there is moisture in the air, whether or not the

[144] The Steenhoeks testified that the Project would have an adverse impact on the panoramic mountain views they enjoy from their residence; they did not quantify or estimate that impact. They also testified that they do not oppose Public Service's use of metal poles in the Project. Finally, they do not oppose Staff's proposals (*i.e.*, use of 3-954 conductor bundles) even though implementation would result in more poles or more wires (or both).

[145] The Steenhoeks also discussed their dissatisfaction with the 2005 Rebuild construction and its aftermath. From testimony at the original hearing, it appears that Public Service and the Steenhoeks are working toward resolution of those issues.

[146] The Steenhoeks provided specific examples of the adverse impact which transmission line noise, estimated to be 50 dB(A), has on their daily lives. *See, e.g.*, Remand Exhibit No. 10 at 4:20-6:9; April 5 tr. at 69-71, 72-73.

line is saturated. Mr. Steenhoek believes that Public Service's weather data under-report the number of days in the area in which he lives on which there is likely to be noise because: (a) the data report the number of days on which there was precipitation but do not report number of days following the precipitation during which the line generates noise; and (b) there is more moisture and precipitation in his geographical area than in the geographical areas reported in the weather data. Mr. Steenhoek did not provide data concerning, or an estimation of, the degree to which Public Service's weather data under-reported noise, moisture, or precipitation in his area.

220. To assist the Commission in making its decision in this matter with respect to the reasonableness of the various projected noise levels, the Steenhoeks recommend that the Commission retain the services of an audiologist because, given the projected level of noise, there is the possibility of long-term adverse effects on hearing and of psychological damage. In this proceeding, no party presented the testimony of an audiologist. The Steenhoeks did not provide any details of how the Commission would implement this recommendation.

221. The Steenhoeks are apprehensive that a Commission reasonableness finding with regard to the projected noise level will deprive them of the ability to make a legal challenge, pursuant to § 25-12-101, C.R.S., *et seq.*, to the actual noise levels experienced when the line is operated at 345kV. They are aware that the General Assembly enacted § 25-12-103(12), C.R.S., regarding noise from transmission lines but request that the Commission refrain from making a reasonableness finding. In essence, they ask the Commission to exercise its discretion; to elect not to make the requested finding; and to leave the issue for resolution by the courts.

222. If the Commission elects to make a finding of reasonableness, however, the Steenhoeks support Staff's recommended 50 dB(A) hard (that is, not to exceed) cap. While not

ideal, the Steenhoeks state that the 50 dB(A) noise level is close to that which they now experience.

223. The Steenhoeks are of the opinion that, because Public Service was aware that the Eastern Circuits eventually would be operated at 345kV and was aware of that fact when the line was upgraded in 2005, Public Service should have constructed the 2005 Rebuild (the segment which directly affects them) in a manner which would produce the least noise when the Eastern Circuits were operated at 345kV. The Steenhoeks assert that it is inappropriate for Public Service to argue in this proceeding that reduction of the expected noise level to 50 dB(A) will be too expensive because: Public Service had exclusive control over the design of the 2005 Rebuild; Public Service was aware of the noise issue at the time of the 2005 Rebuild; Public Service could have, and should have, addressed the noise issue at the time of the 2005 Rebuild; and Public Service can spread the incremental cost over its large ratepayer base.

224. Public Service opposes the recommendations made by the Steenhoeks. For the reasons discussed above, Public Service urges the Commission to make a reasonableness finding in this proceeding and urges the Commission to reject the 50 dB(A) hard cap.

225. In addition, PSCo witness Earley presented two studies,[147] the results of which show that there is no apparent diminution in residential property value if the property is located in close proximity to a transmission line operated at 345kV and that a property's proximity to

[147] PSCo witness Earley performed two studies: (a) a Rate of Change Analysis (compares property value appreciation rates using properties which were sold and resold in the period 1992 through 2005, with the resale occurring in the period 2000 through 2005) which used properties in the Castle Pines area along the Project corridor and in the Steamboat Springs area along a transmission line operated at 345kV; and (b) a Paired Sales Analysis (compares the value of properties which are as similar as possible but which are distinguishable principally by their proximity to the transmission line being studied) which used properties in the Steamboat Springs area along a transmission line operated at 345kV. Hearing Exhibit No. 8.

transmission lines does not appear to have a material impact (positive or negative) on that property's resale value. The studies' results were unrebutted.

226. Finally, Public Service opposes the suggestion that the Midway Substation to Daniels Park Substation segment of the Eastern Circuits be constructed as 345kV-capable but be operated only at 230kV. The record evidence shows that, assuming the Western Circuits are operated at 345kV and the Eastern Circuits are operated at 230kV (as the Steenhoeks propose) and irrespective of the type of conductor used, there will be four cross-overs[148] whereas if the Project is operated as proposed by Public Service (*i.e.*, Western Circuits initially at 230kV and Eastern Circuits at 345kV), there will be one cross-over. Hearing Exhibit No. 4 at Exhibit AS-4B and Exhibit AS-4D. To the extent possible, Public Service avoids cross-overs when it constructs transmission because each cross-over increases safety and reliability concerns.

6. Ms. Glustrom's Proposal.

227. Ms. Glustrom urges the Commission to reject both Public Service's projected noise levels and Staff's proposed 50 dB(A) level as unreasonable. She agrees with Staff that there should be a hard cap for transmission lines but recommends that the Commission adopt as reasonable a 40 dB(A) (or below) noise level, measured using a L_1 exceedance level.[149]

228. Ms. Glustrom supports her recommendation by pointing to the Steenhoeks' experiences with the existing transmission line noise, which they find to be extremely annoying; by citing to the Red Book's discussion of taking into account, when evaluating the degree of annoyance of transmission noise, the high-frequency energy in transmission line noise and

[148] A cross-over occurs when one circuit crosses over the top of another circuit when the circuits enter a substation.

[149] A L_1 exceedance level means that the 40 dB(A) level would be met 99 percent of the time.

consideration of having a 10 dB(A) penalty for noise which occurs at night. Ms. Glustrom argues that Oregon uses an L_1 exceedance level[150] and that the Commission should adopt a similarly-strict standard for transmission noise because, "[w]ithout a stringent exceedance level, it will be difficult to enforce a reasonable noise level for transmission lines." Post Hearing Statement Submitted by Leslie Glustrom at 16. In light of "the continuous, annoying and nighttime operation of transmission lines[,]" Ms. Glustrom recommends that the Commission set the noise level "substantially below 50 dB." *Id.* While she recommends a 40 dB(A) (or below) level,[151] Ms. Glustrom does not specify an exact decibel level which the Commission should adopt.

229. In her opinion, § 25-12-103(12), C.R.S., does not specify, and therefore does not allow the Commission to do, a balancing of the cost necessary to reduce the noise level when the Commission determines the reasonableness of transmission line noise. She argues that, had the General Assembly intended cost to be considered, it would have listed cost as a factor in § 25-12-103(12), C.R.S., but it did not do so. Thus, according to Ms. Glustrom, the factors which the Commission may consider are: the "concerns raised by participants in the commission proceeding and the alternative available to a utility to meet the need for electric transmission facilities." Section 25-12-103(12), C.R.S. It is Ms. Glustrom's position that the Commission may consider only these factors when determining whether a given noise level is reasonable.

[150] The referenced standard applies to private property. Remand Exhibit No. 3 at Exhibit AS-8 at 62 (Table 6.3.2). There is no information which explains how this standard was derived, what "private property" means in this context, or whether this standard applies to transmission lines (and, if it does, under what circumstances).

[151] Ms. Glustrom does not identify any case presented in this docket in which the ENVIRO results for predicted noise levels are 40 dB(A) or less. There are no ENVIRO results presented in this proceeding which are in that range. Consequently, there is no evidence of what it would cost to meet the 40 dB(A) or less standard.

230. In the event that the Commission does consider cost, however, Ms. Glustrom argues that the incremental cost of reducing noise to her recommended level is small when expressed as their impact on rates. Ms. Glustrom points out the impact on rates would be ameliorated by amortizing the investment over the life of the transmission line.

231. Finally, Ms. Glustrom argues that the Commission should neither grant a CPCN for the Project nor make any of the requested findings until Public Service has secured the necessary air quality permit and has secured a source of funding for building the Comanche 3 generating unit.

7. Ms. Nuzum's Proposals.

232. Ms. Nuzum, President of the Castle Pines North Association, Inc., testified at the public hearing held in Castle Rock, Colorado. As this is the first proceeding under the newly-enacted § 25-12-103(12), C.R.S., Ms. Nuzum suggested that the Commission take the opportunity to establish principles to be applied under that section. She offered principles which she urged the Commission to adopt and actions which she urged the Commission to take, both with respect to the Project at issue and with respect to all future transmission projects. She suggested the following: (a) order Public Service to take actual noise readings when the Project is in service at 345kV; (b) order Public Service to conduct on-going monitoring of noise when the Project is in service at 345kV and to report the results to the public; (c) order all new transmission corridor ROW to be sized so that the 50 dB(A) level cannot be exceeded outside the corridor; (d) order electric utilities to use prudent avoidance techniques in the construction of transmission; (e) order electric utilities to notify local governments about projected transmission noise levels and to advise those governments that there should be a limitation on residential development near transmission corridors; and (f) order electric utilities to determine the zone

within which the noise level might exceed 50 dB(A) and require that utility to acquire noise easements within that zone.[152]

233. Public Service responded to Ms. Nuzum's suggestions. As to the monitoring, the ENVIRO model used in this proceeding is based on field measurements taken under various conditions. Public Service opined that there is little reason to believe that the Project's actual noise levels will differ materially from the projected levels. In addition, PSCo witness Schaller testified that noise readings are expensive propositions; that the data gathering and analysis would require the services of an acoustical engineer; that the readings would be difficult to obtain because they must be taken during precipitation events; that there would be little value in taking numerous on-going readings because the noise will not be materially different after the end of the burn-in period; and that a comprehensive study to validate the BPA/EPRI model results for Public Service's system would cost approximately $100,000.

234. As noted above, Public Service has conducted no field readings to determine whether actual noise levels produced by a Public Service transmission line are consistent with the BPA/EPRI modeled levels projected for the Project. PSCo witness Schaller testified that Public Service's actual results may vary from the projected results and stated that Public Service is not opposed to all verification testing provided the testing is done wisely.

[152] Only a portion of these suggestions apply to this proceeding while a number would require the Commission's to impose requirements on all electric utilities seeking to build high-voltage transmission. To the extent that the suggestions seek to have the Commission impose requirements or restrictions on utilities other than Public Service and on transmission projects other than the Project now before the Commission, the suggestions are arguably requests for rulemaking and raise issues which are addressed more properly in a substantive rulemaking proceeding. For this reason, except as pertinent to the Project, the Commission does not discuss the following: sizing of new transmission corridor ROW, using prudent avoidance techniques in the construction of transmission, notifying local governments about projected noise levels and advising those governments that there should be a limitation on residential development near transmission corridors, and requiring a utility to determine the zone within which the noise level might exceed 50 dB(A) and requiring that utility to acquire noise easements within that zone.

8. Discussion.

a. Determine Reasonableness of Projected Noise Levels.

235. Section 25-12-103(12)(a), C.R.S., gives the Commission discretion with respect to determination of the reasonableness of noise. Thus, we may elect to make or not to make a reasonableness determination. In this case, we believe the record allows us to make a reasonableness finding with respect to noise. We do not however, adopt the reasonableness standard sought by Public Service.

236. One party objected to the Commission's making the requested finding in this proceeding. Public Service has done projected noise analyses using the industry standard model for those analyses. Asserting that certainty is necessary given the magnitude of the Project, Public Service and Tri-State urged us to make the noise determination early in the process and before construction begins, thus giving Public Service assurance and noise-related guidelines with respect to the Project's proposed construction and operation. Making the determination now will serve these purposes and is appropriate.

237. Absent a Commission determination of reasonableness, a court may determine that the limits established in § 25-12-103(1), C.R.S., apply to the Project. This eventuality could be detrimental to Public Service and appears to run counter to the General Assembly's intent when it enacted § 25-12-103(12), C.R.S.

238. The Western Circuits between Midway Substation and Daniels Park Substation will be built as 345kV-capable but will be operated at 230kV initially. One could choose to defer a Commission finding of reasonableness with respect to this segment until Public Service seeks authority to operate the segment at 345kV, but that should not be done in this case. There appears to be little purpose in deferring a decision as the record here is sufficient to make the

determination now. In addition, as a practical matter, once the line is constructed as 345kV-capable, Public Service is in a strong position vis-à-vis obtaining Commission authorization to operate the line at 345kV because monies will have been expended to make the line 345kV and failure to give the requested authorization could result in stranded investment. The time to make a decision about the reasonableness of noise is now, before the line is built. This allows us to make a determination which is not affected or influenced by the fact that Public Service has already spent money to build the transmission as 345kV-capable. We should make a reasonableness determination with respect to the projected noise levels to provide certainty and to assist all concerned.

b. Factors to be Considered.

239. Based on the parties' agreement and the record, and taking into account the purpose of § 25-12-103(12), C.R.S., we find that the following are reasonable and appropriate considerations in determining whether the predicted noise levels for 345kV transmission lines, the type of lines at issue in this proceeding, are reasonable:

(a) level of noise in the overall context of the Project (*e.g.*, its purpose, the need to be addressed, general benefits of Project);

(b) characteristics of projected noise levels (*e.g.*, the likely highest projected noise level, when and under what circumstances that noise level is likely to occur, the likely frequency of that noise level, the likely duration of that noise level);

(c) information about the model used to determine projected noise levels (*e.g.*, its appropriateness and efficacy with respect to making such projections);

(d) transmission as a linear asset, one which may or may not operate at the same dB(A) level dependent upon neighboring land uses;

(e) description of, and information about, construction techniques and practices to be used (*e.g.*, whether they are best utility practices to reduce noise and to meet the National Electric Safety Code);

(f) whether transmission line is sited properly within ROW to reduce noise and to meet the National Electric Safety Code;

(g) information about areas through which the line passes (*e.g.*, uses of adjacent properties, ambient noise in adjacent areas, pertinent weather data);

(h) whether placing transmission within an existing transmission corridor maximizes use of that corridor over a specific period of time;

(i) whether projected noise levels are reasonable compared to benefits and costs of alternative line design(s) which would reduce projected noise levels to responsible level(s) thereby preventing future litigation with respect to transmission line noise;

(j) information about maintenance and other activities required to assure that the line, over the life of the transmission asset, will stay within the noise levels the Commission has found to be reasonable (*e.g.*, both for the utility-proposed construction and for an alternative construction proposed, this includes: frequency of maintenance, complexity of maintenance, utility's familiarity with configuration used to mitigate noise); and

(k) considerations required by § 25-12-103(12), C.R.S. (*i.e.*, "concerns raised by participants in the commission proceeding," alternatives available to meet need for transmission facilities, and public input).

240. This is both a preliminary list and an overview. It simply states the factors we believe should be considered and is intended to begin the process by which the Commission develops, on a case-by-case basis, the factors it will consider when asked to make a reasonableness finding pursuant to § 25-12-103(12), C.R.S. The list of factors does not apply in, and is not intended to apply in, any proceeding other than the one at bar. In addition, the list was developed in this proceeding and, to the extent an evidentiary record exists as to any factor, can be applied in this proceeding. Finally, because evidence was not provided on each consideration, not all listed considerations apply in this case.

c. Discussion of Staff's Proposals.

241. Staff has the burden of proof to establish that its proposed 50 dB(A) level in the existing residential neighborhood should be adopted.[153] Staff has failed to meet that burden.

[153] Because Staff seeks a Commission order requiring Public Service to achieve a specific noise level, Staff bears the burden of proving by a preponderance of the evidence that its proposed noise level should be adopted.

Staff's recommended noise level of 50 dB(A) in residential areas -- whether existing or built in the future -- along the transmission corridor will not be adopted.

242. First, the sole basis for Staff's recommendation is the 50 dB(A) level established for residential areas in § 25-12-103(1), C.R.S. Staff argues that the General Assembly has found that level to be reasonable and in the public interest for residential areas; thus, it should be adopted here. This argument overlooks the subsequent addition of § 25-12-103(12), C.R.S., one purpose of which is to eliminate "considerable uncertainty as to the application of article 12 of title 25, [C.R.S.] … to electric transmission facilities[.]" Hearing Exhibit No. 10 at Attachment A at 1 (House Bill No. 04-1348, § 1 [legislative declaration]). The language of § 25-12-103(12), C.R.S., makes it clear that the levels established in § 25-12-103(1), C.R.S., do not apply, *ipso facto*, to transmission lines. Accordingly, Staff's argument based on § 25-12-103(1), C.R.S., is unpersuasive and unavailing. Staff offers no other support for its choice of the 50 dB(A) level.

243. Second, it is undisputed that adopting Staff's proposal: (a) will increase the Project's cost significantly without an appreciable reduction in dB(A) levels; (b) may have an impact on neighboring systems' reliability; (c) will not increase the capacity of the transmission line and likely will result in wasted transmission capacity; (d) will result in rebuilding the recently-completed 2005 Rebuild (*i.e.*, Eastern Circuits between Midway Substation and Daniels Park Substation) for no purpose other than reduction in corona-generated noise; and (e) will have more visual impact (due to the heavier structures and more wires) than the Project as proposed. None of these results is desirable or in the public interest.

244. Third, assuming the Commission allows the Project costs to be placed in Public Service's rate base, Public Service's electric ratepayers and transmission customers will pay for the Project in their rates. The majority (and perhaps all) of those who reside in the 18 existing

residential areas near the Project are not Public Service ratepayers; yet, these are the persons who would experience a reduced noise level if the Commission were to adopt Staff's proposal.[154]

245. Fourth, there is no evidence that the proposed 50 dB(A) level is needed. There is no evidence that the Commission has received complaints about transmission line noise from individuals who live near transmission lines which are operated at 345kV at present. There is no evidence that any of the local jurisdictions in which the Project's transmission line is sited objects to the projected noise levels -- or desires a lower noise level, let alone the Staff-proposed 50 dB(A) level -- although each jurisdiction was informed of the projected levels. Aside from the parties in this proceeding and some of the participants at the public hearing held in this matter, residents along the Project's transmission corridor did not contact the Commission to object to the projected noise levels.

246. Based on Remand Exhibit No. 7, it appears that there is no time to conduct necessary powerflow studies and to do the redesign necessary to meet a 50 dB(A) standard and still meet the necessary transmission line in-service date.

247. For the foregoing reasons, the Staff-proposed noise level will not be adopted.

d. Discussion of Steenhoeks' Proposals.

248. The Steenhoeks have the burden of persuasion on their recommendation that the Commission not make a reasonableness finding in this proceeding and have the burden of proof to establish that the proposed 50 dB(A) level in the existing residential neighborhood should be

[154] It is of note that these persons are customers of Intermountain REA, a transmission customer of Public Service, so costs of these corridor improvements would most likely be passed to these persons benefiting from the noise reductions. The record contains no information concerning the other beneficiaries.

adopted and that the Eastern Circuits should be operated at 230kV.[155] The Steenhoeks have failed to meet their burden. The Steenhoeks' proposals will not be adopted.

249. As discussed above, it is appropriate for the Commission to make a reasonableness finding in this proceeding. In addition, for the reasons discussed above, the 50 dB(A) level is not appropriate for, and will not be adopted for, this transmission corridor. The 50dB(A) level set forth in statute is for residential areas at night.

250. The record evidence establishes that the Project must be operated as proposed by Public Service in order to allow full use of the transfer capability of the transmission line. The Eastern Circuits are intended to provide the capacity necessary to carry the Comanche 3 generating unit's electricity (as well as that of other generating units) to the Metro Denver load center. Due to the nature of transmission, as discussed above, operating any portion of those circuits at 230kV will not accomplish that end and will nullify the principal reason for building the line. In addition, due to the increased number of cross-overs, there is an increased risk to safety and system reliability if the Eastern Circuits are operated at 230kV. There is no counter-balancing reason for this level of operation which justifies the increased risk.

251. For the foregoing reasons, the Steenhoeks' proposals will not be adopted.

e. Discussion of Glustrom's Proposals.

252. Ms. Glustrom has the burden of persuasion on her recommendation that the Commission not make a reasonableness finding in this proceeding and has the burden of proof to establish that a L_1 design value of 40 dB(A) level in the existing residential neighborhood should

[155] Because the Steenhoeks seek a Commission order requiring Public Service to achieve a specific noise level and to operate the transmission line in a specific way, the Steenhoeks bear the burden of proving by a preponderance of the evidence that their proposals should be adopted.

be adopted and that the Eastern Circuits should be operated at 230kV. Miss Glustrom has failed to meet her burden.

253. There is no statutory requirement that power lines be operated at such levels. In addition, Ms. Glustrom's proposal ignores the Legislature's determination of what levels are reasonable for residential areas and its intent that the Commission set reasonableness levels for transmission lines. The Glustrom proposal will not be adopted.

f. Discussion of Nuzum's Proposals.

254. Public Service will be ordered to test the Project when it is operated at 345kV to verify the ability of the ENVIRO model to predict actual noise levels emitted from the Project. Public Service will be ordered to make public the results of the verification testing. Knowing the Project's actual noise levels and publicizing those data will provide information for local jurisdictions and for homeowners and prospective home buyers. There is value in reassuring local governments and present and future individuals who live near the transmission corridor that the line's noise levels will be as projected (or nearly so). In addition, the record is clear that Public Service intends to build and operate other transmission lines at 345kV. Having Public Service-specific data about the ability (or inability) of the ENVIRO model to predict actual noise levels on Public Service's system will assist the Commission, Public Service, and other parties in future transmission project noise-related proceedings. Finally, the evidence provides no basis to believe that noise levels will vary materially after the burn-in period. Therefore, testing will be ordered to be done at six months and at one year after the Project is operated at 345kV under wet conditions.[156]

[156] These two tests will assure that the burn-in period is concluded.

255. The issue of prudent avoidance techniques is discussed elsewhere in this Decision.

256. Lastly, for the reasons already discussed, the proposed 50 dB(A) level is not adopted. Accordingly, Ms. Nuzum's principles based on a 50 dB(A) level will not be adopted.

g. Discussion of Public Service's Projected Noise Levels.

257. This is the first case brought before us in which a utility requests a finding pursuant to § 25-12-103(2), C.R.S. The reasonableness of the projected noise from the Project when operated at 345kV was the only contested issue in this proceeding.

258. This statute has these purposes: (a) clarify that § 25-12-103(1), C.R.S.,[157] does not apply to transmission facilities; (b) give the Commission the discretion to make (or not to make) determinations about the reasonableness of projected noise levels emanating from transmission lines; (c) inform local jurisdictions if a utility files an application seeking a CPCN for a transmission line, thus providing them with the opportunity to seek to participate in the Commission's proceeding if they wish to do so; (d) restrict the ability of a local government to enact an ordinance or resolution which has a noise limit which is stricter than the noise level which the Commission found to be reasonable; and (e) protect the transmission line's owner or

[157] Section 25-12-103(1), C.R.S., provides that:

> [e]very activity to which this article applies shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance[.]

The section then sets out the upper bounds for noise levels in residential, commercial, light industrial, and industrial zones for two time periods: between 7:00 a.m. to the next 7:00 p.m. (day) and between 7:00 p.m. and the next 7:00 a.m. (night). Each zone is defined. For each zone, the upper noise limit for the night is five dB(A) less than the limit for the day.

operator from civil liability so long as the line emits noise at or below the level which the Commission found to be reasonable.

259. Public Service mailed the Application and its direct testimonies to the municipalities and counties in which the Project will be located. None elected to intervene, or sought permission to intervene, in this proceeding. Based on the failure to participate, it appears that none of the local jurisdictions had a concern about the projected level of noise from the Project.

260. Public Service asks the Commission to find that the projected noise levels from the Project are reasonable when the transmission is operated at 345kV and the line is wet or has droplets on it. This request involves these questions: First, should the Commission make the determination? Second, if it should make the determination, should the Commission make a general finding or establish a specific dB(A) level? Third, if it should establish a specific level, what is that level?

261. As to the first question, the Commission will partially grant Public Service's request and make a conditional determination of reasonableness.

262. The record supports the need for the Project. In addition, the characteristics of the noise are such that this level of noise is likely to occur relatively infrequently over the course of a year. We do agree that Public Service's model is based on days of precipitation and thus does not account for days where precipitation accumulations or fog create noise. Public Service's model thus most likely understates the number of days during which there is line noise. Also, the ENVIRO model used is the industry standard for projecting noise levels in 345kV transmission lines; it is appropriate to use and to rely on that model and its results. Further, there is no dispute about the construction techniques and practices which Public Service proposes to use; about the

placement of the line within the ROW; or about the fact that using the existing corridor maximizes use of that corridor. Moreover, a higher noise level is reasonable compared to the benefits and costs of alternative line designs which would reduce the projected noise level to 50 dB(A). Finally, in arriving at this determination, the § 25-12-103(12), C.R.S., factors were taken into account: the concerns raised by the participants were considered; public input was considered; the absence of alternatives available to meet the need for the Project's transmission capacity was considered; and the absence of local jurisdiction objection to the projected noise level was considered.

263. In general, the level of transmission-related noise is affected by numerous factors. Some of those factors are: ground cover; intervening fences and trees; presence of transmission poles, adjacent buildings, or hard surfaces (*e.g.*, roads) which reflect sound; width of the ROW; conductors used; phase-basing; location of the line within the ROW; property uses adjacent to the ROW; air density (corona increases with an increase in elevation); surface condition of the conductor; height of the conductor above the ground; and conductor bundle geometry. Given the number of variables which affect noise levels, each transmission corridor (including the transmission lines within that corridor) must be reviewed and studied individually based on, and to take into consideration, the corridor's individual characteristics. The nature of transmission requires that the Commission examine and determine, on a case-by-case basis, both the projected

noise expected from a transmission line and the reasonableness of that projected noise.[158]

264. Public Service requests a finding of reasonableness for the projected noise levels when the Project is operated at 345kV, although this will occur at some time in the future.[159] Public Service asserts that, in making its reasonableness finding, the Commission should strike a balance between aesthetics, structural capacity of the line, electric requirements to be met, and prudent avoidance techniques to be employed.

265. The reasonableness of the projected noise levels should be determined taking into account the conditions and assumptions under which noise most likely will be the loudest because it is that highest level of noise which Public Service asks the Commission to find reasonable. Therefore, as used in this Decision and unless the context indicates otherwise, "noise" means projected levels of audible corona-generated sound, measured as L_{50} dB(A), which originate from the Project when it is operated at 345kV and when the line is damp or has droplets on it.[160]

266. Having determined that a conditional reasonableness determination should be made, the Commission turns to the second question.

[158] During the hearing, some parties expressed concern that a Commission finding in this proceeding that a specific dB(A) level of projected noise is reasonable might be used in the future as a touchstone for reasonableness. The fact that each transmission line is *sui generis* and the recognized principle of administrative law that a Commission decision in an adjudicative proceeding has no precedential effect, taken together, provide a complete answer to this concern: no touchstone or presumption is created by the decision in this docket. In this proceeding the Commission begins the process of considering the factors it deems appropriate to examine when it chooses to exercise the discretion given it by § 25-12-103(12), C.R.S. In this proceeding the Commission does not establish a level of projected noise which is presumed to be reasonable either for all 345kV transmission lines in Colorado or for 345kV transmission lines owned or operated by Public Service in Colorado. Generally speaking, the proceeding in which to establish such a presumption is substantive rulemaking, which this docket is not.

[159] Public Service modeled the operation at 345kV scenario as Case 2A.

[160] Although Public Service's study presented projected noise levels for other operating conditions, this Decision does not discuss them.

267. In considering this issue, we also considered the following issues which the Commission identified:

> Whether the Commission should issue a 'not to exceed' hard cap noise level as being unreasonable or, instead, find Public Service's projected noise level range to be reasonable [and,] based on a cost-benefit analysis, whether a [different] configuration of the proposed transmission line that reduces noise is justified.

Decision No. C06-0094-I at ¶ 24.

268. There is no need for a temporal factor because that is included in the L-level selected, which is based on one hour of testing. It would be administratively difficult to enforce or to implement a reasonableness standard if a temporal component (*e.g.*, once or twice within 24-hour period) exists because at the least a party would need to do the following: (a) establish beginning and ending of each relevant period; (b) establish whether duration of violation should be considered; and, (c) if duration should be considered, establish what is acceptable and what is unacceptable duration. It is industry practice and more appropriate to continue using the established L_{50} measure, as described in the EPRI red book, which is defined and understood and which will be met (or not) when measured.

269. The Commission believes that the competing interests of construction costs and reasonable noise emissions need to be fairly and accurately evaluated. As indicated by the record, a slight change in dB(A) can result in significant audible noise changes, so attempts should be made to limit the peak values. The Commission needs to be sure that reasonable steps have been taken in the design and construction techniques to minimize the noise level while balancing total project costs. For this reason, the Commission ordered the hearing on remand so that additional evidence could be taken to ensure that all reasonably appropriate alternate design options have been evaluated.

270. The Commission finds that it should establish a reasonableness standard based upon a specific L_{50} dB(A) level and that that level should be 55dB(A). This approach implements all aspects of § 25-12-103(12), C.R.S., because it affords Public Service the protections of that statute while preserving, as circumscribed by § 25-12-103(12)(b), C.R.S., both the ability of local jurisdictions to enact ordinances and resolutions setting noise standards for transmission facilities and the ability of affected persons to pursue legal remedies if the transmission line's noise exceeds the L_{50} level which the Commission has found to be reasonable. Absent a finding that a specific noise level is reasonable, the § 25-12-103(12)(b), C.R.S., protections would be difficult to enforce at best and be meaningless at worst. Both the public interest and PSCo are better served by establishing a specific noise level. As the Colorado Supreme Court has observed, "[i]n the exercise of … any … power granted to [the Commission], the interest of the public should always be given first and paramount consideration." *Public Service*, 142 Colo. at 147, 350 P.2d at 549.

271. In the northern section of this corridor, another rebuild of the 2005 Rebuild is the only way to meet the 55dB(A) noise level unless reverse-phasing is eliminated. This Commission wishes only to establish parameters that must be met in the public's interest; it does not wish to dictate specific solutions since this is the appropriate role for PSCo.

272. The Commission now turns to the third and final question. In considering this issue, we also considered the following issue which the Commission identified: " If a hard cap is recommended, whether a temporal factor should be added, *e.g.*, not to exceed X dB(A) for more than Y minutes/hours per day/week/month/year [.]" Decision No. C06-0094-I at ¶ 24.

273. The Commission makes two conditional reasonableness findings, and leaves to Public Service's discretion whether to receive the protection against civil liability offered by

statute. We find that the 55 dB(A) noise level, stated as L_{50} dB(A), and measured at the edge of the ROW, is reasonable for the Comanche to Midway Substation section of the corridor (both the Eastern Circuits and the Western Circuits), as long as Public Service engineers the line to meet that standard. The Commission similarly makes a conditional finding with respect to the Midway to Daniels Park portion of the line. Public Service has the option of discontinuing reverse phasing for this portion in order to meet the noise level standard. In addition, the Commission finds that this is the maximum reasonable noise level as calculated using BPA/ENVIRO software. We emphasize that Public Service may decline to meet these standards. In that case the Commission would make no finding of reasonableness with respect to any levels of noise generated by the Project.

274. In determining that this 55 dB(A) noise level is reasonable, we weighed and balanced the factors discussed above in light of the record evidence. In addition, the Commission took into account that it may select any point for taking a noise measurement because the Commission is not bound by the provisions of § 25-12-103(1), C.R.S.[161] Further, measuring noise at the edge of the ROW allows for some diminution of noise between the point of measurement and a building (such as a residence) located near the ROW. For these reasons, the Commission finds that the 55dB(A) noise level, stated as L_{50} dB(A), measured at the edge of the ROW, is reasonable.

275. We note that, as modeled, use of 1272 Pheasant conductor will allow Public Service to attain the required noise levels for the Comanche to Midway substation section, albeit at a cost above the total as proposed by the Company. We believe that this balance is appropriate

[161] *See* § 25-12-103(12)(a), C.R.S. (Commission may make transmission noise determinations "[n]otwithstanding subsection (1)").

given that there is likely to be additional development along the corridor in the future. As determined by the General Assembly in § 25-12-103(1), C.R.S., 55 dB(A) is appropriate for a residential area during the day, and a commercial area at night.[162] We emphasize that we believe the estimated costs for this option are reasonable. We also find that, Public Service can reach this level of noise for these estimated costs using a different engineering solution, that would be acceptable.

276. We cannot say that the noise levels predicted by Case 2A are reasonable given that the number of days in which there will be noise are likely to be greater than the number of days during which there will be precipitation, and given that the effect of an increase in decibels is not linear, as discussed above. Perceived noise at 60 db(A) is over three times greater than at 50 db(A).

h. Transmission Corridor Noise Monitoring

277. Public Service will be ordered to test the Project when it is operated at 345kV to verify the ability of the ENVIRO model to predict actual noise levels emitted from the Project in residential areas. Public Service will make public the results of the verification testing. Knowing the Project's actual noise levels and publicizing those data will provide information for local jurisdictions and for homeowners and prospective home buyers. There is value in reassuring local governments and present and future individuals who live near the transmission corridor that the line's noise levels are as projected (or nearly so). In addition, the record is clear that PSCo intends to build and to operate other transmission lines at 345kV. Having PSCo-specific data about the ability (or inability) of the ENVIRO model to predict actual noise levels

[162] We recognize that the Project will be operated during the day and night, and thus the 55 dB(A) reasonableness standard will be applicable 24 hours per day, seven days per week.

on PSCo's system will assist the Commission, PSCo, and other parties in future transmission project noise-related proceedings. Finally, the evidence provides no basis to believe that noise levels will vary materially after the burn-in period. Therefore, testing will be ordered to be done at six months and at one year after the Project is operated at 345kV.

278. The actual noise measurement must be performed under wet conditions since this would be the most accurate approach to determining actual versus modeled results. These actual measurements should be performed twice: first, after the Project has been in service for six months; second, soon after the Project has been in service for one year. This schedule will allow the corridor to be tested after the conductor "burn in" period. As discussed above, Public Service states in its testimony that it would not be opposed to measuring this transmission corridor for noise levels as long as the measurements were performed wisely.

279. We believe that requiring this measurement be performed several times during wet conductor conditions, and as described in the previous paragraph, is appropriate because the noise levels should be at their highest. Staff and Public Service will jointly develop the monitoring criteria and goals.

G. Public Participation in Future Transmission Proceedings.

280. There is one last area to be discussed: public participation in *future* transmission proceedings. Section 25-12-103(12), C.R.S., requires a utility to provide notice of its application to all counties and municipalities in which proposed electric transmission facilities will be sited. In addition, that section directs the Commission to afford the public an opportunity to participate in all proceedings in which permissible noise levels are established.

281. To effectuate these requirements, Staff recommended that the Commission

> direct PSCo, as part of its planning process, to clearly state in its applications to the local jurisdictions all pertinent information related to noise. … The application should make it clear that the municipalities and counties are then responsible to provide this information to the affected land owners in the residential areas.

Staff Statement of Position at 15 (list of data to be provided to local jurisdictions omitted). In Staff's opinion, this process will inform local residents of the pending application and of projected noise levels. Then, the local residents may use the information provided by the local jurisdiction to determine whether to participate in the *Commission* proceeding about the proposed transmission line, and, assuming participation, the Commission can consider their input concerning noise in arriving at its decision.

282. This recommendation will not be adopted.

283. First, the proposal rests on a local jurisdiction's providing noise-related information to its citizens. The Commission has no authority to require a local jurisdiction to provide the information to its citizens. In addition, the Commission's directing a local jurisdiction to provide information to residents seems unnecessarily intrusive.[163]

284. Second, the Commission generally holds well-publicized public hearings in transmission proceedings; and these hearings normally are held in the affected locale and in the evening. The Commission encourages public comment, and there is nothing in the record to suggest that affected residents are reluctant to appear at these public hearings. In addition and assuming the requirements are met, local residents may intervene in transmission proceedings before the Commission (as local residents did in this proceeding) to make their views known.

[163] Similarly, Ms. Nuzum's suggestion that the Commission advise local governments that there should be a limitation on residential development near transmission corridors is arguably beyond the scope of this Commission's mandate and, more importantly, intrudes into an area historically reserved to the local jurisdictions as they are in the best position to determine what is in the best interests of their residents.

Finally, in arriving at its decision, the Commission considers all public input, however received. Adopting Staff's proposal would not significantly improve on the existing process.

285. Third and finally, § 25-12-103(12), C.R.S., contains a requirement that a utility provide noise-related information to local jurisdictions. Nothing in the record suggests that local jurisdictions need or want additional data of the type identified by Staff or that local jurisdictions do not have in place mechanisms by which they inform residents of noise-related data. The Commission's usual practices worked in this proceeding and, insofar as we are aware, have worked in other transmission CPCN proceedings. We see no reason to change the procedures for the future, as recommended by Staff.[164]

H. Lessons Learned and Expectations for the Future.

286. This docket has been somewhat difficult for the Commission. As determined above, Public Service did not meet its burden of proof with respect to EMF emissions. The information provided to the Commission on remand was very useful in arriving at an outcome because it provided information on "the alternatives available to the utility to meet the need for electric transmission facilities." § 25-12-103(12)(a), C.R.S. The first round of hearings produced few options for the Commission because there was little information on engineering alternatives. The Commission is not obligated to remand matters to collect information. Rather, it may make a determination based upon the information before it, even though that may be to the detriment of the applicant. We would hope that in the future, before the Commission makes its decision, a complete record has been developed, one that provides the Commission with a full discussion of engineering options and costs.

[164] Depending on the circumstances, the Commission may order different or additional procedures in a particular case in the future. This decision does not address that possibility.

III. CONCLUSIONS

287. The Commission has jurisdiction over the subject matter of this proceeding (§ 40-5-101(1), C.R.S., and Rule 4 CCR 723-1-55) and over the parties to this proceeding.

288. We grant the requested CPCN and authorize Public Service to construct the project because the public convenience and necessity require that the project be built.

289. We also grant the CPCN to operate the Eastern Circuit 2005 Rebuild section at 345kV because the public convenience and necessity require electricity generated from Comanche Unit #3 to be delivered into the Denver Metropolitan area load center.

290. We cannot make a finding of reasonableness of projected EMF levels for this Application when the four circuits are operated at 345kV, and 2,000 amperes (1200 MVA), because Public Service has not met its burden of proof. Public Service may seek a reasonableness finding in the future.

291. We set an L_{50} threshold value of 55dB(A), as described by EPRI's red book, for the Comanche to Midway substation section because this level best balances costs with noise emissions, and is in the public interest. The Commission does not consider any higher L_{50} value for noise as reasonable. Public Service has the option to not engineer the line to meet this standard, but in that event, the Commission would make no reasonableness finding on this portion of the corridor.[165]

292. We set an L_{50} threshold value of 55dB(A), for the Daniels Park to Midway substation section because this level is achievable, best balances costs with noise emissions, and is in the public interest. The Commission does not consider any higher L_{50} value for noise as

[165] We leave to Public Service to decide whether to engineer only the residential portion of this section, or the entire section. This would be based on business judgment, *i.e.*, the percentage probability of lawsuits and associated liability concerning the non-residential portion of the line.

reasonable. Again, Public Service may choose to not meet this standard, but in that event, the Commission would make no reasonableness finding with respect to noise generated by the transmission lines.

293. Public Service shall conduct on-going monitoring of noise when the Project is in service at 345kV and shall report the results to the Commission so a comparison of projected values, from the ENVIRO software, to actual values can be made.

IV. ORDER

A. The Commission Orders That:

1. Public Service Company of Colorado's application is partially granted.

2. A CPCN to operate the 2005 Rebuild section between Midway and Daniels Park at 345kV shall be issued.

3. A CPCN to construct the Project shall be issued.

4. The Commission finds reasonable an L_{50} threshold value of 55dB(A), as described by EPRI's red book, for noise emitted from the Daniels Park to Midway substation section of the corridor.

5. The Commission finds reasonable an L_{50} threshold value of 55dB(A), as described by EPRI's red book, for noise emitted from the Comanche to Midway substation section of the corridor.

6. Public Service has the option of using suggestions from this docket in meeting these noise levels, as discussed above. If it does not meet the levels, the Commission makes no reasonableness findings with respect to any noise emissions from this project.

7. Public Service has not met its burden of proof with respect to electromagnetic field emissions (EMF). As discussed above, the Commission thus declines to make a finding with respect to the reasonableness of projected EMF emissions.

8. Public Service shall conduct on-going monitoring of noise when the Project is in service at 345kV, as discussed above, and will report the results to the Commission so a comparison of projected values, from the ENVIRO software, to actual values can be made.

9. Recommended Decision No. R05-1349 is superseded and replaced by this Initial Commission Decision.

10. The Motion for Clarification or Reconsideration of Decision No. R05-0526-I filed by the Castle Pines North Association, Inc., is denied as moot.

11. The twenty-day period provided for in § 40-6-114(1), C.R.S., within which to file applications for rehearing, reargument, or reconsideration begins on the first day following the Mailed Date of this decision.

12. This Order is effective upon its Mailed Date.

B. ADOPTED IN COMMISSIONERS' DELIBERATIONS MEETING June 29, 2006.

(S E A L)

ATTEST: A TRUE COPY

Doug Dean,
Director

THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

GREGORY E. SOPKIN

POLLY PAGE

CARL MILLER

Commissioners

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