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BEFORE THE
SURFACE TRANSPORTATION BOARD

STB Finance Docket No. 35557

REASONABLENESS OF BNSF RAILWAY COMPANY
COAL DUST MITIGATION TARIFF PROVISIONS

BNSF RAILWAY COMPANY'S REPLY EVIDENCE AND ARGUMENT

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TABLE OF CONTENTS

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BNSF Railway Company ("BNSF") hereby submits its Reply Evidence and Argument in the above-captioned proceeding in response to the opening evidence and comments of the following: (1) the United States Department of Transportation ("DOT"), (2) Union Pacific Railroad Company ("UP"), (3) Union Electric Company d/b/a Ameren Missouri ("Ameren"), (4) Arkansas Electric Cooperative Corporation ("AECC"), (5) the National Coal Transportation Association ("NCTA"), and (6) Western Coal Traffic League, American Public Power Association, Edison Electric Institute, and National Rural Electric Cooperative Association ("WCTL").

I. Introduction And Summary Of Reply Evidence And Argument

In *Coal Dust I*[1], the Board found that coal dust losses from loaded trains in transit through the Powder River Basin ("PRB") create serious risks for the safety, reliability and efficiency of PRB coal transportation. The Board concluded that "[c]learly, this is a problem that must be addressed." *Coal Dust I* at 14. The Board recognized that it is no longer acceptable for coal shippers to allow their coal to escape from loaded cars in transit to foul the ballast on rail

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[1] *Arkansas Elec. Coop. Corp.—Petition for Declaratory Order*, Docket No. 35305 (STB served March 3, 2011) ("*Coal Dust I*").

lines in the PRB that are critical to the Nation's energy infrastructure. Like any other shipper, coal shippers must take adequate measures when they load coal to keep their coal in the loaded cars during transit.

This would seem to be an obvious proposition. Shippers should not be allowed to load their freight in railcars without securing it properly so that it does not escape in transit. But the shippers and shipper organizations that filed evidence and argument on opening in this proceeding continue to resist measures to deal with coal dust. They ignore the urgency of the coal dust problem in the PRB in an effort to put off their responsibility for coal dust fouling for as long as possible.

AECC argues, as it did in *Coal Dust I*, that coal shippers should not have to take any measures to address coal dust because BNSF's operations and maintenance practices are to blame for coal dust losses in transit. But those arguments were addressed and rejected in *Coal Dust I*, and they are off the table in this proceeding. *Coal Dust I* at 9-10. The Board concluded in *Coal Dust I* that BNSF is entitled to establish reasonable loading requirements to ensure that a coal shipper's freight remains in the loaded railcars in transit. *Coal Dust I* at 10-11. The narrow focus of this proceeding is on the reasonableness of the loading measures that are contained in the safe harbor provisions of BNSF's Coal Loading Rule.[2]

As BNSF explained on opening, and as DOT recognized in its opening submission, the safe harbor provisions in BNSF's Coal Loading Rule identify clear and easily implemented measures that can be taken by coal shippers and their mine agents to ensure compliance with BNSF's coal loading requirements. A coal shipper that instructs its mine agent to apply one of

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[2] *See Arkansas Elec. Coop. Corp.—Petition for a Declaratory Order*, Docket No. 35305, at 4 (STB served Nov. 22, 2011) (instituting a new proceeding in Docket No. 35557 to consider the reasonableness of the safe harbor provision); *Reasonableness of BNSF Railway Co. Coal Dust Mitigation Tariff Provisions*, Docket No. 35557, at 1 (STB served June 25, 2012).

five approved topper chemicals to coal that has been groomed to a specified load profile will be in compliance with BNSF's Coal Loading Rule. As the DOT stated, the safe harbor provisions "appear[] to be a reasonable means of addressing the legitimate problem of coal dust emissions from railcars, providing shippers with conduct-based alternatives, and clarity, about how to satisfy the tariff's requirements." DOT Op. at 7.

The safe harbor approach is also cost-effective. Topper chemicals, when properly applied, can substantially curtail coal losses in transit. Toppers have been used wherever in-transit coal dust losses have been seen to be a problem. The use of toppers is the most effective approach to in-transit coal dust control that is commercially available today. The shipper commenters in this proceeding have presented no credible evidence that toppers are ineffective dust control agents or that there is a superior approach to prevent the loss of coal in transit. Moreover, the cost of toppers is modest. Given the serious risks presented by coal dust fouling in the PRB and the availability of feasible and commercially reasonable means of controlling coal dust losses through the application of toppers, halfway measures that have only a marginal impact, like the use of 3 inch minus coal suggested by WCTL, are not acceptable.

WCTL seeks to avoid responsibility for complying with the safe harbor provisions in BNSF's Coal Loading Rule by raising a flurry of questions about the tests that BNSF conducted to identify the specific topper agents that have been approved for use under the safe harbor. BNSF's witnesses Messrs. VanHook and Carré and Murphy and Dr. Emmitt address WCTL's professed concerns in this Reply Evidence and Argument. But the Board should not be distracted by WCTL's litigation strategy. Coal shippers were invited to participate in the tests that WCTL now criticizes, and some WCTL members had active roles in those tests. Not a single shipper indicated that it was concerned about the way the tests were being conducted at the time or about the reliability of the data generated in those tests. The issues raised by WCTL now, long after the tests have been completed, are made-for-litigation and they should be given short shrift.

There would be no reason for BNSF to give safe harbor treatment to ineffective topper chemicals. The consequences of coal dust losses in transit fall in the first place directly on BNSF. BNSF's objective of keeping shippers' coal from fouling the ballast in the PRB would be poorly served by a safe harbor that allowed coal to continue to blow out of loaded railcars in transit in the PRB. Moreover, shippers talk out of both sides of their mouth when they question the effectiveness of the safe harbor toppers and then argue that BNSF should bear the costs of topper application to reflect the benefits to BNSF that result from keeping the coal in the loaded railcar. In any event, if a shipper wants to pursue safe harbor treatment of a different topper, or pursue an alternative approach altogether, the safe harbor provisions in BNSF's Coal Loading Rule expressly provide an opportunity to do so.

WCTL, joined by NCTA, argues that the safe harbor provisions are unreasonable because shippers bear all of the costs to comply with the safe harbor. But shippers have always had the responsibility to secure their freight so that it does not escape from railcars in transit, and shippers have always borne the necessary costs. WCTL's legal argument that the safe harbor provisions amount to a "special service" that BNSF must pay for is misplaced, as is WCTL's and NCTA's argument that it is "unfair" to make shippers incur the costs necessary to keep the shippers' coal in the loaded cars in transit. The shippers' "fairness" argument {{

}}[3] As Mr. Bobb explains, the issue of cost sharing should be left to commercial discussions between railroads and shippers in the negotiation of private coal transportation agreements. Bobb Reply VS at 7. It is particularly important that the Board avoid any broad pronouncements about cost allocation that have the potential for interfering with commercial arrangements that have already been established.

WCTL and NCTA also argue that the safe harbor provisions are unreasonable because BNSF has not specified the consequences for non-compliance. On opening, BNSF explained that it was premature to establish enforcement measures because BNSF intends for now to treat shippers that attempt in good faith to comply with the safe harbor provisions to be in compliance with BNSF's Coal Loading Rule regardless of the actual level of performance. BNSF also explained that it is unnecessary to establish enforcement measures for shippers that refuse altogether to comply with BNSF's loading requirements since shippers should not have the option to choose whether to comply with reasonable loading and operating rules.

If a shipper simply refuses to comply with reasonable loading requirements, BNSF would have to evaluate its options based on the particular circumstances. In cases where a contract shipper has agreed in a transportation contract to implement BNSF's coal dust mitigation measures, BNSF would have contract remedies that are outside of the Board's jurisdiction. As to BNSF's common carrier shippers, BNSF cannot determine in the abstract what measures might be necessary or appropriate to compel compliance, and the Board cannot evaluate the reasonableness of a particular enforcement measure without knowing the circumstances that gave rise to the need for enforcement or the circumstances of the particular common carrier shipper. The possibility of refusing service to a shipper that deliberately refuses to comply with

[3] Confidential materials are designated by a single bracket – "{" – and Highly Confidential materials are designated with double brackets – "{{".

BNSF's loading rules must be an available option, but that is an option that would not be taken lightly. In any event, BNSF has stated that it will give at least 60 days' notice before taking any enforcement action against a common carrier shipper.

NCTA complains about the uncertainty facing shippers that want to comply with BNSF's coal dust mitigation objectives but choose not to take advantage of the safe harbor. NCTA misunderstands the purpose of a safe harbor. By design, a safe harbor provides shippers that want certainty with a clear and reasonable method of complying with BNSF's loading requirements. If a shipper wishes to opt out of the safe harbor, uncertainty is to be expected. But that uncertainty does not undermine the reasonableness of the safe harbor provision. Moreover, there is already a clear record of BNSF working with its shippers to explore alternatives to the safe harbor provisions. At the request of shippers, BNSF added two products to the list of approved toppers based on field tests conducted following the Super Trial. Similarly, BNSF responded to shippers' interest in the possible use of compaction and body treatments by testing the effectiveness of those approaches to coal dust mitigation. If a shipper is truly interested in pursuing alternatives to the safe harbor, BNSF will work with the shipper to ensure that appropriate measures are taken.

Finally, Ameren focuses its Opening Evidence and Argument on the liability provision of the safe harbor. Ameren's concerns are based on a misunderstanding of the liability provision. The liability provision does not, as Ameren claims, "make shippers become insurers for acts of BNSF." Ameren Op. at 4. As BNSF explained on opening, the liability provision in the safe harbor was intended to hold shippers responsible for negligent or improper use of topper chemicals. BNSF's Op. at 27; Bobb Op. VS at 13. It was also intended to make clear to shippers that new approaches that shippers might want to pursue in the future will have to be safe for BNSF's employees and equipment. Those are reasonable objectives that are consistent with the case law discussed by Ameren.

BNSF's Reply Evidence and Argument is supported by the following verified statements:

- Stevan Bobb, BNSF's Group Vice President, Coal Marketing, addresses several questions raised by NCTA and WCTL about the meaning of BNSF's Coal Loading Rule. Mr. Bobb also addresses the claim of NCTA and WCTL that it is "unfair" to require that coal shipper, like all other shippers, must incur the costs to secure their freight in loaded railcars.

- William VanHook, who recently retired as BNSF's Assistant Vice President and Chief Engineer-Systems Maintenance and Planning, explains that the data generated by BNSF's field tests of topper agents in 2010 and 2011 show that properly formulated toppers produce substantial and consistent reductions in coal dust losses in transit. Mr. VanHook also addresses questions raised by WCTL about the procedures used by the laboratory in BNSF's Technical Research & Development ("TR&D") Department to evaluate the data gathered in the 2010 and 2011 tests.

- Messrs. Carré and Murphy, BNSF's coal dust consultants for several years, explain that there is no credible evidence that properly formulated toppers are ineffective at controlling coal dust losses in transit. In fact, no superior method of coal dust mitigation that is commercially feasible has ever been identified. Messrs. Carré and Murphy also address questions raised by WCTL regarding the protocol used in BNSF's 2010 and 2011 field tests of topper agents.

- Dr. Emmitt, President and Senior Scientist of Simpson Weather Associates, a scientific research and development firm that BNSF hired to assist in the study of coal dust and in the testing of topper agents in 2010 and 2011, addresses the questions raised by WCTL and AECC regarding the design of the 2010 and 2011 tests and the interpretation of the data gathered in those tests.

II. Topper Agents Are Highly Effective In Controlling Coal Dust Losses In Transit.

As BNSF explained in its Opening Evidence and Argument, there is abundant evidence that the use of topper agents applied to well-groomed coal loads can eliminate most coal dust losses from trains in transit. Technical literature, experience outside the PRB, PRB coal shipper studies, tests conducted by PRB mines and BNSF's own data all show that toppers are effective at controlling in-transit coal dust losses. No one has identified a superior approach to dealing with coal dust. Everywhere that coal dust has been perceived to be a problem, the solution has been to use topper agents, usually with coal load grooming, to control coal dust losses.

WCTL nevertheless claims that BNSF insists on the use of toppers not because toppers are effective at coal dust mitigation but "because [BNSF] simply wants to force shippers to apply expensive surfactants." WCTL Op. at 22. The argument is nonsense. The consequences of ballast fouling caused by coal dust losses in transit fall in the first instance directly on BNSF. BNSF would have no reason to establish a safe harbor for coal dust mitigation measures that are not effective. The coal dust problem can only be addressed by keeping coal in the loaded cars and out of the ballast. BNSF has a clear interest in establishing loading rules that will be effective, and the use of topper chemicals is currently the only proven way to substantially reduce coal dust losses.

Shippers recognize that the application of toppers is a reasonable method for dealing with coal dust. NCTA carried out an internal survey of its members' views on coal dust mitigation approaches and 74% of the respondents agreed with the statement that "top spraying systems are available today that have reasonable costs and that will meet the requirements of Tariff 6041-B." *See* Dust Mitigation Technology: Audience Response Questions, attached as Counsel's Reply Exhibit 1 at 3. 83% of the NCTA respondents agreed that "if my utility were to comply with the loading rules of 6041-B, we would consider the best compliance solution to be [] chemical toppers." *Id.* at 2.[4] As noted in BNSF's opening evidence, WCTL's witness in this proceeding, Dr. Viz, acknowledged in his 2009 study of toppers that {

[4] The CD attached to BNSF's Reply Evidence and Argument contains documents that have been excerpted in the exhibits, as well as work papers to graphs and charts included in the Reply Verified Statements of Mr. VanHook and Dr. Emmitt. The CD also contains documents referred to herein that contain a document reference number indicating that the document was produced in discovery.

} Exponent Inc., *Railcar Coal Loss and Suppressant Effectiveness Study: Final Report to the National Coal Transportation Association*, at 163 (Aug. 3, 2009) ("Exponent Report") ({ }).[5]

Notwithstanding his prior views on the issue, Dr. Viz now claims that the effectiveness of toppers is questionable since topper agents were developed for use only on stationary coal stockpiles. This is not the only instance of Dr. Viz's flip-flop on technical issues to support WCTL's litigation objectives. His purported concern is also misplaced.

As Messrs. Carré and Murphy explain in their reply verified statement, topper agents were originally developed for use on stationary coal stockpiles and have been in use to suppress coal dust on stationary coal stockpiles for years. However, most of the topper agents that are used today to suppress coal dust in transit were specially formulated to work on coal cars in transit. Topper agents used for in-transit dust control have been designed to create a cover that can adjust to the settling and redistribution of coal that occurs over the course of a train trip. The cover can be either a flexible crust or a tacky film. One of the criteria used by BNSF in selecting toppers for possible use in the safe harbor was whether the particular topper agent created a tacky film or pliable crust that would withstand the forces that would be applied to it during transit. SWA tested a number of toppers for this characteristic and rejected several toppers that were not appropriate for use in transit.

AECC's witness Mr. Nelson does not challenge the effectiveness of topper agents in general, but he claims that toppers may not be effective when used on coal that has been groomed to a breadloaf design, as required in BNSF's Coal Loading Rule. Nelson Op. VS 21-

[5] The Exponent Report is on the CD attached to BNSF's Opening Evidence and Argument. *See* AFS0007686.

26. Messrs. Carré and Murphy explain why Mr. Nelson is wrong that the use of a breadloaf design could undermine the effectiveness of toppers. As Messrs. Carré and Murphy explain, the use of a breadloaf profile reduces the amount of settling and redistribution of coal that occurs during the movement of the train and therefore reduces the stress on the topper crust. The use of a breadloaf design enhances the effectiveness of the topper.

Moreover, Messrs. Carré and Murphy explain that the evidence Mr. Nelson presents does not support his argument that toppers do not work well on a breadloaf profile. {{

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Mr. Nelson's {{

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Finally, the extensive tests on toppers that BNSF carried out in the Super Trial and in subsequent field tests provide compelling evidence that properly formulated toppers effectively reduce coal dust losses in transit. As Mr. VanHook explains in his reply verified statement, BNSF's objective in the Super Trial was to use simple equipment (passive collectors) and straightforward test procedures that were familiar to coal shippers to evaluate the effectiveness of toppers and to identify the most effective toppers that are commercially available. The tests accomplished this objective by producing clear and irrefutable evidence that some toppers on the market today are highly effective in reducing coal dust losses in transit. The toppers that BNSF has approved for use in the safe harbor consistently produced low levels of coal dust over the course of approximately a 200 mile trip as compared to widely varying levels of coal dust losses from cars on the same train that had not been treated with toppers.

Reproduced below is Table 7 from Mr. VanHook's reply verified statement. The blue line on the chart shows for each test train in the Super Trial the average amount of coal dust that accumulated over the train trip in the passive collectors mounted on the rear sill of seven treated cars in the train. As shown by the relatively flat blue line, the amount of coal dust collected in passive collectors mounted on treated cars is very small and has low variability, demonstrating that toppers effectively control coal dust losses across a wide range of conditions. In contrast, the red line on the chart shows the average amount of coal dust in the passive collectors mounted on cars in the same train that were not treated with toppers. The wide variation in the amount of coal dust from untreated cars reflects the episodic and unpredictable nature of coal dust losses that occur when no remedial measures are taken. The chart shows that the toppers approved for use in BNSF's safe harbor work well to control coal dust losses in transit.

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III. The Coal Shippers Raise No Valid Science Issues About The Tests Used By BNSF To Identify Topper Agents For Use In The Safe Harbor.

AECC and WCTL direct most of their evidence and argument on opening to so-called "science" issues relating to tests done by BNSF in 2010 and 2011 to identify topper agents for use in controlling coal dust losses in transit. The Board should not allow this proceeding to get bogged down in a made-for-litigation controversy about science. The science issues are a smokescreen. The evidence is clear that the topper agents approved for use in the safe harbor effectively suppress coal dust losses in transit. If a shipper believes that other effective topper agents are available, the shipper can obtain safe harbor treatment for those topper agents under the alternative safe harbor provisions in Paragraph 4 of the Coal Loading Rule. The Board should not allow an invented controversy about science to delay implementation of coal dust measures that will have a substantial and immediate impact on coal dust fouling in the PRB.

A. AECC's Science Issues Relating To The Causes Of Coal Dust Are Not A Proper Subject Of This Proceeding.

AECC's primary "science" issue does not even relate to the effectiveness of topper agents. According to AECC's Mr. Nelson, "{

} the underlying causes of fugitive PRB coal." Nelson Op. VS at 21. AECC argues, as it did in *Coal Dust I*, that the problem of coal dust should not be addressed through loading measures that will keep the coal in loaded cars but rather by studying train operating and maintenance conditions that supposedly cause the release of coal dust and then changing train operations and maintenance to deal with those conditions.

The Board properly rejected in *Coal Dust I* AECC's repeated claims that shippers should have no responsibility for addressing the problem of coal dust because coal dust is a problem supposedly caused by the railroads. *Coal Dust I* at 11. The Board made it clear that BNSF is entitled to address coal dust mitigation through reasonable loading requirements that ensure that a shipper's coal remains in the loaded car. *Id.* at 10-11. AECC cannot relitigate that issue here. The Board has expressly stated that it was not going to revisit issues that have already been addressed in *Coal Dust I*.[6]

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[6] *Reasonableness of BNSF Ry. Co. Coal Dust Mitigation Provisions*, STB Fin. Docket No. 35557, at 3 (STB served Nov. 22, 2011); *Reasonableness of BNSF Ry. Co. Coal Dust Mitigation Provisions*, STB Fin. Docket No. 35557, at 2 (served Mar. 5, 2012).

B. WCTL's Made-For-Litigation Concerns About The Design And Implementation Of The Super Trial Are Without Merit.

WCTL, supported by its witness Dr. Viz, asks the Board to find the safe harbor provisions to be unreasonable based on questions raised by Dr. Viz about the science underlying the Super Trial tests that BNSF used to identify the topper agents approved for use in the safe harbor. The science issues described by Dr. Viz are made-for-litigation. If WCTL's members had real concerns about the science underlying the Super Trial, they had the opportunity to raise those concerns while the tests were being carried out. As BNSF explained on opening, numerous shippers, including WCTL's members, participated in the Super Trial.[7] Employees of Ameren, a WCTL member, were the Chair and Co-Chair of the Super Trial committee that selected topper agents to be tested and Western Fuels Association, another WCTL member, was on the same committee. As BNSF explained on opening, several lengthy meeting were held with the shipper participants and shippers were kept fully informed of the progress and results of the tests. Not a single shipper or mine participant in the Super Trial told BNSF that it was concerned about the design and implementation of the passive collector tests or the reliability of the data.

Indeed, the Super Trial tests were simple and straightforward, the test protocol was familiar to shippers, and the data were easy to comprehend. As BNSF explained on opening, in 2008, Peabody Mine Company carried out extensive tests of topper agents using the same equipment and the same basic protocol that BNSF followed in the Super Trial. WCTL's witness Dr. Viz carried out similar tests on the effectiveness of toppers using the same equipment that BNSF used in the Super Trial.

[7] Given the widespread participation of shippers in the Super Trial, WCTL's assertion that BNSF developed and carried out the Super Trial tests behind a "closed door" is patently wrong. WCTL Op. at 18.

In a reply verified statement, BNSF's witness Dr. Emmitt explains why Dr. Viz's specific concerns and criticisms about BNSF's design of the Super Trial and its interpretation of Super Trial data are misplaced. Responding to Dr. Viz's claims, Dr. Emmitt explains the following: (1) The equipment used in the Super Trial – passive collectors – is properly designed to measure the relative amount of coal dust lost from railcars on a particular train that contained coal treated with toppers and railcars on the same train that contained coal that was untreated; (2) The passive collectors were properly mounted on the railcars at a location where coal dust losses are likely to occur; (3) BNSF legitimately excluded data from trains that ran during rainstorms to avoid a distortion in the results; (4) The number of test trains was adequate to determine the relative effectiveness of the tested topper agents; and (5) The data showed little variation in the amount of coal dust lost from treated railcars, thus confirming the effectiveness of toppers in addressing coal dust in transit.

Dr. Viz also criticizes the implementation of the Super Trial tests. His main concern about the implementation of the tests is that BNSF did not extensively document all of the detailed activities that were carried out in the field and in the laboratory. As a result, Dr. Viz claims that he cannot be certain that sufficient care was taken. Dr. Viz's speculation that BNSF's employees and consultants may not have exercised sufficient care in collecting and analyzing the data does not merit serious consideration.

As explained by Messrs. Carré and Murphy, the collection of data in the field was carried out by BNSF's consultants who have spent years assisting BNSF in researching coal dust. Dr. Viz can point to no reason to believe that these consultants suddenly became sloppy in their research methods. Mr. VanHook explains that the analysis of the data collected in the field was performed by BNSF's TR&D Department. As Mr. VanHook explains, the laboratory in the

TR&D Department is a state of the art laboratory that is used by BNSF to carry out sophisticated and extensive tests on a broad range of science issues that affect the railroad. BNSF's TR&D personnel clearly know how to carry out careful measurements and to provide accurate data. Dr. Viz has no basis for raising any concerns over the professionalism used to carry out the data analyses.

IV. The Do-Nothing Approach Advocated By AECC and WCTL Is Irresponsible.

AECC and WCTL cannot continue to use manufactured science issues to justify doing nothing to address coal dust fouling in the PRB. As the Board acknowledged in *Coal Dust I*, "[c]learly, this is a problem that must be addressed." *Coal Dust I* at 14. There is no question about the pernicious effects of coal dust on ballast integrity.[8] As long as shippers allow their coal to be blown out of loaded cars to accumulate in the ballast, there will be a serious risk to the safety and efficiency of rail transportation in the PRB. Any disruption in coal transportation in this important rail corridor would have extremely high costs for shippers, railroads and society in general.

Given the serious risks posed by coal dust fouling, the only responsible approach to coal dust mitigation is to take measures that are commercially feasible to reduce coal dust losses as much as possible. AECC questions the reasonableness of BNSF's "stringent coal dust reduction standard" that requires at least an 85% reduction in coal dust losses. AECC Op. at 15. But the

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[8] In its opening submission, the DOT states that "the Department has already expressed the view that coal dust threatens railroad safety more than other foulants, and that its emission should be contained." DOT Op. at 5. AECC's witness Mr. Nelson nevertheless continues to question the need for any control on coal dust. He claims that {{

}} Nelson Op. VS at 31. In fact, Prof. Tutumluer reiterated in one of the documents that Mr. Nelson cites that {

} UP-AECC-00006349.

Super Trial showed that it is possible to achieve an 85% reduction in coal dust losses through commercially reasonable means. A less stringent standard would allow coal dust to continue to foul PRB ballast for no valid reason.[9]

No party in this proceeding has argued that the cost to comply with the safe harbor provisions will impose any hardship on PRB coal shippers. Nor would such an argument be credible, given the low cost of toppers and the small increase in delivered cost that will result from compliance with the safe harbor. Citing the record in *Coal Dust I*, WCTL claims that the costs to comply with the safe harbor could range from $50 million to $150 million. But BNSF showed on opening in this proceeding that the cost estimates presented in *Coal Dust I* were substantially overstated. Indeed, shippers have acknowledged elsewhere – outside of the context of litigation – that the costs to comply with BNSF's safe harbor are modest. As noted above, 74% of the respondents to an NCTA survey agreed that the costs to apply toppers are "reasonable." *See* Counsel Reply Exhibit 1 at 3. When shippers have actually made arrangements to purchase the toppers, some have expressed surprise that the costs were less than they expected. *See* Counsel Reply Exhibit 2, reporting that City Utilities found that the full year

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[9] AECC claims that {{

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AECC Op. at 15. Messrs. Carré and Murphy address AECC's claim in their reply verified statement. Carré-Murphy Reply VS at 7. But the possibility that the safe harbor approach provides somewhat more coal dust suppression than the minimum required by the Coal Loading Rule does not call into question the reasonableness of the safe harbor. If shippers use the safe harbor, BNSF and its shippers can be confident that coal dust losses are being reduced by at least 85%. Indeed, AECC's argument simply confirms the effectiveness of the approved toppers as a coal dust mitigation approach.

2012 cost for application of a topper would be "$280,000, which is less than what we thought it would be."[10]

WCTL makes a halfhearted argument that some shippers are already taking sufficient coal dust containment measures by profiling coal loads and replacing 2 inch coal with 3 inch coal. WCTL Op. at 22. WCTL does not claim that such practices will achieve an 85% reduction in coal losses in transit as required by BNSF's Coal Loading Rule. Instead, their argument is that shippers should be able to use less expensive coal dust mitigation approaches so long as the approach produces *some* reduction in coal dust.

WCTL's argument that the use of 3 inch coal is a reasonable coal dust mitigation approach is another made-for-litigation claim. When BNSF asked WCTL in interrogatories in this proceeding whether its members were taking any coal dust mitigation approaches other than the use of toppers or profiling, WCTL responded that it was unaware of any such alternative coal dust mitigation approaches.[11] No documents produced by WCTL members in response to discovery requests indicated that they were using 3 inch coal as a dust mitigation approach. When BNSF asked its shippers in 2011 to describe their plans to address coal dust, not a single shipper identified the use of larger coal as a coal dust mitigation measure. No shipper has asked

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[10] Mr. Nelson's speculation that the cost of toppers may go up after shippers begin complying with the Coal Loading Rule is without merit. Nelson Op. VS at 27-28. BNSF presented evidence on opening of the continual decline in topper costs that has occurred over the last few years as shippers have begun to use toppers. If anything, topper costs can be expected to continue to decline as the volume of topper purchases increases, as fixed costs are spread over more users, and as new and lower cost approaches to coal dust mitigation are identified.

[11] *See* WCTL's Response to Interrogatory No. 8 in WCTL's Responses and Objections to BNSF Railway Company's First Set of Interrogatories, at 9; *see also* NCTA's Response to Interrogatory No. 4 in NCTA's Responses and Objections to BNSF Railway Company's First Set of Interrogatories and Requests for Production of Documents, at 4. WCTL's and NCTA's Responses are included on the attached Reference CD.

BNSF to assist them in determining whether the use of coal crushed to larger sizes would be an effective coal dust mitigation approach.

In fact, there is no evidence that the use of 3 inch coal is an effective way of dealing with coal dust losses in transit. Several mines have been crushing coal to pieces that fit between rollers spaced 3 inches apart since before the 2005 derailments. Crushing coal to pieces no larger than 3 inches rather than 2 inches still produces substantial coal dust and small coal particles that could be blown out of loaded rail cars in the PRB if not treated with toppers. As explained by Dr. Emmitt, some preliminary tests were done in 2006, long before the Super Trial, to see if 3 inch coal produced less coal dust in transit than 2 inch coal. Those tests showed a modest reduction in coal dust losses. However, the tests were not done with the controls that BNSF subsequently applied in the Super Trial to ensure the accuracy of the data on coal losses in transit. Moreover, as Dr. Emmitt explains, the limitations in the test that BNSF identified when it presented the results of those tests in 2007 to NCTA likely resulted in coal dust reductions that are overstated. Dr. Viz's willingness to rely on those preliminary tests to conclude that the use of 3 inch coal significantly reduces coal dust while criticizing the far more careful and rigorous tests done in the Super Trial shows his bias and lack of objectivity.

AECC's witness Mr. Nelson suggests that there may be other ways to address coal dust besides the use of toppers. Nelson Op. VS at 55-56. Many of those suggestions are irrelevant here because they relate to AECC's argument that BNSF should change its train operations and maintenance practices, which the Board has stated is not a proper subject of this proceeding. Other approaches suggested by Mr. Nelson may be worth evaluating, such as methods for removing coal dust and small coal pieces from the top layer of the coal load. But the possibility that alternative approaches to coal dust mitigation may become viable in the future does not excuse shippers from taking measures today that are known to be effective.

V. The Board Should Not Establish Any Cost Sharing Rules.

WCTL and NCTA argue that if the Board finds the safe harbor provisions to be reasonable, the Board should require BNSF to compensate shippers for complying with the safe harbor or establish some form of cost sharing between railroads and shippers. But as BNSF previously explained, it is well established that shippers are responsible for loading their freight and securing it in the railcar. *See also Coal Dust I*, BNSF Reply at 28-29 (citing authorities). Because shippers are responsible for loading their freight, shippers traditionally have borne the necessary loading costs. As DOT noted, "shippers should be held responsible, with coal as with virtually every other commodity, to ensure that railcars are securely loaded to prevent spillage or other safety hazards." DOT Op. at 6. There is no reason for the Board to establish a different approach here.

Moreover, cost sharing is a commercial issue that does not belong in this proceeding. As BNSF's witness Mr. Bobb explained, most of BNSF's coal transportation is provided under private contracts that reflect commercial arrangements that vary widely. Any sharing of loading costs between BNSF and its shippers should be left to commercial discussions in the negotiation of private coal transportation agreements. In fact, Mr. Bobb explained that {{

}} The Board should be careful

to avoid making any broad statements about cost sharing that could have an impact on existing arrangements that have already been negotiated.

Neither WCTL nor NCTA has identified any authorities holding that a rail carrier should pay or share the costs of a shipper's compliance with a reasonable loading rule. WCTL makes a strained legal argument that if a railroad imposes on a shipper a requirement that is not necessary for safe transportation, the railroad is obligated to pay the costs of complying with that obligation. *See* WCTL Op. at 24-25. According to WCTL, "there is no question that coal can be carried safely in open-top coal cars without the application of surfactants. For over the past 100+ years coal has moved safely in open top cars . . . ." *Id.* at 25.

WCTL's argument ignores the Board's specific findings in *Coal Dust I.* Based on extensive information presented in that proceeding, the Board found that "the weight of the evidence shows that coal dust is a harmful foulant that could contribute to future accidents by destabilizing tracks." *Coal Dust I* at 8. The DOT has explained that "coal dust can threaten rail safety by damaging rail ballast." DOT Op. at 4. Proper securing of coal shippers' freight is, in fact, necessary for safe and reliable transportation.

Moreover, none of the agency or court decisions cited by WCTL supports WCTL's position that BNSF should incur all or a portion of a coal shipper's costs to comply with a reasonable loading rule. In support of its cost-sharing argument, WCTL cites *Furnishing Suitable Cars for Loading Flour & Other Grain Products*, 128 I.C.C. 442, 444 (1927), where the ICC rejected shippers' arguments that rail carriers should bear the cost of weather-stripping cars for the shipment of grain products. The ICC reasoned that "special safeguards desired by the shipper should be furnished by him." *Id.* The ICC's decision that a shipper should pay for special safeguards that it desires provides no support for WCTL's position that a rail carrier should pay for a shipper's costs of complying with a rail carrier's reasonable loading rule.

WCTL's reliance on the ICC's decision in *Radioactive Materials, Special Train Service, Nationwide*, 359 I.C.C. 70 (1978), is similarly misplaced. There, rail carriers had issued tariffs mandating special train service for the transportation of spent nuclear fuel and radioactive waste materials. *Id.* at 71. The ICC found that the special train service requirement was unreasonable because there was no evidence that special train service provided a demonstrable benefit to safety. *Id.* at 74. The *Coal Dust II* proceeding is clearly distinguishable from *Radioactive Materials* because the Board has already concluded that the release of coal dust from rail cars in transit is a problem that needs to be addressed. *See Coal Dust I* at 14.

Similarly, the district court's decision in *Baltimore & Ohio Railroad v. United States*, 391 F. Supp. 249 (E.D. Pa. 1975), provides no support for WCTL's cost-sharing proposal. There, rail shippers ordered ordinary gondolas but the rail carriers sometimes provided and charged the shippers for more expensive special gondolas. *See id.* at 251. Applying a deferential standard of review, the court affirmed the ICC's finding that it was inequitable to require the shippers to pay for cars they did not order. *See id.* at 253, 257.

WCTL also argues that BNSF should be required to pay for compliance with the safe harbor because it would be an unreasonable practice for BNSF to "[r]equire[] [shippers] to pay an additional $50 to $150 million annually to maintain PRB ballast—when they are already reimbursing the carriers for all ballast maintenance costs in their freight rates." WCTL Op. at 29. In addition to the fact that WCTL overstates the costs to comply with the safe harbor, there are two fundamental problems with this argument. First, by complying with the safe harbor, shippers are not paying to "maintain PRB ballast." They are incurring costs necessary to secure their freight so that it does not escape from the rail cars to foul the PRB ballast – a requirement that applies to all shippers. Second, shippers do not "reimburse" BNSF for ballast maintenance in their freight rates. BNSF does not charge cost-based rates that are designed to recover specific elements of the cost to provide service, such as ballast maintenance. BNSF seeks to ensure that its costs are covered by the rates it charges, but BNSF sets rates based on market conditions.[12]

WCTL makes a similar argument that it is "fundamentally unfair" that shippers will bear the costs of complying with BNSF's Coal Loading Rule while BNSF may incur substantially lower maintenance costs because of reduced coal dust on PRB rail lines. WCTL Op. at 30. WCTL suggests that this might create a "windfall" if BNSF's rates are not adjusted to account for the lower costs. WCTL Op. at 30. NCTA expressly complains that BNSF has given "no indication that [it] would decrease rates" to account for any reduced costs. NCTA Op at 13.

This "windfall" argument is based on the same misunderstanding about BNSF's rate setting practices as WCTL's unreasonable practice argument. BNSF does not charge cost-based rates. BNSF's rates are based on market conditions. The argument is also based on pure speculation about the impact of shipper compliance with the safe harbor on BNSF's maintenance costs. As Mr. Bobb explains in his reply verified statement, BNSF's objective in requiring

[12] Because coal shippers are not paying twice for the same service, the authorities cited by WCTL in support of its "paying-twice" argument are irrelevant. *See* WCTL Op. at 28 n.66. Moreover, the factual circumstances addressed in those decisions are readily distinguishable from the current proceeding. The Board's decision in *Rail Fuel Surcharges*, STB Ex Parte No. 661, at 10-11 (STB served Jan. 26, 2007), found that it would be unreasonable for a railroad to use a fuel surcharge to capture increased fuel costs and at the same time to use a base rate adjustment mechanism or index that expressly reflects fuel cost increases. BNSF's Coal Loading Rule does not involve an index or a surcharge. The Seventh Circuit's decision in *Indiana Harbor Belt Railroad v. General American Transportation Corp.*, 577 F.2d 394, 400 (7th Cir. 1978), applied deferential review and affirmed the ICC's holding that rail carriers could not assess separate switching charges on the movement of private empty rail cars to repair facilities. BNSF's Coal Loading Rule does not involve any separate charges that BNSF collects relating to coal dust mitigation.

shippers to take measures to keep their coal in the loaded cars is not to reduce maintenance costs but to ensure safe, reliable and efficient PRB transportation. It is far from clear that shipper compliance with the safe harbor will have any impact on BNSF's costs, certainly in the near future. In any event, if a shipper believes that BNSF's rates in the future become too high because BNSF's maintenance costs have come down, there are rate reasonableness remedies that the shipper can pursue. The Board should not establish unprecedented cost sharing for coal loading practices based on shippers' speculation that rates may become unreasonable in the future.[13]

WCTL also argues that it is "industry practice" for railroads to share the costs of coal dust mitigation. WCTL Op. at 32-33. As evidence of such an "industry practice," WCTL cites a {{

}} A single e-mail about an unexplained program several years ago involving a coal market that is fundamentally different from PRB coal markets hardly amounts to evidence of an industry practice. But it does reinforce BNSF's position that cost sharing is a commercial issue that should not be addressed in this proceeding. Different circumstances may give rise to different forms of cost allocation. The Board should not prescribe a one-size-fits-all cost sharing formula.

Finally, AECC does not argue for cost sharing. Instead, AECC's argument is that shippers should have no responsibility for coal dust mitigation or any costs associated with coal

[13] NCTA also claims that the Board should impose cost sharing under the allowance provision of 49 U.S.C. § 10745. NCTA's argument is that compliance with BNSF's Coal Loading Rule is intended to help BNSF meet its "responsibility for transporting the car in a manner that avoids releasing or spilling the shipment," therefore, costs incurred by shippers to help BNSF satisfy this responsibility should be reimbursed. NCTA Op. at 14. But the Coal Loading Rule is not intended to help BNSF satisfy its transportation obligations. Rather, the Coal Loading Rule directs shippers to satisfy the *shippers'* obligation to secure their freight in loaded cars so that the freight does not escape in transit.

dust mitigation because coal dust is caused by railroad operating and maintenance practices. As noted above, this argument seeks to relitigate an issue that AECC pursued and lost in *Coal Dust I*. The Board in *Coal Dust I* stated clearly that BNSF has the right to require shippers to take reasonable loading measures that will ensure that the shipper's coal remains in the loaded railcars in transit.

VI. It Is Premature To Establish Enforcement Measures For Non-Compliance With The Safe Harbor Provisions.

WCTL argues that the safe harbor provisions are unreasonable because BNSF has not "explain[ed] the consequences of non-compliance." WCTL Op. at 34. WCTL claims that this is particularly troubling because of the possibility that BNSF might impose draconian financial penalties for "non-performance" or refuse to handle non-compliant trains.

On opening, BNSF explained that it was premature to establish enforcement measures because BNSF intends for now to treat shippers that attempt in good faith to comply with the safe harbor provisions to be in compliance with BNSF's Coal Loading Rule regardless of the actual level of performance. BNSF has decided for now to give shippers and mines an opportunity to gain experience with coal dust mitigation before establishing specific incentives or penalties based on actual performance of the required coal dust mitigation measures.[14]

BNSF also explained that it is unnecessary to establish enforcement measures for shippers that refuse altogether to comply with BNSF's loading requirements since deliberate non-compliance with reasonable loading and operating rules should not be an option that

[14] WCTL complains about BNSF's train profile monitoring practices using a laser-based approach called Coal Car Loading Profiling System, or CCLPS. WCTL Op. at 37. But as BNSF explained on opening, BNSF is using this monitoring system for now simply to provide feedback to mines and shippers to assist them in improving their loading practices. BNSF Op. at 15; Carré/Murphy Op. VS at 5. BNSF is not using CCLPS as a tool for enforcing compliance with the safe harbor.

shippers can choose. Uniform adherence to reasonable operating rules is an essential part of running a safe and efficient railroad. The Board should make it clear that deliberate non-compliance with a reasonable loading rule is not acceptable.

BNSF hopes and expects that if the Board finds that the safe harbor provisions at issue here are reasonable, BNSF's shippers will begin to comply with those provisions. It may not be necessary to deal with deliberate non-compliance with BNSF's Coal Loading Rule. The possibility always exists that a shipper will simply refuse to comply with BNSF's loading requirements. But if that occurs, BNSF would have to evaluate its options based on the particular circumstances. For example, in cases where a contract shipper has agreed in a transportation contract to implement BNSF's coal dust mitigation measures, BNSF would have contract remedies that are outside of the Board's jurisdiction. Other circumstances would justify different enforcement measures. But BNSF cannot determine in the abstract what measures might be necessary or appropriate to compel compliance, and the Board cannot evaluate the reasonableness of a particular enforcement measure without knowing the circumstances that gave rise to the need for enforcement. The possibility of refusing service to a shipper that deliberately refuses to comply with BNSF's loading rules must be an available option, but that is an option that would not be taken lightly. In any event, BNSF has stated that it will give at least 60 days' notice before taking any enforcement action against a common carrier.

NCTA argues that the safe harbor provisions are unreasonable because of the uncertainty facing a shipper that would like to comply with BNSF's Coal Loading Rule without taking advantage of the safe harbor provisions. This argument ignores the purpose of the safe harbor. The safe harbor is intended to provide certainty to shippers who use the safe harbor that they will be in compliance with BNSF's Coal Loading Rule, not to eliminate uncertainty for those shippers that would like to pursue a non-safe harbor approach. The fact that a shipper that opts out of the safe harbor faces uncertainty as to its compliance with BNSF's Coal Loading Rule does not undermine the reasonableness of the safe harbor provision.

Moreover, as Mr. Bobb explains in his reply verified statement, there is already a clear record of BNSF working with its shippers to explore alternatives to the safe harbor provisions. BNSF responded to shipper requests to test additional toppers after completion of the Super Trial, and those tests led to the addition of two products to the list of approved toppers in the safe harbor. In the Super Trial itself, BNSF responded to shippers' interest in the possible use of compaction and body treatments by testing the effectiveness of those approaches to coal dust mitigation. If a shipper is truly interested in pursuing alternatives to the safe harbor, BNSF will work with them to ensure that appropriate measures are taken.

VII. The Liability Provision In The Safe Harbor Is Reasonable.

Ameren focuses its opening evidence on the liability provision contained in paragraph 4 of the safe harbor. That provision states that "[a]ny product, including topper agents, devices or appurtenance utilized by the Shipper or the Shipper's mine agents to control the release of coal dust shall not adversely impact railroad employees, property, locomotives, or owned cars." Ameren interprets this provision as "mak[ing] shippers become insurers for acts of BNSF, not to mention acts of God and third parties." Ameren Op. at 4. WCTL similarly argues that through this liability provision, BNSF "absolves itself from any corresponding responsibilities for liability to it employees, property, locomotives or owned cars, including liability arising from its own negligence." WCTL Op. at 38. Ameren and WCTL cite extensive case law to argue that such a liability provision would be inconsistent with existing law governing liability and indemnification.

Ameren and WCTL misunderstand the purpose and effect of the liability provision. The liability provision is not a strict liability provision. As BNSF explained on opening, BNSF's intent is to hold shippers liable for negligent or improper use of the safe harbor toppers. BNSF has already determined that the safe harbor toppers are not dangerous or damaging when properly used. BNSF does not intend to hold shippers liable for injury or damages associated with the proper use of toppers. *See* BNSF Op. at 27; Bobb Op. VS at 13. The liability provision is also intended to make clear that if a shipper proposes other dust mitigation methods for which it seeks safe harbor treatment, the shipper will first need to show that those alternative approaches will not pose a hazard to BNSF's personnel or property.

The case law cited by Ameren and WCTL is not relevant because all of the cases deal with a situation where the railroad was attempting to avoid liability for its own negligence. *See* Ameren Op. at 8-10; WCTL Op. at 38-39. That is not the intent behind the liability provisions here. Indeed, the cases make it clear that a railroad can establish liability provisions that hold shippers liability for the shipper's negligence or the negligence of the shipper's agents. *See Perishable Freight Investigation*, 56 I.C.C. 449, 483 (1920).

Respectfully submitted,

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November 15, 2012

PUBLIC VERSION

CERTIFICATE OF SERVICE

I hereby certify that on this 15th day of November, 2012, I caused a copy of the foregoing to be served by hand delivery upon all parties of record in this case as follows:

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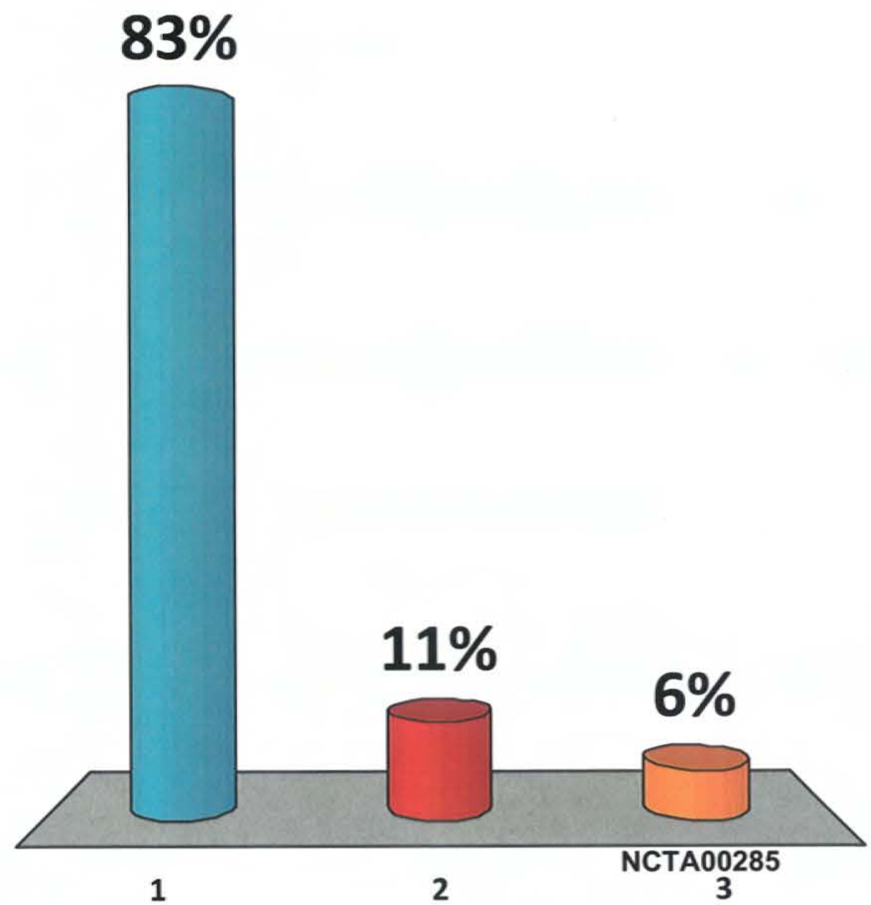
COUNSEL'S EXHIBIT 1

Dust Mitigation Technology

Audience Response Questions

In the near term, if my utility were to comply with the loading rules of 6041-B, we would consider the best the best compliance solution to be:

1. Chemical toppers
2. Compaction
3. Rail car covers

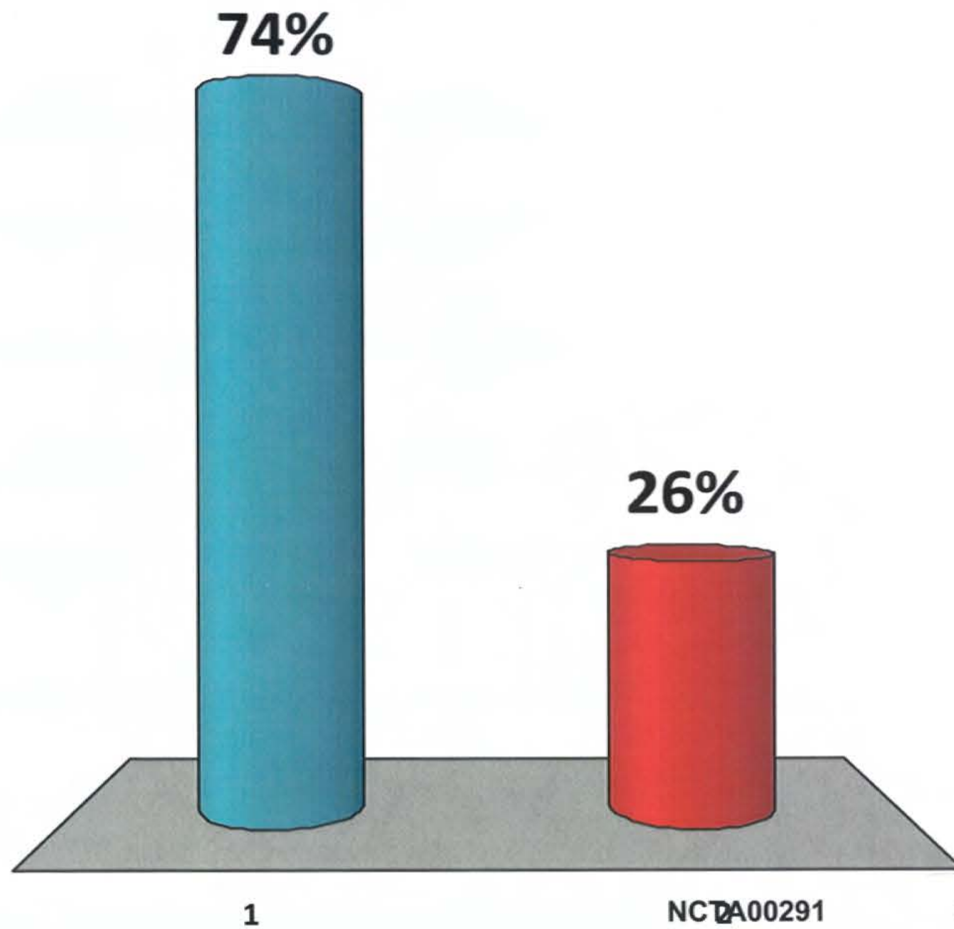


NCTA00285

Exh. 1
Page 2 of 3

Top Spraying Systems are available today that have reasonable costs and will meet the requirements of Tariff 6041-B.

1. Agree
2. Disagree



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Exh. 1
Page 3 of 3

COU8NSEL’S EXHIBIT 2

FOCUS - 57 of 222 DOCUMENTS

Springfield News-Leader (Missouri)

September 30, 2011 Friday

SECTION: LOCAL; Pg. B1

LENGTH: 324 words

HEADLINE: CU finds solution to coal dust issue

BYLINE: By, Wes Johnson

BODY:

News-Leader

City Utilities electric customers will soon pay an extra 5 cents a month to keep coal dust from flying out of rail cars in Wyoming.

Steve Stodden, CU's manager of electric supply, said CU has negotiated a contract with coal mine operators to spray a sticky substance on coal rail cars after they're filled at the mines.

"It looks like our cost in 2012 will be $280,000, which is less than what we thought it would be," Stodden said.

The chemical, which Stodden described as being "almost like Elmer's Glue," hardens into a crust on top of the coal.

BNSF rail operators concluded that coal dust accumulating along its railroad tracks caused rain to seep into and erode the track base, damaging the tracks.

The spray-on chemical will keep coal dust in the rail cars.

"It's been used on coal piles for many, many years," Stodden said.

He said the chemical won't cause any problems in CU's coal-fired power plants when it's burned.

General Manager Scott Miller said BNSF required its coal customers -- such as CU -- to work out a coal dust containment strategy with the mines.

Miller said BNSF includes a maintenance cost in the rates it charges.

With railroad track problems related to coal dust now apparently solved, Miller said he hoped BNSF would reduce the maintenance portion of the rate CU pays.

"We'll get back to you when that happens," Miller said, drawing chuckles from CU board members.

In a related matter, Stodden said BNSF has finally repaired flood-damaged bridges and has resumed normal coal shipments to CU.

In August, CU's coal supply dwindled to less than a 10-day supply. The utility tries to keep between 30 and 45 days of coal on the ground.

Stodden applauded BNSF for responding quickly to get more coal trains to Springfield.

"At one time we had six train sets headed back this way," Stodden said.

He said CU now has 25 days' worth of coal on the ground and is continuing to rebuild its stocks ahead of the winter heating season.

LOAD-DATE: October 1, 2011

REPLY VERIFIED STATEMENT
OF
STEVAN B. BOBB

BEFORE THE
SURFACE TRANSPORTATION BOARD

STB Finance Docket No. 35557

REASONABLENESS OF BNSF RAILWAY COMPANY
COAL DUST MITIGATION TARIFF PROVISIONS

REPLY VERIFIED STATEMENT OF STEVAN B. BOBB

I am Stevan B. Bobb, Group Vice President, Coal Marketing for BNSF. I submitted a verified statement in support of BNSF Railway Company's ("BNSF") Opening Evidence and Argument in this proceeding. As I explained in that verified statement, I have been responsible since 2006 for supervising BNSF's study of coal dust fouling in the Powder River Basin ("PRB") and for developing the safe harbor provisions of BNSF's Coal Loading Rule – Item 100 of BNSF's Price List 6041-B – that are the subject of this proceeding. I am submitting this reply verified statement to address certain questions raised by coal shippers and shipper organizations in their opening submissions about the meaning of BNSF's Coal Loading Rule. I also respond to claims by shippers and shipper organizations that it would be "unfair" to require shippers to pay for loading measures that will prevent coal from escaping from loaded rail cars in transit.

I. Shipper Questions About BNSF's Coal Loading Rule.

The Board initiated this proceeding to look at the reasonableness of the safe harbor provisions in BNSF's Coal Loading Rule. The safe harbor provisions identify cost-effective and easily implemented measures that can be taken by shippers and their mine agents to ensure compliance with BNSF's Coal Loading Rule. The shippers and shipper associations do not raise any serious questions in their opening submissions about the meaning of the safe harbor provisions, as it is clear what needs to be done to satisfy the safe harbor requirements. Instead, the shippers and shipper organizations claim that they are uncertain about the meaning of other aspects of BNSF's Coal Loading Rule. While I do not believe that these issues are relevant to the reasonableness of the safe harbor provisions, I address them below.

Alternatives To The Safe Harbor

The National Coal Transportation Association ("NCTA") claims that there is uncertainty under the Coal Loading Rule for shippers that want to comply with BNSF's coal dust mitigation requirements but do not want to comply with BNSF's requirements by using the specified safe harbor approach. NCTA Op. at 7-9. BNSF's Coal Loading Rule provides a safe harbor for shippers that instruct their mine agents to groom loaded coal to a designated load profile and to apply one of five approved topper agents to the loaded coal. NCTA claims that if a shipper wants to consider alternatives to this safe harbor approach, the shipper needs to know how BNSF will interpret the phrase "remedial measures" in Paragraph 2 of the Coal Loading Rule to determine whether the 85% reduction requirement is met by the use of a non-safe harbor methodology. NCTA Op. at 9-10. BNSF's Coal Loading Rule requires that shippers take measures that will reduce coal dust losses by at least 85% as compared to coal dust losses from loaded cars where no "remedial measures" have been taken. *See* BNSF's Coal Loading Rule, attached at Counsel's Opening Exhibit 1.

The 85% reduction standard reflects BNSF's desire to eliminate at least 85% of the coal dust losses from loaded rail cars in transit that were experienced in the Powder River Basin ("PRB") before shippers and mines began taking any measures to control coal dust losses. For example, at the time of the 2005 derailments, PRB mines were not profiling loaded coal to reduce coal dust losses or applying toppers to the loaded coal. Profiling and topper application are "remedial measures" that some shippers and mines have begun to take to address coal dust losses in transit.

If a shipper is interested in considering a coal dust mitigation approach other than the approach set out in the safe harbor, the alternative would need to reduce coal dust losses by at least 85% relative to cars that have not been profiled or treated with toppers.

Other remedial measures may become available, but I am not aware of any commercially feasible alternatives to the safe harbor measures that produce a sufficient reduction in coal dust losses in transit. BNSF has a long history of working with its customers to investigate alternative coal dust mitigation measures. In the Super Trial of 2010, BNSF identified three effective topper agents, and our safe harbor originally identified only those three toppers as approved for use under the safe harbor. Additionally, shippers asked us to test other toppers agents, and we carried out field tests that resulted in our adding two more toppers to the list of approved toppers. Shippers also asked us to consider compaction and the use of certain body treatment chemicals as alternative coal dust mitigation approaches. We tested both approaches extensively and found that they did not produce a sufficient reduction in coal dust losses in transit.

The safe harbor contains a specific provision in Paragraph 4 for shippers to obtain safe harbor treatment for any other coal dust mitigation approach that they can show is effective in reducing coal dust losses in transit by at least 85%. BNSF encourages shippers, mines and other firms in the dust mitigation business to look for alternatives. BNSF has always believed that once shippers become serious about coal dust mitigation, shippers' demand for effective coal dust mitigation will encourage innovation and lead to new approaches. BNSF will continue to work closely with shippers that are serious about pursuing alternative approaches as they become available.

The Western Coal Traffic League ("WCTL") states that some shippers are already using effective coal dust containment measures by profiling coal loads and using 3 inch coal instead of 2 inch coal. WCTL Op. at 22-23; *see also* NCTA Op. at 8; AECC Op. at 15. When shippers talk about three inch coal, they refer to coal that has been crushed to a size no *larger* than 3 inches. But 3 inch coal contains a substantial amount of smaller coal particles and coal dust. A substantial amount of coal dust is also created in the loading process regardless of the size of the coal being loaded into the rail cars. The use of 3 inch coal, with or without profiling, is not an effective in-transit coal dust mitigation approach. Several mines were using 3 inch coal at the time of the 2005 derailments. Unless this coal is treated with a topper agent after it is loaded, the smaller coal particles created in the crushing and loading process will blow out of loaded cars in transit through the PRB, as they did in the years leading up to the 2005 derailments.

There is no evidence that the use of coal crushed to 3 inches, even with load profile grooming, would be an effective measure for dealing with coal dust in the PRB. Our Coal Loading Rule has a specific provision in Paragraph 4 for a shipper to obtain safe harbor treatment for an alternative coal dust mitigation approach if it can demonstrate that the approach is effective. Shippers can set up tests for alternative approaches and, as noted above, we have already conducted several tests. No shipper has asked us to help test the effectiveness of switching from 2 inch coal to 3 inch coal for purposes of obtaining safe harbor treatment for such an approach. In fact, we know from tests done after the 2005 derailments in the PRB that cars loaded with 3 inch coal still produce substantial coal dust losses in transit in the PRB. We are willing to work with any shipper that wishes in good faith to investigate alternatives to the use of the safe harbor topper agents. But there is no evidence that the use of 3 inch coal, with or without profiling of the loaded coal, is a valid in-transit coal dust mitigation approach.

The Basis For The 85% Reduction Requirement

AECC claims that the 85% reduction requirement in the Coal Loading Rule is arbitrary. AECC Op. at 14. In setting a coal dust reduction standard, BNSF wanted to reduce in-transit coal dust losses as much as possible without creating a commercial hardship for its customers. BNSF believed that it was commercially feasible to achieve an 85% reduction, and the Super Trial confirmed that an 85% reduction in coal dust losses in transit could be achieved using commercially available and relatively low cost topper agents. Therefore, we concluded that a reduction of *less* than 85% would unnecessarily allow dangerous coal dust to foul the ballast in the PRB, while a *higher* requirement might create commercial problems for our shippers. In light of the coal dust mitigation approaches that are currently available, we concluded that an 85% reduction in coal dust losses in transit was reasonable.

The Consequences For Non-Compliance

WCTL and NCTA complain that the Coal Loading Rule does not spell out the consequences for non-compliance with the Rule. WCTL Op. at 33-36; NCTA Op. at 10-13. These shipper organizations fail to understand the purpose of a safe harbor. As I explained in my opening verified statement, the purpose of a safe harbor is to identify specific actions that can be taken to ensure compliance with BNSF's loading requirements so that enforcement measures are not necessary. Use of the safe harbor thus avoids the need for any enforcement measure. I also explained on opening that BNSF will deem a shipper to be in compliance with the Rule so long as the shipper attempts in good faith to comply with the safe harbor provisions in the Rule. Bobb Op. VS at 9-11. Enforcement measures are premature because BNSF has decided for now to give shippers and mines an opportunity to gain experience with in-transit coal dust mitigation before establishing specific incentives or penalties based on actual performance of the required coal dust mitigation measures.

I also explained that when the Board removes the regulatory uncertainty created by this proceeding, I expect that there will be widespread implementation by our shippers of the safe harbor. I do not anticipate any deliberate non-compliance with BNSF's Coal Loading Rule. It is understood by BNSF and our customers that uniform compliance with loading and operating rules is necessary to running a safe and efficient railroad. If a shipper nevertheless refuses to make good faith efforts to comply with BNSF's Coal Loading Rule, BNSF will have to evaluate its options based on the individual circumstances. It is premature for us to determine in the abstract how we will respond to such a refusal or for the Board to determine whether such a response is reasonable. If the shipper has agreed to comply with BNSF's coal dust mitigation requirements in its contract with BNSF, we will have to evaluate our contract remedies. For a common carrier shipper, our response will necessarily depend on the circumstances. The possibility of refusing service to a shipper that deliberately refuses to comply with BNSF's loading rules must be an available option, but that is an option that would not be taken lightly. In any event, I have previously stated that BNSF will give at least 60 days' notice before taking any enforcement measures against a common carrier so that the shipper can challenge the measures if necessary.

II. It Is Not Unfair To Require Shippers To Pay For Loading Measures Necessary To Keep Their Coal In Loaded Railcars In Transit.

WCTL argues that it is "fundamentally unfair" for shippers to incur the costs necessary to comply with the safe harbor provisions in BNSF's Coal Loading Rule since BNSF will benefit from lower maintenance costs in the PRB if shippers keep their coal in the loaded railcars. WCTL Op. at 30-32. It is not at all clear that shippers' compliance with BNSF's Coal Loading

Rule will have any notable impact on BNSF's maintenance costs. But the impact of shipper compliance with proper loading practices on BNSF's costs is beside the point. BNSF's objective in requiring that shippers take measures to keep their coal in the loaded rail cars in transit is not to reduce maintenance costs but to eliminate the serious risks associated with coal dust fouling in the PRB. Shippers must keep their coal in the loaded rail cars to ensure safe and reliable PRB transportation.

It is well established that shippers are responsible for loading their freight and for securing their freight in the loaded cars so that it will not escape from the car in transit. There is no reason for a departure from that practice here. Moreover, as I explained in my opening verified statement, {{

}}[1] Bobb Op. VS at 7, 10, 12. The Board should be careful to avoid making any broad statements about cost sharing that could have an impact on existing arrangements that have already been negotiated.

[1] Highly Confidential materials are designated with double brackets – "{{".

I declare under penalty of perjury that the foregoing is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.

Executed on November 13, 2012

Stevan B. Bobb

REPLY VERIFIED STATEMENT OF WILLIAM VANHOOK

BEFORE THE
SURFACE TRANSPORTATION BOARD

STB Finance Docket No. 35557

REASONABLENESS OF BNSF RAILWAY COMPANY
COAL DUST MITIGATION TARIFF PROVISIONS

REPLY VERIFIED STATEMENT OF WILLIAM VANHOOK

My name is William VanHook. I submitted a verified statement in support of BNSF Railway Company's ("BNSF") Opening Evidence and Argument in this proceeding, and my background is described in that verified statement.

I am submitting this reply verified statement to address questions raised by coal shippers in their opening submissions about the data gathered in passive collector tests that BNSF conducted in 2010 and 2011 on the effectiveness of topper agents in controlling coal dust losses in transit. While the shippers seem interested in raising as many questions as they can about the test procedures, they do not discuss the data that were produced by the passive collector tests. In this statement, I explain that the data collected in those tests demonstrate beyond a doubt that the approved topper agents work effectively to control coal dust losses in transit. Indeed, BNSF would have no reason to provide safe harbor treatment to coal dust mitigation measures unless we were confident that the measures would reduce coal dust losses. I also explain that the coal shippers have no basis for calling into question the professionalism or attention to detail of BNSF's Technical Research & Development ("TR&D") Department in their analysis of the data collected in the 2010 and 2011 passive collector tests.

I. BNSF's Passive Collector Tests Produced Compelling Evidence Of The Effectiveness Of Toppers In Controlling Coal Dust Losses In Transit.

In my opening verified statement, I described the extensive tests that BNSF carried out in 2010 and 2011, including the Super Trial and subsequent field tests, to evaluate the effectiveness of various chemical toppers in controlling coal dust losses in transit. VanHook Op. VS at 10-13. As I explained, the tests were simple and straightforward. Passive collectors were mounted on the rear sill of seven treated cars and seven untreated cars in a train. After moving approximately 200 miles, bags containing the coal dust that accumulated in each passive collector were removed and sent to BNSF's TR&D laboratory where the samples were weighed. After multiple test trains with cars treated with a particular topper were run, the amounts of coal dust collected from treated cars and untreated cars on the same test train were compared to determine how effective the toppers were in reducing in-transit coal dust losses.

This test protocol was familiar to our coal shippers. It was a protocol that we reviewed and discussed with shippers and their mines on multiple occasions. It was the same basic test protocol that had been used by the Peabody Mine Company in 2008 to test the effectiveness of toppers. {

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While the passive collector test approach was familiar and straightforward, BNSF nevertheless made sure that our shippers were directly and actively involved in the tests. As I explained in my opening verified statement, numerous shippers agreed to have their coal tested. Several large meetings were held with shippers to discuss test procedures and results. We exchanged extensive data with the shippers and mines that participated in the tests, as well as

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[1] Confidential materials are designated by a single bracket – "{" – and Highly Confidential materials are designated with double brackets – "{{".

with shippers who attended the meetings but did not volunteer their tons for testing. VanHook Op. VS at 8-9. The shipper participants in the Super Trial did not tell us that they had any concerns regarding the passive collector procedures we had implemented or the reliability of the data that were being generated.

BNSF had a simple objective in carrying out the passive collector tests. We wanted to demonstrate that toppers effectively control in-transit coal dust losses. We also wanted to identify toppers that would reduce in-transit coal dust losses by at least 85%. While we believed it might be possible to achieve a somewhat higher coal dust reduction, we wanted to make sure that our coal loading rule was commercially feasible.

In their opening submissions, the shippers raise a number of questions about test procedures, but they avoid any discussion of the actual data collected in the passive collector tests. I will discuss the actual results, which show without question that the amount of coal dust lost from cars that were treated with properly formulated toppers is substantially and consistently lower than the coal dust lost from untreated cars. There is no need for complex analysis of the data to understand the results, although BNSF did perform statistical analyses of the data to make sure that the results were meaningful. VanHook Op. Exs. 13 & 14; *see* Emmitt Reply VS at 12 n.9. But the data speak for themselves.

Below are two charts showing test results for the two best preforming toppers that were tested in the 2010 Super Trial: Nalco's Dustbind Plus and Midwest's Soil-Sement. For each train, the charts compare the average dust collected in the seven passive collectors from the treated and untreated cars on each train.[2] The results show consistently low levels of coal dust

[2] The data used to compile these charts were produced in discovery and are included on the CD attached to BNSF's Reply Evidence and Argument.

losses from cars that have been treated. In contrast, the coal dust losses on the untreated cars varied widely, which is consistent with the episodic nature of in-transit coal dust losses as BNSF explained in *Coal Dust I*. *Coal Dust I*, BNSF Op. at 14; Emmitt Op. VS at 4. Dr. Emmitt's Reply Verified Statement has a further discussion of in-transit coal dust losses from untreated cars. Emmitt Reply VS at 10-12. It is apparent from a simple review of the data that these two topper agents are highly effective at reducing coal dust losses regardless of the circumstances under which the trains operated.

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Two other toppers – MinTech's MinTopper S+0150 and AKJ's CTS-100 – were not quite as effective as the Midwest and Nalco products, but they still reduced coal dust losses over the course of the tests by at least 85%, and therefore they have been approved for use in the safe harbor.

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[3] {{ }} *See* BNSF_COAL DUST II_00346237 at 00346244-00346245. All documents referred to herein that contain a document reference number were produced in discovery. Unless otherwise noted, copies are contained on the CD that is attached to BNSF's Reply Evidence and Argument.

All of the topper agents that BNSF tested had some impact on coal dust losses in transit. However, the passive collector tests also showed that some topper agents did not perform well in controlling coal dust losses. For example, the { } topper tested during the Super Trial showed inconsistent coal dust reduction, indicating that it was only modestly effective at reducing coal dust losses. The contrast between this topper and the more effective toppers discussed above can be seen through a simple visual inspection of the underlying data.

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The results of tests on { } are particularly interesting. In the Super Trial, the { } topper produced only moderate reduction in coal dust losses in transit. After the Super Trial, { } retested its product with an increased concentration and application rate. The change in the formulation of the topper had an obvious and dramatic impact on the results.[4] Set out below are the results of the subsequent tests, showing that the new formula is very effective at reducing coal dust losses.

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[4] {{ }} Nelson Op. VS at 42-43; *see also* AECC Op. at 19. The issue was created as a result of problems with the temporary application equipment. {{ }} *See* BNSF_COAL DUST II_00149842, which is contained on the CD attached to BNSF's Reply Evidence and Argument.

Set out below in Table 7 are the results of all the passive collector tests of the approved topper agents during the 2010 and 2011. There is very little variability among the cars treated with the approved topper agents. The chart shows beyond any serious question that the toppers selected for the safe harbor are highly effective at reducing coal dust losses.

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Further confirmation of the effectiveness of the approved topper agents can be seen by comparing the results of the passive collector tests of approved toppers to the passive collector tests we did of body treatment and compaction. The coal shippers have acknowledged that body treatment and compaction are not effective.[5] Nelson Op. VS at 54. In fact, the passive collector

[5] The fact that the coal shippers are willing to endorse the results of passive collector tests that suit their litigation objectives just shows that their views on toppers are not to be credited.

tests are very clear that the use of body treatment and compaction do not effectively control coal dust losses in transit.

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Coal shippers may identify other approaches to coal dust mitigation in the future. In the meantime, the data collected by BNSF in the 2010 and 2011 passive collector tests show that five topper agents are highly effective at coal dust control in transit. There is no reason for shippers to delay further implementation of coal dust mitigation using these approved toppers that have been proven effective in the field tests.

II. The Coal Shippers Have No Basis For Questioning The Quality Of Data Analysis Performed By BNSF's TR&D Department.

WCTL and Dr. Viz complain that they have insufficient information about how the passive collector data were analyzed after they were collected in the field and therefore they cannot have confidence in the results of the passive collector tests. They have no basis for their purported concerns.

Dr. Viz claims incorrectly that BNSF has never provided details about the process used to measure the coal dust samples collected from passive collectors. Viz. Op. VS at 15-18. In fact, BNSF provided a detailed description of its methodology in response to interrogatories posed by

WCTL in the first coal dust proceeding. BNSF described there the process used by BNSF's TR&D Department for weighing the coal dust samples collected in the field.[6] As we explained,

> "Weights were taken in the field if the samples were dry. Even when the samples were dry, they would still be sent to the Topeka lab and samples reweighed. If the samples were wet, the bags would be rinsed with water to remove the coal from the bag and the contents transferred to a weighed beaker. The beaker and contents would be dried in a large laboratory oven at 105 degrees Celsius until dry, then reweighed."

Coal Dust I, BNSF Response to WCTL's Interrogatory No. 12.[7] "All weighing [is] done with a certified lab scale." *Coal Dust I*, BNSF Response to WCTL's Interrogatory No. 12.

Dr. Viz questions whether TR&D weighed the passive collector samples using sufficiently precise measurements. Viz Op. VS at 16. {

} *See* Exponent Inc., *Railcar Coal Loss and Suppressant Effectiveness Study: Final Report to the National Coal Transportation Association*, at 125-127 (Aug. 3, 2009) ("Exponent Report").[8] But documents produced in discovery showed that TR&D weighed the passive collector samples to four decimal points or the nearest ten thousandths place. *E.g.*, BNSF_COAL DUST II_00146416 (TR&D lab weights for {

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[6] Dr. Viz criticizes our procedure of informally weighing coal samples in the field, Viz Op. VS at 16-17, but the documents show that {{

}} Carré-Murphy Reply VS Ex. 2 at 2-3.

[7] BNSF's Interrogatory Responses are included on the CD attached to BNSF's Reply Evidence and Argument.

[8] The Exponent Report was included in the folder with exhibits in the Verified Statement of Messrs. Carré and Murphy on the CD attached to BNSF's Opening Evidence and Argument filed in this proceeding. *See* AFS0007686.

Dr. Viz also questions whether we removed "large and obvious non-coal particles" from the passive collector samples before drying and weighing the samples. He asserts that "what one person in the field determines is 'large and obvious' might not be the same as another person.'" Viz Op. VS at 10-11. Again, in our responses to WCTL's Interrogatories in *Coal Dust I*, we explained that "any foreign materials, primarily moths or bugs, that were collected in the passive collectors were removed from the samples before the samples were weighed." *Coal Dust I*, BNSF Response to Interrogatory No. 17. The same person in the TR&D Department, environmental chemist Georgiana Gideon, has completed this process for every PC sample since we began studying coal dust mitigation methods after the derailments in 2005. Dr. Viz's concerns about inconsistent treatment of the samples are without basis.

Indeed, Dr. Viz has no basis for calling into question the professionalism of BNSF's TR&D Department in carrying out any aspect of the passive collector tests. BNSF's TR&D Department includes 18 degreed scientists and engineers with 310 years of collective railroad-specific investigative service experience. The chemistry laboratory in TR&D conducts material testing, approval, and quality control for every chemical used by the railroad. *See* VanHook Reply Exhibit 1, which describes BNSF's TR&D Department. Like any professional laboratory, the equipment used, including scales, is calibrated and certified on an annual basis. Tests in the chemistry laboratory, including the dried weight analyses of the passive collector samples, are conducted in a carefully controlled environment of 75-77 degrees Fahrenheit and 50 percent relative humidity.

Coal shippers are grasping at straws in suggesting that BNSF may have been less than professional in carrying out the passive collector tests. Our objective was to develop credible data that could be used to bring in-transit coal dust releases in the PRB under control, and we did everything necessary to accomplish that objective. We would have had no reason to give safe harbor treatment to topper agents unless we were confident that the use of those toppers will effectively reduce coal dust losses and the ballast fouling that results from in-transit coal dust losses in the PRB. The tests were carried out with the thoroughness and professionalism necessary to give us and the shippers and mines confidence that the approved topper agents will achieve this important objective.

I declare under penalty of perjury that the foregoing is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.

Executed on November 14, 2012

William VanHook

VANHOOK EXHIBIT 1

RAILWAY

THE EMPLOYEE MAGAZINE OF TEAM BNSF SUMMER 2009

BNSF RAILWAY

Hats off to BNSF's 2008 Employees of the Year!

In 2008, nearly 440 BNSF Achievement Awards were presented to members of Team BNSF. Of those, 19 outstanding individual and team achievements, representing 100 employees, were selected as best reflecting BNSF's Vision and Values. These employees, along with six Safety Employees of the Year and 33 Best of the Best leaders who led work groups with exceptional safety performance, were honored during the Employees of the Year Program in April.

Inside this issue of *Railway*, read how your co-workers' efforts are further improving safety, efficiency and service at BNSF.

SAFETY *for us*

Fight the Spike: Summer initiative under way

Although BNSF's injury-frequency and severity ratios are improving overall, an effort is under way to address seasonal injury spikes in certain divisions. Called "Fight the Spike," the program will focus attention on safe work practices to prevent the peaks in injuries that can occur at some locations. Page 9

BNSF's Robert Johnson wins Hammond Award

Northtown (Minneapolis) Diesel Shop Machinist Robert Johnson, one of BNSF's six Safety Employees of the Year, was our nominee for the Hammond Award, a national award recognizing railroad employees' efforts to improve safety. In May, BNSF learned that Johnson was named the winner. Congratulations, Bob! Page 10

TR&D 'knee deep' in almost everything railroad

Their jobs are to be curious, nosy and doubting. In the course of a day, they will look, probe, question, scrape and file - always digging, asking why, what, when, where, how and sometimes who. Microscopes and test tubes are among the many tools they use to make critical analysis and, hopefully, find answers to their questions.

Corey Wills equips locomotives with onboard computer systems and fuel meters to monitor and log power output and fuel consumption.

Sound like another new *CSI* television drama? Nope. Welcome to BNSF Railway's Technical Research & Development Department (TR&D), based not in Miami, New York City or Las Vegas, but in Topeka, Kan.

While the TR&D group is a small one, their work touches nearly every aspect of the railroad. For example, members of TR&D routinely test the diesel fuel to make sure it is up to company standards. Soap for washing hands has to meet their approval to pass quality, environmental and industrial hygiene concerns. And when unfortunate incidents such as derailments occur, members of the team are often at the scene or have components shipped to the lab to determine what went wrong and, if possible, how to prevent them from happening again.

Tasked with a variety of responsibilities, the team, led by Glenn Bowen, Larry Milhon and Dennis Morgart, working under Assistant Vice President Mark Stehly, gets knee-deep with almost everything on the railroad.

"Among the functions we provide is assisting the Mechanical, Engineering and Strategic Sourcing & Supply departments to ensure the railroad buys and uses the best materials available, and that we get the best bang for the buck," says Bowen. "From locomotives and ties to cleaners, paints and chemicals, we're involved in the decision-making process."

It's a responsibility that more often than not finds team members doing their job trackside. Corey Wills, assistant director, Laboratory and Testing Services, for example, equips locomotives with onboard computer systems and fuel meters to monitor and log power output and fuel consumption as the engines move across the system.

"The locomotives will be in the field a couple of months, automatically reporting their fuel efficiency performance back to Topeka," Wills says. "The Mechanical Department asked that we compare the fuel efficiency on the newest GE and EMD locomotives – one factor in future purchasing decisions."

Wills is also responsible for TR&D's two research and test cars. "The test cars let us give our customers, both internal and external, a unique look at how rail transportation can meet their shipping needs. We can run over-the-road tests, monitoring vibration, force and acceleration, all while recording video to help ensure that our customers' freight is delivered damage-free."

Dollars and sense

While Wills works around a locomotive, Environmental Chemist Georgianna Gideon peers into a microscope, evaluating new products to ensure that the company is purchasing products that meet quality specifications at the right price.

"I work closely with the Strategic Sourcing & Supply Department," Gideon says. "When they are considering buying a new product, they will send it to me to determine how good it really is. I'll compare it with current approved materials. When I find one product better than another, I'll let them know."

But TR&D is not just focused on the myriad components that make up railroading. The team is also thinking about the employees doing the jobs. For example, Corey Ruch, engineer II, often works on preventing injuries.

"Somebody is working with a tool and gets hurt – perhaps using a wrench and it breaks. The tool gets sent to us and we determine if the wrench was being misused, if it was the wrong wrench for the application or if the tool failed due to bad construction," explains Ruch, wanting to make sure that no one else gets hurt.

He also reviews fuel additives pitched to the company by vendors claiming their products will improve fuel economy. "If they make a persuasive case, we'll bring in a locomotive, instrument it to monitor power output and fuel consumption, and then test their product out."

Timm Twaddle, on the other hand, is not so much concerned about fuel economy as he is fuel quality control. A fuel chemist, every month he receives samples of vendor-supplied fuel to ensure that they meet crucial BNSF quality-control standards. Very little gets past him, having worked with fuels for more than three decades.

One by one, he pours samples into test tubes. The first exam he makes before submitting the fuels to complex lab equipment is to hold the samples up to the light to make sure they have the right clarity and brightness – initial indicators of quality.

Before Twaddle is done with each sample, he's cooked it in an oil bath for 90 minutes, checking for water droplets and the right amount of stabilizing additives that prevent fuel line filters from clogging and injectors from sticking. Using an array of sophisticated tools, he is confident that by the time he's finished, he'll know whether the sample meets BNSF quality standards.

The GO Team

TR&D's function extends well beyond the capital city of Kansas.

Sometimes, especially during derailment investigations, it's necessary to get to the scene quickly, which is why most of the team are members of the BNSF derailment GO Team.

Larry Milhon, director, Train Dynamics Research and Derailment Prevention, and his group work on research projects aimed at derailment prevention. "If they [the first responders] can't determine what caused the derailment, we go out," Milhon says, adding that decision is made only after long-distance telephone calls and conferences can't solve the puzzle.

Once onsite, the group looks at train dynamics, locomotive event recorder data, the train manifest, and mechanical and engineering measurements. "A key to the investigation is finding the point of the derailment," he adds.

"We look at the car types, how they're positioned in the train, and how heavily they're loaded," explains Milhon. "We ask, 'Where did the cars initially go on the ground?' and 'What were the marks at the point of derailment?' If the rail rolled over, that leads the investigation down one path. If a car's wheels climbed the rail, then that leads the investigation down another path."

Back in Topeka, Alicia Bitner, engineer I, is using a wire brush on the end of a broken piece of rail to remove rust. Among her responsibilities is getting bits and pieces of broken equipment, wheels and rails that have been involved in derailments to "talk" to her. The piece of rail in question was part of the puzzle in a recent derailment.

"Did this piece of rail break as a result of the derailment, or was it the cause of the derailment?" Bitner asks rhetorically. "If the rail caused the derailment, we try and determine why it failed."

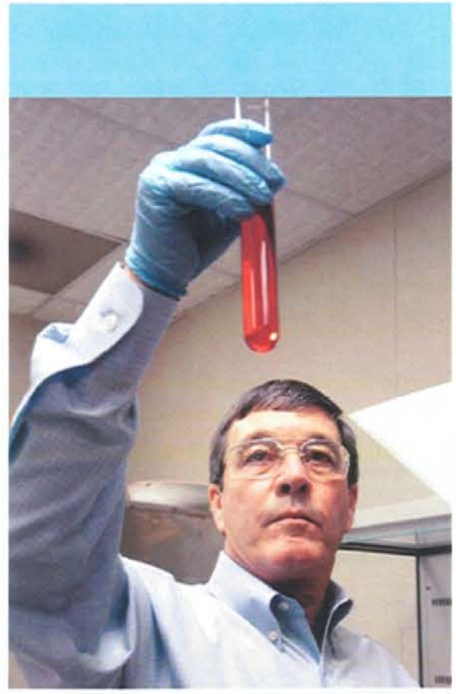
The results of a TR&D investigation can define train handling and train makeup rules.

"If loaded cars can be positioned toward the front of the train, undesirable in-train forces such as stringlining/jackknifing and slack action can be minimized. The result is an improved ride quality with lowered derailment risk and lessened damage to our customers' products," Milhon says.

Dennis Morgart, director, Maintenance of Way & Mechanical Research, and his team become involved if there is an issue regarding a track component, such as ties, ballast, rail, fasteners, etc.

"Recently, research emphasis for us has been rail-wheel friction management. We've found that improved friction control leads to lower lateral forces during curving, reduced rail wear and less tie damage," says Morgart, adding that by reducing the energy input into the track structure, less fuel is needed to move trains.

If field personnel or members of the GO Team are not 100 percent certain what caused the problem, pieces of the puzzle are tagged and sent from the site to Topeka for further investigation and testing, says Morgart, adding, "We're charged with the responsibility of solving problems."



Timm Twaddle, a fuel chemist, checks samples of fuel to ensure that they meet BNSF's quality-control standards.

And while the TR&D group has certain constants, new challenges are always on the horizon. "It's different every day," says Gideon. "We never know from one day to the next what we're going to be working on."

Contributed by David Lustig

Environmental Chemist Georgianna Gideon evaluates new products to ensure that BNSF is purchasing products that meet quality specifications at the right price.

REPLY VERIFIED STATEMENT
OF
E. DANIEL CARRÉ AND MARK MURPHY

BEFORE THE
SURFACE TRANSPORTATION BOARD

STB Finance Docket No. 35557

REASONABLENESS OF BNSF RAILWAY COMPANY
COAL DUST MITIGATION TARIFF PROVISIONS

REPLY VERIFIED STATEMENT OF E. DANIEL CARRÉ AND MARK MURPHY

We are E. Daniel Carré and Mark Murphy. We previously submitted a verified statement in support of BNSF's Opening Evidence and Argument in this proceeding. Our qualifications and experience in assisting BNSF in its study of coal dust in the Powder River Basin ("PRB") are discussed in our opening verified statement. We are submitting this joint reply verified statement to address certain questions that were raised by shippers in their opening submissions regarding the effectiveness of topper agents to reduce coal dust losses in transit. As we explain below, the use of topper agents applied to loaded coal in railcars has been proven to be an effective means of controlling coal dust losses in transit. There is no credible evidence to the contrary. We also address questions raised by Western Coal Traffic League's ("WCTL") witness Dr. Viz and Arkansas Electric Cooperative Corporation's ("AECC") witness Mr. Nelson about the efforts that we and our colleagues at Simpson Weather Associates ("SWA") and Conestoga-Rovers & Associates ("CRA") carried out in support of BNSF's tests of topper agents performed in 2010 and 2011. Those test results showed that properly formulated toppers can effectively control in-transit coal dust losses. Coal shippers have raised no valid basis for questioning the reliability of those test results.

I. Properly Formulated Topper Agents Are Highly Effective At Controlling Coal Dust Losses From Loaded Railcars In Transit.

In their opening submissions, the coal shippers do not seriously question the ability of properly formulated toppers to control coal dust losses in transit. Indeed, as we explained in our opening verified statement, there is abundant evidence in technical literature and in experience around the world that toppers are highly effective in controlling coal dust losses from loaded railcars in transit. Carré-Murphy Op. VS at 9-13. We also noted that the results of BNSF's studies and the shippers' and mines' own studies, including those of National Coal Transportation Association ("NCTA") and Peabody Mine Company in the PRB in 2008, as well as Dr. Viz's static tests, demonstrate that topper agents are effective. *Id.* at 14-16. No one has identified a superior methodology for dealing with in-transit coal dust losses that is commercially feasible.

WCTL's witness Dr. Viz and AECC's witness Mr. Nelson nevertheless suggest that there might be reasons to question the ability of topper agents to effectively deal with coal dust losses from railcars in transit. Dr. Viz claims that topper chemicals were initially formulated for use on stationary coal stockpiles and therefore they might not work effectively on railcars in transit. Viz Op. VS at 3. First, we note that this view is contrary to the view that Dr. Viz expressed in work he did for NCTA in 2009, where he stated that it is possible {

}[1] Exponent Inc., *Railcar Coal Loss and Suppressant Effectiveness Study: Final Report to the National Coal*

[1] The Exponent Report repeatedly emphasizes {

} Confidential materials are designated by a single bracket – "{" – and Highly Confidential materials are designated with double brackets – "{{".

Transportation Association, Executive Summary, page xiv (Aug. 3, 2009) ("Exponent Report").[2] We showed in our opening verified statement that the results from Dr. Viz's static tests demonstrated that {

} Carré-Murphy Op. VS Ex. 10 at 1-2.

Moreover, Dr. Viz ignores the fact that while toppers were originally developed for use on stationary coal stockpiles, the toppers used for coal dust control on railcars in transit have been specially formulated to deal with the conditions presented by coal dust losses from moving railcars. Toppers used on stationary coal stockpiles must be capable of preventing wind from blowing the coal off of the stockpile. Wind is also the primary cause of coal dust losses from railcars in transit. All effective toppers are therefore designed to deal with the effect of wind on the coal. But unlike coal in a stationary coal stockpile, coal in moving railcars also shifts and is redistributed over the course of a train trip. An effective topper must be able to deal with the changing physical properties of the loaded coal. The topper manufacturers are well of aware of the need to deal with shifting coal loads in transit, and they have formulated toppers for use on railcars in transit to be flexible enough to accommodate the changing conditions of the loaded coal. As Mr. VanHook noted in his opening verified statement, SWA did several laboratory tests on the toppers before they were field tested in the Super Trial. VanHook Op. VS at 9-10. One of the characteristics that we examined in those tests was the ability of the topper to provide a crust or film that would accommodate shifting coal loads in transit. *See* VanHook Op. VS Ex. 10 at 11-12. Many of the toppers we tested did not pass SWA's laboratory tests, and they were

[2] The Exponent Report was included in the folder with exhibits of our opening verified statement on the CD attached to BNSF's Opening Evidence and Argument filed in this proceeding. *See* AFS0007686.

rejected because the cover created by the topper could not be expected to provide consistent coal dust control on loaded railcars in transit.

AECC's witness Mr. Nelson does not question the potential for toppers to effectively control coal dust losses in transit. However, he claims that the use of topper agents is incompatible with the breadloaf profile that is also part of the safe harbor provision. Nelson Op. VS at 21-26. Mr. Nelson is mistaken. In fact, the loading of coal to a breadloaf profile enhances the effectiveness of toppers precisely because coal loaded to a breadloaf profile will shift less in transit as compared to the trapezoidal profile that PRB mines previously used. As we explained on opening, over the course of a train trip, loaded coal tends to settle into a breadloaf profile.[3] Carré-Murphy Op. VS at 4. If the coal is loaded to a breadloaf profile at the beginning of the trip, the coal is less likely to settle and be redistributed over the course of the trip because the profile already approximates the natural angle of repose of the sub-bituminous coal found in the PRB. Thus, loading coal to a breadloaf profile minimizes the stresses that can cause a topper to be less effective.

The evidence presented by Mr. Nelson to support his concern about the application of toppers to a breadloaf profile does not support his point. Mr. Nelson cites Australia's "garden bed" profile as an example of a profile that would ensure the topper veneer was effective. Nelson Op. VS at 26. But Australia's {

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[3] We note that WCTL makes an argument in its opening evidence that BNSF's use of the Coal Car Load Profile ("CCLPS") system to monitor the quality of profiling practices at PRB mines is unreasonable because the CCLPS system is located several miles away from the mines and therefore is not observing the coal as it was actually loaded. WCTL Op. at 37-38. This argument shows a complete misunderstanding of the forces that act on coal in transit. As the train moves away from the mine, the coal in a poorly loaded railcar will tend to settle naturally into a breadloaf profile. Thus, the farther away from the mine that the profile is examined, the more likely the profile will conform with the necessary breadloaf profile.

} Since Mr. Nelson's concern is with the effectiveness of topper agents applied to vertical slopes, his endorsement of the Australian profile makes no sense.[4]

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}}[7] We note that cracks may form in a topper crust without leading to a substantial loss in coal dust. BNSF's Coal Loading Rule does not require a 100% elimination of coal dust losses, so some cracking of the topper cover does not necessarily invalidate the topper product. The question is how much coal is allowed to escape.

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[4] Mr. Nelson also suggests that a flat profile should be used instead, Nelson Op. VS at 22, but this would reduce the amount of coal able to be loaded in the railcar. Moreover, mines are unable to fill the space in the front and back of the car without a major modification to loading operations, reducing further the amount of coal that could be loaded into a car and also creating problematic air currents that could affect coal dust control. No other shippers have argued that a flat profile should be used.

[5] All documents referred to herein that contain a document reference number were produced in discovery, and copies are contained on the CD attached herein to BNSF's Reply Evidence and Argument. The CD also contains documents that have been excerpted in the exhibits, as well as work papers to graphs and charts included in the Reply Verified Statements of Mr. VanHook and Dr. Emmitt.

[6] *See* BNSF_COAL DUST II_00303945.

[7] *See* BNSF_COAL DUST II_00000315, which is available in the Appendix included with AECC's Opening Evidence and Argument.

Mr. Nelson also included {{

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When toppers are properly applied, the crust or film that is formed provides a clear protection against coal dust losses. We presented a photograph with our opening statement showing a {{

}} *See* Carré-Murphy Op. VS Ex. 6 at 1, which is attached as Exhibit 1 to this statement.

Indeed, at the same time that Mr. Nelson argues that toppers may not be effective on groomed coal loads, AECC and Mr. Nelson also argue that topper effectiveness may actually exceed the 85% reduction required by BNSF's Coal Loading Rule. {{

}} AECC Op. at 15; Nelson Op. VS at 38. In other words, the toppers were applied to coal loads that may have been groomed to some extent, and the untreated cars in the same test train may also have been groomed to some extent. Thus, the tests showed how much toppers reduced coal dust losses relative to cars that had been loaded using modified coal chutes.

We did not account for the effect of grooming in the Super Trial and subsequent tests because at the time of those tests, the performance of the mines in achieving effective grooming of coal loads was erratic. Therefore, we concluded that load profile grooming was unlikely to have a consistent impact on the level of coal dust losses in transit. {{

}} then the Super Trial and subsequent tests would simply show that the approved toppers achieved well over an 85% reduction in coal dust losses. This would mean that the reduction in coal dust lost from cars treated with toppers would be even greater when compared to cars that were not treated with toppers and were not loaded without any effort to groom the coal load profile, providing even more evidence that the approved toppers are effective in substantially curtailing in-transit coal dust losses.

Mr. Nelson also suggests that environmental concerns could be raised by the use of toppers. Nelson Op. VS at 32-35. There is absolutely no basis for Mr. Nelson's purported environmental concerns. The Super Trial Selection Committee, which consisted of shippers and mines, reviewed extensive information about the chemical properties of the toppers from the vendors before the toppers were approved by the committee for testing, including the MSDS and supplemental information requested by the mines.[8] The environmental sensitivity of the toppers was also tested by shippers and mines during the Super Trial. In some instances, chemical vendors reformulated their products to address concerns raised by a mine, which is what {{

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[8] The manufacturers' information about the toppers makes it clear that the toppers are non-hazardous and have no adverse environmental impacts. VanHook Op. VS Ex. 3 at 1, 11, 40.

II. The Shippers Have No Basis For Concern Over The Protocol Used In The Field To Carry Out BNSF's Passive Collector Tests in 2010 and 2011.

WCTL's witness Dr. Viz complains about BNSF's documentation of the protocol used in the field during the 2010 and 2011 passive collector tests. He claims that since BNSF did not document its efforts more extensively, Dr. Viz cannot evaluate the efforts that were taken. Viz Op. VS at 17-22. Dr. Viz even suggests that we deliberately sought to avoid keeping a written record of our efforts in the field, {{

}} WCTL Op. at 20; Viz Op. at 22. Mr. Nelson does not criticize our documentation of the Super Trial and subsequent 2011 tests, but he argues that we did not carefully implement our protocol in those tests. Nelson Op. VS at 48, 51.

WCTL's claim that we sought to keep from creating a record that would show how we carried out the field tests is clearly wrong and belied by the shippers' filings in this case. AECC submitted with its opening evidence in this proceeding a 400-page appendix containing more than 150 of BNSF's documents produced in discovery that relate to the passive collector tests. WCTL's CD similarly contains numerous BNSF documents on the subject. The extensive discovery record that the coal shippers themselves rely on provides substantial information relating to our activities in carrying out the passive collector tests.

For example, Dr. Viz argued that we did not follow a defined test plan, Viz Op. VS at 17, {

} *See* VanHook Op. VS Ex. 6 at 2-5. {{

}} The documents show that we carefully implemented the Super Trial and subsequent 2011 tests, contrary to Mr. Nelson's suggestion.

Moreover, contrary to the suggestions by WCTL, we kept shippers and their mine agents fully informed about the progress of the passive collector tests while the tests were being performed. As Mr. VanHook explained in his opening verified statement, there were several meetings between BNSF and the shippers and mines participating in the tests. *See* VanHook Op. VS Ex. 7 (attaching agendas of five Super Trial meetings with shippers and mines). We discussed at length the test protocol and data and results generated in the tests. There were no concerns raised at the meetings about the procedures that we carried out in the field or about the passive collector testing protocol after we explained the test design and discussed the data.

I declare under penalty of perjury that the foregoing is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.

Executed on November 14, 2012

E. Daniel Carré

I declare under penalty of perjury that the foregoing is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.

Executed on November 14, 2012

Mark Murphy

CARRÉ-MURPHY EXHIBIT 1

EXHIBIT 1
IS HIGHLY CONFIDENTIAL

CARRÉ-MURPHY EXHIBIT 2

EXHIBIT 2
IS HIGHLY CONFIDENTIAL

REPLY VERIFIED STATEMENT
OF
G. DAVID EMMITT

BEFORE THE
SURFACE TRANSPORTATION BOARD

STB Finance Docket No. 35557

REASONABLENESS OF BNSF RAILWAY COMPANY
COAL DUST MITIGATION TARIFF PROVISIONS

REPLY VERIFIED STATEMENT OF G. DAVID EMMITT

My name is G. David Emmitt. I am the President and Senior Scientist of Simpson Weather Associates ("SWA"). SWA is a scientific consulting firm, specializing in applied solutions to complex environmental issues. For more than twenty-five years, I have worked at SWA on researching and developing solutions to the problems posed by fugitive coal dust. I submitted verified statements on behalf of BNSF Railway Company ("BNSF") in the three rounds of evidence during *Coal Dust I*, as well as an additional verified statement in August 2011. My background and experience are described in my opening verified statement in *Coal Dust I*. My *curriculum vitae* is attached to this statement as Exhibit 1. As I described in those prior verified statements, SWA has worked closely with BNSF for the past seven years to monitor coal dust losses from moving trains in the Powder River Basin ("PRB") and to investigate various means to limit the loss of coal dust from railcars in transit.

In this statement, I respond to the Opening Verified Statements of Western Coal Traffic League ("WCTL") witness Mark J. Viz and Arkansas Electric Cooperative Corporation ("AECC") witness Michael A. Nelson regarding the design of the passive collector tests that BNSF carried out in the PRB in 2010 and 2011 and the reliability of the data generated in those tests. I explain in this statement that their criticisms are not valid. The tests were simple and straightforward. They were similar to tests that have been carried out in the past by other PRB shippers and mines. And they demonstrated beyond question that topper agents that have been approved by BNSF for use in the safe harbor provision of BNSF's Coal Loading Rule are highly effective at reducing coal dust losses in transit.

I. The Passive Collector Tests Were Well Designed To Produce The Data Necessary To Identify Effective Topper Agents.

BNSF had a simple business objective when it asked us to develop and carry out passive collector tests in 2010 and 2011. BNSF wanted to identify topper agents that would reduce in-transit coal dust losses by at least 85%. BNSF wanted to make sure the tests would be feasible to carry out under real world conditions in the PRB, which is one of the most active, high-density rail corridors in the world. BNSF also wanted its shippers to be comfortable with the design of the tests so that the shippers would understand the results and feel that they could use the results to make decisions about toppers that would effectively reduce in-transit coal dust losses.

Many of Dr. Viz's criticisms ignore the practical background for the tests. We wanted enough data to determine which toppers were effective, but we did not want to spend time on potentially interesting, but unnecessary collateral studies. It is certainly true that additional studies would provide even more information about toppers and about the dynamics of coal dust lofted from in-transit rail cars. I have been working on this issue for more than two decades, and I expect to continue studying the coal dust problem and performing additional research. But BNSF's objective was to develop data that could be used to determine if there were dust suppressants on the market today that could reduce in-transit coal losses by at least 85%.

The passive collector tests were very straightforward. Dr. Viz repeatedly tries to compare the passive collector tests to the coal dust monitoring approach that we helped BNSF set up using sophisticated electronic dust monitors. *See* Viz Op. VS at 7. Those electronic monitors and the standards we developed to interpret the electronic data were the subject of the proceedings in *Coal Dust I.* But the two approaches are fundamentally different. The passive collector tests involved a simple comparison of the amount of coal dust collected from passive collectors mounted on several cars on a train that contained coal that had been treated with a topper and several cars on the same train containing coal that was left untreated.[1] The tests did not rely either on sophisticated equipment or complex procedures – the data were easy to evaluate. Moreover, it did not take more than a relatively small number of trains to see how well particular topper agents were performing. There was no need for more complicated or extensive analytical procedures.

Indeed, Dr. Viz himself used procedures very similar to those we used in the 2010 and 2011 passive collector tests in studies that he performed in 2008 for the National Coal Transportation Association ("NCTA"). As requested by the NCTA, Dr. Viz sought to test the effectiveness of various topper agents. His tests used the same passive collectors that BNSF used in the 2010 and 2011 tests.[2] He did not carry out his tests on moving trains, as we did, but

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[1] Dr. Viz previously supported the use of passive collectors as a valid method to measure the relative effectiveness of a topper agent in reducing in-transit coal dust losses. *See* Exponent Inc., *Railcar Coal Loss and Suppressant Effectiveness Study: Final Report to the National Coal Transportation Association*, at 157 (Aug. 3, 2009) ("Exponent Report") {

} The Exponent Report was included in the folder with exhibits in the Verified Statement of Messrs. Carré and Murphy on the CD attached to BNSF's Opening Evidence and Argument filed in this proceeding. *See* AFS0007686.

[2] The Exponent Report states that a {

}

instead used large fans blowing on a stationary car to simulate the effect of wind. *See* Carré-Murphy Op. VS Ex. 9. He collected coal dust that accumulated in passive collectors attached to the rear sill of the railcar. He compared the amount of coal dust collected in passive collectors that had been attached to cars where the coal had been treated with toppers and a car where the coal had not been treated.

I also note that BNSF spent a substantial amount of time and effort during the 2010 and 2011 passive collector tests to keep its shippers informed about the test protocol and the data being collected. BNSF wanted to make sure that its shippers felt comfortable about the tests and had confidence in the data generated by the tests. I am not aware of any concerns that were raised by participating PRB shippers during those tests about the passive collector approach that we were using to test the effectiveness of toppers or about the reliability or meaningfulness of the data with respect to the approved topper agents. Dr. Viz's and Mr. Nelson's criticisms appear to be made up for this proceeding.

II. WCTL's And AECC's Criticisms Of The Design Of BNSF's Passive Collector Tests Are Misplaced.

I address below the specific criticisms that were made by Dr. Viz and Mr. Nelson about the design of the 2010 and 2011 passive collector tests. Their criticism falls into five categories: (1) the adequacy of the passive collectors; (2) the placement of the passive collector on the railcar; (3) the consideration of real world operating conditions; (4) the number of trains included in the test; and (5) the variability of the data collected.

1. Adequacy of The Passive Collectors

Dr. Viz raises questions about the adequacy of the passive collectors to accurately measure the amount of coal dust that is lost from loaded cars in transit. Viz Op. VS at 8-11.

Dr. Viz's purported concern is that he does not know what size particles are retained in the passive collectors. He argues that we should have carried out additional studies to measure the "cut point" of the passive collectors to determine what sized particles are collected in the passive collectors and what sized particles are blown through the "volute" on the side of the collectors. Viz Op. VS at 8-10. In fact, we do know the size range of particles collected by the passive collectors. Several years ago we conducted a sieve analysis of coal collected in the passive collectors, which we shared with the NCTA. The sieve analysis was an exhibit in *Coal Dust I.* (*Coal Dust I*, VanHook Op. Ex. 5 at 77.) {

}

While it is true that some extremely fine coal particles pass through the collectors by design, those particles would be so small that they would be almost gaseous, and would tend to drift away from the train. The collectors were designed to trap the larger particles that are more likely to settle into the ballast and onto the right-of-way.

Dr. Viz's credibility in raising the "cut point" issue now is highly suspect. Dr. Viz used the same passive collectors in his own 2008 tests. In his lengthy report on those tests, he did not refer once to a concern over the "cut point" of the collectors, which he now claims is a "fundamental flaw" in BNSF's tests.

2. <u>Placement of the Passive Collectors</u>

Dr. Viz makes two criticisms regarding the placement of the passive collectors on test cars. First, he claims we should have carried out elaborate air flow studies to determine the best location on the sill of a car to measure coal dust losses. Once again, Dr. Viz's concern is unfounded because we did air flow studies several years ago in connection with our work with Norfolk Southern to determine where passive collectors should be located. Our study involved a rack mounted on the back of a car with nine passive collectors at different heights and distances from the side. We found that the dust collected was greatest in the three passive collectors mounted on the rear sills. However, the variability between passive collectors mounted along the rear sill was unremarkable. In any event, in most cases, the passive collectors were placed on the rear sill of the car near the ladder where it was easier and safer to install.

Dr. Viz also questions our placement of passive collectors on cars within a train, suggesting that coal dust losses might vary based on the location of a particular car within the train. {{

}}

3. Consideration of Real World Operating Conditions

Dr. Viz and Mr. Nelson both criticize our tests based on a supposed failure to account adequately for the real world operating conditions that affect coal dust losses in transit. Viz Op. VS at 19, 27; Nelson Op. VS at 40-44. Dr. Viz claims that we should have accounted for the actual weather conditions for each test train through a complex "normalization" of the passive collector data. According to Dr. Viz, such normalization would have been done using the Rail Transport Emission Profiling System ("RTEPS") data for each train to create a form of "stress index" that could have been used to interpret the data gathered from each test train. The RTEPS is a small mobile weather station that we mounted on a car in each test train to account for weather conditions present during the movement of the test train.

We considered whether to develop a stress index for the BNSF tests using the RTEPS data, but we concluded it was not necessary and would unduly complicate the analysis. We collected extensive weather data for each train so that we could refer to that data if questions were raised about the results on a particular train. We also used the RTEPS data to identify trains that operated during precipitation events so that these trains could be excluded from our analysis. I explain below why such an exclusion of data was necessary. If we had also sought to use the RTEPS data to adjust the actual quantity of coal dust that was collected to account for specific weather variables, we would have injected a subjective element into our analysis that would have called into question the reliability of the data. In a set of rail trip studies in the 1990's for another Class I railroad, we developed a Trip Stress Index using data collected from the RTEPS. From these studies, we concluded that comparing treatment results between different trains with a "stress" adjustment was far inferior to the approach used in the Super Trial tests where we compared the relative weights between treated and untreated cars on the same test train subject to the same weather conditions.

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[3] *See* Exponent Report at 157 {

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Mr. Nelson makes a different argument concerning weather conditions. He argues that the tests only show how toppers perform under idealized conditions since BNSF excluded results when it rained and when there was irregular topper application. Nelson Op. VS at 40-44. The reason for excluding trains that ran during precipitation is obvious. When precipitation wets the surface of the coal, it limits the amount of coal dust from being blown out of a car whether or not the coal was treated with a topper. But we wanted to determine how effective particular topper agents are in controlling in-transit coal dust losses under conditions without precipitation. If we had included the results from tests done during precipitation events, we would not have collected meaningful data regarding the effectiveness of the toppers.[4] Mr. Nelson is wrong to suggest that we excluded data for trains that ran during precipitation because of a concern that precipitation might affect the ability of the topper to provide dust control. {

} *See* VanHook Op. VS Ex. 10 at 8.

Aside from excluding trains for precipitation, in two cases, we excluded data from trains where we knew that there had been a problem with the topper application. At the time of the 2010 and 2011 field tests, the mines and vendors did not have much experience in the application of toppers. We are confident that over time, as the mines gain experience, the quality of application will improve. However, our objective was to determine how effective a particular topper agent was, and errors in the application could distort that assessment and would not be an

[4] Dr. Viz similarly {

}

Exponent Report at 65.

adequate representation of the product's effectiveness. Therefore, where we were aware of a problem with the application of a topper, we excluded the data. First, we excluded some { } trains in 2011 where the vendor experienced problems with application, including a problem with the spray bar.[5] Second, we excluded data from a { } train because there was a discrepancy regarding which section of the train was treated.[6]

Messrs. Nelson and Viz also argue that BNSF did not conduct tests in cold weather, hot weather, or windy conditions. Nelson Op. VS at 41-43; Viz Op. VS at 3. But the Super Trial included tests on windy days and tests with maximum surface temperatures over 100 degrees. With respect to application of topper agents during cold conditions, as Mr. Nelson points out, the Super Trial was conducted in March through September. However, the average temperature of Gillette, Wyoming in March is 31 degrees, and only 42 degrees in April.[7] For practical reasons, we did not conduct Super Trial tests in the middle of winter. But the topper chemicals were specifically designed to be used in cold weather conditions. For instance, Nalco's Dustbind Plus has a freeze point of -20ºF.[8] {

} *See* VanHook Op. VS Ex. 10 at 9-10.

4. Sample Size

Dr. Viz further criticizes our tests on grounds that we did not test enough trains to achieve statistical significance. Viz Op. VS at 23-25. Ten to seventeen trains were included in the analysis of each approved topper agent. Given the relatively low variability in dusting from

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[5] *See* BNSF_COAL DUST II_00158264, which is contained in AECC's Opening appendix.

[6] We also excluded one { } train that experienced mechanical problems.

[7] Weatherbase.com Weather Almanac, *located at* http://www.weatherbase.com/weather/weather.php3?s=13057&refer=&cityname=Gillette-Wyoming-United-States-of-America (last accessed Nov. 8, 2012).

[8] *See* http://www.nalco.com (last accessed Nov. 14, 2012).

treated sections' results in each test, it was not necessary to run a larger number of test trains. The results were clear and consistent. In any event, BNSF carried out recognized statistical analyses in each case to ensure that the data generated statistically significant results. *See* VanHook Op. Ex. 13 & 14. Dr. Viz used even {

} Exponent Report at page 65.

5. Data Variability

Dr. Viz argues that the variability in the amount of coal dust collected in the passive collectors calls into question the ability to reach meaningful conclusions about the effectiveness of the tested toppers. This is not correct. In fact, there was large variability only in the amount of coal dust lost from railcars that were untreated. This is to be expected. We know that in-transit coal dust losses are episodic and highly variable when nothing is done to prevent coal dust from escaping loaded cars. This issue was discussed at length in the *Coal Dust I* proceeding. *See Coal Dust I*, BNSF Op. at 14; Emmitt Op. VS at 4. But what we saw from the passive collector data was a low degree of variability in the results from treated cars. These results were important because they gave us confidence that the treated toppers were performing as they should to keep in-transit coal dust losses down regardless of conditions that would otherwise produce coal dust losses.

Indeed, the low degree of variability in coal dust losses from treated cars is evident from a simple visual review of the data gathered for each of the test trains for the toppers found to be effective in reducing coal dust losses by at least 85%. As seen below, coal dust losses are consistently low for treated cars whereas the coal dust from untreated cars varies substantially.

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One way to measure variability is to calculate the standard deviation of the data from a particular data set.[9] A small standard deviation means that there is very low variability. In other words, when a data set has a small standard deviation, most of the data values are clustered around or are close to the mean, or average. The table below shows the standard deviation for data from treated and untreated cars tested in the Super Trial. As shown in the table, the standard deviation is very small for treated cars as compared to untreated cars in the same trains, showing that the results for treated cars were very consistent. This consistency is an important feature of a good topper agent, which should work consistently across different operating conditions to reduce in-transit coal dust losses.

The table also shows the standard deviation for data from body treatment and compaction tests. Coal shippers acknowledge that body treatment and compaction are not effective coal dust mitigation approaches. The data, as well as the standard deviation for the data, collected in the tests of those approaches bears out this conclusion. The variability in data for cars where body treatment or compaction was used is either similar to the variability where no treatment was done (body treatment) or higher than the control trains (compaction).

[9] Dr. Viz argues that BNSF did not calculate standard deviation, Viz Op. VS at 25, but he is incorrect. {{

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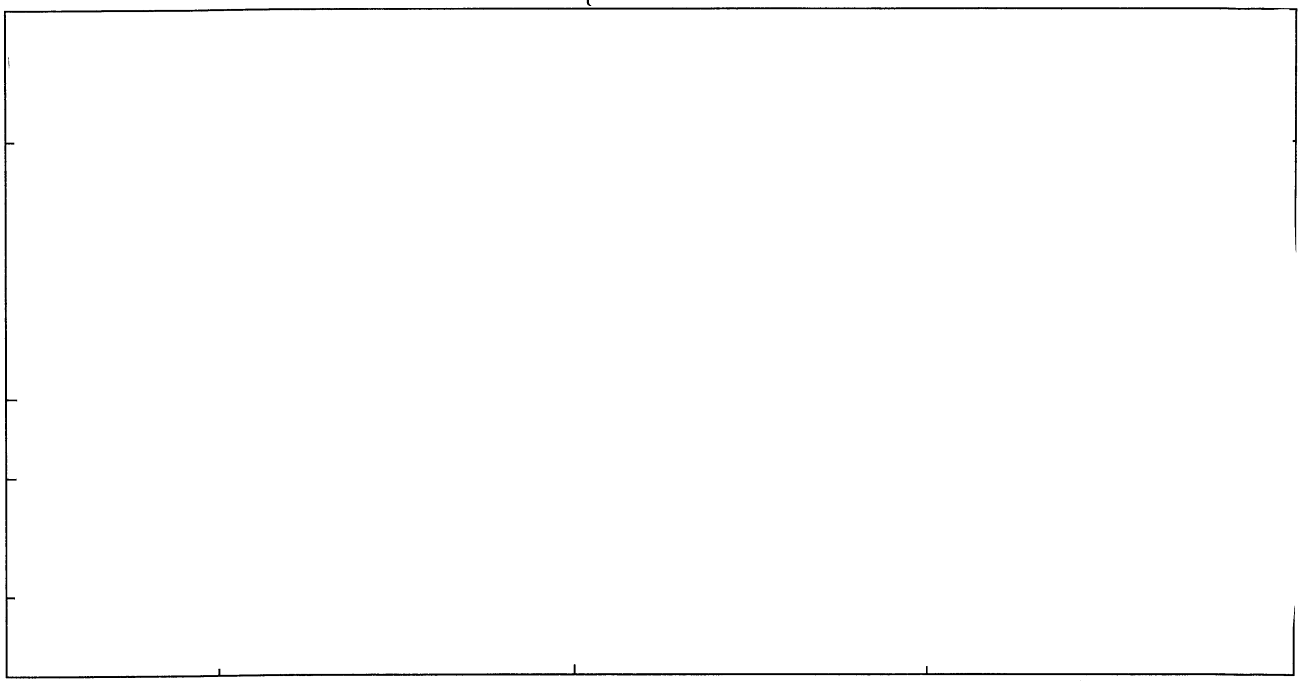

III. The Data We Gathered On Tests Of Three Inch Coal Do Not Show A Substantial Reduction In Coal Dust Losses.

Some coal shippers appear to be taking the position that they do not need to use toppers if they use 3 inch "minus" coal (i.e., coal that has been crushed to pieces that fit between rollers spaced 3 inches apart). The shippers claim that less dust is produced in the mine process in crushing 3 inch minus coal as compared to 2 inch minus coal, therefore the use of 3 inch minus coal in loaded coal cars is likely to produce less coal dust losses in transit. They claim that early tests done by BNSF show that 3 inch minus coal can reduce coal dust losses in transit.

I agree as a general matter that somewhat less coal dust is produced in the mining process if the coal is crushed to a larger size. However, the crushing process inevitably creates a substantial amount of coal dust and smaller coal dust particles even when coal is crushed to 3

[10] The source files for Table 3 are identified in the worksheet on the CD accompanying BNSF's Reply Evidence and Argument. These files are also contained on the CD.

inch chunks. That is why we refer to 3 inch coal as 3 inch "minus" coal. Crushing coal to 3 inches does not eliminate small coal particles. Moreover, the process of loading coal into railcars produces substantial additional coal dust, regardless of the size of the coal chunks. As coal is released from silos above the car, substantial coal dust is created as the coal chucks grind against one another on the way down the silo and into the car, and the coal dust is deposited in the loaded coal car along with the coal chunks. It is not possible to ensure that only the 3 inch pieces are loaded on top of the railcar as opposed to the smaller fines or coal pieces. Indeed it is easy to see small fines and coal pieces on top of the railcars loaded at a mine that is crushing coal to pieces no larger than 3 inches. *See* Exhibit 2 (pictures of a railcar with fine coal particles and a railcar with coarse coal chunks from the same mine that uses 3 inch minus coal). Regardless of the size of the coal chunks, if the coal in the railcar is left untreated, the coal dust that is created in the crushing and loading process will still be free to escape in transit.

WCTL's witness Dr. Barbaro says that "[t]raditionally, PRB coal was crushed to 2"." Barbaro Op. VS at 2. However, this is not accurate since a number of PRB mines have used 3 inch minus coal for years. Several PRB mines were using 3 inch minus coal at the time of the 2005 derailments.

In our early PRB studies of coal dust for BNSF, we acknowledged the possibility that 3 inch minus coal might produce less coal dust in transit than 2 inch minus coal, and we carried out some preliminary tests to see if there was any reason to believe that the use of 3 inch minus coal could effectively deal with in-transit coal dust losses. The data we gathered suggested that only a modest reduction in coal dust losses could be achieved by using 3 inch coal.

The tests we did on 3 inch minus coal were different from the Super Trial tests in an important respect. As noted above, in the Super Trial, we looked at the relative reduction in coal dust losses by comparing coal dust accumulations in passive collectors mounted on cars within a single train. In this way, we compared coal dust losses on a train using coal from the same mine, loaded on the same day, and under the same weather conditions. Thus, if conditions were especially windy on a particular day, the wind would affect results from both the treated and untreated cars on the train. This approach is the most scientifically significant one that has been developed to date.

In contrast, when we tested coal dust losses from cars loaded with 3 inch minus coal, we ran an entire train loaded with 3 inch coal. We ran 5 test trains this way. We also ran 5 test trains that were loaded with 2 inch minus coal. But the 2 inch coal test trains originated at different mines, and therefore used different coal. The 2 inch minus coal test trains also ran at different times under different weather conditions from the 3 inch minus test trains. Therefore, when the amount of coal dust losses measured from cars on trains with 2 inch minus coal is compared to the amount of coal dust losses from cars on trains with 3 inch minus coal, the differences could well be attributable to different coal at different mines or different weather conditions. This (far less preferred) approach was carried out due to operational restrictions at the mines.

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} Although we advised shippers of the test limitations, WCTL and Dr. Viz rely on the results without acknowledging the limitations. I am

[11] The presentation to shippers was contained on the CD accompanying Dr. Viz's verified statement filed with WCTL's Opening Evidence and Argument.

surprised that Dr. Viz is willing to accept the results of the 3 inch minus coal tests while criticizing the results of the far more rigorous Super Trial tests. Dr. Viz's willingness to endorse the tests done on 3 inch minus coal indicates to me that he is more interested in the results of the test than in the underlying test methodology or the reliability of the data.

In any event, the data collected in these tests show that the use of 3 inch minus coal produces only a modest reduction in coal dust losses. {

} Therefore, it is clear from the data that the apparent reduction in coal dust losses was attributable to a large extent to the wind conditions on the days when the tests were run, not to the size of the coal.

The use of 3 inch minus coal, with or without grooming of loaded coal, would reduce in-transit coal dust losses to some extent, but it cannot be the only technique taken to achieve effective dust suppression, even with proper grooming. Toppers will still be needed to achieve a substantial reduction in coal dust losses. There is no reason to believe that a switch to 3 inch minus coal, even with consistent grooming, would have a significant impact on coal dust fouling, and there certainly is no reason to believe that such an approach, without the use of toppers, would meet BNSF's 85% reduction requirement.

I declare under penalty of perjury that the foregoing is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.

Executed on November 14, 2012

G. David Emmitt

EMMITT EXHIBIT 1

GEORGE DAVID EMMITT

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EDUCATION:

Ph.D., 1975, University of Virginia, Charlottesville, VA, Major: Meteorology
"Momentum redistribution by enhanced mixing over a heated island"

M.S., 1972, University of Virginia, Charlottesville, VA, Major: Environmental Sciences, "Wind wave prediction on impounded water bodies: a case study, Smith Mountain Lake"

B.S., 1969, Eastern Nazarene College, Wollaston, Massachusetts, Major: Physics

PRESENT EMPLOYMENT:

April 1998-present	President and Senior Scientist, Simpson Weather Associates, Inc.
July 1992-present (int)	Research Associate Professor (Scholar in Residence), University of Virginia, Department of Environmental Sciences

PREVIOUS EMPLOYMENT:

August 1986-April 1998	Executive Vice President & Senior Scientist, Simpson Weather Associates, Inc.
August 1983-August 1986	Vice President, Simpson Weather Associates, Inc.
July 1981 - August 1983	Visiting Space Scientist, Universities Space Research Association, NASA/MSFC, Huntsville, AL

January 1978 - December 1980Research Assistant Professor, University of Virginia, Department of Environmental Sciences, Charlottesville, VA

August 1978 - July 1981 Cloud Physics Consultant, Butler National Corporation
Lenexa, KS

August 1976 - January 1978 Visiting Scientist, Max-Planck Institut fur Meteorologie
Hamburg, West Germany

August 1975 - August 1976 Research Associate/Assistant Professor, University of Virginia

PROFESSIONAL ACHIEVEMENTS:

2008: Appointed to the Interactive Information and Processing Systems Committee of the American Meteorological Society
2007: Appointed Member of ISETCSC External Advisory Committee
2006: Nominated for the National Academy of Sciences (Atmospheric Panel)
2005: Member of Mission Definition Team for global laser wind sounder
2004: Selected member of NOAA's Thorpex Science Implementation Team
2002: Elected Fellow, American Meteorological Society
2001: Selected member of NASA's Global Tropospheric Wind Sounder Science Team
2000: Selected member of NASA's Code Y Information Technology Subcommittee of Earth Science Advisory Committee
2000: Elected Chair of NASA's Working Group on Space-based Hydrology Mission
1999: Elected Chair of NASA's Consolidated Space Operations Contract (CSOC) Science Working Group
1999: Selected member of NASA's New Data Information System Study team
1998: Elected Chairman, NASA's EOSDIS Science Panel
1997: Mission Scientist on NASA's Space Readiness of Coherent Lidar Experiment
1996: Chairman, NASA/GSFC's DAAC User Working Group
1994: Received "Heros of Reinvention" Award from Vice President Gore in recognition of work done on NASA's Earth Observing System Data Information System
1993: Appointed to NASA's Focus Team on Science and Data Organization/Access
1992: Selected to serve on NASA/CNES (USA/French) Joint Science Team for a space-based Doppler lidar.

1991: Selected to serve on NASA's EOSDIS Version 0 Science Advisory Panel.

1991: Elected to serve as Chairman of NASA's Hydrologic Cycle Data Access and Archive Working Group.

1990: Selected as member of NASA's Earth Observing System Data Information System Science Advisory Panel.

1989: Selected to serve on NASA's Lidar Atmospheric Wind Sounder Science Team to guide the development, deployment and use of a space-based lidar for global wind measurement.

1988: Served on NASA's GLOBE science committee for research on the global distribution of aerosol backscatter.

1987: Served on EPA's Meteorology Division In-House Peer Review Panel.

1987: Served on the 5-man Cloud/Chemistry Cloud Physics Organization's Experiment Design Committee (DOE/NSF).

1986: Selected to serve on NASA panel for a Lidar Atmospheric Wind Sounder (LAWS) as an EOS facility.

1985: Served as member of the NASA organizing committee for Symposiums and Workshops on Global Wind Measurements.

1985: Served on advisory panel for the SPACE/MIST storm research field experiment (1986).

1984-87: Member of American Meteorological Society's Cloud Physics Committee.

1982: Received NASA Award for work on the design, execution and analysis of a flight program to sample the exhaust cloud associated with the launch of the NASA Shuttle.

1981: Received NASA Group Award for research done with the NASA airborne Doppler lidar wind measurement experiments conducted during the CCOPE in Montana.

PUBLICATIONS: Reviewed

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1974: The structure of heat islands (P.D. Tyson, M. Garstang and G. D. Emmitt, 1974:. Occasional paper #12, Department of Geography and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa, 71 pp.

1975: The first 1000 m above a GATE ship (M. Garstang, J. Simpson, G. D. Emmitt, G. Barnes, E. Tollerud). Paper presented at the 9th Tech. Conf. on Hurricanes and Tropical Meteorology, Key Biscayne, FL.

1975: Momentum redistribution by enhanced mixing (G.D. Emmitt). Paper presented at the 9th Tech. Conf. on Hurricanes and Tropical Meteorology, AMS, May, Key Biscayne, FL.

1977: The U. S. GATE tethered balloon system: A discussion of the measurements (M. Garstang, G. D. Emmitt, G. Barnes, D. Fitzjarrald, E. Tollerud and J. D. Brown). Part 3 of Report #2 NSF grant #ATM74-21702 and Final Report on NOAA contract #04-6-
158-44067, 89 pp.

1981: Rain Augmentation in Nelspruit (M. Garstang, G. D. Emmitt and B. Kelbe). Final Report to Water Research Commission, Pretoria, R.S.A., p. 266.

1982: MSFC Doppler lidar experiments and operations plans for 1982/83 ground based research (G.D. Emmitt, J. W. Bilbro, G. H. Fichtl and D. Fitzjarrald). ES-84, NASA, Marshall Space Flight Center, Huntsville, AL 35812.

1984: NASA/MSFC ground-based Doppler lidar Nocturnal Boundary Layer Experiment (NOBLEX)(G.D. Emmitt). Prepared for Marshall Space Flight Center, Huntsville, AL, under Contract NAS8-34010. NASA Contractor Report 3778.

1984: Evaluation of two 1-D cloud models for the analysis of VAS Soundings (G.D. Emmitt). Prepared for Marshall Space Flight Center, Huntsville, AL, under Contract NAS8-34767. NASA Contractor Report 3771.

1985: Convective storm downdraft outflows detected by NASA/ MSFC's airborne 10.6 □m pulsed Doppler lidar system (G.D. Emmitt). Prepared for Marshall Space Flight Center, Huntsville, AL, under Contract NAS8-35597. NASA Contractor Report 3898.

1986: Simpson Weather Associates, Inc. and Kansas International Corporation Limited, Program for Atmospheric Water Supply, 1983-86 Final Report to the Water Research Commission, Pretoria, South Africa.

1987: Contributor to Laser Atmospheric Wind Sounder (LAWS); Instrument Panel Report (Chairman R. J. Curran) (G.D. Emmitt), NASA Earth Observing System, Volume IIg, NASA Headquarters, Washington, D.C.

1994: Norfolk Southern Rail Emission Study (NSRES). Final Rept., February.

1999: NASA Post-2002 Land Surface Hydrology Mission Component for Surface Water Monitoring: HYDRO-SAT HYDROlogical SATellite (C. Vörösmarty, C. Birkett, L. Dingman, D. Lettenmaier, Y. Kim, E. Rodriguez and G.D. Emmitt). Report from the NASA Post-2002 Land Surface Hydrology Planning Workshop, Irvine, CA, April 12-14.

PRESENTATIONS: Seminars/Workshops

2007: Integrating airborne DWL and PBL Models in realtime (G. D. Emmitt, C. O'Handley, S.A. Wood and S. Greco), Working Group on Space-Based Lidar Winds, Miami, FL, February 6 -9.

2007: Prospecting for thermals using an airborne DWL (G.D. Emmitt and C. O'Handley), Working Group on Space-Based Lidar Winds, Miami, FL, February 6 -9.

2007: Correlations of wind shear and clouds: numerical model results (S.A. Wood and G.D. Emmitt), Working Group on Space-Based Lidar Winds, Miami, FL, February 6 -9.

2007: Simulations of hybrid DWL performance with GLAS cloud penetrating statistics (G. D. Emmitt and S. A. Wood), Working Group on Space-Based Lidar Winds, Miami, FL, February 6 -9.

2007: Doppler wind lidar flights: prospecting for vertical motions to enhance SkyWalker performance (G. D. Emmitt, C. O'Handley and S. Greco), DARPA , Arlington, VA, January 31.

2006: Adaptive targeting of a space-based Doppler wind lidar: data and technology implications (G. D. Emmitt), SPIE Europe Remote Sensing, Stockholm, Sweden, September 11 – 14.

2006: Using ICESAT observations to obtain CFLOS statisitics for use in the design of space-based lidars (invited paper) (G. D. Emmitt and S. Greco), SPIE Europe Remote Sensing, Stockholm, Sweden, September 11 – 14.

2006: Tropospheric wind profiler: multi-spectral DWL (G. D. Emmitt), NASA/ESTO lidar workshop, Washington, DC, June.

2006: GLAS cloud statistics and their implications for a hybrid mission (G. D. Emmitt and S. Greco), Working Group on Space-Based Lidar Winds, Welches, OR, June 28 – 30.

2006: New sampling perspectives for TODWL (G. D. Emmitt and C. O'Handley), Working Group on Space-Based Lidar Winds, Welches, OR, June 28 – 30.

2006: Development of a remote sensing testbed for tropospheric air quality and winds (M. Newchurch, et.al and G. D. Emmitt), Working Group on Space-Based Lidar Winds, Welches, OR, June 28 – 30.

2006: OSSE plans related to a hybrid mission and ADM follow-on missions (G.

D. Emmitt), Working Group on Space-Based Lidar Winds, Welches, OR, June 28 – 30.

2006: Planning for airborne DWL participation in PARC (G.D. Emmitt and M. Hardesty), Working Group on Space-Based Lidar Winds, Welches, OR, June 28 – 30.

2006: April test train: preliminary CCLPS results, NCTA specials meeting, Denver, CO, June 21.

2006; Optimizing rail availability for PRB coal transport: summary of trends (G. D. Emmitt), NCTA special meeting, Denver, CO, June 21.

2006: Recommendations for the PRB coal loss mitigation program (G. D. Emmitt), NCTA special meeting, Denver, CO, June 21.

2006: Coal loss study update (G. D. Emmitt and E. D. Carre), NCTA workshop, St Louis, MO, February 21.

2006: CCLPS estimates of coal losses by wind erosion (G. D. Emmitt and E. D. Carre), NCTA workshop, St Louis, MO, February 21.

2006: Adaptive targeting schemes and their technology implications (G. D. Emmitt), Working Group on Space-Based Lidar Winds, Key West, FL, January 16.

2006: Latest simulations for a tropospheric wind sounder on NPOESS and beyond (G. D. Emmitt, S. A. Wood, B. Gentry and M. Kavaya), Working Group on Space-Based Lidar Winds, Key West, FL, January 16.

2006: NPOESS P3I and follow-on threshold operational mission (G. D. Emmitt and S. A. Wood), Working Group on Space-Based Lidar Winds, Key West, FL, January 16.

2006: Status of TODWL and GWOLF (G. D. Emmitt and C. O'Handley), Working Group on Space-Based Lidar Winds, Key West, FL, January 16.

2006: Adaptive targeting OSSEs for planning a space-based Doppler wind lidar (G. D. Emmitt, S. A. Wood, S. Greco, M. Matsutani, J. Woolen, Z. Toth and Y. Song), AMS annual meeting, IOAS-AOLS, January.

2005: Using airborne lidar data in models: an adaptive targeting approach (G. D. Emmitt), UAH, Huntsville, AL Seminar series, November 28.

2005: Coal losses from railcars: summary of data analyses (G. D. Emmitt, D. Carre, L.Wood and C. Palomares), NCTA special meeting, Ft. Worth, TX, November 15.

2005: OSSEs at GSFC (G. D. Emmitt and R. Atlas), Working Group on Space-based Lidar Winds, Welches, OR, June 28 – 30.

2005: OSSEs at NCEPm(M. Matsutani, J. Woolen, Z. Toth, G. D. Emmitt and S. Lord), Working Group on Space-based Lidar Winds, Welches, OR, June 28 – 30.

2005: Investigation of the utility of airborne DWL data in mesoscale models (G. D. Emmitt, S. A. Wood and S. Greco, Working Group on Space-based Lidar Winds, Welches, OR, June 28 – 30.

2005: Scaling TODWL and GWOLF performance to space (G. D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, Welches, OR, June 28 – 30.

2005: SNR issues: definitions, theory and practice (G. D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, Welches, OR, June 28 – 30.

2005: Simulating a dual technology DWL at 833 km (G. D. Emmitt, S. Wood, M. Kavaya and B. Gentry), Working Group on Space-based Lidar Winds, Welches, OR, June 28 – 30.

2005: Preliminary results of GLAS data base study of CFLOS statistics (G. D. Emmitt and S. Greco), Working Group on Space-Based Lidar Winds, Sedona, AZ, February 1 – 3.

2005: Mars related opportunities for DWL applications (G. D. Emmitt, G. Koch, M. Kavaya and U. Singh), Working Group on Space-based Lidar Winds,Sedona, AZ, February 1 – 3.

2005: Status of NCEP and GSFC OSSEs with DWLs (S. Lord, R. Atlas, G. D. Emmitt), Working Group on Space-based Lidar Winds,Sedona, AZ, February 1 – 3.

2005: Investigation of backscatter/wind correlations using an airborne 2-micron coherent Doppler wind lidar (G. D. Emmitt, C. O' Handley, D. Bowdle and H. Jonsson), Working Group on Space-based Lidar Winds,Sedona, AZ, February 1 – 3.

2005: Airborne WindSat Validation Program (Gasiewski, A. J, P. Gaiser, H.

Graber, and G. D. Emmitt), White paper submitted to NPOESS (Mango), January 11.

2004: Airborne Doppler lidar for WindSat Cal/Val (G. D. Emmitt, S. A. Wood, C. O'Handley, S Greco, H. Jonsson), WindSat Cal/Val and Science Meeting, Solomons Md, 17-18 November.

2004: The importance of CALIPSO to the design of follow-on lidars, inparticular, Doppler wind lidars (G. D. Emmitt), CALIPSO Workshop, NCEP, Silver Springs, Md., June 10.

2004: Comparison of measured and modeled aerosol backscatter during TODWL/2003 (D. Bowdle, G.D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, Sedona, AZ, January 27-29.

2004: Using surface returns to correct for aircraft motion induced errors (G.D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, Sedona, AZ, January 27-29.

2004: The DSLM on-line (S. Wood and G.D. Emmitt), Working Group on Space-based Lidar Winds, Sedona, AZ, January 27-29.

2004: GWOLF and VALIDAR comparisons (M. Kavaya, G. Koch, G.D. Emmitt, and S. Wood), Working Group on Space-based Lidar Winds, Sedona, AZ, January 27-29.

2004: Comparisons of TODWL soundings with MM5, microwave sounders, towers, and other wind sensors (G.D. Emmitt, S. Wood, S. Greco, and C. O'Handley), Working Group on Space-based Lidar Winds, Sedona, AZ, January 27-29.

2004: Status of IPO-funded hybrid feasibility and airborne testbed (G.D. Emmitt, B. Gentry, M. Hardesty, and M. Kavaya), Working Group on Space-based Lidar Winds, Sedona, AZ, January 27-29.

2004: OSSEs for realistic DWL concepts (G.D. Emmitt and R. Atlas), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2004: Potential contribution of multiple Doppler wind lidars to a prospective CHEM/ CLOUD experiment in Huntsville, Alabama (G.D. Emmitt, M. Newchurch, and D. Bowdle), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2004: Using TODWL and in situ particle probes to understand the backscatter signature of marine, boundary layer organized structures (D. Bowdle, G.D.

Emmitt, and S. Wood), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2004: Using TODWL data to validate marine boundary layer models (R. Foster, R. Brown, C. O'Handley, and G.D. Emmitt), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2004: Hybrid DWL simulations for OSSEs (G.D. Emmitt and S. Wood), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2004: Accuracy of airborne Doppler lidar using threading and ground returns (G.D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2004: Status of TODWL and GWOLF activities and plans for future airborne DWL (G.D. Emmitt, B. Gentry, M. Hardesty, and M. Kavaya), Working Group on Space-based Lidar Winds, Frisco, CO, June 29-July 1.

2003: Simulating cloud and water vapor motion winds form a nature run (C. O'Handley and G. D. Emmitt), March 6.

2003: IPO Cal/Val for a space-based wind observing system (G.D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, Oxnard, CA, February 17-19.

2003: Status of Hybrid DWL study (G.D. Emmitt, S. Wood, and G.D. Spiers), Working Group on Space-based Lidar Winds, Oxnard, CA, February 17-19.

2003: GWOLF 2003 (G.D. Emmitt, C. O'Handley, M. Kavaya and G. Koch), Working Group on Space-based Lidar Winds, Bar Harbor, ME.

2003: IPO-funded airborne lidar experiments: TODWL 2003 (G.D. Emmitt, S. Greco, C. O'Handley, and S. Wood), Working Group on Space-based Lidar Winds, Bar Harbor, ME.

2003: Investigation of the marine boundary layer and validation of numerical models using an ONR/IPO airborne Doppler wind lidar (G.D. Emmitt), NRL seminar, Moneterey, CA, August.

2003: Airborne Doppler lidar for basic atmospheric research and calibration of space-based wind sensors (G.D. Emmitt , B. Bluth and H. Jonsson), NASA/MSFC seminar, Huntsville, AL.

2003: Airborne Doppler lidar investigation of flow within complex terrain and marine boundary layers (G.D. Emmitt), Invited talk, Arizona State University, November.

2002: Hybrid DWL: simulations of expected data products for use in OSSEs (D. Emmitt and S. Wood), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: Status of IPO's Cal/Val study: the TODWL Spring 2002 checkout flights (D. Emmitt, C. O'Handley, and D. Bowdle), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: Investigation of the marine LAS with an airborne Doppler wind lidar (D. Emmitt, C. O'Handley, D. Bowdle), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: Nadir angle dependence of water surface return at 2 microns using TODWL (D. Emmitt and C. O'Handley), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: TODWL: Between flight programs (D. Emmitt and P. Gatt), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: Technology plan for the coherent subsystem of a space-based hybrid Doppler wind lidar (M. Kavaya, A. Amzajerdian, U. Singh, J. Yu, and D. Emmitt), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: Technology roadmap for a direct detection Doppler lidar subsystem (B. Gentry, M. McGill, G. Schwemmer, B. Heaps, and D. Emmitt), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: Status of the Doppler Lidar Simulation Model (DLSM) for GTWS (S. Wood and D. Emmitt), Working Group on Space-based Lidar Winds, North Conway, NH, July 15-18.

2002: A space-based coherent wind lidar point design for the NASA/NOAA Draft Science and Operational Data Requirements (M. Kavaya, D. Emmitt, R. Frehlich, F. Amzajerdian, U. Singh), Working Group on Space-based Lidar Winds, Key West, FL, January 23-25.

2002: Status of TODWL and other IPO funded activities (G.D. Emmitt et al.), Working Group on Space-based Lidar Winds, Key West, FL, January 23-25.

2002: A hybrid DWL concept for instrument and mission analyses (D.Emmitt, B. Gentry, and M. Kavaya), Working Group on Space-based Lidar Winds, Key West, FL, January 23-25.

2002: Discussion of the GTWS reference atmospheres and their use (D. Emmitt), Working Group on Space-based Lidar Winds, Key West, FL, January 23-25.

2001: Status of bracketing OSSEs at NCEP for several DWL notional concepts (G.D. Emmitt), Working Group on Space-based Lidar Winds, Oxnard, CA, February 7-9.

2001: Developing a CAL/VAL plan for a space-based Doppler wind lidar (G.D. Emmitt), Working Group on Space-based Lidar Winds, Oxnard, CA, February 7-9.

2001: IPO funded airborne DWL for CAL/VAL planning (G.D. Emmitt), Working Group on Space-based Lidar Winds, Oxnard, CA, February 7-9.

2001: Updated report on Hybrid technology DWLs (G.D. Emmitt), Working Group on Space-based Lidar Winds, Oxnard, CA, February 7-9.

2000: Adaptive targeting study for DWL operations (G.D. Emmitt, Z. Toth, E. Kalnay, R. Atlas). Working Group on Space-based Lidar Winds, Boulder, CO, June 21-23.

2000: Update on the feasibility study for a hybrid technology DWL (G.D. Emmitt). Working Group on Space-based Lidar Winds, Boulder, CO, June 21-23.

2000: Simulated DWL observations for the global OSSEs at NCEP: Coverage, accuracy, and systematic errors (G.D. Emmitt). Working Group on Space-based Lidar Winds, Boulder, CO, June 21-23.

2000: HYDROSAT: An opportunity for space-based Doppler lidar (G.D. Emmitt). Working Group on Space-based Lidar Winds, Boulder, CO, June 21-23.

2000: Update on IPO-funded wind lidar studies (G.D. Emmitt). Working Group on Space-based Lidar Winds, Daytona Beach, FL, January 26-28.

2000: Status of the Hybrid DWL feasibility study (G.D. Emmitt). Working Group on Space-based Lidar Winds, Daytona Beach, FL, January 26-28.

2000: HYDRA-SAT and the role of coherent Doppler lidar (G.D. Emmitt). Working Group on Space-based Lidar Winds, Daytona Beach, FL, January 26-28.

2000: The role of DWL OSSE's and appropriate metrics for a commercial wind data buy
(G.D. Emmitt). Working Group on Space-based Lidar Winds, Daytona Beach, FL, January

26-28.

1999: Recent results of IPO funded OSSE efforts at NCEP and GSFC (G.D. Emmitt). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: SPARCLE data product validation plan: Mission scientist's assessment (G.D. Emmitt, R. Menzies and D. Bowdle). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: SPARCLE "Challenges" B Pointing (G.D. Emmitt, T.Miller and G. Spiers). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: SPARCLE performance modeling (G. Spiers and G.D. Emmitt). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: Follow on mission(s) for SPARCLE (M. Kavaya, G.D. Emmitt and T. Miller). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: Status of OSSEs at NCEP (R. Atlas and G.D. Emmitt). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: Review of observational requirements for global DWL winds (G.D. Emmitt). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: Adaptive targeting with a space-based DWL (G.D. Emmitt and R. Atlas). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: Update of LITE analyses of cloud and aerosol backscatter statistics (D. Winker and G.D. Emmitt). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: SPARCLE Science Team Meeting (G.D. Emmitt). Working Group on Space-based Lidar Winds, Key West, FL, January 19-22.

1999: Status of the NASA New Millennium Program. Presented for C. Raymond by G.D. Emmitt. Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: Status of wind lidar OSSEs at NCEP (G.D. Emmitt and R. Atlas). Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: SPARCLE: What happened, lessons learned, what next (T. Miller and G.D.

Emmitt). Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: Results of the ALADIN (ISS) impact study. Presented for W. Wergen et al. By G.D. Emmitt, Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: A notional hybrid DWL on the roadmap to an operational system (G.D. Emmitt). Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: Data requirements and specifications (G.D. Emmitt). Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: OSSEs and impact metrics definitions (G.D. Emmitt). Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: Benefits of a pre-data buy DWL demo mission (G.D. Emmitt). Working Group on Space-based Lidar Winds, Mt. Hood, OR, July 6-9.

1999: An overview of the potential space-based application of coherent Doppler lidar to measure the surface velocity of rivers (G.D. Emmitt). NASA-USGS Workshop on Remote Sensing of River Stage and Discharge, Herndon, VA, September 23-24.

1999: Airborne Doppler lidar observations of river transects (MACAWS) (G.D. Emmitt and J. Rothermel). NASA-USGS Workshop on Remote Sensing of River Stage and Discharge, Herndon, VA, September 23-24.

1998: SPARCLE mission science plan (G.D. Emmitt). NOAA Working Group on Space-based Lidar Winds, Key West, FL, January 20-22.

1998: Pointing knowledge: GPS/INS (G. Kamerman and G.D. Emmitt). NOAA Working Group on Space-based Lidar Winds, Key West, FL, January 20-22.

1998: Velocity error budget (G. Spiers and G.D. Emmitt). NOAA Working Group on Space-based Lidar Winds, Key West, FL, January 20-22.

1998: Simulated performance of SPARCLE and follow-on missions (G.D. Emmitt). NOAA Working Group on Space-based Lidar Winds, Key West, FL, January 20-22.

1998: Simulating coherent and direct detection DWLs for IPO OSSEs (G.D. Emmitt). NOAA Working Group on Space-based Lidar Winds, Key West, FL, January 20-22.

1998: The validation program. OSSEs (G.D. Emmitt). NOAA Working Group on Space-based Lidar Winds, Key West, FL, January 20-22.

1998: Calibration of the GPS/INS (G.D. Emmitt and G. Spiers). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1998: Cloud statistics from LITE and relevance to wind lidar performance (D. Winker and G.D. Emmitt). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1998: An approach to evaluating the merits of a hybrid technology Doppler wind lidar (G.D. Emmitt). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1998: Update of target atmospheres for use in DWL concept studies (S. Wood and G.D. Emmitt). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1998: Inverted quasi-conical partial VAD processing of MACAWS data taken during turns (G.D. Emmitt, S. Wood and S. Greco). NOAA Working Group on Space-Based Lidar
Winds, Boulder, CO, July 13-16.

1998: Update on recent OSSEs (R. Atlas, S. Wood and G.D. Emmitt). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1998: What is a useful wind measurement? (G.D. Emmitt). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1998: Review of the lidar working group data requirements (G.D. Emmitt). NOAA Working Group on Space-Based Lidar Winds, Boulder, CO, July 13-16.

1997: Status of performance simulations in support of the shuttle and NPOESS missions (G.D. Emmitt), NOAA Working Group on Space-based Lidar Winds, Daytona, FL, January 21-23.

1997: Issues related to the comparison of DWL technologies and the simulation of their performance (e.g., wallplug efficiences and beta vs. wavelength) (G.D. Emmitt), NOAA Working Group on Space-based Lidar Winds, Daytona, FL, January 21-23.

1997: Proposed role of OSSEs for CAMEX III (G.D. Emmitt), NOAA Working Group on Space-based Lidar Winds, Daytona, FL, January 21-23.

1997: Relevance of LITE data analysis to space-based DWL performance (G.D. Emmitt and D. Winker), NOAA Working Group on Space-based Lidar Winds, Northglenn, CO, July 15-17.

1997: Update on OSSEs for NPOESS and CAMEX III (G.D. Emmitt, S. Wood, L. Wood, and S. Greco), NOAA Working Group on Space-based Lidar Winds, Northglenn, CO, July 15-17.

1997: Status report on NASA's DWL shuttle mission -- The science/data perspective (G.D. Emmitt, S. Wood, and M. Kavaya), NOAA Working Group on Space-based Lidar Winds, Northglenn, CO, July 15-17.

1997: Issues related to DWL scanning, sampling and LOS co-processing (G.D. Emmitt, S. Wood, B. Rye), NOAA Working Group on Space-based Lidar Winds, Northglenn, CO, July 15-17.

1996: Use of MACAWS data to address issues related to a space-based DWL (G.D. Emmitt, S. Greco and J. Rothermel) Paper presented at the NOAA Working Group on Space-Based Lidar Winds, Daytona Beach, FL, February 6-9.

1996: Figures of Merit for DWL OSSEs (G.D. Emmitt and R. Atlas) Paper presented at the NOAA Working Group on Space-Based Lidar Winds, Daytona Beach, FL,February 6-9.

1996: Effects of wind shear on signal processing (G.D. Emmitt) Paper presented at the NOAA Working Group on Space-Based Lidar Winds, Daytona Beach, FL,February 6-9.

1996: Data volume issues for a 2□m small-sat mission (G.D. Emmitt and S.A. Wood) Paper presented at the NOAA Working Group on Space-Based Lidar Winds, Daytona Beach, FL, February 6-9.

1996: Preliminary cloud and cloud porosity statistics from LITE (G.D. Emmitt and D. Winker) Paper presented at the NOAA Working Group on Space-Based Lidar Winds, Daytona Beach, FL, February 6-9.

1995: Use of NASA/NOAA ground-based lidar data to evaluate several signal processing strategies (G.D. Emmitt) Paper presented at the NOAA Working Group on Space-based Lidar Winds, Clearwater, FL, January 31-February 2.

1995: Revised outlook for mid/upper tropospheric returns for a small-satellite wind lidar (G.D. Emmitt) Paper presented at the NOAA Working Group on Space-based Lidar Winds, Clearwater, FL, January 31-February 2.

1995: OSSEs in support of a small-satellite mission (G.D. Emmitt) Paper presented at the NOAA Working Group on Space-Based Lidar Winds, Clearwater, FL,January 31-February 2.

1995: Status of efforts by the U.S.A. Working Group on Space-Based Lidar Winds (G.D. Emmitt and W.E. Baker) Paper presented at the ESA Doppler Wind Lidar Workshop, Noordwijk, The Netherlands, September 20-22.

1993: Update on LAWS data simulations (G.D. Emmitt). Paper presented at the LAWS Science Team Meeting, January, Clearwater Beach, FL.

1993: Design considerations for a Quick LAWS (G.D. Emmitt). Paper presented at the LAWS Science Team Meeting, January, Clearwater Beach, FL.

1993: Update on ground-based lidar observations (G.D. Emmitt). Paper presented at the LAWS Science Team Meeting, January, Clearwater, FL.

1992: Simulated LAWS performance profiles (G.D. Emmitt). Paper presented at the LAWS Science Team Meeting, July, Cape Cod, MA.

1992: LAWS power budget simulations (G.D. Emmitt). Paper presented at the LAWS Science Team Meeting, July, Cape Cod, MA.

1992: Review of mission science objectives for LAWS (G.D. Emmitt). Paper presented at the LAWS Science Team Meeting, July, Cape Cod, MA.

1991: LAWS, a career in global transports. Seminar given at Florida State University, Tallahassee, FL, January 14-18.

1990: Shot management for LAWS. LAWS Simulation Workshop, March, Goddard Space Flight Center, Greenbelt, MD.

1990: Optimal scanning pattern in partly cloudy regions. LAWS Science Team Meeting, August 1-3, Boulder, CO.

1990: Optimal sampling strategies for space-based laser wind sounders. Seminar at Laboratoire de Météorologie Dynamique, June 8, Ecole Polytechnique, Palaiseau, France.

1990: Preliminary estimates of LAWS global observation opportunities below 15 km. GLOBE Meeting, March 7-8, Huntsville, AL.

1990: Optimal sampling strategies in partly cloudy regions for space-based laser wind sounders. Seminar at Laboratoire de Météorologie Dynamique, Ecole Normal Supérieure, September, Paris, France.

1990: Role of OSSEs in the design of a space-based lidar wind sounder. Seminar at European Center for Medium Range Forecasts, September 4, Reading, England.

1989: LAWS - Can it provide more than just winds? Seminar at NASA Langley Research Center, Hampton, VA, October.

1987: Windstorms: site-specific risk assessment. American International Group's Fall 1987 Seminar on Geophysical Hazards, New York, N.Y., December.

1980: Nocturnal boundary layer measurements made with a tethered balloon. SESAME 1979 Data Users Workshop, January, Boulder, CO.

1979: Seminar on hail suppression and its implications. Departmental Seminar, University of Virginia, April.

1977: Use of direct and indirect estimates of cumulus transports to estimate total active cloud cover. Seminar paper given at MPI fur Meteorologie, Hamburg, West Germany.

1977: Elected to present final report of the GATE Workshop Boundary Layer Group at the International Conference on the energetics of the tropical atmosphere, Tashkent, U.S.S.R., September; report published in proceedings of the conference.

1977: Invited participant at the GATE summer workshop (3 papers), Boulder, Colorado, July 29-August 12.

1977: Technical aspects of tethered balloon operations. Seminar paper given at the Danish Atomic Energy Laboratories, RISϕ, Denmark.

1977: Cumulus convection below cloud base. Seminar paper given at the Danish Atomic Energy Laboratories, RISϕ, Denmark.

1976: Tropical cumulus activity below cloud base. Seminar paper given at MPI fur Meteorologie, Hamburg, West Germany.

1974: Opportunities for physicists in a Department of Environmental Sciences (G.D. Emmitt). Given at Eastern Nazarene College, Wollaston, MA.

RESEARCH

Principal Investigator: NOAA's Integrated Program Office's (IPO) feasibility study for hybrid Doppler wind lidars

Principal Investigator: NOAA's IPO observing system simulation experiments for space-based DWLs

Principal Investigator: NOAA's IPO targeted observing strategies for wind lidars

Principal Investigator: NOAA's IPO calibration/validation plan for space-based DWLs

Principal Investigator: NOAA's IPO twin otter Doppler wind lidar (TODWL) for cal/val strategy development

Principal Investigator: NASA LaRC, Modification of the Doppler lidar simulation model

Principal Investigator: Provincial Energy Ventures Dust Suppression System Design

Principal Investigator: NASA GSFC – GTWS Science Definition efforts

Principal Investigator: Storm top divergence studies using the LAWS, NASA/Marshall Space Flight Center.

Principal Investigator: Cloud top and planetary boundary layer wind measurements using a space-based lidar, SBIR, U.S. Air Force.

Principal Investigator: Simulation experiments to assess LAWS' impact on global climate change modeling, NASA.

Principal Investigator: Vertical velocity structures significant to space-based and ground- based lidar anemometry, CNES, France.

Principal Investigator: Norfolk Southern Rail Study.

Co-Principal Investigator: Interdisciplinary research scenario - Version Ø, NASA.

Principal Investigator: EOS Laser atmosphere wind sounder (LAWS) investigation, NASA.

Principal Investigator: Space-based Doppler lidar sampling strategies -- algorithm development and simulated observation experiments, NASA.

Principal Investigator: PLACEM, Pier IX Terminal Company/Shell Mining.

Principal Investigator, Interdisciplinary research scenario - Version 0, NASA.

Principal Investigator, Airborne/space-based Doppler lidar wind sounders: Sampling the PBL and other regions of significant B and u inhomogeneities, NASA.

Principal Investigator, Lidar mapping of cloud tops and cloud top winds, SBIR, AFGL.

Principal Investigator: Tropospheric wind observations with Doppler lidars: SPARCLE and follow-on missions, NASA.

Principal Investigator: CAMEX-3, NASA.

Principal Investigator, DTA Pile Moisture Modeling project.

Fugitive coal dust emission project at Elk Run Coal Company

Fugitive coal dust emission project for Norfolk Southern

Design of Procontrol System for SINCOR, Jose, Venezuela

EMMITT EXHIBIT 2

EXHIBIT 2
IS HIGHLY CONFIDENTIAL

EMMITT EXHIBIT 3

EXHIBIT 3
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REFERENCE CD